Main Investigation Report

at
47 Bryanston Road, Southampton, Hampshire, SO19 7AQ

for
Doswell Projects Ltd

Reference: 21029/MIR Rev1.0
October 2023

Control Document

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This is not a valid document for use in the design of the project unless it is titled Final in the document status box.

Current regulations and good practice were used in the preparation of this report. The recommendations given in this report must be reviewed by an appropriately qualified person at the time of preparation of the scheme design to ensure that any recommendations given remain valid in light of changes in regulation and practice, or additional information obtained regarding the site.

Commission

This document comprises the Main Investigation Report (MIR) and incorporates the results, discussion, and conclusions to this intrusive works. General site data is recorded below:

Commission Record	
Client	Doswell Projects
Site Name	47 Bryanston Road, Southampton, Hampshire, SO19 7AQ
Grid Reference	SU 43880 12109
Soils Limited Quotation Ref	Q27739 , dated 22nd May 2023
Signed Job Order Form	Q27739, dated 12th July 2(

The record of revision to this document is presented below:

Record Of Revisions		
Revision	Date	Reason
1.0	October 2023	Original

Note(s): The latest revised document supersedes all previous revisions of the MIR produced by Soils Limited.

Documents associated with this development that must be referred to are given below.

Record Of Associated Document			
Reference	Type	Date	Creator
21029/PIR Rev1.0	Preliminary Investigation Report	August 2023	Soils Limited
21029/LR	Executive Summary (post sitework and prior to testing).	August 2023	Soils Limited

Note: The conclusions presented within this report (21029/MIR) supersede those presented in 21029/LR

Limitations and Disclaimers

The report was prepared solely for the brief described in Section 1.1 of this report.

The contents, recommendations and advice given in the report are subject to the Terms and Conditions given in Soils Limited's Quotation

Soils Limited disclaims any responsibility to the Client and others in respect of any matters outside the scope of the above.

This report has been prepared by Soils Limited, with all reasonable skill, care and diligence within the terms of the Contract with the Client, incorporation of our General Conditions of Contract of Business and taking into account the resources devoted to us by agreement with the Client.

The report is personal and confidential to the Client and Soils Limited accept no responsibility of whatever nature to third parties to whom this report, or any part thereof, is made known. Any such party relies on the report wholly at its own risk.

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The ground is a product of continuing natural and artificial processes. As a result, the ground will exhibit a variety of characteristics that vary from place to place across a site, and also with time. Whilst a ground investigation will mitigate to a greater or lesser degree against the resulting risk from variation, the risks cannot be eliminated.

The investigation, interpretations, and recommendations given in this report were prepared for the sole benefit of the Client in accordance with their brief. As such these do not necessarily address all aspects of ground behaviour at the site.

Current regulations and good practice were used in the preparation of this report. An appropriately qualified person must review the recommendations given in this report at the time of preparation of the scheme design to ensure that any recommendations given remain valid in light of changes in regulation and practice, or additional information obtained regarding the site.

If the term "competent person" is used in this report or any Soils Limited document, it means an engineering geologist or civil engineer with a minimum of three years post graduate experience in the understanding and application of the appropriate codes of practice.

Unless the site investigation works have been designed and specified in accordance with EC7, this report is a Geotechnical Investigation Report and is not necessarily a Ground Investigation Report as defined by EC7 (Eurocode 7 Part 1, §3.4, Part 2, §6.1) or a Geotechnical Design Report (Eurocode 7 Part 1, §2.8) as defined by Eurocode 7 and as such may not characterise the ground conditions and additional works may be required to comply with the requirements of EC7.

Within the report reference to ground level relates to the site level at the time of the investigation, unless otherwise stated.

Exploratory hole is a generic term used to describe a method of direct investigation. The term trial pit, borehole or window sample borehole implies the specific technique used to produce an exploratory hole.

The depth to roots and/or of desiccation may vary from that found during the investigation. The Client is responsible for establishing the depth to roots and/or of desiccation on a plot by plot basis prior to the construction of foundations. Supplied site surveys may not include substantial shrubs or bushes and is also unlikely to have data or any trees, bushes or shrubs removed prior to or following the site survey.

Where trees are mentioned in the text this means existing trees, substantial bushes or shrubs, recently removed trees (approximately 20 years to full recovery on cohesive soils) and those planned as part of the site landscaping).

The geotechnical laboratory testing was performed by GEO Site & Testing Services Ltd (GSTL) in accordance with the methods given in BS 1377:1990 Parts 1 to 8 and their UKAS accredited test methods.

For the preparation of this report, the relevant BS code of practice were adopted for the geotechnical laboratory testing technical specifications, in the absence of the relevant Eurocode specifications (ref: ISO TS 17892).

The chemical analyses were undertaken by Derwentside Environmental Testing Services (DETS) in accordance with their UKAS and MCERTS accredited test methods or their documented in-house testing procedures. This investigation did not comprise an environmental audit of the site or its environs.

Ordinary watercourses (OWs) are defined as rivers (which are not designated as main rivers), streams, ditches, drains, culverts, cuts and sewers (other than public sewers). This includes all OWs that are not mapped. Ordinary watercourse consent (OWC) is required from the Lead Local Flood Authority (LLFA) when changing/adapting/adding to the cross sections of OWs. Installations of any structure or obstruction into an OW that impedes the flow without consent is prohibited by the Land Drainage Act 1991 Section 23.

Failure to remove obstructions may result in legal action by the LLFA with powers under Section 25 of the Land Drainage Act 1991.

We suggest surveying the site for OW usually seen in rural areas as boundary ditches in order to avoid potential impacts to residents downstream and prosecution. OWC can be applied for from your LLFA.

Ownership of land brings with it onerous legal liabilities in respect of harm to the environment. “Contaminated Land” is defined in Section 57 of the Environment Act 1995 (as updated 2021) as:

"Land which is in such a condition by reason of substances in, on or under the land that significant harm is being caused or that there is a significant possibility of such harm being caused or that pollution of controlled waters is being, or is likely to be caused".

It must be noted that a detailed survey of the possible presence or absence of invasive species, such as Japanese Knotweed, is outside of the scope of investigation.

Deleterious materials may be present in any Made Ground that pose a potential risk to site workers, end users and adjacent vulnerable receptors. These could include a range of contaminants, including asbestos, especially if the material includes large fractions of demolition derived materials.

The investigation, analysis or recommendations in respect of contamination are made solely in respect of the prevention of harm to vulnerable receptors, using where possible best practice at the date of preparation of the report. The investigation and report do not address, define or make recommendations in respect of environmental liabilities. A separate environmental audit and liaison with statutory authorities is required to address these issues.

All environmental works are undertaken in the context of, and in compliance with, BS10175+A2 2017 and LCRM (EA 2021) and all other pertinent planning, standards, documentation and guidance appropriate to the site at the time of production which may include, but are not necessarily limited to, documents provided by BS/CEN/ISO, NHBC, AGS, CIEH, CIRIA, SoBRA and CLAIRE.

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Contents

List of Figures

List of Tables

List of Appendices

Section 1 Introduction

1.1 Objective of Investigation

The Client commissioned Soils Limited to undertake an intrusive ground investigation and to prepare a Main Investigation Report to supply the Client and their designers with information regarding ground conditions, to assist in preparing a foundation scheme for development that was appropriate to the settings present on the site.

The investigation was to be undertaken to provide comment on appropriate foundation options for the proposed development. The investigation was to be made by means of in-situ testing and geotechnical laboratory testing undertaken on soil samples taken from the exploratory holes.

Soil samples were to be taken for chemical laboratory testing to enable recommendations for the safe redevelopment of the site and the protection of site workers, end-users and the public from any contamination identified as dictated by the Conceptual Site Model (CSM) in the Preliminary Investigation Report undertaken for the site by Soils Limited (Report ref: 21029/PIR, August 2023) and/or the Revised Conceptual Site Model presented in Appendix E.1.

1.2 Site Description

At the time of the investigation (July 2023), the site was not in use and did not include any structures. It was predominantly covered with grass and shrubs and most of the areas were populated with semi-mature/mature trees. A densely wooded area was located on an embankment in the eastern corner of the site. Semi-mature/mature trees in private gardens and a local nature reserve along Itchen Estuary were also observed off-site.

No drainage was noted onsite and the site is assumed to drain via surface runoff as well as through natural soils.

Residential houses with private gardens bounded the site to the east and south. Immediately to west slightly down slope is an active railway track, beyond which is an industrial estate and the River Itchen approximately 100m from the site. Immediately to the north are the private gardens of a row of semi-detached dwellings associated with Ashburnham Close.

Approximately 45m to the south, beyond the existing dwellings on Bryanston Road was a large Local Nature Reserve (Peartree Green). Beyond the existing railway track and industrial estate was the Solent and Southampton Water Special Protection Area (SPA) and Ramsar and Lee-on-The Solent to Itchen Estuary Site of Special Scientific Interest (SSSI).

The on-site topography was noted sloping downwards in a north-westerly direction towards the railway track and the River Itchen beyond it with an average gradient of between 1:10 to 1:5 (i.e. 6° to 11°) based on topographic drawing provided by the client and observed on site. The lowest part of the site and the upper part of it were divided by a steep slope (gradient

estimated as circa 1:1.5 (circa 30° - 35°), which was likely to be originated by cutting into the existing slope in the early 1970s. The slope had level areas at the top and base and was heavily vegetated at the time of the investigation.

A retaining wall belonging to the residential properties beyond the south/south-east boundary was recorded as having a retained height of circa 2m. The wider site was sloping down towards the northwest with a gradient of up to 4°.

The site location plan is given in Figure 1. An aerial photograph of the site and its close environs has been included in Figure 2.

1.3 Proposed Development

The proposal comprised a new housing development of eight two storey dwellings with sloping private gardens, along with parking and landscaping. The parking area included a retaining wall at the base of the above mentioned slope.

In compiling this report reliance was placed on drawing number 23-018-SK04 and 23-018-SK05, dated April 2023 and was prepared by MH Architects. The recommendations provided within this report are made exclusively in relation to the scheme outlined above and must not be applied to any other scheme without further consultation with Soils Limited. Soils Limited must be notified about any change or deviation from the scheme outlined.

Development plans provided by the Client are presented in Appendix G.

1.4 Anticipated Geology

The 1:50,000 BGS map showed the site to be located directly upon the bedrock Wittering Formation with no overlying superficial deposits mapped.

1.4.1 Wittering Formation

The Wittering Formation comprises greyish brown laminated clay; wavy to lenticular-bedded sand interbedded with clay in equal proportions; and fine to medium-grained sparsely glauconitic sand.

Section 2 Site Works

2.1 Proposed Project Works

The proposed intrusive investigation was designed to provide information on the ground conditions and to aid the design of foundations for the proposed residential development. The intended investigation, as outlined within the Soils Limited quotation (Q27739, dated 22nd May 2023), was to comprise the following items:

- Location service clearance with Cable Avoidance Tool (CAT) and Genny
- 1 day windowless sampling and dynamic probing;
- 2No. 20m deep cable percussive boreholes with alternate SPT/U100 testing at 1m centres for the top 5m and at 1.5m centres thereafter
- 2No. 10m deep monitoring well installations in cable percussive boreholes
- Geotechnical laboratory testing
- Contamination laboratory testing

2.1.1 Actual Project Works

The actual project works were undertaken from the 25th July to the 28th July and additionally on the 7th August 2023, with subsequent sample logging, laboratory testing, monitoring, and reporting. The actual works comprised:

- Location service clearance with Cable Avoidance Tool (CAT) and Genny
- 6No. windowless sampling borehole between 1.00m and 4.00m bgl
- 3No. dynamic probes up to 6.00m bgl
- 2No. 20m deep cable percussive boreholes with alternate SPT/U100 testing at 1m centres for the top 5m and at 1.5m centres thereafter
- 2No. 10m deep water monitoring well installations in cable percussive boreholes
- 1No. return monitoring visit upon completion of siteworks
- 6No. return ground gas monitoring visits
- Geotechnical laboratory testing
- Contamination laboratory testing

Six windowless sampler boreholes (WS1 to WS6) were backfilled with gravel and bentonite upon completion of drilling.

Two boreholes (BH01 and BH02) were backfilled with gravel and bentonite to 10.00m bgl and arisings from 10.00m bgl and 20.00m bgl following the installation of monitoring wells.

Monitoring wells were installed from above ground level to a depth of 10.00m bgl within both of the cable percussive boreholes (BH01 and BH02).

The installs comprised plain pipe with a bentonite seal to 1.00m bgl followed by slotted pipe with a gravel filter to 10.00m bgl.

All exploratory hole locations have been presented in Figure 3.

Following completion of site works, soil cores were logged and sub sampled so that samples could be sent to the laboratory for both contamination and geotechnical testing.

2.2 Ground Conditions

Two cable percussive boreholes (BH01 and BH02) were drilled between 25th July and 29th July using a Dando 2000 cable percussive drilling rig to depths of up to 20.00m below ground level (bgl) at locations selected by the Client where access was gained and clear of services.

A standpipe was installed within both of the cable percussive borehole locations (BH01 and BH02) to allow for return monitoring of groundwater.

On 7th August 2023 six windowless sampler boreholes (WS1 to WS6) were drilled, using a Premier 110 drilling rig, to depths ranging between 1.00m and 4.00m below ground level (bgl) at locations selected by Soils Limited using a development plan provided by the Client. Two of the six windowless sampler boreholes (WS1 and WS2) were excavated to provide information on the ground conditions beneath the site and aid foundation design while the remaining four windowless sampler locations were to confirm the conditions of the shallow soils beneath gardens of the proposed plots.

Three super heavy dynamic probes, (DP1 to DP3) were driven prior and adjacent to their corresponding windowless sampler borehole to a depth of 6.00m bgl. The three dynamic probes were driven to give some perspective of the engineering conditions of the soils beneath the proposed residential development.

The maximum depths of exploratory holes have been included in Table 2.1.

All exploratory holes were scanned with a Cable Avoidance Tool (C.A.T.) and GENNY prior to excavation to ensure the health and safety of the operatives.

Table 2.1 Final Depth of Exploratory Holes

Exploratory Hole	Depth (m bgl)	Exploratory Hole	Depth (m bgl)
WS1	4.00	DP1	6.00
WS2	4.00	DP2	6.00
WS3	1.00	DP3	6.00
WS4	1.00	-	-
WS5	1.00	BH01[w]	20.00
WS6	1.00	BH02[w]	20.00

Note(s): [w] - well installation. The depths given in this table are taken from the ground level on-site at the time of investigation.

The soil conditions encountered were recorded and soil sampling commensurate with the purposes of the investigation was carried out. The depths given on the exploratory hole logs and quoted in this report were measured from ground level.

The soils encountered from immediately below ground surface have been described in the following manner. Where the soil incorporated an organic content such as either decomposing leaf litter or roots or has been identified as part of the in-situ weathering profile, it has been described as Topsoil both on the logs and within this report. Where man has clearly either placed the soil, or the composition altered, with say greater than an estimated 5% of a non-natural constituent, it has been referred to as Made Ground both on the log and within this report.

For more complete information about the soils encountered within the general area of the site reference must be made to the detailed records given within Appendix B, but for the purposes of discussion, the succession of conditions encountered in the exploratory holes in descending order can be summarised as:

Made Ground/Topsoil (MG/TS)
Head Deposits (HEAD)
Weathered Wittering Formation (wWTT)
Wittering Formation (WTT)

The ground conditions encountered in the exploratory holes are summarised in Table 2.2.

Table 2.2 Ground Conditions

Strata	Depth Encountered (m bgl)		Typical Thickness (m)	Typical Description
	Top	Bottom		
MG	0.00	0.30 - 1.00	0.60	Dark grey and greyish brown slightly sandy slightly gravelly CLAY with anthropogenic inclusions.
TS	0.00	0.10 - 0.25	0.10	Greyish brown slightly sandy SILT.
HEAD	0.30 - 0.60	0.50 - 1.20	0.50	Orangish brown and greyish brown slightly gravelly silty SAND and sandy CLAY.
wWTT	0.50 - 1.20	3.00 - 6.50	3.80	Greyish brown and brownish grey slightly sandy slightly gravelly CLAY.
WTT	3.00 - 6.50	>20.00[1]	Not established[2]	Grey sandy CLAY

Note(s): [1] Final depth of exploratory hole. [2] Base of strata not encountered. The depths given in this table are taken from the ground level on-site at the time of investigation.

2.3 Ground Conditions Encountered in Exploratory Holes

The ground conditions encountered in exploratory holes have been described below in descending order. The engineering logs are presented in Appendix B.1.

2.3.1 Made Ground and Topsoil

Soils described as Made Ground were encountered in six out of the eight exploratory holes from ground level to depths ranging between 0.30m (BH02) and 1.00m bgl (WS6), the maximum depth of the location. The maximum depth of Made Ground at location WS6 was not established and so likely to extend to depths greater than 1.00m bgl.

The Made Ground typically comprised dark grey and greyish brown slightly sandy slightly gravelly CLAY with occasional brick fragments, wood fragments, plastics and rare metal fragments up to 30mm diameter.

Soils described as Topsoil were encountered in two out of the eight exploratory holes from ground level to depths ranging between 0.10m (WS5) and 0.25m bgl (WS4).

The Topsoil typically comprised greyish brown mottled dark grey slightly clayey slightly sandy SILT.

The established depth of Made Ground and Topsoil found at each exploratory hole location have been included in Table 2.3.

Table 2.3 Established Depth of Made Ground/Topsoil

Exploratory Hole	Strata	Depth (m bgl)
WS1	MG	0.15
WS2	MG	0.50
WS3	MG	0.60
WS4	TS	0.25
WS5	TS	0.10
WS6	MG	1.00 [1]
BH01	MG	1.00
BH02	MG	0.30

Note(s): [1] Final depth of exploratory hole.

2.3.2 Head Deposits

Soils described as Head Deposits were encountered in six out of the eight exploratory holes from beneath the Made Ground/Topsoil to depths of between 0.50m (WS1) and 1.20m bgl (BH02).

The Head Deposits typically comprised orangish brown and greyish brown slightly gravelly silty SAND and sandy CLAY. Sand is fine to coarse. Gravel is fine to coarse subrounded flint.

The established depth of Head Deposits found at each exploratory hole location have been included in Table 2.4 Established Depth of Head Deposits

Table 2.4 Established Depth of Head Deposits

Exploratory Hole	Depth (m bgl
WS1	0.50
WS2	1.00
WS3	1.00 [1]
WS4	1.00 [1]
WS5	1.00 [1]
WS6	1.00 [1]
BH01	- [2]
BH02	1.20

Note(s): [1] Final depth of exploratory hole. [2] Not encountered

2.3.3 Weathered Wittering Formation

Soils described as the weathered Wittering Formation were encountered in four of the eight exploratory holes from beneath the Made Ground or Head Deposits to depths of between 3.00m (BH01) and 6.50m bgl (BH02).

The weathered Wittering Formation typically comprised greyish brown, light brown and brownish grey slightly sandy slightly gravelly CLAY with occasional sand lenses. Sand is fine to coarse. Gravel is fine to coarse subangular flint.

The established depth of Head Deposits found at each exploratory hole location have been included in Table 2.5.

Table 2.5 Established Depth of weathered Wittering Formation

Exploratory Hol	Depth (m bgl
W S1	4.0C [1]
W S2	4.0C [1]
W S3	- [2]
W S4	- [2]
W S5	- [2]
W S6	- [2]
BH01	3.00
BH02	6.50

Note(s): [1] Final depth of exploratory hole. [2] Not encountered

2.3.4 Wittering Formation

Soils described as the Wittering Formation were encountered in two of the eight exploratory holes from beneath the weathered Wittering Formation to the maximum depth of the investigation, 20.00m bgl.

The Wittering Formation typically comprised grey sandy CLAY and clayey SAND.

The established depth of Wittering Formation found at each exploratory hole location have been included in Table 2.6.

Table 2.6 Established Depth of Wittering Formation

Exploratory Hole	Depth (m bgl
W S1	4.0C [1]
W S2	4.0C [1]
W S3	1.0C [1]
W S4	1.0C [1]
W S5	1.0C [1]
W S6	- [2]
BH01	20.00 [1]
BH02	20.00 [1]

Note(s): [1] Final depth of exploratory hole. [2] Not encountered

2.4 Roots

Roots were encountered in all eight exploratory holes at depths ranging between 0.60m and 1.20m bgl. The established depth of root penetration found at the exploratory hole locations has been included in Table 2.7.

Table 2.7 Established Depth of Root Penetration

Exploratory Hole	Depth (m bgl)
WS1	0.70
WS2	1.20
WS3	1.00 [1]
WS4	0.60
WS5	1.00 [1]
WS6	1.00 [1]
BH01	1.20
BH02	1.20

Note(s): [1] Final depth of exploratory hole

Roots may be found to greater depth at other locations on the site particularly close to trees and/or trees that have been removed both within the site and its close environs. Durin the investigation it was noted that the site was densely overgrown with vegetation and mature trees. A review of online available resources (Google Earth) indicated that the vegetation and trees on site had been established for over 20 years.

It must be emphasised that the probability of determining the maximum depth of roots from a narrow diameter borehole is low. A direct observation such as from within a trial pit is necessary to gain a better indication of the maximum root depth.

2.5 Groundwater

Groundwater was not encountered during this phase of investigation. However, this does not negate the presence of shallow groundwater in other areas of the site. Additionally, the methods used in the drilling of the cable percussive boreholes combined with he rate of drilling may have masked the presence of water influx.

Changes in groundwater level occur for a number of reasons including seasonal effects and variations in drainage, tidal effects. The investigation was conducted in July and August (2023) when groundwater levels should be falling to their annual minimum (lowest) elevation, which typically occurs around September, from the annual maximum (highest) which typically occurs around March.

Further groundwater monitoring was conducted within the standpipes installed on site following completion of site works and has been presented in Table 2.8.

Table 2.8 Groundwater Monitoring

Exploratory Hole	Well Depth (m bgl)	Depth to Water (m bg 07/08/2023
BH01	10.00	3.18
BH02	10.00	3.66

Note(s):

Groundwater equilibrium conditions may only be conclusively established, if a series of observations are made via groundwater monitoring wells. A single monitoring visit was requested by the client which has been completed and reported above.

Section 3 Geotechnical In-Situ and Laboratory Testing

3.1 Standard Penetration Tests

Standard Penetration Tests (SPTs) were undertaken in BH01 and BH02. The results were interpreted based on the classifications outlined in Appendix C.1, Table C.1.1 to Table C.1.2.

Table 3.1 SPT Hammer Efficiency

SPT Hammer Re	Energy Ratio Er (%)
DD160033	69.00

Table 3.2 Standard Penetration Tests (SPT) Interpretation

Strata	Depth (m)	N60 Range	Cohesive Soils Classification	Inferred Cohesior
wWTT	1.00 – 6.50	3 - 7	Very low to low	15 – 35 kPa
WTT	3.00 – 20.00	11 - >50	Medium to very high	55 - >250 kPa

Strata	Depth (m)	N60 Range	Granular Soils Relative Density
WTT	18.50 – 20.00	>50	Very Dense

A full interpretation of the SPT results, are outlined in Appendix C.2, Table C.2.1.

3.2 Dynamic Probe Tests

The results were converted to equivalent SPT “N60” values based on dynamic energy using commercial computer software (Geostru). The results were then interpreted based on the classifications outlined in Appendix C.1,Table C.1.1 to Table C.1.2.

Table 3.3 SPT Hammer Efficiency

Rig Reference	Energy Ratio Er (%)
PREMIER3	87.45

Table 3.4 Inferred SPT Interpretation

Strata	Depth (m)	Inferred N60 Range	Cohesive Soils Classification	Inferred Cohesior
HEAD	0.20 –1.00	≤4 - 13	Very low to medium	≤20 –65kPa
wWTT	1.00 – 6.00	≤4 - 17	Very low to high	≤20 – 85kPa
WTT	5.10 – 6.00	17 – 25	High	85 – 125kPa

Note(s): SPT “N6(values presented have been corrected in accordance with BS EN 2:

A full interpretation of the DPSH tests, are outlined in Appendix C.2, Table C.2.2.

3.3 Atterberg Limit Tests

Atterberg Limit tests were performed on twelve samples obtained from the Wittering Formation. The results were classified in accordance with BRE Digest 240 and NHBC Standards Chapter 4.2.

Table 3.5 Atterberg Limit Results Classification

Strata	Depth (m bgl)	Volume Change Potentia	
		NHBC	BRE 240
HEAD	0.90	Low	Low
wWTT	1.20 – 4.00	Medium	Medium
WTT	7.00 – 17.00	Medium	Medium

A full interpretation of the Atterberg Limit tests, are outlined in Table C.2.3, Appendix C.2 and the laboratory report in Appendix C.3.

3.4 Particle Size Distribution Tests

Particle Size Distribution (PSD) tests were performed on four samples from the Wittering Formation.

Table 3.6 Particle Size Distribution Classification

Strata	Depth (m bgl)	Volume Change Potentia	
		NHBC	BRE 240
WTT (Cohesive)	3.00 – 6.00	Yes	Yes
WTT (Granular)	19.50	Yes	None

Note that a cohesive soil is only classified as having a volume change potential if it is also plastic and an Atterberg Limit test can be conducted on the strata.

A full interpretation of the PSD tests, are outlined in Table C.2.4, Appendix C.2 and the laboratory report in Appendix C.3.

3.5 Sulphate and pH Tests

Water soluble sulphate (2:1) and pH testing in accordance with Building Research Establishment Special Digest 1, 2005, ‘Concrete in Aggressive Ground’.

Table 3.7 Sulphate and pH Test Results

Strata	Depth (m bgl)	Sulphate Concentration (mg/l)	pH
wWTT	1.20 – 6.00	19 – 30	4.6 – 7.8
WTT	13.50	531	7.5

The significance of the sulphate and pH Test results are discussed in Section 5.3 and the laboratory report in Appendix C.3.

Section 4 Engineering Appraisal

4.1 Established Ground Conditions

An engineering appraisal of the soil types encountered during the site investigation and likely to be encountered during the redevelopment of this site is presented. Soil descriptions are based on analysis of disturbed samples taken from the exploratory holes.

4.1.1 Made Ground and Topsoil

Foundations must not be placed on non-engineered fill unless such use can be justified on the basis of a thorough ground investigation and detailed design. Foundations must be taken through any Topsoil and/or Made Ground and either into, or onto a suitable underlying natural stratum of adequate bearing characteristics.

Soils described as Made Ground were encountered in six out of the eight exploratory holes from ground level to depths ranging between 0.30m (BH02) and 1.00m bgl (WS6).

The Made Ground typically comprised dark grey and greyish brown slightly sandy slightly gravelly CLAY with occasional brick fragments, wood fragments, plastics and rare metal fragments up to 30mm.

Soils described as Topsoil were encountered in two out of the eight exploratory holes from ground level to depths ranging between 0.10m (WS5) and 0.25m bgl (WS4).

The Topsoil typically comprised greyish brown mottled dark grey slightly clayey slightly sandy SILT.

4.1.2 Head Deposits

Soils described as Head Deposits were encountered in six out of the eight exploratory holes from beneath the Made Ground/Topsoil to depths of between 0.50m (WS1) and 1.20m bgl (BH02).

Soils of the Head Deposits on site are predominantly cohesive and are likely derived from slope movement and creep of the soils upslope of the investigation areas.

The Head Deposits are not a suitable bearing stratum for the proposed development.

4.1.3 Weathered Wittering Formation

Soils described as the weathered Wittering Formation were encountered in four of the eight exploratory holes from beneath the Made Ground or Head Deposits to depths of between 3.00m (BH01) and 6.50m bgl (BH02).

Soils of the weathered Wittering Formation are predominantly cohesive and derived from the surface weathering of the underlying bedrock and are identified on site by the poor engineering characteristics displayed.

The soils of the weathered Wittering Formation were not considered suitable for the proposed development due to the poor engineering characteristics displayed.

4.1.4 Wittering Formation

Soils described as the Wittering Formation were encountered in two of the eight exploratory holes from beneath the weathered Wittering Formation to the maximum depth of the investigation, 20.00m bgl.

Soils of the Wittering Formation are over consolidated, predominantly cohesive with lenses of granular soils and as such are expected to display moderate bearing capacities with moderate to high settlement characteristics.

The soils of the Wittering Formation were considered suitable for the proposed development provided a deep foundation solution is adopted due to the poor engineering characteristics of the overlaying soils.

4.1.5 Guidance on Shrinkable Soils

The ground conditions were established as Made Ground/Topsoil overlying superficial Head Deposits over the weathered Wittering Formation and bedrock of the Wittering Formation.

The volume change potential for each stratum was established and presented in Table 4.1.

Table 4.1 Established Volume Change Potential by Strata

Strata	Volume Change Potentia		Established Lower Boundary (m bgl)
	BRE	NHBC	
HEAD	Low	Low	1.20
wWTT	Medium	Medium	6.50
WTT	Medium	Medium	>20.00

Due to several samples tested indicating a Medium Volume Change Potential, the stratum as a whole should be considered to have a Medium Volume Change Potential in accordance with both BRE Digest 240 and NHBC Standards Chapter 4.2.

4.1.6 Groundwater

Groundwater was encountered during return monitoring at a depth of 3.18m and 3.66m bgl. Due to the granular lenses identified within the Wittering Formation it should be assumed that the water encountered represents a shallow groundwater table beneath the site. Water is likely to migrate in a north-westerly direction towards the River Itchen due to the sloping nature of the site. The presence of a water table beneath the site should be considered during the foundation design stage.

Section 5 Foundation Scheme

5.1 Foundation Recommendations

Foundations **must not** be constructed within any Made Ground/Topsoil due to the likely variability and potential for large load induced settlements both total and differential.

Roots were encountered in all eight exploratory holes at depths ranging between 0.60m and 1.20m bgl. If roots are encountered during the construction phase foundations **must not be placed within any live root penetrated** or desiccated **cohesive soils or those with a volume change potential**. Should the foundation excavations reveal such materials, the excavations **must** be extended to greater depth in order to bypass these unsuitable soils. Excavations must be checked by a suitable person prior to concrete being poured.

Considering the type of development and ground conditions encountered, a shallow foundation solution was considered unsuitable. The soils of the Wittering Formation displayed poor engineering characteristics at shallow depths combined with the shallow ground water encountered beneath the site and potential for slope movement.

5.1.1 Piled Foundations

The piled foundations must be taken through any Made Ground/Topsoil, Head Deposits and weathered Wittering Formation into suitable strength soils of the bedrock Wittering Formation.

The construction of a piled foundation is a specialist job with the actual pile working load depending on the pile type and installation method. Prior to finalising the foundation design, the advice from a reputable contractor who is familiar with the ground and groundwater conditions present at the site must be sought.

The vertical load capacities are provided for varying diameters and lengths of bored piles taken into the Wittering Formation, based on geotechnical laboratory testing and in-situ testing and must only be used for preliminary design purposes.

A factor of safety of 3 was applied to the characteristic line derived from testing undertaken, for both the shaft and base load capacities.

The bearing values given in Appendix D.1., are applicable to single vertically loaded piles. Where piles are to be constructed in groups the bearing value of each individual pile should be reduced by a factor of about 0.8 and a calculation made to check the factor of safety against block failure.

From ground level the upper 6.50m of the pile shaft has been ignored in the preliminary pile design given.

To prevent necking of the green concrete, temporary casing may be required where the pile passes through the Made Ground or Wittering Formation and below the groundwater table (if encountered). To achieve the full bearing value a pile should penetrate the bearing stratum by at least five times the pile diameter.

No allowance has been made for negative skin friction that could be generated where piles pass through Made Ground and very soft cohesive and / or organic soils underlying the site. The negative skin friction must be applied to the pile working load and must not be factored.

5.2 Slope Analysis

The site contained a significant slope on eastern edge sloping downwards towards north west at an angle of circa 30 - 35˚. The proposed development comprised the development of residential properties towards the north west of the site with an area of car parking towards the centre of site, set in the toe of the slope mentioned above. The proposed car parking area includes a retaining structure at the base of the slope to allow for the installation of the parking bays. The insertion of a cofferdam structure could cause a rise of groundwater levels or other changes to the existing groundwater regime that could affect the proposed development.

The retaining structure therefore must be designed to preserve the natural drainage characteristics of the soils and not to interfere with the existing groundwater regime.

This report does not pertain to be a full slope stability assessment and only initial comments have been made. Should the proposed development plan change then an appropriate slope stability assessment may be required.

Natural slopes, in cohesive soils in England, typically stand with a factor of safety against sliding of about one during periods when the groundwater is at or close to ground level. Factors such as drainage installed into the slope and foliage can enhance the overall or local stability of the slope but generally only marginally.

Interference by man in the profile of a natural slope, the groundwater regime in or around the slope, or in the loading on a slope, can initiate both local and/or overall instability. Natural erosional processes, such as a river or the sea eroding the toe of a slope can, and does, initiate instability.

Manmade slopes, such as railway cuttings, can be stable over long periods of time and then fail decades after their construction (due to equalisation of pore water pressures within the slope). Embankments, if not properly engineered can have failures in the short-term due to excess porewater pressures being setup during construction.

Analyses of slopes generally takes the form of a back analyses of the existing ground profile to permit an assessment of the strength parameters within the soil mass being estimated. Laboratory testing, of various forms depending on the slope type or failure, of

soils samples taken through the ground section is then undertaken and the strength parameters found compared to those estimated from the back analyses. The comparison may then be used to provide background data to establish the failure mechanism, to design remedial works or to check the factor of safety against failure of a standing slope. Slope stability analysis must consider the stability of the site and land both upslope and downslope of it.

Initial design parameters can be taken from published values for the residual strength of Wittering Formation and worst-case assumptions of winter groundwater levels, though these would need to be verified by laboratory analysis and long term groundwater monitoring.

5.3 Subsurface Concrete

The sulphate and pH tests carried out in accordance with BRE Special Digest 1, 2005, 'Concrete in Aggressive Ground', established the site concrete classifications for each stratum as presented in Table 5.1.

Table 5.1 Concrete Classification

Stratum	Depth (m)	Design Sulphate Class	ACEC Class
wWTT	1.20 – 6.00	DS– 1	AC – 2z
WTT	13.50	DS– 2	AC – 2

Concrete to be placed in contact with soil or groundwater must be designed in accordance with the recommendations of Building Research Establishment Special Digest 1 2005, *'Concrete in Aggressive Ground'* taking into account any possible exposure of potentially pyrite bearing natural ground and the pH of the soils.

5.4 Excavations

Shallow excavations in the Made Ground/Topsoil are likely to be marginally stable in the short term at best.

Deeper excavations taken into the Wittering Formation are likely to be unstable and require support. Unsupported earth faces formed during excavation may be liable to collapse without warning and suitable safety precautions must therefore be taken to ensure that such earth faces are adequately supported or battered back to a safe angle of repose.

Excavations beneath the groundwater table are likely to be unstable and dewatering of foundation trenches may be necessary.

Section 6 Determination of Chemical Analysis

6.1 Site Characterisation and Revised Conceptual Site Model

The Preliminary Investigation Report undertaken by Soils Limited (report ref: 21029/PIR dated August 2023) identified a very low to moderate risk of ground contamination from previous usage of the site and offsite sources.

This investigation identified Made Ground to depths between 0.30m and 1.00m bgl.

There were no visual or olfactory indicators of contamination noted.

Superficial Head Deposits, weathered Wittering Formation and bedrock deposits of the Wittering Formation were encountered underlying the Made Ground. Shallow groundwater was encountered within the weathered Wittering Formation during return monitoring. The conceptual site model was updated to take account of the shallow groundwater encountered at the site and presented in Appendix E.1.

6.2 Soil Sampling

Exploratory hole locations were established to provide an overview of ground conditions across the site in relation to the proposed construction, together with enabling the collection of samples to enable chemical characterisation of the underlying strata.

Representative samples for potential environmental testing were obtained from the exploratory holes at depths of between 0.05m and 0.70m to allow appropriate representation of the materials encountered, with additional samples to be obtained, if necessary, where there was visual or olfactory evidence of contamination.

Unless otherwise stated, analytical testing was based initially on a screening suite of commonly identified inorganic and organic contaminants, taking into account the prevailing site conditions and the findings of the initial conceptual site model.

6.3 Determination of Chemical Analysis

The driver for determination of the analysis suite was the information obtained from the Preliminary Investigation and Main Investigation.

The chemical analyses were carried out on one sample of Topsoil, three samples of Made Ground and four samples of Head Deposits. The nature of the analyses is detailed in Table 6.1.

Table 6.1 Chemical Analyses Suites - Soil

No. of Tests	Determinants	Soil Tested				
		TS	MG	HEAD	wW TT	W TT
8	Metal suites: Arsenic, Boron (Water Soluble), Cadmium, Chromium (total & hexavalent), Copper, Lead, Mercury, Nickel, Selenium, Vanadium, Zinc	✓	✓	✓	-	-
8	Organic Matter	✓	✓	✓	-	-
8	pH	✓	✓	✓	-	-
8	Polycyclic aromatic hydrocarbons (PAH) – (EPA 16)	✓	✓	✓	-	-
8	Phenols – total monohydric	✓	✓	✓	-	-
8	Extractable petroleum hydrocarbons (EPH) –Texas banding	✓	✓	✓	-	-
8	Asbestos screening	✓	✓	✓	-	-

The soil testing was carried out in compliance with the MCERTS performance standard, and the results are shown in Appendix E.2, test report 23-10865.

Section 7 Qualitative Risk Assessment

7.1 Assessment Criteria

The assessment criteria used to determine risks to human health are derived and explained within Appendix E.3.

7.2 Representative Contamination Criteria - Soil

In compiling this report reliance was placed on drawing number 23-018-SK04, dated April 2023 and was prepared by MH Architects. The recommendations provided within this report are made exclusively in relation to the scheme outlined above and must not be applied to any other scheme without further consultation with Soils Limited. Soils Limited must be notified about any change or deviation from the scheme outlined.

Based on the proposed development, the results of the chemical analysis have been compared against generic assessment criteria (GAC) for a '***Residential with home grown produce***' end use, as presented in SP1010: Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination December 2014 (C4SL), derived for the protection of human health. Where this document has not published screening values for determinants, GACs derived for the same end use have been adopted from the following published guidance; DEFRA Soil Guideline Values (SGV) and LQM/CIEH/Suitable 4 Use Level (S4UL).

To assess the potential toxicity of organic determinants (Petroleum Hydrocarbons and Polyaromatic Hydrocarbons) to the human health, soils samples were analysed for Soil Organic Matter (SOM). The selected samples analysed recorded, SOM values of between 0.9% and 9.8%. For each soil sample tested, the resultant SOM allowed for the correct comparison to be made with the appropriate guideline value for each organic determinants analysed.

7.3 Risk Assessment –Made Ground/Topsoil

Table 7.1 outlines the sample that have exceeded their relevant assessment criteria. The full laboratory report is presented in Appendix E.2.

Table 7.1 Summary of GAC Exceedances –Made Ground/Topsoil

Location	Depth (m bgl	Contaminant	Concentratio	Guidance Level
W S6	0.7(	Lead	382	210

Note(s): Units mg/kg

The risk assessment has established potential pollutant linkage in relation to human health from an elevated Lead concentration within the Made Ground in a single location.

Recommendations in relation to this material are made in Section 7.9.

7.4 Risk Assessment –Head Deposits

None of the samples tested had an exceedance against their relevant assessment criteria. The full laboratory report is presented in Appendix E.2.

7.5 Asbestos

The test certificate for each sample submitted for contamination analysis during this investigation includes the results of an Asbestos Screen. In each case 'Not detected' was reported.

This finding does not obviate the risk of asbestos being present on the site and the Client must seek advice from qualified and competent asbestos specialist during and prior to undertaking works to ensure compliance with appropriate legislation and guidance.

7.6 Risk to Groundwater

The site is located on a Secondary 'A' aquifer and is not within groundwater source protection zone and there are no groundwater abstractions within 1km of the site.

The nearest surface water feature is the River Itchen, located approximately 78m to the northwest of the site.

The single exceedance of Lead identified would present a negligible risk as Lead is relatively insoluble.

Taking into consideration the ground conditions encountered and the limited contaminant concentrations observed, there is not considered to be any significant risk to controlled waters and no further assessment deemed necessary at this time.

The site is currently free draining to the underlying soils, and the proposed development will need to consider the implementation of a new drainage regime on site, as such the proposed development is considered to provide a betterment of site conditions where site drainage would not follow a pathway to impact on third party land or property.

7.7 Risk from Ground Gas Ingression

Potential sources of ground gas within influencing distance of the site identified within the CSM comprise:

- Railway
- Historic Landfill
- Potentially Infilled Land (onsite)

Taking into consideration the likely potential source of ground gases, including the presence of Railway, Historic Landfill, Potentially Infilled Land six monitoring visits have

been scheduled to be undertaken over a period of three months, in accordance with current guidance.

The monitoring is currently ongoing, including targeting periods of low and falling pressure. The full programme of monitoring, which will be reported as an addendum to this report, must be completed before final design is undertaken.

7.7.1 Radon

The site **was not situated** within an area where protection or risk assessment against the ingress of radon was required. Radon protection measures **will not be required** within the proposed new development.

7.8 Generic Quantitative Risk Assessment

Quantitative risk assessments are undertaken for soil and ground gas. The CSM has been updated to take account of the assessments below and presented in Appendix E.1. The full laboratory chemical report is presented in Appendix E.2.

7.8.1 Soils

One of the samples tested showed concentrations in excess of the relevant C4SL for a residential with plant uptake land-use scenario. In WS6 at 0.70m bgl lead was recorded at a concentration of 382mg/kg against the residential end-use C4SL of 210mg/kg.

The Tier 1 Quantitative risk assessment therefore established that there was **a risk to the human health receptors** of construction workers or future end-users.

Further testing is recommended following the initial site strip, primarily targeting the garden plot areas.

7.8.2 Groundwater

A Groundwater Risk Assessment was not conducted due to the negligible risk identified on site.

7.8.3 Ground Gas

The Preliminary Investigation Report identified a moderate risk of ground gas associated with the potentially infilled land on site, railway immediately north west of site, the infilled gravel pits 22m northeast and 195m south east of site and the historical landfill site 47m south west.

At the time of reporting, ground gas monitoring was ongoing and therefore the results of the ground gas risk assessment will be provided in an addendum once the regime is completed.

7.9 Recommendations

Soil chemical analysis recorded one sample with substance levels over its representative guideline value. The exceedance identified within the Made Ground material was at a depth (0.70m bgl) considered to be beneath the maximum depth of digging and was only identified within a single sample. Shallow soils samples across the site indicated no exceedances present. It has been concluded that the garden plots will require inspection and possible testing following the initial site strip.

7.10 Protection of Services

Contamination of the ground may pose a risk to human health by permeating potable water supply pipes. To fulfil their statutory obligations, UK water supply companies require robust evidence from developers to demonstrate either that the ground in which new plastic supply pipes will be laid is free from contaminants specified in UKWIR Report 10/WM/03/21 Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites (UKWIR, 2010), or that the proposed remedial strategy will mitigate any existing risk.

7.11 Duty of Care

Groundworkers must maintain a good standard of personal hygiene including the wearing of overalls, boots, gloves and eye protectors and the use of dust masks during periods of dry weather.

7.12 Excavated Material

Excavated material as waste must be defined or classified prior to any disposal, transport, recycling or re-use at or by an appropriately licensed or exempt carrier and/or off-site disposal facility. The requirements inherent in both Duty of Care and Health and Safety must also be complied with. In order to determine what is to happen, what is suitable, appropriate and most effective in the disposal of wastes, especially those subject to CDM waste management plan requirements, several factors must be considered, and competent advice must always be sought.

7.13 Re-use of Excavated Material On-site

The re-use of on-site soils may be undertaken either under the Environmental Permitting Regulations 2007 (EPR), in which case soils other than uncontaminated soils are classed as waste, or under the CL:AIRE Voluntary Code of Practice (CoP) which was published in September 2008 and is accepted as an alternative regime to the EPR.

7.14 Imported Material

Any soil, which is to be imported onto the site, must undergo chemical analysis to permit classification prior to its importation and placement in order to ascertain its status with specific regard to contamination, i.e. to prove that it is suitable for the purpose intended.

7.15 Discovery Strategy

There may be areas of contamination not identified during the course of the investigation. Such occurrences may also be discovered during the demolition and construction phases for the redevelopment of the site.

List of Figures

List of Appendices

Figure 1 –Site Location Map

Job Number 21029	**Project** 47 Bryanston Road, Southampton, Hampshire, SO19 7AQ
Client Doswell Projects	**Date** October 2023

Figure 2 –Aerial Photograph

Project
47 Bryanston Road, Southampton, Hampshire, SO19 7AQ

Client
Doswell Projects

Date
October 2023

Job Number
21029

Figure 3 –Exploratory Hole Plan

Project
47 Bryanston Road, Southampton, Hampshire, SO19 7AQ

Client
Doswell Projects

Date
October 2023

Job Number
21029

N

Appendix A Standards and Resources

The site works, soil descriptions and geotechnical testing was undertaken in accordance with the following standards were applicable:

- BS 5930:2015 and BS EN ISO 22476-2&3:2005+A1:2011
- BS EN 1997-1:2004+A1:2013 Eurocode 7. Geotechnical design
- BS EN ISO 14688-1:2018 - Geotechnical investigation and testing - Identification and description
- BS EN ISO 14688-2:2018 - Geotechnical investigation and testing - Principles for a classification
- BS 10175:2011+A2:2017 - Investigation of potentially contaminated sites
- LCRM 2021 Environment Agency
- BS 8004:2015 – Code of practice for foundations
- BS 1377:1990 Parts 1 to 8
- BRE Digest 241 “Low-rise buildings on shrinkable clay soils: Part 2
- BRE Special Digest 1, 2005, ‘Concrete in Aggressive Ground’
- Stroud, M. A. 1974, “The Standard Penetration Test – its application and interpretation”, Proc. ICE Conf. on Penetration Testing in the UK, Birmingham. Thomas Telford, London.
- N.E. Simons, B.K. Menzies, “A Short Course in Foundation Engineering”
- NHBC Standards Chapter 4.2, January 2023.
- SP1010: Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination December 2014
- Google Earth
- British Geological Survey Website & iGeology App

Appendix B Field Work

Appendix B.1 Engineers Logs

Samples & In Situ Testing			Strata Details		
Depth	Type	Results	Level (mAOD)	Depth (m) (Thickness)	Legend
				(0.30)	
				0.30	
				(0.70)	
				1.00	
				(2.00)	
				3.00	
				(10.50)	

Samples & In Situ Testing			Strata Details		
Depth	Type	Results	Level (mAOD)	Depth (m) (Thickness)	Legend
				13.50	
				(5.00)	
				18.50	
				(1.50)	
				20.00	

Samples & In Situ Testing			Strata Details		
Depth	Type	Results	Level (mAOD)	Depth (m) (Thickness)	Legend
				(0.30)	
				0.30	
				(0.70)	
				1.00	
				1.20	
				(5.30)	
				6.50	
				(1.50)	
				8.00	

Samples & In Situ Testing			Strata Details		
Depth	Type	Results	Level (mAOD)	Depth (m) (Thickness)	Legend
				(5.50)	
				13.50	
				(6.50)	
				20.00	

Samples & In Situ Testing			Strata Details		
Depth	Type	Results	Level (mAOD)	Depth (m) (Thickness)	Legend
				0.15	
				(0.35)	
				0.50	
				(0.30)	
				0.80	
				(2.80)	
				3.60	
				(0.40)	
				4.00	

Samples & In Situ Testing			Strata Details		
Depth	Type	Results	Level (mAOD)	Depth (m) (Thickness)	Legend
				(0.35)	
				0.35	
				0.50	
				(0.50)	
				1.00	
				(2.10)	
				3.10	
				(0.90)	
				4.00	

Samples & In Situ Testing			Strata Details		
Depth	Type	Results	Level (mAOD)	Depth (m) (Thickness)	Legend
				0.15	
				(0.45)	
				0.60	
				(0.40)	
				1.00	

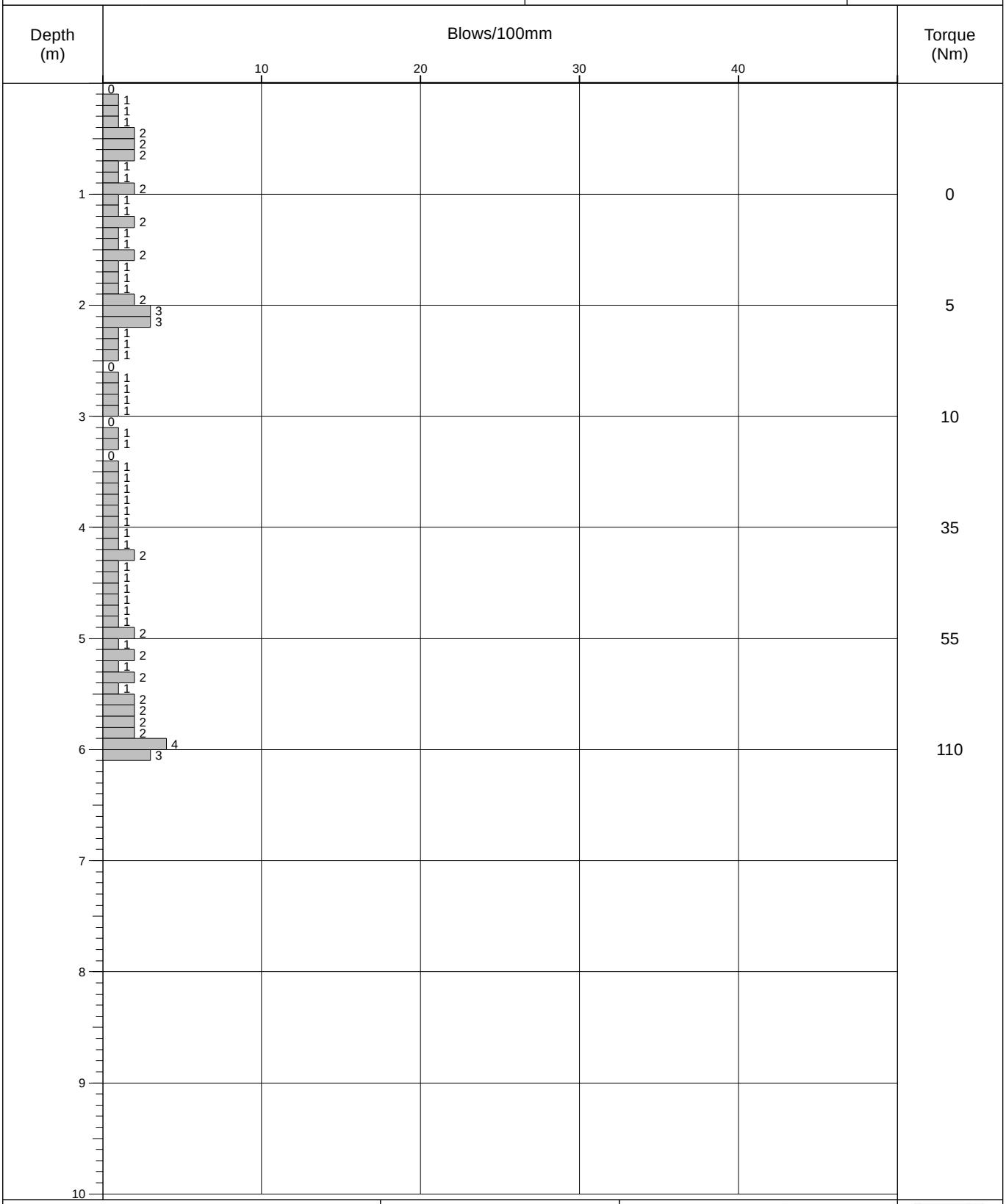
Samples & In Situ Testing			Strata Details		
Depth	Type	Results	Level (mAOD)	Depth (m) (Thickness)	Legend
				0.25	
				0.50	
				0.60	
				0.75	
				1.00	

Samples & In Situ Testing			Strata Details		
Depth	Type	Results	Level (mAOD)	Depth (m) (Thickness)	Legend
				0.10	
				0.35	
				0.55	
				(0.45)	
				1.00	

Samples & In Situ Testing			Strata Details		
Depth	Type	Results	Level (mAOD)	Depth (m) (Thickness)	Legend
				0.20 (0.30) 0.50 (0.50) 1.00	

Soils Limited Newton House, Cross Road, Tadworth KT20 5SR Tel: 01737 814221 Email: admin@soilslimited.co.uk	**Probe Log**	Probe No. **DP1** Sheet 1 of 1	

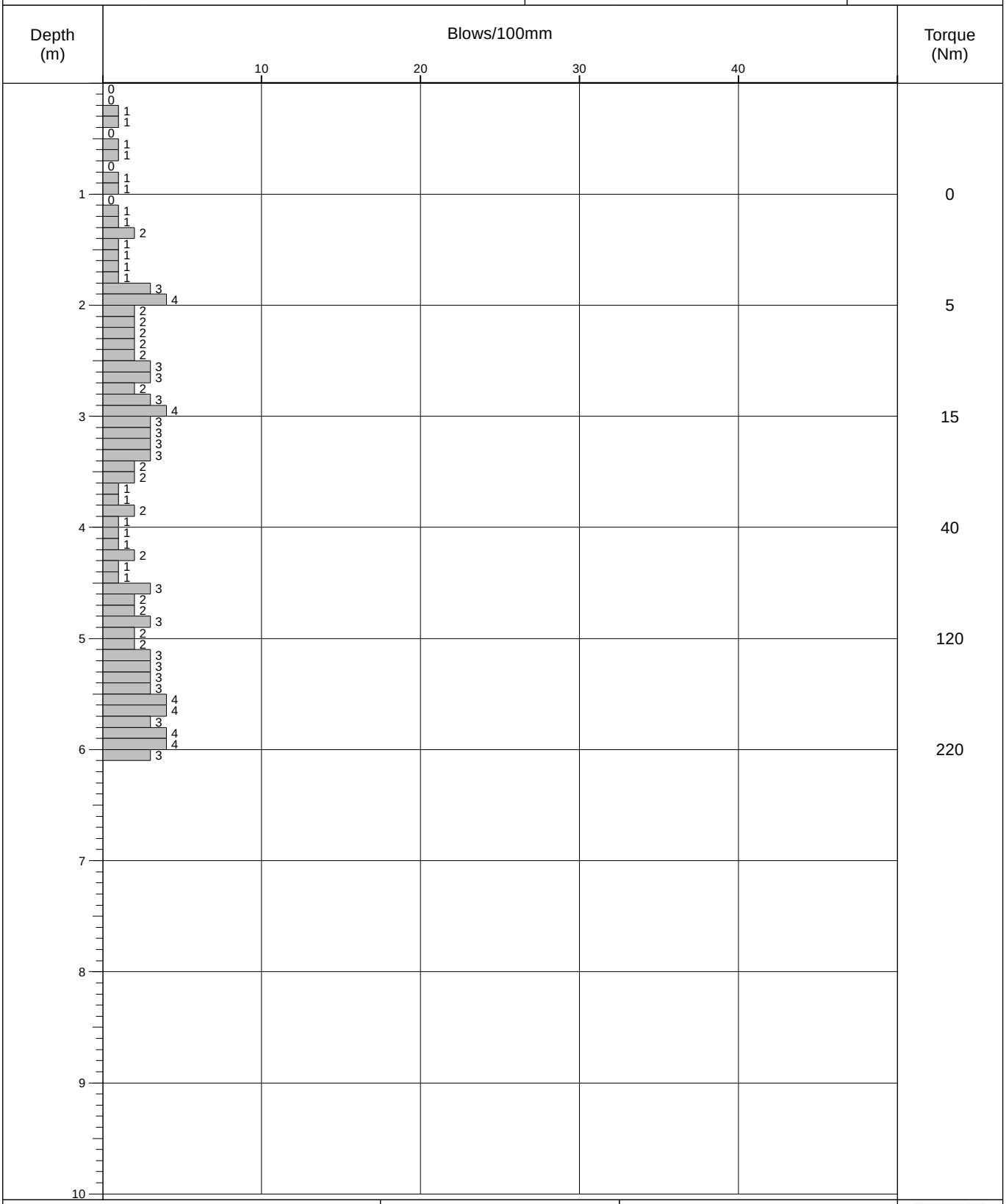
Project Name:	Bryanston Road	Project No. 21029	Co-ords:	Hole Type DP
Location:	Bryanston road, Southampton, SO19 7AQ		Level: m AOD	Scale 1:50
Client:	Doswell Projects		Dates: 07/08/2023	Logged By



Remarks	Fall Height	mm	Cone Base Diameter	50mm	AGS REGISTERED USER 2020
	Hammer Weight	63.5kg	Final Depth	6m	
	Probe Type	DPSH- A	Energy Ratio (Er)	87.45%	

Soils Limited Newton House, Cross Road, Tadworth KT20 5SR Tel: 01737 814221 Email: admin@soilslimited.co.uk	**Probe Log**	Probe No. **DP2** Sheet 1 of 1

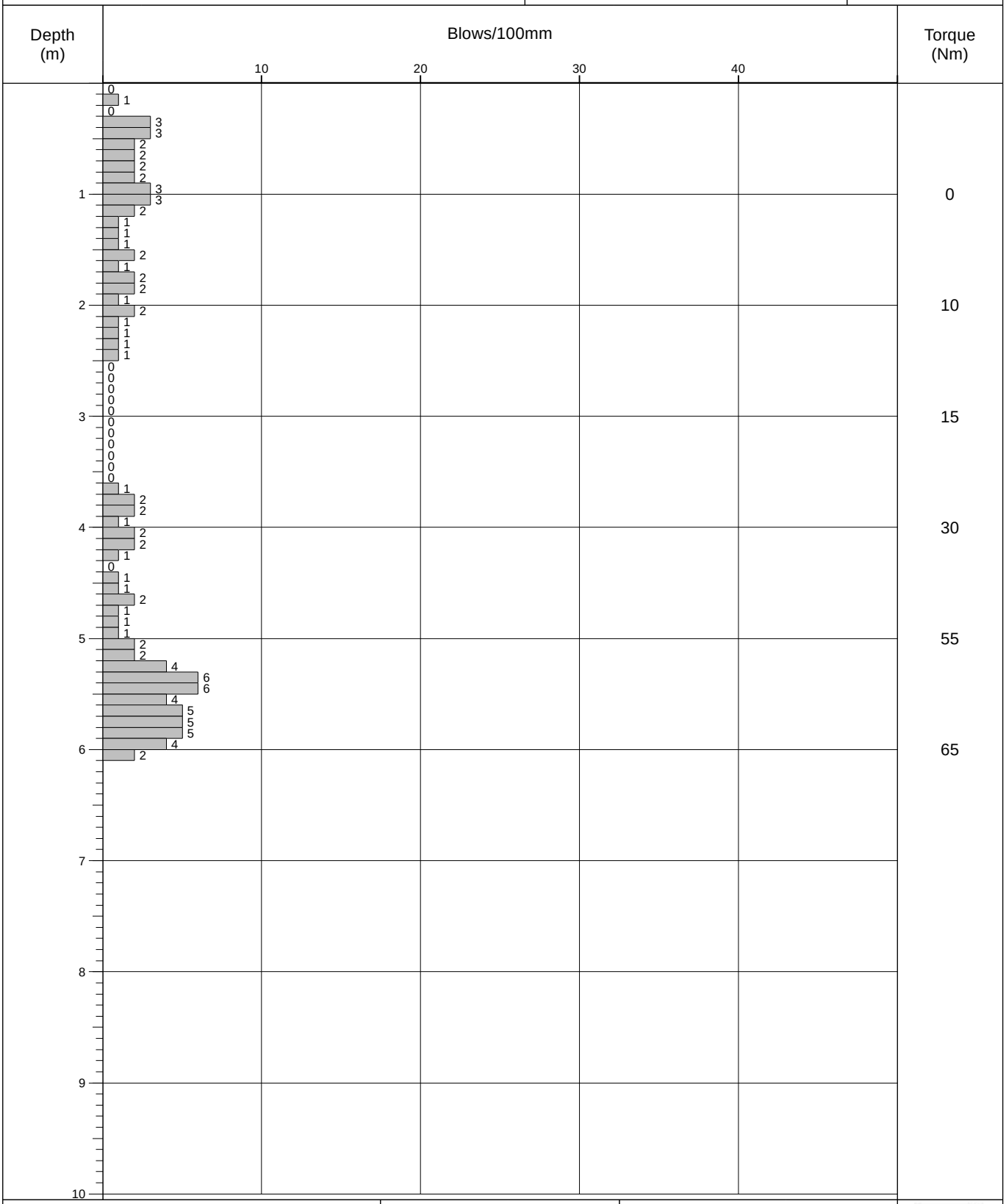
Project Name:	Bryanston Road	Project No. 21029	Co-ords:	Hole Type DP
Location:	Bryanston road, Southampton, SO19 7AQ		Level: m AOD	Scale 1:50
Client:	Doswell Projects		Dates: 07/08/2023	Logged By



Remarks	Fall Height	mm	Cone Base Diameter	50mm	AGS REGISTERED USER 2020
	Hammer Weight	63.5kg	Final Depth	6m	
	Probe Type	DPSH- A	Energy Ratio (Er)	87.45%	

Soils Limited Newton House, Cross Road, Tadworth KT20 5SR Tel: 01737 814221 Email: admin@soilslimited.co.uk	**Probe Log**	Probe No. **DP3** Sheet 1 of 1

Project Name:	Bryanston Road	Project No. 21029	Co-ords:	Hole Type DP
Location:	Bryanston road, Southampton, SO19 7AQ		Level: m AOD	Scale 1:50
Client:	Doswell Projects		Dates: 07/08/2023	Logged By



Remarks	Fall Height	mm	Cone Base Diameter	50mm	AGS REGISTERED USER 2020
	Hammer Weight	63.5kg	Final Depth	6m	
	Probe Type	DPSH- A	Energy Ratio (Er)	87.45%	

Appendix C Geotechnical In-Situ and Laboratory Testing

Appendix C.1 Classification

Classification based on SPT "N" values:

The inferred undrained strength of the cohesive soils was based on the SPT "N" blow counts, derived from the relationship suggested by Stroud (1974) and classified using Table C.1.1. (Ref: Stroud, M. A. 1974, "The Standard Penetration Test – its application and interpretation", Proc. ICE Conf. on Penetration Testing in the UK, Birmingham. Thomas Telford, London.).

Table C.1.1 SPT "N" Blow Count Cohesive Classification

Classification	Undrained Cohesive Strength C_u (kPa)
Extremely low	<10
Very low	10 – 20
Low	20 – 40
Medium	40 – 75
High	75 – 150
Very high	150 – 300
Extremely high	> 300

Note(s): (Ref: BS EN ISO 14688-2:2004+A1:2013 Clause 5.3.)

The relative density of granular soils was classified based of the relationship given in Table C.1.2.

The *UK National Annex to Eurocode 7: Geotechnical design – Part 2: Ground investigation and testing, NA 3.7 SPT test, BS EN 1997-2:2007, Annex F* states "Relative density descriptions on borehole records should also be based on uncorrected SPT N values, unless significantly disturbed, using the density classification in BS 5930:2015, Table 7.

Table C.1.2 SPT "N" Blow Count Granular Classification

Classification	SPT "N" blow count (blows/300mr
Very loose	0 to 4
Loose	4 to 10
Medium dense	10 to 30
Dense	30 to 50
Very dense	Greater than 50

Note(s): (Ref: The Standard Penetration Test (SPT): Methods and Use, CIRIA Report 143, 1995)

Appendix C.2 Interpretation

Table C.2.1 Interpretation of SPT Tests

BH	Strata	SPT N60 Blow Counts	Inferred Cohesive Strength
BH01	wWTT 1.00 –3.00 Sandy CLAY	3 –4	Very low (Cu = 15 - 20kPa)
	WTT 3.00 –18.50 Sandy CLAY	12 - >50	Medium to very high (Cu = 60 - >250kPa)
	WTT 18.50 –20.00 Clayey SAND	>50	Very Dense
BH02	wWTT 1.20 –6.50 Sandy gravelly CLAY	4 –8	Low (Cu = 20 - 40kPa)
	WTT 6.50 –20.00 Sandy CLAY	20 –46	High to very high (Cu = 100 - 230kPa)

Note(s):

Table C.2.2 Interpretation of DPSH Blow Counts

DP	Strata	Equivalent SPT N60 Blow Counts	Inferred Cohesive Strength/Granular Density
DP1	HEAD 0.20 –0.50 SCLAY	4 - 8	Low (C_u = 20 –40kPa)
	wWTT 0.50 –6.00 Sandy CLAY[1]	4 - 8	Low (C_u = 20 –40kPa)
DP2	HEAD 0.50 –1.00 Sandy CLAY	≤4	Very low (C_u = ≤20kPa)
	wWTT 1.00- 6.00 Sandy CLAY[1]	4 - 17	Medium to high (C_u = <40 –85kPa)
DP3	HEAD 0.60 –1.00 CLAY	8 –13	Medium (C_u = 40 –65kPa)
	wWTT 1.00 –5.10 Sandy CLAY[1]	<8	Very low to low (C_u = <40kPa)
	WTT 5.10 –6.00 Sandy CLAY[1]	17 - 30	High (C_u = 85 –150kPa)

Note(s): [1] Ground conditions inferred past the base of windowless sampler boreholes.

Table C.2.3 Interpretation of Atterberg Limit Tests

Stratum	Moisture Content (%)	Plasticity Index (%)	Passing 425µm Sieve (%)	Modified Plasticity Index (%)	Soil Classification	Volume Change Potential	
						BRE	NHBC
HEAD	16 – 19	17 – 18	100	17 – 18	CL	Low	Low
wWTT	16 - 25	21 –26	84 - 100	19 –22	CI	Low to Medium	Low to Medium
WTT	25 – 37	21 – 29	100	21 – 29	CI - CH	Medium	Medium

Note(s): BRE Volume Change Potential refers to BRE Digest 240 (based on Atterberg results)
NHBC Volume Change Potential refers to NHBC Standards Chapter 4.2
Soils Classification based on British Soil Classification System
The most common use of the term clay is to describe a soil that contains enough clay-sized material or clay minerals to exhibit cohesive properties. The fraction of clay-sized material required varies, but can be as low as 15%. Unless stated otherwise, this is the sense used in Digest 240. The term can be used to denote the clay minerals. These are specific, naturally occurring chemical compounds, predominately silicates. The term is often used as a particle size descriptor. Soil particles that have a nominal diameter of less than 2 µm are normally considered to be of clay size, but they are not necessarily clay minerals. Some clay minerals are larger than 2 µm and some particles, 'rock flour' for example, can be finer than 2 µm but are not clay minerals.
(The Atterberg Limit Tests were undertaken in accordance with BS 1377:Part 2:1990 Clauses 3.2, 4.3 and 5)

Table C.2.4 Interpretation of PSD Tests

Location	Depth (m bgl)	Soil Description	Volume Change Potential		Passing 63µm Sieve (%)
			BRE	NHBC	
BH01	3.00	Brown slightly fine to medium gravelly fine to coarse sandy SILT/CLAY	Yes	Yes	54
BH01	6.00	Grey fine to coarse sandy SILT/CLAY	Yes	Yes	66
BH01	19.50	Grey silty/clayey fine to coarse SAND	Yes	No	29

Note(s): BRE 240 states that a soil has a volume change potential when the clay fraction **exceeds 15%** Only the silt and clay combined fraction are determined by sieving therefore the volume change potential is estimated from the percentage passing the 63µm sieve. NHBC Standards Chapter 4.2 states that a soil is shrinkable if the percentage of silt and clay passing the 63µm sieve is greater than 35% and the Plasticity Index is greater than 10%.
(The Particle Size Distribution Tests were undertaken in accordance with BS 1377: Part 2: 1990 Clause 9)

Appendix C.3 Geotechnical In-Situ and Laboratory Results

Laboratory Report

UKAS TESTING 2788

GSTL GEOTECHNICAL SITE & TESTING LABORATORIES A PHENNA GROUP COMPANY

Contract Number: 68310

Client Ref: **21029**
Client PO:

Date Received: **23-08-2023**
Date Completed: **31-08-2023**
Report Date: **31-08-2023**

Client: **Soils Limited**
Newton House
Cross Road
Tadworth
Surrey
KT20 5SR

This report has been checked and approved by:

[redacted]

Brendan Evans
Office Administrator

Contract Title: **Bryanston Road**
For the attention of: **Rob Gardner**

Test Description	Qty
Samples Received - @ Non Accredited Test	6
Moisture Content of Soil BS1377 : Part 2 : Clause 3.2 : 1990 - * UKAS	12
1 Point Liquid & Plastic Limit BS 1377:1990 - Part 2 : 4.4 & 5.3 - * UKAS	12
PSD Wet & Dry Sieve method BS 1377:1990 - Part 2 : 9.2 - * UKAS	3
PSD: Sedimentation by pipette carried out with Wet Sieve (Wet Sieve must also be selected) BS 1377:1990 - Part 2 : 9.4 - * UKAS	3
Disposal of samples for job	1

Notes: **Observations and Interpretations are outside the UKAS Accreditation**
*** - denotes test included in laboratory scope of accreditation**
 # - denotes test carried out by approved contractor
@ - denotes non accredited tests

Approved Signatories:
Brendan Evans (Office Administrator) - Darren Bourne (Quality Senior Technician) - Paul Evans (Director)
Richard John (Quality/Technical Manager) - Shaun Jones (Laboratory manager) - Shaun Thomas (Site Manager)
Wayne Honey (Human Resources/ Health and Safety Manager)

GEO Site & Testing Services Ltd
Units 3-4, Heol Aur, Dafen, Llanelli, Carmarthenshire, Wales SA14 8QN
Tel: 01554 784040 Fax: 01554 784041 info@gstl.co.uk gstl.co.uk

GSTL
GEOTECHNICAL SITE & TESTING LABORATORIES

NATURAL MOISTURE, LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX
(BS 1377:1990 - Part 2 : 4.4 & 5.3)

Contract Number	68310
Project Name	Bryanston Road
Date Tested	25/08/2023

DESCRIPTIONS

Sample/Hole Reference	Sample Number	Sample Type	Depth (m)			Descriptions
WS1		D	1.20	-		Brown gravelly silty CLAY
WS1		D	2.70	-		Brown gravelly silty CLAY
WS1		D	3.80	-		Brown silty sandy CLAY
WS2		D	0.90	-		Brown silty CLAY
WS2		D	3.30	-		Brown silty gravelly CLAY
WS3		D	0.90	-		Brown sandy silty CLAY
BH02		D	2.00	-		Brown sandy silty CLAY
BH02		D	4.00	-		Brown gravelly silty sandy CLAY
BH02		D	7.00	-		Brown silty CLAY
BH02		D	11.00	-		Brown silty CLAY
BH01		D	9.50	-		Brown silty sandy CLAY
BH01		D	17.00	-		Brown silty sandy CLAY
				-		
				-		
				-		
				-		
				-		
				-		
				-		
				-		
				-		
				-		
				-		

Operator
Clayton Jenkins

GSTL
GEOTECHNICAL SITE & TESTING LABORATORIES

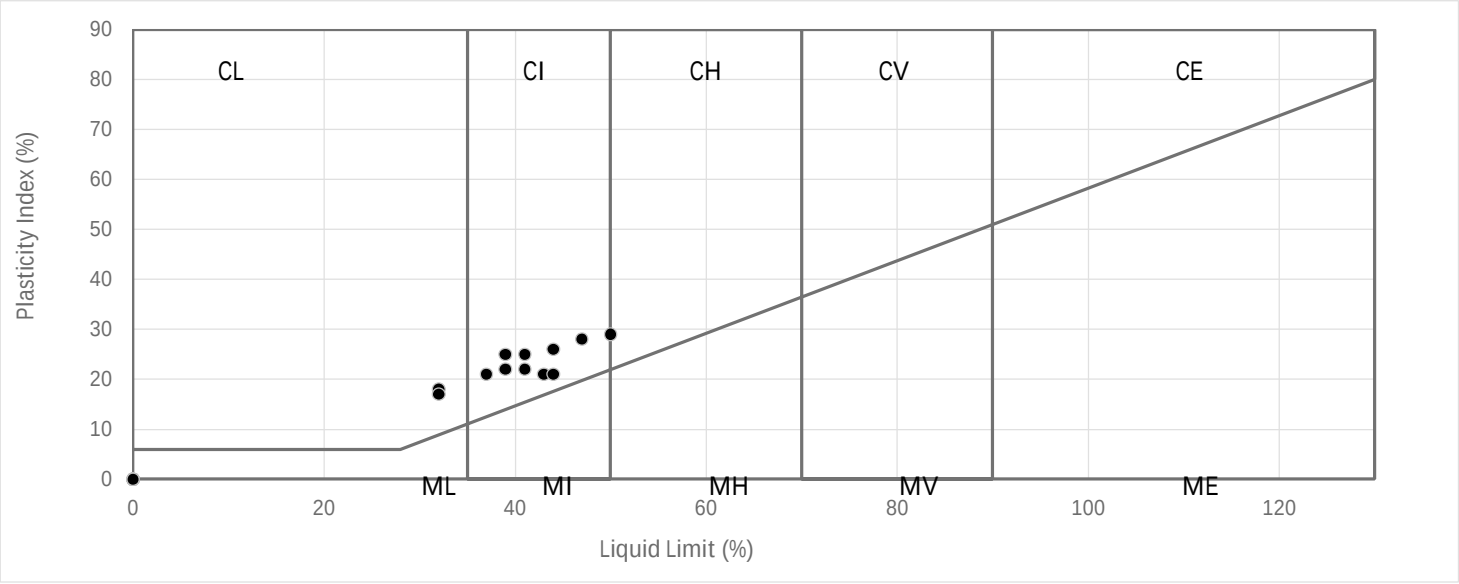
NATURAL MOISTURE, LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX
(BS 1377:1990 - Part 2 : 4.4 & 5.3)

Contract Number	68310
Project Name	Bryanston Road
Date Tested	25/08/2023

Sample/Hole Reference	Sample Number	Sample Type	Depth (m)			Moisture Content %	Liquid Limit %	Plastic Limit %	Plasticity index %	Passing 0.425mm %	Remarks
WS1		D	1.20	-		18	37	16	21	92	CI Intermediate Plasticity
WS1		D	2.70	-		17	41	16	25	86	CI Intermediate Plasticity
WS1		D	3.80	-		24	43	22	21	100	CI Intermediate Plasticity
WS2		D	0.90	-		16	32	14	18	100	CL Low Plasticity
WS2		D	3.30	-		16	39	14	25	94	CI Intermediate Plasticity
WS3		D	0.90	-		19	32	15	17	100	CL Low Plasticity
BH02		D	2.00	-		20	39	17	22	100	CI Intermediate Plasticity
BH02		D	4.00	-		25	44	18	26	84	CI Intermediate Plasticity
BH02		D	7.00	-		37	44	23	21	100	CI Intermediate Plasticity
BH02		D	11.00	-		25	50	21	29	100	CI/H Inter/High Plasticity
BH01		D	9.50	-		25	41	19	22	100	CI Intermediate Plasticity
BH01		D	17.00	-		25	47	19	28	100	CI Intermediate Plasticity
				-							
				-							
				-							
				-							
				-							
				-							
				-							
				-							
				-							
				-							
				-							
				-							

Symbols: NP : Non Plastic # : Liquid Limit and Plastic Limit Wet Sieved

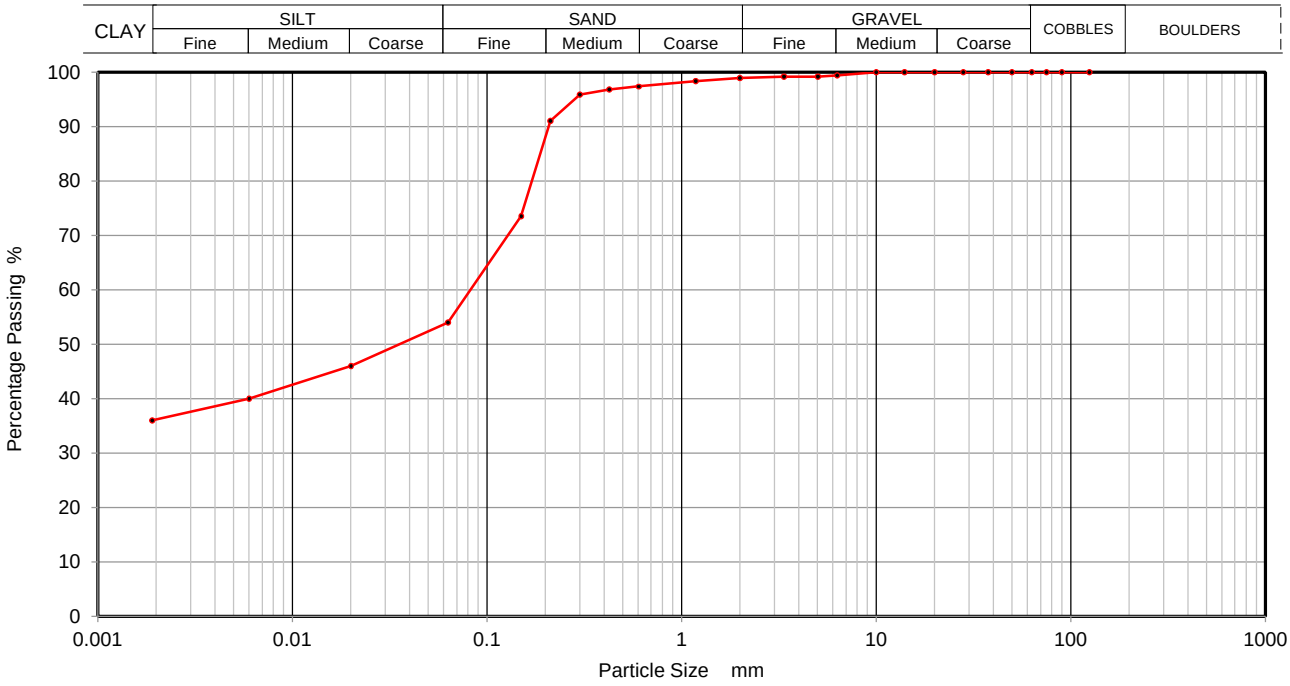
PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION
BS 5930:2015+A1:2020



Operator
Clayton Jenkins

UKAS TESTING
2788

GSTL GEOTECHNICAL SITE & TESTING LABORATORIES	**PARTICLE SIZE DISTRIBUTION** **BS 1377 Part 2:1990** **Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4**	Contract Number	68310
		Borehole/Pit No.	BH01
Project Name	Bryanston Road	Sample No.	
Soil Description	Brown slightly fine to medium gravelly fine to coarse sandy SILT/CLAY	Depth Top	3.00
		Depth Base	
Date Tested	29/08/2023	Sample Type	D



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0200	46
90	100	0.0060	40
75	100	0.0020	36
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	99		
5	99		
3.35	99		
2	99		
1.18	98		
0.6	97		
0.425	97		
0.3	96		
0.212	91		
0.15	74		
0.063	54		

Sample Proportions	% dry mass
Cobbles	0
Gravel	1
Sand	45
Silt	18
Clay	36

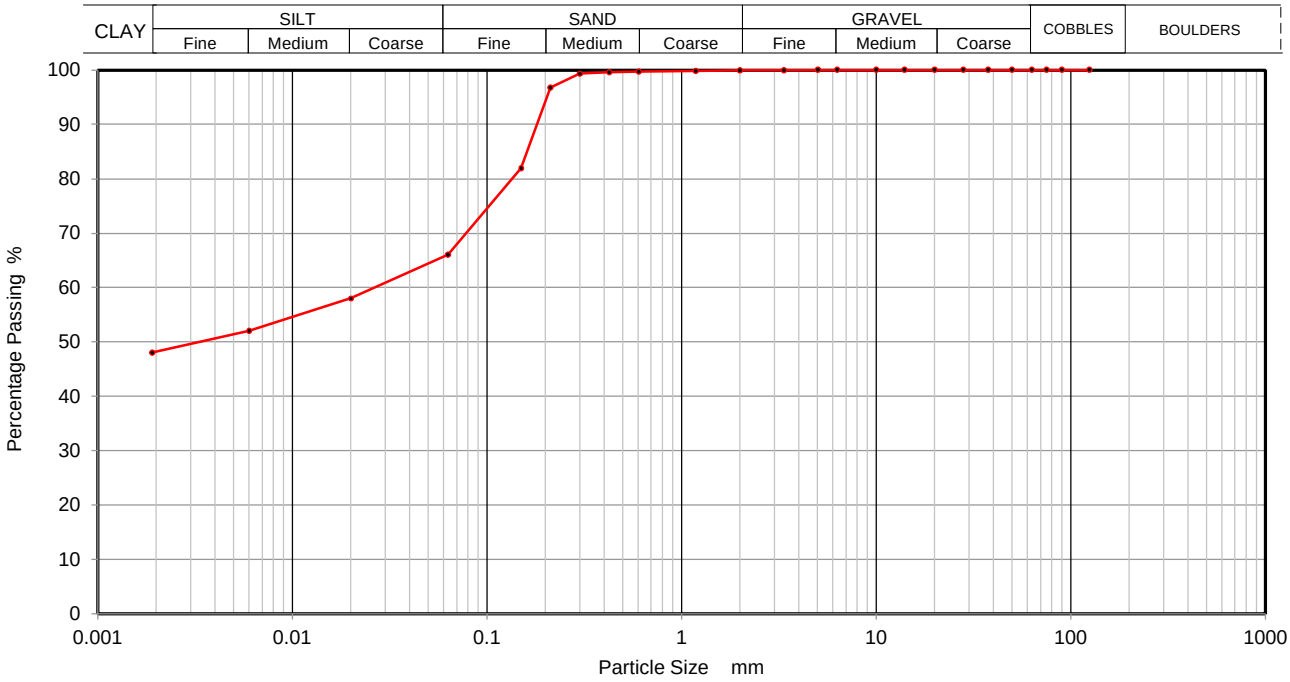
Remarks

Preparation and testing in accordance with BS1377 unless noted below

Operator
David Edwards

UKAS TESTING 2788

GSTL GEOTECHNICAL SITE & TESTING LABORATORIES	**PARTICLE SIZE DISTRIBUTION** **BS 1377 Part 2:1990** **Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4**	Contract Number	68310
		Borehole/Pit No.	BH01
Project Name	Bryanston Road	Sample No.	
Soil Description	Grey fine to coarse sandy SILT/CLAY	Depth Top	6.00
		Depth Base	
Date Tested	29/08/2023	Sample Type	D



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0200	58
90	100	0.0060	52
75	100	0.0020	48
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	100		
1.18	100		
0.6	100		
0.425	100		
0.3	99		
0.212	97		
0.15	82		
0.063	66		

Sample Proportions	% dry mass
Cobbles	0
Gravel	0
Sand	34
Silt	18
Clay	48

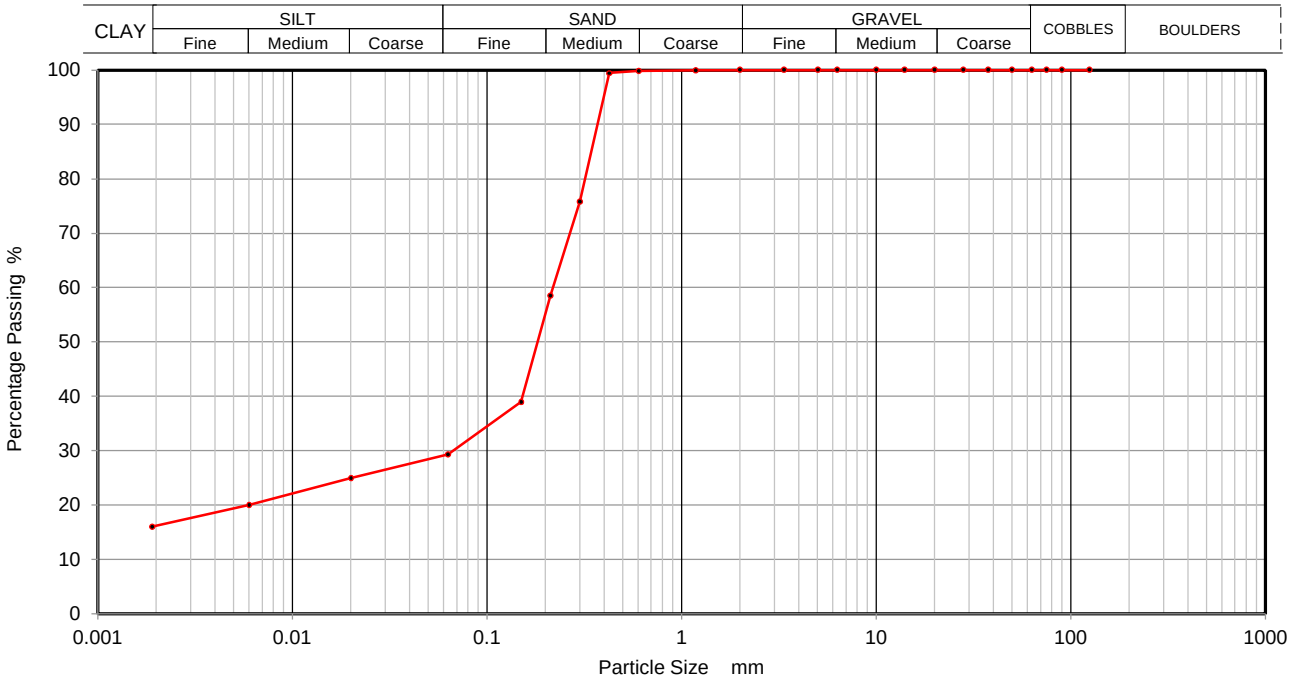
Remarks

Preparation and testing in accordance with BS1377 unless noted below

Operator
David Edwards

UKAS TESTING
2788

GSTL GEOTECHNICAL SITE & TESTING LABORATORIES	**PARTICLE SIZE DISTRIBUTION** **BS 1377 Part 2:1990** **Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4**	Contract Number	68310
		Borehole/Pit No.	BH01
Project Name	Bryanston Road	Sample No.	
Soil Description	Grey silty/clayey fine to coarse SAND	Depth Top	19.50
		Depth Base	
Date Tested	29/08/2023	Sample Type	D



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.0200	25
90	100	0.0060	20
75	100	0.0020	16
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	100		
1.18	100		
0.6	100		
0.425	99		
0.3	76		
0.212	59		
0.15	39		
0.063	29		

Sample Proportions	% dry mass
Cobbles	0
Gravel	0
Sand	71
Silt	13
Clay	16

Remarks

Preparation and testing in accordance with BS1377 unless noted below

Operator
David Edwards

UKAS TESTING 2788

Rob Gardner
Soils Ltd
Thomas Telford House - Unit 11
Sun Valley Business Park
Winnall Close
Winchester
SO23 0LB

Derwentside Environmental Testing Services Ltd
Unit 1
Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Kent
ME17 2JN
t: 01622 850410

DETS Report No: 23-10866

Site Reference:	Bryanston road
Project / Job Ref:	21029
Order No:	21029/RG
Sample Receipt Date:	24/08/2023
Sample Scheduled Date:	24/08/2023
Report Issue Number:	1
Reporting Date:	31/08/2023

Authorised by:

[redacted]

Dave Ashworth
Technical Manager

Dates of laboratory activities for each tested analyte are available upon request.

Opinions and interpretations are outside the laboratory's scope of ISO 17025 accreditation. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

DETS Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410

Soil Analysis Certificate						
DETS Report No: 23-10866	Date Sampled	None Supplied	None Supplied	None Supplied		
Soils Ltd	Time Sampled	None Supplied	None Supplied	None Supplied		
Site Reference: Bryanston road	TP / BH No	BH1	BH2	BH2		
Project / Job Ref: 21029	Additional Refs	None Supplied	None Supplied	None Supplied		
Order No: 21029/RG	Depth (m)	1.20	6.00	13.50		
Reporting Date: 31/08/2023	DETS Sample No	671654	671655	671656		

Determinand	Unit	RL	Accreditation					
pH	pH Units	N/a	MCERTS	4.6	7.8	7.5		
Total Sulphate as SO_4	mg/kg	< 200	MCERTS	669	264	2472		
Total Sulphate as SO_4	%	< 0.02	MCERTS	0.07	0.03	0.25		
W/S Sulphate as SO_4 (2:1)	mg/l	< 10	MCERTS	30	19	531		
W/S Sulphate as SO_4 (2:1)	g/l	< 0.01	MCERTS	0.03	0.02	0.53		
Total Sulphur	%	< 0.02	NONE	0.03	< 0.02	0.41		
Ammonium as NH_4	mg/kg	< 0.5	MCERTS	4.7	4.7	4.5		
Ammonium as NH_4	mg/l	< 0.05	MCERTS	0.47	0.47	0.45		
W/S Chloride (2:1)	mg/kg	< 1	MCERTS	12	18	10		
W/S Chloride (2:1)	mg/l	< 0.5	MCERTS	5.8	8.8	4.9		
Water Soluble Nitrate (2:1) as NO_3	mg/kg	< 3	MCERTS	7	< 3	< 3		
Water Soluble Nitrate (2:1) as NO_3	mg/l	< 1.5	MCERTS	3.3	< 1.5	< 1.5		
W/S Magnesium	mg/l	< 0.1	NONE	1	1	23		

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C. The Method Description page describes if the test is performed on the dried or as-received portion
Subcontracted analysis (S)

DETS Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410

Soil Analysis Certificate - Sample Descriptions
DETS Report No: 23-10866
Soils Ltd
Site Reference: Bryanston road
Project / Job Ref: 21029
Order No: 21029/RG
Reporting Date: 31/08/2023

DETS Sample No	TP / BH No	Additional Refs	Depth (m)	Moisture Content (%)	Sample Matrix Description
^ 671654	BH1	None Supplied	1.20	17.8	Light brown sandy clay
^ 671655	BH2	None Supplied	6.00	14.9	Light brown sandy clay with stones
^ 671656	BH2	None Supplied	13.50	16.3	Grey clay

Moisture content is part of procedure E003 & is not an accredited test
Insufficient Sample I/S
Unsuitable Sample U/S
^ no sampling date provided; unable to confirm if samples are within acceptable holding times

DETS Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410

Soil Analysis Certificate - Methodology & Miscellaneous Information
DETS Report No: 23-10866
Soils Ltd
Site Reference: Bryanston road
Project / Job Ref: 21029
Order No: 21029/RG
Reporting Date: 31/08/2023

Matrix	Analysed On	Determinand	Brief Method Description	Method No
Soil	D	Boron - Water Soluble	Determination of water soluble boron in soil by 2:1 hot water extract followed by ICP-OES	E012
Soil	AR	BTEX	Determination of BTEX by headspace GC-MS	E001
Soil	D	Cations	Determination of cations in soil by aqua-regia digestion followed by ICP-OES	E002
Soil	D	Chloride - Water Soluble (2:1)	Determination of chloride by extraction with water & analysed by ion chromatography	E009
Soil	AR	Chromium - Hexavalent	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry	E016
Soil	AR	Cyanide - Complex	Determination of complex cyanide by distillation followed by colorimetry	E015
Soil	AR	Cyanide - Free	Determination of free cyanide by distillation followed by colorimetry	E015
Soil	AR	Cyanide - Total	Determination of total cyanide by distillation followed by colorimetry	E015
Soil	D	Cyclohexane Extractable Matter (CEM)	Gravimetrically determined through extraction with cyclohexane	E011
Soil	AR	Diesel Range Organics (C10 - C24)	Determination of hexane/acetone extractable hydrocarbons by GC-FID	E004
Soil	AR	Electrical Conductivity	Determination of electrical conductivity by addition of saturated calcium sulphate followed by electrometric measurement	E022
Soil	AR	Electrical Conductivity	Determination of electrical conductivity by addition of water followed by electrometric measurement	E023
Soil	D	Elemental Sulphur	Determination of elemental sulphur by solvent extraction followed by GC-MS	E020
Soil	AR	EPH (C10 – C40)	Determination of acetone/hexane extractable hydrocarbons by GC-FID	E004
Soil	AR	EPH Product ID	Determination of acetone/hexane extractable hydrocarbons by GC-FID	E004
Soil	AR	EPH TEXAS (C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C40)	Determination of acetone/hexane extractable hydrocarbons by GC-FID for C8 to C40. C6 to C8 by headspace GC-MS	E004
Soil	D	Fluoride - Water Soluble	Determination of Fluoride by extraction with water & analysed by ion chromatography	E009
Soil	D	Fraction Organic Carbon (FOC)	Determination of TOC by combustion analyser.	E027
Soil	D	Organic Matter (SOM)	Determination of TOC by combustion analyser.	E027
Soil	D	TOC (Total Organic Carbon)	Determination of TOC by combustion analyser.	E027
Soil	AR	Exchangeable Ammonium	Determination of ammonium by discrete analyser.	E029
Soil	D	FOC (Fraction Organic Carbon)	Determination of fraction of organic carbon by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	D	Loss on Ignition @ 450oC	Determination of loss on ignition in soil by gravimetrically with the sample being ignited in a muffle furnace	E019
Soil	D	Magnesium - Water Soluble	Determination of water soluble magnesium by extraction with water followed by ICP-OES	E025
Soil	D	Metals	Determination of metals by aqua-regia digestion followed by ICP-OES	E002
Soil	AR	Mineral Oil (C10 - C40)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge	E004
Soil	AR	Moisture Content	Moisture content; determined gravimetrically	E003
Soil	D	Nitrate - Water Soluble (2:1)	Determination of nitrate by extraction with water & analysed by ion chromatography	E009
Soil	D	Organic Matter	Determination of organic matter by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	AR	PAH - Speciated (EPA 16)	Determination of PAH compounds by extraction in acetone and hexane followed by GC-MS with the use of surrogate and internal standards	E005
Soil	AR	PCB - 7 Congeners	Determination of PCB by extraction with acetone and hexane followed by GC-MS	E008
Soil	D	Petroleum Ether Extract (PEE)	Gravimetrically determined through extraction with petroleum ether	E011
Soil	AR	pH	Determination of pH by addition of water followed by electrometric measurement	E007
Soil	AR	Phenols - Total (monohydric)	Determination of phenols by distillation followed by colorimetry	E021
Soil	D	Phosphate - Water Soluble (2:1)	Determination of phosphate by extraction with water & analysed by ion chromatography	E009
Soil	D	Sulphate (as SO4) - Total	Determination of total sulphate by extraction with 10% HCl followed by ICP-OES	E013
Soil	D	Sulphate (as SO4) - Water Soluble (2:1)	Determination of sulphate by extraction with water & analysed by ion chromatography	E009
Soil	D	Sulphate (as SO4) - Water Soluble (2:1)	Determination of water soluble sulphate by extraction with water followed by ICP-OES	E014
Soil	AR	Sulphide	Determination of sulphide by distillation followed by colorimetry	E018
Soil	D	Sulphur - Total	Determination of total sulphur by extraction with aqua-regia followed by ICP-OES	E024
Soil	AR	SVOC	Determination of semi-volatile organic compounds by extraction in acetone and hexane followed by GC-MS	E006
Soil	AR	Thiocyanate (as SCN)	Determination of thiocyanate by extraction in caustic soda followed by acidification followed by addition of ferric nitrate followed by colorimetry	E017
Soil	D	Toluene Extractable Matter (TEM)	Gravimetrically determined through extraction with toluene	E011
Soil	D	Total Organic Carbon (TOC)	Determination of organic matter by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	AR	TPH CWG (ali: C5- C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C34, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge for C8 to C35. C5 to C8 by headspace GC-MS	E004
Soil	AR	TPH LQM (ali: C5-C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C35, C35-C44, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35, C35-C44)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge for C8 to C44. C5 to C8 by headspace GC-MS	E004
Soil	AR	VOCs	Determination of volatile organic compounds by headspace GC-MS	E001
Soil	AR	VPH (C6-C8 & C8-C10)	Determination of hydrocarbons C6-C8 by headspace GC-MS & C8-C10 by GC-FID	E001

D Dried
AR As Received

DETS Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410

List of HWOL Acronyms and Operators
DETS Report No: 23-10866
Soils Ltd
Site Reference: Bryanston road
Project / Job Ref: 21029
Order No: 21029/RG
Reporting Date: 31/08/2023

Acronym	Description
HS	Headspace analysis
EH	Extractable Hydrocarbons - i.e. everything extracted by the solvent
CU	Clean-up - e.g. by florisil, silica gel
1D	GC - Single coil gas chromatography
2D	GC-GC - Double coil gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics only
AR	Aromatics only
#1	EH_2D_Total but with humics mathematically subtracted
#2	EH_2D_Total but with fatty acids mathematically subtracted
_	Operator - underscore to separate acronyms (exception for +)
+	Operator to indicate cumulative eg. EH+HS_Total or EH_CU+HS_Total

Det - Acronym

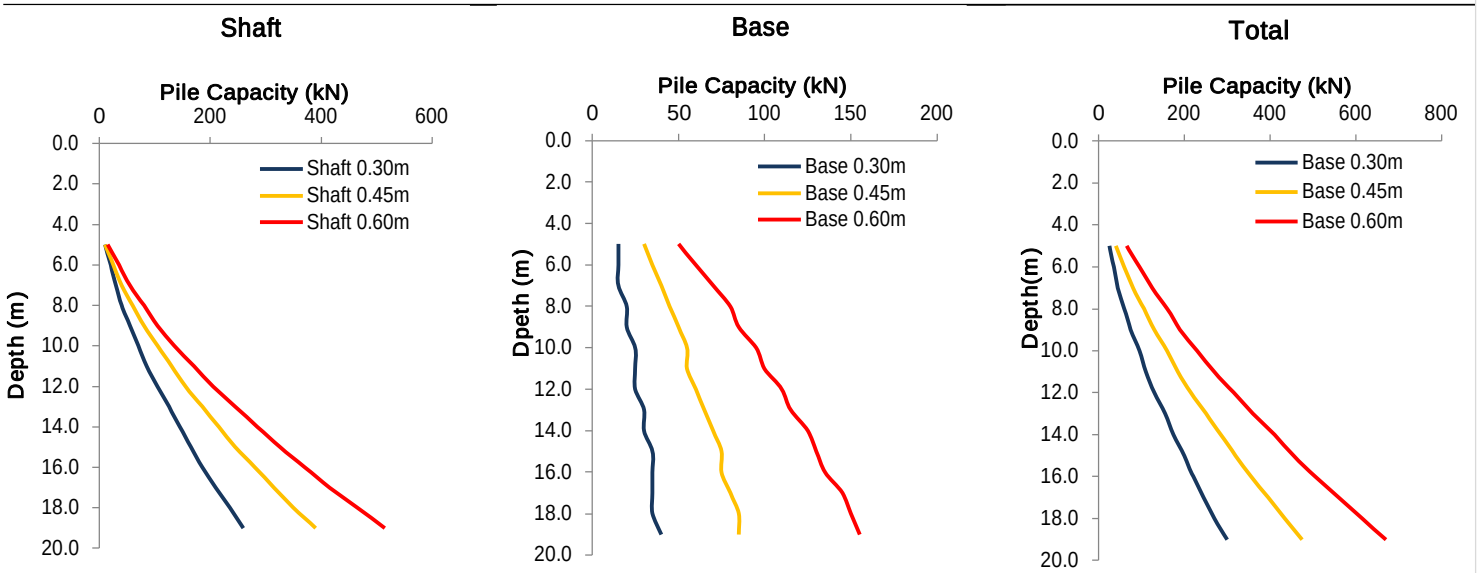
Appendix D Foundation Design

Appendix D.1 Preliminary Pile Design

Preliminary Pile Working Loads

Single Vertically Loaded Pile (kN)

Name:	RG	N_C value	9	Pile Start Depth:	4	FOS	
Job No:	21029	α value:	0.45	Pile Final Depth:	19	Shaft	Base
Date:	5.9.23			Pile Increment:	1	3	3



Pile Depths	Pile Diameter (m): 0.30			0.45			0.60		
(m bgl)	Shaft	Base	Total	Shaft	Base	Total	Shaft	Base	Total
4.0									
5.0	10	15	25	10	30	40	15	50	65
6.0	20	15	35	25	35	60	35	60	95
7.0	30	15	45	40	40	80	55	70	125
8.0	40	20	60	60	45	105	80	80	160
9.0	55	20	75	80	50	130	105	85	190
10.0	70	25	95	105	55	160	135	95	230
11.0	85	25	110	130	55	185	170	100	270
12.0	105	25	130	155	60	215	205	110	315
13.0	125	30	155	185	65	250	245	115	360
14.0	145	30	175	215	70	285	285	125	410
15.0	165	35	200	245	75	320	325	130	455
16.0	185	35	220	280	75	355	370	135	505
17.0	210	35	245	315	80	395	415	145	560
18.0	235	35	270	350	85	435	465	150	615
19.0	260	40	300	390	85	475	515	155	670

Appendix E Chemical Laboratory Analyses

Appendix E.1 Conceptual Site Model

Table E.1.1 CSM Revised Pre-Chemical Analyses

Source	Potential Contaminant	Exposure Pathway	Receptor	Initial Assessment from Preliminary Investigation Report Informatio			Comments	Further Works
				Severity	Probability	Risk		
Railway/Gravel pits/Historical landfill sites/ Potentially Infilled Land (Non-Water)/ Potentially Infilled Lane (Water) Off-site sources from which potential contamination would have migrated onto the site.	Metals, Semi-metals and non-metals, PAHs, Asbestos	Inhalation of dust	Site Workers/Site Maintenance	Medium	Likely	Moderate	Site located on bedrock of the Wittering Formation bedrock, which was classified as Secondary Aquifer A and would support both shallow and deep groundwater. Ground gas may be accumulating from unknown content of organic material when backfilling in gravel pits/historical landfill/potentially infilled land (non-water) and (water).	Monitoring well installations will be required to assess the ground gas risk present.
			End Users	Medium	Likely	Moderate		
			Off-site Users	Medium	Unlikely	Low		
	PAHs, TPHs, ground gas	Inhalation of vapour/gases (including Radon)	Site Workers/Site Maintenance	Medium	Likely	Moderate		
			End Users					
			Off-site Users	Minor	Unlikely	Very low		
	Metals, Semi-metals and non-metals, PAHs, TPHs, pH	Ingestion and absorption via direct contact	Site Workers/Site Maintenance	Medium	Likely	Moderate		
			End Users	Medium	Unlikely	Low		
	Metals, Semi-metals and non-metals, PAHs, TPHs, pH	Migration via surface runoff	Surface Water	Mild	Low	Low		
		Migration in solution via groundwater	Surface Water	Mild	Low	Low		
			Shallow Aquifer	Mild	Low	Low		
			Deep Aquifer	Mild	Low	Low		
		Direct contact with construction material	Buried Structures	Mild	Low	Low		
			Buried Services					
	PAHs, TPHs, ground gas	Migration of gases via permeable soils	Site Workers/Site Maintenance	Medium	Likely	Moderate		
			End Users					
			Off-site Users	Minor	Unlikely	Very low		
			Building and Confined Spaces					

Table E.1.2 CSM Revised Post-Chemical Analyses

Source	Potential Contaminant	Exposure Pathway	Receptor	Initial Assessment from Preliminary Investigation Report Informatio			Comments	Further Assessment
				Severity	Probability	Risk		
Railway/Gravel pits/Historical landfill sites/ Potentially Infilled Land (Non-Water)/ Potentially Infilled Lane (Water) Off-site sources from which potential contamination would have migrated onto the site.	Metals	Inhalation of dust	Site Workers/Site Maintenance	Medium	Unlikely	Very low	Exceedance of Lead in a single sample of Made Ground. Gas monitoring ongoing at time of reporting.	Ground Gas Risk Assessment Garden plots will require inspection and possible testing following the initial site strip.
			End Users	Medium	Unlikely	Very low		
			Off-site Users	Medium	Unlikely	Very low		
	Ground gas	Inhalation of vapour/gases (including Radon)	Site Workers/Site Maintenance	Medium	Unlikely	Low		
			End Users					
			Off-site Users	Minor	Unlikely	Very low		
	Metals	Ingestion and absorption via direct contact	Site Workers/Site Maintenance	Medium	Unlikely	Very low		
			End Users	Medium	Unlikely	Very low		
	Metals	Migration via surface runoff	Surface Water	Mild	Unlikely	Very low		
		Migration in solution via groundwater	Surface Water	Mild	Unlikely	Very low		
			Shallow Aquifer	Mild	Unlikely	Very low		
			Deep Aquifer	Mild	Unlikely	Very low		
		Direct contact with construction material	Buried Structures	Mild	Unlikely	Very low		
			Buried Services					
	Ground gas	Migration of gases via permeable soils	Site Workers/Site Maintenance	Medium	Unlikely	Very low		
			End Users					
			Off-site Users	Minor	Unlikely	Very low		
			Building and Confined Spaces					

Appendix E.2 Chemical Laboratory Results

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Soils Ltd
Thomas Telford House - Unit 11
Sun Valley Business Park
Winnall Close
Winchester
SO23 0LB

Derwentside Environmental Testing Services Ltd
Unit 1
Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Kent
ME17 2JN
t: 01622 850410

DETS Report No: 23-10865

Site Reference:	Bryanston Road
Project / Job Ref:	21029
Order No:	None Supplied
Sample Receipt Date:	24/08/2023
Sample Scheduled Date:	24/08/2023
Report Issue Number:	1
Reporting Date:	31/08/2023

Authorised by:

[redacted]
Dave Ashworth
Technical Manager

Dates of laboratory activities for each tested analyte are available upon request.

Opinions and interpretations are outside the laboratory's scope of ISO 17025 accreditation. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

DETS Ltd
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Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410

Soil Analysis Certificate						
DETS Report No: 23-10865	Date Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Soils Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Bryanston Road	TP / BH No	BH1	BH2	WS2	WS3	WS6
Project / Job Ref: 21029	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Order No: None Supplied	Depth (m)	0.50	0.70	0.70	0.30	0.70
Reporting Date: 31/08/2023	DETS Sample No	671646	671647	671648	671649	671650

Determinand	Unit	RL	Accreditation					
Asbestos Screen (S)	N/a	N/a	ISO17025	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected
pH	pH Units	N/a	MCERTS	5.1	5.6	6.6	5.2	6.9
Organic Matter (SOM)	%	< 0.1	MCERTS	0.9	1.7	1.5	2.6	2.3
Arsenic (As)	mg/kg	< 2	MCERTS	9	6	6	9	8
W/S Boron	mg/kg	< 1	NONE	< 1	< 1	< 1	< 1	< 1
Cadmium (Cd)	mg/kg	< 0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	0.5
Chromium (Cr)	mg/kg	< 2	MCERTS	10	13	12	11	15
Chromium (hexavalent)	mg/kg	< 2	NONE	< 2	< 2	< 2	< 2	< 2
Copper (Cu)	mg/kg	< 4	MCERTS	7	5	4	28	17
Lead (Pb)	mg/kg	< 3	MCERTS	12	10	10	34	382
Mercury (Hg)	mg/kg	< 1	MCERTS	< 1	< 1	< 1	< 1	< 1
Nickel (Ni)	mg/kg	< 3	MCERTS	< 3	3	< 3	< 3	6
Selenium (Se)	mg/kg	< 2	MCERTS	< 2	< 2	< 2	< 2	< 2
Vanadium (V)	mg/kg	< 1	MCERTS	18	22	21	20	25
Zinc (Zn)	mg/kg	< 3	MCERTS	25	36	25	65	218
Total Phenols (monohydric)	mg/kg	< 2	NONE	< 2	< 2	< 2	< 2	< 2

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C. The Method Description page describes if the test is performed on the dried or as-received portion
Subcontracted analysis (S)

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Maidstone
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Tel : 01622 850410

Soil Analysis Certificate						
DETS Report No: 23-10865	Date Sampled	None Supplied	None Supplied	None Supplied		
Soils Ltd	Time Sampled	None Supplied	None Supplied	None Supplied		
Site Reference: Bryanston Road	TP / BH No	WS5	WS1	WS3		
Project / Job Ref: 21029	Additional Refs	None Supplied	None Supplied	None Supplied		
Order No: None Supplied	Depth (m)	0.05	0.30	0.70		
Reporting Date: 31/08/2023	DETS Sample No	671651	671652	671653		

Determinand	Unit	RL	Accreditation					
Asbestos Screen (S)	N/a	N/a	ISO17025	Not Detected	Not Detected	Not Detected		
pH	pH Units	N/a	MCERTS	5.5	4.8	4.5		
Organic Matter (SOM)	%	< 0.1	MCERTS	9.8	1.4	1.9		
Arsenic (As)	mg/kg	< 2	MCERTS	8	5	10		
W/S Boron	mg/kg	< 1	NONE	< 1	< 1	< 1		
Cadmium (Cd)	mg/kg	< 0.2	MCERTS	< 0.2	< 0.2	< 0.2		
Chromium (Cr)	mg/kg	< 2	MCERTS	13	10	14		
Chromium (hexavalent)	mg/kg	< 2	NONE	< 2	< 2	< 2		
Copper (Cu)	mg/kg	< 4	MCERTS	19	< 4	15		
Lead (Pb)	mg/kg	< 3	MCERTS	37	20	47		
Mercury (Hg)	mg/kg	< 1	MCERTS	< 1	< 1	< 1		
Nickel (Ni)	mg/kg	< 3	MCERTS	3	< 3	4		
Selenium (Se)	mg/kg	< 2	MCERTS	< 2	< 2	< 2		
Vanadium (V)	mg/kg	< 1	MCERTS	20	19	22		
Zinc (Zn)	mg/kg	< 3	MCERTS	156	28	43		
Total Phenols (monohydric)	mg/kg	< 2	NONE	< 2	< 2	< 2		

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C. The Method Description page describes if the test is performed on the dried or as-received portion
Subcontracted analysis (S)

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Soil Analysis Certificate - Speciated PAHs						
DETS Report No: 23-10865	Date Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Soils Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Bryanston Road	TP / BH No	BH1	BH2	WS2	WS3	WS6
Project / Job Ref: 21029	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Order No: None Supplied	Depth (m)	0.50	0.70	0.70	0.30	0.70
Reporting Date: 31/08/2023	DETS Sample No	671646	671647	671648	671649	671650

Determinand	Unit	RL	Accreditation					
Naphthalene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Acenaphthylene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Acenaphthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Fluorene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Phenanthrene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	0.18
Pyrene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	0.16
Benzo(a)anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Chrysene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	0.13
Benzo(b)fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	0.16
Benzo(k)fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(a)pyrene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Indeno(1,2,3-cd)pyrene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Dibenz(a,h)anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(ghi)perylene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Total EPA-16 PAHs	mg/kg	< 1.6	MCERTS	< 1.6	< 1.6	< 1.6	< 1.6	< 1.6

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Soil Analysis Certificate - Speciated PAHs						
DETS Report No: 23-10865	Date Sampled	None Supplied	None Supplied	None Supplied		
Soils Ltd	Time Sampled	None Supplied	None Supplied	None Supplied		
Site Reference: Bryanston Road	TP / BH No	WS5	WS1	WS3		
Project / Job Ref: 21029	Additional Refs	None Supplied	None Supplied	None Supplied		
Order No: None Supplied	Depth (m)	0.05	0.30	0.70		
Reporting Date: 31/08/2023	DETS Sample No	671651	671652	671653		

Determinand	Unit	RL	Accreditation					
Naphthalene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1		
Acenaphthylene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1		
Acenaphthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1		
Fluorene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1		
Phenanthrene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1		
Anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1		
Fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1		
Pyrene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1		
Benzo(a)anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1		
Chrysene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1		
Benzo(b)fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1		
Benzo(k)fluoranthene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1		
Benzo(a)pyrene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1		
Indeno(1,2,3-cd)pyrene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1		
Dibenz(a,h)anthracene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1		
Benzo(ghi)perylene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1		
Total EPA-16 PAHs	mg/kg	< 1.6	MCERTS	< 1.6	< 1.6	< 1.6		

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Soil Analysis Certificate - EPH Texas Banded						
DETS Report No: 23-10865	Date Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Soils Ltd	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Bryanston Road	TP / BH No	BH1	BH2	WS2	WS3	WS6
Project / Job Ref: 21029	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Order No: None Supplied	Depth (m)	0.50	0.70	0.70	0.30	0.70
Reporting Date: 31/08/2023	DETS Sample No	671646	671647	671648	671649	671650

Determinand	Unit	RL	Accreditation					
EPH Texas (C6 - C8) : HS_1D_MS_Total	mg/kg	< 0.05	NONE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
EPH Texas (>C8 - C10) : EH_1D_Total	mg/kg	< 1	MCERTS	< 1	< 1	4	< 1	< 1
EPH Texas (>C10 - C12) : EH_1D_Total	mg/kg	< 1	MCERTS	< 1	< 1	< 1	< 1	< 1
EPH Texas (>C12 - C16) : EH_1D_Total	mg/kg	< 1	MCERTS	< 1	< 1	< 1	< 1	< 1
EPH Texas (>C16 - C21) : EH_1D_Total	mg/kg	< 1	MCERTS	< 1	< 1	< 1	< 1	< 1
EPH Texas (>C21 - C40) : EH_1D_Total	mg/kg	< 6	MCERTS	< 6	< 6	< 6	10	9
EPH Texas (C6 - C40) : HS_1D_MS+EH_1D_Total	mg/kg	< 6	NONE	< 6	< 6	< 6	10	9

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Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410

Soil Analysis Certificate - EPH Texas Banded						
DETS Report No: 23-10865	Date Sampled	None Supplied	None Supplied	None Supplied		
Soils Ltd	Time Sampled	None Supplied	None Supplied	None Supplied		
Site Reference: Bryanston Road	TP / BH No	WS5	WS1	WS3		
Project / Job Ref: 21029	Additional Refs	None Supplied	None Supplied	None Supplied		
Order No: None Supplied	Depth (m)	0.05	0.30	0.70		
Reporting Date: 31/08/2023	DETS Sample No	671651	671652	671653		

Determinand	Unit	RL	Accreditation					
EPH Texas (C6 - C8) : HS_1D_MS_Total	mg/kg	< 0.05	NONE	< 0.05	< 0.05	< 0.05		
EPH Texas (>C8 - C10) : EH_1D_Total	mg/kg	< 1	MCERTS	< 1	< 1	< 1		
EPH Texas (>C10 - C12) : EH_1D_Total	mg/kg	< 1	MCERTS	< 1	< 1	< 1		
EPH Texas (>C12 - C16) : EH_1D_Total	mg/kg	< 1	MCERTS	< 1	< 1	< 1		
EPH Texas (>C16 - C21) : EH_1D_Total	mg/kg	< 1	MCERTS	3	< 1	< 1		
EPH Texas (>C21 - C40) : EH_1D_Total	mg/kg	< 6	MCERTS	15	< 6	9		
EPH Texas (C6 - C40) : HS_1D_MS+EH_1D_Total	mg/kg	< 6	NONE	18	< 6	9		

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Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410

Soil Analysis Certificate - Sample Descriptions
DETS Report No: 23-10865
Soils Ltd
Site Reference: Bryanston Road
Project / Job Ref: 21029
Order No: None Supplied
Reporting Date: 31/08/2023

DETS Sample No	TP / BH No	Additional Refs	Depth (m)	Moisture Content (%)	Sample Matrix Description
^ 671646	BH1	None Supplied	0.50	14.5	Light brown sandy clay
^ 671647	BH2	None Supplied	0.70	12.7	Light brown sandy clay with chalk
^ 671648	WS2	None Supplied	0.70	12.2	Light brown sandy clay
^ 671649	WS3	None Supplied	0.30	14.2	Light brown sandy clay with vegetation
^ 671650	WS6	None Supplied	0.70	10.2	Brown sandy clay with stones and chalk
^ 671651	WS5	None Supplied	0.05	30.7	Brown loamy sand with stones and vegetation
^ 671652	WS1	None Supplied	0.30	10.8	Brown sandy clay with stones
^ 671653	WS3	None Supplied	0.70	15.3	Brown sandy clay

Moisture content is part of procedure E003 & is not an accredited test

Insufficient Sample I/S

Unsuitable Sample U/S

^ no sampling date provided; unable to confirm if samples are within acceptable holding times

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Rose Lane
Lenham Heath
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Soil Analysis Certificate - Methodology & Miscellaneous Information
DETS Report No: 23-10865
Soils Ltd
Site Reference: Bryanston Road
Project / Job Ref: 21029
Order No: None Supplied
Reporting Date: 31/08/2023

Matrix	Analysed On	Determinand	Brief Method Description	Method No
Soil	D	Boron - Water Soluble	Determination of water soluble boron in soil by 2:1 hot water extract followed by ICP-OES	E012
Soil	AR	BTEX	Determination of BTEX by headspace GC-MS	E001
Soil	D	Cations	Determination of cations in soil by aqua-regia digestion followed by ICP-OES	E002
Soil	D	Chloride - Water Soluble (2:1)	Determination of chloride by extraction with water & analysed by ion chromatography	E009
Soil	AR	Chromium - Hexavalent	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry	E016
Soil	AR	Cyanide - Complex	Determination of complex cyanide by distillation followed by colorimetry	E015
Soil	AR	Cyanide - Free	Determination of free cyanide by distillation followed by colorimetry	E015
Soil	AR	Cyanide - Total	Determination of total cyanide by distillation followed by colorimetry	E015
Soil	D	Cyclohexane Extractable Matter (CEM)	Gravimetrically determined through extraction with cyclohexane	E011
Soil	AR	Diesel Range Organics (C10 - C24)	Determination of hexane/acetone extractable hydrocarbons by GC-FID	E004
Soil	AR	Electrical Conductivity	Determination of electrical conductivity by addition of saturated calcium sulphate followed by electrometric measurement	E022
Soil	AR	Electrical Conductivity	Determination of electrical conductivity by addition of water followed by electrometric measurement	E023
Soil	D	Elemental Sulphur	Determination of elemental sulphur by solvent extraction followed by GC-MS	E020
Soil	AR	EPH (C10 – C40)	Determination of acetone/hexane extractable hydrocarbons by GC-FID	E004
Soil	AR	EPH Product ID	Determination of acetone/hexane extractable hydrocarbons by GC-FID	E004
Soil	AR	EPH TEXAS (C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C40)	Determination of acetone/hexane extractable hydrocarbons by GC-FID for C8 to C40. C6 to C8 by headspace GC-MS	E004
Soil	D	Fluoride - Water Soluble	Determination of Fluoride by extraction with water & analysed by ion chromatography	E009
Soil	D	Fraction Organic Carbon (FOC)	Determination of TOC by combustion analyser.	E027
Soil	D	Organic Matter (SOM)	Determination of TOC by combustion analyser.	E027
Soil	D	TOC (Total Organic Carbon)	Determination of TOC by combustion analyser.	E027
Soil	AR	Exchangeable Ammonium	Determination of ammonium by discrete analyser.	E029
Soil	D	FOC (Fraction Organic Carbon)	Determination of fraction of organic carbon by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	D	Loss on Ignition @ 450oC	Determination of loss on ignition in soil by gravimetrically with the sample being ignited in a muffle furnace	E019
Soil	D	Magnesium - Water Soluble	Determination of water soluble magnesium by extraction with water followed by ICP-OES	E025
Soil	D	Metals	Determination of metals by aqua-regia digestion followed by ICP-OES	E002
Soil	AR	Mineral Oil (C10 - C40)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge	E004
Soil	AR	Moisture Content	Moisture content; determined gravimetrically	E003
Soil	D	Nitrate - Water Soluble (2:1)	Determination of nitrate by extraction with water & analysed by ion chromatography	E009
Soil	D	Organic Matter	Determination of organic matter by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	AR	PAH - Speciated (EPA 16)	Determination of PAH compounds by extraction in acetone and hexane followed by GC-MS with the use of surrogate and internal standards	E005
Soil	AR	PCB - 7 Congeners	Determination of PCB by extraction with acetone and hexane followed by GC-MS	E008
Soil	D	Petroleum Ether Extract (PEE)	Gravimetrically determined through extraction with petroleum ether	E011
Soil	AR	pH	Determination of pH by addition of water followed by electrometric measurement	E007
Soil	AR	Phenols - Total (monohydric)	Determination of phenols by distillation followed by colorimetry	E021
Soil	D	Phosphate - Water Soluble (2:1)	Determination of phosphate by extraction with water & analysed by ion chromatography	E009
Soil	D	Sulphate (as SO4) - Total	Determination of total sulphate by extraction with 10% HCl followed by ICP-OES	E013
Soil	D	Sulphate (as SO4) - Water Soluble (2:1)	Determination of sulphate by extraction with water & analysed by ion chromatography	E009
Soil	D	Sulphate (as SO4) - Water Soluble (2:1)	Determination of water soluble sulphate by extraction with water followed by ICP-OES	E014
Soil	AR	Sulphide	Determination of sulphide by distillation followed by colorimetry	E018
Soil	D	Sulphur - Total	Determination of total sulphur by extraction with aqua-regia followed by ICP-OES	E024
Soil	AR	SVOC	Determination of semi-volatile organic compounds by extraction in acetone and hexane followed by GC-MS	E006
Soil	AR	Thiocyanate (as SCN)	Determination of thiocyanate by extraction in caustic soda followed by acidification followed by addition of ferric nitrate followed by colorimetry	E017
Soil	D	Toluene Extractable Matter (TEM)	Gravimetrically determined through extraction with toluene	E011
Soil	D	Total Organic Carbon (TOC)	Determination of organic matter by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	AR	TPH CWG (ali: C5- C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C34, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge for C8 to C35. C5 to C8 by headspace GC-MS	E004
Soil	AR	TPH LQM (ali: C5-C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C35, C35-C44, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35, C35-C44)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge for C8 to C44. C5 to C8 by headspace GC-MS	E004
Soil	AR	VOCs	Determination of volatile organic compounds by headspace GC-MS	E001
Soil	AR	VPH (C6-C8 & C8-C10)	Determination of hydrocarbons C6-C8 by headspace GC-MS & C8-C10 by GC-FID	E001

D Dried
AR As Received

DETS Ltd
Unit 1, Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Maidstone
Kent ME17 2JN
Tel : 01622 850410

List of HWOL Acronyms and Operators
DETS Report No: 23-10865
Soils Ltd
Site Reference: Bryanston Road
Project / Job Ref: 21029
Order No: None Supplied
Reporting Date: 31/08/2023

Acronym	Description
HS	Headspace analysis
EH	Extractable Hydrocarbons - i.e. everything extracted by the solvent
CU	Clean-up - e.g. by florisil, silica gel
1D	GC - Single coil gas chromatography
2D	GC-GC - Double coil gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics only
AR	Aromatics only
#1	EH_2D_Total but with humics mathematically subtracted
#2	EH_2D_Total but with fatty acids mathematically subtracted
_	Operator - underscore to separate acronyms (exception for +)
+	Operator to indicate cumulative eg. EH+HS_Total or EH_CU+HS_Total

Det - Acronym
EPH Texas (C10 - C12) - EH_1D_Total
EPH Texas (C12 - C16) - EH_1D_Total
EPH Texas (C16 - C21) - EH_1D_Total
EPH Texas (C21 - C40) - EH_1D_Total
EPH Texas (C6 - C40) - HS_1D_MS+EH_1D_Total
EPH Texas (C6 - C8) - HS_1D_MS_Total
EPH Texas (C8 - C10) - EH_1D_Total

Appendix E.3 General Assessment Criteria

HUMAN HEALTH RISK ASSESSMENT

Introduction

The statutory definition of contaminated land is defined in the Environmental Protection Act 1990, ref. 1.1, which was introduced by the Environment Act 1995, ref. 1.2;

'Land which appears to the local authority in whose area it is situated to be in such a condition, by reason of substances in, on or under the land, that –

(a) significant harm is being caused or there is a significant possibility of such harm being caused; or

(b) pollution of controlled waters is being, or is likely to be, caused.'

The UK guidance on the assessment of contaminated has developed as a direct result of the introduction of these two Acts. The technical guidance supporting the new legislation has been summarised in a number of key documents collectively known as the Contaminated Land Reports (CLRs), a proposed series of twelve documents. Seven were originally published in March 1994, four more were published in April 2002, while the last remaining guidance document, CLR 11, ref 1.3 was published in 2004. In 2008 CLR reports 7 to 10 were withdrawn by DEFRA and the Environment Agency and updated version of CLR 9 and 10 were produced in the form of Science Reports SR2, ref. 1.4 and SR3, ref. 1.5.

In establishing whether a site fulfils the statutory definition of 'contaminated land' it is necessary to identify, whether a pollutant linkage exists in respect of the land in question and whether the pollutant linkage:

- is resulting in significant harm being caused to the receptor in the pollutant linkage,
- presents a significant possibility of significant harm being caused to that receptor,
- is resulting in the pollution of the controlled waters which constitute the receptor, or
- is likely to result in such pollution.

A 'pollutant linkage' may be defined as the link between a contaminant 'source' and a 'receptor' by means of a 'pathway'.

Assessment Methodology

The guidance proposes a four-stage assessment process for identifying potential pollutant linkages on a site. These stages are set out in the table below:

No.	Process	Description
1	Hazard Identification	Establishing contaminant sources, pathways and receptors (the conceptual model).
2	Hazard Assessment	Analysing the potential for unacceptable risks (what linkages could be present, what could be the effects).
3	Risk Estimation	Trying to establish the magnitude and probability of the possible consequences (what degree of harm might result and to what receptors, and how likely is it).
4	Risk Evaluation	Deciding whether the risk is unacceptable.

Stages 1 and 2 develop a *'conceptual model'* based upon information collated from desk based studies, and frequently a walkover of the site. The walkover survey should be conducted in general accordance with CLR 2, ref. 1.6. The formation of a conceptual model is an iterative process and as such, it should be updated and refined throughout each stage of the project to reflect any additional information obtained.

The extent of the desk studies and enquiries to be conducted should be in general accordance with CLR 3, ref. 1.7. The information from these enquiries is presented in a desk study report with recommendations, if necessary, for further work based upon the conceptual model. Specific DoE 'Industry Profiles' provide guidance on the nature of contaminants relating to specific industrial processes.

If potential pollutant linkages are identified within the conceptual model, a Phase 2 site investigation and report will be recommended. The investigation should be planned in general accordance with CLR 4, ref 1.8. The number of exploratory holes and samples collected for analysis should be consistent with the size of the site and the level of risk envisaged. This will enable a contamination risk assessment to be conducted, at which point the conceptual model can be updated and relevant pollutant linkages can be identified.

A two-stage investigation may be more appropriate where time constraints are less of an issue. The first stage investigation being conducted as an initial assessment for the presence of potential sources, a second being a more refined investigation to delineate wherever possible the extent of the identified contamination.

All site works should be in general accordance with the British Standards BS 10175:2011, ref. 1.9. and BS 5930:2015, ref. 1.10.

The generic contamination risk assessment screens the results of the chemical analysis against generic guidance values which are dependent on the proposed end-use of the development.

The end-use may be defined as one of the following ref. 1.15;

- Residential with homegrown produce – domestic low rise and low density housing with gardens where vegetables may be grown for home consumption
- Residential without homegrown produce – domestic low density and low density housing where no gardens are present.
- Allotments – specific areas where vegetables are grown for home consumption.
- Public open space in close proximity to residential housing – includes the predominantly grassed area adjacent to high density housing and the central green area around which houses are developed. This land-use includes the smaller areas commonly incorporated in newer developments as informal grassed areas or more formal landscaped areas with a mixture of open space and covered soil with planting.
- Public open space in use as general parkland – provided for recreational use and may be used for family visits and picnics, children's play area, sports grounds and dig walking.
- Commercial – industrial premises where there is limited exposure to soil.

Standard Land-use Scenarios

The standard land-use scenarios used to develop conceptual exposure models are presented in the following sections:

Residential with homegrown produce

Generic scenario assumes a typical two-storey house built on a ground bearing slab with a private garden having a lawn, flowerbeds and a small fruit and vegetable patch.

• Critical receptor is a young female child (zero to six years old)
• Exposure duration is six years.
• Exposure pathways include direct soil and indoor dust ingestion, consumption of home-grown produce and any adhering soil, skin contact with soils and indoor dust and inhalation of indoor and outdoor dust and vapours.
• Building type is a two-storey small terraced house.

A sub-set of the Residential land-use is **Residential without Homegrown produce**. The generic scenario assumes low density housing with communal landscaped gardens where the consumption of home grown vegetables will not occur.

Allotments

Provision of open space (about 250sq.m) commonly made available to tenants by the local authority to grow fruit and vegetable for their own consumption. Typically, there are a number of plots to a site which may have a total area of up to 1 hectare. The tenants are assumed to be adults and that young children make occasional accompanied visits.

Although some allotment holders may choose to keep animals including rabbits, hens, and ducks, potential exposure to contaminated meat and eggs is not considered.

- Critical receptor is a young female child (zero to six years old)
- Exposure duration is six years.
- Exposure pathways include direct soil ingestion, consumption of homegrown produce and any adhering soil, skin contact with soils and inhalation of outdoor dust and vapours.
- There is no building.

Commercial

The generic scenario assumes a typical commercial or light industrial property comprising a three-storey building at which employees spend most time indoors and are involved in office-based or relatively light physical work.

- Critical receptor is a working female adult (aged 16 to 65 years old).
- Exposure duration is a working lifetime of 49 years.
- Exposure pathways include direct soil and indoor dust ingestion, skin contact with soils and dusts and inhalation of dust and vapours.
- Building type is a three-storey office (pre 1970).

Public Open Space within Residential Area

The generic scenario refers to any grassed area 0.05 ha and that is close to Housing.

- Grassed area of up to 0.05 ha and a considerable proportion of this (up to 50%) may be bare soil
- Predominantly used by children for playing and may be used for activities such as a football kick about
- Sufficiently close proximity to home for tracking back of soil to occur, thus indoor exposure pathways apply
- older children as the critical receptor on basis that they will use site most frequently (Age class 4-9)
- ingestion rate 75 $mg.day^{-1}$

Public Open Space Park

This generic scenario refers to any public park that is more than 0.5ha in area:

- Public park (>0.5 ha), predominantly grassed and may also contain children's play equipment and border areas of soil containing flowers or shrubs (75% cover)
- Female child age classes 1-6
- Soil ingestion rate of 50 $mg.day^{-1}$
- Occupancy period outdoors = 2 $hours.day^{-1}$
- Exposure frequency of 170 days.year-1 for age classes 2-18 and 85
- $days.year^{-1}$ for age class 1
- Outdoor exposure pathways only (no tracking back).

Human Health Generic Quantitative Risk Assessment (GQRA) involves the comparison of contaminant concentrations measured in soil at the site with Generic Assessment Criteria (GAC).

GAC are conservative values adopted to ensure that they are applicable to the majority of possible contaminated site. These values may be published Contaminated Land Exposure Assessment Model (CLEA) derived GAC derived by a third party or the Environment Agency/ DEFRA. It is imperative to the risk assessor to understand the uncertainties and limitations associated with these GAC to ensure that they are used appropriately. Where the adoption of a GAC is not appropriate, for instance when the intended land-use is at variance the CLEA standard land-uses, then a Detailed Quantitative Risk Assessment (DQRA) may be undertaken to develop site specific values for relevant soil contaminants based on the site specific conditions.

In 2014, the publication of Category 4 Screening Levels (C4SL) ref 1.15, 1.16, as part of the Defra-funded research project SP1010, included modifications to certain exposure assumptions documented within EA Science Report SC050221/SR3 (herein after referred to as SR3) ref 1.5 used in the generation of SGVs. C4SL were published for six substances (cadmium, arsenic, benzene, benzo(a)pyrene, chromium VI and lead) for a sandy loam soil type with 6% soil organic matter, based on a low level of toxicological concern (LLTC; see Section 2.3 of research project report SP1010 ref 1.16. Where a C4SL has been published, Soils Limited has adopted them as GAC for these six substances.

For all other substances the soils will be compared to Suitable 4 Use Levels (S4ULs) published by LQM ref. 1.12, which were developed for around 85 substances and are intended to enable a screening assessment of the risks posed by soil quality on development sites. The updated LQM/CIEH GAC publication was developed to accommodate recent developments in the understanding of chemical, toxicological and routine exposure to soil-based contaminants.

Where no S4UL or C4SL is available, the assessment criteria (AC) may be generated using the Contaminated Land Exposure Assessment (CLEA) Software Version 1.07, ref. 1.13. Toxicological and physico-chemical/fate and transport data used to generate the AC has been derived from a hierarchy of data sources as follows:

1. Environment Agency or Department of Environment Food and Rural Affairs (DEFRA) documents;
2. Other documents produced by UK Government or state organisations;
3. European institution documents;
4. International organisation documents;
5. Foreign government institutions.

In the case of the majority of contaminants considered, the toxicological data has been drawn from the relevant CLR 9 TOX report, or updated toxicological data published by the Environment Agency (2009), ref. 1.6, where available. Where no TOX report is available reference has been made to the health criteria values, derived for use in Land Quality Press (2006), ref. 1.17, as this is considered to represent a peer reviewed data source. Similarly, fate and transport data has been derived in the first instance from Environment Agency (2003), ref. 1.18 and for contaminants not considered in this
document the fate and transport data used in previous versions of the CLEA model has been used.

Chemical laboratory test results are processed as follows. A statistical analysis of the results is conducted, as detailed in CIEH and CL:AIRE ‘Guidance on Comparing Soil Contamination Data with a Critical Concentration’, ref. 1.14. Individual concentrations are compared to the selected guideline values to identify concentrations of contaminants that are above the selected screening criteria.

Where the risk estimation identifies significant concentrations of one or more contaminants, a further risk evaluation needs to be undertaken.

References

1.1 The Environmental Protection Act, Part IIA, Section 78, DoE 1990.

1.2 Environment Act 1995, Section 57, DoE 1995.

1.3 CLR 11, '*Model Procedures for the Management of Contaminated Land*', DEFRA and Environment Agency, 2004.

1.4 Environment Agency Science Report SC050021/SR2 'Human health toxicological assessment of contaminants in soil'.

1.5 Science Report SC050021/SR3 '*Updated technical background to the CLEA model*', Environment Agency, 2008

1.6 CLR 2, '*Guidance on preliminary site inspection of contaminated land*', Report by Applied Environmental, DoE 1994.

1.7 CLR 3 '*Documentary Research on Industrial Sites*', Report by RPS Consultants Ltd., DOE, 1994

1.8 CLR 4, '*Sampling strategies for contaminated land*', Report by The Centre for Research into the Built Environment, the Nottingham Trent University, DoE, 1994

1.9 BS 10175: 2011 '*Investigation of potentially contaminated sites. Code of practice*', British Standards Institute, 2011

1.10 BS 5930: 2015 '*Code of practice for ground investigations*', British Standards Institute, 2015

1.11 Science Report SC050021 '*Contaminants in Soil: Updated Collation of Toxicological Data and Intake Values for Humans*', Environment Agency, 2009

1.12 The LQM/S4ULs for Human Health Risk Assessment, Nathanail P, McCaffery C, Gillett A, Ogden R, and Nathanail J, Land Quality Press, Nottingham, published 2015.

1.13 CLEA '*Software Version 1.071*' (downloaded from the Environment Agency website, http://www.environment-agency.gov.uk)

1.14 CIEH '*Guidance on Comparing Soil Contamination Data with a Critical Concentration*', Chartered Institute of Environmental Health (CIEH) and Contaminated Land: Applications in Real Environments (CL:AIRE), May 2008.

1.15 DEFRA SP1010: Development of Category 4 Screening Levels for the Assessment of Land Affected by Contamination, published March 2014.

1.16 Contaminated Land: Applications in Real Environment (CL:AIRE) (2014). 'Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination', Revision 2, DEFRA research project SP1010.

1.17 Generic Assessment Criteria for Human Health Risk Assessment, Nathanial CP, McCaffery C, Ashmore M, Cheng Y, Gillett A, Hooker P and Ogden RC

1.18 CLR 2, '*Guidance on preliminary site inspection of contaminated land*', Report by Applied Environmental, DoE 1994.

				Residential with home-grown produce			Residential without home-grown produce			Allotments			Commercial			Public Open Space - Resi			Public Open Space -Park					
			SOM	1.0	2.5	6	1	2.5	6	1	2.5	6	1	2.5	6	1	2.5	6	1	2.5	6			
Type	Contaminants	Species	Year																					
	Antimony		2010					550						7500								EIC/AGS/	CL:AIRE	2010
	Arsenic		2014		37			40			49			640			79			168		C4SL	DEFRA	2014
			2015		37			40			40			640			79			170		S4UL	LQM/CIEH	2015
	Beryllium		2015		1.7			1.7			35			12			2.2			63		S4UL	LQM/CIEH	2015
	Boror		2015		290			11000			45			240000			21000			46000		S4UL	LQM/CIEH	2015
	Cadmium		2015		11			85			1.9			190			120			532		S4UL	LQM/CIEH	2015
			2014		26			149			4.9			410			220			880		C4SL	DEFRA	2014
	Chromium	III	2015		910			910			18000			8600			1500			33000		S4UL	LQM/CIEH	2015
		VI	2014		21			21			170			49			23			250		C4SL	DEFRA	2014
		VI	2015		6			6			1.8			33			7.7			220		S4UL	LQM/CIEH	2015
	Copper		2015		2400			7100			520			68000			12000			44000		S4UL	LQM/CIEH	2015
	Lead		2014		200			310			80			2330			630			1300		C4SL	DEFRA	2014
	Mercury	Elemental	2015		1.2			1.2			21			*58*			16			*30*		S4UL	LQM/CIEH	2015
		Inorganic	2015		40			56			19			1100			120			240		S4UL	LQM/CIEH	2015
		Methyl	2015		11			15			6			320			40			68		S4UL	LQM/CIEH	2015
	Nickel		2015		130			180			53			980			230			800		S4UL	LQM/CIEH	2015
	Selenium		2015		250			430			88			12000			1100			1800		S4UL	LQM/CIEH	2015
	Vanadium		2015		410			1200			91			9000			2000			5000		S4UL	LQM/CIEH	2015
	Zinc		2015		3700			40000			620			730000			81000			170000		S4UL	LQM/CIEH	2015
	Benzene		2014		0.87			3.3			0.18			98			140			230		C4SL	DEFRA	2014
			2015	0.087	0.17	0.37	0.38	0.7	1.4	0.017	0.034	0.075	27	47	90	72	72	73	90	100	110	S4UL	LQM/CIEH	2015
	Toluene		2015	130	290	660	*880*	1900	3900	22	51	120	*65000*	*110000*	*180000*	56000	56000	56000	*87000*	*95000*	*100000*	S4UL	LQM/CIEH	2015
	Ethylbenzene		2015	47	110	260	83	190	440	16	39	91	*4700*	*13000*	*27000*	24000	24000	25000	*17000*	*22000*	*27000*	S4UL	LQM/CIEH	2015
	Xylenes	o-xylene	2015	60	140	330	88	210	480	28	67	160	*6600*	*15000*	*33000*	41000	42000	43000	*17000*	*24000*	*33000*	S4UL	LQM/CIEH	2015
		m-xylene	2015	59	140	320	82	190	450	31	74	170	*6200*	*14000*	*31000*	41000	42000	43000	*17000*	*24000*	*32000*	S4UL	LQM/CIEH	2015
		p-xylene	2015	56	130	310	79	180	310	29	69	160	*5900*	*14000*	*30000*	41000	42000	43000	*17000*	*23000*	*31000*	S4UL	LQM/CIEH	2015
	Aliphatic >C5 - C6		2015	42	78	160	42	78	160	730	1700	3900	*3200*	*5900*	*12000*	*570000*	590000	600000	*95000*	*130000*	*180000*	S4UL	LQM/CIEH	2015
	Aliphatic >C6 - C8		2015	100	230	530	100	230	530	2300	5600	13000	*7800*	*17000*	*40000*	600000	610000	620000	*150000*	*220000*	*320000*	S4UL	LQM/CIEH	2015
	Aliphatic >C8 - C10		2015	27	65	150	27	65	150	320	770	1700	*2000*	*4800*	*11000*	13000	13000	13000	*14000*	*18000*	*21000*	S4UL	LQM/CIEH	2015
	Aliphatic >C10 - C12		2015	*130*	*330*	*760*	*130*	*330*	*770*	2200	4400	7300	*9700*	*23000*	*47000*	13000	13000	13000	*21000*	*23000*	*24000*	S4UL	LQM/CIEH	2015
	Aliphatic >C12 - C16		2015	*1100*	*2400*	*4300*	*1100*	*2400*	*4400*	11000	13000	13000	*59000*	*82000*	*90000*	13000	13000	13000	*25000*	*25000*	*26000*	S4UL	LQM/CIEH	2015
	Aliphatic >C16 - C35		2015	*65000*	*92000*	*110000*	*65000*	*92000*	110000	260000	270000	270000	1600000	1700000	1800000	250000	250000	250000	450000	480000	490000	S4UL	LQM/CIEH	2015
	Aliphatic >C35 - C44		2015	*65000*	*92000*	*140000*	*65000*	*92000*	110000	260000	270000	270000	1600000	1700000	1800000	250000	250000	250000	450000	480000	490000	S4UL	LQM/CIEH	2015
	Aromatic >C5 - C7		2015	70	140	300	370	690	1400	13	27	57	*26000*	*46000*	*86000*	56000	56000	56000	*76000*	*84000*	*92000*	S4UL	LQM/CIEH	2015
	Aromatic >C7 - C8		2015	130	290	660	860	1800	3900	22	51	120	*56000*	*110000*	*180000*	56000	56000	56000	*87000*	*95000*	*100000*	S4UL	LQM/CIEH	2015
	Aromatic >C8 - C10		2015	34	83	190	47	110	270	8.6	21	51	*3500*	*8100*	*17000*	5000	5000	5000	*7200*	*8500*	*9300*	S4UL	LQM/CIEH	2015
	Aromatic >C10 - C12		2015	74	180	380	250	590	1200	13	31	74	*16000*	*28000*	*34000*	5000	5000	5000	*9200*	*9700*	*10000*	S4UL	LQM/CIEH	2015
	Aromatic >C12 - C16		2015	140	330	660	1800	2300	2500	23	57	130	*36000*	*37000*	*38000*	5100	5100	5000	10000	10000	10000	S4UL	LQM/CIEH	2015
	Aromatic >C16 - C21		2015	260	540	930	1900	1900	1900	46	110	260	28000	28000	28000	3800	3800	3800	7600	7700	7800	S4UL	LQM/CIEH	2015
	Aromatic >C21 - C35		2015	1100	1500	1700	1900	1900	1900	370	820	1600	28000	28000	28000	3800	3800	3800	7800	7800	7900	S4UL	LQM/CIEH	2015
	Aromatic >C34 - C44		2015	1100	1500	1700	1900	1900	1900	370	820	1600	28000	28000	28000	3800	3800	3800	7800	7800	7900	S4UL	LQM/CIEH	2015
	Aliphatic + Aromatic >C44 - C70		2015	1600	1800	1900	1900	1900	1900	1200	2100	3000	28000	28000	28000	3800	3800	3800	7800	7800	7900	S4UL	LQM/CIEH	2015
	Acenaphthene		2015	210	510	1100	*3000*	*4700*	*6000*	34	85	200	*84000*	*97000*	100000	15000	15000	15000	29000	30000	30000	S4UL	LQM/CIEH	2015
	Acenaphthylene		2015	170	420	920	*2900*	*4600*	*6000*	28	69	160	*83000*	*97000*	100000	15000	15000	15000	29000	30000	30000	S4UL	LQM/CIEH	2015
	Anthracene		2015	2400	5400	11000	*31000*	*35000*	*37000*	380	950	2200	520000	54000	540000	74000	74000	74000	150000	150000	150000	S4UL	LQM/CIEH	2015
	Benzo(a)anthracene		2015	7.2	11	13	11	14	15	2.9	6.5	13	170	170	180	29	29	29	49	56	62	S4UL	LQM/CIEH	2015
	Benzo(a)pyrene		2014			5			5.3			5.7			76			10			21	C4SL	DEFRA	2014
			2015	2.2	2.7	3	3.2	3.2	3.2	0.97	2	3.5	35	35	36	5.7	5.7	5.7	11	12	13	S4UL	LQM/CIEH	2015
	Benzo(b)fluoranthene		2015	2.6	3.3	3.7	3.9	4.0	4.0	0.99	2.1	3.9	44	44	45	7.1	7.2	7.2	13	15	16	S4UL	LQM/CIEH	2015
	Benzo(ghi)perylene		2015	320	340	350	360	360	360	290	470	640	3900	4000	4000	640	640	640	1400	1500	1600	S4UL	LQM/CIEH	2015
	Benzo(k)fluoranthene		2015	77	93	100	110	110	110	37	75	130	1200	1200	1200	190	190	190	370	410	440	S4UL	LQM/CIEH	2015
	Chrysene		2015	15	22	27	30	31	32	4.1	9.4	19	350	350	350	57	57	57	93	110	120	S4UL	LQM/CIEH	2015
	Dibenz(a,h)anthracene		2015	0.24	0.28	0.3	0.31	0.32	0.32	0.14	0.27	0.43	3.5	3.6	3.6	0.57	0.57	0.58	1.1	1.3	1.4	S4UL	LQM/CIEH	2015

			Residential with home-grown produce			Residential without home-grown produce			Allotments			Commercial			Public Open Space - Resi			Public Open Space -Park					
		SOM	1.0	2.5	6	1	2.5	6	1	2.5	6	1	2.5	6	1	2.5	6	1	2.5	6			
Type	Contaminants Species	Year																					
	Fluoranthene	2015	280	560	890	1500	1600	1600	52	130	290	23000	23000	23000	3100	3100	3100	6300	6300	6400	S4UL	LQM/CIEH	2015
	Fluorene	2015	170	400	860	*2800*	*3800*	*4500*	27	67	160	63000	68000	71000	9900	9900	9900	20000	20000	20000	S4UL	LQM/CIEH	2015
	Indeno(1,2,3-cd)pyrene	2015	27	36	41	45	46	46	9.5	21	39	500	510	510	82	82	82	150	170	180	S4UL	LQM/CIEH	2015
	Naphthalene	2015	2.3	5.6	13	2.3	5.6	13	4.1	10	24	*190*	*460*	*1100*	4900	4900	4900	*1200*	*1900*	*3000*	S4UL	LQM/CIEH	2015
	Phenanthrene	2015	95	220	440	*1300*	*1500*	*1500*	15	38	90	22000	22000	23000	3100	3100	3100	6200	6200	6300	S4UL	LQM/CIEH	2015
	Pyrene	2015	620	1200	2000	3700	3800	3800	110	270	620	54000	54000	54000	7400	7400	7400	15000	15000	15000	S4UL	LQM/CIEH	2015
	Coal Tar(Bap as surrogate matter	2015	0.79	0.98	1.1	1.2	1.2	1.2	0.32	0.67	1.2	15	15	15	2.2	2.2	2.2	4.4	4.7	4.8	S4UL	LQM/CIEH	2015
	1,2 Dichloroethane	2015	0.0071	0.011	0.019	0.0092	0.013	0.023	0.0046	0.0083	0.016	0.67	0.97	1.7	29	29	29	21	24	28	S4UL	LQM/CIEH	2015
	1,1,1 Trichloroethane	2015	8.8	18	39	9	18	40	48	110	240	660	1300	3000	140000	140000	*140000*	*57000*	*76000*	*100000*	S4UL	LQM/CIEH	2015
	1,1,2,2 Tetrachloroethane	2015	1.6	3.4	7.5	3.9	8	17	0.41	0.89	2	270	550	1100	1400	1400	1400	1800	2100	2300	S4UL	LQM/CIEH	2015
	1,1,1,2 Tetrachloroethane	2015	1.2	2.8	6.4	1.5	3.5	8.2	0.79	1.9	4.4	110	250	560	1400	1400	1400	1500	1800	2100	S4UL	LQM/CIEH	2015
	Tetrachloroethene	2015	0.18	0.39	0.9	0.18	0.4	0.92	0.65	1.5	3.6	19	42	95	1400	1400	1400	*810*	*1100*	1500	S4UL	LQM/CIEH	2015
	Tetrachloromethane (Carbon Tetrachloride)	2015	0.026	0.056	0.13	0.026	0.056	0.13	0.45	1	2.4	2.9	6.3	14	890	920	950	190	270	400	S4UL	LQM/CIEH	2015
	Trichloroethene	2015	0.016	0.034	0.075	0.017	0.036	0.08	0.041	0.091	0.21	1.2	2.6	5.7	120	120	120	70	91	120	S4UL	LQM/CIEH	2015
	Trichloromethan	2015	0.91	1.7	3.4	1.2	2.1	4.2	0.42	0.83	1.7	99	170	350	2500	2500	2500	2600	2800	3100	S4UL	LQM/CIEH	2015
	Vinyl Chloride (cloroethene	2015	0.00064	0.00087	0.0014	0.00077	0.001	0.0015	0.00055	0.001	0.0018	0.059	0.077	0.12	3.5	3.5	3.5	4.8	5	5.4	S4UL	LQM/CIEH	2015
	2,4,6 Trinitrotoluene	2015	1.6	3.7	8.1	65	66	66	0.24	0.58	1.4	1000	1000	1000	130	130	130	260	270	270	S4UL	LQM/CIEH	2015
	RDX (Hexogen/Cyclonite/1,3,5-trinitro-1,3,5-triazacyclohexane)	2015	120	250	540	13000	13000	13000	17	38	85	210000	210000	210000	26000	26000	27000	49000	51000	53000	S4UL	LQM/CIEH	2015
	HMX (Octogen/1,3,5,7-tetrenitro-1,3,5,7-tetrazacyclo-octane)	2015	5.7	13	26	6700	6700	6700	0.86	1.9	3.9	110000	110000	110000	13000	13000	13000	*23000*	*23000*	*24000*	S4UL	LQM/CIEH	2015
	Aldrin	2015	5.7	6.6	7.1	7.3	7.4	7.5	3.2	6.1	9.6	170	170	170	18	18	18	30	31	31	S4UL	LQM/CIEH	2015
	Dieldrir	2015	0.97	2	3.5	7	7.3	7.4	0.17	0.41	0.96	170	170	170	18	18	18	30	30	31	S4UL	LQM/CIEH	2015
	Atrazine	2015	3.3	7.6	17.4	610	620	620	0.5	1.2	2.7	9300	9400	9400	1200	1200	1200	2300	2400	2400	S4UL	LQM/CIEH	2015
	Dichlorvos	2015	0.032	0.066	0.14	6.4	6.5	6.6	0.0049	0.01	0.022	140	140	140	16	16	16	26	26	27	S4UL	LQM/CIEH	2015
	Alpha - Endosulfan	2015	7.4	18	41	*160*	*280*	*410*	1.2	2.9	6.8	*5600*	*7400*	*8400*	1200	1200	1200	2400	2400	2500	S4UL	LQM/CIEH	2015
	Beta - Endosulfan	2015	7	17	39	*190*	*320*	*440*	1.1	2.7	6.4	*6300*	*7800*	*8700*	1200	1200	1200	2400	2400	2500	S4UL	LQM/CIEH	2015
	Alpha -Hexachlorocyclohexanes	2015	0.23	0.55	1.2	6.9	9.2	11	0.035	0.087	0.21	170	180	180	24	24	24	47	48	48	S4UL	LQM/CIEH	2015
	Beta -Hexachlorocyclohexanes	2015	0.085	0.2	0.46	3.7	3.8	3.8	0.013	0.032	0.077	65	65	65	8.1	8.1	8.1	15	15	16	S4UL	LQM/CIEH	2015
	Gamma -Hexachlorocyclohexanes	2015	0.06	0.14	0.33	2.9	3.3	3.5	0.0092	0.023	0.054	67	69	70	8.2	8.2	8.2	14	15	15	S4UL	LQM/CIEH	2015
	Chlorobenzene	2015	0.46	1	2.4	0.46	1	2.4	5.9	14	32	56	130	290	11000	13000	14000	*1300*	*2000*	*2900*	S4UL	LQM/CIEH	2015
	1,2-Dichlorobenzene	2015	23	55	130	24	57	130	94	230	540	*2000*	*4800*	*11000*	90000	95000	98000	*24000*	*36000*	*51000*	S4UL	LQM/CIEH	2015
	1,3-Dichlorobenzene	2015	0.4	1	2.3	0.44	1.1	2.5	0.25	0.6	1.5	30	73	170	300	300	300	390	440	470	S4UL	LQM/CIEH	2015
	1,4-Dichlorobenzene	2015	61	150	350	61	150	350	15	37	88	*4400*	*10000*	*25000*	17000	17000	1700	*36000*	*36000*	*36000*	S4UL	LQM/CIEH	2015
	1,2,3,-Trichlorobenzene	2015	1.5	3.6	8.6	1.5	3.7	8.8	4.7	12	28	102	250	590	1800	1800	1800	*770*	*1100*	*1600*	S4UL	LQM/CIEH	2015
	1,2,4,-Trichlorobenzene	2015	2.6	6.4	15	2.6	6.4	15	55	140	320	220	530	1300	15000	17000	19000	*1700*	*2600*	*4000*	S4UL	LQM/CIEH	2015
	1,3,5,-Trichlorobenzene	2015	**0.33**	**0.81**	**1.9**	**0.33**	**0.81**	**1.9**	**4.7**	**12**	**28**	**23**	**55**	**130**	**1700**	**1700**	**1800**	***380***	***580***	***860***	S4UL	LQM/CIEH	2015
	1,2,3,4,-Tetrachlorobenzene	2015	**15**	**36**	**78**	**24**	**56**	**120**	**4.4**	**11**	**26**	**1700**	**3080**	**4400**	**830**	**830**	**830**	***1500***	***1600***	***1600***	S4UL	LQM/CIEH	2015
	1,2,3,5,- Tetrachlobenzene	2015	**0.66**	**1.6**	**3.7**	**0.75**	**1.9**	**4.3**	**0.38**	**0.9**	**2.2**	***49***	***120***	***240***	**78**	**79**	**79**	***110***	***120***	***130***	S4UL	LQM/CIEH	2015
	1,2,4, 5,- Tetrachlobenzene	2015	**0.33**	**0.77**	**1.6**	**0.73**	**1.7**	**3.5**	**0.06**	**0.16**	**0.37**	***42***	***72***	***96***	**13**	**13**	**13**	**25**	**26**	**26**	S4UL	LQM/CIEH	2015
	Pentachlrobenzene	2015	**5.8**	**12**	**22**	**19**	**30**	**38**	**1.2**	**3.1**	**7**	***640***	***770***	***830***	**100**	**100**	**100**	**190**	**190**	**190**	S4UL	LQM/CIEH	2015
	Hexachlorobenzene	2015	***1.8***	***3.3***	**4.9**	***4.1***	***5.7***	***6.7***	**0.47**	**1.1**	**2.5**	***110***	**120**	**120**	**16**	**16**	**16**	**30**	**30**	**30**	S4UL	LQM/CIEH	2015
	Phenols	2015	120	200	380	440	690	1200	23	42	83	*440*	*690*	*1300*	*440*	*690*	*1300*	*440*	*690*	*1300*	S4UL	LQM/CIEH	2015
	Chlorophenols (4 Congeners)	2015	**0.87**	**2**	**4.5**	**94**	**150**	**210**	**0.13**	**0.3**	**0.7**	**3500**	**4000**	**4300**	**620**	**620**	**620**	**1100**	**1100**	**1100**	S4UL	LQM/CIEH	2015
	Pentachlorophenols	2015	**0.22**	**0.52**	**1.2**	***27***	**29**	**31**	**0.03**	**0.08**	**0.19**	**400**	**400**	**400**	**60**	**60**	**60**	**110**	**120**	**120**	S4UL	LQM/CIEH	2015
	Carbon Disulphide	2015	**0.14**	**0.29**	**0.62**	**0.14**	**0.29**	**0.62**	**4.8**	**10**	**23**	**11**	**22**	**47**	**11000**	**11000**	**12000**	**1300**	**1900**	**2700**	S4UL	LQM/CIEH	2015
	Hexachloro-1,3-Butadiene	2015	**0.29**	**0.7**	**1.6**	**0.32**	**0.78**	**1.8**	**0.25**	**0.61**	**1.4**	**31**	**66**	**120**	**25**	**25**	**25**	**48**	**50**	**51**	S4UL	LQM/CIEH	2015
	Sum of PCDDs, PCDFs and dioxin-like PCB's.	2012			**8**			**8**			**8**			**240**							SGV	DEFRA	2012

NOTE

Priority	Guideline (mg kg^{-1})

				Residential with home-grown produce			Residential without home-grown produce			Allotments			Commercial			Public Open Space - Resi			Public Open Space -Park		
			SOM	1.0	2.5	6	1	2.5	6	1	2.5	6	1	2.5	6	1	2.5	6	1	2.5	6
Type	Contaminants	Species	Year																		
	1	Site Specific Assessment Criteria (SSAC) (Soils Limited)																			
	2	2014: Category 4 Screening Level (C4SL) (Contaminated Land: Application in Real Environment (CL:ARE), 2014)																			
	3	2012: Soil Guideline Value (SGV) (Environment Agency, 2009)																			
	4	2015: Suitable 4 Use Level (S4UL) (Nathanail *et al*, 2015)																			
		For Generic Risk Assessment, the values in Bold have priority																			
		Table reviewed February 2020																			

Appendix F Gas Monitoring

Date	Location	CH4 (%)	CO2 (%)	O2 (%)	H2S (ppm)	CO (ppm)	LEL (%)	aP (mb)	Flow (l/h)	Dp	H2O (m bgl)	BASE OF HOLE	VOC (ppm)
07/08/2023	BH1										3.2	9.3	
	BH2										3.6	9.7	
19/09/230223	BH1	0.0	3.0	18.4	0.0	0.0	0.0	1006.0	0.0	0.0	3.1	9.3	2.0
	BH2	0.0	0.3	21.0	0.0	0.0	0.0	1005.0	0.0	0.0	3.7	9.7	0.4
03/10/2023	BH1	0.0	4.6	16.7	0.0	0.0	0.0	1017.0	0.0	0.0	3.4	9.3	3.0
	BH2	0.0	0.7	19.9	0.0	0.0	0.0	1017.0	0.0	0.0	3.9	9.7	2.0

Appendix G Information Provided by the Client

Notes

1. This drawing is the copyright of MH Architects Ltd
2. Do not scale this drawing except for Local Authority planning purposes
3. All dimensions must be checked on site by the contractor prior to commencement of the works.

Client Approval

X	A - Approved
X	B - Approved with comments
X	C - Do not use

Rev.	Revision Note/Purpose of Issue	Drw By	Date	Chk By	Date

SCHEDULE OF ACCOMMODATION

UNIT	TYPE	Internal Area
Unit 1	2b 4p House	79.1 sq. m
Unit 2	3b 5p House	93.4 sq. m
Unit 3	3b 5p House	93.4 sq. m
Unit 4	2b 4p House	79.1 sq. m
Unit 5	2b 4p House	79.1 sq. m
Unit 6	2b 4p House	79.1 sq. m
Unit 7	3b 5p House	93.4 sq. m
Unit 8	3b 5p House	93.4 sq. m

Development Site	0.3819 Ha
Site Density	21 Units/Ha
Car Parking	TOTAL = 2 spaces per unit

Parking 2 spaces per house. Bins and cycles in private gardens

Key :

Planning application boundary

Site Plan 1:200 @ A1

N

2 0 2 4 6 8 10 12 14 16 18m

1:200

ABRI

BRYANSTON ROAD
SOUTHAMPTON

Drawing title

PROPOSED SITE PLAN

Drawn	Date	Checked	Date	Scale at A1
TM	28/04/23			1:200

Job No.	Pro.	Org.	Zone	Level	Type	Role	No.	Rev.
23-018	BRS	MHA	ZZ	ZZ	DR	A	SK04	/

Purpose of Issue

PRELIMINARY

Ground Floor | Bicentennial Building
Southern Gate | Chichester
West Sussex | PO19 8EZ

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Limited Company
Registered in England No.1994233

Plans 1:100 @ A1

View from entrance

View from N/E end of site

Notes
1. This drawing is the copyright of MH Architects Ltd
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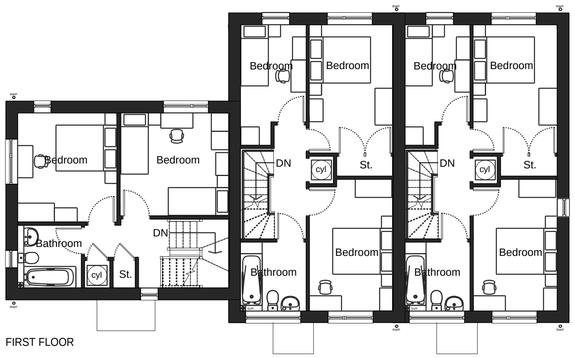
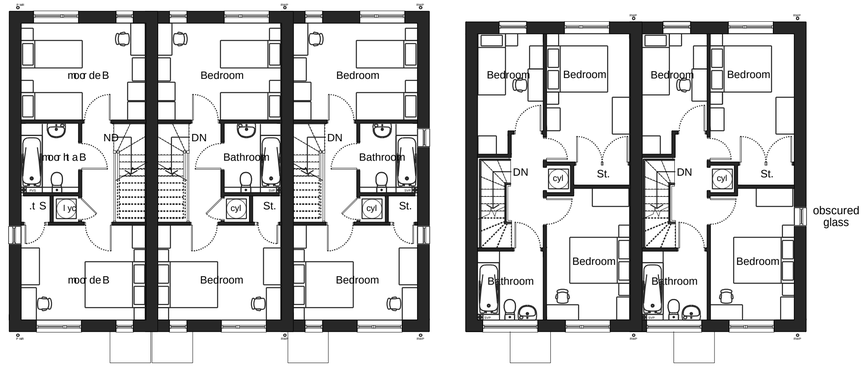
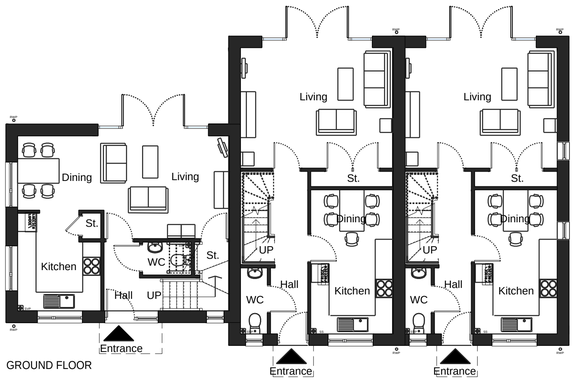
Client Approval	
X	A - Approved
X	B - Approved with comments
X	C - Do not use

Rev.	Revision Note/Purpose of Issue	Drw By	Date	Chk By	Date

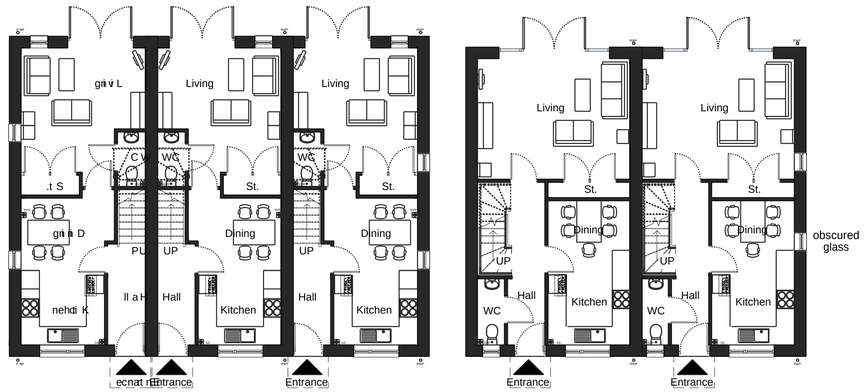


FIRST FLOOR





GROUND FLOOR

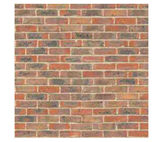


Aerial view looking N/E

Aerial view looking S/W

Key

1. Red / brown roof tiles



2. Red multi stock brick

3. Grey high performance windows

4. Front doors (SBD compliant)

5. Dark grey UPVC rainwater goods & soffits

6. Metal cladding to porch/canopy

7. PV roof panels

ABRI

BRYANSTON ROAD
SOUTHAMPTON

Drawing title

PROPOSED PLANS
AND IMAGES

Drawn	Date	Checked	Date	Scale at A1
TM	28/04/23	NKS	00/00/00	1:100

Job No.	Pro.	Org.	Zone	Level	Type	Role	No.	Rev.
23-018	BRS	MHA	XX	XX	DR	A	SK05	/

Purpose of Issue

PRELIMINARY

Ground Floor | Bicentennial Building
Southern Gate | Chichester
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