Rotary Drilling

21 WESTCLIFFE RISE
CLECKHEATON
BD19 5HX

for

Mr. A. Senior

Report Number 4543

April 2026

Michael D Joyce Associates LLP
Geotechnical and Geoenvironmental Consultants
Registered Office: 531 Denby Dale Road West, Calder Grove, Wakefield, West Yorkshire, WF4 3ND
T +44(0)1924 360458 **E** mdja@geoenvironmental.co.uk **W** www.geoenvironmental.co.uk

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1 INTRODUCTION

1.1 On behalf of Mr. A. Senior, a Coal Mining Risk Assessment (CMRA) has previously been carried out for a proposed development at 21 Westcliffe Rise in Cleckheaton. A Coal Mining Risk Assessment was previously carried out by Rogers Geotechnical Services Limited and is presented in its report "Phase 1 Environmental Desk Study and Coal Mining Risk Assessment - Land adjacent to 21 Westcliffe Rise, Cleckheaton", Report No. C3383/23/E/5124, dated 26th May 2023. This recommended rotary drilling be carried out to prove or disprove potential shallow workings beneath the site, in particular in the Wheatley Lime Coal seam.

2 THE SITE

2.1 The site is located to the north side of Bridle Road, approximately 7km northeast of the centre of Cleckheaton. The Ordnance National Survey Grid Reference is 418350, 425336. Figure 1 shows the general site location and development proposals.

2.2 The site lies in a predominantly residential area, surrounded by existing properties. It has recently been cleared of vegetation and previous garaging in advance of construction. It slopes down gently in a southerly direction towards the head of Westcliffe Rise.

3 GEOLOGY AND COAL MINING RISK ASSESSMENT

3.1 Geology

3.1.1 Maps of the British Geological Survey (BGS), show the site to be underlain by the Undifferentiated mudstones, siltstones and sandstones of the Pennine Lower Coal Measures, which are Carboniferous in age.

3.1.2 There are no drift deposits shown on the geological maps, which also show the site to be free of faulting.

3.1.3 The Wheatley Lime Coal seam is shown on the latest geological maps as outcropping approximately 380m to the north of the site, and dipping (unrecorded) in a southerly direction below the site.

3.2 Coal Mining Risk Assessment

3.2.1 The Rogers Geotechnical Services Limited Coal Mining Risk Assessment report concluded that the Wheatley Lime is anticipated to lie approximately 10m below the site, although no justification was given to this conclusion. Reference has subsequently been made to the memoir "The Geology of the Country around Huddersfield and Halifax", published in 1930, which states that records at Cleckheaton Station record the Wheatley Lime to be 0.5m thick. The memoir also goes on to say that the Wheatley Lime Coal was *"worked to some extent"* in the general area.

3.2.2 According to the memoir, the Wheatley Lime Coal seam is underlain by the Blocking Bed Coal seam. This lies approximately 26m below the Wheatley Lime. As such, any extraction in this seam will be too deep to affect surface stability.

4 THE INVESTIGATION

4.1 The investigation was designed to provide information on any unrecorded shallow coal seams under the site, together with identifying any potential mineworkings. The investigation was undertaken in accordance with the principles of BS5930: 2015 Code of Practice for Site Investigations and CIRIA's Abandoned Mine Workings Manual (C758D).

4.2 The investigation was carried out on the 23rd April 2026. The exploratory borehole positions are shown on figure 1. These were located so that they did not underlie the footprint of the proposed dwelling.

4.3 The rotary drilling was carried out using a Beretta T25 rig, using a water flush technique. The openhole technique meant that logging was carried out by inspecting the arisings that were brought to the surface in the water flush. On completion the boreholes were backfilled with bentonite.

4.4 Supervision and logging was provided by a Chartered Engineer from Michael D Joyce Associates LLP.

5 STRATA PROFILE

5.1 The boreholes encountered between 0.1m and 0.6m of Made Ground, overlying a brown gravelly sandstone. This in turn was underlain by brown and grey silty clay. Bedrock comprises a brown and grey sandstone underlain by grey and dark grey mudstone.

5.2 The Wheatley Lime Coal seam was encountered as intact coal at the following depths. The seam was 400mm thick, and contained dirt partings.

Borehole	Depth of Wheatley Lime Coal (m)
R1	7.80 - 8.20
R2	6.70 - 7.10

5.3 The coal was slightly shallower in borehole R2, reflecting the slightly falling topography to the south.

5.4 The coal was underlain by grey mudstone and a further thin band of coal. Below this was further mudstone. Borehole R1 was extended to a depth of 28m. As anticipated, no further evidence of coal or coal workings was encountered. The strata consisted predominantly of a grey sandstone.

5.5 Intermittent water loss was encountered in borehole R1 between 12.0m and 13.0m, due to fracturing in the sandstone. At all other times, there was a good return of water flush.

5.6 Gas monitoring was carried out throughout and no mine gases were detected.

5.7 The full borehole records are presented in Appendix 1.

6 CONCLUSIONS AND RECOMMENDATIONS

6.1 Both boreholes encountered the Wheatley Lime Coal seam. It was only 400mm thick and contained dirt partings. Given that the seam is thin and of a poor quality, it is very unlikely to have been worked.

6.2 As a rule of thumb, there should be 10 times the seam thickness/workings of rock cover above any workings. In this case, a 0.4m thick seam would require 4m of rock cover to the underside of foundations, which is the case here.

6.3 Given that the seam is thin and poor quality, it is very unlikely to have been worked elsewhere on the site. In the unlikely event it was worked locally, there is sufficient rock cover present, such that subsidence in any workings would not affect surface stability.

6.4 The site can be considered stable in respect of former coal mining, and as such no special precautions are necessary.

A D Joyce

BSc MSc ARSM CEng CGeol CEnv MICE FGS SiLC SQP

April 2026

Procedure Notes

The desk study and/or ground investigation have been carried out using reasonable skill and care in accordance with the principles of Ground Investigation and Testing", BS5930: 2013 and BS10175:2011+A1:2013, and the terms of the client's brief. The report has been prepared for the specific purposes notified at the time of the initial enquiry.

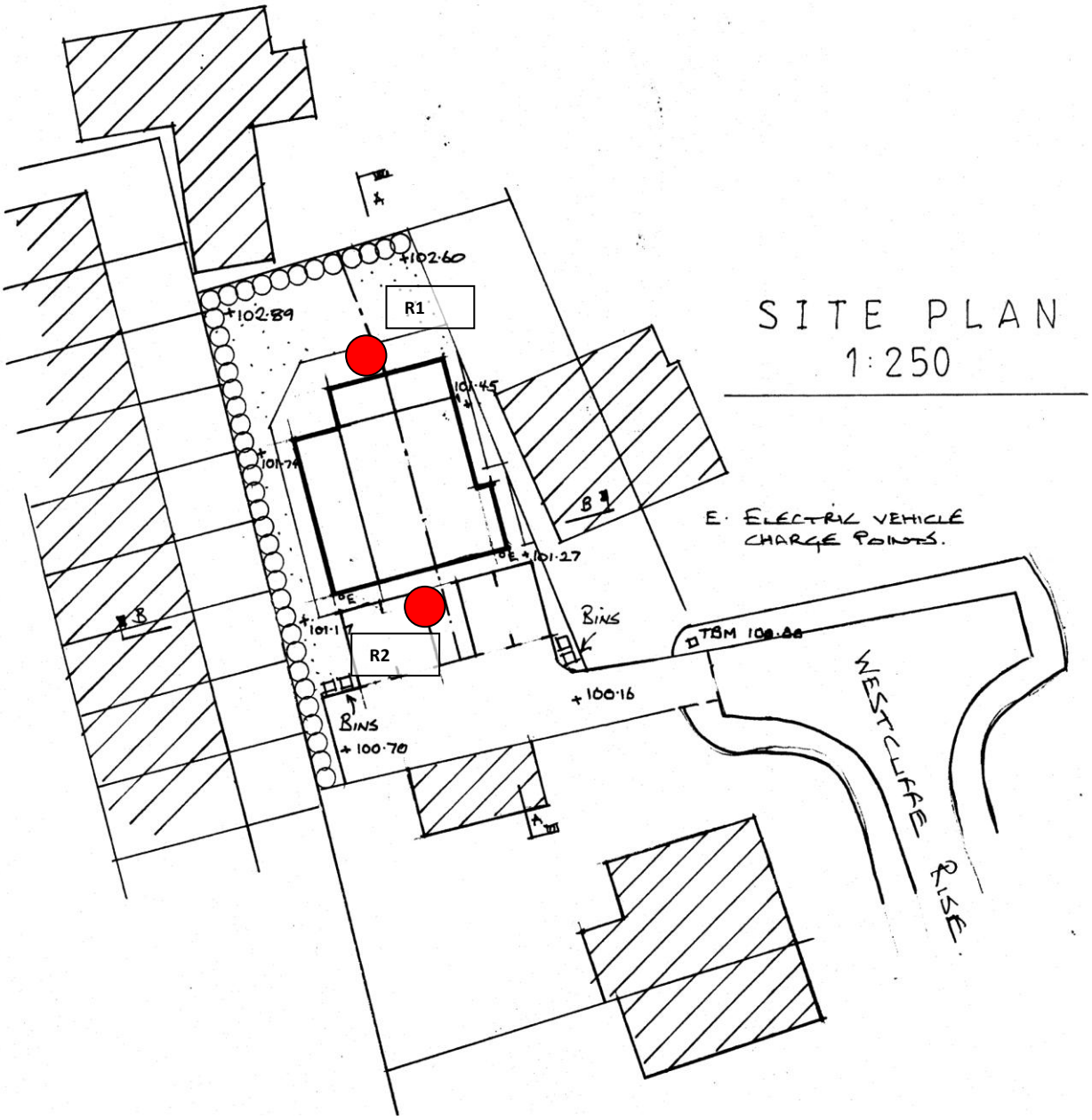
By its very nature any ground investigation only encounters and samples a small percentage of the ground. Consequently changes in ground conditions and soil properties can occur between any two exploratory points, for example local features such as soft ground, pockets of contamination and faults. This is also true of the exploration of mineworkings and such features can extend beneath parts of the site not investigated. Unrecorded bell pits and shafts can also exist between exploratory points. The ground investigation is designed to minimize such risks. Conclusions and recommendations are based on the information presented in this report, but unforeseen features may exist. No liability can be accepted for conditions not revealed by the exploratory holes. Therefore, actual ground conditions should be noted during construction and further advice sought if they differ from those predicted. Michael D. Joyce LLP reserves the right to amend the conclusions and recommendations in the light of further information. Actual methods of construction or alternative designs should be notified to Michael D. Joyce Associates LLP, such that the recommendations made can be reconsidered in the light of any changes.

Further investigation can be carried out to further reduce uncertainty and risk but ultimately these risks cannot be eliminated. Similarly a desk study normally only considers readily available information and further information could be held by other sources. In commissioning further research or investigation the cost/benefit of doing so must be considered.

It is assumed that groundlevels will not change significantly from those at present. The groundwater conditions are based on observations made at the time of the investigation, unless stated otherwise. It should be noted that the observations are subject to the method of the boring or excavation and that groundwater levels will vary due to seasonal or other effects.

Where buildings are present on a site, structural and asbestos surveys have not been carried out, unless specifically stated. An Unexploded Ordnance Survey has not been carried out unless specifically stated. In relevant situations it would be prudent to commission such surveys.

Where information has been obtained from Third Parties, no liability can be accepted for the accuracy or completeness of this information. Where anecdotal evidence or speculations are presented, they must be treated as such and cannot be relied upon.



21 Westcliffe Rise, Cleckheaton

Borehole Locations and Development Proposals

Michael D Joyce Associates LLP

Geotechnical and Geoenvironmental Consultants

Scale: NTS

Figure: 1

Appendix 1

Borehole Records

Site: 21 WESTCLIFFE RISE (4543)

Location: CLECKHEATON

Method: Water Flush

Date: 23rd April 2026

Client: Mr. A. Senior

Borehole No: R1

Michael D Joyce Associates LLP

Depth (m)	TCR (%)	SCR (%)	RQD (%)	FI (%)	Field Records	Depth (mAOD)	Reduced Level (m)	Description	Legend
						0	0	Ground level.	
								MADE GROUND	
						-0.6			
								Brown gravelly SANDSTONE.	
						-1	1		
								Brown and grey silty CLAY.	
						-1.8			
							2	Brown and grey SANDSTONE with thin bands of mudstone.	
							3		
							4		
						-4.6			
								Grey silty MUDSTONE.	
							5		
						-6			
							6	Dark grey MUDSTONE.	
							7		
						-7.8			
							8	Intact COAL with dirt partings.	
						-8.2			
								Grey silty MUDSTONE.	
							9		
							10		
						-10.2			
						-10.4		Intact COAL with dirt partings.	

Equipment: Beretta T25 Rig

Flush: Water flush

Groundwater: Not encountered.

Returns: Good.

Remarks: No gases recorded.

Site: 21 WESTCLIFFE RISE (4543)

Location: CLECKHEATON

Method: Water Flush

Date: 23rd April 2026

Client: Mr. A. Senior

Borehole No: R1

Michael D Joyce Associates LLP

Depth (m)	TCR (%)	SCR (%)	RQD (%)	FI (%)	Field Records	Depth (mAOD)	Reduced Level (m)	Description	Legend
							11	Grey silty MUDSTONE.	
						-12	12	Grey SANDSTONE. Fractured with intermittent water loss.	
						-13	13	Grey SANDSTONE with bands of mudstone.	
							14		
							15		
							16		
							17		
							18		
							19		
							20		

Equipment: Beretta T25 Rig

Flush: Water flush

Groundwater: Not encountered.

Returns: Good.

Remarks: No gases recorded.

Site: 21 WESTCLIFFE RISE (4543)

Location: CLECKHEATON

Method: Water Flush

Date: 23rd April 2026

Client: Mr. A. Senior

Borehole No: R1

Michael D Joyce Associates LLP

Depth (m)	TCR (%)	SCR (%)	RQD (%)	FI (%)	Field Records	Depth (mAOD)	Reduced Level (m)	Description	Legend
							21		
							22		
							23		
							24		
							25		
							26		
							27		
						-28	28	End of Borehole	
							29		
							30		
							31		

Equipment: Beretta T25 Rig

Flush: Water flush

Groundwater: Not encountered.

Returns: Good.

Remarks: No gases recorded.

Site: 21 WESTCLIFFE RISE (4543)

Location: CLECKHEATON

Method: Water Flush

Date: 23rd April 2026

Client: Mr. A. Senior

Borehole No: R2

Michael D Joyce Associates LLP

Depth (m)	TCR (%)	SCR (%)	RQD (%)	FI (%)	Field Records	Depth (mAOD)	Reduced Level (m)	Description	Legend
						0	0	Ground level. MADE GROUND	
								Brown gravelly SANDSTONE.	
						-1.2	1	Brown and grey silty CLAY.	
						-1.9	2	Brown and grey SANDSTONE with thin bands of mudstone.	
						-3.5	3	Grey silty MUDSTONE.	
						-5	4	Dark grey MUDSTONE.	
						-6.7	5	Intact COAL with dirt partings.	
						-7.1	6	Grey silty MUDSTONE.	
						-9.3	7	Intact COAL with dirt partings.	
							8	Grey silty MUDSTONE.	
							9		
							10		

Equipment: Beretta T25 Rig

Flush: Water flush

Groundwater: Not encountered.

Returns: Good.

Remarks: No gases recorded.

Site: 21 WESTCLIFFE RISE (4543)

Location: CLECKHEATON

Method: Water Flush

Date: 23rd April 2026

Client: Mr. A. Senior

Borehole No: R2

Michael D Joyce Associates LLP

Depth (m)	TCR (%)	SCR (%)	RQD (%)	FI (%)	Field Records	Depth (mAOD)	Reduced Level (m)	Description	Legend
						-11	11	End of Borehole	

Equipment: Beretta T25 Rig

Flush: Water flush

Groundwater: Not encountered.

Returns: Good.

Remarks: No gases recorded.

Standard Appendix A

STANDARD APPENDIX A

NOTES ON SITE INVESTIGATION PROCEDURE (June 2021)

1. **GENERAL.** The ground investigation has been carried out in accordance with the requirements of BS5930: 2015 and BS10175: 2011+A1: 2020. By its very nature, any ground investigation only samples a small percentage of the ground. Consequently, changes in ground conditions and soil properties can occur between any two exploratory points, for example local features such as soft ground, pockets of contamination and faults. This is also true of the exploration of mineworkings and such features can extend beneath parts of the site not investigated. Unrecorded bell pits and shafts can also exist between exploratory points. The ground investigation is designed to minimise such risks but they cannot be eliminated.

2. **GROUND INVESTIGATION.**

2.1 **BOREHOLE AND TRIAL PIT RECORDS.** These illustrate the ground conditions only at the location of the particular borehole or trial pit. Correlation between boreholes is for guidance only and its accuracy cannot be guaranteed.

2.2 **SHELL AND AUGER BORING.** This technique uses a tripod winch and an essentially percussive action using a variety of tools. Disturbed and undisturbed samples can be taken. This is the most suitable method for soft ground investigation, enabling the maximum amount of information to be obtained. However, minor changes in lithology may be overlooked unless continuous undisturbed sampling is used.

2.3 **GROUNDWATER**. Groundwater levels vary seasonally and the details given on the borehole logs relate only to the dates and the conditions described in the borehole records. The rate of boring may not have allowed an equilibrium water level to be established and the use of casing may seal off certain seepages.

2.4 **SAMPLING.** Disturbed samples of soils are taken for identification and classification purposes. In cohesive soils 'undisturbed' samples 100mm in diameter are taken by open drive sampler for laboratory testing of strength, permeability and consolidation characteristics.

2.5 **STANDARD PENETRATION TESTS**. S.P.T tests are used in granular and cohesive materials and in soft or weathered rocks. Difficulties in obtaining true 'N' values mean they must only be used as a guide and not as an absolute value in foundation design.

2.6 **ROTARY DRILLING.** Two main types of rotary drilling are carried out in rock. Rock coring using diamond or tungsten carbide tipped core bits provides samples and information on rock types, fissuring and weathering. Openhole drilling only produces small particles for identification purposes and the information gained is therefore limited. The latter is, however, useful as a quick method for detecting major strata changes and for the location of coal seams and old workings. Water, air, foam or drilling muds may be used as the flushing medium in either case.

2.7 **PERMEABILITY TESTS.** These can be carried out in boreholes or trial pits and gives a good indication of in-situ permeability.

2.8 **TRIAL PITTING.** This enables soil conditions to be closely examined at any specific point and samples taken. It also gives useful information on the stability of excavations and ingress of water.

2.9 **WINDOW SAMPLING**. Window sampling consists of driving a series of 1m-long tubes into the ground using a dropping weight. On completion of each 1m run, the tube is withdrawn. The next tube is then inserted and the process repeated to provide a continuous profile of the ground. On each run the tube diameter is reduced in order to assist in its recovery.

2.10 **GAS MONITORING.** This is routinely carried out in trial pits or probe holes to check for elevated levels of methane and carbon dioxide or oxygen deficiency, particularly since risks can exist from natural gases, landfill sites and rising groundwater levels in mine workings below ground. Longer term monitoring is carried out with gas monitoring standpipes.

3. **SOIL DESCRIPTION.** Samples from borings or trial pits are described as specified in the standard procedure outlined in the British Standards. The description includes colour, consistency, structure, weathering, lithological type, inclusions and origin. All descriptions are based on visual and manual identification.

Fire Soils (Cohesive Soils)

The following field terms are used:

Soil Type	Description
Very soft	Exudes between fingers
Soft	Moulded by light finger pressure
Firm	Cannot be moulded by the fingers but can be rolled in hand to 3mm threads.
Stiff	Crumbles and breaks when rolled to 3mm threads but can be remoulded to a lump.
Very stiff	No longer moulded but crumbles under pressure. Can be indented with thumbs.

The following terms are used in accordance with the results of laboratory and field tests.

Description	Undrained Shear Strength Cu (kPa)
Extremely Low	<10
Very Low	10 - 20
Low	20 - 40
Medium	40 - 75
High	75 - 150
Very High	150 - 300
Extremely High	>300

Fine soils can also be classified according to their sensitivity, which is the ratio between undisturbed and remoulded undrained shear strength.

Sensitivity	Ratio
Low	8
Medium	8 - 30
High	>30
Quick	>50

Granular Soils (Non-Cohesive)

The following descriptions are used for granular soils.

Description	Normalised Blow Count (N_1) 60
Very Loose	0 - 3
Loose	3 - 8
Medium	8 - 25
Dense	25 - 42
Very Dense	42 - 58

4. **NATURAL OR IN-SITU MOISTURE CONTENT**. The natural or in-situ moisture content of a soil is defined as the weight of water contained in the pore space, expressed as a percentage of the dry weight of solid matter present in the soil. Soil properties are greatly affected by the moisture content and the test can help to give an indication of likely engineering behaviour.

5. **LIQUID AND PLASTIC LIMITS**. Two simple classification tests are known as the liquid and plastic limits. If a cohesive soil is remoulded with increasing amounts of water, a point will be reached at which it ceases to behave as a plastic material and becomes essentially a viscous fluid. The moisture content corresponding to this change is arbitrarily determined by the liquid limit test. 'Fat' clays, which have high contents of colloidal particles, have high liquid limits; 'lean' clays, having low colloidal particle contents have correspondingly low liquid limits. An increase in the organic content of a clay is reflected by an increase in the liquid and plastic limits.

   If a cohesive soil is allowed to dry progressively, a point is reached at which it ceases to behave as a plastic material, which can be moulded in the fingers, and it becomes friable. The moisture content of the soil at this point is known as the 'plastic limit' of the soil.

   The range of water content over which a cohesive soil behaves plastically, i.e. the range lying between the liquid and plastic limits, is defined as the plasticity index.

   A cohesive soil with a natural water content towards its liquid limit will, in general, be an extremely soft material whereas a cohesive soil with a natural water content below its plastic limit will tend to be a stiff material.

6. **PARTICLE-SIZE DISTRIBUTION.** A knowledge of particle-size distribution is used to classify soils and to indicate likely engineering behaviour. British Standards define soils in relation to their particle-size as shown below:-

Boulders	>200mm	Coarse Sand	2.0 to 0.63mm
Cobbles	200 to 63mm	Medium Sand	0.63 to 0.2mm
		Fine Sand	0.2 to 0.063mm
Coarse Gravel	63 to 20mm	Coarse Silt	0.063 to 0.02mm
Medium Gravel	20 to 6.3mm	Medium Silt	0.02 to 0.0063mm
Fine Gravel	6.3 to 2mm	Fine Silt	0.0063 to 0.002mm
		Clay	<0.002mm

7. **BULK DENSITY.** The bulk density of a material is the weight of that material per unit volume and includes the effects of voids whether filled with air or water. The 'dry density' of a soil is defined as the weight of solids contained in a unit volume of the soil.

8. **PERMEABILITY.** The permeability of a material is defined as the rate at which water flows through it per unit area of soil under unit hydraulic gradient.

9. **CONSOLIDATION CHARACTERISTICS.** When subjected to pressure, a soil tends to consolidate as the air or water in the pore space is forced out and the grains assume a denser state of packing. The decrease in volume per unit of pressure is defined as the 'compressibility' of the soil, and a measure of the rate at which consolidation proceeds is given by the 'coefficient of consolidation' of the soil. These two characteristics Mv and Cv are determined in the consolidation test and the results are used to determine settlement of structures or earthworks.

10. **STRENGTH CHARACTERISTICS.** The strength of geological materials is generally expressed as the maximum resistance that they offer to deformation or fracture by applied shear or compressive stress. The strength characteristics of geological materials depend to an important degree on their previous history and on the conditions under which they will be stressed in practice. Consequently, it is necessary to simulate in the laboratory tests the conditions under which the material will be stressed in the field.

In general, the only test carried out on hard rocks is the determination of their compressive strength but consideration must be given to fissuring, jointing and bedding planes.

The tests at present in use for soils and soft rocks fall into two main categories. Firstly, those in which the material is stressed under conditions of no moisture content change, and secondly those in which full opportunity is permitted for moisture content changes under the applied stresses. Tests in the first category are known as undrained (immediate or quick) tests, while those in the second category are known as drained (slow or equilibrium) tests. The tests are normally carried out in the triaxial compression apparatus but granular materials may be tested in the shear box apparatus.

The undrained triaxial test gives the apparent cohesion C_u and the angle of shearing resistance $\emptyset_u$. In dry sands, $C_u = 0$ and $\emptyset_u$ is equal to the angle of internal friction whereas with saturated non-fissured clays $\emptyset u$ tends to 0 and the apparent cohesion C_u is equal to one-half the unconfined compression strength qu. On site the vane test gives an approximate measure of shear strength.

For some stability problems use is made of a variant of the undrained triaxial test in which the specimen is allowed to consolidate fully under the hydrostatic pressure and is then tested to failure under conditions of no moisture content change. This is known as the consolidated undrained triaxial test. Pore water pressures may be measured during this test or a fully drained test may be carried out. In either case the effective shear strength parameters C' and $\emptyset$' can be obtained which can be used to calculate shear strength at any given pore water pressure.

11. **COMPACTION.** The density at which any soil can be placed in an earth dam, embankment or road depends on its moisture content and on the amount of work which is used in compaction. The influence of these two factors can be studied in compaction tests, which can determine the maximum dry density (MDD) achievable at a certain optimum moisture content (OMC).

12. **CALIFORNIA BEARING RATIO TEST.** In flexible pavement design a knowledge of the bearing capacity of the subgrade is necessary to enable the thickness of pavement for any particular combination of traffic and site conditions to be determined. The quality of the subgrade can be assessed by means of the California Bearing Ratio Test or approximately by the MEXE cone penetrometer.

13. **ROCK DESCRIPTION.** This is based on;

i. Colour (minor then principal colour).
ii. Grain Size.

Description	Predominate Grain Size (mm)
Very Coarse - grained	>63
Coarse - grained	63 - 2
Medium - grained	2 - 0.063
Fine - grained	0.063 - 0.002
Very Fine - grained	<0.002

iii. Matrix.
iv. Weathering.

Term	Description
Fresh	No visible sign of weathering/alteration of the rock material.
Discoloured	The colour of the original fresh rock material is changed and is evidence of weathering/alteration. The degree of change from the original colour should be indicated. If the colour change is confined to particular mineral constituents, this should be mentioned.
Disintegrated	The rock material is broken up by physical weathering, so that bonding between grains is lost and the rock is weathered/altered towards the condition of a soil in which the original material fabric is still intact. The rock material is friable but the grains are not decomposed.
Decomposed	The rock material is weathered by the chemical alteration of the mineral grains to the condition of a sol in which the original material fabric is still intact; some or all of the grains are decomposed.

v. Carbonate Content.
vi. Stability of Rock Material.

Stable indicates no changes when sample left in water for 24 hours. Fairly stable indicates fissuring and crumbling of surfaces. Unstable indicates complete disintegration of the sample.

vii. Unconfined Compressive Strength.

Term	Field Identification	Unconfined Compressive Strength (MPa)
Extremely Weak[a]	Indented by thumbnail.	Less than 1
Very Weak	Crumbles under firm blows with point of geological hammer, can be peeled by a pocket knife.	1 to 5
Weak	Can be peeled by a pocket knife with difficulty, shallow indentations made by firm blow with point of geological hammer.	5 to 25
Medium Strong	Cannot be scraped or peeled with a pocket knife, specimen can be fractured with single firm blow of geological hammer.	25 to 50
Strong	Specimen required more than one blow of geological hammer to fracture it.	50 to 100
Very Strong	Specimen requires many blows of geological hammer to fracture it.	100 to 250
Extremely Strong	Specimen can only be chipped with geological hammer.	Greater than 250

[a] Some extremely weak rocks will behave as soils and should be described as soils.

viii. Structure.

Sedimentary	Metamorphic	Igneous
Bedded	Cleaved	Massive
Interbedded	Foliated	Flowbanded
Laminated	Schistose	Folded
Folded	Banded	Lineated
Massive	Lineated	
Graded	Gneissose	
	Folded	

ix. Discontinuities.
x. Discontinuity Spacing, persistence and roughness, infilling and seepage.
xi. Weathering of the Rock Mass.

Term	Description	Grades
Fresh	No visible sign of rock material weathering; perhaps slight discolouration on major discontinuity surfaces.	0
Slightly weathered	Discolouration indicates weathering of rock material and discontinuity surfaces.	1
Moderately weathered	Less than half of the rock material is decomposed or disintegrated. Fresh or discoloured rock is present either as a continuous framework or as core stones.	2
Highly weathered	More than half of the rock material is decomposed or disintegrated. Fresh or discoloured rock is present either as a continuous framework or as core stones.	3
Completely weathered	All rock material is decomposed and/or disintegrated to soil. The original mass structure is still largely intact.	4
Residual soil	All rock material is converted to soil. The mass structure and material fabric are destroyed. There is a large change in volume, but the soils has not been significantly transported.	5

xii. Rock Mass Permeability

14. **CHEMICAL TESTS.** A knowledge of total soluble sulphate content and pH of soils and groundwater is important in determining the protection required for concrete or steel in contact with the ground. Other specialist tests may be carried out on sites suspected of being contaminated by toxic materials (see standard appendix B).

15. **REFERENCES**

BS5930: 2015+A1:2020 British Standard Code of Practice for Site Investigations
BS10175: 2011+A2:2017 British Standard Code of Practice for the Investigation of Potentially Contaminated Sites