



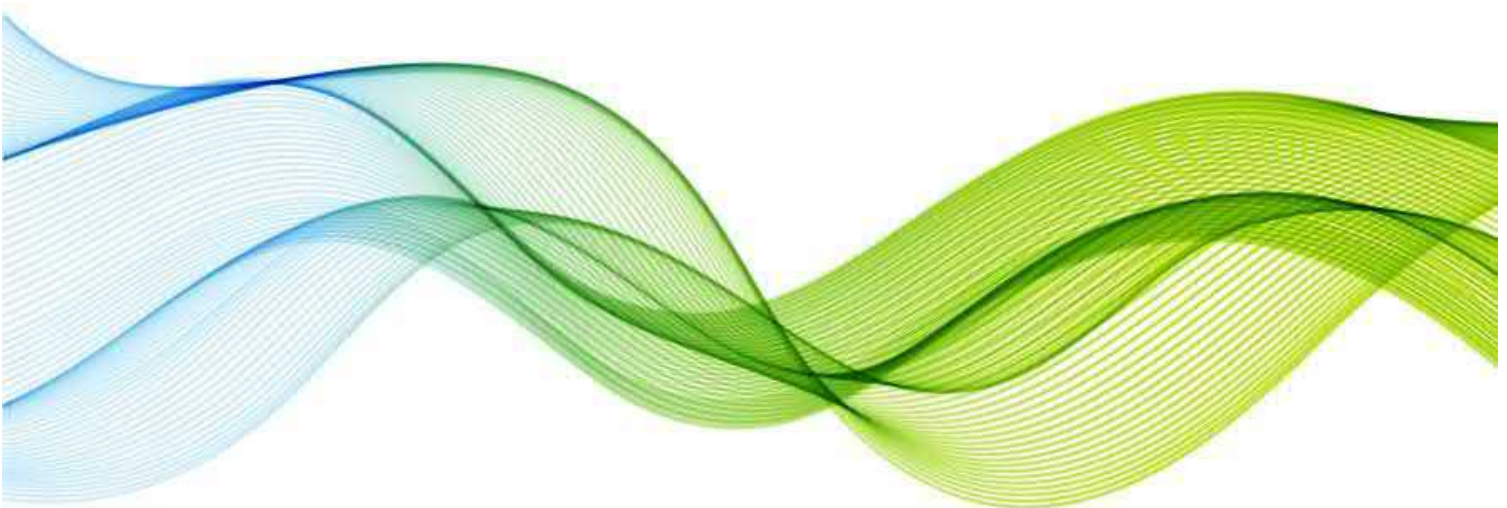
**Phase I - II
Geo-Environmental Site Assessment**

Helmsley House, Bartons Road, Havant, PO9 5NA

Prepared for:
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June 2022

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Geo-environmental



Air Quality

Executive Summary	
Site Address	Helmsley House, Barton's Road, Havant, PO9 5NA
National Grid Reference	473361, 107914
Site Area	0.73 ha
Current Site Use	The site is currently unoccupied open space, containing trees and overgrown vegetation.
Site History	Historically the site has been configured been used as open fields. However, between 1931 and 1970 there was a track present on site, with three (3no.) structures located in the north-eastern extent. From 2001 the eastern and southern extents of the site were denoted as mixed woodland with the centre depicted as open space, with a single structure depicted in the northwest corner.
Geology & Hydrogeology	<u>Geology</u> Published BGS Geological mapping indicates that the northern portion of the site is underlain by Head Deposits, which is classified as a Secondary A Aquifer. The remainder of the site is mapped as being directly underlain by bedrock of the London Clay Formation which is classified as Unproductive Strata. Results of the intrusive investigations works revealed that the superficial Head Deposits were encountered site-wide. The London Clay Formation was found to immediately underlie the Head Deposits and was proven to the base of this intrusive investigation at a maximum depth 20.00m bgl. Groundwater was encountered as a strike in three (3no.) locations (CP101, CP102 and W104) at depths of 2.50m bgl, 5.40m bgl, 6.0m bgl and 17.0m bgl. Results of the return monitoring visits identified resting groundwater levels across the site between dry in (WS105) and 2.63m bgl (WS102). <u>Hydrogeology</u> Review of the environmental database indicates that the site is located within a groundwater Source Protection Zone 1c: an inner catchment within confined aquifer, with the SPZ associated with the Bedhampton & Havant Springs which are directly fed by the Principal Chalk Aquifer. There are no active or historical water abstractions are located within 250m of the site. There are no active or historical potable water abstractions are located within 250m of the site.
Hydrology & Flooding	The Groundsure report indicates that the majority of the site is at moderate risk of groundwater flooding over the majority of the site, with a smaller portion in the north of the site having a low risk. The Groundsure report identifies two different inland watercourses unaffected by tidal action, one 130m southeast and another 132-165m southwest of the site. Historical maps indicate these watercourses to be drainage pathways. Two (2no.) surface water body catchments were recorded on site. The Western streams and East Hampshire Rivers, these are both coastal catchments. The Groundsure Report identified the site to be within an area of both low risk of river and coastal flooding and negligible risk of surface water flooding.
Landfill Sites & Ground Gases	The Groundsure Report identified no records of historic landfill sites or historic waste treatment sites within 250m of the subject site. The Groundsure Report identified no active or recently closed licensed waste sites within 250m of the site boundary. Historical

	pits and ponds, now infilled, have been identified, which have the potential to generate ground gas.		
Radon	The site lies within an area where less than 1% of the properties are above the Action Level. At these levels BRE publication BR211 indicates that no special radon protective measures are required in the construction of new extensions or dwellings.		
Revised Conceptual Site Model			
Following completion of the Tier 1 Risk Assessment, pollution pathways have been identified based on a residential end use with homegrown produce.			
It is therefore recommended that further work is undertaken to delineate the lateral extent of affected soils in the vicinity of locations WS104 & WS106.			
Ground Gas Classification			
It is considered that the site is classified as Characteristic Situation 1 (CS-1) classification in accordance with BS 8485:2015 for residential apartments, based on the three (3no.) ground gas monitoring visits. No gas protection measures are required for a CS-1 classification.			
Concrete Classification			
The shallow soils (<2.00m bgl) including Topsoil, Made Ground and Head Deposits have been assessed against brownfield locations. Due to the size of the dataset (9no. samples), characteristic pH and SO ₄ values were calculated using the mean of the highest two sulphate results and the mean of the lowest two pH results as stated in the BRE Special Digest (2005) producing a site characteristic value for sulphate of 58 mg/l and a pH value of 6.71. The site has been classified as DS-1, Aggressive Chemical Environmental for Concrete Classification (ACEC) AC-1 for brownfield locations as per table C1 in BRE Special Digest (2005).			
For London Clay Formation, due to the size of the dataset (5no. samples), characteristic pH and SO ₄ values were calculated using the mean of the highest two sulphate results and the mean of the lowest two pH results as stated in the BRE Special Digest (2005) producing a site characteristic value for sulphate of 335 mg/l and a pH value of 7.6. The site has been classified as DS-1, Aggressive Chemical Environmental for Concrete Classification (ACEC) AC-1 for greenfield locations as per table C1 in BRE Special Digest (2005).			
Geotechnical Assessment			
Shallow Foundations			
Presumed bearing capacities have been provided for the shallow soils of the Head Deposits and London Clay Formation, for depths between 1.20 and 3.00m bgl. These have been based on empirical values derived from the in-situ testing and laboratory classification data and show that the soil strength and density, and the correlating presumed bearing values are variable across soil types and depths.			
Given the presence of trees on site in assumed close proximity to the proposed structure and the low bearing capacities present it is considered likely that traditional shallow foundations would be unsuitable and that even deep trenchfill may be impractically deep, although this is without knowledge of loadings.			
Piled foundations are considered likely to be a more viable option for the site given conditions encountered.			
Deep Foundations			
Illustrative calculations for axial carrying capacity have been undertaken with results shown below. The following pile capacities have been calculated for various pile diameters and lengths adopting a partial factor of 1.54 for Q _b and 1.4 for Q _s to obtain an ULS axial end bearing capacity.			
Pile Length (m)	Pile Type and Diameter		
	0.30m CFA	0.45m CFA	0.60m CFA
	Axial Pile Capacity (kN)	Axial Pile Capacity (kN)	Axial Pile Capacity (kN)
	Total	Total	Total
	8	143	230
10	244	365	487
12	316	473	631
It is recommended that the advice of a specialist foundation contractor is sought to further discuss proposed pile layout and confirm capacity with regards to the encountered ground conditions.			

Please note that these values for piled foundations should not be considered as design values and are provided for information purposes such that they should not be relied upon without review and consultation with a design engineer.

Volume Change Potential

The fine-grained soils of the Head Deposits and London Clay Formation on site have shown via laboratory analysis to be of high to very high plasticity and medium to high Volume Change Potential. Modified plasticity indices ranged from 29% to 46%.

Recommendations

Environmental

It is recommended that due to a potentially containing Asbestos structure on site that an asbestos survey is undertaken in accordance with the Control of Asbestos Regulations (2012) prior to the commencement of any refurbishment or demolition works.

It is recommended that a nitrate balance report is undertaken as part of the planning application, to assess the potential risk posed from the proposed development on nitrates entering surrounding waters.

As soft landscaping is proposed on site, a potential pathway remains for future site users due to the identification of Heavy Metal, PAH exceedances within WS104 and asbestos within WS106. As such, it is recommended that delineation exercises are carried out in the vicinity of these two locations, to delineate the lateral extent of soils impacted by these contaminants.

If during the development stage any evidence of contamination is identified, works should be halted, and contact made with a suitably qualified Environmental Consultant. As determined appropriate by the Consultant, further investigation and sampling may be required to determine the appropriate actions. Upon completion contact should be made with the regulator to achieve sign off the works.

Geotechnical

At this stage it is recommended that piled foundations be considered and that early discussions with an experienced piling contractor is undertaken to clarify the pile diameters and confirm capacity with regards to the encountered ground conditions. Once the pile cap, positions and diameters are known further pile analysis can be undertaken in a Geotechnical Design Report if required.

However, should it be shown that line loads are sufficiently low, it is recommended that a review of founding options be undertaken and assessed within a Geotechnical Design Report. Subject to regulatory requirements, the potential requirement exists to calculate bearing capacities and undertaken settlement analysis for foundations through production of a Geotechnical Design Report (GDR) which would provide calculations to current guidance, UK National Annex to EC7.

Subject to pile design length, NHBC require proven ground conditions at a minimum of 5m below the base of the longest pile length.

Foundation design should be completed by a suitably qualified Structural Engineer, with specific consideration given to the variability in soil strengths. Further detail should be obtained in relation to the tree and vegetation types on site, those that are to remain and those that are being removed and, where necessary and relevant, considered as part of the foundation design.

Table of Contents

1	INTRODUCTION	8
1.1	Background	8
1.2	Proposed Development	8
1.3	Objectives	8
1.4	Sources of Information	9
1.5	Limitations	9
1.6	Confidentiality	9
2	SITE SETTING	10
2.1	Site Details	10
2.2	Current Site Use	10
2.2.1	Site Description	10
2.2.2	Hazardous Materials Storage	11
2.2.3	Potential Asbestos Containing Material (PACM)	11
2.2.4	Waste Storage	11
2.2.5	Tree Species	11
2.2.6	Potential Invasive Species	11
2.3	Surrounding Area	11
3	SITE HISTORY	12
3.1	Site History	12
3.2	Historical Tank Database	13
3.3	Historical Energy Features Database	14
3.4	Historic Garages and Petrol Stations	14
3.5	Historic Industrial Land Uses	14
3.6	Planning History	14
3.7	Unexploded Ordnance Risk Assessment	15
4	ENVIRONMENTAL SETTING	16
4.1	Geology and Hydrogeology	16
4.1.1	Groundwater Flooding	16
4.2	Hydrology and Flooding	17
4.3	Geotechnical Data	17
4.4	Mining and Ground Workings	17
4.5	Radon Risk Potential	18
4.6	Current Industrial Land Uses	18
4.7	Sensitive Land Uses	18
4.7.1	Sites of Special Scientific Interest (SSSI) Impact Risk Zones	18
4.7.2	Nitrate Vulnerable Zone (NVZ)	18
4.8	Site Sensitivity Assessment	19
5	CONSULTATIONS	20
5.1	Contaminated Land Officer	20
5.2	Landfill and Waste Treatment Sites	20
5.3	Potentially Infilled Land	20
5.4	Regulatory Database	20
6	CONCEPTUAL SITE MODEL (CSM)	22
6.1	Initial CSM	22
6.1.1	On-site Potential Sources	22
6.1.2	Off-site Potential Sources	22
6.1.3	Potential Pathways	22

6.1.4	Potential Receptors	22
7	SITE INVESTIGATION	28
7.1	General	28
7.2	Scope Adjustments	29
7.3	Laboratory Analysis	29
7.4	Ground Gas and Groundwater Monitoring	30
8	GROUND AND GROUNDWATER CONDITIONS	31
8.1	Summary of Ground Conditions	31
8.1.1	Made Ground	31
8.1.2	Topsoil	31
8.1.3	Superficial Deposits	31
8.1.4	Bedrock Deposits	31
8.1.5	Groundwater Conditions	32
8.2	Laboratory Classification Analysis	32
8.2.1	Soil Plasticity	32
8.2.2	Particle Size Distribution Analysis	33
8.2.3	Moisture Content	33
8.2.4	pH and Sulphate	33
8.2.5	Undrained Shear Strength	34
8.3	In-Situ Testing	34
8.3.1	Standard Penetration Tests (SPT)	34
8.3.2	Dynamic Cone Penetrometer (DCP) Testing	35
8.3.3	Ground Gas	35
9	TIER 1 QUALITATIVE CONTAMINATED LAND RISK ASSESSMENT	37
9.1	Human Health Risk Assessment	37
9.1.1	Discussion of Tier 1 Risk Assessment	39
9.2	Controlled Waters Assessment	39
9.3	Ground Gas Assessment	40
9.3.1	BS 8485:2015+A1(2019) – Type B Building – Private property with central building management	40
10	REVISED CONCEPTUAL SITE MODEL.....	41
11	GEOTECHNICAL ASSESSMENT.....	43
11.1	Proposed Development	43
11.2	Site Preparation	43
11.3	Ground Profile	43
11.4	Shallow Foundations	43
11.4.1	In Situ-Testing	44
11.4.2	Shear Strength	44
11.4.3	Bearing Capacities	45
11.5	Deep Foundations	46
11.6	Building Near Trees	47
11.6.1	NHBC Minimum Depth to Foundations	47
11.6.2	Lateral pressure and heave	48
11.7	Ground Floor Slabs	48
11.8	Pavement Construction	48
11.9	Concrete Durability	48
11.10	Discussion	49
11.11	Recommendations	49
12	CONCLUSIONS AND RECOMMENDATIONS.....	51

Tables

Table 2-1 Site Details	10
Table 2-2 Land Use	11
Table 3-1 Historical Land Use	12
Table 4-1 Published Geological Succession	16
Table 4-2 Geotechnical Data	17
Table 5-1 -Summary of Groundsure Data	20
Table 6-1 Initial Conceptual Site Model	23
Table 7-1 Site Investigation Summary	28
Table 8-1 Summary of Groundwater Conditions	32
Table 8-2. Summary of Soil Plasticity	32
Table 8-3. Summary of Particle Size Distribution	33
Table 8-4. Summary of Moisture Content	33
Table 8-5. Summary of pH and Sulphate Data for Topsoil/Made Ground and Head Deposits	33
Table 8-6 pH and Sulphate data for the London Clay Formation	34
Table 8-7 Summary of Triaxial Compression Testing Results	34
Table 8-8. Summary of In-situ CBR Results	35
Table 8-9. Summary of Ground Gas and Groundwater Monitoring Results	36
Table 9-1. Summary of Inorganic and Hydrocarbon Toxicity Assessment for a Residential End Use with Home Grown Produce	37
Table 10-1 Revised Conceptual Site Model	41
Table 11-1 Summary of site ground conditions	43
Table 11-2 Summary of pile foundation bearing capacities.	47
<i>Table 11-3 Minimum depth of foundations (after NHBC 2021)</i>	47
Table 11-4 New tree planting (after NHBC 2021)	48

1 INTRODUCTION

1.1 Background

Omnia have been commissioned by the Highwood Group to undertake a Phase I-II Geo-Environmental Investigation at the site of Helmsley House, Barton's Road, Havant, PO9 5NA, to assist with discharging Planning Condition 12 (1) and (2) as set out by Havant Borough Council under planning reference [APP/20/00761](#) as detailed below.

"...1) Investigation in the vicinity of the suspect material, sufficient to characterise its nature, likely extent & mobility

2) An appropriate assessment of the risks to all receptors that may be affected, based upon 1)"

A site location plan is presented as Figure 1.0 within Appendix III.

1.2 Proposed Development

It is understood that planning permission has been granted subject to conditions by Havant Borough Council for the redevelopment of the site ([Ref: APP/20/00761](#)). This is for the *"Erection of a 64 bed older persons care home (Use Class C2) together with construction of new access road, car/cycle parking, drainage works, hard/soft landscaping and other associated infrastructure."*

The outline proposed site layout is presented as Figure 2.0 (Appendix III).

1.3 Objectives

The objectives of the Phase I-II Geo-Environmental Site Assessment are to.

- Undertake a site walkover and inspection, including interviews with site representatives if available;
- Review historical plans, site investigations, geology, hydrogeology, site sensitivity, floodplain issues, mining records and any local authority information available in order to complete a Desk Study in line with the Environment Agency (EA) document *Land Contamination Risk Management (LCRM)*;
- Undertake an assessment of the near surface through intrusive site investigation;
- Assess the implications of any potential environmental risks, liabilities and development constraints associated with the site in relation to the future use of the site and in relation to off-site receptors;
- Provide general geotechnical characterisation, including outline recommendations for foundation and presumed bearing capacity, outline pavement design values and an indicated of appropriate foundation options; and,
- Provide a factual and interpretative report relating to the site and provide recommendations on any potential development issues with consideration of residential and environmental receptors.

1.4 Sources of Information

Background information was sought from the following sources:

- Groundsure Environmental Database Search (GS-8723170);
- Historical Ordnance Survey Mapping (1859 –2022);
- The British Geological Survey (BGS) map for the site (Sheet 316, Fareham and Havant, Solid and Drift Edition at a scale of 1:50,000, 1998);
- Zetica UXO Risk Maps (<https://zeticauxo.com/downloads-and-resources/risk-maps/>); [Accessed: 2022/06/15]
- British Standard BS10175:2011+A2:2017 – Investigation of Potentially Contaminated Sites – Code of Practice;
- British Standard BS5930:2015+A1:2020 – *Code of Practice for Ground Investigations*;
- British Standard BS1377-9:1990 Incorporating Amendment No. 1 – *Methods of Test for Soils for Civil Engineering Purposes – Part 9: In-situ Tests*;
- British Standard BS8485:2015+A1:2019 – *Code of Practice for the Design of Protective Measures for Methane and Carbon Dioxide Ground Gases for New Buildings*;
- CIRIA Publication C665 (2007). *Assessing Risks Posed by Hazardous Ground Gases to Buildings*;
- BRE DG365 (2016). *Soakaway Design*;
- BRE Special Digest 1 (2005). *Concrete in Aggressive Ground*;
- Tomlinson, M.J. (2001). *Foundation Design and Construction*. 7th Edition. Pearson Prentice;
- NHBC Standards (2019). Chapter 4.2 – *Building Near Trees* (2020); and,
- British Standard BS8004:2015 - *Code of Practice for Foundations*.

1.5 Limitations

The limitations of this report are presented in Appendix I.

1.6 Confidentiality

Omnia has prepared this report solely for the use of the Client and those parties with whom a warranty agreement has been executed, or with whom an assignment has been agreed. Should any third party wish to use or rely upon the contents of the report, written approval must be sought from Omnia; a charge may be levied against such approval.

2 SITE SETTING

2.1 Site Details

Table 2-1 Site Details

Site Address	Helmsley House, Bartons Road, Havant, PO9 5NA
National Grid Reference	473361, 107914
Site Area	0.73 ha

All acronyms used within this report are defined in the Glossary presented in Appendix II.

A site location plan is presented as Figure 1.0 (Appendix III).

2.2 Current Site Use

2.2.1 Site Description

The area of investigation is located approximately 2.00 km northeast of Havant and was irregularly shaped covering an area of 0.73ha. Access onto the site was via a padlocked metal gate off Barton's Road to the north of the site.

At the time of the site walkover the site was configured as an overgrown field containing a variety of long grass, weeds, hedges and mature deciduous trees. The weed and grass areas were located within the centre of the site with vegetation approximately 0.50 to 1.00m in height. The deciduous trees and hedges were located in the eastern, western and southern extents of the site.

Within the northwestern corner was a partially demolished one-storey structure, which extended beyond the site boundary towards the north. The structure appeared to be constructed of concrete and brick, however, was not closely inspected due to dense undergrowth. Within this section of the site was a stockpile (approximately 2.00m (l) x 2.00m (w) x 0.75m (h)) containing mixed and presumably fly-tipped waste. Although not closely inspected the waste appeared to contain wood, old clothing, vehicle tyres and an old bathtub. A stockpile of timber (assumed to be old cuttings from the trees) was located within the eastern extent of site. This was approximately 2.00m (l) 1.00m (w) x 1.00m (h).

The western and southern boundaries were denoted by dense hedgerows, bushes and deciduous trees. The eastern boundary was denoted by barbed wire fencing (approximately 1.00m high) although this was damaged and open in places. There was no physical demarcation of the northern boundary, as the northern boundary lies within an un-divided field.

The topography sloped downwards gently from north to south, and the ground was noted to be uneven underfoot.

Immediately south of the site was a new residential development, which was undergoing construction.

An annotated site walkover plan showing observations from the walk-over survey is presented as Figure 3.0 (Appendix III). Relevant photographs from the site walk-over survey are located in Appendix IV.

2.2.2 Hazardous Materials Storage

There were no potentially hazardous materials found on the site.

2.2.3 Potential Asbestos Containing Material (PACM)

The exact age of the partially demolished structure within the northwestern area of the site is unknown but it is considered to pre-date 2000 and as such is considered to have the potential to contain Asbestos Containing Materials within the building fabric.

It is therefore recommended that an asbestos survey is undertaken in accordance with the Control of Asbestos Regulations (2012) prior to the commencement of any refurbishment or demolition works.

2.2.4 Waste Storage

There was no official waste storage on the site however a stockpile (approximately 2.00m (l) x 2.00m (w) x 0.75m (h)) containing presumably fly-tipped mixed waste was identified within the northwestern area of the site. Although not closely inspected the waste appeared to contain wood, old clothing, vehicle tyres and an old bathtub. A second stockpile of wood (considered to be old cuttings from the trees) was located within the eastern area of the site. This was approximately 2.00m (l) x 1.00m (w) x 1.00m (h).

2.2.5 Tree Species

At the time of the site walkover the site contained multiple mixed species mature deciduous trees, typically concentrated around the site edges. These were noted to be approximately 5 – 15m in height.

2.2.6 Potential Invasive Species

During the site walkover no potential invasive species were identified. However, not all areas of the site were accessible for close visual inspection as large parts of the site were inaccessible due to dense undergrowth.

2.3 Surrounding Area

The surrounding land uses are summarised in Table 2-2 below:

Table 2-2 Land Use

Direction	Land Use
North	Pavement and Barton's Road with field on the opposite side. There was also a residential house with a large garden and a shed contained by hedgerows just adjacent to the site.
East	Lawned grass, Normandy Way Road, and open fields
South	Residential development with ongoing construction work
West	More open land and residential housing with associated landscaping and access routes

3 SITE HISTORY

3.1 Site History

A review of historical land use pertinent to the site and within a 250m radius is summarised in Table 3-1.

Table 3-1 Historical Land Use

Map Edition	Historical Land Use	
	On Site	Off Site
1859 (1:2,500) Partial Mapping	Only the eastern part of the site is covered by mapping and imply shows a field boundary marked by trees.	Gravel Pit is indicated approximately 90-120m northwest of the site boundary. Immediately east of the site is an undeveloped plot of land, assumed agricultural.
1866 (1:10,560)	Open fields with mixed woodland. A road runs through the eastern section of the site from south to north. A track runs through the northeast corner of the site running from southwest to northeast.	Directly south is a pond, which borders the site boundary. Adjacent to northern boundary of the site is road going from west to east. Few assumed residential and farm related structures within a 250m radius of the site, including 'Eastleigh House' 138m east. Inland watercourse from 105m away, assumed drainage ditch as leads to a pond. Additional pond located approximately 150m south.
1869 (1:2,500)	Footpath bisects the site from east to west. The eastern extent of the site is not visible within this map.	No significant change. Areas to the north and east of the site are not visible within this map.
1895 -1897 (1:10,560) (1:2,500)	No significant change.	'Old Gravel Pit' 87m northeast. Pond 120m east and 195m southeast.
1907-1909 (1:10,560) (1:2,500)	Footpath no longer depicted on mapping.	Assumed waterbody located approximately 35m southeast.
1931 -1932 (1:2,500) (10,560)	A track is located on site, which enters the site from the west and transects to the northeast, stopping before the eastern site boundary. Coniferous trees border the track. One the eastern side of track are three (3no.) structures. Mixed woodland is depicted within the eastern extent of the site.	Circular tank 30m northwest. From 58m northwest there is now a building labelled as 'Helmsley House' with a pit 10m west, a greenhouse 10m north and smaller associated buildings around it. A pit 10m west.

Map Edition	Historical Land Use	
	On Site	Off Site
1940 (1:2,500)	No significant change	No significant change
1970-1972 (1:2,500)	Previous track, coniferous trees and three (3no.) structures are no longer depicted on mapping. Structure within the northwest corner of site that partially overlaps into the site boundary.	Increase in residential development to the west. Drainage ditch located from approximately 20m south of the site. Ponds directly south of the site, 120m east and 195m southeast are no longer depicted on the mapping and are assumed to be infilled. 'Old Gravel Pit' 87m northeast of site and pit 10m west of site no longer appear on the mapping and are assumed to be infilled
1990 (1:2,500)	No significant changes	Pond approximately 150m south no longer depicted on mapping. Areas to the north of the site are not visible on this map.
1993 (1:1,250)	Outline of areas of mixed woodland appear on site but no specific identification yet	No significant changes
2001 (1:10,000) 2003 (1:1,250)	The eastern and western extents of the site are depicted as mixed woodland. The centre remains as open space/field.	No significant change.
2010 (1:10,000)	No significant change.	Increase in development to the west and northwest.
2022 (1:10,000)	No significant change.	222m west is a large garden centre and associated hard standing

A selection of historical maps is presented in Appendix V.

3.2 Historical Tank Database

The Groundsure Report identified two (2no.) records of historical tanks within 250m of the study site as detailed below.

- 29m northwest (1932-1940) – *This is the same tank identified within the historical mapping section and is assumed to be either a water tank or agricultural silo due to the shape. This therefore has not been considered any further; and,*
- 248m west (1907) – *Due to the distance and direction from the site, and the expected groundwater flow to the southwest, this tank is not considered to have the potential to impact the subject site and therefore has not been considered further.*

3.3 Historical Energy Features Database

The Groundsure Report identified no historical energy features within a 250m radius of the subject site.

3.4 Historic Garages and Petrol Stations

The Groundsure Report did not identify any historical petrol stations or garages within a 250m radius of the site.

3.5 Historic Industrial Land Uses

The Groundsure Report identified ten (10no.) records of historical industrial land uses within 250m of the study site. Upon further review these entries all relate to the same feature, an Old Gravel Pit (also labelled as sand pit, unspecified pit, unspecified ground workings), located 16-89m east between 1895-1963. This pit is the same as that identified within the historical mapping section.

3.6 Planning History

A review of the online planning portal of Havant Borough Council identified fifty-one (51no.) planning applications attributed to the site postcode.

Numerous applications relate to minor buildings modifications, change of use etc., but the most pertinent planning applications associated with the development of the site are summarised in the sections below.

Planning Reference	APP/18/00894
Date	05/09/2018
Proposal	Erection of 1 No. 3 bed dwelling including landscaping and parking (18.01.19). Request to discharge condition No's 3,5,6,9,10 and 13. (09.04.19)
Decision	Decided – Permission Granted
Notes	This planning application is regarding a location that lies to the east of the site. Within the decision notice for this planning application, one condition states that if piling is needed a piling method statement needs to be developed as the site lies in a groundwater Source Protection Zone 1c for the Havant and Bedhampton Springs public water supply.

Planning Reference	APP/16/01077
Date	21.10.2016
Proposal	Residential development to provide 9 dwellinghouses along with the continued use of Eastleigh House as Class B1(a) offices and the demolition of outbuildings to the rear of the building. (approved 21.01.17) Request to discharge condition No's 2,5,6,7,8,9, and 14 (26.05.17). Request to discharge condition No/s 2,5,6,7,8, 9,13 and 14 (15.01.18). Request to discharge condition No.3 and 16 (07.02.18). Request to Discharge Conditions 5 and 14 (20.06.2018).
Decision	Decided – Permission Granted
Notes	No contaminated land conditions within the Decision Notice.

3.7 Unexploded Ordnance Risk Assessment

A review of publicly available information (provided by Zetica UXO) shows the site as having a 'Moderate risk' associated with bombing density and bomb risk.

The site is consequently considered **Moderate Risk** with regards to unexploded ordnance.

4 ENVIRONMENTAL SETTING

4.1 Geology and Hydrogeology

British Geological Survey Map (Sheet 316, Fareham and Havant, Solid and Drift Edition at a scale of 1:50,000, 1998) indicates that the site is underlain by the following geological sequence:

Table 4-1 Published Geological Succession

Geological Unit	Formation Name	Description	Aquifer Classification
Superficial deposits (North-eastern extent of the site only)	Head Gravel	Clayey Gravel	Secondary A
Bedrock	London Clay Formation	Clay, Silt and Sand	Unproductive Strata

A review of the published geological map indicates that the majority of the site is directly underlain by bedrock of the London Clay Formation, which is classified as Unproductive Strata. However, the north-eastern corner of the site and associated access route are indicated to be underlain by superficial Head Deposits of clayey gravel classified as a Secondary A Aquifer.

The Groundsure report records no data for Artificial and Made Ground on the proposed site or within 250m of the site.

Review of the environmental database indicates that the site is located within a groundwater Source Protection Zone 1c, an inner catchment associated with a confined aquifer which is attributed to the Bedhampton and Havant Springs. There are no active or historical water abstractions located within 250m of the site. There are no active or historical potable water abstractions located within 250m of the site.

Groundwater vulnerability data indicates that the northeast corner of the site is underlain by a Secondary superficial aquifer of medium vulnerability. The remainder of the site is underlain by an unproductive bedrock aquifer.

The site is located in a Source Protection Zone 1c which is an inner catchment within a confined aquifer. Source Protection Zones in the confined aquifer define the sensitivity around a deep groundwater abstraction to contamination. A confined aquifer would normally be protected from contamination by overlying geology and is only considered a sensitive resource if deep excavation/drilling is taking place.

Based on local topography and the location of surface watercourses it is considered likely that shallow groundwater, if present, will follow local topography and flow in a south to southwesterly direction.

4.1.1 Groundwater Flooding

The Groundsure report indicates that the site is at a moderate risk of groundwater flooding. The north-eastern corner is classified as a low risk.

4.2 Hydrology and Flooding

The Groundsure report identifies two different inland watercourses as detailed below:

- 130m southeast – Inland river not influenced by normal tidal action; and,
- 132-165m southwest – Inland river not influenced by normal tidal action.

Historical maps indicate these watercourses to be drainage pathways.

The site is located within two (2no.) surface water body catchments. These are Western Streams and East Hampshire Rivers, which are both coastal catchments.

No surface water abstraction licences were identified on-site or within a 250m radius.

The Groundsure Report identified the site to be within an area of negligible risk of surface water flooding. The site is not located within an Environment Agency Flood Zone 2 or 3.

4.3 Geotechnical Data

Geotechnical Data presented within the Groundsure Report identifies the following potential ground hazards which are summarised in Table 4-2 below:

Table 4-2 Geotechnical Data

Hazard	Designation
Shrink-Swell Clay	Low – Ground conditions predominantly medium plasticity.
Landslides	Very Low – Slope instability problems are not likely to occur but consideration to potential problems of adjacent areas impacting on the site should always be considered.
Ground Dissolution	Negligible – Soluble rocks are not thought to be present within the ground, or not prone to dissolution.
Compressible Ground	Negligible – Compressible deposits are not thought to occur
Collapsible Deposits	Very Low – Deposits with potential to collapse when loaded and saturated are unlikely to be present
Running Sand	Majority of site: Very low – Running sand conditions are unlikely.
	Northern portion of site: Negligible – Running sand conditions are not thought to occur whatever the position of the water table. No identified constraints on lands use due to running conditions.

4.4 Mining and Ground Workings

The site is not located within an area that is affected by coal mining and therefore no Coal Authority mining report was obtained for the purposes of this report.

The Groundsure report identified two (2no.) separate records of Brit Pits (British Pits), which are surface and underground mineral workings. Both records relate to the same occurrence of mining, detailed as:

- 107m northeast 'South Leigh Gravel Pit' - Commodity: Sand and Gravel. Status is ceased; and,
- 369m east 'South Leigh Gravel Pit' – Commodity: Sand and Gravel. Status is ceased.

Fourteen (14no.) records exist for historical surface ground workings within 250m of the study site. Records relate to the ground working mentioned above, and two (2no.) ponds located 135m south (1938) and 249m east (1866).

4.5 Radon Risk Potential

The site lies within an area where less than 1% of the properties are above the Action Level. At these levels BRE publication BR211 indicates that no special radon protective measures are required in the construction of new extensions or dwellings.

4.6 Current Industrial Land Uses

The Groundsure Report identified three (3No.) current industrial land uses within a 250m radius of the subject site.

- 11m south Electricity Sub Station – *Due to the anticipated groundwater flow, low mobility of PCBs and the anticipated fine-grained soils on and surrounding the site, the electricity substation not considered to pose a significant risk to future site users and has not been considered further;*
- 121m northeast – Gas Governor, Gas Features – *As infrastructure cabinets are located within this area, it is assumed that this forms part of the current gas distribution network, and as such will be subject to regular maintenance and inspection. This has therefore not been considered further; and,*
- 192m northeast – Electricity Sub Station, Electrical Features - *Due to the distance from the site, low mobility of PCBs and the anticipated fine-grained soils on and surrounding the site, the electricity substation not considered to pose a significant risk to future site users and has not been considered further.*

4.7 Sensitive Land Uses

The Groundsure report indicates that the site is located within a currently defined Nitrate Vulnerable Zone (NVZ) of the Chichester, Langstone and Portsmouth Harbours Eutrophic Nitrate Vulnerable Zone for Eutrophic Water.

The Groundsure report identified one (1no.) record of designated Ancient & Semi-Natural Woodland 238m north of the site. No other sensitive land uses were identified.

4.7.1 Sites of Special Scientific Interest (SSSI) Impact Risk Zones

The Groundsure Report identified that the site is located within two (2no.) SSSI Impact Risk Zones associated with the Solent nutrient impact area.

The Groundsure Report states that any discharges of waste or water to ground or surface watercourses will need consultation.

4.7.2 Nitrate Vulnerable Zone (NVZ)

The site lies within the Chichester, Langstone and Portsmouth Harbours Eutrophic Nitrate Vulnerable Zone and due to site lying within a SSSI Impact Risk Zone, the nutrient contents of all discharges,

including those to the main sewer, need to be considered in combination for impacts on the surrounding area and Solent Water.

It is considered likely that a nitrate balance report will be required as part of the planning application to assess the potential risk posed from the proposed development on nitrates entering surrounding waters.

4.8 Site Sensitivity Assessment

Based on the information presented in the sections above, the site is considered as being located within a 'Low-Moderate' sensitivity setting due to the following reasons:

- Underlying Secondary A aquifer within the superficial deposits located in the north-eastern extent of the site only;
- The majority of the site is directly underlain by bedrock of the London Clay Formation which is primarily cohesive in nature and classified as Unproductive Strata;
- Site is located within a Groundwater Source Protection Zone 1c (confined aquifer) attributed to the Bedhampton and Havant Springs which abstract from the Chalk Aquifer located at depth beneath the site;
- Site within the Chichester, Langstone and Portsmouth Harbours Eutrophic Nitrate Vulnerable Zone;
- Site located within two SSSI impact risk zones;
- Designated areas of sensitive woodland within 250m;
- Low to Moderate groundwater flooding risk; and
- No groundwater or potable groundwater abstraction licences within 250m.

5 CONSULTATIONS

5.1 Contaminated Land Officer

Contact was made with Havant Borough Council via email in June 2022 regarding whether the council were aware of any environmental issues pertaining to the site.

At the time of writing a response has yet to be received and should any environmentally pertinent information be received then it will be issued as an addendum to this report.

5.2 Landfill and Waste Treatment Sites

The Groundsure Report identified no records of historic landfill sites or historic waste treatment sites within 250m of the subject site.

The Groundsure Report identified no active or recently closed licensed waste sites within 250m of the site boundary.

5.3 Potentially Infilled Land

The Groundsure report identified no area of infilled land within 250m of the site. However, a review of Section 4.4 indicates the South Leigh Gravel Pit has the potential to have been infilled as this is no longer active.

In addition, several ponds identified within the historical mapping within Section 3.1 have the potential to be infilled as they were no longer denoted on the more recent mapping.

5.4 Regulatory Database

The following information has been obtained from a commercially available environmental database. The summary table (Table 2-1) only includes records not otherwise detailed in the report. Where more than two entries have been identified, the Table summarises the closest two entries to the site.

Table 5-1 - Summary of Groundsure Data

	0-249m	250-500m	Details
Sites Determined as Contaminated Land	0	0	N/A
Control of Major Accident Hazards (COMAH)	0	0	N/A
Regulated Explosive Sites	0	0	N/A
Hazardous substance storage/usage	0	0	N/A
Historical licensed Industrial Activities (IPC)	0	0	N/A
Licensed Industrial Activities (Part A(1))	0	0	N/A
Licensed Pollutant Release (Part A(2)/B)	0	1	356m north – A current Part B Permit for Crematoria processes at The Oaks Havant Crematorium but no enforcements notified
Radioactive Substance Authorisations	0	0	N/A
Licensed discharges to controlled	1	3	129m south – Sewage discharges sewer storm

	0-249m	250-500m	Details
waters			overflow for Eastleigh Road into 'Freshwater River'. Issued 1991, revoked 1996. 433m east – Sewage discharges of final/treated effluent into 'Groundwater' issues 1994 and revoked 2005.
Pollutant release to surface water (Red List)	0	0	N/A
Pollutant Release to public sewer	0	0	N/A
List 1 Dangerous Substances	0	0	N/A
List 2 Dangerous Substances	0	0	N/A
Pollution Incidents (EA/NRW)	2	6	81m West Dated: 07/10/2022 Inert Materials and Wastes (Soils and Clays) Land Impact: Minor No impact to air or water 211m West 02/07/2001 Atmospheric Pollutants and Effects No impact to water and land Minor impact to air
Pollution Inventory Substances	0	0	N/A
Pollution Inventory Waste Transfers	0	0	N/A
Pollution Inventory Radioactive Waste	0	0	N/A

6 CONCEPTUAL SITE MODEL (CSM)

6.1 Initial CSM

In accordance with Environment Agency, CLR 11 (2004) and BSI 10175 (Code of Practice for Investigation of Potentially Contaminated Land), Omnia Environmental Consulting have developed an initial CSM to identify potential contamination sources, migration pathways and receptors within the study area. A Residential with Homegrown Produce end use has been adopted given the proposed site development.

6.1.1 On-site Potential Sources

- Partially demolished structure within north-western corner (current);
- Presumed Fly-Tipped Waste (current); and,
- Made Ground associated with the historical development on site within the north and northeast of the site (current).

6.1.2 Off-site Potential Sources

- Construction site – Adjacent to site south (current);
- 0m south and 120m east - Infilled ponds (current);
- 10m west – Unspecified pit (Historic);
- 10m north – Greenhouse (Historic);
- 107m northeast – South Leigh Gravel pit ('Old Gravel Pit') (historical).

6.1.3 Potential Pathways

- Inhalation and ingestion of impacted soils and dusts;
- Dermal contact with impacted soils;
- Inhalation of vapours;
- Vertical and lateral migration; and,
- Migration of ground gas into confined spaces.

6.1.4 Potential Receptors

- Future Site Users.
- Controlled Waters
 - Groundwater in underlying Secondary A Aquifer

Construction workers are not considered to be a plausible receptor due to management of their exposure through the use of suitable PPE and hygienic working practices as required under HSE/CDM regulations. Furthermore, the length of any exposure is very short in comparison to the criteria for which the adopted end use has been derived.

An Initial Conceptual Site Model has been prepared for the site and is presented overleaf within Table 6-1.

Table 6-1 Initial Conceptual Site Model

Source	Contaminant	Potential Migration Pathway	Potential Receptors	Likelihood of Occurrence	Magnitude of Occurrence	Overall Risk Rating	Active/Inactive
On-Site Potential Sources							
Presumed Fly-Tipped Waste (current)	Metals (As, B, Cd, Cr, Pb, Hg, Se, Ni, Zn)	Ingestion of impacted soils and dust	Future site users	Low	Moderate	Low/Moderate	Potentially Active – Further Investigation Required
		Vertical and Lateral Migration	Secondary A Aquifer	Very Low	Minor	Very Low	
		Dermal contact of impacted soils and dust	Future site users	Low	Moderate	Low/Moderate	
	Polycyclic Aromatic Hydrocarbons (PAH)	Ingestion of Impacted soils and dust	Future site users	Low	Moderate	Low/Moderate	
		Vertical and Lateral Migration	Secondary A Aquifer	Very Low	Minor	Very Low	
		Dermal contact of impacted soils and dust	Future site users	Low	Moderate	Low/Moderate	
		Inhalation of Vapours	Future site users	Low	Moderate	Low/Moderate	
	Total petroleum hydrocarbons (TPH)	Ingestion of Impacted soils and dust	Future site users	Low	Moderate	Low/Moderate	
		Vertical and Lateral Migration	Secondary A Aquifer	Low	Minor	Low	
		Dermal contact of impacted soils and dust	Future Site Users	Low	Moderate	Low/Moderate	
		Inhalation of Vapours	Future site users	Low	Moderate	Low/Moderate	

Source	Contaminant	Potential Migration Pathway	Potential Receptors	Likelihood of Occurrence	Magnitude of Occurrence	Overall Risk Rating	Active/Inactive
	Asbestos	Inhalation of fibres	Future site users	Moderate	Moderate	Moderate	
Partially demolished structure within north-eastern corner (current)	Metals (As, B, Cd, Cr, Pb, Hg, Se, Ni, Zn)	Ingestion of Impacted soils and dust	Future site users	Low	Moderate	Low/Moderate	Potentially Active – Further Investigation Required
		Vertical and Lateral Migration	Secondary A aquifer	Very Low	Minor	Very Low	
		Dermal contact of impacted soils and dust	Future site users	Low	Moderate	Low/Moderate	
	Polycyclic Aromatic Hydrocarbons (PAH)	Ingestion of Impacted soils and dust	Future site users	Low	Moderate	Low/Moderate	
		Vertical and Lateral Migration	Secondary A aquifer	Very Low	Minor	Very Low	
		Inhalation of Vapours	Future site users	Low	Moderate	Low/Moderate	
		Dermal contact of impacted soils and dust	Future site users	Low	Moderate	Low/Moderate	
	Total petroleum hydrocarbons (TPH)	Ingestion of Impacted soils and dust	Future site users	Low	Moderate	Low/Moderate	
		Vertical and Lateral Migration	Secondary A aquifer	Low	Minor	Low	
		Dermal contact of impacted soils and dust	Future site users	Low	Moderate	Low/Moderate	
		Inhalation of Vapours	Future site users	Low	Moderate	Low/Moderate	
	Asbestos	Inhalation of fibres	Future site users	Moderate	Moderate	Moderate	

Source	Contaminant	Potential Migration Pathway	Potential Receptors	Likelihood of Occurrence	Magnitude of Occurrence	Overall Risk Rating	Active/Inactive
Made ground associated with the historical development on site (current)	Metals (As, B, Cd, Cr, Pb, Hg, Se, Ni, Zn)	Ingestion of Impacted soils and dust	Future site users	Low	Moderate	Low/Moderate	Potentially Active – Further Investigation Required
		Vertical and Lateral Migration	Secondary A aquifer	Very Low	Minor	Very Low	
		Dermal contact of impacted soils and dust	Future site users	Low	Moderate	Low/Moderate	
	Polycyclic Aromatic Hydrocarbons (PAH)	Ingestion of Impacted soils and dust	Future site users	Low	Moderate	Low/Moderate	
		Vertical and Lateral Migration	Secondary A aquifer	Very Low	Minor	Very Low	
		Dermal contact of impacted soils and dust	Future site users	Low	Moderate	Low/Moderate	
		Inhalation of Vapours	Future site users	Low	Moderate	Low/Moderate	
	Total petroleum hydrocarbons (TPH)	Ingestion of Impacted soils and dust	Future site users	Low	Moderate	Low/Moderate	
		Vertical and Lateral Migration	Secondary A aquifer	Low	Minor	Low	
		Dermal contact of impacted soils and dust	Future site users	Low	Moderate	Low/Moderate	
		Inhalation of Vapours	Future site users	Low	Moderate	Low/Moderate	
	Asbestos	Inhalation of fibres	Future site users	Moderate	Moderate	Moderate	

Source	Contaminant	Potential Migration Pathway	Potential Receptors	Likelihood of Occurrence	Magnitude of Occurrence	Overall Risk Rating	Active/Inactive
Off-Site Potential Sources							
Construction site – Adjacent to site south (current)	Total petroleum hydrocarbons (TPH)	Lateral Migration (Groundwater Flow)	Future site users	Low	Moderate	Low/Moderate	Inactive – Given the anticipated direction of groundwater flow and the gradient of the site it is considered unlikely to pose potential risk for future site user
	Polycyclic Aromatic Hydrocarbons (PAH)	Lateral Migration (Groundwater Flow)	Future site users	Low	Moderate	Low/Moderate	
	Metals (As, B, Cd, Cr, Pb, Hg, Se, Ni, Zn)	Lateral Migration (Airborne Dust)	Future site users	Low	Moderate	Low/Moderate	Potentially Active – Further Investigation Required
0m south and 120m east - Infilled ponds (current)	Ground gas (CH ₄ and CO ₂)	Lateral Migration (Gas ingress)	Future site users	Low	Moderate	Low/Moderate	Potentially Active – Further Investigation Required
10m west – Unspecified pit (Historic)	Ground gas (CH ₄ and CO ₂)	Lateral Migration (Gas ingress)	Future site users	Low	Moderate	Low/Moderate	Potentially Active – Further Investigation Required
10m north – Greenhouse (Historic)	Pesticides and herbicides	Lateral Migration (Groundwater Flow)	Future site users	Low	Moderate	Low/Moderate	Potentially Active – Further Investigation Required
	Heavy metals (Pb, As)	Lateral Migration (Airbourne Dust)	Future site users	Low	Moderate	Low/Moderate	
	Polycyclic Aromatic Hydrocarbons (PAH)	Lateral Migration (Groundwater Flow)	Future site users	Low	Moderate	Low/Moderate	
South Leigh Gravel Pit –107m northeast (Historic)	Total petroleum hydrocarbons (TPH)	Lateral Migration (Groundwater Flow)	Future site users	Low	Moderate	Low/Moderate	Potentially Active – Further Investigation Required
	Polycyclic Aromatic Hydrocarbons	Lateral Migration (Groundwater Flow)	Future site users	Very Low	Moderate	Low	

Source	Contaminant	Potential Migration Pathway	Potential Receptors	Likelihood of Occurrence	Magnitude of Occurrence	Overall Risk Rating	Active/Inactive
	(PAH)						
	Metals (As, B, Cd, Cr, Pb, Hg, Se, Ni, Zn)	Lateral Migration (Airbourne dust)	Future site users	Very Low	Moderate	Low	

7 SITE INVESTIGATION

7.1 General

A ground investigation was designed based on your requirements and the proposed site development as shown in Figure 2.0 (Appendix III).

Following completion of the desk study and a review of the available data, ground investigation works were required on site to investigate the potential for impacted materials to be present on-site from identified on-site and nearby off-site potential sources.

Exploratory fieldwork was conducted over three (3no.) working days, commencing on 11th May 2022 and comprised the following:

Table 7-1 Site Investigation Summary

Potential Source/Rationale	Location Hole	Type	Maximum Depth (m bgl)	Borehole Response Zone (m bgl)
To investigate the soils beneath the proposed care home and obtain in-situ geotechnical data for foundation design. To collect soil samples for subsequent geotechnical laboratory analysis.	CP101	Cable Percussive Borehole	20.00	N/A
To investigate the soils beneath the proposed care home and obtain in-situ geotechnical data for foundation design. To collect soil samples for subsequent geotechnical laboratory analysis.	CP102		20.00	
To investigate the potential for on-site migration of contamination from the construction site located to the south and the infilled ponds to the east. To collect soils samples for subsequent laboratory analysis.	WS101	Window Sample Borehole	4.00	N/A
To investigate the soils beneath the areas that are proposed to be vegetable gardens as per the proposed development. To collect soil sample for subsequent laboratory analysis. To install a gas and groundwater monitoring well to investigate the potential for gas ingress from the historical infilled pond to the south of the site.	WS102		2.90	0.90-2.90
To investigate the soils beneath the large structure of the proposed development, to obtain in-situ geotechnical data for foundation design. To collect soil samples for subsequent laboratory analysis.	WS103		2.60	N/A

Potential Source/Rationale	Location Hole	Type	Maximum Depth (m bgl)	Borehole Response Zone (m bgl)
To investigate the area near the disused structure in the northwest of site for potential contamination. To install a gas monitoring well to investigate the potential for gas ingress from the historical gravel pit to the west. To collect soil samples for subsequent laboratory analysis.	WS104		4.00	0.70-3.70
To investigate the potential for contamination from the historical access track and structures located within the north-eastern extent of the site. To collect soil samples for subsequent laboratory analysis. To install a gas monitoring well to investigate the potential for gas ingress from the historical gravel pit to the east.	WS105		1.20	0.5-1.00
To investigate the potential for contamination from the historical access track and structures located within the north-eastern extent of the site. To collect soil sample for subsequent laboratory analysis.	WS106		1.40	N/A
To assist with road design for the proposed scheme.	DCP101	Dynamic Cone Penetrometer (DCP)	0.614	N/A
	DCP102		0.617	
	DCP103		0.611	
	DCP104		0.603	

The exploratory hole locations are illustrated on Figure 3.0 (Appendix III). The ground conditions encountered are indicated on the exploratory hole logs, which are provided in Appendix VI.

7.2 Scope Adjustments

Early Standard Penetration Testing (SPT) refusals were encountered within four (4no.) window sample locations (WS102, WS103, WS105 and WS106). As such, the target depth of 4.00m bgl was not achieved in these locations.

7.3 Laboratory Analysis

Selected soil samples were submitted for a range of chemical analysis including:

- Asbestos screen;
- Asbestos Quantification;
- CLEA Heavy Metals Suite;
- Speciated Polycyclic Aromatic Hydrocarbons (PAH);
- Banded Total Petroleum Hydrocarbons (TPH);
- pH and Soluble Sulphate;
- Total Cyanide;
- Phenol;

Element Materials Technology of Deeside undertook the analytical work in accordance with UKAS accreditation where applicable and the laboratory analysis certificates are presented as Appendix VII and discussed in Section 9.

Selected soil samples were submitted to I2 Analytical for a range of geotechnical testing, in accordance with UKAS methodology where applicable, comprising:

- Particle Size Distribution (PSD);
- pH and Soluble Sulphate;
- Quick Undrained Triaxial Testing;
- Atterberg Limits; and,
- Moisture Content.

The geotechnical analysis certificates are presented in Appendix IX.

7.4 Ground Gas and Groundwater Monitoring

Concentrations of methane (CH₄), carbon dioxide (CO₂) and oxygen (O₂) were measured using an infrared gas analyser (GA5000), calibrated to a reference standard (before and after each survey) and gas flow rates were measured using an internal flow pod.

Gas concentrations were recorded at thirty second intervals until gas concentrations stabilised for three (3no.) consecutive readings (a minimum of ninety seconds) at each location, at which point the maximum concentrations of CH₄ and CO₂, together with the lowest concentration of O₂ were recorded.

Groundwater monitoring was undertaken using an electronic dip tape to record the depth to groundwater. Ground gas and groundwater results are presented in Section 8.3.3 and discussed in Section 9.3.

8 GROUND AND GROUNDWATER CONDITIONS

8.1 Summary of Ground Conditions

British Geological Survey Map (Sheet 316, Fareham, and Havant, Solid and Drift Edition at a scale of 1:50,000, 1998) indicates that the superficial Head Deposits (Clay, Silt, Sand and Gravel) are located within the north-eastern extent of the site, with the remainder of the site directly underlain by bedrock of the London Clay Formation (Clay, Silt and Sand).

Geology encountered on site generally corresponds with that highlighted within BGS Mapping. However, superficial Head Deposits were encountered site wide. The findings of the intrusive works are summarised below.

8.1.1 Made Ground

Made Ground was encountered within three (3no.) locations (WS103, WS104, WS106) to a maximum depth of 0.56m bgl (WS106). Made ground typically comprised grass over greyish brown slightly sandy gravelly dry and friable CLAY with rare cobbles, roots, and rootlets. Sand was fine to medium. Gravel was angular to subrounded fine to coarse brick and flint. Cobbles were angular brick.

The base of the Made Ground was proven in all intrusive locations.

8.1.2 Topsoil

Topsoil was encountered within five (5no.) locations (CP101, CP102, WS101, WS102, WS105) to a maximum depth of 0.40m bgl (CP102). Topsoil typically comprised grass over greyish brown slightly sandy, slightly gravelly dry and friable CLAY with varying root amounts. Sand is fine to medium. Gravel is sub-angular to rounded fine to coarse flint.

The base of the Topsoil was proven in all intrusive locations.

8.1.3 Superficial Deposits

8.1.3.1 Head Deposits

Head Deposits were encountered within all eight (8no.) locations (CP101-CP102 and WS101-WS106) beneath the Topsoil/Made Ground.

In the shallower deposits these typically comprised soft orangish brown mottled brown and light grey slightly sandy gravelly CLAY or slightly sandy clayey GRAVEL. Sand was fine to medium. Gravel was subangular to rounded fine to coarse flint.

The base of the Head Deposits was proven at six (6no.) locations (CP101, CP102, WS101-WS104) between depths of 1.80m bgl (WS103) and 3.60m bgl (CP101). Due to early terminations, the base of the Head Deposits was not proven within locations WS105 and WS106.

8.1.4 Bedrock Deposits

8.1.4.1 London Clay Formation

Soils attributed to bedrock of the London Clay Formation were encountered within six (6no.) locations (CP101, CP102, WS101-WS104) beneath the Head Deposits. Within the window sample boreholes this

typically firm to stiff comprised brown mottled orangeish brown and grey slightly sandy CLAY. Sand was fine. Within the shallow soils of cable percussive boreholes, this was recovered as firm orangish brown mottled grey and light grey slightly sandy slightly gravelly CLAY. From 2.40 and 3.60m bgl the London Clay Formation was typically recovered as stiff bluish grey and dark grey CLAY with occasional fine sand bands within the CLAY.

The base of the bedrock was not proven within any intrusive location during the course of the ground investigation.

8.1.5 Groundwater Conditions

Groundwater strikes were encountered in three (3no.) locations during works, as summarised Table 8-1.

Table 8-1 Summary of Groundwater Conditions

Location	Depth (m bgl)	Strata	Type of Water Strike
CP101	6.00	London Clay Formation	Water strike
CP101	17.00	London Clay Formation	Water strike
CP102	5.40	London Clay Formation	Water strike
WS104	2.40 rising to 2.50	Head Deposits	Water strike

8.2 Laboratory Classification Analysis

Soil classification testing, including Atterberg Limits, Moisture Content, Particle Size Distribution and pH and Sulphate results are summarised in Table 8-2 – Table 8-5 with analysis certificates presented in Appendix VIII.

8.2.1 Soil Plasticity

Seven (7no.) samples taken from cohesive deposits across the site were submitted to the laboratory for laboratory plasticity analysis. The results of this analysis have been summarised in Table 8-2 below.

Table 8-2. Summary of Soil Plasticity

Location	Depth (m bgl)	Geology	Strata	Natural Moisture Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Percentage passing 425µm sieve	Modified Plasticity Index	Plasticity	Volume Change Potential
WS101	2.80 - 3.00	Clay	LCF	28	65	26	39	100	39	High	Medium
WS102	1.50- 1.70	Clay	HD	27	69	26	43	100	43	High	High
WS104	2.70 – 2.80	Clay	LCF	27	72	26	46	100	46	Very High	High
CP101	0.50	Clay	HD	29	67	25	42	100	42	High	High
CP101	14.50	Clay	LCF	21	50	21	29	100	29	High	Medium
CP102	9.50	Clay	LCF	29	70	25	45	100	45	High	High
CP102	16.00	Clay	LCF	24	50	20	30	100	30	High	Medium

*HD = Head Deposits; LCF = London Clay Formation

The results presented in Table 8-2 indicate that the plasticity of clay on site is High to Very High. The volume changes potential ranges from Medium to High.

8.2.2 Particle Size Distribution Analysis

Two (2no.) soil samples were submitted to the laboratory for Particle Size Distribution (PSD) analysis, with the results presented below in Table 8-3. The results are consistent with the on-site observations and descriptions.

Table 8-3. Summary of Particle Size Distribution

Location	Depth (m bgl)	Granulometric Composition (%)				
		Laboratory Description	Fines (<0.063mm)	Sand	Gravel	Cobbles
CP101	0.80-1.20	Sandy clayey GRAVEL with cobbles	24	11	52	13
CP102	4.50 – 5.00	Slightly sandy CLAY	97	3	0	0

8.2.3 Moisture Content

Seven (7no.) samples taken from deposits across the site were submitted to the laboratory for moisture content analysis. The results of this analysis have been summarised in Table 8-4 below.

Table 8-4. Summary of Moisture Content

Location	Depth (m bgl)	Natural Moisture Content (%)	Lab Description
WS101	2.00 - 3.00	28	Clay
WS102	1.50-1.70	27	Clay
WS104	2.70 – 2.80	27	Clay
CP101	0.50	29	Clay
CP101	14.50	21	Clay
CP102	9.50	29	Clay
CP102	16.00	24	Clay

8.2.4 pH and Sulphate

Chemical analysis for pH and soluble sulphate content are summarised in Table 8-5 and Table 8-6 below with analysis certificates presented as Appendix VII and IX.

Table 8-5. Summary of pH and Sulphate Data for Topsoil/Made Ground and Head Deposits

Location	Depth (m bgl)	Strata	SO ₄ in 2:1 water / soil (mg/l)	pH Value
WS101	0.10-0.20	Topsoil	4.1	7.37
WS102	1.50-1.70	Head Deposits	88.0	7.5
WS102	0.70-0.80	Head Deposits	9.8	7.56
WS103	0.10-0.30	Made Ground	3.3	7.32
WS104	0.20-0.30	Made Ground	2.1	6.68
WS105	0.60-0.70	Head Deposits	15.7	7.68
WS106	0.20-0.40	Made Ground	28.1	6.74

Location	Depth (m bgl)	Strata	SO ₄ in 2:1 water / soil (mg/l)	pH Value
CP101	0.50-0.60	Head Deposits	23.5	8.19
CP102	1.10-1.20	Head Deposits	11.1	7.98

The shallow soils (<2.00m bgl) including Topsoil, Made Ground and Head Deposits have been assessed against brownfield locations. Due to the size of the dataset (9no. samples), characteristic pH and SO₄ values were calculated using the mean of the highest two sulphate results and the mean of the lowest two pH results as stated in the BRE Special Digest (2005) producing a site characteristic value for sulphate of 58 mg/l and a pH value of 6.71.

The site has been classified as DS-1, Aggressive Chemical Environmental for Concrete Classification (ACEC) AC-1 for brownfield locations as per table C1 in BRE Special Digest (2005).

Table 8-6 pH and Sulphate data for the London Clay Formation

Location	Depth (m bgl)	SO ₄ in 2:1 water / soil (mg/l)	pH Value
WS104	2.70-2.80	31.0	7.1
CP101	14.50	270	8.1
CP102	4.50-5.0	320	8.2
CP102	9.50	250	8.4
CP102	16.00	350	8.3

For London Clay Formation, due to the size of the dataset (5no. samples), characteristic pH and SO₄ values were calculated using the mean of the highest two sulphate results and the mean of the lowest two pH results as stated in the BRE Special Digest (2005) producing a site characteristic value for sulphate of 335 mg/l and a pH value of 7.6.

The site has been classified as DS-1, Aggressive Chemical Environmental for Concrete Classification (ACEC) AC-1 for greenfield locations as per table C1 in BRE Special Digest (2005).

8.2.5 Undrained Shear Strength

Two (2no.) samples of the London Clay Formation were scheduled to undergo laboratory unconsolidated undrained triaxial compression testing (UUT). The results are presented within Appendix IX and summarised below.

Table 8-7 Summary of Triaxial Compression Testing Results

Location	Depth (m bgl)	Bulk Density (Mg/m ³)	Moisture Content (%)	Dry Density (Mg/m ³)	Undrained Shear Strength (kPa)	Mode of Failure
CP101	10.50 – 10.95	2.01	28	1.57	95	Compound
CP102	13.50	2.11	21	1.75	209	Compound

8.3 In-Situ Testing

8.3.1 Standard Penetration Tests (SPT)

Standard Penetration Tests (SPT) were carried out in all windowless sampling and cable percussive boreholes in accordance with techniques outlined in BS1377, to assess the strength/density of the

underlying strata. The 'N' value (number of blows per 300mm penetration) was recorded for each test. The results of these in-situ tests, including full blow counts, are presented on the borehole logs within Appendix VI.

8.3.2 Dynamic Cone Penetrometer (DCP) Testing

In-situ California Bearing Ratio (CBR) values for near surface strata were obtained via Dynamic Cone Penetrometer (DCP) testing and were undertaken at four (4no.) locations within locations DCP101 – DCP104 in areas of proposed access infrastructure, as presented on Figure 3.0, Appendix III. The results are summarised in Table 8-8 below with CBR values of underlying strata provided.

The DCP results sheets are included within Appendix IX. CBR results have been given from the blow counts across the strata tested, abnormally high blow counts are likely attributed from larger granular material within the strata and have been excluded as they are not considered to be representative.

Table 8-8. Summary of In-situ CBR Results

Location	Depth (mm bgl)	CBR Value (%)
DCP101	30 – 300	9.3
	300 – 533	21.3
DCP102	52 – 300	3.8
	300 – 536	11.8
DCP103	124 – 300	8.5
	300 - 530	7.5
DCP104	39 – 300	23.2
	300 - 522	55.9

An average estimated CBR value range between 7.5% and 55.9% have been determined using the DCP over the depth range of ~300~600mmbgl. Therefore, adopting a conservative approach, it is recommended that a CBR design value of 7.5% should be adopted across site for pavement design between ~300- ~600mmbgl.

Notwithstanding these results, confirmatory CBR testing should be carried out at formation level once details are finalised.

8.3.3 Ground Gas

Three (3no.) ground gas monitoring visits have been undertaken across three (3no.) monitoring wells at the site between 17/05/2022 and 30/05/2022. The results of the gas monitoring are presented in Table 8-9 overleaf.

Table 8-9. Summary of Ground Gas and Groundwater Monitoring Results

Well	Date	CH ₄ Peak %v/v	CH ₄ Steady %v/v	CH ₄ GSV l/hr	CO ₂ Peak %v/v	CO ₂ Steady %v/v	CO ₂ GSV l/hr	O ₂ %v/v	Atmos (mb)	Atmos. Dynamic	Flow (l/hr)	Depth to Base (m bgl)	Depth to Water (m bgl)
WS102	17/05/2022	<0.1	<0.1	0.0002	1.90	1.90	0.0038	19.1	1016	Rising	0.2	2.81	Dry
	26/05/2022	<0.1	<0.1	0.0001	2.20	2.20	0.0022	19.1	1020	Rising	<0.1	2.82	2.63
	30/05/2022	0.10	<0.1	0.0001	2.20	2.20	0.0022	19.3	1011	Falling	<0.1	2.82	2.49
WS104	17/05/2022	<0.1	<0.1	0.0001	0.70	0.70	0.0007	19.7	1017	Rising	<0.1	3.5	0.95
	26/05/2022	<0.1	<0.1	0.0001	0.80	0.80	0.0008	19.9	1021	Rising	<0.1	3.37	0.88
	30/05/2022	0.10	0.10	0.0001	0.90	0.90	0.0009	20.4	1010	Falling	<0.1	3.32	0.93
WS105	17/05/2022	<0.1	<0.1	-0.0002	1.30	1.30	-0.0026	19.5	1017	Rising	-0.2	0.81	Dry
	26/05/2022	<0.1	<0.1	0.0001	1.20	1.20	0.0012	19.7	1021	Rising	<0.1	0.81	Dry
	30/05/2022	0.10	0.10	0.0001	1.20	1.20	0.0012	20.3	1010	Falling	<0.1	0.82	Dry

9 TIER 1 QUALITATIVE CONTAMINATED LAND RISK ASSESSMENT

Omnia has undertaken a Tier 1 qualitative risk assessment to determine if any potential contaminants within the underlying soils pose an unacceptable level of risk to the identified receptors.

9.1 Human Health Risk Assessment

At a Tier 1 stage the long term (chronic) human health toxicity of the soil has been assessed by comparing the on-site concentrations of organic and inorganic compounds with reference values published by the EA (Contaminated Land Exposure Assessment (CLEA) Soil Guideline Values (SGV)) and where absent, Generic Assessment Criteria (GACs) published by LQM/CIEH Suitable for Use Levels (S4UL) 2015. Based on the proposed development comprising a residential care home, with soft landscaping areas, Omnia has adopted screening values for a residential end use with home grown produce. The origin of the GAC values are presented within Appendix VIII.

The results of this comparison have been summarised within Table 9-1.

Table 9-1. Summary of Inorganic and Hydrocarbon Toxicity Assessment for a Residential End Use with Home Grown Produce

Determinant	Units	GAC	n	MC	Loc. of Ex	Pathway	Assessment
Inorganic (Metals)							
Arsenic	mg/kg	37	8	12.6	N/A	1	No Further Action
Beryllium	mg/kg	1.7	8	1.7	N/A	1	No Further Action
Boron	mg/kg	290	8	2.5	N/A	1	No Further Action
Cadmium	mg/kg	11	8	0.7	N/A	1	No Further Action
Chromium (III)	mg/kg	910	8	95.4	N/A	1	No Further Action
Chromium (VI)	mg/kg	6	8	<0.3	N/A	1	No Further Action
Copper	mg/kg	2,400	8	48	N/A	1	No Further Action
Lead	mg/kg	200	8	390	WS104 0.20-0.30	1	Further Assessment Required
Mercury	mg/kg	40	8	0.2	N/A	4	No Further Action
Nickel	mg/kg	180	8	23.6	N/A	1	No Further Action
Selenium	mg/kg	250	8	2	N/A	1	No Further Action
Zinc	mg/kg	410	8	458	WS104 0.20-0.30	1	Further Assessment Required
Vanadium	mg/kg	3,700	8	124	N/A	1	No Further Action
General (Inorganics)							
Total Cyanide*	mg/kg	50	8	<0.5	N/A	1	No Further Action
Asbestos	%	<0.001% (Chrysotile)	8	0.001%	WS106 0.20-0.40	6	Further Assessment Required
(General Organics)							
Phenol	mg/kg	280	8	<0.15	N/A	1	No Further Action
Polycyclic Aromatic Hydrocarbons (PAH)							
Naphthalene	mg/kg	2.3	8	0.86	N/A	4	No Further Action
Acenaphthylene	mg/kg	170	8	3.99	N/A	1	No Further Action
Acenaphthene	mg/kg	210	8	0.49	N/A	1	No Further Action
Fluorene	mg/kg	170	8	3.85	N/A	1	No Further Action
Phenanthrene	mg/kg	95	8	40.2	N/A	1	No Further Action
Anthracene	mg/kg	2,400	8	16.87	N/A	1	No Further Action

Flouranthene	mg/kg	280	8	43.7	N/A	1	No Further Action
Pyrene	mg/kg	620	8	35.41	N/A	1	No Further Action
Benzo(a)Anthracene	mg/kg	7.2	8	24.33	WS104 0.20-0.30	1	Further Assessment Required
Chrysene	mg/kg	15	8	21.87	WS104 0.20-0.30	1	Further Assessment Required
Benzo(b)Fluoranthene	mg/kg	2.6	8	22.01	WS104 0.20-0.30	1	Further Assessment Required
Benzo(k)Fluoranthene	mg/kg	77	8	8.56	N/A	1	No Further Action
Benzo(a)Pyrene	mg/kg	2.2	8	17.51	WS104 0.20-0.30	1	Further Assessment Required
Indeno(123-cd)Pyrene	mg/kg	27	8	9.81	N/A	1	No Further Action
Dibenzo(a,h)Anthracene	mg/kg	0.24	8	0.14	N/A	1	No Further Action
Benzo(ghi)Perylene	mg/kg	320	8	8.85	N/A	1	No Further Action
Banded Total Petroleum Hydrocarbons (TPH)							
TPH EC 5-6**	mg/kg	42	8	0.2	N/A	4	No Further Action
TPH EC >6-8**	mg/kg	100	8	0.2	N/A	4	No Further Action
TPH EC >8-10**	mg/kg	27	8	<5	N/A	4	No Further Action
TPH EC >10-12**	mg/kg	74	8	<10	N/A	4	No Further Action
TPH EC >12-16**	mg/kg	140	8	14	N/A	4	No Further Action
TPH EC >16-21**	mg/kg	260	8	75	N/A	2	No Further Action
TPH EC >21-35**	mg/kg	1,100	8	351	N/A	1	No Further Action
TPH EC >35-44**	mg/kg	1,100	8	27	N/A	1	No Further Action

Notes

Main Exposure Pathways: 1 = Ingestion of Soil & Indoor Dust, 2 = Consumption of Homegrown Produce & Attached Soil; 3 = Dermal Contact (Indoor & Outdoor); 4 = Inhalation of Vapour (Indoor & Outdoor); 5 = Inhalation of Dust (Indoor & Outdoor), 6 = Inhalation of Fibres

Abbreviations: GAC = General Assessment Criteria, n = number of samples, MC = Maximum Concentration; Loc of Ex = Location of Exceedance.

Total cyanide Tier 1 GAC is taken from the Dutch Intervention Value (2010) for complex cyanide.

** The Tier 1 GAC for the banded hydrocarbon fraction is derived from the CIEH/S4UL assessment for petroleum hydrocarbons Criteria Working Group (CWG) for both aliphatic and aromatic compounds. Omnia has utilised the lowest of the aliphatic and aromatic chain lengths in order to adopt a conservative approach, which is considered satisfactory for the protection of human health.

(sol) – GAC presented exceeds the solubility saturation limit.

(vap) – GAC presented exceeds the vapour saturation limit.

Referring to Table 9-1 above, the results of the direct comparison indicate there have been exceedances of the adopted Tier 1 screening Criteria for the following determinants.

Heavy Metals

- Lead (WS104 @ 0.20 – 0.30m bgl); and,
- Zinc (WS104 @ 0.20-0.30m bgl).

Asbestos

- Chrysotile - 0.001% (WS106 @ 0.20 – 0.40m bgl)

PAH

- Benzo(a)Anthracene (WS104 @ 0.20-0.30m bgl);
- Chrysene (WS104 @ 0.20-0.30m bgl);
- Benzo(b)Fluoranthene (WS104 @ 0.20-0.30m bgl); and,
- Benzo(a)Pyrene (WS104 @ 0.20-0.30m bgl).

9.1.1 Discussion of Tier 1 Risk Assessment

9.1.1.1 Asbestos

Eight (8no.) samples were screened for the presence of asbestos fibres during the investigation. One (1no.) sample from the Made Ground within WS106 at a depth of 0.20 – 0.40m bgl tested positive for the presence of chrysotile fibre bundles. The sample was subject to asbestos fibre quantification, which yielded a concentration of 0.001%. The main exposure pathway for asbestos fibres is the inhalation of fibres. As soft landscaping is proposed on site, a potential pathway is likely to remain active for future site users post-development. As such, it is recommended that further investigation is undertaken within the vicinity of WS106 to delineate the lateral extent of soils impacted by asbestos.

9.1.1.2 Heavy Metals and PAH

Two (2no.) heavy metal and four (4no.) PAH exceedances have been identified within near surface Made Ground (0.20-0.30m bgl) at location WS104. The main exposure pathway for these PAHs is via the ingestion of soil & indoor dust. As soft landscaping is proposed on site, a potential exposure pathway is likely to remain active for future site users post-development. As such, it is recommended that further investigation is undertaken within the vicinity of WS104 to delineate the lateral extent of soils impacted by heavy metals and PAH.

9.2 Controlled Waters Assessment

The site is considered to present a low to medium risk to controlled waters for the following reasons:

- Superficial Head Deposits encountered across the site which are classified as a Secondary A Aquifer;
- Site located within a Source Protection Zone 1c for the Bedhampton & Havant Springs which are fed by groundwater from the confined Principal Chalk Aquifer;
- Fine-grained soils of the London Clay Formation classified as Unproductive Strata have been proven to a depth of at least 20.00m bgl, and are considered to act as a protective aquitard and prevent the vertical migration of contaminants into the deeper underlying Chalk Aquifer; and,
- Concentrations detected within the Tier I human health risk assessment are generally low and suggestive of natural background concentrations. However, where elevated concentrations have been identified, the elevated concentrations comprise, Lead, Zinc, PAHs and long-chain length hydrocarbons within near surface soils, all of which are generally of a low-mobility and as such are not considered to have the potential to present a significant risk to controlled

waters.

9.3 Ground Gas Assessment

The potential impact on the development from ground gases has been assessed with reference to standards and guidelines published in CIRIA Report C665 (*Assessing risks posed by hazardous ground gases to buildings*, 2007). However, it is recommended that the full ground gas assessment and any recommended protection measures are agreed with the local authority prior to the adoption of any protection measures on-site. Furthermore, the installation of any gas protection measures should be validated by a suitably qualified engineer.

The results of the ground gas monitoring and calculated Gas Screening Values (GSVs) are presented in Table 8-9.

Three (3no.) ground gas monitoring visits have been undertaken at locations WS102, WS104 and WS105. CH₄ concentrations were recorded to a maximum concentration of 0.10% v/v at all locations. CO₂ concentrations were recorded to a maximum of 2.20% v/v at location WS102. Ground gas flow rates were recorded across the site, with a maximum flow rate of 0.20l/hr recorded at WS102.

In accordance with the methodology outlined within the CIRIA publication C665, Omnia have utilised the results of the ground gas monitoring surveys to calculate a tentative Gas Screening Value (GSV). The maximum GSV calculated for methane was 0.0002 l/hr whilst the maximum GSV for carbon dioxide was 0.0038 l/hr.

It is understood that the proposed development is for a residential end use with home grown produce comprising a 64-bed residential care home, including the construction of a new road, car/cycle parking, drainage works, hard/soft landscaping and other associated infrastructure.

Therefore, the proposed development is assessed as a **Type B** building under BS8485:2015+A1(2019).

9.3.1 BS 8485:2015+A1(2019) – Type B Building – Private property with central building management

Guidance set out in BS 8485(2015)+A1(2019), which is equivalent to the Characteristic Situations of the modified Wilson & Card classification established in CIRIA Publication C665, stipulates a site characteristic GSV of <0.07 l/hr, with typical permissible concentrations of 1%v/v (CH₄) and 5% v/v (CO₂), for classification as Characteristic Situation 1 (CS-1); a very low hazard potential.

The maximum recorded concentrations of CH₄ were 0.10% v/v with a GSV of 0.0002 l/hr and for CO₂ a maximum concentration of 2.20% v/v with a GSV of 0.0038 l/hr. Both maximum concentrations and GSV's fall below the maximum permissible GSV of 0.16 l/hr (CH₄) and 0.78 l/hr (CO₂) for a characteristic Situation 1 (CS1) classification.

The site is therefore classified as a Characteristic Situation 1 (CS1), and as such no special ground gas protection measures are required for the proposed development.

10 REVISED CONCEPTUAL SITE MODEL

Following completion of the Tier 1 risk assessment active pollution pathways have been identified based on a residential end use with homegrown produce.

Table 10-1 Revised Conceptual Site Model

Source	Potential Migration Pathway	Potential Receptors	Discussion of Pollutant Linkage
Elevated concentrations of Heavy Metals and PAHs within near surface Made Ground at location WS104 (0.20 – 0.30m bgl)	Ingestion of impacted soils and indoor dust	Future Site users	Elevated concentrations of Heavy Metals (Zinc and Lead) and PAHs (Benzo(a)Anthracene, Chrysene, Benzo(b)Fluoranthene and Benzo(a)Pyrene) were identified in near surface Made Ground at location WS104 at a depth of 0.20-0.30m bgl. The near surface Made Ground at this location are therefore considered to have the potential to pose a significant risk to human health. As soft landscaping is proposed on site, the exposure pathway is considered likely to remain active post-development. At this stage it is recommended that further investigation is undertaken in areas where elevated concentrations have been identified (WS104) to determine the lateral extent of near surface soils impacted by elevated concentrations of Heavy Metals and PAH. Once this has been completed remediation may be required within the areas of future soft landscaping. Remedial works should be detailed within a standalone Remediation Method Statement (RMS) which should be submitted to and agreed by the local authority prior to commencement of works.
Chrysotile fibres (0.0001%) identified within WS106 at 0.20-0.40m bgl	Inhalation of fibres	Future Site Users Construction Workers	The presence of asbestos fibres within near surface Made Ground at location WS106 is considered to have the potential to present a significant risk to future site users as soft landscaping is proposed where it is considered likely that an active exposure pathway will remain active post-development. At this stage it is recommended that further investigation is undertaken within WS106 to determine the lateral extent of Made Ground impacted by elevated concentrations of asbestos. Once this has been completed remediation may be required within the areas of future soft

Source	Potential Migration Pathway	Potential Receptors	Discussion of Pollutant Linkage
			landscaping. Remedial works should be detailed within a standalone Remediation Method Statement (RMS) which should be submitted to and agreed by the local authority prior to commencement of works. In addition, asbestos is considered to have the potential to present a significant risk to workers during the construction phase and as such this report should be provided to the principal contractor. A risk assessment should be prepared, in line with the Control of Asbestos Regulations (2012) for tasks due to be undertaken in the affected area prior to the construction phase to ensure the provision of suitable PPE and mitigation measures.

11 GEOTECHNICAL ASSESSMENT

11.1 Proposed Development

It is understood that Highwood Group is proposing to develop the above site from existing gardens to grounds for a 64-bed residential care home, including the construction of a new road, car/cycle parking, drainage works, hard/soft landscaping and other associated infrastructure

The outline proposed site layout is presented as Figure 2.0 (Appendix III).

11.2 Site Preparation

The site should be cleared of any vegetation below the areas of proposed development and stripped in accordance with [Series 200 of Specification of Highway Works](#).

Any roots present below the footprint of proposed structures and infrastructure should be grubbed out and the resulting voids in-filled with suitable compacted material. This should also be undertaken for any redundant or re-routed services.

11.3 Ground Profile

Based on the findings on the current ground investigation, ground conditions at the site comprise Topsoil or Made Ground overlying superficial deposits of Head Deposits, further underlain in some locations by bedrock attributed to London Clay Formation to the full depth of the ground investigation, discussed in 8.1. Site ground conditions are summarised in Table 11-1.

Table 11-1 Summary of site ground conditions

Borehole	Topsoil/Made Ground Thickness (m)	Superficial Deposits	Bedrock	Groundwater (m bgl)
		Head Deposits Thickness (m)	London Clay Formation Thickness (m)	
CP101	0.30	2.00	17.60*	6.0 and 17.0
CP102	0.40	2.00	17.60*	5.40
WS101	0.30	1.60	2.10*	N/A
WS102	0.30	1.80	0.80*	N/A
WS103	0.30	1.70	0.60*	N/A
WS104	0.35	2.20	1.45*	2.50 rising to 2.40
WS105	0.35	0.85*	N/A	N/A
WS106	0.56	0.84*	N/A	N/A

*Thickness not proven

11.4 Shallow Foundations

The following geotechnical assessment has been undertaken based on in-situ testing, laboratory analysis, and descriptions on the underlying geology. Foundation depths presented are indicative only based on a minimum presumed bearing value for a particular foundation type. Line loadings have not been made available such that the final depth and type of foundation required following design could vary.

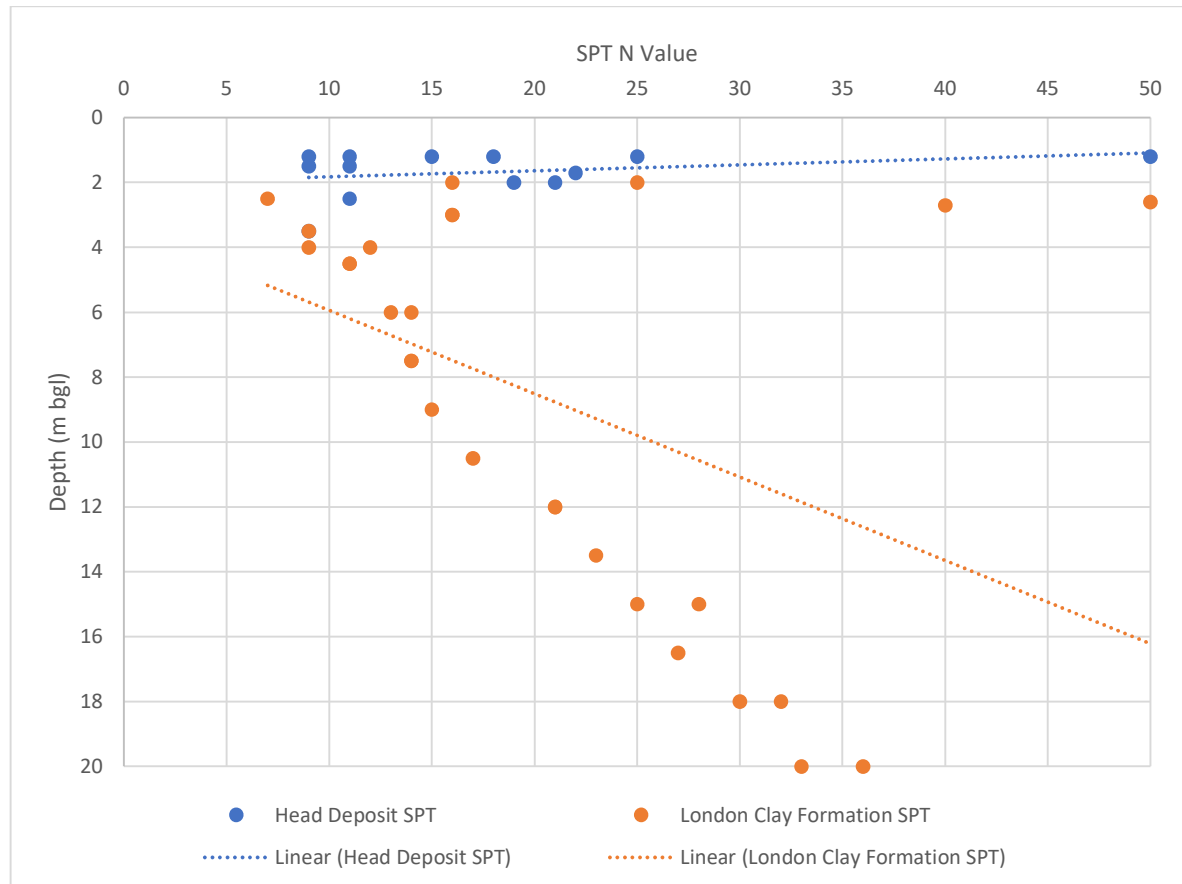
It is considered that Topsoil/Made Ground would not form a suitable founding stratum due to characteristic variability and the associated potential for differential settlement. As such it is

recommended that loads are transferred through the Topsoil/Made Ground to a depth at which competent geology, sufficient to support the proposed load, is encountered.

11.4.1 In Situ-Testing

Standard Penetration Testing was undertaken throughout the Head Deposits and the London Clay Formation. The results are presented in **Error! Reference source not found.** below:

Graph 11-1 SPT vs Depth



The SPT data shows variability within the N-values across Head Deposits, ranging from N=7 at 2.50m bgl to N=50 at 1.20, 1.40 and 2.60m bgl. The N-value generally shows an increase in N-values with depth ranging between N=7 at 2.50m bgl to N=50 at 2.40mbgl for the London Clay Formation.

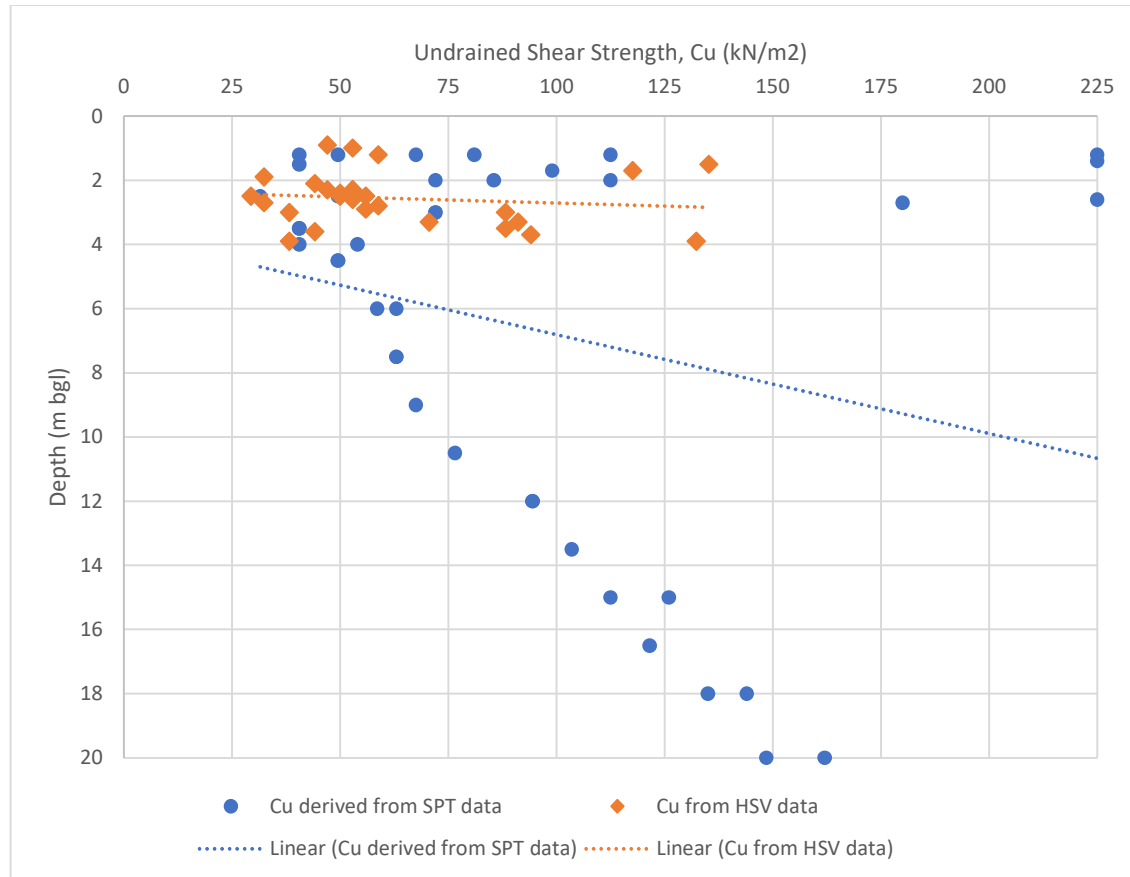
11.4.2 Shear Strength

The undrained Shear Strength of the fine-grained deposits on site have been determined by using the widely accepted empirical relationship, where f_1 is based on the correlation factor based on the plasticity index of the soil (Stroud, 1974):

$$C_u = f_1 \times SPTN$$

Using a correlation factor of 4.5 gives characteristic undrained shear strengths (C_{uk}) of 32kN/m^2 at 2.50m bgl rising to 225kN/m^2 at a depth of 2.40m bgl , represented in Graph 11.2 below. These values are consistent with the formation becoming low to high strength material.

Graph 11-2 Shear Strength vs Depth



11.4.3 Bearing Capacities

11.4.3.1 Head Deposits

Indicative Bearing Capacity at 1.20m bgl

At a depth of 1.20m to 1.50m bgl within the fine-grained soils of the Head Deposits, SPT N values recorded as $N=9$ to $N=50$, providing undrained shear strengths of 41kN/m^2 to 225kN/m^2 , indicating firm to very stiff soils.

Adopting a conservative approach utilising the lowest value of $N=9$, it is considered a traditional strip foundation of 1.00m width at a depth 1.20m bgl provides a presumed bearing capacity of approximately $100\text{-}200\text{kN/m}^2$.

Indicative Bearing Capacity at 2.00m bgl

At a depth of 2.00 to 2.50m bgl within the fine-grained soils of the Head Deposits, SPT N values recorded as N=11 to N=19, providing undrained shear strengths of 50kN/m² to 86kN/m², indicating firm to stiff soils.

Adopting a conservative approach utilising the lowest value of N=11, it is considered a traditional strip foundation of 1.00m width at a depth 2.00m bgl provides a presumed bearing capacity of approximately 100-200kN/m².

Indicative Bearing Capacity at approximately 3.00m bgl

One SPT test was undertaken at 3.50m bgl within CP101 bgl within the fine-grained soils of the Head Deposits. The N=9 providing an undrained shear strength of 41kN/m², indicating firm soils. Utilising this value, it is considered a traditional strip foundation of 1.00m width at a depth of 3.00m bgl provides a presumed bearing capacity of approximately 100-200kN/m².

11.4.3.2 London Clay Formation

Indicative Bearing Capacity at 2.00m bgl

At a depth of 2.00 to 2.50m bgl within the fine-grained soils of the London Clay Formation, SPT N values recorded as N=7 to N=25, providing undrained shear strengths of 32kN/m² to 113kN/m², indicating soft to stiff soils.

Adopting a conservative approach utilising the lowest value of N=7, it is considered a traditional strip foundation of 1.00m width at a depth 2.00m bgl provides a presumed bearing capacity of approximately 50-100kN/m².

Indicative Bearing Capacity at 3.00m bgl

At a depth of 3.00m bgl within the fine-grained soils of the London Clay Formation, SPT N values recorded as N=16, providing undrained shear strengths of 72kN/m², indicating firm soils.

Utilising the value of N=16, it is considered a traditional strip foundation of 1.00m width at a depth 3.00m bgl provides a presumed bearing capacity of approximately 100-200kN/m².

11.5 Deep Foundations

Where bearing capacities are considered insufficient for larger structures, piled foundations could be considered. Depending on foundation column load requirements, a choice of pile lengths and diameters can be designed to bear into the London Clay. The proven ground conditions would indicate that continuous flight auger (CFA) piles could be employed to provide a suitable foundation solution although this is for discussion purposes only. Where groundwater and/or unstable ground conditions are encountered, casing should be considered for CFA piles.

The competency of the soil profile used for the preceding calculations is based on in-situ testing, principally SPT's.

In order to provide indicative single working pile capacities a series of calculations, based on the total

end-bearing capacity value and the sum of shaft capacities across varying strata (consisting of a base and shaft component), have been undertaken.

Illustrative calculations for axial carrying capacity have been undertaken with results shown in Table 11-2. The following pile capacities have been calculated for various pile diameters and lengths adopting a partial factor of 1.54 for Q_b and 1.4 for Q_s to obtain an ULS axial end bearing capacity.

Table 11-2 Summary of pile foundation bearing capacities.

Pile Length (m)	Pile Type and Diameter		
	0.30m CFA	0.45m CFA	0.60m CFA
	Axial Pile Capacity (kN)	Axial Pile Capacity (kN)	Axial Pile Capacity (kN)
	Total	Total	Total
8	143	230	327
10	244	365	487
12	316	473	631

It is recommended that the advice of a specialist foundation contractor is sought to further discuss proposed pile layout and confirm capacity with regards to the encountered ground conditions.

Please note that these values for piled foundations should not be considered as design values and are provided for information purposes such that they should not be relied upon without review and consultation with a design engineer.

11.6 Building Near Trees

11.6.1 NHBC Minimum Depth to Foundations

The shallow fine-grained soils on site have been shown via laboratory analysis to generally be of high to very high plasticity. Modified plasticity indices range from 29% to 46% therefore it is considered that fine-grained soils on site are Medium to High Volume Change Potential. In order to be conservative, a High-Volume Change has been adopted below.

NHBC guidance offers two foundation depth scenarios dependant on future planting regimes for High Volume Change Soils which utilises Tables 4 and 5 of NHBC Chapter 4.2 – Building Near Trees, summarised in

Table 11-3 and Table 11-4 below.

Table 11-3 Minimum depth of foundations (after NHBC 2021)

Volume change potential	(A) Minimum foundation depth (m) (allowing for restricted new planting)	(B) Minimum foundation depth (m) (where planting is outside the zone of influence of trees)
High	1.50	1.00
Medium	1.25	0.90
Low	1.00	0.75

Table 11-4 New tree planting (after NHBC 2021)

Water demand	No tree planting zone for column A in Table 5	No tree planting zone / zone of influence for column B in Table 5
High	1.0 x mature height	1.25 x mature height
Moderate	0.5 x mature height	0.75 x mature height
Low	0.2 x mature height	0.50 x mature height

NHBC guidance indicates a minimum foundation depth of 1.00m bgl for high volume change soils outside of the zone of tree influence (Column B, table 5), which is dependent on the tree species but may be up to 1.25 x mature tree height (Table 11-4). Foundation depths will need to be increased within the zones of influence of existing or recently removed trees, as set out by NHBC Guidance (Chapter 4.2 – Building near Trees).

11.6.2 Lateral pressure and heave

Where foundations are more than 1.5m deep, within the influence of trees which are to remain or be removed, and may be subject to heave, they should be protected by voids, void formers, or compressible materials to be consider the effects of lateral swelling of soils. Minimum thicknesses of voids are set out in Table 7 of NHBC Chapter 4.2 – Building Near Trees.

Guidance is set out in NHBC the basic requirement is that compressible material or void former should be installed on the inside faces of external foundation walls. With piled foundation additional voids are required below ring beams. Position of heave precautions are set out in Table 8 of NHBC Chapter 4.2 – Building Near Trees.

11.7 Ground Floor Slabs

Due to the variability of ground conditions on site and predominately High-Volume Change Potential of the soil it is considered that ground floor slabs are not suitable for adoption and therefore a suspended floor slab should be adopted in accordance with NHBC Chapter 5.2 to mitigate against the effects of differential settlement.

If levels were to be changed on site requiring steps in the substructure, further consideration should be given to the adoption of floor slabs, with reference to NHBC Standards (2011) 5.1 – *Substructure and ground bearing floors*.

11.8 Pavement Construction

Test results from the DCP tests provided in table 8-6. It is recommended that a conservative value of 1.8% over a depth range of 0-536mm bgl is utilised for preliminary pavement design.

Notwithstanding this, and as with all road construction it is recommended that confirmatory testing is undertaken at formation ahead of roadway construction.

11.9 Concrete Durability

From the chemical analysis of pH and sulphate, from Table 8-4.

For topsoil and head deposits (less than 2m bgl). Due to the size of the dataset (9no. samples), characteristic pH and SO₄ values were calculated using the mean of the highest two sulphate results

and the mean of the lowest two pH results as stated in the BRE Special Digest (2005) producing a site characteristic value for sulphate of 58 mg/l and a pH value of 6.71.

The site has been classified as DS-1, Aggressive Chemical Environmental for Concrete Classification (ACEC) AC-1 for brownfield locations as per table C1 in BRE Special Digest (2005).

For London Clay Formation, due to the size of the dataset (5no. samples), characteristic pH and SO₄ values were calculated using the mean of the highest two sulphate results and the mean of the lowest two pH results as stated in the BRE Special Digest (2005) producing a site characteristic value for sulphate of 335 mg/l and a pH value of 7.6.

The site has been classified as DS-1, Aggressive Chemical Environmental for Concrete Classification (ACEC) AC-1 for brownfield locations as per table C1 in BRE Special Digest (2005).

11.10 Discussion

Presumed bearing capacities have been provided for the shallow soils of the Head Deposits and London Clay Formation, for depths between 1.20 and 3.00m bgl. These have been based on empirical values derived from the in-situ testing and laboratory classification data and show that the soil strength and density, and the correlating presumed bearing values are variable across soil types and depths.

In terms of Volume Change Potential, a minimum foundation depth of 1.00m bgl is anticipated for a High-Volume Change soil within the Head Deposits/London Clay Formation outside of the zone of tree influence, in accordance with NHBC. Where foundations are likely to be within the influence of trees foundation depths will require locally deepening. The extent to which they should be deepened should be in accordance with NHBC guidance, Chapter 4.2 – Building Near Trees (Tables 4 and 5).

Given the presence of trees on site in assumed close proximity to the proposed structure and the low bearing capacities present it is considered likely that traditional shallow foundations would be unsuitable and that even deep trenchfill may be impractically deep, although this is without knowledge of loadings.

Piled foundations are considered likely to be a more viable option for the site given conditions encountered.

11.11 Recommendations

At this stage it is recommended that piled foundations be considered and that early discussions with an experienced piling contractor is undertaken to clarify the pile diameters and confirm capacity with regards to the encountered ground conditions. Once the pile cap, positions and diameters are known further pile analysis can be undertaken in a Geotechnical Design Report if required.

However, should it be shown that line loads are sufficiently low, it is recommended that a review of founding options be undertaken and assessed within a Geotechnical Design Report. Subject to regulatory requirements, the potential requirement exists to calculate bearing capacities and undertaken settlement analysis for foundations through production of a Geotechnical Design Report (GDR) which would provide calculations to current guidance, UK National Annex to EC7.

Subject to pile design length, NHBC require proven ground conditions at a minimum of 5m below the base of the longest pile length.

Foundation design should be completed by a suitably qualified Structural Engineer, with specific consideration given to the variability in soil strengths. Further detail should be obtained in relation to the tree and vegetation types on site, those that are to remain and those that are being removed and, where necessary and relevant, considered as part of the foundation design.

12 CONCLUSIONS AND RECOMMENDATIONS

Revised Conceptual Site Model

Following completion of the Tier 1 Risk Assessment, pollution pathways have been identified based on a residential end use with homegrown produce.

It is therefore recommended that further work is undertaken to delineate the lateral extent of affected soils in the vicinity of locations WS104 & WS106.

Ground Gas Classification

It is considered that the site is classified as Characteristic Situation 1 (CS-1) classification in accordance with BS 8485:2015 for residential apartments, based on the three (3no.) ground gas monitoring visits. No gas protection measures are required for a CS-1 classification.

Concrete Classification

The shallow soils (<2.00m bgl) including Topsoil, Made Ground and Head Deposits have been assessed against brownfield locations. Due to the size of the dataset (9no. samples), characteristic pH and SO₄ values were calculated using the mean of the highest two sulphate results and the mean of the lowest two pH results as stated in the BRE Special Digest (2005) producing a site characteristic value for sulphate of 58 mg/l and a pH value of 6.71. The site has been classified as DS-1, Aggressive Chemical Environmental for Concrete Classification (ACEC) AC-1 for brownfield locations as per table C1 in BRE Special Digest (2005).

For London Clay Formation, due to the size of the dataset (5no. samples), characteristic pH and SO₄ values were calculated using the mean of the highest two sulphate results and the mean of the lowest two pH results as stated in the BRE Special Digest (2005) producing a site characteristic value for sulphate of 335 mg/l and a pH value of 7.6. The site has been classified as DS-1, Aggressive Chemical Environmental for Concrete Classification (ACEC) AC-1 for greenfield locations as per table C1 in BRE Special Digest (2005).

Geotechnical Assessment

Shallow Foundations

Presumed bearing capacities have been provided for the shallow soils of the Head Deposits and London Clay Formation, for depths between 1.20 and 3.00m bgl. These have been based on empirical values derived from the in-situ testing and laboratory classification data and show that the soil strength and density, and the correlating presumed bearing values are variable across soil types and depths.

Given the presence of trees on site in assumed close proximity to the proposed structure and the low bearing capacities present it is considered likely that traditional shallow foundations would be unsuitable and that even deep trenchfill may be impractically deep, although this is without knowledge of loadings.

Piled foundations are considered likely to be a more viable option for the site given conditions encountered.

Deep Foundations

Illustrative calculations for axial carrying capacity have been undertaken with results shown below. The following pile capacities have been calculated for various pile diameters and lengths adopting a partial factor of 1.54 for Q_b and 1.4 for Q_s to obtain an ULS axial end bearing capacity.

Pile Length (m)	Pile Type and Diameter		
	0.30m CFA	0.45m CFA	0.60m CFA
	Axial Pile Capacity (kN)	Axial Pile Capacity (kN)	Axial Pile Capacity (kN)
	Total	Total	Total
8	143	230	327
10	244	365	487
12	316	473	631

It is recommended that the advice of a specialist foundation contractor is sought to further discuss proposed pile layout and confirm capacity with regards to the encountered ground conditions.

Please note that these values for piled foundations should not be considered as design values and are provided for information purposes such that they should not be relied upon without review and consultation with a design engineer.

Volume Change Potential

The fine-grained soils of the Head Deposits and London Clay Formation on site have shown via laboratory analysis to be of high to very high plasticity and medium to high Volume Change Potential. Modified plasticity indices ranged from 29% to 46%.

Recommendations

Environmental

It is recommended that due to a potentially containing Asbestos structure on site that an asbestos survey is undertaken in accordance with the Control of Asbestos Regulations (2012) prior to the commencement of any refurbishment or demolition works.

It is recommended that a nitrate balance report is undertaken as part of the planning application, to assess the potential risk posed from the proposed development on nitrates entering surrounding waters.

As soft landscaping is proposed on site, a potential pathway remains for future site users due to the identification of Heavy Metal, PAH exceedances within WS104 and asbestos within WS106. As such, it is recommended that delineation exercises are carried out in the vicinity of these two locations, to delineate the lateral extent of soils impacted by these contaminants.

If during the development stage any evidence of contamination is identified, works should be halted, and contact made with a suitably qualified Environmental Consultant. As determined appropriate by the Consultant, further investigation and sampling may be required to determine the appropriate actions. Upon completion contact should be made with the regulator to achieve sign off the works.

Geotechnical

At this stage it is recommended that piled foundations be considered and that early discussions with an experienced piling contractor is undertaken to clarify the pile diameters and confirm capacity with regards to the encountered ground conditions. Once the pile cap, positions and diameters are known further pile analysis can be undertaken in a Geotechnical Design Report if required.

However, should it be shown that line loads are sufficiently low, it is recommended that a review of founding options be undertaken and assessed within a Geotechnical Design Report. Subject to regulatory requirements, the potential requirement exists to calculate bearing capacities and undertaken settlement analysis for foundations through production of a Geotechnical Design Report (GDR) which would provide calculations to current guidance, UK National Annex to EC7.

Subject to pile design length, NHBC require proven ground conditions at a minimum of 5m below the base of the longest pile length.

Foundation design should be completed by a suitably qualified Structural Engineer, with specific consideration given to the variability in soil strengths. Further detail should be obtained in relation to the tree and vegetation types on site, those that are to remain and those that are being removed and, where necessary and relevant, considered as part of the foundation design.

APPENDIX I - LIMITATIONS

1. This report and its findings should be considered in relation to the terms of reference and objectives agreed between Omnia and the Client as indicated in Section 1.2.
 2. For the work, reliance has been placed on publicly available data obtained from the sources identified. The information is not necessarily exhaustive and further information relevant to the site may be available from other sources. When using the information, it has been assumed it is correct. No attempt has been made to verify the information.
 3. This report has been produced in accordance with current UK policy and legislative requirements for land and groundwater contamination, which are enforced, by the local authority and the Environment Agency. Liabilities associated with land contamination are complex and requires advice from legal professionals.
 4. During the site walkover reasonable effort has been made to obtain an overview of the site conditions. However, during the site walkover no attempt has been made to enter areas of the site that are unsafe or present a risk to health and safety, are locked, barricaded, overgrown, or the location of the area has not been made known or accessible.
 5. Access considerations, the presence of services and the activities being carried out on the site limited the locations where sampling locations could be installed and the techniques that could be used.
 6. Site sensitivity assessments have been made based on available information at the time of writing and are ultimately for the decision of the regulatory authorities.
 7. Where mention has been made to the identification of Japanese Knotweed and other invasive plant species and asbestos or asbestos-containing materials this is for indicative purposes only and do not constitute or replace full and proper surveys.
 8. The executive summary, conclusions and recommendations sections of the report provide an overview and guidance only and should not be specifically relied upon without considering the context of the report in full.
 9. Omnia 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 in this report and other plans and documents prepared by Omnia is owned by them, and no such plans or documents may be reproduced, published or adapted without written consent. Complete copies of this may, however, be made and distributed by the client as is 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 Omnia in this connection without their explicit written agreement there to by Omnia.
 10. New information, revised practices or changes in legislation may necessitate the re-interpretation of the report, in whole or in part.
-

APPENDIX II – GLOSSARY

AST	Above Ground Storage Tank
BGS	British Geological Survey
BSI	British Standards Institute
BTEX	Benzene, Toluene, Ethylbenzene, Xylenes
CIEH	Chartered Institute of Environmental Health
CIRIA	Construction Industry Research Association
CLEA	Contaminated Land Exposure Assessment
CSM	Conceptual Site Model
DNAPL	Dense Non-Aqueous Phase Liquid (Chlorinated Solvents, PCB)
DWS	Drinking Water Standard
EA	Environment Agency
EQS	Environmental Quality Standard
GAC	General Assessment Criteria
GL	Ground Level
GSV	Gas Screening Value
HCV	Health Criteria Value
ICSM	Initial Conceptual Site Model
LNAPL	Light Non-Aqueous Phase Liquid (Petrol, Diesel, Kerosene)
ND	Not Detected
LMRL	Lower Method Reporting Limit
NR	Not Recorded
PAH	Polycyclic Aromatic Hydrocarbon
PCB	Poly-Chlorinated Biphenyl
PID	Photo-Ionisation Detector
QA	Quality Assurance
SGV	Soil Guideline Value
SPH	Separate Phase Hydrocarbon
TPH (CWG)	Total Petroleum Hydrocarbon (Criteria Working Group)
SPT	Standard Penetration Test
SVOC	Semi Volatile Organic Compound
UST	Underground Storage Tank
VCCS	Vibro Concrete Columns
VOC	Volatile Organic Compound
WTE	Water Table Elevation

UNITS

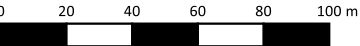
M	Metres
KM	Kilometres
%	Percent
%V/V	Percent Volume in Air
MB	Milli Bars (Atmospheric Pressure)
L/HR	Litres Per Hour
µG/L	Micrograms Per Litre (Parts Per Billion)
PPB	Parts Per Billion
MG/KG	Milligrams Per Kilogram (Parts Per Million)
PPM	Parts Per Million
MG/M ³	Milligram Per Metre Cubed
M BGL	Metres Below Ground Level
M BCL	Metres Below Cover Level

MAOD	Metres Above Ordnance Datum (Sea Level)
KN/M ²	Kilo Newtons Per Metre Squared
µM	Micrometre

APPENDIX III - DRAWINGS

Key

Site Boundary



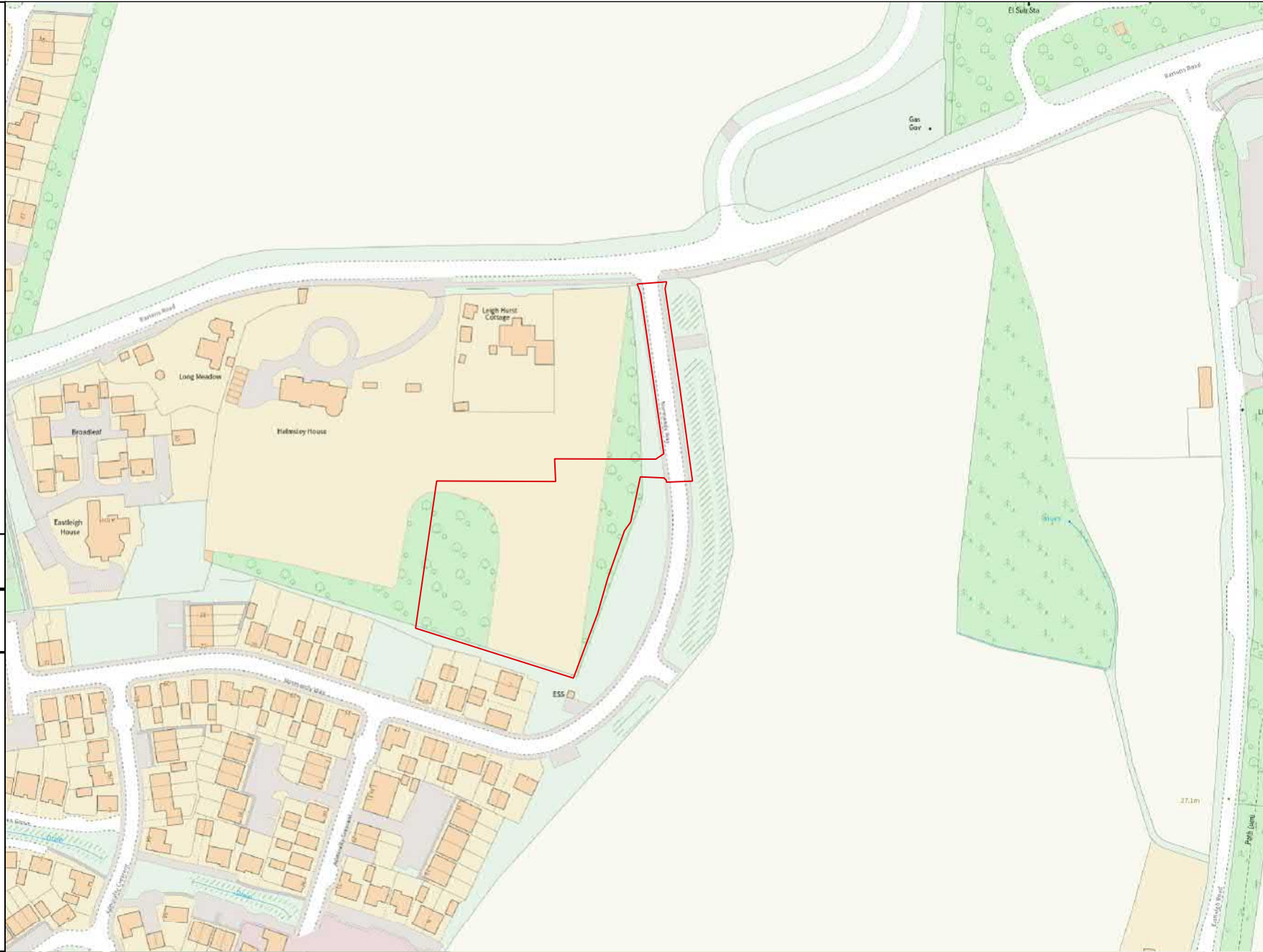
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W: www.omnia-consulting.co.uk



Job Title:
Brackley, Havant

Client:
Highwood Group

Project Number:
A11840

Drawn By:
A. Dodds

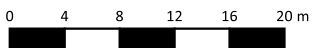
Date:
17/06/2022

Authorised By:
O. Maxwell

Drawing Title:
Figure 1.0
Site Location Map

Key

 Site Boundary



Scale 1:550	Paper Size A4
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Date:
17/06/2022

Authorised By:
O. Maxwell

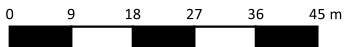
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Proposed Development



Key



- Waste
- Structure
- Site Boundary
- Overgrown areas and trees
- Metal gate and tarmac



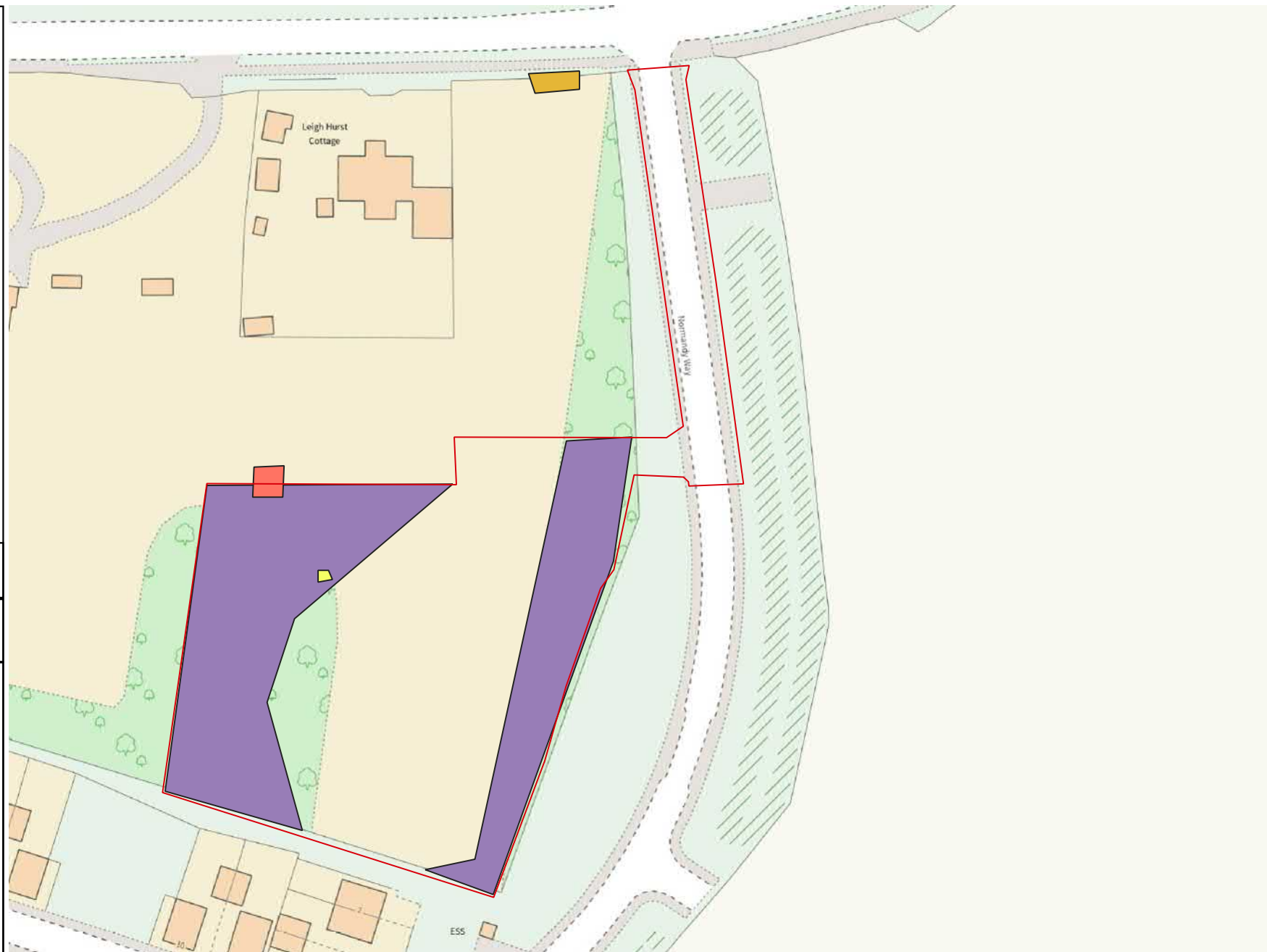
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Job Title:
Brackley, Havant

Client:
Highwood Group

Project Number:
A11840

Drawn By:
A. Dodds

Date:
17/06/2022

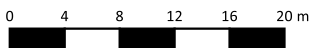
Authorised By:
O. Maxwell

Drawing Title:
Figure 3.0
Annotated walkover survey

Key



-  Site Boundary
-  DCP locations
-  Window locations
-  Cable locations



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Job Title:
Brackley, Havant

Client:
Highwood Group

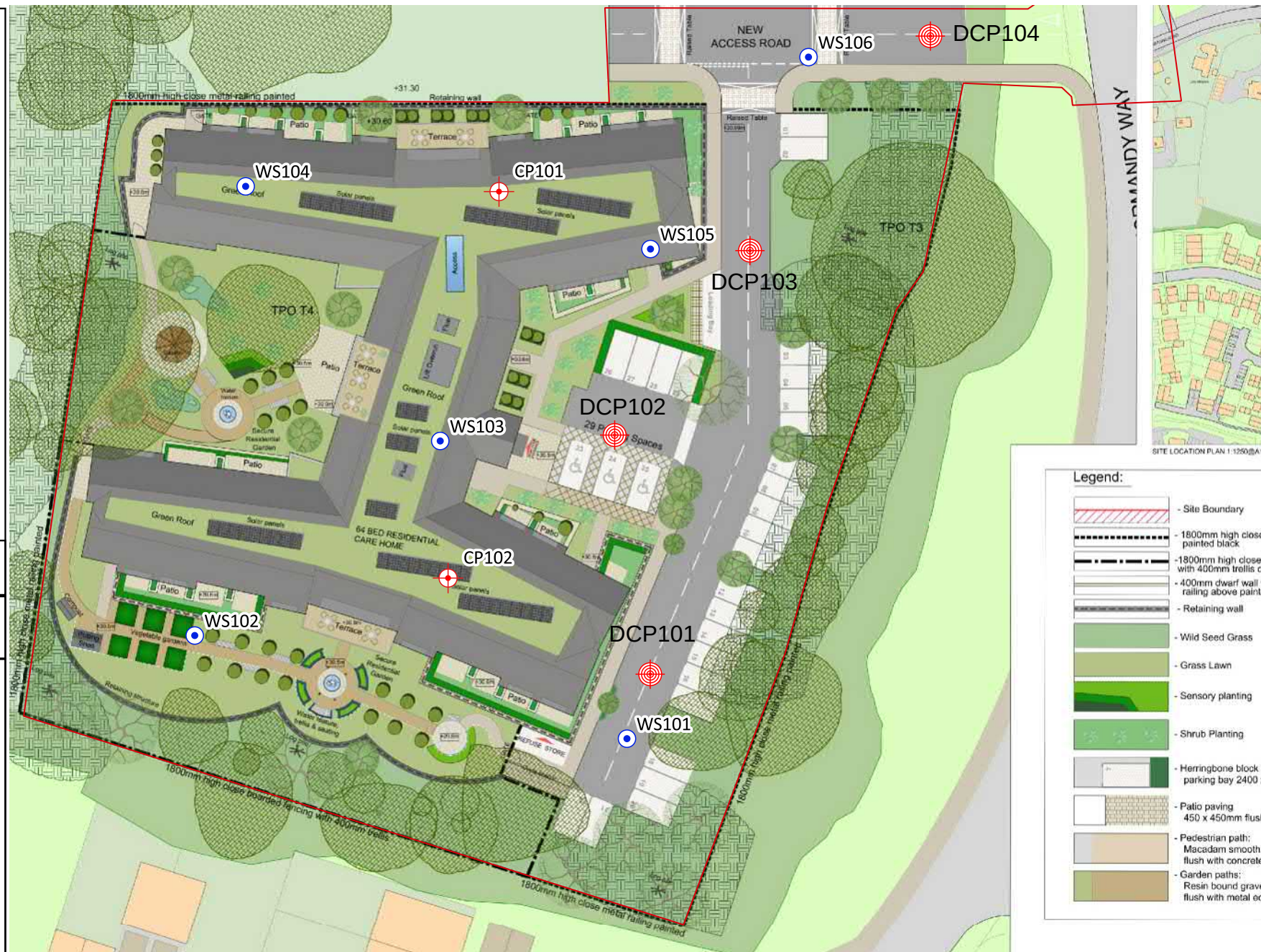
Project Number:
A11840

Drawn By:
A. Dodds

Date:
17/06/2022

Authorised By:
O. Maxwell

Drawing Title:
Figure 4.0
Intrusive Location Plan



APPENDIX IV - PHOTOGRAPHS



Photograph 1 – Metal gate entrance to the north of the site



Photograph 2 – View from northern edge of site facing north, overgrown vegetation



Photograph 3 – View from north edge of site facing south, trees and hedgerows along eastern edge of site



Photograph 4 – View of western side of site showing residential area and trees



Photograph 5 – View of northwest side of site with lots of vegetation



Photograph 6 – View of waste around trees on site



Photograph 7 – View of partially demolished building with overgrown vegetation around it



Photograph 8 – View of wooded area in northwest of the site



Photograph 9 – View of overgrown vegetation on western edge of site

APPENDIX V - HISTORICAL MAPS

Site Details:

HELMSLEY HOUSE, BARTONS
ROAD, HAVANT, PO9 5NA

Client Ref: A11840
Report Ref: GS-8723169
Grid Ref: 473357, 107909

Map Name: County Series

Map date: 1897

Scale: 1:2,500

Printed at: 1:2,500



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Revised 1897
Edition N/A
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Levelled N/A

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Revised 1897
Edition N/A
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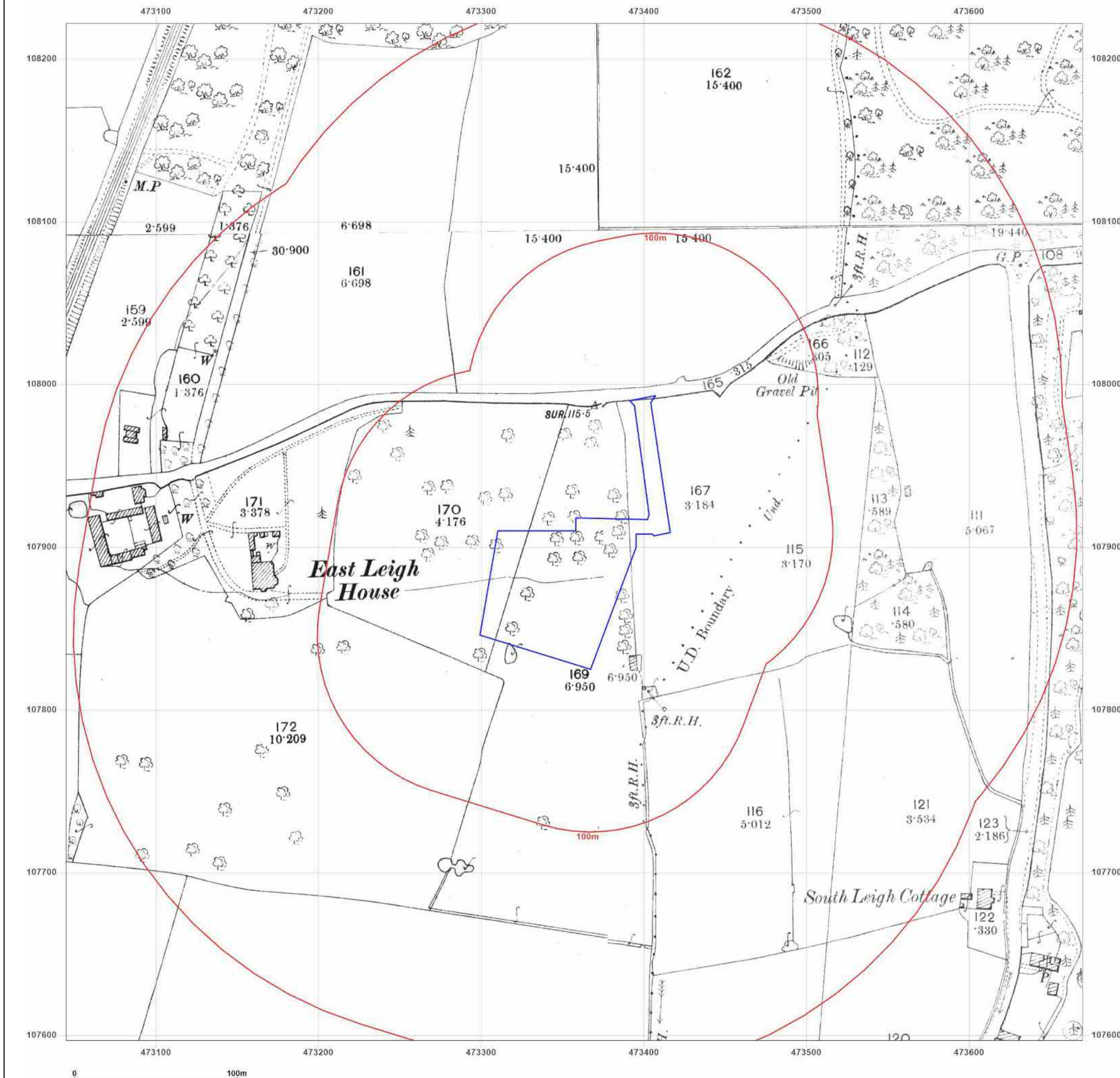


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Site Details:

HELMSLEY HOUSE, BARTONS
ROAD, HAVANT, PO9 5NA

Client Ref: A11840
Report Ref: GS-8723169
Grid Ref: 473357, 107909

Map Name: County Series

Map date: 1932

Scale: 1:2,500

Printed at: 1:2,500



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Revised 1932
Edition N/A
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Revised 1932
Edition N/A
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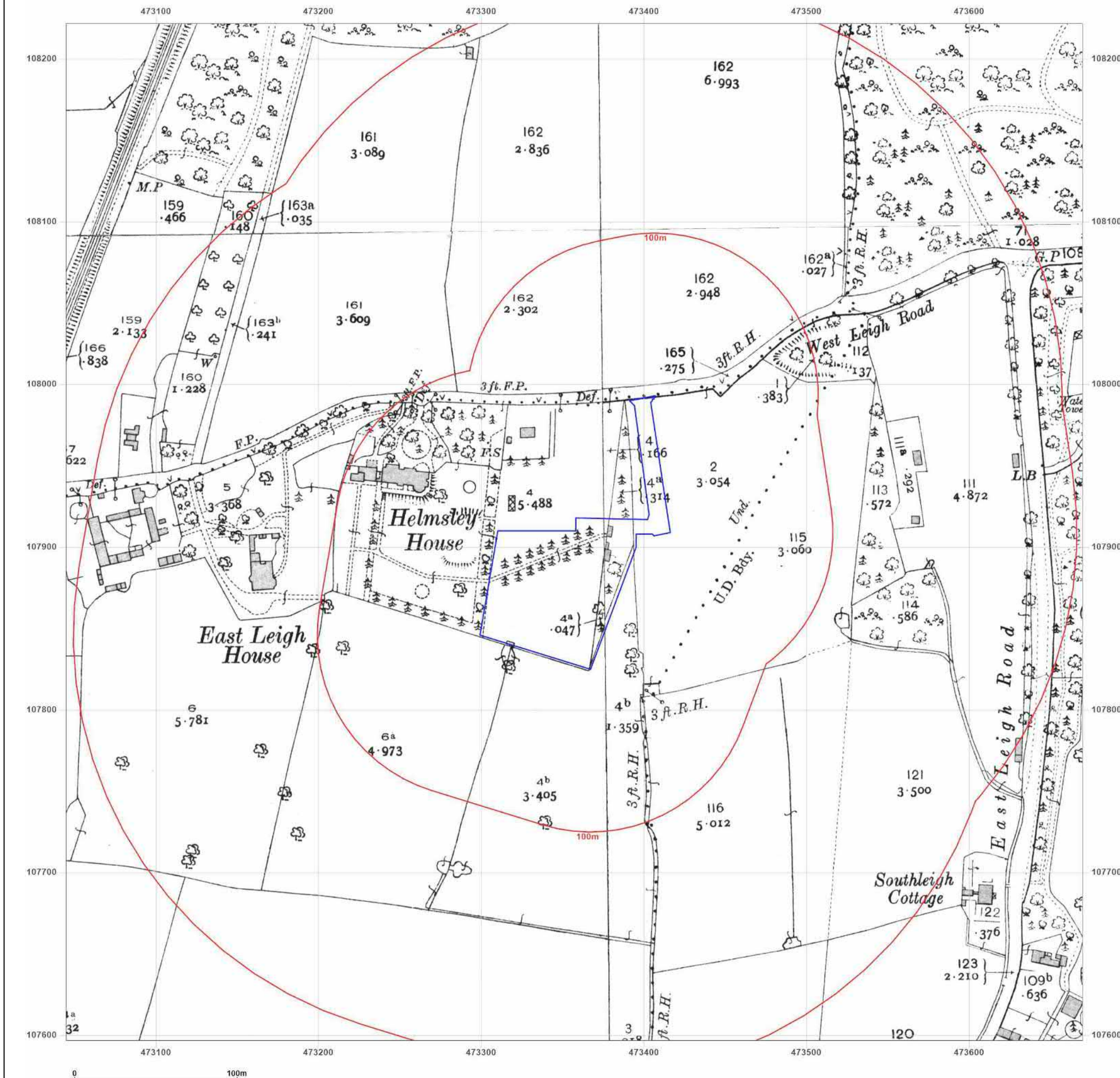


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Site Details:

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ROAD, HAVANT, PO9 5NA

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Report Ref: GS-8723169
Grid Ref: 473357, 107909

Map Name: National Grid

Map date: 1971-1972

Scale: 1:2,500

Printed at: 1:2,500



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Revised N/A
Edition N/A
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Levelled N/A

Surveyed 1972
Revised 1972
Edition N/A
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Site Details:

HELMSLEY HOUSE, BARTONS
ROAD, HAVANT, PO9 5NA

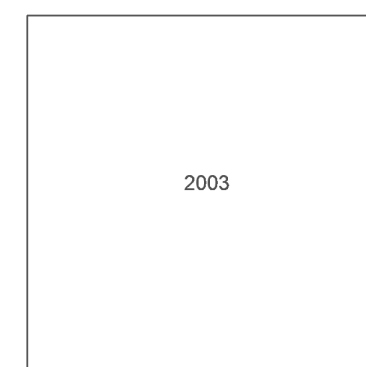
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Map date: 2003

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Printed at: 1:1,250



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APPENDIX VI - EXPLORATORY HOLE LOGS



Borehole Log

Borehole No.

CP101

Sheet 1 of 3

Project Name: Brackley, Havant

Project No.
A11840

Co-ords: 473344.29 - 107899.55

Hole Type
CP

Location: Helmsley House, Bartons Road, Havant, PO9 5NA

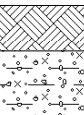
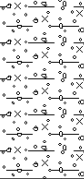
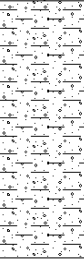
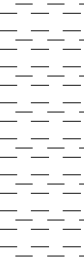
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Scale
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Client: Highwood Group

Dates: 11/05/2022 - 11/05/2022

Logged By
LB

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.10 - 0.40	B		0.30		Grass over greyish brown slightly sandy, slightly gravelly dry and friable CLAY with frequent rootlets. Sand is fine to medium. Gravel is sub-angular to rounded fine to coarse flint. (TOPSOIL)	1	
		0.40 - 0.80	B						
		0.80 - 1.20	B						
		1.50	B	N=11 (1,3/3,3,2,3)	1.90		Soft orangish brown mottled brown sandy very clayey GRAVEL with medium cobble content. Sand is fine to medium. Gravel is angular to subrounded fine to coarse flint. Cobbles are subangular to subrounded flint. (HEAD DEPOSITS)	2	
		1.50 - 2.00							
		2.50	N=11 (1,2/3,3,2,3)		Firm orangish brown mottled grey and light grey slightly sandy slightly gravelly CLAY. Sand is fine. Gravel is sub-rounded to rounded fine to coarse flint. (LONDON CLAY FORMATION)	3			
		3.50	B				N=9 (1,2/3,2,2,2)	3.60	
		3.50 - 4.00							
		4.50	N=11 (2,2/2,2,4,3)		Stiff dark grey CLAY with occasional fine sand bands/pockets within. (LONDON CLAY FORMATION)	4			
		5.50	D						
		6.00	N=13 (2,2/3,4,3,3)						
		7.00	D	N=14 (2,2/3,3,3,5)			5		
		7.50							
8.50	D	N=15 (3,3/4,3,3,5)			6				
9.00									
10.00	D					7			
							8		
							9		
							10		

Continued on next sheet

Continued on next sheet

Remarks

1. Position scanned with calibrated CAT & 'Genny' prior to excavation.
There was a groundwater strike at 6mbgl and 17mbgl.





Borehole Log

Borehole No.

CP101

Sheet 2 of 3

Project Name: Brackley, Havant

Project No.
A11840

Co-ords: 473344.29 - 107899.55

Hole Type
CP

Location: Helmsley House, Bartons Road, Havant, PO9 5NA

Level:

Scale
1:50

Client: Highwood Group

Dates: 11/05/2022 - 11/05/2022

Logged By
LB

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		10.50 - 10.95	U						
		11.00	D						11
		11.50	D						
		12.00		N=21 (4,3/5,5,5,6)					12
		13.00	D						13
		13.50		N=23 (2,2/4,6,5,8)					14
		14.50	D						
		15.00		N=25 (5,5/6,8,6,5)					15
		16.00	D						16
		16.50 - 16.95 16.50 - 17.00	U B						17
		17.50	D						
		18.00		N=32 (5,5/5,8,8,11)					18
		19.00	D						19
		19.50	D						
		20.00		N=33 (5,6/5,9,8,11)	20.00				20

11.00-21.00m bgl: Rounded black septarian concretion pebbles within CLAY.

Continued on next sheet

Remarks

1. Position scanned with calibrated CAT & 'Genny' prior to excavation.
There was a groundwater strike at 6mbgl and 17mbgl.





Borehole Log

Borehole No.

CP101

Sheet 3 of 3

Project Name: Brackley, Havant

Project No.
A11840

Co-ords: 473344.29 - 107899.55

Hole Type
CP

Location: Helmsley House, Bartons Road, Havant, PO9 5NA

Level:

Scale
1:50

Client: Highwood Group

Dates: 11/05/2022 - 11/05/2022

Logged By
LB

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
								End of borehole at 20.00 m	
									21
									22
									23
									24
									25
									26
									27
									28
									29
									30

Remarks

1. Position scanned with calibrated CAT & 'Genny' prior to excavation.
There was a groundwater strike at 6mbgl and 17mbgl.





Borehole Log

Borehole No.

CP102

Sheet 1 of 2

Project Name: Brackley, Havant

Project No.
A11840

Co-ords: 473342.44 - 107858.87

Hole Type
CP

Location: Helmsley House, Bartons Road, Havant, PO9 5NA

Level:

Scale
1:50

Client: Highwood Group

Dates: 12/05/2022 - 12/05/2022

Logged By
LB

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.10 - 0.40	B		0.40			Grass over dark brown slightly sandy slightly gravelly CLAY with occasional rootlets. Sand is fine to medium. Gravel is sub-angular to rounded fine to coarse flint.	1
		0.20 - 0.30	ES					(TOPSOIL)	
		0.40 - 0.50	ES					Soft yellowish brown mottled light grey slightly sandy gravelly CLAY. Sand is fine to medium. Gravel is angular to sub-rounded fine to coarse flint.	
		0.40 - 0.80	B					(HEAD DEPOSITS)	
		0.80 - 1.20	B		0.90			Firm orangish brown mottled reddish brown and grey slightly sandy slightly gravelly CLAY. Sand is fine. Gravel is sub-rounded to rounded fine to coarse flint.	2
		1.10 - 1.20	ES					(HEAD DEPOSITS)	
		1.50		N=9 (2,1/2,2,2,3)	2.40			1.30-2.40m bgl: Occasional bands of sub-angular to sub-rounded fine to coarse GRAVEL and occasional pockets of very clayey SAND.	3
		2.50		N=7 (1,2/2,1,2,2)				Firm to stiff bluish grey mottled brown slightly sandy CLAY with rare gravel. Sand is fine. Gravel is subangular to rounded fine flint.	
		2.50 - 3.00	B					(LONDON CLAY FORMATION)	
		3.50		N=9 (2,3/2,2,3,2)					
		4.50		N=11 (2,2/3,4,2,2)	4.60				4
		4.50 - 5.00	B						
		6.00		N=14 (2,3/3,3,4,4)					
		7.00	D						
		7.50		N=14 (2,3/3,3,4,4)					5
		8.00	D						
		9.00 - 9.45	U						
		9.50	D						
		10.00	D						10

Continued on next sheet

Remarks

1. Position scanned with calibrated CAT & 'Genny' prior to excavation.
There was a groundwater strike at 5.40mbgl.





Borehole Log

Borehole No.

CP102

Sheet 2 of 2

Project Name: Brackley, Havant

Project No.
A11840

Co-ords: 473342.44 - 107858.87

Hole Type
CP

Location: Helmsley House, Bartons Road, Havant, PO9 5NA

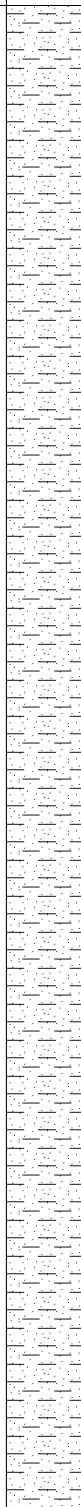
Level:

Scale
1:50

Client: Highwood Group

Dates: 12/05/2022 - 12/05/2022

Logged By
LB

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		10.50		N=16 (3,3/4,4,4,4)				12.00-20.00m bgl: Rounded black septarian concretion pebbles within CLAY.	
		11.00	D						11
		12.00		N=20 (4,4/6,6,4,4)					12
		13.00	D						13
		13.50 - 13.95	U						
		14.00	D						14
		15.00		N=28 (5,6/5,7,7,9)					15
		16.00	D						16
		16.50		21 (6,6/6,7,8,)					17
		18.00 18.00	D	24 (6,6/8,8,8,)					18
		19.00	D						19
		20.00		10 (6,6/10,,,))	20.00				20

End of borehole at 20.00 m

Remarks

1. Position scanned with calibrated CAT & 'Genny' prior to excavation.
There was a groundwater strike at 5.40mbgl.





Borehole Log

Borehole No.

WS101

Sheet 1 of 1

Project Name: Brackley, Havant

Project No.
A11840

Co-ords: 473360.69 - 107842.87

Hole Type
WS

Location: Helmsley House, Bartons Road, Havant, PO9 5NA

Level:

Scale
1:25

Client: Highwood Group

Dates: 11/05/2022 - 11/05/2022

Logged By
LB

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.10 - 0.20	ES		0.30			Grass over brown slightly sandy slightly gravelly dry and friable CLAY with frequent roots and rootlets. Sand is fine to medium. Gravel is sub-angular to sub-rounded fine to medium flint. (TOPSOIL)	1
		0.50 - 0.70	ES		0.55			Grey slightly sandy very clayey angular to sub-rounded fine to coarse GRAVEL of flint. Sand is fine to medium. (HEAD DEPOSITS)	
		1.00		HVP=47 N=11 (3,2/3,3,3,2) HVP=53				Firm orangish brown slightly gravelly slightly sandy CLAY. Sand is fine to medium. Gravel is angular to sub-rounded fine to medium flint. (HEAD DEPOSITS)	
		1.00 - 1.20	D	HVP=59	1.30			0.80-1.30m bgl: Becomes orangish brown mottled grey.	
		1.60 - 1.80	D		1.90			Firm orangish brown mottled grey slightly sandy very gravelly CLAY. Sand is fine to medium. Gravel is angular to sub-rounded fine to medium flint. (HEAD DEPOSITS)	2
		2.00		N=16 (2,3/3,3,5,5) HVP=53 HVP=56				Stiff brown mottled orangish brown and grey slightly sandy CLAY. Sand is fine. (LONDON CLAY FORMATION)	
		2.80 - 3.00	D					2.60-2.90m bgl: Gravel Band within CLAY. Gravel is angular to subangular fine to coarse flint.	3
		3.00		HVP=56 N=16 (1,2/2,4,5,5) HVP=71 HVP=88 HVP=94				3.40-4.00m bgl: Becomes brown mottled bluish grey.	
		3.80 - 4.00	D						
		4.00		HVP=132 N=12 (1,2/2,3,3,4)	4.00			End of borehole at 4.00 m	4

Remarks

1. Position scanned with calibrated CAT & 'Genny' prior to excavation.
No groundwater was reached.





Borehole Log

Borehole No.

WS102

Sheet 1 of 1

Project Name: Brackley, Havant

Project No.
A11840

Co-ords: 473313.79 - 107851.86

Hole Type
WS

Location: Helmsley House, Bartons Road, Havant, PO9 5NA

Level:

Scale
1:25

Client: Highwood Group

Dates: 11/05/2022 - 11/05/2022

Logged By
LB

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.10 - 0.20	ES		0.30			Grass over greyish brown slightly sandy slightly gravelly dry and friable CLAY with frequent rootlets. Sand is fine to medium. Gravel is angular to sub-rounded fine to medium flint. (TOPSOIL)	
		0.70 - 0.80	ES		0.70			Grey and light grey slightly sandy clayey angular to sub-rounded fine to coarse GRAVEL of flint with low cobble content. Sand is fine to medium. Cobbles are sub-angular to sub-rounded flint. (HEAD DEPOSITS)	
		1.00		N=9 (6,6/3,2,2,2)				Firm brown mottled orangish brown gravelly CLAY. Gravel is angular to sub rounded fine to coarse flint. (HEAD DEPOSITS)	1
		1.10 - 1.20	ES						
		1.50 - 1.70	D	HVP=135 HVP=118	1.40			Firm to stiff orangish brown mottled grey slightly sandy CLAY. Sand is fine. (HEAD DEPOSITS) <i>1.50-1.60m bgl: Relic roots within CLAY.</i>	
		2.00		HVP=32 N=19 (3,3/5,5,4,5)	2.10				2
		2.70		HVP=29 40 (7,6/40 for 190mm) HVP=32				Firm to stiff brown mottled bluish grey slightly sandy CLAY. Sand is fine. (LONDON CLAY FORMATION) <i>2.10-2.90m bgl: Becomes brown mottled bluish grey.</i>	
		2.80 - 3.00	D	HVP=38	2.90			End of borehole at 2.90 m	3
									4
									5

Remarks

1. Position scanned with calibrated CAT & 'Genny' prior to excavation.
No groundwater was reached.





Borehole Log

Borehole No.

WS103

Sheet 1 of 1

Project Name: Brackley, Havant

Project No.
A11840

Co-ords: 473340.52 - 107873.09

Hole Type
WS

Location: Helmsley House, Bartons Road, Havant, PO9 5NA

Level:

Scale
1:25

Client: Highwood Group

Dates: 11/05/2022 - 11/05/2022

Logged By
LB

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.10 - 0.30	ES		0.30				
		0.50 - 0.60	ES		0.70				
		1.00 1.00 - 1.10	ES	N=15 (5,4/3,3,4,5)					1
		1.60 - 1.80 1.70	D	N=22 (8,6/7,6,5,4)	1.80				
		2.00		N=25 (2,4/5,7,7,6) HVP=44	2.00				2
		2.30 - 2.50	D	HVP=47 HVP=50					
		2.60		N=50 (7,14/7,17,16,10) HVP=53	2.60				3
									4
									5

Remarks

1. Position scanned with calibrated CAT & 'Genny' prior to excavation.
No groundwater was reached.





Borehole Log

Borehole No.

WS104

Sheet 1 of 1

Project Name: Brackley, Havant

Project No.
A11840

Co-ords: 473318.42 - 107899.42

Hole Type
WS

Location: Helmsley House, Bartons Road, Havant, PO9 5NA

Level:

Scale
1:25

Client: Highwood Group

Dates: 11/05/2022 - 11/05/2022

Logged By
LB

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.20 - 0.30	ES		0.35				
		0.50 - 0.60	ES						
		1.00		N=18 (2,2/4,5,5,4)	1.10				1
		1.20 - 1.30	ES						
		1.60 - 1.80	D		1.60				
		2.00		N=21 (2,4/5,3,6,7)	2.20				2
				HVP=53					
				HVP=50	2.55				
		2.70 - 2.80	D						3
		3.00		N=16 (2,2/3,4,4,5) HVP=88					
				HVP=91					
				HVP=44					
		3.80 - 3.90	D						4
		4.00		HVP=38 N=9 (1,1/2,2,2,3)	4.00			End of borehole at 4.00 m	4
									5

Remarks

1. Position scanned with calibrated CAT & 'Genny' prior to excavation.
Groundwater strike at 2.50m which rose to 2.40m.





Borehole Log

Borehole No.

WS105

Sheet 1 of 1

Project Name: Brackley, Havant

Project No.
A11840

Co-ords: 473363.21 - 107891.95

Hole Type
WS

Location: Helmsley House, Bartons Road, Havant, PO9 5NA

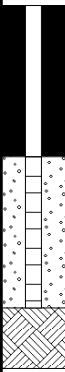
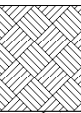
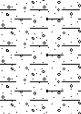
Level:

Scale
1:25

Client: Highwood Group

Dates: 11/05/2022 - 11/05/2022

Logged By
LB

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.20 - 0.30	ES		0.35			Grass over greyish brown slightly sandy slightly gravelly dry and friable CLAY with frequent rootlets. Sand is fine to medium. Gravel is sub-angular to sub-rounded fine to medium flint. (TOPSOIL)	
		0.60 - 0.70	ES					Stiff to firm orangish brown slightly sandy slightly gravelly CLAY. Sand is fine to medium. Gravel is angular to sub-rounded fine to medium flint. (HEAD DEPOSITS)	
		1.00		N=50 (2,7/50 for 240mm)				Becomes very gravelly, gravel is fine to coarse, angular to sub-rounded flint	1
		1.00 - 1.20	D		1.20			End of borehole at 1.20 m	2
									3
									4
									5

Remarks

1. Position scanned with calibrated CAT & 'Genny' prior to excavation.
Groundwater not reached.





Borehole Log

Borehole No.

WS106

Sheet 1 of 1

Project Name: Brackley, Havant

Project No.
A11840

Co-ords: 473382.12 - 107912.98

Hole Type
WS

Location: Helmsley House, Bartons Road, Havant, PO9 5NA

Level:

Scale
1:25

Client: Highwood Group

Dates: 11/05/2022 - 11/05/2022

Logged By
LB

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.20 - 0.40	ES					Greyish brown slightly sandy gravelly dry and friable CLAY with rare cobbles, roots and rootlets. Sand is fine to medium. Gravel is angular to sub-rounded fine to coarse brick and flint. Cobbles are angular brick. (MADE GROUND)	
		0.70 - 0.90	ES		0.56			Soft to firm brown mottled orangish brown slightly sandy very gravelly CLAY. Sand is fine to medium. Gravel is angular to sub-rounded fine to medium flint. (HEAD DEPOSITS)	
		1.00		N=25 (4,5/6,7,6,6)	1.00			0.70m bgl: Root of 12mm diameter.	1
		1.00 - 1.20	ES					Firm grey mottled orangish brown slightly gravelly sandy CLAY. Sand is fine to medium. Gravel is sub-angular to sub-rounded fine to medium flint. (HEAD DEPOSITS)	
		1.20 - 1.40	D					1.20-1.40m bgl: Slightly sandy very gravelly CLAY. End of borehole at 1.40 m	
		1.40		N=50 (12,12/50 for 260mm)	1.40				2
									3
									4
									5

Remarks

1. Position scanned with calibrated CAT & 'Genny' prior to excavation.
No groundwater was reached.



APPENDIX VII - CHEMICAL ANALYSIS CERTIFICATES

Omnia
3-6 The Quarterdeck
Port Solent
Portsmouth
PO6 4TP



Attention : Lauren Burnett
Date : 26th May, 2022
Your reference : A11840
Our reference : Test Report 22/8052 Batch 1
Location : Brackley, Havant
Date samples received : 17th May, 2022
Status : Final Report
Issue : 1

Twenty samples were received for analysis on 17th May, 2022 of which eight were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.

All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Authorised By:



Liza Klebe

Project Co-ordinator

Please include all sections of this report if it is reproduced

Element Materials Technology

Client Name: Omnia
Reference: A11840
Location: Brackley, Havant
Contact: Lauren Burnett
EMT Job No: 22/8052

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

EMT Sample No.	1-3	10-12	13-15	22-24	31-33	34-36	46-48	58-60			Please see attached notes for all abbreviations and acronyms		
Sample ID	WS101	WS102	WS103	WS104	WS105	WS106	CP101	CP102					
Depth	0.10-0.20	0.70-0.80	0.10-0.30	0.20-0.30	0.60-0.70	0.20-0.40	0.50-0.60	1.10-1.20					
COC No / misc													
Containers	V J T	V J T	V J T	V J T	V J T	V J T	V J T	V J T					
Sample Date	11/05/2022	11/05/2022	11/05/2022	11/05/2022	11/05/2022	11/05/2022	11/05/2022	11/05/2022					
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil					
Batch Number	1	1	1	1	1	1	1	1					
Date of Receipt	17/05/2022	17/05/2022	17/05/2022	17/05/2022	17/05/2022	17/05/2022	17/05/2022	17/05/2022			LOD/LOR	Units	Method No.
Arsenic #	10.6	12.6	4.7	10.8	12.4	10.5	11.2	12.5			<0.5	mg/kg	TM30/PM15
Barium #	75	35	43	227	67	54	26	52			<1	mg/kg	TM30/PM15
Beryllium	0.9	0.8	0.6	1.2	1.4	0.7	0.8	1.7			<0.5	mg/kg	TM30/PM15
Cadmium #	0.1	<0.1	0.2	0.7	<0.1	0.2	<0.1	<0.1			<0.1	mg/kg	TM30/PM15
Chromium #	69.3	81.4	46.8	62.3	74.4	54.5	95.4	76.3			<0.5	mg/kg	TM30/PM15
Copper #	16	8	15	48	9	13	10	18			<1	mg/kg	TM30/PM15
Lead #	54	10	78	390	13	74	15	17			<5	mg/kg	TM30/PM15
Mercury #	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.2			<0.1	mg/kg	TM30/PM15
Nickel #	10.6	11.6	12.9	19.9	18.9	9.4	10.5	23.6			<0.7	mg/kg	TM30/PM15
Selenium #	1	2	1	<1	2	<1	2	<1			<1	mg/kg	TM30/PM15
Vanadium	43	52	26	41	80	39	55	124			<1	mg/kg	TM30/PM15
Water Soluble Boron #	1.3	0.4	2.5	1.7	0.6	1.8	0.4	0.4			<0.1	mg/kg	TM74/PM32
Zinc #	66	32	58	458	46	132	22	58			<5	mg/kg	TM30/PM15
PAH MS													
Naphthalene #	<0.04	<0.04	<0.04	0.86	<0.04	<0.04	<0.04	<0.04			<0.04	mg/kg	TM4/PM8
Acenaphthylene	<0.03	<0.03	0.09	3.99	<0.03	0.16	0.16	<0.03			<0.03	mg/kg	TM4/PM8
Acenaphthene #	<0.05	<0.05	<0.05	0.49	<0.05	<0.05	<0.05	<0.05			<0.05	mg/kg	TM4/PM8
Fluorene #	<0.04	<0.04	<0.04	3.85	<0.04	<0.04	<0.04	<0.04			<0.04	mg/kg	TM4/PM8
Phenanthrene #	0.32	<0.03	0.91	40.20	<0.03	0.41	0.20	<0.03			<0.03	mg/kg	TM4/PM8
Anthracene #	0.08	<0.04	0.12	16.87	<0.04	0.18	0.13	<0.04			<0.04	mg/kg	TM4/PM8
Fluoranthene #	0.65	<0.03	1.70	43.70	<0.03	1.53	1.11	<0.03			<0.03	mg/kg	TM4/PM8
Pyrene #	0.56	<0.03	1.44	35.41	<0.03	1.54	1.14	<0.03			<0.03	mg/kg	TM4/PM8
Benzo(a)anthracene #	0.43	<0.06	0.72	24.33	<0.06	0.84	0.59	<0.06			<0.06	mg/kg	TM4/PM8
Chrysene #	0.41	<0.02	0.79	21.87	<0.02	1.00	0.58	<0.02			<0.02	mg/kg	TM4/PM8
Benzo(bk)fluoranthene #	0.70	<0.07	1.34	30.57	<0.07	1.86	1.17	<0.07			<0.07	mg/kg	TM4/PM8
Benzo(a)pyrene #	0.36	<0.04	0.75	17.51	<0.04	1.00	0.76	<0.04			<0.04	mg/kg	TM4/PM8
Indeno(123cd)pyrene #	0.21	<0.04	0.50	9.81	<0.04	0.75	0.53	<0.04			<0.04	mg/kg	TM4/PM8
Dibenzo(ah)anthracene #	<0.04	<0.04	0.06	<0.04	<0.04	0.14	0.10	<0.04			<0.04	mg/kg	TM4/PM8
Benzo(ghi)perylene #	0.25	<0.04	0.47	8.85	<0.04	0.75	0.44	<0.04			<0.04	mg/kg	TM4/PM8
PAH 16 Total	4.0	<0.6	8.9	258.3	<0.6	10.2	6.9	<0.6			<0.6	mg/kg	TM4/PM8
Benzo(b)fluoranthene	0.50	<0.05	0.96	22.01	<0.05	1.34	0.84	<0.05			<0.05	mg/kg	TM4/PM8
Benzo(k)fluoranthene	0.20	<0.02	0.38	8.56	<0.02	0.52	0.33	<0.02			<0.02	mg/kg	TM4/PM8
PAH Surrogate % Recovery	88	89	91	95	90	95	87	94			<0	%	TM4/PM8
EPH >C8-C10 (EH_1D_Total) #	<5	<5	<5	<5	<5	<5	<5	<5			<5	mg/kg	TM5/PM8
EPH >C10-C12 (EH_1D_Total) #	<10	<10	<10	<10	<10	<10	<10	<10			<10	mg/kg	TM5/PM8
EPH >C12-C16 (EH_1D_Total) #	<10	<10	<10	<10	<10	14	<10	<10			<10	mg/kg	TM5/PM8
EPH >C16-C21 (EH_1D_Total) #	15	<10	31	75	<10	43	43	<10			<10	mg/kg	TM5/PM8
EPH >C21-C35 (EH_1D_Total) #	99	<10	153	351	<10	279	159	<10			<10	mg/kg	TM5/PM8
EPH >C35-C44 (EH_1D_Total)	<10	<10	<10	27	<10	26	13	<10			<10	mg/kg	TM5/PM8
EPH >C8-C44 (EH_1D_Total)	114	<30	184	453	<30	362	215	<30			<30	mg/kg	TM5/PM8
GRO (>C4-C6)	<0.1	<0.1	<0.1	<0.1 ^{SV}	<0.1	<0.1 ^{SV}	<0.1	<0.1			<0.1	mg/kg	TM36/PM12

Client Name: Omnia
Reference: A11840
Location: Brackley, Havant
Contact: Lauren Burnett
EMT Job No: 22/8052

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

Please see attached notes for all abbreviations and acronyms

Client Name: Omnia
Reference: A11840
Location: Brackley, Havant
Contact: Lauren Burnett

Note:

Asbestos Screen analysis is carried out in accordance with our documented in-house methods PM042 and TM065 and HSG 248 by Stereo and Polarised Light Microscopy using Dispersion Staining Techniques and is covered by our UKAS accreditation. Detailed Gravimetric Quantification and PCOM Fibre Analysis is carried out in accordance with our documented in-house methods PM042 and TM131 and HSG 248 using Stereo and Polarised Light Microscopy and Phase Contrast Optical Microscopy (PCOM). Asbestos sub-samples are retained for not less than 6 months from the date of analysis unless specifically requested.

The LOQ of the Asbestos Quantification is 0.001% dry fibre of dry mass of sample.

Where the sample is not taken by a Element Materials Technology consultant, Element Materials Technology cannot be responsible for inaccurate or unrepresentative sampling.

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Analyst Name	Date Of Analysis	Analysis	Result
22/8052	1	WS101	0.10-0.20	3	Charlotte Taylor	25/05/2022	General Description (Bulk Analysis)	soil/stones
					Charlotte Taylor	25/05/2022	Asbestos Fibres	NAD
					Charlotte Taylor	25/05/2022	Asbestos ACM	NAD
					Charlotte Taylor	25/05/2022	Asbestos Type	NAD
22/8052	1	WS102	0.70-0.80	12	Charlotte Taylor	25/05/2022	General Description (Bulk Analysis)	soil/stones
					Charlotte Taylor	25/05/2022	Asbestos Fibres	NAD
					Charlotte Taylor	25/05/2022	Asbestos ACM	NAD
					Charlotte Taylor	25/05/2022	Asbestos Type	NAD
22/8052	1	WS103	0.10-0.30	15	Simon Postlewhite	25/05/2022	General Description (Bulk Analysis)	Brown soil/stones
					Simon Postlewhite	25/05/2022	Asbestos Fibres	NAD
					Simon Postlewhite	25/05/2022	Asbestos ACM	NAD
					Simon Postlewhite	25/05/2022	Asbestos Type	NAD
22/8052	1	WS104	0.20-0.30	24	Simon Postlewhite	25/05/2022	General Description (Bulk Analysis)	Brown soil/stones
					Simon Postlewhite	25/05/2022	Asbestos Fibres	NAD
					Simon Postlewhite	25/05/2022	Asbestos ACM	NAD
					Simon Postlewhite	25/05/2022	Asbestos Type	NAD
22/8052	1	WS105	0.60-0.70	33	Simon Postlewhite	25/05/2022	General Description (Bulk Analysis)	Brown soil/stones
					Simon Postlewhite	25/05/2022	Asbestos Fibres	NAD
					Simon Postlewhite	25/05/2022	Asbestos ACM	NAD
					Simon Postlewhite	25/05/2022	Asbestos Type	NAD
22/8052	1	WS106	0.20-0.40	36	Matthew Turner	25/05/2022	General Description (Bulk Analysis)	Brown soil/Stone
					Matthew Turner	25/05/2022	Asbestos Fibres	Fibre Bundles
					Matthew Turner	25/05/2022	Asbestos ACM	NAD
					Matthew Turner	25/05/2022	Asbestos Type	Chrysotile
22/8052	1	CP101	0.50-0.60	48	Matthew Turner	25/05/2022	General Description (Bulk Analysis)	Brown soil/Stone
					Matthew Turner	25/05/2022	Asbestos Fibres	NAD
					Matthew Turner	25/05/2022	Asbestos ACM	NAD
					Matthew Turner	25/05/2022	Asbestos Type	NAD
22/8052	1	CP102	1.10-1.20	60	Simon Postlewhite	25/05/2022	General Description (Bulk Analysis)	Brown soil/stones
					Simon Postlewhite	25/05/2022	Asbestos Fibres	NAD
					Simon Postlewhite	25/05/2022	Asbestos ACM	NAD
					Simon Postlewhite	25/05/2022	Asbestos Type	NAD

Client Name: Omnia
Reference: A11840
Location: Brackley, Havant
Contact: Lauren Burnett

[illegible]

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating. Only analyses which are accredited are recorded as deviating if set criteria are not met.

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

EMT Job No.: 22/8052

SOILS and ASH

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary. Asbestos samples are retained for 6 months.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Limits of detection for analyses carried out on as received samples are not moisture content corrected. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C. Ash samples are dried at 37°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Sufficient amount of sample must be received to carry out the testing specified. Where an insufficient amount of sample has been received the testing may not meet the requirements of our accredited methods, as such accreditation may be removed.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

The calculation of Pyrite content assumes that all oxidisable sulphides present in the sample are pyrite. This may not be the case. The calculation may be an overestimate when other sulphides such as Barite (Barium Sulphate) are present.

WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 accreditation applies to surface water and groundwater and usually one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

STACK EMISSIONS

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation for Dioxins and Furans and Dioxin like PCBs has been performed on XAD-2 Resin, only samples which use this resin will be within our MCERTS scope.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

DEVIATING SAMPLES

All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. The temperature of sample receipt is recorded on the confirmation schedules in order that the client can make an informed decision as to whether testing should still be undertaken.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

BLANKS

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.

Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

Laboratory records are kept for a period of no less than 6 years.

REPORTS FROM THE SOUTH AFRICA LABORATORY

Any method number not prefixed with SA has been undertaken in our UK laboratory unless reported as subcontracted.

Measurement Uncertainty

Measurement uncertainty defines the range of values that could reasonably be attributed to the measured quantity. This range of values has not been included within the reported results. Uncertainty expressed as a percentage can be provided upon request.

Customer Provided Information

Sample ID and depth is information provided by the customer.

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS Ref No. 4225) accredited - UK.
SA	ISO17025 (SANAS Ref No.T0729) accredited - South Africa
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
>>	Results above calibration range, the result should be considered the minimum value. The actual result could be significantly higher.
*	Analysis subcontracted to an Element Materials Technology approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range

HWOL ACRONYMS AND OPERATORS USED

HS	Headspace Analysis.
EH	Extractable Hydrocarbons - i.e. everything extracted by the solvent.
CU	Clean-up - e.g. by florisil, silica gel.
1D	GC - Single coil gas chromatography.
Total	Aliphatics & Aromatics.
AL	Aliphatics only.
AR	Aromatics only.
2D	GC-GC - Double coil gas chromatography.
#1	EH_Total but with humics mathematically subtracted
#2	EU_Total but with fatty acids mathematically subtracted
_	Operator - underscore to separate acronyms (exception for +).
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total
MS	Mass Spectrometry.

EMT Job No: 22/8052

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/ANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM4	Modified USEPA 8270D v5:2014 method for the solvent extraction and determination of PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.			AR	Yes
TM4	Modified USEPA 8270D v5:2014 method for the solvent extraction and determination of PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes
TM5	Modified 8015B v2:1996 method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) within the range C8-C40 by GCFID. For waters the solvent extracts dissolved phase plus a sheen if present.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.			AR	Yes
TM5	Modified 8015B v2:1996 method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) within the range C8-C40 by GCFID. For waters the solvent extracts dissolved phase plus a sheen if present.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes
TM26	Determination of phenols by Reversed Phased High Performance Liquid Chromatography and Electro-Chemical Detection.	PM21B	As Received samples are extracted in Methanol: Water (60:40) by reciprocal shaker.			AR	Yes
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP 6010B, Rev.2, Dec.1996; Modified EPA Method 3050B, Rev.2, Dec.1996	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground.			AD	Yes
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP 6010B, Rev.2, Dec.1996; Modified EPA Method 3050B, Rev.2, Dec.1996	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground.	Yes		AD	Yes
TM36	Modified US EPA method 8015B v2:1996. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID. MTBE by GCFID co-elutes with 3-methylpentane if present and therefore can give a false positive. Positive MTBE results will be re-run using GC-MS to double check, when requested.	PM12	Modified US EPA method 5021A v2:2014. Preparation of solid and liquid samples for GC headspace analysis.			AR	Yes
TM36	Modified US EPA method 8015B v2:1996. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID. MTBE by GCFID co-elutes with 3-methylpentane if present and therefore can give a false positive. Positive MTBE results will be re-run using GC-MS to double check, when requested.	PM12	Modified US EPA method 5021A v2:2014. Preparation of solid and liquid samples for GC headspace analysis.	Yes		AR	Yes
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993) – All anions comparable to BS ISO 15923-1: 2013	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.	Yes		AD	Yes

EMT Job No: 22/8052

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/S ANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993) – All anions comparable to BS ISO 15923-1: 2013	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.	Yes		AR	Yes
TM65	Asbestos Bulk Identification method based on HSG 248 Second edition (2021)	PM42	Modified SCA Blue Book V.12 draft 2017 and WM3 1st Edition v1.1:2018. Solid samples undergo a thorough visual inspection for asbestos fibres prior to asbestos identification using TM065.	Yes		AR	
TM73	Modified US EPA methods 150.1 (1982) and 9045D Rev. 4 - 2004) and BS1377-3:1990. Determination of pH by Metrohm automated probe analyser.	PM11	Extraction of as received solid samples using one part solid to 2.5 parts deionised water.	Yes		AR	No
TM74	Analysis of water soluble boron (20:1 extract) by ICP-OES.	PM32	Hot water soluble boron is extracted from dried and ground samples using a 20:1 ratio.	Yes		AD	Yes
TM89	Modified USEPA method OIA-1667 (1999). Determination of cyanide by Flow Injection Analyser. Where WAD cyanides are required a Ligand displacement step is carried out before analysis.	PM45	As received solid samples are extracted with 1M NaOH by orbital shaker for Cyanide, Sulphide and Thiocyanate analysis.	Yes		AR	Yes
NONE	No Method Code	NONE	No Method Code			AD	Yes

APPENDIX VIII - ORIGIN OF GAC VALUES



ENVIRONMENTAL
CONSULTING

DOC REF

TECH11101

DOCUMENT NAME

Residential End Use with Homegrown Produce

Determinant	Unit	GAC	Exposure Pathway	Origin of Risk Assessment Value
Metals				
Arsenic	mg/kg	37	1	LQM CIEH Suitable for Use Levels (S4UL) 2015- Inorganic Arsenic
Beryllium	mg/kg	1.7	1	LQM CIEH Suitable for Use Levels (S4UL) 2015
Boron	mg/kg	290	1	
Cadmium	mg/kg	11	2	
Chromium (III)	mg/kg	910	1	
Chromium (VI)	mg/kg	6	2	
Copper	mg/kg	2,400	2	
Lead	mg/kg	200	1	Category 4 Screening Level (C4SL) utilising exposure parameters from CLEA SR3 report.
Mercury	mg/kg	40	1	LQM CIEH Suitable for Use Levels (S4UL) 2015- Inorganic Mercury
Nickel	mg/kg	180	1,2	LQM CIEH Suitable for Use Levels (S4UL) 2015
Selenium	mg/kg	250	1,2	
Vanadium	mg/kg	410	2	
Zinc	mg/kg	3,700	2	
General Inorganics				
Total Cyanide*	mg/kg	50	1	Dutch Intervention Values 2010
Asbestos	%	0.001%	6	OEC Derived Value based on ICRL
General Organics				
Phenol	mg/kg	280	2	LQM CIEH Suitable for Use Levels (S4UL) 2015 1%SOM
PAHs				
Naphthalene	mg/kg	2.3	2	LQM CIEH Suitable for Use Levels (S4UL) 2015 based on a sandy loam as defined in SR3 (EA 2009) 1% SOM
Acenaphthylene	mg/kg	170	2	
Acenaphthene	mg/kg	210	2	
Fluorene	mg/kg	170	2	
Phenanthrene	mg/kg	95	2	
Anthracene	mg/kg	2,400	2	
Fluoranthene	mg/kg	280	1,2	
Pyrene	mg/kg	620	1,2	
Benzo(a)Anthracene ^l	mg/kg	7.2	1	
Chrysene	mg/kg	15	1	
Benzo(b)Fluoranthene	mg/kg	2.6	1	
Benzo(k)Fluoranthene	mg/kg	77	1	
Benzo(a)Pyrene	mg/kg	2.2	1	
Indeno(123-cd)Pyrene	mg/kg	27	1	
Dibenzo(a,h)Anthracene	mg/kg	0.24	1	

DOCUMENT VERSION	DOCUMENT DATE	OWNER
5	March 2019	T.Mitchell

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Determinant	Unit	GAC	Exposure Pathway	Origin of Risk Assessment Value
Benzo(ghi)Perylene	mg/kg	320	1	
BTEX & MTBE				
Benzene	mg/kg	0.087	4	LQM CIEH Suitable for Use Levels (S4UL) 2015 1%SOM
Toluene	mg/kg	130	2,4	
Ethylbenzene	mg/kg	47	2,4	
Xylenes	mg/kg	56	2,4	LQM CIEH Suitable for Use Levels (S4UL) 2015 1% SOM o-Xylene
MTBE	mg/kg	49	4	Soil Generic Assessment Criteria for Human Health Risk Assessment (2010)
TPH-CWG				
Aliphatic				
Aliphatic EC 5-6	mg/kg	42	4	LQM CIEH Suitable for Use Levels (S4UL) 2015 based on a sandy loam as defined in SR3 (EA 2009) 1% SOM
Aliphatic EC >6-8	mg/kg	100	4	
Aliphatic EC >8-10	mg/kg	27	4	
Aliphatic EC >10-12	mg/kg	130 ^(vap)	4	
Aliphatic EC > 12-16	mg/kg	1,100 ^(sol)	4	
Aliphatic EC > 16-35	mg/kg	65,000 ^(sol)	1	
Aliphatic EC >35-44	mg/kg	65,000 ^(sol)	1	
Aromatic				
Aromatic EC 5-7	mg/kg	70	4	LQM CIEH Suitable for Use Levels (S4UL) 2015 based on a sandy loam as defined in SR3 (EA 2009) 1% SOM
Aromatic EC>7-8	mg/kg	130	4	
Aromatic EC> 8-10	mg/kg	34	4	
Aromatic EC> 10-12	mg/kg	74	2	
Aromatic EC> 12-16	mg/kg	140	2	
Aromatic EC> 16-21	mg/kg	260	2	
Aromatic EC> 21-35	mg/kg	1,100	1	
Aromatic EC> 35-44	mg/kg	1,100	1	
Banded TPH				
TPH EC 5-6**	mg/kg	42	4	LQM CIEH Suitable for Use Levels (S4UL) 2015 based on a sandy loam as defined in SR3 (EA 2009) 1% SOM, utilising the most conservative of the Ali/Aro chain lengths.
TPH EC >6-8**	mg/kg	100	4	
TPH EC >8-10**	mg/kg	27	4	
TPH EC> 10-12**	mg/kg	74	2	
TPH EC> 12-16**	mg/kg	140	2	
TPH EC> 16-21**	mg/kg	260	1	
TPH EC> 21-35**	mg/kg	1,100	1	

DOCUMENT VERSION	DOCUMENT DATE	OWNER
5	March 2019	T.Mitchell

	DOC REF	DOCUMENT NAME
	TECH11101	Residential End Use with Homegrown Produce

Determinant	Unit	GAC	Exposure Pathway	Origin of Risk Assessment Value
TPH EC> 35-44**	mg/kg	1,100	1	

Notes

Abbreviations: GAC = General Assessment Criteria, n = number of samples, MC = Maximum Concentration; Loc of Ex = Location of Exceedance.

Main Exposure Pathways: 1 = Ingestion of Soil & Indoor Dust, 2 = Consumption of Homegrown Produce & Attached Soil; 3 = Dermal Contact (Indoor & Outdoor); 4 = Inhalation of Vapour (Indoor & Outdoor); 5 = Inhalation of Dust (Indoor & Outdoor), 6 = Inhalation of Fibres

* Total cyanide Tier 1 GAC is taken from the Dutch Intervention Value (2010) for complex cyanide.

** The Tier 1 GAC for the banded hydrocarbon fraction is derived from the CIEH/S4UL assessment for petroleum hydrocarbons Criteria Working Group (CWG) for both aliphatic and aromatic compounds. OEC has utilised the lowest of the aliphatic and aromatic chain lengths in order to adopt a conservative approach, which is considered satisfactory for the protection of human health.

(sol) – GAC presented exceeds the solubility saturation limit.

(vap) – GAC presented exceeds the vapour saturation limit.

DOCUMENT VERSION	DOCUMENT DATE	OWNER
5	March 2019	T.Mitchell

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**Tier 1 Risk Assessment - Soils – Residential End Use with Homegrown Produce**

Determinant	Units	GAC	n	MC	Loc. of Ex	Pathway	Assessment
Inorganics							
Metals							
Arsenic	mg/kg	37			N/A	1	No Further Action
Beryllium	mg/kg	1.7			N/A	1	No Further Action
Boron	mg/kg	290			N/A	1	No Further Action
Cadmium	mg/kg	11			N/A	2	No Further Action
Chromium (III)	mg/kg	910			N/A	1	No Further Action
Chromium (VI)	mg/kg	6			N/A	2	No Further Action
Copper	mg/kg	2,400			N/A	2	No Further Action
Lead	mg/kg	200			N/A	1	No Further Action
Mercury	mg/kg	40			N/A	1	No Further Action
Nickel	mg/kg	180			N/A	1,2	No Further Action
Selenium	mg/kg	250			N/A	1,2	No Further Action
Vanadium	mg/kg	410			N/A	2	No Further Action
Zinc	mg/kg	3,700			N/A	2	No Further Action
General Inorganics							
Asbestos	%	0.001			N/A	5	No Further Action
Total Cyanide *	mg/kg	50			N/A	1	No Further Action
Organics							
General Organics							
Phenol	mg/kg	280			N/A	2	No Further Action
PAH							
Naphthalene	mg/kg	2.3			N/A	2	No Further Action
Acenaphthylene	mg/kg	170			N/A	2	No Further Action
Acenaphthene	mg/kg	210			N/A	2	No Further Action
Fluorene	mg/kg	170			N/A	2	No Further Action
Phenanthrene	mg/kg	95			N/A	2	No Further Action
Anthracene	mg/kg	2,400			N/A	2	No Further Action
Fluoranthene	mg/kg	280			N/A	1,2	No Further Action
Pyrene	mg/kg	620			N/A	1,2	No Further Action
Benzo(a)Anthracene	mg/kg	7.2			N/A	1	No Further Action
Chrysene	mg/kg	15			N/A	1	No Further Action
Benzo(b)Fluoranthene	mg/kg	2.6			N/A	1	No Further Action
Benzo(k)Fluoranthene	mg/kg	77			N/A	1	No Further Action
Benzo(a)Pyrene	mg/kg	2.2			N/A	1	No Further Action
Indeno(123-cd)Pyrene	mg/kg	27			N/A	1	No Further Action
Dibenzo(a,h)Anthracene	mg/kg	0.24			N/A	1	No Further Action
Benzo(ghi)Perylene	mg/kg	320			N/A	1	No Further Action
BTEX & MTBE							
Benzene	mg/kg	0.087			N/A	4	No Further Action
Toluene	mg/kg	130			N/A	2,4	No Further Action
Ethylbenzene	mg/kg	47			N/A	2,4	No Further Action
Xylenes	mg/kg	56			N/A	2,4	No Further Action
MTBE	mg/kg	49			N/A	4	No Further Action
Aliphatic TPH							
Aliphatic EC 5-6	mg/kg	42			N/A	4	No Further Action
Aliphatic EC >6-8	mg/kg	100			N/A	4	No Further Action
Aliphatic EC >8-10	mg/kg	27			N/A	4	No Further Action
Aliphatic EC >10-12	mg/kg	130			N/A	4	No Further Action
Aliphatic EC > 12-16	mg/kg	1,100			N/A	4	No Further Action

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5	March 2019	T.Mitchell

Aliphatic EC > 16-35	mg/kg	65,000			N/A	1	No Further Action
Aliphatic EC >35-44	mg/kg	65,000			N/A	1	No Further Action
Aromatic TPH							
Aromatic EC 5-7	mg/kg	70			N/A	4	No Further Action
Aromatic EC>7-8	mg/kg	130			N/A	4	No Further Action
Aromatic EC> 8-10	mg/kg	34			N/A	4	No Further Action
Aromatic EC> 10-12	mg/kg	74			N/A	2	No Further Action
Aromatic EC> 12-16	mg/kg	140			N/A	2	No Further Action
Aromatic EC> 16-21	mg/kg	260			N/A	2	No Further Action
Aromatic EC> 21-35	mg/kg	1,100			N/A	1	No Further Action
Aromatic EC> 35-44	mg/kg	1,100			N/A	1	No Further Action
Banded TPH							
TPH EC 5-6**	mg/kg	42			N/A	4	No Further Action
TPH EC >6-8**	mg/kg	100			N/A	4	No Further Action
TPH EC >8-10**	mg/kg	27			N/A	4	No Further Action
TPH EC> 10-12**	mg/kg	74			N/A	2	No Further Action
TPH EC> 12-16**	mg/kg	140			N/A	2	No Further Action
TPH EC> 16-21**	mg/kg	260			N/A	1	No Further Action
TPH EC> 21-35**	mg/kg	1,100			N/A	1	No Further Action
TPH EC> 35-44**	mg/kg	1,100			N/A	1	No Further Action

Notes

Main Exposure Pathways: 1 = Ingestion of Soil & Indoor Dust, 2 = Consumption of Homegrown Produce & Attached Soil; 3 = Dermal Contact (Indoor & Outdoor); 4 = Inhalation of Vapour (Indoor & Outdoor); 5 = Inhalation of Dust (Indoor & Outdoor), 6 = Inhalation of Fibres

Abbreviations: GAC = General Assessment Criteria, n = number of samples, MC = Maximum Concentration; Loc of Ex = Location of Exceedance.

* Total cyanide Tier 1 GAC is taken from the Dutch Intervention Value (2010) for complex cyanide.

** The Tier 1 GAC for the banded hydrocarbon fraction is derived from the CIEH/S4UL assessment for petroleum hydrocarbons Criteria Working Group (CWG) for both aliphatic and aromatic compounds. OEC has utilised the lowest of the aliphatic and aromatic chain lengths in order to adopt a conservative approach, which is considered satisfactory for the protection of human health.

(sol) – GAC presented exceeds the solubility saturation limit.

(vap) – GAC presented exceeds the vapour saturation limit.

DOCUMENT VERSION	DOCUMENT DATE	OWNER
5	March 2019	T.Mitchell

APPENDIX IX - GEOTECHNICAL ANALYSIS CERTIFICATES

TEST CERTIFICATE

DETERMINATION OF LIQUID AND PLASTIC LIMITS

Tested in Accordance with: BS 1377-2:1990: Clause 4.4 and 5

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

Client: Omnia Environmental Consulting
Client Address: 3-6 The Quarterdeck, Port Solent,
Portsmouth, PO6 4TP

Contact: Lauren Burnett
Site Address: Brackley, Havant

Client Reference: A11840
Job Number: 22-59060
Date Sampled: 11/05/2022
Date Received: 16/05/2022
Date Tested: 26/05/2022
Sampled By: Client - LB

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

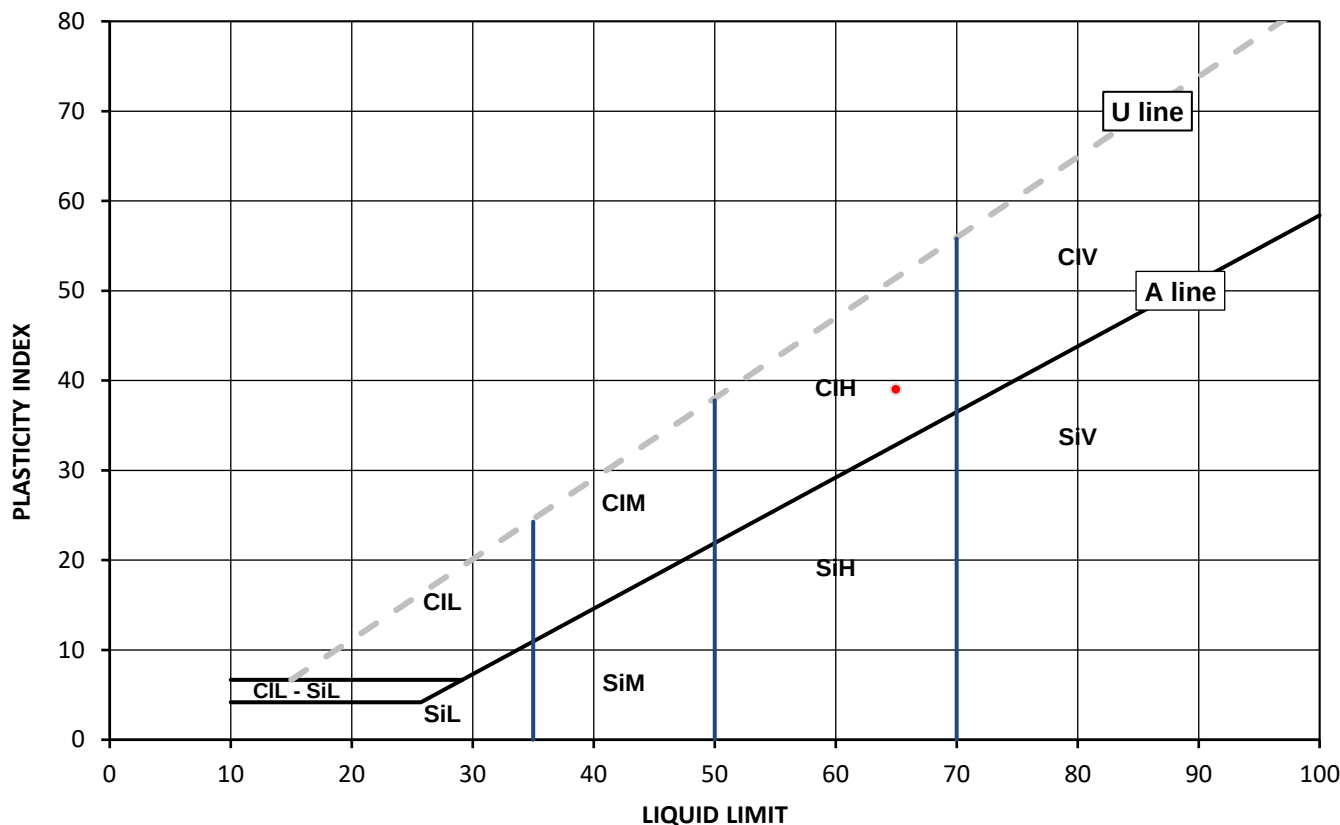
Test Results:

Laboratory Reference: 2279850
Hole No.: WS101
Sample Reference: Not Given
Sample Description: Brown CLAY

Depth Top [m]: 2.00
Depth Base [m]: 3.00
Sample Type: D

Sample Preparation: Tested in natural condition

As Received Water Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	% Passing 425µm BS Test Sieve
28	65	26	39	100



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

	Plasticity	Liquid Limit
Cl	Clay	below 35
Si	Silt	35 to 50
	L	Low
	M	Medium
	H	High
	V	Very high
	O	Organic
		append to classification for organic material (eg CIHO)

Note: Water Content by BS 1377-2: 1990: Clause 3.2

Remarks:

Signed:

Katarzyna Koziel
Technical Reviewer
for and on behalf of i2 Analytical Ltd

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TEST CERTIFICATE

DETERMINATION OF LIQUID AND PLASTIC LIMITS

Tested in Accordance with: BS 1377-2:1990: Clause 4.4 and 5

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Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

Client: Omnia Environmental Consulting
Client Address: 3-6 The Quarterdeck, Port Solent,
Portsmouth, PO6 4TP

Contact: Lauren Burnett
Site Address: Brackley, Havant

Client Reference: A11840
Job Number: 22-59060
Date Sampled: 11/05/2022
Date Received: 16/05/2022
Date Tested: 26/05/2022
Sampled By: Client - LB

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

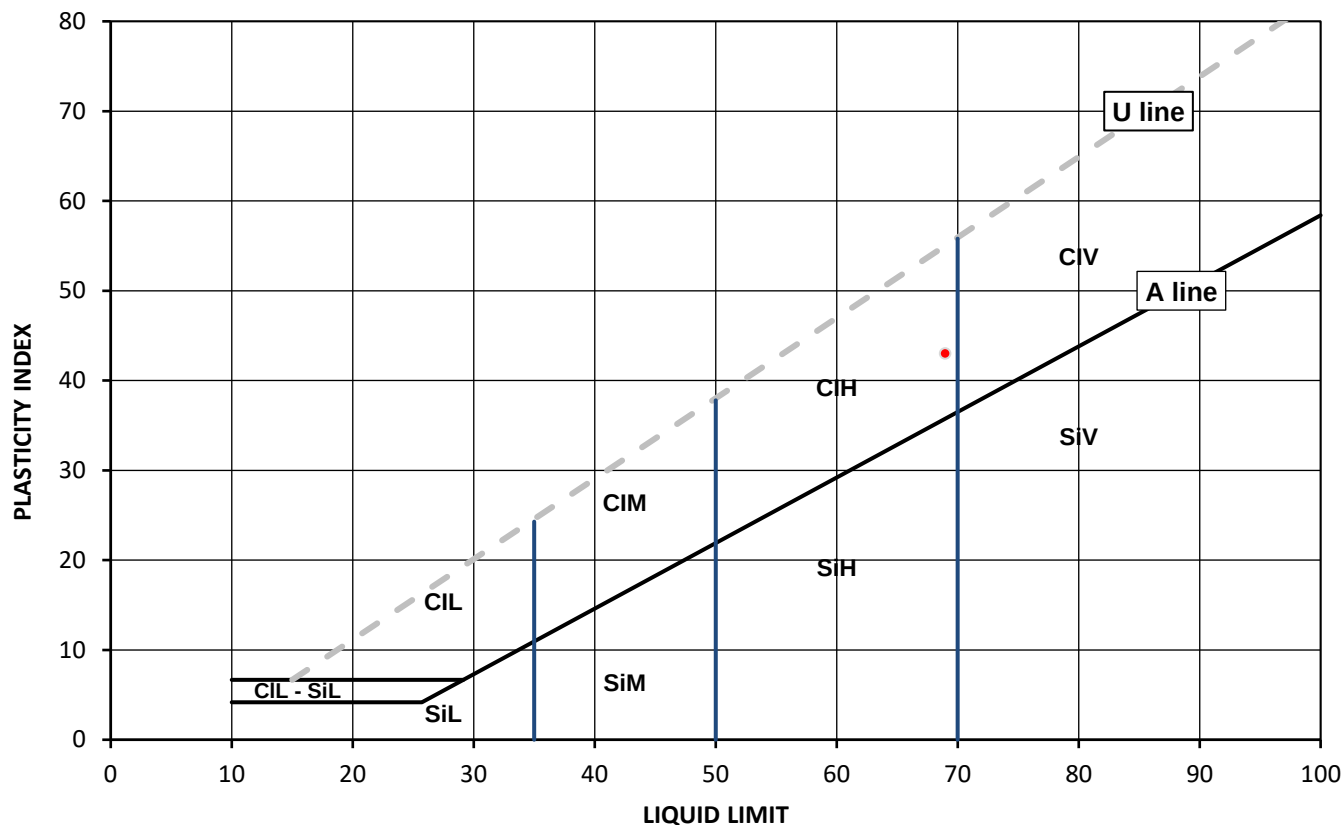
Test Results:

Laboratory Reference: 2279851
Hole No.: WS102
Sample Reference: Not Given
Sample Description: Brown CLAY

Depth Top [m]: 1.50
Depth Base [m]: 1.70
Sample Type: D

Sample Preparation: Tested in natural condition

As Received Water Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	% Passing 425µm BS Test Sieve
27	69	26	43	100



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

	Plasticity	Liquid Limit
Cl Clay	L Low	below 35
Si Silt	M Medium	35 to 50
	H High	50 to 70
	V Very high	exceeding 70
	O Organic	append to classification for organic material (eg CIHO)

Note: Water Content by BS 1377-2: 1990: Clause 3.2

Remarks:

Signed:

Katarzyna Koziel
Technical Reviewer
for and on behalf of i2 Analytical Ltd

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4041

Client: Omnia Environmental Consulting
Client Address: 3-6 The Quarterdeck, Port Solent,
Portsmouth, PO6 4TP

Contact: Lauren Burnett
Site Address: Brackley, Havant

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Śląska, Poland

Client Reference: A11840
Job Number: 22-59060
Date Sampled: 11/05/2022
Date Received: 16/05/2022
Date Tested: 26/05/2022
Sampled By: Client - LB

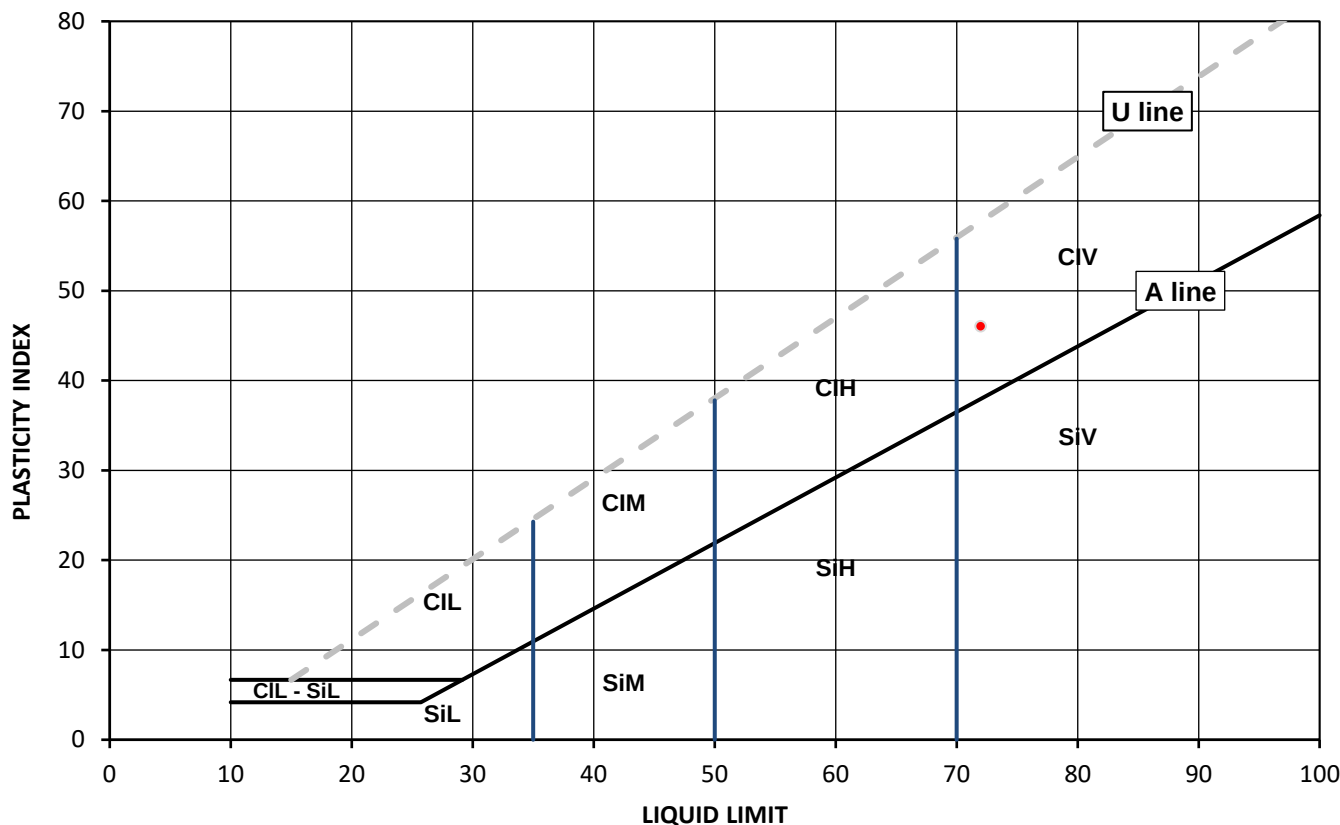
Test Results:

Laboratory Reference: 2279852
Hole No.: WS104
Sample Reference: Not Given
Sample Description: Brown CLAY

Depth Top [m]: 2.70
Depth Base [m]: 2.80
Sample Type: D

Sample Preparation: Tested in natural condition

As Received Water Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	% Passing 425µm BS Test Sieve
27	72	26	46	100



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

	Plasticity	Liquid Limit
Cl	Clay	below 35
Si	Silt	35 to 50
	L	Low
	M	Medium
	H	High
	V	Very high
	O	Organic
		append to classification for organic material (eg CIHO)

Note: Water Content by BS 1377-2: 1990: Clause 3.2

Remarks:

Signed:

Katarzyna Koziel
Technical Reviewer
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TEST CERTIFICATE

DETERMINATION OF LIQUID AND PLASTIC LIMITS

Tested in Accordance with: BS 1377-2:1990: Clause 4.4 and 5

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

Client: Omnia Environmental Consulting
Client Address: 3-6 The Quarterdeck, Port Solent,
Portsmouth, PO6 4TP

Contact: Lauren Burnett
Site Address: Brackley, Havant

Client Reference: A11840
Job Number: 22-59060
Date Sampled: 11/05/2022
Date Received: 16/05/2022
Date Tested: 25/05/2022
Sampled By: Client - LB

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

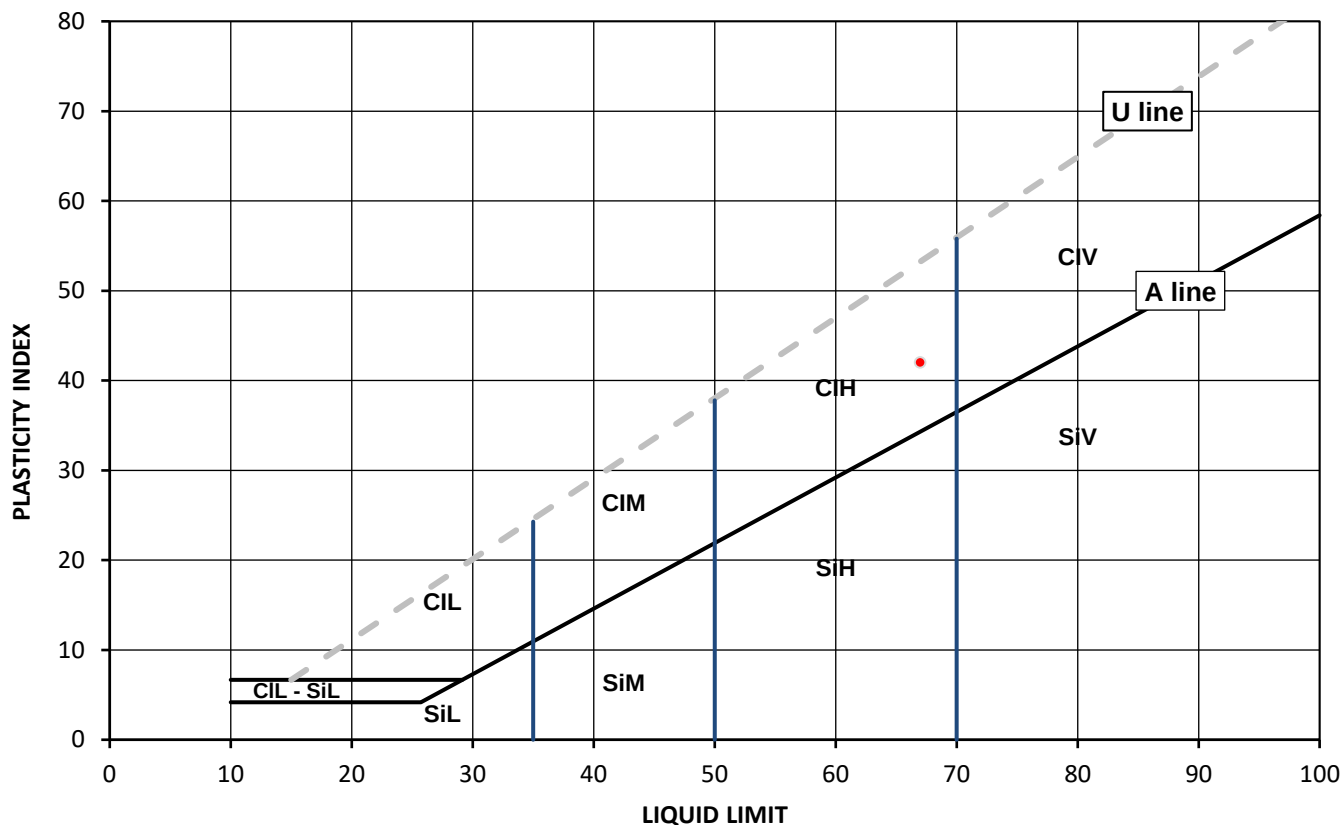
Test Results:

Laboratory Reference: 2279854
Hole No.: CP101
Sample Reference: Not Given
Sample Description: Greyish brown CLAY

Depth Top [m]: 0.50
Depth Base [m]: Not Given
Sample Type: B

Sample Preparation: Tested in natural condition

As Received Water Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	% Passing 425µm BS Test Sieve
29	67	25	42	100



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

	Plasticity	Liquid Limit
Cl Clay	L Low	below 35
Si Silt	M Medium	35 to 50
	H High	50 to 70
	V Very high	exceeding 70
	O Organic	append to classification for organic material (eg CIHO)

Note: Water Content by BS 1377-2: 1990: Clause 3.2

Remarks:

Signed:

Katarzyna Koziel
Technical Reviewer
for and on behalf of i2 Analytical Ltd

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TEST CERTIFICATE

DETERMINATION OF LIQUID AND PLASTIC LIMITS

Tested in Accordance with: BS 1377-2:1990: Clause 4.4 and 5

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

Client: Omnia Environmental Consulting

Client Address: 3-6 The Quarterdeck, Port Solent,
Portsmouth, PO6 4TP

Contact: Lauren Burnett

Site Address: Brackley, Havant

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Client Reference: A11840

Job Number: 22-59060

Date Sampled: 11/05/2022

Date Received: 16/05/2022

Date Tested: 25/05/2022

Sampled By: Client - LB

Test Results:

Laboratory Reference: 2279856

Hole No.: CP101

Sample Reference: Not Given

Sample Description: Greyish brown slightly sandy CLAY

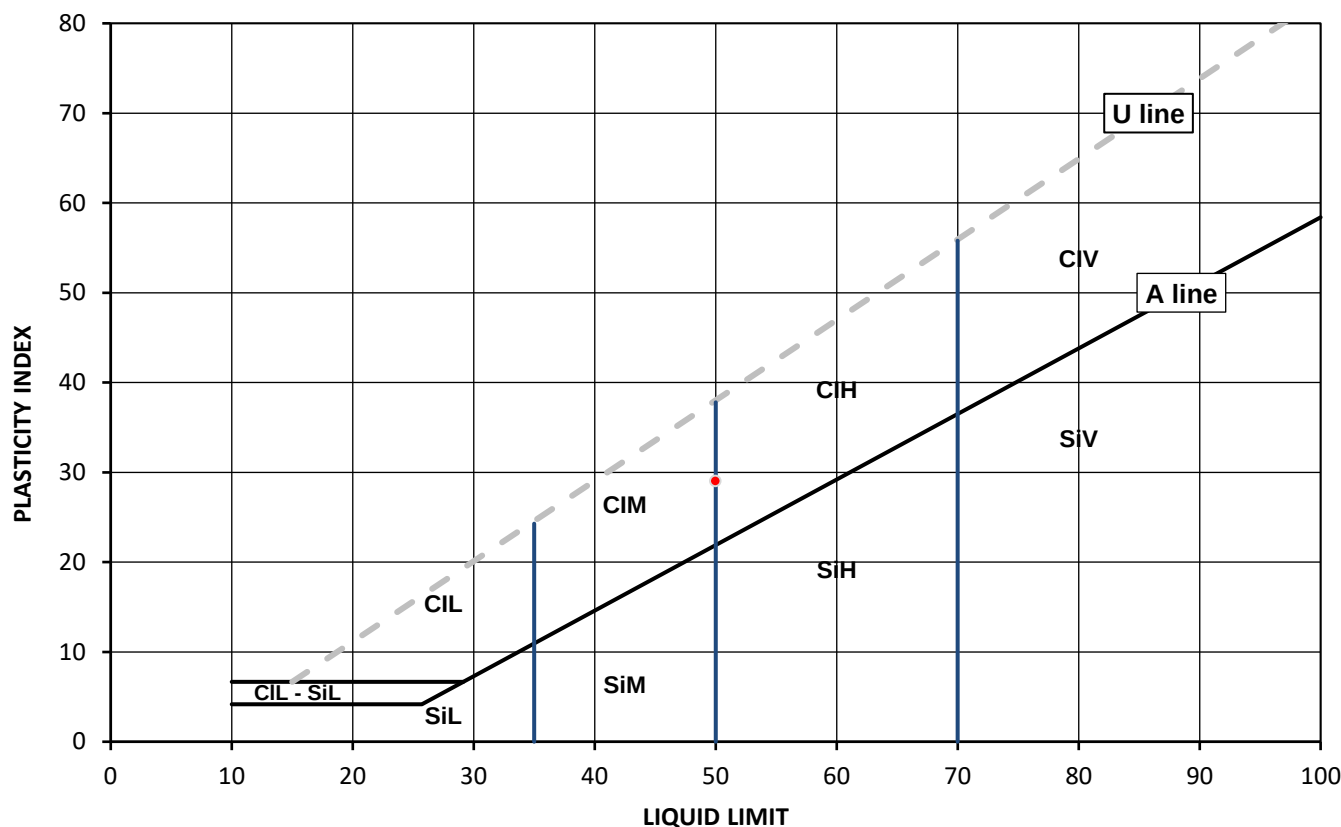
Depth Top [m]: 14.50

Depth Base [m]: Not Given

Sample Type: B

Sample Preparation: Tested in natural condition

As Received Water Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	% Passing 425µm BS Test Sieve
21	50	21	29	100



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

	Plasticity	Liquid Limit
Cl Clay	L Low	below 35
Si Silt	M Medium	35 to 50
	H High	50 to 70
	V Very high	exceeding 70
	O Organic	append to classification for organic material (eg CIHO)

Note: Water Content by BS 1377-2: 1990: Clause 3.2

Remarks:

Signed:

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TEST CERTIFICATE

DETERMINATION OF LIQUID AND PLASTIC LIMITS

Tested in Accordance with: BS 1377-2:1990: Clause 4.4 and 5

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

Client: Omnia Environmental Consulting
Client Address: 3-6 The Quarterdeck, Port Solent,
Portsmouth, PO6 4TP

Contact: Lauren Burnett
Site Address: Brackley, Havant

Client Reference: A11840
Job Number: 22-59060
Date Sampled: 12/05/2022
Date Received: 16/05/2022
Date Tested: 25/05/2022
Sampled By: Client - LB

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

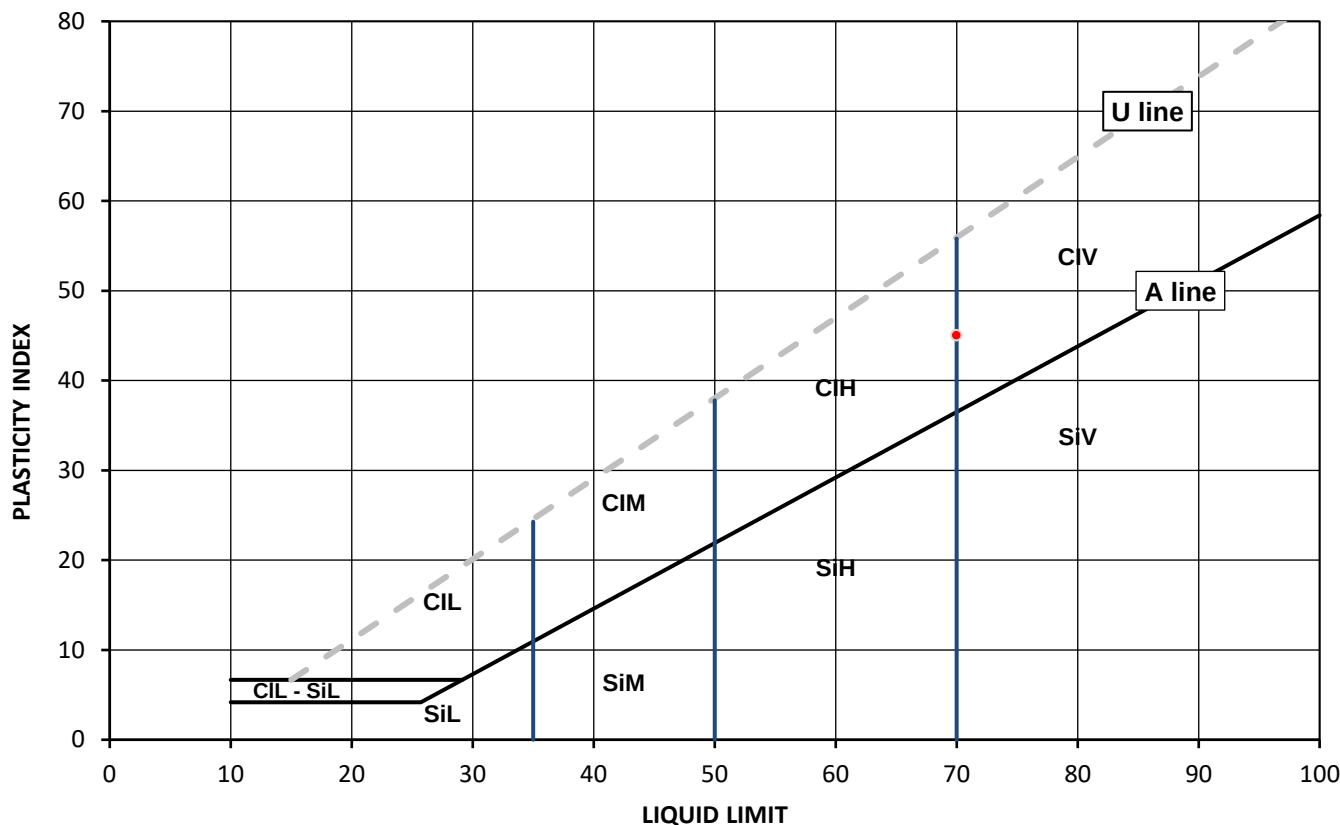
Test Results:

Laboratory Reference: 2279858
Hole No.: CP102
Sample Reference: Not Given
Sample Description: Brownish grey CLAY

Depth Top [m]: 9.50
Depth Base [m]: Not Given
Sample Type: B

Sample Preparation: Tested in natural condition

As Received Water Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	% Passing 425µm BS Test Sieve
29	70	25	45	100



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

	Plasticity	Liquid Limit
Cl Clay	L Low	below 35
Si Silt	M Medium	35 to 50
	H High	50 to 70
	V Very high	exceeding 70
	O Organic	append to classification for organic material (eg CIHO)

Note: Water Content by BS 1377-2: 1990: Clause 3.2

Remarks:

Signed:

Katarzyna Koziel
Technical Reviewer
for and on behalf of i2 Analytical Ltd

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4041

Client: Omnia Environmental Consulting

Client Address: 3-6 The Quarterdeck, Port Solent,
Portsmouth, PO6 4TP

Contact: Lauren Burnett

Site Address: Brackley, Havant

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Client Reference: A11840

Job Number: 22-59060

Date Sampled: 12/05/2022

Date Received: 16/05/2022

Date Tested: 25/05/2022

Sampled By: Client - LB

Test Results:

Laboratory Reference: 2279860

Hole No.: CP102

Sample Reference: Not Given

Sample Description: Greyish brown slightly sandy CLAY

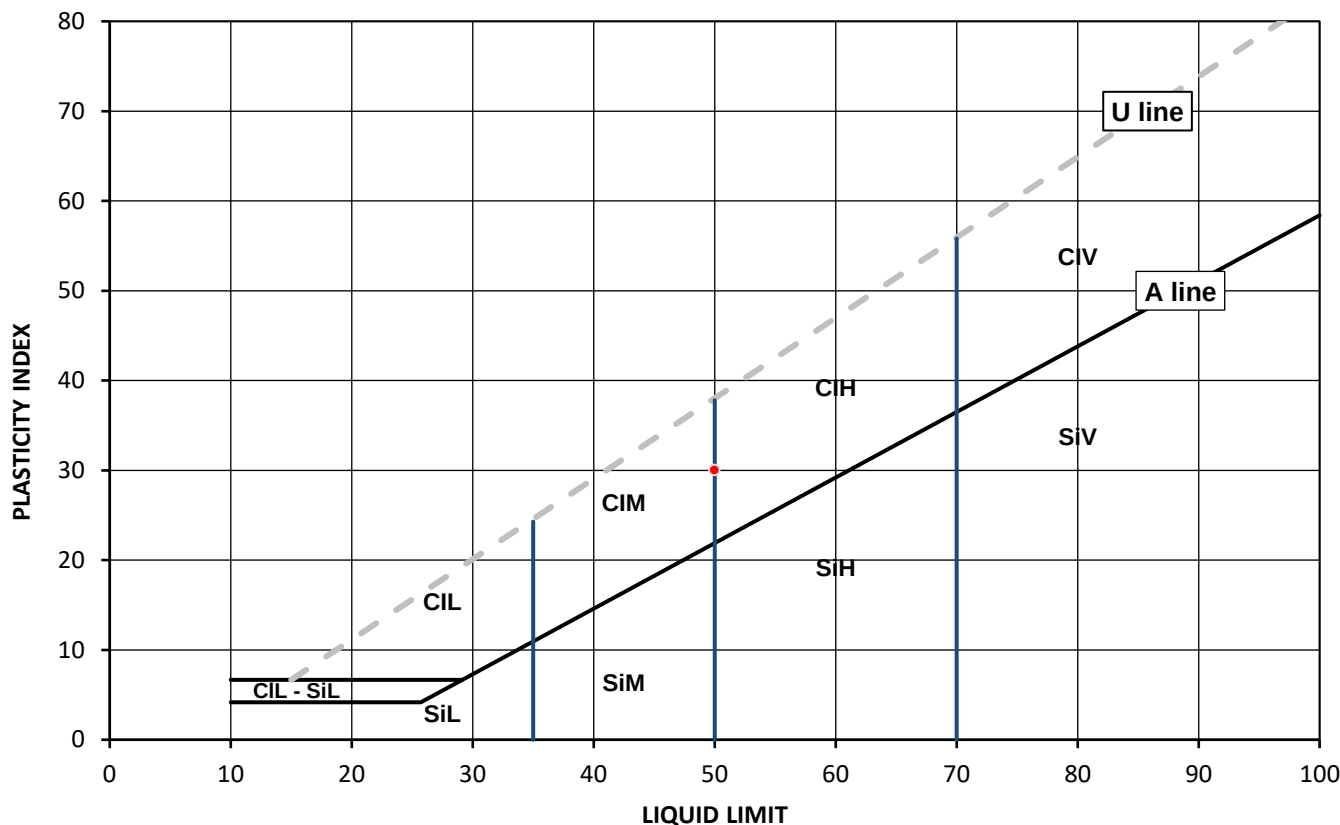
Depth Top [m]: 16.00

Depth Base [m]: Not Given

Sample Type: B

Sample Preparation: Tested in natural condition

As Received Water Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	% Passing 425µm BS Test Sieve
24	50	20	30	100



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

Cl	Clay	Plasticity	L	Low	Liquid Limit	below 35
Si	Silt		M	Medium		35 to 50
			H	High		50 to 70
			V	Very high		exceeding 70
			O	Organic		append to classification for organic material (eg CIHO)

Note: Water Content by BS 1377-2: 1990: Clause 3.2

Remarks:

Signed:

Katarzyna Koziel
Technical Reviewer
for and on behalf of i2 Analytical Ltd

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Client: Omnia Environmental Consulting

Client Address: 3-6 The Quarterdeck, Port Solent,
Portsmouth, PO6 4TP

Contact: Lauren Burnett

Site Address: Brackley, Havant

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

SUMMARY REPORT**SUMMARY OF CLASSIFICATION TEST RESULTS**

Tested in Accordance with:

Water Content by BS 1377-2:1990: Clause 3.2; Atterberg by BS 1377-2: 1990:
Clause 4.3 (4 Point Test), Clause 4.4 (1 Point Test) and 5; PD by BS 1377-2:
1990: Clause 8.2i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

Environmental Science

Client Reference: A11840

Job Number: 22-59060

Date Sampled: 11/05 - 12/05/2022

Date Received: 16/05/2022

Date Tested: 25/05 - 26/05/2022

Sampled By: Client - LB

Test results

Laboratory Reference	Hole No.	Sample				Description	Remarks	Water Content BS 1377-2 [W] %	Water Content BS EN ISO 17892-1 [W] %	Atterberg				Density			Total Porosity# %		
		Reference	Depth Top	Depth Base	Type					% Passing 425um	WL	Wp	Ip	bulk	dry	PD			
			m	m															
2279854	CP101	Not Given	0.50	Not Given	B	Greyish brown CLAY	Atterberg 1 Point	29		100	67	25	42						
2279856	CP101	Not Given	14.50	Not Given	B	Greyish brown slightly sandy CLAY	Atterberg 1 Point	21		100	50	21	29						
2279858	CP102	Not Given	9.50	Not Given	B	Brownish grey CLAY	Atterberg 1 Point	29		100	70	25	45						
2279860	CP102	Not Given	16.00	Not Given	B	Greyish brown slightly sandy CLAY	Atterberg 1 Point	24		100	50	20	30						
2279850	WS101	Not Given	2.00	3.00	D	Brown CLAY	Atterberg 1 Point	28		100	65	26	39						
2279851	WS102	Not Given	1.50	1.70	D	Brown CLAY	Atterberg 1 Point	27		100	69	26	43						
2279852	WS104	Not Given	2.70	2.80	D	Brown CLAY	Atterberg 1 Point	27		100	72	26	46						

Note: # Non accredited; NP - Non plastic

Comments:

Signed:

Katarzyna Koziel
Technical Reviewer
for and on behalf of i2 Analytical Ltd

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Portsmouth, PO6 4TP

Contact: Lauren Burnett

Site Address: Brackley, Havant

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

SUMMARY REPORT**DETERMINATION OF WATER CONTENT**

Tested in Accordance with: BS 1377-2: 1990: Clause 3.2

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

Environmental Science

Client Reference: A11840

Job Number: 22-59060

Date Sampled: 11/05 - 12/05/2022

Date Received: 16/05/2022

Date Tested: 25/05 - 26/05/2022

Sampled By: Client - LB

Test results

Laboratory Reference	Hole No.	Sample				Description	Remarks	WC	Sample preparation / Oven temperature at the time of testing			
		Reference	Depth Top m	Depth Base m	Type							
2279854	CP101	Not Given	0.50	Not Given	B	Greyish brown CLAY		29	Sample was quartered, oven dried at 107.8 °C			
2279856	CP101	Not Given	14.50	Not Given	B	Greyish brown slightly sandy CLAY		21	Sample was quartered, oven dried at 106.9 °C			
2279858	CP102	Not Given	9.50	Not Given	B	Brownish grey CLAY		29	Sample was quartered, oven dried at 109.0 °C			
2279860	CP102	Not Given	16.00	Not Given	B	Greyish brown slightly sandy CLAY		24	Sample was quartered, oven dried at 106.2 °C			
2279850	WS101	Not Given	2.00	3.00	D	Brown CLAY		28	Sample was quartered, oven dried at 108.2 °C			
2279851	WS102	Not Given	1.50	1.70	D	Brown CLAY		27	Sample was quartered, oven dried at 108.2 °C			
2279852	WS104	Not Given	2.70	2.80	D	Brown CLAY		27	Sample was quartered, oven dried at 108.2 °C			

Comments:

Signed:

Katarzyna Koziel
Technical Reviewer
for and on behalf of i2 Analytical Ltd

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Client: Omnia Environmental Consulting
Client Address: 3-6 The Quarterdeck, Port Solent,
Portsmouth, PO6 4TP

Contact: Lauren Burnett
Site Address: Brackley, Havant

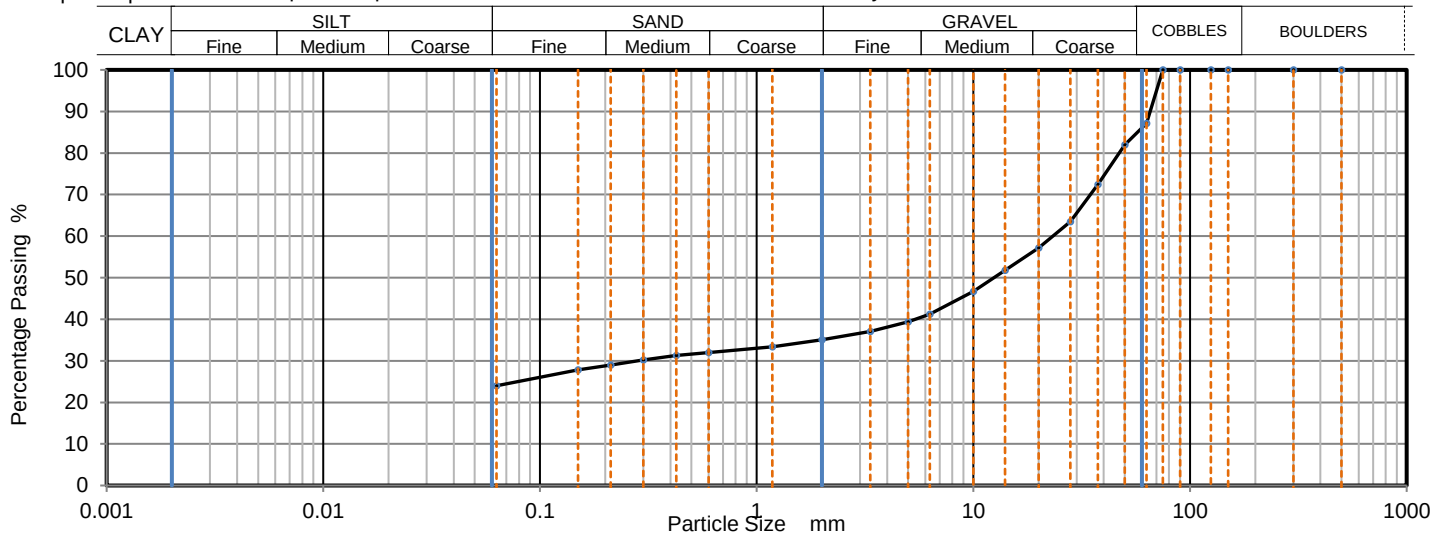
Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Client Reference: A11840
Job Number: 22-59060
Date Sampled: 11/05/2022
Date Received: 16/05/2022
Date Tested: 24/05/2022
Sampled By: Client - LB

Test Results:

Laboratory Reference: 2279853
Hole No.: CP101
Sample Reference: Not Given
Sample Description: Yellowish brown sandy clayey GRAVEL with cobbles
Sample Preparation: Sample was quartered, oven dried at 106.7 °C and broken down by hand.

Depth Top [m]: 0.80
Depth Base [m]: 1.20
Sample Type: B



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
500	100		
300	100		
150	100		
125	100		
90	100		
75	100		
63	87		
50	82		
37.5	72		
28	64		
20	57		
14	52		
10	47		
6.3	41		
5	39		
3.35	37		
2	35		
1.18	33		
0.6	32		
0.425	31		
0.3	30		
0.212	29		
0.15	28		
0.063	24		

Sample Proportions	% dry mass
Very coarse	13
Gravel	52
Sand	11
Fines <0.063mm	24

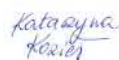
Grading Analysis	
D100	mm 75
D60	mm 23.2
D30	mm 0.286
D10	mm
Uniformity Coefficient	> 370
Curvature Coefficient	

Uniformity Coefficient calculated in accordance with BS EN ISO 14688-2:2018

Note: Tested in Accordance with BS1377:Part 2:1990, clause 9.2

Remarks:

Signed:



Katarzyna Koziel
Technical Reviewer
for and on behalf of i2 Analytical Ltd

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Portsmouth, PO6 4TP

Contact: Lauren Burnett
Site Address: Brackley, Havant

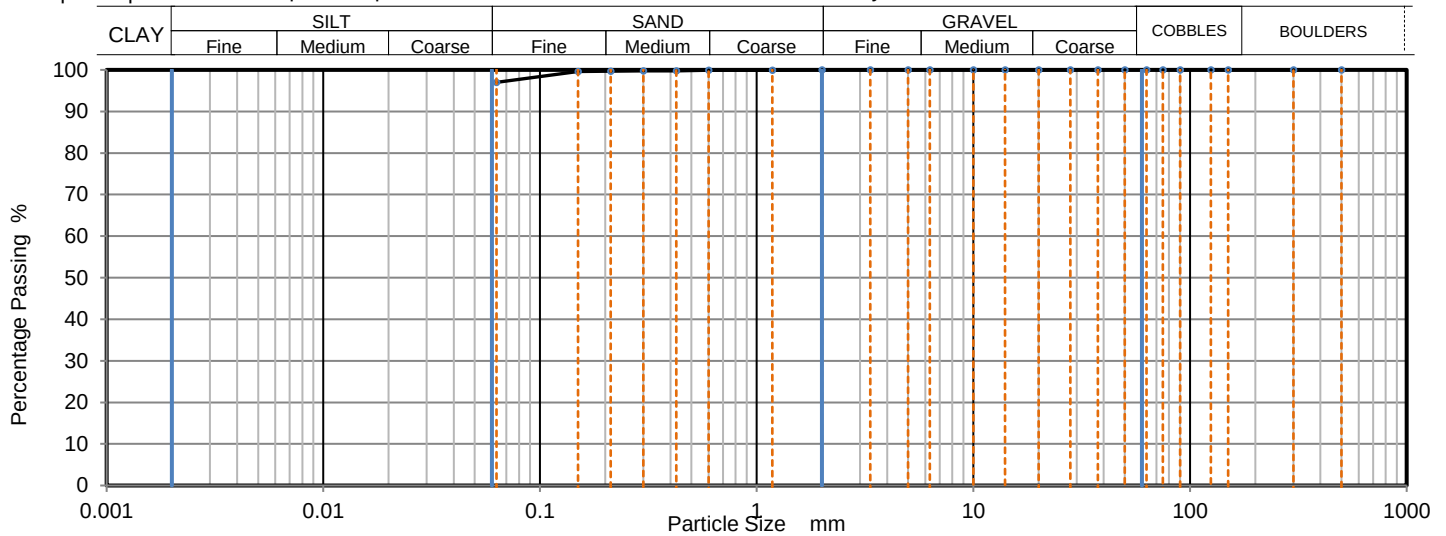
Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Client Reference: A11840
Job Number: 22-59060
Date Sampled: 12/05/2022
Date Received: 16/05/2022
Date Tested: 24/05/2022
Sampled By: Client - LB

Test Results:

Laboratory Reference: 2279857
Hole No.: CP102
Sample Reference: Not Given
Sample Description: Brownish grey slightly sandy CLAY
Sample Preparation: Sample was quartered, oven dried at 109.0 °C and broken down by hand.

Depth Top [m]: 4.50
Depth Base [m]: 5.00
Sample Type: B



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
500	100		
300	100		
150	100		
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	100		
1.18	100		
0.6	100		
0.425	100		
0.3	100		
0.212	100		
0.15	100		
0.063	97		

Sample Proportions	% dry mass
Very coarse	0
Gravel	0
Sand	3
Fines <0.063mm	97

Grading Analysis	
D100	mm
D60	mm
D30	mm
D10	mm
Uniformity Coefficient	N/A
Curvature Coefficient	

Uniformity Coefficient calculated in accordance with BS EN ISO 14688-2:2018

Note: Tested in Accordance with BS1377:Part 2:1990, clause 9.2

Remarks:

Signed:

Katarzyna Koziel
Technical Reviewer
for and on behalf of i2 Analytical Ltd

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TEST CERTIFICATE

DETERMINATION OF THE UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT MEASUREMENT OF PORE PRESSURE

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

Tested in Accordance with: BS 1377-7: 1990: Clause 8

Client: Omnia Environmental Consulting
Client Address: 3-6 The Quarterdeck, Port Solent,
Portsmouth, PO6 4TP

Contact: Lauren Burnett
Site Address: Brackley, Havant

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Client Reference: A11840
Job Number: 22-59060
Date Sampled: 11/05/2022
Date Received: 16/05/2022
Date Tested: 27/05/2022
Sampled By: Client - LB

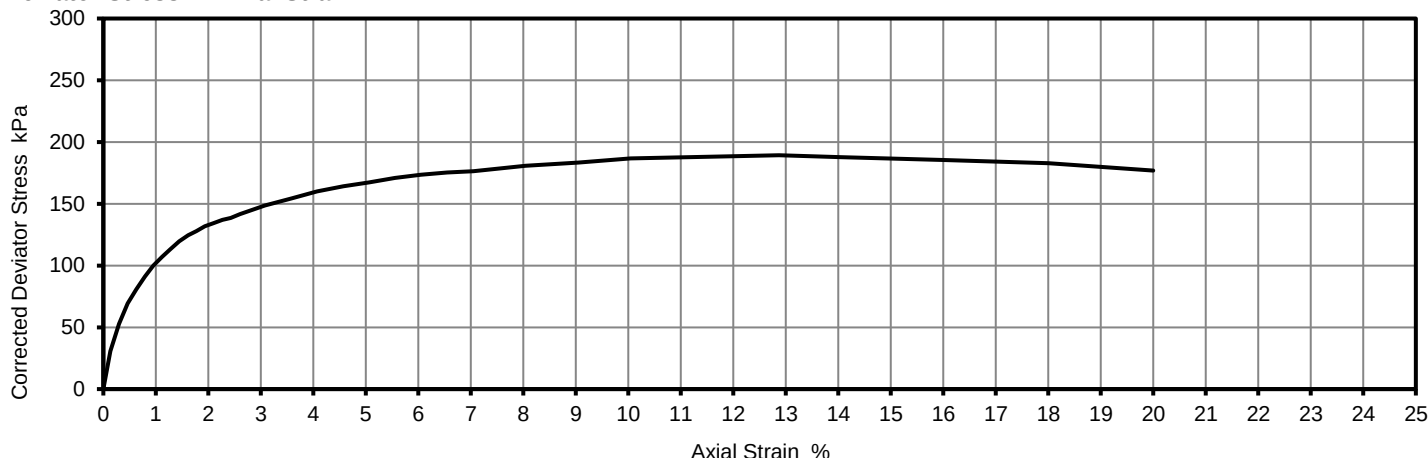
Test Results:

Laboratory Reference: 2279855
Hole No.: CP101
Sample Reference: Not Given
Sample Description: Brownish grey CLAY
Sample Preparation: Sample prepared in accordance with BS 1377-1:2016 Clause 9.1.1.

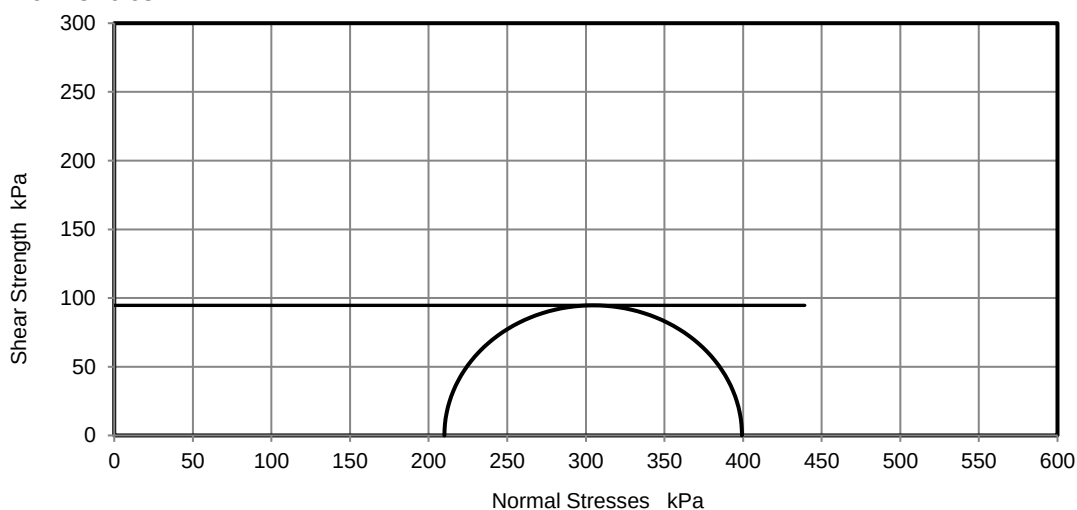
Depth Top [m]: 10.50
Depth Base [m]: 10.95
Sample Type: U

Test Number	1	Rate of Strain	2.00	%/min
Length	199.57	Cell Pressure	210	kPa
Diameter	102.81	Axial Strain at failure	12.9	%
Bulk Density	2.01	Deviator Stress, ($\sigma_1 - \sigma_3$) _f	189	kPa
Moisture Content	28	Undrained Shear Strength, c_u	95	kPa $\frac{1}{2}(\sigma_1 - \sigma_3)_f$
Dry Density	1.57	Mode of Failure	Compound	
Membrane Correction	0.76	Membrane thickness	0.29	mm

Deviator Stress v Axial Strain



Mohr Circles



Position within sample



Note: Deviator stress corrected for area change and membrane effects. Mohr circles and their interpretation is not covered by BS1377.
This is provided for information only.

Remarks:

Signed:

Katarzyna Koziel
Technical Reviewer
for and on behalf of i2 Analytical Ltd

Opinions and interpretations expressed herein are outside of the scope of the UKAS Accreditation. This report may not be reproduced other than in full without the prior written approval of the issuing laboratory. The results included within the report relate only to the sample(s) submitted for testing.

4041

Tested in Accordance with: BS 1377-7: 1990: Clause 8

Client: Omnia Environmental Consulting
Client Address: 3-6 The Quarterdeck, Port Solent,
Portsmouth, PO6 4TP

Contact: Lauren Burnett
Site Address: Brackley, Havant

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Client Reference: A11840
Job Number: 22-59060
Date Sampled: 12/05/2022
Date Received: 16/05/2022
Date Tested: 27/05/2022
Sampled By: Client - LB

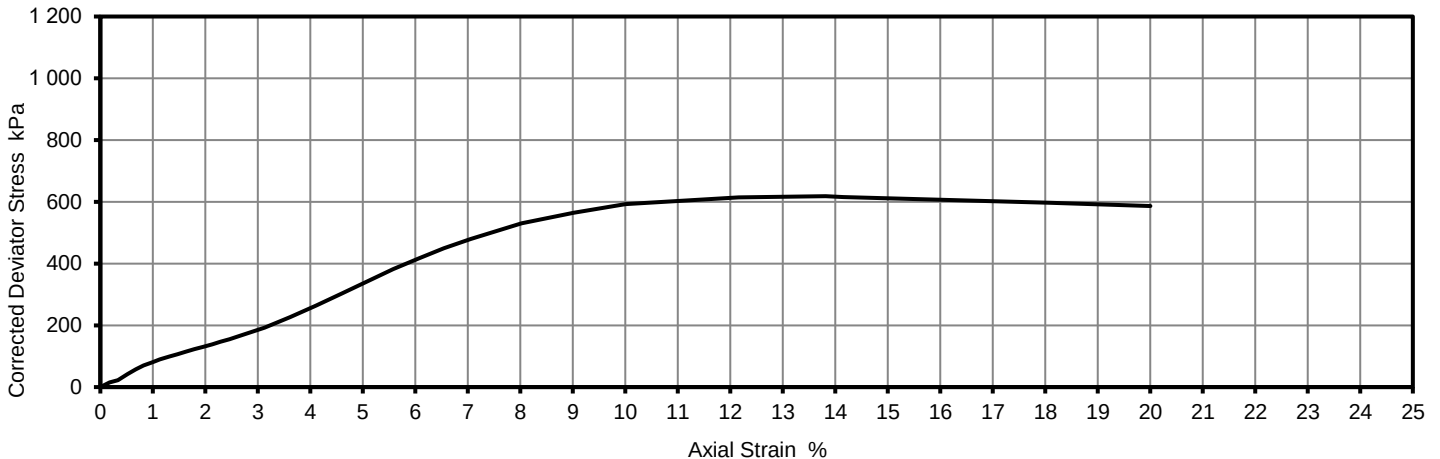
Test Results:

Laboratory Reference: 2279859
Hole No.: CP102
Sample Reference: Not Given
Sample Description: Grey slightly silty CLAY
Sample Preparation: Sample prepared in accordance with BS 1377-1:2016 Clause 9.1.1.

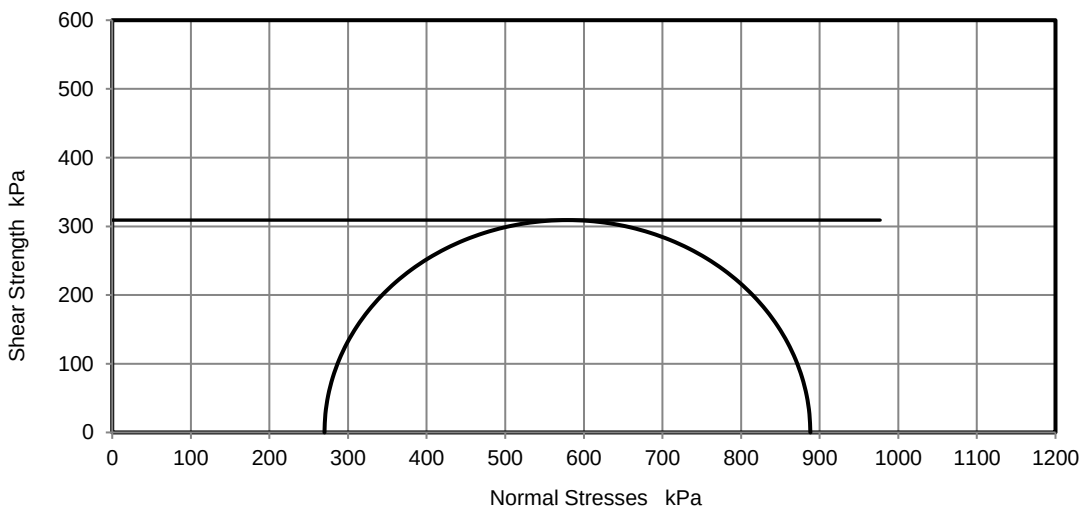
Depth Top [m]: 13.50
Depth Base [m]: Not Given
Sample Type: U

Test Number	1	Rate of Strain	1.98	%/min
Length	201.79	Cell Pressure	270	kPa
Diameter	103.10	Axial Strain at failure	13.8	%
Bulk Density	2.11	Deviator Stress, ($\sigma_1 - \sigma_3$) _f	618	kPa
Moisture Content	21	Undrained Shear Strength, c_u	309	kPa $\frac{1}{2}(\sigma_1 - \sigma_3)_f$
Dry Density	1.75	Mode of Failure	Compound	
Membrane Correction	0.74	Membrane thickness	0.27	mm

Deviator Stress v Axial Strain



Mohr Circles



Position within sample



Note: Deviator stress corrected for area change and membrane effects. Mohr circles and their interpretation is not covered by BS1377.
This is provided for information only.

Remarks:

Signed:

Katarzyna Koziel
Technical Reviewer
for and on behalf of i2 Analytical Ltd

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Lauren Burnett
Omnia Environmental Consulting
3-6 The Quarterdeck
Port Solent
Portsmouth
PO6 4TP

i2 Analytical Ltd.
7 Woodshots Meadow,
Croxley Green
Business Park,
Watford,
Herts,
WD18 8YS

t: 01923 225404

f: 01923 237404

e: reception@i2analytical.com

e: samples@omnia-consulting.co.uk

Analytical Report Number : 22-59065

Project / Site name: Brackley, Havant

Samples received on: 16/05/2022

Your job number: A11840

**Samples instructed on/
Analysis started on:** 17/05/2022

Your order number: PO-889

Analysis completed by: 26/05/2022

Report Issue Number: 1

Report issued on: 26/05/2022

Samples Analysed: 7 soil samples


Signed:

Adam Fenwick
Technical Reviewer
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils - 4 weeks from reporting
leachates - 2 weeks from reporting
waters - 2 weeks from reporting
asbestos - 6 months from reporting

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Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

Analytical Report Number: 22-59065
 Project / Site name: Brackley, Havant
 Your Order No: PO-889

Lab Sample Number				2279879	2279880	2279881	2279882	2279883
Sample Reference				WS102	WS104	CP101	CP101	CP102
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				1.50-1.70	2.70-2.80	8.50	14.50	4.50-5.00
Date Sampled				11/05/2022	11/05/2022	11/05/2022	11/05/2022	12/05/2022
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	17	16	19	16	17
Total mass of sample received	kg	0.001	NONE	0.4	0.4	0.4	0.4	0.4

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	7.5	7.1	8.1	8.1	8.2
Water Soluble SO ₄ 10ml extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.088	0.031	0.27	0.43	0.32

U/S = Unsuitable Sample I/S = Insufficient Sample

Analytical Report Number: 22-59065
 Project / Site name: Brackley, Havant
 Your Order No: PO-889

Lab Sample Number				2279884	2279885
Sample Reference				CP102	CP102
Sample Number				None Supplied	None Supplied
Depth (m)				9.50	16.00
Date Sampled				12/05/2022	12/05/2022
Time Taken				None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status		
Stone Content	%	0.1	NONE	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	17	15
Total mass of sample received	kg	0.001	NONE	0.4	0.4

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	8.4	8.3
Water Soluble SO ₄ 10ml extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.25	0.35

U/S = Unsuitable Sample I/S = Insufficient Sample

Analytical Report Number : 22-59065
Project / Site name: Brackley, Havant

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
2279879	WS102	None Supplied	1.50-1.70	Brown clay and sand with gravel and vegetation.
2279880	WS104	None Supplied	2.70-2.80	Brown clay and sand with gravel.
2279881	CP101	None Supplied	8.5	Brown clay and sand.
2279882	CP101	None Supplied	14.5	Brown clay and sand with vegetation.
2279883	CP102	None Supplied	4.50-5.00	Brown clay and sand.
2279884	CP102	None Supplied	9.5	Brown clay and sand.
2279885	CP102	None Supplied	16	Brown clay and sand.

Analytical Report Number : 22-59065
Project / Site name: Brackley, Havant

Water matrix abbreviations:

Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In house method.	L099-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE

For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.

For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.

Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.

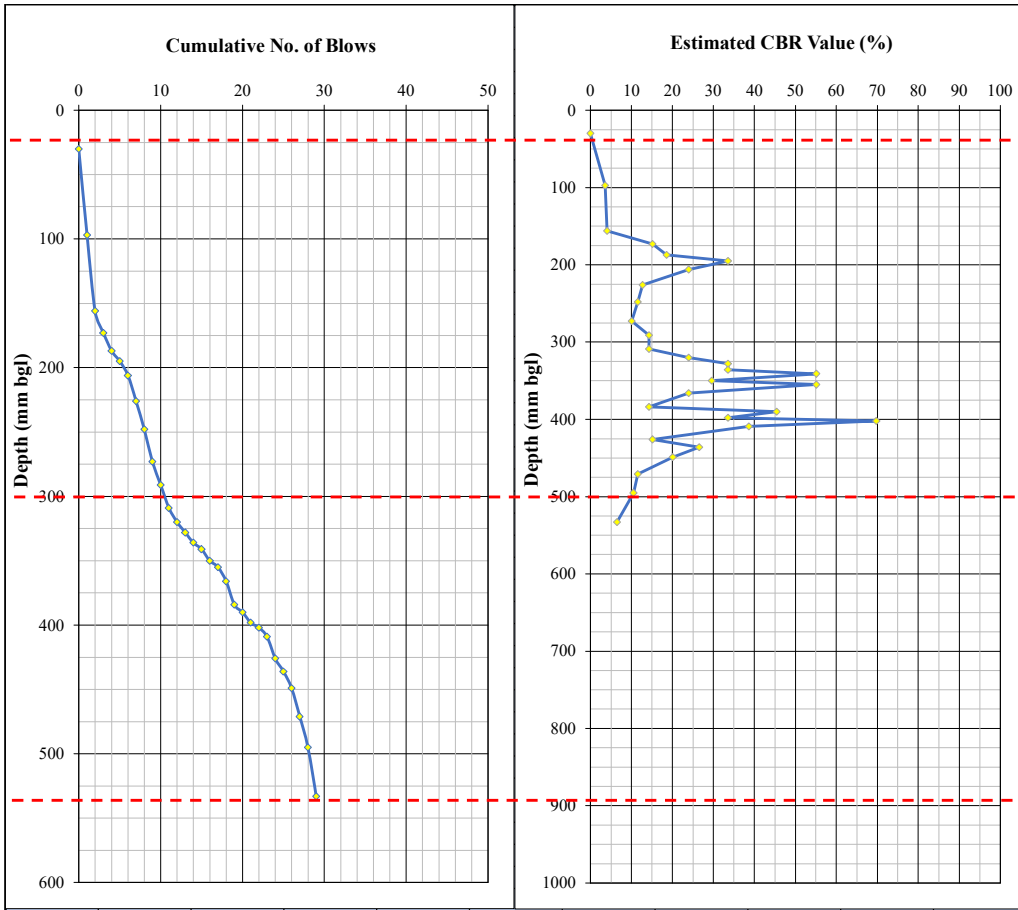
Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

APPENDIX X - IN-SITU DCP TEST CERTIFICATES

Determination of Dynamic Cone Penetrometer - Estimated CBR Value (%)

In Accordance with TRL Report 587(2003) and PR/INT/277/04

Site Name:	Brackley, Havant		Test Date:	17/05/2022
Site Ref:	A11840		Test Location:	DCP101
Initial Depth:	30 mm bgl		Test No.:	1 of 1
Final Depth:	533 mm bgl		Undertaken By:	HS & JR



Start Depth (mm bgl)	End Depth (mm bgl)	Layer Range (mm)	Blows per Layer	DCP mm/Blows per Layer	Average Layer CBR Value (%)
30	300	156	10	27	9.3
300	533	70	19	12	21.3

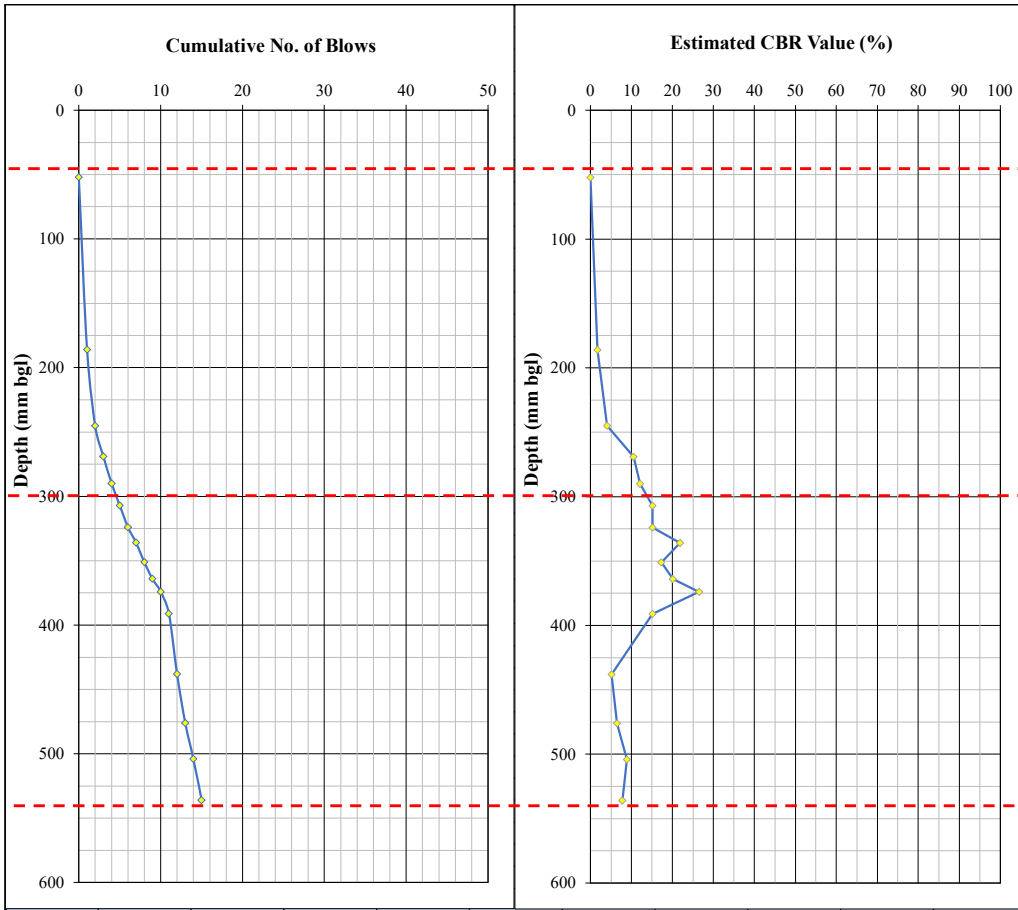
Comments

Site Engineer:	Date:	Checked and Approved By:	Date:	Location
HS & JR	17/05/2022	LB	23/06/2022	DCP101

Determination of Dynamic Cone Penetrometer - Estimated CBR Value (%)

In Accordance with TRL Report 587(2003) and PR/INT/277/04

Site Name:	Brackley, Havant		Test Date:	17/05/2022
Site Ref:	A11840		Test Location:	DCP102
Initial Depth:	52 mm bgl		Test No.:	1 of 1
Final Depth:	536 mm bgl		Undertaken By:	HS & JR



Start Depth (mm bgl)	End Depth (mm bgl)	Layer Range (mm)	Blows per Layer	DCP mm/Blows per Layer	Average Layer CBR Value (%)
52	300	248	4	62	3.8
300	536	236	11	21	11.8

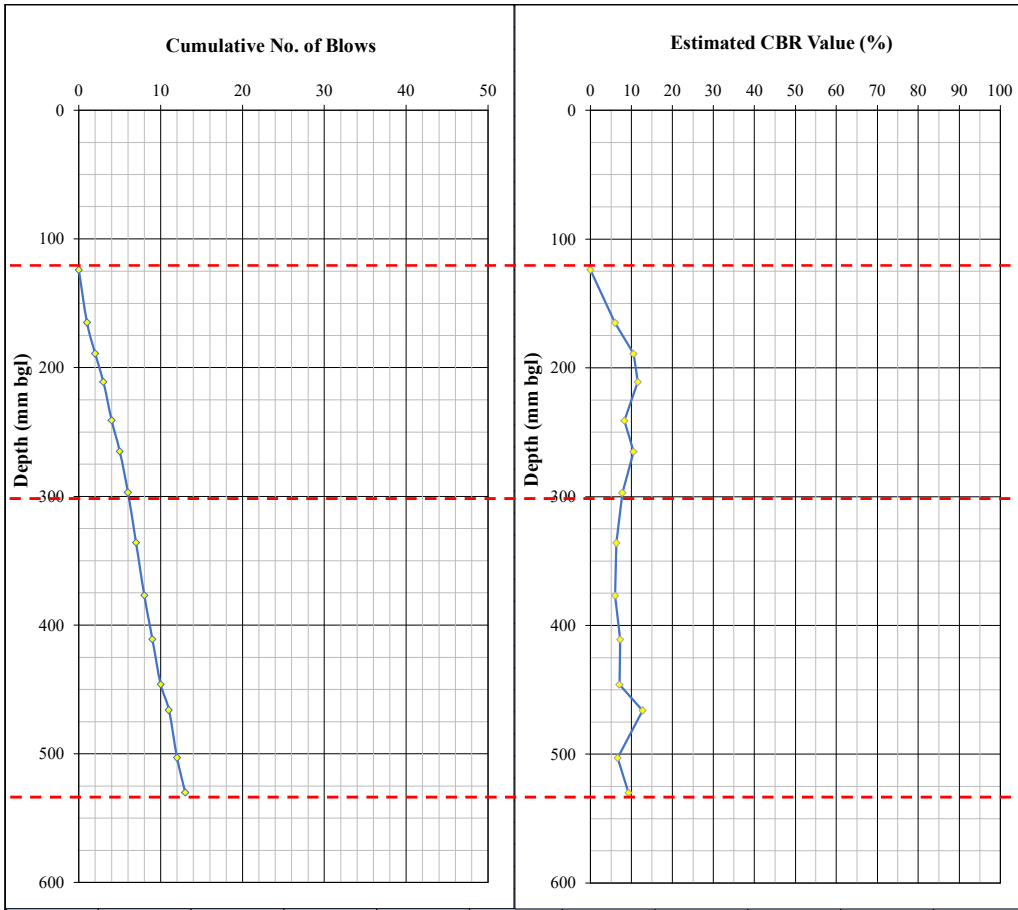
Comments

Site Engineer:	Date:	Checked and Approved By:	Date:	Location
HS & JR	17/05/2022	LB	23/06/2022	DCP102

Determination of Dynamic Cone Penetrometer - Estimated CBR Value (%)

In Accordance with TRL Report 587(2003) and PR/INT/277/04

Site Name:	Brackley, Havant		Test Date:	17/05/2022
Site Ref:	A11840		Test Location:	DCP103
Initial Depth:	124 mm bgl		Test No.:	1 of 1
Final Depth:	530 mm bgl		Undertaken By:	HS & JR



Start Depth (mm bgl)	End Depth (mm bgl)	Layer Range (mm)	Blows per Layer	DCP mm/Blows per Layer	Average Layer CBR Value (%)
124	300	176	6	29	8.5
300	530	230	7	33	7.5

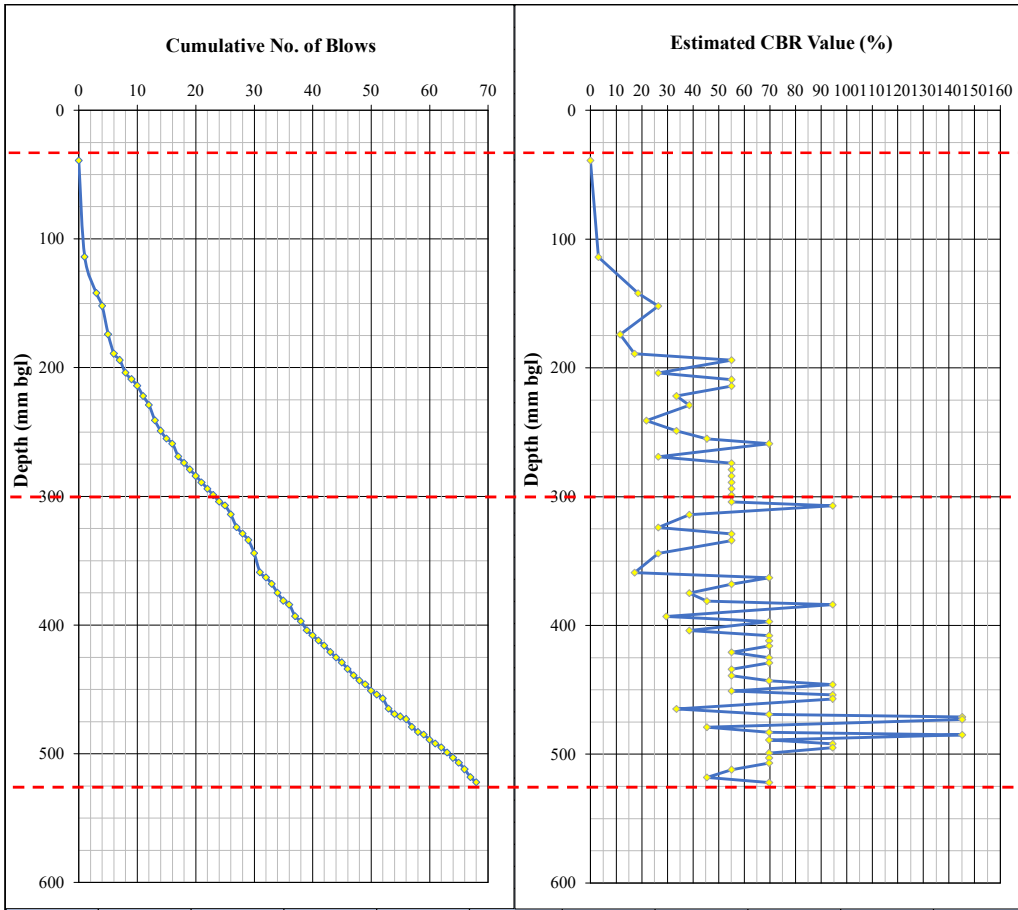
Comments

Site Engineer:	Date:	Checked and Approved By:	Date:	Location
HS & JR	17/05/2022	LB	23/06/2022	DCP103

Determination of Dynamic Cone Penetrometer - Estimated CBR Value (%)

In Accordance with TRL Report 587(2003) and PR/INT/277/04

Site Name:	Brackley, Havant		Test Date:	17/05/2022
Site Ref:	A11840		Test Location:	DCP104
Initial Depth:	39 mm bgl		Test No.:	1 of 1
Final Depth:	522 mm bgl		Undertaken By:	HS & JR



Start Depth (mm bgl)	End Depth (mm bgl)	Layer Range (mm)	Blows per Layer	DCP mm/Blows per Layer	Average Layer CBR Value (%)
39	300	195	23	11	23.2
300	522	75	45	5	55.9

Comments	
----------	--

Site Engineer:	Date:	Checked and Approved By:	Date:	Location
HS & JR	17/05/2022	LB	23/06/2022	DCP104