



Client:

Henderson Homes
Narlin, Clamhunger Lane
Mere
Knutsford
WA16 6QG

Consultant:

BrennanConsult Ltd
Oak House
2 Gatley Road
Cheadle
Stockport
SK8 1PY

Ground Investigation - Geotechnical

Monet Lodge, Cavendish Road, Didsbury

November 2022

Site Ref: 6103/VMD-G v1.0

Unit 4
Sheffield Street
Heaton Norris
Stockport
Cheshire
SK4 1RU

Telephone : 0161 480 8885
e-mail : info@geoassist.co.uk

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Ground Investigation - Geotechnical

1. Introduction

This report is an account of an intrusive Geotechnical Ground Investigation carried out by GeoAssist Limited on the instruction of the Client Henderson Homes for the development at Monet Lodge, Cavendish Road, Didsbury.

The object of this geotechnical investigation was to obtain information on the nature, depth and extent of the superficial deposits beneath the site to assess ground conditions for a Residential development.

Geotechnical parameters and groundwater regime were to be obtained.

The work was commissioned following acceptance of the quotation and an instruction to proceed issued by the Client, Henderson Homes.

It is understood that the proposed development is for residential property and does not include a basement area.

The approximate grid reference for the centre of the site is 383750E, 392600N.

The exploratory hole locations are indicated on the site plan in Appendix A1.

The site development plan is shown in Appendix A3

2. Description of the Site

2.1 Present

The site is a brownfield site in a residential suburban area of Didsbury located on land off Cavendish Road, Didsbury. The site forms an irregular shape, and the topography of the land is relatively level with the surrounding Land and property.

At the time of the site visit, the site was fenced off from public access and the surface cover was formed by long grass and shrubs.

A nursing home forms the Eastern boundary of the site and new build apartment blocks and properties form the southern and western boundary to the site with Cavendish Road and the site access present to the north.

2.2 Proposed

It is understood that the proposed development comprises the construction of a pair of semi-detached residential properties with associated access road, parking and landscaped areas.

3. Geology

The relevant BGS 1:10,000 scale published geological map of the area SJ 89 SW and SJ 89 SE dated 2008, shows the site to be located over Glaciofluvial Sheet Deposits, Devensian, Sand and Gravels. The BGS on line Lexicon indicates that boreholes in the area show that the Glaciofluvial sands and gravels are underlain by Glacial Till (Boulder Clay). The overall thickness of the drift deposits is not readily discernible.

The underlying solid geology is shown as being Wilmslow (Sherwood) Sandstone Formation, of the Triassic Period. No faults are shown as passing beneath the site.

4. Mineworkings and Mineral Extraction

Information provided as part of the Environmental data search report referenced 301701255_1_1 indicates that the property is in an area which may be affected by coal mining.

The report from the Coal Authority referenced 51003313862001, confirms that:

According to the official mining information records held by the Coal Authority at the time of this search, there were no areas of concern relating to coal mining.

The site is not located within a Coal Authority Development High Risk Area.

Consequently, the risk to the development on this site in respect of past, present or future coal workings or mineral extraction is assessed as low.

5. Intrusive Investigation

5.1 Exploratory Hole Programme

Six exploratory holes referenced WS1 to WS6 were undertaken by GeoAssist using windowless sampling and dynamic probing techniques. Exploratory holes TP1 to TP3 were excavated in order to undertake infiltration tests. The location of the exploratory holes is shown on the site plan in Appendix A1.

The details of the strata in the exploratory holes were recorded by a suitably qualified Professional Engineer.

All intrusive work was carried out generally in accordance with British standard 5930: 1999/2015 Code of Practice for Site Investigations and British Standard 10175: 2011 where relevant and applicable.

The fieldwork was completed in two stages on 27th and 28th September 2022 and 1st and 3rd November 2022 in dry weather conditions.

5.2 Field Sampling and Testing

Representative samples were taken of all the strata encountered in the exploratory holes. In Situ Dynamic Penetration tests using the Standard SPT drop weight and drop height were carried out in the exploratory holes. All samples were stored in airtight containers and returned to the laboratory for subsequent examination and testing. Observations of groundwater conditions were made throughout the fieldwork operations.

5.3 Field Results

Full details of the subsoil conditions in the exploratory holes are given in the exploratory hole log sheets, which form Appendix C1 and C2 to this report. The results of the infiltration tests are given in Appendix C3.

6. Laboratory Investigation

6.1 Geotechnical Testing

The following geotechnical tests were performed in GeoAssist's laboratory on samples recovered from the exploratory holes.

Table 6.1 Geotechnical Testing

TEST	PURPOSE
Shear Strength from Hand Vane tests	Assessment of in-situ shear strength of cohesive deposits
Natural Moisture Content and Classification test	Assessment of in-situ subsoil conditions and compressibility/shrinkage of cohesive deposits
Sulphate and pH test	Assessment of potential aggressive ground conditions with respect to subsurface concrete
Particle Size Distribution test	Determination of grading characteristics of granular deposits

6.2 Test Results

The results of the hand vane shear strength tests are given on the exploratory hole logs in Appendix C1. The geotechnical test results are given in the laboratory test results summary sheets, which form Appendices D1 to D4 to this report.

7. Subsurface Stratigraphy

The subsoil profile obtained from the exploratory holes consists of variable made ground overlying silty sands with gravels overlying silty clay. The silty sand varies from very loose to medium dense in state of compaction. The clay is generally firm to stiff in consistency and is intermediate to high in plasticity.

Further details of the subsurface stratigraphy can be found in the exploratory hole log sheets which form Appendix C1 to this report.

Table 7.0 Subsoil Profile Summary

Strata	Depth of Strata (m) below ground level	
	Top	Base
Topsoil/Made Ground - Variable mixed granular	Ground Level	0.60 to 1.80
Superficial Natural Deposits Mainly silty Sands with gravels	0.60 to 1.80	3.60 to 3.80
Superficial Natural Deposits Slightly gravelly sandy silty Clay with occasional silty sand inclusions	3.60 to 3.80	>7.00

8. Groundwater

Seepage groundwater was encountered in exploratory holes WS1 to WS6 at depths between 1.70m and 2.30m during the course of the fieldwork. The groundwater conditions entered on the exploratory hole logs are those observed at the time of the boring operations and the water level may not have reached equilibrium with the surrounding water level prior to the record being taken.

Standing groundwater levels will be subject to seasonal variation or changes in local drainage conditions and could be higher at certain times of the year particularly after periods of heavy rainfall.

9. Geotechnical Properties

The following sections summarise the geotechnical properties for the main strata encountered on this site and are based on physical description, measured and empirical values.

9.1 Made Ground - Granular

Sand and gravel with brick and concrete fragments made ground was present across the site.

Table 9.1 Summary of Geotechnical Properties – Made Ground

Property	Number of Tests	Range of Results	Derived Value
Sulphate 2:1 Water:Soil Extract	2	640 to 650 mg/l	650 mg/l
pH	2	8.6 to 9.4	NA

9.2 Silty Sand with gravel

Silty Sand with gravel was present across the site. The sand is loose to medium dense in state of compaction..

Table 9.1 Summary of Geotechnical Properties – Silty Sand with gravel

Property	Number of Tests	Range of Results	Derived Value
Sulphate 2:1 Water:Soil Extract	2	490 to 610 mg/l	650 mg/l See above
pH	2	8.4 to 8.9	NA
N value uncorrected	13	3 to 27	N = 11 at 1.0m depth N = 4 at 2.0m depth

9.3 Silty Clay

Silty Clay was present at depth across the site. The clay is generally medium to high in strength and intermediate to high in plasticity. The dynamic probe indicates that the clay increases in strength with depth.

Table 9.3 Summary of Geotechnical Properties – Silty Clay

Property	Number of Tests	Range of Results	Derived Value
Plasticity Index	4	22% to 31%	29% at 4.00m depth
Shear Strength from Hand Vane	8	58 to 97kN/m ²	50kN/m ²
N value uncorrected	16	4 to 27	N = 5 at 4.0m depth to N = 20 at 6.0m depth

10. Geotechnical Assessment

10.1 Design Criteria

The following design criteria have been assumed for the proposed development

1. Structural loads of up to 50kN/m on strip foundations at shallow depth of around 1.00m.
2. Allowable foundation settlement of less than 25mm and differential settlement of less than 10mm.

10.2 Foundation Design Considerations

The following foundation design may be considered for this site.

Traditional strip/pad footings located on the Sand would generally be considered for this site.

10.3 Concrete Footings

Reinforced concrete foundations located on the superficial deposits can be designed to the bearing capacity given below with the likely associated settlements as indicated.

Depth m	Material	Foundation Type	Maximum Foundation Size m	Allowable bearing capacity kN/m ²	Long term Settlement mm
1.00	Silty Sand	Strip	Up to 1.00 wide	60	<25

Concreting of foundations should take place as soon as formation level is exposed in order to prevent weakening of the subsoil due to the ingress of surface/seepage groundwater. The silty sand at foundation level should be proof rolled to ensure uniform ground conditions for foundations.

The Made Ground is essentially granular on this site so with proof rolling a ground bearing slab on the granular made ground could be utilised resulting in an allowable bearing pressure of 15kN/m².

10.4 Pile Foundations

Pile foundations may be preferable for the structural foundations for this residential development.

The magnitude of the loads to be taken by pile foundations can only be determined by consultation with the relevant piling contractor. The depth of penetration of piles will be dependent on the pile type and will be variable across the site due to the variability of the underlying ground conditions.

It is probable that a piling specialist would require supplementary information in respect of the strata at depth beneath the site to allow a more efficient and robust pile foundation design

10.5 Excavations

Ancillary shallow depth excavations (<1.20m) will require nominal support with control of groundwater generally by pumping from open sumps.

Deeper excavations will encounter groundwater and groundwater control/sheet piling will be required to prevent instability of the excavation sides and base due to groundwater ingress.

10.6 Ground Shrinkage and Heave

The exploratory holes encountered cohesive deposits of intermediate high plasticity and medium volume change potential. The NHBC Standards Section 4.2 Building near trees should be followed for foundation design including any mitigating measures that might be required.

10.7 Soakaways

The results of the infiltration tests on the sands present at a depth of 1.00m to 1.10m are relatively permeable and soakaways may be designed with a permeability/infiltration value of 1×10^{-6} m/sec provided they do not impinge on the stability of foundations/roads or utilities. The general groundwater level is high and consequently the efficacy of soakaways may be limited on this site.

It is recommended that the efficacy of soakaways is confirmed by larger scale trials during site enabling works to confirm the validity of the design to be undertaken by others.

10.8 Subsurface Concrete Attack

The results of the soluble sulphate and pH tests carried out on samples of subsoil obtained from this site in general indicate that according to Building Research Establishments Special Digest 1 (2005) no particular precautions for concrete foundations will be required.

Generally, the use of concrete mix design sulphate class DS-2 and according to ACEC Class AC-2 of Table C1 conditions can be used for subsurface concrete mix design.



Matthew Benson BSc
Geotechnical/Environmental Engineer



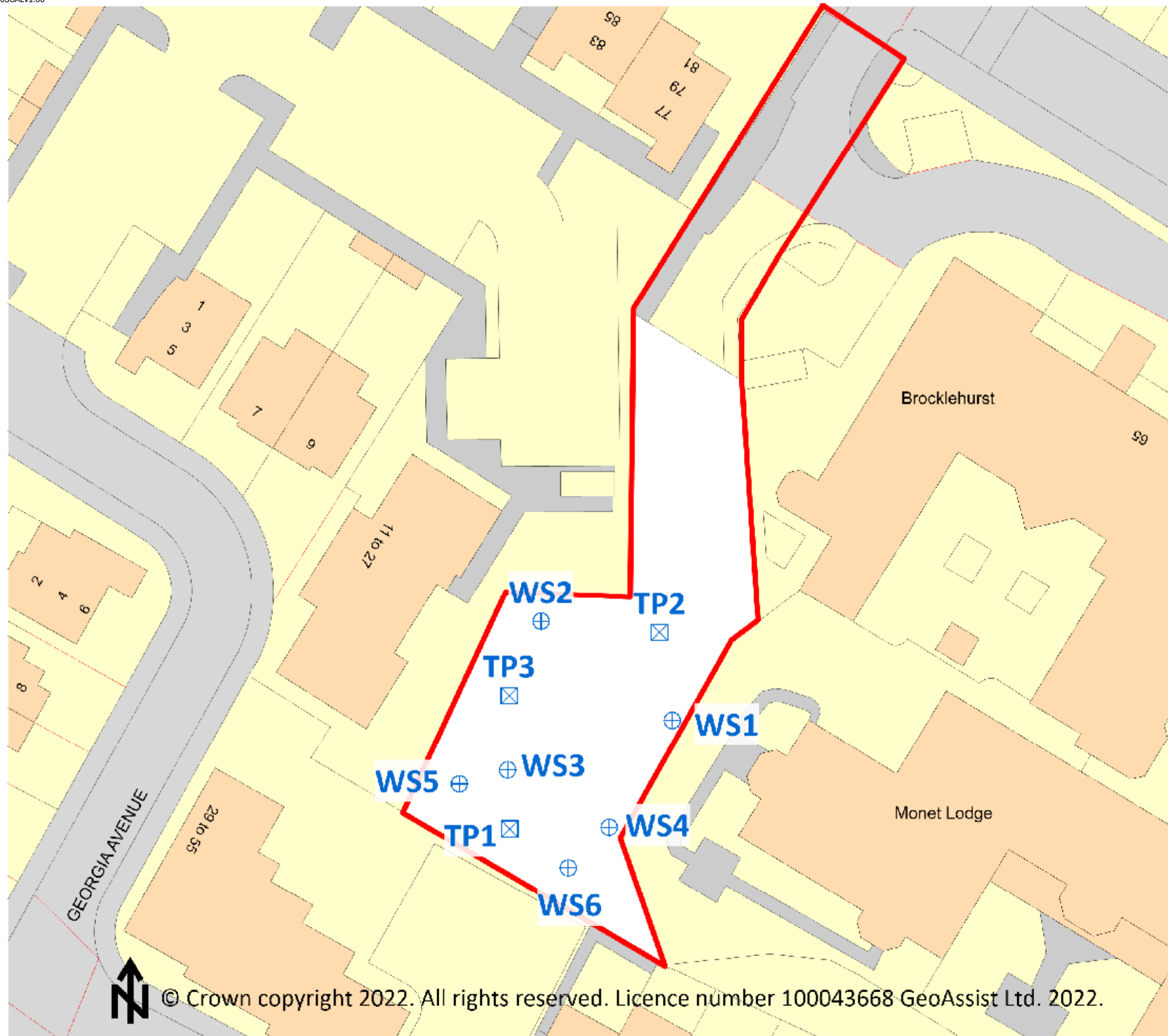
Mark Richardson MSc CEng MICE
Technical Director

Field investigations have been restricted to a level of detail required to achieve the stated objectives of the work. Ground conditions are, and can be, variable and have only been tested at isolated locations across the site. Therefore, the potential exists for ground conditions to be encountered which are different to those considered in this report.

This report has been prepared by GeoAssist Limited with all reasonable professional skill, care and diligence within the terms of the contract with Henderson Homes. The report is confidential to Henderson Homes, their/the named persons advisors and bankers, and GeoAssist Limited accepts no responsibility of whatever nature to third parties to whom this report may be divulged. GeoAssist Limited owns the copyright in this report. All rights are reserved, and unauthorised use is prohibited. Henderson Homes may use the report for their/her/his own purposes.

Appendix A

- A1 Site Plan with Exploratory Hole Locations
- A2 Proposed Site Plan



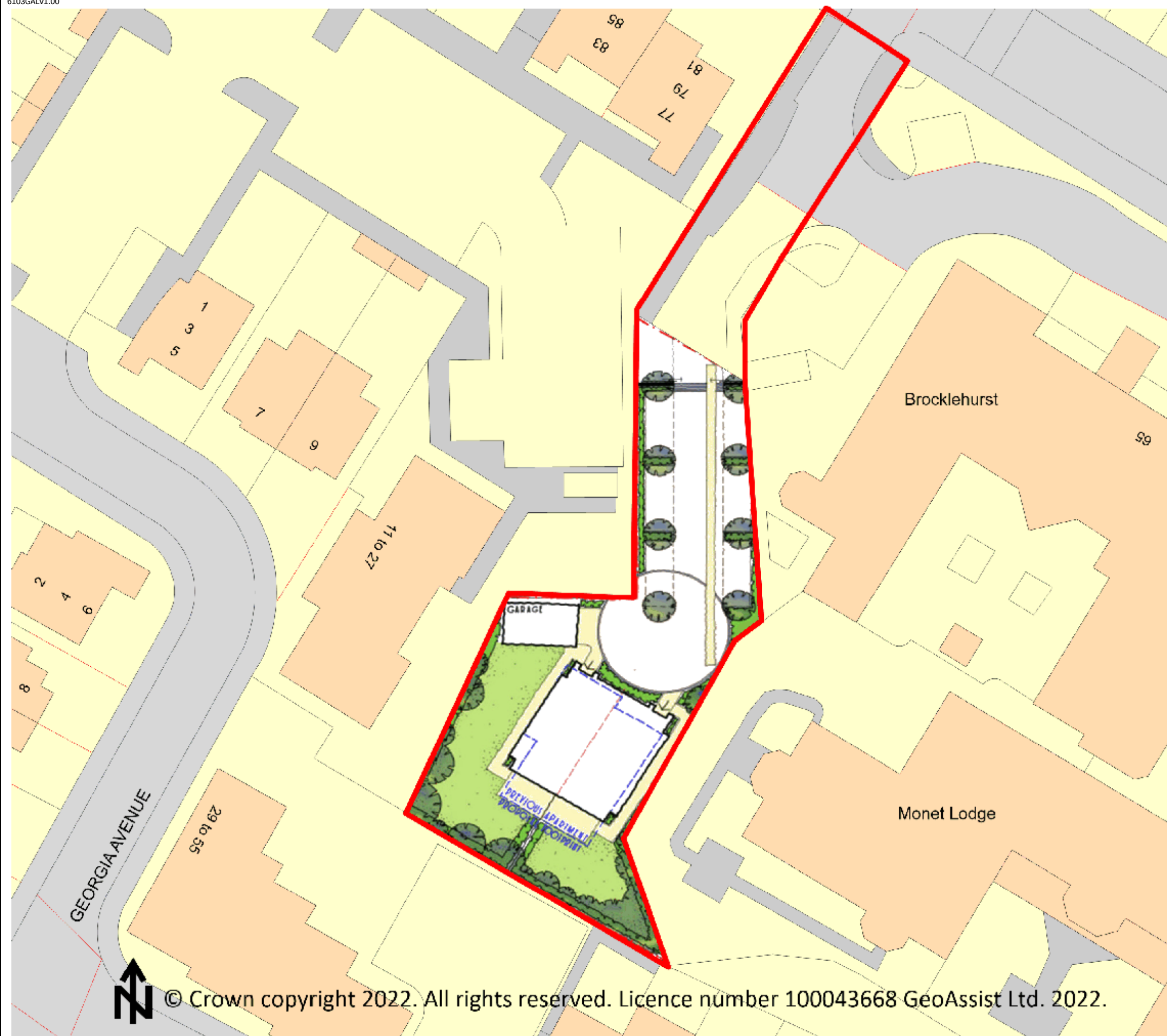
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A1 Site Plan

Site Name	Monet Lodge
Location	Cavendish Road, Didsbury
GeoAssist Ref	6103VMD
Client	Henderson Homes
	Narlin, Clamhunger Lane Mere Knutsford WA16 6QG
Planning Consultant	BrennanConsult Ltd
NGR (centre of site)	383750,392600
Production Date	Nov 22
Survey Method	
Surveyor	Others
Status	Final v1.00
Base Survey	OSGB36

A3 Development Plan

Site Name	Monet Lodge
Location	Cavendish Road, Didsbury
GeoAssist Ref	6103VMD
Client	Henderson Homes
	Narlin, Clamhunger Lane Mere Knutsford WA16 6QG
Planning Consultant	BrennanConsult Ltd
NGR (centre of site)	383750,392600
Production Date	Nov 22
Survey Method	
Surveyor	Others
Status	Final v1.00
Base Survey	OSGB36



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Appendix B

- B1 Terminology used in Soil Descriptions
- B2 List of Abbreviations
- B3 Concrete in Aggressive Ground

Terminology used in Soil Descriptions

The procedure and principles given in BS EN ISO 14688-1:2002 Part 1: 'Identification and description' have been adopted in producing the soil descriptions contained within this report.

The general identification and description of soils is based on a flexible system for immediate (field) use by experienced persons, covering both material and mass characteristics by visual and manual techniques.

Details are given of the individual characteristics for identifying soils and the descriptive terms in regular use, including those related to the results of tests from the field.

This part of ISO 14688 is applicable to natural soils *in situ*, similar man-made materials *in situ* and soils redeposited by man.

Particular sections of BS EN ISO 14688-1:2002 Part 1 are reproduced here in order to clarify the production of the soil descriptions contained within this report.

Identification of soil

General

Soil characteristics that generally permit soil to be identified with adequate accuracy for general (or preliminary) characterization are outlined below. A more accurate identification and classification based on grading, plasticity or organic content can be achieved by laboratory tests. In addition to identifying soils, the condition in which a soil is encountered, any particular secondary constituents, other features of a soil, such as carbonate content, particle shape, surface roughness of particles, odour, any common names and the geological classification are indicated.

The identification and description of soils generally follows the flow chart in Figure B1.1 attached.

Particle size

Particle size is the fundamental basis for designating mineral soils using particle fractions to distinguish the soil mechanical behaviour.

Table B1 shows the terms to be used for each soil fraction and its sub-fractions, together with the corresponding chosen range of particle sizes.

Basic soils are soils with uniform grading (i.e. they consist of particles of only one size range as specified in Table B1.1

Table B1.1 Particle Size Fractions

Soil fractions	Sub-fractions	Symbols	Particle sizes mm
Very coarse soil	Large boulder	LBo	> 630
	Boulder	Bo	> 200 to 630
	Cobble	Co	> 63 to 200
Coarse soil	Gravel	Gr	> 2,0 to 63
	Coarse gravel	CGr	> 20 to 63
	Medium gravel	MGr	> 6,3 to 20
	Fine gravel	FGr	> 2,0 to 6,3
	Sand	Sa	> 0,063 to 2,0
	Coarse sand	CSa	> 0,63 to 2,0
	Medium sand	MSa	> 0,2 to 0,63
	Fine sand	FSa	> 0,063 to 0,2
Fine soil	Silt	Si	> 0,002 to 0,063
	Coarse silt	CSi	> 0,02 to 0,063
	Medium silt	MSi	> 0,006 3 to 0,02
	Fine silt	FSi	> 0,002 to 0,006 3
	Clay	Cl	≤ 0,002

APPENDIX B1

Form No.: QF029AEN

Composite soils

General

Most soils are composite and consist of principal and secondary fractions. They are designated by a noun (main term) describing the principal fraction and by one or more adjectives (qualifying terms) describing the secondary fractions (e.g. sandy gravel saGr, gravelly clay grCl).

Principal fraction

The principal fraction in terms of mass determines the engineering properties of the soil and is given in capital letters for clarity.

In the case of very coarse soils, the principal fraction is the relevant very coarse soil fraction predominating in terms of mass. The very coarse fraction should be separated from the sample before identifying the fine and coarse fractions.

In the case of coarse soils, the principal fraction is the relevant coarse soil fraction predominating in terms of mass.

Composite coarse soils include a fines fraction (silt and/or clay) that does not determine the engineering properties of the soil.

In the case of fine soils, the principal fraction is the relevant fine soil type determining the engineering properties of the soil.

In the case of composite fine soils, the fines fraction determines the engineering properties of the soil. The fines fraction is regarded as determining the characteristics of a composite soil if this is of at least medium dry strength or exhibits a certain degree of plasticity.

In both cases, the soil is termed either "clay" or "silt", depending on the plasticity of the fines fraction and not on the grading.

Secondary fractions

Secondary and further fractions do not determine but will affect the engineering properties of the soil. The secondary fractions as adjectives are placed with the term describing the principal fraction in the order of their relevance.

If coarse secondary fractions are present in a particularly small or particularly large proportion, the term "slightly" or "very" shall precede the qualifying term.

If it is a fine soil, the properties of which are determined by fines fractions, a soil can be identified as "silt" or "clay" by checking for the presence of fine secondary constituents on the basis of its plasticity properties.

If, in the case of coarse soils, two soil fractions are present in approximately equal proportions, an oblique shall be placed between the relevant terms, e.g. gravel/sand (Gr/Sa) or fine/medium sand (FSa/MSa).

Plasticity

Assessment of the plasticity and identification of a soil as either silt or clay permits the soil to be qualified as being of low plasticity or high plasticity.

An exact determination can only be made by establishing the liquid limit and the plastic limit in laboratory tests.

Organic content

Small quantities of dispersed organic matter in a soil can produce a distinctive odour and colour. The intensity of odour and colour indicates the proportion of organic matter and should be described.

Determination of consistency

The consistency of a cohesive soil shall be determined in a manual test, permitting the following identification and description:

- a) a soil is to be identified as **very soft** if it exudes between the fingers when squeezed in the hand;
- b) a soil is to be identified as **soft** if it can be moulded by light finger pressure;
- c) a soil is to be identified as **firm** if it cannot be moulded by the fingers, but rolled in the hand to thick threads without breaking or crumbling;
- d) a soil is to be identified as **stiff** if it crumbles and breaks when rolled to thick threads but is still sufficiently moist to be moulded to a lump again;
- e) a soil is to be identified as **very stiff** if it has dried out and is mostly light coloured. It can no longer be moulded but crumbles under pressure. It can be indented by the thumbnail.

Preliminary descriptions are based on visual and manual identification only.

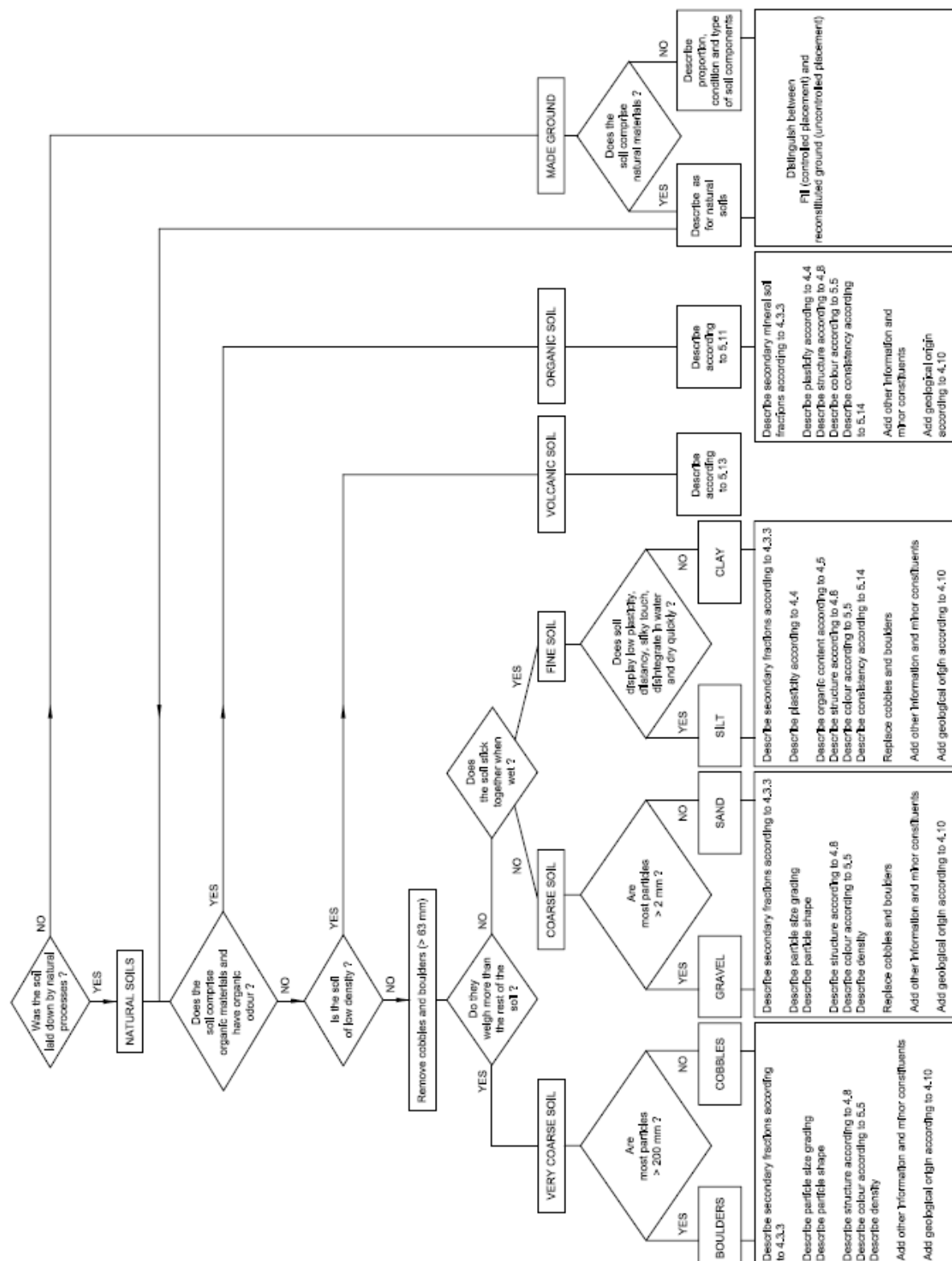


Figure B1.1 Flow chart for the identification and description of soils

Terminology used in Soil Classification

The procedure and principles given in BS EN ISO 14688-2:2004 Part 2: 'Principles for a classification' have been adopted in producing the soil descriptions contained within this report where laboratory or in situ field tests have been carried out.

The classification principles established in this part of ISO 14688 permit soils to be grouped into classes of similar composition and geotechnical properties and, with respect to their suitability for geotechnical engineering purposes.

This part of ISO 14688 is applicable to natural soil and similar man-made material *in situ* and redeposited, but it is not a classification of soil by itself.

Particular sections of BS EN ISO 14688-1:2002 Part 2 are reproduced here in order to clarify the production of the soil descriptions contained within this report.

Principles of soil classifications
General

Soils shall be classified into soil groups on the basis of their nature, which is the composition only, irrespective of their water content or compactness, taking into account the particle size distribution (grading), plasticity, organic content, genesis as appropriate.

The most common approach to classification is to divide the soils on the basis of particle size grading and plasticity. The division is made on the relative size fractions present for the coarser soil fractions, determined on the whole sample, and on the plasticity of the finer fractions (Table B1.2).

Table B1.2 Principles of a classification of soils

Criterion	Soil group	Quantification	Denomination into groups of similiar properties			Further subdivision as appropriate by
Wet soil does not stick together	very coarse	most particles > 200 mm	Bo	xBo		Requires special consideration
				boCo	coBo	
	most particles > 63 mm	Co	saCo, grCo	sagrCo		
	coarse	most particles > 2 mm	Gr	coGr	cosaGr	Particle size (grading) Shape of grading curve Relative density Permeability
			saGr, grSa	sasiGr, grsiSa		
		most particles > 0,063 mm	Sa	siGr, clGr orSa	siSa, clSa, saclGr	(Mineralogy) (Particle shape)
Wet soils sticks together	fine	low plasticity dilatant	Si	saSi	sagrSi saclSi	Plasticity Water content Strength, sensitivity Compressibility, stiffness (Clay mineralogy)
				clSi, siCl		
		plastic non-dilatant	Cl	orSi, orCl	sagrCl	
Dark colour, low density	organic		Or	saOr, siOr	clOr	Requires special consideration
Not naturally	Made ground	deposited	Mg	xMg	Man-made material	Requires special consideration
					Relaid natural materials	As for natural soils
Key to symbols						Cases requiring special consideration should be classified according to national or project requirements
Soil	Principal	Secondary or tertiary component				
Boulders	Bo	bo				
Cobbles	Co	co				
Gravel	Gr	gr	Gr(gr) and Sa(sa) can be subdivided into fine F(f), medium M(m) or coarse C(c)			
Sand	Sa	sa				
Silt	Si	si				
Clay	Cl	cl				
Organic	Or	or				
Made ground	Mg	—				
		x	any combination of components			

APPENDIX B1

Form No.: QF029AEN

Fractions

Soil is a mixture of materials of different particle size, which are grouped into fractions as specified in BS EN ISO 14688-1.

Classification of coarse and very coarse soils is to be based on the particle size distribution alone (see Table B1.3)

Table B1.3 Classification of very coarse soils

Fraction	Percent by mass	Term
Boulders	< 5	low boulder content
	5 to 20	medium boulder content
	> 20	high boulder content
Cobbles	< 10	low cobble content
	10 to 20	medium cobble content
	> 20	high cobble content

In the case of soils composed of both fine and coarse material, classification is to be based on both plasticity and particle size distribution.

Particle size distribution (grading)

The particle sizes and their distribution in a soil are determined by mechanical analysis carried out by the separation of the coarser fractions by sieving on a series of standard sieves and the determination of the finer fractions by sedimentation.

The results of the sieving and sedimentation process are plotted as a grading curve.

Plasticity

The fine fractions of soil, represented by clay and silt and containing clay minerals (see also BS EN ISO 14688-1), both alone or in mixtures with coarser material, are usually classified according to their plasticity characteristics. This is carried out on the basis of laboratory tests to determine the liquid limit w_L and plastic limit w_P .

Organic content

When soils with organic constituents are classified according to their organic content (Table B1.4), a distinction is to be made between organic soils and mineral soils with an organic content.

Table B1.4 Classification of soils with organic constituents

Soil	Organic content (≤ 2 mm) % of dry mass
Low-organic	2 to 6
Medium-organic	6 to 20
High-organic	> 20

Classification of coarse and composite organic soils accumulated *in situ* is based on the type of organic matter and that of organic soils, on the genetic origin and the degree of decomposition of the organic constituents.

APPENDIX B1

Form No.: QF029AEN

Undrained shear strength of fine soils

The terms to be used for the designation of the undrained shear strength according to the results of laboratory and field tests are given in Table B1.5.

Table B1.5 Undrained shear strength of fine soils

Undrained shear strength of clays	Undrained shear strength c_u kPa
Extremely low	< 10
Very low	10 to 20
Low	20 to 40
Medium	40 to 75
High	75 to 150
Very high	150 to 300
Extremely high ^a	> 300
^a Materials with shear strength greater than 300 kPa may behave as weak rocks and should be described as rocks according to ISO 14689-1.	

Table B1.6 Guiding values for the division of mineral soils on a basis of the contents of various fractions

Fraction	Content of fraction in wt % of material ≤ 63 mm	Content of fraction in wt % of material ≤ 0,063 mm	Name of soil	
			Modifying term	Main term
Gravel	20 to 40 > 40		gravelly	gravel
Sand	20 to 40 > 40		sandy	sand
Silt + clay (fine soil)	5 to 15 15 to 40 > 40	< 20 ≥ 20 < 20 ≥ 20 < 10 10 to 20 20 to 40 > 40	slightly silty slightly clayey silty clayey clayey silty	 silt silt clay clay

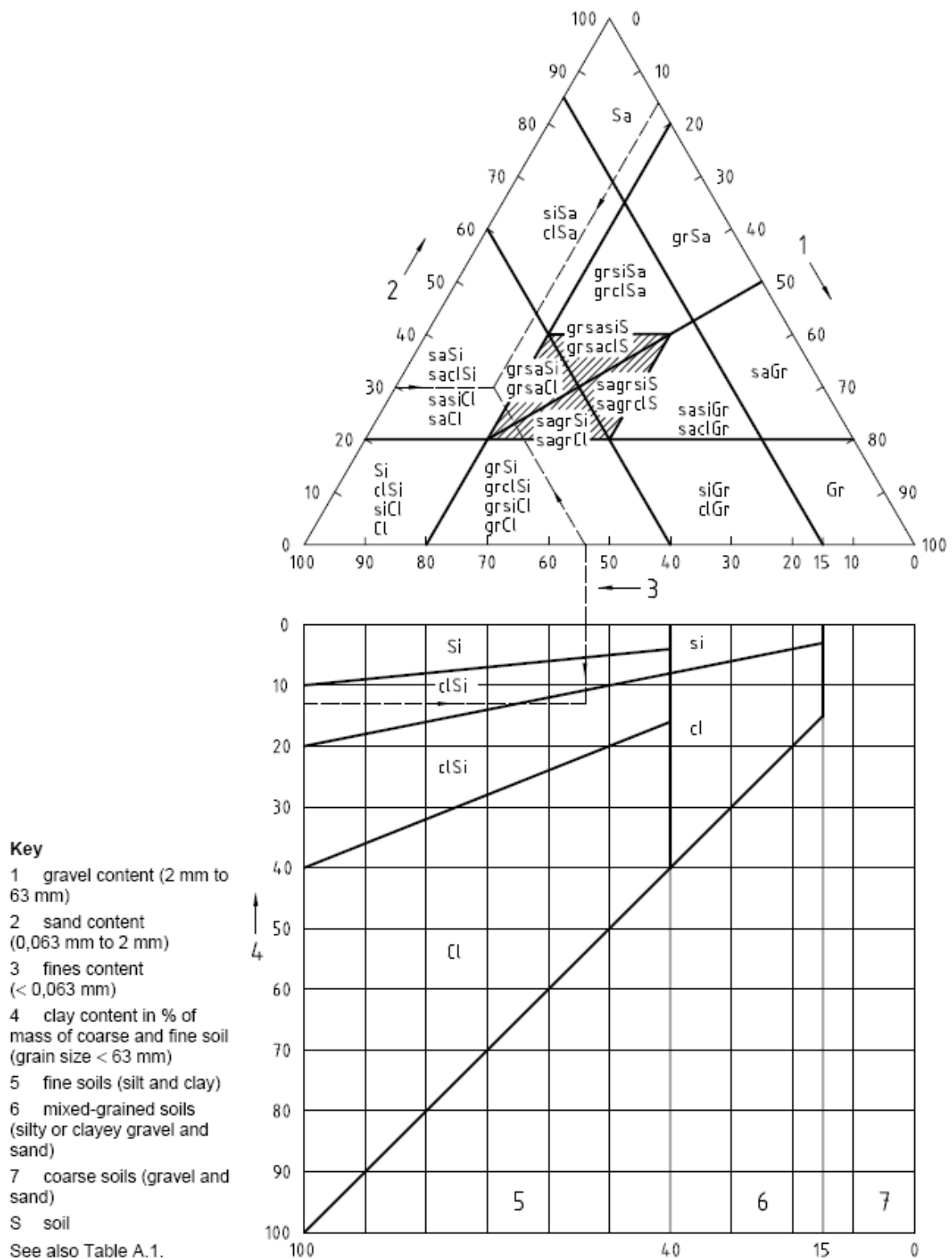


Figure B1.2 Classification of soils, based on grading alone

References

BS EN ISO 14688-1: 2002

Geotechnical investigation and testing — Identification and classification of soil — Part 1: Identification and description

BS EN ISO 14688-2: 2004

Geotechnical investigation and testing — Identification and classification of soil — Part 2: Principles for a classification

Abbreviations

Exploratory Hole log

Sample Type

AGS Code	Sample Type	AGS Code	Sample Type
B	Bulk Disturbed sample	SPT	Penetration Test – split spoon
CBR	CBR sample	U	Undisturbed sample – open drive
CPT	Penetration Test – cone	UF	Undisturbed sample failed recovery
D	Small disturbed sample	W	Water sample
PU	Piston sample	C - ES	Environmental sample

SPT and CPT – Standard Penetration Test

Blow Count (N) – If full penetration of 450mm then the total number of blows for the last 300mm is given.

If limited penetration following 150mm seating blows then the number of blows for the stated penetration is given.

If limited penetration then the total number of blows for the stated penetration is given.

The N values are actual blows recorded and uncorrected.

U - Undisturbed Sample

Blow Count – total number of blows for recovered length

Legend – As per British Standard – if blank then CAVITY/OPEN HOLE

Core Rec.:

T - Total Core Recovery as a percentage of the cored run

S – Solid Core Recovery as a percentage of the cored run

RQD – Rock Quality Designation as a percentage of the cored run

FI – Fracture index as number of fractures per metre

l_f – Fracture spacing as the average length of solid core pieces between natural fractures over core length of reasonable uniform characteristics

APPENDIX B2

Form No.: QF033AEN

Laboratory Test Summary Sheet

Tests on Soils

AGS Code	Test Name	AGS Code	Test Name
ASB	Asbestos	IDEN	In Situ Density
BDEN	Bulk Density	IGNIS	Loss on Ignition
CBR	California Bearing Ratio	IVAN	In Situ Vane
CD	Consolidated drained (single stage)	LS	Linear shrinkage
CDM	Consolidated drained (multi stage)	MCVG	Moisture Condition Value
CLSS	Atterberg Limits	NMC	Natural Moisture content
CMPG	Compaction	OMS	Organic Matter
CNMT	Contaminant and Chemical	PD	Particle density
CONG	Consolidation	PHS	pH
CU	Consolidated undrained with pwp measurement (single stage)	PTST	Laboratory permeability
CUM	Consolidated undrained with pwp measurement (multi stage)	RELD	Relative Density
DDEN	Dry Density	SHBG	Shear box
FRST	Frost Susceptibility	SLIM	Shrinkage Limit
GRAD HY	Particle Size (Hydrometer)	SULWS	Sulphate on 2:1 Water:Soil Extract
GRAD WS	Particle size (wet Sieve)	TNPC	Ten Per Cent Fines
HVP	Hand vane – peak	UU	Unconsolidated quick undrained (single stage)
ICBR	In situ CBR	UUM	Unconsolidated quick undrained (multi stage)

Tests on rocks and Aggregates

AGS Code	Test Name	AGS Code	Test Name
ACV	Aggregate crushing value	SHOR	Shore hardness
BRAZ	Tensile Strength by Brazilian method	SOUN	Aggregate Soundness Test
LOSA	Aggregate Los Angeles Abrasion	UCS	Uniaxial Compressive Strength
PLSI	Point Load Index – size corrected	WTAB	Aggregate Water Absorption

4. Reference AGS Format Edition 3

Concrete in Aggressive Ground

1. Assessing the Aggressive Chemical Environment

In order to assess the levels of sulphate in the ground or groundwater, which may have a deleterious effect on concrete, the sulphate content of soil and groundwater may be determined in accordance with BS 1377 (2001) Test 3:5. The sulphate contents determined are grouped into Aggressive Chemical Environment for Concrete (ACEC) site classifications in Building Research Establishment Special Digest 1 – Part 1 (2005) Tables C1 and C2 as reproduced below.

Based on this classification BRE Special Digest 1 gives recommendations for the design of suitable concrete mixes to resist chemical attack for each ACEC classification. Care should be taken in the interpretation of results over the site area, if classification is based solely on groundwater analysis, it should be based on the highest sulphate concentration recorded. Where a large number of results from soil analysis are available it should be based on the average of the highest 20 per cent of the results. If a varied set of results are recorded from a limited sampling programme it is important to carry out further analyses before a detailed classification is given.

2. References

BS 1377: 2001: 'Methods of Test for Soils for Civil Engineering Purposes': British Standards Institution.

BRE Special Digest 1: 2005: 'Concrete in Aggressive Ground': Building Research Establishment.

Table C1 Aggressive Chemical Environment for Concrete (ACEC) classification for natural ground locations ^a						
Sulfate Design Sulfate Class for location	2:1 water/soil extract ^b	Groundwater	Total potential sulfate ^c	Groundwater Static water	Mobile water	ACEC Class for location
1	2 (SO ₄ mg/l)	3 (SO ₄ mg/l)	4 (SO ₄ %)	5 (pH)	6 (pH)	7
DS-1	< 500	< 400	< 0.24	≥ 2.5	> 5.5 ^d 2.5–5.5	AC-1s AC-1 ^e AC-2z
DS-2	500–1500	400–1400	0.24–0.6	> 3.5 2.5–3.5	> 5.5 2.5–5.5	AC-1s AC-2 AC-2s AC-3z
DS-3	1600–3000	1500–3000	0.7–1.2	> 3.5 2.5–3.5	> 5.5 2.5–5.5	AC-2s AC-3 AC-3s AC-4
DS-4	3100–6000	3100–6000	1.3–2.4	> 3.5 2.5–3.5	> 5.5 2.5–5.5	AC-3s AC-4 AC-4s AC-5
DS-5	> 6000	> 6000	> 2.4	> 3.5 2.5–3.5	≥ 2.5	AC-4s AC-5

Notes

- Applies to locations on sites that comprise either undisturbed ground that is in its natural state (ie is not brownfield – Table C2) or clean fill derived from such ground.
- The limits of Design Sulfate Classes based on 2:1 water/soil extracts have been lowered relative to previous Digests (Box C7).
- Applies only to locations where concrete will be exposed to sulfate ions (SO₄) which may result from the oxidation of sulfides (eg pyrite) following ground disturbance (Appendix A1 and Box C8).
- For flowing water that is potentially aggressive to concrete owing to high purity or an aggressive carbon dioxide level greater than 15 mg/l (Section C2.2.3), increase the ACEC Class to AC-2z.

Table C2 Aggressive Chemical Environment for Concrete (ACEC) classification for brownfield locations ^a								
Sulfate and magnesium						Groundwater		ACEC
Design Sulfate Class for location	2:1 water/soil extract ^b		Groundwater		Total potential sulfate ^c	Static water	Mobile water	Class for location
1	2	3	4	5	6	7	8	9
	(SO ₄ mg/l)	(Mg mg/l)	(SO ₄ mg/l)	(Mg mg/l)	(SO ₄ %)	(pH) ^d	(pH) ^d	
DS-1	< 500		< 400		< 0.24	≥ 2.5	> 6.5 ^e 5.5–6.5 4.5–5.5 2.5–4.5	AC-1s AC-1 AC-2s AC-3s AC-4s
DS-2	500–1500		400–1400		0.24–0.6	> 5.5 2.5–5.5	> 6.5 5.5–6.5 4.5–5.5 2.5–5.5	AC-1s AC-2 AC-2s AC-3s AC-4s AC-5s
DS-3	1600–3000		1500–3000		0.7–1.2	> 5.5 2.5–5.5	> 6.5 5.5–6.5 2.5–5.5	AC-2s AC-3 AC-3s AC-4 AC-5
DS-4	3100–6000	≤ 1200	3100–6000	≤ 1000	1.3–2.4	> 5.5 2.5–5.5	> 6.5 2.5–6.5	AC-3s AC-4 AC-4s AC-5
DS-4m	3100–6000	> 1200 ^e	3100–6000	> 1000 ^e	1.3–2.4	> 5.5 2.5–5.5	> 6.5 2.5–6.5	AC-3s AC-4m AC-4ms AC-5m
DS-5	> 6000	≤ 1200	> 6000	≤ 1000	> 2.4	> 5.5 2.5–5.5	> 2.5	AC-4s AC-5
DS-5m	> 6000	> 1200 ^e	> 6000	> 1000 ^e	> 2.4	> 5.5 2.5–5.5	≥ 2.5	AC-4ms AC-5m

Notes

- a Brownfield locations are those sites, or parts of sites, that might contain chemical residues produced by or associated with industrial production (Section C5.1.3).
- b The limits of Design Sulfate Classes based on 2:1 water/soil extracts have been lowered from previous Digests (Box C7).
- c Applies only to locations where concrete will be exposed to sulfate ions (SO₄²⁻), which may result from the oxidation of sulfides such as pyrite, following ground disturbance (Appendix A1 and Box C8).
- d An additional account is taken of hydrochloric and nitric acids by adjustment to sulfate content (Section C5.1.3).
- e The limit on water-soluble magnesium does not apply to brackish groundwater (chloride content between 12 000 mg/l and 17 000 mg/l). This allows 'm' to be omitted from the relevant ACEC classification. Seawater (chloride content about 18 000 mg/l) and stronger brines are not covered by this table.

Appendix C

- C1 Exploratory Hole Logs WS1 to WS6
- C2 Exploratory Hole Logs TP1 to TP3
- C3 Infiltration Tests in TP1 to TP3

GeoAssist Limited		Exploratory Hole Record Sheet							Ref: WS1		
Consultant: BrennanConsult Ltd		Project: Monet Lodge							Sheet: 1		
		Location: Cavendish Road, Didsbury									
Client: Henderson Homes		Equipment: Archway Dart Rig					Ground Level: 31.22 m.AOD				
							Co-ordinates: Easting: 383750.9(m) Northing: 392575.1(m) Dates: 27/09/2022 to 27/09/2022				
Drilling Foreman: M Walton		Depth (Thick) (m)	Reduced Level (mAOD)	Strata Legend/ Standpipe Backfill	Samples/Tests				Field Records		
STRATUM DESCRIPTION					Depth (m) from to		Sample Type/No	Blow Count N/(U)			
Engineer/Geologist: M Benson											
0 Grass over dark brown gravelly TOPSOIL with rootlets		0.30									
Brown sandy gravel, brick and concrete fragments with rootlets - MADE GROUND		(0.40) 0.70	30.52			0.30 0.40	C1				
Brown SAND and GRAVEL		1.00	30.22								
1 Medium dense brown with occasional dark grey gravelly silty SAND		(1.00)				1.00 1.20 1.30	CP1 D1	12			
2 Very loose to medium dense brown with occasional grey slightly silty very gravelly SAND		2.00	29.22			2.00	CP2	3	Wet from 2.00m depth		
		(1.60)				2.50 2.60	D2				
-3						3.00	CP3	12			
		3.60	27.62								
4 Firm to stiff brown medium to high strength slightly gravelly sandy silty CLAY		(1.40)				3.80 3.90 4.00	D3 CP4	4	Hand vane at 3.80m - 97kPa Hand vane at 4.40m - 59kPa		
5 Stiff brown slightly gravelly sandy silty CLAY - Interpreted Stratum Dynamic probe only from 5.00m		5.00	26.22			5.00	CP5	12			
6		(2.00)				6.00	CP6	19			
7 Exploratory Hole complete at 7.00m		7.00	24.22			6.90	CP7	24	27/09/2022: On completion of exploratory hole at 7.00m. Casing at 4.00m. Standing water level at 4.00m with casing. On withdrawal of casing exploratory hole backfilled and reinstated.		
-8											
-9											
10											

Remarks: 27/09/2022: Inspection pit excavated to 1.00m depth to avoid services	Logged: M Benson
	Date: 29/09/2022
The groundwater conditions entered on the exploratory hole logs are those observed at the time of the drilling operations and the water level may not have reached equilibrium with the surrounding water level prior to the record being taken.	Checked: M Richardson
	Date: 14/10/2022
Standing groundwater levels will be subject to seasonal variation or changes in local drainage conditions and could be higher at certain times of the year particularly after periods of heavy rainfall.	Site Ref: 6103/VMD
	Scale 1:50

GeoAssist Limited		Exploratory Hole Record Sheet					Ref: WS2			
Consultant: BrennanConsult Ltd		Project: Monet Lodge Location: Cavendish Road, Didsbury					Sheet: 1			
Client: Henderson Homes		Equipment: Archway Dart Rig					Ground Level: 31.43 m.AOD Co-ordinates: Easting: 383738.8(m) Northing: 392584.3(m) Dates: 28/09/2022 to 28/09/2022			
Drilling Foreman: M Walton STRATUM DESCRIPTION Engineer/Geologist: M Benson		Depth (Thick) (m)	Reduced Level (mAOD)	Strata Legend/ Standpipe Backfill	Samples/Tests Depth (m) from to			Sample Type/No	Blow Count N/(U)	Field Records
0 Grass over brown gravelly TOPSOIL with rootlets		0.25	31.18		0.30	0.40	C1			
Dark brown/grey sandy gravel with brick and concrete fragments - MADE GROUND		(0.65)			0.80	0.90	D1			
1 Medium dense brown gravelly slightly silty SAND					1.00		CP1	27		
					1.50	1.60	D2			
2		(2.80)			2.00		CP2	16		Wet from 2.00m depth
3					3.00		CP3	12		
Firm to stiff brown medium to high strength slightly gravelly 4 sandy silty CLAY		3.70	27.73		3.90	4.00	D3			Hand vane at 3.90m - 81kPa
		(1.30)			4.00		CP4	5		Hand vane at 4.50m - 74kPa
5 Stiff slightly gravelly sandy silty CLAY - Interpreted Stratum Dynamic probe only from 5.00m		5.00	26.43		5.00		CP5	9		
6		(2.00)			6.00		CP6	21		
7 Exploratory Hole complete at 7.00m		7.00	24.43		6.90		CP7	27		28/09/2022: On completion of exploratory hole at 7.00m. Casing at 4.00m. Standing water level at 4.60m with casing. On withdrawal of casing exploratory hole backfilled and reinstated.
8										
9										
10										
Remarks: 28/09/2022: Inspection pit excavated to 1.00m depth to avoid services The groundwater conditions entered on the exploratory hole logs are those observed at the time of the drilling operations and the water level may not have reached equilibrium with the surrounding water level prior to the record being taken. Standing groundwater levels will be subject to seasonal variation or changes in local drainage conditions and could be higher at certain times of the year particularly after periods of heavy rainfall.								Logged: M Benson Date: 29/09/2022 Checked: M Richardson Date: 14/10/2022 Site Ref: 6103/VMD Scale 1:50		

GeoAssist Limited		Exploratory Hole Record Sheet				Ref: WS3			
Consultant: BrennanConsult Ltd		Project: Monet Lodge Location: Cavendish Road, Didsbury				Sheet: 1			
Client: Henderson Homes		Equipment: Archway Dart Rig				Ground Level: 31.36 m.AOD Co-ordinates: Easting: 383735.7(m) Northing: 392570.6(m) Dates: 27/09/2022 to 27/09/2022			
Drilling Foreman: M Walton STRATUM DESCRIPTION Engineer/Geologist: M Benson		Depth (Thick) (m)	Reduced Level (mAOD)	Strata Legend/ Standpipe Backfill	Samples/Tests Depth (m) from to		Sample Type/No	Blow Count N/(U)	Field Records
0 Grass over dark brown gravelly TOPSOIL		0.30	31.06		0.30	0.40	C1		
Brown sandy gravel brick and concrete fragments with rootlets - MADE GROUND		(0.40) 0.70	30.66						
Brown sand and gravel - MADE GROUND		1.00	30.36		1.00	1.10	CP1 D1	17	
1 Brown sandy gravel with brick and concrete fragments - MADE GROUND Medium dense brown slightly gravelly slightly silty SAND		1.20	30.16		1.00	1.10			
2		(2.20)			2.00		CP2	15	
3					2.50	2.60	D2		Wet from 2.30m depth
4					3.00		CP3	12	
Brown/grey sandy GRAVEL		3.40	27.96						
Firm to stiff brown medium to high strength silty CLAY with sand inclusions		(0.40) 3.80			3.90	4.00	D3 CP4	6	Hand vane at 3.90m - 58kPa
5		(1.20)			4.00				Hand vane at 4.50m - 71kPa
Stiff slightly gravelly sandy silty CLAY - Interpreted Stratum Dynamic probe only from 5.00m		5.00	26.36		5.00		CP5	7	
6		(2.00)			6.00		CP6	16	
7		7.00	24.36		6.90		CP7	27	
Exploratory Hole complete at 7.00m									27/09/2022: On completion of exploratory hole at 7.00m. Casing at 4.00m. Standing water level at 4.00m with casing. On withdrawal of casing exploratory hole backfilled and reinstated.
8									
9									
10									
Remarks: 27/09/2022: Inspection pit excavated to 1.00m depth to avoid services The groundwater conditions entered on the exploratory hole logs are those observed at the time of the drilling operations and the water level may not have reached equilibrium with the surrounding water level prior to the record being taken. Standing groundwater levels will be subject to seasonal variation or changes in local drainage conditions and could be higher at certain times of the year particularly after periods of heavy rainfall.							Logged: M Benson Date: 29/09/2022 Checked: M Richardson Date: 14/10/2022 Site Ref: 6103/VMD Scale 1:50		

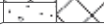
[illegible]

GeoAssist Limited		Exploratory Hole Record Sheet					Ref: WS5	
Consultant: BrennanConsult Ltd		Project: Monet Lodge Location: Cavendish Road, Didsbury					Sheet: 1	
Client: Henderson Homes		Equipment: Archway Dart Rig					Ground Level: 31.32 m.AOD Co-ordinates: Easting: 383731.2(m) Northing: 392569.3(m) Dates: 28/09/2022 to 28/09/2022	
Drilling Foreman: M Walton STRATUM DESCRIPTION Engineer/Geologist: M Benson		Depth (Thick) (m)	Reduced Level (mAOD)	Strata Legend/ Standpipe Backfill	Samples/Tests Depth (m) from to			Sample Type/No
							Blow Count N/(U)	Field Records
0 Grass over dark brown sandy slightly gravelly TOPSOIL		0.30	31.02		0.30	0.40	C1	
Brown sandy gravel with brick and concrete fragments - MADE GROUND								
1 (1.50)								
Brown with grey/dark grey silty fine to medium SAND		1.80	29.52					
2 (0.90)								
Dark brown gravelly silty SAND		2.70	28.62					
3 3.00 28.32								
Exploratory Hole complete at 7.00m								
4								
5								
6								
7								
8								
9								
10								
Remarks: 28/09/2022: Inspection pit excavated to 1.00m depth to avoid services							Logged: M Benson Date: 29/09/2022 Checked: M Richardson Date: 14/10/2022 Site Ref: 6103/VMD Scale 1:50	
The groundwater conditions entered on the exploratory hole logs are those observed at the time of the drilling operations and the water level may not have reached equilibrium with the surrounding water level prior to the record being taken. Standing groundwater levels will be subject to seasonal variation or changes in local drainage conditions and could be higher at certain times of the year particularly after periods of heavy rainfall.								

GeoAssist Limited		Exploratory Hole Record Sheet				Ref: WS6	
Consultant: BrennanConsult Ltd		Project: Monet Lodge Location: Cavendish Road, Didsbury				Sheet: 1	
Client: Henderson Homes		Equipment: Archway Dart Rig				Ground Level: 31.35 m.AOD Co-ordinates: Easting: 383741.3(m) Northing: 392561.6(m) Dates: 28/09/2022 to 28/09/2022	
Drilling Foreman: M Walton STRATUM DESCRIPTION Engineer/Geologist: M Benson		Depth (Thick) (m)	Reduced Level (mAOD)	Strata Legend/ Standpipe Backfill	Samples/Tests Depth (m) from to		Field Records
					Sample Type/No	Blow Count N/(U)	
0 Grass over dark brown gravelly TOPSOIL with rootlets		0.20	31.15				
Brown sand and gravel with brick and concrete fragments - MADE GROUND		(0.50) 0.70	30.65		0.30 0.40	C1	
Brown gravelly silty SAND		(2.10)					
1							
2							
3							
Orange/brown with grey sandy GRAVEL		2.80 3.00	28.55 28.35				
Exploratory Hole complete at 7.00m							
4							
5							
6							
7							
8							
9							
10							
Remarks: 28/09/2022: Inspection pit excavated to 1.00m depth to avoid services					Logged: M Benson Date: 29/09/2022 Checked: M Richardson Date: 14/10/2022 Site Ref: 6103/VMD Scale 1:50		
The groundwater conditions entered on the exploratory hole logs are those observed at the time of the drilling operations and the water level may not have reached equilibrium with the surrounding water level prior to the record being taken. Standing groundwater levels will be subject to seasonal variation or changes in local drainage conditions and could be higher at certain times of the year particularly after periods of heavy rainfall.							

GeoAssist Limited		Exploratory Hole Record Sheet					Ref: TP1	
Consultant: BrennanConsult Ltd		Project: Monet Lodge Location: Cavendish Road, Didsbury					Sheet: 1	
Client: Henderson Homes		Equipment: Excavation with hand Tools				Ground Level: 31.37 m.AOD Co-ordinates: Easting: 383735.9(m) Northing: 392565.2(m) Dates: 01/11/2022 to 01/11/2022		
Drilling Foreman: M Walton STRATUM DESCRIPTION Engineer/Geologist: M Benson		Depth (Thick) (m)	Reduced Level (mAOD)	Strata Legend/ Standpipe Backfill	Samples/Tests Depth (m) from to		Sample Type/No	Blow Count N/(U)
0 Grey/brown sandy TOPSOIL Grey/brown sandy gravel with brick fragments - MADE GROUND Brown/grey gravelly silty SAND 1 Exploratory Hole complete at 1.10m 2 3 4 5 6 7 8 9 10		0.30 (0.40) 0.70 (0.40) 1.10	31.07 30.67 30.27	  	1.10 1.20	D1	01/11/2022: On completion of Trial Pit at 1.10m. Infiltration Test undertaken. Trial Pit backfilled and reinstated.	
Remarks: The groundwater conditions entered on the exploratory hole logs are those observed at the time of the drilling operations and the water level may not have reached equilibrium with the surrounding water level prior to the record being taken. Standing groundwater levels will be subject to seasonal variation or changes in local drainage conditions and could be higher at certain times of the year particularly after periods of heavy rainfall.							Logged: M Benson Date: 01/11/2022 Checked: M Richardson Date: 15/11/2022 Site Ref: 6103/VMD Scale 1:50	

GeoAssist Limited		Exploratory Hole Record Sheet					Ref: TP2	
Consultant: BrennanConsult Ltd		Project: Monet Lodge Location: Cavendish Road, Didsbury					Sheet: 1	
Client: Henderson Homes		Equipment: Excavation with hand Tools					Ground Level: 31.24 m.AOD Co-ordinates: Easting: 383749.7(m) Northing: 392583.3(m) Dates: 01/11/2022 to 01/11/2022	
Drilling Foreman: M Walton STRATUM DESCRIPTION Engineer/Geologist: M Benson		Depth (Thick) (m)	Reduced Level (mAOD)	Strata Legend/ Standpipe Backfill	Samples/Tests Depth (m) from to		Sample Type/No	Blow Count N/(U)
0 Grey/brown sandy TOPSOIL Grey/brown sandy gravel with brick and concrete fragments - MADE GROUND Brown/grey gravelly silty SAND 1 Exploratory Hole complete at 1.00m 2 3 4 5 6 7 8 9 10		0.30 (0.45) 0.75 1.00	30.94 30.49 30.24	  	1.00 1.10	D2	01/11/2022: On completion of Trial Pit at 1.00m. Infiltration Test undertaken. Trial Pit backfilled and reinstated.	
Remarks: The groundwater conditions entered on the exploratory hole logs are those observed at the time of the drilling operations and the water level may not have reached equilibrium with the surrounding water level prior to the record being taken. Standing groundwater levels will be subject to seasonal variation or changes in local drainage conditions and could be higher at certain times of the year particularly after periods of heavy rainfall.							Logged: M Benson Date: 01/11/2022 Checked: M Richardson Date: 15/11/2022 Site Ref: 6103/VMD Scale 1:50	

GeoAssist Limited		Exploratory Hole Record Sheet					Ref: TP3	
Consultant: BrennanConsult Ltd		Project: Monet Lodge Location: Cavendish Road, Didsbury					Sheet: 1	
Client: Henderson Homes		Equipment: Excavation with hand Tools					Ground Level: 31.28 m.AOD Co-ordinates: Easting: 383735.8(m) Northing: 392577.5(m) Dates: 01/11/2022 to 01/11/2022	
Drilling Foreman: M Walton STRATUM DESCRIPTION Engineer/Geologist: M Benson		Depth (Thick) (m)	Reduced Level (mAOD)	Strata Legend/ Standpipe Backfill	Samples/Tests Depth (m) from to		Sample Type/No	Blow Count N/(U)
⁰ Grey/brown sandy TOPSOIL Grey/brown sandy gravel with brick and concrete fragments - MADE GROUND ¹ Brown/grey silty SAND and GRAVEL Exploratory Hole complete at 1.10m -2 -3 -4 -5 -6 -7 -8 -9 -10		(0.35) 0.35 (0.60) 0.95 1.10	30.93 30.33 30.18	  	1.10	1.20	D3	01/11/2022: On completion of Trial Pit at 1.10m. Infiltration Test undertaken. Trial Pit backfilled and reinstated.
Remarks:					Logged: M Benson Date: 01/11/2022 Checked: M Richardson Date: 15/11/2022 Site Ref: 6103/VMD Scale 1:50			
The groundwater conditions entered on the exploratory hole logs are those observed at the time of the drilling operations and the water level may not have reached equilibrium with the surrounding water level prior to the record being taken. Standing groundwater levels will be subject to seasonal variation or changes in local drainage conditions and could be higher at certain times of the year particularly after periods of heavy rainfall.								

GeoAssist Limited	Site: Monet Lodge, Cavendish Road, Didsbury	
	Job Ref: 6103 VMD	TP1
	Soil Infiltration Rate Test	
	Originator: MB	
	Checked: MR	
	Date: 01/11/2022	

Easting Northing Level (mAOD)

Test Pit Dimensions (m)

Inlet Pipe Invert Level (m) 0.5 Assumed

Width (m)	Length (m)	Depth (m)	Volume (m ³)	Effective Depth (m)
0.5	0.5	1.1	0.275	0.6

Test Results

Test Date: 01/11/2022

MixedMADE GROUND over SAND in base

Date	Time (mins)	TEST 1 Depth Below Surface (m)	TEST 2 Depth Below Surface (m)	TEST 3 Depth Below Surface (m)
01/11/2022	0	0.27		
01/11/2022	1	0.36		
01/11/2022	4	0.49		
01/11/2022	10	0.58		
01/11/2022	20	0.63		
01/11/2022	40	0.67		
01/11/2022	80	0.68		
01/11/2022	160	0.7		
01/11/2022	1290	0.75		
01/11/2022	1470	0.81		

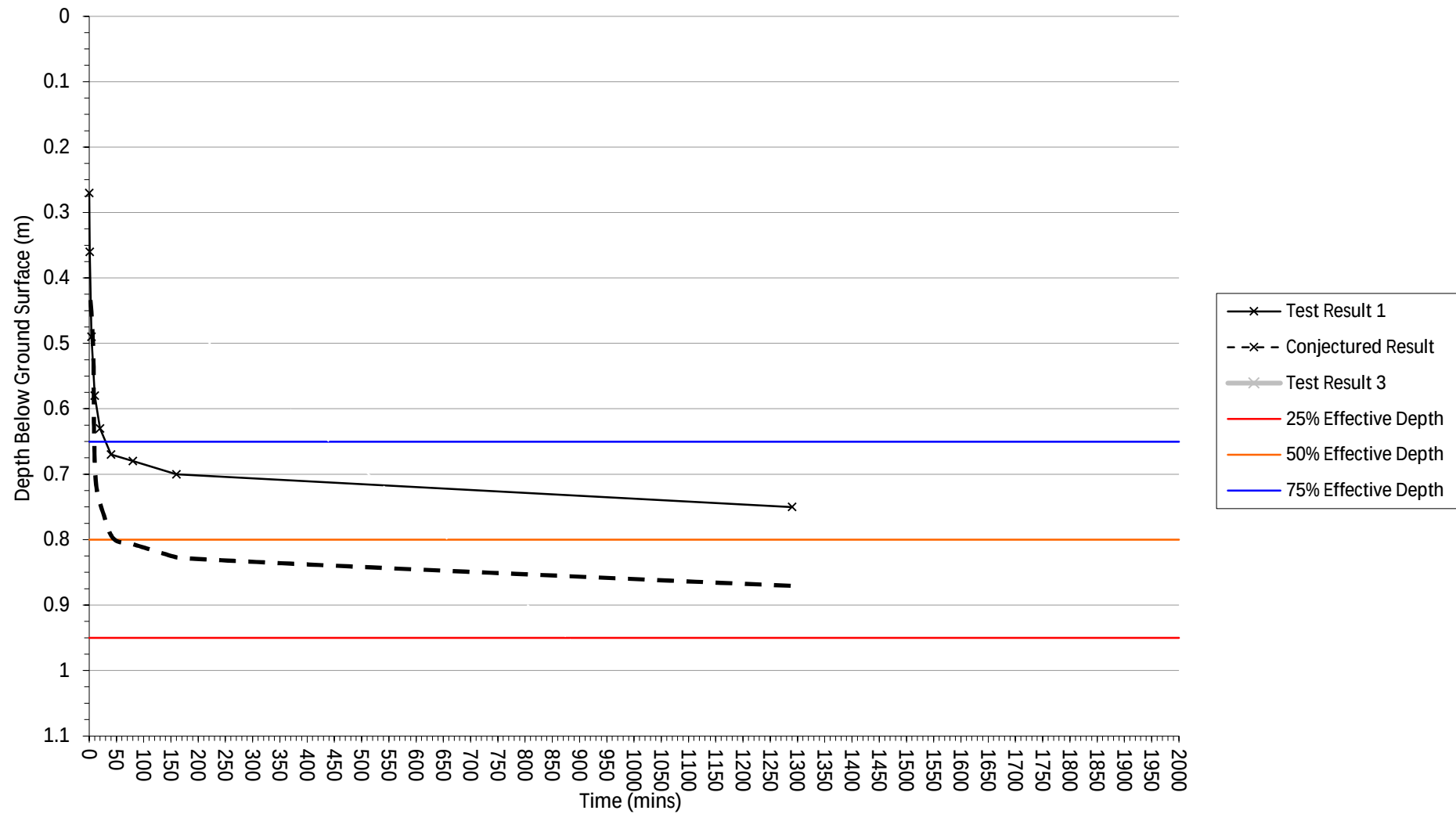
Calculations

Effective Depth (m)	
75%	0.65
25%	0.95
50%	0.80

$$\begin{aligned}
 &as_{50} && 0.6 \text{ m}^2 \\
 &0.675 V_{p75-25} && 0.075 \text{ m}^3 \\
 &1.225 a_{p50} && 0.85 \text{ m}^2 \\
 &t_{p75-25} && 72000 \text{ seconds}
 \end{aligned}$$

Soil Infiltration Rate f 1.2E-06 m/sec

Results of Field Observations 6103 VMD TP1 Soakaway Test



GeoAssist Limited Soil Infiltration Rate Test	Site: Monet Lodge, Cavendish Road, Didsbury	
	Job Ref: 6103 VMD	TP2
	Originator: MB	
	Checked: MR	
	Date: 01/11/2022	

Easting Northing Level (mAOD)

Test Pit Dimensions (m)

Inlet Pipe Invert Level (m) 0.5 Assumed

Width (m)	Length (m)	Depth (m)	Volume (m ³)	Effective Depth (m)
0.5	0.5	1	0.25	0.5

Test Results

Test Date: 01/11/2022

MixedMADE GROUND over SAND in base

Date	Time (mins)	TEST 1 Depth Below Surface (m)	TEST 2 Depth Below Surface (m)	TEST 3 Depth Below Surface (m)
01/11/2022	0	0.26		
01/11/2022	1	0.3		
01/11/2022	2	0.33		
01/11/2022	10	0.41		
01/11/2022	20	0.46		
01/11/2022	40	0.54		
01/11/2022	80	0.62		
01/11/2022	150	0.74		
01/11/2022	800	1		

Calculations

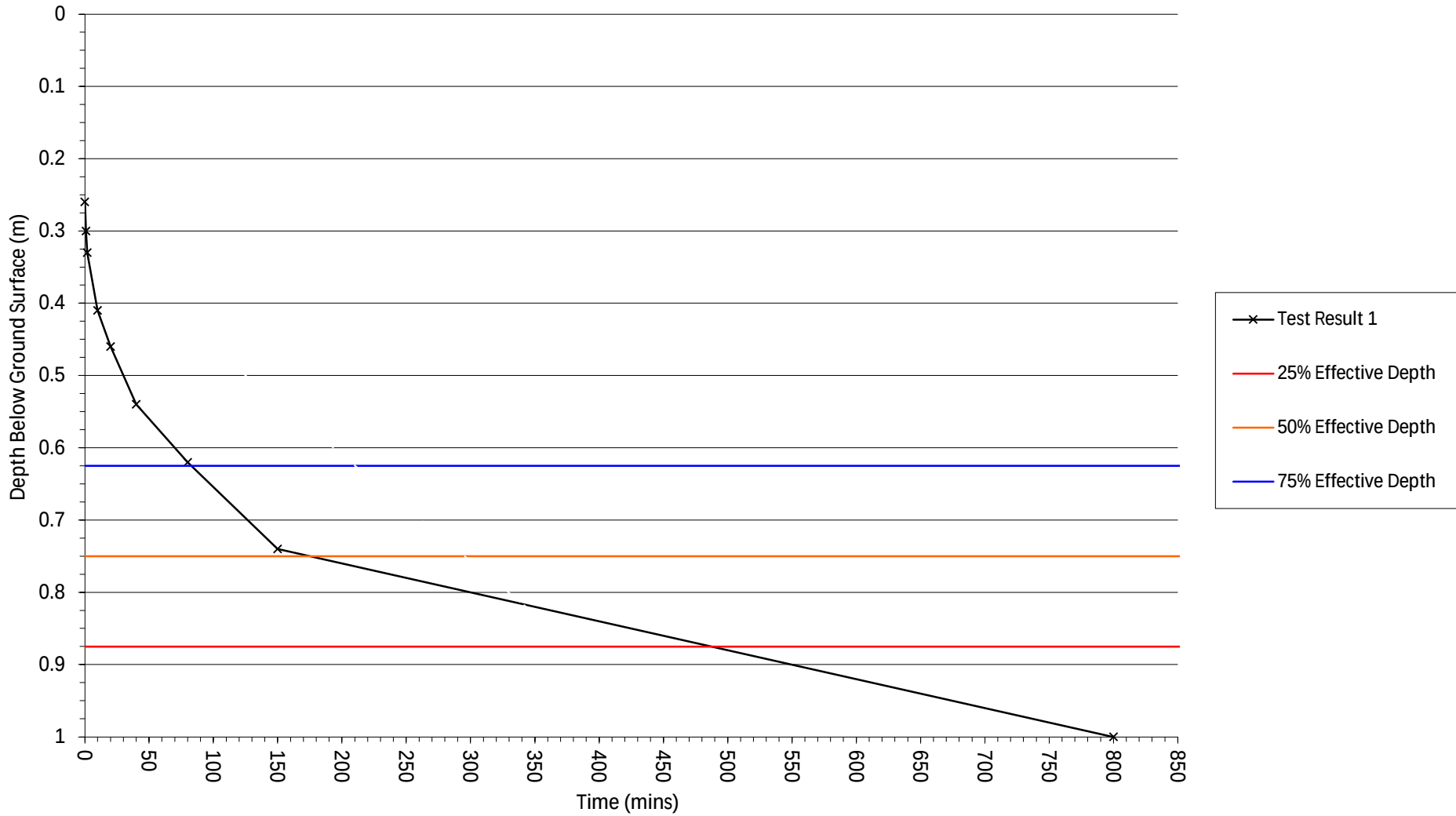
Effective Depth (m)	
75%	0.63
25%	0.88
50%	0.75

$$\begin{aligned}
 &as_{50} && 0.5 \text{ m}^2 \\
 &0.675 V_{p75-25} && 0.0625 \text{ m}^3 \\
 &1.225 a_{p50} && 0.75 \text{ m}^2 \\
 &t_{p75-25} && \text{25500 seconds}
 \end{aligned}$$

Soil Infiltration Rate f 3.3E-06 m/sec

Notes:

Results of Field Observations 6103 VMD TP2



GeoAssist Limited Soil Infiltration Rate Test	Site: Monet Lodge, Cavendish Road, Didsbury	
	Job Ref: 6103 VMD	TP3
	Originator: MB	
	Checked: MR	
	Date: 01/11/2022	

Easting Northing Level (mAOD)

Test Pit Dimensions (m)

Inlet Pipe Invert Level (m) 0.5 Assumed

Width (m)	Length (m)	Depth (m)	Volume (m ³)	Effective Depth (m)
0.3	0.35	1.1	0.1155	0.6

Test Results

Test Date: 01/11/2022

Mixed MADE GROUND over fine to medium SAND

Date	Time (mins)	TEST 1 Depth Below Surface (m)	TEST 2 Depth Below Surface (m)	TEST 3 Depth Below Surface (m)
01/11/2022	0	0.4	0.4	
01/11/2022	1	0.45	0.41	
01/11/2022	10	0.56	0.46	
01/11/2022	20	0.6	0.5	
01/11/2022	40	0.68	0.57	
01/11/2022	80	0.77	0.63	
01/11/2022	160	0.86		
01/11/2022	214	0.92		

Calculations

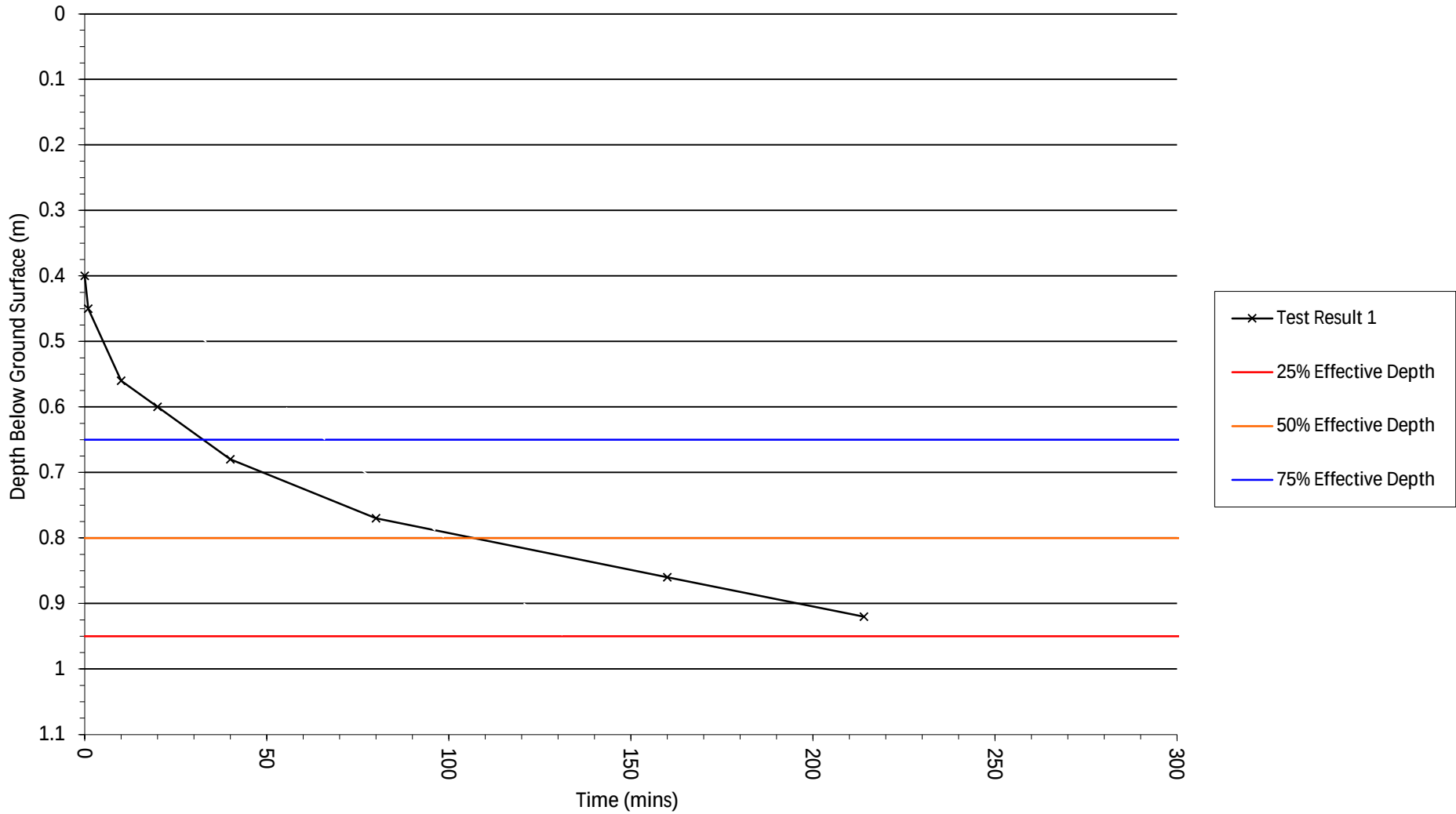
Effective Depth (m)	
75%	0.65
25%	0.95
50%	0.80

$$\begin{aligned}
 &as_{50} && 0.39 \text{ m}^2 \\
 &0.675 V_{p75-25} && 0.0315 \text{ m}^3 \\
 &1.225 a_{p50} && 0.495 \text{ m}^2 \\
 &t_{p75-25} && 15000 \text{ seconds}
 \end{aligned}$$

Soil Infiltration Rate f 4.2E-06 m/sec

Notes:

Results of Field Observations 6103 VMD TP3 Soakaway Test



Appendix D

D1	Laboratory Summary Sheet
D2	Classification Test Summary
D3	Sulphate and pH Summary
D4	Particle Size Distribution Graphs

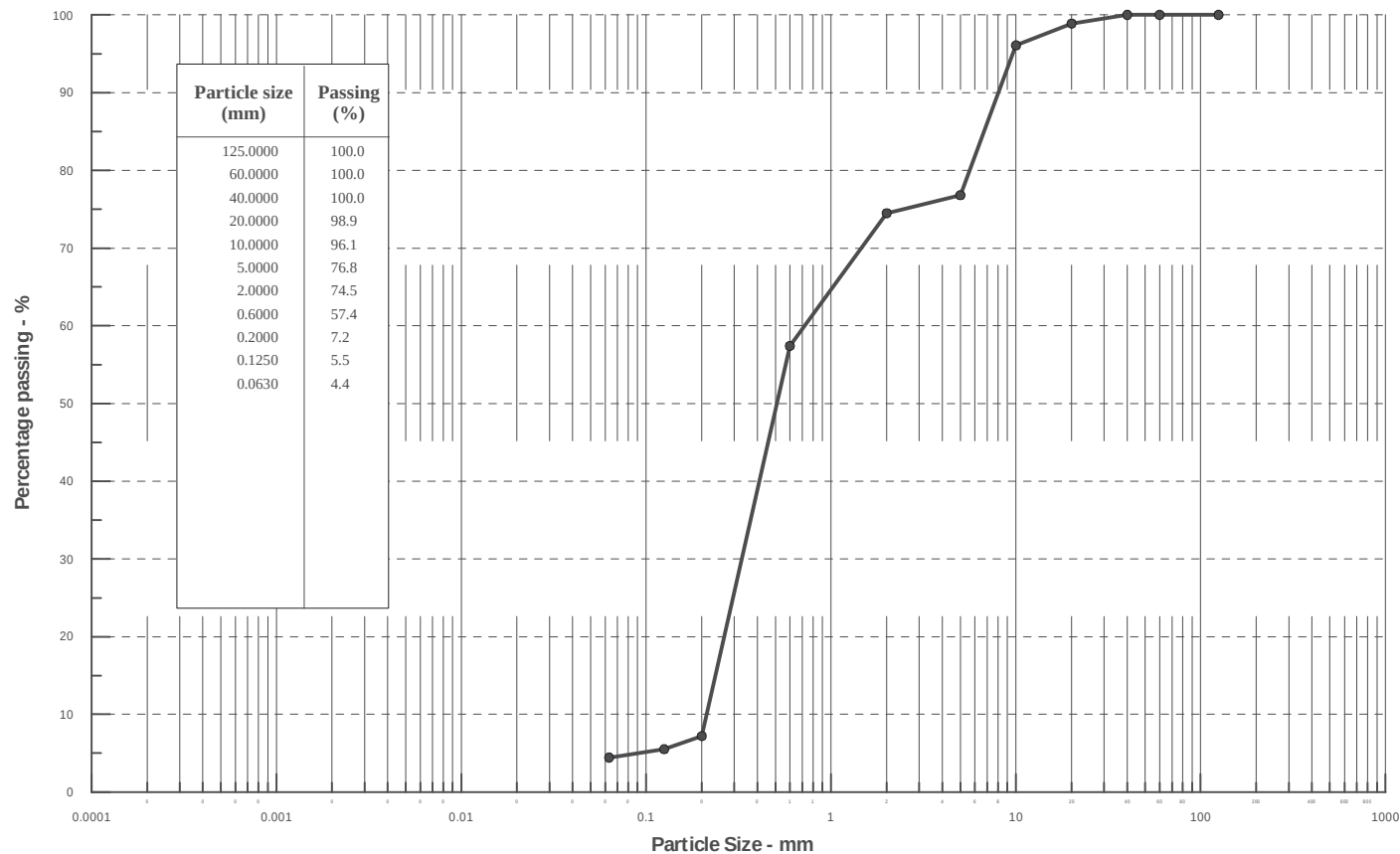
GeoAssist Limited SOIL LABORATORY SUMMARY SHEET	Project: Monet Lodge Location: Cavendish Road, Didsbury Client: Henderson Homes Consultant : BrennanConsult Ltd	Site Ref: 6103/VMD Project Code :
		Hole Ref WS1 to WS4

Sample Ref.	Depth m	Sample Description	Classification					Triaxial Compression					Chemical		Test Code
			LL %	PL %	PI %	% passing 425 m	Moist Cont. %	Bulk Density Mg/m ³	Sample Diameter mm	Lateral Pressure kN/m ²	Deviator Stress kN/m ²	Shear Cohesion kN/m ²	So ₄ 2:1 extract Soil:Water mg/l	pH	
WS1 D1	1.20	Brown with occasional dark grey gravelly silty SAND					-						610	8.9	SULWS PHS
WS1 D2	2.50	Brown with occasional grey slightly silty very gravelly SAND					-								GRAD WS
WS1 D3	3.80	Brown slightly gravelly sandy silty CLAY	46	19	27	99	21								NMC CLSS
WS2 D1	0.80	Dark brown/grey sandy gravel with brick and concrete fragments - MADE GROUND					-						640	8.6	SULWS PHS
WS2 D2	1.50	Brown gravelly slightly silty SAND					-								GRAD WS
WS2 D3	3.90	Brown slightly gravelly sandy silty CLAY	45	20	25	99	21								NMC CLSS
WS3 D1	1.00	Brown sandy gravel with brick and concrete fragments - MADE GROUND					-						650	9.4	SULWS PHS
WS3 D2	2.50	Brown slightly gravelly slightly silty SAND					-								GRAD WS
WS3 D3	3.90	Brown silty CLAY with sand inclusions	41	19	22	97	21								NMC CLSS
WS4 D1	1.50	Brown with grey silty SAND and GRAVEL					-						490	8.4	SULWS PHS
WS4 D2	3.50	Brown with grey slightly silty SAND and GRAVEL					-								GRAD WS
WS4 D3	4.70	Brown slightly sandy very silty CLAY	52	21	31	94	24								NMC CLSS

Site Reference:			6103 VMD					
Project Site:			Monet Lodge					
Project Location:			Cavendish Road, Didsbury					
Client:			Henderson Homes					
Consultant:			BrennanConsult Ltd					
CLASSIFICATION TEST								
Borehole Reference	Sample	Depth	Liquid Limit	Plastic Limit	Plasticity Index	% passing 425 micro	Natural Moisture Content	Material Code
WS1	D3	3.80	46	19	27	99	21	CI
WS2	D3	3.90	45	20	25	99	21	CI
WS3	D3	3.90	41	19	22	97	21	CI
WS4	D3	4.70	52	21	31	94	24	CH
		Mean	46	20	26	97	22	
		Maximum	52	21	31	99	24	
CLAY		Minimum	41	19	22	94	21	
	Standard Deviation		5	1	4	2	2	
	Count		4	4	4	4	4	

Site Reference:			6103	VMD		
Project Site:			Monet Lodge			
Project Location:			Cavendish Road, Didsbury			
Client:			Henderson Homes			
Consultant:			BrennanConsult Ltd			
	GEOTECHNICAL SULPHATE AND PH TEST					
Borehole Reference	Sample	Depth	SO4 2:1 Water:Soil extract mg/l	pH	SO4 Water mg/l	
WS1	D1	1.20	610	8.9		
WS2	D1	0.80	640	8.6		
WS3	D1	1.00	650	9.4		
WS4	D1	1.50	490	8.4		

Project: **Monet Lodge**
Location: **Cavendish Road, Didsbury**
Client: **Henderson Homes**
Consultant: **BrennanConsult Ltd**



BH No: WS1

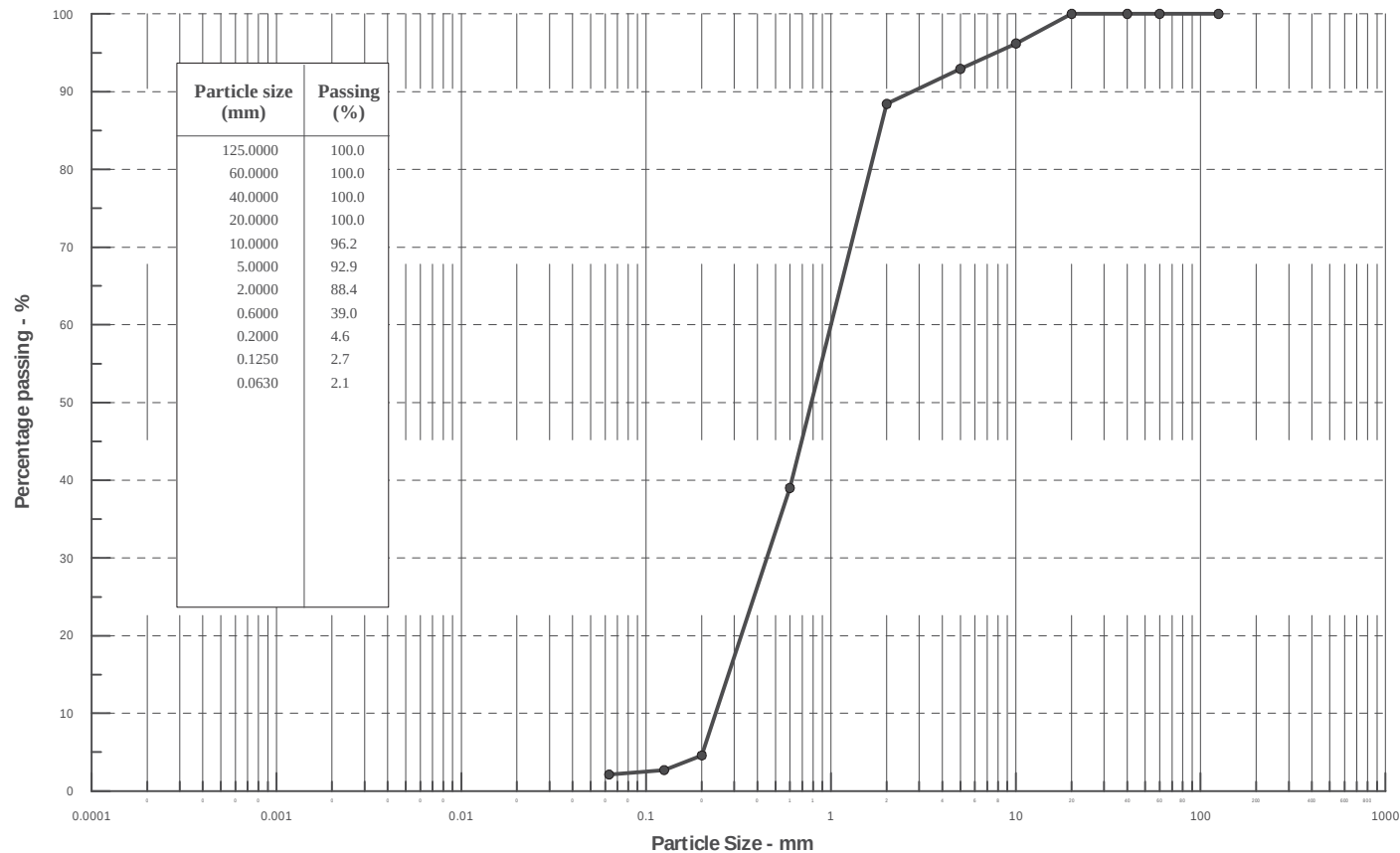
Sample: D2

Depth: 2.50m

%	<i>SIZE</i>
0.0	Cobbles
25.5	Gravel
70.2	Sand
4.4	Silt and Clay

CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	GRAVEL	COB- BLES	BOUL- DERS
	SILT			SAND					

Project: **Monet Lodge**
Location: **Cavendish Road, Didsbury**
Client: **Henderson Homes**
Consultant: **BrennanConsult Ltd**



BH No: WS2

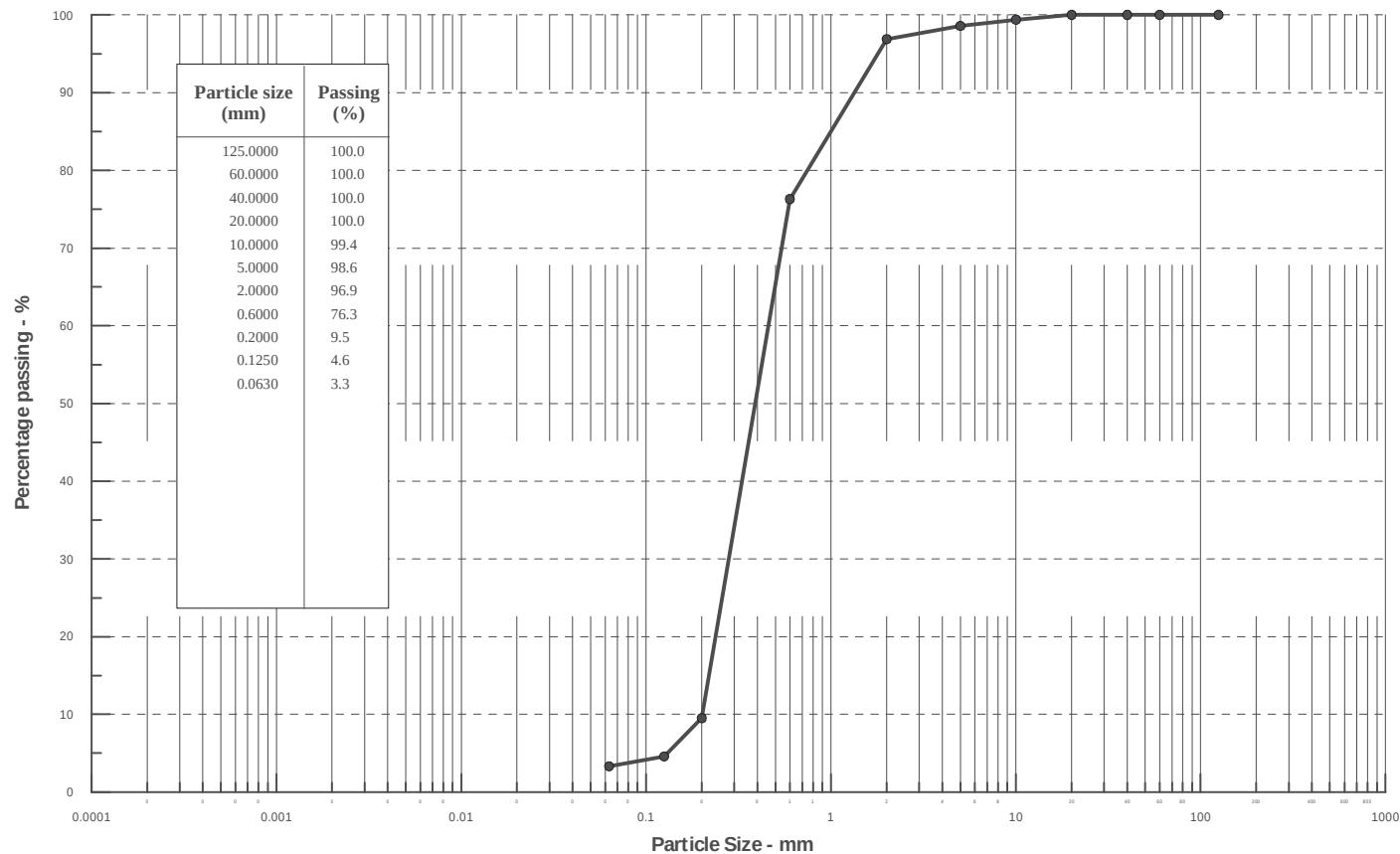
Sample: D2

Depth: 1.50m

%	<i>SIZE</i>
0.0	Cobbles
11.6	Gravel
86.3	Sand
2.1	Silt and Clay

CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	GRAVEL	COB- BLES	BOUL- DERS
	SILT			SAND					

Project: **Monet Lodge**
Location: **Cavendish Road, Didsbury**
Client: **Henderson Homes**
Consultant: **BrennanConsult Ltd**



BH No: WS3

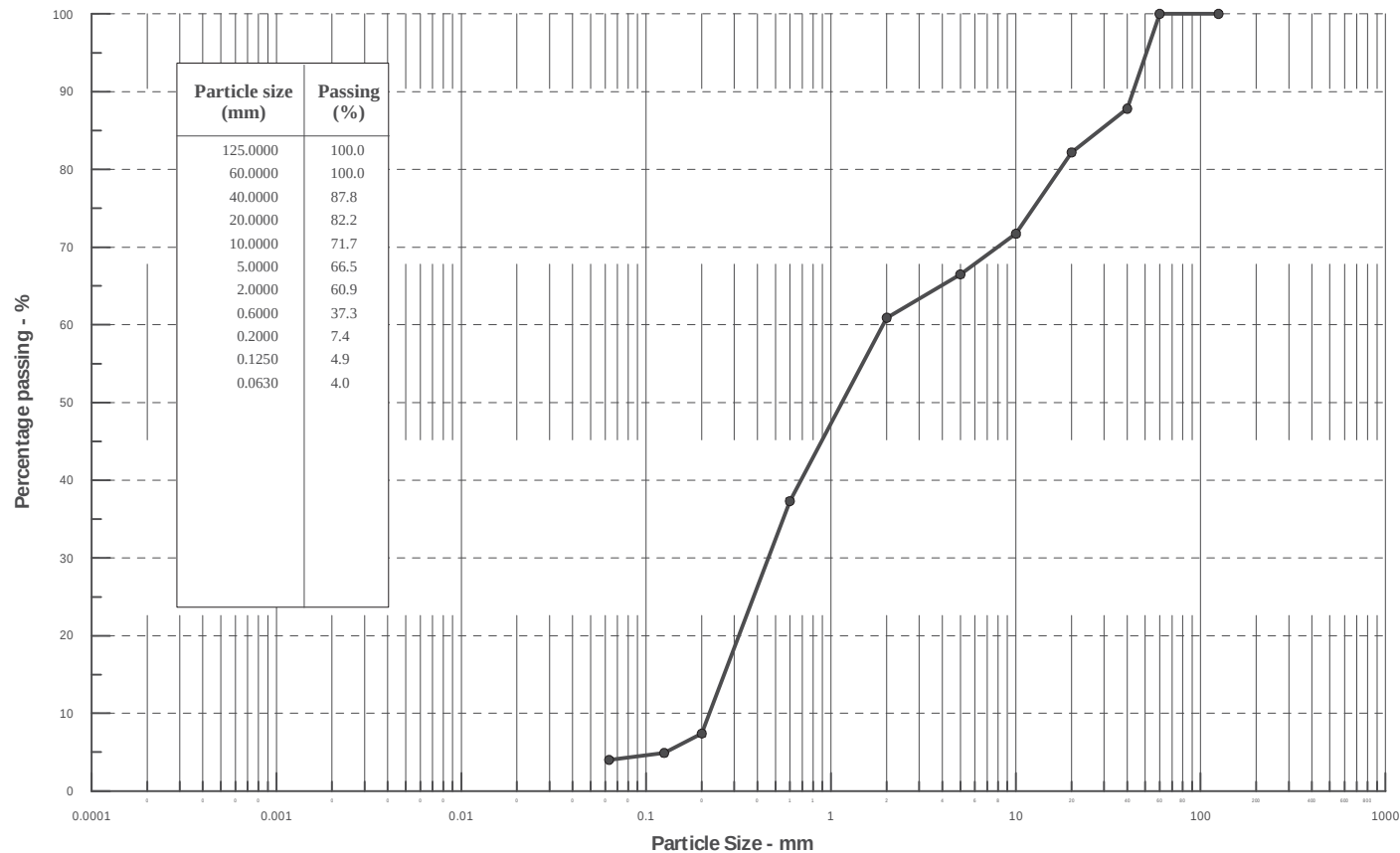
Sample: D2

Depth: 2.50m

%	<i>SIZE</i>
0.0	Cobbles
3.1	Gravel
93.6	Sand
3.3	Silt and Clay

CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	GRAVEL	COB- BLES	BOUL- DERS
	SILT			SAND					

Project: **Monet Lodge**
Location: **Cavendish Road, Didsbury**
Client: **Henderson Homes**
Consultant: **BrennanConsult Ltd**



BH No: WS4
Sample: D2
Depth: 3.50m

%	<i>SIZE</i>
0.0	Cobbles
39.1	Gravel
57.0	Sand
4.0	Silt and Clay

CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	GRAVEL	COB- BLES	BOUL- DERS
	SILT			SAND					