FINAL

Bellway Homes

Phase I Desk Study

&

Phase II

Geotechnical and Geo-Environmental Report

Land Adj. Park Lane

Charvil

Wokingham

RG10 9TR

Report No: 25-07-12

August 2025

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EXECUTIVE SUMMARY

Site Location	Land Adj. Park Lane, Charvil, Wokingham, RG10 9TR
OS Grid Reference	477508, 175191
Development Proposals	The proposed development includes the construction of seventy-five residential dwellings, including a range of two-bed, three-bed, four-bed, and five-bed dwellings. The red line area shown on the development proposal plan totals 17.25 acres. The proposed dwellings include private gardens and driveways. There will also be access roads constructed, public open space, including an allotment area and soft landscaping. It is proposed to construct attenuation basins for drainage, and there is a flood zone limit along the southern boundary. The main access will remain the same via Park Lane to the east, and it is proposed to construct pedestrian access to the existing residential estates to the north. (Drawing No. 25.2208.1000, FINC architects Ltd., April 2025)
Published Geology	Reference to the British Geological Survey website and Sheet 268, Reading, 2000, indicates that the site is directly located on superficial deposits from the Quaternary Period, including River Terrace Deposits (4) underlying the western half of the site and the Kempton Park Gravel Member underlying the eastern extreme of the site. There is a space at the centre of the site where superficial deposits are absent. The superficial deposits are underlain by the Lambeth Group from the Paleogene Period. The Lambeth Group is recorded underlying the western half of the site. The eastern half of the site is underlain by the Seaford Chalk Formation and New Haven Chalk Formation (Undifferentiated), part of the White Chalk Subgroup (formerly Upper Chalk) from the Cretaceous Period.
Site History	Historical information indicates the majority of the site remains unaltered from the first historical records, remaining an open, undeveloped field. The exception being a small area to the east of the site, which has been used as a builder's yard by Hicks Development Ltd. The walkover survey indicated this area comprised a part tarmac, part engineered granular fill surface used for storing building materials, including bricks, plastic drains, pallets, and fences. Machinery, including an excavator and telehandler, was also stored in this area. A concrete slab is located to the north, previously used for supporting concrete silos. The remaining area of the site has remained undeveloped fields, which were once used for motocross, with dirt tracks visible on satellite imagery. Spoil heaps comprising topsoil from the builder's yard and the new residential estate to the north are present on site.
Ground Conditions Encountered	This ground investigation has identified that the underlying ground conditions can be summarised as: • Localised Made Ground exists underlying the builder's yard and a small pocket at the centre of the site – maximum thickness 0.70m bgl • Topsoil underlies the majority of the site • River Terrace Deposits underlie the near-surface soils down to depths of 8.00m bgl in the west and 0.95m in the east (thinning in a south-east direction) • River Terrace Deposits were variable but predominantly granular sand and gravel (non-shrinkable). However, significant layers of cohesive soil were encountered within CT5, TP1, TP3, TP6, TP9, and BH1. Laboratory testing proved this material to be of medium shrinkability in accordance with NHBC guidelines • The Lambeth Group was encountered across the site down to proven depths of 8.90m and 13.70m bgl (thinning to the east) • The Lambeth Group comprised predominantly soft to firm and firm to stiff, dark grey, green, silty clay with shell debris and calcareous horizons, and dense, dark grey, green, very sandy clayey silt with shell debris. Laboratory testing has proven this material contains layers of highly shrinkable soil in accordance with NHBC guidelines • The White Chalk Subgroup underlies the Lambeth Group at depths below 8.90m bgl, proven down to depths in excess of 25.00m bgl (the maximum depth achieved by this ground investigation) • The White Chalk Subgroup was encountered as structureless, off-white chalk with layers of Grade Dm and Grade Dc. High SPT 'N' values within this material indicate competent strata, potentially indicating higher chalk grades than Grade D • The southern boundary of the site is situated in a flood risk zone; as such, groundwater levels are expected to vary seasonally. The ground investigation was undertaken within the summer months, when groundwater levels are at their deepest. See section 6.3 for further details • Localised desiccation was encountered as shown on the geological plan within Appendix A (area highlighted blue and a smaller area surrounding TP9) • Given the underlying chalk strata, there is the potential for chalk dissolution features, see section 6.2 for further details

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Groundwater Encountered	Groundwater was encountered at significant depths ranging between 7.90m and 13.00m bgl, recorded to be at similar depths to the interface between the Lambeth Group and the underlying chalk strata. In addition, minor perched water levels were recorded within CT1 and TP5 resting within the River Terrace Deposits at depths of 1.50m and 2.80m bgl, respectively. Subsequent groundwater monitoring also recorded perched water levels within CT5 at depths of 3.36m bgl
Contamination	Currently, it is considered that the risk of contamination to construction workers, end users and surrounding residents from the proposed development at this site is very low, and as such, no further works or remedial measures are considered necessary prior to development.
Sulphate Attack on Underground Concrete	The following design sulphate class and aggressive chemical environment classification should be applied: **Made Ground:** DS-1/AC-1 **River Terrace Deposits:** DS-1/AC-1 **Lambeth Group:** DS-4/AC-4 **White Chalk Subgroup**: DS-1/AC-1
Foundations	Based on the desiccation assessment, deeper foundations will be required in the eastern area of the site, as shown on the geological plan highlighted in blue in Appendix A. The zone of desiccation was proven down to a maximum depth of 6.50m bgl within BH1. The western half of the site is predominantly underlain by granular soils considered to be non-shrinkable, and as such, conventional shallow foundations are considered viable. The only exception applies to the area surrounding TP9, where significant layers of cohesive soils were encountered with a soil sample showing evidence of desiccation. It is considered that further testing should be undertaken to prove the extent of desiccation, which will dictate the required foundation depth. See section 6.5 for further details.
Waste Soil Classification	Currently, the waste soil on site is recommended to be classified as follows: **Made Ground (Engineered Fill):** 17 01-07 – Non-Hazardous **Topsoil:** 17 05 04 – Inert **Topsoil (Spoil Heaps)** 17 05 04 – Inert **Natural Soil:** 17 05 04 – Inert
Recommendations	We recommend that a watching brief should be undertaken during the construction phase, and if, during development, any previously undiscovered contamination (including visual or olfactory evidence) is found, then site management should be immediately informed and inspection by a suitably qualified person should be undertaken. Given the findings of the desk study, intrusive investigation and laboratory testing, there are complex ground conditions which require further assessment: • The area highlighted blue on the geological plan within Appendix A has found evidence of desiccation down to a proven depth of 6.50m bgl as shown within BH1. Further investigation should be undertaken to prove the ground conditions identified within BH1 are consistent across the area highlighted in blue to suitably design piled foundations • Further investigation incorporating deep boreholes and probes is recommended to provide evidence that dissolution features are not present, which could negatively impact deeper foundations • The western half of the site highlighted yellow on the geological plan in Appendix A is predominantly underlain by granular soils considered to be non-shrinkable, and as such, conventional shallow foundations are considered viable. However, foundations should be reinforced to combat potential differential settlement caused by foundations crossing both granular and cohesive soil • The only exception applies to the area surrounding TP9, where significant layers of cohesive soils were encountered with a soil sample showing evidence of desiccation. It is considered that further testing should be undertaken to prove the extent of desiccation, which will dictate the required foundation depth • Soakaways could be viable at this site; however, given the known flood risk zone along the southern boundary of the site, it is considered that groundwater levels are likely to rise during the wetter winter months. Groundwater monitoring should be undertaken over the winter period to prove potential fluctuations in groundwater; this will likely be required by the LLFA • In addition, as per CIRIA C574, soakaways should be placed at least 10m away from foundations, roads or railways • A small pit filled with wooden sleepers was observed during the walkover survey located along the western boundary of the builder's yard. It is recommended prior to development; the sleepers are removed and the underlying material inspected. Should loose soils indicating potential dissolution features or Made Ground soils be encountered, further assessment should be undertaken by a suitably qualified person.

This executive summary must be read in conjunction with the full report text.

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FACTUAL

1.1 INTRODUCTION

Geo-Integrity Ltd were commissioned by Daniel Giles of Bellway Homes Ltd. (Thames Valley), via email dated 29th July 2025, to undertake a Phase I Desk Study and Phase II Factual and Interpretative Geotechnical and Geo-Environmental Report for Land Adj. Park Lane, Charvil, Wokingham, RG10 9TR, in order to inform the design and construction of the proposed development.

This report describes desk-based searches of geological, environmental and historical information, the fieldwork and laboratory testing undertaken and provides an interpretative section of the geotechnical and geo-environmental data from this investigation to inform the proposed development.

The site is located at National Grid Reference 477508, 175191.

The report is likely to be reviewed by the Wokingham Borough Council with reference to the NPPF. Once the redevelopment is completed, and as a minimum, the land must not be capable of being determined as 'contaminated land' under the terms of Part IIA of the Environmental Protection Act 1990. However, it also states that "Where a site is affected by contamination or land stability issues, responsibility for securing a safe development rests with the developer and/or landowner." As such, the desk study in this report is the first stage in investigating whether the site is likely to be considered "contaminated", in accordance with clause 196 of the NPPF.

The objectives of this phase I and phase II interpretative report are: -

- To undertake a site walkover to identify any potential pollution sources or geotechnical hazards on the site.
- To gather historical, geological and environmental information.
- Briefly summarise the site development proposals and site setting.
- To describe and report the fieldwork undertaken at the site.
- To describe and report the geotechnical and chemical laboratory work undertaken on selected samples.
- To provide an interpretation of the results of this investigation with regards to the geotechnical properties, and geo-environmental and waste disposal implications for the proposed development.

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The investigation was performed in accordance with the general requirements of BS 5930:2015, BS EN 1997-2 (2007), BS EN ISO 22475-1 (2006) and other relevant related standards identified below. The fieldwork took place across six days, starting on the 31st of July 2025 and finishing the following week on the 7th of August 2025.

1.2 SOURCES OF INFORMATION

The following sources of information have been used to compile this report: -

- Extracts of available historical Ordnance Survey (OS) maps covering the period from 1872 to 2025, which are presented in the Appendices.
- Groundsure Report Ref GS-6CQ-TB2-LMT-5BG included in the Appendices.
- Geology of the Reading district — brief explanation of the geological map sheet 268 Reading, S J Mathers and N J P Smith, 2000
- The British Geological Survey (BGS) and Environment Agency (EA) websites.
- A site reconnaissance visit was undertaken on the 31st of July 2025.
- Information from various internet sites on site history and environmental setting.

It should be noted that the information provided in the desk study is obtained from independent third-party sources. It is provided in good faith, but no guarantee can be provided as to its accuracy. The desk study information is not necessarily exhaustive, and further information relevant to the site may be available from other sources.

1.3 DEVELOPMENT PROPOSALS

The proposed development includes the construction of seventy-five residential dwellings, including a range of two-bed, three-bed, four-bed, and five-bed dwellings. The red line area shown on the development proposal plan totals 17.25 acres. The proposed dwellings include private gardens and driveways. There will also be access roads constructed, public open space, including an allotment area and soft landscaping. It is proposed to construct attenuation basins for drainage, and there is a flood zone limit along the southern boundary. The main access will remain the same via Park Lane to the east, and it is proposed to construct pedestrian access to the existing residential estates to the north. (Drawing No. 25.2208.1000, FINC architects Ltd., April 2025)

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2 PHASE I DESK STUDY

2.1 WALKOVER SURVEY

A site walkover survey was undertaken on the 31st of July 2025. Site location and layout plans are included in Appendix A, along with a selection of photographs taken during the survey.

The site is located at the southern edge of the village of Charvil, Berkshire, England. The site is accessed via Park Lane along the eastern boundary.

At the time of the walkover survey, the site comprised two distinguishable areas:

1) A small area at the eastern boundary comprises a tarmacked entrance leading to an area of engineered fill used for storing shipping containers, temporary portable offices, and welfare facilities, as well as various building materials including bricks, wooden pallets, plastic pipes, plastic drainage (tanks, pipes etc.), hears fencing, chapter 8 barriers, metal skips with used paint jars/tubs. Machinery, including an excavator and telehandler, was stored in this area. A concrete slab was located at the north of the site, and it is understood that this was previously supported by two cement silos. This compound was previously used by Hicks Developments Ltd. for the recent housing development located immediately north of the site. A staff member from Hicks Development provided information on the compound, including known services. A land-drain was installed around the perimeter of the compound, water supply pipes and an electricity supply also enter the site from the east along the southern edge of the tarmac road, which are connected to the shipping containers and the concrete floor slab to the north. An underground surface water tank is located to the south of the compound. Along the western boundary of the builder's yard was a pit filled with wooden sleepers and covered by a heras fence panel.
2) The remaining land to the east comprises undeveloped fields with sporadic trees both on site and along the boundaries. There are spoil heaps located immediately west of the existing compound and at the centre of the site, which are understood to comprise topsoil sourced from areas including the area of engineered fill at the east of the site and the recent development immediately north-east of the site. It is understood that this land has previously been used by the land-owner for motocross practice.

The site boundaries were generally marked by fences and trees/hedges. A small woodland exists to the south-west, known as Sandpit Copse. Residential dwellings are located immediately north, The Charvil Piggott Primary School is located immediately east, a small commercial estate is located to

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the south, and Sonning Golf Club is located immediately west. The commercial estate houses a gym, static caravans, a domestic and commercial waste water service, and a mobile valeting service. A train line located south of the commercial estate trends north-east to south-west.

The walkover survey was undertaken to identify potential sources of contamination to aid the human-health risk assessment. No significant sources of contamination were recorded during the walkover survey; however, the existing compound has likely introduced Made Ground soils to the site, which may locally contain levels of contamination, and the storage of materials and machinery may have introduced contaminants via accidental leakages and spillages such as oil/fuel. There are also spoil heaps located on site, which are understood to comprise topsoil from areas within and outside the investigation area, but may locally comprise extraneous material, given the reworked nature.

2.2 GEOLOGY

2.2.1 Published Geology

Reference to the British Geological Survey website and Sheet 268, Reading, 2000, indicates that the site is directly located on superficial deposits from the Quaternary Period, including River Terrace Deposits (4) underlying the western half of the site and the Kempton Park Gravel Member underlying the eastern extreme of the site. There is a space at the centre of the site where superficial deposits are absent. The superficial deposits are underlain by the Lambeth Group from the Paleogene Period. The Lambeth Group is recorded underlying the western half of the site. The eastern half of the site is underlain by the Seaford Chalk Formation and New Haven Chalk Formation (Undifferentiated), part of the White Chalk Subgroup (formerly Upper Chalk) from the Cretaceous Period.

A fault trending north-north west to south-south east passes ~60m from the western edge of the site, with the site located on the downthrow side.

The BGS maps indicate significant areas of Worked Ground (>300m east) located along the River Loddon. The areas of Worked Ground reflect historic extraction of sand and gravel deposits, which at present have been flooded and form nature reserves. In addition, there are also areas of infilled ground 600m to the south associated with landfilling activity.

2.2.2 Superficial

The **Kempton Park Gravel Member** is generally described by the BGS as a sand and gravel, locally with lenses of silt, clay or peat. The gravel clasts are predominantly angular and rounded flint. This

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unit is a low-level terrace deposit of the Thames system. The average thickness of this unit is recorded to be in the region of 6m bgl.

The **Fourth River Terrace Deposits** are generally described by the BGS as sand and gravel, locally with lenses of silt, clay or peat. Furthermore, information obtained from the memoir indicates the fifth, fourth and third Terrace Deposits occur as patches throughout the Loddon-Blackwater Valley, in which the site is located. These deposits are flint-rich gravels and up to 5m thick.

2.2.3 Bedrock

The **Lambeth Group** is generally described by the BGS as "vertically and laterally variable sequences mainly of clay, some silty or sandy, with some sands and gravels, minor limestones, lignite and occasional sandstone and conglomerate. The Lambeth Group was deposited in fluvial, estuarine, lagoonal or proximal marine environments." The thickness of this unit in the site area ranges between 6m and 27m; however, with the geological boundary between the Lambeth and the underlying White Chalk Subgroup located through the centre of the site, it is possible that the thickness will be significantly less, if at all present. The Lambeth Group is well known for causing the following engineering problems:

- Rapid changes in lithology
- Clay with irregular water-bearing sand bodies
- Perched water tables
- Hard bands that obstruct boring, drilling, excavations and piling
- Flint-gravel beds, which are water-bearing and may restrict boring progress and increase wear of cutting equipment
- Lignite, which may provide differential settlement
- Deposits infilling dissolution features in the underlying chalk
- Fissuring of clay, potentially leading to instability in cuts
- De-oxygenation of the atmosphere in tunnels cut into the Upnor Formation sandstones

The **White Chalk Sub Group** (Seaford Chalk Formation and New Haven Chalk Formation Undifferentiated) is generally described by the BGS as chalk with flint seams and discrete marl seams. The thickness of this unit is recorded as between 90m to 130m in the site area.

2.2.4 Historical Borehole Records

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The BGS holds records of historical exploratory holes, including boreholes of which there is one recorded 160m east of the site (ref. SU77NE41). This borehole records gravel down to 2.60m bgl (interpreted to be the Kempton Park Gravel Member), underlain by brown clay down to the base of the borehole in excess of 3.04m bgl (interpreted to be a clay lens within the Kempton Park Gravel Member).

There is also a deeper borehole located 290m south of the site (ref. SU77SE59). The borehole records 'drift deposits' down to a depth of 3.35m bgl, underlain by 'mottled clay Reading Beds' (Lambeth Group) down to a depth of 11.80m bgl, underlain by chalk down to the base of the borehole in excess of 15.24m bgl.

2.2.5 Solution Features

Chalk, as a calcium-carbonate-rich rock, is highly susceptible to dissolution by water containing carbon dioxide. This dissolution can create three common types of features within the chalk, grouped together under the generic term 'dissolution features'. These features include:

- Sinkholes: Depressions at the ground surface caused by the collapse of overlying chalk or superficial deposits into underground voids created by dissolution. Shape and size are dependent on the underlying void feature
- Solution pipes: A feature in the surface of the Chalk caused by increased dissolution in an area of closely spaced discontinuities. These features may or may not have a ground surface expression. Up to 20 metres in diameter, though commonly much smaller
- Swallow Holes: A void within the surface of the Chalk where a stream is 'swallowed' by the Chalk to flow underground. Often occur at the junction of impermeable strata and Chalk. Infilled ancient swallow holes do exist where streams used to flow and may not have any surface expression. Up to 14m in diameter, though commonly a few metres.

The desk study information records two sinkholes within the surrounding area.

The first is located 25m north-east of the site. Internet searches indicate a 2m deep cavity opened up in the East Park Farm Car Park. The cause of the sinkhole is currently unknown. This may have occurred due to an underlying dissolution feature, or other causes may include leaking drains, washing away finer sediment associated with poor construction of the car park.

The second recorded sinkhole is located significantly further away at a distance of >600m north of the site. No further information is available regarding this sinkhole.

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2.2.6 Natural Cavities Risk Assessment

A natural cavities risk assessment has been undertaken following the paper written by Clive Edmonds in 2001, “Predicting natural cavities in chalk”. This gives a score to various factors, including the type of chalk, topography, groundwater level, strata overlying the chalk, and periglacial and glacial history. The score for this site was 640, which correlates to a very high subsidence hazard category (with a 50.9% occurrence). The natural cavities risk assessment can be found in Appendix A.

The known factors which increase the risk of encountering dissolution features at this site, based on the desk study information, include:

- Chalk strata is part of the White Chalk Subgroup (formerly known as the Upper Chalk), which has an increased weathered profile (low-density chalk), commonly associated with a greater number of solution features
- Tertiary Cover Present (Lambeth Group) and a feathered margin between the Lambeth and Chalk is known to correlate with an unusually high density of sinkholes. This relates to the effects of drainage and acidity of water moving down through the cover deposits to the chalk.
- Tertiary deposits are likely to infill dissolution features if present, creating metastable soils
- Quaternary Deposits also present: Low-level terrace gravels (RTD 4) associated with recent drainage pathways (Modern day River Thames Route)
- Outside the proto Thames Valley, however, it is located along the Loddon-Blackwater Valley (therefore considered to be within a significant paleo valley). Literature states that factors which appear to be particularly significant in terms of sinkhole formation are the presence of a paleo valley and the nature and distribution of the Lambeth Group within the valley. Particularly important is the presence of a basal layer of sand within the Tertiary, presenting channel deposits which focus drainage of water down to the chalk.

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2.3 PREVIOUS INVESTIGATIONS

2.3.1 Previous Geophysical Survey (Ref. R4277/21/10/2024)

It is understood that a geophysical survey was requested by the current land-owner (Hicks Development Ltd.) following the opening of the sinkhole at East Park Farm Car Park (25m east of the site). The following report was undertaken by Zetica Ltd., dated July 2024:

- Potential Associated Risks with Ground Dissolution Features undertaken by Earth Environmental & Geotechnical Ltd. Report Ref. R4277/21/10/2024, October 2024.

It is understood that the client does not yet have reliance on the report; however, they have been provided the report by Hicks Development Ltd. The geophysical survey covers the same site boundary as this ground investigation.

The previous geophysical report should be referred to in full; however, a summary of the findings is provided below.

- Low conductivity region across the western part of the site
- High conductivity found in the eastern sector, which may represent localised changes in clay content or highly weathered chalk bedrock
- Two areas of highest apparent ground conductivity within the chalk have been annotated on the map, interpreted as areas with the highest potential to represent dissolution features – should be targeted during future investigations
- Area of no superficial deposits mapped by the BGS may be further west, responsible for the observed low conductivity feature – should be a key feature for future investigation
- The Eastern area in general should be targeted as the Geophysical surveys do not support the geology indicated by the BGS maps, i.e. BGS maps indicate geology should show low conductivity. However, shallow groundwater could influence the high conductivity

The previous geophysical survey recommended that ground investigation works will need to confirm the presence and location of different superficial and bedrock geologies beneath the site, and be used to investigate the potential for dissolution features. If evidence of dissolution features is found, additional ground investigation works targeting such features will be required.

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2.4 HISTORY OF THE SITE

The history of the site has been established by the review of old Ordnance Survey (OS) maps going back to 1884. The maps and any other relevant information are included in Appendix D and indicate the following.

2.4.1 Ordnance Survey

Historical Publication Data		
Date	**Features On Site**	**Features Off-Site**
1872	• The site is recorded to be an open, undeveloped field • Sporadic trees are located along the site boundaries	• Park Lane is located to the east of the site boundary • A small, unspecified building is located immediately east of the site • Sandpit Copse (woodland) is located immediately south • East Park Farm, comprising agricultural buildings and fields, is located 100m north-east • A railway line (Great Western Railway) trends north-east to south-west 60m south of the site • A gravel pit is recorded 300m north-west • Old River and tributaries are recorded 250m north-east of the site
1899	• No significant changes are recorded to the site	• The gravel pit located 300m north-west expands in area
1914	• No significant changes are recorded to the site	• No significant changes are recorded in the surrounding area
1932	• No significant changes are recorded to the site	• Minor residential development is recorded 250m – 500m north of the site • Sonning Golf Course is located immediately west of the site • Gravel pit to the northwest is no longer recorded
1966	• The site is divided into four fields with a track trending north-south through the eastern half of the site	• Drains are recorded along the eastern, southern, and western boundaries • A residential dwelling (The Homestead) is constructed 40m south-east of the site • Agricultural barns and silos are constructed 40m south-east of the site • Areas of Worked Ground are recorded 300m to >750m south of the site associated with the extraction of sand and gravel
1972	• No significant changes are recorded to the site	• Significant areas of worked ground, including sand and gravel pits, are recorded along the western bank of the Old River, 250m – 750m east of the site • Significant residential development is recorded 500m north of the site • The areas of worked ground to the south are recorded as a bird sanctuary

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1981	• No significant changes are recorded to the site	• Further residential development is recorded 400m north of the site as the village of Charvil expands southwards
1985	• No significant changes are recorded to the site	• A residential estate is developed immediately north of the site
2001	• No significant changes are recorded to the site	• Further residential development is recorded 100m north of the site
2010	• No significant changes are recorded to the site	• No significant changes are recorded in the surrounding area
2025	• No significant changes are recorded to the site	• An education facility is recorded immediately east of the site • Further commercial units are constructed immediately south of the site

2.4.2 Freely Available Satellite Imagery

Freely available satellite imagery records the site from 2003. The satellite imagery shows that a motocross track (dirt track) is present at the centre of the site. Sandpit Copse is shown immediately south, commercial units are recorded to the south-east, Sonning Golf Course is recorded to the west and a residential estate to the north. Imagery from 2009 shows no change to the site; however, a car park and tennis courts are recorded east of the site. Imagery dated between 2013 and 2014 shows that the car park to the east is being redeveloped with the construction of a new car park. The motocross dirt track is no longer recorded on site. Imagery dated between 2018 and 2022 shows the eastern limit of the site is developed into a builder's yard, matching the compound seen during the walkover associated with the development of a residential estate located immediately north of the site. The spoil heaps of topsoil recorded during the walkover survey are also seen on site.

2.4.3 Unexploded Ordnance and Bomb Sites

Reference to the site-specific unexploded bomb risk map (UXO) produced by Zetica indicates that the site is located in an area where there is a low risk of unexploded ordnance. Low-risk regions are those with a bombing density of up to 15 bombs per 1000 acres or less.

Care is, however, required when assessing the risk for specific sites where the risk may be higher because of local wartime activity, such as munitions factories, pivotal infrastructure, airfields, and dummy airfields, many of which were removed from historical maps in the interest of national security.

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2.5 HYDROLOGY

The desk study information indicates a drainage channel located along the site boundaries. Old River is located >500m east of the site.

There is a WFD (Water Framework Directive) surface water body catchment located on-site associated with the Loddon and Trib.

There are no surface water abstraction licenses recorded within 1000m of the site.

2.6 HYDROGEOLOGY

Reference to the Environment Agency website indicates that the site is located on the following Aquifers:

- Secondary A Aquifer – associated with the underlying Fourth River Terrace Deposits and the Kempton Park Gravel Member
- Secondary A Aquifer – associated with the Lambeth Group
- Principal Aquifer – associated with the White Chalk Subgroup

The aquifer designation data is based on geological mapping provided by the British Geological Survey. The maps are divided into two different types of aquifer designation:

Superficial (Drift) - permeable, unconsolidated (loose) deposits. For example, sand and gravel.

Bedrock - solid permeable formations, e.g., sandstone, chalk and limestone.

For each type, there are four designations: - Principal, Secondary A, Secondary B and Unproductive Strata, ranked by importance.

The site is located within a source protection zone (SPZ3), Total Catchment.

A Source Protection Zone (SPZ) is a designated area around a well or abstraction borehole.

There are records of groundwater abstraction licenses within 1000m of the site. The nearest is recorded as a historical license located 301m north-west of the site used for spray irrigation purposes. The nearest active license is located 572m west of the site for spray irrigation purposes.

There is one potable water abstraction license recorded within 1000m of the site. This relates to a historical record located 404m north of the site previously operated by Mr Hunt for domestic supply.

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2.7 WASTE TREATMENT AND LANDFILL SITES

2.7.1 Landfills

There are three historical records of landfill sites from the Local Authority records located within 500m of the site. These include:

- Wee Waif Public House, located 414m north of the site
- Strathmore Drive, located 431m north of the site, operated by Wokingham District Council
- Tippings Lane, Woodley, located 486m south-east of the site

There are six historical records of landfill sites from the EA/NRW records. These include:

- Tippings Lane, located 257m south of the site, waste type inert, industrial, last operated in 1980
- Behind Village Hall, located 267m north of the site, waste type inert, last operated in 1979
- East Park Farm, located 348m north-east, waste type inert, last operated in 1962
- Wee Waif, located 394m north of the site, waste type inert, industrial, commercial, last operated in 1979
- Strathmore, located 414m north of the site, waste type inert, industrial, commercial, last operated in 1962
- Ashenbury Park, located 499m south-east of the site, waste type inert, industrial, commercial and household, last operated in 1980

The historical landfills listed above relate to the landfilling of historic sand and gravel pits in the surrounding area.

2.7.2 Other Licensed Waste Sites

There is one record of other historical waste sites associated with Land to the North of Waingels Road, which was a waste pumping station located 179m south-west of the site, dated 2021.

2.7.3 Waste Exemptions

There are three records of waste exemptions within 250m of the site. These include:

- The Homestead, located 36m south-east of the site, relates to non-agricultural waste only, the use of waste in construction
- The Homestead, located 38m south-east, relating to the use of waste in construction
- Unspecified Site, located 238m south of the site relating to the use of waste in construction

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2.8 ENVIRONMENTAL PERMITTING AND INCIDENTS

There are no historic IPC authorisations within 500m of the site.

There are no records of Part A(1) licensed industrial activities within 500m of the site.

There is one record of a Part A(2)/B licensed pollutant release within 500m of the site. This record relates to the unloading of petrol into storage at a service station (Co-op Petrol, Charvil) located 428m north-west.

There have been two licensed discharges to controlled waters recorded within 500m of the site. These discharges were recorded 372m north of the site, relating to sewage discharges.

There is one record of a pollution incident within 250m, situated 16m south-east of the site. This relates to oil and fuel release, which caused a significant water impact dated 2023. Given the significant impact and proximity to the site, this could be a potential source of contamination affecting the south-east corner of the site.

2.9 INDUSTRIAL USAGE SITES

There are records of past or present potentially contaminative industrial sites recorded within 250m of the site.

The past potentially contaminative industrial sites include an unspecified works recorded 37m east of the site, and unspecified tanks located 176m south-east and 225m south-east.

The recent potentially contaminative industrial site includes a publishing goods located 38m south-east, and two electricity substations located 108m north-east and 204m north of the site.

2.9.1 Historical Site Usage

Historical information indicates the majority of the site remains unaltered from the first historical records, remaining an open, undeveloped field. The exception being a small area to the east of the site, which has been used as a builder’s yard by Hicks Development Ltd. The walkover survey indicated this area comprised a part tarmac, part engineered granular fill surface used for storing building materials, including bricks, plastic drains, pallets, and fences. Machinery, including an excavator and telehandler, was also stored in this area. A concrete slab is located to the north, previously used for supporting concrete silos. The remaining area of the site has remained undeveloped fields, which were once used for motocross, with dirt tracks visible on satellite imagery.

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Spoil heaps comprising topsoil from the builder's yard and the new residential estate to the north are present on site.

2.10 WORKED OUT GROUND/MADE GROUND

The desk study information records areas of Worked Ground and Infilled Ground within 500m of the site relating to the extraction of sand and gravel deposits and subsequent landfilling.

There are no recorded areas of Worked Ground or Made Ground beneath the site from the desk study information. However, Made Ground is expected at the eastern side of the site associated with the builder's yard. There are also spoil heaps of topsoil (Reworked Ground) located on site, sourced from the builder's yard and the adjacent residential development.

2.11 GROUND GASES

2.11.1 Radon

Information obtained from the BGS and the National Geoscience Information Service indicates that the site lies within an area where less than 1% and 3% of homes exceed the action level of 200Bq/m^3 for radon gas. Therefore, no radon protection measures are necessary in the construction of new dwellings.

2.11.2 Landfill Gasses

In accordance with BS8576:2013, the site has been provisionally assessed for the risk of ground gases. This has been done with reference to "A pragmatic approach to ground gas risk assessment for the 21st Century" Card and Wilson, 2011.

- Some credible sources or pathways for landfill gas migration have been identified from nearby landfills and records, Infilled Ground
- The site has not been a registered landfill
- The Made Ground is not expected to be 5m deep or an average of 3m in thickness.
- The site is directly located on a carbonate-rich rock that can produce very small amounts of carbon dioxide
- No radon protection measures are recommended for this site
- The site is not directly located on potentially naturally organic soil

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It is considered that there is a potential risk of ground gas affecting this site associated with off-site sources, including landfills and records of Infilled Ground. Therefore, ground gas monitoring will be undertaken as part of this site investigation.

2.12 POTENTIAL GEOTECHNICAL HAZARDS

2.12.1 Mining

The desk study information identified that the site does not lie within an area affected by coal mining activities.

However, the site is located within an area potentially affected by non-coal mining activities associated with chalk, with localised small-scale underground mining possible.

There are three British Pits recorded within 500m of the site. The nearest is recorded 342m north-west of the site and relates to a gravel pit as seen on the historical OS maps. The second is located 413m south of the site, also relating to the extraction of sand and gravel. The third is located 440m east of the site known as the Twyford Pits, also relating to the extraction of sand and gravel.

2.12.2 Mineral Planning Areas

There are records of a historical mineral planning area recorded on site; however, this was refused in 1962. There are multiple records of historic mineral planning areas recorded in the surrounding area associated with the extraction of sand and gravel.

2.12.3 Natural Cavities

The desk study information indicates there are two records of natural cavities within the surrounding area. The nearest cavity is recorded 25m east of the site. Internet searches indicate a 2m deep cavity (1m in width) opened up in the East Park Farm Car Park. The cause of the sinkhole is currently unknown. This may have occurred due to an underlying dissolution feature, or other causes may include leaking drains, washing away finer sediment associated with poor construction of the car park.

The second recorded sinkhole is located significantly further away at a distance of >600m north of the site. No further information is available regarding this sinkhole.

A natural cavities risk assessment has been undertaken following the paper written by Clive Edmonds in 2001, “Predicting natural cavities in chalk”. This gives a score to various factors, including the type of chalk, topography, groundwater level, strata overlying the chalk, and periglacial

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and glacial history. The score for this site was 640, which correlates to a very high subsidence hazard category (with a 50.9% occurrence). The natural cavities risk assessment can be found in Appendix A.

The known factors which increase the risk of encountering dissolution features at this site, based on the desk study information, include:

- Chalk strata is part of the White Chalk Subgroup (formerly known as the Upper Chalk), which has an increased weathered profile (low-density chalk), commonly associated with a greater number of solution features
- Tertiary Cover Present (Lambeth Group) and a feathered margin between the Lambeth and Chalk is known to correlate with an unusually high density of sinkholes. This relates to the effects of drainage and acidity of water moving down through the cover deposits to the chalk.
- Tertiary deposits are likely to infill dissolution features if present, creating metastable soils
- Quaternary Deposits also present: Low-level terrace gravels (RTD 4) associated with recent drainage pathways (Modern day River Thames Route)
- Outside the proto Thames Valley, however, it is located along the Loddon-Blackwater Valley (therefore considered to be within a significant paleo valley). Literature states that factors which appear to be particularly significant in terms of sinkhole formation are the presence of a paleo valley and the nature and distribution of the Lambeth Group within the valley. Particularly important is the presence of a basal layer of sand within the Tertiary, presenting channel deposits which focus drainage of water down to the chalk.

2.12.4 Groundsure Geotechnical Hazard Assessment

The risk of naturally occurring geotechnical hazards at the site is recorded in the Groundsure report as follows:

Ground Stability Hazard	Maximum Hazard Potential Rating
Shrinking and Swelling Clays	Negligible to Moderate
Landslides	Negligible to Very Low
Ground Dissolution of Soluble Rocks	Negligible to Low
Compressible Deposits	Negligible
Collapsible Deposits	Very Low
Running Sand	Negligible to Very Low

The maximum hazard potential rating has been attributed to shrinking and swelling clays. A moderate risk has been attributed to the Lambeth Group, where it is considered that the cohesive layers may

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comprise a medium to high shrinkability. Therefore, the effects of any trees or hedgerows within desiccation influencing the distance of the development (as described in the NHBC Standards, Chapter 4.2) should also be considered during design and construction. Where such vegetation is within the influence of new buildings, then foundations will need to extend to depths where soils are moisture/volume stable and appropriate precautionary foundation and floor slab design measures adopted in accordance with the NHBC Building Near Trees protocol.

As previously discussed, there is a potential risk of dissolution features at this site. The Groundsure report has indicated a low risk; however, based on the natural cavities risk assessment, it is considered that the risk could be higher due to the points highlighted in 2.12.3. Furthermore, the previous geophysical survey highlighted two areas of highest apparent ground conductivity within the chalk, interpreted as areas with the highest potential to represent dissolution features. These will be targeted as part of the intrusive works. It was also stated that the areas where no superficial deposits are mapped by the BGS may be further west, responsible for the observed low conductivity feature and should be a key feature for ground investigation.

The site is also recorded to be underlain by River Terrace Deposits, which are likely to be predominantly granular. Therefore, there is a potential risk of running sand, which causes instability when excavating trenches.

Furthermore, the Lambeth Group is well known to cause the following engineering problems:

- Rapid changes in lithology
- Clay with irregular water-bearing sand bodies
- Perched water tables
- Hard bands that obstruct boring, drilling, excavations and piling
- Flint-gravel beds, which are water-bearing and may restrict boring progress and increase wear of cutting equipment
- Lignite, which may provide differential settlement
- Deposits infilling dissolution features in the underlying chalk
- Fissuring of clay, potentially leading to instability in cuts
- De-oxygenation of the atmosphere in tunnels cut into the Upnor Formation sandstones

Given the potential for complex ground conditions, the intrusive investigation will incorporate trial pits, shallow window sampling boreholes and deep cable percussive boreholes to confirm the underlying ground conditions.

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As recommended by the previous geophysical survey, the ground investigation works will need to confirm the presence and location of different superficial and bedrock geologies beneath the site and will be used to investigate the potential for dissolution features. If evidence of dissolution features is found, additional ground investigation works targeting such features will be required.

A small pit filled with wooden sleepers was observed during the walkover survey located along the western boundary of the builder's yard. It is recommended, prior to development, the sleepers are removed and the underlying material inspected. Should loose soils indicating potential dissolution features or Made Ground soils be encountered, further assessment should be undertaken by a suitably qualified person.

2.13 POTENTIALLY SENSITIVE LAND USES

The Groundsure Report has indicated there is designated ancient woodland on site associated with the Sandpit Copse located to the south of the proposed development. Exploratory holes will therefore be positioned a suitable distance away to protect tree roots. It is also understood that there are tree protection orders on two trees located along the northern boundary, which will also apply here.

The site is located within a nitrate vulnerable zone known as Sheeplands (Groundwater NVZ).

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3 INITIAL GEO-ENVIRONMENTAL CONCEPTUAL SITE MODEL

In accordance with the Environment Agency guidance LCRM *Land Contamination: Risk Management*, (EA, 2019), this desk study and site reconnaissance report constitutes a preliminary risk assessment in order to establish the potential presence of pollutant linkages. The diagram below illustrates the potential linkages.

Historical information indicates the majority of the site remains unaltered from the first historical records dated 1872, remaining an open, undeveloped field. The exception being a small area to the east of the site, which has been used as a builder's yard by Hicks Development Ltd. The walkover survey indicated this area comprised a part tarmac, part engineered granular fill surface used for storing building materials, including bricks, plastic drains, pallets, and fences. Machinery, including an excavator and telehandler, was also stored in this area. A concrete slab is located to the north, previously used for supporting concrete silos. The remaining area of the site has remained undeveloped fields, which were once used for motocross, with dirt tracks visible on satellite imagery. Spoil heaps comprising topsoil from the builder's yard and the new residential estate to the north are present on site. Therefore, the majority of the site is likely to be underlain by natural soils and, therefore, unlikely to pose any risk to receptors.

The main sources of contamination are considered to be Made Ground soils associated with the builder's yard to the east, which may contain local elevations of a range of contaminants, given their unknown origin, and the storage of materials and machinery may have introduced contaminants via accidental leakages and spillages such as oil/fuel.

There is one record of a pollution incident within 250m, situated 16m south-east of the site. This relates to oil and fuel release, which caused a significant water impact dated 2023. Given the significant impact and proximity to the site, this could be a potential source of contamination affecting the south-east corner of the site.

The surrounding area to the east and south has experienced significant quarrying associated with the extraction of sand and gravel. The majority are now flooded, forming nature reserves; however, there are records of landfilling, which could be potential sources of ground gas.

There are spoil heaps located on site, comprising predominantly topsoil from the surrounding developments. It is considered unlikely these will contain elevated levels of contamination, but given their reworked nature, it is possible they may contain anthropogenic material.

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Therefore, currently, it is considered that the following potential source/pathway/receptors may be present at and around the site;

Potential Source	Potential Pathway	Potential Receptor	Considered Risk
Builder's yard at the east of the site – introduction of Made Ground soils and potential for storing materials/machinery which may have leaked oils/fuels	Ingestion, inhalation, or absorption from direct contact with soil.	End Users	Low to Moderate Risk
	Leaching through the ground	Controlled Waters	Low to Moderate Risk
	Possible contact during the work phase	Construction Workers	Low to Moderate Risk
Pollution incident located 16m south-east of the site (hydrocarbons)	Ingestion, inhalation, or absorption from direct contact with soil.	End Users	Low Risk
	Leaching through the ground	Controlled Waters	Low Risk
	Possible contact during the work phase	Construction Workers	Low Risk
Spoil Heaps (Majority Topsoil, but may contain anthropogenic material given the reworked nature.)	Ingestion, inhalation, or absorption from direct contact with soil.	End Users	Very Low Risk
	Leaching through the ground	Controlled Waters	Very Low Risk
	Possible contact during the work phase	Construction Workers	Very Low Risk
Ground gas from nearby Landfills	Inhalation	End Users	Low to Moderate Risk
Potential off-site sources – adjacent commercial estate	Ingestion, inhalation, or absorption from direct contact with soil.	End Users	Very Low Risk
	Leaching through the ground	Controlled Waters	Very Low Risk
	Possible contact during the work phase	Construction Workers	Very Low Risk

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4 PHASE II INTRUSIVE INVESTIGATION

4.1 SITE WORK AND SAMPLING STRATEGY

The fieldwork was undertaken in accordance with BS 5930:2015, BS EN 1997-2 (2007) and BS EN ISO 22475-1 (2006), with the exploratory locations being selected by Geo-Integrity Ltd. The exploratory hole locations can be seen in the Appendices.

The fieldwork was undertaken across six working days between the 31st of July and the 7th of August 2025 and consisted of two deep cable percussive boreholes (BH1 and BH2), seven window sampler boreholes (CT1 – CT7), thirteen machine-excavated trial pits (TP1 – TP13), four soakaway tests following the methods set out within BRE365 Digest, and nine dynamic cone penetrometer (equivalent CBR) tests (CBR1 – CBR9).

A standpipe was also installed within CT2 and CT5 to monitor the groundwater and confirm the gas regime at the site.

The table below provides a list of exploratory holes and the location reasoning:

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Exploratory Hole	Location Reasoning
BH1 and BH2	BH1 was positioned within the area of recorded low conductivity identified during the previous Geophysical Survey to understand the ground conditions to the east of the site and investigate potential solution features. In addition, it was located adjacent to the pit identified during the walkover survey. BH2 was positioned in the western half of the site to understand the deep ground conditions in this area. The deeper boreholes will also aid pile design, should this be required by obtaining soil parameters at depth. Given the likelihood of cohesive soils being present beneath the site and the presence of woodland to the south and along the boundaries, the deeper boreholes will be used to investigate the depth of potential zones of desiccation.
CT1 – CT7	CT1 – CT3 were undertaken at the east of the site – CT2 was positioned within the second area of recorded low conductivity. The boreholes were positioned here to log the ground conditions and to investigate potential dissolution features. Dynamic probes were undertaken at the base of CT1 and CT2 to investigate potential dissolution features at depth. CT2 and CT3 were positioned in close proximity to trees to investigate potential desiccated soils. CT4 – CT7 were positioned at the western half of the site to log the ground conditions, given that the published data indicates the underlying geology varies across the site. Standpipes were installed within CT2 and CT5 to monitor the groundwater and confirm the ground gas regime.

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TP1 – TP13	Trial pits were undertaken to provide suitable coverage of the site, with samples taken for laboratory analysis. TP1 was undertaken within the existing builder's yard to confirm the make-up of the engineered fill and collect samples for chemical analysis. TP2 and TP13 were undertaken within the spoil heaps to confirm the make-up and collect samples for chemical analysis. TP4, TP9 and TP10 were positioned adjacent to trees along the boundaries to investigate potential zones of desiccation.
SA1 – SA4	To undertake infiltration testing following the methods set out within BRE365 Digest to aid soakaway design
CBR1 – CBR9	Undertaken to provide CBR values to aid road design

Disturbed samples were taken at selected depths down to the base of the exploratory holes for subsequent laboratory testing and inspection. On completion, all exploratory holes were carefully backfilled with arisings in thin layers, ensuring that the excavated material was replaced in the same order as it had been removed.

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4.2 GROUND CONDITIONS

4.2.1 Summary

The site and laboratory test work revealed that the general succession of strata can be represented by localised Made Ground soils (in the area of the builder's yard) and Topsoil, overlying the River Terrace Deposits, overlying the Lambeth Group, overlying the White Chalk Subgroup. Spoil heaps of Topsoil were also recorded on site. Descriptions of the strata encountered are given on the exploratory hole records and are summarised below. Further information is provided on the exploratory hole logs within the Appendices.

4.2.2 Spoil Heaps of Reworked Topsoil

Encountered locally immediately west of the builder's yard and at the centre of the site. Trial pits TP2 and TP13 were undertaken on top of the spoil heaps, excavating down to depths in excess of 2.80m bgl. The material was consistent throughout, comprising loose, brown, organic, slightly sandy, gravelly silt, gravels being fine to coarse sub-angular flint.

4.2.3 Topsoil

Encountered in the majority of the holes except those undertaken within the builder's yard (TP1, CT1, TP3) and a localised area situated at the centre of the site within TP12. Topsoil was encountered down to depths ranging between 0.15m and 0.65m bgl. The material was encountered as loose, organic, light brown, gravelly silt.

4.2.4 Made Ground

Encountered in exploratory holes TP1, TP3, CT1 and TP12 located within the area of the builder's yard and a small localised area at the centre of the site from ground level down to depths ranging between 0.30m and 0.70m bgl. The Made Ground soils forming the engineered fill underlying the builder's yard comprised (medium dense), brown, silty, sandy gravel, gravel is fine to coarse brick rubble, flint aggregate, concrete, metal, tile and wood with a geo-membrane at the base.

The Made Ground encountered within TP12, situated at the centre of the site, was described as reworked natural topsoil with anthropogenic material including wood, plastic (motorcycle parts), and metal. It is interpreted that this material was buried as part of the motocross dirt track.

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4.2.5 River Terrace Deposits

Encountered within each of the exploratory holes, except those undertaken within the spoil heaps TP2 and TP13, underlying the Made Ground and Topsoil down to depths ranging between 0.95m and 8.00m bgl. The River Terrace Deposits were thicker at the north-west of the site, thinning to the south-east.

The material was variable across the site, but predominantly loose to medium dense, slightly clayey sand and gravel with local layers of firm silty clay.

Significant layers of cohesive soils were encountered within CT5, TP1, TP3, TP6, TP9, and BH1.

SPT tests undertaken within this material recorded ‘N’ values ranging between 6 and 50. The large value range reflects the variability of the material. Lower SPT values indicating loose granular soil were encountered at near surface levels at the east of the site. Whereas very dense granular soils were encountered at the south-west side of the site at near surface levels.

Laboratory testing undertaken on representative cohesive soil samples revealed a moisture content ranging between 14% and 19% and a modified plasticity index ranging between 11% and 34%. The above testing proves the cohesive layers range between low-shrinkable and medium shrinkable soil in accordance with NHBC guidelines.

Particle size distribution tests undertaken on representative granular soil samples revealed the following grain size percentages: Fines (clay and silt):- 4% to 27%; Sand:- 25% to 90%; Gravel:- 0% to 71%. The results indicate the granular layers comprise predominantly sand and gravel.

4.2.6 Lambeth Group

Encountered within exploratory holes BH1, BH2, CT2, CT3, TP1, TP4 underlying the River Terrace Deposits down to proven depths (within BH1 and BH2) ranging between 8.90m and 13.70m bgl, thinning to the south-east.

The material was encountered as layers of soft to firm and firm to stiff, dark grey, green, silty clay with shell debris and calcareous horizons, dense, dark grey, green, very sandy clayey silt with shell debris.

SPT tests undertaken within this material recorded ‘N’ values ranging between 6 and 50. Softer soils were encountered at the east of the site within BH1 and CT2, however the remaining area of the site recorded competent ‘N’ values.

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Laboratory testing undertaken within this material revealed a moisture content ranging between 15% and 30% and a modified plasticity index ranging between 12% and 45. The above testing proves the Lambeth Group comprises significant layers of highly shrinkable soil in accordance with NHBC guidelines.

Triaxial tests were undertaken on two samples BH1 at a depth of 4.60m bgl which recorded an undrained shear strength of 55kPa and BH2 at a depth of 11.00m bgl which recorded an undrained shear strength of 114kPa.

4.2.7 White Chalk Subgroup

Encountered within exploratory holes BH1 and BH2, underlying the Lambeth Group down to depths in excess of 25.00m bgl where the boreholes terminated.

The material was encountered as structureless, off-white chalk comprising both gravelly silt (Grade Dm) and silty gravel (Grade Dc). Gravels were encountered as very weak, medium density, white chalk. Locally seams of flint were also encountered.

SPT tests undertaken within this material recorded ‘N’ values ranging between 14 and 50. The SPT ‘N’ values indicate competent strata with no evidence of soft zones or voids which may indicate dissolution features.

Laboratory testing undertaken on gravels taken within this material revealed an intact dry density of 1.58 and 1.59Mg/m^3, indicating a medium density.

4.2.8 Super Heavy Dynamic Probes

Dynamic probes were undertaken within CT1 and CT2 at the base of the borehole to investigate the competency of the material below the maximum sampling depth, to investigate potential solution features. However, given the findings of the deep borehole BH1, a substantial thickness of overburden exists above the chalk strata with the Lambeth Group encountered down to a depth of 8.90m bgl.

The probes undertaken at the base of CT1 and CT2 correlate with this. CT1 probe encountered an increasing strength profile from 4.00m to 8.00m bgl, with a more consistent strength profile from 8.00m to 10.00m bgl. CT2 probe encountered an increase in strength from 5.00m to 6.00m bgl with a consistent strength between 6.00m and 9.50m, increasing again between 9.50m and 10.00m bgl.

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No significant weak zones or voided ground over extended depths were encountered from the probes data and it can be interpreted the Lambeth Group exists down to similar depths encountered within BH1.

4.2.9 Sulphate and pH Tests

Water soluble sulphate, pH, were carried out on samples recovered from the Made Ground, River Terrace Deposits, Lambeth Group and the White Chalk Subgroup. The Made Ground soils and the Lambeth Group were also tested for acid soluble sulphate and total sulphur tests. These recorded values as shown in the table below:

Parameter	**Range**			
	Made Ground	**River Terrace Deposits**	**Lambeth Group**	**White Chalk Subgroup**
Soluble Sulphate (mg/l)	120	21 - 26	13 - 610	13 - 25
pH units	10.9	8.4 – 8.5	7.6 - 8.5	8.4 – 8.7
Acid Soluble Sulphate	1.28	-	<0.01 - 0.18	-
Total Sulphur	0.44	-	<0.01 – 0.86	-

4.2.10 Groundwater

Groundwater was encountered as strikes within exploratory holes BH1, BH2, and CT1 at depths ranging between 1.50m and 13.90m bgl.

BH1 encountered a standing level at a depth of 7.90m bgl within dense silt of the Lambeth Group

BH2 encountered a water strike at a depth of 13.90m bgl within the White Chalk Subgroup which rose to a depth of 13.00m bgl within the Lambeth Group, considered to reflect minor artesian water pressure.

CT1 encountered a standing water level at a depth of 1.50m bgl within the granular River Terrace Deposits. Potentially reflecting perched water levels.

Groundwater monitoring is currently ongoing. Currently two monitoring visits have been undertaken on the 14/08/2025 and 20/08/2025 within the standpipes installed within CT2 and CT5.

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CT2 recorded dry conditions on both visits. CT5 recorded standing groundwater levels at 3.36m and 3.40m bgl within the River Terrace Deposits likely reflect perched water levels within the granular layers.

4.2.11 Infiltration Tests

Infiltration tests were undertaken within SA1 – SA4 within the variable near-surface soils of the River Terrace Deposits.

SA1 was located at the south-east corner (proposed location of attenuation pond) of the site and excavated down to a depth of 0.70m bgl within the granular River Terrace Deposits.

SA2 was located at the north-west of the site and excavated down to a depth of 1.30m bgl within the granular River Terrace Deposits.

SA3 was located along the southern boundary of the site (proposed attenuation pond) and excavated down to a depth of 0.90m bgl within the granular River Terrace Deposits.

SA4 was located at the south-west corner of the site (predominantly gravel) and excavated down to a depth of 0.75m bgl.

The results are included in the table below.

Trial Pit	Infiltration Rates (m/s)			
	Test 1	**Test 2**	**Test 3**	**Average**
SA1	2.44×10^{-5}	1.64×10^{-5}	9.88×10^{-6}	1.69×10^{-5}
SA2	2.12×10^{-6}	2.37×10^{-6}	Insufficient time to start third test	-
SA3	2.77×10^{-6}	2.58×10^{-6}	1.97×10^{-6}	2.44×10^{-6}
SA4	3.03×10^{-4}	1.50×10^{-4}	1.48×10^{-4}	2.00×10^{-4}

The graphs are included in Appendix B.

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4.2.12 California Bearing Ratio

Nine TRL DCP (equivalent CBR) tests (CBR1 – CBR9) were undertaken from ground level across the site within areas of proposed roads and pavements. Equivalent CBR values ranged between 5% and 120%.

4.2.13 Gas Monitoring

Gas monitoring is currently ongoing alongside groundwater monitoring within the standpipes installed within CT2 and CT5. The two gas monitoring visits currently undertaken recorded methane below detectable limits, carbon dioxide levels between 0.6% and 1.4%, oxygen levels between 19.8% and 20.5% with hexane levels recorded below detectable limits. Peak flow was recorded at 0l/h, and atmospheric pressure was recorded between 1010mbar and 1013mbar.

4.2.14 Evidence of Contamination

No obvious or significant contamination was identified within the localised near-surface Made Ground soils and underlying natural soils encountered during the fieldwork. Locally anthropogenic material was encountered within the Made Ground soils located at the east of the site and at the centre of the site; however, this was limited to construction materials including brick, plywood and plastic.

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5 GEOENVIRONMENTAL TESTING

Geo-environmental laboratory testing was scheduled by Geo-Integrity on ten soil samples recovered during the fieldwork. The testing was carried out at an MCERTS and UKAS-accredited laboratory. The results are presented in the Appendices.

Ten soil samples were tested for a varied suite containing the following

- Metals and inorganic substances
- Speciated Polycyclic Aromatic Hydrocarbons (PAH)
- Benzene, Toluene, Ethylbenzene and Xylene (BTEX)
- Total Petroleum Hydrocarbons (TPH), with eight band split
- Asbestos Screen

Additionally, UKWIR testing was undertaken on three soil samples, which included a range of banded hydrocarbons, VOCs and SVOCs, BTEX and polyaromatic hydrocarbons, to assess the risk to water pipes.

WAC testing was undertaken on a representative soil sample taken from a spoil heap located on site, and one sample recovered from the engineered fill underlying the builders' yard, recovered from CT1, to aid waste classification of the soils.

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6 GEOTECHNICAL INTERPRETIVE SECTION

6.1 GENERAL GROUND CONDITIONS INTERPRETATION

The exploratory fieldwork undertaken during this investigation has identified that the underlying geology differs significantly from published geological records. This ground investigation has identified that the underlying ground conditions can be summarised as:

- Localised Made Ground exists underlying the builder's yard and a small pocket at the centre of the site – maximum thickness 0.70m bgl
- Topsoil underlies the majority of the site
- River Terrace Deposits underlie the near-surface soils down to depths of 8.00m bgl in the west and 0.95m in the east (thinning in a south-east direction)
- River Terrace Deposits were variable but predominantly granular sand and gravel (non-shrinkable). However, significant layers of cohesive soil were encountered within CT5, TP1, TP3, TP6, TP9, and BH1, with laboratory testing proved this material to have medium shrinkability in accordance with NHBC guidelines
- The Lambeth Group was encountered across the site down to proven depths of 8.90m and 13.70m bgl (thinning to the east)
- The Lambeth Group comprised predominantly soft to firm and firm to stiff, dark grey, green, silty clay with shell debris and calcareous horizons, dense, dark grey, green, very sandy clayey silt with shell debris. Laboratory testing has proven this material contains layers of highly shrinkable soil in accordance with NHBC guidelines
- The White Chalk Subgroup underlies the Lambeth Group at depths below 8.90m bgl, proven down to depths in excess of 25.00m bgl (the maximum depth achieved by this ground investigation)
- The White Chalk Subgroup was encountered as structureless, off-white chalk with layers of Grade Dm and Grade Dc. High SPT 'N' values within this material indicate competent strata, potentially indicating higher chalk grades than Grade D
- Groundwater was encountered at significant depths ranging between 7.90m and 13.00m bgl, recorded to be at similar depths to the interface between the Lambeth Group and the underlying chalk strata. In addition, perched water levels were recorded within CT1 and TP5 resting within the River Terrace Deposits at depths of 1.50m and 2.80m bgl, respectively. Subsequent groundwater monitoring also recorded perched water levels within CT5 at depths of 3.36m bgl

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- The southern boundary of the site is situated in a flood risk zone; as such, groundwater levels are expected to vary seasonally. The ground investigation was undertaken during the summer months, when groundwater levels are at their lowest

The difference between the findings of this ground investigation and the published geology is as follows:

- Superficial Deposits are present across the entire site (thinning to the east) in the form of River Terrace Gravel Deposits. The published data indicated superficial deposits were absent from the centre of the site, which is not the case.
- Similarly, the published geology indicates the Lambeth Group is only present at the western side of the site. This was not the case as the Lambeth Group was encountered within BH1 (located at the east of the site) down to a depth of 8.90m bgl, indicating a significant thickness of overburden above the chalk strata exists.
- As such, the feathered margins previously indicated on the published data are not present beneath the site.

6.2 DISSOLUTION FEATURES

The desk study information, including the natural cavities risk assessment, identified a potentially high risk of encountering dissolution features based on the published geology.

This ground investigation has identified that the actual underlying ground condition differs significantly from the published records. These differences reduce the likelihood that dissolution features exist below the site. These include:

- A significant overburden (River Terrace Deposits and Lambeth Group) has been above the chalk, indicating the site is not located along a feathered margin
- High conductivity areas previously identified by the geophysical survey to the east of the site were interpreted to potentially reflect highly weathered chalk and an increased risk of encountering dissolution features. This is not the case as the Lambeth Group was encountered at depths in excess of 8.90m bgl. Therefore, the high conductivity previously recorded likely reflects the clay soils of the Lambeth Group and not weathered chalk
- The low conductivity previously recorded across the western half of the site reflects the increased granular content associated with the proven thicker River Terrace Deposits

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Feathered margins of the Lambeth Group, where surface run-off is concentrated, present a high concentration of dissolution features. Given the significant thickness of the Lambeth underlying the site, it is considered that the feathered edge is located further east of the site.

Currently, one 25m deep borehole (BH1) has been undertaken at the eastern side of the site, which has proven the depth to the underlying chalk. Given the limited data, further investigation incorporating boreholes and probes should be undertaken to confirm that the ground conditions encountered within BH1 are consistent across this area.

6.3 DESICCATION ASSESSMENT

Information obtained from the walkover survey undertaken as part of this investigation and the desk study indicates there are sporadic areas where significant layers of cohesive soils are present at near-surface levels located to the east of the site and to the north-west. These areas are also located in close proximity to mature and immature trees, including the woodland along the south of the site and trees located along the boundaries of the site. Given the above findings and the fact that the underlying cohesive soils have been proven to be moderately to highly shrinkable, a desiccation assessment has been undertaken. The majority of the site was underlain by predominantly granular soils; therefore, there is not anticipated risk of desiccation for the majority of the site.

Selected samples from boreholes BH1, CT2 and CT3, where significant layers of cohesive soil were encountered, were tested for moisture content and Atterberg classification tests. Graphs are presented in Appendix C showing the moisture profiles alongside index properties with notes on desiccation analysis. The findings of the desiccation assessment are summarised below.

Firstly, all the samples have been weighed before and after oven drying to measure the gravimetric moisture content. Equivalent moistures, factored to take account of the “% passing” value, have been used throughout. The line of the equivalent Mc has been superimposed against depth. The graphs are attached. Moisture content in uniform soil should display a generally linear relationship, decreasing gradually with depth as natural in-situ earth pressures increase. If there is a negative bulge, this indicates a zone of desiccation. From the three moisture profiles, a negative bulge was not observed.

The second method was proposed by Richard Driscoll (Driscoll R. (1983) “Influence of Vegetation on Clay Soils” Geotechnique. Vol. 33). The method seeks to establish a relationship between the moisture content and index properties of the soil. Driscoll suggested that soil might be desiccated if the moisture content is less than (a) 0.4 x LL or (b) 2% + PL. Driscoll preferred the LL test as the

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more reliable of the two and recommends that this assessment be always used in conjunction with other forms of testing. In addition, if the soil is highly desiccated, the tests perform better and become less clear and confusing as the level of desiccation diminishes, as stated by Plante, S., Rollit, E. and Nazareth, C. (2007) “Site Investigation and Soil Testing” The Clay Research Group, Pg. 18.

It can be seen from the BH1 that the equivalent moisture content is significantly lower than (a) 0.4 x LL and (b) PL+2% down to the base of the assessment in excess of 6.00m bgl.

It can be seen from CT2 that the equivalent moisture content is below (a) 0.4 x LL at 0.95m bgl, but equalises at 2.50m bgl and is higher at 4.50m bgl. This is similar to the equivalent moisture content vs (b) PL+2%

It can be seen from CT3 that the equivalent moisture content is above (a) 0.4 x LL. However, when compared to (b) PL+2% the equivalent moisture content is below at a depth of 1.20m bgl, but is greater from a depth of 3.00m bgl.

The final method is the comparison of the Liquidity Indices of the soil with depth. The Liquidity (or Consistency) Index is the normalised value of the moisture content on a scale between PL = 0 and LL = 1. Such that:

LI=(Mc-PL)/(LL-PL) - normalisation formula

When using this method of interpretation, a value below ‘0’ suggests a desiccated soil and ‘1’ a fully saturated soil; a result of ‘0.5’ may be considered as a nominal soil value. The results shown within the lab results indicate negative values are present.

Furthermore, a single sample taken from TP9 at a depth of 1.50m bgl also shows that the equivalent moisture content is significantly lower than the index properties.

Given the findings of the desiccation assessment, the cohesive soils within BH1, CT2, CT3 and TP9 show evidence of desiccation down to depths in excess of 6.00m bgl, as shown in BH1. BH1 proved that non-shrinkable soil exists below 6.50m bgl; therefore, it is considered that the zone of desiccation ends at 6.50m bgl.

It is considered that the eastern area of the site, as highlighted on the geological plan in Appendix A, comprises locally desiccated soil as proven within the three exploratory holes (CT2, CT3 and BH1). This entire area recorded significant layers of cohesive soils, with the exception of CT1, and as such, given the information currently available, this area should be considered at risk of shrinking

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and swelling down to depths of 6.50m bgl, as proven within BH1. Foundations will therefore require deepening past this zone of desiccation (>6.50m bgl).

The majority of the western half of the site, highlighted yellow on the geological plan in Appendix A, is underlain predominantly by granular soils considered to be non-shrinkable and therefore unaffected by the risks of desiccation. However, a localised area of cohesive soil was encountered within TP9 and CT5 at the north-west corner of the site. A single sample taken from TP9 recorded evidence of desiccation, but samples taken from CT5 recorded no such evidence of desiccation. There is a small ground of mature trees and bushes at the north-west corner of the site, which could be the reason for desiccation within TP9. The zone of desiccation has been zoned to the area surrounding TP9; however, the full depth of desiccation has not been proven. As such, further investigation should be undertaken in this area to prove the extent of desiccation. See the geological plan in Appendix A for visual aid.

6.4 EXCAVATIONS

Conventional plant should be sufficient for the excavation of the underlying soils at the site. Excavations are likely to remain stable in the short term. However, granular layers containing minor perched water levels could be encountered locally, as seen within CT1 and TP5, which may become unstable in the short term, requiring trench support.

Excavations are likely to remain dry down to depths in excess of 1.50m bgl. Minor water strikes may be encountered above 2.80m bgl as seen within TP5 and 1.50m bgl as seen within CT1. The ground investigation was undertaken during a significantly dry period during the summer months, and as such, groundwater levels may become significantly shallower during the wetter winter months. The proposed development indicates a flood zone along the southern boundary, which proves the possibility of seasonal changes to the groundwater levels.

6.5 FOUNDATIONS

The proposed development includes the construction of seventy-five residential dwellings, including a range of two-bed, three-bed, four-bed, and five-bed dwellings. Given the findings of this intrusive investigation, the foundation design will comprise both shallow foundations and deeper foundations. Based on the desiccation assessment, deeper foundations will be required in the eastern area of the site, as shown on the geological plan highlighted in blue in Appendix A. The zone of desiccation was proven down to a maximum depth of 6.50m bgl within BH1, where non-shrinkable silt deposits are encountered.

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The western half of the site is predominantly underlain by granular soils considered to be non-shrinkable, and as such, conventional shallow foundations are considered viable.

The only exception applies to the area surrounding TP9, where significant layers of cohesive soils were encountered with a soil sample showing evidence of desiccation. It is considered that further testing should be undertaken to prove the extent of desiccation, which will dictate the required foundation depth.

6.5.1 Shallow Foundations (Area Highlighted Yellow on the Geological Plan)

The Topsoil and localised Made Ground are considered unsuitable as a bearing stratum due to its variability and potential for unacceptable total and differential settlement under applied foundation loadings.

The underlying granular River Terrace Deposits at a depth of 0.75m bgl or 0.20m into the stratum, whichever is the deeper (could be as deep as 1.20m, as per TP12), may be suitable for conventional shallow foundations. At this depth, a net allowable bearing pressure of 150kPa may be adopted for strip foundations not exceeding 1m in width. This allows for a factor of safety of three against shear failure and for settlements generally not to exceed 25mm, taking place over a number of years.

Foundations should be suitably reinforced to combat differential settlement, given the possibility of foundations crossing both granular and cohesive soils.

6.5.2 Piled Foundations (Area Highlighted Blue on the Geological Plan)

The underlying River Terrace Deposits and Lambeth Group down to a depth of 6.50m bgl in the area highlighted blue show evidence of desiccation, and as such, shallow foundations are considered unviable. Therefore, it is anticipated that deeper foundations such as piles will be required.

Should piles be the chosen method of foundation, the advice of a specialist piling contractor should be sought to formulate a suitable piling technique and type for the ground conditions encountered at this site, before commencement of the works.

It is anticipated that a CFA pile system will be appropriate on this site, given the ground conditions. Piles would extend through the Topsoil, Made Ground, and desiccated soils of the Lambeth Group proven to a depth of 6.50m bgl and terminate in the underlying non-shrinkable dense silt deposits within the Lambeth Group and the underlying White Chalk Sub-group. Piles extending through the desiccated soils of the Lambeth Group should be sleeved. In line with NHBC guidelines it is

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recommended sufficient anchorage should be provided below the depth of desiccated soil. Slip liners may be used to reduce uplift, although this reduction is small.

A preliminary assessment of working loads has been based on the skin friction and base resistance within the underlying Lambeth Group (below 6.50m bgl) and the underlying White Chalk Subgroup. An overall factor of safety of 3 has been applied. Further investigation should be undertaken to prove that ground conditions within BH1 are representative of the area highlighted in blue. As such, the estimate of working loads should not be relied upon for design purposes.

Depth of the pile (m bgl)	Assumed founding stratum	Anticipated Working load (kN) for piles of the following diameters	
		Pile diameter 300 mm	Pile diameter 450 mm
7.50	**Lambeth Group**	<100	<200
10	**White Chalk Subgroup**	60	100
15	**White Chalk Subgroup**	200	300

The Lambeth Group has been proven to extend to a depth of 8.90m bgl; however, this could vary across the area highlighted in blue. Therefore, an estimation of the anticipated working loads where piles are founded within the Lambeth Group is given as less than (<). Further investigation should be undertaken to prove the ground conditions identified within BH1 are consistent across the area highlighted in blue to suitably design piled foundations.

6.5.3 Foundations (North-West Corner Surrounding TP9)

The area surrounding TP9 encountered significant layers of cohesive soils, with a soil sample showing evidence of desiccation. It is considered that further testing should be undertaken to prove the extent of desiccation, which will dictate the required foundation depth.

6.6 FLOOR SLAB DESIGN

Floor slabs at the site in the area highlighted yellow can be ground bearing, provided the Topsoil/Made Ground is stripped and removed and is based on a blanket of good quality, free-draining, well-compacted granular material, placed prior to the construction of the floor slab, in order to make up the level.

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Floor slabs in the areas where there is evidence of desiccated soils, and where piled foundations are the chosen method of foundation, will need to be suspended. The advice of the NHBC should be followed.

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6.7 SULPHATE ATTACK ON UNDERGROUND CONCRETE

Water soluble sulphate, pH, was carried out on samples recovered from the Made Ground, River Terrace Deposits, Lambeth Group and the White Chalk Subgroup. The Made Ground soils and the Lambeth Group were also tested for acid soluble sulphate and total sulphur tests to give an indication of the aggressivity of the ground in relation to buried concrete, as set out in the Building Research Establishment (BRE) Special Digest 1 (2005) Concrete in Aggressive Ground, Part 1: Assessing the aggressive chemical environment.

Therefore, in accordance with the BRE Special Digest, these results have been given in the table below, in relation to strata type and required Design Sulphate Class and site Aggressive Chemical Environment Classification (ACEC).

Strata	Design Sulphate Class	Aggressive Chemical Environment Classification
Made Ground	DS-1	AC-1
River Terrace Deposits	DS-1	AC-1
Lambeth Group	DS-4	AC-4
White Chalk Subgroup	DS-1	AC-1

The classification for the Lambeth Group of DS-4 and AC-4 has been restricted from a classification of DS-5/AC-5 respectively, in accord with Fig. C5 of the BRE Special Digest.

The recommendations given in the above digest, with respect to suitable concrete design and other associated precautions against sulphate attack, should be followed for all below-ground-level concrete.

6.8 INFILTRATION MEASURES

Appropriately designed sustainable drainage systems (SuDS) are more sustainable than using piped drainage to local sewer systems. However, infiltration measures close to buildings may result in undermining of foundations and softening of soils, leading to instability. Attenuation measures should be located at suitable distances from foundations and infrastructure. Infiltration testing was undertaken in four locations across the site, SA1 – SA4, within the River Terrace Deposits.

Three repeat tests were achieved within test locations SA1, SA3 and SA4. Two repeat tests were completed within SA2; however, due to low infiltration rates time a third test could not be completed within the time allowed.

The best rates were recorded within SA4, as shown in the table below:

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Trial Pit	Infiltration Rates (m/s)			
	Test 1	Test 2	Test 3	Average
SA1	$2.44x10^{-5}$	$1.64x10^{-5}$	$9.88x10^{-6}$	$1.69x10^{-5}$
SA2	$2.12x10^{-6}$	$2.37x10^{-6}$	Insufficient time to start the third test	-
SA3	$2.77x10^{-6}$	$2.58x10^{-6}$	$1.97x10^{-6}$	$2.44x10^{-6}$
SA4	$3.03x10^{-4}$	$1.50x10^{-4}$	$1.48x10^{-4}$	$2.00x10^{-4}$

CIRIA C574 states that: "Concentrated ingress of water into the chalk can initiate new dissolution features, particularly in low-density chalk, and destabilise the loose backfill of existing ones. For this reason, any soakaways should be sited well away from foundations for structures, roads or railways, as indicated below:

- In areas where dissolution features are known to be prevalent, soakaways should be avoided if at all possible, but, if unavoidable, should be sited at least 20m away from any foundations.
- Where the chalk is of low density, or its density is not known, soakaways should be sited at least 10m away from any foundations."

Given the information gathered from this intrusive investigation, the chalk strata were proven to be overlain by a significant overburden comprising River Terrace Deposits and Lambeth Group soils; therefore, the risk of dissolution features is less than if it was present nearer surface. No evidence of dissolution features was recorded during this investigation; however, only two boreholes (BH1 and BH2) identified chalk at depth. Therefore, as a precaution, it is recommended that soakaways should be sited at least 10m away from foundations for structures, roads and railways. Water pipes and foul and surface water drains should ne constructed with flexible pipes and joints.

6.9 ACCESS ROADS AND PAVEMENT DESIGN

TRL DCP (Equivalent CBR) Tests were undertaken on the underlying sub-grade material, including Made Ground soils, and revealed an equivalent CBR value range of 5% and 120%. In addition, to avoid uneven and excessive settlement in hard-standing areas, it is recommended that the following precautions be taken: -

- Heavy proof-rolling of the exposed sub-grade strata

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- Excavation of soft spots encountered and replacement with well-compacted granular material
- The usage of a geo-textile separator layer above the sub-grade
- A 5% design CBR value is considered in line with the Highways Department document HD 25-94 Road foundations and results of the CBR tests undertaken during this investigation

Additionally, the soils on site are likely to be frost susceptible. Road and pavement construction on frost-susceptible soils is required to be 450mm deep to extend below the frost zone.

6.10 GAS PROTECTION

The risk of ground gases impacting the site was assessed by reference to the paper “A pragmatic approach to ground gas risk assessment for the 21st Century” Card and Wilson, 2011.

Four monitoring visits were undertaken at the site, and recorded methane gas below detectable limits and carbon dioxide levels between 0.6% and 1.4%. A peak flow rate of 0l/h was also recorded. Therefore, the worst-case gas screening value (GSV) is 0l/h due to no flow recorded. Based on the conditions measured during the monitoring visits carried out to date, in accordance with BS8485:2015 and CIRIA C665, 2007, this would be considered as a Characteristic Situation 1 (CS1) and therefore no further action is required. Full details of gas concentrations and gas flow data recorded during the monitoring visits are given in the Appendices.

The site is located in an area where between 1% and 3% of homes exceed the action level of 200Bq/m3 for radon gas, and therefore, no radon protection measures are necessary in the construction of new dwellings or extensions.

Two additional gas monitoring visits are scheduled; therefore, the findings will conclude the level of risk.

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7 GEO-ENVIRONMENTAL INTERPRETATIVE SECTION

7.1 RISKS TO HUMAN HEALTH

7.1.1 Introduction

Environment Agency guidance LCRM *Land Contamination: Risk Management*, (EA, 2019), states that human health risk assessment should be undertaken by a tiered approach using the source-pathway-receptor principle. A desk study constitutes the first tier, and this has been undertaken as part of this investigation. The conclusions of this phase were that: -

"Historical information indicates the majority of the site remains unaltered from the first historical records dated 1872, remaining an open, undeveloped field. The exception being a small area to the east of the site, which has been used as a builder's yard by Hicks Development Ltd. The walkover survey indicated this area comprised a part tarmac, part engineered granular fill surface used for storing building materials, including bricks, plastic drains, pallets, and fences. Machinery, including an excavator and telehandler, was also stored in this area. A concrete slab is located to the north, previously used for supporting concrete silos. The remaining area of the site has remained undeveloped fields, which were once used for motocross, with dirt tracks visible on satellite imagery. Spoil heaps comprising topsoil from the builder's yard and the new residential estate to the north are present on site. Therefore, the majority of the site is likely to be underlain by natural soils and, therefore, unlikely to pose any risk to receptors.

The main sources of contamination are considered to be Made Ground soils associated with the builder's yard to the east, which may contain local elevations of a range of contaminants, given their unknown origin, and the storage of materials and machinery may have introduced contaminants via accidental leakages and spillages such as oil/fuel.

There is one record of a pollution incident within 250m, situated 16m south-east of the site. This relates to oil and fuel release, which caused a significant water impact dated 2023. Given the significant impact and proximity to the site, this could be a potential source of contamination affecting the south-east corner of the site.

The surrounding area to the east and south has experienced significant quarrying associated with the extraction of sand and gravel. The majority are now flooded, forming nature reserves; however, there are records of landfilling, which could be potential sources of ground gas.

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There are spoil heaps located on site, comprising predominantly topsoil from the surrounding developments. It is considered unlikely these will contain elevated levels of contamination, but given their reworked nature, it is possible they may contain anthropogenic material."

Therefore, it is considered that there are some potential source/pathway/receptor linkages at the site, and as such, chemical testing has been undertaken.

Results are analysed under the second tier, known as a Generic Quantitative Risk Assessment (GQRA), which uses generic guideline values to compare site chemical data against, and the final tier would be a Detailed Quantitative Risk Assessment (DQRA), which uses data derived from the ground investigation to assess risks to identified receptors.

The assessment included in this report comprises a GQRA, which is undertaken by comparing soil contaminant concentrations from this investigation with conservative Generic Assessment Criteria (GAC). GACs for various land use and exposure scenarios have been selected from the following sources:

- CL:AIRE Category 4 Screening Levels (C4SL);
- LQM Suitable for Use Levels (S4UL);
- CL:AIRE/EIC/AGS GAC

The GAC have been derived using the Environment Agency Contaminated Land Exposure Assessment (CLEA) model, for a range of land uses and exposure scenarios, including:

- Residential with the consumption of home-grown produce;
- Residential without the consumption of home-grown produce;
- Commercial;
- Allotments;
- Public Open Space near residential housing (POS_{resi}); and
- Public Open Space public park scenario (POS_{park})

Given that the proposed development is to construct residential dwellings with private gardens, a "residential with the consumption of home-grown produce" land-use scenario has been selected for this assessment.

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7.2 RESULTS OF CHEMICAL TESTING

Ten soil samples were screened as part of this investigation.

Made Ground samples:

- TP1 at a depth of 0.20m bgl
- CT1 at a depth of 0.10m to 0.70m bgl
- TP12 at a depth of 0.30m bgl
- TP3 at a depth of 0.20m bgl

Spoil Heap Samples:

- TP2 at a depth of 0.50m bgl
- TP2 at a depth of 2.50m bgl
- TP13 at a depth of 0.20m bgl
- TP13 at a depth of 2.80m bgl

Natural Soil Sample:

- TP9 at a depth of 0.30m bgl
- CT4 at a depth of 0.30m to 0.85m bgl

The above soil samples were screened against the relevant GAC for a “Residential with the consumption of home-grown produce” land-use scenario as described above, and recorded no significantly elevated levels of contaminants with the exception of marginally elevated levels of polyaromatic hydrocarbons within the Made Ground sample recovered from TP1 at a depth of 0.20m bgl.

7.2.1 Asbestos

Screening for the presence of asbestos did not reveal any asbestos-containing material (ACM) or fibres.

7.2.2 Polyaromatic Hydrocarbons

A marginally elevated concentration of dibenz(a,h)anthracene was encountered within one Made Ground soil sample (TP1 at a depth of 0.20m bgl). The concentration recorded was 0.38mg/kg with the relevant GAC being 0.24mg/kg.

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Due to the conservative approach to calculating the S4ULs, we have decided to use the C4SLs for Benzo(a)pyrene (BaP) as a surrogate marker for the PAH on-site. In order to do this, the three criteria below need to be met:-

- The SM (BaP) must be present in all soil samples.
- The profile of the different PAH relative to BaP should be similar in all samples.
- The PAH profile in the soil samples should be similar to that used in the pivotal toxicity study on which HBGV was based, i.e. the Culp study.

This was the case within all the samples where PAHs were encountered, and the soil concentration of BaP did not exceed the relevant C4SL of 5mg/kg. Therefore, it is considered that the risk to end users of the site was below the C4SL level, which is defined as “there is no risk that land poses a significant possibility of significant harm”, therefore in line with DEFRA authorised guidance, we consider that the PAHs do not cause a risk to end users across the site. The BaP Surrogate Marker calculation sheets are included in Appendix C.

7.3 RISK TO END USERS

Given the findings of the desk study, walkover survey, intrusive investigation and laboratory testing, it is considered that the risk of contamination to construction workers, end users and surrounding residents from the proposed development at this site is very low, and **as such, NO further works or remedial measures are necessary prior to development.**

We recommend that the conclusions of this report be agreed with the relevant Local Authority at the earliest stage, to reduce potential delays to the development.

7.4 RISK TO CONTROLLED WATERS

None of the metals and inorganic contaminants tested for within the total soil chemical tests recorded significantly elevated values. It is therefore considered that there is no risk of Controlled Waters pollution from this site.

The Environment Agency is the regulatory body charged with the protection of controlled waters and may be a consultee in the planning process. We recommend that the conclusions of this report be agreed with the relevant Local Authority at the earliest stage, to reduce potential delays to the development.

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7.5 RISK TO UNDERGROUND WATER SUPPLY PIPES

Based upon the guidance document from the UK Water Industry Research (UK WIR), 'Contaminated Land Assessment Guidance', February 2014, and the results of the samples tested specifically for the UKWIR suite from the site, it is considered that conventional PE water pipes would be suitable for the majority of the site including all-natural soils and Topsoil.

However, a marginally elevated level of Bis(2-ethylhexyl) phthalate (SVOC) was recorded within the sample recovered from CT1 at a depth of 0.10m to 0.70m bgl taken from the engineered fill underlying the builder's yard. The value was recorded at 3.1mg/kg with the limit value for SVOC being 2mg/kg. Furthermore, a marginally elevated level of Total TPH C12-C16 was recorded at 11mg/kg in TP 1 at 0.20m bgl, with the limit value for band C10 – C16 being 10mg/kg. Therefore, water pipes crossing the engineered fill underlying the builder's yard will require a barrier pipe.

This should be confirmed with the local water company, as not all authorities use this guidance.

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8 WASTE DISPOSAL CLASSIFICATION

8.1 INTRODUCTION

Excavation for foundations or services will produce waste soil and possibly other waste streams. As a waste producer, you have a duty of care under section 34 of the Environmental Protection Act 1990 to ensure, amongst other things, that these wastes are:

- Correctly stored
- Correctly classify
- Handed only to an authorised person
- Disposed of properly

To aid with these obligations, we have used HazWasteOnline to undertake the Hazard Assessment Screen as part of this investigation, to establish whether the sampled soils should be considered as either hazardous or non-hazardous waste. This classification process is in line with the Environment Agency's guidance WM3 "Guidance on the classification and assessment of waste", Version 1.2, October 2021.

8.2 RESULTS OF HAZARD ASSESSMENT

The samples analysed for human health listed in section 7.2 have been classified using HazWasteOnline.

The full results of the HazWasteOnline Stage-One analyses can be seen in the Appendices.

The HazWasteOnline classification summary sheet from this investigation provides a waste classification of Non-Hazardous for all samples tested.

No visible pieces of asbestos were detected by the naked eye or identified in the chemical testing. Therefore, asbestos was not considered further from a waste perspective.

8.3 WASTE ACCEPTANCE CRITERIA (WAC) TESTING RESULTS

To further classify the waste soil for landfill disposal, Waste Acceptance Criteria (WAC) testing has been carried out on Made Ground (engineered fill underlying the builder's yard) sample taken from CT1 at a depth of 0.10m to 0.70m bgl and a sample taken from the topsoil spoil heap from sample TP2 at a depth of 0.50m bgl.

The results show that the sample passes the inert waste criteria for the Topsoil spoil heap material and a Non-Hazardous waste criterion for the Made Ground (engineered fill underlying the builder's

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yard) due to marginally elevated levels of sulphate. Sulphate was recorded at 1200mg/kg, with the limit value being 1000mg/kg.

It is considered that the underlying natural soils, including the Topsoil beneath the site, qualify in accordance with EU Council Decision 2003/33/EC para. 2.1.1. "uncontaminated soil can be classified as Inert without testing".

As such, given the testing results, currently the underlying soils from the site are considered likely to be classified as follows:

Strata	Classification	Description of Material	EWC Code	Recommended Landfill Tax Rate
Topsoil	Inert	"Naturally occurring soils and stones containing"	17 05 04	Standard Rate
Topsoil Spoil Heaps	Inert	"Naturally occurring soils and stones containing"	17 05 04	Standard Rate
Made Ground (Engineered fill underlying the builder's yard)	Non-Hazardous	"Mixtures of concrete, bricks, tiles and ceramics"	17 01 07	Lower Rate
Natural Soil	Inert	"Naturally occurring soils and stones"	17 05 04	Lower Rate

Under section 63(2) of the Finance Act 1996, it states that where a disposal to landfill consists mainly of qualifying material(s), but includes a small amount of standard-rated material, the whole load is taxable at the lower rate. As such, the Made Ground (engineered fill) soils (excluding any Topsoil) are considered to be taxable at the lower rate. The natural soils are taxable at the lower rate.

We recommend that analytical results relevant to the materials being disposed of should be provided to the landfill operators or waste management contractors to confirm whether it meets their licence agreements and to confirm tipping costs.

All wastes removed from the site should be consigned, transported and disposed of in full accordance with all relevant UK legislation.

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9 RECOMMENDATIONS

9.1.1 Watching Brief

We recommend that a watching brief should be undertaken during the construction phase, and if, during development, any previously undiscovered contamination (including visual or olfactory evidence) is found, then site management should be immediately informed and inspection by a suitably qualified person should be undertaken.

9.1.2 Geo-Environmental Recommendations

Given the findings of the desk study, walkover survey, intrusive investigation and laboratory testing, it is considered that the risk of contamination to construction workers, end users and surrounding residents from the proposed development at this site is very low, and **as such, NO further works or remedial measures are necessary prior to development.**

Barrier water pipes will be required where crossing the Made Ground (Engineered Fill) underlying the builder's yard due to marginally elevated levels of TPH and SVOC when compared to the limit values for water pipe classification.

9.1.3 Geotechnical Recommendations

Given the findings of the desk study, intrusive investigation and laboratory testing, there are complex ground conditions which require further assessment:

- The area highlighted blue on the geological plan within Appendix A has found evidence of desiccation down to a proven depth of 6.50m bgl as shown within BH1. Further investigation should be undertaken to prove the ground conditions identified within BH1 are consistent across the area highlighted in blue to suitably design piled foundations
- Further investigation incorporating deep boreholes and probes is recommended to provide evidence that dissolution features are not present, if present, these could negatively impact deeper foundations
- The western half of the site highlighted yellow on the geological plan in Appendix A is predominantly underlain by granular soils considered to be non-shrinkable, and as such, conventional shallow foundations are considered viable. However, foundations should be reinforced to combat potential differential settlement caused by foundations crossing both granular and cohesive soil

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- The only exception applies to the area surrounding TP9, where significant layers of cohesive soils were encountered with a soil sample showing evidence of desiccation. It is considered that further testing should be undertaken to prove the extent of desiccation, which will dictate the required foundation depth
- Soakaways could be viable at this site; however, given the known flood risk zone along the southern boundary of the site, it is considered that groundwater levels are likely to rise during the wetter winter months. Groundwater monitoring should be undertaken over the winter period to prove potential fluctuations in groundwater; this will likely be required by the LLFA
- In addition, as per CIRIA C574, soakaways should be placed at least 10m away from foundations, roads or railways
- A small pit filled with wooden sleepers was observed during the walkover survey located along the western boundary of the builder's yard. It is recommended prior to development; the sleepers are removed and the underlying material inspected. Should loose soils indicating potential dissolution features or Made Ground soils be encountered, further assessment should be undertaken by a suitably qualified person.

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REFERENCES

Building Research Establishment (BRE) BR 211, Radon: guidance on protective measures for new buildings. 2007.

National House Building Council (NHBC) Standards, Chapter 4.2 Building Near Trees. 2011.

National House Building Council (NHBC) Standards, Chapter 4.1 Land Quality – Managing Ground Conditions. 2011.

Environment Agency, 'Land contamination: risk management', LCRM, 2019.

Health and Safety Executive (HSE), "Protection of Workers and the General Public during Development of Contaminated Land" HS(G) 66. HMSO London 1991.

Environment Agency, 'Human Health Toxicological Assessment of Contaminants in Soil', September 2008.

BGS Geology of Britain Viewer : 2016. www.bgs.ac.uk. British Geological Survey.

BRE Special Digest 1 : 2005 : Concrete in aggressive ground. Building Research Establishment.

BS 1377 : 1990 : Methods of test for soils for civil engineering purposes. British Standards Institution.

BS 5930 : 2015 : Code of practice for ground investigations. British Standards Institution.

BS EN 1997-2 : 2007 : Eurocode 7 - Geotechnical design - Part 2 Ground investigation and testing. British Standards Institution.

BS EN ISO 14688-1:2002+A1 : 2013 : Geotechnical investigation and testing - Identification and classification of soil - Part 1 Identification and description. British Standards Institution.

BS EN ISO 14688-2:2004+A1 : 2013 : Geotechnical investigation and testing - Identification and classification of soil - Part 2 Principles for a classification. British Standards Institution. Investigation of Potentially Contaminated Sites – Code of Practice, BS10175, 2011.

Environment Agency, "Waste Sampling and Testing for Disposal to Landfill" March 2013

G Card and S Wilson, An Alternative Approach for Ground Gas Risk Assessment, 2011.

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APPENDIX A

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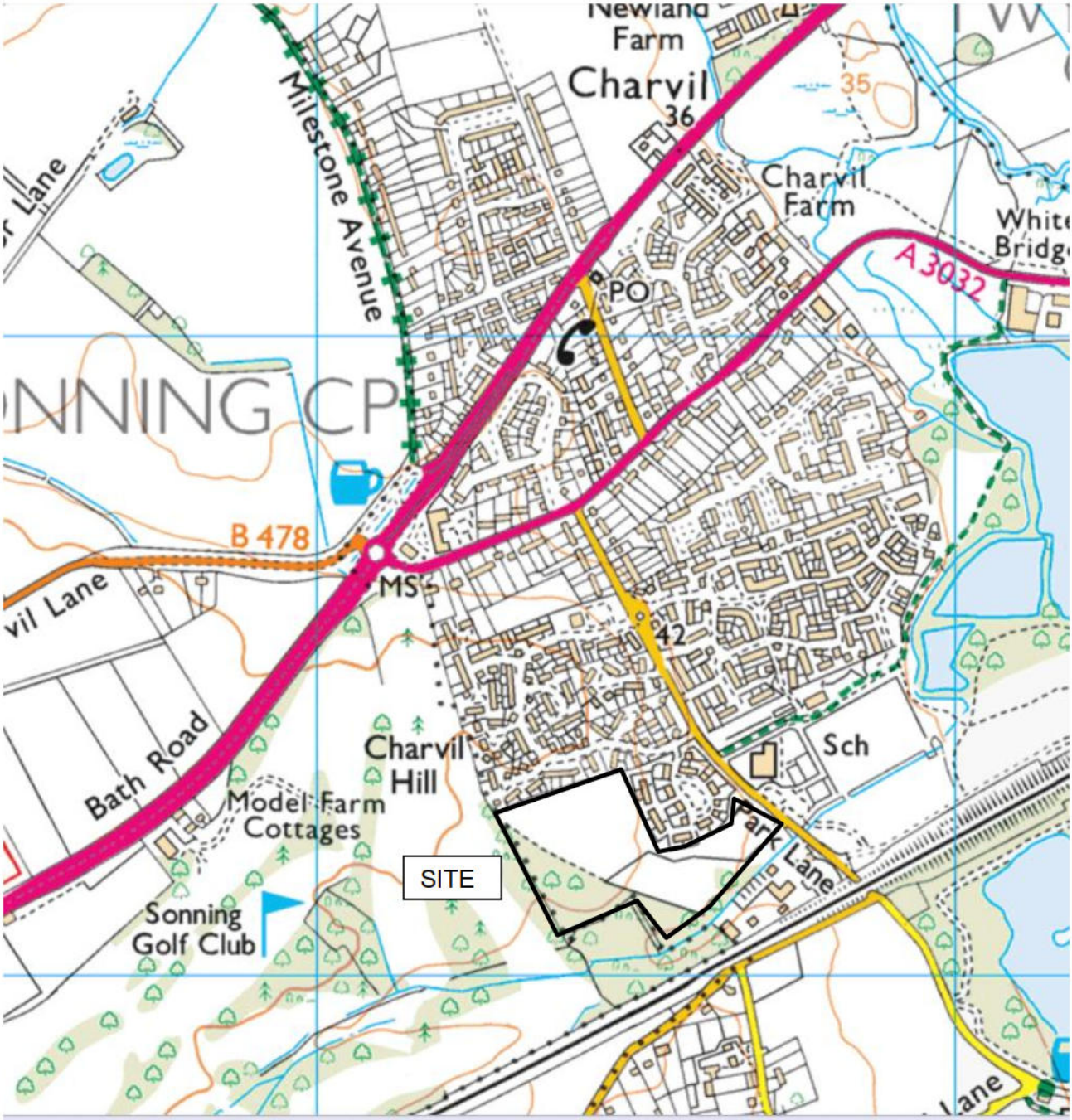
Site Plan



August 2025 **SITE LOCATION PLAN** Report No:- 25-07-12

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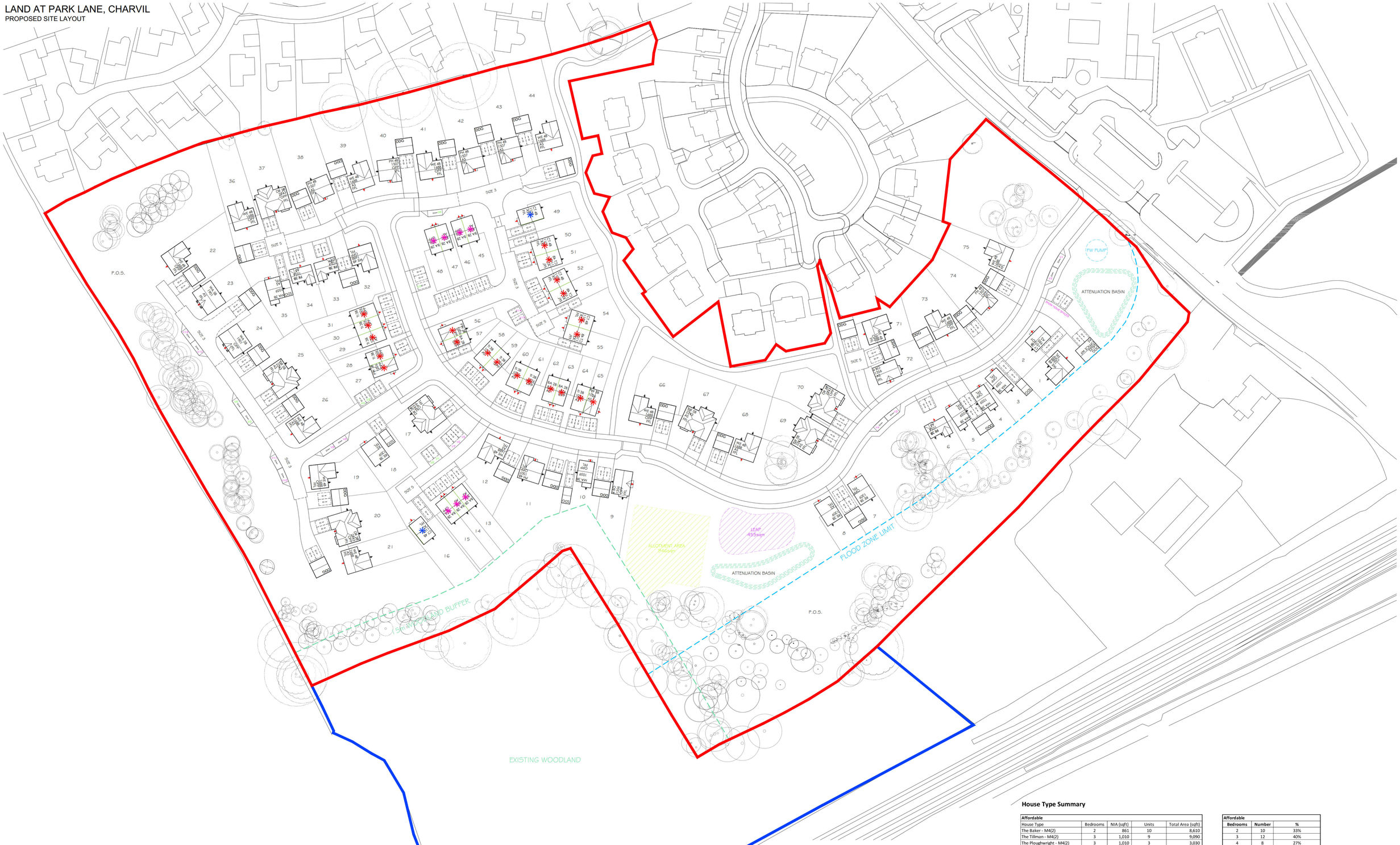
LAND AT PARK LANE, CHARVIL

PROPOSED SITE LAYOUT



House Type Summary

Affordable				
House Type	Bedrooms	NIA (sqft)	Units	Total Area (sqft)
The Baker - M4(2)	2	861	10	8,610
The Tillman - M4(2)	3	1,010	9	9,090
The Ploughwright - M4(2)	3	1,010	3	3,030
The Cartographer - M4(2)	4	1,081	8	8,648
Totals			**30**	**29,378**

Sales				
House Type	Bedrooms	NIA (sqft)	Units	Total Area (sqft)
The Lymner	2	970	1	970
The Fuller	3	1,037	3	3,111
The Mason	3	1,043	5	5,215
The Reedmaker - M4(2)	3	1,292	3	3,876
The Bowyer	4	1,336	2	2,672
The Philosopher	4	1,489	6	8,934
The Weaver	4	1,667	16	26,672
The Watchmaker	5	1,880	2	3,760
The Draper	5	2,211	7	15,477
Totals			**45**	**70,687**

Grand Total			**75**	**100,065**

Parking	
Visitor Spaces	15
Unallocated Spaces	8
Total	**23**

Affordable		
Bedrooms	**Number**	**%**
2	10	33%
3	12	40%
4	8	27%
Total	30	73%

Sales		
Bedrooms	**Number**	**%**
2	1	2%
3	11	24%
4	24	53%
5	9	20%
Total	45	100%

Grand Total	75

Affordable %	40.0%

Overall Mix		
2B	11	15%
3B	23	31%
4B	32	43%
5B	9	12%
Total	75	100%

Redline Area	6.98ha / 17.25acres
Net Developable Area	3.73ha / 9.22acres
Coverage (sqft/acre)	10853

Rev	Date	Amendment	Initials
B	22.04.25	Revised As Per Comments Dated 17.04.2025	CLP
A	15.04.25	Revised As Per Comments Dated 14.04.2025	CLP

Project:
LAND AT PARK LANE
CHARVIL

Client:
BELLWAY (THAMES VALLEY)

Drawing:
PROPOSED SITE LAYOUT

FEASIBILITY

Drawing no: 25.2208.1000 **Rev:** B

Scale@A0: 1:500 **Date:** APR 2025 **Drawn:** CLP **Checked:** RS

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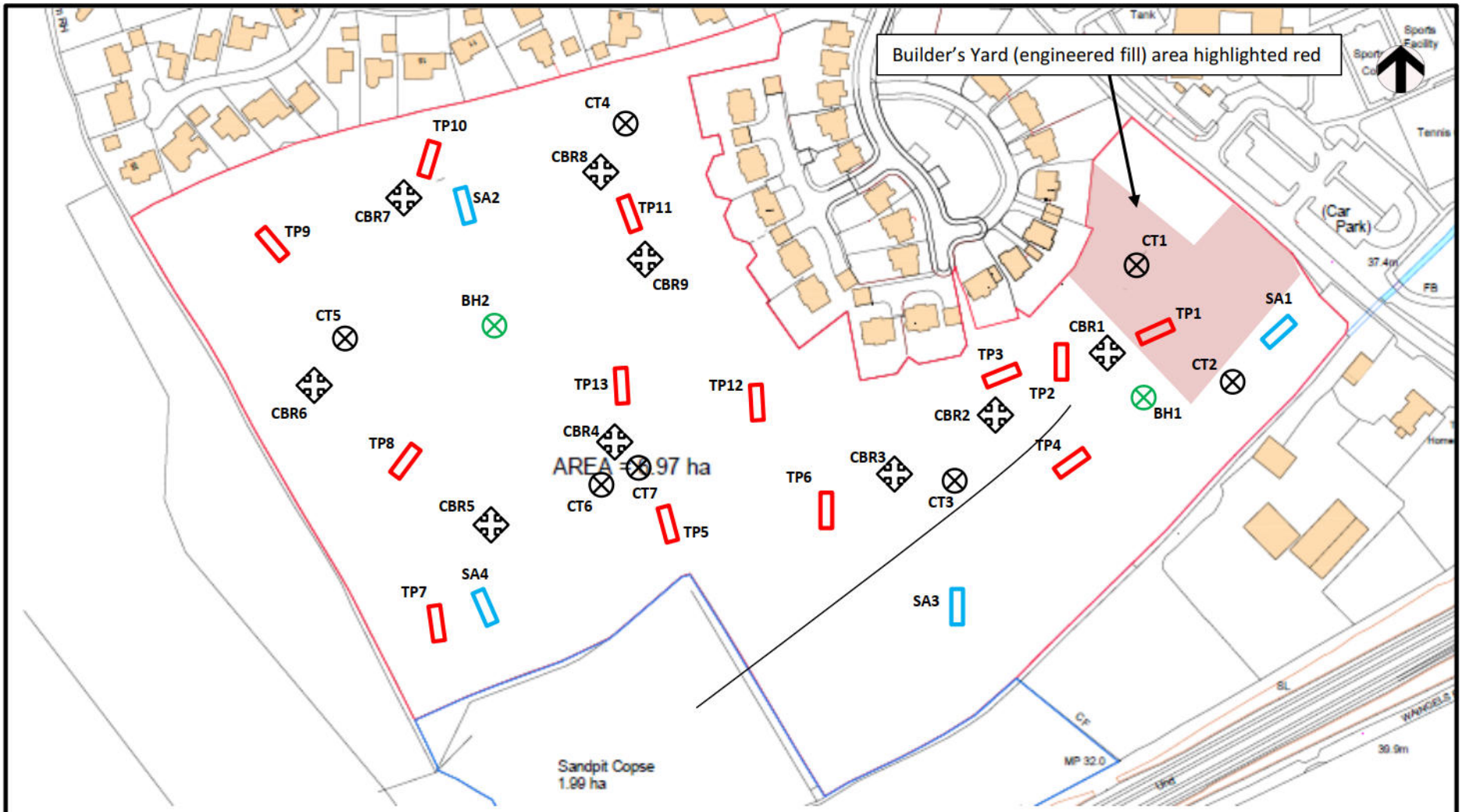
All dimensions and measurements to be checked on site.
Do not scale from this drawing. This drawing is to be printed in colour.

KEY

- AFFORDABLE RENT
- SHARED OWNERSHIP
- FIRST HOMES

0 5 10 20 30 40 50m

SCALE 1:500



Key

- Trial Pit
- Continuous Tube Borehole
- Soakaway Pit
- CBR Test
- Cable Percussive BH

Exploratory Hole Location Plan	**SITE:- Park Lane, Charvil**	**Drawn EM**
JOB NO.:-25-07-12	**CLIENT:- Bellway Thames**	**Checked LA**
Tel:- 01280 816409 Mob:- 07858 367 125 www. geo-integrity.co.uk	4 Church Street Maids Moreton MK18 1QE	**Scale: Not To Scale, for indicative purposes only**

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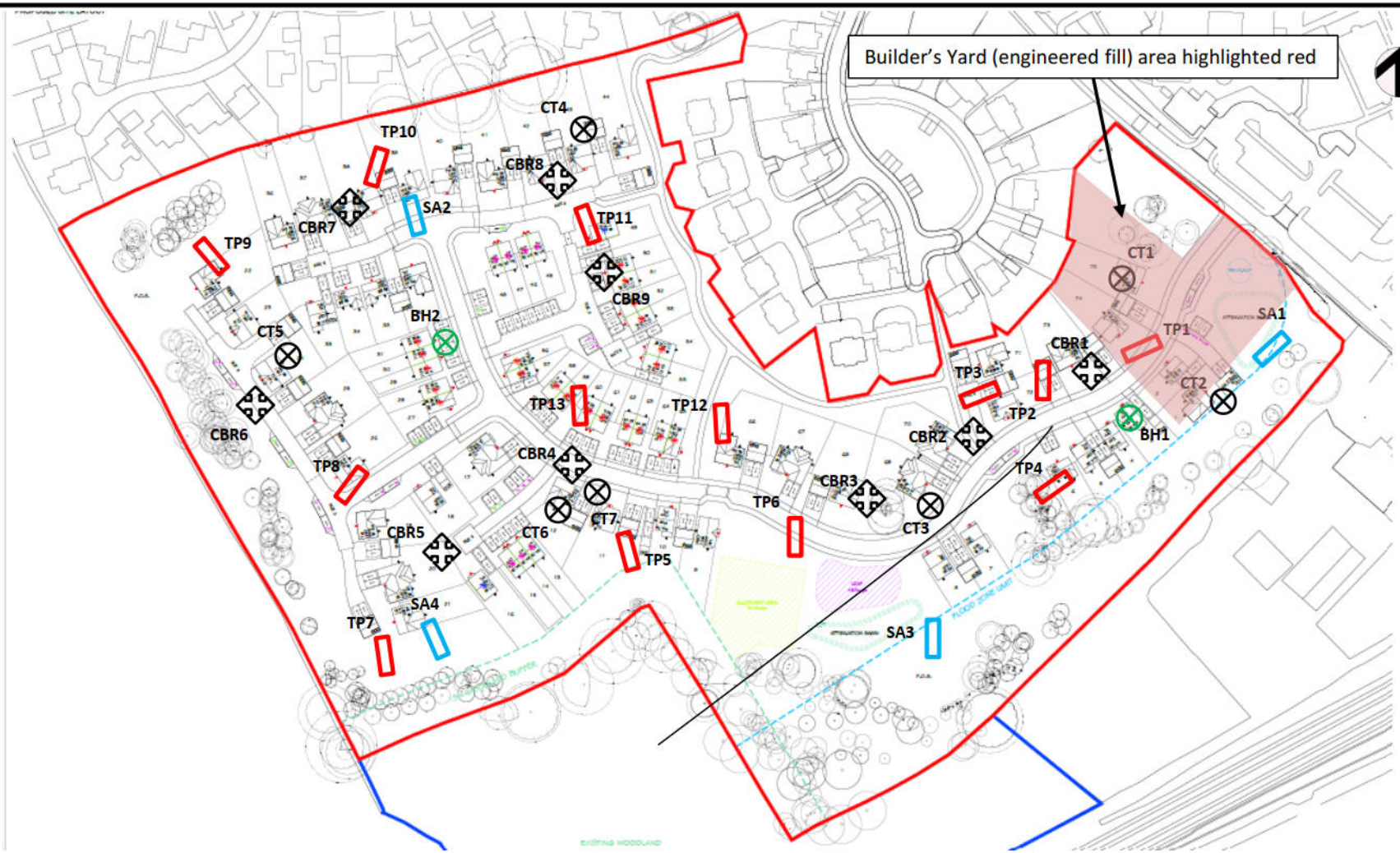

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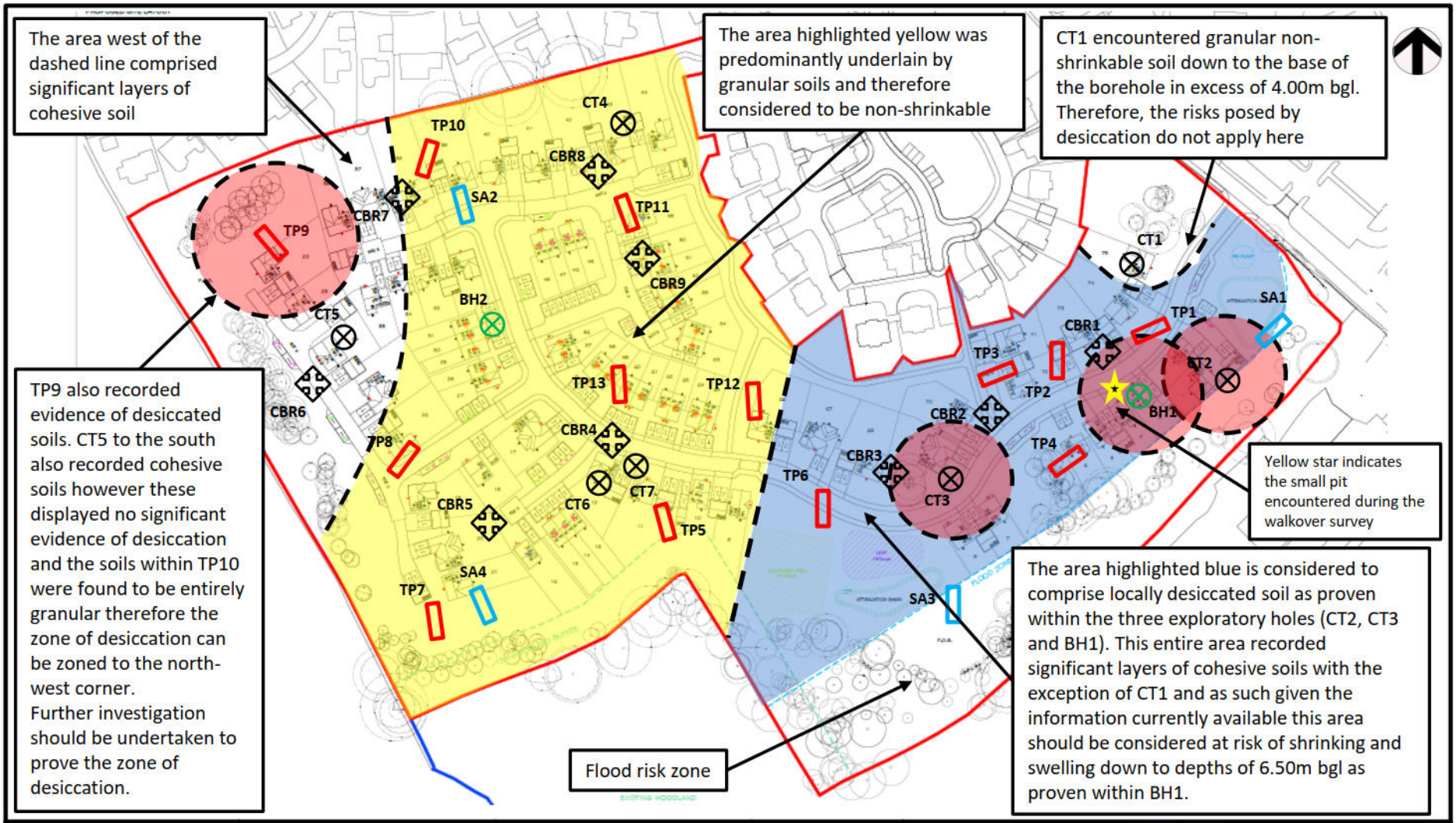

Key

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Geological Plan	**SITE:- Park Lane, Charvil**	**Drawn LA**
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Tel:- 01280 816409 Mob:- 07858 367 125 www. geo-integrity.co.uk	4 Church Street Maids Moreton MK18 1QE	**Scale: Not To Scale, for indicative purposes only**

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Site Entrance

Shipping containers and office space within the builder’s yard

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Mains connection

Surface water collection tank

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Location of water collection tank to the south of the shipping containers

Pallet storage (Builder's Yard)

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Building supplies stored (builder’s yard)

Building supplies stored (builder’s yard)

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Excavator (builder's yard)

Concrete floor slab (previously used for supporting concrete silos)

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Spoil heap of topsoil sourced from the builder’s yard

Spoil heap of Topsoil (sourced from the builder’s yard)

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Small pit filled with wooden sleepers (location shown on the Geological Plan in Appendix A)

Land to the south of the builder’s yard

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Drainage ditch located along the southern boundary

Undeveloped field along the southern boundary

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Undeveloped fields at the centre of the site and woodland to the south and south-east

Northern area of the site comprising undeveloped fields

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Spoil heap of topsoil sourced from the neighbouring residential estate

Tree protection orders along the northern boundary

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Northern undeveloped fields

Undeveloped fields and Sandpit Copse located along the southern boundary

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Sandpit Copse

Small wooded area to the north-west

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Sonning Golf Course to the west

Commercial estate to the south of the site

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