



# C305- Eastern Running Tunnels

## Close Out Report for London Underground to Whitechapel LU/27

CRL Document Number: C305-DSJ-C2-RGN-CRG03-50403

Supplier Document Number:

Contract MDL reference C08.079

### 1. Contractor Document Submittal History:

Revision:	Date:	Prepared by:	Checked by:	Approved by:	Reason for Issue:
2.0	13-06-16	[Redacted]	[Redacted]	[Redacted]	For Approval

### 2a. Stakeholder Review Required? YES NO

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

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: [Redacted] Role: [Redacted] Name: [Redacted] Date: 22/6/16  
 Sign: \_\_\_\_\_ Role: \_\_\_\_\_ Name: \_\_\_\_\_ Date: \_\_\_\_\_

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

Stakeholder Organisation	Job Title	Name	Signature	Date	Acceptance
					<input type="checkbox"/>

### 3. Acceptance by Crossrail:

		<b>Crossrail Review and Acceptance Decal</b>	
This decal is to be used for submitted documents requiring acceptance by Crossrail.			
<input checked="" type="checkbox"/>	Code 1.	Accepted. Work May Proceed	
<input type="checkbox"/>	Code 2.	Not Accepted. Revise and resubmit. Work may proceed subject to incorporation of changes indicated	
<input type="checkbox"/>	Code 3.	Not Accepted. Revise and resubmit. Work may not proceed	
<input type="checkbox"/>	Code 4.	Received for information only. Receipt is confirmed	
[Redacted]	Print Name:	[Redacted]	Date: 23/06/16
[Redacted]	Position:	[Redacted]	

Acceptance by Crossrail does not relieve the designer/supplier from full compliance with their contractual obligations and does not constitute Crossrail approval of design, details, calculations, analyses, test methods or materials developed or selected by the designer/supplier

**Close Out Report for London Underground To Whitechapel  
LU/27**

**C305 Crossrail Eastern Running Tunnels**

This Statement is the intellectual property of GEOCISA and is part of the Management, Environment and Quality System of the same Company.

**Current Version of the Documents & Signatures :**

Revision:	Date:	Prepared by:	Checked by:	Engineering Approved by:
2.0	13-06-16	[Redacted]	[Redacted]	[Redacted]

**Document History :**

Revision:	Date:	Prepared by:	Checked by:	Engineering Approved by:
1.0	23-05-16	[Redacted]	[Redacted]	[Redacted]

CONTENTS

1.	CLOSE OUT REPORT PURPOSE .....	4
2.	LOCATION OF THE WORKS.....	4
3.	DOCUMENTATION SUMMARY .....	5
4.	SUMMARY OF INSTRUMENTATION .....	5
5.	C305 CONSTRUCTION ACTIVITIES .....	5
6.	SUMMARY OF C704 DATA .....	6
7.	C305 MANUAL VERIFICATION READINGS .....	17
8.	SUMMARY.....	19

APPENDIX A: DECOMMISSIONING AGREEMENT

APPENDIX B: LEVELLING MARKS

## 1. CLOSE OUT REPORT PURPOSE

The purpose of this close out report is to summarise the ground movements related to C305 construction activities based on data obtained from both, the C704 automatic monitoring system and C305 manual verification data. This report incorporates the existing C704 decommissioning agreement for this asset (C704 Instrumentation Decommissioning Agreement London Underground Whitechapel (C704-XRL-C-AAG-D061-50002) whereby any ground movements detected by the C704 monitoring system are shown to be at an acceptably low settlement rate and proposes to decommission the monitoring system.

To provide a summary of the effects of C305 construction activities on the asset, the C305 manual verification readings have been reviewed alongside the C704 automatic monitoring system for completeness. This report has been produced to close out the C305 monitoring requirements in connection with this asset.

## 2. LOCATION OF THE WORKS

This document covers the extent of the District line tunnel and assets between LU Whitechapel and Stepney Green stations. The Crossrail works are carried out adjacent to and underneath the Whitechapel London Underground station and Hammersmith & City and District Line rail assets. The monitored section extends from project chainage 79945 to 79755 and is identified in Figure 1. The Hammersmith & City and district line tunnel has an east to west orientation, and will be affected by the construction of the new Crossrail Whitechapel Station and running tunnels from Whitechapel Station to Stepney Green shaft.



Figure 1. Aerial photograph of Whitechapel LU Station and Hammersmith and City and District Line Route. Red lines denote the work area.

### 3. DOCUMENTATION SUMMARY

CROSSRAIL NUMBER	DOCUMENT NAME	REASON FOR ISSUE
C701-ITM-C-RGN-D061-50001	C701 Installation Report for LU/27	Installation report
C122-OVE-C2-RGN-D061-50020	Instrumentation & Monitoring Plan for LU Infrastructure	I&M Plan
C704-XRL-C-AAG-D061-50002	C704 Instrumentation Decommissioning Agreement London Underground Whitechapel	Decommissioning Agreement
C122-OVE-C2-RGN-CRG01-50097	LU/27 Met line east of Whitechapel station	Asset Specific Baseline Report

### 4. SUMMARY OF INSTRUMENTATION

The total numbers of instruments covered in this report are:

- 217 No. prisms on eastbound track, 6ft rail (See Appendix A).
- 217 No. prisms on eastbound track, cess rail (See Appendix A).
- 217 No. prisms on westbound track, cess rail (See Appendix A).
- 218 No. prisms on westbound track, 6ft rail (See Appendix A).
- 146 No. prisms on structures in the eastbound tunnel (See Appendix A).
- 106 No. prisms on structures in the westbound tunnel (See Appendix A).
- 800 No. levelling marks on the track (See Appendix B).

### 5. C305 CONSTRUCTION ACTIVITIES

#### TBM passage

Drive Y Running Tunnel Construction	Rings	Date
Eastbound (EB) Tunnel Boring Machine (TBM) Passage	2835 - 2895	11.01.2014 – 14.01.2014
Westbound (WB) Tunnel Boring Machine Passage	2875 - 2960	27.03.2014 – 03.04.2014

#### Stoppage period

Westbound Drive-Y                      Ring 2904 (Project chainage 79841)                      29/03/2014 to 31/03/2014

The periods of TBM passage and stoppage are related to the rings located close to the instrumentation included in this close out report.

## 6. SUMMARY OF C704 DATA

Below is a table of the summarised ground movements from the readings from the C704 system using the prisms installed in the structure and located above the centre of the running tunnel alignment.

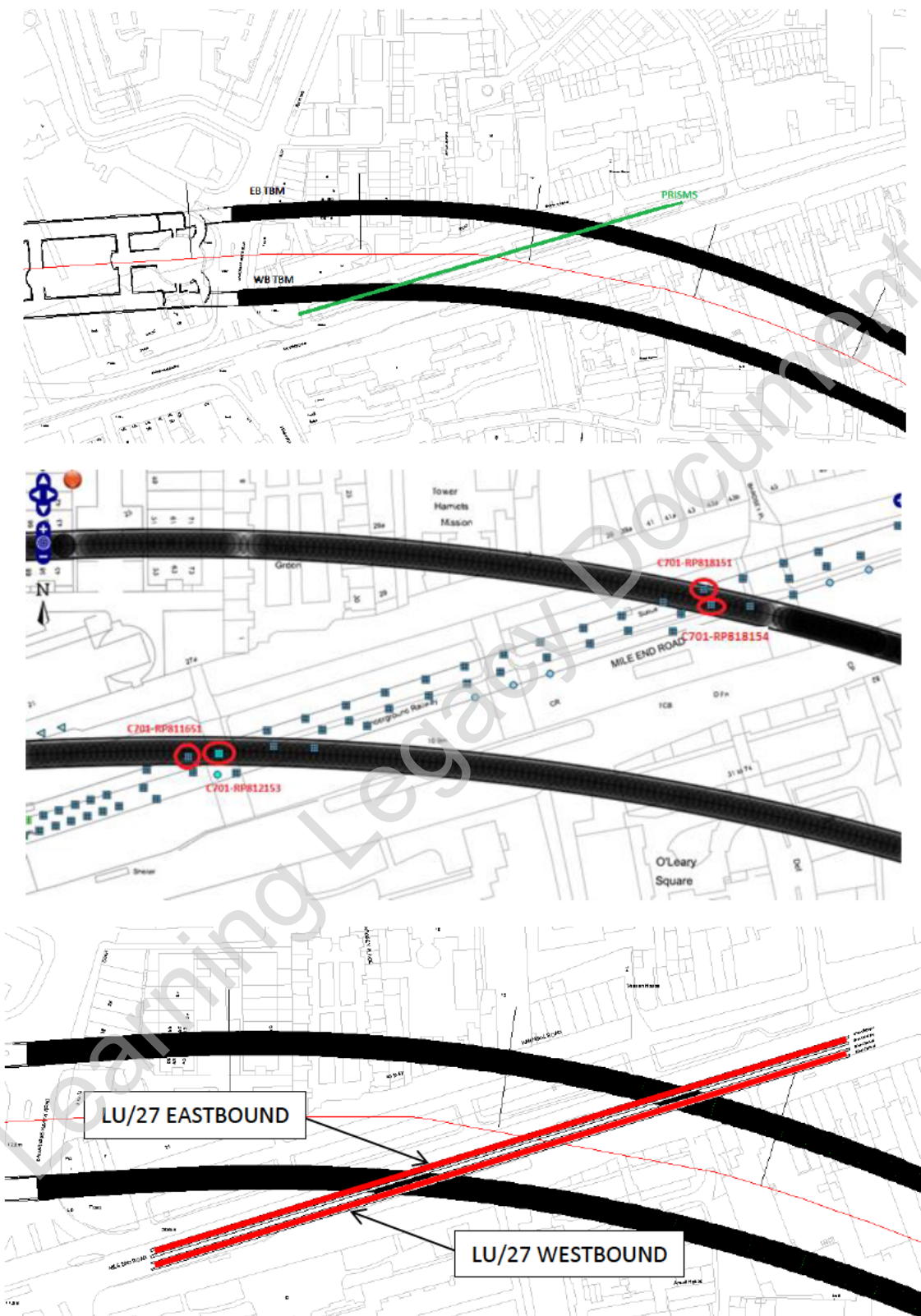
Activity	X Horizontal displacement (mm)			
	EASTBOUND TBM		WESTBOUND TBM	
	C701-RP818151	C701-RP818154	C701-RP811651	C701-RP812153
EB TBM Drive	-1	0	0	0
WB TBM Drive	0	0	0	0
Total displacement	-1	0	0	0

Activity	Y Horizontal displacement (mm)			
	EASTBOUND TBM		WESTBOUND TBM	
	C701-RP818151	C701-RP818154	C701-RP811651	C701-RP812153
EB TBM Drive	1	0	0	0.5
WB TBM Drive	0	0	0	2
Total displacement	1	0	0	2.5

Activity	Maximum Settlement (mm)			
	EASTBOUND TBM		WESTBOUND TBM	
	C701-RP818151	C701-RP818154	C701-RP811651	C701-RP812153
EB TBM Drive	-3	-4	-0.5	-0.5
WB TBM Drive	-1	-1.5	-3.5	-2.5
Total settlement	-4	-5.5	-4	-3

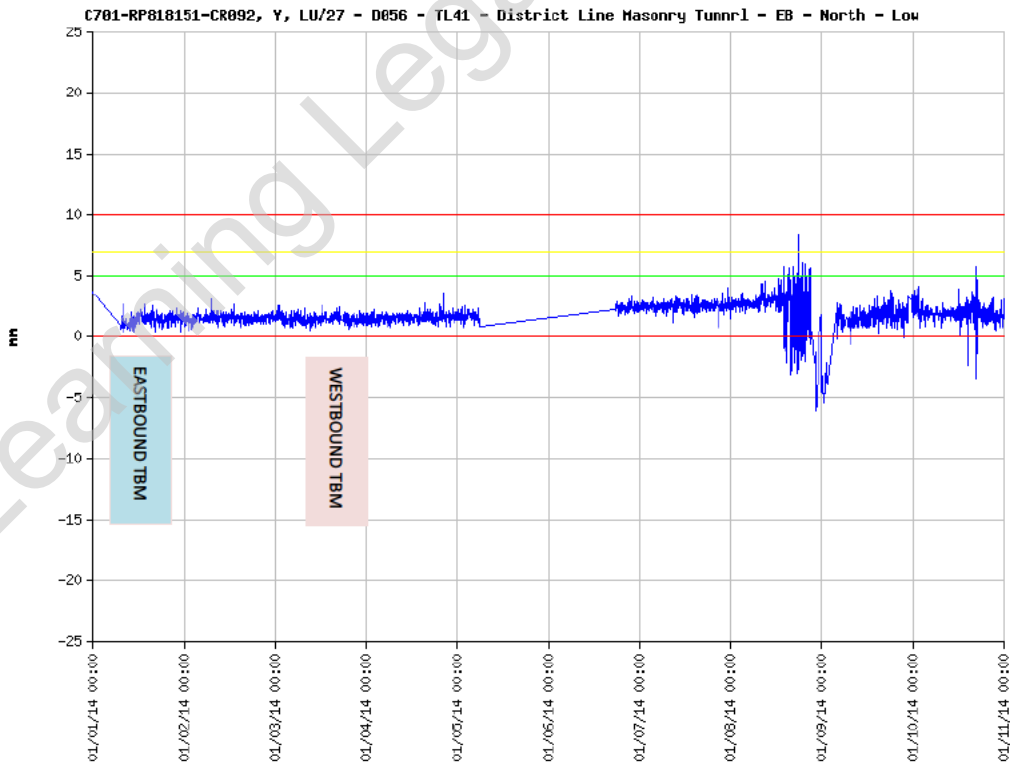
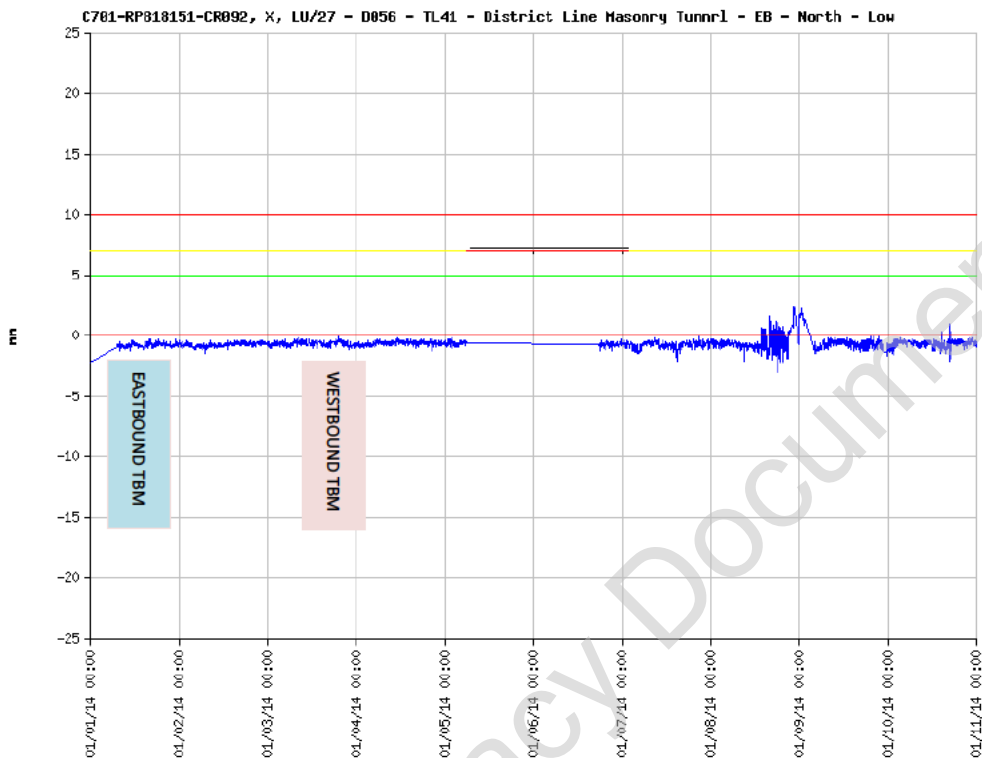
The report summarizes the C305 works in line with the C704 report and focuses on the primary movement of settlement.

The sketch below shows the location of the prisms on the assets.

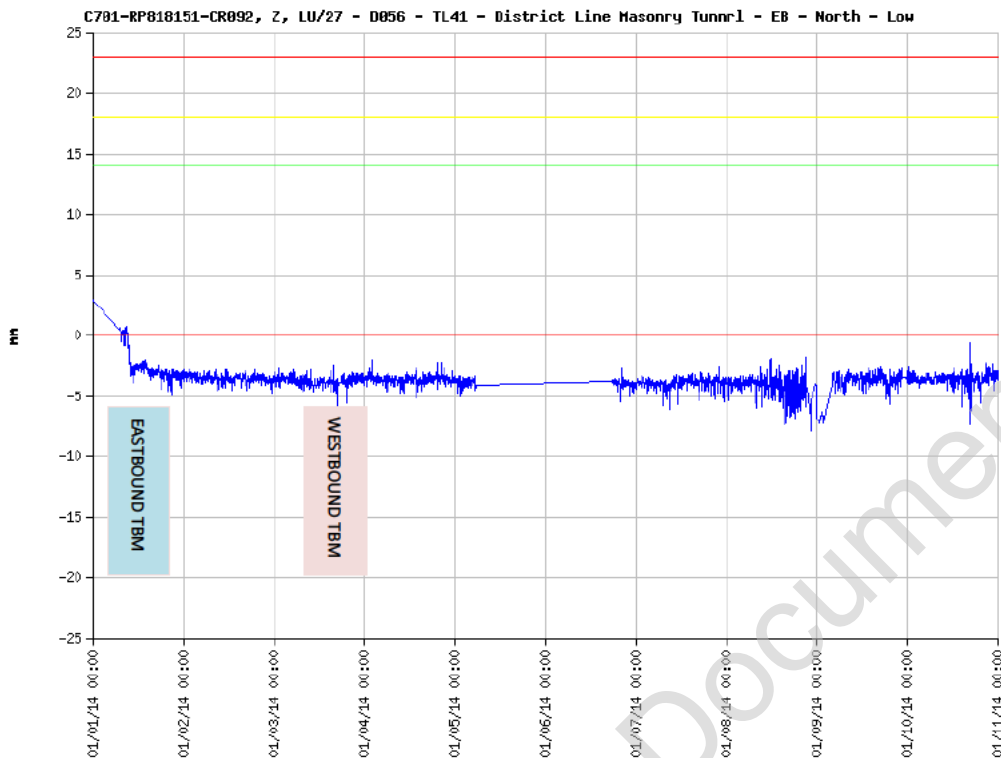


The graphs below show the automatic readings including the construction activities for each location of the prisms.

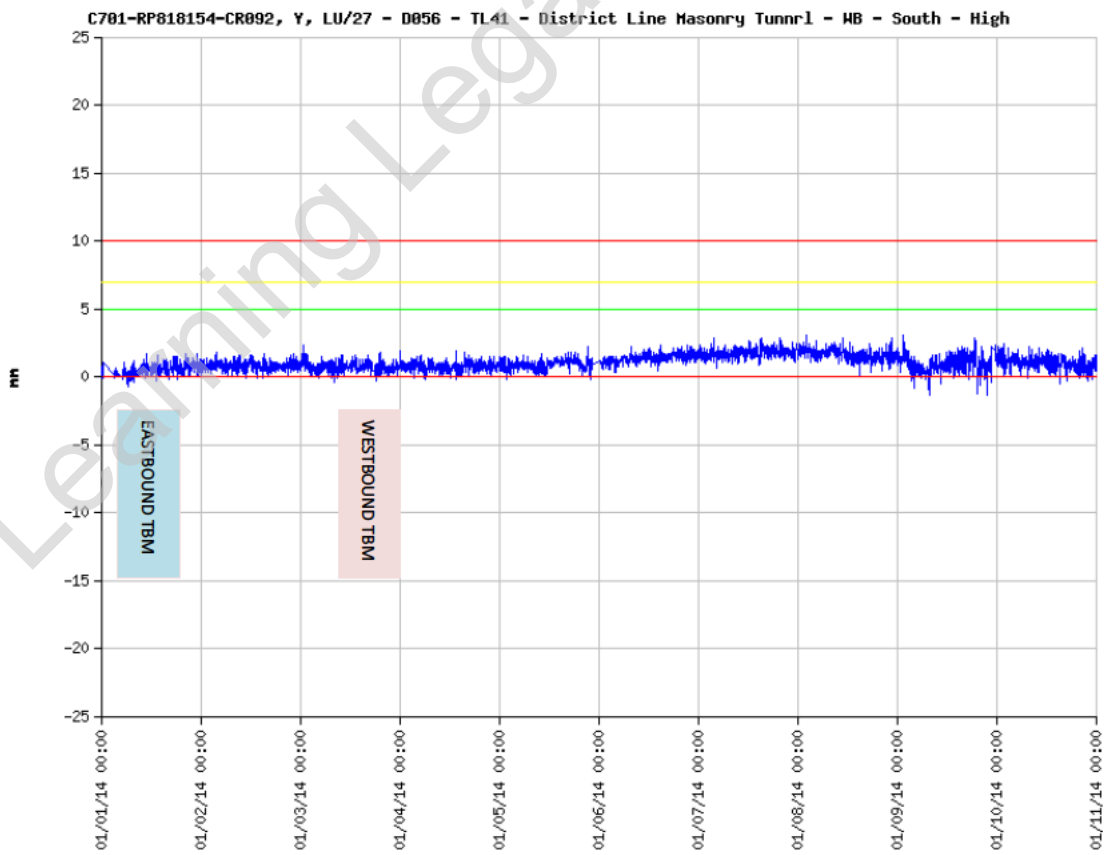
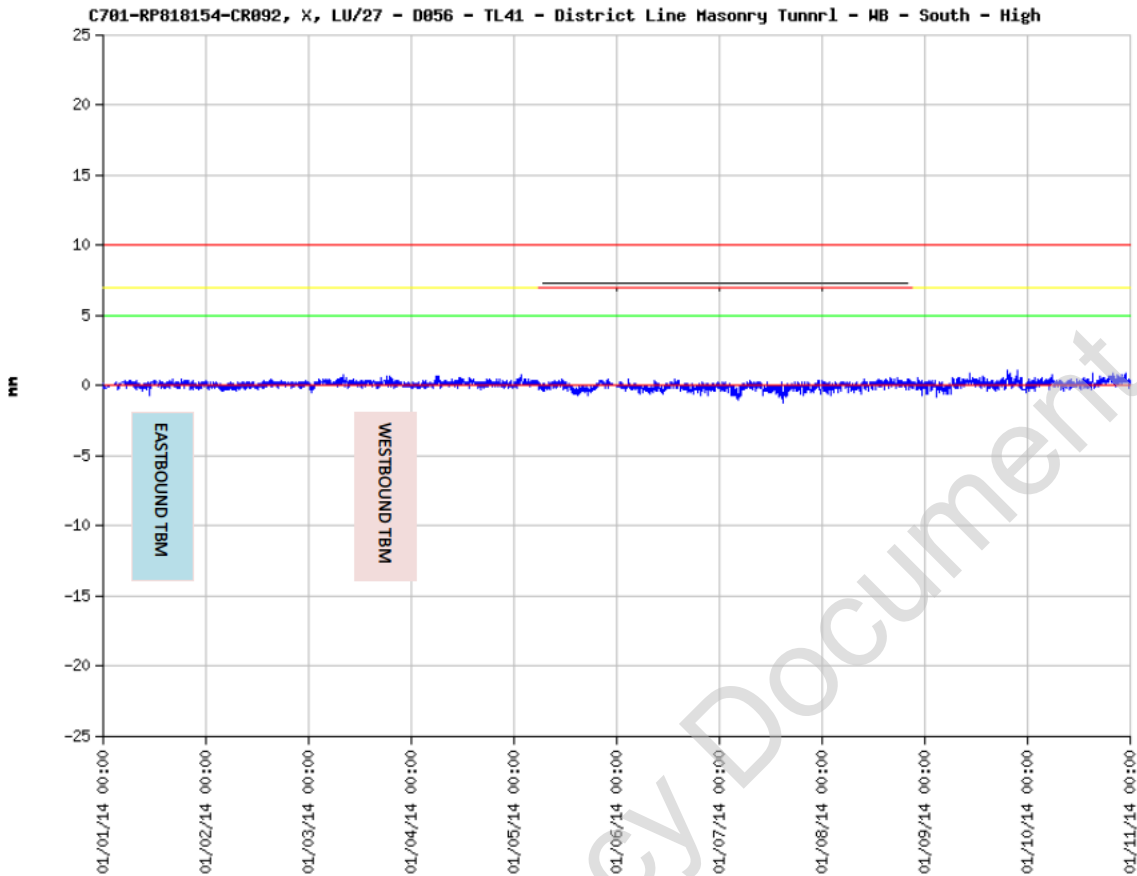
PRISMS EASTBOUND TBM C701-RP818151, C701-RP818154

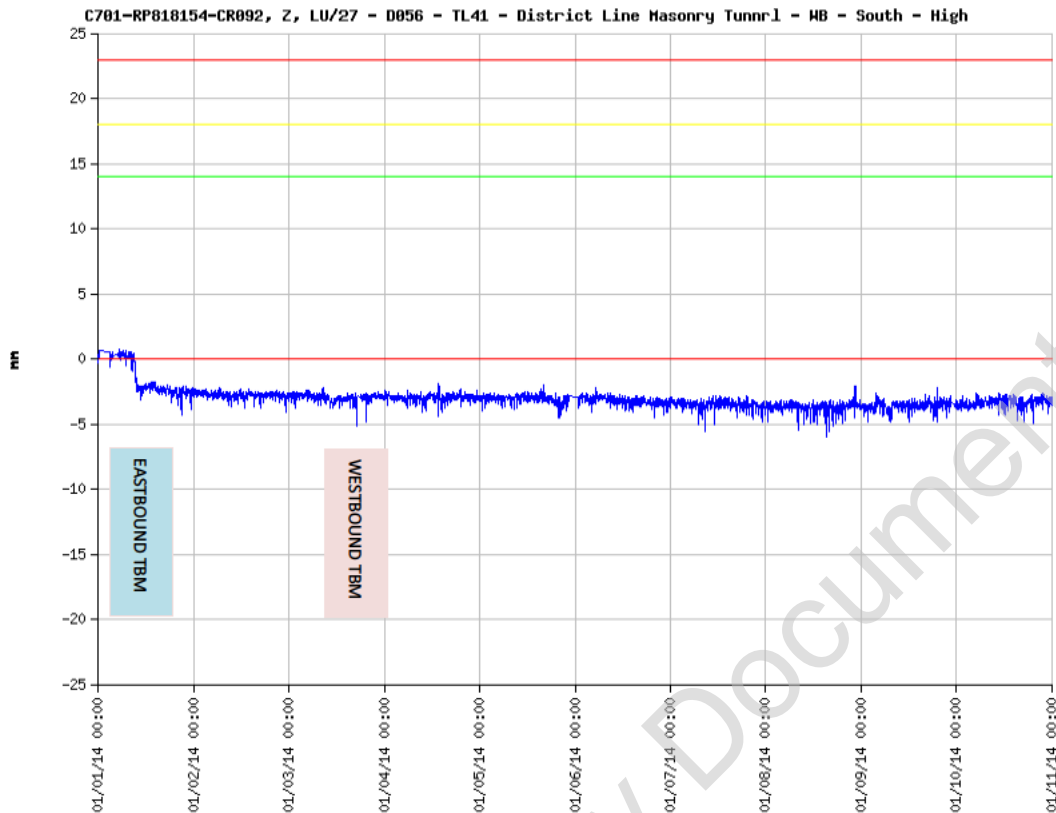




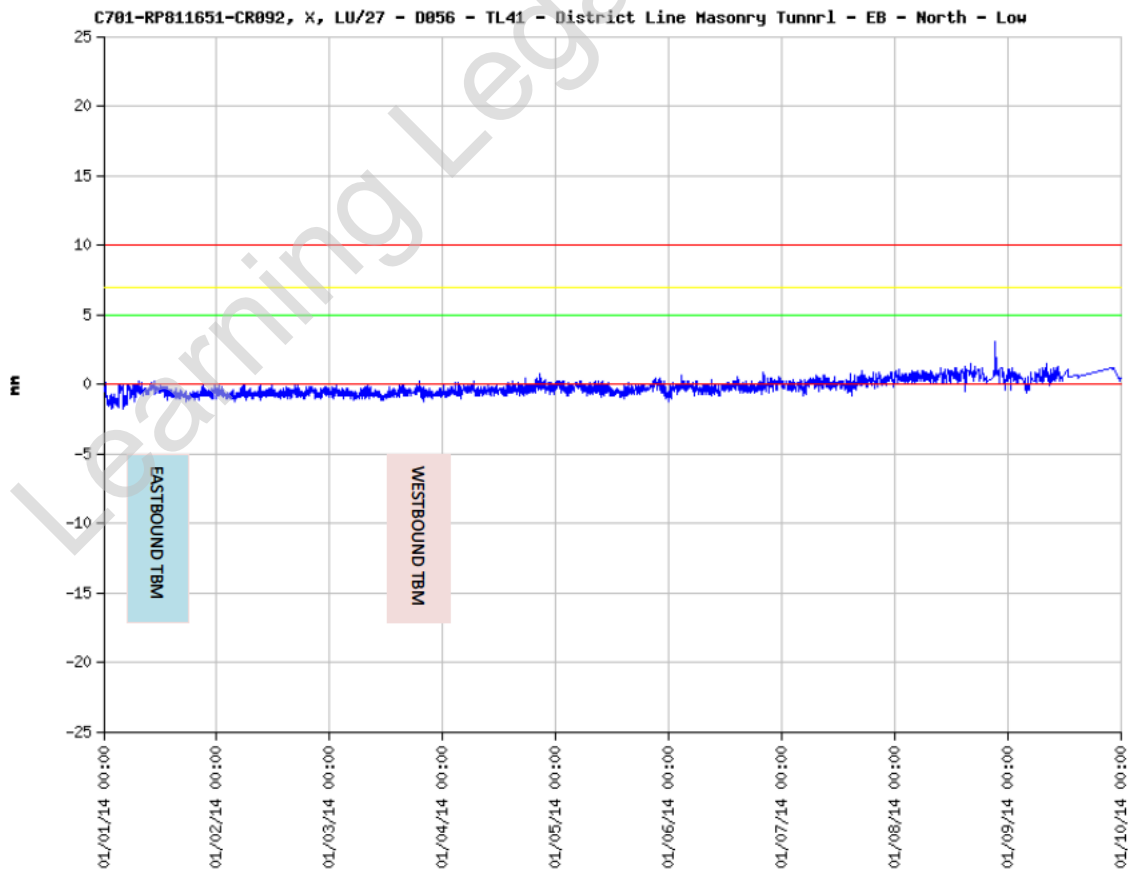


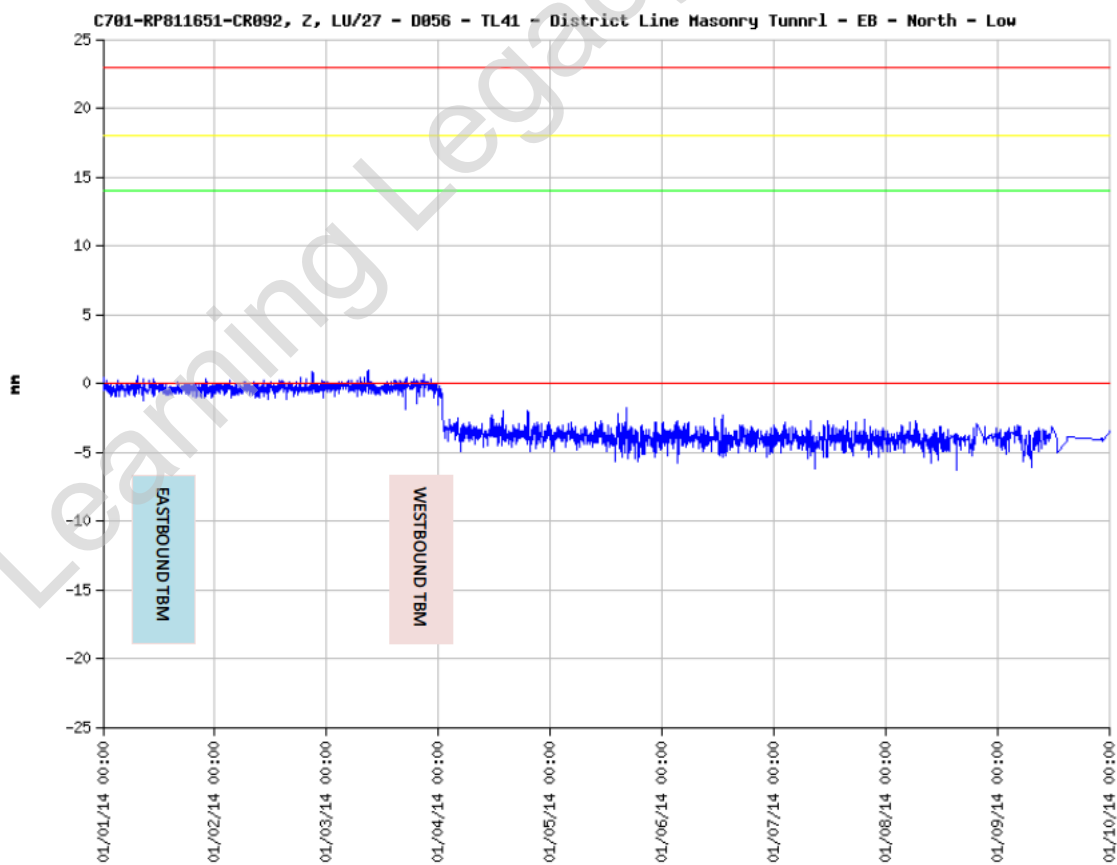
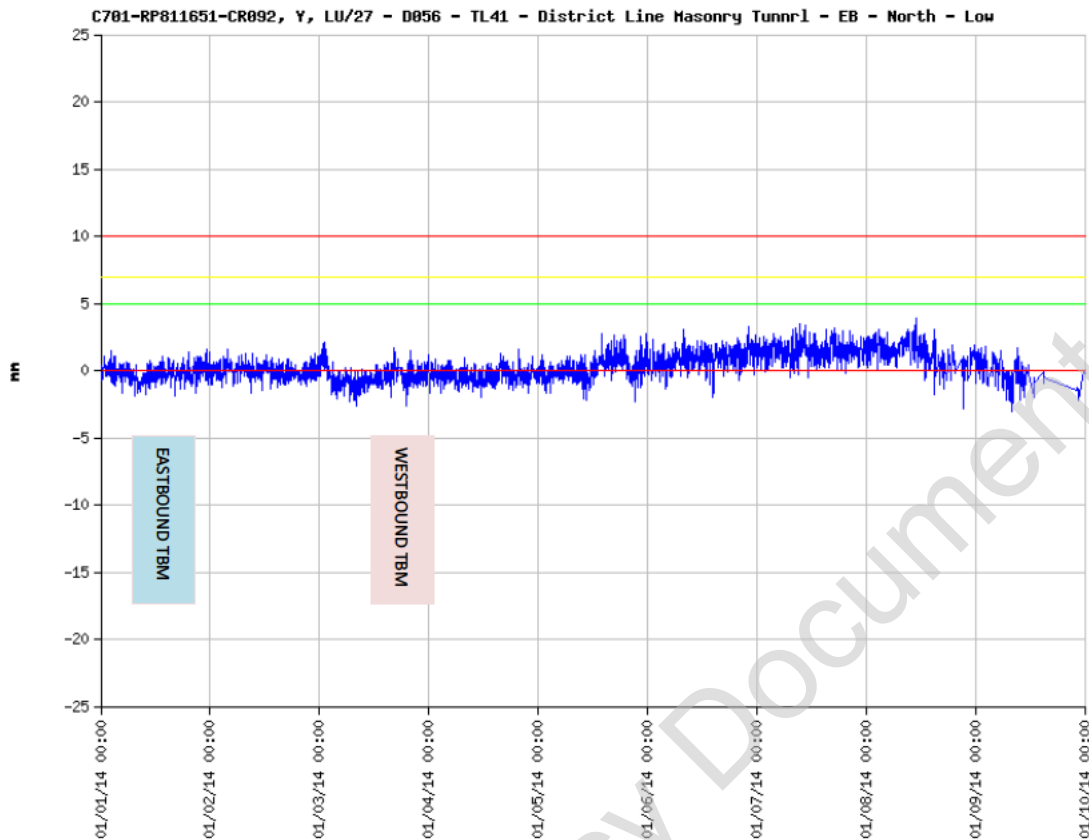
It should be noted for the gaps in monitoring data displayed between early May to late June there is no specific explanation provided by C704.

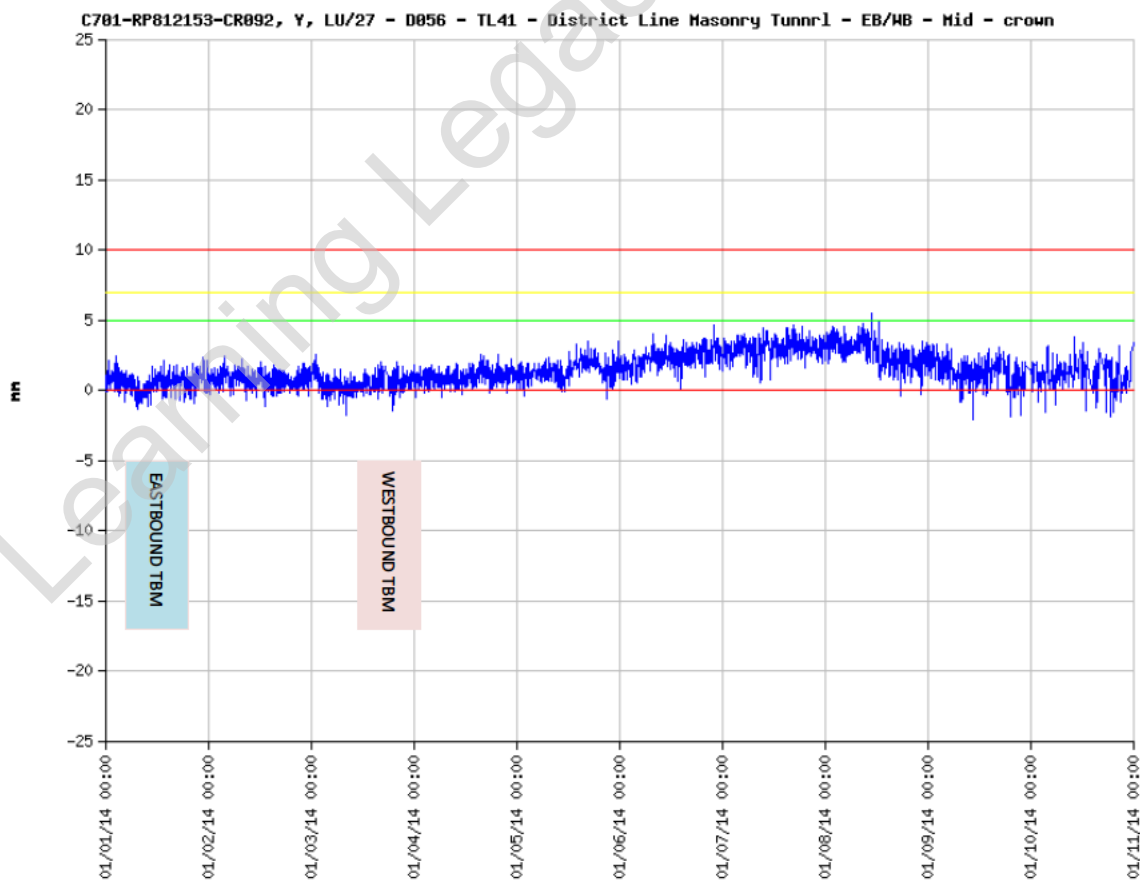
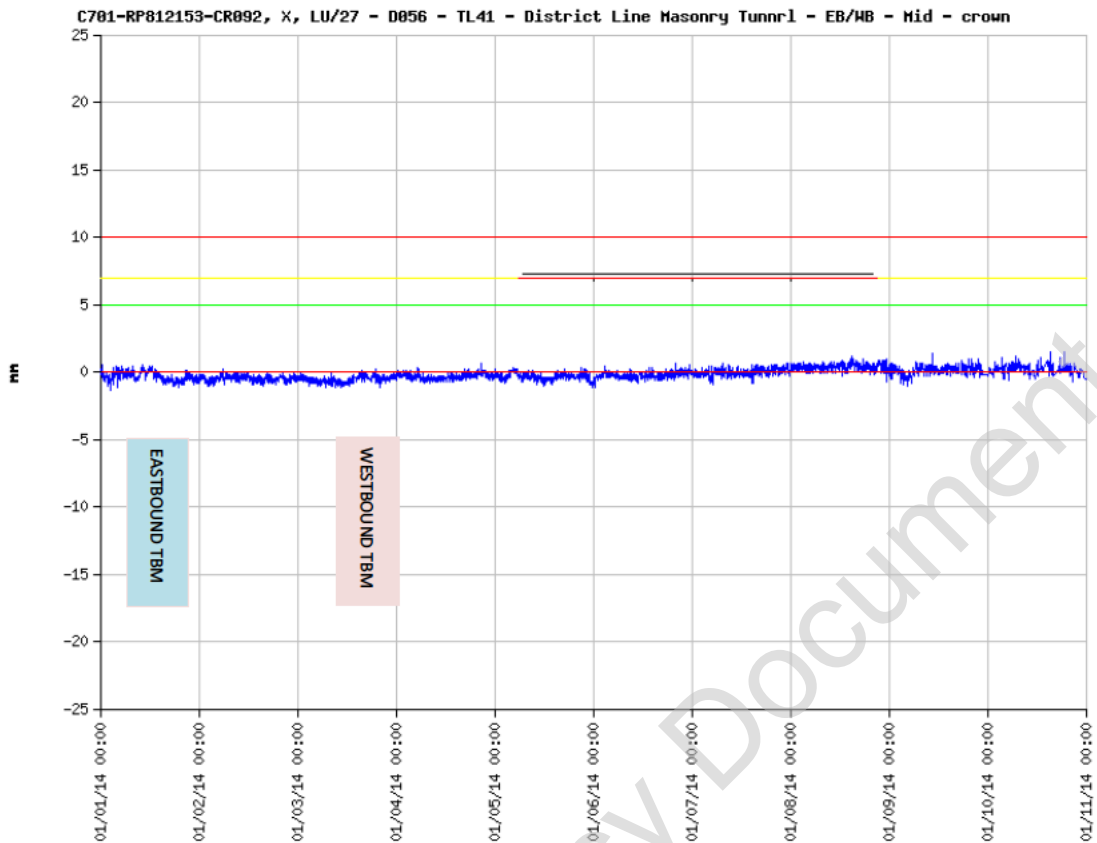


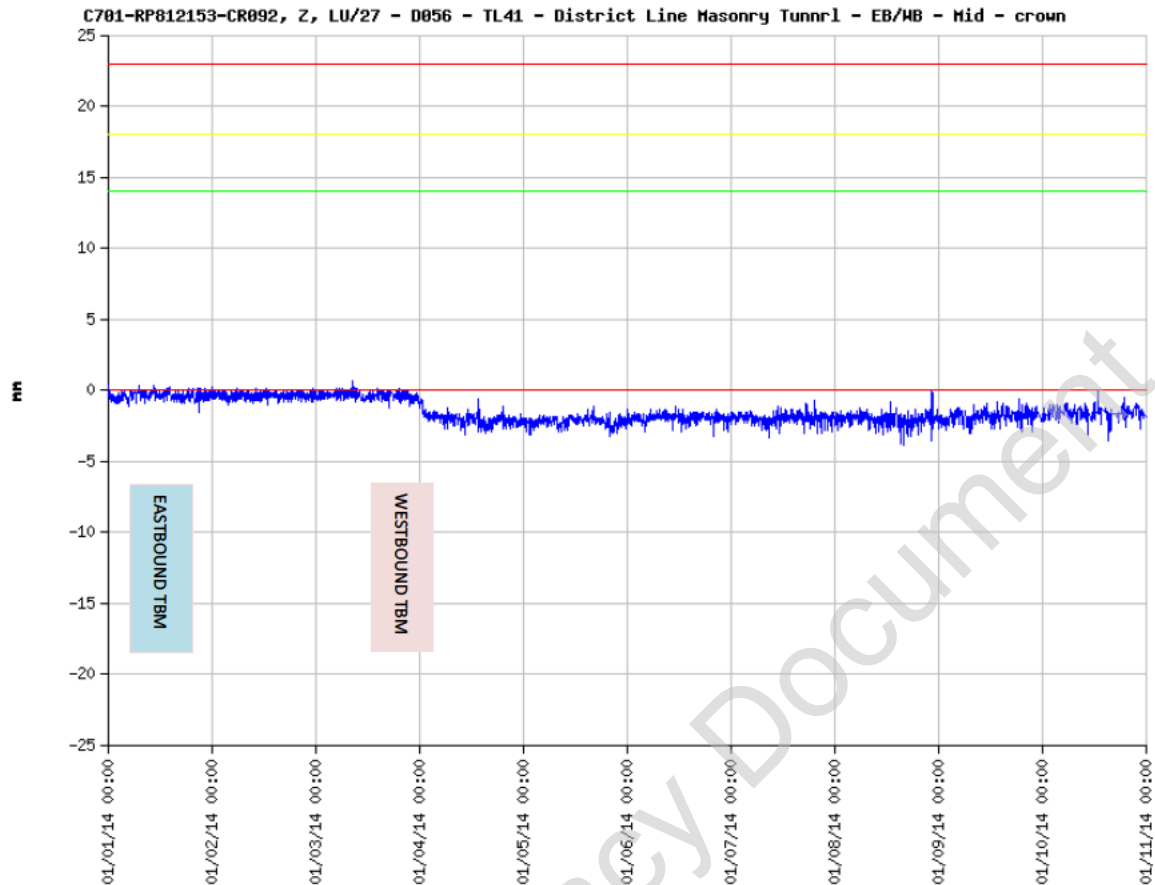


PRISMS WESTBOUND TBM C701-RP811651, C701-RP812153







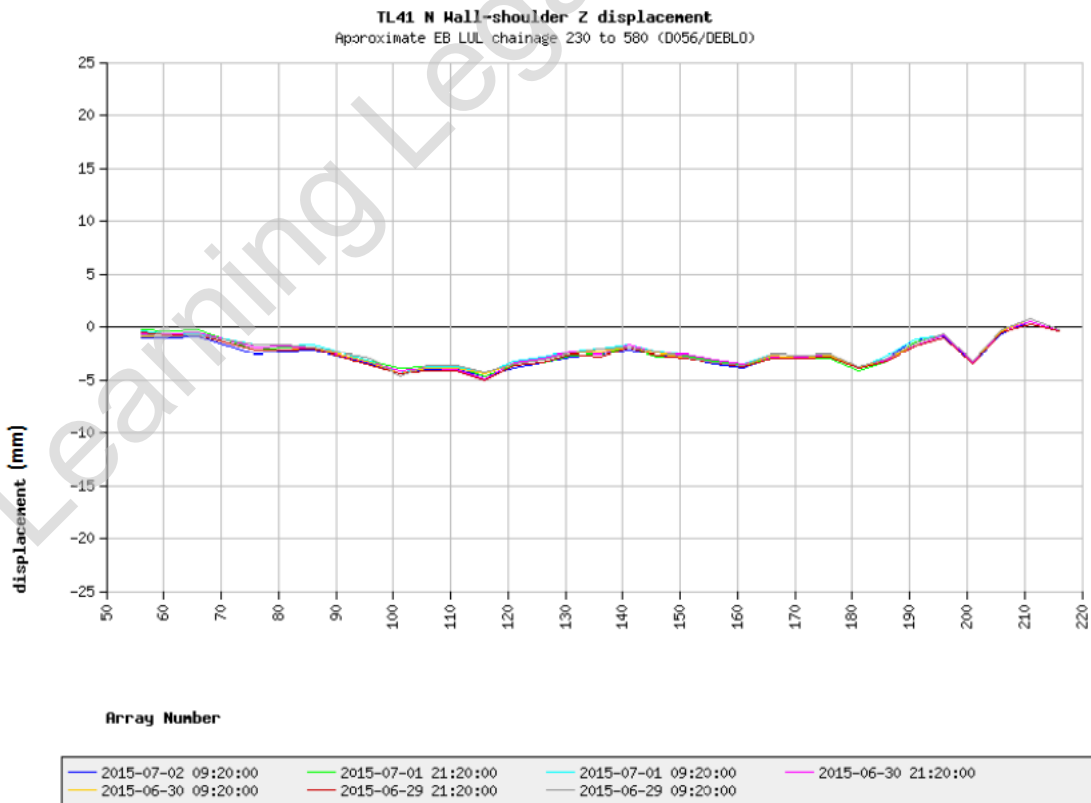
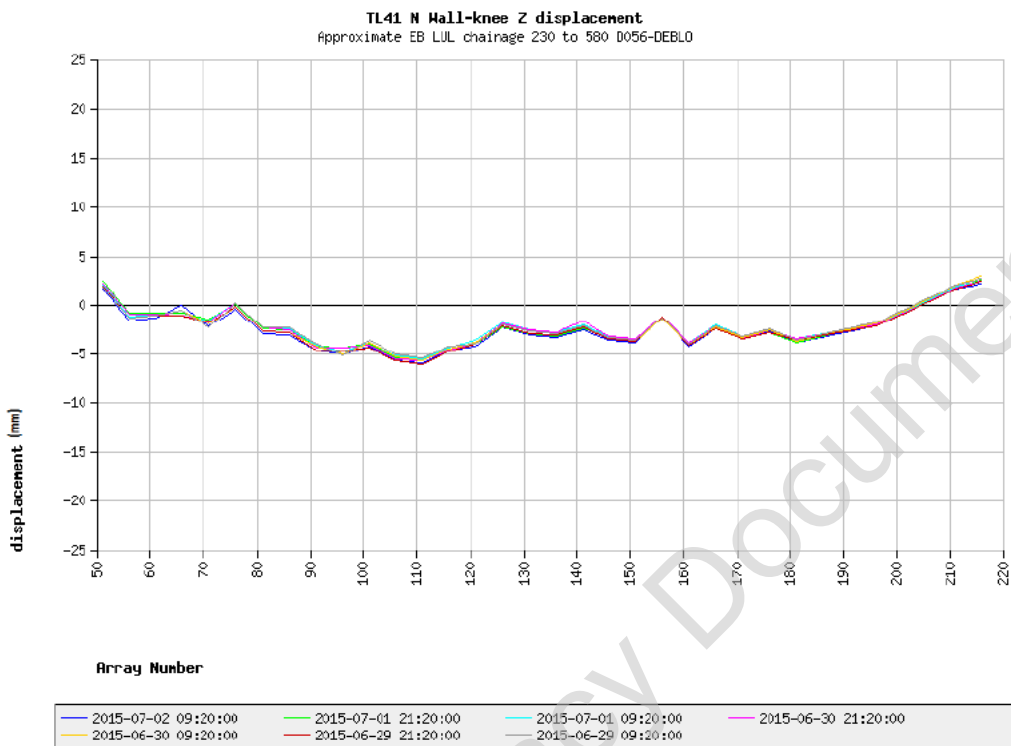


The information on the trigger values displayed in the graphs above is not comprehensive. Monitoring frequencies and trigger values were specified in: Design Consultant Framework Contract C122-Bored Tunnels; Instrumentation and Monitoring Plan: LU/27 District Line between Whitechapel and Stepney Green (C122-OVE-C2-RGN-D061-50020) where it states that the vertical settlement(mm) is 14 green, 18 amber and 23 red and the horizontal displacement (mm) is  $\pm 5$  green,  $\pm 7$  amber and  $\pm 10$  red.

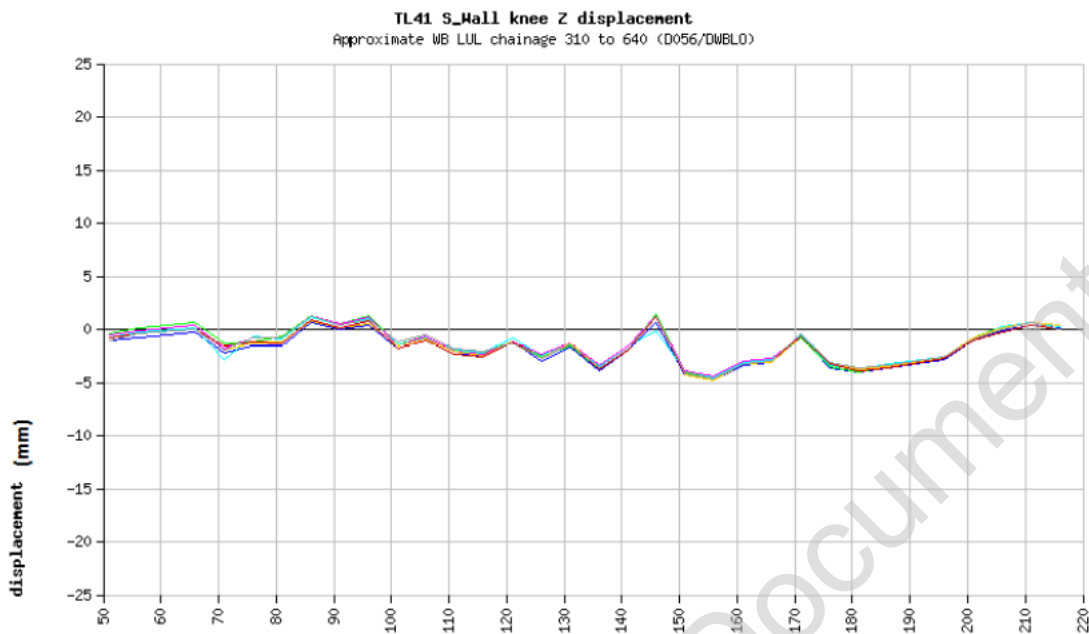
The graphs above show that amber trigger values for these instruments were not exceeded.

Vertical movement profiles (North and South wall) are shown below:

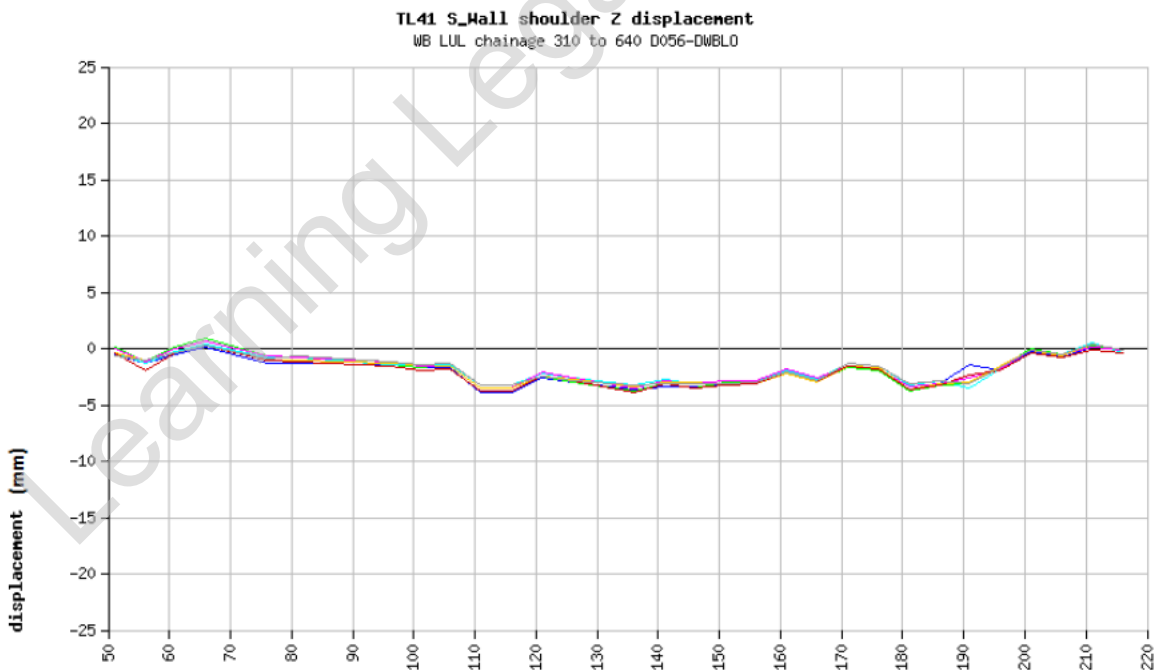
**NORTH WALL**



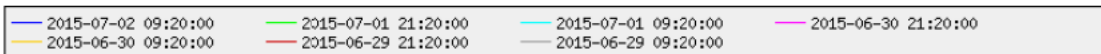
SOUTH WALL



Array Number



Array Number





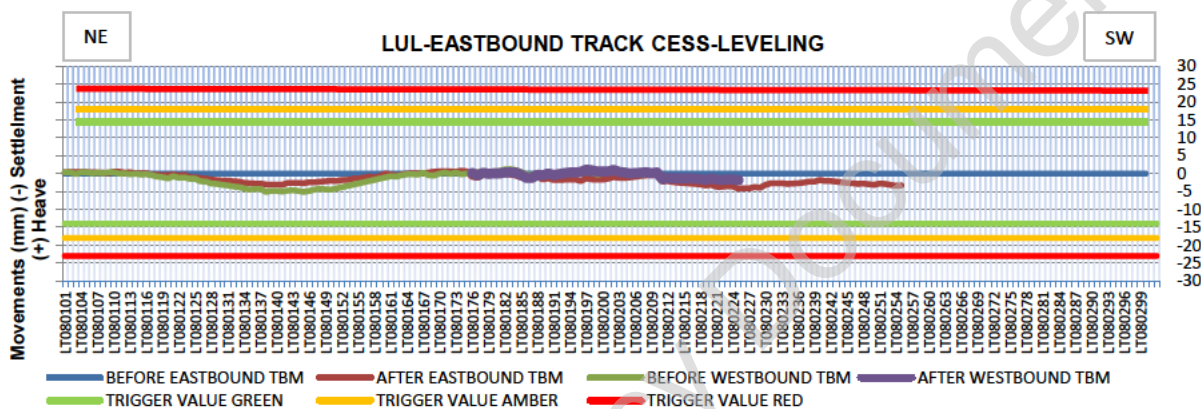
## 7. C305 MANUAL VERIFICATION READINGS

During the passage of the TBMs, manual readings were taken to verify the data provided from the C704 system was accurate and reliable.

### TRACK LEVELLING EASTBOUND TBM

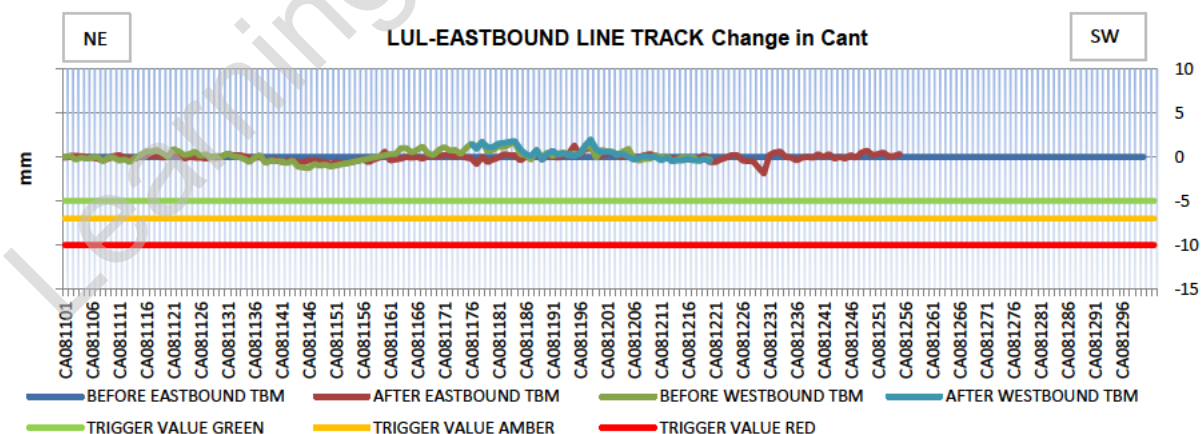
The following profiles of monitoring points run parallel to TBM alignment.

#### SETTLEMENT

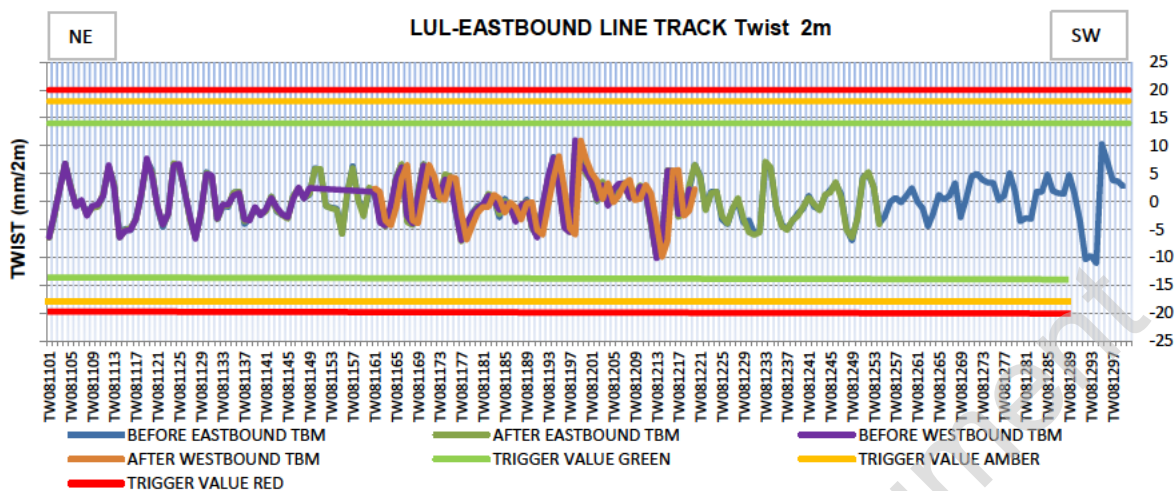


There was a maximum settlement of approximately 3mm after the Eastbound TBM passage, the maximum settlement after the Westbound TBM passage was almost 2mm. The total maximum settlement after both TBM transits was approximately 5mm.

#### CHANGE IN CANT



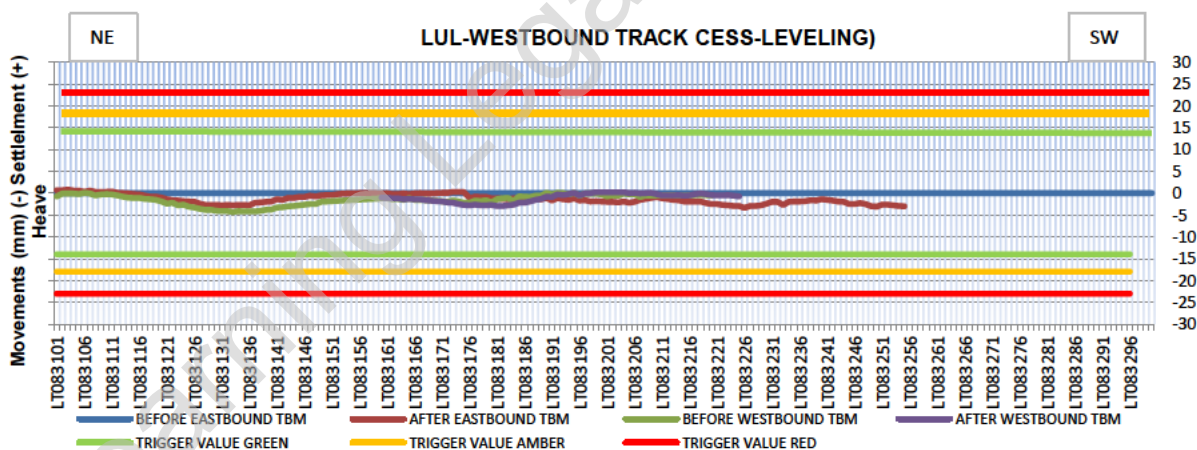
TWIST



No significant changes of twist and change in cant have been registered.

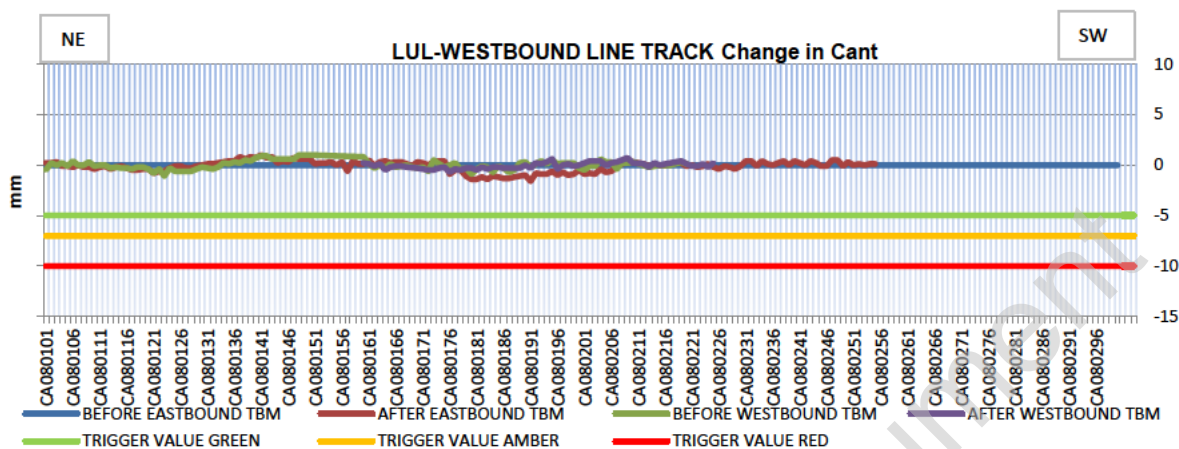
TRACK LEVELLING WESTBOUND TBM

SETTLEMENT

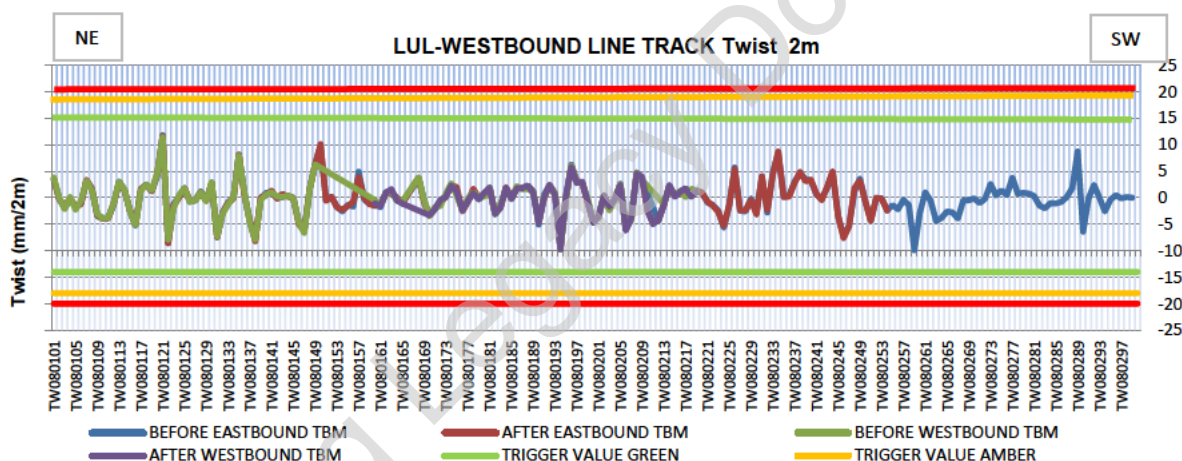


There was a maximum settlement of approximately 3mm after the Eastbound TBM passage, the maximum settlement after the Westbound TBM passage was almost 2mm, and the total maximum settlement after the both TBM transits was approximately 5mm.

## CHANGE IN CANT



## TWIST



No significant changes of twist and change in cant were detected.

Trigger values shown on the graphs are as per C122 I&M Plan (C122-OVE-C2-RGN-D061-50020). As can be seen all movements were within the trigger values specified.

## 8. SUMMARY

The review of both the C305 manual verification data and the C704 automatic system data concludes that the impact of C305 works was within the predictions as per trigger values specified in the C122 I&M plan. The assessment concluded in the document: "C704 Instrumentation Decommissioning Agreement London Underground Whitechapel "C704-XRL-C-AAG-D061-50002" states the long term ground movements have reached an acceptably small rate, and proposes to decommission the automatic system and that manual monitoring should cease.

Learning Legacy Document

**APPENDIX A:**  
**DECOMMISSIONING AGREEMENT**


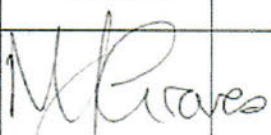
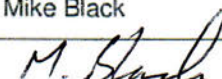


# Crossrail Delivery – Contract C704

## C704 Instrumentation Decommissioning Agreement London Underground Whitechapel

Document Number: C704-XRL-C-AAG-D061-50002

### Document History:

Revision	Date:	Prepared by:	Checked by:	Approved by:	Reason for Issue
1.0	19/05/15	Simon Nevard	Javier Gonzalez	Mike Groves	Comments addressed
2.0	11/06/15	Javier Gonzalez	Simon Nevard	Mike Groves	CEG Comments Addressed
3.0	12/06/15	Simon Nevard	Javier Gonzalez	Mike Groves	Contour plots updated
					
Formal Acceptance by Chief Engineer Group (CEG)				Accepted by:	Mike Black
					

This document contains proprietary information. No part of this document may be reproduced without prior written consent from the chief executive of Crossrail Ltd.

Document uncontrolled once printed. All controlled documents are saved on the CRL Document System

© Crossrail Limited

CRL RESTRICTED

Document Template: CRL1-XRL-Z3-ZFM-CR001\_Z-50001

## Contents

<b>1 Purpose</b> .....	<b>3</b>
<b>2 Scope</b> .....	<b>4</b>
<b>3 Definitions</b> .....	<b>4</b>
<b>4 The Asset: District Line at Whitechapel (LU/27)</b> .....	<b>5</b>
<b>5 I&amp;M Systems in LU27</b> .....	<b>5</b>
5.1 C704 systems .....	5
5.2 Systems Installed by Others.....	6
<b>6 Monitoring Results vs. CRL Construction Works</b> .....	<b>6</b>
<b>7 Assessment of Closeout Trends</b> .....	<b>7</b>
<b>8 Reference Documents</b> .....	<b>8</b>
<b>9 Appendices</b> .....	<b>8</b>

**Appendix A – I&M Drawings**

**Appendix B – C701 Installation report on LU/27 to be decommissioned**

**Appendix C – Summary of monitoring results**

**Appendix D – Detail of proposed area for de-commissioning**

# 1 Purpose

Following detailed assessment of the impact of CRL works on the individual Assets by C122 and as part of CRL's resulting risk management strategy, a comprehensive Instrumentation & Monitoring (I&M) system has been installed by C701 in the Whitechapel London Underground assets (LU/27). The objective of the monitoring regime has been that of automatically (and manually) monitoring the Asset in order to control the effects of the excavation-induced movements caused by Crossrail works beneath the Asset.

Most of the C701 I&M automatic system has been installed in advance of CRL construction activities to record necessary background monitoring data. Currently C704 provide monitoring data from the system to UCIMS.

C701 have also installed a manual system (retro targets, crack gauges, levelling points, etc.) to be used by C510-511-512 as a back up and to validate the automatic system.

The latest CRL work (not including the stations upgrades works) that will be affecting the Asset will be the ESS Piling in September 2014 in the Eastern Station area, the Temporary Ticket Hall construction in December 2014, and the West Lift Shaft (piling and excavation) area by the C512 project.

This document aims to provide a basis on which all relevant parties can agree on C704 partial decommissioning of the automatic I&M system from the different Assets. The partial decommissioning won't have any effect in terms of data quality or instrument performance of the remaining equipment that will be left in place. All the equipment to be removed won't be close to the areas with on going works, or that haven't been stable for more than a six month period

The last relevant construction activity in the area between Brady Street and the eastern side of the assets monitored by C704 was the Drive Y back in January and March 2014. Since the ground stabilised from that, the area has remained stable within its accuracy, recording just noise, which is mostly within the +/-2 mm range, as can be seen in the plots attached to this document.

Because the contract requirements have been achieved, CRL C704 is suggesting to remove the instrumentation within that area (at this stage only in part of the LU27 scope), and not to perform any further monitoring, although there will be a further long term stability check through INSAR (Interferometric Synthetic Aperture Radar), which could be provided if requested to the stake holders on a quarterly basis.



Figure 1 - LU District line Assets included in interface LU/27 are highlighted in yellow (Extract from Metronet Drawing NNNN0000-DWG-CVL-SA00-5531234, Rev 02)

Further detail on decommissioning scope is provided in point 6 of this document, and in Appendices B & D.

The second (and final) stage of the decommission procedure will be related mainly to LU/25/26 and the remaining bit of LU27.

## 2 Scope

This document covers the extent of the District line tunnel and assets between LU Whitechapel and Stepney Green stations (almost all LU27, as per Appendices B & D). The District line tunnel has an east to west orientation, and will be affected by the construction of the new CRL Whitechapel Station and running tunnels from Whitechapel Station to Stepney Green shaft.

The scope of the installation is defined by the *Preliminary Instrumentation & Monitoring Plan for LU Infrastructure C122-OVE-C2-RGN-D061-50020* and by I&M drawing C122-OVE-C2-DDA-CR001\_Z-31116.

## 3 Definitions

<b>Asset</b>	Specific LUL interface covered by this document (LU/27).
<b>ATS</b>	Automated Total Station
<b>CRL</b>	Crossrail.
<b>C122</b>	CRL Contract that assessed excavation-induced ground movements and acts as Designer of C701/C704 I&M systems.
<b>C701</b>	CRL Contract responsible for the installation/maintenance of the automatic I&M system in LU/27.
<b>C704</b>	CRL Contract responsible for the maintenance/decommissioning of C701 manual/automatic I&M system in LU/27.
<b>ELL</b>	East London Line
<b>I&amp;M</b>	Instrumentation & Monitoring
<b>LU/25</b>	District Line at Whitechapel Station
<b>LU/26</b>	Overground at Whitechapel Station (LUL Assets)
<b>LU/27</b>	District Line between Whitechapel and Stepney Green stations
<b>LUL</b>	London Underground Limited
<b>LOL</b>	London Overground Limited
<b>Predicted zone of influence of Crossrail</b>	Area located within the predicted 1mm greenfield ground surface settlement contour associated with Crossrail works.



**works**

**Relevant parties**

Parties requested to formally agree decommissioning of the automatic I&M system presented in this document:

- London Underground Limited (LUL);
- CRL Chief Engineers Group (CEG).

## 4 The Asset: District Line at Whitechapel (LU/27)

The following plots comprise a brief description of the movements due to CRL related constructions that have affected LU/27 District Line between Whitechapel and Stepney Green stations.

Further details are included in *C122 Assessment Report*:

- *Assessment of Ground Movement Effects: LU/27 District Line: Whitechapel to Stepney Green (C122-OVE-C2-RGN-D056-00001\_rev3\_all)*.
- *Analysis report for 3D FE Model of Whitechapel Station: Durward Street Shaft (C122-OVE-C2-RGN-D061-00002)*

## 5 I&M Systems in LU27

### 5.1 C704 systems

The automatic (and manual) I&M system installed in the asset under consideration was specified on drawing C122-OVE-C2-DDA-CR001\_Z-31116.

Monitoring frequencies and trigger values were specified in *Design Consultant Framework Contract C122 – Bored Tunnels: Instrumentation and Monitoring Plan: LU/27 District Line between Whitechapel and Stepney Green (C122-OVE-C2-RGN-D061-50020)*.

The installation of this system in LU27 has been carried out by C701.

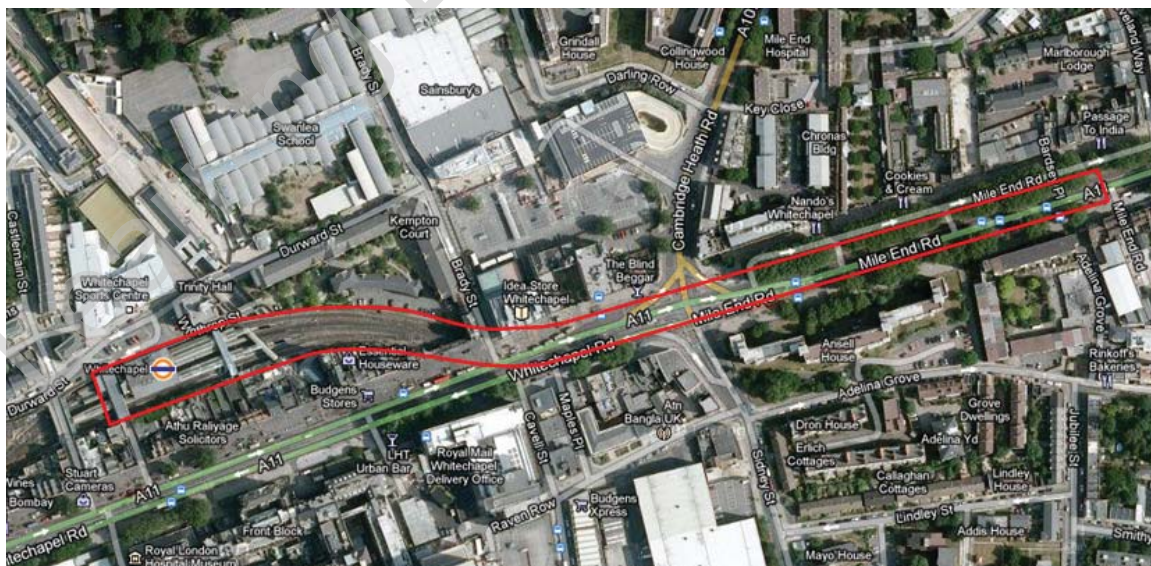


Figure 2 - Aerial photograph of Whitechapel LU Station and Hammersmith and City and District Line Route. Red lines denote the work area.

As described in detail in C701-ITM-C-RGN-D061\_WS105-50001 & C701-ITM-C-RGN-D061-50001 (C701 Installation Whitechapel Station – Hammersmith & City and District Line), the I&M system comprises the following:

- Approximately 1900 geodetic prisms. Following the provided design, running rails and platform nose and base prisms were installed in arrays at one metre centres, with running rail prisms continuing at two metre centres throughout the monitoring section. Prisms to monitor lineside retaining walls and cover way (CW33) structures were requested at 10 m centres. Additional monitoring of bridge and girder structures for assets G179, D122 and D123.
- 15 No. Automated Total Stations (ATS) in different locations with various bracket designs.
- Prisms and ATS's to monitor Whitechapel LO Station (LU assets), bridges and girders.

It is proposed to leave the communication line in place for future use but to end the associated contract with the relevant provider.

Further details of the monitoring equipment installed are included C701-ITM-C-RGN-D061-50001 (C701 Installation Report for LU/27), which can be broken down as follows:

- 8 Leica TM30
- 3 CR1000 Dataloggers
- 8 Logger enclosures
- 217 prisms on eastbound track, 6ft rail
- 217 prisms on eastbound track, cess rail
- 217 prisms on westbound track, cess rail
- 218 prisms on westbound track, 6ft rail
- 146 prisms on structures in the eastbound tunnel
- 106 prisms on structures in the westbound tunnel

## 5.2 Systems Installed by Others

Following a pre-decommissioning site walkthrough, it has been noted that four other monitoring systems (installed by Others) are currently in place in the area of consideration:

- C510 Manual prisms on several locations along the WHI station (LO and LU, mainly in walls), or along the tracks.
- C510 Levelling points across the station.
- C510 Track levelling points (paint marks) in the tracks and sleepers.

Decommissioning of these systems does not fall under C704 umbrella. Necessary actions will be taken by C704 in order to avoid any accidental damage to these systems.

## 6 Monitoring Results vs. CRL Construction Works

*All the assessment of ground movement* provided in the above points present trigger values for the following purposes:

- Asset protection;
- Construction control;

- Track Geometry and Tunnel Clearance.
- Others.

The present document has been intentionally drafted by C704 as a high level reference summary to be used by decision makers and not as a detailed technical report. It is not the purpose of this document to analyse in detail the construction monitoring results for all monitored parameters, compare these results with associated trigger values and provide engineering considerations on residual risk to the Asset. A brief summary of current trends for LU/27 and annexed areas LU/25/26 (in order to provide a wider understanding of the current situation) is included in Appendix C.

The assets identified as falling in the ZOI of the Crossrail works covered by LU/27 are:

LCS Code <sup>1</sup>	Asset Number	Asset Description	Remarks	Within zone of influence
D056	CW33	Covered way	District line	Yes
D056	TL41	Masonry tunnel	District line running tunnel	Yes
D056	W182	Retaining wall	Along EB track	Yes
D056	W183	Retaining wall	Along WB track	Yes
D056		Track	Within Zone of Influence (i.e. approx. LCS chainages D056/DEB16 to D056/DEB120 and D056/DEB210 to D056/DEB570)	Yes
D056		Track drainage		Yes
D056		Lineside services & equipment		Yes

Table 1 - Extract of LU Infrastructure Protection Schedule of Assets at interface LU/27 from C122-OVE-C2-RAN-D056-00001

As per point 1 Figure 1, some of the monitoring in LU/27 will be left in place, as:

- Retaining wall 182 & 183

The rest of the areas will be decommissioned in this stage:

- CW33, as per presented in appendix C, the structure has been stable (in within +-2mm) since April 2014.
- TL41, as per presented in appendix C, the major part of this structure has been stable since the beginning of the project, but the Eastmost side that was affected by the TBM drives in January (EB) and March (WB) 2014. Since April 2014 the Masonry Tunnel has presented stability in within the +- 2 mm.
- Track, Track drainage, & others, always beyond Brady Street (CW33). The track monitoring does not cover the same extension as the structure monitoring, and has shown stability since April 2014 for the area that will be decommissioned at this stage.

## 7 Assessment of Closeout Trends

Following the evolution of the construction activities, and providing that there are very few that have had an unexpected impact on the LU assets, C704 has analysed the current data, arriving to the conclusion that a large part of the instrumentation (prisms and ATS's) can already be removed as the rate of settlement is less than 2mm per year for more than a year of time.

The requirements in terms of duration/frequency for the closeout monitoring regime (minimum 3 months continuous monitoring followed by quarterly readings over a 12 months period) have been accomplished for TBM's and SCL works affecting the this section of LU/27, as per appendix C

As highlighted in Section 6 and presented in Appendix C, the signature of the two TBM excavation phases is clearly identifiable in the construction monitoring data of the prisms sections, as per the other specified assets.

Based on this, it is proposed to partially decommission the I&M automatic system currently installed in LU/27 (from Brady Street to the east) in the areas shown in Appendix B & D..

It is however proposed to leave the remaining monitoring sensors that are not inside the partial decommissioning area, and their associated ATS and reference prisms around Whitechapel Station, until the end of the works.

## 8 Reference Documents

- C701-ITM-O1-GMS-D061\_WS105-50003 (Method Statement for Additional Monitoring System Installation on LO Assets at Whitechapel Station)
- C701-ITM-O1-GMS-D061-00002 (Method Statement for Monitoring System Installation at Whitechapel LU Station)
- C701-ITM-Z-ACT-D061\_WS106-50006 (C701 Space Application)
- C701-ITM-Z-KLI-D061\_WS106-00002 (C701 Clearance approval)
- C701-ITM-C-RGN-D061-50001 (C701 Installation Report)
- C122-OVE-C2-RAN-D056-00001\_rev3\_all (*Assessment of Ground Movement Effects: LU/27 District Line: Whitechapel to Stepney Green*).
- C122-OVE-C2-DDA-CR001\_Z-31116 (C122 I&M Drawing)

## 9 Appendices

**Appendix A** – I&M Drawing C122-OVE-C2-DDA-CR001\_Z-31116

**Appendix B** – I&M As-Built Drawing

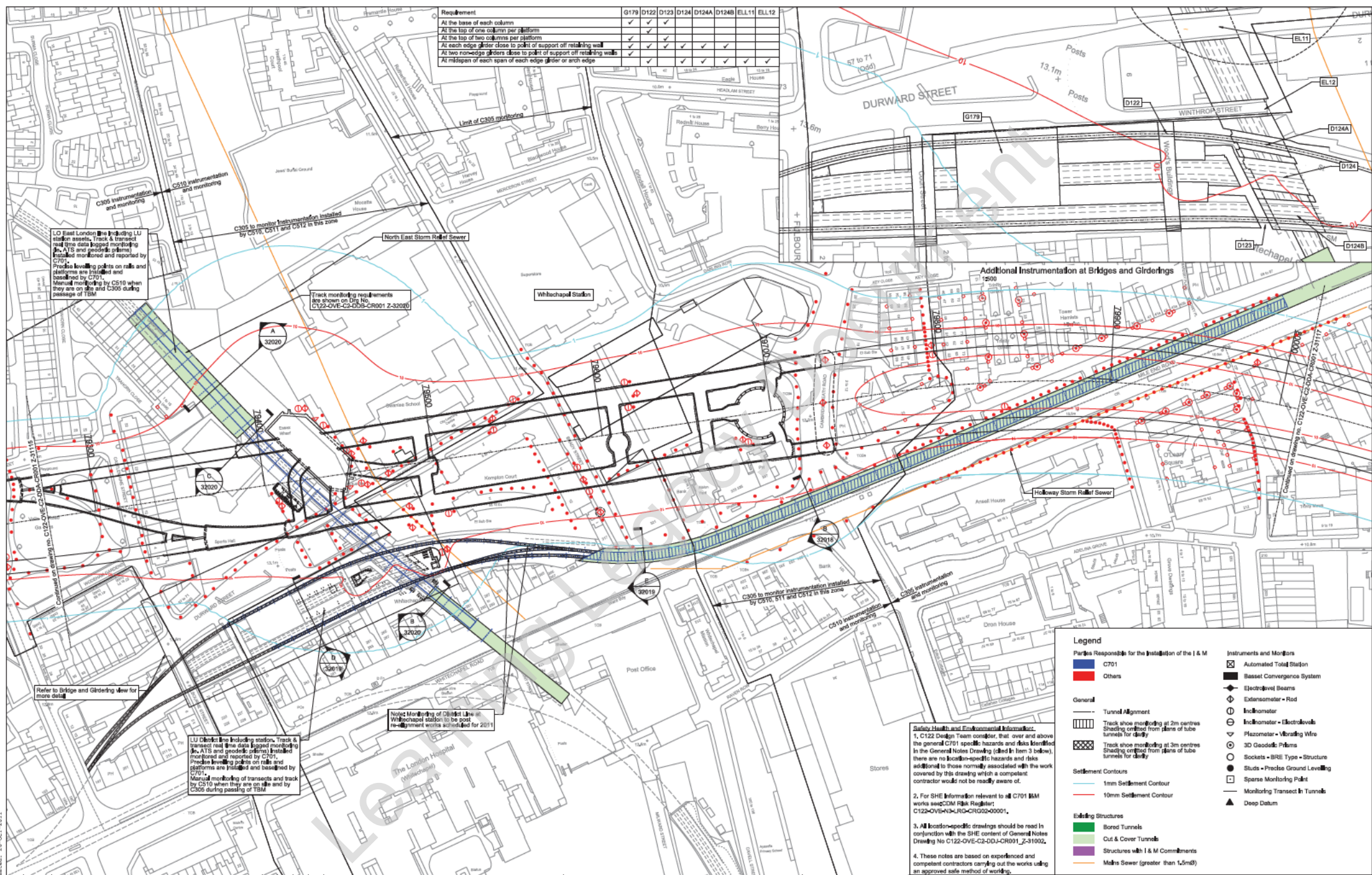
**Appendix C** – Summary of monitoring results for LU/27

**Appendix D** – Detail of proposed area for decommissioning

## APPENDIX A

Learning Legacy Document

Requirement	G179	D122	D123	D124	D124A	D124B	ELL11	ELL12
At the base of each column	✓	✓	✓	✓	✓	✓	✓	✓
At the top of one column per platform	✓	✓	✓	✓	✓	✓	✓	✓
At the top of two columns per platform	✓	✓	✓	✓	✓	✓	✓	✓
At each edge girder close to point of support off retaining wall	✓	✓	✓	✓	✓	✓	✓	✓
At two non-edge girders close to point of support off retaining walls	✓	✓	✓	✓	✓	✓	✓	✓
At midspan of each span of each edge girder or arch edge	✓	✓	✓	✓	✓	✓	✓	✓



### Legend

<span style="color: blue;">■</span> C701	<span style="border: 1px solid black; padding: 2px;"> </span> Automated Total Station
<span style="color: red;">■</span> Others	<span style="border: 1px solid black; padding: 2px;"> </span> Baseline Convergence System
<span style="color: blue;">—</span> Tunnel Alignment	<span style="border: 1px solid black; padding: 2px;"> </span> Electrolvel Beams
<span style="border: 1px solid black; padding: 2px;"> </span> Track shoe monitoring at 2m centres	<span style="border: 1px solid black; padding: 2px;"> </span> Extensometer - Rod
<span style="border: 1px solid black; padding: 2px;"> </span> Track shoe monitoring at 3m centres	<span style="border: 1px solid black; padding: 2px;"> </span> Inclinometer
<span style="border: 1px solid black; padding: 2px;"> </span> Settlement Contours	<span style="border: 1px solid black; padding: 2px;"> </span> Piezometer - Vibrating Wire
<span style="border: 1px solid black; padding: 2px;"> </span> Existing Structures	<span style="border: 1px solid black; padding: 2px;"> </span> 3D Geodesic Prisms
<span style="border: 1px solid black; padding: 2px;"> </span> Bored Tunnels	<span style="border: 1px solid black; padding: 2px;"> </span> Sockets - BSE Type - Structure
<span style="border: 1px solid black; padding: 2px;"> </span> Cut & Cover Tunnels	<span style="border: 1px solid black; padding: 2px;"> </span> Sluds - Precise Ground Levelling
<span style="border: 1px solid black; padding: 2px;"> </span> Structures with I & M Comments	<span style="border: 1px solid black; padding: 2px;"> </span> Sparse Monitoring Points
<span style="border: 1px solid black; padding: 2px;"> </span> Main Sewer (greater than 1.5mØ)	<span style="border: 1px solid black; padding: 2px;"> </span> Monitoring Transact in Tunnels
	<span style="border: 1px solid black; padding: 2px;"> </span> Deep Datum

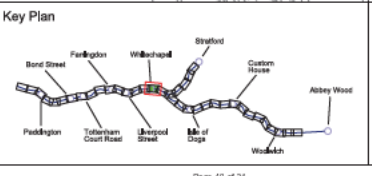
**Safety, Health and Environmental Information:**

- C122 Design Team consider that over and above the general C701 specific hazards and risks identified in the General Notes Drawing (see Item 3 below), there are no location-specific hazards and risks additional to those normally associated with the work covered by this drawing which a competent contractor would not be readily aware of.
- For SHE information relevant to all C701 B&M works see CIM Risk Register: C122-OVE-N3-LRG-CR002-00001.
- All location-specific drawings should be read in conjunction with the SHE content of General Notes Drawing No C122-OVE-C2-DDJ-CR001\_Z-31002.
- These notes are based on experience and competent contractors carrying out the works using an approved safe method of working.

Rev	Date	Description	By	Check	App	Auth
P01	20/11/2010	Issue	JS	RB	RM	--
P02	14/10/2011	Minimum requirement for Instrumentation and Monitoring	AR	JA	SR	--
Rev	Date	Description	By	Check	App	Auth

**Notes**

- For Instrumentation & Monitoring general notes, schedule and monitoring frequency, refer to Dng Nos. C122-OVE-C2-DDJ-CR001\_Z-31002 and C122-OVE-DDJ-CR001\_Z-31007.



Decommissioning Agreement Whitechapel London Underground  
C701 XRL C AAG 0611 51013 Re 3.0

Scale: 0 20m 40m 60m 80m 100m

**Crossrail**

25 Canada Square  
Canary Wharf  
London  
E14 5LQ

**Instrumentation & Monitoring Combined I & M**

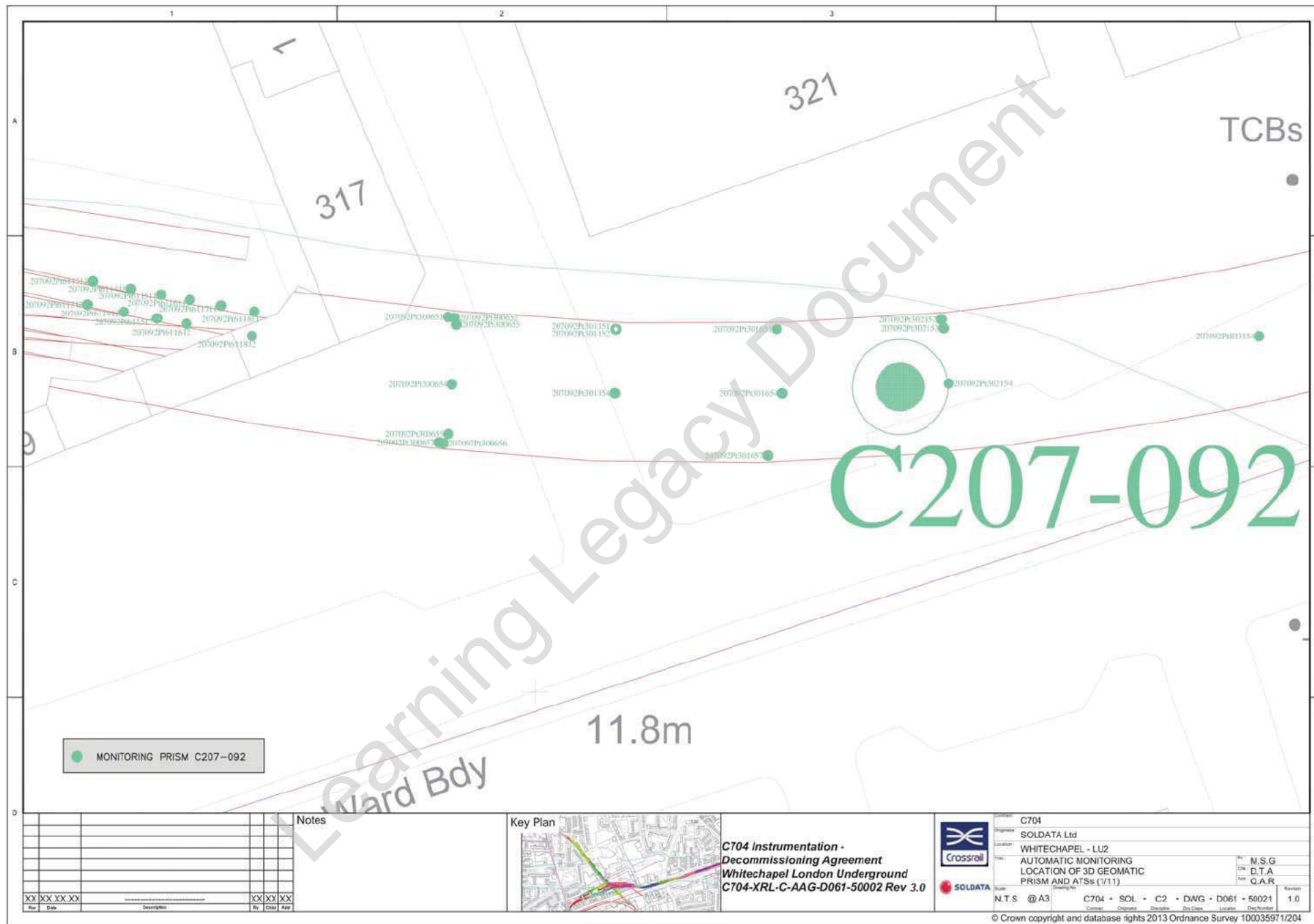
Route/Work Plan Sheet 16 of 38  
C701

Rev: A/REAKES  
CR: J/APPED  
AW: S/READING  
AW: S/READING

Scale: 1:1000 @ A1  
Drawing no: C122-OVE-C2-DDA-CR001\_Z-31116  
Rev: P03  
Sheet: S4

## APPENDIX B

Learning Legacy Document

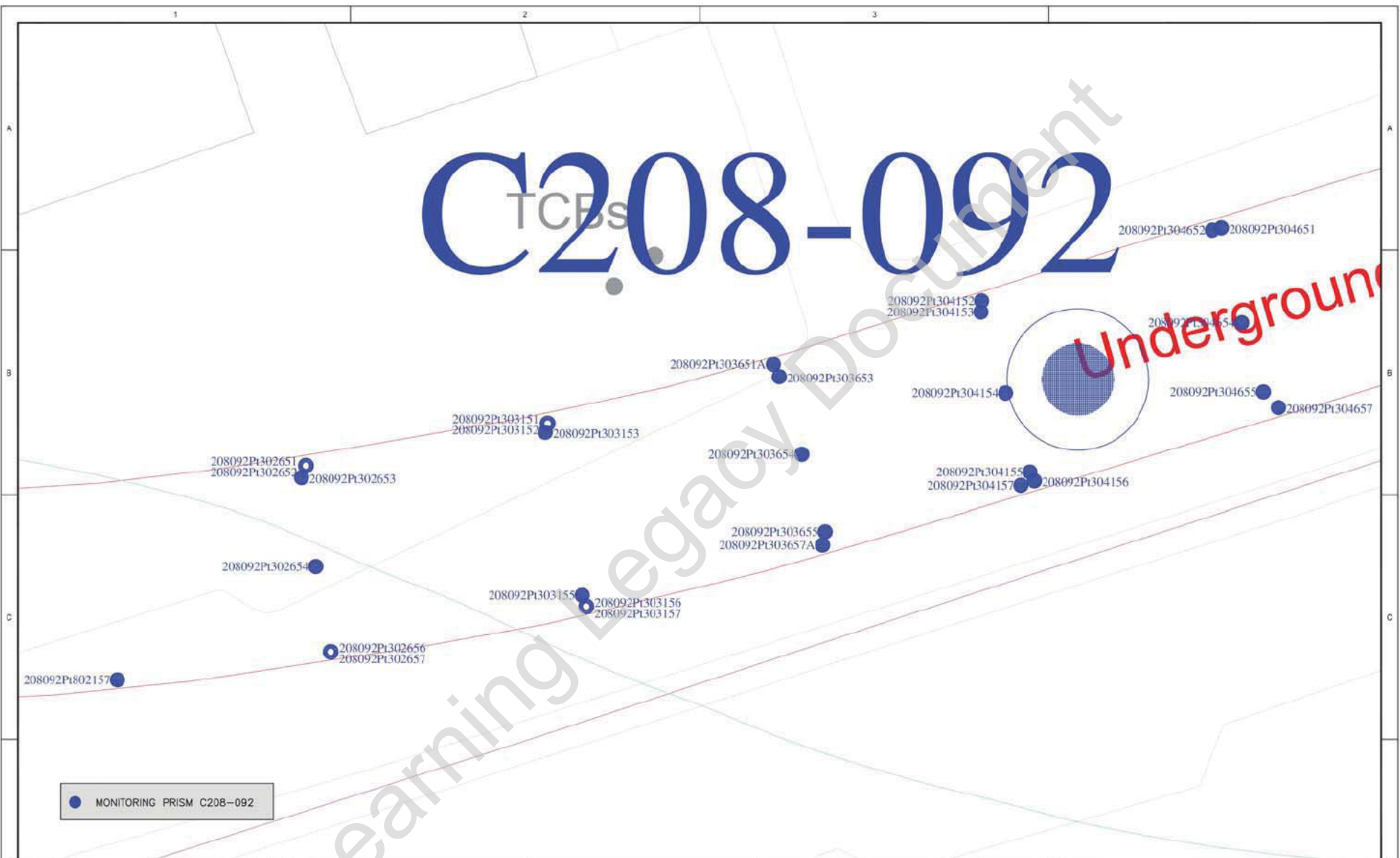




# C208-092

TCBS

Underground



● MONITORING PRISM C208-092

Rev	Date	Description	By	Chk	App
XX	XX	XX	XX	XX	XX

Notes



**C704 Instrumentation -  
Decommissioning Agreement  
Whitechapel London Underground  
C704-XRL-C-AAG-D061-50002 Rev 3.0**



Project	C704	Rev	M.S.G
Contractor	SOLDATA Ltd	Disc	D.T.A
Location	WHITECHAPEL - LU2	Form	G.A.R
AUTOMATIC MONITORING LOCATION OF 3D GEOMATIC PRISM AND ATSS (2/11)			

N.T.S @ A3 C704 - SOL - C2 - DWG - D061 - 50022 1.0  
© Crown copyright and database rights 2013 Ordnance Survey 100035971/204

# C209-092

London Railway

+ 11.6m

● MONITORING PRISM C209-092

Learning Legacy Document

Rev	Date	Description	By	Chk	App
XX	XX	XX	XX	XX	XX

Notes



**C704 Instrumentation -  
Decommissioning Agreement  
Whitechapel London Underground  
C704-XRL-C-AAG-D061-50002 Rev 3.0**

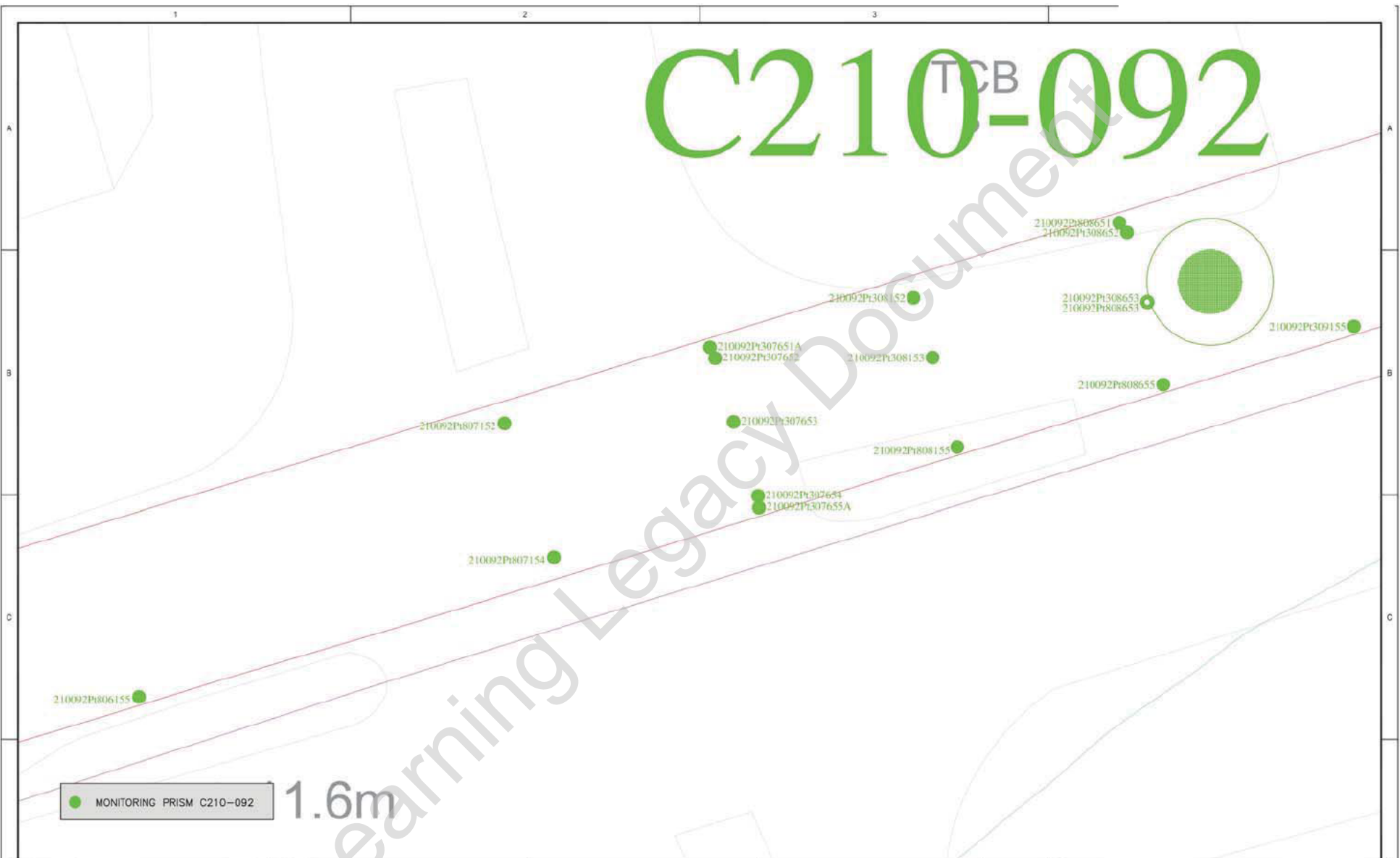


Project	C704	Rev	M.S.G
Client	SOLDATA Ltd	Drawn	D.T.A
Location	WHITECHAPEL - LU2	For	G.A.R
System	AUTOMATIC MONITORING LOCATION OF 3D GEOMATIC PRISM AND ATSS (3/11)	Scale	1:0
Sheet	N.T.S @ A3	Sheet	1.0

© Crown copyright and database rights 2013 Ordnance Survey 100035971/204

# C210-092

TCB



Rev	Date	Description	By	Chk	App
XX	XX	XX	XX	XX	XX

Notes

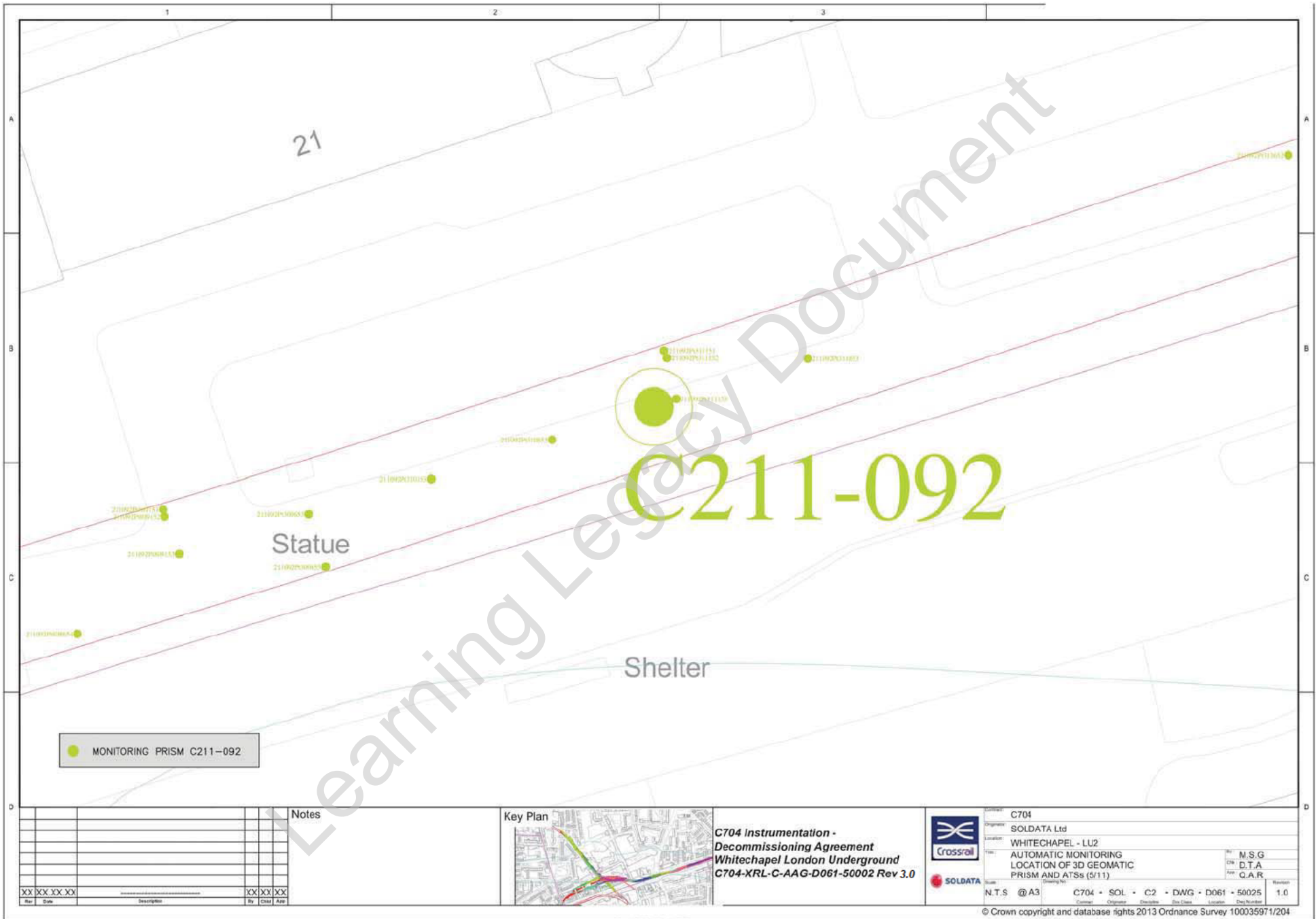


**C704 Instrumentation -  
Decommissioning Agreement**  
Whitechapel London Underground  
C704-XRL-C-AAG-D061-50002 Rev 3.0



Project	C704	Client	M.S.G
Contractor	SOLDATA Ltd	Discipline	D.T.A
Location	WHITECHAPEL - LU2	Author	G.A.R
Description		Revision	1.0
AUTOMATIC MONITORING LOCATION OF 3D GEOMATIC PRISM AND ATSS (4/11)		Scale	N.T.S @ A3
Code	C704 - SOL - C2 - DWG - D061 - 50024	Drawn	
Checked		Discipline	
Location		Location	
Day Number		Day Number	

© Crown copyright and database rights 2013 Ordnance Survey 100035971/204



C211-092

● MONITORING PRISM C211-092

Rev	Date	Description	By	Chk	App
XX	XX	XX	XX	XX	XX

Notes

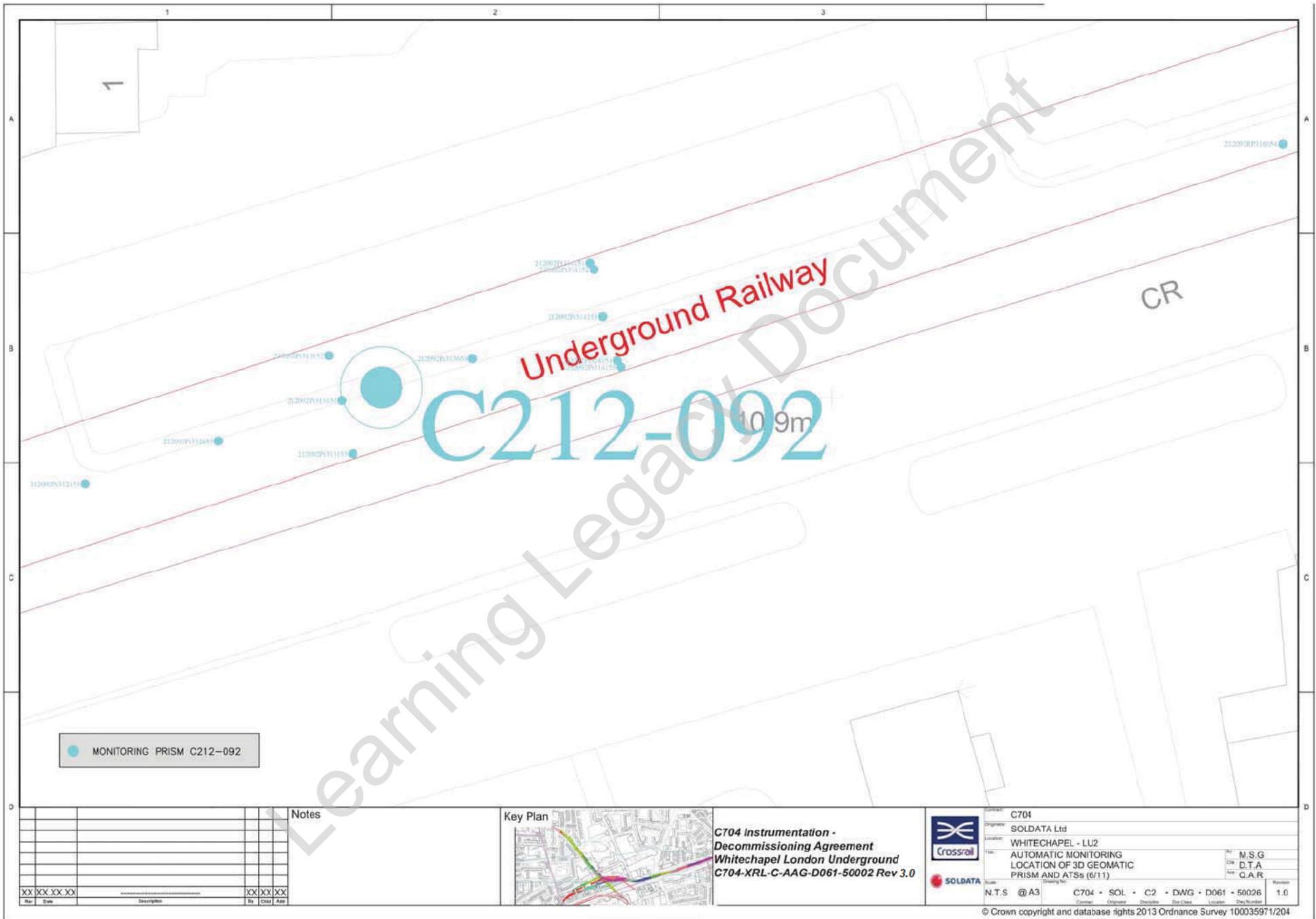


**C704 instrumentation -  
Decommissioning Agreement  
Whitechapel London Underground  
C704-XRL-C-AAG-D061-50002 Rev 3.0**



Project	C704	Rev	M.S.G
Contractor	SOLDATA Ltd	Chk	D.T.A
Location	WHITECHAPEL - LU2	App	G.A.R
Scale	N.T.S	Sheet No	5/11
Author	A3	Drawn	C2
Checked	SOL	Discipline	DWG
Approved	D061	Rev Class	50025
Location	50025	Sheet Number	1.0

© Crown copyright and database rights 2013 Ordnance Survey 100035971/204



Underground Railway

C212-092

10.9m

Learning Legacy Document

● MONITORING PRISM C212-092

Rev	Date	Description	By	Chk	App
XX	XX	XX	XX	XX	XX

Notes



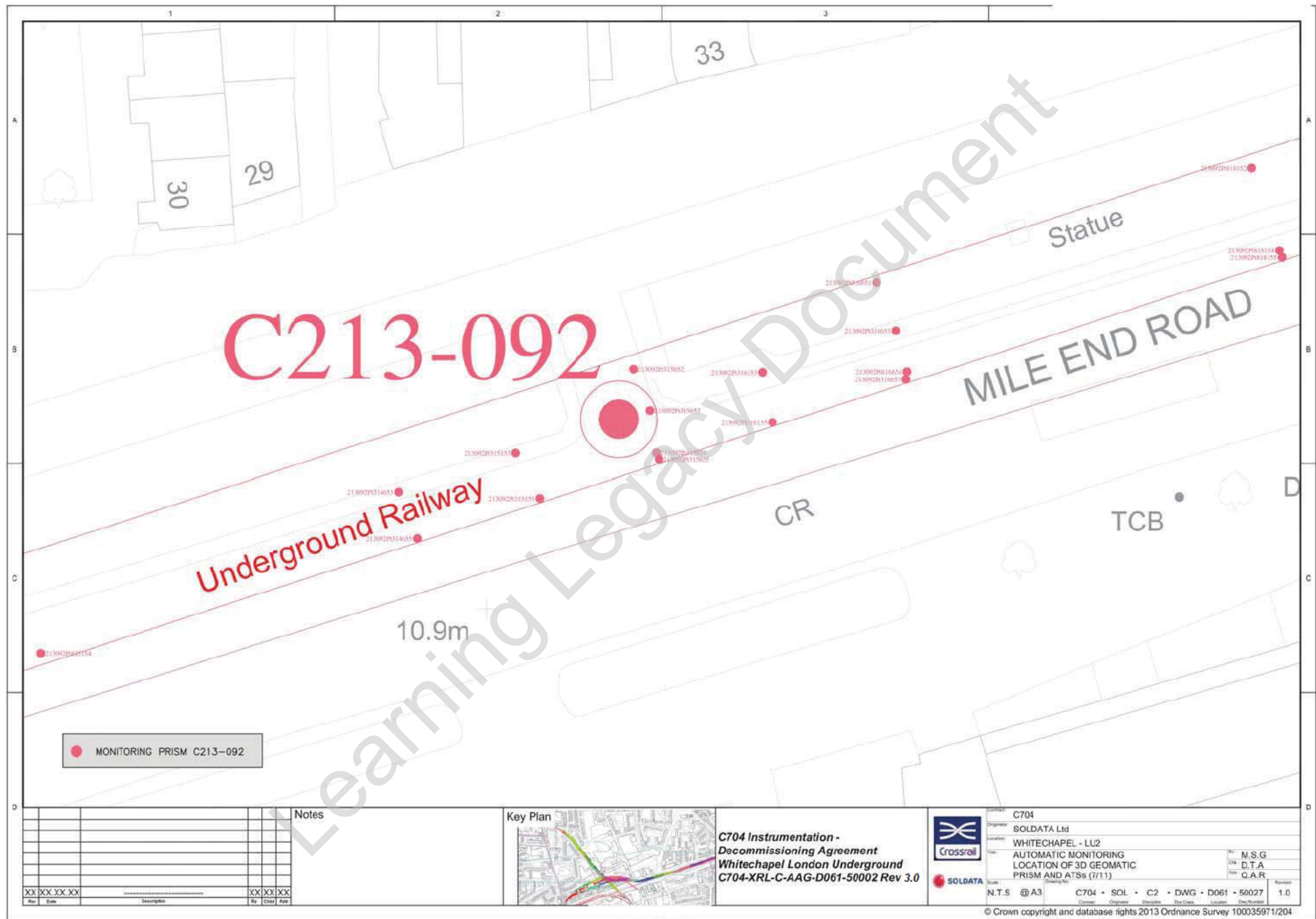
**C704 instrumentation - Decommissioning Agreement Whitechapel London Underground C704-XRL-C-AAG-D061-50002 Rev 3.0**



Project: C704  
 Engineer: SOLDATA Ltd  
 Location: WHITECHAPEL - LU2  
 Title: AUTOMATIC MONITORING LOCATION OF 3D GEOMATIC PRISM AND ATSS (6/11)  
 Rev: M.S.G  
 Chk: D.T.A  
 App: G.A.R

Scale: N.T.S @ A3  
 Drawing: C704 - SOL - C2 - DWG - D061 - 50026  
 Revision: 1.0

© Crown copyright and database rights 2013 Ordnance Survey 100035971/204



C213-092

Underground Railway

MILE END ROAD

● MONITORING PRISM C213-092

10.9m

Rev	Date	Description	By	Chk	App
XX	XX	XX	XX	XX	XX

Notes

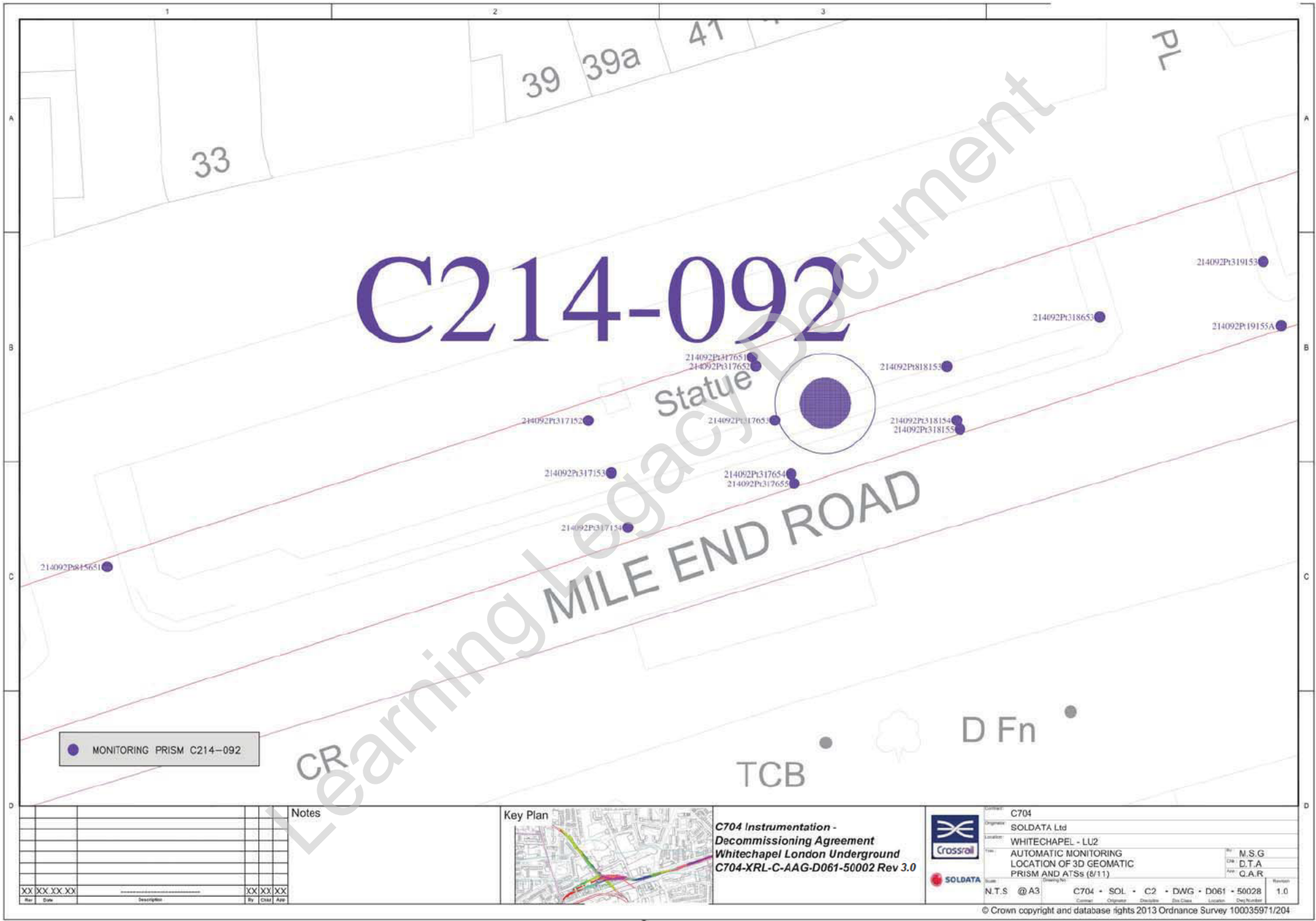


**C704 Instrumentation -  
Decommissioning Agreement  
Whitechapel London Underground  
C704-XRL-C-AAG-D061-50002 Rev 3.0**



Project:	C704	Rev:	M.S.G
Client:	SOLDATA Ltd	Disc:	D.T.A
Location:	WHITECHAPEL - LU2	App:	G.A.R
AUTOMATIC MONITORING LOCATION OF 3D GEOMATIC PRISM AND ATSS (1/1.1)			
Scale:	N.T.S @ A3	Revision:	1.0
Author:	C704 - SOL - C2 - DWG - D061 - 50027	Location:	
Checked:		Drawn:	
Designed:		Checked:	

© Crown copyright and database rights 2013 Ordnance Survey 100035971/204



# C214-092

Statue

MILE END ROAD

● MONITORING PRISM C214-092

Rev	Date	Description	By	Chk	App
XX	XX	XX	XX	XX	XX

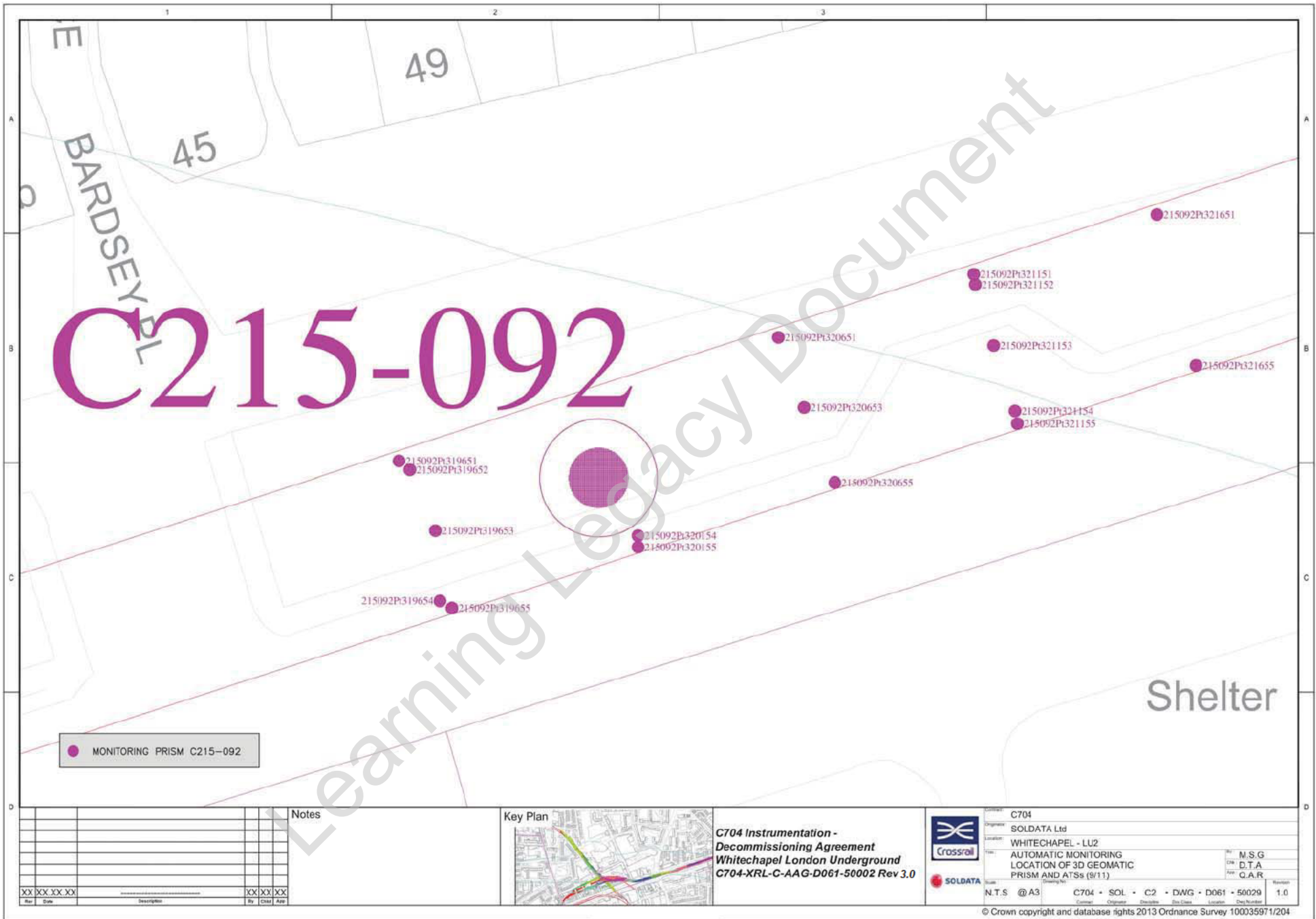
Notes



**C704 Instrumentation -  
Decommissioning Agreement  
Whitechapel London Underground  
C704-XRL-C-AAG-D061-50002 Rev 3.0**



Project	C704	Rev	
Contractor	SOLDATA Ltd	Disc	M.S.G
Location	WHITECHAPEL - LU2	File	D.T.A
System	AUTOMATIC MONITORING	Form	G.A.R
Location	LOCATION OF 3D GEOMATIC PRISM AND ATSS (6/11)	Revision	
Scale	N.T.S @ A3	Sheet	1.0
Author	C704 - SOL - C2 - DWG - D061 - 50028	Location	
Checker		Doc Number	



# C215-092

● MONITORING PRISM C215-092

Rev	Date	Description	By	Chk	App
XX	XX	XX	XX	XX	XX

Notes



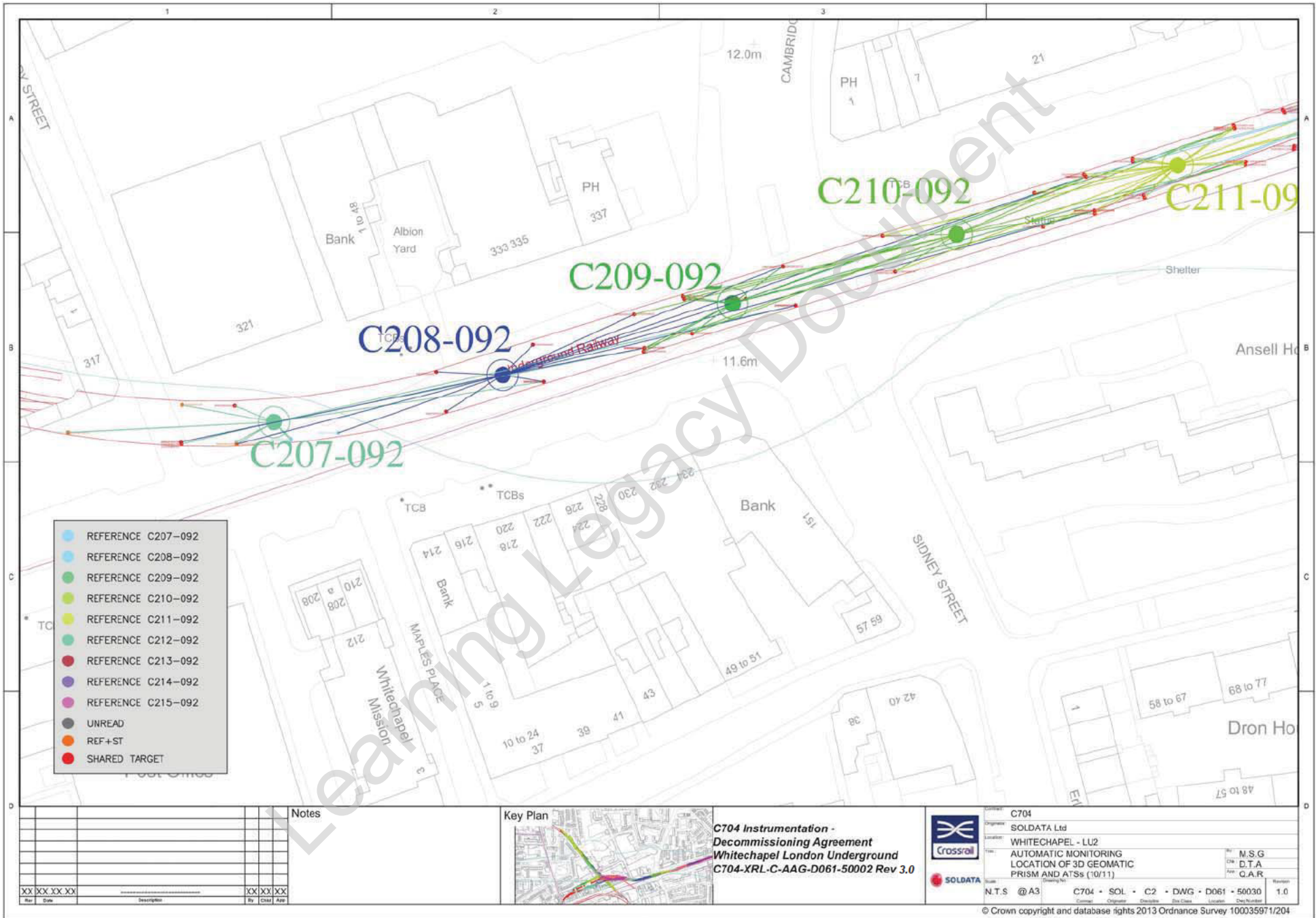
**C704 Instrumentation -  
Decommissioning Agreement  
Whitechapel London Underground  
C704-XRL-C-AAG-D061-50002 Rev 3.0**



Project	C704	Rev	M.S.G
Engineer	SOLDATA Ltd	Chk	D.T.A
Location	WHITECHAPEL - LU2	App	G.A.R
AUTOMATIC MONITORING LOCATION OF 3D GEOMATIC PRISM AND ATSS (9/11)			
Scale	N.T.S @ A3	Revision	1.0
Author	C704 - SOL - C2 - DWG - D061 - 50029	Created	
Checked		Disables	

© Crown copyright and database rights 2013 Ordnance Survey 100035971/204





- REFERENCE C207-092
- REFERENCE C208-092
- REFERENCE C209-092
- REFERENCE C210-092
- REFERENCE C211-092
- REFERENCE C212-092
- REFERENCE C213-092
- REFERENCE C214-092
- REFERENCE C215-092
- UNREAD
- REF+ST
- SHARED TARGET

Notes

Rev	Date	Description	By	Chk	App
XX	XX	XX	XX	XX	XX

Key Plan

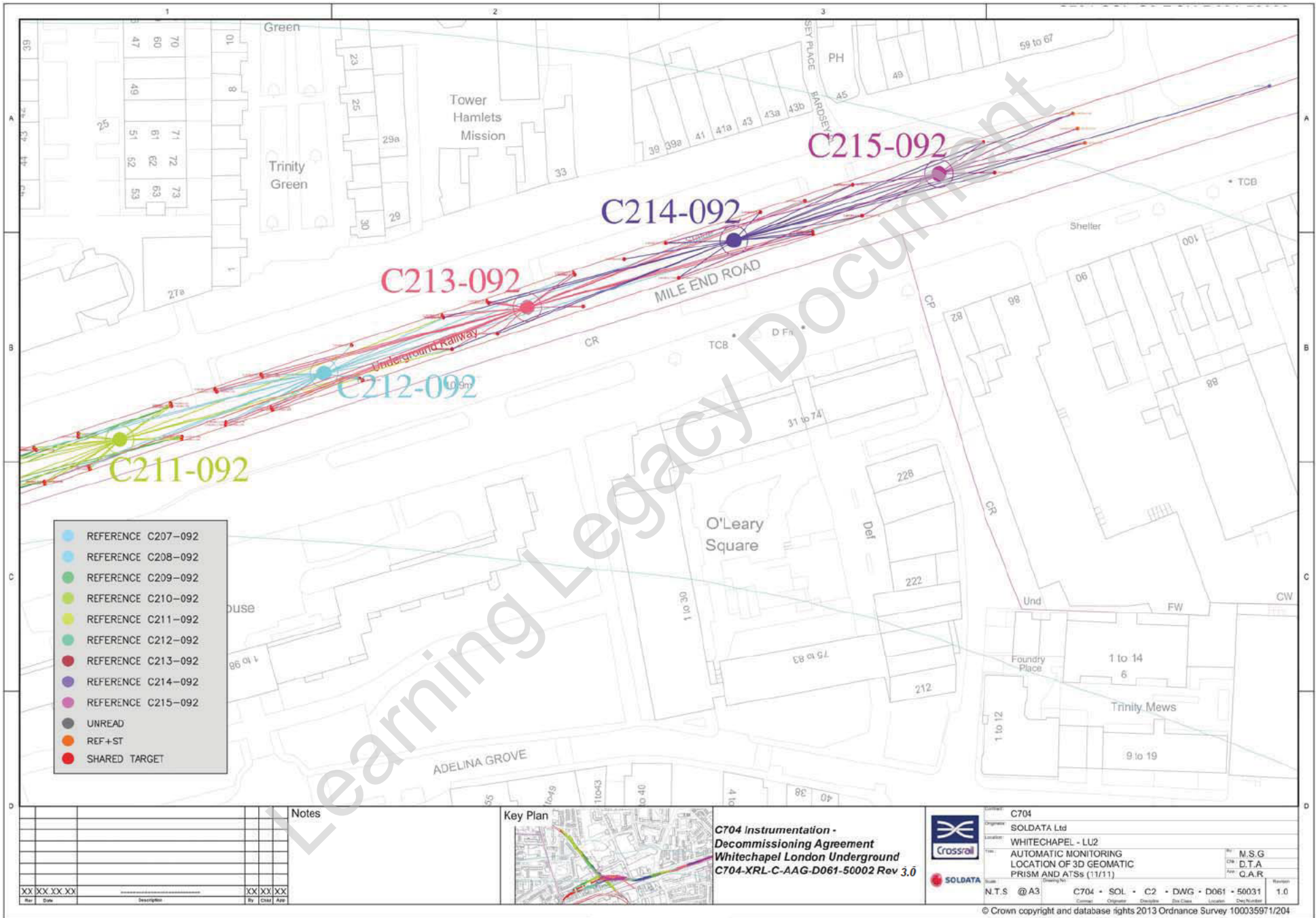


**C704 Instrumentation - Decommissioning Agreement**  
**Whitechapel London Underground**  
**C704-XRL-C-AAG-D061-50002 Rev 3.0**



Project	C704	Rev	1.0
Company	SOLDATA Ltd	Author	M.S.G
Location	WHITECHAPEL - LU2	Check	D.T.A
Scale	N.T.S	Drawn	G.A.R
Sheet	@A3	Created	
Category	C704 - SOL - C2 - DWG - D061 - 50030	Location	
Drawn		Draw Number	

© Crown copyright and database rights 2013 Ordnance Survey 100035971/204



- REFERENCE C207-092
- REFERENCE C208-092
- REFERENCE C209-092
- REFERENCE C210-092
- REFERENCE C211-092
- REFERENCE C212-092
- REFERENCE C213-092
- REFERENCE C214-092
- REFERENCE C215-092
- UNREAD
- REF+ST
- SHARED TARGET

Notes

Key Plan

**C704 Instrumentation -  
Decommissioning Agreement  
Whitechapel London Underground  
C704-XRL-C-AAG-D061-50002 Rev 3.0**



Project	C704	Rev	M.S.G
Client	SOLDATA Ltd	Drawn	D.T.A
Location	WHITECHAPEL - LU2	Issue	G.A.R
AUTOMATIC MONITORING LOCATION OF 3D GEOMATIC PRISM AND ATSS (11/11)			

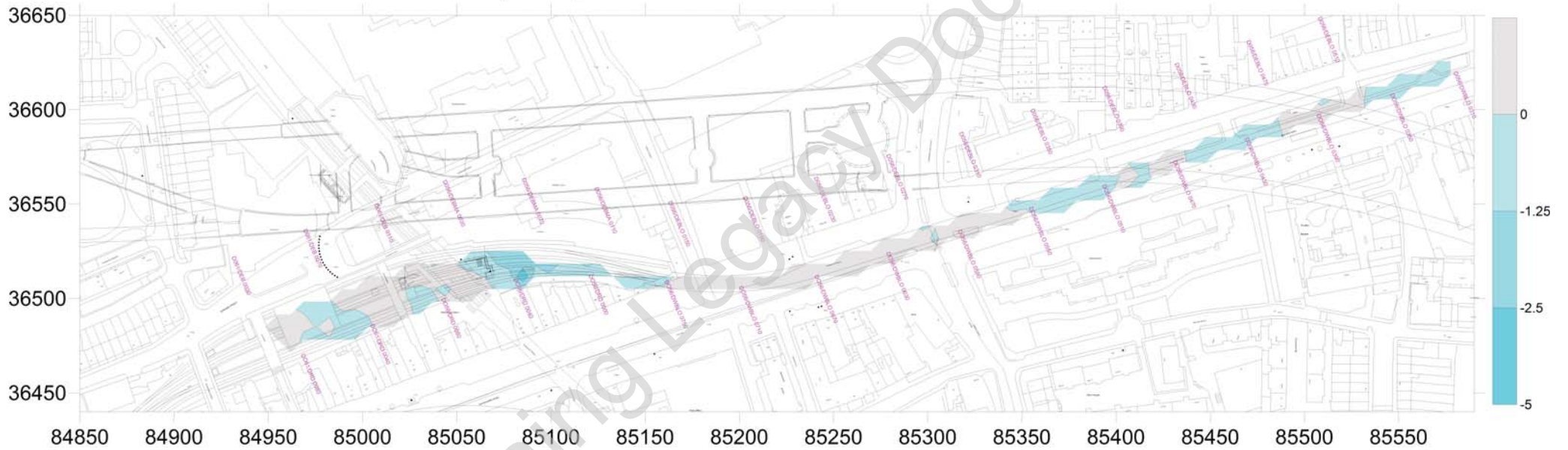
Rev	Date	Description	By	Chk	App
XX	XX	XX	XX	XX	XX

© Crown copyright and database rights 2013 Ordnance Survey 100035971/204

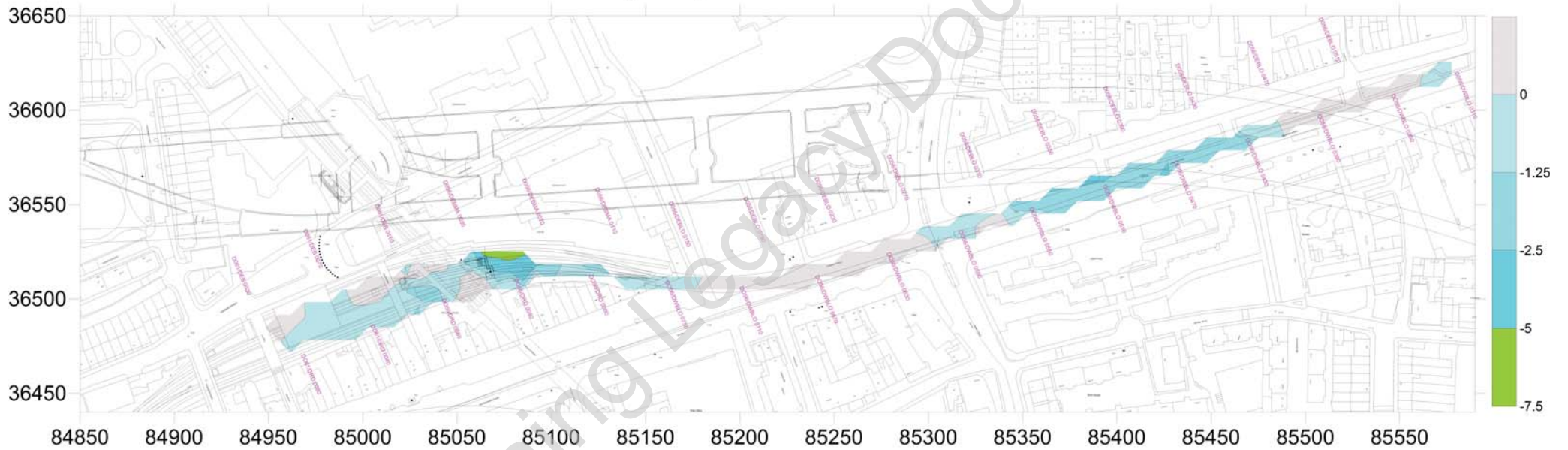
## APPENDIX C

Learning Legacy Document

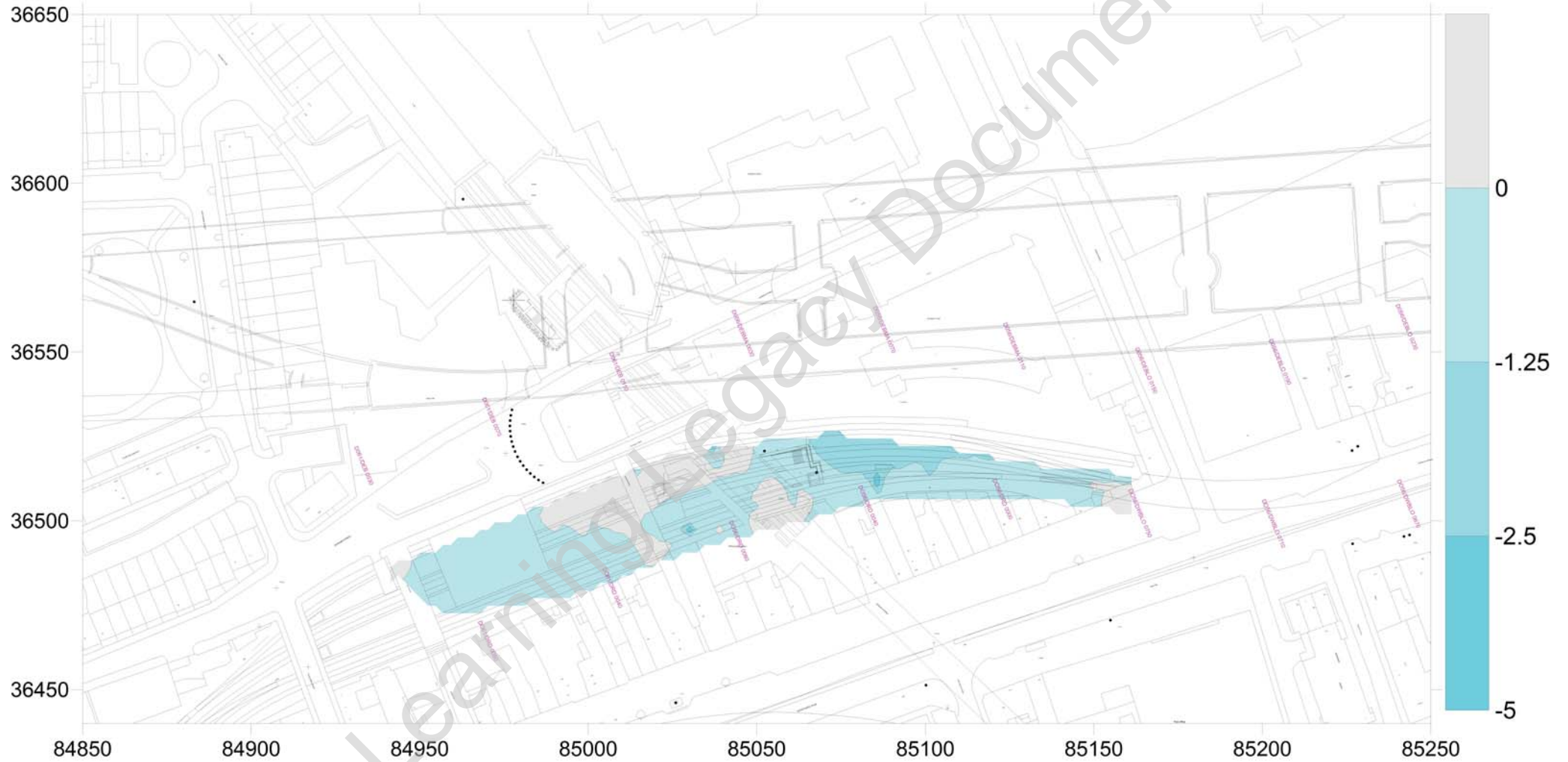
### Differential Movement Z (mm) from 30/01/2015 to 30/04/2015 - Track and Structure



### Differential Movement Z (mm) from 30/01/2015 to 30/04/2015 - Structure



### Differential Movement Z (mm) from 30/01/2015 to 30/04/2015 - Track



Differential Movement Z (mm) from 30/10/2014 to 30/04/2015 - Track and Structure

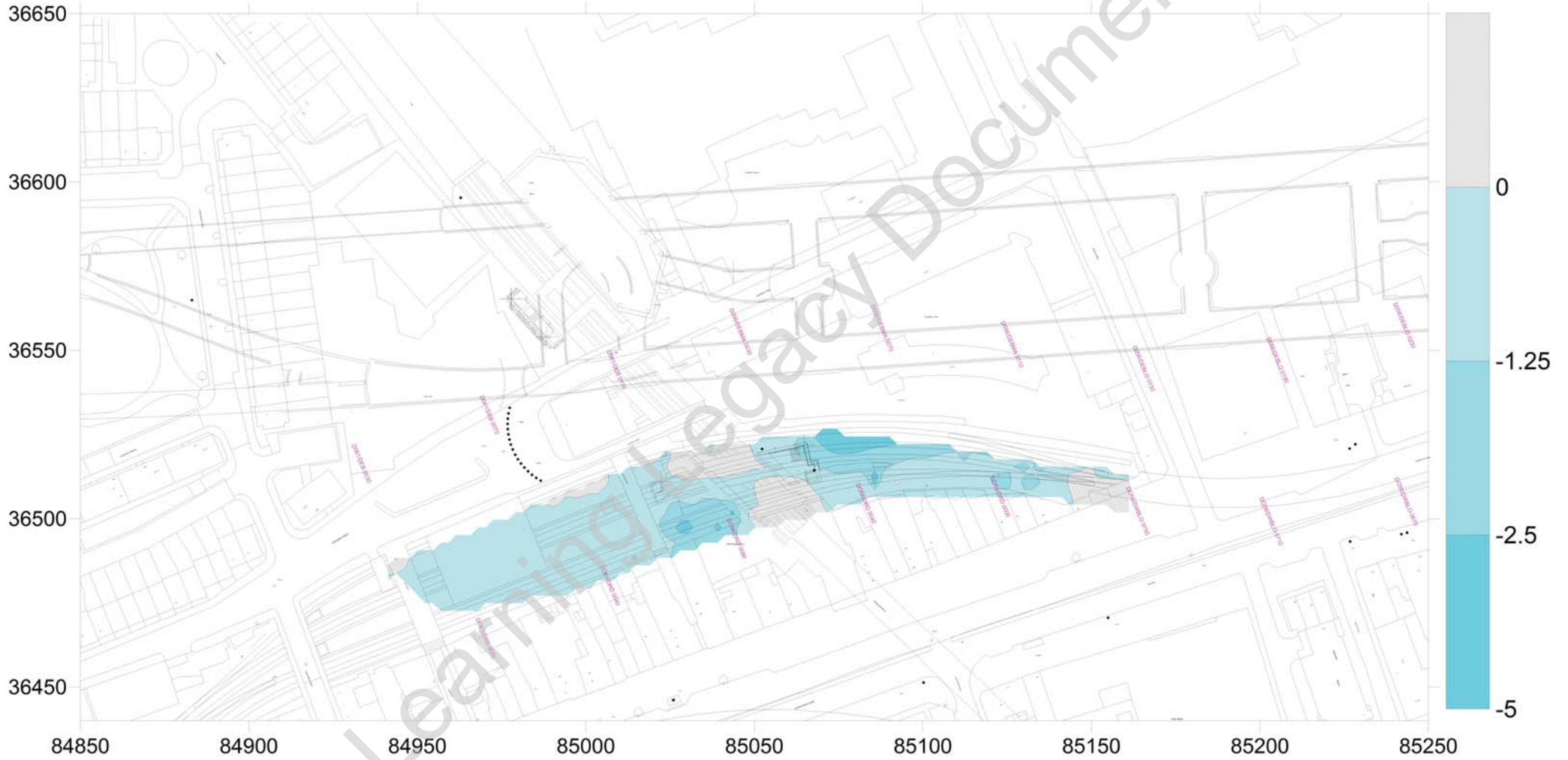


### Differential Movement Z (mm) from 30/10/2014 to 30/04/2015 - Structure

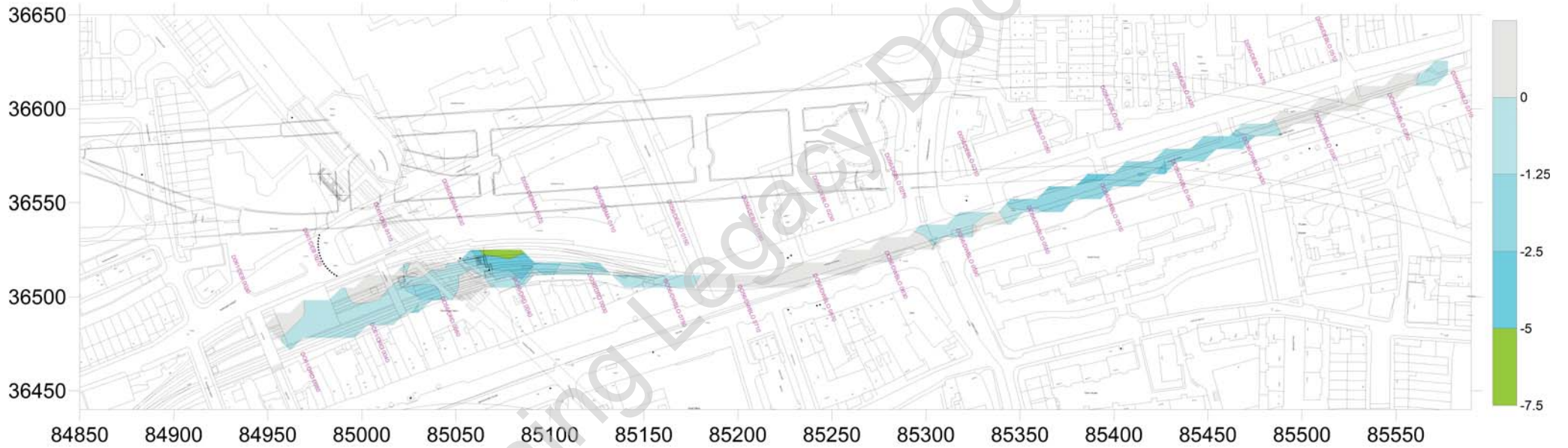




### Differential Movement Z (mm) from 30/10/2014 to 30/04/2015 - Track



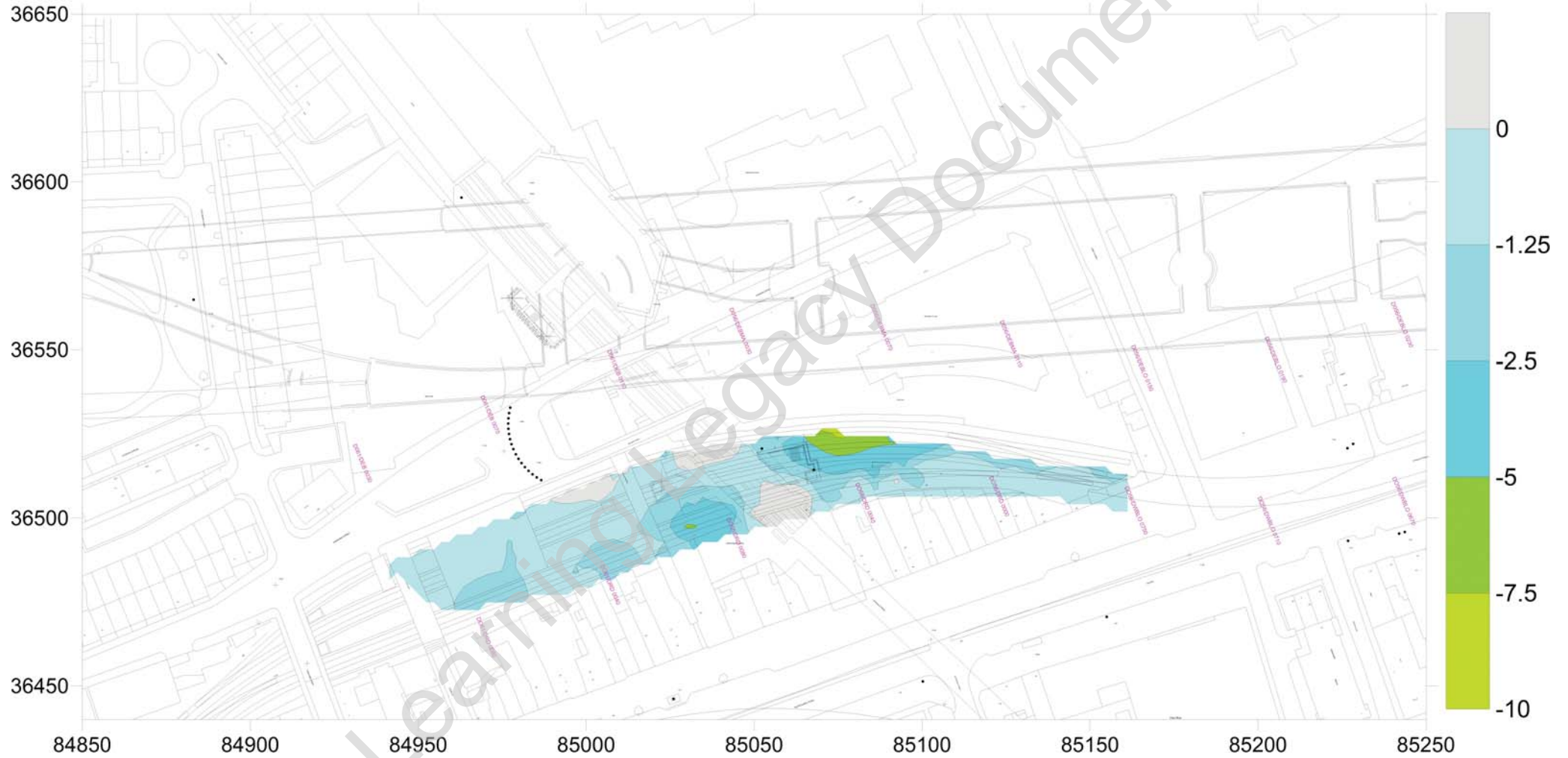
### Differential Movement Z (mm) from 30/04/2014 to 30/04/2015 - Track and Structure



### Differential Movement Z (mm) from 30/04/2014 to 30/04/2015 - Structure

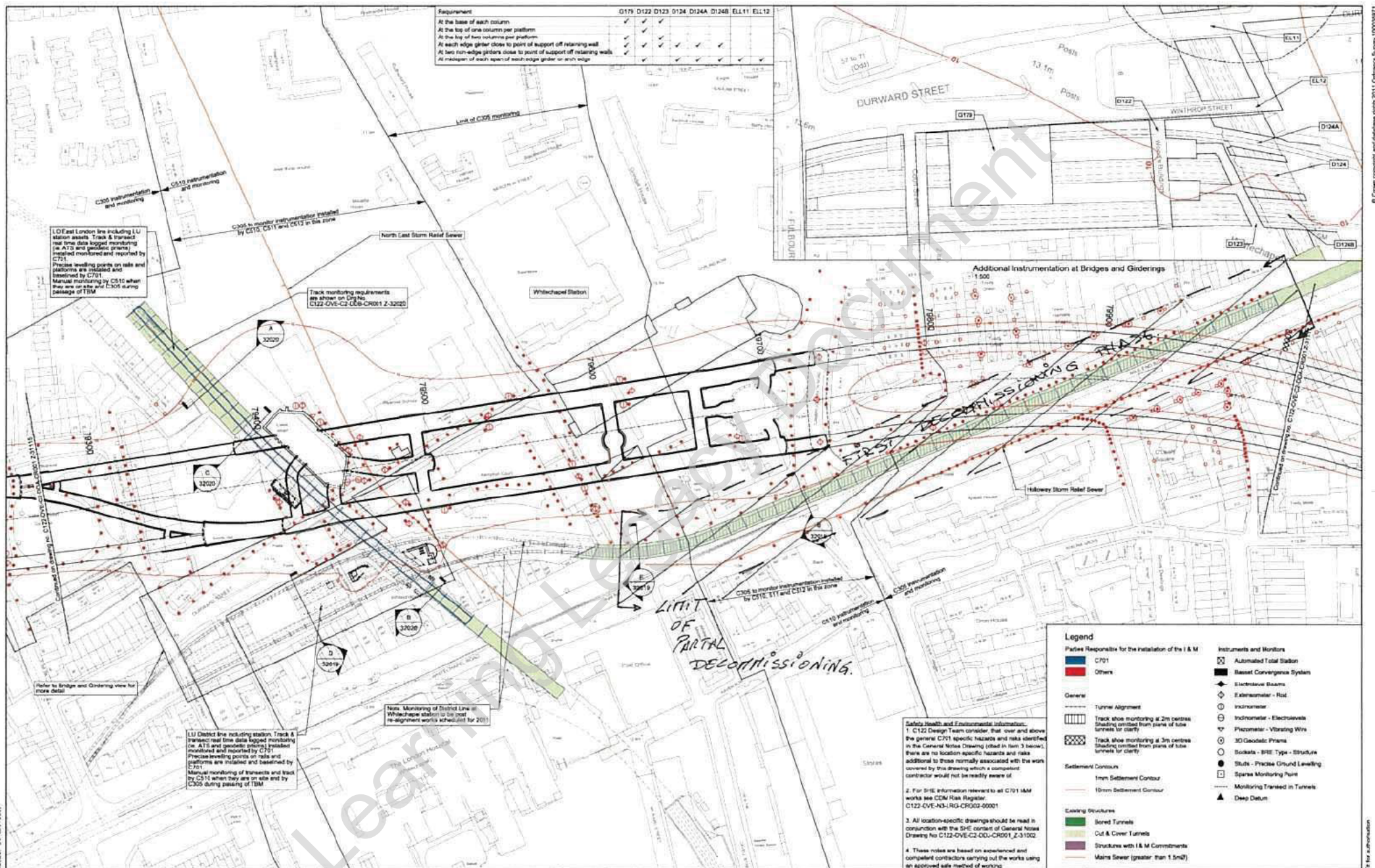


### Differential Movement Z (mm) from 30/04/2014 to 30/04/2015 - Track



## APPENDIX D

Learning Legacy Document



### Legend

<b>Patrols Responsible for the installation of the I &amp; M</b>	<b>Instruments and Monitors</b>
<span style="color: blue;">■</span> C170	Automated Total Station
<span style="color: red;">■</span> Others	Basset Convergence System
<b>General</b>	Extensometer Beams
Tunnel Alignment	Extensometer - Rod
Track show monitoring at 2m centres (Shading omitted from plans of tube tunnels for clarity)	Inclinometer
Track show monitoring at 3m centres (Shading omitted from plans of tube tunnels for clarity)	Inclinometer - Electrodeless
Settlement Contours	Pneumatic - Vibrating Wire
10mm Settlement Contour	3D Geodesic Prisms
5mm Settlement Contour	Boltless - BSE Type - Structure
<b>Existing Structures</b>	Studs - Precise Ground Levelling
Bored Tunnels	Sparse Monitoring Point
Cut & Cover Tunnels	Monitoring Trained in Tunnels
Structures with I & M Commitments	Deep Datum
Main Sewer (greater than 1.5m dia)	

**Safety, Health and Environmental Information:**

1. C122 Design Team consider that over and above the general C701 specific hazards and risks identified in the General Noise Drawing (listed in Item 3 below), there are no location specific hazards and risks additional to those normally associated with the work covered by this drawing which a competent contractor would not be readily aware of.

2. For SHE information relevant to all C701 I&M works see CDM Risk Register C122-OVE-N3-IG-CR002-00001

3. All location-specific drawings should be read in conjunction with the SHE content of General Noise Drawing No C122-OVE-C2-OD-CR001\_Z-31002

4. These notes are based on experienced and competent contractors carrying out the works using an approved safe method of working.

LU District line including station. Track & tunnel real time data logged monitoring (ie. ATIS and geodesic prisms) installed, monitored and reported by C170. Precise levelling points on rails and platforms are installed and baselined by C171. Manual monitoring of tracks and track by C172 when they are on site and by C300 during passing of TBM.

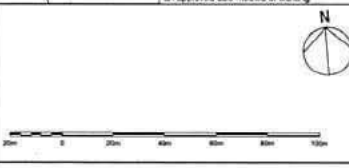
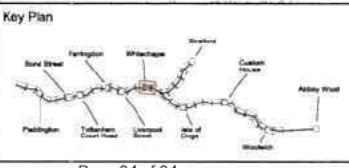
Note: Monitoring of finished line at Whitechapel station to be post re-alignment works scheduled for 2011

Rev	Date	Description	By	CHKD	App	Aut
PST	08/11/2010	Final Issue	JG	RS	RM	
PSD	14/10/2011	Minimum requirement for instrumentation and monitoring	AP	JA	SR	

**Notes**

1. For instrumentation & Monitoring general notes, schedule and monitoring frequency, refer to Dwg Nos. C122-OVE-OD-CR001\_Z-31002 and C122-OVE-OD-CR001\_Z-31007

**Decommissioning Agreement Whitechapel London Underground**  
C704-XRL-C-AAG-D061-50002 Rev 3.0



**Bored Tunnels (Alignment and Track)**

Client: **Over Arup & Partners Limited**

Contract: **Crossrail General**

Contractor: **Crossrail Limited**

28 Canale House, Canary Wharf, London E14 4UG

The Instrumentation & Monitoring Combined I & M Route-wide Plan Sheet 16 of 38 C701

Scale: 1:1000 @ A1

Drawing and CAD No: C122-OVE-C2-DA-CR001\_Z-31116

Page: P03 of 54

Learning Legacy Document

**APPENDIX B:**  
**LEVELLING MARKS**

## TABLE OF CONTENTS

### 1. LEVELLING MARKS LOCATED ON THE FOUR RAILS

#### 1.1 COORDINATES

Learning Legacy Document



1. LEVELLING MARKS LOCATED ON THE FOUR RAILS.

This document includes the location and elevation values for all the levelling marks located on the four rails.

1.1. COORDINATES

SENSOR TYPE	SENSOR ID	SENSOR LOCATION-GPS READING (m)		
		Easting X	Northing Y	Elevation Z (mATD)
Levelling mark	LT080101	85579.553	36624.342	102.504
Levelling mark	LT080102	85575.283	36624.555	102.511
Levelling mark	LT080103	85573.366	36623.930	102.510
Levelling mark	LT080104	85571.475	36623.315	102.505
Levelling mark	LT080105	85569.570	36622.696	102.509
Levelling mark	LT080106	85567.666	36622.075	102.524
Levelling mark	LT080107	85565.765	36621.455	102.534
Levelling mark	LT080108	85563.865	36620.836	102.542
Levelling mark	LT080109	85561.955	36620.208	102.555
Levelling mark	LT080110	85560.068	36619.591	102.566
Levelling mark	LT080111	85558.166	36618.975	102.575
Levelling mark	LT080112	85556.258	36618.356	102.582
Levelling mark	LT080113	85554.359	36617.738	102.587
Levelling mark	LT080114	85552.457	36617.121	102.597
Levelling mark	LT080115	85550.548	36616.497	102.616
Levelling mark	LT080116	85548.655	36615.879	102.629
Levelling mark	LT080117	85546.751	36615.261	102.637
Levelling mark	LT080118	85544.847	36614.640	102.646
Levelling mark	LT080119	85542.945	36614.019	102.653
Levelling mark	LT080120	85541.057	36613.410	102.657
Levelling mark	LT080121	85539.137	36612.787	102.663
Levelling mark	LT080122	85537.226	36612.154	102.673
Levelling mark	LT080123	85535.344	36611.540	102.682
Levelling mark	LT080124	85533.442	36610.922	102.695
Levelling mark	LT080125	85531.540	36610.305	102.702
Levelling mark	LT080126	85529.633	36609.683	102.709
Levelling mark	LT080127	85527.733	36609.063	102.716
Levelling mark	LT080128	85525.830	36608.441	102.722
Levelling mark	LT080129	85523.934	36607.824	102.731
Levelling mark	LT080130	85522.029	36607.204	102.739
Levelling mark	LT080131	85520.131	36606.588	102.746
Levelling mark	LT080132	85518.224	36605.967	102.752
Levelling mark	LT080133	85516.325	36605.349	102.759

Levelling mark	LT080134	85514.413	36604.720	102.768
Levelling mark	LT080135	85512.528	36604.108	102.779
Levelling mark	LT080136	85510.632	36603.501	102.791
Levelling mark	LT080137	85508.703	36602.872	102.804
Levelling mark	LT080138	85506.821	36602.258	102.822
Levelling mark	LT080139	85504.914	36601.640	102.837
Levelling mark	LT080140	85503.011	36601.023	102.847
Levelling mark	LT080141	85501.106	36600.401	102.859
Levelling mark	LT080142	85499.215	36599.792	102.875
Levelling mark	LT080143	85497.304	36599.174	102.886
Levelling mark	LT080144	85495.398	36598.554	102.899
Levelling mark	LT080145	85493.497	36597.933	102.910
Levelling mark	LT080146	85491.596	36597.314	102.922
Levelling mark	LT080147	85489.695	36596.695	102.935
Levelling mark	LT080148	85487.793	36596.075	102.947
Levelling mark	LT080149	85485.891	36595.455	102.959
Levelling mark	LT080150	85483.990	36594.835	102.971
Levelling mark	LT080151	85482.086	36594.212	102.983
Levelling mark	LT080152	85480.206	36593.611	102.997
Levelling mark	LT080153	85478.284	36592.989	103.010
Levelling mark	LT080154	85476.381	36592.370	103.018
Levelling mark	LT080155	85474.487	36591.763	103.029
Levelling mark	LT080156	85472.576	36591.138	103.048
Levelling mark	LT080157	85470.674	36590.520	103.065
Levelling mark	LT080158	85468.772	36589.903	103.076
Levelling mark	LT080159	85466.870	36589.286	103.090
Levelling mark	LT080160	85464.968	36588.669	103.107
Levelling mark	LT080161	85463.120	36588.133	103.118
Levelling mark	LT080162	85461.119	36587.492	103.126
Levelling mark	LT080163	85459.223	36586.855	103.138
Levelling mark	LT080164	85457.328	36586.218	103.155
Levelling mark	LT080165	85455.451	36585.588	103.171
Levelling mark	LT080166	85453.557	36584.971	103.183
Levelling mark	LT080167	85451.653	36584.357	103.194
Levelling mark	LT080168	85449.744	36583.740	103.210
Levelling mark	LT080169	85447.848	36583.123	103.230
Levelling mark	LT080170	85445.937	36582.506	103.249
Levelling mark	LT080171	85444.036	36581.885	103.259
Levelling mark	LT080172	85442.143	36581.276	103.267
Levelling mark	LT080173	85440.263	36580.668	103.278
Levelling mark	LT080174	85438.353	36580.076	103.295
Levelling mark	LT080175	85436.418	36579.447	103.308
Levelling mark	LT080176	85434.519	36578.828	103.313
Levelling mark	LT080177	85432.617	36578.210	103.324
Levelling mark	LT080178	85430.714	36577.590	103.345
Levelling mark	LT080179	85428.812	36576.971	103.366

Levelling mark	LT080180	85426.908	36576.354	103.380
Levelling mark	LT080181	85425.003	36575.732	103.396
Levelling mark	LT080182	85423.111	36575.112	103.415
Levelling mark	LT080183	85421.223	36574.502	103.428
Levelling mark	LT080184	85419.305	36573.894	103.440
Levelling mark	LT080185	85417.395	36573.278	103.456
Levelling mark	LT080186	85415.496	36572.661	103.470
Levelling mark	LT080187	85413.558	36572.027	103.485
Levelling mark	LT080188	85411.701	36571.391	103.512
Levelling mark	LT080189	85409.802	36570.775	103.537
Levelling mark	LT080190	85407.899	36570.160	103.553
Levelling mark	LT080191	85405.990	36569.540	103.570
Levelling mark	LT080192	85404.097	36568.922	103.588
Levelling mark	LT080193	85402.188	36568.305	103.608
Levelling mark	LT080194	85400.287	36567.687	103.619
Levelling mark	LT080195	85398.385	36567.069	103.633
Levelling mark	LT080196	85396.480	36566.449	103.652
Levelling mark	LT080197	85394.653	36565.867	103.669
Levelling mark	LT080198	85392.669	36565.284	103.680
Levelling mark	LT080199	85390.757	36564.672	103.690
Levelling mark	LT080200	85388.861	36564.060	103.701
Levelling mark	LT080201	85386.956	36563.451	103.716
Levelling mark	LT080202	85385.046	36562.843	103.729
Levelling mark	LT080203	85383.144	36562.231	103.735
Levelling mark	LT080204	85381.244	36561.623	103.739
Levelling mark	LT080205	85379.335	36561.015	103.750
Levelling mark	LT080206	85377.400	36560.391	103.771
Levelling mark	LT080207	85375.535	36559.769	103.785
Levelling mark	LT080208	85373.634	36559.163	103.796
Levelling mark	LT080209	85371.746	36558.569	103.811
Levelling mark	LT080210	85369.835	36557.981	103.823
Levelling mark	LT080211	85367.905	36557.378	103.838
Levelling mark	LT080212	85366.003	36556.775	103.852
Levelling mark	LT080213	85364.095	36556.172	103.869
Levelling mark	LT080214	85362.189	36555.571	103.887
Levelling mark	LT080215	85360.287	36554.973	103.904
Levelling mark	LT080216	85358.373	36554.374	103.916
Levelling mark	LT080217	85356.468	36553.776	103.925
Levelling mark	LT080218	85354.569	36553.180	103.937
Levelling mark	LT080219	85352.651	36552.586	103.951
Levelling mark	LT080220	85350.744	36551.990	103.967
Levelling mark	LT080221	85348.762	36551.361	103.979
Levelling mark	LT080222	85346.943	36550.748	103.988
Levelling mark	LT080223	85345.031	36550.152	104.005
Levelling mark	LT080224	85343.119	36549.554	104.018
Levelling mark	LT080225	85341.219	36548.961	104.028

Levelling mark	LT080226	85339.309	36548.370	104.042
Levelling mark	LT080227	85337.397	36547.778	104.064
Levelling mark	LT080228	85335.548	36547.217	104.087
Levelling mark	LT080229	85333.564	36546.657	104.110
Levelling mark	LT080230	85331.646	36546.066	104.133
Levelling mark	LT080231	85329.741	36545.475	104.154
Levelling mark	LT080232	85327.822	36544.881	104.172
Levelling mark	LT080233	85325.913	36544.285	104.192
Levelling mark	LT080234	85324.004	36543.689	104.203
Levelling mark	LT080235	85322.094	36543.093	104.210
Levelling mark	LT080236	85320.185	36542.497	104.225
Levelling mark	LT080237	85318.276	36541.901	104.246
Levelling mark	LT080238	85316.367	36541.305	104.267
Levelling mark	LT080239	85314.458	36540.709	104.287
Levelling mark	LT080240	85312.549	36540.113	104.309
Levelling mark	LT080241	85310.640	36539.517	104.329
Levelling mark	LT080242	85308.722	36538.916	104.342
Levelling mark	LT080243	85306.827	36538.322	104.358
Levelling mark	LT080244	85304.916	36537.729	104.381
Levelling mark	LT080245	85303.006	36537.136	104.400
Levelling mark	LT080246	85301.098	36536.545	104.416
Levelling mark	LT080247	85299.189	36535.955	104.426
Levelling mark	LT080248	85297.282	36535.369	104.439
Levelling mark	LT080249	85295.362	36534.780	104.460
Levelling mark	LT080250	85293.437	36534.178	104.482
Levelling mark	LT080251	85291.531	36533.572	104.505
Levelling mark	LT080252	85289.640	36532.979	104.523
Levelling mark	LT080253	85287.733	36532.389	104.539
Levelling mark	LT080254	85285.855	36531.819	104.551
Levelling mark	LT080255	85283.896	36531.240	104.571
Levelling mark	LT080256	85281.990	36530.650	104.596
Levelling mark	LT080257	85280.076	36530.060	104.620
Levelling mark	LT080258	85278.168	36529.469	104.646
Levelling mark	LT080259	85276.257	36528.881	104.673
Levelling mark	LT080260	85274.346	36528.292	104.698
Levelling mark	LT080261	85272.437	36527.705	104.724
Levelling mark	LT080262	85270.525	36527.119	104.751
Levelling mark	LT080263	85268.614	36526.534	104.776
Levelling mark	LT080264	85266.704	36525.951	104.803
Levelling mark	LT080265	85264.782	36525.365	104.830
Levelling mark	LT080266	85262.886	36524.782	104.855
Levelling mark	LT080267	85260.971	36524.206	104.880
Levelling mark	LT080268	85259.048	36523.618	104.902
Levelling mark	LT080269	85257.139	36523.032	104.922
Levelling mark	LT080270	85255.220	36522.447	104.952
Levelling mark	LT080271	85253.312	36521.861	104.980

Levelling mark	LT080272	85251.405	36521.279	105.001
Levelling mark	LT080273	85249.493	36520.700	105.020
Levelling mark	LT080274	85247.565	36520.117	105.045
Levelling mark	LT080275	85245.712	36519.556	105.071
Levelling mark	LT080276	85243.785	36519.018	105.095
Levelling mark	LT080277	85241.824	36518.461	105.119
Levelling mark	LT080278	85239.805	36517.850	105.141
Levelling mark	LT080279	85238.031	36517.267	105.167
Levelling mark	LT080280	85236.119	36516.721	105.201
Levelling mark	LT080281	85234.194	36516.180	105.238
Levelling mark	LT080282	85232.303	36515.667	105.268
Levelling mark	LT080283	85230.369	36515.158	105.305
Levelling mark	LT080284	85228.448	36514.667	105.344
Levelling mark	LT080285	85226.551	36514.199	105.386
Levelling mark	LT080286	85224.604	36513.743	105.427
Levelling mark	LT080287	85222.688	36513.318	105.472
Levelling mark	LT080288	85220.770	36512.908	105.517
Levelling mark	LT080289	85218.833	36512.531	105.562
Levelling mark	LT080290	85216.867	36512.159	105.607
Levelling mark	LT080291	85214.978	36511.839	105.654
Levelling mark	LT080292	85213.001	36511.537	105.699
Levelling mark	LT080293	85211.024	36511.236	105.747
Levelling mark	LT080294	85209.118	36510.992	105.793
Levelling mark	LT080295	85207.134	36510.756	105.835
Levelling mark	LT080296	85205.241	36510.534	105.885
Levelling mark	LT080297	85203.247	36510.378	105.933
Levelling mark	LT080298	85201.253	36510.221	105.985
Levelling mark	LT080299	85199.259	36510.065	106.037
Levelling mark	LT080300	85198.221	36509.989	106.085
Levelling mark	LT081101	85578.547	36623.835	102.502
Levelling mark	LT081102	85575.745	36623.117	102.504
Levelling mark	LT081103	85573.839	36622.495	102.500
Levelling mark	LT081104	85571.940	36621.878	102.498
Levelling mark	LT081105	85570.037	36621.260	102.508
Levelling mark	LT081106	85568.135	36620.640	102.526
Levelling mark	LT081107	85566.234	36620.019	102.536
Levelling mark	LT081108	85564.333	36619.400	102.543
Levelling mark	LT081109	85562.429	36618.775	102.555
Levelling mark	LT081110	85560.533	36618.154	102.565
Levelling mark	LT081111	85558.630	36617.538	102.572
Levelling mark	LT081112	85556.726	36616.920	102.581
Levelling mark	LT081113	85554.825	36616.302	102.591
Levelling mark	LT081114	85552.923	36615.685	102.605
Levelling mark	LT081115	85551.019	36615.062	102.618
Levelling mark	LT081116	85549.121	36614.443	102.626

Levelling mark	LT081117	85547.218	36613.825	102.628
Levelling mark	LT081118	85545.315	36613.205	102.635
Levelling mark	LT081119	85543.414	36612.584	102.643
Levelling mark	LT081120	85541.517	36611.971	102.654
Levelling mark	LT081121	85539.608	36611.352	102.665
Levelling mark	LT081122	85537.704	36610.722	102.674
Levelling mark	LT081123	85535.810	36610.103	102.679
Levelling mark	LT081124	85533.908	36609.486	102.690
Levelling mark	LT081125	85532.006	36608.869	102.704
Levelling mark	LT081126	85530.102	36608.248	102.717
Levelling mark	LT081127	85528.202	36607.627	102.726
Levelling mark	LT081128	85526.300	36607.006	102.729
Levelling mark	LT081129	85524.400	36606.388	102.731
Levelling mark	LT081130	85522.497	36605.769	102.738
Levelling mark	LT081131	85520.596	36605.151	102.749
Levelling mark	LT081132	85518.693	36604.532	102.760
Levelling mark	LT081133	85516.792	36603.913	102.763
Levelling mark	LT081134	85514.888	36603.287	102.772
Levelling mark	LT081135	85512.992	36602.671	102.782
Levelling mark	LT081136	85511.090	36602.062	102.795
Levelling mark	LT081137	85509.179	36601.439	102.811
Levelling mark	LT081138	85507.285	36600.821	102.824
Levelling mark	LT081139	85505.380	36600.204	102.836
Levelling mark	LT081140	85503.478	36599.586	102.845
Levelling mark	LT081141	85501.575	36598.966	102.855
Levelling mark	LT081142	85499.676	36598.354	102.869
Levelling mark	LT081143	85497.770	36597.738	102.881
Levelling mark	LT081144	85495.867	36597.118	102.892
Levelling mark	LT081145	85493.965	36596.498	102.901
Levelling mark	LT081146	85492.064	36595.878	102.910
Levelling mark	LT081147	85490.162	36595.259	102.924
Levelling mark	LT081148	85488.261	36594.639	102.938
Levelling mark	LT081149	85486.359	36594.019	102.951
Levelling mark	LT081150	85484.458	36593.399	102.964
Levelling mark	LT081151	85482.556	36592.777	102.982
Levelling mark	LT081152	85480.660	36592.171	103.001
Levelling mark	LT081153	85478.750	36591.553	103.013
Levelling mark	LT081154	85476.848	36590.934	103.021
Levelling mark	LT081155	85474.947	36590.325	103.030
Levelling mark	LT081156	85473.043	36589.702	103.044
Levelling mark	LT081157	85471.141	36589.084	103.061
Levelling mark	LT081158	85469.238	36588.467	103.079
Levelling mark	LT081159	85467.336	36587.850	103.094
Levelling mark	LT081160	85465.434	36587.233	103.109
Levelling mark	LT081161	85463.539	36586.683	103.121
Levelling mark	LT081162	85461.600	36586.061	103.130

Levelling mark	LT081163	85459.704	36585.423	103.140
Levelling mark	LT081164	85457.809	36584.786	103.152
Levelling mark	LT081165	85455.920	36584.153	103.167
Levelling mark	LT081166	85454.021	36583.534	103.184
Levelling mark	LT081167	85452.117	36582.920	103.202
Levelling mark	LT081168	85450.212	36582.304	103.214
Levelling mark	LT081169	85448.312	36581.686	103.229
Levelling mark	LT081170	85446.406	36581.070	103.251
Levelling mark	LT081171	85444.505	36580.449	103.267
Levelling mark	LT081172	85442.605	36579.838	103.278
Levelling mark	LT081173	85440.710	36579.226	103.290
Levelling mark	LT081174	85438.800	36578.634	103.308
Levelling mark	LT081175	85436.886	36578.012	103.326
Levelling mark	LT081176	85434.986	36577.392	103.334
Levelling mark	LT081177	85433.083	36576.774	103.344
Levelling mark	LT081178	85431.181	36576.155	103.358
Levelling mark	LT081179	85429.280	36575.535	103.374
Levelling mark	LT081180	85427.377	36574.919	103.386
Levelling mark	LT081181	85425.474	36574.298	103.401
Levelling mark	LT081182	85423.576	36573.676	103.420
Levelling mark	LT081183	85421.679	36573.063	103.434
Levelling mark	LT081184	85419.768	36572.457	103.446
Levelling mark	LT081185	85417.862	36571.842	103.460
Levelling mark	LT081186	85415.961	36571.224	103.474
Levelling mark	LT081187	85414.047	36570.598	103.488
Levelling mark	LT081188	85412.167	36569.955	103.512
Levelling mark	LT081189	85410.266	36569.338	103.535
Levelling mark	LT081190	85408.364	36568.723	103.552
Levelling mark	LT081191	85406.459	36568.104	103.564
Levelling mark	LT081192	85404.560	36567.485	103.576
Levelling mark	LT081193	85402.655	36566.869	103.595
Levelling mark	LT081194	85400.754	36566.250	103.611
Levelling mark	LT081195	85398.851	36565.633	103.632
Levelling mark	LT081196	85396.948	36565.014	103.653
Levelling mark	LT081197	85395.071	36564.416	103.667
Levelling mark	LT081198	85393.129	36563.846	103.672
Levelling mark	LT081199	85391.222	36563.235	103.692
Levelling mark	LT081200	85389.321	36562.622	103.711
Levelling mark	LT081201	85387.416	36562.013	103.731
Levelling mark	LT081202	85385.508	36561.405	103.748
Levelling mark	LT081203	85383.605	36560.794	103.753
Levelling mark	LT081204	85381.702	36560.184	103.760
Levelling mark	LT081205	85379.795	36559.577	103.771
Levelling mark	LT081206	85377.880	36558.959	103.793
Levelling mark	LT081207	85375.995	36558.331	103.811
Levelling mark	LT081208	85374.091	36557.724	103.825

Levelling mark	LT081209	85372.190	36557.126	103.840
Levelling mark	LT081210	85370.279	36556.537	103.853
Levelling mark	LT081211	85368.362	36555.939	103.871
Levelling mark	LT081212	85366.457	36555.335	103.887
Levelling mark	LT081213	85364.550	36554.733	103.899
Levelling mark	LT081214	85362.643	36554.131	103.907
Levelling mark	LT081215	85360.737	36553.532	103.918
Levelling mark	LT081216	85358.827	36552.934	103.935
Levelling mark	LT081217	85356.920	36552.335	103.949
Levelling mark	LT081218	85355.015	36551.738	103.959
Levelling mark	LT081219	85353.102	36551.144	103.971
Levelling mark	LT081220	85351.193	36550.548	103.989
Levelling mark	LT081221	85349.260	36549.936	104.008
Levelling mark	LT081222	85347.392	36549.307	104.022
Levelling mark	LT081223	85345.482	36548.711	104.037
Levelling mark	LT081224	85343.572	36548.113	104.052
Levelling mark	LT081225	85341.666	36547.519	104.064
Levelling mark	LT081226	85339.755	36546.927	104.075
Levelling mark	LT081227	85337.844	36546.336	104.093
Levelling mark	LT081228	85335.954	36545.762	104.114
Levelling mark	LT081229	85334.008	36545.213	104.137
Levelling mark	LT081230	85332.094	36544.624	104.156
Levelling mark	LT081231	85330.186	36544.032	104.174
Levelling mark	LT081232	85328.272	36543.440	104.186
Levelling mark	LT081233	85326.363	36542.844	104.201
Levelling mark	LT081234	85324.454	36542.248	104.218
Levelling mark	LT081235	85322.544	36541.652	104.231
Levelling mark	LT081236	85320.635	36541.056	104.245
Levelling mark	LT081237	85318.726	36540.460	104.262
Levelling mark	LT081238	85316.817	36539.864	104.278
Levelling mark	LT081239	85314.908	36539.268	104.294
Levelling mark	LT081240	85312.999	36538.672	104.314
Levelling mark	LT081241	85311.090	36538.076	104.333
Levelling mark	LT081242	85309.178	36537.476	104.347
Levelling mark	LT081243	85307.274	36536.880	104.362
Levelling mark	LT081244	85305.364	36536.287	104.383
Levelling mark	LT081245	85303.454	36535.694	104.404
Levelling mark	LT081246	85301.544	36535.102	104.421
Levelling mark	LT081247	85299.634	36534.512	104.435
Levelling mark	LT081248	85297.724	36533.926	104.449
Levelling mark	LT081249	85295.809	36533.338	104.465
Levelling mark	LT081250	85293.894	36532.739	104.480
Levelling mark	LT081251	85291.988	36532.133	104.500
Levelling mark	LT081252	85290.087	36531.536	104.523
Levelling mark	LT081253	85288.177	36530.946	104.543
Levelling mark	LT081254	85286.276	36530.369	104.559



Levelling mark	LT081255	85284.343	36529.798	104.575
Levelling mark	LT081256	85282.434	36529.207	104.596
Levelling mark	LT081257	85280.522	36528.617	104.621
Levelling mark	LT081258	85278.612	36528.026	104.647
Levelling mark	LT081259	85276.701	36527.437	104.674
Levelling mark	LT081260	85274.790	36526.849	104.700
Levelling mark	LT081261	85272.879	36526.261	104.728
Levelling mark	LT081262	85270.967	36525.675	104.756
Levelling mark	LT081263	85269.055	36525.090	104.779
Levelling mark	LT081264	85267.144	36524.506	104.802
Levelling mark	LT081265	85265.227	36523.922	104.827
Levelling mark	LT081266	85263.321	36523.336	104.853
Levelling mark	LT081267	85261.406	36522.760	104.878
Levelling mark	LT081268	85259.490	36522.174	104.901
Levelling mark	LT081269	85257.579	36521.588	104.924
Levelling mark	LT081270	85255.664	36521.003	104.951
Levelling mark	LT081271	85253.753	36520.417	104.980
Levelling mark	LT081272	85251.842	36519.834	105.005
Levelling mark	LT081273	85249.929	36519.255	105.029
Levelling mark	LT081274	85248.010	36518.674	105.058
Levelling mark	LT081275	85246.118	36518.101	105.088
Levelling mark	LT081276	85244.191	36517.564	105.115
Levelling mark	LT081277	85242.254	36517.013	105.139
Levelling mark	LT081278	85240.301	36516.424	105.162
Levelling mark	LT081279	85238.447	36515.816	105.194
Levelling mark	LT081280	85236.528	36515.268	105.229
Levelling mark	LT081281	85234.603	36514.726	105.262
Levelling mark	LT081282	85232.687	36514.206	105.290
Levelling mark	LT081283	85230.752	36513.698	105.323
Levelling mark	LT081284	85228.821	36513.203	105.364
Levelling mark	LT081285	85226.895	36512.729	105.407
Levelling mark	LT081286	85224.948	36512.273	105.454
Levelling mark	LT081287	85223.010	36511.843	105.500
Levelling mark	LT081288	85221.067	36511.428	105.547
Levelling mark	LT081289	85219.113	36511.047	105.594
Levelling mark	LT081290	85217.148	36510.676	105.643
Levelling mark	LT081291	85215.206	36510.346	105.691
Levelling mark	LT081292	85213.229	36510.045	105.733
Levelling mark	LT081293	85211.252	36509.743	105.771
Levelling mark	LT081294	85209.297	36509.493	105.807
Levelling mark	LT081295	85207.311	36509.257	105.838
Levelling mark	LT081296	85205.359	36509.028	105.898
Levelling mark	LT081297	85203.365	36508.872	105.954
Levelling mark	LT081298	85201.371	36508.716	106.009
Levelling mark	LT081299	85199.377	36508.560	106.064
Levelling mark	LT081300	85198.325	36508.123	106.115

Levelling mark	LT083101	85578.638	36620.655	102.520
Levelling mark	LT083102	85576.734	36620.042	102.520
Levelling mark	LT083103	85574.848	36619.427	102.525
Levelling mark	LT083104	85572.936	36618.805	102.533
Levelling mark	LT083105	85571.036	36618.188	102.539
Levelling mark	LT083106	85569.137	36617.569	102.543
Levelling mark	LT083107	85567.236	36616.949	102.548
Levelling mark	LT083108	85565.332	36616.329	102.550
Levelling mark	LT083109	85563.442	36615.708	102.557
Levelling mark	LT083110	85561.528	36615.081	102.567
Levelling mark	LT083111	85559.625	36614.465	102.577
Levelling mark	LT083112	85557.727	36613.849	102.591
Levelling mark	LT083113	85555.822	36613.230	102.602
Levelling mark	LT083114	85553.920	36612.612	102.606
Levelling mark	LT083115	85552.027	36611.994	102.612
Levelling mark	LT083116	85550.118	36611.371	102.623
Levelling mark	LT083117	85548.217	36610.753	102.636
Levelling mark	LT083118	85546.318	36610.134	102.642
Levelling mark	LT083119	85544.417	36609.513	102.646
Levelling mark	LT083120	85542.499	36608.894	102.650
Levelling mark	LT083121	85540.614	36608.283	102.652
Levelling mark	LT083122	85538.728	36607.659	102.654
Levelling mark	LT083123	85536.807	36607.031	102.676
Levelling mark	LT083124	85534.905	36606.414	102.687
Levelling mark	LT083125	85533.003	36605.796	102.693
Levelling mark	LT083126	85531.106	36605.178	102.698
Levelling mark	LT083127	85529.204	36604.557	102.706
Levelling mark	LT083128	85527.305	36603.936	102.714
Levelling mark	LT083129	85525.397	36603.315	102.724
Levelling mark	LT083130	85523.498	36602.698	102.731
Levelling mark	LT083131	85521.592	36602.079	102.732
Levelling mark	LT083132	85519.695	36601.461	102.741
Levelling mark	LT083133	85517.791	36600.841	102.746
Levelling mark	LT083134	85515.903	36600.220	102.752
Levelling mark	LT083135	85513.983	36599.597	102.762
Levelling mark	LT083136	85512.070	36598.984	102.773
Levelling mark	LT083137	85510.196	36598.373	102.796
Levelling mark	LT083138	85508.275	36597.746	102.817
Levelling mark	LT083139	85506.378	36597.132	102.835
Levelling mark	LT083140	85504.475	36596.514	102.851
Levelling mark	LT083141	85502.578	36595.896	102.865
Levelling mark	LT083142	85500.661	36595.278	102.880
Levelling mark	LT083143	85498.766	36594.666	102.894
Levelling mark	LT083144	85496.869	36594.048	102.902
Levelling mark	LT083145	85494.967	36593.427	102.910
Levelling mark	LT083146	85493.065	36592.807	102.920

Levelling mark	LT083147	85491.163	36592.188	102.933
Levelling mark	LT083148	85489.262	36591.568	102.945
Levelling mark	LT083149	85487.360	36590.948	102.958
Levelling mark	LT083150	85485.459	36590.328	102.970
Levelling mark	LT083151	85483.562	36589.707	102.983
Levelling mark	LT083152	85481.631	36589.091	102.996
Levelling mark	LT083153	85479.748	36588.481	103.007
Levelling mark	LT083154	85477.847	36587.863	103.022
Levelling mark	LT083155	85475.931	36587.249	103.041
Levelling mark	LT083156	85474.041	36586.630	103.061
Levelling mark	LT083157	85472.138	36586.012	103.081
Levelling mark	LT083158	85470.235	36585.394	103.097
Levelling mark	LT083159	85468.332	36584.778	103.109
Levelling mark	LT083160	85466.430	36584.161	103.123
Levelling mark	LT083161	85464.437	36583.580	103.134
Levelling mark	LT083162	85462.629	36582.999	103.146
Levelling mark	LT083163	85460.734	36582.362	103.160
Levelling mark	LT083164	85458.838	36581.725	103.174
Levelling mark	LT083165	85456.922	36581.082	103.187
Levelling mark	LT083166	85455.013	36580.461	103.200
Levelling mark	LT083167	85453.110	36579.846	103.213
Levelling mark	LT083168	85451.213	36579.233	103.225
Levelling mark	LT083169	85449.305	36578.613	103.236
Levelling mark	LT083170	85447.409	36578.000	103.249
Levelling mark	LT083171	85445.508	36577.379	103.268
Levelling mark	LT083172	85443.593	36576.763	103.286
Levelling mark	LT083173	85441.667	36576.141	103.302
Levelling mark	LT083174	85439.757	36575.549	103.319
Levelling mark	LT083175	85437.888	36574.941	103.330
Levelling mark	LT083176	85435.984	36574.320	103.343
Levelling mark	LT083177	85434.082	36573.702	103.362
Levelling mark	LT083178	85432.181	36573.083	103.386
Levelling mark	LT083179	85430.280	36572.464	103.404
Levelling mark	LT083180	85428.378	36571.848	103.421
Levelling mark	LT083181	85426.481	36571.228	103.439
Levelling mark	LT083182	85424.571	36570.603	103.455
Levelling mark	LT083183	85422.653	36569.983	103.474
Levelling mark	LT083184	85420.758	36569.383	103.491
Levelling mark	LT083185	85418.861	36568.771	103.505
Levelling mark	LT083186	85416.957	36568.152	103.518
Levelling mark	LT083187	85415.093	36567.542	103.531
Levelling mark	LT083188	85413.165	36566.883	103.547
Levelling mark	LT083189	85411.260	36566.265	103.565
Levelling mark	LT083190	85409.360	36565.651	103.583
Levelling mark	LT083191	85407.461	36565.034	103.603
Levelling mark	LT083192	85405.552	36564.411	103.620

Levelling mark	LT083193	85403.654	36563.797	103.638
Levelling mark	LT083194	85401.751	36563.178	103.655
Levelling mark	LT083195	85399.849	36562.561	103.673
Levelling mark	LT083196	85397.951	36561.943	103.691
Levelling mark	LT083197	85395.966	36561.313	103.702
Levelling mark	LT083198	85394.112	36560.769	103.716
Levelling mark	LT083199	85392.214	36560.161	103.732
Levelling mark	LT083200	85390.304	36559.545	103.749
Levelling mark	LT083201	85388.398	36558.936	103.766
Levelling mark	LT083202	85386.497	36558.330	103.783
Levelling mark	LT083203	85384.591	36557.718	103.795
Levelling mark	LT083204	85382.682	36557.107	103.807
Levelling mark	LT083205	85380.779	36556.500	103.817
Levelling mark	LT083206	85378.907	36555.897	103.830
Levelling mark	LT083207	85376.978	36555.254	103.847
Levelling mark	LT083208	85375.067	36554.645	103.862
Levelling mark	LT083209	85373.140	36554.039	103.875
Levelling mark	LT083210	85371.229	36553.450	103.889
Levelling mark	LT083211	85369.340	36552.860	103.907
Levelling mark	LT083212	85367.430	36552.255	103.922
Levelling mark	LT083213	85365.523	36551.653	103.936
Levelling mark	LT083214	85363.614	36551.050	103.950
Levelling mark	LT083215	85361.700	36550.449	103.964
Levelling mark	LT083216	85359.797	36549.853	103.977
Levelling mark	LT083217	85357.886	36549.253	103.991
Levelling mark	LT083218	85355.968	36548.652	104.005
Levelling mark	LT083219	85354.065	36548.062	104.020
Levelling mark	LT083220	85352.154	36547.465	104.036
Levelling mark	LT083221	85350.323	36546.886	104.052
Levelling mark	LT083222	85348.352	36546.223	104.067
Levelling mark	LT083223	85346.445	36545.628	104.078
Levelling mark	LT083224	85344.540	36545.032	104.090
Levelling mark	LT083225	85342.621	36544.433	104.106
Levelling mark	LT083226	85340.710	36543.841	104.122
Levelling mark	LT083227	85338.801	36543.251	104.133
Levelling mark	LT083228	85336.822	36542.651	104.151
Levelling mark	LT083229	85334.957	36542.126	104.171
Levelling mark	LT083230	85333.052	36541.539	104.187
Levelling mark	LT083231	85331.136	36540.945	104.198
Levelling mark	LT083232	85329.234	36540.356	104.205
Levelling mark	LT083233	85327.325	36539.760	104.217
Levelling mark	LT083234	85325.416	36539.165	104.235
Levelling mark	LT083235	85323.507	36538.569	104.251
Levelling mark	LT083236	85321.598	36537.973	104.269
Levelling mark	LT083237	85319.689	36537.377	104.283
Levelling mark	LT083238	85317.779	36536.781	104.300

Levelling mark	LT083239	85315.870	36536.185	104.320
Levelling mark	LT083240	85313.961	36535.589	104.337
Levelling mark	LT083241	85312.052	36534.993	104.352
Levelling mark	LT083242	85310.153	36534.397	104.371
Levelling mark	LT083243	85308.232	36533.795	104.392
Levelling mark	LT083244	85306.321	36533.202	104.408
Levelling mark	LT083245	85304.411	36532.609	104.417
Levelling mark	LT083246	85302.499	36532.016	104.438
Levelling mark	LT083247	85300.586	36531.426	104.463
Levelling mark	LT083248	85298.669	36530.837	104.487
Levelling mark	LT083249	85296.765	36530.252	104.510
Levelling mark	LT083250	85294.873	36529.661	104.532
Levelling mark	LT083251	85292.967	36529.055	104.550
Levelling mark	LT083252	85291.041	36528.450	104.570
Levelling mark	LT083253	85289.127	36527.859	104.592
Levelling mark	LT083254	85287.177	36527.267	104.611
Levelling mark	LT083255	85285.300	36526.713	104.629
Levelling mark	LT083256	85283.385	36526.120	104.650
Levelling mark	LT083257	85281.477	36525.532	104.675
Levelling mark	LT083258	85279.564	36524.940	104.699
Levelling mark	LT083259	85277.652	36524.351	104.725
Levelling mark	LT083260	85275.740	36523.762	104.754
Levelling mark	LT083261	85273.826	36523.173	104.779
Levelling mark	LT083262	85271.913	36522.587	104.802
Levelling mark	LT083263	85270.000	36522.001	104.823
Levelling mark	LT083264	85268.084	36521.416	104.846
Levelling mark	LT083265	85266.179	36520.836	104.873
Levelling mark	LT083266	85264.252	36520.243	104.896
Levelling mark	LT083267	85262.337	36519.667	104.921
Levelling mark	LT083268	85260.434	36519.085	104.949
Levelling mark	LT083269	85258.519	36518.497	104.974
Levelling mark	LT083270	85256.612	36517.916	104.998
Levelling mark	LT083271	85254.697	36517.328	105.024
Levelling mark	LT083272	85252.778	36516.742	105.053
Levelling mark	LT083273	85250.862	36516.162	105.079
Levelling mark	LT083274	85248.961	36515.587	105.109
Levelling mark	LT083275	85246.986	36514.990	105.139
Levelling mark	LT083276	85245.059	36514.453	105.168
Levelling mark	LT083277	85243.173	36513.917	105.200
Levelling mark	LT083278	85241.363	36513.374	105.226
Levelling mark	LT083279	85239.337	36512.711	105.257
Levelling mark	LT083280	85237.402	36512.158	105.290
Levelling mark	LT083281	85235.477	36511.617	105.324
Levelling mark	LT083282	85233.508	36511.082	105.356
Levelling mark	LT083283	85231.574	36510.574	105.390
Levelling mark	LT083284	85229.619	36510.074	105.422

Levelling mark	LT083285	85227.632	36509.584	105.453
Levelling mark	LT083286	85225.685	36509.128	105.484
Levelling mark	LT083287	85223.699	36508.687	105.518
Levelling mark	LT083288	85221.702	36508.261	105.556
Levelling mark	LT083289	85219.713	36507.874	105.594
Levelling mark	LT083290	85217.748	36507.502	105.625
Levelling mark	LT083291	85215.693	36507.153	105.680
Levelling mark	LT083292	85213.716	36506.852	105.720
Levelling mark	LT083293	85211.739	36506.550	105.760
Levelling mark	LT083294	85209.678	36506.286	105.805
Levelling mark	LT083295	85207.690	36506.049	105.854
Levelling mark	LT083296	85205.611	36505.808	105.900
Levelling mark	LT083297	85203.617	36505.652	105.947
Levelling mark	LT083298	85201.623	36505.496	105.992
Levelling mark	LT083299	85199.629	36505.340	106.038
Levelling mark	LT083300	85197.555	36505.200	106.085
Levelling mark	LT084101	85578.176	36622.092	102.524
Levelling mark	LT084102	85576.272	36621.480	102.528
Levelling mark	LT084103	85574.376	36620.862	102.532
Levelling mark	LT084104	85572.470	36620.242	102.539
Levelling mark	LT084105	85570.569	36619.624	102.544
Levelling mark	LT084106	85568.668	36619.005	102.547
Levelling mark	LT084107	85566.767	36618.384	102.551
Levelling mark	LT084108	85564.865	36617.765	102.556
Levelling mark	LT084109	85562.969	36617.142	102.565
Levelling mark	LT084110	85561.063	36616.517	102.571
Levelling mark	LT084111	85559.160	36615.902	102.578
Levelling mark	LT084112	85557.259	36615.285	102.587
Levelling mark	LT084113	85555.356	36614.666	102.597
Levelling mark	LT084114	85553.454	36614.049	102.605
Levelling mark	LT084115	85551.556	36613.428	102.612
Levelling mark	LT084116	85549.652	36612.807	102.620
Levelling mark	LT084117	85547.750	36612.189	102.628
Levelling mark	LT084118	85545.849	36611.570	102.635
Levelling mark	LT084119	85543.948	36610.949	102.641
Levelling mark	LT084120	85542.040	36610.333	102.647
Levelling mark	LT084121	85540.143	36609.718	102.653
Levelling mark	LT084122	85538.249	36609.091	102.667
Levelling mark	LT084123	85536.341	36608.467	102.680
Levelling mark	LT084124	85534.439	36607.850	102.690
Levelling mark	LT084125	85532.537	36607.233	102.696
Levelling mark	LT084126	85530.637	36606.613	102.703
Levelling mark	LT084127	85528.735	36605.992	102.710
Levelling mark	LT084128	85526.835	36605.371	102.718
Levelling mark	LT084129	85524.931	36604.751	102.728
Levelling mark	LT084130	85523.030	36604.133	102.735

Levelling mark	LT084131	85521.127	36603.515	102.739
Levelling mark	LT084132	85519.226	36602.897	102.741
Levelling mark	LT084133	85517.324	36602.277	102.743
Levelling mark	LT084134	85515.428	36601.654	102.748
Levelling mark	LT084135	85513.520	36601.034	102.758
Levelling mark	LT084136	85511.612	36600.423	102.778
Levelling mark	LT084137	85509.720	36599.806	102.801
Levelling mark	LT084138	85507.812	36599.184	102.818
Levelling mark	LT084139	85505.911	36598.568	102.827
Levelling mark	LT084140	85504.009	36597.950	102.843
Levelling mark	LT084141	85502.109	36597.331	102.859
Levelling mark	LT084142	85500.201	36596.716	102.875
Levelling mark	LT084143	85498.300	36596.102	102.888
Levelling mark	LT084144	85496.400	36595.483	102.896
Levelling mark	LT084145	85494.499	36594.863	102.905
Levelling mark	LT084146	85492.597	36594.243	102.915
Levelling mark	LT084147	85490.695	36593.624	102.923
Levelling mark	LT084148	85488.794	36593.004	102.929
Levelling mark	LT084149	85486.892	36592.384	102.943
Levelling mark	LT084150	85484.991	36591.764	102.962
Levelling mark	LT084151	85483.091	36591.142	102.984
Levelling mark	LT084152	85481.177	36590.531	102.996
Levelling mark	LT084153	85479.281	36589.917	103.008
Levelling mark	LT084154	85477.380	36589.299	103.021
Levelling mark	LT084155	85475.471	36588.687	103.038
Levelling mark	LT084156	85473.574	36588.066	103.056
Levelling mark	LT084157	85471.672	36587.448	103.075
Levelling mark	LT084158	85469.769	36586.831	103.095
Levelling mark	LT084159	85467.867	36586.214	103.107
Levelling mark	LT084160	85465.964	36585.597	103.120
Levelling mark	LT084161	85464.017	36585.030	103.130
Levelling mark	LT084162	85462.148	36584.430	103.140
Levelling mark	LT084163	85460.252	36583.793	103.155
Levelling mark	LT084164	85458.357	36583.156	103.170
Levelling mark	LT084165	85456.453	36582.518	103.183
Levelling mark	LT084166	85454.549	36581.897	103.194
Levelling mark	LT084167	85452.646	36581.283	103.207
Levelling mark	LT084168	85450.745	36580.669	103.221
Levelling mark	LT084169	85448.841	36580.050	103.235
Levelling mark	LT084170	85446.940	36579.435	103.249
Levelling mark	LT084171	85445.039	36578.814	103.264
Levelling mark	LT084172	85443.131	36578.201	103.279
Levelling mark	LT084173	85441.220	36577.584	103.296
Levelling mark	LT084174	85439.310	36576.991	103.313
Levelling mark	LT084175	85437.419	36576.376	103.326
Levelling mark	LT084176	85435.517	36575.756	103.340

Levelling mark	LT084177	85433.615	36575.138	103.357
Levelling mark	LT084178	85431.714	36574.519	103.379
Levelling mark	LT084179	85429.812	36573.900	103.398
Levelling mark	LT084180	85427.910	36573.283	103.416
Levelling mark	LT084181	85426.010	36572.663	103.434
Levelling mark	LT084182	85424.106	36572.040	103.452
Levelling mark	LT084183	85422.198	36571.423	103.468
Levelling mark	LT084184	85420.295	36570.820	103.483
Levelling mark	LT084185	85418.394	36570.207	103.499
Levelling mark	LT084186	85416.491	36569.588	103.512
Levelling mark	LT084187	85414.604	36568.971	103.527
Levelling mark	LT084188	85412.699	36568.319	103.545
Levelling mark	LT084189	85410.795	36567.702	103.565
Levelling mark	LT084190	85408.894	36567.087	103.584
Levelling mark	LT084191	85406.992	36566.469	103.599
Levelling mark	LT084192	85405.088	36565.848	103.617
Levelling mark	LT084193	85403.187	36565.233	103.637
Levelling mark	LT084194	85401.285	36564.615	103.655
Levelling mark	LT084195	85399.383	36563.997	103.664
Levelling mark	LT084196	85397.482	36563.379	103.681
Levelling mark	LT084197	85395.548	36562.763	103.698
Levelling mark	LT084198	85393.652	36562.207	103.715
Levelling mark	LT084199	85391.750	36561.598	103.733
Levelling mark	LT084200	85389.844	36560.983	103.750
Levelling mark	LT084201	85387.939	36560.375	103.763
Levelling mark	LT084202	85386.035	36559.768	103.776
Levelling mark	LT084203	85384.130	36559.156	103.789
Levelling mark	LT084204	85382.224	36558.545	103.798
Levelling mark	LT084205	85380.319	36557.938	103.808
Levelling mark	LT084206	85378.427	36557.329	103.823
Levelling mark	LT084207	85376.518	36556.692	103.834
Levelling mark	LT084208	85374.611	36556.084	103.846
Levelling mark	LT084209	85372.696	36555.482	103.864
Levelling mark	LT084210	85370.785	36554.894	103.881
Levelling mark	LT084211	85368.883	36554.300	103.895
Levelling mark	LT084212	85366.975	36553.695	103.907
Levelling mark	LT084213	85365.068	36553.093	103.916
Levelling mark	LT084214	85363.160	36552.490	103.929
Levelling mark	LT084215	85361.250	36551.890	103.946
Levelling mark	LT084216	85359.343	36551.294	103.959
Levelling mark	LT084217	85357.434	36550.694	103.974
Levelling mark	LT084218	85355.522	36550.094	103.989
Levelling mark	LT084219	85353.615	36549.503	104.005
Levelling mark	LT084220	85351.705	36548.906	104.022
Levelling mark	LT084221	85349.826	36548.311	104.039
Levelling mark	LT084222	85347.903	36547.664	104.053



Levelling mark	LT084223	85345.995	36547.069	104.063
Levelling mark	LT084224	85344.087	36546.472	104.073
Levelling mark	LT084225	85342.174	36545.875	104.083
Levelling mark	LT084226	85340.264	36545.284	104.097
Levelling mark	LT084227	85338.354	36544.693	104.114
Levelling mark	LT084228	85336.416	36544.105	104.130
Levelling mark	LT084229	85334.513	36543.569	104.147
Levelling mark	LT084230	85332.604	36542.981	104.163
Levelling mark	LT084231	85330.692	36542.388	104.171
Levelling mark	LT084232	85328.784	36541.798	104.182
Levelling mark	LT084233	85326.875	36541.202	104.191
Levelling mark	LT084234	85324.966	36540.606	104.214
Levelling mark	LT084235	85323.057	36540.010	104.238
Levelling mark	LT084236	85321.148	36539.414	104.256
Levelling mark	LT084237	85319.239	36538.818	104.271
Levelling mark	LT084238	85317.330	36538.222	104.291
Levelling mark	LT084239	85315.420	36537.626	104.315
Levelling mark	LT084240	85313.511	36537.030	104.336
Levelling mark	LT084241	85311.602	36536.434	104.354
Levelling mark	LT084242	85309.697	36535.837	104.374
Levelling mark	LT084243	85307.784	36535.237	104.394
Levelling mark	LT084244	85305.874	36534.644	104.412
Levelling mark	LT084245	85303.964	36534.051	104.426
Levelling mark	LT084246	85302.053	36533.459	104.444
Levelling mark	LT084247	85300.141	36532.869	104.462
Levelling mark	LT084248	85298.227	36532.281	104.481
Levelling mark	LT084249	85296.318	36531.695	104.505
Levelling mark	LT084250	85294.416	36531.100	104.528
Levelling mark	LT084251	85292.510	36530.494	104.547
Levelling mark	LT084252	85290.595	36529.893	104.563
Levelling mark	LT084253	85288.683	36529.302	104.585
Levelling mark	LT084254	85286.756	36528.717	104.603
Levelling mark	LT084255	85284.853	36528.155	104.619
Levelling mark	LT084256	85282.941	36527.563	104.639
Levelling mark	LT084257	85281.031	36526.974	104.661
Levelling mark	LT084258	85279.119	36526.383	104.685
Levelling mark	LT084259	85277.208	36525.794	104.709
Levelling mark	LT084260	85275.296	36525.205	104.729
Levelling mark	LT084261	85273.383	36524.617	104.751
Levelling mark	LT084262	85271.471	36524.031	104.775
Levelling mark	LT084263	85269.558	36523.445	104.796
Levelling mark	LT084264	85267.644	36522.860	104.814
Levelling mark	LT084265	85265.734	36522.279	104.837
Levelling mark	LT084266	85263.817	36521.689	104.858
Levelling mark	LT084267	85261.902	36521.113	104.880
Levelling mark	LT084268	85259.993	36520.529	104.903

Levelling mark	LT084269	85258.080	36519.942	104.928
Levelling mark	LT084270	85256.169	36519.359	104.952
Levelling mark	LT084271	85254.256	36518.772	104.978
Levelling mark	LT084272	85252.341	36518.187	105.005
Levelling mark	LT084273	85250.426	36517.608	105.032
Levelling mark	LT084274	85248.516	36517.030	105.064
Levelling mark	LT084275	85246.580	36516.445	105.094
Levelling mark	LT084276	85244.654	36515.907	105.125
Levelling mark	LT084277	85242.743	36515.364	105.157
Levelling mark	LT084278	85240.866	36514.800	105.187
Levelling mark	LT084279	85238.921	36514.162	105.219
Levelling mark	LT084280	85236.994	36513.612	105.253
Levelling mark	LT084281	85235.068	36513.071	105.287
Levelling mark	LT084282	85233.124	36512.543	105.319
Levelling mark	LT084283	85231.190	36512.034	105.353
Levelling mark	LT084284	85229.246	36511.537	105.382
Levelling mark	LT084285	85227.288	36511.054	105.413
Levelling mark	LT084286	85225.341	36510.598	105.442
Levelling mark	LT084287	85223.377	36510.162	105.476
Levelling mark	LT084288	85221.405	36509.741	105.514
Levelling mark	LT084289	85219.433	36509.357	105.553
Levelling mark	LT084290	85217.467	36508.986	105.593
Levelling mark	LT084291	85215.466	36508.646	105.642
Levelling mark	LT084292	85213.489	36508.344	105.682
Levelling mark	LT084293	85211.511	36508.043	105.724
Levelling mark	LT084294	85209.500	36507.785	105.769
Levelling mark	LT084295	85207.513	36507.549	105.815
Levelling mark	LT084296	85205.493	36507.314	105.861
Levelling mark	LT084297	85203.499	36507.157	105.909
Levelling mark	LT084298	85201.505	36507.001	105.954
Levelling mark	LT084299	85199.511	36506.845	106.000
Levelling mark	LT084300	85199.511	36506.845	106.046