



C305– Eastern Running Tunnels

I&M Close out report for Sockets and Levelling Points Billingsgate Market (Drive Y)

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**I&M CLOSE OUT REPORT FOR SOCKETS AND LEVELLING POINTS BILLINGSGATE MARKET
 (DRIVE Y) C305-DSJ-C2-RGN-CRG03-50325 Rev 2.0**

C305 Crossrail Eastern Running Tunnels

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1. CLOSE OUT REPORT PURPOSE

As stated in the specification: C122-OVE-Z4-RSP-CR001-00007 Rev 7.0, the purpose of this close-out report is to summarize the data from the instrumentation included in this document and to relate the recorded movements to the construction activities and dewatering of cross passages which produce any observed changes. For construction activities it is intended excavation of the C305 twin bored tunnels and dewatering of cross passages; impacts from cross passage excavation or from other CRL contracts are not included in this report.

The long term readings have been used to demonstrate that the subsequent movement has reached an acceptably stable rate within the accuracy of the system in order to decommission and/or that C305 works are no longer impacting the area concerned.

As stated in the specifications the settlement rate of 2 mm/yr has been defined. Where this is not achieved this report seeks agreement from all parties that the rate is acceptably low enough to cease monitoring and decommission.

The settlement rate of monitoring locations, covered by this close-out report, had generally reached the specified rate of 2mm/year post TBM works but they are located in an area affected by dewatering works associated with cross passage construction. Monitoring of instruments close to the dewatering works is included in this report to provide evidence that settlement due to the dewatering works has now reached the specified rate. Therefore by inference, instruments located in the vicinity of the dewatering would have also reached the specified rate.

2. LOCATION OF THE WORKS

The instrumentation included in this report is situated within Area 4, Limmo Shaft to Canary Wharf Station, between project chainage 83100 to 83500. All instrumentation was installed within Billingsgate Market boundaries.

See Appendix A for the instrument location.

3. DOCUMENTATION SUMMARY

CROSSRAIL NUMBER	DOCUMENT NAME	REASON FOR ISSUE	TYPE AND NUMBER OF INSTRUMENTATION INSTALLED
C305-DSJ-C2-GMS-CRG03-50014	I&M of Billingsgate Market (83500-83400)	Main Method statement	6-Sockets
			90- Levelling points
C305-DSJ-C2-RGN-CRG03-50212	Installation Report for I&M MS 'Billingsgate Market (83500-83400), C305-DSJ-C2-GMS-CRG3-50014	Installation report	-

Limmo 4th November 2013 (still on)

Canary Wharf It is understood that Canary Wharf dewatering systems were switched on throughout the monitoring period

6. METHODOLOGY

To determine the settlement rate the following methodology has been used. A Linear Regression has been applied for a defined period using long term readings after TBM construction. This uses the following formula.

$$b = \frac{\sum_{i=1}^n (X_i - \bar{X}_i) \cdot (Y_i - \bar{Y}_i)}{\sum_{i=1}^n (X_i - \bar{X}_i)^2}$$

Where:

B =gradient or slope

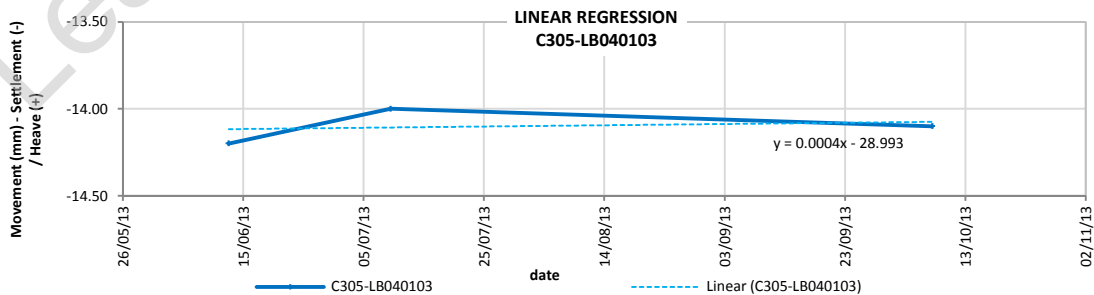
X (independent variable) = date

Y (dependent variable) = vertical movement

From this, the settlement rate per day can be calculated and rate per year determined (negative value is for settlement, positive is for heave). For these values, the percentage at or below 2 mm/yr will be used to determine the trend of the section/area being considered. Also for comparison, values at or below 3mm/year are presented to highlight that the rate is close to achieving the 2 mm/yr. Note the percentages of settlement rate presented in the sections below refer to values rounded to the nearest integer.

One example of this calculation can be seen below for one socket and its projection.

	Registered movement (mm)			RATE mm/year
	12/06/2013	09/07/2013	07/10/2013	
C305-LB040103	-14.20	-14.00	-14.10	0.146



CALCULATION - C305-LB040103

X_i	Y_i	$X_i - \bar{X}_i$	$Y_i - \bar{Y}_i$	$(X_i - \bar{X}_i)^2$	$(X_i - \bar{X}_i) \cdot (Y_i - \bar{Y}_i)$
12/06/2013	-14.2	-47.94	-0.10	2298.67	4.794
09/07/2013	-14	-21.03	0.10	442.17	-2.103
07/10/2013	-14.1	68.97	0.00	4757.17	0.000

\bar{X}_i	41485.53	
\bar{Y}_i	-14.10	
$\sum_{i=1}^n (X_i - \bar{X}_i)^2$	7498.00	(2)
$\sum_{i=1}^n (X_i - \bar{X}_i) \cdot (Y_i - \bar{Y}_i)$	2.692	(1)
m (SLOPE)	(1)/(2)	0.0004
Rate (mm/year)	m * 365	0.146

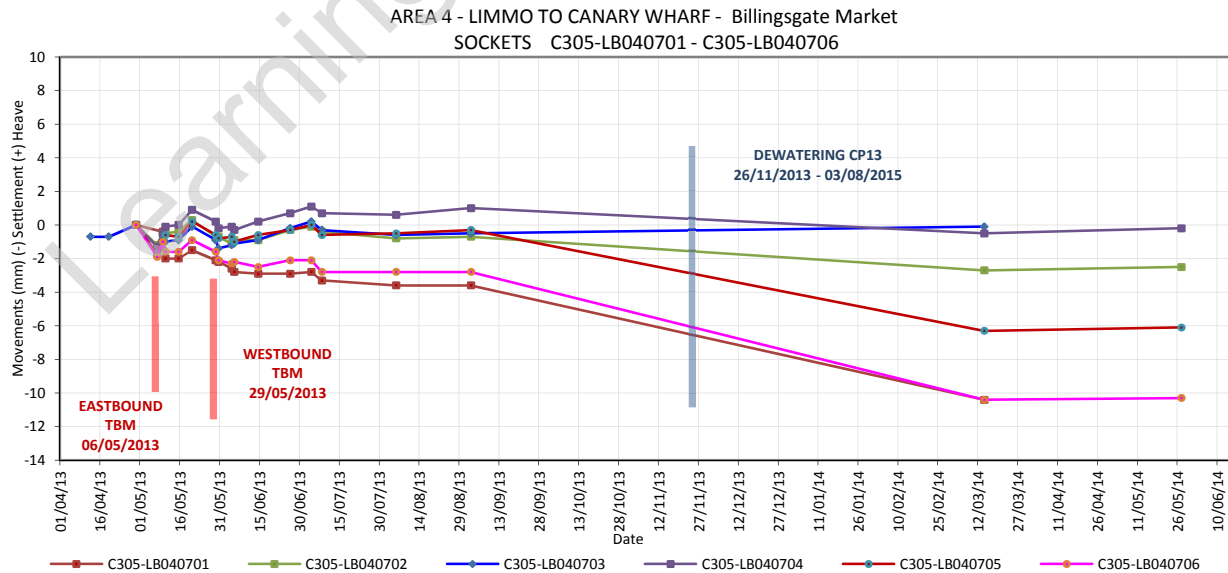
7. SUMMARY OF THE DATA

The methodology described for sockets in section 6, is applied here for sockets and levelling points.

Note: For the following data plots #N/A refers to instances where readings were not taken for that sensor (e.g. damaged sensor, no access, etc.).

SOCKETS

C305-LB040701 - C305-LB040706



As can be observed in the graph above there is a settlement of -2 mm followed by +1 mm heave after the Eastbound TBM transit and a settlement of -2 mm after the Westbound TBM transit.

The effect of the dewatering at Cross Passage 13 can be observed in the graphic above, however the recent readings show a significant reduction of the settlement rate. In order to analyse whether the rate of change in the data has reached an acceptably small value, the last two readings were used to calculate the annual projection.

The table below shows the annual rate for the sockets in this array.

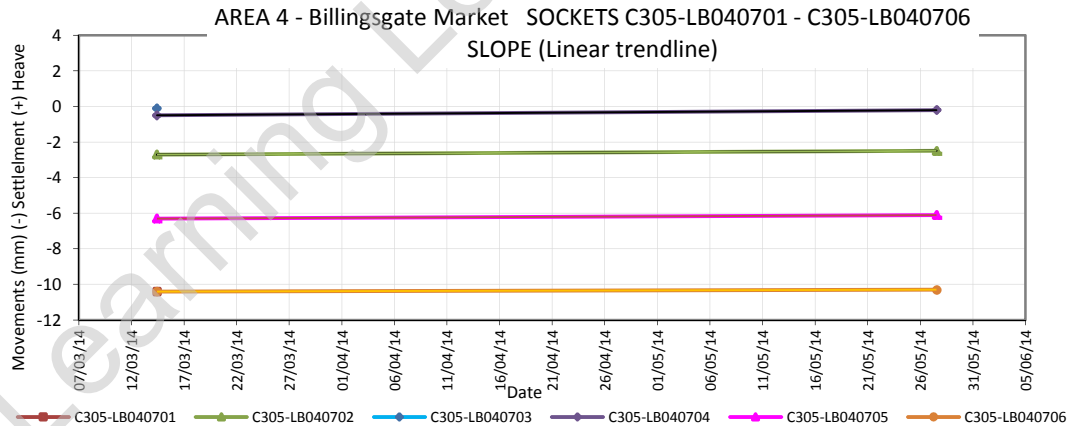
	Recorded Movement (mm)		Rate (mm/year)
	14/03/2014	27/05/2014	
C305-LB040701	-10.40	#N/A	-
C305-LB040702	-2.70	-2.50	0.985
C305-LB040703	-0.10	#N/A	-
C305-LB040704	-0.50	-0.20	1.477
C305-LB040705	-6.30	-6.10	0.985
C305-LB040706	-10.40	-10.30	0.492
	Rate less than -2.5 mm/year	% less 2 mm/ year	100.00%
	Rate greater than -3.5 mm/year	% less 3 mm/ year	100.00%

Note: All the movements are in mm. (-) Settlement / (+) Heave

The percentage of the sockets with a settlement rate less than 2 mm/year is 100%.

See section 8 Summary of movements related to dewatering activities.

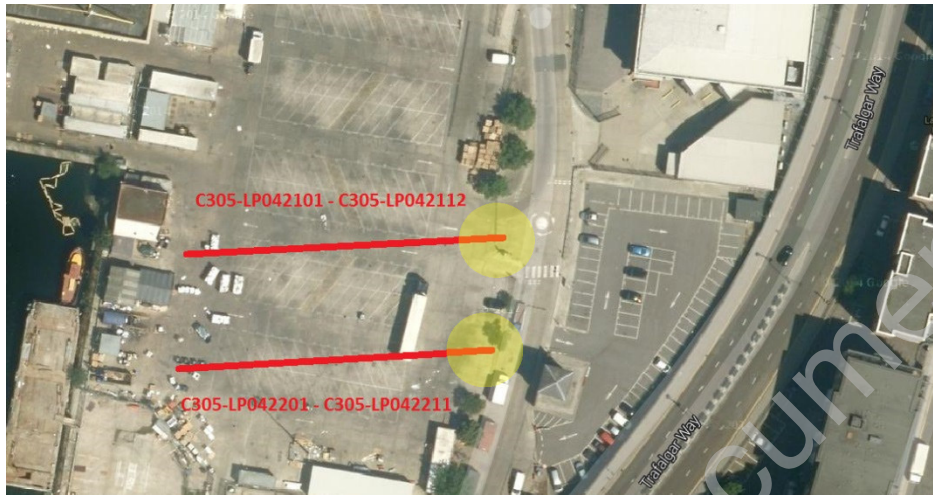
The next plot shows the trend line adjustment for the sockets in this array.



LEVELLING POINTS

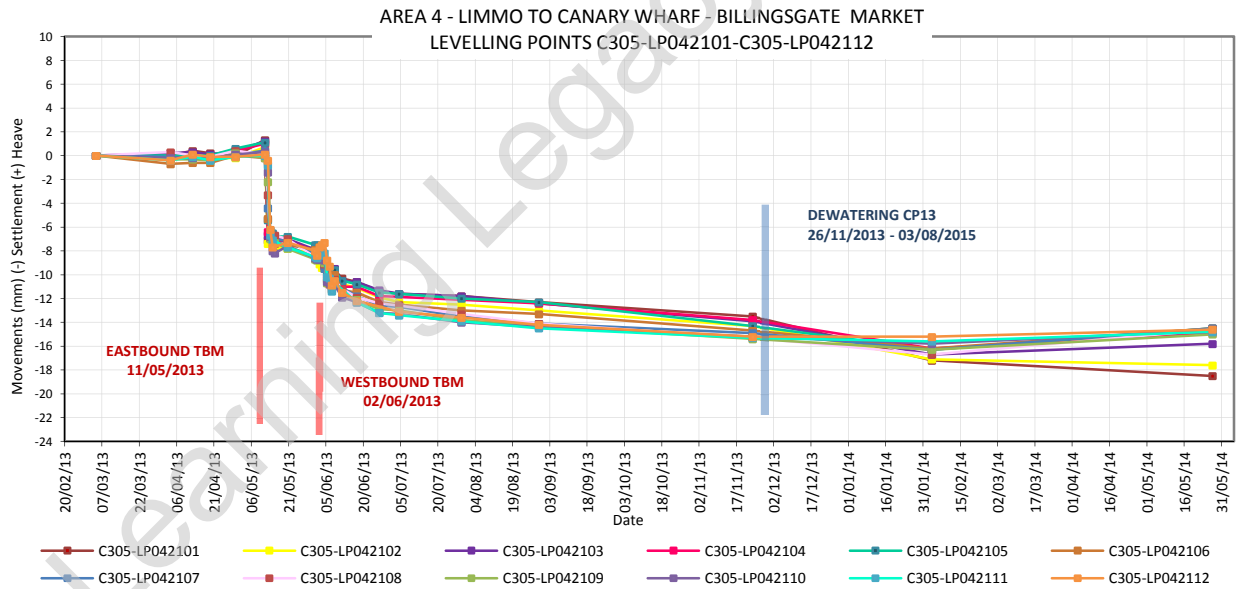
It is noted that levelling points C305-LP042101 and C305-LP042201 were installed in the main entrance to the Billingsgate parking area (area highlighted yellow in image below). This area experiences a high

volume of heavy vehicles passing through, the effect of which may be the likely cause of the data recorded for these points which does not reflect a similar trend for the rest of the levelling point array.

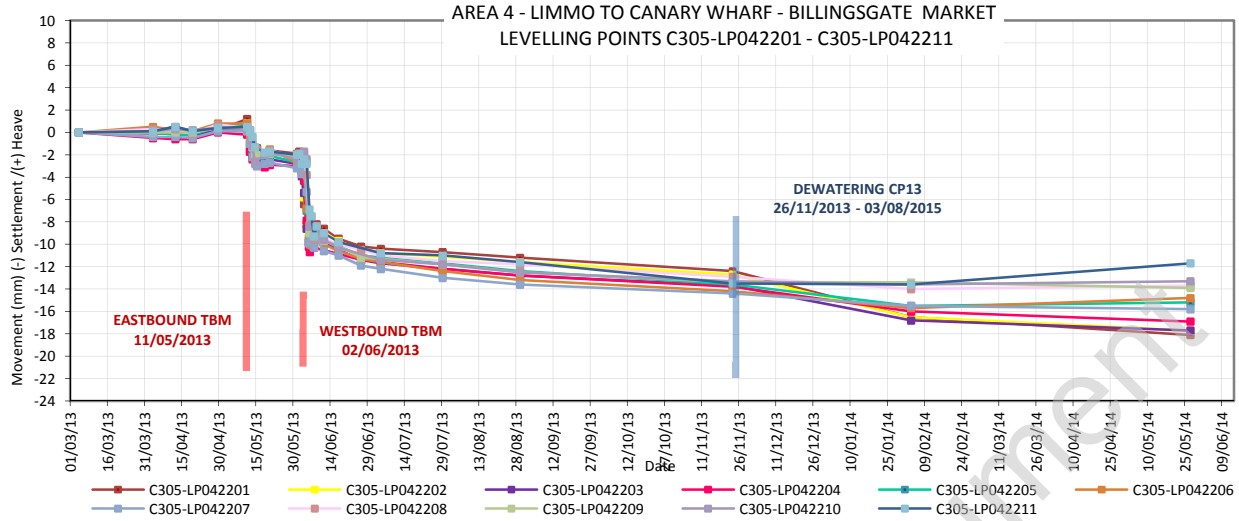


BILLINGSGATE MARKET. LEVELLING POINTS ARRAYS: C305-LP042101 TO C305-LP042112 AND C305-LP042201 TO C305-LP042211

C305-LP042101-C305-LP042112 AND C305-LP042201-C305-LP042211



As can be seen in the graph above this section, located on the surface along the Eastbound crown, shows a settlement of -8 mm after the Eastbound TBM transit and -4 mm during the Westbound TBM transit.



As can be seen in the graph above this section, located on the surface along the Westbound crown, shows a settlement of -4 mm after the Eastbound TBM transit and -8 mm during the Westbound TBM transit.

The effect of the dewatering in the Cross Passage 13 can be observed in the two graphics above, however the recent readings show a significant reduction of the settlement rate. In order to analyse whether the rate of change in the data has reached an acceptably small value, the last two readings were used to calculate the annual projection.

C305-LP042101-C305-LP042112

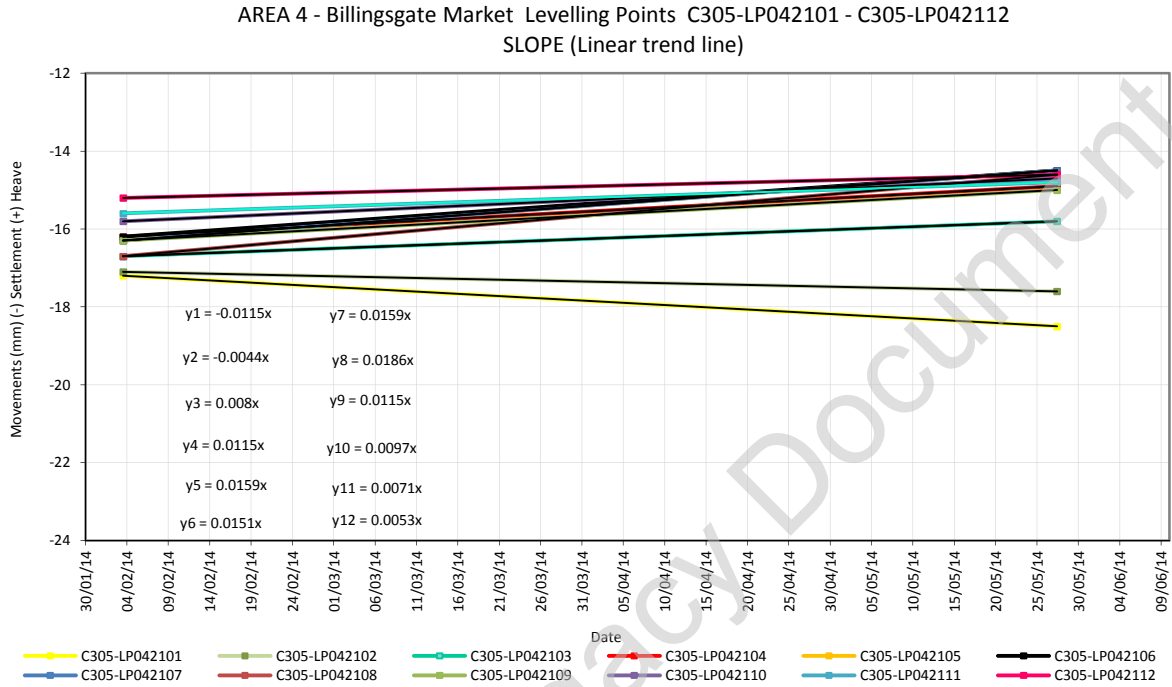
The table below shows the annual rate for the levelling points in this array.

	Recorded Movement (mm)		Rate (mm/year)
	03/02/2014	27/05/2014	
C305-LP042101	-17.20	-18.50	-4.198
C305-LP042102	-17.10	-17.60	-1.606
C305-LP042103	-16.70	-15.80	2.920
C305-LP042104	-16.20	-14.90	4.198
C305-LP042105	-16.30	-14.50	5.804
C305-LP042106	-16.20	-14.50	5.475
C305-LP042107	-16.30	-14.50	5.804
C305-LP042108	-16.70	-14.60	6.789
C305-LP042109	-16.30	-15.00	4.198
C305-LP042110	-15.80	-14.70	3.541
C305-LP042111	-15.60	-14.80	2.592
C305-LP042112	-15.20	-14.60	1.935
	Rate less than -2.5 mm/year	% less 2 mm/ year	91.67%
	Rate greater than -3.5 mm/year	% less 3 mm/ year	91.67%

Note: All the movements are in mm. (-) Settlement / (+) Heave

The percentage of the levelling points with a settlement rate less than 2 mm/year and less than 3 mm/year is 91.67%. See section 8 Summary of movements related to dewatering activities.

The next plot shows the trend line adjustment for the levelling points in this array.



C305-LP042201-C305-LP042211

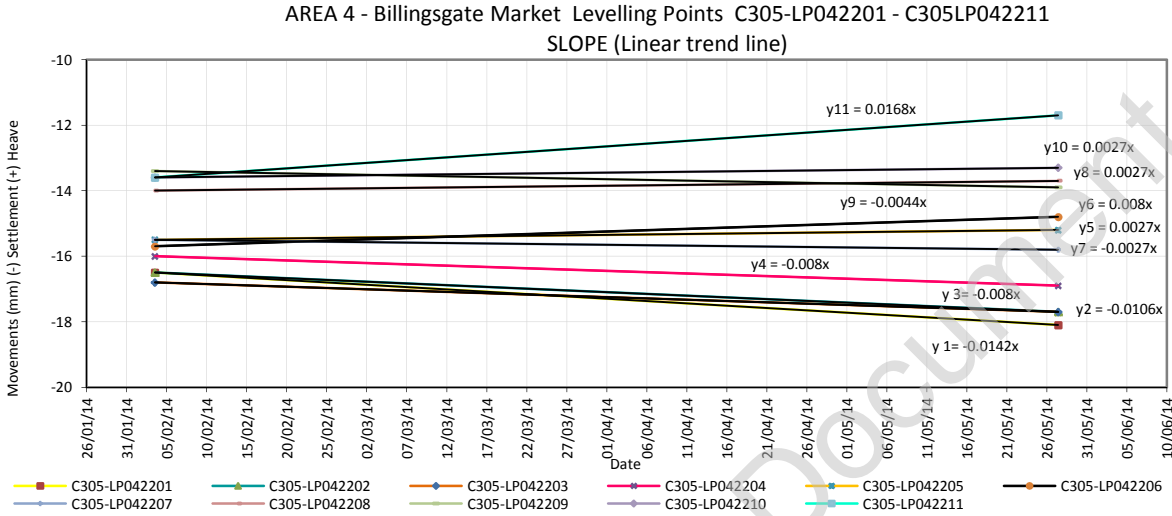
The table below shows the annual rate for the levelling points in this array.

	Recorded Movement (mm)		Rate (mm/year)
	03/02/2014	27/05/2014	
C305-LP042201	-16.50	-18.10	-5.183
C305-LP042202	-16.50	-17.70	-3.869
C305-LP042203	-16.80	-17.70	-2.920
C305-LP042204	-16.00	-16.90	-2.920
C305-LP042205	-15.50	-15.20	0.986
C305-LP042206	-15.70	-14.80	2.920
C305-LP042207	-15.50	-15.80	-0.986
C305-LP042208	-14.00	-13.70	0.986
C305-LP042209	-13.40	-13.90	-1.606
C305-LP042210	-13.60	-13.30	0.986
C305-LP042211	-13.60	-11.70	6.132
	Rate less than -2.5 mm/year	% less 2 mm/ year	63.64%
	Rate greater than -3.5 mm/year	% less 3 mm/ year	81.82%

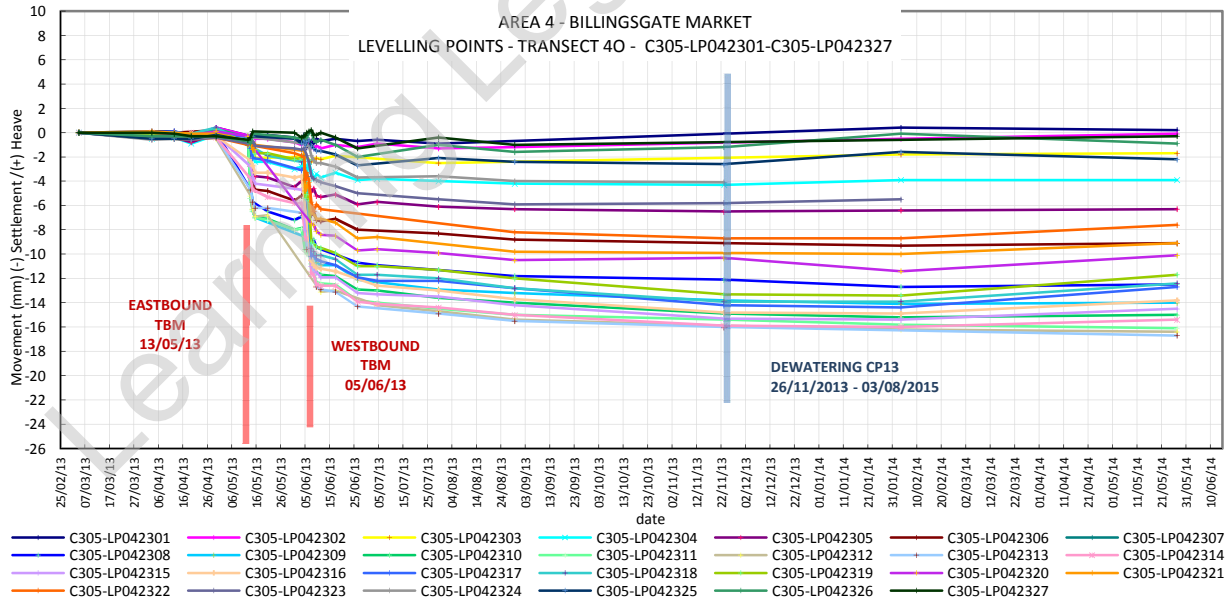
Note: All the movements are in mm. (-) Settlement / (+) Heave

The percentage of levelling points with a settlement rate less than 2 mm/year is 63.64%, whereas a 81.82% is less than 3 mm/year. See section 8 Summary of movements related to dewatering activities.

The next plot shows the trend line adjustment for the levelling points in this array.



C305-LP042301 - C305-LP042327 - TRANSECT 40



The graph above registers a settlement of -7 mm during the Eastbound TBM transit and a -6 mm settlement during the Westbound TBM transit.

The ground movement of this array is not affected by the dewatering at CP13. The last two readings were used to calculate the annual projection.

The table below shows the annual rate for the levelling points in this array.

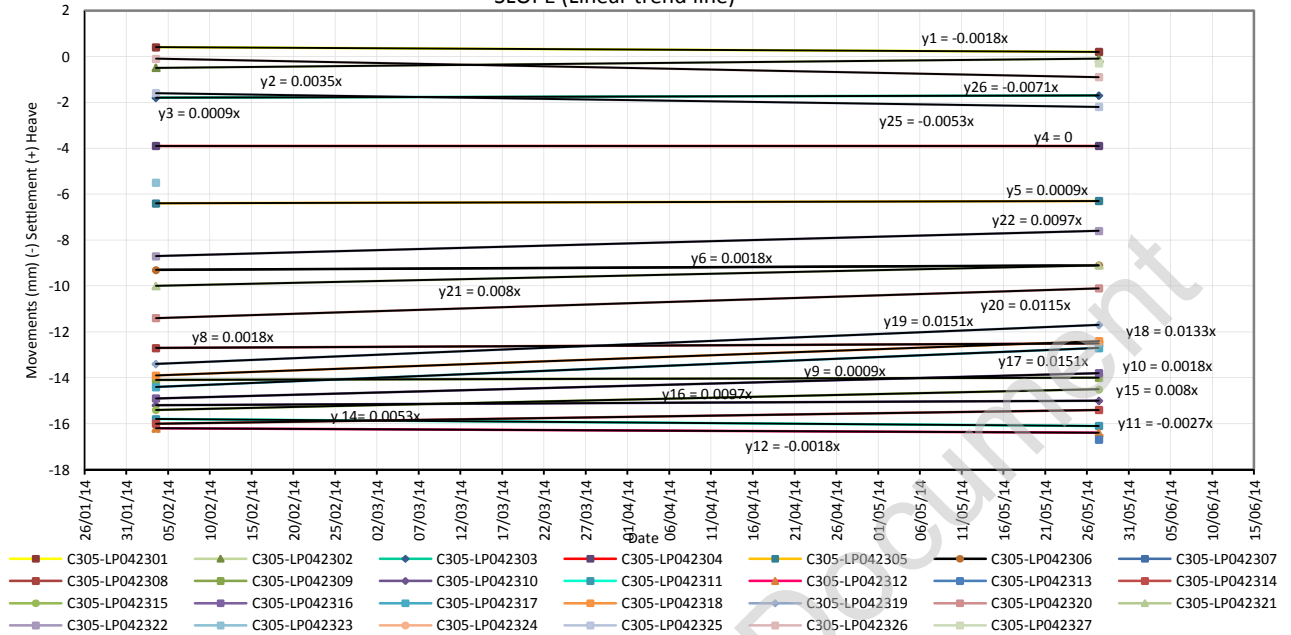
	Recorded Movement (mm)		Rate (mm/year)
	03/02/2014	27/05/2014	
C305-LP042301	0.40	0.20	-0.657
C305-LP042302	-0.50	-0.10	1.278
C305-LP042303	-1.80	-1.70	0.329
C305-LP042304	-3.90	-3.90	0.000
C305-LP042305	-6.40	-6.30	0.329
C305-LP042306	-9.30	-9.10	0.657
C305-LP042307	#N/A	#N/A	
C305-LP042308	-12.70	-12.50	0.657
C305-LP042309	-14.10	-14.00	0.329
C305-LP042310	-15.20	-15.00	0.657
C305-LP042311	-15.80	-16.10	-0.986
C305-LP042312	-16.20	-16.40	-0.657
C305-LP042313	#N/A	-16.70	-
C305-LP042314	-16.00	-15.40	1.935
C305-LP042315	-15.40	-14.50	2.920
C305-LP042316	-14.90	-13.80	3.541
C305-LP042317	-14.40	-12.70	5.475
C305-LP042318	-13.90	-12.40	4.855
C305-LP042319	-13.40	-11.70	5.475
C305-LP042320	-11.40	-10.10	4.198
C305-LP042321	-10.00	-9.10	2.920
C305-LP042322	-8.70	-7.60	3.541
C305-LP042323	-5.50	#N/A	-
C305-LP042324	#N/A	#N/A	-
C305-LP042325	-1.60	-2.20	-1.935
C305-LP042326	-0.10	-0.90	-2.592
C305-LP042327	#N/A	-0.30	-
	Rate less than -2.5 mm/year	% less 2 mm/ year	95.45%
	Rate greater than -3.5 mm/year	% less 3 mm/ year	100.00%

Note: All the movements are in mm. (-) Settlement / (+) Heave

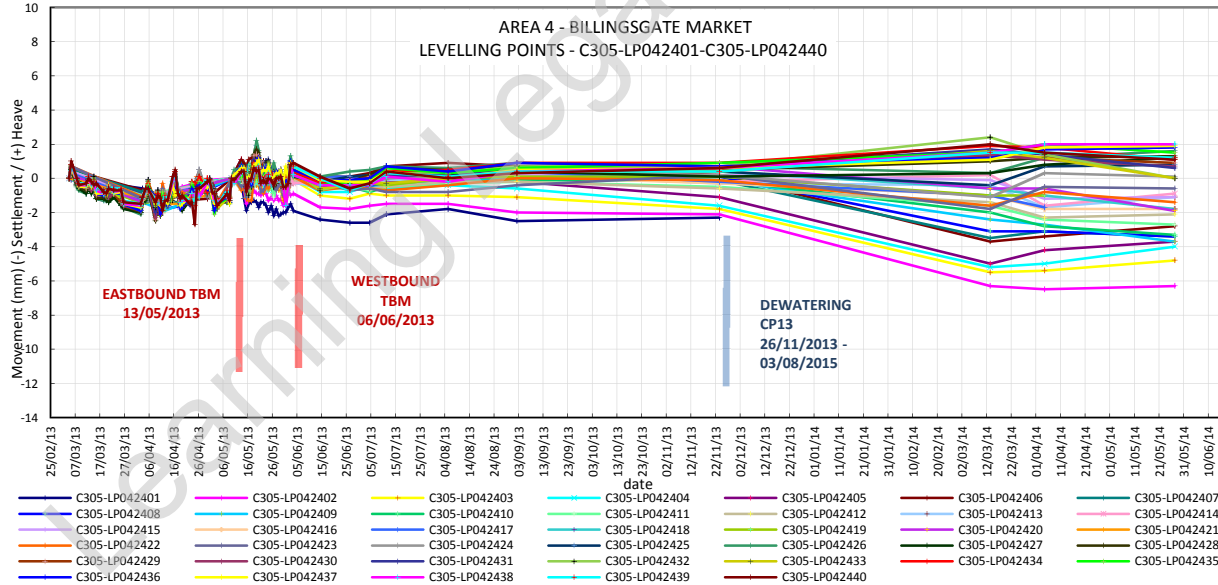
The percentage of the levelling points with a settlement rate less than 2 mm/year is 95.45%, whereas a 100% is less than 3 mm/year.

The next plot shows the trend line adjustment for the levelling points in this array.

AREA 4 - Billingsgate Market Levelling Points C305-LP042301 - C305-LP042327
 SLOPE (Linear trend line)



C305-LP042401-C305-LP042440



The graph above registers a settlement of -2 mm during the Eastbound TBM transit and a -2 mm settlement during the Westbound TBM transit.

The effect of the dewatering in the Cross Passage 13 can be observed in the graphic above, however the recent readings show a significant reduction of the settlement rate. In order to analyse whether the rate

of change in the data has reached an acceptably small value, the last two readings were used to calculate the annual projection.

The table below shows the annual rate for the levelling points in this array.

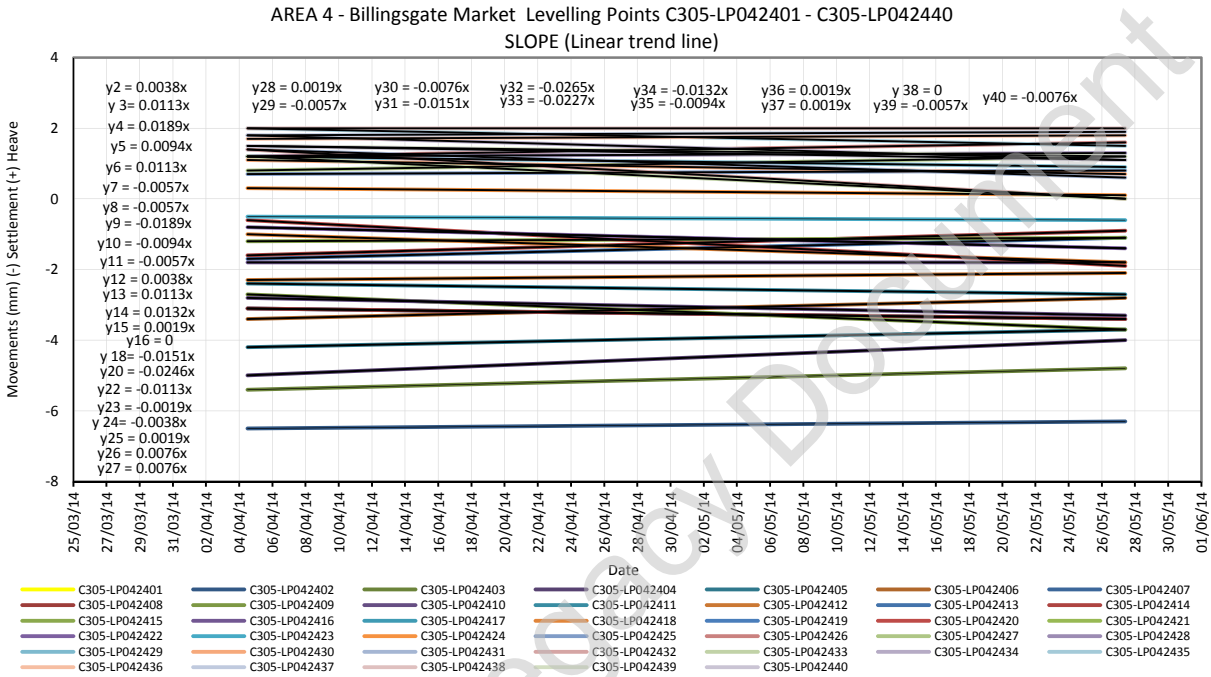
	Recorded Movement (mm)		Rate (mm/year)
	04/04/2014	27/05/2014	
C305-LP042401	#N/A	#N/A	-
C305-LP042402	-6.50	-6.30	1.387
C305-LP042403	-5.40	-4.80	4.125
C305-LP042404	-5.00	-4.00	6.899
C305-LP042405	-4.20	-3.70	3.431
C305-LP042406	-3.40	-2.80	4.125
C305-LP042407	-3.10	-3.40	-2.081
C305-LP042408	-3.10	-3.40	-2.081
C305-LP042409	-2.70	-3.70	-6.899
C305-LP042410	-2.80	-3.30	-3.431
C305-LP042411	-2.40	-2.70	-2.081
C305-LP042412	-2.30	-2.10	1.387
C305-LP042413	-1.70	-1.10	4.125
C305-LP042414	-1.60	-0.90	4.818
C305-LP042415	-1.20	-1.10	0.694
C305-LP042416	-1.80	-1.80	0.000
C305-LP042417	-1.70	#N/A	-
C305-LP042418	-1.00	-1.80	-5.512
C305-LP042419	-1.00	#N/A	-
C305-LP042420	-0.60	-1.90	-8.943
C305-LP042421	#N/A	#N/A	-
C305-LP042422	-0.80	-1.40	-4.125
C305-LP042423	-0.50	-0.60	-0.694
C305-LP042424	0.30	0.10	-1.387
C305-LP042425	0.70	0.80	0.694
C305-LP042426	1.20	1.60	2.738
C305-LP042427	0.80	1.20	2.738
C305-LP042428	1.20	1.30	0.694
C305-LP042429	1.20	0.90	-2.081
C305-LP042430	1.10	0.70	-2.738
C305-LP042431	1.40	0.60	-5.512
C305-LP042432	1.40	0.00	-9.636
C305-LP042433	1.20	0.00	-8.249
C305-LP042434	1.80	1.10	-4.818
C305-LP042435	2.00	1.50	-3.431
C305-LP042436	1.70	1.80	0.694
C305-LP042437	1.80	1.90	0.694
C305-LP042438	2.00	2.00	0.000
C305-LP042439	1.50	1.20	-2.081
C305-LP042440	1.50	1.10	-2.738
	Rate less than -2.5 mm/year	% less 2 mm/ year	66.67%
	Rate greater than -3.5	% less 3 mm/ year	77.78%

Note: All the movements are in mm. (-) Settlement / (+) Heave

The percentage of the levelling points with a settlement rate less than 2 mm/year is 66.67%, whereas a 77.78% is less than 3 mm/year.

See section 8 Summary of movements related to dewatering activities.

The next plot shows the trend line adjustment for the levelling points in this array.



8. SUMMARY OF MOVEMENTS RELATED TO DEWATERING ACTIVITIES

The effect of dewatering systems being switched on is illustrated in the graphs presented in section 7 above. It can be noted for the sockets and levelling points of the Billingsgate Market area, the ground movement shows an initial, sometimes significant, drop when CP13 dewatering was switched on, while it seems to have reached stability in the last two or three readings, covering at least two months of monitoring.

However, in order to provide further evidence the settlement rate had reached or was approaching an acceptably small value, monitoring data graph from transects installed to monitor the dewatering activities has been included in this report. This graph presents over a year collection of data. The description and location of this transect, relative to this report's instruments are shown in the list and figure below:

- Transect North side of Docks (C305-LP041217-C305-LP041239 is located in the North side of Poplar Dock. It was monitored during the dewatering in CP13 and has a reading in March 2015.

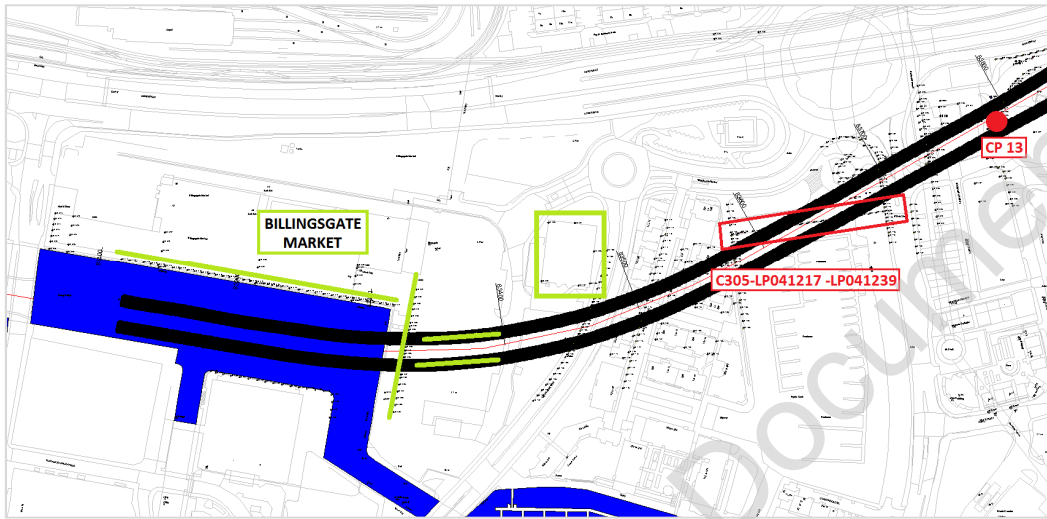
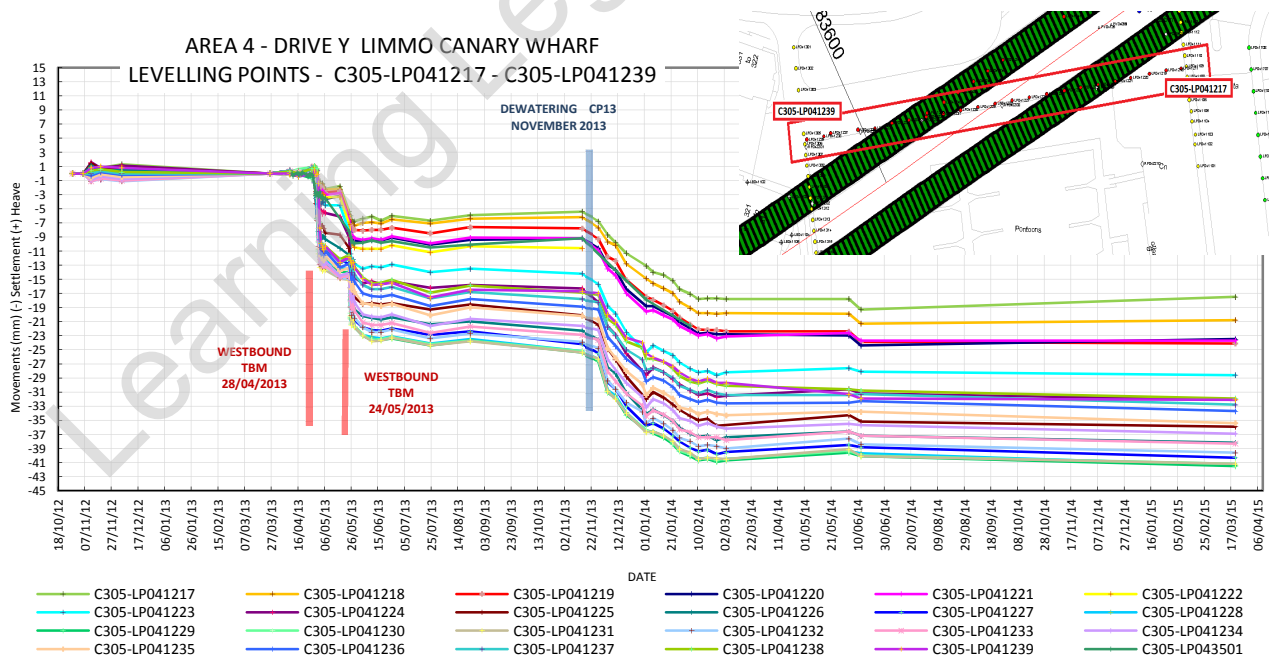


Figure 1: Billingsgate market instrumentations and Cross Passages section North side of Docks

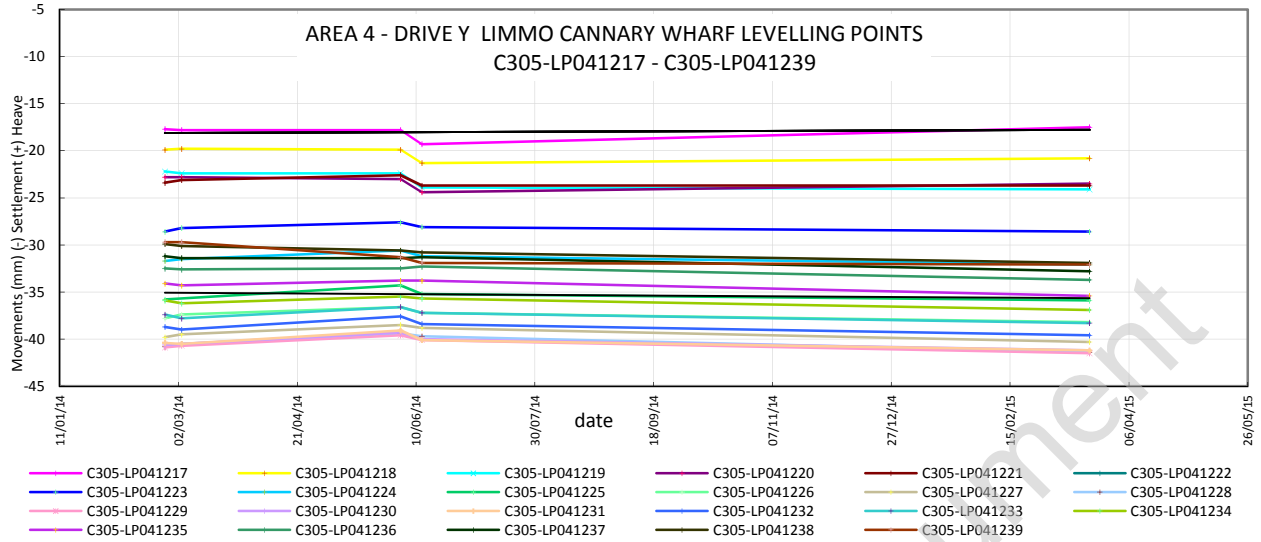
TRANSECT NORTH SIDE OF DOCKS (C305-LP041217-C305-LP041239)



These levelling points close to the area covered in this Close Out Report reach an annual rate less than 2mm/year for the 100%.

The graph and the table below show the data from February 2014 to March 2015 and the annual rate calculated for each levelling point.

	24/02/2014	03/03/2014	03/06/2014	12/06/2014	20/03/2015	Rate (mm/year)
C305-LP041217	-17.7000	-17.8000	-17.8000	-19.3000	-17.5000	0.329
C305-LP041218	-19.9000	-19.8000	-19.9000	-21.3000	-20.8000	-0.840
C305-LP041219	-22.2000	-22.4000	-22.4000	-23.9000	-24.1000	-1.679
C305-LP041220	-22.8000	-22.8000	-23.0000	-24.4000	-23.5000	-0.584
C305-LP041221	-23.4000	-23.1000	-22.6000	-23.7000	-23.7000	-0.475
C305-LP041222	#N/A	#N/A	#N/A	#N/A	#N/A	-
C305-LP041223	-28.6000	-28.2000	-27.6000	-28.1000	-28.6000	-0.256
C305-LP041224	-31.7000	-31.5000	-30.6000	-31.2000	-32.1000	-0.584
C305-LP041225	-35.8000	#N/A	-34.3000	-35.2000	-35.9000	-0.548
C305-LP041226	-37.8000	-37.4000	-36.6000	-37.2000	-38.2000	-0.694
C305-LP041227	-39.8000	-39.5000	-38.5000	-38.8000	-40.3000	-0.767
C305-LP041228	-40.8000	-40.5000	-39.4000	-39.7000	-41.4000	-0.876
C305-LP041229	-40.9000	-40.7000	-39.6000	-40.1000	-41.5000	-0.803
C305-LP041230	-40.6000	-40.5000	-39.3000	-40.0000	-41.2000	-0.767
C305-LP041231	-40.4000	-40.5000	-39.1000	-40.1000	-41.2000	-0.840
C305-LP041232	-38.7000	-39.0000	-37.6000	-38.4000	-39.6000	-0.840
C305-LP041233	-37.4000	-37.8000	-36.6000	-37.2000	-38.3000	-0.803
C305-LP041234	-35.9000	-36.2000	-35.5000	-35.7000	-36.9000	-0.913
C305-LP041235	-34.1000	-34.3000	-33.8000	-33.8000	-35.4000	-1.241
C305-LP041236	-32.5000	-32.6000	-32.5000	-32.3000	-33.7000	-1.132
C305-LP041237	-31.2000	-31.4000	-31.4000	-31.3000	-32.8000	-1.460
C305-LP041238	-29.9000	-30.1000	-30.6000	-30.8000	-31.9000	-1.789
C305-LP041239	-29.7000	-29.7000	-31.3000	-31.9000	-32.1000	-2.117
	Rate less than -2.5 mm/year				% less 2 mm/ year	100.00%
	Rate greater than -3.5 mm/year				% less 3 mm/ year	100.00%



The graphs and tables of settlement rate for the transect show that settlement rate due to dewatering works is less than 2 mm/year. As the instruments in this report are located close to this transect it is concluded that they will behave in a similar manner and hence their settlement rate will be less than the 2 mm/year rate.

9. SUMMARY STATEMENT

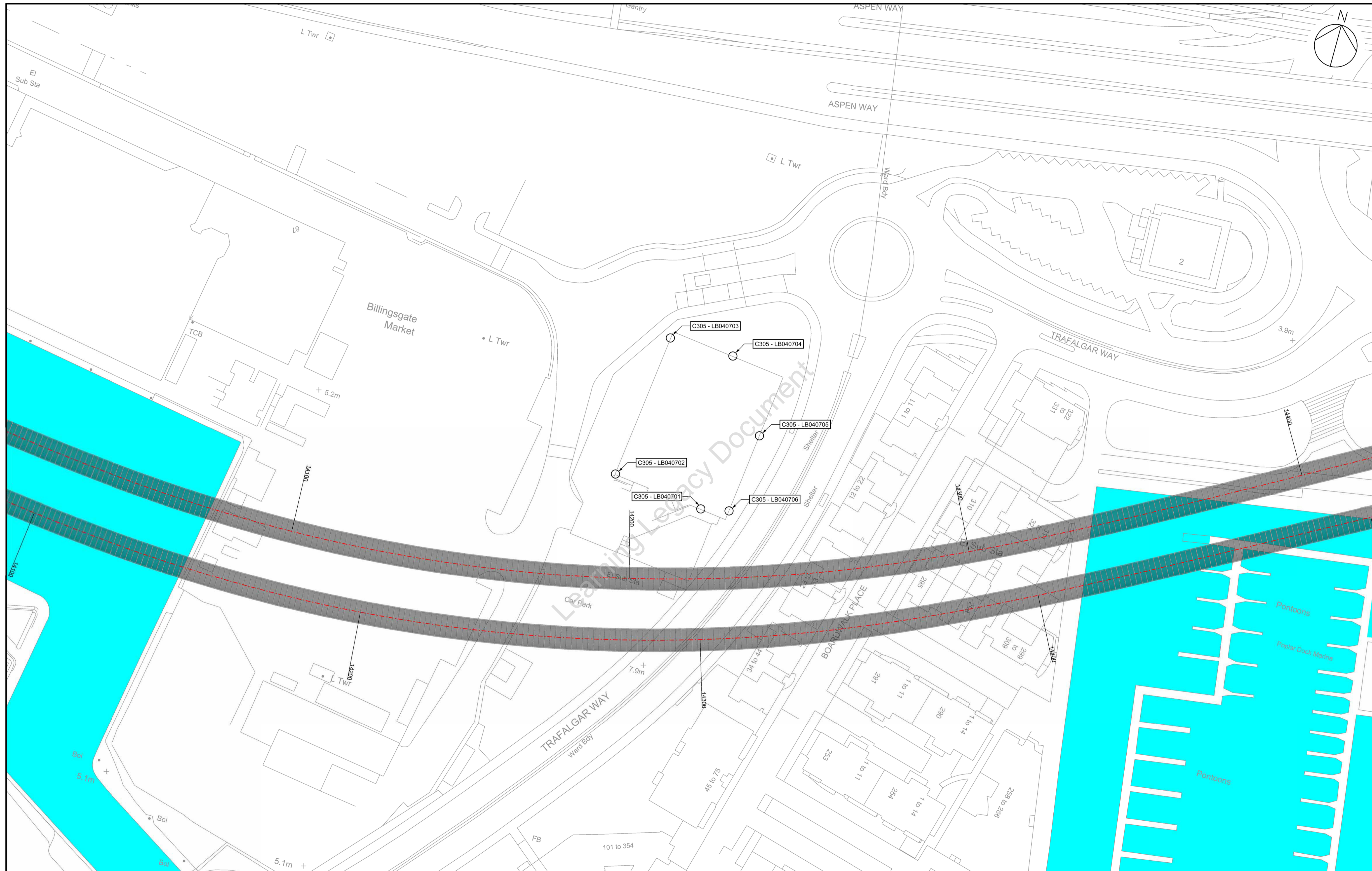
It has been agreed between the Project Manager, the Designer, the Contractor and the Sub Contractor that the instrumentation covered herein, for monitoring ground movement effects of Crossrail works, including long term effects, but which have been subsequently affected by dewatering of cross passages, stations or shafts, prior to the achievement of 12 months 'post-TBM' long term monitoring, can be closed out for decommissioning as the following criteria has been met:

- The trends of the monitoring points was approaching or had achieved the specified 2 mm/year settlement rate; and
- As a further evidence, local monitoring of the effects of dewatering, directly around the Cross passage 13, shows that ground movement has stabilised to an acceptable rate (<2 mm/year) for a period of at least three months.

Minutes of the Close Out meeting are attached as Appendix C.

Learning Legacy Document

APPENDIX A: INSTRUMENT LOCATION



Rev.	Date	Description	By	Chkd	App	Auth
P01	09/03/2015	First Issue	MD	AH	RC	-
P02	10/03/2015	---	MD	AH	RC	-
P03	18/03/2015	---	MD	AH	RC	-

Notes

- 1) This drawing shows the locations of Leveling Sockets.
- 2) For Leveling Points see drawing: C305-DSJ-C2-DDA-CRT00 ST006 Z-08098

○ Leveling Sockets



Crossrail Limited
 25 Canada Square
 Canary Wharf
 London
 E14 5LQ

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 www.crossrail.co.uk

Contract:
Tunnels East - Drive Y LIM to FAR & Drive Z SGJ to PML & Drive G

Originator:
Dragados Sisk Joint Venture

Location:
Crossrail Tunnels - Drive Y (Limmo Peninsula to Farringdon Stn)

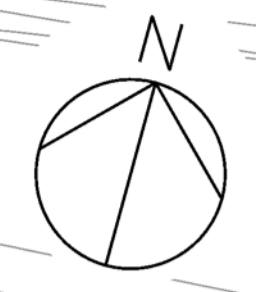
Title:
**Instrumentation & Monitoring
 Installation Report for I&M MS
 Billingsgate Market (83500-83400)
 C305-DSJ-C2-GMS-CRG03-50014**

By: M.DAVIS
 Chk: A.HAWES
 App: R.CULLEN
 Auth: ...

Scale:
 1:500 @ A1

Drawing and CAD file No:
 C305-DSJ-C2-DDA-CRT00_ST006_1-08097

Rev: P03
 Suitability: S4



Rev.	Date	Description	By	Chkd	App	Auth
P01	09/03/2015	First Issue	MD	AH	RC	-
P02	10/03/2015		MD	AH	RC	-
P03	18/03/2015		MD	AH	RC	-

Notes

- 1) This drawing shows the locations of Leveling Points.
- 2) For Leveling Sockets see drawing: C305-DSJ-C2-DDA-CRT00_ST006_1-08097
- 3) Points with an * were reinstalled due to the tarmac surface being re-laid.

○ Leveling Points



Crossrail Limited
 25 Canada Square
 London
 E14 5LQ

Contract: Tunnels East - Drive Y LIM to FAR & Drive Z SGJ to PML & Drive G
 Originator: Dragados Sisk Joint Venture
 Location: Crossrail Tunnels - Drive Y (Limmo Peninsula to Farringdon Stn)

Title: Instrumentation & Monitoring
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 Rev: P03
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Fit for authorisation

RESTRICTED

APPENDIX B: SUMMARY OF INSTRUMENTATION INSTALLED ON SITE

Learning Legacy Document

IRS Installation Record Sheets-Sockets										
Sensor Type	Sensor ID	Date Installation	Status	SENSOR Location - GPS reading (m)			Commissioning Readings (mATD)			
				Eastings X	Northings Y	Elevation Z (mATD)				
							AVERAGE	25/04/2013	25/04/2013	29/04/2013
Socket	C305-LB040701	21/01/2013	Installed	88458.8207	35002.3182	107.8176	107.1948	107.1952	107.1948	107.1945
Socket	C305-LB040702	21/01/2013	Installed	88432.0875	35005.608	106.3176	105.7138	105.7138	105.7136	105.714
Socket	C305-LB040703	21/01/2013	Installed	88437.0685	35048.2343	106.3129	105.6622	105.6621	105.6623	105.6622
Socket	C305-LB040704	21/01/2013	Installed	88456.1383	35047.9753	106.8193	106.1489	106.1487	106.1491	106.149
Socket	C305-LB040705	21/01/2013	Installed	88469.7909	35027.4884	106.9704	106.2711	106.2712	106.271	106.2711
Socket	C305-LB040706	21/01/2013	Installed	88466.9935	35003.9533	106.0762	106.0681	106.0684	106.0681	106.0679

Note: For Sockets - the difference between the Elevation Z reading and Commissioning reading results from the use of a GPS staff and a manual level respectively.

IRS Installation Record Sheets - Levelling Point (Nails)

Sensor Type	Sensor ID	Date Installation	Status	SENSOR Location - GPS reading (m)			Commissioning Readings (mATD)			
				Eastings X	Northings Y	Elevation Z (mATD)				
							AVERAGE	01/03/2013	01/03/2013	04/03/2013
Levelling point	C305-LP042101	22/01/2013	Installed	88400.273	34970.697	104.645	104.5789	104.5788	104.5791	104.5789
Levelling point	C305-LP042102	22/01/2013	Installed	88395.303	34970.139	104.638	104.5674	104.5674	104.5675	104.5673
Levelling point	C305-LP042103	22/01/2013	Installed	88390.323	34969.507	104.649	104.5830	104.583	104.5831	104.5828
Levelling point	C305-LP042104	22/01/2013	Installed	88385.323	34968.915	104.725	104.6633	104.6632	104.6634	104.6633
Levelling point	C305-LP042105	22/01/2013	Installed	88380.257	34968.258	104.796	104.7325	104.7326	104.7325	104.7323
Levelling point	C305-LP042106	22/01/2013	Installed	88375.358	34967.716	104.843	104.7776	104.7776	104.7775	104.7777
Levelling point	C305-LP042107	22/01/2013	Installed	88370.4	34967.111	104.903	104.8425	104.8426	104.8425	104.8424
Levelling point	C305-LP042108	22/01/2013	Installed	88365.407	34966.721	104.988	104.9256	104.9257	104.9255	104.9255
Levelling point	C305-LP042109	22/01/2013	Installed	88360.391	34966.665	105.03	104.9696	104.9697	104.9695	104.9696
Levelling point	C305-LP042110	22/01/2013	Installed	88355.385	34966.424	105.023	104.9604	104.9604	104.9603	104.9605
Levelling point	C305-LP042111	22/01/2013	Installed	88350.446	34966.18	105.059	104.9904	104.9904	104.9903	104.9905
Levelling point	C305-LP042112	22/01/2013	Installed	88345.386	34965.952	105.094	105.0193	105.0191	105.0192	105.0195
Levelling point	C305-LP042201	22/01/2013	Installed	88393.41	34950.473	104.812	104.7439	104.7438	104.7442	104.7438
Levelling point	C305-LP042202	22/01/2013	Installed	88388.433	34949.954	104.768	104.7005	104.7004	104.7006	104.7006
Levelling point	C305-LP042203	22/01/2013	Installed	88383.453	34949.531	104.868	104.7897	104.7896	104.7897	104.7899

Sensor Type	Sensor ID	Date Installation	Status	SENSOR Location - GPS reading (m)			Commissioning Readings (mATD)			
				Eastings X	Northings Y	Elevation Z (mATD)	AVERAGE	01/03/2013	01/03/2013	04/03/2013
Levelling point	C305-LP042204	22/01/2013	Installed	88378.522	34949.052	104.894	104.8374	104.8372	104.8375	104.8374
Levelling point	C305-LP042205	22/01/2013	Installed	88373.473	34948.566	104.821	104.7560	104.7559	104.7558	104.7562
Levelling point	C305-LP042206	22/01/2013	Installed	88368.427	34948.097	104.799	104.7296	104.7296	104.7295	104.7297
Levelling point	C305-LP042207	22/01/2013	Installed	88363.452	34947.826	104.862	104.7972	104.7971	104.7969	104.7975
Levelling point	C305-LP042208	22/01/2013	Installed	88358.603	34947.525	104.929	104.8565	104.8566	104.8567	104.8563
Levelling point	C305-LP042209	22/01/2013	Installed	88353.583	34947.377	104.815	104.7448	104.745	104.7446	104.7447
Levelling point	C305-LP042210	22/01/2013	Installed	88348.458	34947.057	104.838	104.7772	104.7772	104.7774	104.7771
Levelling point	C305-LP042211	22/01/2013	Installed	88343.489	34946.945	104.919	104.8580	104.858	104.8578	104.8581
Levelling point	C305-LP042301	22/01/2013	Installed	88342.337	34999.411	105.125	105.0378	105.0378	105.038	105.0375
Levelling point	C305-LP042302	22/01/2013	Installed	88341.285	34994.052	105.074	105.0022	105.0024	105.0022	105.0021
Levelling point	C305-LP042303	22/01/2013	Installed	88340.459	34989.195	105.032	104.9848	104.9847	104.9848	104.9849
Levelling point	C305-LP042304	22/01/2013	Installed	88339.786	34985.512	105.094	105.0382	105.0384	105.038	105.0381
Levelling point	C305-LP042305	22/01/2013	Installed	88338.853	34980.626	105.15	105.0822	105.082	105.0823	105.0823
Levelling point	C305-LP042306	22/01/2013	Installed	88337.967	34975.732	105.184	105.1021	105.1019	105.1021	105.1024
Levelling point	C305-LP042307	22/01/2013	Installed	88337.558	34973.23	105.19	105.1024	105.1025	105.1022	105.1025
Levelling point	C305-LP042308	22/01/2013	Installed	88336.988	34970.704	105.17	105.1015	105.1017	105.1014	105.1013
Levelling point	C305-LP042309	22/01/2013	Installed	88336.604	34968.353	105.126	105.0655	105.0655	105.0654	105.06559
Levelling point	C305-LP042310	22/01/2013	Installed	88336.153	34965.847	105.046	104.9963	104.9964	104.9962	104.9962
Levelling point	C305-LP042311	22/01/2013	Installed	88335.596	34963.481	105.041	104.9561	104.9564	104.956	104.9559
Levelling point	C305-LP042312	22/01/2013	Installed	88335.178	34960.925	104.959	104.9212	104.9211	104.921	104.9214
Levelling point	C305-LP042313	22/01/2013	Installed	88334.737	34958.505	104.934	104.8885	104.8884	104.8887	104.8883
Levelling point	C305-LP042314	22/01/2013	Installed	88334.306	34956.006	104.922	104.8513	104.8512	104.8512	104.8514
Levelling point	C305-LP042315	22/01/2013	Installed	88333.842	34953.527	104.899	104.8387	104.839	104.8385	104.8386
Levelling point	C305-LP042316	22/01/2013	Installed	88333.384	34951.153	104.89	104.8292	104.8289	104.8294	104.8293
Levelling point	C305-LP042317	22/01/2013	Installed	88332.942	34948.53	104.917	104.8526	104.8525	104.8526	104.8527
Levelling point	C305-LP042318	22/01/2013	Installed	88332.527	34946.162	104.941	104.8810	104.8813	104.881	104.8808
Levelling point	C305-LP042319	22/01/2013	Installed	88331.983	34943.826	104.969	104.9145	104.9146	104.9145	104.9144
Levelling point	C305-LP042320	22/01/2013	Installed	88331.527	34941.31	105.001	104.9512	104.9511	104.9512	104.9512
Levelling point	C305-LP042321	22/01/2013	Installed	88331.101	34938.851	105.013	104.9518	104.9517	104.9518	104.952
Levelling point	C305-LP042322	22/01/2013	Installed	88330.659	34936.314	104.99	104.9402	104.9403	104.9399	104.9404
Levelling point	C305-LP042323	22/01/2013	Installed	88329.698	34931.588	104.944	104.8975	104.8977	104.8974	104.8973
Levelling point	C305-LP042324	22/01/2013	Installed	88328.791	34926.719	104.957	104.8954	104.8957	104.8953	104.8952
Levelling point	C305-LP042325	22/01/2013	Installed	88327.898	34921.716	105.011	104.9471	104.9473	104.9469	104.9472

I&M CLOSE OUT REPORT FOR SOCKETS AND LEVELLING POINTS BILLINGSGATE MARKET (DRIVE Y)

C305-DSJ-C2-RGN-CRG03-50325 Rev 2.0

Sensor Type	Sensor ID	Date Installation	Status	SENSOR Location - GPS reading (m)			Commissioning Readings (mATD)			
				Eastings X	Northings Y	Elevation Z (mATD)	AVERAGE	01/03/2013	01/03/2013	04/03/2013
Levelling point	C305-LP042326	22/01/2013	Installed	88327.026	34916.893	105.022	104.9710	104.9712	104.9711	104.9707
Levelling point	C305-LP042327	22/01/2013	Installed	88326.011	34911.855	105	104.9209	104.9209	104.921	104.9208
Levelling point	C305-LP042401	24/01/2013	Installed	88325.856	34988.222	105.302	105.2438	105.2437	105.2438	105.244
Levelling point	C305-LP042402	24/01/2013	Installed	88321.123	34988.95	105.393	105.3578	105.3578	105.3577	105.3579
Levelling point	C305-LP042403	24/01/2013	Installed	88316.196	34989.779	105.425	105.3778	105.3776	105.378	105.3779
Levelling point	C305-LP042404	24/01/2013	Installed	88311.378	34990.627	105.468	105.4482	105.4482	105.4481	105.4483
Levelling point	C305-LP042405	24/01/2013	Installed	88306.358	34991.55	105.553	105.5017	105.5016	105.5019	105.5017
Levelling point	C305-LP042406	24/01/2013	Installed	88301.656	34992.351	105.588	105.5507	105.5506	105.5508	105.5506
Levelling point	C305-LP042407	24/01/2013	Installed	88296.909	34993.198	105.755	105.6865	105.6863	105.6865	105.6867
Levelling point	C305-LP042408	24/01/2013	Installed	88292.266	34993.682	105.807	105.7570	105.757	105.7572	105.7569
Levelling point	C305-LP042409	24/01/2013	Installed	88286.966	34994.479	105.825	105.7734	105.7734	105.7733	105.7735
							AVERAGE	18/04/2013	18/04/2013	19/04/2013
Levelling point	C305-LP042410	15/04/2013	Reinstalled	88281.386	34995.414	105.559	105.5400	105.5402	105.54	105.5398
Levelling point	C305-LP042411	15/04/2013	Reinstalled	88275.607	34996.441	105.201	105.2240	105.224	105.2238	105.2241
Levelling point	C305-LP042412	15/04/2013	Reinstalled	88269.698	34997.434	105.198	105.2256	105.2255	105.2258	105.2254
Levelling point	C305-LP042413	15/04/2013	Reinstalled	88263.67	34998.497	105.195	105.2323	105.2323	105.2321	105.2325
Levelling point	C305-LP042414	15/04/2013	Reinstalled	88257.617	34999.523	105.21	105.2428	105.243	105.2429	105.2425
Levelling point	C305-LP042415	15/04/2013	Reinstalled	88251.236	35000.673	105.222	105.2431	105.2435	105.2428	105.2431
Levelling point	C305-LP042416	15/04/2013	Reinstalled	88245.071	35001.781	105.286	105.2556	105.2556	105.2553	105.2558
Levelling point	C305-LP042417	15/04/2013	Reinstalled	88242.128	35002.258	105.455	105.2555	105.2559	105.2551	105.2554
Levelling point	C305-LP042418	15/04/2013	Reinstalled	88238.861	35002.858	105.667	105.6938	105.6936	105.6937	105.6941
Levelling point	C305-LP042419	15/04/2013	Reinstalled	88235.659	35003.402	105.758	105.7793	105.7795	105.7793	105.779
Levelling point	C305-LP042420	15/04/2013	Reinstalled	88232.607	35003.956	105.794	105.8057	105.8053	105.8059	105.8058
							AVERAGE	01/03/2013	01/03/2013	04/03/2013
Levelling point	C305-LP042421	24/01/2013	Installed	88227.417	35004.984	105.883	105.8114	105.8114	105.8113	105.8116
Levelling point	C305-LP042422	24/01/2013	Installed	88222.959	35005.777	105.795	105.7318	105.7318	105.732	105.7317
Levelling point	C305-LP042423	24/01/2013	Installed	88218.058	35006.563	105.399	105.3460	105.346	105.3462	105.3459
Levelling point	C305-LP042424	04/03/2013	Installed	88213.215	35007.425	105.269	105.2350	105.2349	105.2353	105.2347
Levelling point	C305-LP042425	04/03/2013	Installed	88208.127	35008.457	105.295	105.2494	105.2496	105.2495	105.2491
Levelling point	C305-LP042426	04/03/2013	Installed	88203.149	35009.288	105.279	105.2362	105.2363	105.2364	105.2359
Levelling point	C305-LP042427	04/03/2013	Installed	88198.112	35010.146	105.271	105.2310	105.2309	105.2312	105.231
Levelling point	C305-LP042428	04/03/2013	Installed	88193.027	35011.03	105.281	105.2373	105.2369	105.2378	105.2372

Sensor Type	Sensor ID	Date Installation	Status	SENSOR Location - GPS reading (m)			Commissioning Readings (mATD)			
				Eastings X	Northings Y	Elevation Z (mATD)	AVERAGE	01/03/2013	01/03/2013	04/03/2013
Levelling point	C305-LP042429	04/03/2013	Installed	88187.945	35011.902	105.269	105.2266	105.2265	105.227	105.2264
Levelling point	C305-LP042430	04/03/2013	Installed	88182.972	35012.781	105.27	105.2221	105.2221	105.2224	105.2219
Levelling point	C305-LP042431	04/03/2013	Installed	88177.808	35013.665	105.264	105.2212	105.2209	105.2212	105.2214
Levelling point	C305-LP042432	04/03/2013	Installed	88172.364	35014.652	105.267	105.2238	105.2238	105.2241	105.2236
Levelling point	C305-LP042433	04/03/2013	Installed	88167.306	35015.443	105.276	105.2375	105.2373	105.2379	105.2374
Levelling point	C305-LP042434	04/03/2013	Installed	88161.879	35016.579	105.271	105.2212	105.2211	105.2215	105.221
Levelling point	C305-LP042435	04/03/2013	Installed	88156.657	35017.377	105.256	105.2092	105.2092	105.2094	105.2091
Levelling point	C305-LP042436	04/03/2013	Installed	88151.374	35018.291	105.267	105.2162	105.2161	105.2166	105.216
Levelling point	C305-LP042437	04/03/2013	Installed	88146.402	35019.175	105.278	105.2330	105.2329	105.2331	105.2329
Levelling point	C305-LP042438	04/03/2013	Installed	88141.091	35020.112	105.275	105.2305	105.2307	105.2304	105.2305
Levelling point	C305-LP042439	04/03/2013	Installed	88135.996	35021.02	105.268	105.2271	105.2269	105.2272	105.2273
Levelling point	C305-LP042440	04/03/2013	Installed	88130.498	35021.915	105.265	105.2206	105.2207	105.2205	105.2206
<i>Instruments marked with a * had to be reinstalled at a later date due a resurfaced with tarmac. Please see below for details.</i>										
Levelling point	C305-LP042410	24/01/2013	Installed *	88282.018	34995.407	105.614	105.5582	105.5583	105.5583	105.558
Levelling point	C305-LP042411	24/01/2013	Installed *	88276.872	34996.4	105.292	105.2574	105.2574	105.2575	105.2574
Levelling point	C305-LP042412	24/01/2013	Installed *	88272.015	34997.19	105.287	105.2184	105.2182	105.2183	105.2186
Levelling point	C305-LP042413	24/01/2013	Installed *	88266.978	34998.083	105.254	105.2192	105.2192	105.2191	105.2194
Levelling point	C305-LP042414	24/01/2013	Installed *	88262.065	34998.911	105.268	105.2216	105.2217	105.2216	105.2215
Levelling point	C305-LP042415	24/01/2013	Installed *	88257.068	34999.848	105.253	105.2286	105.2286	105.2289	105.2284
Levelling point	C305-LP042416	24/01/2013	Installed *	88251.95	35000.658	105.274	105.2216	105.2218	105.2217	105.2214
Levelling point	C305-LP042417	24/01/2013	Installed *	88247.112	35001.477	105.267	105.2180	105.2179	105.2178	105.2182
Levelling point	C305-LP042418	24/01/2013	Installed *	88242.256	35002.36	105.494	105.4462	105.4464	105.4461	105.446
Levelling point	C305-LP042419	24/01/2013	Installed *	88237.633	35003.241	105.778	105.7303	105.7305	105.7303	105.7301
Levelling point	C305-LP042420	24/01/2013	Installed *	88232.844	35004.008	105.84	105.7878	105.788	105.7878	105.7876

Note: For Levelling points - the difference between the Elevation Z reading and Commissioning reading results from the use of a GPS staff and a manual level respectively.
All elevations or levels presented in this document are metres above tunnel datum (mATD).

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APPENDIX C: MINUTES OF THE CLOSE-OUT MEETINGS



I&M Close Out Meeting

Date & Time		15/07/2015 09:00		
Meeting No.		1		
The purpose of this document is to record agreement to cease monitoring long term monitoring and decommission based on review of the data against the requirements. Agreement from this meeting is then considered acceptance from all parties that the Close Out Report can then be produced based on the data shown and this will be acceptable to the Project Manager.				
Attendees:				
[Redacted]				
Data Reviewed				
Monitoring References	Location	Settlement rate	Cease Monitoring?	Decommission/ prepare report?
Levelling Points Area 4 Limmo to Canary Wharf Station				
LP045100-LP045147	Area 4 - River Lea River West Bank Wall (4A)	74% at 2mm/year 80% at 3mm/year	Yes	Yes
LP040101-LP040124	Area 4 - Bridge Court	0% at 2mm/year 0% at 3mm/year	Yes - CP13/14	Yes
LP040201-LP040226	Area 4 - Keel Court	40% at 2mm/year 68% at 3mm/year	Yes - CP13/14	Yes
LP040301-LP040330	Area 4 - John Smith Mews	73% at 2mm/year 83% at 3mm/year	Yes - CP13/14	Yes
LP040422-LP040431	Area 4 - Reuters Car Park	90% at 2mm/year 90% at 3mm/year		
LP041301-LP041328	Area 4 - Poplar Dock	68% at 2mm/year 82% at 3mm/year		
LP041401-LP041425	Area 4 - Boardwalk Place	100% at 2mm/year 100% at 3mm/year		
LP041501-LP041536	Area 4 - Trafalgar Way	36% at 2mm/year 44% at 3mm/year		
LP042301-LP042327	Area 4 - Billingsgate Market	96% at 2mm/year 100% at 3mm/year		
LP04472-LP04477	Area 4 - Lower Lea Crossing	50% at 2mm/year 83% at 3mm/year	Yes - CP14	Yes
LP04301-LP04310	Area 4 - Bow Creek River Wall	90% at 2mm/year 100% at 3mm/year	Yes - CP14	Yes
LP043201-LP043210	Area 4 - Orchard Place	20% at 2mm/year 20% at 3mm/year	Yes - temporary studs due to stoppage	Yes
LP042050-LP042078	Area 4 - East India Dock	79% at 2mm/year 90% at 3mm/year	Yes - CP13/14	Yes
LP040801-LP040805	Area 4 - Prestons Road	100% at 2mm/year 100% at 3mm/year		
LP040201-LP040216	Area 4 - Aspen Way Underpass	100% at 2mm/year 100% at 3mm/year		
LP041701-LP041719	Area 4 - Prestons Road	95% at 2mm/year 95% at 3mm/year		
LP042001-LP042007	Area 4 - East India Dock	100% at 2mm/year 100% at 3mm/year	Yes - CP13/14	Yes
LP042201-LP042211	Area 4 - Billingsgate Market	64% at 2mm/year 82% at 3mm/year		
LP042401-LP042440	Area 4 - Billingsgate Market	67% at 2mm/year 78% at 3mm/year		
LP43201-LP43227	Area 4 - Blackwall Tunnel NB	89% at 2mm/year 100% at 3mm/year		
LP04478-LP04483	Area 4 - Lower Lea Crossing	??% at 2mm/year ??% at 3mm/year		
LP045301-LP045321		52% at 2mm/year		
LP045201-LP045212	Area 4 - Orchard Place (4B)	59% at 3mm/year	Yes	Yes

LPO41241-LPO41249	Area 4 - Poplar Dock	67% at 2mm/year 100% at 3mm/year		
Sockets Area 4 Limmo to Canary Wharf Station				
LB04301-LB04312	Area 4 - Orchard Place	83% at 2mm/year 92% at 3mm/year	Yes	Yes
LB040101-LB040110	Area 4 - Sail Court	100% at 2mm/year 100% at 3mm/year	Yes - CP13/CP14	Yes
LB040201-LB040211	Area 4 - Bridge/Keel Court	100% at 2mm/year 100% at 3mm/year	Yes - CP13/CP14	Yes
LB040301-LB040304	Area 4 - Sexton Court	75% at 2mm/year 100% at 3mm/year	Yes - CP13/14	Yes
LB040401-LB040412	Area 4 - John Smith Mews	80% at 2mm/year 90% at 3mm/year	Yes - CP13/14	Yes
LB040501-LB040506	Area 4 - Proton/Neutron Towers	100% at 2mm/year 100% at 3mm/year	Yes - CP13/14	Yes
LB040701-LB040706	Area 4 - Billingsgate Market	100% at 2mm/year 100% at 3mm/year		
LB041101-LB041110	Area 4 - Boardwalk Place	20% at 2mm/year 50% at 3mm/year		
LB041201-LB041210	Area 4 - Boardwalk Place	20% at 2mm/year 60% at 3mm/year		
LB041301-LB041308	Area 4 - Boardwalk Place	100% at 2mm/year 100% at 3mm/year		
LB041401-LB041410	Area 4 - Boardwalk Place	90% at 2mm/year 100% at 3mm/year		
LB044101-LB044105	Area 4 - Blackwall Tunnel Ventilation Tower (SB)	80% at 2mm/year 100% at 3mm/year		
Notes				
<p>-Cells in yellow indicate data review needs amending. <i>to included for rounding.</i></p> <p>-Limmo dewatering switch on 04/11/13, CP13 dewatering switch on 26/11/13.</p> <p>* -include CP13/CP14 data to demonstrate area is stable after last TBIM readings in close out reports affected by dewatering works. Next meeting tomorrow after CTC.</p>				
Sign off				
DSJV	Gecisa	Crossrail	C122	

I&M Close Out Template - 13th July 2015



I&M Close Out Meeting

Date & Time		16/07/2015 13:00		
Meeting No.		2		
The purpose of this document is to record agreement to cease monitoring long term monitoring and decommission based on review of the data against the requirements. Agreement from this meeting is then considered acceptance from all parties that the Close Out Report can then be produced based on the data shown and this will be acceptable to the Project Manager.				
Attendees:				
[Redacted]				
Data Reviewed				
Monitoring References	Location	Settlement rate	Cease Monitoring?	Decommission/ prepare report?
Levelling Points Area 4 Limmo to Canary Wharf Station				
LP040422-LP040431	Area 4 - Reuters Car Park	90% at 2mm/year 90% at 3mm/year	Yes - CP13	Yes - CP13
LP041301-LP041328	Area 4 - Poplar Dock (4L)	68% at 2mm/year 82% at 3mm/year	Yes - CP13	Yes - CP13 + readings in June '15
LP041401-LP041425	Area 4 - Boardwalk Place	100% at 2mm/year 100% at 3mm/year	Yes - CP13	Yes - CP13
LP041501-LP041536	Area 4 - Trafalgar Way	36% at 2mm/year 44% at 3mm/year	Yes - CP13	Yes - CP13
LP042301-LP042327	Area 4 - Billingsgate Market	96% at 2mm/year 100% at 3mm/year	Yes	Yes
LP040801-LP040805	Area 4 - Prestons Road	100% at 2mm/year 100% at 3mm/year	Yes	Yes
LP040201-LP040216	Area 4 - Aspen Way Underpass	100% at 2mm/year 100% at 3mm/year	Yes	Yes
LP041701-LP041719	Area 4 - Prestons Road	95% at 2mm/year 95% at 3mm/year	Yes	Yes
LP042201-LP042211	Area 4 - Billingsgate Market	64% at 2mm/year 82% at 3mm/year	Yes	Yes
LP042401-LP042440	Area 4 - Billingsgate Market	67% at 2mm/year 78% at 3mm/year	Yes	Yes
LP43201-LP43227	Area 4 - Blackwall Tunnel NB	89% at 2mm/year 100% at 3mm/year	No - Review with CP13 post.	Post CP13
LP04478-LP04483	Area 4 - Lower Lea Crossing	??% at 2mm/year ??% at 3mm/year	Yes	Yes
LP041241-LP041249	Area 4 - Poplar Dock	67% at 2mm/year 100% at 3mm/year	Yes - CP13	Yes
Sockets Area 4 Limmo to Canary Wharf Station				
LB040701-LB040706	Area 4 - Billingsgate Market	100% at 2mm/year 100% at 3mm/year	Yes	Yes
LB041101-LB041110	Area 4 - Boardwalk Place	20% at 2mm/year 50% at 3mm/year	Yes - 4L	Yes
LB041201-LB041210	Area 4 - Boardwalk Place	20% at 2mm/year 60% at 3mm/year	Yes - 4L	Yes
LB041301-LB041308	Area 4 - Boardwalk Place	100% at 2mm/year 100% at 3mm/year	Yes - 4L	Yes
LB041401-LB041410	Area 4 - Boardwalk Place	90% at 2mm/year 100% at 3mm/year	Yes - 4L	Yes
LB044101-LB044105	Area 4 - Blackwall Tunnel Ventilation Tower (SB)	80% at 2mm/year 100% at 3mm/year	No - Review with CP13 post.	Post CP13
Notes				

-Cells in yellow indicate data review needs amending.

-Limmo dewatering switch on 04/11/13, CP13 dewatering switch on 26/11/13.

* -For CP dewatering effects plot representative points from CP monitoring alongside data on same graph for comparison.

Sign off

DSJV	Geocisal	Crossrail	C122
[Redacted]	[Redacted]	[Redacted]	[Redacted]

I&M Close Out Template - 13th July 2015

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