McPartland Planning Ltd.

St. Stephens Green Farm, Chiswell Green Lane, St. Albans, Hertfordshire

Minerals Resource Assessment

1922316 R01 (00)

APRIL 2022

RSK GENERAL NOTES

Project No.: 1922316 R01 (00)

Title: Minerals Resource Assessment: St. Stephens Green Farm, Chiswell Green Lane, St. Albans, Hertfordshire

Client: McPartland Planning Ltd., 10 Orient Close, St. Albans, Hertfordshire, AL1 1AJ

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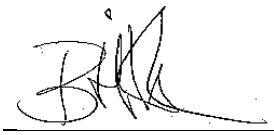
Signature		Signature	

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Rev 00	22/04/2022	First issue

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1 INTRODUCTION

1.1 Commissioning

RSK Environment Limited (RSK) were commissioned by McPartland Planning Ltd. (The Client) to carry out a Minerals Resource Assessment of the land at St. Stephens Green Farm, Chiswell Green Lane, St. Albans, Herts. The project was carried out to an agreed brief as set out in RSK's proposal (1922316 T01 (00), dated 1st March 2022).

RSK have carried out a site investigation to assess the potential workable mineral deposits beneath the site and produce the findings in this Minerals Resource Assessment report.

This report is subject to the RSK service constraints given in **Appendix A** and limitations that may be described through this document.

1.2 Background

1.2.1 Hertfordshire Minerals Local Plan

The National Planning Policy Framework (NPPF) sets out requirements for local planning authorities to ensure the safeguarding of mineral resources and promote the sustainable use of minerals, so that known locations of 'locally and nationally important minerals' do not get sterilised by non-mineral development. To manage minerals within the county, Hertfordshire County Council (ECC) has developed and adopted the Minerals Local Plan 2002-2016 (MLP), which includes the Strategic Policies. The site falls entirely within the 'Sand and Gravel Belt' as identified in the Minerals Local Plan 2002-2016. The Sand and Gravel Belt spans across the southern part of the county and contains the most concentrated deposits of sand and gravel in Hertfordshire.

Adopted Minerals Local Plan Policy 5 (Mineral Sterilisation) sets out that where other development is proposed, prior extraction of mineral resources should be encouraged. Whilst the policy does not create a presumption that the mineral resource beneath the site will ever be worked, it acknowledges the possibility that the known location of the mineral resource may be needlessly sterilised by non-mineral development (should minerals planning policy not be implemented).

In the context of the above, the Minerals Planning Authority at Hertfordshire County Council objected to the planning application and set out that "*the County Council will object to any development proposal within, or adjacent to areas of potential mineral resource, which would prevent, or prejudice potential future mineral extraction unless is clearly demonstrated that:*

i. The land affected does not contain potential workable mineral deposits; and/or

ii. There is an overriding need for the development; and

iii. The mineral cannot practically be extracted in advance."

1.2.2 Regulatory correspondence

A planning objection from the Minerals Planning Authority (Ref: SPU/BQMW, dated 17th December 2021) has been received. The objection specifies the requirement for a site investigation and evaluation by way of a Minerals Resource Assessment in order to assess the potential for workable mineral deposits at the site and the possibility of mineral sterilisation.

1.3 Key objectives

The objective of the work is:

- identification of all contextual information at the site to inform constraints that may impact on mineral extraction;
- to identify the nature and extent of the existing mineral resource beneath the site through an appropriately detailed and policy compliant intrusive site investigation; and
- consideration to the practicality and economic viability of prior mineral extraction and restoration options at the site.

1.4 Scope of works

The scope of this assessment has been developed in accordance with relevant British Standards and authoritative technical guidance as referenced throughout the report.

The scope of the intrusive investigation has been designed in accordance with the recommendations contained within BS5930:2015 Code of Practice for Ground Investigations (BSi, 2016), which maintains compliance with BS EN 1997-1 and 1997-2 and their related standards. It has also been developed in accordance with the policy framework set out within the Hertfordshire Mineral Local Plan 2002-2016.

In order to maintain compliance with the above, the agreed scope of works for the assessment comprised the following:

1.4.1 Desk based assessment

- review of relevant existing reports pertaining to the site and adjacent areas including a Desk Study and Preliminary Risk Assessment undertaken by Structural Soils Ltd. in June 2021;
- assessment of local geology through published geological records, hydrogeology and surface water setting; and
- consideration of pertinent contextual information (such as nature conservation designations (ecology), heritage designations, landscape character, proximity to local communities, land stability, highways infrastructure).

1.4.2 Intrusive site investigation

- design and implementation of a detailed intrusive site investigation to assess the underlying mineral resource comprising the drilling of five cable percussive boreholes

through the full extent of the deposit. Boreholes were positioned spatially in compliance with the policy requirements of HCC Minerals and Waste; and

- a comprehensive programme of material sampling and laboratory testing to enable the classification of materials representative of the full vertical extent of the resource.

1.4.3 Mineral resource quantification, viability of prior extraction assessment and preliminary minerals management

- discussion regarding mineral extent (quantity) and quality with respect to aggregate specifications required for construction;
- consideration to the practicality of prior extraction of mineral resource including its potential value, current marketplace and applicability of prior extraction with respect to the proposed residential redevelopment of the site including restoration options; and
- opportunities for the opportunistic extraction as part of the redevelopment of the site (i.e. to ensure maximum possible recovery of minerals from construction and excavation wastes to ensure the sustainable use of site won mineral).

1.5 Existing reports

The following reports detailing previous works at the site were made available for review:

- Structural Soils Ltd., Desk Study and Preliminary Risk Assessment – North Chiswell Green, 563403-1(00), June 2021.
- Cherryfield Ecology Ltd., Ecology Appraisal for the site of: Chiswell Green Lane and east of The Croft, Chiswell Green, AL2 3AJ, June 2021

Pertinent information from these assessments has been included within this report.

2 SITE DETAILS

2.1 Site location and description

The Site is located to the north of Chiswell Green Lane in Chiswell Green, approximately 2.8 km south-west of St. Albans. The Site covers an area of approximately 14.5 Ha and is centred on National Grid Reference 512830, 204670 and comprises a polo field with associated paddocks.

A site location plan is provided on **Figure 1** whilst the site boundary and current site layout are shown on **Figure 2**.

The site's immediate surrounding land uses are described below, in **Table 1**.

Table 1 Surrounding land uses

North	To the north of the site is woodland and well maintained fields, possibly paddocks, associated with a private residence.
East	Immediately to the east are further paddocks beyond which is a residential area comprising low-rise housing.
South	Mixed use, including a livery yard and riding school, a used car dealership and ground belonging to The Royal Entomological Society.
West	A small area of woodland beyond which are paddocks associated with a private residence.

2.1.1 Historical/current land uses of site and surrounding area of relevance to this assessment

The first historical records available for the site (dated 1880) show the site was separated into four agricultural fields. The site changes little up to the present day, with a small forested area appearing in the centre of the site in the 1920s and stable buildings being constructed around 1999 in the east of the site. The large building on the southern side of the site was constructed sometime between 2018 and 2021.

The current site surroundings are characterised by largely open space, with residential use to the east and light commercial use in the south. Historically, there were chalk pits and gravel pits in the area in the late 19th and early 20th centuries. The village of Chiswell Green expanded significantly from the 1930s to the 1970s with the addition of residential properties.

2.2 Ecological context

The preliminary ecological appraisal referenced within **Section 1.5** confirmed the site to be of limited ecological interest with the proposed development presenting a low level impact. Areas of interest on-site are restricted to the hedgerows on site and the internal framework of buildings which have suitable nesting habitat to support breeding birds. The hedgerows on site have the potential to support amphibians and reptiles but it is noted the majority of the site is undesirable to amphibians and reptiles as it is heavily grazed and cut.

2.3 Geological context

The published geological records for the area indicate that the site is generally underlain by the Kesgrave Catchment Subgroup (Sand and Gravel) over bedrock of the Lewes Nodular Chalk Formation and Seaford Chalk Formation (undifferentiated). The superficial deposits are, however, shown as absent in the north-west of the site.

The site is not located within a Mineral Consultation Area or Preferred Area, according to the Hertfordshire Country Council Minerals Local Plan Review 2002 – 2016 or Mineral Consultation Areas in Hertfordshire Supplementary Planning Document, but is located within a Mineral Safeguarding Area in the emerging minerals plan, which is due for adoption in 2022.

A BGS (formerly institute of geological sciences) borehole (TL10SW22) advanced approximately 30m south-west of the site as part of the minerals resource assessment drilling programme of the 1960's/1970's, recorded the following geological successions:

- 'soil' to 0.4 mbgl (assumed topsoil);
- Brown sandy clay to 3.1 mbgl;
- ''Very clayey' gravel to 6.1 mbgl. The gravel is described as mainly coarse with some fine, subangular to well-rounded flint with some quartz and quartzite. Sand is mainly fine to medium with some coarse;
- Brown and black mottled stiff clay with angular flint cobbles to 6.6 mbgl;
- Brown pebbly sandy clay with rounded flint pebbles to 6.7 mbgl;
- Brown and black mottled stiff clay with angular flint cobbles to 8.0 mbgl;
- Soft white chalk proven to 8.20 mbgl.

No groundwater was encountered.

The mean particle size distribution (gradings analysis) within the granular portion of the soil profile was assessed as:

- **Gravel** = 40%
- **Sand** = 32%
- **Fines** = 28%

In summary, the borehole recorded some 3.0m thickness of potential aggregate, however, laboratory testing recorded a high fines content, suggesting the resource is unlikely to be economically viable for extraction.

A copy of the historical borehole record is included in **Appendix C.**

2.4 Hydrogeological context

Based upon the published geological mapping for the area, the hydrogeology beneath the site is understood to comprise an unconfined shallow aquifer associated with the superficial deposits. The aquifer is classified by the Environment Agency as a secondary 'A' aquifer with respect to groundwater sensitivity. The Chalk bedrock is classified as a Principal Aquifer.

Given the unconfined nature of the shallow aquifer beneath the site and the anticipated permeability of the Kesgrave Catchment Subgroup, the groundwater in the local area is expected to be in hydraulic continuity. The BGS borehole advanced to 8 mbgl did not encounter groundwater.

Information available on the MAGIC (Defra) website indicates that the site lies within a Source Protection Zone (SPZ) II and III. There are two (2 no.) ground water abstractions with 1km of the site, both records relate to abstraction 158m south-west of the site, abstracting water for spray irrigation, horticulture and nurseries.

2.5 Flood risk

A flood risk assessment has been completed for the site (Floodsmart report reference 75188R1, dated July 2021). The report concluded that whilst the site was at a low risk of fluvial flooding, very low risk of flooding from rivers and seas and negligible risk of flooding from groundwater, it was at a very low to high risk from pluvial /surface water flooding. Given the identified risk from pluvial/surface water flooding (where flood depths could be up to 0.30m in depth) mitigation measures were recommended to ensure that finished floor levels should be set above this level.

2.6 Transport Infrastructure/ public rights of way

The main road link in the vicinity of the site comprises Chiswell Green Lane to the south and The Croft to the east. Chiswell Green Lane provides vehicular access to Chiswell Green village centre to the east. The Croft does not currently provide vehicular access.

The relevant major transport route that serves the wider regional area comprises the A414, located approximately 0.9km north of Chiswell Green. The road can be reached from the site via the B4630 to the east which runs through Chiswell Green. The A414 route runs east to west through Hertfordshire and Essex from Hemel Hempstead, Herts (and the M1) to Maldon, Essex. In addition to the A414, North Orbital Road runs north to south approximately 0.5 km to the east of the site. Accessed from the site via Tippendell Lane in Chiswell Green village centre, North Orbital Road provides a link to the A414 to the north and the M25 to the south.

The road network immediately around the site is characterised by minor routes that connect the nearby residential estates, businesses and farms.

Railway infrastructure in the area comprises the Abbey Line located approximately 2km to the north-east, running from Watford to St. Albans Abbey via passenger stations. The Midland Main Line is the major railway line in the area, running from London to Nottingham and Sheffield, the nearest station is St. Albans city, approximately 3.5 km to the north-east. No rail freight depots, terminals or infrastructure have been identified in proximity to the site.

There are no known public rights of way within the site boundaries.

3 SITE INVESTIGATION STRATEGY & METHODOLOGY

3.1 Introduction

Structural Soils Ltd. initially carried out a Desk Study and Preliminary Risk Assessment in 2021. The initial assessment focussed on providing an environmental and geotechnical appraisal of the site.

The intrusive investigation presented here was specifically designed to investigate the underlying mineral resource. The specific objectives were as follows:

- to establish the ground conditions underlying the site including the extent and thickness of overburden, sand and gravel (resource), and any interburden; and
- to assess characteristic properties of soils through a programme of soil sampling and testing.

3.2 Selection of investigation methods

The techniques adopted for the supplementary investigation were chosen with consideration to the objectives and site constraints, which are described in further detail below.

Cable percussive drilling was adopted for the investigation based on the targeted drill depths, the opportunity to collect bulk disturbed samples at regular intervals and to make groundwater observations.

Prior to conducting intrusive works, utility service plans were obtained and buried service clearance undertaken in line with RSK's health and safety procedures.

3.3 Investigation strategy

The ground investigation was carried out using intrusive ground investigation techniques in general accordance with the recommendations of BS5930: 2015 Code of practice for ground investigations, which maintains compliance with BS EN 1997-1 and 1997-2 and their related standards.

The proposed scope of works and the proposed exploratory hole location plan detailing the spatial distancing of exploratory locations was issued to Hertfordshire District Council for their approval prior to the commencement of investigation. The positioning of drilling investigation locations included the application of a 100 m buffer zone from the front elevation of neighbouring residential properties along the eastern flank and south-eastern corner of the site. A 30m buffer was adopted along the remaining boundaries to take in to account the anticipated maximum temporary slope angle of 1v:3H for quarry faces based on an anticipated bedrock depth of approximately 10 m below existing ground level. Introduction of the buffers reduces the area of potential extractable resource significantly to approximately 8 Ha. The consequent limitation to site exploration reflects the constraints applicable to any potential prior mineral resource extraction operation, whereby any potential resource located within the buffer zone would be inaccessible due

to the sensitivity of adjacent residential land use. It is understood from correspondence with the client that the proposed scope of works was subsequently approved by HCC.

Details of the supplementary investigation location rationale are presented in **Table 2**.

Five cable percussive boreholes were drilled to a maximum depth of 9.50 mbgl.

Table 2 Exploratory hole location rationale

Investigation type	Number	Designation	Monitoring well installation	Rationale examples below
Boreholes by cable percussive methods	5	BH01 to BH05	None	To prove the extent and quality of the mineral resource beneath the site and to obtain bulk soil samples for geotechnical/classification testing purposes.

3.3.1 Implementation of investigation works

The exploratory holes were logged by a suitably qualified engineer in accordance with the standards defined within BS 5930:2015 (which incorporates the requirements of BS EN ISO 14688-1, 14688-2 and 14689-1).

The soil sampling and analysis strategy was specifically designed to characterise the entire vertical succession of the ground profile encountered in addition to providing opportunity to collect representative soil samples for future geotechnical testing purposes.

In order to maximise sample recovery and reduce the loss of fines during the sampling process, borehole arisings were retained in sample buckets to allow fine sediment to fall out of participle suspension prior to decanting the material into sample containers.

3.3.2 Groundwater monitoring

Depths to groundwater were recorded using an electronic dip meter during the drilling and at completion of the boreholes.

3.4 Laboratory testing

Laboratory testing was undertaken by a UKAS accredited laboratory with ISO17025 and MCERTS accredited test methods, as shown in the laboratory test certificates appended.

3.4.1 Geotechnical analysis of soils

Bulk soil samples were retrieved for geotechnical classification testing with the depth and nature of samples detailed within the exploratory hole records.

Where appropriate, testing was undertaken in accordance with BS 1377:1990 Method of Tests for Soils for Civil Engineering Purposes or, where superseded, by the relevant part of BS EN ISO 17892:2014 Geotechnical investigation and testing - Laboratory Testing of Soil.

The programme of geotechnical tests undertaken on samples obtained from the intrusive investigation is presented in **Table 3**. The results and UKAS accreditation of testing methods are shown in **Appendix E.**

Table 3 Summary of geotechnical testing undertaken

Strata	Tests undertaken	No. of tests
Kesgrave Catchment Subgroup	Particle Size Distribution sieving method to BS EN ISO 17892-4 2016 Clause 5.2	18

4 SITE INVESTIGATION FACTUAL FINDINGS

The results of the intrusive site investigation and the subsequent geotechnical laboratory analysis on samples, are detailed in the sections below.

4.1 Ground conditions encountered

The descriptions of the strata encountered, sample lists, field observations of soil and groundwater and in-situ testing, are included on the exploratory hole records presented in **Appendix D.**

The exploratory holes revealed that the site is underlain by topsoil 'overburden' overlying a variable sequence of predominantly granular deposits of the Kesgrave Catchment Subgroup. The Kesgrave Catchment Subgroup was variable in thickness and locally had an overburden of clay. The clay content within the Kesgrave Catchment Sub Group increased towards the north west of the site, where the stratum is predicted to feather out. The surface of the chalk bedrock was proven towards the base of all borehole locations across the site.

The ground conditions reported indicate geological conditions similar to those initially recorded by historical IMAU (BGS) mineral assessment borehole TL10SW22 (advanced to the south of the site in 1972).

For the purpose of discussion, the ground conditions encountered during the supplementary fieldworks are summarised below in **Table 4,** whilst the strata are discussed in more detail within the following subsections. Whilst the borehole data provided by TL10SW22 has been considered, it is omitted from the detailed resource assessment given that it lies outside the site boundary.

Table 4 General succession of strata encountered

Stratum		Exploratory holes encountered	Depth to top of stratum m bgl (mAOD)	Proven thickness (m)
Topsoil (overburden)		BH01 to BH05	Ground level	0.50 to 0.60
Kesgrave Catchment Subgroup	Cohesive (overburden)	BH05	0.50 (100.09)	1.50
	Granular (resource)	BH01 to BH05	0.50 to 2.00 (98.59 to 100.09)	1.00 to 4.00
	Cohesive (interburden)	BH01 and BH04	2.00 to 4.30 (97.29 to 98.59)	1.40 to 1.50
Lewes Nodular Chalk Formation And Seaford Chalk Formation (undifferentiated)		BH01 to BH05	3.50 to 8.50 (92.09 to 97.09)	Not proven

4.1.1 Topsoil (overburden)

A mantle of topsoil was encountered to outcrop beneath the site. The material was described as a brown or dark brown with varying constituents of clay, sand and gravel, extending to a maximum depth of 0.60 m.

4.1.2 Kesgrave Catchment Subgroup

4.1.2.1 Cohesive Deposits (Overburden)

Beneath the topsoil in BH05, a discontinuous 1.50m thick cohesive unit was encountered. Described as a firm brown mottled orangish brown and dark brown slightly gravelly sandy clay. The gravel was recorded as subangular to rounded fine and medium flint.

A summary of the in-situ and laboratory test results recorded in this stratum are presented in **Table 5.**

Table 5 Summary of laboratory test results for Kesgrave Catchment Subgroup Cohesive Deposits (Overburden)

Soil parameters	Range		Reference
	Grainsize	Sample proportion (%)	
Grading (%)	Cobbles	0	Appendix E
	Gravel	17	
	Sand	17	
	Silt/Clay	66	

4.1.2.2 Granular Deposits (mineral resource)

Sub cropping beneath either the Cohesive Deposits (BH05) or directly beneath the topsoil (BH01 to BH04) were granular deposits. The material was found to be variable in composition and in thickness. Ranging in thickness from 1.00m to 4.00m, the soils were encountered as an interbedded sequences of sandy gravel and gravelly sand with a variable proportion of a fine secondary fraction. These soils may be classified as the 'mineral resource' for the purposes of the assessment. The lithology of the gravel was predominantly flint.

A summary of the in-situ and laboratory test results recorded in this stratum are presented in **Table 6.**

Table 6 Summary of in-situ and laboratory test results for Kesgrave Catchment Subgroup Granular Deposits (Resource)

Soil parameters	Range		Reference
	Grainsize	Sample proportion (%)	
Grading (%)	Cobbles	0 to 13	Appendix G
	Gravel	2 to 68	

Soil parameters	Range		Reference
	Grainsize	Sample proportion (%)	
	Sand	20 to 83	
	Silt/Clay	4 to 31	

4.1.2.3 *Cohesive Deposits (Interburden)*

A horizon of cohesive soil was encountered at the base of the granular deposits within two of the borehole positions (BH01 and BH04), identified between the depths of 2.50 m and 6.00 mbgl and ranging in thickness between 1.00 m and 2.50 m. The material was typically described as firm to stiff brown slightly sandy (slightly) gravelly clay. The lithology of the gravel comprised flint and chalk.

A summary of the in-situ and laboratory test results recorded in this stratum are presented in **Table 7.**

Table 7 Summary of laboratory test results for Kesgrave Catchment Subgroup Cohesive Deposits (Basal interburden)

Soil parameters	Range		Reference
	Grainsize	Sample proportion (%)	
Grading (%)	Cobbles	0.0 to 13	Appendix G
	Gravel	15 to 44	
	Sand	9 to 35	
	Silt/Clay	41 to 44	

4.1.2.4 *Chalk*

The upper weathered surface of the Lewes Nodular Chalk was encountered beneath the Kesgrave Catchment Sub Group at depths ranging between 3.50m and 8.50m in boreholes BH01 and BH05, respectively.

4.2 Groundwater

4.2.1 Groundwater encountered during intrusive works

Groundwater was not encountered during the progression of the intrusive investigation.

4.3 Geotechnical laboratory results

The results of the grading analysis completed on bulk granular samples is discussed in the sections below and presented in **Appendix E.**

5 MINERALS RESOURCE QUANTIFICATION

5.1 Minerals resource quantification methodology

In order to quantify the size and quality of the potential mineral resource, RSK have assessed the data obtained from the ground investigation.

To initially establish whether the site may contain potentially exploitable materials of economic interest, the following arbitrary physical criteria have been adopted, as advised by the Institute of Geological Sciences Mineral Assessment Reporting series:

- The deposit should average at least 1 m in thickness;
- The ratio of overburden/interburden to sand and gravel should be no more than 3:1;
- The proportion of fines should ideally be below 25% and should not exceed 40%; and
- The deposit should lie within 25 m of the surface.

It should be noted however, that the minerals industry often adopts their own set of criteria for assessing the economic viability of a mineral resource, which are generally considered to be more stringent than those adopted within this assessment.

5.2 Assessment of extent and quality of potential mineral resources

The exploratory hole locations formed during RSK's site investigation are presented on **Figure 2.**

At each location, boreholes were advanced through the full thickness of the Kesgrave Catchment Subgroup (potential mineral resource), terminating within the underlying solid geology (Lewes Nodular Chalk Formation and Seaford Chalk Formation (undifferentiated). Representative soil samples were obtained from the full vertical succession of the stratum sequence for subsequent laboratory analysis.

The exploratory holes revealed that the site is underlain by topsoil 'overburden' overlying a variable sequence of predominantly granular deposits of the Kesgrave Catchment Subgroup, at the base of which is a clay with a secondary granular constituent. The Kesgrave Catchment Subgroup was variable in thickness and locally had an overburden of clay. The stratum graded into a predominately cohesive soil towards the north west of the site, before feathering out. The surface of the chalk bedrock was proven towards the base of all borehole locations across the site.

5.2.1 Gradings analysis

Representative soil samples were retrieved from the Kesgrave Catchment Subgroup during the investigation. 18 No. samples were subsequently scheduled for gradings analysis (particle size distribution (PSD) testing), to ascertain the proportions of sand, gravel and fines (silt and clay) within the ground profile.

A summary of the results is presented in **Table 8** overleaf.

Table 8 Summary of Particle Size Distribution Results

Location	Depth (m bgl)	Particle Size Distribution (%)			
		Coarse			Fine
		Cobbles	Gravel	Sand	Silt/clay
BH1	*0.50*	0	22	50	28
BH1	*2.00*	9	15	35	41
BH1	*3.00*	0	44	12	44
BH2	*1.20*	0	11	65	24
BH2	*3.00*	5	48	32	15
BH2	*4.50*	13	36	20	31
BH3	*1.20*	0	56	30	14
BH3	*2.00*	0	44	44	12
BH3	*3.00*	0	53	36	11
BH4	*1.20*	0	44	42	14
BH4	*2.50*	3	68	25	4
BH4	*4.00*	13	34	9	44
BH5	*0.50*	0	17	17	66
BH5	*2.40*	0	2	83	15
BH5	*3.00*	0	45	51	4
BH5	*4.00*	0	47	48	5
BH5	*5.00*	2	33	45	20
BH5	*7.00*	0	35	49	16
(Average of results >25% fines)	-	1.9	40.5	45.8	12.8

Notes: particle size ranges in accordance with BS5930 (2015)
Orange highlighted – fines content above 25% minimum threshold criteria

The particle size distribution analysis confirmed that with the exception of the soils recorded within borehole BH1 the majority of the samples tested from the mineral resource contained a fines content below the minimum threshold criteria of 25%.

5.2.2 Overburden / interburden to mineral resource ratios

Typically, sand and gravel extraction initially involve the removal of overburden and interburden to gain access to the underlying mineral. The thicknesses of overburden and interburden are therefore influential factors when considering the economic viability of a mineral extraction operation. Acceptability criteria for overburden/interburden to mineral

ratios are variable and dependent upon Mineral Planning Authorities/ Industry operators, although it is commonly quoted by guidance that they should not exceed 3:1.

The overburden/interburden to mineral resource ratios calculated for the site are detailed within **Table 9** below.

Table 9 Summary of overburden/interburden to mineral resource ratios

Location	Overburden (m)	Upper S&G (m)	Calculated Ratio	Pass Criteria 3:1
BH01	**Mineral found to contain >25% fines**			
BH02	0.50	4.0	0.13:1	**Yes**
BH03	0.50	3.8	0.13:1	**Yes**
BH04	0.60	2.7	0.22:1	**Yes**
BH05	2.00	4	0.5:1	**Yes**
(Average)	-	-	(0.25:1)	**Yes**
Pass Rate (%)	-	-	-	**80%**
Notes: S&G – Sand and Gravel, OB – Overburden, IB – Interburden				

With the exception of BH01, where no viable resource was encountered (based on grading), the calculated ratios are below the adopted 3:1 acceptance threshold in all the remaining boreholes.

5.2.3 Mineral resource quantity

The Pan-European Reserves and Resources Reporting Committee (PERC) provides three definitions for the estimation of mineral resources based upon increasing levels of geological confidence:

- **Inferred Mineral Resources** - quantity and grade/quality are estimated on the basis of limited geological evidence and sampling;
- **Indicated Mineral Resources** – quantity, grade/quality, densities, shape and physical characteristics are estimated with sufficient confidence to support planning and evaluation of the economic viability of the deposit. Indicated mineral resources may only be converted to a probable mineral reserve; and
- **Measured Mineral Resources** – quantity, grade/quality, densities, shape and physical characteristics are estimated with confidence sufficient to allow final evaluation of the economic viability of the deposit. Geological evidence is derived from detailed and reliable exploration, sampling and testing and is sufficient to confirm geological and grade, quality continuity between points of observation. May be converted to a proved mineral reserve or a to a probable mineral reserve.

The scope of the ground investigation carried out is considered sufficient to indicate mineral resources with sufficient confidence to support planning and evaluation of the economic viability of the deposit.

Mineral Reserve – A Mineral Reserve is the economically mineable part of a measured and/or indicated mineral resource. It includes diluting materials and allowances for losses which may occur when the material is mined or extracted as well as the application of modifying factors. Mineral reserves should be reported as inclusive of marginally economic and diluting material, which would subsequently be removed during beneficiation (i.e. processing and treatment prior to point of saleable product).

PERC standards report that portions of a mineral deposit that do not have reasonable prospects for eventual economic extraction must not be included within a mineral reserve estimation. Therefore, the following exclusions (modifying factors) have been applied to the mineral reserve volume calculation:

- overburden and interburden – those materials which do not form primary minerals at the site;
- 100 m exclusion zone extending from the boundaries of existing residential properties located to the east and south of the site within which the extraction of minerals would be prohibited;
- the application of a 30 m land margin extending from existing site boundaries to prevent the subsidence/ land slippage of the site perimeter and allow a suitable area for the creation of protective (visual/ acoustic) bunds (composed of stockpiled overburden arisings once stripped from site surface);
- adoption of temporary perimeter excavation faces with safe slope angles of 20 degrees extending to the base of the mineral deposit. Minerals beneath temporary slopes are exempt from extraction and are not accounted for within extractable mineral resource volumes;
- Exclusion of the north western area of the site, where published geological mapping predicts the absence of any potential mineral above the chalk, supported by the results of BH01, where no viable resources of mineral were recorded; and
- whilst not incorporated into the provisional mineral resource calculation, consideration to the positioning of temporary haulage roads serving the excavation, location of pumping equipment for dewatering, silt lagoons, weigh bridges, site accesses, parking, and ancillary plant and infrastructure must all be allocated and applied to final volume calculations to inform prior extraction proposals/ detailed quarry design.

Based upon these factors, the area of the site underlain by potential extractable resource is 6.43 Hectares, using an average thickness of resource deposits of 3.65m, a total volume of **234,695 m^3** potentially extractable mineral resource (sand & gravel) has been calculated to be present beneath the site. This equates to **387,246 tonnes (0.39Mt)** of sand and gravel (calculated assuming a bulk density of 1650kg/m^3 (for naturally occurring dry sand and gravel). It is noted that this figure does not take into consideration the potential for further reduction due to the calculated average fines content of 12.8%.

6 PRIOR EXTRACTION - VIABILITY ASSESSMENT

In order to comply with national planning policy and given the identification of a technically extractable mineral reserve beneath the site, it is necessary to consider the potential for prior mineral extraction, both as a standalone operation and as part of the redevelopment scheme.

6.1 Proposed development and potential sterilisation of resources

The proposed residential development is understood to comprise 330 dwellings, with associated car parking, public open space areas and the construction of a new access road off Chiswell Green to the south-east of the site. The outside of the site will be surrounded by a protected green buffer zone and memorial park, with a new public right of way in the south of the site.

An illustrative masterplan is included as **Figure 3.**

The ground investigation identified the presence of potentially extractable sand and gravel underlying the site, albeit of limited thickness and quality. Therefore, unless the sand and gravel is prior extracted and/ or unless policy is enacted to ensure that the developer employs sustainable construction practices to maximise reuse of the site-won minerals, the mineral reserve is considered at risk from sterilisation.

The viability of prior extraction and the application of sustainable development practices are further explored in the sections below.

6.2 Opportunities and constraints to prior mineral extraction

The minerals resource assessment has identified a potentially extractable reserve of some 0.39 Mt of sand and gravel beneath the site. No groundwater was encountered within the resource and so dewatering is unlikely to be required.

6.2.1 Physical and environmental constraints to prior extraction of mineral resources

The following physical and environmental constraints to the prior extraction of mineral resources have been considered:

- The site is bound to the east and south-east by existing residential properties. A minimum 100 m ‘buffer zone’ from a prior extraction excavation face to the wall of a residential property is required to minimise the impact of working on local amenity. The application of such an exclusion (no dig) zone at the site will vastly reduce the potential workable area, and therefore impose a limit to the overall extractable volume of minerals (as illustrated by the volume calculations). This will be an influential factor for operators when considering the economic prospects of prior extraction at the site.
- The processing and transportation of minerals can lead to adverse impacts on the local environment and community. The processing of minerals using quarry plant and

infrastructure produces excessive noise and dust and would therefore be unsuitable for placement close to existing housing (i.e. within 100 m buffer zone). Processing plant and infrastructure would therefore likely be placed within the footprint of the excavation, potentially requiring relocation during the extraction period, creating additional complications to quarry layout design and to maintaining a safe working environment during operation;

- As part of processing and water treatment/ handling at the site, it will also be necessary to construct silt lagoons/ ponds to facilitate the settlement of fines from aggregate washouts. Whilst it may be possible for these features to be located within the buffer zone, lagoons would normally be required as close to site plant as possible to reduce pumping costs. With the creation of silt lagoons, there is a hazard potential for lagoon failure, the impacts of which would cause significant environmental harm to nearby watercourses, wildlife and the local area. In addition to hazards associated with silt lagoons, the clearance of the site to facilitate quarrying may lead to greater run-offs and heightened rates of erosion, which consequently adds silt to local watercourses, potentially altering local drainage patterns and subsurface infiltration rates (impacting on underlying aquifers); and
- Quarries are also generators of high frequency HGV traffic, leading to noise, air pollution, vibration, dust, congestion and a potential road safety hazard. The haulage of minerals by rail and water are preferential options for transportation and are advocated by MPAs. The main transport link available to The Site are the A414 and M25, access to both is through the village of Chiswell Green. The immediate land uses adjacent to the route comprise residential and retail properties. An alternate route via Noke Lane to the M25 is unlikely to be suitable for HGV traffic due to the narrow width of the road. Any potential application to extract minerals would need to be accompanied by a comprehensive transport assessment to quantify potential impacts on the surrounding environs. As a rough guide, the average HGV load is assumed to be 20t of aggregate. When considering the exportation of some 0.39Mt of processed minerals from the site, this would generate approximately 19,500 HGV movements, both in and out of the gate. HGV movements of a similar order would also (hypothetically) be required should high level restoration of the excavation be required, resulting in potential HGV movements totalling more than 78,000 over the extraction/ restoration period. The magnitude and intensity of such a large scale haulage operation is therefore highly likely to prove incompatible with the local community.

6.2.2 Restoration requirements

The NPPF states that *planning authorities should provide for restoration and beneficial after-use at the earliest opportunity, to be carried out to high environmental standards. Restoration covers any operations designed to return the land to an acceptable landform, environmental condition or beneficial after-use(s). It includes events that take place before and during extraction (such as the stripping and protection of soils), and operations after extraction up until an after-use is established on site.*

Restoration options vary depending upon site conditions, but for dry quarries, can include residential land use and other land uses which require tight controls on long term ground movements within the restored surface. This can be achieved either by low-level restoration (whereby ground levels are not reinstated) or where ground levels are fully

reinstated, by means of controlled backfilling and compaction. Formerly, infilling was a common practice in the restoration process. However, volumes of suitable infill materials have steadily declined due to improvements in recycling and sustainable waste management and therefore, low-level restoration for future residential use is often the default position due to difficulties in acquiring sufficient quantities of inert materials to backfill to original contour levels.

It is noted that due to the requirement to maintain site levels to mitigate the risks identified from surface water flooding, high-level restoration will be required unless alternative flood mitigation measures are incorporated within the development.

High level restoration will dictate the requirement for selected homogeneous fill materials to be imported, placed and compacted in accordance with a strict engineering specification to provide a restored development platform. The imported fill will need to be free from contamination to ensure the absence of risk to the future development or the wider environment.

6.3 Economic considerations to prior extraction – commercial value and marketplace

In addition to physical constraints, it is also essential to consider the current marketplace for aggregates as well as the fundamental economics tied to a mineral extraction operation which on balance, will ultimately dictate the practicality of a prior mineral extraction at a site.

Marketplace

The Hertfordshire County Council Local Aggregates Assessment for 2021 stated that whilst the Hertfordshire landbank is below the required 7-year minimum, it is considered that the landbank will increase once Land adjoining Coopers Green receives planning permission. The reserves from this site (3.52Mt) will boost the total reserves figure and subsequently increase the landbank. The review of the Hertfordshire Minerals Local Plan is being undertaken to address the shortfall in supply. It is intended that the identified sites in the emerging Minerals Local Plan (which does not include the subject site), in addition to the remaining reserves at the current permitted sand and gravel sites, will meet the county's future need for land-won sand and gravel.

Standalone mineral extraction

The actual saleable reserve (excluding consideration of the 12.8% fines content) is in the order of 0.39 Mt. Due to the high cost of establishing a new quarry (rather than an extension to an existing site), the aggregate industry will not consider sand and gravel reserves of less than one million tonnes (1 Mt) to be commercially viable for extraction. For example, the cost of providing plant and equipment required to establish a small sand and gravel quarry can range between £500,000 to £4,000,000, and therefore, it is essential that fixed costs and risk can be accommodated over a larger saleable reserve. Whilst potential revenue from the sale of 0.39 Mt of sand and gravel may be in the order of £3.90 million (adopting an average value across products of £10 per tonne) and assuming current sand and gravel sales could accomplish similar returns to those achieved during the pre-recession financial climate, a potential profit in the order of £400,000 may be obtainable over the extraction period. When compared against the potential establishment costs, this confirms the scale of the resource to not be

commercially viable, as the potential establishment costs exceed the subsequent profits anticipated during the extraction period.

Prior mineral extraction and subsequent residential development

Prior extraction of the mineral as a preliminary phase to construction would also require the high level restoration of the resultant excavation to create a suitably stable development platform to accommodate future structures. It is noted that in order to achieve such a platform, restoration would require an engineered design solution, using selected aggregates of similar grade and quantity to those initially extracted. Considering the potential profits generated by the initial sale of aggregates from the site (£400,000), the assessment must also factor in the follow on costs to the developer, including the detailed design, purchase of suitable material, transportation to the site and re-engineering of the platform, which could potentially be in excess of £5M (cost estimate from similar restoration projects). On balance therefore, it is clear that the potential benefits afforded by the prior extraction of the reserve as part of the redevelopment scheme are in this instance, far outweighed by the constraints applied to restoring the site, and therefore this approach would not be considered economically viable.

7 CONCLUSIONS AND RECOMMENDATIONS

The completion of intrusive site investigation, which comprised the drilling of five exploratory boreholes through the full vertical succession of the mineral resource at one borehole per 2 Ha (scope approved by Herts County Council), is considered to have robustly characterised the nature (quantity/ quality/ grade/ density) of the underlying mineral resource. In compliance with the Pan-European Reserves and Resources Reporting Committee (PERC) standards, the level of intrusive investigation is considered to be of sufficient quality and detail to inform an 'Indicated' mineral resource calculation, derived from sufficient geological confidence.

The assessment has identified a potential aggregate resource (average 3.65m in thickness) to sub crop beneath the site at relatively shallow depths, with the exception of the north western flank of the site, where the resource was shown to be absent (as predicted by published geological mapping).

The assessment of mineral quality (particle size distribution (grading analysis), deposit thickness/depth and the overburden/interburden to resource ratio) has characterised the majority of the mineral resource (where present) to be technically compliant with the adopted acceptability criteria for an extractable resource (considered to be less stringent criteria than many industry standards).

The total volume of potentially extractable sand and gravel resource beneath the site has been calculated at **0.39 Mt**. This figure excludes areas where it would not be practical to work minerals during extraction (buffer zones, beneath excavation perimeter slopes etc.) but is inclusive of diluting materials (silt/clay fraction).

However, whilst a limited mineral resource has been recorded beneath the site, an initial financial viability assessment has shown that due to high costs associated with establishing a new quarry, the size of the reserve is insufficient (less than half the size commercially required) to offset upfront costs. Financial viability is further reduced by the requirement for high level restoration to provide a suitable development platform for subsequent residential development.

In addition to the above, a number of physical and environmental constraints have been identified within the assessment, which would further constrain mineral extraction from this site, which is currently flanked by residential properties on two sides.

Furthermore, it is noted that the Hertfordshire County Council Local Aggregates Assessment for 2021 confirms that the current landbank (supplemented by the remaining reserves at the current permitted sand and gravel sites) will meet the county's current future need for land-won sand and gravel.

Based on the above, prior mineral extraction from this site is not considered to be viable, either as a standalone project or by extraction prior to redevelopment due to the limited size of the reserve and is further constrained due to its location within proximity to a residential area. It is therefore recommended that sterilization of the reserve be limited by implementation of opportunistic extraction during the proposed development. In order to secure sustainable redevelopment, a minerals management plan should be conditioned as part of the planning approval to maximise the use of the reserve within the proposed development to minimise sterilisation.

A copy of this report should be forwarded to the Minerals Planning Authority at Hertfordshire County Council for their consideration.

REFERENCES

Previous SI reports and other site related information

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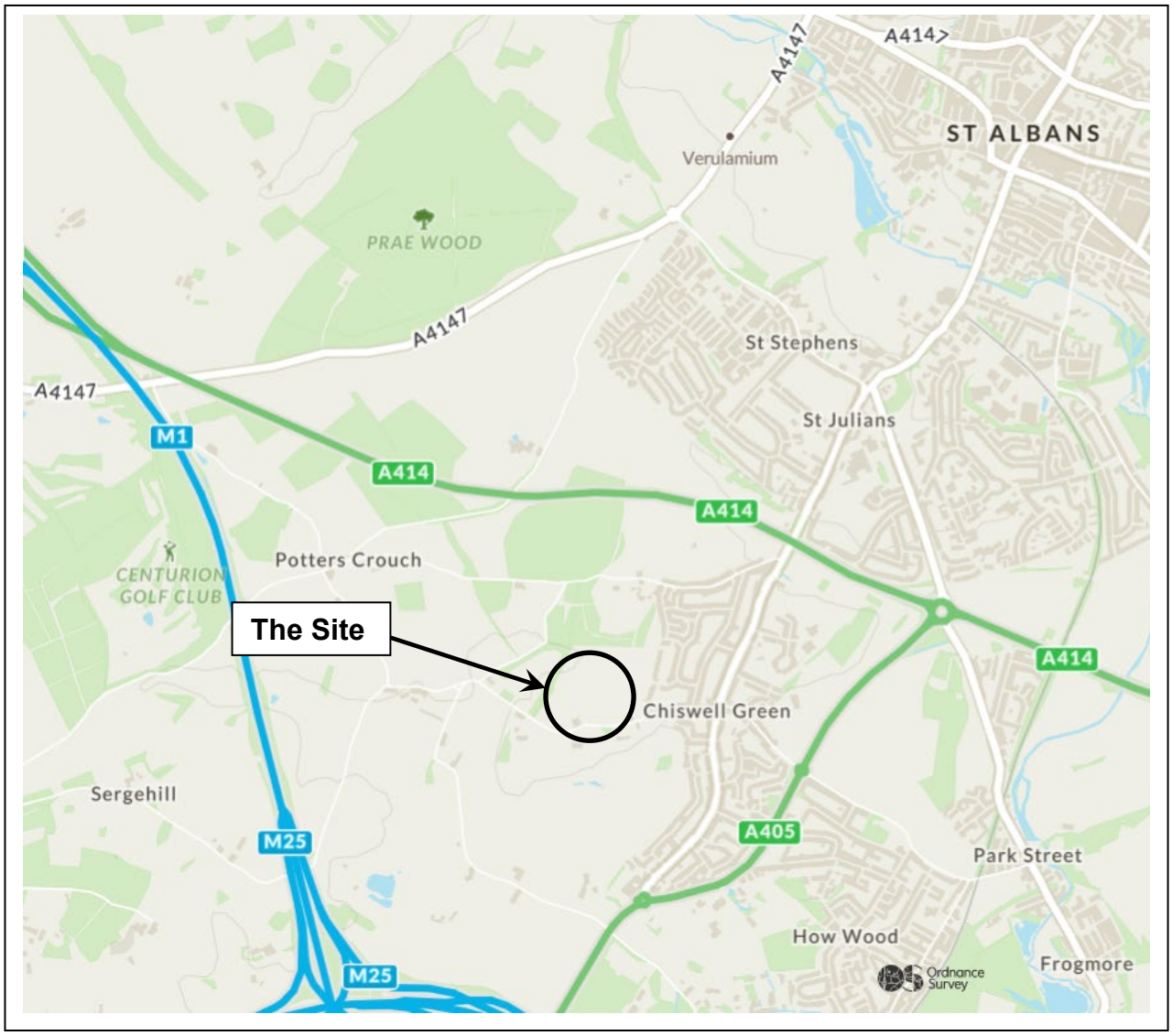
FIGURES



RSK	**SITE LOCATION PLAN**	**Client:** McPartland Planning Ltd.	**Figure No: 1**
		Site: Addison Park, Chiswell Green	**Job No: 1922316**
		Scale: NOT TO SCALE	**Source: OS Map**

Site Location Plan - Revision C - 1:2500@A3

0 25 50 100 250m

RSK	**EXPLORATORY HOLE LOCATION PLAN**	**Client:**	McPartland Planning Ltd	**Figure:**	2
		Site:	Addison Park, Chiswell Green	**Job No:**	1922316
		Scale:	Not To Scale	**Source:**	Base image from Client

Indicative Unit Key:

- 6-unit apartment block - 6 x 2-bed 61sqm flat
- 6-unit apartment block - 3 x 1-bed 50sqm flat - 3 x 2-bed 61sqm flat
- 1-bed dwelling - 56sqm
- 2-bed dwelling - 96sqm
- 3-bed dwelling - 114sqm

Indicative Total: **330 units**

Indicative Unit Mix: 182 x 3-bed - 55%
116 x 2-bed - 35%
32 x 1 -bed - 10%

Indicative Area Analysis:

Site area - 142,000sqm / 14.2ha
Open space - 3,500sqm / 0.35ha
Memorial park - 16,000sqm / 1.6ha
Green buffer zone - 18,000sqm / 1.8ha

Overall percentage of green space - 26%

RSK	**PROPOSED DEVELOPMENT PLAN**	**Client:**	McPartland Planning Ltd	**Figure:**	4
		Site:	Addison Park, Chiswell Green	**Job No:**	1922316
		Scale:	Not To Scale	**Source:**	Client

APPENDIX A
SERVICE CONSTRAINTS

1. This report and the site investigation carried out in connection with the report (together the "Services") were compiled and carried out by RSK Environment Limited (RSK) for McPartland Planning Ltd. (the "client") in accordance with the terms of a contract [RSK Group Standard Terms and Conditions] between RSK and the "client". The Services were performed by RSK with the skill and care ordinarily exercised by a reasonable environmental consultant at the time the Services were performed. Further, and in particular, the Services were performed by RSK taking into account the limits of the scope of works required by the client, the time scale involved and the resources, including financial and manpower resources, agreed between RSK and the client.
2. Other than that, expressly contained in paragraph 1 above, RSK provides no other representation or warranty whether express or implied, in relation to the Services.
3. Unless otherwise agreed in writing the Services were performed by RSK exclusively for the purposes of the client. RSK is not aware of any interest of or reliance by any party other than the client in or on the Services. Unless expressly provided in writing, RSK does not authorise, consent or condone any party other than the client relying upon the Services. Should this report or any part of this report, or otherwise details of the Services or any part of the Services be made known to any such party, and such party relies thereon that party does so wholly at its own and sole risk and RSK disclaims any liability to such parties. Any such party would be well advised to seek independent advice from a competent environmental consultant and/or lawyer.
4. It is RSK's understanding that this report is to be used for the purpose described in the introduction to the report. That purpose was a significant factor in determining the scope and level of the Services. Should the purpose for which the report is used, or the proposed use of the site change, this report may no longer be valid and any further use of or reliance upon the report in those circumstances by the client without RSK 's review and advice shall be at the client's sole and own risk. Should RSK be requested to review the report after the date of this report, RSK shall be entitled to additional payment at the then existing rates or such other terms as agreed between RSK and the client.
5. The passage of time may result in changes in site conditions, regulatory or other legal provisions, technology or economic conditions which could render the report inaccurate or unreliable. The information and conclusions contained in this report should not be relied upon in the future without the written advice of RSK. In the absence of such written advice of RSK, reliance on the report in the future shall be at the client's own and sole risk. Should RSK be requested to review the report in the future, RSK shall be entitled to additional payment at the then existing rate or such other terms as may be agreed between RSK and the client.
6. The observations and conclusions described in this report are based solely upon the Services which were provided pursuant to the agreement between the client and RSK. RSK has not performed any observations, investigations, studies or testing not specifically set out or required by the contract between the client and RSK. RSK is not liable for the existence of any condition, the discovery of which would require performance of services not otherwise contained in the Services. For the avoidance of doubt, unless otherwise expressly referred to in the introduction to this report, RSK did not seek to evaluate the presence on or off the site of asbestos, invasive plants, electromagnetic fields, lead paint, heavy metals, radon gas or other radioactive or hazardous materials, unless specifically identified in the Services.
7. The Services are based upon RSK's observations of existing physical conditions at the Site gained from a visual inspection of the site together with RSK's interpretation of information, including documentation, obtained from third parties and from the client on the history and usage of the site, unless specifically identified in the Services or accreditation system (such as UKAS ISO 17020:2012 clause 7.1.6):

    a. the Services were based on information and/or analysis provided by independent testing and information services or laboratories upon which RSK was reasonably entitled to rely

    b. the Services were limited by the accuracy of the information, including documentation, reviewed by RSK and the observations possible at the time of the visual inspection

    c. the Services did not attempt to independently verify the accuracy or completeness of information, documentation or materials received from the client or third parties, including laboratories and information services, during the performance of the Services.

    RSK is not liable for any inaccurate information or conclusions, the discovery of which inaccuracies required the doing of any act including the gathering of any information which was not reasonably available to RSK and

including the doing of any independent investigation of the information provided to RSK save as otherwise provided in the terms of the contract between the client and RSK.

8. The intrusive environmental site investigation aspects of the Services is a limited sampling of the site at pre-determined locations based on the known historic / operational configuration of the site. The conclusions given in this report are based on information gathered at the specific test locations and can only be extrapolated to an undefined limited area around those locations. The extent of the limited area depends on the properties of the materials adjacent and local conditions, together with the position of any current structures and underground utilities and facilities, and natural and other activities on-site. In addition, chemical analysis was carried out for a limited number of parameters [as stipulated in the contract between the client and RSK] [based on an understanding of the available operational and historical information,] and it should not be inferred that other chemical species are not present.

9. Any site drawing(s) provided in this report is (are) not meant to be an accurate base plan, but is (are) used to present the general relative locations of features on, and surrounding, the site. Features (intrusive and sample locations etc) annotated on-site plans are not drawn to scale but are centred over the approximate location. Such features should not be used for setting out and should be considered indicative only.

APPENDIX B
HERTFORDSHIRE COUNTY COUNCIL LOCATION OF EXISTING SITES AND PREFERRED AREAS PLAN

HERTFORDSHIRE COUNTY COUNCIL

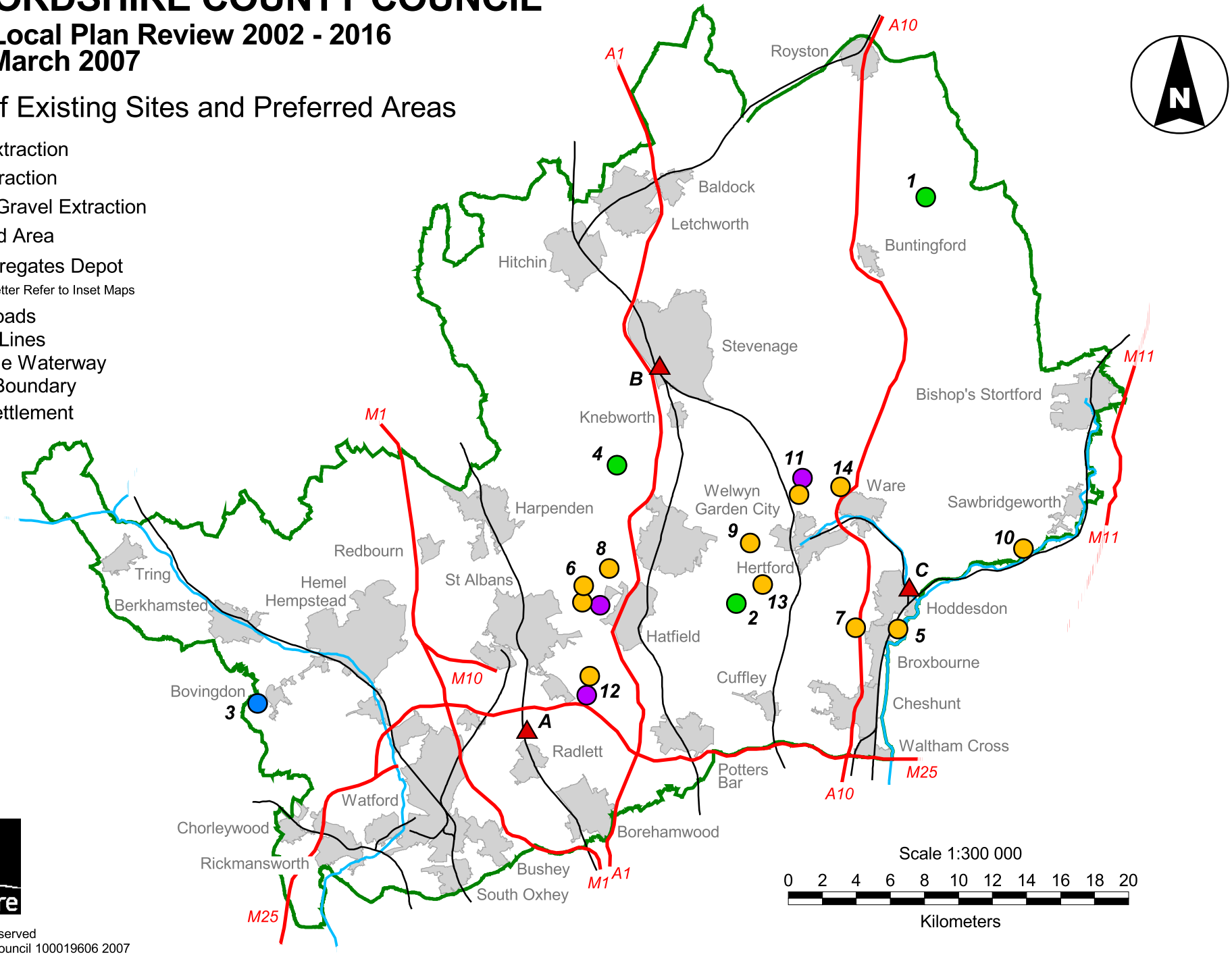
Minerals Local Plan Review 2002 - 2016
Adopted March 2007

Location of Existing Sites and Preferred Areas

- Chalk Extraction
- Clay Extraction
- Sand & Gravel Extraction
- Preferred Area
- Rail Aggregates Depot

Numbers / Letter Refer to Inset Maps

- Major Roads
- Railway Lines
- Navigable Waterway
- County Boundary
- Major Settlement



Scale 1:300 000

0 2 4 6 8 10 12 14 16 18 20

Kilometers

Hertfordshire

APPENDIX C
BGS BOREHOLE RECORD

TL 10 SW/22

TL 10 SW 22 **1257 0449** **Bone Hill, St Stephen** **Block B**

Surface level (+112.4 m) +369 ft
Water not struck
Shell and auger, 6 in (152 mm) diameter
January 1972

Overburden 3.1 m
Mineral 3.0 m
Waste 1.9 m
Bedrock 0.2 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.4	0.4
Glacial Sand and Gravel	Brown sandy clay	2.7	3.1
	'Very clayey' gravel Gravel: mainly coarse with some fine, subangular to well-rounded flint with some quartz and quartzite Sand: mainly fine to medium with some coarse; brown	3.0	6.1
	Brown and black mottled stiff clay with angular flint cobbles	0.5	6.6
	Brown, pebbly sandy clay with rounded flint pebbles	0.1	6.7
	Brown and black mottled stiff clay with angular flint cobbles	1.3	8.0
Upper Chalk	Soft white chalk	0.2+	8.2

GRADING

Mean for deposit *percentages*			Depth below surface (m)	*percentages*					
Fines	Sand	Gravel		Fines	Sand			Gravel	
				−1/16	+1/16–1/4	+1/4–1	+1–4	+4–16	+16
28	32	40	3.1–4.1	35	29	14	3	10	9
			4.1–5.1	15	13	11	8	20	33
			5.1–6.1	33	7	6	6	16	32
			Mean	28	16	10	6	15	25

APPENDIX D
EXPLORATORY HOLE RECORDS

RSK GEOSCIENCES

BOREHOLE LOG

Contract:	Client:	Borehole:
Addison Park, Chiswell Green	**McPartland Planning Limited**	**BH01**

Contract Ref:	Start:	Ground Level (m AOD):	National Grid Co-ordinate:	Sheet:
1922316	**16.03.22** End: **16.03.22**	**100.55**	**E:512809.3 N:204796.4**	**1** of **1**

Samples and In-situ Tests				Water	Backfill	Description of Strata	Depth (Thickness)	Material Graphic Legend
Depth	No	Type	Results					
0.00-0.50	1	B				Brown slightly sandy slightly clayey slightly gravelly TOPSOIL. Gravel is fine and medium subangular to rounded flint.	(0.50) 0.50	
0.50-1.00	2	B				Orangish brown slightly clayey fine to coarse SAND and fine to coarse subangular to rounded GRAVEL of flint.	(1.50) 2.00	
1.20-1.70	3	B						
2.00-2.50	4	B				Firm brown slightly sandy gravelly CLAY. Gravel is fine and medium subangular to rounded flint.	(1.50) 3.50	
3.00-3.50	5	B						
3.50-4.50	6	B				White mottled off white and light brown highly weathered structureless CHALK. Soft clay matrix with nodules of weak chalk and rare flint (Grade VI/ Dm).	(1.00) 4.50	
						Borehole terminated at 4.50m depth.		

Boring Progress and Water Observations					
Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth
16/03/22		2.50	-		
16/03/22		4.50	-		

Chiselling / Slow Progress		
From	To	Duration (hh:mm)
0.00	1.20	01:00

General Remarks

1. Position checked with Ground Penetrating Radar, CAT and Genny prior to excavation.
2. Inspection pit hand dug to 1.20m depth.
3. No visual or olfactory evidence of contamination.
4. No groundwater encountered.
5. On completion, borehole backfilled with arisings.

All dimensions in metres | Scale: **1:50**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Inspection pit + Cable percussion	**Dando 2000 Mark 2**	**???**	**CDuffield**	

AGS

RSK GEOSCIENCES

BOREHOLE LOG

Contract:	Client:	Borehole:
Addison Park, Chiswell Green	**McPartland Planning Limited**	**BH02**

Contract Ref:	Start: **16.03.22** End: **16.03.22**	Ground Level (m AOD):	National Grid Co-ordinate:	Sheet:
1922316		**104.15**	**E:512967.6 N:204817.6**	**1** of **1**

Samples and In-situ Tests				Water	Backfill	Description of Strata	Depth (Thickness)	Material Graphic Legend
Depth	No	Type	Results					
0.00-0.50	1	B				Dark brown slightly clayey sandy gravelly TOPSOIL.	(0.50) 0.50	
0.50-1.00	2	B				Orangish brown clayey fine to coarse SAND and fine and medium subangular to rounded GRAVEL of flint. Low cobble content of flint.	(4.00) 4.50	
1.20-1.70	3	B						
2.00-2.50	4	B						
3.00-3.50	5	B						
4.00-4.50	6	B						
4.50-5.00	7	B				Brown sandy very clayey GRAVEL of fine to coarse subangular to rounded flint and chalk.	(2.50) 7.00	
5.50-6.00	8	B						
6.50-7.00	9	B						
7.00-8.00	10	B				White mottled light brown highly weathered structureless CHALK. Soft silty clay matrix with nodules of hard chalk (Grade VI/ Dm).	(1.00) 8.00	
						Borehole terminated at 8.00m depth.		

Boring Progress and Water Observations					
Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth
17/03/22		4.50	-		
17/03/22		8.00	-		

Chiselling / Slow Progress		
From	To	Duration (hh:mm)
0.00	1.20	01:00

General Remarks

1. Position checked with Ground Penetrating Radar, CAT and Genny prior to excavation.
2. Inspection pit hand dug to 1.20m depth.
3. No visual or olfactory evidence of contamination.
4. No groundwater encountered.
5. On completion, borehole backfilled with arisings.

All dimensions in metres | Scale: **1:50**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Inspection pit + Cable percussion	**Dando 2000 Mark 2**	**Dave Hutson**	**CDuffield**	

AGS

RSK GEOSCIENCES

BOREHOLE LOG

Contract:	Client:	Borehole:
Addison Park, Chiswell Green	**McPartland Planning Limited**	**BH03**

Contract Ref:	Start: **17.03.22**	Ground Level (m AOD):	National Grid Co-ordinate:	Sheet:
1922316	End: **17.03.22**	**105.08**	**E:512893.4 N:204626.0**	**1** of **1**

Samples and In-situ Tests				Water	Backfill	Description of Strata	Depth (Thickness)	Material Graphic Legend
Depth	No	Type	Results					
0.00-0.50	1	B				Brown slightly sandy clayey gravelly TOPSOIL. Gravel is fine and medium subangular to rounded flint.	(0.50) 0.50	
0.50-1.00	2	B				Orangish brown clayey very fine and medium sandy GRAVEL of subangular to rounded fine to coarse flint.	(1.50) 2.00	
1.20-1.70	3	B						
2.00-2.50	4	B				Orangish brown clayey fine to coarse SAND and GRAVEL of fine and medium subangular to rounded flint.	(2.30) 4.30	
3.00-3.50	5	B						
4.00-4.50	6	B				White mottled off white and brown highly weathered structureless CHALK. Clayey silty matrix with nodules of weak chalk (Grade VI/ Dm).	(1.70) 6.00	
5.00-6.00	7	B						
						Borehole terminated at 6.00m depth.		

Boring Progress and Water Observations					
Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth
17/03/22		3.00	-		
17/03/22		6.00	-		

Chiselling / Slow Progress		
From	To	Duration (hh:mm)
0.00	1.20	01:00

General Remarks

1. Position checked with Ground Penetrating Radar, CAT and Genny prior to excavation.
2. Inspection pit hand dug to 1.20m depth.
3. No visual or olfactory evidence of contamination.
4. No groundwater encountered.
5. On completion, borehole backfilled with arisings.

All dimensions in metres | Scale: **1:50**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Inspection pit + Cable percussion	**Dando 2000 Mark 2**	**Dave Hutson**	**CDuffield**	

AGS

BOREHOLE LOG

Contract:	Client:	Borehole:
Addison Park, Chiswell Green	**McPartland Planning Limited**	**BH04**

Contract Ref:	Start:	Ground Level (m AOD):	National Grid Co-ordinate:	Sheet:
1922316	**15.03.22** End: **15.03.22**	**103.47**	**E:512825.8 N:204716.1**	**1** of **1**

Samples and In-situ Tests				Water	Backfill	Description of Strata	Depth (Thickness)	Material Graphic Legend
Depth	No	Type	Results					
0.00-0.50	1	B				Dark brown slightly clayey sandy gravelly TOPSOIL. Rare fine roots.	(0.60) 0.60	
1.20-1.70	2	B				Orangish brown clayey very sandy fine to coarse subangular to subrounded GRAVEL of flint.	(1.80) 2.40	
2.00-2.50	3	B						
2.50-3.00	4	B				Orangish brown slightly clayey very medium and coarse sandy fine to coarse subangular to rounded GRAVEL of flint.	(0.90) 3.30	
3.00-3.50	5	B						
4.00-4.50	6	B				Stiff dark brown slightly sandy slightly gravelly CLAY. Gravel is fine to coarse and subangular to rounded flint. Low cobble content of flint and chalk.	(1.40) 4.70	
5.00-6.00	7	B				White mottled off white highly weathered structureless CHALK. Clay matrix with chalk nodules and black flecks. (Grade VI, Dm).	(1.30) 6.00	
						Borehole terminated at 6.00m depth.		

Boring Progress and Water Observations					
Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth
15/03/22		4.50	-		
15/03/22		6.00	-		

Chiselling / Slow Progress		
From	To	Duration (hh:mm)
0.00	1.20	01:00

General Remarks

1. Position checked with Ground Penetrating Radar, CAT and Genny prior to excavation.
2. Inspection pit hand dug to 1.20m depth.
3. No visual or olfactory evidence of contamination.
4. No groundwater encountered.
5. On completion, borehole backfilled with arisings.

All dimensions in metres | Scale: **1:50**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Inspection pit + Cable percussion	**Dando 2000 Mark 2**	**Dave Hutson**	**CDuffield**	

RSK GEOSCIENCES

BOREHOLE LOG

Contract:	Client:	Borehole:
Addison Park, Chiswell Green	**McPartland Planning Limited**	**BH05**

Contract Ref:	Start: **15.03.22**	Ground Level (m AOD):	National Grid Co-ordinate:	Sheet:
1922316	End: **15.03.22**	**102.92**	**E:512617.2 N:204523.2**	**1** of **2**

Samples and In-situ Tests				Water	Backfill	Description of Strata	Depth (Thickness)	Material Graphic Legend
Depth	No	Type	Results					
0.00-0.50	1	B				Brown slightly gravelly clayey fine and medium sandy TOPSOIL with fine roots and rootlets. Gravel is fine and medium subangular to rounded flint.	(0.50) 0.50	
0.50-1.00	2	B				Firm brown mottled orangish brown and dark brown slightly gravelly slightly sandy CLAY. Gravel is fine and medium subangular to rounded flint.	(1.50) 2.00	
1.20-1.70	3	B						
2.00-2.50	4	B				Orangish brown clayey fine and medium SAND.	(0.50) 2.50	
2.50-3.00	5	B				Orangish brown fine to coarse sandy fine and medium subangular to rounded GRAVEL of flint.	(0.50) 3.00	
3.00-3.50	6	B				Orangish brown slightly clayey very gravelly fine to coarse SAND. Gravel is fine to coarse subangular to rounded flint.	(1.00) 4.00	
4.00-4.50	7	B				Orangish brown slightly clayey fine to coarse SAND and fine and medium subangular to rounded GRAVEL of flint	(1.00) 5.00	
5.00-5.50	8	B				Brown clayey very gravelly fine to coarse SAND. Gravel is fine to coarse subangular to rounded flint. Low cobbles content of flint.	(2.50) 7.50	
6.00-6.50	9	B						
7.00-7.50	10	B						
8.00-8.50	11	B				Stiff brown slightly sandy gravelly CLAY. Gravel is fine to coarse angular to rounded flint. Rare cobbles of flint.	(1.00) 8.50	
8.50-9.50	12	B				White mottled off white highly weathered structureless CHALK. Silty clay matrix with chalk nodules and rare flint. (Grade VI/ Dm).	(1.00)	

Boring Progress and Water Observations					
Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth
15/03/22		5.00	5.00		
15/03/22		9.50	-		

Chiselling / Slow Progress		
From	To	Duration (hh:mm)
0.00	1.20	01:00

General Remarks

1. Position checked with Ground Penetrating Radar, CAT and Genny prior to excavation.
2. Inspection pit hand dug to 1.20m depth.
3. No visual or olfactory evidence of contamination.
4. No groundwater encountered.
5. On completion, borehole backfilled with arisings.

All dimensions in metres | Scale: **1:50**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Inspection pit + Cable percussion	**Dando 2000 Mark 2**	**Dave Hutson**	**CDuffield**	

RSK GEOSCIENCES

BOREHOLE LOG

Contract:	Client:	Borehole:
Addison Park, Chiswell Green	**McPartland Planning Limited**	**BH05**

Contract Ref:	Start: **15.03.22** End: **15.03.22**	Ground Level (m AOD):	National Grid Co-ordinate:	Sheet:
1922316		**102.92**	**E:512617.2 N:204523.2**	**2** of **2**

Samples and In-situ Tests				Water	Backfill	Description of Strata	Depth (Thickness)	Material Graphic Legend
Depth	No	Type	Results					
						White mottled off white highly weathered structureless CHALK. Silty clay matrix with chalk nodules and rare flint. (Grade VI/ Dm). *(stratum copied from 8.50m from previous sheet)*	9.50	

Boring Progress and Water Observations						Chiselling / Slow Progress			General Remarks
Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth	From	To	Duration (hh:mm)	

All dimensions in metres | Scale: **1:50**

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Inspection pit + Cable percussion	**Dando 2000 Mark 2**	**Dave Hutson**	**CDuffield**	AGS

APPENDIX E
LABORATORY CLASSIFICATION TEST RESULTS

STRUCTURAL SOILS LTD

TEST REPORT

Report No. 584798-01 (00) 1774

Date 07-April-2022 Contract Addison Park, Chiswell Green, St Albans

Client RSK
Address 18 Frogmore Rd
Apsley
Hemel Hempstead
Hertfordshire
HP3 9RT
For the Attention of Christopher Duffield

Samples submitted by client	23-March-2022	Client Reference	1922316
Testing Started	24-March-2022	Client Order No.	n/a
Testing Completed	06-April-2022	Instruction Type	Written

Tests marked 'Not UKAS Accredited' in this report are not included in the UKAS Accreditation Schedule for our Laboratory.

UKAS Accredited Tests

1.10 Particle Size Distribution wet sieve method BS1377:Part 2:1990,clause 9.2 (superseded)*

* This clause of BS1377 is no longer the most up to date method due to the publication of ISO17892

Please Note: Remaining samples will be retained for a period of one month from today and will then be disposed of .
Test were undertaken on samples 'as received' unless otherwise stated.
Opinions and interpretations expressed in this report are outside the scope of accreditation for this laboratory.

Structural Soils Ltd 18 Frogmore Rd Hemel Hempstead HP3 9RT Tel.01442 416661 e-mail dimitris.xirouchakis@soils.co.uk

TESTING VERIFICATION CERTIFICATE

1774

The test results included in this report are certified as:-

ISSUE STATUS: **FINAL**

In accordance with the Structural Soils Ltd Laboratory Quality Management System, results sheets and summaries of results issued by the laboratory are checked by an approved signatory. The integrity of the test data and results are ensured by control of the computer system employed by the laboratory as part of the Software Verification Program as detailed in the Laboratory Quality Manual.

This testing verification certificate covers all testing compiled on or before the following datetime: **07/04/2022 12:45:09**.

Testing reported after this date is not covered by this Verification Certificate.

Approved Signatory
Sharon Cairns (Laboratory Manager)

(Head Office)
Bristol Laboratory
Unit 1A, Princess Street
Bedminster
Bristol
BS3 4AG

Castleford Laboratory
The Potteries, Pottery Street
Castleford
West Yorkshire
WF10 1NJ

Hemel Laboratory
18 Frogmore Road
Hemel Hempstead
Hertfordshire
HP3 9RT

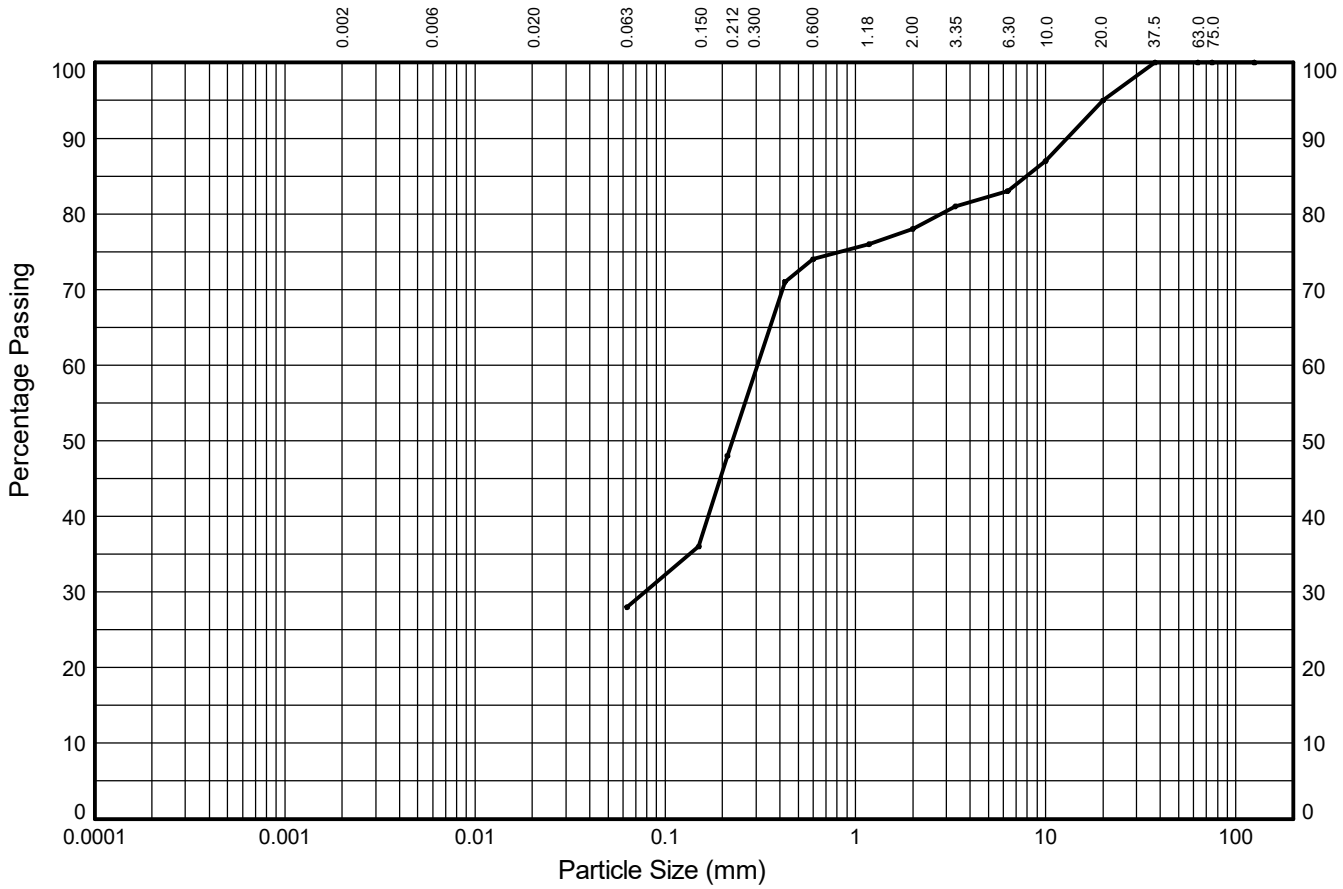
Tonbridge Laboratory
Anerley Court, Half Moon Lane
Hildenborough
Tonbridge
TN11 9HU

STRUCTURAL SOILS LTD	Contract: **Addison Park, Chiswell Green, St Albans**	Job No: **584798**

PARTICLE SIZE DISTRIBUTION TEST

In accordance with clauses 9.2 of BS1377:Part 2:1990

Borehole: **BH1** Sample Ref: **2** Sample Type: **B** Depth (m): **0.50**



CLAY	fine	medium	coarse	fine	medium	coarse	fine	medium	coarse	COBBLES
	-	-	-	18%	28%	4%	5%	12%	5%	
	SILT			SAND			GRAVEL			
28%				50%			22%			0%

Test Sieve (mm)	Percent Passing (%)
125.0	**100**
75.0	**100**
63.0	**100**
37.5	**100**
20.0	**95**
10.0	**87**
6.30	**83**
3.35	**81**
2.00	**78**
1.18	**76**
0.600	**74**
0.425	**71**
0.212	**48**
0.150	**36**
0.063	**28**

Particle Diameter (mm)	Percent Passing (%)

Sedimentation sample was not pre-treated

Coefficients	
D_{10} (mm)	**NA**
D_{15} (mm)	**NA**
D_{30} (mm)	**0.078**
D_{50} (mm)	**0.225**
D_{60} (mm)	**0.305**
D_{85} (mm)	**7.937**
D_{90} (mm)	**12.968**
C_U	**NA**
C_C	**NA**

Soil Description:

Brown mottled orangish brown very gravelly very clayey SAND

Key: C_U = Uniformity coefficient. C_C = Coefficient of curvature as defined in BS EN ISO 14688-2:2018

STRUCTURAL SOILS
18 Frogmore Road
Hemel Hempstead
Hertfordshire
HP3 9RT

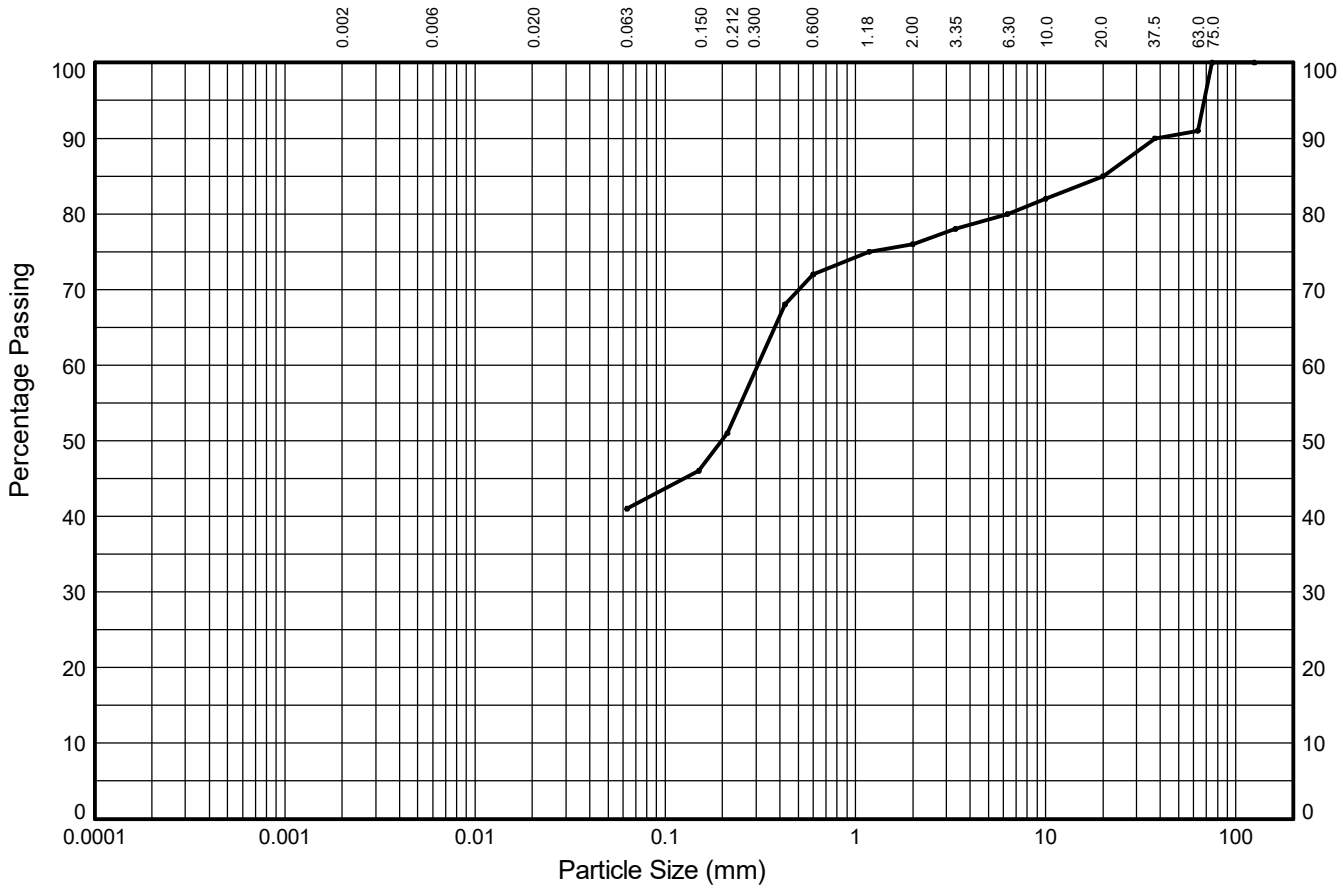
Compiled By	Date
KATIE GIDDINGS	**07/04/22**

Contract	Contract Ref:
Addison Park, Chiswell Green, St Albans	**584798**

PARTICLE SIZE DISTRIBUTION TEST

In accordance with clauses 9.2 of BS1377:Part 2:1990

Borehole: **BH1** Sample Ref: **4** Sample Type: **B** Depth (m): **2.00**



CLAY	fine	medium	coarse	fine	medium	coarse	fine	medium	coarse	COBBLES
	-	-	-	9%	22%	4%	4%	5%	6%	
	SILT			SAND			GRAVEL			
41%				35%			15%			9%

Test Sieve (mm)	Percent Passing (%)
125.0	**100**
75.0	**100**
63.0	**91**
37.5	**90**
20.0	**85**
10.0	**82**
6.30	**80**
3.35	**78**
2.00	**76**
1.18	**75**
0.600	**72**
0.425	**68**
0.212	**51**
0.150	**46**
0.063	**41**

Particle Diameter (mm)	Percent Passing (%)

Sedimentation sample was not pre-treated

Coefficients	
D_{10} (mm)	**NA**
D_{15} (mm)	**NA**
D_{30} (mm)	**NA**
D_{50} (mm)	**0.198**
D_{60} (mm)	**0.306**
D_{85} (mm)	**20.000**
D_{90} (mm)	**37.500**
C_U	**NA**
C_C	**NA**

Soil Description:

Orangish brown slightly gravelly sandy CLAY with a low cobble content

Key: C_U = Uniformity coefficient. C_C = Coefficient of curvature as defined in BS EN ISO 14688-2:2018

STRUCTURAL SOILS
18 Frogmore Road
Hemel Hempstead
Hertfordshire
HP3 9RT

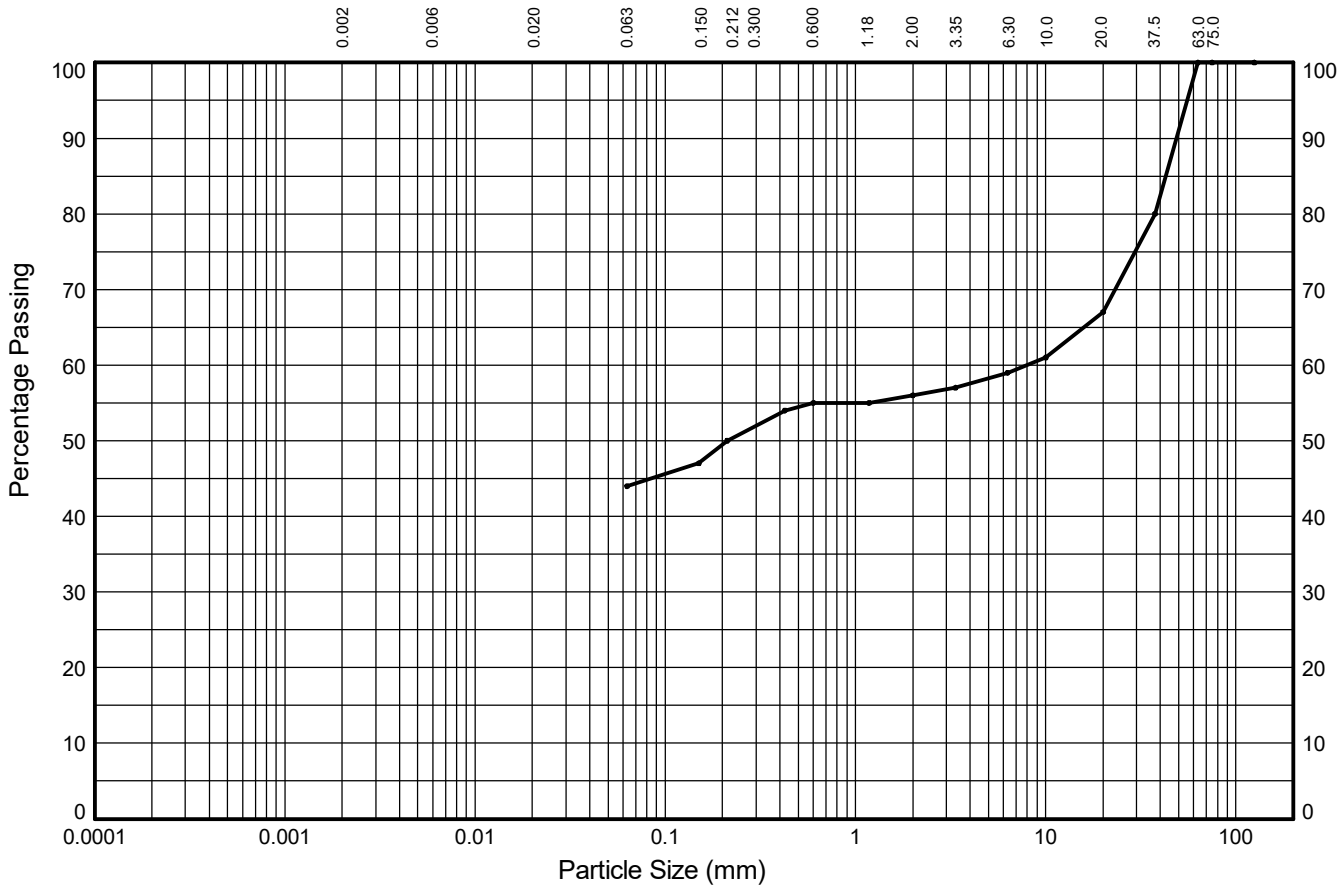
Compiled By	Date
KATIE GIDDINGS	**07/04/22**

Contract	Contract Ref:
Addison Park, Chiswell Green, St Albans	**584798**

PARTICLE SIZE DISTRIBUTION TEST

In accordance with clauses 9.2 of BS1377:Part 2:1990
NON-STANDARD TEST

Borehole: **BH1** Sample Ref: **5** Sample Type: **B** Depth (m): **3.00**



CLAY	fine	medium	coarse	fine	medium	coarse	fine	medium	coarse	COBBLES
	-	-	-	5%	6%	1%	3%	8%	33%	
	SILT			SAND			GRAVEL			
44%				12%			44%			0%

Test Sieve (mm)	Percent Passing (%)
125.0	**100**
75.0	**100**
63.0	**100**
37.5	**80**
20.0	**67**
10.0	**61**
6.30	**59**
3.35	**57**
2.00	**56**
1.18	**55**
0.600	**55**
0.425	**54**
0.212	**50**
0.150	**47**
0.063	**44**

Particle Diameter (mm)	Percent Passing (%)

Sedimentation sample was not pre-treated

Coefficients	
D_{10} (mm)	**NA**
D_{15} (mm)	**NA**
D_{30} (mm)	**NA**
D_{50} (mm)	**0.212**
D_{60} (mm)	**7.937**
D_{85} (mm)	**42.693**
D_{90} (mm)	**48.606**
C_U	**NA**
C_C	**NA**

Soil Description:

Brown mottled light orangish brown, white and dark grey slightly sandy gravelly CLAY. Non standard due to insufficient material

Key: C_U = Uniformity coefficient. C_C = Coefficient of curvature as defined in BS EN ISO 14688-2:2018

STRUCTURAL SOILS
18 Frogmore Road
Hemel Hempstead
Hertfordshire
HP3 9RT

Compiled By	Date
KATIE GIDDINGS	**07/04/22**

Contract: **Addison Park, Chiswell Green, St Albans**

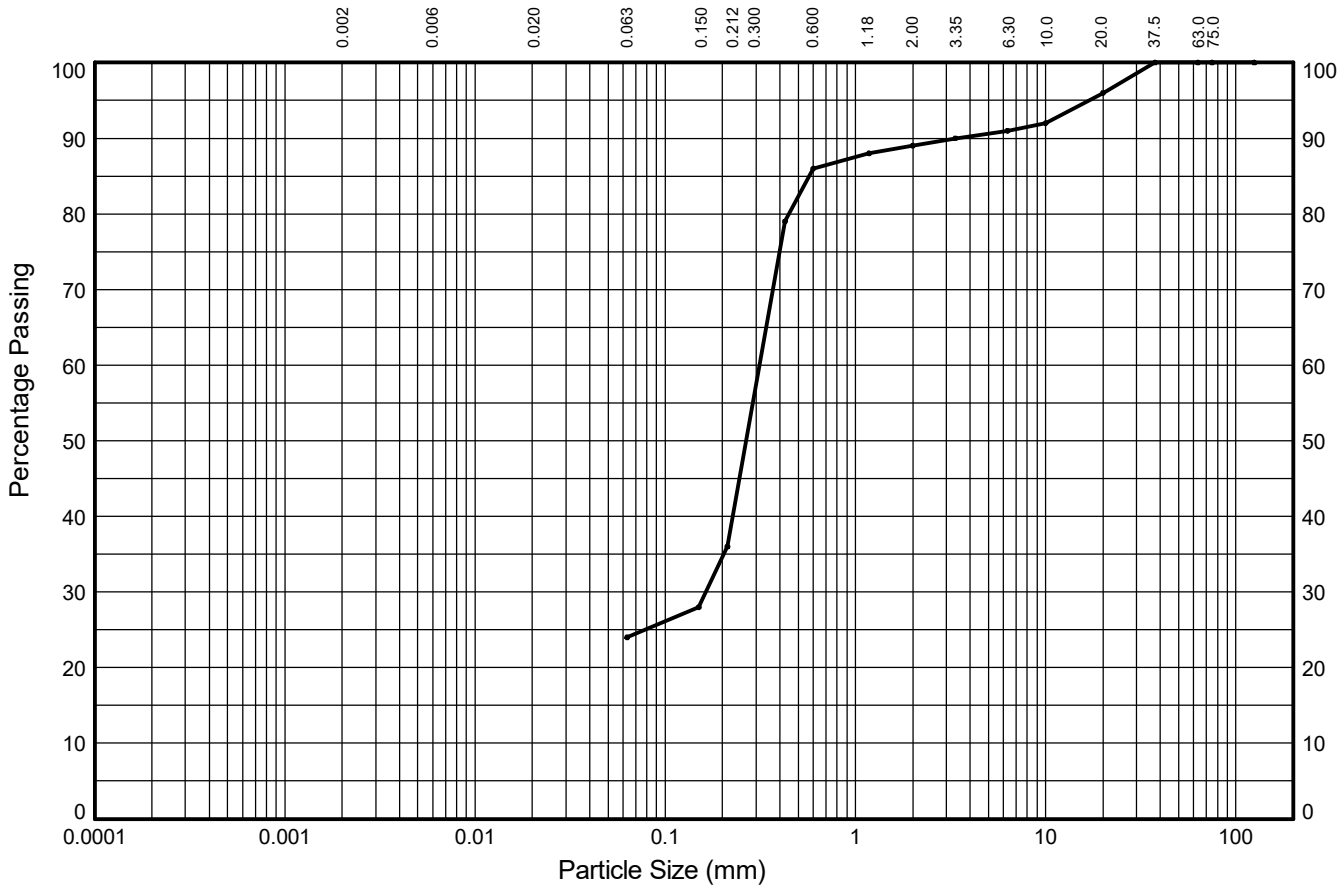
Contract Ref: **584798**

AGS

PARTICLE SIZE DISTRIBUTION TEST

In accordance with clauses 9.2 of BS1377:Part 2:1990

Borehole: **BH2** Sample Ref: **3** Sample Type: **B** Depth (m): **1.20**



CLAY	fine	medium	coarse	fine	medium	coarse	fine	medium	coarse	COBBLES
	-	-	-	10%	52%	3%	2%	5%	4%	
	SILT			SAND			GRAVEL			
24%				65%			11%			0%

Test Sieve (mm)	Percent Passing (%)
125.0	**100**
75.0	**100**
63.0	**100**
37.5	**100**
20.0	**96**
10.0	**92**
6.30	**91**
3.35	**90**
2.00	**89**
1.18	**88**
0.600	**86**
0.425	**79**
0.212	**36**
0.150	**28**
0.063	**24**

Particle Diameter (mm)	Percent Passing (%)

Sedimentation sample was not pre-treated

Coefficients	
D_{10} (mm)	**NA**
D_{15} (mm)	**NA**
D_{30} (mm)	**0.164**
D_{50} (mm)	**0.266**
D_{60} (mm)	**0.313**
D_{85} (mm)	**0.571**
D_{90} (mm)	**3.350**
C_U	**NA**
C_C	**NA**

Soil Description:

Orangish brown gravelly very clayey SAND

Key: C_U = Uniformity coefficient. C_C = Coefficient of curvature as defined in BS EN ISO 14688-2:2018

STRUCTURAL SOILS
18 Frogmore Road
Hemel Hempstead
Hertfordshire
HP3 9RT

Compiled By	Date
KATIE GIDDINGS	**07/04/22**

Contract: **Addison Park, Chiswell Green, St Albans**

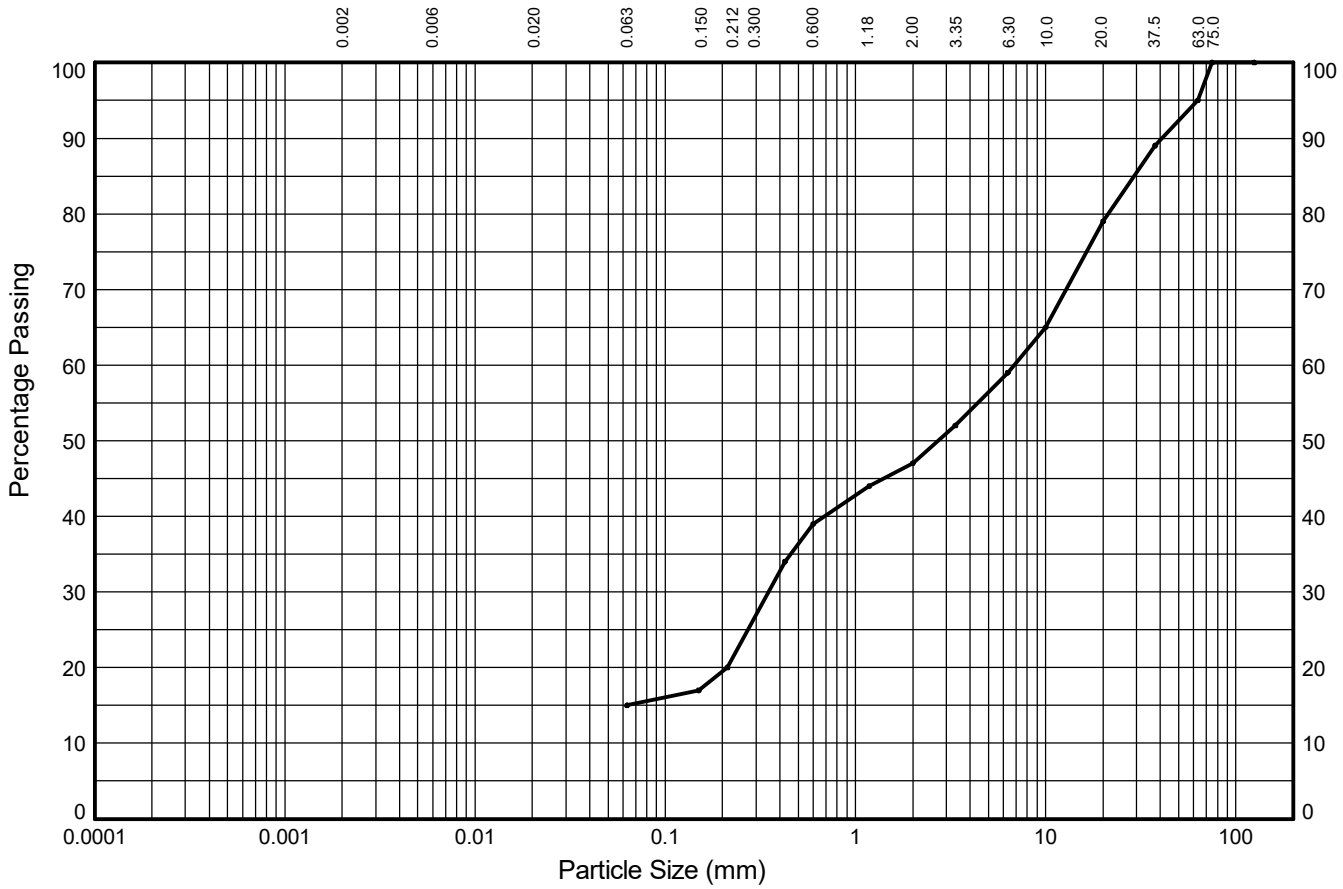
Contract Ref: **584798**

AGS

PARTICLE SIZE DISTRIBUTION TEST

In accordance with clauses 9.2 of BS1377:Part 2:1990

Borehole: **BH2** Sample Ref: **5** Sample Type: **B** Depth (m): **3.00**



CLAY	fine	medium	coarse	fine	medium	coarse	fine	medium	coarse	COBBLES
	-	-	-	4%	20%	8%	12%	20%	16%	
	SILT			SAND			GRAVEL			
15%				32%			48%			5%

Test Sieve (mm)	Percent Passing (%)
125.0	**100**
75.0	**100**
63.0	**95**
37.5	**89**
20.0	**79**
10.0	**65**
6.30	**59**
3.35	**52**
2.00	**47**
1.18	**44**
0.600	**39**
0.425	**34**
0.212	**20**
0.150	**17**
0.063	**15**

Particle Diameter (mm)	Percent Passing (%)

Sedimentation sample was not pre-treated

Coefficients	
D_{10} (mm)	**NA**
D_{15} (mm)	**0.063**
D_{30} (mm)	**0.348**
D_{50} (mm)	**2.725**
D_{60} (mm)	**6.804**
D_{85} (mm)	**29.163**
D_{90} (mm)	**40.887**
C_U	**NA**
C_C	**NA**

Soil Description:

Orangish brown slightly very sandy clayey GRAVEL with low cobble content

Key: C_U = Uniformity coefficient. C_C = Coefficient of curvature as defined in BS EN ISO 14688-2:2018

STRUCTURAL SOILS
18 Frogmore Road
Hemel Hempstead
Hertfordshire
HP3 9RT

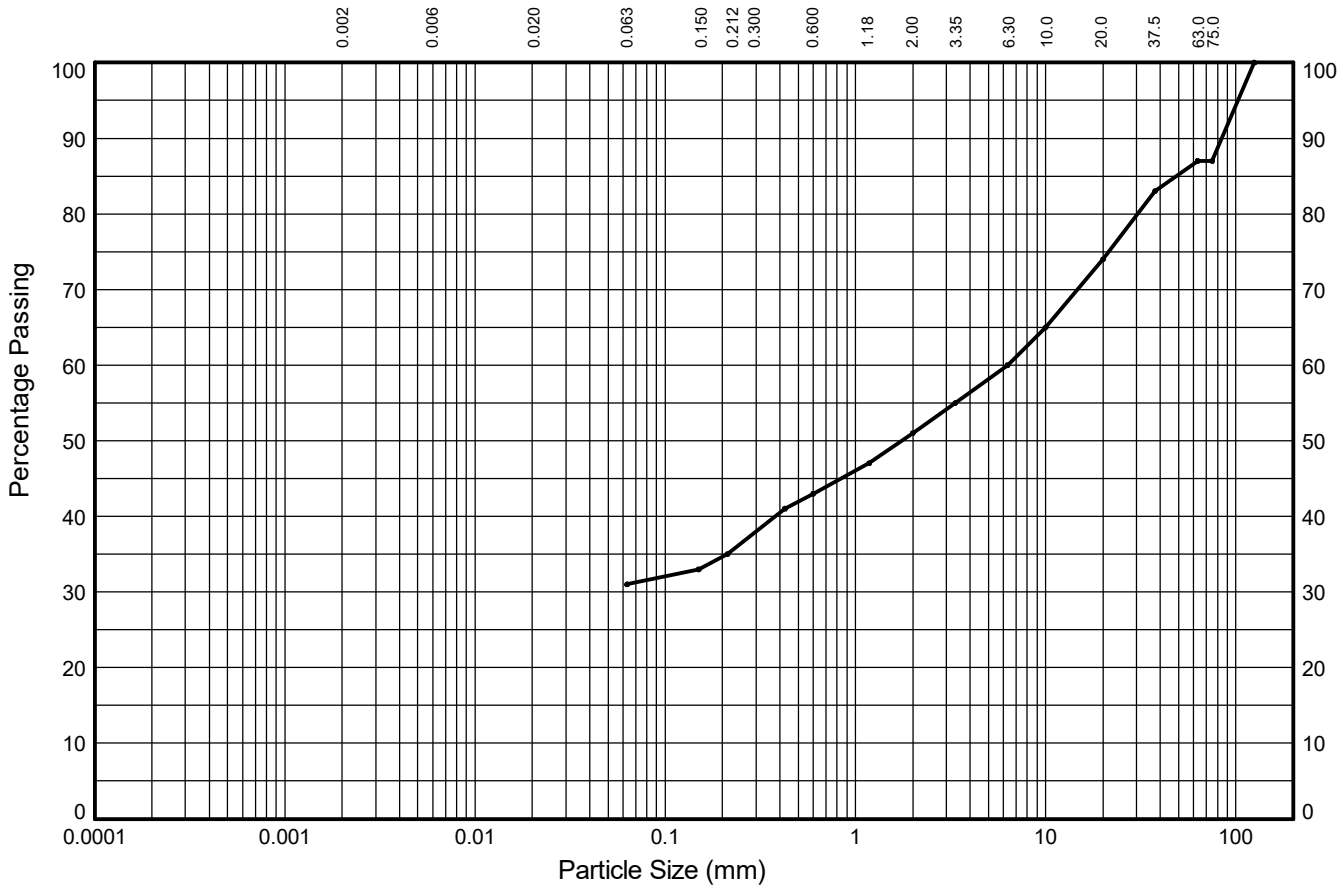
Compiled By	Date
KATIE GIDDINGS	**07/04/22**

Contract	Contract Ref:
Addison Park, Chiswell Green, St Albans	**584798**

PARTICLE SIZE DISTRIBUTION TEST

In accordance with clauses 9.2 of BS1377:Part 2:1990

Borehole: **BH2** Sample Ref: **7** Sample Type: **B** Depth (m): **4.50**



CLAY	fine	medium	coarse	fine	medium	coarse	fine	medium	coarse	COBBLES
	-	-	-	4%	9%	8%	9%	14%	13%	
	SILT			SAND			GRAVEL			
31%				20%			36%			13%

Test Sieve (mm)	Percent Passing (%)
125.0	**100**
75.0	**87**
63.0	**87**
37.5	**83**
20.0	**74**
10.0	**65**
6.30	**60**
3.35	**55**
2.00	**51**
1.18	**47**
0.600	**43**
0.425	**41**
0.212	**35**
0.150	**33**
0.063	**31**

Particle Diameter (mm)	Percent Passing (%)

Sedimentation sample was not pre-treated

Coefficients	
D_{10} (mm)	**NA**
D_{15} (mm)	**NA**
D_{30} (mm)	**NA**
D_{50} (mm)	**1.753**
D_{60} (mm)	**6.300**
D_{85} (mm)	**48.606**
D_{90} (mm)	**84.383**
C_U	**NA**
C_C	**NA**

Soil Description:

Orangish brown mottled very dark grey sandy very clayey GRAVEL with medium cobble content

Key: C_U = Uniformity coefficient. C_C = Coefficient of curvature as defined in BS EN ISO 14688-2:2018

STRUCTURAL SOILS
18 Frogmore Road
Hemel Hempstead
Hertfordshire
HP3 9RT

Compiled By	Date
KATIE GIDDINGS	**07/04/22**

Contract: **Addison Park, Chiswell Green, St Albans**

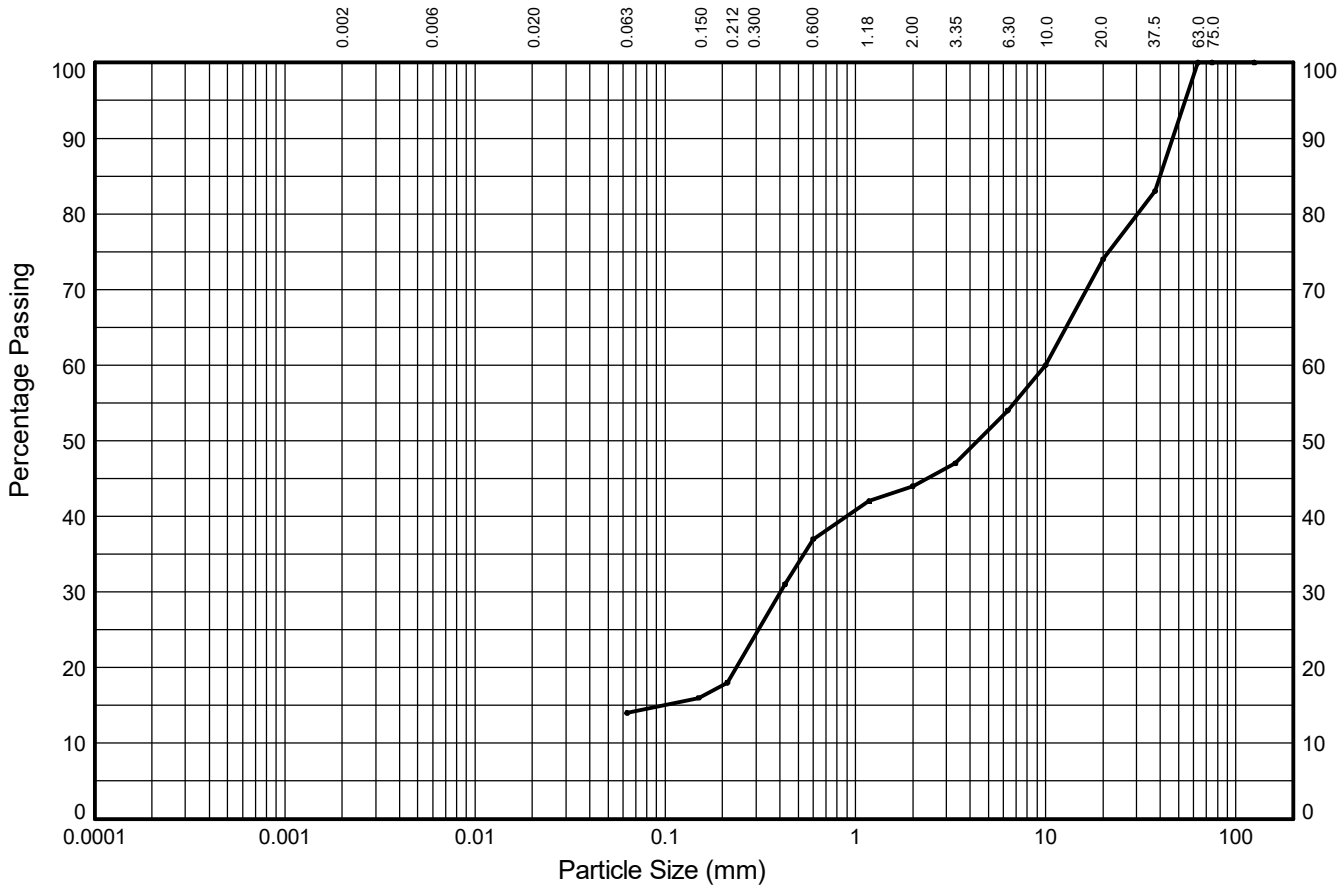
Contract Ref: **584798**

AGS

PARTICLE SIZE DISTRIBUTION TEST

In accordance with clauses 9.2 of BS1377:Part 2:1990

Borehole: **BH3** Sample Ref: **2** Sample Type: **B** Depth (m): **1.20**



CLAY	fine	medium	coarse	fine	medium	coarse	fine	medium	coarse	COBBLES
	-	-	-	4%	20%	7%	10%	20%	26%	
	SILT			SAND			GRAVEL			
14%				30%			56%			0%

Test Sieve (mm)	Percent Passing (%)
125.0	**100**
75.0	**100**
63.0	**100**
37.5	**83**
20.0	**74**
10.0	**60**
6.30	**54**
3.35	**47**
2.00	**44**
1.18	**42**
0.600	**37**
0.425	**31**
0.212	**18**
0.150	**16**
0.063	**14**

Particle Diameter (mm)	Percent Passing (%)

Sedimentation sample was not pre-treated

Coefficients	
D_{10} (mm)	**NA**
D_{15} (mm)	**0.097**
D_{30} (mm)	**0.403**
D_{50} (mm)	**4.391**
D_{60} (mm)	**10.000**
D_{85} (mm)	**39.860**
D_{90} (mm)	**46.431**
C_U	**NA**
C_C	**NA**

Soil Description:

Orangish brown very sandy clayey GRAVEL

Key: C_U = Uniformity coefficient. C_C = Coefficient of curvature as defined in BS EN ISO 14688-2:2018

STRUCTURAL SOILS
18 Frogmore Road
Hemel Hempstead
Hertfordshire
HP3 9RT

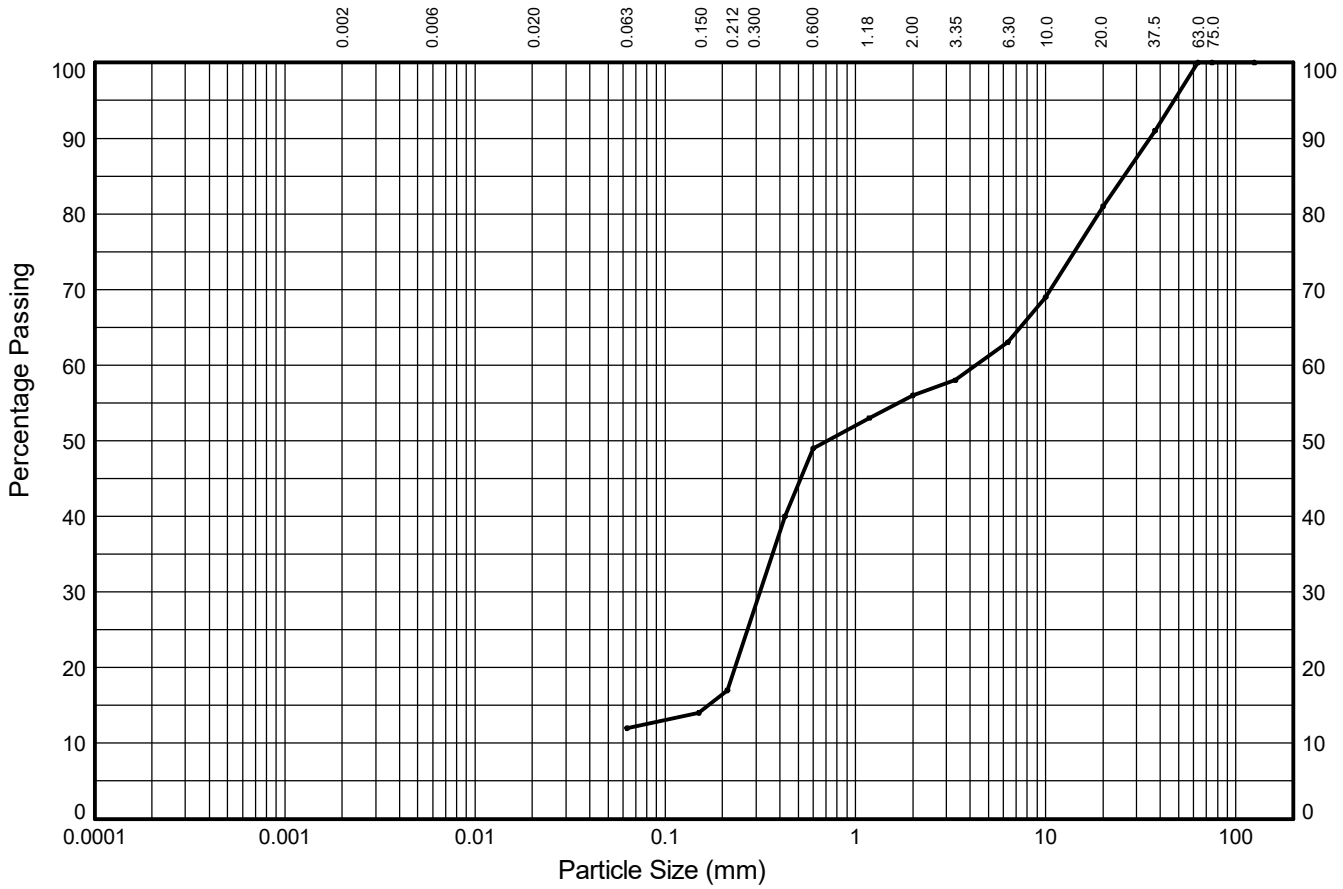
Compiled By	Date
KATIE GIDDINGS	**07/04/22**

Contract	Contract Ref:
Addison Park, Chiswell Green, St Albans	**584798**

PARTICLE SIZE DISTRIBUTION TEST

In accordance with clauses 9.2 of BS1377:Part 2:1990

Borehole: **BH3** Sample Ref: **3** Sample Type: **B** Depth (m): **2.00**



CLAY	fine	medium	coarse	fine	medium	coarse	fine	medium	coarse	COBBLES
	-	-	-	4%	33%	7%	7%	18%	19%	
	SILT			SAND			GRAVEL			
12%				44%			44%			0%

Test Sieve (mm)	Percent Passing (%)
125.0	**100**
75.0	**100**
63.0	**100**
37.5	**91**
20.0	**81**
10.0	**69**
6.30	**63**
3.35	**58**
2.00	**56**
1.18	**53**
0.600	**49**
0.425	**40**
0.212	**17**
0.150	**14**
0.063	**12**

Particle Diameter (mm)	Percent Passing (%)

Sedimentation sample was not pre-treated

Coefficients	
D_{10} (mm)	**NA**
D_{15} (mm)	**0.168**
D_{30} (mm)	**0.314**
D_{50} (mm)	**0.711**
D_{60} (mm)	**4.313**
D_{85} (mm)	**25.718**
D_{90} (mm)	**35.215**
C_U	**NA**
C_C	**NA**

Soil Description:

Orangish brown clayey GRAVEL/SAND

Key: C_U = Uniformity coefficient. C_C = Coefficient of curvature as defined in BS EN ISO 14688-2:2018

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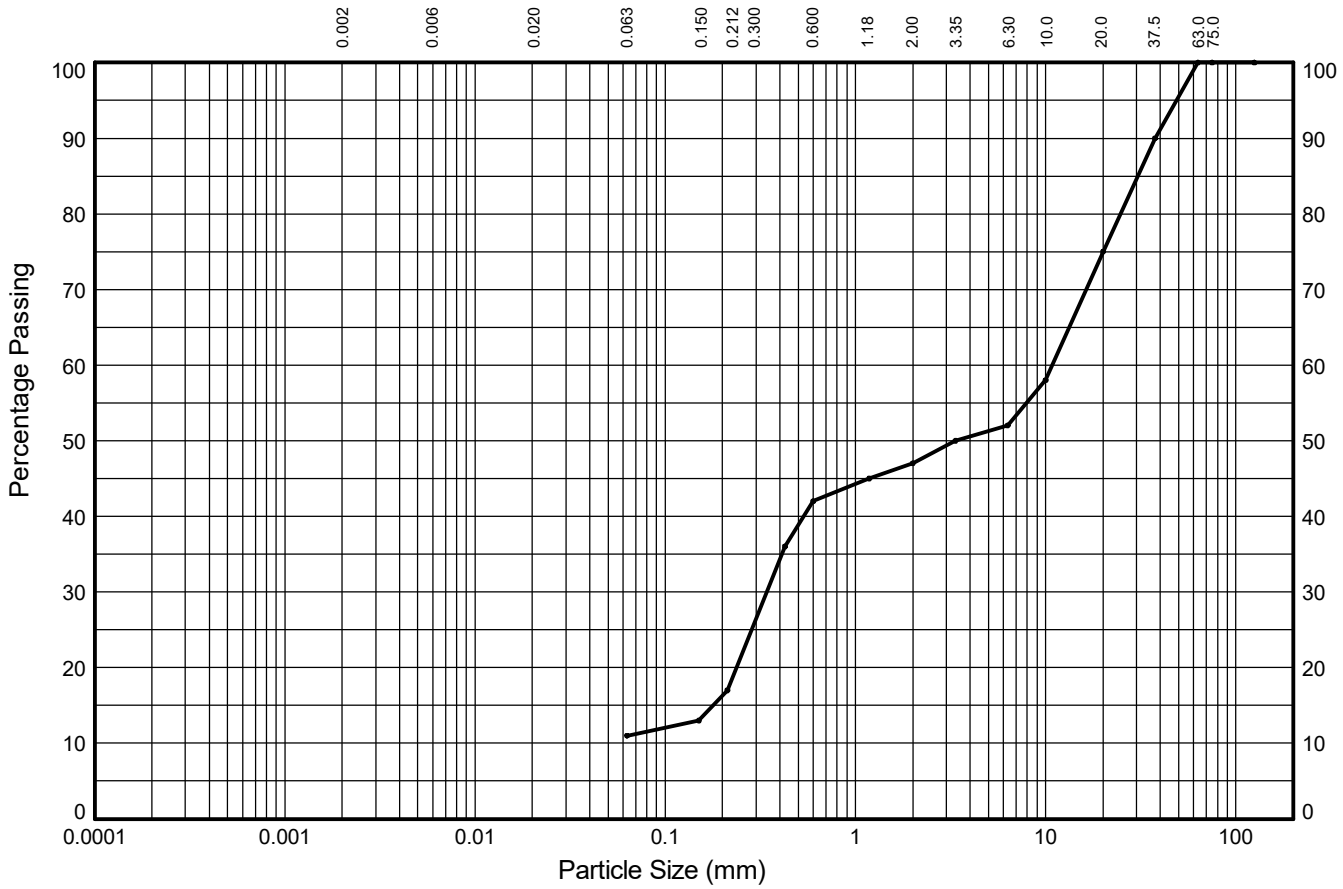
PARTICLE SIZE DISTRIBUTION TEST

In accordance with clauses 9.2 of BS1377:Part 2:1990

Borehole: **BH3** Sample Ref: **5** Sample Type: **B** Depth (m): **3.00**



CLAY	fine	medium	coarse	fine	medium	coarse	fine	medium	coarse	COBBLES
	-	-	-	5%	26%	5%	5%	23%	25%	
	SILT			SAND			GRAVEL			
11%				36%			53%			0%

Test Sieve (mm)	Percent Passing (%)
125.0	**100**
75.0	**100**
63.0	**100**
37.5	**90**
20.0	**75**
10.0	**58**
6.30	**52**
3.35	**50**
2.00	**47**
1.18	**45**
0.600	**42**
0.425	**36**
0.212	**17**
0.150	**13**
0.063	**11**

Particle Diameter (mm)	Percent Passing (%)

Sedimentation sample was not pre-treated

Coefficients	
D_{10} (mm)	**NA**
D_{15} (mm)	**0.178**
D_{30} (mm)	**0.341**
D_{50} (mm)	**3.350**
D_{60} (mm)	**10.850**
D_{85} (mm)	**30.411**
D_{90} (mm)	**37.500**
C_U	**NA**
C_C	**NA**

Soil Description:

Orangish brown very sandy clayey GRAVEL

Key: C_U = Uniformity coefficient. C_C = Coefficient of curvature as defined in BS EN ISO 14688-2:2018

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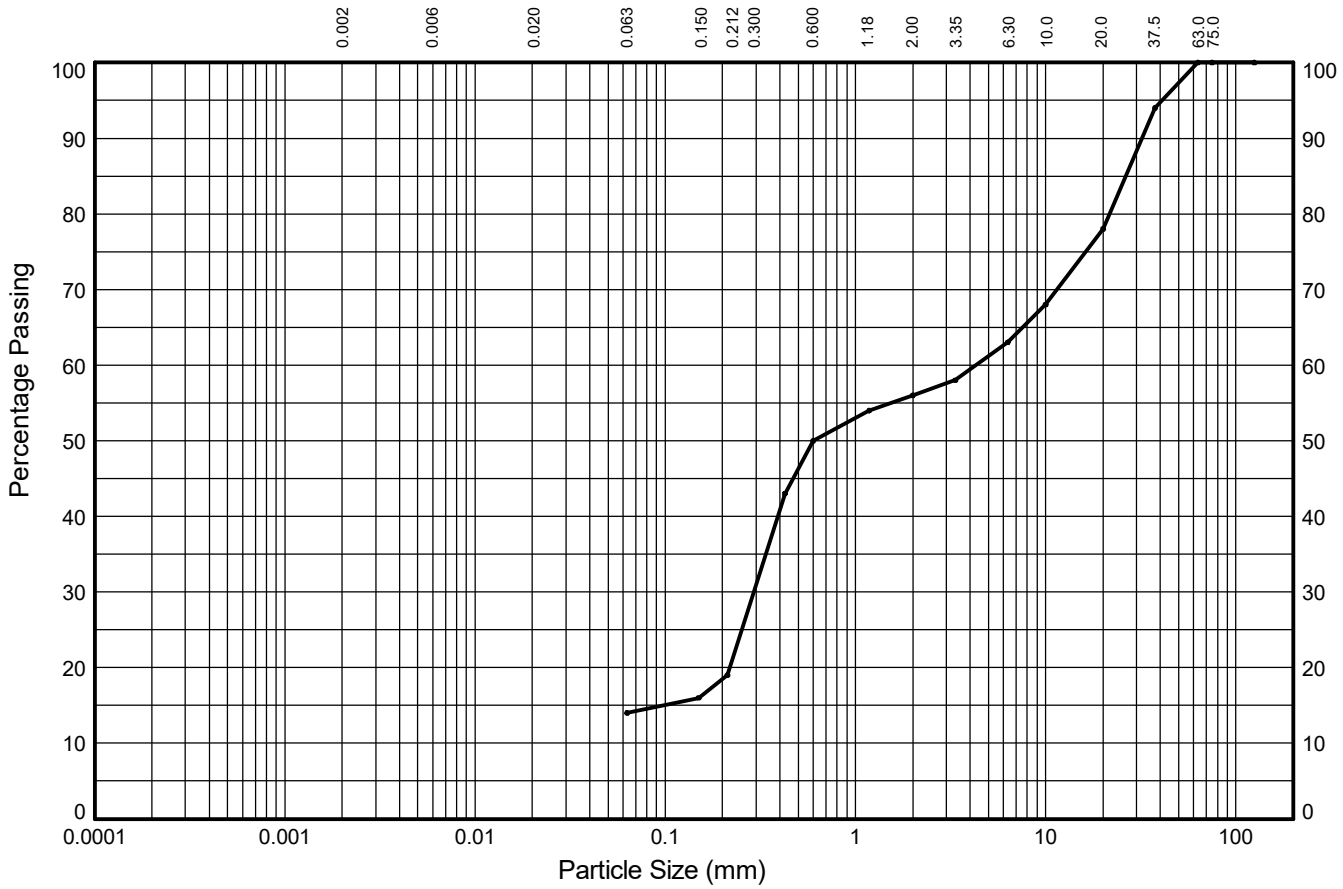
PARTICLE SIZE DISTRIBUTION TEST

In accordance with clauses 9.2 of BS1377:Part 2:1990

Borehole: **BH4** Sample Ref: **2** Sample Type: **B** Depth (m): **1.20**



CLAY	fine	medium	coarse	fine	medium	coarse	fine	medium	coarse	COBBLES
	-	-	-	4%	32%	6%	7%	15%	22%	
	SILT			SAND			GRAVEL			
14%				42%			44%			0%

Test Sieve (mm)	Percent Passing (%)
125.0	**100**
75.0	**100**
63.0	**100**
37.5	**94**
20.0	**78**
10.0	**68**
6.30	**63**
3.35	**58**
2.00	**56**
1.18	**54**
0.600	**50**
0.425	**43**
0.212	**19**
0.150	**16**
0.063	**14**

Particle Diameter (mm)	Percent Passing (%)

Sedimentation sample was not pre-treated

Coefficients	
D_{10} (mm)	**NA**
D_{15} (mm)	**0.097**
D_{30} (mm)	**0.292**
D_{50} (mm)	**0.600**
D_{60} (mm)	**4.313**
D_{85} (mm)	**26.331**
D_{90} (mm)	**32.047**
C_U	**NA**
C_C	**NA**

Soil Description:

Orangish brown very sandy clayey GRAVEL

Key: C_U = Uniformity coefficient. C_C = Coefficient of curvature as defined in BS EN ISO 14688-2:2018

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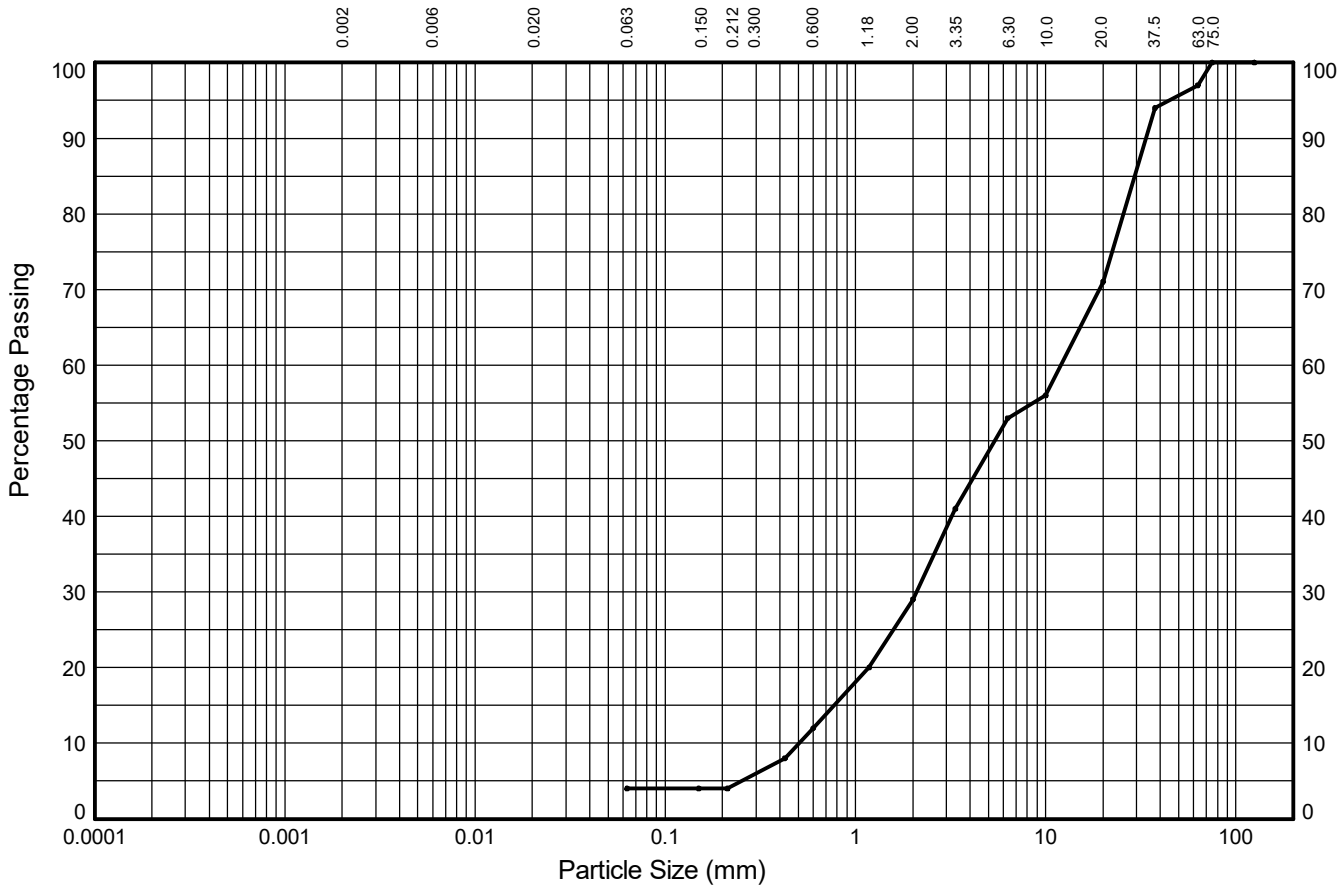
PARTICLE SIZE DISTRIBUTION TEST

In accordance with clauses 9.2 of BS1377:Part 2:1990

Borehole: **BH4** Sample Ref: **4** Sample Type: **B** Depth (m): **2.50**



CLAY	fine	medium	coarse	fine	medium	coarse	fine	medium	coarse	COBBLES
	-	-	-	0%	8%	17%	24%	18%	26%	
	SILT			SAND			GRAVEL			
4%				25%			68%			3%

Test Sieve (mm)	Percent Passing (%)
125.0	**100**
75.0	**100**
63.0	**97**
37.5	**94**
20.0	**71**
10.0	**56**
6.30	**53**
3.35	**41**
2.00	**29**
1.18	**20**
0.600	**12**
0.425	**8**
0.212	**4**
0.150	**4**
0.063	**4**

Particle Diameter (mm)	Percent Passing (%)

Sedimentation sample was not pre-treated

Coefficients	
D_{10} (mm)	**0.505**
D_{15} (mm)	**0.773**
D_{30} (mm)	**2.088**
D_{50} (mm)	**5.380**
D_{60} (mm)	**12.030**
D_{85} (mm)	**29.323**
D_{90} (mm)	**33.617**
C_U	**24**
C_C	**0.72**

Soil Description:

Orangish brown very sandy slightly clayey GRAVEL with low cobble content

Key: C_U = Uniformity coefficient. C_C = Coefficient of curvature as defined in BS EN ISO 14688-2:2018

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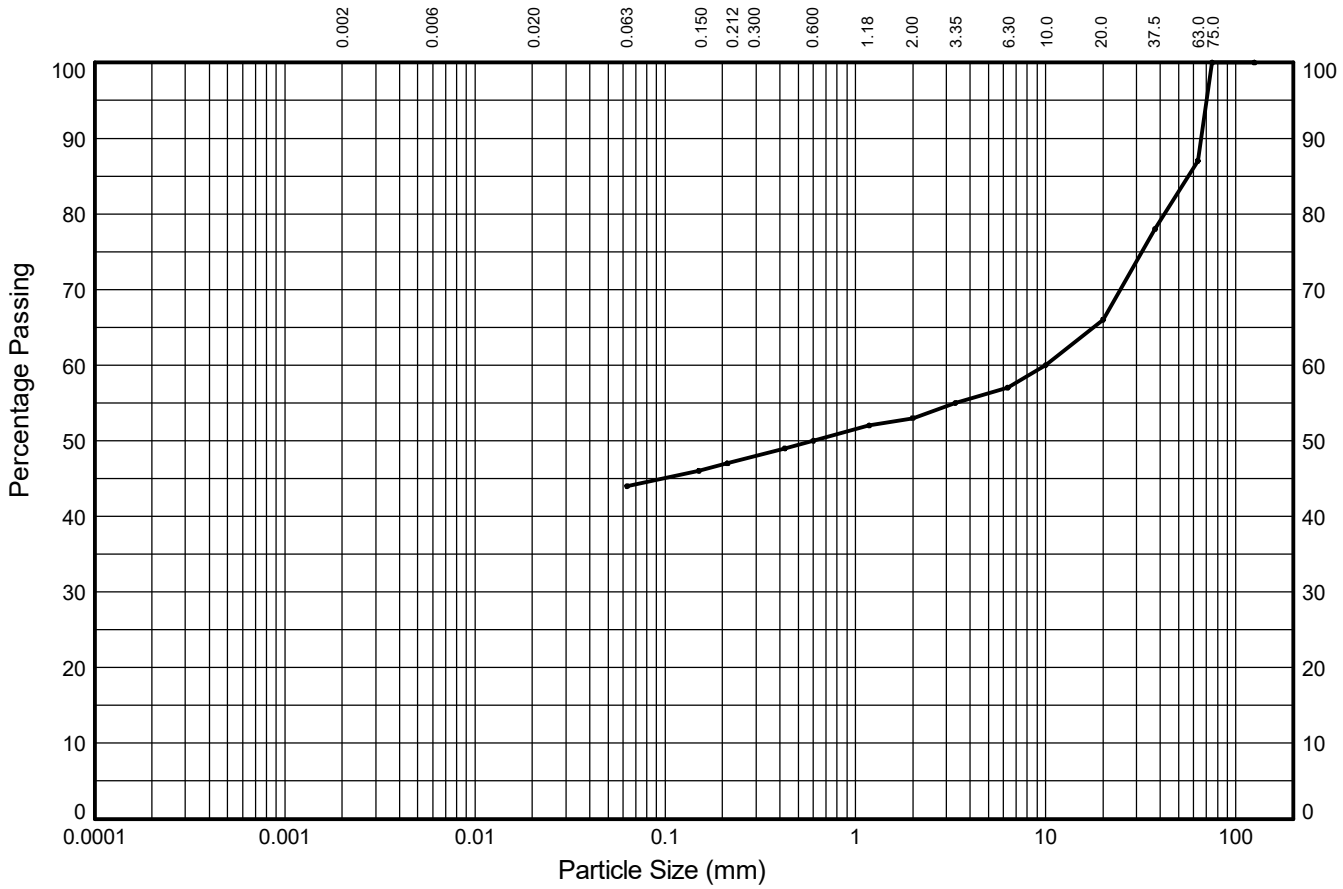
PARTICLE SIZE DISTRIBUTION TEST

In accordance with clauses 9.2 of BS1377:Part 2:1990
NON-STANDARD TEST

Borehole: **BH4** Sample Ref: **6** Sample Type: **B** Depth (m): **4.00**



CLAY										
	fine	medium	coarse	fine	medium	coarse	fine	medium	coarse	COBBLES
	-	-	-	3%	3%	3%	4%	9%	21%	
	SILT			SAND			GRAVEL			
44%				9%			34%			13%

Test Sieve (mm)	Percent Passing (%)
125.0	**100**
75.0	**100**
63.0	**87**
37.5	**78**
20.0	**66**
10.0	**60**
6.30	**57**
3.35	**55**
2.00	**53**
1.18	**52**
0.600	**50**
0.425	**49**
0.212	**47**
0.150	**46**
0.063	**44**

Particle Diameter (mm)	Percent Passing (%)

Sedimentation sample was not pre-treated

Coefficients	
D_{10} (mm)	**NA**
D_{15} (mm)	**NA**
D_{30} (mm)	**NA**
D_{50} (mm)	**0.600**
D_{60} (mm)	**10.000**
D_{85} (mm)	**56.140**
D_{90} (mm)	**65.587**
C_U	**NA**
C_C	**NA**

Soil Description:

Dark brown mottled dark grey and light orangish brown slightly sandy gravelly CLAY with low cobble content. Non standard due to insufficient matieral

Key: C_U = Uniformity coefficient. C_C = Coefficient of curvature as defined in BS EN ISO 14688-2:2018

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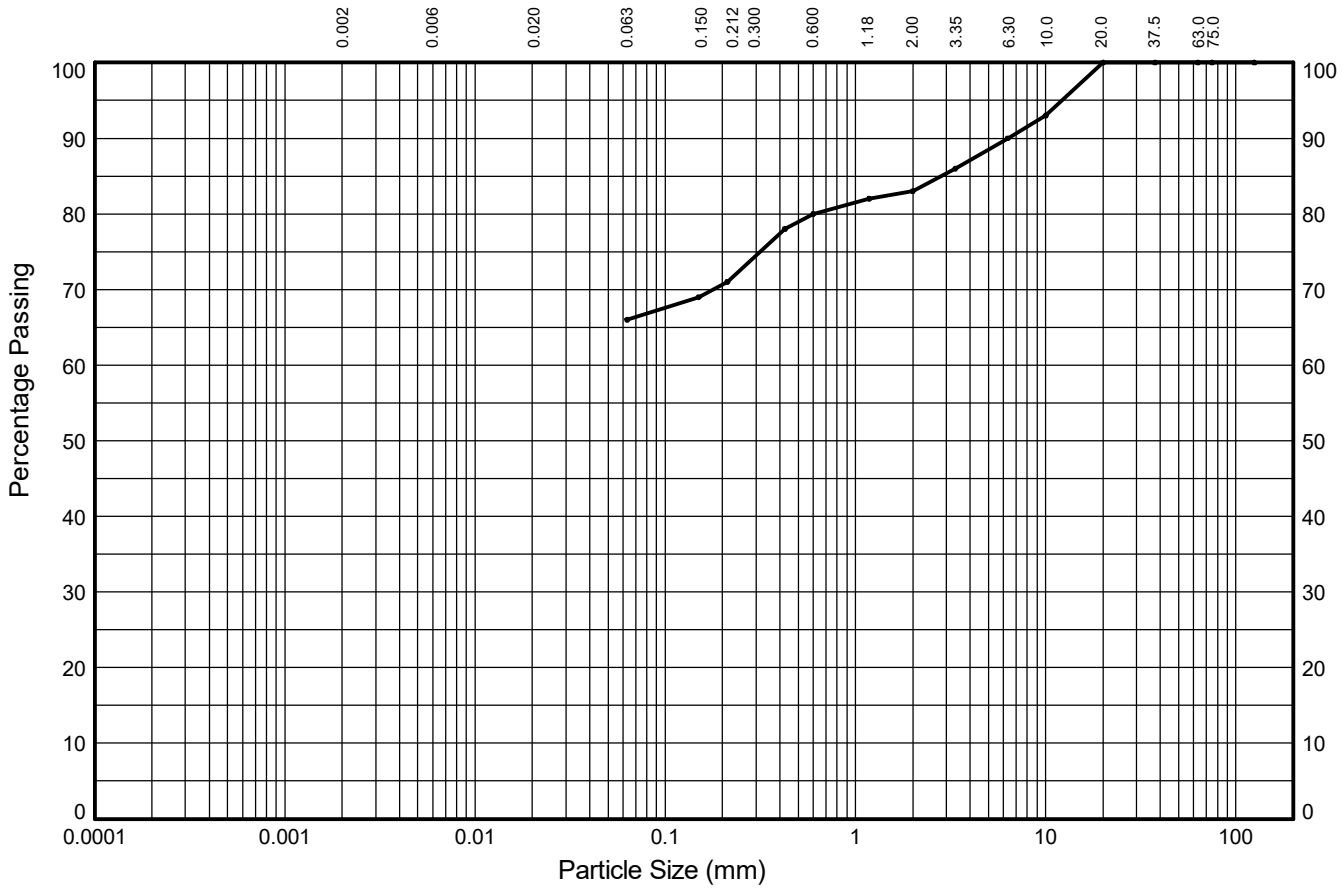
PARTICLE SIZE DISTRIBUTION TEST

In accordance with clauses 9.2 of BS1377:Part 2:1990

Borehole: **BH5** Sample Ref: **2** Sample Type: **B** Depth (m): **0.50**



CLAY	fine	medium	coarse	fine	medium	coarse	fine	medium	coarse	COBBLES
	-	-	-	5%	9%	3%	7%	10%	0%	
	SILT			SAND			GRAVEL			
66%				17%			17%			0%

Test Sieve (mm)	Percent Passing (%)
125.0	**100**
75.0	**100**
63.0	**100**
37.5	**100**
20.0	**100**
10.0	**93**
6.30	**90**
3.35	**86**
2.00	**83**
1.18	**82**
0.600	**80**
0.425	**78**
0.212	**71**
0.150	**69**
0.063	**66**

Particle Diameter (mm)	Percent Passing (%)

Sedimentation sample was not pre-treated

Coefficients	
D_{10} (mm)	**NA**
D_{15} (mm)	**NA**
D_{30} (mm)	**NA**
D_{50} (mm)	**NA**
D_{60} (mm)	**NA**
D_{85} (mm)	**2.821**
D_{90} (mm)	**6.300**
C_U	**NA**
C_C	**NA**

Soil Description:

Brown mottled dark greyish brown slightly gravelly slightly sandy CLAY

Key: C_U = Uniformity coefficient. C_C = Coefficient of curvature as defined in BS EN ISO 14688-2:2018

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PARTICLE SIZE DISTRIBUTION TEST

In accordance with clauses 9.2 of BS1377:Part 2:1990

Borehole: **BH5** Sample Ref: **4** Sample Type: **B** Depth (m): **2.40**

CLAY	fine	medium	coarse	fine	medium	coarse	fine	medium	coarse	COBBLES
	-	-	-	33%	50%	1%	1%	1%	0%	
	SILT			SAND			GRAVEL			
15%				83%			2%			0%

Test Sieve (mm)	Percent Passing (%)
125.0	**100**
75.0	**100**
63.0	**100**
37.5	**100**
20.0	**100**
10.0	**99**
6.30	**99**
3.35	**99**
2.00	**98**
1.18	**98**
0.600	**97**
0.425	**94**
0.212	**52**
0.150	**29**
0.063	**15**

Particle Diameter (mm)	Percent Passing (%)

Sedimentation sample was not pre-treated

Coefficients	
D_{10} (mm)	**NA**
D_{15} (mm)	**0.063**
D_{30} (mm)	**0.152**
D_{50} (mm)	**0.206**
D_{60} (mm)	**0.242**
D_{85} (mm)	**0.366**
D_{90} (mm)	**0.398**
C_U	**NA**
C_C	**NA**

Soil Description:

Orangish brown slightly gravelly clayey SAND

Key: C_U = Uniformity coefficient. C_C = Coefficient of curvature as defined in BS EN ISO 14688-2:2018

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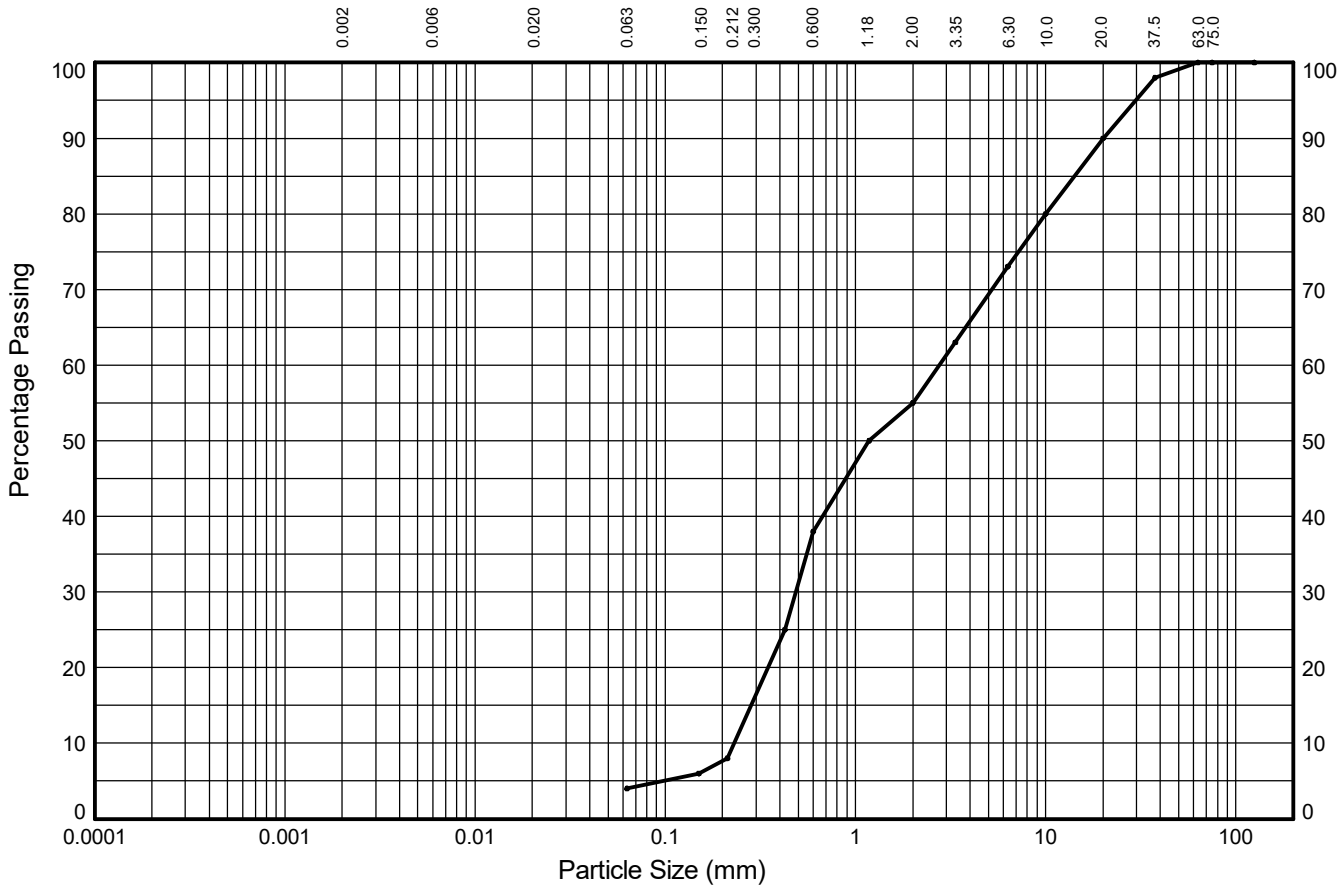
PARTICLE SIZE DISTRIBUTION TEST

In accordance with clauses 9.2 of BS1377:Part 2:1990

Borehole: **BH5** Sample Ref: **6** Sample Type: **B** Depth (m): **3.00**



	fine	medium	coarse	fine	medium	coarse	fine	medium	coarse	
CLAY	-	-	-	4%	31%	16%	18%	17%	10%	COBBLES
	SILT			SAND			GRAVEL			
4%				51%			45%			0%

Test Sieve (mm)	Percent Passing (%)
125.0	**100**
75.0	**100**
63.0	**100**
37.5	**98**
20.0	**90**
10.0	**80**
6.30	**73**
3.35	**63**
2.00	**55**
1.18	**50**
0.600	**38**
0.425	**25**
0.212	**8**
0.150	**6**
0.063	**4**

Particle Diameter (mm)	Percent Passing (%)

Sedimentation sample was not pre-treated

Coefficients	
D_{10} (mm)	**0.230**
D_{15} (mm)	**0.282**
D_{30} (mm)	**0.485**
D_{50} (mm)	**1.180**
D_{60} (mm)	**2.761**
D_{85} (mm)	**14.142**
D_{90} (mm)	**20.000**
C_U	**12**
C_C	**0.37**

Soil Description:

Orangish brown very gravelly slightly clayey SAND

Key: C_U = Uniformity coefficient. C_C = Coefficient of curvature as defined in BS EN ISO 14688-2:2018

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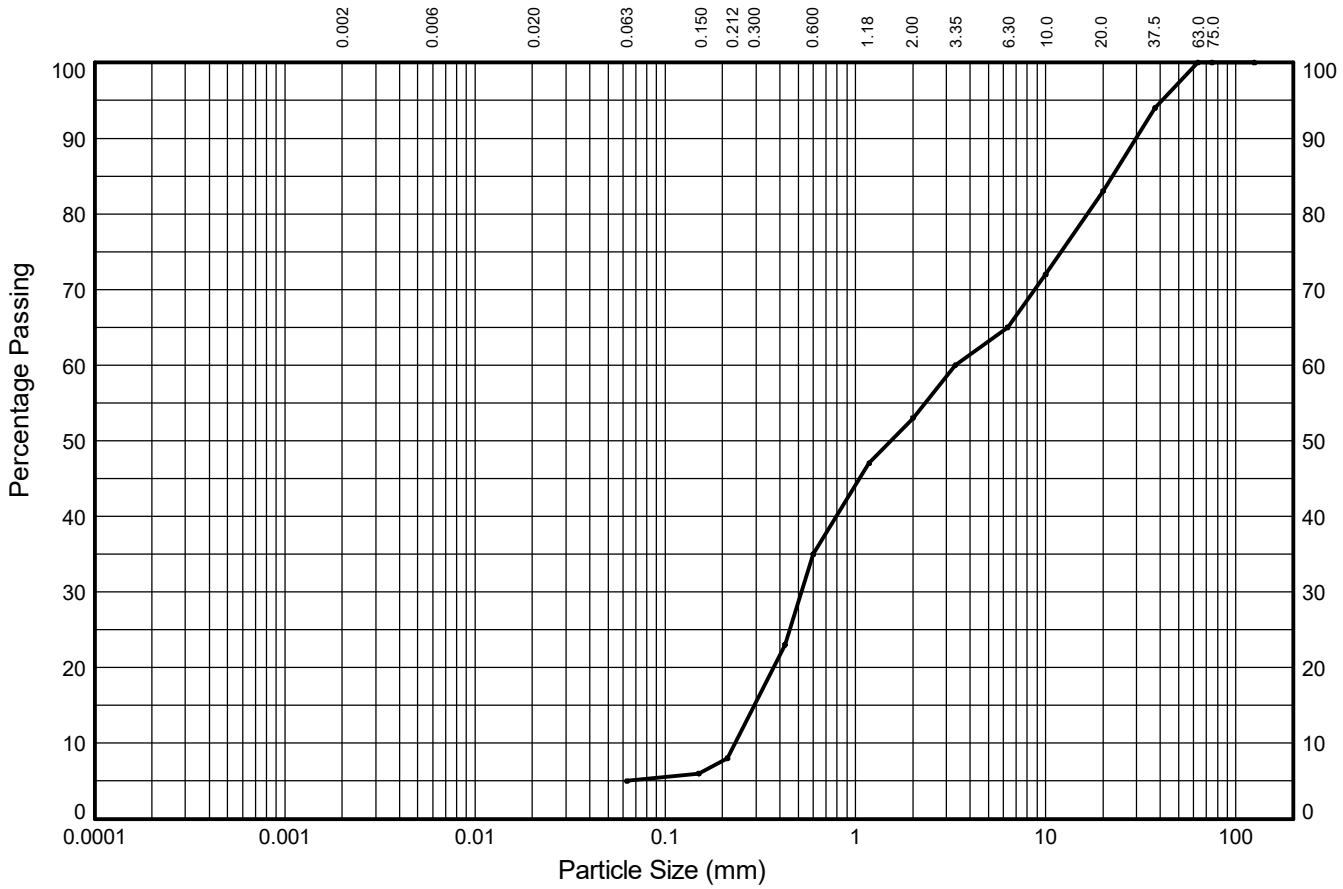
PARTICLE SIZE DISTRIBUTION TEST

In accordance with clauses 9.2 of BS1377:Part 2:1990

Borehole: **BH5** Sample Ref: **7** Sample Type: **B** Depth (m): **4.00**



CLAY	fine	medium	coarse	fine	medium	coarse	fine	medium	coarse	COBBLES
	-	-	-	3%	28%	17%	12%	18%	17%	
	SILT			SAND			GRAVEL			
5%				48%			47%			0%

Test Sieve (mm)	Percent Passing (%)
125.0	**100**
75.0	**100**
63.0	**100**
37.5	**94**
20.0	**83**
10.0	**72**
6.30	**65**
3.35	**60**
2.00	**53**
1.18	**47**
0.600	**35**
0.425	**23**
0.212	**8**
0.150	**6**
0.063	**5**

Particle Diameter (mm)	Percent Passing (%)

Sedimentation sample was not pre-treated

Coefficients	
D_{10} (mm)	**0.233**
D_{15} (mm)	**0.293**
D_{30} (mm)	**0.520**
D_{50} (mm)	**1.536**
D_{60} (mm)	**3.350**
D_{85} (mm)	**22.422**
D_{90} (mm)	**29.837**
C_U	**14**
C_C	**0.35**

Soil Description:

Orangish brown very gravelly slightly clayey SAND

Key: C_U = Uniformity coefficient. C_C = Coefficient of curvature as defined in BS EN ISO 14688-2:2018

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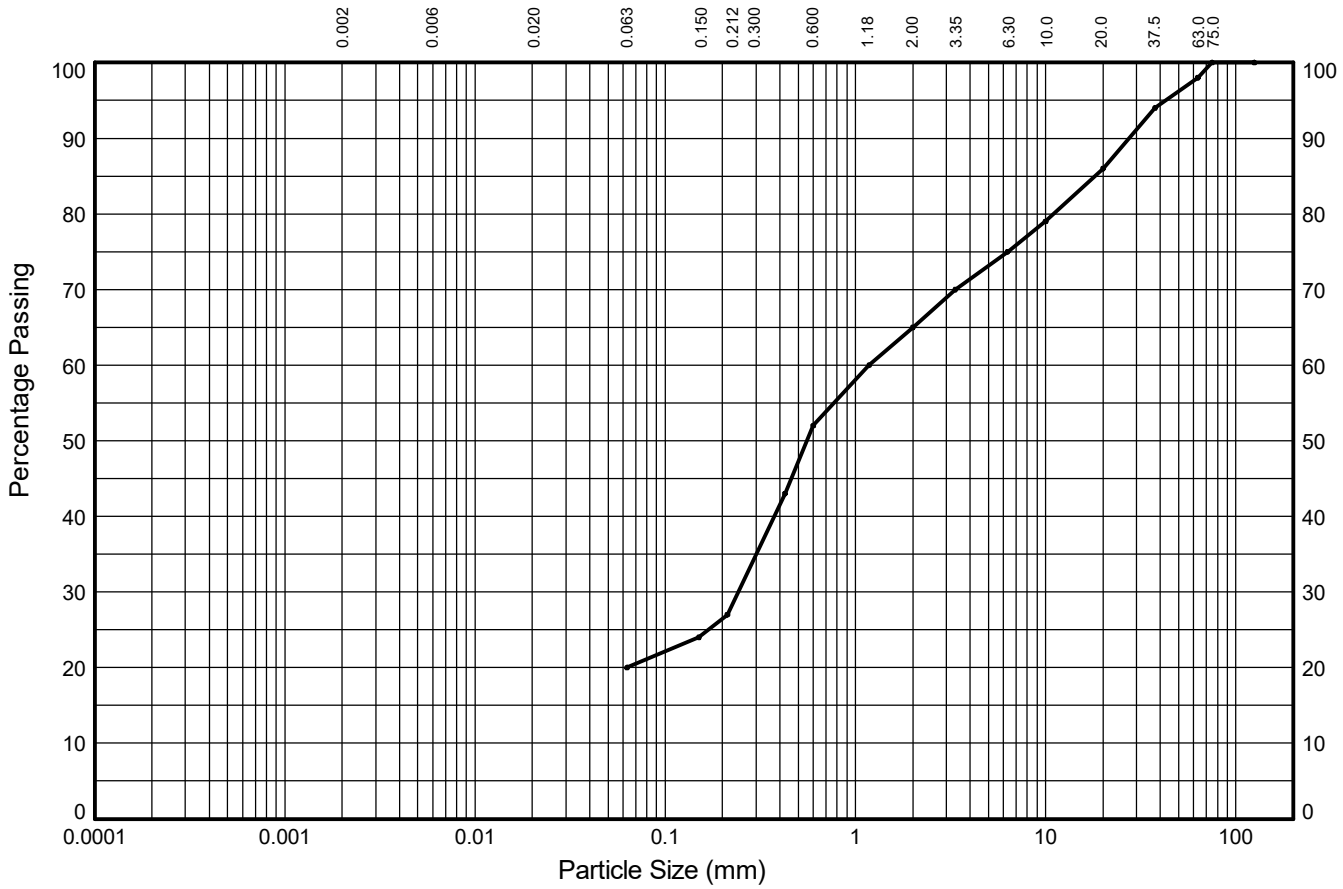
PARTICLE SIZE DISTRIBUTION TEST

In accordance with clauses 9.2 of BS1377:Part 2:1990

Borehole: **BH5** Sample Ref: **8** Sample Type: **B** Depth (m): **5.00**



CLAY	fine	medium	coarse	fine	medium	coarse	fine	medium	coarse	COBBLES
	-	-	-	6%	26%	13%	10%	11%	12%	
	SILT			SAND			GRAVEL			
20%				45%			33%			2%

Test Sieve (mm)	Percent Passing (%)
125.0	**100**
75.0	**100**
63.0	**98**
37.5	**94**
20.0	**86**
10.0	**79**
6.30	**75**
3.35	**70**
2.00	**65**
1.18	**60**
0.600	**52**
0.425	**43**
0.212	**27**
0.150	**24**
0.063	**20**

Particle Diameter (mm)	Percent Passing (%)

Sedimentation sample was not pre-treated

Coefficients	
D_{10} (mm)	**NA**
D_{15} (mm)	**NA**
D_{30} (mm)	**0.242**
D_{50} (mm)	**0.556**
D_{60} (mm)	**1.180**
D_{85} (mm)	**18.114**
D_{90} (mm)	**27.386**
C_U	**NA**
C_C	**NA**

Soil Description:

Brown very gravelly clayey SAND with a low cobble content

Key: C_U = Uniformity coefficient. C_C = Coefficient of curvature as defined in BS EN ISO 14688-2:2018

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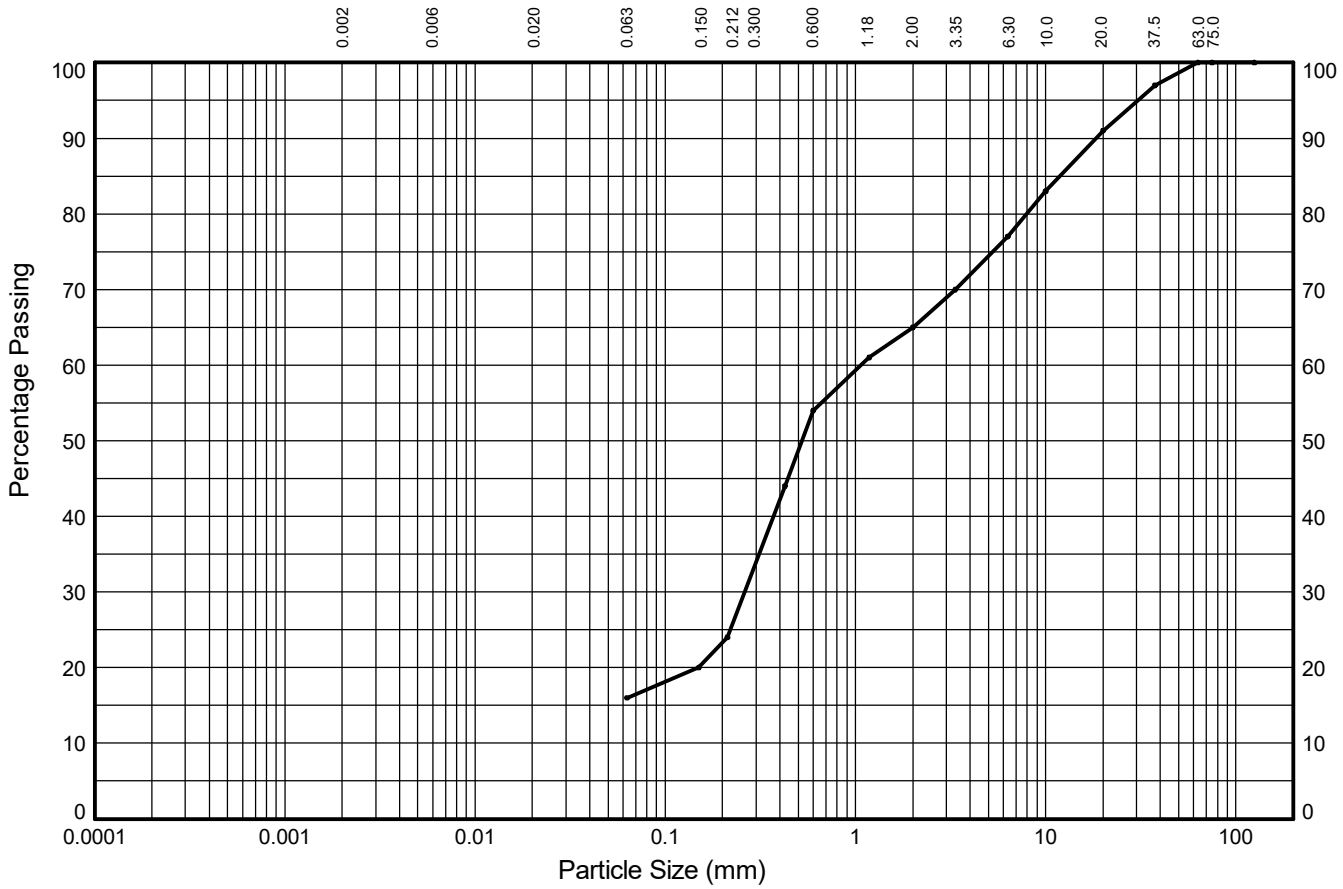
PARTICLE SIZE DISTRIBUTION TEST

In accordance with clauses 9.2 of BS1377:Part 2:1990

Borehole: **BH5** Sample Ref: **10** Sample Type: **B** Depth (m): **7.00**



CLAY	fine	medium	coarse	fine	medium	coarse	fine	medium	coarse	COBBLES
	-	-	-	7%	31%	11%	12%	14%	9%	
	SILT			SAND			GRAVEL			
16%				49%			35%			0%

Test Sieve (mm)	Percent Passing (%)
125.0	**100**
75.0	**100**
63.0	**100**
37.5	**97**
20.0	**91**
10.0	**83**
6.30	**77**
3.35	**70**
2.00	**65**
1.18	**61**
0.600	**54**
0.425	**44**
0.212	**24**
0.150	**20**
0.063	**16**

Particle Diameter (mm)	Percent Passing (%)

Sedimentation sample was not pre-treated

Coefficients	
D_{10} (mm)	**NA**
D_{15} (mm)	**NA**
D_{30} (mm)	**0.261**
D_{50} (mm)	**0.523**
D_{60} (mm)	**1.071**
D_{85} (mm)	**11.892**
D_{90} (mm)	**18.340**
C_U	**NA**
C_C	**NA**

Soil Description:

Orangish brown very gravelly clayey SAND

Key: C_U = Uniformity coefficient. C_C = Coefficient of curvature as defined in BS EN ISO 14688-2:2018

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