



C305- Eastern Running Tunnels

I&M Close out report for LIS-WCH-London Underground Metropolitan Line (includes Liverpool St Station) LU23/24 and London Underground Central Line (includes escalators) LU/22

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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: 8/8/16

Sign: _____ Role: _____ Name: _____ Date: _____

2b. Review by Stakeholder (If required):

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

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I&M Close out report for LIS-WCH-London Underground Metropolitan Line (includes Liverpool St Station) LU23/24 and London Underground Central Line (includes escalators) LU/22					
C305 Crossrail Eastern Running Tunnels					
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APPENDIX A: DECOMMISSIONING AGREEMENTS

APPENDIX B: LEVELLING MARKS

Learning Legacy Document

1. CLOSE OUT REPORT PURPOSE

The purpose of this close out report is to summarise the monitoring data related to C305 construction activities recorded by the C704 monitoring system. This report incorporates the existing C704 decommissioning agreement for this asset (“C704 Instrumentation – Partial Decommissioning Agreement Central Line Westbound Running Tunnel LU/22 at Liverpool Street Underground Station, C704-XRL-C-AAG-C101-50001_Rev 1.0” and “C704 Instrumentation - Decommissioning Agreement Circle, H&C and Metropolitan Line – East of Liverpool Street Underground Station LU/24 C704-XRL-C-AAG-CR092-50001 Rev 1.0”) in which, the C704 monitoring system shows the settlement to be at an acceptably small rate and can now be decommissioned.

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 requirement for C305 monitoring reviews in connection with this asset.

Works by others: CRL Liverpool Street station construction affected the western part of LU/23 assets prior to and post C305 works and that in these areas only movement due to the passage of the TBM’s is considered in this report.

2. LOCATION OF THE WORKS

The instrumentation included within this report covers “Central Line running tunnel located at Liverpool Street Underground Station” and “Circle, H&C and Metropolitan Line Running Tunnel located to the East of Liverpool Street Underground Station” within the predicted zone of influence of Crossrail works, between the chainage 77700 – 78000.

3. DOCUMENTATION SUMMARY

CROSSRAIL NUMBER	DOCUMENT NAME	REASON ISSUE
C704-XRL-C-AAG-CR092-50001	C704 Instrumentation - Decommissioning Agreement Circle, H&C and Metropolitan Line – East of Liverpool Street Underground Station (LU/24)	Decommissioning Agreement
C704-XRL-C-AAG-C101-50001	C704 Instrumentation – Partial Decommissioning Agreement Central Line Westbound Running Tunnel (LU/22) at Liverpool Street Underground Station	Decommissioning Agreement
C305-DSJ-C-STP-CRG03-50057	Specific Action Plan Y031: LU22 - Central Line at/near Liverpool Street Station	SAP
C305-DSJ-C-STP-CRG03-50060	Specific Action Plan Y030: LU24 - Circle, Hammersmith and City, and Metropolitan Line East of Liverpool Street Station, and LU/23 Liverpool Street Metropolitan Line Station & Ticket Hall	SAP

CROSSRAIL NUMBER	DOCUMENT NAME	REASON ISSUE
C701-ITM-C-RGN-C101-50006	C701-Instrumentation and Monitoring Liverpool Street Central Line Running Tunnel Monitoring Installation Report	Installation Report
C701-ITM-C-RGN-C101-50004	C701-Instrumentation and Monitoring Liverpool Street Metropolitan Line Monitoring 3D Geodetic Prisms and Robotic Total Station Installation Report	Installation Report
C701-ITM-C-RGN-C101-50008	C701-Instrumentation and Monitoring Installation Report for the monitoring System at Liverpool Street to Aldgate (LIV ST EAST)	Installation Report
C701-ITM-C-RGN-C101-50007	C701-instrumentation and Monitoring Installation Report for the Monitoring System Installation on - Escalators 4, 5 and 6 at Liverpool Street Station	Installation Report
C305-XRL-C2-RGN-CR092-50002	LU/22 Central Line	Baseline Report
C305-XRL-C2-RGN-CR092-50001	LU23 LU/24 Met line east of Liverpool station	Baseline Report

4. SUMMARY OF INSTRUMENTATION

The total number of instruments covered by this report is:

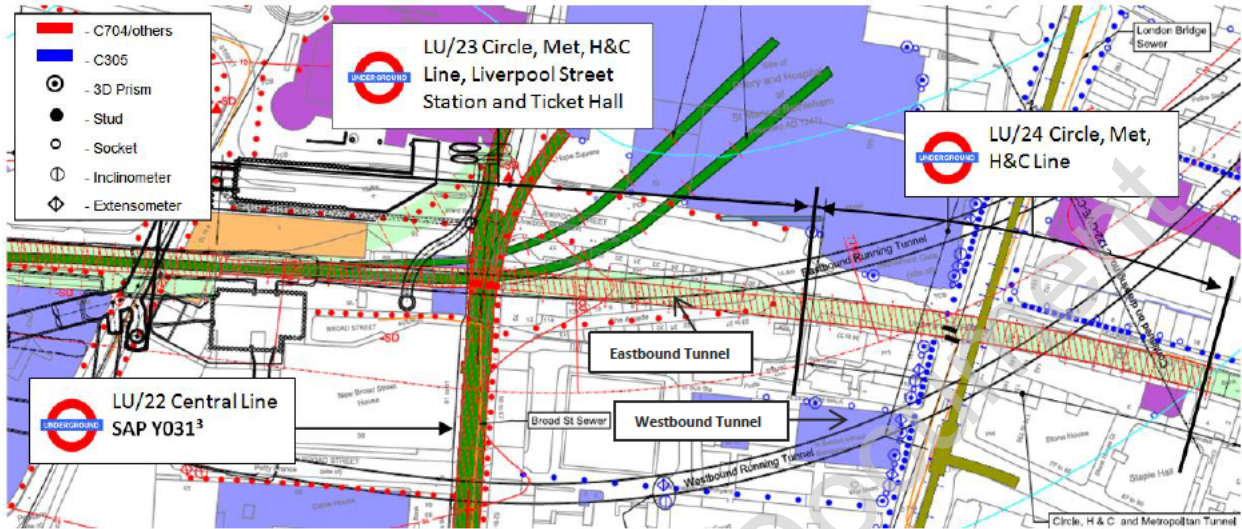
- 1135 No. 3D Prisms. See appendix A.
- 1144 No. Levelling track. See appendix B.
- 177 No. Electrolevels. See appendix A.
- 92 No. Levelling Points. See appendix A.
- 12 No. Bassett convergence system. See appendix A.

5. C305 CONSTRUCTION ACTIVITIES

Drive Y Running Tunnel Construction	RINGS	PROJECT CHAINAGE	DATES
Eastbound (EB) Tunnel Boring Machine (TBM) Passage	3739 - 3907	77000 - 78000	17/01/15 to 31/01/15
Westbound (WB) Tunnel Boring Machine (TBM) Passage	3810 - 4007	78000 - 77000-	24/02/15 to 12/03/15

6. SUMMARY OF C704 DATA

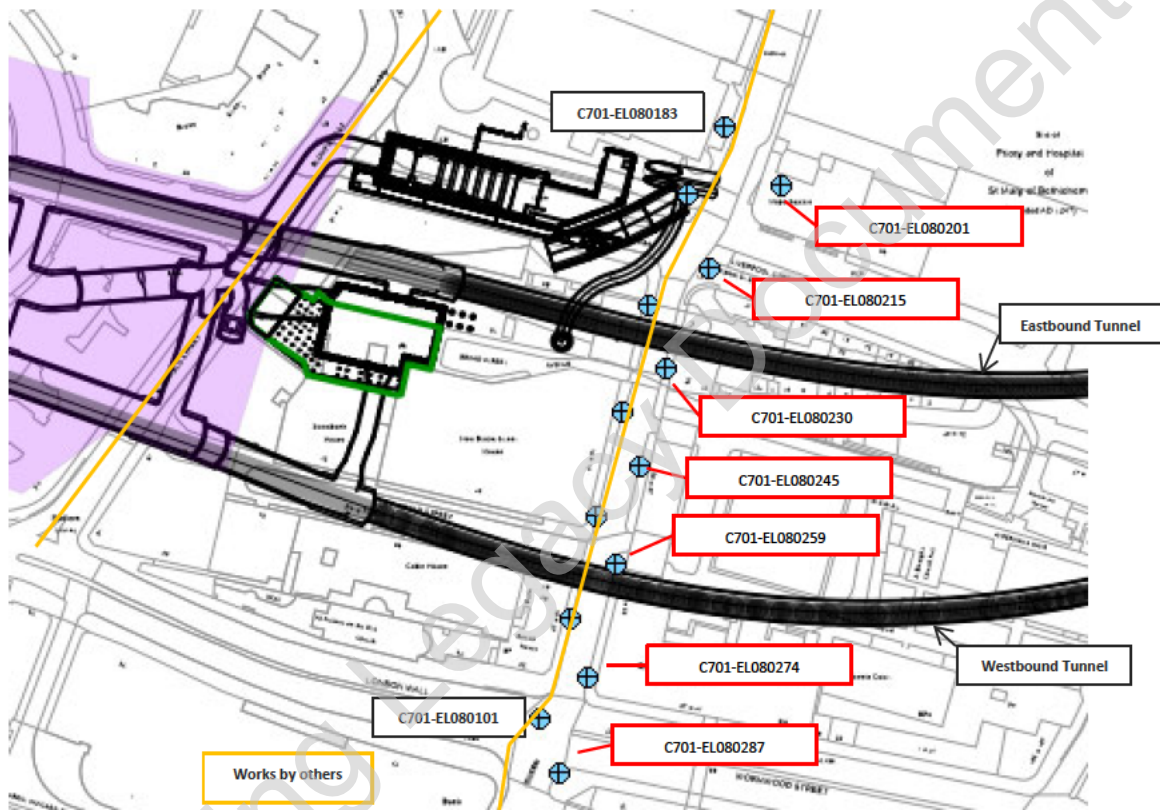
The Sketch below shows the alignment of Eastbound and Westbound Crossrail tunnels and the different locations of the London Underground (stations and lines) referred to in this document:



In order to summarise the data in relation to the construction of Crossrail tunnels a number of selected instrumentation located above the centre of the Crossrail tunnel alignment were specifically chosen to relate any movement caused by these construction activities. The sketches below show the locations of instrumentation.

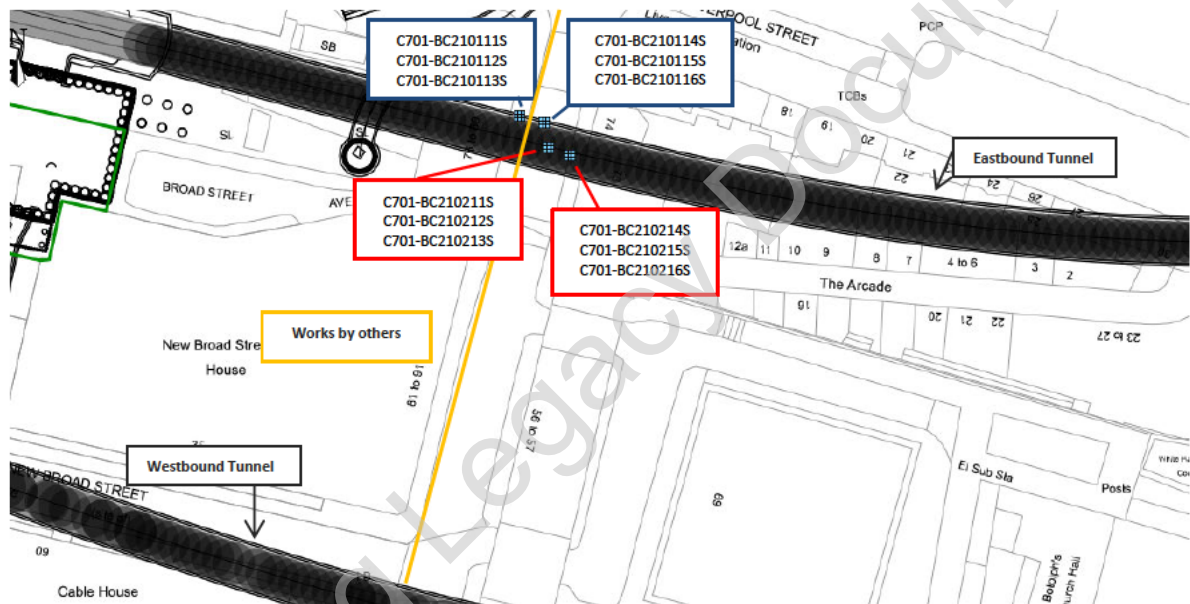
▪ Electrolelevels within “Central Line Westbound Running Tunnel” (LU/22):

LU22 ELECTROLEVELS	LU Track	LOCATION
C701-EL080201	LIS Electrolevel WB	Liverpool Street
C701-EL080215	LIS Electrolevel WB	Liverpool Street
C701-EL080230	LIS Electrolevel WB	Liverpool Street
C701-EL080245	LIS Electrolevel WB	Liverpool Street
C701-EL080259	LIS Electrolevel WB	Liverpool Street
C701-EL080274	LIS Electrolevel WB	Liverpool Street
C701-EL080287	LIS Electrolevel WB	Liverpool Street



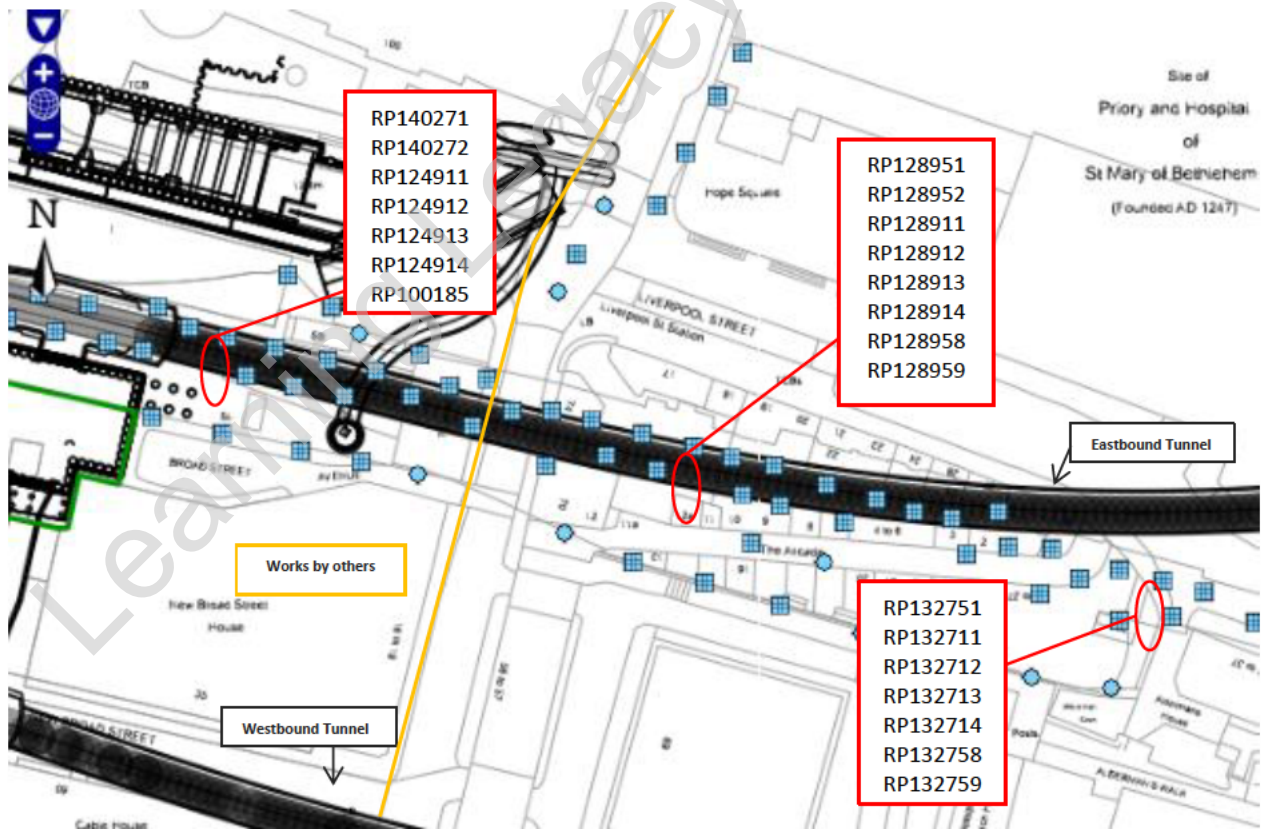
▪ **Bassett Convergence Systems within “Central Line Running Tunnels” (LU/22):**

LU22 ELECTROLEVELS	LU Track	LOCATION
C701-BC210211S	LIS - BCS_WB	Liverpool Street
C701-BC210212S	LIS - BCS_WB	Liverpool Street
C701-BC210213S	LIS - BCS_WB	Liverpool Street
C701-BC210214S	LIS - BCS_WB	Liverpool Street
C701-BC210215S	LIS - BCS_WB	Liverpool Street
C701-BC210216S	LIS - BCS_WB	Liverpool Street
C701-BC210211S	LIS - BCS_EB	Liverpool Street
C701-BC210212S	LIS - BCS_EB	Liverpool Street
C701-BC210213S	LIS - BCS_EB	Liverpool Street
C701-BC210214S	LIS - BCS_EB	Liverpool Street
C701-BC210215S	LIS - BCS_EB	Liverpool Street
C701-BC210216S	LIS - BCS_EB	Liverpool Street



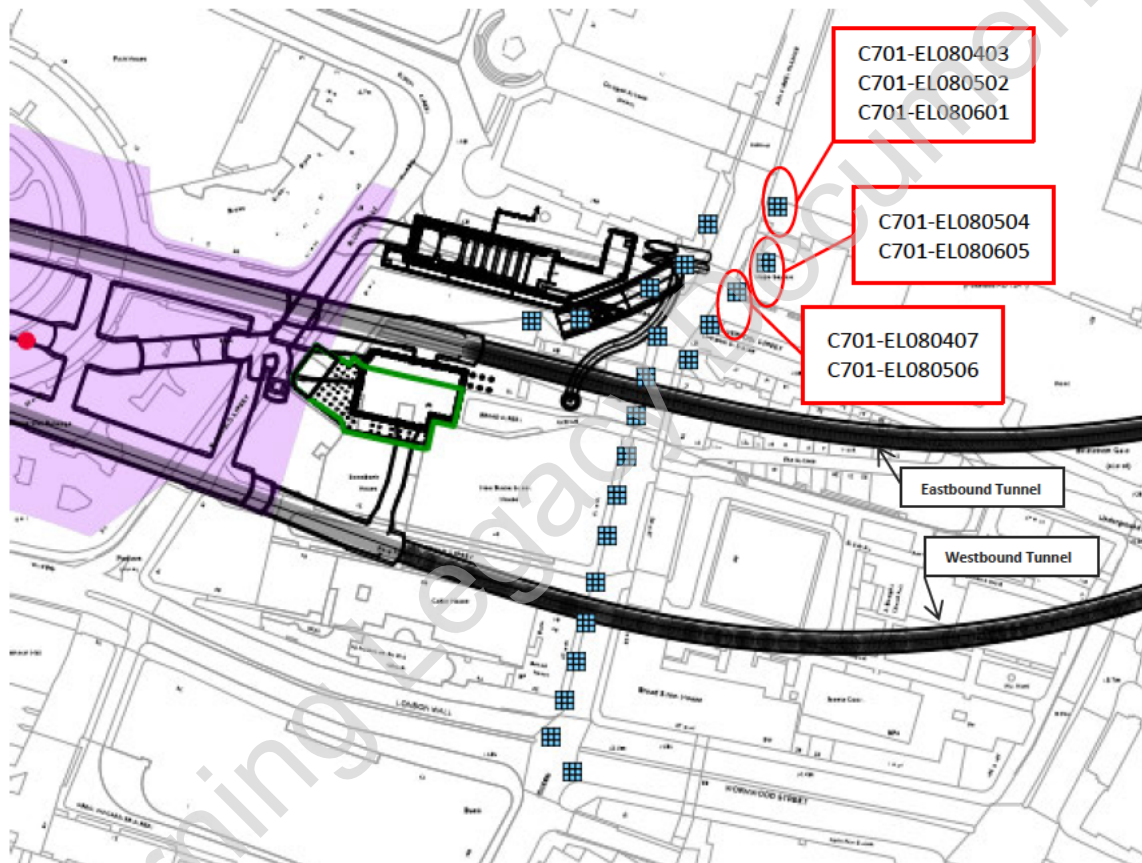
▪ 3D Prisms within “Circle, Met, H&C Line, Liverpool Street Station and Ticket Hall” (LU/23):

LU23 PRISMS	LU Track	LOCATION
C701-RP140271	H&C Buildings Low	Liverpool Street
C701-RP140272	H&C Buildings High	Liverpool Street
C701-RP124911	H&C Track EB Cess	Liverpool Street
C701-RP124912	H&C Track EB 6ft	Liverpool Street
C701-RP124913	H&C Track WB 6ft	Liverpool Street
C701-RP124914	H&C Track WB Cess	Liverpool Street
C701-RP100185	H&C Retaining Walls High	Liverpool Street
C701-RP128951	H&C Platform Low	Liverpool Street
C701-RP128952	H&C Platform High	Liverpool Street
C701-RP128911	H&C Track EB Cess	Liverpool Street
C701-RP128912	H&C Track EB 6ft	Liverpool Street
C701-RP128913	H&C Track WB 6ft	Liverpool Street
C701-RP128914	H&C Track WB Cess	Liverpool Street
C701-RP128958	H&C Platform High	Liverpool Street
C701-RP128959	H&C Platform Low	Liverpool Street
C701-RP132751	H&C Platform Low	Liverpool Street
C701-RP132711	H&C Track EB Cess	Liverpool Street
C701-RP132712	H&C Track EB 6ft	Liverpool Street
C701-RP132713	H&C Track WB 6ft	Liverpool Street
C701-RP132714	H&C Track WB Cess	Liverpool Street
C701-RP132758	H&C Platform High	Liverpool Street
C701-RP132759	H&C Platform Low	Liverpool Street



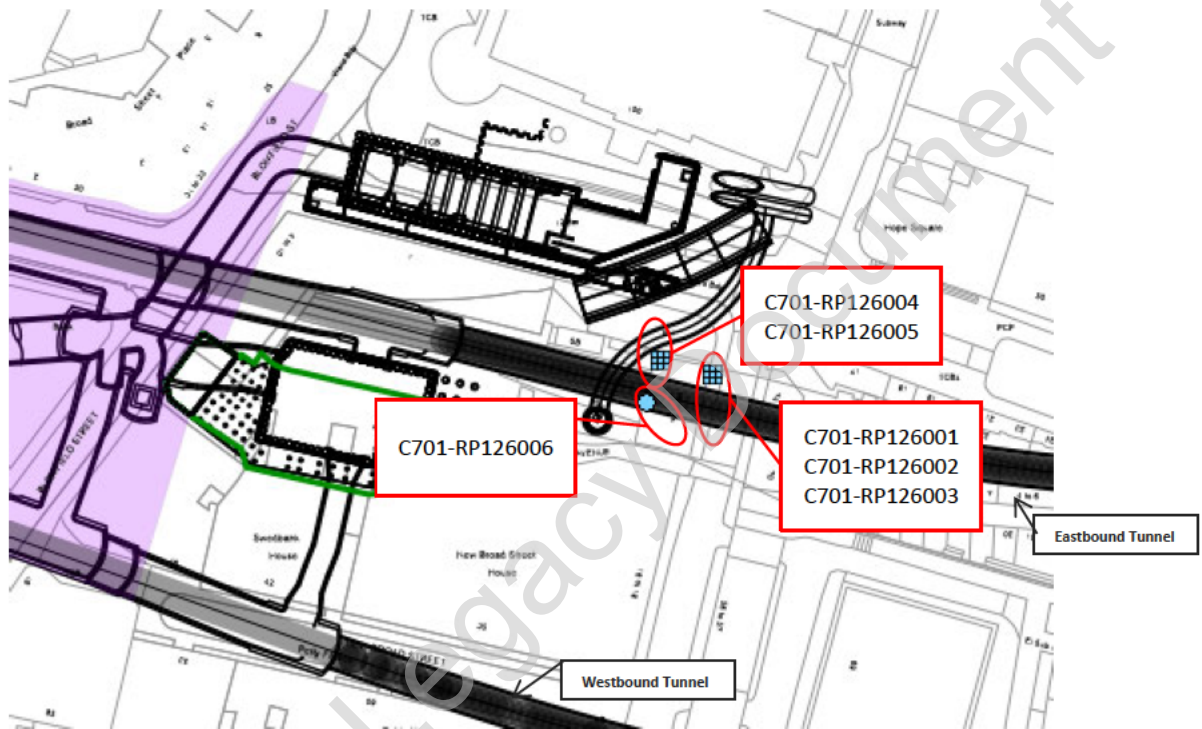
▪ **Electrolevels on Escalators 4, 5 & 6 at Liverpool Street Station (LU/23):**

LU23 Electrolevels on Escalators	LU Track	LOCATION
C701-EL080403	LIS Electrolevel Esc 4	Liverpool Street Station
C701-EL080407	LIS Electrolevel Esc 4	Liverpool Street Station
C701-EL080502	LIS Electrolevel Esc 5	Liverpool Street Station
C701-EL080504	LIS Electrolevel Esc 5	Liverpool Street Station
C701-EL080506	LIS Electrolevel Esc 5	Liverpool Street Station
C701-EL080601	LIS Electrolevel Esc 6	Liverpool Street Station
C701-EL080605	LIS Electrolevel Esc 6	Liverpool Street Station



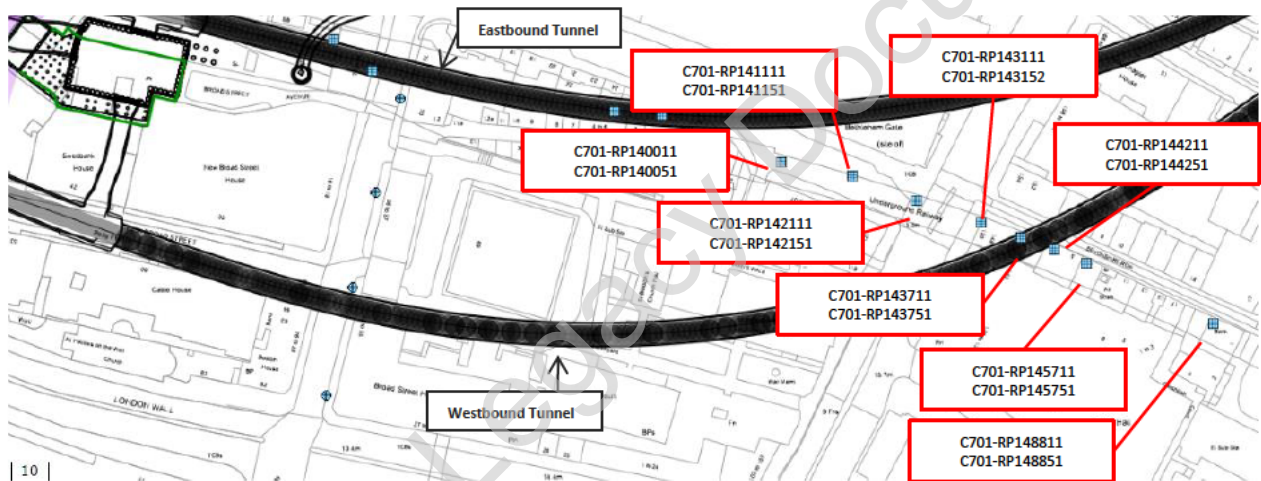
▪ **3D Prisms Girdering G101 / G122 supporting 76-80 Old Broad Street (LU/23):**

LU23 Prisms	LU Track	LOCATION
C701-RP126001-CR092	HCML Girdering North	Liverpool Street
C701-RP126002-CR092	HCML Girdering Centre	Liverpool Street
C701-RP126003-CR092	HCML Girdering South	Liverpool Street
C701-RP126004-CR092	HCML Girdering North	Liverpool Street
C701-RP126005-CR092	HCML Girdering Centre	Liverpool Street
C701-RP126006-CR092	HCML Girdering South	Liverpool Street



▪ 3D Prisms within “Circle, H&C, and Metropolitan Line East of Liverpool Street Station (LU/24)

LU24 PRISMS	LU Track	LOCATION												
C701-RP140011	Bricktunnel EB Cess	Liverpool Street												
C701-RP140051	Bricktunnel North Low	Liverpool Street												
C701-RP141111	Bricktunnel EB Cess	Liverpool Street												
C701-RP141151	Bricktunnel North Low	Liverpool Street												
C701-RP142111	Bricktunnel EB Cess	Liverpool Street												
C701-RP142151	Bricktunnel North Low	Liverpool Street												
C701-RP143111	Bricktunnel EB Cess	Liverpool Street												
C701-RP143152	Bricktunnel North High	Liverpool Street												
C701-RP143711	Bricktunnel EB Cess	Liverpool Street												
C701-RP143751	Bricktunnel North Low	Liverpool Street												
C701-RP144211	Bricktunnel EB Cess	Liverpool Street												
C701-RP144251	Bricktunnel North Low	Liverpool Street </tr <tr> <td>C701-RP145711</td> <td>Bricktunnel EB Cess</td> <td>Liverpool Street</td> </tr> <tr> <td>C701-RP145751</td> <td>Bricktunnel North Low</td> <td>Liverpool Street</td> </tr> <tr> <td>C701-RP148811</td> <td>Bricktunnel EB Cess</td> <td>Liverpool Street</td> </tr> <tr> <td>C701-RP148851</td> <td>Bricktunnel North Low</td> <td>Liverpool Street</td> </tr>	C701-RP145711	Bricktunnel EB Cess	Liverpool Street	C701-RP145751	Bricktunnel North Low	Liverpool Street	C701-RP148811	Bricktunnel EB Cess	Liverpool Street	C701-RP148851	Bricktunnel North Low	Liverpool Street
C701-RP145711	Bricktunnel EB Cess	Liverpool Street												
C701-RP145751	Bricktunnel North Low	Liverpool Street												
C701-RP148811	Bricktunnel EB Cess	Liverpool Street												
C701-RP148851	Bricktunnel North Low	Liverpool Street												



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The tables below summarises the movements recorded by the sensors listed above during the passage of the TBMs due to C305 tunnelling works. It is relative movement recorded by the instruments after the Eastbound and the Westbound TBM passage.

➤ The table below summarises the Settlement recorded by the sensors listed above:

EB&WB TBMs - Settlement (mm)				
Sensor Name	EB TBM	WB TBM	LU Track	LOCATION
C701-EL080201	-0.4	0	LIS Electrolevel WB	Liverpool Street
C701-EL080215	-1.4	0	LIS Electrolevel WB	Liverpool Street
C701-EL080230	-5.4	-0.6	LIS Electrolevel WB	Liverpool Street
C701-EL080245	-2.2	0.5	LIS Electrolevel WB	Liverpool Street
C701-EL080259	-2.5	-3.4	LIS Electrolevel WB	Liverpool Street
C701-EL080274	-0.5	-2.6	LIS Electrolevel WB	Liverpool Street
C701-EL080287	0	-0.1	LIS Electrolevel WB	Liverpool Street
C701-RP140271	-5	-3	H&C Buildings Low	Liverpool Street
C701-RP140272	-4	-6	H&C Buildings High	Liverpool Street
C701-RP124911	-7	-5	H&C Track EB Cess	Liverpool Street
C701-RP124912	-7	-6	H&C Track EB 6ft	Liverpool Street
C701-RP124913	-8	-6	H&C Track WB 6ft	Liverpool Street
C701-RP124914	-6	-5	H&C Track WB Cess	Liverpool Street
C701-RP100185	-2	-2	H&C Retaining Walls High	Liverpool Street
C701-RP128951	-2.5	-3	H&C Platform Low	Liverpool Street
C701-RP128952	-1	-2.5	H&C Platform High	Liverpool Street
C701-RP128911	-5	-3	H&C Track EB Cess	Liverpool Street
C701-RP128912	-5	-2	H&C Track EB 6ft	Liverpool Street
C701-RP128913	-3	-3	H&C Track WB 6ft	Liverpool Street
C701-RP128914	-5	-2	H&C Track WB Cess	Liverpool Street
C701-RP128958	-2	-2	H&C Platform High	Liverpool Street
C701-RP128959	-4	-2	H&C Platform Low	Liverpool Street
C701-RP132751	-5	-2	H&C Platform Low	Liverpool Street
C701-RP132711	-3	-1	H&C Track EB Cess	Liverpool Street
C701-RP132712	-5	-2	H&C Track EB 6ft	Liverpool Street
C701-RP132713	-5	-1	H&C Track WB 6ft	Liverpool Street
C701-RP132714	-2	-1	H&C Track WB Cess	Liverpool Street
C701-RP132758	-2	-1	H&C Platform High	Liverpool Street
C701-RP132759	-1	-1	H&C Platform Low	Liverpool Street
C701-EL080403	0	0	LIS Electrolevel Escalator 4	Liverpool Street
C701-EL080407	0	0	LIS Electrolevel Escalator 4	Liverpool Street
C701-EL080502	0	0	LIS Electrolevel Escalator 5	Liverpool Street
C701-EL080504	0	0	LIS Electrolevel Escalator 5	Liverpool Street
C701-EL080506	0	0	LIS Electrolevel Escalator 5	Liverpool Street
C701-EL080601	0	0	LIS Electrolevel Escalator 6	Liverpool Street
C701-EL080607	0	0	LIS Electrolevel Escalator 6	Liverpool Street
C701-RP126001	-3	-2	HCML Girdering North	Liverpool Street
C701-RP126002	-4	-1	HCML Girdering Centre	Liverpool Street
C701-RP126003	-3	-1	HCML Girdering South	Liverpool Street
C701-RP126004	-4	-3	HCML Girdering North	Liverpool Street
C701-RP126005	-4	-2	HCML Girdering Centre	Liverpool Street
C701-RP126006	-3	-2	HCML Girdering South	Liverpool Street
C701-RP140011	-4	-2	Bricktunnel EB Cess	Liverpool Street
C701-RP140051	-4	-2	Bricktunnel North Low	Liverpool Street
C701-RP141111	-1	-2	Bricktunnel EB Cess	Liverpool Street
C701-RP141151	-2	-2	Bricktunnel North Low	Liverpool Street
C701-RP142111	0	-1	Bricktunnel EB Cess	Liverpool Street
C701-RP142151	-1	-2	Bricktunnel North Low	Liverpool Street
C701-RP143111	0	-4	Bricktunnel EB Cess	Liverpool Street
C701-RP143152	0	-4	Bricktunnel North High	Liverpool Street

EB&WB TBMs - Settlement (mm)				
Sensor Name	EB TBM	WB TBM	LU Track	LOCATION
C701-RP143711	0	-4	Bricktunnel EB Cess	Liverpool Street
C701-RP143751	0	-4	Bricktunnel North Low	Liverpool Street
C701-RP144211	0	-3	Bricktunnel EB Cess	Liverpool Street
C701-RP144251	0	-4	Bricktunnel North Low	Liverpool Street
C701-RP145711	0	-2	Bricktunnel EB Cess	Liverpool Street
C701-RP145751	0	-1	Bricktunnel North Low	Liverpool Street
C701-RP148811	0	0	Bricktunnel EB Cess	Liverpool Street
C701-RP148851	0	0	Bricktunnel North Low	Liverpool Street

➤ The table below summarises the Horizontal Displacement recorded by the prisms listed above:

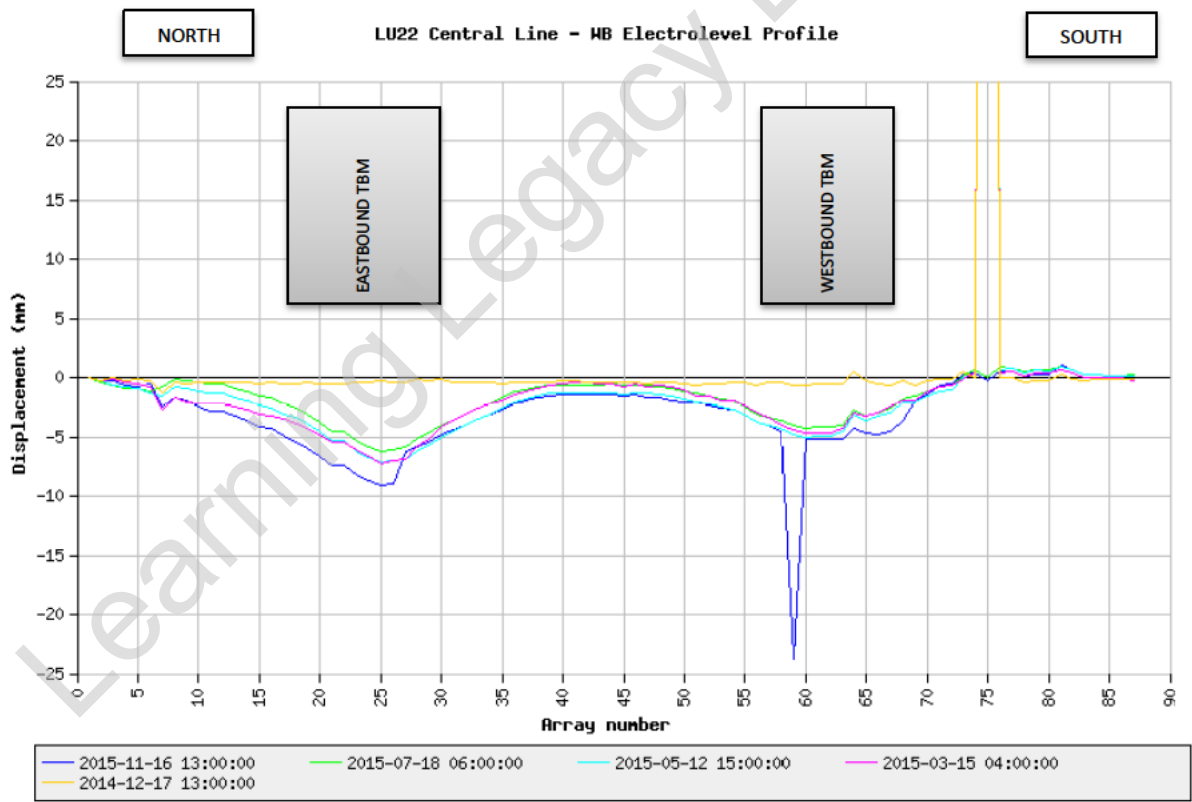
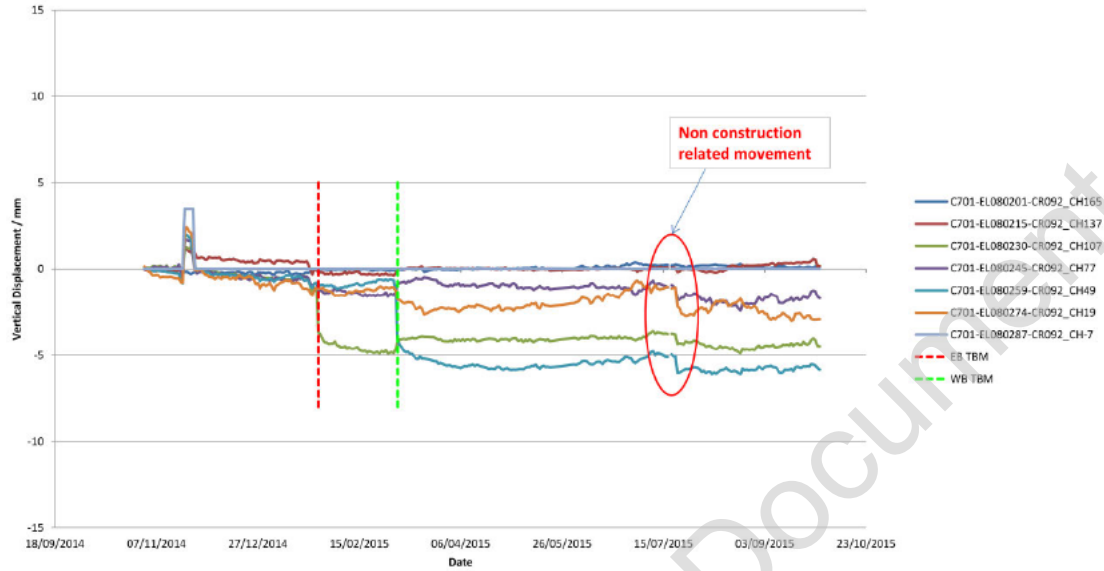
EB&WB TBMs - Horizontal Displacement (mm)						
Sensor Name	X		Y		LU Track	LOCATION
	EB TBM	WB TBM	EB TBM	WB TBM		
C701-RP140271	0	-2	-5	-2	H&C Buildings Low	Liverpool Street
C701-RP140272	0	-2	-6	-3	H&C Buildings High	Liverpool Street
C701-RP100185	0	-1	-5	-1.5	H&C Retaining Walls High	Liverpool Street
C701-RP128951	1	-1	0	-0	H&C Platform Low	Liverpool Street
C701-RP128952	1	-1	0	-1	H&C Platform High	Liverpool Street
C701-RP128958	1	-2	-3	-3	H&C Platform High	Liverpool Street
C701-RP128959	1	-1	-1	-2	H&C Platform Low	Liverpool Street
C701-RP132751	0	-2	0	-1	H&C Platform Low	Liverpool Street
C701-RP132758	0	-1	0	-1.5	H&C Platform High	Liverpool Street
C701-RP132759	0	1	0	-2	H&C Platform Low	Liverpool Street
C701-RP126001	-1	-1.5	-2	1.5	HCML Girdering North	Liverpool Street
C701-RP126002	-1.5	-1.5	-1	2	HCML Girdering Centre	Liverpool Street
C701-RP126003	-1.5	-2	-1.5	1	HCML Girdering South	Liverpool Street
C701-RP126004	-1	0	-1	2	HCML Girdering North	Liverpool Street
C701-RP126005	0	-1	-1	2	HCML Girdering Centre	Liverpool Street
C701-RP126006	0	-1	-1	1	HCML Girdering South	Liverpool Street
C701-RP140051	0	2	0	-2	Bricktunnel North Low	Liverpool Street
C701-RP141151	0	-0.5	0	-2	Bricktunnel North Low	Liverpool Street
C701-RP142151	0	1	0	-2	Bricktunnel North Low	Liverpool Street
C701-RP143152	0	-1	0	-1	Bricktunnel North High	Liverpool Street
C701-RP143751	0	-2	0	-2	Bricktunnel North Low	Liverpool Street
C701-RP144251	0	-2	0	1	Bricktunnel North Low	Liverpool Street
C701-RP145751	0	-2	1	-1	Bricktunnel North Low	Liverpool Street
C701-RP148851	0	-1	0	-1	Bricktunnel North Low	Liverpool Street

The graphs below are taken from the automatic readings from the C704 system and illustrate the related construction activities and summarises the movements recorded by the instruments as per the following documents.

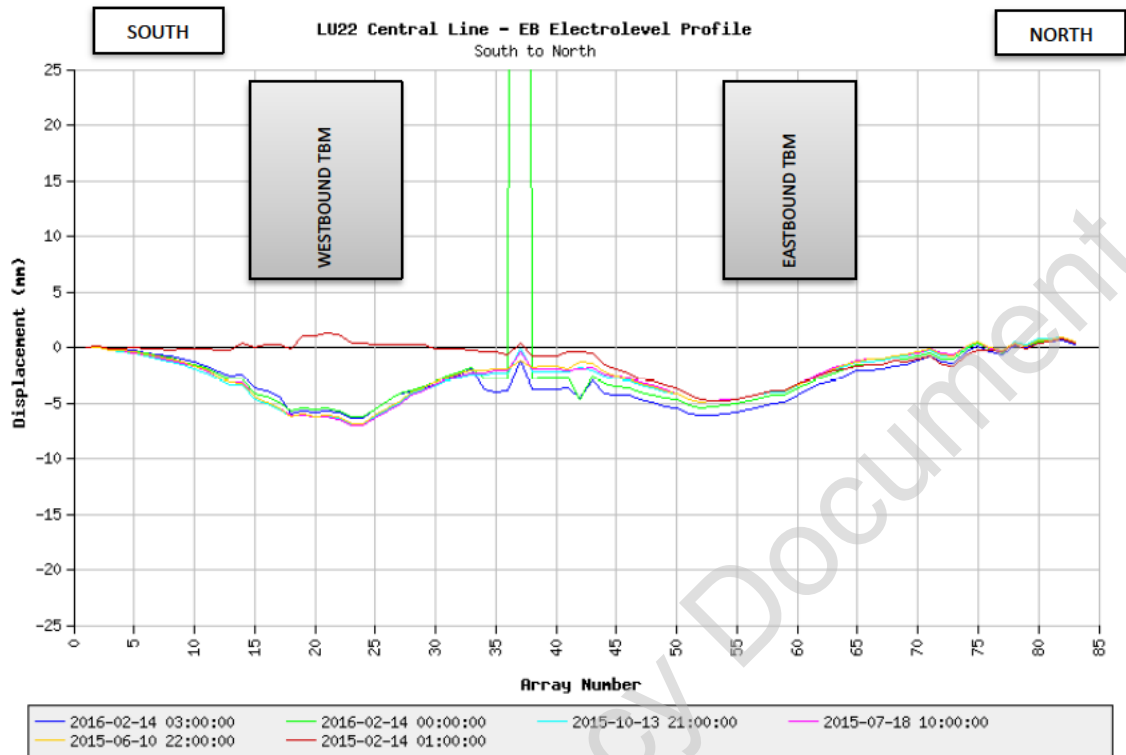
- C305-DSJ-C-STP-CRG03-50057 "Specific Action Plan Y031: LU22 - Central Line at/near Liverpool Street Station":
 - Central Line
 - Horizontal Displacement trigger values: (± 5 mm green, ± 7 mm amber, ± 10 mm red)
 - Settlement trigger values: (10mm green, 15mm amber and 20mm red)
 - Escalators 4, 5 & 6
 - Horizontal Displacement trigger values: (± 3 mm green, ± 5 mm amber, ± 10 mm red)
 - Settlement trigger values: (3mm green, 5mm amber and 10mm red)
- C305-DSJ-C-STP-CRG03-50060 "Specific Action Plan Y030: LU24 - Circle, Hammersmith and City, and Metropolitan Line East of Liverpool Street Station, and LU/23 Liverpool Street Metropolitan Line Station & Ticket Hall":
 - Brick Tunnel
 - Horizontal Displacement trigger values: (± 5 mm green, ± 10 mm amber, ± 15 mm red)
 - Settlement trigger values: (5mm green, 10mm amber, 15mm red)
 - Footbridge
 - Horizontal Displacement trigger values: (± 5 mm green, ± 7 mm amber, ± 10 mm red)
 - Settlement trigger values: (5mm green, 10mm amber, 15mm red)
 - Single-level building:
 - Horizontal Displacement trigger values: (± 15 mm green, ± 20 mm amber, ± 25 mm red)
 - Settlement trigger values: (35mm green, 45mm amber, 55mm red)
 - Platform 2 (westbound) & Platform 3 (disused)
 - Horizontal Displacement trigger values: (30mm green, 35mm amber, 45mm red)
 - Settlement trigger values: (± 10 mm green, ± 15 mm amber, ± 20 mm red)
 - South retaining wall area
 - Horizontal Displacement trigger values: (20mm green, 25mm amber, 30mm red)
 - Settlement trigger values: (± 10 mm green, ± 15 mm amber, ± 20 mm red)
 - Platform 1 (eastbound)
 - Horizontal Displacement trigger values: (35mm green, 45mm amber, 55mm red)
 - Settlement trigger values: (± 15 mm green, ± 20 mm amber, ± 25 mm red)
 - North-west retaining wall
 - Horizontal Displacement trigger values: (50mm green, 60mm amber, 75 mm red)
 - Settlement trigger values: (± 20 mm green, ± 25 mm amber, ± 30 mm red)

▪ **Electrolevels within “Central Line Westbound Running Tunnel” (LU/22):**

Figure C.1: Liverpool Street - Vertical Displacement (Electrolevel) - Central Line Westbound



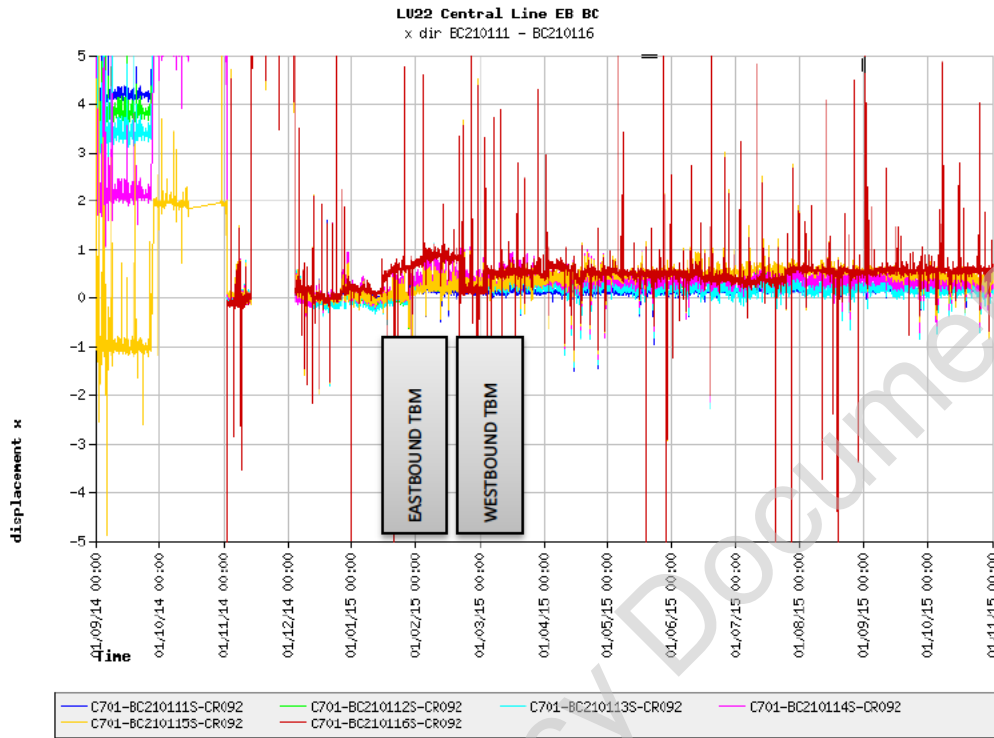
▪ **Electrolevels within “Central Line Eastbound Running Tunnel” (LU/22):**



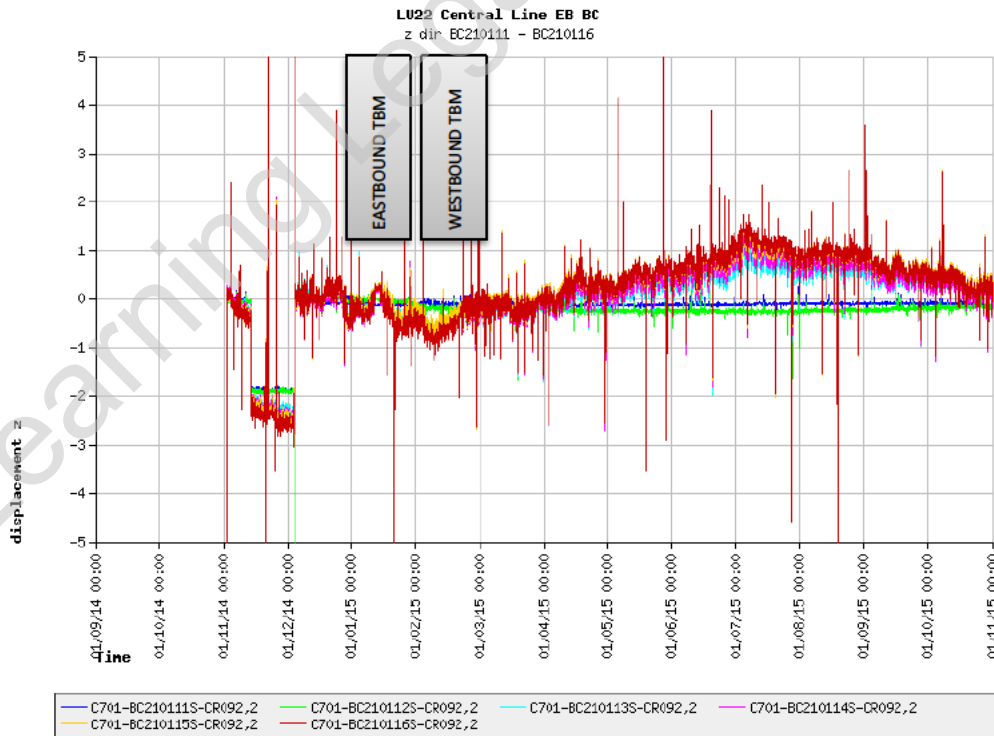
All movements were within the amber specified trigger as per C305-DSJ-C-STP-CRG03-50057 “Specific Action Plan Y031: LU22 - Central Line at/near Liverpool Street Station”:

▪ Bassett Convergence Systems within “Central Line Eastbound Running Tunnel” (LU/22):

Displacement X (mm):

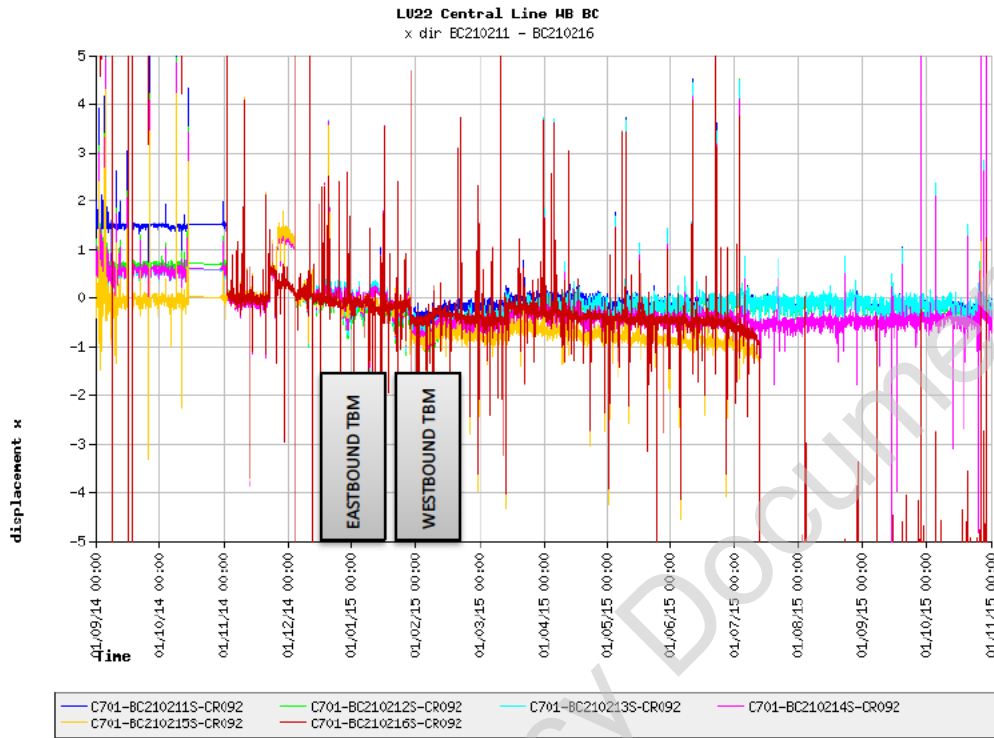


Displacement Z (mm):

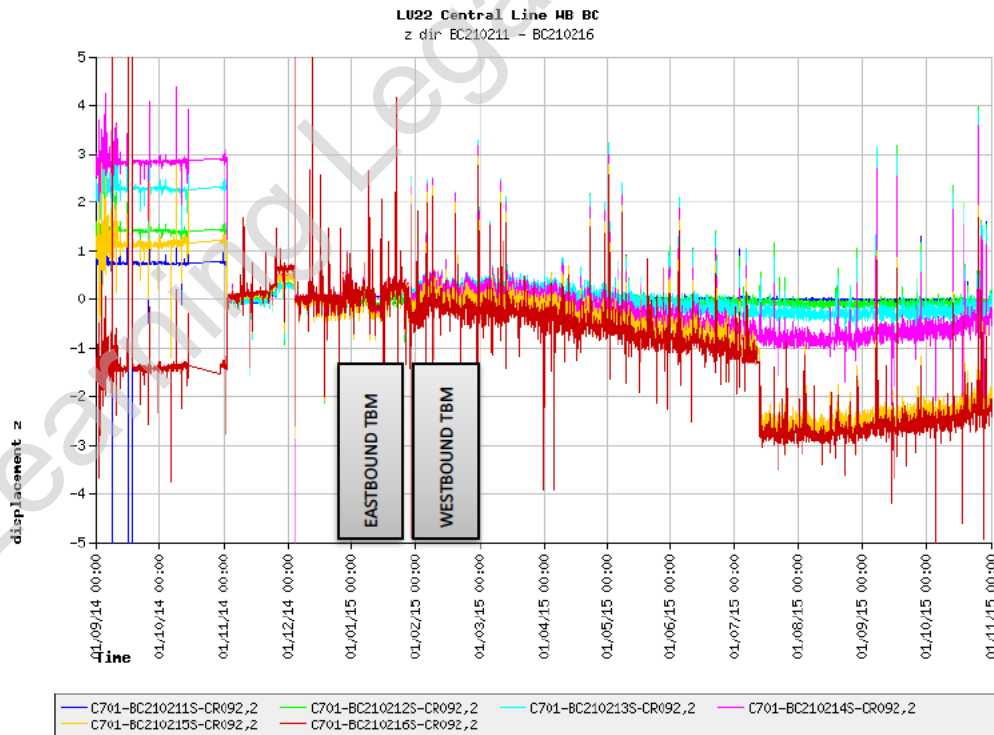


■ Bassett Convergence Systems within “Central Line Westbound Running Tunnel” (LU/22):

Displacement X (mm):

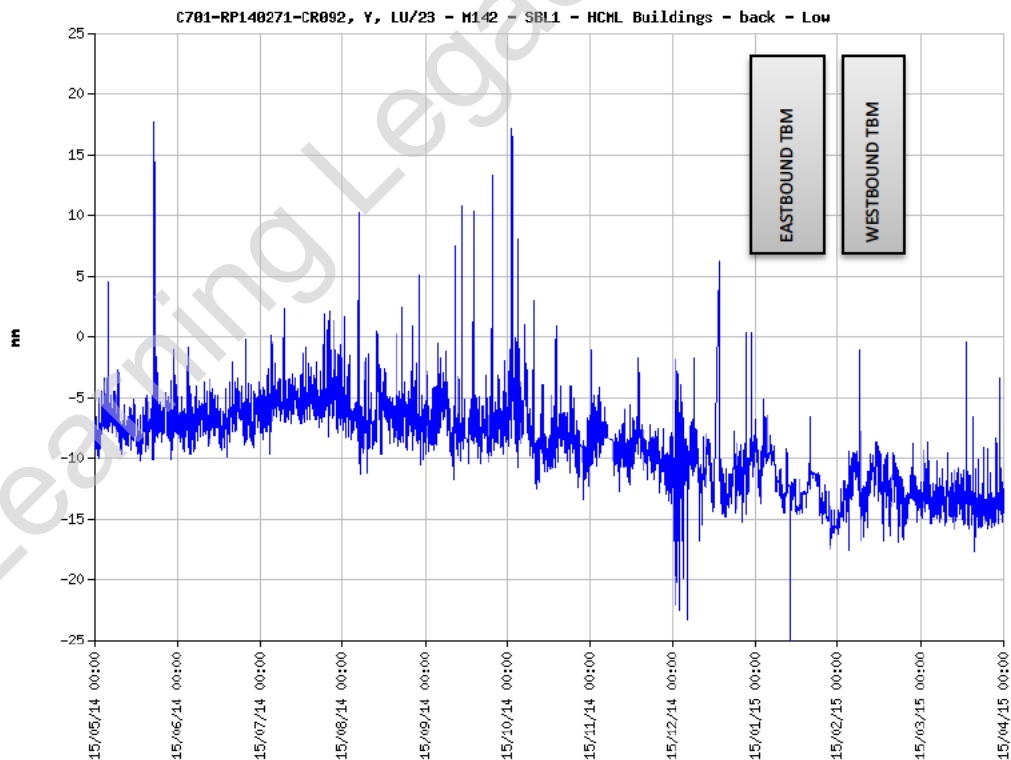
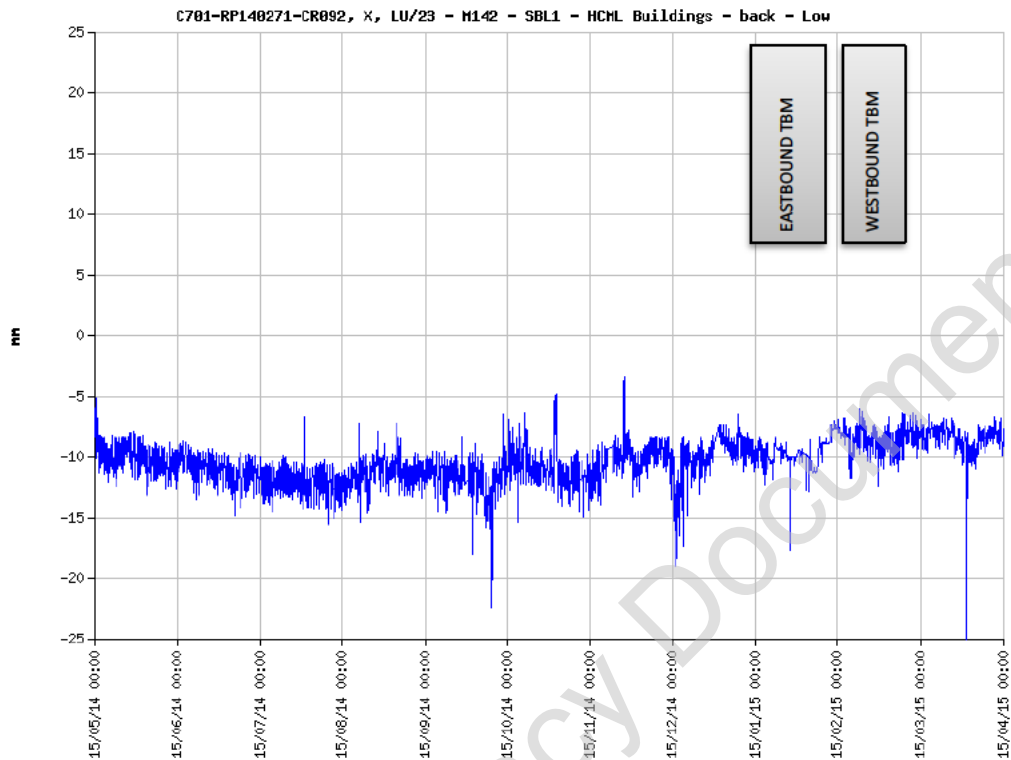


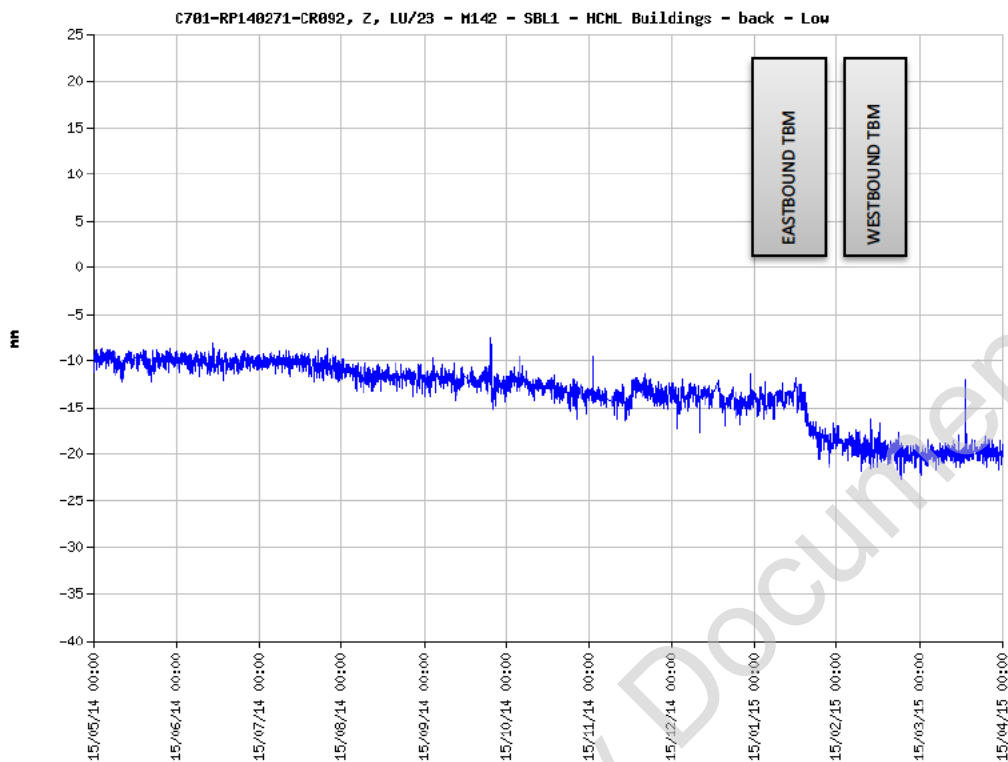
Displacement Z (mm):



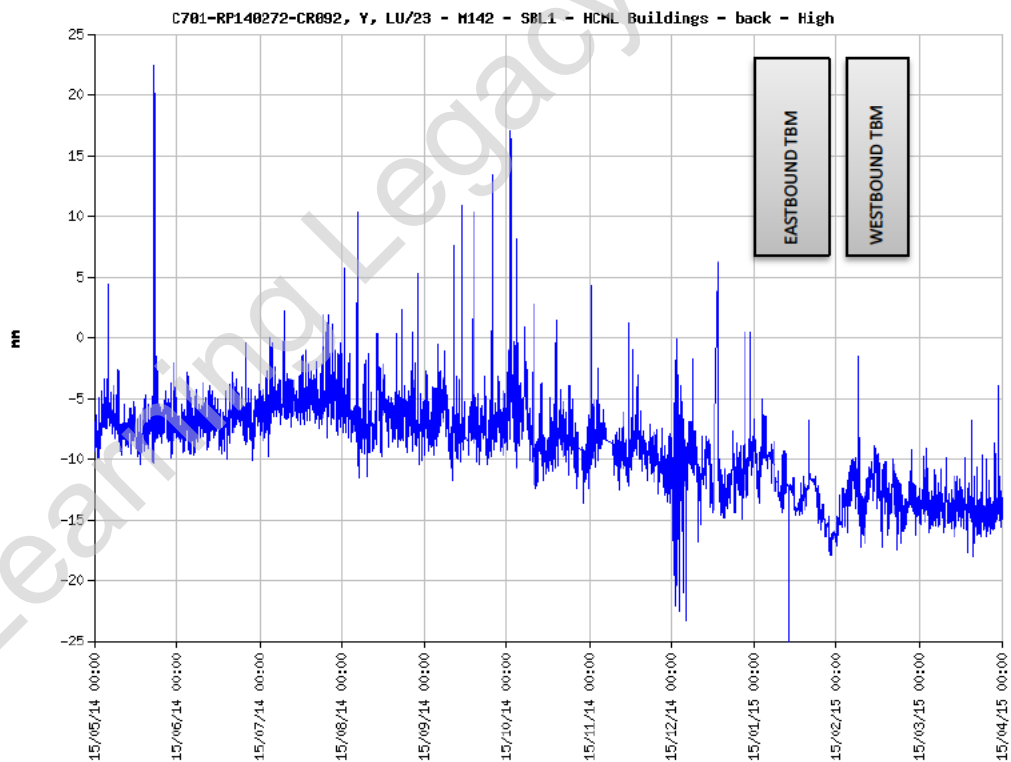
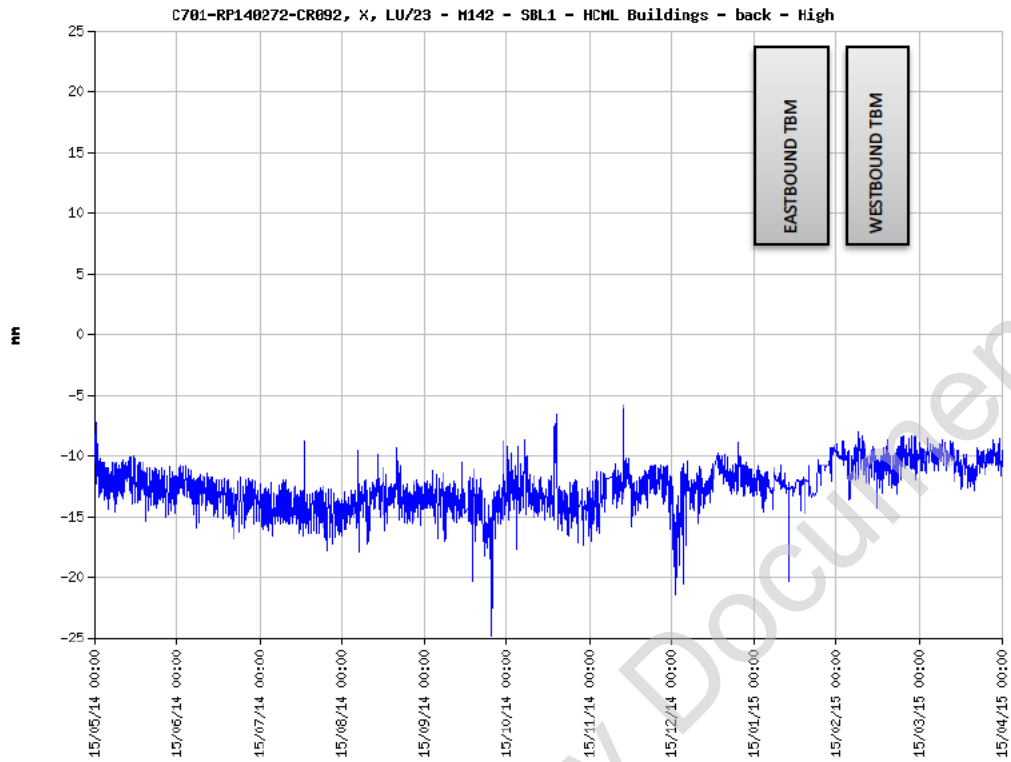
■ 3D Prisms within "Circle, Met, H&C Line, Liverpool Street Station and Ticket Hall" (LU/23):

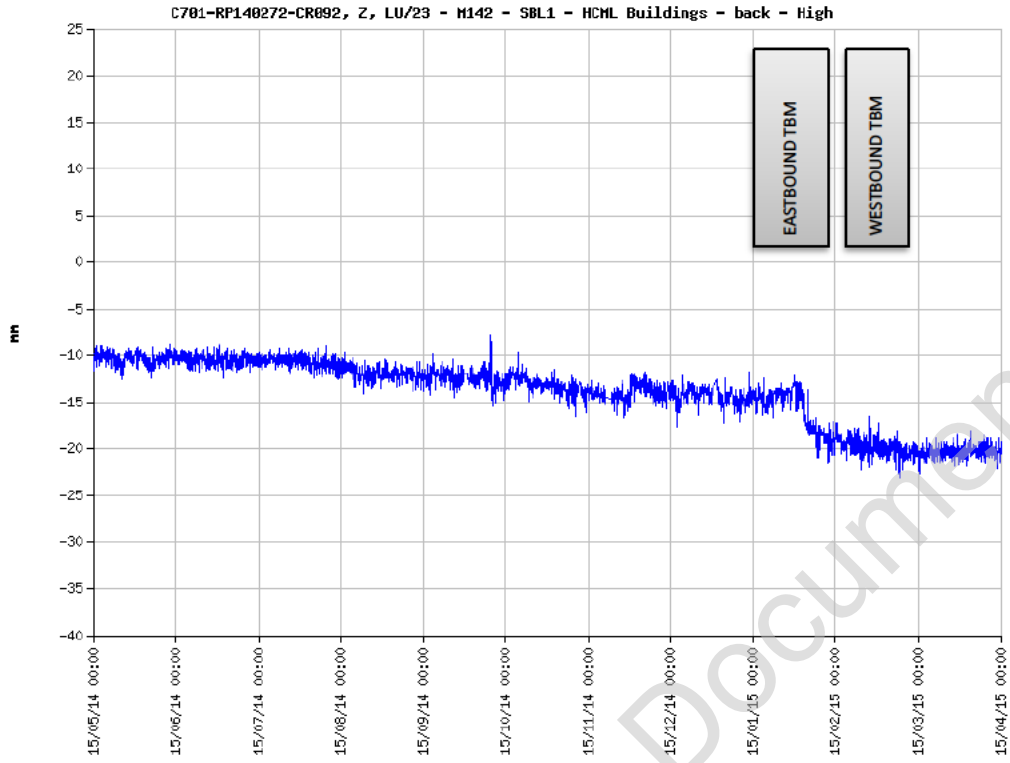
○ C704-RP140271:





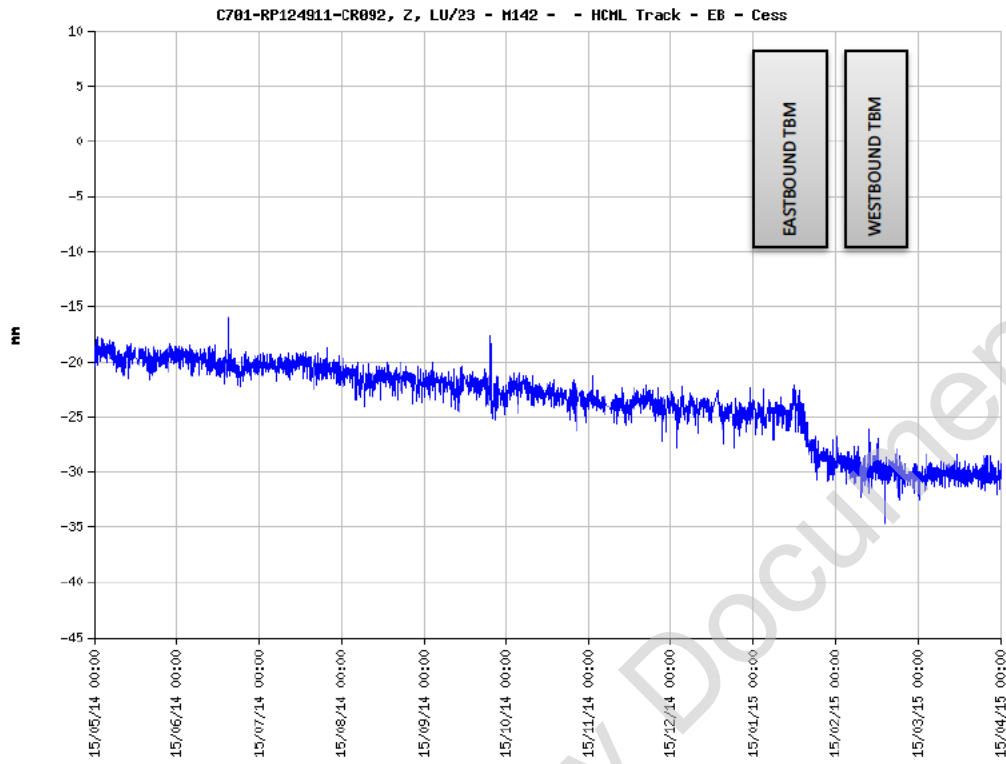
○ **C704-RP140272:**





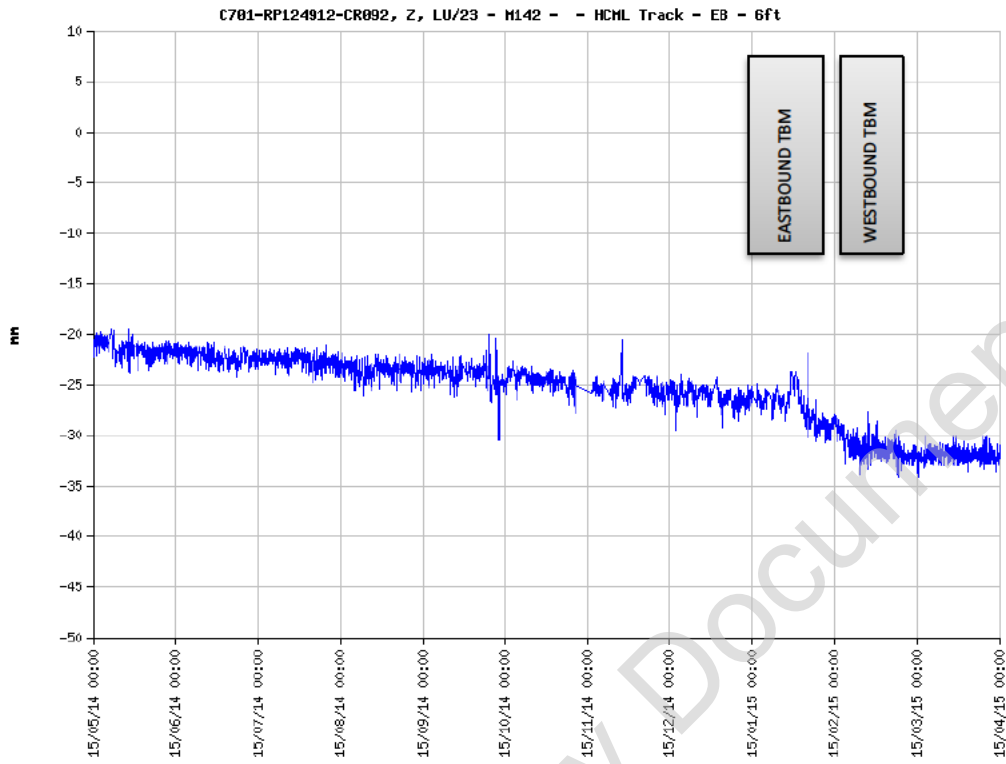
Learning Legacy Document

○ C704-RP124911:



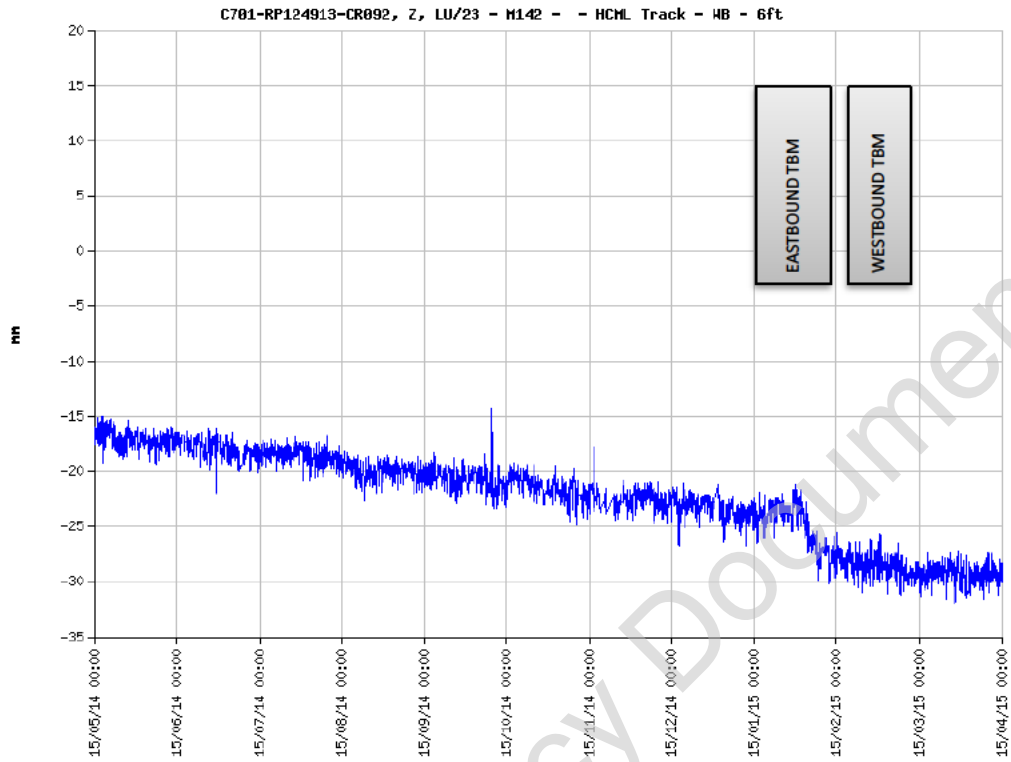
Learning Legacy Document

○ C704-RP124912:



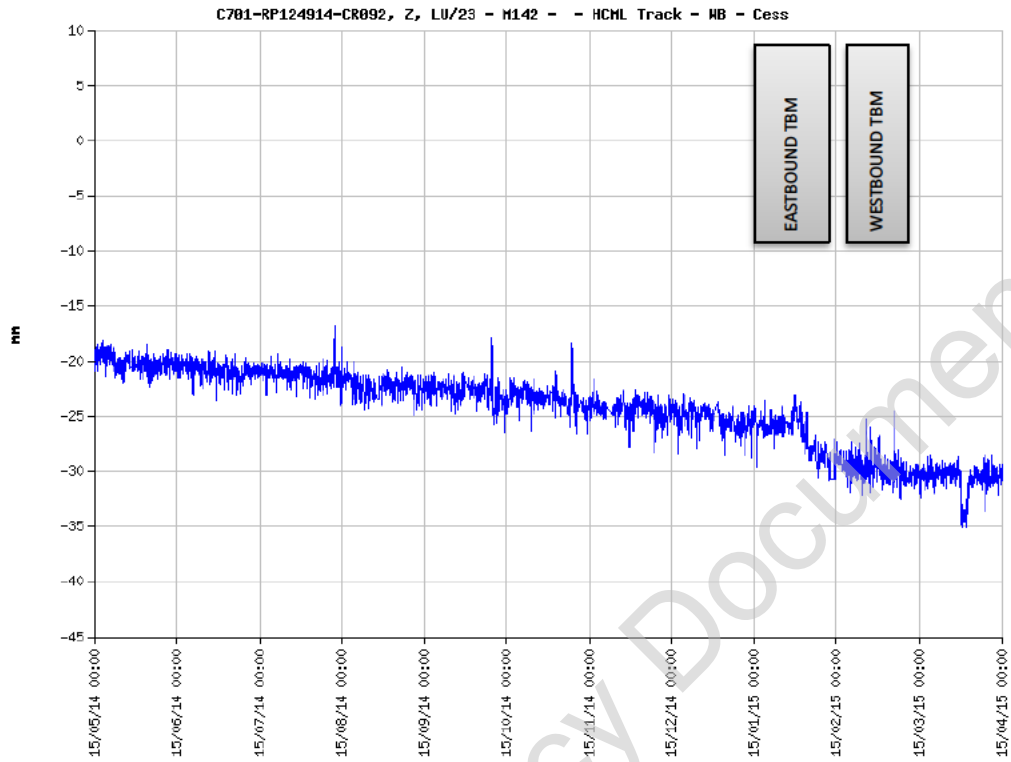
Learning Legacy Document

○ C704-RP124913:

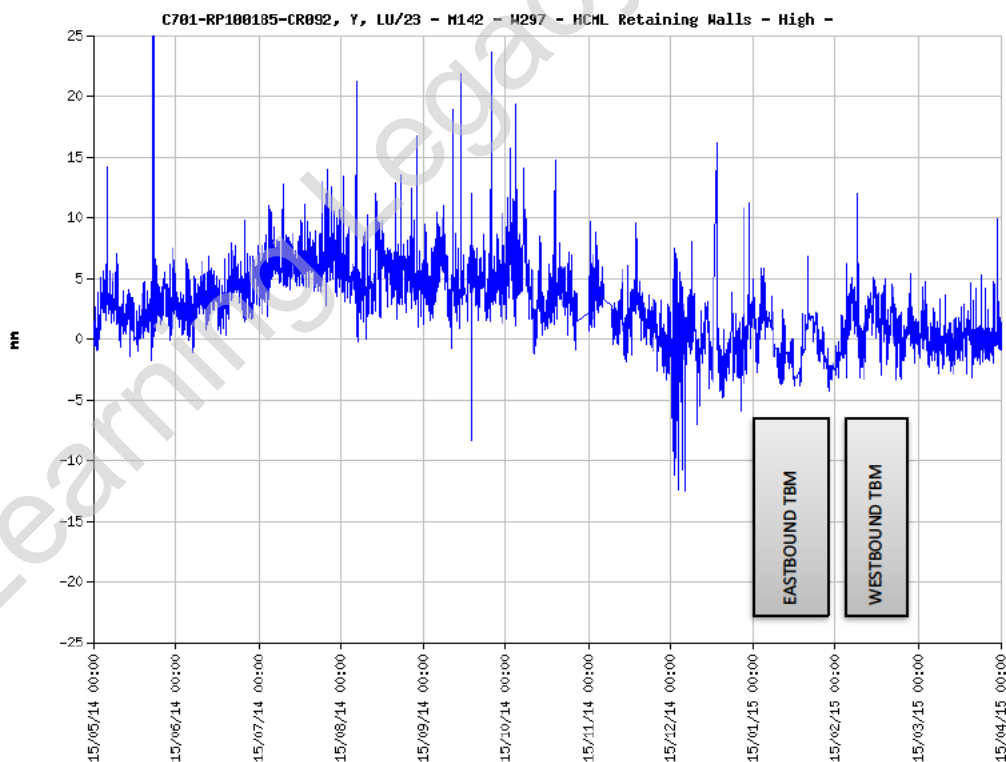
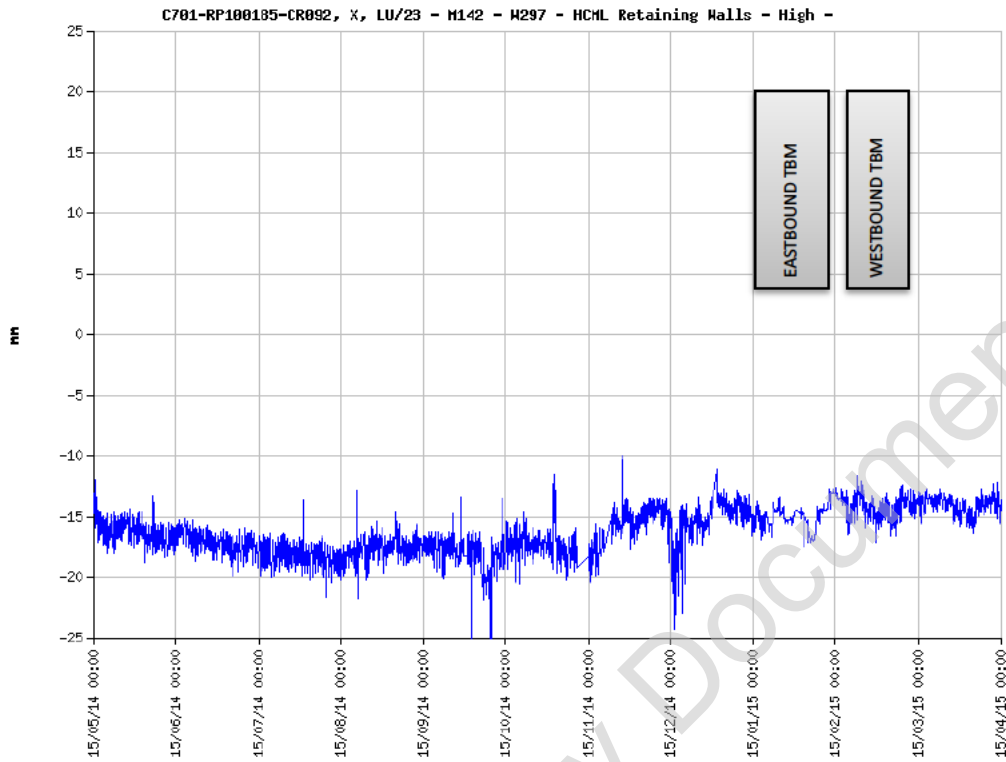


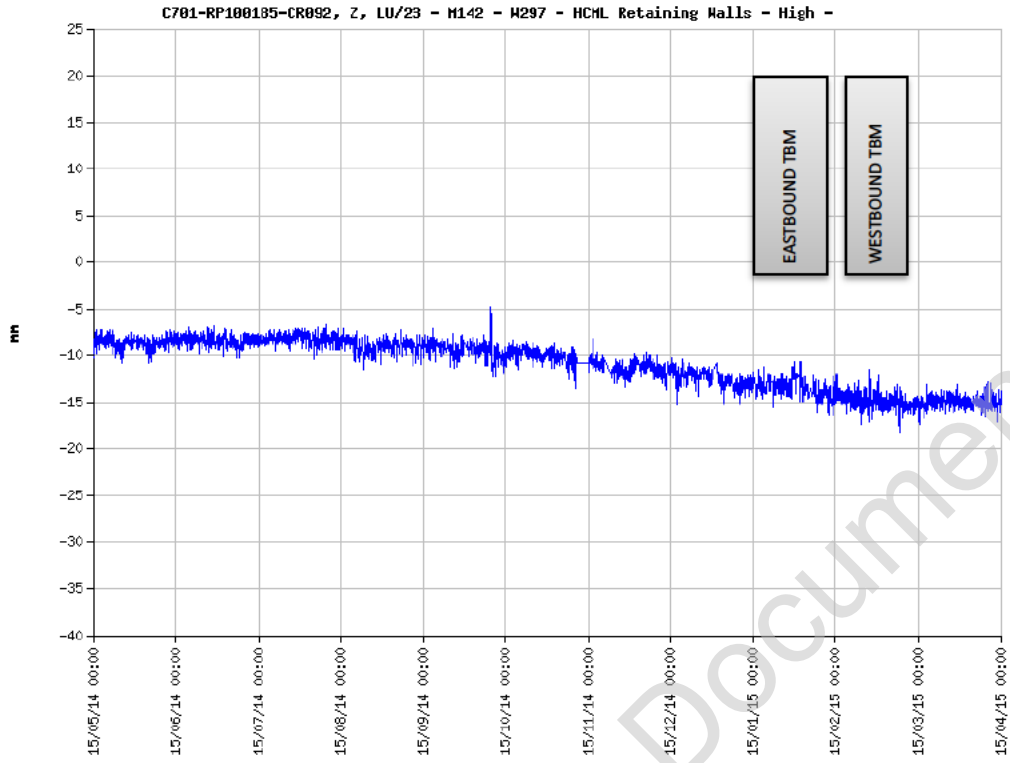
Learning Legacy Document

○ C704-RP124914:



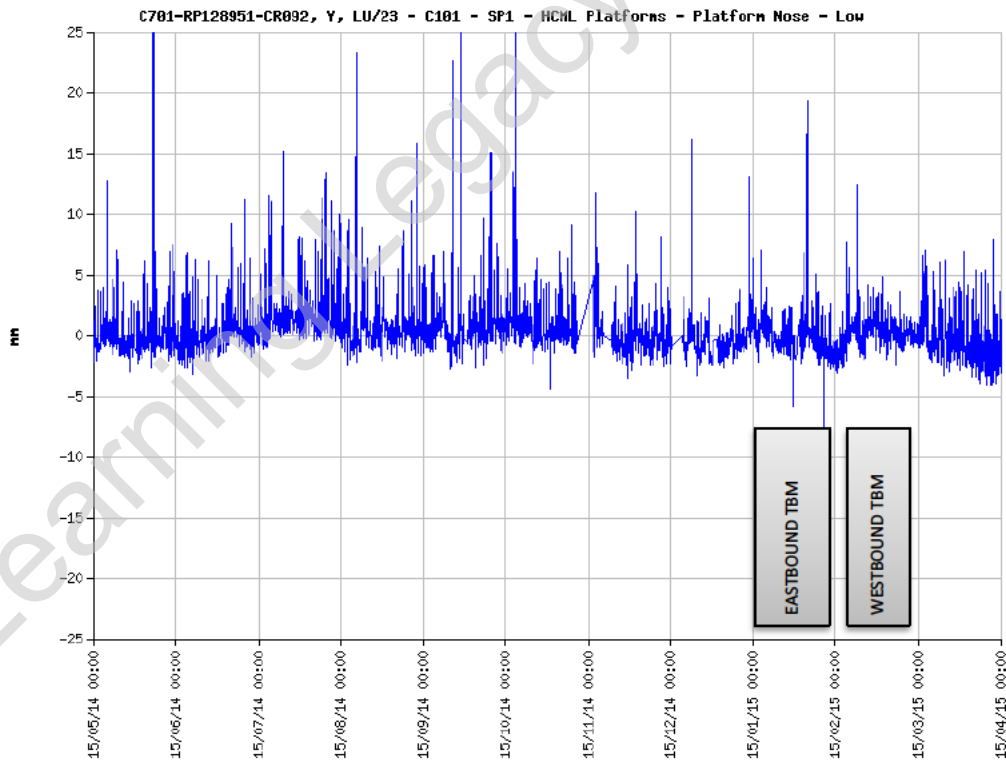
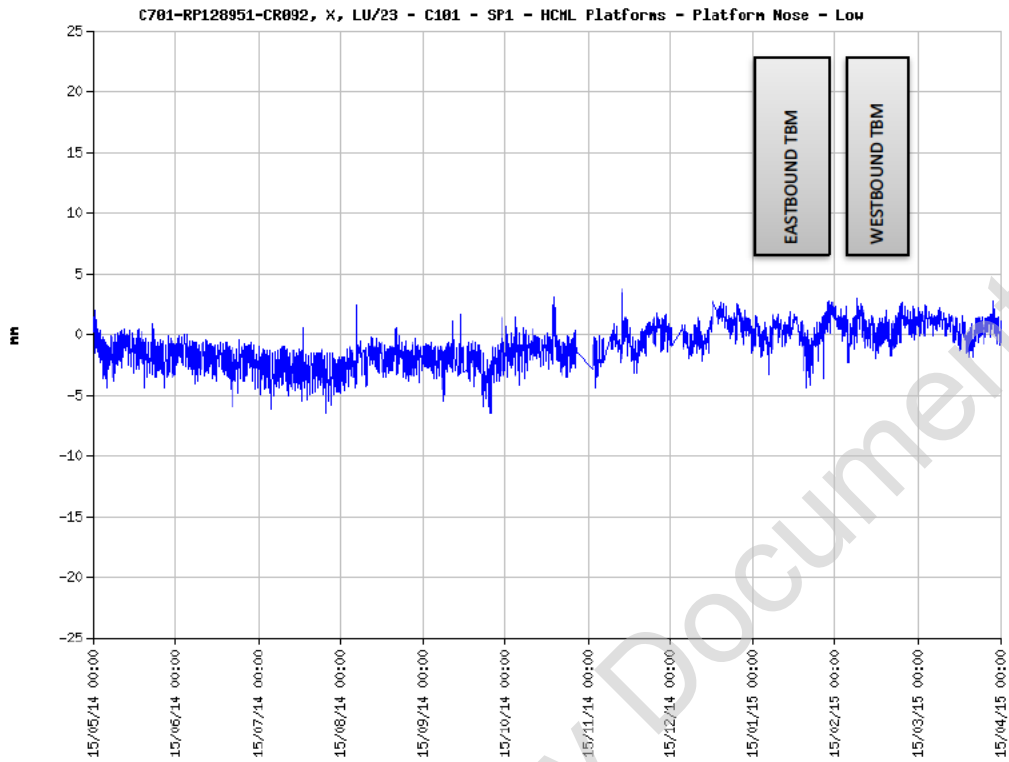
○ **C704-RP100185:**

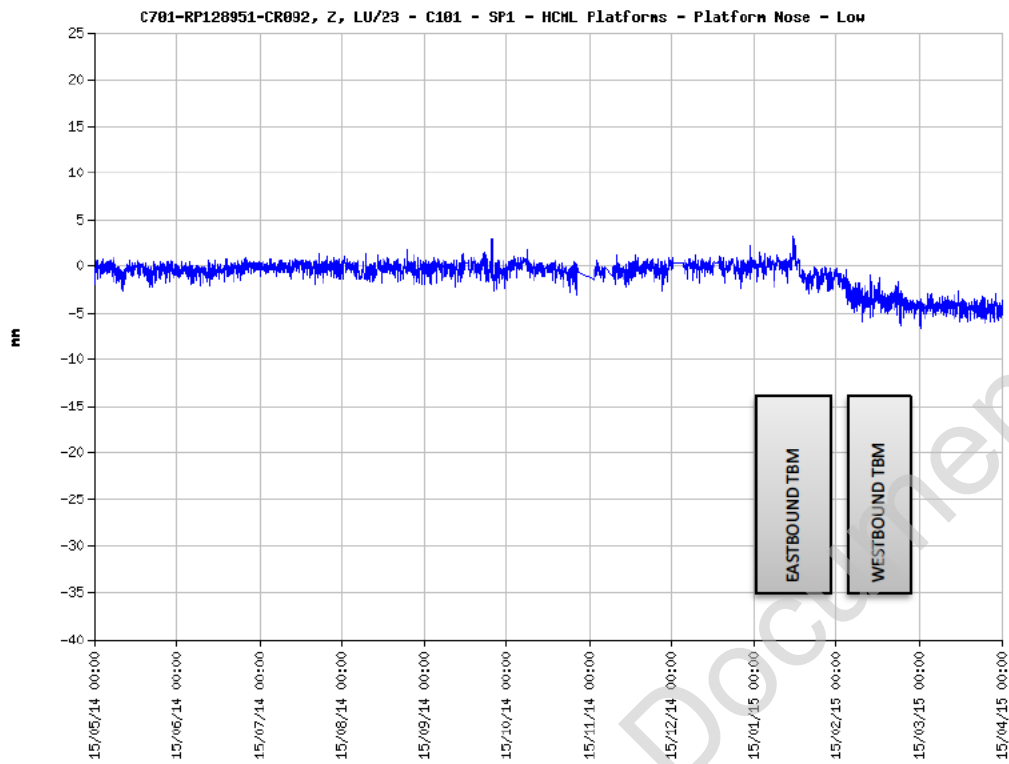




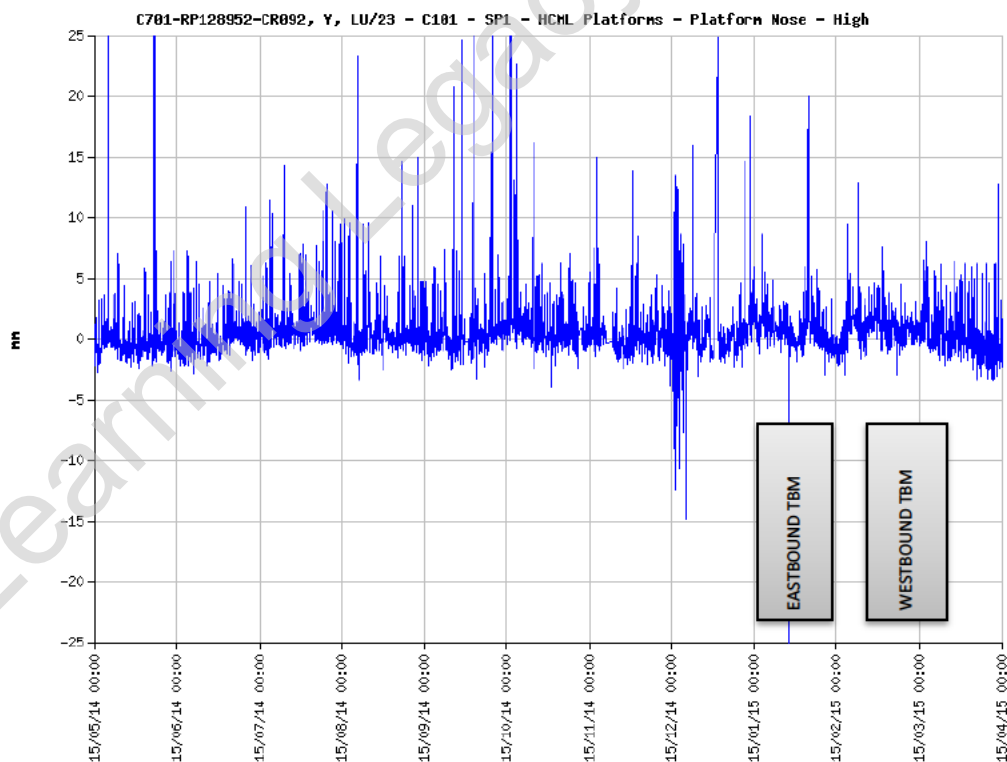
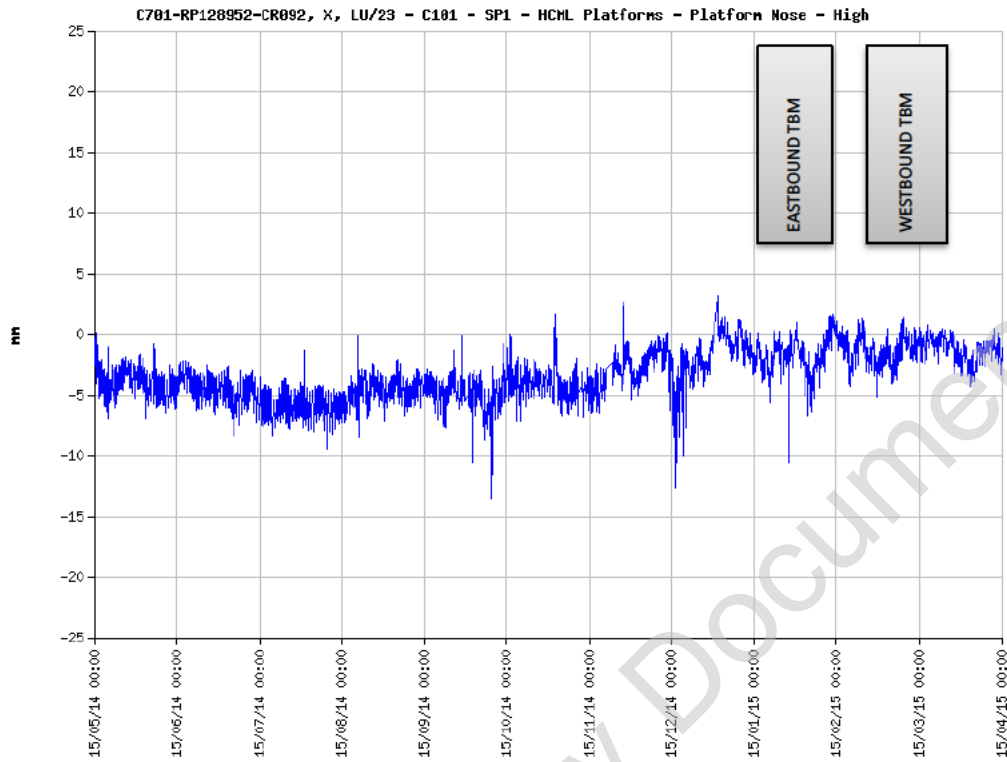
Learning Legacy Document

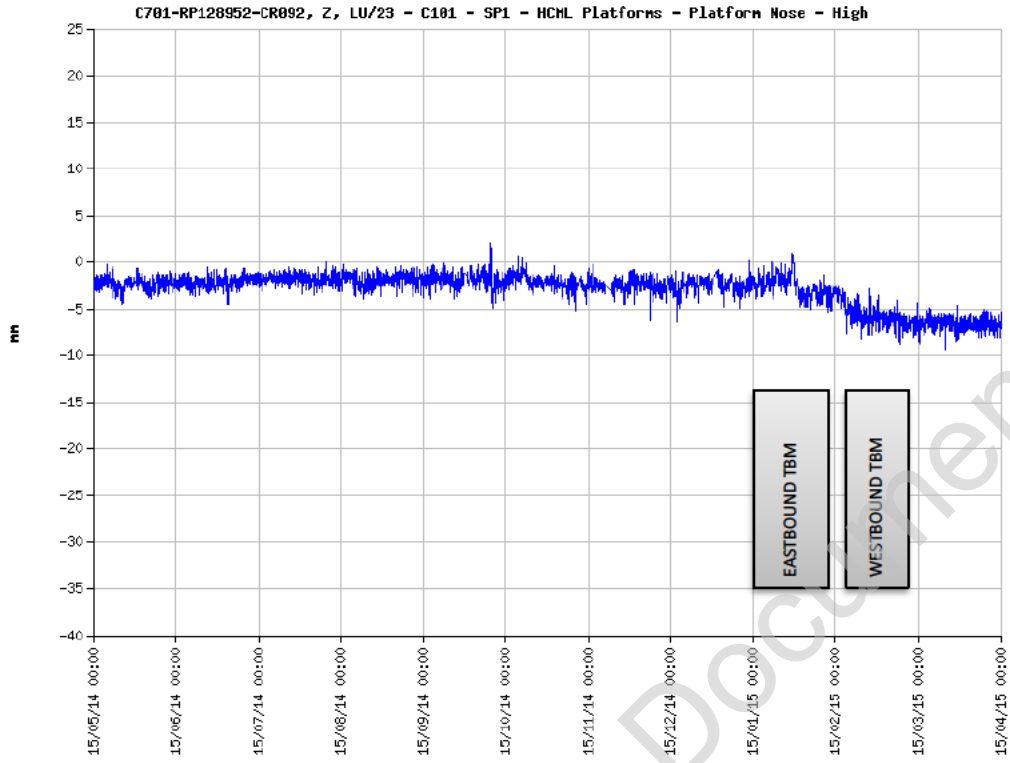
○ **C704-RP128951:**





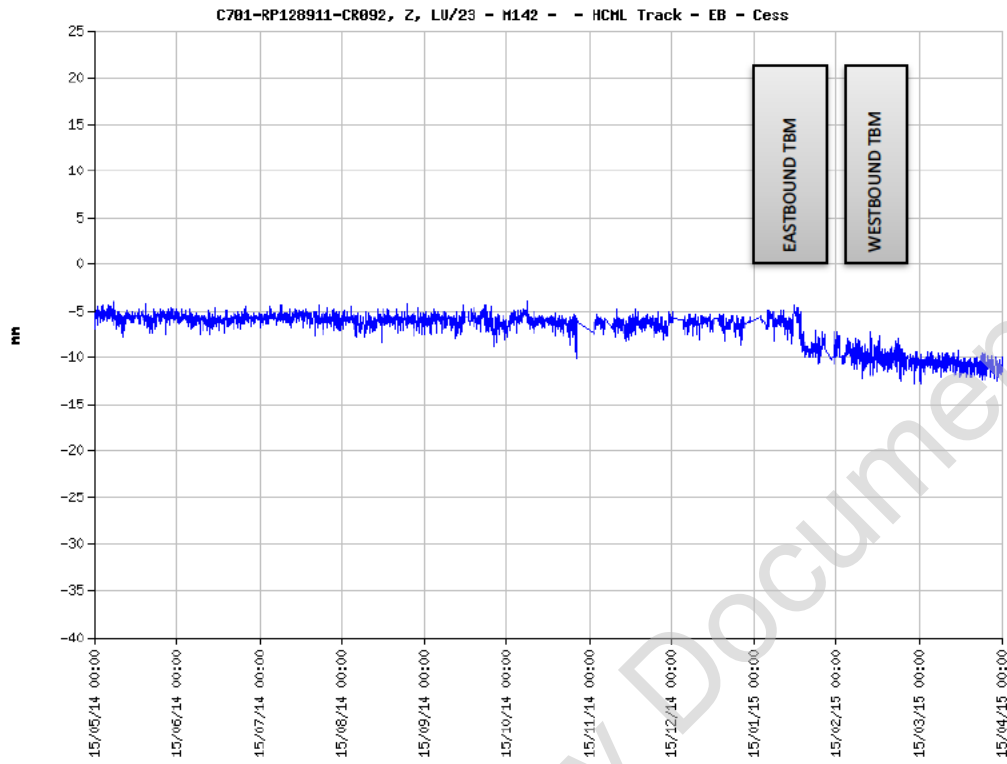
○ **C704-RP128952:**





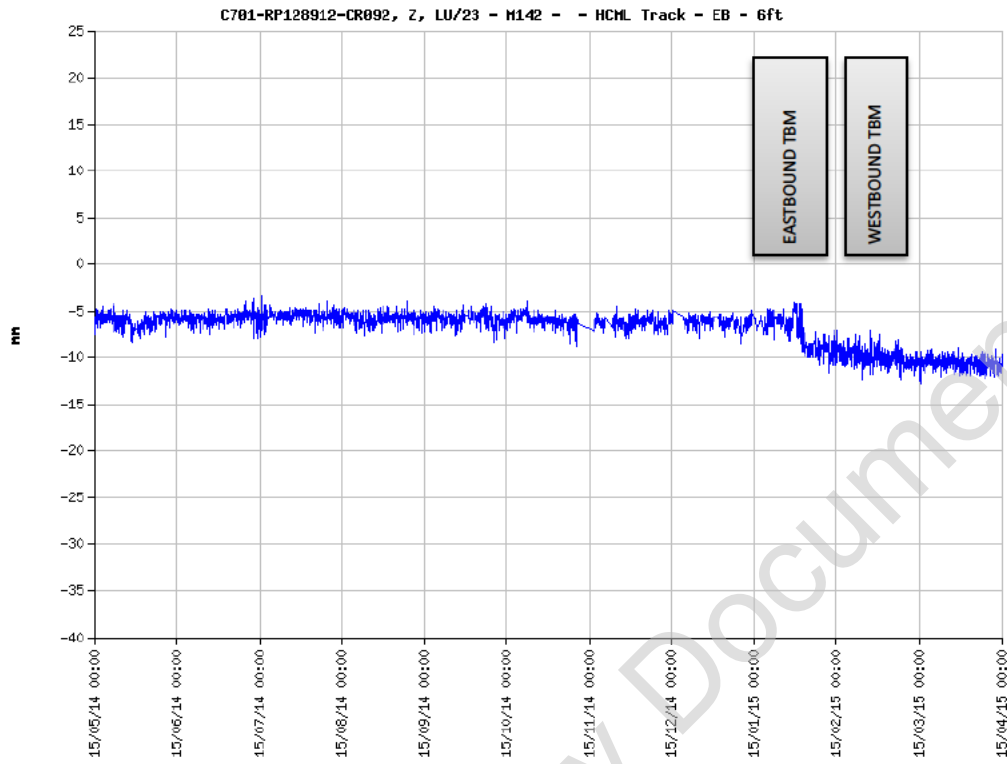
Learning Legacy Document

○ C704-RP128911:



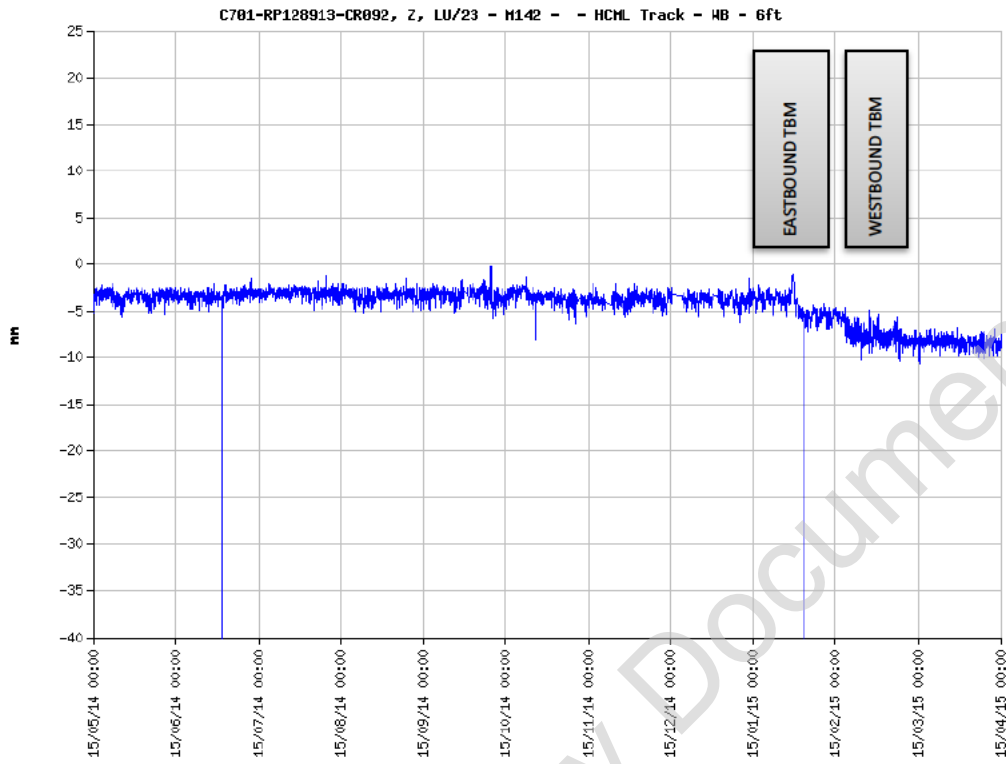
Learning Legacy Document

○ C704-RP128912:



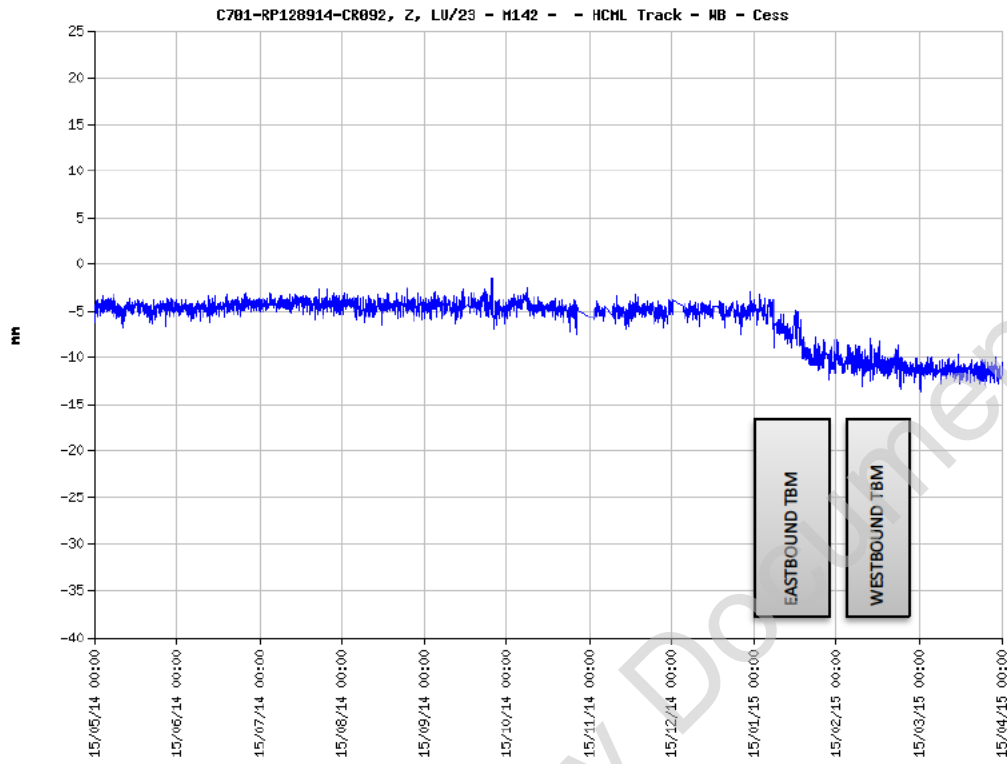
Learning Legacy Document

○ C704-RP128913:

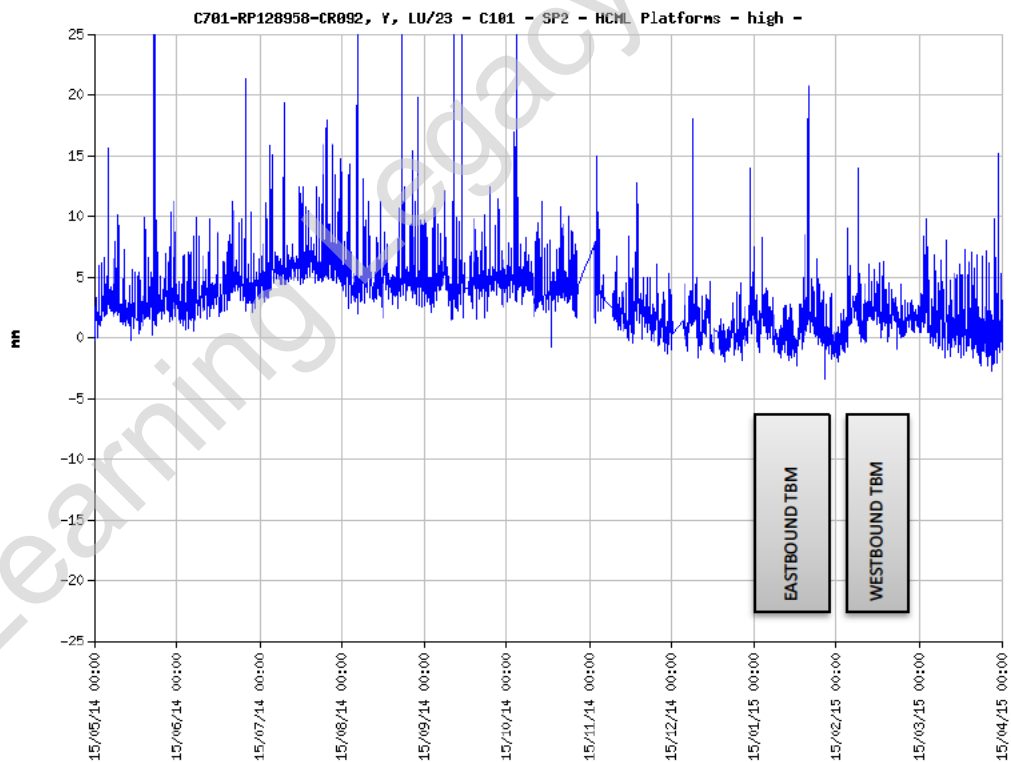
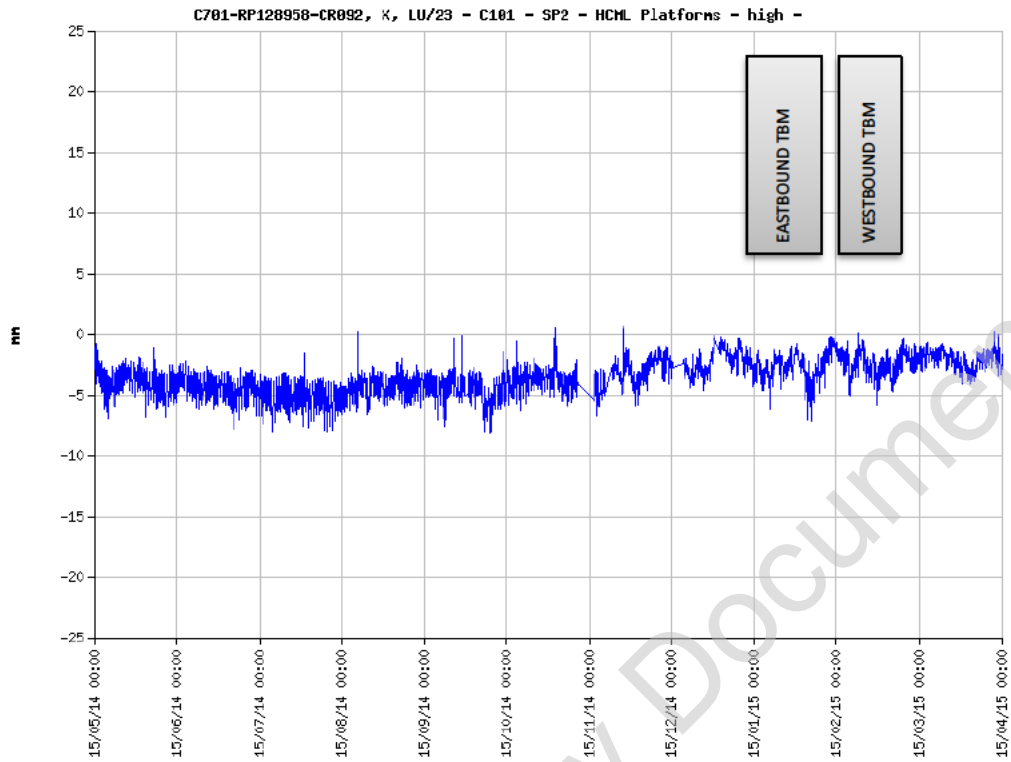


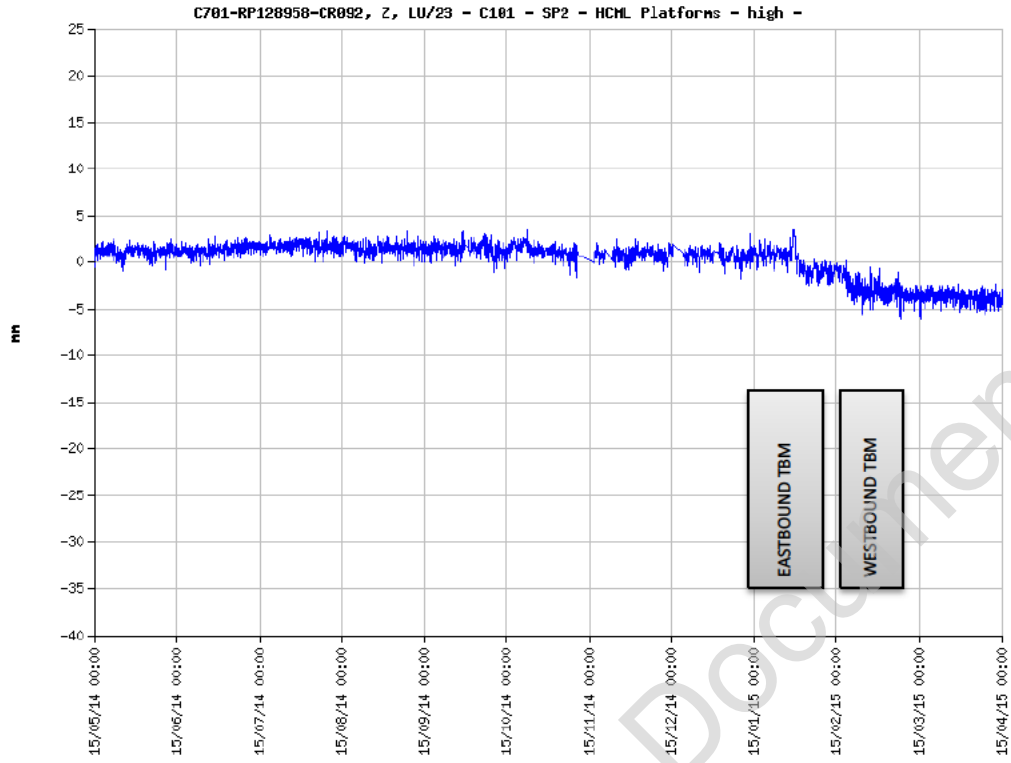
Learning Legacy Document

○ **C704-RP128914:**

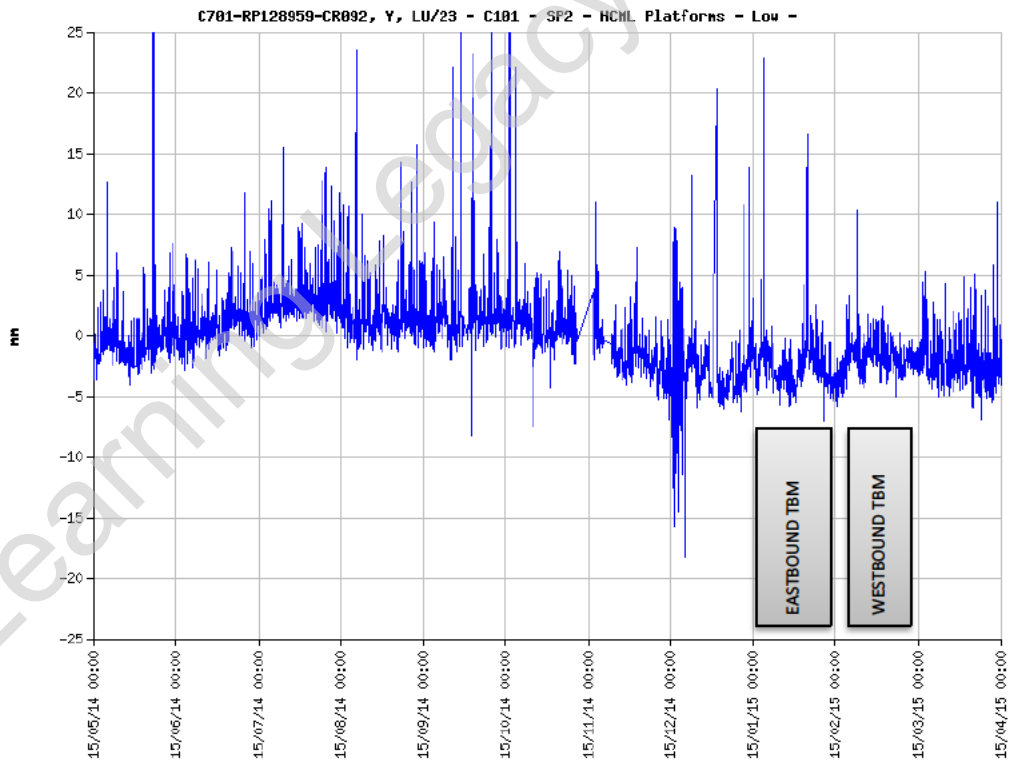
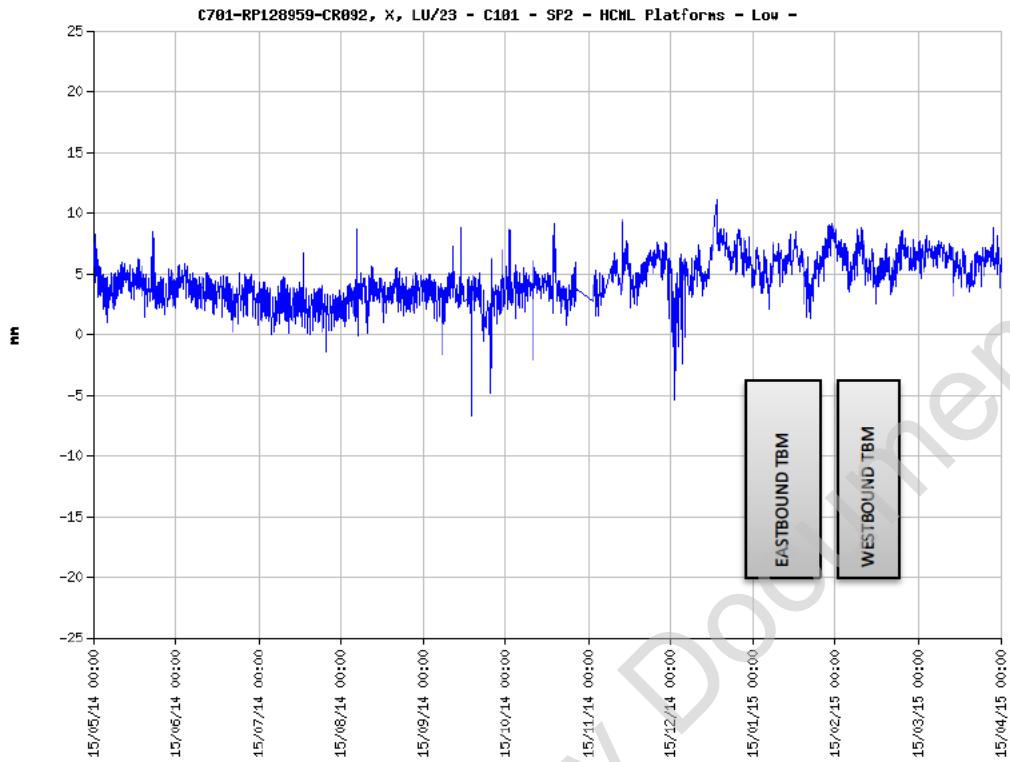


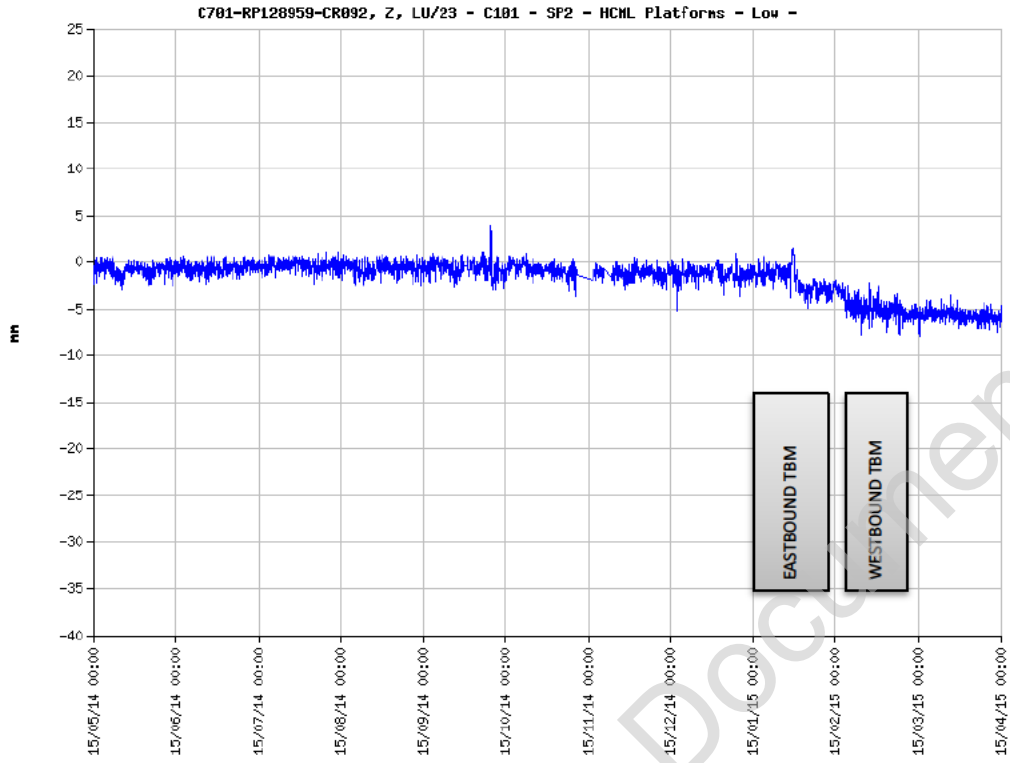
○ **C704-RP128958:**





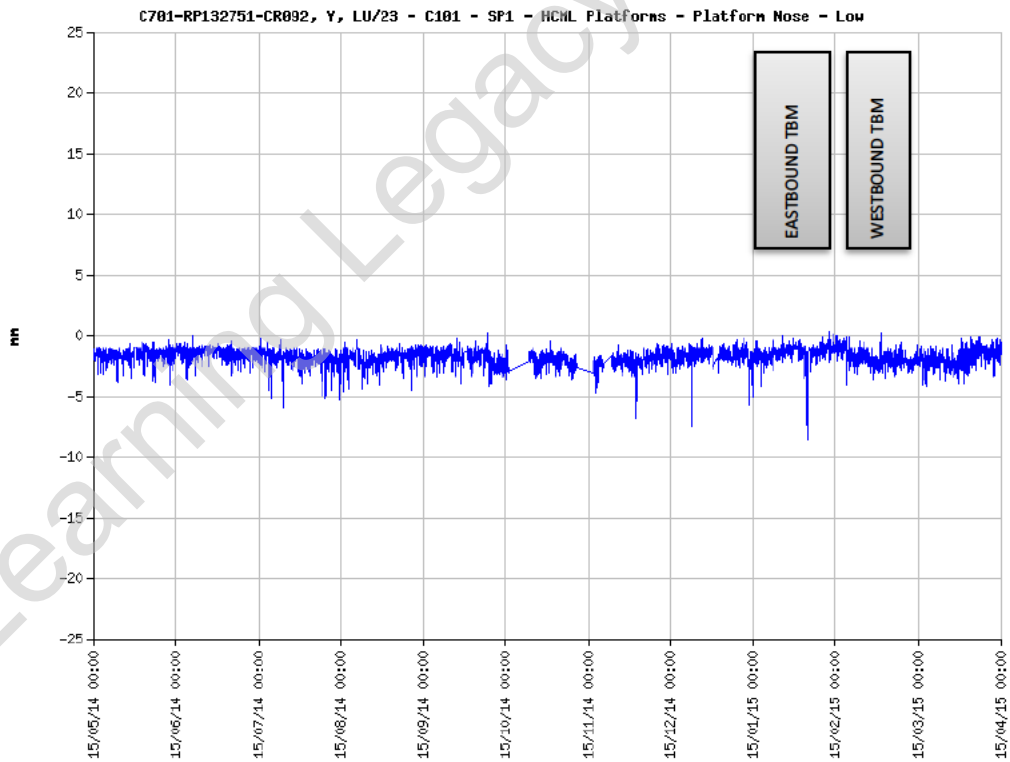
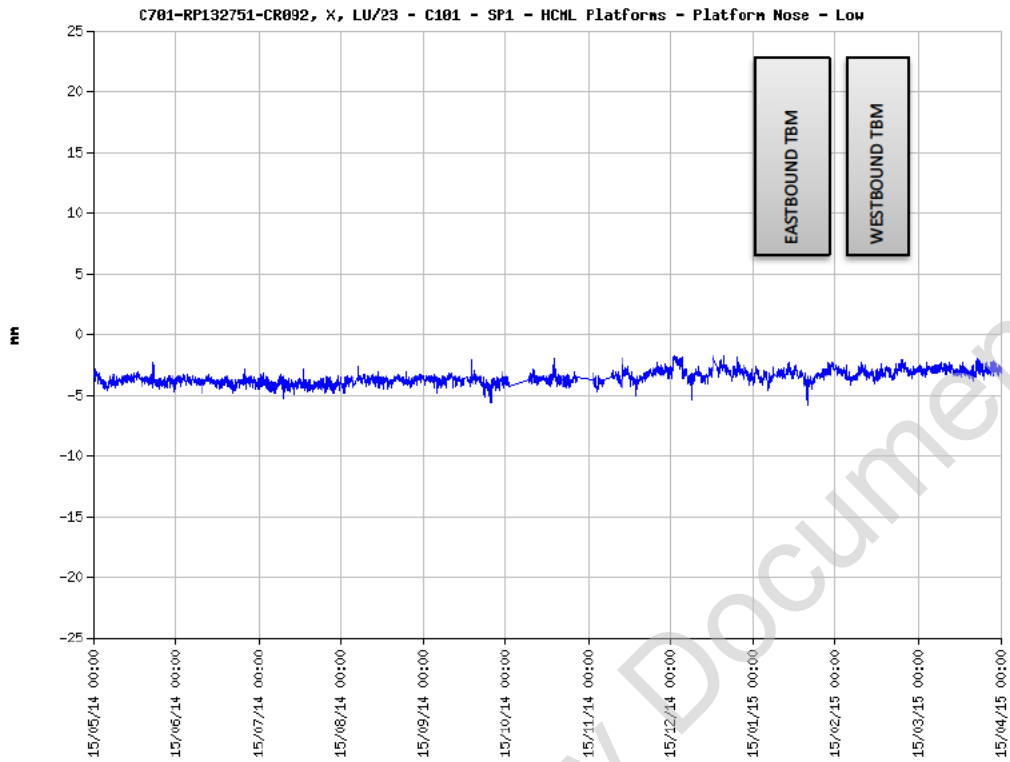
○ **C704-RP128959:**

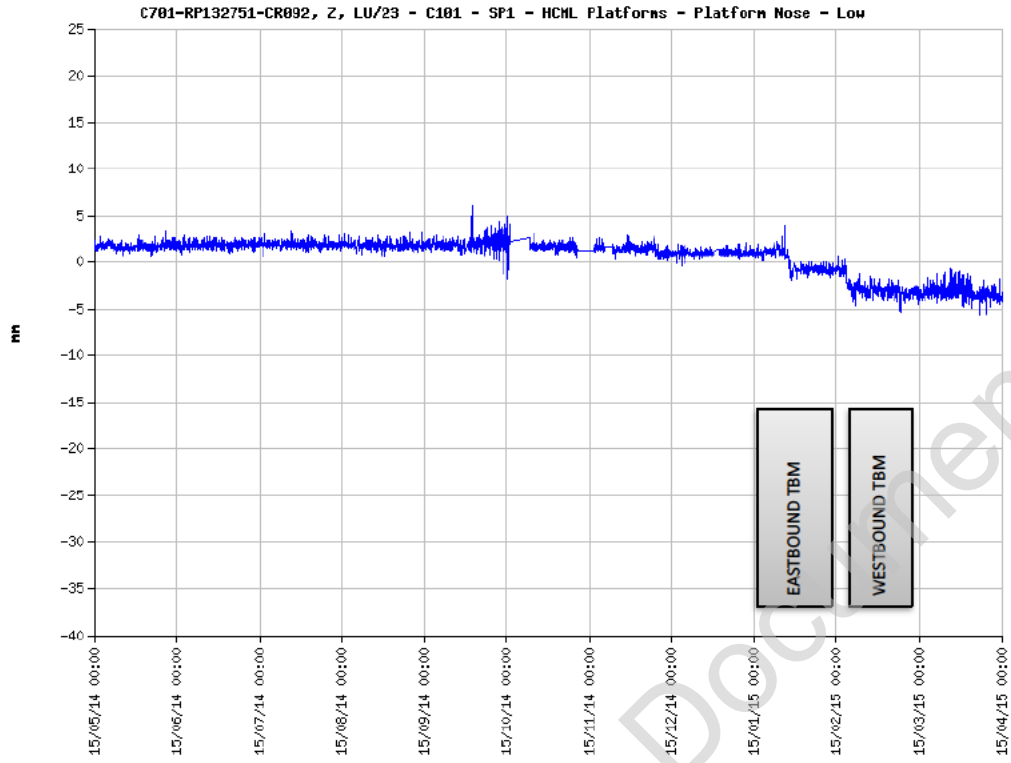




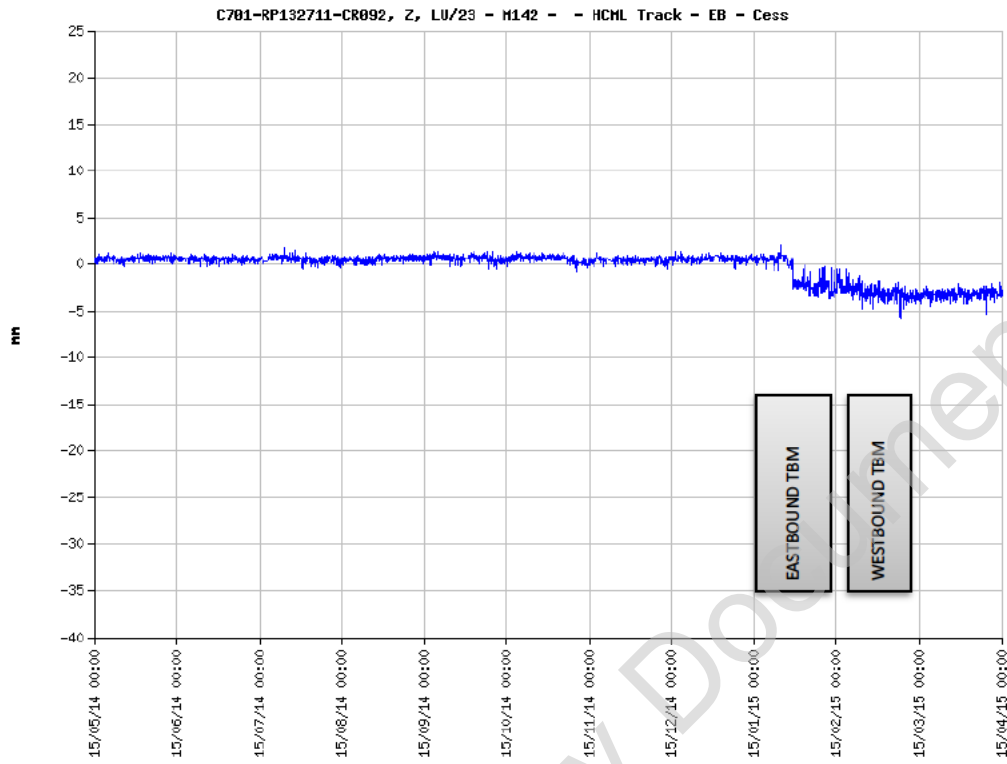
Learning Legacy Document

○ **C704-RP132751:**

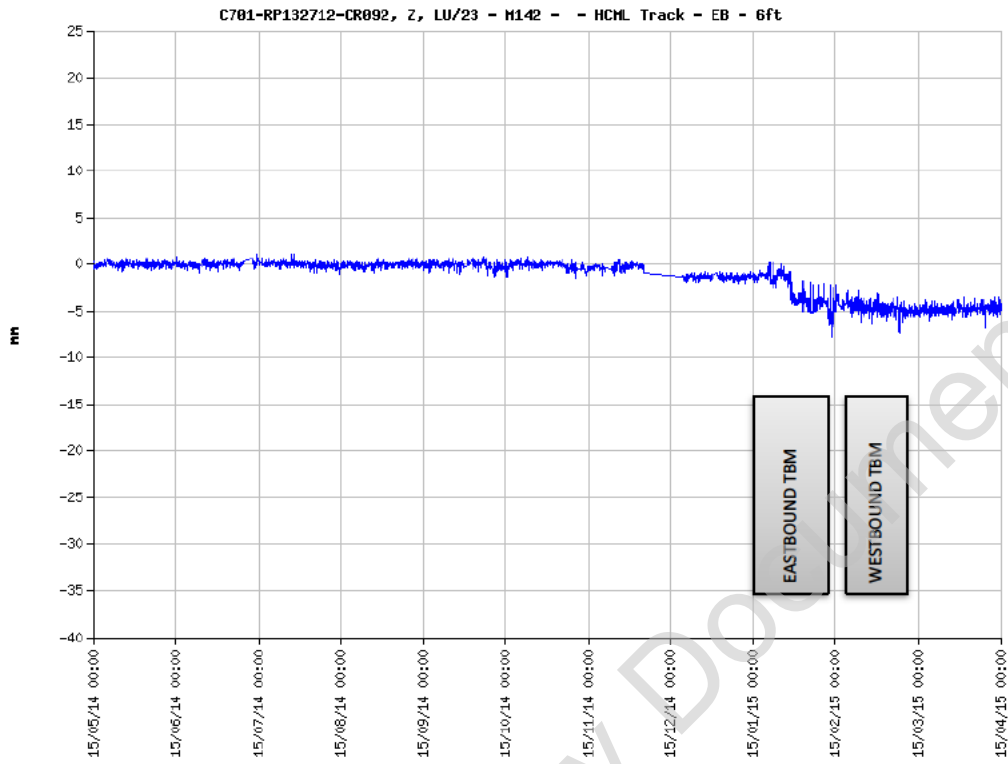




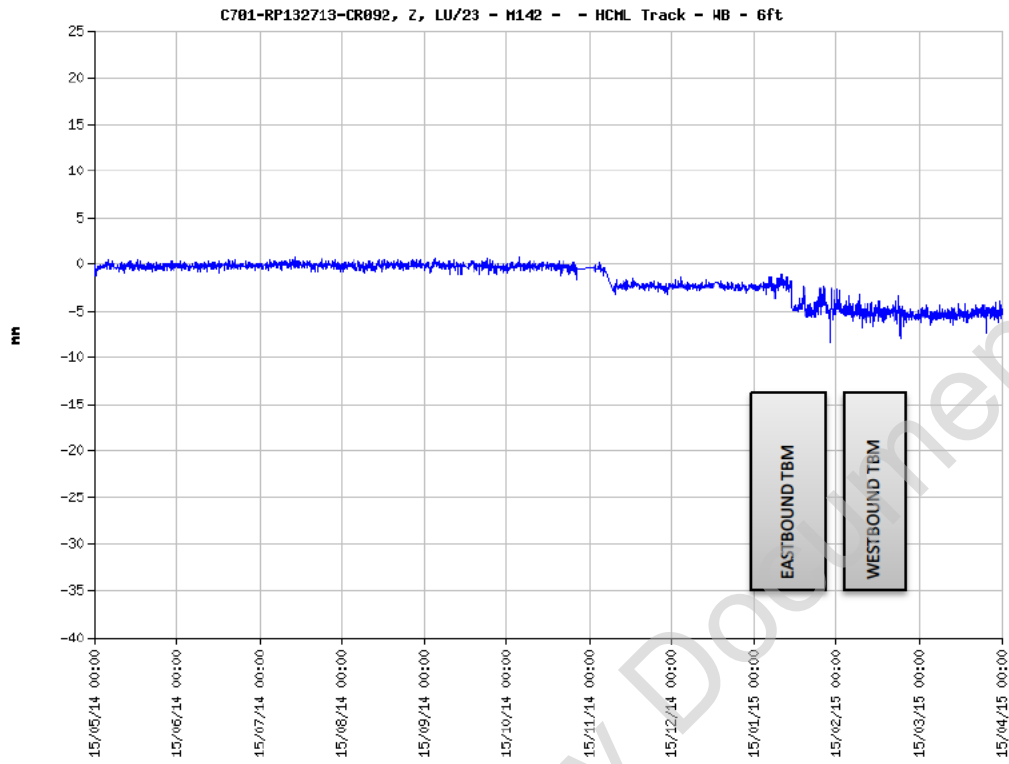
○ **C704-RP132711:**



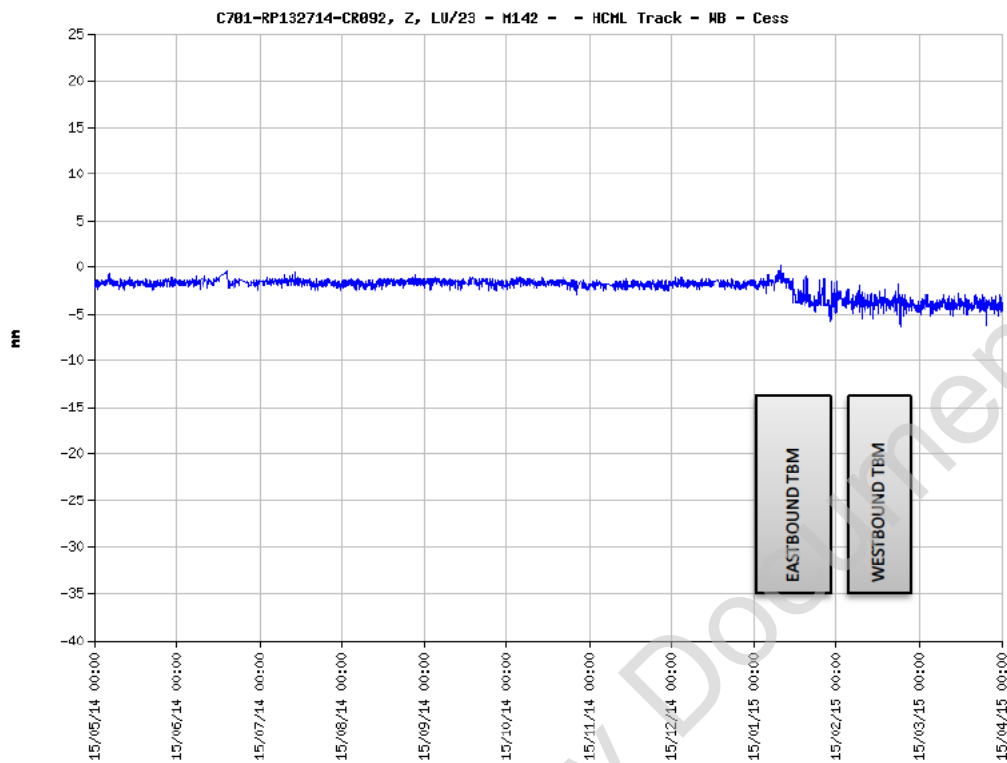
○ **C704-RP132712:**



○ **C704-RP132713:**

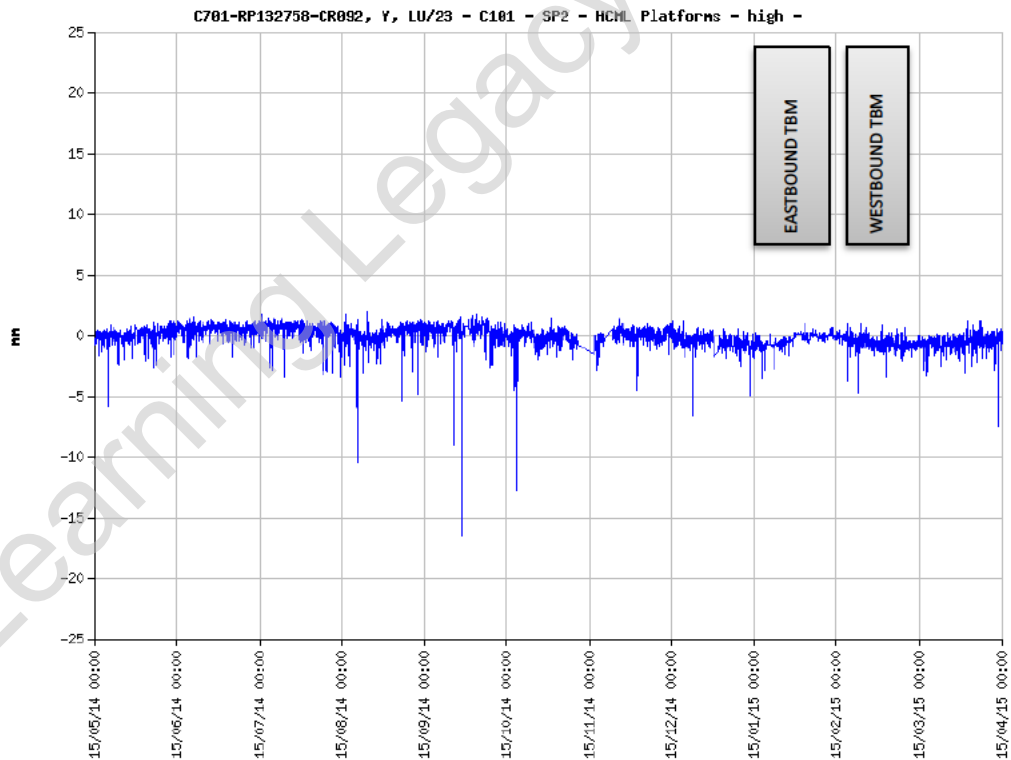
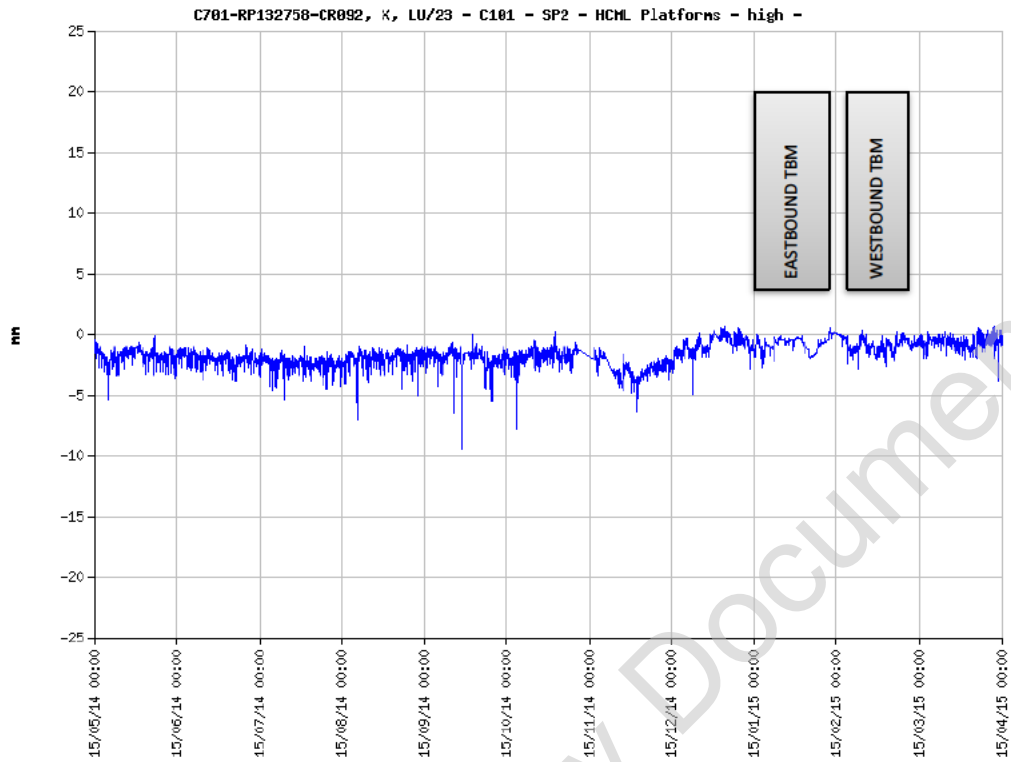


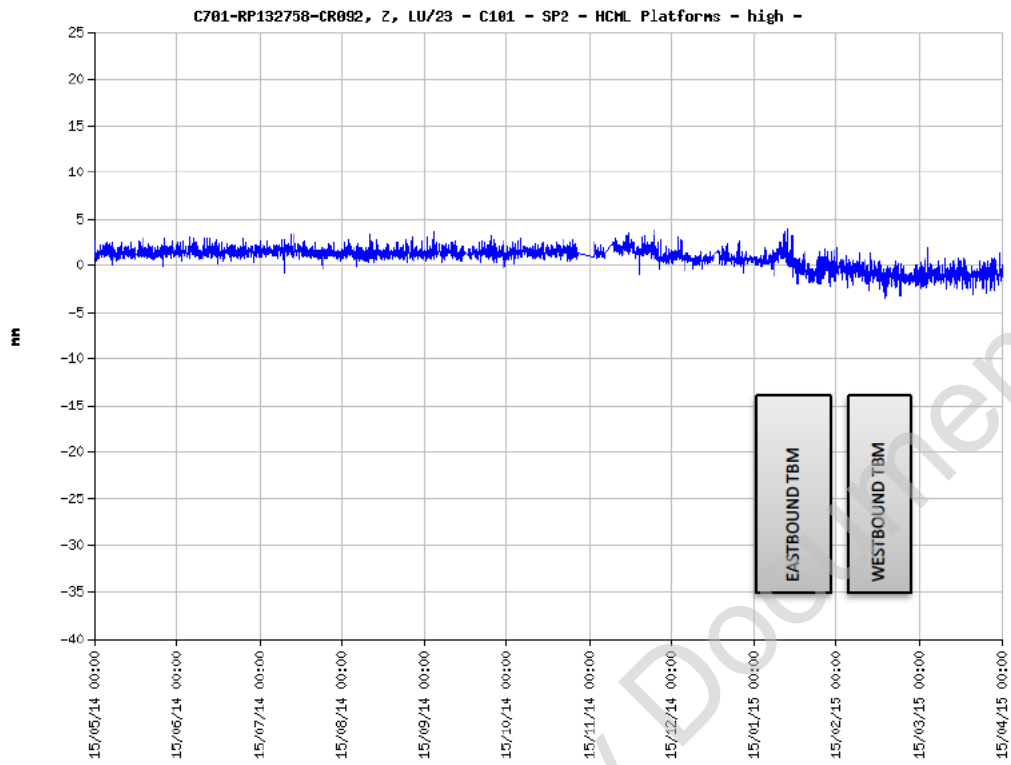
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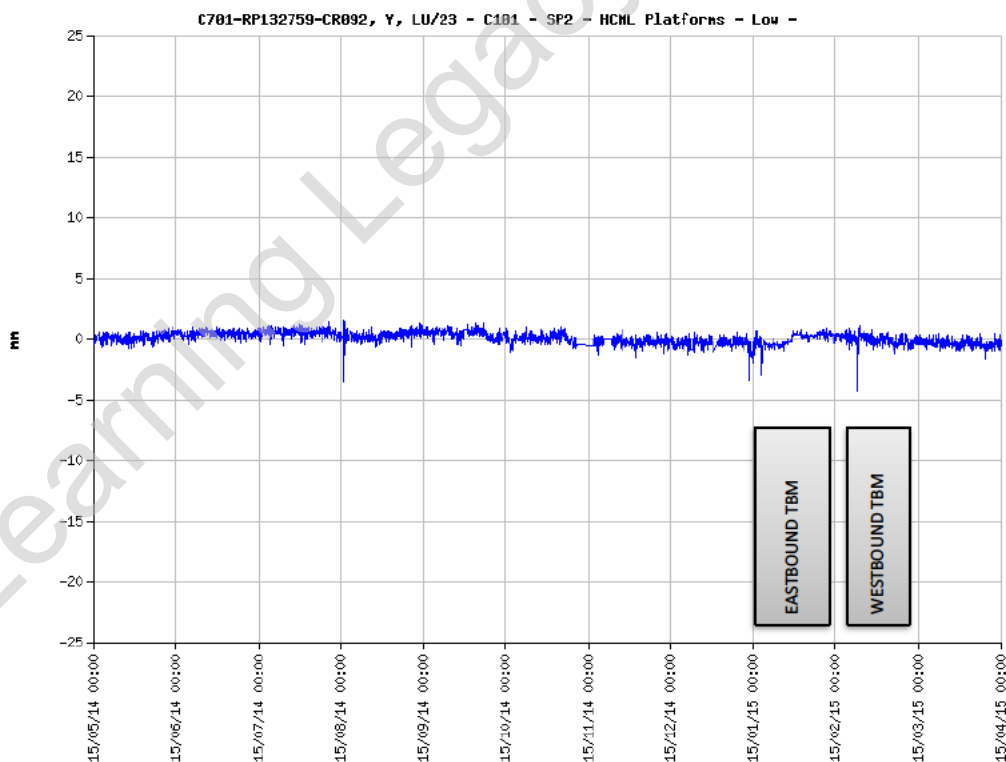
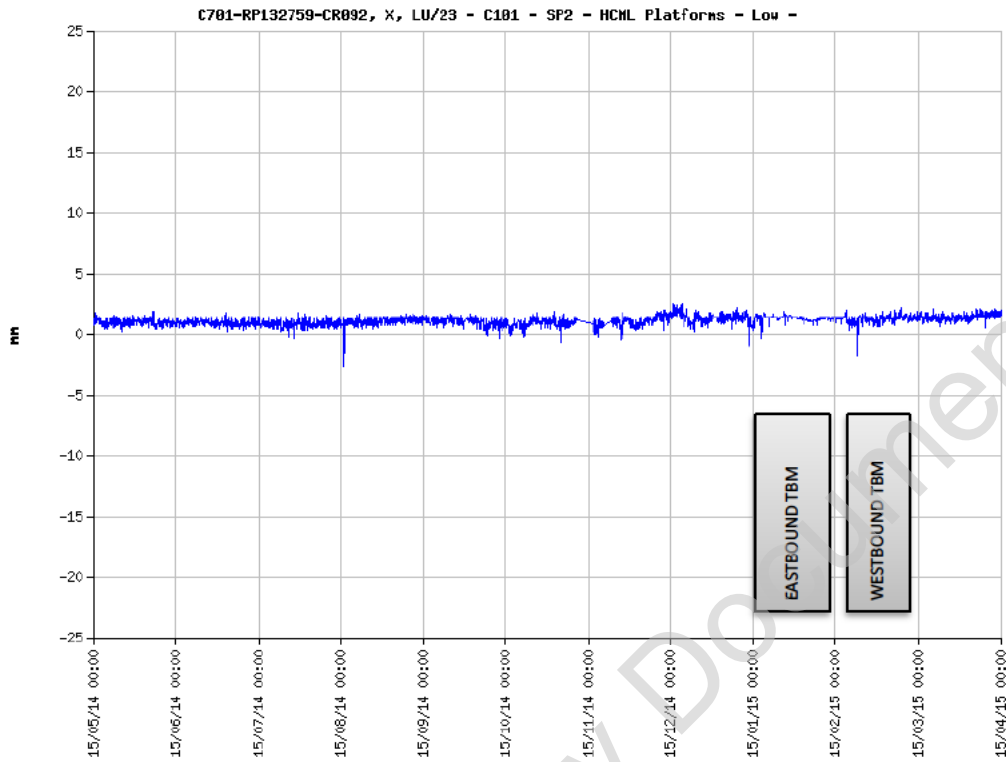
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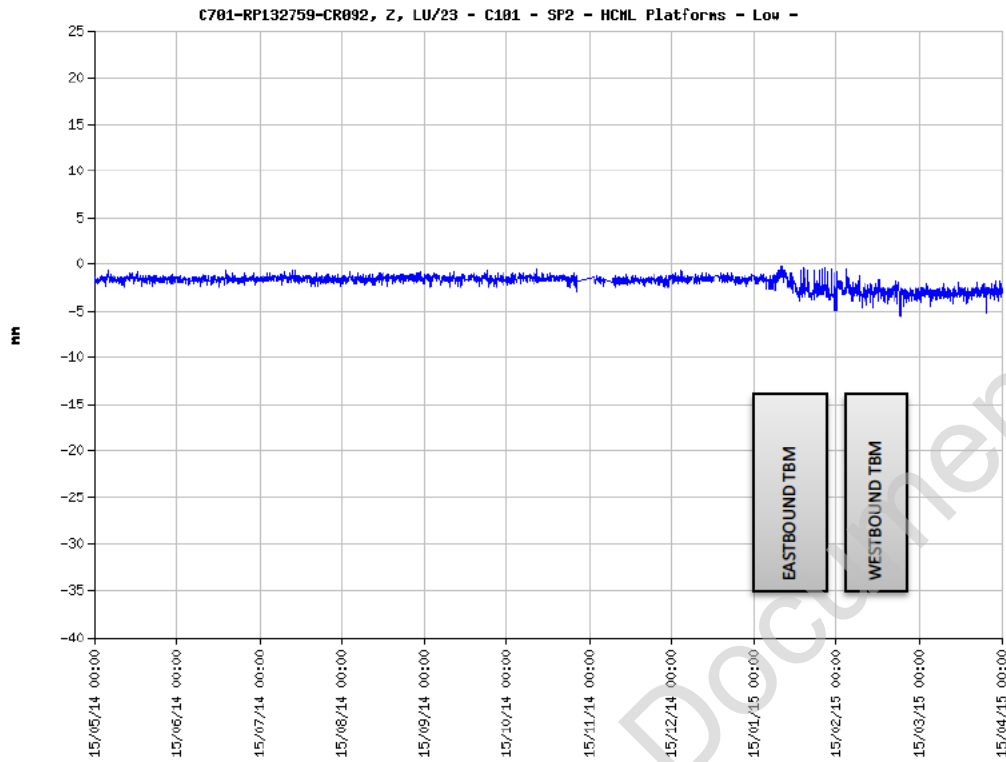
○ **C704-RP132758:**





○ **C704-RP132759:**

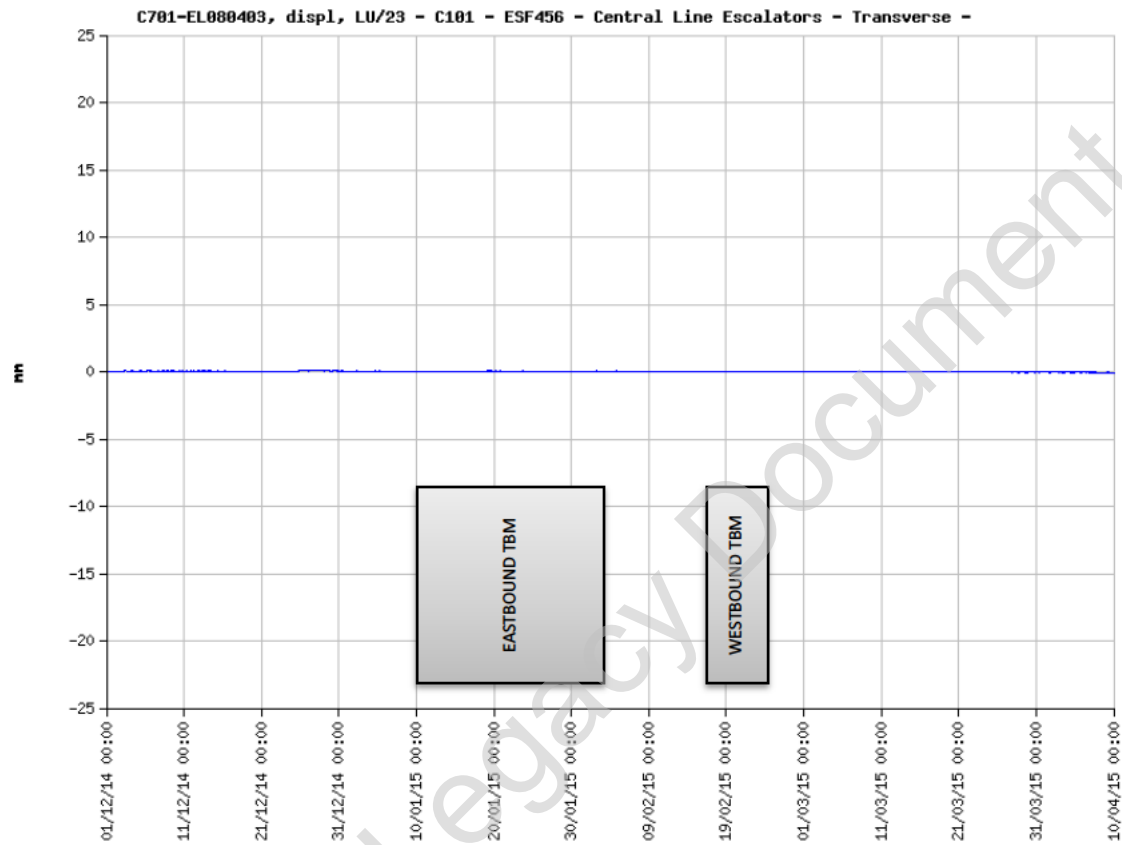




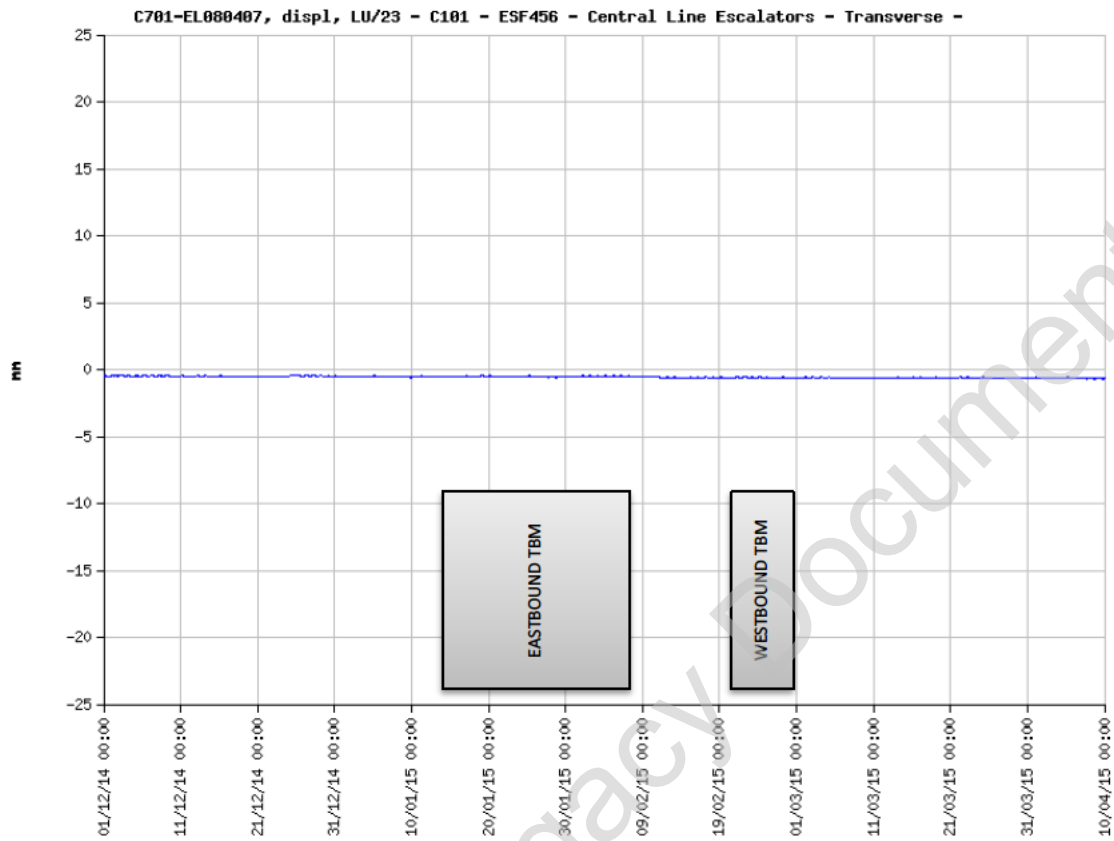
All instruments within the influence of works by others, the total movement immediately after the passage of the TBMs was within the amber specified trigger as per C305-DSJ-C-STP-CRG03-50060 "Specific Action Plan Y030: LU24 - Circle, Hammersmith and City, and Metropolitan Line East of Liverpool Street Station, and LU/23 Liverpool Street Metropolitan Line Station & Ticket Hall".

▪ **Electrolevels on Escalators 4, 5 & 6 at Liverpool Street Station (LU 23 :**

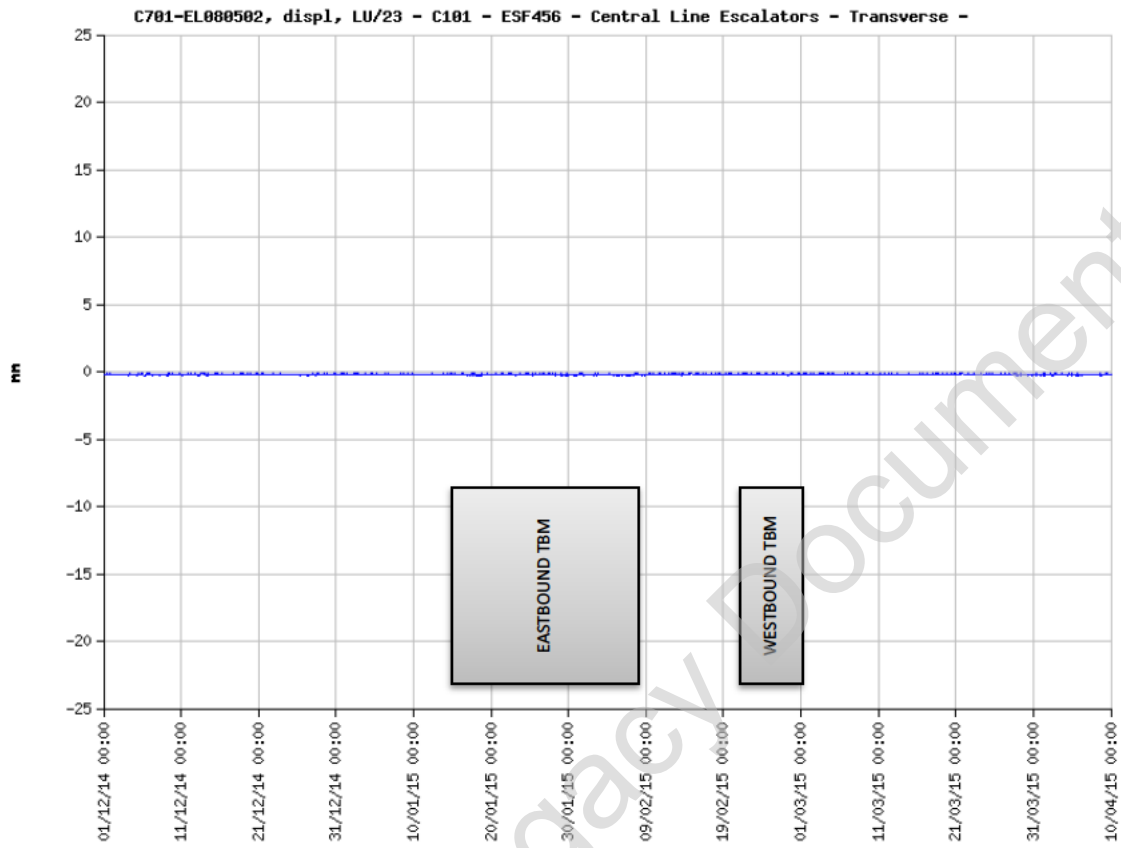
○ **C701-EL080403:**



○ **C701-EL080407:**

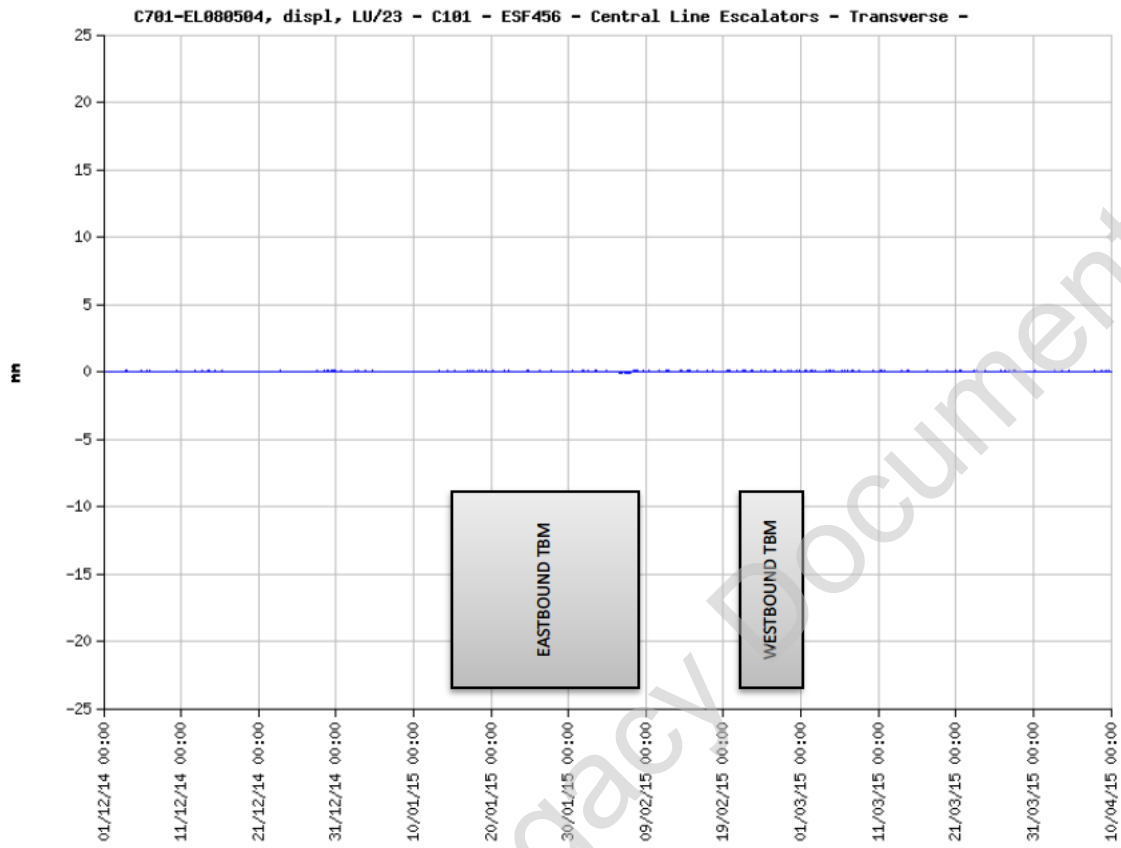


○ **C701-EL080502:**

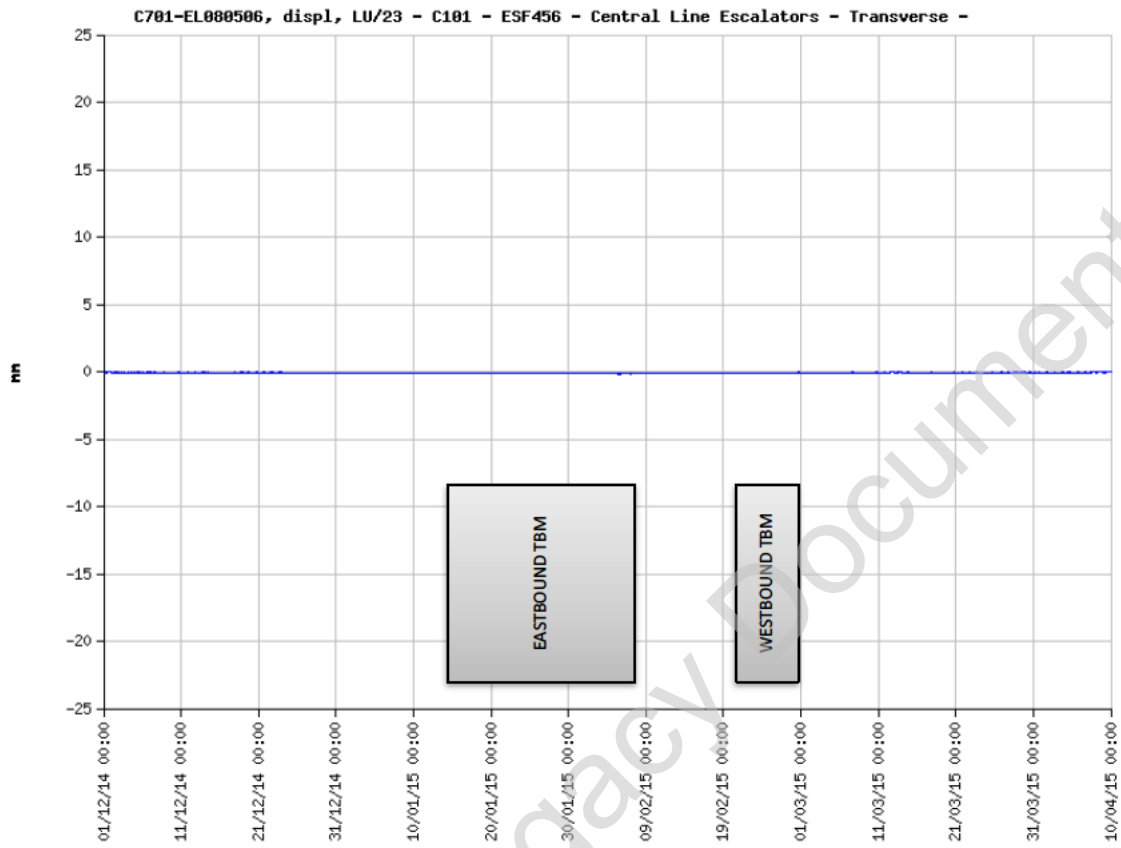


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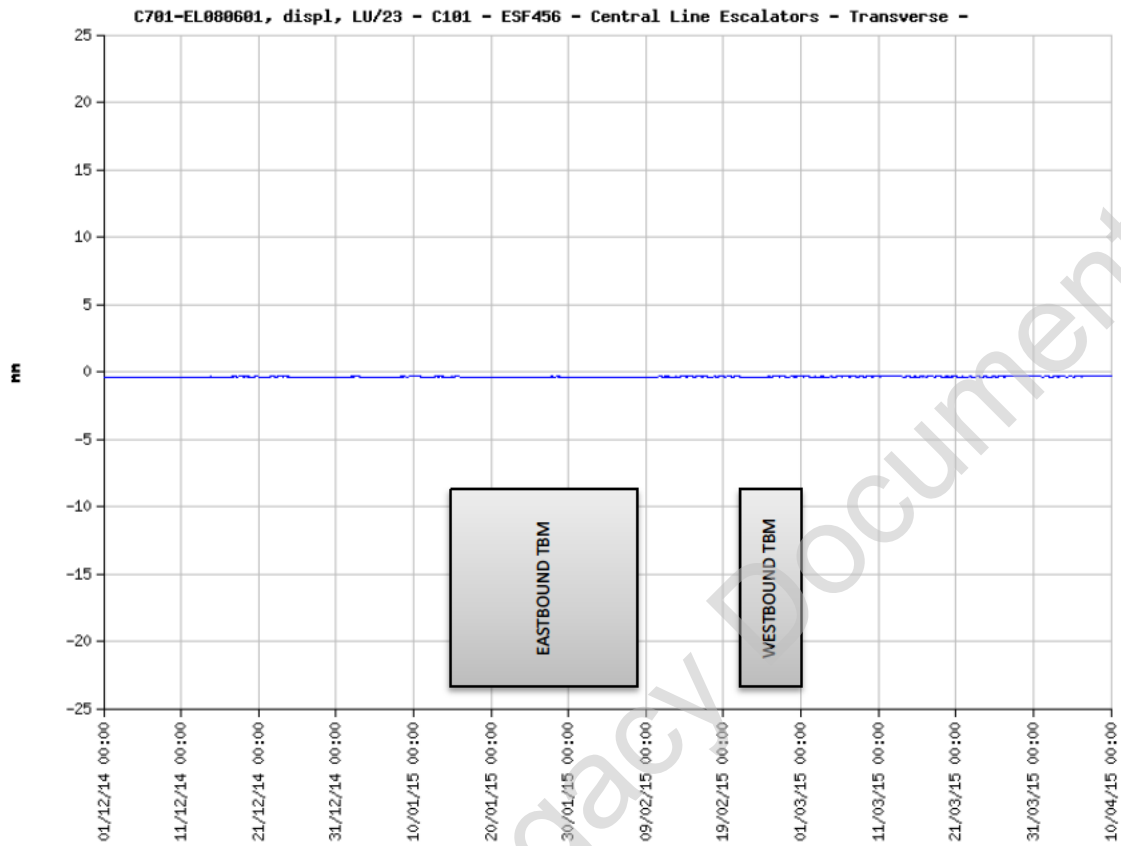
○ **C701-EL080504:**



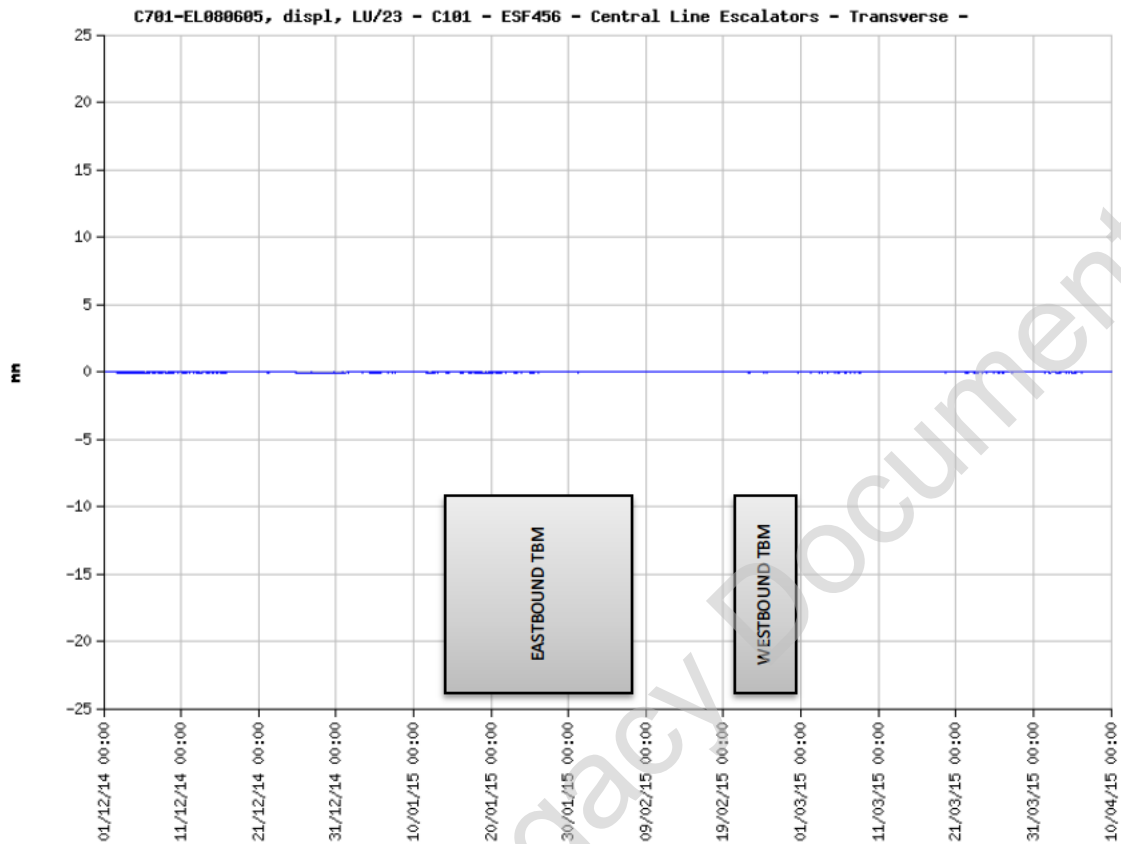
○ **C701-EL080506:**



○ **C701-EL080601:**



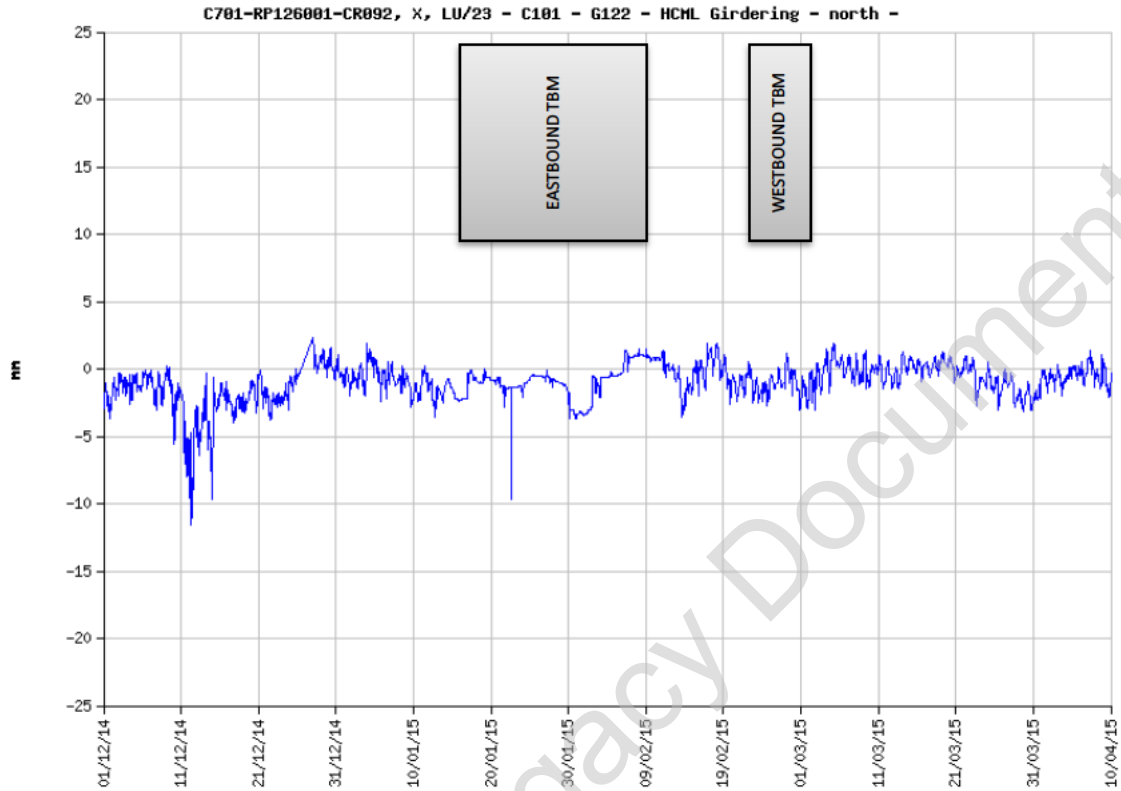
○ **C701-EL080605:**

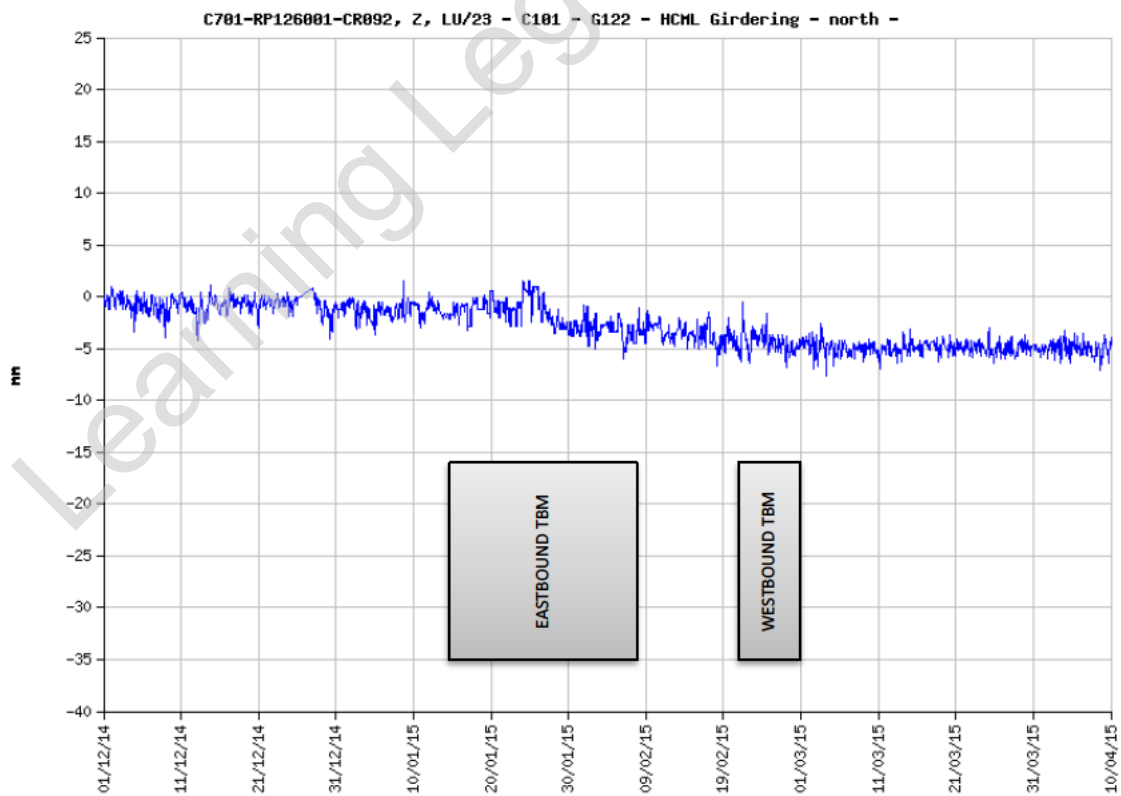
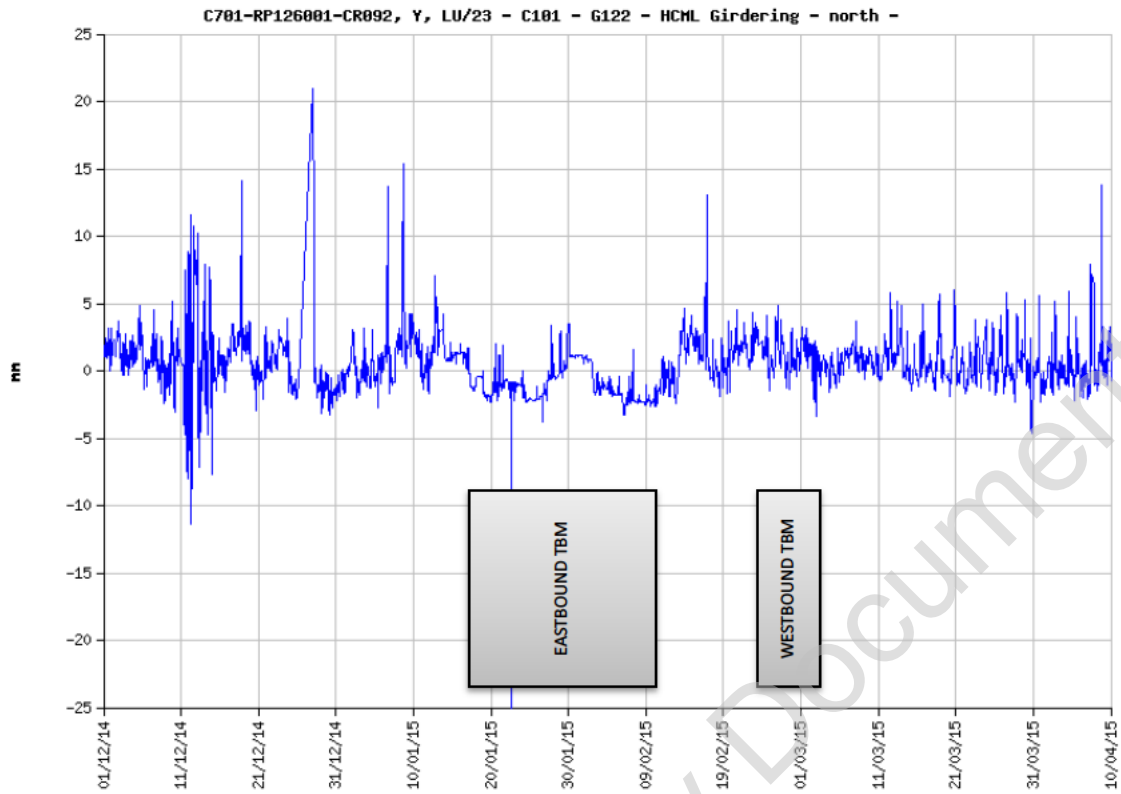


All instruments within the influence of works by others, the total movement immediately after the passage of the TBMs was within the amber specified trigger as per C305-DSJ-C-STP-CRG03-50057 "Specific Action Plan Y031: LU22 - Circle, Hammersmith and City, and Metropolitan Line East of Liverpool Street Station, and LU/23 Liverpool Street Metropolitan Line Station & Ticket Hall".

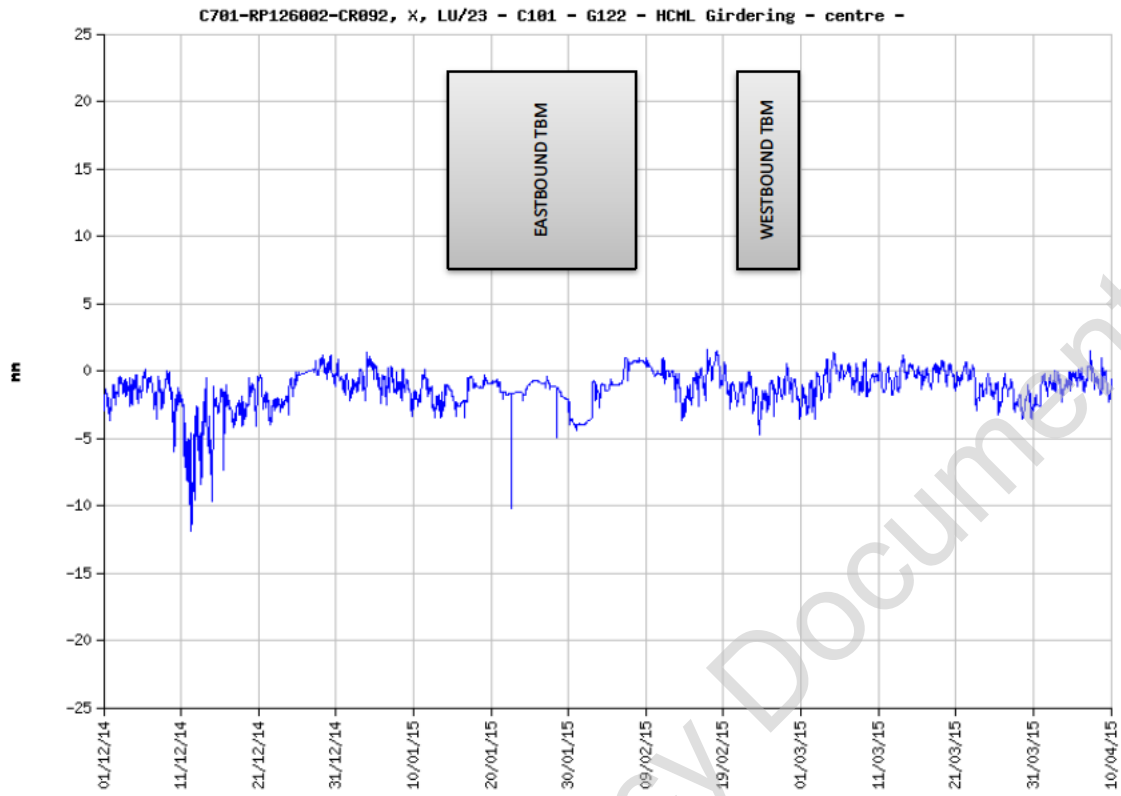
■ **3D Prisms Girdering G101 / G122 supporting 76-80 Old Broad Street (LU/23) :**

○ **C701-RP126001:**

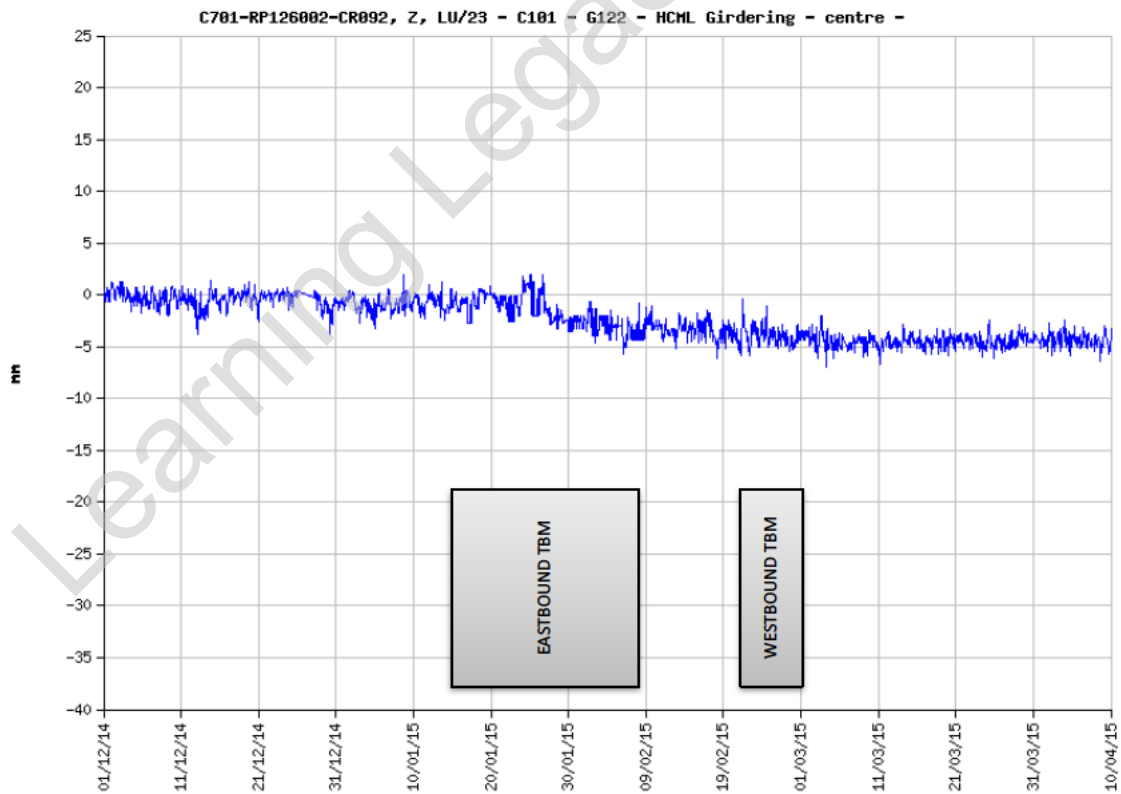
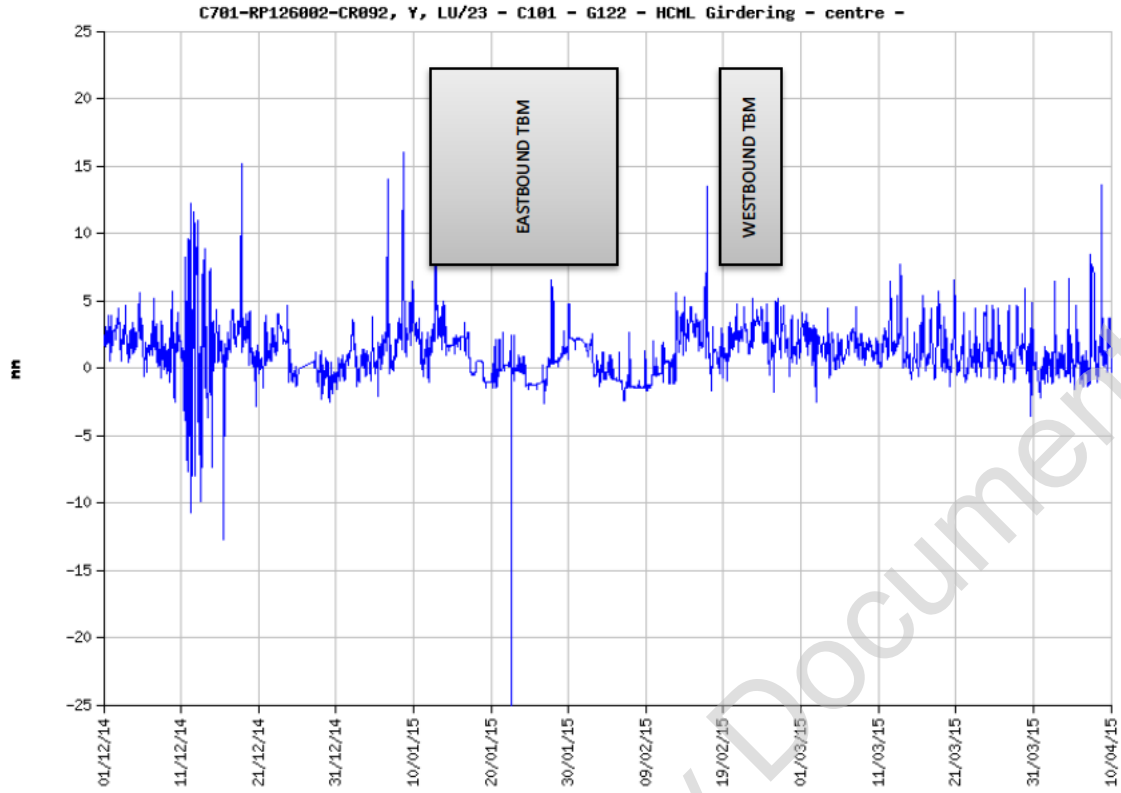




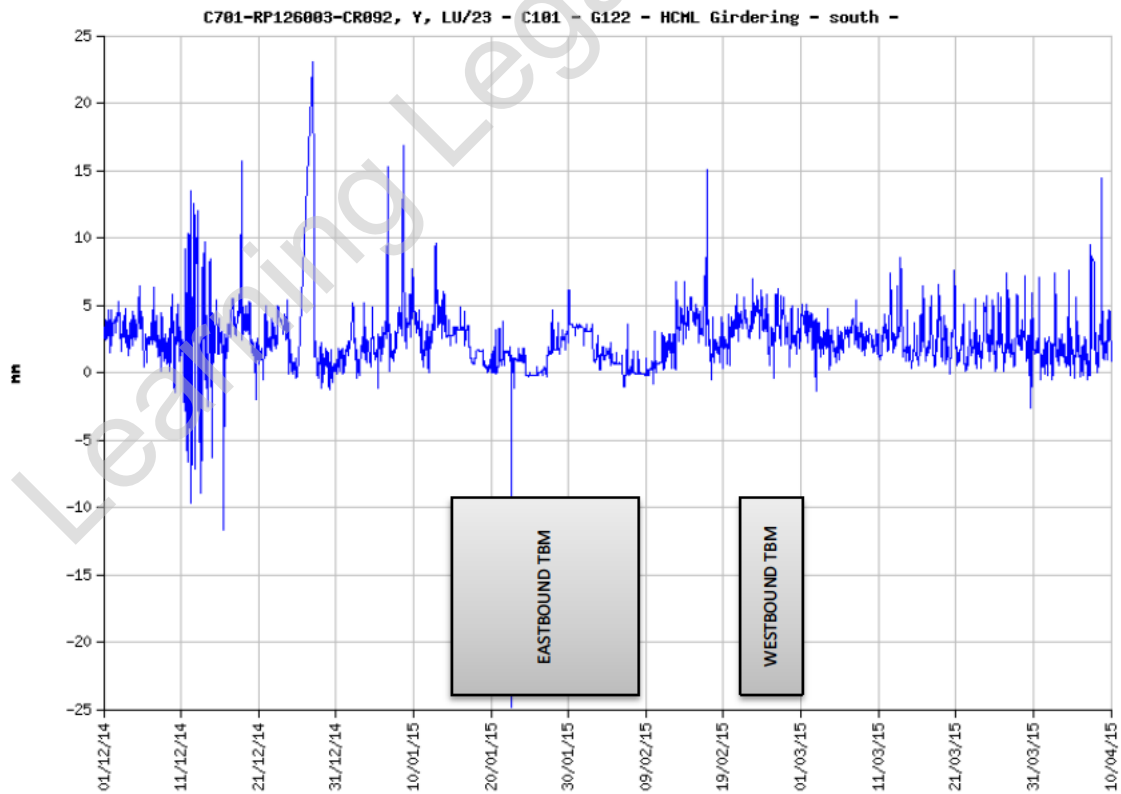
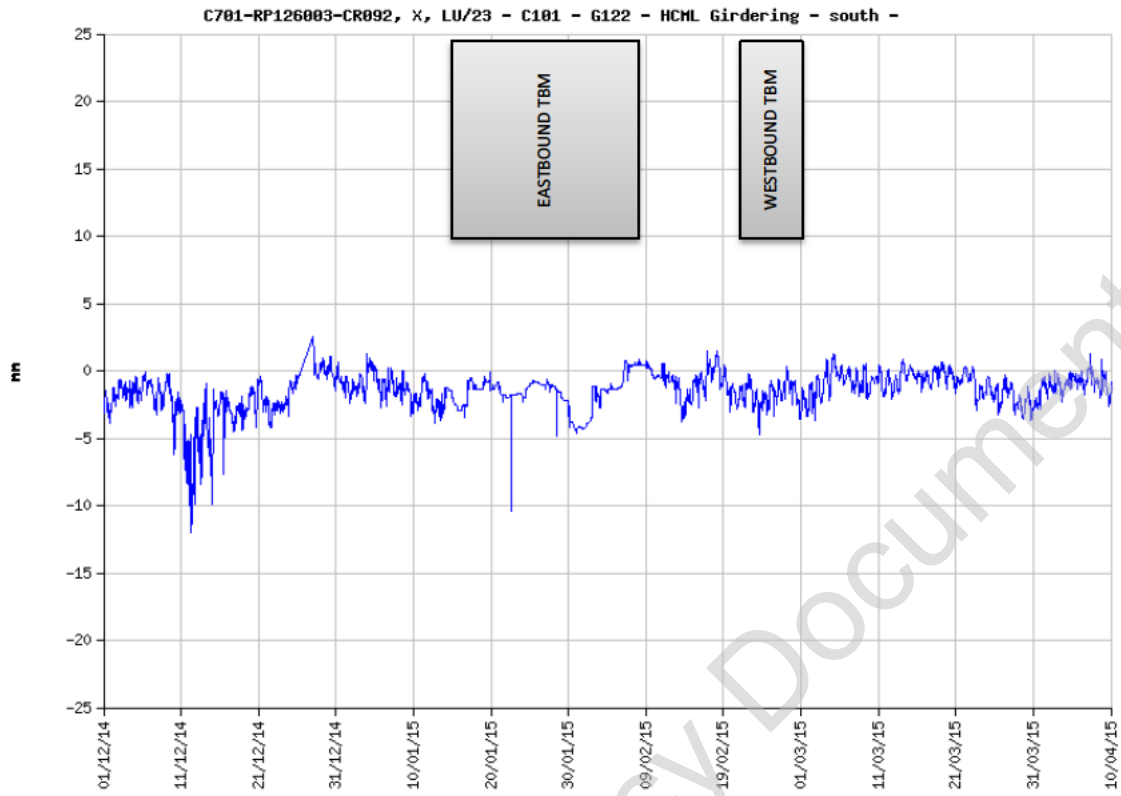
○ **C701-RP126002:**

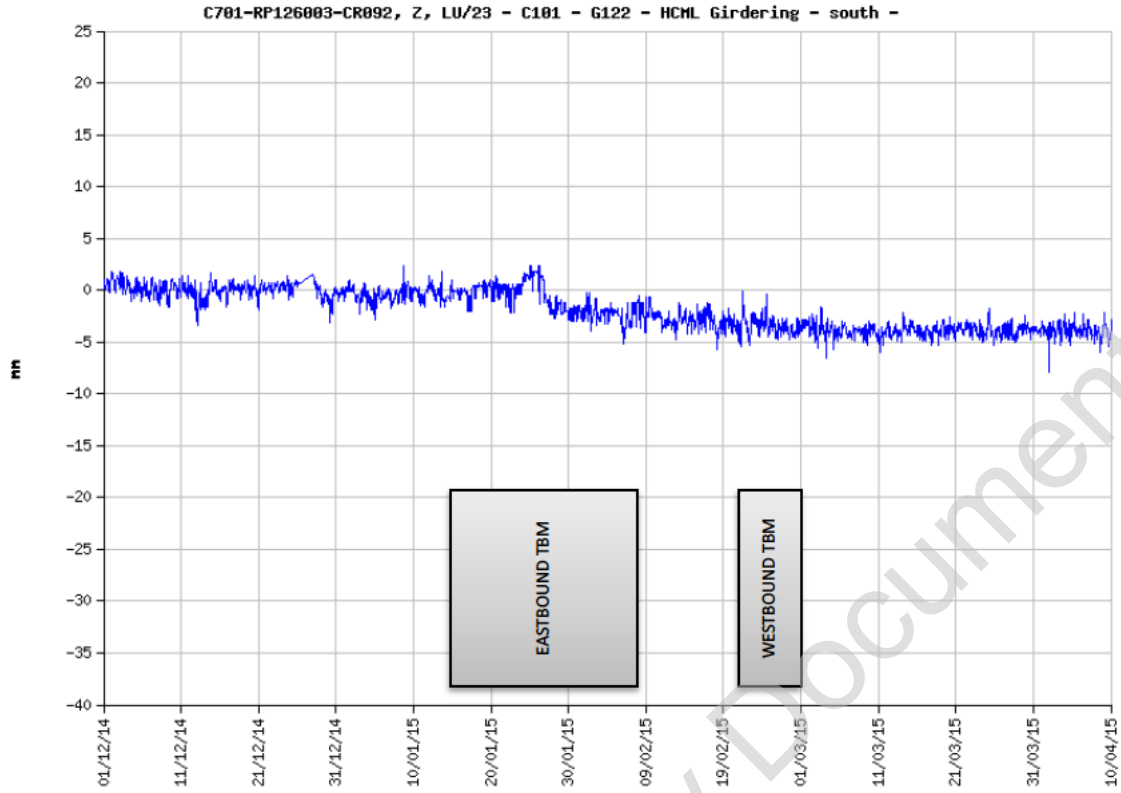


Learning Legacy Document



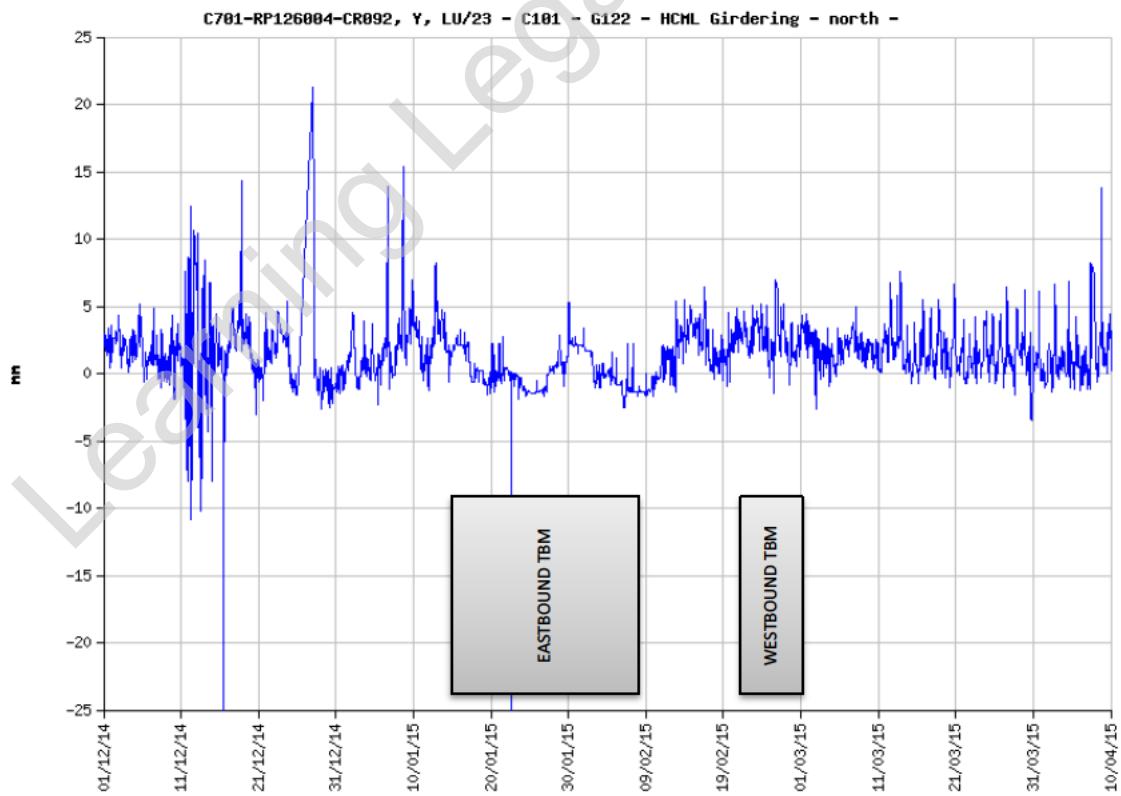
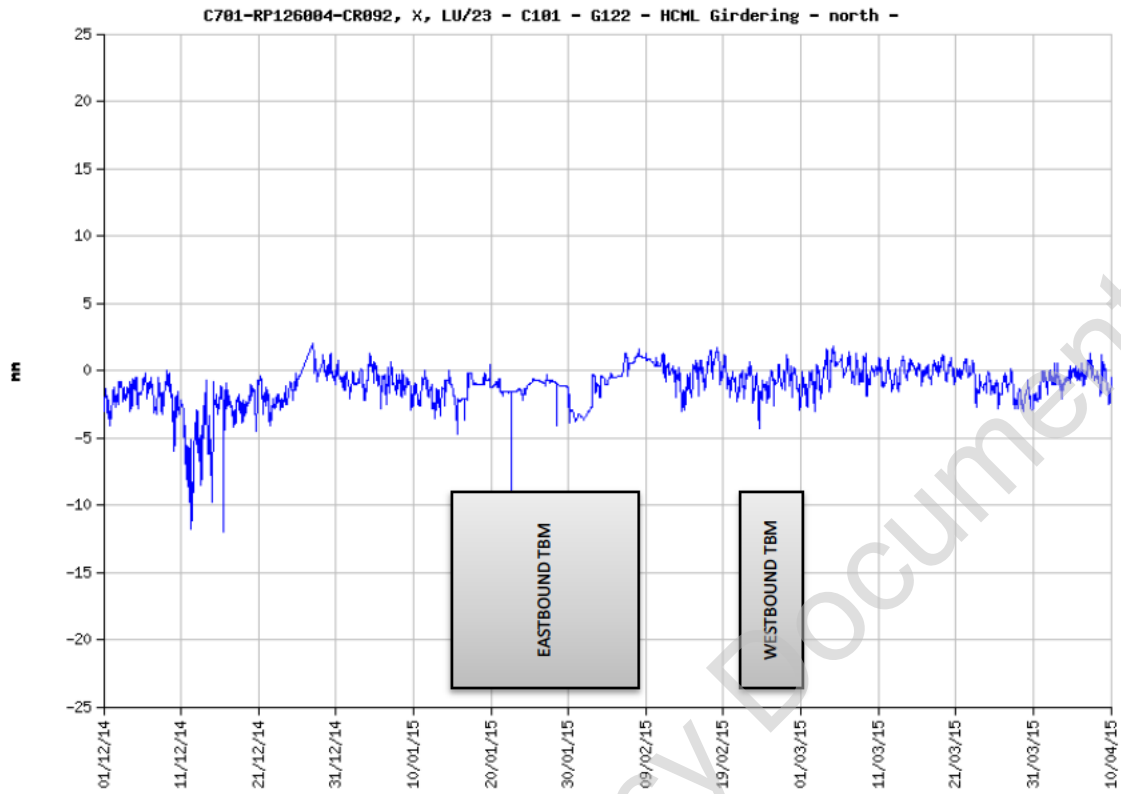
○ **C701-RP126003:**

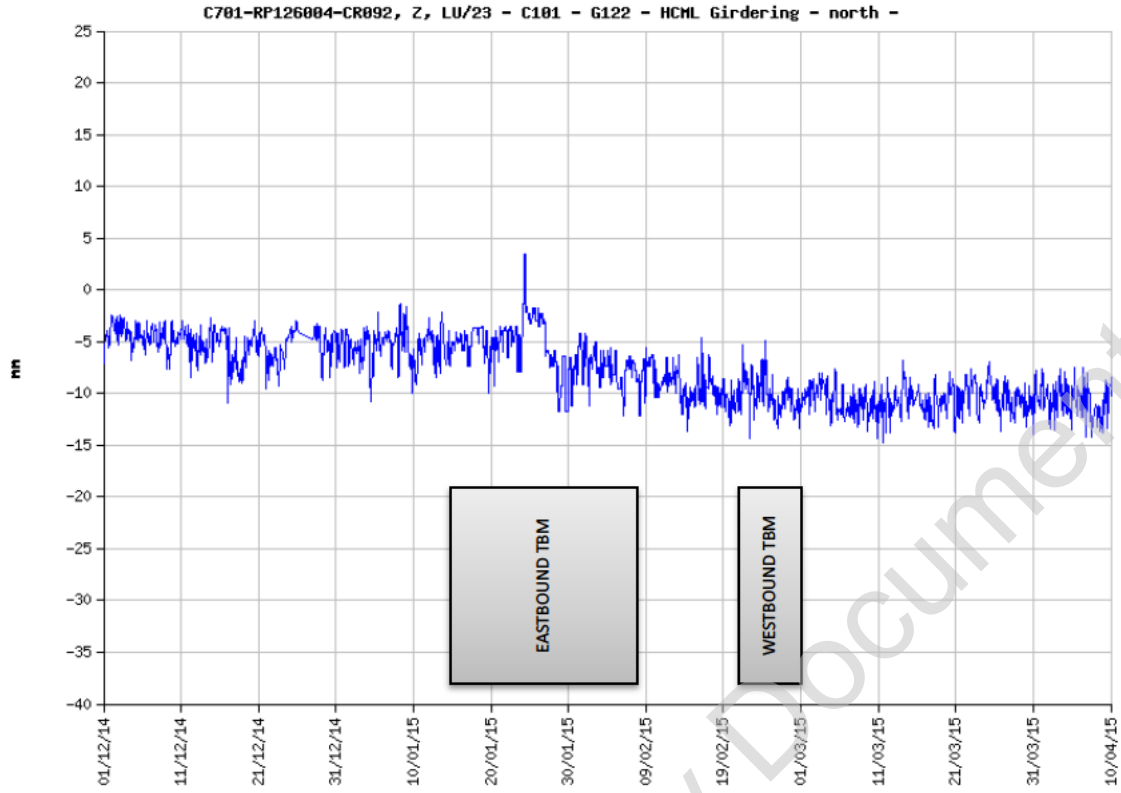




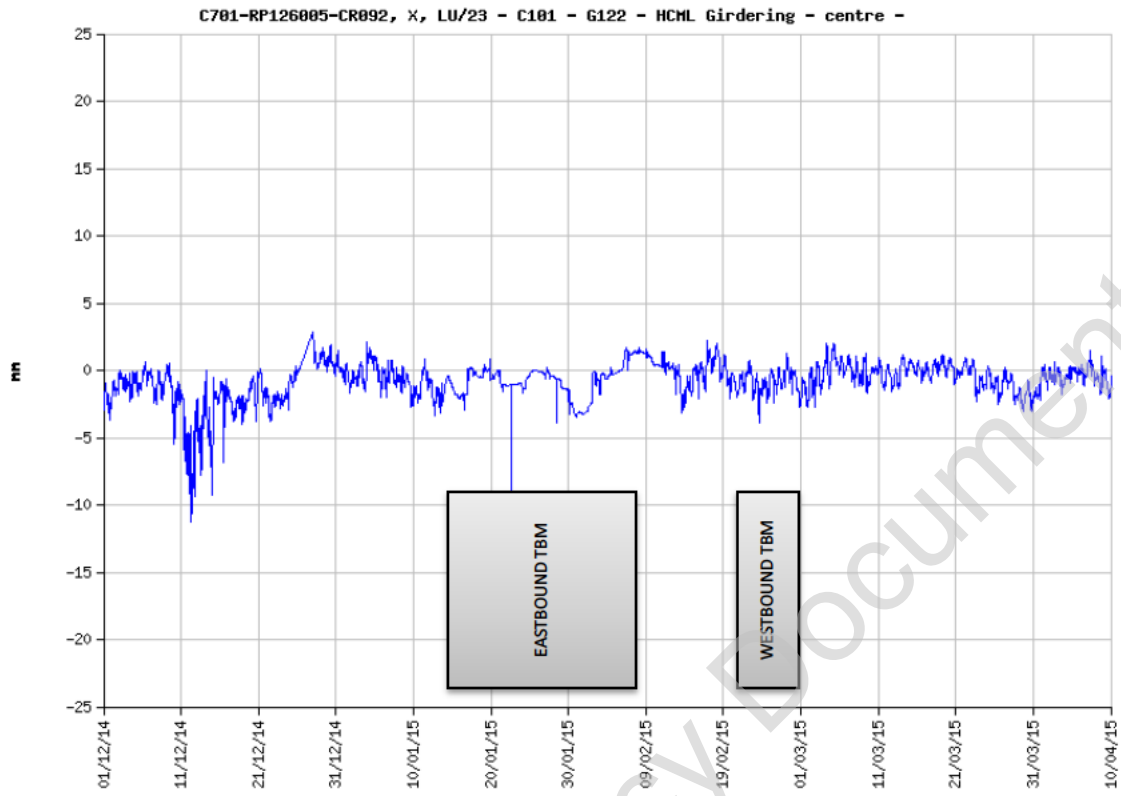
Learning Legacy Document

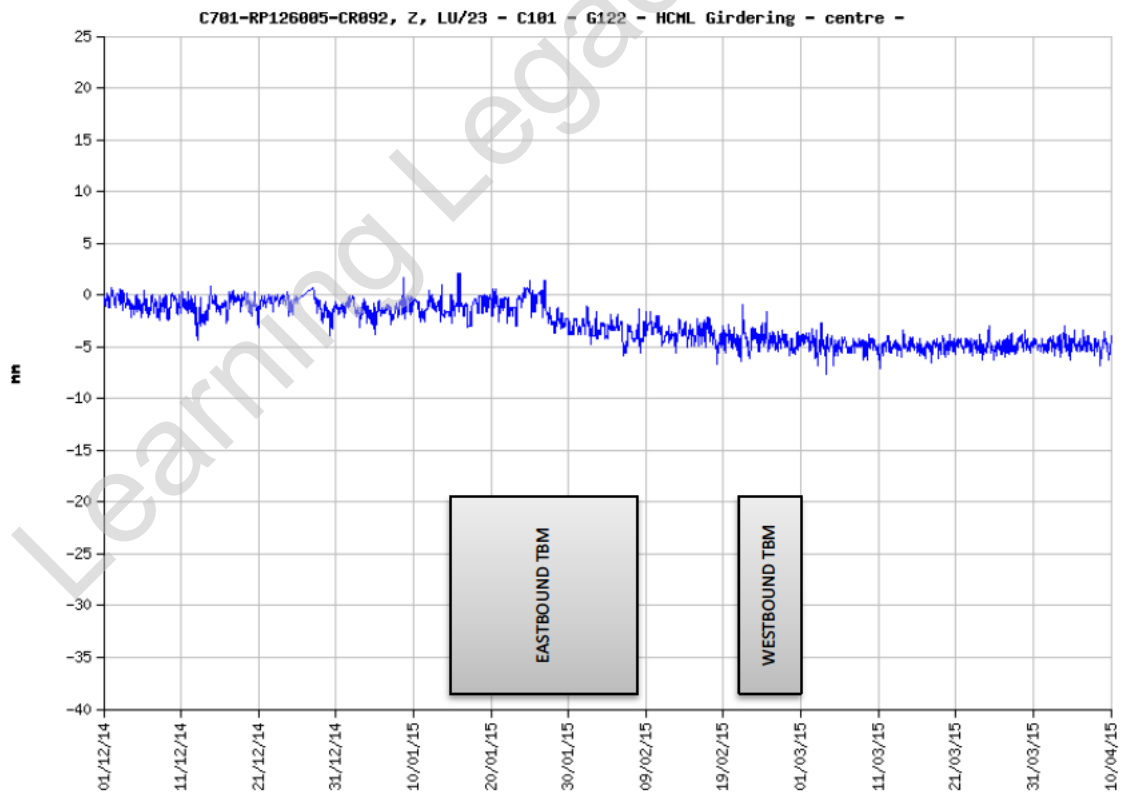
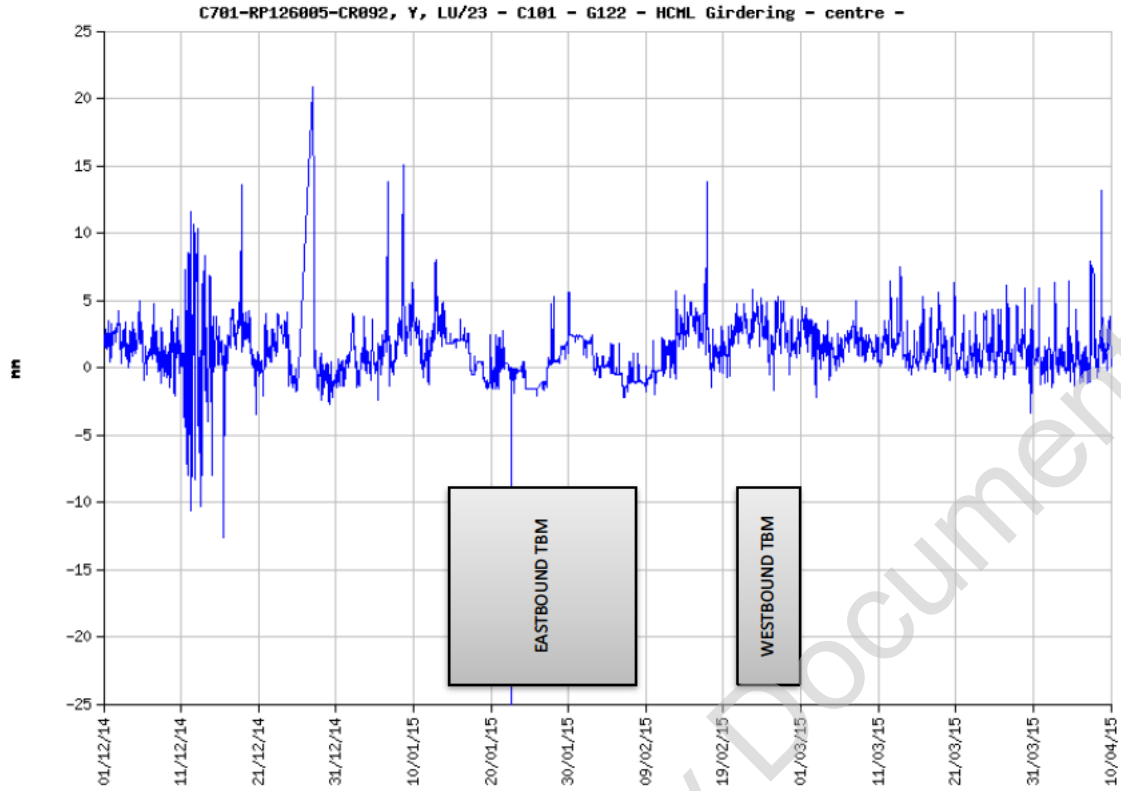
○ C701-RP126004:



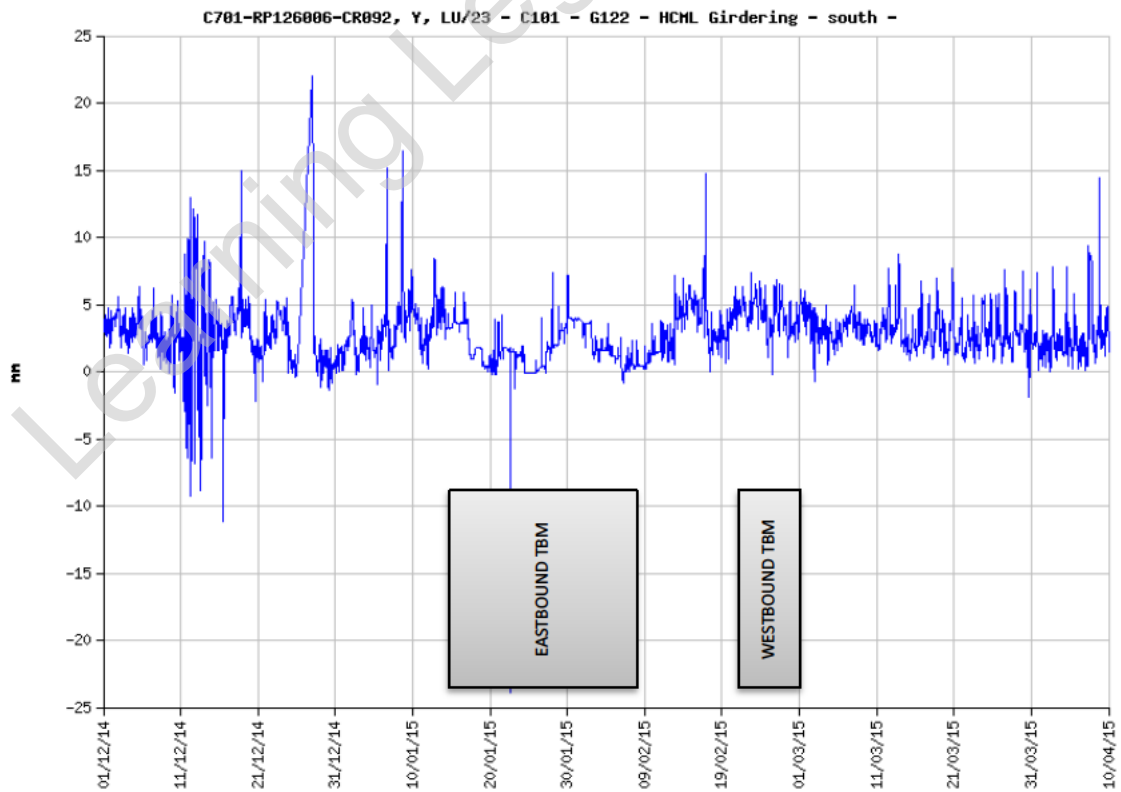
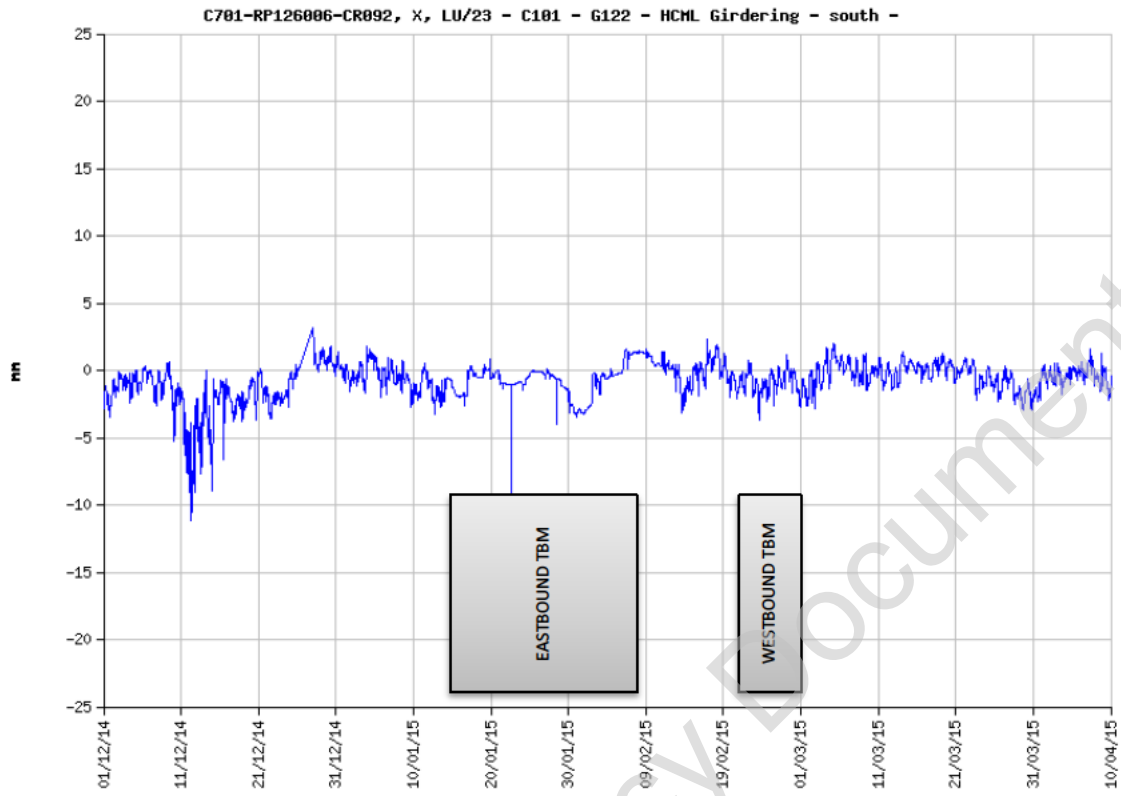


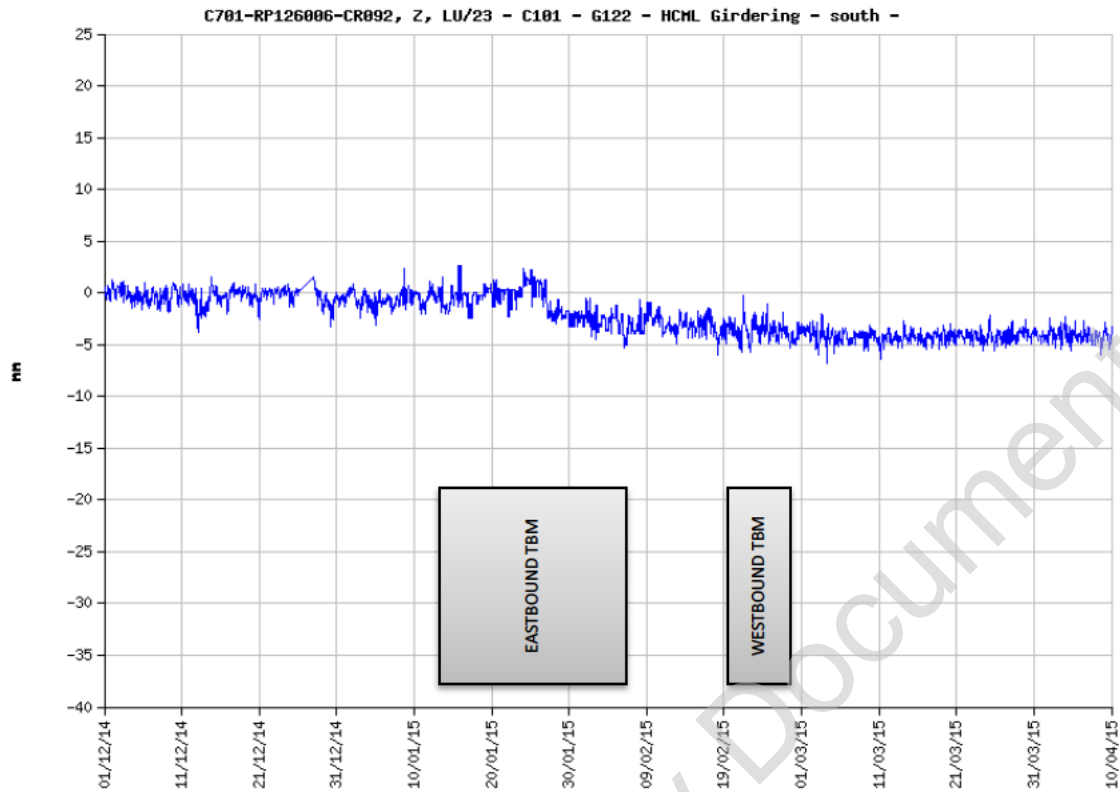
○ **C701-RP126005:**





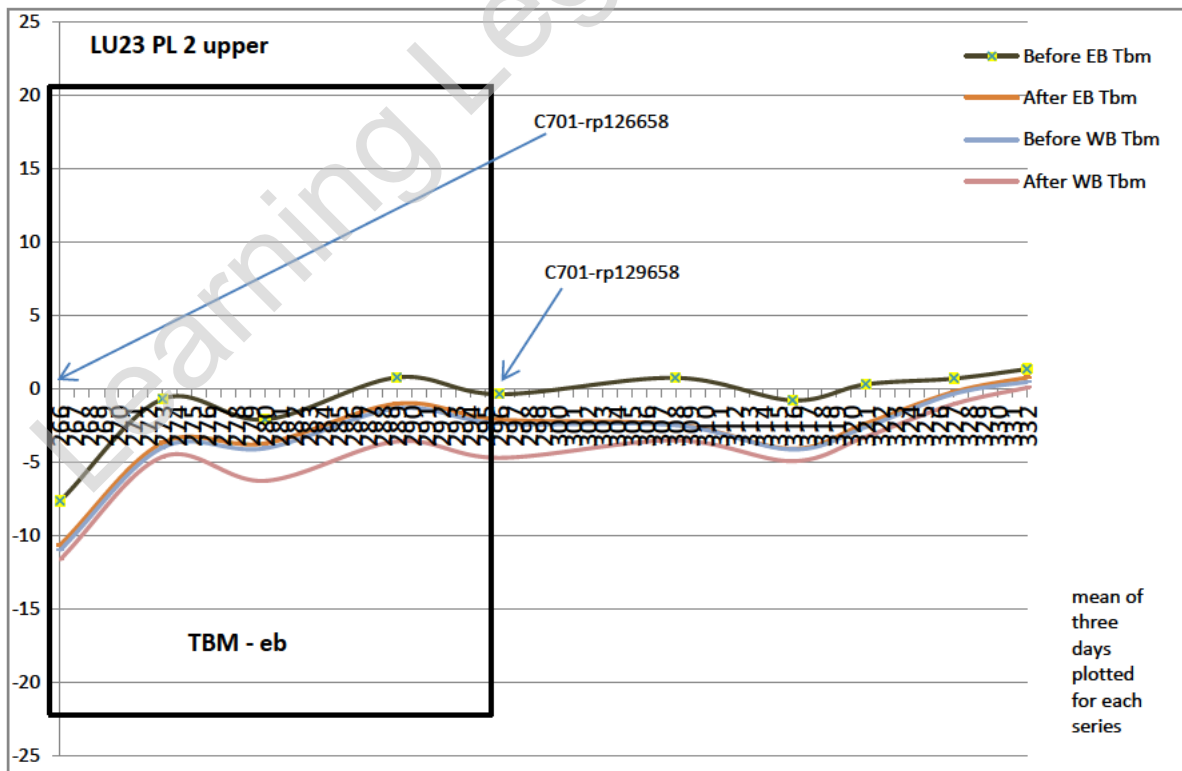
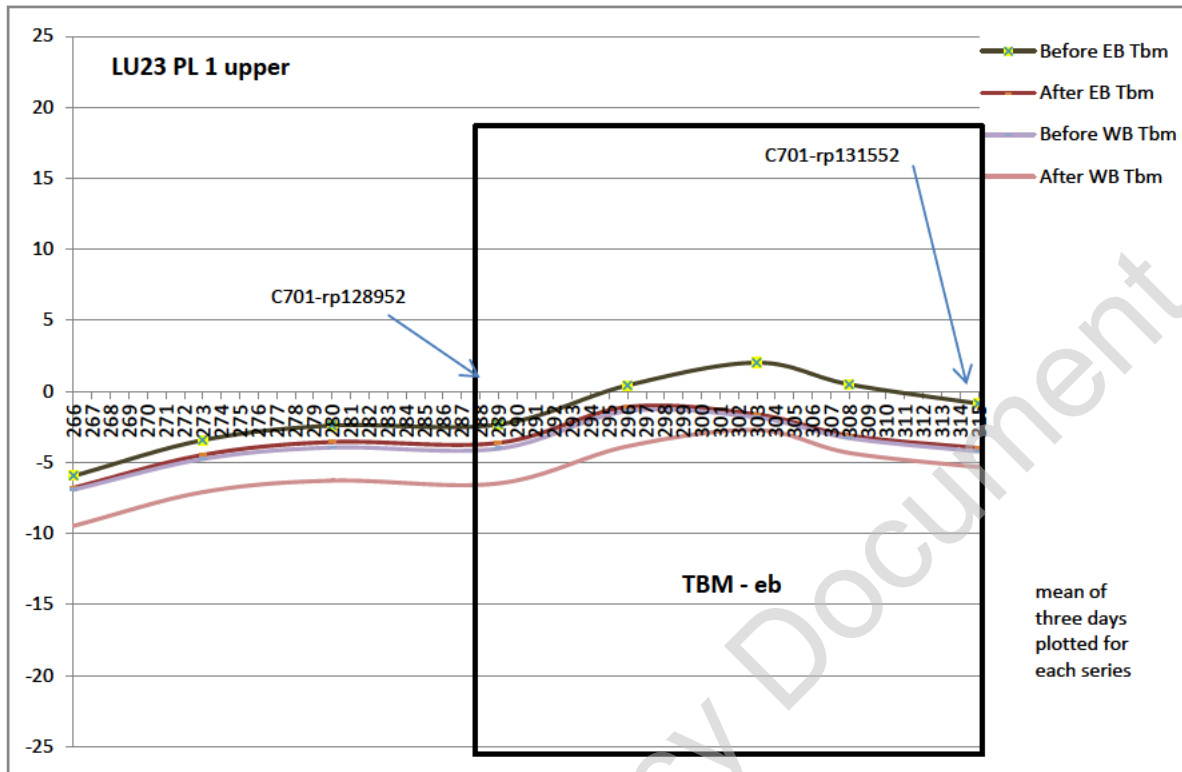
○ **C701-RP126006:**

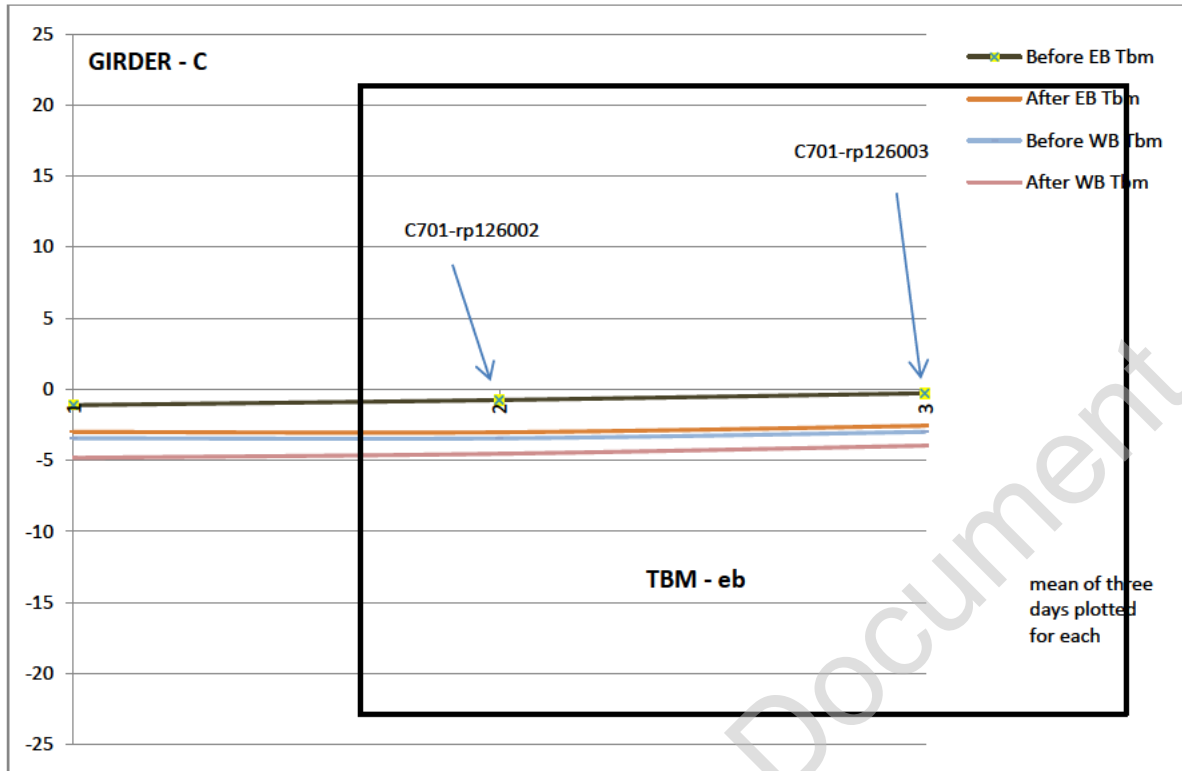




All instruments within the influence of works by others, the total movement immediately after the passage of the TBMs was within the amber specified trigger as per C305-DSJ-C-STP-CRG03-50057 "Specific Action Plan Y031: LU22 - Circle, Hammersmith and City, and Metropolitan Line East of Liverpool Street Station, and LU/23 Liverpool Street Metropolitan Line Station & Ticket Hall".

The graphs below show various settlement profile plots of the structural elements of LU/23.

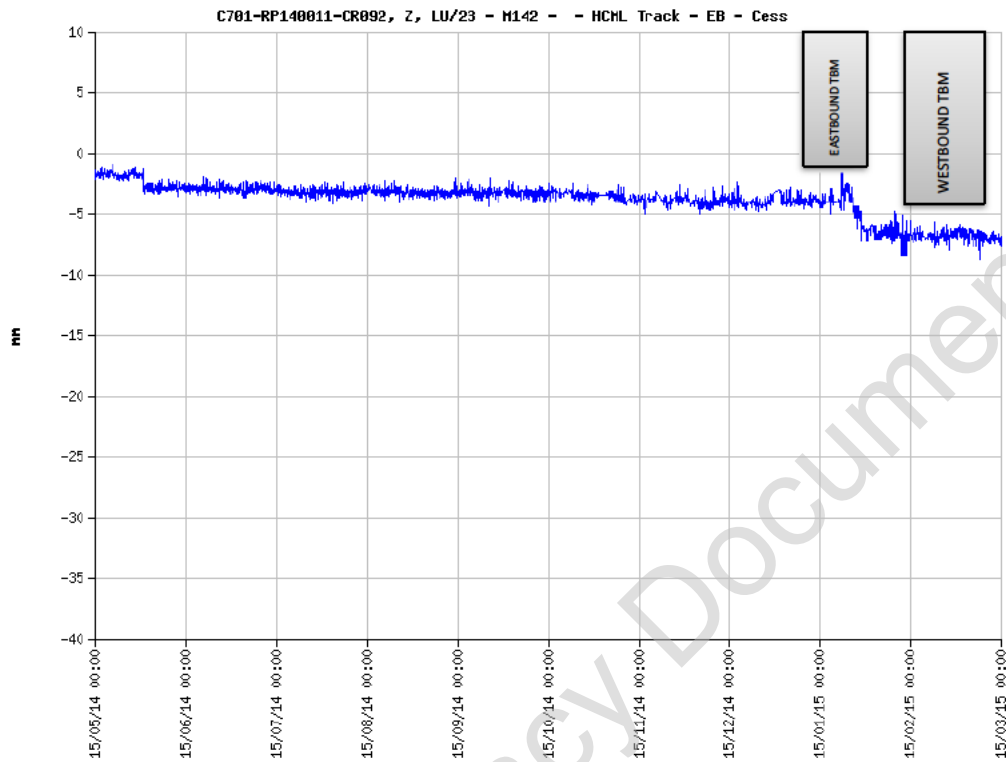




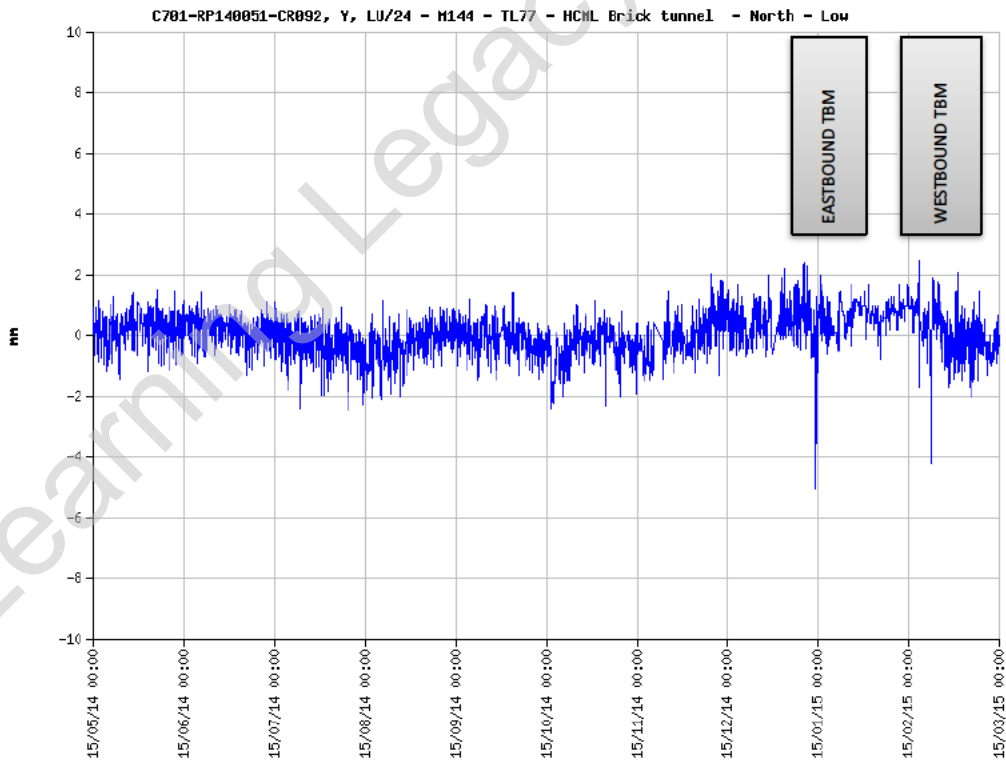
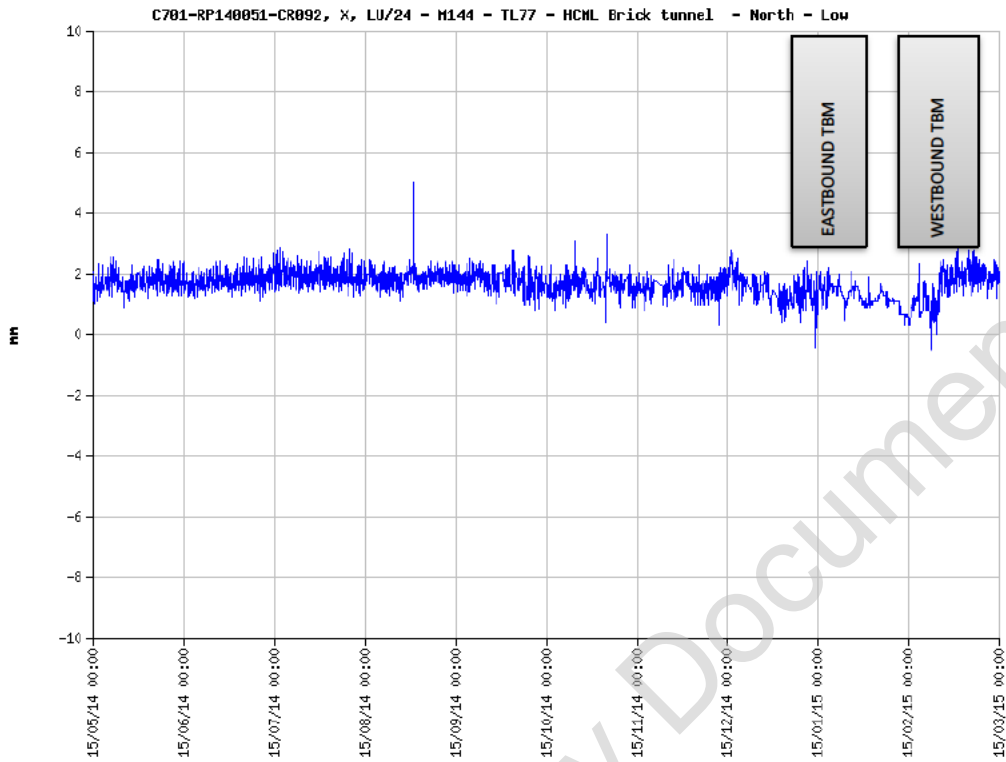
Learning Legacy Document

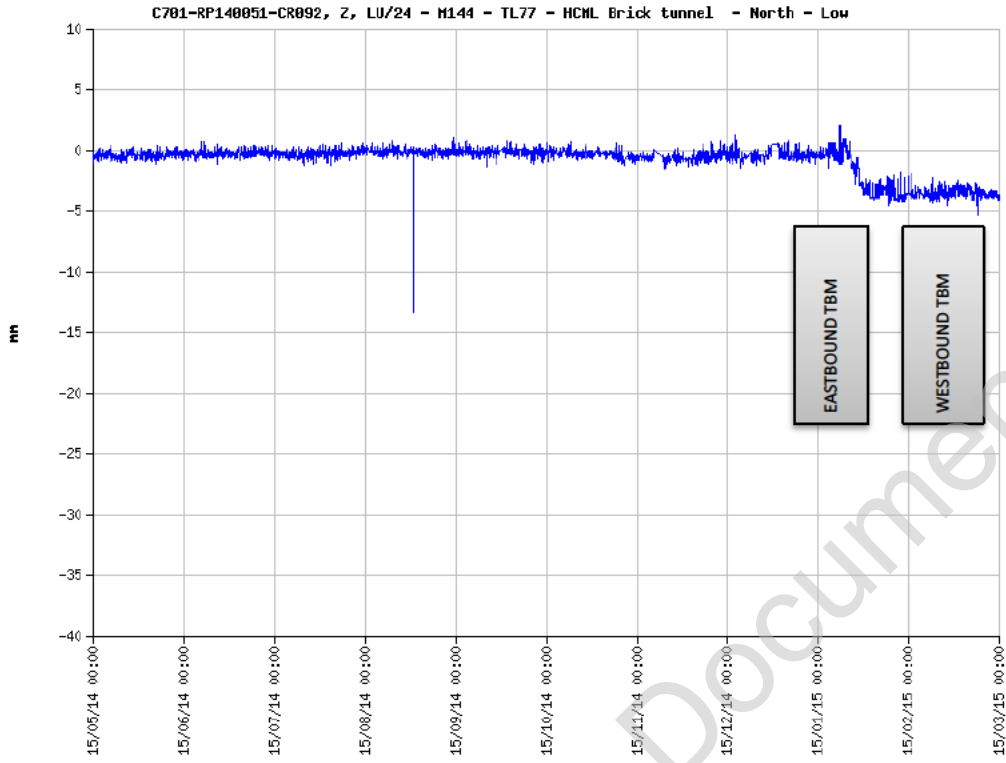
▪ 3D Prisms within "Circle, H&C, and Metropolitan Line East of Liverpool Street Station (LU/24)

○ C704-RP140011:



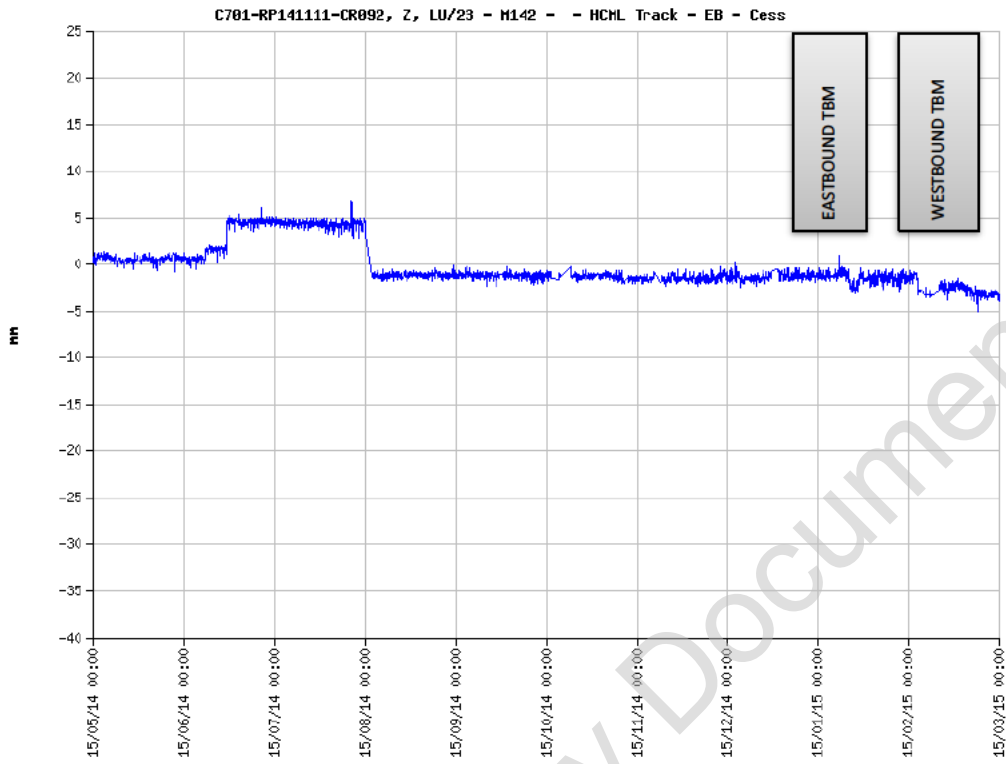
○ **C704-RP140051:**





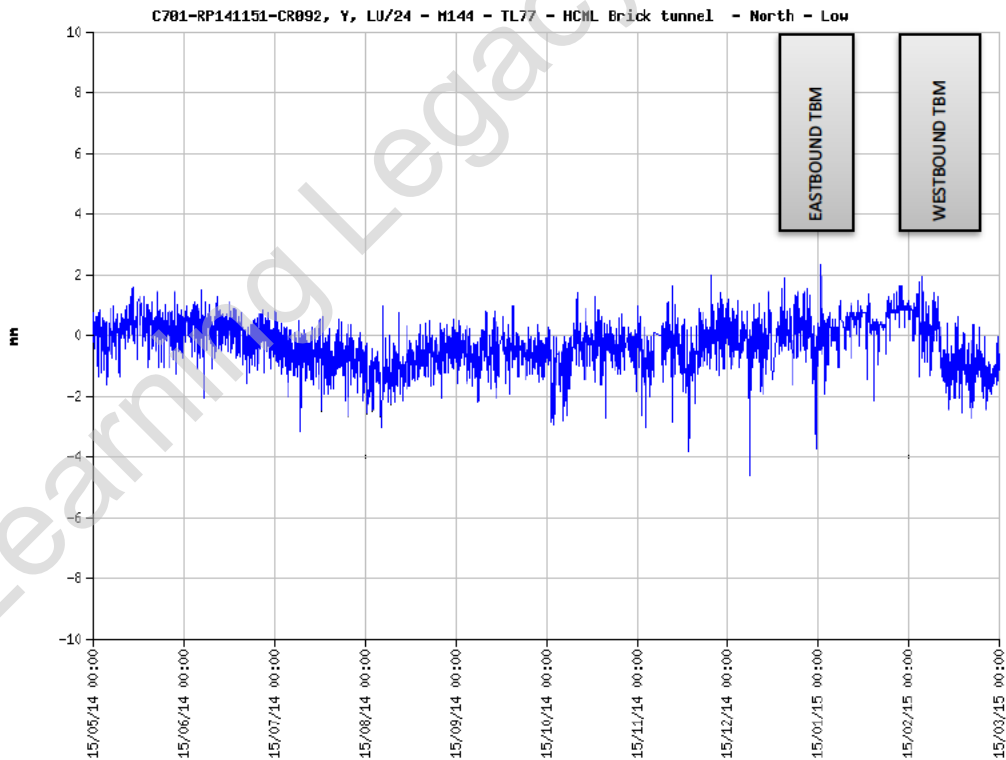
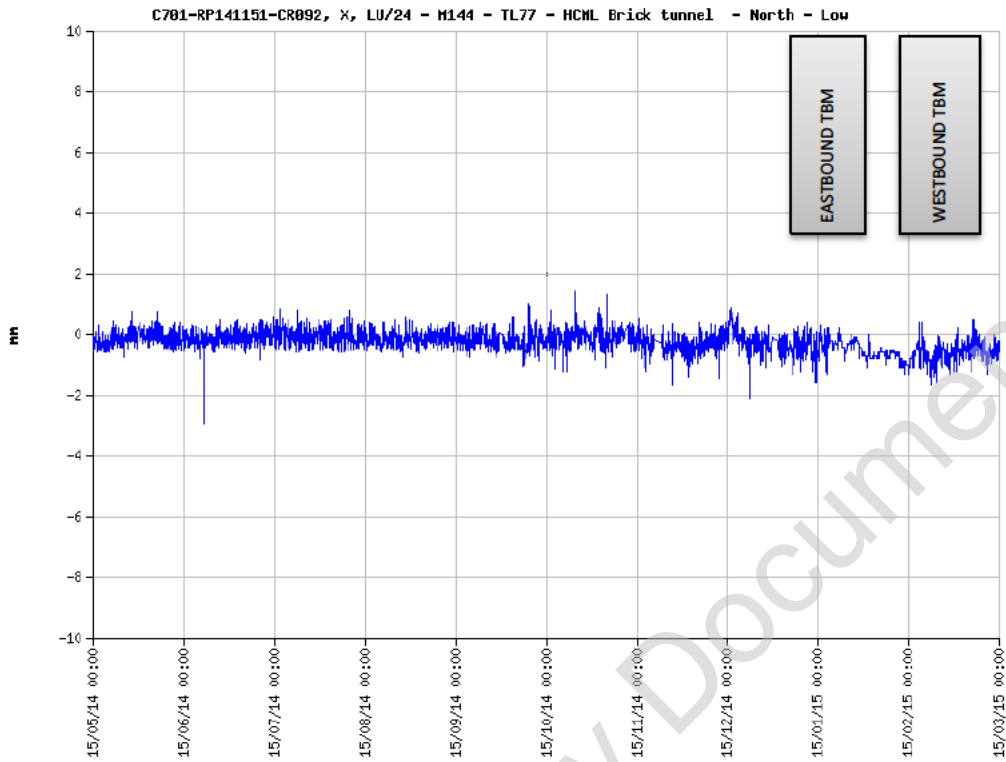
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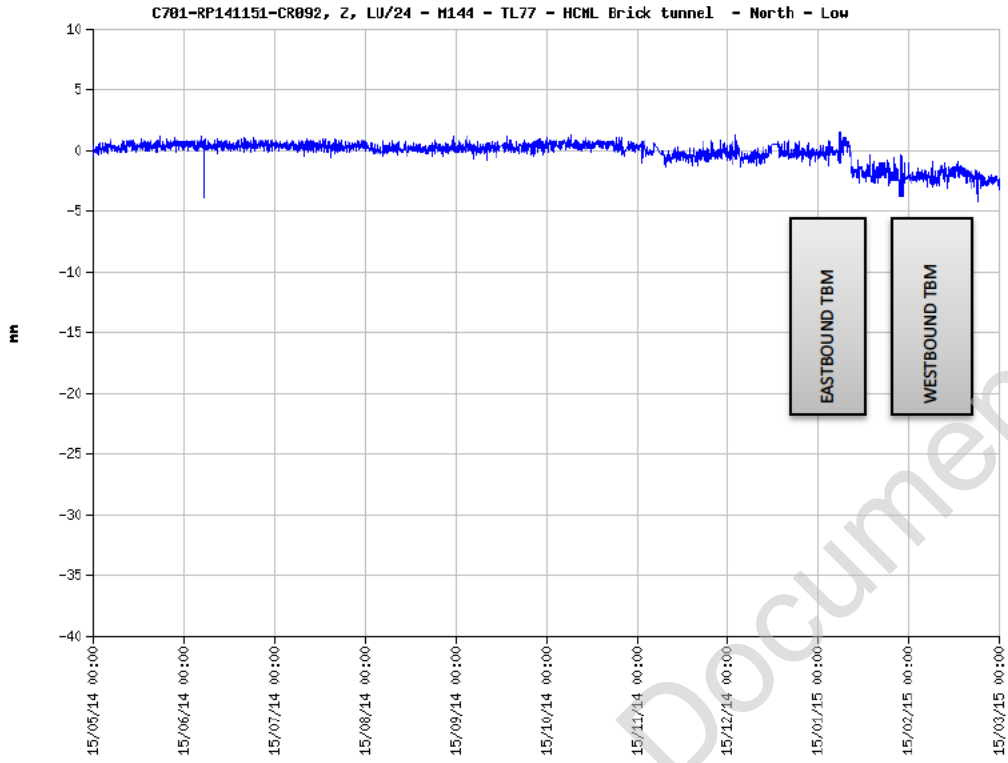
○ **C704-RP141111:**



Learning Legacy Document

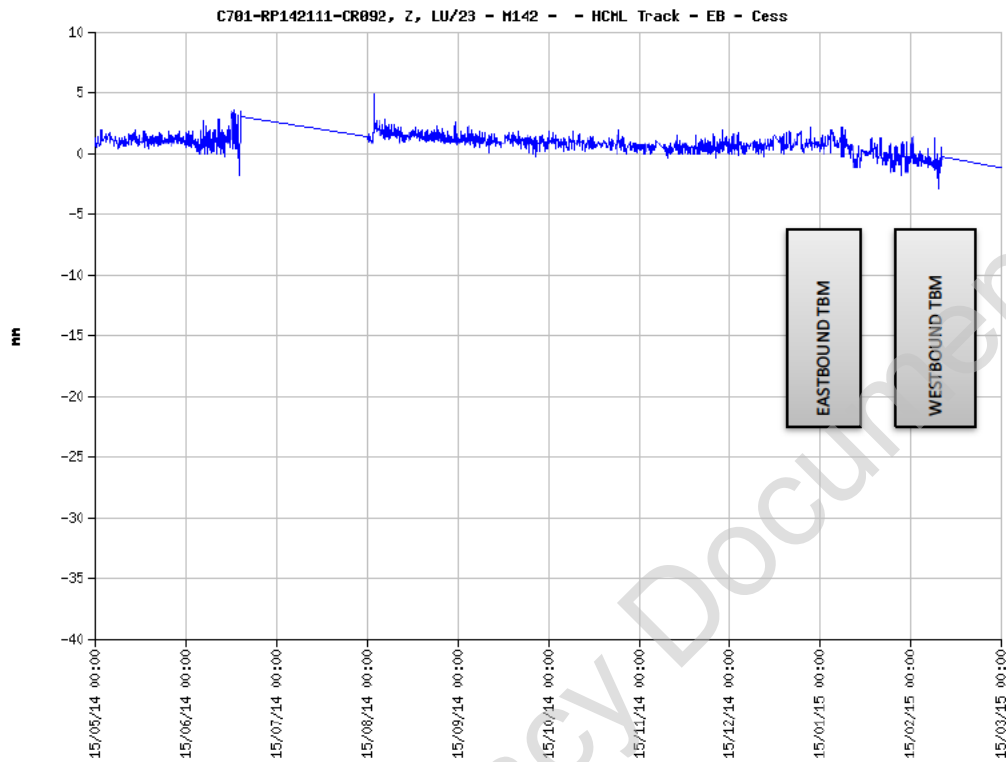
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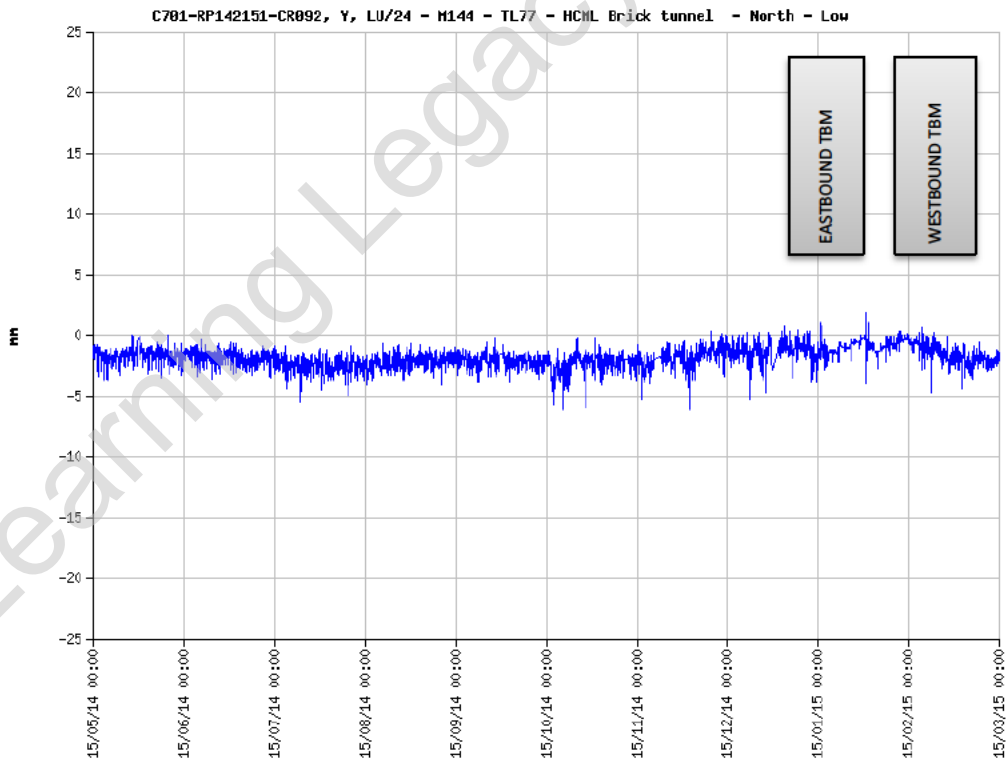
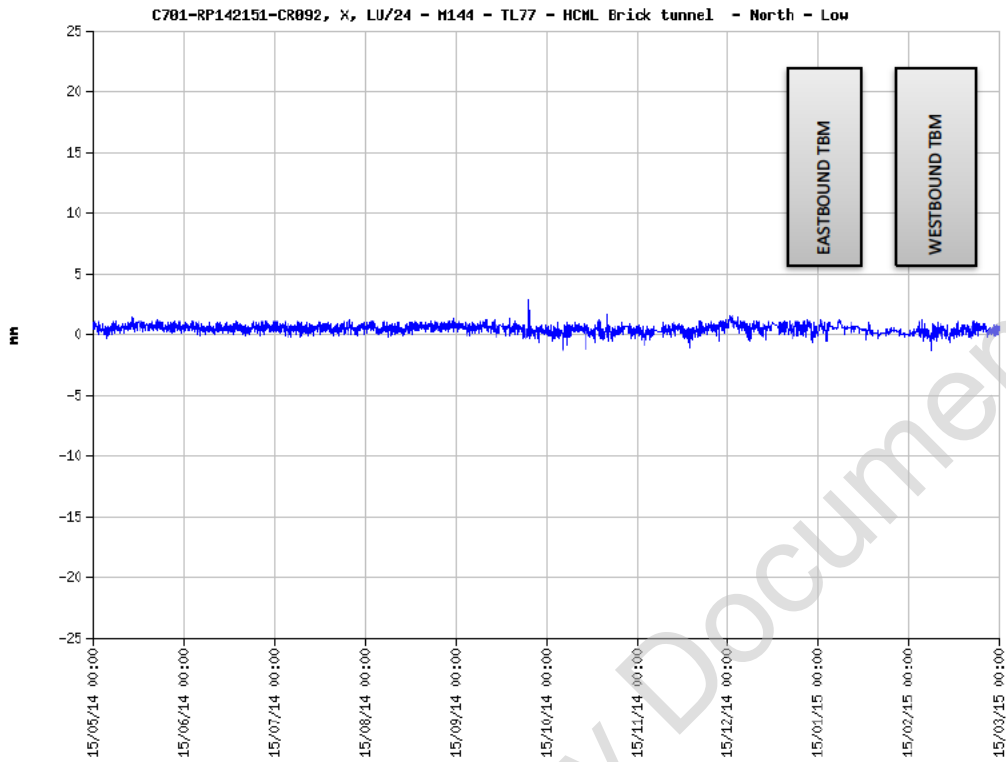
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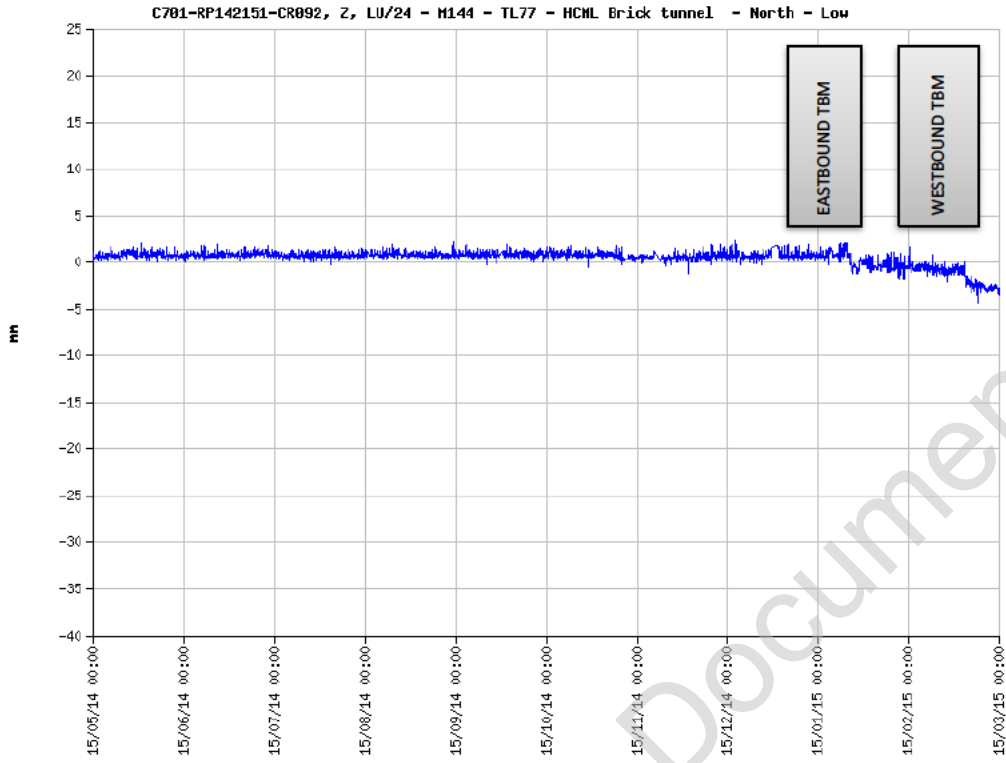
○ C704-RP142111:



It should be noted for the gaps in monitoring data displayed between start of June 2014 and mid-August 2014 there is no specific explanation provided by C704.

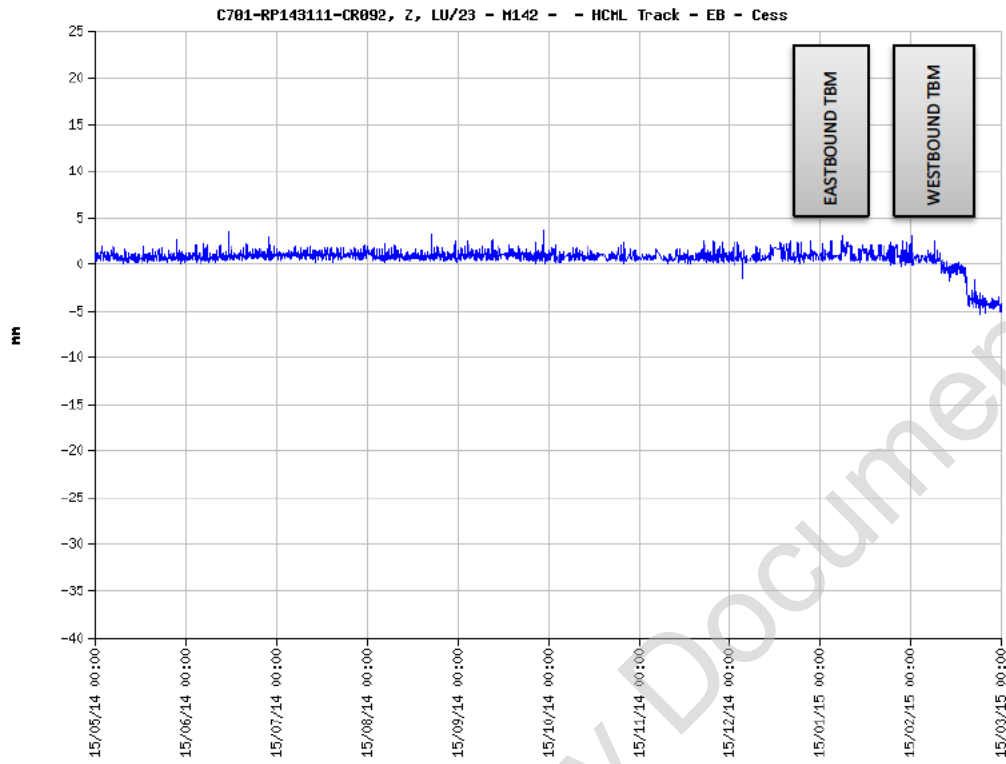
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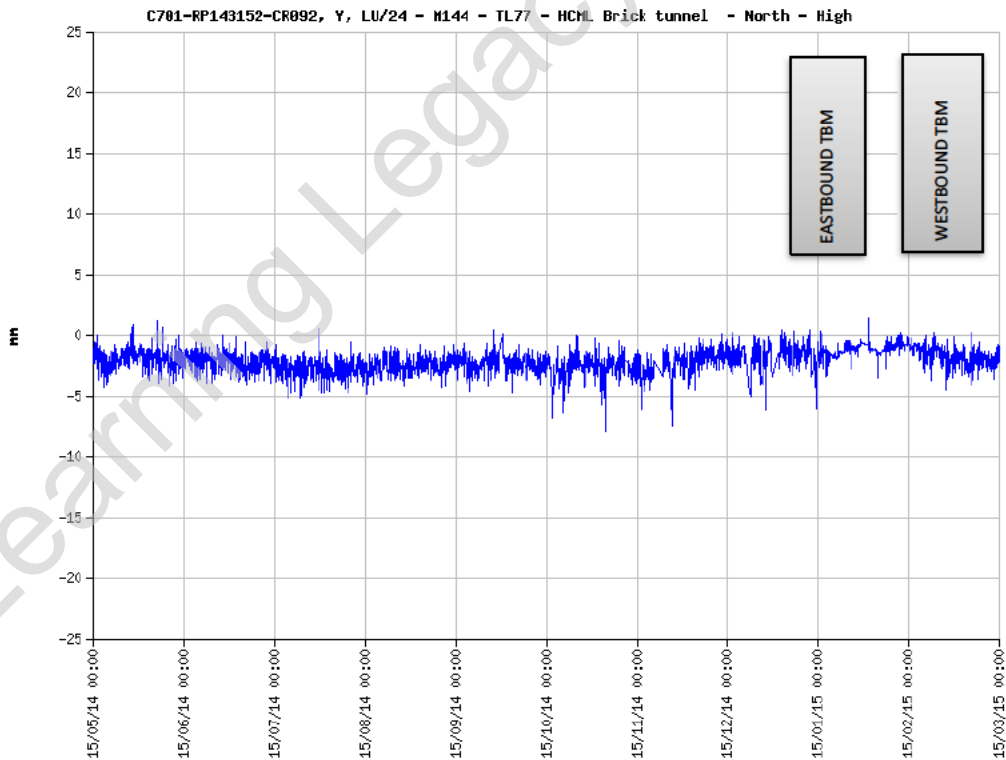
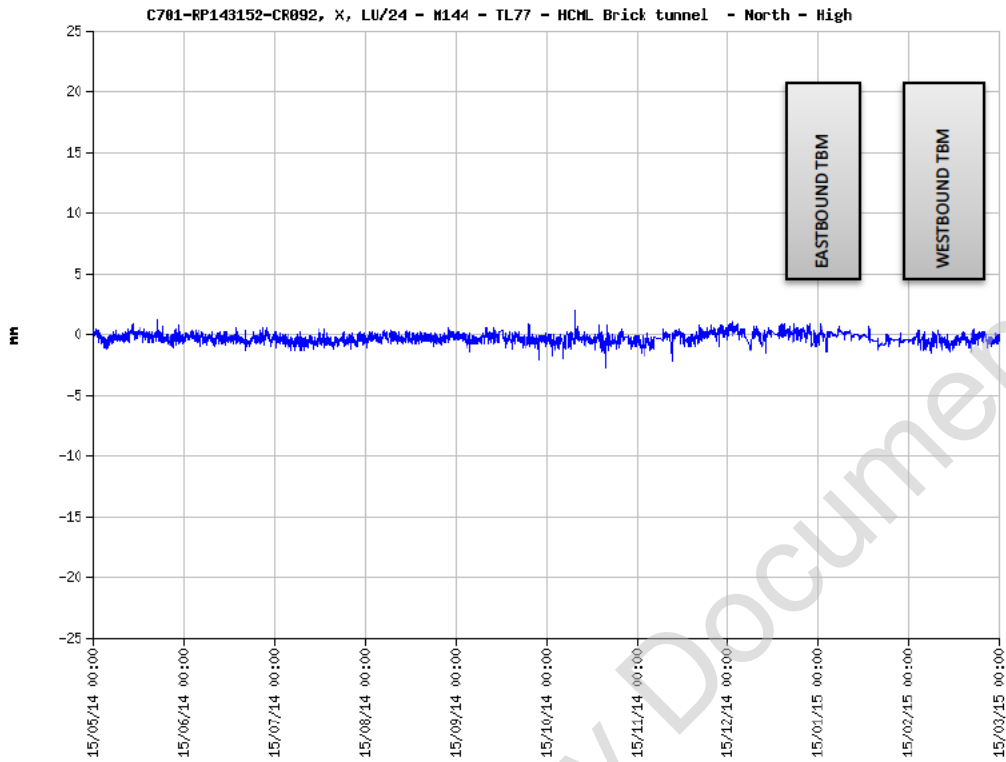
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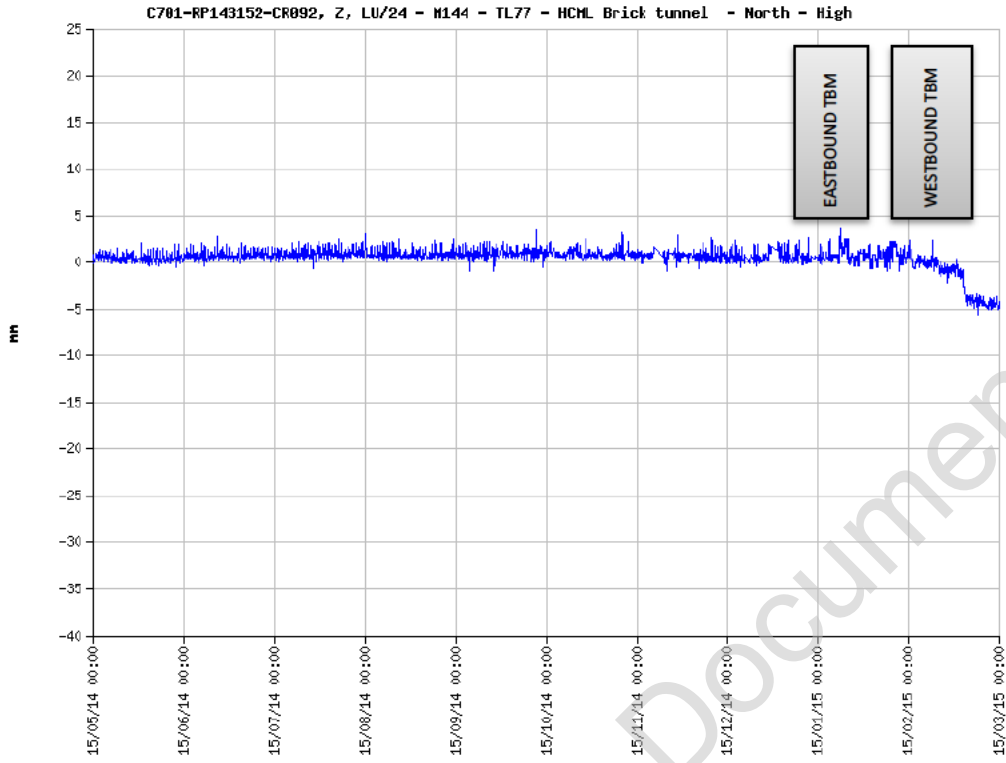
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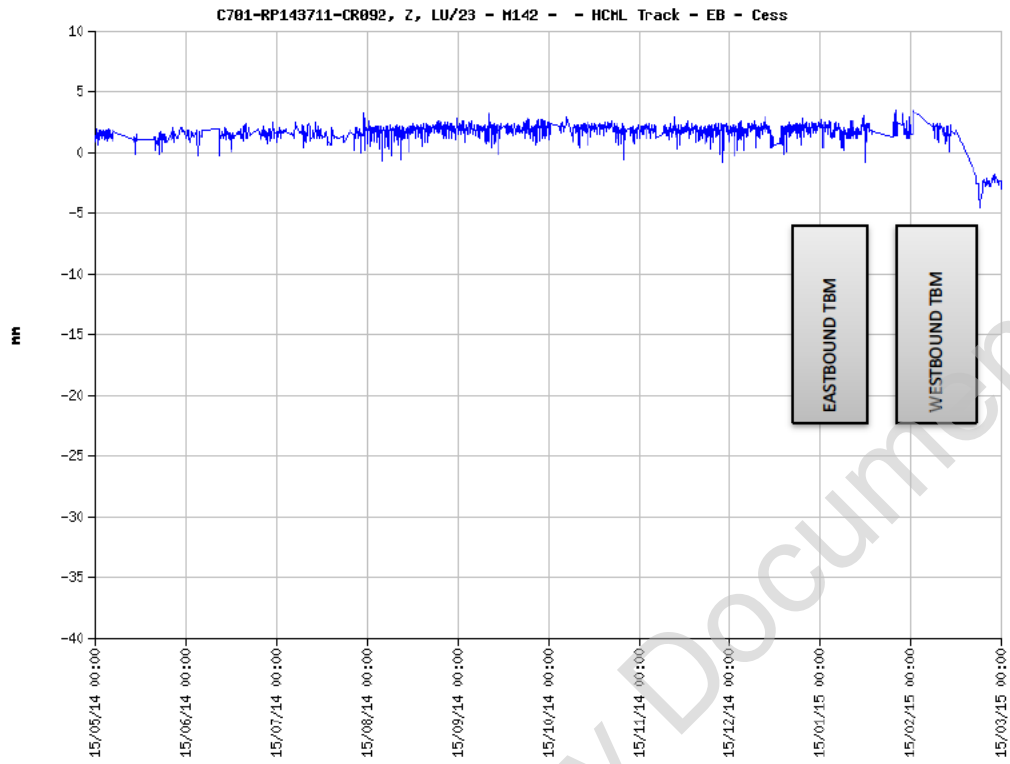
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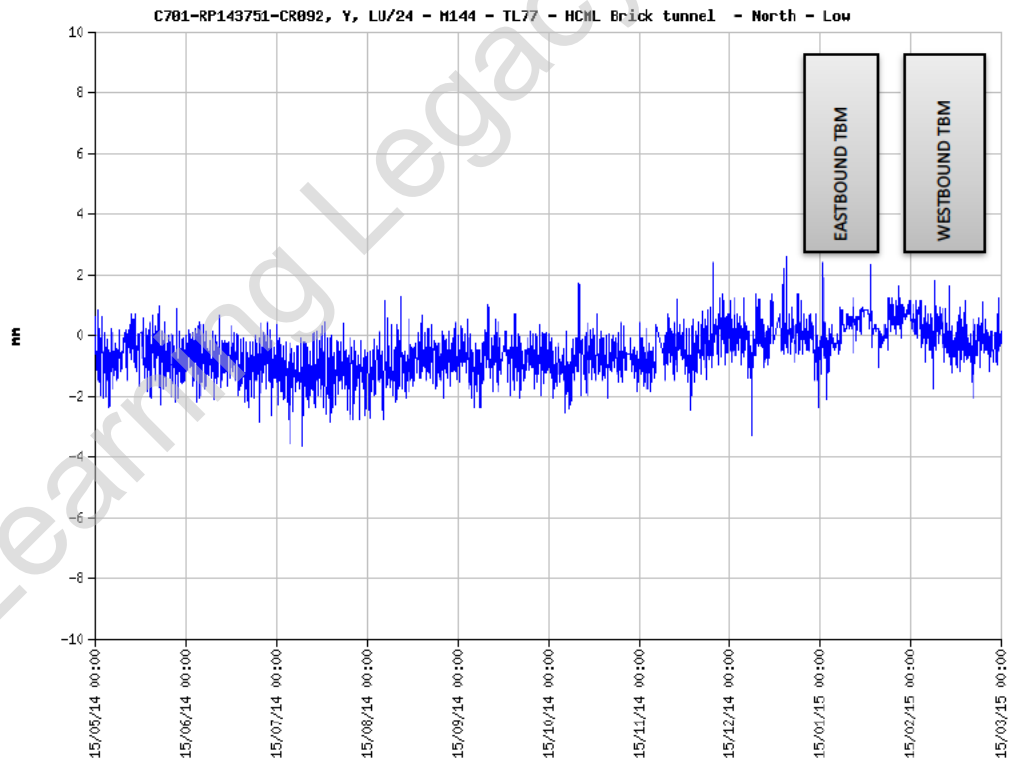
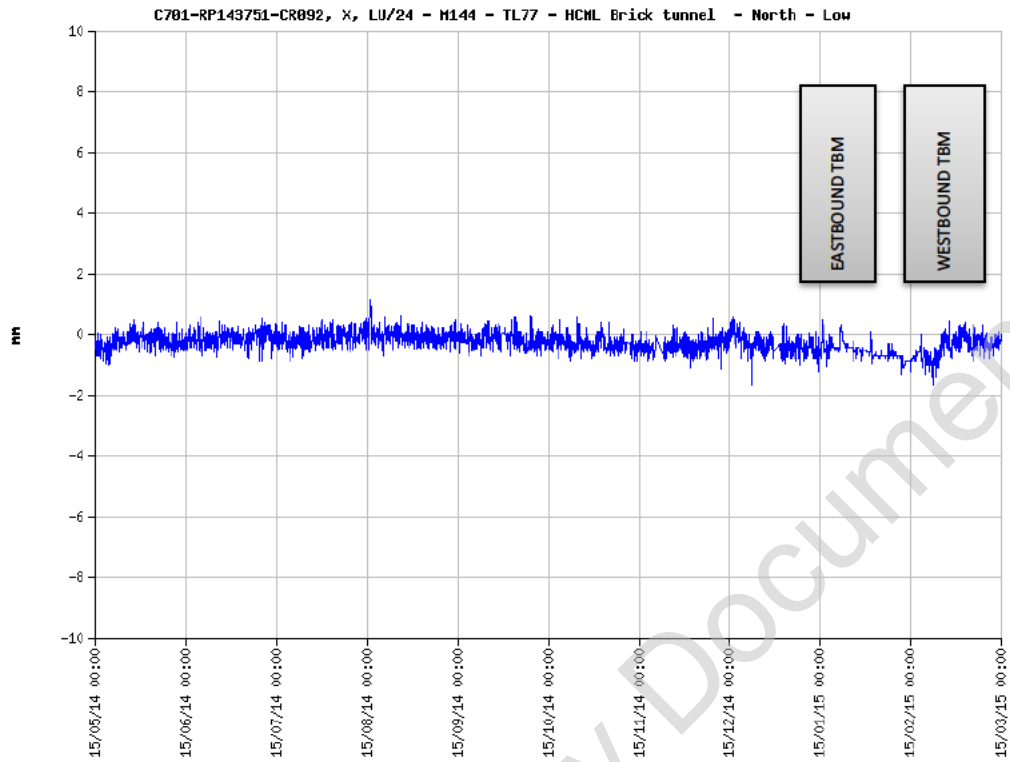


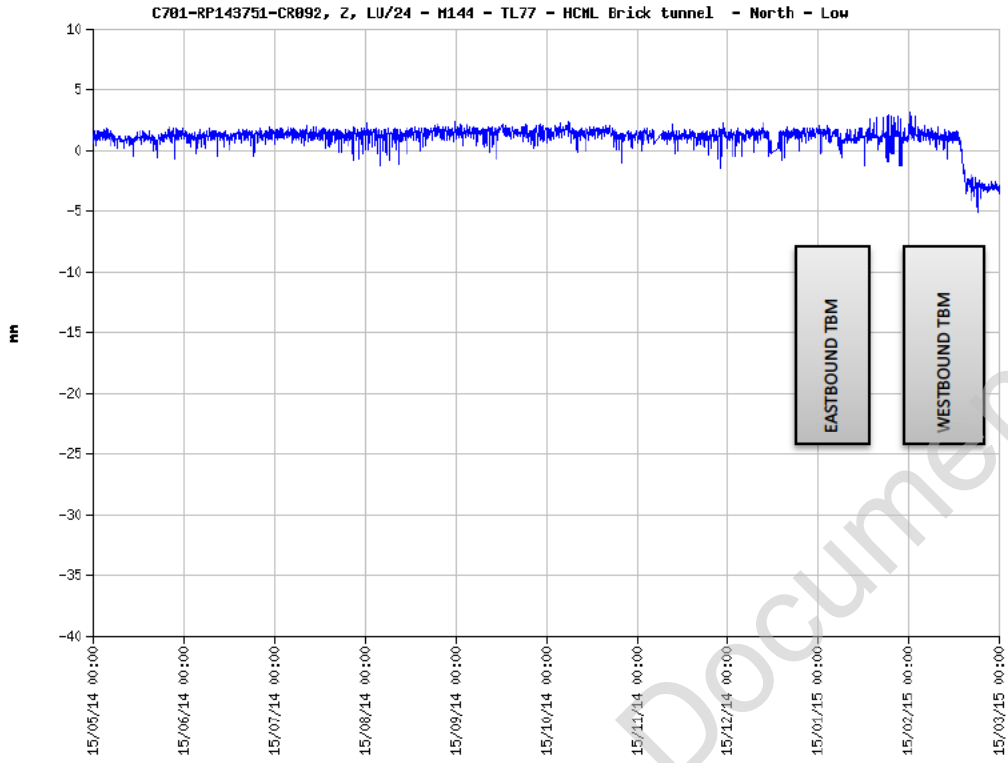
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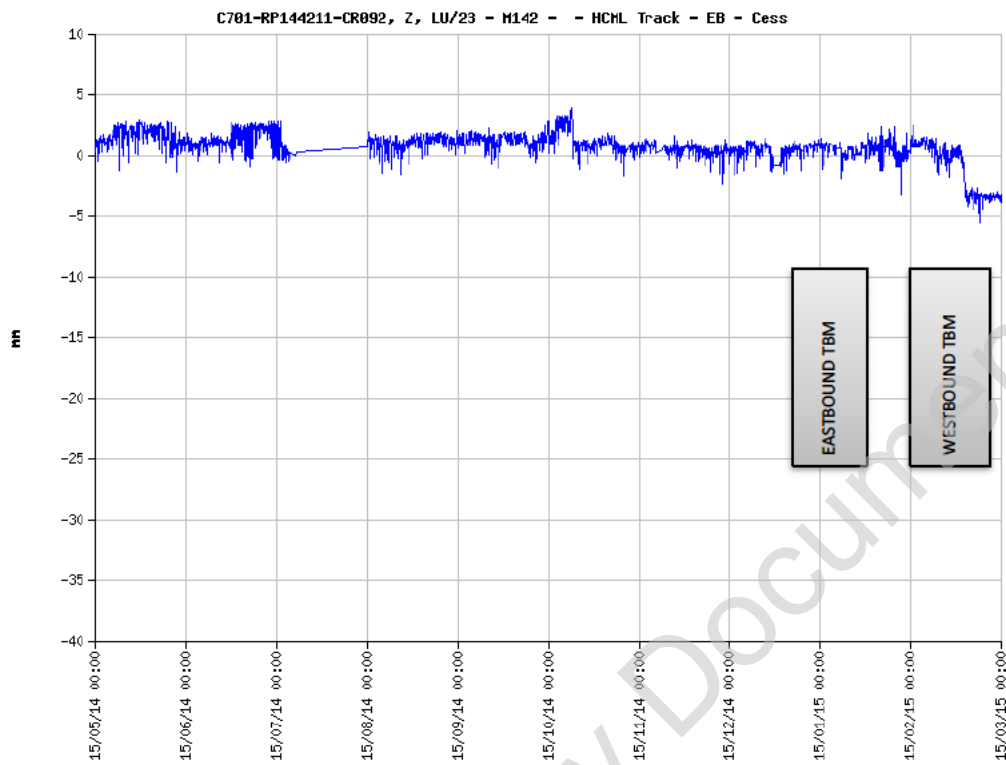


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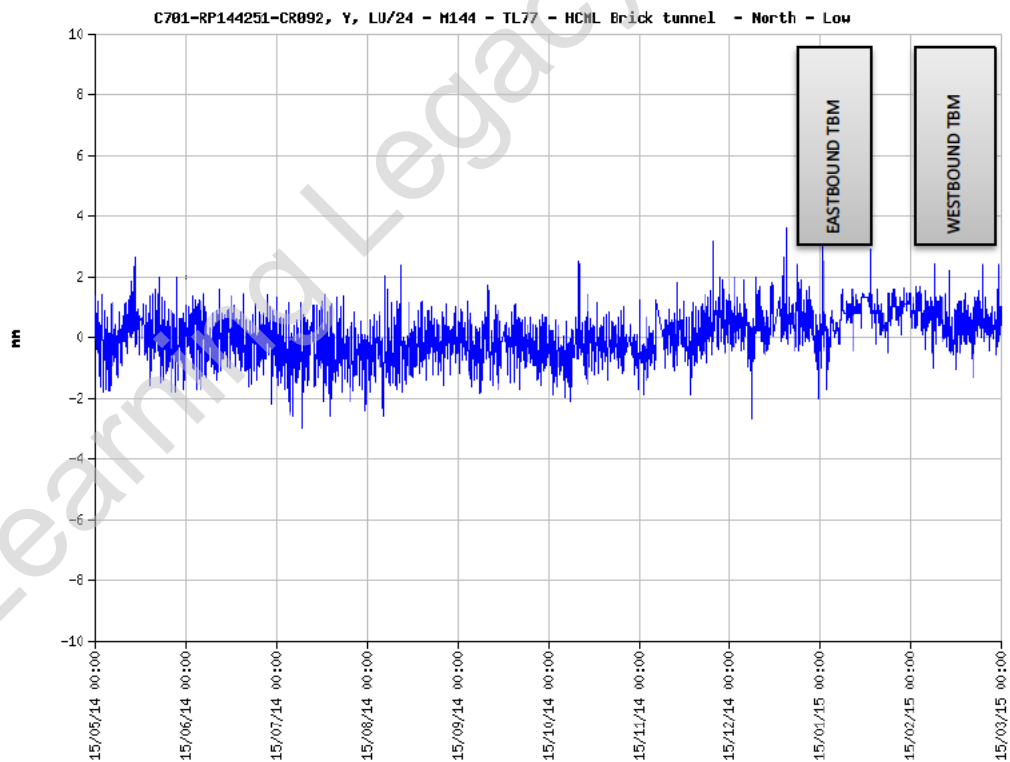
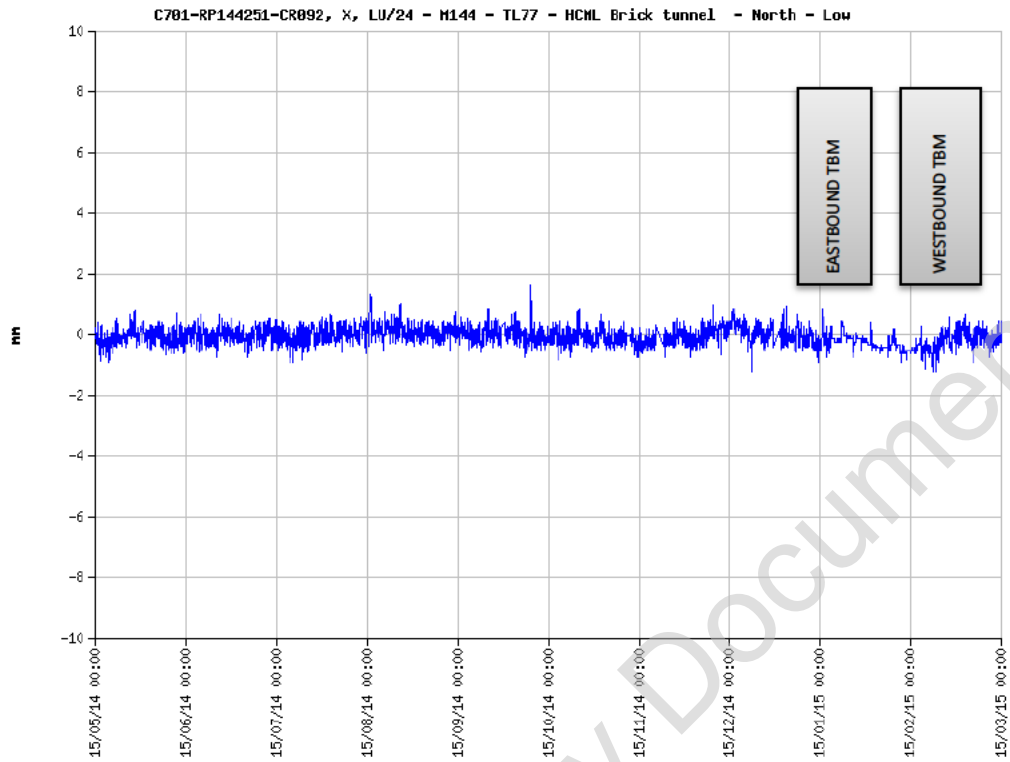


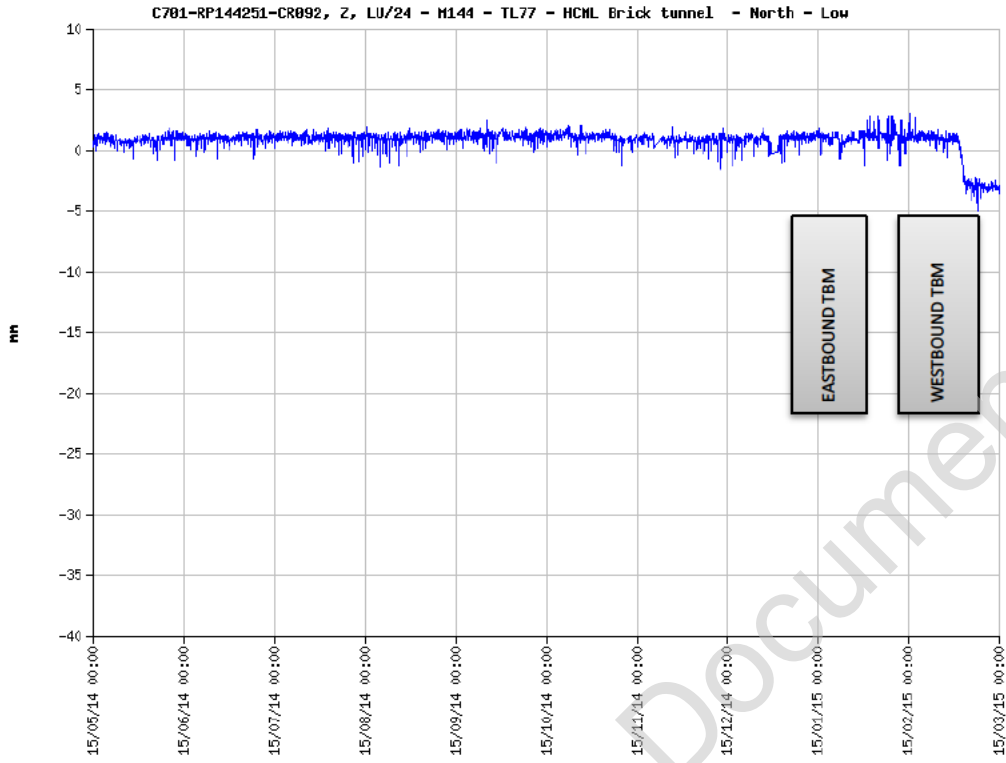
○ C704-RP144211:



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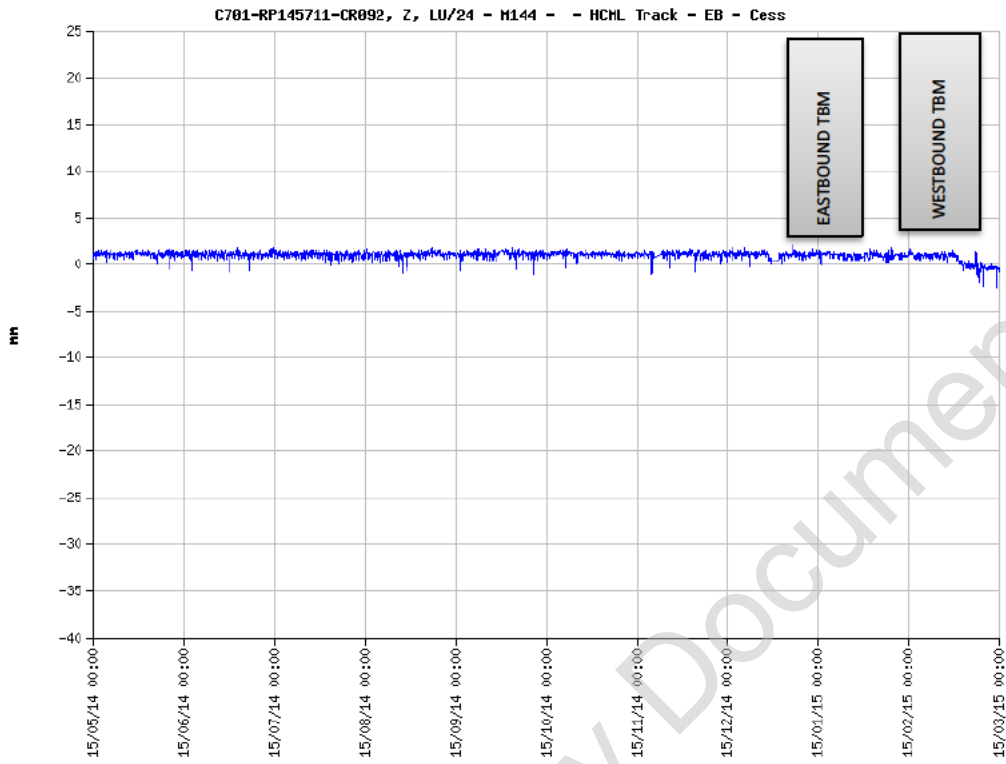
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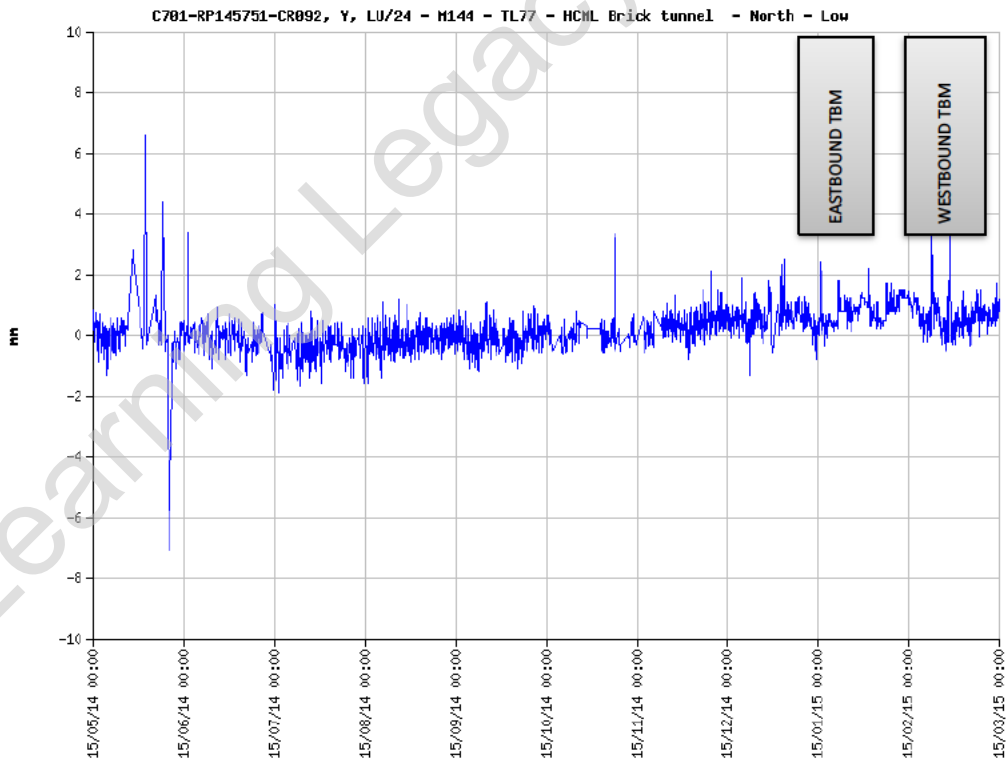
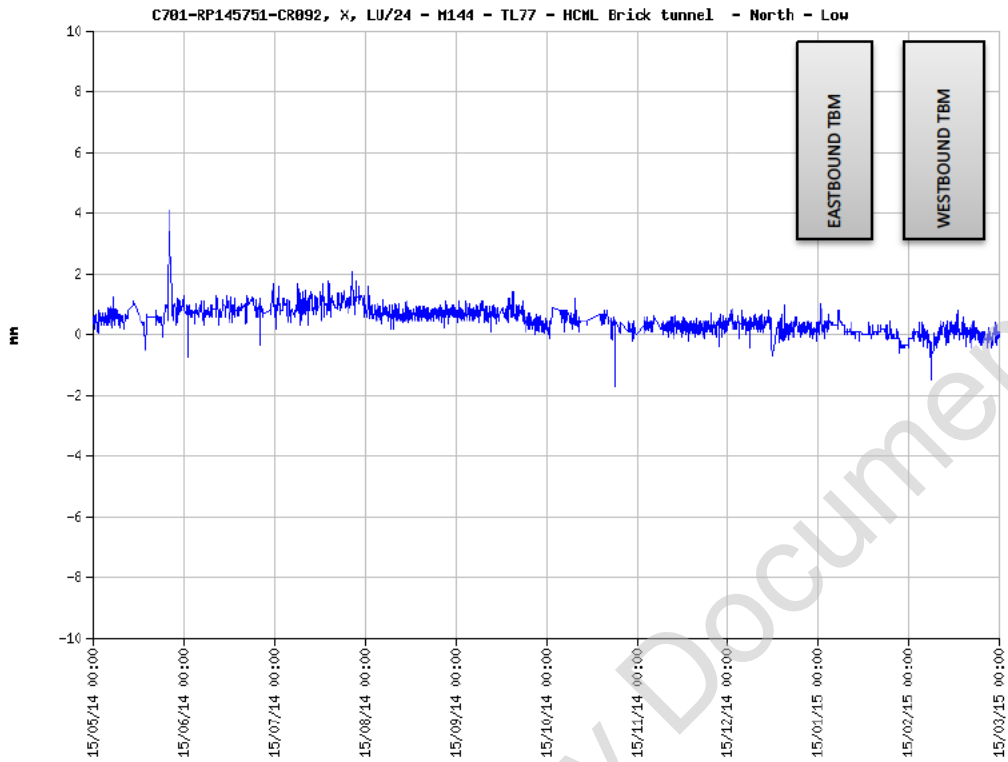
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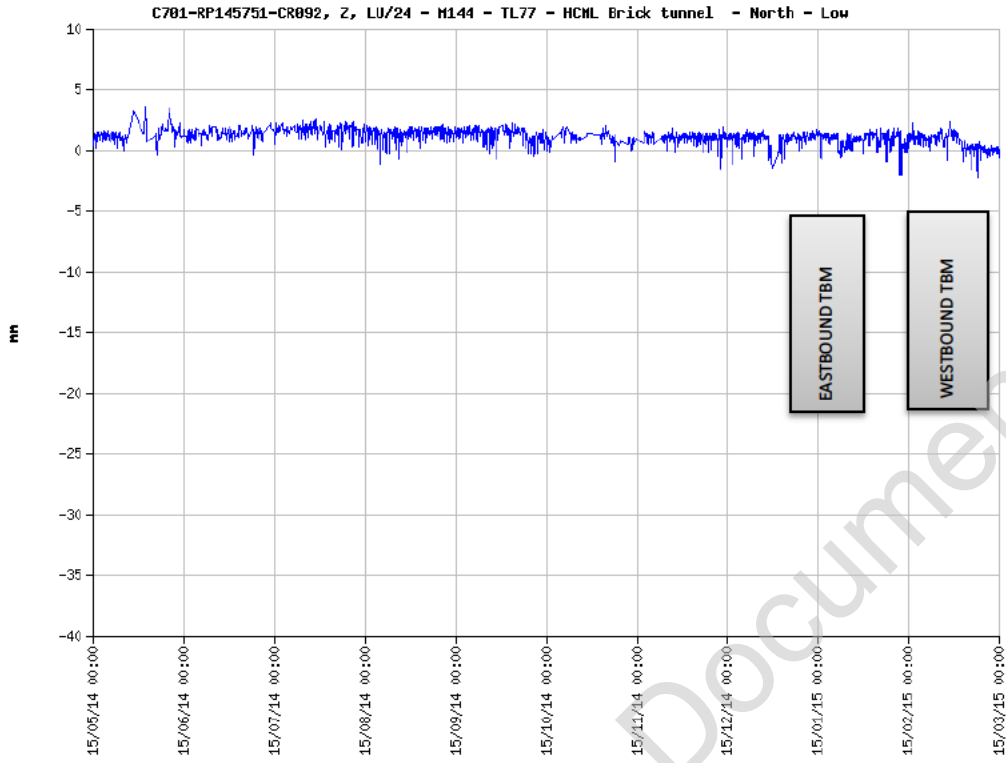
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Learning Legacy Document

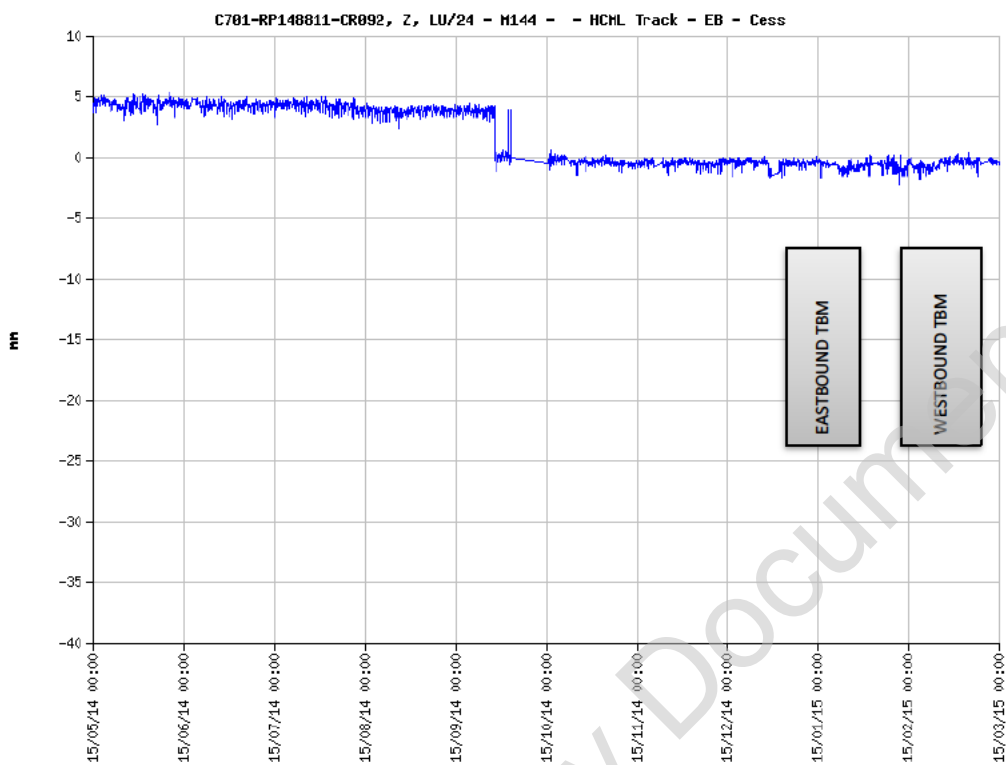
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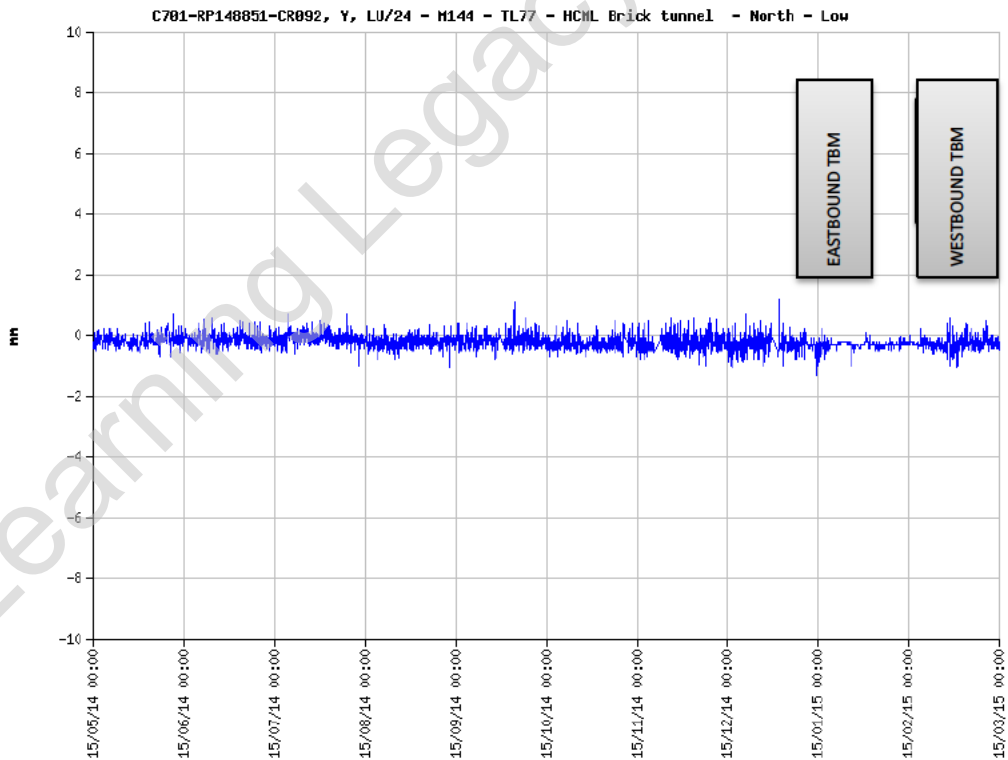
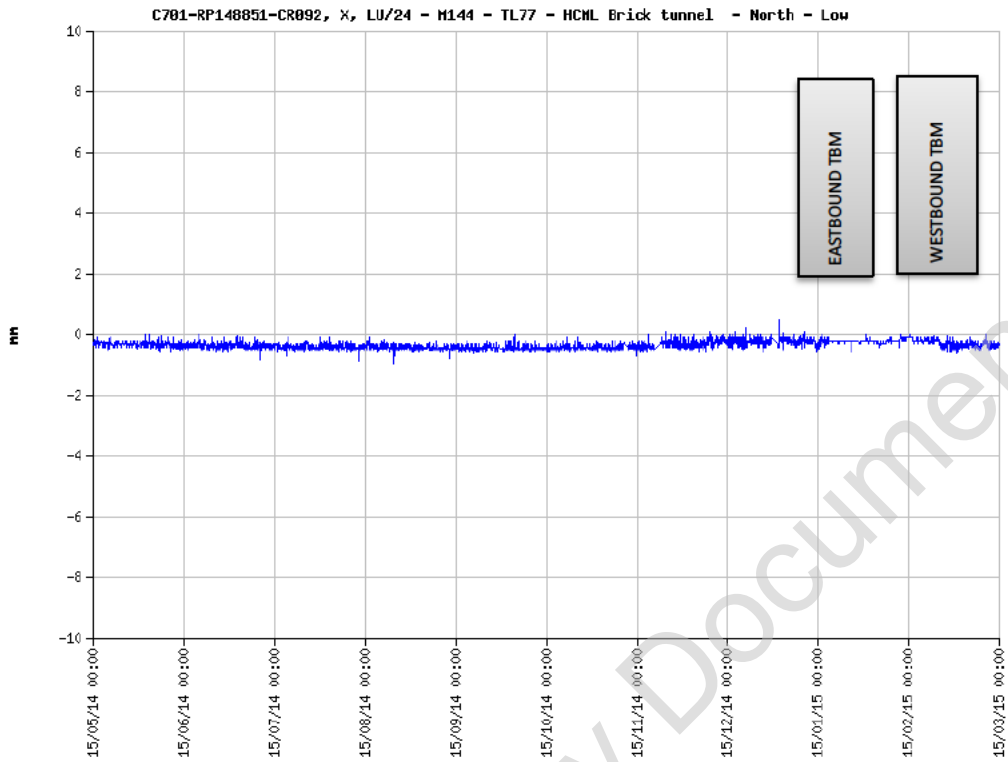


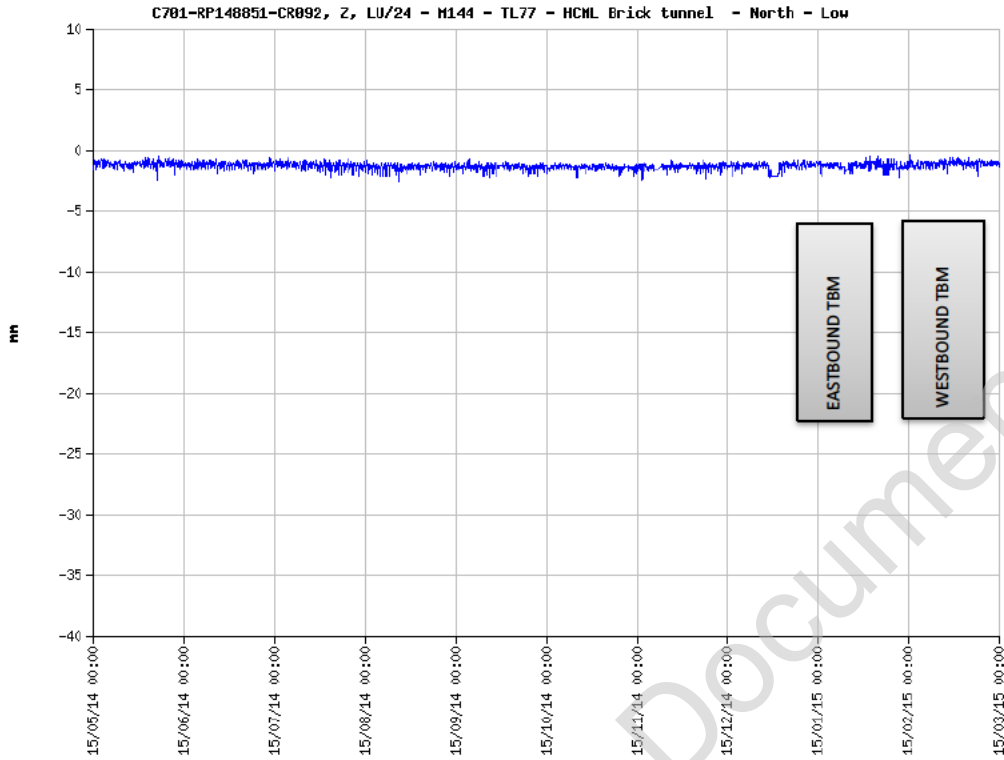
Learning Legacy Document

○ C704-RP148811:



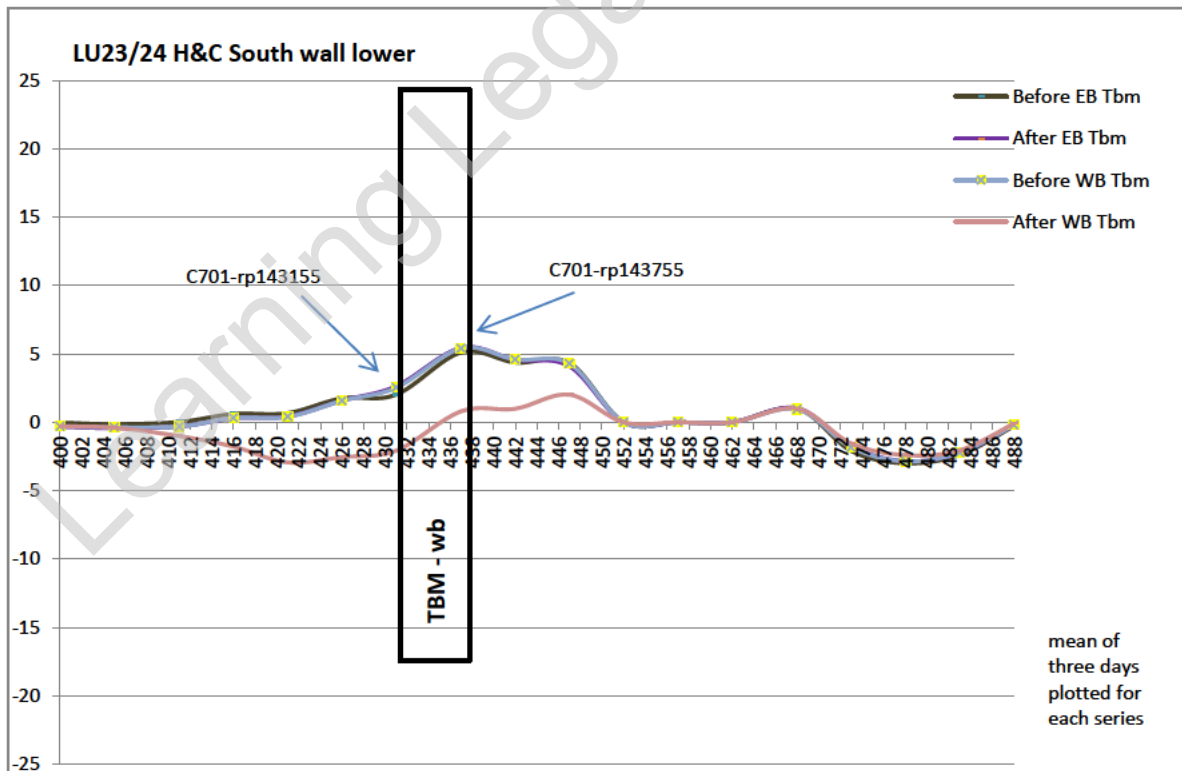
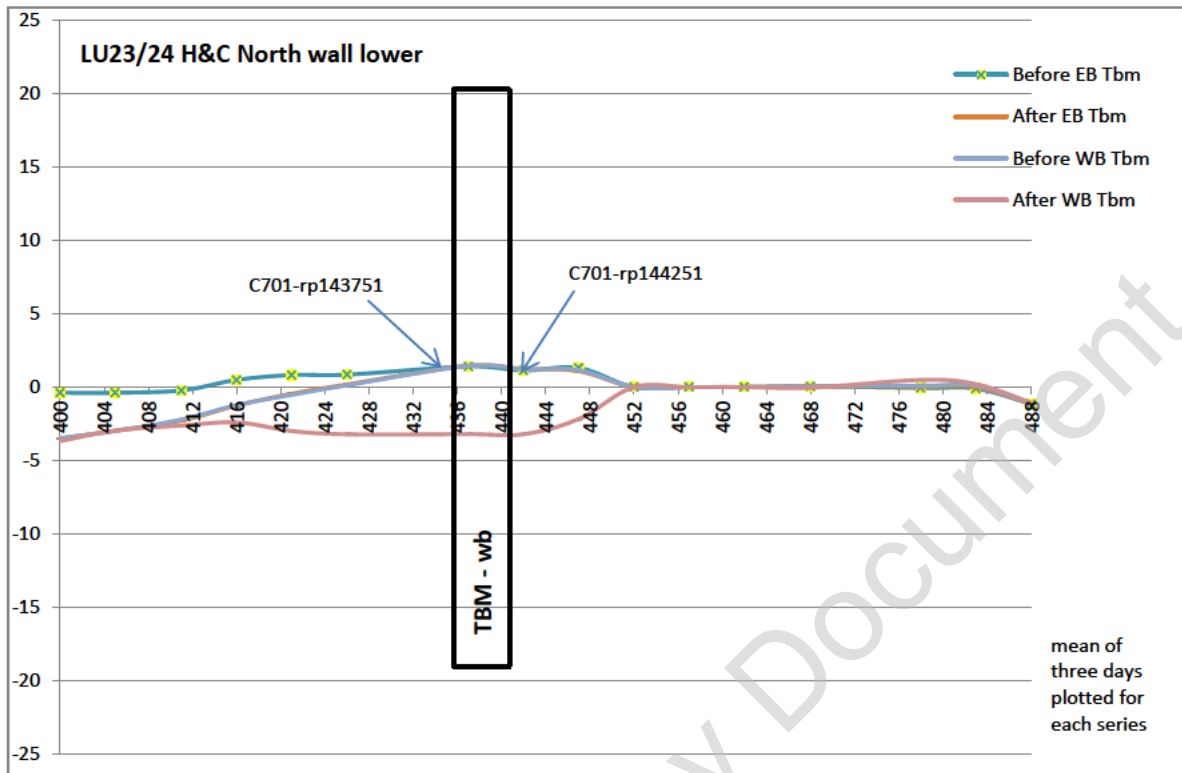
○ **C704-RP148851:**





All movements were within the amber specified trigger as per C305-DSJ-C-STP-CRG03-50060 "Specific Action Plan Y030: LU24 - Circle, Hammersmith and City, and Metropolitan Line East of Liverpool Street Station, and LU/23 Liverpool Street Metropolitan Line Station & Ticket Hall".

The graphs below show various settlement profile plots of the structural elements of LU23/24.



7. C305 MANUAL VERIFICATION READINGS

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

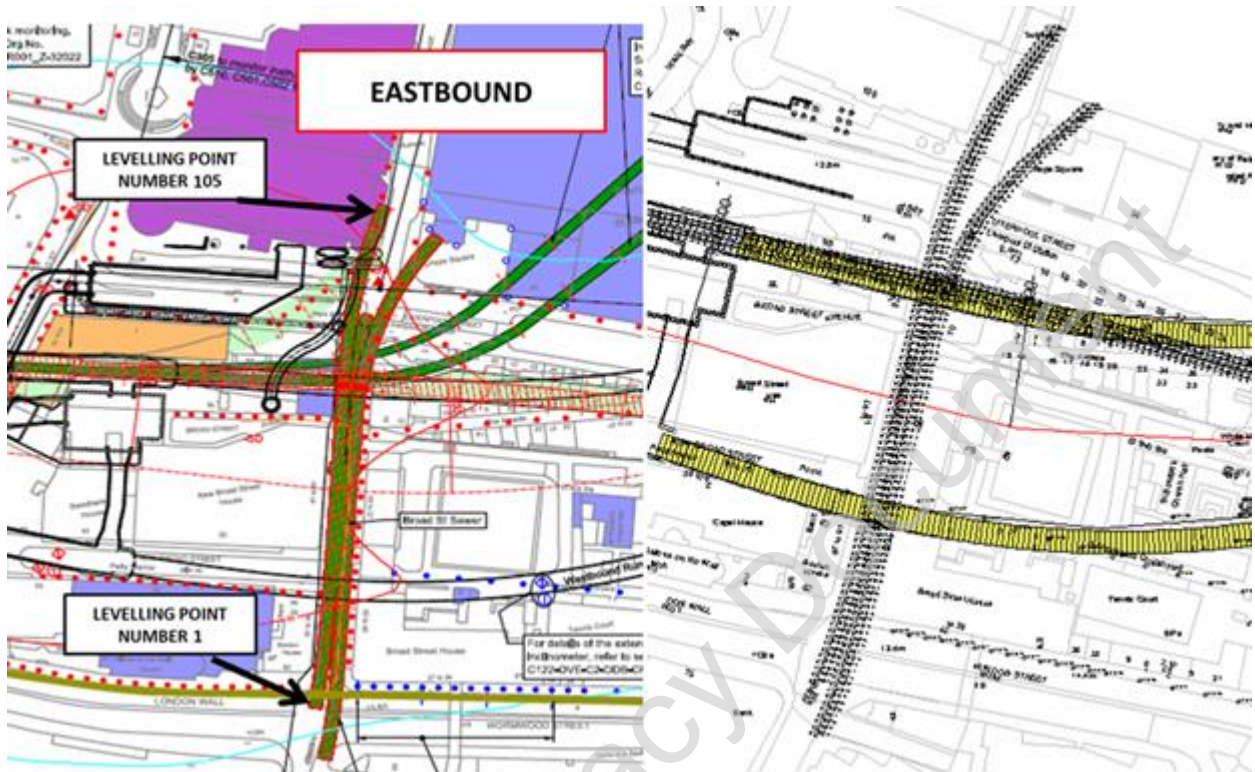
The report summaries the data recorded by the instruments of the C305 works in line with the C704 report and focuses on the primary movement of settlement. For comparison with the automatic readings from the track prisms data has been used from the levelling track points on the following rails:

- LU Central Line Eastbound Track (cess and 6ft)
- LU Central Line Westbound Track (cess and 6ft)
- LU Liverpool St to Moorgate Eastbound Track (cess and 6ft)
- LU Liverpool St to Moorgate Westbound Track (cess and 6ft)

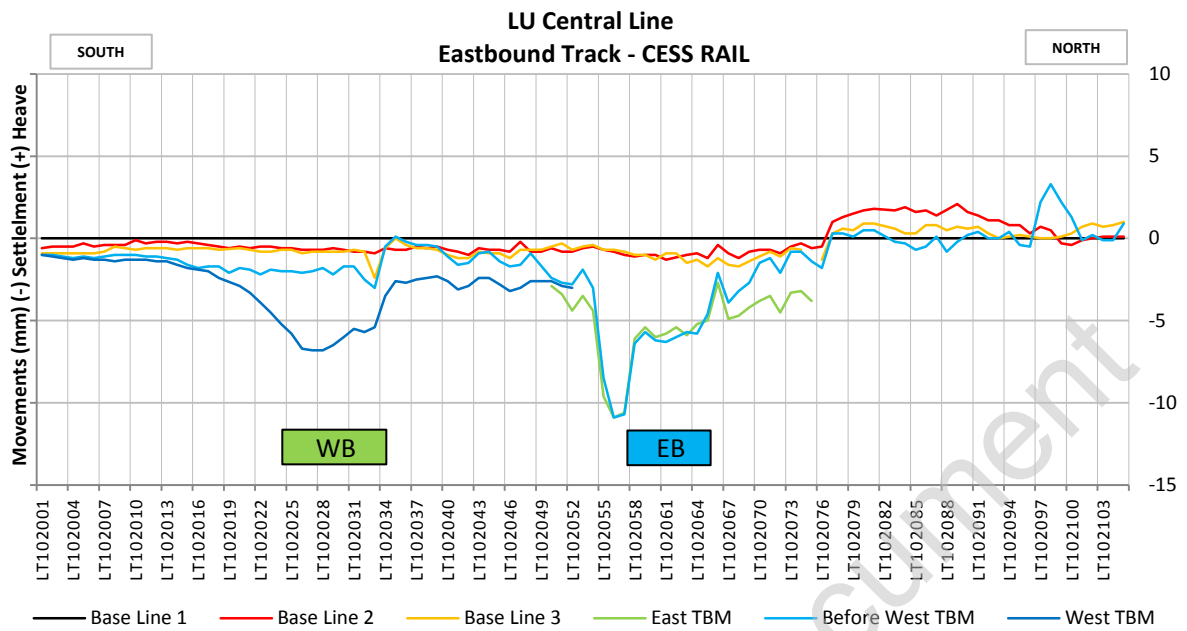
Learning Legacy Document

Track Levelling (LU CENTRAL LINE EASTBOUND TRACK)

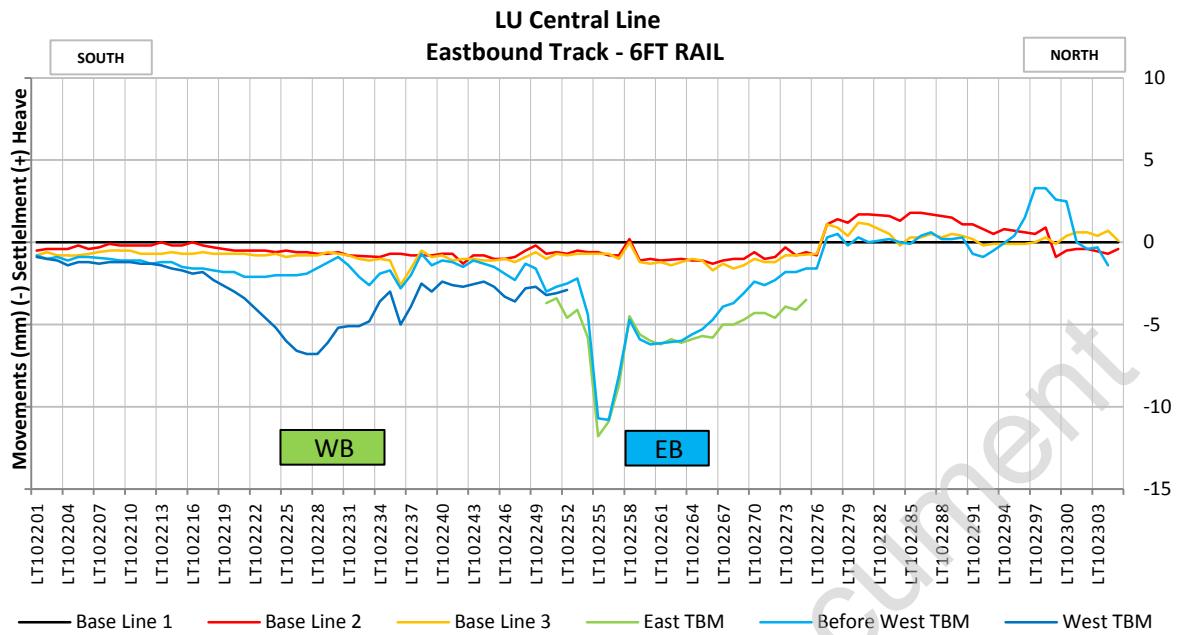
LOCATION:



A minimum of three baseline readings were taken before the TBM passage. See below graphs with those readings:

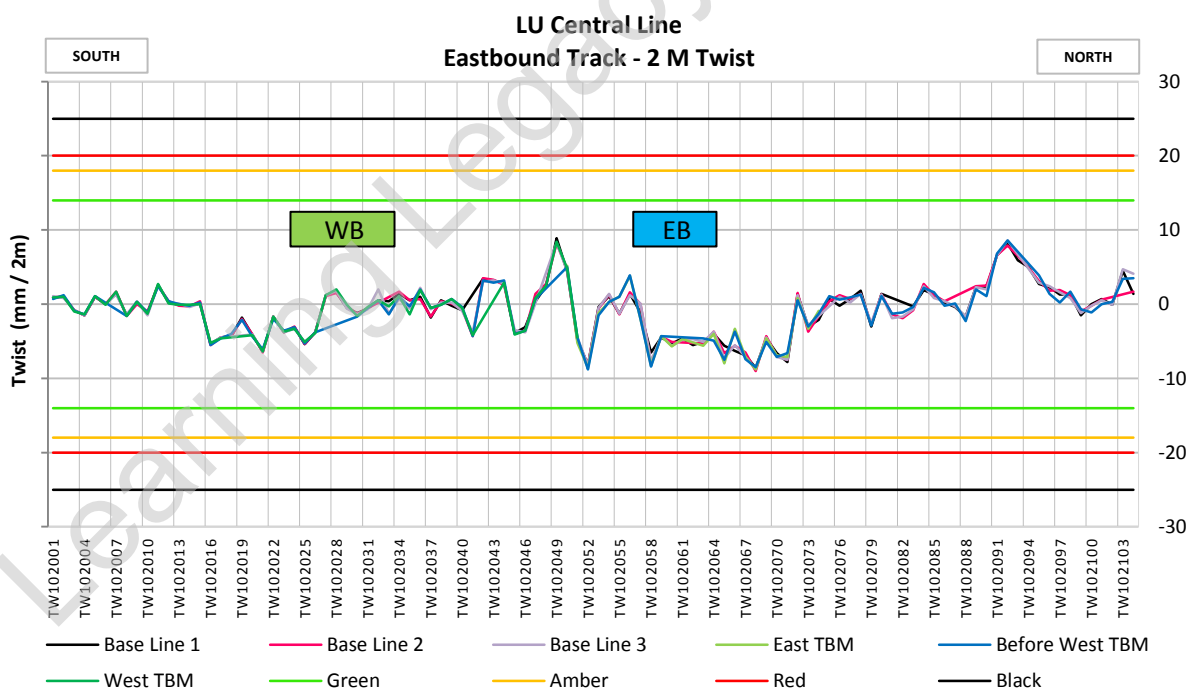
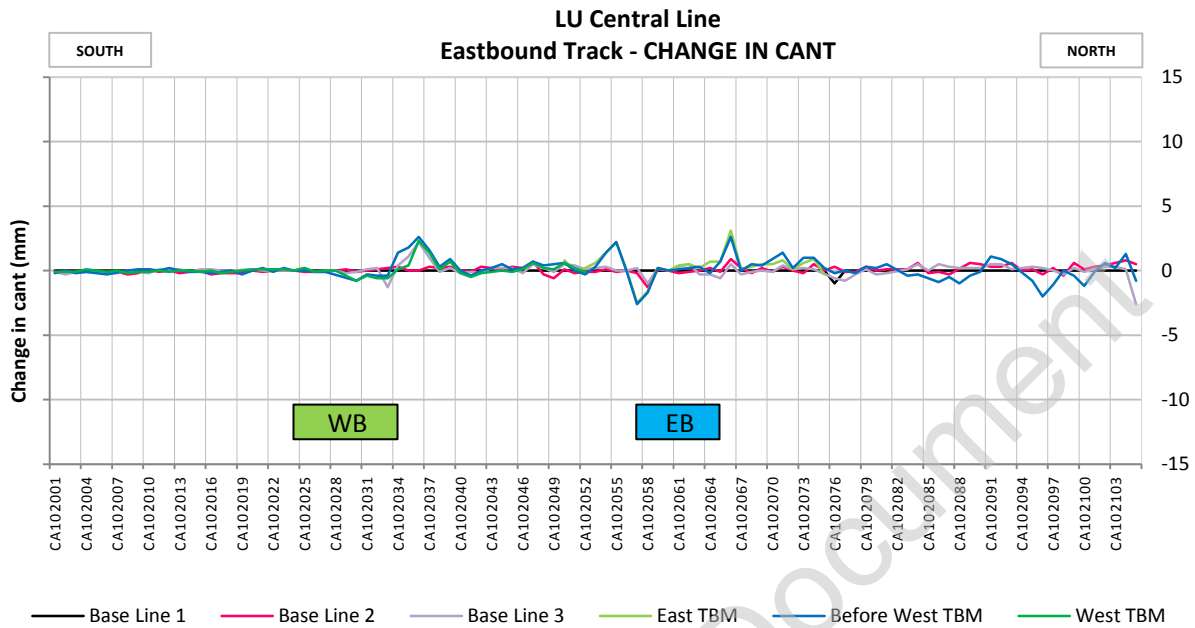


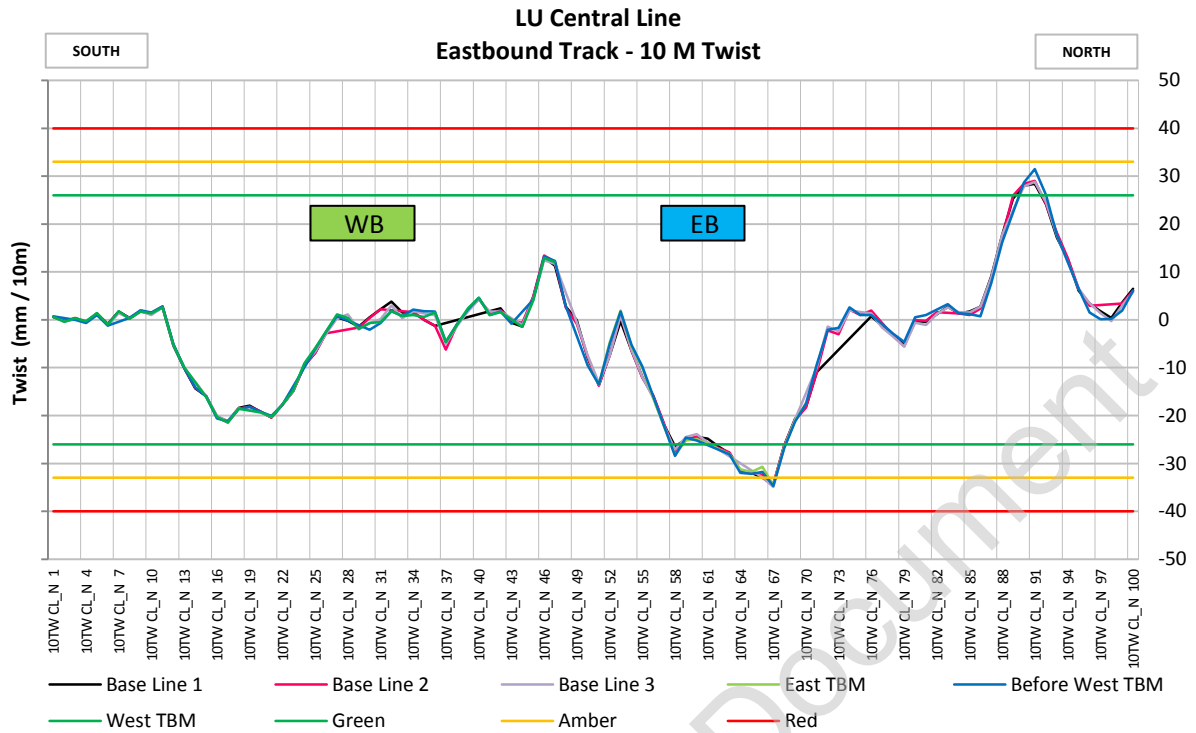
The graph above shows a maximum settlement of approximately 6.8mm after the westbound TBM passage, and a maximum settlement after the eastbound TBM passage of approximately 10.9mm.



The graph above shows a maximum settlement of approximately 6.8mm after the westbound TBM passage, and a maximum settlement after the eastbound TBM passage of approximately 11.8mm.

The graphs below illustrate the change in cant deflection and the Twist

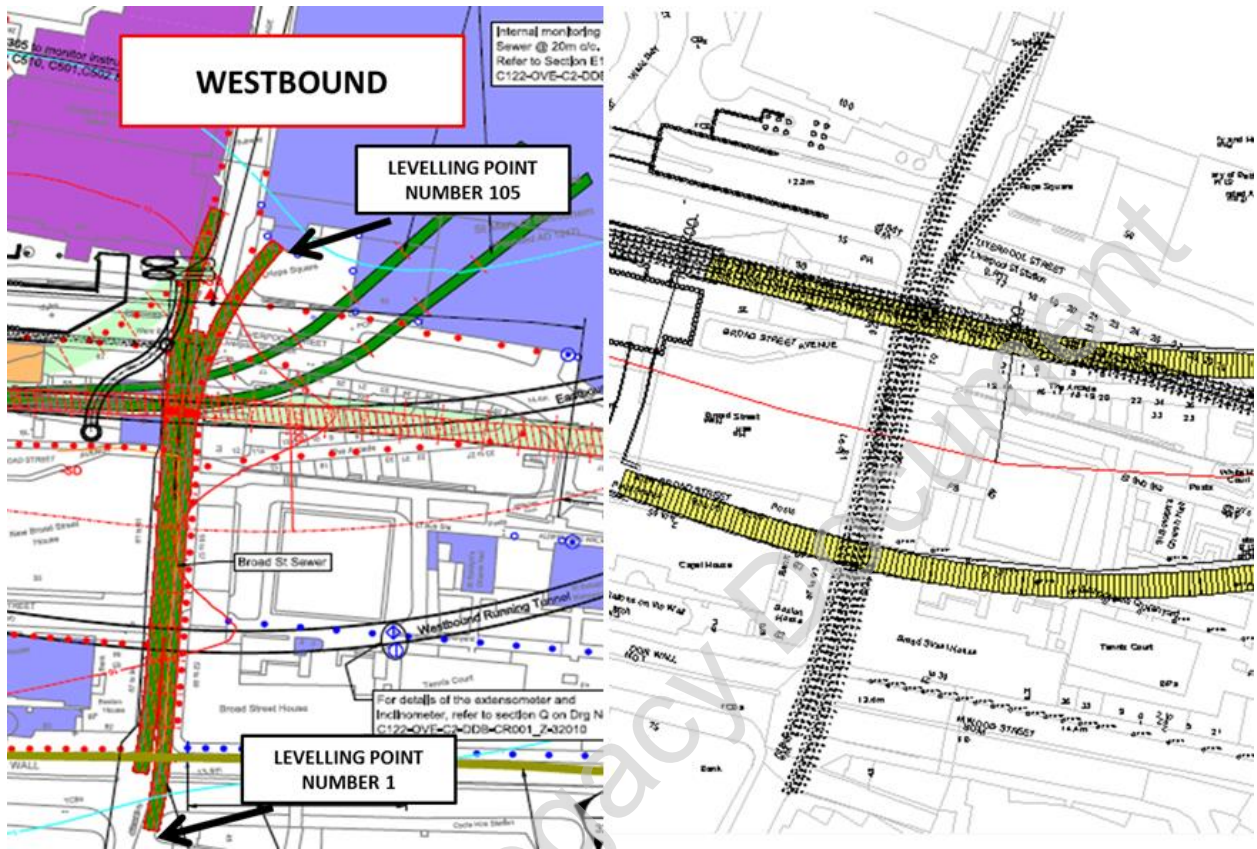




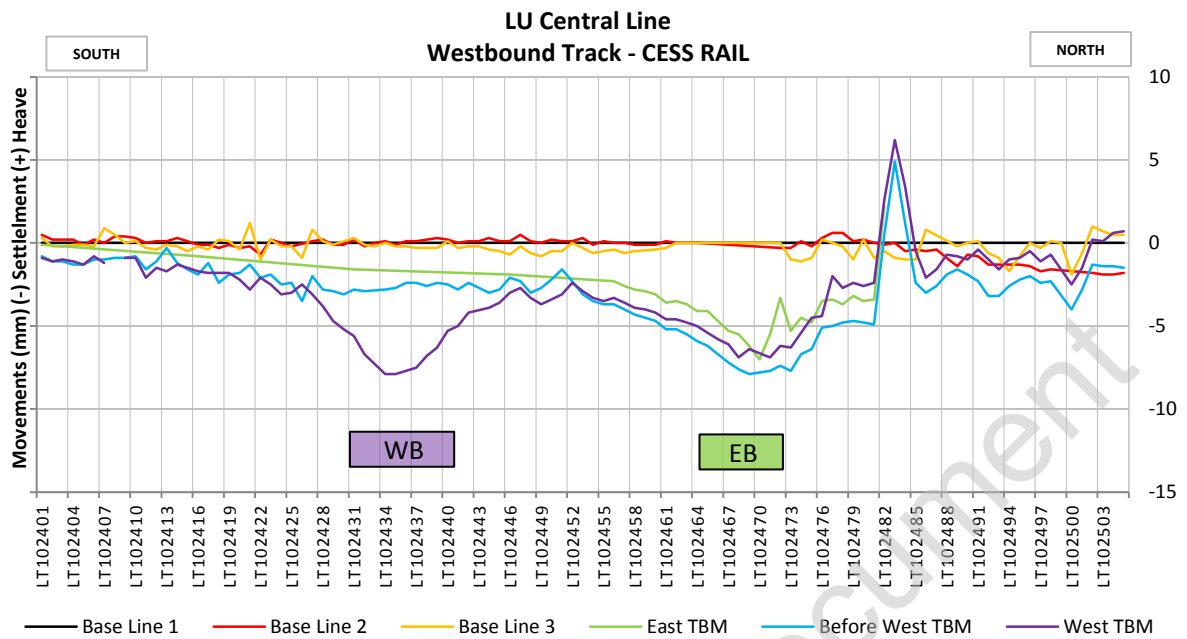
No significant changes of twist or change in cant were detected. The trigger values have been exceeded in some locations due to the previous geometry of the track as indicated in the Base Line Report “C305-XRL-C2-RGN-CR092-50002 LU/22 Central Line”.

Track Levelling (LU CENTRAL LINE WESTBOUND)

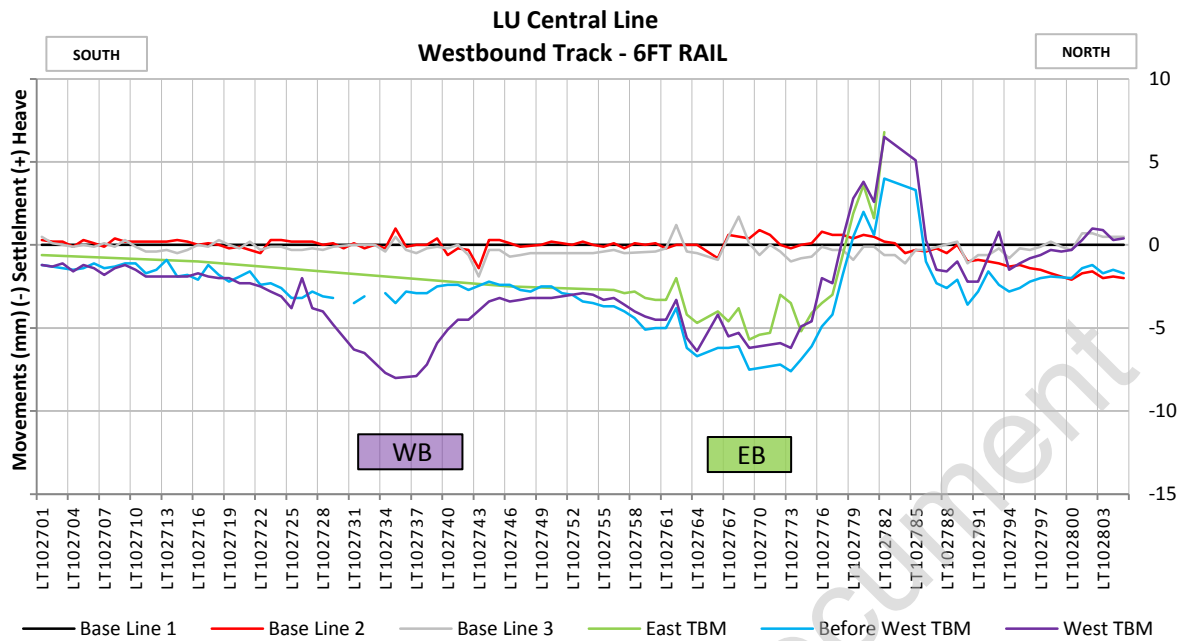
LOCATION:



A minimum of three baseline readings were taken before the TBM passage. See below graphs with those readings:

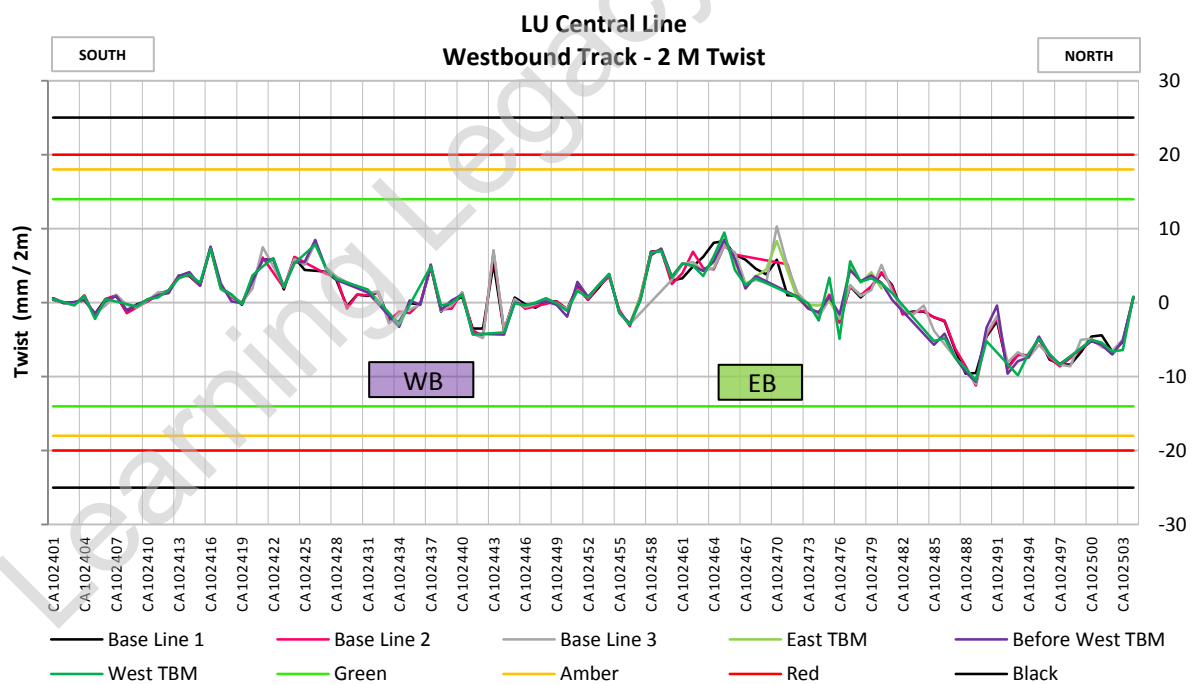
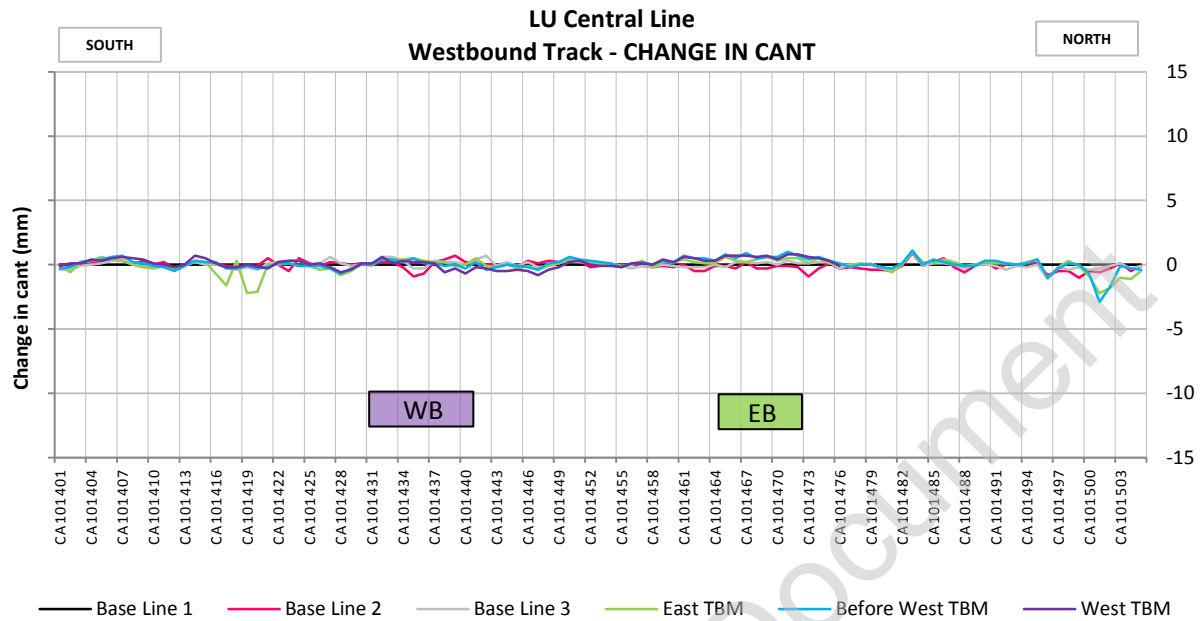


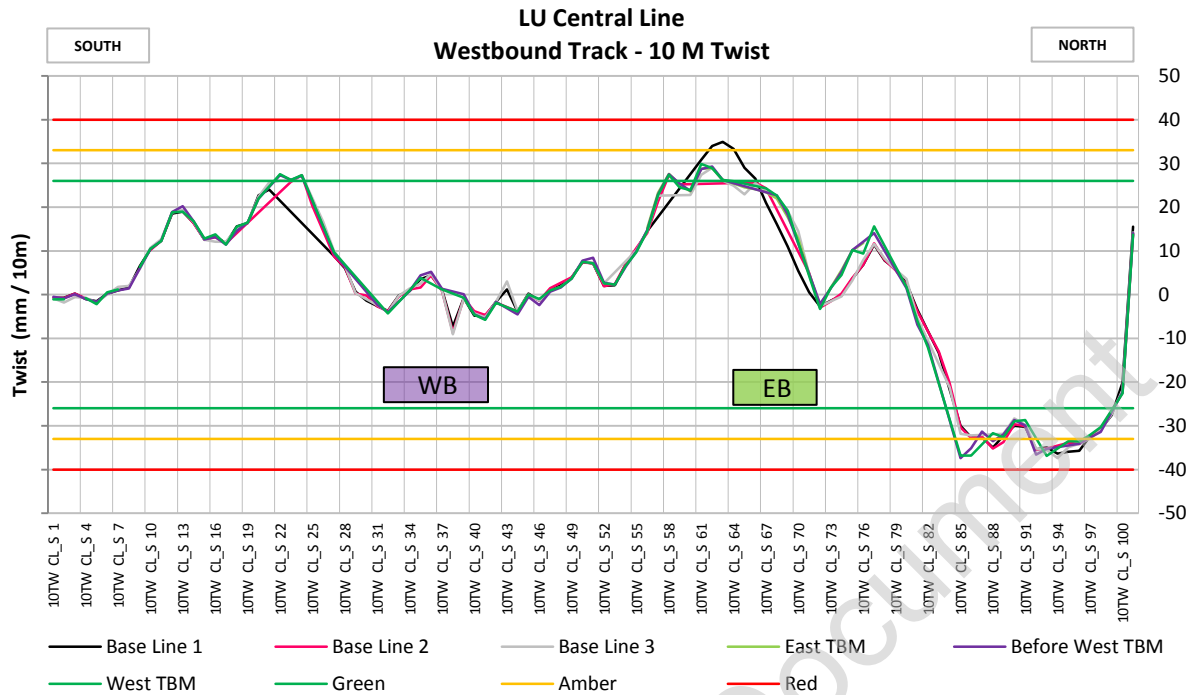
The graph above shows a maximum settlement of approximately 7.9mm after the westbound TBM passage, and a maximum settlement after the eastbound TBM passage of approximately 6.5mm.



The graph above shows a maximum settlement of approximately 8mm after the westbound TBM passage, and a maximum settlement after the eastbound TBM passage of approximately 6mm.

The graphs below illustrate the Change in cant and the Twist:

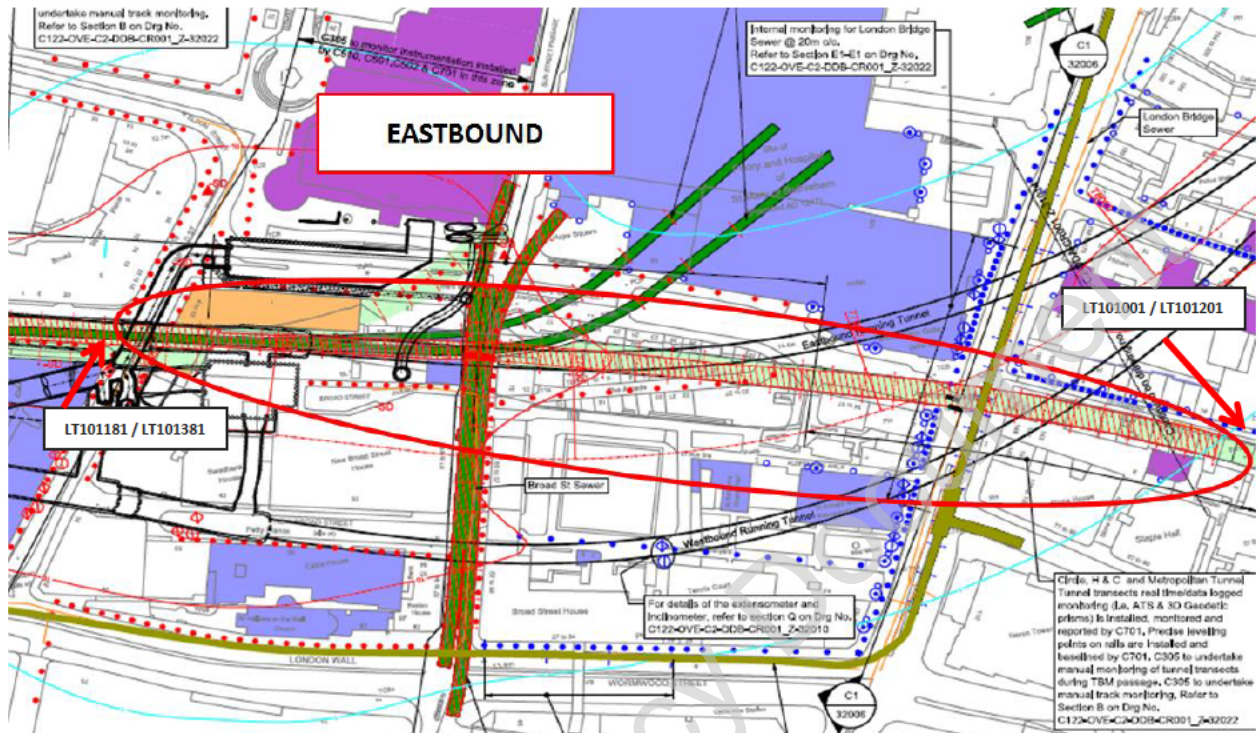




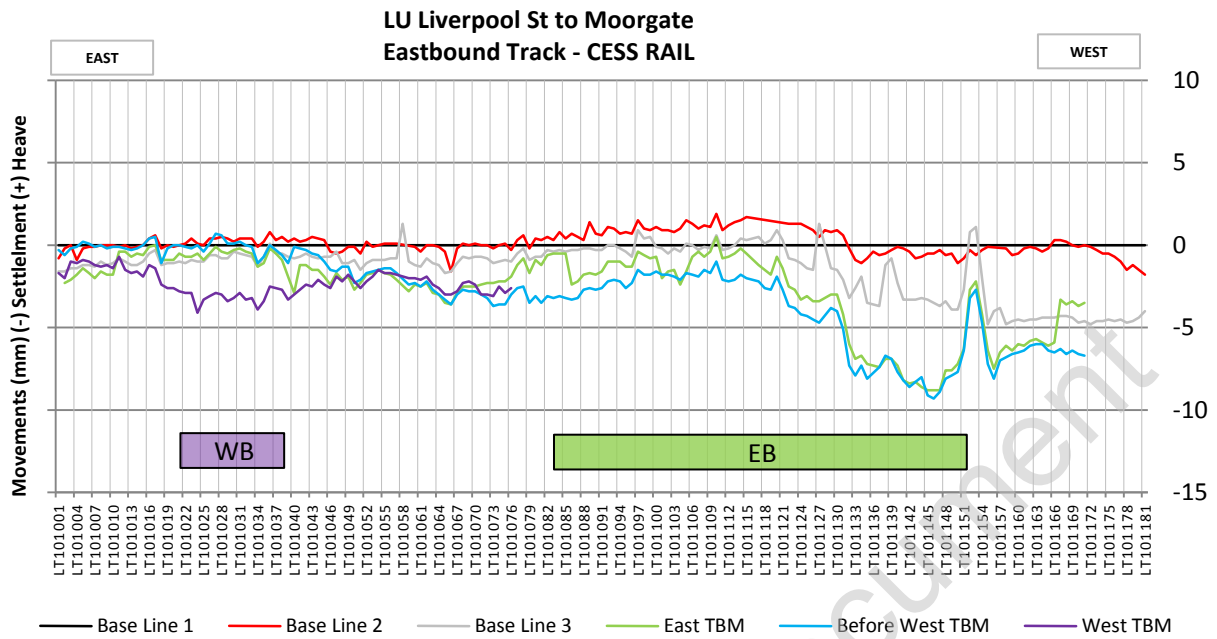
No significant changes of twist or change in cant were detected. The trigger values have been exceeded in some locations due to the previous geometry of the track as indicated in the Base Line Report “C305-XRL-C2-RGN-CR092-50002 LU/22 Central Line”.

Track Levelling (LU LIVERPOOLSTREET TO MOORGATE EASTBOUND TRACK)

LOCATION:

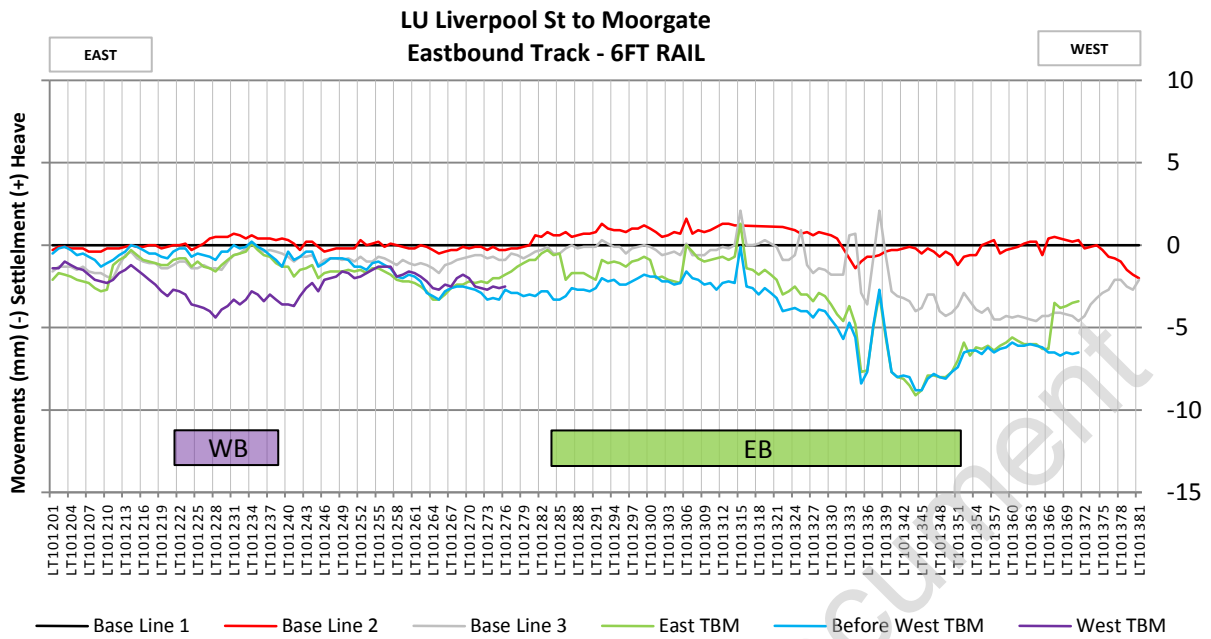


A minimum of three baseline readings were taken before the TBM passage. See below graphs with those readings:



Baseline 3 was affected by works on the rail track carried out by others in the vicinity of the east bound TBM alignment. Therefore the ground movement due to C305 east bound TBM tunnelling is with respect to baseline 3.

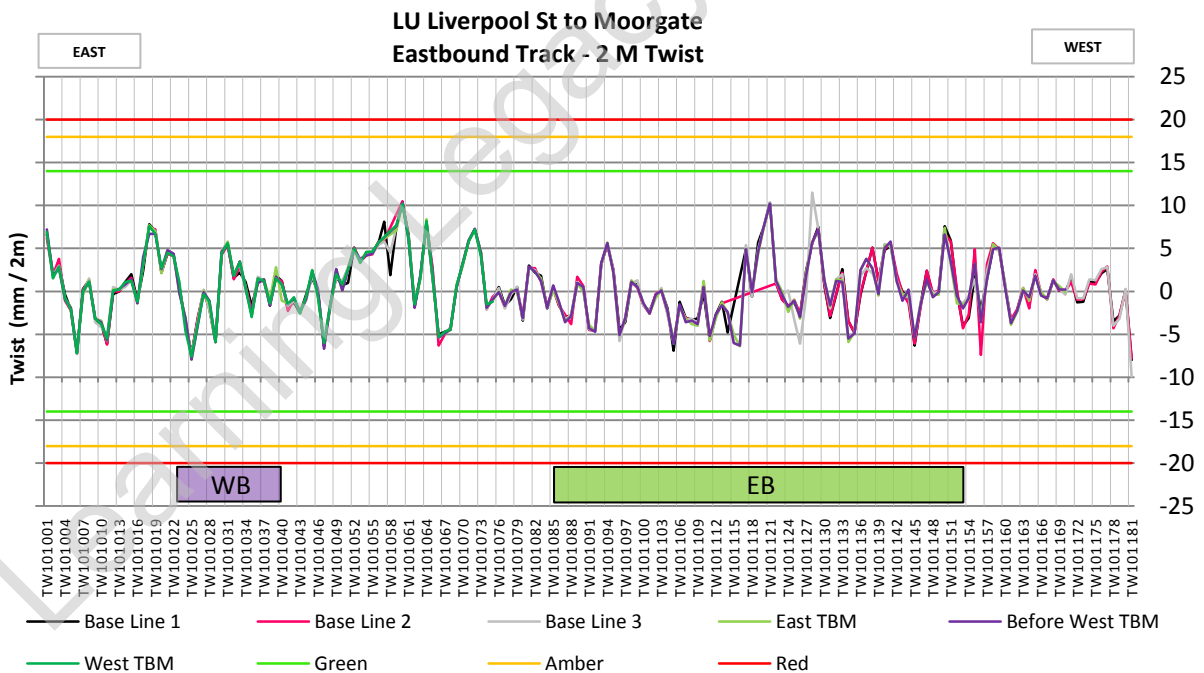
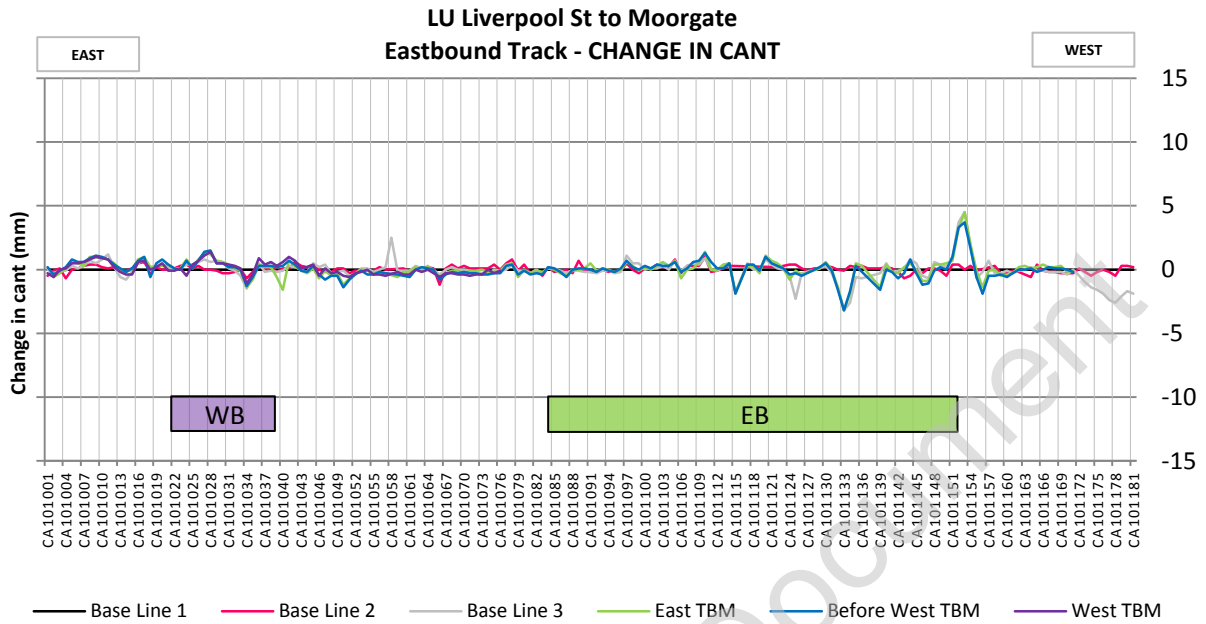
The graph above shows a maximum settlement of approximately 5.3 mm after the Eastbound TBM passage, and a maximum settlement after the Westbound TBM passage of 4.1 mm.

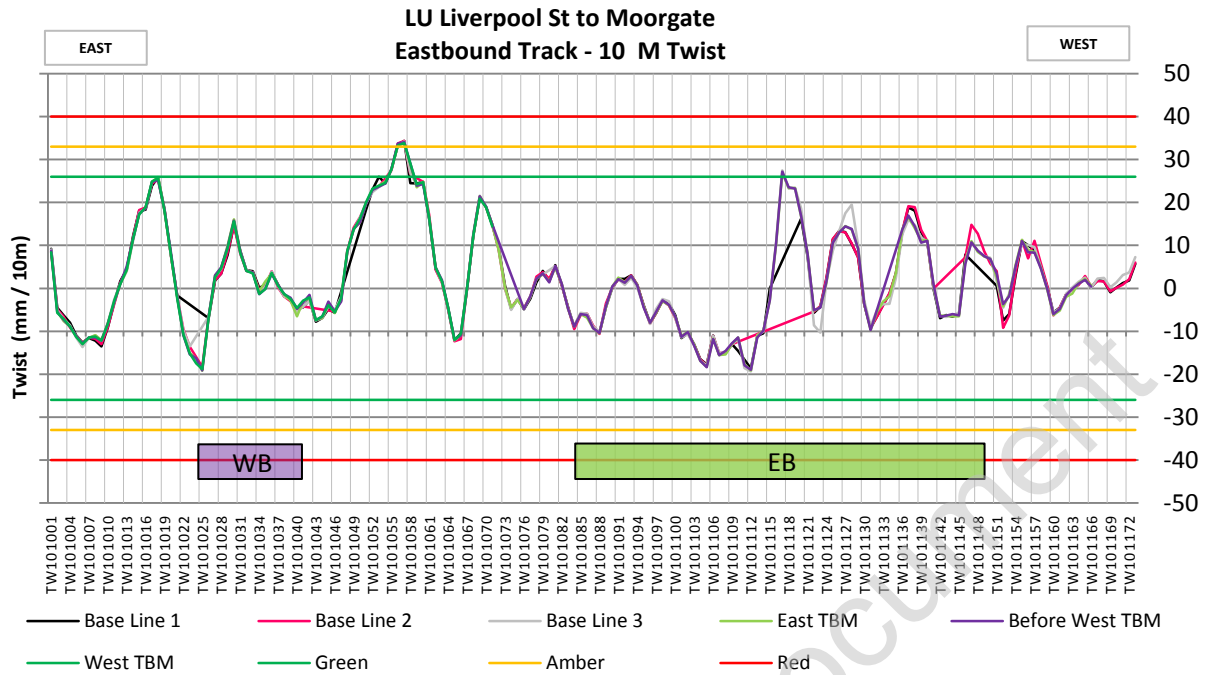


Baseline 3 was affected by works on the rail track carried out by others in the vicinity of the east bound TBM alignment. Therefore the ground movement due to C305 east bound TBM tunnelling is with respect to baseline 3.

The graph above shows a maximum settlement of approximately 5.7 mm after the Eastbound TBM passage, and a maximum settlement after the Westbound TBM passage of 4.0 mm.

The graphs below illustrate the Change in cant and the Twist:

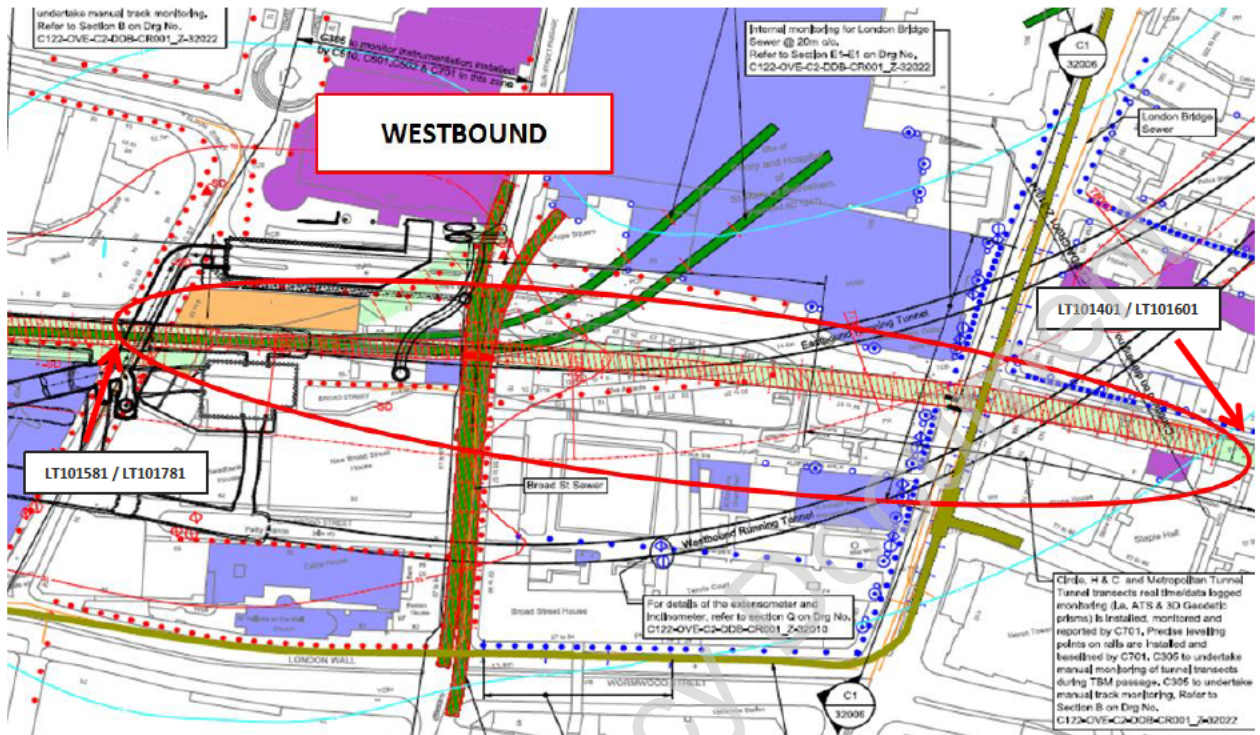




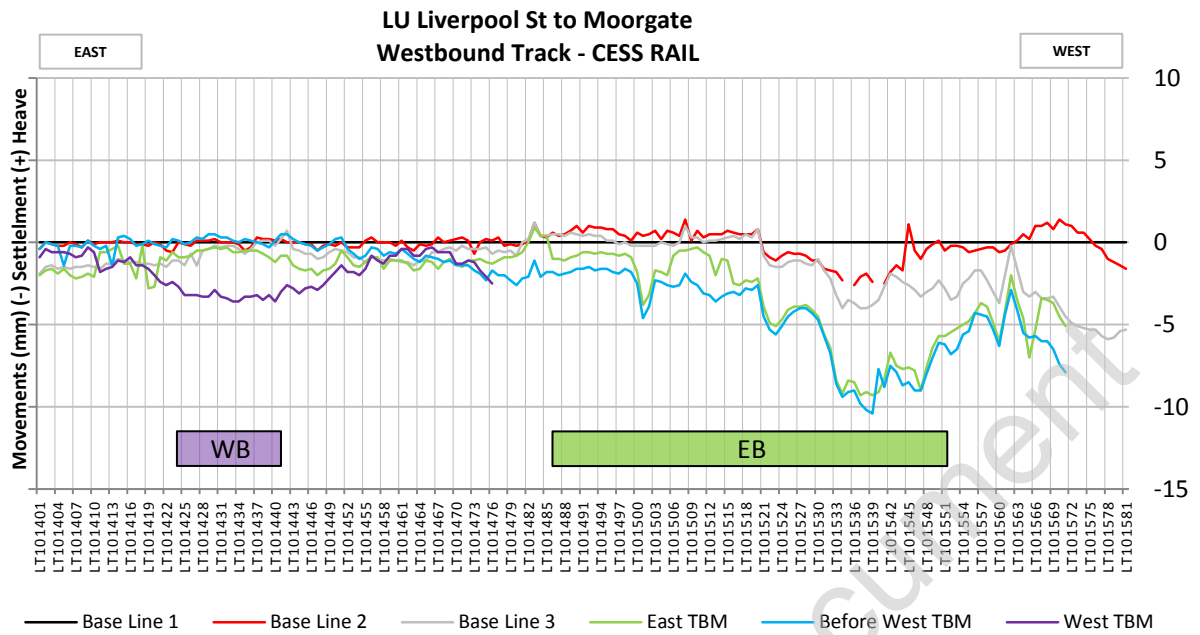
No significant changes of twist or change in cant were detected. The trigger values have been exceeded in some locations due to the previous geometry of the track as indicated in the Base Line Report "C305-XRL-C2-RGN-CR092-50001 LU23 LU/24 Met line east of Liverpool station".

Track Levelling (LU LIVERPOOLSTREET TO MOORGATE WESTBOUND TRACK)

LOCATION:

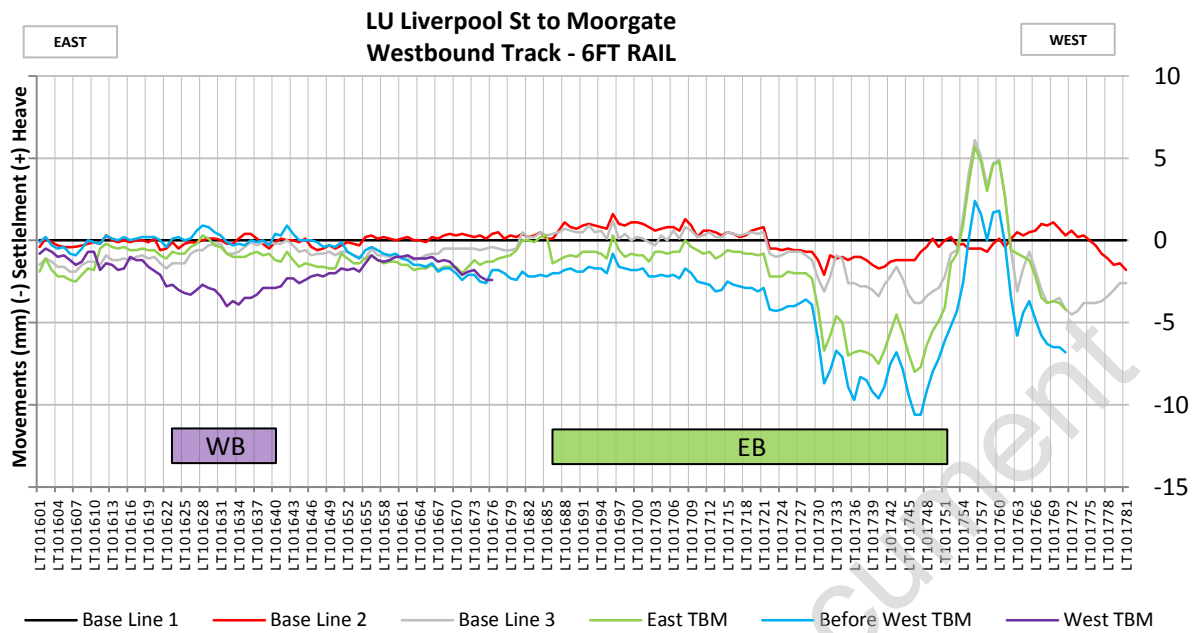


A minimum of three baseline readings were taken before the TBM passage. See below graphs with those readings:



Baseline 3 was affected by works on the rail track carried out by others in the vicinity of the east bound TBM alignment. Therefore the ground movement due to C305 east bound TBM tunnelling is with respect to baseline 3.

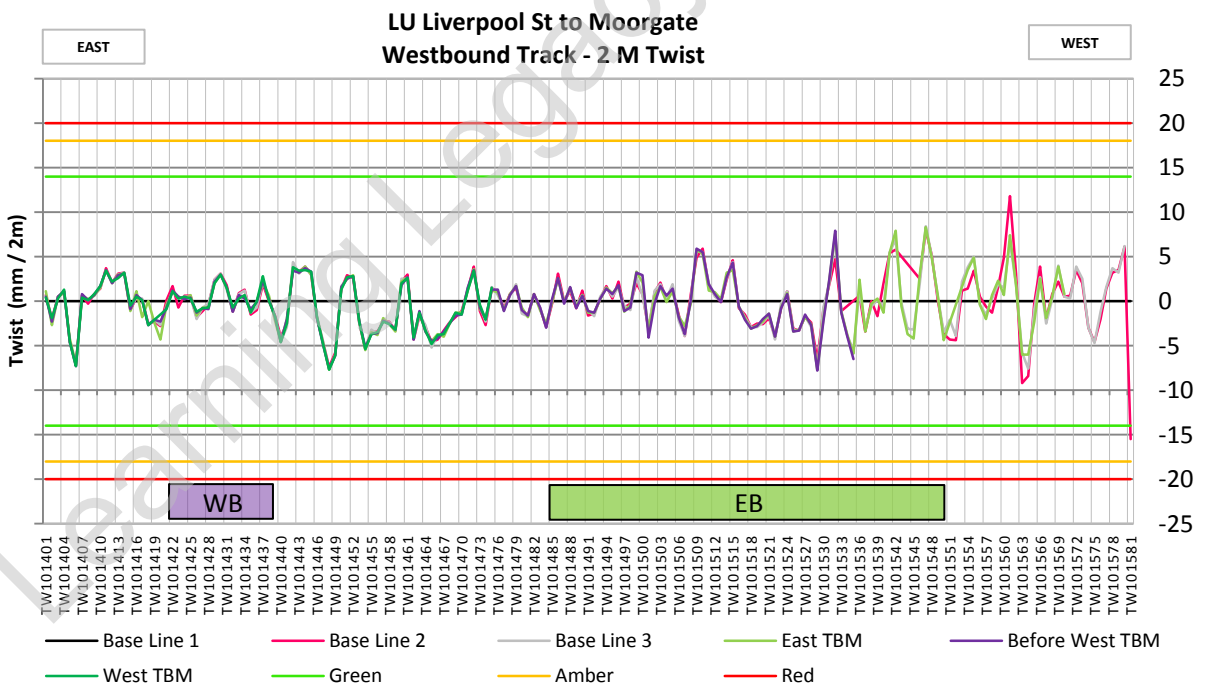
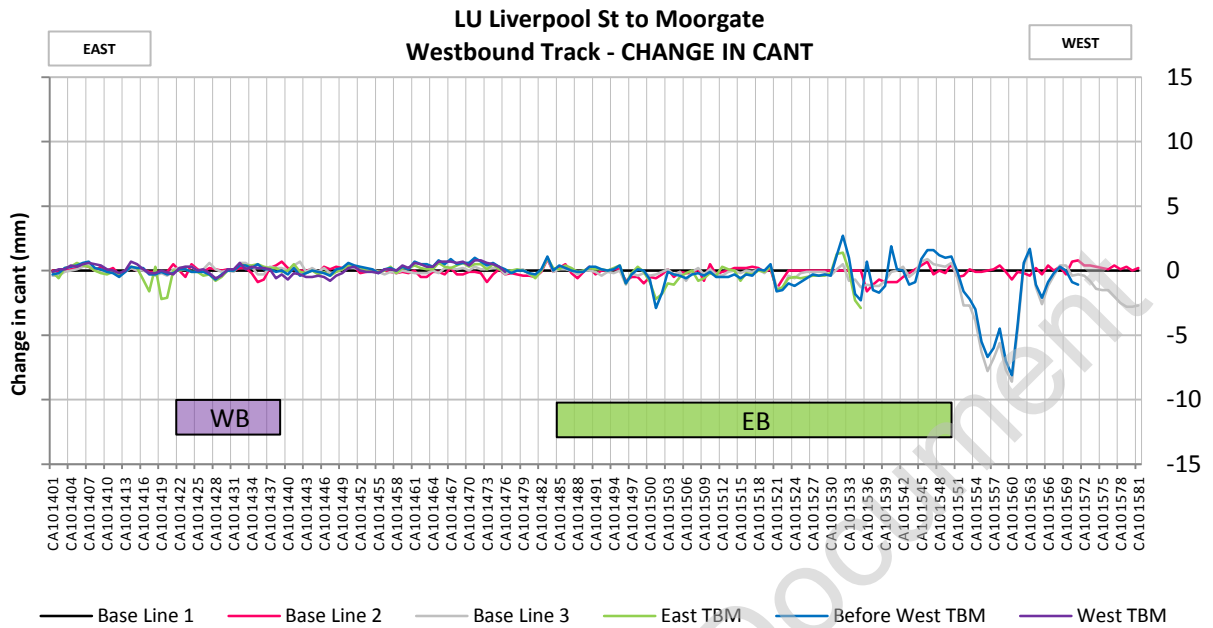
The graph above shows a maximum settlement of approximately 5.1 mm after the Eastbound TBM passage, and a maximum settlement after the Westbound TBM passage of 3.6 mm.

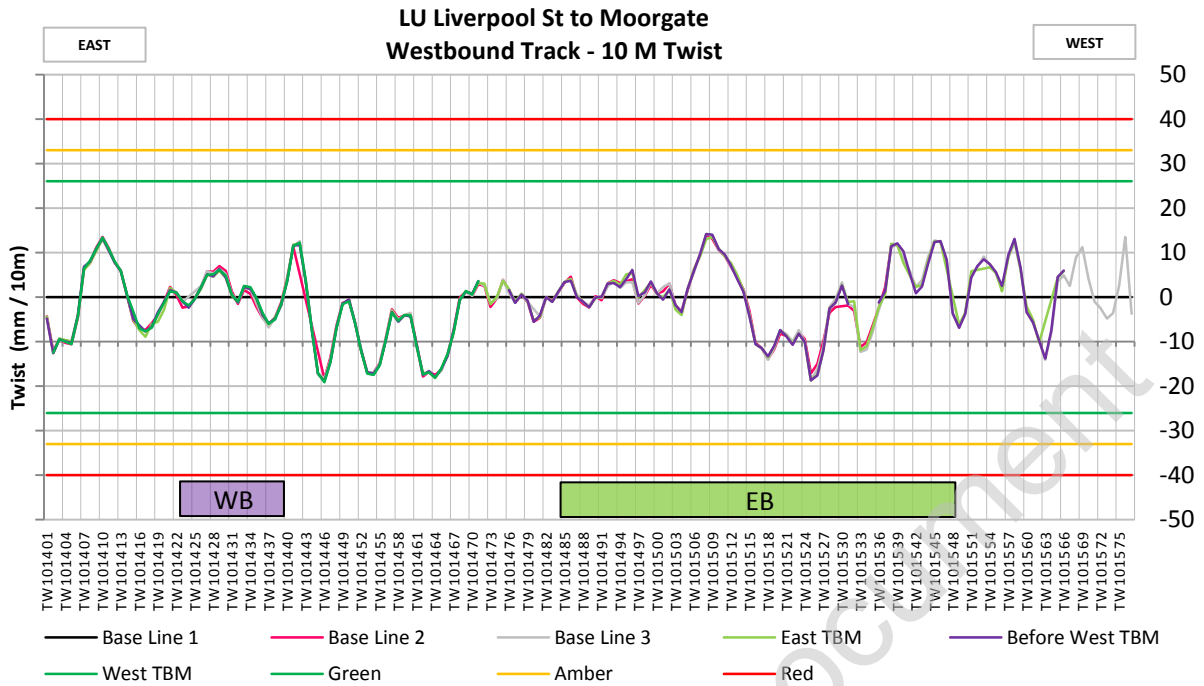


Baseline 3 was affected by works on the rail track carried out by others in the vicinity of the east bound TBM alignment. Therefore the ground movement due to C305 east bound TBM tunnelling is with respect to baseline 3.

The graph above shows a maximum settlement of approximately 4.2 mm after the Eastbound TBM passage, and a maximum settlement after the Westbound TBM passage of 4.0 mm.

The graphs below illustrate the Change in cant and the Twist:





No significant changes of twist or change in cant were detected. The trigger values have been exceeded in some locations due to the previous geometry of the track as indicated in the Base Line Report “C305-XRL-C2-RGN-CR092-50001 LU23 LU/24 Met line east of Liverpool station”.

8. SUMMARY

Review of both C305 manual verification data and C704 data shows that the impact of the C305 works was within the predictions as per the trigger values specified in the I&M Specific Action Plans as included at page 15. Long term movement is at an acceptably small rate, as has been demonstrated in the C704 decommissioning agreement in Appendix A.

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APPENDIX A: DECOMMISSIONING AGREEMENT



Crossrail Delivery – Contract C704

C704 Instrumentation Partial Decommissioning Agreement Central Line Westbound Running Tunnel (LU/22) at Liverpool Street Underground Station

Document Number: C704-XRL-C-AAG-C101-50001

Document History:

Revision	Date:	Prepared by:	Checked by:	Approved by:	Reason for Issue
1.0	29-10-15	Aansan George	Daniele Cravino	Paul Randall	C122/CEG comments incorporated. Issued to LU for approval.
Formal Acceptance by Chief Engineers Group (CEG)				Accepted by:	
				Mike Black	<i>pp J Davis</i>

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Document Template: CRL1-XRL_C3-FM-CP001_2-50001

C704 Instrumentation – Partial Decommissioning Agreement
Central Line Westbound Running Tunnel (LU/22) at Liverpool Street Underground
Station

C704-XRL-C-AAG-C101-50001 Rev1.0

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C704 Instrumentation – Partial Decommissioning Agreement
Central Line Westbound Running Tunnel (LU/22) at Liverpool Street Underground Station

C704-XRL-C-AAG-C101-50001 Rev1.0

1 Purpose

Following detailed assessment of the impact of CRL works on the individual assets by C122 and as part of the resulting risk management strategy, a comprehensive Instrumentation & Monitoring (I&M) system has been installed by C701 in the Central Line running tunnels and on Escalators 4, 5 and 6 at Liverpool Street Underground Station. This LU interface is referred to as LU/22.

The objective of the monitoring regime has been that of automatically and manually monitoring the effects of the excavation-induced movements caused by CRL works on the Asset.

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

The latest CRL activity that affected the Westbound running tunnel was the C305 Westbound TBM drive passing in early March 2015. No remaining CRL works are expected to have an impact on this tunnel. However, the AP8 excavation works by C502, that will allow the connection between the new Broadgate Ticket Hall and the existing LU station, will be completed by early 2016 and they are predicted to affect both the Eastbound running tunnel and Escalators 4, 5 and 6.

This document aims to provide a basis on which all relevant parties can agree on C704 decommissioning of the automatic I&M system from the Central Line Westbound running tunnel. The automatic systems installed in the Eastbound running tunnel and on Escalators 4, 5 and 6 will remain in place until AP8 works have been completed and the post-construction movement has reached a rate that is deemed acceptable.

Given its purpose, the 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. Comments have been provided on the quality, the reliability and the stability of the data collected for the Asset under consideration.

2 Scope

This document covers the extent of the Central Line Westbound running tunnel (Crossover Passage excluded) located at Liverpool Street Underground Station and within the predicted zone of influence of CRL works.

The scope of the installation within LU/22 is defined by the *Preliminary Instrumentation & Monitoring Plan for LU Infrastructure C122-OVE-C2-RGN-C101-50017* and by I&M drawing C122-OVE-C2-DDA-CR001_Z-31113 (see Appendix A) and is shown in Figure 1 below.

The scope covered by the present Partial Decommissioning Agreement includes only the area that extends west from the Western headwalls of Westbound (C102/CWB 0000 - C102/CWB 0180) Central Line running tunnel at Liverpool Street Station.

The Eastbound running tunnel and Escalators 4, 5 and 6 are not covered by the present version of this document.

C704 Instrumentation – Partial Decommissioning Agreement

Central Line Westbound Running Tunnel (LU/22) at Liverpool Street Underground Station

C704-XRL-C-AAG-C101-50001 Rev1.0

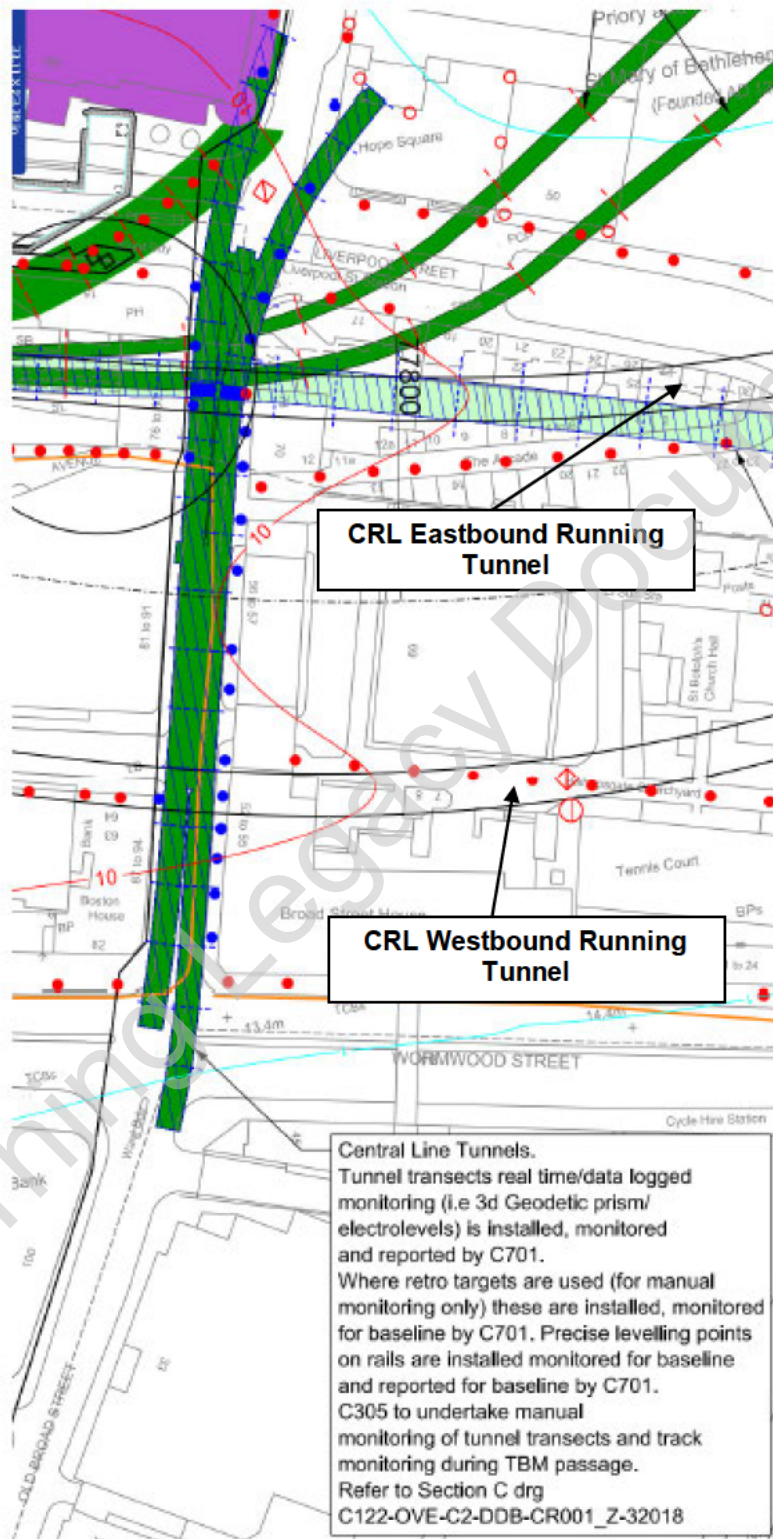


Figure 1: Location Plan for the LU Central Line tunnels within the predicted zone of influence of Crossrail works. (Cyan and Red lines = 1mm and 10mm predicted greenfield ground surface settlement contour plots).

C704 Instrumentation – Partial Decommissioning Agreement
Central Line Westbound Running Tunnel (LU/22) at Liverpool Street Underground Station

C704-XRL-C-AAG-C101-50001 Rev1.0

3 Definitions

Asset	Specific LU interface (LU/22) under consideration. For the purpose of the present version of this document, it comprises only of the Central Line Westbound running tunnel.
BCS	Basset Convergence System.
bgl	below ground level.
CRL	Crossrail.
C122	CRL Contract that assessed excavation-induced ground movements and acts as Designer of C701/C704 I&M systems. C122 assess stability of post-construction monitoring data.
C701	CRL Contract responsible for the installation and maintenance of the automatic I&M system installed in the Asset under consideration.
C704	CRL Contract currently responsible for the maintenance and decommissioning of the automatic I&M system installed by C701 in the Asset under consideration. Power isolation between power source and the power and communications enclosure will be carried out by LUL.
ELB	Electrolevel beam.
ID	Internal diameter.
I&M	Instrumentation & Monitoring.
LUL	London Underground Limited.
PLP	Precise Levelling Point.
Predicted zone of influence of Crossrail works	Area located within the predicted 1mm greenfield ground surface settlement contour associated with Crossrail works.
Relevant parties	Parties requested to formally agree decommissioning of the automatic I&M system presented in this document: <ul style="list-style-type: none">- <i>London Underground Limited (LUL);</i>- <i>CRL Chief Engineers Group (CEG).</i>

4 The Asset under consideration: Central Line Westbound running tunnel

The following sections comprise a brief description of of the Asset under consideration. A brief presentation of the CRL works that have affected this asset is also included.

Further details of LU/22 (including the results of the analytical assessment carried out by CRL in November and December 2010) are included in *C122 Assessment Report: LU/22 Central Line at/near Liverpool Street Station* (C122-OVE-C2-RGN-B071_WS077-50002).

4.1 Asset Description

4.1.1 Central Line Westbound running tunnel

The area under consideration extends west from the Western headwalls of the Westbound (C102/CWB 0000 - C102/CWB 0180) Central Line running tunnel at Liverpool Street Station.

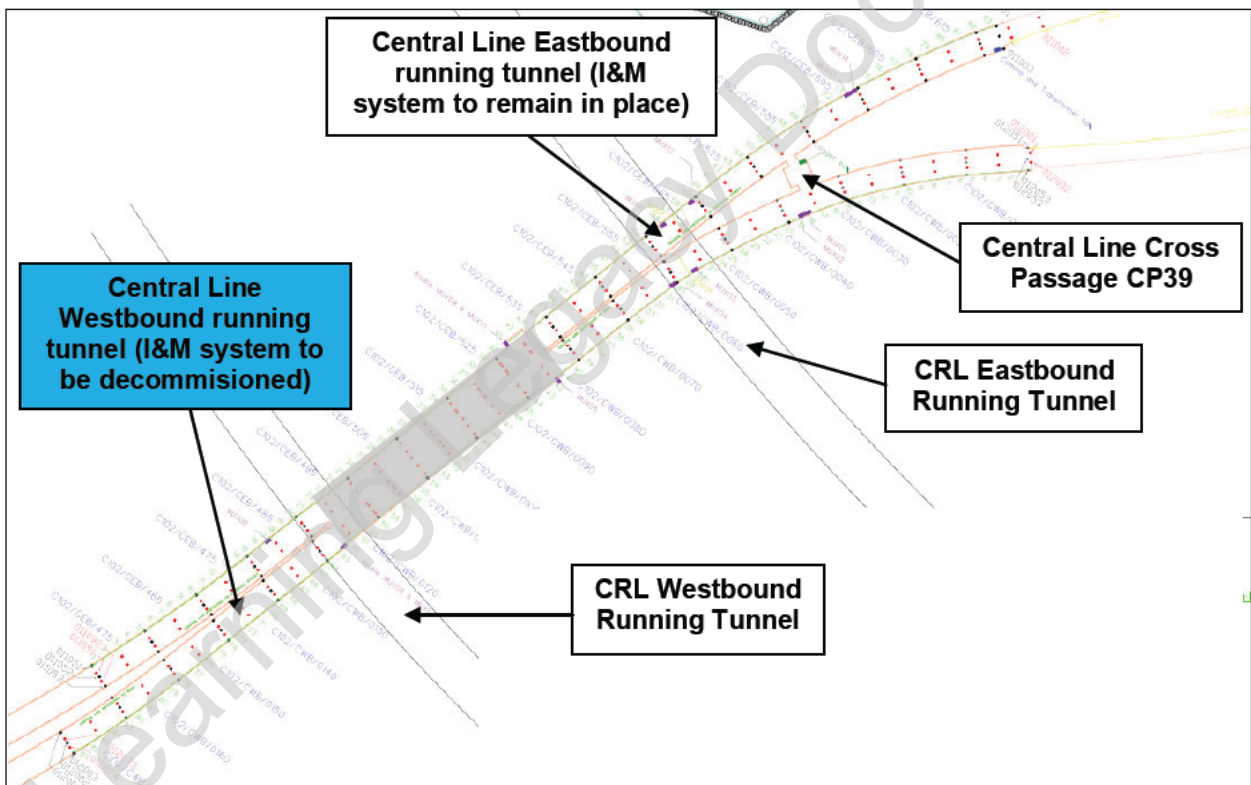


Figure 2: Extent of the Central Line running tunnels monitored by C701/C704. In the present version of this document it is proposed to decommission only the I&M system installed in the Westbound running tunnel.

The Central Line running tunnels generally consist of 12'5" (3810mm) ID bolted grey cast iron lining. They were generally constructed using a six segments (plus key) with machined and bolted radial flanges. However, the central section of the monitored area is a 42m long crossover tunnel (see Figure 1 above) that consists of a 25' (7620mm) ID grey cast iron lining. The tunnel linings are bolted grey cast iron segments. Each ring generally comprises of 14 segments and a key at the crown.

4.2 Crossrail Works affecting the Asset

As shown in Figure 3 below, the CRL works that had the potential of affecting the extent of the Central Line Westbound running tunnel under consideration comprise the following:

- Services shaft, tunnel and corridor;
- Blomfield Box construction (deep excavation);
- Broadgate Ticket Hall with a connecting passageway to the existing Ticket Hall B, and;
- Crossrail bored running tunnels (Drive Y).

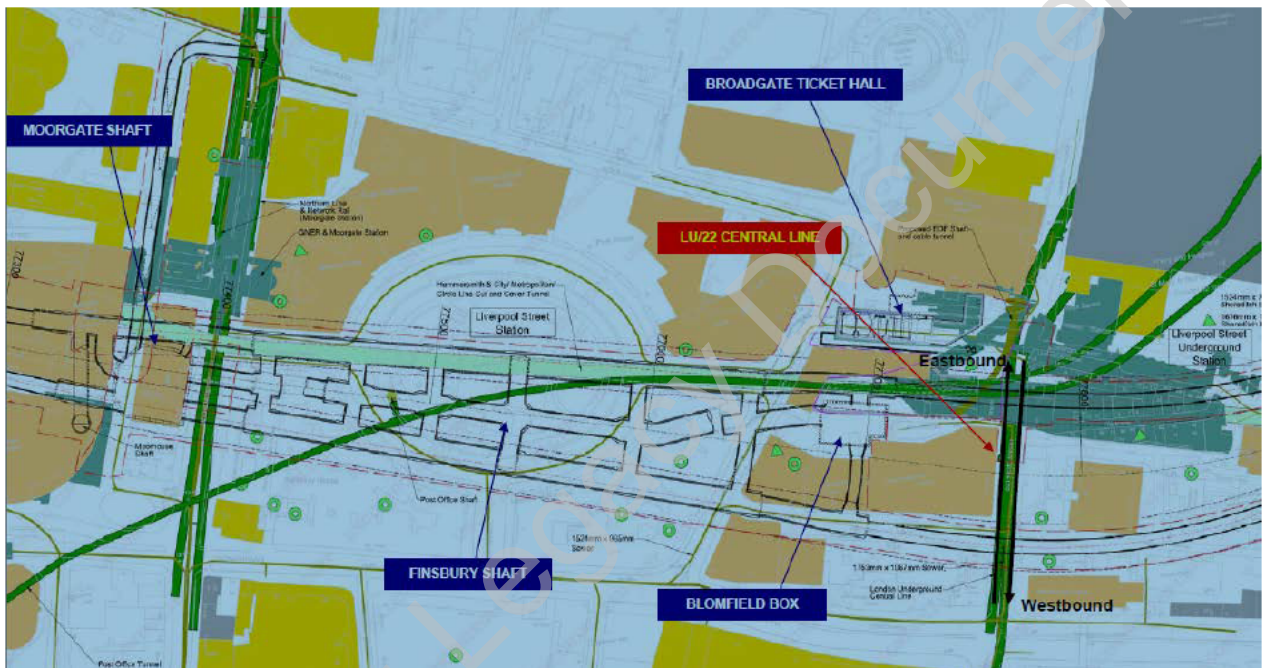


Figure 3: Location Plan for interface between CRL running tunnels and LU Central line EB & WB (based on drawing: C122-OVE-C2-DDA-CR001_Z-21013).

The minimum clearance between CRL works and the Central Line Westbound running tunnel was 10.7m (CRL TBM).

Sprayed concrete lined (SCL) works, including platform tunnels, cross-passages, escalator barrels, ventilation adits and access passages, were located too far from the Westbound running tunnel to cause any significant ground movements as highlighted in *C122 Assessment Report: LU/22 Central Line at/near Liverpool Street Station (C122-OVE-C2-RGN-B071_WS077-50002)*.

5 Predicted impact of CRL Works on the Asset

The methodology used to assess the predicted impact of Crossrail works on LU/22 and a summary of the results of these assessments are presented in *C122 Assessment Report: LU/22 Central Line at/near Liverpool Street Station (C122-OVE-C2-RGN-B071_WS077-50002 Rev 5.0)*.

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Central Line Westbound Running Tunnel (LU/22) at Liverpool Street Underground Station

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6 C701/C704 I&M Systems

The automatic and manual I&M system to be installed in the Central Line Westbound running tunnel was specified on drawing C122-OVE-C2-DDA-CR001_Z-31113.

Monitoring frequencies and trigger values were specified in *Design Consultant Framework Contract C122 – Bored Tunnels: Instrumentation and Monitoring Plan: LU/22 Central Line at/near Liverpool Street Station (C122-OVE-C2-RGN-C101-50017)*.

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

6.1 Central Line Westbound running tunnel

As described in detail in C701-ITM-C-RGN-C101-50006 (C701 Installation Report for LU/22, escalators excluded), the I&M system installed in the Westbound Central Line running tunnels comprises the following:

- 87 No. Electrolevels.
- 7 No. Multiplexer Enclosures.
- 1 No. Data-logger Enclosure installed in the cross passage of the running tunnels. This will have to remain in place to feed the system installed in the Eastbound running tunnel and in the Cross Passage.
- 1 No. Communications and Transformer Enclosure installed on Eastbound Running Tunnel. This will have to remain in place to serve the system installed in the Eastbound running tunnel and in the Cross Passage.
- 1 No. Bassett Convergence System on the Westbound running tunnel.

121 No. Retro Reflective Targets have been installed in the two running tunnels but it is proposed to leave them in place as they are not facing the direction of travel (this has been assessed during the pre-decommissioning site walkthrough).

Further details are included in C701-ITM-O1-GMS-C101-50001 (C701 Method Statement for LU/22).

7 Monitoring Results vs. CRL Construction Works

Design Consultant Framework Contract C122 – Bored Tunnels: Instrumentation and Monitoring Plan: LU/22 Central Line at/near Liverpool Street Station (C122-OVE-C2-RGN-C101-50017) presents trigger values for the following purposes:

- Asset protection;
- Construction control;
- Track Geometry and Tunnel Clearance.

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 the impact of CRL works on the Asset. A summary of current trends for the Central Line Westbound running tunnel is presented in Appendix C.

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The latest (and only) CRL works that have affected this tunnel are dated:

- Late January 2015 (Eastbound TBM drive Y);
- Early March 2015 (Westbound TBM drive Y).

The construction monitoring data recorded by the automatic systems indicate a clear correlation with these two excavation phases.

The data recorded during both construction and closeout monitoring regimes are considered reliable and non construction-related variations are within the expected repeatability for this kind of system. The data collected reflect the effect of the movements induced by the two TBM drives on the tunnel and they are consistent with the manual monitoring results obtained by C305 (not presented in this document).

7.1 Central Line Westbound running tunnels

7.1.1 Electrolevels

The settlement curves associated with the first TBM drive (CRL Eastbound) and with the cumulative effect of both TBM drives are easily identifiable in the data recorded by the electrolevels (installed longitudinally to the tunnel to cover the extent of the predicted zone of influence).

The maximum settlement recorded by this automatic system following the first TBM drive is approx. 5.5mm, while the cumulative vertical displacement due to the combination of the two TBM drives is approx. 7.5mm. The post-TBM drives data collected over the last seven months highlight a total stabilisation.

Results obtained by C305 from manual monitoring have been used to confirm the actual extent of the zone of influence and regularly validate the fixity assumption throughout construction works.

7.1.2 Basset Convergence System

The data collected by the BCS show no significant movement at any time, and the signature of the two relevant construction stages that affected the tunnel is not clearly recognisable.

8 Assessment of Closeout Trends

Following the Westbound TBM drive (early March 2015), the closeout monitoring regime has been implemented and it is currently on-going.

The requirements in terms of duration/frequency for the closeout monitoring regime (minimum 3 months continuous monitoring) have been exceeded.

As highlighted in Section 7 and presented in Appendix C, the signature of the two TBM excavation phases is clearly identifiable in the construction monitoring data of the electrolevels installed in the Westbound running tunnel.

Current closeout trends highlight a total stabilization with residual (post-construction) variations that are lower than the 2mm/year criterion defined by C122 as the trigger for decommissioning (see graphs in Appendix C).

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Central Line Westbound Running Tunnel (LU/22) at Liverpool Street Underground Station

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C122 have confirmed that remaining construction works currently on-going in the area surrounding the Westbound running tunnel have no impact on it.

Based on the above, it is therefore proposed to decommission the I&M automatic system currently installed in the Central Line Westbound running tunnel.

It is proposed to leave the retro targets (installed in the running tunnels) in place as they are not facing the direction of travel (this has been assessed during the pre-decommissioning site walkthrough).

Decommissioning of the I&M systems installed in the remaining assets included in LU/22 (Eastbound running tunnel and Escalators 4, 5 and 6) will be carried out once the AP8 excavation works by C502 (see Figure 4 below) have been completed (expected early 2016) and the post-construction movement has reached a rate that is deemed acceptable. This second phase of decommissioning within LU/22 will be covered by the next revision of this document.

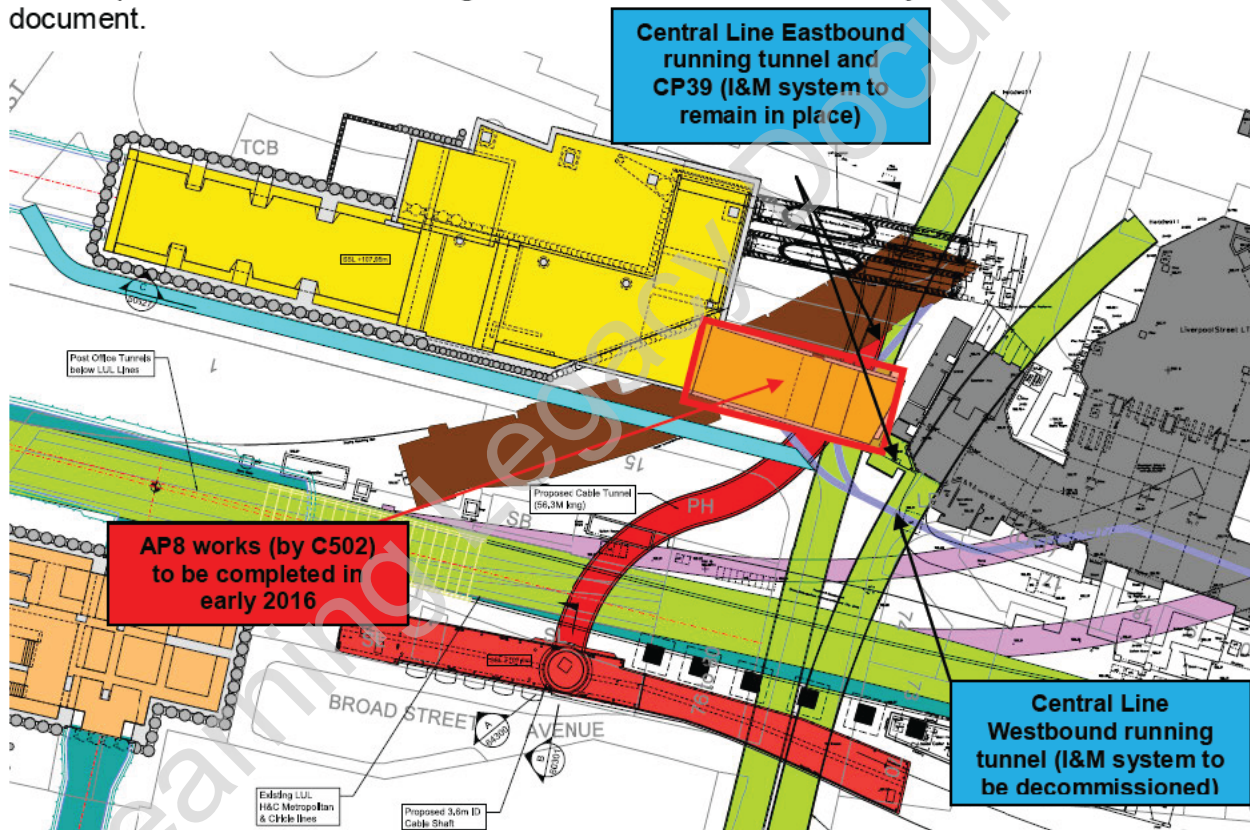


Figure 4: Location Plan showing AP8 works that are expected to affect the Central Line Eastbound running tunnel and Escalators 4, 5 and 6 (but not on the Westbound running tunnel). AP8 is a cut and cover tunnel to approx. 5m bgl with piles extending deeper. Central line running tunnels are approx. 19-20m bgl. This plan is taken from drawing C122-OVE-C2-DDB-CR001_Z-32018.

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Central Line Westbound Running Tunnel (LU/22) at Liverpool Street Underground Station

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9 Reference Documents

- C701-ITM-O1-GMS-C101-50001 (C701 Method Statement for LU/22)
- C701-ITM-C-RGN-C101-50006 (C701 Installation Report for LU/22)
- C122-OVE-C2-RGN-B071_WS077-50002 (C122 Assessment for LU/22)
- C122-OVE-C2-RGN-C101-50017 (C122 I&M Plan for LU/22)
- C122-OVE-C2-DDA-CR001_Z-31113 (C122 I&M Drawing)

10 Appendices

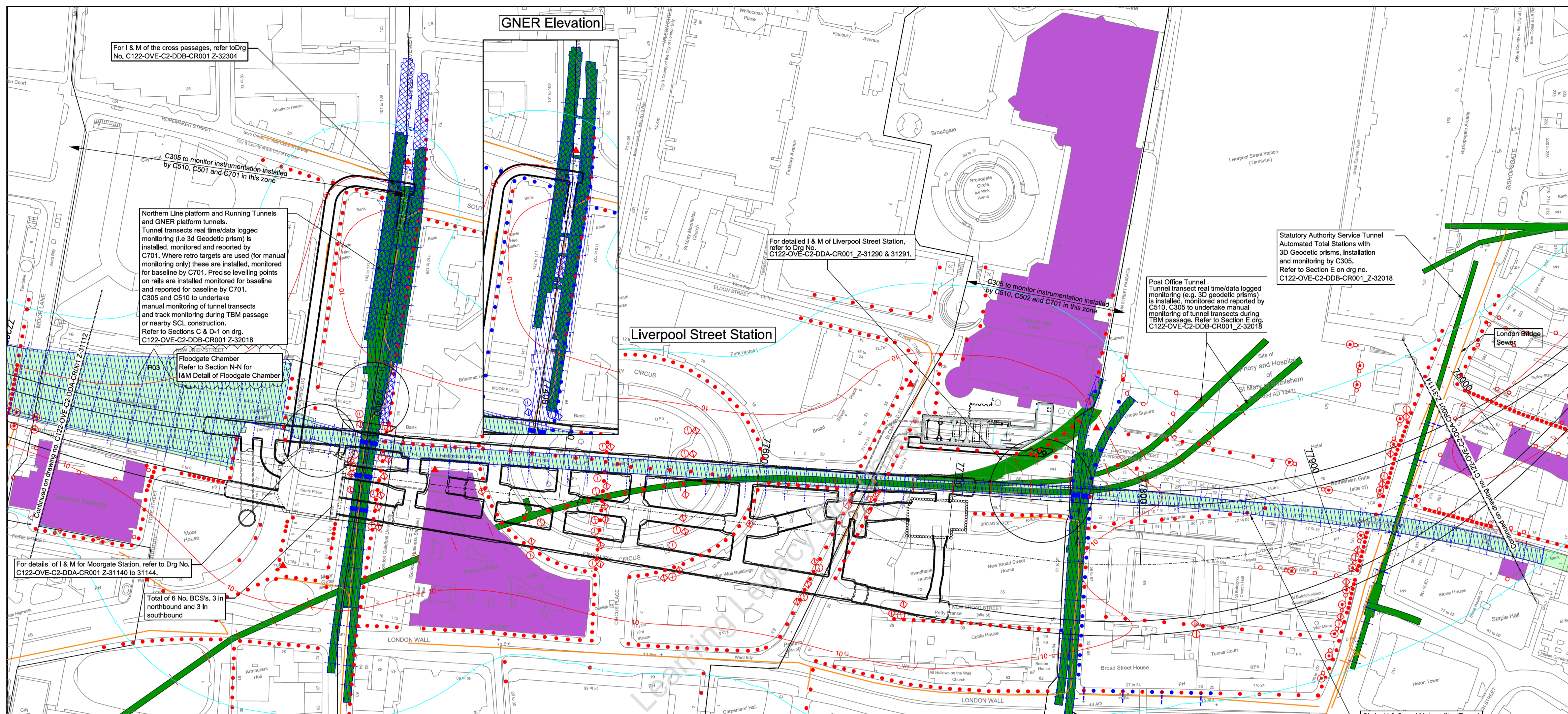
Appendix A – I&M Drawing

Appendix B – I&M As-Built Drawing

Appendix C – Summary of monitoring results for the Central Line Westbound running tunnel

APPENDIX A

Learning Legacy Document



For I & M of the cross passages, refer to Drg No. C122-OVE-C2-DDB-CR001 Z-32304

Northern Line platform and Running Tunnels and GNER platform tunnels. Tunnel transects real time/data logged monitoring (i.e. 3d Geodetic prism) is installed, monitored and reported by C701. Where retro targets are used (for manual monitoring only) these are installed, monitored for baseline by C701. Precise levelling points on rails are installed monitored for baseline and reported for baseline by C701. C305 and C510 to undertake manual monitoring of tunnel transects and track monitoring during TBM passage or nearby SCL construction. Refer to Sections C & D-1 on drg. C122-OVE-C2-DDB-CR001 Z-32018

Floodgate Chamber Refer to Section N-N for I&M Detail of Floodgate Chamber

For details of I & M for Moorgate Station, refer to Drg No. C122-OVE-C2-DDA-CR001 Z-31140 to 31144.

Total of 6 No. BCS's. 3 in northbound and 3 in southbound

GNER Elevation

Liverpool Street Station

For detailed I & M of Liverpool Street Station, refer to Drg No. C122-OVE-C2-DDA-CR001 Z-31290 & 31291.

C305 to monitor instrumentation installed by C510, C502 and C701 in this zone

Post Office Tunnel Tunnel transect real time/data logged monitoring (i.e. 3d geodetic prisms) is installed, monitored and reported by C510. C305 to undertake manual monitoring of tunnel transects during TBM passage. Refer to Section E drg. C122-OVE-C2-DDB-CR001 Z-32018

Statutory Authority Service Tunnel Automated Total Stations with 3D Geodetic prisms, installation and monitoring by C305. Refer to Section E on drg no. C122-OVE-C2-DDB-CR001 Z-32018

Circle, H & C and Metropolitan Tunnel Tunnel transects real time/data logged monitoring (i.e. 3d Geodetic prism/ATS) is installed, monitored and reported by C701. Precise levelling points on rails are installed and baselined by C701. C305 to undertake manual monitoring of tunnel transects during TBM passage. C305 to undertake manual track monitoring. Refer to Section B on drg no. C122-OVE-C2-DDB-CR001 Z-32018

Central Line Tunnels. Tunnel transects real time/data logged monitoring (i.e. 3d Geodetic prism/ electrolevels) is installed, monitored and reported by C701. Where retro targets are used (for manual monitoring only) these are installed, monitored for baseline by C701. Precise levelling points on rails are installed monitored for baseline and reported for baseline by C701. C305 to undertake manual monitoring of tunnel transects and track monitoring during TBM passage. Refer to Section C drg C122-OVE-C2-DDB-CR001 Z-32018

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 Notes Drawing (cited 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-LRG-CRG02-00001. 3. 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. 4. These notes are based on experienced and competent contractors carrying out the works using an approved safe method of working.

Legend

Parties Responsible for the installation of the I & M

- C701
- Others

General

- Tunnel Alignment
- Track shoe monitoring at 2m centres Shading omitted from plans of tube tunnels for clarity
- Track shoe monitoring at 3m centres Shading omitted from plans of tube tunnels for clarity

Settlement Contours

- 1mm Settlement Contour
- 10mm Settlement Contour

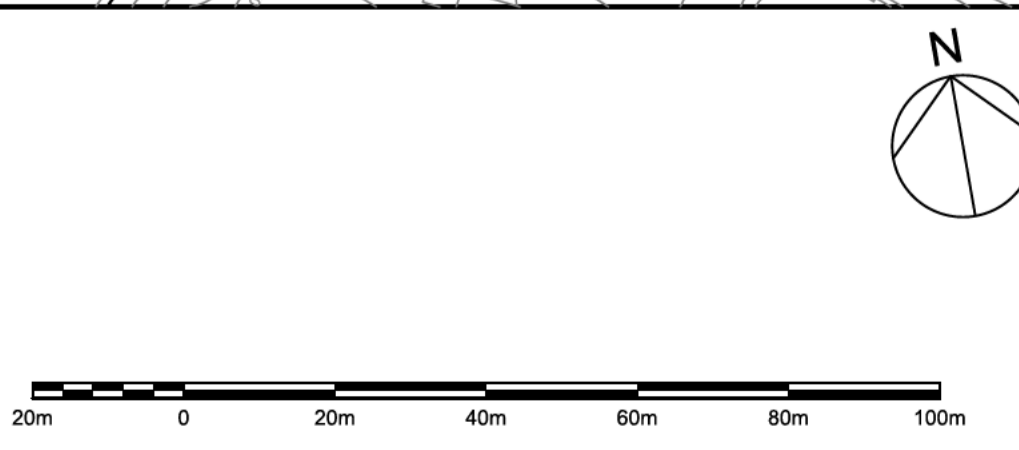
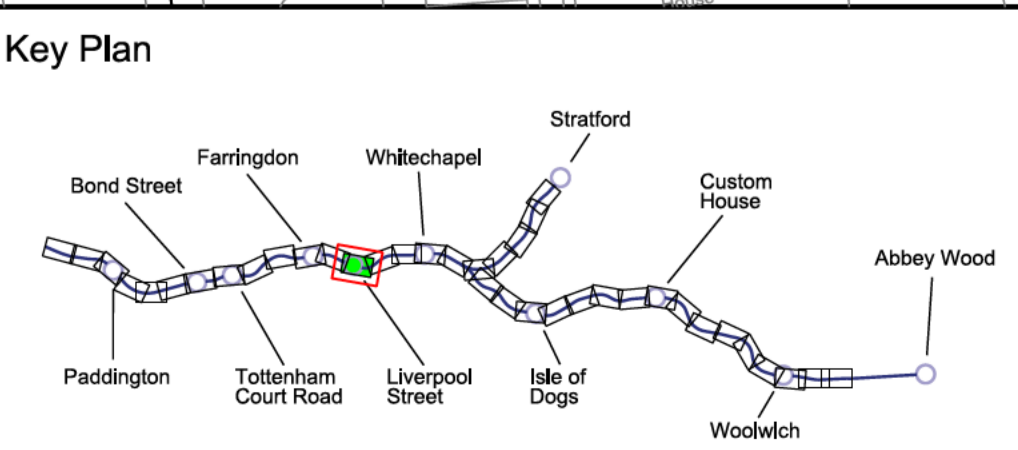
Existing Structures

- Bored Tunnels
- Cut & Cover Tunnels
- Structures with I & M Commitments
- Mains Sewer (greater than 1.5m²)

Instruments and Monitors

- Automated Total Station
- Basset Convergence System
- Electrolevel Beams
- Extensometer - Rod
- Inclinometer
- Inclinometer - Electrolevels
- Piezometer - Vibrating Wire
- 3D Geodetic Prisms
- Sockets - BRE Type - Structure
- Studs - Precise Ground Levelling
- Sparse Monitoring Point
- Monitoring Transect in Tunnels
- Deep Datum

Notes
1. For Instrumentation & Monitoring general notes, schedule and monitoring frequency, refer to Drg Nos. C122-OVE-DDJ-CR001 Z-31002 and C122-OVE-DDJ-CR001 Z-31007.



Crossrail

Contract 1: Bored Tunnels (Alignment and Track)
 Original: Ove Arup & Partners Limited
 Location: Crossrail General
 Title: Instrumentation & Monitoring Combined I & M Routewide Plan Sheet 13 of 38 C701
 Scale: 1:1000@A1
 Drawing and CAD file No: C122-OVE-C2-DDA-CR001 Z-3113
 Rev: C02
 Submittal: A

By: G.KAVANAGH
 CHK: J.APTE
 App: R.MCCRAE
 Auth: C.THOMAS

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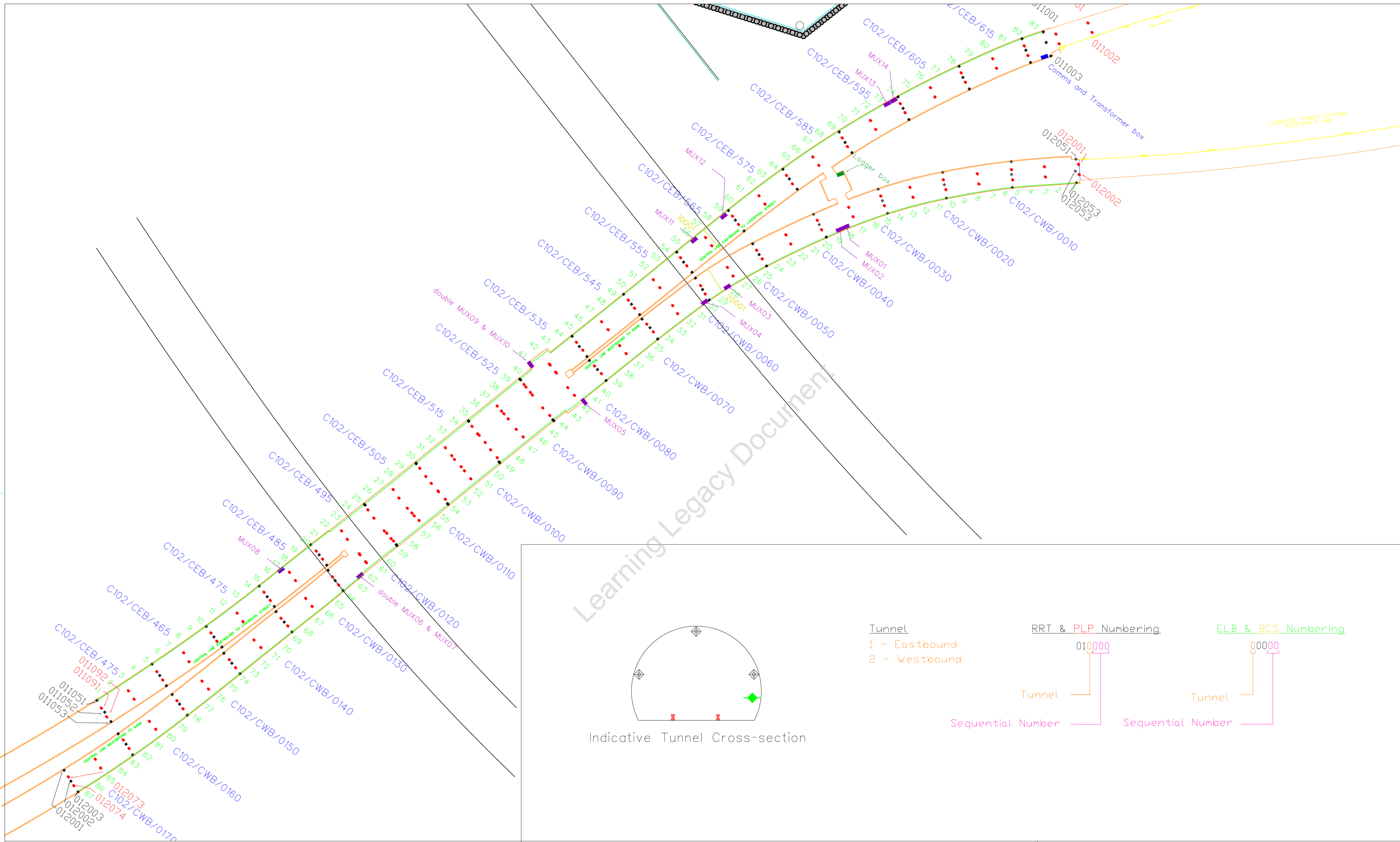
Rev.	Date	Description	By	Chkd	App	Auth
P01	03/11/2010	First Issue	JG	RB	RM	-
P02	14/10/2011	Minimum requirement for Instrumentation and Monitoring	AR	JA	SR	-
C01	09/11/2011	Issued as FIR for construction	AR	JA	SR	IT
P03	10/12/2012	Issued as FIR for construction	GK	JA	RM	-
C02	14/01/2013	Issued as FIR for construction	GK	JA	RM	CT

***C704 Instrumentation – Partial Decommissioning Agreement
Central Line Westbound Running Tunnel (LU/22) at Liverpool Street Underground
Station***

C704-XRL-C-AAG-C101-50001 Rev1.0

APPENDIX B

Learning Legacy Document



Indicative Tunnel Cross-section

Tunnel

1 - Eastbound

2 - Westbound

RRT & PLP Numbering

Tunnel Sequential Number: 010000

ELB & BCS Numbering

Tunnel Sequential Number: 00000

Notes

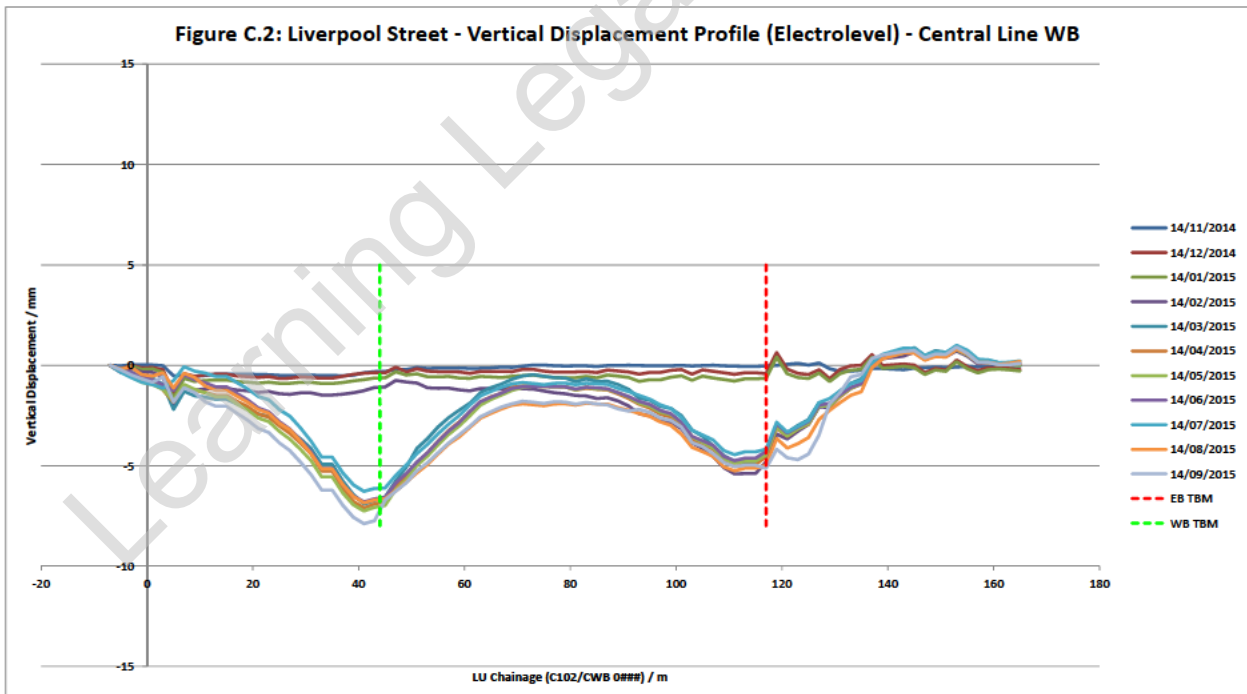
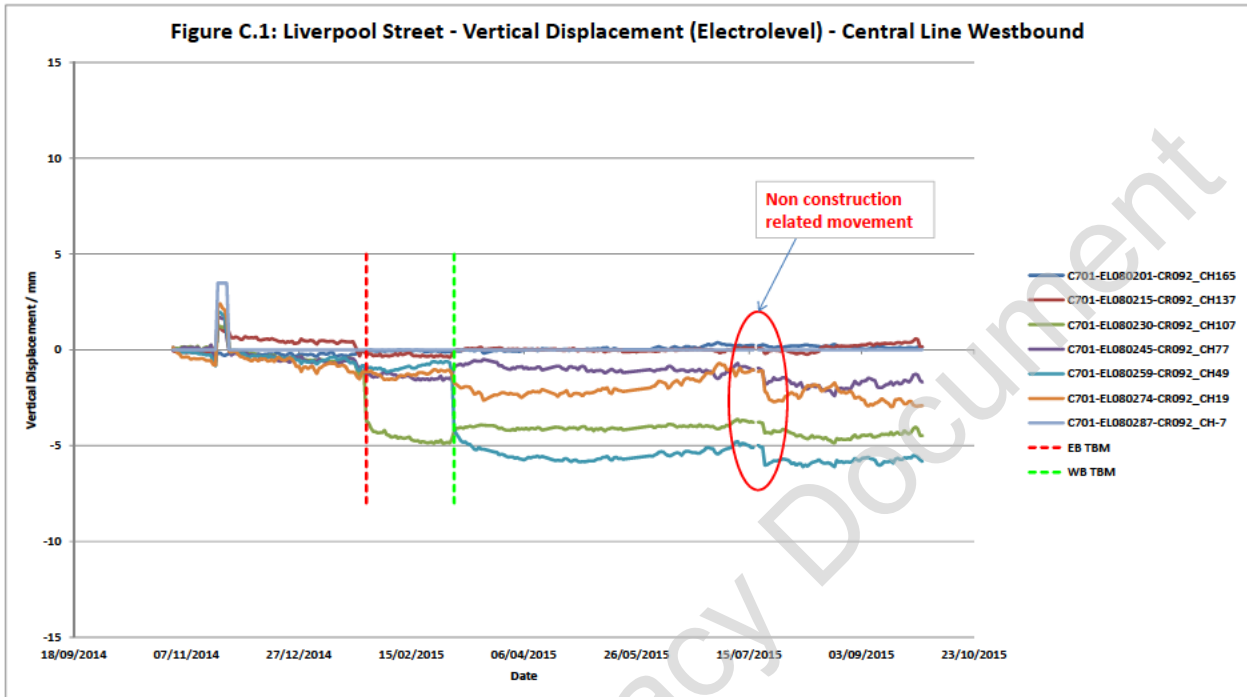
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- 2- For RRTs - add C701-RRxxxxxx-CR092 to obtain Crossrail number
- 3- For ELBs - add C701-EL100xx-CR092 to obtain Crossrail number (eastbound)
- 4- For ELBs - add C701-EL200xx-CR092 to obtain Crossrail number (westbound)
- 5- For BCSs - add C701-BCxxxxxx-CR092 to obtain Crossrail number

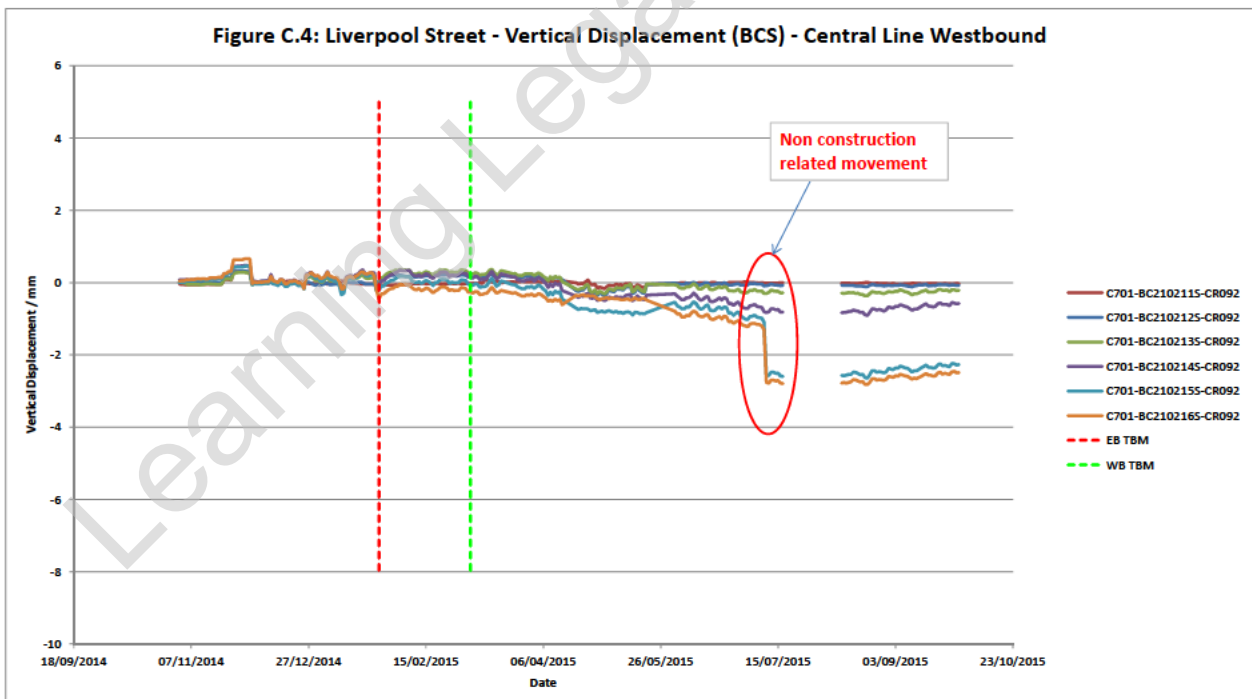
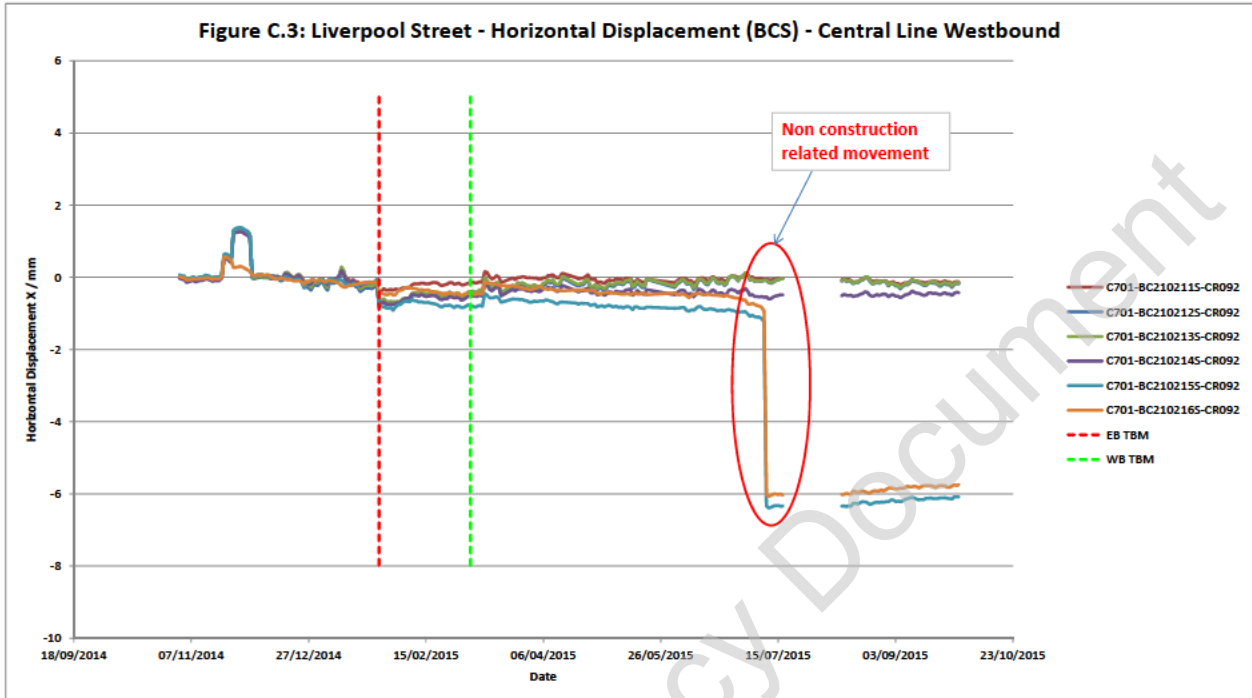
- Legend**
- Precise Levelling Point
 - Multiplex Box
 - Data Logger Box
 - ⊠ Reflective Retro Target - indicative location only
 - ◆ Electrolevel Beam
 - Communications & Transformer Box
 - Bassett Convergence System

itmsoil		itmsoil UCKFIELD EAST SUSSEX TN22 1QL ENGLAND Tel: +44(0)1825 765044 Fax: +44(0)1825 761740		
Drawn	CC	Title		
Checked	JD	C701-ITM-LIV-UND-0001 Liverpool Street Central Line Instrumentation Layout		
Date	25-03-12	Paper	Drawing No.	Sheet
Rev	07	A3	C701-ITM-LIS_UND-001	01
Scale	NTS	Job Number 228		

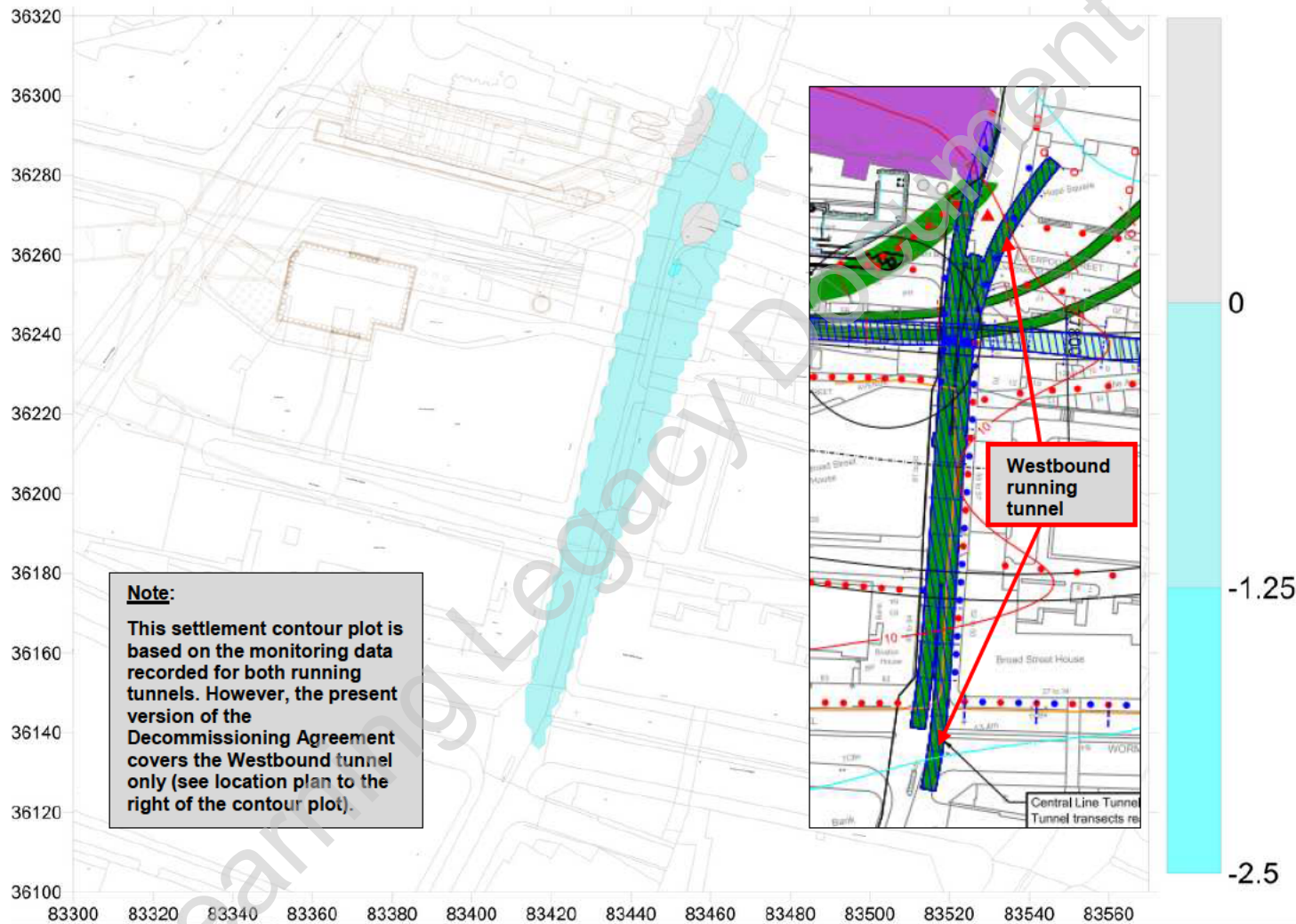
APPENDIX C

Learning Legacy Document





Differential Movement Z (mm) from 14/06/2015 to 14/09/2015 - Tunnel



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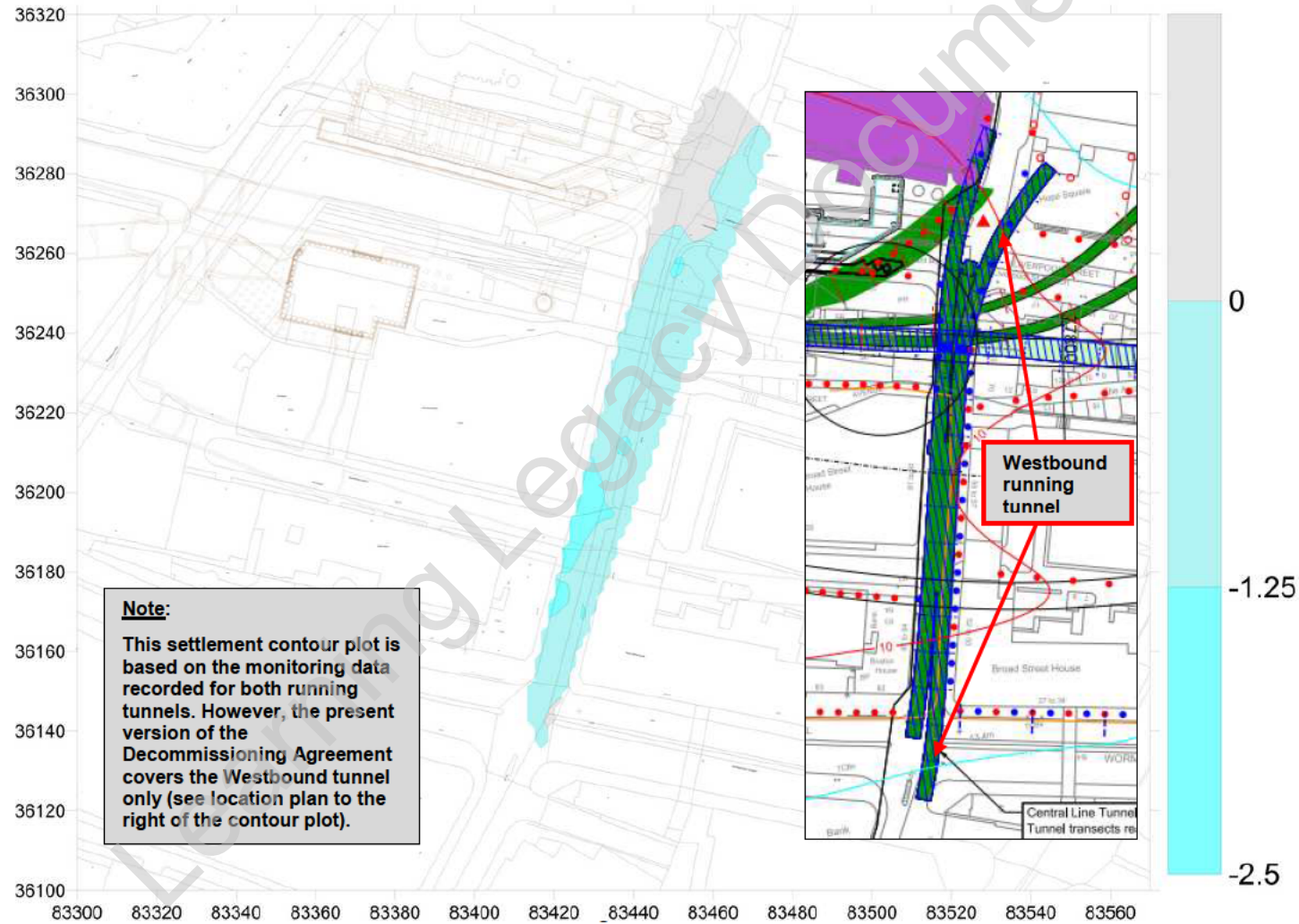
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Document Template: CRL1-XRL-Z3-ZFM-CR001_Z-50001

C704 Instrumentation – Partial Decommissioning Agreement
Central Line Westbound Running Tunnel (LU/22) at Liverpool Street Underground Station
C704-XRL-C-AAG-C101-50001 Rev1.0

Differential Movement Z (mm) from 14/03/2015 to 14/09/2015 - Tunnel



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Crossrail Delivery – Contract C704

C704 Instrumentation Decommissioning Agreement Circle, H&C and Metropolitan Line East of Liverpool Street Underground Station (LU/24)

Document Number: C704-XRL-C-AAG-CR092-50001

Document History:

Revision	Date:	Prepared by:	Checked by:	Approved by:	Reason for Issue
1.0	30-07-15	Daniele Cravino	Paul Randall	Mike Groves	C122/CEG comments incorporated. Issued to LU.
Formal Acceptance by Chief Engineers Group (CEG)				Accepted by:	
				Mike Black	M. Black

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Document Template: CRL1-XRL-Z3-ZFM-CR001_Z-50001

C704 Instrumentation - Decommissioning Agreement

**Circle, H&C and Metropolitan Line – East of Liverpool Street Underground Station
(LU/24)**

C704-XRL-C-AAG-CR092-50001 Rev1.0

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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 a section of the Circle, H&C and Metropolitan Line Running Tunnel located to the East of Liverpool Street Underground Station (LU/24). The objective of the monitoring regime has been that of automatically and manually monitoring the effects of the excavation-induced movements caused by Crossrail works on the Asset.

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

The latest CRL work that affected the Asset was the C305 Westbound TBM drive passing at the end of February 2015.

This document aims to provide a basis on which all relevant parties can agree on C704 decommissioning of the automatic I&M system from the Asset.

Given its purpose, the 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. Comments have been provided on the quality and the reliability of the data collected, but any engineering considerations with regards to the impact induced by CRL works on the Assets and to the residual risk (associated with long term movements/deformations) to the Assets will be provided by the Main Contractors' close-out/final reports in consultation with CRL.

2 Scope

This document covers the extent of the Circle, H&C and Metropolitan Line Running Tunnel located to the East of Liverpool Street Underground Station and within the predicted zone of influence of Crossrail works. This LU interface is referred to as LU/24 as defined in C704 Affected Property List..

The scope of the installation is defined by the *Preliminary Instrumentation & Monitoring Plan for LU Infrastructure* C122-OVE-C2-TPL-CRG03-00003 and by I&M drawings C122-OVE-C2-DDA-CR001_Z-31113 and C122-OVE-C2-DDA-CR001_Z-31114 (see Appendix A), as shown in Figures 1 and 2 below.

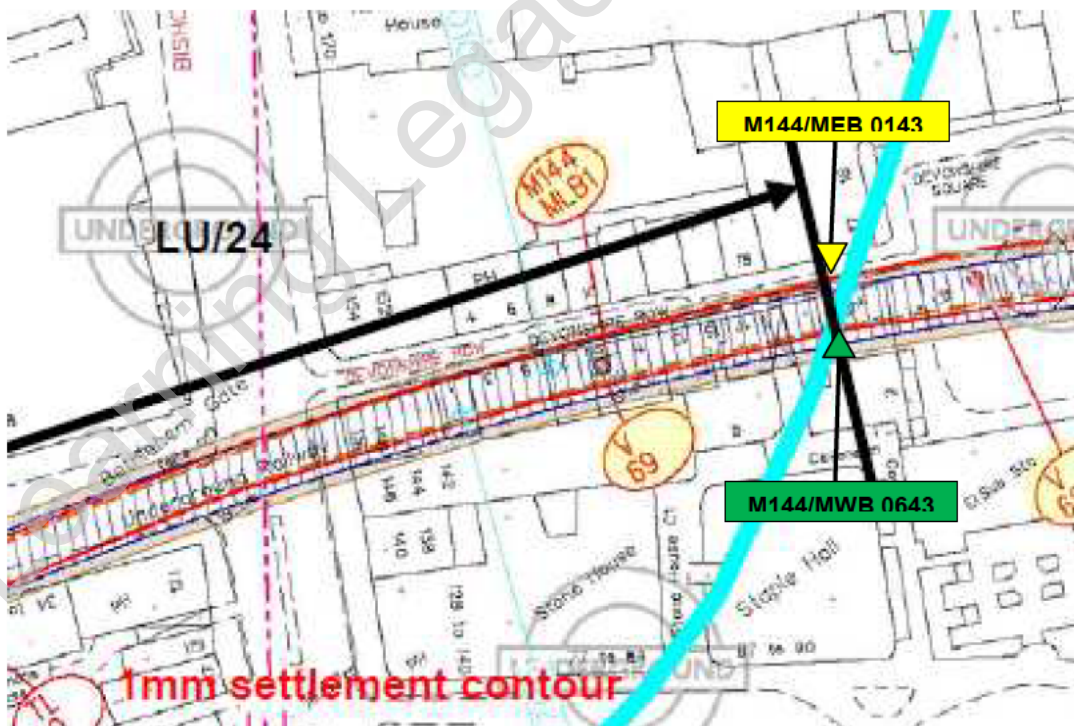
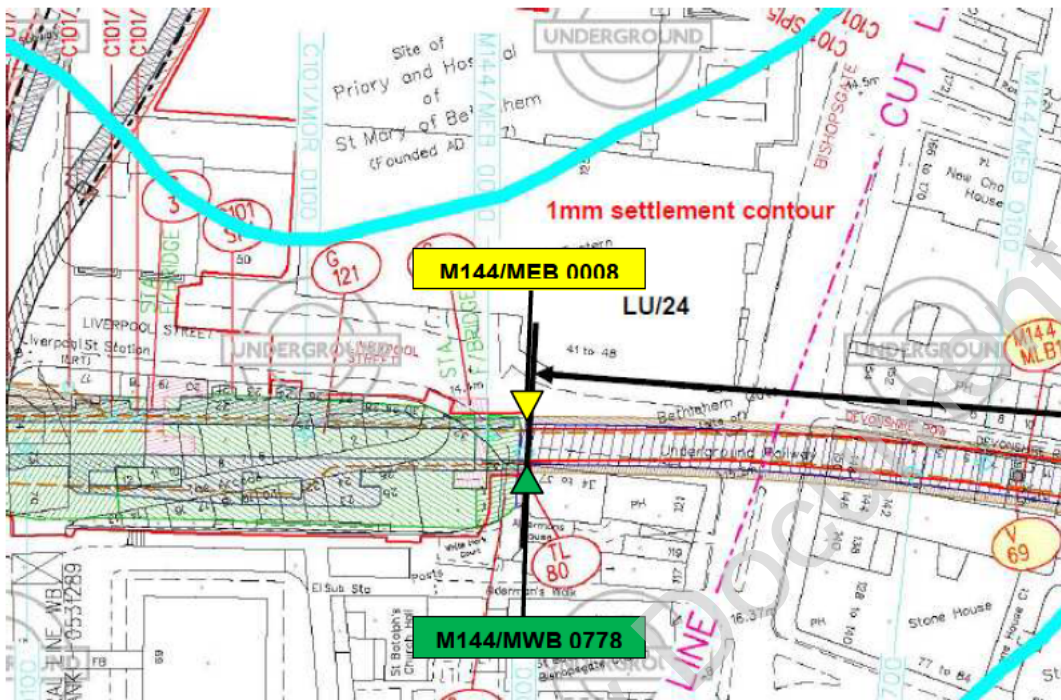
This includes the portion of the Circle, H&C and Metropolitan Line Running Tunnel that extends East of Liverpool Street Station:

- Eastbound: M144/MEB 0008 to M144/MEB 0178
- Westbound: M144/MWB 0778 to M144/MWB 0608

C704 Instrumentation - Decommissioning Agreement

**Circle, H&C and Metropolitan Line – East of Liverpool Street Underground Station
(LU/24)**

C704-XRL-C-AAG-CR092-50001 Rev1.0



Figures 1 (above) & 2 (below): Location plans for LU/24 (Circle, H&C and Metropolitan Line Running Tunnel located to the East of Liverpool Street Station, within the predicted zone of influence of Crossrail works). (Cyan line = 1mm predicted greenfield ground surface settlement contour plot). The monitored area extends further to the East (35m beyond the 1mm contour).

C704 Instrumentation - Decommissioning Agreement

**Circle, H&C and Metropolitan Line – East of Liverpool Street Underground Station
(LU/24)**

C704-XRL-C-AAG-CR092-50001 Rev1.0

3 Definitions

Asset	Specific LU interface (LU/24, located to the East of Liverpool Street Station) covered by this document, that comprises the section of the Circle, H&C and Metropolitan Line Running Tunnel located to the East of Liverpool Street Underground Station and within the predicted zone of influence of Crossrail works.
CRL	Crossrail.
C122	CRL Contract that assessed excavation-induced ground movements and acts as Designer of C701/C704 I&M systems. C122 assess stability of post-construction monitoring data and confirm no objection to decommissioning of C701/C704 systems.
C701	CRL Contract responsible for the installation and maintenance of the automatic I&M system installed in the Asset under consideration.
C704	CRL Contract currently responsible for the maintenance and decommissioning of the automatic I&M system installed by C701 in the Asset under consideration. Power isolation between power source and the power and communications enclosure will be carried out by LUL.
I&M	Instrumentation & Monitoring.
LUL	London Underground Limited.
Predicted zone of influence of Crossrail works	Area located within the predicted 1mm greenfield ground surface settlement contour associated with Crossrail works.
Relevant parties	Parties requested to formally agree decommissioning of the automatic I&M system presented in this document: <ul style="list-style-type: none">- <i>London Underground Limited (LUL);</i>- <i>CRL Chief Engineers Group (CEG).</i>

4 The Asset: Circle, H&C and Metropolitan Lines Running Tunnel to the East of Liverpool Street Station (LU/24)

The following sections comprise a brief description of the Asset under consideration, as defined in Section 3. A presentation of the Crossrail works that have affected this asset is also included.

Further details for LU/24 are included in *C122 Ground Movement Assessment for LU/24* (C122-OVE-C2-RGN-C101-50001) where results of the analytical assessment carried out by C122 in November 2010 are presented.

4.1 Asset Description

As shown in Figures 1 & 2 above, the area under consideration is the portion of the Circle, H&C and Metropolitan Lines Running Tunnel that extends East of Liverpool Street Station:

- Eastbound: M144/MEB 0008 to M144/MEB 0178
- Westbound: M144/MWB 0778 to M144/MWB 0608

The tunnel (M144/TL77) contains the Eastbound and Westbound tracks running beneath Liverpool Street, Bishopsgate, Devonshire Row, Devonshire Square and Harrow Place between the existing LU Liverpool Street and Aldgate stations. The tunnel also carries the Hammersmith and City line, which runs the full length of the tunnel before branching off to Aldgate East station. The HMC lines tunnel was constructed using the cut-and-cover technique, with a cover of about 1.0m to 3.2m above the tunnel crown.

The crown arch of the tunnel is semi-circular in shape, comprising a 0.56m (1.8ft) thick (five-ring) stock brick arch barrel springing from curved brick side walls. The tunnel has a uniform cross-section between LU Liverpool Street and Aldgate stations. The full length of the tunnel is 308m approximately. However, only a length of about 135m falls within the zone of influence of CRL works.

4.2 Crossrail Works affecting the Assets

As shown in Figure 3 below, the CRL works that have affected LU/24 comprise the construction of 6.8m outer diameter segmental concrete lining tunnels east of Liverpool Street station (Westbound and Eastbound).

The CRL EB running tunnel will pass beneath the HMC lines tunnel with a minimum offset of 14m approximately (to the north), whereas the WB running tunnel crosses the HMC lines tunnel (see Figure 5 below).

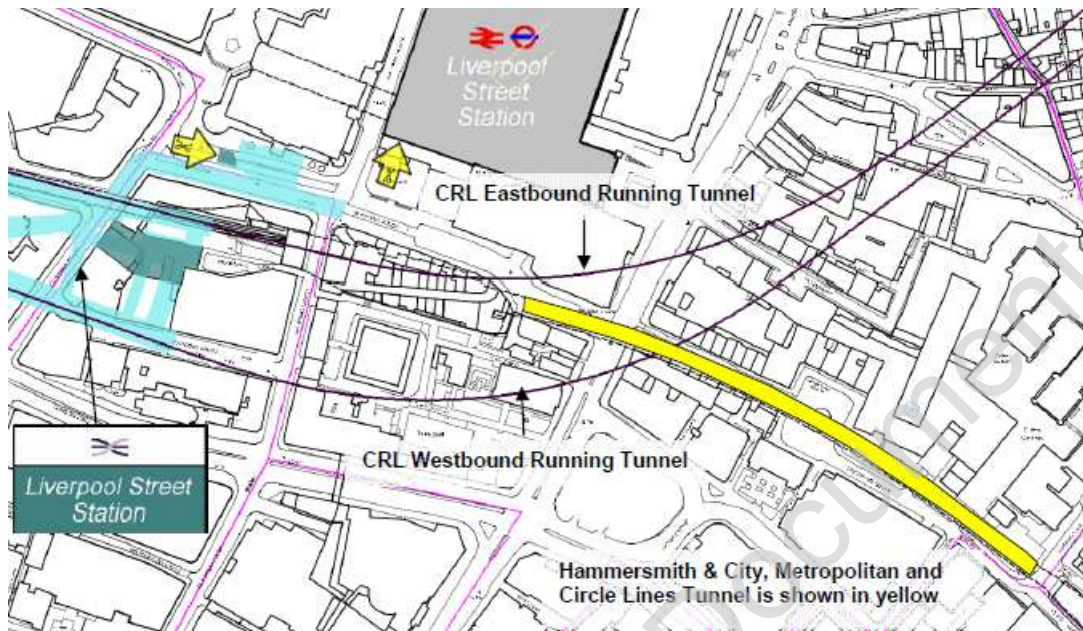


Figure 3: Location Plan for LU/24 (highlighted in yellow).

5 Predicted impact of CRL Works on the Asset

The methodology used to assess the predicted impact of Crossrail works on LU/24 and a summary of the results of these assessments are presented in *C122 Assessment Report: LU/24 Metropolitan Line East of Liverpool Street Station* (C122-OVE-C2-RGN-C101-50001).

6 C701/C704 I&M Systems

The automatic and manual I&M system to be installed in the assets under consideration was specified on drawings C122-OVE-C2-DDA-CR001_Z-31113 and C122-OVE-C2-DDA-CR001_Z-31114.

Monitoring frequencies and trigger values were specified in *Design Consultant Framework Contract C122 – Bored Tunnels: Instrumentation and Monitoring Plan: LU/24 Metropolitan Line East of Liverpool Street Station* (C122-OVE-C2-RGN-C101-50019).

The installation of this system in LU/24 has been carried out by C701.

As described in detail in C701-ITM-C-RGN-C101-50008 (C701 Installation Report for LU/24), the I&M system installed in the section of the Circle, H&C and Metropolitan Lines Running Tunnel located to the East of Liverpool Street Station comprises the following:

- 4 No. Robotic Total Stations.
- 348 No. Track Prisms.
- 98 No. Structural Prisms.
- 10 No. 360° Prisms.
- 5 No. Reference Prisms.

C704 Instrumentation - Decommissioning Agreement

Circle, H&C and Metropolitan Line – East of Liverpool Street Underground Station (LU/24)

C704-XRL-C-AAG-CR092-50001 Rev1.0

- 4 No. Dataloggers.



Figure 4: Overview of the instrumentation installed by C701 in the section of the Circle, H&C and Metropolitan Lines Running Tunnel located to the East of Liverpool Street Station.

Further details are included in C701-ITM-C-TPL-C101-00001 (C701 Method Statement for LU/24).

7 Monitoring Results vs. CRL Construction Works

Design Consultant Framework Contract C122 – Bored Tunnels: Instrumentation and Monitoring Plan: LU/24 Metropolitan Line East of Liverpool Street Station (C122-OVE-C2-RGN-C101-50019) presents trigger values for the following purposes:

- Asset protection;
- Construction control;
- Track Geometry and Tunnel Clearance.

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 the impact of CRL works on the Asset. A summary of current trends for LU/24 is presented in Appendix C.

The construction activities carried out by Others either side of Bishopsgate, in particular the works for the 150 Bishopsgate project located east side of Bishopsgate, are likely to have caused heave in the Asset prior to TBM arrival. This heave has been recorded by the C701/C704 I&M system installed by Crossrail (see settlement contour 18/01/2015 (pre-TBM's) in Appendix C).

The CRL works that have affected the Asset are dated:

- End of January 2015 (Eastbound TBM drive Y);
- End of February 2015 (Westbound TBM drive Y).

C704 Instrumentation - Decommissioning Agreement

Circle, H&C and Metropolitan Line – East of Liverpool Street Underground Station (LU/24)

C704-XRL-C-AAG-CR092-50001 Rev1.0

The construction monitoring data recorded by the automatic systems indicate a clear correlation with these excavation phases for LU/24.

The data recorded during both construction and closeout monitoring regimes are considered reliable and non construction-related variations are within the expected repeatability for this kind of systems.

The data collected for LU/24 reflect the effect of the movements induced by the TBM drives on the Asset (see settlement contours and graphs in Appendix C) and they are consistent with the manual monitoring results obtained by C305 (not presented in this document).

The settlement curves associated with the TBM drives are easily identifiable in the data recorded by the automatic optical system.

The maximum settlement recorded by this automatic system following the Westbound TBM drive is approx. 5mm.

The post-TBM drives data collected over the last three months (see settlement contour from 15/04/2015 to 17/07/2015 in Appendix C) highlight a total stabilisation, with recorded vertical movements that are within the accuracy of the monitoring system.

8 Assessment of Closeout Trends

Following the Westbound TBM drive (end of February 2015), the closeout monitoring regime has been implemented and it is currently on-going.

The requirements in terms of duration/frequency for the closeout monitoring regime (minimum 3 months continuous monitoring) have been satisfied.

As highlighted in Section 7 and presented in Appendix C, the signature of the TBM excavation phases is clearly identifiable in the construction monitoring data of the automatic optical system installed in the running tunnel.

Current closeout trends for LU/24 highlight a total stabilization with residual (post-construction) variations that are within the accuracy of the monitoring system and lower than the 2mm/year criterion defined by C122 as the trigger for decommissioning (see graphs in Appendix C).

Based on the above, it is therefore proposed to decommission the I&M automatic optical system currently installed in LU/24.

It should be noted that the automatic optical system installed in LU/24 is part of the wider network that extends from the eastern end of LU/24 up to Farringdon Station. The decommissioning of the portion of this network installed in LU/24 will not compromise the performance of the remaining section that will be decommissioned at later stages depending on the specific requirements.

9 Handover of C704 system to the 150 Bishopsgate project

At the time of writing this Decommissioning Agreement, discussions are being held regarding the potential handover of part of C704 I&M system (currently installed in LU/24) to the 150 Bishopsgate project. Should an agreement be achieved, specific details will be covered in C704 Decommissioning Report.

10 Reference Documents

- C122-OVE-C2-TPL-CRG03-00003 (Preliminary Instrumentation & Monitoring Plan for LU Infrastructure)
- C701-ITM-C-TPL-C101-00001 (C701 Method Statement for LU/24)
- C701-ITM-C-RGN-C101-50008 (C701 Installation Report for LU/24)
- C122-OVE-C2-RGN-C101-50003 (C122 Inspection for Analytical Assessment for LU/24)
- C122-OVE-C2-RGN-C101-50001 (C122 Ground Movement Assessment for LU/24)
- C122-OVE-C2-RGN-C101-50019 (C122 I&M Plan for LU/24)
- C122-OVE-C2-DDA-CR001_Z-31113 and C122-OVE-C2-DDA-CR001_Z-31114 (C122 I&M Drawings)

11 Appendices

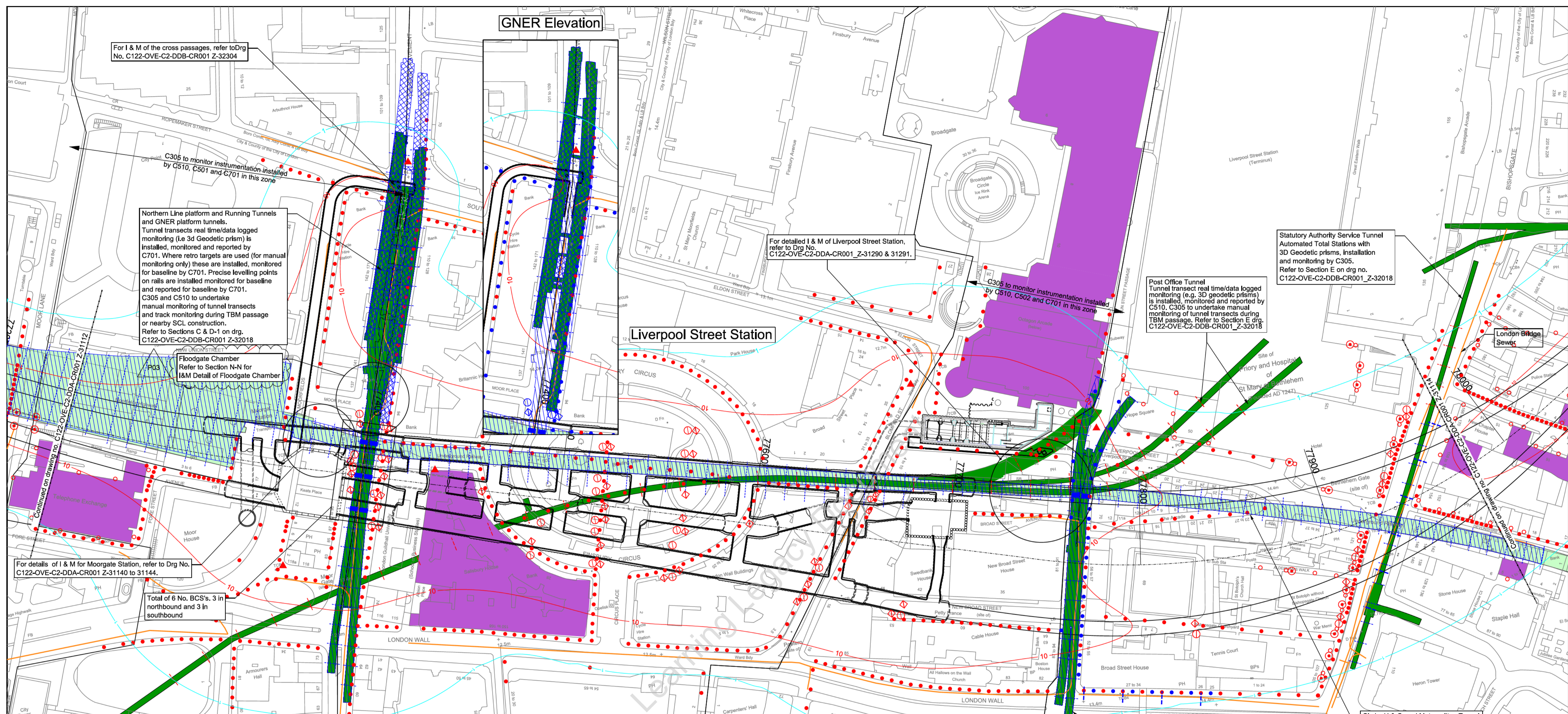
Appendix A – I&M Drawing

Appendix B – I&M As-Built Drawing

Appendix C – Summary of monitoring results for LU/24

APPENDIX A

Learning Legacy Document



For I & M of the cross passages, refer to Drg No. C122-OVE-C2-DDB-CR001 Z-32304

Northern Line platform and Running Tunnels and GNER platform tunnels. Tunnel transects real time/data logged monitoring (i.e. 3d Geodetic prism) is installed, monitored and reported by C701. Where retro targets are used (for manual monitoring only) these are installed, monitored for baseline by C701. Precise levelling points on rails are installed monitored for baseline and reported for baseline by C701. C305 and C510 to undertake manual monitoring of tunnel transects and track monitoring during TBM passage or nearby SCL construction. Refer to Sections C & D-1 on drg. C122-OVE-C2-DDB-CR001 Z-32018

Floodgate Chamber Refer to Section N-N for I&M Detail of Floodgate Chamber

For details of I & M for Moorgate Station, refer to Drg No. C122-OVE-C2-DDA-CR001 Z-31140 to 31144.

Total of 6 No. BCS's. 3 in northbound and 3 in southbound

For detailed I & M of Liverpool Street Station, refer to Drg No. C122-OVE-C2-DDA-CR001 Z-31290 & 31291.

C305 to monitor instrumentation installed by C510, C502 and C701 in this zone

Post Office Tunnel Tunnel transect real time/data logged monitoring (e.g. 3D geodetic prisms) is installed, monitored and reported by C510, C305 to undertake manual monitoring of tunnel transects during TBM passage. Refer to Section E drg. C122-OVE-C2-DDB-CR001 Z-32018

Statutory Authority Service Tunnel Automated Total Stations with 3D Geodetic prisms, installation and monitoring by C305. Refer to Section E on drg no. C122-OVE-C2-DDB-CR001 Z-32018

Circle, H & C and Metropolitan Tunnel Tunnel transects real time/data logged monitoring (i.e. 3D Geodetic prism/ATS) is installed, monitored and reported by C701. Precise levelling points on rails are installed and baselined by C701. C305 to undertake manual monitoring of tunnel transects during TBM passage. C305 to undertake manual track monitoring. Refer to Section B on drg no. C122-OVE-C2-DDB-CR001 Z-32018

Central Line Tunnels. Tunnel transects real time/data logged monitoring (i.e. 3D Geodetic prism/ electrolevels) is installed, monitored and reported by C701. Where retro targets are used (for manual monitoring only) these are installed, monitored for baseline by C701. Precise levelling points on rails are installed monitored for baseline and reported for baseline by C701. C305 to undertake manual monitoring of tunnel transects and track monitoring during TBM passage. Refer to Section C drg C122-OVE-C2-DDB-CR001 Z-32018

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 Notes Drawing (cited 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-LRG-CRG02-00001.
 3. 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.
 4. These notes are based on experienced and competent contractors carrying out the works using an approved safe method of working.

Legend

Parties Responsible for the installation of the I & M

- C701
- Others

General

- Tunnel Alignment
- Track shoe monitoring at 2m centres Shading omitted from plans of tube tunnels for clarity
- Track shoe monitoring at 3m centres Shading omitted from plans of tube tunnels for clarity

Settlement Contours

- 1mm Settlement Contour
- 10mm Settlement Contour

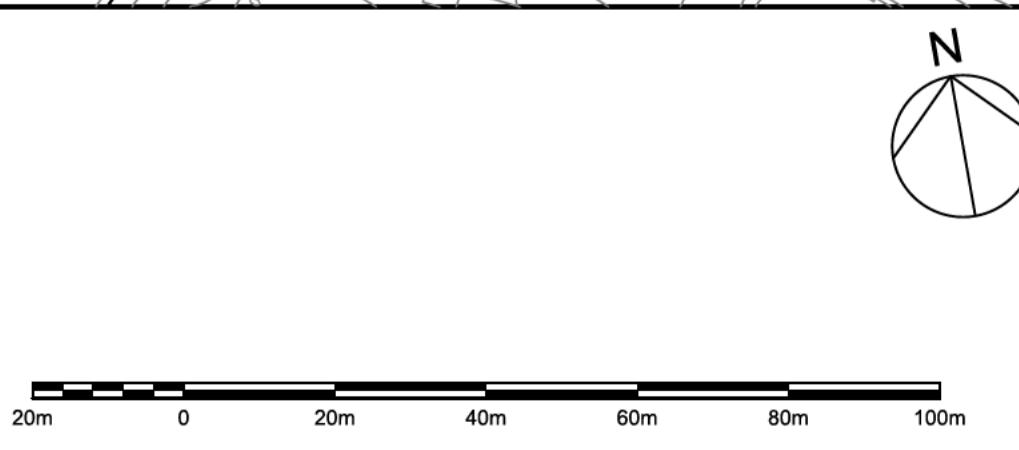
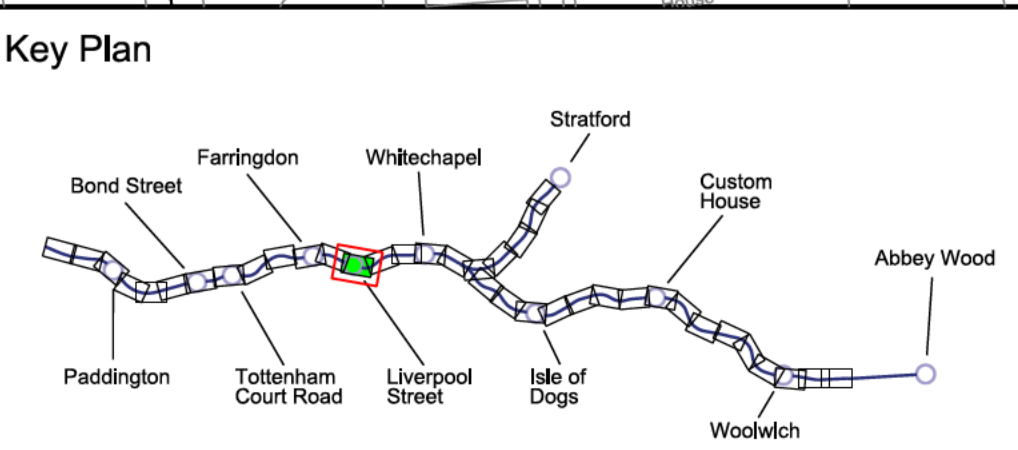
Existing Structures

- Bored Tunnels
- Cut & Cover Tunnels
- Structures with I & M Commitments
- Mains Sewer (greater than 1.5m²)

Instruments and Monitors

- Automated Total Station
- Basset Convergence System
- Electrolevel Beams
- Extensometer - Rod
- Inclinometer
- Inclinometer - Electrolevels
- Piezometer - Vibrating Wire
- 3D Geodetic Prisms
- Sockets - BRE Type - Structure
- Studs - Precise Ground Levelling
- Sparse Monitoring Point
- Monitoring Transect in Tunnels
- Deep Datum

Notes
 1. For Instrumentation & Monitoring general notes, schedule and monitoring frequency, refer to Drg Nos. C122-OVE-DDJ-CR001 Z-31002 and C122-OVE-DDJ-CR001 Z-31007.



Crossrail
 25 Canada Square
 Canary Wharf
 London
 E14 5LQ

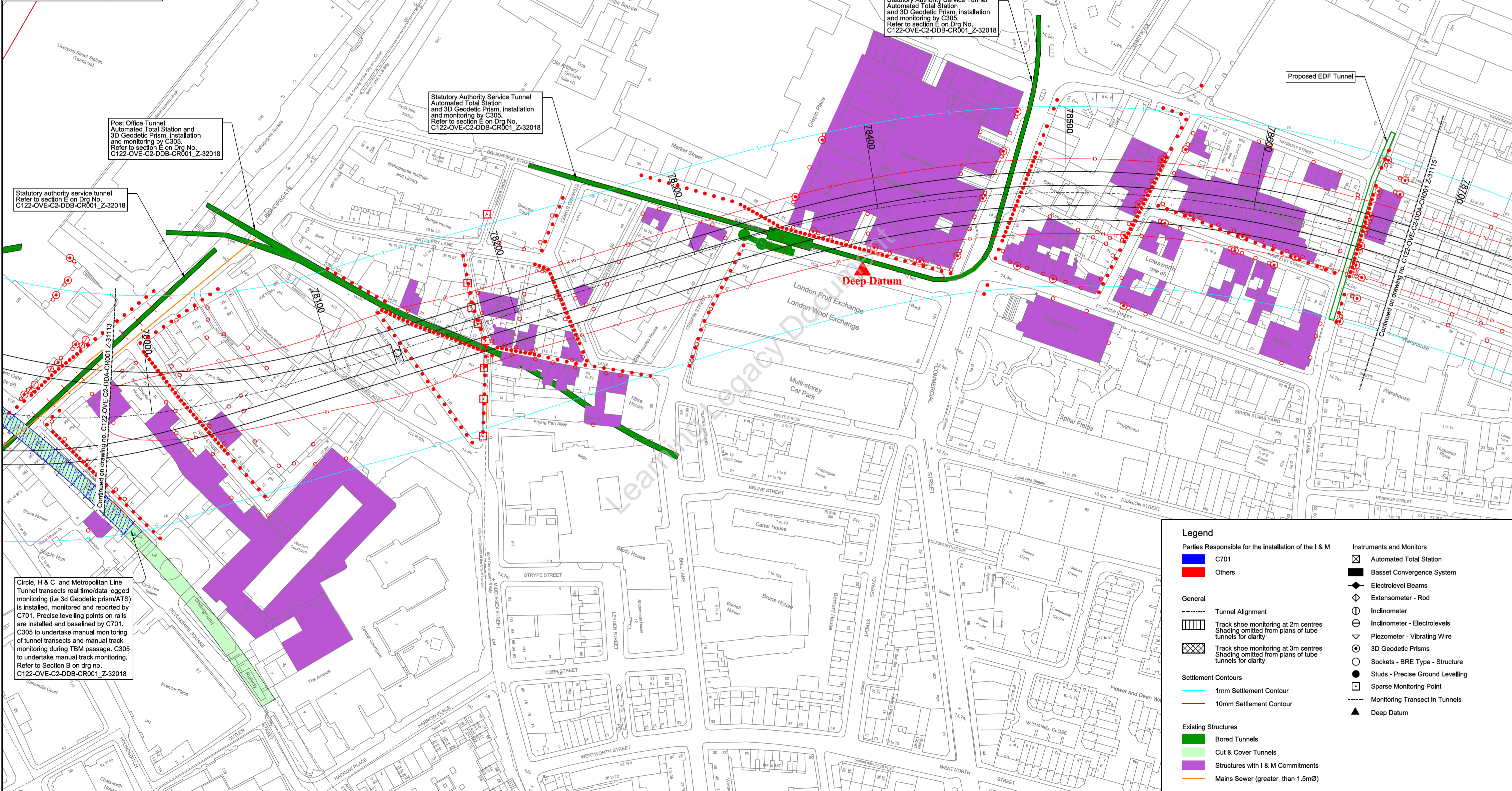
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Original: Ove Arup & Partners Limited
Location: Crossrail General
Title: Instrumentation & Monitoring Combined I & M Routeway Plan Sheet 13 of 38 C701
Scale: 1:1000@A1
Drawing and CAD file No.: C122-OVE-C2-DDA-CR001 Z-3113
Rev: C02
Suitability: A

By: G.KAVANAGH
CHK: J.APTEJ
APP: R.MCCRAE
Auth: C.THOMAS

Rev.	Date	Description	By	Chkd	App	Auth
P01	03/11/2010	First Issue	JG	RB	RM	-
P02	14/10/2011	Minimum requirement for Instrumentation and Monitoring	AR	JA	SR	-
C01	09/11/2011	Issued as FIR for construction	AR	JA	SR	IT
P03	10/12/2012	Issued as FIR for construction	GK	JA	RM	-
C02	14/01/2013	Issued as FIR for construction	GK	JA	RM	CT

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 Notes Drawing (cited 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-LRG-CRG02-00001.
3. 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.
4. These notes are based on experienced and competent contractors carrying out the works using an approved safe method of working.



Post Office Tunnel Automated Total Station and 3D Geodetic Prism, installation and monitoring by C305. Refer to section E on Drg No. C122-OVE-C2-DDB-CR001_Z-32018

Statutory Authority Service Tunnel Automated Total Station and 3D Geodetic Prism, installation and monitoring by C305. Refer to section E on Drg No. C122-OVE-C2-DDB-CR001_Z-32018

Statutory Authority Service Tunnel Automated Total Station and 3D Geodetic Prism, installation and monitoring by C305. Refer to section E on Drg No. C122-OVE-C2-DDB-CR001_Z-32018

Statutory authority service tunnel Refer to section E on Drg No. C122-OVE-C2-DDB-CR001_Z-32018

Circle, H & C and Metropolitan Line Tunnel transects real time/data logged monitoring (i.e. 3d Geodetic prism/ATS) is installed, monitored and reported by C701. Precise levelling points on rails are installed and baselined by C701. C305 to undertake manual monitoring of tunnel transects and manual track monitoring during TBM passage. C305 to undertake manual track monitoring. Refer to Section B on drg no. C122-OVE-C2-DDB-CR001_Z-32018

Legend

Parties Responsible for the installation of the I & M

- C701
- Others

General

- Tunnel Alignment
- Track shoe monitoring at 2m centres Shading omitted from plans of tube tunnels for clarity
- Track shoe monitoring at 3m centres Shading omitted from plans of tube tunnels for clarity

Settlement Contours

- 1mm Settlement Contour
- 10mm Settlement Contour

Existing Structures

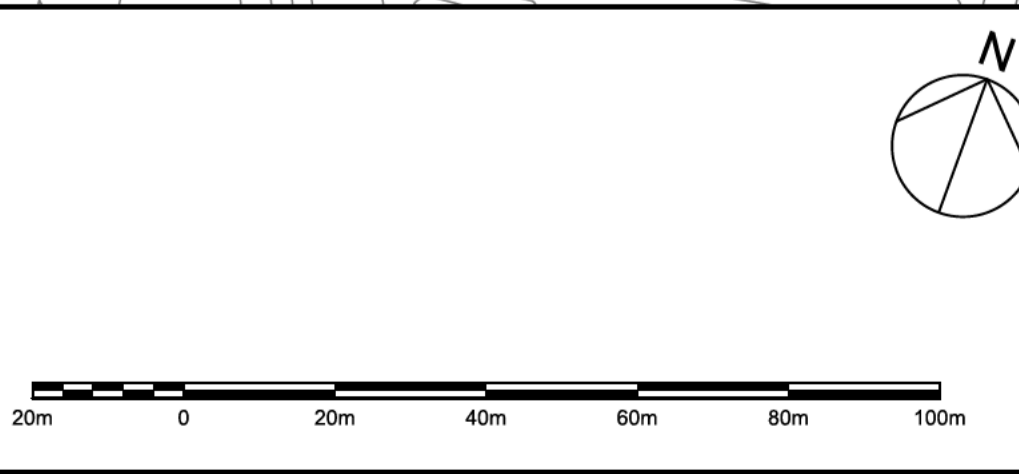
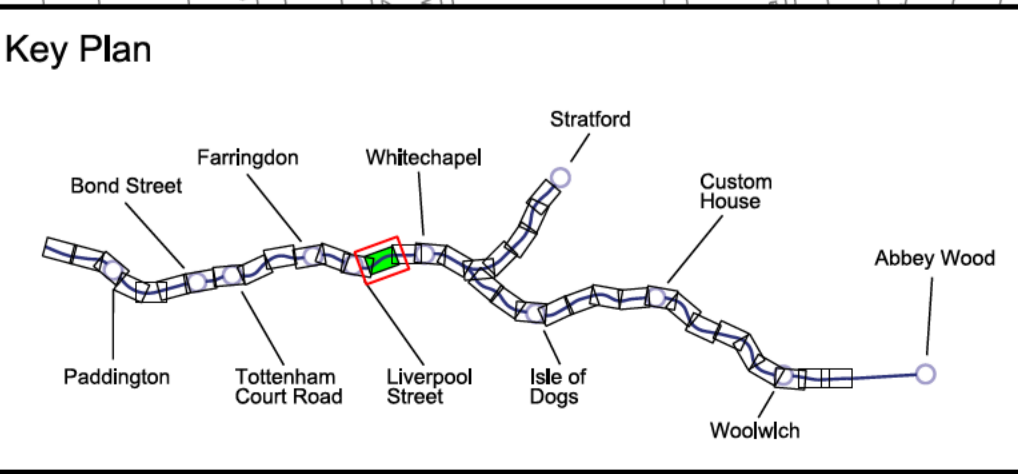
- Bored Tunnels
- Cut & Cover Tunnels
- Structures with I & M Commitments
- Mains Sewer (greater than 1.5mØ)

Instruments and Monitors

- Automated Total Station
- Bassel Convergence System
- Electrolevel Beams
- Extensometer - Rod
- Inclinometer
- Inclinometer - Electrolevels
- Piezometer - Vibrating Wire
- 3D Geodetic Prisms
- Sockets - BRE Type - Structure
- Studs - Precise Ground Levelling
- Sparse Monitoring Point
- Monitoring Transect in Tunnels
- Deep Datum

Rev.	Date	Description	By	Chkd	App	Auth
P01	25/11/2010	Issued for Information	JG	RB	RM	—
P02	14/10/2011	Minimum requirement for Instrumentation and Monitoring	AR	JA	SR	—
C01	09/11/2011	Issued as Fit for construction	AR	JA	SR	IT

Notes
 1. For Instrumentation & Monitoring general notes, schedule and monitoring frequency, refer to Drg Nos. C122-OVE-DDJ-CR001_Z-31002 and C122-OVE-DDJ-CR001_Z-31007.



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 Original: Ove Arup & Partners Limited
 Location: Crossrail General
 Title: Instrumentation & Monitoring Combined I & M Routewide Plan Sheet 14 of 38 C701
 Scale: 1:1000@A1
 Drawing and CAD file No: C122-OVE-C2-DDA-CR001_Z-31114
 Rev: C01
 Sublicability: A

By: A. REAKES
 CHK: J. APTE
 App: S. READING
 Auth: L. THOMSON

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 Crossrail Limited
 25 Canada Square
 Canary Wharf
 London
 E14 5LQ

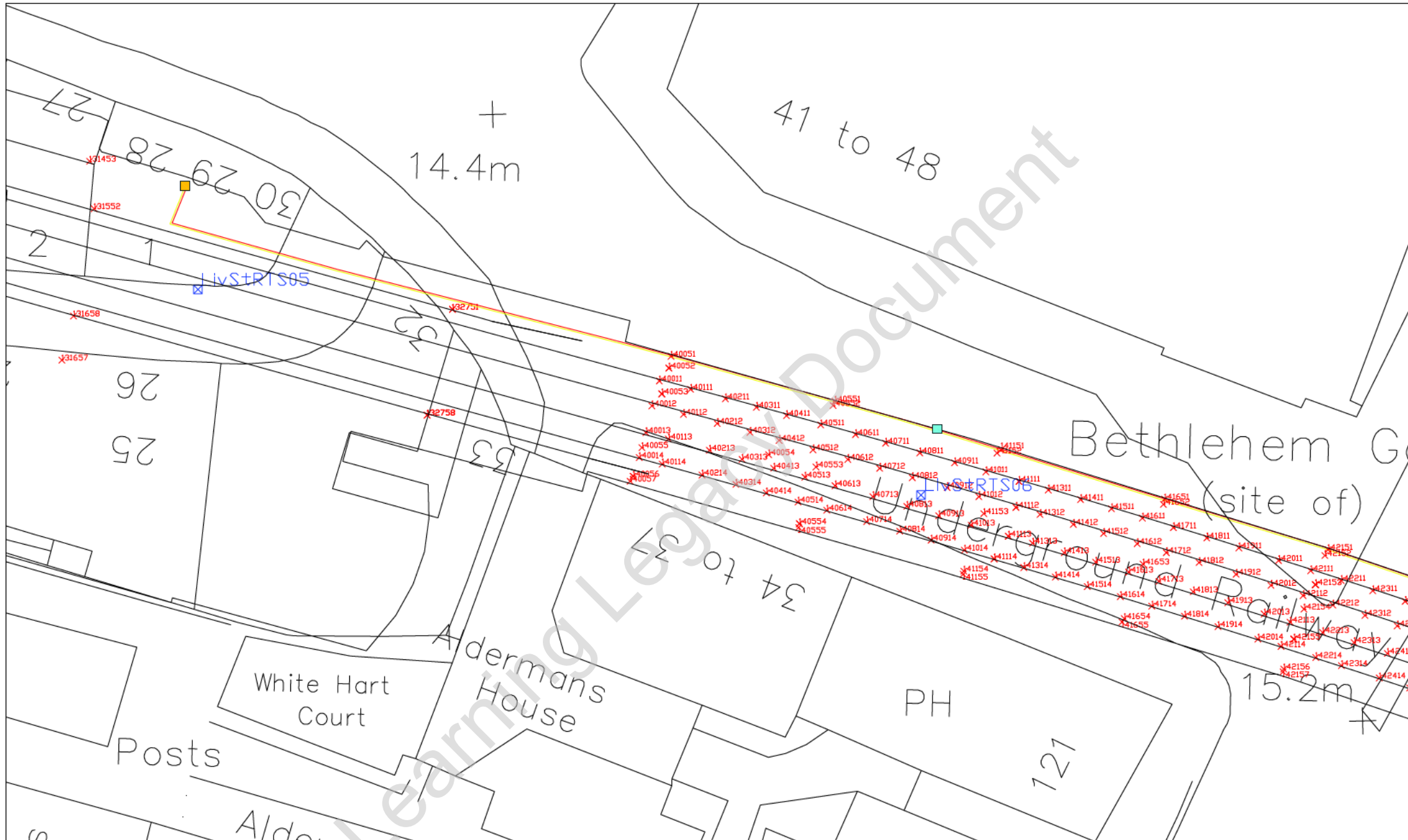
Copy Approved for Design - Created: 09-NOV-2011

Fit for construction RESTRICTED

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APPENDIX B

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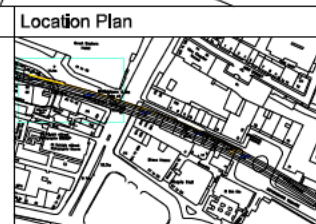


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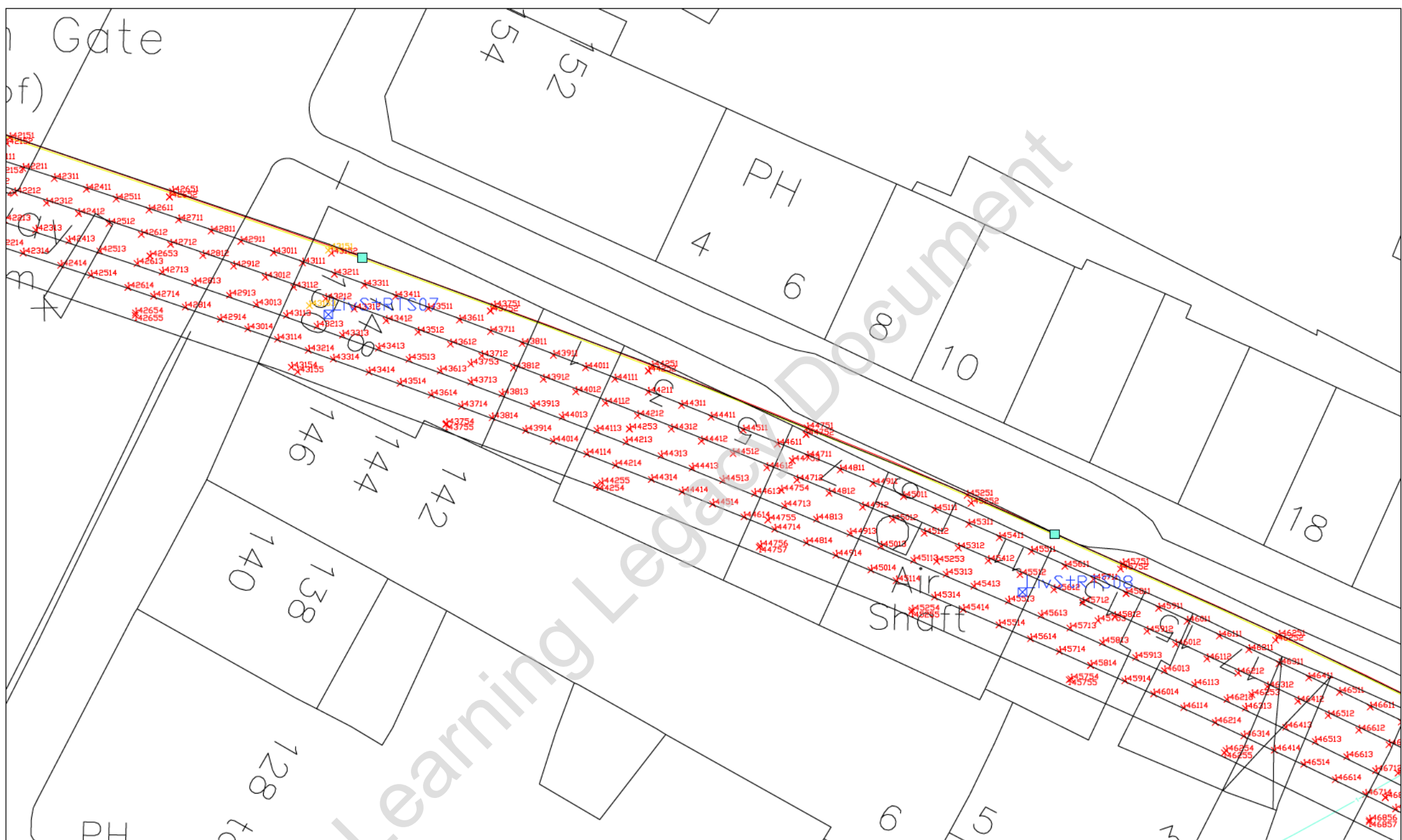
- 1 - Track Prisms installed at 2m centres
- 2 - Prisms attached to running rail via non-intrusive 'Bull head' Rail clips
- 3 - All positions of the Crossrail Horizontal Grid & Crossrail Vertical Datum
- 4 - To be read in conjunction with Installation Report C701-ITM-C-RGN-C101-50008

Legend

- x Monitoring Prism
- x Prism covered by FCD
- RTS
- 1mm/10mm Settlement Contour
- Crossrail Eastbound Chalmage
- Data Logger Enclosure
- Power Transformer Enclosure
- ELV Power/Comms Cable Route



		itmsoil UCKFIELD EAST SUSSEX TN22 1QL ENGLAND Tel: +44(0)1825 765044 Fax: +44(0)1825 761740	
		Title Liverpool Street Met Line East As-Built (From C701-ITM-C-RGN-C101-50008)	
Drawn CK Checked CK Date 15/11/2013 Rev 04 Scale 1:100	Paper A1 Job Number 228-021	Drawing No. C701-ITM-C-RGN-C101-50008	Sheet 01

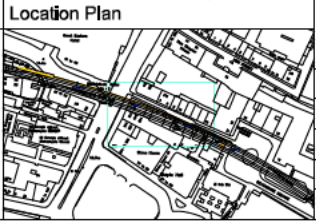


Notes

- 1 - Track Prisms installed at 2m centres
- 2 - Prisms attached to running rail via non-intrusive 'Bull head' Rail clips
- 3 - All positions of the Crossrail Horizontal Grid & Crossrail Vertical Datum
- 4 - To be read in conjunction with Installation Report C701-ITM-C-RGN-C101-50008

Legend

x	Monitoring Prism
x	Prism covered by FCD
x	RTS
	1mm/10mm Settlement Contour
	Crossrail Eastbound Chalmage
	Data Logger Enclosure
	Power Transformer Enclosure
	ELV Power/Comms Cable Route



itmsoil

UCKFIELD EAST SUSSEX TN22 1QL
 ENGLAND Tel: +44(0)1825 765044
 Fax: +44(0)1825 761740

Drawn	CK	Title	
Checked	CK	Liverpool Street Met Line East As-Built (From C701-ITM-C-RGN-C101-50008)	
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Rev	04	A1	C701-ITM-C-RGN-C101-50008
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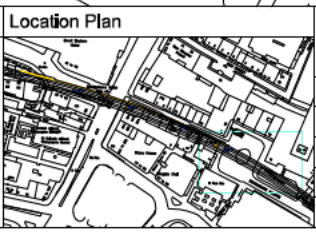


Notes

- 1 - Track Prisms installed at 2m centres
- 2 - Prisms attached to running rail via non-intrusive 'Bull head' Rail clips
- 3 - All positions of the Crossrail Horizontal Grid & Crossrail Vertical Datum
- 4 - To be read in conjunction with Installation Report C701-ITM-C-RGN-C101-50008

Legend

- x Monitoring Prism
- x Prism covered by FCD
- RTS
- 1mm/10mm Settlement Contour
- Crossrail Eastbound Chainage
- Data Logger Enclosure
- Power Transformer Enclosure
- ELV Power/Comms Cable Route



itmsoil

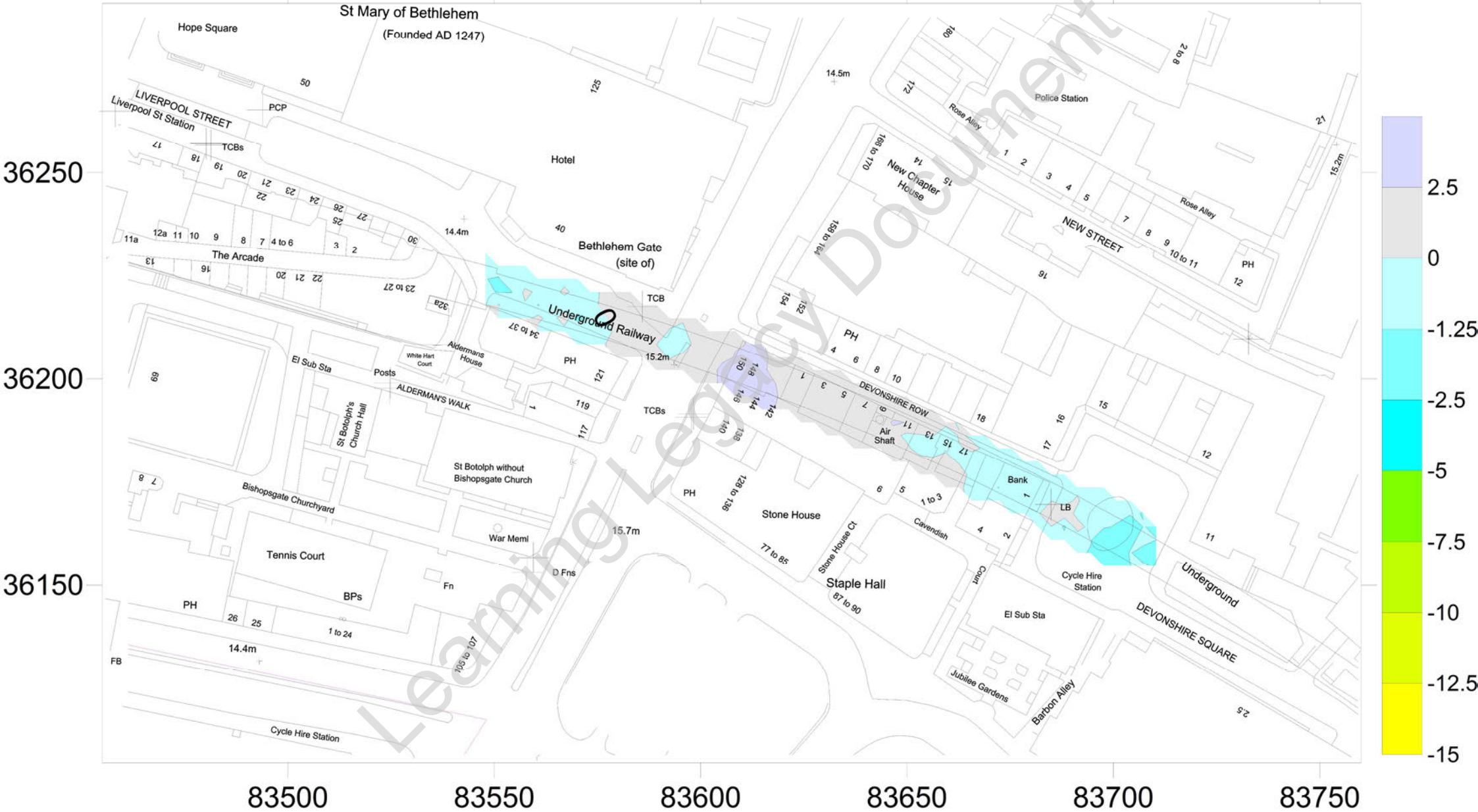
UCKFIELD EAST SUSSEX TN22 1QL
 ENGLAND Tel: +44(0)1825 765044
 Fax: +44(0)1825 761740

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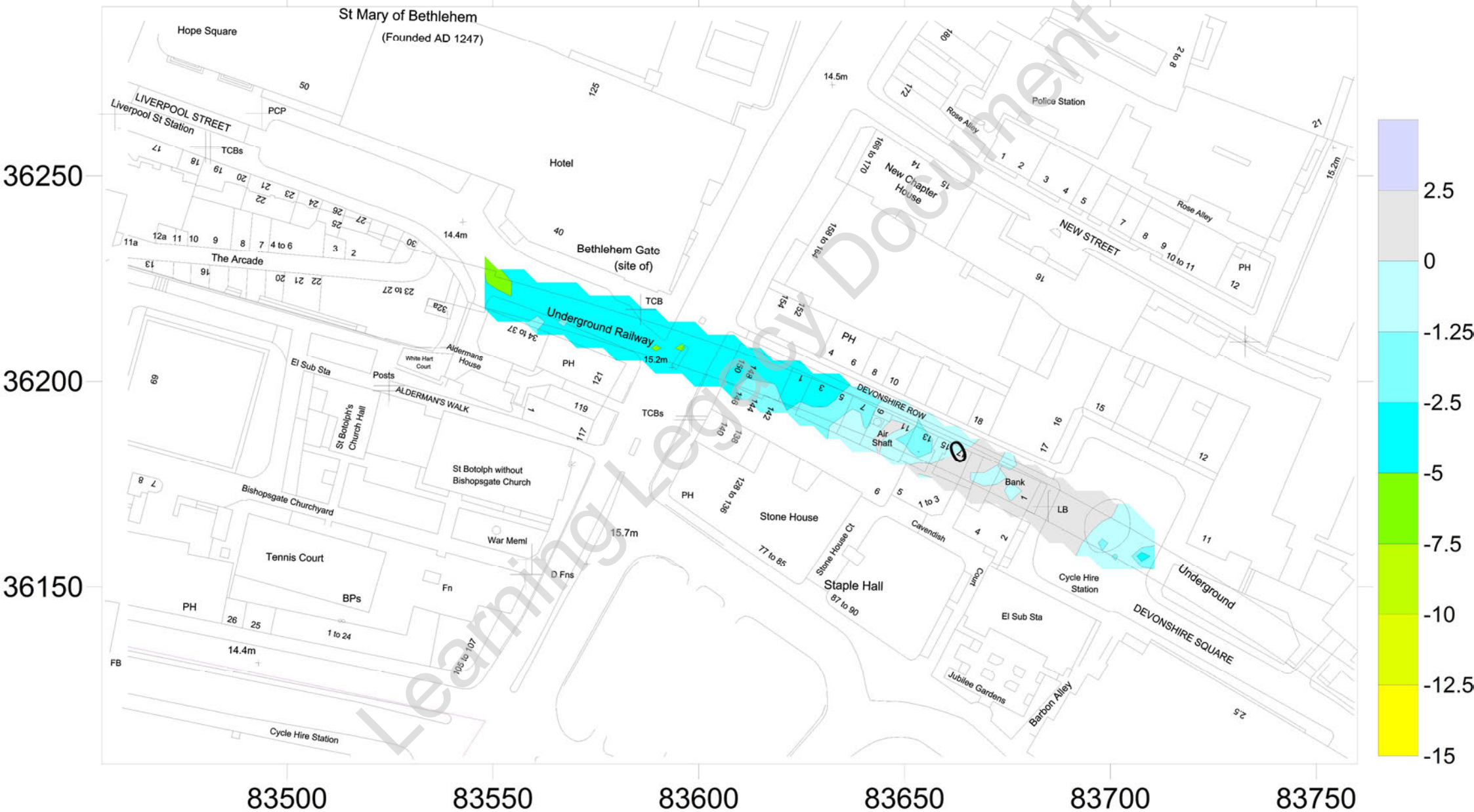
APPENDIX C

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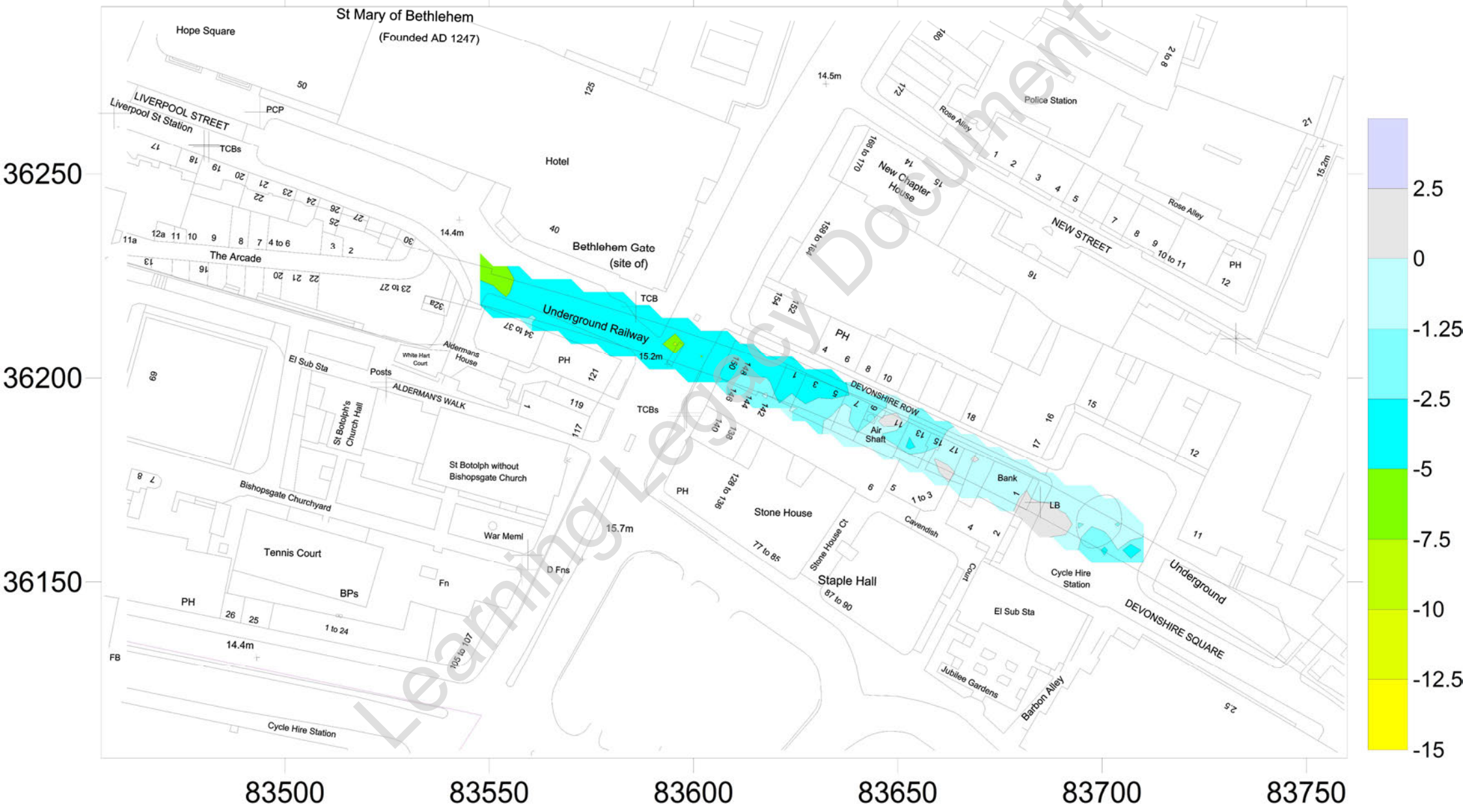
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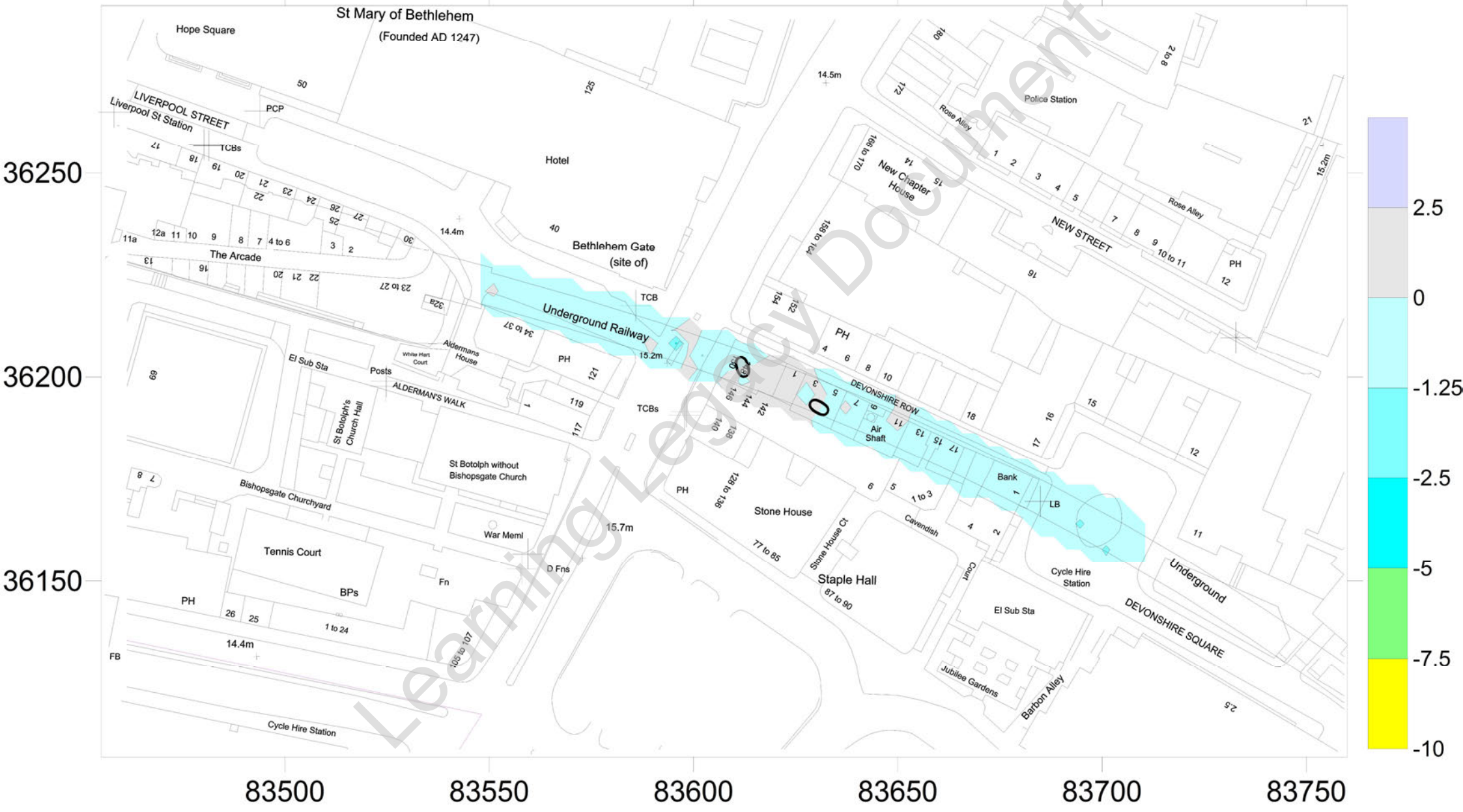
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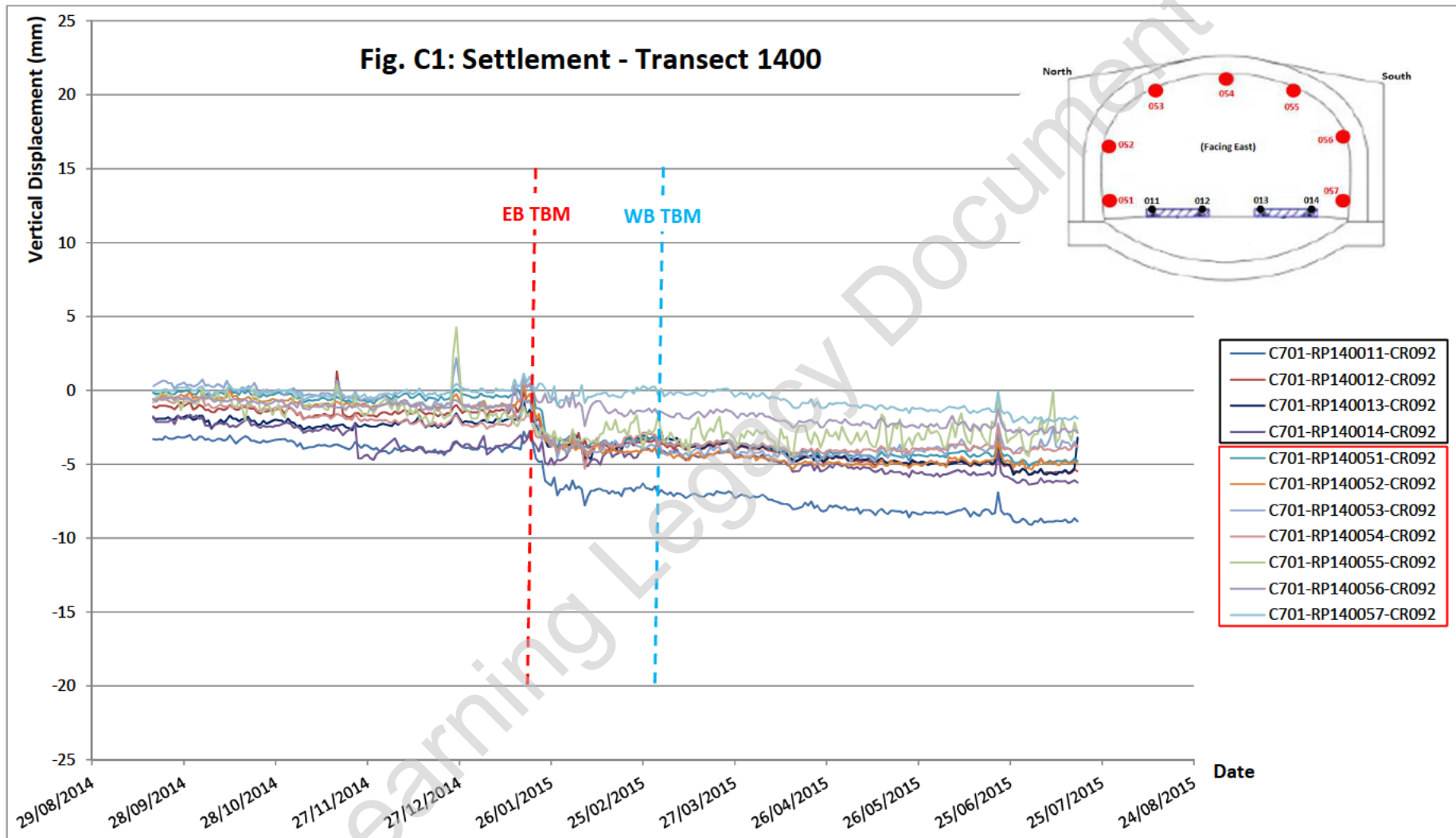


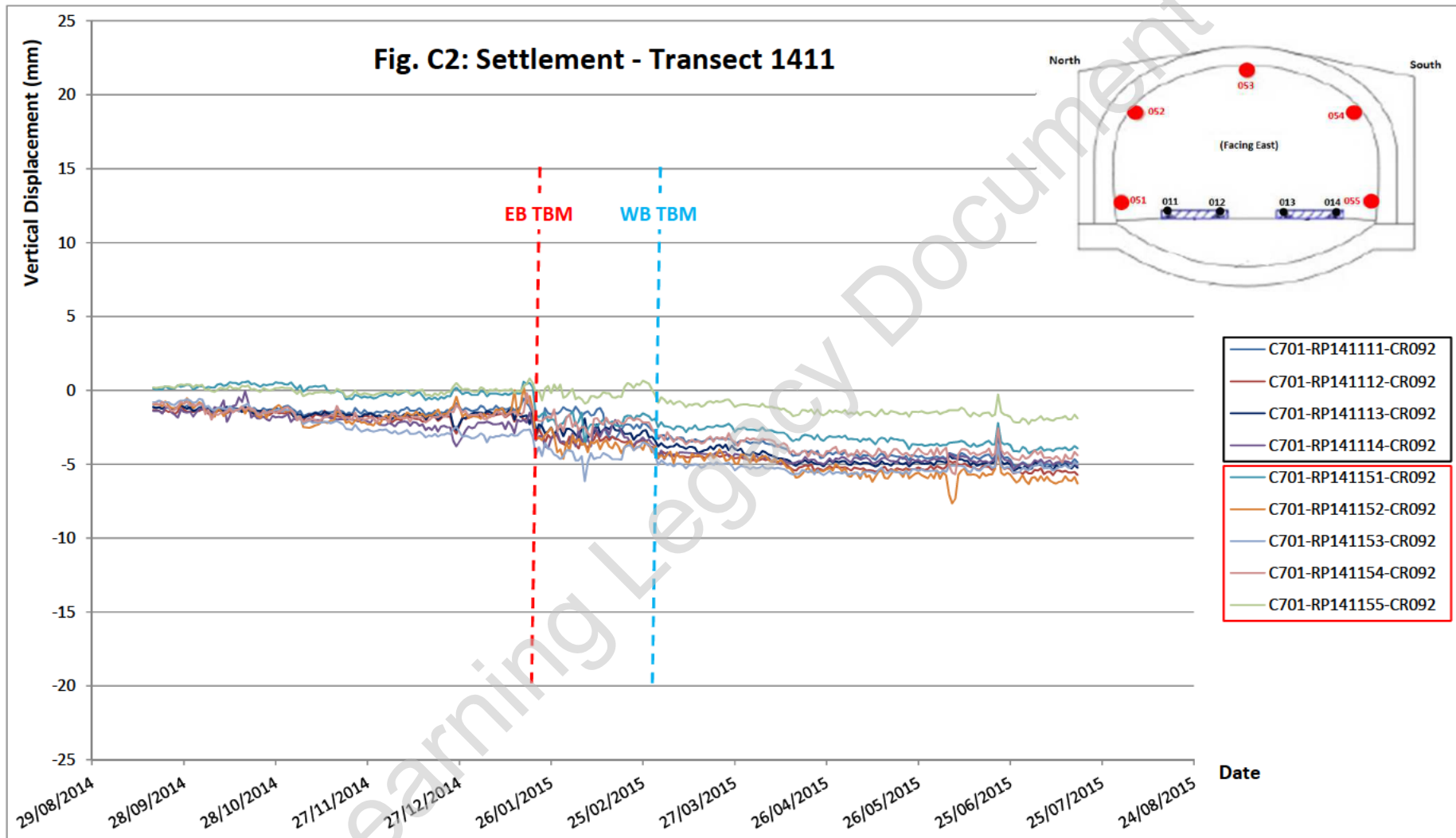
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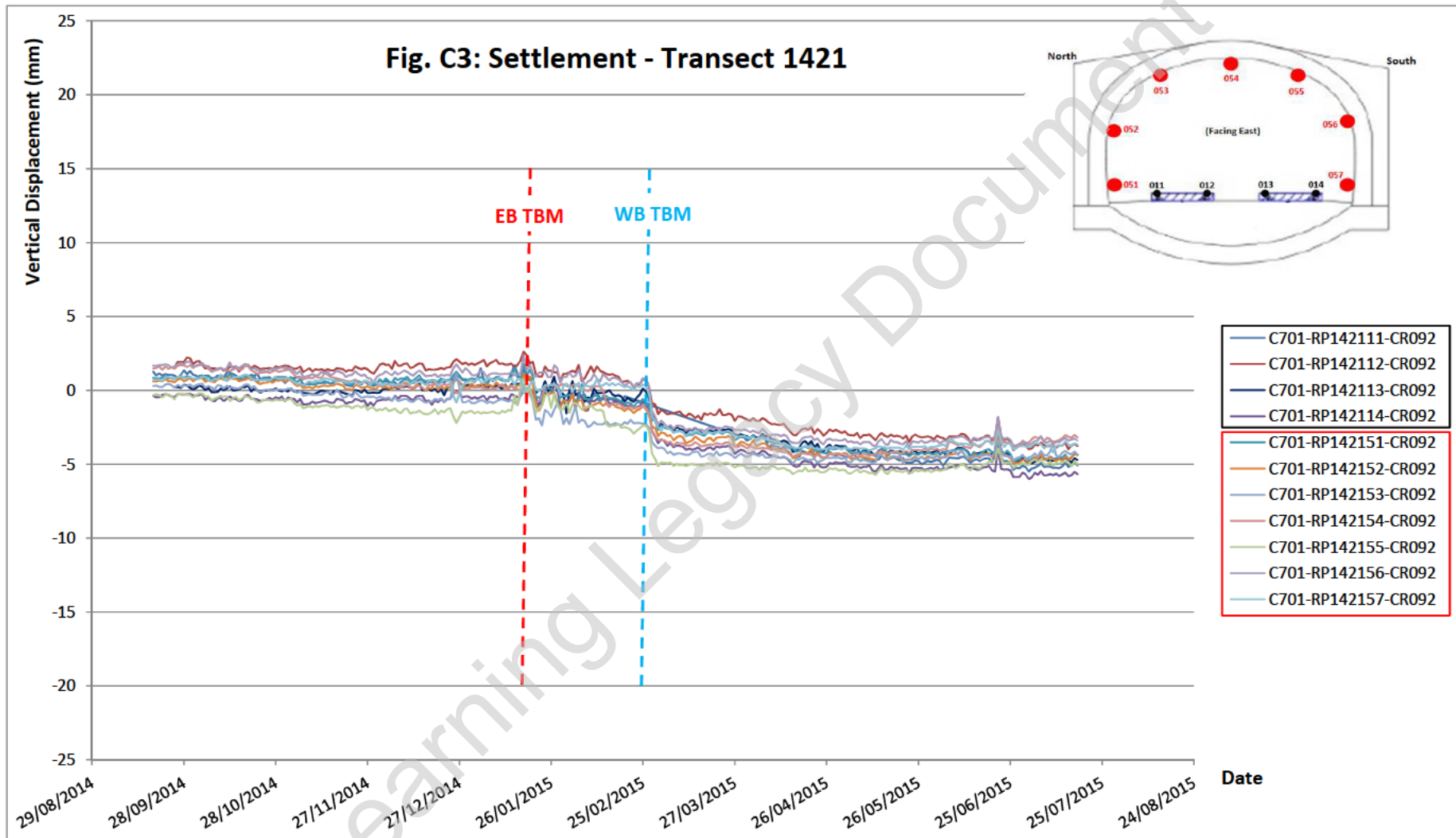


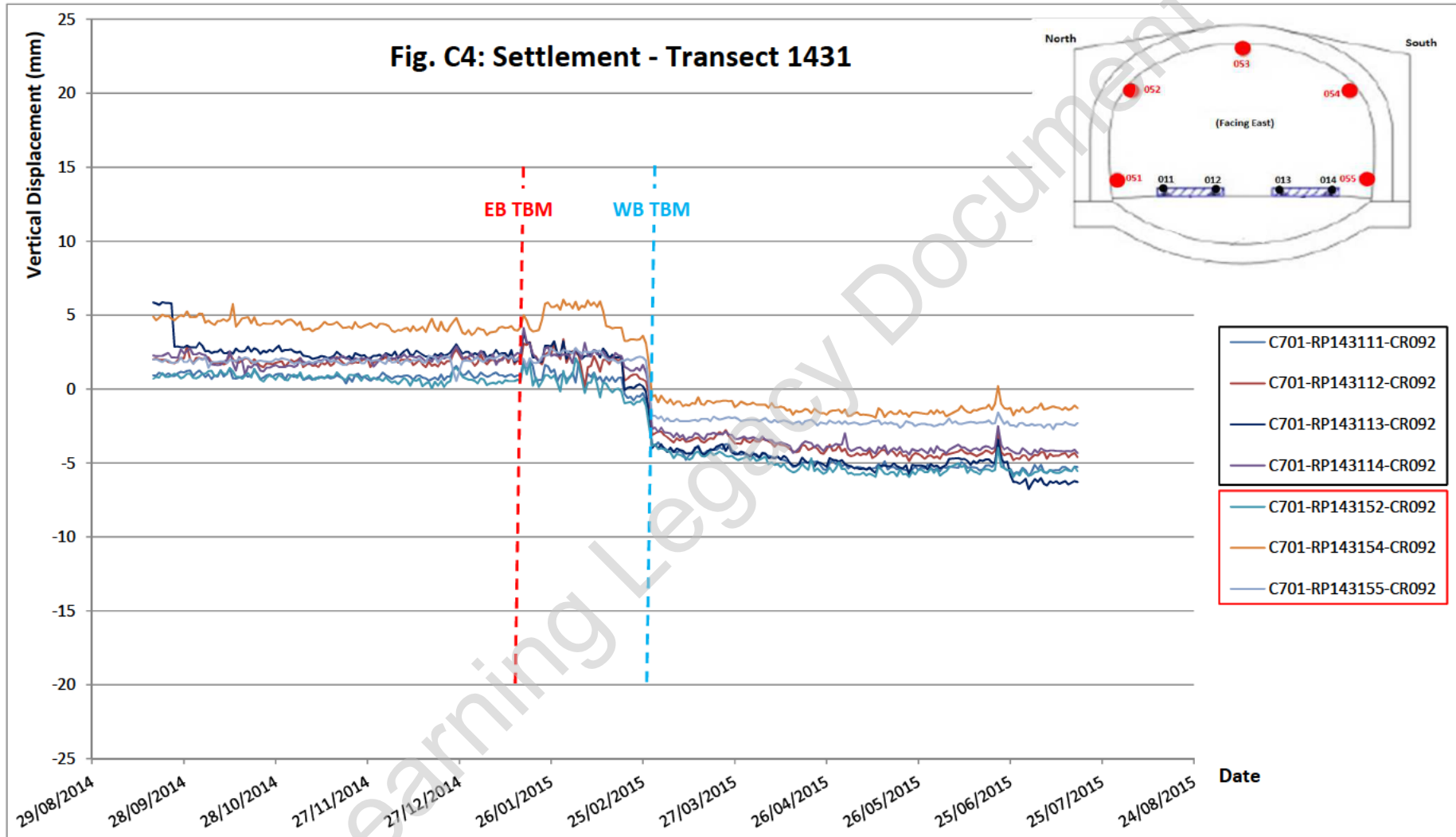
Differential Movement Z (mm) from 15/04/2015 to 17/07/2015 - Track and Structure

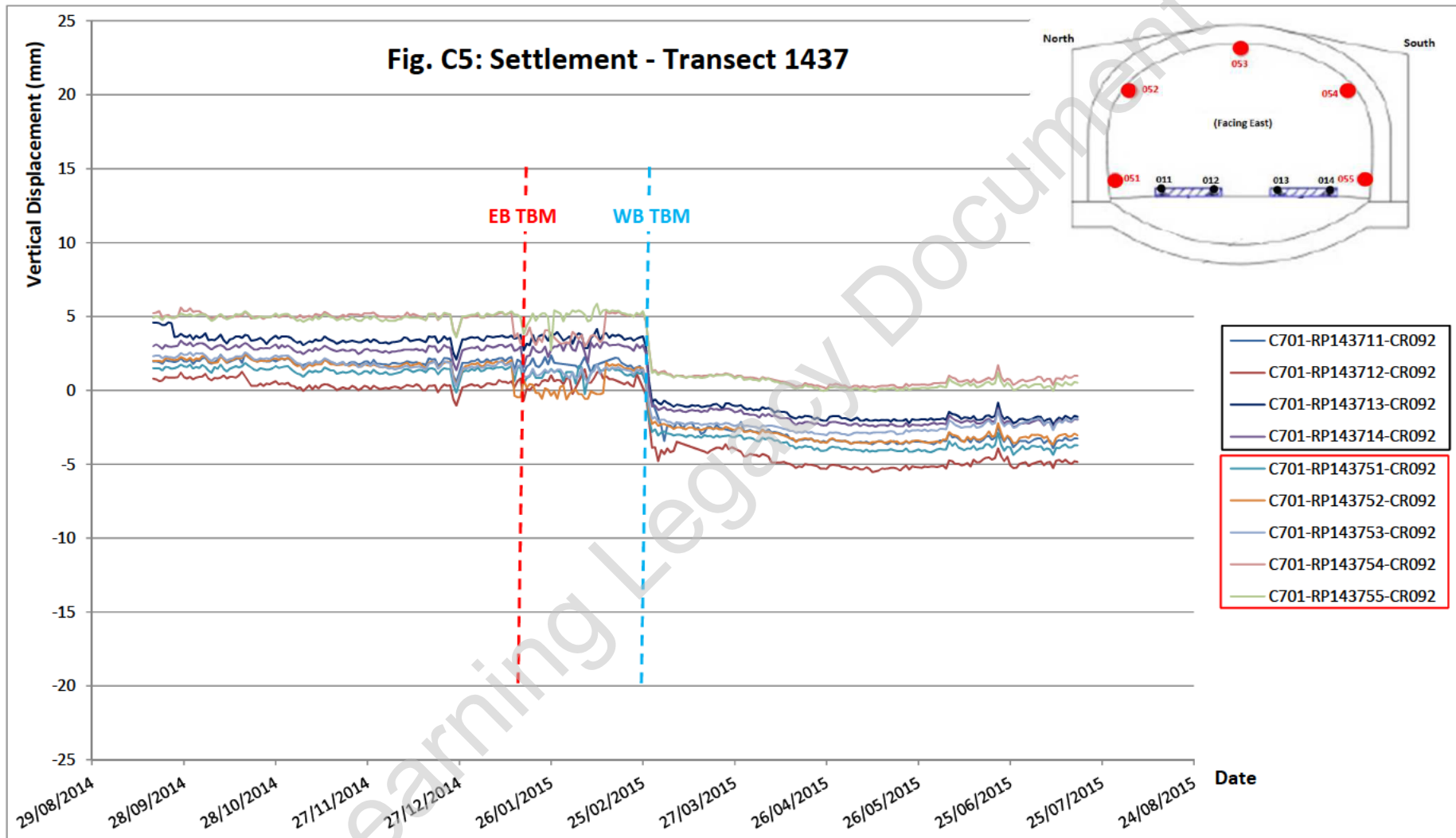


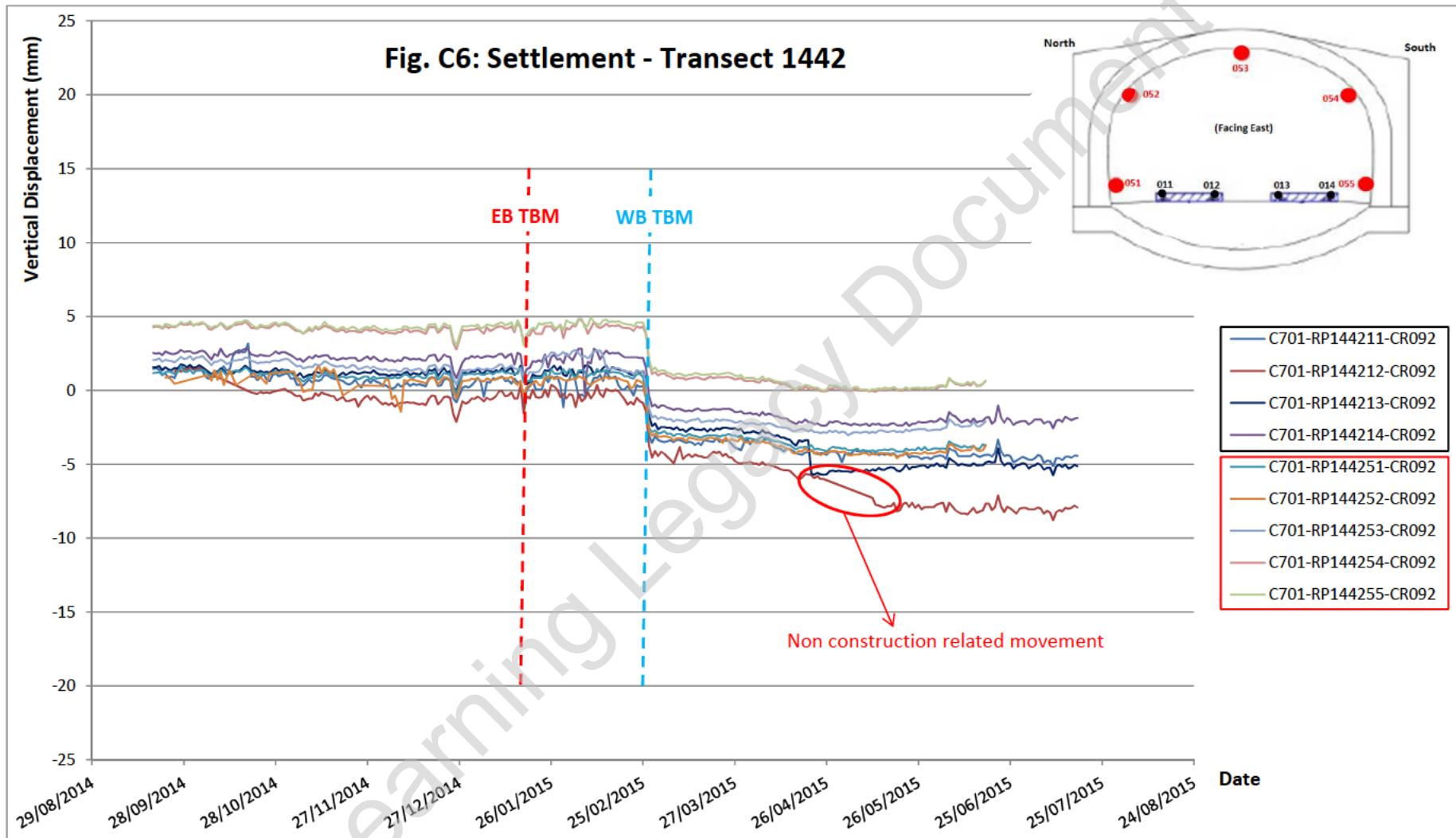


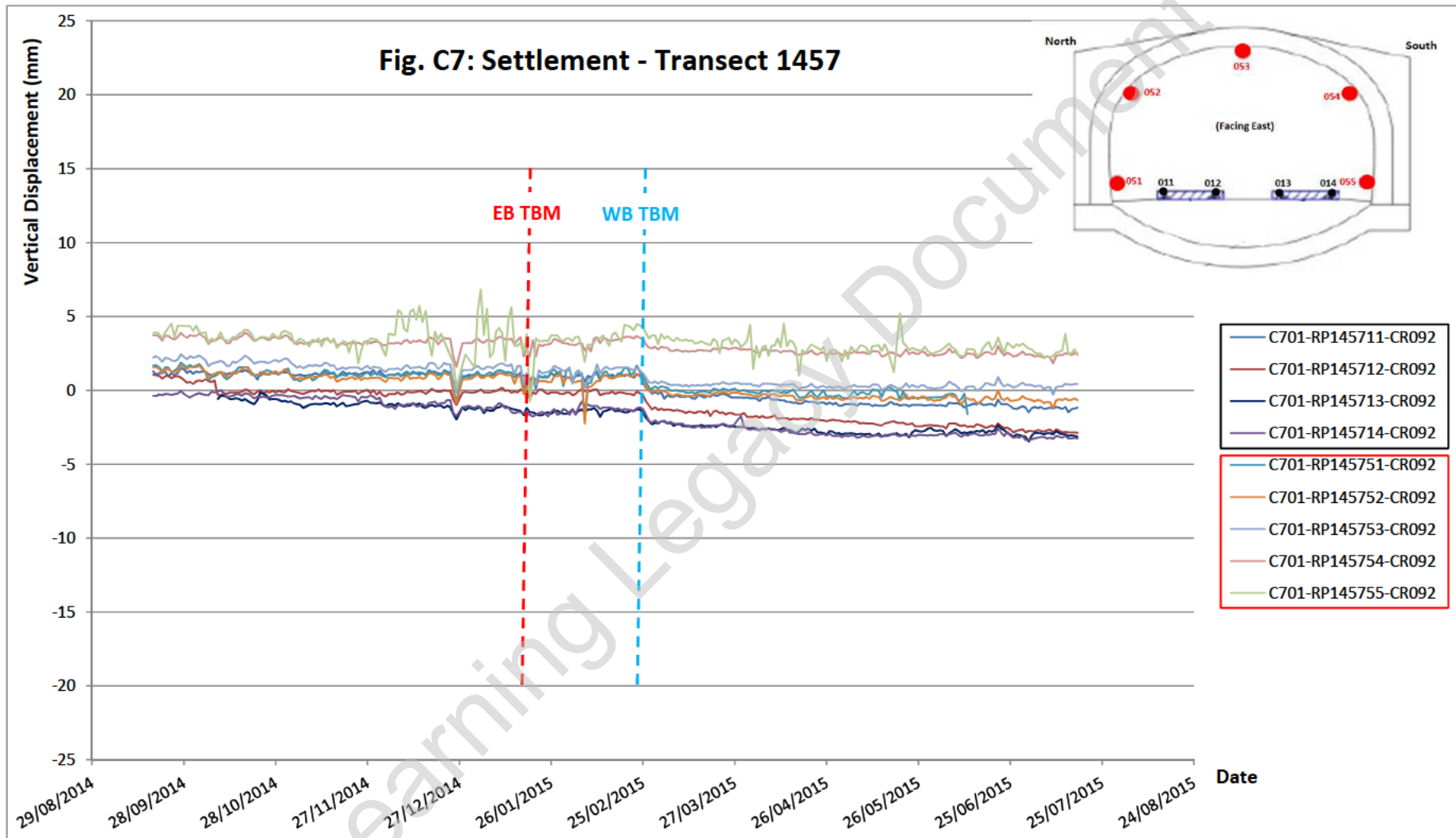


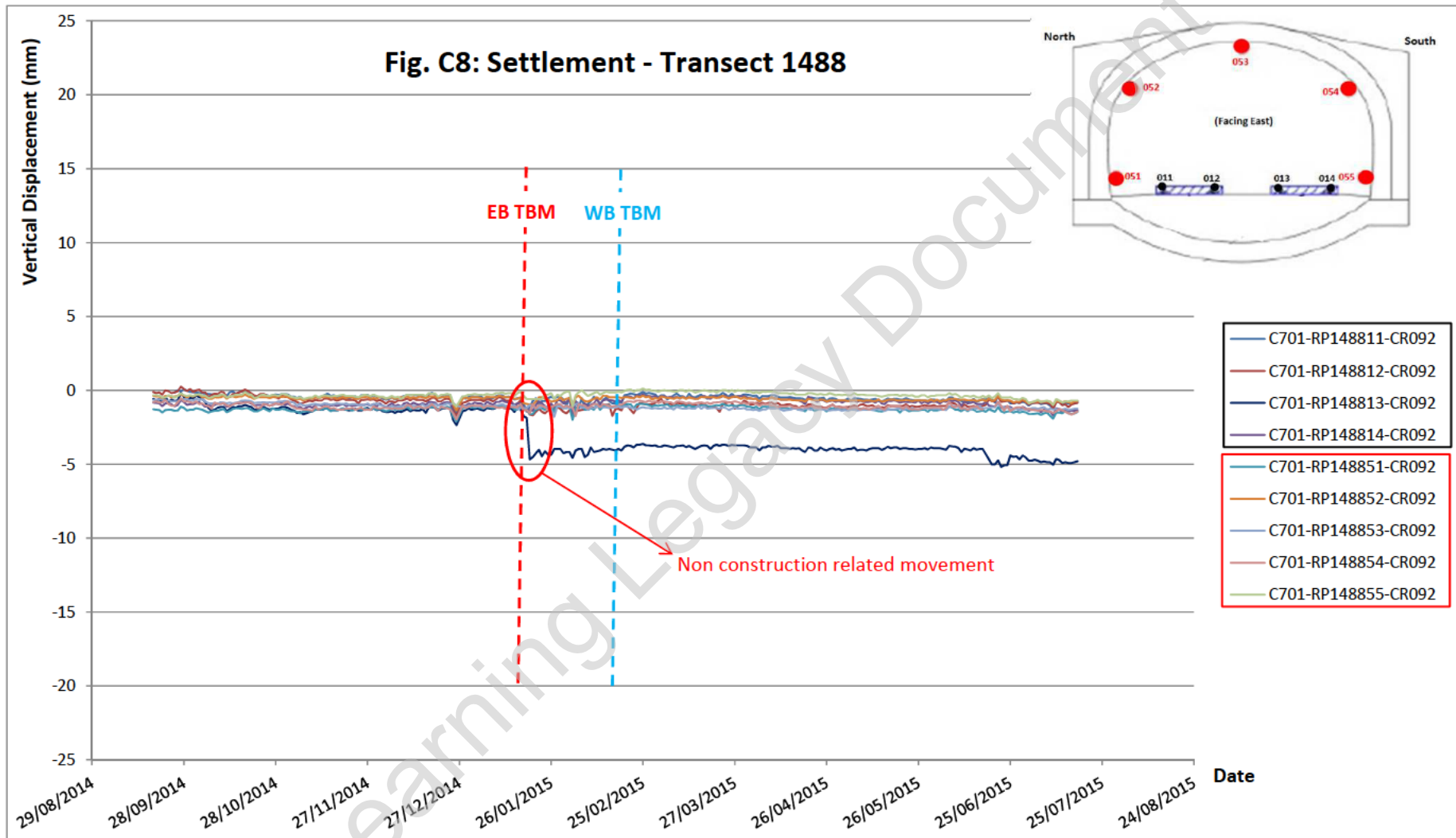


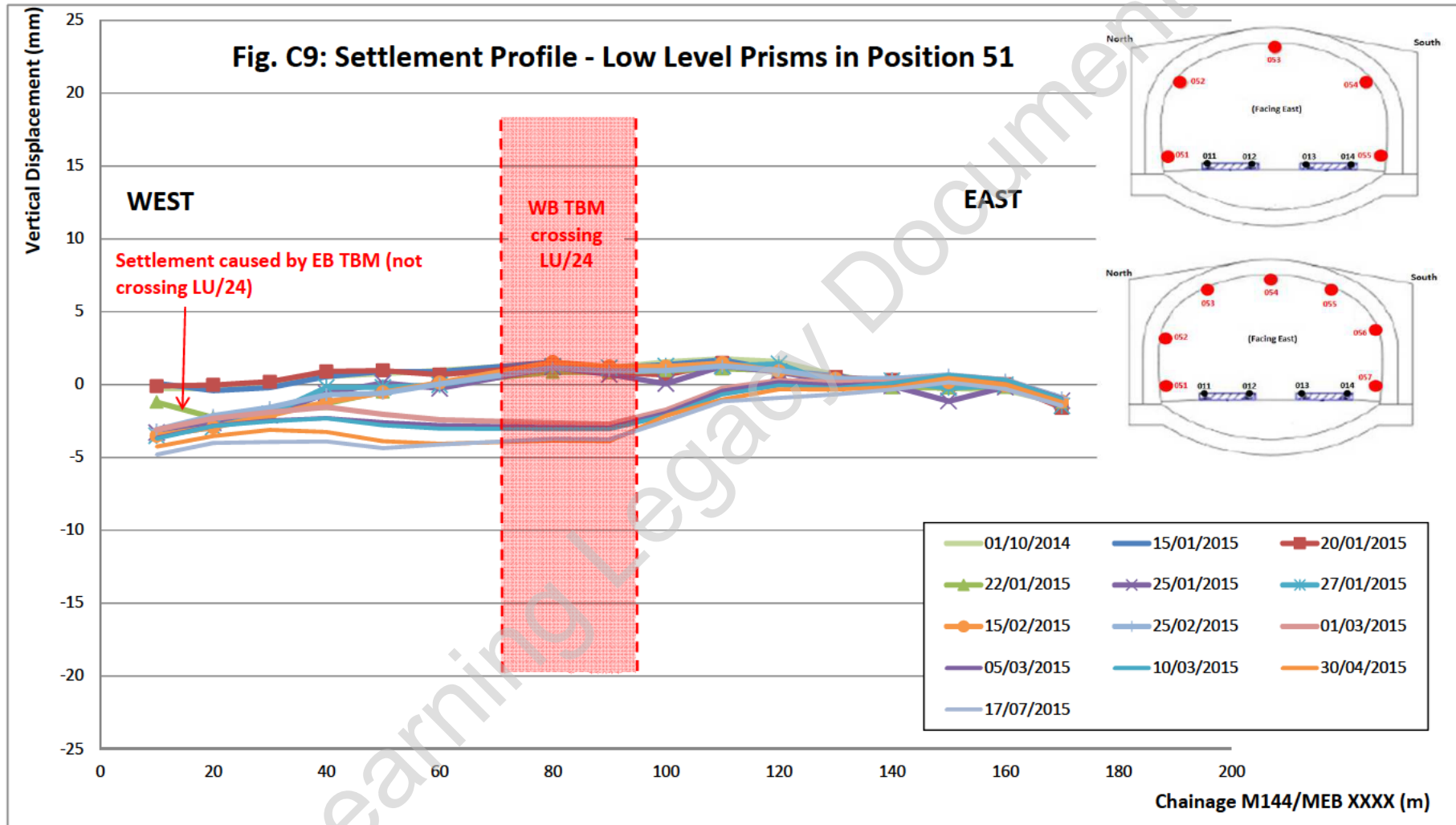


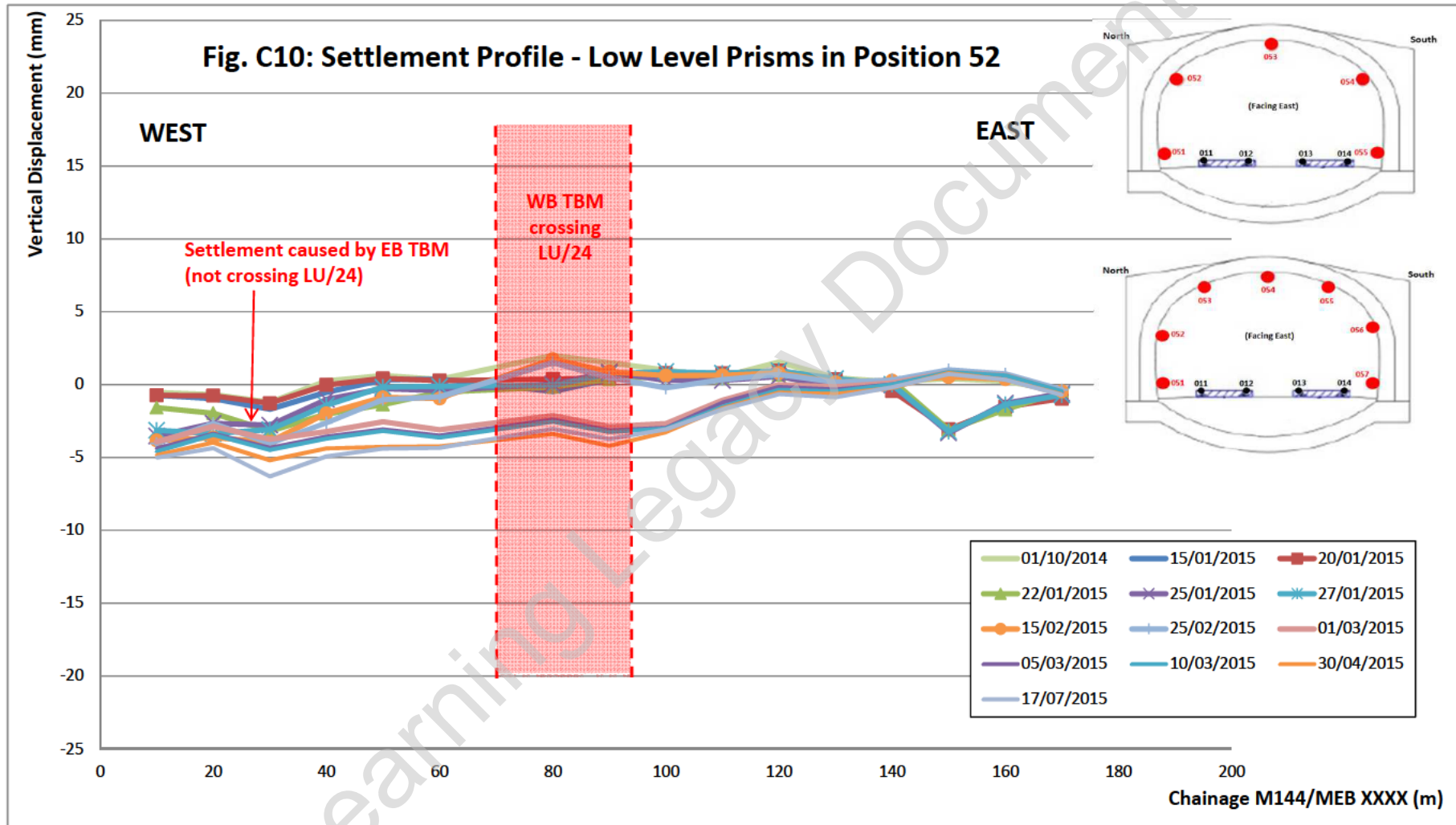












Learning Legacy Document

APPENDIX B: LEVELLING MARKS

SENSOR TYPE	SENSOR ID	LU Track	SENSOR LOCATION-GPS READING(m)		
			Easting X	Northing Y	Elevation Z (mATD)
Levelling mark	C305-LT101001	Liverpool Street-Moorgate EB CESS	83672.806	36178.983	99.497
Levelling mark	C305-LT101002	Liverpool Street-Moorgate EB CESS	83671.000	36179.843	99.483
Levelling mark	C305-LT101003	Liverpool Street-Moorgate EB CESS	83669.195	36180.703	99.464
Levelling mark	C305-LT101004	Liverpool Street-Moorgate EB CESS	83667.389	36181.562	99.444
Levelling mark	C305-LT101005	Liverpool Street-Moorgate EB CESS	83665.583	36182.422	99.432
Levelling mark	C305-LT101006	Liverpool Street-Moorgate EB CESS	83663.767	36183.287	99.422
Levelling mark	C305-LT101007	Liverpool Street-Moorgate EB CESS	83661.948	36184.118	99.413
Levelling mark	C305-LT101008	Liverpool Street-Moorgate EB CESS	83660.129	36184.950	99.402
Levelling mark	C305-LT101009	Liverpool Street-Moorgate EB CESS	83658.310	36185.781	99.393
Levelling mark	C305-LT101010	Liverpool Street-Moorgate EB CESS	83656.491	36186.613	99.389
Levelling mark	C305-LT101011	Liverpool Street-Moorgate EB CESS	83654.661	36187.450	99.388
Levelling mark	C305-LT101012	Liverpool Street-Moorgate EB CESS	83652.828	36188.251	99.390
Levelling mark	C305-LT101013	Liverpool Street-Moorgate EB CESS	83650.996	36189.052	99.390
Levelling mark	C305-LT101014	Liverpool Street-Moorgate EB CESS	83649.163	36189.854	99.389
Levelling mark	C305-LT101015	Liverpool Street-Moorgate EB CESS	83647.331	36190.655	99.388
Levelling mark	C305-LT101016	Liverpool Street-Moorgate EB CESS	83645.498	36191.456	99.380
Levelling mark	C305-LT101017	Liverpool Street-Moorgate EB CESS	83643.643	36192.235	99.372
Levelling mark	C305-LT101018	Liverpool Street-Moorgate EB CESS	83641.799	36193.007	99.363
Levelling mark	C305-LT101019	Liverpool Street-Moorgate EB CESS	83639.954	36193.780	99.352
Levelling mark	C305-LT101020	Liverpool Street-Moorgate EB CESS	83638.109	36194.552	99.347
Levelling mark	C305-LT101021	Liverpool Street-Moorgate EB CESS	83636.264	36195.325	99.347
Levelling mark	C305-LT101022	Liverpool Street-Moorgate EB CESS	83634.397	36196.074	99.344
Levelling mark	C305-LT101023	Liverpool Street-Moorgate EB CESS	83632.541	36196.818	99.337
Levelling mark	C305-LT101024	Liverpool Street-Moorgate EB CESS	83630.684	36197.562	99.329
Levelling mark	C305-LT101025	Liverpool Street-Moorgate EB CESS	83628.828	36198.305	99.324
Levelling mark	C305-LT101026	Liverpool Street-Moorgate EB CESS	83626.971	36199.049	99.319
Levelling mark	C305-LT101027	Liverpool Street-Moorgate EB CESS	83625.092	36199.769	99.311
Levelling mark	C305-LT101028	Liverpool Street-Moorgate EB CESS	83623.223	36200.482	99.298
Levelling mark	C305-LT101029	Liverpool Street-Moorgate EB CESS	83621.355	36201.196	99.290
Levelling mark	C305-LT101030	Liverpool Street-Moorgate EB CESS	83619.487	36201.909	99.287
Levelling mark	C305-LT101031	Liverpool Street-Moorgate EB CESS	83617.618	36202.622	99.280
Levelling mark	C305-LT101032	Liverpool Street-Moorgate EB CESS	83615.727	36203.311	99.269
Levelling mark	C305-LT101033	Liverpool Street-Moorgate EB CESS	83613.848	36203.994	99.262
Levelling mark	C305-LT101034	Liverpool Street-Moorgate EB CESS	83611.968	36204.677	99.256
Levelling mark	C305-LT101035	Liverpool Street-Moorgate EB CESS	83610.088	36205.360	99.249
Levelling mark	C305-LT101036	Liverpool Street-Moorgate EB CESS	83608.209	36206.043	99.236
Levelling mark	C305-LT101037	Liverpool Street-Moorgate EB CESS	83606.308	36206.702	99.218
Levelling mark	C305-LT101038	Liverpool Street-Moorgate EB CESS	83604.418	36207.356	99.204
Levelling mark	C305-LT101039	Liverpool Street-Moorgate EB CESS	83602.528	36208.010	99.193
Levelling mark	C305-LT101040	Liverpool Street-Moorgate EB CESS	83600.638	36208.663	99.179
Levelling mark	C305-LT101041	Liverpool Street-Moorgate EB CESS	83598.747	36209.317	99.166
Levelling mark	C305-LT101042	Liverpool Street-Moorgate EB CESS	83596.822	36209.928	99.159
Levelling mark	C305-LT101043	Liverpool Street-Moorgate EB CESS	83594.914	36210.530	99.151
Levelling mark	C305-LT101044	Liverpool Street-Moorgate EB CESS	83593.007	36211.132	99.146
Levelling mark	C305-LT101045	Liverpool Street-Moorgate EB CESS	83591.100	36211.734	99.138
Levelling mark	C305-LT101046	Liverpool Street-Moorgate EB CESS	83589.193	36212.336	99.131
Levelling mark	C305-LT101047	Liverpool Street-Moorgate EB CESS	83587.286	36212.939	99.129
Levelling mark	C305-LT101048	Liverpool Street-Moorgate EB CESS	83585.371	36213.532	99.131
Levelling mark	C305-LT101049	Liverpool Street-Moorgate EB CESS	83583.460	36214.122	99.124
Levelling mark	C305-LT101050	Liverpool Street-Moorgate EB CESS	83581.549	36214.712	99.115
Levelling mark	C305-LT101051	Liverpool Street-Moorgate EB CESS	83579.638	36215.302	99.105
Levelling mark	C305-LT101052	Liverpool Street-Moorgate EB CESS	83577.727	36215.892	99.098
Levelling mark	C305-LT101053	Liverpool Street-Moorgate EB CESS	83575.816	36216.483	99.083
Levelling mark	C305-LT101054	Liverpool Street-Moorgate EB CESS	83573.905	36217.073	99.070
Levelling mark	C305-LT101055	Liverpool Street-Moorgate EB CESS	83571.994	36217.663	99.059
Levelling mark	C305-LT101056	Liverpool Street-Moorgate EB CESS	83570.083	36218.253	99.047
Levelling mark	C305-LT101057	Liverpool Street-Moorgate EB CESS	83568.142	36218.805	99.030

SENSOR TYPE	SENSOR ID	LU Track	SENSOR LOCATION-GPS READING(m)		
			Easting X	Northing Y	Elevation Z (mATD)
Levelling mark	C305-LT101058	Liverpool Street-Moorgate EB CESS	83566.218	36219.350	99.011
Levelling mark	C305-LT101059	Liverpool Street-Moorgate EB CESS	83564.294	36219.895	99.000
Levelling mark	C305-LT101060	Liverpool Street-Moorgate EB CESS	83562.370	36220.440	98.979
Levelling mark	C305-LT101061	Liverpool Street-Moorgate EB CESS	83560.445	36220.986	98.959
Levelling mark	C305-LT101062	Liverpool Street-Moorgate EB CESS	83558.510	36221.517	98.946
Levelling mark	C305-LT101063	Liverpool Street-Moorgate EB CESS	83556.581	36222.045	98.936
Levelling mark	C305-LT101064	Liverpool Street-Moorgate EB CESS	83554.652	36222.573	98.924
Levelling mark	C305-LT101065	Liverpool Street-Moorgate EB CESS	83552.723	36223.101	98.909
Levelling mark	C305-LT101066	Liverpool Street-Moorgate EB CESS	83550.794	36223.629	98.899
Levelling mark	C305-LT101067	Liverpool Street-Moorgate EB CESS	83548.867	36224.160	98.891
Levelling mark	C305-LT101068	Liverpool Street-Moorgate EB CESS	83546.939	36224.692	98.888
Levelling mark	C305-LT101069	Liverpool Street-Moorgate EB CESS	83545.011	36225.224	98.886
Levelling mark	C305-LT101070	Liverpool Street-Moorgate EB CESS	83543.083	36225.755	98.879
Levelling mark	C305-LT101071	Liverpool Street-Moorgate EB CESS	83541.155	36226.287	98.875
Levelling mark	C305-LT101072	Liverpool Street-Moorgate EB CESS	83539.228	36226.820	98.869
Levelling mark	C305-LT101073	Liverpool Street-Moorgate EB CESS	83537.301	36227.353	98.861
Levelling mark	C305-LT101074	Liverpool Street-Moorgate EB CESS	83535.373	36227.886	98.858
Levelling mark	C305-LT101075	Liverpool Street-Moorgate EB CESS	83533.445	36228.419	98.856
Levelling mark	C305-LT101076	Liverpool Street-Moorgate EB CESS	83531.518	36228.953	98.850
Levelling mark	C305-LT101077	Liverpool Street-Moorgate EB CESS	83529.592	36229.489	98.841
Levelling mark	C305-LT101078	Liverpool Street-Moorgate EB CESS	83527.665	36230.025	98.835
Levelling mark	C305-LT101079	Liverpool Street-Moorgate EB CESS	83525.739	36230.561	98.836
Levelling mark	C305-LT101080	Liverpool Street-Moorgate EB CESS	83523.812	36231.098	98.838
Levelling mark	C305-LT101081	Liverpool Street-Moorgate EB CESS	83521.885	36231.634	98.843
Levelling mark	C305-LT101082	Liverpool Street-Moorgate EB CESS	83519.967	36232.181	98.840
Levelling mark	C305-LT101083	Liverpool Street-Moorgate EB CESS	83518.043	36232.730	98.838
Levelling mark	C305-LT101084	Liverpool Street-Moorgate EB CESS	83516.120	36233.279	98.840
Levelling mark	C305-LT101085	Liverpool Street-Moorgate EB CESS	83514.197	36233.828	98.843
Levelling mark	C305-LT101086	Liverpool Street-Moorgate EB CESS	83512.274	36234.377	98.844
Levelling mark	C305-LT101087	Liverpool Street-Moorgate EB CESS	83510.350	36234.925	98.844
Levelling mark	C305-LT101088	Liverpool Street-Moorgate EB CESS	83508.427	36235.474	98.840
Levelling mark	C305-LT101089	Liverpool Street-Moorgate EB CESS	83506.504	36236.022	98.839
Levelling mark	C305-LT101090	Liverpool Street-Moorgate EB CESS	83504.580	36236.570	98.838
Levelling mark	C305-LT101091	Liverpool Street-Moorgate EB CESS	83502.657	36237.119	98.837
Levelling mark	C305-LT101092	Liverpool Street-Moorgate EB CESS	83500.735	36237.670	98.839
Levelling mark	C305-LT101093	Liverpool Street-Moorgate EB CESS	83498.813	36238.221	98.841
Levelling mark	C305-LT101094	Liverpool Street-Moorgate EB CESS	83496.890	36238.772	98.839
Levelling mark	C305-LT101095	Liverpool Street-Moorgate EB CESS	83494.968	36239.323	98.841
Levelling mark	C305-LT101096	Liverpool Street-Moorgate EB CESS	83493.045	36239.874	98.843
Levelling mark	C305-LT101097	Liverpool Street-Moorgate EB CESS	83491.123	36240.426	98.847
Levelling mark	C305-LT101098	Liverpool Street-Moorgate EB CESS	83489.201	36240.979	98.849
Levelling mark	C305-LT101099	Liverpool Street-Moorgate EB CESS	83487.279	36241.531	98.848
Levelling mark	C305-LT101100	Liverpool Street-Moorgate EB CESS	83485.357	36242.083	98.850
Levelling mark	C305-LT101101	Liverpool Street-Moorgate EB CESS	83483.434	36242.635	98.848
Levelling mark	C305-LT101102	Liverpool Street-Moorgate EB CESS	83481.509	36243.184	98.845
Levelling mark	C305-LT101103	Liverpool Street-Moorgate EB CESS	83479.586	36243.731	98.845
Levelling mark	C305-LT101104	Liverpool Street-Moorgate EB CESS	83477.662	36244.279	98.850
Levelling mark	C305-LT101105	Liverpool Street-Moorgate EB CESS	83475.738	36244.827	98.855
Levelling mark	C305-LT101106	Liverpool Street-Moorgate EB CESS	83473.815	36245.374	98.861
Levelling mark	C305-LT101107	Liverpool Street-Moorgate EB CESS	83471.887	36245.916	98.859
Levelling mark	C305-LT101108	Liverpool Street-Moorgate EB CESS	83469.961	36246.457	98.856
Levelling mark	C305-LT101109	Liverpool Street-Moorgate EB CESS	83468.036	36246.998	98.852
Levelling mark	C305-LT101110	Liverpool Street-Moorgate EB CESS	83466.110	36247.538	98.853
Levelling mark	C305-LT101111	Liverpool Street-Moorgate EB CESS	83464.185	36248.079	98.853
Levelling mark	C305-LT101112	Liverpool Street-Moorgate EB CESS	83462.254	36248.613	98.856
Levelling mark	C305-LT101113	Liverpool Street-Moorgate EB CESS	83460.327	36249.147	98.857
Levelling mark	C305-LT101114	Liverpool Street-Moorgate EB CESS	83458.399	36249.680	98.858
Levelling mark	C305-LT101115	Liverpool Street-Moorgate EB CESS	83456.472	36250.213	98.861

SENSOR TYPE	SENSOR ID	LU Track	SENSOR LOCATION-GPS READING(m)		
			Easting X	Northing Y	Elevation Z (mATD)
Levelling mark	C305-LT101116	Liverpool Street-Moorgate EB CESS	83454.544	36250.746	98.866
Levelling mark	C305-LT101117	Liverpool Street-Moorgate EB CESS	83452.576	36251.225	98.868
Levelling mark	C305-LT101118	Liverpool Street-Moorgate EB CESS	83450.631	36251.692	98.865
Levelling mark	C305-LT101119	Liverpool Street-Moorgate EB CESS	83448.686	36252.159	98.865
Levelling mark	C305-LT101120	Liverpool Street-Moorgate EB CESS	83446.742	36252.626	98.858
Levelling mark	C305-LT101121	Liverpool Street-Moorgate EB CESS	83444.797	36253.093	98.846
Levelling mark	C305-LT101122	Liverpool Street-Moorgate EB CESS	83442.830	36253.527	98.833
Levelling mark	C305-LT101123	Liverpool Street-Moorgate EB CESS	83440.876	36253.957	98.823
Levelling mark	C305-LT101124	Liverpool Street-Moorgate EB CESS	83438.923	36254.386	98.817
Levelling mark	C305-LT101125	Liverpool Street-Moorgate EB CESS	83436.970	36254.815	98.809
Levelling mark	C305-LT101126	Liverpool Street-Moorgate EB CESS	83435.016	36255.244	98.803
Levelling mark	C305-LT101127	Liverpool Street-Moorgate EB CESS	83433.063	36255.674	98.800
Levelling mark	C305-LT101128	Liverpool Street-Moorgate EB CESS	83431.109	36256.103	98.794
Levelling mark	C305-LT101129	Liverpool Street-Moorgate EB CESS	83429.156	36256.532	98.783
Levelling mark	C305-LT101130	Liverpool Street-Moorgate EB CESS	83427.203	36256.961	98.771
Levelling mark	C305-LT101131	Liverpool Street-Moorgate EB CESS	83425.249	36257.390	98.763
Levelling mark	C305-LT101132	Liverpool Street-Moorgate EB CESS	83423.299	36257.824	98.753
Levelling mark	C305-LT101133	Liverpool Street-Moorgate EB CESS	83421.347	36258.258	98.742
Levelling mark	C305-LT101134	Liverpool Street-Moorgate EB CESS	83419.394	36258.693	98.735
Levelling mark	C305-LT101135	Liverpool Street-Moorgate EB CESS	83417.442	36259.127	98.732
Levelling mark	C305-LT101136	Liverpool Street-Moorgate EB CESS	83415.490	36259.561	98.731
Levelling mark	C305-LT101137	Liverpool Street-Moorgate EB CESS	83413.538	36259.996	98.723
Levelling mark	C305-LT101138	Liverpool Street-Moorgate EB CESS	83411.586	36260.431	98.715
Levelling mark	C305-LT101139	Liverpool Street-Moorgate EB CESS	83409.634	36260.866	98.709
Levelling mark	C305-LT101140	Liverpool Street-Moorgate EB CESS	83407.682	36261.301	98.708
Levelling mark	C305-LT101141	Liverpool Street-Moorgate EB CESS	83405.730	36261.737	98.703
Levelling mark	C305-LT101142	Liverpool Street-Moorgate EB CESS	83403.781	36262.178	98.693
Levelling mark	C305-LT101143	Liverpool Street-Moorgate EB CESS	83401.831	36262.620	98.683
Levelling mark	C305-LT101144	Liverpool Street-Moorgate EB CESS	83399.880	36263.061	98.672
Levelling mark	C305-LT101145	Liverpool Street-Moorgate EB CESS	83397.930	36263.503	98.662
Levelling mark	C305-LT101146	Liverpool Street-Moorgate EB CESS	83395.979	36263.945	98.657
Levelling mark	C305-LT101147	Liverpool Street-Moorgate EB CESS	83394.033	36264.394	98.646
Levelling mark	C305-LT101148	Liverpool Street-Moorgate EB CESS	83392.085	36264.844	98.627
Levelling mark	C305-LT101149	Liverpool Street-Moorgate EB CESS	83390.136	36265.295	98.604
Levelling mark	C305-LT101150	Liverpool Street-Moorgate EB CESS	83388.187	36265.745	98.581
Levelling mark	C305-LT101151	Liverpool Street-Moorgate EB CESS	83386.239	36266.195	98.553
Levelling mark	C305-LT101152	Liverpool Street-Moorgate EB CESS	83384.290	36266.645	98.525
Levelling mark	C305-LT101153	Liverpool Street-Moorgate EB CESS	83382.341	36267.095	98.502
Levelling mark	C305-LT101154	Liverpool Street-Moorgate EB CESS	83380.393	36267.546	98.486
Levelling mark	C305-LT101155	Liverpool Street-Moorgate EB CESS	83378.444	36267.996	98.461
Levelling mark	C305-LT101156	Liverpool Street-Moorgate EB CESS	83376.495	36268.446	98.425
Levelling mark	C305-LT101157	Liverpool Street-Moorgate EB CESS	83374.552	36268.904	98.410
Levelling mark	C305-LT101158	Liverpool Street-Moorgate EB CESS	83372.605	36269.362	98.394
Levelling mark	C305-LT101159	Liverpool Street-Moorgate EB CESS	83370.658	36269.821	98.371
Levelling mark	C305-LT101160	Liverpool Street-Moorgate EB CESS	83368.712	36270.279	98.350
Levelling mark	C305-LT101161	Liverpool Street-Moorgate EB CESS	83366.765	36270.738	98.332
Levelling mark	C305-LT101162	Liverpool Street-Moorgate EB CESS	83364.819	36271.198	98.316
Levelling mark	C305-LT101163	Liverpool Street-Moorgate EB CESS	83362.873	36271.658	98.299
Levelling mark	C305-LT101164	Liverpool Street-Moorgate EB CESS	83360.927	36272.118	98.283
Levelling mark	C305-LT101165	Liverpool Street-Moorgate EB CESS	83358.980	36272.579	98.269
Levelling mark	C305-LT101166	Liverpool Street-Moorgate EB CESS	83357.037	36273.038	98.249
Levelling mark	C305-LT101167	Liverpool Street-Moorgate EB CESS	83355.093	36273.507	98.227
Levelling mark	C305-LT101168	Liverpool Street-Moorgate EB CESS	83353.148	36273.975	98.204
Levelling mark	C305-LT101169	Liverpool Street-Moorgate EB CESS	83351.204	36274.443	98.184
Levelling mark	C305-LT101170	Liverpool Street-Moorgate EB CESS	83349.259	36274.911	98.169
Levelling mark	C305-LT101171	Liverpool Street-Moorgate EB CESS	83347.316	36275.380	98.157
Levelling mark	C305-LT101172	Liverpool Street-Moorgate EB CESS	83345.373	36275.852	98.145
Levelling mark	C305-LT101173	Liverpool Street-Moorgate EB CESS	83343.430	36276.324	98.143

SENSOR TYPE	SENSOR ID	LU Track	SENSOR LOCATION-GPS READING(m)		
			Easting X	Northing Y	Elevation Z (mATD)
Levelling mark	C305-LT101174	Liverpool Street-Moorgate EB CESS	83341.486	36276.796	98.143
Levelling mark	C305-LT101175	Liverpool Street-Moorgate EB CESS	83339.543	36277.268	98.142
Levelling mark	C305-LT101176	Liverpool Street-Moorgate EB CESS	83337.600	36277.740	98.143
Levelling mark	C305-LT101177	Liverpool Street-Moorgate EB CESS	83335.657	36278.215	98.145
Levelling mark	C305-LT101178	Liverpool Street-Moorgate EB CESS	83333.715	36278.690	98.142
Levelling mark	C305-LT101179	Liverpool Street-Moorgate EB CESS	83331.772	36279.165	98.145
Levelling mark	C305-LT101180	Liverpool Street-Moorgate EB CESS	83329.829	36279.640	98.149
Levelling mark	C305-LT101181	Liverpool Street-Moorgate EB CESS	83327.973	36280.093	98.158

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SENSOR TYPE	SENSOR ID	LU Track	SENSOR LOCATION-GPS READING(m)		
			Easting X	Northing Y	Elevation Z (mATD)
Levelling mark	C305-LT101201	Liverpool Street-Moorgate EB 6FT	83672.161	36177.629	99.428
Levelling mark	C305-LT101202	Liverpool Street-Moorgate EB 6FT	83670.356	36178.489	99.421
Levelling mark	C305-LT101203	Liverpool Street-Moorgate EB 6FT	83668.550	36179.348	99.403
Levelling mark	C305-LT101204	Liverpool Street-Moorgate EB 6FT	83666.744	36180.208	99.387
Levelling mark	C305-LT101205	Liverpool Street-Moorgate EB 6FT	83664.938	36181.068	99.374
Levelling mark	C305-LT101206	Liverpool Street-Moorgate EB 6FT	83663.143	36181.923	99.362
Levelling mark	C305-LT101207	Liverpool Street-Moorgate EB 6FT	83661.324	36182.754	99.346
Levelling mark	C305-LT101208	Liverpool Street-Moorgate EB 6FT	83659.505	36183.586	99.334
Levelling mark	C305-LT101209	Liverpool Street-Moorgate EB 6FT	83657.686	36184.417	99.327
Levelling mark	C305-LT101210	Liverpool Street-Moorgate EB 6FT	83655.867	36185.249	99.320
Levelling mark	C305-LT101211	Liverpool Street-Moorgate EB 6FT	83654.060	36186.075	99.315
Levelling mark	C305-LT101212	Liverpool Street-Moorgate EB 6FT	83652.227	36186.877	99.312
Levelling mark	C305-LT101213	Liverpool Street-Moorgate EB 6FT	83650.395	36187.678	99.312
Levelling mark	C305-LT101214	Liverpool Street-Moorgate EB 6FT	83648.562	36188.479	99.311
Levelling mark	C305-LT101215	Liverpool Street-Moorgate EB 6FT	83646.730	36189.281	99.310
Levelling mark	C305-LT101216	Liverpool Street-Moorgate EB 6FT	83644.897	36190.082	99.304
Levelling mark	C305-LT101217	Liverpool Street-Moorgate EB 6FT	83643.064	36190.851	99.296
Levelling mark	C305-LT101218	Liverpool Street-Moorgate EB 6FT	83641.219	36191.624	99.289
Levelling mark	C305-LT101219	Liverpool Street-Moorgate EB 6FT	83639.374	36192.396	99.285
Levelling mark	C305-LT101220	Liverpool Street-Moorgate EB 6FT	83637.530	36193.169	99.287
Levelling mark	C305-LT101221	Liverpool Street-Moorgate EB 6FT	83635.685	36193.941	99.289
Levelling mark	C305-LT101222	Liverpool Street-Moorgate EB 6FT	83633.840	36194.682	99.292
Levelling mark	C305-LT101223	Liverpool Street-Moorgate EB 6FT	83631.983	36195.426	99.289
Levelling mark	C305-LT101224	Liverpool Street-Moorgate EB 6FT	83630.126	36196.169	99.281
Levelling mark	C305-LT101225	Liverpool Street-Moorgate EB 6FT	83628.270	36196.913	99.272
Levelling mark	C305-LT101226	Liverpool Street-Moorgate EB 6FT	83626.413	36197.657	99.260
Levelling mark	C305-LT101227	Liverpool Street-Moorgate EB 6FT	83624.557	36198.367	99.249
Levelling mark	C305-LT101228	Liverpool Street-Moorgate EB 6FT	83622.688	36199.081	99.236
Levelling mark	C305-LT101229	Liverpool Street-Moorgate EB 6FT	83620.820	36199.794	99.225
Levelling mark	C305-LT101230	Liverpool Street-Moorgate EB 6FT	83618.952	36200.508	99.217
Levelling mark	C305-LT101231	Liverpool Street-Moorgate EB 6FT	83617.083	36201.221	99.214
Levelling mark	C305-LT101232	Liverpool Street-Moorgate EB 6FT	83615.215	36201.901	99.209
Levelling mark	C305-LT101233	Liverpool Street-Moorgate EB 6FT	83613.335	36202.584	99.204
Levelling mark	C305-LT101234	Liverpool Street-Moorgate EB 6FT	83611.456	36203.267	99.200
Levelling mark	C305-LT101235	Liverpool Street-Moorgate EB 6FT	83609.576	36203.950	99.194
Levelling mark	C305-LT101236	Liverpool Street-Moorgate EB 6FT	83607.696	36204.633	99.179
Levelling mark	C305-LT101237	Liverpool Street-Moorgate EB 6FT	83605.817	36205.284	99.163
Levelling mark	C305-LT101238	Liverpool Street-Moorgate EB 6FT	83603.927	36205.938	99.149
Levelling mark	C305-LT101239	Liverpool Street-Moorgate EB 6FT	83602.037	36206.592	99.137
Levelling mark	C305-LT101240	Liverpool Street-Moorgate EB 6FT	83600.147	36207.246	99.124
Levelling mark	C305-LT101241	Liverpool Street-Moorgate EB 6FT	83598.257	36207.900	99.112
Levelling mark	C305-LT101242	Liverpool Street-Moorgate EB 6FT	83596.370	36208.498	99.104
Levelling mark	C305-LT101243	Liverpool Street-Moorgate EB 6FT	83594.463	36209.100	99.095
Levelling mark	C305-LT101244	Liverpool Street-Moorgate EB 6FT	83592.556	36209.702	99.087
Levelling mark	C305-LT101245	Liverpool Street-Moorgate EB 6FT	83590.648	36210.303	99.078
Levelling mark	C305-LT101246	Liverpool Street-Moorgate EB 6FT	83588.741	36210.906	99.073
Levelling mark	C305-LT101247	Liverpool Street-Moorgate EB 6FT	83586.834	36211.509	99.071
Levelling mark	C305-LT101248	Liverpool Street-Moorgate EB 6FT	83584.928	36212.099	99.066
Levelling mark	C305-LT101249	Liverpool Street-Moorgate EB 6FT	83583.017	36212.689	99.058
Levelling mark	C305-LT101250	Liverpool Street-Moorgate EB 6FT	83581.106	36213.279	99.051
Levelling mark	C305-LT101251	Liverpool Street-Moorgate EB 6FT	83579.195	36213.869	99.044
Levelling mark	C305-LT101252	Liverpool Street-Moorgate EB 6FT	83577.284	36214.459	99.037
Levelling mark	C305-LT101253	Liverpool Street-Moorgate EB 6FT	83575.373	36215.049	99.027
Levelling mark	C305-LT101254	Liverpool Street-Moorgate EB 6FT	83573.462	36215.639	99.018
Levelling mark	C305-LT101255	Liverpool Street-Moorgate EB 6FT	83571.551	36216.229	99.011
Levelling mark	C305-LT101256	Liverpool Street-Moorgate EB 6FT	83569.640	36216.820	99.003
Levelling mark	C305-LT101257	Liverpool Street-Moorgate EB 6FT	83567.733	36217.361	98.993
Levelling mark	C305-LT101258	Liverpool Street-Moorgate EB 6FT	83565.809	36217.907	98.981

SENSOR TYPE	SENSOR ID	LU Track	SENSOR LOCATION-GPS READING(m)		
			Easting X	Northing Y	Elevation Z (mATD)
Levelling mark	C305-LT101259	Liverpool Street-Moorgate EB 6FT	83563.885	36218.452	98.972
Levelling mark	C305-LT101260	Liverpool Street-Moorgate EB 6FT	83561.961	36218.997	98.958
Levelling mark	C305-LT101261	Liverpool Street-Moorgate EB 6FT	83560.036	36219.543	98.949
Levelling mark	C305-LT101262	Liverpool Street-Moorgate EB 6FT	83558.114	36220.070	98.942
Levelling mark	C305-LT101263	Liverpool Street-Moorgate EB 6FT	83556.185	36220.598	98.930
Levelling mark	C305-LT101264	Liverpool Street-Moorgate EB 6FT	83554.256	36221.126	98.920
Levelling mark	C305-LT101265	Liverpool Street-Moorgate EB 6FT	83552.327	36221.655	98.913
Levelling mark	C305-LT101266	Liverpool Street-Moorgate EB 6FT	83550.398	36222.183	98.904
Levelling mark	C305-LT101267	Liverpool Street-Moorgate EB 6FT	83548.469	36222.714	98.892
Levelling mark	C305-LT101268	Liverpool Street-Moorgate EB 6FT	83546.541	36223.246	98.885
Levelling mark	C305-LT101269	Liverpool Street-Moorgate EB 6FT	83544.613	36223.777	98.878
Levelling mark	C305-LT101270	Liverpool Street-Moorgate EB 6FT	83542.685	36224.309	98.872
Levelling mark	C305-LT101271	Liverpool Street-Moorgate EB 6FT	83540.757	36224.841	98.871
Levelling mark	C305-LT101272	Liverpool Street-Moorgate EB 6FT	83538.828	36225.374	98.870
Levelling mark	C305-LT101273	Liverpool Street-Moorgate EB 6FT	83536.901	36225.907	98.870
Levelling mark	C305-LT101274	Liverpool Street-Moorgate EB 6FT	83534.973	36226.440	98.871
Levelling mark	C305-LT101275	Liverpool Street-Moorgate EB 6FT	83533.045	36226.974	98.868
Levelling mark	C305-LT101276	Liverpool Street-Moorgate EB 6FT	83531.118	36227.507	98.860
Levelling mark	C305-LT101277	Liverpool Street-Moorgate EB 6FT	83529.190	36228.043	98.852
Levelling mark	C305-LT101278	Liverpool Street-Moorgate EB 6FT	83527.263	36228.580	98.845
Levelling mark	C305-LT101279	Liverpool Street-Moorgate EB 6FT	83525.336	36229.116	98.844
Levelling mark	C305-LT101280	Liverpool Street-Moorgate EB 6FT	83523.410	36229.653	98.847
Levelling mark	C305-LT101281	Liverpool Street-Moorgate EB 6FT	83521.483	36230.189	98.849
Levelling mark	C305-LT101282	Liverpool Street-Moorgate EB 6FT	83519.555	36230.739	98.849
Levelling mark	C305-LT101283	Liverpool Street-Moorgate EB 6FT	83517.632	36231.288	98.850
Levelling mark	C305-LT101284	Liverpool Street-Moorgate EB 6FT	83515.709	36231.836	98.853
Levelling mark	C305-LT101285	Liverpool Street-Moorgate EB 6FT	83513.785	36232.385	98.854
Levelling mark	C305-LT101286	Liverpool Street-Moorgate EB 6FT	83511.862	36232.934	98.856
Levelling mark	C305-LT101287	Liverpool Street-Moorgate EB 6FT	83509.939	36233.483	98.854
Levelling mark	C305-LT101288	Liverpool Street-Moorgate EB 6FT	83508.016	36234.031	98.847
Levelling mark	C305-LT101289	Liverpool Street-Moorgate EB 6FT	83506.092	36234.579	98.843
Levelling mark	C305-LT101290	Liverpool Street-Moorgate EB 6FT	83504.169	36235.128	98.844
Levelling mark	C305-LT101291	Liverpool Street-Moorgate EB 6FT	83502.246	36235.676	98.843
Levelling mark	C305-LT101292	Liverpool Street-Moorgate EB 6FT	83500.322	36236.228	98.841
Levelling mark	C305-LT101293	Liverpool Street-Moorgate EB 6FT	83498.399	36236.779	98.838
Levelling mark	C305-LT101294	Liverpool Street-Moorgate EB 6FT	83496.477	36237.330	98.839
Levelling mark	C305-LT101295	Liverpool Street-Moorgate EB 6FT	83494.554	36237.881	98.847
Levelling mark	C305-LT101296	Liverpool Street-Moorgate EB 6FT	83492.632	36238.432	98.851
Levelling mark	C305-LT101297	Liverpool Street-Moorgate EB 6FT	83490.709	36238.985	98.851
Levelling mark	C305-LT101298	Liverpool Street-Moorgate EB 6FT	83488.787	36239.537	98.849
Levelling mark	C305-LT101299	Liverpool Street-Moorgate EB 6FT	83486.865	36240.089	98.849
Levelling mark	C305-LT101300	Liverpool Street-Moorgate EB 6FT	83484.942	36240.642	98.852
Levelling mark	C305-LT101301	Liverpool Street-Moorgate EB 6FT	83483.020	36241.194	98.848
Levelling mark	C305-LT101302	Liverpool Street-Moorgate EB 6FT	83481.098	36241.741	98.843
Levelling mark	C305-LT101303	Liverpool Street-Moorgate EB 6FT	83479.175	36242.289	98.842
Levelling mark	C305-LT101304	Liverpool Street-Moorgate EB 6FT	83477.251	36242.836	98.847
Levelling mark	C305-LT101305	Liverpool Street-Moorgate EB 6FT	83475.328	36243.384	98.850
Levelling mark	C305-LT101306	Liverpool Street-Moorgate EB 6FT	83473.404	36243.932	98.849
Levelling mark	C305-LT101307	Liverpool Street-Moorgate EB 6FT	83471.481	36244.472	98.846
Levelling mark	C305-LT101308	Liverpool Street-Moorgate EB 6FT	83469.556	36245.013	98.839
Levelling mark	C305-LT101309	Liverpool Street-Moorgate EB 6FT	83467.630	36245.553	98.832
Levelling mark	C305-LT101310	Liverpool Street-Moorgate EB 6FT	83465.705	36246.094	98.830
Levelling mark	C305-LT101311	Liverpool Street-Moorgate EB 6FT	83463.779	36246.635	98.830
Levelling mark	C305-LT101312	Liverpool Street-Moorgate EB 6FT	83461.855	36247.168	98.828
Levelling mark	C305-LT101313	Liverpool Street-Moorgate EB 6FT	83459.927	36247.701	98.826
Levelling mark	C305-LT101314	Liverpool Street-Moorgate EB 6FT	83457.999	36248.234	98.826
Levelling mark	C305-LT101315	Liverpool Street-Moorgate EB 6FT	83456.072	36248.767	98.826
Levelling mark	C305-LT101316	Liverpool Street-Moorgate EB 6FT	83454.144	36249.300	98.824

SENSOR TYPE	SENSOR ID	LU Track	SENSOR LOCATION-GPS READING(m)		
			Easting X	Northing Y	Elevation Z (mATD)
Levelling mark	C305-LT101317	Liverpool Street-Moorgate EB 6FT	83452.225	36249.766	98.821
Levelling mark	C305-LT101318	Liverpool Street-Moorgate EB 6FT	83450.281	36250.233	98.823
Levelling mark	C305-LT101319	Liverpool Street-Moorgate EB 6FT	83448.336	36250.701	98.822
Levelling mark	C305-LT101320	Liverpool Street-Moorgate EB 6FT	83446.391	36251.168	98.820
Levelling mark	C305-LT101321	Liverpool Street-Moorgate EB 6FT	83444.447	36251.635	98.815
Levelling mark	C305-LT101322	Liverpool Street-Moorgate EB 6FT	83442.508	36252.062	98.812
Levelling mark	C305-LT101323	Liverpool Street-Moorgate EB 6FT	83440.555	36252.492	98.803
Levelling mark	C305-LT101324	Liverpool Street-Moorgate EB 6FT	83438.601	36252.921	98.797
Levelling mark	C305-LT101325	Liverpool Street-Moorgate EB 6FT	83436.648	36253.350	98.789
Levelling mark	C305-LT101326	Liverpool Street-Moorgate EB 6FT	83434.694	36253.779	98.779
Levelling mark	C305-LT101327	Liverpool Street-Moorgate EB 6FT	83432.741	36254.209	98.772
Levelling mark	C305-LT101328	Liverpool Street-Moorgate EB 6FT	83430.788	36254.638	98.769
Levelling mark	C305-LT101329	Liverpool Street-Moorgate EB 6FT	83428.834	36255.067	98.764
Levelling mark	C305-LT101330	Liverpool Street-Moorgate EB 6FT	83426.881	36255.496	98.759
Levelling mark	C305-LT101331	Liverpool Street-Moorgate EB 6FT	83424.927	36255.925	98.752
Levelling mark	C305-LT101332	Liverpool Street-Moorgate EB 6FT	83422.973	36256.360	98.738
Levelling mark	C305-LT101333	Liverpool Street-Moorgate EB 6FT	83421.021	36256.794	98.730
Levelling mark	C305-LT101334	Liverpool Street-Moorgate EB 6FT	83419.069	36257.228	98.725
Levelling mark	C305-LT101335	Liverpool Street-Moorgate EB 6FT	83417.116	36257.663	98.715
Levelling mark	C305-LT101336	Liverpool Street-Moorgate EB 6FT	83415.164	36258.097	98.709
Levelling mark	C305-LT101337	Liverpool Street-Moorgate EB 6FT	83413.212	36258.532	98.703
Levelling mark	C305-LT101338	Liverpool Street-Moorgate EB 6FT	83411.259	36258.967	98.700
Levelling mark	C305-LT101339	Liverpool Street-Moorgate EB 6FT	83409.307	36259.402	98.697
Levelling mark	C305-LT101340	Liverpool Street-Moorgate EB 6FT	83407.355	36259.837	98.694
Levelling mark	C305-LT101341	Liverpool Street-Moorgate EB 6FT	83405.403	36260.273	98.694
Levelling mark	C305-LT101342	Liverpool Street-Moorgate EB 6FT	83403.450	36260.715	98.689
Levelling mark	C305-LT101343	Liverpool Street-Moorgate EB 6FT	83401.499	36261.157	98.681
Levelling mark	C305-LT101344	Liverpool Street-Moorgate EB 6FT	83399.549	36261.598	98.670
Levelling mark	C305-LT101345	Liverpool Street-Moorgate EB 6FT	83397.598	36262.040	98.659
Levelling mark	C305-LT101346	Liverpool Street-Moorgate EB 6FT	83395.648	36262.482	98.648
Levelling mark	C305-LT101347	Liverpool Street-Moorgate EB 6FT	83393.696	36262.933	98.636
Levelling mark	C305-LT101348	Liverpool Street-Moorgate EB 6FT	83391.747	36263.383	98.618
Levelling mark	C305-LT101349	Liverpool Street-Moorgate EB 6FT	83389.798	36263.833	98.595
Levelling mark	C305-LT101350	Liverpool Street-Moorgate EB 6FT	83387.850	36264.283	98.571
Levelling mark	C305-LT101351	Liverpool Street-Moorgate EB 6FT	83385.901	36264.733	98.552
Levelling mark	C305-LT101352	Liverpool Street-Moorgate EB 6FT	83383.952	36265.184	98.530
Levelling mark	C305-LT101353	Liverpool Street-Moorgate EB 6FT	83382.004	36265.634	98.507
Levelling mark	C305-LT101354	Liverpool Street-Moorgate EB 6FT	83380.055	36266.084	98.486
Levelling mark	C305-LT101355	Liverpool Street-Moorgate EB 6FT	83378.106	36266.534	98.457
Levelling mark	C305-LT101356	Liverpool Street-Moorgate EB 6FT	83376.158	36266.984	98.424
Levelling mark	C305-LT101357	Liverpool Street-Moorgate EB 6FT	83374.208	36267.444	98.406
Levelling mark	C305-LT101358	Liverpool Street-Moorgate EB 6FT	83372.261	36267.902	98.391
Levelling mark	C305-LT101359	Liverpool Street-Moorgate EB 6FT	83370.314	36268.361	98.374
Levelling mark	C305-LT101360	Liverpool Street-Moorgate EB 6FT	83368.368	36268.819	98.357
Levelling mark	C305-LT101361	Liverpool Street-Moorgate EB 6FT	83366.421	36269.278	98.340
Levelling mark	C305-LT101362	Liverpool Street-Moorgate EB 6FT	83364.474	36269.738	98.321
Levelling mark	C305-LT101363	Liverpool Street-Moorgate EB 6FT	83362.528	36270.198	98.302
Levelling mark	C305-LT101364	Liverpool Street-Moorgate EB 6FT	83360.581	36270.659	98.286
Levelling mark	C305-LT101365	Liverpool Street-Moorgate EB 6FT	83358.635	36271.119	98.271
Levelling mark	C305-LT101366	Liverpool Street-Moorgate EB 6FT	83356.686	36271.580	98.253
Levelling mark	C305-LT101367	Liverpool Street-Moorgate EB 6FT	83354.741	36272.048	98.230
Levelling mark	C305-LT101368	Liverpool Street-Moorgate EB 6FT	83352.797	36272.517	98.207
Levelling mark	C305-LT101369	Liverpool Street-Moorgate EB 6FT	83350.853	36272.985	98.188
Levelling mark	C305-LT101370	Liverpool Street-Moorgate EB 6FT	83348.908	36273.453	98.173
Levelling mark	C305-LT101371	Liverpool Street-Moorgate EB 6FT	83346.962	36273.922	98.161
Levelling mark	C305-LT101372	Liverpool Street-Moorgate EB 6FT	83345.019	36274.394	98.151
Levelling mark	C305-LT101373	Liverpool Street-Moorgate EB 6FT	83343.075	36274.866	98.147
Levelling mark	C305-LT101374	Liverpool Street-Moorgate EB 6FT	83341.132	36275.339	98.147

SENSOR TYPE	SENSOR ID	LU Track	SENSOR LOCATION-GPS READING(m)		
			Easting X	Northing Y	Elevation Z (mATD)
Levelling mark	C305-LT101375	Liverpool Street-Moorgate EB 6FT	83339.188	36275.811	98.148
Levelling mark	C305-LT101376	Liverpool Street-Moorgate EB 6FT	83337.244	36276.283	98.150
Levelling mark	C305-LT101377	Liverpool Street-Moorgate EB 6FT	83335.301	36276.758	98.154
Levelling mark	C305-LT101378	Liverpool Street-Moorgate EB 6FT	83333.358	36277.233	98.154
Levelling mark	C305-LT101379	Liverpool Street-Moorgate EB 6FT	83331.416	36277.708	98.153
Levelling mark	C305-LT101380	Liverpool Street-Moorgate EB 6FT	83329.473	36278.182	98.154
Levelling mark	C305-LT101381	Liverpool Street-Moorgate EB 6FT	83327.617	36278.636	98.164

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SENSOR TYPE	SENSOR ID	LU Track	SENSOR LOCATION-GPS READING(m)		
			Easting X	Northing Y	Elevation Z (mATD)
Levelling Mark	C305-LT101401	Liverpool Street-Moorgate WB CESS	83670.656	36174.539	99.322
Levelling Mark	C305-LT101402	Liverpool Street-Moorgate WB CESS	83668.853	36175.407	99.316
Levelling Mark	C305-LT101403	Liverpool Street-Moorgate WB CESS	83667.051	36176.274	99.311
Levelling Mark	C305-LT101404	Liverpool Street-Moorgate WB CESS	83665.249	36177.141	99.300
Levelling Mark	C305-LT101405	Liverpool Street-Moorgate WB CESS	83663.447	36178.009	99.289
Levelling Mark	C305-LT101406	Liverpool Street-Moorgate WB CESS	83661.658	36178.869	99.284
Levelling Mark	C305-LT101407	Liverpool Street-Moorgate WB CESS	83659.839	36179.700	99.280
Levelling Mark	C305-LT101408	Liverpool Street-Moorgate WB CESS	83658.020	36180.530	99.264
Levelling Mark	C305-LT101409	Liverpool Street-Moorgate WB CESS	83656.200	36181.361	99.254
Levelling Mark	C305-LT101410	Liverpool Street-Moorgate WB CESS	83654.381	36182.191	99.244
Levelling Mark	C305-LT101411	Liverpool Street-Moorgate WB CESS	83652.573	36183.014	99.232
Levelling Mark	C305-LT101412	Liverpool Street-Moorgate WB CESS	83650.739	36183.813	99.220
Levelling Mark	C305-LT101413	Liverpool Street-Moorgate WB CESS	83648.905	36184.611	99.215
Levelling Mark	C305-LT101414	Liverpool Street-Moorgate WB CESS	83647.071	36185.409	99.210
Levelling Mark	C305-LT101415	Liverpool Street-Moorgate WB CESS	83645.238	36186.208	99.205
Levelling Mark	C305-LT101416	Liverpool Street-Moorgate WB CESS	83643.412	36187.002	99.204
Levelling Mark	C305-LT101417	Liverpool Street-Moorgate WB CESS	83641.569	36187.777	99.204
Levelling Mark	C305-LT101418	Liverpool Street-Moorgate WB CESS	83639.725	36188.553	99.202
Levelling Mark	C305-LT101419	Liverpool Street-Moorgate WB CESS	83637.882	36189.328	99.204
Levelling Mark	C305-LT101420	Liverpool Street-Moorgate WB CESS	83636.038	36190.104	99.201
Levelling Mark	C305-LT101421	Liverpool Street-Moorgate WB CESS	83634.196	36190.879	99.192
Levelling Mark	C305-LT101422	Liverpool Street-Moorgate WB CESS	83632.350	36191.618	99.183
Levelling Mark	C305-LT101423	Liverpool Street-Moorgate WB CESS	83630.493	36192.361	99.173
Levelling Mark	C305-LT101424	Liverpool Street-Moorgate WB CESS	83628.636	36193.104	99.167
Levelling Mark	C305-LT101425	Liverpool Street-Moorgate WB CESS	83626.780	36193.848	99.164
Levelling Mark	C305-LT101426	Liverpool Street-Moorgate WB CESS	83624.935	36194.586	99.159
Levelling Mark	C305-LT101427	Liverpool Street-Moorgate WB CESS	83623.066	36195.299	99.154
Levelling Mark	C305-LT101428	Liverpool Street-Moorgate WB CESS	83621.197	36196.011	99.150
Levelling Mark	C305-LT101429	Liverpool Street-Moorgate WB CESS	83619.328	36196.723	99.150
Levelling Mark	C305-LT101430	Liverpool Street-Moorgate WB CESS	83617.459	36197.436	99.147
Levelling Mark	C305-LT101431	Liverpool Street-Moorgate WB CESS	83615.601	36198.140	99.142
Levelling Mark	C305-LT101432	Liverpool Street-Moorgate WB CESS	83613.720	36198.820	99.139
Levelling Mark	C305-LT101433	Liverpool Street-Moorgate WB CESS	83611.839	36199.499	99.139
Levelling Mark	C305-LT101434	Liverpool Street-Moorgate WB CESS	83609.958	36200.179	99.135
Levelling Mark	C305-LT101435	Liverpool Street-Moorgate WB CESS	83608.077	36200.859	99.131
Levelling Mark	C305-LT101436	Liverpool Street-Moorgate WB CESS	83606.204	36201.531	99.129
Levelling Mark	C305-LT101437	Liverpool Street-Moorgate WB CESS	83604.315	36202.186	99.120
Levelling Mark	C305-LT101438	Liverpool Street-Moorgate WB CESS	83602.425	36202.841	99.098
Levelling Mark	C305-LT101439	Liverpool Street-Moorgate WB CESS	83600.535	36203.496	99.076
Levelling Mark	C305-LT101440	Liverpool Street-Moorgate WB CESS	83598.646	36204.151	99.060
Levelling Mark	C305-LT101441	Liverpool Street-Moorgate WB CESS	83596.767	36204.794	99.046
Levelling Mark	C305-LT101442	Liverpool Street-Moorgate WB CESS	83594.865	36205.412	99.031
Levelling Mark	C305-LT101443	Liverpool Street-Moorgate WB CESS	83592.963	36206.030	99.019
Levelling Mark	C305-LT101444	Liverpool Street-Moorgate WB CESS	83591.061	36206.647	99.013
Levelling Mark	C305-LT101445	Liverpool Street-Moorgate WB CESS	83589.158	36207.265	99.006
Levelling Mark	C305-LT101446	Liverpool Street-Moorgate WB CESS	83587.258	36207.880	99.003
Levelling Mark	C305-LT101447	Liverpool Street-Moorgate WB CESS	83585.354	36208.492	99.007
Levelling Mark	C305-LT101448	Liverpool Street-Moorgate WB CESS	83583.450	36209.103	99.011
Levelling Mark	C305-LT101449	Liverpool Street-Moorgate WB CESS	83581.546	36209.715	99.015
Levelling Mark	C305-LT101450	Liverpool Street-Moorgate WB CESS	83579.641	36210.327	99.013
Levelling Mark	C305-LT101451	Liverpool Street-Moorgate WB CESS	83577.737	36210.938	98.997
Levelling Mark	C305-LT101452	Liverpool Street-Moorgate WB CESS	83575.841	36211.491	98.984
Levelling Mark	C305-LT101453	Liverpool Street-Moorgate WB CESS	83573.918	36212.039	98.970
Levelling Mark	C305-LT101454	Liverpool Street-Moorgate WB CESS	83571.994	36212.587	98.960
Levelling Mark	C305-LT101455	Liverpool Street-Moorgate WB CESS	83570.071	36213.135	98.957
Levelling Mark	C305-LT101456	Liverpool Street-Moorgate WB CESS	83568.144	36213.687	98.955
Levelling Mark	C305-LT101457	Liverpool Street-Moorgate WB CESS	83566.224	36214.245	98.953
Levelling Mark	C305-LT101458	Liverpool Street-Moorgate WB CESS	83564.303	36214.804	98.945

SENSOR TYPE	SENSOR ID	LU Track	SENSOR LOCATION-GPS READING(m)		
			Easting X	Northing Y	Elevation Z (mATD)
Levelling Mark	C305-LT101459	Liverpool Street-Moorgate WB CESS	83562.383	36215.362	98.939
Levelling Mark	C305-LT101460	Liverpool Street-Moorgate WB CESS	83560.462	36215.920	98.940
Levelling Mark	C305-LT101461	Liverpool Street-Moorgate WB CESS	83558.547	36216.472	98.942
Levelling Mark	C305-LT101462	Liverpool Street-Moorgate WB CESS	83556.621	36217.012	98.944
Levelling Mark	C305-LT101463	Liverpool Street-Moorgate WB CESS	83554.696	36217.553	98.942
Levelling Mark	C305-LT101464	Liverpool Street-Moorgate WB CESS	83552.770	36218.094	98.933
Levelling Mark	C305-LT101465	Liverpool Street-Moorgate WB CESS	83550.845	36218.635	98.931
Levelling Mark	C305-LT101466	Liverpool Street-Moorgate WB CESS	83548.923	36219.171	98.934
Levelling Mark	C305-LT101467	Liverpool Street-Moorgate WB CESS	83546.994	36219.699	98.933
Levelling Mark	C305-LT101468	Liverpool Street-Moorgate WB CESS	83545.065	36220.227	98.932
Levelling Mark	C305-LT101469	Liverpool Street-Moorgate WB CESS	83543.136	36220.756	98.927
Levelling Mark	C305-LT101470	Liverpool Street-Moorgate WB CESS	83541.207	36221.284	98.919
Levelling Mark	C305-LT101471	Liverpool Street-Moorgate WB CESS	83539.275	36221.815	98.913
Levelling Mark	C305-LT101472	Liverpool Street-Moorgate WB CESS	83537.349	36222.354	98.907
Levelling Mark	C305-LT101473	Liverpool Street-Moorgate WB CESS	83535.423	36222.893	98.901
Levelling Mark	C305-LT101474	Liverpool Street-Moorgate WB CESS	83533.497	36223.431	98.897
Levelling Mark	C305-LT101475	Liverpool Street-Moorgate WB CESS	83531.571	36223.970	98.895
Levelling Mark	C305-LT101476	Liverpool Street-Moorgate WB CESS	83529.644	36224.509	98.891
Levelling Mark	C305-LT101477	Liverpool Street-Moorgate WB CESS	83527.718	36225.048	98.888
Levelling Mark	C305-LT101478	Liverpool Street-Moorgate WB CESS	83525.792	36225.587	98.882
Levelling Mark	C305-LT101479	Liverpool Street-Moorgate WB CESS	83523.866	36226.126	98.878
Levelling Mark	C305-LT101480	Liverpool Street-Moorgate WB CESS	83521.940	36226.665	98.877
Levelling Mark	C305-LT101481	Liverpool Street-Moorgate WB CESS	83520.012	36227.205	98.877
Levelling Mark	C305-LT101482	Liverpool Street-Moorgate WB CESS	83518.088	36227.751	98.877
Levelling Mark	C305-LT101483	Liverpool Street-Moorgate WB CESS	83516.164	36228.297	98.874
Levelling Mark	C305-LT101484	Liverpool Street-Moorgate WB CESS	83514.240	36228.842	98.872
Levelling Mark	C305-LT101485	Liverpool Street-Moorgate WB CESS	83512.316	36229.388	98.871
Levelling Mark	C305-LT101486	Liverpool Street-Moorgate WB CESS	83510.393	36229.932	98.868
Levelling Mark	C305-LT101487	Liverpool Street-Moorgate WB CESS	83508.468	36230.473	98.865
Levelling Mark	C305-LT101488	Liverpool Street-Moorgate WB CESS	83506.542	36231.014	98.865
Levelling Mark	C305-LT101489	Liverpool Street-Moorgate WB CESS	83504.617	36231.556	98.862
Levelling Mark	C305-LT101490	Liverpool Street-Moorgate WB CESS	83502.691	36232.097	98.861
Levelling Mark	C305-LT101491	Liverpool Street-Moorgate WB CESS	83500.765	36232.640	98.859
Levelling Mark	C305-LT101492	Liverpool Street-Moorgate WB CESS	83498.841	36233.186	98.860
Levelling Mark	C305-LT101493	Liverpool Street-Moorgate WB CESS	83496.917	36233.732	98.863
Levelling Mark	C305-LT101494	Liverpool Street-Moorgate WB CESS	83494.993	36234.278	98.862
Levelling Mark	C305-LT101495	Liverpool Street-Moorgate WB CESS	83493.069	36234.824	98.860
Levelling Mark	C305-LT101496	Liverpool Street-Moorgate WB CESS	83491.142	36235.372	98.860
Levelling Mark	C305-LT101497	Liverpool Street-Moorgate WB CESS	83489.220	36235.925	98.860
Levelling Mark	C305-LT101498	Liverpool Street-Moorgate WB CESS	83487.298	36236.478	98.861
Levelling Mark	C305-LT101499	Liverpool Street-Moorgate WB CESS	83485.376	36237.031	98.860
Levelling Mark	C305-LT101500	Liverpool Street-Moorgate WB CESS	83483.454	36237.585	98.855
Levelling Mark	C305-LT101501	Liverpool Street-Moorgate WB CESS	83481.535	36238.135	98.852
Levelling Mark	C305-LT101502	Liverpool Street-Moorgate WB CESS	83479.611	36238.681	98.852
Levelling Mark	C305-LT101503	Liverpool Street-Moorgate WB CESS	83477.686	36239.227	98.849
Levelling Mark	C305-LT101504	Liverpool Street-Moorgate WB CESS	83475.762	36239.773	98.848
Levelling Mark	C305-LT101505	Liverpool Street-Moorgate WB CESS	83473.838	36240.319	98.845
Levelling Mark	C305-LT101506	Liverpool Street-Moorgate WB CESS	83471.915	36240.864	98.841
Levelling Mark	C305-LT101507	Liverpool Street-Moorgate WB CESS	83469.990	36241.407	98.839
Levelling Mark	C305-LT101508	Liverpool Street-Moorgate WB CESS	83468.066	36241.951	98.841
Levelling Mark	C305-LT101509	Liverpool Street-Moorgate WB CESS	83466.141	36242.494	98.840
Levelling Mark	C305-LT101510	Liverpool Street-Moorgate WB CESS	83464.216	36243.037	98.832
Levelling Mark	C305-LT101511	Liverpool Street-Moorgate WB CESS	83462.299	36243.573	98.824
Levelling Mark	C305-LT101512	Liverpool Street-Moorgate WB CESS	83460.368	36244.092	98.819
Levelling Mark	C305-LT101513	Liverpool Street-Moorgate WB CESS	83458.436	36244.611	98.820
Levelling Mark	C305-LT101514	Liverpool Street-Moorgate WB CESS	83456.504	36245.130	98.822
Levelling Mark	C305-LT101515	Liverpool Street-Moorgate WB CESS	83454.573	36245.648	98.820
Levelling Mark	C305-LT101516	Liverpool Street-Moorgate WB CESS	83452.654	36246.150	98.817

SENSOR TYPE	SENSOR ID	LU Track	SENSOR LOCATION-GPS READING(m)		
			Easting X	Northing Y	Elevation Z (mATD)
Levelling Mark	C305-LT101517	Liverpool Street-Moorgate WB CESS	83450.712	36246.625	98.812
Levelling Mark	C305-LT101518	Liverpool Street-Moorgate WB CESS	83448.769	36247.100	98.808
Levelling Mark	C305-LT101519	Liverpool Street-Moorgate WB CESS	83446.826	36247.575	98.809
Levelling Mark	C305-LT101520	Liverpool Street-Moorgate WB CESS	83444.883	36248.051	98.809
Levelling Mark	C305-LT101521	Liverpool Street-Moorgate WB CESS	83442.954	36248.510	98.808
Levelling Mark	C305-LT101522	Liverpool Street-Moorgate WB CESS	83441.001	36248.942	98.806
Levelling Mark	C305-LT101523	Liverpool Street-Moorgate WB CESS	83439.048	36249.375	98.804
Levelling Mark	C305-LT101524	Liverpool Street-Moorgate WB CESS	83437.096	36249.807	98.799
Levelling Mark	C305-LT101525	Liverpool Street-Moorgate WB CESS	83435.143	36250.240	98.797
Levelling Mark	C305-LT101526	Liverpool Street-Moorgate WB CESS	83433.193	36250.670	98.794
Levelling Mark	C305-LT101527	Liverpool Street-Moorgate WB CESS	83431.239	36251.095	98.784
Levelling Mark	C305-LT101528	Liverpool Street-Moorgate WB CESS	83429.284	36251.519	98.774
Levelling Mark	C305-LT101529	Liverpool Street-Moorgate WB CESS	83427.330	36251.944	98.767
Levelling Mark	C305-LT101530	Liverpool Street-Moorgate WB CESS	83425.376	36252.369	98.761
Levelling Mark	C305-LT101531	Liverpool Street-Moorgate WB CESS	83423.421	36252.795	98.751
Levelling Mark	C305-LT101532	Liverpool Street-Moorgate WB CESS	83421.467	36253.222	98.742
Levelling Mark	C305-LT101533	Liverpool Street-Moorgate WB CESS	83419.513	36253.649	98.731
Levelling Mark	C305-LT101534	Liverpool Street-Moorgate WB CESS	83417.559	36254.077	98.724
Levelling Mark	C305-LT101535	Liverpool Street-Moorgate WB CESS	83415.605	36254.504	98.716
Levelling Mark	C305-LT101536	Liverpool Street-Moorgate WB CESS	83413.653	36254.929	98.705
Levelling Mark	C305-LT101537	Liverpool Street-Moorgate WB CESS	83411.698	36255.352	98.692
Levelling Mark	C305-LT101538	Liverpool Street-Moorgate WB CESS	83409.743	36255.774	98.683
Levelling Mark	C305-LT101539	Liverpool Street-Moorgate WB CESS	83407.788	36256.197	98.674
Levelling Mark	C305-LT101540	Liverpool Street-Moorgate WB CESS	83405.833	36256.619	98.665
Levelling Mark	C305-LT101541	Liverpool Street-Moorgate WB CESS	83403.876	36257.046	98.659
Levelling Mark	C305-LT101542	Liverpool Street-Moorgate WB CESS	83401.923	36257.478	98.644
Levelling Mark	C305-LT101543	Liverpool Street-Moorgate WB CESS	83399.970	36257.911	98.622
Levelling Mark	C305-LT101544	Liverpool Street-Moorgate WB CESS	83398.017	36258.343	98.601
Levelling Mark	C305-LT101545	Liverpool Street-Moorgate WB CESS	83396.065	36258.775	98.585
Levelling Mark	C305-LT101546	Liverpool Street-Moorgate WB CESS	83394.110	36259.211	98.572
Levelling Mark	C305-LT101547	Liverpool Street-Moorgate WB CESS	83392.159	36259.651	98.554
Levelling Mark	C305-LT101548	Liverpool Street-Moorgate WB CESS	83390.208	36260.091	98.535
Levelling Mark	C305-LT101549	Liverpool Street-Moorgate WB CESS	83388.257	36260.532	98.520
Levelling Mark	C305-LT101550	Liverpool Street-Moorgate WB CESS	83386.306	36260.972	98.504
Levelling Mark	C305-LT101551	Liverpool Street-Moorgate WB CESS	83384.349	36261.419	98.484
Levelling Mark	C305-LT101552	Liverpool Street-Moorgate WB CESS	83382.403	36261.878	98.467
Levelling Mark	C305-LT101553	Liverpool Street-Moorgate WB CESS	83380.456	36262.336	98.452
Levelling Mark	C305-LT101554	Liverpool Street-Moorgate WB CESS	83378.509	36262.795	98.429
Levelling Mark	C305-LT101555	Liverpool Street-Moorgate WB CESS	83376.562	36263.253	98.408
Levelling Mark	C305-LT101556	Liverpool Street-Moorgate WB CESS	83374.614	36263.714	98.384
Levelling Mark	C305-LT101557	Liverpool Street-Moorgate WB CESS	83372.669	36264.178	98.364
Levelling Mark	C305-LT101558	Liverpool Street-Moorgate WB CESS	83370.723	36264.642	98.347
Levelling Mark	C305-LT101559	Liverpool Street-Moorgate WB CESS	83368.778	36265.105	98.328
Levelling Mark	C305-LT101560	Liverpool Street-Moorgate WB CESS	83366.832	36265.569	98.307
Levelling Mark	C305-LT101561	Liverpool Street-Moorgate WB CESS	83364.883	36266.038	98.291
Levelling Mark	C305-LT101562	Liverpool Street-Moorgate WB CESS	83362.941	36266.513	98.272
Levelling Mark	C305-LT101563	Liverpool Street-Moorgate WB CESS	83360.998	36266.988	98.253
Levelling Mark	C305-LT101564	Liverpool Street-Moorgate WB CESS	83359.055	36267.463	98.242
Levelling Mark	C305-LT101565	Liverpool Street-Moorgate WB CESS	83357.112	36267.938	98.231
Levelling Mark	C305-LT101566	Liverpool Street-Moorgate WB CESS	83355.172	36268.410	98.219
Levelling Mark	C305-LT101567	Liverpool Street-Moorgate WB CESS	83353.227	36268.877	98.210
Levelling Mark	C305-LT101568	Liverpool Street-Moorgate WB CESS	83351.283	36269.344	98.203
Levelling Mark	C305-LT101569	Liverpool Street-Moorgate WB CESS	83349.338	36269.811	98.193
Levelling Mark	C305-LT101570	Liverpool Street-Moorgate WB CESS	83347.393	36270.278	98.177
Levelling Mark	C305-LT101571	Liverpool Street-Moorgate WB CESS	83345.447	36270.748	98.165
Levelling Mark	C305-LT101572	Liverpool Street-Moorgate WB CESS	83343.504	36271.220	98.159
Levelling Mark	C305-LT101573	Liverpool Street-Moorgate WB CESS	83341.560	36271.692	98.154
Levelling Mark	C305-LT101574	Liverpool Street-Moorgate WB CESS	83339.617	36272.164	98.149

SENSOR TYPE	SENSOR ID	LU Track	SENSOR LOCATION-GPS READING(m)		
			Easting X	Northing Y	Elevation Z (mATD)
Levelling Mark	C305-LT101575	Liverpool Street-Moorgate WB CESS	83337.673	36272.636	98.149
Levelling Mark	C305-LT101576	Liverpool Street-Moorgate WB CESS	83335.729	36273.110	98.148
Levelling Mark	C305-LT101577	Liverpool Street-Moorgate WB CESS	83333.786	36273.585	98.148
Levelling Mark	C305-LT101578	Liverpool Street-Moorgate WB CESS	83331.843	36274.060	98.148
Levelling Mark	C305-LT101579	Liverpool Street-Moorgate WB CESS	83329.901	36274.535	98.154
Levelling Mark	C305-LT101580	Liverpool Street-Moorgate WB CESS	83327.958	36275.011	98.160
Levelling Mark	C305-LT101581	Liverpool Street-Moorgate WB CESS	83326.757	36275.305	100.000

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SENSOR TYPE	SENSOR ID	LU Track	SENSOR LOCATION-GPS READING(m)		
			Easting X	Northing Y	Elevation Z (mATD)
Levelling Mark	C305-LT101601	Liverpool Street-Moorgate WB 6FT	83671.306	36175.891	99.368
Levelling Mark	C305-LT101602	Liverpool Street-Moorgate WB 6FT	83669.504	36176.758	99.363
Levelling Mark	C305-LT101603	Liverpool Street-Moorgate WB 6FT	83667.702	36177.625	99.356
Levelling Mark	C305-LT101604	Liverpool Street-Moorgate WB 6FT	83665.900	36178.493	99.346
Levelling Mark	C305-LT101605	Liverpool Street-Moorgate WB 6FT	83664.098	36179.360	99.335
Levelling Mark	C305-LT101606	Liverpool Street-Moorgate WB 6FT	83662.281	36180.233	99.326
Levelling Mark	C305-LT101607	Liverpool Street-Moorgate WB 6FT	83660.462	36181.064	99.315
Levelling Mark	C305-LT101608	Liverpool Street-Moorgate WB 6FT	83658.643	36181.895	99.299
Levelling Mark	C305-LT101609	Liverpool Street-Moorgate WB 6FT	83656.823	36182.725	99.289
Levelling Mark	C305-LT101610	Liverpool Street-Moorgate WB 6FT	83655.004	36183.556	99.280
Levelling Mark	C305-LT101611	Liverpool Street-Moorgate WB 6FT	83653.171	36184.390	99.269
Levelling Mark	C305-LT101612	Liverpool Street-Moorgate WB 6FT	83651.338	36185.188	99.261
Levelling Mark	C305-LT101613	Liverpool Street-Moorgate WB 6FT	83649.504	36185.986	99.258
Levelling Mark	C305-LT101614	Liverpool Street-Moorgate WB 6FT	83647.670	36186.785	99.256
Levelling Mark	C305-LT101615	Liverpool Street-Moorgate WB 6FT	83645.836	36187.583	99.254
Levelling Mark	C305-LT101616	Liverpool Street-Moorgate WB 6FT	83643.994	36188.385	99.253
Levelling Mark	C305-LT101617	Liverpool Street-Moorgate WB 6FT	83642.150	36189.160	99.252
Levelling Mark	C305-LT101618	Liverpool Street-Moorgate WB 6FT	83640.307	36189.935	99.251
Levelling Mark	C305-LT101619	Liverpool Street-Moorgate WB 6FT	83638.463	36190.711	99.250
Levelling Mark	C305-LT101620	Liverpool Street-Moorgate WB 6FT	83636.620	36191.486	99.245
Levelling Mark	C305-LT101621	Liverpool Street-Moorgate WB 6FT	83634.777	36192.261	99.233
Levelling Mark	C305-LT101622	Liverpool Street-Moorgate WB 6FT	83632.907	36193.010	99.224
Levelling Mark	C305-LT101623	Liverpool Street-Moorgate WB 6FT	83631.051	36193.754	99.216
Levelling Mark	C305-LT101624	Liverpool Street-Moorgate WB 6FT	83629.194	36194.497	99.209
Levelling Mark	C305-LT101625	Liverpool Street-Moorgate WB 6FT	83627.337	36195.240	99.207
Levelling Mark	C305-LT101626	Liverpool Street-Moorgate WB 6FT	83625.469	36195.988	99.203
Levelling Mark	C305-LT101627	Liverpool Street-Moorgate WB 6FT	83623.600	36196.700	99.196
Levelling Mark	C305-LT101628	Liverpool Street-Moorgate WB 6FT	83621.731	36197.413	99.190
Levelling Mark	C305-LT101629	Liverpool Street-Moorgate WB 6FT	83619.862	36198.125	99.190
Levelling Mark	C305-LT101630	Liverpool Street-Moorgate WB 6FT	83617.993	36198.837	99.189
Levelling Mark	C305-LT101631	Liverpool Street-Moorgate WB 6FT	83616.111	36199.551	99.188
Levelling Mark	C305-LT101632	Liverpool Street-Moorgate WB 6FT	83614.230	36200.230	99.186
Levelling Mark	C305-LT101633	Liverpool Street-Moorgate WB 6FT	83612.349	36200.910	99.185
Levelling Mark	C305-LT101634	Liverpool Street-Moorgate WB 6FT	83610.468	36201.590	99.182
Levelling Mark	C305-LT101635	Liverpool Street-Moorgate WB 6FT	83608.587	36202.269	99.179
Levelling Mark	C305-LT101636	Liverpool Street-Moorgate WB 6FT	83606.696	36202.948	99.176
Levelling Mark	C305-LT101637	Liverpool Street-Moorgate WB 6FT	83604.806	36203.603	99.166
Levelling Mark	C305-LT101638	Liverpool Street-Moorgate WB 6FT	83602.916	36204.258	99.146
Levelling Mark	C305-LT101639	Liverpool Street-Moorgate WB 6FT	83601.027	36204.914	99.124
Levelling Mark	C305-LT101640	Liverpool Street-Moorgate WB 6FT	83599.137	36205.569	99.106
Levelling Mark	C305-LT101641	Liverpool Street-Moorgate WB 6FT	83597.231	36206.221	99.088
Levelling Mark	C305-LT101642	Liverpool Street-Moorgate WB 6FT	83595.328	36206.839	99.070
Levelling Mark	C305-LT101643	Liverpool Street-Moorgate WB 6FT	83593.426	36207.456	99.062
Levelling Mark	C305-LT101644	Liverpool Street-Moorgate WB 6FT	83591.524	36208.074	99.059
Levelling Mark	C305-LT101645	Liverpool Street-Moorgate WB 6FT	83589.622	36208.692	99.056
Levelling Mark	C305-LT101646	Liverpool Street-Moorgate WB 6FT	83587.717	36209.309	99.057
Levelling Mark	C305-LT101647	Liverpool Street-Moorgate WB 6FT	83585.813	36209.920	99.056
Levelling Mark	C305-LT101648	Liverpool Street-Moorgate WB 6FT	83583.908	36210.532	99.058
Levelling Mark	C305-LT101649	Liverpool Street-Moorgate WB 6FT	83582.004	36211.143	99.058
Levelling Mark	C305-LT101650	Liverpool Street-Moorgate WB 6FT	83580.100	36211.755	99.054
Levelling Mark	C305-LT101651	Liverpool Street-Moorgate WB 6FT	83578.196	36212.366	99.047
Levelling Mark	C305-LT101652	Liverpool Street-Moorgate WB 6FT	83576.252	36212.933	99.032
Levelling Mark	C305-LT101653	Liverpool Street-Moorgate WB 6FT	83574.329	36213.482	99.022
Levelling Mark	C305-LT101654	Liverpool Street-Moorgate WB 6FT	83572.405	36214.030	99.010
Levelling Mark	C305-LT101655	Liverpool Street-Moorgate WB 6FT	83570.482	36214.578	98.998
Levelling Mark	C305-LT101656	Liverpool Street-Moorgate WB 6FT	83568.563	36215.128	98.989
Levelling Mark	C305-LT101657	Liverpool Street-Moorgate WB 6FT	83566.642	36215.686	98.985
Levelling Mark	C305-LT101658	Liverpool Street-Moorgate WB 6FT	83564.722	36216.244	98.979

SENSOR TYPE	SENSOR ID	LU Track	SENSOR LOCATION-GPS READING(m)		
			Easting X	Northing Y	Elevation Z (mATD)
Levelling Mark	C305-LT101659	Liverpool Street-Moorgate WB 6FT	83562.801	36216.802	98.968
Levelling Mark	C305-LT101660	Liverpool Street-Moorgate WB 6FT	83560.881	36217.360	98.960
Levelling Mark	C305-LT101661	Liverpool Street-Moorgate WB 6FT	83558.953	36217.916	98.958
Levelling Mark	C305-LT101662	Liverpool Street-Moorgate WB 6FT	83557.027	36218.456	98.962
Levelling Mark	C305-LT101663	Liverpool Street-Moorgate WB 6FT	83555.102	36218.997	98.967
Levelling Mark	C305-LT101664	Liverpool Street-Moorgate WB 6FT	83553.176	36219.538	98.960
Levelling Mark	C305-LT101665	Liverpool Street-Moorgate WB 6FT	83551.251	36220.079	98.950
Levelling Mark	C305-LT101666	Liverpool Street-Moorgate WB 6FT	83549.319	36220.617	98.945
Levelling Mark	C305-LT101667	Liverpool Street-Moorgate WB 6FT	83547.390	36221.146	98.943
Levelling Mark	C305-LT101668	Liverpool Street-Moorgate WB 6FT	83545.461	36221.674	98.939
Levelling Mark	C305-LT101669	Liverpool Street-Moorgate WB 6FT	83543.532	36222.202	98.934
Levelling Mark	C305-LT101670	Liverpool Street-Moorgate WB 6FT	83541.604	36222.731	98.926
Levelling Mark	C305-LT101671	Liverpool Street-Moorgate WB 6FT	83539.679	36223.260	98.917
Levelling Mark	C305-LT101672	Liverpool Street-Moorgate WB 6FT	83537.753	36223.799	98.910
Levelling Mark	C305-LT101673	Liverpool Street-Moorgate WB 6FT	83535.827	36224.337	98.905
Levelling Mark	C305-LT101674	Liverpool Street-Moorgate WB 6FT	83533.901	36224.876	98.903
Levelling Mark	C305-LT101675	Liverpool Street-Moorgate WB 6FT	83531.975	36225.414	98.898
Levelling Mark	C305-LT101676	Liverpool Street-Moorgate WB 6FT	83530.049	36225.953	98.893
Levelling Mark	C305-LT101677	Liverpool Street-Moorgate WB 6FT	83528.123	36226.492	98.891
Levelling Mark	C305-LT101678	Liverpool Street-Moorgate WB 6FT	83526.197	36227.031	98.888
Levelling Mark	C305-LT101679	Liverpool Street-Moorgate WB 6FT	83524.271	36227.570	98.882
Levelling Mark	C305-LT101680	Liverpool Street-Moorgate WB 6FT	83522.345	36228.109	98.878
Levelling Mark	C305-LT101681	Liverpool Street-Moorgate WB 6FT	83520.421	36228.648	98.878
Levelling Mark	C305-LT101682	Liverpool Street-Moorgate WB 6FT	83518.497	36229.194	98.878
Levelling Mark	C305-LT101683	Liverpool Street-Moorgate WB 6FT	83516.573	36229.740	98.874
Levelling Mark	C305-LT101684	Liverpool Street-Moorgate WB 6FT	83514.649	36230.286	98.872
Levelling Mark	C305-LT101685	Liverpool Street-Moorgate WB 6FT	83512.725	36230.831	98.868
Levelling Mark	C305-LT101686	Liverpool Street-Moorgate WB 6FT	83510.799	36231.376	98.864
Levelling Mark	C305-LT101687	Liverpool Street-Moorgate WB 6FT	83508.873	36231.917	98.864
Levelling Mark	C305-LT101688	Liverpool Street-Moorgate WB 6FT	83506.948	36232.459	98.864
Levelling Mark	C305-LT101689	Liverpool Street-Moorgate WB 6FT	83505.023	36233.000	98.863
Levelling Mark	C305-LT101690	Liverpool Street-Moorgate WB 6FT	83503.097	36233.541	98.861
Levelling Mark	C305-LT101691	Liverpool Street-Moorgate WB 6FT	83501.174	36234.083	98.859
Levelling Mark	C305-LT101692	Liverpool Street-Moorgate WB 6FT	83499.250	36234.629	98.860
Levelling Mark	C305-LT101693	Liverpool Street-Moorgate WB 6FT	83497.326	36235.175	98.861
Levelling Mark	C305-LT101694	Liverpool Street-Moorgate WB 6FT	83495.402	36235.721	98.861
Levelling Mark	C305-LT101695	Liverpool Street-Moorgate WB 6FT	83493.478	36236.267	98.860
Levelling Mark	C305-LT101696	Liverpool Street-Moorgate WB 6FT	83491.557	36236.814	98.861
Levelling Mark	C305-LT101697	Liverpool Street-Moorgate WB 6FT	83489.635	36237.367	98.862
Levelling Mark	C305-LT101698	Liverpool Street-Moorgate WB 6FT	83487.713	36237.920	98.862
Levelling Mark	C305-LT101699	Liverpool Street-Moorgate WB 6FT	83485.791	36238.473	98.860
Levelling Mark	C305-LT101700	Liverpool Street-Moorgate WB 6FT	83483.869	36239.026	98.858
Levelling Mark	C305-LT101701	Liverpool Street-Moorgate WB 6FT	83481.944	36239.578	98.856
Levelling Mark	C305-LT101702	Liverpool Street-Moorgate WB 6FT	83480.020	36240.124	98.853
Levelling Mark	C305-LT101703	Liverpool Street-Moorgate WB 6FT	83478.096	36240.670	98.851
Levelling Mark	C305-LT101704	Liverpool Street-Moorgate WB 6FT	83476.172	36241.216	98.852
Levelling Mark	C305-LT101705	Liverpool Street-Moorgate WB 6FT	83474.248	36241.762	98.849
Levelling Mark	C305-LT101706	Liverpool Street-Moorgate WB 6FT	83472.323	36242.307	98.847
Levelling Mark	C305-LT101707	Liverpool Street-Moorgate WB 6FT	83470.398	36242.851	98.843
Levelling Mark	C305-LT101708	Liverpool Street-Moorgate WB 6FT	83468.473	36243.394	98.841
Levelling Mark	C305-LT101709	Liverpool Street-Moorgate WB 6FT	83466.548	36243.937	98.841
Levelling Mark	C305-LT101710	Liverpool Street-Moorgate WB 6FT	83464.624	36244.481	98.838
Levelling Mark	C305-LT101711	Liverpool Street-Moorgate WB 6FT	83462.688	36245.022	98.836
Levelling Mark	C305-LT101712	Liverpool Street-Moorgate WB 6FT	83460.757	36245.561	98.833
Levelling Mark	C305-LT101713	Liverpool Street-Moorgate WB 6FT	83458.825	36246.105	98.834
Levelling Mark	C305-LT101714	Liverpool Street-Moorgate WB 6FT	83456.894	36246.648	98.836
Levelling Mark	C305-LT101715	Liverpool Street-Moorgate WB 6FT	83454.962	36247.197	98.837
Levelling Mark	C305-LT101716	Liverpool Street-Moorgate WB 6FT	83453.011	36247.740	98.838

SENSOR TYPE	SENSOR ID	LU Track	SENSOR LOCATION-GPS READING(m)		
			Easting X	Northing Y	Elevation Z (mATD)
Levelling Mark	C305-LT101717	Liverpool Street-Moorgate WB 6FT	83451.068	36248.082	98.833
Levelling Mark	C305-LT101718	Liverpool Street-Moorgate WB 6FT	83449.125	36248.557	98.826
Levelling Mark	C305-LT101719	Liverpool Street-Moorgate WB 6FT	83447.183	36249.032	98.825
Levelling Mark	C305-LT101720	Liverpool Street-Moorgate WB 6FT	83445.240	36249.508	98.822
Levelling Mark	C305-LT101721	Liverpool Street-Moorgate WB 6FT	83443.278	36249.974	98.819
Levelling Mark	C305-LT101722	Liverpool Street-Moorgate WB 6FT	83441.326	36250.407	98.815
Levelling Mark	C305-LT101723	Liverpool Street-Moorgate WB 6FT	83439.373	36250.839	98.809
Levelling Mark	C305-LT101724	Liverpool Street-Moorgate WB 6FT	83437.420	36251.272	98.803
Levelling Mark	C305-LT101725	Liverpool Street-Moorgate WB 6FT	83435.468	36251.705	98.803
Levelling Mark	C305-LT101726	Liverpool Street-Moorgate WB 6FT	83433.512	36252.135	98.796
Levelling Mark	C305-LT101727	Liverpool Street-Moorgate WB 6FT	83431.557	36252.560	98.783
Levelling Mark	C305-LT101728	Liverpool Street-Moorgate WB 6FT	83429.603	36252.985	98.772
Levelling Mark	C305-LT101729	Liverpool Street-Moorgate WB 6FT	83427.649	36253.410	98.761
Levelling Mark	C305-LT101730	Liverpool Street-Moorgate WB 6FT	83425.694	36253.835	98.747
Levelling Mark	C305-LT101731	Liverpool Street-Moorgate WB 6FT	83423.741	36254.261	98.737
Levelling Mark	C305-LT101732	Liverpool Street-Moorgate WB 6FT	83421.787	36254.688	98.730
Levelling Mark	C305-LT101733	Liverpool Street-Moorgate WB 6FT	83419.833	36255.115	98.726
Levelling Mark	C305-LT101734	Liverpool Street-Moorgate WB 6FT	83417.879	36255.542	98.718
Levelling Mark	C305-LT101735	Liverpool Street-Moorgate WB 6FT	83415.926	36255.969	98.706
Levelling Mark	C305-LT101736	Liverpool Street-Moorgate WB 6FT	83413.970	36256.395	98.689
Levelling Mark	C305-LT101737	Liverpool Street-Moorgate WB 6FT	83412.015	36256.818	98.678
Levelling Mark	C305-LT101738	Liverpool Street-Moorgate WB 6FT	83410.060	36257.240	98.666
Levelling Mark	C305-LT101739	Liverpool Street-Moorgate WB 6FT	83408.105	36257.663	98.656
Levelling Mark	C305-LT101740	Liverpool Street-Moorgate WB 6FT	83406.150	36258.085	98.648
Levelling Mark	C305-LT101741	Liverpool Street-Moorgate WB 6FT	83404.200	36258.510	98.641
Levelling Mark	C305-LT101742	Liverpool Street-Moorgate WB 6FT	83402.247	36258.943	98.631
Levelling Mark	C305-LT101743	Liverpool Street-Moorgate WB 6FT	83400.294	36259.375	98.616
Levelling Mark	C305-LT101744	Liverpool Street-Moorgate WB 6FT	83398.342	36259.808	98.595
Levelling Mark	C305-LT101745	Liverpool Street-Moorgate WB 6FT	83396.389	36260.240	98.576
Levelling Mark	C305-LT101746	Liverpool Street-Moorgate WB 6FT	83394.440	36260.674	98.560
Levelling Mark	C305-LT101747	Liverpool Street-Moorgate WB 6FT	83392.489	36261.114	98.544
Levelling Mark	C305-LT101748	Liverpool Street-Moorgate WB 6FT	83390.538	36261.555	98.533
Levelling Mark	C305-LT101749	Liverpool Street-Moorgate WB 6FT	83388.587	36261.995	98.523
Levelling Mark	C305-LT101750	Liverpool Street-Moorgate WB 6FT	83386.636	36262.435	98.507
Levelling Mark	C305-LT101751	Liverpool Street-Moorgate WB 6FT	83384.693	36262.879	98.484
Levelling Mark	C305-LT101752	Liverpool Street-Moorgate WB 6FT	83382.746	36263.338	98.465
Levelling Mark	C305-LT101753	Liverpool Street-Moorgate WB 6FT	83380.800	36263.796	98.446
Levelling Mark	C305-LT101754	Liverpool Street-Moorgate WB 6FT	83378.853	36264.255	98.426
Levelling Mark	C305-LT101755	Liverpool Street-Moorgate WB 6FT	83376.906	36264.713	98.408
Levelling Mark	C305-LT101756	Liverpool Street-Moorgate WB 6FT	83374.962	36265.173	98.389
Levelling Mark	C305-LT101757	Liverpool Street-Moorgate WB 6FT	83373.016	36265.637	98.368
Levelling Mark	C305-LT101758	Liverpool Street-Moorgate WB 6FT	83371.071	36266.101	98.350
Levelling Mark	C305-LT101759	Liverpool Street-Moorgate WB 6FT	83369.125	36266.564	98.331
Levelling Mark	C305-LT101760	Liverpool Street-Moorgate WB 6FT	83367.180	36267.028	98.313
Levelling Mark	C305-LT101761	Liverpool Street-Moorgate WB 6FT	83365.240	36267.495	98.298
Levelling Mark	C305-LT101762	Liverpool Street-Moorgate WB 6FT	83363.297	36267.970	98.286
Levelling Mark	C305-LT101763	Liverpool Street-Moorgate WB 6FT	83361.354	36268.445	98.269
Levelling Mark	C305-LT101764	Liverpool Street-Moorgate WB 6FT	83359.411	36268.920	98.251
Levelling Mark	C305-LT101765	Liverpool Street-Moorgate WB 6FT	83357.469	36269.395	98.233
Levelling Mark	C305-LT101766	Liverpool Street-Moorgate WB 6FT	83355.522	36269.868	98.220
Levelling Mark	C305-LT101767	Liverpool Street-Moorgate WB 6FT	83353.578	36270.335	98.214
Levelling Mark	C305-LT101768	Liverpool Street-Moorgate WB 6FT	83351.633	36270.802	98.204
Levelling Mark	C305-LT101769	Liverpool Street-Moorgate WB 6FT	83349.688	36271.269	98.194
Levelling Mark	C305-LT101770	Liverpool Street-Moorgate WB 6FT	83347.744	36271.736	98.182
Levelling Mark	C305-LT101771	Liverpool Street-Moorgate WB 6FT	83345.801	36272.205	98.171
Levelling Mark	C305-LT101772	Liverpool Street-Moorgate WB 6FT	83343.858	36272.677	98.166
Levelling Mark	C305-LT101773	Liverpool Street-Moorgate WB 6FT	83341.914	36273.149	98.164
Levelling Mark	C305-LT101774	Liverpool Street-Moorgate WB 6FT	83339.971	36273.621	98.162

SENSOR TYPE	SENSOR ID	LU Track	SENSOR LOCATION-GPS READING(m)		
			Easting X	Northing Y	Elevation Z (mATD)
Levelling Mark	C305-LT101775	Liverpool Street-Moorgate WB 6FT	83338.027	36274.093	98.158
Levelling Mark	C305-LT101776	Liverpool Street-Moorgate WB 6FT	83336.085	36274.567	98.153
Levelling Mark	C305-LT101777	Liverpool Street-Moorgate WB 6FT	83334.143	36275.042	98.151
Levelling Mark	C305-LT101778	Liverpool Street-Moorgate WB 6FT	83332.200	36275.517	98.153
Levelling Mark	C305-LT101779	Liverpool Street-Moorgate WB 6FT	83330.257	36275.992	98.163
Levelling Mark	C305-LT101780	Liverpool Street-Moorgate WB 6FT	83328.314	36276.468	98.173
Levelling Mark	C305-LT101781	Liverpool Street-Moorgate WB 6FT	83327.113	36276.762	98.176

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SENSOR TYPE	SENSOR ID	LU Track	SENSOR LOCATION-GPS READING(m)		
			Easting X	Northing Y	Elevation Z (mATD)
Levelling Mark	C305-LT102001	CENTRAL LINE EB CESS	83407.884	36133.359	99.862
Levelling Mark	C305-LT102002	CENTRAL LINE EB CESS	83408.614	36135.221	99.854
Levelling Mark	C305-LT102003	CENTRAL LINE EB CESS	83409.345	36137.083	99.847
Levelling Mark	C305-LT102004	CENTRAL LINE EB CESS	83410.075	36138.945	99.843
Levelling Mark	C305-LT102005	CENTRAL LINE EB CESS	83410.806	36140.807	99.837
Levelling Mark	C305-LT102006	CENTRAL LINE EB CESS	83411.525	36142.644	99.829
Levelling Mark	C305-LT102007	CENTRAL LINE EB CESS	83412.188	36144.531	99.824
Levelling Mark	C305-LT102008	CENTRAL LINE EB CESS	83412.851	36146.417	99.816
Levelling Mark	C305-LT102009	CENTRAL LINE EB CESS	83413.514	36148.304	99.807
Levelling Mark	C305-LT102010	CENTRAL LINE EB CESS	83414.177	36150.191	99.803
Levelling Mark	C305-LT102011	CENTRAL LINE EB CESS	83414.828	36152.055	99.798
Levelling Mark	C305-LT102012	CENTRAL LINE EB CESS	83415.426	36153.964	99.792
Levelling Mark	C305-LT102013	CENTRAL LINE EB CESS	83416.023	36155.872	99.785
Levelling Mark	C305-LT102014	CENTRAL LINE EB CESS	83416.621	36157.781	99.778
Levelling Mark	C305-LT102015	CENTRAL LINE EB CESS	83417.218	36159.690	99.771
Levelling Mark	C305-LT102016	CENTRAL LINE EB CESS	83417.805	36161.575	99.765
Levelling Mark	C305-LT102017	CENTRAL LINE EB CESS	83418.338	36163.503	99.761
Levelling Mark	C305-LT102018	CENTRAL LINE EB CESS	83418.870	36165.430	99.756
Levelling Mark	C305-LT102019	CENTRAL LINE EB CESS	83419.403	36167.358	99.750
Levelling Mark	C305-LT102020	CENTRAL LINE EB CESS	83419.935	36169.286	99.742
Levelling Mark	C305-LT102021	CENTRAL LINE EB CESS	83420.462	36171.201	99.738
Levelling Mark	C305-LT102022	CENTRAL LINE EB CESS	83420.958	36173.138	99.734
Levelling Mark	C305-LT102023	CENTRAL LINE EB CESS	83421.453	36175.076	99.725
Levelling Mark	C305-LT102024	CENTRAL LINE EB CESS	83421.949	36177.013	99.720
Levelling Mark	C305-LT102025	CENTRAL LINE EB CESS	83422.444	36178.951	99.716
Levelling Mark	C305-LT102026	CENTRAL LINE EB CESS	83422.937	36180.885	99.715
Levelling Mark	C305-LT102027	CENTRAL LINE EB CESS	83423.422	36182.825	99.716
Levelling Mark	C305-LT102028	CENTRAL LINE EB CESS	83423.906	36184.766	99.713
Levelling Mark	C305-LT102029	CENTRAL LINE EB CESS	83424.391	36186.706	99.712
Levelling Mark	C305-LT102030	CENTRAL LINE EB CESS	83424.875	36188.647	99.711
Levelling Mark	C305-LT102031	CENTRAL LINE EB CESS	83425.358	36190.586	99.715
Levelling Mark	C305-LT102032	CENTRAL LINE EB CESS	83425.838	36192.527	99.713
Levelling Mark	C305-LT102033	CENTRAL LINE EB CESS	83426.318	36194.469	99.712
Levelling Mark	C305-LT102034	CENTRAL LINE EB CESS	83426.797	36196.410	99.715
Levelling Mark	C305-LT102035	CENTRAL LINE EB CESS	83427.277	36198.352	99.712
Levelling Mark	C305-LT102036	CENTRAL LINE EB CESS	83427.757	36200.294	99.707
Levelling Mark	C305-LT102037	CENTRAL LINE EB CESS	83428.236	36202.235	99.704
Levelling Mark	C305-LT102038	CENTRAL LINE EB CESS	83428.716	36204.177	99.707
Levelling Mark	C305-LT102039	CENTRAL LINE EB CESS	83429.196	36206.119	99.708
Levelling Mark	C305-LT102040	CENTRAL LINE EB CESS	83429.675	36208.060	99.703
Levelling Mark	C305-LT102041	CENTRAL LINE EB CESS	83430.154	36210.001	99.695
Levelling Mark	C305-LT102042	CENTRAL LINE EB CESS	83430.631	36211.943	99.690
Levelling Mark	C305-LT102043	CENTRAL LINE EB CESS	83431.107	36213.886	99.690
Levelling Mark	C305-LT102044	CENTRAL LINE EB CESS	83431.584	36215.828	99.693
Levelling Mark	C305-LT102045	CENTRAL LINE EB CESS	83432.061	36217.770	99.693
Levelling Mark	C305-LT102046	CENTRAL LINE EB CESS	83432.536	36219.711	99.689
Levelling Mark	C305-LT102047	CENTRAL LINE EB CESS	83433.006	36221.655	99.680
Levelling Mark	C305-LT102048	CENTRAL LINE EB CESS	83433.477	36223.598	99.683
Levelling Mark	C305-LT102049	CENTRAL LINE EB CESS	83433.948	36225.542	99.684
Levelling Mark	C305-LT102050	CENTRAL LINE EB CESS	83434.418	36227.486	99.678
Levelling Mark	C305-LT102051	CENTRAL LINE EB CESS	83434.888	36229.429	99.674
Levelling Mark	C305-LT102052	CENTRAL LINE EB CESS	83435.357	36231.374	99.670
Levelling Mark	C305-LT102053	CENTRAL LINE EB CESS	83435.826	36233.318	99.669
Levelling Mark	C305-LT102054	CENTRAL LINE EB CESS	83436.295	36235.262	99.668
Levelling Mark	C305-LT102055	CENTRAL LINE EB CESS	83436.763	36237.206	99.669
Levelling Mark	C305-LT102056	CENTRAL LINE EB CESS	83437.232	36239.151	99.670
Levelling Mark	C305-LT102057	CENTRAL LINE EB CESS	83437.701	36241.095	99.668
Levelling Mark	C305-LT102058	CENTRAL LINE EB CESS	83438.170	36243.039	99.663

SENSOR TYPE	SENSOR ID	LU Track	SENSOR LOCATION-GPS READING(m)		
			Easting X	Northing Y	Elevation Z (mATD)
Levelling Mark	C305-LT102059	CENTRAL LINE EB CESS	83438.637	36244.982	99.666
Levelling Mark	C305-LT102060	CENTRAL LINE EB CESS	83439.102	36246.927	99.669
Levelling Mark	C305-LT102061	CENTRAL LINE EB CESS	83439.571	36248.878	99.676
Levelling Mark	C305-LT102062	CENTRAL LINE EB CESS	83440.051	36250.820	99.683
Levelling Mark	C305-LT102063	CENTRAL LINE EB CESS	83440.532	36252.761	99.696
Levelling Mark	C305-LT102064	CENTRAL LINE EB CESS	83441.017	36254.707	99.712
Levelling Mark	C305-LT102065	CENTRAL LINE EB CESS	83441.512	36256.644	99.727
Levelling Mark	C305-LT102066	CENTRAL LINE EB CESS	83442.023	36258.597	99.746
Levelling Mark	C305-LT102067	CENTRAL LINE EB CESS	83442.563	36260.522	99.766
Levelling Mark	C305-LT102068	CENTRAL LINE EB CESS	83443.104	36262.448	99.788
Levelling Mark	C305-LT102069	CENTRAL LINE EB CESS	83443.644	36264.373	99.816
Levelling Mark	C305-LT102070	CENTRAL LINE EB CESS	83444.185	36266.299	99.847
Levelling Mark	C305-LT102071	CENTRAL LINE EB CESS	83444.764	36268.256	99.885
Levelling Mark	C305-LT102072	CENTRAL LINE EB CESS	83445.411	36270.149	99.923
Levelling Mark	C305-LT102073	CENTRAL LINE EB CESS	83446.057	36272.041	99.948
Levelling Mark	C305-LT102074	CENTRAL LINE EB CESS	83446.704	36273.934	99.980
Levelling Mark	C305-LT102075	CENTRAL LINE EB CESS	83447.351	36275.826	100.015
Levelling Mark	C305-LT102076	CENTRAL LINE EB CESS	83448.031	36277.758	100.055
Levelling Mark	C305-LT102077	CENTRAL LINE EB CESS	83448.799	36279.605	100.095
Levelling Mark	C305-LT102078	CENTRAL LINE EB CESS	83449.567	36281.452	100.136
Levelling Mark	C305-LT102079	CENTRAL LINE EB CESS	83450.335	36283.298	100.176
Levelling Mark	C305-LT102080	CENTRAL LINE EB CESS	83451.103	36285.145	100.221
Levelling Mark	C305-LT102081	CENTRAL LINE EB CESS	83451.897	36287.034	100.260
Levelling Mark	C305-LT102082	CENTRAL LINE EB CESS	83452.784	36288.826	100.303
Levelling Mark	C305-LT102083	CENTRAL LINE EB CESS	83453.672	36290.619	100.344
Levelling Mark	C305-LT102084	CENTRAL LINE EB CESS	83454.559	36292.411	100.386
Levelling Mark	C305-LT102085	CENTRAL LINE EB CESS	83455.446	36294.203	100.428
Levelling Mark	C305-LT102086	CENTRAL LINE EB CESS	83456.334	36295.996	100.470
Levelling Mark	C305-LT102087	CENTRAL LINE EB CESS	83457.356	36297.772	100.513
Levelling Mark	C305-LT102088	CENTRAL LINE EB CESS	83458.359	36299.502	100.555
Levelling Mark	C305-LT102089	CENTRAL LINE EB CESS	83459.363	36301.232	100.595
Levelling Mark	C305-LT102090	CENTRAL LINE EB CESS	83460.366	36302.962	100.628
Levelling Mark	C305-LT102091	CENTRAL LINE EB CESS	83461.370	36304.692	100.658
Levelling Mark	C305-LT102092	CENTRAL LINE EB CESS	83462.570	36306.384	100.682
Levelling Mark	C305-LT102093	CENTRAL LINE EB CESS	83463.742	36308.005	100.701
Levelling Mark	C305-LT102094	CENTRAL LINE EB CESS	83464.914	36309.625	100.718
Levelling Mark	C305-LT102095	CENTRAL LINE EB CESS	83466.086	36311.246	100.729
Levelling Mark	C305-LT102096	CENTRAL LINE EB CESS	83467.258	36312.867	100.739
Levelling Mark	C305-LT102097	CENTRAL LINE EB CESS	83468.430	36314.487	100.743
Levelling Mark	C305-LT102098	CENTRAL LINE EB CESS	83469.601	36316.108	100.744
Levelling Mark	C305-LT102099	CENTRAL LINE EB CESS	83470.773	36317.729	100.742
Levelling Mark	C305-LT102100	CENTRAL LINE EB CESS	83471.945	36319.349	100.746
Levelling Mark	C305-LT102101	CENTRAL LINE EB CESS	83473.117	36320.970	100.748
Levelling Mark	C305-LT102102	CENTRAL LINE EB CESS	83474.289	36322.591	100.746
Levelling Mark	C305-LT102103	CENTRAL LINE EB CESS	83475.461	36324.211	100.744
Levelling Mark	C305-LT102104	CENTRAL LINE EB CESS	83476.633	36325.832	100.741
Levelling Mark	C305-LT102105	CENTRAL LINE EB CESS	83477.805	36327.453	100.737

SENSOR TYPE	SENSOR ID	LU Track	SENSOR LOCATION-GPS READING(m)		
			Easting X	Northing Y	Elevation Z (mATD)
Levelling Mark	C305-LT102201	CENTRAL LINE EB 6FT	83409.280	36132.811	99.902
Levelling Mark	C305-LT102202	CENTRAL LINE EB 6FT	83410.010	36134.673	99.896
Levelling Mark	C305-LT102203	CENTRAL LINE EB 6FT	83410.741	36136.535	99.890
Levelling Mark	C305-LT102204	CENTRAL LINE EB 6FT	83411.472	36138.397	99.885
Levelling Mark	C305-LT102205	CENTRAL LINE EB 6FT	83412.202	36140.259	99.877
Levelling Mark	C305-LT102206	CENTRAL LINE EB 6FT	83412.941	36142.146	99.870
Levelling Mark	C305-LT102207	CENTRAL LINE EB 6FT	83413.604	36144.033	99.865
Levelling Mark	C305-LT102208	CENTRAL LINE EB 6FT	83414.267	36145.920	99.859
Levelling Mark	C305-LT102209	CENTRAL LINE EB 6FT	83414.930	36147.807	99.849
Levelling Mark	C305-LT102210	CENTRAL LINE EB 6FT	83415.593	36149.694	99.845
Levelling Mark	C305-LT102211	CENTRAL LINE EB 6FT	83416.260	36151.607	99.838
Levelling Mark	C305-LT102212	CENTRAL LINE EB 6FT	83416.857	36153.516	99.835
Levelling Mark	C305-LT102213	CENTRAL LINE EB 6FT	83417.455	36155.424	99.829
Levelling Mark	C305-LT102214	CENTRAL LINE EB 6FT	83418.052	36157.333	99.821
Levelling Mark	C305-LT102215	CENTRAL LINE EB 6FT	83418.650	36159.241	99.814
Levelling Mark	C305-LT102216	CENTRAL LINE EB 6FT	83419.251	36161.175	99.808
Levelling Mark	C305-LT102217	CENTRAL LINE EB 6FT	83419.784	36163.103	99.799
Levelling Mark	C305-LT102218	CENTRAL LINE EB 6FT	83420.316	36165.031	99.790
Levelling Mark	C305-LT102219	CENTRAL LINE EB 6FT	83420.849	36166.959	99.779
Levelling Mark	C305-LT102220	CENTRAL LINE EB 6FT	83421.381	36168.887	99.769
Levelling Mark	C305-LT102221	CENTRAL LINE EB 6FT	83421.915	36170.829	99.761
Levelling Mark	C305-LT102222	CENTRAL LINE EB 6FT	83422.441	36172.767	99.751
Levelling Mark	C305-LT102223	CENTRAL LINE EB 6FT	83422.906	36174.704	99.740
Levelling Mark	C305-LT102224	CENTRAL LINE EB 6FT	83423.402	36176.642	99.731
Levelling Mark	C305-LT102225	CENTRAL LINE EB 6FT	83423.897	36178.580	99.724
Levelling Mark	C305-LT102226	CENTRAL LINE EB 6FT	83424.393	36180.522	99.718
Levelling Mark	C305-LT102227	CENTRAL LINE EB 6FT	83424.877	36182.462	99.715
Levelling Mark	C305-LT102228	CENTRAL LINE EB 6FT	83425.362	36184.403	99.713
Levelling Mark	C305-LT102229	CENTRAL LINE EB 6FT	83425.846	36186.343	99.713
Levelling Mark	C305-LT102230	CENTRAL LINE EB 6FT	83426.330	36188.283	99.712
Levelling Mark	C305-LT102231	CENTRAL LINE EB 6FT	83426.815	36190.226	99.715
Levelling Mark	C305-LT102232	CENTRAL LINE EB 6FT	83427.294	36192.167	99.713
Levelling Mark	C305-LT102233	CENTRAL LINE EB 6FT	83427.774	36194.109	99.712
Levelling Mark	C305-LT102234	CENTRAL LINE EB 6FT	83428.254	36196.051	99.715
Levelling Mark	C305-LT102235	CENTRAL LINE EB 6FT	83428.733	36197.992	99.713
Levelling Mark	C305-LT102236	CENTRAL LINE EB 6FT	83429.213	36199.934	99.709
Levelling Mark	C305-LT102237	CENTRAL LINE EB 6FT	83429.693	36201.876	99.707
Levelling Mark	C305-LT102238	CENTRAL LINE EB 6FT	83430.172	36203.817	99.709
Levelling Mark	C305-LT102239	CENTRAL LINE EB 6FT	83430.652	36205.759	99.710
Levelling Mark	C305-LT102240	CENTRAL LINE EB 6FT	83431.132	36207.700	99.705
Levelling Mark	C305-LT102241	CENTRAL LINE EB 6FT	83431.611	36209.643	99.696
Levelling Mark	C305-LT102242	CENTRAL LINE EB 6FT	83432.088	36211.586	99.687
Levelling Mark	C305-LT102243	CENTRAL LINE EB 6FT	83432.564	36213.528	99.690
Levelling Mark	C305-LT102244	CENTRAL LINE EB 6FT	83433.041	36215.470	99.696
Levelling Mark	C305-LT102245	CENTRAL LINE EB 6FT	83433.517	36217.413	99.699
Levelling Mark	C305-LT102246	CENTRAL LINE EB 6FT	83433.994	36219.358	99.692
Levelling Mark	C305-LT102247	CENTRAL LINE EB 6FT	83434.464	36221.302	99.679
Levelling Mark	C305-LT102248	CENTRAL LINE EB 6FT	83434.935	36223.245	99.683
Levelling Mark	C305-LT102249	CENTRAL LINE EB 6FT	83435.405	36225.189	99.686
Levelling Mark	C305-LT102250	CENTRAL LINE EB 6FT	83435.876	36227.133	99.689
Levelling Mark	C305-LT102251	CENTRAL LINE EB 6FT	83436.347	36229.078	99.689
Levelling Mark	C305-LT102252	CENTRAL LINE EB 6FT	83436.815	36231.022	99.680
Levelling Mark	C305-LT102253	CENTRAL LINE EB 6FT	83437.284	36232.966	99.672
Levelling Mark	C305-LT102254	CENTRAL LINE EB 6FT	83437.753	36234.911	99.670
Levelling Mark	C305-LT102255	CENTRAL LINE EB 6FT	83438.222	36236.855	99.672
Levelling Mark	C305-LT102256	CENTRAL LINE EB 6FT	83438.690	36238.799	99.672
Levelling Mark	C305-LT102257	CENTRAL LINE EB 6FT	83439.159	36240.743	99.672
Levelling Mark	C305-LT102258	CENTRAL LINE EB 6FT	83439.628	36242.688	99.665

SENSOR TYPE	SENSOR ID	LU Track	SENSOR LOCATION-GPS READING(m)		
			Easting X	Northing Y	Elevation Z (mATD)
Levelling Mark	C305-LT102259	CENTRAL LINE EB 6FT	83440.096	36244.634	99.662
Levelling Mark	C305-LT102260	CENTRAL LINE EB 6FT	83440.561	36246.579	99.661
Levelling Mark	C305-LT102261	CENTRAL LINE EB 6FT	83441.027	36248.518	99.661
Levelling Mark	C305-LT102262	CENTRAL LINE EB 6FT	83441.507	36250.459	99.664
Levelling Mark	C305-LT102263	CENTRAL LINE EB 6FT	83441.988	36252.400	99.671
Levelling Mark	C305-LT102264	CENTRAL LINE EB 6FT	83442.471	36254.336	99.683
Levelling Mark	C305-LT102265	CENTRAL LINE EB 6FT	83442.965	36256.274	99.694
Levelling Mark	C305-LT102266	CENTRAL LINE EB 6FT	83443.467	36258.191	99.707
Levelling Mark	C305-LT102267	CENTRAL LINE EB 6FT	83444.007	36260.117	99.720
Levelling Mark	C305-LT102268	CENTRAL LINE EB 6FT	83444.548	36262.042	99.736
Levelling Mark	C305-LT102269	CENTRAL LINE EB 6FT	83445.089	36263.968	99.755
Levelling Mark	C305-LT102270	CENTRAL LINE EB 6FT	83445.629	36265.893	99.781
Levelling Mark	C305-LT102271	CENTRAL LINE EB 6FT	83446.183	36267.771	99.813
Levelling Mark	C305-LT102272	CENTRAL LINE EB 6FT	83446.830	36269.664	99.843
Levelling Mark	C305-LT102273	CENTRAL LINE EB 6FT	83447.477	36271.556	99.870
Levelling Mark	C305-LT102274	CENTRAL LINE EB 6FT	83448.123	36273.449	99.899
Levelling Mark	C305-LT102275	CENTRAL LINE EB 6FT	83448.770	36275.341	99.932
Levelling Mark	C305-LT102276	CENTRAL LINE EB 6FT	83449.416	36277.182	99.972
Levelling Mark	C305-LT102277	CENTRAL LINE EB 6FT	83450.184	36279.029	100.013
Levelling Mark	C305-LT102278	CENTRAL LINE EB 6FT	83450.952	36280.875	100.055
Levelling Mark	C305-LT102279	CENTRAL LINE EB 6FT	83451.720	36282.722	100.096
Levelling Mark	C305-LT102280	CENTRAL LINE EB 6FT	83452.488	36284.569	100.139
Levelling Mark	C305-LT102281	CENTRAL LINE EB 6FT	83453.241	36286.368	100.179
Levelling Mark	C305-LT102282	CENTRAL LINE EB 6FT	83454.128	36288.161	100.221
Levelling Mark	C305-LT102283	CENTRAL LINE EB 6FT	83455.016	36289.953	100.259
Levelling Mark	C305-LT102284	CENTRAL LINE EB 6FT	83455.903	36291.745	100.301
Levelling Mark	C305-LT102285	CENTRAL LINE EB 6FT	83456.791	36293.538	100.345
Levelling Mark	C305-LT102286	CENTRAL LINE EB 6FT	83457.678	36295.330	100.389
Levelling Mark	C305-LT102287	CENTRAL LINE EB 6FT	83458.653	36297.019	100.431
Levelling Mark	C305-LT102288	CENTRAL LINE EB 6FT	83459.657	36298.749	100.473
Levelling Mark	C305-LT102289	CENTRAL LINE EB 6FT	83460.660	36300.479	100.512
Levelling Mark	C305-LT102290	CENTRAL LINE EB 6FT	83461.664	36302.209	100.547
Levelling Mark	C305-LT102291	CENTRAL LINE EB 6FT	83462.667	36303.939	100.579
Levelling Mark	C305-LT102292	CENTRAL LINE EB 6FT	83463.785	36305.505	100.610
Levelling Mark	C305-LT102293	CENTRAL LINE EB 6FT	83464.957	36307.126	100.637
Levelling Mark	C305-LT102294	CENTRAL LINE EB 6FT	83466.129	36308.746	100.659
Levelling Mark	C305-LT102295	CENTRAL LINE EB 6FT	83467.301	36310.367	100.676
Levelling Mark	C305-LT102296	CENTRAL LINE EB 6FT	83468.473	36311.988	100.688
Levelling Mark	C305-LT102297	CENTRAL LINE EB 6FT	83469.645	36313.608	100.695
Levelling Mark	C305-LT102298	CENTRAL LINE EB 6FT	83470.817	36315.229	100.697
Levelling Mark	C305-LT102299	CENTRAL LINE EB 6FT	83471.989	36316.850	100.696
Levelling Mark	C305-LT102300	CENTRAL LINE EB 6FT	83473.161	36318.470	100.698
Levelling Mark	C305-LT102301	CENTRAL LINE EB 6FT	83474.333	36320.091	100.701
Levelling Mark	C305-LT102302	CENTRAL LINE EB 6FT	83475.505	36321.712	100.699
Levelling Mark	C305-LT102303	CENTRAL LINE EB 6FT	83476.677	36323.333	100.698
Levelling Mark	C305-LT102304	CENTRAL LINE EB 6FT	83477.848	36324.953	100.699
Levelling Mark	C305-LT102305	CENTRAL LINE EB 6FT	83479.020	36326.574	100.696

zSENSOR TYPE	SENSOR ID	LU Track	SENSOR LOCATION-GPS READING(m)		
			Easting X	Northing Y	Elevation Z (mATD)
Levelling Mark	C305-LT102401	CENTRAL LINE WB CESS	83409.311	36117.081	99.463
Levelling Mark	C305-LT102402	CENTRAL LINE WB CESS	83410.111	36118.914	99.436
Levelling Mark	C305-LT102403	CENTRAL LINE WB CESS	83410.912	36120.747	99.407
Levelling Mark	C305-LT102404	CENTRAL LINE WB CESS	83411.712	36122.580	99.377
Levelling Mark	C305-LT102405	CENTRAL LINE WB CESS	83412.512	36124.413	99.347
Levelling Mark	C305-LT102406	CENTRAL LINE WB CESS	83413.323	36126.283	99.318
Levelling Mark	C305-LT102407	CENTRAL LINE WB CESS	83414.028	36128.155	99.291
Levelling Mark	C305-LT102408	CENTRAL LINE WB CESS	83414.732	36130.027	99.264
Levelling Mark	C305-LT102409	CENTRAL LINE WB CESS	83415.437	36131.898	99.240
Levelling Mark	C305-LT102410	CENTRAL LINE WB CESS	83416.141	36133.770	99.217
Levelling Mark	C305-LT102411	CENTRAL LINE WB CESS	83416.851	36135.679	99.192
Levelling Mark	C305-LT102412	CENTRAL LINE WB CESS	83417.462	36137.584	99.167
Levelling Mark	C305-LT102413	CENTRAL LINE WB CESS	83418.073	36139.488	99.143
Levelling Mark	C305-LT102414	CENTRAL LINE WB CESS	83418.684	36141.393	99.114
Levelling Mark	C305-LT102415	CENTRAL LINE WB CESS	83419.294	36143.297	99.090
Levelling Mark	C305-LT102416	CENTRAL LINE WB CESS	83419.912	36145.230	99.066
Levelling Mark	C305-LT102417	CENTRAL LINE WB CESS	83420.448	36147.157	99.037
Levelling Mark	C305-LT102418	CENTRAL LINE WB CESS	83420.984	36149.084	99.011
Levelling Mark	C305-LT102419	CENTRAL LINE WB CESS	83421.520	36151.011	98.988
Levelling Mark	C305-LT102420	CENTRAL LINE WB CESS	83422.056	36152.938	98.965
Levelling Mark	C305-LT102421	CENTRAL LINE WB CESS	83422.593	36154.883	98.939
Levelling Mark	C305-LT102422	CENTRAL LINE WB CESS	83423.083	36156.822	98.911
Levelling Mark	C305-LT102423	CENTRAL LINE WB CESS	83423.572	36158.761	98.883
Levelling Mark	C305-LT102424	CENTRAL LINE WB CESS	83424.062	36160.700	98.859
Levelling Mark	C305-LT102425	CENTRAL LINE WB CESS	83424.552	36162.639	98.834
Levelling Mark	C305-LT102426	CENTRAL LINE WB CESS	83425.041	36164.581	98.809
Levelling Mark	C305-LT102427	CENTRAL LINE WB CESS	83425.524	36166.522	98.780
Levelling Mark	C305-LT102428	CENTRAL LINE WB CESS	83426.007	36168.463	98.752
Levelling Mark	C305-LT102429	CENTRAL LINE WB CESS	83426.490	36170.404	98.723
Levelling Mark	C305-LT102430	CENTRAL LINE WB CESS	83426.972	36172.345	98.697
Levelling Mark	C305-LT102431	CENTRAL LINE WB CESS	83427.455	36174.289	98.673
Levelling Mark	C305-LT102432	CENTRAL LINE WB CESS	83427.930	36176.232	98.655
Levelling Mark	C305-LT102433	CENTRAL LINE WB CESS	83428.404	36178.175	98.642
Levelling Mark	C305-LT102434	CENTRAL LINE WB CESS	83428.878	36180.118	98.635
Levelling Mark	C305-LT102435	CENTRAL LINE WB CESS	83429.353	36182.061	98.628
Levelling Mark	C305-LT102436	CENTRAL LINE WB CESS	83429.827	36184.002	98.615
Levelling Mark	C305-LT102437	CENTRAL LINE WB CESS	83430.305	36185.944	98.605
Levelling Mark	C305-LT102438	CENTRAL LINE WB CESS	83430.783	36187.886	98.601
Levelling Mark	C305-LT102439	CENTRAL LINE WB CESS	83431.261	36189.828	98.600
Levelling Mark	C305-LT102440	CENTRAL LINE WB CESS	83431.740	36191.770	98.592
Levelling Mark	C305-LT102441	CENTRAL LINE WB CESS	83432.218	36193.712	98.581
Levelling Mark	C305-LT102442	CENTRAL LINE WB CESS	83432.696	36195.654	98.572
Levelling Mark	C305-LT102443	CENTRAL LINE WB CESS	83433.173	36197.596	98.564
Levelling Mark	C305-LT102444	CENTRAL LINE WB CESS	83433.651	36199.538	98.563
Levelling Mark	C305-LT102445	CENTRAL LINE WB CESS	83434.129	36201.481	98.567
Levelling Mark	C305-LT102446	CENTRAL LINE WB CESS	83434.606	36203.423	98.566
Levelling Mark	C305-LT102447	CENTRAL LINE WB CESS	83435.083	36205.365	98.561
Levelling Mark	C305-LT102448	CENTRAL LINE WB CESS	83435.560	36207.308	98.559
Levelling Mark	C305-LT102449	CENTRAL LINE WB CESS	83436.037	36209.250	98.559
Levelling Mark	C305-LT102450	CENTRAL LINE WB CESS	83436.514	36211.192	98.561
Levelling Mark	C305-LT102451	CENTRAL LINE WB CESS	83436.991	36213.135	98.561
Levelling Mark	C305-LT102452	CENTRAL LINE WB CESS	83437.466	36215.078	98.560
Levelling Mark	C305-LT102453	CENTRAL LINE WB CESS	83437.941	36217.021	98.559
Levelling Mark	C305-LT102454	CENTRAL LINE WB CESS	83438.416	36218.964	98.559
Levelling Mark	C305-LT102455	CENTRAL LINE WB CESS	83438.891	36220.906	98.557
Levelling Mark	C305-LT102456	CENTRAL LINE WB CESS	83439.366	36222.850	98.558
Levelling Mark	C305-LT102457	CENTRAL LINE WB CESS	83439.838	36224.794	98.562
Levelling Mark	C305-LT102458	CENTRAL LINE WB CESS	83440.310	36226.737	98.563

zSENSOR TYPE	SENSOR ID	LU Track	SENSOR LOCATION-GPS READING(m)		
			Easting X	Northing Y	Elevation Z (mATD)
Levelling Mark	C305-LT102459	CENTRAL LINE WB CESS	83440.782	36228.681	98.563
Levelling Mark	C305-LT102460	CENTRAL LINE WB CESS	83441.253	36230.625	98.566
Levelling Mark	C305-LT102461	CENTRAL LINE WB CESS	83441.729	36232.550	98.569
Levelling Mark	C305-LT102462	CENTRAL LINE WB CESS	83442.244	36234.482	98.571
Levelling Mark	C305-LT102463	CENTRAL LINE WB CESS	83442.759	36236.415	98.573
Levelling Mark	C305-LT102464	CENTRAL LINE WB CESS	83443.275	36238.347	98.578
Levelling Mark	C305-LT102465	CENTRAL LINE WB CESS	83443.790	36240.280	98.581
Levelling Mark	C305-LT102466	CENTRAL LINE WB CESS	83444.316	36242.158	98.586
Levelling Mark	C305-LT102467	CENTRAL LINE WB CESS	83444.957	36244.052	98.595
Levelling Mark	C305-LT102468	CENTRAL LINE WB CESS	83445.598	36245.947	98.606
Levelling Mark	C305-LT102469	CENTRAL LINE WB CESS	83446.239	36247.841	98.624
Levelling Mark	C305-LT102470	CENTRAL LINE WB CESS	83446.880	36249.736	98.646
Levelling Mark	C305-LT102471	CENTRAL LINE WB CESS	83447.538	36251.548	98.667
Levelling Mark	C305-LT102472	CENTRAL LINE WB CESS	83448.352	36253.375	98.691
Levelling Mark	C305-LT102473	CENTRAL LINE WB CESS	83449.167	36255.201	98.713
Levelling Mark	C305-LT102474	CENTRAL LINE WB CESS	83449.982	36257.028	98.737
Levelling Mark	C305-LT102475	CENTRAL LINE WB CESS	83450.797	36258.854	98.766
Levelling Mark	C305-LT102476	CENTRAL LINE WB CESS	83451.634	36260.591	98.796
Levelling Mark	C305-LT102477	CENTRAL LINE WB CESS	83452.616	36262.333	98.830
Levelling Mark	C305-LT102478	CENTRAL LINE WB CESS	83453.598	36264.075	98.862
Levelling Mark	C305-LT102479	CENTRAL LINE WB CESS	83454.581	36265.818	98.895
Levelling Mark	C305-LT102480	CENTRAL LINE WB CESS	83455.563	36267.560	98.929
Levelling Mark	C305-LT102481	CENTRAL LINE WB CESS	83456.570	36269.193	98.966
Levelling Mark	C305-LT102482	CENTRAL LINE WB CESS	83457.729	36270.824	99.003
Levelling Mark	C305-LT102483	CENTRAL LINE WB CESS	83458.887	36272.454	99.038
Levelling Mark	C305-LT102484	CENTRAL LINE WB CESS	83460.046	36274.084	99.073
Levelling Mark	C305-LT102485	CENTRAL LINE WB CESS	83461.204	36275.715	99.112
Levelling Mark	C305-LT102486	CENTRAL LINE WB CESS	83462.391	36277.214	99.151
Levelling Mark	C305-LT102487	CENTRAL LINE WB CESS	83463.726	36278.704	99.192
Levelling Mark	C305-LT102488	CENTRAL LINE WB CESS	83465.060	36280.193	99.236
Levelling Mark	C305-LT102489	CENTRAL LINE WB CESS	83466.395	36281.683	99.279
Levelling Mark	C305-LT102490	CENTRAL LINE WB CESS	83467.729	36283.172	99.324
Levelling Mark	C305-LT102491	CENTRAL LINE WB CESS	83469.082	36284.548	99.364
Levelling Mark	C305-LT102492	CENTRAL LINE WB CESS	83470.546	36285.911	99.398
Levelling Mark	C305-LT102493	CENTRAL LINE WB CESS	83472.010	36287.274	99.431
Levelling Mark	C305-LT102494	CENTRAL LINE WB CESS	83473.474	36288.636	99.460
Levelling Mark	C305-LT102495	CENTRAL LINE WB CESS	83474.938	36289.999	99.485
Levelling Mark	C305-LT102496	CENTRAL LINE WB CESS	83476.407	36291.319	99.506
Levelling Mark	C305-LT102497	CENTRAL LINE WB CESS	83477.916	36292.632	99.530
Levelling Mark	C305-LT102498	CENTRAL LINE WB CESS	83479.425	36293.944	99.556
Levelling Mark	C305-LT102499	CENTRAL LINE WB CESS	83480.933	36295.257	99.578
Levelling Mark	C305-LT102500	CENTRAL LINE WB CESS	83482.442	36296.570	99.591
Levelling Mark	C305-LT102501	CENTRAL LINE WB CESS	83483.949	36297.897	99.600
Levelling Mark	C305-LT102502	CENTRAL LINE WB CESS	83485.445	36299.225	99.607
Levelling Mark	C305-LT102503	CENTRAL LINE WB CESS	83486.940	36300.553	99.614
Levelling Mark	C305-LT102504	CENTRAL LINE WB CESS	83488.435	36301.882	99.617
Levelling Mark	C305-LT102505	CENTRAL LINE WB CESS	83489.930	36303.210	99.614

SENSOR TYPE	SENSOR ID	LU Track	SENSOR LOCATION-GPS READING(m)		
			Easting X	Northing Y	Elevation Z (mATD)
Levelling Mark	C305-LT102701	CENTRAL LINE WB 6FT	83407.936	36117.681	99.401
Levelling Mark	C305-LT102702	CENTRAL LINE WB 6FT	83408.737	36119.514	99.375
Levelling Mark	C305-LT102703	CENTRAL LINE WB 6FT	83409.537	36121.347	99.346
Levelling Mark	C305-LT102704	CENTRAL LINE WB 6FT	83410.337	36123.180	99.316
Levelling Mark	C305-LT102705	CENTRAL LINE WB 6FT	83411.137	36125.013	99.286
Levelling Mark	C305-LT102706	CENTRAL LINE WB 6FT	83411.920	36126.811	99.256
Levelling Mark	C305-LT102707	CENTRAL LINE WB 6FT	83412.624	36128.683	99.228
Levelling Mark	C305-LT102708	CENTRAL LINE WB 6FT	83413.328	36130.555	99.203
Levelling Mark	C305-LT102709	CENTRAL LINE WB 6FT	83414.033	36132.427	99.177
Levelling Mark	C305-LT102710	CENTRAL LINE WB 6FT	83414.737	36134.299	99.155
Levelling Mark	C305-LT102711	CENTRAL LINE WB 6FT	83415.423	36136.138	99.130
Levelling Mark	C305-LT102712	CENTRAL LINE WB 6FT	83416.034	36138.042	99.105
Levelling Mark	C305-LT102713	CENTRAL LINE WB 6FT	83416.644	36139.946	99.083
Levelling Mark	C305-LT102714	CENTRAL LINE WB 6FT	83417.255	36141.851	99.058
Levelling Mark	C305-LT102715	CENTRAL LINE WB 6FT	83417.866	36143.755	99.038
Levelling Mark	C305-LT102716	CENTRAL LINE WB 6FT	83418.466	36145.632	99.016
Levelling Mark	C305-LT102717	CENTRAL LINE WB 6FT	83419.003	36147.559	98.994
Levelling Mark	C305-LT102718	CENTRAL LINE WB 6FT	83419.539	36149.486	98.970
Levelling Mark	C305-LT102719	CENTRAL LINE WB 6FT	83420.075	36151.413	98.948
Levelling Mark	C305-LT102720	CENTRAL LINE WB 6FT	83420.611	36153.340	98.925
Levelling Mark	C305-LT102721	CENTRAL LINE WB 6FT	83421.139	36155.250	98.902
Levelling Mark	C305-LT102722	CENTRAL LINE WB 6FT	83421.629	36157.189	98.879
Levelling Mark	C305-LT102723	CENTRAL LINE WB 6FT	83422.118	36159.128	98.858
Levelling Mark	C305-LT102724	CENTRAL LINE WB 6FT	83422.608	36161.067	98.836
Levelling Mark	C305-LT102725	CENTRAL LINE WB 6FT	83423.097	36163.007	98.817
Levelling Mark	C305-LT102726	CENTRAL LINE WB 6FT	83423.586	36164.943	98.796
Levelling Mark	C305-LT102727	CENTRAL LINE WB 6FT	83424.069	36166.884	98.777
Levelling Mark	C305-LT102728	CENTRAL LINE WB 6FT	83424.551	36168.825	98.753
Levelling Mark	C305-LT102729	CENTRAL LINE WB 6FT	83425.034	36170.766	98.727
Levelling Mark	C305-LT102730	CENTRAL LINE WB 6FT	83425.517	36172.707	98.700
Levelling Mark	C305-LT102731	CENTRAL LINE WB 6FT	83425.998	36174.645	98.677
Levelling Mark	C305-LT102732	CENTRAL LINE WB 6FT	83426.473	36176.587	98.660
Levelling Mark	C305-LT102733	CENTRAL LINE WB 6FT	83426.947	36178.530	98.649
Levelling Mark	C305-LT102734	CENTRAL LINE WB 6FT	83427.421	36180.473	98.640
Levelling Mark	C305-LT102735	CENTRAL LINE WB 6FT	83427.896	36182.416	98.630
Levelling Mark	C305-LT102736	CENTRAL LINE WB 6FT	83428.370	36184.361	98.617
Levelling Mark	C305-LT102737	CENTRAL LINE WB 6FT	83428.849	36186.303	98.607
Levelling Mark	C305-LT102738	CENTRAL LINE WB 6FT	83429.327	36188.245	98.607
Levelling Mark	C305-LT102739	CENTRAL LINE WB 6FT	83429.805	36190.187	98.605
Levelling Mark	C305-LT102740	CENTRAL LINE WB 6FT	83430.283	36192.129	98.597
Levelling Mark	C305-LT102741	CENTRAL LINE WB 6FT	83430.761	36194.070	98.587
Levelling Mark	C305-LT102742	CENTRAL LINE WB 6FT	83431.239	36196.013	98.575
Levelling Mark	C305-LT102743	CENTRAL LINE WB 6FT	83431.717	36197.955	98.563
Levelling Mark	C305-LT102744	CENTRAL LINE WB 6FT	83432.194	36199.897	98.568
Levelling Mark	C305-LT102745	CENTRAL LINE WB 6FT	83432.672	36201.839	98.568
Levelling Mark	C305-LT102746	CENTRAL LINE WB 6FT	83433.150	36203.781	98.567
Levelling Mark	C305-LT102747	CENTRAL LINE WB 6FT	83433.627	36205.723	98.563
Levelling Mark	C305-LT102748	CENTRAL LINE WB 6FT	83434.103	36207.665	98.560
Levelling Mark	C305-LT102749	CENTRAL LINE WB 6FT	83434.580	36209.608	98.560
Levelling Mark	C305-LT102750	CENTRAL LINE WB 6FT	83435.057	36211.550	98.562
Levelling Mark	C305-LT102751	CENTRAL LINE WB 6FT	83435.534	36213.492	98.561
Levelling Mark	C305-LT102752	CENTRAL LINE WB 6FT	83436.009	36215.434	98.562
Levelling Mark	C305-LT102753	CENTRAL LINE WB 6FT	83436.484	36217.377	98.562
Levelling Mark	C305-LT102754	CENTRAL LINE WB 6FT	83436.959	36219.320	98.564
Levelling Mark	C305-LT102755	CENTRAL LINE WB 6FT	83437.434	36221.263	98.565
Levelling Mark	C305-LT102756	CENTRAL LINE WB 6FT	83437.909	36223.204	98.565
Levelling Mark	C305-LT102757	CENTRAL LINE WB 6FT	83438.380	36225.148	98.566
Levelling Mark	C305-LT102758	CENTRAL LINE WB 6FT	83438.852	36227.091	98.568

SENSOR TYPE	SENSOR ID	LU Track	SENSOR LOCATION-GPS READING(m)		
			Easting X	Northing Y	Elevation Z (mATD)
Levelling Mark	C305-LT102759	CENTRAL LINE WB 6FT	83439.324	36229.035	98.574
Levelling Mark	C305-LT102760	CENTRAL LINE WB 6FT	83439.796	36230.978	98.585
Levelling Mark	C305-LT102761	CENTRAL LINE WB 6FT	83440.279	36232.936	98.591
Levelling Mark	C305-LT102762	CENTRAL LINE WB 6FT	83440.795	36234.869	98.596
Levelling Mark	C305-LT102763	CENTRAL LINE WB 6FT	83441.310	36236.801	98.603
Levelling Mark	C305-LT102764	CENTRAL LINE WB 6FT	83441.825	36238.734	98.614
Levelling Mark	C305-LT102765	CENTRAL LINE WB 6FT	83442.341	36240.666	98.625
Levelling Mark	C305-LT102766	CENTRAL LINE WB 6FT	83442.895	36242.638	98.639
Levelling Mark	C305-LT102767	CENTRAL LINE WB 6FT	83443.536	36244.533	98.654
Levelling Mark	C305-LT102768	CENTRAL LINE WB 6FT	83444.177	36246.427	98.671
Levelling Mark	C305-LT102769	CENTRAL LINE WB 6FT	83444.818	36248.322	98.693
Levelling Mark	C305-LT102770	CENTRAL LINE WB 6FT	83445.459	36250.216	98.719
Levelling Mark	C305-LT102771	CENTRAL LINE WB 6FT	83446.168	36252.160	98.746
Levelling Mark	C305-LT102772	CENTRAL LINE WB 6FT	83446.983	36253.986	98.771
Levelling Mark	C305-LT102773	CENTRAL LINE WB 6FT	83447.797	36255.813	98.794
Levelling Mark	C305-LT102774	CENTRAL LINE WB 6FT	83448.612	36257.639	98.817
Levelling Mark	C305-LT102775	CENTRAL LINE WB 6FT	83449.427	36259.465	98.845
Levelling Mark	C305-LT102776	CENTRAL LINE WB 6FT	83450.327	36261.328	98.876
Levelling Mark	C305-LT102777	CENTRAL LINE WB 6FT	83451.310	36263.070	98.908
Levelling Mark	C305-LT102778	CENTRAL LINE WB 6FT	83452.292	36264.812	98.941
Levelling Mark	C305-LT102779	CENTRAL LINE WB 6FT	83453.274	36266.554	98.975
Levelling Mark	C305-LT102780	CENTRAL LINE WB 6FT	83454.256	36268.296	99.012
Levelling Mark	C305-LT102781	CENTRAL LINE WB 6FT	83455.348	36270.062	99.053
Levelling Mark	C305-LT102782	CENTRAL LINE WB 6FT	83456.506	36271.692	99.092
Levelling Mark	C305-LT102783	CENTRAL LINE WB 6FT	83457.664	36273.323	99.126
Levelling Mark	C305-LT102784	CENTRAL LINE WB 6FT	83458.823	36274.953	99.160
Levelling Mark	C305-LT102785	CENTRAL LINE WB 6FT	83459.981	36276.583	99.197
Levelling Mark	C305-LT102786	CENTRAL LINE WB 6FT	83461.274	36278.215	99.234
Levelling Mark	C305-LT102787	CENTRAL LINE WB 6FT	83462.608	36279.704	99.272
Levelling Mark	C305-LT102788	CENTRAL LINE WB 6FT	83463.943	36281.194	99.310
Levelling Mark	C305-LT102789	CENTRAL LINE WB 6FT	83465.278	36282.684	99.343
Levelling Mark	C305-LT102790	CENTRAL LINE WB 6FT	83466.612	36284.173	99.379
Levelling Mark	C305-LT102791	CENTRAL LINE WB 6FT	83468.060	36285.646	99.414
Levelling Mark	C305-LT102792	CENTRAL LINE WB 6FT	83469.525	36287.009	99.446
Levelling Mark	C305-LT102793	CENTRAL LINE WB 6FT	83470.989	36288.372	99.470
Levelling Mark	C305-LT102794	CENTRAL LINE WB 6FT	83472.453	36289.734	99.492
Levelling Mark	C305-LT102795	CENTRAL LINE WB 6FT	83473.917	36291.097	99.510
Levelling Mark	C305-LT102796	CENTRAL LINE WB 6FT	83475.423	36292.450	99.526
Levelling Mark	C305-LT102797	CENTRAL LINE WB 6FT	83476.931	36293.763	99.543
Levelling Mark	C305-LT102798	CENTRAL LINE WB 6FT	83478.440	36295.076	99.560
Levelling Mark	C305-LT102799	CENTRAL LINE WB 6FT	83479.949	36296.389	99.573
Levelling Mark	C305-LT102800	CENTRAL LINE WB 6FT	83481.457	36297.702	99.580
Levelling Mark	C305-LT102801	CENTRAL LINE WB 6FT	83482.953	36299.018	99.585
Levelling Mark	C305-LT102802	CENTRAL LINE WB 6FT	83484.448	36300.346	99.587
Levelling Mark	C305-LT102803	CENTRAL LINE WB 6FT	83485.944	36301.675	99.587
Levelling Mark	C305-LT102804	CENTRAL LINE WB 6FT	83487.439	36303.003	99.585
Levelling Mark	C305-LT102805	CENTRAL LINE WB 6FT	83488.934	36304.331	99.583