C510 – Whitechapel and Liverpool Street Station Tunnels

Instrumentation and Monitoring Close Out Report
Block 11 Liverpool Street
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2a. Stakeholder Review Required? YES ☐ NO ☐

Stakeholder submission required: LU ☐ RfL ☐ NR ☐ LO ☐ DLR ☐ Other: ☐

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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: _____ Role: _____ Name: _____ Date: _____

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

2b. Review by Stakeholder (if required):

Stakeholder Organisation	Job Title	Name	Signature	Date	Acceptance
					☐
					☐

3. Acceptance by *Crossrail*:

		***Crossrail* Review and Acceptance Decal** This decal is to be used for submitted documents requiring acceptance by *Crossrail*.
☒	Code 1.	Accepted. Work May Proceed
☐	Code 2.	Not Accepted. Revise and resubmit. Work may proceed subject to incorporation of changes indicated
☐	Code 3.	Not Accepted. Revise and resubmit. Work may not proceed
☐	Code 4.	Received for information only. Receipt is confirmed

[redacted] Date: 07/11/16

[redacted] does not relieve the designer/supplier from full compliance with their contractual obligations and does not constitute *Crossrail* approval of design, details, calculations, [redacted] or materials developed or selected by the designer/supplier.

Document Revision History		
Revision	Date	Purpose
1.0	15/09/2016	For approval

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1 Purpose of Close out Report

Materials and Workmanship Specification - Instrumentation and Monitoring (C122 OVE Z4 RSP CR001 00007), section KX10.2114 specifies the requirement for a close out report prior to the decommissioning of monitoring sensors and instruments. It is therefore, the purpose of this close out report to gain acceptance to decommission identified monitoring sensors in Block 11 of Crossrails's C510 Liverpool St. Acceptance to decommission sensors will result in ceasing measurements, stopping the reporting and removing sensors.

To gain approval to decommission instrumentation and monitoring, the monitoring data will be analysed to demonstrate settlement does not breach specified rates after the minimum monitoring period is complete.

N.B. Monitoring sensors refers to all monitoring points; which includes BREs, road studs, extensometers, inclinometers, tilt meters, crack meters, retros (survey stickers) and prisms. Please note this is not an exhaustive list and does not include monitoring systems/equipment, such as communication boxes.

2 Scope of Monitoring Assessment for Close Out

Specification KX10.4103 of document C122-OVE-Z4-RSP-CR001-00007 states that to establish approval for decommissioning, the contractor is to produce a close out report which summarises the observations in correlation with the construction activities. The report is to demonstrate monitoring has reached acceptable settlement rates; whether to the specified rate, or where no rate is specified trigger values are evaluated against potential residual risks. I&M schedule C122-OVE-C2-DDJ-CR001-Z-31511 specifies the acceptable settlement rates with the requirements to monitor at different construction phases, and duration for completion. To summarise the I&M schedule states that the manual monitoring decommissioning specified rate is 2mm per year, following 16 months post construction monitoring (4 months step down and quarterly measurements for a minimum of 12 months long term monitoring). The I&M schedule does not identify the need for long term automated monitoring or specify a settlement rate requirement, it only states that monitoring must continue for 6 months post construction. At the 6 month juncture, agreement must be sought from the project manager to decommission automated monitoring programmes through a close out report or agreeing to cease the works with the project manager. In most cases decommissioning will be possible, as the residual risk will be captured through the remaining long term manual monitoring.

Contrary to the Specification for Instrumentation and Monitoring (C122-OVE-Z4-RSP-CR001-00007), the Project Managers Instruction (PMI) C510-PMI-01102 replaces long term monitoring with satellite interferometry (InSAR) for the areas agreed by the project manager. If long term monitoring responsibilities are removed from BBMV and covered by satellite interferometry, the specified settlement criteria may not be met by BBMV. If this occurs, reference to the agreement will be provided to state BBMV are no longer responsible for the sensors and consequently decommissioning acceptance will be proposed.

In some cases it may be agreed with the project manager to cease monitoring prior to meeting the specified rates. The close out report will be revised to incorporate these agreements prior to decommissioning. Due to multiple influencers and large construction monitoring zones, it may be prudent to submit successive document revisions for close out reports, where the specification is not met or the minimum post construction monitoring has not been achieved.

3 Close Out Report Block Description and Location Plan

3.1 Block 11 Location

Figure 1 shows the Liverpool St general location plan, C510 tunnel construction and where Block 11 is situated. Detailed location plans can be found within the installation reports and photomontages as listed in Section 3.2. Each monitoring sensor's location is shown within the assessment plans (Section 5.4).

Thames water (sewer and water mains), NGG assets (gas utilities) and BT tunnels are located in the vicinity of Block 11, including a 9 inch cast iron main (Critical Asset). The location and details of these assets can be found in Instrumentation and Monitoring Plan: Liverpool Street Station Ground Movement and Asset Protection C122-OVE-C2-RGN-C101-50013 or the relevant C122 prepared Damage Assessment Reports.

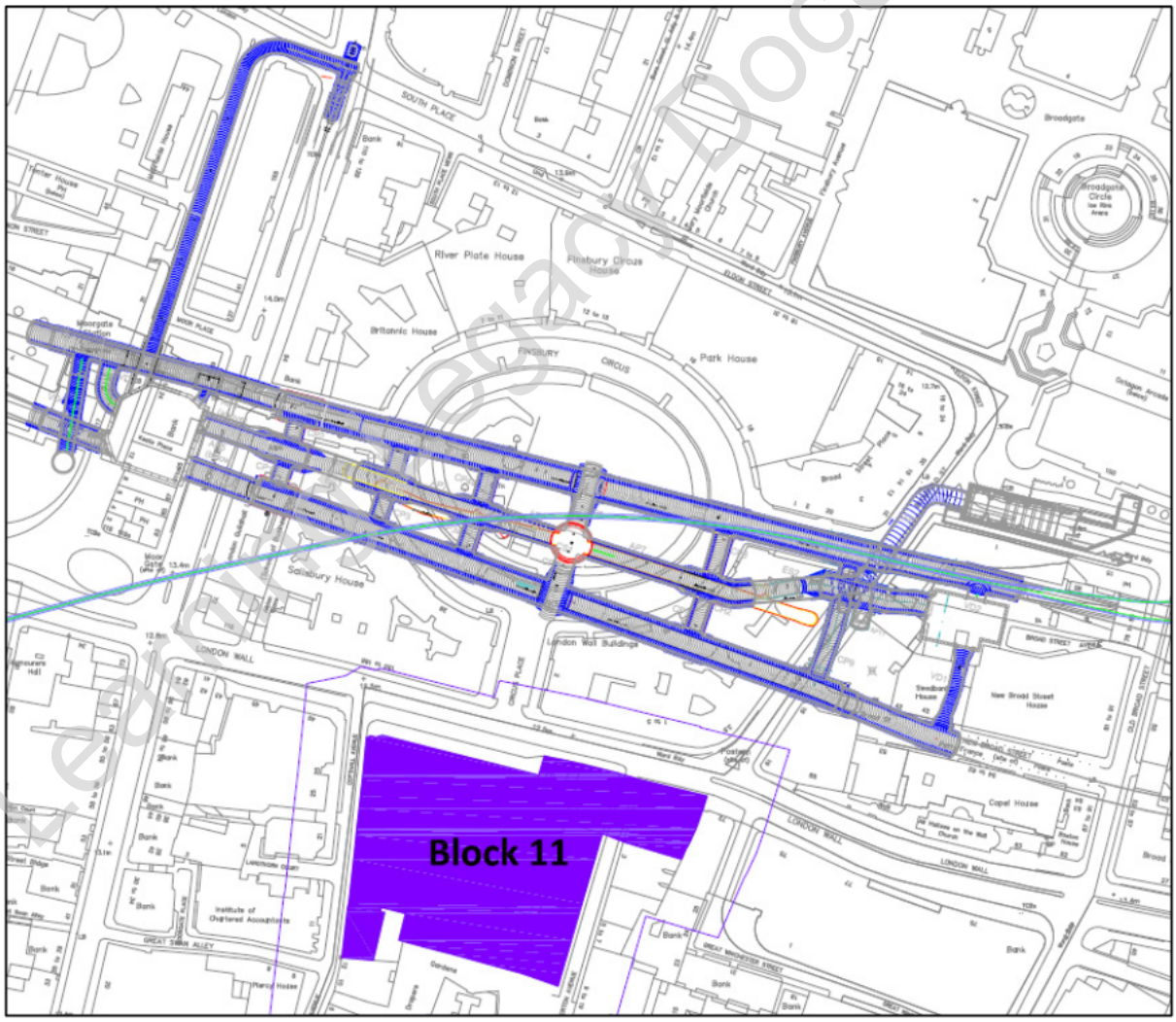


Figure 1 - Liverpool St General Location Plan (Block 11)

3.2 Block 11 Description

Block 11 is located on the South side of London Wall, between Copthall Ave and approximately Throgmorton Ave. The block is approximately 50 metres south and parallel to the Platform Tunnel West (PTW) tunnel, further detail of the construction programmes can be found in Section 4. Block 11 contains the following types of monitoring sensors:

- Building (BREs) - manual monitoring
- Road Studs (LP) – manual monitoring

Each monitoring assets details are listed within the Decommissioning Status Tracker (Table 2) and further relevant information can be sourced from the installation reports.

Block 11 Installation Report References:

- Monitoring Installation Report LIV-LB-11-Liverpool Street
  CRL Document Number: C510-BBM-C2-RGN-C101-50130
- Monitoring Installation Report LIV-LP-11-Liverpool Street
  CRL Document Number: C510-BBM-C2-RGN-C101-50137
- Monitoring Installation Report (Block 11), Liverpool Street
  CRL Document Number: C510-BBM-C2-RGN-C101-50123 (ATS)

The Settlement Contour Drawing (C122-OVE-C2-DDA-CR001_Z-21313) predicts the Block 11 area to experience less than 5mm of settlement.

4 Construction Programme Influencing Block 11

Extent of Influence (EOI) monitoring areas were established to record ground movements in relation to C510 construction. The EOI purpose is to ensure all assets and areas are adequately monitored for movement during construction, this is achieved by controlling when and how often monitoring occurs. The Asset Protection Instrument and Monitoring (I&M) Schedules (C122 –OVE-C2-DDJ-CR001_Z-31511) states the extent of influence (EOI) of an active tunnel is 2 x depth from the active tunnel face. The EOI is used to determine when monitoring sensors are no longer influenced by construction and can be considered for decommissioning.

The original specification received amendments to manual monitoring frequency within the EOI through several PMIs, with the latest PMI (C510-PMI-01103) establishing an Active ZOI (Zone of Influence) as 2 x tunnel diameter from the active tunnel face projected to the surface. The Active ZOI changed the rates of monitoring frequency, it did not replace EOI. The EOI is used to determine when a monitoring sensor is eligible for decommissioning. Whereas, active ZOI is used to analyse manual monitoring movement against construction.

To identify the tunnels that had the potential to significantly affect Block 11, a ZOI area was established by giving each monitoring sensor a radius of 2.0 x tunnel diameter. This area was then used to determine all the mining advances that occurred within its boundary, Figure 2 shows the ZOI area (purple outline) and the tunnels. Start and finish dates of tunnel constructions will be used in the assessment of the monitoring data.

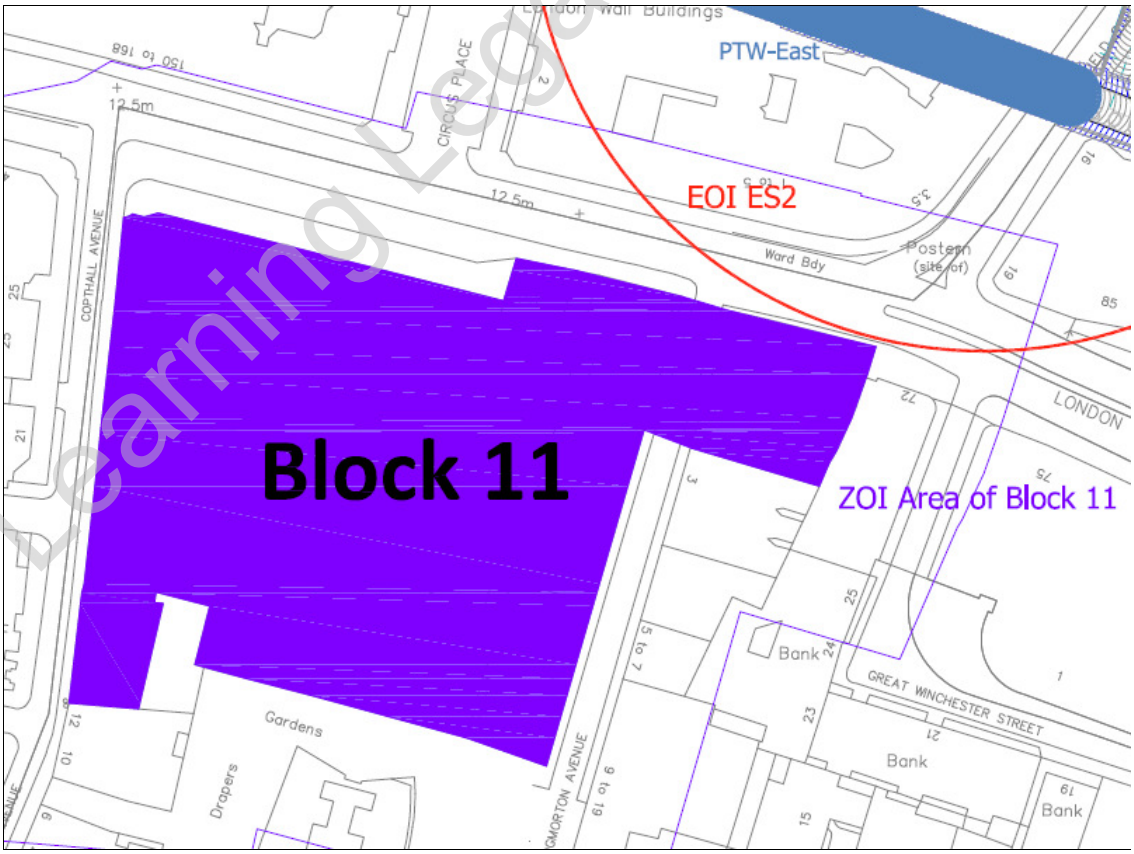


Figure 2 - Block 11 and C510 Construction

Figure 2 shows that no C510 works are within 2 x tunnel diameter of Block 11 (active ZOI). Therefore, to assist the settlement analysis a 50 metre radius will be referenced. The construction advances within a 50 metre radius of Block 11 are listed and summarised in Table 1.

The last completed SCL advance, which had the potential to affect Block 11 through its EOI is CP9 Enlargement advance 32, which was completed on 23/08/2014. ES2 EOI (76m radius from active construction) boundary is shown in Figure 2 & Figure 3 to prove that Block 11 monitoring sensors are not in the zone of this construction. As there is no further C510 construction that has the potential to affect Block 11 and the last EOI advance that influenced Block 11 has surpassed 16 months of post construction monitoring, the entire Block 11 can be assessed for decommissioning. Further evidence for construction dates can be seen in the decommissioning tracker Table 2, which lists the last tunnel advances within a 50m radius for each point.

4.1.1 Tunnel Advances Affecting Block 11

The information presented in Table 1 is used in the monitoring graph (Section 5.1) to show ground movement in relation to construction. As Block 11 is not within the active ZOI (25m radius) for any construction a 50m radius was used to assess the monitoring data. Additionally, the initial and final EOI construction affecting Block 11 has been listed.

TUNNEL ADVANCES STARTS & ENDS FOR GRAPHS							
Tunnel Code	Tunnel Reference	Primary Layer Type	Start Date	End Date	Start Advance	End Advance	Zone
CP9-Enlargement	CP9	Enlargement	08/08/2014	23/08/2014	4	32	EOI
PTW-East-Enlargement	PTW-East	Enlargement	17/11/2013	09/04/2014	4	160	50m Radius
PTW-East-Pilot	PTW-East	Pilot	28/07/2013	13/10/2013	19	104	50m Radius
CP5-Enlargement	CP5	Enlargement	10/01/2013	13/01/2013	25	34	50m Radius
CP5-Pilot	CP5	Pilot	14/11/2012	16/11/2012	22	27	50m Radius
AP7 East-Pilot	AP7 East	Pilot	21/10/2012	14/02/2013	2	42	EOI

Table 1 - Tunnel Advances Affecting Block 11

Heading Index:

AP – Access Passage

CH - Chamber

CP - Cross Passage

ES – Escalator

GAD – Grout Adit

LCE - Launch Chamber East

LCW – Launch Chamber West

PTE – Platform Tunnel East

PTW – Platform Tunnel West

RCE – Reception Chamber East

RCW – Reception Chamber West

TBM – Tunnel Boring Machine

VD – Ventilation Drive

5 Monitoring Assessment of Block 11

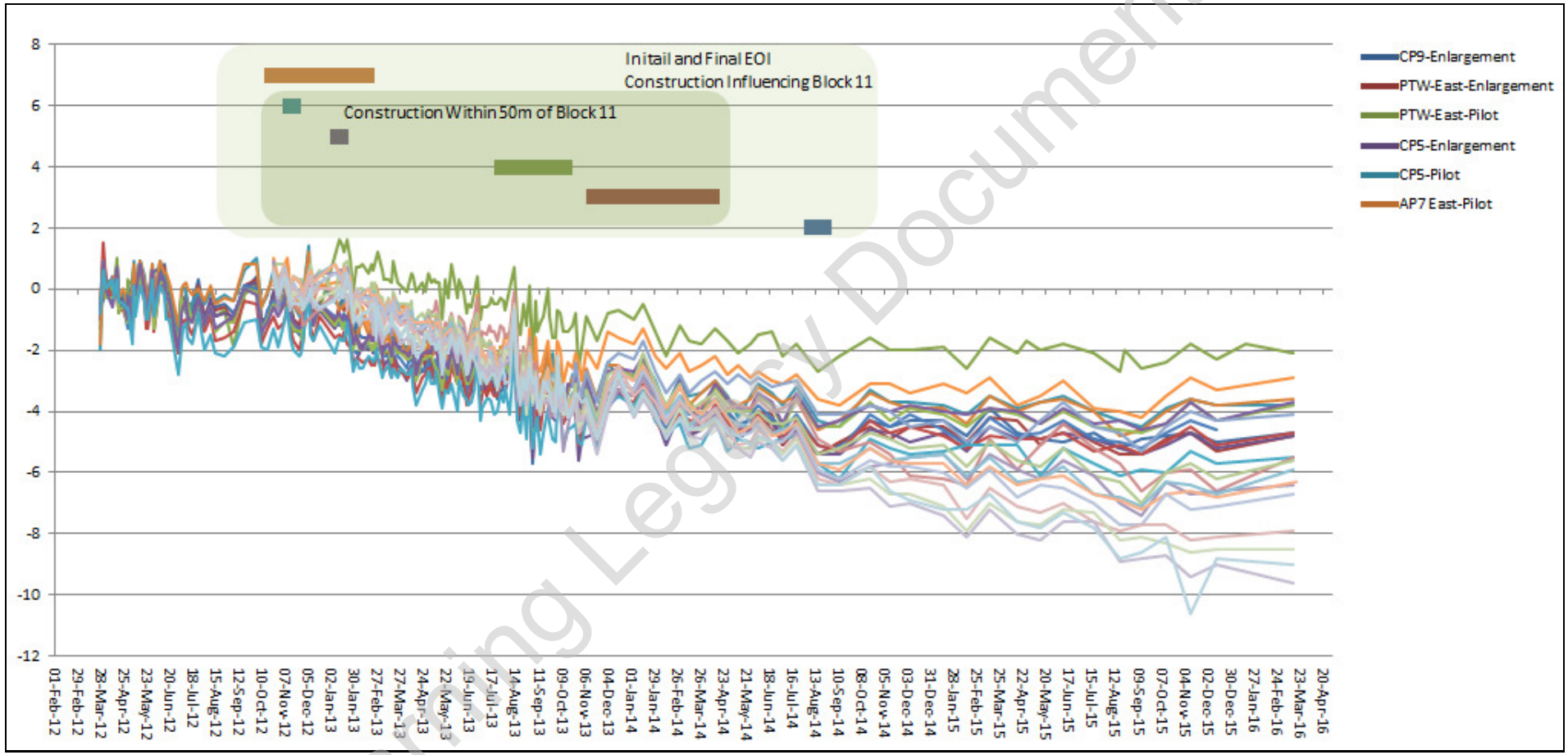
Evidence for decommissioning each monitoring sensor is shown through graphs, tables (Table 2) and plans. Each element of assessment compliments the other and is used together to determine acceptance of decommissioning. Table 2 - Block 11 Decommissioning Status Tracker highlights the monitoring sensors to be considered for decommissioning and provides the supporting evidence for the decision. In some cases supplementary evidence is required to prove stability or provide reasoning for decommissioning.

5.1 Time Graphs Monitoring Full History and Construction Durations

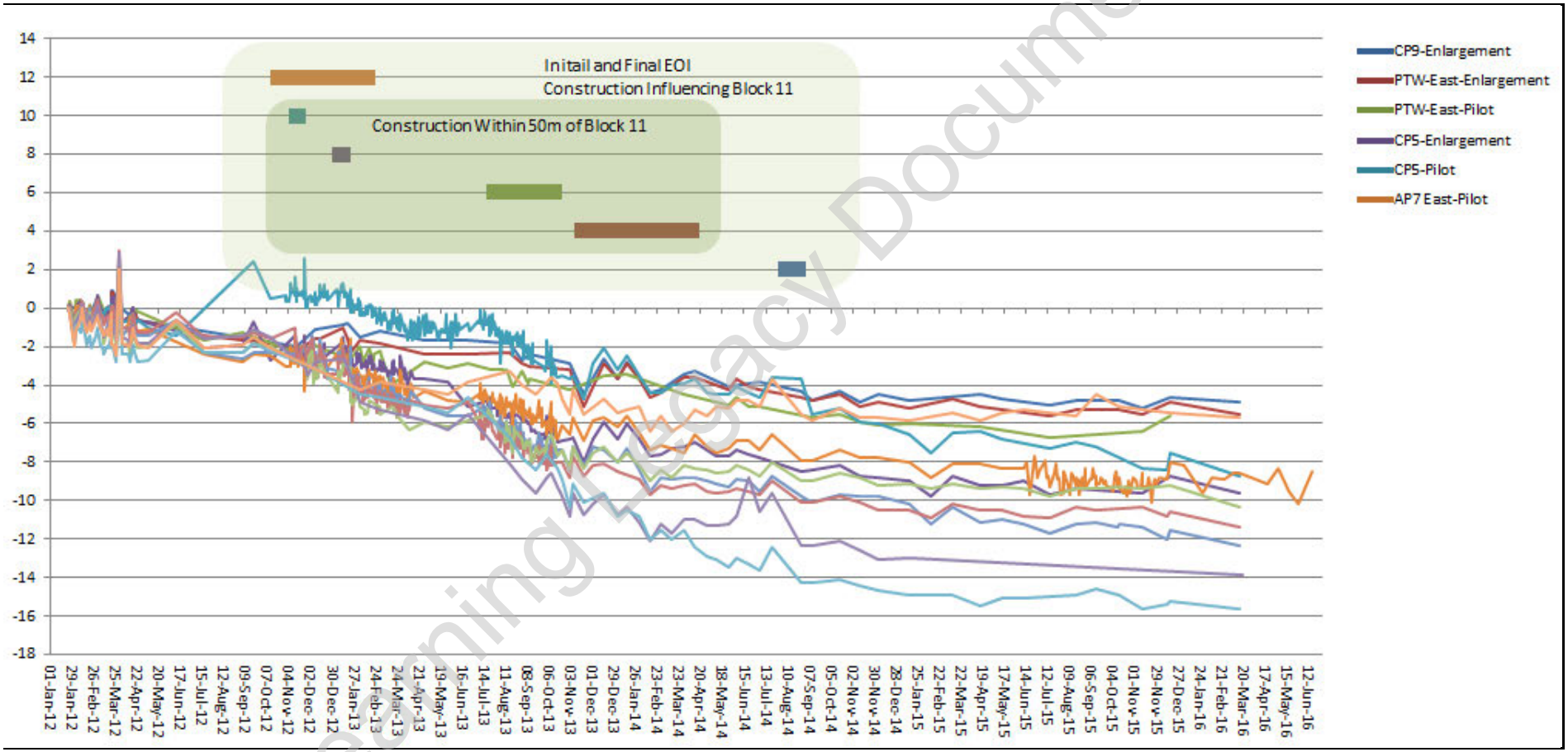
To assess the movement of Block 11 monitoring sensors; each monitoring sensor data type is displayed in a line graph, with a gantt chart (bar) representing the construction identified in Section 4:

- Graph 1- All Block 11 Building (BRE) Manual Monitoring History in Relation to Construction
- Graph 2 - All Block 11 Road Stud (LP) Manual Monitoring History in Relation to Construction

Graph 1- All Block 11 Building (BRE) Manual Monitoring History in Relation to Construction



Graph 2 - All Block 11 Road Stud (LP) Manual Monitoring History in Relation to Construction



5.2 Block 11 Decommissioning Status Tracker

The decommissioning tracker identifies (Table 2) each monitoring sensor and provides the critical information to enable decommissioning assessment for each sensor. The initial fields shown in the tracker are descriptors of the monitoring sensor, whilst the remaining fields are the assessment for decommissioning. The purpose of the tracker is to provide Crossrail reviewers with sufficient information in conjunction with construction movement graphs and plots, to accept BBMV's proposal to decommission sensors on an individual basis.

Detailed explanation of the tracker column headers:

Tracker Column Header – Last Construction Date and Traffic Lights

For each sensor the EOI parameter is used to determine the latest completed construction advance that had the potential to cause settlement. All construction tunnel advances that had the potential to affect a sensor through its EOI are listed for each sensor, from the list the latest advance is used as a construction completion indicator. A traffic light system is used to highlight when a sensor has surpassed defined monitoring time frames 4 months (120 days), 6 months (180 days) and 16 months (480 days)

> **N.B.** Each monitoring sensor's last affecting primary construction heading and advance number's completion date has been listed within the Decommissioning Status Tracker. The last construction heading listed, is not the closest to the monitoring sensor, but the last completed within a 50m radius.
>
> If any Block 11 sensors are not within a distance of 2 x depth of any tunnel advance location, the last completed construction within a 50m radius that had the potential to affect Block 11 is used as a reference.

Tracker Column Header – 120, 180 & 365 Days Average Settlement Trend

There are three average settlement trends, which tie into the defined monitoring time frames; 120, 180 and 365 days. The calculation used to determine the trend is the same for all three periods. It is a slope calculation (explained below) of the defined period, multiplied over one year. The trend is calculated from the latest reading and includes all readings within the defined period, which is averaged and then multiplied over 1 year. If there is no initial reading for the time frame date, the calculation will continue back to include the next available date. This is an important consideration when assessing the trend and to assist the reviewers, the time frame used within the calculation is included within the decommissioning tracker status table. Defined monitoring time frames:

- The 120 day average rate is used to show the completion of manual monitoring step down period, this is the minimum period of monitoring prior to InSAR taking monitoring responsibility.
- The 180 day average rate is the minimum monitoring period after construction for automated sensors.
- The 365 day average trend is the desired period to be used if the long term monitoring has been completed for decommissioning evidence. The specification states that if the trend is below 2mm/yr, then the sensor is eligible for decommissioning.

Slope calculation Settlement Trend:

Description – The settlement trend calculates the slope of the linear regression line through data points in known_y's and known_x's. The slope is the vertical distance divided by the horizontal distance between any two points on the line, which is the rate of change along the regression line.

Calculation

$$b = \frac{\sum (x - \bar{x})(y - \bar{y})}{\sum (x - \bar{x})^2}$$

Example - If the calculated trend for a 6 month period is 1.5mm, it is multiplied into 365 days, to equal a projected settlement trend of 3mm over 1 year.

Tracker Column Header – ERP Ceased date

ERP and CTC meetings have identified project efficiencies, by ceasing manual monitoring programmes early, or prior to reaching 2mm/yr. InSAR may have taken responsibility of monitoring or the perceived risk may be low enough to warrant ceasing the monitoring. In these situations the cease date is provided, along with a comment explaining the reasoning. Monitoring that has been ceased still requires approval to decommission and will be identified within the decommissioning status tracker as proposed to decommission.

Tracker Column Header – Decommissioning Status

The status is the decommissioning situation for each sensor within Block 10. The different statuses are as follows:

- Outstanding - Monitoring sensor has not met the close out requirements and approval to decommission will be sought in subsequent revisions of this close out report.
- Proposed - the sensor is proposed to be decommissioned. Crossrail to accept the sensor can be decommissioned.
- Agreed – Agreed to decommission through previous revision of the close out report. No further reporting or monitoring has taken place.
- Complete - Monitoring sensor has been removed and evidence gathered during decommissioning.

N.B. When monitoring sensors have not met the requirements, it may still be appropriate to decommission. In this scenario supplementary evidence will be provided to explain the reasoning for decommissioning.

Table 2 - Block 11 Decommissioning Status Tracker

< 2.0 mm GREEN	< 3.5 mm AMBER	> 3.5 mm RED

05/08/2016

AVERAGE SETTLEMENT TREND

C510 Sensor Name	Block	Section	Int / Ext	Measurement Type	Sensor Type	Sensor Description	Asset	Last Primary Layer Construction	Last Construction Date	Latest Surveyed Date	120 Days	120 Day Calculation Period	180 Days	180 Day Calculation Period	365 Days	365 Day Calculation Period	Ceased Date	General Comment	Decommissioning Status
C510-LB11101	Block 111	S11101	External	Manual	LB	BRE	London Wall 54-65	CP9-Enlargement	23/08/2014	15/03/2016	0.27	125	0.25	185	-0.39	370	10/03/2016	ERP Ceased 10/03/2016.	Proposed
C510-LB11102	Block 111	S11101	External	Manual	LB	BRE	London Wall 54-65	CP9-Enlargement	23/08/2014	15/03/2016	0.23	125	0.69	185	-0.64	370	10/03/2016	ERP Ceased 10/03/2016.	Proposed
C510-LB11103	Block 111	S11101	External	Manual	LB	BRE	London Wall 54-65	CP9-Enlargement	23/08/2014	15/03/2016	-0.36	125	1.00	185	-0.31	370	10/03/2016	ERP Ceased 10/03/2016.	Proposed
C510-LB11104	Block 111	S11101	External	Manual	LB	BRE	London Wall 54-65	CP9-Enlargement	23/08/2014	15/03/2016	0.14	125	0.88	185	-0.29	370	10/03/2016	ERP Ceased 10/03/2016.	Proposed
C510-LB11105	Block 111	S11101	External	Manual	LB	BRE	London Wall 54-65	CP9-Enlargement	23/08/2014	15/03/2016	-0.45	125	0.96	185	-0.19	370	10/03/2016	ERP Ceased 10/03/2016.	Proposed
C510-LB11106	Block 111	S11101	External	Manual	LB	BRE	London Wall 54-65	CP9-Enlargement	23/08/2014	15/03/2016	0.18	125	1.57	185	-0.03	370	10/03/2016	ERP Ceased 10/03/2016.	Proposed
C510-LB11107	Block 111	S11101	External	Manual	LB	BRE	London Wall 54-65	CP9-Enlargement	23/08/2014	12/12/2015	1.45	149	0.21	185	-0.25	373	10/03/2016	ERP Ceased 10/03/2016.	Proposed
C510-LB11108	Block 111	S11101	External	Manual	LB	BRE	London Wall 54-65	CP9-Enlargement	23/08/2014	15/03/2016	-0.09	125	0.98	185	0.05	370	10/03/2016	ERP Ceased 10/03/2016.	Proposed
C510-LB11109	Block 111	S11101	External	Manual	LB	BRE	London Wall 54-65	CP9-Enlargement	23/08/2014	15/03/2016	0.23	125	1.47	185	0.14	370	10/03/2016	ERP Ceased 10/03/2016.	Proposed
C510-LB11110	Block 111	S11101	External	Manual	LB	BRE	London Wall 54-65	CP9-Enlargement	23/08/2014	15/03/2016	0.54	125	1.54	185	0.14	370	10/03/2016	ERP Ceased 10/03/2016.	Proposed
C510-LB11111	Block 111	S11101	External	Manual	LB	BRE	London Wall 54-65	CP9-Enlargement	23/08/2014	15/03/2016	-0.27	125	0.81	185	-0.33	370	10/03/2016	ERP Ceased 10/03/2016.	Proposed
C510-LB11112	Block 111	S11101	External	Manual	LB	BRE	London Wall 64	CP9-Enlargement	23/08/2014	15/03/2016	0.36	125	2.06	185	0.30	370	10/03/2016	ERP Ceased 10/03/2016.	Proposed
C510-LB11113	Block 111	S11101	External	Manual	LB	BRE	London Wall 64	CP9-Enlargement	23/08/2014	15/03/2016	-0.04	125	1.81	185	0.34	370	10/03/2016	ERP Ceased 10/03/2016.	Proposed
C510-LB11114	Block 111	S11101	External	Manual	LB	BRE	London Wall 64	CP9-Enlargement	23/08/2014	15/03/2016	1.89	125	1.59	185	-1.13	370	10/03/2016	ERP Ceased 10/03/2016.	Proposed
C510-LB11115	Block 111	S11101	External	Manual	LB	BRE	London Wall 54-65	CP9-Enlargement	23/08/2014	15/03/2016	0.77	125	2.00	185	-0.64	370	10/03/2016	ERP Ceased 10/03/2016.	Proposed
C510-LB11116	Block 111	S11101	External	Manual	LB	BRE	1-2 Throgmorton Ave (Carpenters Hall)	CP9-Enlargement	23/08/2014	15/03/2016	0.85	125	1.25	185	-1.10	370	10/03/2016	ERP Ceased 10/03/2016.	Proposed
C510-LB11117	Block 111	S11101	External	Manual	LB	BRE	1-2 Throgmorton Ave (Carpenters Hall)	CP9-Enlargement	23/08/2014	15/03/2016	1.85	125	1.76	185	-0.44	370	10/03/2016	ERP Ceased 10/03/2016.	Proposed
C510-LB11118	Block 111	S11101	External	Manual	LB	BRE	1-2 Throgmorton Ave (Carpenters Hall)	CP9-Enlargement	23/08/2014	18/03/2016	1.10	128	1.39	188	-0.59	373	10/03/2016	ERP Ceased 10/03/2016.	Proposed
C510-LB11119	Block 111	S11101	External	Manual	LB	BRE	1-2 Throgmorton Ave (Carpenters Hall)	CP9-Enlargement	23/08/2014	15/03/2016	1.48	125	1.31	185	-0.76	370	10/03/2016	ERP Ceased 10/03/2016.	Proposed
C510-LB11120	Block 111	S11102	External	Manual	LB	BRE	1-2 Throgmorton Ave (Carpenters Hall)	CP9-Enlargement	23/08/2014	15/03/2016	0.85	125	-0.41	185	-1.43	370	10/03/2016	ERP Ceased 10/03/2016.	Proposed
C510-LB11121	Block 111	S11102	External	Manual	LB	BRE	1-2 Throgmorton Ave (Carpenters Hall)	CP9-Enlargement	23/08/2014	15/03/2016	0.22	125	-0.66	185	-1.61	370	10/03/2016	ERP Ceased 10/03/2016.	Proposed
C510-LB11122	Block 111	S11102	External	Manual	LB	BRE	1-2 Throgmorton Ave (Carpenters Hall)	CP9-Enlargement	23/08/2014	15/03/2016	-0.99	125	-1.62	185	-2.27	370	10/03/2016	ERP Ceased 10/03/2016.	Proposed
C510-LB11123	Block 111	S11102	External	Manual	LB	BRE	1-2 Throgmorton Ave (Carpenters Hall)	CP9-Enlargement	23/08/2014	15/03/2016	3.41	125	-0.79	185	-2.56	370	10/03/2016	ERP Ceased 10/03/2016.	Proposed
C510-LP11101	Block 111	S11101	External	Manual	LP	Road Stud	Throgmorton Ave	CP9-Enlargement	23/08/2014	15/03/2016	0.47	125	-0.04	211	-0.18	426	10/03/2016	ERP Ceased 10/03/2016.	Proposed
C510-LP11102	Block 111	S11101	External	Manual	LP	Road Stud	Throgmorton Ave	CP9-Enlargement	23/08/2014	15/03/2016	-0.48	125	-0.16	211	-0.44	370	10/03/2016	ERP Ceased 10/03/2016.	Proposed
C510-LP11103	Block 111	S11101	External	Manual	LP	Road Stud	Throgmorton Ave	CP9-Enlargement	23/08/2014	16/12/2015	2.19	154	0.59	245	-0.05	377	10/03/2016	ERP Ceased 10/03/2016.	Proposed
C510-LP11104	Block 111	S11101	External	Manual	LP	Road Stud	Throgmorton Ave	CP9-Enlargement	23/08/2014	15/03/2016	-0.71	125	0.01	211	-0.44	370	10/03/2016	ERP Ceased 10/03/2016.	Proposed
C510-LP11105	Block 111	S11101	External	Manual	LP	Road Stud	London Wall	CP9-Enlargement	23/08/2014	15/03/2016	-1.65	125	-2.45	185	-2.27	370	10/03/2016	ERP Ceased 10/03/2016.	Proposed
C510-LP11106	Block 111	S11101;S105XS2	External	Manual	LP	Road Stud	London Wall	CP9-Enlargement	23/08/2014	16/06/2016	-1.56	129	-1.69	183	-0.34	367	10/03/2016	ERP Ceased 10/03/2016. Do not remove LP, used in XS2 Transect.	Proposed
C510-LP11107	Block 111	S11101	External	Manual	LP	Road Stud	London Wall	CP9-Enlargement	23/08/2014	15/03/2016	-2.45	125	-2.39	185	-1.36	370	10/03/2016	ERP Ceased 10/03/2016.	Proposed
C510-LP11108	Block 111	S11101	External	Manual	LP	Road Stud	Copthall Ave	CP9-Enlargement	23/08/2014	15/03/2016	-3.06	125	-1.98	185	-0.57	370	10/03/2016	ERP Ceased 10/03/2016.	Proposed
C510-LP11109	Block 111	S11101	External	Manual	LP	Road Stud	Copthall Ave	CP9-Enlargement	23/08/2014	15/03/2016	-2.99	125	-1.80	185	-0.59	370	10/03/2016	ERP Ceased 10/03/2016.	Proposed
C510-LP11110	Block 111	S11101	External	Manual	LP	Road Stud	Copthall Ave	CP9-Enlargement	23/08/2014	19/03/2016	-0.76	430	-0.76	430	-0.76	430	10/03/2016	ERP Ceased 10/03/2016.	Proposed
C510-LP11111	Block 111	S11101	External	Manual	LP	Road Stud	Copthall Ave	CP9-Enlargement	23/08/2014	15/03/2016	-0.35	125	-1.76	185	-0.38	370	10/03/2016	ERP Ceased 10/03/2016.	Proposed
C510-LP11112	Block 111	S11101	External	Manual	LP	Road Stud	Copthall Ave	CP9-Enlargement	23/08/2014	15/03/2016	-1.41	155	-2.12	185	0.07	370	10/03/2016	ERP Ceased 10/03/2016.	Proposed

5.3 Supplementary Evidence for Decommissioning

Revision 1 of Block 11 close out report does not require supplementary evidence.

5.4 Monitoring sensor Location Plan and Decommissioning Status

The following plots provide a visual representation of all Block 11 monitoring sensors with a colour circle that defines its settlement status. A green circle represents when a trend is below 2mm/yr and the larger the circle the greater the trend period. When a trend has not been met, a small red circle will represent the monitoring sensor. There are two plots for Block 11 monitoring sensors:

- Figure 3- LB Monitoring Sensor Settlement Status and Location Plan
- Figure 4 - LP Monitoring Sensor Settlement Status and Location Plan

Figure 3 - LB Monitoring Sensors Settlement Status and Location Plan

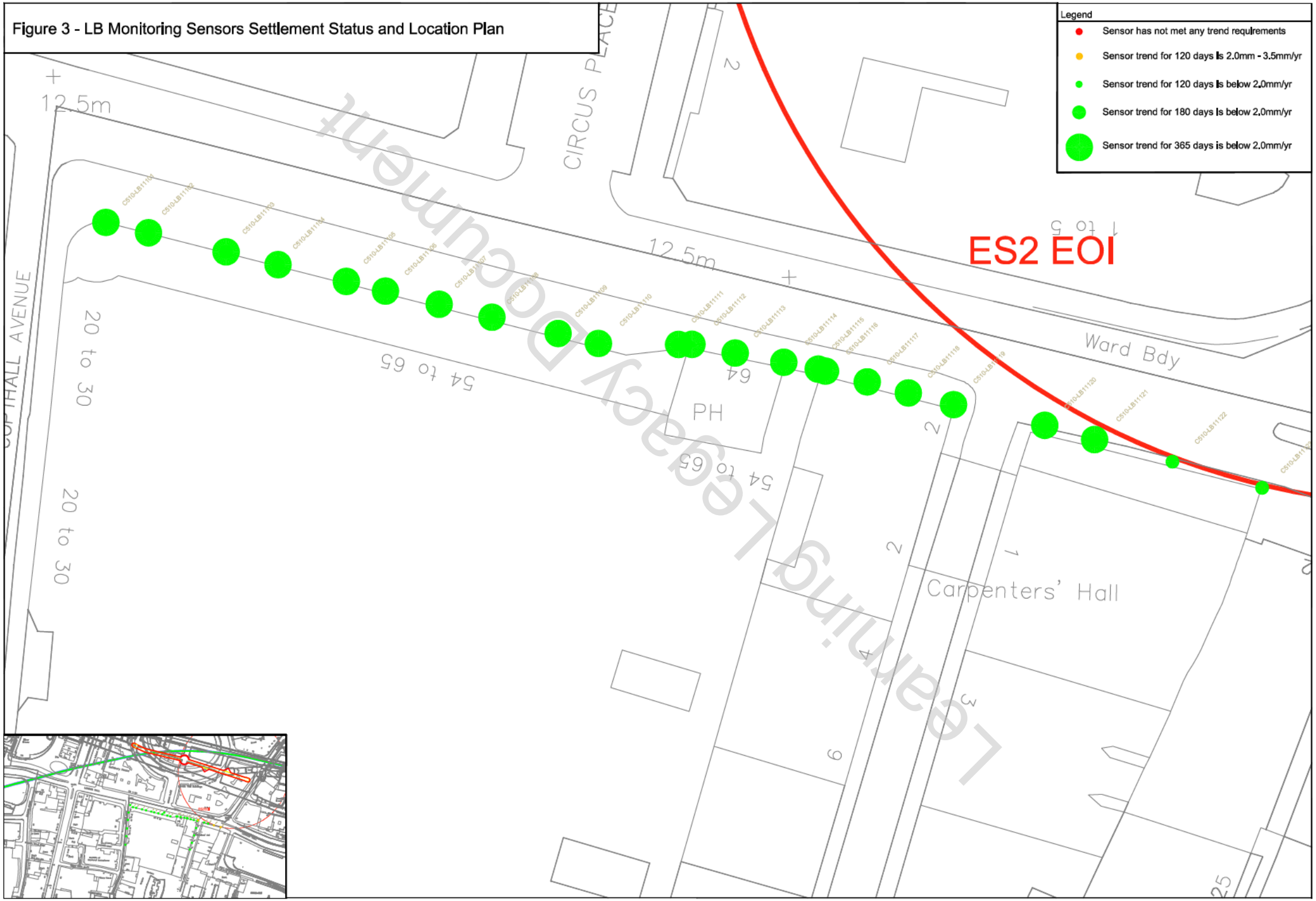
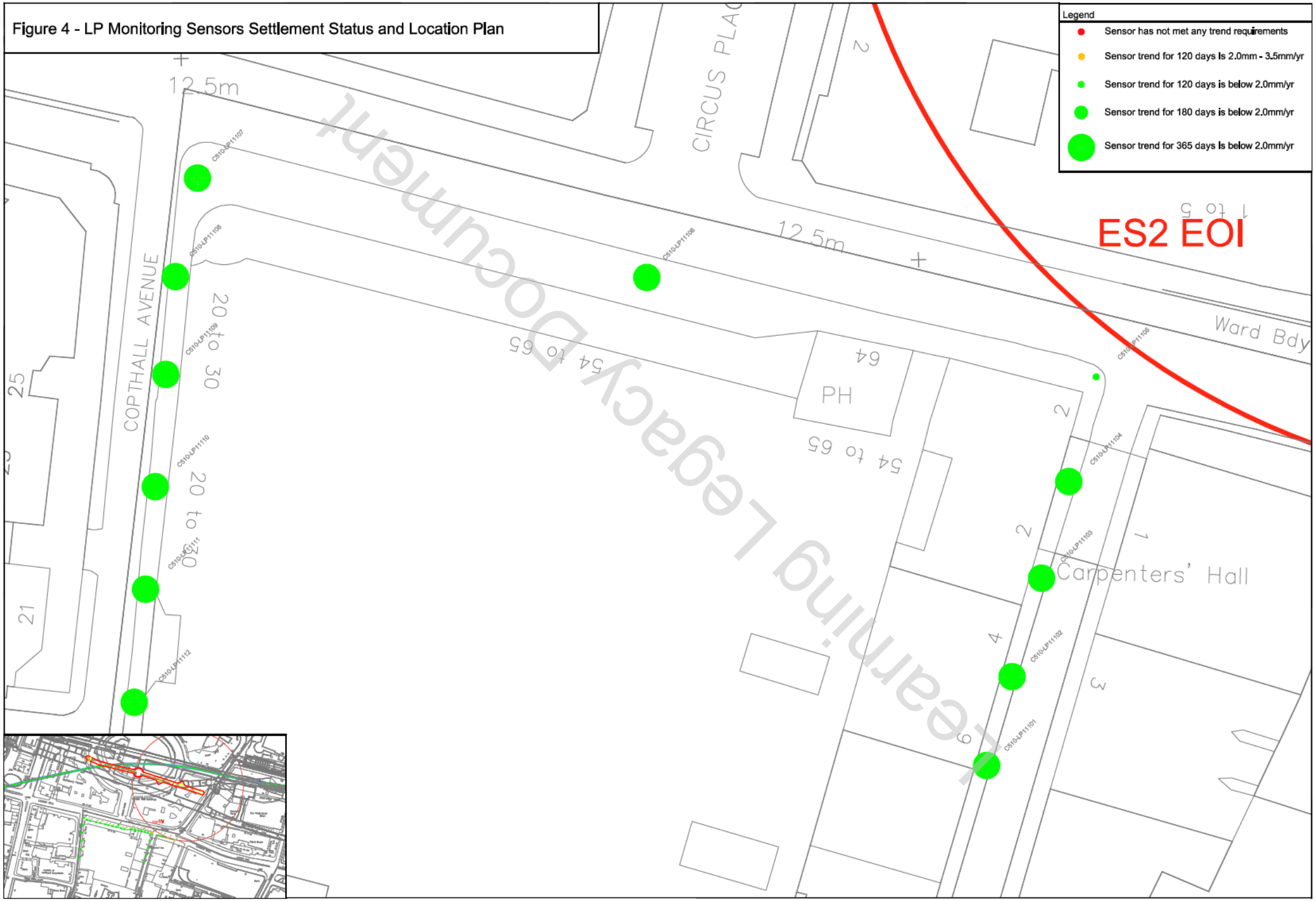


Figure 4 - LP Monitoring Sensors Settlement Status and Location Plan



6 Decommissioning Recommendations

Through the monitoring assessment process in Section 5, it is purposed that all Block 11 sensors have met the monitoring specifications and are proposed to be decommissioned. Table 2 - Block 11 Decommissioning Status Tracker lists all Block 11 monitoring sensor's decommissioning status and the supporting evidence. All Block 11 sensors have met the specification identified in Section 2 and were ceased as part of an ERP meeting held on the 10th March 2016.

N.B. When required, decommissioning and re-instatement evidence will be collected during the removal of monitoring sensors, which will be included within the final report.