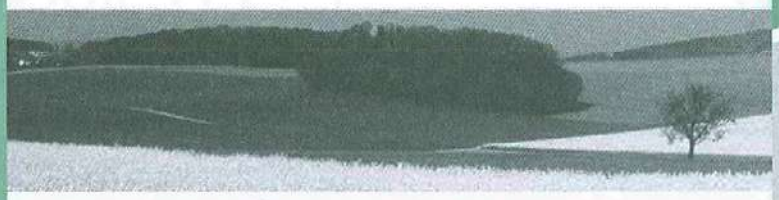
Settlement Report
Proposed Residential Development
Herbert Road
Newport

Prepared for: Engie

August 2018

Report No. 12032/SR



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REPORT TITLE	**:**	**Settlement Report:** Herbert Road, Newport
REPORT STATUS	**:**	**Final**
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APPROVED BY	**:**	…….. **(Dr G. C. Lake)**

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SECTION 1 Introduction

In order to comply with current Government directives and the Flood Consequence Assessment (FCA) approved by NRW the site has been raised from its original level to 9.20m AOD.

Riversee Limited undertook the majority of the fill works to a level below the piling mat at 9.0m AOD. Pobl Group took possession of the site in 2017 and Engie, the Management Contractor, further raised the site during June - August 2017 with the importation of a 200mm piling mat.

The original ground conditions on site comprised made ground over soft alluvial clay with bands of soft peat, over sand and gravel and mudstone bedrock. Due to the presence of soft clays and peat placement of fill on site would cause ground settlement.

The following section details the settlement monitoring carried out and presents predicted remaining settlement.

The Settlement Report has been prepared for Engie. This report shall not be relied upon or transferred to any other parties without the express written authorisation of Terra Firma (Wales) Limited. If an unauthorised third party comes into possession of this report they rely on it at their peril and the authors owe them no duty of care and skill.

The report represents the findings and opinions of experienced geo-technical and geo-environmental consultants. Terra Firma (Wales) Limited does not provide legal advice and the advice of lawyers may also be required.

SECTION 2 Settlement Monitoring

During July 2015 six vibrating wire piezometers to measures pore pressures were installed across the site. Eight settlement monitoring pins were also installed to survey changes in level as settlement occurs. In June 2017 eight new settlement pins were installed to replace the original pins that, with the exception of one, had been damaged through site activity. Also in June 2017 Piezometers P1 and P4 (which had been lost) were replaced by P1A and P4A. The location of these monitoring points is illustrated in **Figure 3.1** below.

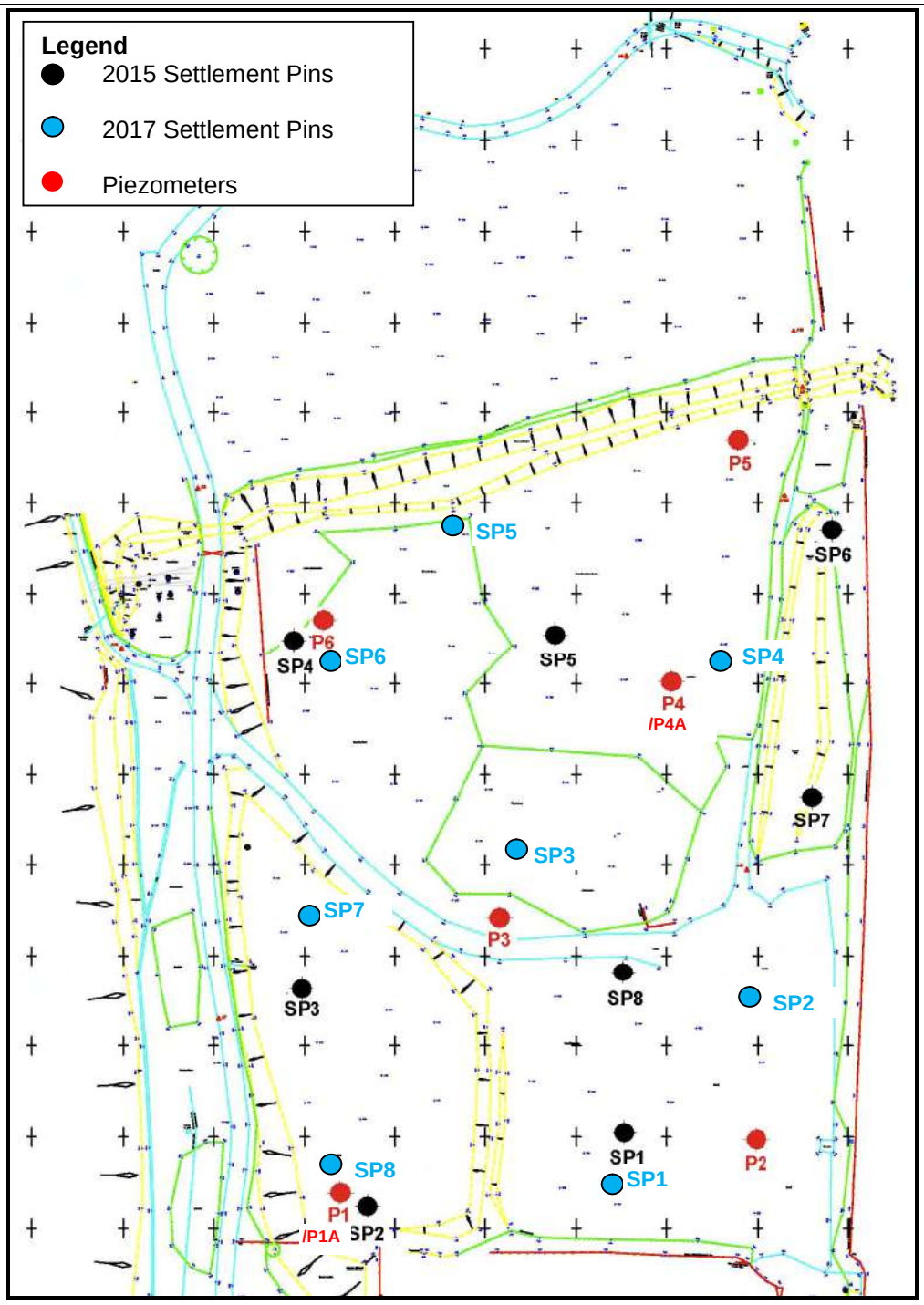


Figure 2.1: Approximate Piezometer (P1 – P6) and Settlement Pin (SP1 – SP8) Locations

SECTION 2 Settlement Monitoring (Continued)

The piezometers and settlement pins were monitored and surveyed at regular intervals during the earthworks.

With raising ground levels settlement was anticipated to occur on site in three phases, instantaneous and primary settlement, primary consolidation settlement and secondary consolidation settlement.

During instantaneous settlement the soil experiences only shear deformation resulting into change in shape without volumetric deformation. The loss of pore pressure in the soil is zero. Since this settlement is instantaneous it can only be monitored via monitoring pins as the pore pressure cannot be measured (zero).

During primary consolidation / settlement the soil is deformed by movement and compression of soil particles which overall results in volume change. Water held in pores of a saturated soil will migrate to pores of lower pressure (The process of consolidation). Primary settlement is time dependent on a logarithmic scale and stops when pore water pressure returns to baseline level.

Secondary consolidation / settlement occurs following the fall of pore water pressure. Secondary consolidation / settlement includes but is not limited to the following factors;

- Creep: With increasing pressure the grains may become so tightly packed that they will deform causing the soil mass to continue to reduce in volume
- Viscous behaviour of water between particles and pore water: During secondary compression the highly viscous water between the points of contact of soil particles is squeezed out.
- Compression and degradation of organic matter,

Consolidation is a process by which soils decrease in volume by decreasing water content within a saturated soil without replacement of water by air. Consolidation occurs when water is expelled under long term static loads. When a stress or surcharge is applied to a saturated soil the soil particles can compact, therefore reducing its bulk volume and excess water will be “squeezed out”. As a soil consolidates excess pore water pressure will fall.

Vibrating wire piezometers were used to monitor pore water pressures (a pressure correlating to meters of water). Vibrating wire piezometers convert fluid pressures on a sensitive diaphragm into a frequency signal. The signals are capable of long transmission distances without degradation, tolerant of wet conditions and resistant to external electrical noise.

To measure settlement baseline data is required, as shown in **Table 2.1**.

SECTION 2 Settlement Monitoring (Continued)

Table 2.1 Installation Details of Piezometers

Piezometer	Depth	Strata Description	Initial Reading		Possible Baseline Reading	
			mH_2O	Date	mH_2O	Date
P1	6.30mbgl	Peat	2.05	14/7/15	4.45	23/7/16
P1A	7.0mbgl	Peat	5.887	9/6/17	5.90	27/6/17
P2	2.60mbgl	Clay	0.017	15/7/15	2.20	24/7/16
P3	3.70mbgl	Clay	2.429	16/7/15	2.20	24/7/16
P4	4.95mbgl	Peat	0.358	16/7/15	4.10	22/7/16
P4A	8.3mbgl	Peat	4.756	9/6/17	4.67	27/6/17
P5*	2.90mbgl	Peat	0.324	17/7/15	1.95	29/7/16
P6	5.00mbgl	Clay	4.087	22/7/15	4.50	28/7/16
	Replacement Piezometer					

The possible baseline readings are considered representative although the project program would not permit prolonged monitoring to refine the baseline pressures further. Piezometers P1A and P4A were installed, replacing P1 and P4 which had been lost.

During the establishment of a baseline the piezometers were monitored for changes in pore pressure coinciding with changes in tide level. The tidal range of the River Usk in Newport can extend over 13m. Tide information from The United Kingdom Hydrographic Office for Newport, Wales was used to identify low tide and high tides. Despite the significant tidal range the effect on piezometers was slight / negligible.

As confirmation the piezometers were measured again from low tide to high tide, (a 10.3m tidal range) between 11:00 and 17:00 on 27/5/2016. The data is summarised below.

Table 2.2 Tidal Effect on Piezometers

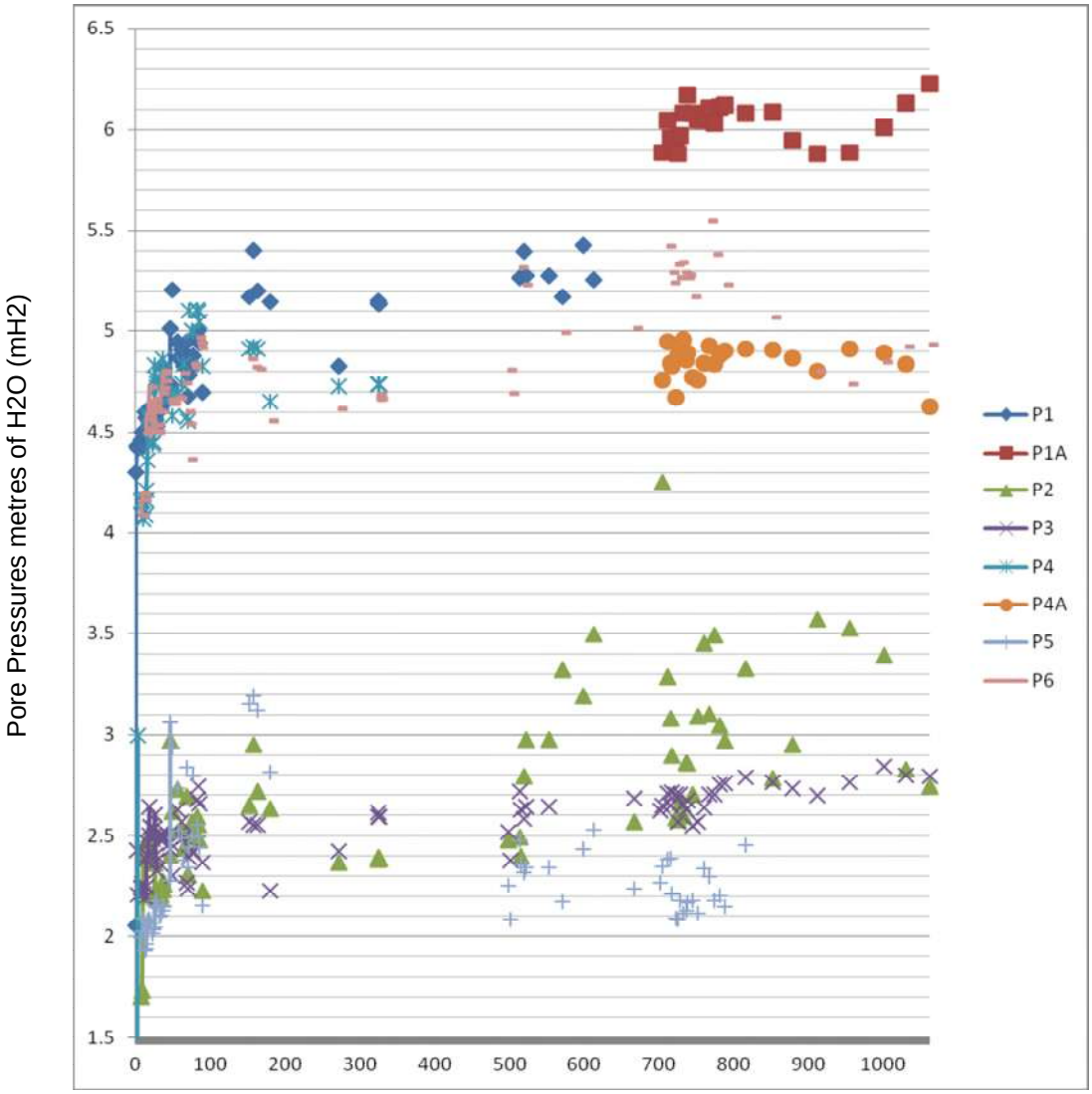
Time	11:00	14:00	17:00	Maximum measured Change in Pore Pressure
Tide Description	Low Tide	Rising Tide	High Tide	
P1	5.151573	5.13387	5.13387	-0.018mH_2O
P2	2.3939187	2.3825055	2.3882121	-0.011mH_2O
P3	2.6096248	2.5912062	2.5912062	-0.018mH_2O
P4	4.7355286	4.7355286	4.7355286	0mH_2O
P5	Not recorded			
P6	4.6853254	4.6593008	4.6646852	-0.026mH_2O
Pore Pressures reported in mH_2O.				

Pore water pressure would be anticipated to increase at high tide with rising water levels however this did not appear to be evident. The equivalent of under 30mm groundwater change was observed between low tide and high tide in this instance. It was considered that the groundwater beneath the site is unlikely to be significantly influenced by the high tidal range of the Usk.

SECTION 2 Settlement Monitoring (Continued)

Pore water pressure was monitored daily during the period of full time supervision and significant activity on site. Full time supervision was between 14/7/2015 through to 20/8/2015. Monitoring continued beyond this point on a less frequent basis, to reflect reduced site activity.

Graph 2.1 : Piezometer Monitoring Results

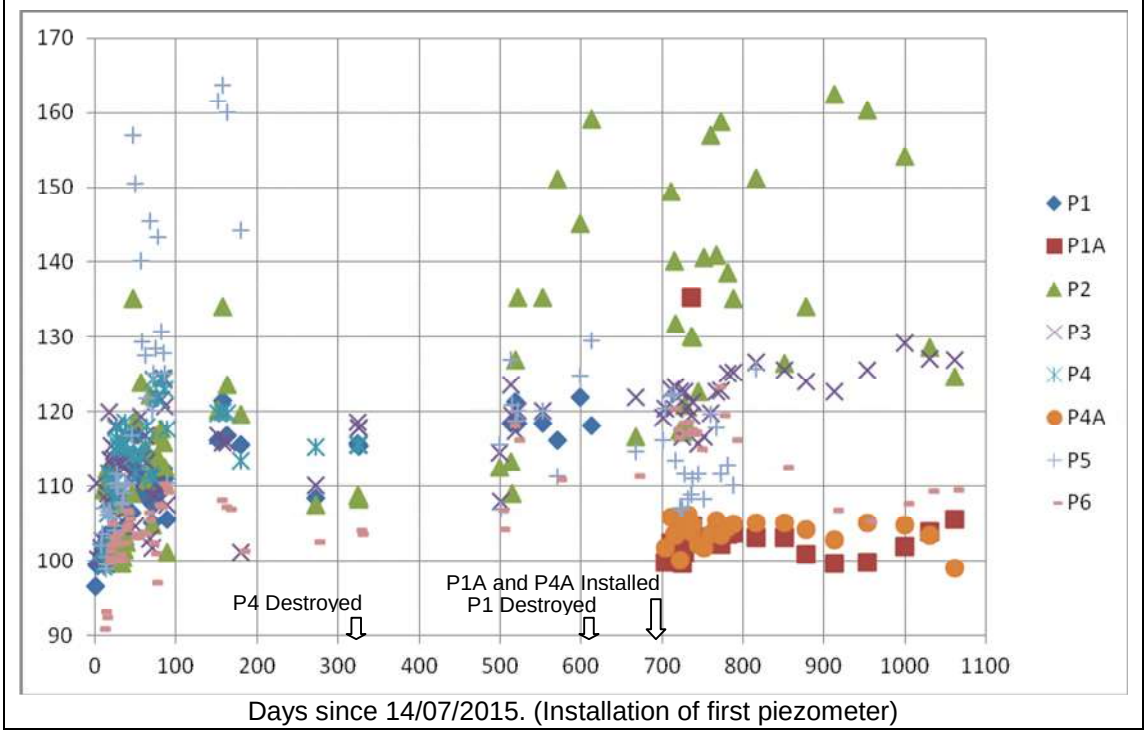


During full time supervision the increasing pore water pressures observed from the piezometers appeared to correlate with the placement of fill. As evidenced by jumps in pore water pressure over the day. Peak pore water pressure dissipated initially quickly but the rate of dissipation reduced resulting in jumps of pore water pressure.

SECTION 2 Settlement Monitoring (Continued)

During settlement pore water pressure dissipates as water is squeezed out of consolidating material. The graph below shows the generation of peak pore water pressure generated by the placement of fill typically between 3 and 5 months after the commencement of the earthworks.

Graph 2.2 : Dissipation of Pore Water Pressure



Pore water pressure has been observed to be dissipating, evidence of consolidation and settlement. However the monitoring of pore water pressure dissipation has been disrupted by filling events.

Pore water pressure dissipation of a single filling event should produce a single curve. However multiple filling events are likely to explain for the peaks and troughs of pore water dissipation suggesting that following the initial placement of the assessed stockpile further material has been placed on site.

A summary of pore water pressure dissipation ~1060 days or 2.9years after commencement of the earthworks is presented in Table 3.5.

SECTION 2 Settlement Monitoring (Continued)

Table 2.3 Summary of Piezometer Monitoring

Piezometer 1	Strata: Peat (6.30mbgl)	Location: South-western Corner of Site (Near River Usk Embankment)
Piezometer P1 initially achieved peak water pressure after ~150days. Pore water pressure appears to have steadily dissipated to ~40% of peak pore water pressure after ~200 days. However, placement of fill has raised pore water pressure to a new peak after ~600 days. Shortly after Piezometer P1 was subsequently lost, however it is expected that a further ~200days (800 days) pore water would return to ~40% of peak pore water pressure.		
Piezometer P1 was destroyed and replaced by Piezometer P1A.		
Piezometer 1A	Strata: Peat (7.0mbgl)	Location: South-western Corner of Site (Near River Usk Embankment)
Maximum pore water pressure (105% baseline) was achieved at ~730days. Pore water pressure had dissipated by Six months (by 900days). Pore water pressure has since increased but is considered attributable to natural variation.		
Piezometer 2	Strata: Clay (3.70mbgl)	Location: South-eastern Corner of Site (Near Rail Embankment)
Piezometer P2 dissipated initially but established a new peak pore water pressure after ~700 days after a new fill event. After 100days pore water pressure has dissipated to <40% of maximum. Water pressure has previously appeared to dissipated to ~30% of peak pore water pressure after ~50 days and 20% after ~100 days. After ~1000 days pore water pressure is 125% of baseline conditions. It is considered that changes in pore water pressure are now attributable to natural conditions.		
Piezometer 3	Strata: Clay (2.60mbgl)	Location: Southern Centre of Site
Piezometer P3 like Piezometer P1 also dissipated to 40% of peak water pressure taking ~200 days. Pore water pressure does not appear to be dissipating as fast as initially. After ~1000 days pore water pressure is 125% of baseline conditions. It is considered that changes in pore water pressure are now attributable to natural conditions.		
Piezometer 4	Strata: Peat (4.95mbgl)	Location: North-Centre of Site
Piezometer P4 initially achieved peak water pressure after ~100days. Pore water dissipated to ~55% of peak pore water pressure after a further ~100 days. However shortly after ~300days Piezometer P4 was destroyed and no further observations could be made.		
Piezometer P4 was destroyed and replaced by Piezometer P4A		
Piezometer 4A	Strata: Peat (8.3mbgl)	Location: North-Centre of Site
Maximum pore water pressure (105% baseline) was achieved at ~730days. Pore water pressure has dissipated.		
Piezometer 5	Strata: Peat (2.90mbgl)	Location: North-eastern corner of Site (Near Rail Embankment)
Piezometer 5 achieved peak pore water pressure after ~150days. Despite multiple filling events pore water pressure has dissipated reaching 110% of base line. It is considered that changes in pore water pressure are now attributable to natural conditions.		
Piezometer 6	Strata: Clay (5.00mbgl)	Location: North-western corner of Site (Near River Usk Embankment)
Piezometer P6 dissipated initially but established a new peak pore water pressure after ~775days after a new fill event. After a further ~175 days pore water pressure dissipated to ~105% of base line. A new maximum pore water pressure was achieved at ~750days. It is considered that changes in pore water pressure are now attributable to natural conditions.		
Observations: There are difficulties observing pore water dissipation when there have been multiple filling events. Normally peak pore water pressure is achieved following placement of a single fill event. However, in this case limited dissipation has occurred only for further fill events to increase pore water pressure to new peaks. Dissipation of pore water pressure appears faster in the peat layers than in the clay. Peat is known to be a more susceptible material to change than clay. The percentage change to pore water pressure in some cases equates to small groundwater level change in real terms, see Graph 5.1. Peak pore water pressure was not as high as initially envisaged because the earthworks were spread over a longer duration than anticipated. Pore water change has been slight in P1A and P4A since very little additional load has been generated since their installation. There is very little difference between peak pore water pressure and base line water pressure and therefore even a small change can cause a high proportional change. **Primary settlement appears complete since variation of pore water pressure appears to be attributable to natural conditions.**		

SECTION 2 Settlement Monitoring (Continued)

The original (2015) settlement monitoring pins were installed targeting the following areas;

Monitoring Pin 1: South-eastern Corner of the site, near rail embankment,
Monitoring Pin 2: South-western Corner of the site, near River Usk Embankment,(Destroyed)
Monitoring Pin 3: Western Edge of the site, near River Usk Embankment,(Destroyed)
Monitoring Pin 4: North-western Corner of the site, near River Usk Embankment,(Destroyed)
Monitoring Pin 5: Northern edge of the site, near reen,
Monitoring Pin 6: North-eastern corner of the site, near rail embankment,(Destroyed)
Monitoring Pin 7: Eastern Edge of the site, near rail embankment,
Monitoring Pin 8: Centre of site

Unfortunately half of the original monitoring pins were disturbed during the earthworks in 2015 and 2016 causing the loss of corresponding baseline information for settlement monitoring. A summary of all survey data to date is presented in **Table 2.4** below.

Table 2.4 Summary of Survey Data (mAOD)

	Round 1	Round 2	Round 3	Round 4	Round 5	Round 6	Round 7	Round 8	Round 9
Pin	17/7/15	24/7/15	7/8/15	17/8/15	24/8/15	2/10/15	29/12/15	17/3/16	15/12/16
P1	9.435	9.435	9.435	9.435	9.424	9.427	9.4187	9.418	9.414
P2	**D**	10.069	**D**	**D**	**D**	**D**	**D**	**D**	**D**
P2A	-	-	10.071	10.064	10.055	10.059	10.0464	10.0429	**D**
P3	9.136	9.136	9.137	**D**	**D**	**D**	**D**	**D**	**D**
P3A	-	-	-	9.195	**D**	**D**	**D**	**D**	**D**
P3B	-	-	-	-	-	9.708	9.6882	9.68	9.682
P4	8.772	8.773	8.771	**D**	**D**	**D**	**D**	**D**	**D**
P4A	-	-	-	-	9.009	9.013	8.9902	8.982	8.977
P5	9.195	9.195	9.198	9.195	9.186	9.178	9.1563	9.149	9.145
P6	9.22	**D**	**D**	**D**	**D**	**D**	**D**	**D**	**D**
P6A	-	9.268	9.267	9.271	9.264	9.274	9.2721	9.263	9.264
P7	8.954	8.954	8.955	8.955	8.945	8.935	8.9125	8.91	**D**
P8	9.209	9.209	9.207	9.208	9.199	9.202	Anomalous Result	9.185	9.180

- = not present, **D** = Destroyed, Green filled cells indicate pins with a mostly complete set of monitoring data

Justification of Survey Rounds:

Round 1, 17/7/15.	Initial Survey (P2 damaged - not surveyed)
Round 2, 24/7/15.	Initial Survey of P2 and P6A
Round 3, 7/8/15,	Initial Survey of P2A
Round 4, 17/8/15,	Initial Survey of P3A and survey of damaged P2A
Round 5, 24/8/15,	Initial Survey (P3A damaged - not surveyed)
Round 6, 2/10/15	Initial Survey of P3A
Round 7, 29/12/15	Follow up survey
Round 8, 17/3/15	Follow up survey
Round 9, 15/12/16	Follow up survey

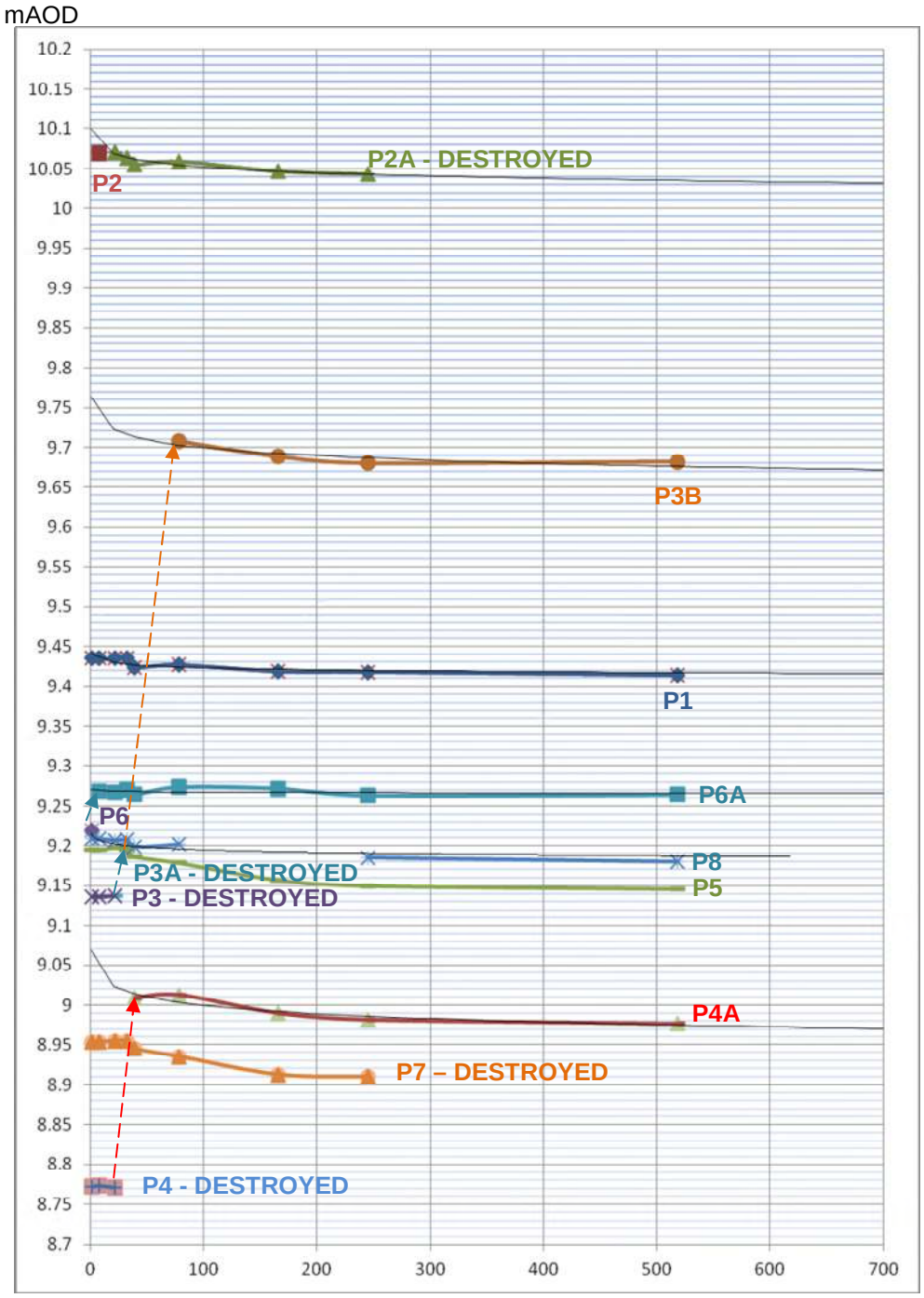
The following extrapolations are based on measured settlement over a period of ~530days. Monitoring pins were replaced following this assessment.

The settlement monitoring pins were replaced. The following recent change at monitoring pins will be summarised at the end of Section 3.

SECTION 2 Settlement Monitoring (Continued)

The graph below shows all of the surveyed original monitoring pins on an arithmetic time scale. When a monitoring pin was damaged or destroyed an effort was made to replace the pin. When a monitoring pin was damaged / destroyed it was given a sequential alphabetical designation.

Graph 2.3 : Settlement Monitoring Pin Results

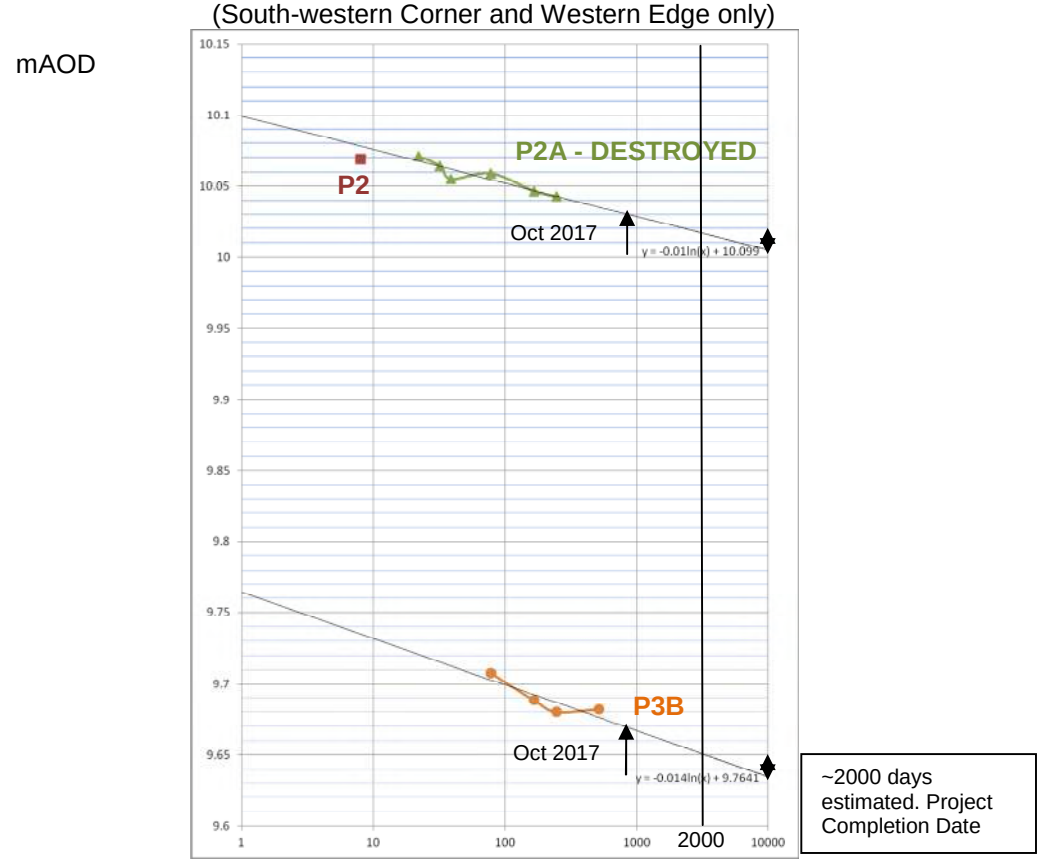


SECTION 2 Settlement Monitoring (Continued)

In principle secondary settlement is infinite with settlement rates dropping on a logarithmic scale. However in practice the increase in settlement after 10^4 days (~30years) appears to be generally "complete".

Graph 2.4 Settlement at Monitoring Pins P2A and P3B

(South-western Corner and Western Edge only)



Days since 17/07/2015. (First survey of Settlement Pins) – Log base 10

* Note Original Pins of P2, P3 and P3A were lost or damaged.

Monitoring Pin 2

Unfortunately baseline conditions for Monitoring Pin 2 (located within the south-western corner of the site) were lost as the pin was destroyed following the placement of fill. Monitoring Pin 2A however recorded ~28mm of settlement over 223 days. Whilst the initial readings may be lost and the monitoring point has been destroyed it may be possible to conjecture future settlement from the data obtained.

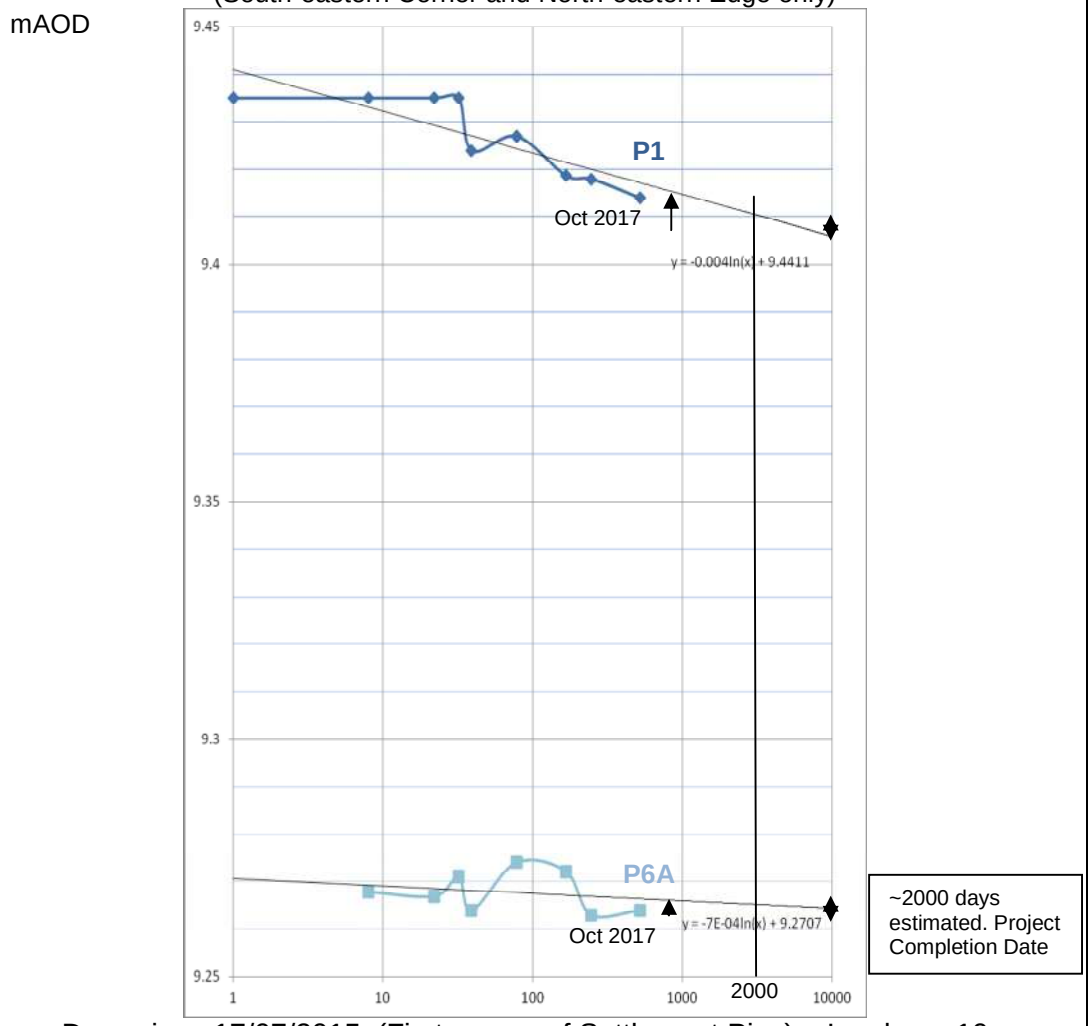
Following the current trend of settlement the above graph indicates that levels may settle to 10.005mAOD after 10^4 days (~30years or 2045). With the last survey indicating levels of 10.043m a further 0.035m (35mm) should be anticipated under the current surcharge by 2045 or ~20mm after project completion.

Monitoring Pin 3

Unfortunately baseline conditions for Monitoring Pin 3 (located on the western edge of the site) were following the placement of fill. Monitoring Pin 3A was similarly lost. It is considered that any attempt to assess future settlement from Monitoring Pin 3B would be open to too much error and inaccuracy to predict. 28mm settlement was measured over 440days. Future settlement at this location may be slightly greater than at Monitoring Pin 2A but still less than 50mm or ~20mm after project completion.

SECTION 2 Settlement Monitoring (Continued)

Graph 2.5 Settlement at Monitoring Pins P1 and P6A
(South-eastern Corner and North-eastern Edge only)



Days since 17/07/2015. (First survey of Settlement Pins) – Log base 10
* Note Original Pin of P6 was lost.

Monitoring Pin 1

Data for Monitoring Pin 1 (located near the South-eastern Corner of the site) is complete and to date indicates settlement of ~21mm over 517 days. Conjecturing future settlement from the data obtained indicates that levels may settle to 9.405mAOD after 10^4 days (~30years or 2045). With the last survey indicating levels of 9.414m a further 0.010m (10mm) should be anticipated under the current surcharge by 2045 or ~5mm after project completion.

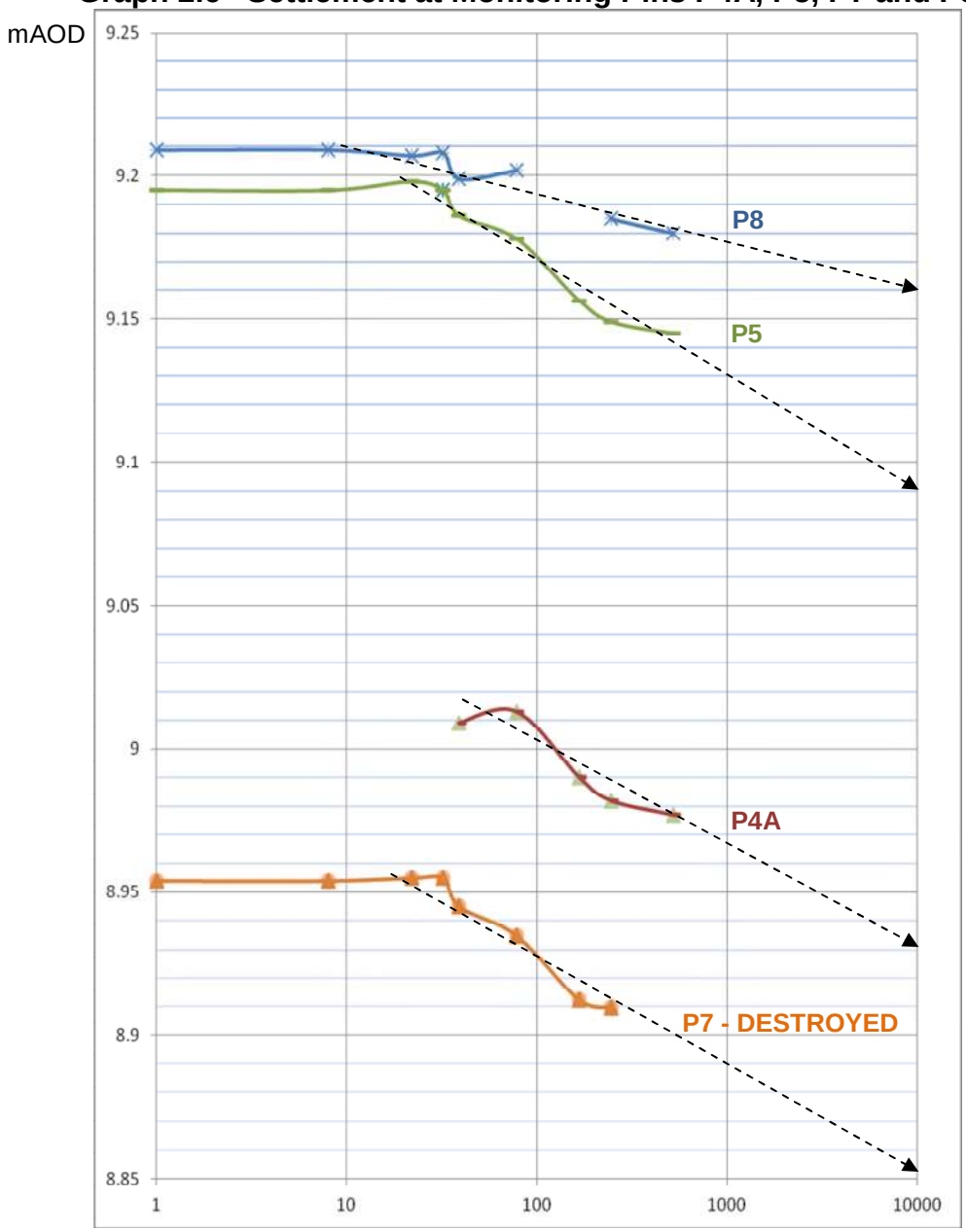
Monitoring Pin 6

Unfortunately baseline conditions for Monitoring Pin 6 (located within the North-eastern corner of the site) were lost as the pin was destroyed. Monitoring Pin 6A has however recorded ~5mm of settlement over 510 days. Whilst the initial readings may be lost it may be possible to conjecture future settlement from the data obtained.

Following the current trend of settlement the above graph indicates at that levels may have settled at 9.27mAOD after 10^4 days (~30years or 2045). With the survey indicating fluctuating levels of 9.263m no further settlement is anticipated under the current surcharge by 2045.

SECTION 2 Settlement Monitoring (Continued)

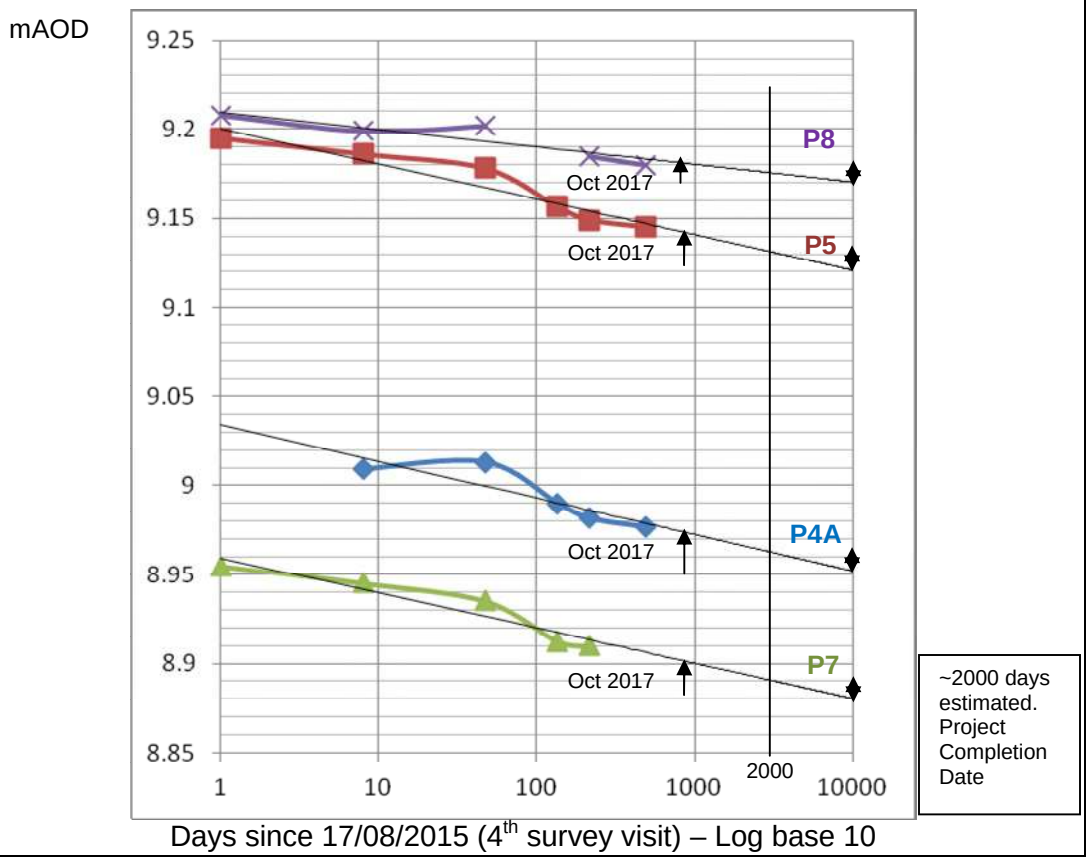
Graph 2.6 Settlement at Monitoring Pins P4A, P5, P7 and P8



Days since 17/07/2015. (First survey of Settlement Pins) – Log base 10
* Note Original Pin of P4 was lost.

SECTION 2 Settlement Monitoring (Continued)

Graph 2.7 Two Week Adjusted fit of Logarithmic Settlement Curve Due to Earthworks Delay for Monitoring Pins 4A, 5, 7 and 8.



Monitoring Pin 4A

Unfortunately baseline conditions for Monitoring Pin 4 (located within the North-western corner of the site) were lost as the pin was destroyed. Monitoring Pin 4 recorded 1mm of settlement within ~20 days. It is considered that any attempt to assess future settlement at Monitoring Pin 4A would be open to too much error and inaccuracy to predict.

It is noted that following the current trend of settlement the graph indicates at that levels may settle to 8.950mAOD after 10^4 days (~30years or 2045). With the most recent survey indicating levels of 8.978mAOD a further ~30mm settlement is anticipated under the current surcharge by 2045 or ~20mm after project completion.

Monitoring Pin 5,

Monitoring Pin 5 from the northern centre of the site follows a logarithmic settlement curve fairly closely. In an effort to predict settlement the existing trend, which may be inaccurate, indicate a possible settlement to ~9.12mAOD, a further ~25mm settlement from recent level or ~20mm after project completion.

SECTION 2 Settlement Monitoring (Continued)

Monitoring Pin 7

Monitoring Pin 7 from the eastern edge of the site follows a logarithmic settlement curve fairly closely. In an effort to predict settlement the existing trend, which may be inaccurate, indicate a possible settlement from ~8.91mAOD to ~8.88mAOD, a further ~30mm settlement from recent level or ~20mm after project completion.

Monitoring Pin 8

Monitoring Pin 8 from the southern centre of the site follows a logarithmic settlement curve fairly closely. In an effort to predict settlement the existing trend, which may be inaccurate, indicate a possible settlement to ~9.18 to ~9.17mAOD, a further ~10mm settlement from recent level or ~5mm after project completion.

Table 2.5 Summary of Predicted Settlements

Monitoring Pin	Initial Survey mAOD	Measured Settlement	Predicted Settlement after 10^4 days (from July 2015 - 2045)*		Predicted Settlement Remaining after December 2016 until 2045)*	Predicted Settlement between 2000days to 2045*
Monitoring Pin 1 (SE Corner)	9.435	- 21mm (517 days)	- 30mm (approx)	9.405 mAOD	- 9mm (approx)	-5mm (approx)
Monitoring Pin 2 (SW Corner)	10.069	Not Achieved	N/A		N/A	
Monitoring Pin 2A (SW Corner)	10.071	- 28mm (223 days)	- 66mm (approx)	10.005m AOD	- 38mm (approx)	-20mm (approx)
Monitoring Pin 3 (W Edge)	N/A	+ 1mm (21 days)	N/A		N/A	
Monitoring Pin 3A (W Edge)	9.195	Not Achieved	N/A		N/A	
Monitoring Pin 3B (W Edge)	9.708	- 28mm (440 days)	N/A		N/A	
Monitoring Pin 4 (NW Corner)	8.772	- 1mm (21 days)	N/A		N/A	
Monitoring Pin 4A** (NW Corner)	9.009	- 32mm (479 days)	- 59mm (approx)	8.950 mAOD	- 27mm (approx)	-20mm (approx)
Monitoring Pin 5** (N Edge)	9.195	- 50mm (517 days)	- 75mm (approx)	9.120 mAOD	- 25mm (approx)	-20mm (approx)
Monitoring Pin 6 (NE Corner)	9.220	Not Achieved	N/A		N/A	
Monitoring Pin 6A (NE Corner)	9.268	- 5mm (510 days)	0mm (approx)	9.264 mAOD	0mm (approx)	0mm (approx)
Monitoring Pin 7** (E Edge)	8.954	- 44mm (244 days)	74mm (approx)	8.880 mAOD	- 30mm (approx)	-20mm (approx)
Monitoring Pin 8** (Centre)	9.209	- 29mm (517 days)	39mm (approx)	9.17 mAOD	- 10mm (approx)	- 10mm (approx)

Assumptions:
Earthworks are instantiations with settlement beginning on Day 1. (Or 17/08/2015 for Monitoring Pins 4A, 5, 7 and 8.)
Settlement is logarithmic.

Known Inaccuracies:
Earthworks was not instantaneous and in reality took longer than anticipated.
Earthworks has not occurred equally across the site, notably:

- Some areas have more fill placed than others.
- Additional fill has been placed during the settlement process sometimes months later through intermittent earthworks post supervision.

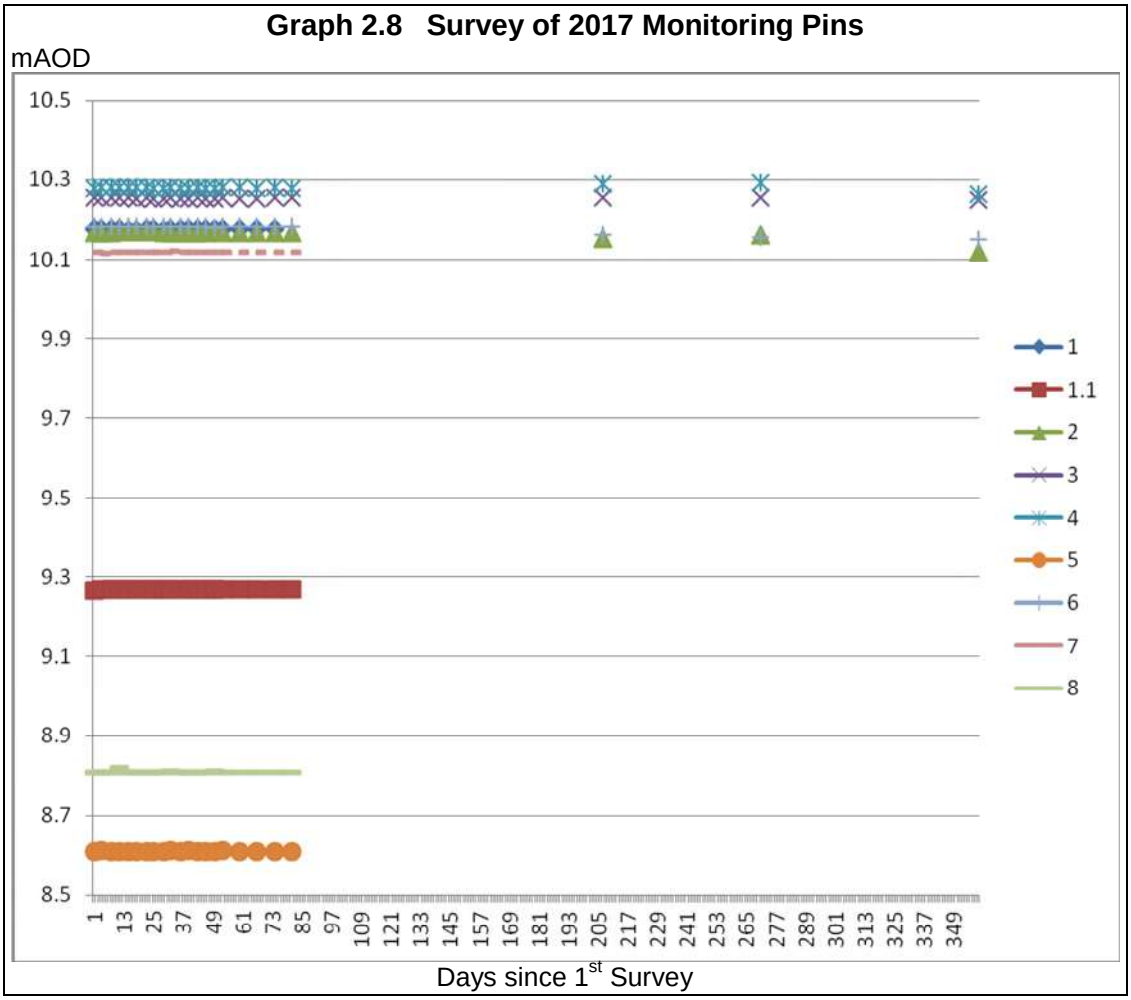
Notes:
* Assuming no further fill is placed
** Monitoring Pins 4a 5, 7 and 8 do not conform with a logarithmic settlement curve. A better fit is achieved when the start date is set back. Estimates for these Monitoring Pins therefore discounts any settlement during the first three survey rounds.
N/A = Not achievable, insufficient baseline information.

SECTION 2 Settlement Monitoring (Continued)

A series of new settlement monitoring pins were installed 6th June 2017 to replace the original series which were unserviceable for future phases of earthworks. ~1 year has passed, however this does not appear to have been a long enough period of time to demonstrate further settlement.

Not a single pin had dropped by 1mm in the first 80 days. This was to be expected as the rate of settlement is anticipated to be slow and less than 1% of the predicted settlement by 2045. See **Graph 3.8.**

Graph 2.8 Survey of 2017 Monitoring Pins



Settlement pins were monitored less frequently during the past 80 days. Settlement Pin 1 was lost to construction of the haul road and Settlement Pin 5 was lost to construct the reen. Settlement Pins 7 and 8 were accidentally lost / destroyed at this time.

SECTION 2 Settlement Monitoring (Continued)

A summary of settlement and remaining settlement for the new series of Monitoring Pins is presented in **Table 2.6** below. It should be noted that this does not take any future fill events into consideration.

Table 2.6 Summary of Predicted Settlements (From Replacement Series of Monitoring Pins)

Monitoring Pin	Predicted Settlement Remaining from October 2017 to 2045*- from original series	Initial Survey mAOD	Lowest Result mAOD	Measured Settlement since New Monitoring Pins Installed	Current Predicted Settlement Remaining* (2045) - measured settlement subtracted from predicted settlement from original series
Monitoring Pin 1 (SE Corner)	5mm (approx)	10.175	10.173	- 0mm (74 days)	**5mm (approx)**
Monitoring Pin 2 (SW Corner)	30mm (approx)	10.168	10.167	- 0mm (81 days)	**30mm (approx)**
			10.117	- 53mm (359 days)	Suspected unrecorded damage of monitoring pin
Monitoring Pin 3 (W Edge)	N/A	10.254	10.253	- 0mm (80 days)	N/A
			10.255	- 0mm (271 days)	N/A
			10.250	- 4mm (359 days)	Suspected unrecorded damage of monitoring pin
Monitoring Pin 4 (NW Corner)	25mm (approx)	10.279	10.278	- 0mm (80 days)	**25mm (approx)**
			10.265	- 23mm (359 days)	Suspected unrecorded damage of monitoring pin
Monitoring Pin 5 (N Edge)	20mm (approx)	8.608	8.608	+1mm (81days)	**20mm (approx)**
Monitoring Pin 6 (NE Corner)	0mm (approx)	10.181 – destroyed 9.17 – 20/7/17	9.17	- 1mm (207 days)	**0mm (approx)**
			9.138	-32mm (359 days)	Suspected unrecorded damage of monitoring pin
Monitoring Pin 7 (E Edge)	20mm (approx)	10.118 – destroyed 9.109 – 20/7/17	9.108	- 0mm (42 days)	**20mm (approx)**
Monitoring Pin 8 (Centre)	10mm (approx)	9.81– destroyed 8.81 – 26/7/17	8.81	- 0mm (36 days)	**10mm (approx)**

Assumptions:
Settlement is logarithmic.

Known Inaccuracies:
Earthworks was not instantaneous and in reality took longer than anticipated.
Earthworks has not occurred equally across the site, notably:

- Some areas have more fill placed than others.
- Additional fill has been placed during the settlement process sometimes months later through intermittent earthworks post supervision.

Notes:
* Assuming no further fill is placed
N/A = Not achievable, insufficient baseline information.
Lost through planned construction | Lost / Destroyed | Suspected unrecorded damage

An average remaining settlement of 25mm is anticipated across the site by 2045.