Recreational Grounds

Bernards heath, St Albans

Dynamic Probe Investigation Report

for St Albans City and District Council

Recreational Grounds

Bernards Heath, St Albans

Dynamic Probe Investigation Report

For St Albans City and District Council

Prepared By

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Date 26th January 2016

Reference: J-M0220.00.Ro
Status: Final

Contents

1 Introduction

This report describes a Ground Investigation undertaken on behalf of St Albans City and District Council for a site in the Bernards Heath area of St Albans, Hertfordshire. (Drawing J-M0220.00_100_R0)

Opus was appointed to investigate the Recreational Ground, in particular in the vicinity of the children's playground, and to assess the short term stability of the ground following the discovery of a microgravity anomaly.

This report has been prepared by Opus International Consultants (UK) Ltd (Opus) with all reasonable skill, care and diligence within the terms of the Contract with The Client (St Albans City and District Council) and taking account of the information made available by The Client, as well as the manpower and resources devoted to it by agreement with The Client. Opus disclaims any responsibility to The Client and others in respect of any matters outside the scope of the above Contract.

The objectives of the current investigation were to carry out a dynamic probe investigation of the site, comprising a number of tests to determine the ground conditions in the vicinity of the microgravity anomaly present beneath the Heath, therefore determining the possible risk of ground stability beneath the site.

This report should not be relied upon or transferred to any other parties without the express written authorisation of Opus. If any unauthorised Third Party comes into possession of this report, they rely on it at their own risk and the authors owe them no duty of care or skill.

Whilst this report may express an opinion on the possible ground conditions beyond exploratory hole positions or on the possible presence of features based on visual, verbal or published evidence, this is for guidance only, and no liability can be accepted for its accuracy.

The comments on groundwater conditions are based on observations made at the time of the investigation. It should be noted, however, that groundwater levels may vary from those reported due to seasonal or other effects.

The site plans enclosed in this report should not be used for scaling purposes.

This report has been produced following on from a microgravity survey carried out by Geotechnology Ltd in November 2015. It should be noted that at the time the site work associated with the current investigation was carried out, only draft geophysics data was available and a final geophysics report with data interpretation was subsequently provided on 23rd December 2016.

Section A Factual Information

2 The Site

2.1 Location & Access

The site is surrounded by open park land located to the north of Sandridge Road, St Albans and is approximately 0.1 hectares in area, with Bridle Close, Fontmell close and Heathside to the north. There are residential properties to the north south and east, with the playing fields of Heathlands School to the north west.

The site location is shown on the appended Drawing No. J-M0220.00_100_R1 and is centred at approximate National Grid Reference 515400, 208315.

At the time of the investigation, pedestrian access was gained off Sandridge Road.

2.2 Site Description

At the time of the investigation, the site comprised of a children's playground with a climbing frame including a slide, swings, a roundabout and a rocker. These were located on rubber flooring surrounded by grass, and enclosed with a metal fence and a hedge to the north west and north east sides. Surrounding the playground was a maintained vegetated recreational open park land including a hardtop basketball court to the west and a number of trees lining Sandridge Road to the south. A footpath connects the playground to the road, this is currently extended northward creating a temporary footpath leading to Bridle Close and Fontmell close, via wooded area north of the playground.

In general the site was level and at approximately 125m above Ordnance Datum (aOD).

3 Microgravity Survey Review

In December 2015 Geotechnology Ltd prepared a microgravity survey (report number 1557r1v1d1115) of Bernards Heath including the playground, topographic features to the north of the heath and the temporary footpath. This survey was commissioned following the appearance of an approximate 12m diameter crown hole in the nearby Fontmell Close. As such it was determined that in the interests of public safety the recreational ground also needed to be investigated.

3.1 History of the Site

The earliest available map from 1878 reveals that the site comprised of heathland however there are a numerous clay pits, two brick kilns, two lime kilns and three shafts shown close by. The presence of these features suggests that clay / gravel and probably chalk were being extracted in the area at this time. The closest of the aforementioned features is a clay pit located to the north of site on the edge of the heath bordering the area now occupied by Fontmell Close and Bridle Close.

By the 1889 map the majority of these features are no longer shown and those that do remain are referred to as Old Clay Pits apart from the clay pits north of the recreation ground which have grown in size.

By 1924 the clay pits to the north are beginning to be infilled to the west, these pit continue to be infilled until all that remains are the topographic features present today.

3.1.1 Geology

According to the inspected published geological information (BGS Sheet 239 'Hertford' 1:50000 scale, Drift edition) and the BGS GeoIndex website; the site is shown to be underlain by the Kesgrave Catchment Subgroup superficial drift deposits. These strata comprise fluvial gravels associated with the early River Thames.

The solid geology across the site is shown as the Lambeth Group which unconformably sits above the White Chalk Subgroup. The Lambeth Group comprises variable sequences of clay, silts and sands with some gravel and occasional limestone or sandstone beds. Beneath this is the White Chalk Subgroup, comprising chalk with flints.

3.2 Summary of Results

The results of the microgravity survey are shown in Drawing No. J-M0220.00_101_R0, these results are colour coded with low density bodies corresponding to the areas of lower gravity (coloured blue or green). It is evident from the survey results that there a number of microgravity anomalies beneath the heath and the subject site. The largest of these is located south eastern area of the playground and beyond (labelled as anomaly 12) and is reported to exist 19m below the ground surface (bgl). Anomaly 12 stretches towards the smaller anomaly 11 which is located on the edge of a topographical depression to the north east of the site. There are a number of additional gravity anomalies throughout the area of the heath surveyed, however these are noted to be considerably smaller.

It has been recommended by Geotechnology Ltd that all microgravity anomalies are investigated, thus determining their root cause and specifically addressing whether it is natural cavities / solution features, manmade voids or other features causing the microgravity anomaly.

4 Investigation Methodology

4.1 Objectives

Given the conclusions of the microgravity survey, the objectives of the current investigation are as follows;

- Investigate gravity anomaly 12
- Determine the risk of ground instability in relation to the playground

The ground investigation techniques adopted for the investigation were requested by The Client and were to include Dynamic Penetrometer Testing. The location of the exploratory holes were chosen by Opus based on the microgravity survey carried out for the site to achieve good site coverage, while investigating gravity anomaly 12, as well as considering the anticipated ground conditions, bearing in mind the nature of the site, limitations to site access in some areas due to existing structures.

The site work commenced on the 18th December 2015 and comprised 5No. Dynamic penetrometer tests with associated trial pits, being completed under the supervision of Opus. The exploratory hole locations are shown on the drawing J-M3898.00_102_R1.

4.2 Clearance of Underground Services

In addition to the above, the positions were scanned by Opus with a cable avoidance tool (CAT) as a further precautionary measure.

4.3 Site Works

Super Heavy Dynamic Probing (DPSH-B) was carried in accordance with BS EN ISO 22476-2, BS EN 1997-2 AN NA to BS EN 1997-2. Probing involves the driving of a metal cone into the ground using a series of steel rods. These rods are driven into the ground using a hammer system that repeatedly lifts and releases a 63.5kg weigh onto the rods from a set height, ensuring a constant energy input. The number of hammer blows required to drive the cone into the ground by 100mm are recorded, giving a comparative assessment from which correlations with engineering parameters can be generated.

Before coming dynamic testing a 1.20m bgl trial pit was hand dug to ensure the absence of any services. All exploratory holes were logged by a qualified Opus Geo-Environmental Engineer in accordance with BS 5930:2015 'Code of Practice for Ground Investigations', incorporating requirements of BS EN ISO 14688-1+2:2002+2003 'Geotechnical Investigation and Testing – Identification and Classification of Soil'.

Dynamic Penetrometer and Trial pit logs are presented in Appendix 'B'

Five dynamic probe holes (DP301 to DP305) were advanced using a tracked percussive window sampling rig to depths of between 2.30m and 23.30m bgl to provide good site coverage. On completion, the dynamic penetrometer holes and trial pits were backfilled with bentonite pellets and finished with arisings in the top 0.5m to preserve the usual appearance of the playground. For a summary of individual tests please see the table below;

Table 4.1: Individual Dynamic penetrometer tests.

Exploratory Hole ID	Depth (m)
DP301	23.30
DP302	10.00
DP303	9.00
DP304	2.3 (refusal)
DP305	20.00m

5 Results of the Investigation

5.1 Strata Encountered

5.1.1 Topsoil

Topsoil was encountered in all trial pits from ground level to 0.70m bgl. The topsoil comprised soft dark brown sandy clay.

5.1.2 Made Ground

Made Ground was encountered within all exploratory holes from 0.20m to 1.20m bgl. The Gade Ground comprised firm, orange brown sandy gravelly clay. The gravel is fine to coarse angular to rounded clinker, brick and flint. Occasional low cobble content, comprising angular to rounded flint was present.

5.1.3 Lambeth Group

The Lias Group was encountered underlying the made ground in TP304A from 0.75m bgl to completion at 1.20m bgl. The cohesive Lambeth Group comprised firm light orange brown mottled grey slightly sandy gravely clay. The gravel is fine to coarse, angular to rounded flint.

5.2 Dynamic Probe Tests

5.2.1 Introduction

Dynamic probing is a method of site investigation allowing a rapid assessment of ground conditions where sample recovery is not required, typically carried out as a precursor to more intrusive forms of investigation. The 'Blow Count' from dynamic probing gives a relative assessment of 'ground strength' but cannot be used to definitively confirm the actual composition of the geological strata, therefore any reference to strata composition is an interpretation, subject to confirmatory testing at a later date.

5.2.2 DP301

The dynamic probe results show that the ground at this location has a variable strength profile from ground level to 7.00m bgl. Between 7.00m to 9.50m bgl the readings level out representing a layer interpreted to comprise firm strata before they become lower strength from 9.50m to 10.30, when they gradually begin to increase in strength with depth. From 23.00m to completion the strata are very firm to strong.

5.2.3 DP302

The dynamic probe results show that from ground level to 4.30m bgl the strata are of low strength which is increasing with depth. Between 4.30m to 10.00 bgl the readings while fairly variable do indicate that the strata is of moderate strength.

5.2.4 DP303

The dynamic penetrometer results show that the ground at this location has a concordant strength profile from ground level to 6.80m bgl representing moderately strong strata. Between 6.80m to 7.20m bgl the readings increase demonstrating a layer of strata of reasonable strength before they

decrease to a lower strength profile at 7.20m to 8.00m bgl, where the strength profile increases to strong until completion at 9.00m bgl.

5.2.5 DP304

The dynamic penetrometer results show that the ground at this location has an initially low strength profile from ground level to 1.60m bgl. Between 1.60m to 2.30m bgl the readings rapidly increase until a refusal at 2.30m bgl.

5.2.6 DP305

The dynamic penetrometer results show that the ground at this location has a variable strength profile from ground level to 9.00m bgl. Between 9.00m to 10.60m bgl the readings increase and level out representing a layer of moderately strong strata before they become lower strength from 10.60m to 12.40 when they gradually begin to strengthen up again with depth. An area of lower strength strata is identifiable between 14.70m to 15.10m bgl. At 16.20m bgl a very strong section was encountered, before the strength profile lowers slightly between 17.20m and 18.20m. From 18.20m to completion the strata once again strengthens.

Section B Assessment & Recommendations

6 Introduction

This report has been prepared to provide preliminary information specific to the ground conditions at the site.

Recommendations made within this report should be considered to be preliminary and subject to ongoing review as additional information comes to light.

Should the proposed site usage change significantly from that of a recreational grounds and associated playground, the contents of this report will require review and amendment as appropriate.

7 Interpretation

7.1 Inferred Ground Stability Classification

From the results of the Dynamic Probing it is possible to extrapolate the general strength properties of the ground beneath the site. This classification requires the equivalent SPT 'N' blow counts to be derived from the dynamic probe tests, this was completed by adding three consecutive results to give the blows per 300mm N value as used in SPT's. These values were in turn used to calculate the N_{60} value which is used to infer the strength of cohesive soils using the relationship suggested in Stroud (1974). (Stroud, M. A. 1974, "The Standard Penetration Test – its application and interpretation", Proc. ICE Conf. on Penetration Testing in the UK, Birmingham. Thomas Telford, London.)

Table 7.1: Terms for the classification of relative density in non-cohesive soils, taken from BS 5930:2015

SPT 'N' blow count (blows/300mm)	Classification
0 - 4	Very Loose
4 - 10	Loose
10 - 30	Medium Dense
30 - 50	Dense
>50	Very dense

Table 7.2: Terms for the classification of cohesive soils using N_{60}, taken from Stroud (1974)

Corrected N_{60} blow count (blows/300mm) - Clays	Classification
0 - 4	Very Soft
4 - 8	Soft
8 - 15	Firm
15 - 30	Stiff
30 - 60	Very Stiff
>60	Hard

Table 7.3: Terms for the classification of Chalk using N_{60}, taken from Stroud (1974)

Corrected N60 blow count (blows/300mm) - Chalk	Classification
0 - 25	Very Weak
25 - 100	Weak
100 - 250	Moderately Weak
>250	Moderately Strong to Very Strong

When analysing the results of the dynamic penetration testing the geology has been simplified to that of Chalk and Clay, this is based on the strata logged within the trial pits and the expected geology beneath the site with reference to geological mapping and experience of working in adjacent areas. Recorded throughout the site are Lambeth Group Clays (the Made Ground beneath the site comprise natural strata mixed with anthropogenic waste), beneath this is the White Chalk Subgroup. None of

the exploratory holes contained any Kesgrave Catchment Subgroup cohesive deposits, as such this unit was excluded from the interpretation of the results.

It should be noted that the inferred geological profile discussed in this report is tentative and would need to be confirmed by more intrusive forms of investigation should more reliable data be needed at a later date.

The upper boundary of the chalk was inferred by a comparatively weaker zone that occurred at approximately the same depth beneath the site (6.20m – 7.20m bgl), this boundary was not visually encountered within any of the exploratory holes and as such is unverified.

The full calculations and subsequent interpretations are presented in Appendix 'C'

7.1.1 DP301

Strata interpreted to comprise clay strata were encountered at this location to approximately 6.00m depth and is initially judged to be firm before becoming stiffer after 1.50m bgl. The strata then appears to increase in strength for approximately 1.00m before softening for roughly 0.50m, the strata then becomes very stiff until approximately 6.00m bgl at which point the chalk Formation is judges to be present.

The chalk is initially very weak for approximately 0.50m before it strengthens slightly, at 9.60m bgl the chalk deteriorates to very weak, this persists until 13.20m bgl apart from a weak band at roughly 11m bgl. From 13.20m to 23.20m bgl (when the hole was terminated) the chalk has a fairly uniform weak classification apart from a layer of very weak to weak strata at 20.00m bgl.

7.1.2 DP302

Initially judged to be soft the strata appears to increase in strength at 1.80m bgl where it is thought to be firm, this persists until 3.00m bgl when the ground strengthens again to become stiff until 4.50m bgl, apart from an approximately 0.50m deep layer of firm strata at roughly 3.50m bgl. Below 4.50m to 6.90m bgl the strata determined to be clay seems to be very stiff with two bands of softer strata at 5.70m and 6.30m bgl, beneath this is a layer of stiff to very stiff strata that is considered to lie unconformably on the chalk.

The top of the chalk is interpreted at 7.20m bgl where it is very weak, at 7.50m bgl it strengthens slightly, this continues until 10.00m bgl (when the exploratory hole was completed), apart from a section judged to be very weak chalk occurring at 9.30m bgl.

7.1.3 DP303

The initial classification of the clay was assessed to be very stiff, with a reduction in strength by 1.50m bgl, apart from bands of very stiff strata at 4.10m and 5.10m bgl, this persisted until 6.00m bgl where it strengthens once more. Except for a band of very strong strata at 6.60m bgl this classification continued until approximately 7.50m bgl where the top of the Chalk Formation is judged to start.

At this location the chalk is unvaryingly classified as weak until the completion of the exploratory hole at 9.00m bgl

7.1.4 DP304

The initial strength of the clay encountered was judged to be soft to firm, this classification rapidly increased in strengths to very stiff at 1.80m bgl. This exploratory Hole was terminated at 2.10m due to a refusal of the drilling equipment.

7.1.5 DP305

The clay encountered in this exploratory hole is determined to be classified as stiff between 1.20m to 7.10m bgl where it is judged to overlie the chalk, except for a small band of lower strength strata at 1.50m bgl.

The top of the chalk is classified as very weak, this strengthens slightly at 9.00m bgl this evaluation persists until 20.00m bgl (termination of the hole). Below 9.00m bgl there are two sections where the classification changes, at 11.70m bgl the chalk it was judged to be very weak and an area of harder strata at 15.90m bgl.

7.2 Health & Safety

Due to recent collapses in the immediate vicinity of Bernards Heath, microgravity anomaly 12 was investigated from an area of safety into more hazardous areas. The exploratory holes were positioned in such a way that the investigation worked its way toward the centre of microgravity anomaly 12, and although the investigation got close, the centre of the anomaly was avoided ensuring the safety of the drilling crew.

Opus have an agreed safety protocol in place for all site investigations in the vicinity of suspected unstable ground. Whereby it is only permitted to investigate with heavy drilling machinery, once near surface conditions have been verified as safe using lighter investigation equipment such as dynamic probing.

On this site, since no near surface voids or potentially unstable ground has been encountered, then it may be appropriate to proceed with more extensive site investigation at a later date, if required appropriate methods and risk assessments would have to be agreed in advance.

7.3 Conclusions

The investigation has targeted microgravity anomaly 12, in particular the area below Bernards heath Playground, it was ensured that multiple probes extended below 19.00m bgl as it was at that depth that the microgravity report suggested a void was present.

During the course of the investigation there were no voids or areas of very soft strata encountered, with the lowest SPT 'N' value being 6 blows per 300mm, which while indicating soft ground strongly suggests that there are no voids present within the exploratory hole depths. These results tentatively suggest that the ground beneath the playground is probably stable in the short term and of reasonable strength. This does not however gives any indication as to the origin(s) of microgravity anomaly 12.

With respect to anomaly 12, the findings of this investigation indicate that there is a low probability of voids forming beneath the playground on the short term as a result of ground instability caused by chalk dissolution or chalk mining.

However, the cause of the negative microgravity anomaly labelled as number 12 and also the other anomalies within the Bernards Heath area remains unconfirmed at this time. There remains therefore a possibility that voids caused by mining or dissolution of the chalk may exist in the area below depths of current investigation or between or away from the positions of the current probe points.

It would be prudent to consider further more extensive investigation at a later date to assess the long term stability of the ground at Bernards Heath, especially with regards to anomalies 7 / 8 / 9 and 12.

It should be noted that this assessment is specific to continued use of the subject site as a recreational play area which is a low risk usage with regard to potential for induced ground instability. Further assessment would be required if the site usage is to change or if heavy machinery is required to traffic across the site.

7.4 Recommendations

Any recommendations made within this report are considered the most appropriate considering a number of factors including investigation findings, financial and safety implications. All design recommendations are considered to be achievable within a safe system of work.

Any recommendations suggested within this report should be carried out in line with current best practice and regulatory requirements. It is considered that the contractor carrying out any recommendations contained within this report will be aware of the standard construction processes involved and have detailed knowledge of the relevant health and safety measures.

8 Further Recommendations

The following additional works are recommended at this site:-

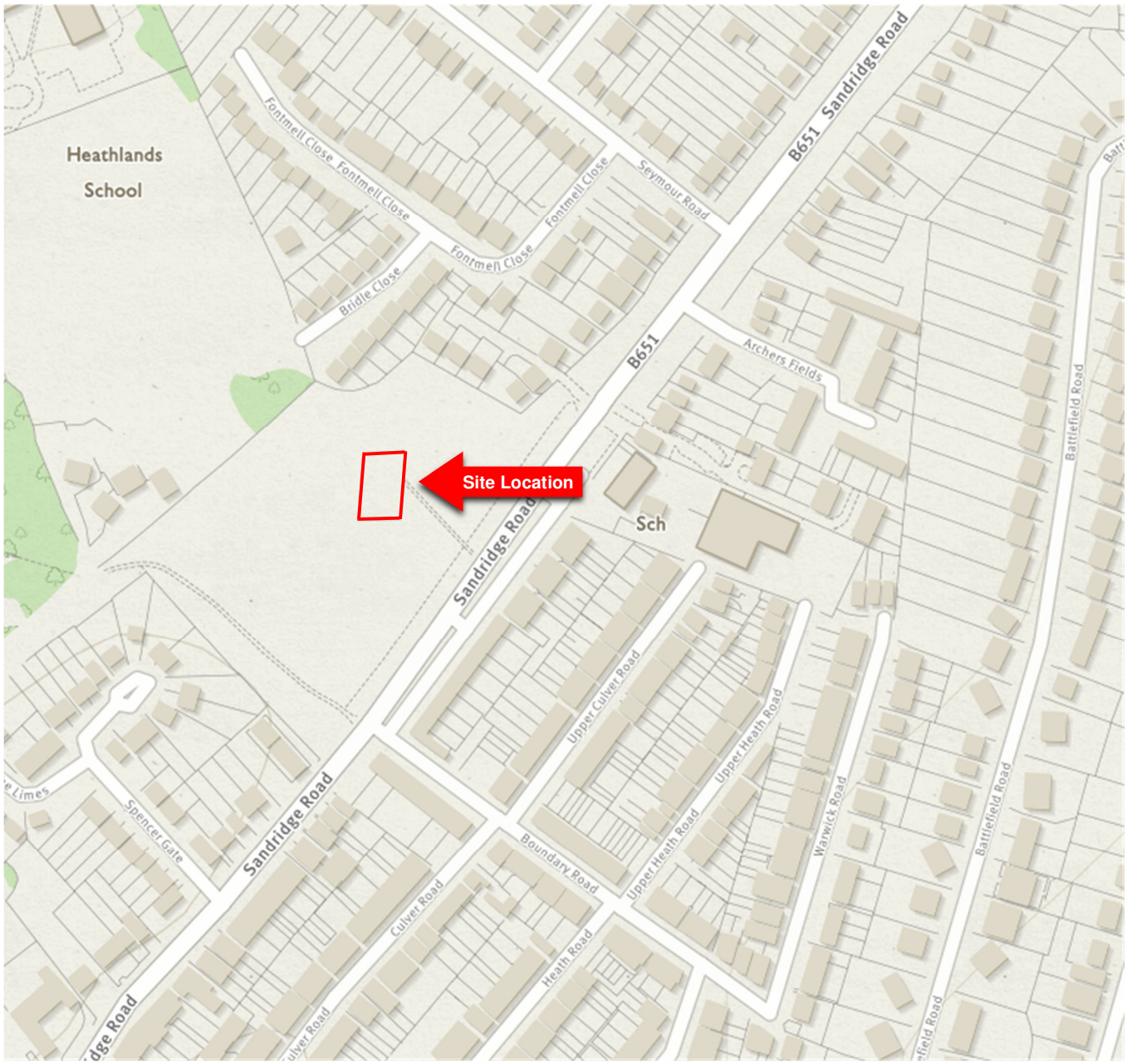
a) Further intrusive investigation to include; assessment of Anomaly No.7 and deeper assessment of anomaly 12 to assess the long term ground stability of the Bernards Heath recreational area.

DRAWINGS

J-M0220.00_100_R0	**Site Location Plan**
J-M0220.00_101_R0	**Microgravity survey Plan**
J-M0220.00_102_R0	**Exploratory Hole Location Plan**

Site Location Plan

Reference: Ordnance Survey map:



	BY	CHECKED	DATE
DESIGN	EDH	NM	Jan 16
DRAWN	EDH	NM	Jan 16

APPROVED: NM

OPUS

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1 South House
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Milton Keynes
MK1 1SW

Site: Bernards Heath Recreational Area

Client: St Albans District and City Council

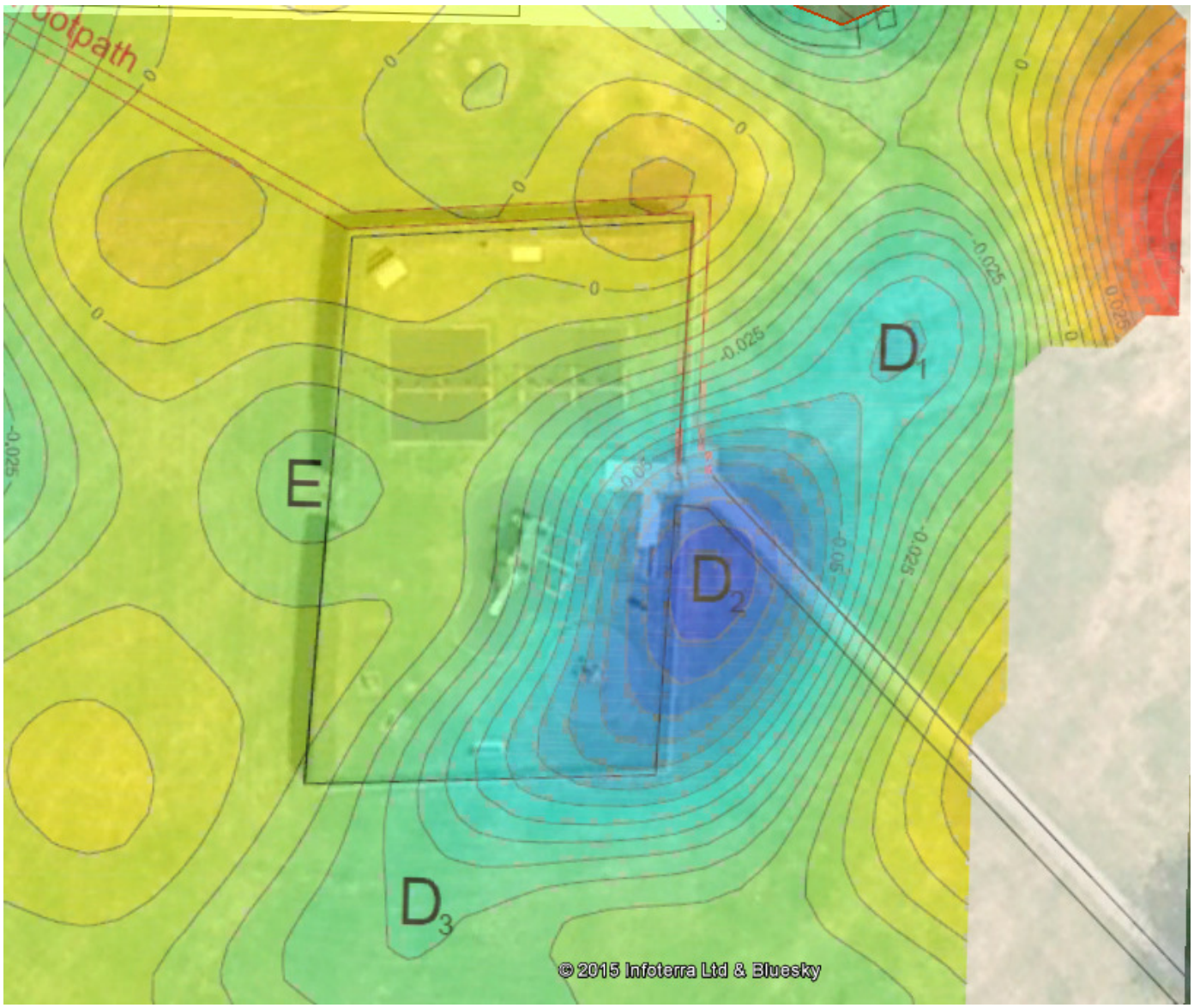
Status: Final | **File:** J-M0220.00

Scale: Not to scale | **Date:** 26th January 2016

Drawing Number: MK J-M0220.00_100_R0

Microgravity Survey Plan

Reference: Geotechnology Ltd, Google Earth 2016



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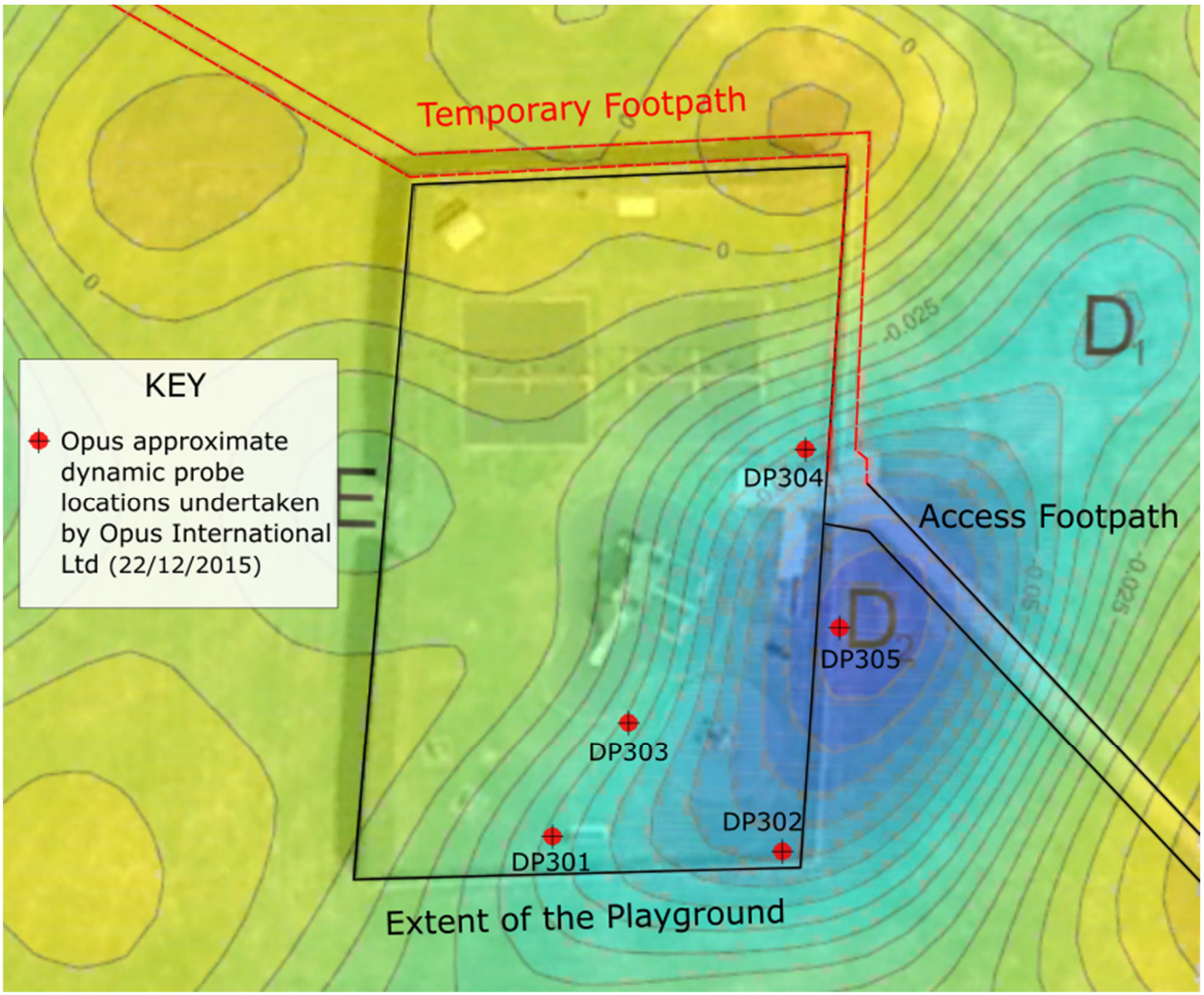
Status: Final | **File:** J-M0220.00

Scale: Not to scale | **Date:** 26th January 2016

Drawing Number: **MK J-M0220.00_101_R0**

Exploratory Hole Plan

Reference: Geotechnology Ltd.



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DRAWN	EDH	RP	Jan 16

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Scale: Not to scale | **Date:** 26th January 2016

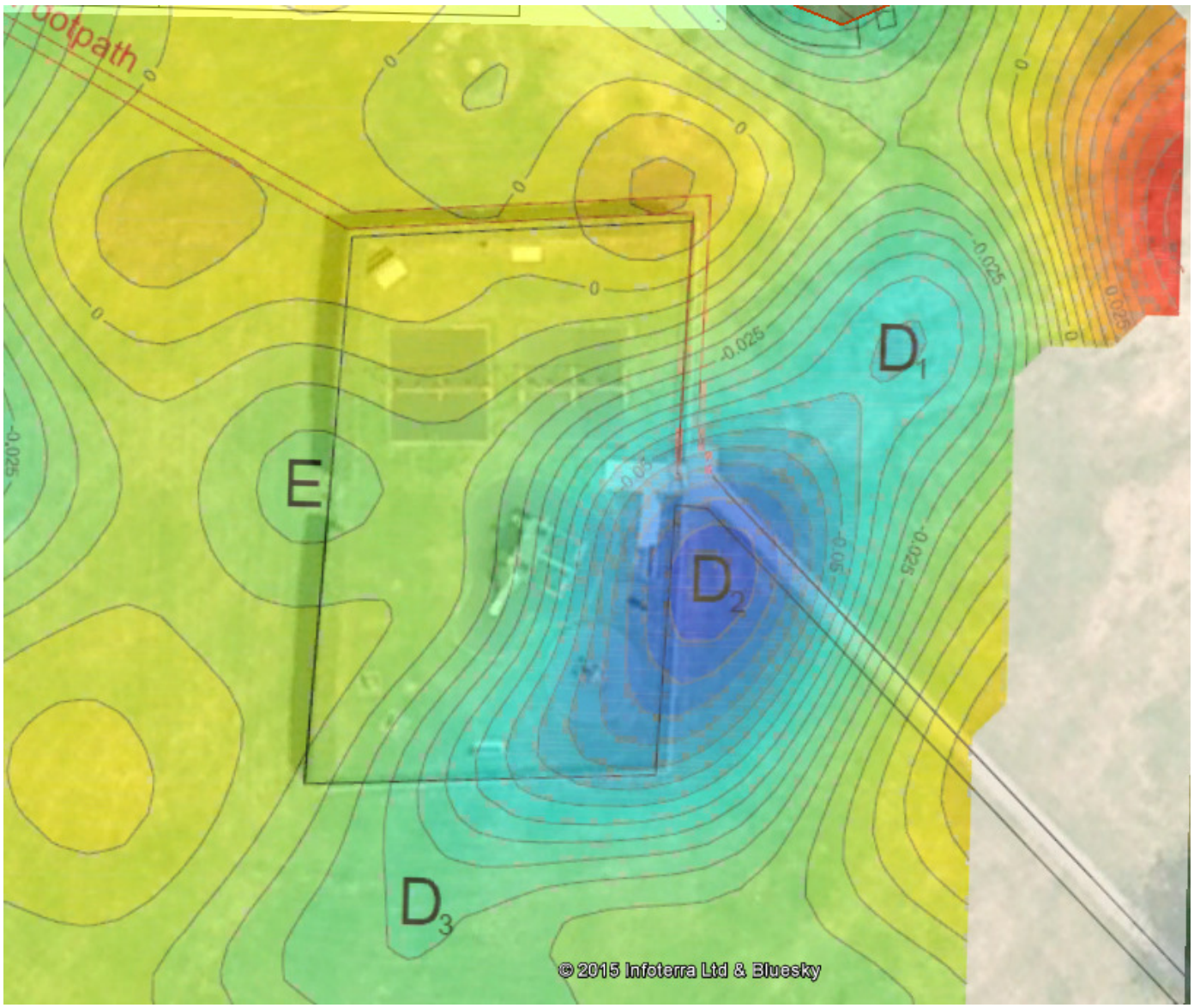
Drawing Number: MK J-M0220.00_102_R0

APPENDIX A

Microgravity Survey Report

Microgravity Survey Plan

Reference: Geotechnology Ltd, Google Earth 2016



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DESIGN	EDH	NM	Jan 16
DRAWN	EDH	NM	Jan 16

APPROVED: NM

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Site: Bernards Heath Recreational Area, St Albans

Client: St Albans City and District Council

Status: Final | **File:** J-M0220.00

Scale: Not to scale | **Date:** 24th January 2016

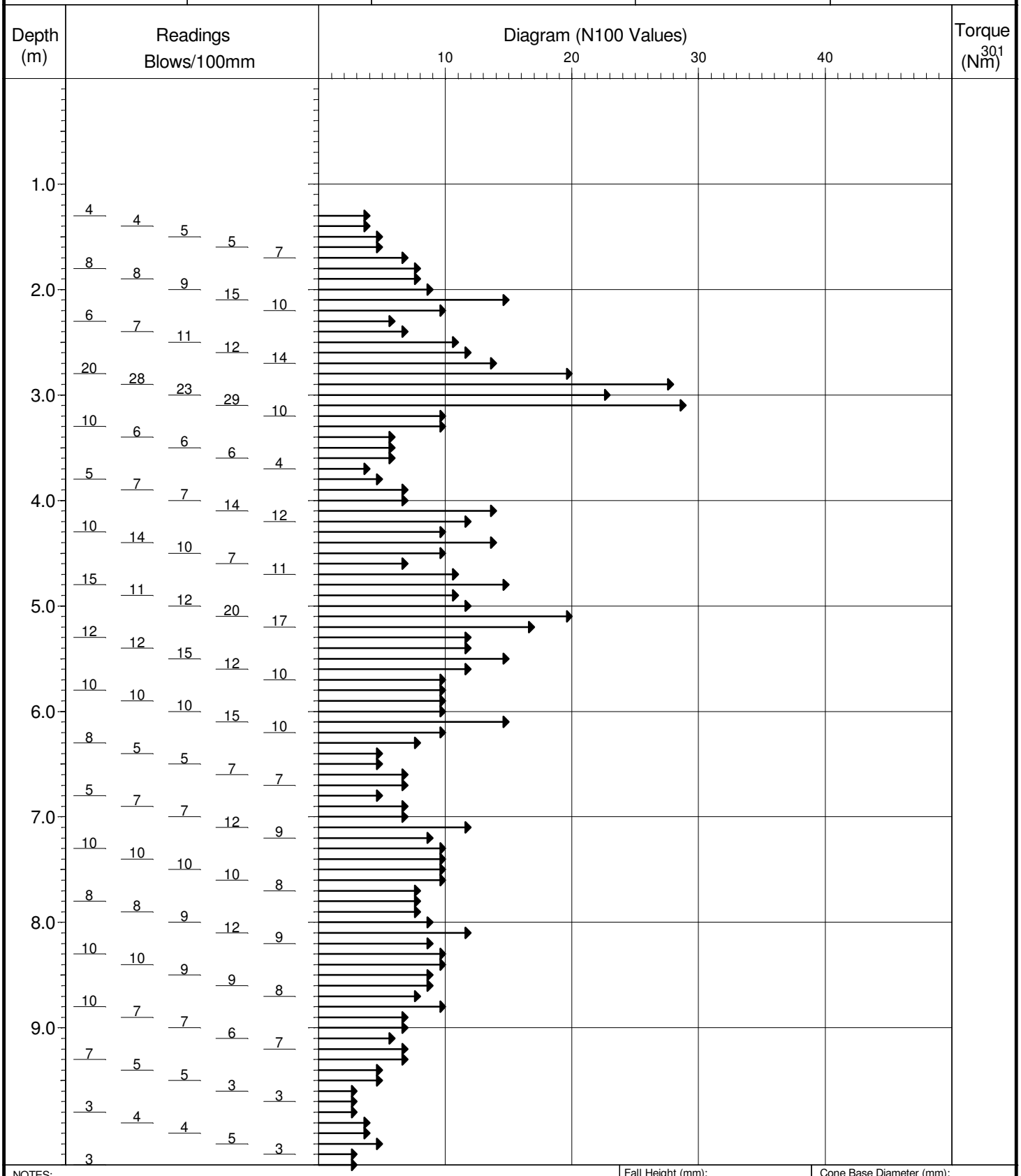
Drawing Number: **MK J-M0220.00_101_R0**

APPENDIX B

Exploratory Hole Records

Probe No:	Client:	
301	St Albans City and District Council	OPUS
	Site: Bernards Heath Recreational Ground	www.opusinternational.co.uk

Project No	Start Date:	End Date:	Logged:	Field Records:
J-M0220.00	21/12/2015	21/12/2015	EDH	EDH
Easting:	**Northing:**	**Ground Level (mAOD):**	**Checked:**	**Approved:**
-	-	-	NM	

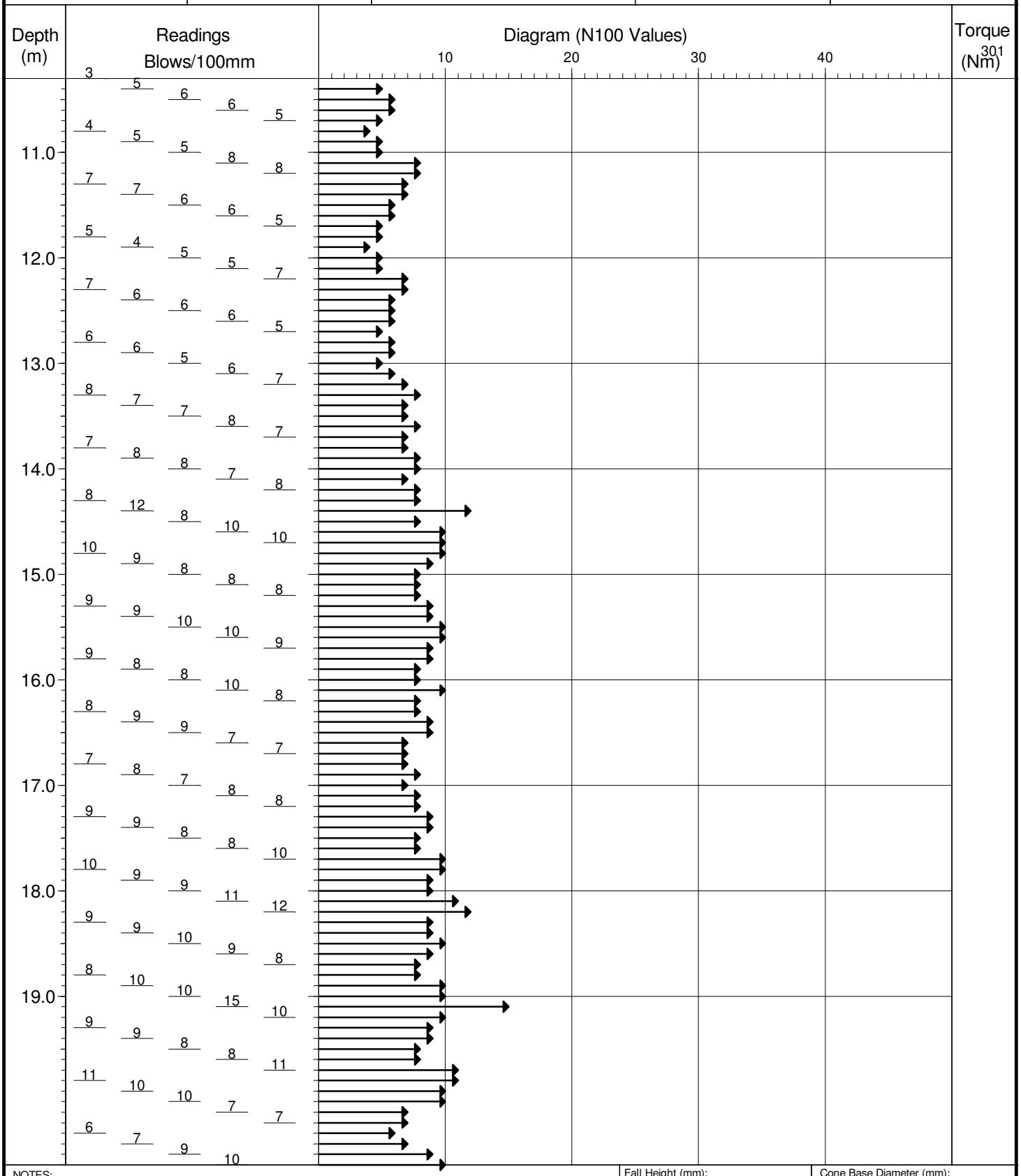


NOTES:
1. Trial pit completed at 1.20m bgl, see log 301a.
2. Backfilled with arisings upon completion.

Fall Height (mm):	Cone Base Diameter (mm):
750	50
Hammer Wt (kg): 63.50	**Probe Type:** DPSH

Probe No:	Client:	
301	St Albans City and District Council	OPUS
	Site: Bernards Heath Recreational Ground	www.opusinternational.co.uk

Project No	Start Date:	End Date:	Logged:	Field Records:
J-M0220.00	21/12/2015	21/12/2015	EDH	EDH
Easting:	**Northing:**	**Ground Level (mAOD):**	**Checked:**	**Approved:**
-	-	-	NM	



NOTES:
1. Trial pit completed at 1.20m bgl, see log 301a.
2. Backfilled with arisings upon completion.

Fall Height (mm):	Cone Base Diameter (mm):
750	50
Hammer Wt (kg): 63.50	**Probe Type:** DPSH

Probe No:	Client:	
301	St Albans City and District Council	OPUS
	Site: Bernards Heath Recreational Ground	www.opusinternational.co.uk

Project No	Start Date:	End Date:	Logged:	Field Records:
J-M0220.00	21/12/2015	21/12/2015	EDH	EDH
Easting:	**Northing:**	**Ground Level (mAOD):**	**Checked:**	**Approved:**
-	-	-	NM	

Depth (m)	Readings Blows/100mm	Diagram (N100 Values)	Torque (Nm) 301
21.0	10 10 9 8 8 / 8 8 9 8 8 / 10 10 7 7 7	10 20 30 40	
22.0	7 7 8 7 8 / 8 8 8 9 9		
23.0	10 14 11		
24.0			
25.0			
26.0			
27.0			
28.0			
29.0			

NOTES:
1. Trial pit completed at 1.20m bgl, see log 301a.
2. Backfilled with arisings upon completion.

Fall Height (mm):	Cone Base Diameter (mm):
750	50
Hammer Wt (kg): 63.50	**Probe Type:** DPSH

Exploratory Hole ID:	Client:	
301A	St Albans City and District Council	
	Site: Bernards Heath Recreational Ground	

OPUS
www.opusinternational.co.uk

Job No:	Start Date:	End Date:
J-M0220.00	21/12/2015	21/12/2015

Drilling Equipment/ Excavation Method:	Co-ords:	Backfill Date:	Field Records:
Dart C103		21/12/2015	EDH

Ground Level (mAOD):	Logged:	Chkd:	Appr:
	EDH	NM	

Strata Description	Depth (m)	Level (m)	Legend	Sample Type	Sample Depth (m)	Tests	Groundwater Records	Backfill Details
TOPSOIL comprising soft concistency brown very sandy CLAY with frequent rootlets and roots. Sand is fine to coarse.	0.25							
MADE GROUND comprising firm consistency orange brown mottled grey sandy gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse angular to rounded flint and brick.								
End of Exploratory Hole at 1.20 m	1.20							

Remarks:
1. Compleated at 1.20m bgl.
2. Backfilled with arisings upon completion.
3. Density and strength descriptions are reported in accordance with the guidance stated in BS 5930:2015 incorporating requirements of BS EN ISO 14688-1:2002, BS EN ISO 14688-2:2004 and BS EN ISO 14689-1:2003.

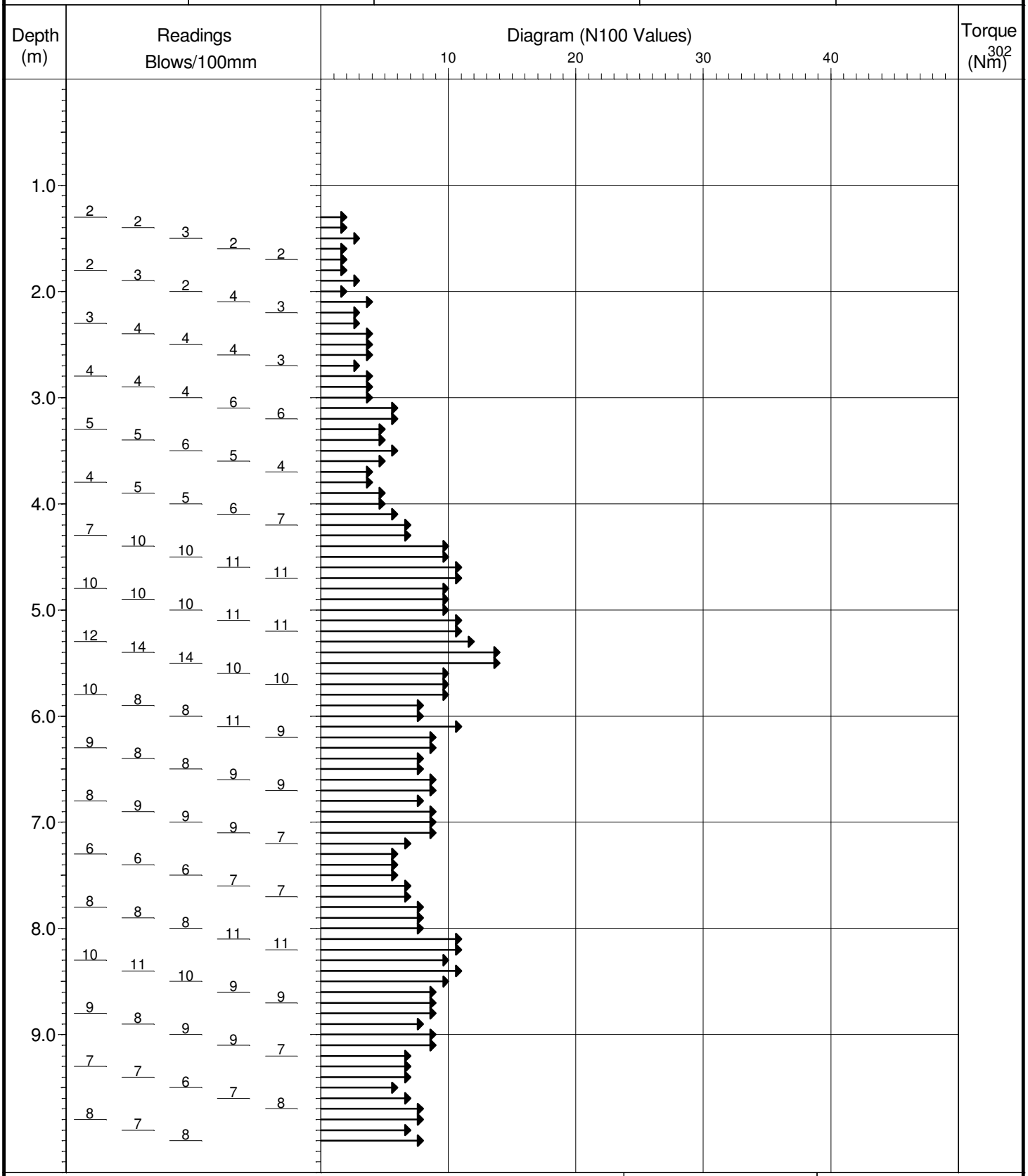
Sample Type Key
D - Disturbed Representative
B - Bulk Representative
ES - Environmental Sample
W - Water
U - Undisturbed Representative
J - Jar Sample (For Chemical Testing)
P - Piston Sample
UT - Undisturbed thin-walled
LB - Large Bulk (Disturbed)
DC - Disturbed Core

Test Type Key
(C) - Cone SPT
(S) - Spoon SPT
P - Pocket Pen Reading
PID - PID Reading
V - Hand Shear Vane Reading

Sheet:
Sheet 1 of 1

Probe No:	Client:	
302	St Albans City and District Council	OPUS
	Site: Bernards Heath Recreational Ground	www.opusinternational.co.uk

Project No	Start Date:	End Date:	Logged:	Field Records:
J-M0220.00	21/12/2015	21/12/2015	EDH	EDH
Easting:	**Northing:**	**Ground Level (mAOD):**	**Checked:**	**Approved:**
-	-	-	NM	



NOTES:
1. Trial pit completed at 1.20m bgl, see log 302a.
2. Backfilled with arisings upon completion.

Fall Height (mm):	Cone Base Diameter (mm):
750	50
Hammer Wt (kg): 63.50	**Probe Type:** DPSH

Exploratory Hole ID:	Client:	
302A	St Albans City and District Council	
	Site: Bernards Heath Recreational Ground	

OPUS
www.opusinternational.co.uk

Job No:	Start Date:	End Date:
J-M0220.00	21/12/2015	21/12/2015

Drilling Equipment/ Excavation Method:	Co-ords:	Backfill Date:	Field Records:
Dart C103		21/12/2015	EDH

Ground Level (mAOD):	Logged:	Chkd:	Appr:
	EDH	NM	

Strata Description	Depth (m)	Level (m)	Legend	Sample Type	Sample Depth (m)	Tests	Groundwater Records	Backfill Details
TOPSOIL comprising firm consistency brown sandy CLAY with frequent rootlets and roots.								
MADE GROUND firm consistency orange brown mottled grey sandy gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse angular to rounded flint with possible bits of clinker.	0.70							
End of Exploratory Hole at 1.20 m	1.20							

Remarks:
1. Compleated at 1.20m bgl.
2. Backfilled with arisings upon completion.
3. Density and strength descriptions are reported in accordance with the guidance stated in BS 5930:2015 incorporating requirements of BS EN ISO 14688-1:2002, BS EN ISO 14688-2:2004 and BS EN ISO 14689-1:2003.

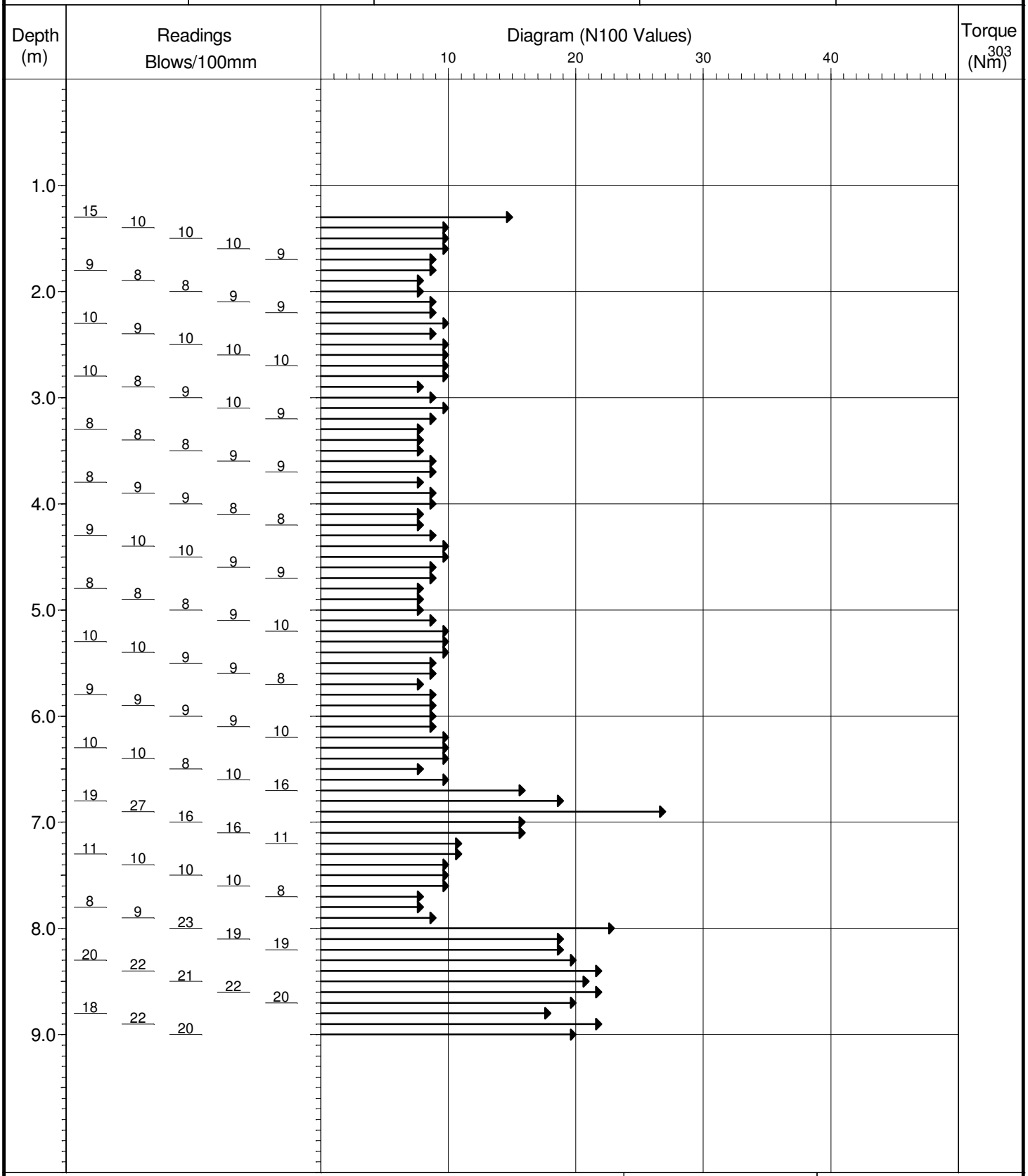
Sample Type Key
D - Disturbed Representative
B - Bulk Representative
ES - Environmental Sample
W - Water
U - Undisturbed Representative
J - Jar Sample (For Chemical Testing)
P - Piston Sample
UT - Undisturbed thin-walled
LB - Large Bulk (Disturbed)
DC - Disturbed Core

Test Type Key
(C) - Cone SPT
(S) - Spoon SPT
P - Pocket Pen Reading
PID - PID Reading
V - Hand Shear Vane Reading

Sheet:
Sheet 1 of 1

Probe No:	Client:	
303	St Albans City and District Council	OPUS
	Site: Bernards Heath Recreational Ground	www.opusinternational.co.uk

Project No	Start Date:	End Date:	Logged:	Field Records:
J-M0220.00	21/12/2015	21/12/2015	EDH	21/12/2015
Easting:	**Northing:**	**Ground Level (mAOD):**	**Checked:**	**Approved:**
-	-	-	NM	



NOTES:
1. Trial pit completed at 1.20m bgl, see log 303a.
2. Backfilled with arisings upon completion.

Fall Height (mm):	Cone Base Diameter (mm):
750	50
Hammer Wt (kg): 63.50	**Probe Type:** DPSH

Exploratory Hole ID:	Client:	
303A	St Albans City and District Council	
	Site: Bernards Heath Recreational Ground	

OPUS
www.opusinternational.co.uk

Job No:	Start Date:	End Date:
J-M0220.00	21/12/2015	21/12/2015

Drilling Equipment/ Excavation Method:	Co-ords:	Backfill Date:	Field Records:
Dart C103		21/12/2015	EDH

Ground Level (mAOD):	Logged:	Chkd:	Appr:
	EDH	NM	

Strata Description	Depth (m)	Level (m)	Legend	Sample Type	Sample Depth (m)	Tests	Groundwater Records	Backfill Details
TOPSOIL comprising firm consistency brown sandy CLAY with frequent rootlets and roots. Sand is fine to coarse.	0.30							
MADE GROUND comprising firm consistency light brown sandy gravelly CLAY. Sand is fine to coarse. Gravel is fine medium angular to rounded flint and brick.	0.70							
MADE GROUND comprising firm consistency orange brown sandy gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse angular to rounded flint and clinker.	1.20							
End of Exploratory Hole at 1.20 m								

Remarks:
1. Compleated at 1.20m bgl.
2. Backfilled with arisings upon completion.
3. Density and strength descriptions are reported in accordance with the guidance stated in BS 5930:2015 incorporating requirements of BS EN ISO 14688-1:2002, BS EN ISO 14688-2:2004 and BS EN ISO 14689-1:2003.

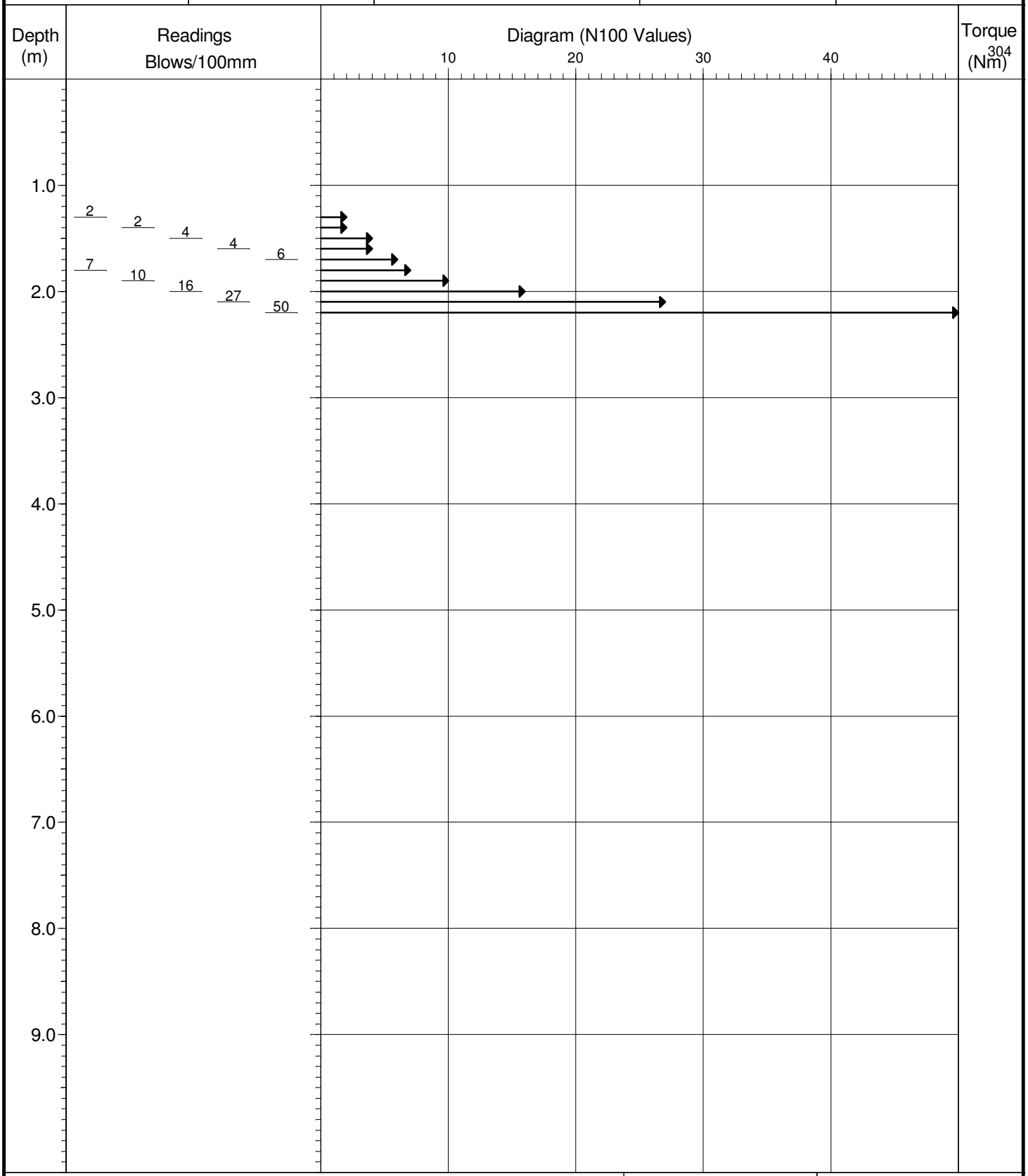
Sample Type Key
D - Disturbed Representative
B - Bulk Representative
ES - Environmental Sample
W - Water
U - Undisturbed Representative
J - Jar Sample (For Chemical Testing)
P - Piston Sample
UT - Undisturbed thin-walled
LB - Large Bulk (Disturbed)
DC - Disturbed Core

Test Type Key
(C) - Cone SPT
(S) - Spoon SPT
P - Pocket Pen Reading
PID - PID Reading
V - Hand Shear Vane Reading

Sheet:
Sheet 1 of 1

Probe No:	Client:	
304	St Albans City and District Council	OPUS
	Site: Bernards Heath Recreational Ground	www.opusinternational.co.uk

Project No	Start Date:	End Date:	Logged:	Field Records:
J-M0220.00	21/12/2015	21/12/2015	EDH	EDH
Easting:	**Northing:**	**Ground Level (mAOD):**	**Checked:**	**Approved:**
-	-	-	NM	



NOTES:
1. Trial pit completed at 1.20m bgl, see log 304a.
2. Terminated at 2.20m bgl due to flint obstruction.

Fall Height (mm):	Cone Base Diameter (mm):
750	50
Hammer Wt (kg): 63.50	**Probe Type:** DPSH

Exploratory Hole ID:	Client:	
304A	St Albans City and District Council	
	Site: Bernards Heath Recreational Ground	

OPUS
www.opusinternational.co.uk

Job No:	Start Date:	End Date:
J-M0220.00	21/12/2015	21/12/2015

Drilling Equipment/ Excavation Method:	Co-ords:	Backfill Date:	Field Records:
Dart C103		21/12/2015	EDH

Ground Level (mAOD):	Logged:	Chkd:	Appr:
	EDH	NM	

Strata Description	Depth (m)	Level (m)	Legend	Sample Type	Sample Depth (m)	Tests	Groundwater Records	Backfill Details
MADE GROUND comprising firm consistency orange brown sandy gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse angular to rounded flint and clinker.	0.20							
MADE GROUND comprising firm consistency light brown sandy gravelly CLAY with a low cobble content. Sand is fine to coarse. Gravel is fine to coarse angular to rounded flint brick and clinker. Cobbles are angular to rounded flint.	0.75							
Firm consistency light orange brown mottled grey slightly sandy very gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse angular to rounded flint.	1.20							
End of Exploratory Hole at 1.20 m								

Remarks:
1. Compleated at 1.20m bgl.
2. Backfilled with arisings upon completion.
3. Density and strength descriptions are reported in accordance with the guidance stated in BS 5930:2015 incorporating requirements of BS EN ISO 14688-1:2002, BS EN ISO 14688-2:2004 and BS EN ISO 14689-1:2003.

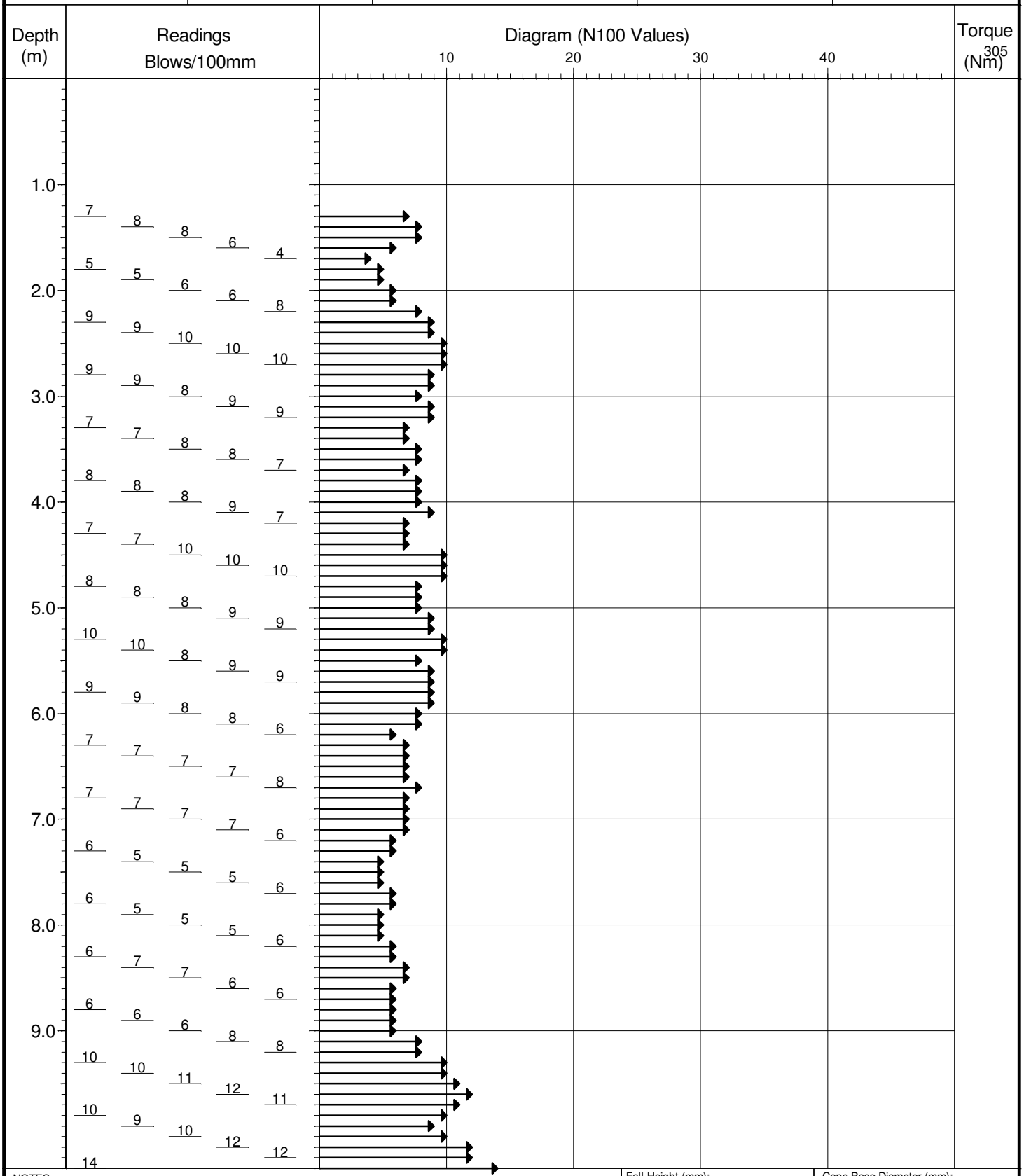
Sample Type Key
D - Disturbed Representative
B - Bulk Representative
ES - Environmental Sample
W - Water
U - Undisturbed Representative
J - Jar Sample (For Chemical Testing)
P - Piston Sample
UT - Undisturbed thin-walled
LB - Large Bulk (Disturbed)
DC - Disturbed Core

Test Type Key
(C) - Cone SPT
(S) - Spoon SPT
P - Pocket Pen Reading
PID - PID Reading
V - Hand Shear Vane Reading

Sheet:
Sheet 1 of 1

Probe No:	Client:	
305	St Albans City and District Council	OPUS
	Site: Bernards Heath Recreational Ground	www.opusinternational.co.uk

Project No	Start Date:	End Date:	Logged:	Field Records:
J-M0220.00	21/12/2015	21/12/2015	EDH	EDH
Easting:	**Northing:**	**Ground Level (mAOD):**	**Checked:**	**Approved:**
-	-	-	NM	

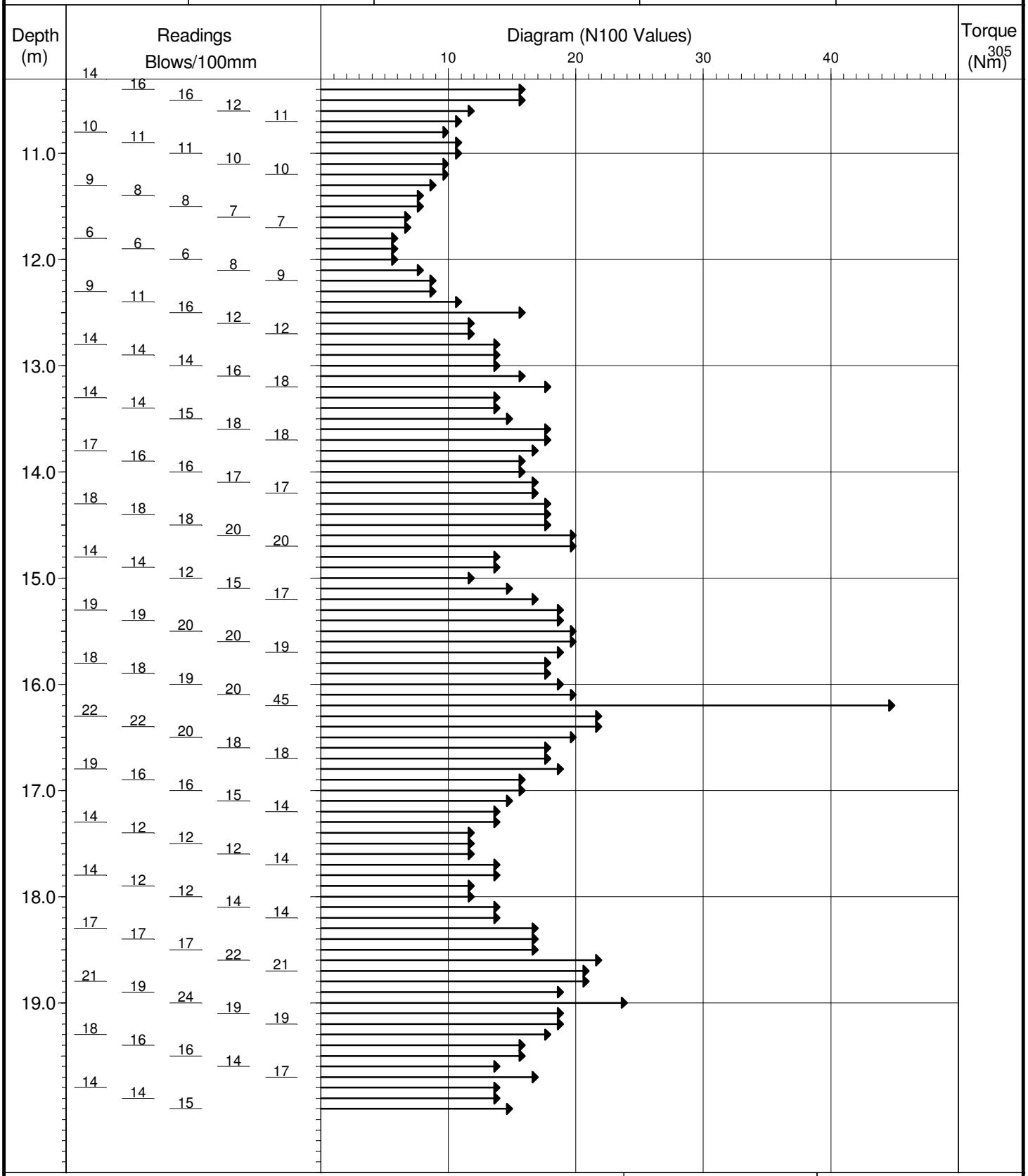


NOTES:
1. Trial pit completed at 1.20m bgl, see log 305a.
2. Backfilled with arisings upon completion.

Fall Height (mm):	Cone Base Diameter (mm):
750	50
Hammer Wt (kg): 63.50	**Probe Type:** DPSH

Probe No:	Client:	
305	St Albans City and District Council	OPUS
	Site: Bernards Heath Recreational Ground	www.opusinternational.co.uk

Project No	Start Date:	End Date:	Logged:	Field Records:
J-M0220.00	21/12/2015	21/12/2015	EDH	EDH
Easting:	**Northing:**	**Ground Level (mAOD):**	**Checked:**	**Approved:**
-	-	-	NM	



NOTES:
1. Trial pit completed at 1.20m bgl, see log 305a.
2. Backfilled with arisings upon completion.

Fall Height (mm):	Cone Base Diameter (mm):
750	50
Hammer Wt (kg): 63.50	**Probe Type:** DPSH

Exploratory Hole ID:	Client:	
305A	St Albans City and District Council	
	Site: Bernards Heath Recreational Ground	

OPUS
www.opusinternational.co.uk

Job No:	Start Date:	End Date:
J-M0220.00	21/12/2015	21/12/2015

Drilling Equipment/ Excavation Method:	Co-ords:	Backfill Date:	Field Records:
Dart C103		21/12/2015	EDH

Ground Level (mAOD):	Logged:	Chkd:	Appr:
	EDH	NM	

Strata Description	Depth (m)	Level (m)	Legend	Sample Type	Sample Depth (m)	Tests	Groundwater Records	Backfill Details
TOPSOIL firm consistency brown sandy CLAY with frequent rootlets and roots. Sand is fine to coarse. TOPSOIL	0.50							
MADE GROUND comprising firm consistency orange brown mottled grey sandy gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse angular to rounded flint and clinker.	1.20							
End of Exploratory Hole at 1.20 m								

Remarks:
1. Compleated at 1.20m bgl.
2. Backfilled with arisings upon completion.
3. Density and strength descriptions are reported in accordance with the guidance stated in BS 5930:2015 incorporating requirements of BS EN ISO 14688-1:2002, BS EN ISO 14688-2:2004 and BS EN ISO 14689-1:2003.

Sample Type Key
D - Disturbed Representative
B - Bulk Representative
ES - Environmental Sample
W - Water
U - Undisturbed Representative
J - Jar Sample (For Chemical Testing)
P - Piston Sample
UT - Undisturbed thin-walled
LB - Large Bulk (Disturbed)
DC - Disturbed Core

Test Type Key
(C) - Cone SPT
(S) - Spoon SPT
P - Pocket Pen Reading
PID - PID Reading
V - Hand Shear Vane Reading

Sheet:
Sheet 1 of 1

APPENDIX C

Interpretation of Results

DP301

Depth below ground (m)	Blows per 100mm	SPT 'N'	Corrected N_{60}	Classification	Strata
1.2	4				
1.3	4	13	12	Firm	Clay
1.4	5				
1.5	5				
1.6	7	20	19	Stiff	Clay
1.7	8				
1.8	8				
1.9	9	32	30	Stiff to Very Stiff	Clay
2.0	15				
2.1	10				
2.2	6	23	22	Stiff	Clay
2.3	7				
2.4	11				
2.5	12	37	35	Very Stiff	Clay
2.6	14				
2.7	20				
2.8	28	71	67	Hard	Clay
2.9	23				
3.0	29				
3.1	10	49	47	Very Stiff	Clay
3.2	10				
3.3	6				
3.4	6	18	17	Stiff	Clay
3.5	6				
3.6	4				
3.7	5	16	15	Firm to Stiff	Clay
3.8	7				
3.9	7				
4.0	14	33	36	Very Stiff	Clay
4.1	12				
4.2	10				
4.3	14	34	37	Very Stiff	Clay
4.4	10				
4.5	7				
4.6	11	33	36	Very Stiff	Clay
4.7	15				
4.8	11				
4.9	12	43	46	Very Stiff	Clay
5.0	20				
5.1	17				
5.2	12	41	44	Very Stiff	Clay
5.3	12				
5.4	15				
5.5	12	37	40	Very Stiff	Clay
5.6	10				
5.7	10				
5.8	10	30	32	Very Stiff	Clay
5.9	10				
6.0	15				
6.1	10	33	40	Very Stiff	Clay
6.2	8				
6.3	5				
6.4	5	17	20	Very Weak	Chalk
6.5	7				
6.6	7				
6.7	5	19	23	Very Weak	Chalk
6.8	7				
6.9	7				
7.0	12	28	34	Weak	Chalk
7.1	9				
7.2	10				
7.3	10	30	36	Weak	Chalk
7.4	10				
7.5	10				
7.6	8	26	31	Weak	Chalk
7.7	8				
7.8	8				
7.9	9	29	35	Weak	Chalk
8.0	12				
8.1	9				
8.2	10	29	35	Weak	Chalk
8.3	10				
8.4	9				
8.5	9	26	31	Weak	Chalk
8.6	8				
8.7	10				
8.8	7	24	29	Weak	Chalk
8.9	7				
9.0	6				
9.1	7	20	24	Very Weak	Chalk
9.2	7				
9.3	5				
9.4	5	13	16	Very Weak	Chalk
9.5	3				
9.6	3				
9.7	3	10	12	Very Weak	Chalk
9.8	4				
9.9	4				
10.0	5	12	15	Very Weak	Chalk
10.1	3				
10.2	3				
10.3	5	14	18	Very Weak	Chalk
10.4	6				
10.5	6				
10.6	5	15	19	Very Weak	Chalk
10.7	4				
10.8	5				
10.9	5	18	23	Very Weak	Chalk
11.0	8				
11.1	8				
11.2	7	22	28	Weak	Chalk
11.3	7				
11.4	6				
11.5	6	17	22	Very Weak	Chalk
11.6	5				
11.7	5				
11.8	4	14	18	Very Weak	Chalk
11.9	5				
12.0	5				
12.1	7	19	24	Very Weak	Chalk
12.2	7				

$$N_{60} = \frac{E_m C_B C_S C_R N}{0.60}$$

E_m (Hammer Energy Transfer)	0.76
C_B (Correction of Borehole Diameter)	1.00
C_S (Correction of Sampling Method Factor)	1.00
C_R (Correction of Rod Length)	

	Rod length
0.75	< 4m
0.85	4 - 6m
0.95	6 - 10m
1.00	> 10m

Interpretated a change to chalk due to an area of softer strata that correlates across the investigation, this is taken as the weathered chalk surface

DP301

Continued

Depth below ground (m)	Blows per 100mm	SPT 'N'	Corrected N_{60}	Classification	Strata
12.3	6	18	23	Very Weak	Chalk
12.4	6				
12.5	6				
12.6	5	17	22	Very Weak	Chalk
12.7	6				
12.8	6				
12.9	5	18	23	Very Weak	Chalk
13.0	6				
13.1	7				
13.2	8	22	28	Weak	Chalk
13.3	7				
13.4	7				
13.5	8	22	28	Weak	Chalk
13.6	7				
13.7	7				
13.8	8	23	29	Weak	Chalk
13.9	8				
14.0	7				
14.1	8	28	35	Weak	Chalk
14.2	8				
14.3	12				
14.4	8	28	35	Weak	Chalk
14.5	10				
14.6	10				
14.7	10	27	34	Weak	Chalk
14.8	9				
14.9	8				
15	8	25	32	Weak	Chalk
15.1	8				
15.2	9				
15.3	9	29	37	Weak	Chalk
15.4	10				
15.5	10				
15.6	9	26	33	Weak	Chalk
15.7	9				
15.8	8				
15.9	8	26	33	Weak	Chalk
16.0	10				
16.1	8				
16.2	8	26	33	Weak	Chalk
16.3	9				
16.4	9				
16.5	7	21	27	Weak	Chalk
16.6	7				
16.7	7				
16.8	8	23	29	Weak	Chalk
16.9	7				
17.0	8				
17.1	8	26	33	Weak	Chalk
17.2	9				
17.3	9				
17.4	8	26	33	Weak	Chalk
17.5	8				
17.6	10				
17.7	10	28	35	Weak	Chalk
17.8	9				
17.9	9				
18.0	11	32	41	Weak	Chalk
18.1	12				
18.2	9				
18.3	9	28	35	Weak	Chalk
18.4	10				
18.5	9				
18.6	8	26	33	Weak	Chalk
18.7	8				
18.8	10				
18.9	10	35	44	Weak	Chalk
19.0	15				
19.1	10				
19.2	9	26	33	Weak	Chalk
19.3	9				
19.4	8				
19.5	8	30	38	Weak	Chalk
19.6	11				
19.7	11				
19.8	10	27	34	Weak	Chalk
19.9	10				
20	7				
20.1	7	20	25	Very Weak to Weak	Chalk
20.2	6				
20.3	7				
20.4	9	29	37	Weak	Chalk
20.5	10				
20.6	10				
20.7	9	25	32	Weak	Chalk
20.8	8				
20.9	8				
21.0	8	25	32	Weak	Chalk
21.1	8				
21.2	9				
21.3	8	26	33	Weak	Chalk
21.4	8				
21.5	10				
21.6	10	24	30	Weak	Chalk
21.7	7				
21.8	7				
21.9	7	21	27	Weak	Chalk
22.0	7				
22.1	7				
22.2	8	23	29	Weak	Chalk
22.3	7				
22.4	8				
22.5	8	24	30	Weak	Chalk
22.6	8				
22.7	8				
22.8	9	28	35	Weak	Chalk
22.9	9				
23.0	10				
23.1	14	25	32	Weak	Chalk
23.2	11				

DP302

Depth below ground (m)	Blows per 100mm	SPT 'N'	Corrected N_{60}	Classification	Strata
1.2	2				
1.3	2	7	7	Soft	Clay
1.4	3				
1.5	2				
1.6	2	6	6	Soft	Clay
1.7	2				
1.8	3				
1.9	2	9	9	Firm	Clay
2.0	4				
2.1	3				
2.2	3	10	10	Firm	Clay
2.3	4				
2.4	4				
2.5	4	11	10	Firm	Clay
2.6	3				
2.7	4				
2.8	4	12	11	Firm	Clay
2.9	4				
3.0	6				
3.1	6	17	16	Stiff	Clay
3.2	5				
3.3	5				
3.4	6	16	15	Firm to Stiff	Clay
3.5	5				
3.6	4				
3.7	4	13	12	Firm	Clay
3.8	5				
3.9	5				
4.0	6	18	19	Stiff	Clay
4.1	7				
4.2	7				
4.3	10	27	29	Stiff	Clay
4.4	10				
4.5	11				
4.6	11	32	34	Very Stiff	Clay
4.7	10				
4.8	10				
4.9	10	31	33	Very Stiff	Clay
5.0	11				
5.1	11				
5.2	12	37	40	Very Stiff	Clay
5.3	14				
5.4	14				
5.5	10	34	37	Very Stiff	Clay
5.6	10				
5.7	10				
5.8	8	26	28	Stiff	Clay
5.9	8				
6.0	11				
6.1	9	29	35	Very Stiff	Clay
6.2	9				
6.3	8				
6.4	8	25	30	Stiff to Very Stiff	Clay
6.5	9				
6.6	9				
6.7	8	26	31	Very Stiff	Clay
6.8	9				
6.9	9				
7.0	9	25	30	Stiff to Very Stiff	Clay
7.1	7				
7.2	6				
7.3	6	18	22	Very Weak	Chalk
7.4	6				
7.5	7				
7.6	7	22	26	Weak	Chalk
7.7	8				
7.8	8				
7.9	8	27	32	Weak	Chalk
8.0	11				
8.1	11				
8.2	10	32	39	Weak	Chalk
8.3	11				
8.4	10				
8.5	9	28	34	Weak	Chalk
8.6	9				
8.7	9				
8.8	8	26	31	Weak	Chalk
8.9	9				
9.0	9				
9.1	7	23	28	Weak	Chalk
9.2	7				
9.3	7				
9.4	6	20	24	Very Weak	Chalk
9.5	7				
9.6	8				
9.7	8	23	28	Weak	Chalk
9.8	7				
9.9	8	8	10	Not enough data	Chalk

$$N_{60} = \frac{E_m C_B C_S C_R N}{0.60}$$

E_m (Hammer Energy Transfer)	0.76
C_B (Correction of Borehole Diameter)	1.00
C_S (Correction of Sampling Method Factor)	1.00
C_R (Correction of Rod Length)	

	Rod length
0.75	< 4m
0.85	4 - 6m
0.95	6 - 10m
1.00	> 10m

Interpretated a change to chalk due to an area of softer strata that correlates across the investigation, this is taken as the weathered chalk surface

DP303

Depth below ground (m)	Blows per 100mm	SPT 'N'	Corrected N_{60}	Classification	Strata
1.2	15				
1.3	10	35	33	Very Stiff	Clay
1.4	10				
1.5	10				
1.6	9	28	27	Stiff	Clay
1.7	9				
1.8	8				
1.9	8	25	24	Stiff	Clay
2.0	9				
2.1	9				
2.2	10	28	27	Stiff	Clay
2.3	9				
2.4	10				
2.5	10	30	29	Stiff	Clay
2.6	10				
2.7	10				
2.8	8	27	26	Stiff	Clay
2.9	9				
3.0	10				
3.1	9	27	26	Stiff	Clay
3.2	8				
3.3	8				
3.4	8	25	24	Stiff	Clay
3.5	9				
3.6	9				
3.7	8	26	25	Stiff	Clay
3.8	9				
3.9	9				
4.0	8	25	27	Stiff	Clay
4.1	8				
4.2	9				
4.3	10	29	31	Very Stiff	Clay
4.4	10				
4.5	9				
4.6	9	26	28	Stiff	Clay
4.7	8				
4.8	8				
4.9	8	25	27	Stiff	Clay
5.0	9				
5.1	10				
5.2	10	30	32	Very Stiff	Clay
5.3	10				
5.4	9				
5.5	9	26	28	Stiff	Clay
5.6	8				
5.7	9				
5.8	9	27	29	Stiff	Clay
5.9	9				
6.0	9				
6.1	10	29	35	Very Stiff	Clay
6.2	10				
6.3	10				
6.4	8	28	34	Very Stiff	Clay
6.5	10				
6.6	16				
6.7	19	62	75	Hard	Clay
6.8	27				
6.9	16				
7.0	16	43	52	Very Stiff	Clay
7.1	11				
7.2	11				
7.3	10	31	37	Very Stiff	Clay
7.4	10				
7.5	10				
7.6	8	26	31	Weak	Chalk
7.7	8				
7.8	9				
7.9	23	51	61	Weak	Chalk
8.0	19				
8.1	19				
8.2	20	61	73	Weak	Chalk
8.3	22				
8.4	21				
8.5	22	63	76	Weak	Chalk
8.6	20				
8.7	18				
8.8	22	60	72	Weak	Chalk
8.9	20				

$$N_{60} = \frac{E_m C_B C_S C_R N}{0.60}$$

E_m (Hammer Energy Transfer)	0.76
C_B (Correction of Borehole Diameter)	1.00
C_S (Correction of Sampling Method Factor)	1.00
C_R (Correction of Rod Length)	

	Rod length
0.75	< 4m
0.85	4 - 6m
0.95	6 - 10m
1.00	> 10m

Interpretated a change to chalk due to an area of softer strata that correlates across the investigation, this is taken as the weathered chalk surface

DP304

Depth below ground (m)	Blows per 100mm	SPT 'N'	Corrected N_{60}	Classification	Strata
1.2	2	8	8	Soft to Firm	Clay
1.3	2				
1.4	4				
1.5	4	17	16	Stiff	Clay
1.6	6				
1.7	7				
1.8	10	53	50	Very Stiff	Clay
1.9	16				
2.0	27				
2.1	50	50	48	Very Stiff	Clay

$$N_{60} = \frac{E_m C_B C_S C_R N}{0.60}$$

E_m (Hammer Energy Transfer)	0.76	
C_B (Correction of Borehole Diameter)	1.00	
C_S (Correction of Sampling Method Factor)	1.00	
C_R (Correction of Rod Length)		Rod length
	0.75	< 4m
	0.85	4 - 6m
	0.95	6 - 10m
	1.00	> 10m

DP305

Depth below ground (m)	Blows per 100mm	SPT 'N'	Corrected N_{60}	Classification	Strata
1.2	7				
1.3	8	23	22	Stiff	Clay
1.4	8				
1.5	6				
1.6	4	15	14	Firm	Clay
1.7	5				
1.8	5				
1.9	6	17	16	Stiff	Clay
2.0	6				
2.1	8				
2.2	9	26	25	Stiff	Clay
2.3	9				
2.4	10				
2.5	10	30	29	Stiff	Clay
2.6	10				
2.7	9				
2.8	9	26	25	Stiff	Clay
2.9	8				
3.0	9				
3.1	9	25	24	Stiff	Clay
3.2	7				
3.3	7				
3.4	8	23	22	Stiff	Clay
3.5	8				
3.6	7				
3.7	8	23	22	Stiff	Clay
3.8	8				
3.9	8				
4.0	9	24	26	Stiff	Clay
4.1	7				
4.2	7				
4.3	7	24	26	Stiff	Clay
4.4	10				
4.5	10				
4.6	10	28	30	Stiff	Clay
4.7	8				
4.8	8				
4.9	8	25	27	Stiff	Clay
5.0	9				
5.1	9				
5.2	10	29	31	Stiff	Clay
5.3	10				
5.4	8				
5.5	9	26	28	Stiff	Clay
5.6	9				
5.7	9				
5.8	9	26	28	Stiff	Clay
5.9	8				
6.0	8				
6.1	6	21	25	Stiff	Clay
6.2	7				
6.3	7				
6.4	7	21	25	Stiff	Clay
6.5	7				
6.6	8				
6.7	7	22	26	Stiff	Clay
6.8	7				
6.9	7				
7.0	7	20	24	Stiff	Clay
7.1	6				
7.2	6				
7.3	5	16	19	Very Weak	Chalk
7.4	5				
7.5	5				
7.6	6	17	20	Very Weak	Chalk
7.7	6				
7.8	5				
7.9	5	15	18	Very Weak	Chalk
8.0	5				
8.1	6				
8.2	6	19	23	Very Weak	Chalk
8.3	7				
8.4	7				
8.5	6	19	23	Very Weak	Chalk
8.6	6				
8.7	6				
8.8	6	18	22	Very Weak	Chalk
8.9	6				
9.0	8				
9.1	8	26	31	Weak	Chalk
9.2	10				
9.3	10				
9.4	11	33	40	Weak	Chalk
9.5	12				
9.6	11				
9.7	10	30	38	Weak	Chalk
9.8	9				
9.9	10				
10.0	12	34	43	Weak	Chalk
10.1	12				
10.2	14				
10.3	16	46	58	Weak	Chalk
10.4	16				
10.5	12				
10.6	11	33	42	Weak	Chalk
10.7	10				
10.8	11				
10.9	11	32	41	Weak	Chalk
11.0	10				
11.1	10				
11.2	9	27	34	Weak	Chalk
11.3	8				
11.4	8				
11.5	7	22	28	Weak	Chalk
11.6	7				
11.7	6				
11.8	6	18	23	Very Weak	Chalk
11.9	6				
12.0	8				
12.1	9	26	33	Weak	Chalk
12.2	9				

$$N_{60} = \frac{E_m C_B C_S C_R N}{0.60}$$

E_m (Hammer Energy Transfer)	0.76
C_B (Correction of Borehole Diameter)	1.00
C_S (Correction of Sampling Method Factor)	1.00
C_R (Correction of Rod Length)	

	Rod length
0.75	< 4m
0.85	4 - 6m
0.95	6 - 10m
1.00	> 10m

Interpretated a change to chalk due to an area of softer strata that correlates across the investigation, this is taken as the weathered chalk surface

DP305

Continued

Depth below ground (m)	Blows per 100mm	SPT 'N'	Corrected N_{60}	Classification	Strata
12.3	11				
12.4	16	39	49	Weak	Chalk
12.5	12				
12.6	12				
12.7	14	40	51	Weak	Chalk
12.8	14				
12.9	14				
13.0	16	48	61	Weak	Chalk
13.1	18				
13.2	14				
13.3	14	43	54	Weak	Chalk
13.4	15				
13.5	18				
13.6	18	53	67	Weak	Chalk
13.7	17				
13.8	16				
13.9	16	49	62	Weak	Chalk
14.0	17				
14.1	17				
14.2	18	53	67	Weak	Chalk
14.3	18				
14.4	18				
14.5	20	58	73	Weak	Chalk
14.6	20				
14.7	14				
14.8	14	40	51	Weak	Chalk
14.9	12				
15.0	15				
15.1	17	51	65	Weak	Chalk
15.2	19				
15.3	19				
15.4	20	59	75	Weak	Chalk
15.5	20				
15.6	19				
15.7	18	55	70	Weak	Chalk
15.8	18				
15.9	19				
16.0	20	84	106	Moderatly Weak	Chalk
16.1	45				
16.2	22				
16.3	22	64	81	Weak	Chalk
16.4	20				
16.5	18				
16.6	18	55	70	Weak	Chalk
16.7	19				
16.8	16				
16.9	16	47	60	Weak	Chalk
17.0	15				
17.1	14				
17.2	14	40	51	Weak	Chalk
17.3	12				
17.4	12				
17.5	12	38	48	Weak	Chalk
17.6	14				
17.7	14				
17.8	12	38	48	Weak	Chalk
17.9	12				
18.0	14				
18.1	14	45	57	Weak	Chalk
18.2	17				
18.3	17				
18.4	17	56	71	Weak	Chalk
18.5	22				
18.6	21				
18.7	21	61	77	Weak	Chalk
18.8	19				
18.9	24				
19	19	62	79	Weak	Chalk
19.1	19				
19.2	18				
19.3	16	50	63	Weak	Chalk
19.4	16				
19.5	14				
19.6	17	45	57	Weak	Chalk
19.7	14				
19.8	14	29	37	Weak	Chalk
19.9	15				

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