

GRM Development Solutions
Laurus House
First Avenue
Centrum 100
Burton upon Trent
Staffordshire, DE14 2WH
www.grm-uk.com

t. 01283 551249
f. 01283 211968
e. info@grm-uk.com



STANTON LANE, STANTON UNDER BARDON

PHASE II SITE APPRAISAL FOR SUTTON LAND DEVELOPMENT LTD.

Project Ref:
P8079

Date:
September 2017

Prepared for:
Sutton Land Development Ltd.
Charnwood Edge
Syston Road
Cossington
Leicestershire
LE7 4UZ

This report has been prepared in accordance with GRM's Accredited Quality Procedures

If you have any queries regarding this report please contact the project manager in the first instance.

Prepared by:	Reviewed by:		Approved by:
Russell Hurcombe MGeoSci (Hons) FGS (Geologist) russell.hurcombe@grm-uk.com	Dr Tim Rogers FGS (Senior Geologist) tim.rogers@grm-uk.com	Clive Kirby CGeol FGS (Principal Geologist) clive.kirby@grm-uk.com	Dr Bill Peacock Enter Qualifications (Director) bill.peacock@grm-uk.com
When required in-house geological, geotechnical, environmental, structural and civil staff helped to produce this document.			
Issue	Description of Revision		Signature



constructionline
UK REGISTER OF PRE-QUALIFIED CONSTRUCTION SERVICES



info@grm-uk.com

www.grm-uk.com

Site Appraisal for Stanton Lane, Stanton under Bardon

SUMMARY OF RECOMMENDATIONS

Where further assessment is required it is indicated with a "Y" in the right hand column.		
Proposed Development	Steel framed structures	
CONTAMINATION ASSESSMENT - REMEDIATION / WASTE DISPOSAL		
End Users	No remediation required.	
Site Workers	No remediation required.	
Construction Materials	Appropriate concrete specification. PE water supply pipes required (to be confirmed)	Y
Groundwater	No remediation required.	
Surface Water	No remediation required.	
Waste Disposal	Preliminary Waste Classification: Non-Hazardous for topsoil. Inert for natural strata. Will need to be confirmed by receiving landfill.	Y
GEOTECHNICAL ASSESSMENT – FOUNDATIONS		
Ground Treatment Required	Temporary haul roads or working platforms.	
Main Bearing Strata	Clay and gravels.	
Nett Allowable Bearing Pressure	110-125kN/m ² (Clay); 220kN/m ² (gravel).	Y
Rockhead	Potentially identified in TP05 circa 1.0m begl, TP06 (2.1m), TP07 (2.5m) and TP02 (2.7m).	
Tree Influence	Some around periphery of site. Extent to be confirmed by a tree survey.	Y
Volume Change Potential	High.	
Likely Foundation Types	100% pad and strip foundations.	
Likely Foundation Depth Range	1.0m begl minimum, 2.5m begl maximum depths; average depth 2.0m begl.	Y
Excavation Hazards	Existing underground cable in north western area of site. Shallow rock. Existing foundations in south eastern corner.	
Floor Slab Types	100% ground bearing.	
Gas Protection Requirements Radon and/or Landfill	Gas protection measures required for carbon dioxide. Radon protection not required.	Y
GEOTECHNICAL ASSESSMENT - GENERAL		
Slope Stability Risk	Low.	
Soakaways Potential	Potentially suitable.	Y
New Access Roads	Remoulded CBRs 0.4% to 6.8%.	Y
Buried Concrete Class	DS - 1; AC- 1. GEN-1, RC35	
Retaining Walls and Boundary Features	Yes. Retaining wall against boundary in north western corner. Potential for new retaining features following earthworks.	Y
Further Assessment Targets	Potential made ground in south eastern corner will require investigation once accessible. Additional GI along quarry edge to ensure units will not overlie the quarry high-wall. Further investigation including plate load testing once foundation levels have been finalised.	Y
Other Comments	Cut and fill earthworks likely to be required. Tree survey.	Y

This summary is based on the full report that provides the detailed assessment of the ground risks affecting the development and how to manage them. It should not be used in isolation.

TABLE OF CONTENTS

1	INTRODUCTION.....	1
2	PHASE I DESK STUDY SUMMARY.....	2
3	PHASE II GROUND INVESTIGATION.....	5
4	LABORATORY ANALYSES RATIONALE	8
5	QUANTITATIVE RISK ASSESSMENT – HUMAN HEALTH (SOIL).....	9
6	QUANTITATIVE RISK ASSESSMENT – HUMAN HEALTH (GROUND GAS).....	11
7	QUANTITATIVE RISK ASSESSMENT - CONTROLLED WATERS	12
8	PHASE II CONCEPTUAL SITE MODEL.....	13
9	REMEDICATION	14
10	GEOTECHNICAL ASSESSMENT	16
11	FURTHER INVESTIGATION	20
12	CONCLUSIONS.....	20

APPENDICES

General Appraisal Comments and Standard Limitations	Appendix A
Proposed Development Plan	Appendix B
Site Location and Boundary Plans	Appendix C
Phase I Ground Hazard Diagram	Appendix D
Exploratory Hole Location Plan	Appendix E
Exploratory Hole Logs	Appendix F
Gas Monitoring Plan	Appendix G
Gas and Groundwater Monitoring Results	Appendix H
Chemical Analysis Results	Appendix I
Geotechnical Test Results	Appendix J
GRM Contaminant Screening Values	Appendix K
Statistical Analysis Sheets (with outliers removed) / Outliers Sheet	Appendix L

1 INTRODUCTION

1.1 PREAMBLE

GRM Development Solutions Limited (GRM) has been appointed by Sutton Land Development Ltd. (Client) to undertake a Phase II Site Appraisal. A previous desk study by GRM (Phase I Site Appraisal (Desk Study), GRM/8079/DS.1, August 2017) formed Phase I of the assessment and allowed the geotechnical and geo-environmental setting of the site to be determined and the identification of areas of particular concern that required targeted investigation. The Phase II works reported within this document comprise the intrusive ground investigation, geotechnical testing and chemical analysis. The information gained from the Phase II works will be used to refine the conceptual model for the site and determine cost-effective development solutions.

This document is intended to provide information that will assist decision making by identifying and recommending solutions to ground engineering and contamination issues.

GRM Standard Limitations of Reporting are provided in Appendix A of this report.

The Client proposes to develop the site with a number of steel framed buildings and associated infrastructure. The proposed end use may include areas of soft landscaping. The outline development proposals provided by the Client are presented in Appendix B.

The Client has not informed GRM of any potential development hazards.

1.2 OBJECTIVES OF THE SITE APPRAISAL

The principal aims of the Phase II Site Appraisal are as follows:

- a) Obtain information, from easily accessible sources, about the soil and groundwater conditions within the area of the site.
- b) Determine the possible ground-related geotechnical and contamination hazards within the site boundaries that may affect the proposed development.
- c) Provide preliminary development recommendations.
- d) Provide advice on further works required for the cost-effective reduction of risks to the development and procedures likely to satisfy regulators.

Whilst every effort has been made to pre-empt the likely requirements of the Local Authority and the Environment Agency, they are likely to have specific requirements that will need to be discussed and addressed at a later date.

2 PHASE I DESK STUDY SUMMARY

Project Name.	Stanton Lane, Stanton under Bardon
Project Reference.	P8079
Client.	Sutton Land Developments Ltd.
Site Location (address).	The site is located approximately 1km north of Stanton under Bardon village centre and approximately 5km southeast of Coalville town centre.
National Grid Reference.	SK469114
Site Area (Ha).	2.05ha
Summary of Proposed Development.	Steel framed buildings and associated infrastructure.
Client Supplied Information.	Location of the site (included in Appendix C) Proposed development layout (included in Appendix B)
Site Setting.	The site is presently an open grassed field used for silage. The site is bounded by fields to the west, east and south and by an industrial unit to the north. An equestrian centre is also present to the east of the site. Dense vegetation surrounds the site and includes semi-mature to mature oak, hawthorn and elder trees/hedges. The site boundary comprises wooden fencing along the north western, southern and eastern boundaries and by metallic fencing along the northern boundary. In the north western corner, adjacent to the steel warehouse, a gabion retaining wall is present. An overhead cable enters the site in the north western corner and terminates at a pylon. The ends of the cables are exposed by the pylon and run east along the site boundary towards the steel warehouses. A derelict brick building was identified in the south eastern corner of the site, currently separated from the main area of the site by barbed wire fencing and is densely overgrown.
Site History.	1884 – records site and surrounding area to be open fields. 1903 – Buildings in south eastern corner of the site and an old quarry is recorded immediately west of the site. 1959 – no significant changes to site. Old quarry is now recorded as disused. 1966 – No significant changes to site. The quarry is no longer visible and presumed to be backfilled. 1991 – Buildings on site no longer recorded. A depot is recorded on the land immediately north. Present day – no significant changes on site. Depot to the north is present with an equestrian centre to the east of the site.
Geology.	Superficial deposits of Head (clay, silt, sand and gravel). Solid geology of Mercia Mudstone including Edwalton Formation (mudstone) and Cotgrave Member (sandstone). The Bradgate Formation (volcanoclastic siltstone) is recorded in the south western corner.
Groundwater and Surface Water.	Superficial deposits classified as Secondary Aquifer (undifferentiated). Edwalton Formation classified as Secondary B Aquifer and the Cotgrave Member classified as Secondary A Aquifer. A tertiary river is located approximately 150m east of the site – considered to be at negligible risk from site derived contamination.

Mining/Quarrying	No coal mining activities within the area. Historical quarry adjacent to or just within the site boundary.
Potential Soil Contamination Sources.	Historical landfill within old quarry (recorded by the Environment Agency). Made ground associated with demolition of buildings in south eastern corner of site.
Potential Ground Gas Sources (including Radon).	Historical landfill within old quarry (recorded by the Environment Agency). Made ground associated with demolition of buildings in south eastern corner of site. No radon protective measures are required.

The Phase I Ground Hazard Diagram is presented in Appendix D.



2.1 PHASE I CONCEPTUAL SITE MODEL

HUMAN HEALTH			
Source	Pathway	Receptor	Level of Risk
Made ground / fill associated with previous development and historical landfill.	Indoor and outdoor inhalation of soil dust, the ingestion of, and dermal contact with, contaminated soil and soil dust, ingestion of vegetables that have taken up contamination and contaminated soil attached to vegetables.	End users.	Low.
Pesticides associated with agricultural land use.		Construction and Maintenance Workers.	
Localised made ground / fill.	Inhalation of ground gas.	End users.	Very low to low (Based on BS8576).
Historical landfill site in former quarry.			
Made ground.	Water pipes.	End users.	Very Low.

CONTROLLED WATERS			
Made ground / fill and historical landfill.	Leaching of contaminants and vertical migration to the groundwater. (pathway likely to be restricted by cohesive soils)	Secondary A, B and undifferentiated Aquifers.	Low.

3 PHASE II GROUND INVESTIGATION

3.1 FIELDWORK

The ground investigation has been designed in accordance with the general comments outlined in Appendix A (iv).

The ground investigation fieldwork was conducted on 7th and 8th August with groundwater/gas monitoring visits continuing after that period. A total of 15 exploratory holes (eight trial pits and five windowless sample boreholes) were progressed, to a maximum depth of 5.0m below existing ground level (begl). The exploratory hole location plan and exploratory hole logs are presented in Appendix E and Appendix F respectively.

The south eastern corner was not accessible at the time of the investigation due to fence lines and dense vegetation.

Five gas and water monitoring standpipes were installed during the site works, the rationale for these works are discussed fully in Section 6. A Gas Monitoring Plan, illustrating the locations of the standpipes, is presented in Appendix G. The standpipes will need to remain in place until the end of September.

3.2 PROVEN GROUND

The following ground conditions were encountered during the investigation fieldwork:

- Topsoil
- Head
- Weathered Edwalton Formation

3.2.1 Topsoil

Topsoil was encountered as soft, dark brown, sandy, gravelly CLAY in all exploratory holes and ranged in thickness from 0.2m to 0.45m with a general thickness of 0.3m.

3.2.2 Head

These deposits generally comprised:

- Firm to stiff, orangish brown (locally yellow and grey in colour), locally silty and sandy, gravelly to very gravelly, cobbly CLAY. The gravel comprised fine to coarse, angular to subangular chert and volcanoclastic sandstone and siltstone with rare rounded quartzite.
- Medium dense, light brown sandy gravelly SILT.
- Medium dense to dense, light brown, tabular GRAVEL with cobbles of volcanoclastic siltstone.

This material was found across the site in all exploratory holes, to depths of up to 3.4m and encountered with thicknesses between 0.7m and 3.1m but was generally around 1.8m thick. The base of the head deposits was not proven in TP01 at 3.1m begl. In trial pits TP02 and TP05 to TP07 the excavator was unable to proceed

beyond the dense gravels (terminated at depths between 1.1m and 2.7m begl) and may have been on rockhead of the Bradgate Formation.

Where hand shear vane measurements were recorded, shear strengths ranging from 57 to 61kN/m² were obtained, indicating a medium strength.

Standard Penetration Test N-values generally ranged from 10 to 50 at 1m depth, 18 to 25 at 2m depth, and 21 at 3m depth; indicating a variable strength but generally of medium strength material. When encountered, sand was generally medium dense.

Window sample boreholes WS03 to WS05 recorded SPT refusals at 1.0m to 1.8m begl and may indicate shallow rock depths.

3.2.3 Weathered Edwalton Formation

These deposits comprised firm to very stiff, reddish brown, locally slightly gravelly, silty CLAY with mudstone and siltstone gravel. This unit is considered to represent the completely weathered profile of the Edwalton Formation.

This material was only found in exploratory holes TP03, TP04, TP08, WS01 and WS02 at depths between 1.5m and 4.0m begl.

Hand shear vane measurements recorded shear strengths ranging from 65kN/m² to 126kN/m² indicating a medium to high strength.

Standard Penetration Test N-values were obtained in WS01 and WS02 between 4 and 5m begl. The resulting values were between 32 and 50 indicating a high strength material.

3.3 CONTAMINATION OBSERVATIONS

No visual or olfactory evidence of potential contamination was encountered during the fieldwork and monitoring. In addition, potential sources of ground gas were not observed.

3.4 GROUNDWATER OBSERVATIONS

No groundwater was observed in any of the exploratory holes. However, the exploratory techniques used were rapid and may have masked small water seepages.

Two groundwater monitoring visits have been conducted and the results of the monitoring are reported in Appendix H. In summary, standing water was recorded at depths of 1.61m begl to 1.79m begl in WS01 and was recorded on one occasion in WS05 at 1.09m begl. The remaining installations were dry during the monitoring visits.

Long term monitoring of groundwater levels has not been conducted as part of this investigation and interpreted levels are approximate and may be dependent on seasonal variations.

3.5 GROUND GAS AND VAPOURS

Ground gases are discussed in full in Section 6. In summary, the concentrations of ground gases recorded to date are presented in Appendix H and summarised below:

- Methane has not been detected.
- Carbon dioxide concentrations between 0.4%v/v and 7.0%v/v have been detected, with readings close or above 5% across the site.
- Oxygen concentrations between 10.3%v/v and 19.5%v/v have been detected.

No flow was noted during the monitoring completed to date.

3.6 SUMMARY OF FIELDWORK OBSERVATIONS

The fieldwork has revealed/confirmed the following:

Significant Features identified during fieldwork
Generally medium strength material. Variable strata – cohesive and granular.

4 LABORATORY ANALYSES RATIONALE

4.1 CHEMICAL LABORATORY ANALYSIS

Chemical laboratory analyses were selected to provide the parameters necessary to make an initial assessment of potentially contaminated soils and/or waters, for the budgetary design of the development. The choice of contamination testing was based on the Phase I assessment, identified past uses of the site, site observations and comprised:

- Six samples were analysed for a general suite of contaminants (metals, inorganics and speciated PAH).
- Six samples have been screened for the presence of pesticides.

The chemical analysis results are presented in Appendix I.

Samples not used for testing will be stored for a month after issue of this report and then disposed of, unless the client requests in writing that they be kept.

4.2 GEOTECHNICAL LABORATORY TESTING

Geotechnical soils testing has been undertaken as part of the ground investigation including the following:

- Five samples underwent Atterberg Limits (PI) classification.
- Eleven samples underwent pH and water soluble sulphate testing.
- Six samples underwent Remoulded CBR testing to provide indicative information for roadway and floor slab design.

Geotechnical tests were selected to provide the parameters necessary for the budgetary design of the development including foundations and infrastructure. The geotechnical test results are presented in Appendix J, and summarised in Section 10.2.

5 QUANTITATIVE RISK ASSESSMENT – HUMAN HEALTH (SOIL)

5.1 INTRODUCTION

The Client proposes to develop the site with steel frame commercial/industrial buildings and infrastructure.

The desk study revealed the potential backfilled quarry as a source of contamination that may extend onto site, and the former buildings in the south eastern corner to be a source of contamination. However, the exploratory holes in the south west corner did not encounter the back-filled quarry and it was not possible to access the area containing the derelict buildings. The fieldwork has not revealed any potential contamination on this site at this stage, accordingly testing has only been carried out to provide parameters for the reuse of soils.

Representative samples of all strata and those considered to be potentially contaminated by virtue of the desk study and/or based on site observations were collected for further examination and/or potential testing.

The rationale for the end use specific *Tier 1 Acceptance Criteria* (TAC) used by GRM is outlined in Appendix A (vi) and for this site the chemical analysis results are being compared against the TAC for commercial/industrial end use. In order to adopt a conservative approach a Soil Organic Matter (SOM) content of 1% has been used to assess the topsoil, as this reflects the lowest SOM recorded in each material.

To provide an initial assessment, benzo(a)pyrene has been used as a surrogate marker compound for all PAHs with exception of naphthalene. A copy of the thresholds used in this assessment is presented in Appendix K.

5.2 RISK TO END USERS

The chemical analysis results are presented in Appendix I.

Statistical analysis in accordance with the principles outlined in the CIEH document *Guidance on Soil Contamination Data with a Critical Concentration* (May 2008) has been used to assess the chemical analysis test results for the general suite analysis (metals, inorganics and speciated PAHs) for the topsoil; the accompanying reports are presented in Appendix L.

5.2.1 Analysis of Soil Contamination Data

GRM General Suite – Topsoil

The 'Upper Confidence Limit (UCL) of the True Mean' values for all of the contaminants are below the relevant 'Critical Concentrations' (i.e. TAC) for commercial/industrial land use.

The statistical analysis revealed statistical outliers for benzo(a)pyrene (detailed on the Statistical Analysis Summary) which is below the relevant 'Critical Concentrations', and is considered not to be indicative of another population that requires further consideration.

Pesticides

The screening for pesticides did not reveal the presence of such contamination in the samples analysed.

5.2.2 Water Supply Pipes

It is considered that, based on the UKWIR guidance, the concentrations of contaminants recorded to date are such that standard water supply pipes should be suitable for the site. However, it is recommended that the local water supply company for the site be contacted to confirm their requirements with regard to pipe materials.

5.2.3 Summary of Risk to End Users

The risk to end users from soil contamination is considered to be negligible.

5.3 RISK TO SITE WORKERS

The investigation has not revealed any specific risk to site workers; however, the general comments outlined in Appendix A (vii) should be considered when site specific risk assessments are completed.

6 QUANTITATIVE RISK ASSESSMENT – HUMAN HEALTH (GROUND GAS)

The gas risk assessment methodology used by GRM is outlined in Appendix A (v).

As the proposed land use is classed as low sensitivity (commercial); five 35mm gas/water monitoring standpipes have been installed across the site (WS01 to WS05). The response zones have been targeted at the natural strata as no made ground was encountered.

Based on BS8576:2013 *Guidance on investigations for ground gas – Permanent gases and Volatile Organic Compounds*, the gas hazard is considered very low to low and so the monitoring programme will comprise four visits over one month.

The gas monitoring has been completed with four visits being conducted over a one month time frame. The gas monitoring results are presented in Appendix H, and summarised in Section 3.5.

The gas monitoring has been undertaken using both the LMSxi Multifunction Gas Analyser and Gas Data GFM430.

The primary guidance document to determine if protection measures are required is BS8485:2015 *Code of practice for the design of protective measures from methane and carbon dioxide ground gases for new buildings*. This uses hazardous gas flow rates (Q_{hg}), which are gas concentrations multiplied by borehole flow rates, to derive a Gas Flow Rate (GSV) for the site. The gas regime is then determined based on the GSV and other limiting factors such as gas concentrations.

As both flow rate and methane concentrations have been consistently below the monitor's lower limit of detection a default flow rate of 0.1l/hr and a default methane concentration of 0.1%v/v have been used in the following assessment.

Using the default flow rate of 0.1l/hr and the default methane concentration of 0.1%v/v a Q_{hg} of 0.0001l/hr has been calculated for methane. Using the maximum flow rate of 0.1l/hr and the maximum carbon dioxide concentration of 7.0%v/v, a Q_{hg} of 0.007l/hr has been calculated for carbon dioxide. On this basis the GSV for the site is determined as 0.007l/hr.

Although the GSV is <0.07l/hr, and the maximum recorded concentration of methane is <1%v/v; as the maximum recorded concentration of carbon dioxide is >5%v/v, consideration has to be given the increasing the 'Characteristic Situation' from 1 to 2 as outlined in table 2 of BS8485:2015, for which gas protection measures are required.

Gas precautions are required, refer to Section 9 for details.

The desk study risk assessment determined that no radon protection measures are required.

6.1 SUMMARY OF RISK FROM GAS

The investigation has revealed a risk to end users from ground gas and protection measures will be required.

7 QUANTITATIVE RISK ASSESSMENT - CONTROLLED WATERS

The methodology, rationale and guidance GRM have used to assess the risk to controlled waters is set out in Appendix A (viii).

The primary receptors for this site have been identified as the underlying aquifers. The primary pathway has been identified as infiltration.

A potential significant source of contamination has not been identified at the site and, in the absence of a source, there is considered to be no risk to controlled waters and so soil leachate/water analysis has not been undertaken.

The desk study considered that there are no nearby surface water features that could be impacted by any site derived contamination.

7.1 SUMMARY OF RISK TO CONTROLLED WATERS

The risk to the aquifer below the site is negligible.

The risk to nearby surface waters is negligible.

8 PHASE II CONCEPTUAL SITE MODEL

HUMAN HEALTH			
Source	Pathway	Receptor	Remedial Solution
A source of contamination has not been identified.	Indoor and outdoor inhalation of soil/soil dust and asbestos fibres, ingestion of, and dermal contact with contaminated soil and soil dust, ingestion of vegetables that have taken up contamination and contaminated soil attached to vegetables.	End users.	No remediation required.
		Construction workers.	
Natural strata.	Inhalation of carbon dioxide.	End users.	Gas protection measures are required.
Made ground associated with backfilled quarry and derelict buildings.			
A source of contamination has not been identified.	Migration of contamination through leaks and joints, degradation of water pipe materials.	End Users.	Standard water supply pipes should be suitable. (to be confirmed by water supply company)
CONTROLLED WATERS			
A source of contamination has not been identified.	Leaching of contaminants and vertical migration to the groundwater.	Secondary A, B and undifferentiated Aquifers.	No remediation required.
		Surface water features.	

9 REMEDIATION

9.1 RECOMMENDED REMEDIAL MEASURES AND VALIDATION REQUIREMENTS

9.1.1 Protection of End Users

Soil Contamination

A source of soil contamination has not been identified at the site and so remedial measures are not required to protect end users.

The existing topsoil has been shown be uncontaminated and can be used as a growing medium in soft landscaped areas or sold as a commodity.

Completion of the ground investigation is required in the south eastern corner of the site when this area is accessible.

Should any material suspected of being significantly contaminated be encountered during the redevelopment of the site, GRM can be contacted to undertake additional investigation if necessary. The local Environmental Health Officer should be contacted and informed of any additional remedial work required.

Ground Gas

Gas protection measures are required for the proposed development.

The proposed development is predominantly made up of Type D (industrial) buildings (as outlined in table 4 in BS8485:2015). In order to achieve the required 1.5 points it is recommended that the gas protection measures include cast in situ monolithic reinforced ground bearing slab with minimal penetrations and a pressure relief pathway. Where offices are on the ground floor, additional gas protection measures may be required. More details would need to be provided in a Gas Protection Measures Verification Plan.

9.1.2 Protection of Site Workers

The risk to site workers from the identified soil contamination is negligible. Elevated concentrations of carbon dioxide have been identified. No remedial measures are required. However, the use of suitable PPE and adoption of appropriate working protocols should be enforced during the ground works stage of construction and suitable precautions should be taken during the removal of any asbestos containing materials or oil contaminated soils.

Due to the recorded low oxygen and elevated carbon dioxide concentrations care should be taken when working in enclosed spaces. Additional respiratory aids may be required if workers are to be in enclosed spaces for extended periods of time.

9.1.3 Protection of Controlled Waters

The risk to controlled waters is negligible and no remedial measures are required.

9.1.4 Protection of Water Pipes

Following consultation with the relevant water supply company, remedial measures to protect underground plastic water pipes should not be required.

9.2 REMEDIATION METHOD STATEMENT

A Remediation Method Statement is not required; however a Gas Verification Plan will be required due to the presence of elevated gas concentrations.

Following your review of this document, we would recommend that a copy of it be forwarded to the Local Authority for comment and approval, prior to commencing development of the site. The Local Authority may choose to include other consultees as part of the planning process (such as the Environment Agency).

Consultation should be undertaken at the earliest possible opportunity to avoid abortive or delayed works.

9.3 DISPOSAL AND CLASSIFICATION

The topsoil will be classified as Non-Hazardous Waste.

The natural strata underlying the site is likely to be classified as Inert for disposal purposes, however, further testing will be required to confirm this. Natural soils may be suitable for re-use on-site as part of any general landscaping or as a non-structural fill and consideration should be given to retaining this material on-site. Alternatively, it may be sold as a commodity to off-set construction costs.

Care should be taken to keep natural arisings separate from any made ground and free from construction materials, as natural soils mixed with made ground and construction materials may attract additional disposal costs.

Although not identified during the site works, visible asbestos containing materials (ACMs) within soils will result in the soils being classified as Hazardous Waste. Visible ACMs should be removed, employing appropriate health and safety protocols and where possible should be undertaken prior to disposal.

It is recommended that any materials to be exported are stockpiled and tested to confirm disposal rates, as this may be more cost effective than using the results contained within this report.

10 GEOTECHNICAL ASSESSMENT

10.1 INTRODUCTION

The Client proposes to develop the site with steel frame commercial/industrial buildings and infrastructure. Finished floor levels and the levels of any underground engineering works have not been provided.

In addition to the site specific comments below reference should be made to the general comments relating to the Geotechnical Assessment listed in Appendix A (xi to xvi).

10.2 GEOTECHNICAL TESTING

Geotechnical testing has been carried out both on site and in the laboratory; the results of this testing are provided on the logs in Appendix F, and in Appendix J. These results are summarised in the tables below:

Head Deposits

Insitu Testing:

Test Parameter	Range of Results
Hand Shear Vane	57 to 61 kN/m ²
SPT 'N' values	10 to 50

Laboratory Testing:

Test Parameter	Range of Results
Natural Moisture Content	17 to 22%
Liquid Limit	26 to 38%
Plasticity Index	7 to 22%
Remoulded CBR	0.4 to 6.8%

Edwalton Member

Insitu Testing:

Test Parameter	Range of Results
Hand Shear Vane	65 to 126 kN/m ²
SPT 'N' values	32 to 50

Laboratory Testing:

Test Parameter	Range of Results
Natural Moisture Content	20 to 27%
Liquid Limit	45 to 67%
Plasticity Index	27 to 45%

10.3 ENGINEERING GROUND TREATMENT

Due to the sloping nature of the site and the proposed development, it is considered likely that cut and fill works will be required to provide level platform for the proposed buildings.

Testing will be required to classify the soils for suitability for re-use as engineering fill in cut and fill, as structural capping for road and sub-base for ground bearing slabs.

The near surface soils were generally firm under foot during the intrusive investigation. However, because of near surface strata particularly silts, in wet conditions the near surface soils are likely to become soft under foot. It is therefore recommended that temporary haul roads are implemented until the main roads are constructed.

10.4 EXCAVATION CONDITIONS

Excavation of most of the materials encountered during the ground investigation should be achieved using conventional hydraulic excavation techniques. However, a breaker may be required for deeper excavations into the dense gravel deposits and/or rock strata of the Bradgate Formation, as the machine used for trial pitting was struggling to excavate the material.

From the ground investigation undertaken, it is likely that excavations will be generally stable in the short term. Some materials such as granular soils and made ground are liable to collapse without warning. This situation is likely to be exacerbated by water ingress.

It is considered unlikely that dewatering will be required for shallow short-term excavations except in the north of the site around WS01 where groundwater was recorded on all monitoring visits.

10.5 EXISTING STRUCTURES / SUBSTRUCTURES

There is an underground electric cable in the north western corner of the site leading into the adjacent depot.

There is a potential for buried foundations in the south eastern area of the site due to the previous buildings recorded on the OS maps. This area was inaccessible at the time of the investigation.

10.6 FOUNDATIONS

Minimum foundation depths of between 0.6m (granular strata) and 1m (localised high volume change potential cohesive strata) would normally be applicable for this site. However, as the occurrence of granular strata is unpredictable, it would be prudent to allow for a minimum founding depth of 1.0m throughout.

Because gas protection measures are required, it is recommended that a minimum foundation depth of 1m be allowed for across the site.

There are trees along and within the site boundaries and any new foundations within the zone of influence of these trees bearing into shrinkable soils will need to be deepened in line with guidance with accepted standards.

PADS AND STRIP FOUNDATIONS

At this stage, (subject to consideration of the proposed levels) it is considered that pad foundations will be suitable for the proposed development. The cohesive Head deposits were generally firm and should achieve an allowable bearing pressure of at least 110kN/m². The Edwalton Formation was generally medium strength and should

achieve at least 125kN/m². The Head deposit gravel was generally medium dense to dense and will achieve in excess of 220kN/m².

It is therefore considered that 2m by 2m square pads should be suitable to support a maximum column load of 440kN. The firm Head deposits will also be suitable to support a maximum line load of 66kN based on 600mm wide strip foundations (for connecting walls).

Due to the topography of the site and the requirement for cut and fill earthworks, it is considered likely that the site will be benched and may result in individual industrial units crossing multiple geological units. Founding onto different geological units with variable compressive natures will result in differential settlements, and it is recommended that an allowance is made for reinforcing the foundations to mitigate the risk of differential settlement. It is recommended that additional investigation is undertaken to check the strata at foundation depths once ground levels are finalised.

10.7 FLOOR SLABS

Due to the heavy loads proposed in the development it is recommended to use ground bearing floor slabs. Due to the gas protection requirements, it is recommended that the slab is reinforced and monolithic in nature with minimal penetrations and a pressure relief pathway.

Old substructures should be removed to at least 0.5m below any new floor slabs to prevent the formation of 'hard spots'.

10.8 BURIED CONCRETE

Based on the recorded water soluble sulphate and pH levels in the soils below the site and assuming mobile groundwater conditions, in accordance with requirements of BRE Special Digest 1 (2005), 'Concrete in Aggressive Ground', the Design Sulphate Class for buried concrete at the site should be assumed as DS-1 and the ACEC Class as AC-1.

For unreinforced foundations with a width of greater than 450mm, the classifications above equate to a concrete designated as GEN1 in BS8500 and RC35 for reinforced foundations.

The results of the water soluble sulphate and pH testing of are presented in Appendix I.

10.9 SLOPE STABILITY AND RETAINING STRUCTURES

The site has a high point along the central western boundary and slopes away to the north, east and south from this point (dropping approximately 7m over the width of the site). The lowest area of the site is the north eastern corner, adjacent to Stanton Lane. It is considered that there is a low risk of slope instability at present gradients.

Grading of the site, cut and fill operations, removal of trees/vegetation from existing slopes, interference with drainage around existing slopes or the cutting of the toe or surcharging of the crest of existing slopes may cause instability and failure to occur.

There are no existing retaining structures on site, however, a retaining wall is present on the north western corner boundary into the adjacent compound. Before any work is done in this area it is recommended that an experienced structural engineer inspect and report on the condition and state of the wall.

The present gradients on site are likely to be adjusted by earthworks. Future ground profiles may require earth retaining structures, for which further advice may be required when more information is available.

10.10 SOAKAWAY DRAINAGE

The strata encountered during the investigation may be suitable for soakaway drainage. Soakaway testing will be required to design cost effective and appropriate soakaways to BRE Digest 365 / BS5930.

The results of the testing should be provided to the project's drainage engineer for inclusion within the site's surface water drainage design after taking into account suitable factors of safety.

If soakaway drainage is to be considered please see Section XV in Appendix A.

It is recommended that the Local Authority and Environment Agency be consulted with regards to the use of soakaways.

10.11 NEW ACCESS ROADS AND EARTHWORKS

Remoulded CBR tests have been undertaken and recorded CBR values ranging from 0.4% to 6.8%. Two results were 6% to 6.8% whilst the remaining results were 0.4% to 1.4%. The results suggest that improvement of the formation using lime or cement stabilisation or the removal and replacement of unsuitable materials with well graded granular fill engineered by compaction might be required. However, prior to this decision and once road levels are known, it is recommended that large plate load tests are carried out at proposed formation levels to determine the modulus of subgrade reaction and equivalent CBR value.

Proof rolling and the improvement of soft spots may result in increased CBR values and the incorporation of a geotextile grid into sub-base layers may allow for reduced capping thickness.

11 FURTHER INVESTIGATION

Further investigation, to determine more accurately the effect of some of the identified hazards on the development, is recommended. This includes the following:

- Tree survey.
- Retaining wall survey (including foundation depths)
- Specific investigation in south eastern corner once accessible and along the boundary of the former quarry/landfill.
- Soakaway testing to BRE specification.
- Additional investigation for foundation and floor slab design.
- Geotechnical design of earthwork/cut and fill programme. This will require additional ground investigation with deep trial pits undertaken by a large excavator with breaker to assess whether rockhead has been encountered.
- Plate Load Tests once final levels have been finalised.

A copy of this report should be submitted to the Planning Department of the Local Authority/Local Authority EHO for review, if planning conditions exist for this site.

12 CONCLUSIONS

Assuming compliance with all the recommendations contained within this report (for abridged version see 'Summary of Recommendations' table at the beginning of the report) the site should be suitable for the proposed development.

Based on the evidence currently available the site is assessed as being of low to moderate risk for geotechnical hazards and low risk for contamination hazards.



A P P E N D I X A

**GRM Development Solutions provides
multi-disciplinary consultancy services, UK-wide:**

- Geotechnical and Geo-environmental Services
- Civil and Infrastructure Services
- Structural Engineering Services
- Construction Management
- Site Services

Tel: 01283 551249

info@grm-uk.com

Fax: 01283 211968

www.grm-uk.com

GENERAL APPRAISAL COMMENTS

i INFORMATION SOURCES

Where available the following sources have been used for the identification and assessment of potential ground hazards:

- Relevant British Standards
- British Geological Survey (BGS) Geology Map Scale 1:10,000 for local area
- British Geological Survey (BGS) Geology Map Scale 1:50,000/1:63,320
- BGS Memoir
- BGS Borehole Records
- Environment Agency Groundwater Vulnerability Maps
- Historical Ordnance Survey (OS) Maps
- Environmental Data Report
- Environment Agency Website: <http://www.environment-agency.gov.uk/>
- Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites, UKWIR, 2010.
- Coal Authority Records / Coal Mining Report
- DEFRA/Environment Agency Contaminated Land publications and DoE Industry Profiles
- BRE Guide BR211 (2007), 'Radon: Guidance on protective measures for new buildings'
- HPA-RPD-033 (2007), 'Indicative Atlas of Radon in England and Wales'
- NRPB Publication W26 (2002), 'Radon Atlas of England and Wales'
- CIRIA C665 'Assessing risks posed by hazardous ground gases to buildings'
- BS8485:2015 Code of practice for the design of protective measures from methane and carbon dioxide ground gases for new buildings.
- BS8576:2013 Guidance on investigations for ground gas – Permanent gases and Volatile Organic Compounds.
- Other technical references used throughout this document are detailed in the text.

ii CONTAMINANTS OF CONCERN

The DoE Industry Profiles are normally used to assess likely contaminants from past land use and potential nearby industrial sources. For land uses where no profile is available, likely contaminants of concern are selected by GRM based on past experience of similar sites, a general screening suite of contaminants covered by CLEA and common contaminants from the Industry Profiles.

- | | | |
|-------------------------|-------------------|--|
| • Arsenic | • Copper | • Water soluble sulphate |
| • Cadmium | • Nickel | • PAH (polycyclic aromatic hydrocarbons) |
| • Chromium (III and IV) | • Zinc | |
| • Lead | • Phenols | |
| • Mercury | • cyanide (total) | |
| • Selenium | • pH | |

Asbestos and PCBs are listed in the vast majority of profiles. PCBs are listed as the profiles expect electricity substations and switch boxes on all industrial sites. There is the potential for asbestos containing material to be mixed up with made ground, following any demolition works.

CONCEPTUAL MODEL METHODOLOGY

The consideration of contamination is based upon the principles of risk assessment, using the 'source-pathway-receptor' model in order to establish the presence, or potential presence, of a pollutant linkage.

To create a risk, contamination must have the potential to cause harm to susceptible targets or receptors such as humans, the water environment or the built environment. The potential for harm to occur requires three conditions to be satisfied to form a pollutant linkage:

- The presence of substances that may cause harm (SOURCE).
- The presence of a target which may be harmed (RECEPTOR).
- The existence of a plausible migration route between the source and the receptor (PATHWAY).

In the absence of a plausible pollutant linkage there is no risk. Where a potential linkage is identified in order for it not to pose a risk to the identified receptor it must be broken.

iv INTRUSIVE INVESTIGATION SAMPLING METHODOLOGY

The ground investigation (including fieldwork, sampling, monitoring and laboratory analyses) has been designed to identify and assess potential ground related problems and to allow cost effective solutions to be advised. It has been planned on the basis of the desk study, site inspection and the proposed development layout (where available). All fieldwork and soil descriptions were carried out in general accordance with relevant British Standards.

The exploratory holes have been positioned and advanced to depths to determine the general ground/groundwater/gas conditions below the site. A general grid pattern has been adopted, where possible, to provide sufficient information based on the current proposed layout scheme. Some holes have been targeted at particular hazards identified in the Phase I assessment. The resultant exploratory hole density is considered to be commensurate with the complexity of the site conditions and detail of information required for this phase of the investigation.

v GROUND GAS RISK ASSESSMENT METHODOLOGY

Gas monitoring programmes undertaken by GRM are designed to broadly comply with the recommendations outlined in BS8576:2013.

To assess the risks posed by ground gases such as carbon dioxide and methane, the relevant current guidance has been used (i.e. BS8485:2015). For radon the site has been assessed following the guidelines in 'Radon: guidance on protective measures for new dwellings (BR211: 2007)'.

vi HUMAN HEALTH RISK ASSESSMENT METHODOLOGY

Guidance contained in the Environment Agency's CLEA Report has been used to assess the risks posed to human health.

For residential developments that include domestic gardens the default Tier 1 Assessment Criteria (TAC) for 'residential land with plant uptake' are used, i.e. a female with a start age class of one and an end age class of six. All pathways are considered including the consumption of home-grown vegetables.

For residential developments that do not include domestic gardens the default Tier 1 Assessment Criteria (TAC) for 'residential land without plant uptake' are used, i.e. a female with a start age class of one and an end age class of six. All pathways are considered except the consumption of home-grown vegetables.

For commercial/industrial developments the default Tier 1 Assessment Criteria (TAC) for 'commercial/industrial' are used, i.e. a female with a start age class of sixteen and an end age class of eighteen. All pathways are considered except the consumption of home-grown vegetables.

The TAC used by C4SLs published by DEFRA, values calculated by GRM using the CLEA v1.07 risk assessment and values and chemical data developed by LQM/CIEH.

Where soil chemical analysis results are found to exceed the TAC, Site-Specific Risk Assessments may be undertaken using the CLEA v1.07 risk assessment software using the age classes and pathways described above.

vii RISK TO SITE WORKERS – GENERAL COMMENTS

The risks to site workers are similar to those posed to site end users, although likely to be less severe due to the site workers' shorter exposure to the identified contamination. However, site workers (particularly groundworkers) are more likely to come into direct contact with contaminated soils due to the nature of their work. On this basis ground and construction workers should be provided with basic Personal Protective Equipment based on the site's general health and safety risk assessment, but including as a minimum safety footwear, gloves and overalls.

A site specific risk assessment should be carried out for all hazards identified within the ground investigation in accordance with current health and safety legislation. This assessment should identify any measures required to further reduce risks i.e. providing further Personal Protective Equipment, welfare facilities and if necessary preventing access to certain areas.

Demolition and dismantling of existing structures on the site must be carried out to a safe and acceptable standard, in accordance with current UK guidance and best practice. Whilst not ground related, asbestos and hazardous substances surveys should be conducted prior to any demolition.

Any unusual colours, odours and suspicious ground should be reported immediately to site management and then GRM.

Whilst this appraisal has considered the long-term effects of contamination, GRM can also help during the formulation of Health and Safety documentation, if required.

viii CONTROLLED WATERS RISK ASSESSMENT METHODOLOGY

Where the desk study and fieldwork do not reveal a potential source of contamination no leachate or groundwater testing will be performed. Where a potential source is identified the testing will comprise leachate testing on the material considered most likely to pose a risk, groundwater testing will be undertaken if water is present at shallow depth.

The UK Drinking Water Standards (UKDWS) or Environmental Quality Standards (EQS) are usually adopted for comparison with the leachate/groundwater test results. When the most sensitive receptor is considered to be the an aquifer (groundwater) UKDWS will be adopted as the Initial Tier 1 screening values. Where the most sensitive receptor is a surface water feature the EQS values will be used as Initial Tier I Screening values.

ix CONSTRUCTION MATERIALS RISK ASSESSMENT METHODOLOGY

The 'screening levels' adopted for the assessment of risk to construction materials are taken from the following documents:

- UK Water Industry Research (UKWIR) Contamination thresholds for sub-surface water pipes, for the protection of buried pipes.
- Building Research Establishment (BRE) Special Digest SD1 (2005), 'Concrete in Aggressive Ground', for the protection of buried concrete.

x WASTE DISPOSAL AND SITE WASTE MANAGEMENT PLANS

Under current Waste Management Regulations, waste soil materials produced from the site will require characterisation to enable it to be disposed of correctly.

The chemical analysis results included in this report should be provided to the relevant landfill operators to establish the characterisation of the waste, confirm its suitability for landfill disposal and provide estimated costings. If material is classified as hazardous, then the site will need to be registered with the Environment Agency prior to the movement of the waste.

Depending on the receiving landfill's current permit, further chemical analysis, incorporating Waste Acceptance Criteria (WAC) leachate analysis, may be required.

All materials removed from the site will be classified as 'waste' and therefore must be removed by a suitably licensed carrier of waste. This applies whether or not the waste is contaminated. All waste removed to landfill will attract Landfill Tax.

The developer/builder is likely to be classed as the waste producer and therefore, has a duty of care to ensure that all waste is disposed of appropriately. This includes ensuring the waste carrier is licensed and disposes of the waste to a suitably licensed landfill site. They are also required to keep a paper trail from 'cradle to grave' including copies of the waste disposal tickets.

Efficient materials management on site is recommended as it can lead to significant cost savings when compared to the traditional side casting or single stockpile of arisings. Likewise making the site as volume neutral as possible will reduce the costs of development.

Site Waste Management Plans allow better waste management practices, help to reduce the amount of waste produced and identify best environmental disposal options. Implementing a Site Waste Management Plan (SWMP) can reduce costs (increasing business profits) and maximise resource efficiency.

SWMPs are a legal requirement for all projects with an overall development cost of over £300k. GRM can assist in the production of SWMPs which comply with the Code of Practice and identify best environmental disposal options when dealing with waste.

xi GEOTECHNICAL ASSESSMENT GENERAL COMMENTS

Where finished floor levels of proposed structures have not been provided by the Client, then for the purposes of initial assessment, GRM will assume that finished levels will not vary appreciably from the existing ground levels. If the depths of any underground engineering works (i.e. sewers, pumping stations etc.) are unknown they will not be taken in to account in the assessment and it will be assumed that any such works will not compromise foundation or ground stability.

Should the development proposals or finished levels be different from these assumptions then the comments/recommendations in the Geotechnical Assessment may require revising.

It should be noted that the results of window sampling and/or cable percussive boreholes may not give a true indication of a soils actual engineering properties (i.e. stability, mass structure etc). GRM consider that that prior to development trial pitting should be undertaken to confirm the recommendations in the Geotechnical Assessment.

xii GEOTECHNICAL ASSESSMENT – ENGINEERING GROUND TREATMENT

Near surface soils have the potential to be disturbed by weathering and site traffic. Precautions should always be taken to avoid this, as excessive disturbance may leads to more onerous floor slab designs, road cap thickness and increased amounts of off site disposal etc.

Near surface soils may need treatment or reinforcing to allow safe movement of construction plant and labour. An assessment by the contractor should be undertaken once the type of machinery/plant needed to complete the development is known.

GEOTECHNICAL ASSESSMENT – EXCAVATIONS

Excavation instability (over-break) can result in damage to existing services or structures (e.g. foundations, roads or boundary walls/fences) both on and off-site, as well as increased foundation concrete costs. In order to minimise this, all excavations deeper than 1.2m deep (or any excavation within 1.5m of any existing structure or service) should be supported. Full support should be provided to the full depth of all near vertically sided excavations in made ground, soft and very soft clays and granular soils. A reduction to intermediate support should be acceptable within firm and stiffer natural clays.

Wherever possible, man entry into excavations should be prevented; however, where this is not possible, entry to, and time spent in, excavations should be kept to a minimum.

The build program should be tailored to reflect the impact that deep excavations through potentially unstable strata can have on adjacent properties, so that they are not undermined.

All excavations on site should be in accordance with HSE guidelines and stability should be practically maintained at all times. Reference should be made to HSE construction information sheet No. 8 (Revision 1) 'Safety in Excavations'.

Care should be taken to ensure that falls from excavation faces do not adversely affect the integrity of foundation concrete.

If contaminated water enters excavations it should be removed and transported to an appropriate treatment facility by a suitably licensed carrier before construction begins.

GEOTECHNICAL ASSESSMENT – SUBSTRUCTURES

Where practicable, existing buried construction should be fully removed; however, if this is not practicable all new foundations should be carried down to fully penetrate it and it should be broken well away from all new structures.

There may be existing structures and/or infrastructure in close proximity to the proposed development. New build foundations may be constructed next to pavements with existing underground services beneath them, or excavations may be required near existing footings associated with adjacent properties. These potential hazards need to be taken into consideration when designing foundations and the groundworker needs to be made aware of their potential impact during the redevelopment works. Foundations close to existing underground services or buildings may require alternative foundation techniques (such as piling) to protect the integrity of these structures.

The contractor for the works should carry them out in such a fashion so as to not cause excessive overbreak, concrete usage or undermine existing buildings/roads/ services that are to be retained.

GEOTECHNICAL ASSESSMENT – SOAKAWAYS

Soakaway testing in trial pits by GRM is broadly carried out in accordance with BRE 365 (1991). The testing comprises the excavation of a test pit to a suitable depth, and the placement of water into the pit. The level of water present is then monitored over time. For borehole installations, the permeability testing (falling head/rising head) is undertaken in accordance with BS5930.

If it is decided to proceed with the use of soakaway drainage, then the following general points should be noted:

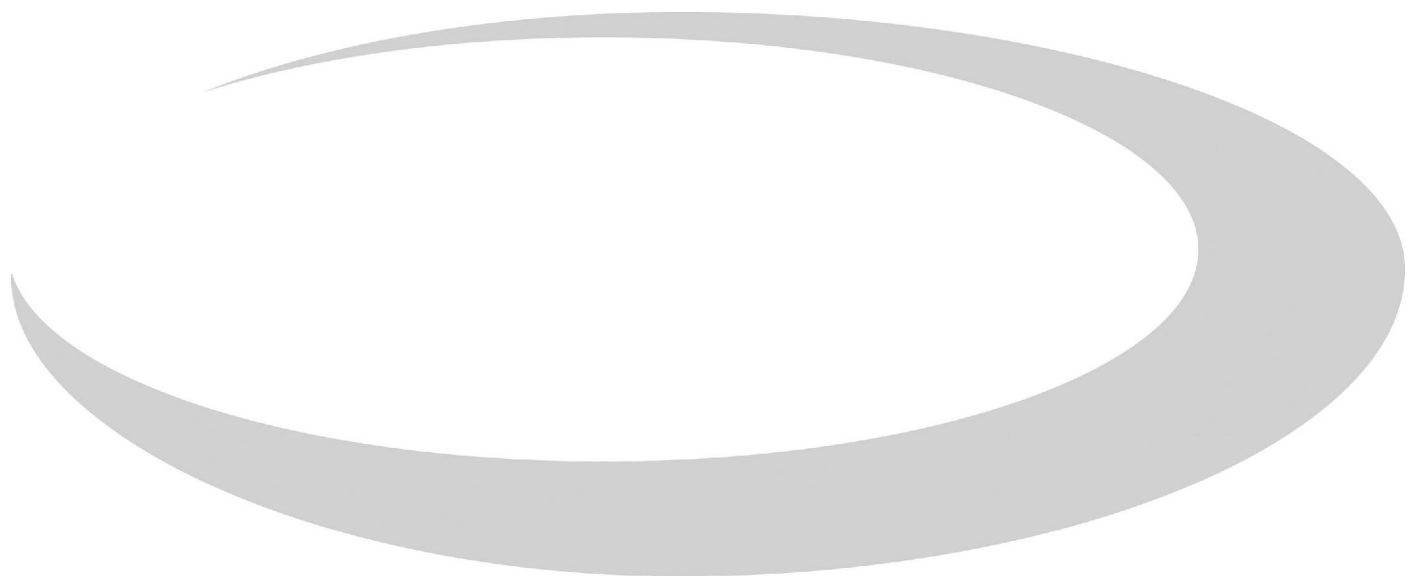
- Soakaways should not be placed so that water can be discharged through potentially contaminated made ground.
- The Environment Agency may require soakaways to be sealed systems such that only roof run off falls to soakaway.
- Interceptors are likely to be required for soakaways for highway drainage. The adopting authority for the highways should be consulted at the earliest opportunity regarding the use of soakaways for highways drainage.
- Consideration of site levels and slopes should be taken into account during the design.

- The construction of all soakaways should be in accordance with the current building regulations.
- Soakaways should not be placed within 5m of a proposed building.
- Placement of soakaways needs to be considered so as to avoid ponding of water down slope.
- The base of a soakaway should not be below the highest recorded water level.
- The Environment Agency prefer 1m of dry soil to be present between the base of a soakaway and the water table to provide attenuation for contamination.

xvi GEOTECHNICAL ASSESSMENT – FOUNDATIONS

If soft or hard spots are encountered during foundation excavation then they should be replaced with suitably compacted material or the footings deepened to suitable strata, to avoid differential settlement.

If strata of differing bearing character (e.g. sand and clay) are encountered at foundation levels within the excavations for a single plot then the excavation depths should be altered as appropriate to ensure the foundations rest on a single stratum, or strata that will not induce differential settlement. Where this is impractical then GRM should be contacted to assess a reinforced concrete detail or an alternative foundation solution (e.g. piles or vibro-replacement).



NOTES ON LIMITATIONS**General**

GRM Development Solutions Limited has prepared this report solely for the use of the Client and those parties with whom a warranty agreement had been executed, or with whom an assignment had been agreed. Should any third party wish to use or rely upon the contents of the report, written approval must be sought from GRM Development Solutions Limited; a charge may be levied against such approval.

GRM Development Solutions Limited accepts no responsibility or liability for:

- a) the consequences of this document being used for any purpose or project other than for which it was commissioned, and
- b) the consequences of this document being used by any third party with whom an agreement has not been executed.

Phase I Environmental Audits/ Desk Studies

The work undertaken to provide the basis of this report comprised a study of available documented information from a variety of sources (including the Client), together with (where appropriate) a brief walk over inspection of the site and meetings and discussions with relevant authorities and other interested parties. The opinions given in this report have been dictated by the finite data on which they are based and are relevant only to the purpose for which the report was commissioned. The information reviewed should not be considered exhaustive and has been accepted in good faith as providing true and representative data pertaining to site conditions. Should additional information become available which may affect the opinions expressed in this report, GRM Development Solutions Limited reserves the right to review such information and as considered necessary and appropriate to modify the opinions accordingly. It should be noted that any risks identified in a Phase 1 report are perceived risks based on the information reviewed; actual risks can only be assessed following a physical investigation of the site.

Phase II Environmental Audits (Contamination Investigations)

The investigation of the site has been carried out to provide sufficient information concerning the type and degree of contamination, ground and groundwater conditions to allow a reasonable risk assessment to be made. The objectives of the investigation have been limited to establishing the risks associated with potential human targets, building materials, and controlled waters.

The amount of exploratory work and chemical testing undertaken has necessarily been restricted by the short timescale available, and the locations of exploratory holes have been restricted to the areas unoccupied by the building(s) on the site and by buried services. A more comprehensive investigation may be required if the site is to be redeveloped as, in addition to risk assessment, a number of important engineering and environmental issues need to be resolved.

For these reasons if costs have been included in relation to site remediation these must be considered as provisional only and must, in any event, be confirmed by a commercial adviser.

The exploratory holes undertaken, which investigate only a small volume of the ground in relation to the size of the site, can only provide a general indication of site conditions. Whilst exploratory testing is intended to gain an accurate representation of the site, the very nature of sampling and testing is such that it cannot ensure that all localised conditions are detected.

The risk assessment and opinions provided take in to consideration, inter alia, currently available guidance relating to acceptable contamination concentrations; no liability can be accepted for the retrospective effects of any future changes or amendments to these values.

Phase II Geo-environmental Investigations (Combined Geotechnical and Contamination Investigations)

The investigation of the site has been carried out to provide sufficient information concerning the type and degree of contamination, geotechnical characteristics, and ground and groundwater conditions to provide a reasonable assessment of the environment risks together with engineering and development implications. If costs have been included in relation to site development a commercial adviser must confirm these.

The exploratory holes undertaken, which investigate only a small volume of the ground in relation to the size of the site, can only provide a general indication of site conditions. The opinions provided and recommendations given in this report are based on the ground conditions apparent at the site for each of the exploratory holes. There may be exceptional ground conditions elsewhere on the site which have not been disclosed by this investigation and which have therefore not been taken into account in this report.

The comments made on groundwater conditions are based on observations made at the time the site work was conducted. It should be noted that groundwater levels will vary owing to seasonal, tidal and weather related effects. The scope of the investigation was selected on the basis of the specific development proposed by the Client and may be inappropriate to another form of development or scheme.

The risk assessment and opinions provided take in to consideration, inter alia, currently available guidance relating to acceptable contamination concentrations; no liability can be accepted for the retrospective effects of any future changes or amendments to these values.



A P P E N D I X B

**GRM Development Solutions provides
multi-disciplinary consultancy services, UK-wide:**

- Geotechnical and Geo-environmental Services
- Civil and Infrastructure Services
- Structural Engineering Services
- Construction Management
- Site Services

Tel: 01283 551249

info@grm-uk.com

Fax: 01283 211968

www.grm-uk.com

COPYRIGHT NOTICE:
This drawing is the copyright of the Architects and
may not be reproduced or used except by written
permission.



KEY	
	Total Site Area= 1.36ha
	A. 21500sqft
	1. 8000sqft
	2. 5500sqft
	3. 5500sqft
	4. 5500sqft
	5. 5500sqft
	6. 8000sqft
	7. 8000sqft
	Entrance to warehouse
	Entrance to offices



Pera Innovation Park, Nottingham Road
Melton Mowbray, LE13 0PB

Telephone: 01664 563 288 Fax: 01664 503 300
E-Mail: info@hssparchitects.co.uk Web: www.hssparchitects.co.uk

Project:
Proposed Extensions To
CJ Upton Steel & Sons Ltd
Shaw Lane
Markfield

SKETCH PLAN			
Scale: NTS	Drawn: DTM	Checked: JCB	Date: October 2016
Drawing No. 6637P-203	Revision: A		



A P P E N D I X C

**GRM Development Solutions provides
multi-disciplinary consultancy services, UK-wide:**

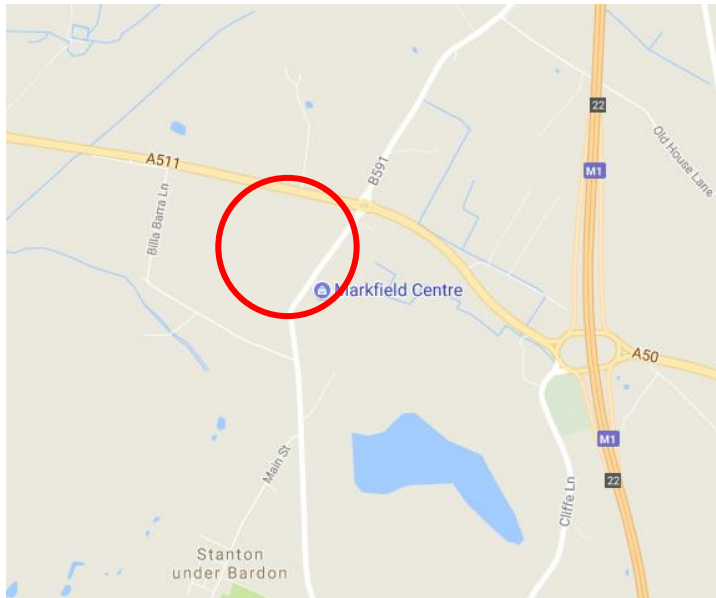
- Geotechnical and Geo-environmental Services
- Civil and Infrastructure Services
- Structural Engineering Services
- Construction Management
- Site Services

Tel: 01283 551249

info@grm-uk.com

Fax: 01283 211968

www.grm-uk.com



DO NOT SCALE



NOTES:



Approximate Site Boundary



GRM Development Solutions Ltd

Laurus House, First Ave, Centrum 100,
Burton-on-Trent, Staffordshire
Tel: 01283 551 249 Fax: 01283 211 968

mail@grm-uk.com www.grm-uk.com

CLIENT:

Sutton Land Development

PROJECT:

Stanton Lane, Stanton under Bardon

TITLE:

Site Location Plan

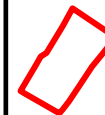
SCALE@SIZE :	ISSUE:
NTS	FINAL
DESIGN/DRAWN :	DATE:
RDH	August 2017
PROJECT No:	DRAWING No:
P8079	Figure 1



DO NOT SCALE



NOTES:



Approximate Site Boundary



GRM Development Solutions Ltd

Laurus House, First Ave, Centrum 100,
Burton-on-Trent, Staffordshire

Tel: 01283 551 249 Fax: 01283 211 968

mail@grm-uk.com www.grm-uk.com

CLIENT:

Sutton Land Development

PROJECT:

Stanton Lane, Stanton under Bardon

TITLE:

Site Boundary Plan

SCALE@SIZE :

NTS

ISSUE:

FINAL

DESIGN/DRAWN :

RDH

DATE:

August 2017

PROJECT No:

P8079

DRAWING No:

Figure 1

© GRM Development Solutions Ltd

© Crown Copyright. AL 100014100



A P P E N D I X D

**GRM Development Solutions provides
multi-disciplinary consultancy services, UK-wide:**

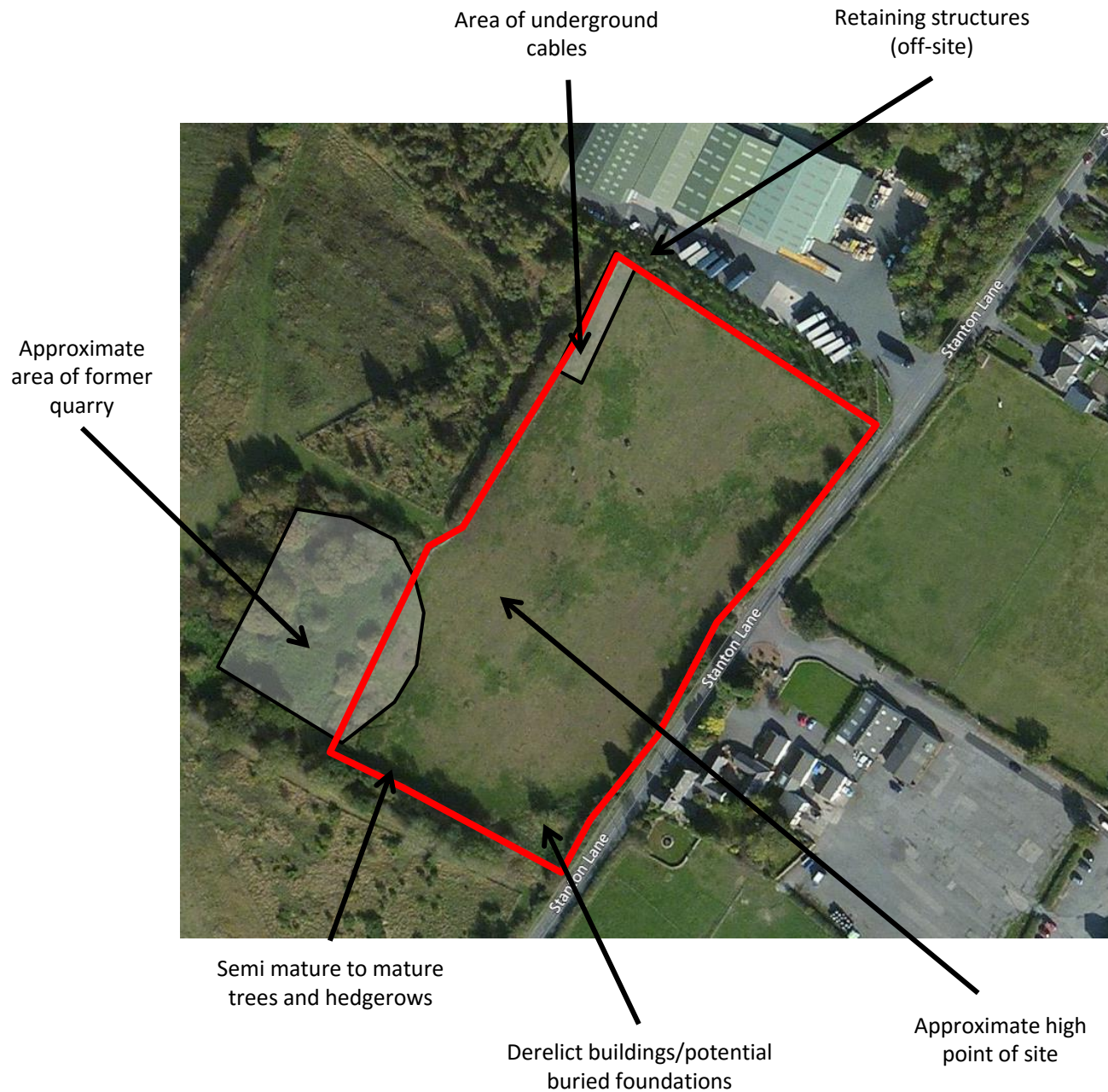
- Geotechnical and Geo-environmental Services
- Civil and Infrastructure Services
- Structural Engineering Services
- Construction Management
- Site Services

Tel: 01283 551249

info@grm-uk.com

Fax: 01283 211968

www.grm-uk.com



DO NOT SCALE

NOTES:

 Approximate Site Boundary



GRM Development Solutions Ltd

Laurus House, First Ave, Centrum 100,
Burton-on-Trent, Staffordshire
Tel: 01283 551 249 Fax: 01283 211 968

mail@grm-uk.com www.grm-uk.com

CLIENT:

Sutton Land Development

PROJECT:

Stanton Lane, Stanton under Bardon

TITLE:

Ground Hazard Plan

SCALE@SIZE :

NTS

ISSUE:

FINAL

DESIGN/DRAWN :

RDH

DATE:

August 2017

PROJECT No:

P8079

DRAWING No:

Figure 1

© GRM Development Solutions Ltd

© Crown Copyright. AL 100014100



A P P E N D I X E

**GRM Development Solutions provides
multi-disciplinary consultancy services, UK-wide:**

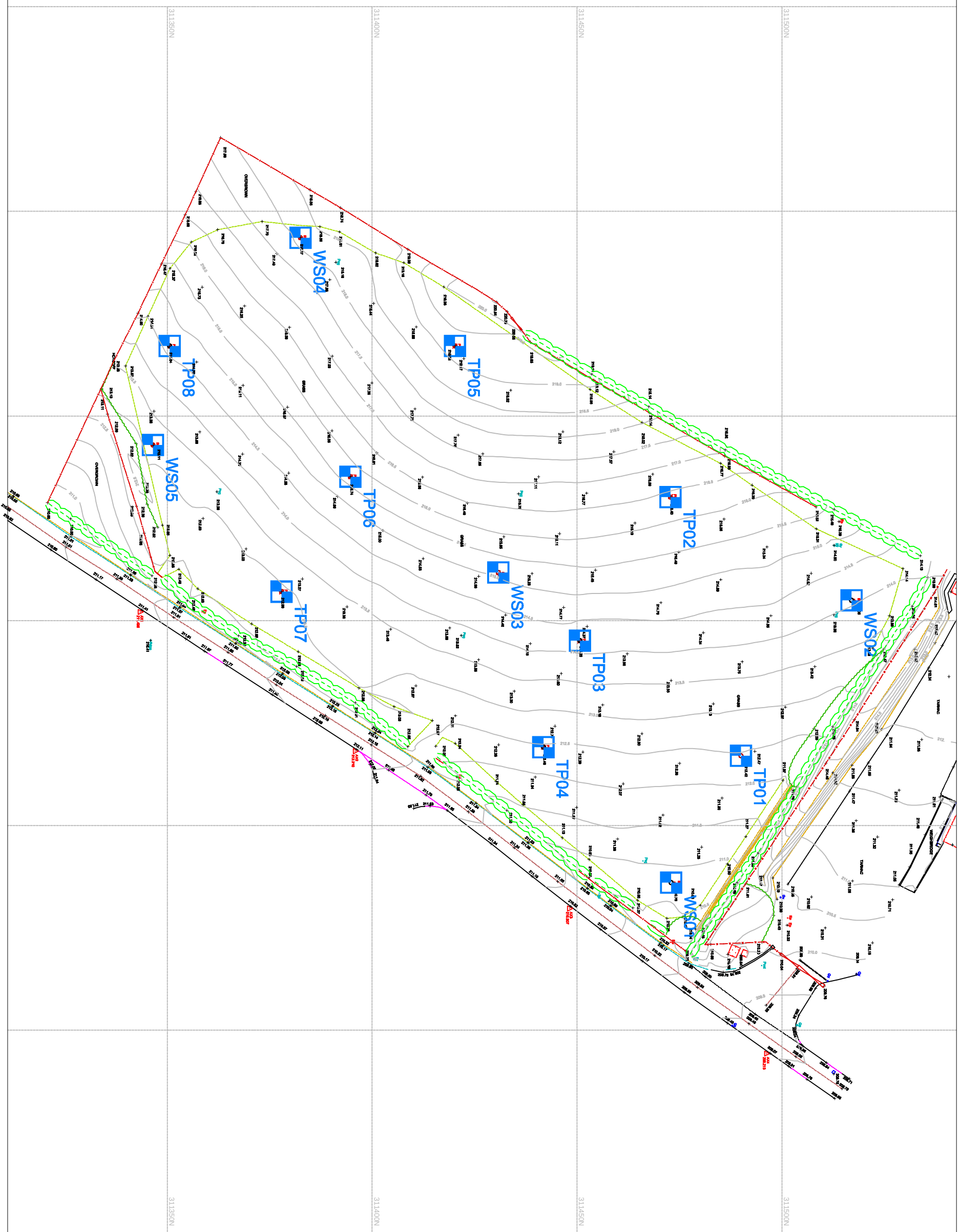
- Geotechnical and Geo-environmental Services
- Civil and Infrastructure Services
- Structural Engineering Services
- Construction Management
- Site Services

Tel: 01283 551249

info@grm-uk.com

Fax: 01283 211968

www.grm-uk.com



3A



proven for better results
Laurus House, First Avenue, Centrum 100
Burton on Trent, Staffs, DE14 2WH
Tel: (01283) 551249 Fax: (01283) 211968

CLIENT	Sutton Land Developments		DATE	5-9-17
	PROJECT	Stanton Lane, Stanton	REF	P8079
DRAWING NO			001	
TITLE		Exploratory Hole Location Plan	REV	A
		DRAWN BY	RDH	
		CHECKED	TDJR	



A P P E N D I X F

**GRM Development Solutions provides
multi-disciplinary consultancy services, UK-wide:**

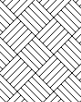
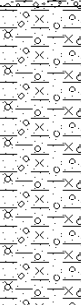
- Geotechnical and Geo-environmental Services
- Civil and Infrastructure Services
- Structural Engineering Services
- Construction Management
- Site Services

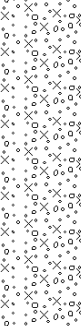
Tel: 01283 551249

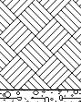
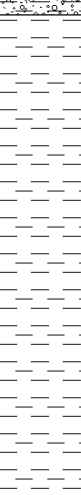
info@grm-uk.com

Fax: 01283 211968

www.grm-uk.com

		GRM Development Solutions Ltd Laurus House, First Avenue, Centrum 100, Burton-on-Trent, DE14 2WH Tel (HQ): 01283 551249 Email: info@grm-uk.com		Trial Pit Log			Trial Pit No TP01 Sheet 1 of 1	
Site Name: Stanton Lane, Stanton under Bardon							Ground Level (mAOD) 212.40	
Client: Sutton Land Development					GRM Project Ref: P8079		Coordinates 446983 E 311490 N	
Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.20 0.20	D ES		0.35	212.05		Soft, dark brown, slightly sandy slightly gravelly CLAY topsoil. Sand is fine to medium. Gravel is fine to coarse, subangular sandstone, volcanic sandstone, siltstone and chert. TOPSOIL	1
	0.50 0.70	D D					Firm, light brown and orangish brown slightly sandy gravelly cobbly CLAY. Gravel is fine to coarse, angular to subangular volcanic sandstone and siltstone. HEAD	
	1.50	D						
	2.10	D		2.10	210.30		Firm, orangish brown silty gravelly CLAY. Gravel is fine to coarse, angular to subangular chert and volcanic sandstone. HEAD	2
	3.00	D		3.10	209.30		End of Pit at 3.10m	3
								4
Date Excavated: 08/08/2017				Groundwater Observations:				
Date Backfilled: 08/08/2017				No groundwater encountered.				
Shoring: None								
Stability: Stable								
Plant Used: Tracked 8 Ton Excavator				Trial Pit Dimensions (m):		Reason for termination of Trial Pit:		
Logged by: RDH				0.70 		Target depth achieved.		
General Remarks: Land drain encountered at 0.9m begl.								
Strata consistencies/densities determined by observation only					Version: FINAL		Scale: 1:25	

		GRM Development Solutions Ltd Laurus House, First Avenue, Centrum 100, Burton-on-Trent, DE14 2WH Tel (HQ): 01283 551249 Email: info@grm-uk.com		Trial Pit Log			Trial Pit No TP02 Sheet 1 of 1	
Site Name: Stanton Lane, Stanton under Bardon							Ground Level (mAOD) 216.40	
Client: Sutton Land Development					GRM Project Ref: P8079		Coordinates 446920 E 311473 N	
Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.20	D		0.30	216.10		Soft, dark brown, slightly sandy slightly gravelly CLAY topsoil. Sand is fine to medium. Gravel is fine to coarse, subangular sandstone, volcanic sandstone, siltstone and chert.	1
	0.20	ES					TOPSOIL	
	0.50	D		1.00	215.40		Medium dense, light brown slightly sandy clayey gravelly SILT. Gravel is fine to coarse, angular to subangular volcanic sandstone.	
	0.60	B					HEAD	
	1.30	D		2.10	214.30		Dense, light brown silty sandy GRAVEL and COBBLES of subangular tabular volcanic sandstone.	
			HEAD					
	2.50	D		2.70	213.70		Dense light brown slightly sandy cobbly GRAVEL of subangular volcanic sandstone and siltstone.	3
							End of Pit at 2.70m	
								4
Date Excavated: 08/08/2017 Date Backfilled: 08/08/2017 Shoring: None Stability: Stable Plant Used: Tracked 8 Ton Excavator Logged by: RDH				Groundwater Observations: No groundwater encountered.				
				Trial Pit Dimensions (m): 0.70  3.10		Reason for termination of Trial Pit: Unable to continue through dense gravel.		
General Remarks: None.								
Strata consistencies/densities determined by observation only					Version: FINAL		Scale: 1:25	

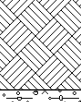
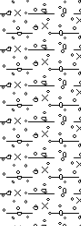
		GRM Development Solutions Ltd Laurus House, First Avenue, Centrum 100, Burton-on-Trent, DE14 2WH Tel (HQ): 01283 551249 Email: info@grm-uk.com		Trial Pit Log			Trial Pit No TP03 Sheet 1 of 1	
Site Name: Stanton Lane, Stanton under Bardon							Ground Level (mAOD) 214.20	
Client: Sutton Land Development					GRM Project Ref: P8079		Coordinates 446955 E 311451 N	
Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.20 0.20	D ES		0.30	213.90		Soft, dark brown, slightly sandy slightly gravelly CLAY topsoil. Sand is fine to medium. Gravel is fine to coarse, subangular sandstone, volcanic sandstone, siltstone and chert. TOPSOIL	
	0.70 - 0.80	B					Firm, orangish brown and grey slightly sandy very gravelly cobbly CLAY. Gravel is fine to coarse, subangular chert and volcanic sandstone. HEAD	1
	1.70 1.70 1.70 1.70	D	HVP=65 HVP=77 HVP=96	1.50	212.70		Firm to stiff, reddish brown CLAY. Clay contains completely weathered mudstone lithorelicts. EDWALTON FORMATION	2
	2.40	D		3.10	211.10		End of Pit at 3.10m	3
								4
Date Excavated: 08/08/2017 Date Backfilled: 08/08/2017 Shoring: None Stability: Stable Plant Used: Tracked 8 Ton Excavator Logged by: RDH				Groundwater Observations: No groundwater encountered.				
				Trial Pit Dimensions (m): 0.70  3.10		Reason for termination of Trial Pit: Target depth achieved.		
General Remarks: Land drain encountered at 0.8m begl.								
Strata consistencies/densities determined by observation only					Version: FINAL		Scale: 1:25	

		GRM Development Solutions Ltd Laurus House, First Avenue, Centrum 100, Burton-on-Trent, DE14 2WH Tel (HQ): 01283 551249 Email: info@grm-uk.com		Trial Pit Log		Trial Pit No TP04 Sheet 1 of 1	
Site Name: Stanton Lane, Stanton under Bardon						Ground Level (mAOD) 212.50	
Client: Sutton Land Development				GRM Project Ref: P8079		Coordinates 446981 E 311442 N	

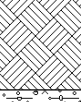
Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.10	D		0.20	212.30		Soft, dark brown, slightly sandy slightly gravelly CLAY topsoil. Sand is fine to medium. Gravel is fine to coarse, subangular sandstone, volcanic sandstone, siltstone and chert. TOPSOIL	
	0.10	ES						
	0.30	D						
	0.60	D		0.50	212.00		Firm, grey and orange very sandy CLAY. Sand is fine to coarse. HEAD	
				1.10	211.40		Firm to stiff, orangish brown and reddish brown locally silty gravelly CLAY. Gravel is fine to coarse, subangular chert and volcanic sandstone. HEAD	1
	1.30	D	HVP=57					
	1.30		HVP=57					
	1.30		HVP=61	1.50	211.00		Firm to stiff, reddish brown locally silty CLAY. Clay contains weathered mudstone lithorelicts. EDWALTON FORMATION	
	2.00	D		2.10	210.00			2
	2.10		HVP=102					
	2.10		HVP=106					
	2.10		HVP=85	3.00	209.50			
	2.80	D		3.00	209.50			3
	2.80		HVP=101					
	2.80		HVP=109					
	2.80		HVP=126					
End of Pit at 3.00m								4

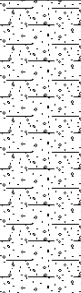
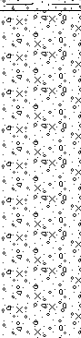
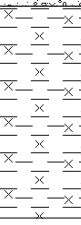
Date Excavated: 08/08/2017		Groundwater Observations:	
Date Backfilled: 08/08/2017		No groundwater encountered.	
Shoring: None			
Stability: Stable			
Plant Used: Tracked 8 Ton Excavator		Reason for termination of Trial Pit:	
Logged by: RDH		Target depth achieved.	
General Remarks: None.			

Strata consistencies/densities determined by observation only		Version: FINAL	Scale: 1:25
---	--	-----------------------	--------------------

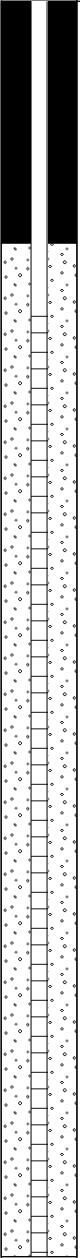
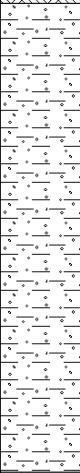
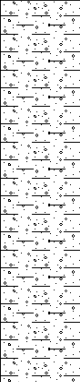
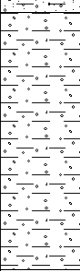
		GRM Development Solutions Ltd Laurus House, First Avenue, Centrum 100, Burton-on-Trent, DE14 2WH Tel (HQ): 01283 551249 Email: info@grm-uk.com		Trial Pit Log			Trial Pit No TP05 Sheet 1 of 1	
Site Name: Stanton Lane, Stanton under Bardon							Ground Level (mAOD) 219.25	
Client: Sutton Land Development					GRM Project Ref: P8079		Coordinates 446883 E 311420 N	
Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.20 0.20	D ES		0.30	218.95		Soft, dark brown, slightly sandy slightly gravelly CLAY topsoil. Sand is fine to medium. Gravel is fine to coarse, subangular sandstone, volcanic sandstone, siltstone and chert. TOPSOIL	1
	0.50 - 0.60	B					Medium dense to dense, light brown and orange slightly clayey sandy silty cobbly GRAVEL of fine to coarse, subangular volcanic sandstone and siltstone. HEAD	
				1.10	218.15		End of Pit at 1.10m	2
								3
								4
Date Excavated: 08/08/2017				Groundwater Observations:				
Date Backfilled: 08/08/2017				No groundwater encountered.				
Shoring: None								
Stability: Stable								
Plant Used: Tracked 8 Ton Excavator				Trial Pit Dimensions (m):		Reason for termination of Trial Pit:		
Logged by: RDH				0.70 		Excavator bucket scraping along base of trial pit.		
General Remarks: None.								
Strata consistencies/densities determined by observation only					Version: FINAL		Scale: 1:25	

		GRM Development Solutions Ltd Laurus House, First Avenue, Centrum 100, Burton-on-Trent, DE14 2WH Tel (HQ): 01283 551249 Email: info@grm-uk.com		Trial Pit Log		Trial Pit No TP06 Sheet 1 of 1	
Site Name: Stanton Lane, Stanton under Bardon						Ground Level (mAOD) 215.70	
Client: Sutton Land Development				GRM Project Ref: P8079		Coordinates 446915 E 311395 N	
Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.20	215.50		Soft, dark brown, slightly sandy slightly gravelly CLAY topsoil. Sand is fine to medium. Gravel is fine to coarse, subangular sandstone, volcanic sandstone, siltstone and chert. TOPSOIL Medium dense to dense, light brown and orange slightly clayey sandy cobbly GRAVEL of fine to coarse, angular to subangular volcanic sandstone and siltstone. HEAD
	0.50	B					
	1.60	D					
	2.00	D		2.10	213.60		End of Pit at 2.10m
Date Excavated: 08/08/2017 Date Backfilled: 08/08/2017 Shoring: None Stability: Stable Plant Used: Tracked 8 Ton Excavator Logged by: RDH				Groundwater Observations: No groundwater encountered.			
				Trial Pit Dimensions (m): 0.70  3.10		Reason for termination of Trial Pit: Unable to continue through dense gravel.	
General Remarks: None.							
Strata consistencies/densities determined by observation only				Version: FINAL		Scale: 1:25	

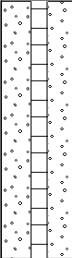
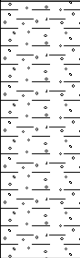
		GRM Development Solutions Ltd Laurus House, First Avenue, Centrum 100, Burton-on-Trent, DE14 2WH Tel (HQ): 01283 551249 Email: info@grm-uk.com		Trial Pit Log			Trial Pit No TP07 Sheet 1 of 1	
Site Name: Stanton Lane, Stanton under Bardon							Ground Level (mAOD) 212.90	
Client: Sutton Land Development					GRM Project Ref: P8079		Coordinates 446943 E 311378 N	
Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.20 0.20	D ES		0.30	212.60		Soft, dark brown, slightly sandy slightly gravelly CLAY topsoil. Sand is fine to medium. Gravel is fine to coarse, subangular sandstone, volcanic sandstone, siltstone and chert. TOPSOIL	1
	0.60	B						
	1.60	D						
	2.50							
							End of Pit at 2.50m	3
								4
Date Excavated: 08/08/2017				Groundwater Observations:				
Date Backfilled: 08/08/2017				No groundwater encountered.				
Shoring: None								
Stability: Stable								
Plant Used: Tracked 8 Ton Excavator				Trial Pit Dimensions (m):		Reason for termination of Trial Pit:		
Logged by: RDH				0.70 		Unable to continue through dense gravel.		
General Remarks: None.								
Strata consistencies/densities determined by observation only					Version: FINAL		Scale: 1:25	

		GRM Development Solutions Ltd Laurus House, First Avenue, Centrum 100, Burton-on-Trent, DE14 2WH Tel (HQ): 01283 551249 Email: info@grm-uk.com		Trial Pit Log			Trial Pit No TP08 Sheet 1 of 1	
Site Name: Stanton Lane, Stanton under Bardon							Ground Level (mAOD) 214.60	
Client: Sutton Land Development					GRM Project Ref: P8079		Coordinates 446883 E 311351 N	
Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.20	D		0.30	214.30		Soft, dark brown, slightly sandy slightly gravelly CLAY topsoil. Sand is fine to medium. Gravel is fine to coarse, subangular sandstone, volcanic sandstone, siltstone and chert. TOPSOIL	
	0.20	ES						
	0.50	D		1.30	213.30		Medium dense, light brown slightly clayey gravelly SAND. Gravel is fine to coarse, subangular sandstone. HEAD	1
	1.60	D						
			2.40	212.20		Dense, orangish brown and light brown, slightly sandy silty cobbly GRAVEL of fine to coarse, subangular volcanic sandstone and siltstone. HEAD	2	
2.80	D							
			3.10	211.50		Stiff, reddish brown, silty CLAY with mudstone lithorelicts. EDWALTON FORMATION	3	
						End of Pit at 3.10m		4
Date Excavated: 08/08/2017 Date Backfilled: 08/08/2017 Shoring: None Stability: Stable Plant Used: Tracked 8 Ton Excavator Logged by: RDH				Groundwater Observations: No groundwater encountered.				
				Trial Pit Dimensions (m): 0.70  3.10		Reason for termination of Trial Pit: Target depth achieved.		
General Remarks: None.								
Strata consistencies/densities determined by observation only					Version: FINAL		Scale: 1:25	

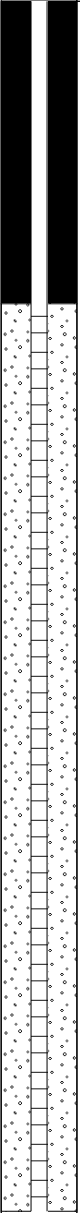
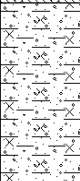
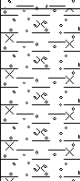
		GRM Development Solutions Ltd Laurus House, First Avenue, Centrum 100, Burton-on-Trent, DE14 2WH Tel (HQ): 01283 551249 Email: info@grm-uk.com		Windowless Sample Borehole				Borehole No WS01 Sheet 1 of 2	
Site Name: Stanton Lane, Stanton under Bardon								Ground Level (mAOD) 210.70	
Client: Sutton Land Development						GRM Project Ref: P8079		Coordinates 447014 E 311473 N	

Installation/ Backfill	Water Strike	Samples/Tests			Dynamic Probing (Blows per 100mm)	Depth (m)	Level (m)	Legend	Stratum Description	
		Depth	Type	Result						
		0.20 0.20	D ES		0.45	210.25		Soft, dark brown, slightly sandy slightly gravelly CLAY topsoil. Sand is fine to medium. Gravel is fine to coarse, subangular siltstone and chert. TOPSOIL		
		0.70 - 0.80	D					Firm, orange brown, gravelly CLAY. Gravel is fine to coarse, angular to rounded grey igneous siltstone and quartzite. HEAD		
		1.00	S	N=10 (1,1/2,2,3,3)	2.00	208.70			1	
		1.60 - 1.70	D					Firm to stiff, yellowish orange slightly gravelly slightly sandy CLAY. Sand is medium to coarse. Gravel is fine to medium, sandstone, siltstone and chert. HEAD		
		2.00	S	N=18 (1,2/3,4,4,7)	3.30	207.40			2	
		2.60 - 2.70	D					Firm to stiff, yellowish orange slightly gravelly slightly sandy CLAY. Sand is medium to coarse. Gravel is fine to medium, sandstone, siltstone and chert. HEAD		
		3.00	S	N=21 (2,3/4,4,6,7)					3	
		3.50 - 3.60	D					Stiff, reddish brown, slightly gravelly CLAY. Gravel is fine to medium subangular mudstone and siltstone. EDWALTON FORMATION		
		4.00	S	N=32 (4,5/7,7,7,11)					4	
	Continued on Next Sheet									

Crew: Dynamic Sampling Ltd.		Logger: RDH		Weather: Dry	
Equipment: Premier Compact 120 Series					
Reason for termination of borehole: Target depth achieved.					
Groundwater Remarks: No groundwater encountered.					
General Remarks: None.					
Hole Started: 07/08/2017		Hole Complete:		Version: FINAL	Scale: 1:25

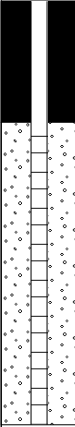
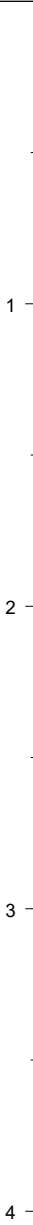
		GRM Development Solutions Ltd Laurus House, First Avenue, Centrum 100, Burton-on-Trent, DE14 2WH Tel (HQ): 01283 551249 Email: info@grm-uk.com		Windowless Sample Borehole				Borehole No WS01 Sheet 2 of 2		
Site Name: Stanton Lane, Stanton under Bardon								Ground Level (mAOD) 210.70		
Client: Sutton Land Development						GRM Project Ref: P8079		Coordinates 447014 E 311473 N		
Installation/ Backfill	Water Strike	Samples/Tests			Dynamic Probing (Blows per 100mm)	Depth (m)	Level (m)	Legend	Stratum Description	
		Depth	Type	Result						
		4.50 - 4.60	D			5.00	205.70			
		5.00	S	N=38 (5,6/8,10,10,10)						
									End of Borehole at 5.00m	5
										6
										7
										8
Crew: Dynamic Sampling Ltd.					Logger: RDH		Weather: Dry			
Equipment: Premier Compact 120 Series										
Reason for termination of borehole: Target depth achieved.										
Groundwater Remarks: No groundwater encountered.										
General Remarks: None.										
Hole Started: 07/08/2017		Hole Complete:			Version: FINAL		Scale: 1:25			

		GRM Development Solutions Ltd Laurus House, First Avenue, Centrum 100, Burton-on-Trent, DE14 2WH Tel (HQ): 01283 551249 Email: info@grm-uk.com		Windowless Sample Borehole				Borehole No WS02 Sheet 1 of 1	
Site Name: Stanton Lane, Stanton under Bardon								Ground Level (mAOD) 214.00	
Client: Sutton Land Development						GRM Project Ref: P8079		Coordinates 446945 E 311517 N	

Installation/ Backfill	Water Strike	Samples/Tests			Dynamic Probing (Blows per 100mm)	Depth (m)	Level (m)	Legend	Stratum Description	
		Depth	Type	Result						
		0.40 - 0.50	D			0.30	213.70		Soft, dark brown, slightly sandy slightly gravelly CLAY topsoil. Sand is fine to medium. Gravel is fine to coarse, subangular siltstone and sandstone and chert. TOPSOIL	1
						0.90	213.10		Firm, grey and brown, silty sandy slightly gravelly CLAY. Gravel is fine to medium, subangular to subrounded sandstone. HEAD	
	1.00	S	N=16 (1,2/2,3,4,7)					Firm to stiff, orangish brown gravelly CLAY. Gravel is fine to coarse, angular to subangular volcanoclastic sandstone. HEAD		
		1.60 - 1.70	D							2
		2.00	S	N=25 (2,3/4,6,6,9)						
		2.60 - 2.70 2.70	D C	N=44 (7,9/10,10,11,13)						
	3.60 - 3.70	D				3.40	210.60		Stiff to very stiff, reddish brown, silty slightly gravelly CLAY. Gravel is fine to medium subangular, sandstone, siltstone and mudstone. EDWALTON FORMATION	
	4.00	S	N=50 (6,13/50 for 227mm)			4.00	210.00		End of Borehole at 4.00m	4

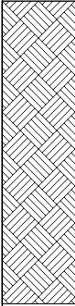
Crew: Dynamic Sampling Ltd.		Logger: RDH		Weather: Dry	
Equipment: Premier Compact 120 Series					
Reason for termination of borehole: SPT refusal					
Groundwater Remarks: No groundwater encountered.					
General Remarks: None.					
Hole Started: 07/08/2017		Hole Complete:		Version: FINAL	Scale: 1:25

		GRM Development Solutions Ltd Laurus House, First Avenue, Centrum 100, Burton-on-Trent, DE14 2WH Tel (HQ): 01283 551249 Email: info@grm-uk.com		Windowless Sample Borehole				Borehole No WS03 Sheet 1 of 1	
Site Name: Stanton Lane, Stanton under Bardon								Ground Level (mAOD) 215.06	
Client: Sutton Land Development						GRM Project Ref: P8079		Coordinates 446938 E 311431 N	

Installation/ Backfill	Water Strike	Samples/Tests			Dynamic Probing (Blows per 100mm)	Depth (m)	Level (m)	Legend	Stratum Description		
		Depth	Type	Result							
		0.20 - 0.30	D			0.30	214.76		Soft, dark brown, slightly sandy slightly gravelly CLAY topsoil. Sand is fine to medium. Gravel is fine to coarse, subangular sandstone, volcanic sandstone, siltstone and chert. TOPSOIL		
		0.20 - 0.30	ES								
		0.30 - 0.40	D								
		0.40 - 0.60	D								
		0.60 - 0.70									
		1.00	S	N=50 (6,4/5,12,20,13)							
		1.50 - 1.60	D								
		1.80	C	50 (7,9/50 for 215mm)							
								End of Borehole at 1.80m			

Crew: Dynamic Sampling Ltd.			Logger: RDH			Weather: Dry		
Equipment: Premier Compact 120 Series								
Reason for termination of borehole: SPT refusal								
Groundwater Remarks: No groundwater encountered.								
General Remarks: None.								
Hole Started: 07/08/2017			Hole Complete:			Version: FINAL		Scale: 1:25

Scale: 1:25

		GRM Development Solutions Ltd Laurus House, First Avenue, Centrum 100, Burton-on-Trent, DE14 2WH Tel (HQ): 01283 551249 Email: info@grm-uk.com		Windowless Sample Borehole				Borehole No WS05 Sheet 1 of 1		
Site Name: Stanton Lane, Stanton under Bardon								Ground Level (mAOD) 213.10		
Client: Sutton Land Development						GRM Project Ref: P8079		Coordinates 446907 E 311347 N		
Installation/ Backfill	Water Strike	Samples/Tests			Dynamic Probing (Blows per 100mm)	Depth (m)	Level (m)	Legend	Stratum Description	
		Depth	Type	Result						
		0.50 - 0.60	D			0.20	212.90		Soft, dark brown, slightly sandy slightly gravelly CLAY topsoil. Sand is fine to medium. Gravel is fine to coarse, subangular sandstone, volcanic sandstone, siltstone and chert.	
		1.00	S	50 (25 for 140mm/50 for 160mm)		1.00	212.10		TOPSOIL Medium dense to dense, gravelly to very gravelly slightly sandy SILT. Gravel is fine to coarse, angular to subangular volcanoclastic siltstone. HEAD	1
									End of Borehole at 1.00m	
										2
										3
										4
Crew: Dynamic Sampling Ltd.					Logger: RDH			Weather: Dry		
Equipment: Premier Compact 120 Series										
Reason for termination of borehole: SPT refusal										
Groundwater Remarks: No groundwater encountered.										
General Remarks: None.										
Hole Started: 07/08/2017		Hole Complete:				Version: FINAL		Scale: 1:25		



A P P E N D I X G

**GRM Development Solutions provides
multi-disciplinary consultancy services, UK-wide:**

- Geotechnical and Geo-environmental Services
- Civil and Infrastructure Services
- Structural Engineering Services
- Construction Management
- Site Services

Tel: 01283 551249

info@grm-uk.com

Fax: 01283 211968

www.grm-uk.com



DO NOT SCALE

NOTES:



 Approximate Site Boundary

 Window Sample Installations



GRM Development Solutions Ltd

Laurus House, First Ave, Centrum 100,

Burton-on-Trent, Staffordshire

Tel: 01283 551 249 Fax: 01283 211 968

mail@grm-uk.com www.grm-uk.com

CLIENT:

Sutton Land Development

PROJECT:

Stanton Lane, Stanton under Bardon

TITLE:

Gas Monitoring Location Plan

SCALE@SIZE :

NTS

ISSUE:

FINAL

DESIGN/DRAWN :

RDH

DATE:

August 2017

PROJECT No:

P8079

DRAWING No:

Figure 1

© GRM Development Solutions Ltd

© Crown Copyright. AL 100014100



A P P E N D I X H

**GRM Development Solutions provides
multi-disciplinary consultancy services, UK-wide:**

- Geotechnical and Geo-environmental Services
- Civil and Infrastructure Services
- Structural Engineering Services
- Construction Management
- Site Services

Tel: 01283 551249

info@grm-uk.com

Fax: 01283 211968

www.grm-uk.com

In-Situ Gas Monitoring Results

Project Name: Stanton Lane, Stanton under Bardon
 Project Number: P8079
 Client: Sutton Land Development Ltd
 Date: 18 August 2017
 Weather: Dry
 Atmospheric Pressure (mb): 991
 Pressure Trend: Rising
 Equipment: Gas Data GFM430
 Operator: Tom Robson

Ground Gases													
Well ID	Response Zone (mbegl)			Methane (%v/v)		Carbon Dioxide (%v/v)		Oxygen (%v/v)		Gas Flow (l/h)		PID Reading (ppm)	
	Top	Base	Strata	Peak	Steady	Peak	Steady	Low	Steady	Peak	Steady	Peak	Steady
WS01	1.0	5.0	Natural	0.00	0.00	3.20	3.20	15.10	15.10	0.0	0.0	N/R	N/R
WS02	1.0	4.0	Natural	0.00	0.00	3.60	3.60	15.30	15.30	0.0	0.0	N/R	N/R
WS03	0.4	1.4	Natural	0.00	0.00	3.20	3.20	16.30	16.30	0.0	0.0	N/R	N/R
WS04	0.4	1.2	Natural	0.00	0.00	3.10	3.10	17.00	17.00	0.0	0.0	N/R	N/R
WS05	0.4	1.2	Natural	0.00	0.00	1.90	1.90	18.80	18.80	0.0	0.0	N/R	N/R

Groundwater	
Depth to Groundwater (mbegl)	Total Well Depth (mbegl)
1.61	5.13
N/D	4.07
N/D	1.45
N/D	1.33
1.09	1.25

Comments:

Notes

L.E.L.	Lower Explosive Limit (100% L.E.L. = 5% Flammable Gas)	Highlighted cell for following conditions: a. Methane $\geq 1\%$ v/v b. Carbon Dioxide $\geq 5\%$ v/v
N.D.	Not Detected	
N.R.	Not Recorded	MG Made Ground NS Natural Strata
PID	Photo-Ionising Detector	
%	By volume	

In-Situ Gas Monitoring Results

Project Name: Stanton Lane, Stanton under Bardon
 Project Number: P8079
 Client: Sutton Land Development Ltd
 Date: 24 August 2017
 Weather: Dry
 Atmospheric Pressure (mb): 983
 Pressure Trend: Steady
 Equipment: Gas Data LMSXi
 Operator: Dave Evans

Well ID	Ground Gases												PID Reading (ppm)
	Response Zone (mbegl)			Methane (%v/v)		Carbon Dioxide (%v/v)		Oxygen (%v/v)		Gas Flow (l/h)		Peak	Steady
	Top	Base	Strata	Peak	Steady	Peak	Steady	Low	Steady	Peak	Steady		
WS01	1.0	5.0	Natural	0.00	0.00	4.70	4.70	14.60	14.60	0.0	0.0	NR	NR
WS02	1.0	4.0	Natural	0.00	0.00	5.10	5.10	13.70	13.70	0.0	0.0	NR	NR
WS03	0.4	1.4	Natural	0.00	0.00	4.10	4.10	16.40	16.40	0.0	0.0	NR	NR
WS04	0.4	1.2	Natural	0.00	0.00	3.90	3.90	17.40	17.40	0.0	0.0	NR	NR
WS05	0.4	1.2	Natural	0.00	0.00	5.20	5.20	12.70	12.70	0.0	0.0	NR	NR

Groundwater	
Depth to Groundwater (mbegl)	Total Well Depth (mbegl)
1.79	5.15
ND	4.08
ND	1.46
ND	1.33
ND	1.25

Comments: ALL HOLES PIPED UP.

Notes

L.E.L.	Lower Explosive Limit (100% L.E.L. = 5% Flammable Gas)	Highlighted cell for following conditions:
N.D.	Not Detected	a. Methane $\geq 1\%$ v/v
N.R.	Not Recorded	b. Carbon Dioxide $\geq 5\%$ v/v
PID	Photo-Ionising Detector	Made Ground
%	By volume	NS Natural Strata

In-Situ Gas Monitoring Results

Project Name: Stanton Lane, Stanton under Bardon
 Project Number: P8079
 Client: Sutton Land Development Ltd
 Date: 01 September 2017
 Weather: Wet
 Atmospheric Pressure (mb): 1005
 Pressure Trend: Rising
 Equipment: Gas Data LMSXi
 Operator: Liam Press

Ground Gases													
Well ID	Response Zone (mbegl)			Methane (%v/v)		Carbon Dioxide (%v/v)		Oxygen (%v/v)		Gas Flow (l/h)		PID Reading (ppm)	
	Top	Base	Strata	Peak	Steady	Peak	Steady	Low	Steady	Peak	Steady	Peak	Steady
WS01	1.0	5.0	Natural	0.00	0.00	6.80	6.80	15.50	15.50	0.0	0.0		
WS02	1.0	4.0	Natural	0.00	0.00	0.40	0.40	19.50	19.50	0.0	0.0		
WS03	0.4	1.4	Natural	0.00	0.00	1.70	1.70	19.10	19.10	0.0	0.0		
WS04	0.4	1.2	Natural	0.00	0.00	2.80	2.80	18.40	18.40	0.0	0.0		
WS05	0.4	1.2	Natural	0.00	0.00	2.30	2.30	19.00	19.00	0.0	0.0		

Groundwater	
Depth to Groundwater (mbegl)	Total Well Depth (mbegl)
1.78	5.13
n.d.	4.07
n.d.	1.46
n.d.	1.32
n.d.	1.24

Comments:

Notes

L.E.L.	Lower Explosive Limit (100% L.E.L. = 5% Flammable Gas)	Highlighted cell for following conditions:
N.D.	Not Detected	a. Methane $\geq 1\%$ v/v
N.R.	Not Recorded	b. Carbon Dioxide $\geq 5\%$ v/v
PID	Photo-Ionising Detector	Made Ground
%	By volume	NS Natural Strata

In-Situ Gas Monitoring Results

Project Name: Stanton Lane, Stanton under Bardon
 Project Number: P8079
 Client: Sutton Land Development Ltd
 Date: 05 September 2017
 Weather: Dry
 Atmospheric Pressure (mb): 987
 Pressure Trend: Steady
 Equipment: Gas Data GFM430
 Operator: Wayne Barry

Ground Gases													
Well ID	Response Zone (mbegl)			Methane (%v/v)		Carbon Dioxide (%v/v)		Oxygen (%v/v)		Gas Flow (l/h)		PID Reading (ppm)	
	Top	Base	Strata	Peak	Steady	Peak	Steady	Low	Steady	Peak	Steady	Peak	Steady
WS01	1.0	5.0	Natural	0.00	0.00	7.00	7.00	16.20	16.20	0.0	0.0	N/R	N/R
WS02	1.0	4.0	Natural	0.00	0.00	5.40	5.40	10.30	10.30	0.0	0.0	N/R	N/R
WS03	0.4	1.4	Natural	0.00	0.00	4.30	4.30	17.00	17.00	0.0	0.0	N/R	N/R
WS04	0.4	1.2	Natural	0.00	0.00	2.90	2.90	18.30	18.30	0.0	0.0	N/R	N/R
WS05	0.4	1.2	Natural	0.00	0.00	4.90	4.90	17.10	17.10	0.0	0.0	N/R	N/R

Groundwater	
Depth to Groundwater (mbegl)	Total Well Depth (mbegl)
1.96	5.13
N/D	4.07
N/D	1.45
N/D	1.33
N/D	1.25

Comments:

Notes

L.E.L.	Lower Explosive Limit (100% L.E.L. = 5% Flammable Gas)	Highlighted cell for following conditions:
N.D.	Not Detected	a. Methane $\geq 1\%$ v/v
N.R.	Not Recorded	b. Carbon Dioxide $\geq 5\%$ v/v
PID	Photo-Ionising Detector	Made Ground
%	By volume	MG
		NS
		Natural Strata



A P P E N D I X I

**GRM Development Solutions provides
multi-disciplinary consultancy services, UK-wide:**

- Geotechnical and Geo-environmental Services
- Civil and Infrastructure Services
- Structural Engineering Services
- Construction Management
- Site Services

Tel: 01283 551249

info@grm-uk.com

Fax: 01283 211968

www.grm-uk.com

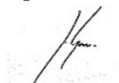
GRM Development Solutions

Laurus House
First Avenue
Centrum 100
Burton Upon Trent
Staffs
DE14 2WH

Analytical Test Report: L17/1826/GRM/001

Your Project Reference:	Stanton Lane, Stanton under Bardon	Samples Received on:	11.08.2017
Your Order Number:	P8079	Testing Instruction Received:	11.08.2017
Report Issue Number:	1	Sample Tested:	11 to 23.08.2017
Samples Analysed:	11 Soils	Report issued:	23.08.2017

Signed



James Gane
Commercial Manager
Nicholls Colton Group

Notes:

General

Please refer to Methodologies tab for details pertaining to the analytical methods undertaken.

Samples will be retained for 14 days after issue of this report unless otherwise requested.

Moisture Content was determined in accordance with NC method statement MS - CL - Sample Prep, oven dried at <30°C.

Moisture Content is reported as a percentage of the dry mass of soil, this calculation is in accordance with BS1377, Part 2, 1990, Clause 3.2

Stone Content was determined in accordance with NC method statement MS - CL - Sample Prep and refers to the percentage of stones retained on a 10mm BS test sieve.

With the exception of Sulphate, which is crushed over the 2mm test sieve, concentrations are reported as a percentage mass of the dry soil passing the 10mm BS test sieve. As received samples have been corrected for moisture content but not stone content.

Samples were supplied by customer, results are representative of the material provided

Deviating Samples

Samples were received in suitable containers **Yes**

A date and time of sampling was provided **Yes**

Sample holding times were exceeded prior to analysis of determinants **No**

Where samples do not meet one or more of the above criteria they will be classed as deviating, this means data may not be representative of the sample at the time of sampling and it is possible that results provided may be compromised.

Accreditation Key

UKAS = UKAS Accreditation, MCERTS = MCERTS Accreditation, u = Unaccredited

Date of Issue 24.01.2017

Owned by Emily Blissett - Customer Services Supervisor

Authorised by James Gane - Commercial Manager

G:\LE1 Production\Commercial\Current Reports\2017\L17\GRM - GRM Development Solutions\L17-1826-GRM P8079\L17-1826-GRM 001.xlsx\GRM Suite

L17/1826/GRM/001

Project Reference - Stanton Lane, Stanton under
Bardon

Analytical Test Results - GRM Soil Suite

NC Reference			17-26282	17-26283	17-26284	17-26285	17-26286	17-26287
Client Sample Reference			TP01	TP02	TP03	TP05	TP07	TP08
Client Sample Location			TP01	TP02	TP03	TP05	TP07	TP08
Depth (m)			0.20	0.20	0.20	0.20	0.20	0.20
Date of Sampling			08.08.2017	08.08.2017	08.08.2017	08.08.2017	08.08.2017	08.08.2017
Time of Sampling			11:15	11:45	12:30	13:30	15:15	16:00
Sample Matrix			Clay	Clay	Clay	Clay	Clay	Clay
Determinant	Units	Accreditation						
Arsenic	(mg/kg)	MCERTS	< 10	< 10	< 10	< 10	< 10	< 10
Cadmium	(mg/kg)	MCERTS	0.4	0.6	0.4	0.7	0.6	0.5
Chromium (Total)	(mg/kg)	UKAS	8.5	10.4	9.4	9.6	10.1	8.4
Copper	(mg/kg)	MCERTS	10.3	13.7	14.4	20.9	16.5	13.3
Lead	(mg/kg)	MCERTS	32.5	38.2	38.7	50.0	43.9	44.3
Mercury	(mg/kg)	UKAS	< 2.5	< 2.5	< 2.5	< 2.5	< 2.5	< 2.5
Nickel	(mg/kg)	MCERTS	7.8	8.7	8.1	9.7	9.6	8.3
Selenium	(mg/kg)	u	< 8	< 8	< 8	< 8	< 8	< 8
Zinc	(mg/kg)	MCERTS	43.1	67.6	61.1	95.6	76.6	68.0
Total Phenols	(mg/kg)	MCERTS	< 10	< 10	< 10	< 10	< 10	< 10
Cyanide (Total)	(mg/kg)	MCERTS	< 10	< 10	< 10	< 10	< 10	< 10
Chromium (Hexavalent)	(mg/kg)	u	< 10	< 10	< 10	< 10	< 10	< 10
pH	pH Units	MCERTS	6.6	6.6	6.2	6.8	6.5	6.2
SOM	(%)	UKAS	4.4	5.6	6.4	8.0	5.0	6.7
Sulphate	(mg/l)	u	<10	<10	<10	<10	<10	<10
Acenaphthene	(mg/kg)	MCERTS	0.17	<0.02	<0.02	<0.02	<0.02	<0.02
Acenaphthylene	(mg/kg)	UKAS	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Anthracene	(mg/kg)	UKAS	0.14	<0.02	<0.02	<0.02	0.04	<0.02
Benzo (a) anthracene	(mg/kg)	MCERTS	<0.02	0.04	0.05	0.06	0.16	0.06
Benzo (a) pyrene	(mg/kg)	MCERTS	<0.02	0.03	0.05	0.06	0.16	0.06
Benzo (b) fluoranthene	(mg/kg)	MCERTS	<0.02	0.05	0.07	0.09	0.22	0.08
Benzo (g, h, i) perylene	(mg/kg)	MCERTS	<0.02	<0.02	0.04	0.05	0.11	0.05
Benzo (k) fluoranthene	(mg/kg)	MCERTS	<0.02	<0.02	<0.02	0.03	0.09	0.03
Chrysene	(mg/kg)	MCERTS	0.03	0.04	0.06	0.08	0.20	0.08
Dibenzo (a,h) anthracene	(mg/kg)	MCERTS	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Fluoranthene	(mg/kg)	MCERTS	0.03	0.07	0.11	0.11	0.40	0.13
Fluorene	(mg/kg)	MCERTS	0.31	<0.02	<0.02	<0.02	<0.02	<0.02
Indeno (1, 2, 3,-cd) pyrene	(mg/kg)	MCERTS	<0.02	<0.02	0.03	0.04	0.10	0.04
Naphthalene	(mg/kg)	MCERTS	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Phenanthrene	(mg/kg)	MCERTS	0.43	0.03	0.04	0.04	0.16	0.05
Pyrene	(mg/kg)	MCERTS	0.05	0.07	0.10	0.10	0.35	0.12
Total PAH (Sum of USEPA 16)	(mg/kg)	UKAS	1.39	0.58	0.74	0.83	2.10	0.86
Pesticide Screen	(mg/kg)	u	Undetected <1	Undetected <1	Undetected <1	Undetected <1	Undetected <1	Undetected <1

L17/1826/GRM/001

Project Reference - Stanton Lane, Stanton under
Bardon

Analytical Test Results - GRM Soil Suite

NC Reference			17-26289	17-26290	17-26291	17-26292	17-26293
Client Sample Reference			TP01	TP02	TP04	TP04	TP08
Client Sample Location			TP01	TP02	TP04	TP04	TP08
Depth (m)			0.50	0.50	0.60	2.00	2.80
Date of Sampling			08.08.2017	08.08.2017	08.08.2017	08.08.2017	08.08.2017
Time of Sampling			Not provided	Not provided	Not provided	Not provided	Not provided
Sample Matrix			Clay	Clay	Clay	Clay	Clay
Determinant	Units	Accreditation					
Arsenic	(mg/kg)	MCERTS	-	-	-	-	-
Cadmium	(mg/kg)	MCERTS	-	-	-	-	-
Chromium (Total)	(mg/kg)	UKAS	-	-	-	-	-
Copper	(mg/kg)	MCERTS	-	-	-	-	-
Lead	(mg/kg)	MCERTS	-	-	-	-	-
Mercury	(mg/kg)	UKAS	-	-	-	-	-
Nickel	(mg/kg)	MCERTS	-	-	-	-	-
Selenium	(mg/kg)	u	-	-	-	-	-
Zinc	(mg/kg)	MCERTS	-	-	-	-	-
Total Phenols	(mg/kg)	MCERTS	-	-	-	-	-
Cyanide (Total)	(mg/kg)	MCERTS	-	-	-	-	-
Chromium (Hexavalent)	(mg/kg)	u	-	-	-	-	-
pH	pH Units	MCERTS	6.5	7.3	6.3	6.8	6.0
SOM	(%)	UKAS	-	-	-	-	-
Sulphate	(mg/l)	u	<10	<10	17	<10	34
Acenaphthene	(mg/kg)	MCERTS	-	-	-	-	-
Acenaphthylene	(mg/kg)	UKAS	-	-	-	-	-
Anthracene	(mg/kg)	UKAS	-	-	-	-	-
Benzo (a) anthracene	(mg/kg)	MCERTS	-	-	-	-	-
Benzo (a) pyrene	(mg/kg)	MCERTS	-	-	-	-	-
Benzo (b) fluoranthene	(mg/kg)	MCERTS	-	-	-	-	-
Benzo (g, h, i) perylene	(mg/kg)	MCERTS	-	-	-	-	-
Benzo (k) fluoranthene	(mg/kg)	MCERTS	-	-	-	-	-
Chrysene	(mg/kg)	MCERTS	-	-	-	-	-
Dibenzo (a,h) anthracene	(mg/kg)	MCERTS	-	-	-	-	-
Fluoranthene	(mg/kg)	MCERTS	-	-	-	-	-
Fluorene	(mg/kg)	MCERTS	-	-	-	-	-
Indeno (1, 2, 3,-cd) pyrene	(mg/kg)	MCERTS	-	-	-	-	-
Naphthalene	(mg/kg)	MCERTS	-	-	-	-	-
Phenanthrene	(mg/kg)	MCERTS	-	-	-	-	-
Pyrene	(mg/kg)	MCERTS	-	-	-	-	-
Total PAH (Sum of USEPA 16)	(mg/kg)	UKAS	-	-	-	-	-
Pesticide Screen	(mg/kg)	u	-	-	-	-	-

L17/1826/GRM/001

Project Reference - Stanton Lane, Stanton under Bardon

Sample Descriptions

NC Reference	Client Sample Reference	Sample Depth (m)	Description	Moisture Content (%)	Stone Content (%)
17-26282	TP01	0.20	Dark brown silty sandy gravelly clay with root fragments.	29	0
17-26283	TP02	0.20	Dark brown silty sandy gravelly clay with organic matter.	32	13
17-26284	TP03	0.20	Dark brown silty sandy gravelly clay with root fragments.	34	12
17-26285	TP05	0.20	Dark brown silty sandy gravelly clay with root fragments.	34	15
17-26286	TP07	0.20	Dark brown silty sandy gravelly clay with root fragments.	19	50
17-26287	TP08	0.20	Dark brown silty sandy gravelly clay with root fragments.	31	17

NC Reference	Client Sample Reference	Sample Depth (m)	Description	% Passing 2mm BS test sieve
17-26289	TP01	0.50	Red/brown gravelly silty clay.	98
17-26290	TP02	0.50	Light brown silty clay.	81
17-26291	TP04	0.60	Brown gravelly silt clay with occasional siltstone.	89
17-26292	TP04	2.00	Red/brown clay.	100
17-26293	TP08	2.80	Red/brown silty clay.	100

L17/1826/GRM/001

Project Reference - Stanton Lane, Stanton under Bardon

Analysis Methodologies

Matrix	Determinant	Sample condition for analysis	Test Method used
Soil	Metals	Air Dried	In house method statement - MS - CL - ICP metals
Soil	PAH	As Received	In house method statement - MS - CL - PAH (As received)
Soil	Phenols	As Received	In house method statement - MS - CL - Phenols by Skalar
Soil	Chromium (hexavalent)	As Received	In house method statement - MS - CL - Hexavalent Chromium by Skalar
Soil	Cyanide	As Received	In house method statement - MS - CL - Cyanide by Skalar
Soil	pH	As Received	In house method statement - MS - CL - pH in soils (using a 1:3 soil to water extraction)
Soil	SOM	Air Dried	In house method statement - MS - CL - TOC Eltra
Soil	Sulphate (w/s)	Oven Dried	In house method statement - MS - CL - Anions by Aquakem
Soil	Pesticide Screen	As Received	In house method statement - MS - CL - Pesticides



A P P E N D I X J

**GRM Development Solutions provides
multi-disciplinary consultancy services, UK-wide:**

- Geotechnical and Geo-environmental Services
- Civil and Infrastructure Services
- Structural Engineering Services
- Construction Management
- Site Services

Tel: 01283 551249

info@grm-uk.com

Fax: 01283 211968

www.grm-uk.com



Nicholls Colton Group
7-11 Harding Street, Leicester, LE1 4DH
E-mail: info@nicholls-colton.co.uk
Website: www.nicholls-colton.co.uk
Tel: 0116 253 6333.

TEST REPORT

BS 1377 PLASTICITY INDEX AND MOISTURE CONTENT

Stanton Lane, Stanton under Bardon

Report no. L17/1826/GRM/002			
Order reference: P8079	Date of receipt: 11/08/2017	Date of testing: 14/08/2017 to 17/08/2017	Date of issue: 23/08/2017

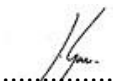
NC Sample reference	Client sample reference	Sample type	Depth (m)	Sample description	Fines passing 425µm (%)	Liquid limit (%)	Plastic limit (%)	Plasticity index (%)	Moisture content (%)
17-26294	TP01	Disturbed	0.50	Red/brown gravelly silty clay.	91	27	14	13	17
17-26295	TP02	Disturbed	0.50	Light brown silty clay.	76	26	19	7	22
17-26296	TP04	Disturbed	0.60	Brown gravelly silt clay with occasional siltstone.	73	38	16	22	19
17-26297	TP04	Disturbed	2.00	Red/brown clay.	100	67	22	45	27
17-26298	TP08	Disturbed	2.80	Red/brown silty clay.	100	45	18	27	20

NOTES:

1. Sample preparation was in accordance with BS 1377 : Part 1 : 2016.
2. Plasticity index testing was in accordance with BS 1377 : Part 2 : 1990 Clauses 3, 4.4 (one-point) & 5.
3. Moisture content testing was in accordance with BS 1377 : Part 2 : 1990 Clause 3.2.3.1.
4. The material was prepared from its natural state.
5. Some information required by BS 1377 is not included in the report. The information will be provided if requested.

GRM Development Solutions Ltd

Laurus House
First Avenue
Centrum 100
Burton Upon Trent
Staffordshire
DE14 2WH


.....

James Gane
Commercial Manager
Nicholls Colton Group

Date of Issue 30.01.2017

Owned by Emily Blissett – Customer Services Supervisor

Authorised by James Gane – Commercial Manager

G:\LE1 Production\Controlled Documents\Report Templates\1377\RT – 1377 PI & MC.doc

Page 1 of 1



Nicholls Colton Group
7 - 11 Harding Street
Leicester
LE1 4DH

Nicholls Colton Group

Cover Sheet

GRM Development Solutions

Laurus House
First Avenue
Centrum 100
Burton Upon Trent
Staffs
DE14 2WH

Analytical Test Report: L17/1826/GRM/003

Your Project Reference:	Stanton Lane, Stanton under Bardon	Date of Testing	16 to 18.08.2017
Your Order Number:	P8079	Tests Undertaken	6 Soils
Report Issue Number:	1	Report issued:	23.08.2017

Signed

James Gane
Commercial Manager
Nicholls Colton Group

Notes:

Date of Issue 09/08/2017

Owned by Emily Blissett - Customer Services Supervisor

Authorised by James Gane - Commercial Manager

G:\LE1 Production\Commercial\Current Reports\2017\L17\GRM - GRM Development Solutions\L17-1826-GRM P8079\L17-1826-GRM 003.xlsx\Cover Sheet

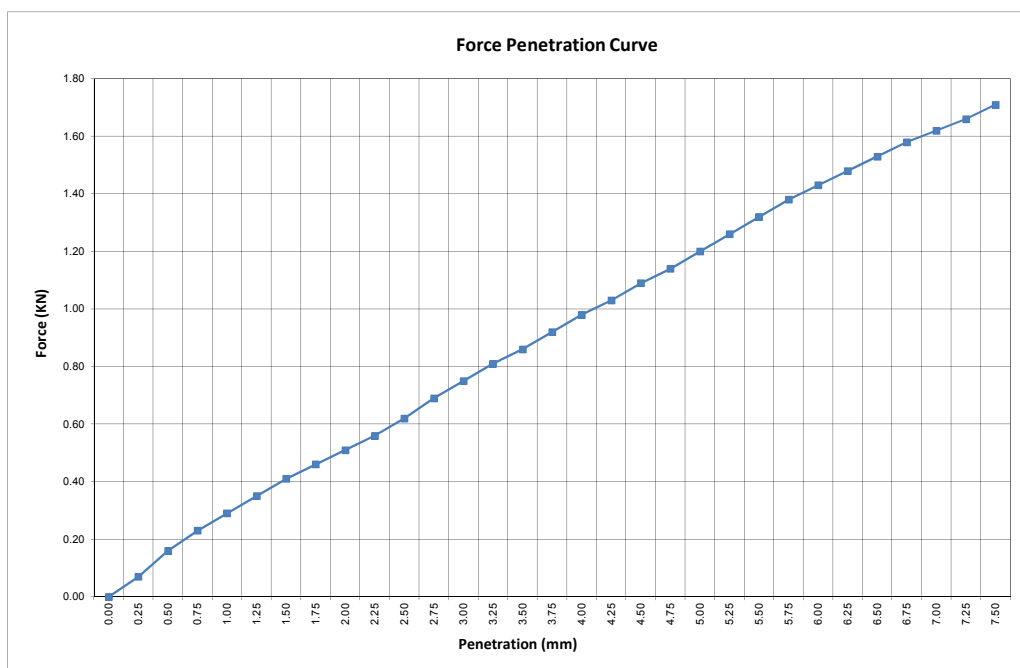
L17/1826/GRM/003

Project Reference - Stanton Lane, Stanton under Bardon

Test Result - BS 1377 Laboratory CBR value - Top only

NC Reference	17-26364
--------------	----------

Client reference :	TP1		
Sample Depth - Top (m):	0.7	Sample Depth - Bottom (m)	0.7
Visual description :	Light brown silty gravelly clay with siltstone.		
Sample type	Disturbed		
Initial Bulk Density (Mg/m3) :	2.18	Initial Dry Density (Mg/m3) :	1.90
Material retained on 20mm test sieve (%) :	16	Moisture content (%) :	15
California Bearing Ratio (CBR) % :	6.0		



NOTES :

- Testing was in accordance with BS 1377 : Part 4 : 1990 : Clause 7.
- Sample preparation was in accordance with cl.7.2.4.4 method 5 4.5kg rammer.
- The test specimen was not soaked prior to testing.

GRM Development Solutions
Laurus House
First Avenue
Burton Upon Trent
Staffs
DE14 2WH

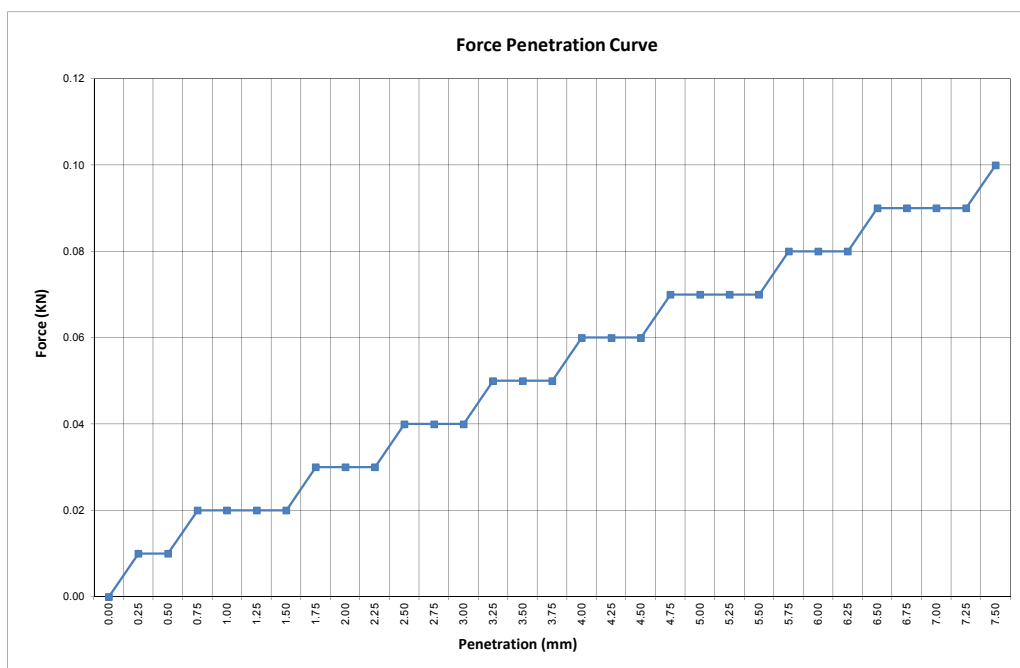
L17/1826/GRM/003

Project Reference - Stanton Lane, Stanton under Bardon

Test Result - BS 1377 Laboratory CBR value - Top only

NC Reference	17-26365
--------------	----------

Client reference :	TP2		
Sample Depth - Top (m):	0.6	Sample Depth - Bottom (m)	0.6
Visual description :	Light brown silty gravelly clay with siltstone.		
Sample type	Disturbed		
Initial Bulk Density (Mg/m3) :	2.03	Initial Dry Density (Mg/m3) :	1.69
Material retained on 20mm test sieve (%) :	42	Moisture content (%) :	20
California Bearing Ratio (CBR) % :	0.4		



NOTES :

- Testing was in accordance with BS 1377 : Part 4 : 1990 : Clause 7.
- Sample preparation was in accordance with cl.7.2.4.4 method 5 4.5kg rammer.
- The test specimen was not soaked prior to testing.
- The test sample classified as 'not appropriate' for testing in accordance with BS1377:Part 4:1990 Clause 7.2.1.2. Testing has been carried out in agreement with our client.

GRM Development Solutions
Laurus House
First Avenue
Burton Upon Trent
Staffs
DE14 2WH

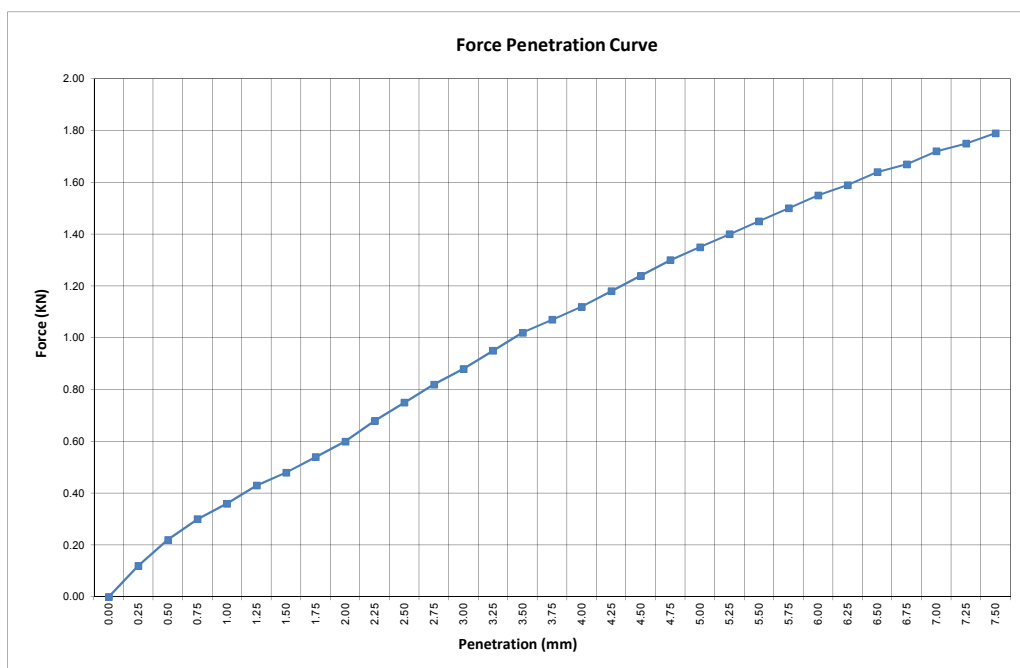
L17/1826/GRM/003

Project Reference - Stanton Lane, Stanton under Bardon

Test Result - BS 1377 Laboratory CBR value - Top only

NC Reference	17-26366
--------------	----------

Client reference :	TP3		
Sample Depth - Top (m):	0.7	Sample Depth - Bottom (m)	0.7
Visual description :	Light brown silty gravelly clay with siltstone.		
Sample type	Disturbed		
Initial Bulk Density (Mg/m3) :	2.20	Initial Dry Density (Mg/m3) :	1.93
Material retained on 20mm test sieve (%) :	20	Moisture content (%) :	14
California Bearing Ratio (CBR) % :	6.8		



NOTES :

1. Testing was in accordance with BS 1377 : Part 4 : 1990 : Clause 7.
2. Sample preparation was in accordance with cl.7.2.4.4 method 5 4.5kg rammer.
3. The test specimen was not soaked prior to testing.

GRM Development Solutions
Laurus House
First Avenue
Burton Upon Trent
Staffs
DE14 2WH

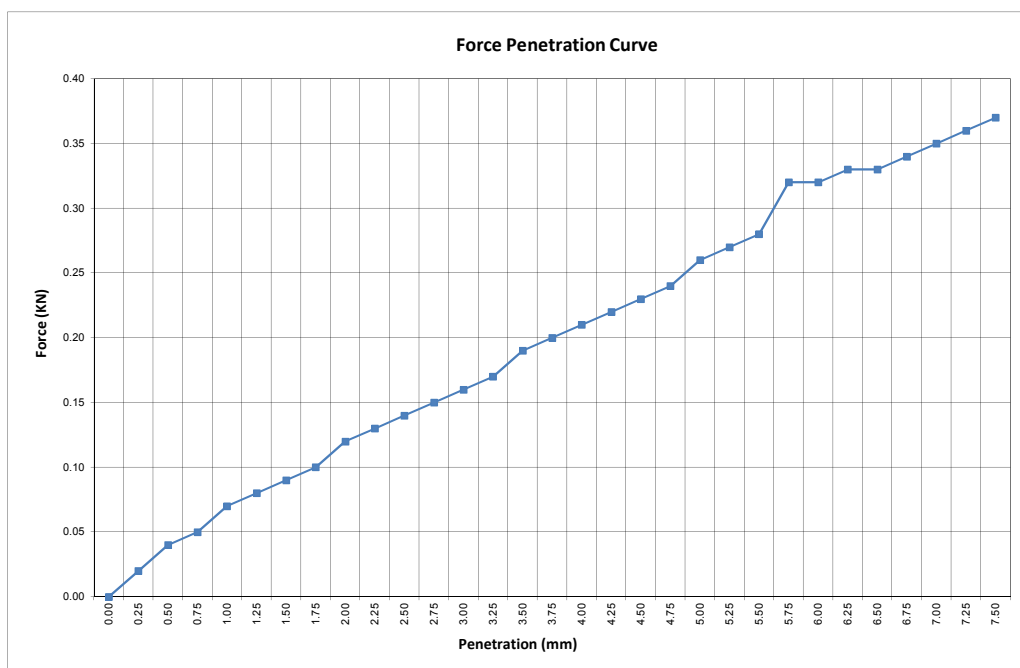
L17/1826/GRM/003

Project Reference - Stanton Lane, Stanton under Bardon

Test Result - BS 1377 Laboratory CBR value - Top only

NC Reference	17-26367
--------------	----------

Client reference :	TP5		
Sample Depth - Top (m):	0.6	Sample Depth - Bottom (m)	0.7
Visual description :	Brown crushed rock and siltstone with silty gravelly clay.		
Sample type	Disturbed		
Initial Bulk Density (Mg/m3) :	2.09	Initial Dry Density (Mg/m3) :	1.79
Material retained on 20mm test sieve (%) :	69	Moisture content (%) :	17
California Bearing Ratio (CBR) % :	1.3		



NOTES :

1. Testing was in accordance with BS 1377 : Part 4 : 1990 : Clause 7.
2. Sample preparation was in accordance with cl.7.2.4.4 method 5 4.5kg rammer.
3. The test specimen was not soaked prior to testing.
4. The test sample classified as 'not appropriate' for testing in accordance with BS1377:Part 4:1990 Clause 7.2.1.2. Testing has been carried out in agreement with our client.

GRM Development Solutions
Laurus House
First Avenue
Burton Upon Trent
Staffs
DE14 2WH

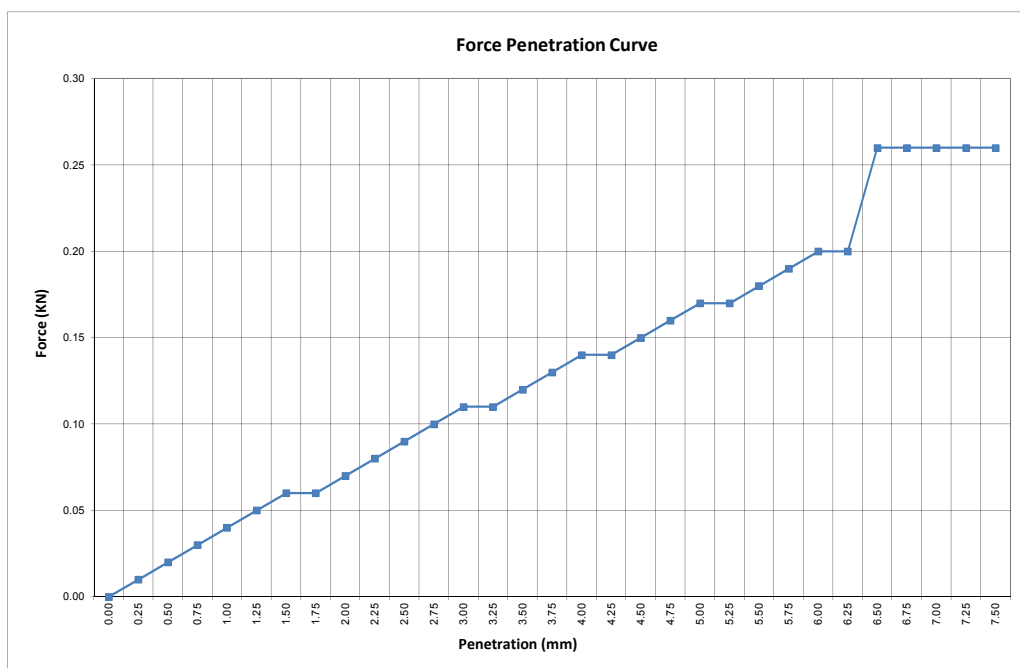
L17/1826/GRM/003

Project Reference - Stanton Lane, Stanton under Bardon

Test Result - BS 1377 Laboratory CBR value - Top only

NC Reference	17-26368
--------------	----------

Client reference :	TP6		
Sample Depth - Top (m):	0.6	Sample Depth - Bottom (m)	0.6
Visual description :	Brown crushed rock and siltstone with silty gravelly clay.		
Sample type	Disturbed		
Initial Bulk Density (Mg/m3) :	2.05	Initial Dry Density (Mg/m3) :	1.72
Material retained on 20mm test sieve (%) :	82	Moisture content (%) :	19
California Bearing Ratio (CBR) % :	0.9		



NOTES :

- Testing was in accordance with BS 1377 : Part 4 : 1990 : Clause 7.
- Sample preparation was in accordance with cl.7.2.4.4 method 5 4.5kg rammer.
- The test specimen was not soaked prior to testing.
- The test sample classified as 'not appropriate' for testing in accordance with BS1377:Part 4:1990 Clause 7.2.1.2. Testing has been carried out in agreement with our client.

GRM Development Solutions
Laurus House
First Avenue
Burton Upon Trent
Staffs
DE14 2WH

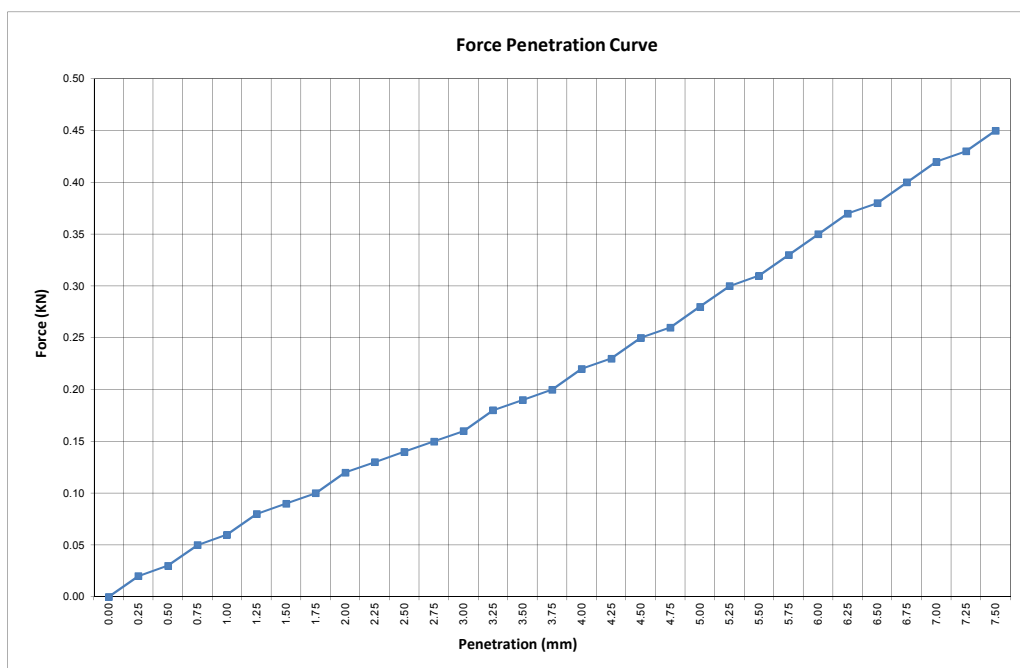
L17/1826/GRM/003

Project Reference - Stanton Lane, Stanton under Bardon

Test Result - BS 1377 Laboratory CBR value - Top only

NC Reference	17-26369
--------------	----------

Client reference :	TP7		
Sample Depth - Top (m):	0.6	Sample Depth - Bottom (m)	0.6
Visual description :	Brown crushed rock and siltstone with silty gravelly clay.		
Sample type	Disturbed		
Initial Bulk Density (Mg/m3) :	2.10	Initial Dry Density (Mg/m3) :	1.76
Material retained on 20mm test sieve (%) :	64	Moisture content (%) :	19
California Bearing Ratio (CBR) % :	1.4		



NOTES :

- Testing was in accordance with BS 1377 : Part 4 : 1990 : Clause 7.
- Sample preparation was in accordance with cl.7.2.4.4 method 5 4.5kg rammer.
- The test specimen was not soaked prior to testing.
- The test sample classified as 'not appropriate' for testing in accordance with BS1377:Part 4:1990 Clause 7.2.1.2. Testing has been carried out in agreement with our client.

GRM Development Solutions
Laurus House
First Avenue
Burton Upon Trent
Staffs
DE14 2WH



A P P E N D I X K

**GRM Development Solutions provides
multi-disciplinary consultancy services, UK-wide:**

- Geotechnical and Geo-environmental Services
- Civil and Infrastructure Services
- Structural Engineering Services
- Construction Management
- Site Services

Tel: 01283 551249

info@grm-uk.com

Fax: 01283 211968

www.grm-uk.com

	GRM TIER 1 ASSESSMENT CRITERIA		
LAND USE	Commercial Industrial		
CONTAMINANT	1%	2.50%	6%
^a Arsenic	640	640	640
^a Cadmium	410	410	410
^b Chromium III	8600	8600	8600
^a Chromium VI	49	49	49
^a Lead	2330	2330	2330
^c Mercury	1100	1100	1100
^b Selenium	12000	12000	12000
^b Nickel	980	980	980
^b Phenols	760	1500	3200
^b Copper	68800	68800	68800
^b Zinc	730000	730000	730000
^d Cyanide	280	280	280
^e Benzene	0.18	0.18	0.18
^b Toluene	56000	110000	180000
^b Ethylbenzene	5700	13000	27000
^b <i>o</i> - xylene	6600	15000	33000
^b <i>m</i> - xylene	6200	14000	31000
^b <i>p</i> - xylene	5900	14000	30000
Non Genotoxic PAHs			
^b Acenaphthene	84000	97000	100000
^b Acenaphthylene	83000	97000	100000
^b Anthracene	520000	540000	540000
^b Fluoranthene	23000	23000	23000
^b Fluorene	63000	68400	70800
^b Naphthalene	190	460	1100
^b Phenanthrene	22000	22000	23000
^b Pyrene	54000	54000	54000
Genotoxic PAHs			
^{a/e} Benzo(a)pyrene	5.7	5.7	5.7
ALIPHATIC HYDROCARBONS			
^b C5-C6	3200	5900	12000
^b C6-C8	7800	17000	40000
^b C8-C10	2000	4800	11000
^b C10-C12	9700	23000	47000
^b C12-C16	59000	82000	90000
^b C16-35	1600000	1700000	1800000
AROMATIC HYDROCARBONS			
^b C5-7 (benzene)	26000	46000	86000
^b C7-8 (toluene)	56000	110000	180000
^b C8-C10	3500	8100	17000
^b C10-C12	16000	28000	34000
^b C12-C16	36000	37000	38000
^b C16-C21	28000	28000	28000
^b C21-C35			

Notes

- a C4SL - SP1010 (2014)
- b LQM/CIEH S4UL values (2015).
- c S4UL for inorganic Hg used.
- d Atkins ATRISKsoil Value
- Benzo(a)pyrene is a surrogate marker for the 8 genotoxic PAHs (Benzo(a)pyrene, Benzo(a)anthracene, Benzo(b)fluoranthene, Benzo(ghi)perylene, Benzo(k)fluoranthene, Chrysene, Dibenzo(ah)anthracene, Ideno(1,2,3-cd)pyrene)
- e

GRM.TAC.08.14



A P P E N D I X L

**GRM Development Solutions provides
multi-disciplinary consultancy services, UK-wide:**

- Geotechnical and Geo-environmental Services
- Civil and Infrastructure Services
- Structural Engineering Services
- Construction Management
- Site Services

Tel: 01283 551249

info@grm-uk.com

Fax: 01283 211968

www.grm-uk.com

Client/client ref:
Project ref:
Site ref:
Data description:
Contaminant(s):
Test scenario: Planning
Date: 0 January 1900
User details:

	Arsenic (mg/kg)	Cadmium (mg/kg)	Chromium III (mg/kg)	Chromium VI (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	Selenium (mg/kg)	Nickel (mg/kg)	Copper (mg/kg)	Zinc (mg/kg)	Cyanide (mg/kg)	SOM (%)	Benzo(a)pyren e (mg/kg)	Napthalene (mg/kg)	Phenols (mg/kg)					
Critical concentration, C _c	640	410	8600	49	2330	1100	12000	980	68800	730000	280		5.7	190	760					
Notes																				
Full dataset size	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	0	0	0	0	0
Outliers present?	No	No	No	No	No	No	No	No	No	No	No	No	Yes	No	No					
Number of outliers temporarily excluded	0																			
Number removed by filter	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sample size, n	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	0	0	0	0	0
Sample mean, $\bar{x}$	5	0.53333333	9.4	5	41.2666667	1.25	4	8.7	14.85	68.6666667	5	6.01666667	0.06231667	0.01	5	No Data	No Data	No Data	No Data	No Data
Standard deviation, s	0	0.12110601	0.81731267	0	6.08692588	0	0	0.79246451	3.57645075	17.3253187	0	1.2937027	0.05113427	0	0					
Number of non-detects	6	0	0	6	0	6	6	0	0	0	6	0	1	6	6	0	0	0	0	0
Set non-detect values to:	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit	Half detection limit
Distribution	Single value	Normal	Normal	Single value	Normal	Single value	Single value	Normal	Normal	Normal	Single value	Normal	Normal	Single value	Single value					
Statistical approach	Auto: Chebychev	Auto: One-sample t	Auto: One-sample t	Auto: Chebychev	Auto: One-sample t	Auto: Chebychev	Auto: Chebychev	Auto: One-sample t	Auto: One-sample t	Auto: One-sample t	Auto: Chebychev	Auto: One-sample t	Auto: One-sample t	Auto: Chebychev	Auto: Chebychev	Auto	Auto	Auto	Auto	Auto
Test scenario:	Planning: is true mean lower than critical concentration ($\mu < C_c$)?										Evidence level required: 95%		Use Normal distribution to test for outliers							
t statistic, t ₀ (or k ₀)	N/A	-8281.87111	-25746.06679	N/A	-921.0279433	N/A	N/A	-3002.266166	-47110.53806	-103199.2167	N/A		-270.0624696	N/A	N/A					
Upper confidence limit (on true mean concentration, μ)	5	0.63295999	10.0723541	5	46.2740157	1.25	4	9.35191305	17.7921316	82.9191677	5	7.08091832	0.10438177	0.01	5					
Evidence level	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%		100%	100%	100%					
Base decision on:	evidence level	evidence level	evidence level	evidence level	evidence level	evidence level	evidence level	evidence level	evidence level	evidence level	evidence level	lower bound	evidence level	evidence level	evidence level					
Result	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$		$\mu < C_c$	$\mu < C_c$	$\mu < C_c$					
Select dataset	☒ Y	☐ Y	☐ Y	☐ Y	☐ Y	☐ Y	☐ Y	☐ Y	☐ Y	☐ Y	☐ Y	☐ Y	☐ Y	☐ Y	☐ Y	☐ Y	☐ Y	☐ Y	☐ Y	☐ Y

Back to data

Go to outlier test

Go to normality test

Show individual summary