JOMAS ENGINEERING ENVIRONMENTAL

WE LISTEN, WE PLAN, WE DELIVER

Geotechnical Engineering and Environmental Services across the UK.

BASEMENT IMPACT ASSESSMENT REPORT

28 NICHOLAS WAY

NORTHWOOD

HA6 2TT

JOMAS ASSOCIATES LTD

Unit 24 Sarum Complex, Salisbury Road, Uxbridge Ub8 2RZ

www.jomasassociates.com 0333-305-9054 info@jomasassociates.com

Report Title: **Basement Impact Assessment for 28 Nicholas Way, Northwood HA6 2TT**

Report Status: **Final v1.0**

Job No: **P35048J2804/JWT**

Date: **31 May 2023**

Quality Control - Revisions

Version	Date	Issued By	Comment

Prepared by: JOMAS ASSOCIATES LTD **For: NEIL MAROO**

Prepared by	Reviewed by	Approved by
Shaw Carter BSc (Hons), FGS	Derek Grange BSc (Hons), MSc, CGeol, FGS, RoGEP - Specialist	James Field BSc (Hons) CGeol FGS RoGEP - Professional
Geotechnical Engineer	Senior Principal - Geotechnics	Associate Director

Should you have any queries relating to this report, please contact

JOMAS ASSOCIATES LTD

www.jomasassociates.com

0843 289 2187

info@jomasassociates.com

CONTENTS

Page

EXECUTIVE SUMMARY

Neil Maroo ("The Client") has commissioned Jomas Associates Ltd ('Jomas'), to prepare a Basement Impact Assessment for a site referred to as 28 Nicholas Way, Northwood, HA6 2TT.

It should be noted that the table below is an executive summary of the findings of this report and is for briefing purposes only. Reference should be made to the main report for detailed information and analysis.

Desk Study	
Current Site Use	Two-storey house with associated gardens and driveway.
Proposed Site Use	Demolition of the existing residential property and construction of a new two-storey house plus basement level.
Site History	A review of earliest available historical maps dated 1865-1914 indicates that the site and surrounding area comprised part of a woodland. By the map dated 1932, residential houses had been built in vicinity of the site but not on site itself. The site was shown as developed and occupied by the existing residential house by the map dated 1959, associated with widespread residential development of the area including new roads. No further significant changes occurred in the mapping history.
Site Setting	The British Geological Survey indicates that the site is directly underlain by solid deposits of the London Clay Formation, identified as an Unproductive stratum. There are no detailed river entries or surface water features reported within 250m of the site. The site is located within Environment Agency Flood Zone 1. A very low risk (<0.1% annual chance) of surface water flooding was identified. A negligible risk of groundwater flooding was identified.
Potential Geological Hazards	The London Clay Formation is reported to directly underlie the site. This stratum is well-established as having a high-volume change potential and therefore the shrink/swell potential of the soils underlying the site requires further assessment. Furthermore, the walkover by Land Science noted several trees on site (up to 7m tall) and therefore clay soils will more likely shrink/swell resultant from water uptake from trees.

Screening and Scoping (Basement Impact Assessment)	
Subterranean (Groundwater) Flow	A ground investigation was recommended to confirm the ground conditions and groundwater levels (if any) beneath the site. This can then confirm the relative depths of the basement to the groundwater levels. It was also recommended that the ground investigation confirm whether soil infiltration drainage is likely to be feasible, and to inform the drainage strategy.
Land Stability	The recommended ground investigation should also determine the possibility of encountering groundwater and the possibility of Made Ground and/or clay. Atterberg

Screening and Scoping (Basement Impact Assessment)	
	Limits of the underlying clay should be determined by the ground investigation to assess shrink/swell potential of the soils. It is noted that the London Borough of Camden's guidance documents requires a Ground Movement Assessment to be undertaken as part of the Basement Impact Assessment. Such an assessment uses a ground model based on a zone of influence equivalent of four times the proposed depth of excavation. Consequently, such a study is not deemed necessary as there are no neighbouring structures within 12m of the proposed excavation.
Surface Flow and Flooding	There will be an increase in hardstanding/building footprint on site. However, the new hardstanding is proposed to be of permeable construction but would need to be positively drained to an attenuation tank as site is directly underlain by highly impermeable London Clay Formation. Given this geology, there will not be a significant change in surface water run-off. SUDS will be required by NPPF, PPG and LLFA policy requirements, and this will likely be provided by surface and above ground attenuation before releasing to the existing sewer network. Infiltration SUDS are likely to be unfeasibly given the anticipated presence of London Clay Formation.

Ground Investigation	
Intrusive Investigation	A ground investigation was undertaken by Land Science in January 2023, and consisted of the following: • 4No. windowless sampler boreholes (DS01 – DS04), drilled up to 5.0m below ground level (bgl), with associated in situ testing and sampling. • 1No. cable percussive borehole (BH01), drilled up to 15.0m bgl, with associated in situ testing and sampling. • 1No. falling head test undertaken within DS01. • 1No. groundwater monitoring well installed to 5.0m bgl in DS02. • 1No. return visit to monitor groundwater levels. • Geotechnical laboratory testing.
Ground Conditions	The results of the ground investigation revealed a ground profile comprising Topsoil/Made Ground (0.15-0.30m thick), underlain by mid-orange brown, sandy clay becoming dark orange-brown, mottled blue-grey clay (London Clay Formation) to the base of all exploratory holes (deepest 15m bgl). Groundwater was struck during the excavation of DS01 and DS02 with short-term standing water depths in the order of 2.50m and 1.40m, respectively. A groundwater monitoring visit was undertaken on 20th January 2023. Groundwater was reported at 0.98m bgl in DS02. It was understood that this was perched water, present within the granular lenses near the top of the boreholes, and not representative of a shallow groundwater table.

Ground Investigation	
	The preliminary falling head soakage test failed, and an infiltration rate could not be calculated for the London Clay Formation Following geotechnical laboratory testing, the London Clay Formation was indicated to be of high-volume change potential.
Basement Impact Assessment	The overall assessment of the site is that the creation of a basement for the proposed development should not adversely impact the site or its immediate environs, providing measures are taken to protect surrounding land during construction. The proposed basement excavation will be within 5m of a public pavement/road, but it is not within 5m of neighbouring properties and a railway. Unavoidable lateral ground movements associated with the basement excavations must be controlled during temporary and permanent works so as not to impact adversely on the stability of the surrounding ground and any associated services. During the construction phase careful and regular monitoring will need to be undertaken to ensure that these are not adversely affected. This may mean that structures will need to be suitably propped and supported. The ground conditions mean that infiltration SuDS (e.g. soakaways) are unsuitable and therefore alternate methods should be designed, such as release into the sewer network Permeable paving is proposed, however, these would likely need to be positively drained to an attenuation tank, given the presence of highly impermeable London Clay Formation.

1 INTRODUCTION

1.1 Terms of Reference

1.1.1 Neil Maroo ("The Client") has commissioned Jomas Associates Ltd ('Jomas'), to prepare a Basement Impact Assessment for a site referred to as 28 Nicholas Way, Northwood, HA6 2TT.

1.1.2 Jomas' work has been undertaken in accordance with email proposal dated 27th February 2023.

1.2 Proposed Development

1.2.1 The proposed development comprises the demolition of the existing residential property and construction of a new two-storey house plus basement level.

1.2.2 The proposed development plans are included in Appendix 1.

1.2.3 For the purpose of geotechnical assessment, it is considered that the project could be classified as a Geotechnical Category (GC) 2 site in accordance with BS EN 1997 Part 1.

1.3 Objectives

1.3.1 The objectives of Jomas' investigation were as follows:

- To present a description of the present site status, based upon the published geology, hydrogeology and hydrology of the site and surrounding area;
- To review readily available historical information (i.e., Ordnance Survey maps and database search information) for the site and surrounding areas;
- To assess the potential impacts that the proposal may have on ground stability, the hydrogeology and hydrology on the site and its environs;

1.4 Scope of Works

1.4.1 The following tasks were undertaken to achieve the objectives listed above:

- Review of a third-party report provided by the client, as well as publicly available information relating to flood risk in the surrounding area.
- Carrying out a Basement Impact Assessment (BIA);
- The compilation of this report, which collects and discusses the above data, and presents an assessment of the site conditions, conclusions and recommendations.

1.4.2 The site lies within the remit of the London Borough of Hillingdon. The council has published a document "Local Plan Part 2 – Development Management Policies" (January 2020). This gives detail on the issues relevant to basements within the Borough but does not go into specifics as to how these issues should be assessed. The guidance on requirements broadly mirrors the more detailed guidance published by the London Borough of Camden in their document "Camden Planning Guidance Basements" (CPGB) (January 2021), which does provide guidance as to how to undertake a BIA.

1.4.3 Consequently, Jomas has based the methodology of the BIA on the guidance given in CPGB published by the London Borough of Camden This document has been used as it is generally accepted that this gives the best available guidance on the practicalities regarding how to the undertake a BIA.

1.4.4 Jomas' BIA covers most items required under CPGB, with the exception of;

- Drainage assessment.
- Programme for enabling works, construction and restoration.
- Construction Sequence Methodology.
- Proposals for monitoring during construction.
- Plans and sections to show foundation details of adjacent structures.
- Evidence of consultation with neighbours.
- Ground Movement Assessment (GMA), to include assessment of significant adverse impacts and Specific mitigation measures required, as well as confirmatory and reasoned statement identifying likely damage to nearby properties according to the Burland Scale.

1.4.5 This Jomas BIA also takes into account the Campbell Reith pro forma BIA produced on behalf of and published by the London Borough of Camden as guidance for applicants to ensure that all of the required information is provided.

1.4.6 A number of the requirements set out in the London Borough of Camden document CPGB would need to be addressed in a construction management plan, this stage is not within the scope of work that Jomas Associates have been commissioned.

1.5 Supplied Documentation

1.5.1 Table 1.1 details the documents produced for the site by third parties. The Land Science report was provided by the client, whilst the Hodel report was found by Jomas on the Hillingdon planning portal.

Table 1.1: Third-Party Reports

Title	Author	Reference	Date
28 Nicholas Way, Northwood, HA6 2TT Phase I And II Geotechnical Assessment	Land Science	LS6678	27th January 2023
28 Nicholas Way, Northwood, HA6 2TT Drainage Strategy Report Including Management and Maintenance Requirements	Hodel Consulting Engineers	22-254	6th January 2023

1.6 Limitations

1.6.1 Jomas Associates Ltd has prepared this report for the sole use of Neil Maroo in accordance with the generally accepted consulting practices and for the intended purposes as stated in the agreement under which this work was completed. This report may not be relied upon by any other party without the explicit written agreement of Jomas. No other third party warranty, expressed or implied, is made as to the professional advice included in this report. This report must be used in its entirety.

1.6.2 The records search was limited to information available from public sources; this information is changing continually and frequently incomplete. Unless Jomas has actual knowledge to the contrary, information obtained from public sources or provided to Jomas by site personnel and other information sources, have been assumed to be correct. Jomas does not assume any liability for the misinterpretation of information or for items not visible, accessible or present on the subject property at the time of this study.

1.6.3 Whilst every effort has been made to ensure the accuracy of the data supplied, and any analysis derived from it, there may be conditions at the site that have not been disclosed by the investigation, and could not therefore be taken into account. As with any site, there may be differences in soil conditions between exploratory hole positions. Furthermore, it should be noted that groundwater conditions may vary due to seasonal and other effects and may at times be significantly different from those measured by the investigation. No liability can be accepted for any such variations in these conditions.

1.6.4 ***This report is not an engineering design and the figures and calculations contained in the report should be used by the Structural Engineer, taking note that variations may apply, depending on variations in design loading, in techniques used, and in site conditions. Our recommendations should therefore not supersede the Engineer's design.***

2 SITE SETTING & HISTORICAL INFORMATION

2.1 Site Information

2.1.1 The site location plan is appended to this report in Appendix 1.

Table 2.1: Site Information

Name of Site	-
Address of Site	28 Nicholas Way Northwood HA6 2TT
Approx. National Grid Ref.	E:508123, N:190735
Site Area (Approx.)	0.36 ha
Site Occupation	Residential property and garden
Local Authority	London Borough of Hillingdon
Proposed Site Use	Demolition of existing structures and construction of new 2-storey residential property with basement level.

2.2 Walkover Survey

2.2.1 A site walkover survey was undertaken by Land Science in January 2023 and is detailed within their report referenced in Table 1.1. The information is summarised in the table below.

Table 2.2: Site Description

Area	Item	Details
On-site:	**Current Uses:**	Residential – a two storey house with associated gardens and driveway.
	Surfaces:	A patio was noted to the south of the property, this was made up of concrete slabs. The front driveway was made up of tarmac. The rear garden to the south of the property was laid to lawn, with a woodland surrounding it.
	Vegetation:	Numerous tall mature trees were noted in the garden area surrounding the entire existing dwelling and in proximity to the proposed building footprint. These included species of evergreen and deciduous trees, as well as shrubs and various grasses in the form of a sparse woodland. Theses ranged in height, up to a maximum of 7.00m.
	Topography/Slope Stability:	The site gently sloped relatively uniformly to the east.

Area	Item	Details
	Drainage:	Wet boggy ground was noted in the wooded area to the west of the site; however this is understood to relate to the ground conditions and extreme wet weather at the time of the walkover.
	Controlled waters:	No controlled waters were noted on site.
	Tanks:	No tanks observed.
Neighbouring land:	**North, east, south and west:**	Residential.

2.3 Historical Mapping Information

2.3.1 The historical development of the site and its surrounding areas was evaluated following the review of a number of Ordnance Survey historic maps, provided within Appendix G of the Phase I And II Geotechnical Assessment report (Land Science, 2023).

2.3.2 A summary produced from the review of the historical map is given in Table 2.3 below. Distances are taken from the site boundary.

Table 2.3: Historical Development

Dates and Scale of Map	Relevant Historical Information	
	On Site	**Off Site**
1865-90 1:2,500 1895-96 1:2,500 1913-14 1:2,500	Site comprises woodland. Footpath present along western boundary.	Woodland with footpaths present across majority of mapped area.
1932-34 1:2,500	No significant changes.	Residential properties present 100m+ north-east of site and 200m+ west/north-west of site. New road (Nicholas Way) present 100m to the east.
1959 1:1,250 1959-84 1:1,250 1960-61 1:2,500	Trees no longer shown on site and large detached property shown in approximate centre of site -resembling existing site layout.	Widespread residential development including new roads. Access road leading to site from Nicholas Way.
1992 1:1,250	No significant changes.	No significant changes.
1999 Aerial photograph	No significant changes.	No significant changes.

3 GEOLOGICAL SETTING & HAZARD REVIEW

3.1.1 The following section summarises the principal geological resources of the site and its surroundings. The data discussed herein is generally based on publicly available BGS data and the information given within the Envirocheck Report (in Appendix G of the Phase I And II Geotechnical Assessment report (Land Science, 2023).

3.2 Solid and Drift Geology

3.2.1 Information provided by the British Geological Survey (BGS) indicates that the site is directly underlain by solid deposits of the London Clay Formation. An extract of the BGS description is provided below:

> *"…bioturbated or poorly laminated, blue-grey or grey-brown, slightly calcareous, silty to very silty clay, clayey silt and sometimes silt, with some layers of sandy clay. It commonly contains thin courses of carbonate concretions ('cementstone nodules') and disseminated pyrite."*

3.2.2 The London Clay Formation is underlain by Lambeth Group, described by BGS as:

> *"Vertically and laterally variable sequences mainly of clay, some silty or sandy, with some sands and gravels, minor limestones and lignites and occasional sandstone and conglomerate."*

3.2.3 No Made Ground is reported on site but given the site is developed, a depth of Made Ground should be expected.

3.3 British Geological Survey (BGS) Borehole Data

3.3.1 As part of the assessment, publicly available BGS borehole records were reviewed from the surrounding area, however, no such records were found within 500m of the site.

3.4 Geological Hazards

3.4.1 The following are brief findings extracted from the supplied Envirocheck Report, that relate to factors that may have a potential impact upon the engineering of the proposed development.

Table 3.1: Geological Hazards

Potential Hazard	Envirocheck Hazard Rating	Jomas Comment
Shrinking or Swelling Clay	Low (Moderate 177m from site)	The London Clay Formation is reported to directly underlie the site. This stratum is well-established as having a high-volume change potential and therefore the shrink/swell potential of the soils underlying the site requires further assessment. Furthermore, the walkover by Land Science noted several trees on site (up to 7m tall) and therefore clay soils will more likely shrink/swell resultant from water uptake from trees.

Potential Hazard	Envirocheck Hazard Rating	Jomas Comment
Collapsible Ground	Very Low	N/A
Landslide	Very Low	N/A
Running Sand	Very Low	N/A
Compressible Ground	No Hazard	N/A
Ground Dissolution	No Hazard	N/A
Coal Mining	No Hazard	In an area which may not be affected by coal mining.
Non-Coal Mining	Unlikely	

3.4.2 The Envirocheck report included in the Land Science report also notes the following

- No historical surface ground working features are reported within 250m of the site.
- No historical underground working features are reported within 1km of the site.
- No BGS Current Ground Working Features are reported within 1km of the site.

3.4.3 In addition, the Land Science Report states that the site is in area where less than 1% of homes are estimated by PHE to exceed the threshold for Radon Gas in residential dwellings. As such, the report states that no radon protection is required for new dwellings or extensions constructed at this location.

3.4.4 It should be noted however that a growing number of London Boroughs are adopting Public Health England guidance as outlined in their 'UK National Radon Action Plan' (PHE, 2018), which states that Radon measurements should be made in regularly occupied basements of properties irrespective of their geographical location. Therefore, such an assessment, or radon protection measures may be required by the London Borough of Hillingdon.

3.4.5 The clearance of the site, including removal of foundations and services is likely to increase the depth of Made Ground on the site.

3.4.6 Foundations should not be formed within Made Ground or organic rich materials (i.e. Topsoil and potentially may include the Kempton Park Gravels) due to the unacceptable risk of total and differential settlement.

3.4.7 The presence of Made Ground derived from demolition material may be a source of elevated sulphate results associated with plaster from the previous structures.

3.4.8 The BGS notes disseminated pyrite within the London Clay Formation and as such may be a source of elevated sulphate. If such levels are noted then sulphate resistant concrete may be required.

4 HYDROGEOLOGY, HYDROLOGY AND FLOOD RISK REVIEW

4.1 Hydrogeology & Hydrology

4.1.1 General information about the hydrogeology of the site was obtained from the MAGIC and Groundsure.io websites.

Groundwater Vulnerability

4.1.2 Since 1 April 2010, the EA's Groundwater Protection Policy uses aquifer designations that are consistent with the Water Framework Directive. This comprises;

- **Secondary A** – permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers;
- **Secondary B** – predominantly lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering. These are generally the water-bearing parts of the former non-aquifers.
- **Secondary Undifferentiated** – has been assigned in cases where it has not been possible to attribute either category A or B to a rock type. In most cases, this means that the layer in question has previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type.
- **Principal Aquifer** – this is a formation with a high primary permeability, supplying large quantities of water for public supply abstraction.
- **Unproductive Strata** – These are rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow.

Hydrogeology

4.1.3 The baseline hydrogeology of the site is based on available hydrogeological mapping, including the BGS online mapping.

4.1.4 The available data indicates that the geology of the area consists of London Clay Formation. It would be expected that a groundwater table would not be present within this highly impermeable stratum. Groundwater may be present at depth within of Lambeth Group which underlies the London Clay Formation.

Hydrology

4.1.5 The hydrology of the site and the area covers water abstractions, rivers, streams, other water bodies and flooding.

4.1.6 The Environment Agency defines a floodplain as the area that would naturally be

affected by flooding if a river rises above its banks, or high tides and stormy seas cause flooding in coastal areas.

4.1.7 There are two different kinds of area shown on the Flood Map for Planning. They can be described as follows:

Areas that could be affected by flooding, either from rivers or the sea, if there were no flood defences. This area could be flooded:

- from the sea by a flood that has a 0.5 per cent (1 in 200) or greater chance of happening each year;
- or from a river by a flood that has a 1 per cent (1 in 100) or greater chance of happening each year.

(For planning and development purposes, this is the same as Flood Zone 3, in England only.)

- The additional extent of an extreme flood from rivers or the sea. These outlying areas are likely to be affected by a major flood, with up to a 0.1 per cent (1 in 1000) chance of occurring each year.

(For planning and development purposes, this is the same as Flood Zone 2, in England only.)

4.1.8 These two areas show the extent of the natural floodplain if there were no flood defences or certain other manmade structures and channel improvements.

4.1.9 Outside of these areas flooding from rivers and the sea is very unlikely. There is less than a 0.1 per cent (1 in 1000) chance of flooding occurring each year. The majority of England and Wales falls within this area. (For planning and development purposes, this is the same as Flood Zone 1, in England only.)

4.1.10 Some areas benefit from flood defences and these are detailed on Environment Agency mapping.

4.1.11 Flood defences do not completely remove the chance of flooding, however, and can be overtopped or fail in extreme weather conditions.

Table 4.1: Summary of Hydrogeological & Hydrology

Feature		On Site	Off Site
Aquifer	**Superficial:**	N/A	N/A
	Solid:	Unproductive	Secondary A (Lambeth Group ~200m east)
Surface Water Features		None	No surface water features or river networks within 500m of site.

Feature		On Site	Off Site
Flood Risk	**EA Flood Zone 2**	No	N/A
	EA Flood Zone 3	No	N/A
	RoFRaS	N/A	N/A
	Historical Flood Events	None reported within 250m of site.	
	Flood Defences	There are no areas benefiting from Flood Defences within 250m of the study site	
	Surface Water Flooding	Very low risk – each year this area has a chance of flooding of less than 0.1%	Low risk ~70m south-east of site.
	Groundwater Flooding	Negligible risk on site due to presence of unproductive stratum (London Clay Formation).	Negligible risk within 100m due to presence of unproductive stratum (London Clay Formation).

4.2 Flood Risk Review

4.2.1 In accordance with the NPPF Guidance, below is a review of flood risks posed to and from the development and recommendations for appropriate design mitigation where necessary. Specific areas considered are based on the requirements laid out in the "Camden Guidance for Subterranean Development" as this document is generally considered to be the most comprehensive Local Authority Guidance in the London area.

Table 4.2: Flood Risk Review

Flood Sources	Site Status	Comment on flood risk posed to / from the development
Fluvial / Tidal	Site is not within 50m of an Environment Agency Zone 2 or zone 3 floodplain. Risk of flooding from rivers and the sea (RoFRaS) rating is negligible.	Low Risk.
Groundwater	Based on the geology, the area is unlikely to be susceptible to groundwater flooding due to presence of London Clay Formation (an Unproductive stratum).	As SUDS will be required by NPPF, PPG and LLFA policy requirements, this is likely to be provided by surface and above ground attenuation before releasing to the existing sewer network. This will ensure that the proposed development will not increase the potential risk of groundwater flooding. Basement will be fully waterproofed as appropriate to industry standard. Low Risk.
Artificial Sources	No surface water features reported within 250m of site. No nearby artificial sources identified by map review.	Low Risk.
Surface Water / Sewer Flooding	No surface water features within 250m of site. Condition, depth and location of surrounding infrastructure uncertain.	As SUDS will be required by NPPF, PPG and LLFA policy requirements, these are likely to include attenuation before releasing to the existing sewer network. If permeable paving is used this would likely reduce the risk of surface water flooding. Combined, these are likely to reduce the risk of both surface and sewer flooding to both the site and surrounding properties. Basement will be fully waterproofed as appropriate to industry standard. Low Risk.
Climate Change	Included in the flood modelling extents. Site not within climate change flood extent area	Development will not significantly increase the peak flow and volume of discharge from the site. Low risk posed to and from the development.

4.2.2 Information about the risk to the study site from flooding has been obtained from the following documents produced for London Borough of Hillingdon: West London Strategic Flood Risk Assessment (Metis, 2023); and Surface Water Management Plan (Capita Symonds, 2013). Potential impacts to the site are discussed below.

<u>Flooding from Fluvial/Tidal Sources</u>

4.2.3 The site is located in EA Flood Zone 1.

4.2.4 The nearest Main River is located approximately 1.1km west of the site and the nearest Ordinary Watercourse is reported ~430m south of the site.

4.2.5 According to the SWMP, there were no historical records of flooding from Ordinary Watercourses available in Hillingdon.

4.2.6 In addition, the West London SFRA shows that no EA recorded flood outlines or EA historic flooding events are shown within 1km of the site.

Groundwater Flooding

4.2.7 The West London SFRA shows the site within an area of <25% susceptibility to groundwater flooding. The site is underlain by unproductive strata of London Clay Formation.

4.2.8 The site is not in an area at increased potential for elevated groundwater according to the West London SFRA.

4.2.9 According to the SWMP, there are 6No. records of groundwater water flooding in Hillingdon, the nearest of which was located on Linksway, approximately 360m east of site. It should be noted however, that this road is underlain by deposits of Lambeth group (a Secondary A aquifer), unlike the site which is underlain by London Clay Formation (an Unproductive stratum).

Surface Water Flooding

4.2.10 The West London SFRA shows that the site is ~80m away from the lowest EA surface water flood risk modelled (0.1% annual chance).

4.2.11 According to the SWMP, there are 6No. records of surface water flooding in Hillingdon, none of which were within 1km of the site.

4.2.12 In addition to this, the site lies within an EA Flood Zone 1. Based on EA mapping, the site and highways surrounding the site are not within an area identified as a high risk for surface water flooding potential; the site itself not likely to be inundated.

Sewer/Artificial Flooding

4.2.13 The West London SFRA shows the site is 775m from the maximum extent of risk of flooding from reservoirs.

4.2.14 The LB Hillingdon SWMP shows the number of sewer flooding events for the postcode "HA6 2--". This indicates that 11No. properties were impacted by sewer flooding prior to 2010. This is broadly average for the Hillingdon borough. This is shown in Figure 9.1 of the SWMP.

Critical Drainage Areas (CDAs)

4.2.15 A critical drainage area is defined in the SWMP as "a discrete geographic area (usually a hydrological catchment) where multiple and interlinked sources of flood risk (surface water, groundwater, sewer and/or river) often cause flooding in a Flood Risk Area during severe weather thereby affecting people, property or local infrastructure".

4.2.16 17No. CDAs have been identified within or crossing the administrative boundary of the London Borough of Hillingdon. However, the study site is not located within a CDA.

Sustainable Drainage Systems (SuDS)

4.2.17 In accordance with the NPPF, PPG and LLFA policy requirements, sustainable drainage systems (SUDS) should be incorporated wherever possible to reduce positive surface water run-off and flood risk to other areas.

4.2.18 Given the expected underlying ground and hydrogeological conditions it is considered that infiltration drainage would likely be impractical, and other methods to manage surface water run-off should be sought. This is indicated in the Hodel Drainage Strategy report to include the construction of permeable hardstandings and driveway to drain their own areas. Alternatively, these areas may be positively drained to an attenuation tank.

4.2.19 Conclusion

4.2.20 Based on the available data, the site is considered to be at low risk from identified potential sources of flooding. The basement can be constructed and operated safely in flood risk terms without increasing flood risk elsewhere and is therefore considered NPPF compliant.

4.2.21 Screenshots from the West London SFRA and Hillingdon SWMP are included in Appendix 2.

4.3 Sequential and Exception Tests

4.3.1 The Sequential Test aims to ensure that development does not take place in areas at high risk of flooding when appropriate areas of lower risk are reasonably available.

Sequential Test: within FZ1 and no additional dwelling hence pass by default.

4.3.2 Paragraph 19 of PPS25 recognizes the fact that wider sustainable development criteria may require the development of some land that cannot be delivered through the sequential test. In these circumstances, the Exception Test can be applied to some developments depending on their vulnerability classification (Table D.2 of PPS25). The Exception Test provides a method of managing flood risk while still allowing necessary development to occur.

Exception Test: FZ1 hence pass by default and low risk posed to and from other sources.

4.4 Flood Resilience

4.4.1 In accordance with general basement flood policy and basement design, the proposed development will utilize the flood resilient techniques recommended in the NPPF Technical Guidance where appropriate and also the recommendations that have previously been issued by various councils.

4.4.2 These include:

- Basement to be fully waterproofed (tanked) and waterproofing to be tied in to the ground floor slab as appropriate: to reduce the turnaround time for returning the property to full operation after a flood event.
- Plasterboards will be installed in horizontal sheets rather than conventional vertical installation methods to minimise the amount of plasterboard that could be damaged in a flood event.
- Wall sockets will be raised to as high as is feasible and practicable in order to minimise damage if flood waters inundate the property.
- Any wood fixings on basement / ground floor will be robust and/or protected by suitable coatings in order to minimise damage during a flood event.
- The basement waterproofing where feasible will be extended to an appropriate level above existing ground levels.
- The concrete sub floor as standard will likely be laid to fall to drains or gullies which will remove any build-up of ground water to a sump pump where it will be pumped into the mains sewer. This pump will be fitted with a non-return valve to prevent water backing up into the property should the mains sewer become full.
- Insulation to the external walls will be specified as rigid board which has impermeable foil facings that are resistant to the passage of water vapour and double the thermal resistance of the cavity.

5 SCREENING AND SCOPING ASSESSMENT

5.1 Screening Assessment

5.1.1 Screening is the process of determining whether or not there are areas of concern which require a BIA for a particular project. This was undertaken in previous sections by the site characterisation. Scoping is the process of producing a statement which defines further matters of concern identified in the screening stage. This defining is in terms of ground processes in order that a site-specific BIA can be designed and executed by deciding what aspects identified in the screening stage require further investigation by desk research or intrusive drilling and monitoring or other work.

5.1.2 The scoping stage highlights areas of concern where further investigation, intrusive soil and water testing and groundwater monitoring may be required.

5.1.3 This Jomas BIA also takes into account the Campbell Reith pro forma BIA produced on behalf of and published by the London Borough of Camden as guidance for applicants to ensure that all of the required information is provided. Within the pro forma a series of tables have been used to identify what issues are relevant to the site.

5.1.4 Each question posed in the tables is completed by answering “Yes”, “No” or “Unknown”. Any question answered with “Yes” or “Unknown” is then subsequently carried forward to the scoping phase of the assessment.

5.1.5 The results of the screening process for the site are provided in Table 5.1 below. Where further discussion is required the items have been carried forward to scoping.

5.1.6 The numbering within the questions refers the reader to the appropriate question / section in the London Borough of Camden BIA pro forma.

5.1.7 It should also be noted that the London Borough of Hillingdon may not place the same importance on the issues identified in the London Borough of Camden’s guidance documents. It should be noted that the pro forma is mainly concerned with the pond chain on Hampstead Heath, if other ponds / waterbodies may similarly affect the development Jomas will indicate this.

5.1.8 A ground investigation is undertaken where necessary to establish base conditions and the impact assessment determines the impact of the proposed basement on the baseline conditions, taking into account any mitigating measures proposed.

Table 5.1: Screening Assessment

Query	Y / N	Comment
Subterranean (Groundwater) Flow (see London Borough of Camden BIA Pro Forma Section 4.1.1)		
1a) Is the site located directly above an aquifer?	No	The site is directly underlain by London Clay Formation (Undifferentiated) Aquifer.
1b) Will the proposed basement extend below the surface of the water table?	Unknown	Given the anticipated geology, groundwater is unlikely to be present at shallow depth. However, this should be confirmed by a ground investigation.
2) Is the site within 100m of a watercourse, well (disused or used) or a potential spring line?	No	No surface water features, or water networks are reported within 250m of site.
3) Is the site within the catchment of any surface water features?	No	No surface water features, or water networks are reported within 250m of site.
4) Will the proposed basement development result in a change in the proportion of hard surfaced/paved areas?	Yes	The existing area of hardstanding/building footprint is approximately 776m^2 (~21% of the total site). The proposed area of hardstanding/building footprint is approximately 1009m^2, (~25% of the total site). It is proposed that the new hardstanding formed will be of permeable construction to allow drainage of surface water. However, given the geology under site is highly impermeable London Clay Formation these would need to be positively drained to an attenuation tank. Further details are included within the Drainage Strategy Report (Hodel, 2023).
5) As part of the site drainage, will more surface water (e.g. rainfall and run-off) than at present be discharged to the ground (e.g. via soakaways and/or SUDS)?	No	Soakaways/infiltration SUDS considered unlikely due to presence of highly impermeable London Clay Formation.
6) Is the lowest point of the proposed excavation (allowing of any drainage and foundation space under the basement floor) close to, or lower than, the mean water level in any local pond (not just the pond chains on Hampstead Heath or spring line?	No	No surface water features or water networks are reported within 250m of site.
Slope Stability ((see London Borough of Camden BIA Pro Forma Section 4.2)		
1) Does the existing site include slopes, natural or manmade, greater than 7 degrees? (approximately 1 in 8)	No	The site only gently slopes downwards to the east.

Query	Y / N	Comment
2) Will the proposed re-profiling of landscaping change slopes at the property to more than 7 degrees? (approximately 1 in 8)	No	Re-profiling or change of slopes is not anticipated.
3) Does the developments' neighbouring land include railway cuttings and the like, with a slope greater than 7 degrees? (approximately 1 in 8)	No	Neighbouring land uses are residential and relatively level with site.
4) Is the site within a wider hillside setting in which the general slope is greater than 7 degrees? (approximately 1 in 8)	No	Surrounding area is generally level.
5) Is the London Clay the shallowest strata at the site?	Yes	The British Geological Survey indicates that the site is directly underlain by solid deposits of London Clay Formation.
6) Will any trees be felled as part of the proposed development and/or are any works proposed within any tree protection zones where trees are to be retained?	Unknown	Several trees were noted on site, but it is not known whether any will be felled for the development.
7) Is there a history of seasonal shrink-swell subsidence in the local area, and/or evidence of such effects at the site?	Unknown	The London Clay Formation is well established as commonly having a high-volume change potential. No evidence of shrink/swell was noted in the third-party walkover.
8) Is the site within 100m of a watercourse or a spring line?	No	No surface water features, or water networks are reported within 250m of site.
9) Is the site within an area of previously worked ground?	No	No evidence of significant ground working was noted in the site vicinity on historical mapping.
10) Is the site within an aquifer? If so, will the proposed basement extend beneath the water table such that dewatering may be required during construction?	Unknown	The site is underlain by unproductive London Clay. Given the geology, groundwater is unlikely to be present at shallow depth. However, this should be confirmed by a ground investigation.
11) Is the site within 50m of the Hampstead Heath ponds (or other waterbody)?	No	No surface water features, or water networks are reported within 250m of site.
12) Is the site within 5m of a highway or pedestrian 'right of way'?	Yes	The site faces onto a road to the north-east.
13) Will the proposed basement significantly increase the differential depth of foundations relative to neighbouring properties?	Unknown	Neighbouring foundations are unknown.
14) Is the site over (or within the exclusion of) any tunnels e.g. railway lines?	No	-

Query	Y / N	Comment
Surface Flow and Flooding (see London Borough of Camden BIA Pro Forma Section 4.3)		
1) Is the site within the catchment of the pond chains on Hampstead Heath?	No	No surface water features or water networks are reported within 250m of site.
2) As part of the site drainage, will surface water flows (e.g. volume of rainfall and peak run-off) be materially different from the existing route?	No	The proposed development will not significantly alter the volume of surface water discharged to the ground.
3) Will the proposed basement development result in a change in the proportion of hard surfaced / paved external areas?	Yes	The area of hardstanding/building footprint will increase by 233m^2. However, it is understood that new hardstanding will comprise permeable paving. Given the geology under site is highly impermeable London Clay Formation, these would need to be positively drained to an attenuation tank.
4) Will the proposed basement result in changes to the profile of the inflows (instantaneous and long term) of surface water being received by adjacent properties or downstream watercourses?	No	-
5) Will the proposed basement result in changes to the quality of surface waters being received by adjacent properties or downstream watercourses?	No	-
6) Is the site in an area identified to have surface water flood risk according to either the Local Flood Risk Management Strategy or Strategic Flood Risk Assessment or is it at risk from flooding, for example because the proposed basement is below the static water level of a nearby surface water feature?	No	No nearby surface water features and not within an EA flood zone.

5.2 Scoping

5.2.1 Scoping is the activity of defining in further detail the matters to be investigated as part of the BIA process. Scoping comprises the definition of the required investigation needed in order to determine in detail the nature and significance of the potential impacts identified during screening.

5.2.2 The potential impacts for each of the matters highlighted in Table 5.1 above are discussed in further detail below together with the requirements for further investigations. Detailed assessment of the potential impacts and recommendations are provided where possible.

Subterranean (Groundwater) Flow

5.2.3 A ground investigation is recommended to confirm the ground conditions and groundwater levels (if any) beneath the site. This can then be used to confirm the relative depths of the basement to the groundwater levels.

5.2.4 The ground investigation should also confirm whether soil infiltration drainage is likely to be feasible, and to inform the drainage strategy.

Land Stability

5.2.5 The recommended ground investigation should also determine the possibility of encountering groundwater and the possibility of Made Ground and/or clay. Atterberg Limits of the underlying clay should be determined by the ground investigation to assess shrink/swell potential of the soils.

5.2.6 It is noted that the London Borough of Camden's guidance documents requires a Ground Movement Assessment to be undertaken as part of the Basement Impact Assessment. Such an assessment uses a ground model based on a zone of influence equivalent of four times the proposed depth of excavation. Consequently, such a study is not deemed necessary as there are no neighbouring structures within 12m of the proposed excavation.

Surface Flow and Flooding

5.2.7 There will be an increase in hardstanding/building footprint on site. However, the new hardstanding is proposed to be of permeable construction but would need to be positively drained to an attenuation tank as site is directly underlain by highly impermeable London Clay Formation. Given this geology, there will not be a significant change in surface water run-off.

5.2.8 SUDS will be required by NPPF, PPG and LLFA policy requirements, and this will likely be provided by surface and above ground attenuation before releasing to the existing sewer network. Infiltration SUDS are likely to be unfeasible given the anticipated presence of London Clay Formation.

6 SUMMARY OF GROUND INVESTIGATION

6.1 Introduction

6.1.1 As detailed in Table 1.1, a Phase I & II Geotechnical Assessment has been produced for the site and issued separately (Land Science, January 2023). The pertinent findings of the report are presented factually in the following section. Reference should be made to the original reports and documents for further details. Comments made in the following section regarding possible ground conditions on the site and within the surrounding area are based purely on this third-party information. Where appropriate, this information will be used in the later sections of this report as supplementary information to assist in the evaluation of the ground conditions and aid the Basement Impact Assessment.

6.2 Scope

6.2.1 The ground investigation was undertaken on 6th January 2023. A summary of the fieldwork carried out at the site is presented in Table 6.1 below.

Table 6.1: Scope of Intrusive Investigation

Investigation Type	Number of Exploratory Holes Achieved	Exploratory Hole Designation	Depth Achieved
Windowless Sample Boreholes	4	DS01, DS02, DS03, DS04	Up to 5m bgl
Cable Percussion Boreholes	1	BH01	15m bgl
Monitoring Wells	1	DS02	5m bgl
Falling Head Testing	1	DS01	Unknown

6.3 Ground Conditions

6.3.1 The ground conditions encountered are summarised in Table 6.2 below.

Table 6.2: Ground Conditions Encountered

Stratum and Description	Encountered from (mbgl)	Base of strata (mbgl)	Thickness range (m)
Dark brown clayey silt with fine to medium rootlets and occasional flint gravel. (TOPSOIL) *Only encountered within DS01, DS02, DS03 & DS04.*	0.00	0.15 – 0.20	0.15 – 0.20
Tarmac over dark grey black slightly sandy gravel. Sand is fine to coarse. Gravel consists of fine to medium, sub-angular to sub-rounded flint, tarmac and concrete with occasional ash. (MADE GROUND) *Only encountered within BH01.*	0.00	0.30	0.30

Table 6.2: Ground Conditions Encountered

Stratum and Description	Encountered from (mbgl)	Base of strata (mbgl)	Thickness range (m)
Firm, becoming stiff, mid-orange brown, sandy CLAY becoming dark orange-brown, mottled blue-grey CLAY. Rare selenite mineralisation from 10m bgl. (LONDON CLAY FORMATION) *Encountered within and to the base of all positions.*	0.15 – 0.30	>3.00 - >15.00 [base not proven]	>2.85 - >14.70 [thickness not proven]

6.3.2 No evidence of possible soil contamination (such as staining, malodours, or brightly coloured soils) was identified in the field.

6.4 Groundwater

6.4.1 Groundwater was struck during the excavation of DS01 and DS02 with short-term standing water depths in the order of 2.50m and 1.40m, respectively.

6.4.2 A groundwater monitoring visit was undertaken on 20th January 2023. Groundwater was reported at 0.98m bgl in DS02.

6.4.3 It was understood that this was perched water, present within the granular lenses near the top of the boreholes, and not representative of a shallow groundwater table.

6.5 Geotechnical Laboratory Testing

6.5.1 Atterberg Limit determination was undertaken on 5No. samples of London Clay Formation, at depths ranging from 1.0m to 2.5m bgl.

6.5.2 Plasticity Index values ranged from 42.4% to 72.9. Modified Plasticity Index values ranged from 39.9% to 72.9%, indicating soils with medium to high volume change potential.

6.6 Geotechnical Considerations

6.6.1 The proposed development included a basement under the part of the building footprint, assumed to be constructed at a formation level of approximately 2.75mbgl.

6.6.2 A piled foundation solution was recommended given the presence of nearby trees and soil with a high volume change potential.

6.6.3 Excavations within the London Clay Formation were considered to remain generally stable in the short to medium term.

6.6.4 The preliminary falling head soakage test failed, and an infiltration rate could not be calculated for the London Clay Formation. It is unlikely that soakaways will perform satisfactorily in these materials. Consideration should be given to an alternative drainage solution.

7 BASEMENT IMPACT ASSESSMENT

7.1 Proposed Changes to Areas of External Hardstanding

7.1.1 According to the Drainage Strategy Report (Hodel, 2023), the area of hardstanding on site will increase by approximately 233m^2 in the post-development scenario. However, it is understood that new hardstanding will comprise permeable paving. Given the geology under site is highly impermeable London Clay Formation, these would need to be positively drained to an attenuation tank.

7.1.2 The site is directly underlain by highly impermeable London Clay Formation and as such there will not be a significant change in surface water run-off.

7.1.3 SUDS will be required by NPPF, PPG and LLFA policy requirements, however, infiltration drainage has been deemed unsuitable following falling head testing undertaken in the London Clay Formation.

7.2 Past Flooding

7.2.1 The National Planning Policy Framework sets strict tests to protect people and property from flooding which all local planning authorities are expected to follow.

7.2.2 When assessing the site-specific flood risk and the potential for historic flooding to reoccur the above guidance recommends that, historic flooding records and any other relevant and available information including flood datasets (e.g. flood levels, depths and/or velocities) and any other relevant data, which can be acquired are assessed.

7.2.3 According to the SWMP, there were no historical records of flooding from Ordinary Watercourses available in Hillingdon.

7.2.4 In addition, the West London SFRA shows that no EA recorded flood outlines or EA historic flooding events are shown within 1km of site.

7.2.5 According to the SWMP, there are 6No. records of groundwater water flooding in Hillingdon, the nearest of which was located on Linksway, approximately 360m east of site. It should be noted however, that this road is underlain by deposits of Lambeth group (a Secondary A aquifer), unlike the site which is underlain by London Clay Formation (an Unproductive stratum).

7.2.6 According to the SWMP, there are 6No. records of surface water flooding in Hillingdon, none of which were within 1km of the site.

7.2.7 The LB Hillingdon SWMP shows the number of sewer flooding events for the postcode “HA6 2--”. This showed 11No. properties were impacted by flooding of sewers in the area prior to 2010. This figure is broadly average within the Hillingdon Borough.

7.2.8 The site is therefore considered to be at low risk of flooding based on historic flooding.

7.3 Geological Impact

7.3.1 The published geological maps indicated that the site is directly underlain by solid deposits of the London Clay Formation. This was confirmed by the intrusive investigation (Land Science, 2023).

7.3.2 The proposed basement will be founded within the London Clay Formation.

7.3.3 Geotechnical laboratory analysis has shown the London Clay Formation to be of medium and high-volume change potential. Heave precautions will therefore be required in accordance with NHBC guidance.

7.4 Hydrology and Hydrogeology Impact

7.4.1 There are no surface water features on or within 250m of the site.

7.4.2 No risk of flooding to the site from artificial sources has been identified.

7.4.3 Significant quantities of water are not anticipated to be present within the London Clay Formation (an Unproductive stratum). Any groundwater encountered is considered to be a result of slow migration of possibly perched overlying groundwater making its way through narrow bands or fissures within this stratum.

7.4.4 Any surface water/ground water ingress encountered during basement construction is likely to be readily dealt with by traditional sump pumping and is not considered to be a significant impediment to construction.

7.4.5 Appropriate water proofing measures should be included within the whole of the proposed basement wall/floor design as a precaution.

7.4.6 Creation of the basement is not likely to have any significant impact on the hydrogeology of the area, given the limited groundwater encountered and that this geological stratum is not an aquifer.

7.4.7 The proposed basement is unlikely to have a detectable impact on the local groundwater regime.

7.4.8 Permeable paving is proposed to be installed and would likely increase the volume of water discharged to the ground. However, given the geology under site is highly impermeable London Clay Formation, these would likely need to be positively drained to an attenuation tank. The soft landscaped areas are also underlain by high impermeable soils and therefore the proposed development will not significantly increase the volume of surface water discharged and may result in betterment where SuDS drainage is implemented. The ground conditions mean that infiltration SuDS (e.g. soakaways) are unsuitable and therefore alternate methods should be designed, such as release into the sewer network.

7.5 Impacts of Basement on Adjacent Properties and Pavement

7.5.1 The proposed basement excavation will be within 5m of a public pavement/road, although it is not within 5m of neighbouring properties.

7.5.2 Unavoidable lateral ground movements associated with the basement excavations must be controlled during temporary and permanent works so as not to impact adversely on the stability of the surrounding ground, any associated services and structures.

7.5.3 It will be necessary to ensure that the basements are designed in accordance with the NHBC Standards and take due cognisance of the potential impacts highlighted above. This may be achieved by ensuring best practice engineering and design of the proposed scheme by competent persons and in full accordance with the Construction (Design and Management) Regulations. This will include:

- Establishment of the likely ground movements arising from the temporary and permanent works and the mitigation of excessive movements;
- Assessment of the impact on any adjacent structures (including adjacent properties and the adjacent pavement with potential services);
- Determination of the most appropriate methods of construction of the proposed basements;
- Undertake pre-condition surveys of adjacent structures;
- Monitor any movements and pre-existing cracks during construction;
- Establishment of contingencies to deal with adverse performance;
- Ensuring quality of workmanship by competent persons.

7.5.4 Full details of the suitable engineering design of the scheme in addition to an appropriate construction method statement should be submitted by the Developer to the London Borough of Hillingdon.

8 REFERENCES

British Standards Institution (2015) BS 5930:2015 *Code of practice for ground investigations*. Milton Keynes: BSI

Campbell Reith (March 2018) *"Pro Forma Basement Impact Assessment*", London Borough of Camden

Capita Symonds (2013) "*Surface Water Management Plan*"

CIRIA C580, Embedded retaining walls – guidance for economic design

Hodel Consulting Engineers (January 2023) "*28 Nicholas Way, Northwood, HA6 2TT Drainage Strategy Report Including Management and Maintenance Requirements*" 22-2554

Land Science (January 2023) "*28 Nicholas Way, Northwood, HA6 2TT Phase I And II Geotechnical Assessment*" LS6678

London Borough of Camden (January 2021) *"Camden Planning Guidance Basements"*

London Borough of Hillingdon (January 2020) "*Local Plan Part 2 – Development Management Policies*"

Metis Consultants Ltd (2023) "*West London Strategic Flood Risk Assessment*"

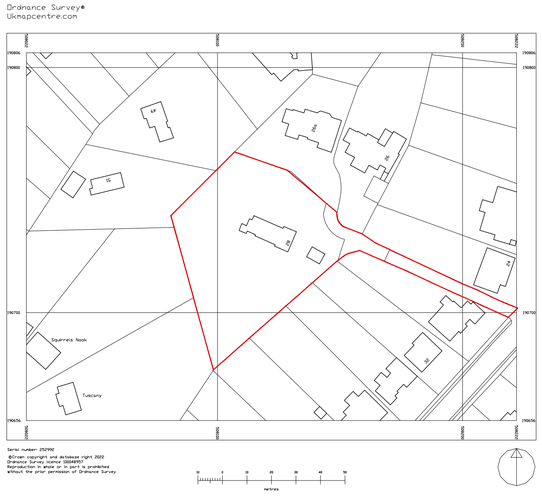
Ministry of Housing, Communities & Local Government: *National Planning Policy Framework*. February 2019

APPENDICES

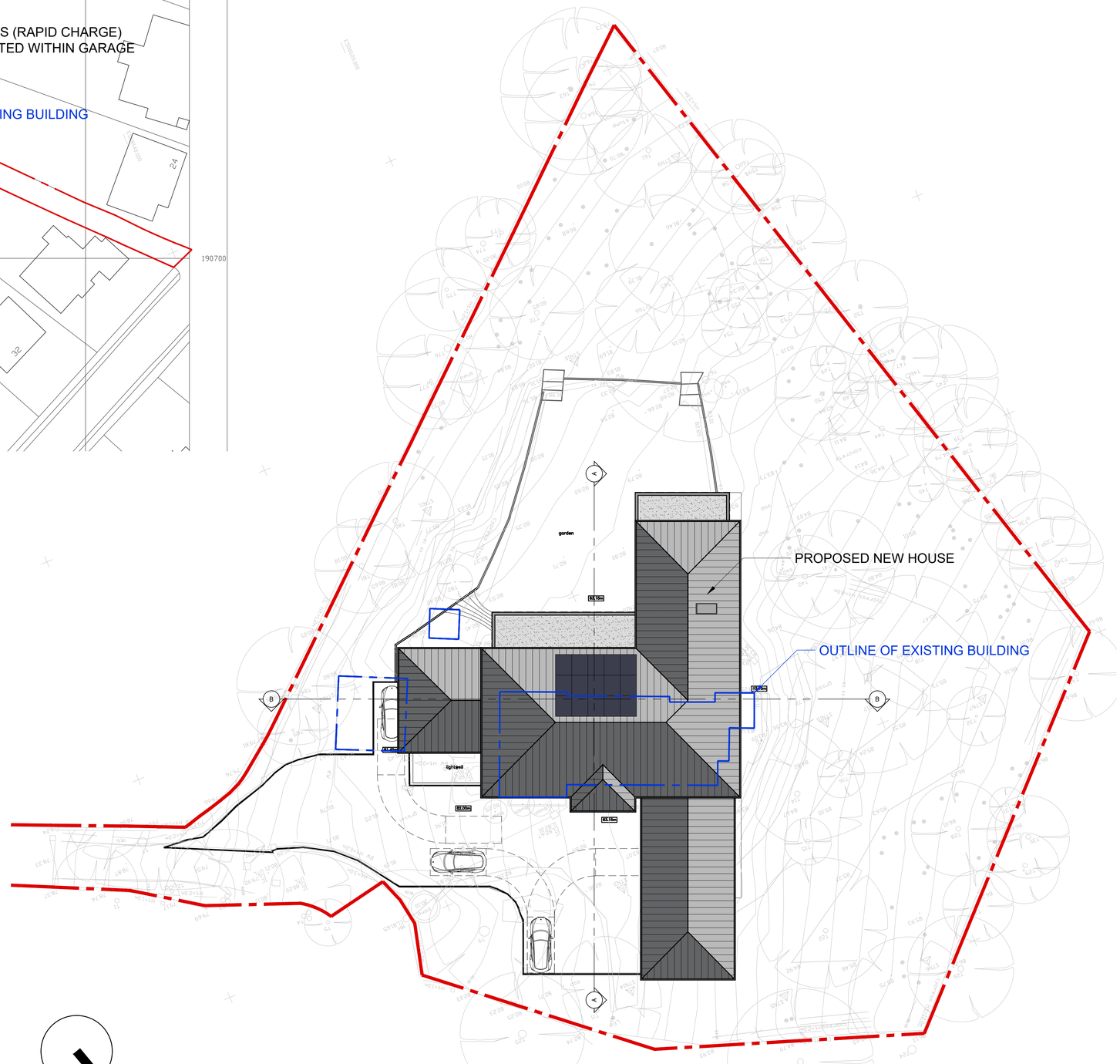
APPENDIX 1 – FIGURES

Figure 1 - Site Location Plan

Block Plan 1:500



Site Location Plan 1:1250



Site Plan 1:200

Notes:

0 2 10 20
scale 1:200

0 5 5 50
scale 1:500

REV:	DESCRIPTION:	BY:	DATE:
	.		
	.		

STATUS: Planning Application

HOUSE MANUFACTURER:

BAUFRITZ
WIR BAUEN GESUNDHEIT

Baufritz (UK) Ltd The Workplace Oakington Road
Cambridge CB3 0QH phone 01223 235632 www.baufritz.co.uk

CLIENT: Neil and Talisha Maroo
Wealdon House, Watford Road
Northwood, HA6 3PE

ARCHITECT: The Housedesigners Ltd
The Workplace, Oakington Road
Cambridge CB3 0QH
phone: 01223 235632

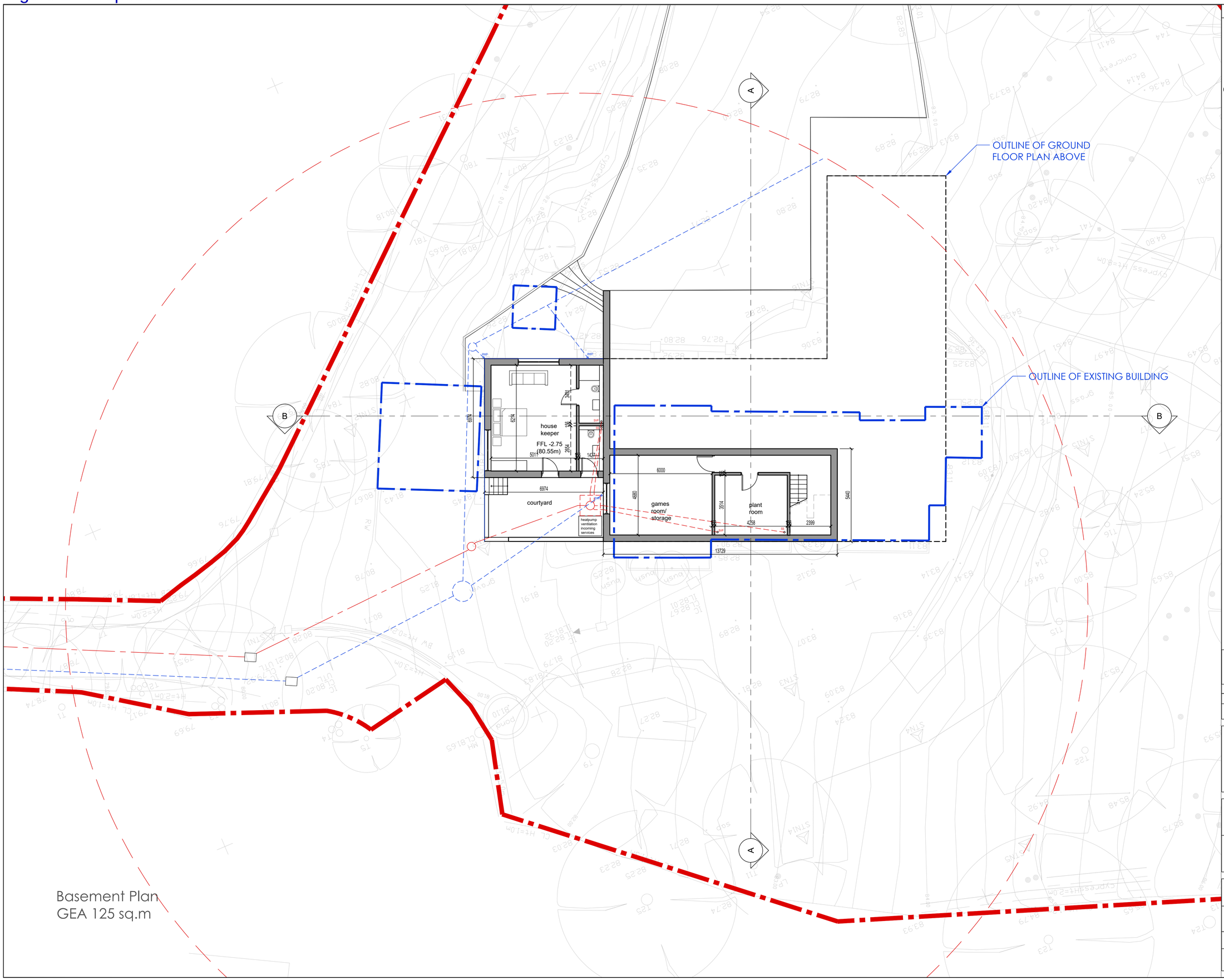
SITE: 28 Nicholas Way
Northwood, HA6 2TT

TITLE: Site Location, Block and Site plan

SCALE AT A1:	DATE:	DRAWN:	CHECKED:
1:200/500/1250 (A1)	04.07.2022	ORM	ORM

PROJECT NO:	DRAWING NO:	REVISION:
375	001	0

Figure 2 - Proposed Basement Plan



Notes:

0 1 5 10

scale 1:100

1	4.8M WIDE SLIDING DOOR SIZES REVISED. MINOR AMENDMENTS TO POCKET DOOR WALL THICKNESS.	ARCi	23/02/01

REV:	DESCRIPTION:	BY:	DATE:

STATUS: Planning Application

HOUSE MANUFACTURER:

BAUFRITZ
WIR BAUEN GESUNDHEIT

Baufritz (UK) Ltd The Workplace Oakington Road
Cambridge CB3 0QH phone 01223 235632 www.baufritz.co.uk

CLIENT: Neil and Talisha Maroo
Wealdon House, Watford Road
Northwood, HA6 3PE

ARCHITECT: The Housedesigners Ltd
The Workplace, Oakington Road
Cambridge CB3 0QH
phone: 01223 235632

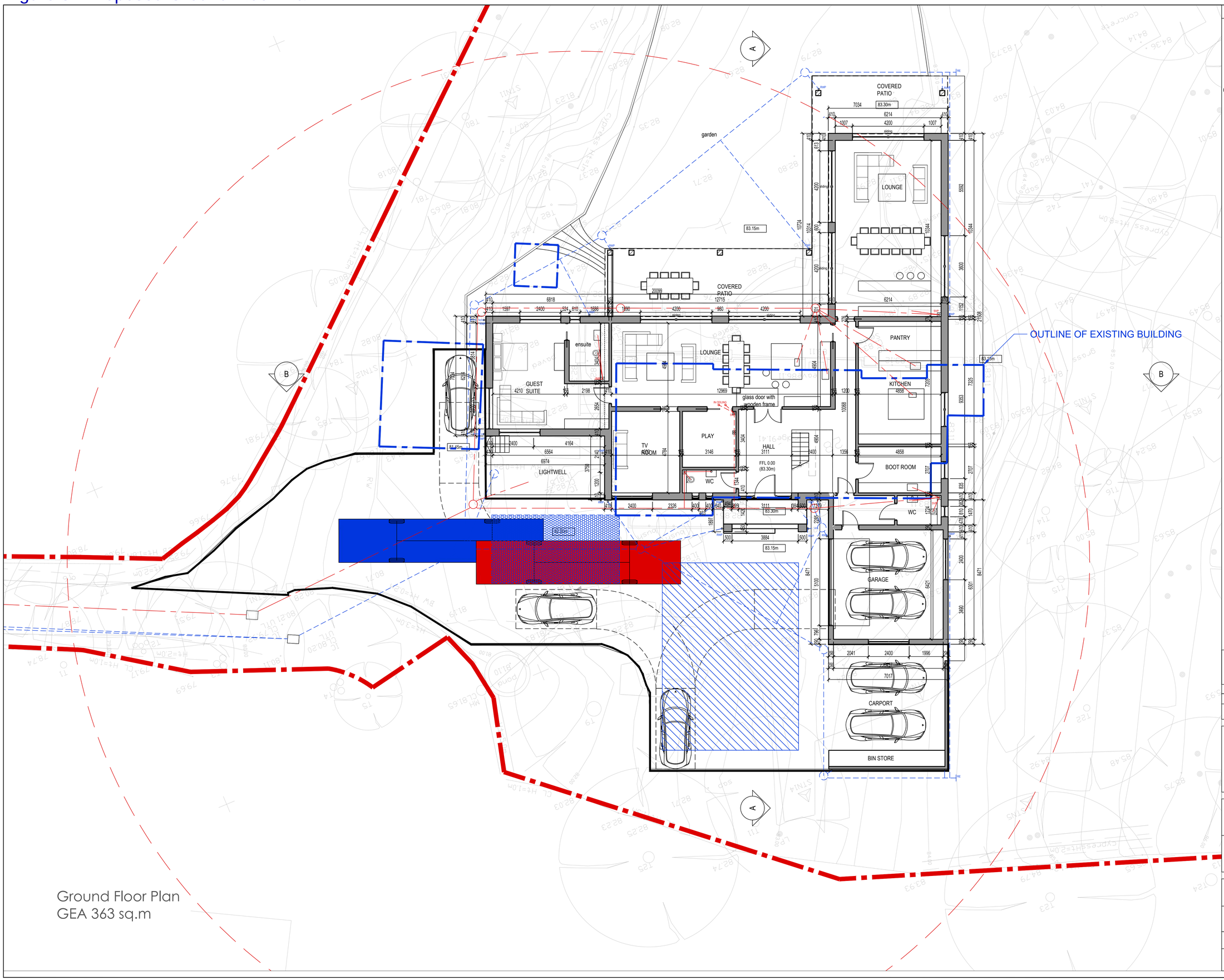
SITE: 28 Nicholas Way
Northwood, HA6 2TT

TITLE: Proposed new house
Basement

SCALE AT A1:	DATE:	DRAWN:	CHECKED:
1:100	04.07.2022	ARCi	ORM

PROJECT NO:	DRAWING NO:	REVISION:
375	002	1

Figure 3 - Proposed Ground Floor Plan



Ground Floor Plan
GEA 363 sq.m

Notes:

0 1 5 10
scale 1:100

1	4.8M WIDE SLIDING DOOR SIZES REVISED. MINOR AMENDMENTS TO POCKET DOOR WALL THICKNESS.	ARCi	23/02/01

REV:	DESCRIPTION:	BY:	DATE:

STATUS: Planning Application

HOUSE MANUFACTURER:
BAUFRITZ
WIR BAUEN GESUNDHEIT
Baufritz (UK) Ltd The Workplace Oakington Road
Cambridge CB3 0QH phone 01223 235632 www.baufritz.co.uk

CLIENT: Neil and Talisha Maroo
Wealdon House, Watford Road
Northwood, HA6 3PE

ARCHITECT: The Housedesigners Ltd
The Workplace, Oakington Road
Cambridge CB3 0QH
phone: 01223 235632

SITE: 28 Nicholas Way
Northwood, HA6 2TT

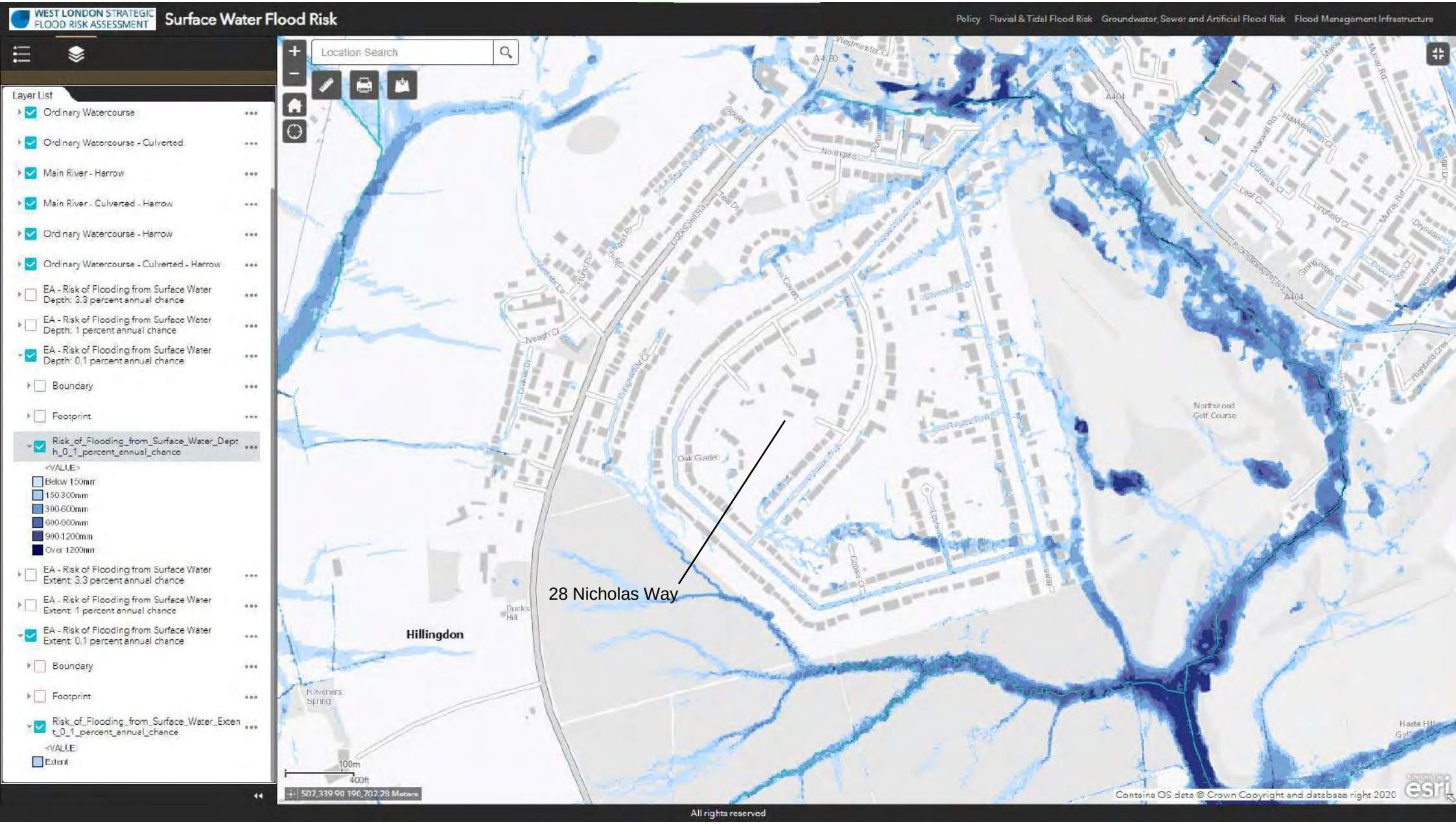
TITLE: Proposed new house
Ground Floor

SCALE AT A1:	DATE:	DRAWN:	CHECKED:
1:100	04.07.2022	ARCi	ORM

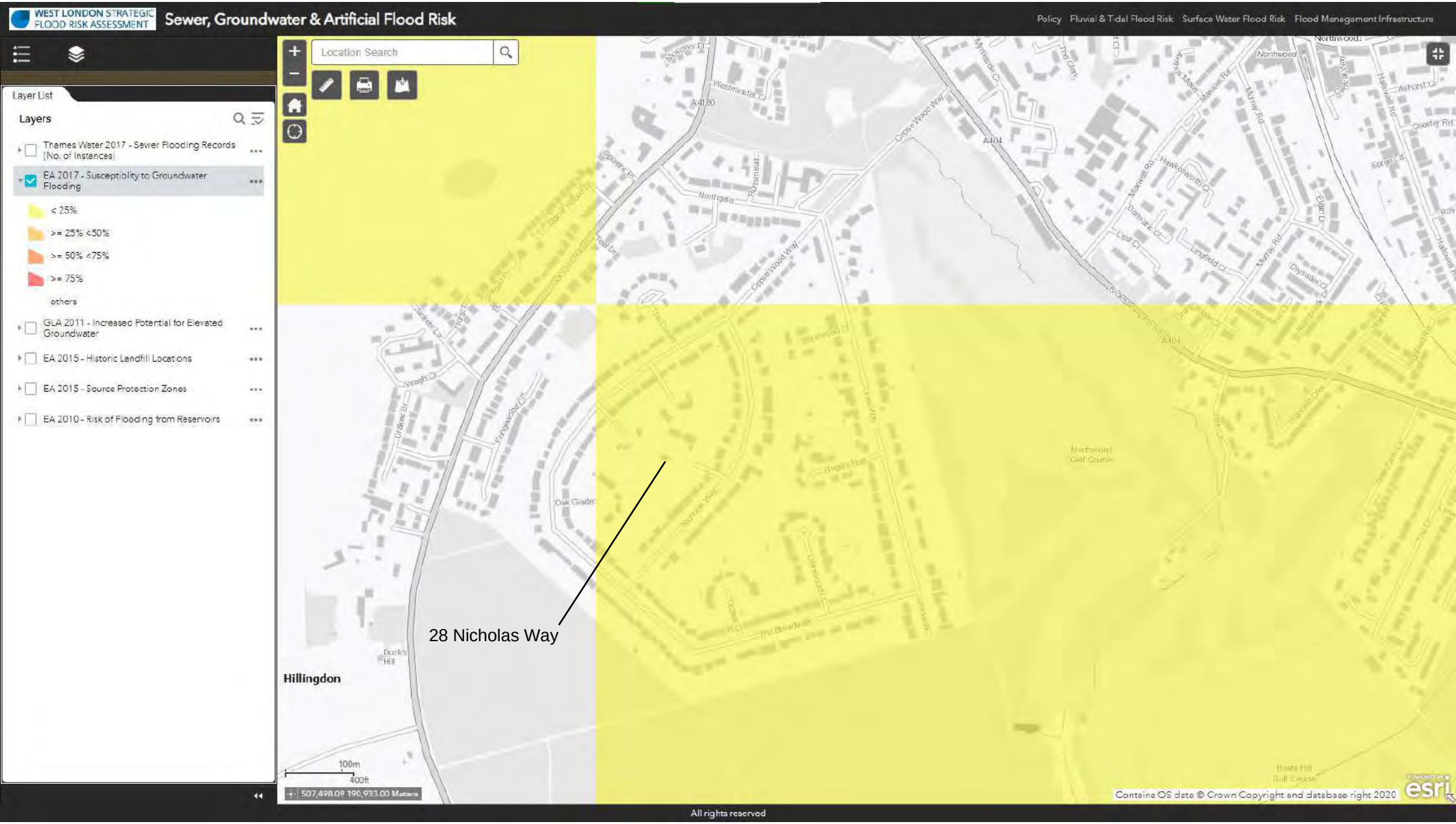
PROJECT NO:	DRAWING NO:	REVISION:
375	003	1

APPENDIX 2 – EXTRACTS FROM WEST LONDON SFRA AND LB HILLINGDON SWMP


WEST LONDON STRATEGIC FLOOD RISK ASSESSMENT
Sewer, Groundwater & Artificial Flood Risk
Policy
Fluvial & Tidal Flood Risk
Surface Water Flood Risk
Flood Management Infrastructure
Location Search
Layer List
Layers
Thames Water 2017 - Sewer Flooding Records (No. of Instances)
Total
> 100
81 - 100
61 - 80
41 - 60
21 - 40
1 - 20
0
EA 2017 - Susceptiblity to Groundwater Flooding
GLA 2011 - Increased Potential for Elevated Groundwater
EA 2015 - Historic Landfill Locations
EA 2015 - Source Protection Zones
EA 2010 - Risk of Flooding from Reservoirs
28 Nicholas Way
Hillingdon
Northwood Golf Course
Haste Hill Golf Course
100m
400ft
507,519.26 190,596.98 Meters
Contains OS data © Crown Copyright and database right 2020
All rights reserved


WEST LONDON STRATEGIC FLOOD RISK ASSESSMENT
Surface Water Flood Risk
Policy
Fluvial & Tidal Flood Risk
Groundwater, Sewer and Artificial Flood Risk
Flood Management Infrastructure
Location Search
Layer List
Ordinary Watercourse
Ordinary Watercourse - Culverted
Main River - Harrow
Main River - Culverted - Harrow
Ordinary Watercourse - Harrow
Ordinary Watercourse - Culverted - Harrow
EA - Risk of Flooding from Surface Water Depth: 3.3 percent annual chance
EA - Risk of Flooding from Surface Water Depth: 1 percent annual chance
EA - Risk of Flooding from Surface Water Depth: 0.1 percent annual chance
Boundary
Footprint
Risk_of_Flooding_from_Surface_Water_Depth_0_1_percent_annual_chance
<VALUE>
Below 150mm
150-300mm
300-600mm
600-900mm
900-1200mm
Over 1200mm
EA - Risk of Flooding from Surface Water Extent: 3.3 percent annual chance
EA - Risk of Flooding from Surface Water Extent: 1 percent annual chance
EA - Risk of Flooding from Surface Water Extent: 0.1 percent annual chance
Boundary
Footprint
Risk_of_Flooding_from_Surface_Water_Extent_0_1_percent_annual_chance
<VALUE>
Extent
28 Nicholas Way
Hillingdon
Northwood Golf Course
Oak Glade
Ducks Hill
Raveners Spring
A404
A4180
100m
400ft
507,339.90 190,702.28 Meters
Contains OS data © Crown Copyright and database right 2020
esri
All rights reserved


WEST LONDON STRATEGIC FLOOD RISK ASSESSMENT
Sewer, Groundwater & Artificial Flood Risk
Policy
Fluvial & Tidal Flood Risk
Surface Water Flood Risk
Flood Management Infrastructure
Location Search
Layer List
Layers
Thames Water 2017 - Sewer Flooding Records (No. of Instances)
EA 2017 - Susceptiblity to Groundwater Flooding
GLA 2011 - Increased Potential for Elevated Groundwater
EA 2015 - Historic Landfill Locations
EA 2015 - Source Protection Zones
EA 2010 - Risk of Flooding from Reservoirs
Risk_of_Flooding_from_Reservoirs_Maximum_Flood_Extent
28 Nicholas Way
Nicholas Way
Oak Glade
The Broadwalk
Copse Wood Way
Northgate
Northwood Golf Course
Haste Hill Golf Course
Hillingdon
Duck's Hill
A404
100m
400ft
507,449.14 190,873.47 Meters
Contains OS data © Crown Copyright and database right 2020 | These datasets have been made freely available b...
All rights reserved



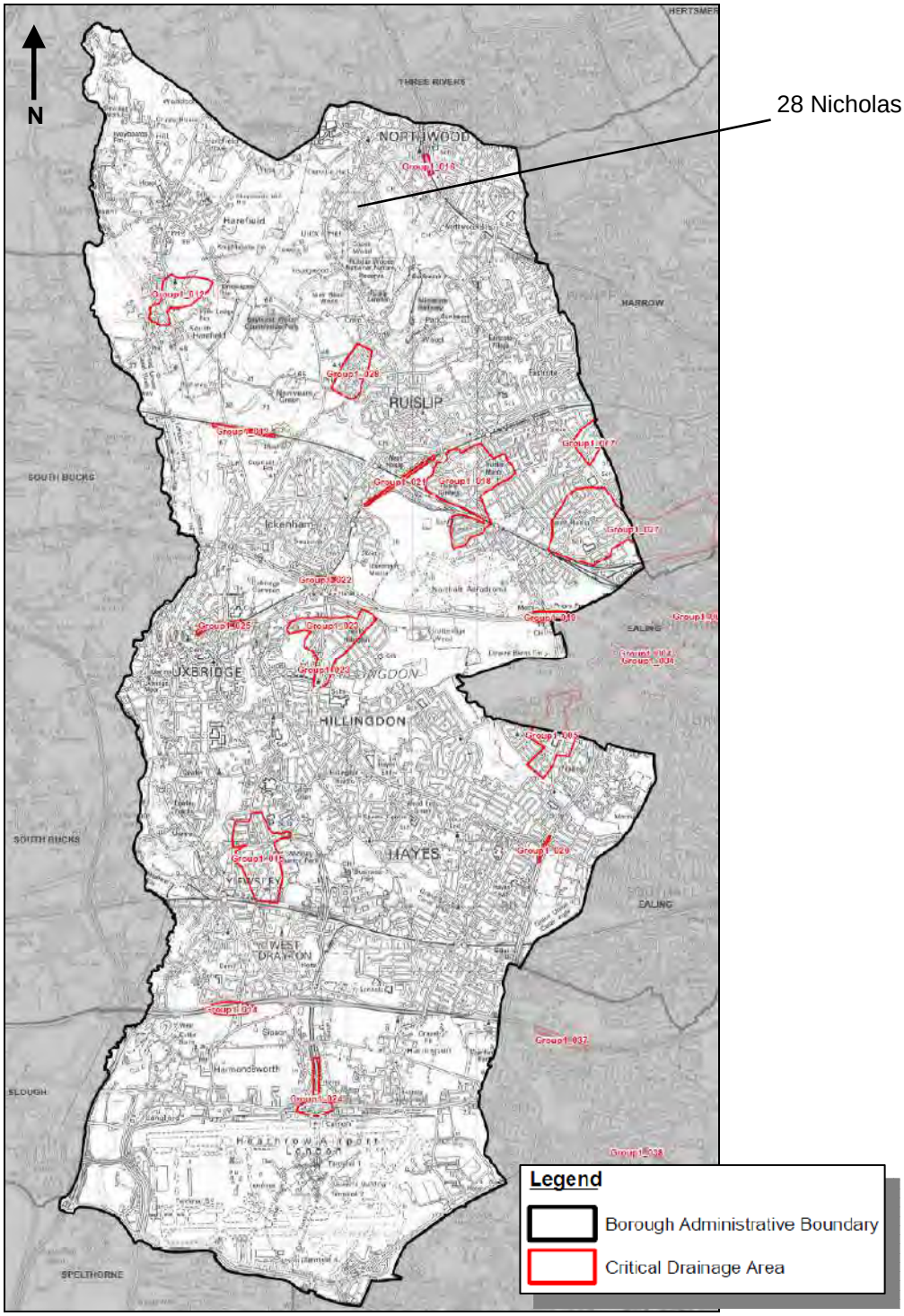
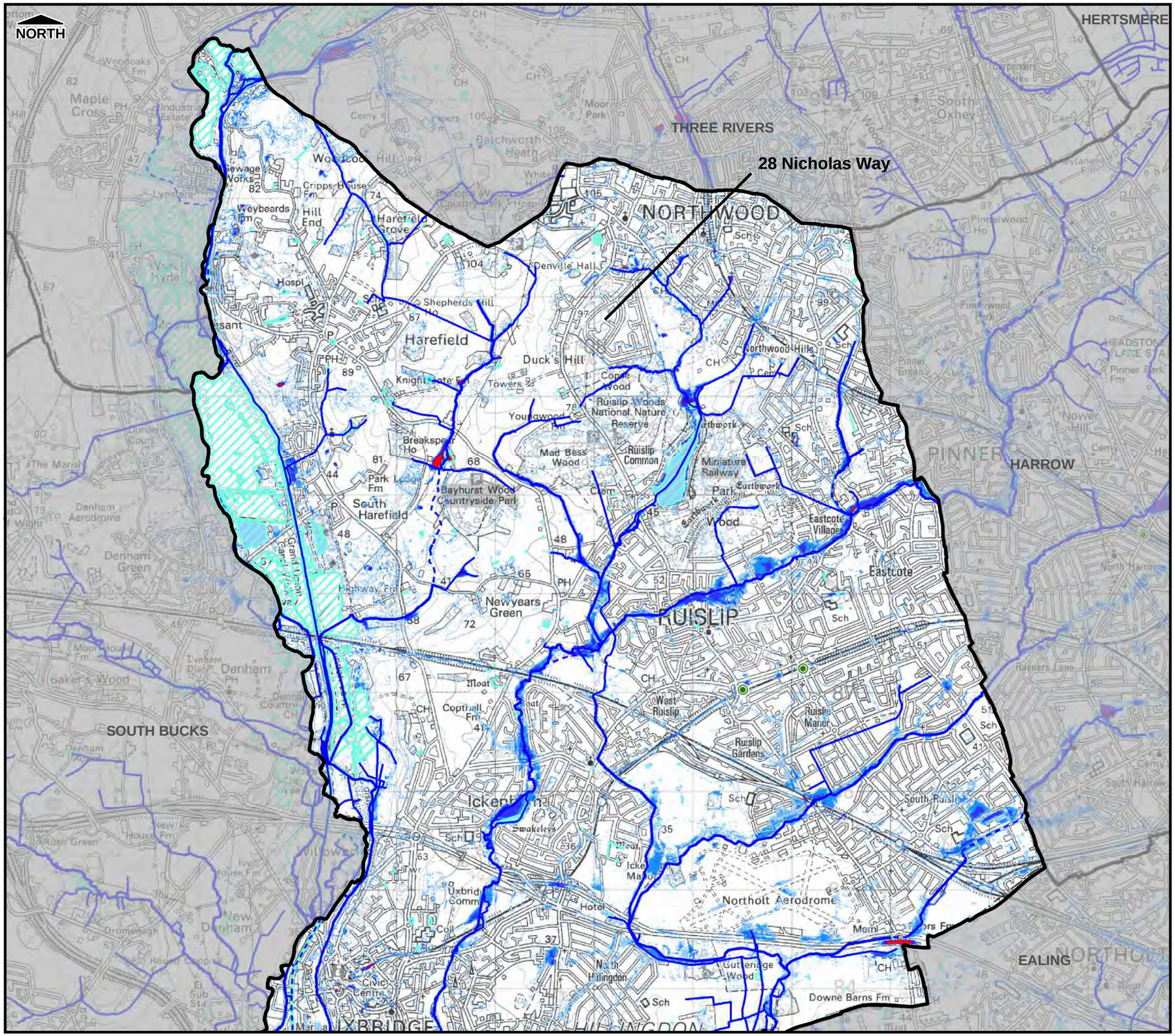


Figure 3-3 Critical Drainage Areas Locations within Hillingdon

3.8.7 Guidance on the depths and velocities (hazard) of floodwater that can be a risk to people is shown within Figure 3-4 (overleaf). These are typically classified as caution (very low hazard), moderate (danger for some), significant (danger for most), extreme (danger for all).



THIS DRAWING MAY BE USED ONLY FOR THE PURPOSE INTENDED

Legend

- Borough Administrative Boundary
- Main River
- Ordinary Watercourse
- Culverted Watercourse (Main River)
- Permanent Water Bodies
- Surface Water Flooding Incidents
- Surface Water Flood Outline

Flood Depth

< 0.1m	0.5m - 1.0m
0.1m - 0.25m	1.0m - 1.5m
0.25m - 0.5m	> 1.5m

Notes

1. This map only shows the predicted likelihood of surface water flooding (this includes flooding from sewers, drains, small watercourses and ditches that occurs in heavy rainfall) for defined areas, and due to the coarse nature of the source data used, are not detailed enough to account for precise addresses.
2. Users of this map should refer to section 3.2 of the Surface Water Management Plan for a complete description of limitations and accuracy of the flood/hazard extents shown.

London Borough of Hillingdon

Surface Water Management Plan

Scale at A3	Date	Drawn by	Approved by
1:40,000	08/04/2011	R.MOORE	P.HLINOVSKY

1 in 100 year rainfall event depth and recorded surface water flood incidents

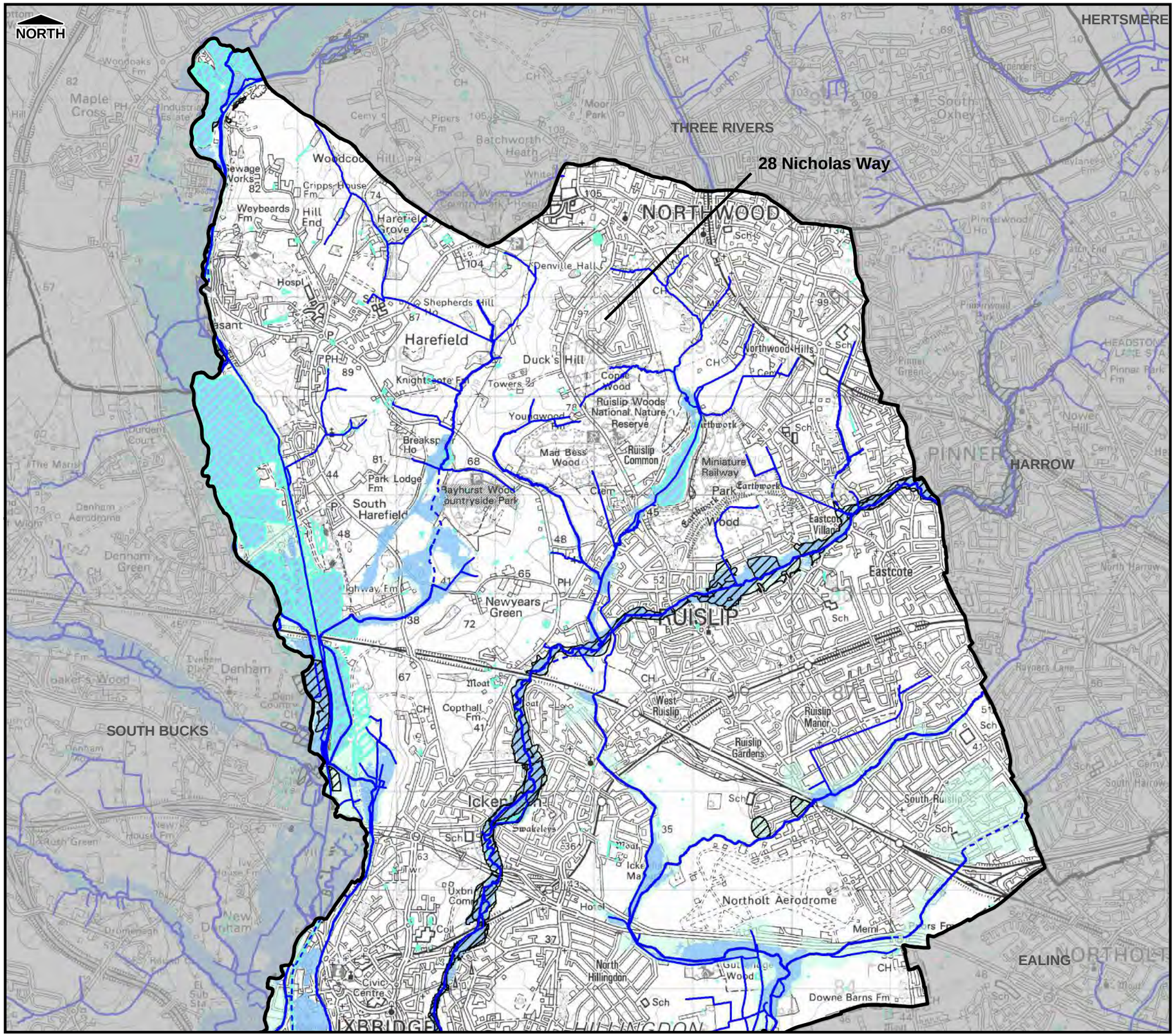
Consultants
CAPITA SYMONDS Flood Risk Management
Scott Wilson
Capita Symonds
Level Seven,
52 Grosvenor Gardens,
Belgravia,
London
SW1W 0AU

Drain London Programme Board Members

Environment Agency · Thames Water · LONDON COUNCILS · GREATERLONDONAUTHORITY

FIGURE 5.1

Filepath: L:\Environment\zwetCS046913_DrainLondon_Tier2\Group1\ARC\mxds\GP1_Hillingdon_Fig5.1_Depth_SWIncidents_100.mxd



THIS DRAWING MAY BE USED ONLY FOR THE PURPOSE INTENDED

Legend

- Borough Administrative Boundary
- Main River
- Ordinary Watercourse
- Culverted Watercourse (Main River)
- Permanent Water Bodies
- Fluvial Flooding Incidents
- Historic Fluvial Flood Outline
- Environment Agency Flood Zone 3
- Environment Agency Flood Zone 2

Notes

1. Environment Agency Flood Zone 3 represents a 1% AEP flood event.
2. Environment Agency Flood Zone 2 represents a 0.1% AEP flood event.

London Borough of Hillingdon

HILLINGDON LONDON

Surface Water Management Plan

Scale at A3	Date	Drawn by	Approved by
1:40,000	08/04/2011	R.MOORE	P.HLINOVSKY

Environment Agency Flood Map and Fluvial Flooding Incidents

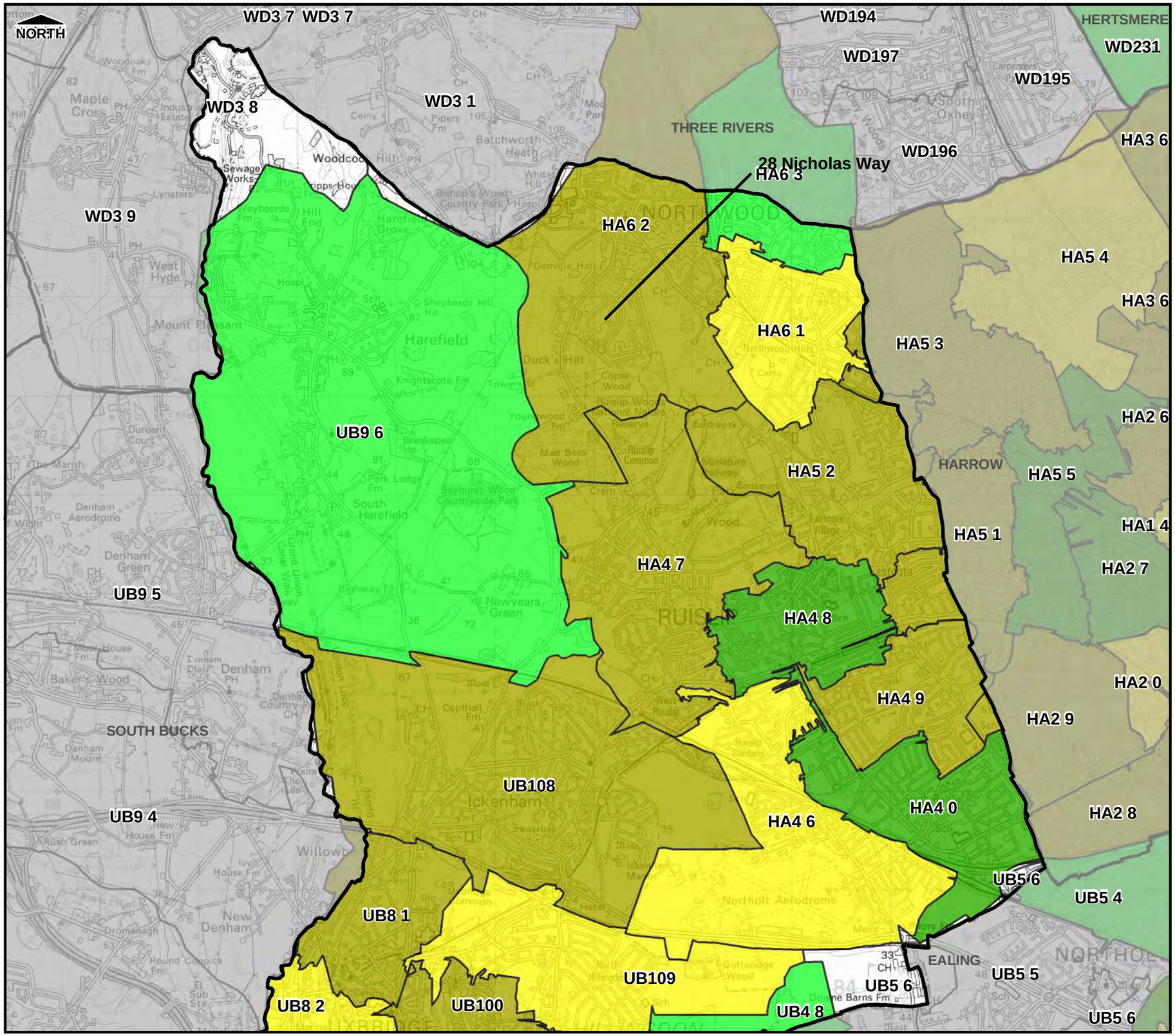
Consultants
CAPITA SYMONDS Flood Risk Management
Scott Wilson
Capita Symonds
Level Seven,
52 Grosvenor Gardens,
Belgravia,
London
SW1W 0AU

Drain London Programme Board Members

Environment Agency · Thames Water · LONDON COUNCILS · GREATERLONDONAUTHORITY

FIGURE 7.1

Filepath: L:\Environment\zwet\CS046913_DrainLondon_Tier2\Group1\ARC\mxds\GP1_Hillingdon_Fig7.1_EAFloodMap_FlvIncidents.mxd



THIS DRAWING MAY BE USED ONLY FOR THE PURPOSE INTENDED

Legend

- Borough Administrative Boundary
- Sewer Flooding Incidents
- Sewer Flood Outline

No. of Sewer Flood Records

- None
- 1 - 5
- 6 - 10
- 11 - 20
- 21 - 50
- 51 - 100
- 101+

Notes

London Borough of Hillingdon

Surface Water Management Plan

Scale at A3	Date	Drawn by	Approved by
1:40,000	06/04/2011	R.MOORE	P.HLINOVSKY

Recorded Incidents of Sewer Flooding

Consultants
CAPITA SYMONDS Scott Wilson
Flood Risk Management
Capita Symonds
Level Seven,
52 Grosvenor Gardens,
Belgravia,
London
SW1W 0AU

Drain London Programme Board Members

Environment Agency · Thames Water · LONDON COUNCILS · GREATERLONDONAUTHORITY

FIGURE 9.1

Filepath: L:\Environment\zwet\CS046913_DrainLondon_Tier2\Group1\ARC\mxds\GP1_Hillingdon_Fig9.1_SewerIncidents.mxd

APPENDIX 3 – LAND SCIENCE "*28 NICHOLAS WAY, NORTHWOOD, HA6 2TT PHASE I AND II GEOTECHNICAL ASSESSMENT*" (JANUARY 2023)

Land Science

28 NICHOLAS WAY, NORTHWOOD, HA6 2TT

PHASE I AND II GEOTECHNICAL ASSESSMENT

NEIL MAROO

27TH JANUARY 2023

LS6678

Site:	**28 NICHOLAS WAY, NORTHWOOD, HA6 2TT**
Title:	**PHASE I AND PHASE II GEOTECHNICAL ASSESSMENT**
Project:	**RESIDENTIAL DEVELOPMENT**
Client:	**NEIL MAROO**
Contact:	**BAUFRITZ**
Date:	**27TH JANUARY 2023**
Reference:	**LS6678**
Version:	**A – final for issue**

Prepared By:	*Emily Prosser*	**EMILY PROSSER M.Sc., B.Sc. (Hons.), FGS** **Project Geo-Environmental Consultant**
Checked By:	*Mike Rose*	**MICHAEL ROSE M.Sc., B.Sc., FGS, AIEMA** **Principal Geo-Environmental Consultant**
Authorised By:	*Elliot Toms*	**ELLIOT TOMS CEnv, M.Sc., B.Sc. (Hons.), FGS, MIEnvSci** **Managing Director**

CONTENTS

FIGURES

APPENDICES

1.0 EXECUTIVE SUMMARY

This summary is a brief precis of the main findings and conclusions of the investigation. For detailed information, the reader is referred to the main report.

The existing site comprised a two-storey residential dwelling with private garden and driveway. The proposed development was understood to comprise a two-storey dwelling with a partial basement, garden and driveway. The intrusive investigation included 4no dynamic sampler boreholes and 1no cable percussion borehole.

Strata	Base Depth range (m)	Summary
Hardstanding	0.05	Tarmac hardstanding.
Topsoil	0.15-0.20	Dark brown clayey SILT or silty CLAY.
Made Ground	0.30	Dark grey black slightly sandy, ashy, GRAVEL.
London Clay Formation	15.00+	Mid-orange brown, sandy CLAY before changing colour to a dark orange-brown, mottled blue-grey CLAY, becoming dark blue grey at depth.

Groundwater was recorded during the intrusive investigation standing at levels of between 1.40-2.50mbgl, on return monitoring groundwater was recorded standing at 0.98mbgl.

Traditional foundations are not likely to be suitable to the ground and groundwater conditions, consideration may be given to the use of piled foundations. Suggested design parameters are given. The formation should be treated as being high volume change potential.

Excavations are generally likely to remain stable. Excavations below the water table may become highly unstable.

A CBR value of 2.0% recommended for the London Clay Formation, which is not classified as being frost susceptible.

Buried structural concrete may be designed to DS-4 and AC-3s in accordance with BS8500. Water supply pipe work will not require protection from aggressive soil contaminants.

Preliminary falling head soakage tests failed, and it is unlikely that soakaways will perform satisfactorily on site.

No issues with respect to ground gases or Radon have been identified. Soil testing has not identified elevated levels of contamination.

Chemical results on the London Clay Formation corresponded to Inert Waste classification.

No immediate requirements for further ground investigation have been identified. This report should be submitted to relevant authorities etc in good time for consideration and approval.

2.0 INTRODUCTION

2.1 General

Land Science was instructed to undertake a combined Phase I and Phase II Geotechnical Assessment in relation to the proposed redevelopment at 28 Nicholas Way, Northwood, HA6 2TT. The location is shown on Figure 1, which is centred at grid reference TQ 08123 90735.

2.2 Client

The Client for this appointment was Neil Maroo through Baufritz (UK) Limited. This report may only be used by this named client and their project team for the purposes set out and subject to the report conditions. It was understood that the Client already owned the property, and that this investigation was not a pre-purchase appraisal.

2.3 Area Under Investigation

The area under investigation comprised a two-storey residential dwelling with associated garden and driveway. The layout is indicated on Figure 2, and a walkover survey is presented in section 3.0. The area was approximately 0.36 hectares.

2.4 Proposed Development

The proposed development was understood to comprise a new 2-storey residential dwelling with a partial basement for car parking and associated private garden and driveway. It was understood that the findings of this report would support a future planning application. Figure 3 illustrates the layout of the proposed redevelopment. The findings of this report may be not valid if the proposed development is altered.

2.5 Previous Investigations

Land Science was not aware of any previous desk studies or ground investigation(s) for this project.

2.6 Scope of Work

The work carried out is described in detail in following sections but in summary included:

- A phase I assessment desk study.
- An intrusive investigation comprising dynamic sampler boreholes, a cable percussion borehole, and soakage testing.
- Preliminary geotechnical testing of selected soil samples in the field and laboratory.
- Preliminary chemical testing of selected soil samples in the laboratory.
- Installation of gas and water monitoring wells and return visits. Monitoring to include one preliminary visit in the fortnight following the site work.

The fieldwork was conducted on the 6th of January 2023, under the supervision of Land Science. The return monitoring visit was conducted on the 20th of January 2023

2.7 Geotechnical Objectives

An interpretive Ground Investigation Report (GIR) was required in order to provide an assessment of ground conditions with respect to proposed foundations, pavements, soakaways, concrete specification, excavations and basements.

2.8 Standards

Where practicable, the investigation was undertaken in accordance with the following primary standards and guidance:

- BS 5930:2015 Code of Practice for Site Investigations
- BS 1377:2018 Soils for Civil Engineering Purposes
- BS 8004:2015 Code of Practice for Foundations
- BS EN 1997-2:2007. Eurocode 7: Geotechnical Design – Part 2: Ground Investigation and testing.

Other technical sources have been cited in respect of specific aspects of the investigation, as referenced throughout the text.

3.0 DESK STUDY

3.1 General

A desk study was carried out to inform the preliminary conceptual understanding of the site and its setting, and to identify potential aspects of concern, in the context of the stated report objectives.

3.2 Walkover Survey

A walkover survey was carried out, as recorded in Appendix A, with photographs from the site in Appendix B. In summary, the area under investigation comprised a two-storey residential dwelling with associated private garden and driveway. A small outbuilding was noted to the east of the main dwelling. The site was noted to slope gently towards the southeast, with an angle of ~6°.

The garden of the property was laid to lawn towards the centre; however, the majority was covered with tall mature trees forming a sparse woodland. The woodland included both evergreen and deciduous trees, including species of Oak, Hornbeam, Cypress, and Cedar. These ranged in height, up to a maximum of ~15.00m. Shrubs and various grasses were also noted. Areas of boggy waterlogged ground were noted throughout the wooded area on site as well, particularly in the west.

The walkover survey did not identify any areas of particular concern regarding the geo-environmental condition of the site. No significant evidence of tanks, chemical storage, staining or sheens, built up ground, contaminative land uses etc, were noted.

3.3 Historical Land Use Data

Various historical records were reviewed in order to assess potential historical land uses and activities that may impact on ground conditions at the site.

A set of historical ordnance survey maps was obtained from Envirocheck, and a copy is presented in Appendix G. The following key features were noted:

- The earliest map dated 1865-1890 showed the site comprised a portion of a much larger woodland, with a small track noted to run along the western boundary of the site. The site remained unchanged on the 1932 map.
- The 1959 map showed the site to be redeveloped with a residential dwelling located towards the east of the site, in the same footprint to that of the present day. The site has remained in this layout up until the present day.
- Off site, the site remained surrounded by woodland up until the mapping of the 1932-1934 map which showed residential development had started to take place to the east and west of the site. By the mapping of the 1959 map the surrounding area was in a similar layout to the present day, surrounded by residential dwellings.
- The historical map set included an aerial photograph dated 1999. The imagery showed the garden area of the site, and the majority of the surrounding gardens to contain mature trees.

Recent aerial photography covering the site was examined using Google Earth Pro. Although of poor quality, imagery dated 1945 showed the site to be covered with trees, with a small clearing located just to the east. Other more recent imagery showed that the site had remained in a similar layout to the present day since 1999.

A brief internet search was carried out, which did not immediately reveal any relevant land use information.

3.4 Ground Conditions

A preliminary ground model was derived for the site by based on a combination of various sources including published maps, borehole records, previous investigations, and the site history. In summary, the following potential ground model was identified:

Strata	Approximate Depth (mbgl)	Summary Description
Topsoil	<0.40	The site has been covered with trees since the publication of the earliest historical maps and therefore a layer of highly weathered and decayed organic material is likely to be present at the surface.
London Clay Formation	To depth	Bioturbated or poorly laminated, blue-grey or grey-brown, slightly calcareous, silty to very silty clay, clayey silt and sometimes silt, with some layers of sandy clay.

Shallow groundwater was not anticipated on site, however, groundwater may be perched within granular lenses of the London Clay Formation.

The desk study included searches of geological hazards. None of the hazards were rated as moderate or above, considered the screening threshold for further investigation.

A search of various databases for coal mining, mining, brine compensation, and natural cavities was carried out. No relevant features were identified.

3.5 Environmental Setting

The site lies in the following groundwater setting:

- Superficial aquifer: None - No superficial strata were classified.
- Bedrock aquifer: The London Clay Formation was classified as an Unproductive Strata - Low permeability strata that have negligible significance for water supply or river base flow.
- Source protection zone: the site lies within a SPZ 'III' - defined as the total area needed to support the abstraction.
- Flooding from Rivers and Sea: Zone 1 Low Probability - Land having a less than 1 in 1,000 annual probability of river or sea flooding.
- Surface water flooding on site: Very low risk - each year this area has a chance of flooding of less than 0.1%. Flooding from surface water is difficult to predict as rainfall location and volume are difficult to forecast. In addition, local features can greatly affect the chance and severity of flooding.

3.6 Radon Gas

The requirement for Radon Protection Measures (RPM) has been assessed in accordance with BRE 211:2015. Public Health England and the BGS estimate the potential for radon and the requirement for Radon Protection Measures on site as follows:

- Radon probability: Not at risk - less than 1% of homes are estimated by PHE to exceed the threshold for Radon gas in residential dwellings.

- Radon Protection Measures (RPM): No Radon protection is required for new dwellings or extensions constructed at this location.

4.0 INTRUSIVE INVESTIGATION

4.1 Investigation Strategy

Based on the geotechnical objectives, the intrusive investigation was based on the following strategy:

- Dynamic sampler boreholes were used to minimise disruption to the site and to enable a monitoring well to be installed.
- The positions were located to give broad coverage across the site and across the footprint of the proposed dwelling.
- A deeper borehole was also drilled to determine pile design parameters.
- A monitoring well was installed in DS02. The installation was sealed through the Topsoil, with the response zone in the London Clay Formation.

Position	Provisional Depth / strata	Existing Location	Proposed Location	Testing, installations etc
DS01	3.00m or refusal	Rear garden SE of dwelling	Possible Soakaway	DP, HP, SV
DS02	5.00m or refusal	Rear garden NW of dwelling	Building Footprint	DP, HP, SV, MW
DS03		Garden W of dwelling	W of building footprint	DP, HP, SV
DS04		Garden N of site	NW of building footprint	FHST, HP, SV
BH01	15.00m or refusal	Front driveway		SPT

4.2 Dynamic (Windowless) Sampling (DS)

Dynamic Sampling entails 1m long hollow tubes with liners driven into the ground and retracted to obtain samples. The liners are split, logged, tested, and subsampled as required.

4.3 Dynamic Probing (DP)

Dynamic Probing involves driving a cone point using a percussive hammer and recording the number of blows required for each increment of penetration. The particular testing method employed was DPSH-A as prescribed under BS EN 1997-:2004 and EN ISO 22476-2.

4.4 Cable Percussive Boreholes (CP)

Cable Percussion is a traditional drilling technique which essentially involves repeatedly dropping a hollow sampling tube from height and removing any plug of soil that is retrieved. Clay cutters, chisels, a shelling attachment, and casing can also be used down the hole.

4.5 Falling Head Soakage Testing (FHST)

A test bore is filled with water and the drop in water level over time is recorded, to provide an indication on the likely permeability of different strata.

4.6 Standard Penetration Test (SPT)

The Standard Penetration Test involved driving a cone (SPT(C)) or split spoon sampler (SPT(S)) with a percussive hammer weight and recording the number of blows to penetrate six consecutive intervals of 75mm; the first two are discarded as 'seating blows', while the final four are added together to calculate an N-Value. The procedure is defined under numerous standards including BS5930:2015.

4.7 Monitoring Wells (MW)

Monitoring wells are installations within boreholes that enable return monitoring to be carried out. The pipework was 50mm diameter HDPE, with cased section sealed with bentonite, and the slotted response zone packed with a shingle filter pack.

Monitoring installations are summarised below and are shown on the relevant logs in the appendix.

Position	Response zone		Diameter	Strata	Objective
	Top	Bottom			
DS02	1.00m	5.00m	50mm	London Clay Formation	Water monitoring

4.8 Soil Sampling

Soil samples were recovered from the exploratory holes during the ground investigation and stored/transported in containers appropriate for the laboratory testing undertaken. Sample types and depths are recorded on the relevant exploratory hole records.

4.9 Post-Fieldwork Monitoring

Post-fieldwork monitoring of ground gas, organic vapour and groundwater levels was undertaken the 20th of January 2023.

5.0 GROUND CONDITIONS

5.1 General

The expected ground conditions were anticipated to comprise London Clay Formation to depth. The investigation confirmed the anticipated ground conditions. A thin capping of hardstanding, topsoil and/or Made Ground was encountered at surface. A summary of the encountered conditions is presented below.

Strata	Base Depth (m)				
	DS01	DS02	DS03	DS04	BH01
Hardstanding	-	-	-	-	0.05
Topsoil	0.15	0.15	0.20	0.15	-
Made Ground	-	-	-	-	0.30
London Clay Formation	3.00+	5.00+	5.00+	5.00+	15.00+

The naming of geological strata is tentative and should be used as a guide. Interpolation between or below investigation points should be treated with caution. The description of soils and rocks was in accordance with BS5930. Topsoil can be distinguished from Made Ground, even though these may have been disturbed through human activity and may contain materials such as brick, pottery, or charcoal etc.

5.2 Hardstandings

Position BH01 was located within the driveway of the site and a tarmac hardstanding was encountered to a depth of 0.05mbgl.

5.3 Topsoil

Topsoil was encountered at positions DS01-DS04 to depths of between 0.15-0.20mbgl and comprised a dark brown clayey SILT or silty CLAY, in DS04 the Topsoil comprised a dark grey, firm, slightly gravelly CLAY where gravels are of fine to coarse, subangular to subrounded flints.

5.4 Made Ground

Made Ground was encountered beneath the tarmac hardstanding in BH01 to a depth of 0.30mbgl and comprised a dark grey black slightly sandy, ashy, GRAVEL. Where sands are fine to coarse, and gravels are of fine to medium, subangular to subrounded flint, tarmac, and concrete.

5.5 London Clay Formation

The London Clay Formation was encountered to depth in all positions and generally comprised a mid-orange brown, sandy CLAY before changing colour to a dark orange-brown, mottled blue-grey CLAY. In BH01, from 10.00m the strata comprised a stiff dark blue grey CLAY, with rare selenite mineralisation.

The London Clay was slightly variable throughout the shallower boreholes; in DS01, from 2.30mbgl a stiff brown, gravelly silty clay was encountered, where gravels are of relic mudstones. In DS02 a band

of mudstone was encountered between depths of 2.60-2.90mbgl. In DS03 a sandy SILTSTONE was encountered from 1.30-4.80mbgl, beyond this a band of sandstone was encountered to depth. In DS04, a dense brown sandy siltstone was encountered from 2.30mbgl to depth.

5.6 Roots and Rootlets

A summary of roots and rootlets encountered is given below:

Position	Roots	Rootlets
DS01	None	0.00-1.50; Fine to medium rootlets noted throughout.
DS02		0.00-1.20; Fine to medium rootlets noted throughout.
DS03	0.50m; root noted	0.00-1.30; Fine to medium rootlets noted throughout.
DS04	None	0.00-2.00; Rare fine rootlets noted throughout.
BH01	None	0.30-1.30; Rare fine rootlets noted throughout.

5.7 Field Evidence of Contamination

No evidence of possible soil contamination (such as staining, malodours, or brightly coloured soils) was identified in the field.

Made Ground was identified 0.30m, and such materials may be imported from an unknown source or mixed with hazardous materials, and as such may contain a wide range of potential contaminants. All such materials should be treated as suspect unless proven otherwise. Preliminary testing has been carried out, as described in section 10.0.

5.8 Groundwater

Groundwater was struck during the excavation of DS01 and DS02 with short-term standing water depths in the order of 2.50m and 1.40m, respectively.

The level of water in a borehole can be affected by the drilling process and speed of infiltration; short-term rest levels should be used with caution.

5.9 Stability and Casing

Positions remained stable throughout the investigation; BH01 was cased to a depth of 3.00mbgl.

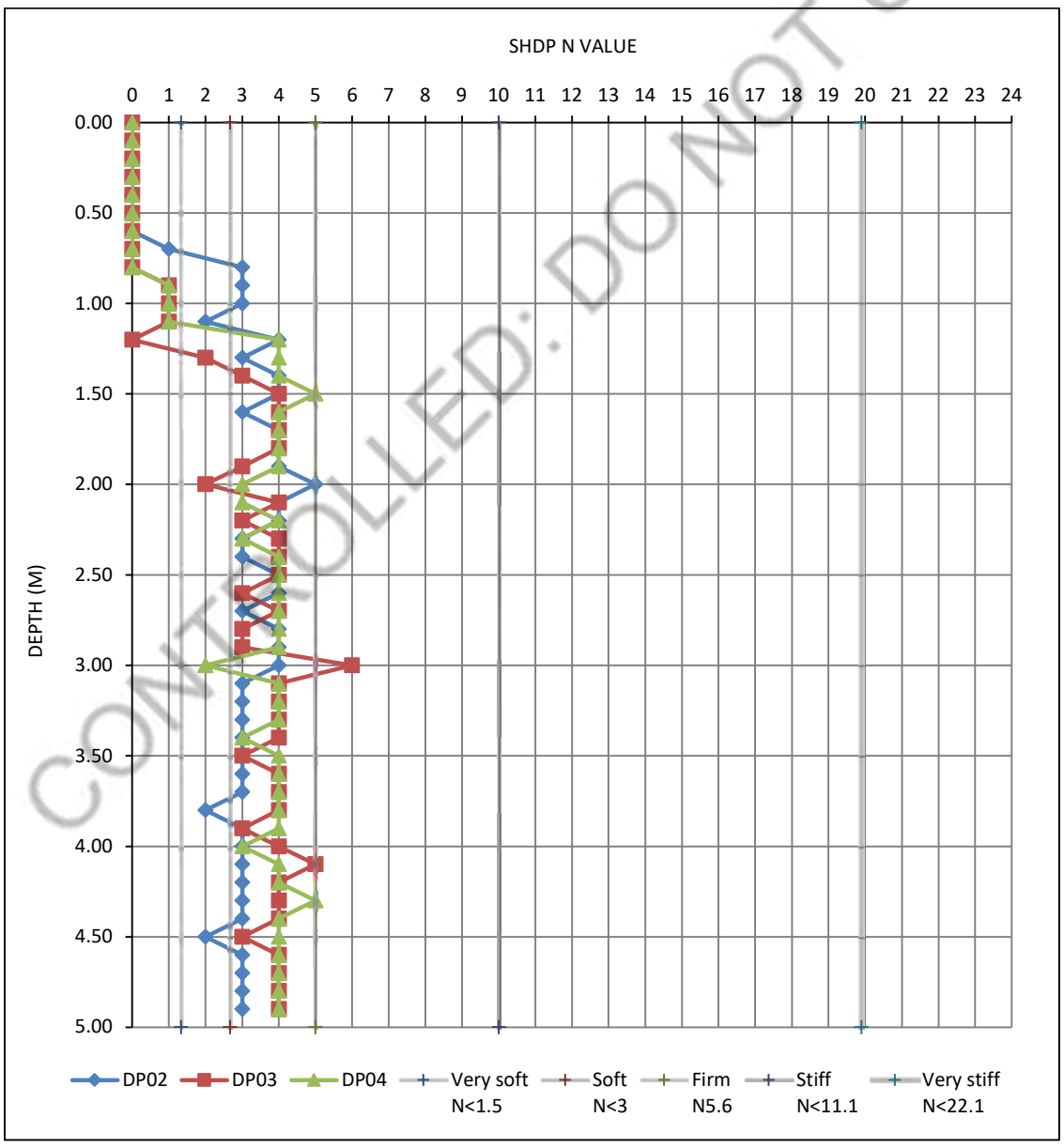
6.0 FIELD TESTING

6.1 Falling Head Soakage Testing (FHST)

A falling head soakage test was undertaken in DS01. The water level rose 0.16m in 180mins, at a steady rate. The readings were insufficient to calculate a soil infiltration rate.

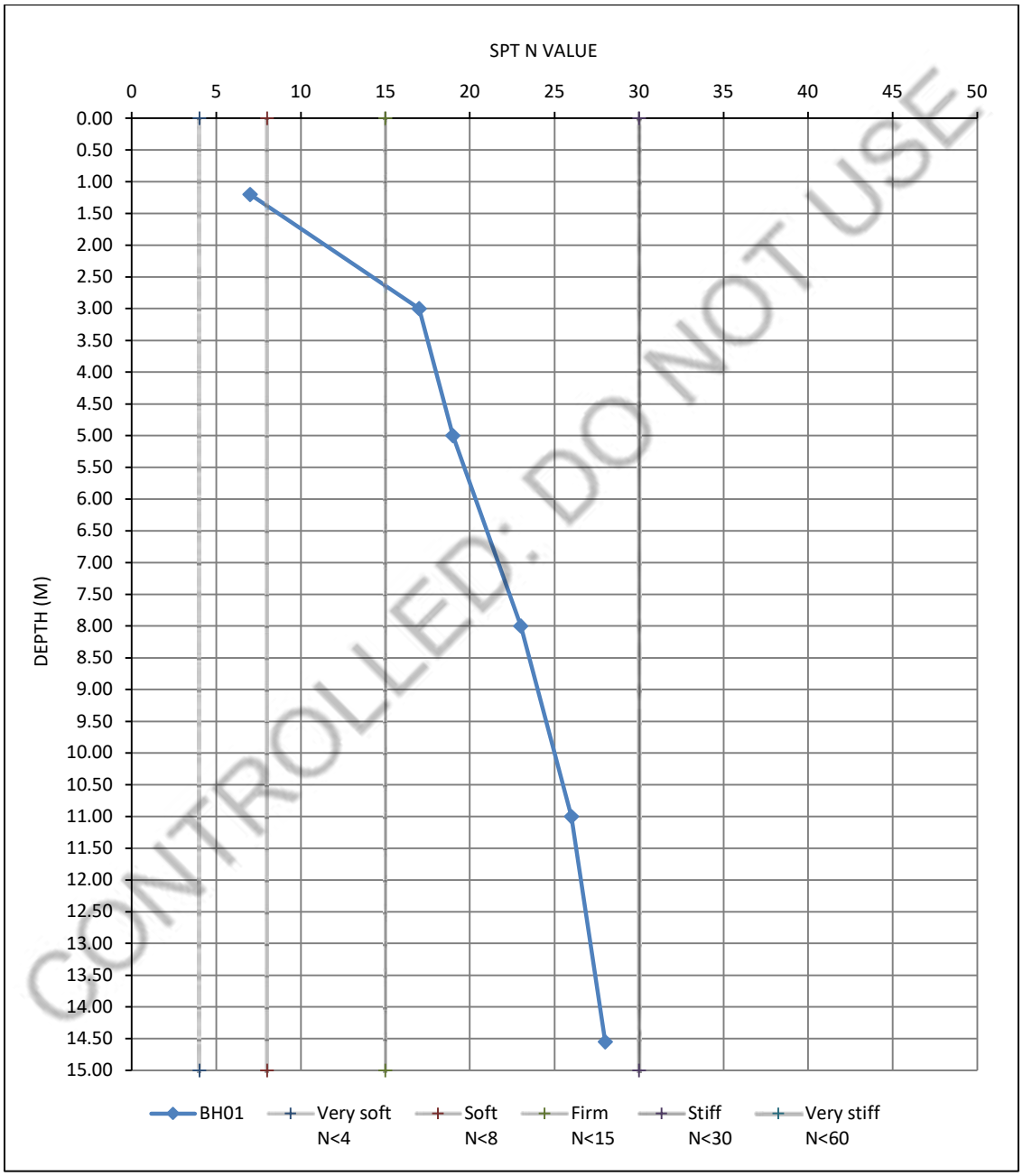
6.2 Super Heavy Dynamic Probing (SHDP)

The results in the London Clay Formation typically ranged between N=0 and N=2 to a depth of 1.00m, before increasing to values of between N=3 and N=5 to depth.



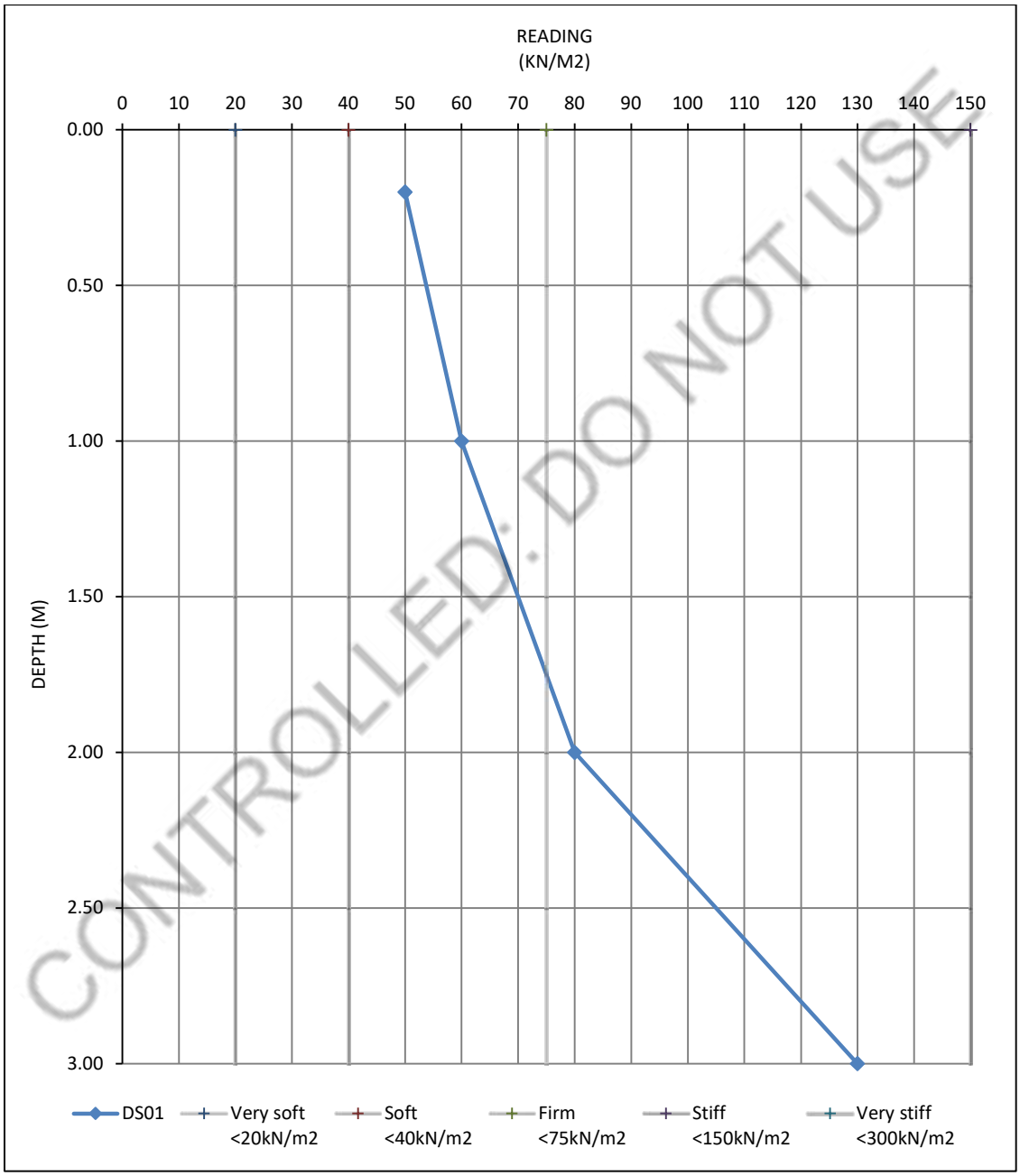
6.3 Standard Penetration Test (SPT)

The results in the London Clay Formation showed an overall consistent trend of increasing results with depth. At ~1.20m, a value of N=7 was recorded, increasing to N=28 at 14.50m depth.



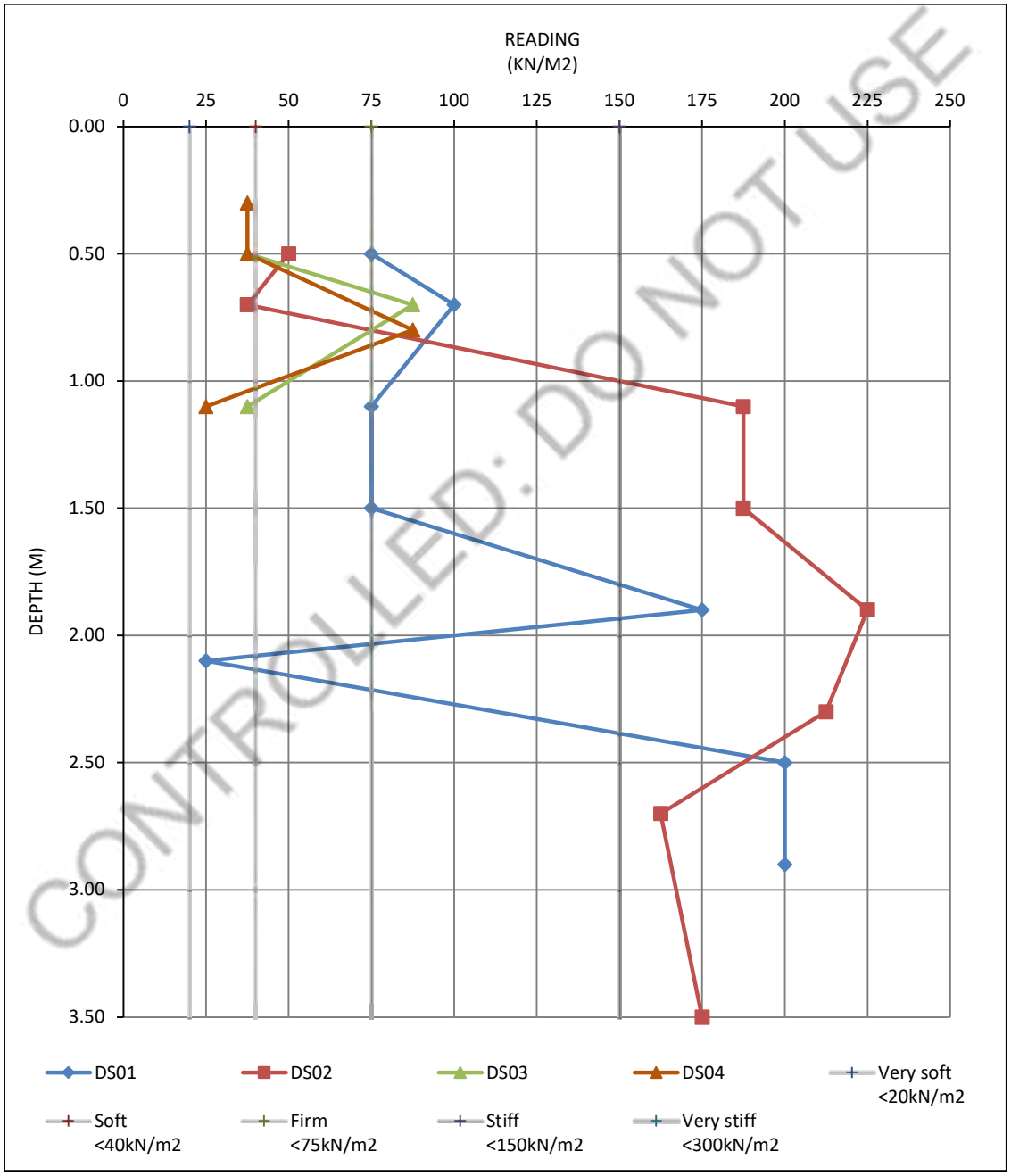
6.4 Shear Vanes (SV)

Materials suitable for shear vane tests were only encountered in DS01, the results showed a general increase in shear strength with depth, ranging from 50 kN/m^2 at 0.20m, up to 130 kN/m^2 at 3.00m.



6.5 Hand Penetrometers (HP)

The results in the London Clay Formation were highly variable due to notable changes in the strata across the site. They typically ranged between 25 kN/m^2 and 100 kN/m^2 from 0.30-1.10m depth. Beyond this depth results in DS01 and DS02 became variable, ranging between 25 kN/m^2 and 225 kN/m^2 a depth of ~2.00mbgl.



7.0 MONITORING DATA

7.1 Groundwater Monitoring

Groundwater was recorded in the return monitoring visit, standing at a depth of 0.98m.

Position	During drilling	Return monitoring
DS02	1.40m	0.98m

7.2 Ground Gas Monitoring

The results of the ground gas monitoring are summarised on the following table. Depending on the parameter with the maximum (peak) or minimum readings are reported, as stated.

Measurement		DS02
Carbon Dioxide %	Maximum	1.6
Methane %	Maximum	0.0
Oxygen %	Minimum	18.5
VOCs ppm	Maximum	0.0
Flow rate l/hr	Full range	0.0

Below is a summary of the atmospheric pressure conditions during the monitoring visits:

Visit	Pressure (recorded on site)	Published pressure trend
20/01/2023	1003 mB	Rising high pressure (Northolt)

8.0 GEOTECHNICAL LABORATORY TESTING

8.1 Geotechnical Laboratory Testing

Samples were selected for geotechnical testing, based on the following rationale:

- For general classification purposes, representative cohesive natural samples of soil were analysed for 1pt Atterberg Limit (Plasticity Index) tests (PI).
- Moisture content (MC) determinations were carried out in association with the Atterberg limit tests.
- Moisture content (MC) determinations were also carried out at approximate 0.50m centres in DS04 to provide a profile of moisture content, with particular focus on identifying desiccation.
- To determine the required concrete specification to resist chemical attack, samples were tested for pH and soil soluble sulphate (pH/SO4).
- Quick undrained unconsolidated triaxial (UUT) tests were scheduled on 'undisturbed' samples, to provide further evidence of undrained shear strengths.

A summary of the testing scheduled is given below:

Sample	Strata	Test			
		PI	MC	pH/SO4	UUT
DS01, 1.00m	London Clay Formation			✓	
DS01, 1.50m		✓	✓		
DS01, 2.50m		✓	✓		
DS02, 1.00m		✓	✓		
DS02, 2.00m			✓		
DS02, 3.00m				✓	
DS03, 1.50m		✓	✓		
DS03, 2.50m				✓	
DS04, 0.50m			✓		
DS04, 1.00m		✓	✓		
DS04, 1.50m			✓		
DS04, 2.00m			✓		
DS04, 2.50m			✓		
BH01, 6.50m					✓
BH01, 9.00m				✓	
BH01, 9.50m					✓
BH01, 12.50m					✓

The results are discussed in the relevant sections.

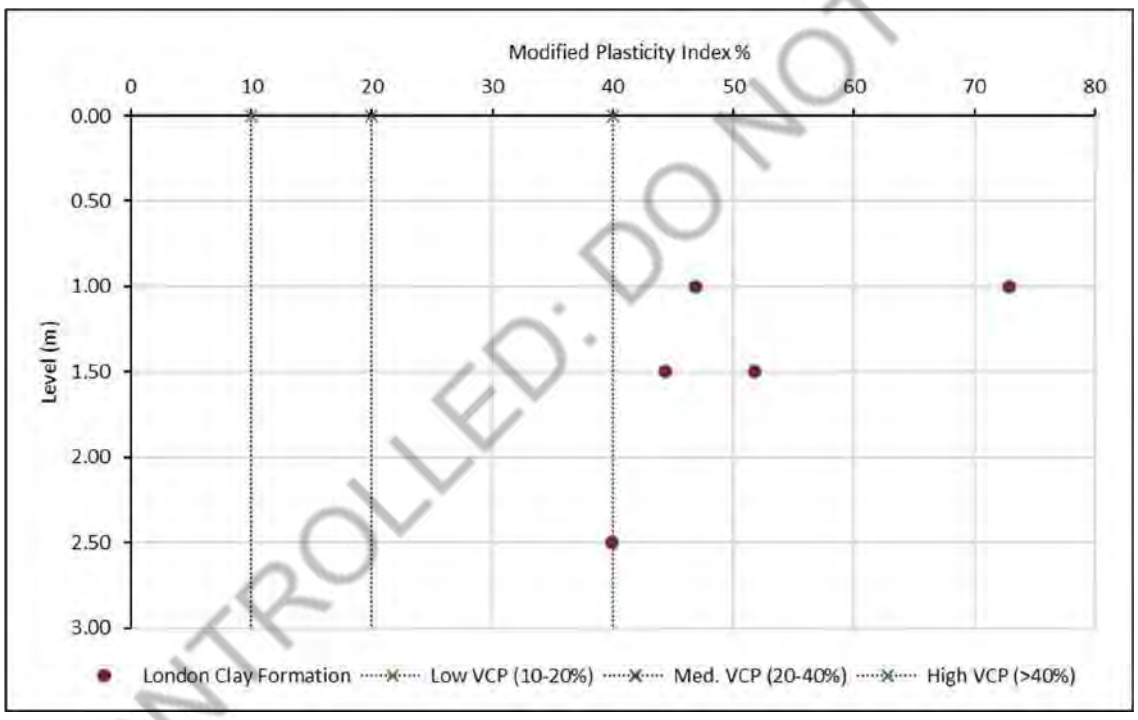
8.2 Plasticity Indexes (Atterberg Limits)

Atterberg Limit tests were undertaken on selected samples of cohesive soils, as summarised below.

Strata	No. of tests	Plasticity Index %		
		Minimum	Maximum	Average
London Clay Formation	5	42.4	72.9	51.6

A modified plasticity index (PI') was calculated following the NHBC methodology, to account for any non-shrinkable percentage not passing the 425µm sieve:

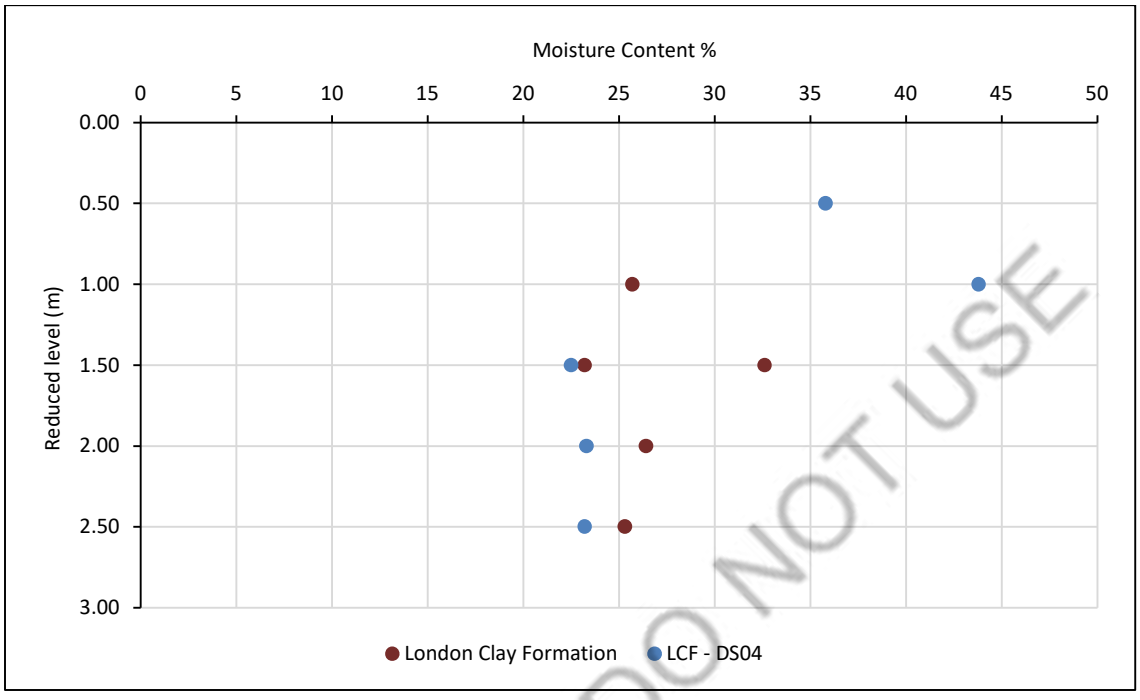
Strata	No. of tests	Modified Plasticity Index %		
		Minimum	Maximum	Average
London Clay Formation	5	39.9	72.9	51.2



8.3 Water Content

Water content determinations (formerly known as *moisture content*) were undertaken in combination with various classification tests, and the results are summarised below.

Strata	No. of tests	Moisture content %		
		Minimum	Maximum	Average
London Clay Formation	10	22.5	43.8	28.2



DS04 is plotted separately from the other moisture content results as numerous tall mature trees were noted around this position. This is to show a profile of moisture contents with depth in an attempt to identify any evidence of desiccation, if present

8.4 pH and Sulphate

Geochemical testing for water soluble Sulphate and pH were undertaken, and the results are summarised on the following table.

Strata	No. of tests	Water soluble Sulphate (SO_4 g/l)	pH (value)
London Clay Formation	5	0.07-3.5	5.7-7.6

8.5 Triaxial testing

Laboratory quick undrained single stage triaxial tests were undertaken on selected "undisturbed" samples recovered from the boreholes, as summarised below. The mode of failure was generally brittle, with the exception of the sample at 9.50m which underwent compound failure.

Strata	No. of tests	Bulk density (Mg/m^3)	Dry density (Mg/m^3)	Shear strength (kPa)
London Clay Formation	3	1.93-1.99	1.53-1.57	112-170

9.0 GEOTECHNICAL ASSESSMENT

9.1 General

The proposed development was understood to comprise a two-storey residential dwelling with a partial basement, associated driveway and private gardens.

Groundwater was struck during drilling at depths of 1.40m and 2.50m, on return monitoring groundwater was encountered within the standpipe at DS02 at a depth of 0.98m. It was understood that this was perched water, present within the granular lenses near the top of the boreholes, and not representative of a shallow groundwater table.

Groundwater levels may vary seasonally. Water may also become perched upon cohesive strata or around features such as foundations, and may also occur from leaking drains and water mains etc. Groundwater at or close to formation levels may be problematic for foundation construction and may influence the allowable bearing capacity.

Cohesive soils were identified, which are susceptible to heave and shrinkage through changes in moisture content, such as seasonally or through the action of trees. The BGS designate the hazard of shrinking-swelling clays as Low. Mature trees and shrubs were noted across the majority of the site, especially to the east and west, forming a sparse woodland. It was understood that some trees were to be removed in order to construct the northeast portion of the proposed dwelling.

Based on the ground and groundwater conditions encountered, it is considered that shallow foundations would not be appropriate for the proposed development. This is based on the presence of high water demand trees within high volume change potential soils below the proposed building footprint. Chapter 4.2 of the NHBC standards states that traditional shallow foundations would need to be taken to a depth >2.50m where a tree of height 10.00m is positioned <5.00m away from the proposed footprint. At these depths the construction of traditional strip foundations may be uneconomical.

On this basis, it is recommended that consideration may be given to an alternative foundation solution, such as the use of piles.

The final foundation scheme will depend on other constraints and should be evolved in consultation with the design team.

9.2 Volume Change Potential

Reference may be given to the NHBC standards or similar guidance for designing and constructing foundations in the zone of influence of trees and hedgerows that currently exist, are to be planted, or have recently been felled.

Strata	Modified PI'	Shrinkability classification
London Clay Formation	>40%	High volume change potential

Specifications for heave precautions are summarised below. In addition to the depths marked *, localised deepening of foundations will be required in the influence of trees; it will be necessary to evaluate tree species and height in relation to the proposed building footprints.

Volume Change Potential		**High**
Minimum void dimension	Against side of ground beams etc.	35mm
	Beneath ground beam and suspended in-situ concrete ground etc.	150mm
Minimum allowance for potential ground movement for new drains		150mm

Checks should be made to ensure that the proposed basement is below the zone of influence of trees in accordance with the NHBC Standards, as it may still be necessary to take further precautions.

All foundations should extend below any major root zones or desiccated soil encountered, and trenches should be carefully inspected accordingly.

9.3 Basement Construction

The proposed development included a basement under the part of the building footprint, assumed to be constructed at a formation level of approximately 2.75mbgl. Factors to consider include excavation stability, potential water ingress, the space, materials handling, waste disposal costs, etc. Where a perimeter wall is proposed, the installation technique, vibration, propping and lateral support will need to be considered.

An open basement excavation might be considered. The sides will need to be battered back to a safe angle of repose and sufficient working area for personnel and plant at the toe and crest.

Driven steel sheet piles are potentially suitable, given the absence of sensitive structures in the vicinity. Bored piles may also be considered, which are suitable under most ground and groundwater conditions. Tree protection areas may need to be considered to preserve the roots of nearby trees.

Openings such as light-wells or vents etc. should be carefully positioned, and construction joints should be detailed appropriately. Soakaways should be positioned a suitable distance away from the proposed basement and be designed to discharge to a level below the basement.

Water seepages will be encountered within excavations. All inhabitable basements should be protected against water and moisture to grade 3 of BS8102:2009. It should be noted that water may occur from sources such as leaking drains or water mains, that groundwater levels may vary, or flooding may potentially occur.

The basement is to be constructed within low permeable clays and therefore water will preferentially accumulate around the basement. While consideration may be given to installing a perimeter land drain around the basement, the ground was unsuitable for soakaways. Shallow drainage fields might be considered.

Heave forces developing under the basement are not expected to be particularly onerous.

9.4 Retaining Walls

The following design values are suggested as a guide to assist in the design of retaining walls. The values have been obtained from BS8002 and BS EN 1997-1:2004 (Eurocode 7 – Geotechnical Design). The values are based on a level ground surface. The ratio of δ/f' will depend on retaining wall construction, but a value of 1.0 might be appropriate for a cast in-situ concrete wall.

London Clay Formation	δ/f' = 0	δ/f' = 0.66	δ/f' = 1.0
Critical state angle of shearing resistance (f')	16		
Effective Cohesion kN/m^2	0		
Saturated Bulk Weight (g_{sat}) kN/m^3	18		
Passive Resistance K_p	2.0	2.5	2.7
Active Pressure K_a	0.52	0.45	0.43

9.5 Piled Foundations

The construction of piled foundations is a specialist job and the advice of a reputable contractor should be sought prior to finalising the design.

Pile working loads will depend on the ground and groundwater conditions, the installation technique, the dimensions of the individual piles, and any pile grouping.

Whilst driven piles may give a higher working load compared to a bored pile, their use may be prevented due to the proximity of adjacent structures. Preliminary working load capacities have been calculated for varying diameters of bored piles taken into the London Clay Formation, below:

Depth (m)	300mm diameter	450mm diameter	600mm diameter
8	110	190	270
10	150	240	350
12	180	300	420

These working loads have been calculated on the basis of the ground and groundwater conditions encountered within the boreholes and based on the following assumptions:

- The contribution to the working load on the upper 3.00m has been ignored.
- A factor of safety of 3 was used on the skin friction and end bearing working loads respectively.

Piles should be taken at least five times the pile diameter into the founding strata.

The working loads above apply to single vertically loaded piles. Where groups of piles are to be constructed, the bearing value of each individual pile should be reduced by a factor of 0.8 and a calculation made to check for the factor of safety against block failure.

Heave precautions may be required on the upper portions of piles and on ground beams within the zone of influence of trees.

The piling contractor should be aware that the cable percussion borehole was cased to a depth of 3.00m in order to prevent collapse as drilling progressed.

9.6 Excavations

The risks arising from excavation works should be properly assessed and appropriate safety precautions should be adopted. Reference may be made to various guidance including BS8000-1:1989, BS6031:2009 and CIRIA C97.

The likelihood of excavation instability through different strata has been assessed as summarised below. It should be noted that all open unsupported excavations have the potential to collapse.

Strata	Stability
Topsoil/Made Ground	Generally unstable. May be battered back to a safe angle. Deeper excavations may require trench support.
London Clay Formation	Generally stable in the short to medium term.

Excavations which are to remain open for prolonged periods will require trench support.

Water seepages may be encountered at shallow depth, particularly during wetter climatic conditions.

BS 8000-1:1989 provides guidance on the steepest angles of batter for different slopes, as summarised below. These apply to temporary excavations open for less than 14 days, are subject to experience of ground conditions on site, and prevalence of water.

Type of ground	Angle of slope (from horizontal)	
	Dry site	Wet site
Soft Clay (<3m deep)	30° to 45°	10° to 20°
Firm Clay (<3m deep)	35° to 45°	20° to 25°

Any battered slope should be regularly inspected for signs of potential instability, and sufficient working space should be allowed at the base.

It is considered that normal-rated plant and machinery will be sufficient for undertaking excavations. Breakers will be required for removing any former foundations, retaining walls etc.

Adjacent excavations should generally be tackled in order of depth with the deepest first. Vehicles and spoil heaps etc. should not surcharge excavations, and edge protection and fencing should be used as appropriate. Frozen materials should generally not be used as backfill.

9.7 Pavements

The design of pavements will depend on the performance requirements and specification, as well as the ground conditions and finished levels etc. The suitability of shallow soils encountered as a formation level for pavements is summarised as follows:

Strata	Base Depth	Suitability
Topsoil	0.15-0.20m	Not suitable for trafficable pavements. All topsoil should be removed and replaced.
Made Ground (BH01 only)	0.30m	Only suitable for pavements with low performance requirements. CBR values for these materials will not reflect the possible settlements that may occur. The materials will be frost susceptible so a minimum pavement thickness of 450mm will be required. The

		formation should be subject to a suitable programme of treatment and the sub-bases appropriately engineered.
London Clay Formation	To depth	These materials are generally a suitable formation level. The formation is non-frost susceptible and therefore no minimum pavement thickness required. TRRL 1132 suggests a CBR of around 2.0%, assuming average construction conditions and a high water table. Cohesive formations will degrade rapidly if exposed to standing water and should be protected.

The formation level should be carefully inspected, and any soft or loose zones should be removed and replaced with engineering fill, well-compacted in layers to a suitable specification. Consideration might be given to installing geotextiles. All engineering fill should be granular and non-frost susceptible (i.e. <10% fine material passing 425µm sieve).

Any hard spots in the formation level such as old foundations may induce reflective cracking in the pavement and allowance should be made for removing any slabs or other hard spots that may be present.

9.8 Building Materials

All sub surface concrete should be designed and specified in accordance with BS8500-1:2015+A1:2016. The results of the Sulphate and pH analyses fell into Class DS-4 and an ACEC class AC-3s is appropriate.

Buried plastics used for potable water supplies should not require any special specification in order to resist chemical contamination. No pipework should be laid where there is evidence of hydrocarbons.

9.9 Surface Water Drainage

The preliminary falling head soakage test failed, and an infiltration rate could not be calculated for the London Clay Formation. It is unlikely that soakaways will perform satisfactorily in these materials. Consideration should be given to an alternative drainage solution.

Other sustainable drainage solutions such as permeable paving might also be considered.

10.0 CONTAMINATION LABORATORY TESTING

10.1 Scheduled Testing

Waste classification testing on one sample was included in the scope of works, to provide a preliminary assessment for waste handling. In the absence of any areas to specifically target, a representative sample of London Clay was selected for testing.

The Made Ground encountered was a subbase to the existing driveway, and the topsoil encountered was very thin and therefore a shallow sample of London Clay was tested as this would be the majority of the material excavated for the partial basement.

Sample	Strata	LS1	LS2	Asbestos
DS01, 0.50m	London Clay Formation	✓	✓	✓

The relevant screening suites are defined below. Where duplicate analysis exists between suites, each test is performed only once:

Suite	Definition
LS1 (soil)	Screening suite: pH, fraction of organic carbon, Metals and Non-Metals, water soluble Sulphate, Sulphide, total Cyanide, total Phenols, speciated PAH's.
Asbestos	Asbestos screen: Laboratory screening for fibres and Asbestos Containing Materials; identification where identified. Using polarising light and dispersion staining as described in HSG 248, HSE Contract Research Report No 83/1996and in Davies et al, 1996.
LS2	Waste Acceptance Criteria: Total Organic Carbon, Loss on Ignition, BTEX, speciated PCB's, Mineral Oil (EC10 – EC40), pH, Acid Neutralisation Capacity, speciated PAH's, 10:1 leachable Metals and Non Metals.

The results are discussed in the relevant sections.

11.0 PRELIMINARY CONTAMINATION ASSESSMENT

Contaminated land risks are evaluated on following a source-pathway-receptor ('SPR') approach, in accordance with best practice. A full geo-environmental risk assessment was outside the scope of this report. However, based on the findings of the desk study, no significant sources of potential contamination, natural or man-made, arising in soils, ground gases or groundwater phases, were suspected. The ground and groundwater conditions encountered in section 5.0 did not identify any potentially suspect ground condition. In the absence of any sources, no SPR linkages exist, and consequently no risk has been identified.

However, as always, any Made Ground, shallow soils which have been disturbed, or those showing field evidence of possible contamination such as staining, should be treated as suspect, handled with appropriate care, and relevant advice sought from a qualified professional.

12.0 PRELIMINARY WASTE ASSESSMENT

12.1 General

Waste may be defined as any substance or object in Annex 1 of the Waste Framework Directive which the holder discards, intends to discard, or is required to discard. Subject to certain provisions, soils may either be handled as either:

- Non-Waste, and re-used (on or off-site), or
- Waste, and disposed of (to a waste management facility).

The waste producer has a legal duty of care to ensure that waste materials are handled properly and sent to the appropriate licenced facility. Further inspection, testing, segregation etc will be required on site, and the advice of a suitably qualified consultant sought wherever necessary. Substantial tax penalties and fines are being levied by the regulators. The advice contained in this section is preliminary only.

12.2 Non-Waste

Soils may potentially be handled as Non-Waste and re-used on site (or on other sites) in accordance with various protocols such as those published by the EA or CL:AIRE. Typical requirements include:

- That the re-use of material will not endanger human health, cause nuisance, or harm the wider environment (controlled waters, ecosystems, etc.)
- That there is there a clear Environmental benefit from the activity, and that the waste is being used as a substitute for non-waste material.
- The materials are suitable for use in terms of chemical and geotechnical parameters without further treatment.
- The holder is certain that the materials will be used in a safe manner, and only the necessary quantities of materials are being used.
- Where the activities do not require a waste management licence (e.g. landfilling).
- A Waste Recovery Plan (EA) or Materials Management Plan (CL:AIRE) are produced and followed, and audited in a Verification Plan.

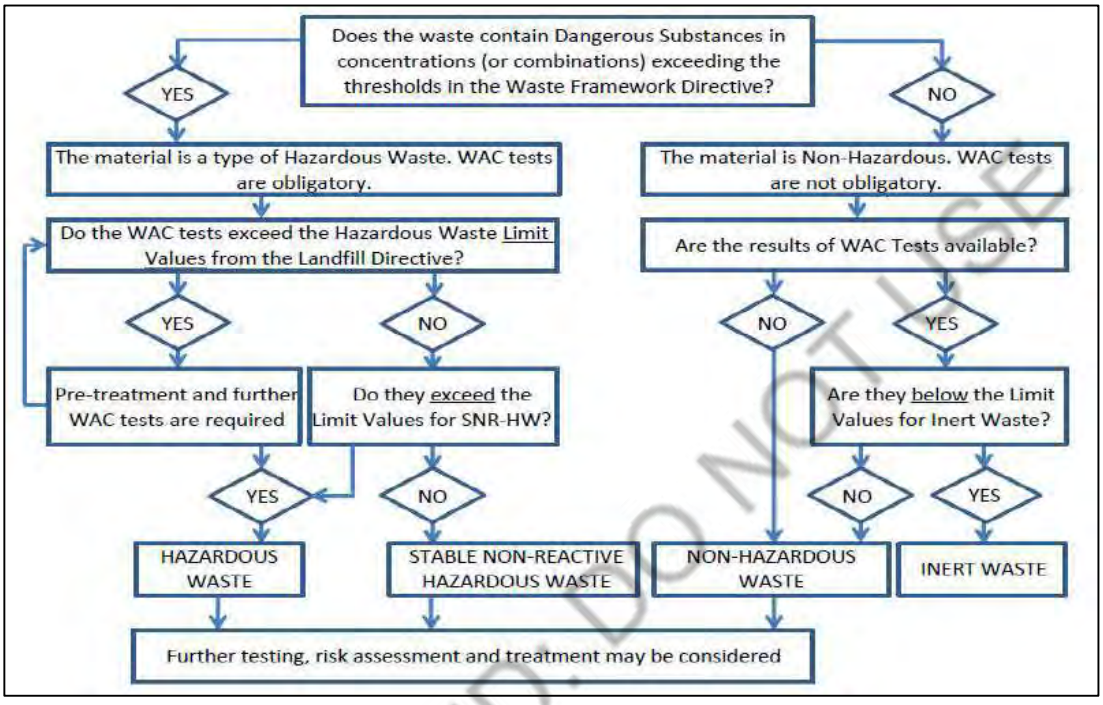
The Topsoil is considered to be potentially suitable for re-use on site. The chemical analysis suggests these materials may be suitable for use in soft landscaped areas (subject to landscaping specifications), or under hardstandings such as roads or slabs (subject to geotechnical considerations).

Soil	Suitability for re-use on site			Notes
	Landscaping	Hard cover	Not suitable	
Natural Soils	✓	✓		No significant risks identified

12.3 Waste Disposal

Where materials are not re-used, they must be handled as Waste, and must be sent to a licenced waste management facility. The classification of waste is prescribed under the Waste Framework

Directive and the Landfill Directive, as summarised below. Different waste management facilities may also have specific acceptance criteria, and their advice should be sought.



The results of the soil analysis have been classified as follows:

Soil	Hazardous		Non-Hazardous		Details
	Hazardous	Stable Non-Reactive	Non-Hazardous	Inert	
London Clay Formation – W of garden (DS03, 0.50m)				✓	The soil analysis was not identified as hazardous, and the WAC test met the requirements for Inert. Interpretation: Inert Waste.

With reference to the current List of Wastes (formerly European Waste Catalogue), waste soils and stone derived from construction and demolition sites may be disposed of under either of the following codes as appropriate:

Waste	Code	Description
Hazardous	17 05 03*	soil and stones containing dangerous substances
Non-Hazardous	17 05 04	soil and stones other than those mentioned in 17 05 03

(Note, the asterix is a Mirror Entry, as defined in the List of Wastes, conferring the relationship with the non-hazardous code 17-05-04).

REFERENCES

A number of technical references have been referred to in the preparation of this document, including:

- Smith, I. (2014) Smith's Elements of Soil Mechanics. Chichester. Wiley Blackwell. 9th Edition.
- Highways England 2009. Interim Advice Note 73/06 revision 1: Design Guidance for Road Pavement foundations (draft HD25)
- BRE Design Guide 365. Soakaway design ("DG365")
- Radon: Guidance on protective measures for new buildings, BRE Report BR 211, 2015 2ND edition
- Groundwater protection: Principles and practice (GP3) August 2013 Version 1.1
- Revised EU Waste Framework Directive 2008 2008/98/EC [transposed into English law under The Waste (England and Wales) Regulations 2011]
- European Community (EC) Directive 1999/31/EC [transposed into English law under the Landfill (England and Wales) Regulations 2002]
- Defining Waste Recovery - Permanent Deposit of Waste on Land, EPR13 v1.0, EA 2010
- The definition of waste: Development Industry Code of Practice, v2, CL:AIRE 2011
- Guidance on the classification and assessment of waste Technical Guidance WM3 ("WM3") EA publication (1st edition 2015)

REPORT CONDITIONS

The Client

This report may also be used only by the client named in section 1 and their appointed project team for the purpose of design, obtaining planning, building regulations approval, and in connection with finance. This report must not be used by any other persons or for other purposes without express written agreement of Land Science.

General

Land Science takes all reasonable professional care in preparation of this report, using current standards and industry practice. However, the evaluation of ground conditions depends on an interpretation and extrapolation of the conditions revealed by a limited data set. The level of risk is related to the extent of investigation and no site is ever free of risk. The client should understand their risks and liabilities. We accept no liability whatsoever in respect of:

- The scope, extent or design of an investigation.
- Any conditions not directly revealed by the investigation.
- Published standards or methodologies used or adopted in this report.
- The opinion of any other party including any regulator, authority or stakeholder.
- Any dispute, claim or consequential loss arising from any findings of this report.
- Third party information and data.

This report relates solely to ground-related matters as set out in the objectives and makes no representation on other matters such as ecology, arboriculture, invasive plant species, the condition of buildings and structures, hazardous building materials such as insulation or asbestos, the locations of boundaries, unexploded ordnance, and or planning constraints etc. Further reports should be commissioned in this respect as appropriate.

Regulators and Approvals

This (and any other) report should be submitted to relevant authorities for their own assessments and to provide their approval or comments accordingly. This should be in good time before commencing on site in case additional work is to be carried out.

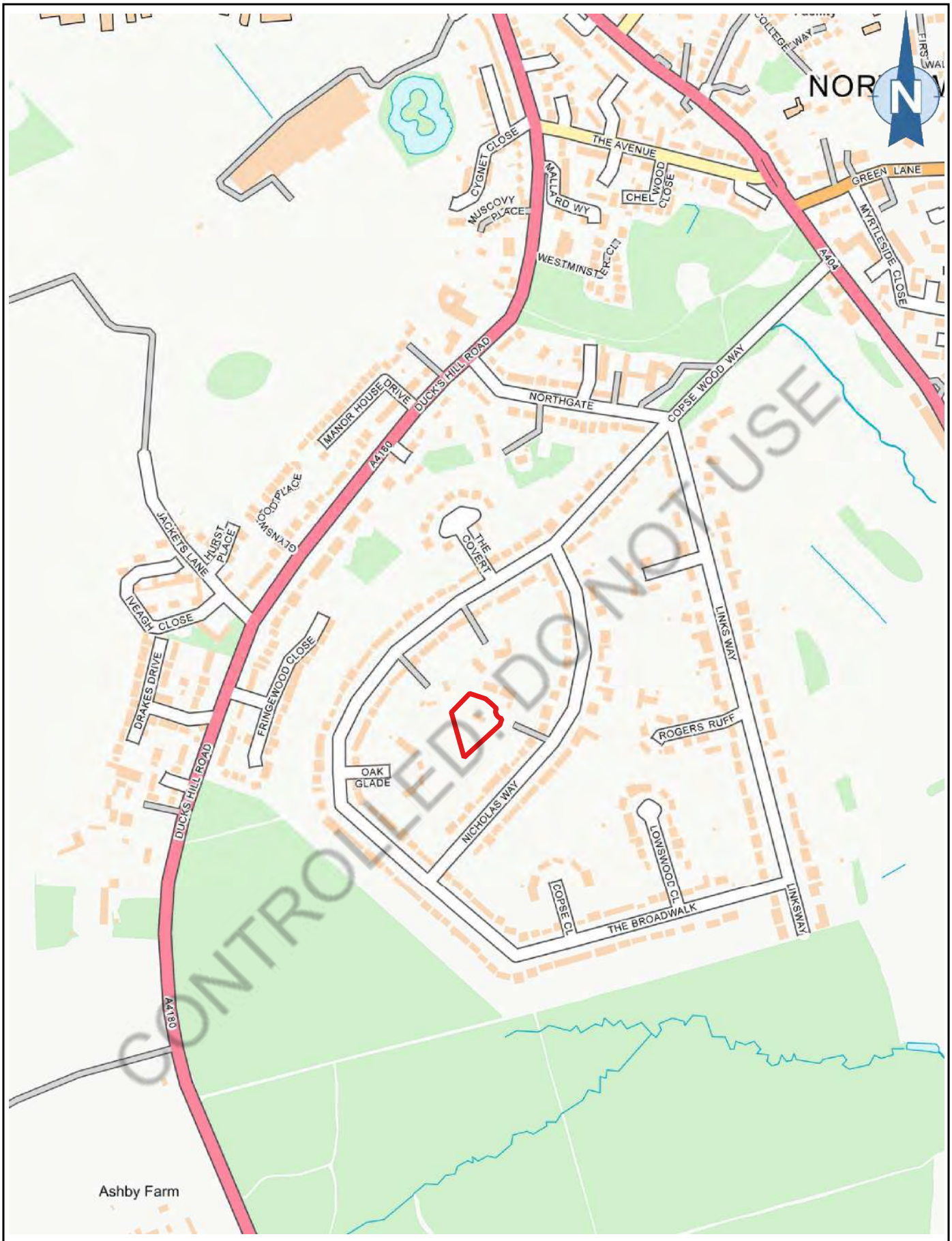
Standards, technical guidance and regulatory positions change over time and which may therefore affect the findings and recommendations made in this report; this should be verified by the client prior to any critical project milestones. Where this information is used in design, the designer should verify that the information is appropriate and has been used correctly.

Variations with time

The report relates to conditions revealed at the time of the investigation and any monitoring visits. Some parameters may vary over time or seasonally; groundwater levels, ground gas compositions, or concentrations of contaminants are particularly variable in this respect. Further monitoring or verification should be considered as appropriate.

GLOSSARY OF TERMS

ACM	Asbestos Containing Material
BGS	British Geological Survey
BRE	Building Research Establishment
BS	British Standard
C4SL	Category 4 Screening Level
CBR	California Bearing Ratio
CDM	Construction Design and Management regulations
CIRIA	Construction Industry Research and Information Association
CL:AIRE	Contaminated Land: Applications in Real Environments
CLEA	Contaminated Land Exposure Assessment model
CSM	Conceptual Site Model
EA	Environment Agency
EQS	Environmental Quality Standards
FOC	Fraction of Organic Carbon
GAC	Generic Assessment Criterion
GQRA	Generic Quantitative Risk Assessment
mbgl	Meters Below Ground Level
NHBC	National House Building Council
mOD	Metres above Ordnance Datum
PAH's	Polycyclic Aromatic Hydrocarbons
PHE	Public Health England
PID	Photo-Ionisation Detector
PQRA	Preliminary Quantitative Risk Assessment
PSD	Particle Size Distribution Test
RMS	Remediation Method Statement
S4UL	Suitable for Use Level
SOM	Soil Organic Matter
SPZ	Source Protection Zone
SPT	Standard Penetration Test
SSSI	Sites of Special Scientific Interest
ST-WEL	Short Term Workplace Exposure Limit
SVOC's	Semi-Volatile Organic Compounds
TPH	Total Petroleum Hydrocarbons
TRRL / TRL	Transport Road Research Laboratory
TWA-WEL	Time Weighted Average Workplace Exposure Limit
UK HBF	United Kingdom House Building Federation
VOC's	Volatile Organic Compounds
WAC	Waste Acceptance Criteria

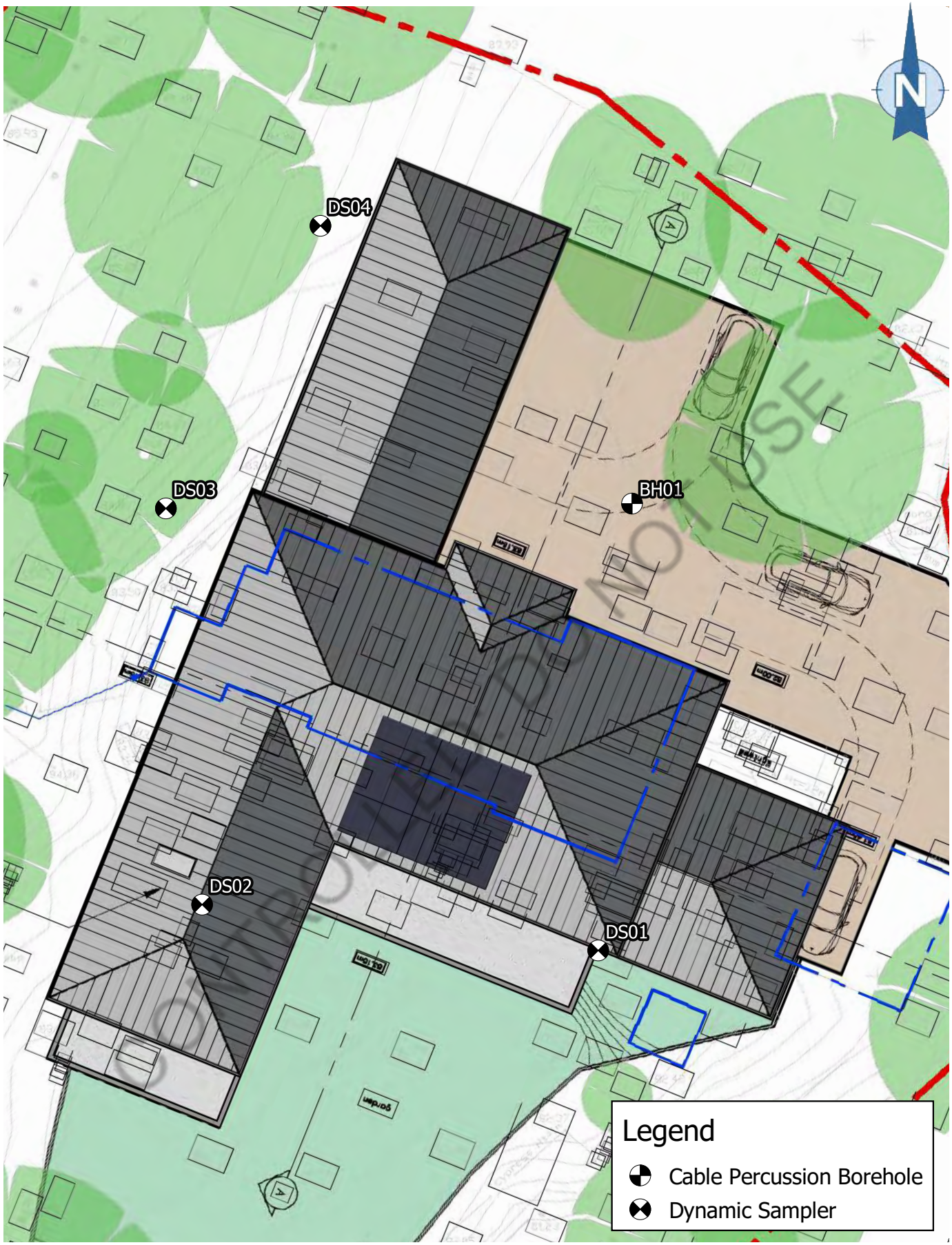


Land Science	Title: Site Location		Reference: LS6678
	Project: 28 Nicholas Way, Northwood, HA6 2TT		Figure: 1
	Client: Neil Maroo		Date: 03/01/2023
	Prepared by: EP	Checked by: ET	Version: 01	Sheet: 1 of 1

www.landscience.co.uk
Telephone: 01444 882 084
Unit 10, 19 Albert Drive, Burgess Hill, West Sussex, RH15 9TN

Land Science	Title: Investigation Layout		Reference: LS6678
	Project: 28 Nicholas Way, Northwood, HA6 2TT		Figure: 2
	Client: Neil Maroo		Date: 03/01/2023
	Prepared by: EP	Checked by: ET	Version: 01	Sheet: 1 of 1

www.landscience.co.uk
Telephone: 01444 882 084
Unit 10, 19 Albert Drive, Burgess Hill, West Sussex, RH15 9TN



Land Science	Title: Proposed Site Layout		Reference: LS6678
	Project: 28 Nicholas Way, Northwood, HA6 2TT		Figure: 3
	Client: Neil Maroo		Date: 03/01/2023
	Prepared by: EP	Checked by: ET	Version: 01	Sheet: 1 of 1

www.landscience.co.uk
Telephone: 01444 882 084
Unit 10, 19 Albert Drive, Burgess Hill, West Sussex, RH15 9TN

APPENDIX A

SITE WALKOVER RECORD

The walkover is restricted only to aspects related to the Land Science report and the stated objectives therein. The walkover does not replace other surveys such as asbestos, arboriculture, ecology, utilities etc which the client should consider. The client should review the walkover and provide any further relevant information where available.

SITE DETAILS			
Project	*28 Nicholas Way, Northwood, HA6 2TT*		
Reference	*LS6678*	**Date of walkover**	*06/01/2023*
Engineer	*Connor Sutherland*		
CURRENT USE			
Existing land uses	*Residential – a two storey house with associated gardens and driveway.*		
Status	*Vacant*		
Suspected asbestos	*No immediate evidence.*		
Below ground structures	*No immediate evidence.*		
Hardstandings	*A patio area was noted to the south of the property, this was made up of concrete slabs. The front driveway was made up of tarmac.*		
Soft landscaping	*The rear garden to the south of the property was laid to lawn, with a woodland surrounding it. The garden appeared well-kept; however it was covered with leaves due to the time of year the visit was carried out.*		
General condition	*Old.*		
Boundaries	*Boundaries were concealed by shrubs and woodland.*		
Adjacent land uses	*The site was surrounded by other residential dwellings.*		
TOPOGRAPHY			
General lie of the land	*Located on a relatively level elevated area.*		
General lie of the site	*Gently sloped relatively uniformly to the east.*		
Abrupt changes in slope	*N/A*		
Excavations and Depressions	*N/A*		

Raised ground	*N/A*
GROUND STABILITY	
Signs of landslip	*N/A*
Cracking in buildings and walls etc	*N/A*
Subsidence on ground surface	*N/A*
GROUND CONDITIONS	
Possible filled-in ground	*N/A*
Possible built-up ground	*N/A*
Exposed soils	*N/A*
Desiccation	*N/A*
Disturbance	*N/A*
WATER CONDITIONS	
Wet boggy ground	*Wet boggy ground was noted in the wooded area to the west of the site, however this is understood to relate to the ground conditions and extreme wet weather at the time of the walkover.*
Wells and ditches	*N/A*
Ponds or ponding	*N/A*
Streams / Rivers	*N/A*
ECOLOGY	
Burrows	*N/A*
VEGETATION	
Reeds or water loving plants	*N/A*
Sparse growth or die back	*N/A*
Invasive species	*N/A*
TREE	
Relevant trees height/species	*Numerous tall mature trees were noted in the garden area surrounding the entire existing dwelling and in proximity to the proposed building footprint. These included species of evergreen and deciduous trees, as*

	well as shrubs and various grasses in the form of a sparse woodland. Theses ranged in height, up to a maximum of 7.00m.
Off-site	*Trees continued off site.*
Hedgerows	*N/A*
Recent felling and older stumps	*N/A*
CONTAMINATION	
Tipped materials	*N/A*
Areas of possible fill	*N/A*
Discolouration/sheens of waterbodies	*N/A*
Surface staining	*N/A*
Chemicals storage	*N/A*
Drums and tanks	*N/A*
Petrol interceptor	*N/A*
Soakaways	*N/A*
LOCAL INFORMATION	
Place/road names	*N/A*
3rd party information	*N/A*
OTHER INFORMATION	

APPENDIX B


West of site


Centre of site looking Northwest


Centre of site looking East


Centre of site looking Northeast


West of site


Centre of site looking East

Land Science	**TITLE:**	Site Photographs	**REF:** LS6678	**PREPARED:**	EP
	PROJECT:	28 Nicholas Way, Northwood, HA6 2TT	**PAGE:** 1 of 2	**CHECKED:**	ET
	CLIENT:	Nail Maroo	**DATE:** 13/01/2023	**VERSION**	V1

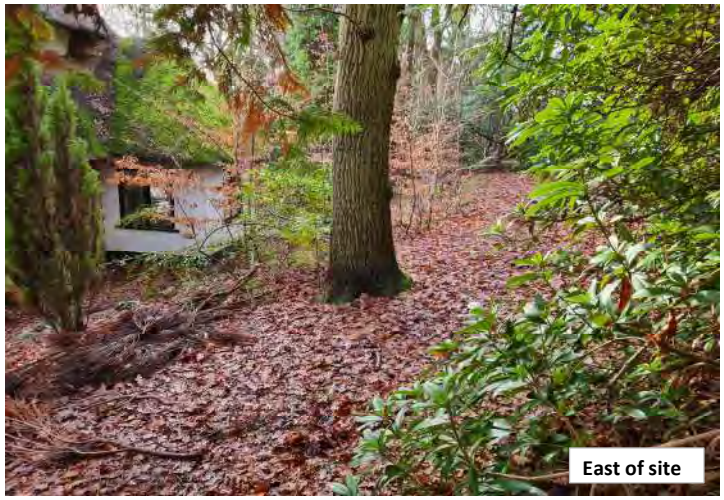

Driveway looking west


West of site


Driveway looking East


Southwest of site


Southwest of site


East of site

Land Science	**TITLE:**	Site Photographs	**REF:** LS6678	**PREPARED:**	EP
	PROJECT:	28 Nicholas Way, Northwood, HA6 2TT	**PAGE:** 2 of 2	**CHECKED:**	ET
	CLIENT:	Nail Maroo	**DATE:** 13/01/2023	**VERSION**	V1

APPENDIX C

Land Science	Brighton | London | Bristol 0845 604 6494 www.landscience.co.uk	**Site** 28 Nicholas Way, Northwood, HA6 2TT	**Number** **DS01**

Excavation Method	**Dimensions**	**Ground Level (mOD)**	**Client**	**Job Number**
Drive-in Windowless Sampler		82.42	Neil Maroo	LS6678
	Location 508126 E 190722 N	**Dates** 06/01/2023	**Project Contractor** Land Science	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.15)	Flora over dark brown clayey SILT. Fine to medium rootlets noted throughout. (TOPSOIL)		
				82.27	0.15			
0.20	IV(P) 50 kPa					Stiff, light brown slightly gravelly CLAY. Gravels are subrounded fine to medium flint. (LONDON CLAY FORMATION)		
0.50	HP 75kPa							
0.50	D							
0.70	HP 100kPa					... Colour noted to become dark grey mottled brown from 0.60mbgl. ... Cobble of subangular to subrounded flint noted at 0.60mbgl.		
1.00	IV(P) 60 kPa							
1.00	D							
1.10	HP 75kPa							
					(2.15)			
1.50	HP 75kPa					... Rare fine rootlets noted to 1.50mbgl.		
1.50	D							
1.90	HP 175kPa							
2.00	IV(P) 80 kPa							
2.00	D							
2.10	HP 25kPa							
				80.12	2.30	Stiff, brown, gravelly, slightly silty CLAY. Gravels are fine to medium subangular to subrounded relic mudstone. (LONDON CLAY FORMATION)		
2.50	HP 200kPa		Water strike(1) at 2.50m.		(0.40)			▽1
2.50	D							
				79.72	2.70	Stiff, brown mottled grey CLAY. (LONDON CLAY FORMATION)		
2.90	HP 200kPa				(0.30)	... Mudstone lens noted at 2.70mbgl.		
3.00	IV(P) 130 kPa			79.42	3.00	Complete at 3.00m		

Remarks
GROUNDWATER: Standing at 2.50m after drilling.
CASING: No casing used.
INSTALLATION: No installation.
BACKFILL: Backfilled with arisings.
SLOW PROGRESS: None.
NOTES: Hand excavated inspection pit to 1.20mbgl. Borehole terminated at target depth.

Scale (approx)	**Logged By**
1:25	CS

Figure No.
LS6678.DS01

Land Science	Brighton | London | Bristol 0845 604 6494 www.landscience.co.uk	**Site** 28 Nicholas Way, Northwood, HA6 2TT	**Number** **DS02**

Excavation Method	**Dimensions**	**Ground Level (mOD)**	**Client**	**Job Number**
Drive-in Windowless Sampler		83.00	Neil Maroo	LS6678
	Location	**Dates**	**Project Contractor**	**Sheet**
	508114 E 190724 N	06/01/2023	Land Science	1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
				82.85	(0.15) 0.15	Flora over clayey SILT. Fine to medium rootlets noted throughout. (TOPSOIL)			
0.50	HP 50kPa					Firm brown mottled grey, slightly gravelly CLAY. Gravels are rare fine to coarse, subangular to subrounded flint. Rare fine rootlets noted throughout. (LONDON CLAY FORMATION)			
0.50	D								
0.70	HP 37.5kPa				(1.05)	... No flints noted below 0.70mbgl.			
1.00	D								
1.10	HP 187.5kPa			81.80	1.20	Very stiff, brown slightly sandy, silty, CLAY. Sands are fine to medium. (LONDON CLAY FORMATION)			
			Water strike(1) at 1.40m.					▽1	
1.50	HP 187.5kPa				(0.75)	... Selenite mineralisation noted at 1.60mbgl.			
1.50	D								
1.90	HP 225kPa			81.05	1.95	Very stiff brown, gravelly, slightly silty CLAY. Gravels are fine to medium subangular to subrounded relic mudstone. (LONDON CLAY FORMATION)			
2.00	D								
2.30	HP 212.5kPa				(0.65)				
2.50	D			80.40	2.60	Dark brown MUDSTONE. (LONDON CLAY FORMATION)			
2.70	HP 162.5kPa				(0.30)				
				80.10	2.90	Very stiff brown, CLAY. (LONDON CLAY FORMATION)			
3.00	D								
3.50	HP 175kPa								
3.50	D								
					(2.10)				
4.00	D								
4.50	D								
				78.00	5.00				

Remarks
GROUNDWATER: Groundwater standing at 1.40mbgl after drilling.
CASING: No casing used.
INSTALLATION: 50mm diameter HDPE standpipe to 5.00m; plain casing to 1.00m, slotted response zone 1.00m to 4.00m.
BACKFILL: Bentonite sealing pellets 0.00-1.00m. 10mm washed pea gravel filter pack 1.00-4.00m.
SLOW PROGRESS: None.
NOTES: Hand excavated inspection pit to 1.20mbgl. Borehole terminated at target depth.

Scale (approx)	**Logged By**
1:25	CS

Figure No.
LS6678.DS02

Land Science	Brighton | London | Bristol 0845 604 6494 www.landscience.co.uk	**Site** 28 Nicholas Way, Northwood, HA6 2TT	**Number** **DS03**

Excavation Method	**Dimensions**	**Ground Level (mOD)**	**Client**	**Job Number**
Drive-in Windowless Sampler		84.70	Neil Maroo	LS6678
	Location 508105 E 190739 N	**Dates** 06/01/2023	**Project Contractor** Land Science	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.20)	Flora over dark brown silty CLAY. Fine to medium rootlets noted throughout. (TOPSOIL)		
				84.50	0.20	Stiff brown mottled grey, CLAY. Rare fine rootlets noted throughout. (LONDON CLAY FORMATION)		
0.50	HP 37.5kPa					... Root noted at 0.50mbgl.		
0.50	D							
0.70	HP 87.5kPa				(1.10)	... Colour becomes brown from 0.70mbgl.		
1.00	IV(P) 130 kPa							
1.00	D							
1.10	HP 37.5kPa							
				83.40	1.30	Orange brown, mottled off white, slightly sandy SILTSTONE. Selenite mineralisation noted throughout. (LONDON CLAY FORMATION)		
1.50	D							
2.00	IV(P) 130 kPa							
2.00	D							
2.50	D							
3.00	IV(P) 130 kPa				(3.50)			
3.00	D							
3.50	D							
4.00	IV(P) 130 kPa							
4.00	D							
4.50	D							
				79.90	4.80			
					(0.20)	Orange brown, mottled off white SANDSTONE. Selenite mineralisation noted throughout. (LONDON CLAY FORMATION)		
5.00	IV(P) 130 kPa			79.70	5.00			

Remarks
GROUNDWATER: No groundwater encountered.
CASING: No casing used.
INSTALLATION: No installation.
BACKFILL: Backfilled with arisings.
SLOW PROGRESS: None.
NOTES: Hand excavated inspection pit to 1.20mbgl. Borehole terminated at target depth.

Scale (approx)	**Logged By**
1:25	CS

Figure No.
LS6678.DS03

Land Science	Brighton | London | Bristol 0845 604 6494 www.landscience.co.uk	**Site** 28 Nicholas Way, Northwood, HA6 2TT	**Number** **DS04**

Excavation Method	**Dimensions**	**Ground Level (mOD)**	**Client**	**Job Number**
Drive-in Windowless Sampler		85.48	Neil Maroo	LS6678
	Location 508110 E 190757 N	**Dates** 06/01/2023	**Project Contractor** Land Science	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.15)	Dark grey firm, slightly gravelly CLAY. Gravels are fine to coarse subangular to subrounded flints. Abundant fine roots noted throughout. (TOPSOIL)		
				85.33	0.15			
0.30	HP 37.5kPa					Firm orange brown mottled grey CLAY. (LONDON CLAY FORMATION)		
0.50	HP 37.5kPa							
0.50	D							
0.80	HP 87.5kPa							
1.00	D							
1.10	HP 25kPa				(2.15)			
1.50	D					... Colour noted as brown between 1.60-1.90mbgl.		
2.00	D					... Rare fine rootlets noted to 2.00mbgl.		
				83.18	2.30	Very stiff brown slightly sandy SILTSTONE. Selenite mineralisation noted throughout. (LONDON CLAY FORMATION)		
2.50	D							
3.00	D							
3.50	D				(2.70)			
4.00	D							
4.50	D							
				80.48	5.00			

Remarks
GROUNDWATER: No groundwater encountered.
CASING: No casing used.
INSTALLATION: No installation.
BACKFILL: Backfilled with arisings.
SLOW PROGRESS: None.
NOTES: Hand excavated inspection pit to 1.20mbgl. Borehole terminated at target depth.

Scale (approx)	**Logged By**
1:25	CS

Figure No.
LS6678.DS04

Land Science

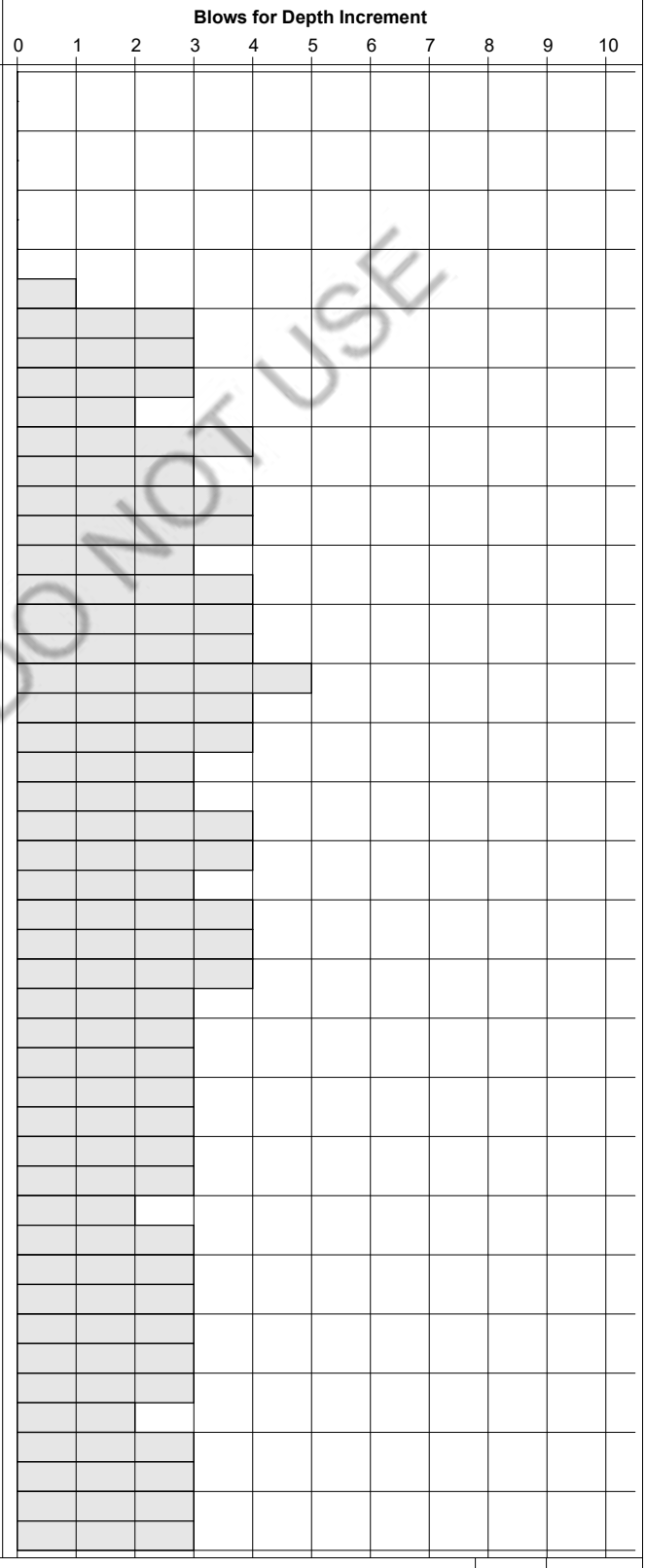
Brighton | London | Bristol
0845 604 6494
www.landscience.co.uk

Site	Probe Number
28 Nicholas Way, Northwood, HA6 2TT	DP02

Method	Cone Dimensions	Ground Level (mOD)	Client	Job Number
Dynamic Probing			Neil Maroo	LS6678

Location	Dates	Engineer	Sheet
	06/01/2023	Land Science	1/1

Depth (m)	Blows for Depth Increment	Field Records	Level (mOD)
0.00-0.10	0		
0.10-0.20	0		
0.20-0.30	0		
0.30-0.40	0		
0.40-0.50	0		
0.50-0.60	0		
0.60-0.70	0		
0.70-0.80	1		
0.80-0.90	3		
0.90-1.00	3		
1.00-1.10	3		
1.10-1.20	2		
1.20-1.30	4		
1.30-1.40	3		
1.40-1.50	4		
1.50-1.60	4		
1.60-1.70	3		
1.70-1.80	4		
1.80-1.90	4		
1.90-2.00	4		
2.00-2.10	5		
2.10-2.20	4		
2.20-2.30	4		
2.30-2.40	3		
2.40-2.50	3		
2.50-2.60	4		
2.60-2.70	4		
2.70-2.80	3		
2.80-2.90	4		
2.90-3.00	4		
3.00-3.10	4		
3.10-3.20	3		
3.20-3.30	3		
3.30-3.40	3		
3.40-3.50	3		
3.50-3.60	3		
3.60-3.70	3		
3.70-3.80	3		
3.80-3.90	2		
3.90-4.00	3		
4.00-4.10	3		
4.10-4.20	3		
4.20-4.30	3		
4.30-4.40	3		
4.40-4.50	3		
4.50-4.60	2		
4.60-4.70	3		
4.70-4.80	3		
4.80-4.90	3		
4.90-5.00	3		



Remarks

Scale (approx)	Logged By
1:25	CS

Figure No. LS6678.DP02

Land Science

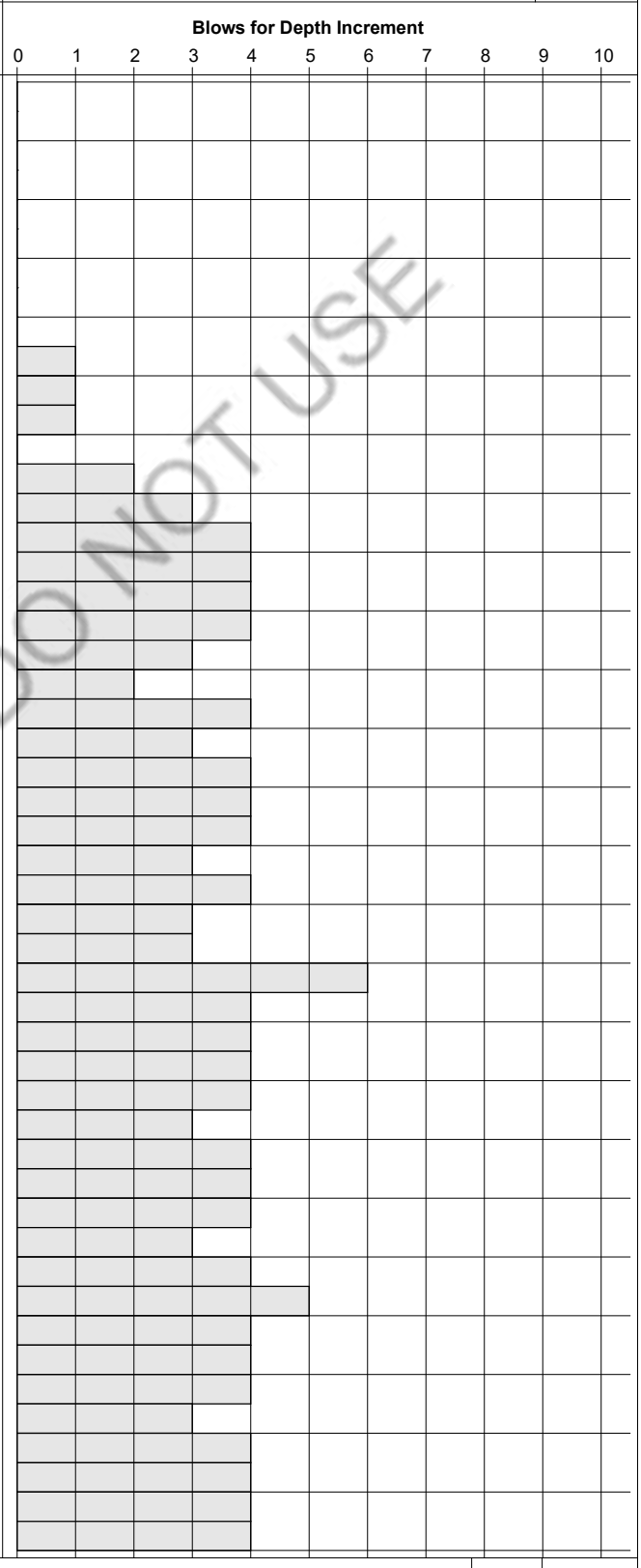
Brighton | London | Bristol
0845 604 6494
www.landscience.co.uk

Site	Probe Number
28 Nicholas Way, Northwood, HA6 2TT	DP03

Method	Cone Dimensions	Ground Level (mOD)	Client	Job Number
Dynamic Probing			Neil Maroo	LS6678

Location	Dates	Engineer	Sheet
	06/01/2023	Land Science	1/1

Depth (m)	Blows for Depth Increment	Field Records	Level (mOD)
0.00-0.10	0		
0.10-0.20	0		
0.20-0.30	0		
0.30-0.40	0		
0.40-0.50	0		
0.50-0.60	0		
0.60-0.70	0		
0.70-0.80	0		
0.80-0.90	0		
0.90-1.00	1		
1.00-1.10	1		
1.10-1.20	1		
1.20-1.30	0		
1.30-1.40	2		
1.40-1.50	3		
1.50-1.60	4		
1.60-1.70	4		
1.70-1.80	4		
1.80-1.90	4		
1.90-2.00	3		
2.00-2.10	2		
2.10-2.20	4		
2.20-2.30	3		
2.30-2.40	4		
2.40-2.50	4		
2.50-2.60	4		
2.60-2.70	3		
2.70-2.80	4		
2.80-2.90	3		
2.90-3.00	3		
3.00-3.10	6		
3.10-3.20	4		
3.20-3.30	4		
3.30-3.40	4		
3.40-3.50	4		
3.50-3.60	3		
3.60-3.70	4		
3.70-3.80	4		
3.80-3.90	4		
3.90-4.00	3		
4.00-4.10	4		
4.10-4.20	5		
4.20-4.30	4		
4.30-4.40	4		
4.40-4.50	4		
4.50-4.60	3		
4.60-4.70	4		
4.70-4.80	4		
4.80-4.90	4		
4.90-5.00	4		



Remarks

Scale (approx)	Logged By
1:25	CS

Figure No. LS6678.DP03

Land Science

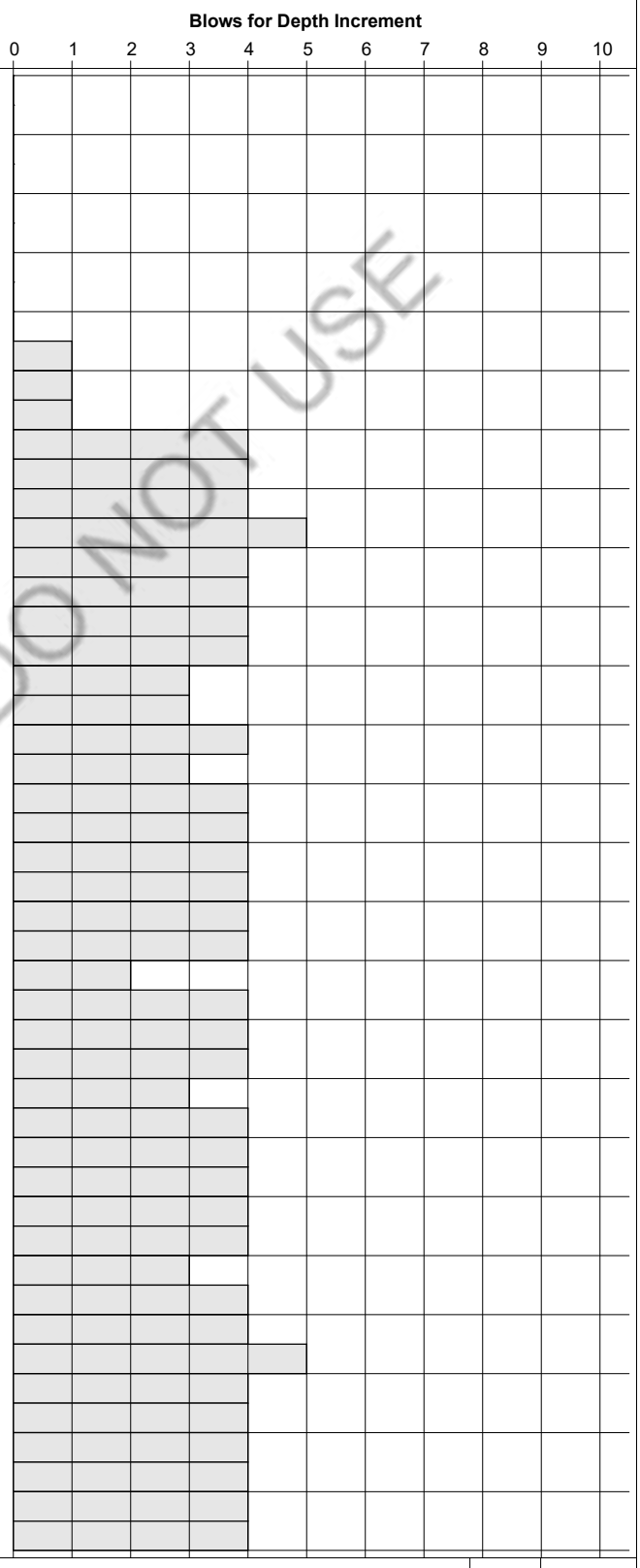
Brighton | London | Bristol
0845 604 6494
www.landscience.co.uk

Site	Probe Number
28 Nicholas Way, Northwood, HA6 2TT	DP04

Method	Cone Dimensions	Ground Level (mOD)	Client	Job Number
Dynamic Probing			Neil Maroo	LS6678

Location	Dates	Engineer	Sheet
	06/01/2023	Land Science	1/1

Depth (m)	Blows for Depth Increment	Field Records	Level (mOD)	Depth (m)
0.00-0.10	0			0.00
0.10-0.20	0			
0.20-0.30	0			
0.30-0.40	0			
0.40-0.50	0			
0.50-0.60	0			0.50
0.60-0.70	0			
0.70-0.80	0			
0.80-0.90	0			
0.90-1.00	1			
1.00-1.10	1			1.00
1.10-1.20	1			
1.20-1.30	4			
1.30-1.40	4			
1.40-1.50	4			
1.50-1.60	5			1.50
1.60-1.70	4			
1.70-1.80	4			
1.80-1.90	4			
1.90-2.00	4			
2.00-2.10	3			2.00
2.10-2.20	3			
2.20-2.30	4			
2.30-2.40	3			
2.40-2.50	4			
2.50-2.60	4			2.50
2.60-2.70	4			
2.70-2.80	4			
2.80-2.90	4			
2.90-3.00	4			
3.00-3.10	2			3.00
3.10-3.20	4			
3.20-3.30	4			
3.30-3.40	4			
3.40-3.50	3			
3.50-3.60	4			3.50
3.60-3.70	4			
3.70-3.80	4			
3.80-3.90	4			
3.90-4.00	4			
4.00-4.10	3			4.00
4.10-4.20	4			
4.20-4.30	4			
4.30-4.40	5			
4.40-4.50	4			
4.50-4.60	4			4.50
4.60-4.70	4			
4.70-4.80	4			
4.80-4.90	4			
4.90-5.00	4			5.00



Remarks

Scale (approx)	Logged By
1:25	CS

Figure No.
LS6678.DP04

Land Science	Brighton | London | Bristol 0845 604 6494 www.landscience.co.uk	Site 28 Nicholas Way, Northwood, HA6 2TT	Borehole Number **BH01**

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Cable Percussion			Neil Maroo	LS6678
	Location	**Dates** 06/01/2023	**Project Contractor** Land Science	**Sheet** 1/2

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
						0.05	Tarmac. (HARDSTANDING)		
						(0.20)			
0.30	D					0.30	Dark grey black, slightly sandy, ashy GRAVEL. Sands are fine to coarse. Gravels are fine to medium, subangular to subrounded flint, tarmac and concrete. (MADE GROUND)		
0.50	B					(0.80)			
1.00	D					1.10	Dark grey black, slightly sandy, GRAVEL. Sands are fine to coarse. Gravels are fine to medium, subangular to subrounded flint, tarmac and concrete. (MADE GROUND)		
1.20-1.65	SPT N=7			1,0/1,2,2,2			Firm, mid-orange brown CLAY. Occasional rootlets noted throughout. (LONDON CLAY FORMATION)		
1.20-1.65	SP					(0.90)			
1.75	D						Firm, mid-orange brown, sandy CLAY. (LONDON CLAY FORMATION)		
2.00-2.45	U			25 blows		2.00	Firm becoming stiff, dark orange brown mottled blue grey CLAY. (LONDON CLAY FORMATION)		
2.75	D								
3.00-3.45	SPT N=17			2,2/3,4,5,5					
3.00-3.45	SP					(2.50)			
3.75	D								
4.00-4.45	U			28 blows		4.50	Firm becoming stiff, dark brown orange slightly sandy CLAY. Sands are fine to medium. Rare selenite mineralisation noted. (LONDON CLAY FORMATION)		
5.00-5.45	SPT N=19			2,3/4,5,5,5					
5.00-5.45	SP					(2.00)			
6.00	D								
6.50-6.95	U			28 blows		6.50	Firm becoming stiff, dark brown orange CLAY. (LONDON CLAY FORMATION)		
7.50	D								
8.00-8.45	SPT N=23			2,4/5,6,6,6					
8.00-8.45	SP					(3.50)			
9.00	D								
9.50-9.95	U			38 blows					

Remarks
GROUNDWATER: No groundwater encountered.
DIAMETER: 150mm throughout.
CASING: 150mm casing to 3.00m, open hole to 15.00m.
INSTALLATION: No installation.
BACKFILL: Backfilled with arisings.
CHISELLING: None.
SLOW PROGRESS: None.
NOTES: Hand excavated inspection pit to 1.20mbgl. Borehole terminated at target depth.

Scale (approx)	Logged By
1:50	EP

Figure No.
LS6678.BH01

Land Science
Brighton | London | Bristol
0845 604 6494
www.landscience.co.uk

Site	Borehole Number
28 Nicholas Way, Northwood, HA6 2TT	BH01

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Cable Percussion			Neil Maroo	LS6678
	Location	**Dates** 06/01/2023	**Project Contractor** Land Science	**Sheet** 2/2

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
						10.00	Stiff dark blue grey CLAY. Rare selenite mineralisation noted throughout. (LONDON CLAY FORMATION)		
10.50	D								
11.00-11.45	SPT N=26			3,4/6,7,6,7					
11.00-11.45	SP								
12.00	D								
12.50-12.95	U			46 blows		(5.00)			
14.00	D								
14.55-15.00	SPT N=28			3,5/6,7,8,7					
14.55-15.00	SP								
						15.00	Complete at 15.00m		

Remarks

Scale (approx)	Logged By
1:50	EP

Figure No. LS6678.BH01

Borehole Soakage Test Results (after BRE Digest 365)

Project Name : 28 Nicholas Way

Client : Neil Maroo

Notes: Modified methodology to meet the principles behind BRE365

Job No. : LS6678

Date : 10/01/2023

Trial Pit :

Time (min)	Depth to water (m)
0.50	0.50
30.00	0.45
45.00	0.41
72.00	0.40
95.00	0.38
132.00	0.36
180.00	0.34

$$f = \frac{V_{p75-25}}{A_{p50} \times t_{p75-25}}$$

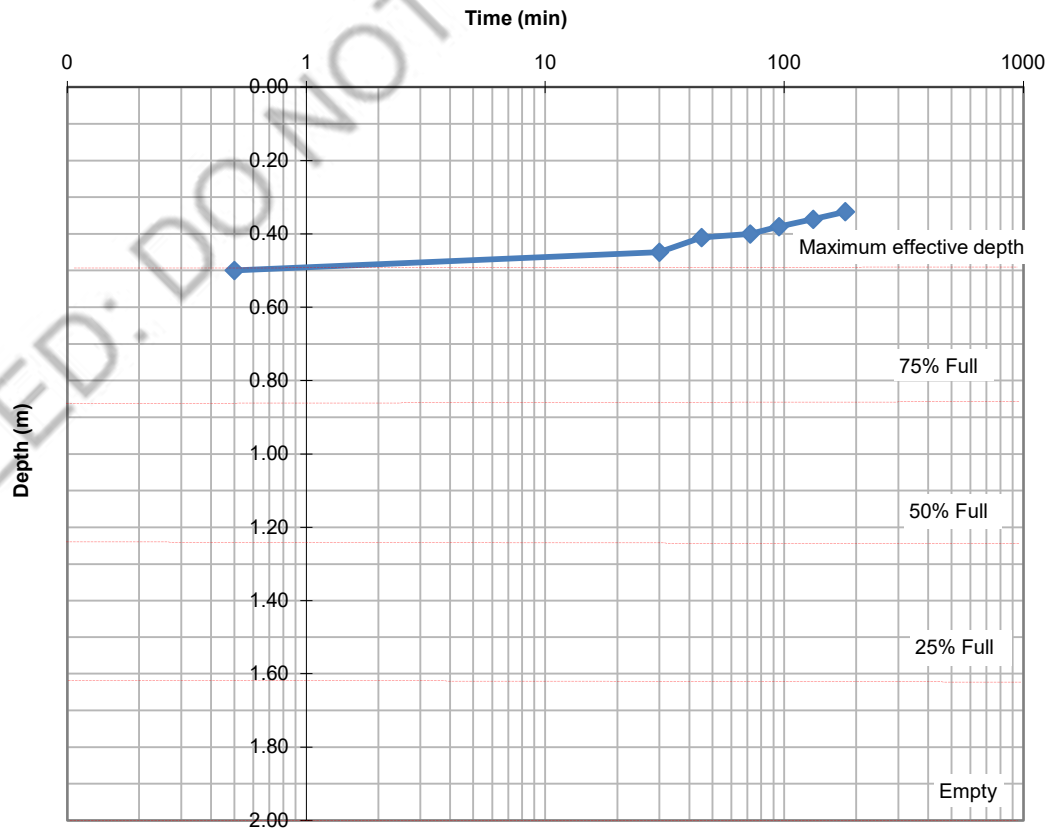
f = soil infiltration rate

Vp75-25 = the effective storage volume of water in the borehole between 75% and 25% effective depth

Ap50 = the internal surface area of the borehole up to 50% effective depth and including the base area.

tp75-25 = the time for the water level to fall from 75% to 25% effective depth.

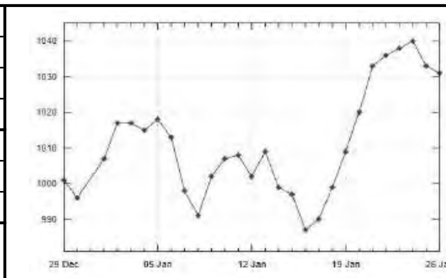
Borehole Diameter	0.1	m
Depth (75%-25%)	-	m
Include base?	n	y/n
tp75-25	-	mins
Vp75-25	-	m^3
Ap50	-	m^2
f	**Test Failed**	**m/s**



APPENDIX D

GROUND GAS AND GROUNDWATER MONITORING

Project:	Nicholas Way, Northwood	**Ref:**	LS6678
Date:	20/01/2023	**Visit:**	1 of 1
Engineer:	CS	**Check:**	EP
Weather:	Sunny, cold.	**Page:**	1 of 1
Atmospheric Pressure		**before:**	1003
		after:	1003
Published pressure trend:	Rising High Pressure. (Benson)		



Remarks: Equipment used: GFM 435, Phocheck TigerLT PID, Dipmeter

Position	Flow (l/hr)		Common Gases (%)				VOC's (ppm)	Groundwater (m)				Remarks
	High	Low	Time	CO2	CH4	O2		LNAPL	Water	DNAPL	Base	
Calibration Check	0.0	0.0	15s	0.1	0.0	19.1						
			30s	0.0	0.0	19.2		-	-	-	-	
			60s	0.0	0.0	19.2						
DS02	0.0	0.0	15s	0.9	0.0	19.1						
			30s	1.5	0.0	18.6						
			60s	1.6	0.0	18.5						
			120s	1.6	0.0	18.5		-	0.98	-	4.82	
			180s	1.5	0.0	18.5						
			240s	1.5	0.0	18.5						
			300s	1.5	0.0	18.5						
			15s									
			30s									
			60s									
			120s					-		-		
			180s									
			240s									
			300s									
			15s									
			30s									
			60s									
			120s					-		-		
			180s									
			240s									
			300s									
			15s									
			30s									
			60s									
			120s					-		-		
			180s									
			240s									
			300s									
			15s									
			30s									
			60s									
			120s					-		-		
			180s									
			240s									
			300s									
Calibration Check			15s	0.0	0.0	19.2						
			30s	0.0	0.0	19.2		-	-	-	-	
			60s	0.0	0.0	19.2						

Land Science

Land Science Ltd., Unit 10, 19 Albert Drive, Burgess Hill, West Sussex, RH15 9TN
T: 01444 882 084 **E:** info@landscience.co.uk

APPENDIX E

SUMMARY OF MOISTURE CONTENT AND ATTERBERG LIMIT DETERMINATIONS

Site Name:	28 Nicholas Way	**Samples Received:**	10/01/2023
Reference:	LS6678	**Reported:**	19/01/2023

Position	Depth m	Sample Description	Moisture Content %	Liquid Limit %	Plastic Limit %	Plasticity Index %	Passing 425µm %	Modified PI %
DS01	1.50	Brown and grey slightly silty CLAY with rootlets	32.6	76.0	24.2	51.8	100.0	51.8
DS01	2.50	Brown and grey CLAY with selenite	25.3	67.3	24.9	42.4	94.1	39.9
DS02	1.00	Brown CLAY	25.7	71.7	24.8	46.9	100.0	46.9
DS02	2.00	Brown CLAY with selenite	26.4					
DS03	1.50	Brown slightly silty CLAY	23.2	67.9	23.6	44.3	100.0	44.3
DS04	0.50	Brown CLAY with rootlets	35.8					
DS04	1.00	Brown and grey slightly silty CLAY	43.8	99.2	26.4	72.9	100.0	72.9
DS04	1.50	Brown CLAY	22.5					
DS04	2.00	Brown and grey silty CLAY with rootlets	23.3					
DS04	2.50	Brown and grey slightly silty CLAY	23.2					

TEST CERTIFICATE

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

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

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

UKAS TESTING 4041

Client:	Land Science	Client Reference:	LS6678
Client Address:	Unit 10, 19 Albert Drive, Burgess Hill, West Sussex, RH15 9TN	Job Number:	23-11094
		Date Sampled:	06/01/2023
		Date Received:	09/01/2023
Contact:	Emily Prosser	Date Tested:	16/01/2023
Site Address:	28 Nicholas Way HA6 2TT	Sampled By:	Not Given

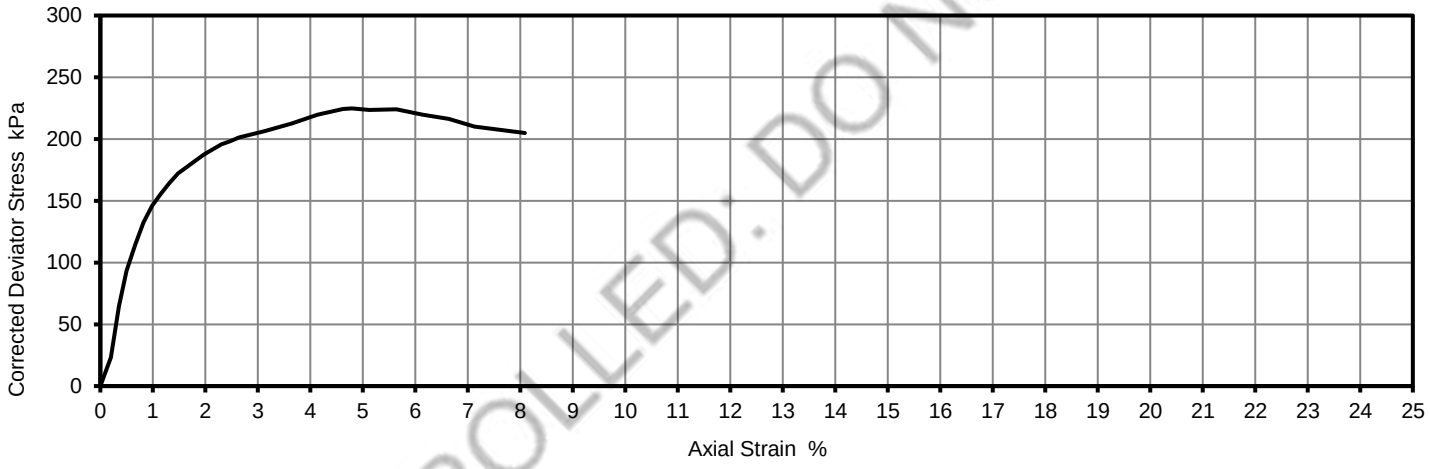
Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

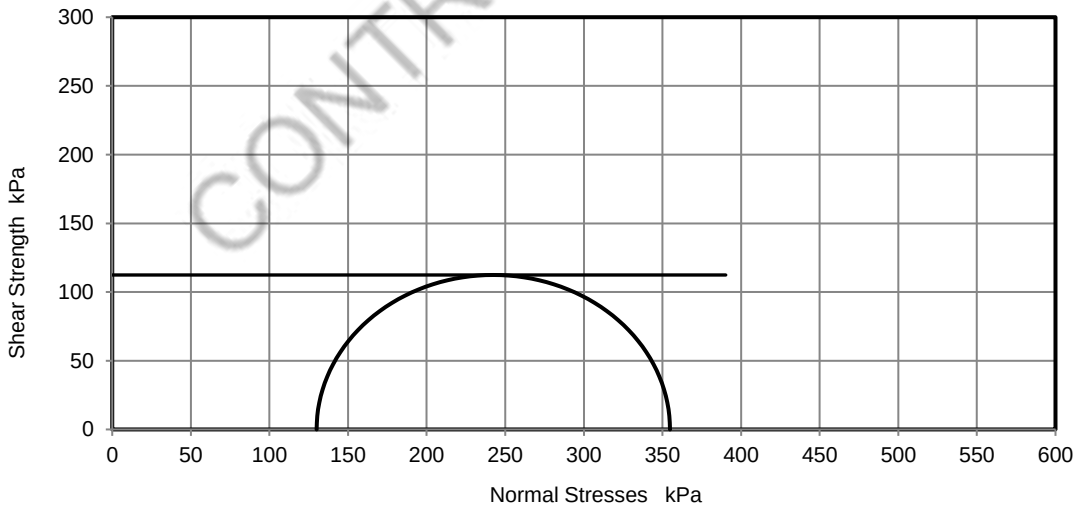
Laboratory Reference:	2550141	Depth Top [m]:	6.50
Hole No.:	BH01	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	U
Sample Description:	Yellowish brown slightly silty CLAY		
Sample Preparation:	Sample prepared in accordance with BS 1377-1:2016 Clause 9.1.1.		

Test Number	1		Rate of Strain	2.00	%/min
Length	139.74	mm	Cell Pressure	130	kPa
Diameter	69.40	mm	Axial Strain at failure	4.8	%
Bulk Density	1.97	Mg/m3	Deviator Stress, (σ1 - σ3)f	225	kPa
Moisture Content	29	%	Undrained Shear Strength, cu	112	kPa ½(σ1 - σ3)f
Dry Density	1.53	Mg/m3	Mode of Failure	Brittle	
Membrane Correction	0.45	kPa	Membrane thickness	0.24	mm

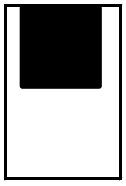
Deviator Stress v Axial Strain



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: Monika Siewior

Monika Siewior
Reporting Specialist
for and on behalf of i2 Analytical Ltd

Date Reported: 25/01/2023

GF 184.12

TEST CERTIFICATE

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

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

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

UKAS TESTING 4041

Client:	Land Science	Client Reference:	LS6678
Client Address:	Unit 10, 19 Albert Drive, Burgess Hill, West Sussex, RH15 9TN	Job Number:	23-11094
		Date Sampled:	06/01/2023
		Date Received:	09/01/2023
Contact:	Emily Prosser	Date Tested:	16/01/2023
Site Address:	28 Nicholas Way HA6 2TT	Sampled By:	Not Given

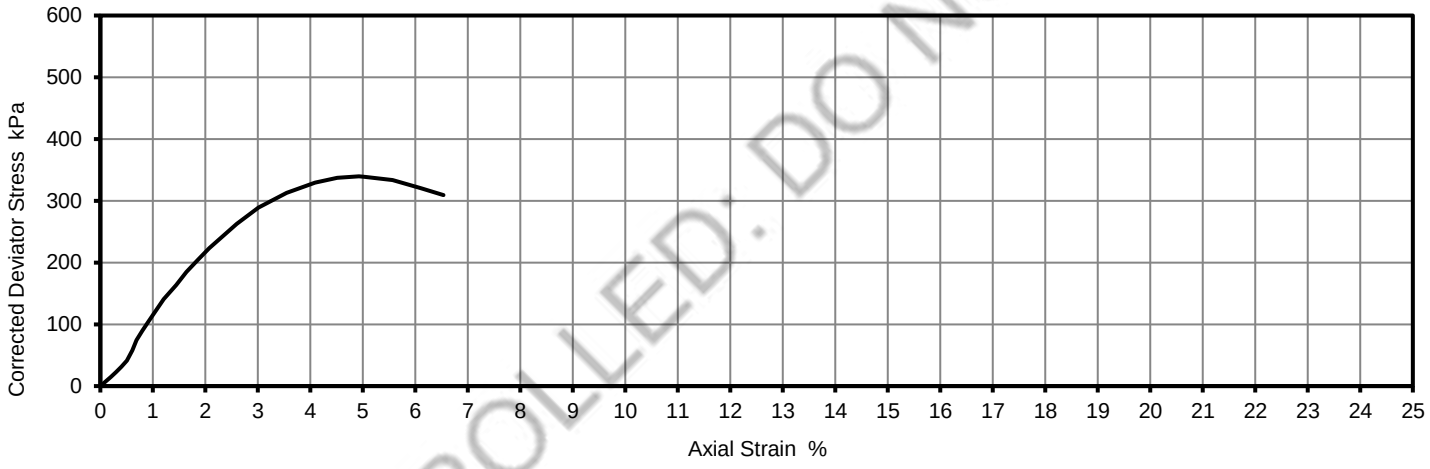
Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

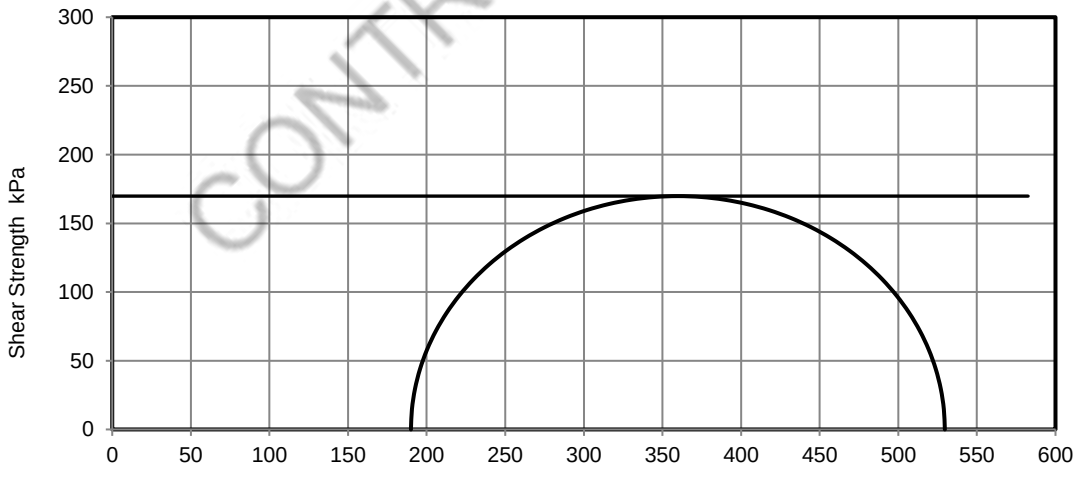
Laboratory Reference:	2550142	Depth Top [m]:	9.50
Hole No.:	BH01	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	U
Sample Description:	Brown mottled yellowish brown slightly silty CLAY		
Sample Preparation:	Sample prepared in accordance with BS 1377-1:2016 Clause 9.1.1.		

Test Number	1		Rate of Strain	2.00	%/min	
Length	139.85	mm	Cell Pressure	190	kPa	
Diameter	68.83	mm	Axial Strain at failure	4.9	%	
Bulk Density	1.93	Mg/m3	Deviator Stress, (σ1 - σ3)f	340	kPa	
Moisture Content	26	%	Undrained Shear Strength, cu	170	kPa	½(σ1 - σ3)f
Dry Density	1.54	Mg/m3	Mode of Failure	Compound		
Membrane Correction	0.45	kPa	Membrane thickness	0.23	mm	

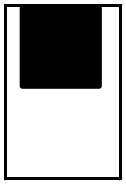
Deviator Stress v Axial Strain



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: Monika Siewior

Monika Siewior
Reporting Specialist
for and on behalf of i2 Analytical Ltd

Date Reported: 25/01/2023

GF 184.12

TEST CERTIFICATE

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

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

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

UKAS TESTING 4041

Client:	Land Science	Client Reference:	LS6678
Client Address:	Unit 10, 19 Albert Drive, Burgess Hill, West Sussex, RH15 9TN	Job Number:	23-11094
		Date Sampled:	06/01/2023
		Date Received:	09/01/2023
Contact:	Emily Prosser	Date Tested:	16/01/2023
Site Address:	28 Nicholas Way HA6 2TT	Sampled By:	Not Given

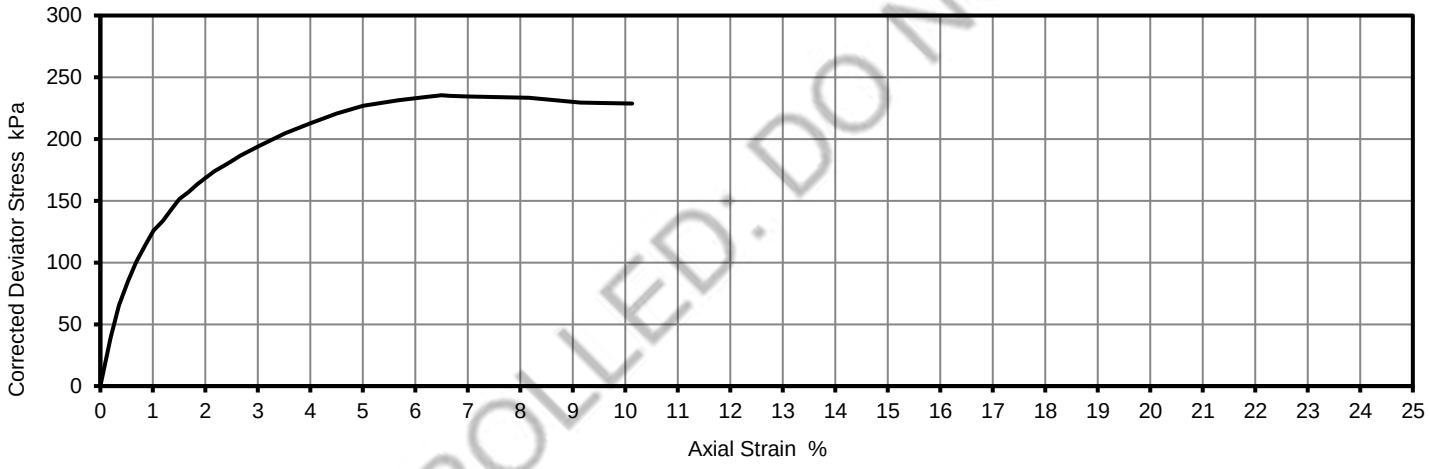
Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

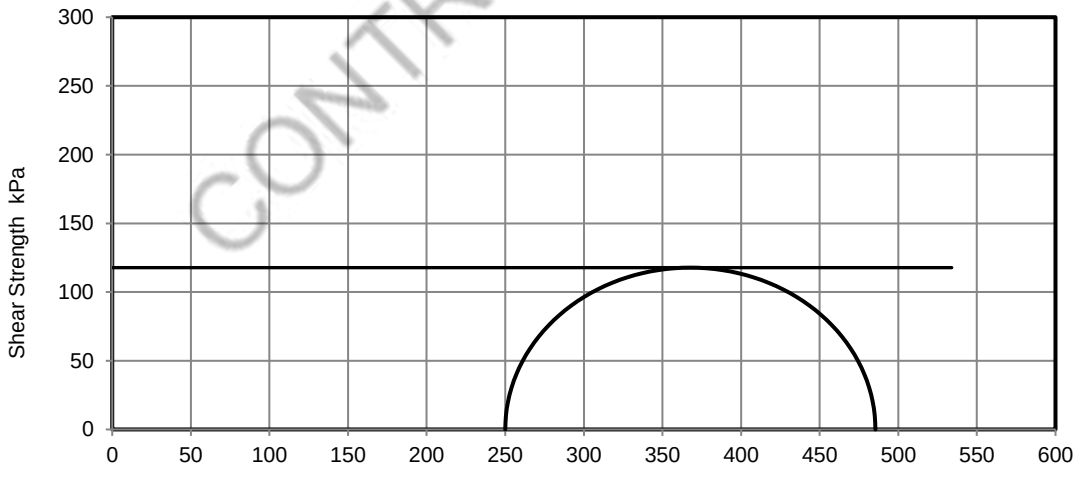
Laboratory Reference:	2550143	Depth Top [m]:	12.50
Hole No.:	BH01	Depth Base [m]:	Not Given
Sample Reference:	Not Given	Sample Type:	U
Sample Description:	Dark brown slightly silty CLAY		
Sample Preparation:	Sample prepared in accordance with BS 1377-1:2016 Clause 9.1.1.		

Test Number	1		Rate of Strain	2.00	%/min
Length	139.68	mm	Cell Pressure	250	kPa
Diameter	69.22	mm	Axial Strain at failure	6.5	%
Bulk Density	1.99	Mg/m3	Deviator Stress, (σ1 - σ3)f	235	kPa
Moisture Content	27	%	Undrained Shear Strength, cu	118	kPa ½(σ1 - σ3)f
Dry Density	1.57	Mg/m3	Mode of Failure	Brittle	
Membrane Correction	0.60	kPa	Membrane thickness	0.25	mm

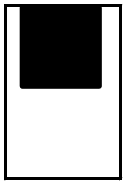
Deviator Stress v Axial Strain



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: Monika Siewior

Monika Siewior
Reporting Specialist
for and on behalf of i2 Analytical Ltd

Date Reported: 25/01/2023

GF 184.12

APPENDIX F

Emily Prosser
Land Science
Unit 10
19 Albert Drive
Burgess Hill
West Sussex
RH15 9TN

e: emily.prosser@landscience.co.uk

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

t: 01923 225404
f: 01923 237404
e: reception@i2analytical.com

Analytical Report Number : 23-10728

Project / Site name:	28 Nicholas Way, HA6 2TT	**Samples received on:**	09/01/2023
Your job number:	LS6678	**Samples instructed on/ Analysis started on:**	09/01/2023
Your order number:		**Analysis completed by:**	23/01/2023
Report Issue Number:	1	**Report issued on:**	23/01/2023
Samples Analysed:	1 leachate sample - 5 soil samples		

Signed:

Dominika Warjan
Junior Reporting Specialist
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

Excel copies of reports are only valid when accompanied by this PDF certificate.

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: 23-10728
Project / Site name: 28 Nicholas Way, HA6 2TT

Lab Sample Number				2548135	2548136	2548137	2548138	2548139
Sample Reference				DS01	DS02	DS03	DS03	BH01
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				1.00	3.00	0.50	2.50	9.00
Date Sampled				06/01/2023	06/01/2023	06/01/2023	06/01/2023	06/01/2023
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	18	19	20	14	16
Total mass of sample received	kg	0.001	NONE	1	1	0.8	2	2
Asbestos in Soil	Type	N/A	ISO 17025	-	-	Not-detected	-	-
Asbestos Analyst ID	N/A	N/A	N/A	N/A	N/A	DSO	N/A	N/A
General Inorganics								
pH - Manual	pH Units	N/A	MCERTS	-	-	5.9	-	-
pH - Automated	pH Units	N/A	MCERTS	5.8	7.6	5.7	7.6	7.6
Total Cyanide	mg/kg	1	MCERTS	-	-	< 1.0	-	-
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.07	2.2	0.58	3.2	3.5
Sulphide	mg/kg	1	MCERTS	-	-	< 1.0	-	-
Fraction Organic Carbon (FOC) Automated	N/A	0.001	MCERTS	-	-	0.003	-	-
Total Organic Carbon (TOC) - Automated	%	0.1	MCERTS	-	-	0.3	-	-
Loss on Ignition @ 450oC	%	0.2	MCERTS	-	-	5.2	-	-
Acid Neutralisation Capacity	+/- mmol/kg	-999	NONE	-	-	-1.4	-	-
Total Phenols								
Total Phenols (monohydric)	mg/kg	1	MCERTS	-	-	< 1.0	-	-
Speciated PAHs								
Naphthalene	mg/kg	0.05	MCERTS	-	-	< 0.05	-	-
Acenaphthylene	mg/kg	0.05	MCERTS	-	-	< 0.05	-	-
Acenaphthene	mg/kg	0.05	MCERTS	-	-	< 0.05	-	-
Fluorene	mg/kg	0.05	MCERTS	-	-	< 0.05	-	-
Phenanthrene	mg/kg	0.05	MCERTS	-	-	< 0.05	-	-
Anthracene	mg/kg	0.05	MCERTS	-	-	< 0.05	-	-
Fluoranthene	mg/kg	0.05	MCERTS	-	-	< 0.05	-	-
Pyrene	mg/kg	0.05	MCERTS	-	-	< 0.05	-	-
Benzo(a)anthracene	mg/kg	0.05	MCERTS	-	-	< 0.05	-	-
Chrysene	mg/kg	0.05	MCERTS	-	-	< 0.05	-	-
Benzo(b)fluoranthene	mg/kg	0.05	ISO 17025	-	-	< 0.05	-	-
Benzo(k)fluoranthene	mg/kg	0.05	ISO 17025	-	-	< 0.05	-	-
Benzo(a)pyrene	mg/kg	0.05	MCERTS	-	-	< 0.05	-	-
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	-	-	< 0.05	-	-
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	-	-	< 0.05	-	-
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	-	-	< 0.05	-	-
Coronene	mg/kg	0.05	NONE	-	-	< 0.05	-	-
Total PAH								
Total WAC-17 PAHs	mg/kg	0.85	NONE	-	-	< 0.85	-	-

Analytical Report Number: 23-10728
Project / Site name: 28 Nicholas Way, HA6 2TT

Lab Sample Number				2548135	2548136	2548137	2548138	2548139
Sample Reference				DS01	DS02	DS03	DS03	BH01
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				1.00	3.00	0.50	2.50	9.00
Date Sampled				06/01/2023	06/01/2023	06/01/2023	06/01/2023	06/01/2023
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	-	-	15	-	-
Barium (aqua regia extractable)	mg/kg	1	MCERTS	-	-	34	-	-
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	-	-	1.1	-	-
Boron (water soluble)	mg/kg	0.2	MCERTS	-	-	0.6	-	-
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	-	-	< 0.2	-	-
Chromium (hexavalent)	mg/kg	1.2	NONE	-	-	< 1.2	-	-
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	-	-	47	-	-
Copper (aqua regia extractable)	mg/kg	1	MCERTS	-	-	22	-	-
Lead (aqua regia extractable)	mg/kg	1	MCERTS	-	-	16	-	-
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	-	-	< 0.3	-	-
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	-	-	26	-	-
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	-	-	< 1.0	-	-
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	-	-	90	-	-
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	-	-	61	-	-
Monoaromatics & Oxygenates								
Benzene	µg/kg	5	MCERTS	-	-	< 5.0	-	-
Toluene	µg/kg	5	MCERTS	-	-	< 5.0	-	-
Ethylbenzene	µg/kg	5	MCERTS	-	-	< 5.0	-	-
p & m-xylene	µg/kg	5	MCERTS	-	-	< 5.0	-	-
o-xylene	µg/kg	5	MCERTS	-	-	< 5.0	-	-
Total BTEX	µg/kg	5	MCERTS	-	-	< 5.0	-	-
Petroleum Hydrocarbons								
Mineral Oil (C10 - C40) EH_CU_1D_AL	mg/kg	10	NONE	-	-	< 10	-	-
PCBs by GC-MS								
PCB Congener 28	mg/kg	0.001	MCERTS	-	-	< 0.001	-	-
PCB Congener 52	mg/kg	0.001	MCERTS	-	-	< 0.001	-	-
PCB Congener 101	mg/kg	0.001	MCERTS	-	-	< 0.001	-	-
PCB Congener 118	mg/kg	0.001	MCERTS	-	-	< 0.001	-	-
PCB Congener 138	mg/kg	0.001	MCERTS	-	-	< 0.001	-	-
PCB Congener 153	mg/kg	0.001	MCERTS	-	-	< 0.001	-	-
PCB Congener 180	mg/kg	0.001	MCERTS	-	-	< 0.001	-	-
Total PCBs by GC-MS								
Total PCBs	mg/kg	0.007	MCERTS	-	-	< 0.007	-	-

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected

Analytical Report Number: 23-10728
Project / Site name: 28 Nicholas Way, HA6 2TT

Lab Sample Number				2548140
Sample Reference				DS03
Sample Number				None Supplied
Depth (m)				0.50
Date Sampled				06/01/2023
Time Taken				None Supplied
Analytical Parameter (Leachate Analysis)	**Units**	**Limit of detection**	**Accreditation Status**	
10:1 WAC Leachate				
Arsenic	mg/l	0.001	ISO 17025	0.001
Barium	mg/l	0.00005	ISO 17025	0.0053
Cadmium	mg/l	0.0001	ISO 17025	< 0.0001
Chromium	mg/l	0.0004	ISO 17025	< 0.0004
Copper	mg/l	0.0007	ISO 17025	0.011
Mercury	mg/l	0.0005	ISO 17025	< 0.0005
Molybdenum	mg/l	0.0004	ISO 17025	< 0.0004
Nickel	mg/l	0.0003	ISO 17025	0.003
Lead	mg/l	0.001	ISO 17025	0.0015
Antimony	mg/l	0.0017	ISO 17025	< 0.0017
Selenium	mg/l	0.004	ISO 17025	< 0.0040
Zinc	mg/l	0.0004	ISO 17025	0.016
Chloride	mg/l	0.15	ISO 17025	20
Fluoride	mg/l	0.05	ISO 17025	< 0.050
Sulphate	mg/l	0.1	ISO 17025	39
Total dissolved solids	mg/l	4	ISO 17025	99
Total monohydric phenols	mg/l	0.01	ISO 17025	< 0.010
Dissolved organic carbon	mg/l	0.1	NONE	4.42
10:1 WAC Leachate				
Arsenic	mg/kg	0.01	NONE	< 0.0100
Barium	mg/kg	0.0005	NONE	0.0391
Cadmium	mg/kg	0.0008	NONE	< 0.0008
Chromium	mg/kg	0.004	NONE	< 0.0040
Copper	mg/kg	0.007	NONE	0.08
Mercury	mg/kg	0.005	NONE	< 0.0050
Molybdenum	mg/kg	0.004	NONE	< 0.0040
Nickel	mg/kg	0.003	NONE	0.022
Lead	mg/kg	0.01	NONE	0.011
Antimony	mg/kg	0.017	NONE	< 0.017
Selenium	mg/kg	0.04	NONE	< 0.040
Zinc	mg/kg	0.004	NONE	0.12
Chloride	mg/kg	1.5	NONE	150
Fluoride	mg/kg	0.5	NONE	< 0.50
Sulphate	mg/kg	1	NONE	290
Total dissolved solids	mg/kg	40	ISO 17025	730
Total monohydric phenols	mg/kg	0.1	NONE	< 0.10
Dissolved organic carbon	mg/kg	1	NONE	32.7

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected

Analytical Report Number : 23-10728
Project / Site name: 28 Nicholas Way, HA6 2TT

* 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 *
2548135	DS01	None Supplied	1	Brown clay and sand.
2548136	DS02	None Supplied	3	Brown clay.
2548137	DS03	None Supplied	0.5	Brown clay with vegetation.
2548138	DS03	None Supplied	2.5	Brown clay.
2548139	BH01	None Supplied	9	Brown clay.

Analytical Report Number : 23-10728
Project / Site name: 28 Nicholas Way, HA6 2TT

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
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
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
BS EN 12457-2 (10:1) Leachate Prep	10:1 (as recieved, moisture adjusted) end over end extraction with water for 24 hours. Eluate filtered prior to analysis.	In-house method based on BSEN12457-2.	L043-PL	W	NONE
Acid neutralisation capacity of soil	Determination of acid neutralisation capacity by addition of acid or alkali followed by electronic probe.	In-house method based on Guidance an Sampling and Testing of Wastes to Meet Landfill Waste Acceptance""	L046-PL	W	NONE
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with dispersion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
Boron, water soluble, in soil	Determination of water soluble boron in soil by hot water extract followed by ICP-OES.	In-house method based on Second Site Properties version 3	L038-PL	D	MCERTS
Loss on ignition of soil @ 450oC	Determination of loss on ignition in soil by gravimetrically with the sample being ignited in a muffle furnace.	In house method.	L047-PL	D	MCERTS
Mineral Oil (Soil) C10 - C40	Determination of mineral oil fraction extractable hydrocarbons in soil by GC-MS/GC-FID.	In-house method with silica gel split/clean up.	L076-PL	D	NONE
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
Monohydric phenols in soil	Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	MCERTS
Speciated WAC-17 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270.	L064-PL	D	MCERTS
PCB's By GC-MS in soil	Determination of PCB by extraction with acetone and hexane followed by GC-MS.	In-house method based on USEPA 8082	L027-PL	D	MCERTS
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
pH at 20oC in soil	Determination of pH in soil by addition of water followed by electrometric measurement.	In house method.	L005-PL	W	MCERTS
Sulphide in soil	Determination of sulphide in soil by acidification and heating to liberate hydrogen sulphide, trapped in an alkaline solution then assayed by ion selective electrode.	In-house method	L010-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
Total cyanide in soil	Determination of total cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS

Analytical Report Number : 23-10728
Project / Site name: 28 Nicholas Way, HA6 2TT

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
Total organic carbon (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method.	L009-PL	D	MCERTS
BTEX in soil (Monoaromatics)	Determination of BTEX in soil by headspace GC-MS. Individual components MCERTS accredited	In-house method based on USEPA8260	L073B-PL	W	MCERTS
Total BTEX in soil (Poland)	Determination of BTEX in soil by headspace GC-MS. Individual components MCERTS accredited	In-house method based on USEPA8260	L073-PL	W	MCERTS
Fraction Organic Carbon FOC Automated	Determination of fraction of organic carbon in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method	L009	D	MCERTS
Hexavalent chromium in soil (Lower Level)	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method	L080-PL	W	NONE
D.O. for Gravimetric Quant if Screen/ID positive	Dependent option for Gravimetric Quant if Screen/ID positive scheduled.	In house asbestos methods A001 & A006.	A006-PL	D	NONE
Metals in leachate by ICP-OES	Determination of metals in leachate by acidification followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil""	L039-PL	W	ISO 17025
Chloride 10:1 WAC	Determination of Chloride colorimetrically by discrete analyser.	In house based on MEWAM Method ISBN 0117516260.	L082-PL	W	ISO 17025
Fluoride 10:1 WAC	Determination of fluoride in leachate by 1:1ratio with a buffer solution followed by Ion Selective Electrode.	In-house method based on Use of Total Ionic Strength Adjustment Buffer for Electrode Determination"	L033B-PL	W	ISO 17025
Sulphate 10:1 WAC	Determination of sulphate in leachate by ICP-OES	In-house method based on MEWAM 1986 Methods for the Determination of Metals in Soil""	L039-PL	W	ISO 17025
Total dissolved solids 10:1 WAC	Determination of total dissolved solids in water by EC probe using a factor of 0.6.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L031	W	ISO 17025
Monohydric phenols 10:1 WAC	Determination of phenols in leachate by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L080-PL	W	ISO 17025

Analytical Report Number : 23-10728
Project / Site name: 28 Nicholas Way, HA6 2TT

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
Dissolved organic carbon 10:1 WAC	Determination of dissolved inorganic carbon in leachate by TOC/DOC NDIR Analyser.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L037-PL	W	NONE

For method numbers ending in 'UK or A' analysis have been carried out in our laboratory in the United Kingdom (WATFORD).
For method numbers ending in 'F' analysis have been carried out in our laboratory in the United Kingdom (East Kilbride).
For method numbers ending in 'PL or B' 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.

Information in Support of Analytical Results

List of HWOL Acronyms and Operators

Acronym	Descriptions
HS	Headspace Analysis
MS	Mass spectrometry
FID	Flame Ionisation Detector
GC	Gas Chromatography
EH	Extractable Hydrocarbons (i.e. everything extracted by the solvent(s))
CU	Clean-up - e.g. by Florisil®, silica gel
1D	GC - Single coil/column gas chromatography
2D	GC-GC - Double coil/column gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics
AR	Aromatics
#1	EH_2D_Total but with humics mathematically subtracted
#2	EH_2D_Total but with fatty acids mathematically subtracted
_	Operator - understore to separate acronyms (exception for +)
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total

HazWasteOnline™

Waste Classification Report

HazWasteOnline™ classifies waste as either **hazardous** or **non-hazardous** based on its chemical composition, related legislation and the rules and data defined in the current UK or EU technical guidance (Appendix C) (note that HP 9 Infectious is not assessed). It is the responsibility of the classifier named below to:

a) understand the origin of the waste
b) select the correct List of Waste code(s)
c) confirm that the list of determinands, results and sampling plan are fit for purpose
d) select and justify the chosen metal species (Appendix B)
e) correctly apply moisture correction and other available corrections
f) add the meta data for their user-defined substances (Appendix A)
g) check that the classification engine is suitable with respect to the national destination of the waste (Appendix C)

CMLXK-8BITD-MVFZX

To aid the reviewer, the laboratory results, assumptions and justifications managed by the classifier are highlighted in pale yellow.

Job name

Nicholas Way

Description/Comments

Project

LS6678

Site

Nicholas Way

Classified by

Name:
Tom Kistruck
Date:
25 Jan 2023 15:25 GMT
Telephone:
01444 882 084

Company:
Land Science
Unit 10
19 Albert Drive
Burgess Hill
RH15 9TN

HazWasteOnline™ provides a two day, hazardous waste classification course that covers the use of the software and both basic and advanced waste classification techniques. Certification has to be renewed every 3 years.

HazWasteOnline™ Certification: -

Course	Date
Hazardous Waste Classification	-

Purpose of classification

4 - Classification of Waste Products

Address of the waste

Post Code

SIC for the process giving rise to the waste

Description of industry/producer giving rise to the waste

Description of the specific process, sub-process and/or activity that created the waste

Description of the waste

Job summary

#	Sample name	Depth [m]	Classification Result	Hazard properties	Page
1	DS03	0.50	Non Hazardous		3

Related documents

#	Name	Description
1	Land Science Template WM3 v1.2GB	waste stream template used to create this Job

Report

Created by: Tom Kistruck

Created date: 25 Jan 2023 15:25 GMT

Classification of sample: DS03

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample name:
DS03
Sample Depth:
0.50 m
Moisture content:
20%
(no correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 20% No Moisture Correction applied (MC)

#		Determinand	EU CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1	●	pH			PH		5.9	pH		5.9	pH	5.9 pH		
2		phenol	604-001-00-2	203-632-7	108-95-2		<1	mg/kg		<1	mg/kg	<0.0001 %		<LOD
3		naphthalene	601-052-00-2	202-049-5	91-20-3		<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<LOD
4	●	acenaphthylene		205-917-1	208-96-8		<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<LOD
5	●	acenaphthene		201-469-6	83-32-9		<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<LOD
6	●	fluorene		201-695-5	86-73-7		<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<LOD
7	●	phenanthrene		201-581-5	85-01-8		<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<LOD
8	●	anthracene		204-371-1	120-12-7		<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<LOD
9	●	fluoranthene		205-912-4	206-44-0		<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<LOD
10	●	pyrene		204-927-3	129-00-0		<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<LOD
11		benzo[a]anthracene	601-033-00-9	200-280-6	56-55-3		<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<LOD
12		chrysene	601-048-00-0	205-923-4	218-01-9		<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<LOD
13		benzo[b]fluoranthene	601-034-00-4	205-911-9	205-99-2		<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<LOD
14		benzo[k]fluoranthene	601-036-00-5	205-916-6	207-08-9		<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<LOD
15		benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5	50-32-8		<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<LOD
16	●	indeno[123-cd]pyrene		205-893-2	193-39-5		<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<LOD
17		dibenz[a,h]anthracene	601-041-00-2	200-181-8	53-70-3		<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<LOD

#		Determinand	EU CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
18		benzo[ghi]perylene		205-883-8	191-24-2		<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<LOD
19		coronene		205-881-7	191-07-1		<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<LOD
20		arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		15	mg/kg	1.32	19.805	mg/kg	0.00198 %		
21		barium { barium sulfate }		231-784-4	7727-43-7		34	mg/kg	1.7	57.784	mg/kg	0.00578 %		
22		beryllium { beryllium oxide }	004-003-00-8	215-133-1	1304-56-9		1.1	mg/kg	2.775	3.053	mg/kg	0.000305 %		
23		boron { diboron trioxide; boric oxide }	005-008-00-8	215-125-8	1303-86-2		0.6	mg/kg	3.22	1.932	mg/kg	0.000193 %		
24		cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		<0.2	mg/kg	1.142	<0.228	mg/kg	<0.0000228 %		<LOD
25		chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		<1.2	mg/kg	1.923	<2.308	mg/kg	<0.000231 %		<LOD
26		copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		22	mg/kg	1.126	24.77	mg/kg	0.00248 %		
27		lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	16	mg/kg	1.56	24.957	mg/kg	0.0016 %		
28		mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		<0.3	mg/kg	1.353	<0.406	mg/kg	<0.0000406 %		<LOD
29		nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		26	mg/kg	2.976	77.383	mg/kg	0.00774 %		
30		selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				<1	mg/kg	1.405	<1.405	mg/kg	<0.000141 %		<LOD
31		vanadium { divanadium pentaoxide; vanadium pentoxide }	023-001-00-8	215-239-8	1314-62-1		90	mg/kg	1.785	160.667	mg/kg	0.0161 %		
32		zinc { zinc chromate }	024-007-00-3	236-878-9	13530-65-9		61	mg/kg	2.774	169.223	mg/kg	0.0169 %		
33		benzene	601-020-00-8	200-753-7	71-43-2		<5	mg/kg		<5	mg/kg	<0.0005 %		<LOD
34		toluene	601-021-00-3	203-625-9	108-88-3		<5	mg/kg		<5	mg/kg	<0.0005 %		<LOD
35		ethylbenzene	601-023-00-4	202-849-4	100-41-4		<5	mg/kg		<5	mg/kg	<0.0005 %		<LOD
36		o-xylene; [1] p-xylene; [2] m-xylene; [3] xylene [4]	601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]	95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4]		<5	mg/kg		<5	mg/kg	<0.0005 %		<LOD
37		polychlorobiphenyls; PCB	602-039-00-4	215-648-1	1336-36-3		<0.007	mg/kg		<0.007	mg/kg	<0.0000007 %		<LOD
											Total:	0.0557 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
ND	Not detected
CLP: Note 1	Only the metal concentration has been used for classification

Appendix A: Classifier defined and non GB MCL determinands

- **pH** (CAS Number: PH)

Description/Comments: Appendix C4
Data source: WM3 1st Edition 2015
Data source date: 25 May 2015
Hazard Statements: None.

- **acenaphthylene** (EC Number: 205-917-1, CAS Number: 208-96-8)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 17 Jul 2015
Hazard Statements: Acute Tox. 4; H302 , Acute Tox. 1; H330 , Acute Tox. 1; H310 , Eye Irrit. 2; H319 , STOT SE 3; H335 , Skin Irrit. 2; H315

- **acenaphthene** (EC Number: 201-469-6, CAS Number: 83-32-9)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 17 Jul 2015
Hazard Statements: Eye Irrit. 2; H319 , STOT SE 3; H335 , Skin Irrit. 2; H315 , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410 , Aquatic Chronic 2; H411

- **fluorene** (EC Number: 201-695-5, CAS Number: 86-73-7)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 06 Aug 2015
Hazard Statements: Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

- **phenanthrene** (EC Number: 201-581-5, CAS Number: 85-01-8)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 06 Aug 2015
Hazard Statements: Acute Tox. 4; H302 , Eye Irrit. 2; H319 , STOT SE 3; H335 , Carc. 2; H351 , Skin Sens. 1; H317 , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410 , Skin Irrit. 2; H315

- **anthracene** (EC Number: 204-371-1, CAS Number: 120-12-7)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 17 Jul 2015
Hazard Statements: Eye Irrit. 2; H319 , STOT SE 3; H335 , Skin Irrit. 2; H315 , Skin Sens. 1; H317 , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

- **fluoranthene** (EC Number: 205-912-4, CAS Number: 206-44-0)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 21 Aug 2015
Hazard Statements: Acute Tox. 4; H302 , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

- **pyrene** (EC Number: 204-927-3, CAS Number: 129-00-0)

Description/Comments: Data from C&L Inventory Database; SDS Sigma Aldrich 2014
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 21 Aug 2015
Hazard Statements: Skin Irrit. 2; H315 , Eye Irrit. 2; H319 , STOT SE 3; H335 , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

- **indeno[123-cd]pyrene** (EC Number: 205-893-2, CAS Number: 193-39-5)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 06 Aug 2015
Hazard Statements: Carc. 2; H351

- **benzo[ghi]perylene** (EC Number: 205-883-8, CAS Number: 191-24-2)

Description/Comments: Data from C&L Inventory Database; SDS Sigma Aldrich 28/02/2015
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 23 Jul 2015
Hazard Statements: Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

- **coronene** (EC Number: 205-881-7, CAS Number: 191-07-1)

Description/Comments: Data from C&L Inventory Database; no entries in Registered Substances or Pesticides Properties databases; SDS: Sigma Aldrich, 1907/2006 compliant, dated 2012 - no entries; IARC – Group 3, not carcinogenic.
Data source: http://clp-inventory.echa.europa.eu/SummaryOfClassAndLabelling.aspx?SubstanceID=17010&HarmOnly=no?fc=true&lang=en
Data source date: 16 Jun 2014
Hazard Statements: STOT SE 2; H371

- **barium sulfate** (EC Number: 231-784-4, CAS Number: 7727-43-7)

Description/Comments: No hazard statements
Data source: https://echa.europa.eu/information-on-chemicals/cl-inventory-database/-/discli/details/89983 Sigma Aldrich SDS dated 15/4/19
Data source date: 02 Apr 2020
Hazard Statements: None.

- **divanadium pentaoxide; vanadium pentoxide** (EC Number: 215-239-8, CAS Number: 1314-62-1)

GB MCL index number: 023-001-00-8
Description/Comments:
Additional Hazard Statement(s): Carc. 1B; H350 , Acute Tox. 3; H301 , Acute Tox. 2; H330
Reason for additional Hazards Statement(s):
20 Sep 2022 - Carc. 1B; H350 hazard statement sourced from: ATP 18 (Regulation (EU) 2022/692) considers vanadium pentoxide to be Carc. 1B; H350. The GB MCL Agency has reached the same opinion [but is yet to formerly make this change to the MCL List]. Substance has therefore been self-classified.
28 Sep 2022 - Acute Tox. 3; H301 hazard statement sourced from: ATP 18 (Regulation (EU) 2022/692) considers vanadium pentoxide to be "Acute tox 3; H301". The GB MCL Agency has reached the same opinion [but is yet to formerly make this change to the MCL List]. Substance has therefore been self-classified.
28 Sep 2022 - Acute Tox. 2; H330 hazard statement sourced from: ATP 18 (Regulation (EU) 2022/692) considers vanadium pentoxide to be "Acute tox 2; H330". The GB MCL Agency has reached the same opinion [but is yet to formerly make this change to the MCL List]. Substance has therefore been self-classified.

- **ethylbenzene** (EC Number: 202-849-4, CAS Number: 100-41-4)

GB MCL index number: 601-023-00-4
Description/Comments:
Additional Hazard Statement(s): Carc. 2; H351
Reason for additional Hazards Statement(s):
20 Nov 2021 - Carc. 2; H351 hazard statement sourced from: IARC Group 2B (77) 2000

- **polychlorobiphenyls; PCB** (EC Number: 215-648-1, CAS Number: 1336-36-3)

GB MCL index number: 602-039-00-4
Description/Comments: Worst Case: IARC considers PCB Group 1; Carcinogenic to humans; POP specific threshold from ATP1 (Regulation 756/2010/EU) to POPs Regulation (Regulation 850/2004/EC). Where applicable, the calculation method laid down in European standards EN 12766-1 and EN 12766-2 shall be applied.
Additional Hazard Statement(s): Carc. 1A; H350
Reason for additional Hazards Statement(s):
20 Nov 2021 - Carc. 1A; H350 hazard statement sourced from: IARC Group 1 (23, Sup 7, 100C) 2012

Appendix B: Rationale for selection of metal species

arsenic {arsenic trioxide}

Reasonable case CLP species based on hazard statements/molecular weight and most common (stable) oxide of arsenic. Industrial sources include: smelting; main precursor to other arsenic compounds (edit as required)

barium {barium sulfate}

No hexavalent chromium detected.

beryllium {beryllium oxide}

Reasonable case CLP species based on hazard statements/molecular weight. Industrial sources include: most common (non alloy) form, used in ceramics (edit as required)

boron {diboron trioxide; boric oxide}

Reasonable case CLP species based on hazard statements/ molecular weight, physical form and low solubility. Industrial sources include: fluxing agent for glass/enamels; additive for fibre optics, borosilicate glass (edit as required)

cadmium {cadmium oxide}

Reasonable case CLP species based on hazard statements/molecular weight, very low solubility in water. Industrial sources include: electroplating baths, electrodes for storage batteries, catalysts, ceramic glazes, phosphors, pigments and nematocides. (edit as required) Worst case compounds in CLP: cadmium sulphate, chloride, fluoride & iodide not expected as either very soluble and/or compound's industrial usage not related to site history (edit as required)

chromium in chromium(VI) compounds {chromium(VI) oxide}

Worst case CLP species based on hazard statements/molecular weight. Industrial sources include: production stainless steel, electroplating, wood preservation, anti-corrosion agents or coatings, pigments (edit as required)

copper {dicopper oxide; copper (I) oxide}

Reasonable case CLP species based on hazard statements/molecular weight and insolubility in water. Industrial sources include: oxidised copper metal, brake pads, pigments, antifouling paints, fungicide. (edit as required) Worse case copper sulphate is very soluble and likely to have been leached away if ever present and/or not enough soluble sulphate detected. (edit as required)

lead {lead chromate}

Worst case CLP species based on hazard statements/molecular weight (edit as required)

mercury {mercury dichloride}

Worst case CLP species based on hazard statements/molecular weight (edit as required)

nickel {nickel chromate}

Worst case CLP species based on hazard statements/molecular weight (edit as required)

selenium {selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex}

Harmonised group entry used as most reasonable case. Pigment cadmium sulphoselenide not likely to be present in this soil. No evidence for the other CLP entries: sodium selenite, nickel II selenite and nickel selenide, to be present in this soil. (edit as required)

vanadium {divanadium pentaoxide; vanadium pentoxide}

Worst case CLP species based on hazard statements/molecular weight (edit as required)

zinc {zinc chromate}

Worst case CLP species based on hazard statements/molecular weight (edit as required)

Appendix C: Version

HazWasteOnline Classification Engine: WM3 1st Edition v1.2.GB - Oct 2021
HazWasteOnline Classification Engine Version: 2023.24.5508.10203 (24 Jan 2023)
HazWasteOnline Database: 2023.24.5508.10203 (24 Jan 2023)

This classification utilises the following guidance and legislation:
WM3 v1.2.GB - Waste Classification - 1st Edition v1.2.GB - Oct 2021
CLP Regulation - Regulation 1272/2008/EC of 16 December 2008
1st ATP - Regulation 790/2009/EC of 10 August 2009
2nd ATP - Regulation 286/2011/EC of 10 March 2011
3rd ATP - Regulation 618/2012/EU of 10 July 2012
4th ATP - Regulation 487/2013/EU of 8 May 2013
Correction to 1st ATP - Regulation 758/2013/EU of 7 August 2013
5th ATP - Regulation 944/2013/EU of 2 October 2013
6th ATP - Regulation 605/2014/EU of 5 June 2014
WFD Annex III replacement - Regulation 1357/2014/EU of 18 December 2014
Revised List of Waste 2014 - Decision 2014/955/EU of 18 December 2014
7th ATP - Regulation 2015/1221/EU of 24 July 2015
8th ATP - Regulation (EU) 2016/918 of 19 May 2016
9th ATP - Regulation (EU) 2016/1179 of 19 July 2016
10th ATP - Regulation (EU) 2017/776 of 4 May 2017
HP14 amendment - Regulation (EU) 2017/997 of 8 June 2017
13th ATP - Regulation (EU) 2018/1480 of 4 October 2018
14th ATP - Regulation (EU) 2020/217 of 4 October 2019
15th ATP - Regulation (EU) 2020/1182 of 19 May 2020
The Chemicals (Health and Safety) and Genetically Modified Organisms (Contained Use)(Amendment etc.) (EU Exit) Regulations 2020 - UK: 2020 No. 1567 of 16th December 2020
The Waste and Environmental Permitting etc. (Legislative Functions and Amendment etc.) (EU Exit) Regulations 2020 - UK: 2020 No. 1540 of 16th December 2020
GB MCL List - version 1.1 of 09 June 2021

WASTE ACCEPTANCE CRITERIA
(WAC) ASSESSMENT

Site: LS6678 - Nicholas Way
Date: 25/01/2023

Assesment Criteria	Inert Waste Landfill	SNRHW Landfill	Hazardous Waste Landfill									
				Sample	Position	**DS03**	-	-	-	-	-	-
					Depth	**0.50**	-	-	-	-	-	-
					Sample ref	**None Supplied**	-	-	-	-	-	-
					Preliminary Hazardous Assessment*	Non-Hazardous						
	--	6.0	--	Solid Analysis	pH (units)	5.9	-	-	-	-	-	-
	3	5	6		Total Organic Carbon (TOC) (%)	0.3	-	-	-	-	-	-
	--	--	10		Loss on Ignition @ 450oC (%)	5.2	-	-	-	-	-	-
	--	to be evaluated			Acid Neutralisation Capacity (mol/kg)	-1.4	-	-	-	-	-	-
	6000	--	--		BTEX (µg/kg)	0	-	-	-	-	-	-
	1	--	--		Total PCB's (mg/kg)	0	-	-	-	-	-	-
	500	--	--		Mineral Oil (mg/kg)	< 0.001	-	-	-	-	-	-
	100	--	--		Total PAH (mg/kg)	< 0.85	-	-	-	-	-	-
	0.50	2	25	10:1 WAC Leachate Analysis (mg/kg equivalent)	Arsenic	< 0.0100	-	-	-	-	-	-
	20	100	300		Barium	0.0391	-	-	-	-	-	-
	0.0400	1	5		Cadmium	< 0.0008	-	-	-	-	-	-
	0.5	10	70		Chromium	< 0.0040	-	-	-	-	-	-
	2	50	100		Copper	0.08	-	-	-	-	-	-
	0.01	0.2	2		Mercury	< 0.0050	-	-	-	-	-	-
	0.500	10	30		Molybdenum	< 0.0040	-	-	-	-	-	-
	0.400	10	40		Nickel	0.022	-	-	-	-	-	-
	0.5	10	50		Lead	0.011	-	-	-	-	-	-
	0.060	0.7	5		Antimony	< 0.017	-	-	-	-	-	-
	0.10	0.5	7		Selenium	< 0.040	-	-	-	-	-	-
	4	50	200		Zinc	0.12	-	-	-	-	-	-
	800	15000	25000		Chloride	150	-	-	-	-	-	-
	10	150	500		Fluoride	< 0.50	-	-	-	-	-	-
	1000	20000	50000		Sulphate	290	-	-	-	-	-	-
	4000	60000	100000		Total dissolved solids	730	-	-	-	-	-	-
	1	--	--		Total monohydric phenols	< 0.10	-	-	-	-	-	-
	500	800	1000		Dissolved organic carbon	32.7	-	-	-	-	-	-
					Classification	**Inert**						

*Soils are classified as Hazardous or Non-Hazardous based on the total soils analysis. The WAC test is then used to potentially sub-classify as Inert or Stable Non-Reactive Hazardous Waste (SNRHW). Where a material is Hazardous, a WAC test is mandatory, and where it **exceeds** the Hazardous waste limit, the material must be pre-treated to reduce the hazardous constituents to be below the WAC limit.*

Unit 10, 19 Albert Drive, Burgess Hill, **West Sussex,** RH15 9TN
2nd Floor, 25-28 Field Street, **London,** WC1X 9DA
W: www.landscience.co.uk **T:** 03456046494

APPENDIX G

Envirocheck® Report:

Mining and Ground Stability Datasheet

Order Details:

Order Number:
306175893_1_1

Customer Reference:
LS6678

National Grid Reference:
508110, 190720

Slice:
A

Site Area (Ha):
0.36

Search Buffer (m):
1000

Site Details:

28, Nicholas Way
NORTHWOOD
HA6 2TT

Client Details:

Mr E Toms
Land Science Ltd
Unit 10
19 Albert Drive
Burgess Hill
West Sussex
RH15 9TN

Contents

Report Version v53.0

Data Type	Page Number	On Site	0 to 250m	251 to 500m	501 to 1000m
Mining and Natural Cavities Data					
BGS Recorded Mineral Sites	pg 1				11
Coal Mining Affected Areas			n/a	n/a	n/a
Man Made Mining Cavities					
Mining Instability			n/a	n/a	n/a
Natural Cavities					
Non Coal Mining Areas of Great Britain	pg 2	Yes		n/a	n/a
Potential Mining Areas					
Historical Land Use Information (1:2,500)					
Extractive Industries or Potential Excavations from 1855-1909 (100m)				n/a	n/a
Extractive Industries or Potential Excavations from 1893-1915 (100m)				n/a	n/a
Extractive Industries or Potential Excavations from 1906-1937 (100m)				n/a	n/a
Extractive Industries or Potential Excavations from 1924-1949 (100m)				n/a	n/a
Extractive Industries or Potential Excavations from 1950-1980 (100m)				n/a	n/a
Subterranean Features (100m)				n/a	n/a
Historical Land Use Information (1:10,000)					
Air Shafts					
Disturbed Ground					
General Quarrying					
Heap, unknown constituents					
Mineral Railway					
Mining & quarrying general					
Mining of coal & lignite					
Quarrying of sand & clay, operation of sand & gravel pits	pg 3				6
Former Marshes					
Potentially Infilled Land (Non-Water)	pg 3				4
Potentially Infilled Land (Water)	pg 3			1	6
Ground Stability Data (1:50,000)					
CBSCB Compensation District			n/a	n/a	n/a
Brine Pumping Related Features					
Brine Subsidence Solution Area					
Potential for Collapsible Ground Stability Hazards	pg 4	Yes		n/a	n/a
Potential for Compressible Ground Stability Hazards	pg 4	Yes		n/a	n/a
Potential for Ground Dissolution Stability Hazards	pg 4	Yes		n/a	n/a
Potential for Landslide Ground Stability Hazards	pg 4	Yes		n/a	n/a
Potential for Running Sand Ground Stability Hazards	pg 4	Yes		n/a	n/a
Potential for Shrinking or Swelling Clay Ground Stability Hazards	pg 4	Yes	Yes	n/a	n/a
Salt Mining Related Features					

Summary

Mining and Natural Cavities Data

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
1	**BGS Recorded Mineral Sites** Site Name: Northwood Pits Location: Northwood, Middlesex Source: British Geological Survey, National Geoscience Information Service Reference: 154702 Type: Opencast **Status: Ceased** Operator: Unknown Operator Operator Location: Not Supplied Periodic Type: Cretaceous Geology: White Chalk Subgroup Commodity: Chalk Positional Accuracy: Located by supplier to within 10m	A18SE (NE)	598	1	508380 191300
1	**BGS Recorded Mineral Sites** Site Name: Northwood Pits Location: Northwood, Middlesex Source: British Geological Survey, National Geoscience Information Service Reference: 154702 Type: Opencast **Status: Ceased** Operator: Unknown Operator Operator Location: Not Supplied Periodic Type: Palaeogene Geology: Lambeth Group Commodity: Common Clay and Shale Positional Accuracy: Located by supplier to within 10m	A18SE (NE)	598	1	508380 191300
1	**BGS Recorded Mineral Sites** Site Name: Northwood Pits Location: Northwood, Middlesex Source: British Geological Survey, National Geoscience Information Service Reference: 154702 Type: Opencast **Status: Ceased** Operator: Unknown Operator Operator Location: Not Supplied Periodic Type: Palaeogene Geology: Lambeth Group Commodity: Sand Positional Accuracy: Located by supplier to within 10m	A18SE (NE)	598	1	508380 191300
2	**BGS Recorded Mineral Sites** Site Name: Northwood Pits Location: Northwood, Middlesex Source: British Geological Survey, National Geoscience Information Service Reference: 154701 Type: Opencast **Status: Ceased** Operator: Unknown Operator Operator Location: Not Supplied Periodic Type: Cretaceous Geology: White Chalk Subgroup Commodity: Chalk Positional Accuracy: Located by supplier to within 10m	A18NE (NE)	710	1	508410 191410
3	**BGS Recorded Mineral Sites** Site Name: Northwood Pits Location: Northwood, Middlesex Source: British Geological Survey, National Geoscience Information Service Reference: 154703 Type: Opencast **Status: Ceased** Operator: Unknown Operator Operator Location: Not Supplied Periodic Type: Palaeogene Geology: Lambeth Group Commodity: Sand Positional Accuracy: Located by supplier to within 10m	A19SW (NE)	719	1	508480 191385
4	**BGS Recorded Mineral Sites** Site Name: Northwood Pits Location: Northwood, Middlesex Source: British Geological Survey, National Geoscience Information Service Reference: 154704 Type: Opencast **Status: Ceased** Operator: Unknown Operator Operator Location: Not Supplied Periodic Type: Palaeogene Geology: Lambeth Group Commodity: Sand Positional Accuracy: Located by supplier to within 10m	A19SW (NE)	778	1	508575 191395

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
4	**BGS Recorded Mineral Sites** Site Name: Northwood Pits Location: Northwood, Middlesex Source: British Geological Survey, National Geoscience Information Service Reference: 154704 Type: Opencast **Status: Ceased** Operator: Unknown Operator Operator Location: Not Supplied Periodic Type: Palaeogene Geology: Lambeth Group Commodity: Common Clay and Shale Positional Accuracy: Located by supplier to within 10m	A19SW (NE)	778	1	508575 191395
5	**BGS Recorded Mineral Sites** Site Name: Northwood Pits Location: Northwood, Middlesex Source: British Geological Survey, National Geoscience Information Service Reference: 154705 Type: Opencast **Status: Ceased** Operator: Unknown Operator Operator Location: Not Supplied Periodic Type: Palaeogene Geology: Lambeth Group Commodity: Sand Positional Accuracy: Located by supplier to within 10m	A19NW (NE)	895	1	508690 191455
5	**BGS Recorded Mineral Sites** Site Name: Northwood Pits Location: Northwood, Middlesex Source: British Geological Survey, National Geoscience Information Service Reference: 154705 Type: Opencast **Status: Ceased** Operator: Unknown Operator Operator Location: Not Supplied Periodic Type: Cretaceous Geology: White Chalk Subgroup Commodity: Chalk Positional Accuracy: Located by supplier to within 10m	A19NW (NE)	895	1	508690 191455
6	**BGS Recorded Mineral Sites** Site Name: Northwood Pits Location: Northwood, Middlesex Source: British Geological Survey, National Geoscience Information Service Reference: 154706 Type: Opencast **Status: Ceased** Operator: Unknown Operator Operator Location: Not Supplied Periodic Type: Cretaceous Geology: White Chalk Subgroup Commodity: Chalk Positional Accuracy: Located by supplier to within 10m	A19NW (NE)	940	1	508765 191450
6	**BGS Recorded Mineral Sites** Site Name: Northwood Pits Location: Northwood, Middlesex Source: British Geological Survey, National Geoscience Information Service Reference: 154706 Type: Opencast **Status: Ceased** Operator: Unknown Operator Operator Location: Not Supplied Periodic Type: Palaeogene Geology: Lambeth Group Commodity: Sand Positional Accuracy: Located by supplier to within 10m	A19NW (NE)	940	1	508765 191450
	Coal Mining Affected Areas In an area which may not be affected by coal mining				
	Non Coal Mining Areas of Great Britain Risk: Unlikely Source: British Geological Survey, National Geoscience Information Service	A13NW (S)	0	1	508113 190723

Historical Land Use Information (1:10,000)

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
7	**Quarrying of sand & clay, operation of sand & gravel pits** Use: Not Supplied Date of Mapping: 1877	A18SE (NE)	539	-	508342 191253
8	**Quarrying of sand & clay, operation of sand & gravel pits** Use: Not Supplied Date of Mapping: 1938	A14SE (E)	720	-	508869 190673
9	**Quarrying of sand & clay, operation of sand & gravel pits** Use: Not Supplied Date of Mapping: 1938	A9NE (SE)	831	-	508840 190261
10	**Quarrying of sand & clay, operation of sand & gravel pits** Use: Not Supplied Date of Mapping: 1877	A19NW (NE)	853	-	508664 191422
11	**Quarrying of sand & clay, operation of sand & gravel pits** Use: Not Supplied Date of Mapping: 1877	A19SW (NE)	882	-	508782 191354
12	**Quarrying of sand & clay, operation of sand & gravel pits** Use: Not Supplied Date of Mapping: 1916	A15NW (E)	996	-	509143 190821
13	**Potentially Infilled Land (Non-Water)** Use: Unknown Filled Ground (Pit, quarry etc) Date of Mapping: 1990	A18SE (NE)	539	-	508342 191253
14	**Potentially Infilled Land (Non-Water)** Use: Unknown Filled Ground (Pit, quarry etc) Date of Mapping: 1990	A19NW (NE)	853	-	508664 191422
15	**Potentially Infilled Land (Non-Water)** Use: Unknown Filled Ground (Pit, quarry etc) Date of Mapping: 1990	A19SW (NE)	882	-	508782 191354
16	**Potentially Infilled Land (Non-Water)** Use: Unknown Filled Ground (Pit, quarry etc) Date of Mapping: 1990	A14NE (E)	970	-	509121 190753
17	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1960	A12NE (W)	387	-	507694 190730
18	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1920	A19SW (NE)	640	-	508537 191251
19	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1899	A19SW (NE)	722	-	508657 191253
20	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1960	A19SW (NE)	772	-	508755 191216
21	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1883	A14SE (E)	798	-	508942 190629
22	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1920	A18NW (N)	949	-	508019 191710
23	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1960	A19NE (NE)	966	-	508816 191438

Ground Stability Data (1:50,000)

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	CBSCB Compensation District The site does not fall within the brine compensation area.				
	Brine Subsidence Solution Area The site does not fall within the brine subsidence solution area.				
24	**Potential for Collapsible Ground Stability Hazards** Hazard Potential: Very Low Source: British Geological Survey, National Geoscience Information Service	A13NW (S)	0	1	508113 190723
	Potential for Compressible Ground Stability Hazards Hazard Potential: No Hazard Source: British Geological Survey, National Geoscience Information Service	A13NW (S)	0	1	508113 190723
	Potential for Ground Dissolution Stability Hazards Hazard Potential: No Hazard Source: British Geological Survey, National Geoscience Information Service	A13NW (S)	0	1	508113 190723
25	**Potential for Landslide Ground Stability Hazards** Hazard Potential: Very Low Source: British Geological Survey, National Geoscience Information Service	A13NW (S)	0	1	508113 190723
26	**Potential for Running Sand Ground Stability Hazards** Hazard Potential: Very Low Source: British Geological Survey, National Geoscience Information Service	A13NW (S)	0	1	508113 190723
27	**Potential for Shrinking or Swelling Clay Ground Stability Hazards** Hazard Potential: Low Source: British Geological Survey, National Geoscience Information Service	A13NW (S)	0	1	508113 190723
28	**Potential for Shrinking or Swelling Clay Ground Stability Hazards** Hazard Potential: Moderate Source: British Geological Survey, National Geoscience Information Service	A13SE (SE)	177	1	508238 190553

Historical Map List

The following mapping has been analysed for Historical Land Use Information (1:2,500):

1:2,500	Mapsheet	Published Date
Middlesex	010_01	1865
Middlesex	009_04	1890
Middlesex	009_04	1895
Middlesex	010_01	1896
Middlesex	010_01	1913
Middlesex	009_04	1914
Middlesex	010_01	1932
Middlesex	009_04	1934
Ordnance Survey Plan	TQ0790	1961
Ordnance Survey Plan	TQ0791	1961

Historical Map List

The following mapping has been analysed for Historical Land Use Information (1:10,000):

1:10,560	Mapsheet	Published Date
Middlesex	010_00	1868
Middlesex	005_00	1877
Hertfordshire	043_00	1878
Middlesex	004_00	1883
Middlesex	009_00	1883
Buckinghamshire	049_00	1883
Middlesex	010_NW	1897
Middlesex	004_SE	1899
Middlesex	005_SW	1899
Hertfordshire	043_SE	1899
Hertfordshire	044_SW	1899
Middlesex	009_NE	1900
Hertfordshire	047_NE	1900
Buckinghamshire	049_SW	1900
Middlesex	009_NE	1916
Middlesex	010_NW	1916
Hertfordshire	047_NE	1916
Middlesex	004_SE	1920
Middlesex	005_SW	1920
Hertfordshire	043_SE	1920
Hertfordshire	044_SW	1920
Middlesex	009_NE	1934
Hertfordshire	043_SE	1934
Hertfordshire	044_SW	1934
Hertfordshire	047_NE	1934
Middlesex	004_SE	1938
Middlesex	005_SW	1938
Middlesex	010_NW	1938
Ordnance Survey Plan	TQ08NE	1960
Ordnance Survey Plan	TQ09SE	1960
1:10,000	**Mapsheet**	**Published Date**
Ordnance Survey Plan	TQ08NE	1989
Ordnance Survey Plan	TQ09SE	1990

Mining and Cavities Data	Version	Update Cycle
BGS Recorded Mineral Sites British Geological Survey - National Geoscience Information Service	November 2022	Bi-Annually
Coal Mining Affected Areas The Coal Authority - Property Searches	March 2014	Annual Rolling Update
Man Made Mining Cavities Stantec UK Ltd	December 2021	Bi-Annually
Mining Instability Ove Arup & Partners	June 1998	Not Applicable
Natural Cavities Stantec UK Ltd	December 2022	Bi-Annually
Non Coal Mining Areas of Great Britain British Geological Survey - National Geoscience Information Service	May 2015	Not Applicable
Historical Land Use Information (1:2,500)	**Version**	**Update Cycle**
Subterranean Features Landmark Information Group Limited	June 2022	Bi-Annually
Ground Stability Data (1:50,000)	**Version**	**Update Cycle**
CBSCB Compensation District Cheshire Brine Subsidence Compensation Board (CBSCB) Cheshire Brine Subsidence Compensation Board (CBSCB)	August 2011 November 2020	As notified
Potential for Collapsible Ground Stability Hazards British Geological Survey - National Geoscience Information Service	April 2020	As notified
Potential for Compressible Ground Stability Hazards British Geological Survey - National Geoscience Information Service	January 2019	As notified
Potential for Ground Dissolution Stability Hazards British Geological Survey - National Geoscience Information Service	January 2019	As notified
Potential for Landslide Ground Stability Hazards British Geological Survey - National Geoscience Information Service	January 2019	As notified
Potential for Running Sand Ground Stability Hazards British Geological Survey - National Geoscience Information Service	January 2019	As notified
Potential for Shrinking or Swelling Clay Ground Stability Hazards British Geological Survey - National Geoscience Information Service	January 2019	As notified
Brine Subsidence Solution Area Johnson Poole & Bloomer	December 2020	Annual Rolling Update

Data Suppliers

A selection of organisations who provide data within this report

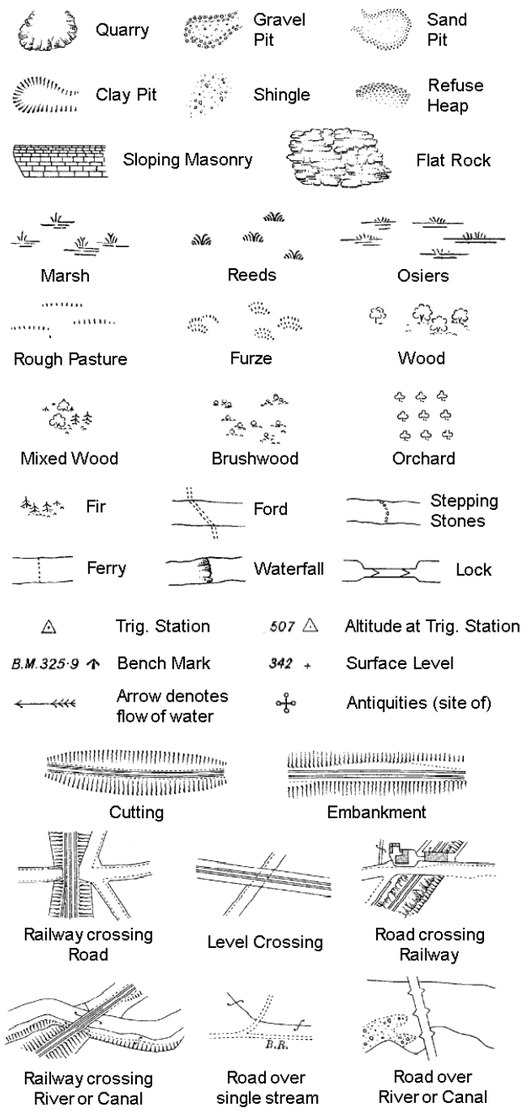
Data Supplier	Data Supplier Logo
Ordnance Survey	
British Geological Survey	
The Coal Authority	
Ove Arup	
Stantec UK Ltd	
Wardell Armstrong	
Johnson Poole & Bloomer	

Useful Contacts

Contact	Name and Address	Contact Details
1	**British Geological Survey - Enquiry Service** British Geological Survey, Environmental Science Centre, Keyworth, Nottingham, Nottinghamshire, NG12 5GG	Telephone: 0115 936 3143 Fax: 0115 936 3276 Email: enquiries@bgs.ac.uk Website: www.bgs.ac.uk
2	**Ove Arup & Partners** Central Square, Forth Street, Newcastle upon Tyne, Tyne and Wear, NE1 3PL	Telephone: 0191 261 6080 Fax: 0191 261 7879
-	**Landmark Information Group Limited** Imperium, Imperial Way, Reading, Berkshire, RG2 0TD	Telephone: 0844 844 9952 Fax: 0844 844 9951 Email: customerservices@landmarkinfo.co.uk Website: www.landmarkinfo.co.uk

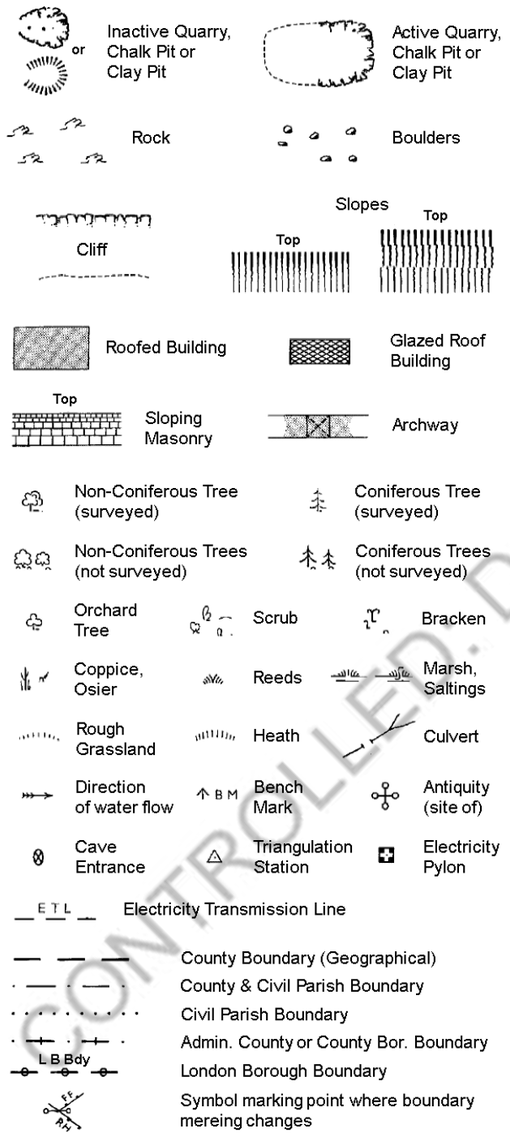
Historical Mapping Legends

Ordnance Survey County Series and Ordnance Survey Plan 1:2,500



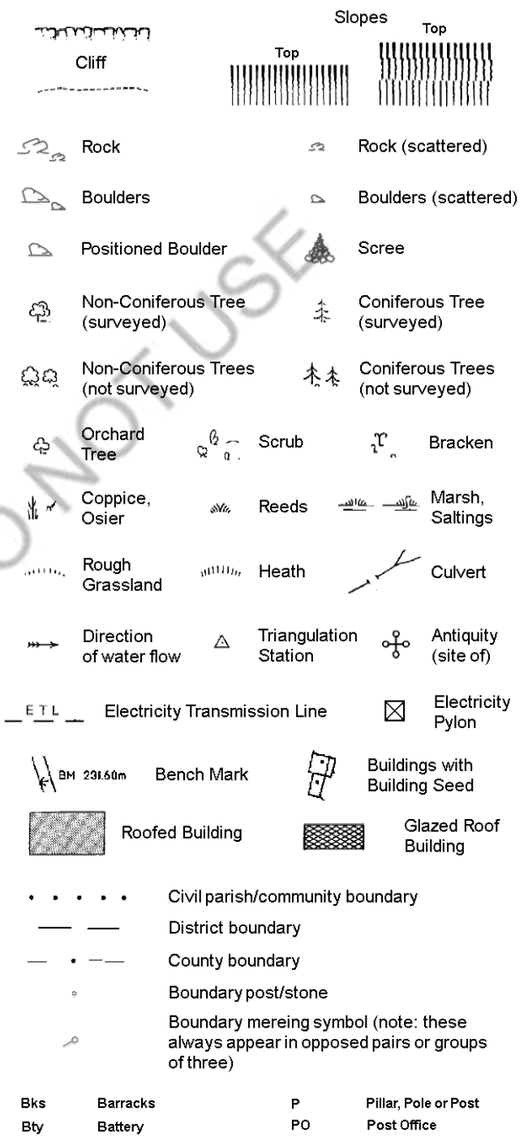
B P B S	Boundary Post or Stone	P.C.B	Police Call Box
B.R.	Bridle Road	P	Pump
E.P	Electricity Pylon	S.P	Signal Post
F.B.	Foot Bridge	Sl.	Sluice
F.P.	Foot Path	Sp.	Spring
G.P	Guide Post or Board	T.C.B	Telephone Call Box
M.S	Mile Stone	Tr.	Trough
M.P M.R	Mooring Post or Ring	W	Well

Ordnance Survey Plan, Additional SIMs and Supply of Unpublished Survey Information 1:2,500 and 1:1,250



BH	Beer House	P	Pillar, Pole or Post
BP, BS	Boundary Post or Stone	PO	Post Office
Cn, C	Capstan, Crane	PC	Public Convenience
Chy	Chimney	PH	Public House
D Fn	Drinking Fountain	Pp	Pump
El P	Electricity Pillar or Post	SB, S Br	Signal Box or Bridge
FAP	Fire Alarm Pillar	SP, SL	Signal Post or Light
FB	Foot Bridge	Spr	Spring
GP	Guide Post	Tk	Tank or Track
H	Hydrant or Hydraulic	TCB	Telephone Call Box
LC	Level Crossing	TCP	Telephone Call Post
MH	Manhole	Tr	Trough
MP	Mile Post or Mooring Post	Wr Pt, Wr T	Water Point, Water Tap
MS	Mile Stone	W	Well
NTL	Normal Tidal Limit	Wd Pp	Wind Pump

Large-Scale National Grid Data 1:2,500 and 1:1,250

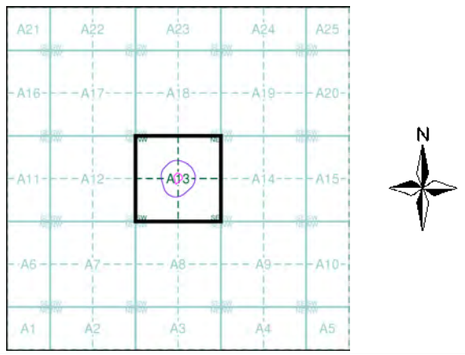


Bks	Barracks	P	Pillar, Pole or Post
Bty	Battery	PO	Post Office
Cemy	Cemetery	PC	Public Convenience
Chy	Chimney	Pp	Pump
Cis	Cistern	Ppg Sta	Pumping Station
Dismtd Rly	Dismantled Railway	PW	Place of Worship
El Gen Sta	Electricity Generating Station	Sewage Ppg Sta	Sewage Pumping Station
El P	Electricity Pole, Pillar	SB, S Br	Signal Box or Bridge
El Sub Sta	Electricity Sub Station	SP, SL	Signal Post or Light
FB	Filter Bed	Spr	Spring
Fn / D Fn	Fountain / Drinking Ftn.	Tk	Tank or Track
Gas Gov	Gas Valve Compound	Tr	Trough
GVC	Gas Governer	Wd Pp	Wind Pump
GP	Guide Post	Wr Pt, Wr T	Water Point, Water Tap
MH	Manhole	Wks	Works (building or area)
MP, MS	Mile Post or Mile Stone	W	Well

Land Science

Historical Mapping & Photography included:

Historical Map - Segment A13



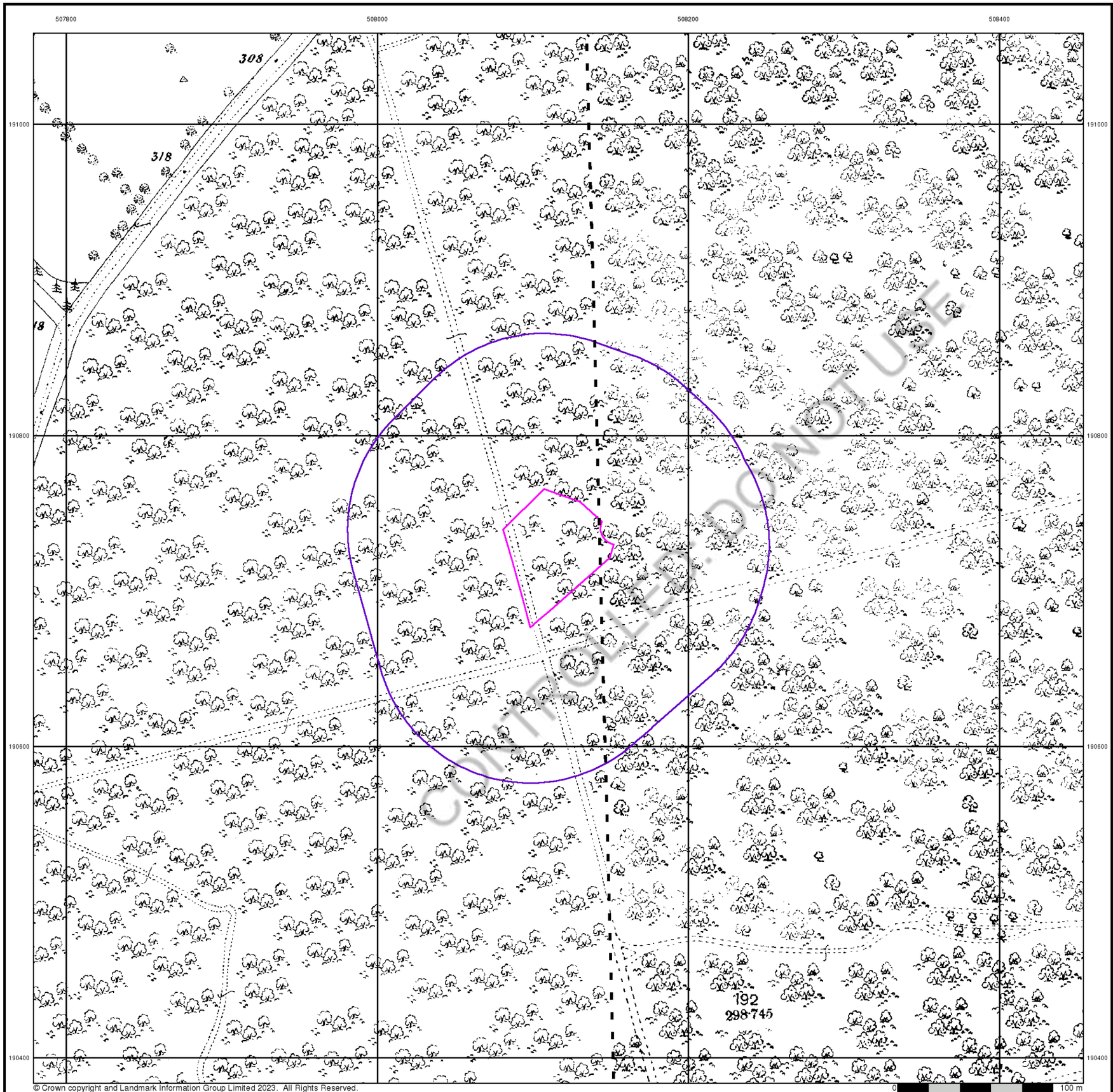
Order Details

Order Number: 306175893_1_1
Customer Ref: LS6678
National Grid Reference: 508110, 190720
Slice: A
Site Area (Ha): 0.36
Search Buffer (m): 100

Site Details

28, Nicholas Way, NORTHWOOD, HA6 2TT

Landmark INFORMATION GROUP
Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk



Land Science

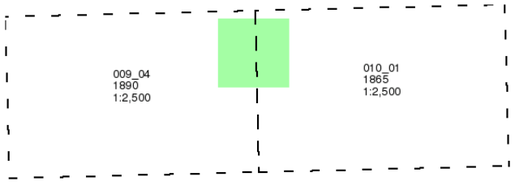
Middlesex

Published 1865 - 1890

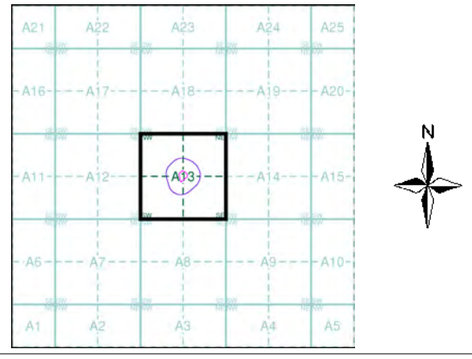
Source map scale - 1:2,500

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)



Historical Map - Segment A13



Order Details

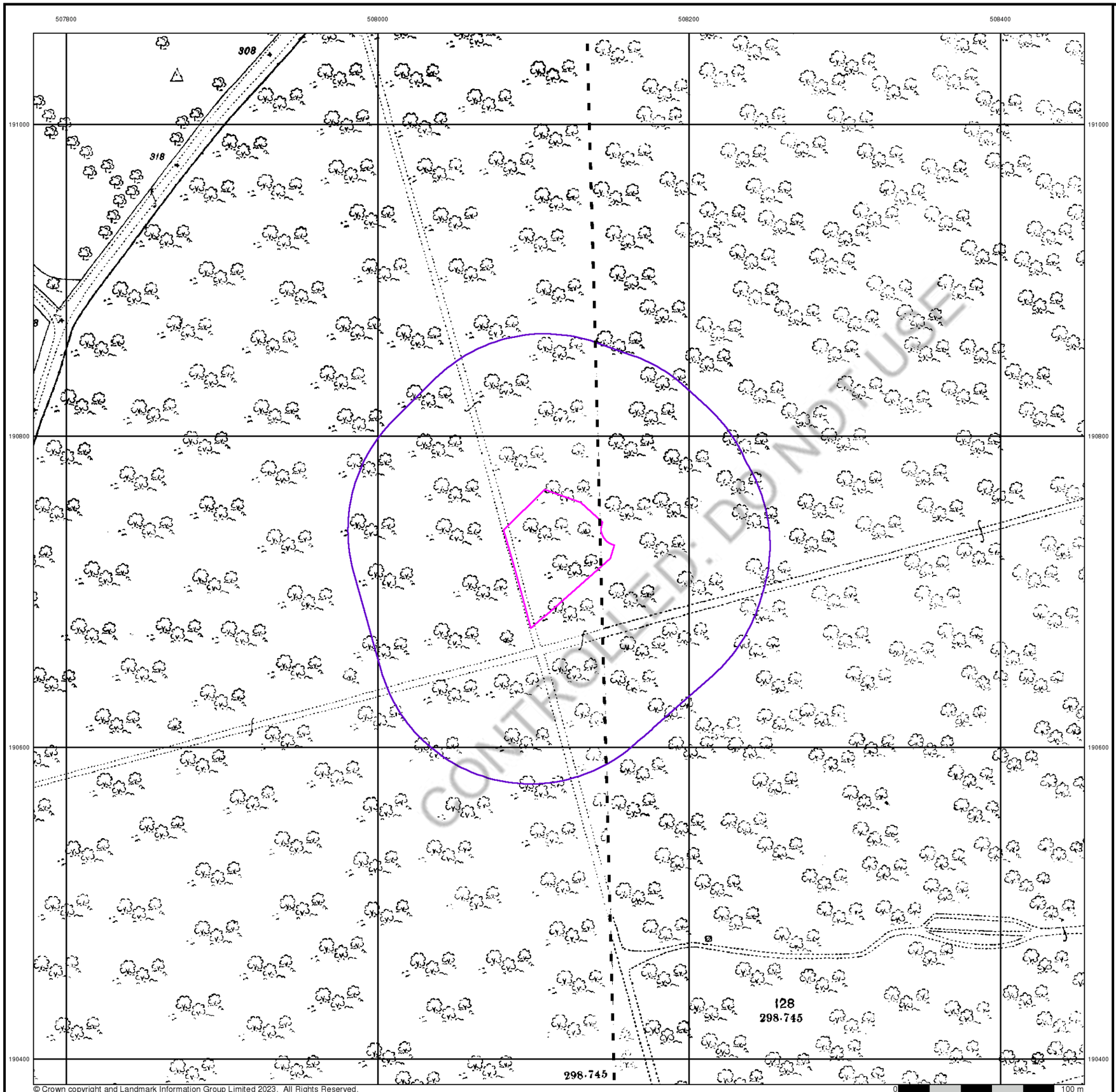
Order Number:	306175893_1_1
Customer Ref:	LS6678
National Grid Reference:	508110, 190720
Slice:	A
Site Area (Ha):	0.36
Search Buffer (m):	100

Site Details

28, Nicholas Way, NORTHWOOD, HA6 2TT

Landmark INFORMATION GROUP

Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk



Land Science

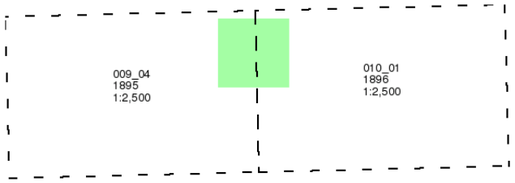
Middlesex

Published 1895 - 1896

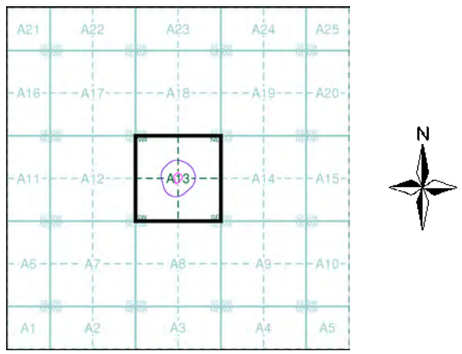
Source map scale - 1:2,500

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)



Historical Map - Segment A13



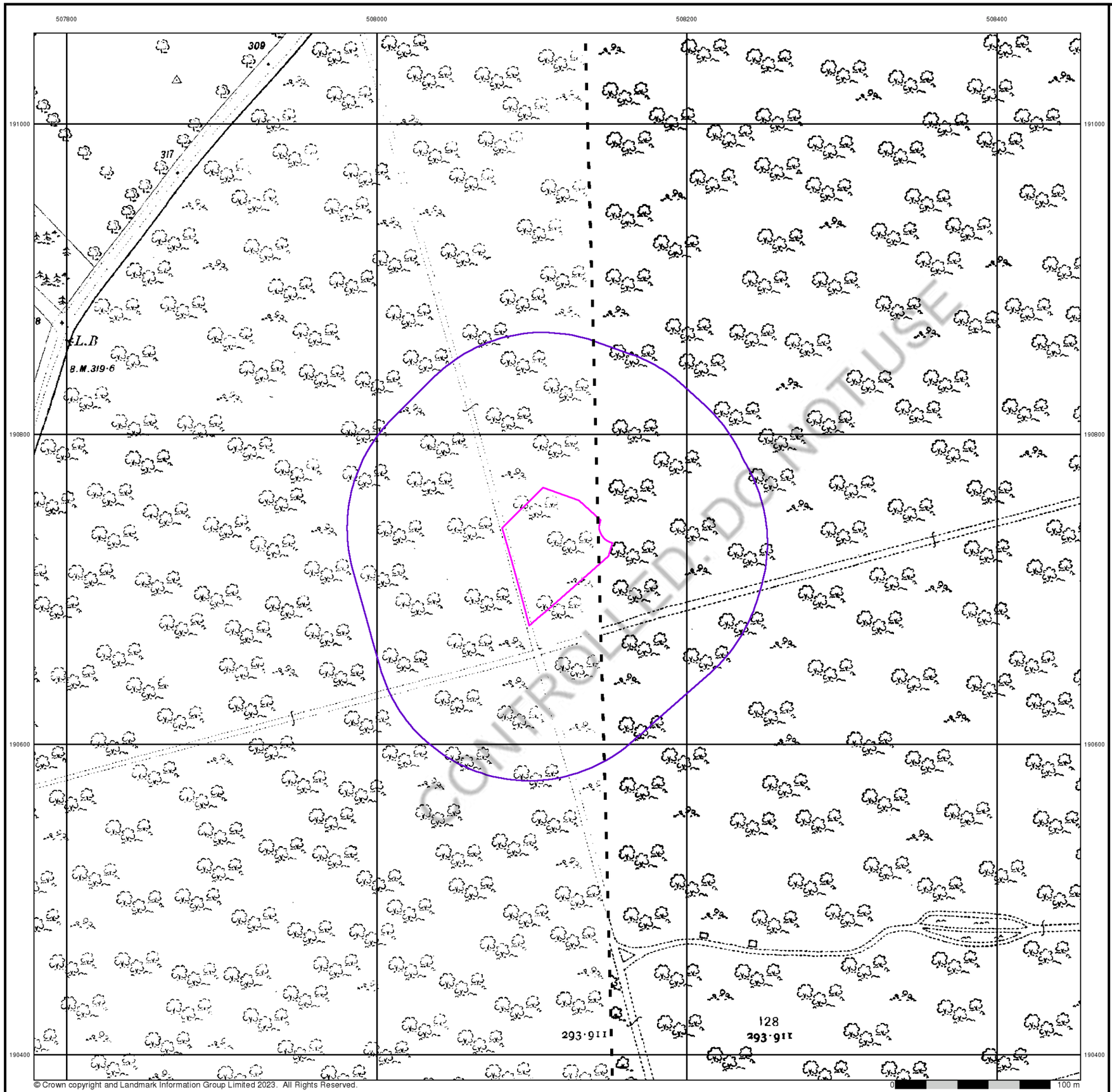
Order Details

Order Number:	306175893_1_1
Customer Ref:	LS6678
National Grid Reference:	508110, 190720
Slice:	A
Site Area (Ha):	0.36
Search Buffer (m):	100

Site Details

28, Nicholas Way, NORTHWOOD, HA6 2TT

Landmark INFORMATION GROUP
Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk



Land Science

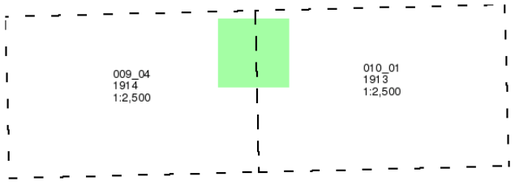
Middlesex

Published 1913 - 1914

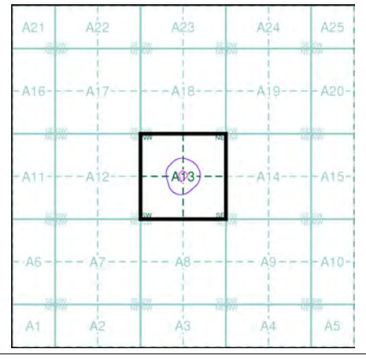
Source map scale - 1:2,500

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)



Historical Map - Segment A13



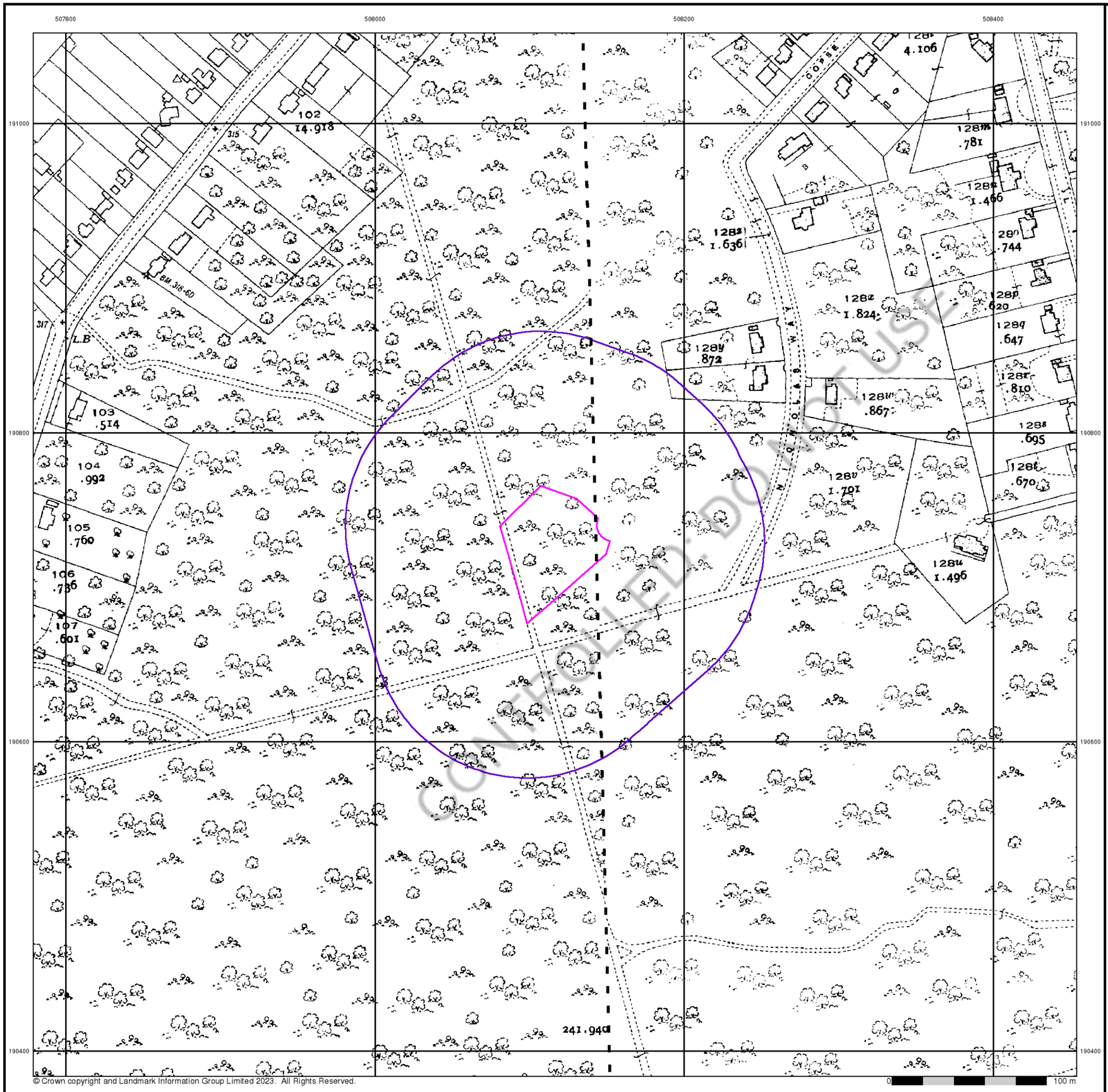
Order Details

Order Number:	306175893_1_1
Customer Ref:	LS6678
National Grid Reference:	508110, 190720
Slice:	A
Site Area (Ha):	0.36
Search Buffer (m):	100

Site Details

28, Nicholas Way, NORTHWOOD, HA6 2TT

Landmark INFORMATION GROUP
Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk



Land Science

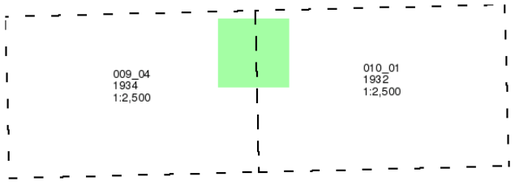
Middlesex

Published 1932 - 1934

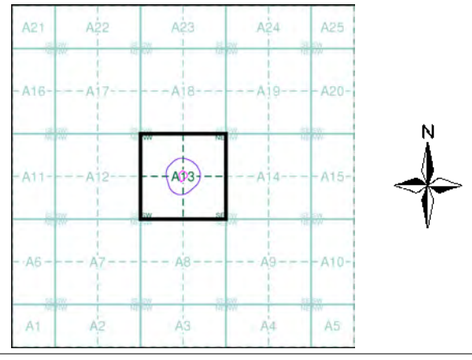
Source map scale - 1:2,500

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)



Historical Map - Segment A13



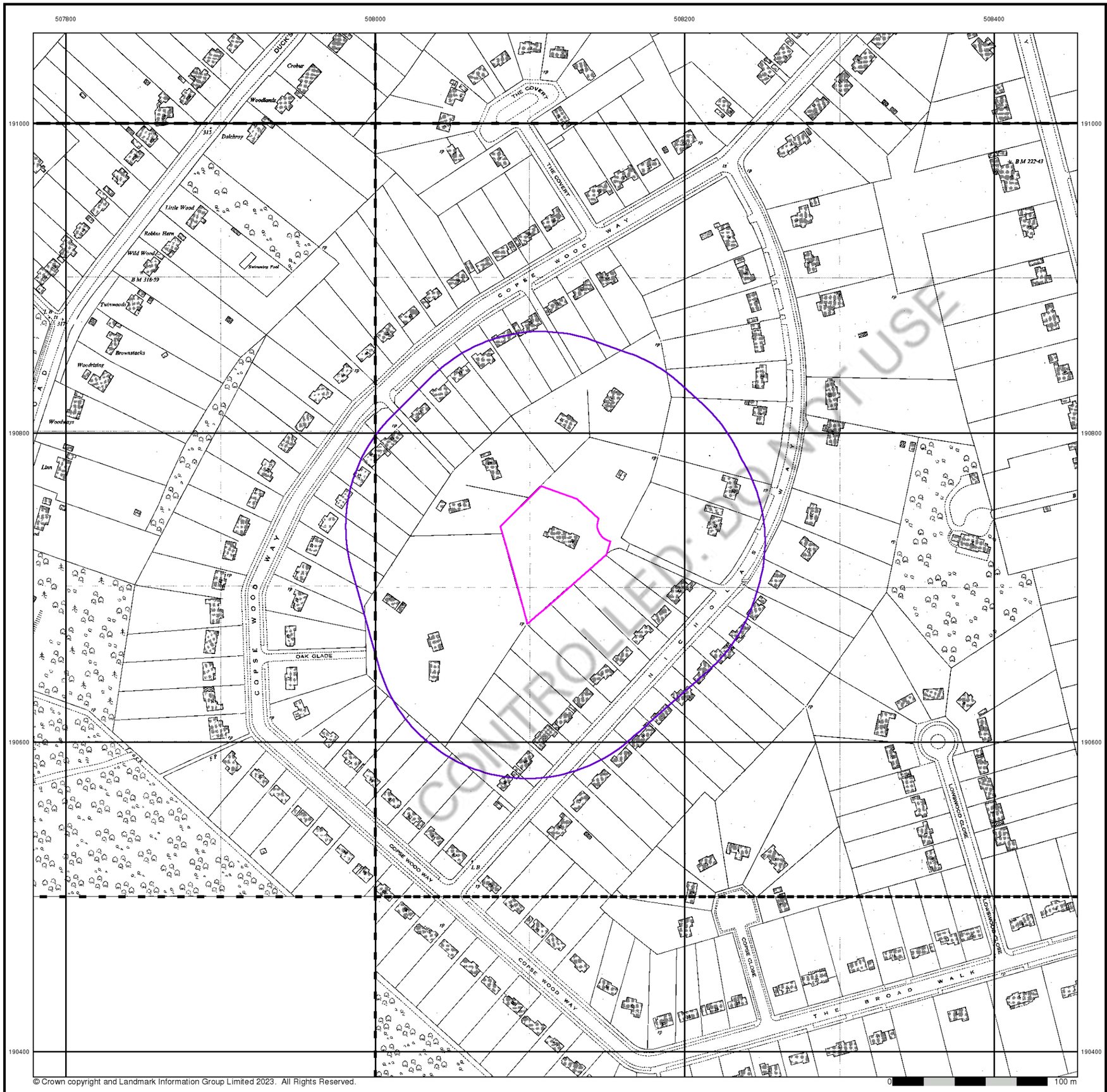
Order Details

Order Number:	306175893_1_1
Customer Ref:	LS6678
National Grid Reference:	508110, 190720
Slice:	A
Site Area (Ha):	0.36
Search Buffer (m):	100

Site Details

28, Nicholas Way, NORTHWOOD, HA6 2TT

Landmark INFORMATION GROUP
Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk



Land Science

Ordnance Survey Plan

Published 1959

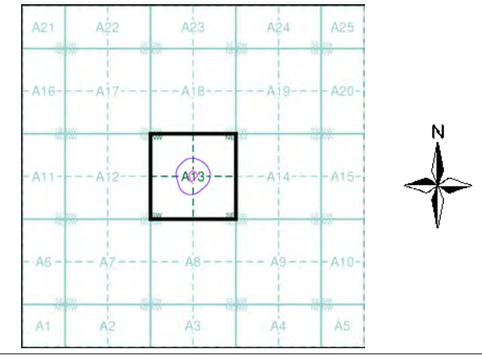
Source map scale - 1:1,250

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)

TQ0791SE 1959 1:1,250
TQ0891SW 1959 1:1,250
TQ0790NE 1959 1:1,250
TQ0890NW 1959 1:1,250
TQ0890SW 1959 1:1,250

Historical Map - Segment A13



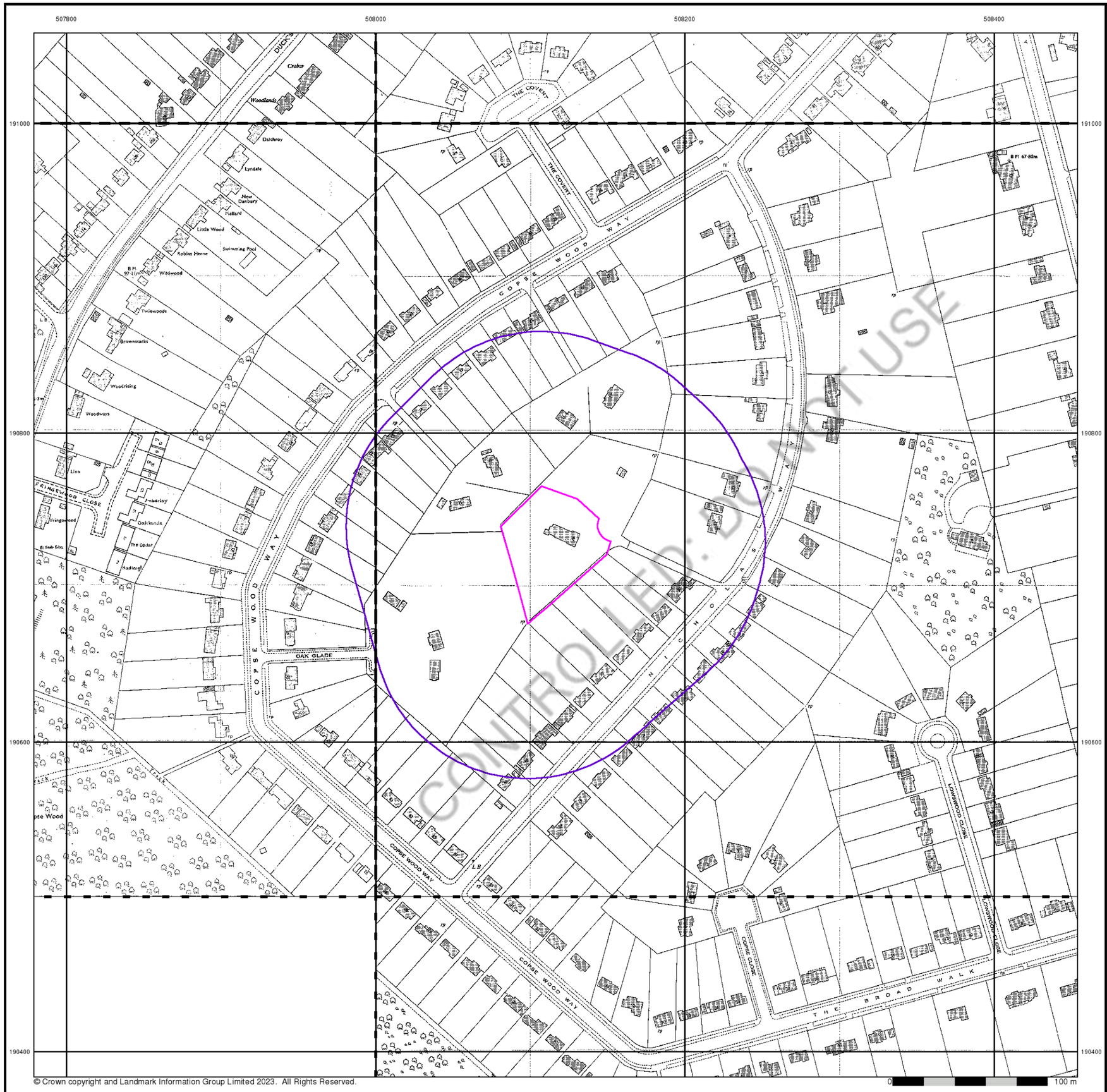
Order Details

Order Number:	306175893_1_1
Customer Ref:	LS6678
National Grid Reference:	508110, 190720
Slice:	A
Site Area (Ha):	0.36
Search Buffer (m):	100

Site Details

28, Nicholas Way, NORTHWOOD, HA6 2TT

Landmark INFORMATION GROUP
Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk



Land Science

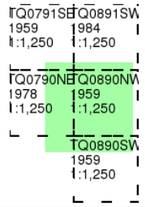
Additional SIMs

Published 1959 - 1984

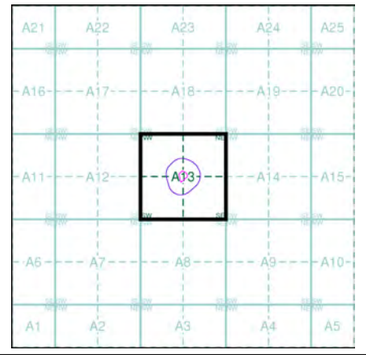
Source map scale - 1:1,250

The SIM cards (Ordnance Survey's `Survey of Information on Microfilm') are further, minor editions of mapping which were produced and published in between the main editions as an area was updated. They date from 1947 to 1994, and contain detailed information on buildings, roads and land-use. These maps were produced at both 1:2,500 and 1:1,250 scales.

Map Name(s) and Date(s)



Historical Map - Segment A13



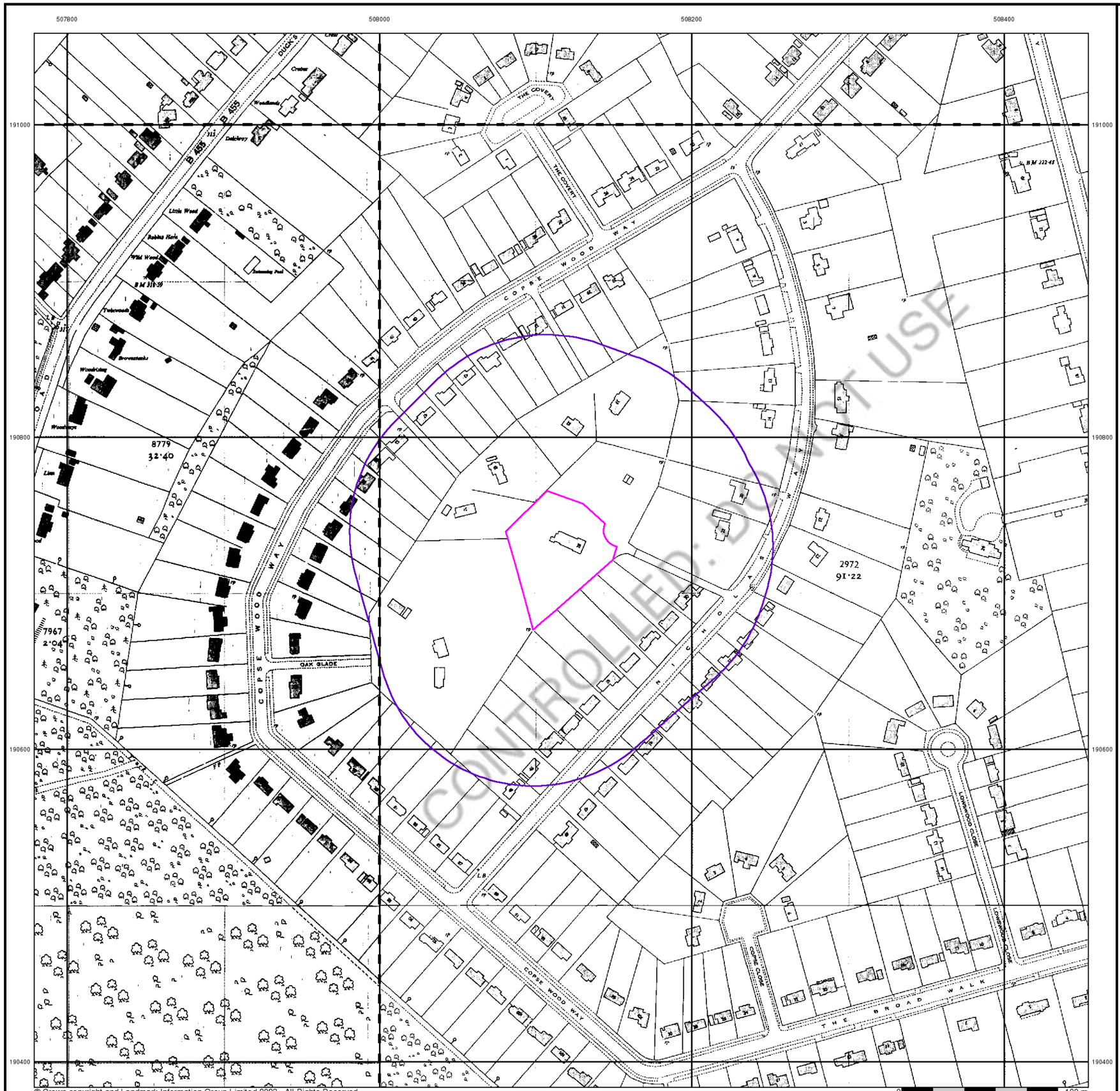
Order Details

Order Number:	306175893_1_1
Customer Ref:	LS6678
National Grid Reference:	508110, 190720
Slice:	A
Site Area (Ha):	0.36
Search Buffer (m):	100

Site Details

28, Nicholas Way, NORTHWOOD, HA6 2TT

Landmark INFORMATION GROUP
Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk



Land Science

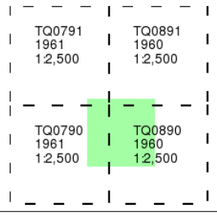
Ordnance Survey Plan

Published 1960 - 1961

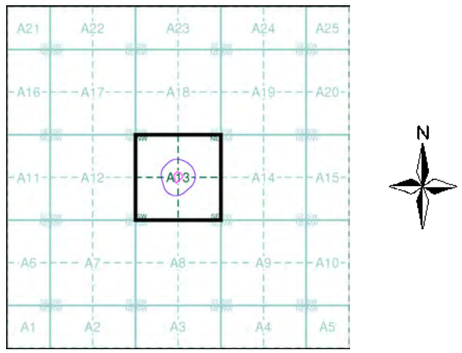
Source map scale - 1:2,500

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)



Historical Map - Segment A13

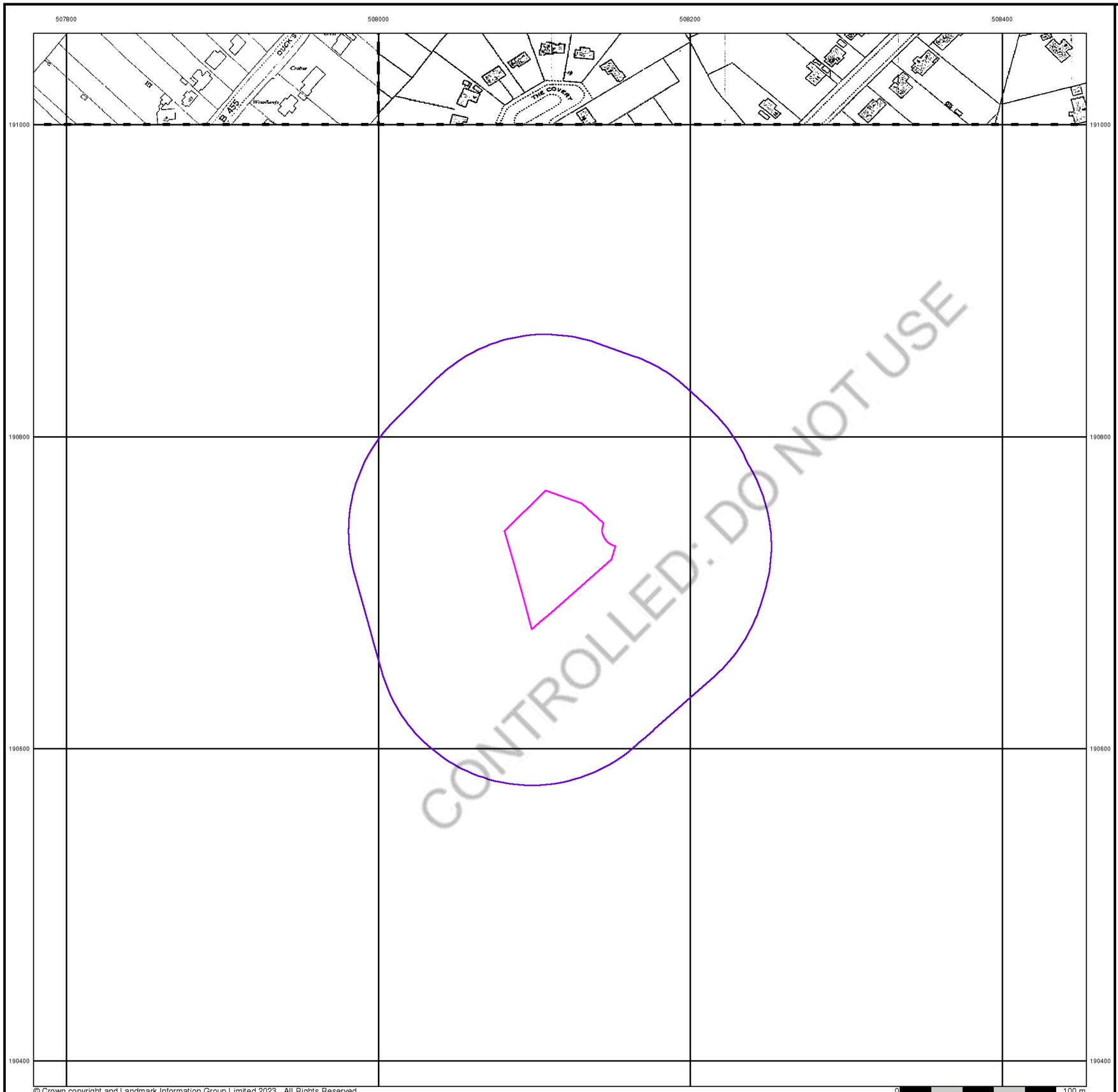


Order Details

Order Number:	306175893_1_1
Customer Ref:	LS6678
National Grid Reference:	508110, 190720
Slice:	A
Site Area (Ha):	0.36
Search Buffer (m):	100

Site Details

28, Nicholas Way, NORTHWOOD, HA6 2TT



Land Science

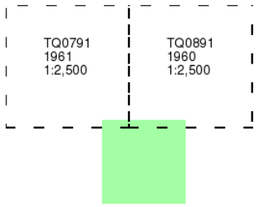
Additional SIMs

Published 1960 - 1961

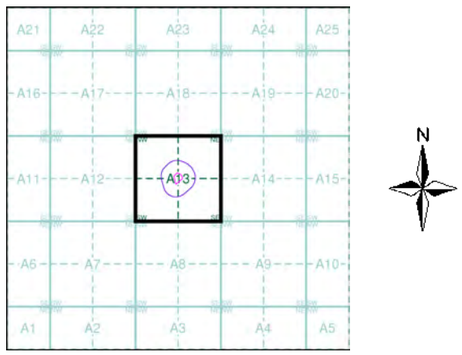
Source map scale - 1:2,500

The SIM cards (Ordnance Survey's `Survey of Information on Microfilm') are further, minor editions of mapping which were produced and published in between the main editions as an area was updated. They date from 1947 to 1994, and contain detailed information on buildings, roads and land-use. These maps were produced at both 1:2,500 and 1:1,250 scales.

Map Name(s) and Date(s)



Historical Map - Segment A13



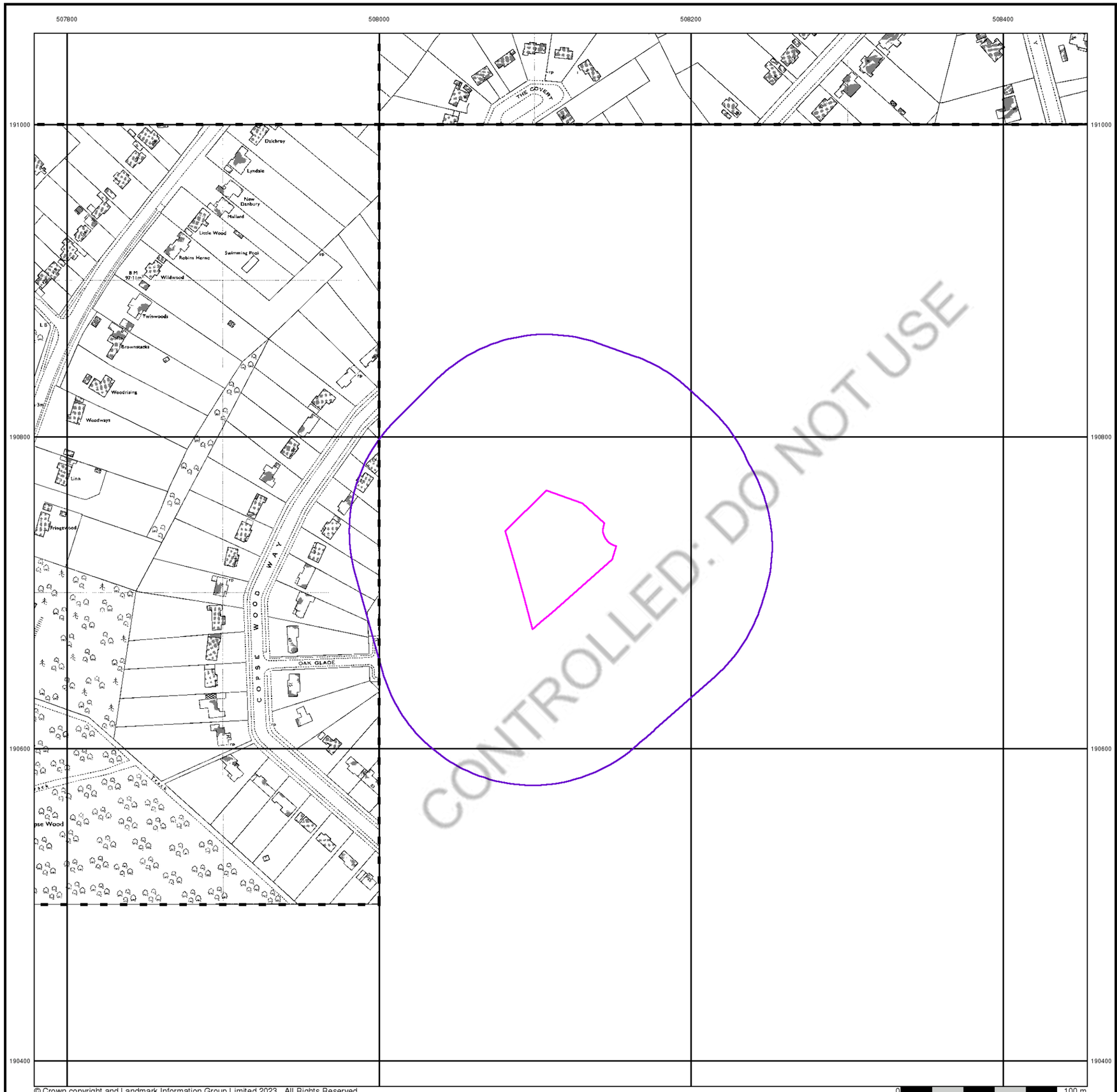
Order Details

Order Number:	306175893_1_1
Customer Ref:	LS6678
National Grid Reference:	508110, 190720
Slice:	A
Site Area (Ha):	0.36
Search Buffer (m):	100

Site Details

28, Nicholas Way, NORTHWOOD, HA6 2TT

Landmark INFORMATION GROUP
Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk



Land Science

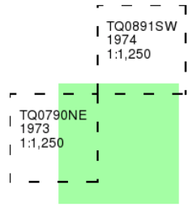
Ordnance Survey Plan

Published 1973 - 1974

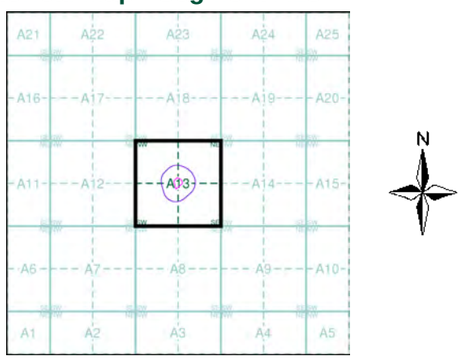
Source map scale - 1:1,250

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)



Historical Map - Segment A13



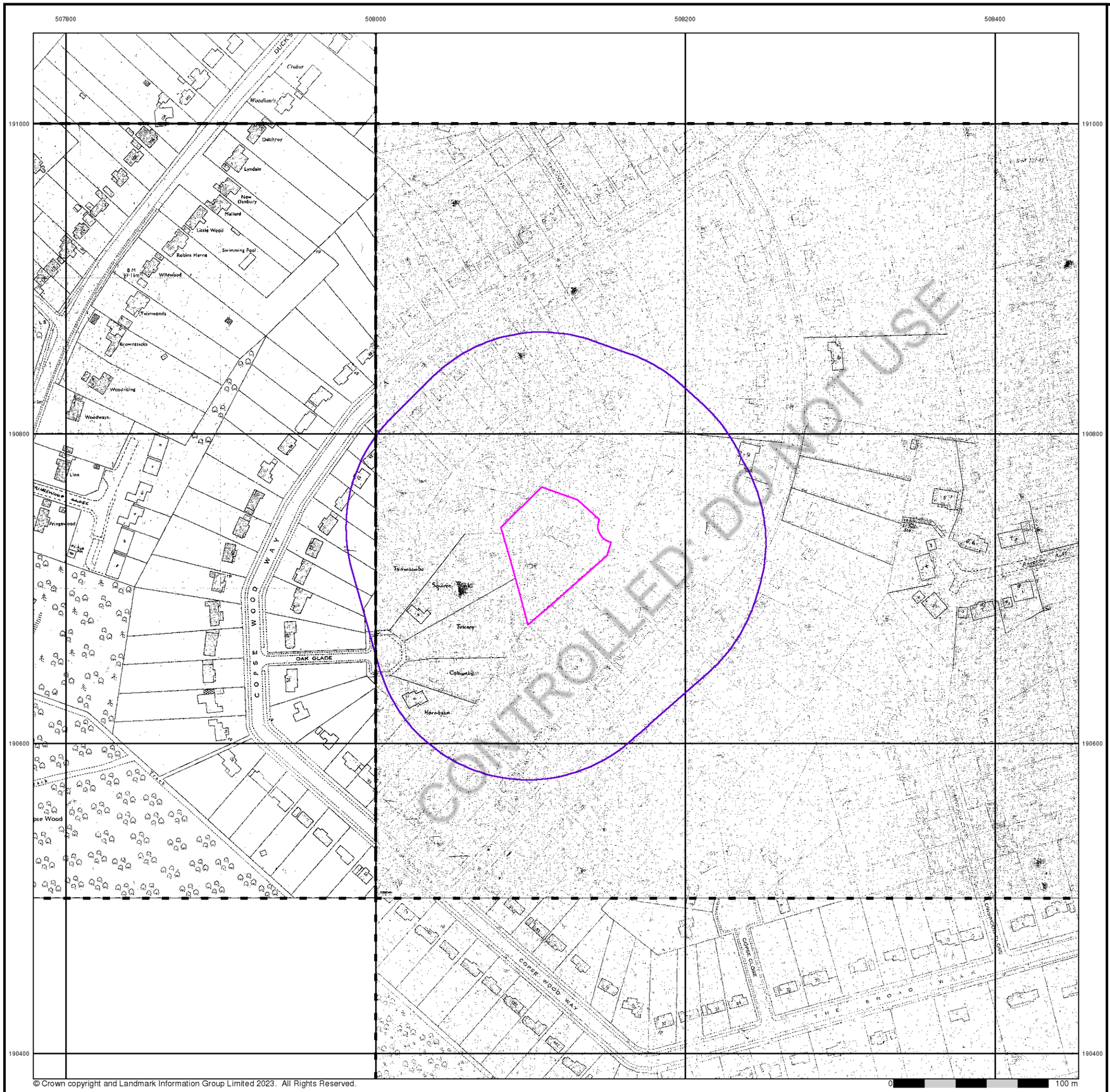
Order Details

Order Number:	306175893_1_1
Customer Ref:	LS6678
National Grid Reference:	508110, 190720
Slice:	A
Site Area (Ha):	0.36
Search Buffer (m):	100

Site Details

28, Nicholas Way, NORTHWOOD, HA6 2TT

Landmark INFORMATION GROUP
Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk



Land Science

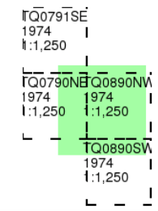
Supply of Unpublished Survey Information

Published 1974

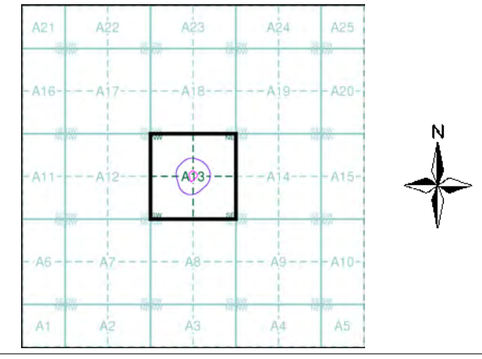
Source map scale - 1:1,250

SUSI maps (Supply of Unpublished Survey Information) were produced between 1972 and 1977, mainly for internal use at Ordnance Survey. These were more of a `work-in-progress' plan as they showed updates of individual areas on a map. These maps were unpublished, and they do not represent a single moment in time. They were produced at both 1:2,500 and 1:1,250 scales.

Map Name(s) and Date(s)



Historical Map - Segment A13



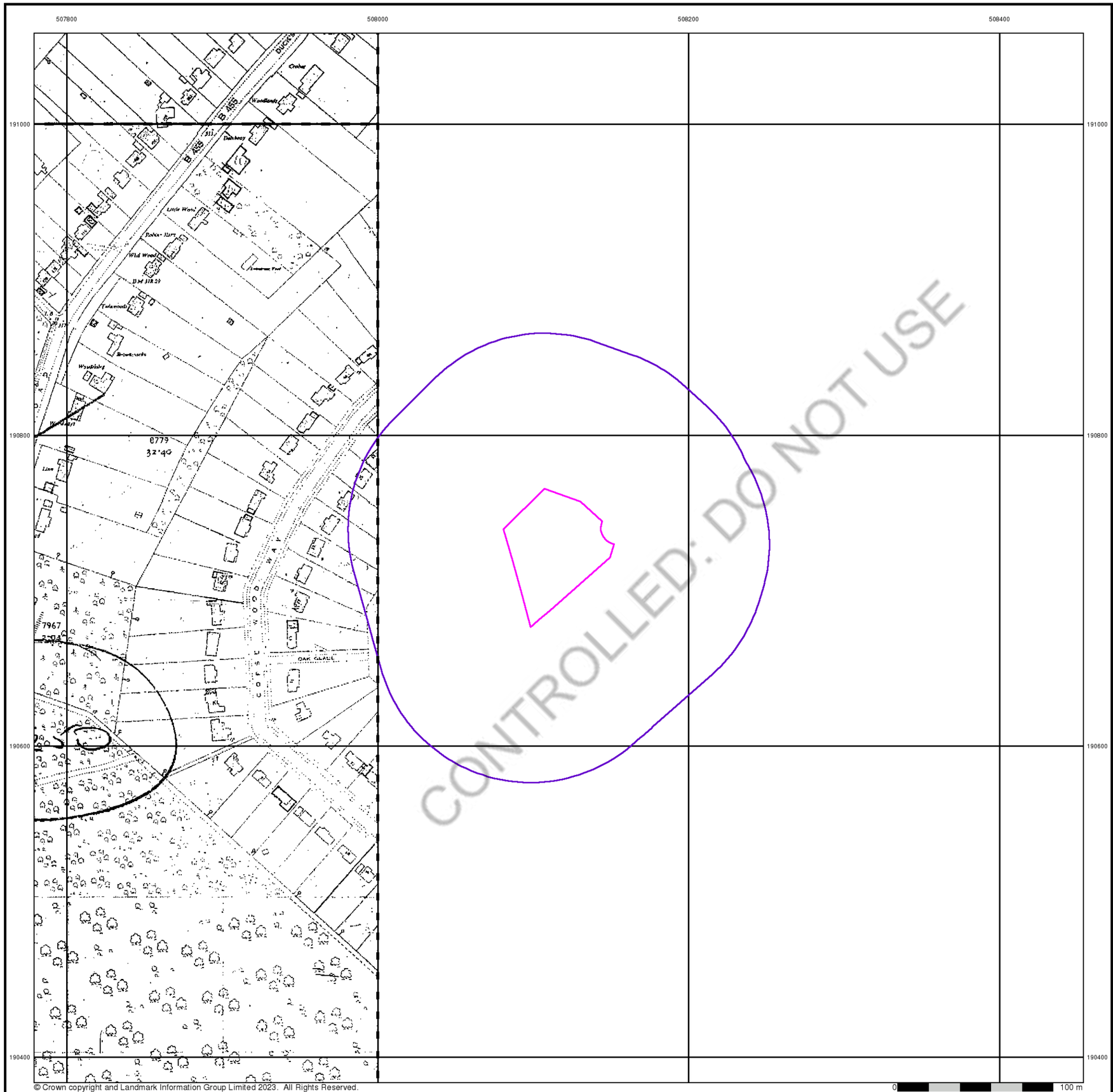
Order Details

Order Number:	306175893_1_1
Customer Ref:	LS6678
National Grid Reference:	508110, 190720
Slice:	A
Site Area (Ha):	0.36
Search Buffer (m):	100

Site Details

28, Nicholas Way, NORTHWOOD, HA6 2TT

Landmark INFORMATION GROUP
Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk



Land Science

Supply of Unpublished Survey Information

Published 1974

Source map scale - 1:2,500

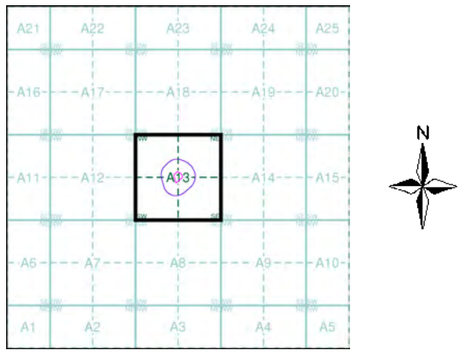
SUSI maps (Supply of Unpublished Survey Information) were produced between 1972 and 1977, mainly for internal use at Ordnance Survey. These were more of a `work-in-progress' plan as they showed updates of individual areas on a map. These maps were unpublished, and they do not represent a single moment in time. They were produced at both 1:2,500 and 1:1,250 scales.

Map Name(s) and Date(s)

TQ0791
1974
1:2,500

TQ0790
1974
1:2,500

Historical Map - Segment A13



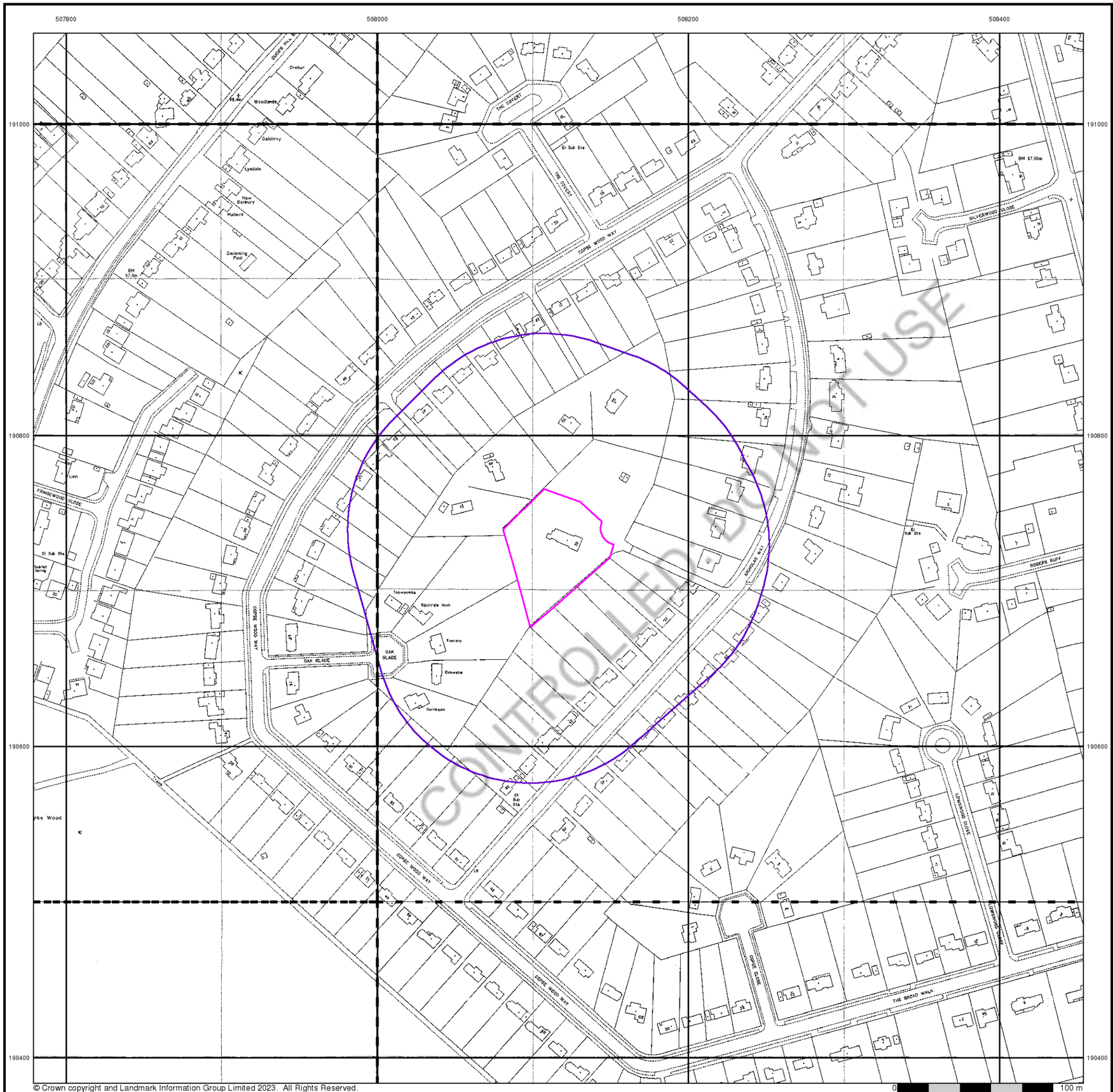
Order Details

Order Number:	306175893_1_1
Customer Ref:	LS6678
National Grid Reference:	508110, 190720
Slice:	A
Site Area (Ha):	0.36
Search Buffer (m):	100

Site Details

28, Nicholas Way, NORTHWOOD, HA6 2TT

Landmark INFORMATION GROUP
Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk



Land Science

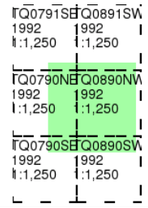
Large-Scale National Grid Data

Published 1992

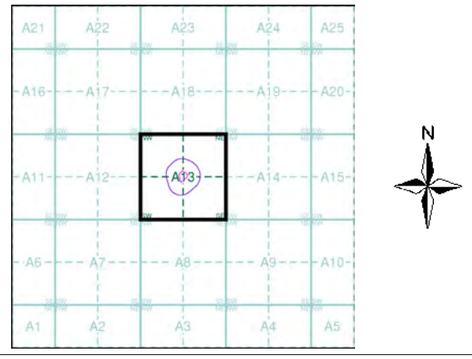
Source map scale - 1:1,250

'Large Scale National Grid Data' superseded SIM cards (Ordnance Survey's 'Survey of Information on Microfilm') in 1992, and continued to be produced until 1999. These maps were the fore-runners of digital mapping and so provide detailed information on houses and roads, but tend to show less topographic features such as vegetation. These maps were produced at both 1:2,500 and 1:1,250 scales.

Map Name(s) and Date(s)



Historical Map - Segment A13



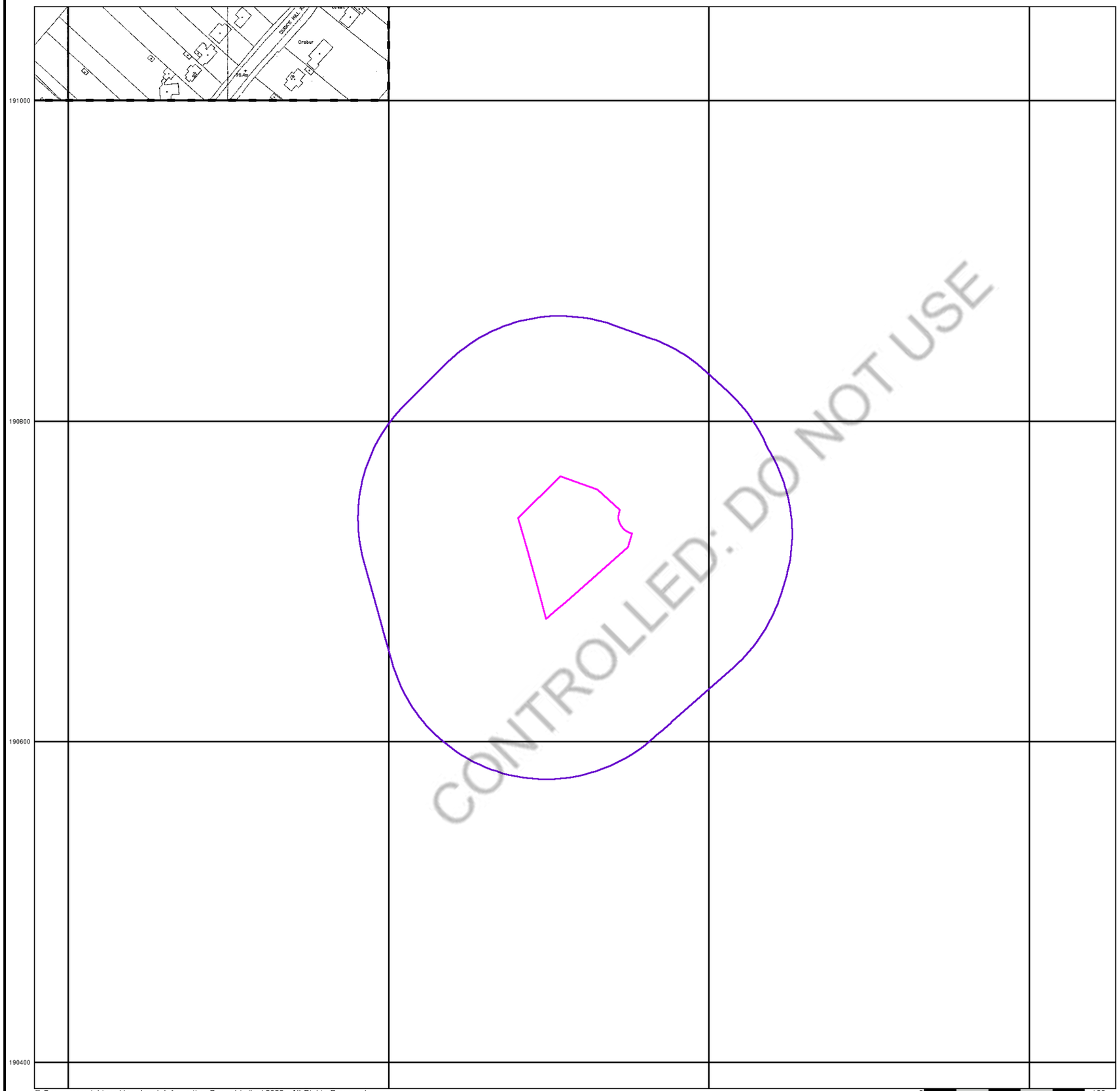
Order Details

Order Number:	306175893_1_1
Customer Ref:	LS6678
National Grid Reference:	508110, 190720
Slice:	A
Site Area (Ha):	0.36
Search Buffer (m):	100

Site Details

28, Nicholas Way, NORTHWOOD, HA6 2TT

Landmark INFORMATION GROUP
Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk



Land Science

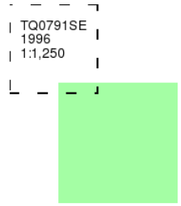
Large-Scale National Grid Data

Published 1996

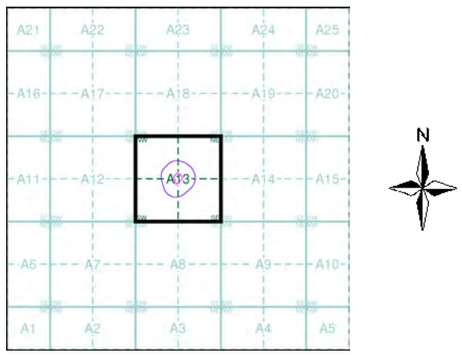
Source map scale - 1:1,250

'Large Scale National Grid Data' superseded SIM cards (Ordnance Survey's 'Survey of Information on Microfilm') in 1992, and continued to be produced until 1999. These maps were the fore-runners of digital mapping and so provide detailed information on houses and roads, but tend to show less topographic features such as vegetation. These maps were produced at both 1:2,500 and 1:1,250 scales.

Map Name(s) and Date(s)



Historical Map - Segment A13



Order Details

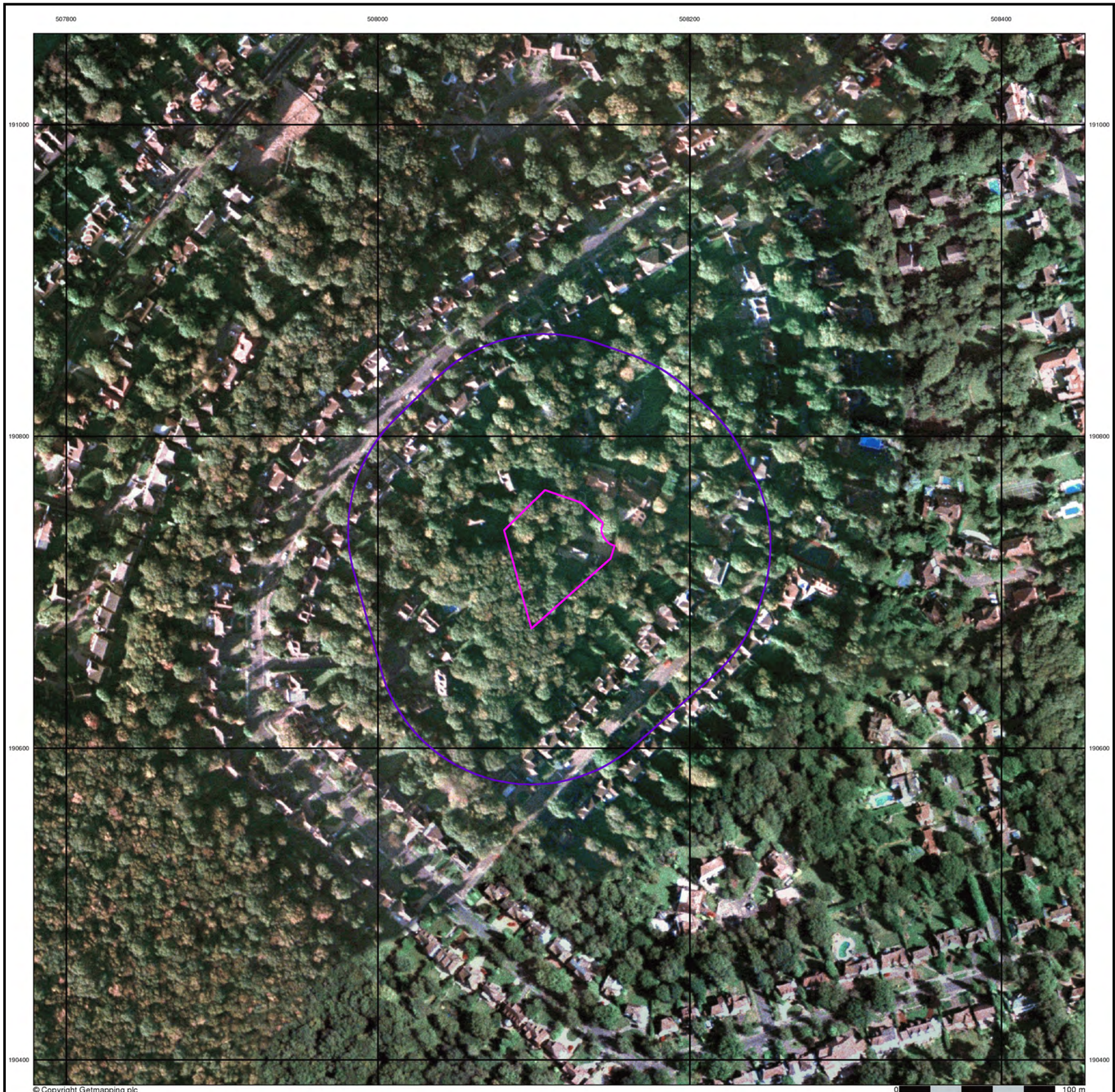
Order Number:	306175893_1_1
Customer Ref:	LS6678
National Grid Reference:	508110, 190720
Slice:	A
Site Area (Ha):	0.36
Search Buffer (m):	100

Site Details

28, Nicholas Way, NORTHWOOD, HA6 2TT

Landmark INFORMATION GROUP

Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk

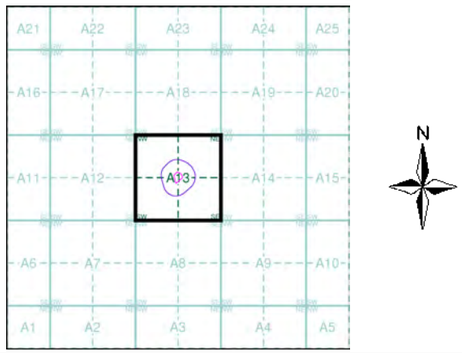


Historical Aerial Photography

Published 1999

This aerial photography was produced by Getmapping, these vertical aerial photographs provide a seamless, full colour survey of the whole of Great Britain

Historical Aerial Photography - Segment A13



Order Details

Order Number:	306175893_1_1
Customer Ref:	LS6678
National Grid Reference:	508110, 190720
Slice:	A
Site Area (Ha):	0.36
Search Buffer (m):	100

Site Details

28, Nicholas Way, NORTHWOOD, HA6 2TT

APPENDIX H

UK Health Security Agency

Report of address search for radon risk

British Geological Survey

Address searched: 28 Nicholas Way, Northwood, HA6 2TT
Date of report: 23 January 2023

Guidance for existing properties

Is this property in a radon Affected Area? - No

A radon Affected Area is defined as where the radon level in at least one property in every hundred is estimated to exceed the Action Level.

The estimated probability of the property being above the Action Level for radon is: 0-1%

The probability result is only valid for properties above ground. All basement and cellar areas are considered to be at additional risk from high radon levels.
The result may not be valid for buildings larger than 25 metres.
If this site if for redevelopment, you should undertake a GeoReport provided by the British Geological Survey.

This report informs you of the estimated probability that this particular property is above the Action Level for radon. This does not necessarily mean there is a radon problem in the property; the only way to find out whether it is above or below the Action Level is to carry out a radon measurement in an existing property.

Radon Affected Areas are designated by the UK Health Security Agency. UKHSA advises that radon gas should be measured in all properties within Radon Affected Areas.

If you are buying a currently occupied property in a Radon Affected Area, you should ask the present owner whether radon levels have been measured in the property. If they have, ask whether the results were above the Radon Action Level and if so, whether remedial measures were installed, radon levels were re-tested, and the results of re-testing confirmed the effectiveness of the measures.

Further information is available from UKHSA or https://www.ukradon.org

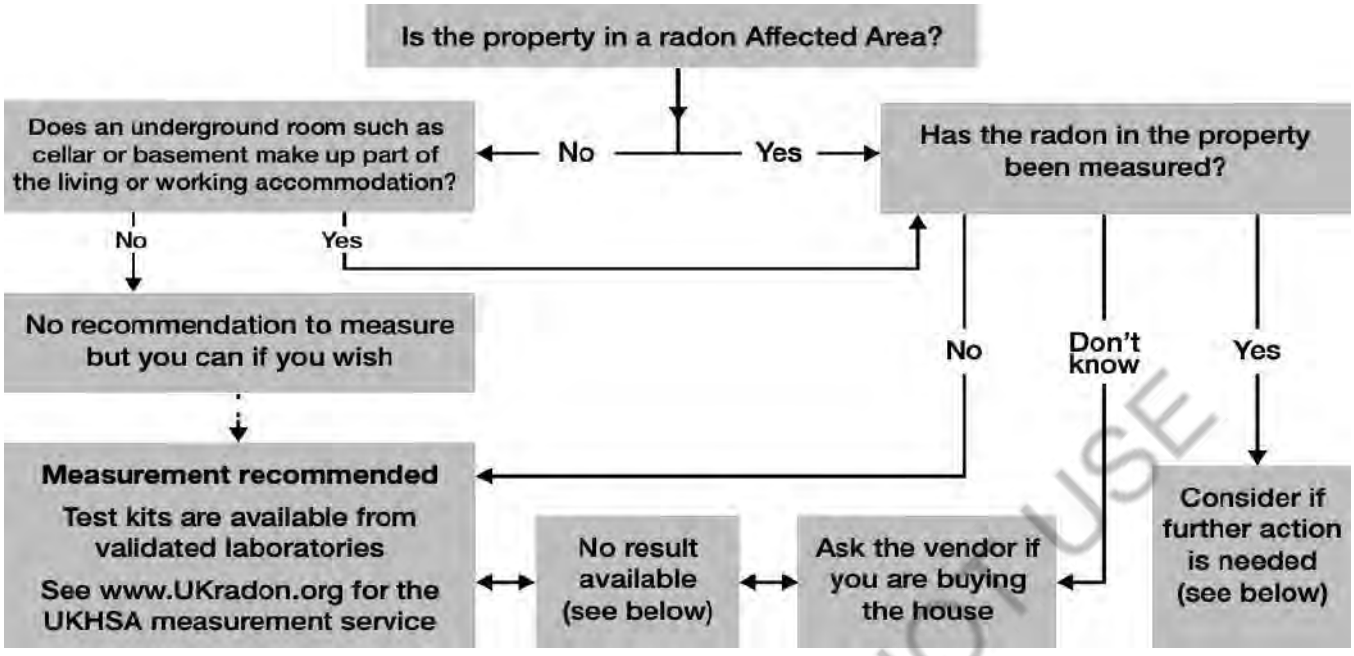
Guidance for new buildings and extensions to existing properties

What is the requirement under Building Regulations for radon protection in new buildings and extensions at the property location? - None

If you are buying a new property in a Radon Affected Area, you should ask the builder whether radon protective measures were incorporated in the construction of the property.

See the Radon and Building Regulations for more details.

UKHSA guidance for occupiers and prospective purchases



Existing radon test results: There is no public record of individual radon measurements. Results of previous tests can only be obtained from the seller. Radon levels can be significantly affected by changes to the building or its use, particularly by alterations to the heating and ventilation which can also be affected by changes in occupier. If in doubt, test again for reassurance.

Radon Bond: This is simply a retained fund, the terms of which are negotiated between the purchaser and the vendor. It allows the conveyance of the property to proceed without undue delay. The purchaser is protected against the possible cost of radon reduction work and the seller does not lose sale proceeds if the result is low. Make sure the agreement allows enough time to complete the test, get the result and arrange the work if needed.

High Results: Exposure to high levels of radon increases the risk of developing lung cancer. If a test in a home gives a result at or above the Action Level of 200 Becquerels per cubic metre of air (Bq/m3), formal advice will be given to lower the level. Radon reduction will also be recommended if the occupants include smokers or ex-smokers when the radon level is at or above the Target Level of 100 Bq/m3; these groups have a higher risk. Information on health risks and radon reduction work is available from UKHSA. Guidance about radon reduction work is also available from some Local Authorities, the Building Research Establishment and specialist contractors.

UKHSA designated radon website:	https://www.ukradon.org
Building Research Establishment:	http://www.bre.co.uk/page.jsp?id=3137

JOMAS ENGINEERING ENVIRONMENTAL

WE LISTEN, WE PLAN, WE DELIVER

Geotechnical Engineering and Environmental Services across the UK.

Construction Enquirer Awards – BEST CONSULTANT TO WORK FOR – WINNER

Constructionline Gold Member

SSIP Safety Schemes in Procurement – Acclaim Accreditation

CSCS

CEnv Chartered Environmentalist

National Quality Mark Scheme for Land Contamination Management

The Chartered Institution of Wastes Management

Asilc – Specialist in Land Condition

The Geological Society

IEMA Transforming the world to sustainability

LCA London Construction Awards Finalist – Engineering Consultant of the Year

JOMAS ASSOCIATES LTD

24 Sarum Complex

Salisbury Road

Uxbridge

UB8 2RZ

CONTACT US

Website: www.jomasassociates.com

Tel: 0333 305 9054

Email: info@jomasassociates.com