



September 2013
Report No 1858/R/03-2

GATEWEN ROAD, WREXHAM

PHASE 2

EARTHWORKS VALIDATION REPORT

Carried out for:

McAuliffe Environmental Ltd

Developer:

Bloor Homes





GATEWEN ROAD, WREXHAM

PHASE 2

EARTHWORKS VALIDATION REPORT

Date: 30th September 2013



Carried Out For:

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DISCLAIMER

TerraConsult Ltd completed this consultancy contract on the basis of a defined programme and scope of works and terms and conditions agreed with the client. This report was compiled with all reasonable skill, and care, bearing in mind the project objectives, the agreed scope of works, the prevailing site conditions, the budget, the degree of manpower and resources allocated to the project as agreed.

TerraConsult Ltd cannot accept responsibility to any parties whatsoever, following the issue of this report, for any matters arising that may be considered outwith the agreed scope of works.

This report is issued solely to the client and TerraConsult cannot accept any responsibility to any third parties to whom this report may be circulated, in part or in full, and any such parties rely on the contents at their own risk.



FS 573193



EMS 573194

GATEWEN ROAD, WREXHAM PHASE 2 EARTHWORKS VALIDATION REPORT

CONTENTS

INTRODUCTION.....	1
Report Context	1
SCOPE OF WORKS	1
SITE RECORDS	2
LABORATORY TESTING	2
Geotechnical testing	2
Contamination testing	3
SITE TESTING.....	3
Compaction Trial.....	3
Sand replacement tests	3
Plate bearing tests.....	4
Settlement Monitoring.....	4
As-built surveys and test records	5
CONTAMINATION	5
VALIDATION STATEMENT	5

McAULIFFE DRAWINGS

MCA-652	Earthworks methodology
BLR-1077	D1- Formation Level
BLR-1077	Top of first calorific layer
BLR-1077	Top of non-calorific layer
BLR-1077	Top of final calorific layer
BLR-1077	Final level survey

COOPERS DRAWING

4763/ 104/ Ph2	Section through Re-engineered fill for combustible material remediation
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APPENDICES

Appendix A	Earthworks Specification
Appendix L1	Geotechnical Laboratory Tests
Appendix L2	Calorific Value Laboratory Tests
Appendix S1	Daily Site records
Appendix S2	Sand Calibration
Appendix S3A	Compaction Daily Site Records
Appendix S3B(i)-	Combined density results - High Calorific Material
Appendix S3B(ii)	Combined density results - Low Calorific Material
Appendix S4	Trial Pad
Appendix S5	Plate Bearing Tests

Gatewen Road, Wrexham Phase 2 Earthworks Validation Report

INTRODUCTION

Report Context

1. TerraConsult Ltd (TCL) was instructed by McAuliffe Environmental Ltd (the Client) to prepare a specification for the earthworks for Phase 2 at Gatewen Road, Wrexham. McAuliffe Environmental Ltd is contracted to Bloor Homes (the ultimate Client) to carry out the earthworks.
2. The works comprised the excavation of combustible materials and colliery spoil across the site and the re-use of these materials as engineering fill on the site in such a manner as to remove the need for special precautions to avoid combustion of the fill in the future.
3. TerraConsult Ltd produced the specification for the earthworks (see Appendix A). TCL also provided full-time suitably qualified staff to collect samples for routine laboratory testing and to monitor the construction quality assurance for the re-engineered materials in accordance with the Specification.

SCOPE OF WORKS

4. The following scope of works was required as part of the earthworks:
 - Re-orientation of the existing stockpile of high calorific material so that it occupied the area of the proposed plots 189 to 198 (McAuliffe Drawing No. MCA 652).
 - Excavation of further high calorific material that had been shown to exist over the areas that are shown hatched green on the drawing and this material was placed on the re-orientated existing stockpile.
 - At proposed residential unit locations, the depth of excavation was such as to ensure that the minimum depth of engineered non-combustible fill beneath raft foundation edge beams was 2.0 m. The formation level for the raft foundations will be 0.725 m below the finished ground level.
 - Combustible materials were placed below the 2.0 m thickness of non-combustible fill with a maximum layer thickness of 0.50 m in any single layer (later revised to 0.6 m with the agreement of Wrexham Council). Where two layers of combustible materials were placed they were separated by a 0.60 m thick layer of non-combustible materials.
 - An illustrative section through the construction where two layers of combustible materials is shown on Coopers Drawing No 4763/ 104/ Ph2 drawing (Note: the

- 0.5 m thicknesses of the bottom three layers was later revised to 0.6 m with the agreement of Wrexham Council).
5. Non-combustible fill material is defined as having a calorific value less than 7 MJ/kg). High calorific material is material having a calorific value greater than 7 MJ/kg.
 6. Outside the footprint of buildings excavation or filling was to the proposed finished ground levels minus 0.6 m to allow for inert cover to gardens.
 7. All works were carried out under the Material's Management Plan (MMP) produced by TerraConsult for this site (dated 22nd July 2013) in accordance with the CL:AIRE "Code of Practice for the Definition of Waste" and had the approval of a Qualified Person (QP declaration dated 23rd July 2013). The Environment Agency Reference No for this site is DCL742.
 8. The overall earthworks method was to excavate the site in three cells. Cell 1 was excavated to the required formation depth and this material moved to a temporary stockpile. Then high calorific value soils were placed in the cell then low calorific value soils from Cell 2. When Cell 2 was at the required formation level, high calorific value soils were placed in the cell then low calorific value soils from Cell 3. To complete the works high calorific value soils were placed in Cell 3 and then the original material from Cell 1 was taken from the temporary stockpile and placed in Cell 3 to complete the works

SITE RECORDS

9. Daily site records were kept by TCL which showed the activities being carried out on site. These are presented as Appendix S1 to this report.

LABORATORY TESTING

Geotechnical testing

10. During the works routine geotechnical testing was carried out on samples taken by TCL and the contractor comprising the following:
 - Compaction (at PSL) – 4.5 kg method (6 No results are presented in Appendix L1)
 - Particle density (at PSL, 8 No results are presented in Appendix L1)
 - Calorific Value (at ESG - 14 No results are presented in Appendix L2)
11. The compaction test results generally confirmed the results of earlier testing on which the specification was based.
12. The particle density tests were in general agreement with the earlier testing however it is considered that the average particle density of 1.93 Mg/m³ obtained in the laboratory is marginally low. The reason for this is that the particle density test is carried out on

particle sizes in the material smaller than 37.5 mm; larger particles require to be crushed to less than 37.5 mm for the test. The material on site contained particles up to large gravel, cobbles and small boulders. These sizes comprised materials with higher particle densities (typically 2.68 Mg/m^3) than the finer gravels and sand with higher calorific values (in the region of 2.0 Mg/m^3). Sampling on site tended to be selective and omitted the large gravel, cobbles and small boulders. In order to assess the air voids content of the materials, therefore, the particle densities have been adjusted to 2.05 Mg/m^3 for the high calorific materials and 2.3 Mg/m^3 for the low calorific materials.

13. The calorific value testing gave results that are significantly lower than previous testing indicating that they would all be considered as being low calorific material.

	Net Calorific Value MJ/m ³			
Material	Cell 1	Cell 2	Cell 3	Surface 2m
High Calorific	2.144	2.897	2.544	
Low Calorific	2.140	2.405	1.699	0.4 to 2.365

Contamination testing

14. During excavation and filling works, no obvious signs of contamination were apparent or any unusual materials uncovered: no suspected asbestos containing materials were encountered. Therefore, no contamination testing was required to be carried out.

SITE TESTING

Compaction Trial

15. A compaction trial was carried out (supervised by TCL) to demonstrate that the selected plant and methods could achieve the specified requirements. The trial results are presented in Appendix S4 and showed that six passes of the roller would achieve the required densities.

Sand Replacement Tests

16. Sand replacement tests were carried out by TCL on each layer that was compacted at a frequency of 1 test per layer for each 25m x 25m area.
17. The sand was calibrated twice during the works; the results are presented in Appendix S2.
18. The results of the sand replacement tests are presented in Appendix S3A (compaction daily site records) with the combined density results for both high and low calorific materials being presented in Appendix S3B(i) and (ii) respectively.

- High calorific material:

Average dry density achieved = 1.519 Mg/m^3
(Specification required $> 1.414 \text{ Mg/m}^3$) $\therefore$ OK

Average air voids content achieved = -0.5% (Specification required $< 5\%$) $\therefore$ OK

- Low calorific material:

Average dry density achieved = 1.793 Mg/m^3
(Specification required $> 1.655 \text{ Mg/m}^3$) $\therefore$ OK

Average air voids content achieved = 4% (Specification required $< 5\%$) $\therefore$ OK

Although the majority of this material was placed at less than 12 % moisture content the compactive effort applied by the roller was sufficient to increase the dry density and hence reduce the air voids content so that only 10 out of the 54 results with greater than 12% moisture content had greater than 10 % air voids. This is considered acceptable and within specification

Plate bearing tests

19. Plate bearing tests were carried out by TCL on the finished surface at a frequency of 1 test for each 70 m x 70 m area. Note 1 test was carried out by Murray Rix (MR).
20. The results are presented in Appendix S5 and summarised in the table below.

Settlement of plate in mm at 75 kN/m^2 applied pressure										
Test	1	2	3	4	5	6	7	8	9	Plate dia mm
TCL	1.50	0.90	0.85	0.45	0.85	1.15	0.75	0.70	0.75	460
MR	2.23									600

21. The specification required 5 mm or less settlement of a 450 mm diameter plate at 75 kN/m^2 pressure applied to the plate. The above results are well within the specification.

Settlement Monitoring

22. Settlement monuments at ground level have been installed by McAuliffe (2 each in Cells 1 and 2 and one in Cell 3) at locations agreed with Bloor Homes.
23. The data will be presented to the Engineer weekly in both tabular and graphical format when available.

As-built surveys and test records

24. The as-built drawings are presented with this report as follows:

- Formation Level
- Top of first calorific layer
- Top of non-calorific layer
- Top of final calorific layer
- Final level survey

25. Inspection of the drawings gives the following conclusions:

- Thickness of bottom high calorific material layer is between 0.6 and 0.7 m.
- Thickness of sandwiched low calorific material layer is between 0.7 and 1.0 m.
- Thickness of top high calorific material layer is between 0.3 and 0.8 m.
- Thickness of top low calorific material layer (to surface) is between 2.0 and 2.4 m.

CONTAMINATION

26. As stated earlier, no obvious signs of contamination (i.e. either visually or odours) were apparent or any unusual materials uncovered during excavation and filling works and no suspected asbestos containing materials were encountered. Therefore, no contamination testing was required to be carried out.

VALIDATION STATEMENT

27. The earthworks have been carried out in compliance with the specification on the evidence obtained from the site testing.

DRAWINGS

McAULIFFE DRAWINGS

MCA-652	Earthworks methodology
BLR-1077	D1- Formation Level
BLR-1077	Top of first calorific layer
BLR-1077	Top of non-calorific layer
BLR-1077	Top of final calorific layer
BLR-1077	Final level survey

COOPERS DRAWING

4763/ 104/ Ph2	Section through Re-engineered fill for combustible material remediation
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Approx North



Surveying & Engineering Department

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Mobile : 07793 936959

Earthworks Methodology

Legend

- Existing Survey
- Proposed re-grade
- Planning Layout

JOB
GATEWEN_PHASE_2
WREXHAM
DRAWING
EARTHWORKS_METHODODOLOGY

DATE: 22.07.13 | DRAWN: DKW | SCALE: NTS

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DRAWING No:

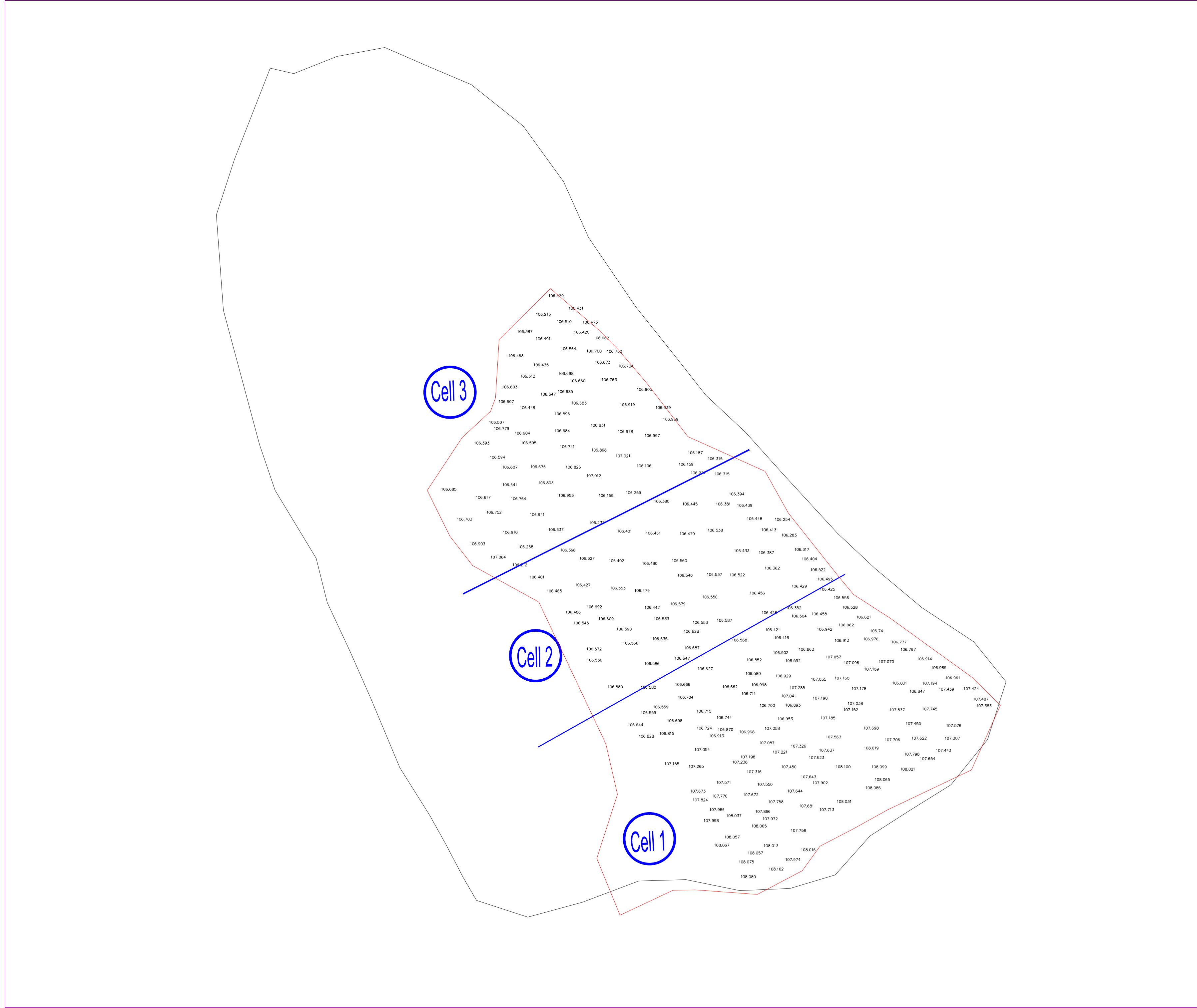
MCA-652

EARTHWORKS METHODOLOGY

1. Relocate initial calorific stockpile and carefully excavate remaining calorific zones
2. Excavate initial cell No 1, minimum 2,500m² to formation and stockpile
3. Place high calorific to base of excavated No 1 Cell and sandwich layer as required.
4. Excavate cell No 2 and place as fill or into stockpile as testing/filling productivity dictates
5. Place Calorific material into cell 2 at base and fill with material from cell 3
6. Complete excavation of cell 3 into cell 2 and place remaining calorific at base of cell 3
Backfill cell 3 with stockpiled material

STOCKPILE AREA
(HIGH CALORIFIC MATERIAL)

STOCKPILING
ZONE



N

Approx North

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Legend:

Phase boundary

Extent of work

Cell boundary

JOB

GATEWEN_VILLAGE
WREXHAM

DRAWING

D1_FORMATION_LEVEL

DATE: 19/09/2013

DRAWN: DL

SCALE: 1:500@A2

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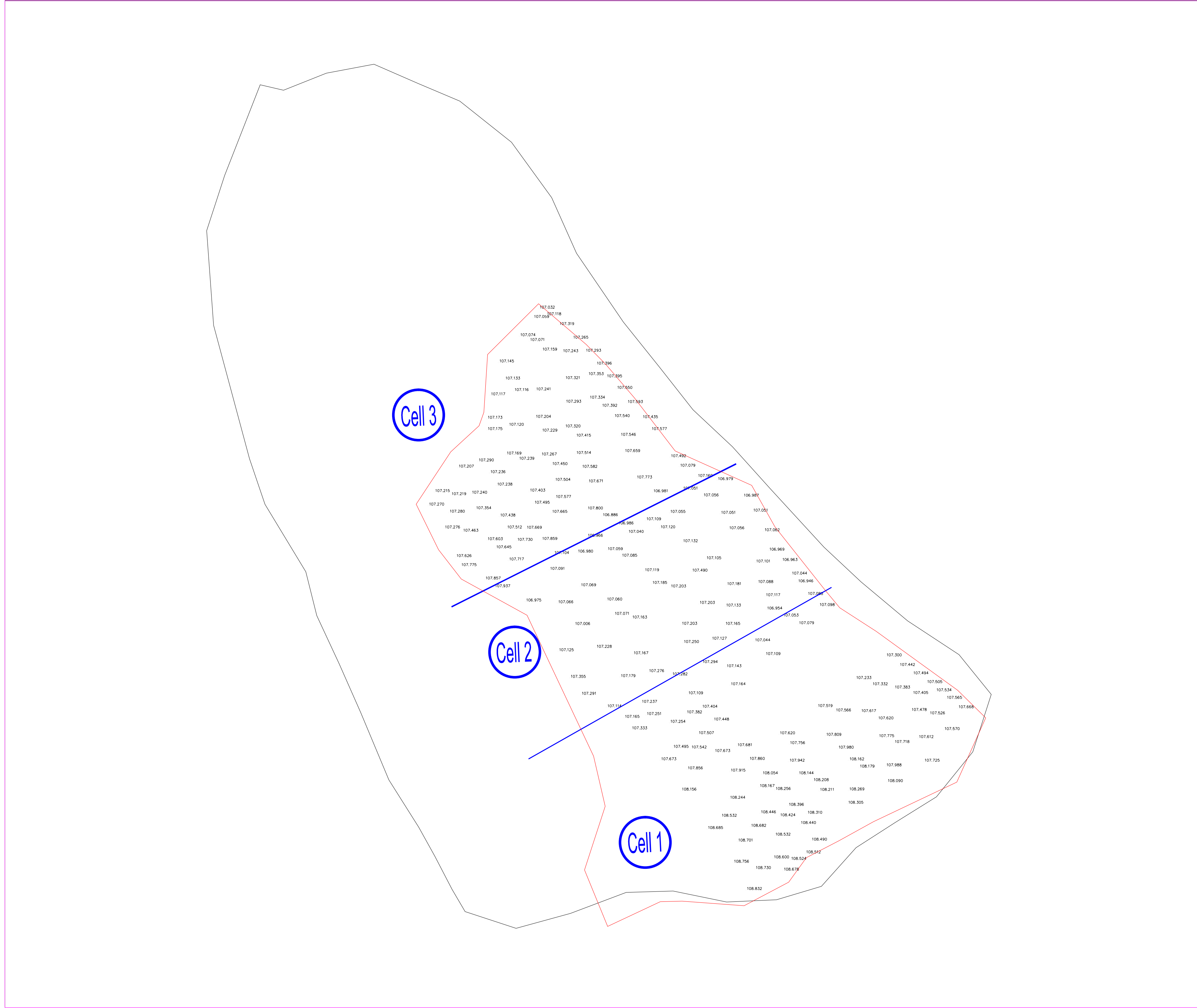
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BLR-1077



N

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Legend:

Phase boundary

Extent of works

Cell boundary

JOB

GATEWEN_VILLAGE
WREXHAM

DRAWING

TOP_OF_FIRST_CALORIFIC_LAYER

DATE: 19/09/2013

DRAWN: DL

SCALE: 1:500@A2

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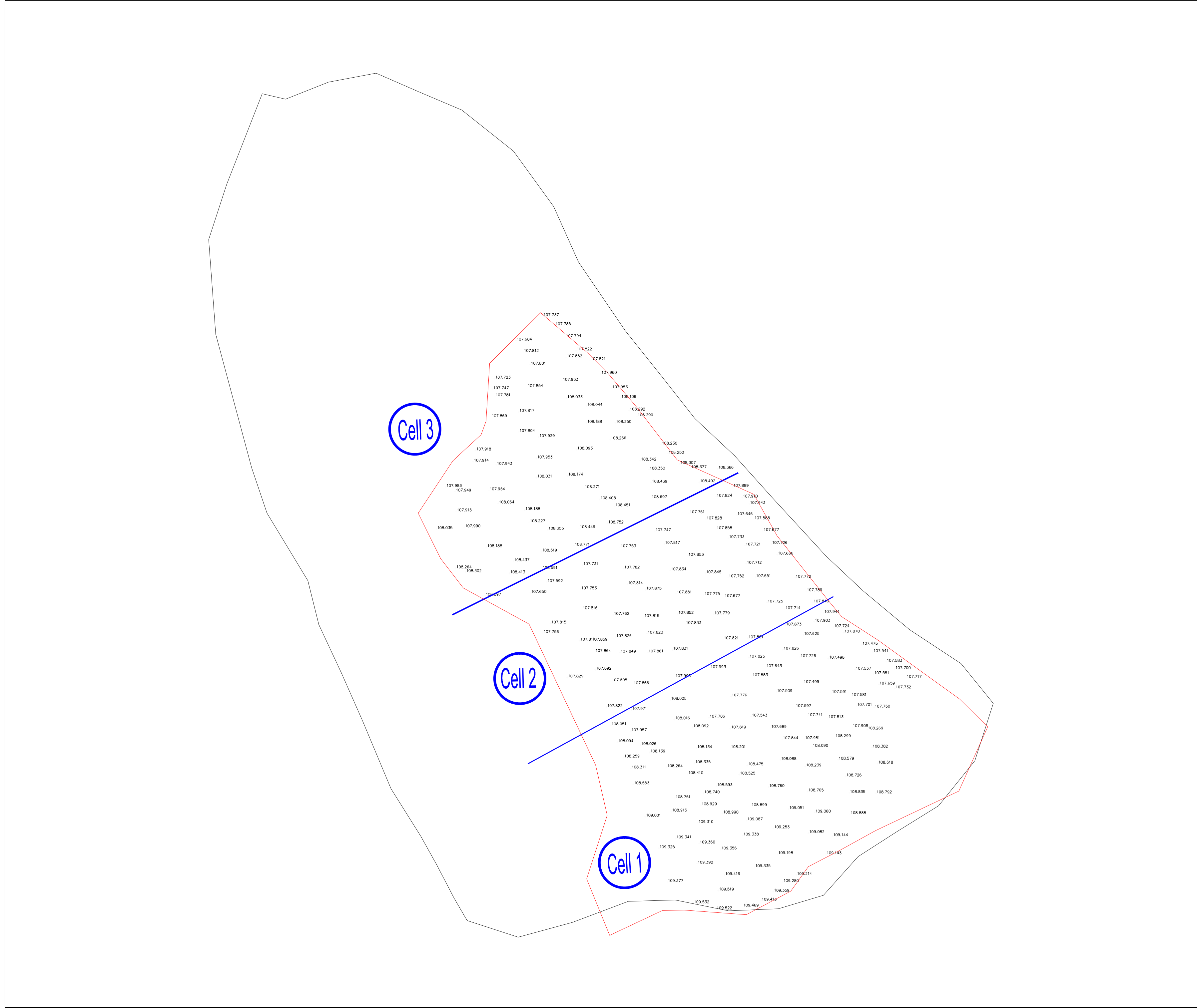
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DRAWING No:

BLR1077



N

Approx North

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Legend:

Phase boundary

Extents of work

Cell boundary

JOB

GATEWEN
WREXHAM

DRAWING

TOP_OF_NON-CALORIFIC_LAYER

DATE: 19/09/2013

DRAWN: DL

SCALE: 1:500@A2

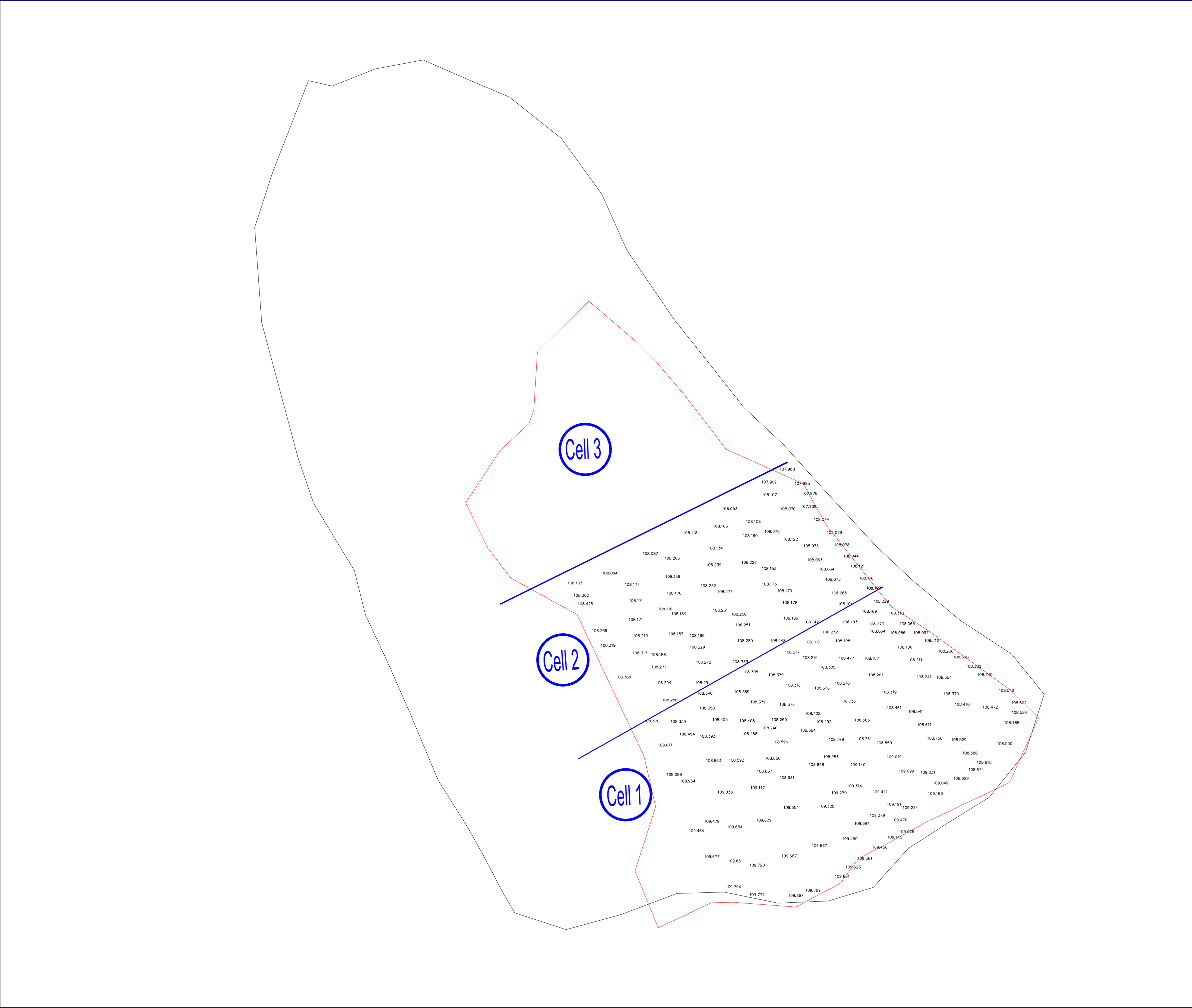
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DRAWING No:

BLR-1077



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Legend:

Phase boundary

Extents of work

Cell boundary

JOB

GATEWEN
WREXHAM

DRAWING

TOP_OF_FINAL_CALORIFIC_LAYER

DATE: 19/09/2013

DRAWN: DL

SCALE: 1:500@A2

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McAULIFFE

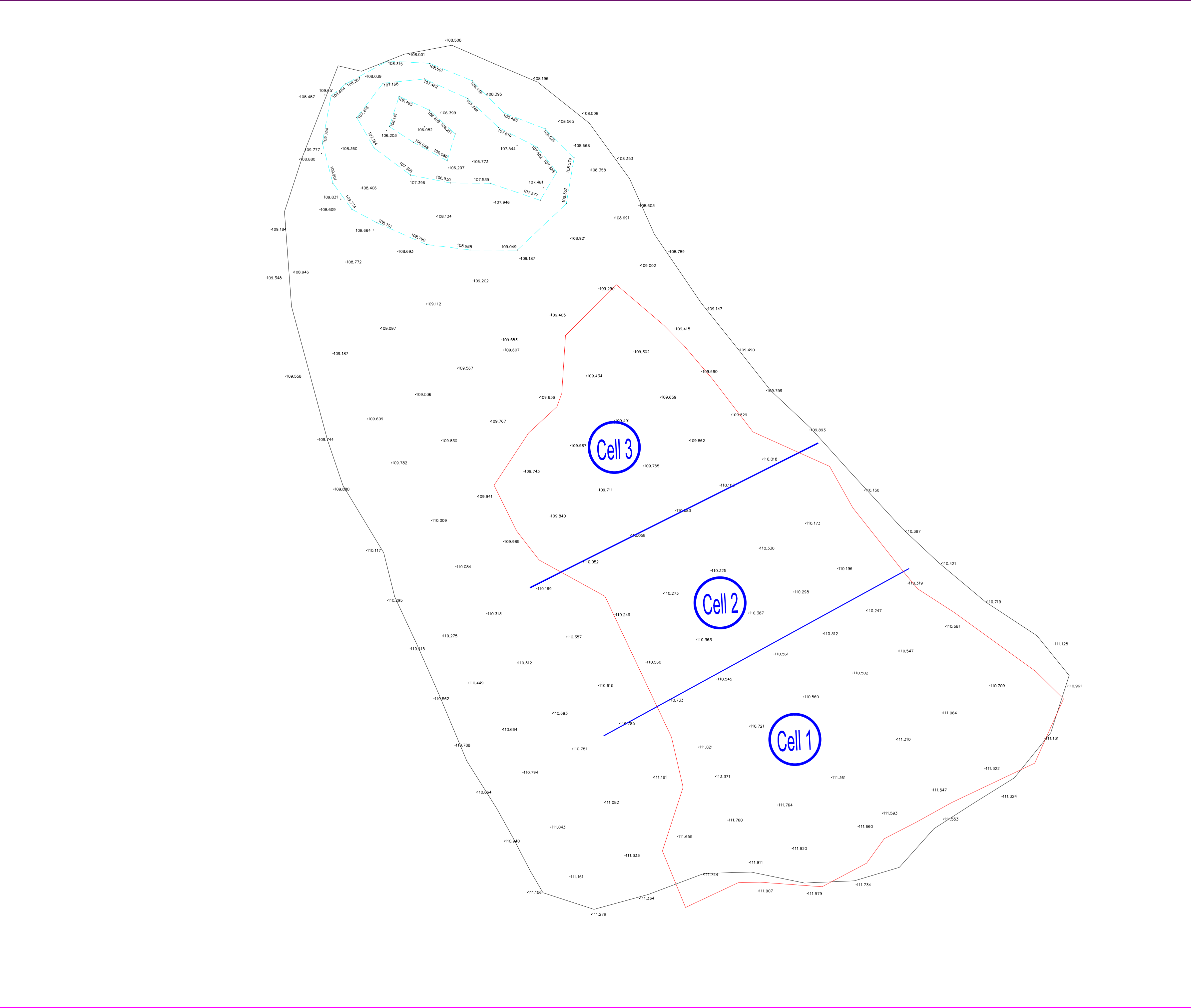
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DRAWING No:

BLR-1077



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Legend:

Phase boundary

Extents of work

Cell boundary

Balancing pond contours

JOB

GATEWEN_VILLAGE
WREXHAM

DRAWING

FINAL_LEVEL_SURVEY

DATE: 19.09.13

DRAWN: DL

SCALE: 1:500@A2

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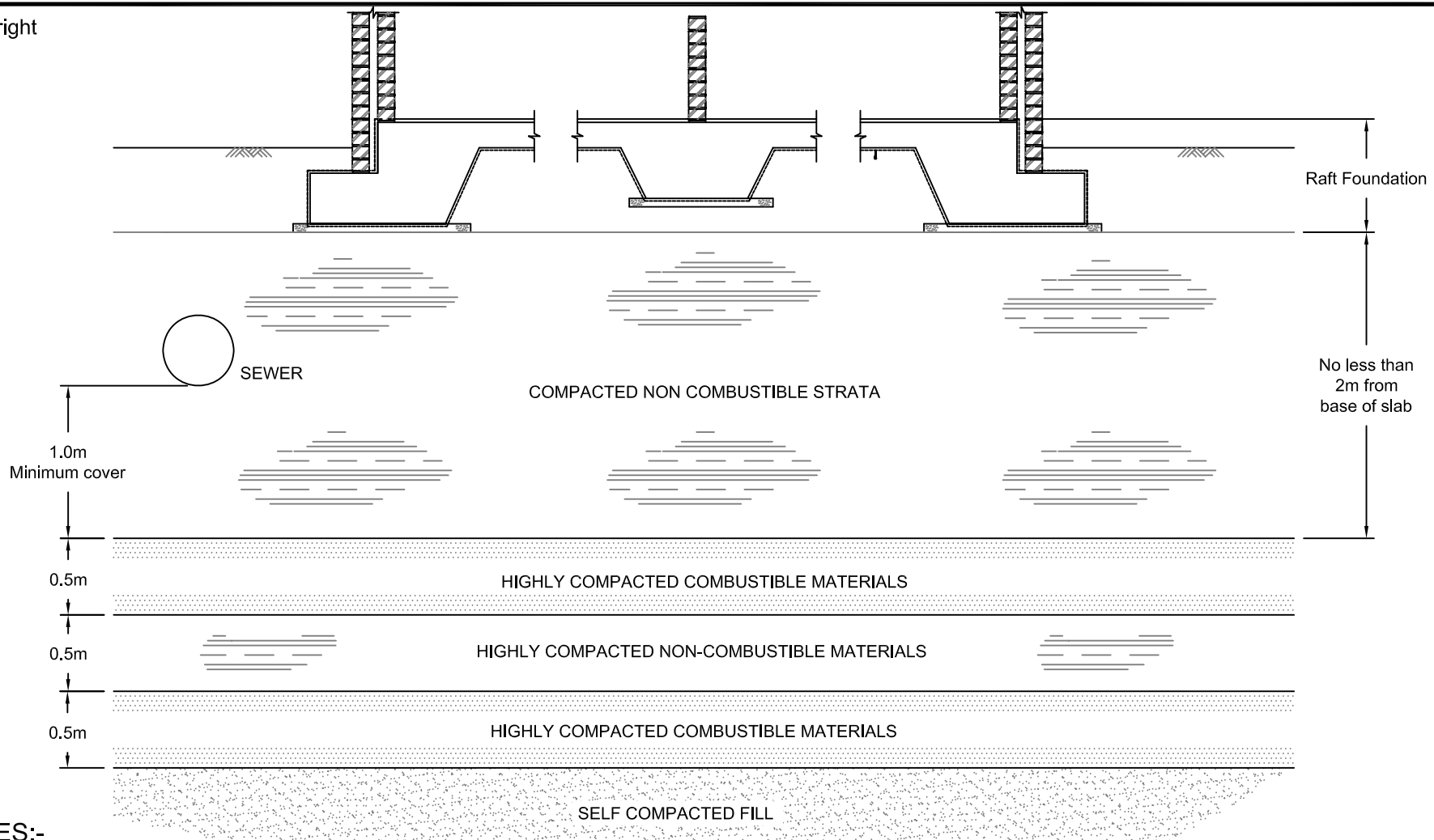
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DRAWING No:

BLR-1077

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NOTES:-

1. All potentially combustible fill is to be laid to ensure air voids are less than 5%.
2. Thickness of each layer must be recorded.
3. All completed units must have a robust 3D surveyed surface.
4. Geotechnical validation testing is required on all layers, with confirmation of non-combustible properties of capping layers.
5. Compaction of non combustible strata must be undertaken in a controlled manner, in layers to achieve a minimum safe bearing pressure of 50kN/m² with no greater than 25mm differential settlement across the plot.

SCALE	1 : 20 @ A4						Phase 2, Former Gatewen Colliery, Wrexham. SECTION THROUGH RE-ENGINEERED FILL FOR COMBUSTIBLE MATERIAL REMEDIATION	 chartered consulting engineers Tel: 01244 684910 Fax: 01244 684911 Email: admin@coopers.co.uk Web: http://coopers.co.uk Park House Sandpiper Court Chester Business Park Chester CH4 9QU
DATE	03.05.13							
DRAWN	AH							
CHEK'D		Rev	Drwn	Date	Appd	Comments	Drg No: 4763 / 104 / Ph2	Rev: _

Appendix A

Earthworks Specification



July 2013
Report No 1858/R/001-2

GATEWEN ROAD, WREXHAM

PHASE 2

SPECIFICATION FOR EARTHWORKS

Carried out for:
McAuliffe Environmental Ltd

Developer:
Bloor Homes



GATEWEN ROAD, WREXHAM

PHASE 2

SPECIFICATION FOR EARTHWORKS

Date: 18th July 2013



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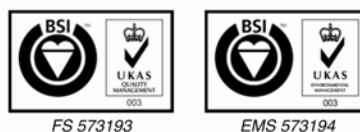
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			Checked & Approved By: C Eccles BSc MSc C Geol, SiLC, ROGEP Adviser		
2	draft	19.07.2013	Prepared By A. Binns BSc CEng FICE		
			Checked & Approved By: C Eccles BSc MSc C Geol, SiLC, ROGEP Adviser		

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GATEWEN ROAD, WREXHAM PHASE 2 SPECIFICATION FOR EARTHWORKS

CONTENTS

INTRODUCTION.....	1
Report Context	1
Site Location and Description	1
Information sources.....	1
SCOPE OF WORKS	1
EARTHWORKS SPECIFICATION.....	2
General	2
Compliance Criteria	2
End product criteria for highly compacted combustible materials	3
End product criteria for highly compacted non-combustible materials	3
End product criteria for the Compacted Non-combustible Materials	3
Performance Criteria to be carried out both during the works and on the finished surface	3
Testing.....	3
Specific filling requirements	4
Compaction trial.....	4
Benching.....	4
Proof rolling	4
Weather conditions.....	4
Water control.....	4
Excavation stability	5
Soft materials.....	5
Obstructions	5
Existing Slopes.....	5
Layers	6
Plant	6
Haul Roads	6
Uniform Distribution of fill types	6
Moisture Content Control.....	7
End of Shift	7
Inadequate Compaction.....	7
Monitoring.....	7
As-built surveys and test records	8
Material Acceptability.....	8
Compliance Testing.....	9
Laboratory testing	9
In Situ Testing	9
Removal of Unsuitable Fill	10
Potentially Contaminated Material.....	10

Imported Fill.....	10
Site Supervision.....	11
Health & Safety Precautions	11
Post Completion Validation Testing	11
ANALYSIS CRITERIA AND CLASSIFICATION.....	12
Scope of Works	12
Testing Requirements for Soil Samples	12
Chemical Analysis of Imported Strata	12

DRAWINGS

MCA-652	McAuliffe Drawing: Excavation areas
4763/104/Ph2	Coopers Drawing: Section through re-engineered fill for combustible remediation

APPENDICES

Appendix 6/1	Acceptable Earthworks Materials: Classification and Compaction Requirements
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Gatewen Road, Wrexham Phase 2 Specification for Earthworks

INTRODUCTION

Report Context

1. TerraConsult Ltd (TCL) was instructed by McAuliffe Environmental Ltd (the Client) to prepare a specification for the earthworks for Phase 2 at Gatewen Road, Wrexham. McAuliffe Environmental Ltd is contracted to Bloor Homes (the ultimate Client) to carry out the earthworks.
2. The works will comprise the excavation of combustible materials and colliery spoil across the site and the re-use of these materials as engineering fill on the site in such a manner as to remove the need for special precautions to avoid combustion of the fill in the future.

Site Location and Description

3. The site is located approximately 2.3 km to the northwest of Wrexham town centre with access off Gatewen Road. The Phase 2 part of the site is centred on National Grid Reference SJ 3130 5190.
4. It is understood that the initial roads and sewer works have been completed for Phase 2, with the initial 2 no parcels of properties as well as the Bloor Homes site cabin and compound.

Information sources

5. The following reports and information sources have been provided by the Client and have been referred to as part of this assessment:
 - Site Investigation Report No 4763/SI_P2, dated 1 May 2012
 - Murray Rix Report No MRN 1985/71 of 30/04/13

SCOPE OF WORKS

6. The following scope of works is required as part of the earthworks:
 - Re-orientation of the existing stockpile of high calorific material so that it occupies the area of the proposed plots 189 to 198 (McAuliffe Drawing No. MCA 652).
 - Excavation of further high calorific material that has been shown to exist over the areas that are shown hatched green on the drawing and placing this material on the re-orientated existing stockpile.

- At proposed residential unit locations, the depth of excavation shall be such as to ensure that the minimum depth of engineered non-combustible fill beneath raft foundation edge beams is 2.0 m. The formation level for the raft foundations will be 0.725 below the finished ground level.
- Combustible materials will be placed below this depth with a maximum layer thickness of 0.50 m in any single layer. Where two layers of combustible materials are to be placed they will be separated by a 0.50 m thick layer of non-combustible materials.
- Where a single layer of combustible materials is to be placed then the formation level will be at least 3.225 m below the finished ground level.
- Where two layers of combustible materials are to be placed then the formation level will be at least 4.225 m below the finished ground level.
- A section through the construction where there are two layers of combustible materials is shown on Coopers Drawing No 4763/ 104/ Ph2 drawing
- Non-combustible fill material is defined as having a calorific value less than 7 MJ/kg). High calorific material is material having a calorific value greater than 7 MJ/kg.
- Outside the footprint of buildings excavation or filling shall be to the proposed finished ground levels minus 0.6 m to allow for inert cover to gardens.
- The contractor shall maintain the stability of cut faces at site boundaries, along the existing spine roads (which contain services) and in the vicinity of the steep slope.
- Validation sampling and testing shall be carried out during and after earthworks have been completed to confirm calorific values of the re-engineered materials in accordance with this Specification.
- All works shall be carried out under the CL:AIRE "Code of Practice for the Definition of Waste" and must have the approval of a Qualified Person. The Qualified Person Declaration shall be submitted to the NRW (formerly Environment Agency) prior to commencement of the works.

EARTHWORKS SPECIFICATION

General

7. This specification is based on the Specification for Highway Works, Series 600, Earthworks, the recommendations of which should be followed particularly those dealing with deleterious materials, benching in adjacent surfaces, compacting to gradients that shed water and sealing the surface at the end of a working shift.

Compliance Criteria

8. Materials shall be placed such that they comply with the end product criteria together with the performance criteria detailed below.

End product criteria for highly compacted combustible materials

- The moisture content of the materials shall be less than 20 %. **(Note: this will probably require that these materials will require drying out prior to placement).**
- The moisture content of the materials shall be greater than 12 %.
- The average air voids content from any group of 6 consecutive test results shall not be greater than 90% of 5 % ie 4.5 %.
- Each individual test result shall be less than 110% of 5% ie 5.5%.
- The average dry density achieved shall be greater than 1.414 Mg/m³.

End product criteria for highly compacted non-combustible materials

- The moisture content of the materials must be less than 19 %.
- The moisture content of the materials shall be greater than 12 %.
- The average air voids content from any group of 6 consecutive test results shall not be greater than 90% of 5 % ie 4.5 %.
- Each individual test result shall be less than 110% of 5% ie 5.5%.
- The average dry density achieved shall be greater than 1.655 Mg/m³.

End product criteria for the Compacted Non-combustible Materials

- The moisture content of the materials must be less than 22%.
- The moisture content of the materials shall be greater than 12 %.
- The average air voids content from any group of 6 consecutive test results shall not be greater than 90% of 10 % ie 9.0 %.
- Each individual test result shall be less than 110% of 10 % ie 11.0 %.
- The average dry density achieved shall be greater than 1.588 Mg/m³.

Performance Criteria to be carried out both during the works and on the finished surface

- The average settlement of 450 mm diameter plate at a pressure of 75 kN/m² from any group of 6 consecutive test results shall not be greater than 90% of 5 mm ie 4.5 mm
- Each individual test result shall be less than 110% of 5 mm ie 5.5 mm.

Note: 5 mm settlement of 450 mm diameter plate at a pressure of 75 kN/m² is equivalent to a CBR value of 2.4 %.

Testing

9. The Contractor shall carry out testing to demonstrate compliance with the end product and performance criteria under the supervision/ validation of the Engineer. In the event that the test criteria cannot be achieved then alternative methods of working shall be proposed by the Contractor. The proposed method shall require verification by a site compaction trial.

Specific filling requirements

10. The earthworks shall be carried out in agreement with the Specification for Highway Works, Series 600, Earthworks, the recommendations of which should be followed particularly those dealing with deleterious materials, benching in adjacent surfaces, compacting to gradients that shed water and sealing the surface at the end of a working shift.

Compaction trial

11. Prior to carrying out any filling works, the Contractor shall carry out a compaction trial to demonstrate that the elected plant and methods will achieve the specified requirements.
12. The Contractor shall provide the details of the compaction plant prior to the trial.
13. The trial pad shall have a minimum thickness of fill of 1.0 m and may be incorporated into the permanent works provided that all layers of fill have complied with the specification.
14. The pad shall:
 - cover a minimum area of 12 m x 6 m to suit the plant and operations
 - be constructed to ensure that each layer complies with the specification. This may require that the layer thickness and/or the number of passes of the compaction plant be varied.

Benching

15. The benching shall be 0.5 m vertical and 1.0 m horizontal.

Proof rolling

16. All areas which are to receive fill shall be proof rolled prior to placement of fill. Any soft material shall be removed and treated as wet fill (see paragraph 28).
17. The area shall then be accurately surveyed and then made good with compacted material.

Weather conditions

18. If weather conditions are such that the compliance criteria cannot be achieved, then the Contractor shall cease working until such times as they can.
19. If testing indicates that weather conditions have caused deterioration of finished work such that it is no longer compliant, then the Contractor shall repair the damaged areas at his own cost.

Water control

20. The area to be filled shall be graded to falls which will allow sump-pumping or other suitable means to keep the base of the excavation dry at all times.

21. Areas of compacted fill shall be graded to prevent ponding.
22. The Contractor shall be responsible for ensuring that surface water run-off does not affect the works or surrounding off-site areas.

Excavation stability

23. The Contractor is responsible for ensuring that the excavation and filling works are carried out in a safe manner and do not adversely affect the stability of existing excavations, buildings, structures and services.

Soft materials

24. All soft and compressible soils or existing fill shall be removed and run to spoil in dumps provided by the Contractor and agreed by the Engineer.
25. If the material is found to be contaminated then it shall be removed to a suitably licensed facility.
26. The work shall be carried out such that there is no undercutting of the sides of existing excavations.
27. Material that is too wet to comply with the specification shall be spread and allowed to dry for future incorporation in the works.
28. All stockpiles of wet material shall be sealed for periods of wet weather to prevent further ingress of water and shall be reworked/ turned during dry weather to promote drying.

Obstructions

29. Boulders, tree roots, former services or other obstructions at the base of an area to be filled shall be removed to stockpiles and replaced with general fill compacted to the same specification as that used for the subsequent filling.
30. Where unsuitable material has been removed, the underlying material shall be compacted to the same specification as that used for the subsequent filling.
31. For the duration of the works, the Contractor shall record on a weekly basis by topographic survey the volume of unsuitable material stockpiled on site.

Existing Slopes

32. The northern and eastern boundaries of the area for proposed excavation and re-engineering comprise a crest of a significant slope. The integrity of this feature must be maintained.

33. It is not permitted to re-engineer the calorific material within 3m of the slope face. Precautionary mitigation measures will be required should the slope become destabilised due to works.

Layers

34. Fill shall be placed and compacted in near-horizontal layers of the thicknesses required to achieve the specified end product and as far as practicable, be in accordance with the guidance given in the Specification for Highway Works for the class of material and type of compaction plant.
35. The maximum layer thickness shall be 300mm.

Plant

36. The compaction plant selected, the number of passes made, the fill layer thickness and moisture content used shall have regard to the specified end product, the means and manner of control testing and generally be in accordance with the guidance given in the Specification for Highway Works for the class of material.

Haul Roads

37. During the works the Contractor shall ensure that haul roads on compacted fill are maintained so as to minimise damage to underlying layers and to avoid softening of the fill.
38. Where necessary haul roads shall be re-compacted and re-tested to ensure the fill meets the required specification.
39. On removal of the Contractors effects, at the end of the works, the Contractor shall ensure the integrity of the Development Platform. Care must be taken to minimise damage to the compacted fill and where necessary make good any damaged caused by the removal of plant and machinery.

Uniform Distribution of fill types

40. Where several different types of fill material are to be employed, they shall be deposited in such a way that as far as possible, the material is deposited evenly across the site in approximately the same sequence, thus ensuring a uniform distribution of fill types over the whole fill thickness.
41. In particular there shall be a uniform distribution of fill types over the whole fill thickness beneath and within a 5.0m zone of the footprints of proposed buildings.
42. The Contractor shall maintain survey records to show where different classes and sources of fill are deposited. The groundwork's contractor shall notify the developer where a uniform distribution of engineered fill cannot be achieved for properties, and the area available for excavation should be modified accordingly.

Moisture Content Control

43. The Contractor shall take all necessary steps to ensure that the fill is placed at the moisture content necessary to achieve the specified level of compaction and shall, where necessary, add water to or dry the fill, in order to obtain this value.
44. Where it is necessary to add water, this shall be done as a fine spray and in such a way that there is time for the water to be absorbed into the fill before being rolled by the plant.

End of Shift

45. No fill shall be placed and left uncompacted at the end of a working day.
46. Compacted fill shall be graded to falls to ensure free runoff of rainwater without ponding, and shall be appropriately sealed.

Inadequate Compaction

47. If the results of control tests indicate that the fill is being placed and compacted in such a way that the desired level of compaction is not being achieved, the Contractor shall further compact or, if necessary, shall excavate the affected work and replace with new fill, compacted to meet the specification requirements.
48. The Contractor shall maintain a record of the volume of material removed as unsuitable for the duration of the works.

Monitoring

49. Settlement monitoring of the completed fill will be required. The Contractor shall provide an appropriate TBM to ordnance datum, and shall be responsible for ensuring its integrity.
50. The Contractor shall install settlement monuments at ground level within one week of completion of filling to ground level in specific areas of the site. The final locations of the settlement monuments shall be determined by the Engineer.
51. Each monument shall comprise a proprietary steel survey marker 600 mm long driven into the ground so that the flat top plate is level with the ground surface.
52. Each settlement monument shall be adequately protected by the Contractor.
53. The Contractor shall record the level of the monument to a fixed datum to an accuracy of 1mm.
54. The Contractor shall record the level of each monument:
 - once a week for a period of 1 month after installation.
 - once every two weeks for the next two month period after installation.
 - once every month for the next 3 months after installation.

55. The data shall be presented to the Engineer weekly in both tabular and graphical format.
56. The information shall be supplied in both hard copy and electronic copy compatible with Microsoft Excel.

As-built surveys and test records

57. The Contractor shall survey the works and supply as-built drawings. The drawings shall be supplied in both hardcopy and electronic format compatible with AutoCAD.
58. Records of all testing shall be provided. The information provided shall include as a minimum:
- All surveys to have 3D survey positions.
 - Records and plans of excavations, including depth of excavations, volume of material excavated, volume of unsuitable material excavated and volume of contaminated material excavated;
 - Records of fill thickness, including isopachyte plots;
 - Records of actual finished ground levels, including plans;
 - Records of settlement monument locations, including plans;
 - Records of plate bearing test locations, including plans;
 - Records of sampling locations, including plans;
 - Results of all earthworks compliance testing and post completion validation testing.

Material Acceptability

59. Deleterious materials such as cobbles, boulders, rock or waste fragments whose largest dimension is greater than two thirds of the compacted layer thickness shall not be incorporated into the fill.
60. The materials to be used as engineered fill on the site shall comply with the specification shown in Table 6/1 (based on the DoT Manual of Contract Documents for Highways Works, Volume 1 Specification for Highway Works, Series 600: Earthworks), which is included in Clause 9.0.
61. The following materials are deemed to be unsuitable fill:
- Cohesive soils with a liquid limit in excess of 90% or plasticity index in excess of 65;
 - Any material with wood or peat;
 - Any material with biodegradables;
 - Any material with scrap metal;
 - Frozen or waterlogged substances;
 - Material that cannot be properly compacted because of its particle size or shape;
 - Slag resulting as a by product of steel production;
 - Material with a Calorific value in excess of 7MJ/kg, measured in as received condition, and placed within 2.0m beneath raft foundation edge beams.
 - Material, which, in the opinion of the Engineer, has significant coal content.

62. The geotechnical testing to date indicates that low to intermediate plasticity materials have predominantly been recorded.
63. The Contractor shall carry out visual assessment for the presence of metal, slag, wood, biodegradables etc, and such material shall be excluded from the earthworks fill.

Compliance Testing

Laboratory testing

64. During the works, routine geotechnical testing shall be carried out by the Contractor comprising the following:
- Compaction – 4.5 kg method;
 - Particle size distribution;
 - Liquid and plastic limits;
 - Particle density;
 - Bulk density;
 - Shear strength by hand shear vane;
 - Moisture content;
 - Calorific Value;
- The testing carried out will depend upon the type of fill and the frequency of testing is as per appendix 6/1.
65. Appropriate samples, whether bulk, small disturbed or undisturbed samples shall be taken by the Contractor to facilitate this testing as fill is placed.
66. The methodology for the sampling, testing and assessment of calorific value shall be agreed with the Engineer in advance of the works.
67. All testing, with the exception of Calorific Value, shall be in accordance with the relevant parts of BS1377 and the results issued to the Engineer on a regular basis not exceeding 5 working days after sampling.
68. The testing for calorific value shall be carried out at ESG Bretby (in accordance with ISO 1928 (2009)) as a net calorific value as received method.

In Situ Testing

69. The Contractor shall carry out plate bearing tests both during and after completion of the works to ensure compliance with the performance criteria. Each test shall be carried out in accordance with BS1377 part 9. Testing shall include six increments of loading, at 25%, 50%, 75%, 100%, 125% and 150% of working load, together with monitoring on release to 0%. See also Appendix 6/1.
70. If excessive deflections of greater than 5.0mm are recorded in the plate tests then the material may be investigated further by trial holes excavated by the Contractor at the

direction of the Engineer, and if necessary shall be subjected to further compaction and/or removal and replacement.

71. In situ density tests using core cutter or sand replacement methods will be carried out by the Contractor to ensure compliance with the end product criteria.

Removal of Unsuitable Fill

72. Materials that are deemed geotechnically unsuitable for compaction in the development area shall be removed from the areas which are to be re-engineered and stockpiled with a geotextile separator layer at the base. The stockpiles shall be maintained and sealed by the Contractor. Offsite disposal of Class U1 material may be required.

Potentially Contaminated Material

73. In the event that potentially contaminated material is encountered during the earthworks, the Contractor shall advise immediately the Engineer who will instruct on a course of action.
74. This may include removal of the potentially contaminated material to a separate stockpile constructed on a geomembrane separator layer, subsequent sampling and laboratory testing at an interval to be agreed by the Engineer dependent on volume, and advice provided on the suitability of the material for use in the permanent works.
75. No potentially contaminated material shall be incorporated in the works until the results of the laboratory testing have been reviewed and assessed by the Engineer. Liaison will be required with the Engineer in the event that the material is confirmed as contaminated. Offsite disposal of Class U2 material may be required.
76. The Contractor shall maintain a record of the volume of material removed as contaminated for the duration of the works. All contamination testing shall be carried out by a UKAS accredited laboratory.

Imported Fill

77. During the works there may be a requirement to import fill material to site in order to achieve the required finished levels.
78. Prior to the importing of any fill material the Contractor shall ensure the following:
- Geotechnical laboratory testing, as listed in paragraph 64, is carried out on the material at an interval to be agreed with the Engineer, but nominally the material shall be tested every 500 m³;
 - Contamination laboratory testing as listed in paragraphs 91 and 92 is carried out on the material at an interval to be agreed with the Engineer, but nominally the material shall be tested every 500 m³;
 - Any waste exemption certificates or licences are sought and approved by the relevant licensing authority.

79. The results of the testing shall be presented to the Engineer. No material will be imported to site or incorporated into the works until its geotechnical and contamination properties and suitability have been agreed by the Engineer.

Site Supervision

80. The Contractor shall ensure that a suitably experienced Works Manager is in full time attendance on site for the duration of the Works.
81. TerraConsult Ltd will provide a suitably qualified engineering geologist to monitor the construction quality assurance for the works.
82. The Contractor shall collect samples for the routine laboratory geotechnical testing and the contamination validation sampling.

Health & Safety Precautions

83. The works will be subject to Construction (Design & Management) Regulations.
84. The works shall be carried out in a manner as to safeguard all site employees and possible site trespassers. This shall include, but not be limited to;
- site induction for all staff and visitors;
 - training/safety awareness courses, the issue of personal protective equipment, tool box talks and
 - suitable welfare facilities.
85. The works shall be carried out in a manner to protect against damage to property on the site or in its immediate vicinity.
86. Appropriate temporary protection and warning signs shall be erected to warn of hazards that are a consequence of the works.
87. Upon completion of the works the Contractor shall forward to the Planning Supervisor all information pertaining to the works that is of relevance to the Health & Safety File.

Post Completion Validation Testing

88. It will be necessary to undertake validation sampling after earthworks have been completed at the site to confirm contamination concentrations at the finished site surface. Soil samples shall be collected and tested by the Contractor as detailed in paragraphs 91 and 92.
89. The calorific value data collected shall be analysed by TerraConsult Ltd. In the event that Calorific Value hotspots are identified, then the hotspots shall be delineated by further investigation by the Contractor and the offending material removed. The subsequent void shall be backfilled with inert material.
90. Any contamination data collected shall be statistically analysed by TerraConsult Ltd in accordance with standard Environment Agency guidelines. In the event that

contamination hotspots are identified, then the hotspots shall be delineated by further window sample exploration by TerraConsult Ltd, with a possible requirement for excavation and offsite disposal by the Contractor. The subsequent void shall be backfilled with inert material, compacted to meet the specification requirements.

ANALYSIS CRITERIA AND CLASSIFICATION

Scope of Works

Testing Requirements for Soil Samples

91. Soil samples will be collected and tested by the Contractor as follows:

Sample Grid	25.0m across the whole site
Testing Frequency	Calorific Value 1 sample in the upper 2.0m (50% at 0.5m, 25% at 1.0m and 25% at 2.0m)
Testing	Calorific Value General Suite as follows:

General Suite carried out only if contamination is found or suspected on site

pH

Metals (arsenic, cadmium, selenium, chromium, nickel, mercury, lead, copper)

Speciated PAH

All contamination testing shall be carried out by a UKAS accredited laboratory.

Chemical Analysis of Imported Strata

92. Imported fill shall be subjected to the following contamination testing:

- pH
- Metals (Arsenic, cadmium, selenium, chromium, nickel, mercury, lead, copper)
- Cyanide (total and free)
- Speciated TPH (in accordance with the TPH Criteria Working Group)
- Speciated PAH
- VOC (if elevated levels of benzene identified by Speciated TPH test)
- Water Soluble Sulphate
- Asbestos
- Calorific Value

93. All testing shall be carried out by a UKAS accredited laboratory.

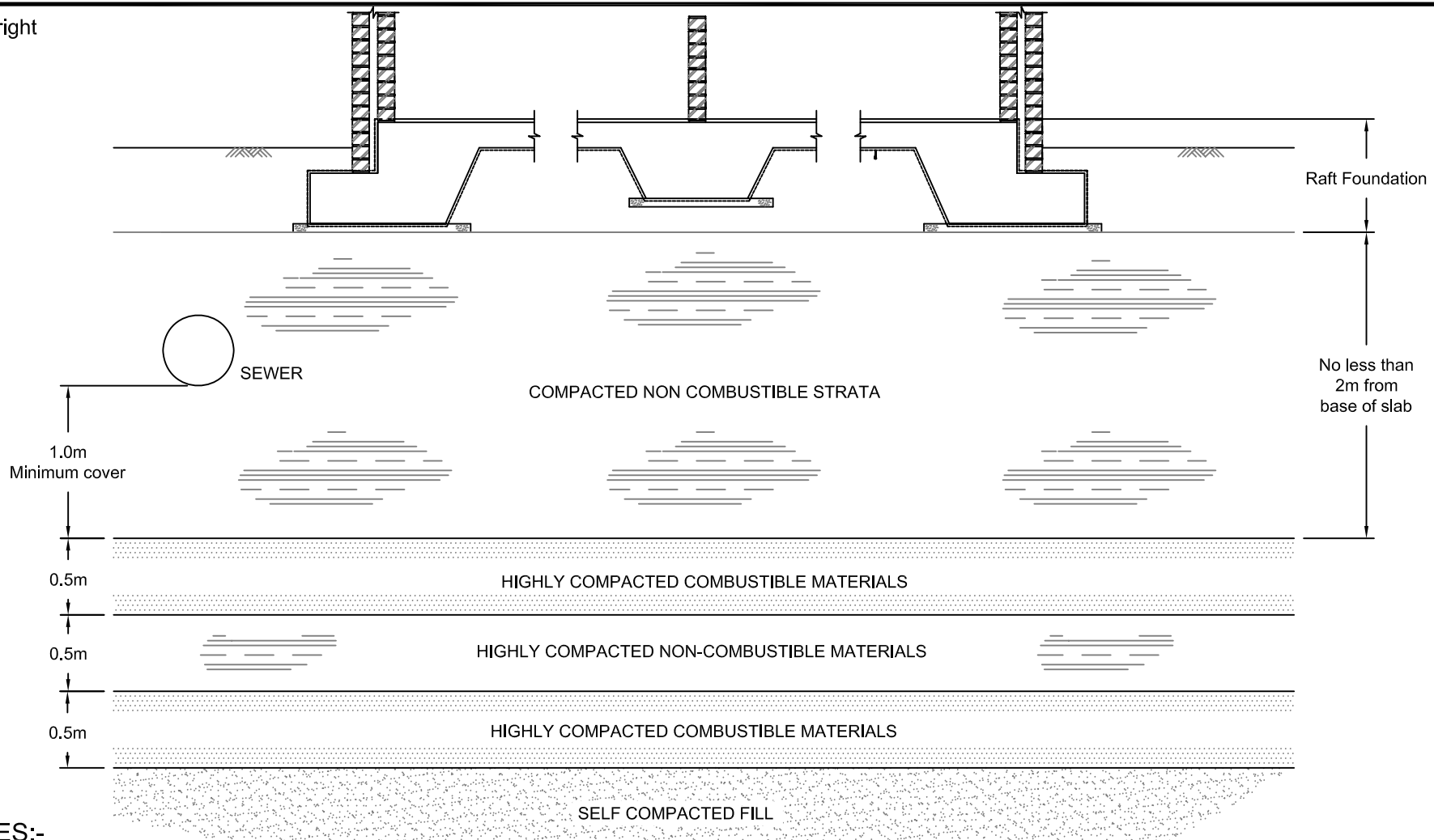
94. The threshold values for elements and compounds within imported fill materials will be as per Coopers' SI Report.

Appendix 6/1

Acceptable Earthworks Materials: Classification and Compaction Requirements

Appendix 6/1 Acceptable Earthworks Materials: Classification and Compaction Requirements	
1	Granular material excavated on site may be re-used in the fill works as Class 1A, 1B or 1C, providing it meets the acceptability criteria for the material already discussed and in agreement with HA SHW Series 600 Table 6/1.
2	Cohesive material excavated on site may be re-used in the fill works as Class 2A, 2B or 2C, providing it meets the acceptability criteria for the material already discussed and in agreement with HA SHW Series 600 Table 6/1.
3	Testing of materials generally shall be as follows: Class 1A, 1B or 1C • Grading - 1 samples per week per class of material. • Compaction/particle density - 1 sample per week for each class. • Plate bearing - 1 per 5,000 m³. Minimum depth of fill 1.0 m. • Core cutter or sand replacement determination of density and moisture content – as per BS 1377 - minimum of 1 test per layer for each 25m x 25m cell. • Calorific value – 1 per 1,250 m³. Class 2A, 2B or 2C • Grading - 1 samples per week per class of material. • Shear strength - 2 tests per layer in each bay of placed material. • Compaction/particle density - 1 sample per week for each class. • PI - 1 per 500 m³. • Plate bearing - 1 per 5,000 m³. Minimum depth of fill 1.0m. • Core cutter or sand replacement determination of density and moisture content – as per BS 1377 - minimum of 1 test per layer for each 25m x 25m cell. • Calorific value – 1 per 1,250 m³.
4	• Existing rootbound material shall be classified as Class U1. • Cohesive material containing blockwork, bricks and other occlusions shall be classified as Class U1. It shall be separated and stockpiled with a geotextile separator layer at the base. • Material with Calorific values in excess of 7 MJ/kg shall be classified as Class U1, but may be incorporated in the works if deeper than 2.0m below finished ground level.
5	The frequency of testing shall be as shown above or as agreed with the Engineer on the basis of visual inspections and existing laboratory test results.

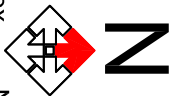
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NOTES:-

1. All potentially combustible fill is to be laid to ensure air voids are less than 5%.
2. Thickness of each layer must be recorded.
3. All completed units must have a robust 3D surveyed surface.
4. Geotechnical validation testing is required on all layers, with confirmation of non-combustible properties of capping layers.
5. Compaction of non combustible strata must be undertaken in a controlled manner, in layers to achieve a minimum safe bearing pressure of 50kN/m² with no greater than 25mm differential settlement across the plot.

SCALE	1 : 20 @ A4						Phase 2, Former Gatewen Colliery, Wrexham. SECTION THROUGH RE-ENGINEERED FILL FOR COMBUSTIBLE MATERIAL REMEDIATION	 coopers chartered consulting engineers Tel: 01244 684910 Fax: 01244 684911 Email: admin@coopers.co.uk Web: http://coopers.co.uk	Park House Sandpiper Court Chester Business Park Chester CH4 9QU
DATE	03.05.13								
DRAWN	AH								
CHEK'D		Rev	Drwn	Date	Appd	Comments	Drg No:	4763 / 104 / Ph2	Rev: _



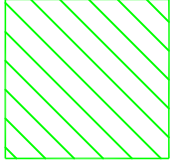
Approx North



Surveying & Engineering Department

Contact :dean@mcauliffegroup.co.uk

Mobile : 07793 936959



Calorific Volumes/Area
1909m3,251m3,78.5m3
317m3.
TOTAL 2555.5m3



Turnover Volume/Area
33233m3

JOB
GATEMEN_PHASE_2
WEXHAM

DRAWING
EXCAVATION_AREAS

DATE: 29.03.13 DRAWN: DKW SCALE: NTS

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DRAWING No:

MCA-652

Client: Bloor/McAuliffe
Project Name: Gatewen Road, Wrexham
Project No: 1858

TerraConsult

High Calorific Material

Max particle size mm	4.5kg				Vibrating hammer				Zero Air Voids Mg/m3	5% Air Voids Mg/m4	10% Air Voids Mg/m5
	Dry Density Mg/m3	moisture %	Particle density Mg/m3	Particle density Mg/m3	Dry Density Mg/m3	moisture %	Particle density Mg/m3	Particle density Mg/m3			
	Murray Rix		measured	assumed			measured	assumed			
125	As received	23	Colliery spoil - 11% fines								
	1.388	10.2	1.9						1.592	1.512	1.432
	1.427	12.4							1.538	1.461	1.384
	1.488	14.1							1.499	1.424	1.349
	1.433	16.2							1.453	1.380	1.308
	1.377	18.5							1.406	1.336	1.265
125	As received	18	Colliery spoil - 15% fines								
	1.352	9.3							1.615	1.534	1.453
	1.415	10.8							1.577	1.498	1.419
	1.471	12.4							1.538	1.461	1.384
	1.433	14.1							1.499	1.424	1.349
	1.394	16.1							1.455	1.382	1.309
75	As received	26	Colliery spoil - 13% fines								
	1.325	11.5							1.559	1.481	1.403
	1.392	13.6							1.510	1.434	1.359
	1.437	15.2							1.474	1.401	1.327
	1.388	17.4							1.428	1.357	1.285
	1.348	19.5							1.386	1.317	1.248
50	As received	21	Colliery spoil - 13% fines								
	1.369	9.6							1.607	1.527	1.446
	1.415	11.6							1.557	1.479	1.401
	1.452	13.4							1.514	1.439	1.363
	1.420	15.5							1.468	1.394	1.321
	1.394	17.4							1.428	1.357	1.285
125	As received	26	Colliery spoil - 13% fines								
	1.312	9.6							1.607	1.527	1.446
	1.365	11.6							1.557	1.479	1.401
	1.410	13.4							1.514	1.439	1.363
	1.367	15.5							1.468	1.394	1.321
	1.327	17.4							1.428	1.357	1.285
75	As received	22	Colliery spoil - 13% fines								
	1.387	9.9							1.599	1.519	1.439
	1.437	11.9							1.550	1.472	1.395
	1.480	14.0							1.501	1.426	1.351
	1.433	16.0							1.457	1.384	1.311
	1.394	17.7							1.422	1.351	1.280
Max	1.488	19.5									
Min	1.312	9.3									

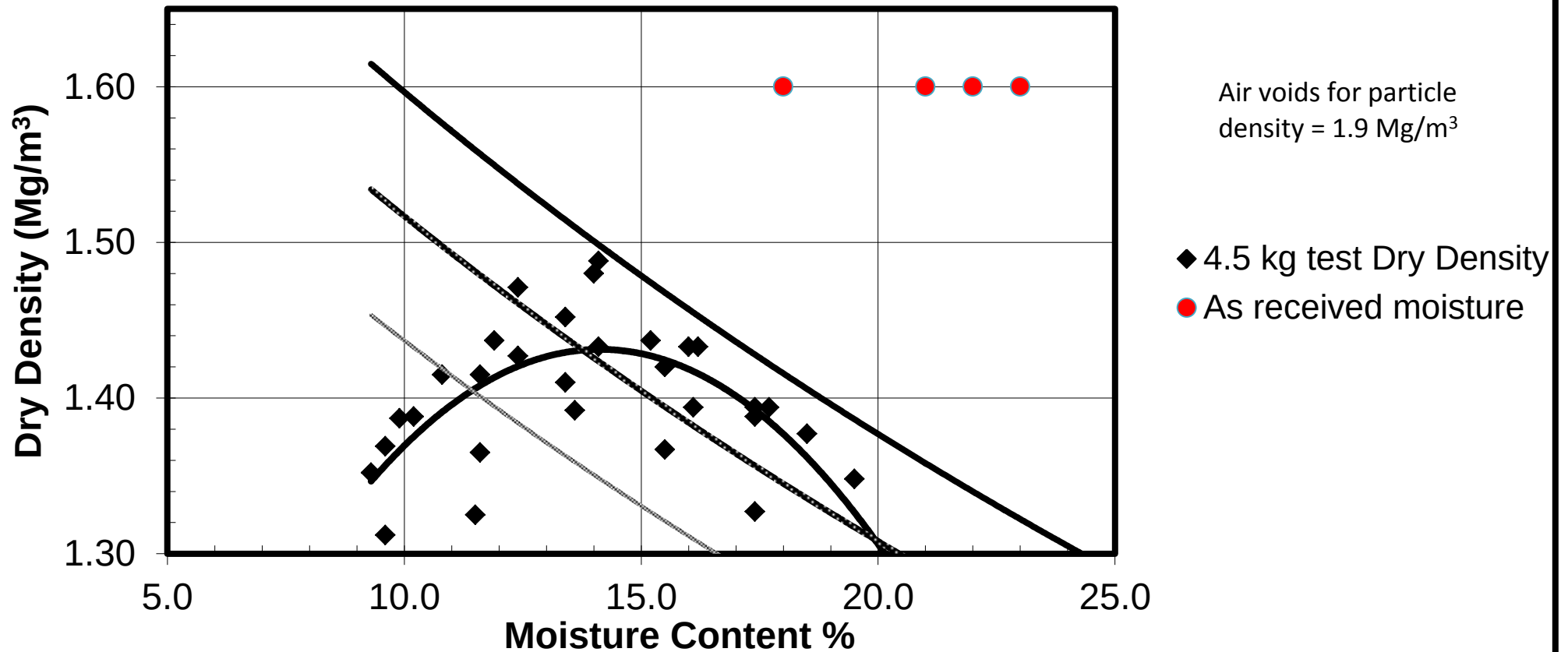
Compaction data 4.5 kg test

Y:\Jobs\1858-McAuliffe-Bloor-Gatewen Road\Technical\1858 Compaction data

Client: Bloor/McAuliffe
Project Name: Gatewen Road, Wrexham
Project No: 1858

TerraConsult

Compaction results - 4.5 kg tests on High Calorific Colliery spoil



Client: Bloor/McAuliffe
Project Name: Gatewen Road, Wrexham
Project No: 1858

TerraConsult

Max particle size mm	4.5kg				Vibrating hammer				Zero Air Voids Mg/m3	5% Air Voids Mg/m4	10% Air Voids Mg/m5
	Dry Density Mg/m3	moisture %	Particle density Mg/m3	Particle density Mg/m3	Dry Density Mg/m3	moisture %	Particle density Mg/m3	Particle density Mg/m3			
Max	Murray Rix		measured	assumed			measured	assumed			
	As received				As received		Colliery spoil - granular -				
					1.560	10.7		2.2	1.781	1.692	1.603
					1.620	12.2			1.734	1.648	1.561
					1.682	13.9			1.685	1.601	1.516
					1.635	15.8			1.633	1.551	1.469
					1.570	17.8			1.581	1.502	1.423
	As received				As received						
						19.0		2.50	1.695	1.610	1.525
	As received				As received						
									#DIV/0!	#DIV/0!	#DIV/0!
									#DIV/0!	#DIV/0!	#DIV/0!
									#DIV/0!	#DIV/0!	#DIV/0!
									#DIV/0!	#DIV/0!	#DIV/0!
									#DIV/0!	#DIV/0!	#DIV/0!
Max Min	#REF!	#REF!			#REF!	#REF!			1.781	1.692	1.603
	#REF!	#REF!			#REF!	#REF!			1.581	1.502	1.423

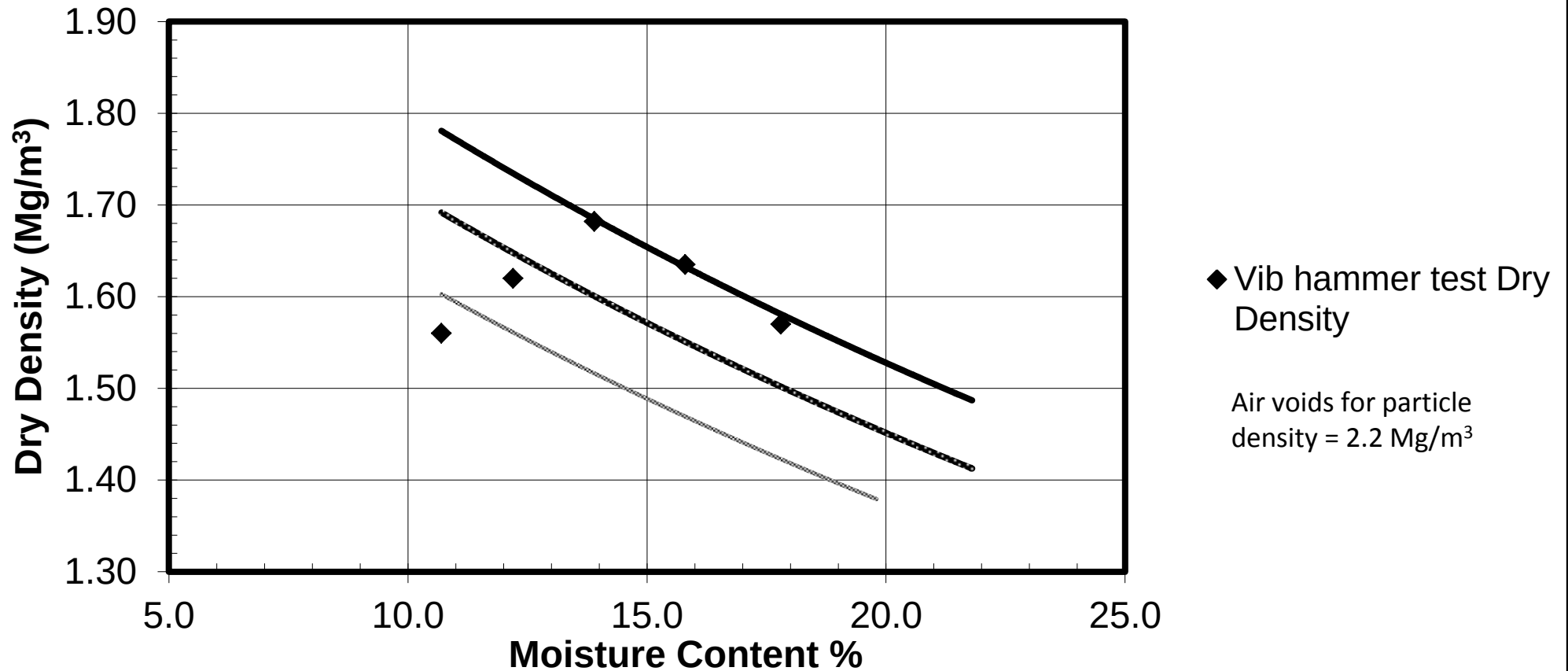
Compaction data Vib hammer test

Y:\Jobs\1858-McAuliffe-Bloor-Gatewen Road\Technical\1858 Compaction data

Client: Bloor/McAuliffe
Project Name: Gatewen Road, Wrexham
Project No: 1858

TerraConsult

Colliery spoil - granular fill compaction results



Client: Bloor/McAuliffe
Project Name: Gatewen Road, Wrexham
Project No: 1858

TerraConsult

High Calorific Material

Laboratory	MDD	OMC	As received Moisture content	Description	Particle density assumed /measured	
	Mg/m ³	%	%		Mg/m ³	
Murray Rix						
4.5 kg rammer	1.49	14.0	23.0	Colliery spoil - 11% fines	1.90	measured
	1.47	12.0	18.0	Colliery spoil - 15% fines		
	1.44	15.0	26.0	Colliery spoil - 13% fines		
	1.45	13.0	21.0	Colliery spoil - 22% fines		
	1.41	16.0	26.0	Colliery spoil - 18% fines		
	1.48	14.0	22.0	Colliery spoil - 17% fines		
Celtest						
Vibrating hammer	1.68	14.0		Granular fill (Colliery spoil) 21%coarser than 37.5 mm	2.20	assumed
Average	1.489	14.0				
90% MDD	1.340					
95% MDD	1.414					

OMC-MDD 4.5kg tests >7MJ

Client: Bloor/McAuliffe
Project Name: Gatewen Road, Wrexham
Project No: 1858

TerraConsult

**High calorific
material**

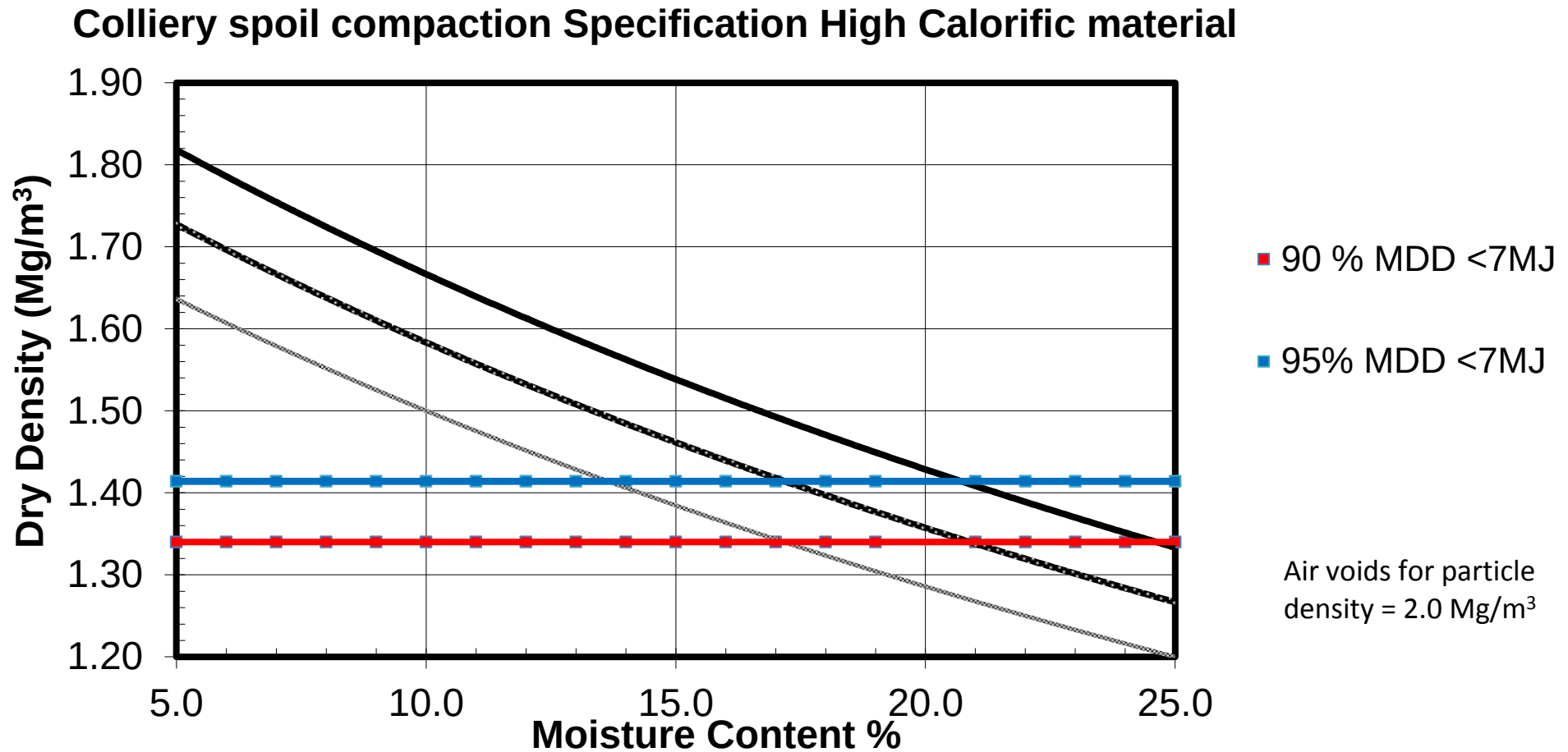
								Zero Air Voids Mg/m3	5% Air Voids Mg/m4	10% Air Voids Mg/m5
	Dry Density Mg/m3	moisture %		Dry Density Mg/m3	moisture %	Particle density Mg/m3	Particle density Mg/m3			
	90 % MDD <7MJ	95% MDD <7MJ				measured	assumed			
	1.340	1.414			5.0		2.0	1.818	1.727	1.636
	1.340	1.414			6.0			1.786	1.696	1.607
	1.340	1.414			7.0			1.754	1.667	1.579
	1.340	1.414			8.0			1.724	1.638	1.552
	1.340	1.414			9.0			1.695	1.610	1.525
	1.340	1.414			10.0			1.667	1.583	1.500
	1.340	1.414			11.0			1.639	1.557	1.475
	1.340	1.414			12.0			1.613	1.532	1.452
	1.340	1.414			13.0			1.587	1.508	1.429
	1.340	1.414			14.0			1.563	1.484	1.406
	1.340	1.414			15.0			1.538	1.462	1.385
	1.340	1.414			16.0			1.515	1.439	1.364
	1.340	1.414			17.0			1.493	1.418	1.343
	1.340	1.414			18.0			1.471	1.397	1.324
	1.340	1.414			19.0			1.449	1.377	1.304
	1.340	1.414			21.0			1.408	1.338	1.268
	1.340	1.414			22.0			1.389	1.319	1.250
	1.340	1.414			23.0			1.370	1.301	1.233
	1.340	1.414			24.0			1.351	1.284	1.216
	1.340	1.414			25.0			1.333	1.267	1.200
	1.340	1.414			26.0			1.316	1.250	1.184
	1.340	1.414			27.0			1.299	1.234	1.169
	1.340	1.414			28.0			1.282	1.218	1.154
	1.340	1.414			29.0			1.266	1.203	1.139
	1.340	1.414			30.0			1.250	1.188	1.125

Spec Compaction data>7MJ

Y:\Jobs\1858-McAuliffe-Bloor-Gatewen Road\Technical\1858 Compaction data

Client: Bloor/McAuliffe
Project Name: Gatewen Road, Wrexham
Project No: 1858

TerraConsult



Client: Bloor/McAuliffe
 Project Name: Gatewen Road, Wrexham
 Project No: 1858

TerraConsult

Low calorific material

Laboratory	MDD	OMC	As received Moisture content	Description	Particle density assumed /measured	
	Mg/m ³	%	%		Mg/m ³	
Soil Mechanics						
2.5 kg rammer	1.93	10.0	13.0	Slightly sandy gravelly silty CLAY - CI - 11% fines	2.32	assumed
	1.80	12.5	11.0	Slightly sandy gravelly silty CLAY - CI - 16% fines	2.39	assumed
	1.64	15.0	14.0	Slightly sandy gravelly silty CLAY - CI - 23% fines	2.25	assumed
	1.60	18.2	29.0	Slightly sandy gravelly clayey SILT - MH - 21% fines	2.50	assumed
Average	1.743	13.9	16.8			2.4
90% MDD	1.568					
95% MDD	1.655					

OMC-MDD 2.5 kg tests <7MJ

Client: Bloor/McAuliffe
Project Name: Gatewen Road, Wrexham
Project No: 1858

TerraConsult

**Low calorific
material**

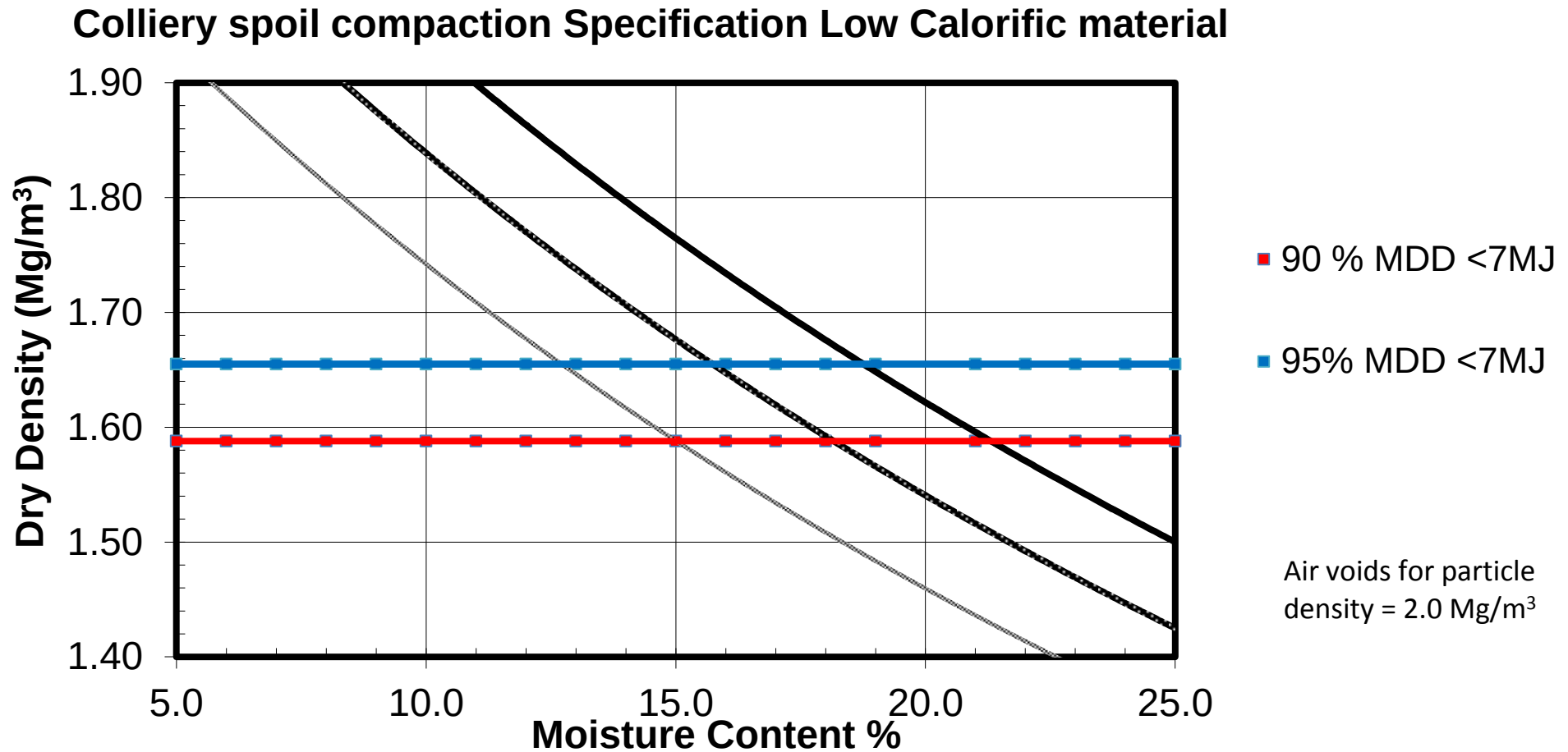
								Zero Air Voids Mg/m3	5% Air Voids Mg/m4	10% Air Voids Mg/m5
	Dry Density Mg/m3	moisture %		Dry Density Mg/m3	moisture %	Particle density Mg/m3	Particle density Mg/m3			
	90 % MDD <7MJ	95% MDD <7MJ				measured	assumed			
	1.588	1.655			5.0		2.4	2.143	2.036	1.929
	1.588	1.655			6.0			2.098	1.993	1.888
	1.588	1.655			7.0			2.055	1.952	1.849
	1.588	1.655			8.0			2.013	1.913	1.812
	1.588	1.655			9.0			1.974	1.875	1.776
	1.588	1.655			10.0			1.935	1.839	1.742
	1.588	1.655			11.0			1.899	1.804	1.709
	1.588	1.655			12.0			1.863	1.770	1.677
	1.588	1.655			13.0			1.829	1.738	1.646
	1.588	1.655			14.0			1.796	1.707	1.617
	1.588	1.655			15.0			1.765	1.676	1.588
	1.588	1.655			16.0			1.734	1.647	1.561
	1.588	1.655			17.0			1.705	1.619	1.534
	1.588	1.655			18.0			1.676	1.592	1.508
	1.588	1.655			19.0			1.648	1.566	1.484
	1.588	1.655			21.0			1.596	1.516	1.436
	1.588	1.655			22.0			1.571	1.492	1.414
	1.588	1.655			23.0			1.546	1.469	1.392
	1.588	1.655			24.0			1.523	1.447	1.371
	1.588	1.655			25.0			1.500	1.425	1.350
	1.588	1.655			26.0			1.478	1.404	1.330
	1.588	1.655			27.0			1.456	1.383	1.311
	1.588	1.655			28.0			1.435	1.364	1.292
	1.588	1.655			29.0			1.415	1.344	1.274
	1.588	1.655			30.0			1.395	1.326	1.256

Spec Compaction data <7MJ

Y:\Jobs\1858-McAuliffe-Bloor-Gatewen Road\Technical\1858 Compaction data

Client: Bloor/McAuliffe
Project Name: Gatewen Road, Wrexham
Project No: 1858

TerraConsult





TerraConsult

**Leaders in
waste management
environmental &
ground engineering
consultancy**

**TerraConsult Limited
Bold Business Centre
Bold Lane, Sutton
St. Helens
WA9 4TX**

**Telephone: +44 (0) 1925 291111
Fax: +44 (0) 1925 291191**

**Email: mailbox@terraconsult.co.uk
Website: www.terraconsult.co.uk**



FS 573193



EMS 573194



Appendix L

Laboratory Tests

Appendix L1	Geotechnical Laboratory Tests
Appendix L2	Calorific Value Laboratory Tests

Appendix L1

Geotechnical Laboratory Tests



LABORATORY REPORT



4043

Contract Number: PSL13/2760

Client's Reference:

Report Date: 15 August 2013

Client Name: Terra Consult
Bold Business Centre
Bold Lane, Sutton
St Helens
Merseyside
WA9 4TX

For the attention of: Alan Binns

Contract Title: Gatewen Road, Wrexham

Date Received: 7/8/2013

Date Commenced: 7/8/2013

Date Completed: 15/8/2013

Notes: Observations and Interpretations are outside the UKAS Accreditation

A copy of the Laboratory Schedule of accredited tests as issued by UKAS is attached to this report. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced in full, without the prior written approval of the laboratory.

Checked and Approved Signatories:

R Gunson
(Director)

A Watkins
(Director)

M Beastall
(Laboratory Manager)

SUMMARY OF LABORATORY SOIL DESCRIPTIONS

[illegible]

Professional Soils Laboratory

Compiled by	Date	Checked by	Date	Approved by	Date
	15/08/13		15/08/13		15/08/13
GATEWEN ROAD, WREXHAM.				Contract No: PSL13/2760	
				Client Ref:	

SUMMARY OF SOIL CLASSIFICATION TESTS

(B.S. 1377 : PART 2 : 1990)

[illegible]

SYMBOLS : NP : Non Plastic



Professional Soils Laboratory

Compiled by

Date _____

15/08/13

Checked by

Date _____

15/08/13

Approved by

Date _____

15/08/13

Contract No:	PSL13/2760
---------------------	-------------------

Client Ref:

GATEWEN ROAD, WREXHAM.



LABORATORY REPORT



4043

Contract Number: PSL13/2761

Client's Reference:

Report Date: 13 August 2013

Client Name: Terra Consult
Bold Business Centre
Bold Lane, Sutton
St Helens
Merseyside
WA9 4TX

For the attention of: Alan Binns

Contract Title: Gatewen Road, Wrexham

Date Received: 7/08/2013

Date Commenced: 07/08/2013

Date Completed: 13/08/2013

Notes: Observations and Interpretations are outside the UKAS Accreditation

A copy of the Laboratory Schedule of accredited tests as issued by UKAS is attached to this report. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced in full, without the prior written approval of the laboratory.

Checked and Approved Signatories:

R Gunson
(Director)

A Watkins
(Director)


M Beastall
(Laboratory Manager)

SUMMARY OF LABORATORY SOIL DESCRIPTIONS

[illegible]

 Professional Soils Laboratory	Compiled by	Date	Checked by	Date	Approved by	Date
		13/08/13		13/08/13		13/08/13
	GATEWEN ROAD, WREXHAM.				Contract No: PSL13/2761	
					Client Ref: 1858	

SUMMARY OF SOIL CLASSIFICATION TESTS

(B.S. 1377 : PART 2 : 1990)

[illegible]

SYMBOLS : NP : Non Plastic

*** : Liquid Limit and Plastic Limit Wet Sieved.**

 Professional Soils Laboratory	Compiled by	Date	Checked by	Date	Approved by	Date
		13/08/13		13/08/13		13/08/13
	GATEWEN ROAD, WREXHAM.				Contract No: PSL13/2761	
					Client Ref: 1858	



LABORATORY REPORT



4043

Contract Number: PSL13/2945

Client's Reference:

Report Date: 28 August 2013

Client Name: Terra Consult
Bold Business Centre
Bold Lane, Sutton
St Helens
Merseyside
WA9 4TX

For the attention of: Alan Binns

Contract Title: Gatewen Road, Wrexham

Date Received: 19/8/2013

Date Commenced: 19/8/2013

Date Completed: 28/8/2013

Notes: Observations and Interpretations are outside the UKAS Accreditation

A copy of the Laboratory Schedule of accredited tests as issued by UKAS is attached to this report. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced in full, without the prior written approval of the laboratory.

Checked and Approved Signatories:

R Gunson
(Director)

A Watkins
(Director)


M Beastall
(Laboratory Manager)

SUMMARY OF LABORATORY SOIL DESCRIPTIONS

[illegible]

Professional Soils Laboratory

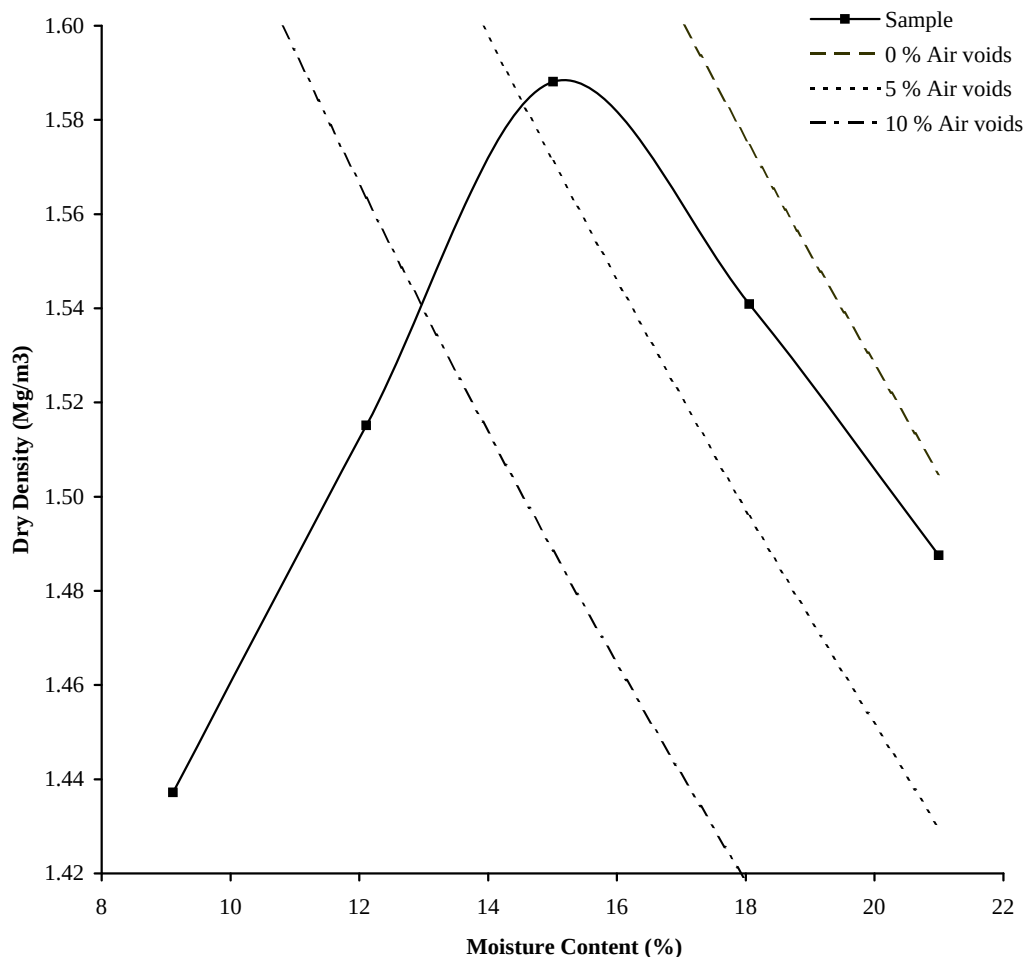
Compiled by	Date	Checked by	Date	Approved by	Date
	28/08/13		28/08/13		28/08/13
GATEWEN ROAD, WREXHAM.				Contract No: PSL13/2945	
				Client Ref: 1858	

Dry Density/Moisture Content Relationship Test

BS 1377 : Part 4 : 1990

Date Taken: 13.08.13

Sample Ref: Cell 1 High Calorific



Initial Moisture Content:	18	Method of Compaction	4.5kg / Separate Sample	
Particle Density (Mg/m³):	2.20	Assumed	Material Retained on 37.5 mm Test Sieve (%):	5
Maximum Dry Density (Mg/m³):		1.59	Material Retained on 20.0 mm Test Sieve (%):	10
Optimum Moisture Content (%):		15		
Remarks	See Summary of Soil Descriptions.			

Checked By	Date	Approved By	Date
<i>H. Jones</i>	28/08/13	<i>H. Jones</i>	28/08/13

PSL Professional Soils Laboratory	GATEWAY ROAD, WREXHAM.	Contract No. PSL13/2945
---	------------------------	----------------------------



LABORATORY REPORT



4043

Contract Number: PSL13/3026

Client's Reference:

Report Date: 09 September 2013

Client Name: Terra Consult
Bold Business Centre
Bold Lane, Sutton
St Helens
Merseyside
WA9 4TX

For the attention of: Mike Collinson

Contract Title: Gatewen Road, Wrexham

Date Received: 23/08/2013

Date Commenced: 23/08/2013

Date Completed: 09/09/2013

Notes: Observations and Interpretations are outside the UKAS Accreditation

A copy of the Laboratory Schedule of accredited tests as issued by UKAS is attached to this report. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced in full, without the prior written approval of the laboratory.

Checked and Approved Signatories:

R Gunson
(Director)

A Watkins
(Director)


M Beastall
(Laboratory Manager)

SUMMARY OF LABORATORY SOIL DESCRIPTIONS

[illegible]

Professional Soils Laboratory

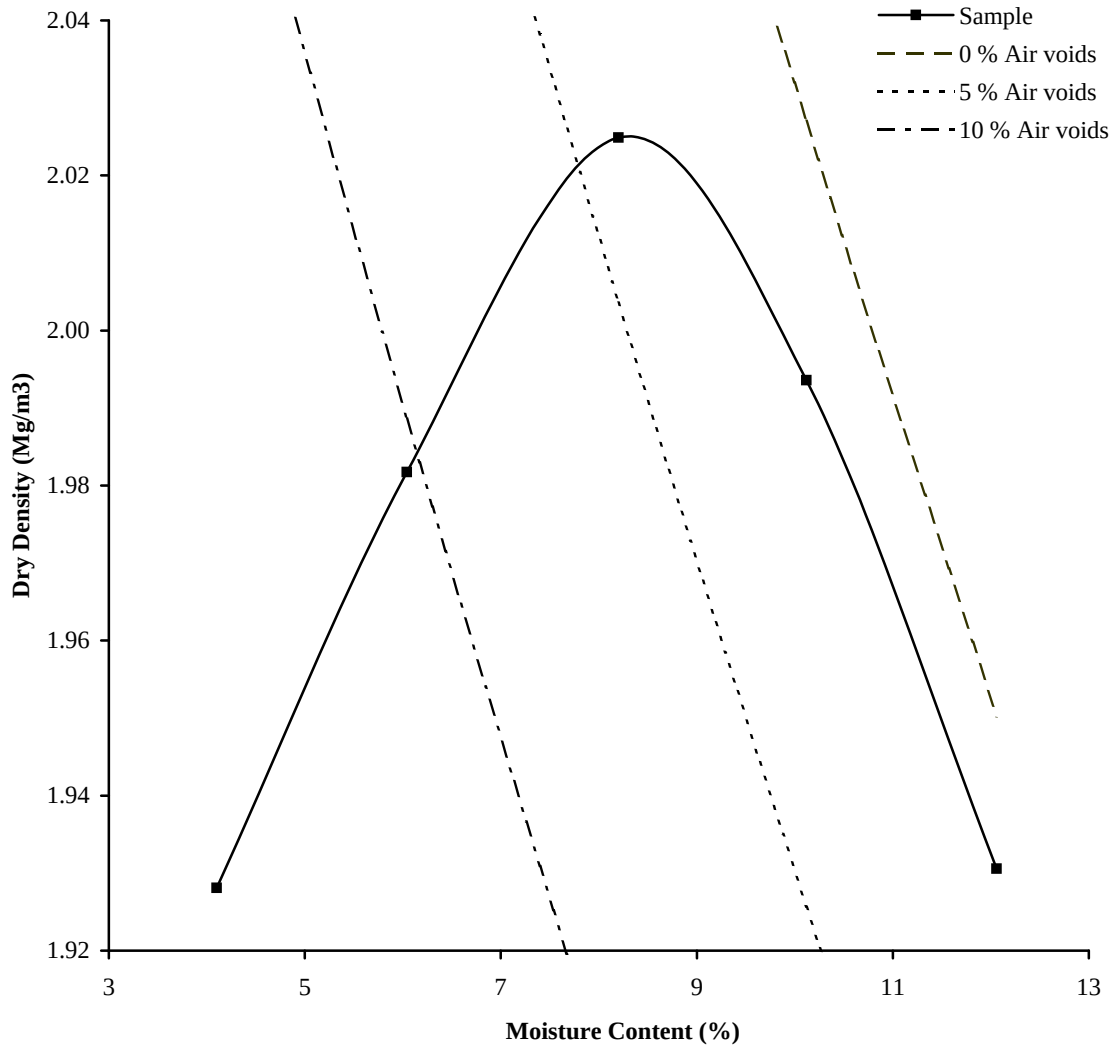
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	09/09/13		09/09/13		09/09/13
GATEWEN ROAD, WREXHAM.				Contract No:	PSL13/3026
				Client Ref:	1858

Dry Density/Moisture Content Relationship Test

Non Compliance with BS 1377 : Part 4 : 1990

Hole Number: Low Calorific Cell 1

Sample ID: A Sample Type:



Initial Moisture Content:	8.2	Method of Compaction	4.5Kg Rammer / Separate Sample
Particle Density (Mg/m3):	2.55	Assumed	Material Retained on 37.5 mm Test Sieve (%): 14
Maximum Dry Density (Mg/m3):	2.02		Material Retained on 20.0 mm Test Sieve (%): 18
Optimum Moisture Content (%):	8		
Remarks	See Summary of Soil Descriptions.		

Checked By	Date	Approved By	Date
	09/09/13		09/09/13

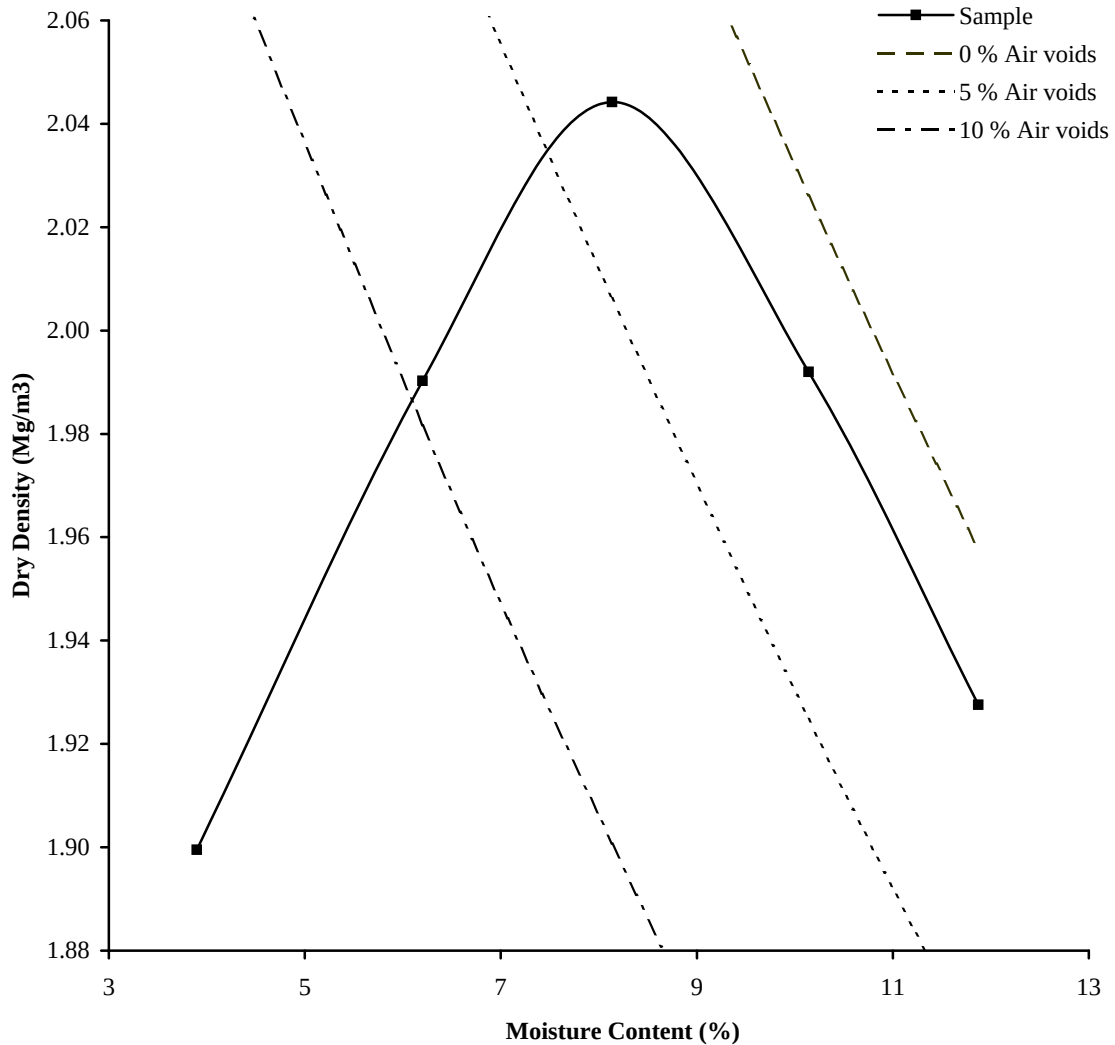
PSL Professional Soils Laboratory	GATEWEN ROAD, WREXHAM.	Contract No. PSL13/3026
---	------------------------	----------------------------

Dry Density/Moisture Content Relationship Test

Non Compliance with BS 1377 : Part 4 : 1990

Hole Number: Low Calorific Cell 1

Sample ID: B Sample Type:



Initial Moisture Content:	8.1	Method of Compaction	4.5Kg Rammer / Separate Sample	
Particle Density (Mg/m3):	2.55	Assumed	Material Retained on 37.5 mm Test Sieve (%):	13
Maximum Dry Density (Mg/m3):		2.04	Material Retained on 20.0 mm Test Sieve (%):	16
Optimum Moisture Content (%):		8		
Remarks	See Summary of Soil Descriptions.			

Checked By	Date	Approved By	Date
	09/09/13		09/09/13

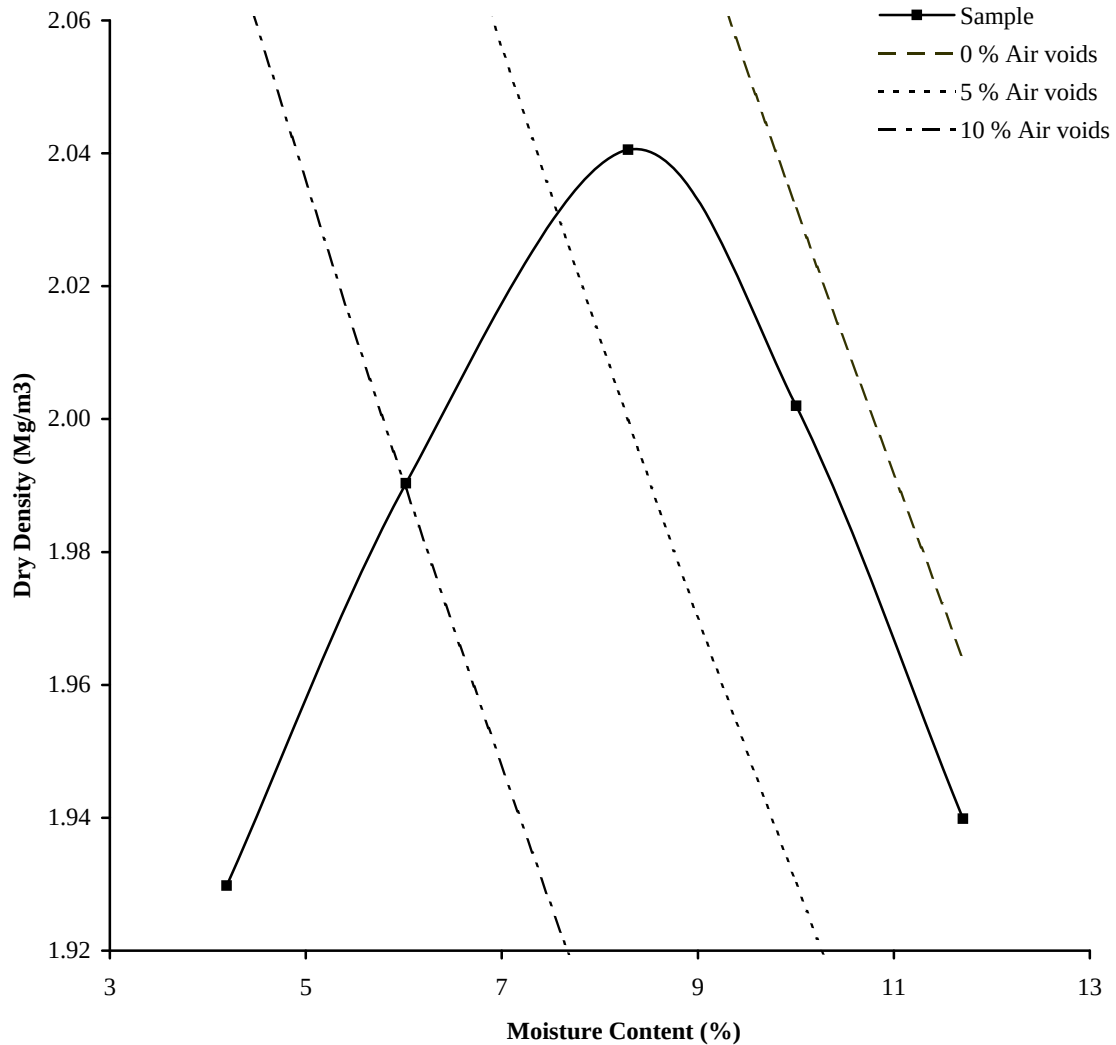
PSL Professional Soils Laboratory	GATEWEN ROAD, WREXHAM.	Contract No. PSL13/3026
---	------------------------	----------------------------

Dry Density/Moisture Content Relationship Test

Non Compliance with BS 1377 : Part 4 : 1990

Hole Number: Low Calorific Cell 2

Sample ID: A Sample Type:



Initial Moisture Content:	8.3	Method of Compaction	4.5Kg Rammer / Separate Sample
Particle Density (Mg/m ³):	2.55	Assumed	Material Retained on 37.5 mm Test Sieve (%): 16
Maximum Dry Density (Mg/m ³):	2.04		Material Retained on 20.0 mm Test Sieve (%): 16
Optimum Moisture Content (%):	8		
Remarks	See Summary of Soil Descriptions.		

Checked By	Date	Approved By	Date
	09/09/13		09/09/13

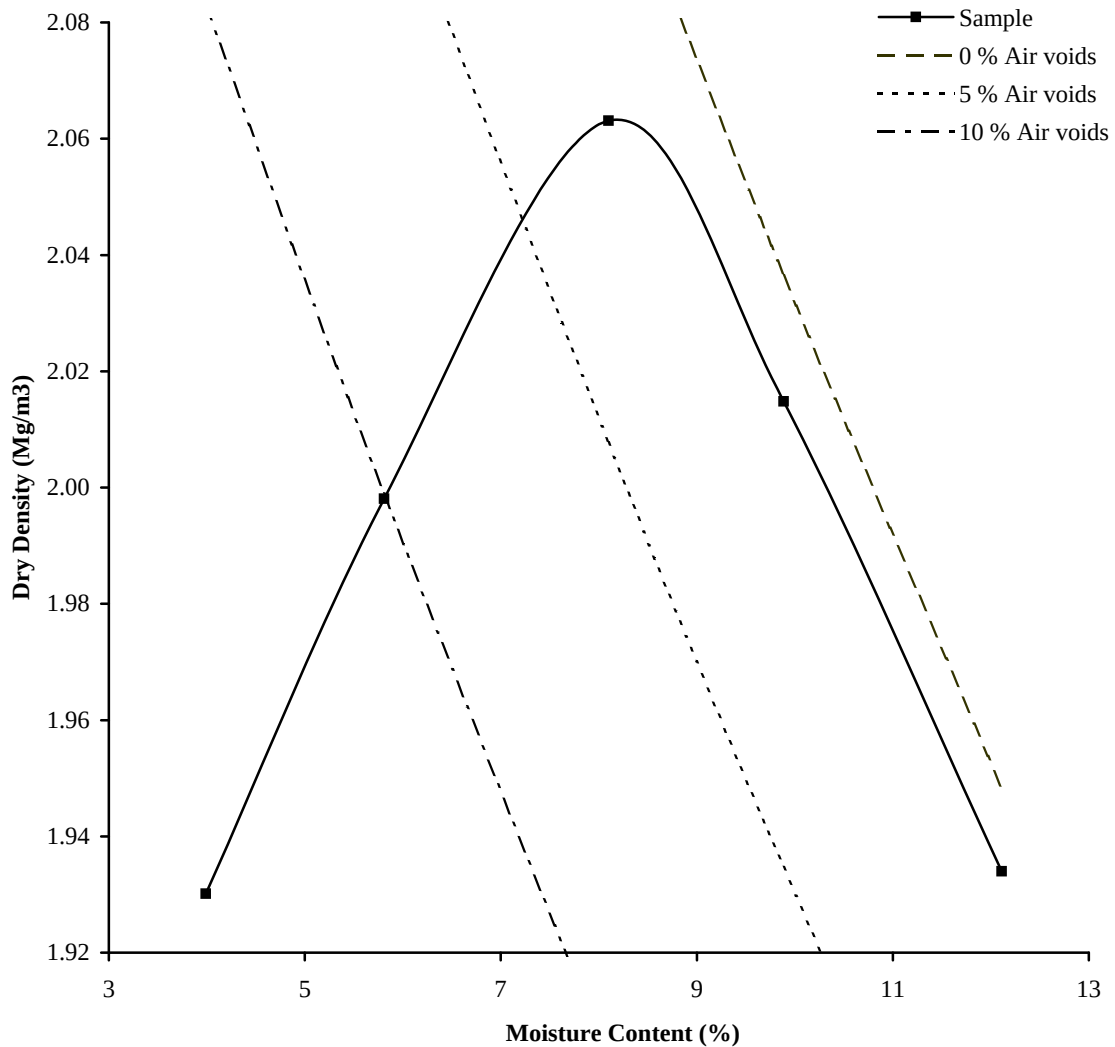
PSL Professional Soils Laboratory	GATEWEN ROAD, WREXHAM.	Contract No. PSL13/3026
---	------------------------	----------------------------

Dry Density/Moisture Content Relationship Test

Non Compliance with BS 1377 : Part 4 : 1990

Hole Number: Low Calorific Cell 2

Sample ID: B Sample Type:



Initial Moisture Content:	8.1	Method of Compaction	4.5Kg Rammer / Separate Sample	
Particle Density (Mg/m3):	2.55	Assumed	Material Retained on 37.5 mm Test Sieve (%):	13
Maximum Dry Density (Mg/m3):		2.06	Material Retained on 20.0 mm Test Sieve (%):	18
Optimum Moisture Content (%):		8		
Remarks	See Summary of Soil Descriptions.			

Checked By	Date	Approved By	Date
	09/09/13		09/09/13

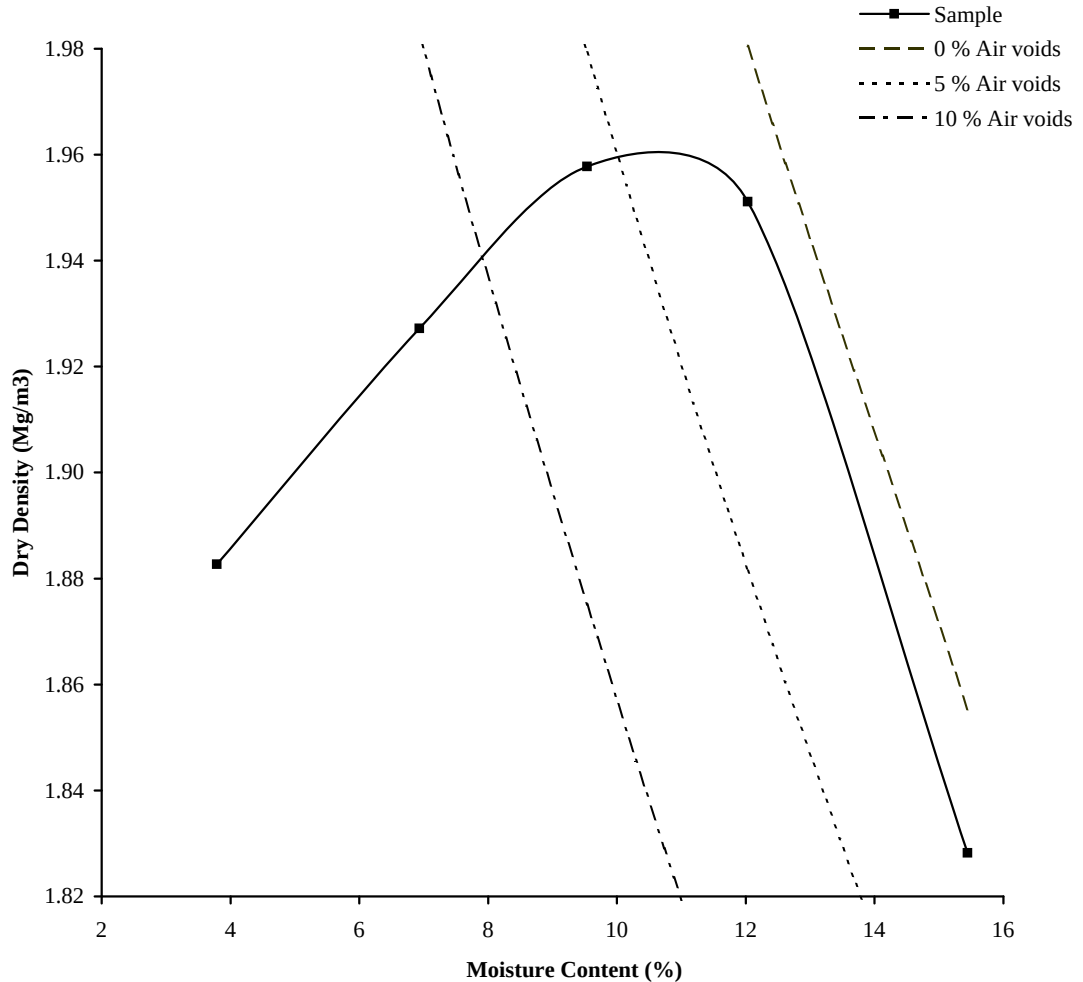
PSL Professional Soils Laboratory	GATEWEN ROAD, WREXHAM.	Contract No. PSL13/3026
---	------------------------	----------------------------

Dry Density/Moisture Content Relationship Test

BS 1377 : Part 4 : 1990

Date Taken: 13.08.13

Sample Ref: Cell 1 Low Calorific



Initial Moisture Content:	10	Method of Compaction	4.5kg / Separate Sample	
Particle Density (Mg/m3):	2.6	Assumed	Material Retained on 37.5 mm Test Sieve (%):	6
Maximum Dry Density (Mg/m3):		1.96	Material Retained on 20.0 mm Test Sieve (%):	10
Optimum Moisture Content (%):		11		
Remarks	See Summary of Soil Descriptions.			

Checked By	Date	Approved By	Date
<i>H. be</i>	28/08/13	<i>H. be</i>	28/08/13

PSL Professional Soils Laboratory	GATEWAY ROAD, WREXHAM.	Contract No. PSL13/2945
---	------------------------	----------------------------

Appendix L2

Calorific Value Laboratory Tests

Analysis Report

Page 1 of 1

Report Number: 13/SEP/COA/5471a

Client **Terra Consult**
Bold Business Centre
Bold Lane
Sutton

Sample Reference **Sample A**

Date Sampled: 29th August 2013

Date Received: 12th September 2013

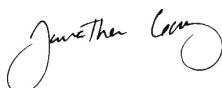
Test Date: 13th to 18th September 2013

Date Reported: 19th September 2013

Method Reference		Units	Results Basis	
			As Received *	Dry Ash Free *
SP1 & CA2	Total Moisture	%	11.8	-
CA 2	Analysis Moisture	%	1.9	-
CA 3	Ash	%	80.2	-
CA 6	Volatile Matter	%	7.8	97.5
CA31	Total Sulphur	%	0.57	-
CA11	Gross Calorific Value	kJ/kg	926	11580
*	Net Calorific Value	kJ/kg	400	-

Samples prepared using UKAS accredited methods SP1 & SP2

* Calculated using UKAS accredited results



Report Authorised By
Jonathan Clay
Head of Client Services
(Energy Services Reporting)
For and on behalf of Environmental Scientifics Group Ltd

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0001

Analysis Report

Page 1 of 1

Report Number: 13/SEP/COA/5471b

Client **Terra Consult**
Bold Business Centre
Bold Lane
Sutton

Sample Reference **Sample B**

Date Sampled: 29th August 2013

Date Received: 12th September 2013

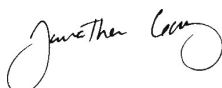
Test Date: 13th to 18th September 2013

Date Reported: 19th September 2013

Method Reference		Units	Results Basis	
			As Received *	Dry Ash Free *
SP1 & CA2	Total Moisture	%	11.4	-
CA 2	Analysis Moisture	%	1.6	-
CA 3	Ash	%	78.1	-
CA 6	Volatile Matter	%	7.5	71.4
CA31	Total Sulphur	%	0.39	-
CA11	Gross Calorific Value	kJ/kg	1891	18010
*	Net Calorific Value	kJ/kg	1365	-

Samples prepared using UKAS accredited methods SP1 & SP2

* Calculated using UKAS accredited results



Report Authorised By
Jonathan Clay
Head of Client Services
(Energy Services Reporting)
For and on behalf of Environmental Scientifics Group Ltd

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0001

Analysis Report

Page 1 of 1

Report Number: 13/SEP/COA/5487a

Client **Terra Consult**
Bold Business Centre
Bold Lane
Sutton

Sample Reference **Cell 1 Cal 1**

Date Sampled: 20th August 2013

Date Received: 12th September 2013

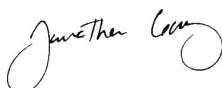
Test Date: 13th to 18th September 2013

Date Reported: 19th September 2013

Method Reference		Units	Results Basis	
			As Received *	Dry Ash Free *
SP1 & CA2	Total Moisture	%	8.5	-
CA 2	Analysis Moisture	%	1.5	-
CA 3	Ash	%	77.4	-
CA 6	Volatile Matter	%	8.9	63.1
CA31	Total Sulphur	%	1.53	-
CA11	Gross Calorific Value	kJ/kg	2620	18580
*	Net Calorific Value	kJ/kg	2144	-

Samples prepared using UKAS accredited methods SP1 & SP2

* Calculated using UKAS accredited results



Report Authorised By
Jonathan Clay
Head of Client Services
(Energy Services Reporting)
For and on behalf of Environmental Scientifics Group Ltd

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0001

Analysis Report

Page 1 of 1

Report Number: 13/SEP/COA/5487b

Client **Terra Consult**
Bold Business Centre
Bold Lane
Sutton

Sample Reference **Cell 1 Cal 2**

Date Sampled: 20th August 2013

Date Received: 12th September 2013

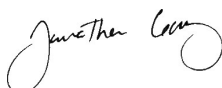
Test Date: 13th to 18th September 2013

Date Reported: 19th September 2013

Method Reference		Units	Results Basis	
			As Received *	Dry Ash Free *
SP1 & CA2	Total Moisture	%	8.3	-
CA 2	Analysis Moisture	%	1.4	-
CA 3	Ash	%	77.8	-
CA 6	Volatile Matter	%	8.8	63.3
CA31	Total Sulphur	%	0.15	-
CA11	Gross Calorific Value	kJ/kg	2613	18800
*	Net Calorific Value	kJ/kg	2140	-

Samples prepared using UKAS accredited methods SP1 & SP2

* Calculated using UKAS accredited results



Report Authorised By
Jonathan Clay
Head of Client Services
(Energy Services Reporting)
For and on behalf of Environmental Scientifics Group Ltd

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0001

Analysis Report

Page 1 of 1

Report Number: 13/SEP/COA/5487c

Client **Terra Consult**
Bold Business Centre
Bold Lane
Sutton

Sample Reference **Cell 2 Cal 1**

Date Sampled: 20th August 2013

Date Received: 12th September 2013

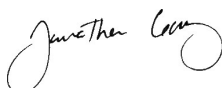
Test Date: 13th to 18th September 2013

Date Reported: 19th September 2013

Method Reference		Units	Results Basis	
			As Received *	Dry Ash Free *
SP1 & CA2	Total Moisture	%	8.9	-
CA 2	Analysis Moisture	%	1.7	-
CA 3	Ash	%	75.3	-
CA 6	Volatile Matter	%	9.2	58.2
CA31	Total Sulphur	%	0.19	-
CA11	Gross Calorific Value	kJ/kg	3401	21520
*	Net Calorific Value	kJ/kg	2897	-

Samples prepared using UKAS accredited methods SP1 & SP2

* Calculated using UKAS accredited results



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Head of Client Services
(Energy Services Reporting)
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0001

Analysis Report

Page 1 of 1

Report Number: 13/SEP/COA/5487d

Client **Terra Consult**
Bold Business Centre
Bold Lane
Sutton

Sample Reference **Cell 3 Cal 1**

Date Sampled: 20th August 2013

Date Received: 12th September 2013

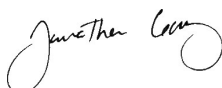
Test Date: 13th to 18th September 2013

Date Reported: 19th September 2013

Method Reference		Units	Results Basis	
			As Received *	Dry Ash Free *
SP1 & CA2	Total Moisture	%	9.0	-
CA 2	Analysis Moisture	%	1.7	-
CA 3	Ash	%	76.1	-
CA 6	Volatile Matter	%	9.3	62.4
CA31	Total Sulphur	%	0.19	-
CA11	Gross Calorific Value	kJ/kg	3046	20440
*	Net Calorific Value	kJ/kg	2544	-

Samples prepared using UKAS accredited methods SP1 & SP2

* Calculated using UKAS accredited results



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0001

Analysis Report

Page 1 of 1

Report Number: 13/SEP/COA/5487e

Client **Terra Consult**
Bold Business Centre
Bold Lane
Sutton

Sample Reference **Cell 3 Cal 2**

Date Sampled: 20th August 2013

Date Received: 12th September 2013

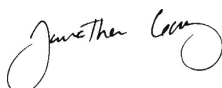
Test Date: 13th to 18th September 2013

Date Reported: 19th September 2013

Method Reference		Units	Results Basis	
			As Received *	Dry Ash Free *
SP1 & CA2	Total Moisture	%	7.9	-
CA 2	Analysis Moisture	%	1.3	-
CA 3	Ash	%	75.5	-
CA 6	Volatile Matter	%	13.2	79.5
CA31	Total Sulphur	%	0.15	-
CA11	Gross Calorific Value	kJ/kg	2156	12990
*	Net Calorific Value	kJ/kg	1669	-

Samples prepared using UKAS accredited methods SP1 & SP2

* Calculated using UKAS accredited results



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Analysis Report

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Report Number: 13/SEP/COA/5487f

Client **Terra Consult**
Bold Business Centre
Bold Lane
Sutton

Sample Reference **Cell 2 Cal 2**

Date Sampled: 20th August 2013

Date Received: 12th September 2013

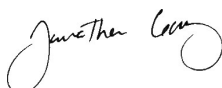
Test Date: 13th to 18th September 2013

Date Reported: 19th September 2013

Method Reference		Units	Results Basis	
			As Received *	Dry Ash Free *
SP1 & CA2	Total Moisture	%	9.0	-
CA 2	Analysis Moisture	%	1.6	-
CA 3	Ash	%	76.3	-
CA 6	Volatile Matter	%	8.6	58.5
CA31	Total Sulphur	%	0.20	-
CA11	Gross Calorific Value	kJ/kg	2987	20320
*	Net Calorific Value	kJ/kg	2495	-

Samples prepared using UKAS accredited methods SP1 & SP2

* Calculated using UKAS accredited results



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Analysis Report

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Report Number: 13/AUG/COA/5077a

Client **Terra Consult**
Bold Business Centre
Bold Lane
Sutton

Sample Reference **Low Cal Cell 1 @1m**

Date Sampled:

Date Received: 19 August 2013

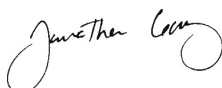
Test Date: 21 August to 12 September 2013

Date Reported: 12 September 2013

Method Reference		Units	Results Basis	
			As Received *	Dry Ash Free *
SP1 & CA1	Total Moisture	%	8.7	-
CA 2	Analysis Moisture	%	2.1	-
CA 3	Ash	%	80.8	-
CA 6	Volatile Matter	%	9.4	89.5
CA31	Total Sulphur	%	0.49	-
CA11	Gross Calorific Value	kJ/kg	1231	11720
*	Net Calorific Value	kJ/kg	763	-

Samples prepared using UKAS accredited methods SP1 & SP2

* Calculated using UKAS accredited results



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Analysis Report

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Report Number: 13/AUG/COA/5077b

Client **Terra Consult**
Bold Business Centre
Bold Lane
Sutton

Sample Reference **Low Cal Cell 2 @1m**

Date Sampled:

Date Received: 19 August 2013

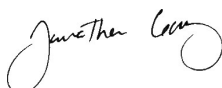
Test Date: 21 August to 12 September 2013

Date Reported: 12 September 2013

Method Reference		Units	Results Basis	
			As Received *	Dry Ash Free *
SP1 & CA1	Total Moisture	%	12.1	-
CA 2	Analysis Moisture	%	2.9	-
CA 3	Ash	%	75.6	-
CA 6	Volatile Matter	%	7.1	57.7
CA31	Total Sulphur	%	0.14	-
CA11	Gross Calorific Value	kJ/kg	2698	21940
*	Net Calorific Value	kJ/kg	2147	-

Samples prepared using UKAS accredited methods SP1 & SP2

* Calculated using UKAS accredited results



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Analysis Report

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Report Number: 13/AUG/COA/5077c

Client **Terra Consult**
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Bold Lane
Sutton

Sample Reference **Low Cal Cell 1 @1m**

Date Sampled:

Date Received: 19 August 2013

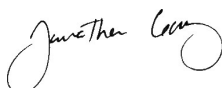
Test Date: 21 August to 20 September 2013

Date Reported: 20 September 2013

Method Reference		Units	Results Basis	
			As Received *	Dry Ash Free *
SP1 & CA1	Total Moisture	%	8.7	-
CA 2	Analysis Moisture	%	2.1	-
CA 3	Ash	%	81.0	-
CA 6	Volatile Matter	%	9.1	88.3
CA31	Total Sulphur	%	0.50	-
CA11	Gross Calorific Value	kJ/kg	1250	12130
*	Net Calorific Value	kJ/kg	783	-

Samples prepared using UKAS accredited methods SP1 & SP2

* Calculated using UKAS accredited results



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Analysis Report

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Report Number: 13/AUG/COA/5077d

Client **Terra Consult**
Bold Business Centre
Bold Lane
Sutton

Sample Reference **Low Cal Cell 2 @1m**

Date Sampled:

Date Received: 19 August 2013

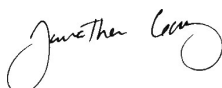
Test Date: 21 August to 20 September 2013

Date Reported: 20 September 2013

Method Reference		Units	Results Basis	
			As Received *	Dry Ash Free *
SP1 & CA1	Total Moisture	%	11.4	-
CA 2	Analysis Moisture	%	2.1	-
CA 3	Ash	%	75.5	-
CA 6	Volatile Matter	%	8.0	61.1
CA31	Total Sulphur	%	0.15	-
CA11	Gross Calorific Value	kJ/kg	2887	22040
*	Net Calorific Value	kJ/kg	2338	-

Samples prepared using UKAS accredited methods SP1 & SP2

* Calculated using UKAS accredited results



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Appendix S

Site testing

Appendix S1	Site Daily Records
Appendix S2	Sand Calibration
Appendix S3	Compaction Daily Site Records
Appendix S3B(i)-	Combined density results - High Calorific Material
Appendix S3B(ii)	Combined density results - Low Calorific Material
Appendix S4	Trial Pad
Appendix S5	Plate Bearing Tests

Appendix S1

Site Daily Records

Client	Bloor Homes	Site	Gatewen Road, Wrexham
Staff Member	J Peters	Day/Date	day Thursday 1.08.2013
Weather	Dry / sunny spells	Time on site	07:00 – 18:00
Visitors	Richard Quinn (McAuliffe) Allan Binns		
Activities On Site	McAuliffe: Arrived on site and had induction. Area was prepared for trial pad. Dumper truck took a mixture of stockpile one (high calorific value) and stockpile two and lay it for roller to give it four passes. Four SRDs were done but oven was not connected so was unable to get Results. Cleaned up on site and left at 6. No materials left site.		
McAuliffe: Plant & Personnel On Site	1 x 21 tonne excavator 1 x 29 tonne excavator 2 x 25 tonne ADT's 1 x 13 tonne excavator 1 x D61 bulldozer 1 x Bunded fuel tank 1 x 3 tonne forward tipping dumper 1 x 12 tonne padfoot vibratory roller 1 x mobile decontamination unit	Personnel: 1 x Site manager 1 x foreman 5 x drivers 1 x labourer	
Details of QA Work :	General site inspection. Visual assessment of material transported from spoil heap to screening bund in accordance with the remediation strategy implementation and verification plan. All exposed faces within the spoil heap and bund checked to ensure that no asbestos or high risk materials were left exposed. All ACM is covered with 2000 gauge visqueen or non-asbestos containing ash or clay.		
Samples Taken			
Soil Sent Off Site			

Client	Bloor Homes	Site	Gatewen Road, Wrexham
Staff Member	J Peters	Day/Date	Day 2 .08.2013
Weather	Dry / sunny spells	Time on site	07:00 – 18:00
Visitors	Richard Quinn (McAuliffe)		
Activities On Site	McAuliffe: Arrived on site at 7.00. Trial pad was cleaned up and giving a further 2 passes = 6 passes From the roller. Electrician arrived on site and connected the oven for cooking samples. Completed 4 SRDs and had further 2 passes on trial pad = 8 passes. Completed further 3 SRDs. No material left site		
McAuliffe: Plant & Personnel On Site	1 x 21 tonne excavator 1 x 29 tonne excavator 2 x 25 tonne ADT's 1 x 13 tonne excavator 1 x D61 bulldozer 1 x Bunded fuel tank 1 x 3 tonne forward tipping dumper 1 x 12 tonne padfoot vibratory roller 1 x mobile decontamination unit	Personnel: 1 x Site manager 1 x foreman 5 x drivers 1 x labourer	
Details of QA Work :	General site inspection. Visual assessment of material transported from spoil heap to screening bund in accordance with the remediation strategy implementation and verification plan. All exposed faces within the spoil heap and bund checked to ensure that no asbestos or high risk materials were left exposed. All ACM is covered with 2000 gauge visqueen or non-asbestos containing ash or clay.		
Samples Taken			
Soil Sent Off Site			

Client	Bloor Homes	Site	Gatewen Road, Wrexham
Staff Member	J Peters	Day/Date	day Monday 5.08.2013
Weather	Wet, overcast	Time on site	07:00 – 18:00
Visitors	Richard Quinn (McAuliffe)		
Activities On Site	McAuliffe: Arived on site and was unable to carry on with testing as weather conditions were unworkable. Started SRD testing. Oven turned on at 13.10 hrs. samples 1-11 were put in the oven. Calibrated sand and started typing up data. Dumper truck ADT25Fexcavated 92 loads to stockpile. Dumper truck A25F excavated 91 loads to stockpile. No material left site.		
McAuliffe: Plant & Personnel On Site	1 x 21 tonne excavator 1 x 29 tonne excavator 2 x 25 tonne ADT's 1 x 13 tonne excavator 1 x D61 bulldozer 1 x Bunded fuel tank 1 x 3 tonne forward tipping dumper 1 x 12 tonne padfoot vibratory roller 1 x mobile decontamination unit	Personnel: 1 x Site manager 1 x foreman 5 x drivers 1 x labourer	
Details of QA Work :	General site inspection. Visual assessment of material transported from spoil heap to screening bund in accordance with the remediation strategy implementation and verification plan. All exposed faces within the spoil heap and bund checked to ensure that no asbestos or high risk materials were left exposed. All ACM is covered with 2000 gauge visqueen or non-asbestos containing ash or clay.		
Samples Taken			
Soil Sent Off Site			

Client	Bloor Homes	Site	Gatewen Road, Wrexham
Staff Member	J Peters	Day/Date	day Tuesday 6.08.2013
Weather	Dry /	Time on site	07:00 – 18:00
Visitors	Richard Quinn (McAuliffe)		
Activities On Site	McAuliffe: Arrived on site at 6.30 and took soil samples out of the oven to cool down. Once samples were cool I took first dry weight. Samples put back in the oven for a further 3 hours. Then took samples back out the oven for second dry weight. Work started on digging cell 1 which was moved into second stock pile. Trial pad was given another 2 passes = 10 passes then further 4 SRDs were taking. Core cutter sample was taking as well. SRDs and core cutter sample were put in the oven and left over night. Dumper truck A25F excavated 98 loads to stock pile. Dumper truck ADT NO23 excavated 112 loads to stock pile. No materials left site.		
McAuliffe: Plant & Personnel On Site	1 x 21 tonne excavator 1 x 29 tonne excavator 2 x 25 tonne ADT's 1 x 13 tonne excavator 1 x D61 bulldozer 1 x Bunded fuel tank 1 x 3 tonne forward tipping dumper 1 x 12 tonne padfoot vibratory roller 1 x mobile decontamination unit	Personnel: 1 x Site manager 1 x foreman 5 x drivers 1 x labourer	
Details of QA Work :	General site inspection. Visual assessment of material transported from spoil heap to screening bund in accordance with the remediation strategy implementation and verification plan. All exposed faces within the spoil heap and bund checked to ensure that no asbestos or high risk materials were left exposed. All ACM is covered with 2000 gauge visqueen or non-asbestos containing ash or clay.		
Samples Taken			
Soil Sent Off Site			

Client	Bloor Homes	Site	Gatewen Road, Wrexham
Staff Member	J Peters	Day/Date	Day Wednesday 7 .08.2013
Weather	Dry / sunny spels	Time on site	07:00 – 18:00
Visitors	Richard Quinn (McAuliffe)		
Activities On Site	McAuliffe: Arrived on site at 7.00 and removed samples from oven to cool down before taking first dry weight. Samples went back into the oven for a further 4 hours and then removed again for second dry weight. Dumper trucks excavated soil from cell and brought calorific material in to be rolled. Roller compacted calorific material at 6 passes. Testing to be carried out every 25 meter squared. Dumper truck A25F no 23 excavated 93 loads to stock pile. Dumper truck volvo 22 excavated 95 loads to stock pile. Two SRDs completed on calorific layer 1. No materials left site		
McAuliffe: Plant & Personnel On Site	1 x 21 tonne excavator 1 x 29 tonne excavator 2 x 25 tonne ADT's 1 x 13 tonne excavator 1 x D61 bulldozer 1 x Bunded fuel tank 1 x 3 tonne forward tipping dumper 1 x 12 tonne padfoot vibratory roller 1 x mobile decontamination unit	Personnel: 1 x Site manager 1 x foreman 5 x drivers 1 x labourer	
Details of QA Work :	General site inspection. Visual assessment of material transported from spoil heap to screening bund in accordance with the remediation strategy implementation and verification plan. All exposed faces within the spoil heap and bund checked to ensure that no asbestos or high risk materials were left exposed. All ACM is covered with 2000 gauge visqueen or non-asbestos containing ash or clay.		
Samples Taken			
Soil Sent Off Site			

Client	Bloor Homes	Site	Gatewen Road, Wrexham
Staff Member	J Peters	Day/Date	day Thursday 8.08.2013
Weather	Dry /	Time on site	07:00 – 18:00
Visitors	Richard Quinn (McAuliffe)		
Activities On Site	McAuliffe: Arived on site at 7.00. first and second layer of calorific material was layed and given required passes and first layer of low calorific material was layed and given required passes. Dump truck A25F NO23 excavated 91 loads from stockpile. 148 loads of calorific into fill. Dumper A25F 22 excavated 24bloads of muck from stockpile, 19 loads of calorific material from stockpile, 12 loads of muk straight into fill and 95 loads loads to stockpile. No material left site.		
McAuliffe: Plant & Personnel On Site	1 x 21 tonne excavator 1 x 29 tonne excavator 2 x 25 tonne ADT's 1 x 13 tonne excavator 1 x D61 bulldozer 1 x Bunded fuel tank 1 x 3 tonne forward tipping dumper 1 x 12 tonne padfoot vibratory roller 1 x mobile decontamination unit	Personnel: 1 x Site manager 1 x foreman 5 x drivers 1 x labourer	
Details of QA Work :	General site inspection. Visual assessment of material transported from spoil heap to screening bund in accordance with the remediation strategy implementation and verification plan. All exposed faces within the spoil heap and bund checked to ensure that no asbestos or high risk materials were left exposed. All ACM is covered with 2000 gauge visqueen or non-asbestos containing ash or clay.		
Samples Taken			
Soil Sent Off Site			

Client	Bloor Homes	Site	Gatewen Road, Wrexham
Staff Member	J Peters	Day/Date	day Friday 09.08.2013
Weather	Overcast, light showers	Time on site	07:00 – 18:00
Visitors	Richard Quinn (McAuliffe)		
Activities On Site	McAuliffe: Arived on site at 7.00 and took soil samples out of the oven. Completed 8 SRDs. Muck for part of LCV layer 3 was put down and rolled. Dumper truck A25 22 excavated 8 loads of muck to stockpile, 20 loads of calorific material into fill and 28 loads of muck straight to fill. No material left site.		
McAuliffe: Plant & Personnel On Site	1 x 21 tonne excavator 1 x 29 tonne excavator 2 x 25 tonne ADT's 1 x 13 tonne excavator 1 x D61 bulldozer 1 x Bunded fuel tank 1 x 3 tonne forward tipping dumper 1 x 12 tonne padfoot vibratory roller 1 x mobile decontamination unit	Personnel: 1 x Site manager 1 x foreman 5 x drivers 1 x labourer	
Details of QA Work :	General site inspection. Visual assessment of material transported from spoil heap to screening bund in accordance with the remediation strategy implementation and verification plan. All exposed faces within the spoil heap and bund checked to ensure that no asbestos or high risk materials were left exposed. All ACM is covered with 2000 gauge visqueen or non-asbestos containing ash or clay.		
Samples Taken			
Soil Sent Off Site			

Client	Bloor Homes	Site	Gatewen Road, Wrexham
Staff Member	J Peters	Day/Date	day .13.08.2013
Weather	Dry / Overcast 11°C – 13°C	Time on site	07:00 – 18:00
Visitors	Richard Quinn (McAuliffe)		
Activities On Site	McAuliffe: Arived on site at 7am. Continued with SRDs. Dumper truck A25F NO23 excavated 30 loads of muck into fill. Dumper truck A25F 22 excavated 4 loads of calorific to stockpile. 34 loads of calorific into fill. 53 loads of muck to fill. Continued with testing, no materials left site.		
McAuliffe: Plant & Personnel On Site	1 x 21 tonne excavator 1 x 29 tonne excavator 2 x 25 tonne ADT's 1 x 13 tonne excavator 1 x D61 bulldozer 1 x Bunded fuel tank 1 x 3 tonne forward tipping dumper 1 x 12 tonne padfoot vibratory roller 1 x mobile decontamination unit	Personnel: 1 x Site manager 1 x foreman 5 x drivers 1 x labourer	
Details of QA Work :	General site inspection. Visual assessment of material transported from spoil heap to screening bund in accordance with the remediation strategy implementation and verification plan. All exposed faces within the spoil heap and bund checked to ensure that no asbestos or high risk materials were left exposed. All ACM is covered with 2000 gauge visqueen or non-asbestos containing ash or clay.		
Samples Taken			
Soil Sent Off Site			

Client	Bloor Homes	Site	Gatewen Road, Wrexham
Staff Member	J Peters	Day/Date	day 14.08.2013
Weather	Dry / Overcast 11°C – 13°C	Time on site	07:00 – 18:00
Visitors	Richard Quinn (McAuliffe)		
Activities On Site	McAuliffe: Arrived on site at 7.00am. Took SRD samples out of the oven and took first weight. Samples were then put back in oven before taking back out for second weight. Work commenced on cell 2. A further 12 SRDs were taking and weighed before put in the oven. Dumper truck A25F NO:23 excavated 94 loads of muck into fill and 9 loads of calorific material into fill. Dumper truck A25F NO:22 excavated 21 loads of calorific material into fill and 95 loads of muck into fill. No materials left site.		
McAuliffe: Plant & Personnel On Site	1 x 21 tonne excavator 1 x 29 tonne excavator 2 x 25 tonne ADT's 1 x 13 tonne excavator 1 x D61 bulldozer 1 x Bunded fuel tank 1 x 3 tonne forward tipping dumper 1 x 12 tonne padfoot vibratory roller 1 x mobile decontamination unit	Personnel: 1 x Site manager 1 x foreman 5 x drivers 1 x labourer	
Details of QA Work :	General site inspection. Visual assessment of material transported from spoil heap to screening bund in accordance with the remediation strategy implementation and verification plan. All exposed faces within the spoil heap and bund checked to ensure that no asbestos or high risk materials were left exposed. All ACM is covered with 2000 gauge visqueen or non-asbestos containing ash or clay.		
Samples Taken			
Soil Sent Off Site			

Client	Bloor Homes	Site	Gatewen Road, Wrexham
Staff Member	J Peters	Day/Date	day 15.08.2013
Weather	Dry / Overcast 11°C – 13°C	Time on site	07:00 – 18:00
Visitors	Richard Quinn (McAuliffe)		
Activities On Site	McAuliffe: Arrived on site at 7.00am. took SRD samples out of the oven and took first weight, placed back in oven before taking second weight. Went on site to continue with SRD testing. Completed 6 SRDs. Dumper truck A25F NO23 excavated 59 lads of muck into fill and 31 loads of calorific into fill. Dumper truck A25FNO:22 excavated 30 loads of calorific from stock pile to fill and 55 loads of muck to fill. Site was cleaned up and sand bags weighed for following day. No material left site.		
McAuliffe: Plant & Personnel On Site	1 x 21 tonne excavator 1 x 29 tonne excavator 2 x 25 tonne ADT's 1 x 13 tonne excavator 1 x D61 bulldozer 1 x Bunded fuel tank 1 x 3 tonne forward tipping dumper 1 x 12 tonne padfoot vibratory roller 1 x mobile decontamination unit	Personnel: 1 x Site manager 1 x foreman 5 x drivers 1 x labourer	
Details of QA Work :	General site inspection. Visual assessment of material transported from spoil heap to screening bund in accordance with the remediation strategy implementation and verification plan. All exposed faces within the spoil heap and bund checked to ensure that no asbestos or high risk materials were left exposed. All ACM is covered with 2000 gauge visqueen or non-asbestos containing ash or clay.		
Samples Taken			
Soil Sent Off Site			

Client	Bloor Homes	Site	Gatewen Road, Wrexham
Staff Member	J Peters	Day/Date	day .08.2013
Weather	Dry / Overcast 11°C – 13°C	Time on site	07:00 – 18:00
Visitors	Richard Quinn (McAuliffe)		
Activities On Site	McAuliffe: Arrived on site at 7.00am and took SRD samples out of the oven. Took first and second weights. Dumper truck A25F no22 excavated 54 loads of muck into fill and 20 loads of calorific into fill. Dumper truck A25F NO23 excavated 52 loads of muck into fill and 20 loads of calorific into fill.		
McAuliffe: Plant & Personnel On Site	1 x 21 tonne excavator 1 x 29 tonne excavator 2 x 25 tonne ADT's 1 x 13 tonne excavator 1 x D61 bulldozer 1 x Bunded fuel tank 1 x 3 tonne forward tipping dumper 1 x 12 tonne padfoot vibratory roller 1 x mobile decontamination unit	Personnel: 1 x Site manager 1 x foreman 5 x drivers 1 x labourer	
Details of QA Work :	General site inspection. Visual assessment of material transported from spoil heap to screening bund in accordance with the remediation strategy implementation and verification plan. All exposed faces within the spoil heap and bund checked to ensure that no asbestos or high risk materials were left exposed. All ACM is covered with 2000 gauge visqueen or non-asbestos containing ash or clay.		
Samples Taken			
Soil Sent Off Site			

Client	Bloor Homes	Site	Gatewen Road, Wrexham
Staff Member	J Peters	Day/Date	day 19.08.2013
Weather	Dry / Overcast 11°C – 13°C	Time on site	07:00 – 18:00
Visitors	Richard Quinn (McAuliffe)		
Activities On Site	McAuliffe: Arrived on site at 6.30 and took SRD samples out of the oven. Took first and second weight and logged in records. Dumper truck A25F NO:22 excavated 13loads of calorific from stockpile into fill. And 95 loads of muck straight into fill. Dumper truck A25F NO:23 excavated 91 loads of muck into fill and 14 loads of calorific into fill. No materials left site.		
McAuliffe: Plant & Personnel On Site	1 x 21 tonne excavator 1 x 29 tonne excavator 2 x 25 tonne ADT's 1 x 13 tonne excavator 1 x D61 bulldozer 1 x Bunded fuel tank 1 x 3 tonne forward tipping dumper 1 x 12 tonne padfoot vibratory roller 1 x mobile decontamination unit	Personnel: 1 x Site manager 1 x foreman 5 x drivers 1 x labourer	
Details of QA Work :	General site inspection. Visual assessment of material transported from spoil heap to screening bund in accordance with the remediation strategy implementation and verification plan. All exposed faces within the spoil heap and bund checked to ensure that no asbestos or high risk materials were left exposed. All ACM is covered with 2000 gauge visqueen or non-asbestos containing ash or clay.		
Samples Taken			
Soil Sent Off Site			

Client	Bloor Homes	Site	Gatewen Road, Wrexham
Staff Member	J Peters	Day/Date	day 20.08.2013
Weather	Dry / Overcast 11°C – 13°C	Time on site	07:00 – 18:00
Visitors	Richard Quinn (McAuliffe)		
Activities On Site	McAuliffe: Arrived on site at 7.00am and took samples out of the oven. Took first weight and second weight and recorded data. Completed a further 8 SRDs and took weights before placing in the oven. Dumper truck A25F NO:23 excavated 19 loads of muck from stockpile into fill and 66 loads of calorific from stockpile into fill. Dumper truck A25F NO:22 excavated 51 loads of calorific into fill and 122 loads of muck from stockpile into fill. No materials left site.		
McAuliffe: Plant & Personnel On Site	1 x 21 tonne excavator 1 x 29 tonne excavator 2 x 25 tonne ADT's 1 x 13 tonne excavator 1 x D61 bulldozer 1 x Bunded fuel tank 1 x 3 tonne forward tipping dumper 1 x 12 tonne padfoot vibratory roller 1 x mobile decontamination unit	Personnel: 1 x Site manager 1 x foreman 5 x drivers 1 x labourer	
Details of QA Work :	General site inspection. Visual assessment of material transported from spoil heap to screening bund in accordance with the remediation strategy implementation and verification plan. All exposed faces within the spoil heap and bund checked to ensure that no asbestos or high risk materials were left exposed. All ACM is covered with 2000 gauge visqueen or non-asbestos containing ash or clay.		
Samples Taken			
Soil Sent Off Site			

Client	Bloor Homes	Site	Gatewen Road, Wrexham
Staff Member	J Peters	Day/Date	day 21.08.2013
Weather	Dry / Overcast 11°C – 13°C	Time on site	07:00 – 18:00
Visitors	Richard Quinn (McAuliffe)		
Activities On Site	McAuliffe: Arrived on site at 7.00am and took samples out of the oven. Took first and second weight and logged data. Completed 13 SRDs took weights and put samples in the oven. Dumper truck A25F NO:23 excavated 146 loads of muck from stockpile into fill. Dumper truck A25F NO:22 excavated 149 loads from stockpile into fill. No materials left site.		
McAuliffe: Plant & Personnel On Site	1 x 21 tonne excavator 1 x 29 tonne excavator 2 x 25 tonne ADT's 1 x 13 tonne excavator 1 x D61 bulldozer 1 x Bunded fuel tank 1 x 3 tonne forward tipping dumper 1 x 12 tonne padfoot vibratory roller 1 x mobile decontamination unit	Personnel: 1 x Site manager 1 x foreman 5 x drivers 1 x labourer	
Details of QA Work :	General site inspection. Visual assessment of material transported from spoil heap to screening bund in accordance with the remediation strategy implementation and verification plan. All exposed faces within the spoil heap and bund checked to ensure that no asbestos or high risk materials were left exposed. All ACM is covered with 2000 gauge visqueen or non-asbestos containing ash or clay.		
Samples Taken			
Soil Sent Off Site			

Client	Bloor Homes	Site	Gatewen Road, Wrexham
Staff Member	J Peters	Day/Date	day 22.08.2013
Weather	Dry / Overcast 11°C – 13°C	Time on site	07:00 – 18:00
Visitors	Richard Quinn (McAuliffe)		
Activities On Site	McAuliffe: Arrived on site at 7.00am and took samples out of the oven. Took first and second weight and logged data. Completed 17 SRDs took weights and put samples in the oven. Dumper truck A25F NO:23 excavated 148 loads of muck from stockpile into fill. Dumper truck A25F NO:22 excavated 149 loads from stockpile into fill. No materials left site.		
McAuliffe: Plant & Personnel On Site	1 x 21 tonne excavator 1 x 29 tonne excavator 2 x 25 tonne ADT's 1 x 13 tonne excavator 1 x D61 bulldozer 1 x Bunded fuel tank 1 x 3 tonne forward tipping dumper 1 x 12 tonne padfoot vibratory roller 1 x mobile decontamination unit	Personnel: 1 x Site manager 1 x foreman 5 x drivers 1 x labourer	
Details of QA Work :	General site inspection. Visual assessment of material transported from spoil heap to screening bund in accordance with the remediation strategy implementation and verification plan. All exposed faces within the spoil heap and bund checked to ensure that no asbestos or high risk materials were left exposed. All ACM is covered with 2000 gauge visqueen or non-asbestos containing ash or clay.		
Samples Taken			
Soil Sent Off Site			

Appendix S2

Sand Calibration

Sand Calibration

Weight of tray:	1531	g
Weight of Top Hat:	6039	g
Weight of tray + sand in cone:	4761	g
Weight of sand in cone minus the weight of the tray:	4761	g
	-1531	g
	3230	g
Weight of sand in Tower:	18000	g
Weight of sand left in Tower:	3274	g
Weight of sand in Top Hat and cone :	18000	g
	3274	g
	14726	g
Minus the weight of sand in the cone:	14726	g
	-3230	g
	11496	g
Weight of water in Top Hat:	13836	g
Minus the weight of Top Hat:	13836	g
	-6039	g
	7797	g
Density = weight of sand shared by the weight of water:	11496	g
	7797	g
	1.47	Mg/m ³

Sand Calibration

Weight of tray:	1531	g
Weight of Top Hat:	6039	g
Weight of tray + sand in cone:	4761	g
Weight of sand in cone minus the weight of the tray:	4761	g
	-1531	g
	3230	g
Weight of sand in Tower:	18000	g
Weight of sand left in Tower:	3274	g
Weight of sand in Top Hat and cone :	18000	g
	3274	g
	14726	g
Minus the weight of sand in the cone:	14726	g
	-3230	g
	11496	g
Weight of water in Top Hat:	13836	g
Minus the weight of Top Hat:	13836	g
	-6039	g
	7797	g
Density = weight of sand shared by the weight of water:	11496	g
	7797	g
	1.47	Mg/m ³

Appendix S3A

Compaction Daily Site Records

Site: Gatewen Road

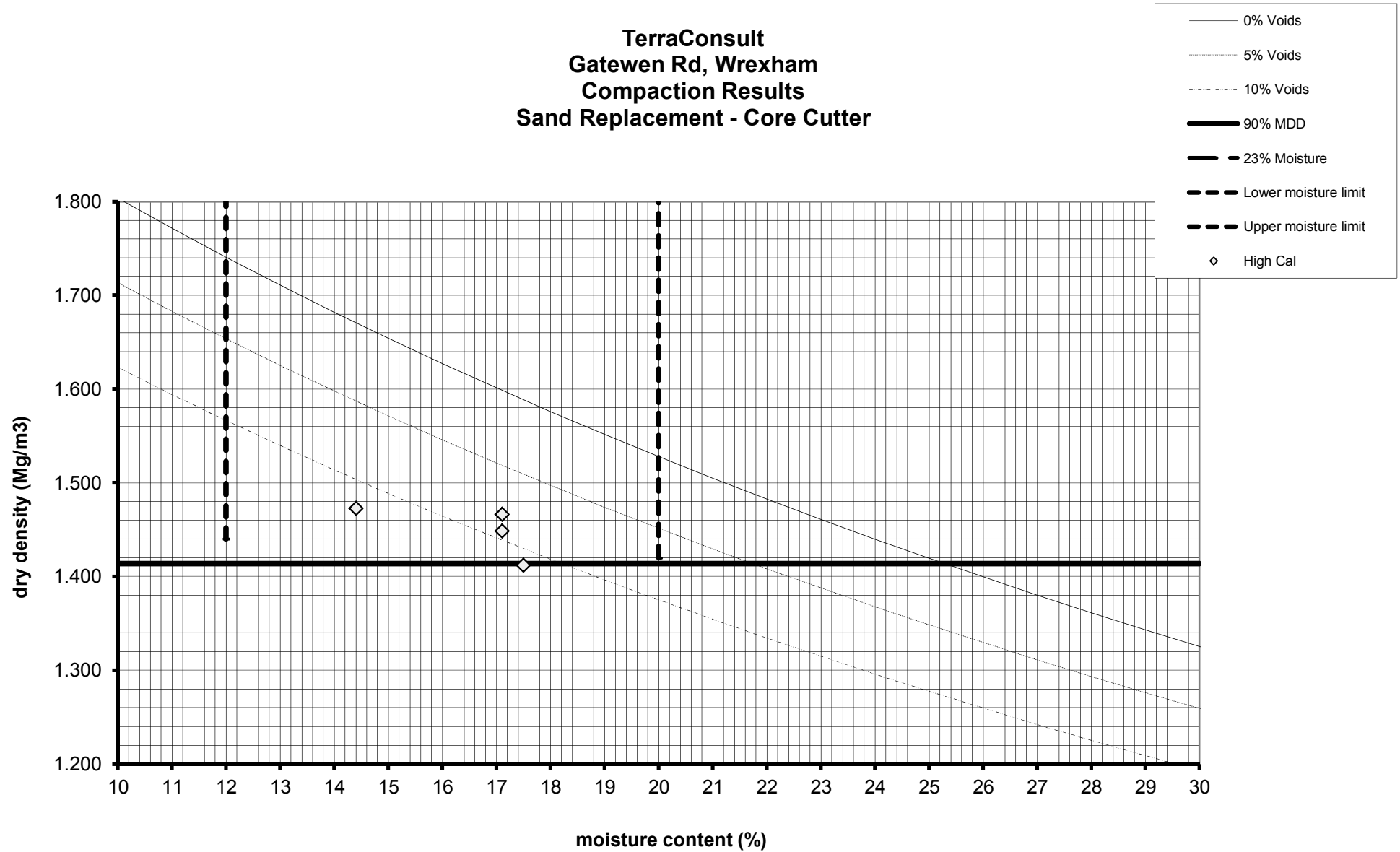
Job No. 1858

Location: Wrexham

OPERATOR:

[illegible]

TerraConsult
Gatewen Rd, Wrexham
Compaction Results
Sand Replacement - Core Cutter



Calculation of Voids Lines

Change the yellow figure to the required particle density

m/c %	0% Voids	5% Voids	10% Voids
0	2.200	2.090	1.980
1	2.153	2.045	1.937
2	2.107	2.002	1.897
3	2.064	1.961	1.857
4	2.022	1.921	1.820
5	1.982	1.883	1.784
6	1.943	1.846	1.749
7	1.906	1.811	1.716
8	1.871	1.777	1.684
9	1.836	1.745	1.653
10	1.803	1.713	1.623
11	1.771	1.683	1.594
12	1.741	1.653	1.566
13	1.711	1.625	1.540
14	1.682	1.598	1.514
15	1.654	1.571	1.489
16	1.627	1.546	1.464
17	1.601	1.521	1.441
18	1.576	1.497	1.418
19	1.551	1.474	1.396
20	1.528	1.451	1.375
21	1.505	1.430	1.354
22	1.482	1.408	1.334
23	1.461	1.388	1.315
24	1.440	1.368	1.296
25	1.419	1.348	1.277
26	1.399	1.330	1.260
27	1.380	1.311	1.242
28	1.361	1.293	1.225
29	1.343	1.276	1.209
30	1.325	1.259	1.193
31	1.308	1.243	1.177
32	1.291	1.227	1.162
33	1.275	1.211	1.147
34	1.259	1.196	1.133
35	1.243	1.181	1.119
36	1.228	1.166	1.105
37	1.213	1.152	1.092
38	1.198	1.138	1.078
39	1.184	1.125	1.066
40	1.170	1.112	1.053
41	1.157	1.099	1.041
42	1.143	1.086	1.029
43	1.131	1.074	1.017

Calculation of MDD Line

Figures highlighted in yellow are site specific

Maximum Dry Density(MDD) @ 2.5kg rammer = 1.728		
Horizontal axis limits	Vertical axis limits	
10	1.414	sets 90% MDD line
30	1.414	sets 90% MDD line
1.42	0.000	sets 0% moisture limit
2.100	0.000	sets 0% moisture limit
1.44	12.000	sets lower moisture limit
2.100	12.000	sets lower moisture limit
1.42	20.000	sets upper moisture limit
2.100	20.000	sets upper moisture limit

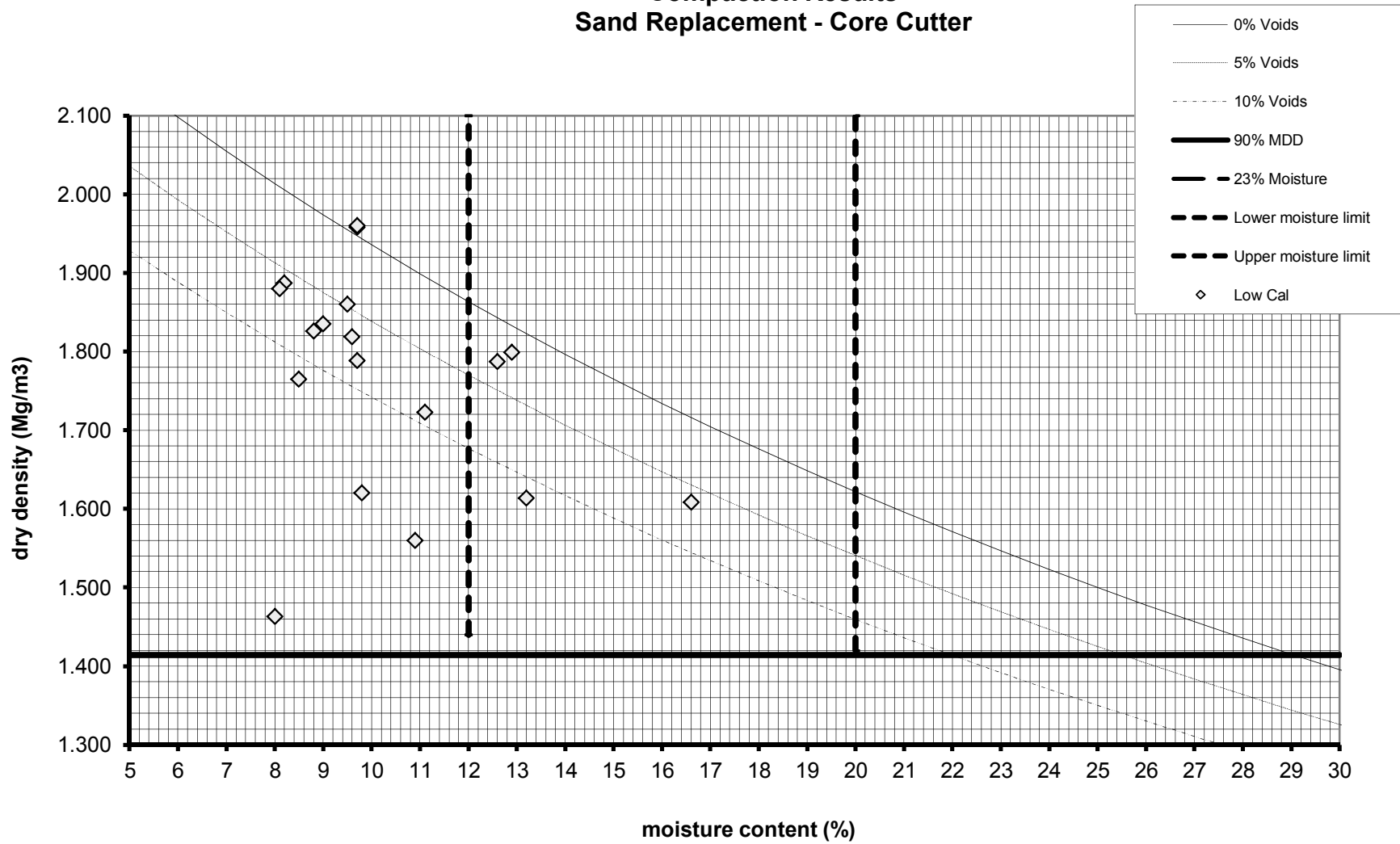
41518.000

Site: Gatewen RoadJob No. 1858Location: Wrexham

OPERATOR:

Date	Test No.	Cell No	Layer No from bottom	GPS readings for test location			SRD Results			
				EASTING	NORTHING	LEVEL	B.D Mg/m ³	M.C. %	D.D Mg/m ³	
14.8.13	1	2	1	331326.76	351897.110		2.012	12.6	1.787	
14.8.13	2	2	1	331308.2	351885.795		2.031	12.9	1.799	
15.8.13	3	2	2	331328.195	351899.630		2.148	9.7	1.958	
15.8.13	4	2	2	331301.235	351891.255		1.993	9.6	1.818	
16.8.13	5	2	3	331324.805	351902.515		1.730	10.9	1.560	
16.8.13	6	2	3	331303.276	351890.858		1.827	13.2	1.614	
16.8.13	7	2	4	331300.89	351887.245		2.150	9.7	1.960	
16.8.13	8	2	4	331318.666	351898.062		1.962	9.7	1.789	
20.8.13	9	2	5	331292.522	351888.981		1.914	11.1	1.723	
20.8.13	10	2	5	331313.821	351905.738		1.875	16.6	1.608	
21.8.13	11	2	6	331308.427	351897.295		1.580	8.0	1.463	
21.8.13	12	2	6	331318.335	351904.905		1.915	8.5	1.765	
21.8.13	13	2	7	331328.262	351899.035		1.779	9.8	1.620	
21.8.13	14	2	7	331305.042	351890.370		2.037	9.5	1.860	
22.8.13	15	2	8	337324.991	351907.140		1.987	8.8	1.826	
22.8.13	16	2	8	331302.23	351896.057		2.042	8.2	1.887	
22.8.13	17	2	9	331297.568	351888.389		2.032	8.1	1.880	
22.8.13	18	2	9	331326.505	351908.785		2.000	9.0	1.835	

TerraConsult
Gatewen Rd, Wrexham
Compaction Results
Sand Replacement - Core Cutter



Calculation of Voids Lines

Change the yellow figure to the required particle density

m/c %	0% Voids	5% Voids	10% Voids
0	2.400	2.280	2.160
1	2.344	2.227	2.109
2	2.290	2.176	2.061
3	2.239	2.127	2.015
4	2.190	2.080	1.971
5	2.143	2.036	1.929
6	2.098	1.993	1.888
7	2.055	1.952	1.849
8	2.013	1.913	1.812
9	1.974	1.875	1.776
10	1.935	1.839	1.742
11	1.899	1.804	1.709
12	1.863	1.770	1.677
13	1.829	1.738	1.646
14	1.796	1.707	1.617
15	1.765	1.676	1.588
16	1.734	1.647	1.561
17	1.705	1.619	1.534
18	1.676	1.592	1.508
19	1.648	1.566	1.484
20	1.622	1.541	1.459
21	1.596	1.516	1.436
22	1.571	1.492	1.414
23	1.546	1.469	1.392
24	1.523	1.447	1.371
25	1.500	1.425	1.350
26	1.478	1.404	1.330
27	1.456	1.383	1.311
28	1.435	1.364	1.292
29	1.415	1.344	1.274
30	1.395	1.326	1.256
31	1.376	1.307	1.239
32	1.357	1.290	1.222
33	1.339	1.272	1.205
34	1.322	1.256	1.189
35	1.304	1.239	1.174
36	1.288	1.223	1.159
37	1.271	1.208	1.144
38	1.255	1.192	1.130
39	1.240	1.178	1.116
40	1.224	1.163	1.102
41	1.210	1.149	1.089
42	1.195	1.135	1.076
43	1.181	1.122	1.063

Calculation of MDD Line

Figures highlighted in yellow are site specific

Maximum Dry Density(MDD) @ 2.5kg rammer = 1.728		
Horizontal axis limits	Vertical axis limits	
5	1.414	sets 90% MDD line
30	1.414	sets 90% MDD line
1.42	0.000	sets 0% moisture limit
2.100	0.000	sets 0% moisture limit
1.44	12.000	sets lower moisture limit
2.100	12.000	sets lower moisture limit
1.42	20.000	sets upper moisture limit
2.100	20.000	sets upper moisture limit

41518.000

Site: Gatewen Road

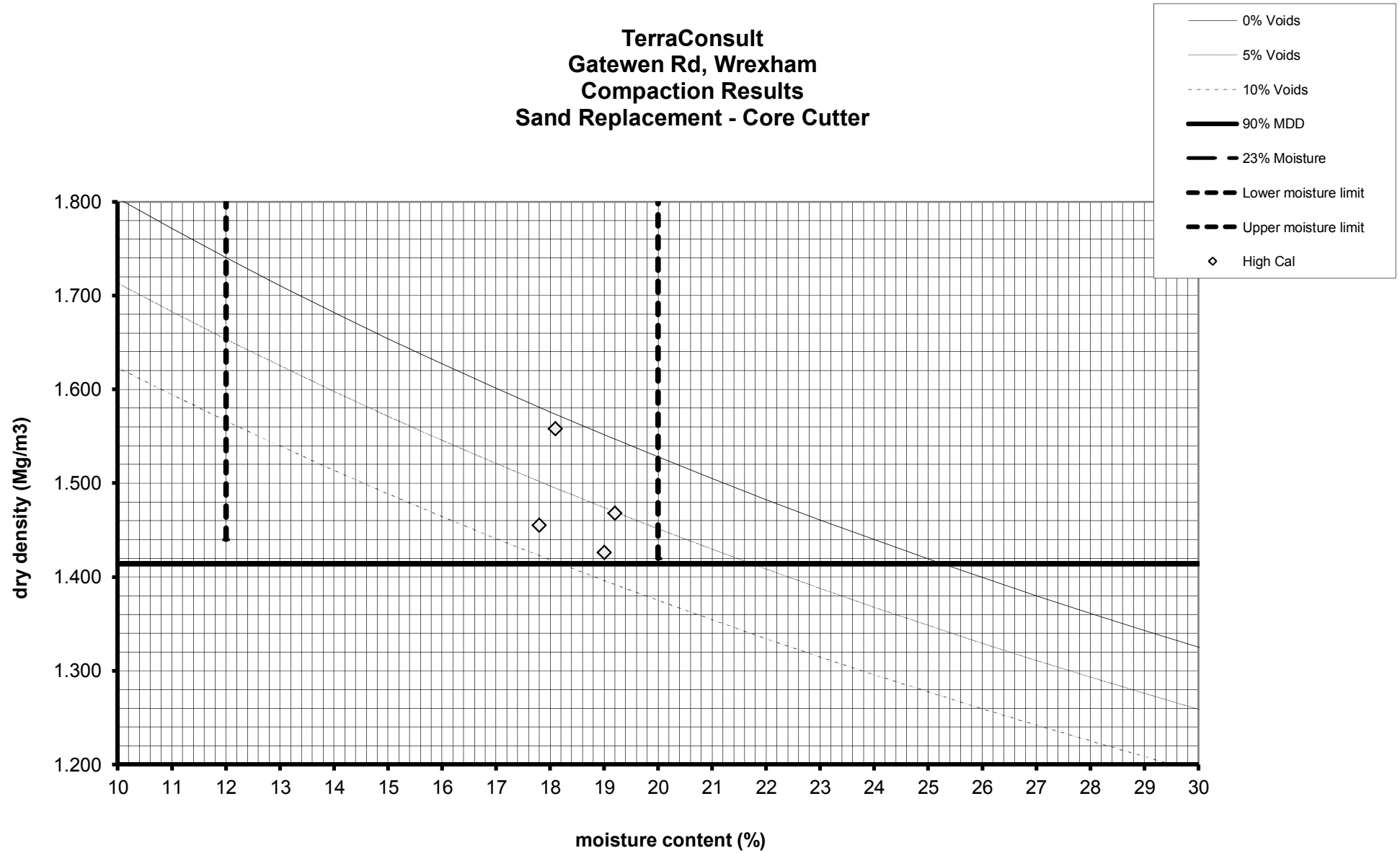
Job No. 1858

Location: Wrexham

OPERATOR:

[illegible]

**TerraConsult
Gatewen Rd, Wrexham
Compaction Results
Sand Replacement - Core Cutter**



Calculation of Voids Lines

Change the yellow figure to the required particle density

m/c %	0% Voids	5% Voids	10% Voids
0	2.200	2.090	1.980
1	2.153	2.045	1.937
2	2.107	2.002	1.897
3	2.064	1.961	1.857
4	2.022	1.921	1.820
5	1.982	1.883	1.784
6	1.943	1.846	1.749
7	1.906	1.811	1.716
8	1.871	1.777	1.684
9	1.836	1.745	1.653
10	1.803	1.713	1.623
11	1.771	1.683	1.594
12	1.741	1.653	1.566
13	1.711	1.625	1.540
14	1.682	1.598	1.514
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16	1.627	1.546	1.464
17	1.601	1.521	1.441
18	1.576	1.497	1.418
19	1.551	1.474	1.396
20	1.528	1.451	1.375
21	1.505	1.430	1.354
22	1.482	1.408	1.334
23	1.461	1.388	1.315
24	1.440	1.368	1.296
25	1.419	1.348	1.277
26	1.399	1.330	1.260
27	1.380	1.311	1.242
28	1.361	1.293	1.225
29	1.343	1.276	1.209
30	1.325	1.259	1.193
31	1.308	1.243	1.177
32	1.291	1.227	1.162
33	1.275	1.211	1.147
34	1.259	1.196	1.133
35	1.243	1.181	1.119
36	1.228	1.166	1.105
37	1.213	1.152	1.092
38	1.198	1.138	1.078
39	1.184	1.125	1.066
40	1.170	1.112	1.053
41	1.157	1.099	1.041
42	1.143	1.086	1.029
43	1.131	1.074	1.017

Calculation of MDD Line

Figures highlighted in yellow are site specific

Maximum Dry Density(MDD) @ 2.5kg rammer = 1.728		
Horizontal axis limits	Vertical axis limits	
10	1.414	sets 90% MDD line
30	1.414	sets 90% MDD line
1.42	0.000	sets 0% moisture limit
2.100	0.000	sets 0% moisture limit
1.44	12.000	sets lower moisture limit
2.100	12.000	sets lower moisture limit
1.42	20.000	sets upper moisture limit
2.100	20.000	sets upper moisture limit

41518.000

Site: Gatewen RoadJob No. 1858Location: Wrexham

OPERATOR:

Date	Test No.	Cell No	Layer No from bottom	GPS readings for test location			SRD Results			
				EASTING	NORTHING	LEVEL	B.D Mg/m ³	M.C. %	D.D Mg/m ³	
9.8.13	1		1	331344.66	351858.680		2.149	8.1	1.988	
9.8.13	2		1	331361.02	351869.285		2.039	9.5	1.862	
9.8.13	3		1	331343.32	351882.055		2.215	8.6	2.040	
9.8.13	4		1	331330.95	351868.900		2.190	9.2	2.005	
10.8.13	5		1	331321.105	351852.970		2.052	11.3	1.844	
12.8.13	6		2	331332.315	351870.635		2.054	8.5	1.893	
12.8.13	7		2	331344.445	351878.030		2.203	8.4	2.032	
12.8.13	8		2	331360.147	351869.637		1.925	7.1	1.797	
12.8.13	9		2	331346.285	351859.325		2.154	7.9	1.996	
10.8.13	10		2	331317.7	351857.705		2.107	11.1	1.896	
12.8.13	11		3	331342.37	351860.735		1.743	18.5	1.471	
12.8.13	12		3	331360.03	351860.735		1.783	86.0	0.959	
12.8.13	13		3	331341.213	351885.980		1.962	8.5	1.808	
12.8.13	14		3	331326.76	351876.905		2.018	12.6	1.792	
	15		3	331320.01	351849.855		2.171	9.4	1.984	
	16		3	331314.54	351865.900		2.088	9.6	1.905	
14.8.13	17		4	331352.04	351862.534		2.019	14.6	1.762	
14.8.13	18		4	331346.472	351874.155		2.033	9.0	1.865	
14.8.13	19		4	331306.465	351880.457		2.078	7.6	1.931	

Data

TerraConsult

CQA Form 6

Site: Gatewen Road

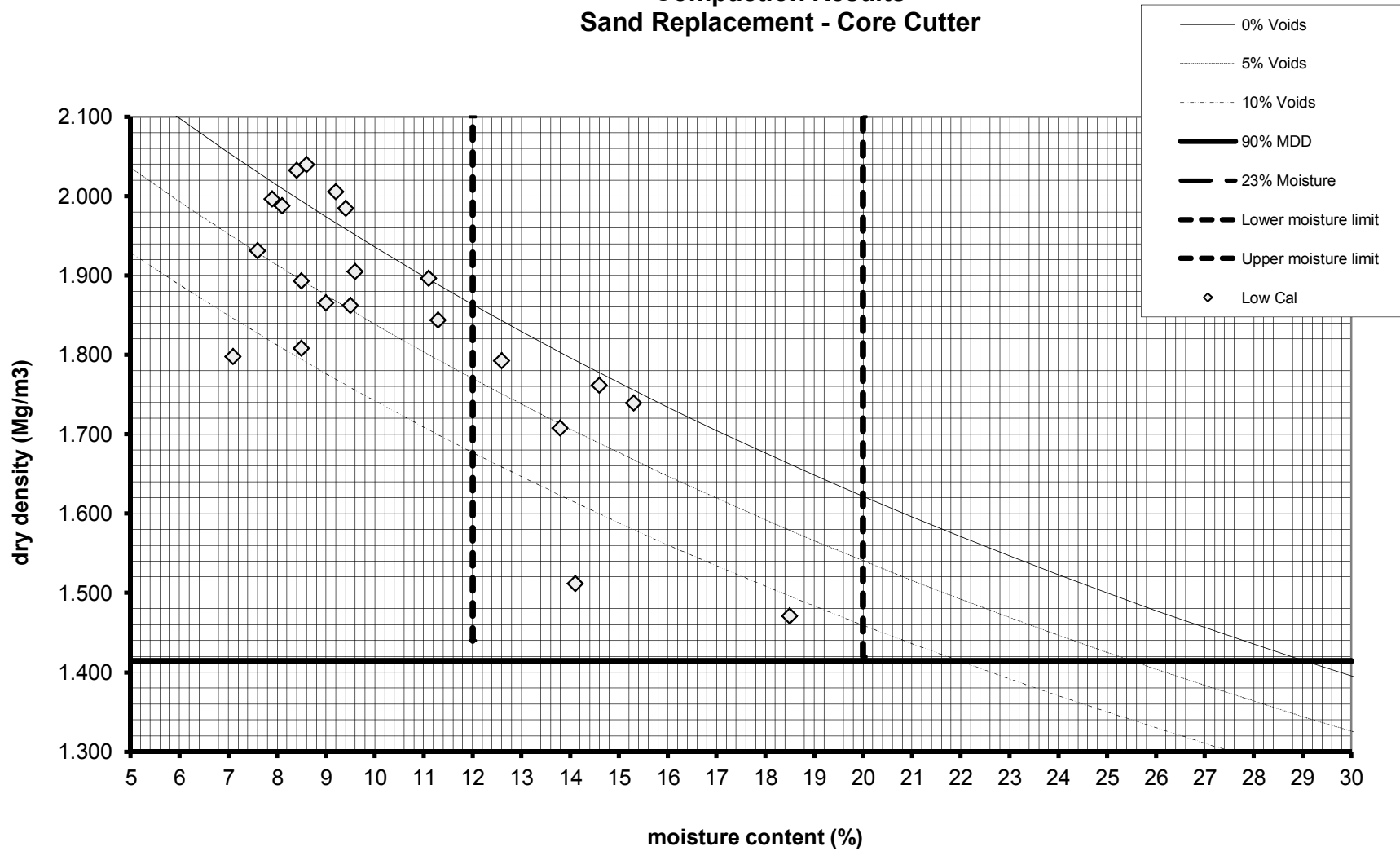
Job No. 1858

Location: Wrexham

OPERATOR:

Date	Test No.	Cell No	Layer No from bottom	GPS readings for test location			SRD Results			
				EASTING	NORTHING	LEVEL	B.D Mg/m ³	M.C. %	D.D Mg/m ³	
14.8.13	20		4	331303.485	351877.160		1.725	14.1	1.512	
14.8.13	21		5	331346.151	351871.719		1.943	13.8	1.707	
14.8.13	22		5	331316.254			2.005	15.3	1.739	

**TerraConsult
Gatewen Rd, Wrexham
Compaction Results
Sand Replacement - Core Cutter**



Calculation of Voids Lines

Change the yellow figure to the required particle density

m/c %	0% Voids	5% Voids	10% Voids
0	2.400	2.280	2.160
1	2.344	2.227	2.109
2	2.290	2.176	2.061
3	2.239	2.127	2.015
4	2.190	2.080	1.971
5	2.143	2.036	1.929
6	2.098	1.993	1.888
7	2.055	1.952	1.849
8	2.013	1.913	1.812
9	1.974	1.875	1.776
10	1.935	1.839	1.742
11	1.899	1.804	1.709
12	1.863	1.770	1.677
13	1.829	1.738	1.646
14	1.796	1.707	1.617
15	1.765	1.676	1.588
16	1.734	1.647	1.561
17	1.705	1.619	1.534
18	1.676	1.592	1.508
19	1.648	1.566	1.484
20	1.622	1.541	1.459
21	1.596	1.516	1.436
22	1.571	1.492	1.414
23	1.546	1.469	1.392
24	1.523	1.447	1.371
25	1.500	1.425	1.350
26	1.478	1.404	1.330
27	1.456	1.383	1.311
28	1.435	1.364	1.292
29	1.415	1.344	1.274
30	1.395	1.326	1.256
31	1.376	1.307	1.239
32	1.357	1.290	1.222
33	1.339	1.272	1.205
34	1.322	1.256	1.189
35	1.304	1.239	1.174
36	1.288	1.223	1.159
37	1.271	1.208	1.144
38	1.255	1.192	1.130
39	1.240	1.178	1.116
40	1.224	1.163	1.102
41	1.210	1.149	1.089
42	1.195	1.135	1.076
43	1.181	1.122	1.063

Calculation of MDD Line

Figures highlighted in yellow are site specific

Maximum Dry Density(MDD) @ 2.5kg rammer = 1.728		
Horizontal axis limits	Vertical axis limits	
5	1.414	sets 90% MDD line
30	1.414	sets 90% MDD line
1.42	0.000	sets 0% moisture limit
2.100	0.000	sets 0% moisture limit
1.44	12.000	sets lower moisture limit
2.100	12.000	sets lower moisture limit
1.42	20.000	sets upper moisture limit
2.100	20.000	sets upper moisture limit

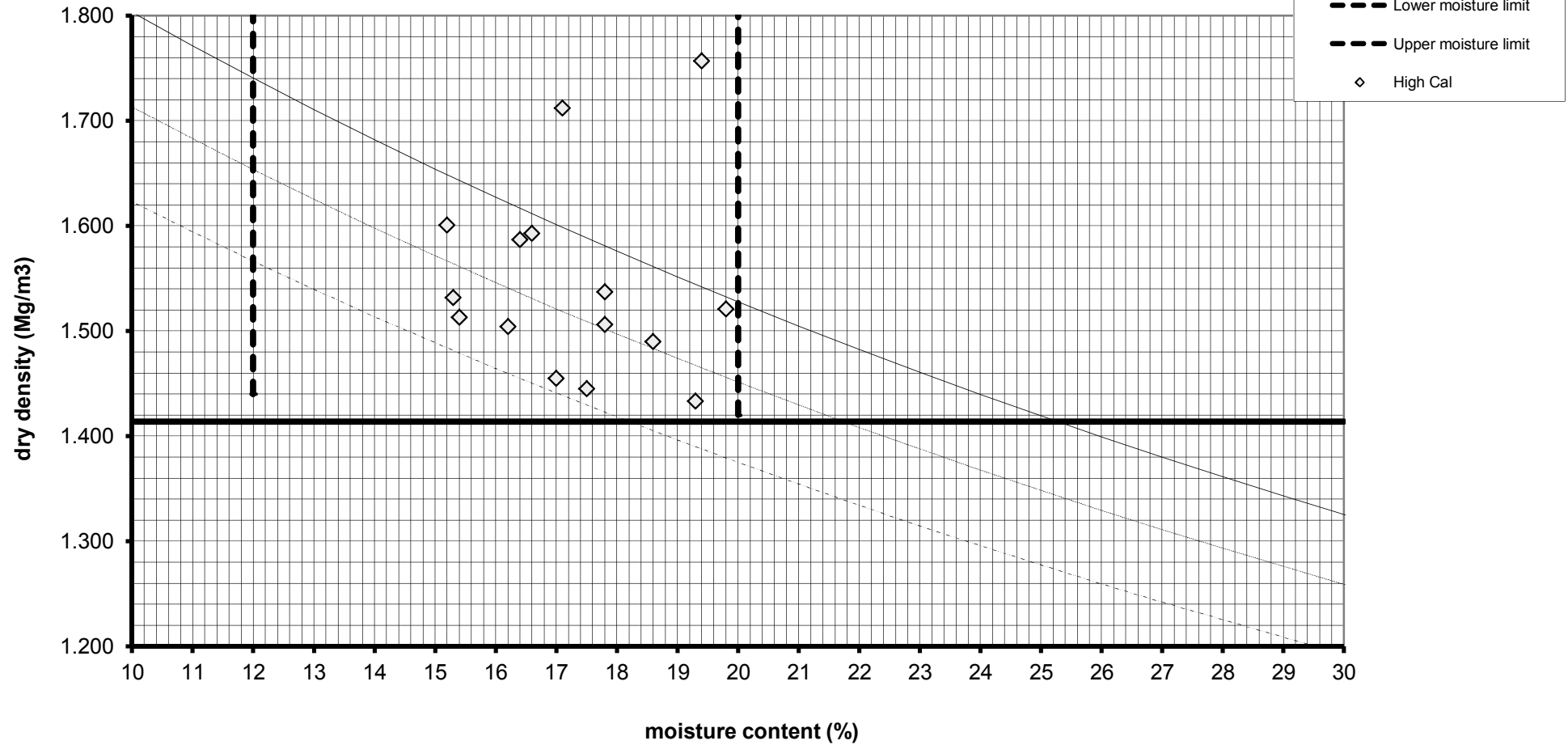
41518.000

Site: Gatewen RoadJob No. 1858Location: Wrexham

OPERATOR:

Date	Test No.	Cell No	Layer No from bottom	GPS readings for test location			SRD Results			
				EASTING	NORTHING	LEVEL	B.D Mg/m ³	M.C. %	D.D Mg/m ³	
8.8.13	1	1	1	331359.215	351868.955		1.857	16.6	1.593	
8.8.13	2	1	1	331343.6	351859.640		1.811	17.8	1.537	
9.8.13	3	1	1	331341.09	351880.720		1.748	16.2	1.504	
9.8.13	4	1	1	331325.09	351873.150		1.249	17.1	1.067	
12.8.13	5	1	1	331321.83	351859.410		1.746	15.4	1.513	
8.8.13	6	1	2	331360.99	351870.820		1.774	17.8	1.506	
8.8.13	7	1	2	331342.65	351858.445		1.847	16.4	1.587	
9.8.13	8	1	2	331340.16	351880.940		1.844	15.2	1.601	
9.8.13	9	1	2	331325.767	351870.080		2.005	17.1	1.712	
12.8.13	10	1	2	331327.23	351853.050		1.766	15.3	1.532	
12.8.13	11	1	3	331322.44	351874.505		1.822	19.8	1.521	
12.8.13	12	1	3	331337.3	351886.345		1.767	18.6	1.490	
12.8.13	13	1	3	331358.63	351854.610		2.098	19.4	1.757	
12.8.13	14	1	3	331341.575	351854.610		1.710	19.3	1.433	
10.8.13	15	1	3	331324.014	351846.045		1.698	17.5	1.445	
10.8.13	16	1	3	331316.553	351862.410		1.702	17.0	1.455	
									0.000	
									0.000	

**TerraConsult
Gatewen Rd, Wrexham
Compaction Results
Sand Replacement - Core Cutter**



High Cal Value Compaction Site Records

Calculation of Voids Lines

Change the yellow figure to the required particle density

m/c %	0% Voids	5% Voids	10% Voids
0	2.200	2.090	1.980
1	2.153	2.045	1.937
2	2.107	2.002	1.897
3	2.064	1.961	1.857
4	2.022	1.921	1.820
5	1.982	1.883	1.784
6	1.943	1.846	1.749
7	1.906	1.811	1.716
8	1.871	1.777	1.684
9	1.836	1.745	1.653
10	1.803	1.713	1.623
11	1.771	1.683	1.594
12	1.741	1.653	1.566
13	1.711	1.625	1.540
14	1.682	1.598	1.514
15	1.654	1.571	1.489
16	1.627	1.546	1.464
17	1.601	1.521	1.441
18	1.576	1.497	1.418
19	1.551	1.474	1.396
20	1.528	1.451	1.375
21	1.505	1.430	1.354
22	1.482	1.408	1.334
23	1.461	1.388	1.315
24	1.440	1.368	1.296
25	1.419	1.348	1.277
26	1.399	1.330	1.260
27	1.380	1.311	1.242
28	1.361	1.293	1.225
29	1.343	1.276	1.209
30	1.325	1.259	1.193
31	1.308	1.243	1.177
32	1.291	1.227	1.162
33	1.275	1.211	1.147
34	1.259	1.196	1.133
35	1.243	1.181	1.119
36	1.228	1.166	1.105
37	1.213	1.152	1.092
38	1.198	1.138	1.078
39	1.184	1.125	1.066
40	1.170	1.112	1.053
41	1.157	1.099	1.041
42	1.143	1.086	1.029
43	1.131	1.074	1.017

Calculation of MDD Line

Figures highlighted in yellow are site specific

Maximum Dry Density(MDD) @ 2.5kg rammer = 1.728		
Horizontal axis limits	Vertical axis limits	
10	1.414	sets 90% MDD line
30	1.414	sets 90% MDD line
1.42	0.000	sets 0% moisture limit
2.100	0.000	sets 0% moisture limit
1.44	12.000	sets lower moisture limit
2.100	12.000	sets lower moisture limit
1.42	20.000	sets upper moisture limit
2.100	20.000	sets upper moisture limit

41518.000

Site: Gatewen RoadJob No. 1858Location: Wrexham

OPERATOR:

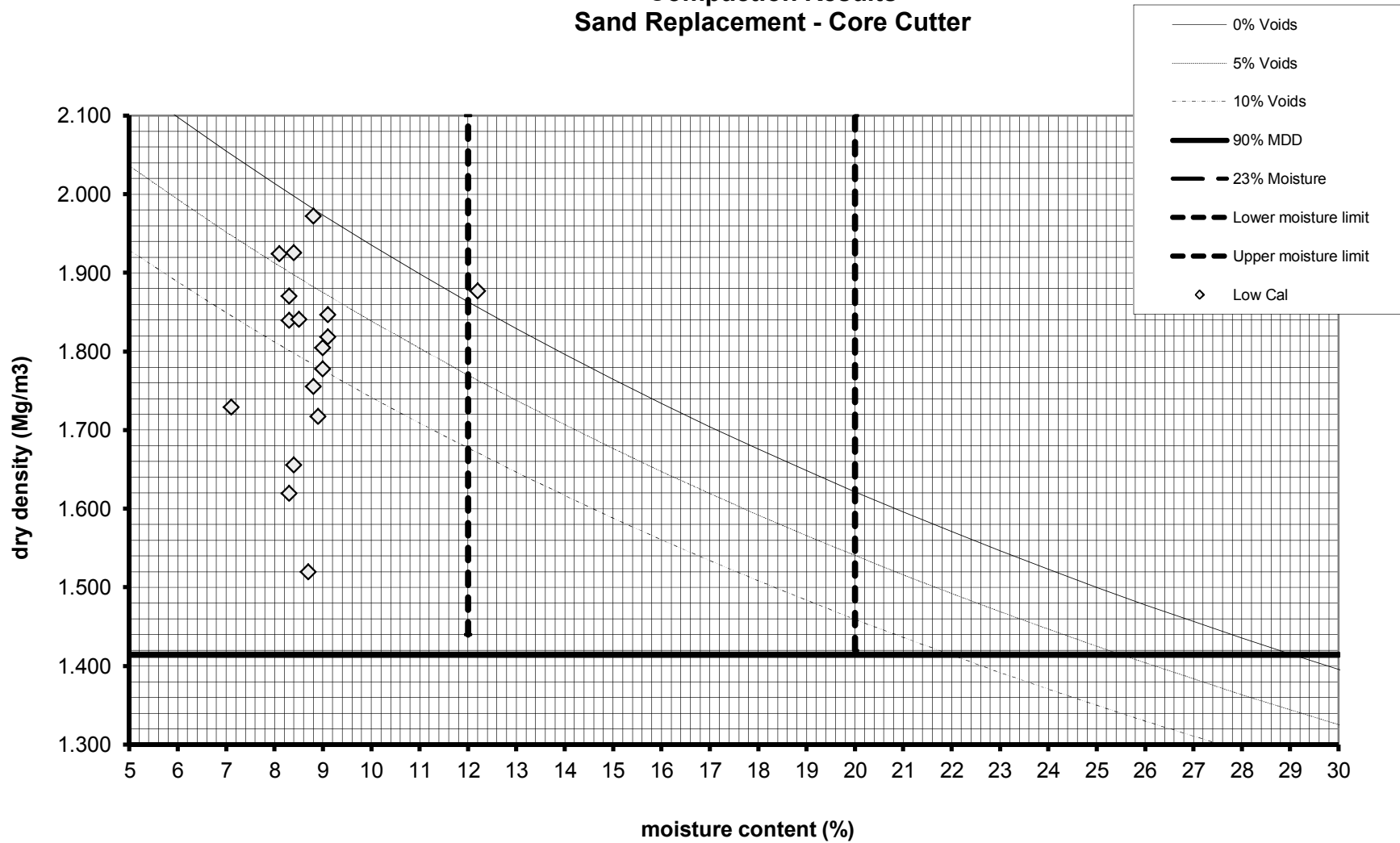
Date	Test No.	Cell No	Layer No from bottom	GPS readings for test location			SRD Results			
				EASTING	NORTHING	LEVEL	B.D Mg/m ³	M.C. %	D.D Mg/m ³	
20.8.13	1	3	1	331279.128	351906.856		2.015	9.1	1.847	
20.8.13	2	3	1	331295.413	351923.840		2.146	8.8	1.972	
20.8.13	3	3	1	331290.47	351938.685		2.026	8.3	1.871	
20.8.13	4	3	2	331304.225	351922.301		1.967	9.0	1.805	
21.8.13	5	3	2	331292.1	351935.779		1.652	8.7	1.520	
21.8.13	6	3	2	331283.505	351915.896		1.754	8.3	1.620	
21.8.13	7	3	3	331279.317	351909.435		1.984	9.1	1.819	
21.8.13	8	3	3	331284.885	351934.317		1.992	8.3	1.839	
21.8.13	9	3	3	331303.845	351931.351		2.087	8.4	1.925	
21.8.13	10	3	4	331278.227	351918.445		1.938	9.0	1.778	
21.8.13	11	3	4	331288.686	351933.826		1.910	8.8	1.756	
21.8.13	12	3	4	331302.744	351926.480		2.080	8.1	1.924	
22.8.13	13	3	5	331276.734	351920.768		1.870	8.9	1.717	
22.8.13	14	3	5	331285.94	351943.442		2.786	8.0	2.580	
22.8.13	15	3	5	331300.344	351927.344		1.997	8.5	1.841	
									0.000	
									0.000	
									0.000	
22.8.13	16	3	6	331281.984	351903.375		1.852	7.1	1.729	

Site: Gatewen RoadJob No. 1858Location: Wrexham

OPERATOR:

Date	Test No.	Cell No	Layer No from bottom	GPS readings for test location			SRD Results			
				EASTING	NORTHING	LEVEL	B.D Mg/m ³	M.C. %	D.D Mg/m ³	
22.8.13	17	3	6	331294.908	351924.005		2.106	12.2	1.877	
22.8.13	18	3	6	331310.208	351921.230		1.795	8.4	1.656	
									0.000	

TerraConsult
Gatewen Rd, Wrexham
Compaction Results
Sand Replacement - Core Cutter



Calculation of Voids Lines

Change the yellow figure to the required particle density

m/c %	0% Voids	5% Voids	10% Voids
0	2.400	2.280	2.160
1	2.344	2.227	2.109
2	2.290	2.176	2.061
3	2.239	2.127	2.015
4	2.190	2.080	1.971
5	2.143	2.036	1.929
6	2.098	1.993	1.888
7	2.055	1.952	1.849
8	2.013	1.913	1.812
9	1.974	1.875	1.776
10	1.935	1.839	1.742
11	1.899	1.804	1.709
12	1.863	1.770	1.677
13	1.829	1.738	1.646
14	1.796	1.707	1.617
15	1.765	1.676	1.588
16	1.734	1.647	1.561
17	1.705	1.619	1.534
18	1.676	1.592	1.508
19	1.648	1.566	1.484
20	1.622	1.541	1.459
21	1.596	1.516	1.436
22	1.571	1.492	1.414
23	1.546	1.469	1.392
24	1.523	1.447	1.371
25	1.500	1.425	1.350
26	1.478	1.404	1.330
27	1.456	1.383	1.311
28	1.435	1.364	1.292
29	1.415	1.344	1.274
30	1.395	1.326	1.256
31	1.376	1.307	1.239
32	1.357	1.290	1.222
33	1.339	1.272	1.205
34	1.322	1.256	1.189
35	1.304	1.239	1.174
36	1.288	1.223	1.159
37	1.271	1.208	1.144
38	1.255	1.192	1.130
39	1.240	1.178	1.116
40	1.224	1.163	1.102
41	1.210	1.149	1.089
42	1.195	1.135	1.076
43	1.181	1.122	1.063

Calculation of MDD Line

Figures highlighted in yellow are site specific

Maximum Dry Density(MDD) @ 2.5kg rammer = 1.728		
Horizontal axis limits	Vertical axis limits	
5	1.414	sets 90% MDD line
30	1.414	sets 90% MDD line
1.42	0.000	sets 0% moisture limit
2.100	0.000	sets 0% moisture limit
1.44	12.000	sets lower moisture limit
2.100	12.000	sets lower moisture limit
1.42	20.000	sets upper moisture limit
2.100	20.000	sets upper moisture limit

41518.000

Appendix S3B(i)

Combined density results - High Calorific Material

Site: Gatewen RoadJob No. 1858Location: Wrexham

OPERATOR:

2.05

Date	Test No.	Cell No	Layer No from bottom	GPS readings for test location			SRD Results			
				EASTING	NORTHING	LEVEL	B.D Mg/m ³	M.C. %	D.D Mg/m ³	
8.8.13	1	1	1	331359.215	351868.955		1.857	16.6	1.593	-4.1
8.8.13	2	1	1	331343.6	351859.640		1.811	17.8	1.537	-2.4
9.8.13	3	1	1	331341.09	351880.720		1.748	16.2	1.504	2.2
9.8.13	4	1	1	331325.09	351873.150		1.249	17.1	1.563	-3.0
12.8.13	5	1	1	331321.83	351859.410		1.746	15.4	1.513	2.9
8.8.13	6	1	2	331360.99	351870.820		1.774	17.8	1.506	-0.3
8.8.13	7	1	2	331342.65	351858.445		1.847	16.4	1.587	-3.4
9.8.13	8	1	2	331340.16	351880.940		1.844	15.2	1.601	-2.4
9.8.13	9	1	2	331325.767	351870.080		2.005	17.1	1.712	-12.8
12.8.13	10	1	2	331327.23	351853.050		1.766	15.3	1.532	1.9
12.8.13	11	1	3	331322.44	351874.505		1.822	19.8	1.521	-4.3
12.8.13	12	1	3	331337.3	351886.345		1.767	18.6	1.490	-0.4
12.8.13	13	1	3	331358.63	351854.610		2.098	19.4	1.757	-19.8
12.8.13	14	1	3	331341.575	351854.610		1.710	19.3	1.433	2.4
10.8.13	15	1	3	331324.014	351846.045		1.698	17.5	1.445	4.2
10.8.13	16	1	3	331316.553	351862.410		1.702	17.0	1.455	4.3
14.8.13	1	2	1	331327.345	351899.525		1.714	17.8	1.455	3.1
14.8.13	2	2	1	331304.225	351877.121		1.697	19.0	1.426	3.3
14.8.13	3	2	2	331322.645	351893.666		1.750	19.2	1.468	0.2

Site: Gatewen RoadJob No. 1858Location: Wrexham

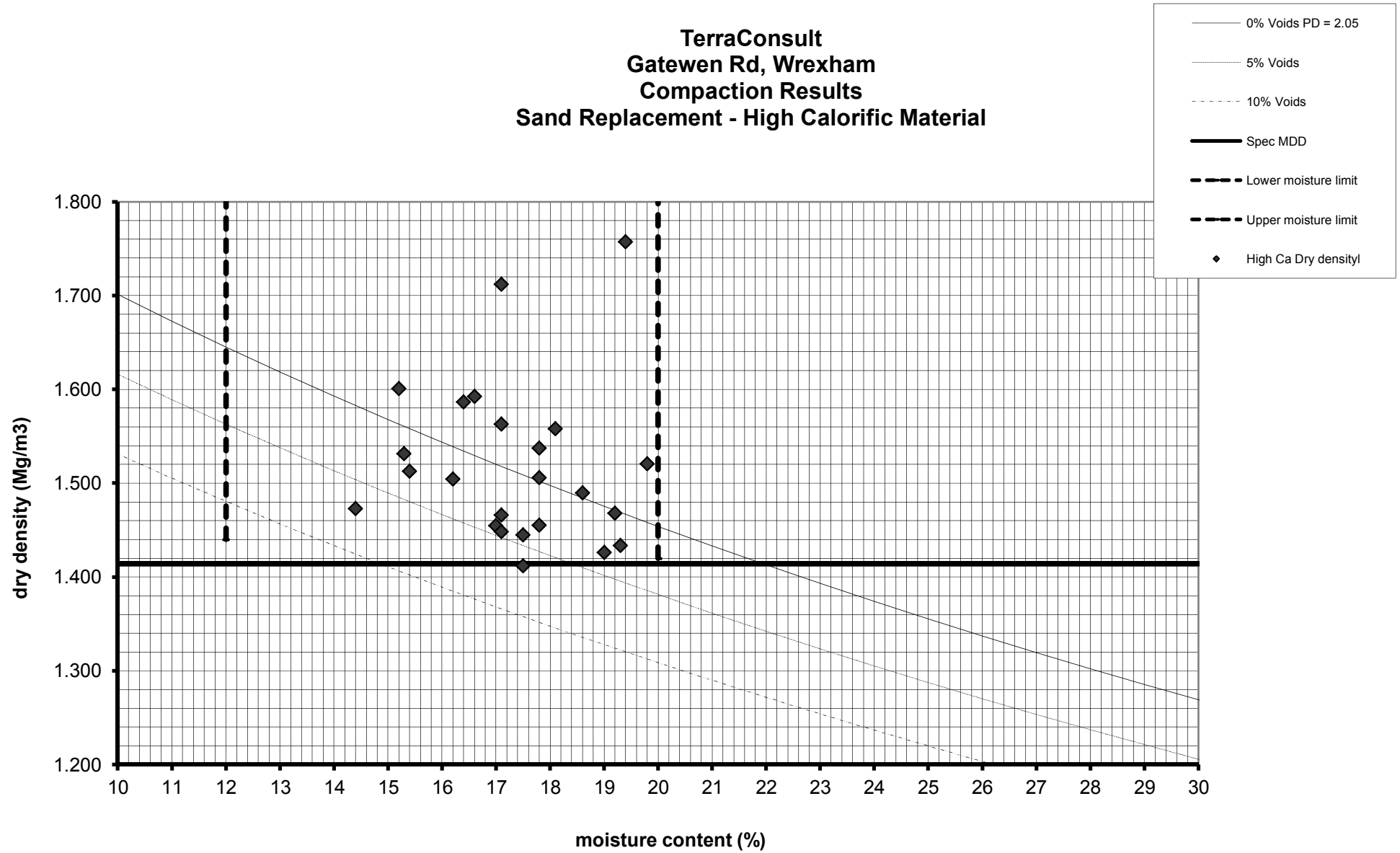
OPERATOR:

2.05

Date	Test No.	Cell No	Layer No from bottom	GPS readings for test location			SRD Results			
				EASTING	NORTHING	LEVEL	B.D Mg/m ³	M.C. %	D.D Mg/m ³	
14.8.13	4	2	2	331321.554	351893.075		1.840	18.1	1.558	-4.2
20.8.13	1	3	1	331293.81	351933.264		1.717	17.1	1.466	3.4
20.8.13	2	3	1	331282.765	351912.375		1.659	17.5	1.412	6.4
20.8.13	3	3	2	331308.01	351916.550		1.685	14.4	1.473	6.9
20.8.13	4	3	2	331281.874	351907.995		1.696	17.1	1.448	4.6
Column1						Average	1.758	17.363	1.519	-0.463
Mean						Max	2.098	19.800	1.757	6.941
Standard Err						Min	1.249	14.400	1.412	-19.8
Median										
Mode										
Standard Dev										
Sample Variance										
Kurtosis										
Skewness										
Range										
Minimum										
Maximum										
Sum										
Count										

Mean	-0.463
Standard Err	1.2322
Median	1.0236
Mode	#N/A
Standard Dev	6.0366
Sample Variance	36.441
Kurtosis	3.8589
Skewness	-1.725
Range	26.743
Minimum	-19.8
Maximum	6.9413
Sum	-11.11
Count	24

TerraConsult
Gatewen Rd, Wrexham
Compaction Results
Sand Replacement - High Calorific Material



Appendix S3B(ii)

Combined density results - Low Calorific Material

Site: Gatewen RoadJob No. 1858Location: Wrexham

OPERATOR:

PD 2.3

Date	Test No.	Cell No	Layer No from bottom	GPS readings for test location			SRD Results			
				EASTING	NORTHING	LEVEL	B.D Mg/m ³	M.C. %	D.D Mg/m ³	
9.8.13	1	1	1	331344.66	351858.680		2.149	8.1	1.988	-2.5
9.8.13	2	1	1	331361.02	351869.285		2.039	9.5	1.862	1.3
9.8.13	3	1	1	331343.32	351882.055		2.215	8.6	2.040	-6.2
9.8.13	4	1	1	331330.95	351868.900		2.190	9.2	2.005	-5.6
10.8.13	5	1	1	331321.105	351852.970		2.052	11.3	1.844	-1.0
12.8.13	6	1	2	331332.315	351870.635		2.054	8.5	1.893	1.6
12.8.13	7	1	2	331344.445	351878.030		2.203	8.4	2.032	-5.4
12.8.13	8	1	2	331360.147	351869.637		1.925	7.1	1.797	9.1
12.8.13	9	1	2	331346.285	351859.325		2.154	7.9	1.996	-2.6
10.8.13	10	1	2	331317.7	351857.705		2.107	11.1	1.896	-3.5
12.8.13	11	1	3	331342.37	351860.735		1.743	18.5	1.471	8.8
12.8.13	13	1	3	331341.213	351885.980		1.962	8.5	1.808	6.0
12.8.13	14	1	3	331326.76	351876.905		2.018	12.6	1.792	-0.5
	15	1	3	331320.01	351849.855		2.171	9.4	1.984	-4.9
	16	1	3	331314.54	351865.900		2.088	9.6	1.905	-1.1
14.8.13	17	1	4	331352.04	351862.534		2.019	14.6	1.762	-2.3
14.8.13	18	1	4	331346.472	351874.155		2.033	9.0	1.865	2.1
14.8.13	19	1	4	331306.465	351880.457		2.078	7.6	1.931	1.4
14.8.13	20	1	4	331303.485	351877.160		1.725	14.1	1.512	13.0

Site: Gatewen RoadJob No. 1858Location: Wrexham

OPERATOR:

PD 2.3

Date	Test No.	Cell No	Layer No from bottom	GPS readings for test location			SRD Results			
				EASTING	NORTHING	LEVEL	B.D Mg/m ³	M.C. %	D.D Mg/m ³	
14.8.13	21	1	5	331346.151	351871.719		1.943	13.8	1.707	2.2
14.8.13	22	1	5	331316.254			2.005	15.3	1.739	-2.2
14.8.13	23	1	5	331331.425	351862.354		2.100	8.6	1.934	-0.7
14.8.13	24	1	5	331324.09	351850.390		1.732	8.6	1.595	16.9
15.8.13	25	1	6	331330.552	351853.350		1.779	10.1	1.616	13.4
15.8.13	26	1	6	331340.785	351885.834		1.920	10.2	1.742	6.5
15.8.13	27	1	6	331355.369	351867.750		1.843	15.3	1.598	6.0
15.8.13	28	1	6	331316.36	351876.215		1.883	17.0	1.609	2.7
20.8.13	29	1	7	331329.479	351855.225		1.779	10.1	1.616	13.4
20.8.13	30	1	7	331336.695	351887.257		1.920	10.2	1.742	6.5
20.8.13	31	1	7	331353.4	351869.247		1.843	15.3	1.598	6.0
20.8.13	32	1	7	331311.605	351876.155		1.883	17.0	1.609	2.7
22.8.13	33	1	8	331357.348	351874.830		2.110	8.2	1.950	-0.8
22.8.13	34	1	8	331346.7	351889.880		1.911	8.4	1.763	8.5
22.8.13	35	1	8	331334.549	351855.921		2.086	7.6	1.939	1.0
22.8.13	36	1	8	331312.955	351865.547		1.910	7.6	1.775	9.3
14.8.13	1	2	1	331326.76	351897.110		2.012	12.6	1.787	-0.2
14.8.13	2	2	1	331308.2	351885.795		2.031	12.9	1.799	-1.4
15.8.13	3	2	2	331328.195	351899.630		2.148	9.7	1.958	-4.1

Site: Gatewen RoadJob No. 1858Location: Wrexham

OPERATOR:

PD 2.3

Date	Test No.	Cell No	Layer No from bottom	GPS readings for test location			SRD Results			
				EASTING	NORTHING	LEVEL	B.D Mg/m ³	M.C. %	D.D Mg/m ³	
15.8.13	4	2	2	331301.235	351891.255		1.993	9.6	1.818	3.5
16.8.13	5	2	3	331324.805	351902.515		1.730	10.9	1.560	15.2
16.8.13	6	2	3	331303.276	351890.858		1.827	13.2	1.614	8.5
16.8.13	7	2	4	331300.89	351887.245		2.150	9.7	1.960	-4.2
16.8.13	8	2	4	331318.666	351898.062		1.962	9.7	1.789	4.9
20.8.13	9	2	5	331292.522	351888.981		1.914	11.1	1.723	6.0
20.8.13	10	2	5	331313.821	351905.738		1.875	16.6	1.608	3.4
21.8.13	12	2	6	331318.335	351904.905		1.915	8.5	1.765	8.3
21.8.13	13	2	7	331328.262	351899.035		1.779	9.8	1.620	13.7
21.8.13	14	2	7	331305.042	351890.370		2.037	9.5	1.860	1.4
22.8.13	15	2	8	337324.991	351907.140		1.987	8.8	1.826	4.5
22.8.13	16	2	8	331302.23	351896.057		2.042	8.2	1.887	2.5
22.8.13	17	2	9	331297.568	351888.389		2.032	8.1	1.880	3.0
22.8.13	18	2	9	331326.505	351908.785		2.000	9.0	1.835	3.7
20.8.13	1	3	1	331279.128	351906.856		2.015	9.1	1.847	2.9
20.8.13	2	3	1	331295.413	351923.840		2.146	8.8	1.972	-3.1
20.8.13	3	3	1	331290.47	351938.685		2.026	8.3	1.871	3.1
20.8.13	4	3	2	331304.225	351922.301		1.967	9.0	1.805	5.3
21.8.13	5	3	2	331292.1	351935.779		1.652	8.7	1.520	20.7

Site: Gatewen RoadJob No. 1858Location: Wrexham

OPERATOR:

PD 2.3

Date	Test No.	Cell No	Layer No from bottom	GPS readings for test location			SRD Results			
				EASTING	NORTHING	LEVEL	B.D Mg/m ³	M.C. %	D.D Mg/m ³	
21.8.13	6	3	2	331283.505	351915.896		1.754	8.3	1.620	16.1
21.8.13	7	3	3	331279.317	351909.435		1.984	9.1	1.819	4.4
21.8.13	8	3	3	331284.885	351934.317		1.992	8.3	1.839	4.8
21.8.13	9	3	3	331303.845	351931.351		2.087	8.4	1.925	0.1
21.8.13	10	3	4	331278.227	351918.445		1.938	9.0	1.778	6.7
21.8.13	11	3	4	331288.686	351933.826		1.910	8.8	1.756	8.2
21.8.13	12	3	4	331302.744	351926.480		2.080	8.1	1.924	0.8
22.8.13	13	3	5	331276.734	351920.768		1.870	8.9	1.717	10.1
22.8.13	15	3	5	331300.344	351927.344		1.997	8.5	1.841	4.3
22.8.13	16	3	6	331281.984	351903.375		1.852	7.1	1.729	12.5
22.8.13	17	3	6	331294.908	351924.005		2.106	12.2	1.877	-4.5
22.8.13	18	3	6	331310.208	351921.230		1.795	8.4	1.656	14.1
Column1						Average	1.974	10.200	1.793	3.974
						Max	2.215	18.500	2.040	20.701
						Min	1.652	7.100	1.471	-6.219

Mean 3.9736
 Standard Err 0.7387
 Median 3.1369
 Mode 13.428
 Standard Dev 6.1361
 Sample Vari 37.652
 Kurtosis -0.182

Site: Gatewen RoadJob No. 1858Location: Wrexham

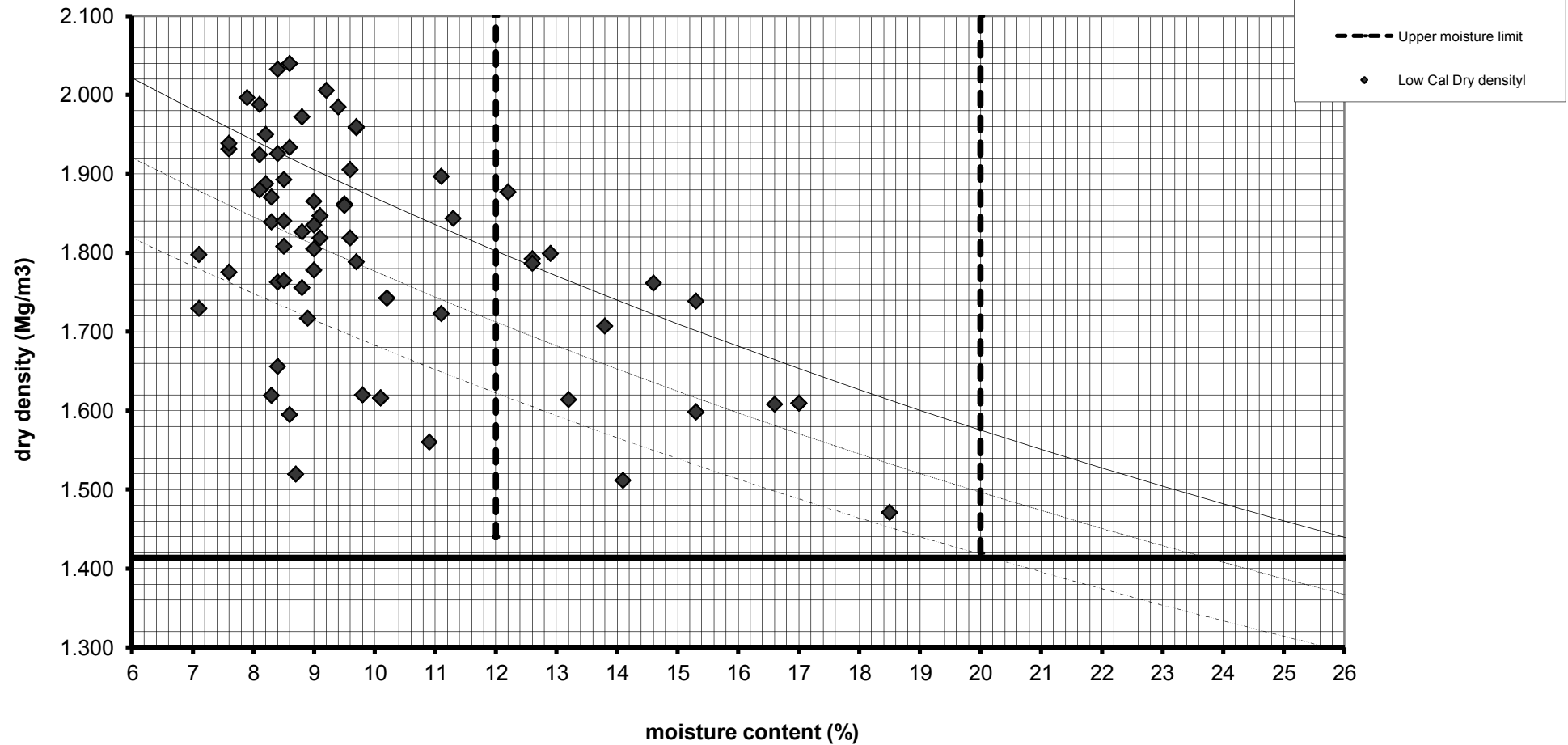
OPERATOR:

PD 2.3

Date	Test No.	Cell No	Layer No from bottom	GPS readings for test location			SRD Results			
				EASTING	NORTHING	LEVEL	B.D Mg/m ³	M.C. %	D.D Mg/m ³	

Skewness 0.5334
 Range 26.919
 Minimum -6.219

TerraConsult
Gatewen Rd, Wrexham
Compaction Results
Sand Replacement - low Calorific Material



Appendix S4

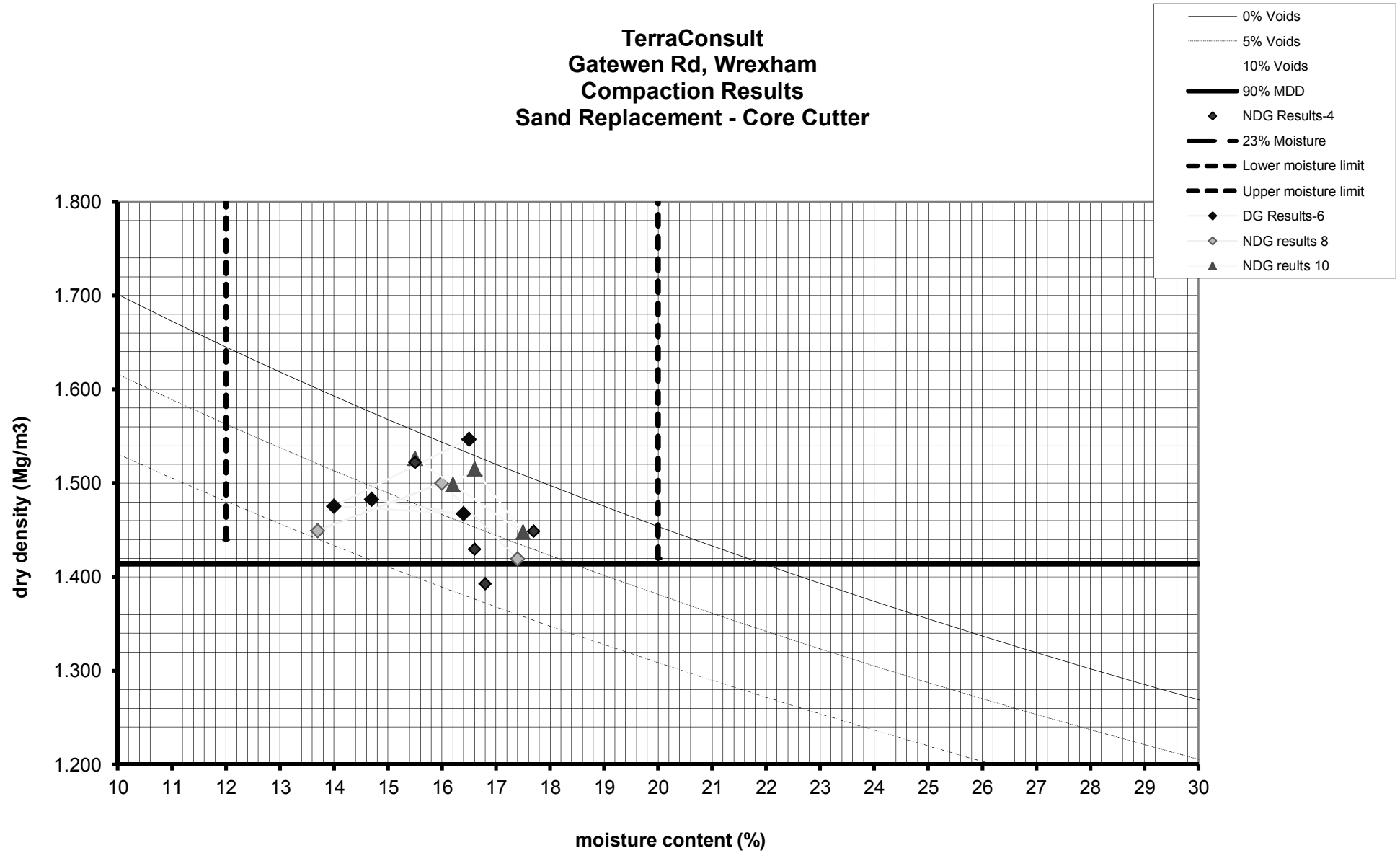
Trial Pad

Site: Gatewen RoadJob No. 1858Location: Wrexham

OPERATOR:

Date	Test No.	Cell No	Layer No from bottom	GPS readings for test location			SRD Results			
				EASTING	NORTHING	LEVEL	B.D Mg/m ³	M.C. %	D.D Mg/m ³	No of Pass
							1.705	17.7	1.449	4.00
							1.758	15.5	1.522	4.00
							1.627	16.8	1.393	4.00
							1.667	16.6	1.430	4.00
							1.802	16.5	1.547	6.00
							1.682	14.0	1.475	6.00
							1.708	16.4	1.467	6.00
							1.701	14.7	1.483	6.00
							1.666	17.4	1.419	8.00
							1.740	16.0	1.500	8.00
							1.648	13.7	1.449	8.00
							1.741	16.2	1.498	10.00
							1.767	16.6	1.515	10.00
							1.701	17.5	1.448	10.00
							1.763	15.5	1.526	10.00
							0.000	0.0	0.000	
							0.000	0.0	0.000	
							0.000	0.0	0.000	

**TerraConsult
Gatewen Rd, Wrexham
Compaction Results
Sand Replacement - Core Cutter**



Calculation of Voids Lines

Change the yellow figure to the required particle density

m/c %	0% Voids	5% Voids	10% Voids
0	2.050	1.948	1.845
1	2.009	1.908	1.808
2	1.969	1.871	1.772
3	1.931	1.835	1.738
4	1.895	1.800	1.705
5	1.859	1.766	1.673
6	1.825	1.734	1.643
7	1.793	1.703	1.613
8	1.761	1.673	1.585
9	1.731	1.644	1.558
10	1.701	1.616	1.531
11	1.673	1.589	1.506
12	1.645	1.563	1.481
13	1.619	1.538	1.457
14	1.593	1.513	1.434
15	1.568	1.489	1.411
16	1.544	1.466	1.389
17	1.520	1.444	1.368
18	1.497	1.423	1.348
19	1.475	1.402	1.328
20	1.454	1.381	1.309
21	1.433	1.361	1.290
22	1.413	1.342	1.272
23	1.393	1.323	1.254
24	1.374	1.305	1.237
25	1.355	1.288	1.220
26	1.337	1.270	1.204
27	1.320	1.254	1.188
28	1.302	1.237	1.172
29	1.286	1.221	1.157
30	1.269	1.206	1.142
31	1.253	1.191	1.128
32	1.238	1.176	1.114
33	1.223	1.162	1.101
34	1.208	1.148	1.087
35	1.194	1.134	1.074
36	1.180	1.121	1.062
37	1.166	1.107	1.049
38	1.152	1.095	1.037
39	1.139	1.082	1.025
40	1.126	1.070	1.014
41	1.114	1.058	1.002
42	1.102	1.046	0.991
43	1.090	1.035	0.981

Calculation of MDD Line

Figures highlighted in yellow are site specific

Maximum Dry Density(MDD) @ 2.5kg rammer = 1.728		
Horizontal axis limits	Vertical axis limits	
10	1.414	sets 90% MDD line
30	1.414	sets 90% MDD line
1.42	0.000	sets 0% moisture limit
2.100	0.000	sets 0% moisture limit
1.44	12.000	sets lower moisture limit
2.100	12.000	sets lower moisture limit
1.42	20.000	sets upper moisture limit
2.100	20.000	sets upper moisture limit

41518.000

Appendix S5

Plate Bearing Tests

Plate Bearing Test

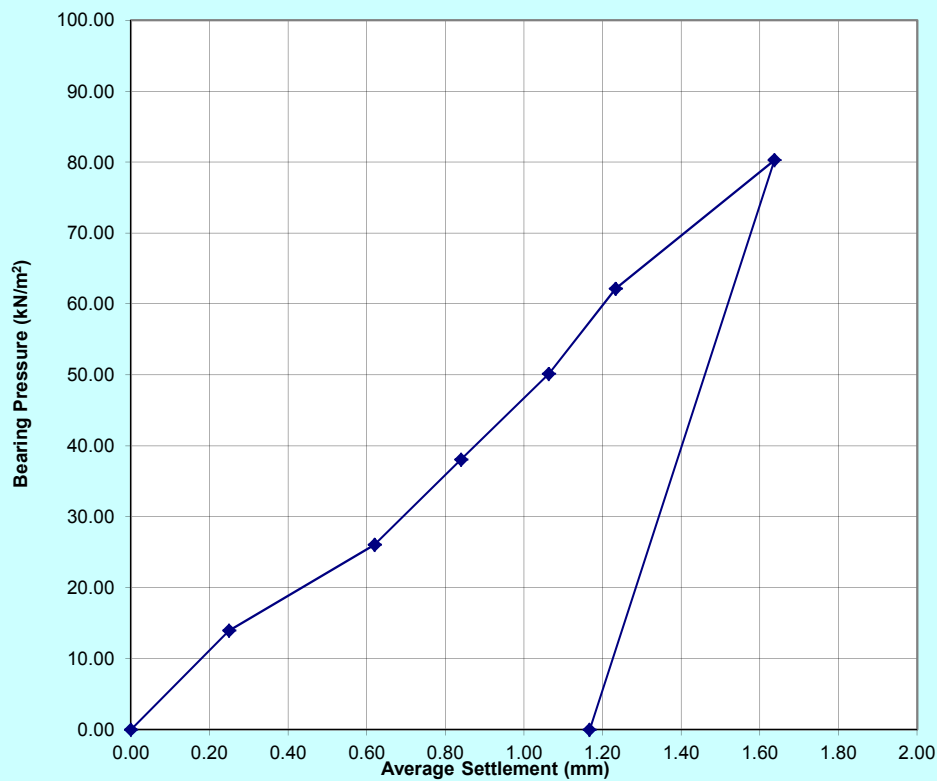
TerraConsult

Project: Gatewen Road, Wrexham
Project No: 1858

Client: McAuliffe

Test Method: BS1377:1990 Part 9 and IAN 73/06 rev.1

Location	Test No	Date	Weather	Description of Material	Diameter of Plate (mm)	Reaction Load
331358.505 351866.594	Test 1	27/08/2013	Dry	Firm grey COLLIERY SPOIL, consisting of fine to coarse mudstone, occasional fine to medium fragments of coal, and rare fine to medium rounded gravel	460	MOXI Dumper



Applied Bearing Pressure (kN/m ²)	Settlement at Applied Bearing Pressure (mm)				Modulus of Subgrade Reaction K ⁷⁶² (kN/m ² /m)	
0.00 14.00 26.10 38.10 50.20 62.20 80.30 0.00	1	2	3	Mean	3.30E+04	
	0.00	0.00	0.00	0.00		
	0.14	0.30	0.31	0.25		
	0.53	0.70	0.63	0.62		
	0.75	0.94	0.83	0.84		
	0.98	1.18	1.03	1.06		
	1.20	1.30	1.20	1.23	CBR Value %	
	1.59	1.78	1.54	1.64	4.1	
	1.19	1.23	1.08	1.17		
Notes:					Carried out by:	AC
					Checked by:	AB

Plate Bearing Test

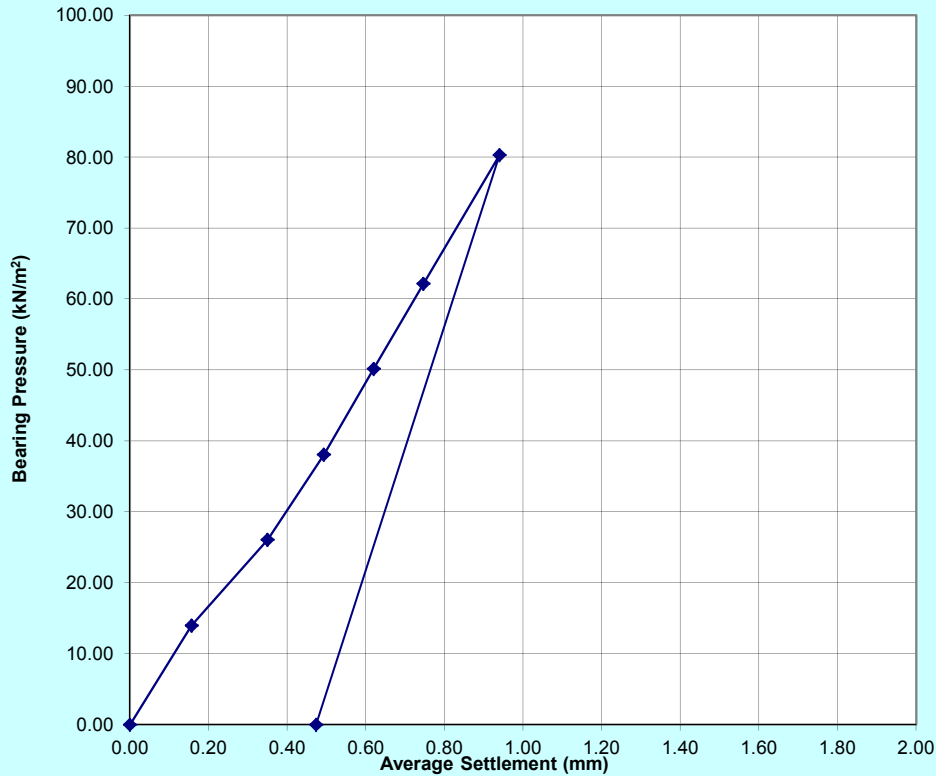
TerraConsult

Project: Gatewen Road, Wrexham
Project No: 1858

Client: McAuliffe

Test Method: BS1377:1990 Part 9 and IAN 73/06 rev.1

Location	Test No	Date	Weather	Description of Material	Diameter of Plate (mm)	Reaction Load
331317.547 351845.021	Test 2	27/08/2013	Dry	Firm grey COLLIERY SPOIL, consisting of fine to coarse mudstone, occasional fine to medium fragments of coal, and rare fine to medium rounded gravel	460	MOXI Dumper



Applied Bearing Pressure (kN/m ²)	Settlement at Applied Bearing Pressure (mm)				Modulus of Subgrade Reaction K ⁷⁶² (kN/m ² /m)	
	1	2	3	Mean	4.21E+04	
0.00	0.00	0.00	0.00	0.00		
14.00	0.17	0.14	0.16	0.16		
26.10	0.37	0.33	0.35	0.35		
38.10	0.52	0.48	0.48	0.49		
50.20	0.64	0.62	0.60	0.62		
62.20	0.76	0.76	0.72	0.75		
80.30	0.95	0.97	0.90	0.94	CBR Value %	
0.00	0.49	0.35	0.58	0.47	>6.3	
Notes:					Carried out by:	AC
					Checked by:	AB

Plate Bearing Test

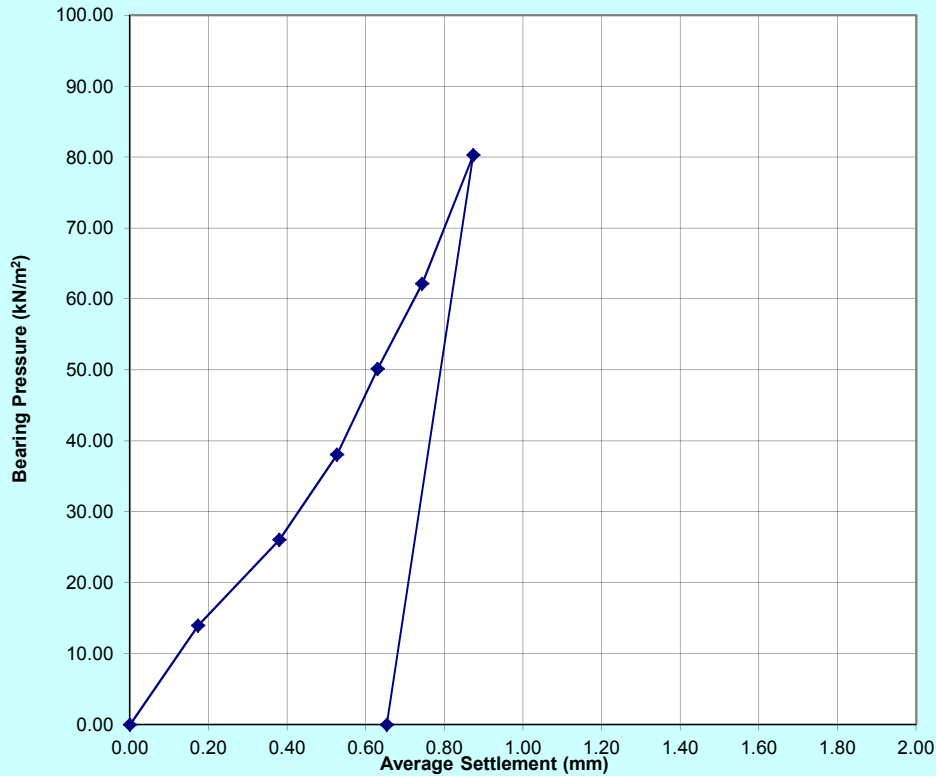
TerraConsult

Project: Gatewen Road, Wrexham
Project No: 1858

Client: McAuliffe

Test Method: BS1377:1990 Part 9 and IAN 73/06 rev.1

Location	Test No	Date	Weather	Description of Material	Diameter of Plate (mm)	Reaction Load
331355.728 351880.420	Test 3	27/08/2013	Dry	Firm grey COLLIERY SPOIL, consisting of fine to coarse mudstone, occasional fine to medium fragments of coal, and rare fine to medium rounded gravel	460	MOXI Dumper



Applied Bearing Pressure (kN/m ²)	Settlement at Applied Bearing Pressure (mm)				Modulus of Subgrade Reaction K ⁷⁶² (kN/m ² /m)	
	1	2	3	Mean	4.21E+04	
0.00	0.00	0.00	0.00	0.00		
14.00	0.12	0.20	0.20	0.17		
26.10	0.29	0.39	0.46	0.38		
38.10	0.39	0.55	0.64	0.53		
50.20	0.46	0.66	0.77	0.63		
62.20	0.54	0.77	0.92	0.74		
80.30	0.63	0.90	1.09	0.87		
0.00	0.44	0.69	0.83	0.65	CBR Value %	
					>6.3	
Notes:					Carried out by:	AC
					Checked by:	AB

Plate Bearing Test

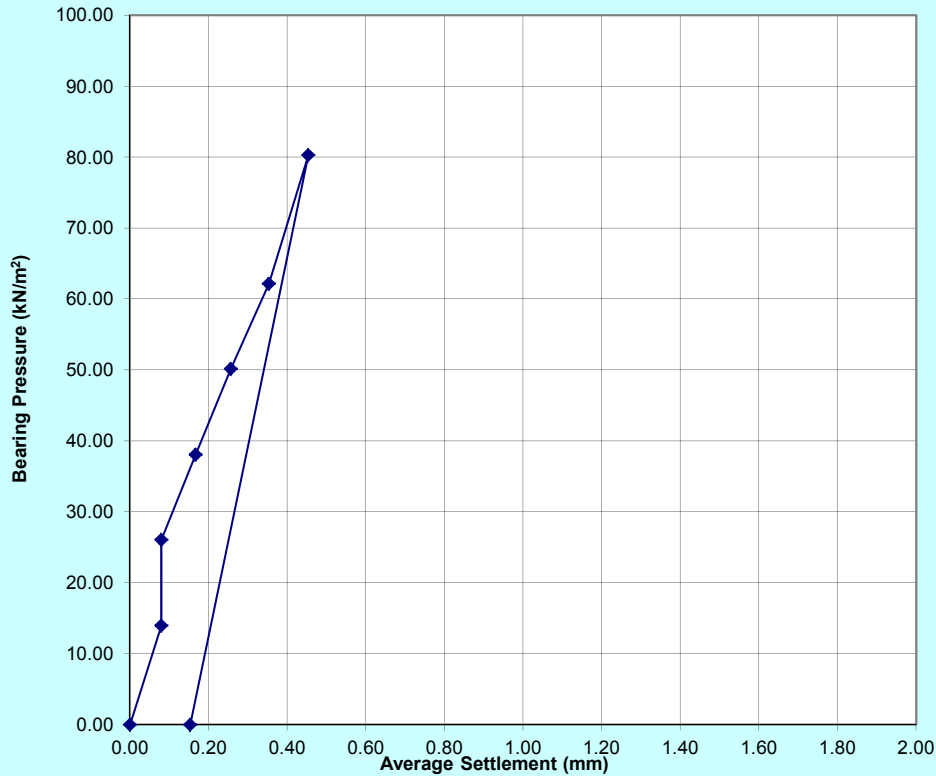
TerraConsult

Project: Gatewen Road, Wrexham
Project No: 1858

Client: McAuliffe

Test Method: BS1377:1990 Part 9 and IAN 73/06 rev.1

Location	Test No	Date	Weather	Description of Material	Diameter of Plate (mm)	Reaction Load
331305.058 351870.535	Test 4	27/08/2013	Dry	Firm grey COLLIERY SPOIL, consisting of fine to coarse mudstone, occasional fine to medium fragments of coal, and rare fine to medium rounded gravel	460	MOXI Dumper



Applied Bearing Pressure (kN/m ²)	Settlement at Applied Bearing Pressure (mm)				Modulus of Subgrade Reaction K ⁷⁶² (kN/m ² /m)	
	1	2	3	Mean	4.21E+04	
0.00	0.00	0.00	0.00	0.00		
14.00	0.15	0.01	0.08	0.08		
26.10	0.15	0.01	0.08	0.08		
38.10	0.20	0.12	0.18	0.17		
50.20	0.32	0.19	0.26	0.26		
62.20	0.41	0.28	0.37	0.35	CBR Value %	
80.30	0.52	0.36	0.48	0.45		
0.00	0.17	0.11	0.18	0.15	>6.3	
Notes:						
					Carried out by:	AC
					Checked by:	AB

Plate Bearing Test

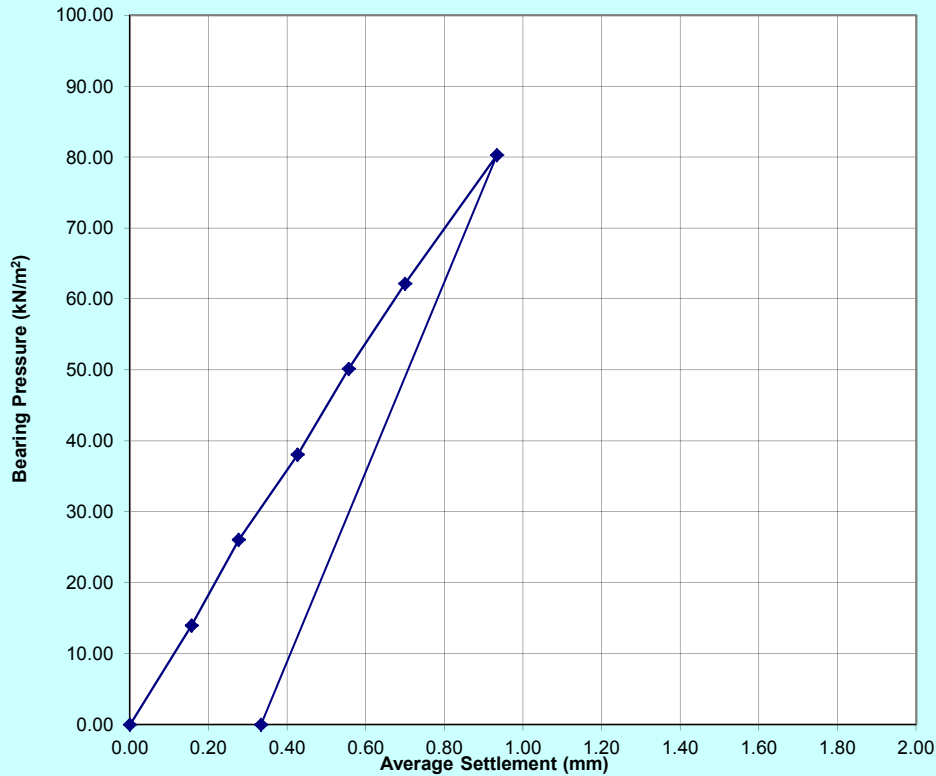
TerraConsult

Project: Gatewen Road, Wrexham
Project No: 1858

Client: McAuliffe

Test Method: BS1377:1990 Part 9 and IAN 73/06 rev.1

Location	Test No	Date	Weather	Description of Material	Diameter of Plate (mm)	Reaction Load
331314.366 351912.143	Test 5	27/08/2013	Dry	Firm grey COLLIERY SPOIL, consisting of fine to coarse mudstone, occasional fine to medium fragments of coal, and rare fine to medium rounded gravel	460	MOXI Dumper



Applied Bearing Pressure (kN/m ²)	Settlement at Applied Bearing Pressure (mm)				Modulus of Subgrade Reaction K ⁷⁶² (kN/m ² /m)	
	1	2	3	Mean	4.21E+04	
0.00	0.00	0.00	0.00	0.00		
14.00	0.14	0.16	0.17	0.16		
26.10	0.27	0.28	0.28	0.28		
38.10	0.41	0.43	0.44	0.43		
50.20	0.53	0.56	0.58	0.56		
62.20	0.66	0.70	0.74	0.70	CBR Value %	
80.30	0.90	0.93	0.97	0.93		
0.00	0.39	0.29	0.32	0.33	>6.3	
Notes:						
					Carried out by:	AC
					Checked by:	AB

Plate Bearing Test

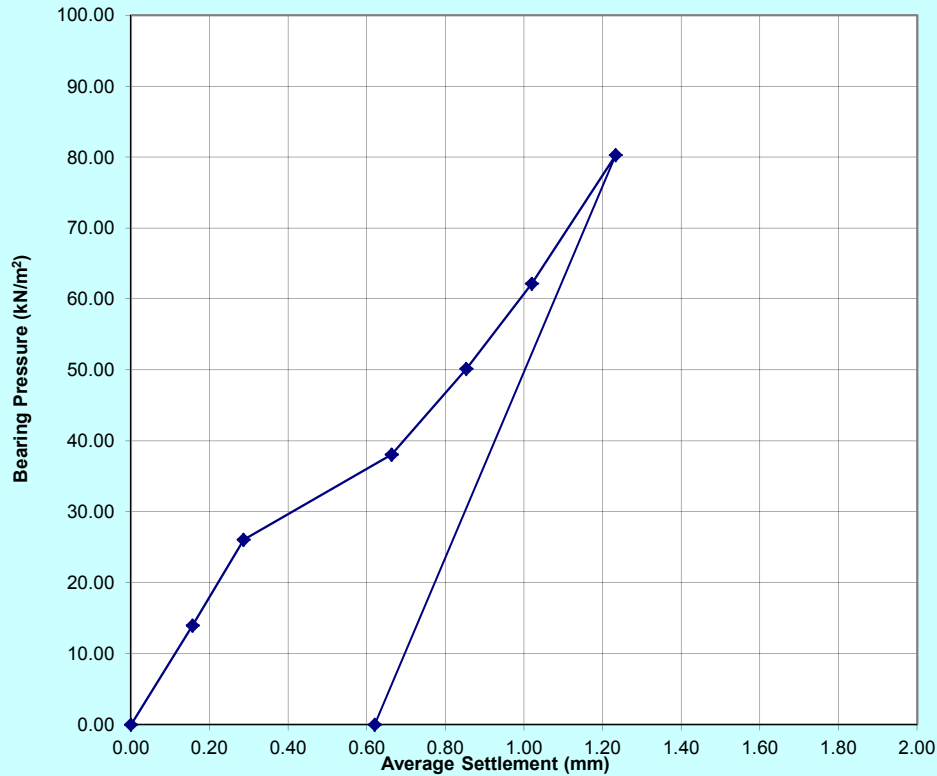
TerraConsult

Project: Gatewen Road, Wrexham
Project No: 1858

Client: McAuliffe

Test Method: BS1377:1990 Part 9 and IAN 73/06 rev.1

Location	Test No	Date	Weather	Description of Material	Diameter of Plate (mm)	Reaction Load
331296.685 351889.805	Test 6	27/08/2013	Dry	Firm grey COLLIERY SPOIL, consisting of fine to coarse mudstone, occasional fine to medium fragments of coal, and rare fine to medium rounded gravel	460	MOXI Dumper



Applied Bearing Pressure (kN/m²)	Settlement at Applied Bearing Pressure (mm)	Modulus of Subgrade Reaction K^{762} (kN/m²/m)
	123Mean	
0.00	0.000.000.000.00	4.21E+04
14.00	0.150.120.200.16	
26.10	0.280.240.340.29	
38.10	0.690.580.720.66	
50.20	0.880.760.920.85	
62.20	1.050.921.091.02	
80.30	1.271.131.301.23	CBR Value %
0.00	0.730.460.670.62	>6.3
Notes:		Carried out by: AC
		Checked by: AB

Plate Bearing Test

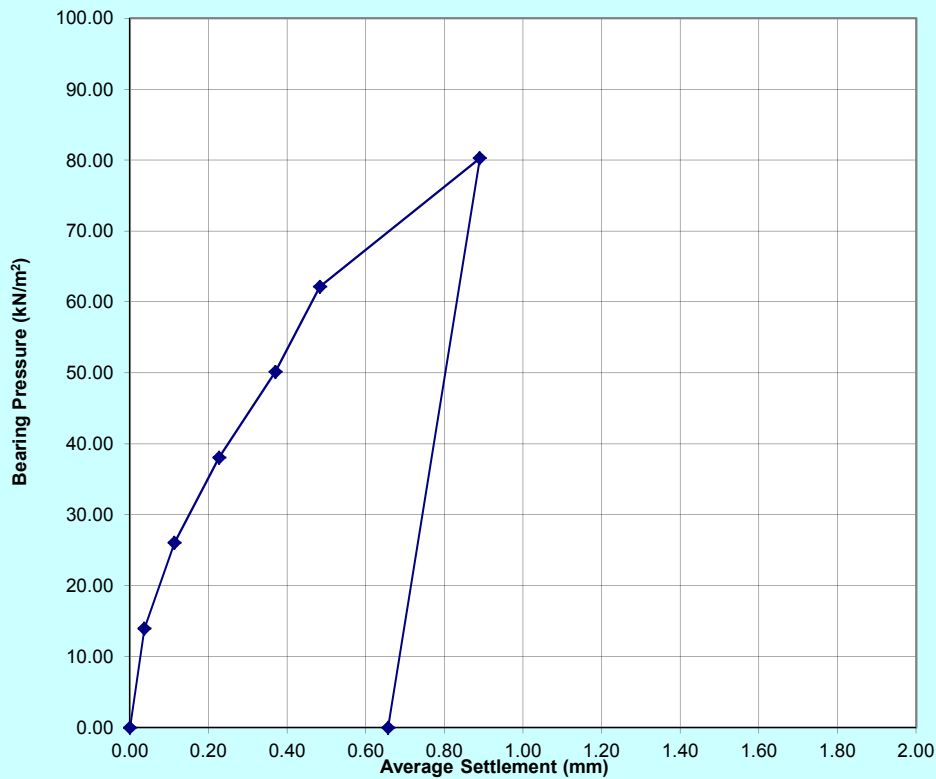
TerraConsult

Project: Gatewen Road, Wrexham
Project No: 1858

Client: McAuliffe

Test Method: BS1377:1990 Part 9 and IAN 73/06 rev.1

Location	Test No	Date	Weather	Description of Material	Diameter of Plate (mm)	Reaction Load
331304.096 351925.144	Test 7	27/08/2013	Dry	Firm grey COLLIERY SPOIL, consisting of fine to coarse mudstone, occasional fine to medium fragments of coal, and rare fine to medium rounded gravel	460	MOXI Dumper



Applied Bearing Pressure (kN/m ²)	Settlement at Applied Bearing Pressure (mm)				Modulus of Subgrade Reaction K ⁷⁶² (kN/m ² /m)	
	1	2	3	Mean	4.21E+04	
0.00	0.00	0.00	0.00	0.00		
14.00	0.02	0.01	0.08	0.04		
26.10	0.10	0.04	0.20	0.11		
38.10	0.31	0.10	0.27	0.23		
50.20	0.55	0.18	0.38	0.37	CBR Value %	
62.20	0.75	0.26	0.44	0.48		
80.30	1.14	0.81	0.72	0.89	>6.3	
0.00	0.75	0.79	0.43	0.66		
Notes:					Carried out by:	AC
					Checked by:	AB

Plate Bearing Test

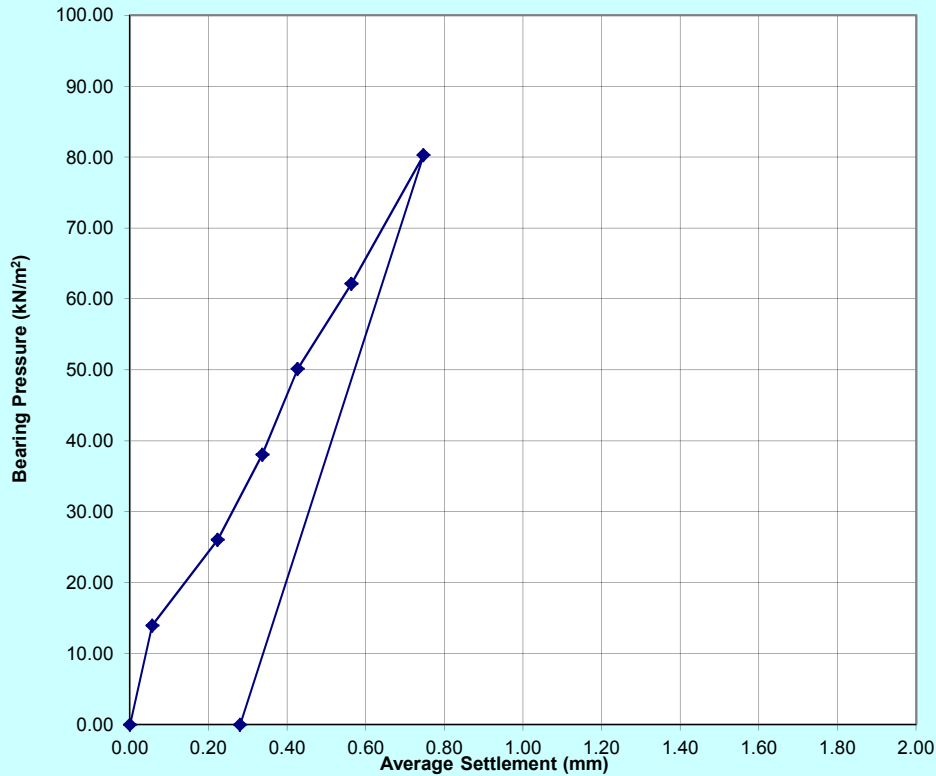
TerraConsult

Project: Gatewen Road, Wrexham
Project No: 1858

Client: McAuliffe

Test Method: BS1377:1990 Part 9 and IAN 73/06 rev.1

Location	Test No	Date	Weather	Description of Material	Diameter of Plate (mm)	Reaction Load
331273.560 351916.528	Test 8	27/08/2013	Dry	Firm grey COLLIERY SPOIL, consisting of fine to coarse mudstone, occasional fine to medium fragments of coal, and rare fine to medium rounded gravel	460	MOXI Dumper



Applied Bearing Pressure (kN/m ²)	Settlement at Applied Bearing Pressure (mm)				Modulus of Subgrade Reaction K ⁷⁶² (kN/m ² /m)	
	1	2	3	Mean	4.21E+04	
0.00	0.00	0.00	0.00	0.00		
14.00	0.08	0.05	0.04	0.06		
26.10	0.34	0.16	0.17	0.22		
38.10	0.50	0.25	0.26	0.34		
50.20	0.64	0.30	0.34	0.43	CBR Value %	
62.20	0.78	0.43	0.48	0.56		
80.30	0.97	0.59	0.68	0.75		
0.00	0.51	0.13	0.20	0.28	>6.3	
Notes:					Carried out by:	AC
					Checked by:	AB

Plate Bearing Test

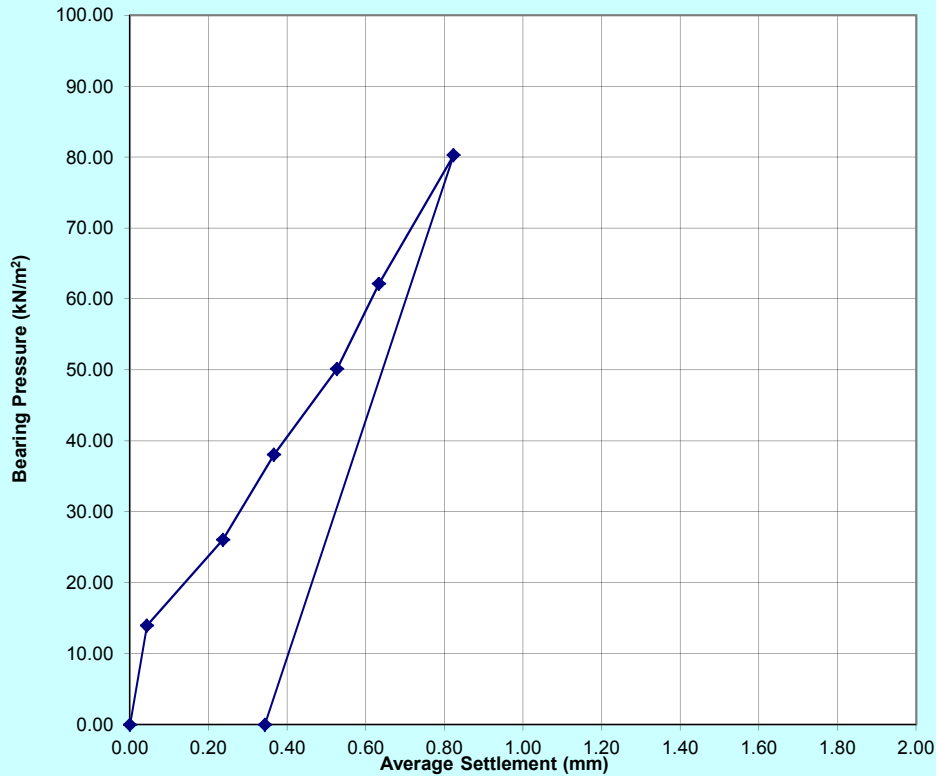
TerraConsult

Project: Gatewen Road, Wrexham
Project No: 1858

Client: McAuliffe

Test Method: BS1377:1990 Part 9 and IAN 73/06 rev.1

Location	Test No	Date	Weather	Description of Material	Diameter of Plate (mm)	Reaction Load
331288.220 351944.398	Test 9	27/08/2013	Dry	Firm grey COLLIERY SPOIL, consisting of fine to coarse mudstone, occasional fine to medium fragments of coal, and rare fine to medium rounded gravel	460	MOXI Dumper



Applied Bearing Pressure (kN/m ²)	Settlement at Applied Bearing Pressure (mm)				Modulus of Subgrade Reaction K ⁷⁶² (kN/m ² /m)	
0.00 14.00 26.10 38.10 50.20 62.20 80.30 0.00	1	2	3	Mean	4.21E+04	
	0.00	0.00	0.00	0.00		
	0.07	0.05	0.01	0.04		
	0.26	0.23	0.22	0.24		
	0.38	0.38	0.34	0.37		
	0.56	0.53	0.49	0.53		
	0.65	0.65	0.60	0.63		
	0.83	0.85	0.79	0.82		
	0.37	0.35	0.31	0.34	CBR Value %	
					>6.3	
Notes:					Carried out by:	AC
					Checked by:	AB



TEST REPORT

Client Coopers

Address Park House
Sandpiper Court
Chester Business Park
Chester
CH4 9QU

Contract Gatewen Colliery, New Broughton, Wrexham
(McAuliffe Civil Engineering Ltd)
Client Job Ref: 4763
Order Number: P/O 5847

Job Number MRN 1985/81

Date of Issue 16 August 2013

Page 1 of 2

Approved Signatories

S J Hutchings, A W Hutchings, A Richardson

Notes

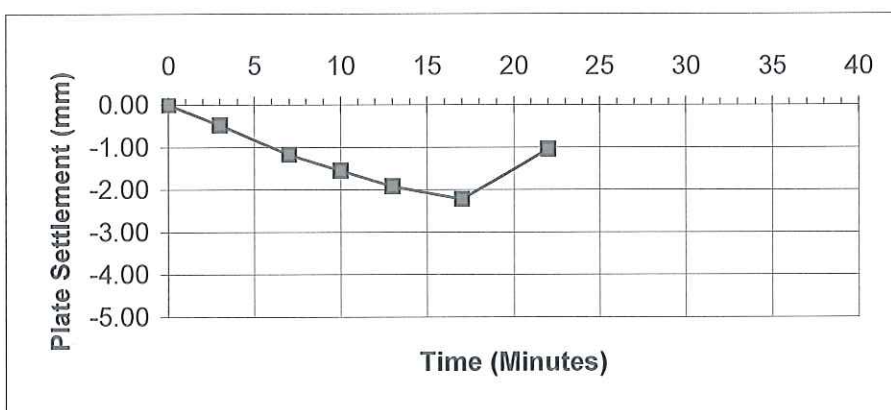
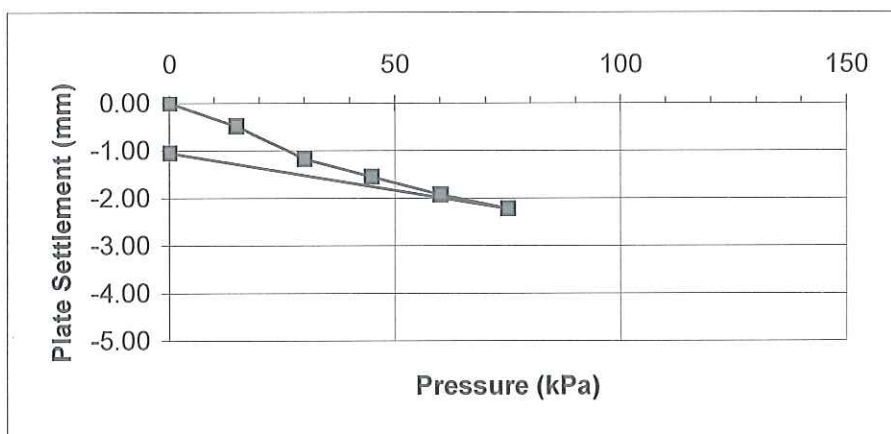
- 1 All remaining samples and remnants from this contract will be disposed 28 days from the date of this report unless you notify us to the contrary.
- 2 Result certificates, in this report, not bearing a UKAS mark, are not included in our UKAS accreditation schedule.
- 3 Opinions and interpretations expressed herein are outside the scope of our UKAS accreditation
- 4 Certified that the samples have been examined and tested in accordance with the terms of the contract/order and unless otherwise stated conform to the standards/specifications quoted. This does not, however, guarantee the balance of the materials from which the tested samples have been taken to be of equal quality.



TEST CERTIFICATE
PLATE INCREMENTAL LOAD TEST
BS 1377 : PART 9 : CL 4.1

CLIENT	Coopers				
SITE	(4763) Gatewen Colliery, New Broughton, Wrexham (McAuliffe Civil Engineering Ltd)				
JOB NUMBER	MRN 1985/81				
TEST LOCATION	Cell 1		LOADING DEVICE	20 Tonne Enerpac Jack	
TEST DATE	14-Aug-13		PLATE SIZE (mm)	600 diameter	
TEST DEPTH	Surface		REACTION LOAD USED	Site Excavator	
MATERIAL UNDER TEST	Stony Fill		MOISTURE CONTENT	Not Required	

Dial Gauge 1 (mmx100)	Dial Gauge 2 (mmx100)	Dial Gauge 3 (mmx100)	Mean Gauge (mmx100)	Mean Deflection (mm)	Load (kN)	Pressure (kPa)
3569	3179		3374	0.00	0.00	0.0
3534	3117		3326	-0.49	4.20	14.9
3479	3034		3257	-1.18	8.50	30.1
3447	2991		3219	-1.55	12.70	44.9
3412	2951		3182	-1.93	17.00	60.1
3379	2924		3152	-2.23	21.20	75.0
3477	3061		3269	-1.05	0.00	0.0



REMARKS

1 kN seating load applied to plate. Test shows compliance with the advised compliance criteria i.e. settlement ≤ 5 mm at a pressure of 75 kPa

Only two dial gauges used due to equipment malfunction whilst on site.

SIGNED

NAME S.J. Hutchings (Director)

DATE 16-Aug-13



TerraConsult

**Leaders in
waste management
environmental &
ground engineering
consultancy**

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FS 573193



EMS 573194

