



**C305– Eastern Running Tunnels
I&M Close out report for Sockets at
Boardwalk Place (Drive Y)**

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Stakeholder Organisation	Job Title	Name	Signature	Date	Acceptance
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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 summarise the data from the instrumentation included in this document and to relate the recorded movements to the construction activities which produce any observed changes. For construction activities it is intended excavation of the C305 twin bored tunnels and cross passage dewatering; 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 within this report is situated within Area 4, Limmo Shaft to Canary Wharf Station, between project chainage 83600 to 83500. The instruments were all installed onto the outer structure of several buildings situated between Poplar Dock and Trafalgar Way.

The buildings include residential properties situated along Boardwalk Place. All permissions were requested and received before any instruments were installed.

A plan view of the area and the location of the instrumentation is shown on drawings presented in Appendix A.

3. DOCUMENTATION SUMMARY

CROSSRAIL NUMBER	DOCUMENT NAME	REASON FOR ISSUE	TYPE AND NUMBER OF INSTRUMENTATION INSTALLED
C305-DSJ-C2-GMS-CRG03-50020	Method Statement for I&M Sockets & 3D Prisms Installation (83900-83500): Ibis Hotel, New Providence Wharf, Streamlight Tower and Boardwalk Place Buildings	Main Method Statement	13 3D Prisms 64 Sockets
C305-DSJ-C2-RGN-CRG03-50205	Installation Report for I&M MS "Sockets & 3D Prisms (83900-83500)	Installation Report	-

4. SUMMARY OF INSTALLED INSTRUMENTATION ON SITE

The total number of instruments installed as per method statement and RFI, and covered in this report is:

- 38 – Sockets

Detailed information of the installed instrumentation is reported in Appendix B.

The average commissioning readings included in Appendix B have been used to calculate the relative movements provided in the graphs of this report. In some of them, new values were determined as a baseline according to the requirement of the client in CTC meeting. The dates of the new baselines are as follows:

- C305-LB041101 - C305-LB041110: 11th April 2013
- C305-LB041201 - C305-LB041210: 11th April 2013
- C305-LB041301 - C305-LB041308: 17th April 2013
- C305-LB041401 - C305-LB041410: 11th April 2013

5. CONSTRUCTION ACTIVITY

TBM PASSAGE

DRIVE Y	RINGS	PROJECT CHAINAGE	DATES
Eastbound	793 – 855	83600 - 83500	01/05/2013 to 05/05/2013
Westbound	786 – 870	83600 - 83472	26/05/2013 to 29/05/2013

Stoppage period: None

DEWATERING

Cross passage 13	26 th November 2013 to 3 rd August 2015
Cross passage 14	16 th December 2013 to 17 th January 2014 28 th July 2014 to 27 th July 2015
Limmo	4 th 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

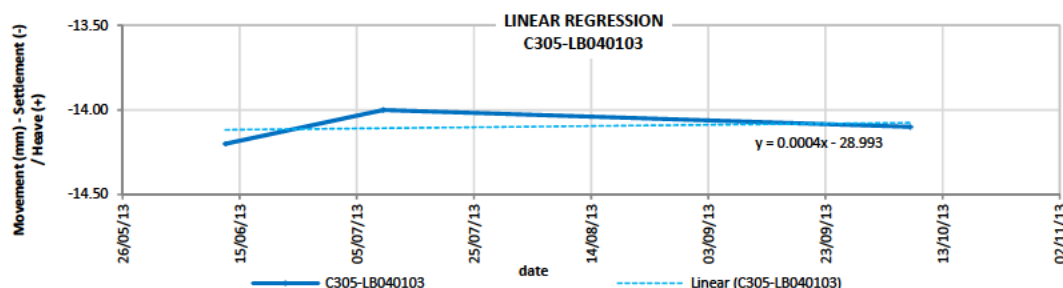
X (independent variable) = date

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	

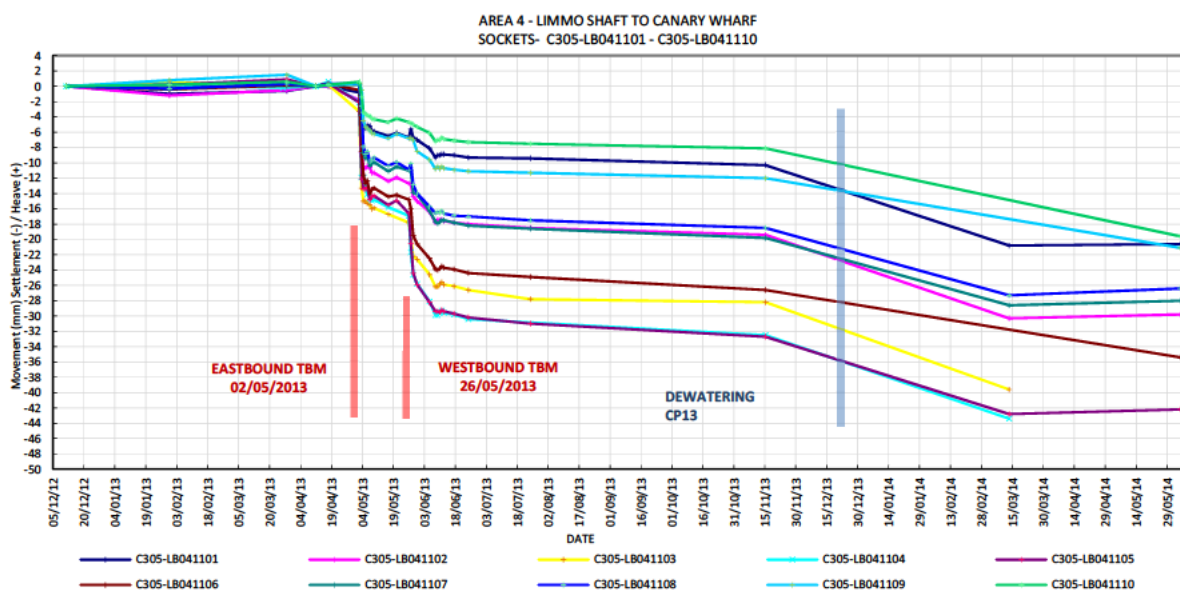
7. SUMMARY OF THE DATA

The methodology described in section 6 is applied here for sockets.

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-LB041101 - C305-LB041110



The graph above shows a maximum settlement of -16 mm during the Eastbound TBM transit and a -14 mm settlement (C305-LB041104 and C305-LB041105) from the Westbound TBM transit.

The effect of the dewatering in the Cross Passage 13 can be observed in the graphic above. In order to differentiate the movement due to the TBM transit from the dewatering and analyse whether the rate of change in the data has reached an acceptably small rate, the three readings before the dewatering were used to calculate the annual projection.

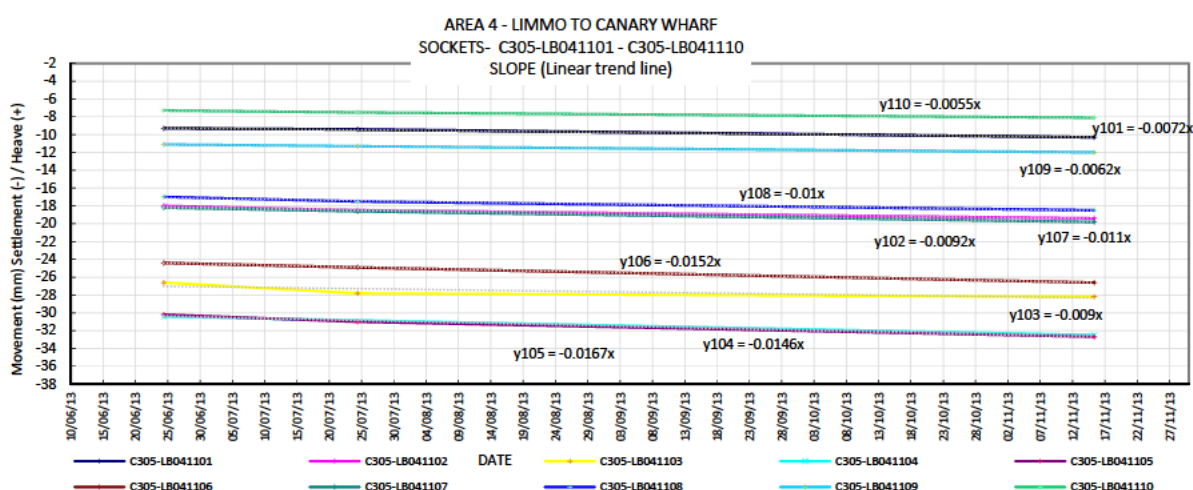
The table below shows the annual rate for the sockets in this array.

	Registered Movement (mm)			Rate (mm/year)
	24/06/2013	24/07/2013	15/11/2013	
C305-LB041101	-9.30	-9.40	-10.30	-2.628
C305-LB041102	-18.00	-18.50	-19.40	-3.358
C305-LB041103	-26.60	-27.80	-28.20	-3.285
C305-LB041104	-30.40	#N/A	-32.50	-5.329
C305-LB041105	-30.20	-31.00	-32.70	-6.096
C305-LB041106	-24.40	-24.90	-26.60	-5.548
C305-LB041107	-18.20	-18.60	-19.80	-4.015
C305-LB041108	-17.00	-17.50	-18.50	-3.650
C305-LB041109	-11.10	-11.30	-12.00	-2.263
C305-LB041110	-7.30	-7.50	-8.10	-2.008
	Rate less than -2.5 mm/year		% less 2 mm/ year	20.00%
	Rate greater than -3.5 mm/year		% less 3 mm/ year	50.00%

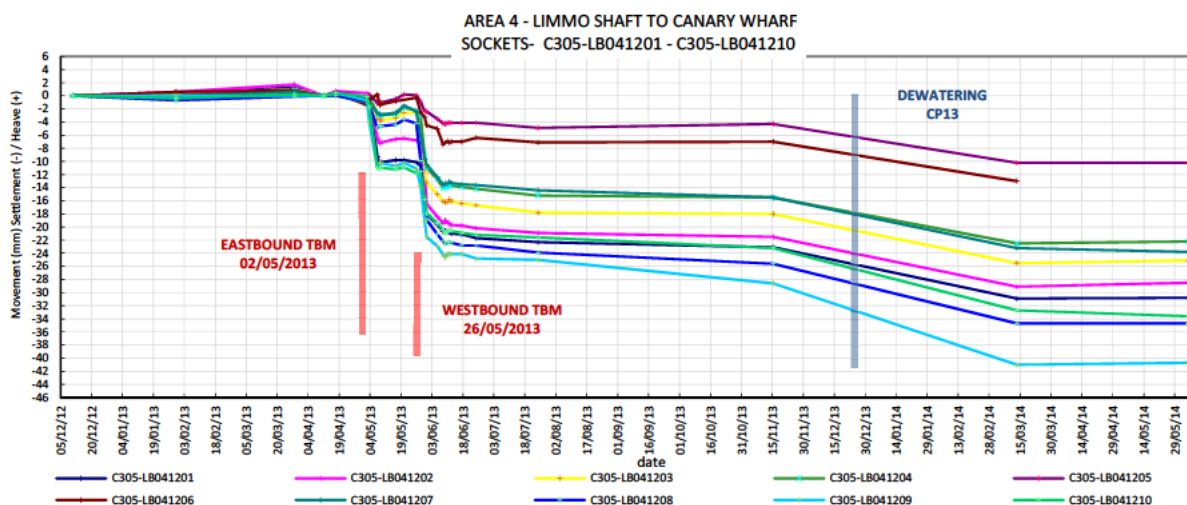
Note: All the movements are in mm. (-) Settlement / (+) Heave
 #N/A: No readings

The percentage of the sockets with a settlement rate less than 2 mm/year is 20%, whereas a 50% 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 sockets in this array.



C305-LB041201 - C305-LB041210



The graph above shows a maximum settlement of -11 mm (C305-LB041210) during the Eastbound TBM transit and an additional -15 mm settlement (C305-LB041209) during the Westbound TBM transit.

The effect of the dewatering in the Cross Passage 13 can be observed in the graphic above. In order to differentiate the movement due to the TBM transit from the dewatering and analyse whether the rate of change in the data has reached an acceptably small rate, the three readings before the dewatering were used to calculate the annual projection.

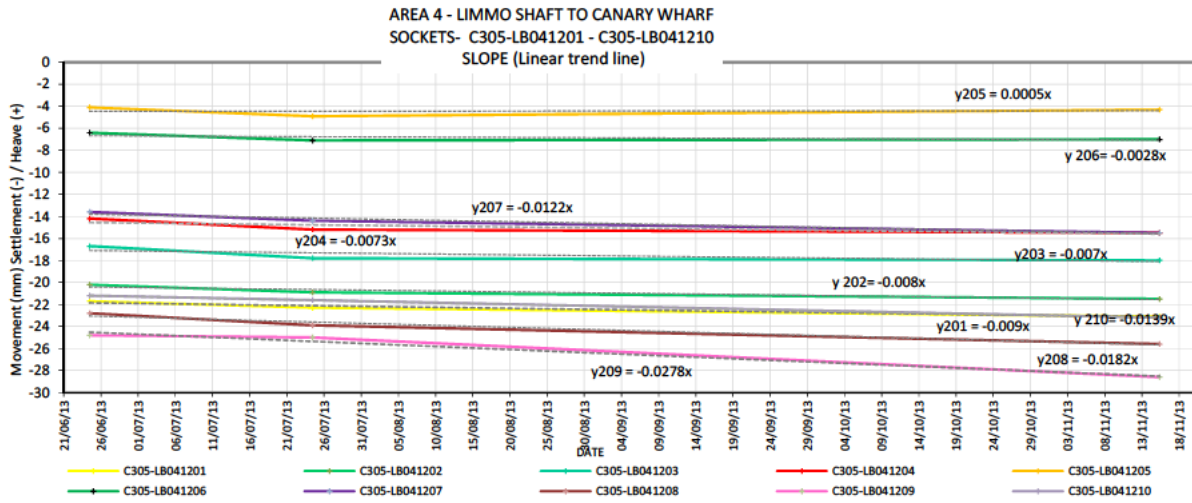
The table below shows the annual rate for the sockets in this array.

	Registered movement (mm)			Rate (mm/year)
	24/06/2013	24/07/2013	15/11/2013	
C305-LB041201	-21.70	-22.30	-23.10	-3.285
C305-LB041202	-20.20	-20.90	-21.50	-2.920
C305-LB041203	-16.70	-17.80	-18.00	-2.555
C305-LB041204	-14.20	-15.20	-15.50	-2.665
C305-LB041205	-4.10	-4.90	-4.30	0.183
C305-LB041206	-6.40	-7.10	-7.00	-1.022
C305-LB041207	-13.60	-14.40	-15.50	-4.453
C305-LB041208	-22.80	-23.90	-25.60	-6.643
C305-LB041209	-24.80	-25.00	-28.60	-10.147
C305-LB041210	-21.20	-21.60	-23.20	-5.074
	Rate less than -2.5 mm/year		% less 2 mm/ year	20.00%
	Rate greater than -3.5 mm/year		% less 3 mm/ year	60.00%

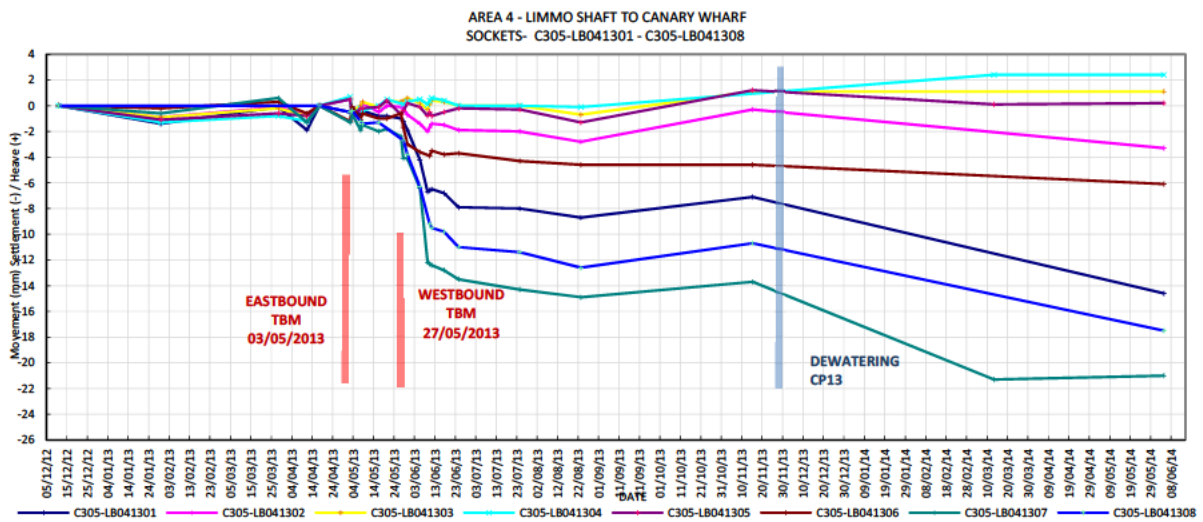
Note: All the movements are in mm. (-) Settlement / (+) Heave
 #N/A: No readings

The percentage of the sockets with a settlement rate less than 2 mm/year is 20%, whereas a 60% 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 sockets in this array.



C305-LB041301 - C305-LB041308



The graph above shows a maximum settlement of -2 mm during the Eastbound TBM transit and an additional -12 mm settlement during the Westbound TBM transit for the socket C305-LB041307.

The effect of the dewatering in the Cross Passage 13 can be observed in the graphic above. In order to differentiate the movement due to the TBM transit from the dewatering and analyse whether the rate of change in the data has reached an acceptably small rate, the four readings before the dewatering were used to calculate the annual projection.

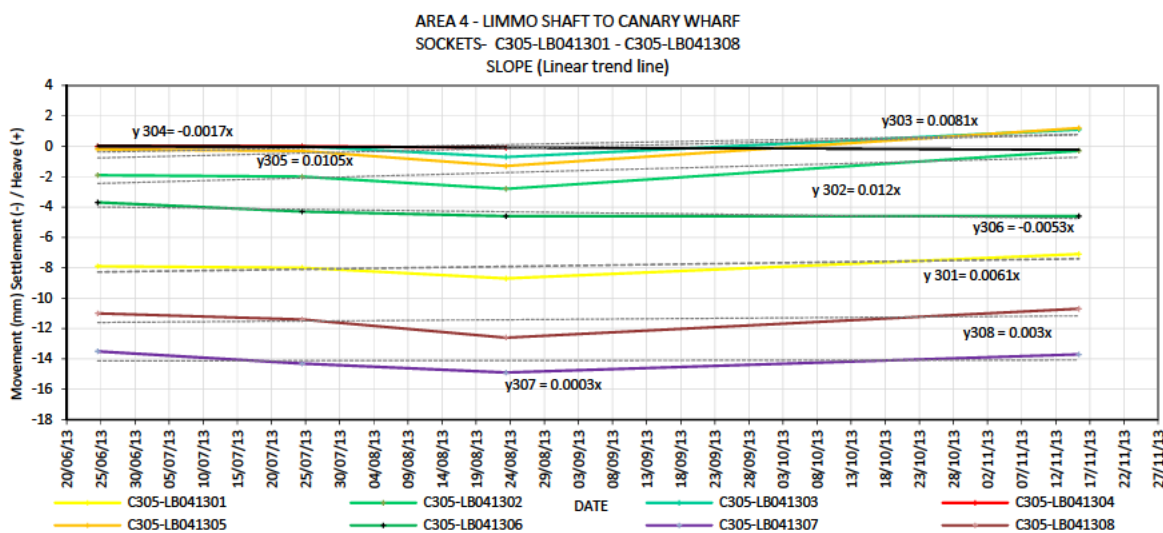
The table below shows the annual rate for the sockets in this array.

	Registered movement (mm)				Rate (mm/year)
	24/06/2013	24/07/2013	23/08/2013	15/11/2013	
C305-LB041301	-7.90	-8.00	-8.70	-7.10	2.227
C305-LB041302	-1.90	-2.00	-2.80	-0.30	4.380
C305-LB041303	0.00	0.00	-0.70	1.10	2.957
C305-LB041304	0.00	0.00	-0.10	#N/A	-0.621
C305-LB041305	-0.20	-0.30	-1.30	1.20	3.833
C305-LB041306	-3.70	-4.30	-4.60	-4.60	-1.935
C305-LB041307	-13.50	-14.30	-14.90	-13.70	0.110
C305-LB041308	-11.00	-11.40	-12.60	-10.70	1.095
	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%

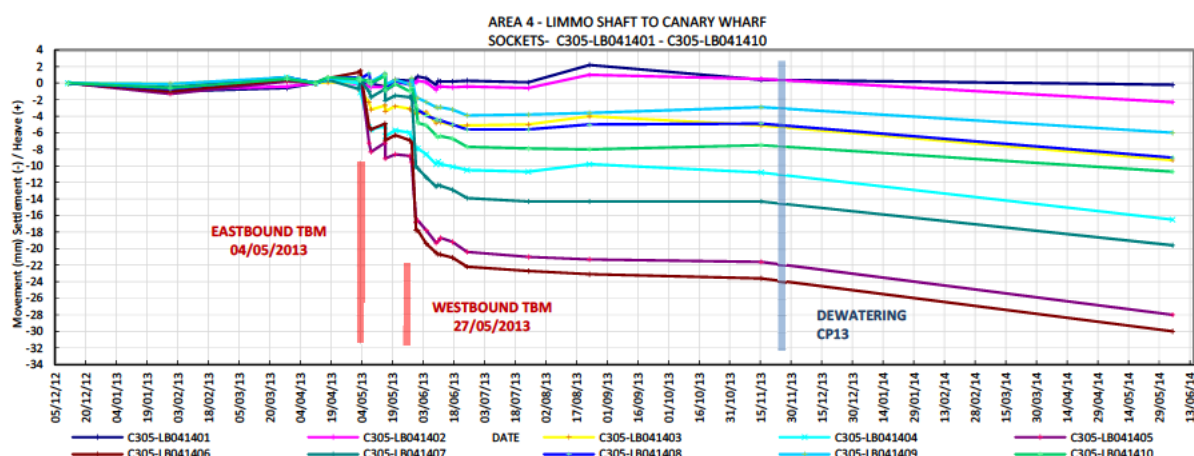
Note: All the movements are in mm. (-) Settlement / (+) Heave
 #N/A: No readings

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.



C305-LB041401 - C305-LB041410



The graph above shows a maximum settlement of -9 mm (C305-LB041405) during the Eastbound TBM transit and an additional -13 mm settlement (C305-LB041406) during the Westbound TBM transit.

The effect of the dewatering in the Cross Passage 13 can be observed in the graphic above. In order to differentiate the movement due to the TBM transit from the dewatering and analyse whether the rate of change in the data has reached an acceptably small rate, the three readings before the dewatering were used to calculate the annual projection.

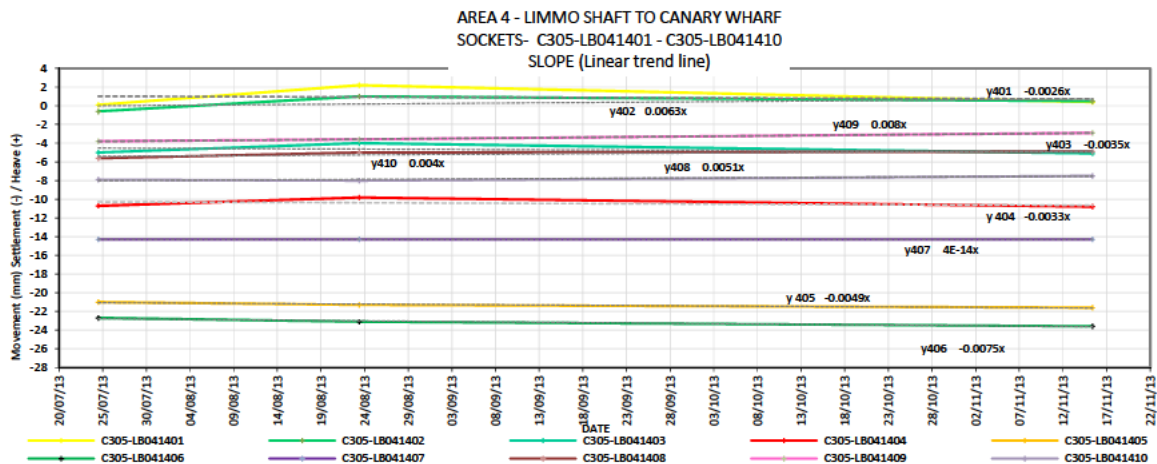
The table below shows the annual rate for the sockets in this array.

	Registered movement (mm)			Rate (mm/year)
	24/07/2013	23/08/2013	15/11/2013	
C305-LB041401	0.10	2.20	0.40	-0.949
C305-LB041402	-0.60	1.00	0.50	2.300
C305-LB041403	-5.00	-4.00	-5.10	-1.278
C305-LB041404	-10.70	-9.80	-10.80	1.460
C305-LB041405	-21.00	-21.30	-21.60	-1.789
C305-LB041406	-22.70	-23.10	-23.60	-2.738
C305-LB041407	-14.30	-14.30	-14.30	0.000
C305-LB041408	-5.60	-5.00	-4.90	1.862
C305-LB041409	-3.80	-3.60	-2.90	2.920
C305-LB041410	-7.90	-8.00	-7.50	1.460
	Rate less than -2.5 mm/year		% less 2 mm/ year	90.00%
	Rate greater than -3.5 mm/year		% less 3 mm/ year	100.00%

Note: All the movements are in mm. (-) Settlement / (+) Heave
 #N/A: No readings

The percentage of the sockets with a settlement rate less than 2 mm/year is 90%, whereas a 100% 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 sockets in this array.



8. SUMMARY OF MOVEMENTS RELATED TO DEWATERING ACTIVITIES

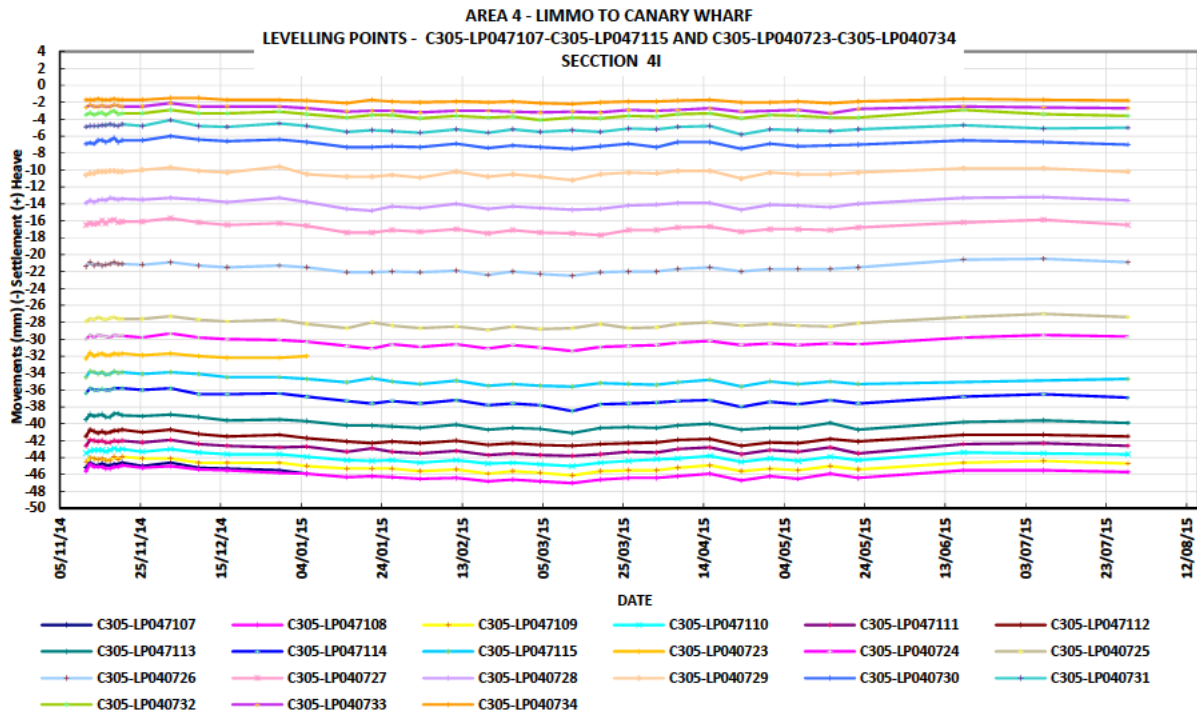
The effect of dewatering systems being switched on is clearly illustrated in the graphs presented in section 7 above.

Where possible, the monitoring data sets used to calculate the settlement projections in this report were selected up to this stage of works (ie: they do not include the periods affected by dewatering activities). In some instances the period from which the data sets were used to calculate the settlement projections was two months. This limited monitoring period has resulted in slightly higher settlement ratios. Furthermore, for some areas it is evident that dewatering systems were switched on before ground movements could be demonstrated to have stabilised for post TBM works.

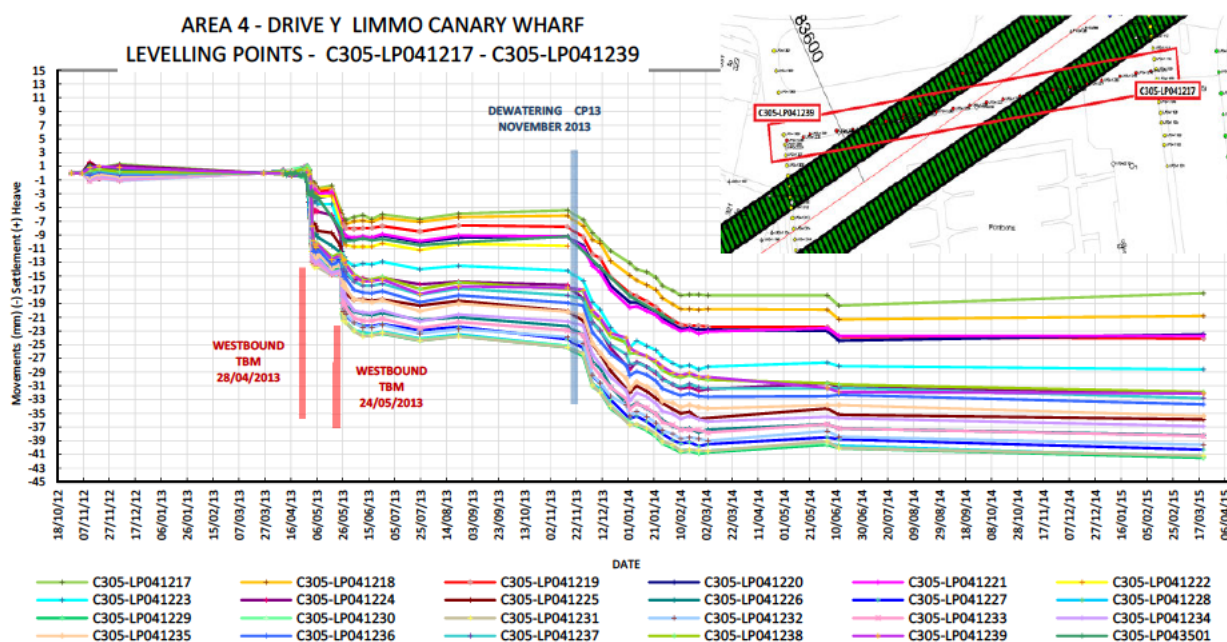
Monitoring data graphs from transects installed to monitor the dewatering activities have been included in this report. These graphs present over a year collection of data. The description and location of these transects, relative to this report’s instruments are shown in the list and figure below:

- The transect 4I (C305-LP047107-C305-LP047115 and C305-LP040723-C305-LP040734) is not covered by this close out report. It is included in Cross Passage 13 and their data will be summarised in a separate Close out report (I&M Close out report for Cross Passages: Phase I - C305-DSJ-C2-RGN-CRG03-50374).
- 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.

	Registered movement (mm)		Rate mm/Year		
C305-LP047107			-		
C305-LP047108			-1.7		
C305-LP047109			-1.7		
C305-LP047110			-1.5		
C305-LP047111			-1.5		
C305-LP047112			-1.7		
C305-LP047113			-2.2		
C305-LP047114			-2.3		
C305-LP047115			-2.4		
C305-LP040723			-		
C305-LP040724			-1.1		
C305-LP040725			-0.6		
C305-LP040726	READINGS FROM 11/11/2014 TO 28/07/2015 WERE TAKEN FROM THE GRAPH ILLUSTRATED BELOW		-0.4		
C305-LP040727			-1.1		
C305-LP040728			-0.7		
C305-LP040729			-0.1		
C305-LP040730			-0.8		
C305-LP040731			-0.8		
C305-LP040732			-0.5		
C305-LP040733			-0.8		
C305-LP040734			-0.4		
			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%



TRANSECT (C305-LP041217-C305-LP041239)

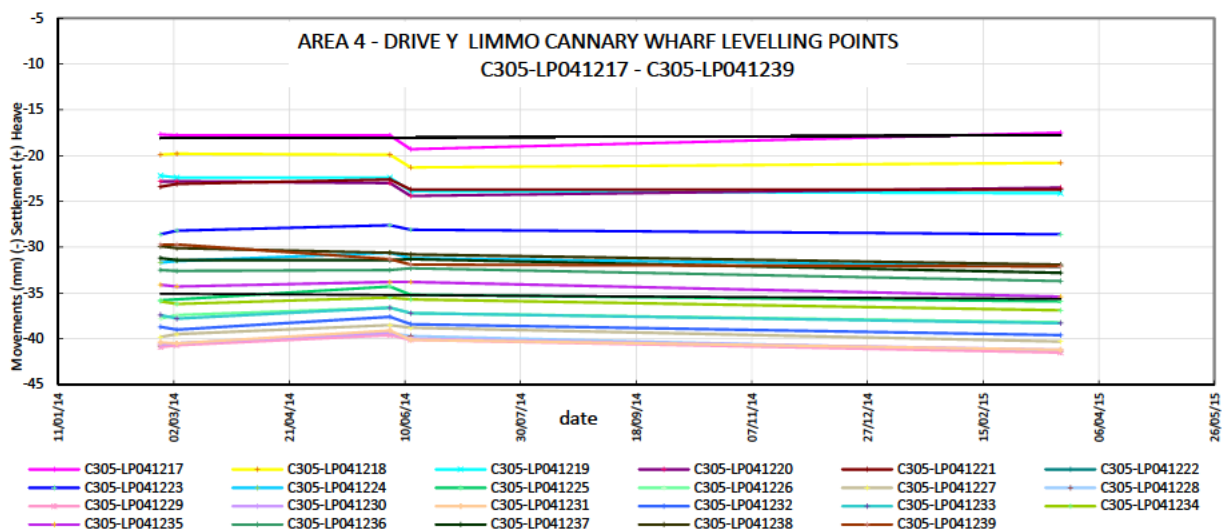


These levelling points close to the area covered in this Close Out Report reach an annual rate less than 2mm/year for the 100%.

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

	24/02/2014	03/03/2014	03/06/2014	12/06/2014	20/03/2015	Rate (mm/year)
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 both transects show that settlement rate due to dewatering works is less than 2 mm/year. As the instruments in this report are located between these two transects 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

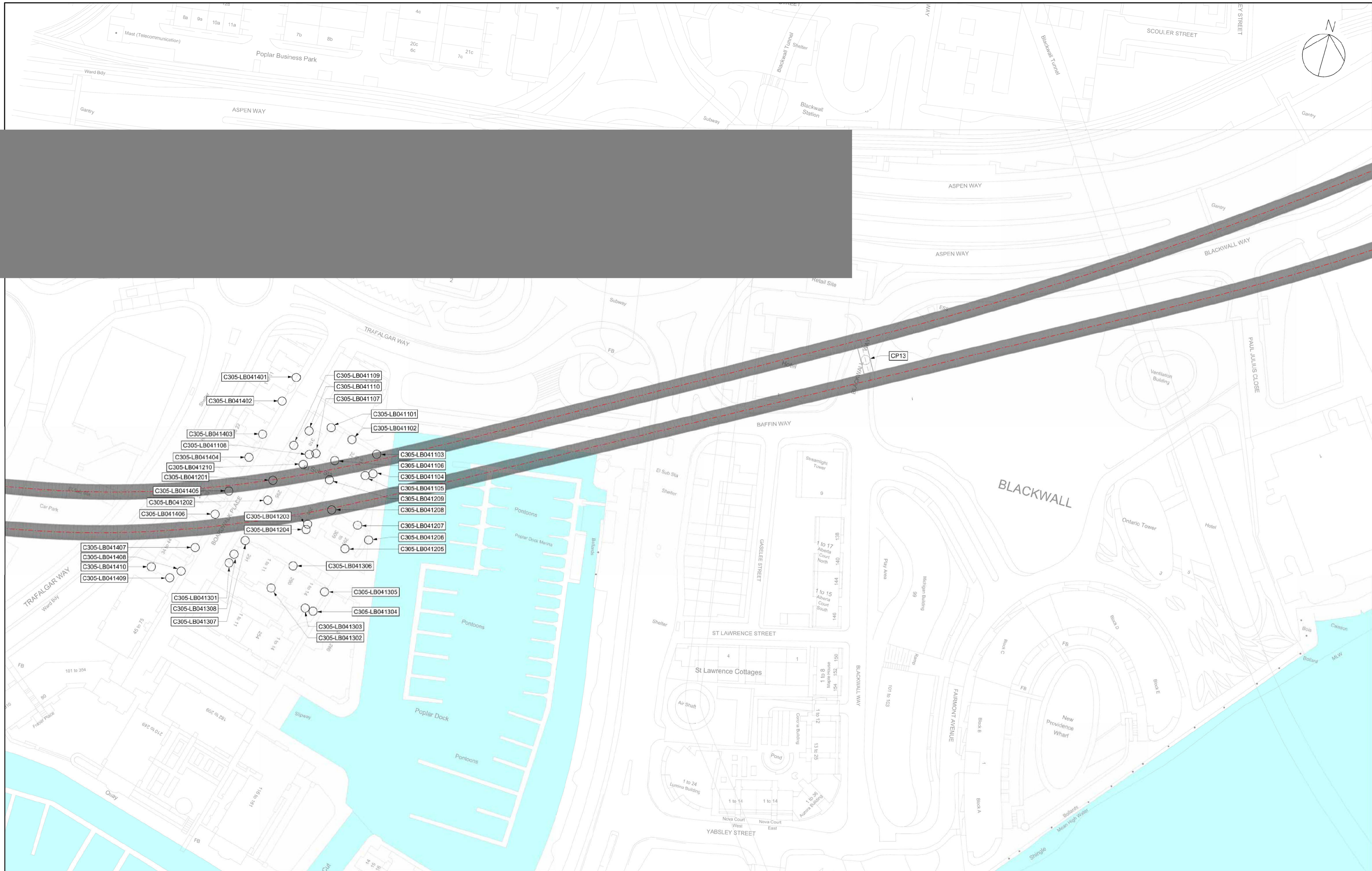
It has been agreed between the Project Manager, the Designer, the Contractor and the Sub Contractor that the instrumentation covered herein, for monitoring ground movement effects of Crossrail works, including long term effects, but which have been subsequently affected by dewatering of cross passages, 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 have been met:

- The trends of the monitoring points, prior to commencement of dewatering, was approaching or had achieved the specified 2 mm/year settlement rate; and

- 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.

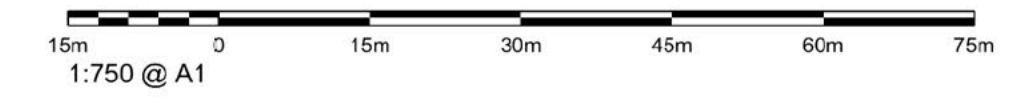
APPENDIX A: INSTRUMENT LOCATION



Rev.	Date	Description	By	Chkd	App	Auth
P01	02/03/2015	First Issue	AH	AH	RC	-
P02	10/03/2015		MD	AH	RC	-
P03	10/03/2015		MD	AH	RC	-
P04	04/08/2015		MD	RC	RC	-
P05	09/11/2015		MD	MD	MD	-

Notes

- Levelling Sockets



<p>Crossrail Limited 25 Canada Square Canary Wharf London E14 5LQ</p> <p>© Crossrail www.crossrail.co.uk</p>	<p>Contract: Tunnels East - Drive Y LIM to FAR & Drive Z SGJ to PML & Drive G</p> <p>Originator: Dragados Sisk Joint Venture</p> <p>Location: Crossrail Tunnels - Drive Y (Limmo Peninsula to Farringdon Stn)</p>	<p>By: M.DAVIS</p> <p>CHK: M.DAVIS</p> <p>App: M.DAVIS</p> <p>Auth: ...</p>	
	<p>Title: Instrumentation & Monitoring Installation Report for I&M MS Sockets and 3D Prisms (83900-83500) C305-DSJ-C2-GMS-CRG03-50020</p>	<p>Scale: 1:750 @ A1</p>	<p>Rev: P05</p>
	<p>Drawing and CAD file No: C305-DSJ-C2-DDA-CRT00_ST006_Z-08099</p>	<p>Sutability: S4</p>	
	<p>Contract No: 08099</p>		
	<p>Project No: 08099</p>		

RESTRICTED

APPENDIX B: SUMMARY OF INSTRUMENTATION INSTALLED ON SITE

IRS Installation Record Sheets

Sensor Type	Sensor ID	Date Installation	Sub-area	Status	SENSOR Location - GPS reading (m)			Commissioning Readings (m)			
					Eastings X	Northings Y	Elevation Z (mATD)	AVERAGE	10/12/2012	10/12/2012	11/12/2012
								AVERAGE	10/12/2012	10/12/2012	11/12/2012
Socket	C305-LB041101	18/11/2012	Boardwalk Pl.	Installed	88541.61	35032.85	106.834	106.8335	106.8337	106.8331	106.8336
Socket	C305-LB041102	18/11/2012	Boardwalk Pl.	Installed	88551.774	35030.233	106.927	106.9270	106.9272	106.9270	106.9268
Socket	C305-LB041103	18/11/2012	Boardwalk Pl.	Installed	88563.88	35026.863	106.412	106.4122	106.4118	106.4125	106.4123
Socket	C305-LB041104	18/11/2012	Boardwalk Pl.	Installed	88564.627	35018.19	106.442	106.4422	106.4421	106.4420	106.4425
Socket	C305-LB041105	18/11/2012	Boardwalk Pl.	Installed	88561.569	35016.524	106.98	106.9800	106.9800	106.9802	106.9798
Socket	C305-LB041106	18/11/2012	Boardwalk Pl.	Installed	88546.926	35019.355	107.015	107.015	107.0151	107.0148	107.0151
Socket	C305-LB041107	18/11/2012	Boardwalk Pl.	Installed	88538.181	35020.191	106.969	106.9689	106.9692	106.9690	106.9685
Socket	C305-LB041108	18/11/2012	Boardwalk Pl.	Installed	88535.478	35019.039	107.03	107.0300	107.0296	107.0301	107.0304
Socket	C305-LB041109	18/11/2012	Boardwalk Pl.	Installed	88527.923	35021.083	107.136	107.1362	107.1362	107.1363	107.1361
Socket	C305-LB041110	18/11/2012	Boardwalk Pl.	Installed	88532.663	35028.946	107.093	107.093	107.0932	107.0931	107.0928
								AVERAGE	10/12/2012	10/12/2012	11/12/2012
Socket	C305-LB041201	18/11/2012	Boardwalk Pl.	Installed	88523.137	35003.826	107.273	107.2951	107.2950	107.2954	107.2948
Socket	C305-LB041202	18/11/2012	Boardwalk Pl.	Installed	88523.244	34994.84	107.394	107.4144	107.4140	107.4148	107.4145
Socket	C305-LB041203	18/11/2012	Boardwalk Pl.	Installed	88542.832	34989.355	106.957	106.9743	106.9741	106.9745	106.9744
Socket	C305-LB041204	18/11/2012	Boardwalk Pl.	Installed	88542.766	34986.848	106.979	106.9935	106.9933	106.9936	106.9937
Socket	C305-LB041205	18/11/2012	Boardwalk Pl.	Installed	88561.431	34983.166	106.97	106.9743	106.9741	106.9745	106.9742
Socket	C305-LB041206	18/11/2012	Boardwalk Pl.	Installed	88570.41	34989.584	105.621	105.6114	105.6116	105.6113	105.6112
Socket	C305-LB041207	18/11/2012	Boardwalk Pl.	Installed	88564.078	34994.609	107.108	107.1219	107.1217	107.1219	107.1222
Socket	C305-LB041208	18/11/2012	Boardwalk Pl.	Installed	88551.286	34998.222	107.107	107.1310	107.1307	107.1311	107.1312
Socket	C305-LB041209	18/11/2012	Boardwalk Pl.	Installed	88546.92	35010.567	106.961	106.9863	106.9860	106.9864	106.9865
Socket	C305-LB041210	18/11/2012	Boardwalk Pl.	Installed	88534.077	35014.033	107.028	107.0504	107.0505	107.0503	107.0504
								AVERAGE	10/12/2012	10/12/2012	11/12/2012
Socket	C305-LB041301	18/11/2012	Boardwalk Pl.	Installed	88514.04	34963.787	107.264	107.2731	107.2725	107.2733	107.2734
Socket	C305-LB041302	18/11/2012	Boardwalk Pl.	Installed	88534.84	34958.055	107.292	107.2946	107.2944	107.2946	107.2947
Socket	C305-LB041303	18/11/2012	Boardwalk Pl.	Installed	88551.442	34953.479	107.294	107.2944	107.2942	107.2948	107.2941
Socket	C305-LB041304	18/11/2012	Boardwalk Pl.	Installed	88555.124	34953.025	106.697	106.6981	106.6980	106.6984	106.6979
Socket	C305-LB041305	18/11/2012	Boardwalk Pl.	Installed	88557.78	34962.596	106.678	106.6791	106.6789	106.6790	106.6795
Socket	C305-LB041306	18/11/2012	Boardwalk Pl.	Installed	88541.542	34969.991	106.334	106.3378	106.3376	106.3381	106.3376
Socket	C305-LB041307	18/11/2012	Boardwalk Pl.	Installed	88518.282	34975.11	107.452	107.4661	107.4664	107.4660	107.4659
Socket	C305-LB041308	18/11/2012	Boardwalk Pl.	Installed	88515.116	34968.014	106.668	106.6805	106.6811	106.6801	106.6804
								AVERAGE	10/12/2012	10/12/2012	11/12/2012

Sensor Type	Sensor ID	Date Installation	Sub-area	Status	SENSOR Location - GPS reading (m)			Commissioning Readings (m)			
					Eastings X	Northings Y	Elevation Z (mATD)				
Socket	C305-LB041401	18/11/2012	Boardwalk Pl.	Installed	88521.117	35050.153	107.302	107.3024	107.3020	107.3026	107.3026
Socket	C305-LB041402	18/11/2012	Boardwalk Pl.	Installed	88517.895	35038.464	107.299	107.2986	107.2982	107.2988	107.2987
Socket	C305-LB041403	18/11/2012	Boardwalk Pl.	Installed	88513.365	35022.167	107.53	107.5295	107.5294	107.5296	107.5295
Socket	C305-LB041404	18/11/2012	Boardwalk Pl.	Installed	88510.213	35010.758	107.526	107.5256	107.5252	107.5261	107.5255
Socket	C305-LB041405	18/11/2012	Boardwalk Pl.	Installed	88505.631	34994.134	107.675	107.6747	107.6749	107.6747	107.6744
Socket	C305-LB041406	18/11/2012	Boardwalk Pl.	Installed	88502.522	34982.867	107.676	107.6763	107.6761	107.6767	107.6760
Socket	C305-LB041407	18/11/2012	Boardwalk Pl.	Installed	88497.943	34966.358	107.82	107.8199	107.8197	107.8204	107.8196
Socket	C305-LB041408	18/11/2012	Boardwalk Pl.	Installed	88494.745	34954.792	107.802	107.8019	107.8017	107.8023	107.8018
Socket	C305-LB041409	18/11/2012	Boardwalk Pl.	Installed	88490.744	34950.633	107.762	107.7618	107.7619	107.7620	107.7615
Socket	C305-LB041410	18/11/2012	Boardwalk Pl.	Installed	88481.697	34953.217	107.84	107.8395	107.8389	107.8402	107.8394

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

All elevations or levels presented in this document are metres above tunnel datum (mATD)

APPENDIX C: MINUTES CLOSE OUT MEETING AREA 4



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:				
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 storage	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				
LBO4301-LB04312	Area 4 - Orchard Place	83% at 2mm/year 92% at 3mm/year	Yes	Yes
LBO40101-LB040110	Area 4 - Sail Court	100% at 2mm/year 100% at 3mm/year	Yes - CP13/CP14	Yes
LBO40201-LB040211	Area 4 - Bridge/Keel Court	100% at 2mm/year 100% at 3mm/year	Yes - CP13/CP14	Yes
LBO40301-LB040304	Area 4 - Sexton Court	75% at 2mm/year 100% at 3mm/year	Yes - CP13/14	Yes
LBO40401-LB040412	Area 4 - John Smith Mews	80% at 2mm/year 90% at 3mm/year	Yes - CP13/14	Yes
LBO40501-LB040506	Area 4 - Proton/Neutron Towers	100% at 2mm/year 100% at 3mm/year	Yes - CP13/14	Yes
LBO40701-LB040706	Area 4 - Billingsgate Market	100% at 2mm/year 100% at 3mm/year	/	/
LBO41101-LB041110	Area 4 - Boardwalk Place	20% at 2mm/year 50% at 3mm/year	/	/
LBO41201-LB041210	Area 4 - Boardwalk Place	20% at 2mm/year 60% at 3mm/year	/	/
LBO41301-LB041308	Area 4 - Boardwalk Place	100% at 2mm/year 100% at 3mm/year	/	/
LBO41401-LB041410	Area 4 - Boardwalk Place	90% at 2mm/year 100% at 3mm/year	/	/
LBO44101-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 TBW readings in close out reports affected by dewatering works. Next meeting tomorrow after CTC.</p>				
Sign off				
DSJV	Geocisa	Crossrail	C122	
[Redacted]	[Redacted]	[Redacted]	[Redacted]	



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 - CPI3	Yes - CPI3
LP041301-LP041328	Area 4 - Poplar Dock (4L)	68% at 2mm/year 82% at 3mm/year	Yes - CPI3	Yes - CPI3 + feedbacks in June '15
LP041401-LP041425	Area 4 - Boardwalk Place	100% at 2mm/year 100% at 3mm/year	Yes - CPI3	Yes - CPI3
LP041501-LP041536	Area 4 - Trafalgar Way	36% at 2mm/year 44% at 3mm/year	Yes - CPI3	Yes - CPI3
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 CPI3 post.	Post CPI3
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 - CPI3	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 CPI3 post.	Post CPI3
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	Geosia	Crosstail	C122
[Redacted]	[Redacted]	[Redacted]	[Redacted]

I&M Close Out Template - 13th July 2015