

1.1 Limitations and Exceptions of Investigation

Merthyr Tydfil County Borough Council have requested that in-situ soakaway and in situ CBR testing be performed at the site.

The report has been conducted and this report has been prepared for the sole internal reliance of Merthyr Tydfil County Borough Council and their design team. 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 geotechnical and geo-environmental consultants. Terra Firma (Wales) Limited does not provide legal advice and the advice of lawyers may also be required. The subsurface geological profiles, any contamination and other plots are generalised by necessity and have been based on the information found at the locations of the exploratory holes and depths sampled and tested.

2.0 Site Work

The site works were undertaken on 12th September 2019 and comprised the excavation of six trial pits for infiltration testing and six in situ CBR tests.

The trial pits were excavated using a JCB 3CX and the position of the soakage tests was determined by Merthyr Tydfil County Borough Council. The preferred depth of testing was specified as 3m, with the final decision made on site by Terra Firma (Wales) Limited dependant on the material encountered and trial pit stability.

The fieldworks were supervised by Terra Firma (Wales) Limited, who also logged the trial pits to the requirements of BS5930:2015. The soakaway tests were conducted to the requirements of BRE365.

The trial pits are referenced SA01-SA06 located in the order of time they were excavated.

The trial pit logs are presented in **Annex A** and their locations are shown on **Drawing 02**.

3.0 Ground Conditions

Table 3.1 Summary of Ground Conditions				
Depth (m)			Thickness (m)	Stratum
GL	-	0.0.3/0.2	0.03-0.2	Soft Brown CLAY
0.05/0.3	-	0.5/0.6	0.3-0.45	Firm/Stiff yellowish brown/brownish grey gravelly CLAY. (SA1 & SA4) (Colliery Spoil)
0.03/2	-	0.3/2.35	0.27-1.7	Loose / Medium Dense GRAVELS of mudstone. (SA1, SA4, SA5 and SA6) (Colliery Spoil)
0.05/0.1	-	1.58/2.0	1.5-1.95	Medium dense clayey GRAVEL. Very CLAYEY in places. (SA2, SA3 & SA6) (Colliery Spoil)
1.7/1.9	-	1.8/2.2	0.1-0.3	Firm/Stiff yellowish brown/greenish brown gravelly CLAY. (SA1 & SA30 (Colliery Spoil)
- No groundwater was encountered during the investigations. - Where pure gravels were encountered the trial pit became unstable.				

4.0 In-situ Soakaway Test Results

During the site investigation six soakaway tests were undertaken in SA1 to SA6.

Terra Firma were unable to achieve a head of water in SA1 SA4 SA5 and SA6 where the infiltration of the soils was higher than the flow rate of the pump. Three 2000 litre water bowers were pumped into the test pit. The pump (Honda WB30) can deliver 1100 litres of water per minute. From past experience an infiltration rate of 4.0×10^{-4} m/s may be used.

High Clay content was encountered throughout SA2 and SA4. The water in these soakaways did not move during the observation period. A summary of the soakaway test results is presented in **Table 4.1**.

Table 4.1 Soakaway Test Results		
Trial pit	Test	Rate of Infiltration
SA1	1 of 1	4.0×10^{-4} m/s
SA2	1 of 1	No infiltration
SA3	1 of 1	No Infiltration
SA4	1 of 1	4.0×10^{-4} m/s
SA5	1 of 1	4.0×10^{-4} m/s
SA6	1 of 1	4.0×10^{-4} m/s

Due to the infiltration test results and the underlying strata encountered it is suggested that shallow soakaways are feasible within the pure Gravel strata below the site.

The infiltration rates given are only representative of the depths and locations that they were undertaken. Clay containing strata is not suitable for soakaway drainage.

5.0 In Situ CBR Testing

During the investigation six CBR tests were conducted in close proximity to the trial pits. The top soil was removed at each location. Given the granular nature of ground on site, the CBR value was derived from plate load bearing tests. The full test results can be viewed within **Annex B** at the back of the report.

We trust that the above is to your satisfaction, however, if you have any queries or require any further information please do not hesitate to contact us.

Yours sincerely
for: Terra Firma (Wales) Ltd

A handwritten signature in black ink, appearing to read "I. Brooks", enclosed within a simple oval outline.

Ieuan Brooks

enc.

Annex A - Trial Pit Logs
Annex B – CBR Testing
Drawing 01 - Site Location
Drawing 02 - Site Layout

ANNEX A
Trial Pit Logs



Tel: 02920 735354
info@terrafirmawales.co.uk
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Terra Firma (Wales) Limited
5 Deryn Court, Wharfedale Road
Pentwyn, Cardiff
CF23 7HA

Trial Pit No:

SA2

Sheet 1 of 1

Project Name: Orbit Centre Car Park

Project No:
15602

Co-ords: -
Level:

Date:
12/09/2019

Location: Merthyr

Dimensions: 1.58

Depth
1.58

0.60

Scale:
1:25

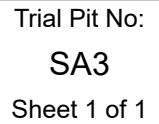
Logged:
leuan

Client: Merthyr Tydfil County Borough Council

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.08			Soft brown CLAY with fine rootlets. (Colliery Spoil Made Ground).
				1.58			Medium dense? clayey GRAVELS with rare boulders. (Colliery Spoil Made Ground).
							End of Pit at 1.580m

Stability: Trial pit sides were unstable.

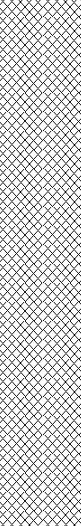
Remarks: No groundwater encountered. Trial pit backfilled with arisings.



Date:
12/09/2019

Scale:
1:25

Logged:
leuan

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.10		 	Soft brown CLAY with fine rootlets. (Colliery Spoil Made Ground). Medium dense? grey very clayey GRAVELS with rare boulders. Gravels are fine to coarse angular mudstone. Single piece of timber. (Colliery Spoil Made Ground).
				1.90			Stiff greenish grey gravelly CLAY. (Colliery Spoil Made Ground).
				2.20			End of Pit at 2.200m

Remarks: No groundwater encountered. Trial pit backfilled with arisings.



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Trial Pit No:

SA4

Sheet 1 of 1

Project Name: Orbit Centre Car Park				Project No: 15602		Co-ords: - Level:		Date: 12/09/2019	
Location: Merthyr						Dimensions: 1.50		Scale: 1:25	
Client: Merthyr Tydfil County Borough Council						Depth 1.65		Logged: Ieruan	
Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description		
	Depth	Type	Results						
				0.03			Soft brown CLAY with fine rootlets.		
				0.30			Medium dense grey fine to coarse angular GRAVELS of mudstone. With frequent cobble content (Colliery Spoil Made Ground).		
				0.60			Firm soft in places brown and grey very gravelly CLAY. Gravels are fine to coarse subangular gravels of mudstone. (Colliery Spoil Made Ground).		
				1.65			Medium dense/Loose? grey fine to coarse angular GRAVELS of mudstone. With frequent cobble content. (Colliery Spoil Made Ground).		
							End of Pit at 1.650m		
									1
									2
									3
									4
									5

Stability: Sides of trial pit collapsing at depth.

Remarks: No groundwater encountered. Trial pit backfilled with arisings.



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Trial Pit No:

SA5

Sheet 1 of 1

Project Name: Orbit Centre Car Park	Project No: 15602	Co-ords: - Level:	Date: 12/09/2019
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Location: Merthyr	Dimensions: 1.80 Depth 1.90	Scale: 1:25 Logged: leuan
Client: Merthyr Tydfil County Borough Council		

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.20			Soft brown CLAY with fine rootlets.
							Medium dense? grey fine to coarse angular GRAVELS of mudstone with rare angular cobbles. (Colliery Spoil Made Ground). <i>Old tarmac layer sloping towards to the south.</i>
				1.90			End of Pit at 1.900m

Stability: Sides becoming unstable at depth.

Remarks: No groundwater encountered. Trial pit backfilled with arisings.



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Trial Pit No:

SA6

Sheet 1 of 1

Project Name: Orbit Centre Car Park	Project No: 15602	Co-ords: - Level:	Date: 12/09/2019
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Location: Merthyr	Dimensions: 1.80 Depth 2.35	Scale: 1:25 Logged:
Client: Merthyr Tydfil County Borough Council		

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.05			Soft brown CLAY with fine rootlets. Medium dense? clayey GRAVEL with frequent cobbles and rare boulders. Rare bricks. Becoming very clayey with depth. (Colliery Spoil Made Ground).
				1.60			Medium dense? very clayey GRAVEL. (Colliery Spoil Made Ground).
				2.00			Loose to medium dense? very CLAYEY gravel fine to coarse with cobbles. (Colliery Spoil Made Ground).
				2.35			End of Pit at 2.350m

Stability: Trial Pit sides are unstable at depth

Remarks: No groundwater encountered. Trial pit backfilled with arisings.

ANNEX B
CBR Results

**Apex Testing Solutions**

Sturmi Way
Village Farm Industrial Estate
Pyle
Bridgend
CF33 6BZ
Telephone :01656 746762
Facsimile :01656 749096
Email andrew.grogan@apex-drilling.com

REPORT No. : **D9325-19**

CLIENT : Terra Firma

SITE : Merthyr

MATERIAL DESCRIPTION : See Individual Tests Results

DATE TESTED : 12 September 2019

TESTING REQUIRED : 6 No. Plate Load Bearing Tests

RELEVANT SPECIFICATION : BS 1377 : Part 9 : 1990
In House Method / Clients Specification
IAN 73/06 (supersedes HD 25/94)

TEST METHOD : Clause 4.1.6.4.2

TEST RESULTS : See Pages 3 – 8

**Apex Testing Solutions**

Sturmi Way
Village Farm Industrial Estate
Pyle
Bridgend
CF33 6BZ
Telephone :01656 746762
Facsimile :01656 749096
Email : andrew.grogan@apex-drilling.com

REPORT No. : **D9326-19**

CLIENT : Terra Firma

SITE : Merthyr

TEST LOCATION : 6 No. Locations as instructed by Client

DEPTH (m) : See Individual Test Results

Reaction Load : JCB

Plate Diameter : 300mm

TEST RESULTS

Test No.	1	2	3	4	5	6
CBR%	25	7.7	10	10	18	23

COMMENTS

Weather - Overcast

CHECKED BY: A Grogan

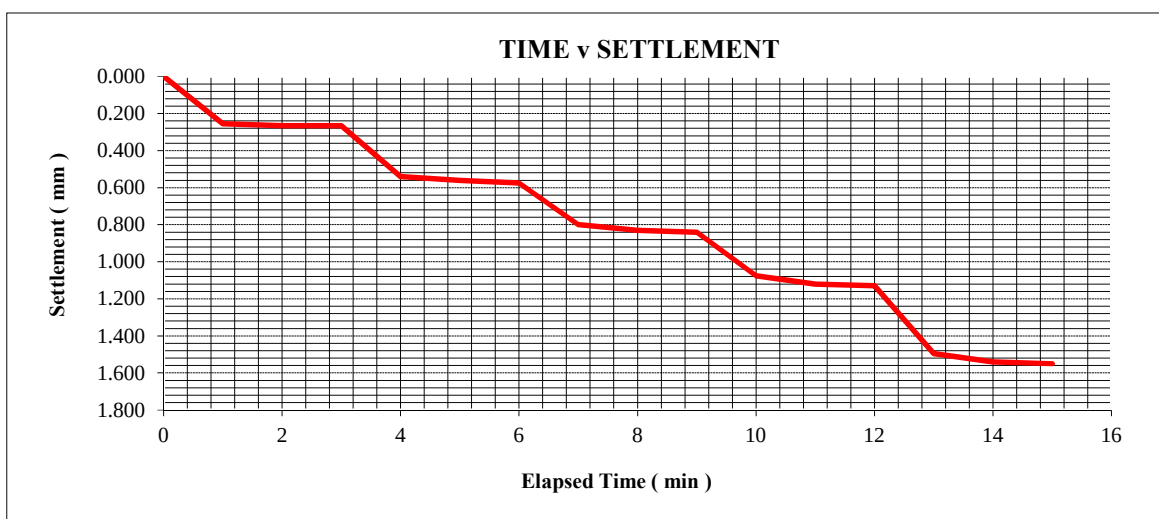
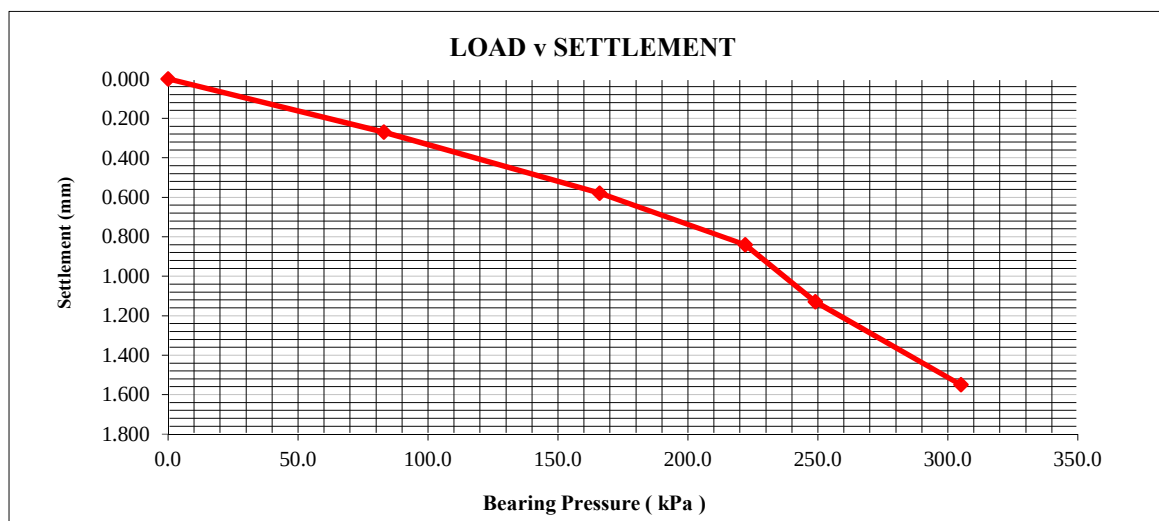
DATE : 13.09.2019



REPORT No : D9325-19
CLIENT : Terra Firma
SITE : Merthyr

TEST RESULTS

TEST No.	: 1
DATE TESTED	: 12 September 2019
SAMPLE TYPE	: Natural
DEPTH (m)	: Topsoil Removed
SAMPLE DESCRIPTION	: Dark grey gravelly CLAY
LOCATION	: Soakaway 1
Plate Size	: 300 mm
LOAD TO ACHIEVE 1.25mm SETTLEMENT >	: 265.00 kN/m ²
MODULUS OF SUBGRADE REACTION (k_{762}) >	: 93640 kN/m ² /m
Equivalent CBR VALUE >	: 25 %

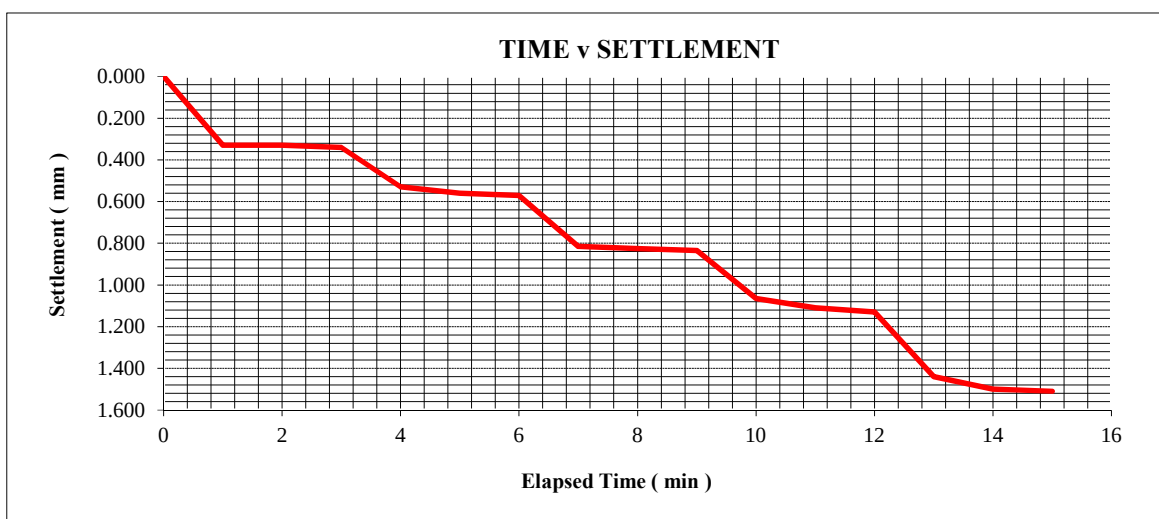
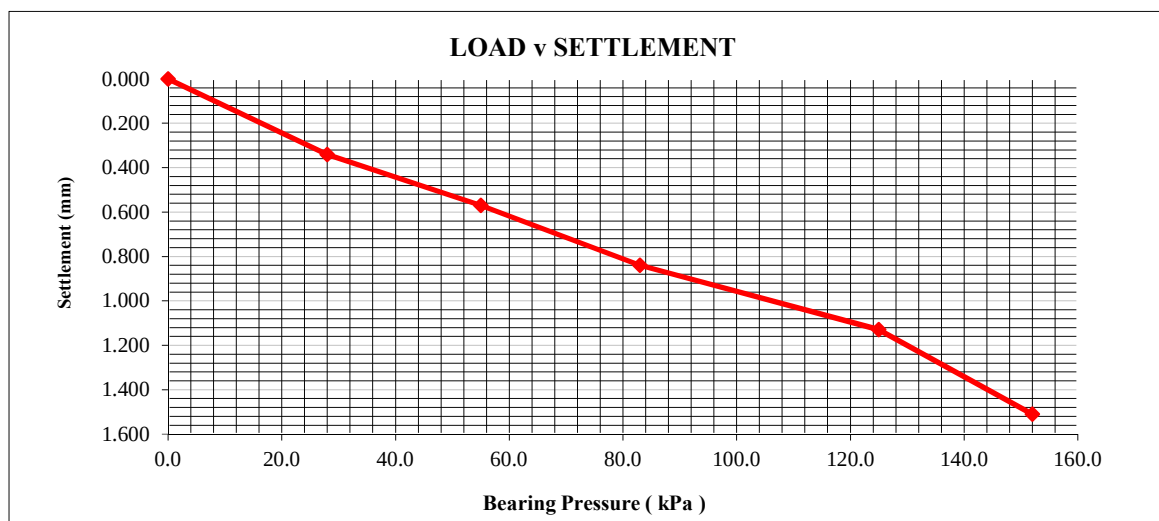




REPORT No : D9325-19
CLIENT : Terra Firma
SITE : Merthyr

TEST RESULTS

TEST No.	: 2
DATE TESTED	: 12 September 2019
SAMPLE TYPE	: Natural
DEPTH (m)	: Topsoil Removed
SAMPLE DESCRIPTION	: Dark grey gravelly CLAY
LOCATION	: Soakaway 5
Plate Size	: 300 mm
LOAD TO ACHIEVE 1.25mm SETTLEMENT >	: 133.53 kN/m ²
MODULUS OF SUBGRADE REACTION (k_{762}) >	: 47183 kN/m ² /m
Equivalent CBR VALUE >	: 7.7 %

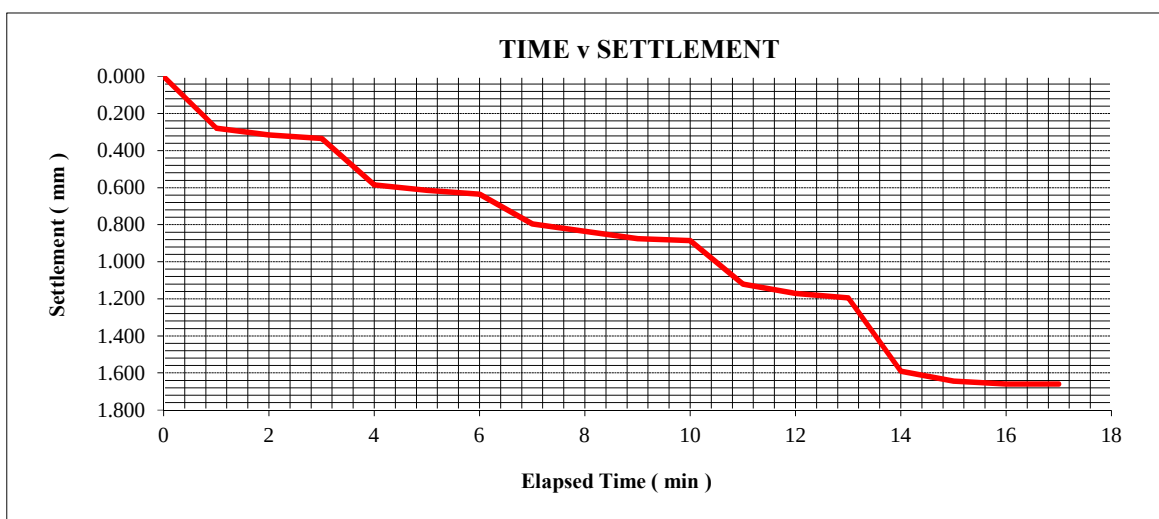
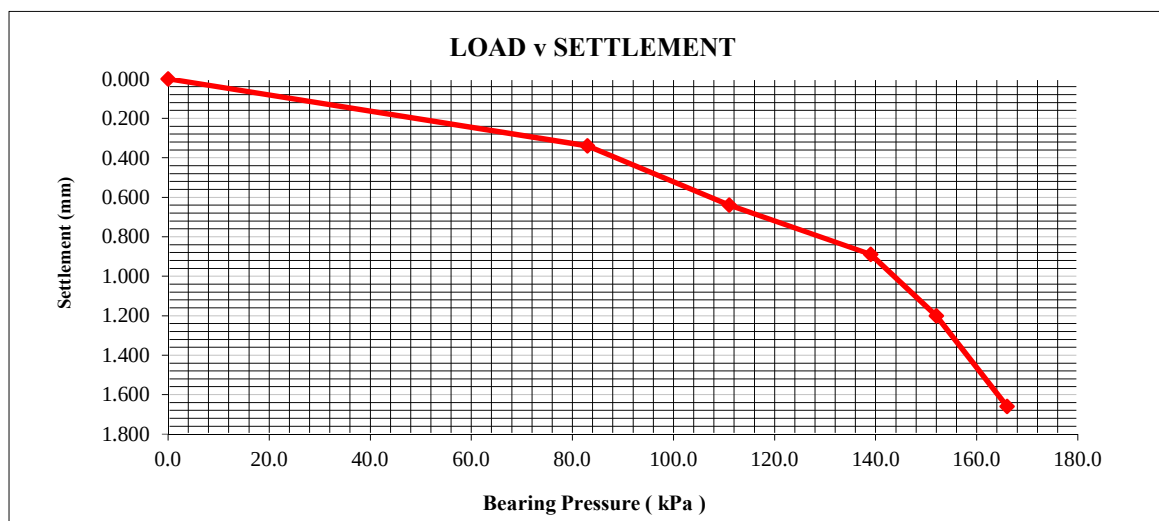




REPORT No : D9325-19
CLIENT : Terra Firma
SITE : Merthyr

TEST RESULTS

TEST No.	: 3
DATE TESTED	: 12 September 2019
SAMPLE TYPE	: Natural
DEPTH (m)	: Topsoil Removed
SAMPLE DESCRIPTION	: Dark grey gravelly CLAY
LOCATION	: Soakaway 2
Plate Size	: 300 mm
LOAD TO ACHIEVE 1.25mm SETTLEMENT >	: 153.52 kN/m ²
MODULUS OF SUBGRADE REACTION (k_{762}) >	: 54248 kN/m ² /m
Equivalent CBR VALUE >	: 10 %

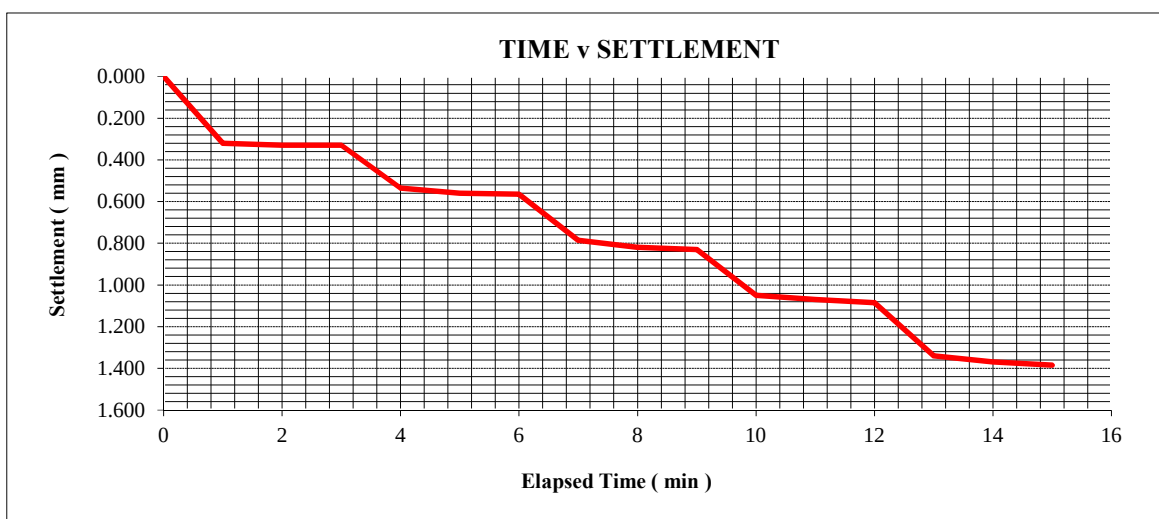
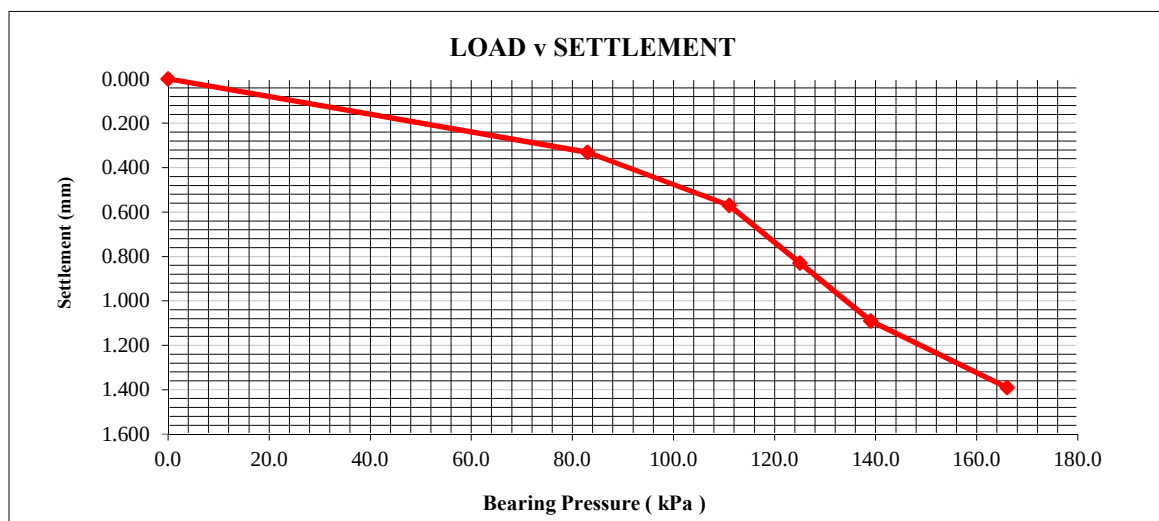




REPORT No : D9325-19
 CLIENT : Terra Firma
 SITE : Merthyr

TEST RESULTS

TEST No.	: 4
DATE TESTED	: 12 September 2019
SAMPLE TYPE	: Natural
DEPTH (m)	: Topsoil Removed
SAMPLE DESCRIPTION	: Dark grey gravelly CLAY
LOCATION	: Soakaway 6
Plate Size	: 300 mm
LOAD TO ACHIEVE 1.25mm SETTLEMENT >	: 153.40 kN/m ²
MODULUS OF SUBGRADE REACTION (k_{762}) >	: 54205 kN/m ² /m
Equivalent CBR VALUE >	: 10 %

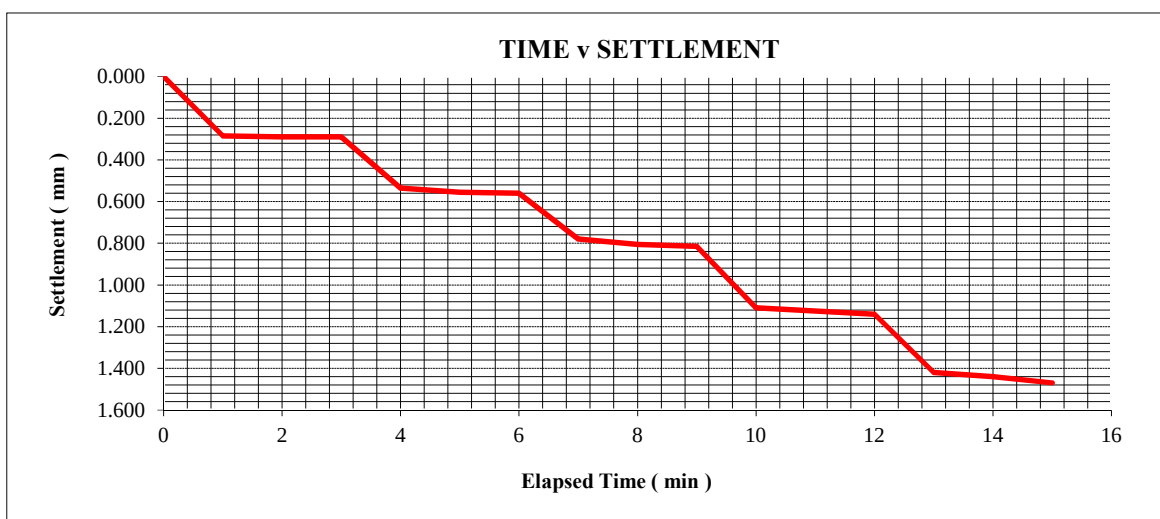
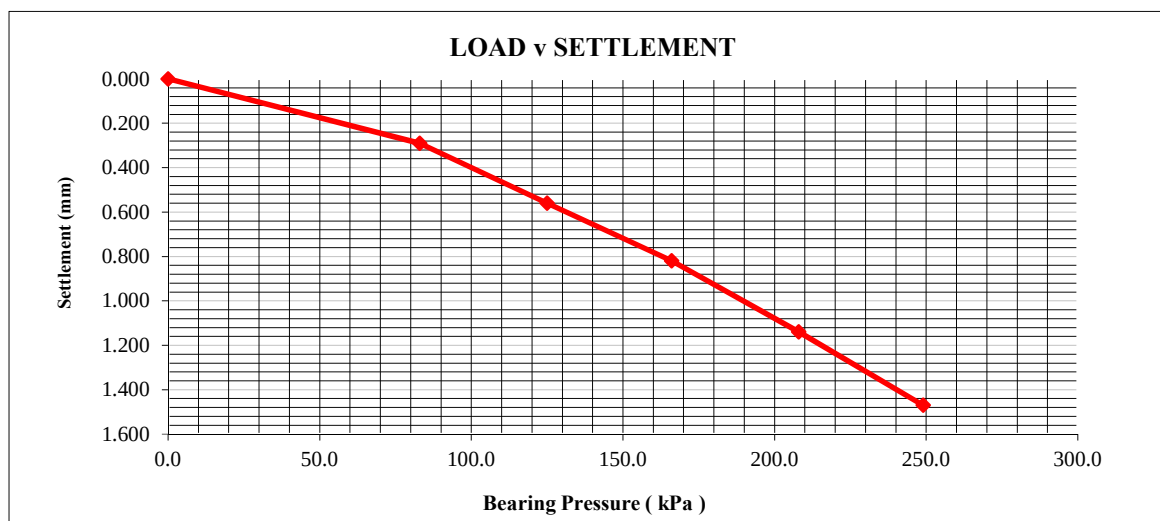




REPORT No : D9325-19
 CLIENT : Terra Firma
 SITE : Merthyr

TEST RESULTS

TEST No.	: 5
DATE TESTED	: 12 September 2019
SAMPLE TYPE	: Natural
DEPTH (m)	: Topsoil Removed
SAMPLE DESCRIPTION	: Dark grey gravelly CLAY
LOCATION	: Soakaway 3
Plate Size	: 300 mm
LOAD TO ACHIEVE 1.25mm SETTLEMENT >	: 221.67 kN/m ²
MODULUS OF SUBGRADE REACTION (k_{762}) >	: 78328 kN/m ² /m
Equivalent CBR VALUE >	: 18 %

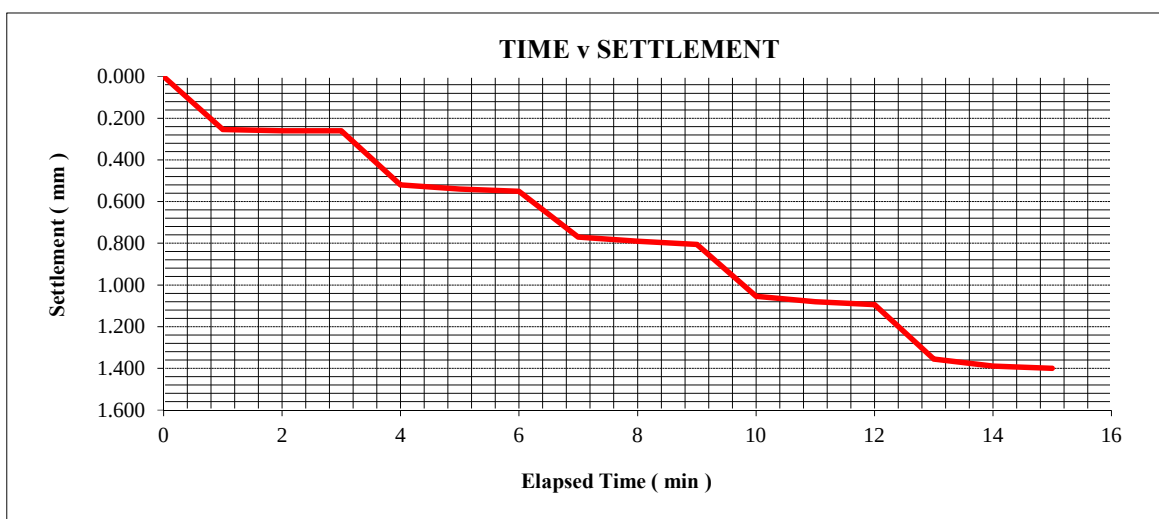
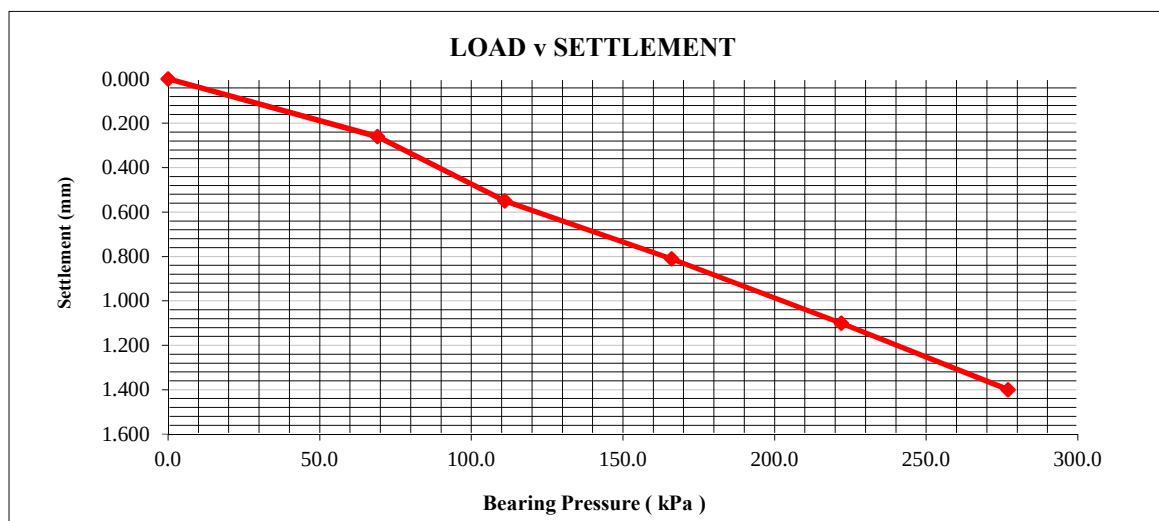




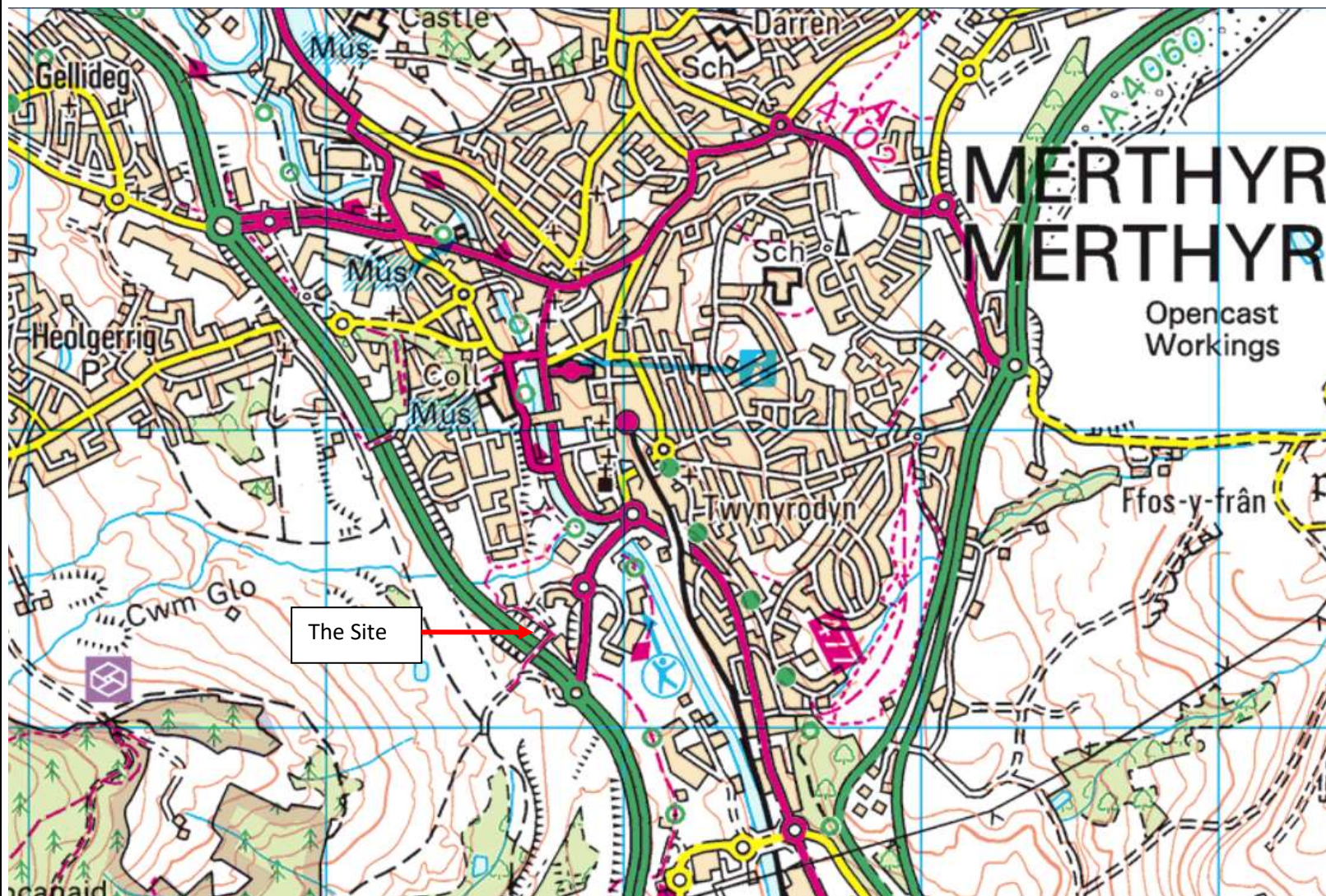
REPORT No : D9325-19
CLIENT : Terra Firma
SITE : Merthyr

TEST RESULTS

TEST No.	: 6
DATE TESTED	: 12 September 2019
SAMPLE TYPE	: Natural
DEPTH (m)	: Topsoil Removed
SAMPLE DESCRIPTION	: Dark grey gravelly CLAY
LOCATION	: Soakaway 4
Plate Size	: 300 mm
LOAD TO ACHIEVE 1.25mm SETTLEMENT >	: 249.50 kN/m ²
MODULUS OF SUBGRADE REACTION (k_{762}) >	: 88163 kN/m ² /m
Equivalent CBR VALUE >	: 23 %



Drawings



Drawing Number
01

Drawing Title
Site Location
Merthyr Tydfil

Job Number
15602

Job Title
Orbit Centre Car Park

NOT TO SCALE



Drawing Number
02

Drawing Title
SITE LAYOUT

Job Number
15602

Job Title
Orbit Centre Car Park

⊕ - Soakaway
Locations

(Locations are
approximate.)

NOT TO SCALE

