CampbellReith
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2 Merton Road, Bishopston, Bristol

Geoenvironmental and Geotechnical Preliminary Risk Assessment (Desk Study)

For
Horders Electrical (Contracting) Ltd

Project No.
14047/A

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Campbell Reith Hill LLP
Unit 5.03 HERE
470 Bath Road
Bristol BS4 3AP

T: +44 (0)117 916 1066
E: bristol@campbellreith.com
W: www.campbellreith.com

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Author	Sam Savery, CGeol MSc BSc FGS
Project Partner	[redacted], BSc (Hons) MSc DIC MIEnvSc CEnv
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EXECUTIVE SUMMARY

SITE LOCATION	2 Merton Road, Bishopston, Bristol, BS7 8TL
PROPOSED DEVELOPMENT	Development proposals include repurposing and conversion of the existing structure into residential accommodation. These proposals comprise 5 no flats, a maisonette, communal garden area and bicycle storage.
ENVIRONMENTAL SETTING	The bedrock geology is mapped as the Charmouth Mudstone Formation, a productive secondary aquifer of High to Medium sensitivity with respect to hydrogeology, and Low sensitivity with respect to hydrology. There are no water abstraction points within the search boundaries nor sensitive land-uses within 250m. The ground conditions are anticipated to comprise a thin mantle of made ground at the surface over bedrock of the Charmouth Mudstone Formation.
CURRENT USE AND HISTORY	The site remained undeveloped on the earliest historical maps (1881-1883) as garden areas for the terraced properties on Gloucester Road. The main rectangular structure is present on the 1916-1918 maps when Merton Road was established. The site is in a mixed commercial/ light industrial and residential area. The main structure has been used as a metal fabrication shop and is currently in use as warehouse storage for kitchen units and electrical fixings. The external hardstanding area features asphalt surfacing and is in current use as cark parking for the occupants.
GEOTECHNICAL HAZARDS	The following potential geotechnical hazards have been identified to be present on site: ▪ Made Ground and buried obstructions ▪ Natural obstructions ▪ Shrink/ swell soils ▪ Aggressive ground conditions to buried concrete
CONTAMINATION ISSUES	Given the site's environmental setting and known history, potential contamination is considered to present a LOW to MODERATE risk to end users and a LOW to MODERATE risk to controlled waters receptors. The risk associated with hazardous ground gas is LOW and basic radon protective measures are required. Potential sources of contamination comprise: ▪ Hardstanding materials (external asphalt) ▪ Made Ground ▪ Electricity sub-station, 11m south of the site Invasive plant species, such as Japanese Knotweed, have not been considered.
RECOMMENDATIONS	Prior to any development a ground investigation should be designed by a competent person, implemented in accordance with current versions of BS10175:2011, BS5930:2015, BS EN 1997-1:2004 and BS EN 1997-2:2007 and reported in accordance with current technical guidance. It should provide information on the general ground conditions and target the identified pollutant linkages and potential

	geotechnical risks. Where appropriate, consideration should be given to soils reuse and waste classification. Land quality assessment is an iterative process and likely to be a condition of planning consent for the redevelopment. It is recommended that this report is submitted to the Local Authority as part of the planning process. The site is in a HIGH risk UXO area therefore detailed UXO risk assessment will be required.

1.0 INTRODUCTION

1.1 Appointment

1.1.1 This report has been produced by Campbell Reith Hill LLP (CampbellReith) on behalf of Horders Electrical (Contracting) Ltd ('the Client') to summarise geoenvironmental and geotechnical information relating to the property at 2 Merton Road (hereafter referred to as 'the site'). The limitations associated with this report follow the main text.

1.1.2 Figures showing the site location, annotated layout, LiDAR data, BGS geology data and the development proposals are presented in Appendix 1.

1.2 Objectives

1.2.1 The objective of the report is to collate and interpret Desk Study information in order to provide:

a) an overview of the site area including a description of the site's environmental setting;

b) a review of the site's historical and industrial development;

c) a preliminary qualitative environmental risk assessment and conceptual site model;

d) a discussion of potential geotechnical risks and development considerations; and,

e) recommendations for further surveys and reporting.

1.2.2 The contamination appraisal is intended to identify the likely presence of potential source-pathway-receptor contaminant linkages and provides a qualitative indication of the level of risk posed by potential ground contamination at the site. As such, this report has been prepared in accordance with the requirements laid down in the Environment Agency's Land Contamination Risk Assessment for a Tier 1 Preliminary Risk Assessment.

1.2.3 Further to this assessment, actions considered necessary to permit the redevelopment of the site are recommended.

1.3 Basis of Assessment

1.3.1 The standards upon which this report are based are summarised in the Environmental Risk Assessment Standards and Supporting Information section, which follows the main text.

1.3.2 This report is based on a site walkover and a review of readily available information as detailed in Table 1.1. The desk study information is presented in Appendix 2.

Table 1.1 Information Reviewed

Reference Details		Author	Reference
Groundsure Insight	Reference CAR1-ZO8-E6J-SX4-M7A	Groundsure	[1]
1:50,000 Geological Sheet Solid and Drift: Bristol	Map 264. 2004	British Geological Survey	[2]
GeoIndex Onshore	https://www.bgs.ac.uk/	British Geological Survey	[3]
Historical borehole record	File ref. ST57NE9; Fears Dairy	British Geological Survey	[4]
Engineering Geology of British Rocks and Soils	Lias Group	British Geological Survey	[5]
UXO bomb risk map		Zetica	[6]

2.0 SITE DESCRIPTION AND ENVIRONMENTAL SETTING

2.1 Site Location

2.1.1 The site location is presented in Figure 1. The site is located at 2 Merton Road, Bishopston, Bristol BS7 8TL and Grid Reference 359359, 176135, approximately 3.7km north of Bristol. The site is accessed from Merton Road on the southern boundary, via the A38 Gloucester Road to the west.

2.2 Site Layout

2.2.1 An annotated site layout plan is presented in Figure 2. A reconnaissance site visit was carried out by a member of CampbellReith on 4th of April 2023.

2.2.2 The site covers an area of approximately 0.02ha, comprising a rectangular shape structure measuring 11 by 21 metres, and an external asphalt parking area approximately 10 by 10 metres. The structure is a circa 1930s 2-storey redbrick building with a more recent concrete floor slab and metal sheet roofing (photos 1 & 2). The topography is generally flat at approximately 57m AOD.

2.2.3 The structure is currently in use by Horders Electrical Ltd. as warehouse storage for kitchen units and electrical fixings. There is a small quantity of collectible automobile parts on a mezzanine that appear in good dry condition (photo 8). The external hardstanding area of asphalt is used for cark parking.

2.2.4 The existing structure largely appears to be in good condition, although anecdotal evidence suggests that a section of the roof/guttering leaks following periods of heavy rain. This corresponds with observations of water on the ground floor in the northern portion of the structure. Hardstanding is present across the entirety of the site. The concrete floor slab appears to be in reasonable condition although it has some minor changes in level, rough edges and uniform dark staining. There are no obvious areas of significant hydrocarbon and/or chemical spillages. A pile of crushed concrete and brick is present in the north-eastern corner of the site on the ground floor (photo 7).

2.3 Surrounding Land-Use

2.3.1 The site is in a mixed residential light industrial urban area. The north of the site is bound by commercial/ light industrial units and associated parking. The site is bound to the south by Merton Road beyond which are further commercial/ light industrial units. The surrounding structures are labelled as a motorcycle repair shop, automotive service, fitness studios, and catering premises.

2.4 Invasive Plant Species

2.4.1 The potential presence of invasive plant species, such as Japanese Knotweed, has not been assessed.

2.5 Redevelopment Proposal

2.5.1 The proposed site redevelopment is shown in Figure 3. Development proposals include repurposing and conversion of the existing structure into residential accommodation comprising ground floor and first floor flats and a maisonette as follows:

- FLAT A, 1 bedroom for 2 people
- FLAT B, 1 bedroom for 2 people
- FLAT C, 1 bedroom for 2 people
- Maisonette D, 1 bedroom for 2 people
- FLAT E, 1 bedroom for 2 people
- FLAT F, 2 bedrooms for 4 people

2.5.2 Development proposals for the external asphalt area include a grassed lawn, hard paving bicycle storage and a bin & recycling store.

2.5.3 For the purposes of contamination assessment, the development is considered to have Medium-High sensitivity end use although the development comprises only communal gardens.

2.6 Geology

2.6.1 The site geology is summarised in Table 2.1. The associated references are provided in Table 1.1.

Made Ground

2.6.2 No Made Ground is mapped on site although given the urban setting variable thicknesses of Made Ground are likely to be present across the site. This is likely to comprise hardstanding at surface over sub-base materials followed by thin horizon of reworked natural material.

Superficial Deposits

2.6.3 There are no Superficial Deposits mapped on site nor within the immediate vicinity.

Bedrock

2.6.4 The bedrock geology is mapped as the Charmouth Mudstone Formation of the Jurassic Period, comprising dark grey laminated shales and pale bluish grey blocky mudstones. Sporadic nodular limestone beds are present locally. The formation typically features sub-horizontal high persistence discontinuities. The bedrock typically weathers to a cohesive soil near the surface. The parent unit of the Charmouth Mudstone Formation is the Lias Group. The British Geological Survey (BGS) specialist publication on the Lias Group [5] states *'the engineering behaviour of the Lias Group is frequently found to be close to the borderline between soil and rock'.*

Historical Borehole Logs

2.6.5 A single historical borehole record is present within 250m of the site; the 1928 Fears Dairy, 404 Gloucester Road borehole [4]. The strata description is *'red, marl shale & limestone'* extending to approximately 68m below ground level (bgl). Groundwater was recorded at 33.5m depth.

2.6.6 The anticipated site geology is summarised in Table 2.1.

Table 2.1 Summary of Anticipated Geology

Strata	Depth to Base (m bgl)	Typical Description
Made Ground	<1	Anthropogenic materials such as hardstanding over some reworked natural material.
Superficial Deposits	Absent	-
Charmouth Mudstone Formation	>67	Cohesive soils grading into an extremely weak mudstone. Highly weathered in upper levels. Lenses of limestone maybe present.

2.7 Potential Ground Hazards

2.7.1 The Potential ground hazard ratings stated in the Groudsure report [1] and BGS specialist publication on the Lias Group [5] have been summarised below.

2.7.2 The Groundsure report lists the potential ground hazards on site as follows:

- Shrink swell clays – Low, predominantly medium plasticity
- Running sands – Negligible
- Compressible deposits – Negligible
- Collapsible deposits – Very low
- Landslides – Very low
- Ground dissolution of soluble rocks – negligible

2.7.3 The BGS specialist publication on the Lias Group [5] presents a summary of the engineering geological assessment of the Charmouth Mudstone Formation. Key engineering geological factors affecting engineering behaviour as follows:

- Main Lithologies – Mudstone, Limestone
- Bearing Capacity – Good
- Plasticity – High
- Shrink/Swell Potential – Medium
- Slope Stability – Poor
- Diggability (Ease of Excavation) – Medium to Hard, Easy ripping
- Trafficability – Moderate to Poor

- Concrete Attack Potential – High

2.7.4 Revised ratings for the potential ground hazards based on the Groundsure report and BGS publication are as follows:

- Shrink swell clays – Moderate
- Running sands – Negligible
- Compressible deposits – Low
- Collapsible deposits – Very low
- Landslides – Very low
- Ground dissolution of soluble rocks – Negligible
- Diggability (Ease of Excavation) – Medium to Hard, Easy ripping
- Trafficability – Moderate to Poor
- Concrete Attack Potential – High

2.8 Seismicity

2.8.1 The national foreword to BS EN 1998-1:2004+A1:2013 'Eurocode 8: Design of Structures for Earthquake Resistance – Part1' states there are no requirements in the UK to consider seismic loading, and the whole of the UK may be considered an area of very low seismicity in which the provisions of EN 1998 need not apply.

2.9 Hydrogeology

2.9.1 The site hydrogeology is summarised in Table 2.2 and the associated references listed in Table 1.1.

Table 2.2 Summary of Hydrogeology

Type	Description	Reference
Superficial/Drift Deposits	None recorded	[1]
Solid/Bedrock Deposits	Secondary Undifferentiated	
Source Protection Zone	No records within 500m	
Groundwater Abstractions		
Groundwater Vulnerability	High Vulnerability	

2.9.2 The groundwater flow direction is unknown.

2.9.3 The site is considered to have a Medium sensitivity with respect to hydrogeology. The sensitivities are based upon the definitions provided in NHBC R&D66, as amended to include the requirements of the Water Framework Directive and the EA's River Basin Management Plans. The high groundwater vulnerability is associated with the combination of a productive Secondary Aquifer with high persistence sub-horizontal discontinuities creating potential contaminant migration pathways [5].

2.10 Hydrology

2.10.1 The site hydrology is summarised in Table 2.3 and the associated references listed at the rear of the report.

Table 2.3 Summary of Hydrology

Type	Distance	Description	Reference
Surface Waters	-	No records within 250m	[1]
Surface Water Abstractions	-	No records within 2000m	[1]
Flooding	-	The site is not within a Flood Zone. The risk of flooding is negligible.	[1]

2.10.2 The Water Framework Directive (WFD) indicates the site is within the Avon Bristol Urban catchment area of the Frome water body catchment [1].

2.10.3 The site is considered to have a Very Low sensitivity with respect to hydrology. The sensitivities are based upon the guidance detailed for the hydrogeological assessment above.

2.11 Radon

2.11.1 The Groundsure report states that the site is within an area where between 5% - 10% of properties are estimated to be at/or above the Action Level in Great Britain. Basic radon protective measures are considered to be required.

2.12 Sensitive Land Uses

2.12.1 A review has been made of designated ecological and heritage sites using desk study information provided by Groundsure and the MAGIC website and is summarised in Table 2.4. The main purpose of this is to identify receptors that may be at risk due to potential contamination at the site and to highlight sensitive land uses identified by the sources consulted. It should be noted that this review does not constitute a formal environmental / ecological assessment and further works may be required in this regard.

Table 2.4 Summary of Designated Sites

Type	Description	Reference
Ecological	None recorded on or within the vicinity of the site	[1], [2]
Heritage		
Archaeological		

2.12.2 There are no sensitive land uses associated with the site.

3.0 SITE HISTORY AND INDUSTRIAL SETTING

3.1 Site History

3.1.1 Information relating to the site history has been obtained by reference to historical OS maps [1] and is summarised for the site and its surroundings in Table 3.1 and Table 3.2.

Table 3.1 Site History

Date	Development	Location
1881 – 1883	Site spans 4 gardens of the Gloucester Road terrace properties.	On site
1881 – 1887	No changes from previous map	
1903	Internal garden boundaries reduced. Area mapped as part of the Salvation Army Barracks grounds	On site
1912 – 1913	Development on site	On site
1916 – 1918	Main structure mapped	Central portion
1921	No changes from previous map	
1934 – 1936	Development on site. Internal structural lines modified	Northern portion
1950 – 1953	No significant change	-
1972		
1990 – 1999		
2003		

Table 3.2 Adjacent Land History

Date	Development	Distance and Orientation
1881 – 1883	Residential buildings on main road	20m W
	Smithy	185m SW
	Well	200m S
	Railway line	210m SE
	Well	250m N
	Quarry	295m S
	Old quarry	315m SE

Date	Development	Distance and Orientation
1881 – 1884	No changes from previous map	
1883 – 1887	No changes from previous map	
1903	Salvation Army Barracks	30m E
	Tramway	45m W
	Smithy mapped as meeting house	185m SW
	Urban expansion (residential)	All directions
	Tramway depot	225m N
	Old quarry absent	315m SE
1912 – 1913	Merton Road established	2m S
1916 – 1918	Neighbouring structures mapped	Northern boundary 5m W
	Smithy	90m S
	Laundry centre	170m NW
	Tank	175m S
1921	Chimney	105m S
1934 – 1936	Merton road developments mapped	10m S
	Cinema	70m S
	Training centre	185m SW
	Residential expansion	250m W
1950 – 1953	Electrical sub-station	15m S
1972	3 no car body works	17m N, 17m E, 75m SE
	Undertakers works	75m E
	Garage	170m S

Date	Development	Distance and Orientation
	Works & Depot	250m SW
1990 – 1999	No significant changes	-
2003	Works & Depot changed to residential plots	250m SW

3.1.2 In summary, the site remained undeveloped on the earliest 1881-1883 maps as garden areas for the terraced properties of Gloucester Road. The rectangular structure corresponding with the current layout was present on the 1916-1918 maps when Merton Road was established. Slightly different internal boundaries on the 1934-1936 maps suggest there were some minor alterations to the structure. There had been no significant changes to the site discernible from the historical OS maps between 1934 to 2003 however, recent site changes visible on the aerial imagery indicate the roof tiles on the 1999 image and were replaced by metal sheeting by 2006.

3.1.3 In the surrounding area, there was an old quarry and smithy mapped on the earliest maps 1881-1883. These features are no longer mapped from the 1903 map and there has been widespread urban expansion throughout the 1900s, largely comprising residential developments. Since Merton Road was established on the 1916-1918 maps, the neighbouring structures usage includes 3 no car body works premises, and an undertaker works within 100m distance site. These are essentially the light industrial/ commercial units still in use today.

3.1.4 There was an electrical sub-station mapped 11m south of site between 1950-1972.

3.2 Regulatory Consultation

3.2.1 Land quality enquiries have been made to Bristol City Council building control. This report will be updated once this information is received.

3.3 Unexploded Ordnance (UXO)

3.3.1 A preliminary review has been made of the UXO risk presented by the site based upon the assessment matrices in Tables 5.1 - 5.3 of CIRIA C681 ('Unexploded Ordnance (UXO) – A guide for the construction industry').

3.3.2 Zetica UXO maps indicate that the site is within a High risk UXO area, having a bombing density of 50 bombs per 1000 acre or higher [6]. The image below indicates that there was bombing in the surrounding area:

Image courtesy of https://www.bishoproad.bristol.sch.uk/history-of-bishop-road-school/world-war-two-2/

3.3.3 Reference to the historical maps shows that the site itself has not undergone significant redevelopment since the 1930s and as such it is unlikely that extensive excavation has been undertaken and a risk of UXO exists for future intrusive works.

3.3.4 It is recommended that a detailed UXO risk assessment is undertaken prior to any intrusive works at the site. Notwithstanding the above information, UXO hazards should be included as part of the health and safety briefing and as tool-box talks during any future intrusive works, such that if any suspicious articles are found they can be quickly identified and treated appropriately by specialist inspection.

3.4 Tunnels and Infrastructure

3.4.1 There are no tunnels nor infrastructure assets identified during the desk study that pose a significant impact on the proposed development.

3.4.2 It should be noted that the above review does not constitute a formal review of all buried utilities that may be present at the site.

3.5 Current Industrial Setting

Table 3.3 summarises identified industrial features, which may present a potential source of contamination to the site based upon the Groundsure Report and this should be consulted for further details. Unless otherwise stated, only those features that are within the stated review distances have been included.

Table 3.3 Industrial Setting

Type	Distance Reviewed	Distance from Site	Description
Contaminated land register entries and notices	<500m	-	Not Present
Landfills	<250m	-	Not Present
Waste Transfer / Treatment Stations	<100m	-	Not Present
Waste exemptions	<100m	14m SE 15m SE	Units 12a & 9. Storage of waste in a secure place
Potentially Infilled Land	<250m	-	Not Present
Pollution Incidents	<50m	-	Not Present
Environmental Permits	<150m	-	Not Present
Discharge Consents	<100m	-	Not Present
Abstractions	<250m	-	Not Present
Fuel Stations	<200m	117m SW	Garage mapped since 1972
Control of Major Accident Hazards (COMAH) Sites	<500m	-	Not Present
Other	<200	11m S 185m N	Electricity substations

3.5.1 Of the above, the electricity substation and waste exemptions associated with the industrial units immediately south of site are considered to require further consideration from a risk perspective.

4.0 PRELIMINARY CONCEPTUAL SITE MODEL & QUALITATIVE RISK ASSESSMENT

4.1 Introduction

4.1.1 Current practice for land contamination evaluation involves classification of risk for each of the identified contaminant source-pathway-receptor linkages. These are summarised below, considering the desk study information obtained.

4.2 Classification of Risk

4.2.1 Risk is defined by the combination of two factors: i) the probability of an occurrence (expressed as a likelihood); and ii) the consequence of it happening (expressed as a severity). The definitions of these categories are defined in the Environmental Risk Assessment Standards and Supporting Information section to the rear of this report, together with definitions of the classifications of probability and consequence. The procedure for classifying risk is summarised in Table 4.1

Table 4.1 Classification of Risk

Probability (Likelihood)		Consequence			
		Severe	Medium	Mild	Minor
	High likelihood	Very high risk	High risk	Moderate risk	Low risk
	Likely	High risk	Moderate risk	Moderate/low risk	Low risk
	Low likelihood	Moderate risk	Moderate/low risk	Low risk	Very low risk
	Unlikely	Moderate/low risk	Low risk	Very low risk	Very low risk

4.3 Potential Sources of Contamination

4.3.1 Table 4.2 summarises the potential contamination sources that identified on or near the site. Theoretical onsite sources essentially comprise the made ground/ hardstanding at surface (stained floor slab and asphalt). The electrical sub-station and light industrial units to the south are also considered. The potential contaminant types associated with these is then given based upon a review of industry profiles and anecdotal information. The structure is in use as warehouse storage for and electrical/ kitchen unit contractor, including some items from previous usage including paint and dry car parts. There was no obvious visual nor olfactory evidence of gross contamination during the site walkover.

Table 4.2 Potential Sources of Contamination

Feature on or near site	Potential Contaminant
Reworked &/or Made Ground including the potential for buried asbestos from historical development	M, TPH, PAH & ACM
Asphalt	M, TPH & PAH

Feature on or near site	Potential Contaminant
Stained floor slab	M, TPH & PAH
Off-site sub-station	Polychlorinated biphenyls (PCBs)
Off-site industrial use – automotive	M, M, TPH & PAH TPH & PAH
Notes: M – Metals. TPH – Total Petroleum Hydrocarbons. VOC – Volatile Organic Compounds. ACM – Asbestos Containing Materials. PAH – Polycyclic Aromatic Hydrocarbons – Polychlorinated biphenyls. GG – Ground Gases.	

4.4 Receptors and Exposure Pathways

4.4.1 Potential risks have been identified based on the proposed site use, the receptors and potential pathways by which the receptor/s may be exposed to the contaminant source/s. These are presented in Table 4.3.

Table 4.3 Receptors and Exposure Pathways Following Site Redevelopment

Receptor	Pathway	Risk
End Users	Ingestion of soil / dust	Moderate
Neighbours		Very low
Construction Workers		Very low
End Users	Inhalation of soil / dust	Very low
Neighbours		Very low
Construction Workers		Very low
End Users	Dermal contact with soil / dust / water	Moderate
Neighbours		Very low
Construction Workers		Moderate
End Users	Inhalation of vapour from soil / dust	Low
Neighbours		Very low
Construction Workers		Low
End Users	Consumption of vegetables/ plants	Low
End Users	Migration of soil gases to confined spaces/ structures	Very low
Construction Workers		Very low
Building		
End Users	Inhalation of vapour from groundwater	No potential
Neighbours		
Construction Workers		

Receptor	Pathway	Risk
Surface Waters	Migration of water borne contaminants from on site	Very low
Groundwater Aquifer	Migration of contamination from surface and/or subsurface to groundwater	Low
Groundwater Aquifer	Migration of water borne contamination from off-site	Very low
End Users	Movement of contaminants to engineered structures (water pipes)	Low
Sensitive Land Use (SSSI etc.)	Uptake by flora / fauna associated with sensitive land use	No potential

4.4.2 Given the proposed end-use classification of residential without plant uptake, long term exposure to any contaminated soils in the garden areas (ingestion and dermal contact) is considered MODERATE risk to end-users. There is also MODERATE risk associated with dermal contact and dust inhalation of any contaminated soils to construction workers.

4.4.3 The site is considered to have a Medium sensitivity with respect to hydrogeology. A historical borehole notes groundwater at 33.5m depth [4]. On this basis there is low likelihood of any significant source-pathway-receptor linkage therefore the risk of migration from surface to the groundwater regime is considered LOW.

4.4.4 The historical electrical sub-station located 11m south of site is a theoretical source of Polychlorinated Biphenyls (PCBs), although these PCBs are not readily mobile in soil and are considered a VERY LOW risk to this development as the asset is offsite.

4.4.5 The general requirements of the intrusive investigation required to target the identified contaminant linkages is provided as Table 5.2.

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 Proposed Development and Site History

5.1.1 Development proposals include repurposing and converting the existing structure into residential accommodation comprising 5 no flats, a maisonette and a communal garden area.

5.1.2 In summary, the site remained undeveloped on the earliest 1881-1883 maps as garden areas for the terraced properties of Gloucester Road. The rectangular structure corresponding with the current layout was present on the 1916-1918 maps when Merton Road was first established. The site is located within a mixed commercial/ light industrial and residential area. The main structure has been used as a metal fabrication shop and is currently in use as warehouse storage for kitchen units and electrical fixings. The external hardstanding area is of asphalt and is in use as car parking for the local tenants.

5.2 Geotechnical Conclusions and Recommendations

5.2.1 The ground conditions are anticipated to comprise a thin mantle of Made Ground at surface over weathered Charmouth Mudstone Formation.

5.2.2 The anticipated geotechnical hazards are summarised in Table 5.1 and discussed below.

Table 5.1 Summary of Geotechnical Hazards

Hazard	Description
Made Ground and buried obstructions	Hardstanding and sub-base materials of unknown quality and thickness are likely to be present. Due to the current land use, buried concrete foundations are likely to be present.
Natural obstructions	Relatively shallow bedrock which may contain bands of limestone is anticipated. Such materials, depending on the strength, may impede future intrusive ground works and could require breaking out/ use of alternative excavation equipment.
Shrink/swell soils	Cohesive soils may exhibit a degree of volume change upon changes in moisture content. The cyclical action of shrink/swell can cause damage to foundations placed too shallow within the ground.
Aggressive ground conditions to buried concrete	The natural ground conditions comprise sulphate bearing strata which presenting a risk to buried concrete.

5.2.3 Due to its heterogeneity, Made Ground is not considered to be a suitable bearing stratum, and therefore foundations will need to formed within the underlying natural soils.

5.2.4 The presence of buried concrete foundations and the potential for bands of limestone may require breaking out when undertaking future intrusive ground works.

5.2.5 The weathered clays of the Lias Group are typically of sufficient strength to allow for a traditional shallow foundation solution, although foundations will need to be extended to a suitable depth to account for the volume change potential of the near surface cohesive soils.

5.2.6 Aggressive ground conditions to buried concrete is a known geotechnical hazard in the Lias Group bedrock [5]. A concrete classification will be required in accordance with BRE SD1 (2005) to quantify the level of protective measures.

5.2.7 It is anticipated that buried utilities will be present within the site boundary. At the time of writing, no utility plans for the site were available. Buried utilities may conflict with future intrusive ground works.

5.2.8 This report has revealed a HIGH risk of UXO at the site. It is therefore recommended that a detailed UXO Risk Assessment be carried out by a suitably qualified specialist to further assess the risk and make recommendations for appropriate mitigation during both the intrusive ground investigation works and the subsequent construction of the proposed development.

5.3 Environmental Conclusions and Recommendations

5.3.1 The site has a Medium hydrogeological sensitivity being a productive Secondary Aquifer with high persistence sub-horizontal discontinuities, and a Low hydrological sensitivity due to the absence of any potable groundwater abstraction points within 2000m distance of site.

5.3.2 Given the proposed development of the site for residential use without plant uptake, the site is adjudged a Medium sensitivity with regards to human health.

5.3.3 Based on a review of historical information and the findings of a site walkover the following potential contamination sources have been identified:

- Hardstanding materials (stained concrete slab and asphalt coal tar)
- Made Ground
- Sub-station, 11m south

5.3.4 In relation to potential contamination issues and given the proposed end user, the site is considered to present a:

- MODERATE risk to future users from soil/ groundwater sources.
- LOW risk due to potential ground gas; and,
- MODERATE risk to controlled water receptors.

5.3.5 The risks to other receptors (groundworkers etc.) are listed in Section 4.0.

5.3.6 Although the potential risk is generally Moderate, confirmatory sampling and analysis of soils is recommended as part of any investigation that is carried out. The results can be used to confirm the risk rating for the site's end use and the construction workers. They can also be used to inform waste soil classification for disposal purposes.

5.3.7 In accordance with the phased process of assessment recommended in BS 10175:2011 (+A2:2017) and BS 5930:2015 (+A1:2020), intrusive investigation(s) should be undertaken to appraise potential land contamination, as well as geotechnical matters which would necessitate the design to be based on the requirements of Eurocode 7 part 2 (and the associated national annex) and NHBC standards. The investigation should include an

investigation of the general ground conditions and target the most likely potential pollutant linkages as discussed in Table 5.2.

Table 5.2 Targeted Contaminant Linkages

Issue	Exploration
Human exposure to shallow Made Ground soils	General/Targeted. Shallow soil samples in all holes within 1.0m of ground level
Leachate generation from Made Ground Soils	General. Leachate preparations of soils and/or analysis of both perched and deeper groundwater
PCBs	Targeted. Southern area of site.
Risk to groundwater	Targeted. Groundwater installations in the Secondary Aquifer.
Risk to surface water	Targeted. Groundwater installations in the Secondary Aquifer. Analysis of surface water
Vapour risk from impacted soils and/or groundwater	Targeted within the proposed building footprint (if known) / general site coverage. Ground gas monitoring installations in the Made Ground.

5.3.8 Considering the past uses of the site, a contamination analysis suite should be applied that considers metals, semi-metals, inorganic chemicals, polyaromatic hydrocarbons and speciated petroleum hydrocarbons with the specific analytical suite informed by site location / CSM. In addition, the presence of asbestos in soils should be appraised by testing. Such testing should be completed in accordance with UKAS and MCERTs standards.

5.3.9 Given that disposal of waste soils can potentially lead to elevated development costs the investigation could also sampling and analysis to enable classification of waste soil arisings.

5.3.10 The results of any intrusive investigation should be reported within a Land Quality Statement (LQS) for the site considering the requirements of current technical guidance (as summarised in the Environmental Risk Assessment Standards and Supporting Information to the rear of the text) and / or associated planning conditions. This report should include: a Generic Quantitative (Tier 2) Environmental Risk Assessment; a revised Conceptual Site Model; recommendations for further assessments (if required); and, outline remedial and geotechnical recommendations. Land quality assessment is a phased process and it should be noted that further investigation, assessment and reporting might be required, dependent on the findings of the LQS.

5.3.11 This Desk Study is considered sufficient to satisfy planning conditions relating to former site uses and provision of a preliminary risk assessment. It is likely that site investigation and reporting will be required in order to satisfy further planning condition(s) relating to land contamination.

5.3.12 The potential presence of invasive plant species, such as Japanese Knotweed, has not been assessed and it is recommended that a survey be carried out by an appropriately qualified specialist if this is of concern to the client.

5.4 Recommendations for Intrusive Investigation

5.4.1 An intrusive ground investigation with geotechnical and contamination monitoring and testing is required to confirm the findings of this desk study.

5.4.2 The ground investigation should be designed based on the requirements of Eurocode 7 part 2 (and the associated national annex) and NHBC standards. As noted in Section 5.3.8, which also lists the industry design requirements, the investigation should be tailored so as to ensure the geotechnical hazards and land contamination risks identified above are addressed.

ENVIRONMENTAL RISK ASSESSMENT STANDARDS AND SUPPORTING INFORMATION

Normative Standards

Contamination

The report has been produced in general accordance with the procedures for ground investigation, interpretation and reporting set out in Environment Agency guidance Land Contamination Risk Management (LCRM) (England), BS 5930:2015 (+A1:2020), BS 10175:2011 (+A2:2017) and BS EN 1997 (Eurocode 7).

This assessment considers the objectives of the National Planning Policy Framework which requires information to demonstrate that a site is suitable for its new use (taking account of ground conditions and land instability) and not capable of being determined as contaminated land under Part IIA of the Environmental Protection Act 1990 (after remediation). The NPPF requires adequate site investigation information, prepared by a competent person.

Definitions of Consequence, Probability and Risk

The following classification has been taken from Guidance for the Safe Development of Housing on Land Affected by Contamination R&D66: 2008 Volume 1 (Environment Agency, NHBC and CIEH.

The key to the classification is that the designation of risk is based upon the consideration of both:

a) the magnitude of the potential consequence (i.e. severity).
[takes into account both the potential severity of the hazard and the sensitivity of the receptor]

b) the magnitude of probability (i.e. likelihood).
[takes into account both the presence of the hazard and receptor and the integrity of the pathway]

Classification of Consequence

Classification	Definition	Examples
Severe	Highly elevated concentrations likely to result in "significant harm" to human health as defined by the EPA 1990, Part 2A, if exposure occurs. Equivalent to EA Category 1 pollution incident including persistent and/or extensive effects on water quality; leading to closure of a potable abstraction point; major impact on amenity value or major damage to agriculture or commerce. Major damage to aquatic or other ecosystems, which is likely to result in a substantial adverse change in its functioning	Significant harm to humans is defined in circular 01.2006 as death, disease*, serious injury, genetic mutation, birth defects or the impairment of reproductive functions. Major fish kill in surface water from large spillage of contaminants from site. Highly elevated concentrations of List I and II substances present in groundwater close to small potable abstraction (high sensitivity).

Classification	Definition	Examples
	or harm to a species of special interest that endangers the long-term maintenance of the population. Catastrophic damage to crops, buildings or property.	Explosion, causing building collapse (can also equate to immediate human health risk if buildings are occupied).
Medium	Elevated concentrations which could result in "significant harm" to human health as defined by the EPA 1990, Part 2A if exposure occurs. Equivalent to EA Category 2 pollution incident including significant effect on water quality; notification required to abstractors; reduction in amenity value or significant damage to agriculture or commerce. Significant damage to aquatic or other ecosystems, which may result in a substantial adverse change in its functioning or harm to a species of special interest that may endanger the long-term maintenance of the population. Significant damage to crops, buildings or property.	Significant harm to humans is defined in circular 01/2006 as death, disease*, serious injury, genetic mutation, birth defects or the impairment of reproductive functions. Damage to building rendering it unsafe to occupy e.g. foundation damage resulting in instability. Ingress of contaminants through plastic potable water pipes.
Mild	Exposure to human health unlikely to lead to "significant harm". Equivalent to EA Category 3 pollution incident including minimal or short lived effect on water quality; marginal effect on amenity value, agriculture or commerce. Minor or short lived damage to aquatic or other ecosystems, which is unlikely to result in a substantial adverse change in its functioning or harm to a species of special interest that would endanger the long-term maintenance of the population. Minor damage to crops, buildings or property.	Exposure could lead to slight short-term effects (e.g. mild skin rash). Surface spalling of concrete.
Minor	No measurable effect on humans. Equivalent to insubstantial pollution incident with no observed effect on water quality or ecosystems.	The loss of plants in a landscaping scheme. Discoloration of concrete.

Classification	Definition	Examples
	Repairable effects of damage to buildings, structures and services.	

Classification of Probability

Classification	Definition	Examples
High likelihood	There is pollutant linkage and an event would appear very likely in the short-term and almost inevitable over the long-term, or there is evidence at the receptor of harm or pollution.	*a) Elevated concentrations of toxic contaminants are present in soils in the top 0.5m in a residential garden.* *b) Ground/groundwater contamination could be present from chemical works, containing a number of USTs, having been in operation on the same site for over 50 years.*
Likely	There is pollutant linkage and all the elements are present and in the right place which means that it is probable that an event will occur. Circumstances are such that an event is not inevitable, but possible in the short-term and likely over the long-term.	*a) Elevated concentrations of toxic contaminants are present in soils at depths of 0.5-1.0m in a residential garden, or the top 0.5m in public open space.* *b) Ground/groundwater contamination could be present from an industrial site containing a UST present between 1970 and 1990. The tank is known to be single skin. There is no evidence of leakage although there are no records of integrity tests.*
Low likelihood	There is pollutant linkage and circumstances are possible under which an event could occur. However, it is by no means certain that even over a long period such an event would take place, and is less likely in the shorter term.	*a) Elevated concentrations of toxic contaminants are present in soils at depths >1m in a residential garden, or 0.5-1.0m in public open space.* *b) Ground/groundwater contamination could be present on a light industrial unit constructed in the 1990s containing a UST in operation over the last 10 years – the tank is double skinned but there is no integrity testing or evidence of leakage.*
Unlikely	There is pollutant linkage but circumstances are such that it is improbable that an event would occur even in the very long-term.	*a) Elevated concentrations of toxic contaminants are present below hardstanding.* *b) Light industrial units <10 yrs old containing a double-skinned UST with annual integrity testing results available.*

- Note: A pollution linkage must first be established before probability is classified. If there is no pollution linkage then there is no potential risk. If there is no pollution linkage then there is no need to apply tests for probability and consequence.
- For example, if there is surface contamination and a principal aquifer is present at depth, but this principal aquifer is overlain by an aquiclude of significant thickness then there is no pollution linkage and the risks to the principal aquifer are not assessed. The report should identify both the source and the receptor but state that because there is no linkage there are no potential risks.

Description of the Classified Risks

Very high risk

- There is a high probability that severe harm could arise to a designated receptor from an identified hazard at the site without remediation action OR there is evidence that severe harm to a designated receptor is already occurring. Realisation of that risk is likely to present a substantial liability to be site owner/or occupier. Investigation is required as a matter of urgency and remediation works likely to follow in the short-term.

High risk

- Harm is likely to arise to a designated receptor from an identified hazard at the site without remediation action. Realisation of the risk is likely to present a substantial liability to the site owner/or occupier. Investigation is required as a matter of urgency to clarify the risk. Remediation works may be necessary in the short-term and are likely over the longer term.

Moderate risk

- It is possible that harm could arise to a designated receptor from an identified hazard. However, it is either relatively unlikely that any such harm would be severe, and if any harm were to occur it is more likely, that the harm would be relatively mild. Further investigative work is normally required to clarify the risk and to determine the potential liability to site owner/occupier. Some remediation works may be required in the longer term.

Low risk

- It is possible that harm could arise to a designated receptor from identified hazard, but it is likely at worst, that this harm if realised would normally be mild. It is unlikely that the site owner/or occupier would face substantial liabilities from such a risk. Further investigative work (which is likely to be limited) to clarify the risk may be required. Any subsequent remediation works are likely to be relatively limited.

Very low risk

- It is a low possibility that harm could arise to a designated receptor, but it is likely at worst, that the harm if realised would normally be mild or minor.

No potential risk

- There is no potential risk if no pollution linkage has been established.

LIMITATIONS

Environmental & Geotechnical Interpretative Reports

1. This report provides available factual data for the site obtained only from the sources described in the text and related to the site on the basis of the location information provided by the client.
2. Where any data or information supplied by the client or other external source, including that from previous studies, has been used, it has been assumed that the information is correct. No responsibility can be accepted by CampbellReith for inaccuracies within this data or information. In relation to historic maps, the accuracy of maps cannot be guaranteed and it should be recognized that different conditions on site may have existed between and subsequent to the various map surveys.
3. This report is limited to those aspects of historical land use and enquiries related to environmental matters reported on and no liability is accepted for any other aspects. The opinions expressed cannot be absolute due to the limit of time and resources implicit within the agreed brief and the possibility of unrecorded previous uses of the site and adjacent land.
4. The material encountered and samples obtained during on-site investigations represent only a small proportion of the materials present on the site. There may be other conditions prevailing at the site which have not been revealed and which have therefore not been taken into account in this report. These risks can be minimised and reduced by additional investigations. If significant variations become evident, additional specialist advice should be sought to assess the implications of these few findings.
5. The generalised soil conditions described in the text are intended to convey trends in subsurface conditions. The boundaries between strata are approximate and have been developed on interpretations of the exploration locations and samples collected.
6. Water level and gas readings have been taken at times and under conditions stated on the exploration logs. It must be noted that fluctuations in the level of groundwater or gas may occur due to a variety of factors, which may differ from those prevailing at the time the measurements were taken.
7. Please note that CampbellReith cannot accept any liability for observations or opinions expressed regarding the absence or presence of asbestos or on any product or waste that may contain asbestos. We recommend that an asbestos specialist, with appropriate professional indemnity insurance, is employed directly by the client in every case where asbestos may be present on the site or within the buildings or installations. Any comments made in this report with respect to asbestos, or asbestos containing materials, are only included to assist the client with the initial appraisal of the project and should not be relied upon in any way.
8. The findings and opinions expressed are relevant to those dates of the reported site work and should not be relied upon to represent conditions at substantially later dates.
9. This report is produced solely for the benefit of the client, and no liability is accepted for any reliance placed upon it by any other party unless specifically agreed in writing.

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Appendix 1 - Figures

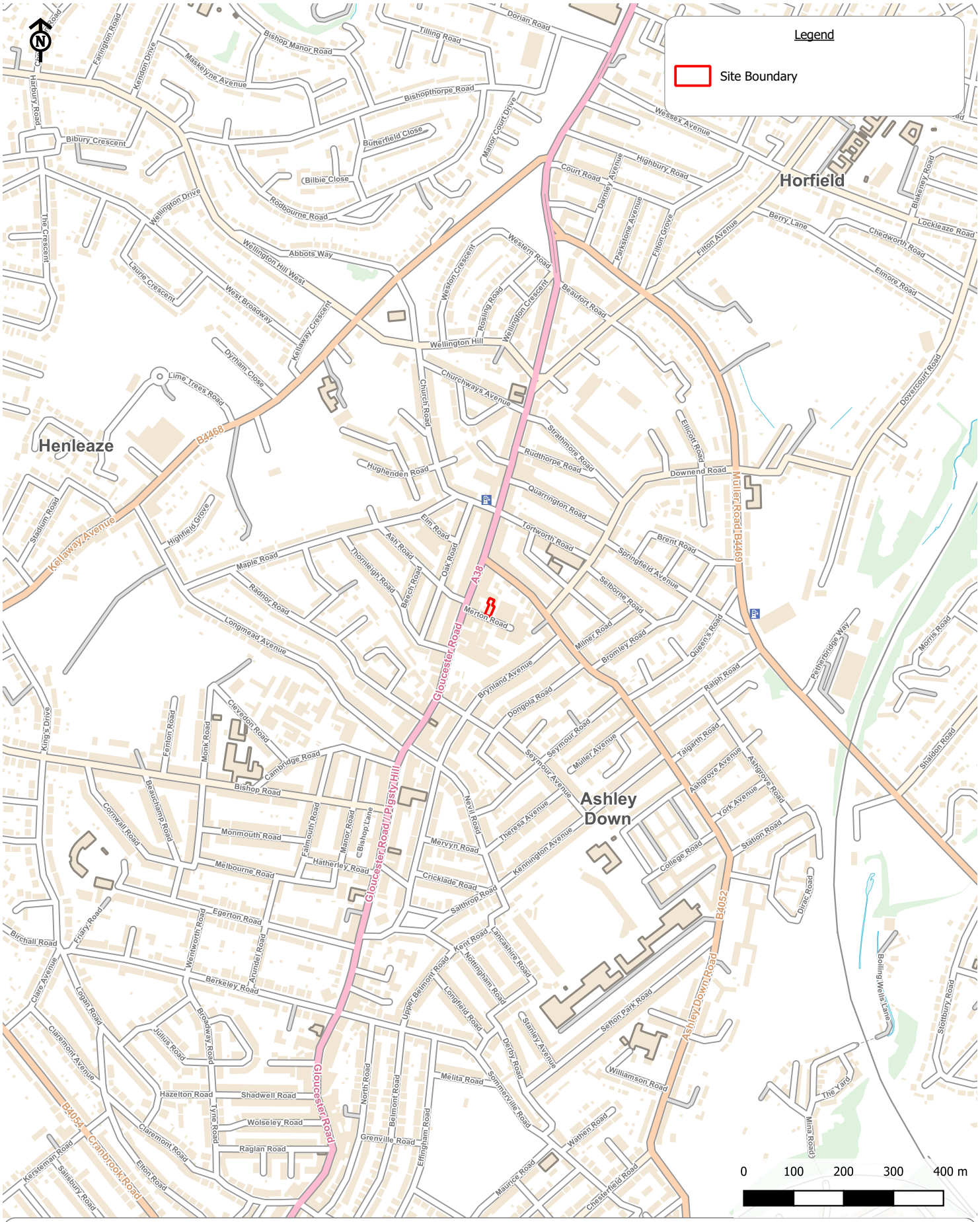
Figure 1: Site Location

Figure 2: Annotated Site Layout Plan – Photo Location and Orientation

Figure 3: LiDAR Data

Figure 4: BGS Geology Plan

Figure 5: Proposed Development



2 Merton Road, Bishopston

Client: Horders Electrical (Contracting) Ltd

Figure 1:
Site Location Plan

Scale: 1:10000@A4

Job Number: 14047
Drawn by - Checked by: RLF - SS
Drg No - Status/Revision: 14047-CRH-XX-XX-FG-G-7000 - P1
File location: N:\14000 - 14249\14047 B - 2 Merton Road\Project_Workspaces (pdf in Outputs)
Date (Revision History): 25/04/2023 (P1, First Issue, 25/04/23, RLF)

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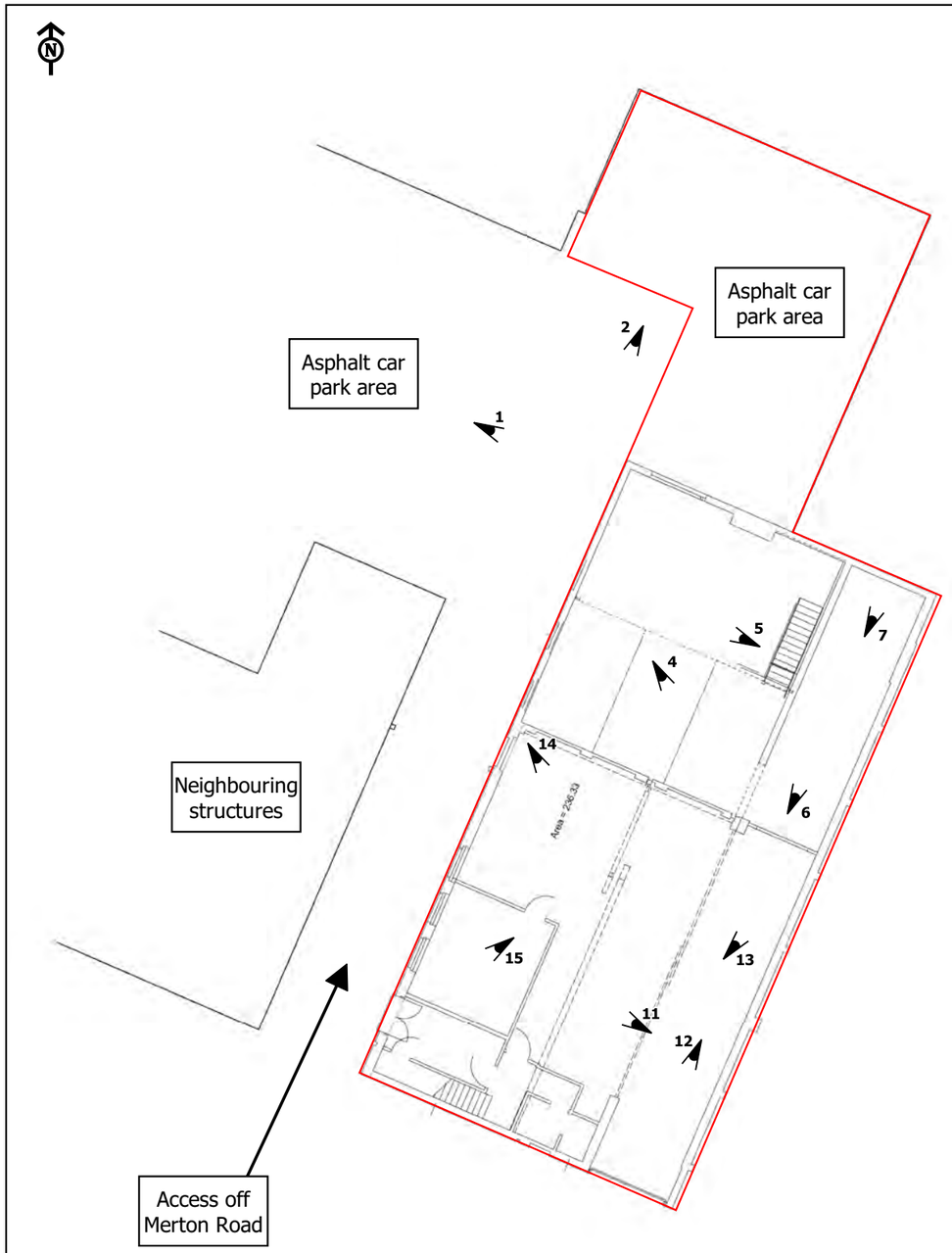

Ground Floor

First Floor

0 2 4 6 8 m

2 Merton Road, Bishopston

Client: Horders Electrical (Contracting) Ltd

Figure 2:
Annotated Site Plan - Photo Location and Orientation

Scale: 1:200@A3

Job Number: 14047
Drawn by - Checked by: RLF - SS
Drg No - Status/Revision: 14047-CRH-XX-XX-FG-G-7001 - P1
File location: N:\14000 - 14249\14047 B - 2 Merton Road\Project_Workspaces (pdf in Outputs)
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Site Photographs – Site Visit 4th April 2023

Photo 1: External view of existing structure, facing southeast

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Project Number: 14047
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Site Photographs – Site Visit 4th April 2023

Photo 2: External view of existing structure, facing south
Gated site access

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Site Photographs – Site Visit 4th April 2023

Photo 3: Internal view of first floor, facing west

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Site Photographs – Site Visit 4th April 2023

Photo 4: Internal view of ground floor, facing southeast

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Site Photographs – Site Visit 4th April 2023

Photo 5: Internal view of existing structure, facing west

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Project Number: 14047
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Site Photographs – Site Visit 4th April 2023

Photo 6: Internal view of existing structure, facing north

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Photo 7: Dry masonry rubble in the north eastern part of the existing structure

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