



STOKE LANE, STOKE GOLDING

PHASE II SITE APPRAISAL
FOR
DAVIDSONS DEVELOPMENTS LTD

Project Ref:
P9032/F.1

Date:
July 2021

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

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Land Appraisal | Environmental | Geotechnical | Design | Mining | Inspections

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Site Appraisal for Stoke Lane, Stoke Golding

SUMMARY OF RECOMMENDATIONS

Where further assessment is required it is indicated with a "Y" in the right hand column.		
Proposed Development	Residential properties (2-storey detached and semi-detached) with associated private gardens / soft landscaping, infrastructure and areas of public open space. Part of the development area has been set aside for an attenuation pond.	
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 by water company).	Y
Groundwater	No remediation required.	
Surface Water	No remediation required.	
Waste Disposal	Preliminary Waste Classification: Non-Hazardous for Topsoil. Assumed Inert for natural strata. Will need to be confirmed by receiving landfill.	Y
GEOTECHNICAL ASSESSMENT - FOUNDATIONS		
Ground Treatment Required	None required. For pile foundations, a safe working platform would be required – piling mat in the region of 600mm thick likely.	
Main Bearing Strata	For traditional foundations – firm to stiff sandy silty clay or medium dense gravelly clayey silty sand. For pile foundations (if required) – to be confirmed.	
Nett Allowable Bearing Pressure	For natural cohesive strata or submerged granular deposits – at least 110kN/m ² considered appropriate.	
Rockhead	Not encountered.	
Tree Influence	Yes. Extent to be confirmed by a tree survey.	Y
Volume Change Potential	Medium for clay; non-shrinkable for granular deposits.	
Likely Foundation Types	100% Strip/Trench Fill at this stage. Potentially some rafts or piles, subject to proposed final layout and site levels.	Y
Likely Foundation Depth Range	For traditional foundations – 0.9m begl minimum, 1.8m begl maximum depths. Some deepening in cohesive strata may be required where there is tree influence.	Y
Excavation Hazards	Shallow excavations in the short-term should generally be stable. Groundwater may accumulate over time in open excavations, but particularly where granular deposits are present.	
Floor Slab Types	100% voided suspended floor slabs required (to be reviewed on completion of gas monitoring programme).	Y
Gas Protection Requirements Radon and/or Landfill	Gas protection measures unlikely to be required - to be confirmed when third and final gas monitoring visit is complete. No radon gas protection required.	Y
GEOTECHNICAL ASSESSMENT - GENERAL		
Slope Stability Risk	Negligible across the site area.	
Soakaways Potential	Not suitable.	
New Access Roads	Observational CBRs – assume <2% in topsoil / soft natural strata; 4% for firm sandy silty clay. Remoulded CBRs – between 3.9% and 7.7% for the cohesive strata. Insitu CBR testing is recommended immediately prior to road construction.	Y
Buried Concrete Class	DS - 1 / AC – 1. GEN-1 (unreinforced); RC35 concrete (reinforced).	
Retaining Walls and Boundary Features	No retaining walls present. Stoke Lane / Wykin Lane, residential properties and fields form the site boundaries.	



Further Assessment Targets	Review requirement for gas protection measures on completion of monitoring programme. Once a detailed development layout is available (along with a completed tree survey report), a budgetary foundation schedule can be produced. Additional ground investigation to further assess the soft silt bands, once the development layout and site levels have been finalised to confirm likely foundation types.	Y
Other Comments	Flood risk assessment required as site > 1ha.	

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.

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1 INTRODUCTION

1.1 PREAMBLE

GRM Development Solutions Limited (GRM) has been appointed by Davidsons Developments Ltd (Client), to undertake a Phase II Site Appraisal for land off 'Stoke Lane, Stoke Golding'.

A previous Phase I Desk Study report was undertaken for the Client by GRM (Ref: GRM/P9032/DS.1, dated August 2019). It should be noted that the previous Phase I desk study assessment covered a much larger area than that covered by this Phase II site appraisal report. The previous desk study 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 the most 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 low-rise (up to 2 storey) residential properties including detached and semi-detached houses, along with associated infrastructure including access roads. The proposed end use includes private gardens / soft landscaping and areas of public open space. Part of the development area has been set aside for an attenuation pond. The proposed development layout provided by the Client, on which this report is based, is presented in Appendix B.

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.	Wykin Lane / Stoke Lane, Stoke Golding
Project Reference.	P9032.
Client.	Davidsons Developments Ltd.
Site Location (address).	Land off Stoke Lane, Stoke Golding, Leicestershire, CV13 6HW. See Appendix C for a site location and boundary plan.
National Grid Reference.	SP402967.
Site Area (Ha).	2.12 Ha.
Summary of Proposed Development.	Construction of low-rise (up to 2 storey) residential properties including detached and semi-detached houses, along with associated infrastructure including access roads. The proposed end use includes private gardens / soft landscaping and areas of public open space. Part of the development area has been set-a-side for an attenuation pond.
Client Supplied Information.	➤ Site location plan. ➤ Proposed development layout plan. ➤ Utilities report.
Site Setting.	The site comprises a single grassed field. Hedgerows with mature trees (including hawthorn and oak) form the site boundaries. There is an overhead cable, running north west to south east, across the western half of the field. The site is generally flat lying. The northern boundary is formed by a field. The western boundary is formed by residential properties. The eastern boundary is formed by further fields. The southern boundary is formed by Stoke Lane / Wykin Lane.
Site History.	The site has remained undeveloped agricultural land since at least the 1880s, with no changes to the site area. In the immediate vicinity of the site there has been allotment gardens, a cemetery, residential properties, Willow Farm, and a relatively new burial ground (cemetery) located on the opposite side of Wykin / Stoke Lane.
Geology.	Topsoil anticipated across the site area, whilst made ground not expected. Superficial Deposits comprising Bosworth Clay Member (clay and silt) underlying the whole of the site area; both the Oadby Member (Glacial Till clay) and the Wigston Member (sand and gravel) are

	present adjacent to the south western site boundary and may encroach into the site area. The solid geology comprises the Mercia Mudstone Group (including the Gunthorpe Member), consisting of dominantly red, less commonly green-grey, mudstone and subordinate siltstone; the rock strata are considered likely to have weathered to clay at the near surface.
Hydrogeology.	The Bosworth Clay Member is classified as unproductive strata. The nearby Oadby Member is classified as a Secondary (undifferentiated) Aquifer, whilst the Wigston Member is classified as a Secondary (A) Aquifer. The Mercia Mudstone / Gunthorpe Member are classified as a Secondary B Aquifer. No recorded groundwater / potable water abstraction licenses within 1km of the site and the site is not recorded to be within a Groundwater Source Protection Zone.
Hydrology.	There are no significant surface water features, except for drainage ditches, within 250m of the site area. No recorded surface water abstraction licenses within 1km of the site.
Flooding.	The site area is not within 250m of an indicative fluvial floodplain. The Environment Agency have recorded there is a very low risk from river flooding on site. As the site is greater than 1 hectare in size, a Flood Risk Assessment (FRA) is required.
Mining and Quarrying.	The site is not at risk from historic coal mining. There is no evidence of any non-coal mineral extraction (via quarrying) having taken place within, or close to, the site area.
Environmental Information.	No historical or active landfills / waste treatment sites within 500m of the site area.
Potential Soil Contamination Sources.	Most recently the land was being used as pasture for grazing animals, and there is a negligible risk from historic use of pesticides. No other site specific contaminants have been identified.
Potential Ground Gas Sources (including Radon).	With no source identified, the risk from ground gases is considered to be very low. Site not within an area that requires radon protection measures.



2.1 PHASE I CONCEPTUAL SITE MODEL

HUMAN HEALTH			
Source	Pathway	Receptor	Level of Risk
None.	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.	Negligible.
		Construction and Maintenance Workers.	
None.	Inhalation of ground gas.	End users.	Very Low.
None.	Migration of contamination through leaks and joints, degradation of pipe materials.	Water supply pipes.	Negligible.

CONTROLLED WATERS			
None.	Leaching of contaminants and vertical migration to the groundwater.	Secondary A Aquifer (off site Superficial Deposits) / Secondary B Aquifer (Mercia Mudstone Group).	Very low.
	Leaching of contaminants and lateral migration to surface waters.	Drainage ditches (off-site).	Negligible.

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 the 11th June 2021, with groundwater/gas monitoring visits continuing after that period. A total of sixteen exploratory holes were progressed to a maximum depth of 3.9m below existing ground level (begl). The exploratory holes comprised eleven trial pits (TP01-TP11 inclusive) and five hand-held window sample boreholes (WS01-WS05 inclusive). The exploratory hole location plan is presented in Appendix D, whilst the exploratory hole logs are presented in Appendix E.

The exploratory holes were positioned to provide an adequate coverage of the site and to provide information with regard to the ground conditions for the proposed structures.

Five gas and groundwater monitoring standpipes were installed during the site works, with the rationale for these works discussed fully in Section 6. The limited monitoring programme was mainly for groundwater but also to undertake an initial, precautionary, assessment for ground gases. A Gas Monitoring Plan, illustrating the locations of the standpipes, is presented in Appendix F. The standpipes will need to remain in place until at least the 30th July 2021.

Infiltration permeability tests (known as 'Falling Head tests') were undertaken within the monitoring installations.

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.

3.2 PROVEN GROUND

The following ground conditions were encountered during the investigation fieldwork:

- Topsoil
- Bosworth Clay Member (Superficial Deposits)
- Wigston Member (Superficial Deposits)

3.2.1 Topsoil

Topsoil (including subsoil) was encountered in all of the exploratory holes undertaken and varied between 0.4m and 0.5m thick, with a general thickness of 0.40m recorded.

The topsoil generally comprised brown, slightly gravelly sandy CLAY. Gravel is fine to coarse, subrounded of quartzite, ironstone and sandstone. Rare brick fragments were also recovered from TP06, TP10 and WS03, with no consistent pattern in occurrence.

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3.2.2 Bosworth Clay Member

These deposits were encountered in all of the exploratory holes across the site (except for TP07). The full thickness of these superficial deposits was not proven.

The deposits generally comprised:

- Firm to stiff (medium to high strength), reddish brown mottled grey and bluish grey mottled brown, slightly sandy silty CLAY, with sandy partings.
- Firm (locally soft), low to medium strength, reddish brown, slightly sandy SILT.

3.2.3 Wigston Member

These deposits were encountered in only four of the exploratory holes across the site (TP07, TP09, TP10 and WS05 – being in the western / south western areas). The full thickness of these superficial deposits was not proven.

The deposits generally comprised:

- Medium dense, orange brown, variably gravelly / clayey / silty, fine to coarse SAND. Gravel is fine to coarse, subrounded to rounded of quartzite.
- Firm (locally soft), low to medium strength, orange brown, slightly gravelly very sandy CLAY. Gravel is fine to coarse, subrounded to rounded of quartzite. TP07 only at shallow depth.

3.3 CONTAMINATION OBSERVATIONS

No visual evidence of potential contamination was encountered within the natural strata.

No visual or olfactory evidence of petroleum hydrocarbon contamination was encountered during the fieldwork.

3.4 GROUNDWATER OBSERVATIONS

Damp strata or groundwater ingresses were recorded in the following exploratory holes:

- TP06 – damp strata below 3.2m begl (sandy silt – Bosworth Clay Member).
- TP07 – groundwater ingress from 1.8m begl (sand – Wigston Member).
- TP08 – damp strata between 2.3m and 2.8m begl (sandy silt); groundwater ingress from 3.2m begl (sandy silt – Bosworth Clay Member).
- TP09 – groundwater ingress from 1.8m begl (sand – Wigston Member).

- TP10 – groundwater ingress from 2.2m begl (sand – Wigston Member).
- WS05 – damp strata below 1.2m begl (sand – Wigston Member).

Two groundwater monitoring visits have been conducted at this stage and the results of the monitoring are reported in Appendix G. In summary, standing water was recorded at depths of between 0.54m to 1.30m begl (in two installations only). The other three installations remained dry.

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.

The groundwater encountered is considered to be representative of perched water within the granular deposits (particularly in the Wigston Member). Groundwater ingresses are considered unlikely within the dominantly clay strata.

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 G and summarised below:

- Methane has not been detected.
- Carbon dioxide between 0.4%v/v and 1.9%v/v.
- Oxygen between 19.0%v/v and 20.8%v/v.

No gas flow has been recorded during the monitoring completed to date.

3.6 SUMMARY OF FIELDWORK OBSERVATIONS

The fieldwork has revealed/confirmed the following:

Significant Features identified during fieldwork
No made ground recorded. No visual evidence of soil contamination. Both shrinkable and non-shrinkable deposits encountered. Soft layers recorded, particularly at depth. Shallow groundwater / damp strata recorded within the sand / sandy silt deposits from 1.2m begl. Excavations stable – potential for groundwater to accumulate in excavations if left open for a period of time. Where excavations are entirely within clay strata, groundwater ingresses considered unlikely. No methane and carbon dioxide concentrations below 5%v/v have been recorded.

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:

- Five samples of topsoil were analysed for a general suite of contaminants (metals, inorganics and speciated PAH).
- Two samples of topsoil were screened for the presence of pesticides.

The chemical analysis results are presented in Appendix H. Representative samples from across the area investigated were tested.

4.2 GEOTECHNICAL LABORATORY TESTING

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

- Eight samples of the natural strata (Bosworth Clay Member) were tested for Natural Moisture Content.
- Eight samples of the natural strata (Bosworth Clay Member) underwent Atterberg Limits (PI) classification.
- Four samples of natural strata (3 of Bosworth Clay Member & 1 of Wigston Member) underwent pH and water soluble sulphate testing.
- Two samples of the natural strata (Bosworth Clay Member) underwent Remoulded CBR testing.

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 I and summarised in Section 10.2. Representative samples from across the area investigated were tested.

5 QUANTITATIVE RISK ASSESSMENT – HUMAN HEALTH (SOIL)

5.1 INTRODUCTION

Development proposals for the site include residential properties with associated gardens and areas of public open space.

The only viable source of contamination put forward in the earlier text and summarised in the Phase I conceptual model was potential pesticide contamination of the shallow soils. The fieldwork has not revealed any potential contamination on this site, accordingly testing has only been carried out to provide parameters for the reuse of the topsoil.

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 residential end use with plant uptake. In order to adopt a conservative approach a Soil Organic Matter (SOM) content of 2.5% has been used to assess the topsoil samples, as this closely reflects the lowest SOM recorded.

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

5.2 RISK TO END USERS

The chemical analysis results are presented in Appendix H.

Whilst the number of samples tested is considered sufficient to characterise the topsoil, it is not considered appropriate to carry out statistical analysis on this data set. Therefore, the results for the topsoil have been compared directly against the TAC for residential end use with plant uptake.

The test results for the pesticide screening will be assessed separately.

5.2.1 Analysis of Soil Contamination Data

GRM General Suite – Topsoil

Five representative samples of topsoil have been analysed for a general suite of contaminants and the results for all the contaminants are below their respective TACs for residential end use with plant uptake, and are not therefore considered to pose a potential risk to end users.

Pesticide Screening

The pesticide screening of two representative samples of topsoil has not identified the presence of any such contamination.

Remedial works are not considered to be necessary. The topsoil is chemically suitable for reuse on site and for sale, if there is a surplus of material.

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 PE water supply pipes should be suitable for the site. There was no visual or olfactory evidence for the presence of petroleum hydrocarbons.

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.

Remedial works are not considered to be necessary. The topsoil is chemically suitable for reuse on site.

5.3 RISK TO SITE WORKERS

The investigation has not revealed any specific contamination risk to site workers; however, the general comments outlined in Appendix A (vii) should be considered when site specific risk assessments are completed. The use of suitable PPE should be enforced during the ground works stage of construction.

6 QUANTITATIVE RISK ASSESSMENT – HUMAN HEALTH (GROUND GAS)

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

The desk study assessment and Phase I conceptual site model did not identify any risk from ground gases and therefore it was not considered necessary to undertake a full gas monitoring programme as required by BS8576:2013. However, five monitoring standpipes were installed in the window sample boreholes (see gas monitoring plan presented in Appendix F) to assess the groundwater situation across the site. The standpipes had response zones in the natural strata due to the absence of made ground.

Based on 'BS8576:2013 Guidance on investigations for ground gas – Permanent Gases and Volatile Organic Compounds', the gas hazard is considered to be low (natural soil strata with low degradable organic content).

The monitoring programme was to comprise three visits only, mainly to assess the groundwater situation across the site. Only an initial assessment of the local gas regime has been undertaken at this stage with two visits completed.

The gas and groundwater monitoring results to date are presented in Appendix G and summarised in Section 3.5. The gas monitoring has been undertaken using an LMSxi Multifunction Gas Analyser.

The primary guidance document to determine if protection measures are required is BS8485:2015+A1:2019 *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 Screening Value (GSV) for the site. The gas regime is then determined based on the GSV and other limiting factors such as gas concentrations.

A default gas flow rate of 0.1l/hr has been used in the following assessment, along with a default methane concentration of 0.1%v/v.

Using the default flow rate of 0.1l/hr and a default methane concentration of 0.1%v/v, a Q_{hg} of 0.0001l/hr has been calculated for methane. Using the same flow rate, the maximum steady state carbon dioxide concentration of 1.9%v/v equates to a Q_{hg} of 0.0019l/hr. On this basis, the GSV for the site is determined as 0.0019l/hr.

As the maximum concentration of methane is <1%v/v, the maximum concentration of carbon dioxide is <5%, and the maximum GSV is <0.07l/hr, the site has been assessed as 'Characteristic Situation 1' or CS1 as outlined in BS8485:2015, for which gas protection measures are not required. This is in line with the sites conceptual site model.

Therefore, at this stage, it is considered that gas protection measures for methane or carbon dioxide are not required for the proposed residential development. Following

completion of the third and final monitoring visit to confirm the preliminary appraisal, a gas risk addendum letter report will be issued.

In addition, the desk study risk assessment determined that no radon gas protection measures are required.

6.1 SUMMARY OF RISK FROM GAS

The investigation has not revealed any specific risk to end users from methane or carbon dioxide and gas protection measures are unlikely to be required; however, the limited gas monitoring programme needs to be completed to confirm this.

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 the site are as follows:

- Superficial deposits (Wigston Member) – Secondary A Aquifer.
- Mercia Mudstone / Gunthorpe Member – Secondary B Aquifer.
- Drainage ditches (off site).

There are no recorded groundwater / potable water abstraction licenses within 1km of the site and the site is not recorded to be within a Groundwater Source Protection Zone. There are no recorded surface water abstraction licenses within 1km of the site.

The primary pathways are vertical migration to the groundwater and lateral migration to surface waters.

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.

7.1 INTERPRETATION OF GROUNDWATER OBSERVATIONS AND MONITORING

For the vast majority of the exploratory holes, groundwater or damp strata was not encountered. Damp strata or groundwater ingresses were recorded in six exploratory holes only (within sand / sandy silt deposits), at depths of between 1.2m and 3.2m begl.

Two groundwater monitoring visits have been conducted at this stage and the results of the monitoring are reported in Appendix G. In summary, standing water was recorded at depths of between 0.54m and 1.30m begl (with installation depths of up to 2.0m begl). Three of the installations remained dry.

The groundwater encountered is considered to be representative of perched water within granular deposits (particularly in the Wigston Member). Groundwater ingresses are considered unlikely within the dominantly clay strata.

7.2 SUMMARY OF RISK TO CONTROLLED WATERS

The risk to the aquifers below the site is negligible.

The risk to off-site drainage ditches is negligible.

8 PHASE II CONCEPTUAL SITE MODEL

HUMAN HEALTH			
Source	Pathway	Receptor	Remedial Solution
None identified.	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.	No remediation required.
		Construction workers.	
No source identified.	Inhalation of ground gas.	End users.	Gas precautions not required at this stage, prior to completion of the third and final gas monitoring visit.
None identified.	Migration of contamination through leaks and joints, degradation of water pipe materials.	Water supply pipes.	PE water supply pipes and clean backfill required (to be confirmed by water supply company).

CONTROLLED WATERS			
None identified.	Leaching of contaminants and vertical migration to the groundwater.	Secondary A Aquifer (Superficial Deposits – Wigston Member) / Secondary B Aquifer (Mercia Mudstone Group).	No remediation required.
	Leaching of contaminants and lateral migration to surface waters.	Drainage ditches (off-site).	

9 REMEDIATION

9.1 RECOMMENDED REMEDIAL MEASURES AND VALIDATION REQUIREMENTS

9.1.1 Protection of End Users

Soil Contamination

Development proposals for the site include residential properties with associated gardens and areas of public open space.

A source of soil contamination has not been identified and so remedial measures are not required.

The existing topsoil has been shown to be uncontaminated and can be used as a growing medium in private gardens and soft landscaping.

Any topsoil / subsoil strip will need to be undertaken when the material is dry. The stripped material will need to be stockpiled and stored in accordance with the Defra Code of Practice *Construction Code of Practice for the Sustainable Use of Soils on Construction Sites*, BS8332:2015 and BS8601:2013. The topsoil / subsoil will need to be placed within garden areas in accordance with the methods outlined in the aforementioned documents, taking care not to compact them whilst doing so. Should soils become compacted as part of the building process then allowance should be made for the soils to be loosened and thereby promote aeration and drainage, which will reduce water-logging and subsequent aftercare costs.

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

At this stage, it is assessed that gas protection measures for methane or carbon dioxide are not required for the proposed residential development. However, this will be reviewed on completion of the third and final monitoring visit, with a gas risk addendum letter report then issued.

No radon gas protection measures are required.

9.1.2 Protection of Site Workers

The risk to site workers from soil contamination is negligible. No remedial measures are required. However, the use of suitable PPE should be enforced during the ground works stage of construction.

9.1.3 Protection of Controlled Waters

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

9.1.4 Protection of Water Pipes

It is considered that, based on the UKWIR guidance, the concentrations of contaminants recorded to date are such that PE water supply pipes should be suitable for the site. There was no visual or olfactory evidence for the presence of petroleum hydrocarbons.

However, it is recommended that the local water supply company for the site be contacted to confirm their requirements with regard to pipe materials.

9.2 REMEDIATION METHOD STATEMENT

A Remediation Method Statement is not considered to be necessary.

Based on the gas monitoring undertaken at this stage, a Gas Protection Measures Design and Verification Plan is not considered to be required.

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 Waste Classification Report is presented in Appendix K. The topsoil will be classified as Non-Hazardous Waste.

The natural strata underlying the site are likely to be classified as Inert for disposal purposes; however, further testing will be required to confirm this.

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

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 low-rise (up to 2 storey) residential properties including detached and semi-detached houses, along with associated infrastructure including access roads. The proposed end use includes private gardens / soft landscaping and areas of public open space. Part of the development area has been set aside for an attenuation pond.

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 only been carried out in the laboratory; the results of this testing are provided in Appendix I. These results are summarised in the tables below:

Laboratory Testing for Bosworth Clay Member (Superficial Deposits):

Test Parameter	Range of Results
Natural Moisture Content	17% to 28%
Plasticity Index	15% to 37%

The above Plasticity Index (PI) test results indicate that the cohesive strata of the Bosworth Clay Member are of low (PI 10%-20%) to medium (PI 20%-40%) volume change potential. For the subsequent foundation assessment, assuming a worst-case situation, medium volume change potential will be used for design purposes.

10.3 ENGINEERING GROUND TREATMENT

The near surface soils were generally firm under foot during the intrusive investigation. It is therefore considered unlikely that pre-treatment of the surface soils will be required for any small plant/personnel movements.

If a piled foundation solution is to be adopted for part of the site development (see Section 10.6), a suitable working platform (i.e. piling matt) will be required. It is recommended that the design of the working platform is carried out as soon as possible. The working platform certificate requires signing by the Principal Contractor for the site. An allowance for this, and responsibility for the design of the platform (estimated at 600mm thick if constructed without reinforcement), should be made in tender packages and site programmes.

10.4 EXCAVATION CONDITIONS

Excavation of the materials encountered during the ground investigation should be easily achieved using conventional hydraulic excavation techniques.

From the ground investigation undertaken, it is likely that excavations will be generally stable in the short term, although some side trench collapse is inevitable particularly in the medium term and in inclement periods. Some materials such as granular soils are liable to collapse without warning. This situation is likely to be exacerbated by water ingress.

Only a few locations encountered granular strata, with groundwater ingresses recorded from as shallow as 1.2m begl (one location only), but generally between 1.8m and 3.2m begl in the southern half of the site. Once excavations are dug, if they are left open for any length of time, water may accumulate (depending on the presence of granular deposits) and stability will be compromised. Where excavations are entirely within clay strata, groundwater ingresses are considered unlikely.

Where required, trench stability should be maintained by providing full support to the side walls, in line with the necessary Temporary Works procedures and Code of Practices.

The observed groundwater conditions suggest that the use of conventional sump pumping would be adequate.

10.5 EXISTING STRUCTURES / SUBSTRUCTURES

At the time of the investigation works, no building structures were present within the site. There has been no previous development of the site.

However, there is an overhead cable, running north west to south east, across the western half of the field.

10.6 FOUNDATIONS

The topsoil or any soft natural strata are considered unsuitable as a bearing stratum and all new foundations should be carried down through them to found on the more competent natural cohesive or granular strata.

The site is mainly underlain at shallow depths by cohesive strata (generally firm to stiff / medium to high strength sandy silty clay). However, in part of the site, granular deposits (medium dense gravelly clayey silty sand) will be present at potential founding depths. A minimum foundation depth of 0.9m (medium volume change potential cohesive strata) will be applicable for this site. However, typical construction thicknesses of 1m below FFL may entail deeper minimum depths.

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Where proposed levels and stress force foundation depths too close to the deeper soft silt bands, then alternative foundations such as rafts or piles may be required due to reduced bearing capacities and increased settlements. Once the proposed layout and site levels are finalised, further investigation is recommended to confirm competency of the silt deposits and proposed foundation types. Foundations deeper than 1.5m begl in the south of the site are most likely to need alternative foundations.

Development proposals for the site comprise low-rise (up to 2 storey) residential properties including detached and semi-detached houses, along with associated infrastructure including access roads. The proposed end use includes private gardens / soft landscaping and areas of public open space. Part of the development area has been set aside for an attenuation pond.

TRENCH FILL

It is considered likely that trench fill foundations, founded within the natural cohesive or granular strata, will be suitable for the proposed residential development. The founding strata are likely to mainly comprise generally firm to stiff sandy silty clay or a limited area of medium dense gravelly clayey silty sand. In general, foundation depths of around 0.9m begl are expected for the vast majority of the development. Foundation depths of up to 1.8m begl in granular strata may be required in part of the site due to unsuitable deposits from shallow depths. Deepening for trees will be required where some plots are located close to the existing hedgerows / trees. See Appendix L for a foundation zone plan.

The natural cohesive soils encountered, at anticipated foundation depths, were generally at least firm (medium strength). It is anticipated that a nett allowable bearing pressure of at least 110kN/m² should be available for conventional strip or trench fill footings. This will allow line loads up to 50kN/m to be taken on footings 450mm wide and 66kN/m on footings 600mm wide. This should result in total settlements of not more than 25mm, keeping differential settlements within acceptable limits.

Although the natural granular soils encountered, at anticipated foundation depths, were generally medium dense, a worst case assumption of submerged conditions (groundwater present) should be considered. Based on this, it is anticipated that a nett allowable bearing pressure of at least 110kN/m² (based on a gravel-sand mixture) should be available for conventional strip or trench fill footings. This will allow line loads up to 50kN/m to be taken on footings 450mm wide and 66kN/m on footings 600mm wide. This should also result in total settlements of not more than 25mm, keeping differential settlements within acceptable limits.

Wider footings may be required for higher point/line loads such as at party walls etc. Should wider footings be required for higher point/line loads, GRM should be contacted for further advice.

The strata are potentially variable (varying between cohesive and granular deposits at likely foundation depths particularly in the southern part of the site) and so an allowance

should be made for the localised use of reinforcement, or the deepening of foundations to consistent strata. If variable strata are encountered within the footing of a single plot and deepening is not appropriate, the use of S2 concrete to mass fill the majority of the foundation and topped by a wet strip of RC35 reinforced concrete containing two layers of B785 mesh is recommended.

Heave precautions will be required where the foundations lie within the heave zone of trees / hedges as defined in NHBC Standards Chapter 4.2. Foundations should be remote from the direct action of tree roots, and should not be constructed so close to trees as to significantly damage their root systems.

Where trees and / or hedges are present within influencing distance of new build structures, the foundations within the zone of influence of these trees / hedges will need to be deepened in line with guidance in NHBC Standards Chapter 4.2. The resultant foundation depths can only be determined by a tree survey and tree influence drawing (as well as proposed site levels and detailed layout drawings).

PILES

Depending on the final development layout and proposed levels, some plots may be located close enough to the existing trees / hedges along the boundaries of the site to require deepened trench fill foundations or even pile foundations.

If pile foundations are required, a piling specialist will need to be approached to provide pile dimensions and safe pile capacities. They are likely to require the provision of cable percussion boreholes to provide information for detailed design (the boreholes would need to be a minimum 5m beyond anticipated pile lengths). Consideration should be given to nearby structures and infrastructure and achieving sufficient penetration to resist heave, when choosing the appropriate pile type.

When piling due to the influence of trees being greater than 2.5m and rock is shallower than 10m, the use of predrilled and / or CFA piles which socket into the rock should be considered. Piles less than 7.5m long are unlikely to be acceptable to the warranting bodies where the potential influence of trees is greater than 2.5m.

Whilst piled foundations would end bear beneath the influence of trees, the piles and ring beams should be designed to resist potential heave, down-drag and negative skin friction.

A testing regime and objectives of the works will need agreeing with regulatory and warranting bodies prior to works. The pile design will need to be justified to the warranting bodies and the justification should be included within the piling contract.

It should be noted that a working platform will be required by the piling contractor.

Pile layouts and ground beams will need to be engineer designed.

10.7 FLOOR SLABS

Shallow strata are likely to become heavily disturbed by construction activities (especially during inclement weather) and in excess of 600mm of unsuitable material could remain below floor slabs following site preparation/regrading. Therefore, at this stage, an allowance should be made for suspended floor slabs across the whole of the site.

A suspended floor system incorporating a sub-floor void, such as beam and block, will be required for all properties where the foundations lie within the heave zone of trees as defined by NHBC Standards in Chapter 4.2, where seasonally desiccated soils are present at the time of construction and if gas protection measures are needed. An allowance for 100% beam and block floor slabs should be made at this stage.

10.8 BURIED CONCRETE

Testing for pH and water soluble sulphate has been undertaken in the natural soils. The results of the water soluble sulphate and pH testing are presented in Appendix H.

Based on the recorded water soluble sulphate and general pH levels in the soils below the site and assuming mobile groundwater conditions (worst case) for the site, in accordance with the 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 trench fill foundations with a width of greater than 450mm, the classifications above equate to a concrete designated as GEN1 in BS8500. However, reinforced foundations should be specified by a designer appropriate for the proposed development.

10.9 SLOPE STABILITY AND RETAINING STRUCTURES

The site is generally flat-lying, and the area surrounding the site is similar. Therefore, there is no significant risk of slope instability occurring on the site at present gradients.

10.10 SOAKAWAY DRAINAGE

The strata encountered during the investigation were considered unlikely to be suitable for soakaway drainage. However, infiltration permeability tests (known as 'Falling Head tests') were undertaken within four of the window sample borehole monitoring installations (WS01-WS04). The testing was carried out in the Bosworth Clay Member strata (sandy silty clay). The gas monitoring plan presented in Appendix F shows the approximate locations of the relevant monitoring installations.

Due to negligible reductions in water levels, the tests could not be completed satisfactorily. Therefore, a valid infiltration rate could not be calculated due to the insufficient testing data.

The granular Wigston Member strata is not suitable for soakaway drainage due to the presence of groundwater.

At this stage, an alternative means of surface water disposal should be investigated.

10.11 NEW ACCESS ROADS

The topsoil and soft natural deposits are considered unsuitable as a sub-grade, with likely CBR values to be less than 2%.

Laboratory testing (remoulded CBR's) was undertaken on two representative samples of the natural cohesive deposits, recovered from shallow depths (0.6m begl) during the site works. Testing of the samples resulted in CBR values of between 3.9% and 7.7%.

Site observations suggest that, when suitably drained, the natural cohesive deposits from shallow depths will have CBR values of around 4% (based on PI test results). However, experience suggests that poorer CBR's are likely during the winter months when moisture contents are typically greater.

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 should be considered.

Further insitu CBR testing immediately prior to road construction, if this is acceptable under the adopting authorities procedures, may allow a more reliable CBR value to be used for design purposes.

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:

- Completion of the gas monitoring programme is to be undertaken and an addendum gas risk assessment letter report will be issued at a later date following the issue of this report.
- Once a detailed development layout is available (along with the completed tree survey report), a budgetary foundation schedule can be produced.
- Additional ground investigation to further assess the soft silt bands, once the development layout and site levels have been finalised to confirm likely foundation types.
- If required, a piling specialist will need to be approached to confirm the appropriate pile type, provide pile dimensions and safe pile capacities.
- If required, cable percussion boreholes will need to be undertaken to provide additional geotechnical information for pile design.
- Insitu CBR testing to be undertaken once proposed site levels are known.
- An arboricultural specialist will be required to conduct a tree survey.
- A flood risk assessment (FRA) is required for this site as it is over 1ha in size.
- Liaison with the Local Water Supply Company to determine the appropriate water supply pipes at the site.

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. A copy should also be sent to the NHBC for their records.

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 is suitable for the proposed development.

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



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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
- BGS online viewer: <http://www.bgs.ac.uk/data/mapViewers/home.html>
- 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 (2015), 'Radon: Guidance on protective measures for new buildings'
- HPA-RPD-033 (2007), 'Indicative Atlas of Radon in England and Wales'
- PHE-CRCE-032 (PHE, 2017), Radon in Homes in England: 2016 Data Report
- CIRIA C665 'Assessing risks posed by hazardous ground gases to buildings'
- BS8485:2015, 'Code of Practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings'
- 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 | · 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.

iii 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 CIRIA Report C665 'Assessing risks posed by hazardous ground gas to buildings' (2007) and BS8576 'Guidance on Investigations for ground gas – Permanent gases and Volatile Organic Compounds (VOCs) (2013).

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

Where flow is not recorded during the monitoring a default flow rate of 0.1l/hr will be used in the assessment to produce a positive result.

vi HUMAN HEALTH RISK ASSESSMENT METHODOLOGY

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Guidance contained in the Environment Agency's CLEA Reports 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 GRM include Category 4 Screening Levels (C4SLs) published by DEFRA, values calculated by GRM using the CLEA v1.071 risk assessment, and values and Suitable for Use Levels (S4UL) developed by LQM/CIEH. The TAC used in the assessment are selected based on the lowest site specific SOM values returned as part of the chemical analysis.

Where soil chemical analysis results are found to exceed the TAC, Site-Specific Risk Assessments may be undertaken using the CLEA v1.071 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 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 1 Screening values.

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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, SITE WASTE MANAGEMENT PLANS AND MATERIAL 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. GRM can assist in the production of Material Management Plans under the CL:AIRE Definition of Waste: Code of Practice. The DoWCoP enables:

- The direct transfer and re-use of clean naturally occurring soil materials between sites, and
- The re-use of both contaminated and uncontaminated materials on their site of origin and between sites within defined Cluster projects.

GRM can also undertake the role of Qualified Person and submit the DoW CoP project Declaration.

Likewise making the site as volume neutral as possible will reduce the costs of development. Whilst not a statutory requirement, 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.

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.

xiii 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.

xiv 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.

xv **GEOTECHNICAL ASSESSMENT – SOAKAWAYS**

Soakaway testing in trial pits by GRM is broadly carried out in accordance with BRE DG 365 (2016). 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.

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- 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.



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www.grm-uk.com | info@grm-uk.com | 01283 551249 Company No. 3099018 (England), VAT Reg. No. 658 1005 48



DO NOT SCALE

NOTES:



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Burton-on-Trent, Staffordshire

Tel: 01283 551 249

info@grm-uk.com www.grm-uk.com

CLIENT:

Davidsons Developments Ltd

PROJECT:

**Stoke Lane,
Stoke Golding**

TITLE:

Proposed Development Layout

SCALE@SIZE:

NTS

ISSUE:

FINAL

DESIGN/DRAWN:

RHC

DATE:

July 2021

PROJECT No:

P9032

DRAWING No:

Figure 1

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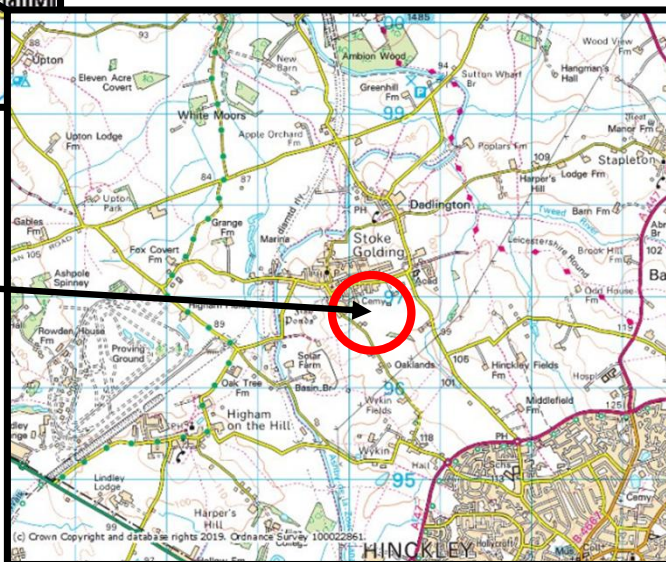
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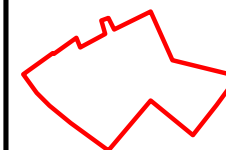


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NOTES:



Approximate site location



Approximate site boundary



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Burton-on-Trent, Staffordshire

Tel: 01283 551 249

info@grm-uk.com www.grm-uk.com

CLIENT:

Davidsons Developments Ltd

PROJECT:

**Stoke Lane,
Stoke Golding**

TITLE:

Site Location and Boundary Plan

SCALE@SIZE:

NTS

ISSUE:

FINAL

DESIGN/DRAWN:

RHC

DATE:

July 2021

PROJECT No:

P9032

DRAWING No:

Figure 2

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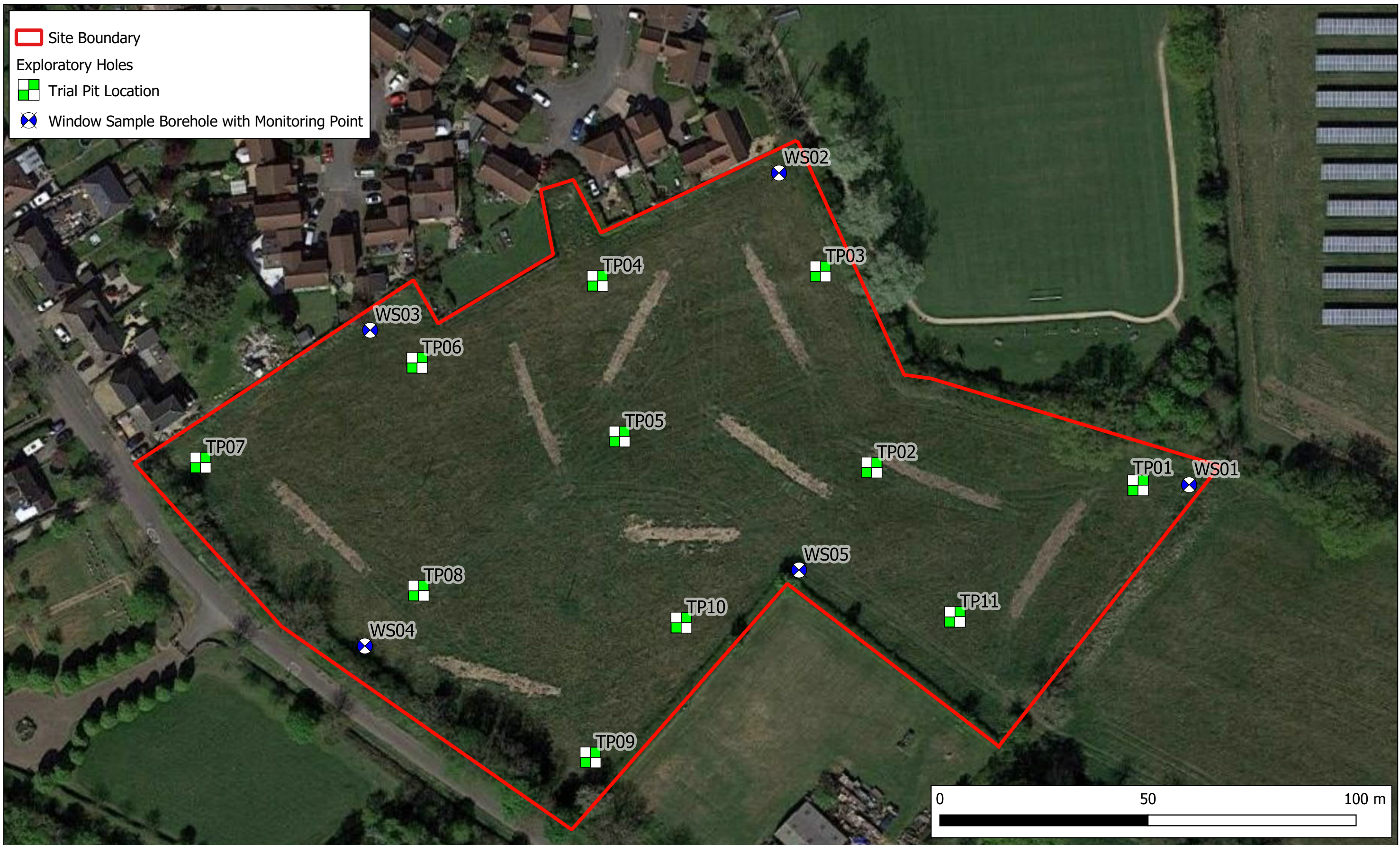
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NOTES:	CLIENT:	DAVIDSONS DEVELOPMENTS LTD	PROJECT No:	P9032	DATE:	JUNE 2021	DESIGN/DRAWN:	AL	 GRM Development Solutions Ltd Tel: 01283 551 249 mail@grm-uk.com www.grm-uk.com	
	PROJECT:	STOKE LANE, STOKE GOLDING	DRAWING NUMBER:	FIGURE 3		ISSUE:				FINAL
	TITLE:	EXPLORATORY HOLE LOCATION PLAN	© GRM Development Solutions Ltd © Crown Copyright. AL 100014100							



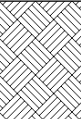
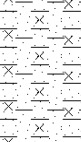
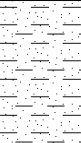
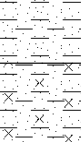
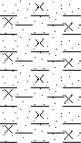
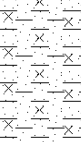
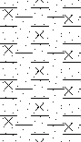
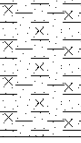
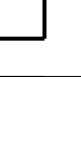
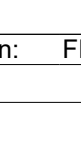
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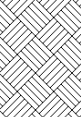
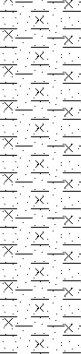
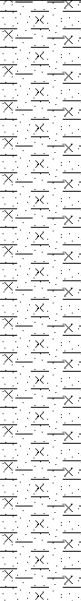
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		GRM Development Solutions Ltd Laurus House, First Avenue, Centrum 100, Burton-on-Trent, DE14 2WH Tel (HQ): 01283 551249 Email: info@grm-uk.com		Trial Pit Log			Trial Pit No TP01 Sheet 1 of 1	
Site Name: Stoke Lane, Stoke Golding							Ground Level (mAOD)	
Client: Davidsons Developments Ltd					GRM Project Ref: P9032		Coordinates 440202 E 296202 N	
Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.10	ES		0.50			Vegetation over brown, slightly gravelly, sandy CLAY. Sand is fine to coarse. Gravel is fine to coarse, sub-rounded of quartzite, sandstone and ironstone. TOPSOIL	1 2 3 4
	0.90 - 1.00	D					Firm, approximately medium strength, reddish brown mottled grey, slightly sandy, silty CLAY with sandy pockets and partings present. Sand is fine to medium. BOSWORTH CLAY MEMBER	
	1.50	D						
	2.70 - 2.80	D		2.80		Firm, approximately medium strength, bluish grey mottled brown, slightly sandy, silty CLAY with sandy partings. BOSWORTH CLAY MEMBER		
	3.50 - 3.60	D		3.70		End of Pit at 3.70m		
Date Excavated: 11/06/2021 Date Backfilled: 11/06/2021 Shoring: None. Stability: Stable at full depth. Plant Used: JCB 3CX. Logged by: AL.				Groundwater Observations: No groundwater encountered.				
				Trial Pit Dimensions (m): 0.80  2.80		Reason for termination of Trial Pit: Target depth achieved.		
General Remarks:								
Relative density is approximate and 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: Stoke Lane, Stoke Golding							Ground Level (mAOD)	
Client: Davidsons Developments Ltd					GRM Project Ref: P9032		Coordinates 440138 E 296810 N	

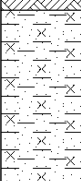
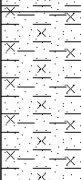
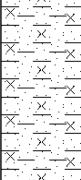
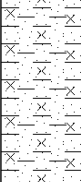
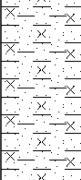
Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.10	ES					Vegetation over brown, slightly gravelly, sandy CLAY. Sand is fine to coarse. Gravel is fine to coarse, sub-angular to sub-rounded of quartzite, mudstone and sandstone. TOPSOIL	
	0.50 - 0.60	B		0.40			Firm, approximately medium strength, reddish brown mottled grey, slightly sandy, silty CLAY with silty and sandy partings. Sand is fine to medium. BOSWORTH CLAY MEMBER	
	1.20	D		0.90			Firm (locally soft), approximately low to medium strength, reddish brown, slightly silty, very sandy CLAY. Sand is fine to medium. BOSWORTH CLAY MEMBER	1
				1.60			Stiff, approximately high strength, bluish grey mottled brown, slightly sandy silty CLAY. Sand is fine to medium. BOSWORTH CLAY MEMBER	2
	2.80 - 2.90	D						3
	3.40	D						
				3.80				
								
								
								
								
								
								

		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: Stoke Lane, Stoke Golding							Ground Level (mAOD)	
Client: Davidsons Developments Ltd					GRM Project Ref: P9032		Coordinates 440126 E 296857 N	

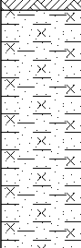
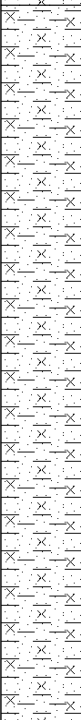
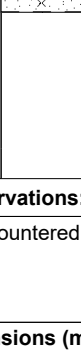
Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.10	ES		0.40			Vegetation over brown, slightly gravelly, sandy CLAY. Sand is fine to coarse. Gravel is fine to medium, sub-angular to sub-rounded of quartzite, ironstone and mudstone. TOPSOIL	
	0.90 - 1.00	D					Firm, approximately medium strength, reddish brown mottled grey, slightly sandy, silty CLAY with sandy and silty partings. Sand is fine to medium. BOSWORTH CLAY MEMBER	1
	2.10 - 2.20	D			1.60		Stiff, approximately high strength, bluish grey mottled brown, slightly sandy, silty CLAY. Sand is fine to medium. BOSWORTH CLAY MEMBER	2
	2.50 - 2.60	D						3
	3.40 - 3.50	D		3.60				4
						End of Pit at 3.60m		

Date Excavated: 11/06/2021		Groundwater Observations:	
Date Backfilled: 11/06/2021		No groundwater encountered.	
Shoring: None.			
Stability: Stable at full depth.			
Plant Used: JCB 3CX.		Reason for termination of Trial Pit:	
Logged by: AL.		Target depth achieved.	
General Remarks:			

Relative density is approximate and determined by observation only.		Version: FINAL	Scale: 1:25
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		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: Stoke Lane, Stoke Golding							Ground Level (mAOD)	
Client: Davidsons Developments Ltd					GRM Project Ref: P9032		Coordinates 440072 E 296885 N	
Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.10	ES					Vegetation over brown, slightly gravelly, sandy CLAY. Sand is fine to coarse. Gravel is fine to coarse, sub-rounded of quartzite, sandstone and ironstone. TOPSOIL	
	0.60	B		0.40			Firm, approximately medium strength, reddish brown, slightly sandy, silty CLAY. Sand is fine to medium. BOSWORTH CLAY MEMBER	
	1.30 - 1.40	D		1.00			Firm, approximately medium strength, bluish grey mottled brown, slightly sandy, silty CLAY with sandy partings. Sand is fine to medium. BOSWORTH CLAY MEMBER	1
	2.50 - 2.60	D						2
	3.30 - 3.40	D						3
				3.80				4
Date Excavated: 11/06/2021 Date Backfilled: 11/06/2021 Shoring: None. Stability: Stable at full depth. Plant Used: JCB 3CX. Logged by: AL.				Groundwater Observations: No groundwater encountered.				
				Trial Pit Dimensions (m): 0.80  2.80		Reason for termination of Trial Pit: Target depth achieved.		
General Remarks:								
Relative density is approximate and determined by observation only.				Version: FINAL			Scale: 1:25	

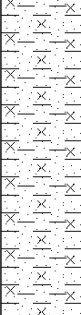
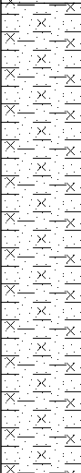
		GRM Development Solutions Ltd Laurus House, First Avenue, Centrum 100, Burton-on-Trent, DE14 2WH Tel (HQ): 01283 551249 Email: info@grm-uk.com		Trial Pit Log			Trial Pit No TP05 Sheet 1 of 1	
Site Name: Stoke Lane, Stoke Golding							Ground Level (mAOD)	
Client: Davidsons Developments Ltd					GRM Project Ref: P9032		Coordinates 440077 E 296818 N	

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.10	ES					Vegetation over brown, slightly gravelly, sandy CLAY. Sand is fine to coarse. Gravel is fine to coarse, angular to sub-rounded of quartzite, ironstone and rare ceramics. TOPSOIL	
	0.60	B		0.40			Firm, approximately medium strength, reddish brown mottled grey, slightly sandy, silty CLAY with sandy and silty partings. Sand is fine to coarse. BOSWORTH CLAY MEMBER	1
	1.50 - 1.60	D		1.20			Firm, approximately medium strength, bluish grey mottled brown, slightly sandy, silty CLAY with sandy partings. Sand is fine to coarse. BOSWORTH CLAY MEMBER	2
	2.60 - 2.70	D						3
	3.50 - 3.60	D		3.60				4
End of Pit at 3.60m								

Date Excavated: 11/06/2021		Groundwater Observations:	
Date Backfilled: 11/06/2021		No groundwater encountered.	
Shoring: None.			
Stability: Stable at full depth.			
Plant Used: JCB 3CX.		Reason for termination of Trial Pit:	
Logged by: AL.		Target depth achieved.	
General Remarks:			

Relative density is approximate and determined by observation only.		Version: FINAL	Scale: 1:25
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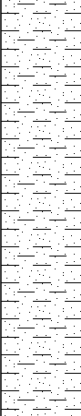
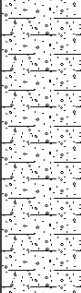
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Site Name: Stoke Lane, Stoke Golding							Ground Level (mAOD)	
Client: Davidsons Developments Ltd					GRM Project Ref: P9032		Coordinates 440029 E 296836 N	

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
▼	0.10	ES		0.50			Vegetation over brown, slightly gravelly, sandy CLAY. Sand is fine to coarse. Gravel is fine to coarse, angular to sub-rounded of quartzite, sandstone, and rare brick. TOPSOIL	1
	0.60 - 0.70	D					Firm, approximately medium strength, reddish brown mottled grey, slightly sandy silty CLAY. Sand is fine to medium. BOSWORTH CLAY MEMBER	
	2.20 - 2.30	D		1.60			Stiff, approximately high strength, bluish grey mottled brown, slightly sandy, silty CLAY with partings and pockets of reddish brown silty sand. Sand is fine to medium. BOSWORTH CLAY MEMBER	2
				3.20			Firm (locally soft), approximately low to medium strength, reddish brown sandy SILT. Sand is fine to medium. Damp. BOSWORTH CLAY MEMBER	3
	3.50 - 3.60	D		3.90			End of Pit at 3.90m	4

Date Excavated: 11/06/2021		Groundwater Observations:	
Date Backfilled: 11/06/2021		Groundwater encountered as damp natural strata below 3.2m begl.	
Shoring: None.			
Stability: Stable at full depth.			
Plant Used: JCB 3CX.		Reason for termination of Trial Pit:	
Logged by: AL.		Target depth achieved.	
General Remarks:			

Relative density is approximate and determined by observation only.		Version: FINAL		Scale: 1:25	
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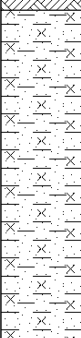
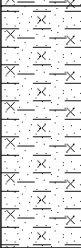
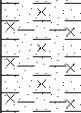
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Site Name: Stoke Lane, Stoke Golding							Ground Level (mAOD)	
Client: Davidsons Developments Ltd					GRM Project Ref: P9032		Coordinates 439977 E 296812 N	

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.10	ES		0.40			Vegetation over brown, slightly gravelly, sandy CLAY. Sand is fine to coarse. Gravel is fine to medium of quartzite and sandstone. TOPSOIL	
	0.60 0.60 0.70	D ES B					Firm (locally soft), approximately low to medium strength, orange brown, slightly gravelly, very sandy CLAY. Sand is fine to coarse. Gravel is fine to coarse, sub-rounded to rounded of quartzite. Damp. WIGSTON MEMBER	1
				1.80			Medium dense, orange brown, slightly clayey, gravelly fine to coarse SAND. Gravel is fine to coarse, sub-rounded to rounded of quartzite. WIGSTON MEMBER	2
	2.80	D		2.80			End of Pit at 2.80m	3
								4

Date Excavated: 11/06/2021		Groundwater Observations:	
Date Backfilled: 11/06/2021		Groundwater encountered at 1.8m begl.	
Shoring: None.			
Stability: Unstable within granular strata.			
Plant Used: JCB 3CX.		Reason for termination of Trial Pit:	
Logged by: AL.		Terminated at 2.8m begl due to sidewall collapse.	
General Remarks:			

Relative density is approximate and determined by observation only.	Version: FINAL	Scale: 1:25
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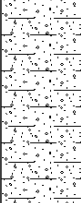
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Site Name: Stoke Lane, Stoke Golding							Ground Level (mAOD)	
Client: Davidsons Developments Ltd					GRM Project Ref: P9032		Coordinates 440029 E 296781 N	

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
 	0.10	ES		0.40			Vegetation over brown, slightly gravelly, sandy CLAY. Sand is fine to coarse. Gravel is fine to coarse, sub-angular to sub-rounded of quartzite, ironstone and mudstone. TOPSOIL	1 2 3 4
	0.60 - 0.70	D					Firm, approximately medium strength, reddish brown mottled grey, slightly sandy, silty CLAY. Sand is fine to medium. BOSWORTH CLAY MEMBER	
	1.90 - 2.00	D		1.50			Stiff, approximately high strength, bluish grey mottled brown, slightly sandy, silty CLAY. Sand is fine to medium. BOSWORTH CLAY MEMBER	
	2.40 - 2.50	D		2.30			Soft, approximately low strength, reddish brown slightly sandy SILT. Sand is fine. Damp. BOSWORTH CLAY MEMBER	
	3.60 - 3.70	D		2.80			Stiff, approximately high strength, bluish grey mottled brown, slightly sandy, silty CLAY. Sand is fine to medium. BOSWORTH CLAY MEMBER	
				3.20			Soft, approximately low strength, reddish brown slightly sandy SILT. Sand is fine. Wet. BOSWORTH CLAY MEMBER	
	3.90				End of Pit at 3.90m			

Date Excavated: 11/06/2021		Groundwater Observations:	
Date Backfilled: 11/06/2021		Damp natural strata encountered between 2.3m and 2.8m begl. Groundwater encountered below 3.2m begl.	
Shoring: None.		Trial Pit Dimensions (m): 0.80  2.80 Reason for termination of Trial Pit: Target depth achieved.	
Stability: Stable at full depth.			
Plant Used: JCB 3CX.			
Logged by: AL.			
General Remarks:			

Relative density is approximate and determined by observation only.	Version: FINAL	Scale: 1:25
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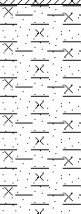
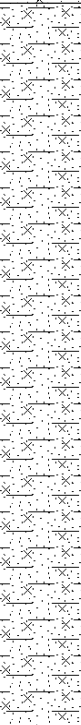
		GRM Development Solutions Ltd Laurus House, First Avenue, Centrum 100, Burton-on-Trent, DE14 2WH Tel (HQ): 01283 551249 Email: info@grm-uk.com		Trial Pit Log			Trial Pit No TP09 Sheet 1 of 1	
Site Name: Stoke Lane, Stoke Golding							Ground Level (mAOD)	
Client: Davidsons Developments Ltd					GRM Project Ref: P9032		Coordinates 440070 E 296741 N	

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.10	ES		0.40			Vegetation over brown, slightly gravelly, sandy CLAY. Sand is fine to coarse. Gravel is fine to coarse, sub-rounded of quartzite. TOPSOIL	
	0.50 - 0.60 0.50 - 0.60	B D						
	2.20 - 2.30	D		1.80			Medium dense, orange brown, slightly gravelly, clayey fine to coarse SAND. Gravel is fine to coarse, sub-rounded to rounded of quartzite. WIGSTON MEMBER	
				2.50		End of Pit at 2.50m		

Date Excavated: 11/06/2021		Groundwater Observations:	
Date Backfilled: 11/06/2021		Groundwater encountered at 1.8m begl.	
Shoring: None.		Trial Pit Dimensions (m): 0.80 3.20	
Stability: Unstable with wet granular strata.			
Plant Used: JCB 3CX.		Reason for termination of Trial Pit:	
Logged by: AL.		Terminated at 2.5m begl due to sidewall collapse.	
General Remarks:			

Relative density is approximate and determined by observation only.	Version: FINAL	Scale: 1:25
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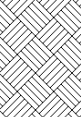
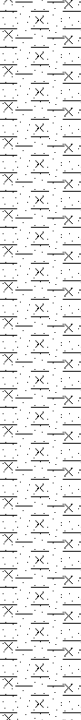
		GRM Development Solutions Ltd Laurus House, First Avenue, Centrum 100, Burton-on-Trent, DE14 2WH Tel (HQ): 01283 551249 Email: info@grm-uk.com		Trial Pit Log			Trial Pit No TP10 Sheet 1 of 1	
Site Name: Stoke Lane, Stoke Golding							Ground Level (mAOD)	
Client: Davidsons Developments Ltd					GRM Project Ref: P9032		Coordinates 440092 E 296773 N	

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.10	ES					Vegetation over brown, slightly gravelly, sandy CLAY. Sand is fine to coarse. Gravel is fine to coarse, sub-angular to sub-rounded of quartzite, brick and sandstone. TOPSOIL	
	0.50 - 0.60	D		0.50			Firm, approximately medium strength, reddish brown mottled grey, slightly sandy, silty CLAY with sandy partings. Sand is fine to medium. BOSWORTH CLAY MEMBER	1
	1.60 - 1.70	D		1.20			Medium dense, orange brown, silty, fine to medium SAND. Damp. WIGSTON MEMBER	2
	2.80 - 2.90	D		3.60			End of Pit at 3.60m	3
								4

Date Excavated: 11/06/2021		Groundwater Observations:	
Date Backfilled: 11/06/2021		Groundwater encountered at 2.2m begl.	
Shoring: None.			
Stability: Stable at full depth.			
Plant Used: JCB 3CX.		Reason for termination of Trial Pit:	
Logged by: AL.		Target depth achieved.	

General Remarks:	
Relative density is approximate and 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 TP11 Sheet 1 of 1	
Site Name: Stoke Lane, Stoke Golding							Ground Level (mAOD)	
Client: Davidsons Developments Ltd					GRM Project Ref: P9032		Coordinates 440158 E 296774 N	

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.10	ES		0.40			Vegetation over brown, slightly gravelly, sandy CLAY. Sand is fine to coarse. Gravel is fine to coarse, sub-angular to sub-rounded of quartzite, ironstone and mudstone. TOPSOIL	
	0.50 - 0.60	D					Firm, approximately medium strength, reddish brown mottled grey, slightly sandy, silty CLAY with sandy partings. Sand is fine to medium. BOSWORTH CLAY MEMBER	1
	1.30 - 1.40	D						2
	2.20 - 2.30	D						
				2.80			Firm (locally soft), approximately low to medium strength, reddish brown, slightly sandy, SILT. Sand is fine to medium. Damp. BOSWORTH CLAY MEMBER	3
	3.00 - 3.10	D		3.60			End of Pit at 3.60m	4

Date Excavated: 11/06/2021		Groundwater Observations:	
Date Backfilled: 11/06/2021		No groundwater encountered.	
Shoring: None.			
Stability: Stable at full depth.			
Plant Used: JCB 3CX.		Reason for termination of Trial Pit:	
Logged by: AL.		Target depth achieved.	
General Remarks:			

Relative density is approximate and determined by observation only.		Version: FINAL		Scale: 1:25	
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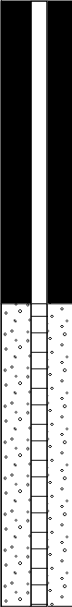
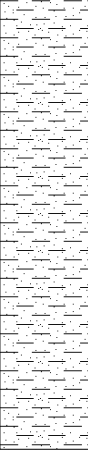
		GRM Development Solutions Ltd Laurus House, First Avenue, Centrum 100, Burton-on-Trent, DE14 2WH Tel (HQ): 01283 551249 Email: info@grm-uk.com		Windowless Sample Borehole			Borehole No WS01 Sheet 1 of 1	
Site Name: Stoke Lane, Stoke Golding							Ground Level (mAOD)	
Client: Davidsons Developments Ltd					GRM Project Ref: P9032		Coordinates 440214 E 296806 N	

Installation/ Backfill	Water Strike	Samples/Tests			Dynamic Probing (Blows per 100mm)	Depth (m)	Level (m)	Legend	Stratum Description	
		Depth	Type	Result						
									Vegetation over brown, slightly gravelly, sandy CLAY. Sand is fine to coarse. Gravel is fine to coarse, sub-rounded of quartzite, sandstone and ironstone. TOPSOIL	
		0.80	D						Firm, approximately medium strength, reddish brown mottled grey, slightly sandy, silty CLAY with sandy pockets partings present. Sand is fine to medium. BOSWORTH CLAY MEMBER	1
		1.50	D							
						1.60			End of Borehole at 1.600m	2
										3
										4

Crew: GRM.		Logger: AL.		Weather: Sunny, dry	
Equipment: Hand-held Sampler.					
Reason for termination of borehole:		Refused on stiff clay at 1.6m begl.			
Groundwater Remarks: No groundwater encountered.					
General Remarks:					

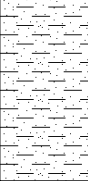
Hole Started:	11/06/2021	Hole Complete:	11/06/2021	Version:	FINAL	Scale:	1:25
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		GRM Development Solutions Ltd Laurus House, First Avenue, Centrum 100, Burton-on-Trent, DE14 2WH Tel (HQ): 01283 551249 Email: info@grm-uk.com		Windowless Sample Borehole			Borehole No WS02 Sheet 1 of 1	
Site Name: Stoke Lane, Stoke Golding							Ground Level (mAOD)	
Client: Davidsons Developments Ltd					GRM Project Ref: P9032		Coordinates 440116 E 296881 N	

Installation/ Backfill	Water Strike	Samples/Tests			Dynamic Probing (Blows per 100mm)	Depth (m)	Level (m)	Legend	Stratum Description	
		Depth	Type	Result						
		0.80	D			0.50			Vegetation over brown, slightly gravelly, sandy CLAY. Sand is fine to coarse. Gravel is fine to medium, sub-angular to sub-rounded of quartzite, ironstone and mudstone. TOPSOIL	1
		1.50	D					Firm, approximately medium strength, reddish brown, mottled grey, slightly sandy, silty CLAY with sandy partings. Sand is fine to medium. BOSWORTH CLAY MEMBER		
								2.00		End of Borehole at 2.000m
										3
										4

Crew: GRM.			Logger: AL.			Weather: Sunny, dry		
Equipment: Hand-held Sampler.								
Reason for termination of borehole: Design depth achieved.								
Groundwater Remarks: No groundwater encountered.								
General Remarks:								
Hole Started: 11/06/2021		Hole Complete: 11/06/2021		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: Stoke Lane, Stoke Golding							Ground Level (mAOD)	
Client: Davidsons Developments Ltd					GRM Project Ref: P9032		Coordinates 440017 E 296843 N	

Installation/ Backfill	Water Strike	Samples/Tests			Dynamic Probing (Blows per 100mm)	Depth (m)	Level (m)	Legend	Stratum Description	
		Depth	Type	Result						
		0.50	D			0.40			Vegetation over brown, slightly gravelly, sandy CLAY. Sand is fine to coarse. Gravel is fine to coarse, angular to sub-rounded of quartzite, sandstone, and rare brick. TOPSOIL	
						1.00			Firm, approximately medium strength, reddish brown mottled grey, slightly sandy silty CLAY. Sand is fine to medium. BOSWORTH CLAY MEMBER	
									End of Borehole at 1.000m	1
										2
										3
										4

Crew: GRM.		Logger: AL.		Weather: Sunny, dry.	
Equipment: Hand-held Sampler.					
Reason for termination of borehole:		Refused on stiff clay at 1.0m begl.			
Groundwater Remarks: No groundwater encountered.					
General Remarks:					
Hole Started:	11/06/2021	Hole Complete:	11/06/2021	Version:	FINAL
				Scale:	1:25

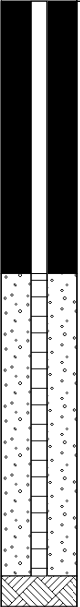
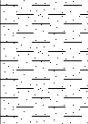
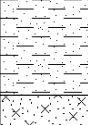
		GRM Development Solutions Ltd Laurus House, First Avenue, Centrum 100, Burton-on-Trent, DE14 2WH Tel (HQ): 01283 551249 Email: info@grm-uk.com		Windowless Sample Borehole				Borehole No WS04 Sheet 1 of 1	
Site Name: Stoke Lane, Stoke Golding								Ground Level (mAOD)	
Client: Davidsons Developments Ltd						GRM Project Ref: P9032		Coordinates 440016 E 296767 N	

Installation/ Backfill	Water Strike	Samples/Tests			Dynamic Probing (Blows per 100mm)	Depth (m)	Level (m)	Legend	Stratum Description	
		Depth	Type	Result						
									Vegetation over brown, slightly gravelly, sandy CLAY. Sand is fine to coarse. Gravel is fine to medium, sub-angular to sub-rounded of quartzite, ironstone and mudstone. TOPSOIL	
		0.80	D			0.40			Firm, approximately medium strength, reddish brown mottled grey, slightly sandy silty CLAY. Sand is fine to medium. BOSWORTH CLAY MEMBER	1
		1.30	D			1.40			End of Borehole at 1.400m	2
										3
										4

Crew: GRM.		Logger: AL.		Weather: Sunny, dry.	
Equipment: Hand-held Sampler.					
Reason for termination of borehole:		Refused on stiff clay at 1.4m begl.			
Groundwater Remarks: No groundwater encountered.					
General Remarks:					

Hole Started:	11/06/2021	Hole Complete:	11/06/2021	Version:	FINAL	Scale:	1:25
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		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: Stoke Lane, Stoke Golding							Ground Level (mAOD)	
Client: Davidsons Developments Ltd					GRM Project Ref: P9032		Coordinates 296786 E 440120 N	

Installation/ Backfill	Water Strike	Samples/Tests			Dynamic Probing (Blows per 100mm)	Depth (m)	Level (m)	Legend	Stratum Description	
		Depth	Type	Result						
		0.50	D			0.40		 Vegetation over brown, slightly gravelly, sandy CLAY. Sand is fine to coarse. Gravel is fine to medium, sub-angular to sub-rounded of quartzite, ironstone and mudstone. TOPSOIL	1	
								 Firm, approximately medium strength, reddish brown mottled grey, slightly sandy silty CLAY. Sand is fine to medium. BOSWORTH CLAY MEMBER		
		1.50	D			1.20		 Medium dense, orange brown, silty, fine to medium SAND. Damp. WIGSTON MEMBER		
						2.00		End of Borehole at 2.000m	2	
									3	
									4	

Crew: GRM.		Logger: AL.		Weather: Sunny, dry.	
Equipment: Hand-held Sampler.					
Reason for termination of borehole: Design depth achieved.					
Groundwater Remarks: Damp natural strata encountered at 1.2m begl.					
General Remarks: Slight collapse within bottom of hole - installation pipe stopped a 1.9m begl.					
Hole Started: 11/06/2021		Hole Complete: 11/06/2021		Version: FINAL	
				Scale: 1:25	



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GRM Development Solutions Limited, Laurus House, First Avenue, Centrum 100, Burton upon Trent, Staffs DE14 2WH
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In-Situ Gas Monitoring Results

Project Name	Stoke Lane, Stoke Golding
Project Number	P9032
Client	Davidsons Developments Ltd
Date	21/06/2021
Weather	Cloudy
Atmospheric Pressure (mb)	1013
Pressure Trend	Steady
Equipment	Gas Data LMSXi
Operator	James Wardle

Ground Gas													
Well ID	Response Zone			Methane		CO2		Oxygen		Gas Flow		PID Reading	
	mbegl			%v/v		%v/v		%v/v		l/h		ppm	
ID	Top	Base	Strata	Peak	Steady	Peak	Steady	Low	Steady	Peak	Steady	Peak	Steady
WS1	1.00	1.60	NS	0.00	0.00	1.30	1.30	20.00	20.00	0.00	0.00	Not Recorded	
WS2	1.00	2.00	NS	0.00	0.00	0.90	0.90	19.90	19.90	0.00	0.00	Not Recorded	
WS3	0.50	1.00	NS	0.00	0.00	1.20	1.20	19.80	19.80	0.00	0.00	Not Recorded	
WS4	0.50	1.50	NS	0.00	0.00	1.30	1.30	19.50	19.50	0.00	0.00	Not Recorded	
WS5	1.00	2.00	NS	0.00	0.00	0.40	0.40	20.20	20.20	0.00	0.00	Not Recorded	

Groundwater	
Depth to Groundwater	Total Well Depth
mbegl	mbegl
Not Detected	1.55
1.30	1.98
Not Detected	0.90
Not Detected	1.46
0.54	1.79

Notes

L.E.L.	Lower Explosive Limit (100% L.E.L.= 5% Flammable Gas)
N.D.	Not Detected
N.R.	Not Recorded
PID	Photo-Ionising Detector
%	By volume

Ground Material Key

NS	Natural Strata
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Key

	Response Zone Flooded
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In-Situ Gas Monitoring Results

Project Name	Stoke Lane, Stoke Golding
Project Number	P9032
Client	Davidsons Developments Ltd
Date	08/07/2021
Weather	Partly Sunny
Atmospheric Pressure (mb)	1006
Pressure Trend	Steady
Equipment	Gas Data LMSXi
Operator	James Wardle

Ground Gas													
Well ID	Response Zone			Methane		CO2		Oxygen		Gas Flow		PID Reading	
	mbegl			%v/v		%v/v		%v/v		l/h		ppm	
ID	Top	Base	Strata	Peak	Steady	Peak	Steady	Low	Steady	Peak	Steady	Peak	Steady
WS1	1.00	1.60	NS	0.00	0.00	1.60	1.60	19.60	19.60	0.00	0.00	Not Recorded	
WS2	1.00	2.00	NS	0.00	0.00	1.40	1.40	19.50	19.50	0.00	0.00	Not Recorded	
WS3	0.50	1.00	NS	0.00	0.00	1.60	1.60	19.80	19.80	0.00	0.00	Not Recorded	
WS4	0.50	1.50	NS	0.00	0.00	1.90	1.90	19.00	19.00	0.00	0.00	Not Recorded	
WS5	1.00	2.00	NS	0.00	0.00	0.60	0.60	20.80	20.80	0.00	0.00	Not Recorded	

Groundwater	
Depth to Groundwater	Total Well Depth
mbegl	mbegl
Not Detected	1.50
1.26	2.00
Not Detected	0.90
Not Detected	1.50
0.56	1.80

Notes

L.E.L.	Lower Explosive Limit (100% L.E.L.= 5% Flammable Gas)
N.D.	Not Detected
N.R.	Not Recorded
PID	Photo-Ionising Detector
%	By volume

Ground Material Key

NS	Natural Strata
----	----------------

Key

	Response Zone Flooded
--	-----------------------



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

GRM Development Solutions

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

Analytical Test Report: L21/01937/GRM - 21-19044

Your Project Reference: **P9032 Stoke Lane Stoke Golding**

Your Order Number: P9032 Samples Received / Instructed: 15/06/2021 / 15/06/2021

Report Issue Number: 1 Sample Tested: 15/06 to 23/06/2021

Samples Analysed: 9 soil samples Report issued: 23/06/2021

Signed

Peter Swanston

Environmental Labs Manager
Nicholls Colton Group

Notes:

General

Please refer to Methodologies page 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.

Where specification limits are included these are for guidance only. Where a measured value has been highlighted this is not implying acceptance or failure and certainty of measurement values have not been taken into account.

Uncertainty of measurement values are available on request.

Samples were supplied by customer, results apply to the samples as received.

Deviating Samples

On receipt samples are compared against our sample holding and handling protocols, where any deviations have been noted these are reported on our deviating sample page (if present)

Accreditation Key

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

MCERTS Accreditation only covers the SAND, CLAY and LOAM matrices

Date of Issue 10/12/2020

Owned by Emily Blissett - Customer Services Supervisor

Authorised by James Gane - Commercial Manager

J:\Public\Projects\2021\L21\GRM - GRM\L21-1937-GRM P9032\L21-01937-GRM - 21-19044.XLSX\Cover Sheet

L21/01937/GRM - 21-19044

Project Reference - P9032 Stoke Lane Stoke Golding

Analytical Test Results - Soil

NC Reference			173004	173005	173006	173007	173008
Client Sample ID			TP01	TP03	TP06	TP08	TP10
Client Sample Location			-	-	-	-	-
Client Sample Type			-	-	-	-	-
Client Sample Number			-	-	-	-	-
Depth - Top (m)			0.10	0.10	0.10	0.10	0.10
Depth - Bottom (m)			0.10	0.10	0.10	0.10	0.10
Date of Sampling			11/06/2021	11/06/2021	11/06/2021	11/06/2021	11/06/2021
Time of Sampling			-	-	-	-	-
Sample Matrix			Clay	Clay	Clay	Clay	Clay
Determinant	Units	Accreditation					
Arsenic	(mg/kg)	MCERTS	< 10	< 10	< 10	< 10	< 10
Cadmium	(mg/kg)	MCERTS	0.7	0.6	0.6	0.6	0.5
Chromium (Total)	(mg/kg)	UKAS	31	24	23	22	18
Copper	(mg/kg)	MCERTS	18	18	25	19	14
Lead	(mg/kg)	MCERTS	37	30	50	36	25
Mercury	(mg/kg)	UKAS	< 2.5	< 2.5	< 2.5	< 2.5	< 2.5
Nickel	(mg/kg)	MCERTS	23	26	24	22	15
Selenium	(mg/kg)	u	< 8.0	< 8.0	< 8.0	< 8.0	< 8.0
Zinc	(mg/kg)	MCERTS	83	62	74	63	56
Total Phenols	(mg/kg)	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Cyanide (Total)	(mg/kg)	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Chromium (Hexavalent)	(mg/kg)	u	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
pH	pH Units	MCERTS	7.5	7.3	7.1	7.0	6.7
Sulphate (Water soluble)	(mg/l)	u	< 10	< 10	< 10	< 10	< 10
Acenaphthene	(mg/kg)	MCERTS	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Acenaphthylene	(mg/kg)	UKAS	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Anthracene	(mg/kg)	UKAS	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Benzo (a) anthracene	(mg/kg)	MCERTS	0.03	0.07	< 0.02	0.03	< 0.02
Benzo (a) pyrene	(mg/kg)	MCERTS	0.04	0.06	< 0.02	0.03	< 0.02
Benzo (b) fluoranthene	(mg/kg)	MCERTS	0.05	0.09	< 0.02	0.04	< 0.02
Benzo (g, h, i) perylene	(mg/kg)	MCERTS	0.03	0.05	< 0.02	0.03	< 0.02
Benzo (k) fluoranthene	(mg/kg)	MCERTS	< 0.02	0.03	< 0.02	< 0.02	< 0.02
Chrysene	(mg/kg)	MCERTS	0.04	0.09	< 0.02	0.03	< 0.02
Dibenzo (a,h) anthracene	(mg/kg)	MCERTS	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Fluoranthene	(mg/kg)	MCERTS	0.05	0.17	< 0.02	0.05	< 0.02
Fluorene	(mg/kg)	MCERTS	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Indeno (1, 2, 3-cd) pyrene	(mg/kg)	MCERTS	0.03	0.04	< 0.02	0.02	< 0.02
Naphthalene	(mg/kg)	MCERTS	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Phenanthrene	(mg/kg)	MCERTS	0.02	0.14	< 0.02	< 0.02	< 0.02
Pyrene	(mg/kg)	MCERTS	0.05	0.15	< 0.02	0.04	< 0.02
Total PAH (Sum of USEPA 16)	(mg/kg)	UKAS	0.51	1.0	< 0.32	0.46	< 0.32
SOM (via TOC)	(%)	UKAS	5.0	2.5	3.9	3.3	2.4
Pesticide Screen	(mg/kg)	u	-	Undetected <1mg/kg	-	Undetected <1mg/kg	-

L21/01937/GRM - 21-19044

Project Reference - P9032 Stoke Lane Stoke Golding

Analytical Test Results - Soil Analysis

NC Reference			173009	173010	173011	173012
Client Sample ID			TP01	TP05	TP08	TP09
Client Sample Location			-	-	-	-
Client Sample Type			-	-	-	-
Client Sample Number			-	-	-	-
Depth - Top (m)			0.90	1.50	1.90	2.20
Depth - Bottom (m)			1.00	1.60	2.00	2.30
Date of Sampling			11/06/2021	11/06/2021	11/06/2021	11/06/2021
Time of Sampling			-	-	-	-
Sample Matrix			Clay	Clay	Clay	Sand
Determinant	Units	Accreditation				
Water soluble sulphate	(mg/l)	u	12	330	43	< 10
pH Value	pH Units	MCERTS	8.2	8.1	8.2	7.7

L21/01937/GRM - 21-19044

Project Reference - P9032 Stoke Lane Stoke Golding

Sample Descriptions

NC Reference	Client Sample ID	Client Sample Location	Client Sample Type	Client Sample Number	Description	Moisture Content (%)	Stone Content (%)	Passing 2mm test sieve (%)
173004	TP01	-	-	-	Dark brown slightly silty slightly gravelly sandy clay with rare brick fragments organic matter rootlets	17	0.0	95
173005	TP03	-	-	-	Dark brown slightly silty slightly gravelly sandy clay with rare brick fragments organic matter rootlets	17	0.0	82
173006	TP06	-	-	-	Dark brown slightly silty slightly gravelly sandy clay with rare brick fragments organic matter rootlets	17	0.0	84
173007	TP08	-	-	-	Brown slightly silty slightly gravelly sandy clay with rare organic matter rootlets	16	0.0	88
173008	TP10	-	-	-	Brown slightly silty slightly gravelly sandy clay with rare organic matter rootlets	12	0.0	90
173009	TP01	-	-	-	Mottled brown grey slightly sandy slightly gravelly silty clay	-	-	100
173010	TP05	-	-	-	Brownish grey slightly sandy silty clay	-	-	100
173011	TP08	-	-	-	Brownish grey slightly sandy silty clay	-	-	100
173012	TP09	-	-	-	Dark orange clayey sand	-	-	100



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7 - 11 Harding Street
Leicester
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L21/01937/GRM - 21-19044

Project Reference - P9032 Stoke Lane Stoke Golding

Sample Comments

NC Reference	Client Sample ID	Client Sample Location	Client Sample Type	Client Sample Number	Comments
173004	TP01	-	-	-	
173005	TP03	-	-	-	
173006	TP06	-	-	-	
173007	TP08	-	-	-	
173008	TP10	-	-	-	
173009	TP01	-	-	-	
173010	TP05	-	-	-	
173011	TP08	-	-	-	
173012	TP09	-	-	-	

L21/01937/GRM - 21-19044

Project Reference - P9032 Stoke Lane Stoke Golding

Analysis Methodologies

Test Code	Test Name / Reference	Sample condition for analysis	Sample Preparation	Test Details
ANIONSS	MS - CL - Anions by Aquakem (2:1Extract)	Oven dried	Passing 2mm test sieve	Determination of Anions (inc Sulphate, chloride etc.) in soils by Aquakem. Analysis is based on a 2:1 water to soil extraction ratio
PAHASRDS	MS - CL - PAH (As Received)	As received	Passing 10mm test sieve	Determination of Polyaromatic hydrocarbons in soil via GC-MS
TOCS	MS - CL - TOC Eltra	Air Dried	Passing 10mm test sieve	Determination of Total Organic Carbon in soils
SKALARCNS	MS - CL - Cyanide by Skalar	As received	Passing 10mm test sieve	Determination of cyanide (total / free / complex) in soil using a Skalar segmented flow analyser
SKALARHCS	MS - CL - Hexavalent Chromium by Skalar	As received	Passing 10mm test sieve	Determination of hexavalent chromium in soil using Skalar segmented flow analyser
ICPMETS	MS - CL - ICP Metals	Air dried	Passing 10mm test sieve	Determination of metals in soils via ICP
PHS	MS - CL - pH in Soils	As received	Passing 10mm test sieve	Determination of pH in soils using a pH probe (using a 1:3 soil to water extraction)
PESTS	MS - CL - Pesticides	As received	Passing 10mm test sieve	Determination of pesticides in soils via GC-MS
SKALARPHS	MS - CL - Phenols by Skalar	As received	Passing 10mm test sieve	Determination of total phenols in soil using Skalar segmented flow analyser
SAMPLEPREP	MS - CL - Sample Preparation	-	-	Preparation of samples (including determination of moisture content) to allow for subsequent analysis



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GRM Development Solutions

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

Analytical Test Report: L21/01937/GRM - 21-19045

Your Project Reference:	P9032 Stoke Lane Stoke Golding	Samples Received on:	15/06/2021
Your Order Number:	P9032	Testing Instruction Received:	15/06/2021
Report Issue Number:	1	Sample Tested:	15/06 to 23/06/2021
Samples Analysed:	10 soil samples	Report issued:	23/06/2021

Signed

Rob McGoff
GCM Assistant Lab Manager
Nicholls Colton Group

Notes:

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

The results included within the report are representative of the samples submitted for analysis.

A certificate of sampling was not supplied.

Samples were supplied by customer, results apply to the samples as received.

1377 Plasticity Index

Sample preparation was in accordance with BS1377:Part 1:2016.

Testing was in accordance with BS1377:Part 2:1990

1377 Moisture Content

Sample preparation was in accordance with BS1377:Part 1:2016.

Moisture content testing was in accordance with BS1377 : Part 2 :1990

Accreditation Key

UKAS = UKAS Accreditation, u = Unaccredited

Date of Issue 10/12/2020

Owned by Emily Blissett - Commercial Reporting Supervisor

Authorised by Lee Harbottle - GCM Operations Manager

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L21/01937/GRM - 21-19045

Project Reference - P9032 Stoke Lane Stoke Golding

Analytical Test Results - Soil

NC Reference			173013	173014	173015	173017	173019	173030
Client Sample ID			TP01	TP02	TP03	TP04	TP05	TP06
Depth - Top (m)			0.90	1.20	0.90	2.50	1.50	0.60
Depth - Bottom (m)			1.00	1.20	1.00	2.60	1.60	0.70
Date of Sampling			11/06/2021	11/06/2021	11/06/2021	11/06/2021	11/06/2021	11/06/2021
Sample type			Disturbed	Disturbed	Disturbed	Disturbed	Disturbed	Disturbed
Sample Description			Brown slightly gravelly silty clay	Brown clayey silt	Brown silty clay	Brown silty clay	Brown silty clay	Brown silty clay
Determinant	Specification	Units						
Moisture Content		(%)	17	28	24	24	24	21
Moisture Content Prep		-	3.2.3.2 (medium)	3.2.3.1 (fine)	3.2.3.2 (medium)	3.2.3.1 (fine)	3.2.3.1 (fine)	3.2.3.1 (fine)
Fines passing 425µm test sieve		(%)	93	100	100	100	100	100
Liquid Limit		(%)	47	28	59	46	58	50
Plastic Limit		(%)	21	Non Plastic	23	22	21	22
Plasticity Index		(%)	26	Non Plastic	36	24	37	28
PI preparation		-	from its natural state	from its natural state	from its natural state	from its natural state	from its natural state	from its natural state
PI Test Method			clause 4.4 (one point)	clause 4.4 (one point)	clause 4.4 (one point)	clause 4.4 (one point)	clause 4.4 (one point)	clause 4.4 (one point)



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L21/01937/GRM - 21-19045

Project Reference - P9032 Stoke Lane Stoke Gold

Analytical Test Results - Soil

NC Reference			173031	173032
Client Sample ID			TP08	TP10
Depth - Top (m)			1.90	0.50
Depth - Bottom (m)			2.00	0.60
Date of Sampling			11/06/2021	11/06/2021
Sample type			Disturbed	Disturbed
Sample Description			Brown silty clay	Brown silty clay
Determinant	Specification	Units		
Moisture Content		(%)	25	24
Moisture Content Prep		-	3.2.3.1 (fine)	3.2.3.1 (fine)
Fines passing 425µm test sieve		(%)	100	100
Liquid Limit		(%)	54	33
Plastic Limit		(%)	23	18
Plasticity Index		(%)	31	15
PI preparation		-	from its natural state	from its natural state
PI Test Method			clause 4.4 (one point)	clause 4.4 (one point)



L21/01937/GRM - 21-19045

Project Reference - P9032 Stoke Lane Stoke Golding

Test Result - BS 1377 Laboratory CBR value

NC Reference

173016

Client Sample ID TP04 Depth (Top) (m) 0.60

Client Sample Location - Depth - Bottom (m) 0.60

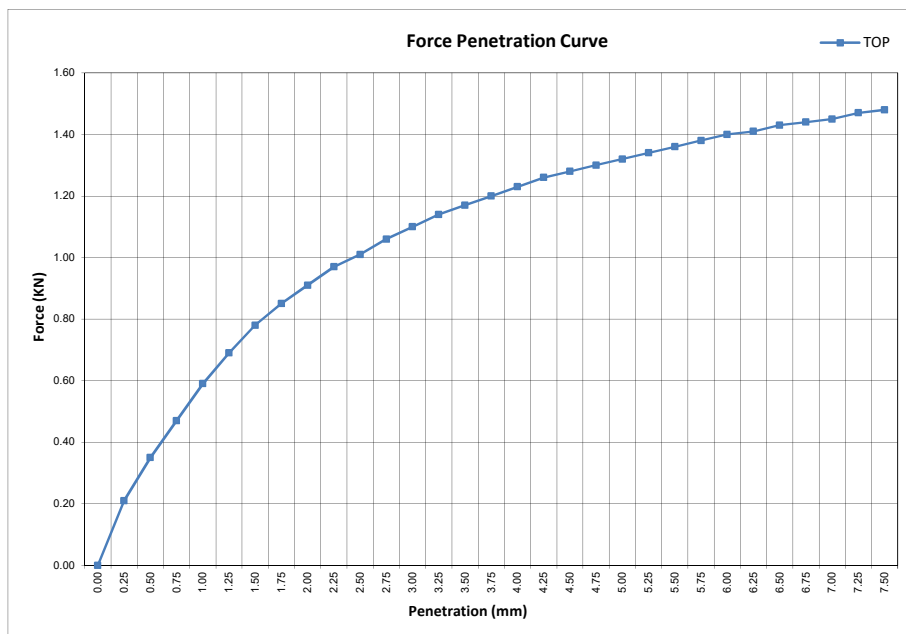
Visual description : Brown slightly gravelly silty clay

Sample type: Disturbed

Initial Bulk Density (Mg/m³) : 2.02 Initial Dry Density (Mg/m³) : 1.66

Material retained on 20mm test sieve (%) : 0 Moisture content after test (%) : 22

California Bearing Ratio (%) : 7.7



NOTES :

1. Testing was in accordance with BS 1377 : Part 4 : 1990 : Clause 7.
2. Sample preparation was in accordance with d.7.2.4.4 method 5 - 2.5Kg rammer
3. The test specimen was not soaked prior to testing



L21/01937/GRM - 21-19045

Project Reference - P9032 Stoke Lane Stoke Golding

Test Result - BS 1377 Laboratory CBR value

NC Reference

173018

Client Sample ID TP05 Depth (Top) (m) 0.60

Client Sample Location - Depth - Bottom (m) 0.60

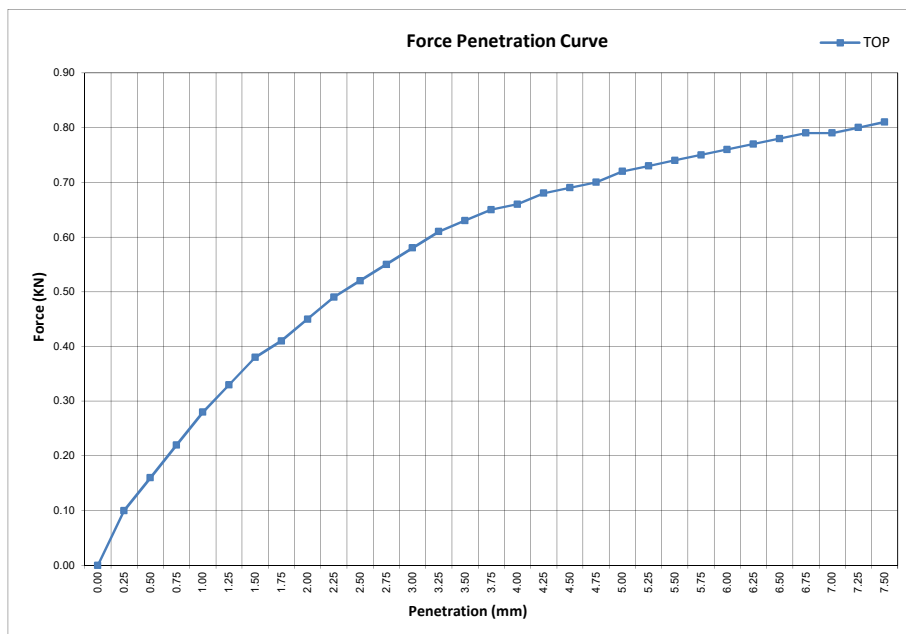
Visual description : Brown slightly gravelly clay with occasional roots

Sample type: Disturbed

Initial Bulk Density (Mg/m3) : 1.95 Initial Dry Density (Mg/m3) : 1.54

Material retained on 20mm test sieve (%) : 0 Moisture content after test (%) : 27

California Bearing Ratio (%) : 3.9



NOTES :

1. Testing was in accordance with BS 1377 : Part 4 : 1990 : Clause 7.
2. Sample preparation was in accordance with d.7.2.4.4 method 5 - 2.5Kg rammer
3. The test specimen was not soaked prior to testing



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	GRM TIER 1 ASSESSMENT CRITERIA		
LAND USE	Residential with Plant Uptake		
CONTAMINANT	1%	2.50%	6%
^a Arsenic	37	37	37
^a Cadmium	22	22	22
^b Chromium III	910	910	910
^a Chromium VI	21	21	21
^a Lead	200	200	200
^{b/c} Mercury	40	40	40
^b Selenium	250	250	250
^b Nickel	180	180	180
^b Phenols	280	550	1100
^b Copper	2400	2400	2400
^b Zinc	3700	3700	3700
^d Cyanide	34	34	34
^a Benzene	0.20	0.33	0.87
^b Toluene	130	290	660
^b Ethylbenzene	47	110	260
^b <i>o</i> - xylene	60	140	330
^b <i>m</i> - xylene	59	140	320
^b <i>p</i> - xylene	56	130	310
Non Genotoxic PAHs			
^b Acenaphthene	210	510	1100
^b Acenaphthylene	170	420	920
^b Anthracene	2400	5400	11000
^b Fluoranthene	280	560	890
^b Fluorene	170	400	860
^b Naphthalene	2.3	5.6	13
^b Phenanthrene	95	220	440
^b Pyrene	620	1200	2000
Genotoxic PAHs			
^{a/e} Benzo(a)pyrene	5	5	5
ALIPHATIC HYDROCARBONS			
^b C5-C6	42	78	160
^b C6-C8	100	230	530
^b C8-C10	27	65	150
^b C10-C12	130	330	760
^b C12-C16	1100	2400	4300
^b C16-35	65000	92000	110000
AROMATIC HYDROCARBONS			
^b C5-7 (benzene)	70	140	300
^b C7-8 (toluene)	130	290	660
^b C8-C10	34	83	190
^b C10-C12	74	180	380
^b C12-C16	140	330	660
^b C16-C21	260	540	930
^b C21-C35	1100	1500	1700

Notes

- a C4SL - SP1010 (2014) - Benzene and Benzo(a)pyrene values for 1% and 2.5% SOM have been calculated using default C4SL parameters in CLEA v1.07
- b LQM/CIEH S4UL values (2015).
- c S4UL for inorganic Hg used.
- d Atkins ATRISKsoil Value
- e 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)

GRM TAC 11-2016

Contaminant Thresholds for Subsurface Water Pipes

Contaminant	Thresholds (mg/kg)
Corrosion	
Wrapped Steel	pH<7 Cond >400µS/cm
Wrapped Ductile Iron	pH<5 Cond >400µS/cm, he not neutral
Copper	pH<5 >8 and Eh +ve
Toxic Substances	
Chromium (total) (Cr)	Applies to above pipe materials
Organic Contaminants	
VOC's	0.5 PE/0.125 PVC
BTEX & MTBE	0.1 PE/0.03 PVC
SVOC	2 PE/1.4 PVC
Phenols	2 PE/0.4 PVC
Cresols & Chlorinated Phenols	2 PE/0.04 PVC
Mineral Oil C11-C20	10 PE
Mineral Oil C21 - C40	500
Ether/Ketone/Amines, Nitrobenzene/Aldehydes	0.5 PE/0.02-1 PVC

Notes.

It is not recommended that water pipes should be laid in sites where these substances are identified or suspected

Local Utility Companies should be consulted prior to pipe specifications being finalised.

Ref: Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites. UKWIR Ref. No. 10/WM/03/21. 2010.

GRM Controlled Waters Tier 1 Assessment Criteria

Table 1a

UKDWS			EQS freshwater (µg/l)*	EQS other surface water (µg/l)* (Including saline waters)
Parameter	Concentration	Units		
Acrylamide	0.1	µg/l	-	
Aluminium	200	µgAl/l	-	
Ammonium	0.5	mgNH4/l	0.2 as N	0.021 unionised as N
Antimony	5	µgSb/l	-	
Arsenic	10	µgAs/l	50 (dissolved)	25 (dissolved)
Benzene	1	µg/l	10	8
Boron	1	mgB/l	750 [#]	-
Bromate	10	µgBrO3/l	-	-
Cadmium	5	µgCd/l	See Table 2b	0.2
Chromium	50	µgCr/l	-	-
Chromium (III)	-	µg/l	4.7	-
Chromium (VI)	-	µg/l	3.4	0.6
Chloride (i)	250	mgCl/l	188mg/l [#]	
Conductivity (i)	2500	µS/cm at 20°C	-	
Copper(ii)	2	mg/l	1	3.76 (where DOC <1mg/l)
Cyanide	50	µgCN/l	1	1
1, 2 dichloroethane	3	µg/l	10	
Dichloromethane	-	µg/l	20	20
Epichlorohydrin	0.1	µg/l	-	
Fluoride	1.5	mgF/l	1mg/l [#]	
Hydrogen ion	10	pH value	-	
Iron	200	µgFe/l	1000 (dissolved)	1000 (dissolved)
Lead (ii)	10	µgPb/l	1.2 (dissolved & bioavailable)	1.3
Manganese	50	µgMn/l	130 (bioavailable)	-
Mercury	1	µgHg/l	0.07 (dissolved)	0.07 (dissolved)
Mineral Oil (TPH)	10	µg/l	5000 (total) ****	5000 (total) ****
Nickel (ii)	20	µgNi/l	4 (dissolved & bioavailable)	8.6
Nitrate (iii)	50	mgNO3/l	-	-
Nitrite (iii)	0.5	mgNO2/l	-	-
Phenol	0.5	µg/l	7.7	7.7
Polycyclic Aromatic Hydrocarbons (vii) *	0.1	µg/l	-	-
Fluoranthene	-	µg/l	0.0063	0.0063
Naphthalene	-	µg/l	2	2
Benzo(a)pyrene	0.01	µg/l	0.00017	0.00017
Benzo(b)fluoranthene	-	µg/l	-	-
Benzo(k)fluoranthene	-	µg/l	-	-
Benzo(g,h,i)perylene	-	µg/l	-	-
Indeno(1,2,3-cd)pyrene	-	µg/l	-	-
Anthracene	-	µg/l	0.1	0.1
Selenium	10	µgSe/l	7.5	-
Sodium	200	mgNa/l	150mg/l [#]	-
Sulphate (i)	250	mgSO4/l	188mg/l [#]	-
Tetrachloroethene and Trichloroethene (viii)	10	µg/l	10	10
Tetrachloroethane	-	µg/l	140	-
Tetrachloromethane	3	µg/l	12	12
Toluene	700***	µg/l	74	74
Xylene	500***	µg/l	30 [†]	30 [†]
Ethylbenzene	300***	µg/l	20**	20**
1,1,1-Trichloroethane	-	µg/l	100 [†]	100 [†]
Trichlorobenzenes	-	µg/l	0.4	0.4
Trichloromethane	-	µg/l	2.5	2.5
Tributyltin	-	µg/l	0.0002	0.0002
Vinyl chloride	0.5	µg/l	-	-
Carbon Tetrachloride	-	µg/l	12	12
Zinc	5000	µg/l	10.9 (dissolved & bioavailable) + background concentration	6.8 (dissolved & bioavailable) + 1.1

Table 1b

Pesticides			EQS freshwater (µg/l)*	EQS other surface water (µg/l)* (Including saline waters)
Aldrin	0.03	µg/l	-	
Dieldrin	0.03	µg/l	-	-
Heptachlor	0.03	µg/l	-	-
Heptachlor epoxide	0.03	µg/l	-	-
other pesticides	0.1	µg/l	-	-
Cyclodiene pesticides: Sum of Aldrin, Dieldrin, Endrin & Isodrin	-	µg/l	0.01 (sum)	0.005
DDT total	-		0.025	0.025
Pesticides: Total (vi)	0.5	µg/l	-	-

Table 2

EQS for Hardness Related Substances*						
Substance	EQS Type	EQS (µg/l) for hardness classes (mg/l CaCO ₃)				
		Class 1: <40	Class 2: 40-50	Class 3: 50-100	Class 4: 100-200	Class 5: >200
Cadmium (dissolved)	Annual average	<0.08	0.08	0.09	0.15	0.25

Reference

* The Water Framework Directive (Standards and Classification) Directions (England and Wales) Directions 2015

** Provisional EQS Value

*** WHO Drinking Water Standard

**** EA PPG3

[†] The River Basin Districts Typology, Standards and Groundwater Threshold Values (Water Framework Directive) (England and Wales) Directions 2010 - Now Withdrawn

[#] Groundwater Drinking Water Protected Zones Only

Ambient Background Concentrations for dissolved zinc in freshwaters in England and Wales (to be used in conjunction with Table 1a)	
Catchment/Group of catchments ⁽ⁱⁱ⁾	ABC (µg/l)
Tyne	4.8
Tees	4.1
Ouse, Humber	2.9
Nene	4.0
Great Ouse	3.1
River Stour	3.0
Blackwater/Chelmer	3.6
Lee	3.3
Thames	2.0
Test	2.0
Avon/Hants	3.1
Exe	1.4
Dart	1.7
Clywd/Conwy	2.0
Dee	2.9
Eden	1.2
Anglesey	3.0
Tamar	2.9
Fal	5.8
Camel	7.1
Tone/Parrett	3.3
Frome, Bristol Avon	2.3
Wye	2.0
Usk	2.2
Taff	2.8
Neath	2.8
Loughar	3.9
Tywi	2.0
Teifi	2.5
Rheidol/Ystwyth	4.1
Dovey	3.2
Glaslyn	2.6
All other freshwaters not listed above	1.4



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Waste Classification Report

HazWasteOnline™ classifies waste as either **hazardous** or **non-hazardous** based on its chemical composition, related legislation and the rules and data defined in the current UK or EU technical guidance (Appendix C) (note that HP 9 Infectious is not assessed). It is the responsibility of the classifier named below to:

- understand the origin of the waste
- select the correct List of Waste code(s)
- confirm that the list of determinands, results and sampling plan are fit for purpose
- select and justify the chosen metal species (Appendix B)
- correctly apply moisture correction and other available corrections
- add the meta data for their user-defined substances (Appendix A)
- check that the classification engine is suitable with respect to the national destination of the waste (Appendix C)



LJLUE-MMFVD-BQ3AS

To aid the reviewer, the laboratory results, assumptions and justifications managed by the classifier are highlighted in **pale yellow**.

Job name

P9032 Stoke Lane, Stoke Golding

Description/Comments

Data obtained from a human health risk assessment.

Project

P9032

Site

Stoke Lane, Stoke Golding

Classified by

Name:

George Salloway

Company:

GRM Development Solutions Ltd

Date:

13 Jul 2021 09:03 GMT

Telephone:

01283 551 249

HazWasteOnline™ provides a two day, hazardous waste classification course that covers the use of the software and both basic and advanced waste classification techniques. Certification has to be renewed every 3 years.

HazWasteOnline™ Certification:

CERTIFIED

Course

Hazardous Waste Classification

Date

06 Dec 2018

Next 3 year Refresher due by Dec 2021

Job summary

#	Sample name	Depth [m]	Classification Result	Hazard properties	Page
1	TP01	0.1	Non Hazardous		2
2	TP03	0.1	Non Hazardous		4
3	TP06	0.1	Non Hazardous		6
4	TP08	0.1	Non Hazardous		8
5	TP10	0.1	Non Hazardous		10

Related documents

#	Name	Description
1	GRM Standard Suite	waste stream template used to create this Job

Report

Created by: George Salloway

Created date: 13 Jul 2021 09:03 GMT

Appendices

	Page
Appendix A: Classifier defined and non CLP determinands	12
Appendix B: Rationale for selection of metal species	13
Appendix C: Version	13



A P P E N D I X L

Land Appraisal | Environmental | Geotechnical | Design | Mining | Inspections

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DO NOT SCALE

NOTES:



Foundation depths of up to 1.8m begl in granular deposits (due to unsuitable shallow strata above)

Foundation depths of around 0.9m begl in cohesive strata (firm sandy silty clay) expected for vast majority of site (with deepening near hedgerows / trees).



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CLIENT:

Davidsons Developments Ltd

PROJECT:

**Stoke Lane,
Stoke Golding**

TITLE:

Foundation Zone Plan

SCALE@SIZE:

NTS

ISSUE:

FINAL

DESIGN/DRAWN:

RHC

DATE:

July 2021

PROJECT No:

P9032

DRAWING No:

Figure 4

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N.B. Foundations in the south of the site (TP06-TP11) need to be kept shallow due to 'soft silt bands' at depth. If deeper than 1.5m begl, then rafts or piles may be required.