

MJH EXECUTIVE HOMES LIMITED

LANGFORD, HORSEMERE GREEN LANE, CLIMPING

GROUND INVESTIGATION REPORT

The Granary
White Hall Farm
Long Itchington
Warwickshire
CV47 9PU

March 2020
Report No. CCL03279.CL23

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1. INTRODUCTION

It is proposed to redevelop land south of Horsemere Green Lane, Climping for residential purposes. The site is currently occupied by a residential property and associated grounds. The site has historically been associated with agricultural and horticultural usage. The proposed development comprises the construction of two-storey residential properties with associated garden areas, car parking facilities and access road.

Crossfield Consulting Limited has been commissioned to undertake an investigation of the site to identify potential constraints to redevelopment relating to the ground conditions and including a risk-based environmental assessment and recommendations for remediation works, foundations, road pavement design and general construction advice in the context of the above development proposals.

This report presents the information obtained from a desk study and ground investigation. Sections 2 to 4 of the report, together with the associated Figures and Appendices, provides a Ground Investigation Report (GIR), as defined in BS EN 1997-1:2004 and BS EN 1997-2:2007.

A risk-based assessment of potential contamination is included in Section 6 of the report. This assessment makes reference to the desk study, ground investigation information and a Conceptual Site Model. It is considered that the report complies with National Planning Policy Framework and is in general accordance with guidance published by the Environment Agency and the NHBC.

The report also includes information required to form a Geotechnical Design Report as defined in BS EN 1997-1:2004, and the salient information, assessments and recommendations are presented in Sections 8 to 12 of the report, together with the associated Figures and Appendices.

It is considered that the report is suitable for submission in support of a planning application and the report is appropriate to assist in an appraisal of development solutions and costs, together with the preparation of engineering designs for the development. The report also complies with the published guidance relating to the requirements of a Building Control authority.

2. THE SITE

2.1 Location

The site is located off Horsemere Green Lane, approximately 3 km west of Littlehampton town centre, as shown on Figure 1. The National Grid Reference for the site is SU 997 022. The site boundaries are formed by Horsemere Green Lane to the north, residential properties to the east and south and a private access lane to the west, as shown on Figure 2.

2.2 Site Description

The following site description is based on observations made at the time of both phases of ground investigation in December 2019 and March 2020.

The site is generally rectangular in shape and narrows slightly within the southern section, with a total approximate area of 0.5 ha. The site is generally level with some minor variations.

One residential property currently occupies the northern part of the site. This property is a bungalow of traditional construction with an associated garage. The rest of the site predominantly consists of a private garden. Along the western boarder a static caravan and also a small concrete surfaced track running north to

south are present. Recent site clearance works have removed all trees from the southern and western sections of the site, such that these areas are now open.

2.3 Site History

The site history has been researched with reference to available online resources. It is indicated that the site has previously been associated with agricultural land in the late 1800s and early 1900s. In the 1920s or 1930s the site was redeveloped to form part of an orchard and/or nursery. Further redevelopment works at the site occurred prior to 1975, with the residential property on site developed with no significant changes occurring after this time.

3. PUBLISHED GEOLOGY

Geological map data published by the British Geological Survey (BGS) online and in print, on 1:50,000 scale Sheet No. 317/332 Chichester and Bognor indicate that superficial River Terrace Deposits are present on site. The solid strata below the site are indicated to comprise undifferentiated Chalk of the Upper Cretaceous period.

4. GROUND CONDITIONS AND GEOLOGICAL MODEL

4.1 Ground Investigation

Details of the rationale and scope of the ground investigation and laboratory testing, together with exploratory hole logs, monitoring, in situ and laboratory test results, are given in Appendix I. The investigation has identified the presence of the following, below the site.

4.2 Buried Foundations and Services

Buried foundations and services were not encountered within the exploratory holes. Services and foundations will be present on site associated with the current residential property.

4.3 Strata Encountered

Topsoil/Made Ground

Topsoil is present across the site to depths of between 0.1 m and 0.45 m. The materials typically comprise sandy silts and silty clay/clayey silt with occasional fragments of brick, charcoal and concrete recorded.

River Terrace Deposits

Underlying the topsoil are strata considered to be River Terrace Deposits, comprising sandy gravelly clays and silty sands. The River Terrace Deposits have been recorded to depths of between 3.4 m and in excess of 5.0 m.

Upper Cretaceous Chalk strata

Underlying the River Terrace Deposits weathered chalk strata is present to the maximum depth investigated of 5.0 m, comprising Grade Dc structureless chalk (as defined in CIRIA C574).

4.4 Groundwater

Groundwater strikes were recorded within the windowless sample boreholes at depths of between 2.5 m and 3.2 m and as seepages within trial pits between 1.4 m and 2.0 m depth. Subsequent ground water monitoring

data collected from standpipes installed within the boreholes has recorded water depths of between 1.0 m and 1.9 m.

The groundwater conditions are based on observations made at the time of the fieldwork. It should be noted that groundwater levels may vary due to seasonal and other effects.

5. PROPOSED DEVELOPMENT

The proposed development, which is shown on Figure 3, comprises the following:

- Two-storey residential properties with associated private gardens
- Car parking areas and areas of hardstanding
- New access road

6. ASSESSMENT OF POTENTIAL CONTAMINATION AND GROUND GASES

6.1 Assessment Criteria

Assessment of potential contamination and ground gases has been undertaken using a risk assessment based approach, as recommended within the Environmental Protection Act (1990), CLR11 (2004), CLEA Model (2004-2009), BS 10175:2011+A2:2017, CIRIA C552 (2001) and NHBC R&D Report 66 (2008). This approach considers the likely source of contamination, given the history and location of the site, and the possible migration pathways by which these potentially hazardous substances may reach likely receptors, such as end users of the site, controlled waters or the wider environment, in the context of the proposed development.

Part IIA of the Environmental Protection Act (1990) states that

“Contaminated Land is any 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) significant pollution of controlled waters is being caused or there is significant possibility of such pollution being caused;”

All risk assessments carried out as part of this investigation have been carried out with respect to the definition of “contaminated land” within Part IIA of the Environmental Protection Act (1990) and have considered the site both before and on completion of the development. The basis of the risk assessment is the Conceptual Site Model, which is derived from the desk study and initial information and identifies potential pollutant linkages that could affect receptors relevant to the site and the wider environment. The Conceptual Site Model is presented in Table 1.

Based on the model, a ground investigation was designed to obtain relevant information to assess the validity of the model. The rationale for the sampling and testing is set out in Appendix I.

6.2 Potential Sources of Contamination

With reference to the site history, the site has previously been used primarily for agricultural and horticultural purposes and has not been associated with industrial activities. Made Ground was encountered at one location and there was no visual or olfactory evidence of potentially contaminating material within the Made Ground or

the natural strata encountered. Therefore it is considered that there are no sources of on-site contamination that could constrain development at this site and no remediation works are required.

No putrescible material has been identified at the site and there are no recorded landfills within influencing distance. The site is not within an area where precautions against the ingress of radon gas are required in new dwellings. Therefore, it is considered that there are no sources of hazardous ground gases at the site and ground gas protection is not required for the proposed development.

6.3 Pollutant Linkages – Solids and Liquids

Based on the Conceptual Site Model, consideration is given below to identified pollutant linkages and a risk evaluation is undertaken of each possible source-pathway-receptor linkage that may occur at the site. The risk evaluation considers the potential consequences and probability of occurrence in accordance with CIRIA C552 (2001). Where risks are identified as “negligible”, then by implication such risks are within normally accepted levels for the proposed development, and the further reduction of such risks by remediation works is considered unnecessary. Where risks are identified that are “low” as defined in CIRIA C552 (2001), or worse, then consideration is given to the management of the identified risks, with appropriate recommended actions that may include engineering solutions / remediation works as described in the following sections.

6.3.1 Durability of Buried Structures and Services

In view of the low potential sulphate and low soluble sulphate content and near-neutral soil conditions, there are no special precautions required for the protection of good quality buried foundation concrete. Based on guidance within *BRE Special Digest 1* (2005), the specified DC Class of concrete for buried structures and foundations should be suitable for an ACEC site classification of AC-1.

The site has not been associated with past fuel and/or chemical storage and there are no such storage facilities in close proximity. Therefore, the site would not be considered to be ‘brownfield’ under the definition provided by UKWIR (2010) with respect to the assessment of ground for water supply pipes. Based on the guidance provided by UKWIR, conventional plastic materials can be used for potable water supply pipes without any requirements for specific testing.

It should be noted that individual water companies may have in-house requirements for the assessment of ground conditions for potable water supply pipes and these requirements may be in addition to, or may contradict, the guidance provided by UKWIR. Therefore, it is recommended that the relevant water supply company be consulted prior to finalising the potable water supply design.

6.4 Potential Liabilities

On the basis of the above assessment, it is considered that the site does not present a significant risk of harm to end users or the wider environment and retention of the materials currently at the site should not be associated with any liability following completion of the development.

7. ASSESSMENT OF MINING, QUARRYING AND OVERALL GROUND STABILITY

The site is not within an area of recorded underground mining. There are no quarries recorded at, or within the immediate vicinity of, the site. Therefore, the proposed development should not be constrained by ground stability issues associated with mining or quarrying activities.

8. GEOTECHNICAL ASSESSMENT

8.1 Assessment of Foundation Solutions

With reference to the recorded ground conditions and corresponding Geological Model presented in Section 4, characteristic values relating to the geotechnical properties of the strata within influencing distance of the proposed structures are presented in Appendix II. Salient elements of the geotechnical model are outlined below.

Ground conditions at the site generally comprise a limited thickness of topsoil overlying River Terrace Deposits comprising firm (medium strength) consistency clays (locally some sands). Chalk strata are indicated to be present at depth. In addition, shallow groundwater has been recorded at the site.

It is considered that it should be possible to support the proposed development on traditional strip or trench-fill footings placed within the medium strength clays of the River Terrace Deposits. It will be necessary to deepen foundations through any locally soft material and within influencing distance of trees.

8.2 Recommended Foundation Design Parameters

On the basis of the foregoing assessment it is considered that strip fill footings provide the foundation solution that should be compatible with the proposed structure. On the basis of the ground conditions and structures described in the report, the recommended parameters for the foundation design are as follows:

<i>Foundation Strata:</i>	Medium strength clays (River Terrace Deposits) (If encountered: Medium dense sands)
<i>Foundation Depth:</i>	Minimum 0.9 m, deepened through any low strength material and within influence of trees
<i>Foundation Width/Size:</i>	Up to 3.0 m max
<i>Nett Allowable Bearing Pressure:</i>	100 kN/m ²

It is considered that total settlement of foundations designed on the above basis should be less than the normal serviceability limit state for this development (i.e. total settlements of 25 mm) as outlined in the assessment presented in Appendix II.

Laboratory testing results indicate the clayey horizons at the site comprise 'low volume change' potential soils, as defined in NHBC Standards (2020). Within the influence zones of existing or proposed trees, suitable foundation precautions should be adopted, as outlined in NHBC Standards (2020).

Based on guidance published within BRE Special Digest 1 (2005), the specified DC Class of concrete for buried structures and foundations should be suitable for an ACEC site classification of AC-1

8.6 Floor Slab Recommendations

Due to the presence of “low volume change potential” soils beneath the site, it is recommended that allowance be made for the provision of suspended ground floor slabs with an underfloor void of at least 200 mm thickness in the zone of influence of trees, in accordance with NHBC Standards.

8.7 General Construction Advice

All formations should be cleaned, and subsequently inspected by a suitably qualified engineer prior to placing concrete. Should any soft, compressible or otherwise unsuitable materials be encountered they should be removed and replaced by blinding concrete.

Foundation concrete, or alternatively, a blinding layer of concrete, should be placed immediately after excavation and inspection in order to protect the formation against softening and disturbance.

Generally, all formations should be placed wholly within the same material type, unless specific geotechnical inspection and assessment have been undertaken.

Care should be taken to ensure that any field drains encountered are carefully and satisfactorily blocked to prevent water seeping through the drains and into any excavations.

The locations of any trial pits undertaken as part of this investigation should be accurately surveyed in order that their precise locations are known and that appropriate precautions can be taken when building over or near to these locations.

9. TEMPORARY WORKS

Conventional plant is considered appropriate for shallow excavation works at this site. Shallow excavations may remain stable in the short term. However, instability may occur if excavations are left open for extended periods of time, particularly if water is encountered. Support should be provided, or the sides battered back, in any excavations requiring man entry.

Groundwater is present at relatively shallow depth. It is recommended that excavations for substructures and services be kept above the indicated groundwater levels, where possible. If deeper excavations are required, it may be necessary to undertake dewatering. Conventional sump pumping techniques may be considered for shallow excavations within clay strata. However, if water bearing gravels are encountered then it may be necessary to use sheet piles in conjunction with sump pumping or, alternatively, more extensive dewatering systems.

10. ASSESSMENT OF SOAKAWAY DRAINAGE

The in-situ percolation testing, undertaken in accordance with BRE DG365 (2016), confirmed that the near-surface River Terrace Deposit strata, above indicated groundwater levels, generally have low permeability. The test results, as presented in Appendix I, indicate that these strata have an estimated soil infiltration rate of between approximately 1×10^{-5} m/s and less than 1×10^{-6} m/s.

The soakaway testing performed within trial pits indicates that, due to the variable nature of the shallow strata, areas of the site are underlain by strata with an estimated soil infiltration rate of less than 1×10^{-6} m/s. The maximum estimated infiltration values are indicated to be significantly above 1×10^{-6} m/s and a mean value of

about 4×10^{-6} m/s is indicated. However, it is noted that, when the first trial pit was refilled with water for a second test, the soil infiltration rate calculated was lower. It is therefore recommended that any permeable paving design is based on soil infiltration rate of no greater than 2×10^{-6} m/s.

The base of any soakaways should be located above the shallowest recorded groundwater levels and soakaway discharges should be located at least 5 m from proposed or existing building foundations (including off-site structures). Significant storage of run-off is likely to be required.

11. ROAD PAVEMENTS

Based on the nature of the shallow soils beneath the site, the guidance published in TRRL LR1132 and with reference to IAN 73/06, it is considered that an Estimated Design Subgrade CBR of 3 % may be used to design road pavements. It is considered that the materials at shallow depth should be regarded as frost susceptible.

12. ASSESSMENT OF MATERIALS FOR WASTE DISPOSAL

There is no requirement to remove soils from site and, therefore, development levels should be set such that soils can be retained and reused on site where possible. Providing development levels are set to accommodate soil arisings (for example, from foundation excavations), such materials would not be classified as waste if retained and re-used on site. However, if materials are in excess to requirements, they should be taken to an appropriately permitted waste facility.

If material is identified for removal to a waste facility, it will be necessary to provide a description of the material to the receiving facility. This information is included in Appendix III. It should be noted that testing for classification purposes or for waste acceptance criteria (WAC) testing to confirm acceptability of the waste may also be required (as noted below).

- Topsoil/Made Ground is likely to be classified as “non-hazardous” waste if taken to a landfill due to the organic content of such materials. Alternatively, these materials could be taken to a recycling facility.
- Natural strata, providing they have not been impacted by potential contaminants, would be classified as “inert” waste without any requirement for laboratory testing.

Waste requires pre-treatment prior to disposal at landfill and this may take the form of physical or chemical treatment to reduce hazards and/or waste volumes. The segregation and screening of waste soils into separate, and appropriately classified, waste streams would satisfy the pre-treatment criteria by ensuring that volumes of each waste category are minimised. Segregation of waste streams is also important to prevent materials being classified within a worse-case category and, therefore, incurring higher disposal costs. Mixing of different waste streams to dilute hazardous properties is not permitted.

It should be noted that the above assessment is provided in accordance with current waste disposal and environmental permitting legislation and guidance documents. However, individual landfills and other waste disposal facilities may have variances in their permit that differs from standard guidance. Waste facilities may also make decisions with respect to accepting waste on a commercial basis. Therefore, landfills or other waste facilities should be approached to confirm that they will accept waste materials prior to finalising waste disposal proposals.

13. SUMMARY

It is proposed to redevelop land south of Horsemere Green Lane, Climping for residential purposes. The site is currently occupied by a residential property and associated grounds. The site has historically been associated with agricultural and horticultural usage. The proposed development comprises the construction of two-storey residential properties with associated garden areas, car parking facilities and access road.

Ground conditions at the site comprise a layer of topsoil present across the whole site to depths of between 0.1 m and 0.5 m. Made Ground has been identified at one location comprising topsoil charcoal fragments and some man-made inclusions. Such materials were encountered at between 0 m to 0.5 m depth. Below the topsoil firm, medium strength sandy clays and medium dense sands considered to be River Terrace Deposit strata have been proven to depths of between 3.4 m and 5.0 m. Underlying the River Terrace Deposit is Upper Cretaceous Chalk strata and have been proven at two locations to 5.0 m depth.

Based on historical maps and information from regulatory authorities, a conceptual site model has been developed that has not identified valid potential pollutant linkages. The ground investigation has confirmed that, there are no valid pollutant linkages relating to end users, construction workers or neighbours/the public. No unacceptable risks to controlled waters have been identified. It is evident that no viable source of ground gas emission is present and ground gas precautions should not be necessary for the proposed development.

It should be feasible to support the proposed residential development on conventional strip or trench fill foundations placed in medium strength River Terrace Deposits. These foundations will require to be deepened in the influencing distance of trees.

River Terrace Deposit strata are of relatively low permeability and, therefore, have a relatively low infiltration rate such that, whilst permeable paving could be considered as a drainage solution for the proposed development, significant storage capacity is likely to be required.

REFERENCES

BRE (2005) *Special Digest 1 – Concrete in aggressive ground*, CRC Ltd

BRE (2015) *BR211 – Radon: Guidance on protective measures for new buildings* BRE Press

BRE (2016) *DG365 – Soakaway Design* IHS

BSI (2015) *BS 5930:2015 Code of Practice for Site Investigations* British Standards Institution

BSI (2017) *BS 10175:2011+A2:2017 Code of Practice for Investigation of Potentially Contaminated Sites* British Standards Institution

BSI (2004) *BS EN1997-1:2004 Eurocode 7: Geotechnical Design – Part 1: General Rules* British Standards Institution

BSI (2007) *BS EN1997-2:2007 Eurocode 7: Geotechnical Design – Part 2: Ground Investigation and Testing* British Standards Institution

CIRIA (2001) *CIRIA C552 – Contaminated Land Risk Assessment: A Guide to Good Practice* Construction Industry Research Association

CIRIA (2016) *C753 SuDs Design Manual for England and Wales* Construction Industry Research Association

Environment Agency (2004) *Model Procedures for the Management of Land Contamination CLR11* EA

Environment Agency (2010) *Guiding Principles for Land Contamination – GPLC1 to 3* EA

Highways Agency (2009) *Interim Advice Note 73/06 Revision 1 – Design Guidance for Road Pavements (Draft HD25)* HA

Ministry of Housing, Communities and Local Government (2018) *National Planning Policy Framework*

NHBC (2020) *Standards* National House Building Council

TRRL (1989) *LR1132 – The Design of Bituminous Road Pavements* Transport and Road Research Laboratory

UKWIR (2010) *Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites* Report Ref. No. 10/WM/03/21 UK Water Industry Research

GENERAL NOTES

1. This report is provided in the context of the stated development proposals and should not be used in a different context.
2. The accuracy of map extracts cannot be guaranteed and it should be recognised that different conditions on site may have existed between and subsequent to the various map surveys.
3. Any borehole data from the British Geological Survey sources are included on the following basis: 'The British Geological Survey accept no responsibility for omissions or misinterpretation of the data from their Data Bank as this may be old or obtained from non-BGS sources and may not represent current interpretation.
4. Where any data supplied by the Client or by other external sources, including previous site investigation data, have been used it has been assumed that the information is correct unless otherwise stated. No responsibility can be accepted by Crossfield Consulting Limited for inaccuracies within the data supplied by others.
5. Exploratory hole locations provided in the report are generally established by tape measurement from existing features or boundaries. Hole locations are not accurately surveyed and ground levels at these locations are not obtained unless specifically requested.
6. Any assessments made in this report are based on the ground conditions indicated by the trial pits and/or boreholes, together with the results of any field or laboratory testing undertaken and, where appropriate, other relevant site data which may have been obtained for the site. Variations in ground conditions may occur between exploratory hole locations and there may be special conditions appertaining to the site which have not been revealed by the investigation and which have not been taken into account in the report. The assessment may be subject to amendment in the light of additional information becoming available.
7. The report is provided for the sole use by the Client or its assignees and is confidential to the Client's professional advisers. No responsibility whatsoever for the contents of this report will be accepted to any person other than the Client or its assignees.
8. New information, improved practices and legislation may necessitate an alteration to the report in whole, or in part, after its submission. Therefore with any change in circumstances or after the expiry of one year from the date of the report, the report should be referred to Crossfield Consulting Limited for re-assessment and, if necessary, re-appraisal.

TABLES

TABLE 1

CONCEPTUAL SITE MODEL

Potential Contaminant Source	Potential Pathway	Receptors and Assessed Pollutant Linkage
Solids <i>On-site:</i> <i>Toxic metals:</i> No realistic source identified <i>Phototoxic metals:</i> No realistic source identified <i>Polyaromatic Hydrocarbons:</i> No realistic source identified <i>Asbestos:</i> No realistic source identified <i>Off-site:</i> No realistic source identified Liquids No realistic liquid source identified within desk study information. Gases <i>Landfill gases:</i> No realistic potential source identified <i>Putrescible Material/Thick Made Ground:</i> No evidence to suggest that such materials should be expected at significant depth beneath the site <i>Radon:</i> The site is not located within a radon affected area.	Movement of Solids Not applicable (No source). Release into Liquid Phase Not applicable (No source). Release into Vapour Phase Not applicable (No source) Movement of Liquids Not applicable (No source). Movement of Gases Not applicable (No source).	Human Health <i>End Users:</i> No pollutant linkage <i>Construction Workers:</i> No pollutant linkage <i>Adjacent Properties:</i> No pollutant linkage Buried Structures & Services No pollutant linkage Landscape & Garden Areas No pollutant linkage Controlled Waters <i>Groundwater:</i> Principal Aquifer in solid strata - No pollutant linkage <i>Surface Water:</i> No pollutant linkage Human Health No pollutant linkage

NOTES

1. The above conceptual model is based on CIRIA C552 (2001) and BS 10175:2011+A2:2017.
2. The Conceptual Site Model is prepared from available desk study information. Where a site walkover or ground investigation identifies information that was not known at the desk study stage, such information is used to modify the Model.

FIGURES

FIGURE 1



SITE LOCATION PLAN

Scale 1: 50,000

Reproduced from the 2012, 1:50,000 Ordnance Survey map with the permission of Ordnance Survey on behalf of The Controller of Her Majesty's Stationery Office, © Crown copyright. Licence No.100014660

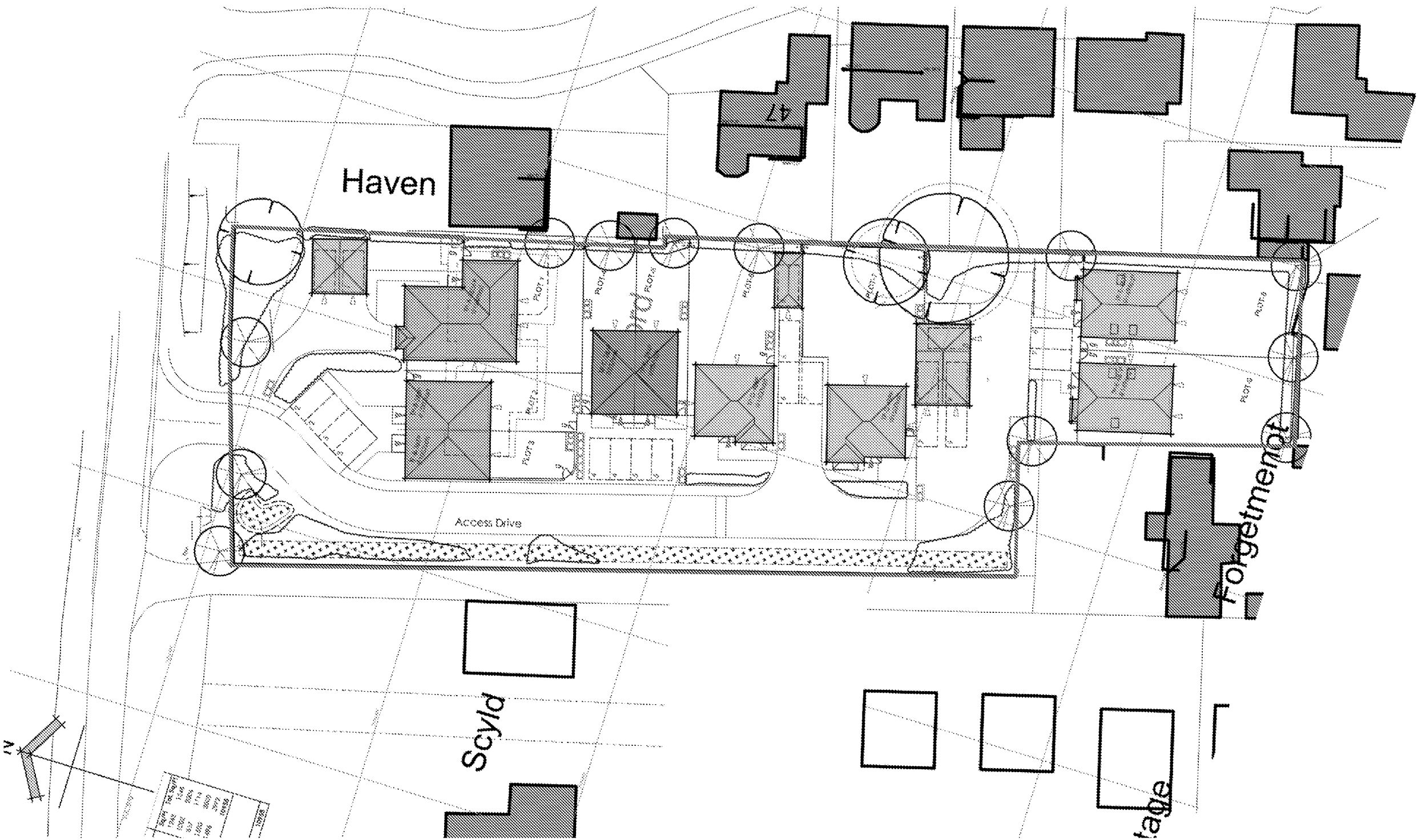
FIGURE 2



SITE PLAN
Not to Scale

Google Maps

FIGURE 3



PROPOSED DEVELOPMENT PLAN
Scale 1:500

Reproduced from the 1:500 scale Site Layout by Carlton Design Partnership dated 03/12/2019. Drg No. 190725/SL-01

APPENDIX I

APPENDIX I – GROUND INVESTIGATION

Introduction

This Appendix, together with Sections 2 to 5 of the report (*and other documents, as referenced*), forms the Ground Investigation Report for the development described in the report, in compliance with the requirements of BS 5930:2015, BS EN1997-1:2004(2007) and BS EN1997-2:2007(2007).

The site operations were carried out between 23rd December 2019 and 12th March 2020 under the supervision of a geotechnical/geoenvironmental engineer from Crossfield Consulting Limited. The scope and rationale for the design of the investigation is presented in Table I-1.

The ground investigation was designed and supervised by qualified and experienced geotechnical/geoenvironmental specialists from Crossfield Consulting Limited. Where appropriate, and as outlined below, specialist drilling/sampling equipment was procured together with trained and experienced operators. Unless otherwise indicated, sampling and logging remained the responsibility of trained staff from Crossfield Consulting Limited and field records were prepared on site, during or immediately following drilling/sampling or in situ measurements/tests. The results of in situ tests are presented on the relevant record sheets in this Appendix.

An exploratory hole location plan is presented as Figure I-1.

Trial Pits

Nine trial pits, denoted as TP1 to TP4A and TPSSK1 to TPSSK3, were excavated by a Cat 307c excavator on 12th March 2020. The trial pit records from the investigation are presented in this Appendix and these records include the descriptions and depths of the strata encountered, together with sample depths, groundwater observations and other pertinent comments.

In situ hand vane tests were carried out on fine-grained soils, where appropriate, to provide undrained shear strength data representative of the tested horizon. The tests were carried out using Pilcon-Edeco hand vane tester, with extension rods in accordance with the site health and safety method statement. With reference to the guidance published in Serota & Jangle (1972), it is noted that this instrument is calibrated and scaled to provide a direct reading of undrained shear strength, such that application of additional correction factors on the recorded measurements is not necessary. Published correlations with undrained shear strength, as measured by immediate undrained triaxial tests, indicate this hand vane tester provides measurements with a significantly lower scatter in comparison to triaxial tests, with fewer anomalous results.

In Situ Soakaway Tests

In situ soakaway tests were performed in Trial Pits SSK1 to SSK3 generally in accordance with the requirements of BRE DG365 (2016) except that they were filled only once. Trial Pits were filled with clean water and the fall in water level measured with time. The results of the in situ testing are presented in this Appendix.

Windowless Sampling

Four windowless sampling boreholes, denoted as WS1 to WS4, were sunk by 360 Drilling Limited, on 23rd December 2019 to 5.0m depth. Dynamic/driven open-tube soil sampling/boring was undertaken using a *Premier Compact* rig. Using a 1.0 m long thick-walled open-tube sampler (with plastic liner), Category A and B samples were recovered (sample disturbance being influenced by the specific soils encountered). Where appropriate, small disturbed sub-samples were recovered from the materials recovered in the open-tube sampler.

The records from the investigation are presented in this Appendix. These records include the descriptions and depths of the strata encountered, together with sample depths, in situ test results (uncorrected values),

groundwater observations, details of installations/backfill within exploratory holes and other pertinent comments.

Groundwater Monitoring

Groundwater levels within the four boreholes were measured on four occasions between 30th December 2019 and 12th March 2020 by experienced staff from Crossfield Consulting Limited and Environmental Site Sampling Limited. Results of groundwater monitoring are presented in this Appendix.

Geotechnical Laboratory Testing

The rationale for the geotechnical laboratory testing is set out in the Table I-2.

Selected samples of the soils encountered were submitted for analysis for the following tests:

- pH value
- Water soluble sulphate
- Moisture content
- Atterberg Limits

The analyses were carried out by i2 Analytical, a UKAS accredited laboratory, and the results are presented in this Appendix.

TABLE I-1

RATIONALE FOR THE DESIGN OF THE GROUND INVESTIGATION

The scope of the supplementary ground investigation was designed with reference to the published geology and ground conditions indicated in the desk study information.

In compliance with the guidance published in BS EN 1997-2:2007, the ground investigation was designed to verify the preliminary ground model, established from the desk study information and to characterise the ground conditions within influencing distance of the proposed structures. In this regard, the exploratory holes were targeted within relevant areas of the site to provide information on the strata profile down to competent materials. With reference to the desk study information and the support requirements of the proposed development, it is evident that adequate support is provided by the strata that continue below the depths of the exploratory holes.

Exploratory Hole and Technique	Rationale for Hole Location	Depth (m)	Sampling/In Situ Testing and Monitoring
WS1-WS4	All exploratory hole locations were chosen to provide data in relevant areas across the site	5.0 m	Standpipes installed to enable groundwater monitoring
TP1-TP4A	Exploratory holes located within, or in close proximity to, the proposed building to provide additional information on shallow strata and groundwater.	Up to 2.1 m	Representative samples of potential founding strata recovered for geotechnical testing Hand vane shear strength tests undertaken where appropriate
TPSSK1-TPSSK3	Exploratory holes were located 5 m from proposed buildings to provide information on the water infiltration characteristics of the ground	Up to 1.1 m	In situ soakaway test Representative samples of potential founding strata recovered for geotechnical testing

Key

TP X	Machine dug trial pit
WS X	Windowless Sample Borehole

TABLE I-2

RATIONALE FOR THE GEOTECHNICAL TESTING SUITE

Exploratory Hole and Sample	Selection Criteria	Geotechnical Tests
TP2 1.0 m TP3 0.4 m TP3 1.6 m TP4 1.0 m	Representative samples of potential founding strata to undertake testing to aid concrete design	pH Water soluble sulphate
SSK1 0.7 m TP1 0.7 m TP2 1.4 m TP2 1.6 m TP3 0.9 m TP4 1.7 m	Representative samples of founding strata to undertake classification testing	Moisture content Atterberg Limits

TABLE I-3

GROUNDWATER MONITORING DATA

Borehole	Depth to Groundwater (m)				
	23.12.19	30.12.19	21.01.20	26.02.20	12.03.20
WS1	1.40	1.70*	1.90	1.63	1.55
WS2	0.72	1.14	1.40	1.07	1.00
WS3	0.99	1.39	1.60	1.32	1.29
WS4	0.99	1.35	1.50	1.33	1.30

Notes:

*Estimated groundwater depth

TRIAL PIT RECORDS

KEY

	J	Disturbed Jar Sample	}	Category B Samples
	G	Soil Sample in Glass Container		
	g	Soil Sample in Glass Vial		
	B	Disturbed Bulk Sample		
	C	"Undisturbed" CBR Mould Sample (denoted Category A: OS-TK/W in BS EN 22475-1:2006)		
	W	Water Sample		
FVT	{	c_{fv}	Undrained Shear Strength (from hand vane shear vane test)	
		c_{rv}	Undrained Remoulded Shear Strength (from hand vane shear vane test)	
		c_{fv}^*	Undrained Shear Strength from Hand Vane Shear Strength Test on block sample dug from pit by excavator	

Notes:

1. All measurement values on record sheets are uncorrected, unless otherwise indicated.
2. For corrected test values, refer to report.
3. Identification and classification of strata is based on the guidance published in the current edition of BS5930 together with BS EN ISO 14688-1:2002, BS EN ISO 14688-2:2004, BS EN ISO 14689-1:2003
4. Consistency (soft, firm, stiff etc.) relates to a manual test/inspection on site (in compliance with BS EN ISO 14688-1:2002 Section 5.14)
5. Undrained shear strength (low, medium, high etc.) relates to in situ or laboratory test data and the associated assessed strength of a stratum (in compliance with BS EN ISO 14688-2:2004 Section 5.3 and Table 5).
6. The density of coarse-grained soils is based on SPT N values (or equivalent Dynamic Probe test or CPT data) as outlined in BS5930 and BS EN ISO 14688-2:2004.
7. Rock strength (weak, strong etc.) is based on field identification (and/or strength test data), as outlined in BS EN ISO 14689-1:2003 Table 5.

Trial Pit Record Sheet

Hole Ref. **TP SSK1**

Project Horsemere Green Lane, Climping

Sheet 1 of 1

Date 12/03/2020

Job No. CCL03279

Bearing: North

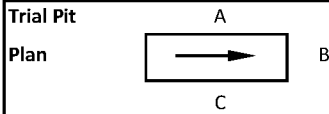
Shoring None used

Ground Level m OD

Plant CAT 307c

Stability Sides stable and vertical throughout excavation

Co-ordinates



Water None encountered

Logged by [Redacted] Logged on site during excavation
Checked by [Redacted]

Depth	Face A	Face B	Face C	Depth
0.30		(1)		0.30
1.00		(2)		1.00
		Base of Pit		

Sampling			Strata		
Sample/Test Depth	Type	Strength (kN/m ²)	Ref. No.	Strata Depth	Description
0.70	J		1	0.00-0.30	Woodchippings over brown silty clay with roots and rootlets (TOPSOIL)
			2	0.30-1.00	Firm consistency orangish brown sandy CLAY with rare rootlets (RIVER TERRACE DEPOSITS)

Remarks	Notes
	1. All logging and sampling in accordance with BS 5930:2015 2. Symbols and abbreviations are explained on the accompanying key 3. All linear dimensions are in metres unless otherwise stated

Trial Pit Record Sheet

Hole Ref. **TP SSK3**

Project Horsemere Green Lane, Climping

Sheet 1 of 1

Date 12/03/2020

Job No. CCL03279

Bearing: Northeast

Shoring None used

Ground Level m OD

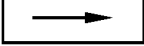
Plant CAT 307c

Stability Sides stable and vertical throughout excavation

Co-ordinates

Trial Pit A

Logged by [REDACTED] Logged on site during excavation

Plan  B

Checked by [REDACTED]

Water None encountered

Depth	Face A	Face B	Face C	Depth
0.45		(1)		0.45
1.00		(2)		1.00
		Base of Pit		

Sampling			Strata		
Sample/Test	Type	Strength (kN/m ²)	Ref. No.	Strata Depth	Description
S	JGg		1	0.00-0.45	Dark brown silty clay with roots and rootlets, occasional charcoal and brick fragments (TOPSOIL/MADE GROUND)
0.70	J		2	0.45-1.00	Firm consistency orangish brown sandy CLAY (RIVER TERRACE DEPOSITS)

Remarks	Notes
	1. All logging and sampling in accordance with BS 5930:2015 2. Symbols and abbreviations are explained on the accompanying key 3. All linear dimensions are in metres unless otherwise stated

Trial Pit Record Sheet

Hole Ref. **TP1**

Project Horsemere Green Lane, Climping

Sheet 1 of 1

Date 12/03/2020

Job No. CCL03279

Bearing: Northeast

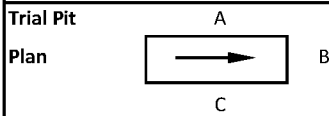
Shoring None used

Ground Level m OD

Plant CAT 307c

Stability Sides stable and vertical throughout excavation

Co-ordinates



Water None encountered

Logged by [Redacted] Logged on site during excavation
Checked by [Redacted]

Depth	Face A	Face B	Face C	Depth
0.30		(1)		0.30
0.90		(2)		0.90
		Base of Pit		

Sampling			Strata		
Sample/Test Depth	Type	Strength (kN/m ²)	Ref. No.	Strata Depth	Description
0.70	J		1	0.00-0.30	Dark black clayey silt with roots and rootlets and occasional concrete (TOPSOIL/MADE GROUND)
			2	0.30-0.90	Firm consistency dark orangish brown sandy CLAY with rootlets (RIVER TERRACE DEPOSITS)

Remarks	Notes
	1. All logging and sampling in accordance with BS 5930:2015 2. Symbols and abbreviations are explained on the accompanying key 3. All linear dimensions are in metres unless otherwise stated

Trial Pit Record Sheet

Hole Ref. TP2

Project Horsemere Green Lane, Climping

Sheet 1 of 1

Date 12/03/2020

Job No. CCL03279

Bearing: South

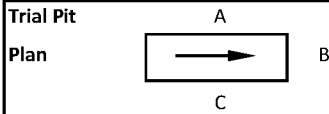
Shoring None used

Ground Level m OD

Plant CAT 307c

Stability Sides stable and vertical throughout excavation

Co-ordinates



Water Strata damp with seepages below 1.6 m depth

Logged by [Redacted] Logged on site during excavation
Checked by [Redacted]

Depth	Face A	Face B	Face C	Depth
0.10		(1)		0.10
1.50		(2)		1.50
2.00		(3)		2.00
		Base of Pit		

Sampling			Strata		
Sample/Test Depth	Type	Strength (kN/m ²)	Ref. No.	Strata Depth	Description
			1	0.00-0.10	Grass over brown silty clay with rootlets (TOPSOIL)
0.70	J		2	0.10-1.50	Firm consistency orangish brown slightly gravelly sandy CLAY. Gravel is fine to coarse angular predominately of flint.
0.70	c _{fv}	65,60,50			(RIVER TERRACE DEPOSITS)
1.00	J	58			
1.10	c _{fv}	40,52,48	3	1.50-2.00	Soft to firm consistency yellowish orangish brown slightly sandy gravelly SILT/CLAY with rare cobbles. Gravel is fine to coarse subangular mixed lithologies including flint.
1.40	J				(RIVER TERRACE DEPOSITS)
1.60	J				
1.90	J				

Remarks	Notes
Trial pit terminated at 2.0 m due to groundwater seepages and potential instability	1. All logging and sampling in accordance with BS 5930:2015 2. Symbols and abbreviations are explained on the accompanying key 3. All linear dimensions are in metres unless otherwise stated

Trial Pit Record Sheet

Hole Ref. **TP3**

Project Horsemere Green Lane, Climping

Sheet 1 of 1

Date 12/03/2020

Job No. CCL03279

Bearing: West

Shoring None used

Ground Level m OD

Plant CAT 307c

Stability Sides stable and vertical throughout excavation

Co-ordinates

Trial Pit A

Logged by [REDACTED] logged on

Plan B

Checked by [REDACTED] site during excavation

Water Strata damp below 1.7 m depth

Depth	Face A	Face B	Face C	Depth
0.20		(1)		0.20
2.10		(2)		2.10
		Base of Pit		

Sampling			Strata		
Sample/Test Depth	Type	Strength (kN/m ²)	Ref. No.	Strata Depth	Description
			1	0.00-0.20	Dark brown clayey silt with roots and rootlets (TOPSOIL)
0.40	J		2	0.20-2.10	Soft to firm consistency dark orangish brown sandy CLAY with occasional rootlets and grey silty clay inclusions below 1.7 m (RIVER TERRACE DEPOSITS)
0.50	c _{fv}	38,44,46			
0.90	J	55			
1.00	c _{fv}	60,54,50			
1.50	c _{fv} *	50,50,55			
1.60	J				

Remarks	Notes
	1. All logging and sampling in accordance with BS 5930:2015 2. Symbols and abbreviations are explained on the accompanying key 3. All linear dimensions are in metres unless otherwise stated

Trial Pit Record Sheet

Hole Ref. **TP4**

Project Horsemere Green Lane, Climping

Sheet 1 of 1

Date 12/03/2020

Job No. CCL03279

Bearing: North

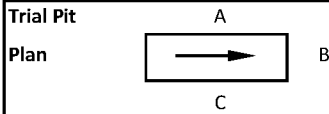
Shoring None used

Ground Level m OD

Plant CAT 307c

Stability Sides stable and vertical throughout excavation

Co-ordinates



Water Seepage at base of pit

Logged by [Redacted] Logged on site during excavation
Checked by [Redacted]

Depth	Face A	Face B	Face C	Depth
0.20		(1)		0.20
0.80		(2)		0.80
2.00		(3)		2.00
		Base of Pit		

Sampling			Strata		
Sample/Test Depth	Type	Strength (kN/m ²)	Ref. No.	Strata Depth	Description
0.40	c _{fv} *	40,35		0.00-0.20	Woodchippings over black clayey silt with rootlets (TOPSOIL)
0.60	J			0.20-0.80	Firm consistency dark orangish brown sandy CLAY with roots and rootlets (RIVER TERRACE DEPOSITS)
1.00	J			0.80-2.00	Firm to stiff consistency yellowish orangish brown slightly sandy gravelly CLAY. Gravel is fine to coarse subangular to subrounded mixed lithologies including chalk (RIVER TERRACE DEPOSITS)
1.00	c _{fv} *	50,55,42			
1.70	J				

Remarks	Notes
Trial pit terminated at 2.0 m due to groundwater seepages	1. All logging and sampling in accordance with BS 5930:2015 2. Symbols and abbreviations are explained on the accompanying key 3. All linear dimensions are in metres unless otherwise stated

Trial Pit Record Sheet

Hole Ref. **TP4A**

Project Horsemere Green Lane, Climping

Sheet 1 of 1

Date 12/03/2020

Job No. CCL03279

Bearing: North

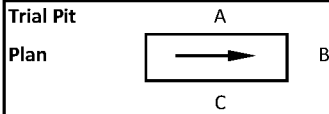
Shoring None used

Ground Level m OD

Plant CAT 307c

Stability Sides stable and vertical throughout excavation

Co-ordinates



Water Minor seepage at 1.4 m depth

Logged by [Redacted] Logged on site during excavation
Checked by [Redacted]

Depth	Face A	Face B	Face C	Depth
0.30		(1)		0.30
0.70		(2)		0.70
1.40		(3)		1.40
		Base of Pit		

Sampling			Strata		
Sample/Test Depth	Type	Strength (kN/m ²)	Ref. No.	Strata Depth	Description
			1	0.00-0.30	Dark brown clayey silt with roots and rootlets (TOPSOIL)
0.60	c _{fv}	42,54,52 60	2	0.30-0.70	Firm consistency dark orangish brown sandy CLAY with roots and rootlets (RIVER TERRACE DEPOSITS)
1.10	c _{fv}	70,60,65 54	3	0.70-1.40	Firm consistency yellowish orangish brown slightly sandy gravelly CLAY. Gravel is fine to coarse subangular to subrounded mixed lithologies including chalk and rare flint (RIVER TERRACE DEPOSITS)

Remarks	Notes
	1. All logging and sampling in accordance with BS 5930:2015 2. Symbols and abbreviations are explained on the accompanying key 3. All linear dimensions are in metres unless otherwise stated

In Situ Percolation Test

Hole Ref. **TP SSK1**

Project: Horsemere Green Lane, Climping

Sheet 1 of 2

Job No. CCL03279

Date: 12/03/2020

Test by:

Checked by:

Trial Pit SSK1

Test 1

Depth 0.90 m
Length 0.70 m
Width 0.40 m

Depth to water at start of test 0.55 m
Max Effective Depth 0.35 m
75% Effective Depth 0.26 m
25% Effective Depth 0.09 m

Water Level Measurements

Time at Start of Test	Time (Minutes)	Depth to Water (metres)	Effective Depth (m)
9:20	0	0.55	0.35
	1	0.55	0.35
	2	0.55	0.35
	3	0.55	0.35
	4	0.56	0.34
	5	0.56	0.34
	20	0.62	0.28
	40	0.66	0.24
	70	0.70	0.20
	105	0.75	0.15
	135	0.80	0.10

75% Effective Depth - 35 - 0.26
25% Effective Depth - 155 (estimated) 0.09

Outflow Volume

Volume outflowing between 75% & 25% effective depth:

$$V_{p75} = 0.05 \text{ m}^3$$

The mean surface area through which the outflow occurs, taken to be the pit sides to 50% effective depth and the base.

$$a_{p50} = 0.67 \text{ m}^2$$

Time for outflow

$$t_p = 120 \text{ mins}$$

Soil Infiltration Rate

as defined in

BRE DG365 (2016)

$$f = V_{p75} / a_{p50} * t_p$$

$$f = 1.0E-05 \text{ m/sec (estimated)}$$

In Situ Percolation Test

Hole Ref. **TP SSK1**

Project: Horsemere Green Lane, Climping

Sheet 2 of 2

Job No. CCL03279

Date: 12/03/2020

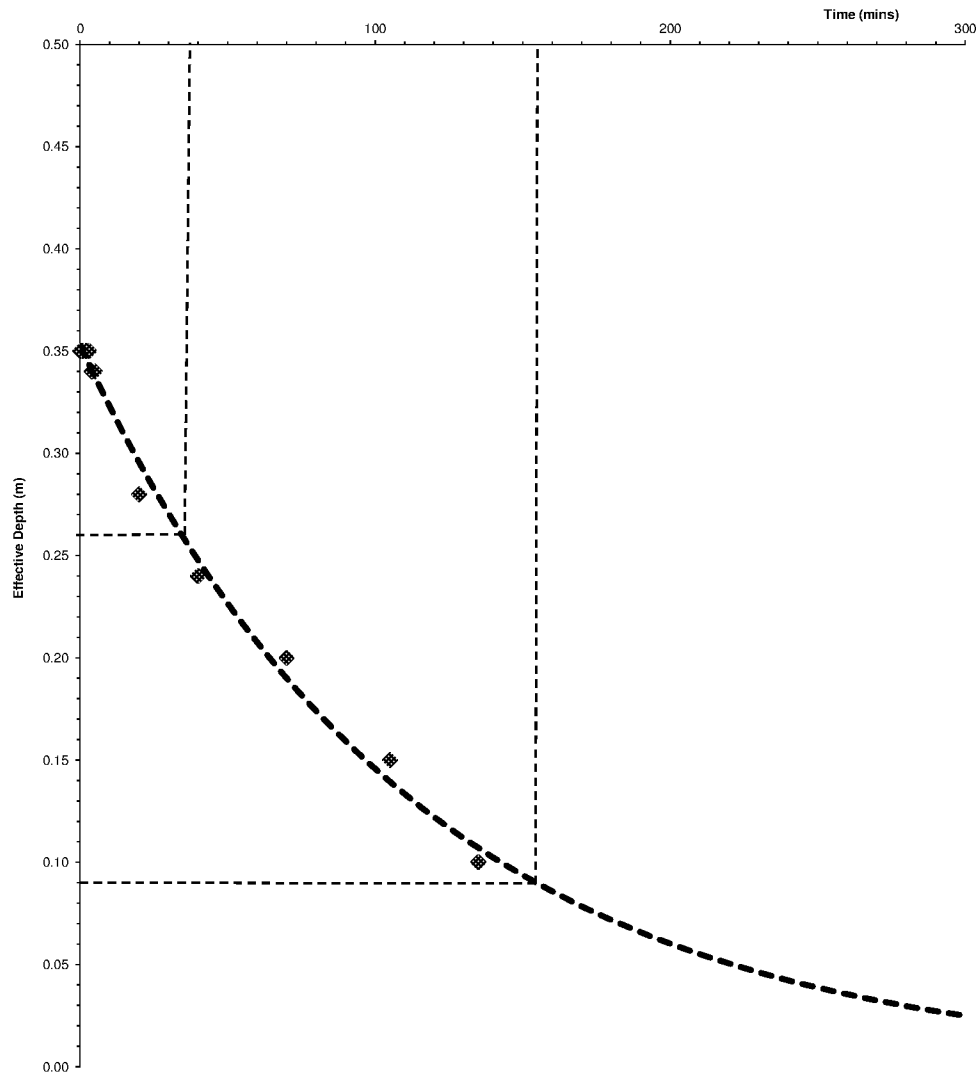
Test by:

Checked by:

Trial Pit SSK1

Test 1

Infiltration Rate



In Situ Percolation Test

Hole Ref. **TP SSK1**

Project: Horsemere Green Lane, Climping

Sheet 1 of 2

Job No. CCL03279

Date: 12/03/2020

Test by:

Checked by:

Trial Pit SSK1

Test 2

Depth	0.80 m
Length	0.70 m
Width	0.40 m
Depth to water at start of test	0.40 m
Max Effective Depth	0.40 m
75% Effective Depth	0.30 m
25% Effective Depth	0.10 m

Water Level Measurements

Time at Start of Test	Time (Minutes)	Depth to Water (metres)	Effective Depth (m)
11:35	0	0.40	0.40
	1	0.40	0.40
	2	0.40	0.40
	3	0.41	0.39
	4	0.41	0.39
	5	0.42	0.38
	40	0.52	0.28
	80	0.57	0.23
	140	0.62	0.18
	160	0.63	0.17
	190	0.64	0.16
75% Effective Depth -	50	-	0.30
25% Effective Depth -	260	(estimated)	0.10

Outflow Volume

Volume outflowing between 75% & 25% effective depth:

$$V_{p75} = 0.06 \text{ m}^3$$

The mean surface area through which the outflow occurs, taken to be the pit sides to 50% effective depth and the base.

$$a_{p50} = 0.72 \text{ m}^2$$

Time for outflow

$$t_p = 210 \text{ mins}$$

Soil Infiltration Rate

as defined in

BRE DG365 (2016)

$$f = V_{p75} / a_{p50} * t_p$$

$$f = 6.2E-06 \text{ m/sec (estimated)}$$

In Situ Percolation Test

Hole Ref. **TP SSK1**

Project: Horsemere Green Lane, Climping

Sheet 2 of 2

Job No. CCL03279

Date: 12/03/2020

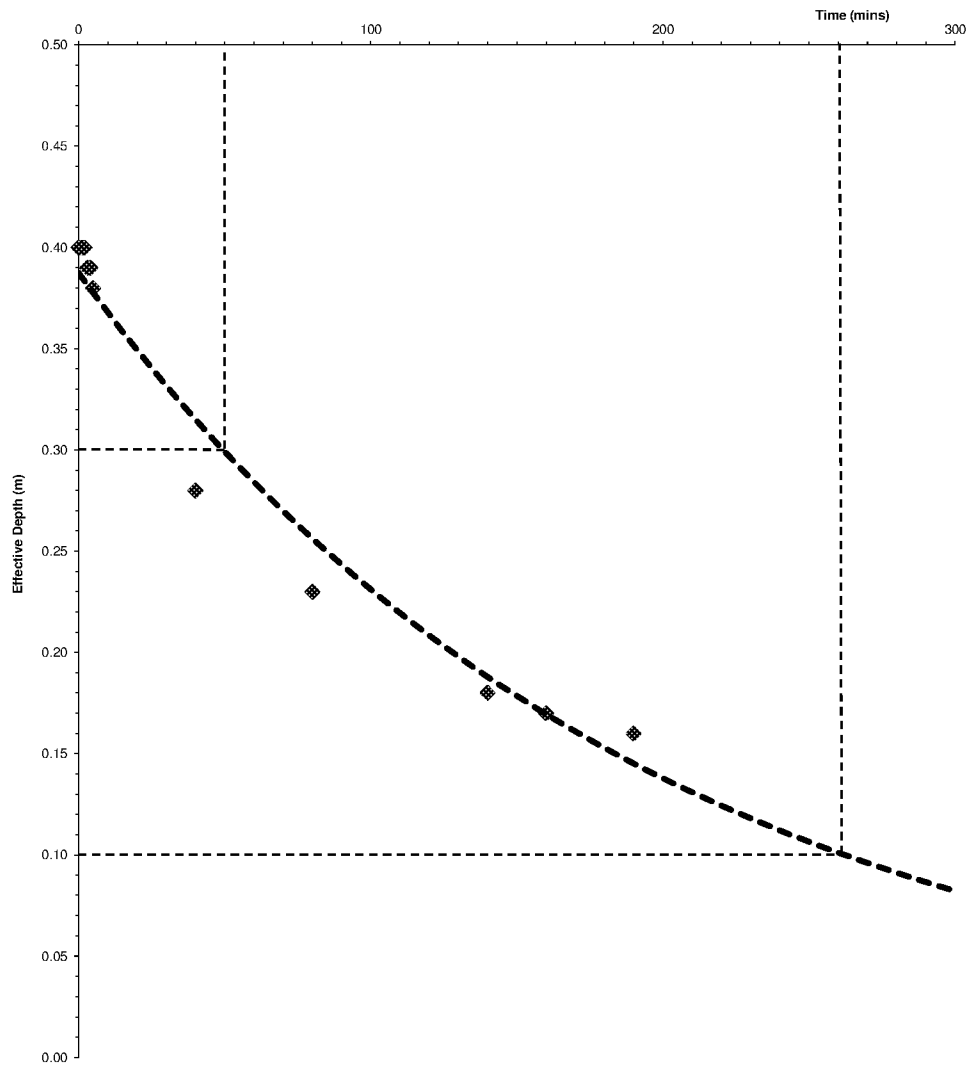
Test by:

Checked by:

Trial Pit SSK1

Test 2

Infiltration Rate



In Situ Percolation Test

Hole Ref. **TP SSK2**

Project: Horsemere Green Lane, Climping

Sheet 1 of 2

Job No. CCL03279

Date: 12/03/2020

Test by:

Checked by:

Trial Pit SSK2

Test 1

Depth 1.10 m
Length 1.60 m
Width 0.35 m

Depth to water at start of test 0.50 m
Max Effective Depth 0.60 m
75% Effective Depth 0.45 m
25% Effective Depth 0.15 m

Water Level Measurements

Time at Start of Test	Time (Minutes)	Depth to Water (metres)	Effective Depth (m)
9:10	0	0.50	0.60
	2	0.50	0.60
	3	0.50	0.60
	4	0.50	0.60
	5	0.50	0.60
	20	0.52	0.58
	30	0.53	0.57
	50	0.54	0.56
	75	0.54	0.56
	115	0.55	0.55
	155	0.56	0.54
	190	0.57	0.53
	220	0.57	0.53
	280	0.59	0.51
	310	0.60	0.50

75% Effective Depth - 500 (estimated) 0.45
25% Effective Depth - 2300 (estimated) 0.15

Outflow Volume

Volume outflowing between 75% & 25% effective depth:

$$V_{p75} = 0.17 \text{ m}^3$$

The mean surface area through which the outflow occurs, taken to be the pit sides to 50% effective depth and the base.

$$a_{p50} = 1.73 \text{ m}^2$$

Time for outflow

$$t_p = 1800 \text{ mins}$$

Soil Infiltration Rate

as defined in

BRE DG365 (2016)

$$f = V_{p75} / a_{p50} * t_p$$

$$f = 9.0E-07 \text{ m/sec (estimated)}$$

In Situ Percolation Test

Hole Ref. **TP SSK2**

Project: Horsemere Green Lane, Climping

Sheet 2 of 2

Job No. CCL02270

Date: 12/03/2020

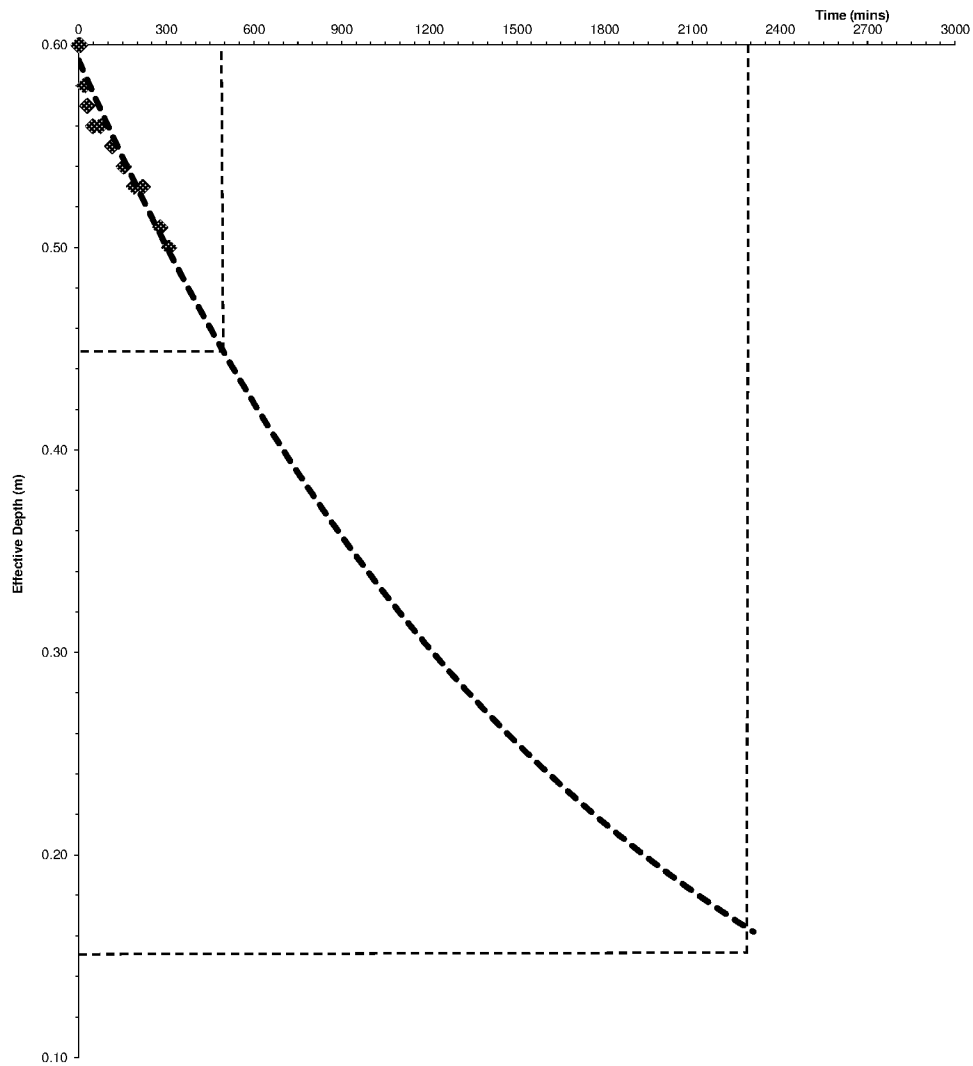
Test by:

Checked by:

Trial Pit SSK2

Test 1

Infiltration Rate



In Situ Percolation Test

Hole Ref. **TP SSK2A**

Project: Horsemere Green Lane, Climping

Sheet 1 of 2

Job No. CCL03279

Date: 12/03/2020

Test by:

Checked by:

Trial Pit SSK2A

Test 1

Depth 0.80 m
Length 1.60 m
Width 0.35 m

Depth to water at start of test 0.25 m
Max Effective Depth 0.55 m
75% Effective Depth 0.41 m
25% Effective Depth 0.14 m

Water Level Measurements

Time at Start of Test	Time (Minutes)	Depth to Water (metres)	Effective Depth (m)
12:10	0	0.25	0.55
	1	0.25	0.55
	2	0.25	0.55
	3	0.25	0.55
	4	0.26	0.54
	5	0.27	0.53
	15	0.29	0.51
	45	0.32	0.48
	105	0.37	0.43
	130	0.38	0.42
	150	0.40	0.40

75% Effective Depth - 130 0.41
25% Effective Depth - 650 (estimated) 0.14

Outflow Volume

Volume outflowing between 75% & 25% effective depth:

$$V_{p75} = 0.15 \text{ m}^3$$

The mean surface area through which the outflow occurs, taken to be the pit sides to 50% effective depth and the base.

$$a_{p50} = 1.63 \text{ m}^2$$

Time for outflow

$$t_p = 520 \text{ mins}$$

Soil Infiltration Rate

as defined in

BRE DG365 (2016)

$$f = V_{p75} / a_{p50} * t_p$$

$$f = 3.0E-06 \text{ m/sec (estimated)}$$

In Situ Percolation Test

Hole Ref. **TP SSK2A**

Project: Horsemere Green Lane, Climping

Sheet 2 of 2

Job No. CCL03279

Date: 12/03/2020

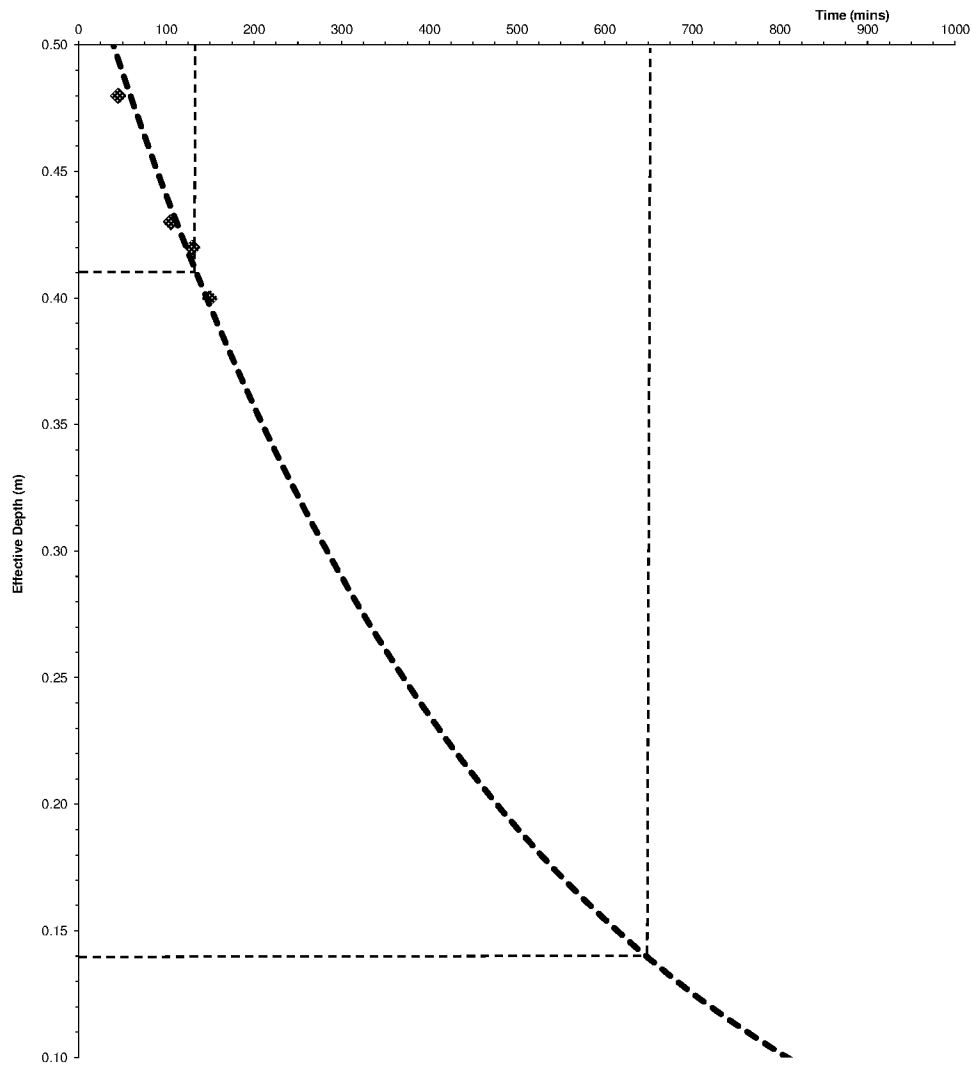
Test by:

Checked by:

Trial Pit SSK2A

Test 1

Infiltration Rate



In Situ Percolation Test

Hole Ref. **TP SSK3**

Project: Horsemere Green Lane, Climping

Sheet 1 of 2

Job No. CCL03279

Date: 12/03/2020

Test by:

Checked by:

Trial Pit SSK3

Test 1

Depth 1.00 m
Length 1.60 m
Width 0.35 m

Depth to water at start of test 0.55 m
Max Effective Depth 0.45 m
75% Effective Depth 0.34 m
25% Effective Depth 0.11 m

Water Level Measurements

Time at Start of Test	Time (Minutes)	Depth to Water (metres)	Effective Depth (m)
9:50	0	0.55	0.45
	1	0.55	0.45
	2	0.55	0.45
	3	0.55	0.45
	4	0.56	0.44
	5	0.56	0.44
	35	0.58	0.42
	70	0.61	0.39
	115	0.65	0.35
	150	0.67	0.33
	180	0.69	0.31
	235	0.71	0.29
	270	0.72	0.28
	295	0.74	0.26
75% Effective Depth -	150	-	0.34
25% Effective Depth -	750	(estimated)	0.11

Outflow Volume

Volume outflowing between 75% & 25% effective depth:

$$V_{p75} = 0.13 \text{ m}^3$$

The mean surface area through which the outflow occurs, taken to be the pit sides to 50% effective depth and the base.

$$a_{p50} = 1.44 \text{ m}^2$$

Time for outflow

$$t_p = 600 \text{ mins}$$

Soil Infiltration Rate

as defined in

BRE DG365 (2016)

$$f = V_{p75} / a_{p50} * t_p$$

$$f = 2.5E-06 \text{ m/sec (estimated)}$$

In Situ Percolation Test

Hole Ref. **TP SSK3**

Project: Horsemere Green Lane, Climping

Sheet 2 of 2

Date: 12/03/2020

Job No.

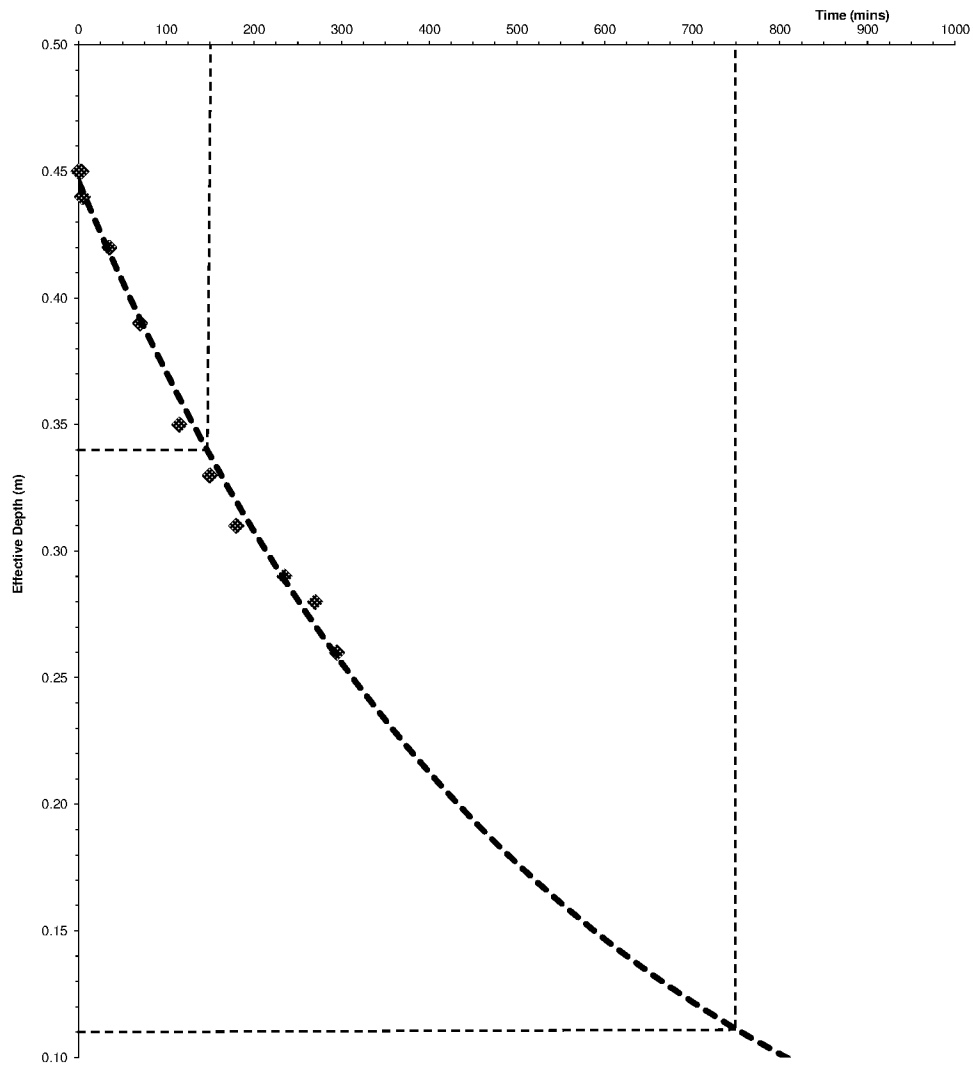
Test by:

Checked by:

Trial Pit SSK3

Test 1

Infiltration Rate



WINDOWLESS SAMPLE RECORDS

KEY

Sampling

J	Disturbed Jar Sample
G	Jar Sample in Glass Container
g	Soil Sample in Glass Vial
W	Water Sample
IC	Nett sample recovery ratio (ratio of length of recovered sample to length of sample run)

In Situ Measurements

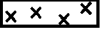
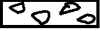
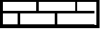
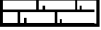
FVT	C_{fv}	Undrained Shear Strength (from hand vane shear vane test)
	C_{rv}	Undrained Remoulded Shear Strength (from hand vane shear vane test)
	C_{fv}^*	Hand Vane Shear Strength Test (on Category A: OS-TK/W soil sample recovered in window sampler)
	S	Standard Penetration Test (SPT: split spoon sampler)
	SPT(C)	SPT carried out with a 60° cone
	'N'	'N' Value from SPT test
	N_{10}	Dynamic Probe Test: Number of blows to drive 100 mm
DPH	N_{H10}	Dynamic Probe Test: Heavy (30 kg mass & 500 mm fall)
DPSH-A	N_{SHA10}	Dynamic Probe Test: Super-Heavy A (63.5 kg mass & 500 mm fall)
DPSH-B	N_{SHB10}	Dynamic Probe Test: Super-Heavy B (63.5 kg mass & 750 mm fall)
	$\frac{x}{y}$	x Blows per y Driving Distance (for non-standard SPT or DP driving distance)
	y mm	
	T	Torque (max) required to turn rods (unit: Nm, unless otherwise shown)

Notes:

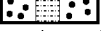
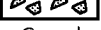
1. All measurement values on record sheets are uncorrected, unless otherwise indicated.
2. For corrected test values, refer to report.
3. Identification and classification of strata is based on the guidance published in the current edition of BS5930 together with BS EN ISO 14688-1:2002, BS EN ISO 14688-2:2004 and BS EN ISO 14689-1:2003
4. Consistency (soft, firm, stiff etc) relates to a manual test/inspection on site (in compliance with BS EN ISO 14688-1:2002 Section 5.14).
5. Undrained shear strength (low, medium, high etc) relates to in situ or laboratory test data and the associated assessed strength of a stratum (in compliance with BS EN ISO 14688-2:2004 Section 5.3 and Table 5).
6. The density of coarse-grained soils is based on SPT N values (or equivalent Dynamic Probe test or CPT data) as outlined in BS5930 and BS EN ISO 14688-2:2004.
7. Rock strength (weak, strong etc) is based on field identification (and/or strength test data), as outlined in BS EN ISO 14689-1:2003 Table 5.

BOREHOLE & DRILLHOLE RECORDS - LEGENDS KEY SHEET

Legend - Strata Encountered in Exploratory Hole

Soil	Rock		
	Sedimentary	Igneous	Metamorphic
 Made Ground	 Mudstone	 Fine-grained	 Fine-grained
 Clay	 Shale	 Medium-grained	 Medium-grained
 Silt	 Siltstone	 Coarse-grained	 Coarse-grained
 Sand	 Sandstone		
 Gravel	 Limestone		
 Peat/Topsoil	 Chalk		
 Organic Sand	 Coal		
 Organic Clay	 Conglomerate		

Legend - Backfill to Borehole and Standpipe Installations

Backfill	Installations
 Soil arisings	 Concrete Cover Over Standpipe
 Bentonite	 Plain Standpipe - Bentonite Surround
 Cement-based Grout	 Perforated Standpipe - Geotextile and Granular Filter Surround
 Gravel	 Perforated Standpipe End Geotextile and Granular Filter Surround

Notes:

1. A combination of the strata symbols are indicative of mixed soil types.
2. The response zone of a standpipe refers to the section of perforated pipe within a granular surround, where substances may freely enter the standpipe from the surrounding strata.

Windowless Sample Record Sheet

Hole Ref. **WS1**

Project: Horsemere Green Lane, Climping

Sheet 1 of 1

Date: 23/12/2019

Job No. CCL03279

Contractor 360 Drilling **Equipment** Premier Compact 110

Ground Level. m OD

Method 0.0 m to 5.0 m windowless sampling

Co-ordinates

Boring Diameter 100 mm

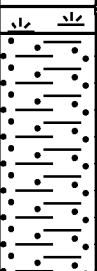
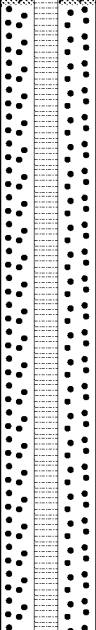
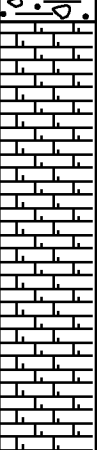
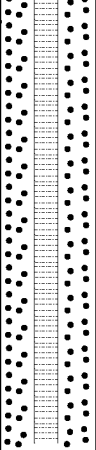
Logged by: GK Logged on site during

Sample Depth	Sample or Test	Casing Depth	Water Depth	Test Value	Description	Depth	Diagram	O.D.
					Grass over dark brown sandy clay with rootlets. (TOPSOIL)	0.10		
					Soft consistency dark orangish brown sandy CLAY. (RIVER TERRACE DEPOSITS)	0.70		
0.90	J				Firm to stiff consistency orangish brown slightly gravelly sandy CLAY. Gravel is fine to medium subrounded (RIVER TERRACE DEPOSITS)	1.20		
1.80	J				Firm consistency orangish brown slightly gravelly sandy CLAY. Gravel is fine to coarse subangular including flint (RIVER TERRACE DEPOSITS)	2.10		
3.20	J				Orangish brown slightly gravelly silty SAND. Gravel is fine to coarse subangular mixed lithologies including flint (RIVER TERRACE DEPOSITS)	5.00		
(End of Hole)						5.00		

Core Recovery		Groundwater			Additional Tests		
Depth	Recovery	Hole Depth	Strike Depth	Water Depth	Observations	Test type	Test Value
0.00-1.00	90%	5.00	3.00	1.40	Water depth on completion of hole		
1.00-2.00	85%						
2.00-3.00	85%						
3.00-4.00	100%						
4.00-5.00	80%						

Remarks	Notes
	1. All logging and sampling in accordance with BS 5930:2015 2. The depths to strata change are approximate only 3. Symbols and abbreviations are explained on the accompanying key 4. All linear dimensions are in metres unless otherwise stated 5. Undrained shear strength test value given in kN/m ²

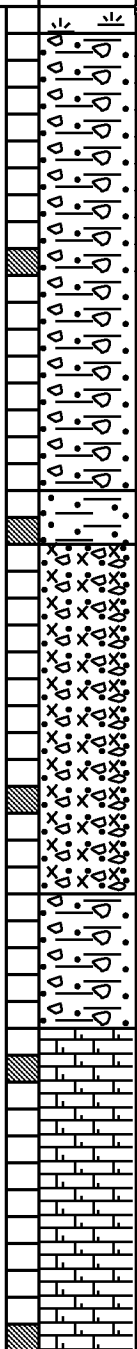
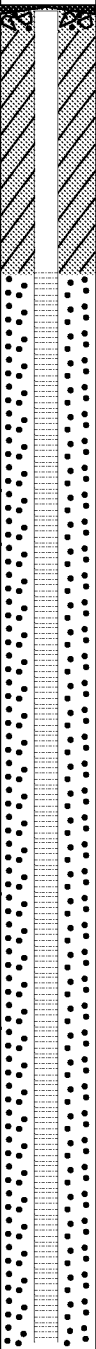
		Windowless Sample Record Sheet				Hole Ref. WS2	
		Project: Horsemere Green Lane, Climping Date: 23/12/2019				Sheet 1 of 1 Job No. CCL03279	
Contractor 360 Drilling		Equipment Premier Compact 110		Ground Level. m OD			
Method 0.0 m to 5.0 m windowless sampling		Co-ordinates				Logged by: GK Logged on site during drilling operations	
Boring Diameter 100 mm							

Sample Depth	Sample or Test	Casing Depth	Water Depth	Test Value	Description	Depth	Legend	Backfill	Level O.D.
0.80	J				Dark brown very clayey sand with rootlets (TOPSOIL)	0.10			
					Soft consistency dark orangish brown very sandy CLAY with rootlets and roots. (RIVER TERRACE DEPOSITS)	1.00			
3.80	J				Firm consistency orangish brown slightly gravelly sandy CLAY. Gravel is fine to coarse subangular to subrounded mixed lithologies including chalk and flint (RIVER TERRACE DEPOSITS)	3.40			
					Structureless CHALK comprising whitish cream mottled orangish brown gravelly CLAY. Clasts are extremely weak low density (LEWES NODULAR CHALK FORMATION)	5.00			
(End of Hole)						5.00			

Core Recovery		Groundwater			Additional Tests			
Depth	Recovery	Hole Depth	Strike Depth	Water Depth	Observations	Test type	Test Depth	Test Value
0.00-1.00	100%	5.00	2.50	0.72	Water depth on completion of hole			
1.00-2.00	100%							
2.00-3.00	100%							
3.00-4.00	60%							
4.00-5.00	100%							

Remarks	Notes
	1. All logging and sampling in accordance with BS 5930:2015 2. The depths to strata change are approximate only 3. Symbols and abbreviations are explained on the accompanying key 4. All linear dimensions are in metres unless otherwise stated 5. Undrained shear strength test value given in kN/m ²

					Windowless Sample Record Sheet					Hole Ref. WS3	
					Project: Horsemere Green Lane, Climping Date: 23/12/2019					Sheet 1 of 1 Job No. CCL03279	
Contractor 360 Drilling			Equipment Premier Compact 110			Ground Level. m OD Co-ordinates Logged by: GK Logged on site during g operations					
Method 0.0 m to 5.0 m windowless sampling											
Boring Diameter 100 mm											

Sample Depth	Sample or Test	Casing Depth	Water Depth	Test Value	Description	Depth	Legend	Backfill	Level O.D.
2.50	J				Dark brown clayey sand with rootlets (TOPSOIL)	0.10			
					Soft consistency orangish brown slightly gravelly sandy CLAY. Gravel is fine to coarse subrounded (RIVER TERRACE DEPOSITS)				
					... Becoming firm consistency below 1.5 m depth				
					Stiff consistency greyish orangish brown slightly sandy CLAY (RIVER TERRACE DEPOSITS)	1.80			
					Orangish brown slightly gravelly silty SAND with grey clay inclusions. Gravel is fine to coarse subrounded of chalk (RIVER TERRACE DEPOSITS)	2.00			
					Firm to stiff consistency greyish orangish brown slightly sandy slightly gravelly CLAY. Gravel is fine to coarse subrounded mixed lithologies including chalk. (RIVER TERRACE DEPOSITS)	3.30			
					Structureless CHALK comprising whitish cream mottled orangish brown gravelly CLAY. Clasts are weak low density (LEWES NODULAR CHALK FORMATION)	3.80			
					(End of Hole)	5.00			

Core Recovery		Groundwater			Additional Tests			
Depth	Recovery	Hole Depth	Strike Depth	Water Depth	Observations	Test type	Test Depth	Test Value
0.00-1.00	100%	5.00	-	0.99	Water depth on completion of hole			
1.00-2.00	100%							
2.00-3.00	80%							
3.00-4.00	100%							
4.00-5.00	70%							

Remarks	Notes
	1. All logging and sampling in accordance with BS 5930:2015 2. The depths to strata change are approximate only 3. Symbols and abbreviations are explained on the accompanying key 4. All linear dimensions are in metres unless otherwise stated 5. Undrained shear strength test value given in kN/m ²

					Windowless Sample Record Sheet			Hole Ref. WS4	
Contractor 360 Drilling Equipment Premier Compact 110					Project: Horsemere Green Lane, Climping Date: 23/12/2019			Sheet 1 of 1 Job No. CCL03279	
Method 0.0 m to 5.0 m windowless sampling Boring Diameter 100 mm								Ground Level. m OD Co-ordinates Logged by: GK Logged on site during drilling operations	
Sample Depth	Sample or Test	Casing Depth	Water Depth	Test Value	Description	Depth	Legend	Backfill	Level O.D.
1.20	J				Woodchippings (MADE GROUND)	0.10			
					Dark brown to black humic very clayey sand with rootlets (TOPSOIL)	0.20			
					Soft to firm consistency orangish brown slightly gravelly sandy CLAY. Gravel is fine to coarse subrounded (RIVER TERRACE DEPOSITS)	1.10			
					Greyish orangish brown slightly gravelly clayey SAND. Gravel is fine to coarse subrounded (RIVER TERRACE DEPOSITS)	3.00			
					Orangish brown silty SAND with rare grey clay inclusions (RIVER TERRACE DEPOSITS)	5.00			
(End of Hole)									
Core Recovery		Groundwater				Additional Tests			
Depth	Recovery	Hole Depth	Strike Depth	Water Depth	Observations	Test type	Test Depth	Test Value	
0.00-1.00	100%	5.00	3.20	0.99	Water depth on completion of hole				
1.00-2.00	90%								
2.00-3.00	100%								
3.00-4.00	20%								
4.00-5.00	100%								
Remarks					Notes 1. All logging and sampling in accordance with BS 5930:2015 2. The depths to strata change are approximate only 3. Symbols and abbreviations are explained on the accompanying key 4. All linear dimensions are in metres unless otherwise stated 5. Undrained shear strength test value given in kN/m ²				



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i2 Analytical Ltd.
7 Woodshots Meadow,
Croxley Green
Business Park,
Watford,
Herts,
WD18 8YS

Analytical Report Number : 20-92669

Project / Site name:	Horsemere Green Lane, Climping	Samples received on:	13/03/2020
Your job number:	CCL03279	Samples instructed on:	13/03/2020
Your order number:	PO11436	Analysis completed by:	24/03/2020
Report Issue Number:	1	Report issued on:	24/03/2020
Samples Analysed:	4 soil samples		

Zina Abdul Razzak
Senior Quality Specialist

For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :	soils	- 4 weeks from reporting
	leachates	- 2 weeks from reporting
	waters	- 2 weeks from reporting
	asbestos	- 6 months from reporting

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Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement. Application of uncertainty of measurement would provide a range within which the true result lies. An estimate of measurement uncertainty can be provided on request.

Analytical Report Number: 20-92669

Project / Site name: Horsemere Green Lane, Climping

Your Order No: PO11436

Lab Sample Number				1472689	1472690	1472691	1472692	
Sample Reference				TP2	TP3	TP3	TP4	
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	
Depth (m)				1.00	0.40	1.60	1.00	
Date Sampled				07/03/2020	07/03/2020	07/03/2020	07/03/2020	
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	
Moisture Content	%	N/A	NONE	15	15	17	12	
Total mass of sample received	kg	0.001	NONE	1.3	1.2	1.2	1.2	
General Inorganics								
pH - Automated	pH Units	N/A	MCERTS	7.2	7.5	7.8	8.6	
Water Soluble SO ₄ 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.0079	0.0096	0.019	0.027	



Analytical Report Number : 20-92669

Project / Site name: Horsemere Green Lane, Climping

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
1472689	TP2	None Supplied	1.00	Light brown clay and sand.
1472690	TP3	None Supplied	0.40	Light brown clay and sand.
1472691	TP3	None Supplied	1.60	Light brown clay.
1472692	TP4	None Supplied	1.00	Light brown clay and sand with chalk and gravel.

Analytical Report Number : 20-92669

Project / Site name: Horsemere Green Lane, Climping

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In house method.	L099-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS

For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.

For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.

Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.



TEST CERTIFICATE

Liquid and Plastic Limits

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB



Environmental Science

4041

Tested in Accordance with: BS 1377-2: 1990: Clause 4.3 and 5

Client: Crossfield Consulting Ltd
Client Address: The Granary, White Hall Farm,
Leamington Road, Long Itchington,
Warwickshire, CV47 9PU

Contact: George Kavanagh
Site Address: Horsemere Green Lane, Climping

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Client Reference: CCL03279
Job Number: 20-92552
Date Sampled: 12/03/2020
Date Received: 13/03/2020
Date Tested: 20/03/2020
Sampled By: GK

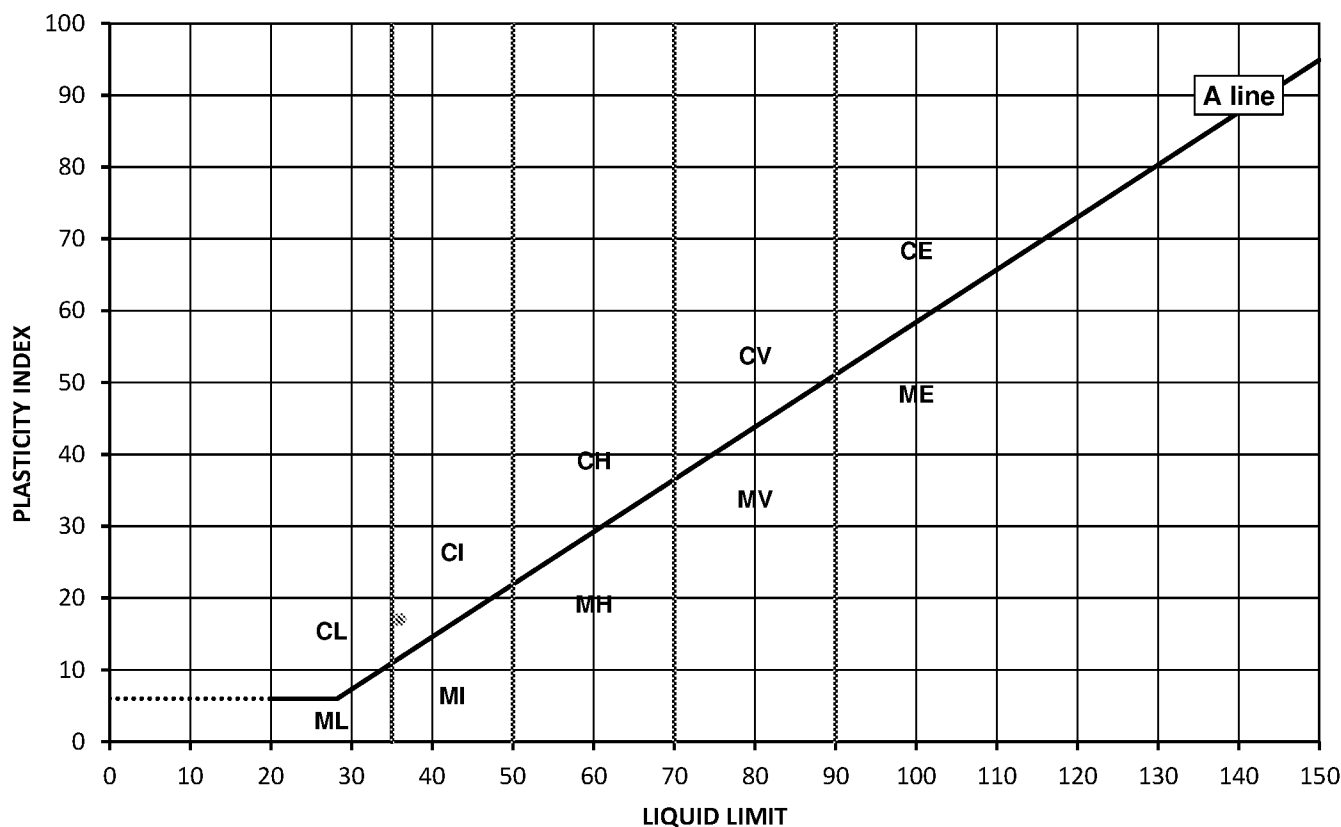
Test Results:

Laboratory Reference: 1472045
Hole No.: SSK1
Sample Reference: Not Given
Soil Description: Orangish brown sandy CLAY

Depth Top [m]: 0.70
Depth Base [m]: Not Given
Sample Type: D

Sample Preparation: Tested in natural condition

As Received Moisture Content [%]	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index [%]	% Passing 425µm BS Test Sieve
21	36	19	17	100



Legend, based on BS 5930:2015 Code of practice for site investigations

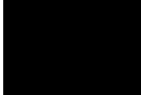
C	Clay	Plasticity	L	Low	Liquid Limit	below 35
M	Silt		I	Medium		35 to 50
			H	High		50 to 70
			V	Very high		70 to 90
			E	Extremely high		exceeding 90
	Organic		O	append to classification for organic material (eg CHO)		

Note: Moisture Content by BS 1377-2: 1990: Clause 3.2

Remarks:

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Signed:



Szczepan Bielatowicz
PL Deputy of Head of Geotechnical Section
for and on behalf of i2 Analytical Ltd

Page 1 of 1

Date Reported: 27/03/2020

GF 236.8



TEST CERTIFICATE

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Sampled By: GK

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

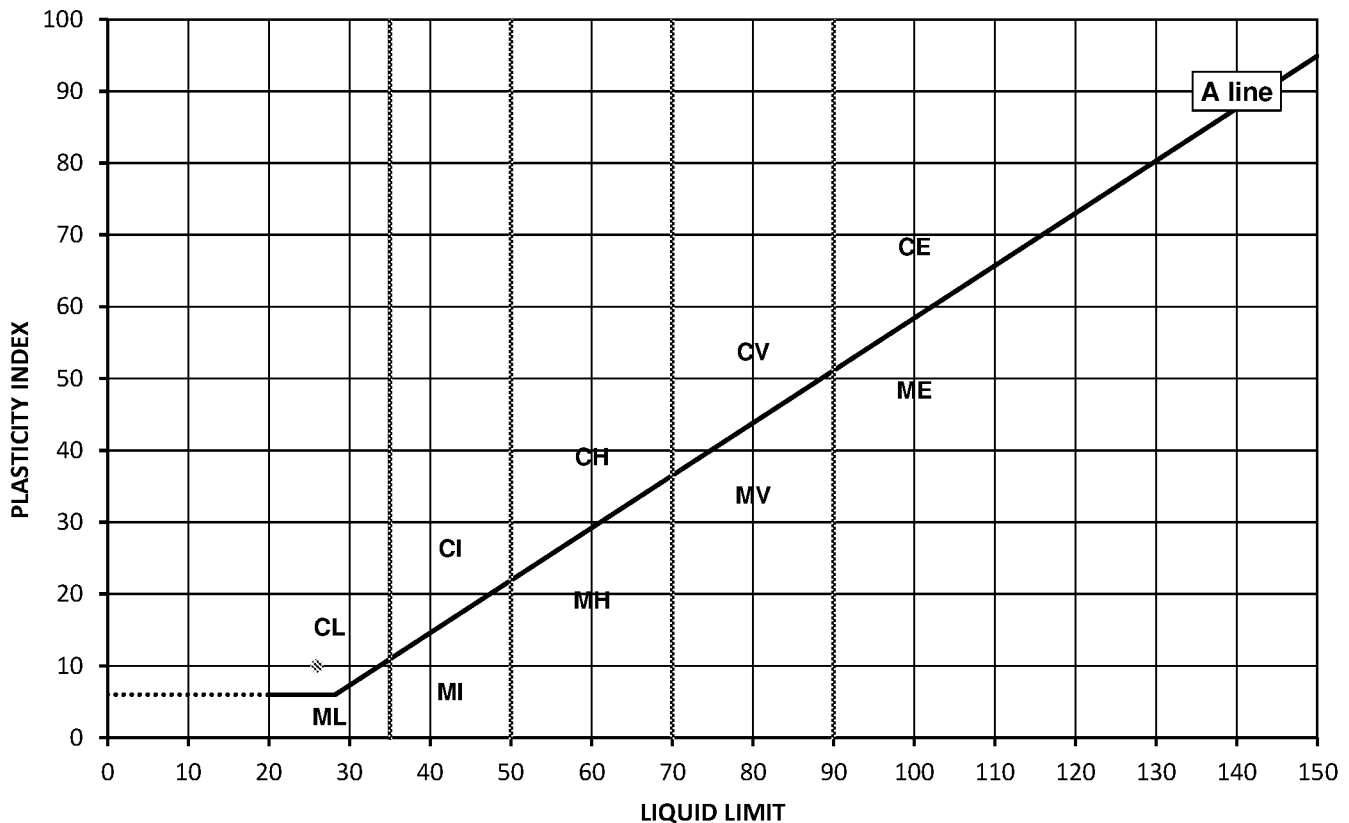
Test Results:

Laboratory Reference: 1472046
Hole No.: TP1
Sample Reference: Not Given
Soil Description: Brown slightly gravelly very sandy CLAY

Depth Top [m]: 0.70
Depth Base [m]: Not Given
Sample Type: D

Sample Preparation: Tested after >425um removed by hand

As Received Moisture Content [%]	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index [%]	% Passing 425µm BS Test Sieve
21	26	16	10	99



Legend, based on BS 5930:2015 Code of practice for site investigations

C	Clay	Plasticity	L	Low	Liquid Limit	below 35
M	Silt		I	Medium		35 to 50
			H	High		50 to 70
			V	Very high		70 to 90
			E	Extremely high		exceeding 90
	Organic		O	append to classification for organic material (eg CHO)		

Note: Moisture Content by BS 1377-2: 1990: Clause 3.2

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Client Reference: CCL03279
Job Number: 20-92552
Date Sampled: 12/03/2020
Date Received: 13/03/2020
Date Tested: 20/03/2020
Sampled By: GK

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

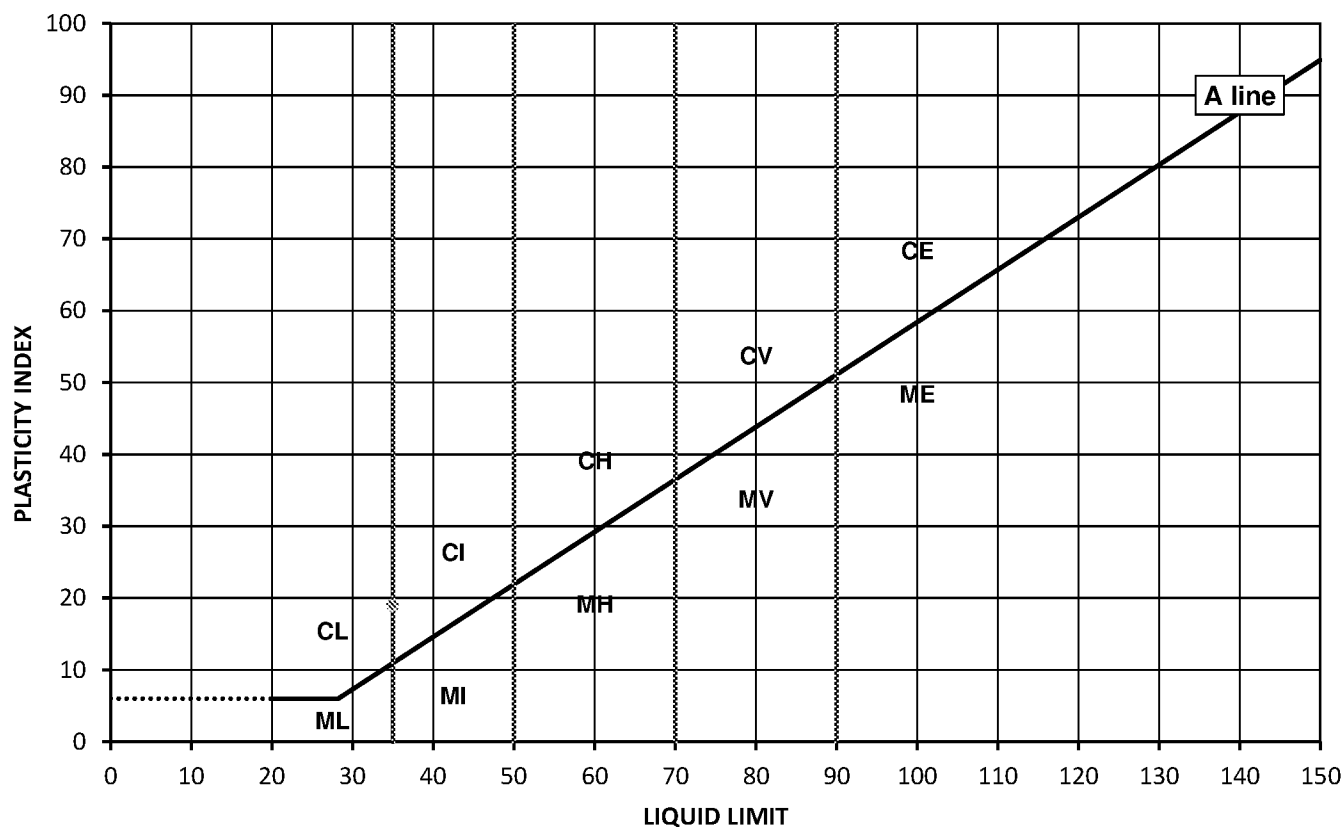
Test Results:

Laboratory Reference: 1472047
Hole No.: TP2
Sample Reference: Not Given
Soil Description: Orangish brown slightly gravelly sandy CLAY

Depth Top [m]: 1.40
Depth Base [m]: Not Given
Sample Type: D

Sample Preparation: Tested after >425um removed by hand

As Received Moisture Content [%]	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index [%]	% Passing 425µm BS Test Sieve
19	35	16	19	90



Legend, based on BS 5930:2015 Code of practice for site investigations

C	Clay	Plasticity	L	Low	Liquid Limit	below 35
M	Silt		I	Medium		35 to 50
			H	High		50 to 70
			V	Very high		70 to 90
			E	Extremely high		exceeding 90
	Organic		O	append to classification for organic material (eg CHO)		

Note: Moisture Content by BS 1377-2: 1990: Clause 3.2

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Warwickshire, CV47 9PU

Contact: George Kavanagh
Site Address: Horsemere Green Lane, Climping

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Client Reference: CCL03279
Job Number: 20-92552
Date Sampled: 12/03/2020
Date Received: 13/03/2020
Date Tested: 20/03/2020
Sampled By: GK

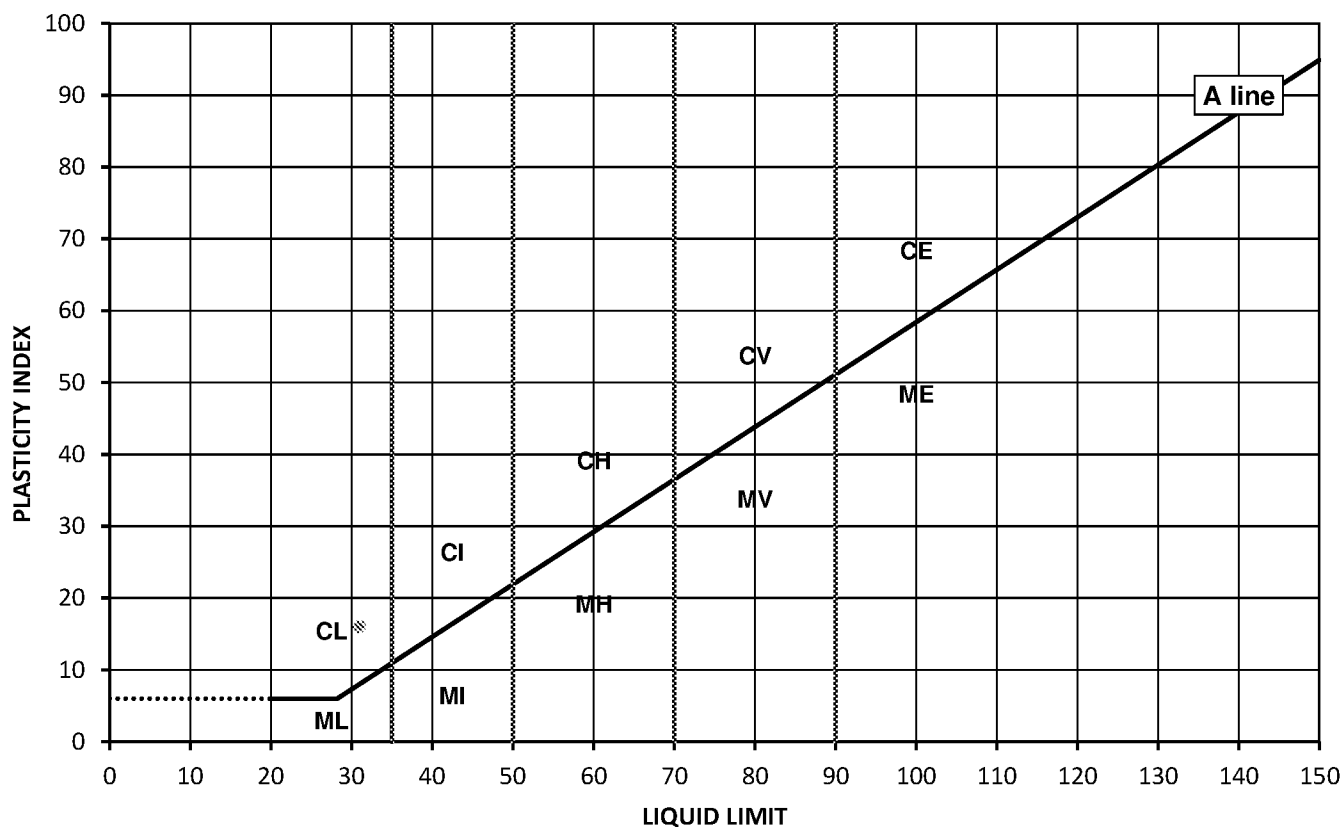
Test Results:

Laboratory Reference: 1472048
Hole No.: TP2
Sample Reference: Not Given
Soil Description: Yellowish brown slightly gravelly very sandy CLAY

Depth Top [m]: 1.60
Depth Base [m]: Not Given
Sample Type: D

Sample Preparation: Tested after washing to remove >425um

As Received Moisture Content [%]	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index [%]	% Passing 425µm BS Test Sieve
19	31	15	16	84



Legend, based on BS 5930:2015 Code of practice for site investigations

C	Clay	Plasticity	Liquid Limit
M	Silt	L	below 35
		I	35 to 50
		H	50 to 70
		V	70 to 90
		E	exceeding 90
	Organic	O	append to classification for organic material (eg CHO)

Note: Moisture Content by BS 1377-2: 1990: Clause 3.2

Remarks:

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PL Deputy of Head of Geotechnical Section
for and on behalf of i2 Analytical Ltd

Date Reported: 27/03/2020

GF 236.8



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Liquid and Plastic Limits

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB



Environmental Science

4041

Tested in Accordance with: BS 1377-2: 1990: Clause 4.3 and 5

Client: Crossfield Consulting Ltd
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Warwickshire, CV47 9PU

Contact: George Kavanagh
Site Address: Horsemere Green Lane, Climping

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Client Reference: CCL03279
Job Number: 20-92552
Date Sampled: 12/03/2020
Date Received: 13/03/2020
Date Tested: 20/03/2020
Sampled By: GK

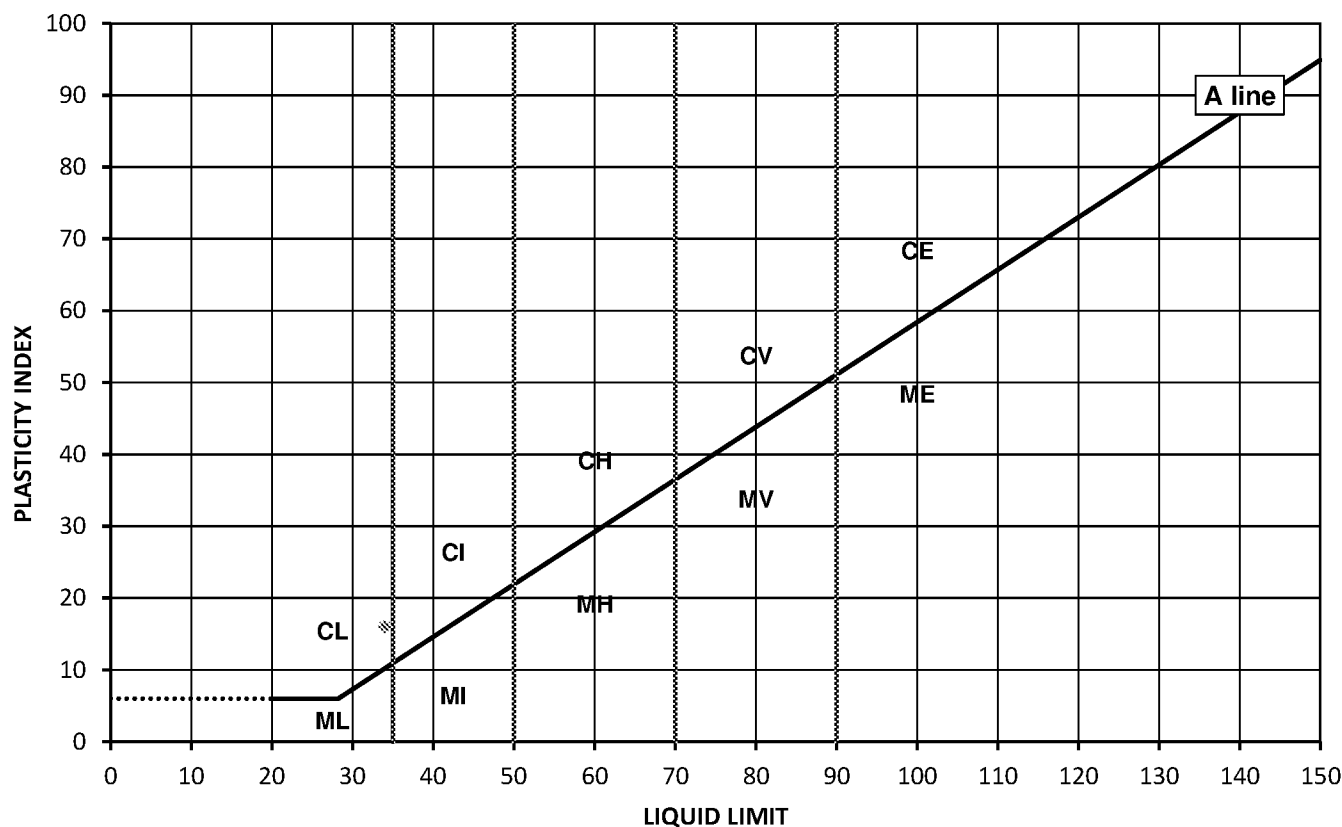
Test Results:

Laboratory Reference: 1472049
Hole No.: TP3
Sample Reference: Not Given
Soil Description: Orangish brown very sandy CLAY

Depth Top [m]: 0.90
Depth Base [m]: Not Given
Sample Type: D

Sample Preparation: Tested in natural condition

As Received Moisture Content [%]	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index [%]	% Passing 425µm BS Test Sieve
23	34	18	16	100



Legend, based on BS 5930:2015 Code of practice for site investigations

C	Clay	Plasticity	Liquid Limit
M	Silt	L	Low
		I	Medium
		H	High
		V	Very high
		E	Extremely high
			below 35
			35 to 50
			50 to 70
			70 to 90
			exceeding 90
	Organic	O	append to classification for organic material (eg CHO)

Note: Moisture Content by BS 1377-2: 1990: Clause 3.2

Remarks:

Opinions and interpretations expressed herein are outside of the scope of the UKAS Accreditation. This report may not be reproduced other than in full without the prior written approval of the issuing laboratory. The results included within the report are representative of the samples submitted for analysis.

Signed:

Szczepan Bielatowicz
PL Deputy of Head of Geotechnical Section
for and on behalf of i2 Analytical Ltd

Date Reported: 27/03/2020

GF 236.8



TEST CERTIFICATE

Liquid and Plastic Limits

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB



Environmental Science

4041

Tested in Accordance with: BS 1377-2: 1990: Clause 4.3 and 5

Client: Crossfield Consulting Ltd
Client Address: The Granary, White Hall Farm,
Leamington Road, Long Itchington,
Warwickshire, CV47 9PU

Contact: George Kavanagh
Site Address: Horsemere Green Lane, Climping

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Client Reference: CCL03279
Job Number: 20-92552
Date Sampled: 12/03/2020
Date Received: 13/03/2020
Date Tested: 20/03/2020
Sampled By: GK

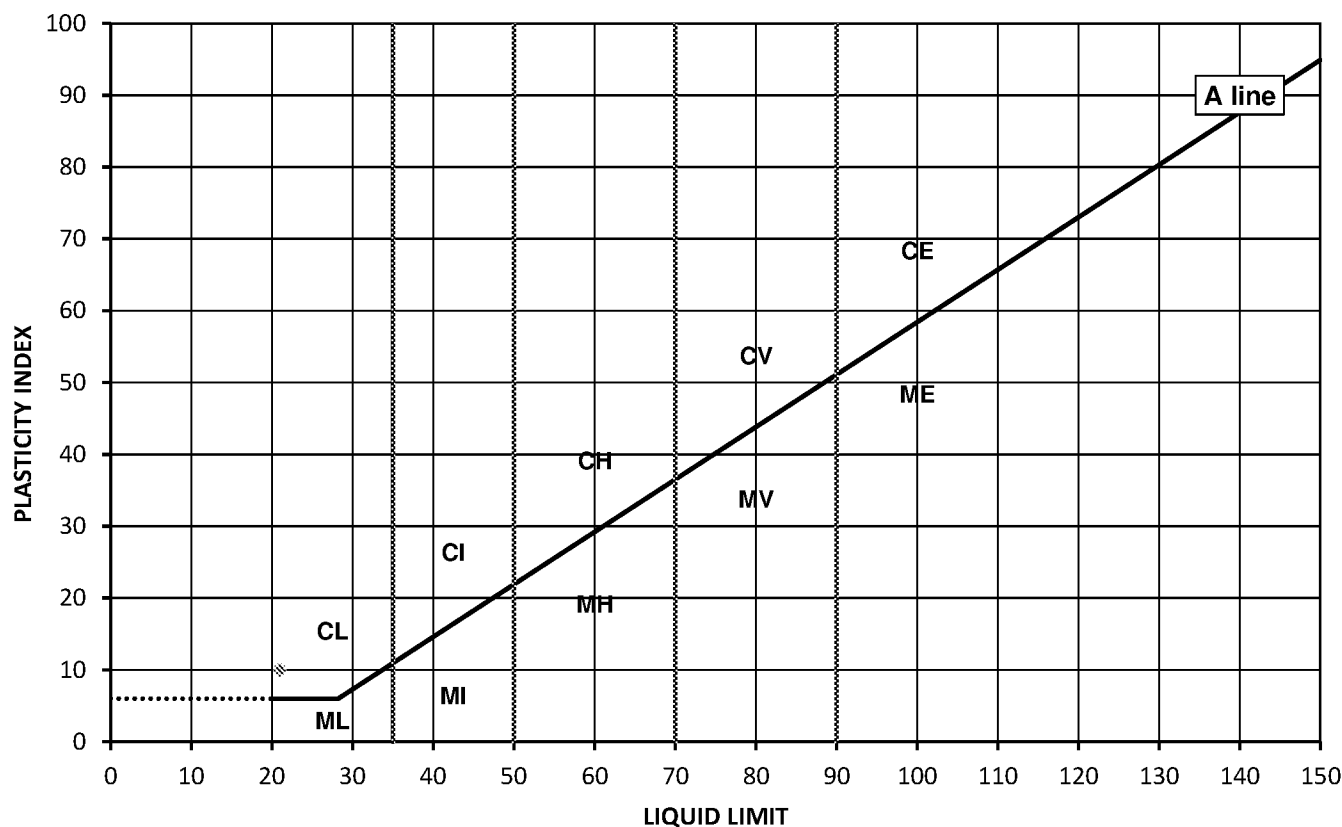
Test Results:

Laboratory Reference: 1472050
Hole No.: TP4
Sample Reference: Not Given
Soil Description: Orangish brown slightly clayey SAND with fragments of chalk

Depth Top [m]: 1.70
Depth Base [m]: Not Given
Sample Type: D

Sample Preparation: Tested after washing to remove >425um

As Received Moisture Content [%]	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index [%]	% Passing 425µm BS Test Sieve
14	21	11	10	89



Legend, based on BS 5930:2015 Code of practice for site investigations

C	Clay	Plasticity	Liquid Limit
M	Silt	L	Low
		I	Medium
		H	High
		V	Very high
		E	Extremely high
			below 35
			35 to 50
			50 to 70
			70 to 90
			exceeding 90
	Organic	O	append to classification for organic material (eg CHO)

Note: Moisture Content by BS 1377-2: 1990: Clause 3.2

Remarks:

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Signature

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 Warwickshire, CV47 9PU
 Contact: George Kavanagh
 Site Address: Horsemere Green Lane, Climping

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

SUMMARY REPORT

Summary of Classification Test Results

Tested in Accordance with:

MC by BS 1377-2: 1990: Clause 3.2; WC by BS EN 17892-1: 2014; Atterberg
 by BS 1377-2: 1990: Clause 4.3, Clause 4.4 and 5; PD by BS 1377-2: 1990:
 Clause 8.2

i2 Analytical Ltd
 Unit 8 Harrowden Road
 Brackmills Industrial Estate
 Northampton NN4 7EB



Environmental Science

Client Reference: CCL03279
 Job Number: 20-92552
 Date Sampled: 12/03/2020
 Date Received: 13/03/2020
 Date Tested: 20/03/2020
 Sampled By: GK

Test results

Laboratory Reference	Hole No.	Sample				Description	Remarks	MC	WC	Atterberg				Density			Total Porosity#		
		Reference	Depth Top m	Depth Base m	Type					% Passing 425um	LL	PL	PI	bulk Mg/m3	dry Mg/m3	PD Mg/m3			
1472045	SSK1	Not Given	0.70	Not Given	D	Orangish brown sandy CLAY	Atterberg 4 Point	21		100	36	19	17						
1472046	TP1	Not Given	0.70	Not Given	D	Brown slightly gravelly very sandy CLAY	Atterberg 4 Point	21		99	26	16	10						
1472047	TP2	Not Given	1.40	Not Given	D	Orangish brown slightly gravelly sandy CLAY	Atterberg 4 Point	19		90	35	16	19						
1472048	TP2	Not Given	1.60	Not Given	D	Yellowish brown slightly gravelly very sandy CLAY	Atterberg 4 Point	19		84	31	15	16						
1472049	TP3	Not Given	0.90	Not Given	D	Orangish brown very sandy CLAY	Atterberg 4 Point	23		100	34	18	16						
1472050	TP4	Not Given	1.70	Not Given	D	Orangish brown slightly gravelly slightly clayey SAND with fragments of chalk	Atterberg 4 Point	14		89	21	11	10						

Note: # Non accredited; NP - Non plastic

Comments:

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Signed:

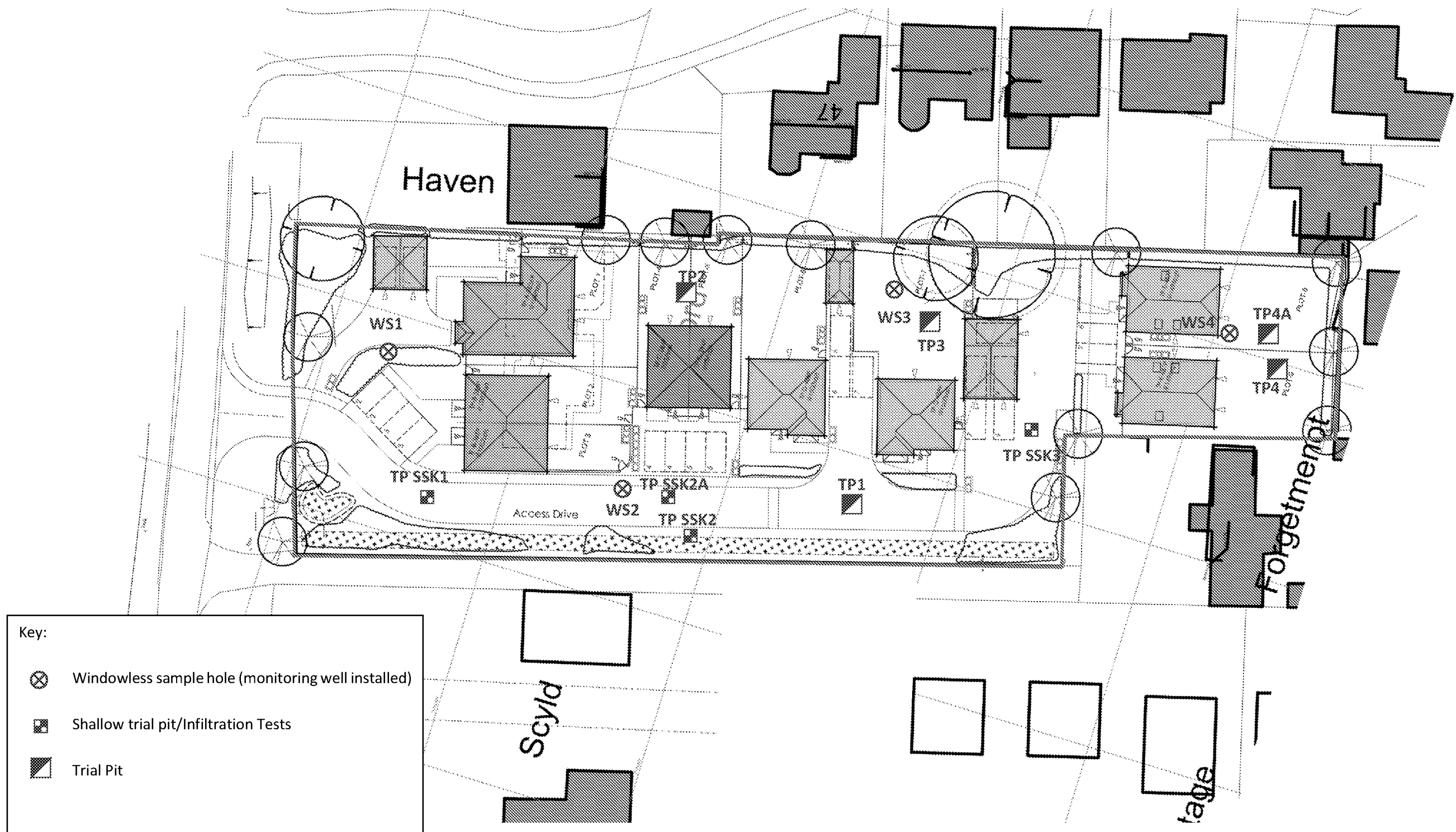
Szczepan Bielatowicz
 PL Deputy of Head of Geotechnical Section
 for and on behalf of i2 Analytical Ltd

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Date Reported: 27/03/2020

GF 234.10

FIGURE I-1



EXPLORATORY HOLE LOCATION PLAN

Scale 1:500

Reproduced from the 1:500 scale Site Layout by Carlton Design Partnership dated 03/12/2019. Drg No. 190725/SL-01

APPENDIX II

APPENDIX II – BASIS OF GEOTECHNICAL ASSESSMENT FOR FOUNDATIONS

Geotechnical Design Category of Structure: 2

Design Working Life: Standard building structure (50 years)

Design Approach: 1

1. Geotechnical Model

On the basis of the ground investigation data, the following model of the ground conditions is considered appropriate for foundation design purposes:

Depth (m)	General Description of Strata (and classification)	Parameter	Characteristic Value & Units	Remarks
0.0 to 0.30	Topsoil/Made Ground			
0.30 to 3.40	Firm, medium strength, sandy clay (River Terrace Deposits)	γ c_u ϕ_u Modified PI	19 kN/m ³ 55 kN/m ² 0° 15 %	Estimated from site data Based on hand vane tests Low volume-change potential NHBC (2020)
3.40 to 5.00	Structureless chalk comprising gravelly clay (Undifferentiated Upper Cretaceous chalk)	γ	20 kN/m ³	Estimated from site data

Characteristic Depth to Groundwater (or groundwater level): 1.5 m

Reference should be made to Section 7-8 of the report for an assessment of overall ground stability, seismic risk, combined failure of the structure/ground, excessive settlements and potential soil-volume changes (including heave).

2. Imposed Actions from Proposed Structure

The following are generic values, based on the development proposed, as described in the report. In compliance with BS EN 1997-1:2004, final designs should include consideration of the calculated imposed loads.

Imposed Load on Foundations: 100 kN/m run (maximum anticipated load for two-storey building)

Serviceability Limit Values (associated with above action)

Maximum Total Settlement: 25 mm

Maximum Deflection (angular distortion value): 1/1000

3. Geometry of Proposed Foundations

Footing Width (assumed for assessment): Up to 3.0 m maximum

Footing Depth (assumed for assessment): Minimum 0.9 m

4. Shallow Foundations

In assessing the allowable bearing pressures below structural foundations, a number of methods are used, as outlined below.

4.1. Fine Grained Soils

Where the foundations are to be placed on these soils, the ultimate bearing capacity has been estimated using the method proposed by Terzaghi (1943) using total stress parameters. Partial factors have been considered in this assessment, in accordance with BS EN 1997-1:2004 and the relevant National Annex.

The recommended Net Allowable Bearing Pressure is based on a value less than 0.3 times the ultimate bearing capacity and, therefore, the serviceability limit state will be satisfied where imposed serviceability loading is not greater than this value.

4.2. Coarse Grained Soils

Where foundations are to be placed on these soils, the allowable bearing pressure is estimated using the method of Terzaghi and Peck, as modified by Meyerhof (1965). Using this method, total settlements are assumed to be not greater than 25 mm (and a detailed serviceability limit calculation is not necessary).