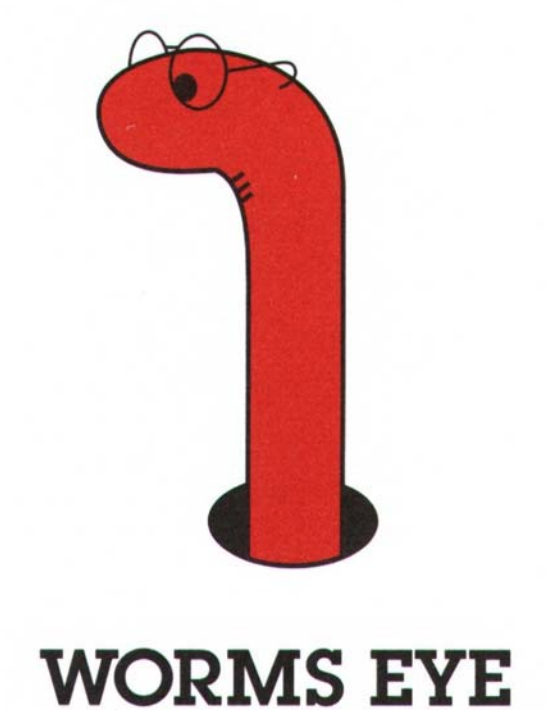
Electronic Report



Worms Eye Limited
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Our Ref: Northcote Road/BB6 8BG/2024
Date: 13 June 2024

John Holland
Broak Oaks
Northcote Road
Langho
BB6 8DG

[redacted]

Copy to : Liam Reed
[redacted]

BROAK OAKS, NORTHCOTE ROAD, LANGHO, BB6 8BG

SITE INVESTIGATION REPORT – Updated 13/6/24

INTRODUCTION

A pool house is proposed. Instructions were to carry out boreholes and tests to investigate geotechnical conditions. This is an updated version of our report dated 21/5/24 following further inspection of nearby trees.

SITE LOCATION

The existing property is a detached house located to the northeast of Northcote Road in Langho and at OS Grid reference 370708, 434613. The existing house is at the northwest of the plot, with a summer house along the southeast boundary, a driveway at the southwest and extensive gardens at the northeast.

A main sewer crosses the plot from northeast to southwest, passing just to the southeast of the summer house.

PROPOSED DEVELOPMENT

It is proposed to demolish the summer house and build a pool house, containing plant room and swimming pool, over a larger footprint along the southeast boundary. A reinforced masonry basement retaining structure will be constructed to the entire perimeter with the underside of the concrete raft at 2.1m below finished floor level.

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GEOLOGY OF SITE

The geology map indicates that underlying solid rocks are mudstone of the Bowland Shale Formation.

Surface drift is shown as glacial till (boulder clay) of unknown thickness.

GROUND INVESTIGATIONS

A series of two boreholes, preceded by a shallow starter pit, and two dynamic probes were carried out. Details are given on the enclosed location plan, borehole logs dynamic probe logs.

BH1, at the northeast of the proposed pool house, found topsoil to about 0.15m overlying soft to firm clay becoming medium strength below 1.0m. High strength clay was encountered below 1.8m and continued to the base of the borehole at 4.8m deep.

Probe 1, adjacent to BH1, had very high strength strata between 6.4m and 8.4m where it stopped.

BH2, southwest of the proposed pool house, found gravel to about 0.15m overlying firm clay which became high strength below 0.9m, continuing in high strength clay to the base of BH2 at 4.2m deep.

Probe 2, adjacent to BH2, found very high strength strata between 5.7m and 6.9m where it stopped.

The following approximates to a section looking northwest.

Findings	BH2/Pr2	BH1/Pr1
Topsoil/gravel	0.0 – 0.25	0.0 – 0.20
Soft to firm CLAY	-	0.15 – 1.0
Firm CLAY	0.15 – 0.9	-
Medium strength CLAY	-	1.0 – 1.8
High strength CLAY	0.9 – 4.2+	1.8 – 4.8+
Probe (very high strength)	5.7 – 6.9+	6.4 – 8.4+
Water (monitored)	0.56	1.04
Water (	0.48	0.84

PLASTICITY TESTS

Two samples of clay, one per BH at 1.0m deep, have been tested to determine their plasticity index (PI). These results are included and show the clay to have a medium shrinkage potential.

CONCLUSION

Trees

There is a medium shrinkage potential clay and the nearest deciduous trees on site are 20m northeast. Assuming a high water demand shows these trees will not affect footings below 1.7m.

The next nearest trees are as follows.

Tree	Distance (m)	Mature Height (m)	Water Demand	Minimum Foundation Depth (m)	Notes
Sycamore (stump)	1.7	22	Moderate	1.8	Felled with limited regrowth.
Western Red Cedar	1.5	Up to 65m	Moderate	Approx 1.9	We understand the trees are to be removed
Elder	8	10	Low	0.9	
Ashe Juniper	8.5	12	High	0.9	
Common Yew	13	12	Moderate	0.9	
Wild Cherry	19	17	Moderate	0.9	
Deodar Cedar	21	50	Moderate	0.9	

Footings

The boreholes show slightly differing conditions at shallow depth, which, in BH1, are not suitable for strip footings. However, due to the construction of the pool and raft footings need to go to at least 2.1m deep, taking them into the high strength clay where a bearing capacity of 220 KN/m² could be used. For higher loadings footings could be taken down to 2.4m where a bearing capacity of 280 KN/m² could be used.

The findings show footings below 2.1m should not be affected by nearby trees. However, a nearby Sycamore has been felled, and we understand nearby Cedar trees will be felled. Appropriate heave precautions (voids, void formers or compressible materials) will be required for the sub-structure.

Water

The monitoring shows water to be at about 0.5 to 1.0m deep. This may pose difficulties for excavations and will need to be taken into account with the pool design.

Yours faithfully
on behalf of Worms Eye Ltd

[redacted]

David Lord
BSc (Hons)
FGS, MIEnvSc, AIEMA

BROAK OAKS, NORTHCOTE ROAD, LANGHO, BB6 8BG

List of Appendices – Site Investigation Report

List of Acronyms

Existing site plan – showing borehole and probe locations

Proposed site plan – showing borehole and probe locations

Window Samper Borehole Logs

Dynamic Probe Logs

Plasticity Test Results

CONTAMINATION TEST UNITS

Conversion factor	Name	Symbol	Numerical Value	Alternative description	Commonly used for:
	per cent	%	1 in 100 (10^2)		total sulphur, hazardous waste
% x10	parts per thousand	‰	1 in 1000 (10^3)	g/l (grams per litre)	water soluble sulphate test
‰ x 1,000	parts per million	ppm	1 in 1,000,000 (10^6)	mg/kg (milligrams per kilogram)	most soil tests
				mg/l (milligrams per litre)	water tests
ppm x 1,000	parts per billion	ppb	1 in 1,000,000,000 (10^9)	μg/kg (micrograms per kilogram)	PAH soil tests
				μg/l (micrograms per litre)	water/leachate tests
ppb x 1,000	parts per trillion	ppt	1 in 1,000,000,000,000 (10^{12})	ng/kg (nanograms per kilogram)	PAH soil tests
				ng/l (nanograms per litre)	water/leachate tests

ABBREVIATIONS

Chemical	BAP	Benzo(a)pyrene
	BTEX	Benzene, toluene, ethylbenzene, xylene
	DAHA	Dibenzo(ah)anthracene
	MTBE	Methyl tertiaryt-butyl ether (additive to petrol)
	EPH	Extractable petroleum hydrocarbons (formerly diesel range organics – DRO)
	NFD	No fibres detected (asbestos test)
	PAH	Polycyclic aromatic hydrocarbons
	PCB	Polychlorinated biphenyls
	PCE	Perchloroethylene or tetrachloroethylene
	PID	Photo ionisation detector (screen for VOC)
	PRO/GRO	Petrol range organics/gasoline range organics
	SVOC	Semi-volatile organic compounds
	TCE	Trichloroethylene
	TPH	Total petroleum hydrocarbons
	VOC	Volatile organic compounds
Other	AGS	Association of Geotechnical Specialists
	BGS	British Geological Survey
	BRE	Building Research Establishment
	CBR	California Bearing Ratio
	CIEH	Chartered Institute of Environmental Health
	CIRIA	Construction Industry Research and Information Association
	CLEA	Contaminated Land Exposure Assessment (Environment Agency/DEFRA)
	CLR 8	Contaminated Land Research Report 8 (Environment Agency/DEFRA)
	DWQ	Drinking water quality
	EA	Environment Agency
	EQS	Environmental quality standards (for rivers etc.)
	ICRCL	Inter-departmental Commission for the Reclamation of Contaminated Land
	LQM	Land Quality Management Ltd (Land and Environmental Consultancy).
	NHBC	National House Builders Council
	SGV	Soil Guideline Values
	SPT	Standard penetration test

TPHWG TPH Working Group

1. This report should be considered in relation to the objectives agreed between Worms Eye and the Client, outlined in the introduction.

2. For the work, reliance has been placed on publicly available data, obtained from the sources identified in the report. The information is not exhaustive and further information may be available from other sources. When using the information it has been assumed it is correct, and no attempt has been made to verify the information.

3. This report has been produced in accordance with current UK policy and guidelines, for land and groundwater contamination, enforced by the Local Authority and the Environment Agency.

4. During the site walkover, reasonable effort was made to obtain an overview of the site. However, no attempt was made to enter areas that are unsafe, a risk to health and safety, locked, barricaded, overgrown, or areas not made accessible.

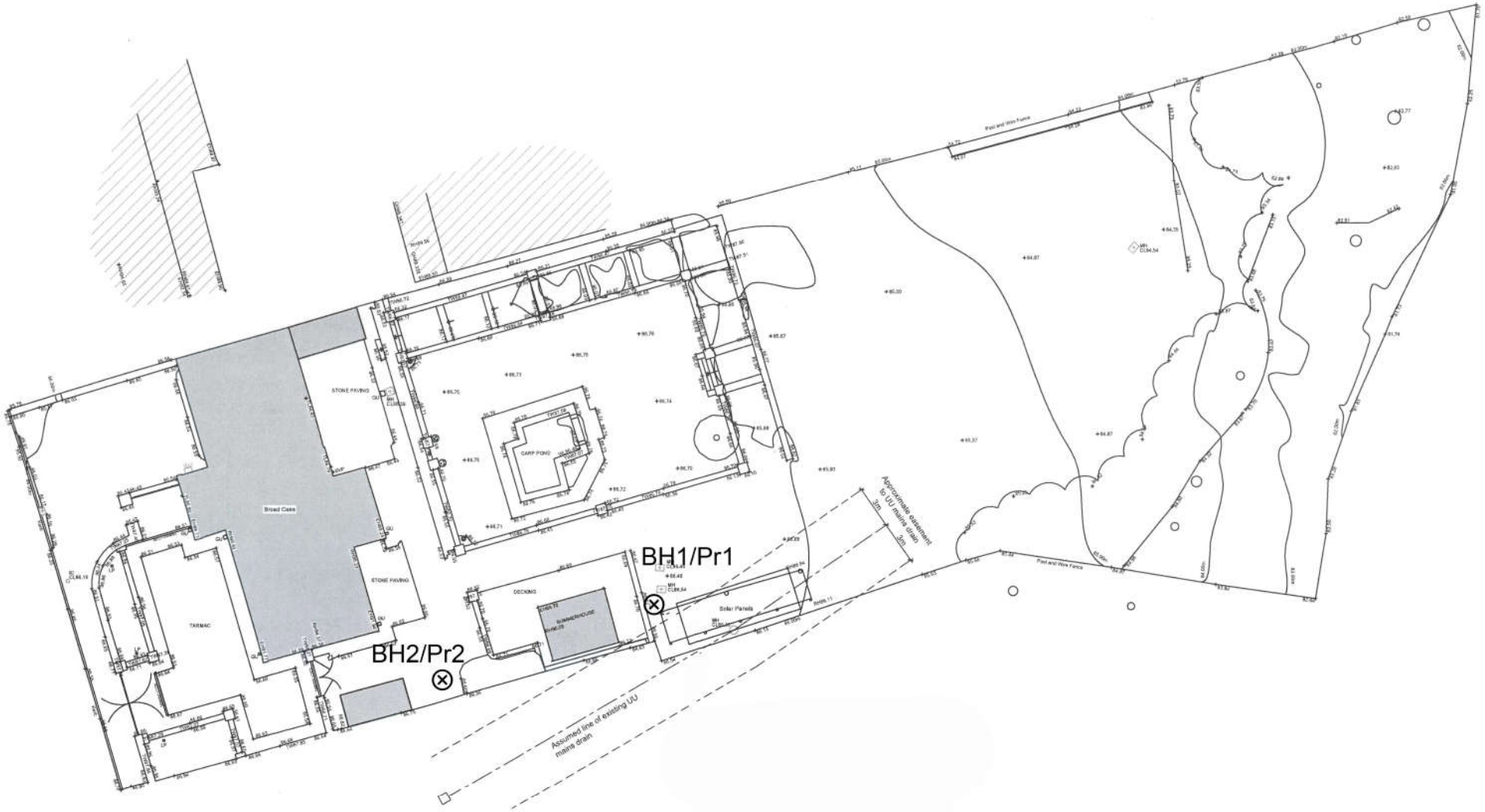
5. Access, the presence of services and activities on the site, limited locations where sampling could be carried out and the techniques that could be used.

6. Assessments are based on available information at the time of writing and are ultimately for the decision of the regulatory authorities.

7. The conclusions and recommendations provide an overview and guidance only and should not be specifically relied upon without considering the context of the report in full.

8. Worms Eye cannot be held responsible for any use of the report or its contents for any purpose other than that for which it was prepared. The copyright of this report, and other plans or documents prepared by Worms Eye, is owned by them, and no such plans or documents may be reproduced, published or adapted without written consent. Complete copies may be made and distributed by the client, as expected, in dealing with matters related to its commission. Should the client pass copies of the report to other parties for information, the whole report should be copied, but no professional liability, or warranties, shall be extended to other parties by Worms Eye, without their written agreement.

9. New information, revised practices, or changes in legislation, may necessitate the re-interpretation of the report, in whole or in part.



EXISTING SITE PLAN

SCALE 1:200

EXISTING SITE PLAN

SCALE 1:200

Worms Eye Ltd

Cannon House, 52 Bank Parade
Burnley, Lancashire, BB11 1TS

Site
Broad Oaks, Northcote Road, Langho

Number
BH1

Machine : Trecker
Method : Drive-in Windowless Sampler

Dimensions

Ground Level (mOD)

Client
John Holland

Job Number
BB6 8BG

Location
Northeast (see Probe 1)

Dates
17/04/2024

Project Contractor
Worms Eye Ltd

Sheet
1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
					(0.20) 0.20	Topsoil (excavated by hand)			
					(0.80) 1.00	Soft to firm brown sandy, gravelly, CLAY (excavated by hand)			
1.30	VANE 62kPa				(3.80)	Medium strength dark brown and grey mottled, sandy, gravelly, CLAY becoming high strength below 1.8m deep			
1.80	VANE 108kPa								
2.40	VANE 130kPa								
3.00	VANE 130kPa								
3.70	VANE 130kPa								
4.20	VANE 130kPa				4.80	Complete at 4.80m			

Remarks
See Probe 1
Standing water at 1.04m deep during monitoring

Scale (approx)
1:25

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Figure No.
BB6 8BG.BH1

Worms Eye Ltd

Cannon House, 52 Bank Parade
Burnley, Lancashire, BB11 1TS

Site
Broad Oaks, Northcote Road, Langho

Number
BH2

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Drive-in Windowless Sampler			John Holland	BB6 8BG
	Location Southwest (see Probe 2)	**Dates** 17/04/2024	**Project Contractor** Worms Eye Ltd	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
					(0.25)	Grave/topsoil/hardcore (excavated by hand)			
					0.25				
					(0.65)	Firm brown sandy, gravelly, CLAY (excavated by hand)			
					0.90				
1.60	VANE 130kPa					High strength brown and grey mottled sandy, very gravelly, CLAY with stone cobbles			
2.10	VANE 130kPa								
2.50	VANE 130kPa				(3.30)				
3.00	VANE 130kPa								
3.60	VANE 130kPa								
					4.20	Complete at 4.20m			

Remarks
See Probe 2
Standing water at 0.56m deep during monitoring

Scale (approx)	Logged By
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Figure No.
BB6 8BG.BH2

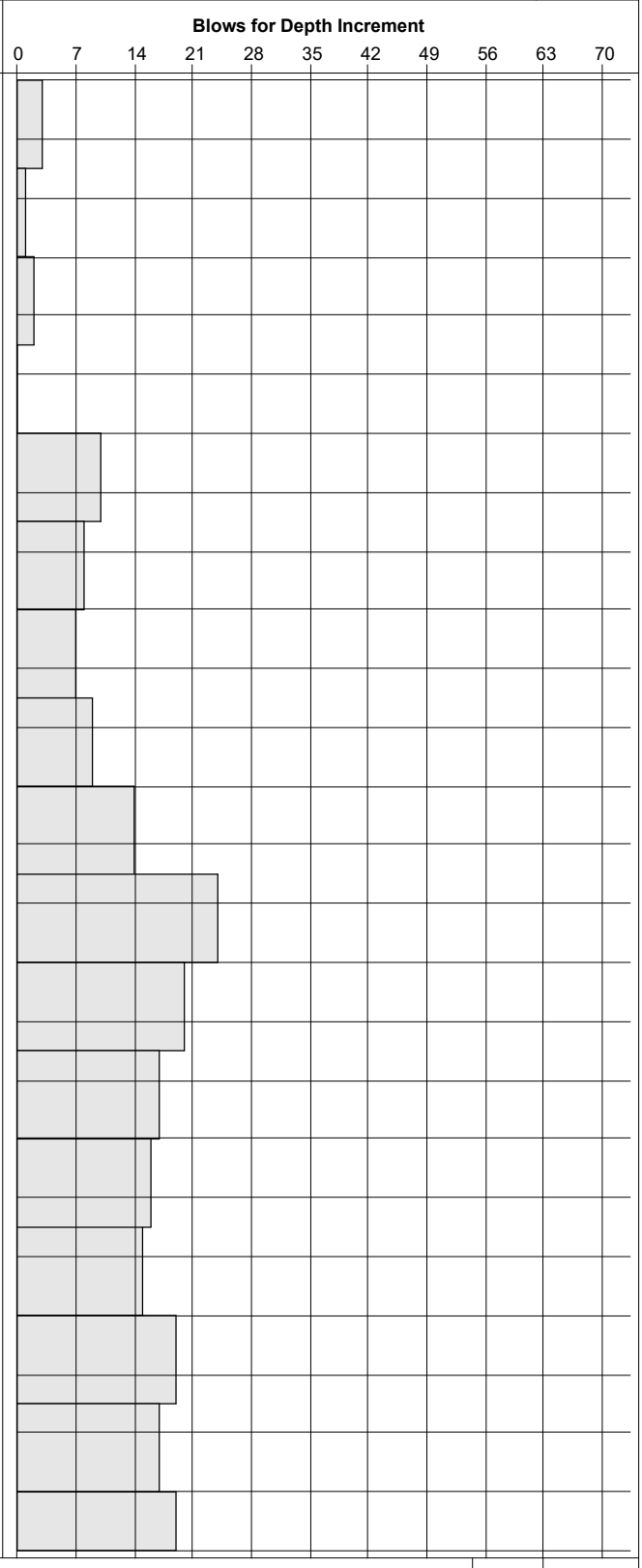
Worms Eye Ltd

Cannon House, 52 Bank Parade
Burnley, Lancashire, BB11 1TS

Site	Probe Number
Broad Oaks, Northcote Road, Langho	PR 1

Method	Cone Dimensions	Ground Level (mOD)	Client	Job Number
Dynamic Probing			John Holland	BB6 8BG
	Location	**Dates**	**Engineer**	**Sheet**
	Northeast, by BH1	18/04/2024	David Lord	1/2

Depth (m)	Blows for Depth Increment	Field Records	Level (mOD)
0.00-0.30	3		
0.30-0.60	1		
0.60-0.90	2		
0.90-1.20	0		
1.20-1.50	10		
1.50-1.80	8		
1.80-2.10	7		
2.10-2.40	9		
2.40-2.70	14		
2.70-3.00	24		
3.00-3.30	20		
3.30-3.60	17		
3.60-3.90	16		
3.90-4.20	15		
4.20-4.50	19		
4.50-4.80	17		
4.80-5.10	19		



Remarks

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Figure No. BB6 8BG.PR 1

Worms Eye Ltd

Cannon House, 52 Bank Parade
Burnley, Lancashire, BB11 1TS

Site	Probe Number
Broad Oaks, Northcote Road, Langho	PR 1

Method	Cone Dimensions	Ground Level (mOD)	Client	Job Number
Dynamic Probing			John Holland	BB6 8BG
	Location	**Dates**	**Engineer**	**Sheet**
	Northeast, by BH1	18/04/2024	David Lord	2/2

Depth (m)	Blows for Depth Increment	Field Records	Level (mOD)
5.10-5.40	15		
5.40-5.70	16		
5.70-6.00	15		
6.00-6.30	17		
6.30-6.60	26		
6.60-6.90	32		
6.90-7.20	41		
7.20-7.50	38		
7.50-7.80	46		
7.80-8.10	52		
8.10-8.40	63		

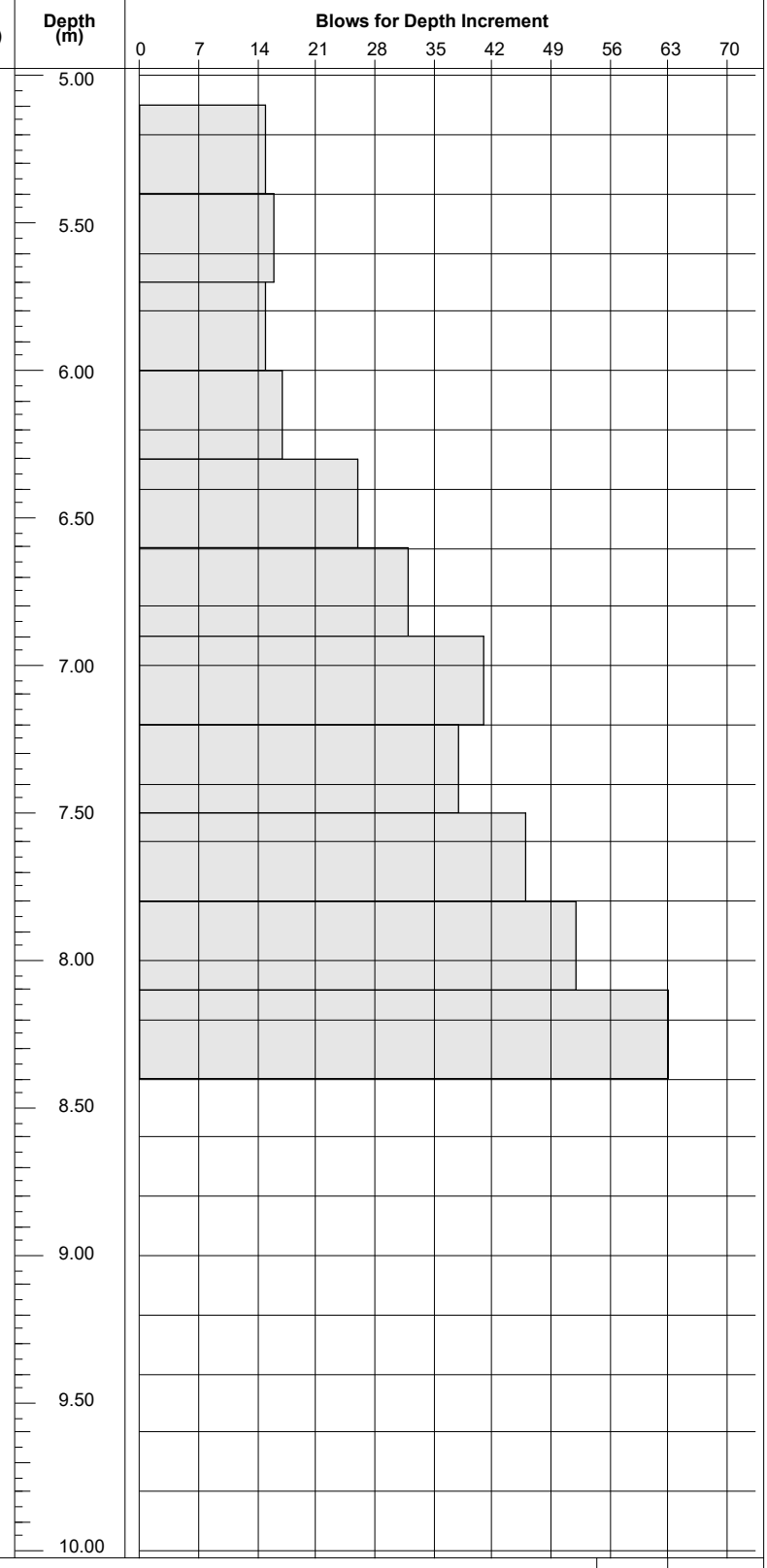

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Figure No. BB6 8BG.PR 1

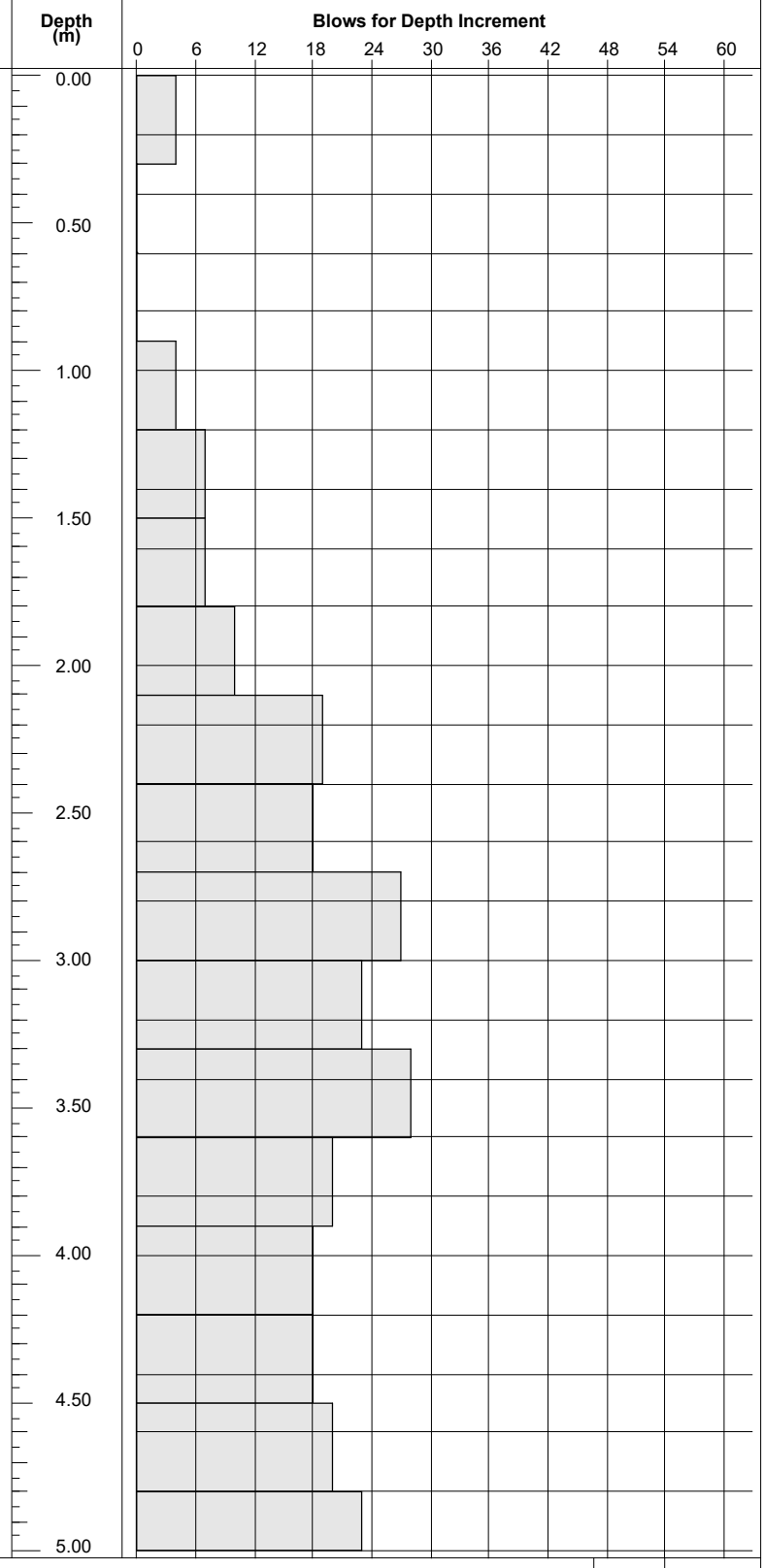
Worms Eye Ltd

Cannon House, 52 Bank Parade
Burnley, Lancashire, BB11 1TS

Site	Probe Number
Broad Oaks, Northcote Road, Langho	PR 2

Method	Cone Dimensions	Ground Level (mOD)	Client	Job Number
Dynamic Probing			John Holland	BB6 8BG
	Location	**Dates**	**Engineer**	**Sheet**
	Southwest, by BH2	18/04/2024	David Lord	1/2

Depth (m)	Blows for Depth Increment	Field Records	Level (mOD)
0.00-0.30	4		
0.30-0.60	0		
0.60-0.90	0		
0.90-1.20	4		
1.20-1.50	7		
1.50-1.80	7		
1.80-2.10	10		
2.10-2.40	19		
2.40-2.70	18		
2.70-3.00	27		
3.00-3.30	23		
3.30-3.60	28		
3.60-3.90	20		
3.90-4.20	18		
4.20-4.50	18		
4.50-4.80	20		
4.80-5.10	23		



Remarks

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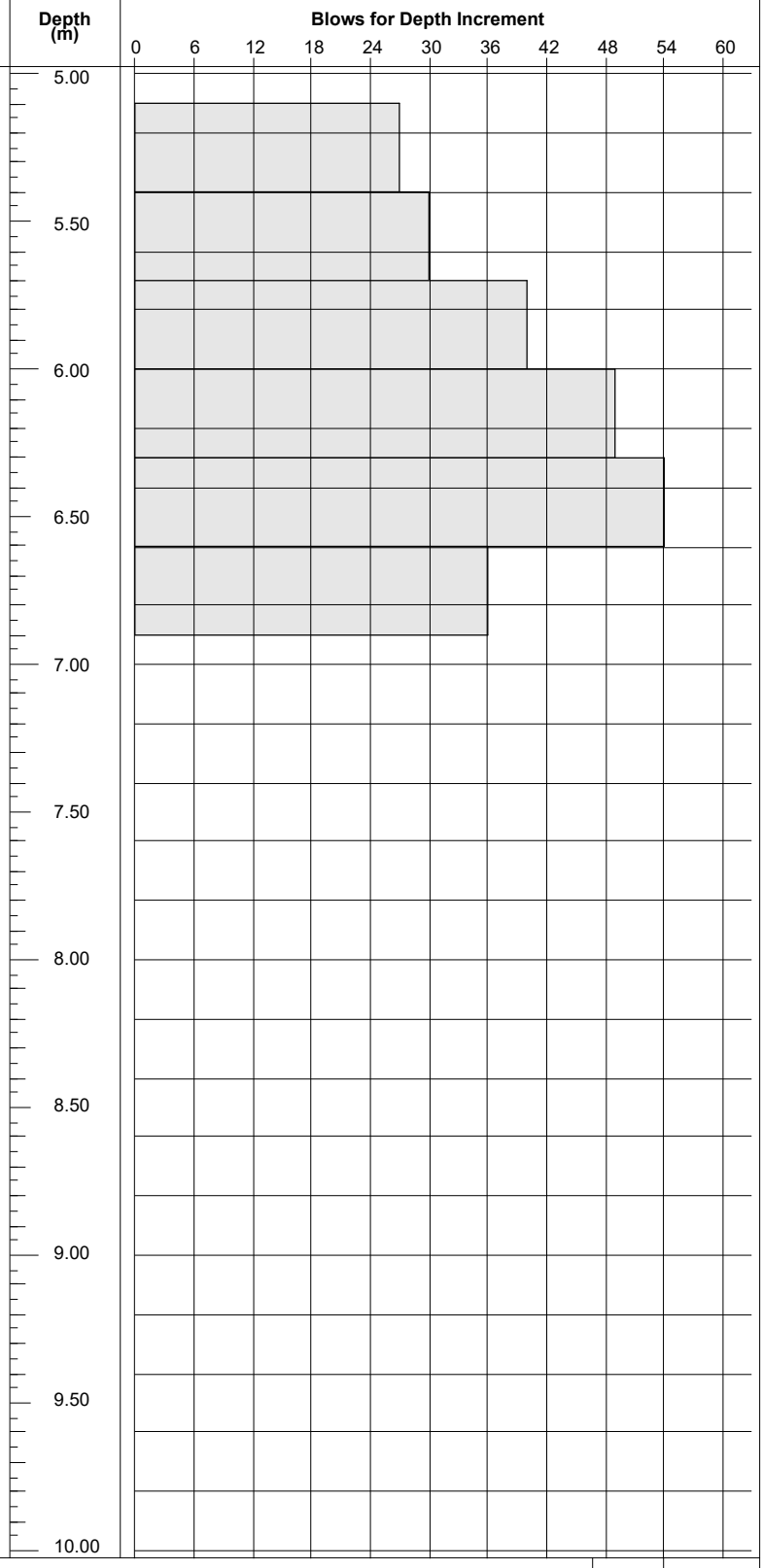
Figure No.
BB6 8BG.PR 2

Worms Eye Ltd	Cannon House, 52 Bank Parade Burnley, Lancashire, BB11 1TS	Site Broad Oaks, Northcote Road, Langho	Probe Number PR 2

Method	Cone Dimensions	Ground Level (mOD)	Client	Job Number
Dynamic Probing			John Holland	BB6 8BG
	Location Southwest, by BH2	**Dates** 18/04/2024	**Engineer** David Lord	**Sheet** 2/2

Depth (m)	Blows for Depth Increment	Field Records	Level (mOD)
5.10-5.40	27		
5.40-5.70	30		
5.70-6.00	40		
6.00-6.30	49		
6.30-6.60	54		
6.60-6.90	36		



Remarks

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Figure No.
BB6 8BG.PR 2

GQF-008-48
Issue 01 - Oct 22

Summary of Classification Test Results

Project No.
J271524

Project Name
Broad Oaks, Northcote Road

Hole No.	Sample				Soil Description	Density bulk Mg/m³	Density dry Mg/m³	w %	Passing 425µm %	LL %	PL %	PI %	Particle density Mg/m³	Remarks
	Ref	Top	Base	Type										
1		1.00		D	Brown slightly sandy slightly gravelly CLAY			27	90	45	22	23		
2		1.00		D	Dark grey slightly sandy slightly gravelly CLAY			48	89	51	24	27		

All tests performed in accordance with BS1377:1990 unless specified otherwise

Date Printed 17/05/2024

Key

Density test
Linear measurement unless :
wd - water displacement
wi - immersion in water

Liquid Limit
4pt cone unless :
cas - Casagrande method
1pt - single point test

Particle density
sp - small pyknometer
gj - gas jar

TTL

UKAS TESTING
7758

INDEX