PATRICK PARSONS

Built environment | Engineering | Consultancy

Earthworks Specification

Thewlis Lane Quarry

Crossland Hill, Huddersfield

for

Johnsons Wellfield Quarries Ltd

H18028

March 2019

patrickparsons.co.uk

PATRICK PARSONS

Earthworks Specification

Thewlis Lane Quarry

for

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1.0 Introduction

1.1 Patrick Parsons (PPL) have been appointed by Johnsons Wellfield Quarries Limited (The Client) to produce an Earthworks Specification for the backfill of their quarry at Thewlis Lane, Crosland Hill, Huddersfield.

1.2 The quarry is located to the east of Thewlis Lane in Crosland Hill approximately 2km southwest of Huddersfield town centre and is centred on National Grid Reference 412035, 414431 (approximate postcode HD4 7AB).

1.3 The quarry covers an area of approximately 4.5 ha and is will extract blockstone from the Rough Rock Sandstone Unit which forms part of the Millstone Grit Series. The quarry will extend to depths of around 30m and total void volume is anticipated to be in the region of 1.1 million m^3. Site location and proposed quarry plans are presented in Appendix A.

1.4 The main elements of the works anticipated to be required will include:

- Preparation of a Materials Management Plan; Necessary to facilitate the re-use and movement of site-won and imported materials, detailing materials suitability properties.
- Investigation of proposed site-won materials; Performing in situ and laboratory testing to obtain suitable samples of materials to be used as part of the earthworks. The samples shall be tested to confirm soil classification and compaction properties to determine suitability for use.
- Identification and investigation of suitable off site sources of materials for importation; Undertaking all necessary geotechnical and chemical testing to confirm that proposed off site source of materials are suitable for use on the site and obtain all necessary permits necessary to move and include such materials within the works.
- Perform fill earthworks; Using heavy plant and vibratory compaction techniques to move; place and compact suitable fill placed and compacted into layers up to the specified platform levels in accordance with the design drawings.

2.0 Summary of Proposed Works

2.1 A scheme of earthworks is proposed to backfill the quarry void to leave a stable level development plateau for potential future residential development. Selected quarry interburden material will be used to back fill the void. The aim of this specification is to allow selection and engineering of suitable materials to provide ground conditions which are chemically inert and geotechnically stable, such that the materials will not be subject to short or long term settlement, heave or swelling or other physical degradation. Details and methodology of post compaction settlement assessment are included.

2.2 Geo-environmental testing required for re-use and material management is not included within this earthworks specification.

2.3 Terms of Reference

2.3.1 Patrick Parsons have undertaken material testing, this testing forms the basis of this specification and results from these works are present in Appendix B and discussed in section 3.

2.4 Limitations

2.5 This document is based on the Manual of Contract Documents for Highways Works: Volume 1: Specification for Highways Works: EARTHWORKS (Highways Agency Series 600) and has been prepared for the Client and their appointed agents only and should not be relied upon by any third party without the written permission of PPL. If any unauthorised third party comes into possession of this report, they rely on it at their own risk and the authors do not owe them any Duty of Care or Skill.

2.6 This specification relates to material observed and tested by PPL; while broadly concordant with the ground conditions reported as being present elsewhere on site PPL is not responsible for ground conditions not revealed during investigations by others nor for conditions in areas not previously investigated.

3.0 Earthworks

3.1 Preliminary Assumptions

3.1.1 Based on the previous site investigations and various reports supplied by the Client and laboratory testing carried out PPL, the following preliminary assumptions have been made (all of which are subject to additional testing):

- Topsoil/subsoil was present ons-ite, this material has been stockpiled to form screening bunds around the quarry. This material could be classified as Class 5A.
- No significant Made Ground Deposits are present across site.
- No significant Superficial Deposits are present across the site.
- Site won quarry interburden material will be crushed and graded prior to use as backfill. The crushed quarry interburden material will generally comprise Class 1A material.

3.2 PPL Earthworks Testing

3.2.1 Patrick Parsons undertook earthworks testing on samples of quarry interburden material that had been crushed/graded by the client. Samples were subject to appropriate classification testing with regards to the proposed scheme of earthworks. The additional testing comprised particle size distribution and compaction tests on quarry interburden material crushed to varying 'fines' content, testing was undertaken on samples of material comprising basal shale and the sandstone interburden. The findings of these works are summarised as follows:

- The results of tests on the ten samples crushed rock recorded as received moisture contents of between 3.1% and 6.2% with the majority <5%.
- PSD tests on samples of both the basal shale material and the sandstone interburden generally classify the material in to Class 1A “well graded granular material” in accordance with the Highways Agency Series 600 document.
- Particle density tests were performed on the samples. Results ranged from 2.58Mg/m^3 to 2.62Mg/m^3 for the basal shale and 2.59Mg/m^3 to 2.62Mg/m^3 for the sandstone interburden.
- Compaction tests performed on four samples of the basal shale returned maximum dry densities of 2.07Mg/m^3 to 2.11Mg/m^3 and optimum moisture contents (OMC) of between 7% and 9%. As received moisture contents ranged from 3.1% and 4.8%. The moisture content / dry density testing indicated that the samples were generally around 4% dry of optimum.
- Compaction tests performed on six samples of the sandstone interburden material returned maximum dry densities of 2.03Mg/m^3 to 2.09Mg/m^3 and optimum moisture contents of between 8% and 10%. As received moisture contents ranged from 3.9% and 6.2%. The moisture content / dry density testing indicated that the samples were generally around 4% dry of optimum.
- The testing indicates that interburden material proposed for backfilling of the quarry is generally around 4% dry of optimum and whilst placement at these natural moisture contents is likely to achieve the required 95% of the Maximum Dry Density the compaction curves suggest that at these moisture contents the engineered interburden material would have air voids ratios of >10% and as such there would be a risk of future

inundation settlement. As such moisture contents for the placed interburden should be limited to the range OMC to OMC+2%.

3.3 Specific Upfill Requirements

3.3.1 All vegetation and organic material will be removed prior to earthwork operations.

3.3.2 The upfill materials shall meet the criteria of Appendix 6/1 and Table 6/1. Material placed shall be compacted to a minimum of 95% of maximum dry density with a maximum of 5% air voids. This shall be confirmed via sand replacement tests and nuclear density testing on site following the filling works, at the frequencies and levels defined within this Specification.

3.3.3 A visual inspection shall then be undertaken prior to backfilling and any soft, unsuitable or organic materials shall be removed.

3.3.4 Selected upfill materials are to be placed to formation level as detailed in Appendix 6/6 and Appendix 6/7.

3.3.5 Acceptability testing as detailed in Appendix 6/1 and at the designated testing rate detailed in Appendix 5/1 shall be undertaken.

4.0 Appendix 5/1 - Testing to be carried out

4.1.1 The testing, including provision of associated samples, scheduled in the following tables shall be undertaken during the works.

4.1.2 Materials and geotechnical testing shall be undertaken only by independent testing laboratories accredited by the United Kingdom Accreditation Service (UKAS).

4.1.3 A daily record of samples of materials taken for testing shall be kept. Records shall be in sufficient detail to record the nature and the source of materials and shall identify the locations and means of selection and sampling. A copy of the daily record, along with chain of custody records for sample delivery and evidence of receipt by the laboratory shall be provided.

4.1.4 All site-won materials are to be tested for their geotechnical properties as presented in Table 5/1, Appendix 5/1.

4.1.5 As the backfilling will be completed with site won natural material chemical analysis to prove this material is suitable for use is not required. However, chemical analysis of any soils and waters with visual and/or olfactory indications of potential contamination will be undertaken should any be encountered during the works.

4.1.6 Additional site investigation works are not anticipated to be necessary at this stage; should any additional works be undertaken they shall be undertaken in accordance with the Specification for Ground Investigation, Site Investigation Steering Group, published by Thomas Telford, London.

4.1.7 Table 5/1: Testing to be carried during the works to confirm material properties comply with this Specification:

Series 600						
Clause/s	**Acceptability of Materials**					
601, 631-633 and 635-636	Class	General Description	Test	Frequency	Test Cert	Comments
	1A	General Granular Fill	Grading	1 per 10,000m³ min 3 per source	Req	The frequency of testing for earthworks classification is a minimum requirement. The actual rate of testing required shall be to ensure the correct classification of materials taking into account the variation in their properties.
			Uniformity Coefficient	1 per 10,000m³ min 3 per source	Req	
			MCV	1 per 10,000m³ min 3 per source	Req	
			Moisture Content	1 per 5000m³ min 3 per source	Req	

5.0 Appendix 6/1 - Requirements for acceptability and testing of earthworks materials

5.1.1 Acceptable limits for the earthworks materials, and the testing required on these materials are particularised in Tables 6/1 and 6/2 of this Appendix.

5.1.2 The permitted classifications of earthworks materials are described in this Specification. Where a particular class of material is specified for a specific location, the use of an alternative class of material will not be permitted, unless otherwise agreed with the Engineer.

5.1.3 The frequency of testing required to determine material acceptability as detailed in Appendix 1/5 shall be carried during the works.

5.1.4 Determination of the suitability of site-won general Fill shall be undertaken by the client under the supervision of Patrick Parsons.

5.1.5 Earthworks materials shall be categorised into one of the following classifications:

5.2 Acceptable Material – Site-Won:

5.2.1 All back fill materials will comprise site won basal siltstone and sandstone interburden that has been crushed and graded to class 1A.

5.2.2 Acceptable limits for site won earthworks materials and the testing requirements on these materials are set out in Tables 6/1 and 6/2 of this Appendix.

5.2.3 Confirmation of the acceptability of all earthworks materials excavated on-site shall be carried out following processing/crushing and prior to placement.

5.2.4 Clean cover materials shall be sourced from the current screening bunds which comprise site won subsoil and topsoil.

5.3 Acceptable Material – Imported:

5.3.1 At this stage it is not anticipated that any material will be imported to site for use as general fill in the back fill operations Any materials imported for use within the works will be approved by the Patrick Parsons prior to use within the earthworks.

5.3.2 Any imported material shall be clean and inert, and not pose a risk to any on or off site receptors. The material should be certified and all certificates and documentary evidence will be assessed by Patrick Parsons for approval prior to being imported to site.

5.4 Unacceptable Materials:

5.4.1 Materials are deemed unacceptable when they do not meet the requirements of Tables 6/1 and 6/2 or contain the following material constituents:

(a) Peat, organic soils and organic perishable materials (i.e. wood, straw, sawdust and paper),

(b) Materials in a frozen condition,

(c) Cohesive material (clay),

(d) Class U2 materials having hazardous chemical, biological or physical properties.

5.5 Potentially Combustible Materials:

5.5.1 No significant laterally or vertically extensive combustible materials have been identified within the site won material to date.

Table 6/1: Acceptable Earthworks Materials: Classification and Compaction Requirements (See Footnotes)

Class				General Material Description	Typical Use	Permitted Constituents (All Subject to Requirements of Clause 601 and Appendix 6/1)	Material Properties Required for Acceptability in Clause 601 and Testing in Clause 631)				Compaction Requirements in Clause 612	Class		
							Property (See Exceptions in Previous Column)	Defined and Tested in Accordance With:	Acceptable Limits Within:					
									Lower	Upper				
GENERAL GRANULAR FILL	1	A	-	Well graded granular material	General Fill	Any material, or combination of materials, other than material designated as Class 3 in the Contract	(i) Grading	BS 1377: Part 2	Tab 6/2	Tab 6/2	End product to be compacted to minimum of 95% maximum dry density with maximum 5% air voids site wide. This is to be confirmed through Nuclear Density Testing/ Sand Replacement Test (SRT) on every layer of up fill material at a rate of 1 per 625m² (25m grid).	1	A	-
							(ii) Uniformity Coefficient	See Note 5	10	-				
							(iii) mc	BS 1377: Part 2	OMC	OMC +2%				
							(iv) MCV	Clause 632	TBC	TBC				

Footnotes to Table 6/1:
1. App = Appendix
2. Tab = Table
3. Where in the Acceptable Limits column reference is made to App 6/1, only those properties having limits ascribed to them in Appendix 6/1 shall apply. Where Appendix 6/1 gives limits for other properties not listed in this Table such limits shall also apply.
4. Where BS 1377: Part 2 is specified for mc, this shall mean BS 1377: Part 2 or BS 812: Part 3 as appropriate.
5. Uniformity coefficient is defined as the ratio of the particle diameters D60 to D10 on the particle size distribution curve, where -
D60 = particle diameter at which 60% of the soil weight is finer
D10 = particle diameter at which 10% of the soil weight is finer.

Table 6/2: Grading Requirements for Acceptable Site-Won Earthworks Materials

Percentage by Mass Passing the Test Sieve Shown																					
Class	Size (mm)		Size (mm) BS Series													Size (microns) BS Series					Class
	500	300	125	90	75	37.5	28	20	14	10	6.3	5	3.35	2	1.18	600	300	150	63	2	
1A		100	95-100																<15		1A

Table 6/3: Grading Requirements for Acceptable Imported Earthworks Materials

Percentage by Mass Passing the Test Sieve Shown																	
Class	Size (mm) BS Series													Size (microns) BS Series			
	125	80	63	40	31.5	20	16	10	8	6.3	4	2	1	500	125	63	
6F4			100		75-99		50-90		30-75		15-60		0-35			<15	6F4
6F5	100	75-99		50-90		30-75		15-60				0-35				0-12	6F5
6N & 6P																<15	6N & 6P

6.0 Appendix 6/2: Requirements for dealing with unacceptable materials

6.1 Occurrence of U1 and U2 Materials:

6.1.1 Class U1 materials are defined as materials which are unacceptable for re-use within the permanent works.

6.2 U1 Materials Identified within the Scheme:

6.2.1 All Class U1 materials excavated from the site which cannot be reused in the permanent works shall be stockpiled on-site for Waste Classification in accordance with the European Waste Code 2002. After classification, U1A materials shall be disposed of off-site at an appropriately licensed treatment/recovery or disposal facility.

6.3 U2 Hazardous Materials Identified within the Scheme:

6.3.1 In the event of Class U2 contaminated soils or waters being identified during the works, Patrick Parsons will determine the extent of the contamination and organise for suitable analysis.

6.4 Testing of U2 Hazardous Materials for Off-Site Disposal:

6.4.1 All U2 materials shall be tested to characterise them for treatment or off-site disposal purposes. As a minimum, U2 hazardous materials will be tested and categorised in accordance with the Environment Agency - WM2, "Hazardous waste: Interpretation of the definition and classification of hazardous waste" and WAC testing. The frequency of testing shall be determined by Patrick Parsons.

6.5 Special Requirements to Prevent Pollution of Surface Waters:

6.5.1 No special requirements to prevent pollution of surface waters is considered necessary.

7.0 Appendix 6/3: Requirements for excavation, deposition, compaction

7.1 Blasting:

7.1.1 Blasting will not be required.

7.2 Site Preparation:

7.2.1 Prior to the main back filling operations site clearance of any surface detritus shall be undertaken.

7.2.2 Vegetation (i.e. shrubs and roots etc) shall be disposed off-site as waste.

7.3 Excavation Works:

7.3.1 Excavation works will be undertaken as part of general quarry activities, no additional excavation prior to backfilling will be required.

7.3.2 No discharges shall be made to Controlled Waters or drains without the consent of the appropriate bodies.

7.4 Development of Formation Levels:

7.4.1 The formation levels for the back-filling works are to be the final quarry base levels.

7.4.2 As rock will be present at formation level, proof rolling to check for soft spots etc will not be undertaken.

7.5 Compaction Trial:

7.5.1 Prior to start of the main back filling works a compaction trial will be undertaken to determine the thickness of the layers to which the material will be compacted in and the number of passes of the roller required to meet the specified end product performance criteria.

7.5.2 In addition to determining layer thickness and number of roller passes, the compaction trial will assess different methods of adding moisture to the general fill so that its placed moisture content complies with the limits set out table 6/1, Appendix 6/1.

7.5.3 Each compaction trial panel will be no less than 625m² and a minimum of two layers will be placed prior to performance verification testing. The performance verification testing will comprise determinations of in-situ dry density and moisture content as set out in table 6/1.

7.5.4 The results of the compaction trial will be used to determine the most effective method of compaction and this will be used for the remainder of the earthworks. Should it be necessary to alter the method of compaction, due to a change in material properties or a change in compaction plant backfilling operations will be paused and another compaction trial completed.

7.6 Filling Works:

7.6.1 The Contractor shall remove all surface detritus prior to raising site levels with suitably engineered Fill, as detailed in this Appendix and Appendix 6/7.

7.6.2 Appropriate measures will be adopted to control ground and surface water run-off. Areas to be filled shall be kept dry by sump pumping or other suitable means.

7.7 End Product Compaction:

7.7.1 End product compaction for the Class 1A site won material will be completed as per the requirements detailed in Table 6/1, 6/2 and 6/3. Acceptability testing shall be carried out at the frequencies outlined in Appendix 1/5.

7.7.2 Prior to the placement of all fill materials the formation, will be visually inspected and any soft or loose materials will be removed to the satisfaction of the Patrick Parsons as detailed in this Appendix and Appendix 6/7. Any soft/loose spots shall be removed below formation level and replaced with well-compacted granular fill and compacted in accordance with the method determined by the compaction trial and subject to same performance verification testing as the general fill.

7.7.3 Performance verification testing on each compacted layer as per the requirements detailed in SHW Clause 612 and at the designated testing rate given in Appendix 6/1.

7.7.4 The maximum particle size shall be no greater that two thirds of the layer thickness.

7.7.5 A nuclear density gauge (NDG) is permitted for determining field densities of structural fill material and shall be used in conjunction with the sand replacement test (BS 1377: Part 9) at a ratio not exceeding 25No. NDG to 1No. sand replacement test.

7.7.6 The NDG will be calibrated against measurements determined using Test 3.7 of BS 1377: Part 4 on materials to be compacted. The NDG equipment will be operated and stored in accordance with the manufacturer's recommendations and current safety legislation and will only be used only be personnel fully trained in its operation.

7.8 Benching Into Existing Soils:

7.8.1 The proposed final quarry faces are for the most part shown as 5m horizontal and vertical benches. No additional benching will be undertaken prior to backfilling. All loose or weathered material present within the quarry faces will be removed prior to backfilling works.

7.8.2 Fill materials shall be thoroughly compacted/consolidated up to the vertical face of each bench.

7.9 Records and Reporting Requirements:

7.9.1 A daily diary of the works undertaken shall be kept, this will include comprising:

(a) Areas of fill,

(b) Location of testing and results,

(c) Compaction method utilised (including layer thickness, plant used and number of passes),

(d) Material types placed and location,

(e) Weather conditions,

(f) Stockpiled material details and stockpile management plan,

(g) Type and quantities of materials sent to/held in quarantine, if any,

(h) Quantities of materials removed from site and to where,

(i) Quantities of untreated and treated water discharged from the site, if any,

(j) Pollution incidents and near misses and,

(k) Plant and labour returns (weekly).

7.9.2 The following surveys will be undertaken prior to and during the works:

(a) Survey of the sub-formation level of the development site following completion of quarrying,

(b) Surveys detailing the locations of where different classes of fill materials have been deposited within the works,

(c) Surveys of the locations of acceptability test locations and,

(d) A survey of the development site following earthworks completion.

7.9.3 These surveys shall be on a 25m grid to OS National Grid. The surveys shall be carried out to an accuracy of ±100mm horizontally and ±5mm vertically. Plans of the survey at appropriate scales shall be provided to the Project Manager/Client's Representative in hard copy and electronic format.

7.10 Clean Covers:

7.10.1 Upon completion of the backfilling works the topsoil/subsoil within the screening bunds will be placed across the site area at a thickness of not less than 200mm (thickness tolerance ±40mm).

7.10.2 Should it be necessary to imported topsoil/subsoil materials (SHW Class 5B) for use as clean.

7.10.3 the following surveys shall be undertaken in relation to the clean cover:

(a) Formation below clean cover,

(b) Final surface of clean cover.

7.10.4 The survey shall be on a frequency equivalent to a 5m grid, with a minimum of three points per landscaped area, to an accuracy of ±100mm horizontally and ±5mm vertically.

7.11 Earthworks Report:

7.11.1 Interim monthly Earthworks Factual Reports will be complied during the works and a formal 'As Built' Earthworks Factual Report will be produced upon completion of the works; this will include the following:

(a) Names and addresses of all contacts used for works including dates and activities undertaken on-site,

(b) Site diary of the works,

(c) Dates for each set of works,

(d) Confirmation of compliance with Statutory Authorities/Service Providers,

(e) Documentary evidence including desk study and source sampling of any imported materials used on-site, delivery dates, quantities, delivery tickets, placement location details and compaction details, as necessary,

(f) Copies of licenses and permits for crushing operations and plans and records of crushed materials reinstated on-site,

(g) Details of noise/dust control measures undertaken,

(h) Reporting of potential contamination observed during soil stripping of the site,

(i) Plans and records of the lateral extent and thicknesses of the clean cover materials. This is to include a pre and post cover placement survey indicating the location of each different cover source material used on-site,

(j) Tabulated geotechnical, chemical and in-situ density test results comprising detailed location (co-ordinates and levels) of testing, reporting on compliance in accordance acceptability requirements and similarly and compilation of records for remedial works undertaken.

(k) Documentation for all wastes disposed of off-site (soils and groundwaters) including details of removed soils / groundwaters, locations of where material was taken from site, quantities, waste transfer notes, landfill details, license and tickets and waste carrier certificates,

(l) Records of water disposed off-site via sewers or discharged back to groundwater including details of the Discharge Consent or the letter of confirmation from the Drainage Authority / Environment Agency,

(m) Details of unexpected materials encountered,

8.0 Appendix 6/4: Requirements for Class 3 material

8.1 Not used.

9.0 Appendix 6/5: Geotextiles used to separate earthworks materials

9.1 Not used.

10.0 Appendix 6/6 Fill to structures and fill above structural foundations 1.

10.1 Not used.

11.0 Appendix 6/7: Sub-formation and capping and preparation and surface treatment of formation

11.1 Not used.

12.0 Appendix 6/8: Topsoiling

12.1 Not used.

13.0 Appendix 6/9: Earthwork environmental bunds, landscape areas, strengthened embankments

13.1 Not used.

14.0 Appendix 6/10: Anchorages, crib walling and gabions

14.1 Not used.

15.0 Appendix 6/11: Swallow holes and other naturally occurring cavities and disused mine workings

15.1 Not applicable.

16.0 Appendix 6/12: Instrumentation and monitoring

16.1 Post Restoration Monitoring:

16.1.1 The purpose of this end product Earthworks Specification is to ensure that all backfill materials are engineered to achieve a minimum of 95% of maximum dry density with a maximum of 5% air voids with performance verification testing undertaken at prescribed intervals. As such, any deficiency of materials or method of compaction is addressed in real time. However, for completeness, post completion monitoring is proposed.

16.2 Surface Monitoring Stations.

16.2.1 Upon completion of backfilling, or completion of individual phases, it is proposed to install surface monitoring stations or monuments at a frequency of not <3 per hectare. These are to be provided by the Client.

16.2.2 Each surface monitoring monument is to comprise an approximate 1 metre square concrete block buried and set within the compacted materials. A defined survey datum will be available on the upper surface of each block.

16.2.3 A programme of surveying will be initiated whereby the reduced level and positions relative to National Grid coordinates of all surface monitoring stations are recorded. The period of monitoring will be weekly for 3 months, to be reviewed thereafter.

16.3 Static Loading Tests.

16.3.1 Upon completion of backfilling, or completion of individual phases, Zone Load Testing is to be undertaken in liaison with the NHBC or appropriate warranty provider. At this stage, the spatial interval for such testing is not known, however, a sensible estimate would be one test per 5,000m^3.

16.3.2 The most appropriate type of test would be a skip load test whereby a filled skip is positioned over a test cast foundation and incrementally loaded and unloaded with the deflection and settlement of the ground recorded. The duration of monitoring may be up to 3 months to provide a representative assessment of the performance of the compacted fill materials under loading.

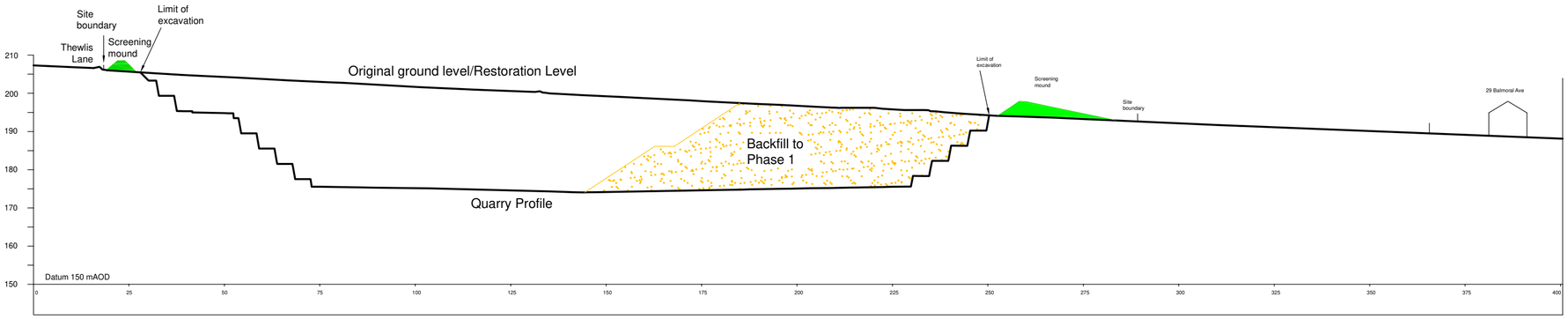
16.3.3 The results of the load testing would quantify the degree of residual settlement, if any, that may remain within the compacted fill materials and assist with the design of foundation solutions for the proposed redevelopment of the restored site.

17.0 Appendix 6/13 Ground Improvement

17.1 Not required

Appendix A

Drawings



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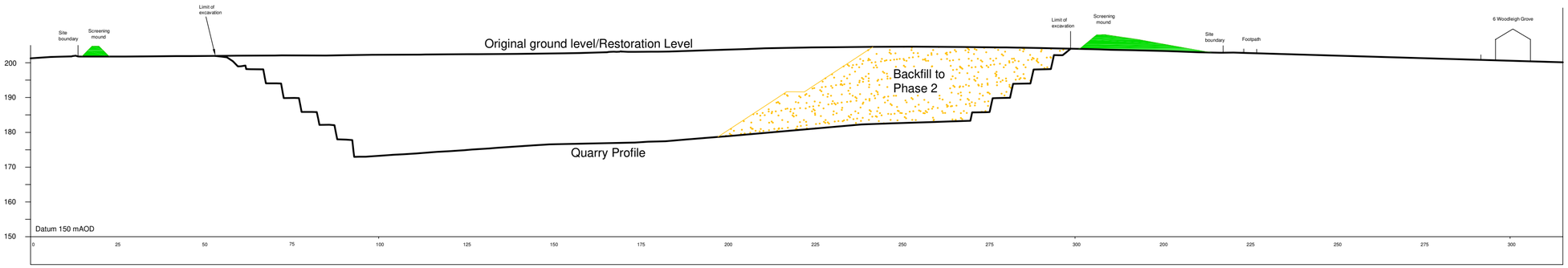
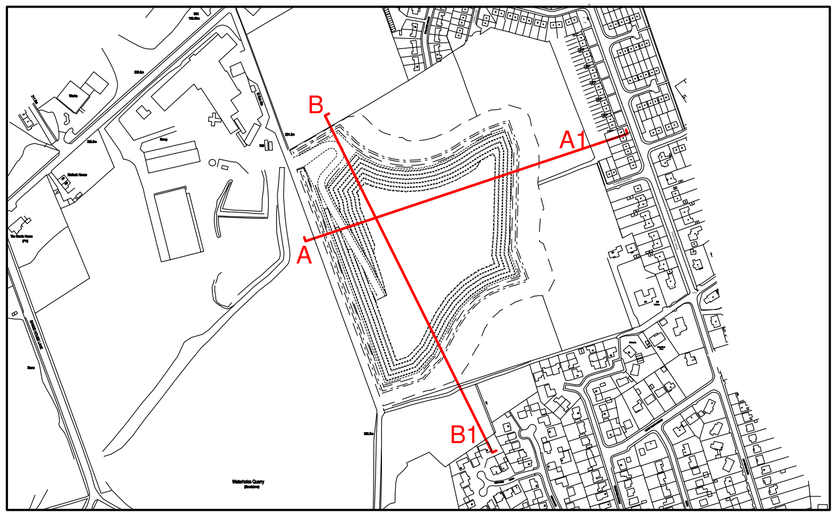


Section B-B1



CROSS SECTION LOCATIONS

Rev	Description	Date	By	Chkd

Client:

Johnsons Wellfield Quarries Ltd.
MyersGroup.co.uk

Project:

THEWLIS LANE QUARRY

Plan Title:

CROSS SECTIONS THROUGH
THEWLIS LANE QUARRY

Silkstone
Environmental Ltd
www.silkstoneenvironmental.co.uk
7, Hall Annex, Thorncliffe Park, Chapeltown, Sheffield, S35 2PH
Tel (0114) 2573487 Fax (0114) 2573459

Project No. 10093		Dwg No. 10093/464	Rev
Date: Oct 2012	Drawn: NC	Chkd: PS	Scale: 1:1000 @ A2

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Appendix B

Laboratory Geotechnical Testing Results

LABORATORY REPORT

4043

Contract Number: PSL18/4743

Report Date: 24 October 2018

Client's Reference: H18028

Client Name: Patrick Parsons
5 Waverley Road
Huddersfield
West Yorkshire
HD1 5NA

For the attention of: Jonny Roberts

Contract Title: TL Quarry, Huddersfield

Date Received: 19/9/2018
Date Commenced: 19/9/2018
Date Completed: 24/10/2018

Notes: Opinions and Interpretations are outside the UKAS Accreditation

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SUMMARY OF LABORATORY SOIL DESCRIPTIONS

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Description of Sample
BS1	1-3	B			Grey sandy slightly clayey GRAVEL with cobbles.
BS2	1-3	B			Grey slightly sandy clayey GRAVEL with cobbles.
BS3	1-3	B			Grey slightly sandy GRAVEL with cobbles.
BS4	1-3	B			Grey slightly sandy slightly clayey GRAVEL with cobbles.
SS1	1-3	B			Brown slightly sandy slightly clayey GRAVEL with cobbles.
SS2	1-3	B			Brown sandy slightly clayey GRAVEL of cobbles.
SS3	1-3	B			Brown sandy slightly clayey GRAVEL of cobbles.
SS4	1-3	B			Brown slightly sandy slightly clayey GRAVEL with cobbles.
SS5	1-3	B			Brown very sandy clayey GRAVEL with cobbles.
SS6	1-3	B			Brown very sandy clayey GRAVEL with cobbles.

PARTICLE SIZE DISTRIBUTION TEST

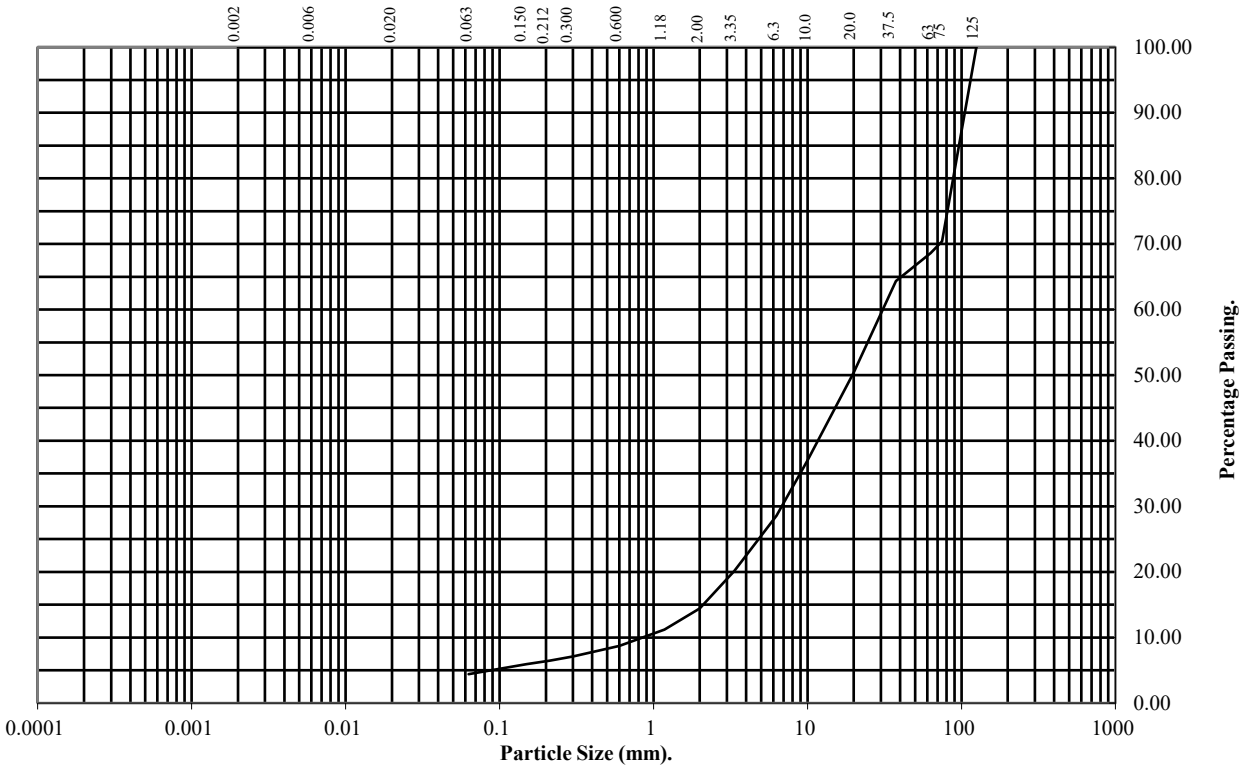
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: **BS1** **Top Depth (m):**

Sample Number: **1-3** **Base Depth(m):**

Sample Type: **B**



BS Test Sieve (mm)	Percentage Passing
125	100
75	70
63	69
37.5	64
20	50
10	37
6.3	29
3.35	20
2	14
1.18	11
0.6	9
0.3	7
0.212	6
0.15	6
0.063	4

Soil Fraction	Total Percentage
Cobbles	31
Gravel	55
Sand	10
Silt/Clay	4

Remarks:
See Summary of Soil Descriptions

UKAS TESTING 4043	PSL Professional Soils Laboratory	**TL Quarry, Huddersfield**	**Contract No:** PSL18/4743
			Client Ref: H18028

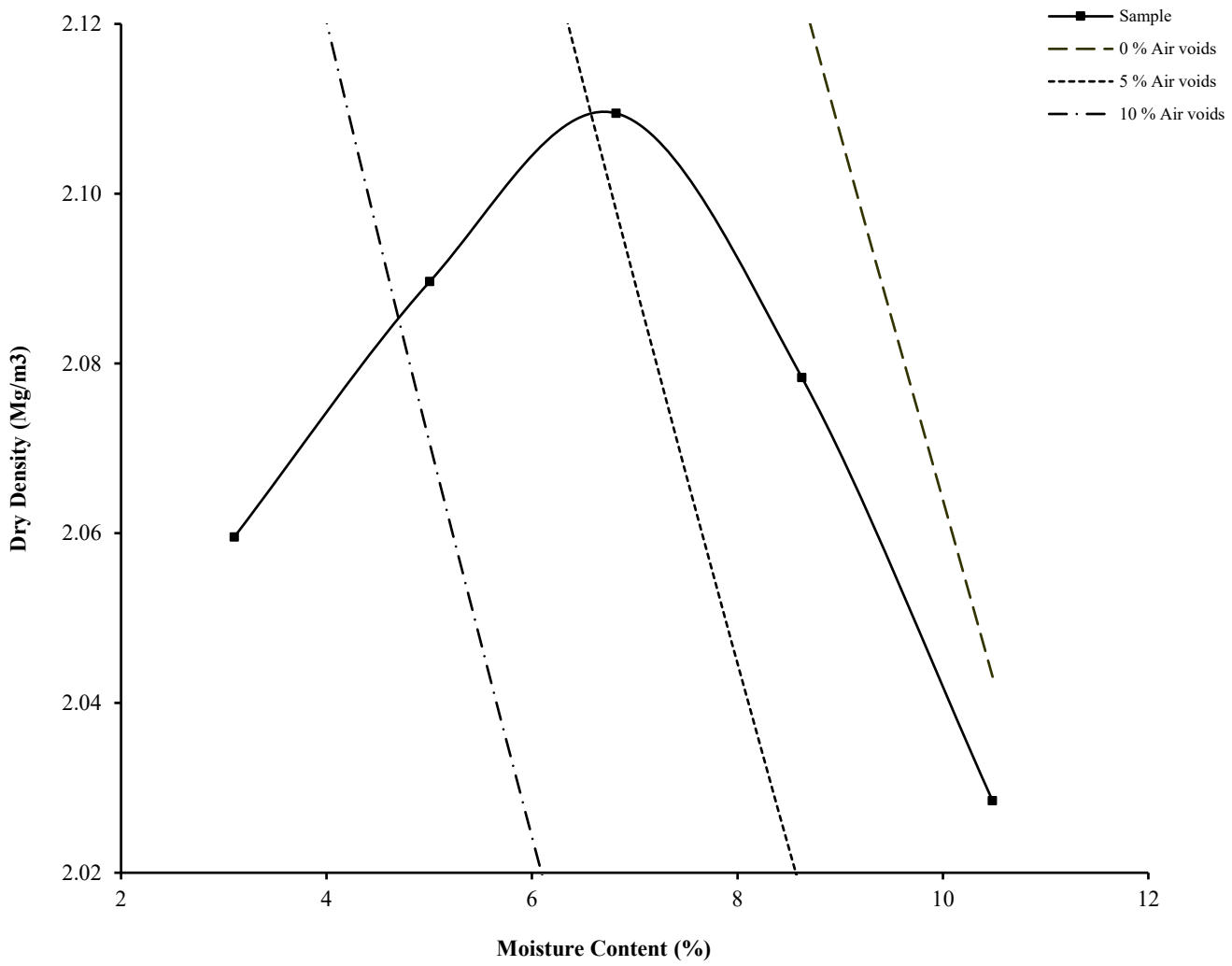
DRY DENSITY / MOISTURE CONTENT RELATIONSHIP

Non compliance with BS 1377 : Part 4 : 1990

Hole Number: BS1 **Top Depth (m) :**

Sample Number: 1-3 **Base Depth (m) :**

Sample Type: B



Initial Moisture Content:		3.1	Method of Compaction:	Vibro	Separate Samples
Particle Density (Mg/m3):	2.60	Actual	Material Retained on 37.5 mm Test Sieve (%):		36
Maximum Dry Density (Mg/m3):		2.11	Material Retained on 20.0 mm Test Sieve (%):		14
Optimum Moisture Content (%):		7			
Remarks See summary of soil descriptions.					

UKAS TESTING 4043	PSL Professional Soils Laboratory	TL Quarry, Huddersfield	Contract PSL18/4743 Client Ref H18028

PARTICLE SIZE DISTRIBUTION TEST

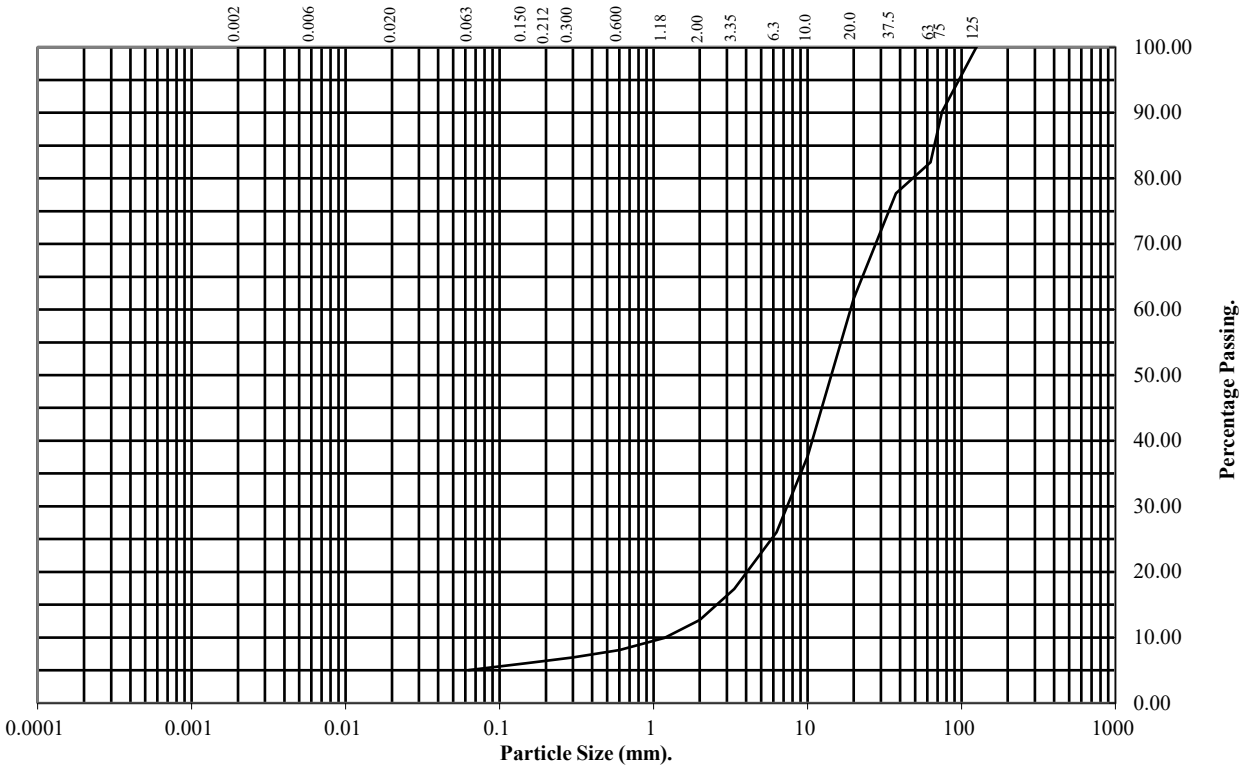
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: **BS2** **Top Depth (m):**

Sample Number: **1-3** **Base Depth(m):**

Sample Type: **B**



BS Test Sieve (mm)	Percentage Passing
125	100
75	90
63	82
37.5	78
20	62
10	38
6.3	26
3.35	17
2	13
1.18	10
0.6	8
0.3	7
0.212	7
0.15	6
0.063	5

Soil Fraction	Total Percentage
Cobbles	18
Gravel	69
Sand	8
Silt/Clay	5

Remarks:
See Summary of Soil Descriptions

UKAS TESTING 4043

PSL Professional Soils Laboratory

TL Quarry, Huddersfield

Contract No:
PSL18/4743
Client Ref:
H18028

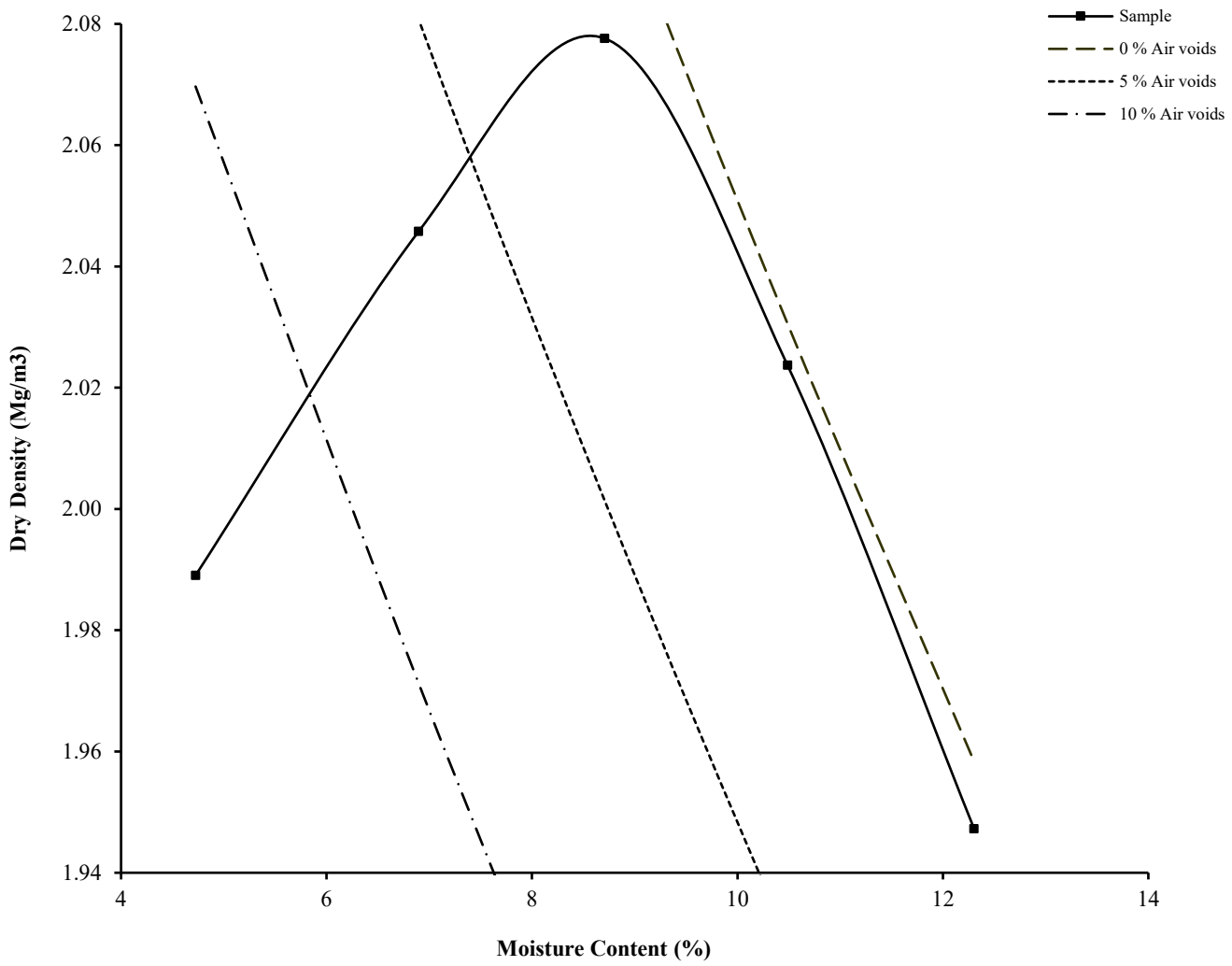
DRY DENSITY / MOISTURE CONTENT RELATIONSHIP

Non compliance with BS 1377 : Part 4 : 1990

Hole Number: BS2 **Top Depth (m) :**

Sample Number: 1-3 **Base Depth (m) :**

Sample Type: B



Initial Moisture Content:		4.7	Method of Compaction:	Vibro	Separate Samples
Particle Density (Mg/m3):	2.58	Actual	Material Retained on 37.5 mm Test Sieve (%):		22
Maximum Dry Density (Mg/m3):		2.08	Material Retained on 20.0 mm Test Sieve (%):		16
Optimum Moisture Content (%):		9			
Remarks See summary of soil descriptions.					

UKAS TESTING 4043	PSL Professional Soils Laboratory	H18028	Contract PSL18/4743 Client Ref rry, Hudders

PARTICLE SIZE DISTRIBUTION TEST

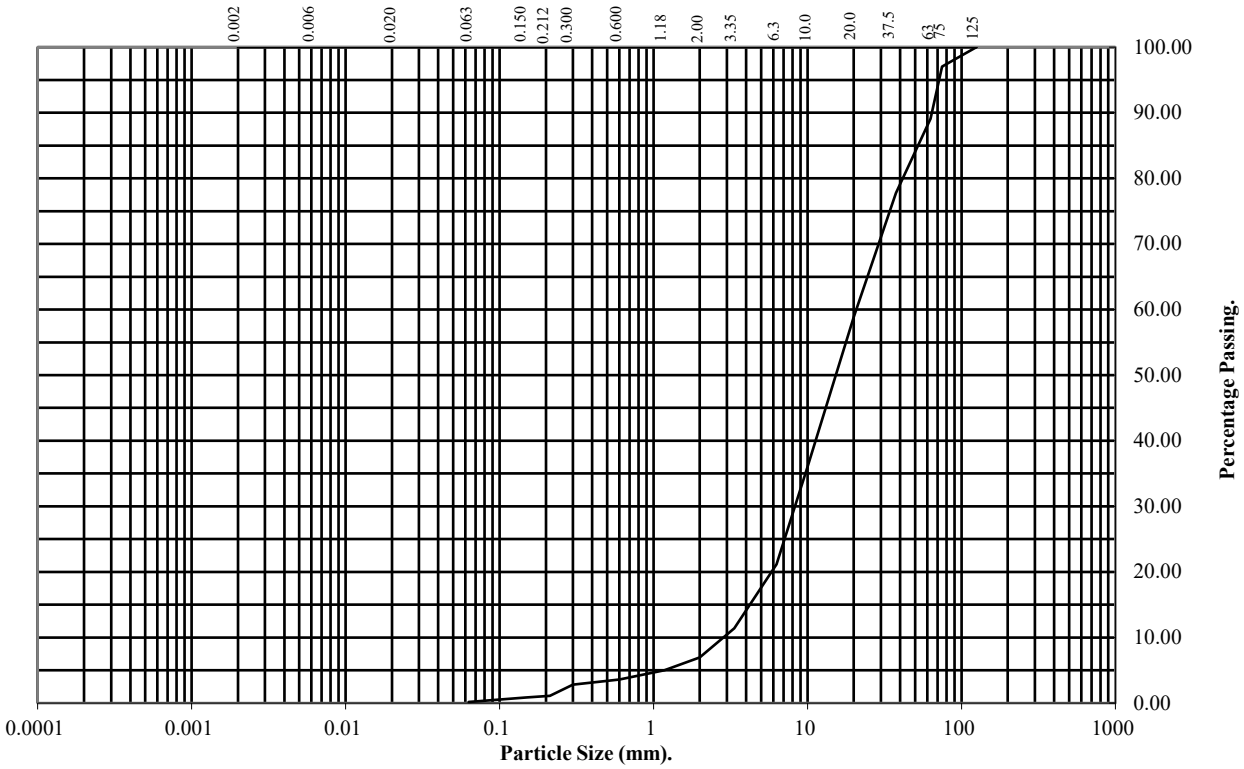
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: **BS3** **Top Depth (m):**

Sample Number: **1-3** **Base Depth(m):**

Sample Type: **B**



BS Test Sieve (mm)	Percentage Passing
125	100
75	97
63	89
37.5	78
20	59
10	36
6.3	21
3.35	11
2	7
1.18	5
0.6	4
0.3	3
0.212	1
0.15	1
0.063	0

Soil Fraction	Total Percentage
Cobbles	11
Gravel	82
Sand	7
Silt/Clay	0

Remarks:
See Summary of Soil Descriptions

UKAS TESTING 4043

PSL Professional Soils Laboratory

TL Quarry, Huddersfield

Contract No: PSL18/4743

Client Ref: H18028

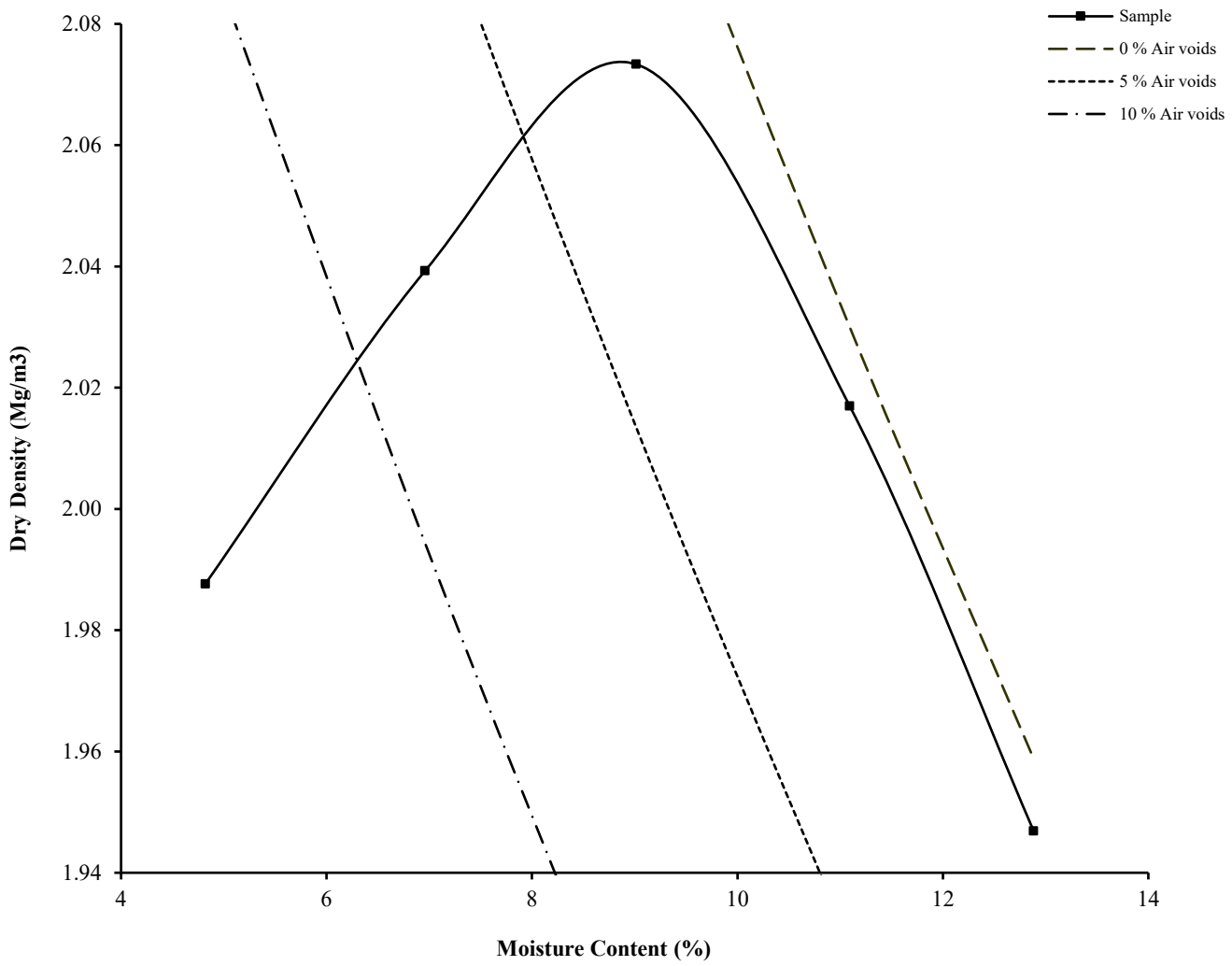
DRY DENSITY / MOISTURE CONTENT RELATIONSHIP

Non compliance with BS 1377 : Part 4 : 1990

Hole Number: BS3 **Top Depth (m) :**

Sample Number: 1-3 **Base Depth (m) :**

Sample Type: B



Initial Moisture Content:		4.8	Method of Compaction:	Vibro	Separate Samples
Particle Density (Mg/m3):	2.62	Actual	Material Retained on 37.5 mm Test Sieve (%):		22
Maximum Dry Density (Mg/m3):		2.07	Material Retained on 20.0 mm Test Sieve (%):		19
Optimum Moisture Content (%):		9			
Remarks See summary of soil descriptions.					

UKAS TESTING 4043	PSL Professional Soils Laboratory	TL Quarry, Huddersfield	Contract PSL18/4743 Client Ref H18028

PARTICLE SIZE DISTRIBUTION TEST

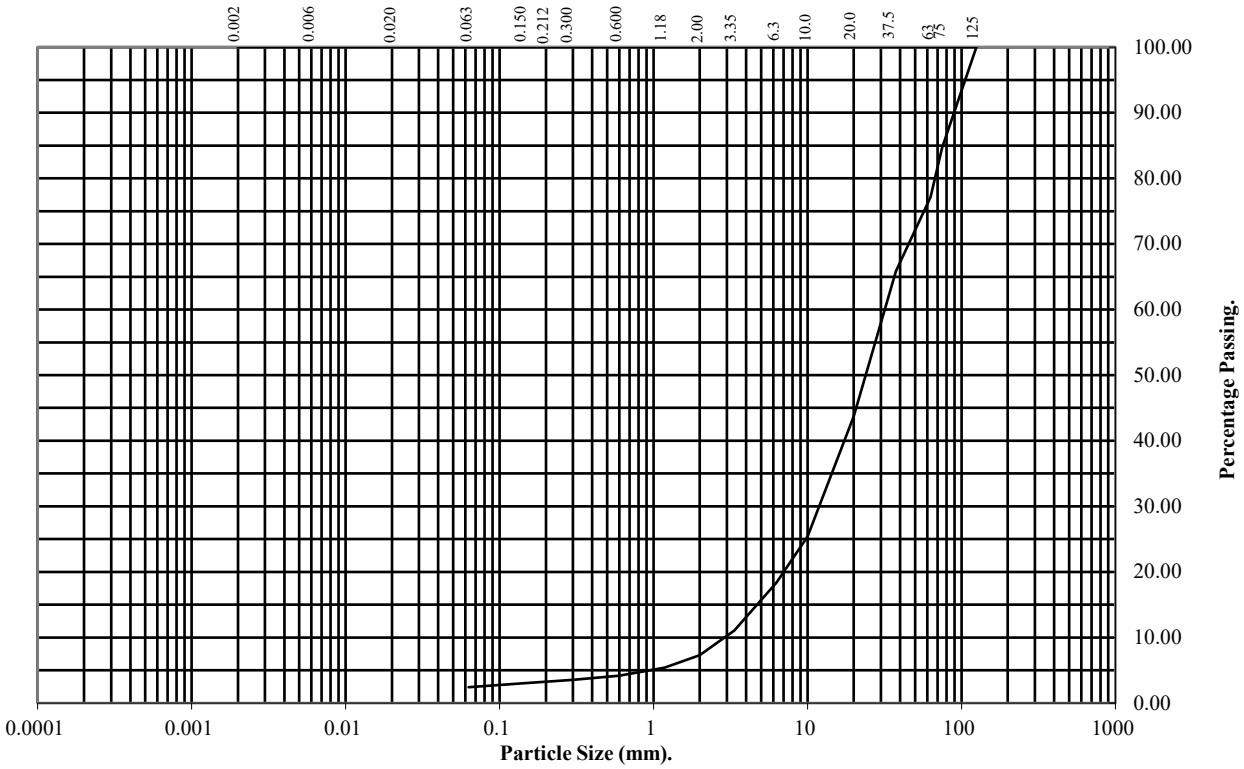
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: **BS4** **Top Depth (m):**

Sample Number: **1-3** **Base Depth(m):**

Sample Type: **B**



BS Test Sieve (mm)	Percentage Passing
125	100
75	85
63	77
37.5	66
20	44
10	25
6.3	18
3.35	11
2	7
1.18	5
0.6	4
0.3	4
0.212	3
0.15	3
0.063	2

Soil Fraction	Total Percentage
Cobbles	23
Gravel	70
Sand	5
Silt/Clay	2

Remarks:
See Summary of Soil Descriptions

UKAS TESTING 4043	PSL Professional Soils Laboratory	**TL Quarry, Huddersfield**	**Contract No:** PSL18/4743 **Client Ref:** H18028

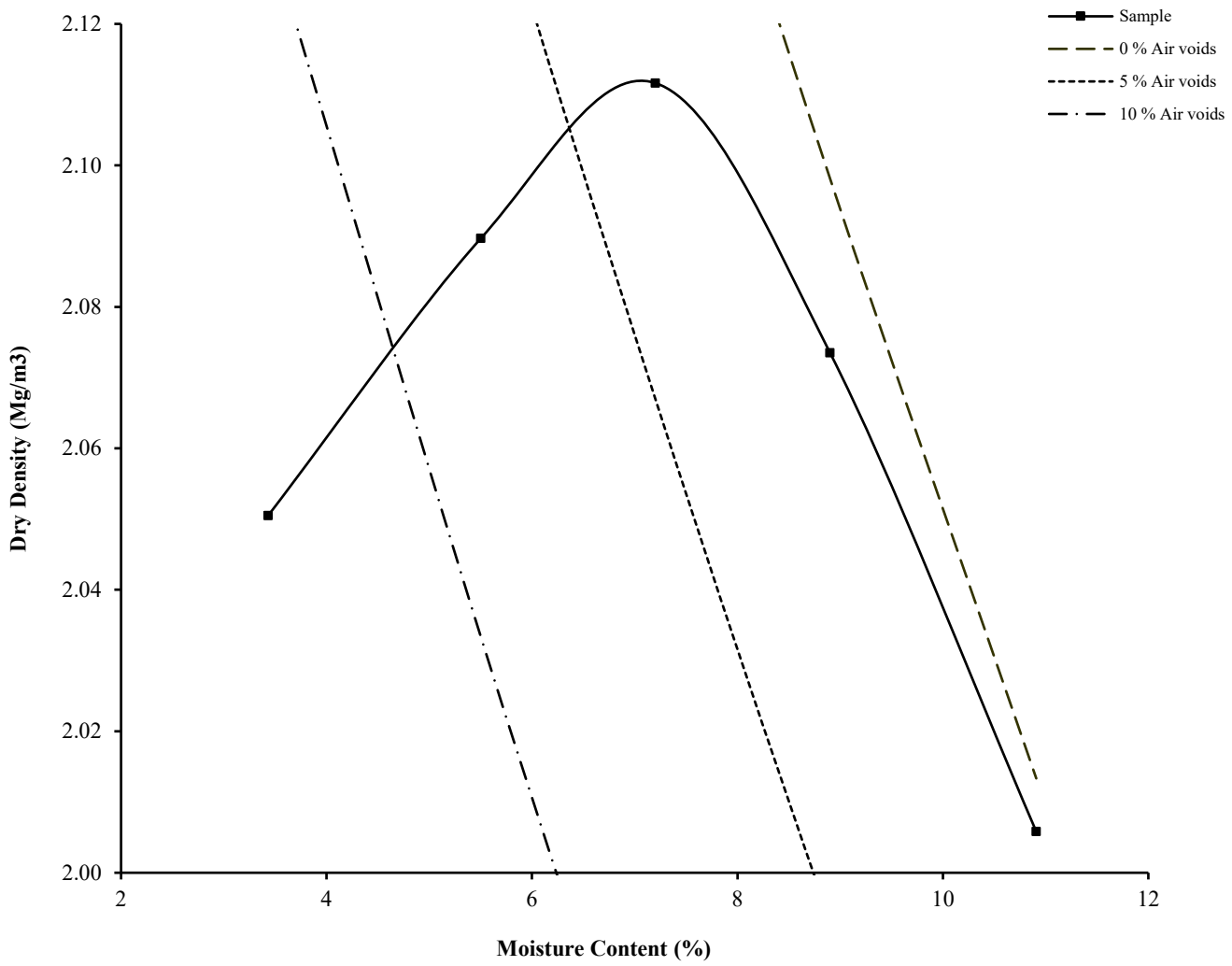
DRY DENSITY / MOISTURE CONTENT RELATIONSHIP

Non compliance with BS 1377 : Part 4 : 1990

Hole Number: BS4 **Top Depth (m) :**

Sample Number: 1-3 **Base Depth (m) :**

Sample Type: B



Initial Moisture Content:		3.4	Method of Compaction:	Vibro	Separate Samples
Particle Density (Mg/m3):	2.58	Actual	Material Retained on 37.5 mm Test Sieve (%):		34
Maximum Dry Density (Mg/m3):		2.11	Material Retained on 20.0 mm Test Sieve (%):		22
Optimum Moisture Content (%):		7			
Remarks See summary of soil descriptions.					

UKAS TESTING 4043	PSL Professional Soils Laboratory	TL Quarry, Huddersfield	Contract PSL18/4743 Client Ref H18028

PARTICLE SIZE DISTRIBUTION TEST

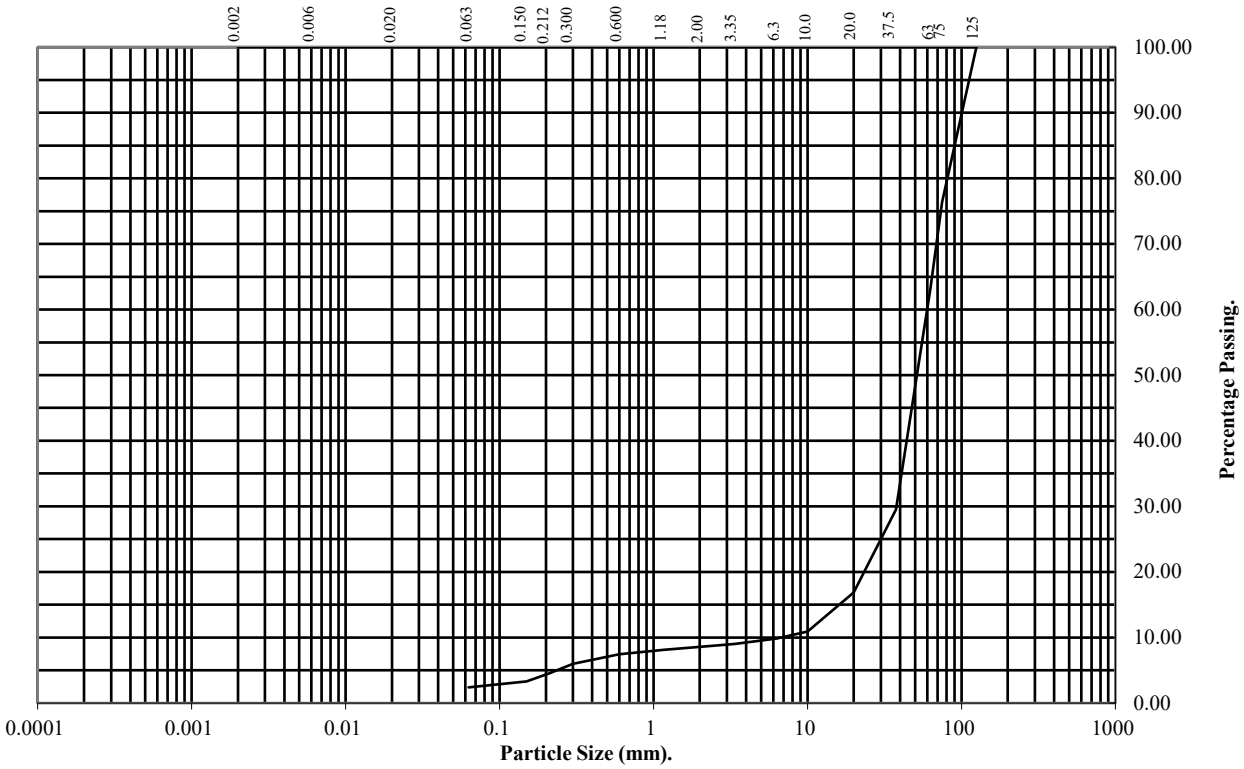
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: SS1 **Top Depth (m):**

Sample Number: 1-3 **Base Depth(m):**

Sample Type: B



BS Test Sieve (mm)	Percentage Passing
125	100
75	76
63	63
37.5	29
20	17
10	11
6.3	10
3.35	9
2	9
1.18	8
0.6	7
0.3	6
0.212	5
0.15	3
0.063	2

Soil Fraction	Total Percentage
Cobbles	37
Gravel	54
Sand	7
Silt/Clay	2

Remarks:
See Summary of Soil Descriptions

UKAS TESTING 4043	PSL Professional Soils Laboratory	TL Quarry, Huddersfield	**Contract No:** PSL18/4743 **Client Ref:** H18028

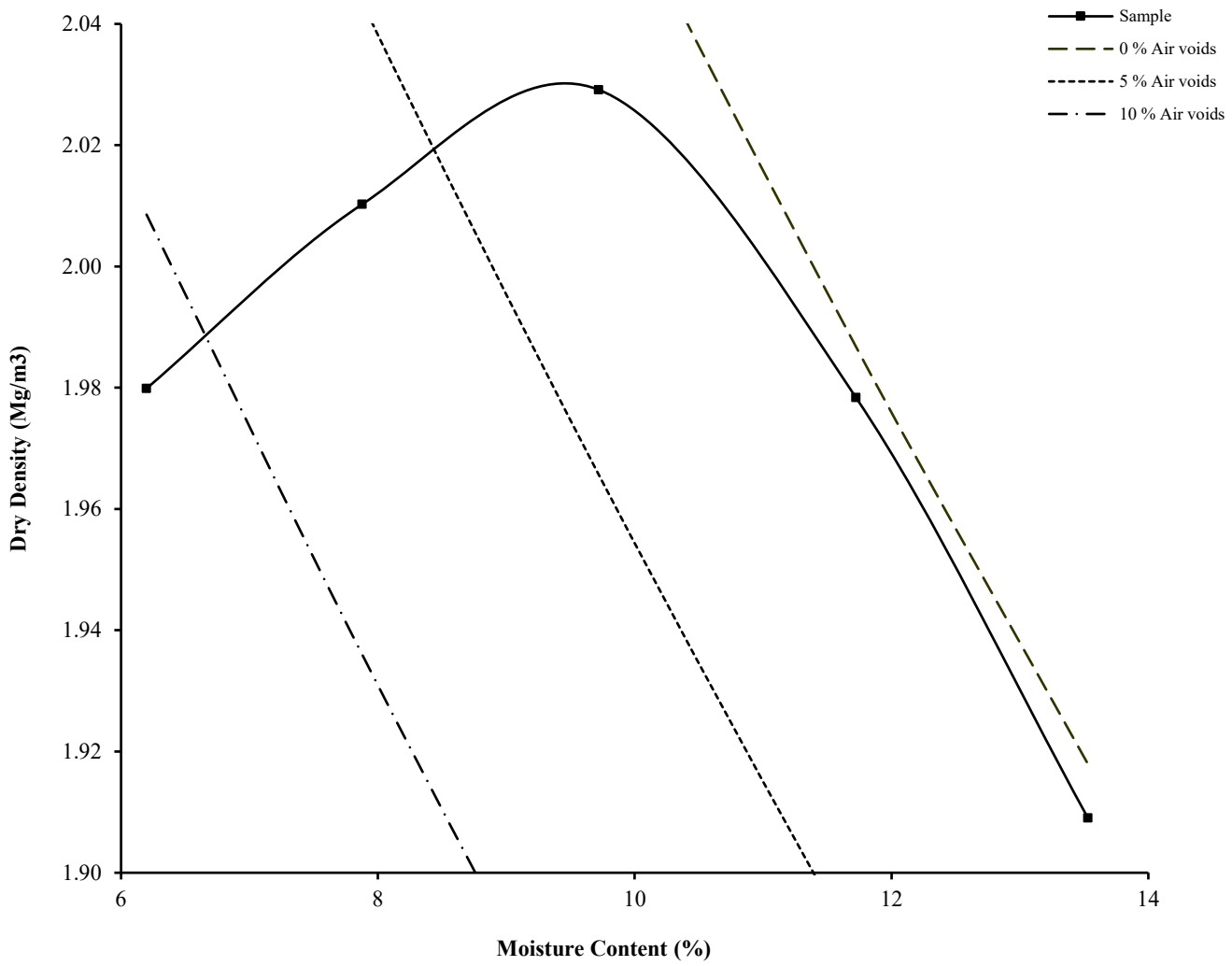
DRY DENSITY / MOISTURE CONTENT RELATIONSHIP

Non compliance with BS 1377 : Part 4 : 1990

Hole Number: SS1 **Top Depth (m) :**

Sample Number: 1-3 **Base Depth (m) :**

Sample Type: B



Initial Moisture Content:		6.2	Method of Compaction:	Vibro	Separate Samples
Particle Density (Mg/m3):	2.59	Actual	Material Retained on 37.5 mm Test Sieve (%):		71
Maximum Dry Density (Mg/m3):		2.03	Material Retained on 20.0 mm Test Sieve (%):		12
Optimum Moisture Content (%):		10			
Remarks See summary of soil descriptions.					

UKAS TESTING 4043	PSL Professional Soils Laboratory	TL Quarry, Huddersfield	Contract PSL18/4743 Client Ref H18028

PARTICLE SIZE DISTRIBUTION TEST

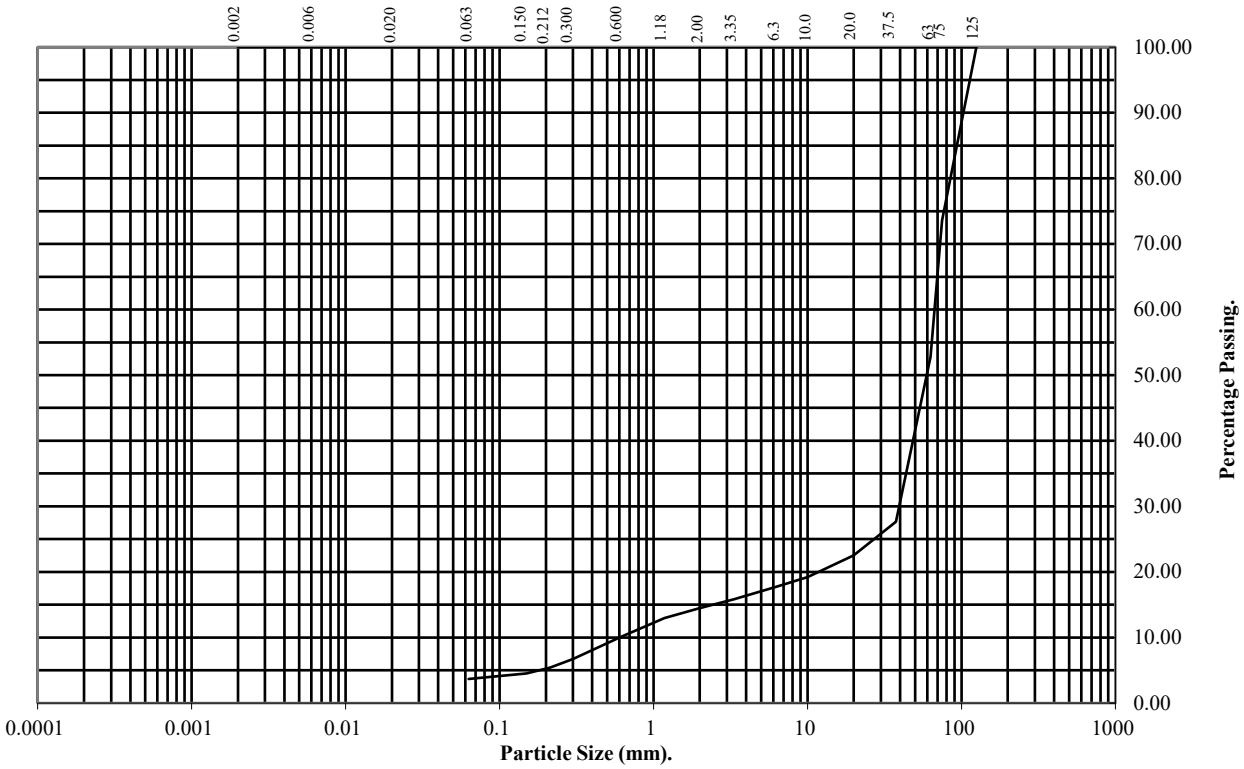
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: SS2 **Top Depth (m):**

Sample Number: 1-3 **Base Depth(m):**

Sample Type: B



BS Test Sieve (mm)	Percentage Passing
125	100
75	74
63	53
37.5	28
20	23
10	19
6.3	18
3.35	16
2	14
1.18	13
0.6	10
0.3	7
0.212	5
0.15	5
0.063	4

Soil Fraction	Total Percentage
Cobbles	47
Gravel	39
Sand	10
Silt/Clay	4

Remarks:
See Summary of Soil Descriptions

UKAS TESTING 4043

PSL Professional Soils Laboratory

TL Quarry, Huddersfield

Contract No:
PSL18/4743
Client Ref:
H18028

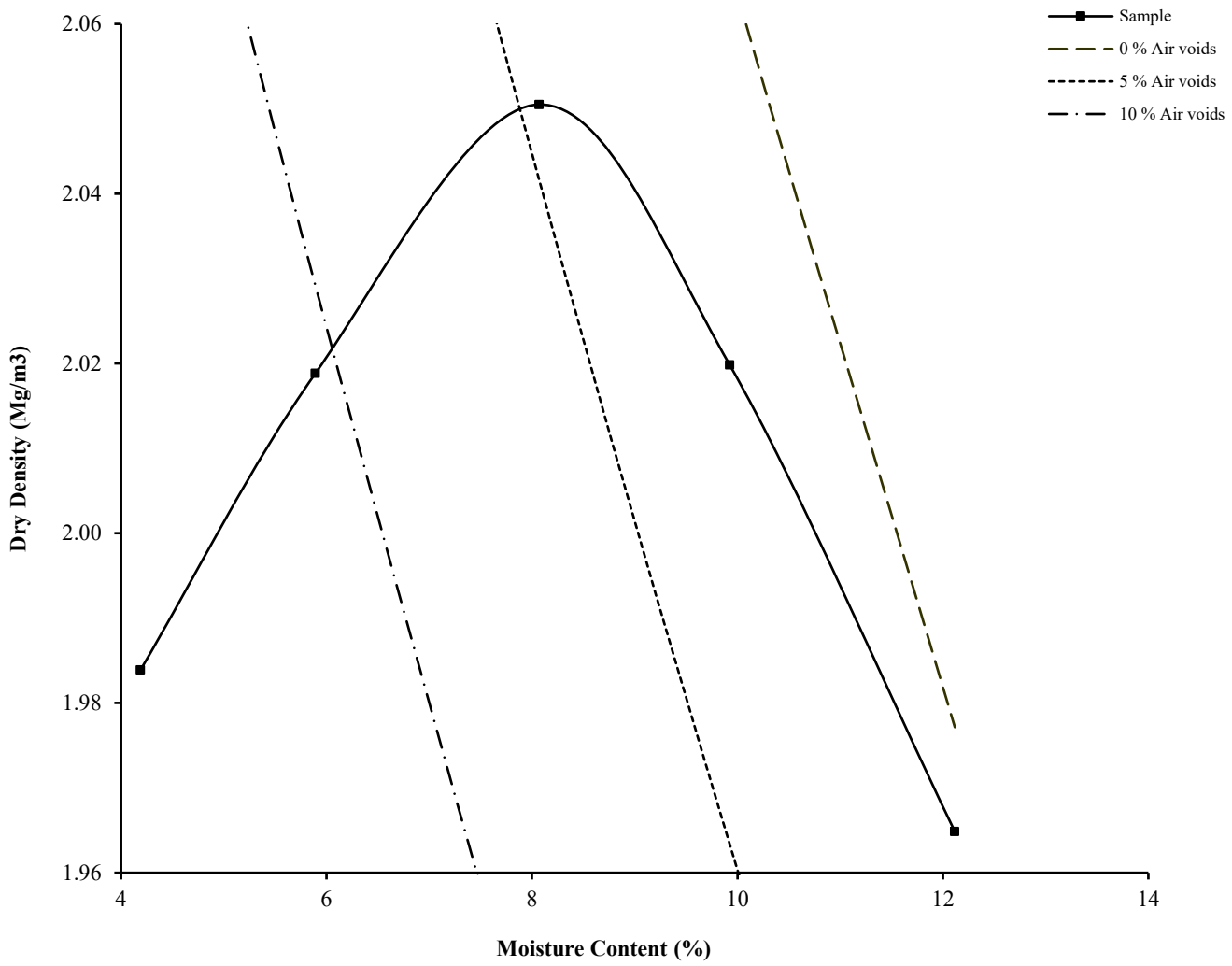
DRY DENSITY / MOISTURE CONTENT RELATIONSHIP

Non compliance with BS 1377 : Part 4 : 1990

Hole Number: SS2 **Top Depth (m) :**

Sample Number: 1-3 **Base Depth (m) :**

Sample Type: B



Initial Moisture Content:		4.2	Method of Compaction:	Vibro	Separate Samples
Particle Density (Mg/m3):	2.60	Actual	Material Retained on 37.5 mm Test Sieve (%):		72
Maximum Dry Density (Mg/m3):		2.05	Material Retained on 20.0 mm Test Sieve (%):		5
Optimum Moisture Content (%):		8			
Remarks See summary of soil descriptions.					

UKAS TESTING 4043	PSL Professional Soils Laboratory	TL Quarry, Huddersfield	Contract PSL18/4743 Client Ref H18028

PARTICLE SIZE DISTRIBUTION TEST

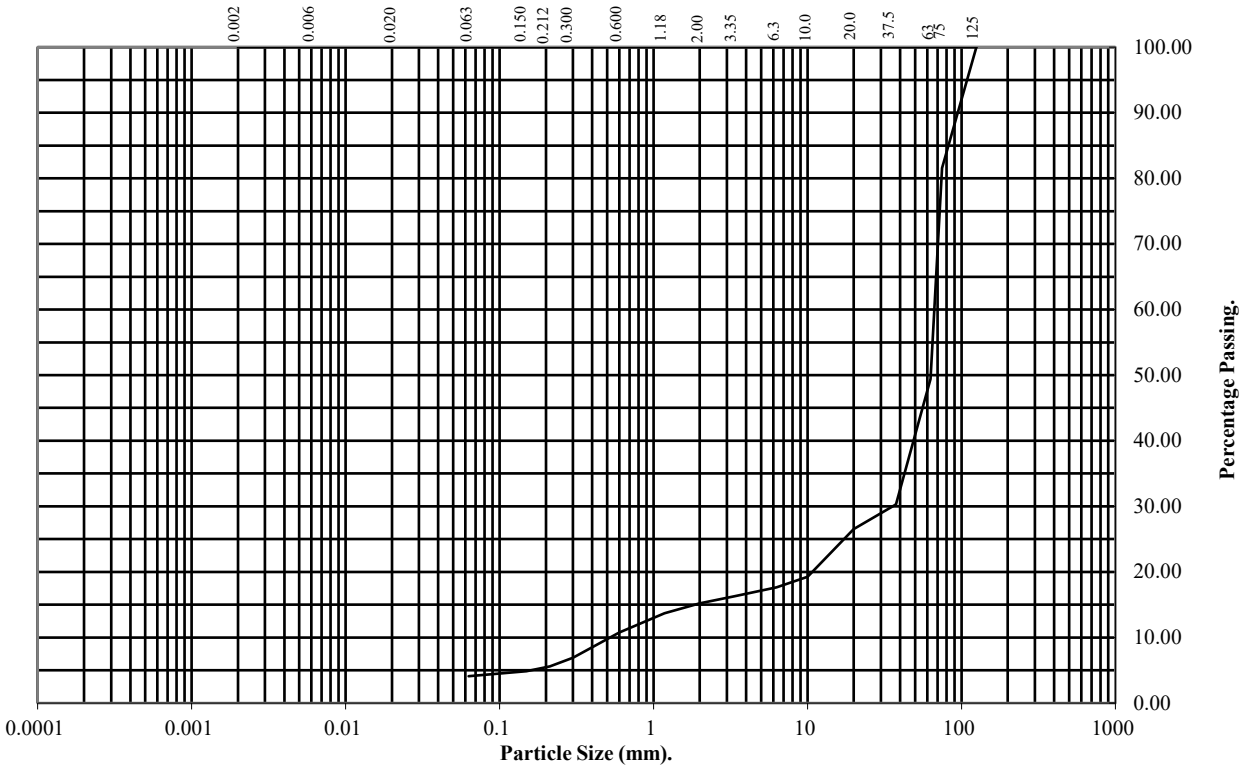
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: SS3 **Top Depth (m):**

Sample Number: 1-3 **Base Depth(m):**

Sample Type: B



BS Test Sieve (mm)	Percentage Passing
125	100
75	82
63	49
37.5	30
20	27
10	19
6.3	18
3.35	16
2	15
1.18	14
0.6	11
0.3	7
0.212	6
0.15	5
0.063	4

Soil Fraction	Total Percentage
Cobbles	51
Gravel	34
Sand	11
Silt/Clay	4

Remarks:
See Summary of Soil Descriptions

UKAS TESTING 4043	PSL Professional Soils Laboratory	TL Quarry, Huddersfield	**Contract No:** PSL18/4743 **Client Ref:** H18028

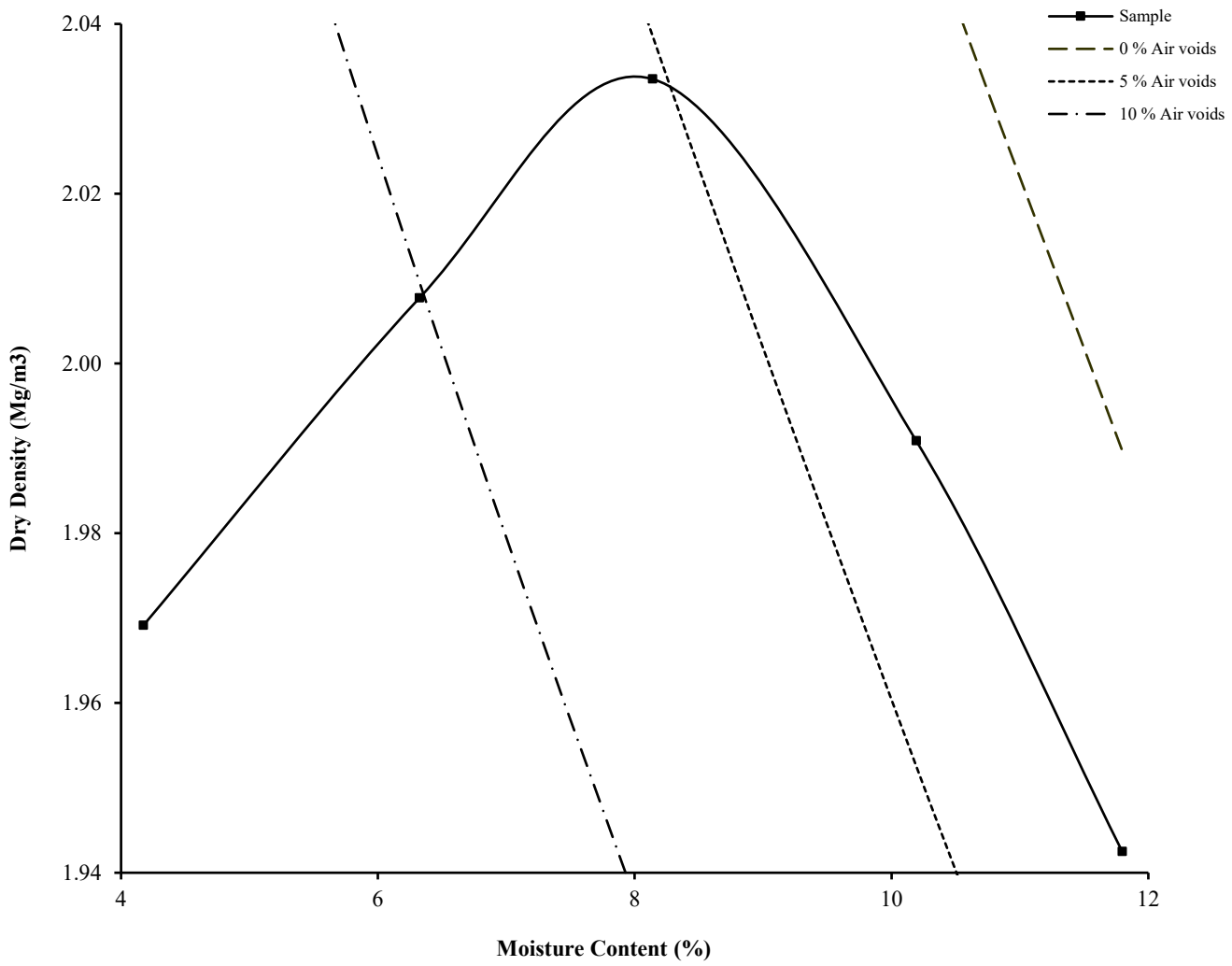
DRY DENSITY / MOISTURE CONTENT RELATIONSHIP

Non compliance with BS 1377 : Part 4 : 1990

Hole Number: SS3 **Top Depth (m) :**

Sample Number: 1-3 **Base Depth (m) :**

Sample Type: B



Initial Moisture Content:		4.1	Method of Compaction:	Vibro	Separate Samples
Particle Density (Mg/m3):	2.60	Actual	Material Retained on 37.5 mm Test Sieve (%):		70
Maximum Dry Density (Mg/m3):		2.03	Material Retained on 20.0 mm Test Sieve (%):		3
Optimum Moisture Content (%):		8			
Remarks See summary of soil descriptions.					

UKAS TESTING 4043	PSL Professional Soils Laboratory	TL Quarry, Huddersfield	Contract PSL18/4743 Client Ref H18028

PARTICLE SIZE DISTRIBUTION TEST

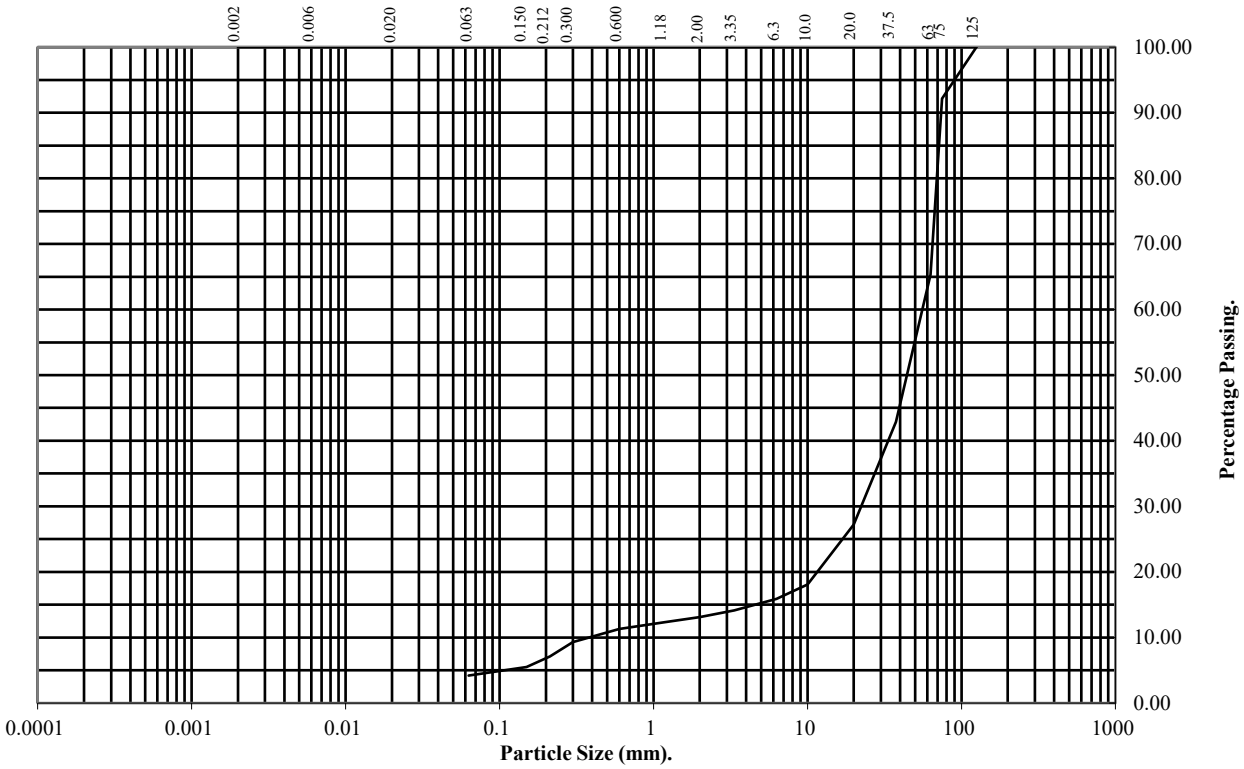
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: SS4 **Top Depth (m):**

Sample Number: 1-3 **Base Depth(m):**

Sample Type: B



BS Test Sieve (mm)	Percentage Passing
125	100
75	92
63	65
37.5	43
20	27
10	18
6.3	16
3.35	14
2	13
1.18	12
0.6	11
0.3	9
0.212	7
0.15	5
0.063	4

Soil Fraction	Total Percentage
Cobbles	35
Gravel	52
Sand	9
Silt/Clay	4

Remarks:
See Summary of Soil Descriptions

UKAS TESTING 4043	PSL Professional Soils Laboratory	TL Quarry, Huddersfield	**Contract No:** PSL18/4743 **Client Ref:** H18028

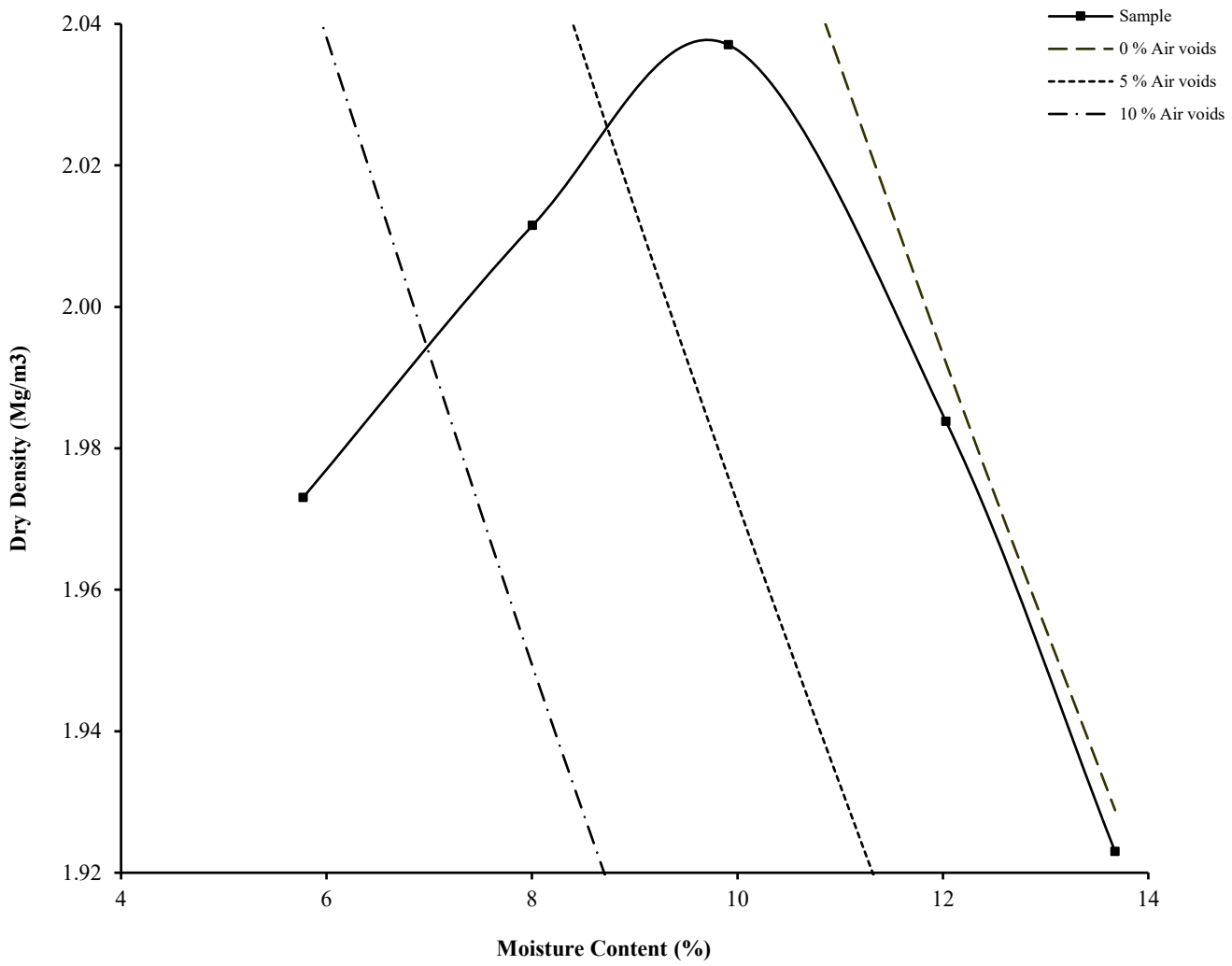
DRY DENSITY / MOISTURE CONTENT RELATIONSHIP

Non compliance with BS 1377 : Part 4 : 1990

Hole Number: SS4 **Top Depth (m) :**

Sample Number: 1-3 **Base Depth (m) :**

Sample Type: B



Initial Moisture Content:		5.8	Method of Compaction:	Vibro	Separate Samples
Particle Density (Mg/m3):	2.62	Actual	Material Retained on 37.5 mm Test Sieve (%):		57
Maximum Dry Density (Mg/m3):		2.04	Material Retained on 20.0 mm Test Sieve (%):		16
Optimum Moisture Content (%):		10			
Remarks See summary of soil descriptions.					

UKAS TESTING 4043	PSL Professional Soils Laboratory	TL Quarry, Huddersfield	Contract PSL18/4743 Client Ref H18028

PARTICLE SIZE DISTRIBUTION TEST

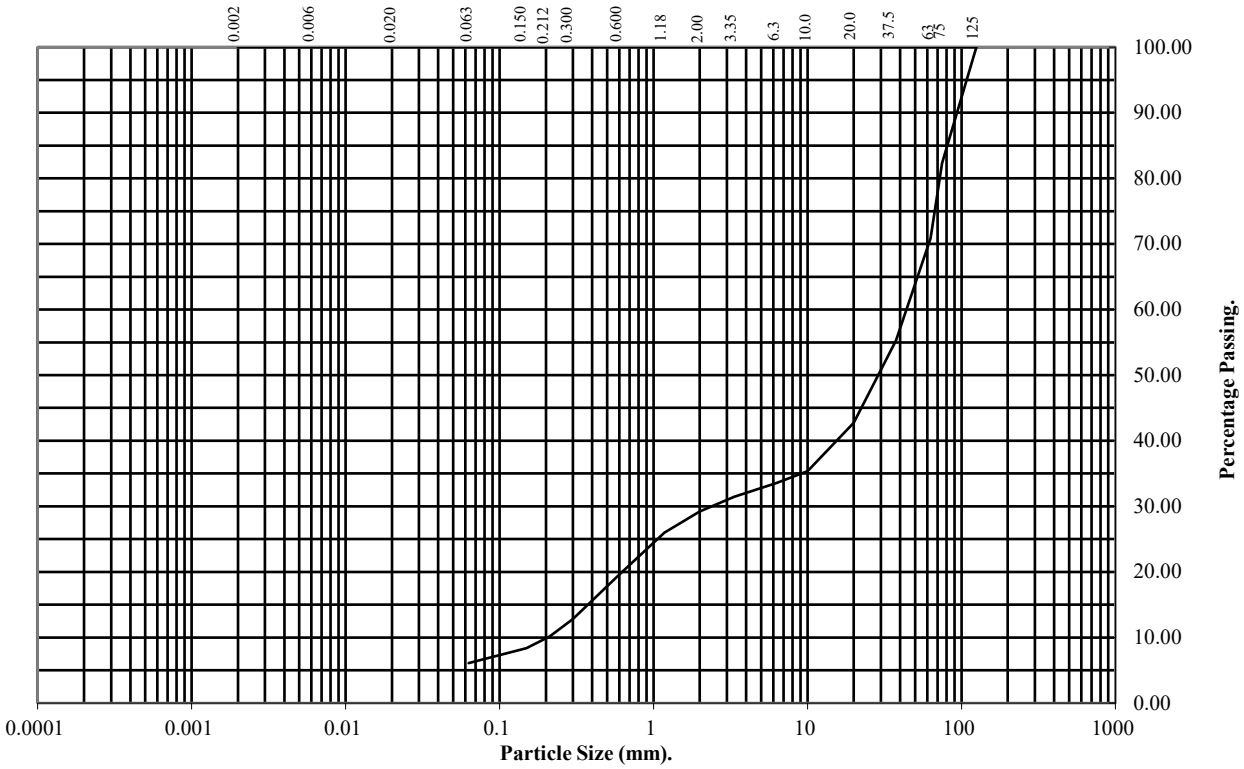
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: SS5 **Top Depth (m):**

Sample Number: 1-3 **Base Depth(m):**

Sample Type: B



BS Test Sieve (mm)	Percentage Passing
125	100
75	82
63	71
37.5	55
20	43
10	35
6.3	34
3.35	31
2	29
1.18	26
0.6	20
0.3	13
0.212	10
0.15	8
0.063	6

Soil Fraction	Total Percentage
Cobbles	29
Gravel	42
Sand	23
Silt/Clay	6

Remarks:
See Summary of Soil Descriptions

UKAS TESTING 4043	PSL Professional Soils Laboratory	TL Quarry, Huddersfield	**Contract No:** PSL18/4743 **Client Ref:** H18028

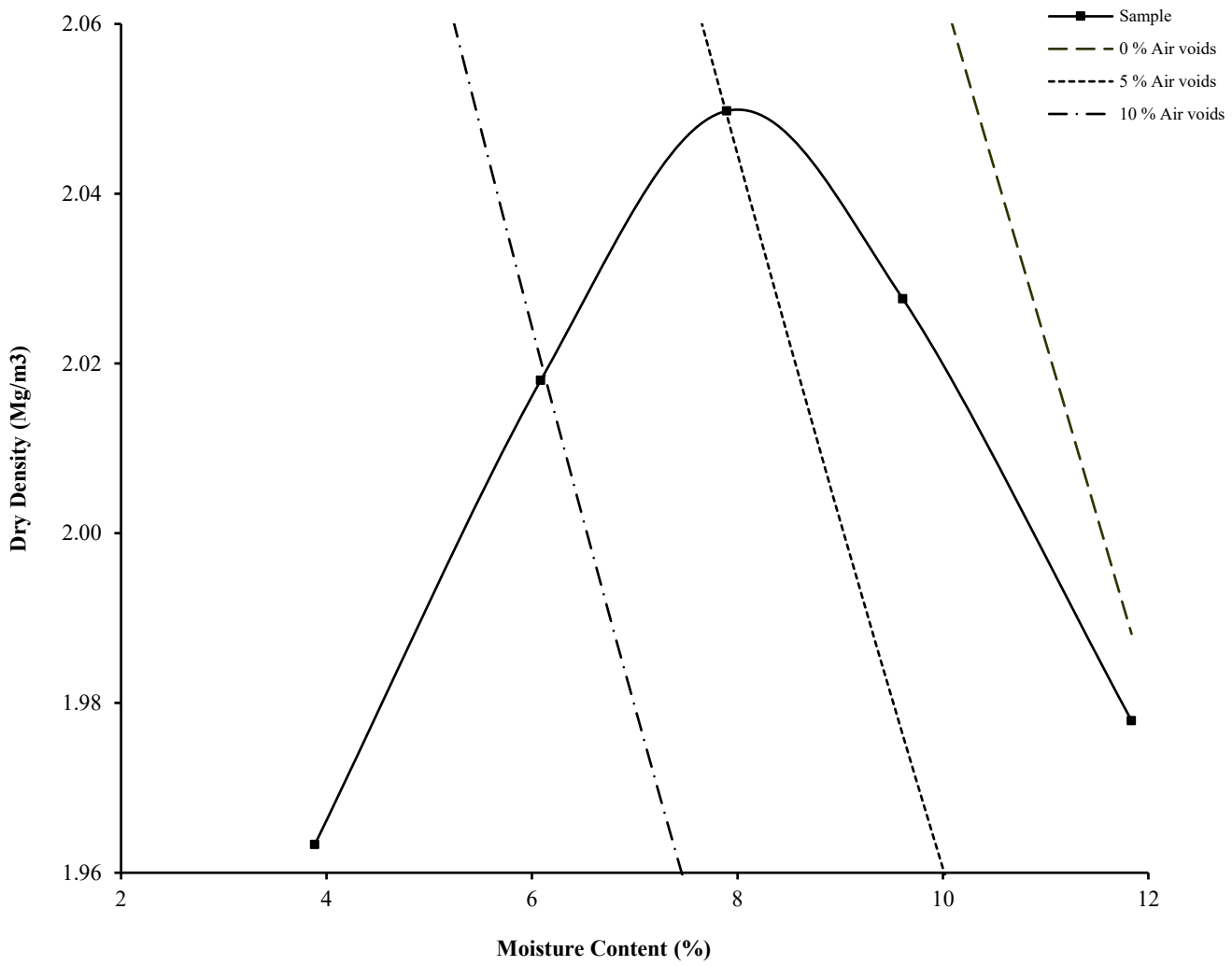
DRY DENSITY / MOISTURE CONTENT RELATIONSHIP

Non compliance with BS 1377 : Part 4 : 1990

Hole Number: SS5 **Top Depth (m) :**

Sample Number: 1-3 **Base Depth (m) :**

Sample Type: B



Initial Moisture Content:		3.9	Method of Compaction:	Vibro	Separate Samples
Particle Density (Mg/m3):	2.60	Actual	Material Retained on 37.5 mm Test Sieve (%):		45
Maximum Dry Density (Mg/m3):		2.05	Material Retained on 20.0 mm Test Sieve (%):		12
Optimum Moisture Content (%):		8			
Remarks See summary of soil descriptions.					

UKAS TESTING 4043	PSL Professional Soils Laboratory	TL Quarry, Huddersfield	Contract PSL18/4743 Client Ref H18028

PARTICLE SIZE DISTRIBUTION TEST

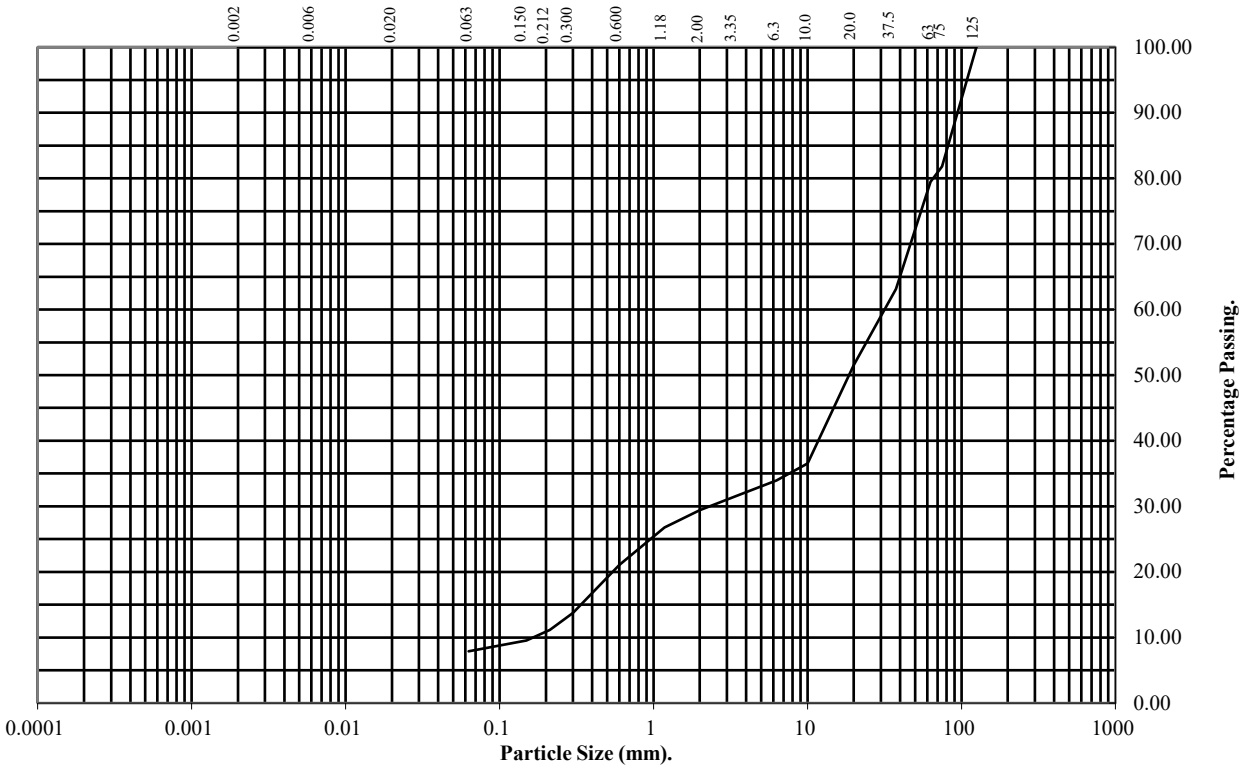
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: SS6 **Top Depth (m):**

Sample Number: 1-3 **Base Depth(m):**

Sample Type: B



BS Test Sieve (mm)	Percentage Passing
125	100
75	82
63	79
37.5	63
20	52
10	37
6.3	34
3.35	31
2	29
1.18	27
0.6	21
0.3	14
0.212	11
0.15	10
0.063	8

Soil Fraction	Total Percentage
Cobbles	21
Gravel	50
Sand	21
Silt/Clay	8

Remarks:
See Summary of Soil Descriptions

UKAS TESTING 4043	PSL Professional Soils Laboratory	TL Quarry, Huddersfield	**Contract No:** PSL18/4743 **Client Ref:** H18028

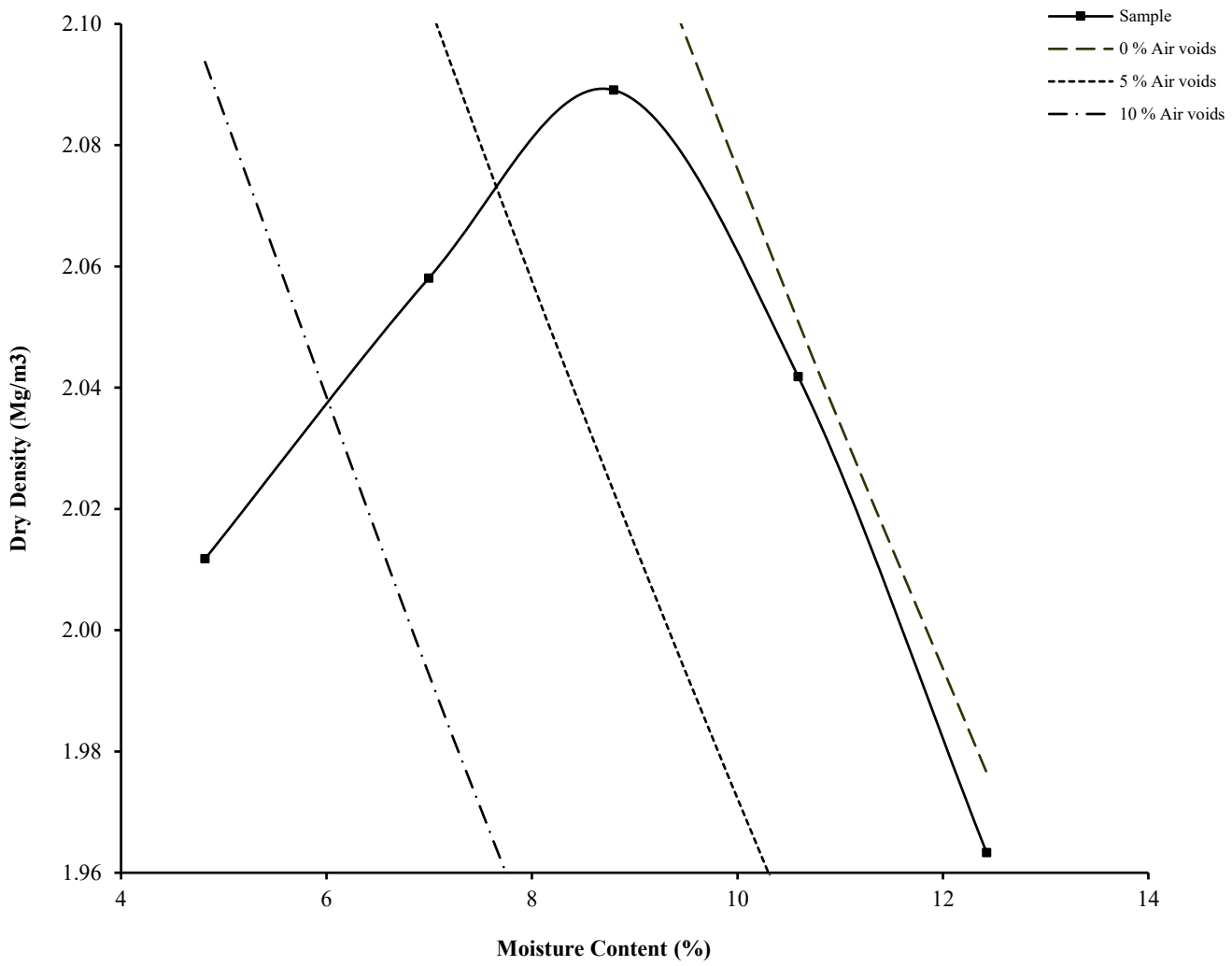
DRY DENSITY / MOISTURE CONTENT RELATIONSHIP

Non compliance with BS 1377 : Part 4 : 1990

Hole Number: SS6 **Top Depth (m) :**

Sample Number: 1-3 **Base Depth (m) :**

Sample Type: B



Initial Moisture Content:		4.8	Method of Compaction:	Vibro	Separate Samples
Particle Density (Mg/m3):	2.62	Actual	Material Retained on 37.5 mm Test Sieve (%):		37
Maximum Dry Density (Mg/m3):		2.09	Material Retained on 20.0 mm Test Sieve (%):		11
Optimum Moisture Content (%):		9			
Remarks See summary of soil descriptions.					

UKAS TESTING 4043	PSL Professional Soils Laboratory	TL Quarry, Huddersfield	Contract PSL18/4743 Client Ref H18028

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