GEOENVIRONMENTAL AND GEOTECHNICAL ASSESSMENT
81-88 BERESFORD STREET
WOOLWICH
B WOOLWICH LTD
GEA-22277-23-283 REV 4
FEBRUARY 2024

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Prepared by		Approved by	
Callum Moller	BSc (Hons) FGS	Simon Edwards	CPhys MInstP AMIOA FRMetS
Kudzaishe Mawire	BSc (Hons), MSc, DIC, PhD, CEng, MICE, Pr. Eng (ECSA)		

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EXECUTIVE SUMMARY

A Geo-Environmental Assessment was requested by B Woolwich Ltd. The purpose of the assessment was to identify any contaminative or geotechnical issues associated with former land use at 81-88 Beresford Street, Woolwich which might impact on the site's redevelopment.

SITE DETAILS	
Approximate site area	0.1 ha
Current use / historic use	Catholic club and historically used for religious building and residential properties.
Proposed use	Multistorey residential tower block.

PHASE 1 NON-INTRUSIVE INVESTIGATION	
Expected geology	Limited made ground overlying superficial head deposits and solid geology of the Thanet Sand Formation to depths ranging between 17 and 19 m overlying chalk.
Groundwater	Thanet Sand Formation designated a Secondary A Aquifer. Undifferentiated Chalk designated a Principal Aquifer.
Surface water	River Thames 300m north. No surface water abstraction license and no risk of surface water flooding.
Other	UXO risk in London.

PHASE 2 EXPLORATORY INVESTIGATION	
Ground Conditions	Made ground encountered to between 0.74 and 2.50 m bgl; granular head deposits encountered to between 3.10 and 3.80 m bgl. Dense to very dense Thanet Sand Formation encountered to between 17.80 and 17.90 m bgl overlying Dm grade and B2 grade chalk. Groundwater struck at the chalk/Thanet interface, rose to between 11.5 and 10.6 m bgl under sub-artesian pressures.
Contamination Assessment	Moderate exceedance of human health screening values for metals and PAH were noted however these are unlikely to present a significant risk to people and the environment. Asbestos was noted in one location.
Geotechnical Assessment	Near surface made ground and superficial soils unsuitable as bearing stratum. Dense to very dense Thanet Sand Formation suitable as a founding stratum. Undifferentiated chalk underlies the dense sands and is also suitable for deep piled foundations. Nearby Crossrail Tunnel and Thames Water assets are sensitive to ground movement; assessment has been carried out under separate cover. DS-1 and ACEC-1 for buried concrete. Unlikely to be suitable for a soakaway drainage system.

RECOMMENDATIONS	
Geotechnical	Raft foundation solution proposed with bored cast-in-situ piled foundations in highly loaded areas to control settlement of the raft. Ground movement assessment undertaken for the foundation solution but further assessment required for temporary works. If piles are to end bear within, or close to, the chalk, then additional provision of a rotary cored borehole to better understand the properties of the chalk. Additionally Pilling Works Risk Assessment, vibration assessment and working platform design may also be required.
Remediation	Limited to no remediation required; construction of the basement and the development likely to remove or encapsulate contaminated soil.
Waste classification	At this stage, the ground materials identified are expected to be predominantly non-hazardous for the purpose of disposal. The detection of asbestos in one sample above the threshold for hazardous waste implies the need for additional testing of materials will be required when the existing structure is demolished.

SECTION 1 INTRODUCTION

1.1 B Woolwich Ltd proposes to redevelop an area of land located adjacent to Beresford Street, Woolwich currently occupied by a disused Catholic Club. The proposed redevelopment of the site comprises a 14-storey student accommodation tower block. The proposed development also includes:

i. Underground basement;

ii. Outdoor roof terrace atop the south-eastern half of the building.

1.2 IDOM Merebrook Limited (IDOM) has been commissioned by B Woolwich Ltd to undertake preliminary site investigation works and to advise on the geo-environmental and geotechnical implications of the proposed redevelopment and end use.

1.3 The objectives of the investigation are to:

i. Assess surface and sub-surface ground conditions present at the site;

ii. Identify hazards associated with ground contamination which may place constraints on the site and the proposed development;

iii. Evaluate the risks associated with any identified hazards;

iv. Provide preliminary recommendations for the mitigation of any significant risks identified;

v. Provide preliminary geotechnical comments on the feasibility of the proposed raft or piled foundation options;

vi. Evaluate risk associated with the geotechnical aspects of the proposed development.

1.4 A Phase 1 (Non-intrusive Investigation) has previously been completed for the site (Ref: DS-22277-21-94 REVA dated November 2021) and a Phase 2 (Exploratory Investigation) has now been undertaken for the subject site.

1.5 This report presents the findings of the geoenvironmental investigation and provides an interpretation of the geoenvironmental conditions that exist at the site. The contaminative status of the site and the implications with respect to development have been interpreted in accordance with the current government guidance on source-pathway-receptor risk assessment. This report uses a Tier 1 risk assessment to ascribe a conservative qualitative appraisal of the hazards associated with the site.

1.6 Additionally, this report presents an interpretation of the ground conditions in relation to the geotechnical aspects of the development. Preliminary calculations have been made to assess the feasibility of the proposed raft or piled foundation options. These calculations should not be considered a detail design of the foundation options;

further advice should be sought from the structural engineer and specialist foundation contractors.

1.7 This report has been prepared for B Woolwich Ltd for the sole purpose described above and no extended duty of care to any third party is implied or offered. Third parties making reference to the report should consult B Woolwich Ltd and IDOM as to the extent to which the findings may be appropriate for their use.

SECTION 2 PHASE 1 (NON-INTRUSIVE INVESTIGATION)

2.1 INTRODUCTION

2.1.1 The non-intrusive investigation has been conducted with reference to the documents and sources detailed in Table 1 below:

Table 1: Published Data and Information Sources

Source Data	Groundsure/Landmark Data
BGS 1:50,000 Series Geological Sheet 271	Ordnance Survey (OS) historical maps scaled at 1:10,560, 1:10,000, 1:2,500, 1:1,250 and 1:1,056 dated 1866 - 2021
BGS Geology of Britain 1:50,000 online maps	Water abstraction, discharge and pollution data
Radon: guidance on protection measures for new dwellings	Registered waste management sites
Environment Agency (EA) online data maps	Mining records and natural ground stability data
UK National Air Quality Archive, online	Protected areas of environmentally sensitive land use or conservation
Planning Records	Other relevant designations and/or authorisations and Trade Directory entries

2.1.2 The above sources are all authoritative and it is believed that they are reasonably reliable. However, independent verification of the information supplied has not necessarily been carried out and IDOM cannot be held liable for inaccuracies or deficiencies in the information.

2.2 SITE LOCATION AND SETTING

2.2.1 The site is located approximately 13.7 km east of London City centre to the northeast of Beresford Street, Woolwich. The National Grid Reference (NGR) for the approximate centre of the site is ^{5}43678 ^{1}79059. A site location plan is presented on the drawing 22277-001-001 in Appendix 1. Figure 1 shows the redline boundary of the site and nearby landmarks.

2.2.2 The site occupies an area of approximately 0.10 hectares. The southeastern boundary and part of the northeastern boundary is formed by a wooden fence. The southwestern and northwestern boundaries are formed by the existing building that covers the majority of the site and wooden fencing.

2.2.3 Beresford street is located immediately southwest of the site whilst the surrounding areas comprise recently constructed residential tower blocks, particularly to the north, and areas of public open space with some commercial buildings.

2.2.4 The site is almost completely occupied by an existing building that was formerly used as a Catholic Club. Access was granted through the building at the time of the investigation and the interior of the building comprised a bar and open areas

assumed to have been used historically for events. However, a detailed survey of the building was not conducted for potentially contaminative uses. The northern are of the site was occupied by temporary portacabins that support the adjacent Berkely construction office/welfare; although it is understood that most, if not all, of these cabins have recently been removed from the site. This are of the site is covered entirely by tarmac hardstanding and was used as pedestrian access to the Berkely office/welfare.

2.2.5 There are no trees located within the site area, however two semi-mature/mature maple trees are located a few meters beyond the southernmost corner of the site. No evidence of protected/invasive species were identified, although there was evidence of bird activity within the building.

Figure 1: Recent satellite imagery of site (red boundary) and surrounding land.

2.2.6 As the subject site lies within the footprint of a pre-existing building, the site topography is flat. The existing site building is not adjoined to any other structures.

2.3 SITE HISTORY

2.3.1 The site history, based on a review of the historic and current maps, dating from 1866 to 2021 is summarised below. Potentially contaminative land uses are shown in **bold**. Copies of key maps used in this review are provided in Appendix 2.

Table 2: Summary of the key features shown on historic maps

DATA SOURCE	SITE / SURROUNDINGS
1866	Site: Site was occupied by unmarked buildings, presumed to be larger residential properties.

DATA SOURCE	SITE / SURROUNDINGS
(1:10,560 scale) and 1869 (1:2,500 scale) 1.	Surroundings: Beresford Street formed the southwestern boundary of the site and Rope Yard Rails (roadway) formed the north-eastern boundary. Terraced residential plots were present adjacent to the site. Within 30 m of site, an extensive **Military Store Department** was indicated with a gun yard, timber yard, and many unspecified large military buildings. In many of the later historical maps, the military ground was shown as blank presumably for security purposes. To the south and east comprised built up residential streets with a church within 50 m southeast of the site and a **Smithy** within 100 m west of the site boundary. A theatre was indicated within 90 m north of the site. A **Gas Works** existed approximately 200 m north of the site on the banks of the Thames with a large **Workshop** indicated approximately 300 m northwest of site. A training **Royal Artillery Barracks**, **Royal Marine Barracks**, **Naval Hospital** and a training barracks existed within 1 km west and southwest of the site. A **railway** line was indicated running within approximately 150 m south of the site with a station roughly 300 m southeast of site.
1882, 1894 and 1894-1899 (1:10,560 scale), 1896 (1:1,056 scale) and 1897 (1:2,500 scale).	Site: No significant changes.
	Surrounding: Royal Arsenal West military-owned area (within 30 m east of the site) was shown blank and extends eastwards. The gas works to the north of site has been indicated as a **Timber Yard**. A Drill Hall and a School were indicated within 50 and 60 m west of the site and **Tramway** lines run along Beresford Street.
1916 (1:2,500 scale) and 1920 (1:10,560 scale).	Site: The site has become almost entirely occupied by a Baptist place of worship with only the southern section of the site occupied by a terraced residential plot.
	Surroundings: Royal Arsenal West military-owned area (within 30 m east of the site) was shown blank and extends eastwards. The **Military Barracks** to the southwest has extended to within 400 m of the site. The Workhouse and Timber Yard to the north of site have no longer been indicated.
1916 (1:2,500 scale) and 1920 (1:10,560 scale).	Site: The site has become almost entirely occupied by a Baptist place of worship with only the southern section of the site occupied by a terraced residential plot.
	Surroundings: Royal Arsenal West military-owned area (within 30 m east of the site) was shown blank and extends eastwards. The **Military Barracks** to the southwest has extended to within 400 m of the site. The Workhouse and Timber Yard to the north of site have no longer been indicated.
1948 and 1962-1966 (1:10,560 scale), 1956-1957 (1:1,250 scale) and 1958 (1:2,500 scale)	Site: No significant changes.
	Surroundings: Royal Arsenal West military owned area remains blank / unmapped. The tramway line is no longer indicated on Beresford Street. From 1957 mapping onwards, a car park has replaced terraced residential buildings directly north of Rope Yard Rails (within 10 m of site). A large **Works** building has been indicated approximately 200 m northwest of the site. Woolwich

DATA SOURCE	SITE / SURROUNDINGS
	Polytechnic college has been indicated approximately 250 m southwest of the site. Increased commercial buildings have been indicated within 300 m southeast of the site, including a covered market, a cinema and a furniture depository.
1970-1971 (1:10,560 scale) and 1970-1971 (1:1,250 scale).	Site: The terraced residential property has been removed from the south of site.
	Surroundings: Royal Arsenal West military area remains blank / unmapped. A **Garage** directly north of the site has been built adjacent to the northern site boundary. Rope Yard Rails road has been divided by the garage. North of the garage, **builders' yards**, **works** and **factory** buildings have been indicated. Works building 250 m northwest of site is indicated as a **Power Station**.
1988-1990 and 1995 (1:10,000 scale) and 1988 and 1991 (1:1,250 scale).	Site: Building has been extended to cover the whole of site footprint as it is today.
	Surroundings: Royal Arsenal West military area remains blank / unmapped. Beresford Street has extended to become a dual carriageway. The Power Station to the north of site has been developed into a car park.
2001 (1:10,000 scale) and 2003 (1:1,250 scale).	Site: No significant changes.
	Surroundings: **Royal Brass Foundry** is shown approximately 30 m from the site. Two **Royal Laboratory** buildings have been indicated from 100 m north and northeast of the site.
2010 (1:10,000 scale).	Site: No significant changes.
	Surroundings: Garage and works buildings to the north have been removed. Museums have been indicated 250 m northeast of the site.
2021 (1:10,000 scale).	Site: No significant changes.
	Surroundings: Neighbouring hotel building and car park have been constructed directly north of the site. Further high-rise residential developments been built from approximately 50 m northeast of the site and extending northwards to the River Thames.

2.3.2 In summary, historic plans show that the subject site has been developed from residential buildings which pre-date 1866 up until 1910s, by which time the site was largely occupied by a Baptist Tabernacle. This remained *in situ* until the 1970s, when the building occupying the site today was constructed.

2.3.3 From historic mapping the nearby potential contaminative land uses within 250 m of the site have included a gas works, workshops, a power plant, a garage, builders and timber yards, and nearby barracks.

2.3.4 Former military land to the northeast known as the *Royal Arsenal London / Woolwich Warren* has existed from 21 m northeast of the site. Although this has not been indicated in many of the historical maps, it is known that the site was used for armaments manufacture, ammunition proofing, explosives research for British armed forces; Shell Filling factories/explosive factories on site/gas works and chemical works. Based on mapping data available online for the Royal Arsenal

history[1], the Laboratory Department buildings existed in closest proximity to the site (roughly 21 m northeast). Due to these activities existing on site until 1994, it is important that contamination derived from the Royal Arsenal London is considered for the subject site.

2.3.5 Given the nature of the historical mapping process (scale, representation of conditions at discrete time intervals frequency *etc*.), any such maps and plans may not provide a comprehensive account of a site's history. Identification of pertinent land uses and associated potentially contaminative activities, may therefore be absent from mapping records.

2.4 GEOLOGY

2.4.1 The British Geological Survey (BGS) indicates that the site is underlain by the following geological sequence:

Table 3: Summary of Published Geology

Geological Unit	Type	Description	Anticipated thickness on site (m)
Superficial	Head deposits	Clay, silt, sand and gravel	2
Solid	Thanet Sand Formation	Sand	15
Solid	Undifferentiated Chalk	Chalk	>30m

2.4.2 The BGS indicates two borehole records located approximately 12 m and 24 m northeast of the site, respectively. These boreholes both suggest up to 3 m of variable made ground. One of the boreholes records the presence of granular superficial river terrace deposits to a depth of 4 m. Underlying the made ground and superficial deposits, the Thanet Sand Formation is recorded from 3 m and 4 m, respectively; and comprises light brown sand. The undifferentiated chalk is recorded from 17.42 m and 18.60 m, respectively, to the base of the two boreholes. The chalk is generally described as moderately weak, high density white chalk, grades B2 and B3 within the rotary borehole which is considered to be more representative of the in-situ character of the chalk rather than the cable percussive boreholes which describes the chalk as very weak, medium density and from 28.00 m as comminuted chalk.

2.4.3 There is no reference to made/filled ground onsite from the Groundsure report.

2.5 HYDROGEOLOGY

2.5.1 The Aquifer status of groundwater held within the geological units, the presence of Source Protection Zones and related abstractions are summarised in Table 4.

[1] https://www.royal-arsenal-history.com/royal-arsenal-west---woolwich.html

Table 4: Summary of Published Geology

Geological Unit	Aquifer Designation	Source Protection Zone	Location of Abstraction
Superficial Head	Secondary Undifferentiated	None	None within 1 km
Thanet Sand Formation	Secondary A		
Undifferentiated Chalk	Principal Aquifer		

2.6 HYDROLOGY

2.6.1 There are two surface water features within 250m of the site. These are identified as insignificant ponds roughly 200 m south of the site. The River Thames lies approximately 300 m north of site.

2.6.2 There are no surface water abstraction licences within 1 km of the site.

2.6.3 The flood risk from EA mapping is negligible.

2.6.4 Groundwater flooding susceptibility is considered low risk on the site.

2.7 CURRENT SITE ISSUES

2.7.1 Potentially significant environmental issues have been investigated within relevant distances of the site, based on the database of records supplied by Groundsure. These relate to the following searches:

i. Water discharge or pollution incidents within 250 m of the site;

ii. Waste management sites within 250 m of the site;

iii. Statutory authorisations within 50 m of the site;

iv. Trade directory entries of possible contaminative use within 50 m of the site;

v. Special protection or conservation areas within 50 m of the site; and

vi. Any other relevant issues.

2.7.2 Potentially significant environmental issues identified by the above searches are summarised in Table 5.

Table 5: Potentially significant environmental issues.

ENVIRONMENTAL CATEGORY	DESCRIPTION
Water discharge or pollution incidents within 250 m	None identified.
Waste management sites within 250 m	A licenced waste transfer station existed from 1992 to 2009, 22 m south est of site for commercial and industrial waste. This is considered unlikely to impact the subject site.
Statutory authorisations within 50 m	None identified.
Trade directory entries of possible contaminative use within 50 m	None identified.
Special protection or conservation areas within 50 m	None identified.
Other relevant issues	Crossrail 1 railway line (Elizabeth line) lies within proximity to the site. Nearby tunnel alignments exist 19 m and 44 m northeast of site.

2.8 INDICATIVE GROUND STABILITY HAZARDS

2.8.1 The following natural ground subsidence hazard rating have been prescribed:

Table 6: Summary of Natural Ground Subsidence Hazards

Geological Unit	Type	Hazard rating
Superficial Head	Shrink swell clays	Very Low
Thanet Sand Formation	Running sands	Very Low
Thanet Sand Formation	Compressible deposits	Very Low
Thanet Sand Formation	Collapsible deposits	Very Low
Thanet Sand Formation	Landslides	Very Low
Thanet Sand Formation	Ground dissolution of soluble rocks	Negligible

2.9 MINING, GROUND WORKINGS AND NATURAL CAVITIES

2.9.1 The historic maps do not record any evidence of historic mining within the vicinity of the site.

2.9.2 The Sand and Gravel Resources map for the London Boroughs suggest the site is underlain by bedrock sand and gravel resources relating to the Thanet Sand Formation. The nearest active mineral site is Peruvian Warf located on the opposite bank of the River Thames, approximately 1.7 km northwest of the site.

2.9.3 There is no evidence of the extraction of minerals such as coal, gypsum or brine extraction, and the underlying recorded geology is not suitable for the extraction of these resources.

2.10 RADON GAS

2.10.1 The site does not lie within a Radon Affected Area as defined by the former Health Protection Agency, now Public Health England (less than 1% of houses are above the action level). Guidance issued by the Buildings Research Establishment (BRE-211) indicates that no radon protective measures are necessary. Radon dataset maps are provided in Appendix 3.

2.11 UXO

2.11.1 Regional Unexploded Bomb Risk Maps published by Zetica have been consulted which show the area is at high risk from unexploded ordnance. A Luftwaffe target is recorded on the map approximately 300 m northwest of the site. It is recommended that further work is undertaken including a UXO Desktop Search / Preliminary UXO assessment

2.12 AIR QUALITY

2.12.1 The site lies within a designated Air Quality Management Area (AQMA) for the Royal Borough of Greenwich in relation to particulate matter (PM_{10}) 24-hour mean and nitrogen dioxide (NO_2) annual mean. Proposals for new development are likely to require an air quality assessment.

2.13 ECOLOGY AND WOODLAND

2.13.1 Information from environmental and ecological datasets was obtained from a review of the MAGIC (Multi-Agency Geographic Information for the Countryside) website and the Groundsure report. The data assessed indicates that the site lies within a SSSI Impact Risk Zone, however the development proposals are unlikely to trigger a requirement for consultation in this regard. No other environmental designations lie within 1 km of the site.

2.14 ARCHAEOLOGICAL SITES AND ANCIENT MONUMENTS

2.14.1 Information from the visual and cultural designations dataset was obtained from a review of the Groundsure Enviro data Viewer (https://wimby.co.uk/) website in order to identify any archaeological, historic building or historic site receptors that might be relevant to redevelopment of the site.

2.14.2 There are no ancient monuments recorded in the vicinity of the site. There are a number of listed buildings located near to the site that may be sensitive to vibrations associated with construction activity; including the Royal Brass Foundry located approximately 25 m northeast of the site and the Guard House located approximately 35 m east of the site. It may be necessary to undertake a vibration assessment if

significant vibrations are anticipated during construction activities such as a piled foundation.

2.14.3 It is understood that an Archaeological assessment of the site has been undertaken by specialist consultants and their report should be referred to in this regard.

2.15 PREVIOUS INVESTIGATIONS

2.15.1 On the Royal Borough Greenwich planning portal, some information from investigations exists in the area in relation to the wider Berkeley site (Planning reference: 13/0117/O) however, none of these reports include the subject site. A Subadra investigation in 2007 progressed one shallow borehole (to 1.2 m bgl) close to the northern boundary of the site. The extent of the made ground was not proven in the Subadra investigations; however, it was often described as gravelly sands with occasional black staining and rare red brick fragments. Taking information from the wider investigations it is likely that made ground is between 1 and 2 m thick.

2.15.2 Deeper ground investigation information relating to the Premier Inn to the north of the site suggests made ground to depths ranging between 2.50 and 3.60 m bgl, overlying superficial river terrace deposits of sandy gravels to depths raging between 3.50 and 5.30 m bgl. The Thanet Sand Formation is encountered underlying the superficial strata to a maximum depth of 17.60 m bgl, although the base was only proven in one of the exploratory holes. Chalk underlies the Thanet Sand Formation and is described as very weak or putty chalk to a maximum depth of 30 m bgl.

2.16 PRELIMINARY CONCEPTUAL SITE MODEL AND RISK ASSESSMENT

2.16.1 From the Phase 1 assessment a preliminary site conceptual model and risk assessment have been produced using the framework established in Part IIA of the *Environmental Protection Act 1990* and detailed in Contaminated Land Report *CLR11 - Model Procedures for the Management of Land Contamination*.

2.16.2 Risk from contamination has been assessed using the source-pathway-receptor and pollutant linkage methodology, whereby a risk can only exist if all elements of: source, pathway and receptor, are present.

2.16.3 Potential site derived sources of contamination are considered to be limited due to the site not being subject to significant industrial activity. There is potential made ground with contaminative impacts from the demolition, or usage, of the previous residential buildings that existed on the site.

2.16.4 Potential pathways for contamination to impact receptors would include:

i. ingestion of soils / dust / homegrown produce,

ii. inhalation of vapours / dust and

iii. direct contact with materials.

2.16.5 Potential receptors include current site users, future residents of the proposed development, construction workers, groundwater aquifers, new infrastructure, adjacent land and the nearby River Thames.

2.16.6 Pollutant Linkages and Risk Ratings

2.16.7 From the Phase 1 assessment a preliminary site conceptual model has been produced as Table 7 which identifies the potential pollutant linkages. These have been used to inform the Phase 2 intrusive investigation presented in the subsequent sections.

Table 7: Preliminary Conceptual Model

POSSIBLE POLLUTANT LINKAGE			RISK CHARACTERISATION
POTENTIAL SOURCES	**PATHWAYS**	**RECEPTORS**	
Heavy metals and hydrocarbons (made ground)	Contact with contaminated soil	Human health (current users)	**Low risk identified** Potential for made ground beneath existing building infrastructure which can contain elevated metals and hydrocarbons. Exposure limited.
	Ingestion and inhalation of contaminated soil and dust	Human health (current users)	
Heavy metals and hydrocarbons (made ground)	Contact with contaminated soil	Human health (future residents and construction workers)	**Low risk identified** Potential for made ground beneath existing building infrastructure which can contain elevated metals and hydrocarbons. Exposure limited.
	Ingestion and inhalation of contaminated soil and dust	Human health (future residents and construction workers)	
Asbestos (made ground)	Ingestion and inhalation of contaminated soil and dust	Human health (future residents)	**Low risk identified** Potential for made ground to contain asbestos from demolition of buildings. Exposure limited.
Asbestos (made ground)	Ingestion and inhalation of contaminated soil and dust	Human health (construction workers)	**Moderate risk identified** Potential for made ground to contain asbestos from demolition of buildings. Exposure likely.
Contamination (all forms)	Vertical migration to aquifer	Controlled waters	**Low to Moderate risk identified** Potential for localised low-level contamination (which is unlikely to be significantly leachable) to affect Secondary A aquifer.
Contamination (all forms)	Horizontal migration to surface water	Controlled waters	**Low risk identified** Potential for localised low-level contamination (which is unlikely to be significantly leachable) to affect the River Thames.
Hydrocarbons	Direct contact	Plastic water pipes	**Moderate risk identified** Cannot rule out presence of hydrocarbon contamination at this stage.
Hazardous Gas/Vapours In soil	Ingress into buildings and voids	Human health (future residents and construction workers)	**Moderate risk identified** Potential for made ground which could act as source of hazardous gas. Cannot rule out fuel spillages as source of vapours

POSSIBLE POLLUTANT LINKAGE			RISK CHARACTERISATION
POTENTIAL SOURCES	PATHWAYS	RECEPTORS	
Adjacent Land (Former Military Land to the east and northeast)	Leaching and migration via aquifer or run-off	Human health and infrastructure in subject site development	**Low to Moderate risk identified** The former Military land to the north and east has been subject to redevelopment in recent years, however, cannot rule out any unknown leachable contamination derived from the former land uses.
Adjacent Land (Former garage to the north)	Gas/vapours migration, leaching and migration via aquifer	Human health and infrastructure in subject site development	**Moderate risk identified** Potential for fuel spillages on the former garage to the north of site to impact the subject site.

SECTION 3 SITE INVESTIGATION RATIONALE

3.1 INTRODUCTION

3.1.1 A site investigation rationale has been devised in accordance with the findings of the Phase 1 investigation and the resultant preliminary conceptual site model and risk assessment.

3.1.2 Intrusive sampling locations was chosen on the basis of providing the required assessment of ground conditions for the proposed structure, particularly from a geotechnical perspective, whilst avoiding the existing site access constraints.

3.2 SITE INVESTIGATION METHODS

3.2.1 An intrusive investigation was carried out by IDOM between 22nd May and 6th June 2023. Initial delays occurred due to the risk from buried services and the ground investigation was primarily completed between 3rd and 6th June 2023. The investigation comprised the following scope of work:

i. One cable percussion borehole (MBH01) to a depth of 40 metres below ground level (m bgl).

3.2.2 A second phase of ground investigation was undertaken between 8th and 11th January 2024 in the northern corner of the site which was recently acquired by the Client as an extension to the existing site. The second phase of ground investigation comprised the following scope of works:

i. One cable percussion borehole (MBH201) to a depth of 40 metres below ground level (m bgl).

ii. Six windowless sample boreholes (MWS101 to MWS103b) to depths ranging between 0.40 and 5.00m bgl.

3.2.3 A combined exploratory hole location plan is presented on drawing 22277-304-001 Rev. B in Appendix 1. Logging of exploratory holes was undertaken by an IDOM Officer. Exploratory hole logs are provided in Appendix 4.

3.2.4 Initially, hand dug inspection pits were progressed for all the exploratory holes. Additional vacuum excavation was undertaken to progress MBH01 to a maximum depth of 1.50 m bgl due to a number of buried electric cables. Light cable percussion equipment was then used to advance the boreholes (MBH01 MBH201) to the required depth of 40 m bgl and tracked windowless sample rig was used to progress the shallow exploratory holes. In a number of the windowless boreholes, buried concrete obstructions were identified within the made ground and these borehole were terminated within the made ground.

3.2.5 Standard Penetration Tests (SPTs) were performed at approximate 1 metre intervals, to a depth of 5 m bgl and 1.5 m intervals beyond to a depth of 40 m bgl. The tests involved driving a steel cone tipped series of rods into the ground over a depth of 450 mm using the repeated blows of a 63.5 kg weight allowed to free fall over a height of 760 mm. The total number of blows required for the final 300 mm penetration (the 'N' value) is recorded on the borehole log.

3.2.6 In MBH01 undisturbed samples were collected at depths of 24.0, 27.0 and 30.0 m bgl, in favour of the SPT test, to be able to assess the chalk from an intact specimen; however, the samples did not recover any chalk and the character and grade was described based on limited recovery within the shoe sample. No further undisturbed sampling was conducted in MBH201.

3.2.7 Gas/groundwater monitoring standpipes were installed in a number of the exploratory holes. The standpipes and response zones are summarised in Table 8.

Table 8: Gas/groundwater monitoring standpipe details.

Hole ID	Response Zone (m bgl)	Targeted Strata
MBH01	3.00 – 10.00	Head deposits and Thanet Sand Formation
MBH02	1.00 – 10.40	Made ground, Head deposits and Thanet Sand Formation
MWS101	0.70 – 2.00	Made ground
MWS102c	0.20 – 0.70	Made ground
MWS103b	1.00 – 5.00	Made ground, Head deposits and Thanet Sand Formation

3.2.8 Representative soil samples were taken from various depths and strata to assess the contaminative status of the site. Soil samples were submitted to an MCERTS/ UKAS accredited laboratory for chemical analysis of a broad suite of potential contaminants. The results are provided in Appendix 5.

3.2.9 A programme of geotechnical laboratory testing was performed on selected soil samples obtained from the boreholes, comprising classification tests. Chemical testing was also undertaken to assess the aggressiveness of the ground with respect

to buried concrete. The results of the geotechnical laboratory testing are provided in Appendix 6.

SECTION 4 GROUND CONDITIONS

4.1 SURFACE GROUND CONDITIONS

4.1.1 The ground surface comprised a thin veneer or tarmacadam hardstanding that covered the entirety of the accessible site area (i.e., the area of the site not currently occupied by the existing building). Current ground level at which the boreholes were progressed ranges between +10.55 to 10.85 m AOD.

4.2 SUB-SURFACE GROUND CONDITIONS

4.2.1 A summary of the ground conditions encountered is presented in Table 9, whilst a more detailed assessment of the strata is contained in the following sections of the report.

Table 9: Summary of Sub-surface Ground Conditions

Strata	Depth to Top of Range (m AOD)	Thickness Range (m)
Made Ground	10.55 – 10.85	0.40 – 2.50
Superficial – Head deposits	8.30 – 9.20	0.60 – 2.20
Solid – Thanet Sand Formation	6.95 – 7.70	3.20 – 14.10
Solid – Undifferentiated Chalk	-7.15 – -7.10	22.10 – 22.20

4.2.2 Made Ground

4.2.2.1 Made ground was encountered in all the exploratory holes from the ground surface to a maximum depth of 2.50 m. The base of the made ground was only proven in three of the exploratory holes (MBH01, MBH201 and MWS103b). Underlying the tarmacadam hardstanding, the made ground was encountered as the following range of materials:

i. Light brown, gravelly clayey sand with low cobble content. The gravels comprise concrete, brick, flint, plastic and chalk whilst the cobbles comprise only concrete.

ii. Red, yellow and brown sandy, locally silty, gravel with gravels of concrete, flint and brick.

iii. Brown, sandy gravelly clayey silt with gravels of concrete, brick, metal, flint, chalk, coal, glass and clay pipe fragments.

iv. Grey concrete.

4.2.2.2 A weak hydrocarbon odour was noted within the made ground arisings of MWS103a. Other than the above localised olfactory evidence of contamination with the made ground and significant quantities of anthropogenic material within the soils, there was no further visual or olfactory evidence of contamination within the made ground and it is considered likely to have been placed during development / re-development of the site and establishing site levels.

4.2.2.3 Groundwater was not encountered within the made ground.

4.2.2.4 Three Standard Penetration Tests (SPT) were performed within the made ground at depths ranging between 1.20 to 1.50 m bgl. The recorded N-values range between 2 and 10 blows indicating the granular horizons are between very loose and loose relative density.

4.2.2.5 Due to the existing development of the site, the thickness and character of the made ground is likely to vary, a basement has been constructed as part of the existing development and is likely to mean that the thickness of the made ground is likely to be thinner beneath the basement, if present at all.

4.2.3 Head deposits

4.2.3.1 A thin veneer of superficial strata was identified in the three holes which fully penetrated the made ground (MBH01, MBH201 and MWS103b) from depths ranging between 1.60 and 2.50 m bgl. The head deposits were typically described as orangish brown, sandy clayey gravel or very gravelly sand. The gravels comprise chert, quartzite, flint and siltstone.

4.2.3.2 There was no visual or olfactory evidence of contamination and groundwater was not observed within the superficial strata.

4.2.3.3 Three SPTs were undertaken within the superficial strata at depths ranging between 2.00 and 3.00 m bgl. The SPT N-values range between 10 and 36 indicating that the granular superficial deposits are variable in nature and the relative density ranges between loose and dense.

4.2.4 Thanet Sand Formation

4.2.4.1 The Thanet Sand Formation was encountered underlying the superficial deposits from depths ranging between 3.10 and 3.80 m bgl. The stratum comprised medium to very dense, light grey and yellowish brown fine to medium grained sand.

4.2.4.2 There was no visual or olfactory evidence of contamination and groundwater was not observed within the Thanet Sand Formation.

4.2.4.3 SPTs were performed throughout the stratum at various depths. Within MBH01 every test recorded refusal (N-value of 50 blows) between 4.50 and 15.00 m bgl with amounts of penetration ranging between 122 and 280 mm. Only one test did not record refusal at a depth of 16.50 m with an N-value of 16 indicative of medium

dense sand. This lower value may be explained by drilling disturbance ahead of the test where the interface of the underlying chalk is recorded.

4.2.4.4 Within MBH201, at 4.0 m depth an N-value of 21 was recorded which indicates medium dense sands. Beyond this depth, all SPTs indicate granular soils that are at least dense with N-values ranging between 30 and 47 to a depth of 16.50 m bgl and only recorded refusal at two depths (12.00 and 13.50 m bgl) with amounts of penetration ranging between 229 and 247 mm.

4.2.4.5 In MWS103b, at 4.0 m depth an SPT N-value of 29 indicates medium dense sand whilst at 5.0 m depth refusal was recorded indicative very dense sand.

In summary, the SPTs generally indicate the Thanet Sand Formation is at least dense with only 3 tests indicating medium dense sands, two of which were recorded shallowly at 4.0 m depth and the deeper value in MBH01 at 16.50 m bgl may be anomalous due to drilling disturbance.

4.2.5 Undifferentiated Chalk

4.2.5.1 Undifferentiated Chalk deposits were encountered in the deeper boreholes only, underlying the Thanet Sand Formation from depths ranging between 17.80 to 17.90 m bgl. The chalk was generally recovered as structureless comminuted chalk and is initially classified as Grade Dm and Dc in-line with CIRIA Publication 574: Engineering in Chalk. Within MBH01, from a depth of 22.0 m the chalk is described as extremely weak, medium density chalk and classified as Grade B4 based on the limited shoe samples from SPTs and undisturbed samples, although the majority of stratum was still recovered as structureless comminuted chalk. Within MBH201 the chalk remained structureless comminuted chalk grade Dm and Dc throughout the whole depth.

4.2.5.2 No visual or olfactory evidence of contamination was identified within the chalk.

4.2.5.3 Groundwater was struck in both deep exploratory holes (MBH01 and MBH201) at depths of 17.90 and 18.00 m bgl, respectively. After 20 minutes the groundwater rose in both boreholes to 10.60 and 11.60 m bgl.

4.2.5.4 SPT N-values generally range between 29 and 39 throughout the chalk; however, N-values as low as 4 blows and as high as 50 blows were also encountered throughout the chalk. It is considered that the large range in SPT blow counts is a result of disturbance within the chalk during the drilling operations.

SECTION 5 PRELIMINARY GEOTECHNICAL RECOMMENDATIONS

5.1 GEOTECHNICAL SOIL TESTING RESULTS

5.1.1 A number of disturbed samples were recovered from the intrusive investigation for geotechnical laboratory testing. The rationale for the testing is highlighted below:

i. 2 no. sample of superficial head deposits and 1 no. sample of Thanet Sand Formation underwent Particle Size Distribution analysis for classification of the shallow underlying soils.

ii. 7 no. samples of undifferentiated chalk were tested for saturation moisture content, the bulk density and the dry density. However, due to the poor recovery of undisturbed samples, all three of these samples failed to comply with the volume requirements of the tests in accordance with BS1377:2.

iii. 17 no. samples (1 sample of made ground, 2 sample of head deposits, 7 samples of Thanet Sand Formation and 7 samples of undifferentiated Chalk) were tested for a full suite of sulphates in-line with BRE Special Digest 1.

5.1.1.2 The geotechnical test results are presented in Appendix 6 and summarised in the tables below. The results of sulphate testing are presented later in this report.

Table 10 – Results of particle size distribution analysis.

Sample ID (Stratum)	D60 (mm)	Uniformity Coefficient	Description	Series 600 Classification
MBH01 at 2.50 - 2.95 m (Head deposits)	12.6	45	Sandy GRAVEL	1A
MBH01 at 4.50 – 4.77 m (Thanet Sand Formation)	0.168	2.4	SAND	1B
MBH201 at 2.00 – 2.45 m (Head deposits)	11.9	52	Sandy GRAVEL	1A

Table 11 – Results of density testing of undifferentiated chalk samples.

Sample ID	Saturation Moisture Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)
MBH01 at 24.00 – 24.65 m	33	1.89	1.43
MBH01 at 27.00 – 27.65 m	30	1.93	1.50
MBH01 at 30.00 – 30.65 m	27	1.97	1.56
MBH201 at 18.00 – 18.45 m	30	1.94	1.49
MBH201 at 22.50 – 22.95	29	1.95	1.51
MBH201 at 30.00 – 30.45	31	1.92	1.47
MBH201 at 36.50 – 37.50	33	1.87	1.44

5.2 GEOTECHNICAL DESIGN PARAMETERS

5.2.1 The above laboratory geotechnical testing results combined with in-situ geotechnical testing have been analysed and characteristic values have been selected for the individual geologies. Characteristic soil parameters have been determined in accordance with BS 8004:2015: Code of practise for foundations.

5.2.2 SPT N-values have been corrected to $(N_1)_{60}$ values in accordance with BS EN ISO 22476-3:2005 to account for the effects of overburden pressure, theoretical hammer free fall energy and rod length. Where SPTs refused in the Thanet Sand Formation an extrapolated N-value has been determined for the full penetration depth based on the actual amount of penetration recorded; however, these values must be used with extreme caution and are considered not to have any merit above an N-value of 50 for the overall assessment of a characteristic design value.

5.2.3 Figure 2 below presents the relationship between $(N_1)_{60}$ values and depth for the individual geologies. The revised graph no longer presents historic data local to the area in light of the recently undertaken ground investigation which provides more substantial site-specific data. The figure presents the results from the 2023 and 2024 investigations separately.

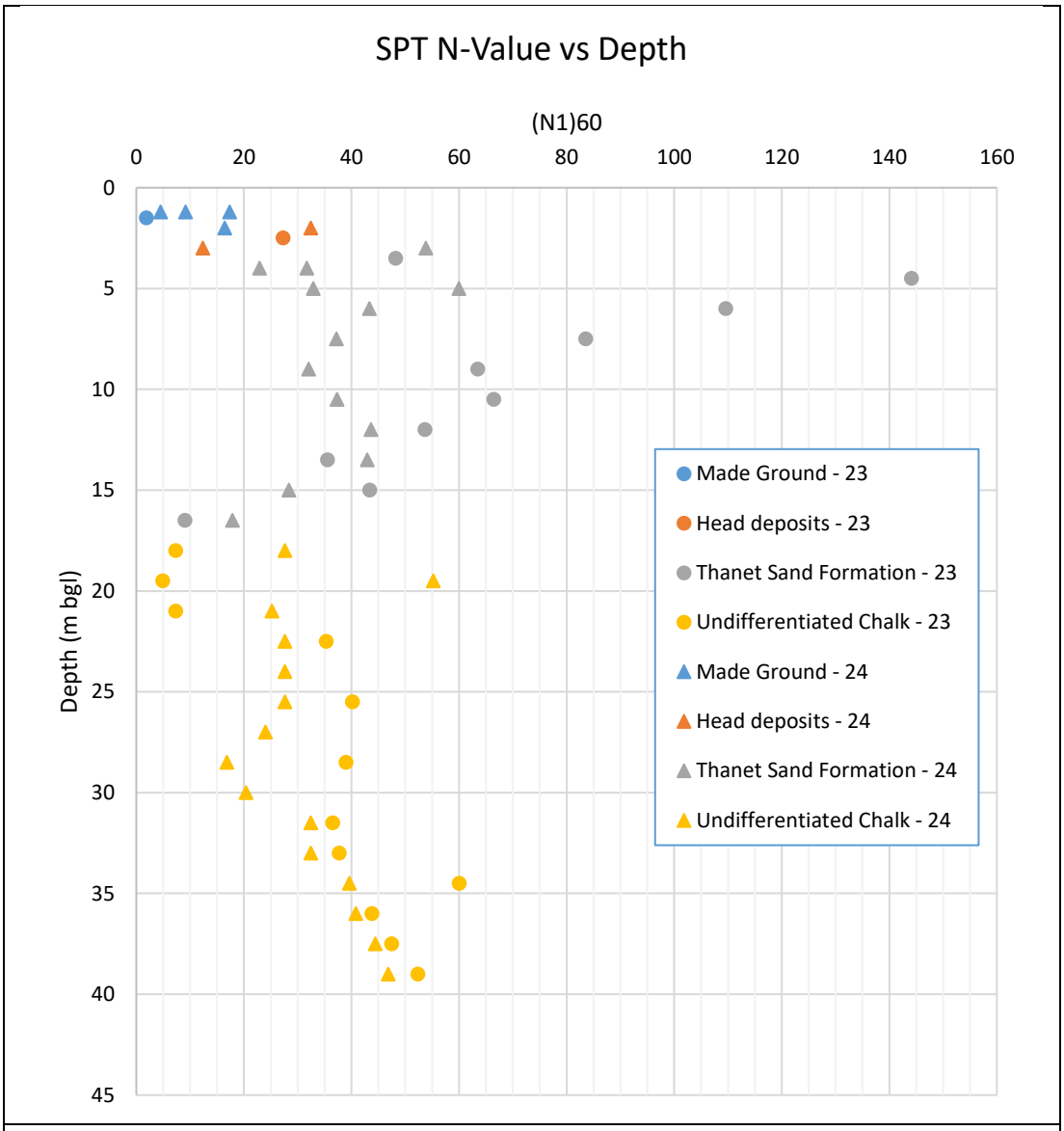


Figure 2 – $(N_1)_{60}$ vs depth.

5.2.4 The following are the design SPT values adopted for correlation to obtain the geotechnical parameters.

i. Made ground N = 3

ii. Heads Deposits N = 20

iii. Thanet Sand Formation N = 40

iv. Undifferentiated chalk N = 30

5.2.5 The angle of shearing resistance has been determined using well established empirical relationships with SPT N-value (Peck *et al.*, 1974) and through particle size distribution data and stratum descriptions provided on the logs in Appendix 4 in accordance with BS 8004:2015.

The table below presents the design parameters used in the foundation calculations.

Table 12 – Geotechnical Design Parameters

Stratum	Bulk Unit Weight, (kN/m^3)	Undrained Shear Strength, cu (kN/m^2)	Angle of internal friction, ϕ' (°)
Made Ground	18	23	23
Head Deposits	17	-	32
Thanet Sand Formation	18	-	35
Undifferentiated Chalk	19	-	36*
*CIRIA C574: Engineering in Chalk			

5.3 FOUNDATIONS

5.3.1 The proposed development comprises a multistorey tower block for residential purposes and includes a basement. A total of 14 above-ground stories are proposed and the structural engineer has indicated that preliminary unfactored column loads are anticipated to be 4,500 kN.

5.3.2 The ground investigation findings suggest only a thin veneer of made ground and superficial strata underlie the site. The Thanet Sand Formation is encountered from 3.70 m bgl to a depth of 16.50 m where it is generally dense to very dense. Undifferentiated chalk deposits are encountered underlying the Thanet Sand Formation to the maximum depth of investigation of 40.00 m bgl.

5.3.3 Due to the scale of the structure and the anticipated column loads, traditional strip footings are considered not to be suitable for the proposed development. An 800-900 mm thick raft slab has been proposed by the structural engineer as the favoured foundation solution. Alternatively, a piled foundation solution could be considered. An appraisal of these foundation options is detailed below.

5.4 RAFT FOUNDATION SOLUTION

5.4.1 The proposed formation level of the raft is +5.40m AOD (approximately 5.0 m bgl). An existing Thames Water sewer is present along the northeast boundary of the site and a Crossrail tunnel is located further beyond the northeastern site boundary. Shallower Thames Water assets are also present on the southwest boundary along Beresford Street. Figure 3 presents the proposed raft foundation solution and Figure 4 presents a birds-eye view of the proposed development in relation to the existing Thames Water sewer and Crossrail tunnel.

5.4.2 As indicated in Figure 3, it is desirable that the load spread angle from the proposed raft foundation solution should not load the existing Thames Water sewer or

Crossrail tunnel. It is noted that Thames Water criteria for ground movement are stringent, of the order of millimetres and therefore, a ground movement assessment is required to assess the influence of the raft option on existing assets. Ground movement assessments for the Thames Water sewer and shallow assets and the Crossrail tunnel have been carried out by IDOM and issued under separate cover as reports:

i. Thames Water – GMA-22277-23-342 Rev 3

ii. Crossrail – GMA-22277-23-402 Rev 2

5.4.3 The respective ground movement assessments have been approved by Thames Water and Crossrail.

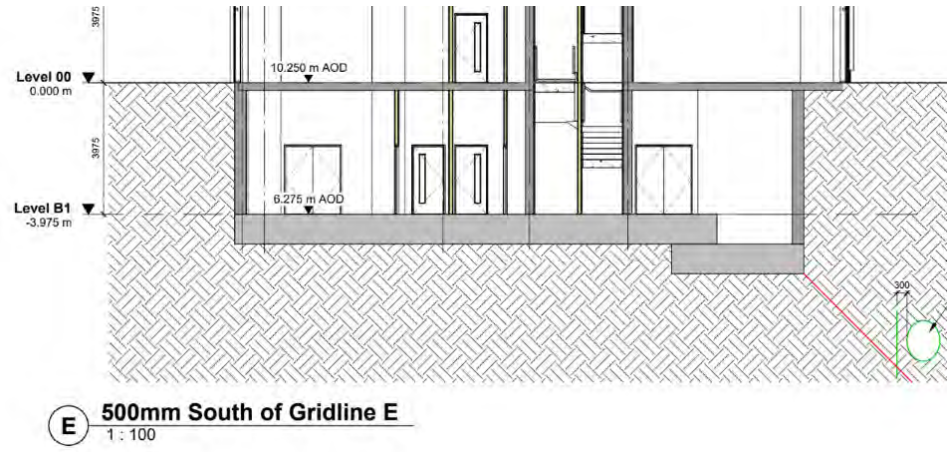


Figure 3. Proposed raft foundation solution.

5.4.4 Bearing Capacity

5.4.4.1 The Thanet Sand Formation was encountered between levels +6.95 m and +7.70 m OD and overlies the chalk at -7.10 m to -7.15 m OD. At the proposed raft foundation formation level of approximately +5.40 m AOD and below, the Thanet Sands were described as dense to very dense, with SPT N-values ranging between 38 and 50 blows.

5.4.4.2 Assuming raft foundation width B = 17 m, preliminary assessment indicates that the bearing capacity of 250-300 kN/m^2 is feasible in the Thanet Sand Formation.

5.4.5 Raft Foundation Settlement

5.4.6 The Thanet Sand Formation is cohesionless and therefore preliminary settlement was estimated using Burland and Burbridge's method for overconsolidated sand. Preliminary settlement assessment indicates that predicted settlements are up to 30 mm for B = 17 m anticipated for the proposed structure.

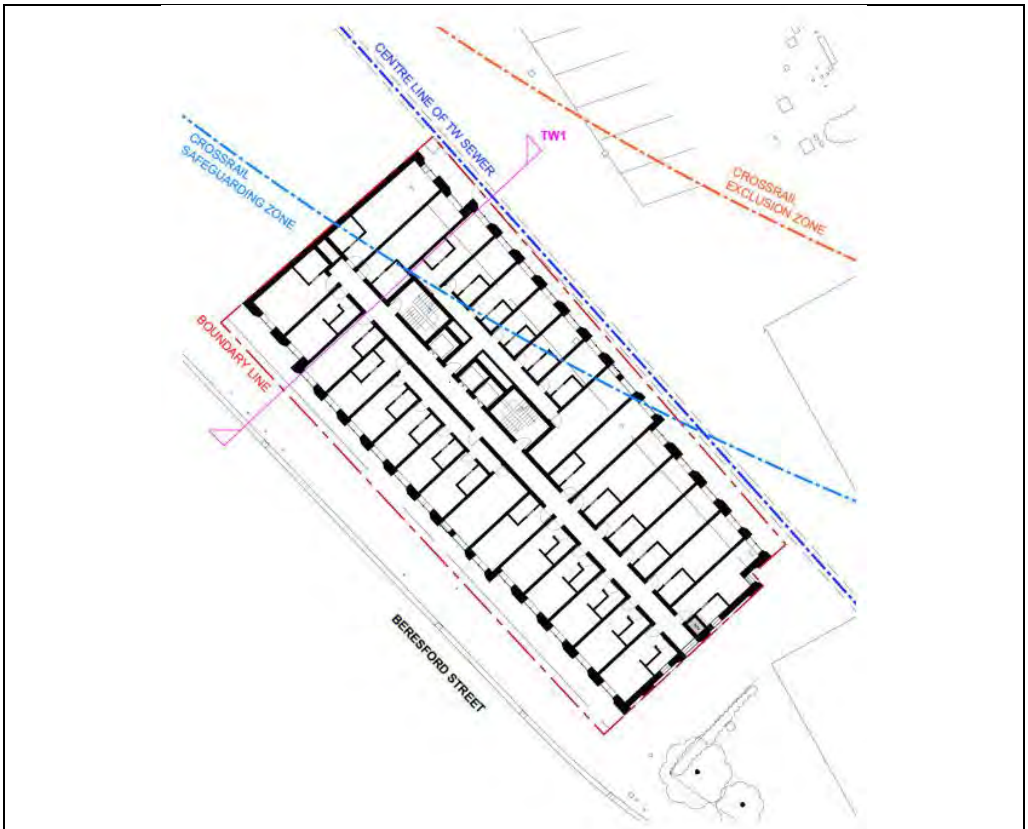


Figure 4 – Proposed development in relation to buried assets.

5.5 PILE FOUNDATIONS

5.5.1 Piling will be required under highly loaded areas of the raft in order to provide settlement control. Piling will also be required for the construction of basement walls. Pile design recommendations are provided below.

5.5.2 Based on the encountered geology underlying the site, it is considered that a driven pile foundation solution is unlikely to be a feasible piling method because precast piles are unlikely to penetrate the very dense Thanet Sand Formation. Additionally, due to the proximity of the site to existing residential properties and listed buildings, the vibrations associated with driven piles are likely to be considered unacceptable. Furthermore, if piles are to be progressed into the chalk, the Environment Agency are unlikely to approve the use of driven piles due to the potential pathway linkage to the underlying Principal Aquifer.

5.5.3 Preliminary pile capacity calculations have been undertaken for a single pile (ignoring the group effect) and assuming the type of piles adopted will be low displacement piles such as CFA or bored cast-in-situ piles which utilise a method of piling able to penetrate through the very dense sands.

5.5.4 Any positive frictional resistance along the pile shaft within the top 5.0 m of the pile have been ignored due to proposed basement. Furthermore, no allowance has been made at this stage for any potential down drag (negative skin friction) acting on the piles and any stresses associated with the retained soil acting on the basements.

5.5.5 Piles should ultimately be designed in accordance with BS-EN-1997-1 which requires knowledge of pile loads (actions). This information was not available at the time of preparing this report and in any case a Eurocode 7 compliant pile design is outside IDOM's current scope of works. In lieu of Eurocode calculations a traditional working stress assessment has been carried out based on the global factors of safety approach, to provide a preliminary indication of safe working capacities for piles of varying length and diameter. Preliminary pile calculations have been carried out in accordance with BS8004:2015.

5.5.6 Safe pile capacity has been determined using a factor of safety of 2.5 for skin friction and 3.0 for end bearing resistance within the Thanet Sand Formation. For piles that extend into the underlying chalk, a factor of safety of 2.5 has been applied to skin friction and 5.0 to base resistance in accordance with CIRIA Publication 574.

5.5.7 Whilst pile capacity calculations are well researched, they utilise empirical relationships and adjustment factors that are fundamentally uncertain given the range of ground conditions, types of piles and methods of installation. Therefore, a scheme of in-situ integrity testing should be agreed upon such as full-scale load tests to ensure the piles meet the requirements of the proposed development. Additional integrity testing may also allow for lower factors of safety and more economic design.

5.5.8 If a piled foundation solution is adopted where the piles end bear into the underlying chalk, then a Piling Works Risk Assessment should be carried out since the chalk is identified as a Principal Aquifer. Furthermore, if piles are adopted that end bear in, or within influencing of the chalk, then it is recommended that further ground investigation is undertaken using a rotary coring, or cable percussive drilling with rotary coring follow on, to retrieve core samples of the chalk for better assessment of the chalk characteristics and grade, and for geotechnical rock testing such as unconfined compressive tests.

5.5.9 Table 13 and Figure 5 present preliminary safe pile capacities for variously sized circular diameter piles installed to various depths. The results indicate a reduced capacity at 13 m below the base of the proposed basement coinciding with the interface of the Thanet Sand Formation with the Undifferentiated chalk and the associated reduction in vertical effective stress due to the sub-artesian water pressures existing in the Undifferentiated chalk.

5.5.10 Where piles are required it is recommended that the advice of a specialist contractor be sought to determine the most appropriate / cost effective system and to advise on pile diameters, depths, and safe working capacity.

5.5.11 A working platform will be required for the piling plant; once the type of piling rig is known IDOM can undertake a working platform design upon request.

Table 13: Preliminary safe pile capacities.

Preliminary pile capacity design - Beresford Street

Pile Length (m)	Pile Diameter (mm)							Assumed stratigraphy
	375	400	450	600	750	800	900	
								Basemet to approx. 5m bgl
1.0	104	117	145	249	379	429	537	Dense Thanet Sand Formation
2.0	166	186	229	388	587	663	828	
3.0	233	261	321	537	808	911	1134	
4.0	307	343	420	697	1041	1172	1455	
5.0	388	432	527	866	1287	1446	1791	
6.0	474	527	641	1045	1546	1734	2142	
7.0	567	629	762	1235	1817	2035	2508	
8.0	666	738	892	1434	2100	2350	2889	
9.0	750	829	997	1588	2310	2579	3160	
10.0	819	902	1080	1699	2447	2726	3326	
11.0	894	982	1170	1819	2598	2886	3506	
12.0	975	1069	1268	1950	2761	3060	3702	
13.0	1063	1163	1373	2090	2936	3247	3913	
14.0	843	907	1038	1455	1907	2065	2394	Undifferentiated Chalk
15.0	921	990	1131	1579	2062	2231	2580	
16.0	1002	1076	1228	1709	2224	2404	2775	
17.0	1086	1166	1330	1844	2393	2584	2978	
18.0	1174	1260	1436	1985	2569	2772	3189	
19.0	1266	1358	1545	2131	2752	2967	3409	
20.0	1361	1459	1659	2283	2942	3170	3637	
21.0	1459	1564	1777	2440	3139	3380	3873	
22.0	1561	1673	1900	2603	3343	3597	4117	
23.0	1666	1785	2026	2772	3553	3822	4370	
24.0	1775	1901	2157	2946	3771	4054	4631	
25.0	1887	2021	2291	3126	3995	4293	4901	
26.0	2025	2170	2462	3367	4315	4641	5306	
27.0	2144	2297	2605	3558	4554	4895	5592	
28.0	2267	2428	2752	3754	4799	5157	5886	
29.0	2393	2562	2904	3956	5051	5426	6189	
30.0	2523	2700	3059	4164	5310	5702	6500	

Notes

1 - Stratigraphy based on MBH01 and MBH201

2 - Pile bearing capacity based on the N-values reported on the borehole logs and within CIRIA C574: Engineering in Chalk

3 - Basement assumed to be approximately 5m below ground level

4 - Shaft resistance factor of safety = 2.5

5 - Base resistance factor of safety = 3.0

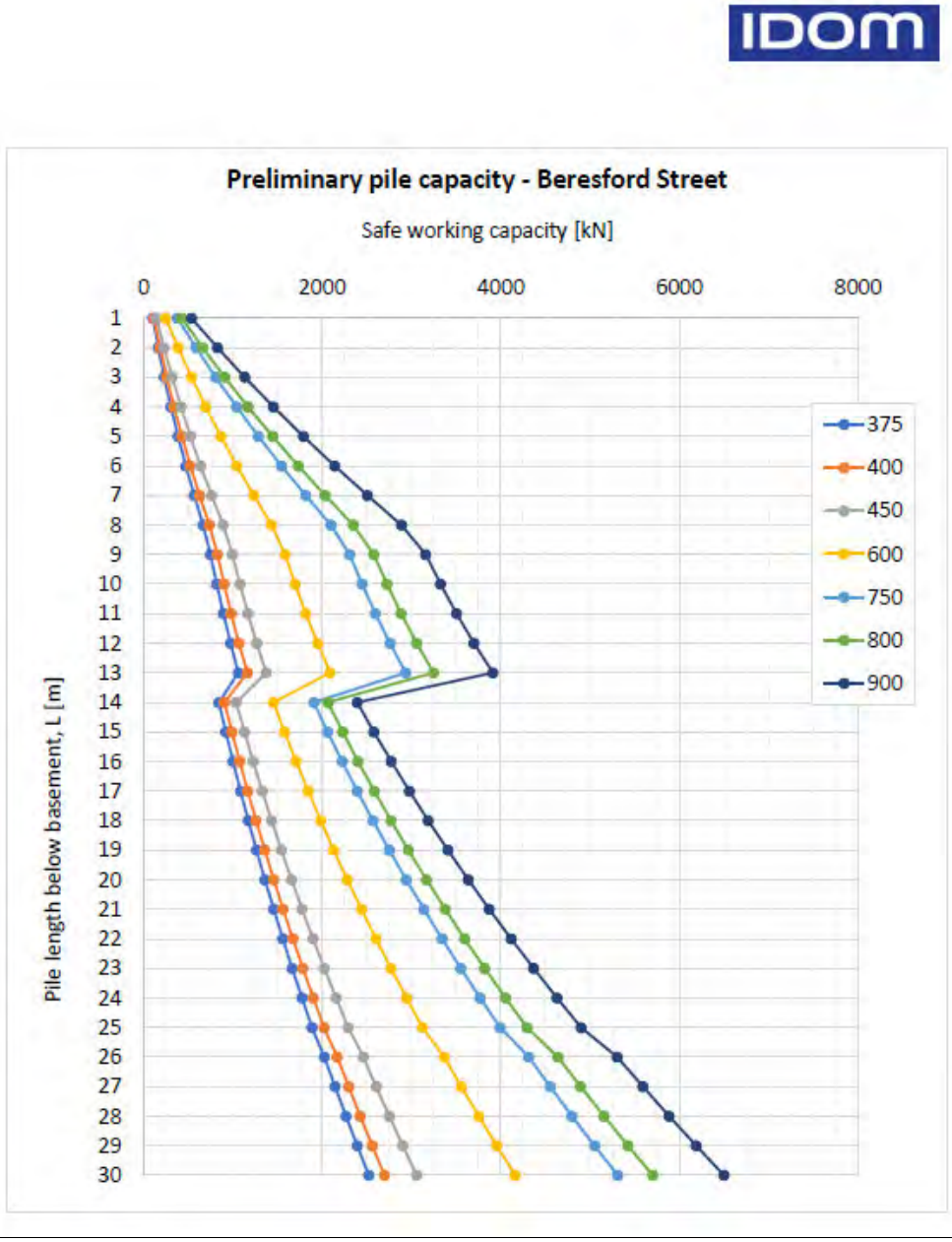


Figure 5 – Pile capacity vs depth plot.

5.6 FOUNDATION OPTIONS SUMMARY

5.6.1 Preliminary assessment of a raft foundation indicates that the raft foundation solution is feasible for the proposed structure. At the indicated formation level, a bearing capacity of 250 – 300 kN/m^2 has been assessed and settlements of up to 30 mm have been estimated. This information should be reviewed by the structural engineers as part of the feasibility study.

5.6.2 The feasibility of the raft foundation is subject to assessment of ground movements against the Thames sewer and Crossrail assets. Ground movement assessments have been carried out for both Thames Water and Crossrail assets and it has been

concluded that current proposals for the raft foundation will not adversely affect the assets.

5.6.3 Where piling is required, due to the dense sands underlying the site, CFA or bored cast in-situ piling methods are recommended. It is considered necessary to undertake further ground investigation work targeted at the underlying chalk if piles are anticipated to end bear within, or within influencing depth of the chalk. Furthermore, it is also recommended that a Piling Work Risk Assessment, vibration assessment and working platform design are undertaken for a piled foundation solution. The preliminary pile capacity calculations provided are indicative only and detailed calculations in accordance with Eurocode 7 should be undertaken for the pile group by a specialist contactor.

5.7 EXCAVATIONS AND GROUNDWATER

5.7.1 Granular soils underlying the site were encountered during the ground investigation. It is considered that excavations are unlikely to be stable in the short-term. Man-entry into excavations should be minimised. Excavations should be supported by shoring or otherwise battered back to a safe angle to protect the workforce from possible collapse of the excavation.

5.7.2 Groundwater was struck at 18.00 m bgl; it is considered unlikely that dewatering of shallow soils will be required. However, minor volumes of perched groundwater may exist within the made ground, and it is considered that only small-scale sump pumping will be required in shallow excavations.

5.8 FLOOR SLABS

5.8.1 Due to the proposed raft foundation solution, it is likely that a cast-in-situ ground bearing slab will be required with reinforcement to prevent cracking of the slab; the exact detail of the floor slab should be designed by the structural engineer.

5.9 BURIED CONCRETE

5.9.1 Recommendations given in BRE Special Digest 1:2005 *"Concrete in aggressive ground"* have been followed in order to give recommendations with respect to buried concrete.

5.9.2 Water soluble sulphate analysis was carried out on 17 soil samples obtained from depths of between 1.95 and 37.50 m bgl with soil pH determination also carried out on these samples. Water soluble sulphate contents ranged between 9.8 mg/l to 134 mg/l. In accordance with BRE guidelines the characteristic value is calculated by determining the mean of the highest 20 % of results. In this case the characteristic value is 96.5mg/l. On this basis the Design Sulphate Class is DS-1.

5.9.3 The pH values in the soil samples varied between 8.3 and 9.4. The mean of the lowest 20 % of values is 8.5 which represents the characteristic value. Mobile groundwater conditions have been assumed and, on this basis, the Aggressive Chemical Environment for Concrete (ACEC) class for the site is AC-1.

5.10 ROADS AND PAVED AREAS

5.10.1 For preliminary design purposes it is recommended that a California Bearing Ratio (CBR) value of < 2 % is assumed for the made ground. Once the positions of hardstanding have been finalised, testing could be undertaken to determine an appropriate design CBR value.

5.11 SOAKAWAYS

5.11.1 No infiltration data is available; however, it is considered unlikely that the site will be suitable for a soakaway drainage system due to the limited space within the site boundaries and the effect a soakaway system may have on the proposed foundation solution. If a soakaway system is proposed, then infiltration testing will be required in accordance with BRE Digest 365.

SECTION 6 ENVIRONMENTAL ASSESSMENT

6.1 SOIL QUALITY

6.1.1 A total of 11 soil sample of made ground was submitted to the laboratory for chemical analysis. The laboratory chemical analysis certificates are contained in Appendix 5. The results of the analysis are summarised in Table 14.

6.1.2 An initial screening exercise has been undertaken whereby contaminant concentrations recorded in soils have been assessed against *Suitable for Use Levels* (S4ULs) published in 2015 by LQM/CIEH[2]. These precautionary screening levels are designed to be representative of minimal risk to human health in a number of land use scenarios. In this report S4ULs have been selected for a residential land use without the possibility of consumption of homegrown produce exists and assuming a soil organic matter of 2.5 %. For lead the DEFRA Category 4 Screening Level[3] has been used as this is based on updated toxicological data and a low risk to human health.

6.1.3 An additional set of phytotoxin screening levels have been adopted from 'The Code of Agricultural Practice for the Protection of Soil' Ministry of Agriculture, Fisheries and Food (MAFF), 1993, which are protective of healthy plant growth.

[2] Nathanail, C. P., McCaffrey, C., Gillett, A. G., Ogden, R. C. and Nathanail, J. F. 2015. *The LQM/CIEH S4ULs for Human Health Risk Assessment*. Land Quality Press, Nottingham. Copyright Land Quality Management Limited reproduced with permission; Publication Number S4UL3100. All rights reserved. Including August 2015 nickel update.
[3] SP1010 *Development of Category 4 Screening Levels Main Report* (Dec 2013) and SP1010 *Policy Companion Document* (Mar 2014).

Table 14: Summary of Soils Chemical Analysis Results

CONTAMINANT	No of Tests	MAX ($mg.kg^{-1}$)	MEAN ($mg.kg^{-1}$)	SCREENING LEVEL (SL) ($mg.kg^{-1}$)	No > SL*
HUMAN HEALTH RISK ASSESSMENT					
Asbestos in soil	11	0.727%	-	Detected	2
pH	6	11.1	9.5	5 – 9	4
Arsenic	6	29.0	15.6	40	0
Barium	6	380.0	180.5	1300	0
Cadmium	6	0.0	-	85	0
Chromium (III)	6	30.0	22.3	910	0
Hexavalent Chromium	6	0.0	-	6	0
Lead	6	970.0	401.0	310	3
Mercury	6	1.4	0.7	56	0
Nickel	6	24.0	18.7	180	0
Selenium	6	0.0	-	430	0
Vanadium	6	49.0	38.0	1200	0
TPH Aliphatic >EC_5 - EC_6	6	0.000	-	42	0
TPH Aliphatic >EC_6 - EC_8	6	0.000	-	100	0
TPH Aliphatic >EC_8 - EC_{10}	6	0.000	-	27	0
TPH Aliphatic >EC_{10} - EC_{12}	6	0.00	-	130	0
TPH Aliphatic >EC_{12} - EC_{16}	6	3.60	3.15	1100	0
TPH Aliphatic >EC_{16} - EC_{21}	6	14.00	14.00	65000	0
TPH Aliphatic >EC_{21} - EC_{35}	6	130.00	66.00	65000	0
TPH Aromatic >EC_5 - EC_7	6	0.000	-	370	0
TPH Aromatic >EC_7 - EC_8	6	0.000	-	860	0
TPH Aromatic >EC_8 - EC_{10}	6	0.000	-	47	0
TPH Aromatic >EC_{10} - EC_{12}	6	1.40	1.40	250	0
TPH Aromatic >EC_{12} - EC_{16}	6	6.00	4.57	1800	0
TPH Aromatic >EC_{16} - EC_{21}	6	41.00	23.33	1900	0
TPH Aromatic >EC_{21} - EC_{35}	6	140.00	60.67	1900	0
Benzene	0	<0.005	<0.005	0.38	0
Toluene	0	<0.005	<0.005	880	0
Ethylbenzene	0	<0.005	<0.005	83	0
Xylene	0	<0.005	<0.005	79	0
Naphthalene	6	0.24	0.13	2.3	0
Acenaphthylene	6	0.34	0.20	2900	0
Acenaphthene	6	0.50	0.20	3000	0
Fluorene	6	0.34	0.16	2800	0
Phenanthrene	6	10.00	2.89	1300	0
Anthracene	6	2.80	0.72	31000	0
Fluoranthene	6	20.00	5.67	1500	0
Pyrene	6	17.00	5.00	3700	0

Benzo(a)anthracene	6	9.10	2.74	11	0
Chrysene	6	7.60	2.39	30	0
Benzo(b)fluoranthene	6	8.90	2.83	3.9	1
Benzo(k)fluoranthene	6	3.00	1.09	110	0
Benzo(a)pyrene	6	7.20	2.37	3.2	1
Indeno(1,2,3-c,d)pyrene	6	3.30	1.20	45	0
Dibenzo(a,h)anthracene	6	1.00	0.35	0.31	1
Benzo(g,h,i)perylene	6	3.70	1.32	360	0
Phenol	6	0.0	-	440	0
PHYTOTOXICITY RISK ASSESSMENT					
Copper	6	86.0	49.0	200	0
Nickel	6	24.0	18.7	110	0
Zinc	6	400.0	158.3	300	1

Notes: * Number of samples exceeding screening level nd = not detected

6.1.4 Zootoxic Metals (harmful to human health)

6.1.4.1 Three exceedances of the screening level was identified within made ground samples. This are all for lead and were concentrations of 970 mg/kg (BH01 at 1.5 m), 600 mg/kg (MWS101 0.6 m) and 330 mg/kg (MWS101 at 1.8 m) compared to the screening value of 310 mg/kg.

6.1.5 Phytotoxic Metals (harmful to plant health)

6.1.5.1 One exceedances of phytotoxic metals potentially harmful to plant health. This was 400 mg/kg (MWS101 at 0.6 m) in comparison with a screening value of 300 mg/kg.

6.1.6 Organic Contaminants

6.1.6.1 A single sample (MWS102c at 0.6 m) showed the presence of three polyaromatic hydrocarbon species at concentrations in excess of the screening value. A slight hydrocarbon odour was noted in MWS103a but testing did not identify any hydrocarbon presence likely to be of significance.

6.1.7 Inorganic Contaminants

6.1.7.1 No exceedances of inorganic contaminants were identified.

6.1.8 Asbestos

6.1.8.1 a total of 11 samples were tested for asbestos content. Nine of these did not detect asbestos. Two samples from a single location (MWS101 at 1.3 m and 1.8 m) showed the presence of asbestos at 0.727% and <0.001 % respectively.

6.1.9 pH

6.1.9.1 Elevated levels of pH above screening values were noted in three samples

6.1.10 Summary

6.1.10.1 Lead, zinc, PAH s and pH have been identified as contaminants that exceeded the screening level for residential end-use without plant uptake. The proposed development does not include any areas of soft landscaping where end-users may be in contact with the soil. Due to the absence of a pathway to end-users it is considered that the identified contamination presents a negligible risk to end-users. Furthermore, during the re-development of the site, the construction of the basement is likely remove, most, if not all of the impacted made ground soils.

6.2 LEACHABILITY

6.2.1 A significant source of contamination has not been identified within the underlying soils. The made ground is considered to be of limited thickness and lateral extent due to the existing basement. Leachability testing has not been undertaken; however, a significant source of contamination has not been identified. Whilst a minor exceedance has been identified for lead concentrations, it is likely that most, if not all of the made ground impacted soil will be removed from site during construction of the basement.

6.3 GROUNDWATER

6.3.1 Groundwater level monitoring and sampling has so far been undertaken on a maximum of six occasions.

6.3.2 No groundwater was encountered in the window sample boreholes.

6.3.3 Groundwater strikes were noted in BH01 and BH201 at the top od chalk and were observed to rise to 10.6 m bgl and 11.5 m bgl respectively.

6.3.4 On the first three rounds on monitoring of MBH01, the installation was dry. On the final three rounds, water was detected at just above the base of the standpipe.

6.3.5 Similarly water levels were detected in boreholes MBH201 jus above the base of the installed standpipe on the two monitoring rounds undertaken.

6.3.6 It is considered that groundwater in the chalk is partially confined by the fairly low permeability fine sand of the Thanet Formation but that over the two strata an approximately resting water level of c 9.5 m bgl is likely to be sustained.

6.3.7 No evidence of odours or visible contamination was noted in waters.

6.4 HAZARDOUS GAS

6.4.1 Gas monitoring has so far been undertaken on six occasions. Levels of methane, carbon dioxide and oxygen were recorded in the standpipe, together with associated parameters including borehole flow and ambient air pressure. The results of these gas monitoring rounds are contained in Appendix 7.

6.4.2 The monitoring round was undertaken at a barometric pressures ranfging from 1002 to 1029 mb and a peak positive flow of 0.9 l/hr was recorded. Methane (CH_4) was not detected in any round whilst carbon dioxide (CO_2) was detected to a maximum of 4.70 % v/v with a corresponding slightly depleted oxygen concentration of 17.3 % v/v.

6.5 WASTE CLASSIFICATION, OFF-SITE DISPOSAL OR RE-USE

6.5.1 Waste Considerations

6.5.1.1 A HazWasteOnline assessment of the made ground samples has been undertaken and suggests the ground should be considered generally non-hazardous.

6.5.1.2 Asbestos was however identified in two samples from one location. The asbestos presence was not observed by site engineers and was only detected by microscopic analysis. Nonetheless, matrail containing asbestos at concentrations of >0.1% would be hazardous waste if disposed. If similar conditions are detected or visible asbestos sis detected, appropriate disposal such material whilst and the adoption of safe working protocols will be required.

6.5.1.3 Natural soils are likely to be considered inert for disposal purposes.

6.5.1.4 Materials, including waste soils which are not to be retained on site, should be removed and disposed of in accordance with all relevant statues including the *Environmental Protection Act 1990* (as amended), *The Controlled Waste Regulations 2012* (as amended), *The Waste (England and Wales) Regulations 2011* (as amended) , *The Hazardous Waste (England and Wales), Regulations 2005* as amended, *The Waste Management (England and Wales) Regulations 2006*, and *The Environmental Permitting (England and Wales) Regulations 2016* (as amended).

6.5.1.5 It is a requirement of these regulations that waste sent to landfill should have been subject to measures to reduce the amount of waste, reduce harmful or hazardous properties and facilitate recycling. These requirements may be satisfied by measures such as segregation and screening of wastes to recover suitable fill and material for crushing, segregation of inert materials and putrescible wastes.

6.5.2 Re-use Considerations

6.5.2.1 There is likely to be only limited excess material from the re-development of the site. Due to the existing site levels, it is considered unlikely that there will be a use for any excess soil.

SECTION 7 RISK ASSESSMENT

7.1 The potential sources of contamination at the site and the implications with respect to development have been interpreted in accordance with the current government guidance on source-pathway-receptor risk assessment.

7.2 The investigations demonstrate that the former uses of the site have resulted in minor exceedance it the concentration of lead. It is considered likely that the contamination is a result of anthropogenic materials within the made ground during the historic development of the site. These materials are considered for their potential to act as sources for a number of pollutant linkages.

7.3 The potential impacts of contamination sources have been considered with respect to the following receptors:

i. The general public and present site users,

ii. Residents of future development,

iii. Groundwater,

iv. Surface water,

v. Construction workers,

vi. Adjacent land, and

vii. Infrastructure.

7.4 In each case the existence of a pollutant linkage requires a pathway by which the receptor could be exposed to the source. A qualitative assessment of risk is thus considered in the first instance with respect to the site in its current condition and is summarised in the sections below.

7.5 **The general public and present site users**

7.5.1 Currently there is no direct pathway to the general public and present site users due to the presence of hardstanding and the existing building which covers the entire site area. In the absence of a pathway the risk to current users is considered to be negligible.

7.6 **Residents of future development**

7.6.1 <u>Soil contamination (chemical)</u>

7.6.1.1 Analysis has identified levels of lead, zinc and PAH and pH contamination which moderately exceeds the screening level; however during redevelopment of the site, it is likely that most, if not all, of the existing made ground will be removed to construct a basement. Furthermore, there are no areas of soft landscaping or gardens within the proposed redevelopment of the site and therefore there is considered to be negligible risk to end users.

7.6.2 <u>Asbestos</u>

7.6.2.1 Asbestos analysis was undertaken on 11 samples and was detected in two of these from one location. This observation demonstrates that asbestos is present within made ground. While the presence of asbestos is consistent with the history of the

site which includes several phases of development and demolition, it is noted that the asbestos survey of the current structure did not discover any asbestos building materials. It is presumed that other asbestos containing materials are likely to be present in made ground and site works should be cognisant of this.

7.6.2.2 The risk to the end-users from asbestos is considered very low, assuming that any in-situ asbestos is appropriately removed from the existing building and that existing made ground is not left exposed in the completed development.

7.6.3 Hazardous Soil Gas/Vapours (including hydrocarbon vapours/radon)

7.6.3.1 Gas Screening Values (GSV) for methane and carbon dioxide have been calculated following BS8485[4] guidance. For methane, the maximum concentration and maximum gas flow rate are used to calculate the GSV because consequences are instantaneous, while for carbon dioxide, the GSV is calculated using the steady state concentration and steady state flow rate as the consequences are more gradual.

7.6.3.2 BS8485(2015+A1:2019) has been followed to assess the recorded soil gas and flow conditions. Calculations are presented in Appendix 8 which suggest that the gas regime presents a very low risk and the site is assessed to be Characteristic Situation 1 where gas protection measures are not required.

7.7 Controlled waters

7.7.1 Moderate exceedances of human health criteria for lead, zinc and PAH compounds was noted in a small number of sample, within the made ground. However, most, if not all, of the made ground will be removed during construction of the basement and the site will be capped by the development proposed. As a result, a significant source of contamination will not be present on-site from the proposed development and therefore the risk to controlled waters is considered negligible. Groundwater is expected to be at approximately 10 m and not in contact with any made ground. Furthermore, the distance and intervening land-uses to the surface water feature (River Thames) means that the migration of contaminants to surface water features will be negligible.

7.8 Construction workers

7.8.1 Construction workers are potentially at the greatest risk from exposure to hazardous contamination initially due to excavation works and during the handling of materials. Providing that dust levels are kept within statutory limits and appropriate health and safety procedures are adhered to during the construction phase, there is considered to be a very low risk to the health of construction workers. Asbestos was detected in made ground and construction management plans should ensure that appropriate safe working procedures are adopted.

[4] Code of Practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings. BS 8495:2015 + A1:2019.

7.9 **Adjacent land**

7.9.1 No sources of mobile contamination capable affecting adjacent land have been identified.

7.9.2 The risk to adjacent land is assessed as very low.

7.10 **Infrastructure**

No significant hydrocarbon contamination has been identified on the site and it is considered that standard PE water pipes will be sufficient for the proposed development; however, it is recommended that the utility provider is consulted with respect to their requirements for water supply pipes.

SECTION 8 UPDATED CONCEPTUAL MODEL

8.1 Following completion of phases 1 and 2 of the investigation and a qualitative risk assessment, the conceptual model for the site, with relation to pollutant linkages, has been updated. The revised model is presented in Table 15 below.

Table 15: Revised Conceptual Model

POSSIBLE POLLUTANT LINKAGE			RISK CHARACTERISATION
POTENTIAL SOURCES	PATHWAYS	RECEPTORS	
Heavy metals (Lead in made ground)	No pathway identified	Human health (current users)	**Negligible risk identified**
		Human health (future residents)	
Heavy metals (Lead in made ground)	Contact with contaminated soil	Human health (construction workers)	**Very Low risk identified** Potential for made ground beneath existing building infrastructure which can contain elevated metals and hydrocarbons. Exposure limited.
	Ingestion and inhalation of contaminated soil and dust	Human health (construction workers)	
Asbestos (made ground)	Ingestion and inhalation of contaminated soil and dust	Human health (future residents)	**Very Low risk identified** Potential for made ground to contain asbestos from demolition of buildings.
Asbestos (made ground)	Ingestion and inhalation of contaminated soil and dust	Human health (construction workers)	**Low to Moderate risk identified** Potential for asbestos to be present within made ground.
Heavy metals (Lead in made ground) – Source likely to be removed	Vertical migration to aquifer	Controlled waters	**Very Low risk identified** Low-level lead contamination is unlikely to remain on-site within the made ground during redevelopment of the site; unlikely to be significantly affect Secondary A aquifer. No water present in monitoring borehokles

POSSIBLE POLLUTANT LINKAGE			RISK CHARACTERISATION
POTENTIAL SOURCES	PATHWAYS	RECEPTORS	
Heavy metals (Lead in made ground) – Source likely to be removed	Significant horizontal migration to surface water unlikely	Controlled waters	**Very Low risk identified** Low-level lead contamination is unlikely to remain on-site within the made ground during redevelopment of the site; additionally, horizontal migration considered to be very unlikely to the River Thames or other sensitive receptor.
Hydrocarbons	Direct contact	Plastic water pipes	**Low risk identified**
Hazardous Gas/Vapours In soil	Ingress into buildings and voids	Human health (future residents and construction workers)	**Low Risk Identified** but ongoing gas monitoring

SECTION 9 REMEDIATION AND VERIFICATION STRATEGY

9.1 GENERAL

9.1.1 The identified risks at the site can be mitigated by removal of either the source, pathway or receptor. With reference to the conceptual model for the site a remediation strategy, based on source or pathway removal, has been designed.

9.1.2 The only significant risk to receptors which has been identified is due to the presence of asbestos in made ground. This was detected in one window sample at two depths. Given the development history of the site it is reasonable to assume that other asbestos containing materials may be present. It is noted that a building survey of the existing structure on the site did not identify the presence of asbestos and therefore concluded likely that any asbestos is more likely to have arisen due the demolition of earlier generations of structure.

9.2 OPTIONS APPRAISAL

9.2.1 As no contamination has been identified which is required to be removed from site to mitigate an identified risk, no remediation options appraisal is applicable of required. It is however accepted that the construction process will bring site workers into proximity with made ground soils which may contain asbestos and therefore precautions will be necessary to prevent harmful exposure associated with the development.

9.3 REMEDIATION STRATEGY

9.3.1 Potential risks to construction workers have been identified particularly with respect to asbestos presence. The adoption of appropriate Health and Safety procedures will be necessary to ensure that any asbestos containing materials encountered do not present a risk to site workers or any other receptors.

9.3.2 Due diligence should be exercised for the presence of any asbestos contaminated material.

9.3.3 Operatives should not be allowed to eat, drink or smoke on site except in designated areas and should be required to wash all exposed skin at the end of each shift. Operatives should be informed of the potential hazards at the site and should be required to report any observations of suspect material.

9.3.4 No gas protection is considered necessary.

9.4 VERIFICATION PLAN

9.4.1 As no prestart remedial action beyond operating good safety precautions is proposed, the full scope of verification measures cannot be specified.

9.4.2 If significant asbestos containing materials or other materials with significant contamination potential are identified, appropriate resources should be deployed to characterise the discovery and undertake additional risk assessment.

9.4.3 If the assessment concludes that remediation action is required an updated verification plan should be prepared.

9.4.4 If remediation entails removal of material from site for the purposes of risk reduction, testing should be carried out to confirm that the removal has been effected satisfactorily

9.5 ADDITIONAL RECOMMENDATIONS

9.2 Materials, including waste soils which are not to be retained on site, should be removed and disposed of in accordance with all relevant statues including the *Environmental Protection Act 1990* (as amended), *The Controlled Waste Regulations 2012* (as amended), *The Waste (England and Wales) Regulations 2011* (as amended) , *The Hazardous Waste (England and Wales), Regulations 2005* as amended, *The Waste Management (England and Wales) Regulations 2006*, and *The Environmental Permitting (England and Wales) Regulations 2016* (as amended).

9.3 It is recommended that this report is submitted to the regulators Local Authority EHO and Planners in support of application to discharge Condition 29 prior to commencement of the works.

9.4 Any observations of ground conditions atypical of those already described should be reported to IDOM immediately so that an assessment of appropriate action can be made.

SECTION 10 CONCLUSIONS

10.1 The ground conditions encountered during this investigation comprise a thin veneer of made ground and superficial head deposits overlying sands of the Thanet Sand

Formation to a depth of 17.80 to 17.90 m bgl with chalk encountered to the base of the borehole at 40 m bgl.

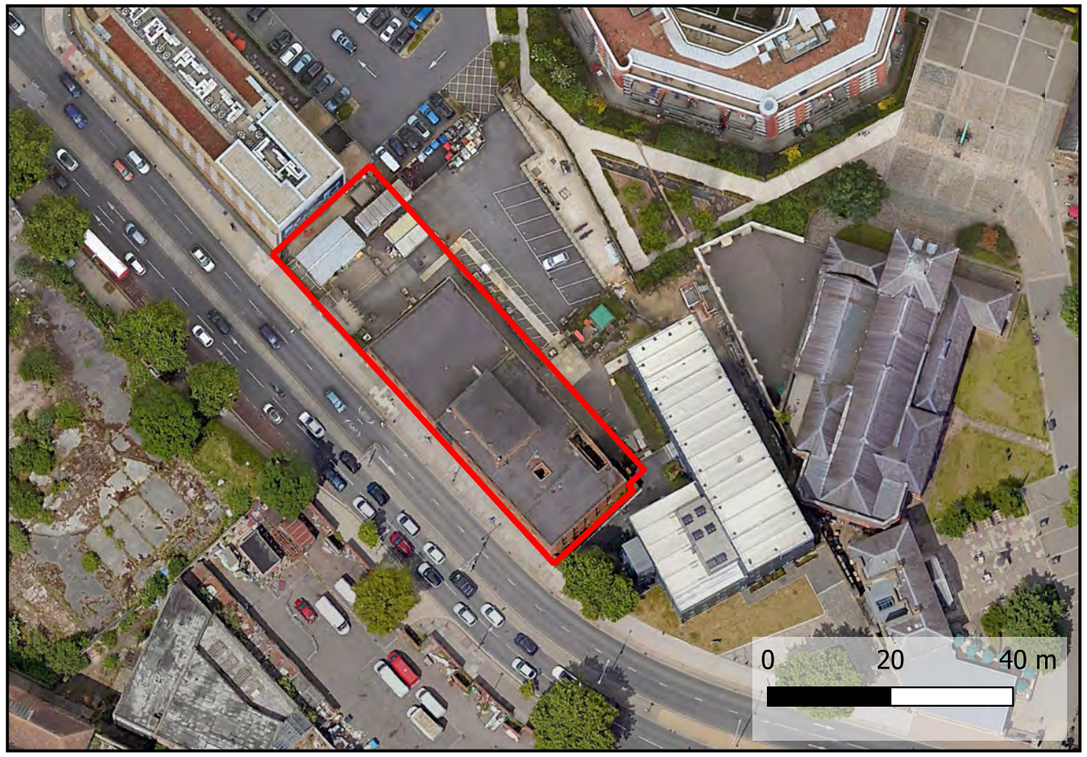
10.2 The proposed development comprises a 14 storey tower block with a basement. A raft is the preferred foundation solution for the proposed structure and a bearing capacity of 250-300kN/m^2 has been assessed at the proposed formation level with anticipated settlements of up to 30 mm. Ground movement assessments have been undertaken to assess the effects of the raft solution on Thames Water and Crossrail buried assets. Reports have been provided under separate cover and conclude that there will be no detrimental impact on the existing buried assets. Where piles are required (for example for settlement control under the raft) then a CFA or bored cast-in-situ pile foundation solution is likely to be required. Preliminary pile calculations have been provided for a single pile; however, detailed calculations in accordance with BS-EN-1997-1 will be required by a specialist contractor for the pile group and advice sort as to the exact dimensions and layout of the piles. Furthermore, if a piled foundation solution is adopted it is likely that further ground investigation will be required into the underlying chalk and further work including a Piling Works Risk Assessment, vibration assessment and a working platform designed specific to the proposed piling plant will be required.

10.3 It is considered that it will not be feasible to incorporate a soakaway drainage system will into the proposed development due to the low available space within the site boundary and due to the potential impact of the soakaway on the proposed foundation solution. CBR values of <2% should be assumed for pavement design within the made ground

10.4 Limited contamination has been identified within the made ground. This contamination presents a negligible risk to current and future end-users due to the presence of hardstanding. The construction of a basement is likely to remove most, if not all, of the impacted soils. and in the absence of a source, presents a negligible risk to the underlying aquifers with the redevelopment of the site. Asbestos was observed in made ground and construction management plans should ensure appropriate safe working procedures are adopted.

10.5 It is likely that any soils removed from the site will be considered non-hazardous waste; however any material is to be disposed in which visible asbestos is detected or which when tested has asbestos content above 0.1% , then that material would have hazardous classification.

APPENDIX 1 ▪ Drawings



IDOM

IDOM Cromford Mills, Mill Lane, Matlock, Derbyshire DE4 3RQ
t: +44(0)1773 829 988 e: info.derbyshire@idom.com

Client/Project **81 - 88 Beresford Street** **B Woolwich Ltd**	Map Title **Site Location Plan**	Job no. 22277	Drawing No. 22277-001-001	Revision A
		Scale	Date 08/02/2024	Frame dimensions A3
		Drawn CMM	Checked SE	Approved SE

Legend

- Site Boundary
- Cable Percussive Borehole
- Windowless Sample Borehole

Update following additional ground investigation	07/02/2024		B
	CMM	SE	SE
First Issue	31/07/2023		A
	CMM	SE	SE
Issue Details	Dwn	Chd	App'd

Client

B Woolwich Ltd

Project

81-88 Beresford Street

Dwg Title

Exploratory Hole Location Plan

Drawing No. 22277-304-001		Revision B
Scale 1:250	Date 08/02/2024	Frame dimension mm (A3) 392 x 277
Drawn CMM	Checked SE	Approved SE

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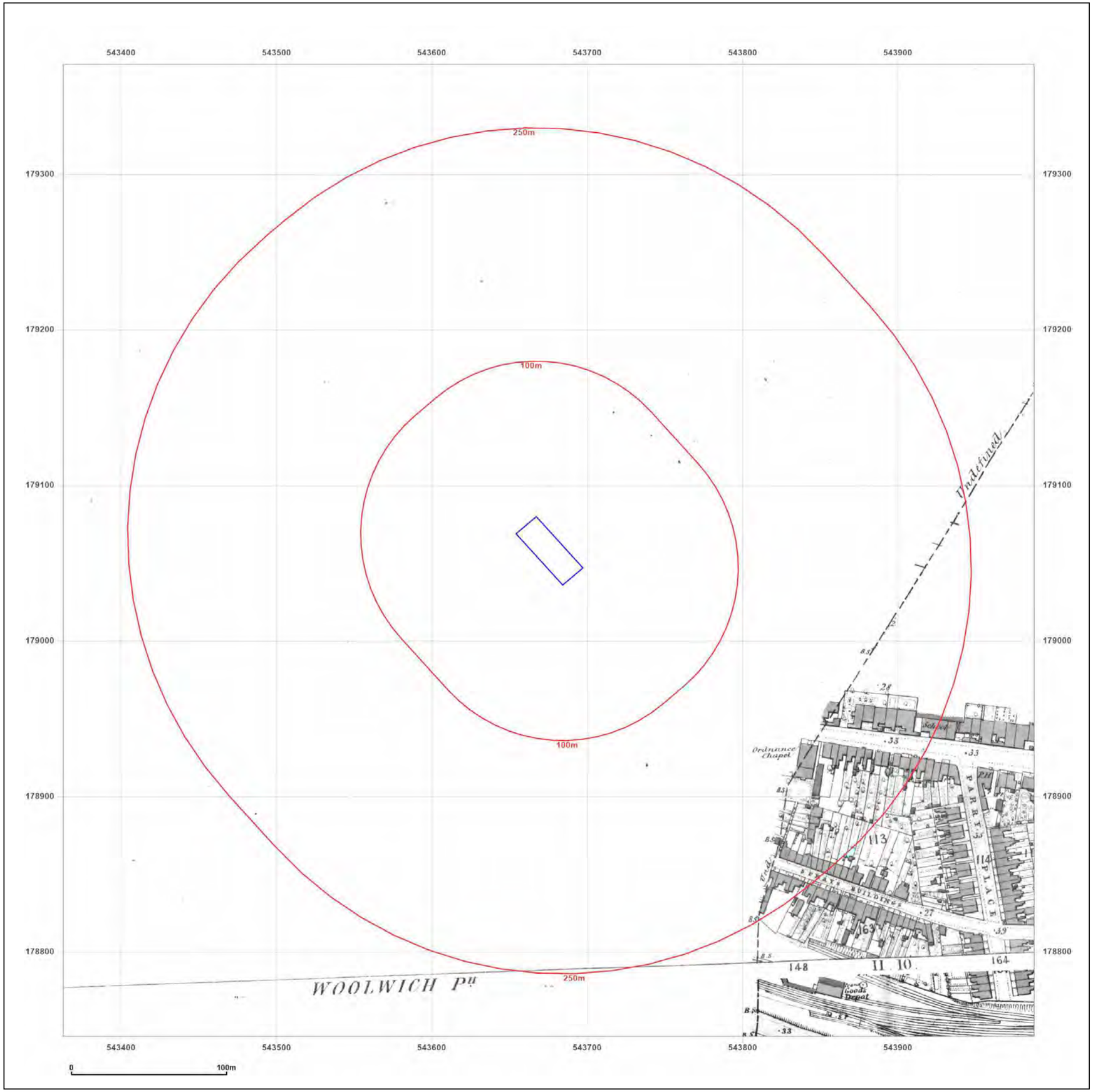
APPENDIX 2 ▪ Historical Plans



Site Details:

DEVELOPMENT SITE AT
FORMER 81 TO 88,
BERESFORD STREET,
WOOLWICH, SE18 6BG

Client Ref: 21-237-FDO-22277
Report Ref: HMD-154-7652360
Grid Ref: 543675, 179058

Map Name: County Series

Map date: **1865**

Scale: 1:2,500

Printed at: 1:2,500

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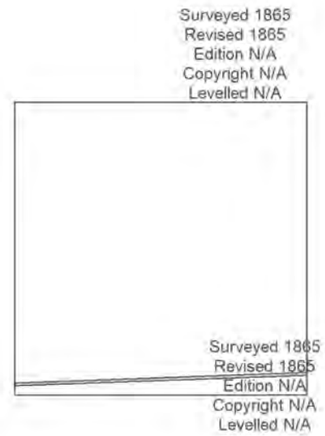

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WOOLWICH, SE18 6BG

Client Ref: 21-237-FDO-22277
Report Ref: HMD-154-7652360
Grid Ref: 543675, 179058

Map Name: County Series

Map date: **1869**

Scale: 1:2,500

Printed at: 1:2,500

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Surveyed 1867
Revised N/A
Edition 1869
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Surveyed 1896
Revised 1896
Edition N/A
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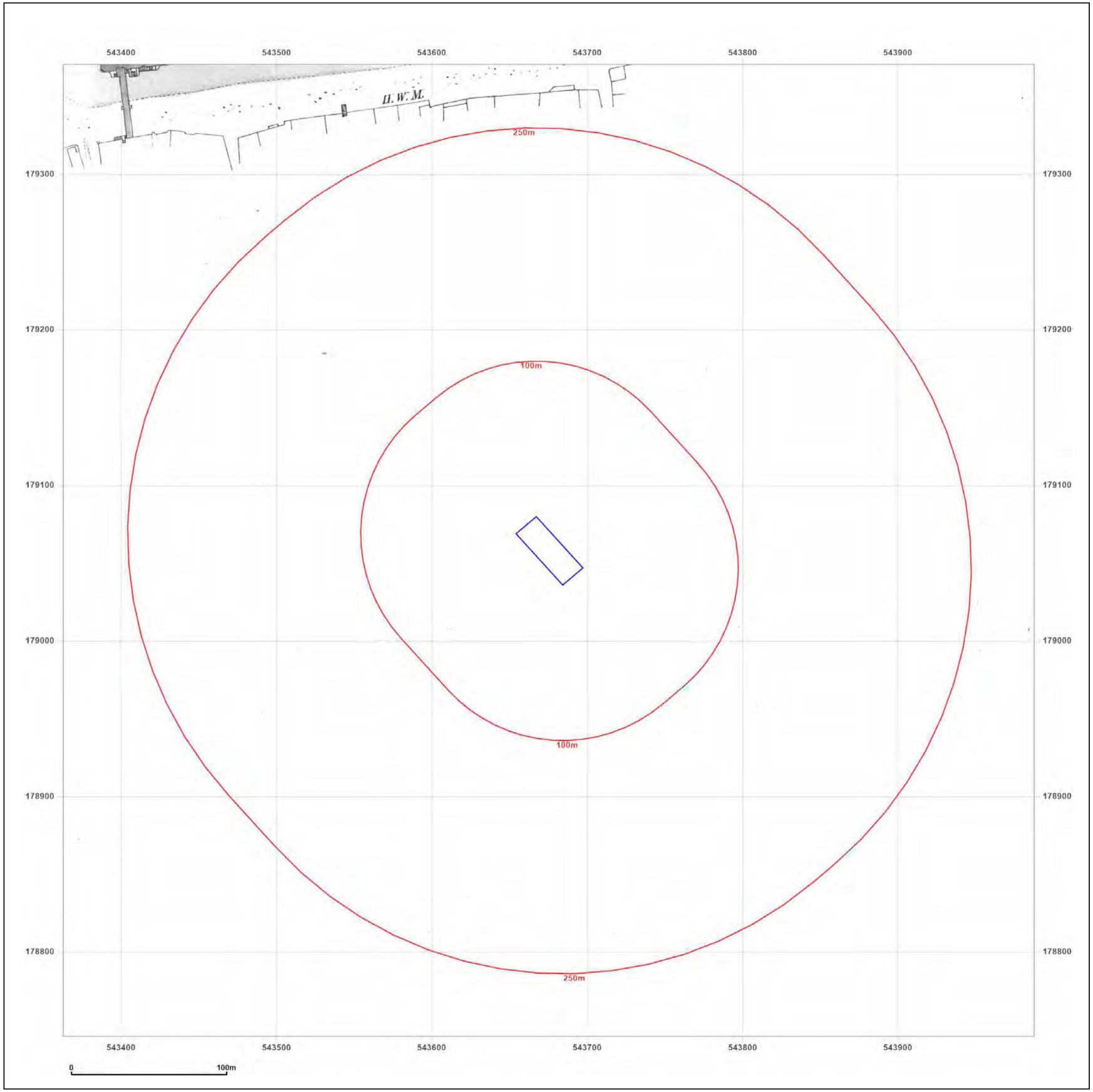

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Site Details:

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Client Ref: 21-237-FDO-22277
Report Ref: HMD-154-7652360
Grid Ref: 543675, 179058

Map Name: County Series
Map date: **1875**
Scale: 1:2,500
Printed at: 1:2,500

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Surveyed 1875
Revised 1875
Edition N/A
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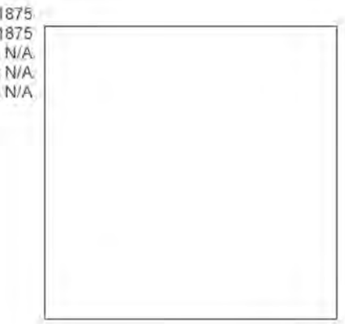
Levelled N/A



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Production date: 12 March 2021

Map legend available at:
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Site Details:

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WOOLWICH, SE18 6BG

Client Ref: 21-237-FDO-22277
Report Ref: HMD-154-7652360
Grid Ref: 543675, 179058

Map Name: 1056 Scale Town Plan
Map date: **1896**
Scale: 1:1,056
Printed at: 1:1,056

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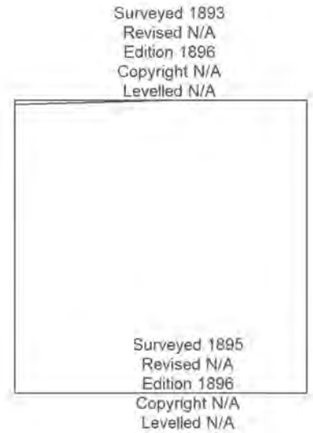

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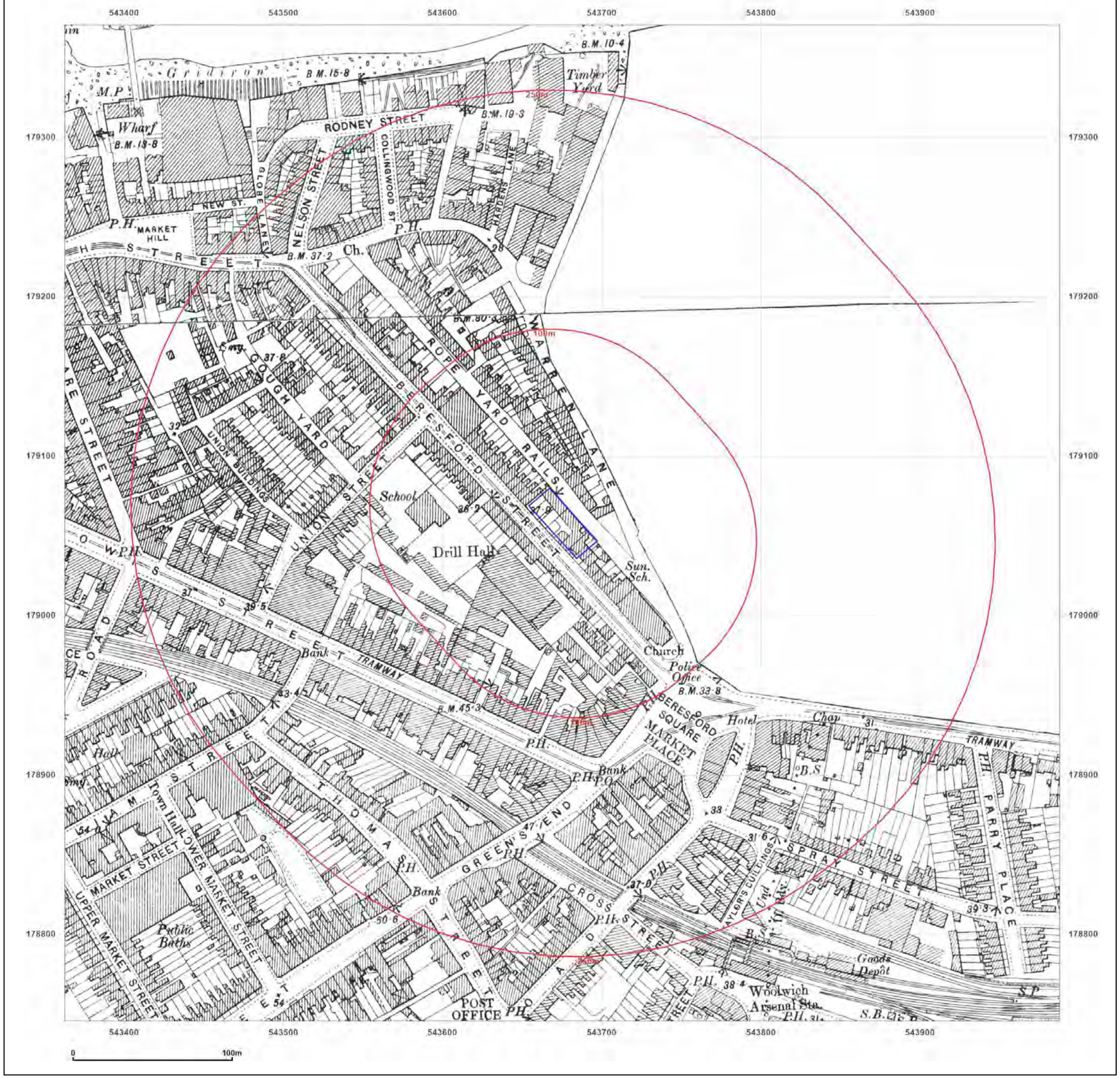

Groundsure INSIGHTS

Site Details:

DEVELOPMENT SITE AT
FORMER 81 TO 88,
BERESFORD STREET,
WOOLWICH, SE18 6BG

Client Ref: 21-237-FDO-22277
Report Ref: HMD-154-7652360
Grid Ref: 543675, 179058

Map Name: County Series

Map date: **1896-1897**

Scale: 1:2,500

Printed at: 1:2,500

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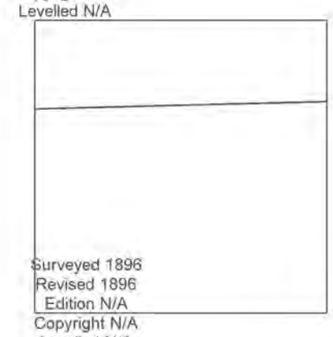
Surveyed N/A
Revised 1896
Edition 1897
Copyright N/A
Levelled N/A



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Groundsure INSIGHTS

Site Details:

DEVELOPMENT SITE AT
FORMER 81 TO 88,
BERESFORD STREET,
WOOLWICH, SE18 6BG

Client Ref: 21-237-FDO-22277
Report Ref: HMD-154-7652360
Grid Ref: 543675, 179058

Map Name: County Series

Map date: **1916**

Scale: 1:2,500

Printed at: 1:2,500

N
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Surveyed 1916
Revised 1916
Edition N/A
Copyright N/A
Levelled N/A

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Groundsure INSIGHTS

Site Details:

DEVELOPMENT SITE AT
FORMER 81 TO 88,
BERESFORD STREET,
WOOLWICH, SE18 6BG

Client Ref: 21-237-FDO-22277
Report Ref: HMD-154-7652360
Grid Ref: 543675, 179058

Map Name: National Grid
Map date: **1956**
Scale: 1:1,250
Printed at: 1:2,000

N
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Surveyed 1956
Revised 1956
Edition N/A
Copyright N/A
Levelled 1953

Surveyed 1956
Revised 1956
Edition N/A
Copyright N/A
Levelled 1953

Surveyed 1956
Revised 1956
Edition N/A
Copyright N/A
Levelled 1952

Surveyed 1956
Revised 1956
Edition N/A
Copyright N/A
Levelled 1952

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Groundsure INSIGHTS

Site Details:

DEVELOPMENT SITE AT
FORMER 81 TO 88,
BERESFORD STREET,
WOOLWICH, SE18 6BG

Client Ref: 21-237-FDO-22277
Report Ref: HMD-154-7652360
Grid Ref: 543675, 179058

Map Name: National Grid

Map date: **1956-1957**

Scale: 1:1,250

Printed at: 1:2,000

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Surveyed N/A Revised N/A Edition N/A Copyright N/A Levelled N/A			Surveyed 1956 Revised 1956 Edition N/A Copyright N/A Levelled 1953
Surveyed 1956 Revised 1956 Edition N/A Copyright N/A Levelled 1952			Surveyed N/A Revised N/A Edition N/A Copyright N/A Levelled N/A

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Groundsure INSIGHTS

Site Details:

DEVELOPMENT SITE AT
FORMER 81 TO 88,
BERESFORD STREET,
WOOLWICH, SE18 6BG

Client Ref: 21-237-FDO-22277
Report Ref: HMD-154-7652360
Grid Ref: 543675, 179058

Map Name: National Grid
Map date: **1957**
Scale: 1:1,250
Printed at: 1:2,000

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Surveyed N/A
Revised N/A
Edition N/A
Copyright N/A
Levelled N/A

Surveyed N/A
Revised N/A
Edition N/A
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Groundsure INSIGHTS

Site Details:

DEVELOPMENT SITE AT
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BERESFORD STREET,
WOOLWICH, SE18 6BG

Client Ref: 21-237-FDO-22277
Report Ref: HMD-154-7652360
Grid Ref: 543675, 179058

Map Name: National Grid
Map date: **1957**
Scale: 1:1,250
Printed at: 1:2,000

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Surveyed N/A
Revised N/A
Edition N/A
Copyright N/A
Levelled N/A

Surveyed N/A
Revised N/A
Edition N/A
Copyright N/A
Levelled N/A

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Production date: 12 March 2021

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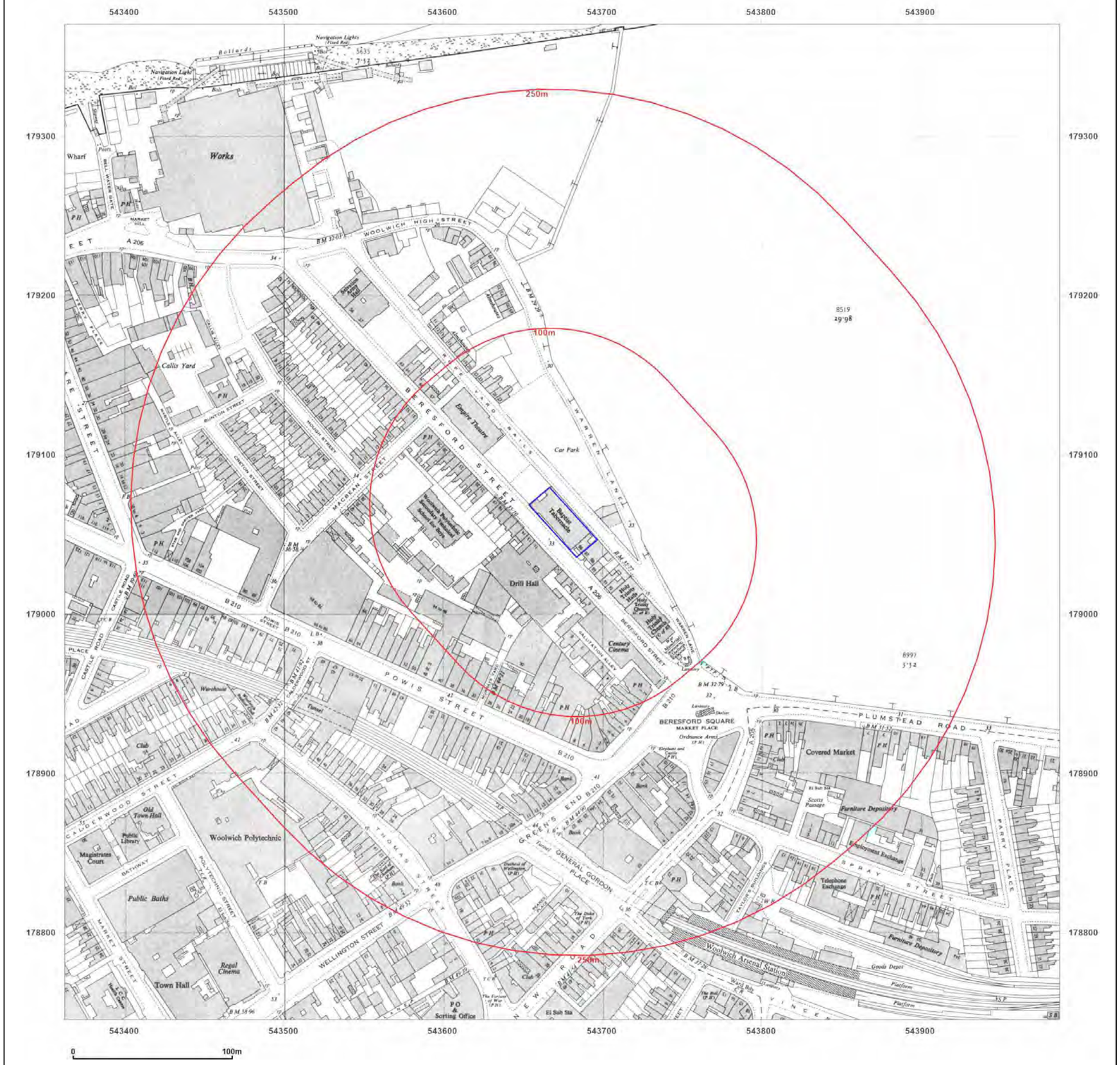

Groundsure INSIGHTS

Site Details:

DEVELOPMENT SITE AT
FORMER 81 TO 88,
BERESFORD STREET,
WOOLWICH, SE18 6BG

Client Ref: 21-237-FDO-22277
Report Ref: HMD-154-7652360
Grid Ref: 543675, 179058

Map Name: National Grid

Map date: **1958**

Scale: 1:2,500

Printed at: 1:2,500

N
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Surveyed 1956
Revised 1956
Edition 1958
Copyright N/A
Levelled 1953

Surveyed 1956
Revised 1956
Edition 1958
Copyright N/A
Levelled 1952

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Groundsure INSIGHTS

Site Details:

DEVELOPMENT SITE AT
FORMER 81 TO 88,
BERESFORD STREET,
WOOLWICH, SE18 6BG

Client Ref: 21-237-FDO-22277
Report Ref: HMD-154-7652360
Grid Ref: 543675, 179058

Map Name: National Grid

Map date: **1970-1971**

Scale: 1:1,250

Printed at: 1:2,000

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Surveyed 1956
Revised 1969
Edition N/A
Copyright 1970
Levelled 1968

Surveyed 1956
Revised 1969
Edition N/A
Copyright 1970
Levelled 1958

Surveyed 1956
Revised 1971
Edition N/A
Copyright 1971
Levelled 1969

Surveyed 1956
Revised 1971
Edition N/A
Copyright 1971
Levelled 1969

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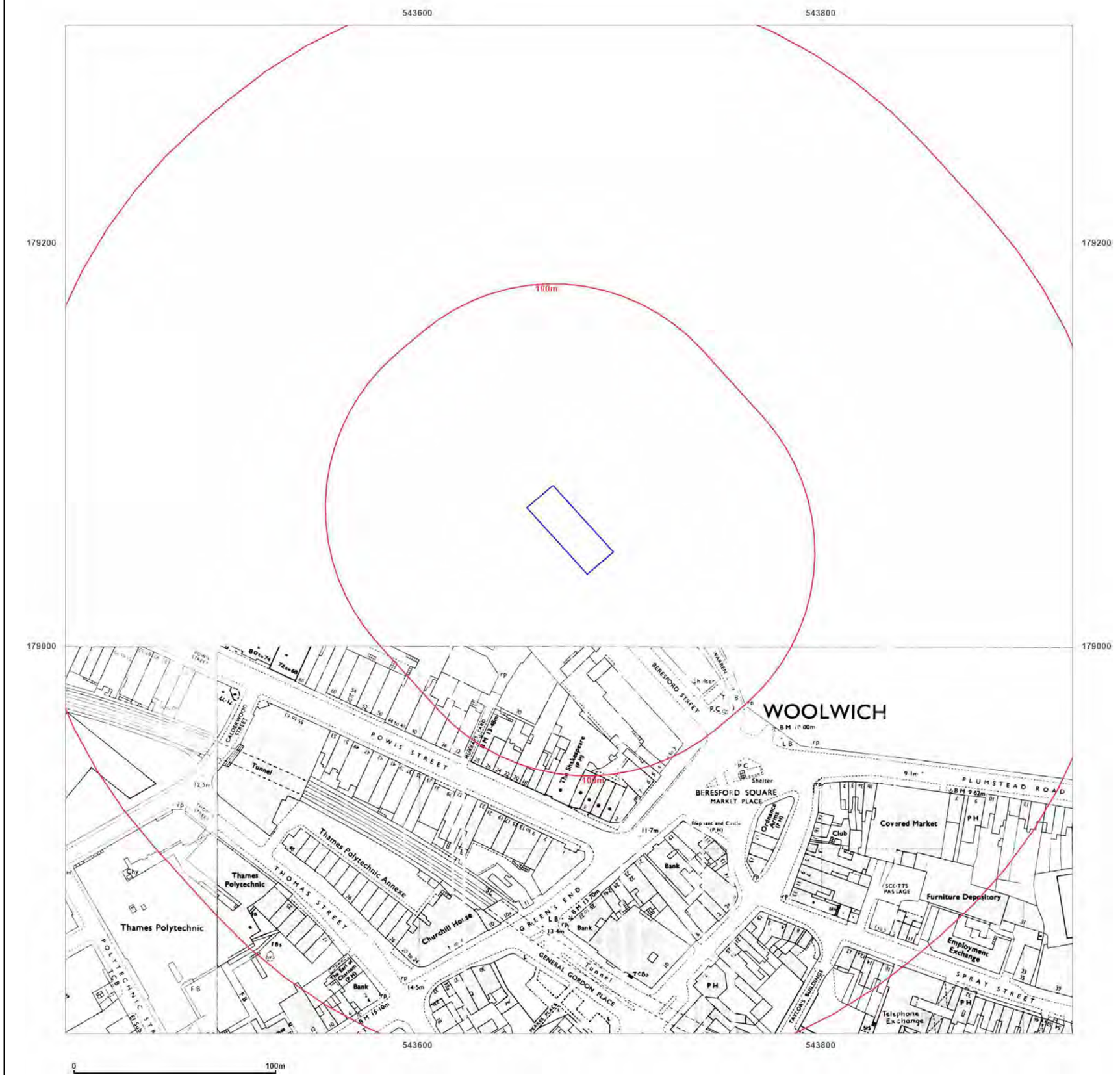

Groundsure INSIGHTS

Site Details:

DEVELOPMENT SITE AT
FORMER 81 TO 88,
BERESFORD STREET,
WOOLWICH, SE18 6BG

Client Ref: 21-237-FDO-22277
Report Ref: HMD-154-7652360
Grid Ref: 543675, 179058

Map Name: National Grid
Map date: **1973-1977**
Scale: 1:1,250
Printed at: 1:2,000

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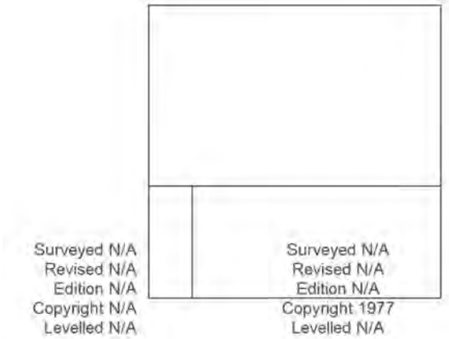

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Production date: 12 March 2021

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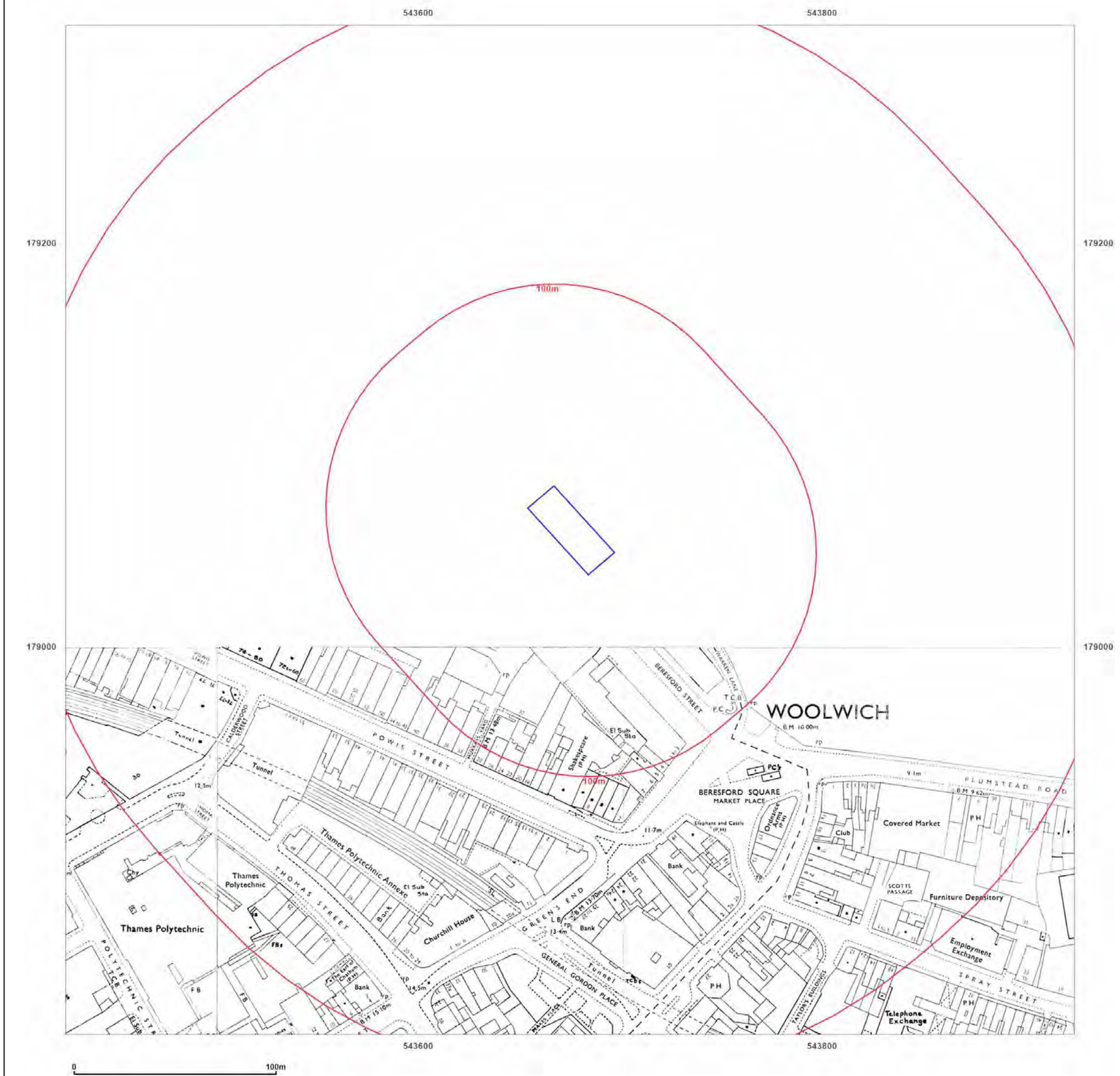

Groundsure INSIGHTS

Site Details:

DEVELOPMENT SITE AT
FORMER 81 TO 88,
BERESFORD STREET,
WOOLWICH, SE18 6BG

Client Ref: 21-237-FDO-22277
Report Ref: HMD-154-7652360
Grid Ref: 543675, 179058

Map Name: National Grid
Map date: **1977-1982**
Scale: 1:1,250
Printed at: 1:2,000

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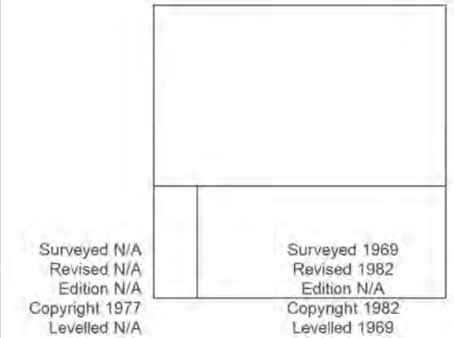

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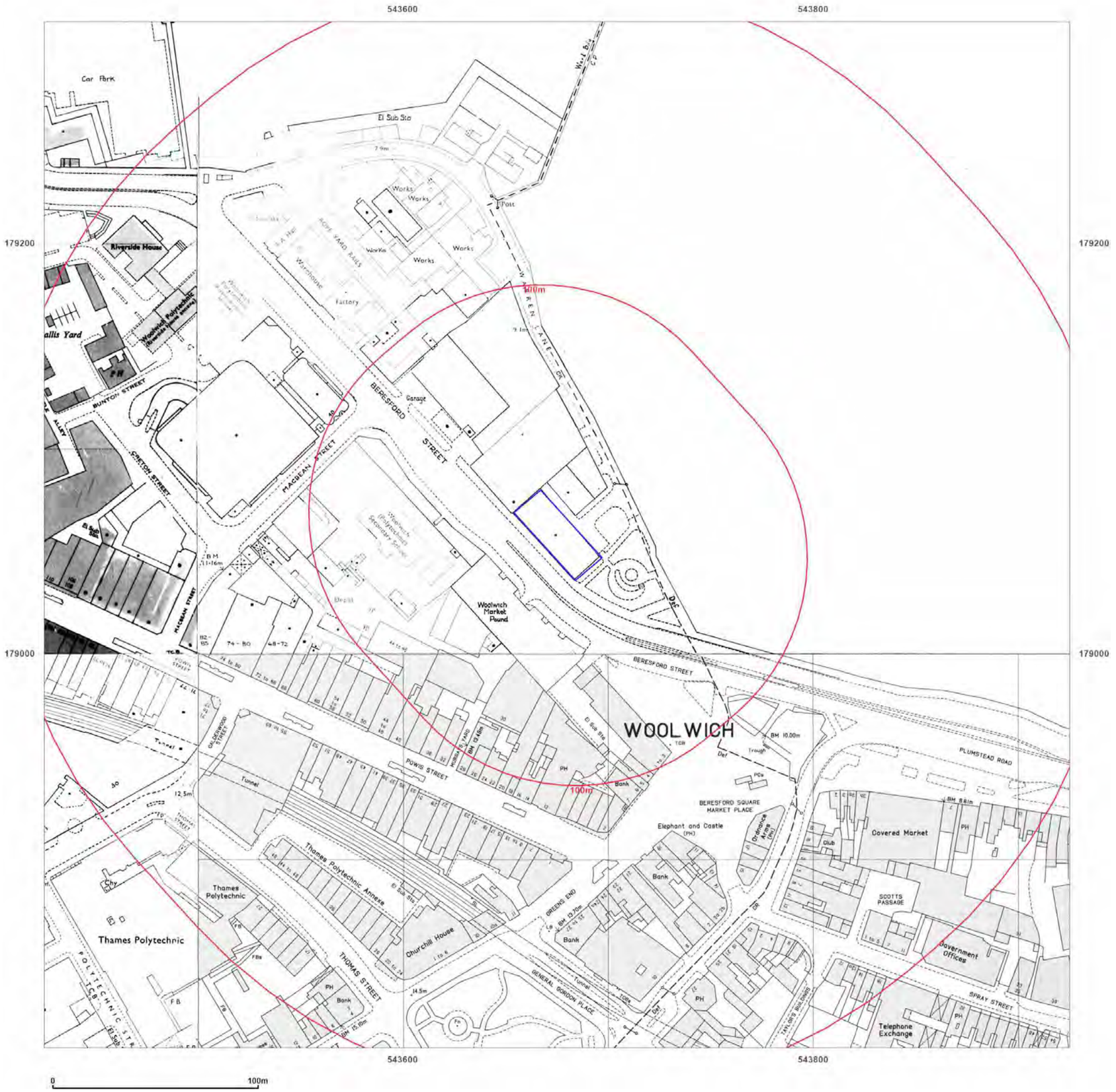

Groundsure INSIGHTS

Site Details:

DEVELOPMENT SITE AT
FORMER 81 TO 88,
BERESFORD STREET,
WOOLWICH, SE18 6BG

Client Ref: 21-237-FDO-22277
Report Ref: HMD-154-7652360
Grid Ref: 543675, 179058

Map Name: National Grid

Map date: **1986-1988**

Scale: 1:1,250

Printed at: 1:2,000

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Surveyed 1983 Revised 1988 Edition N/A Copyright 1988 Levelled 1983	Surveyed 1971 Revised 1987 Edition N/A Copyright 1987 Levelled 1971
Surveyed 1971 Revised 1986 Edition N/A Copyright 1986 Levelled 1971	Surveyed 1956 Revised 1987 Edition N/A Copyright N/A Levelled N/A

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Groundsure INSIGHTS

Site Details:

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WOOLWICH, SE18 6BG

Client Ref: 21-237-FDO-22277
Report Ref: HMD-154-7652360
Grid Ref: 543675, 179058

Map Name: National Grid

Map date: **1987-1991**

Scale: 1:1,250

Printed at: 1:2,000

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Surveyed N/A Revised N/A Edition N/A Copyright 1991 Levelled N/A	Surveyed N/A Revised N/A Edition N/A Copyright 1991 Levelled N/A
Surveyed N/A Revised N/A Edition N/A Copyright 1991 Levelled N/A	Surveyed 1983 Revised 1987 Edition N/A Copyright 1987 Levelled 1983

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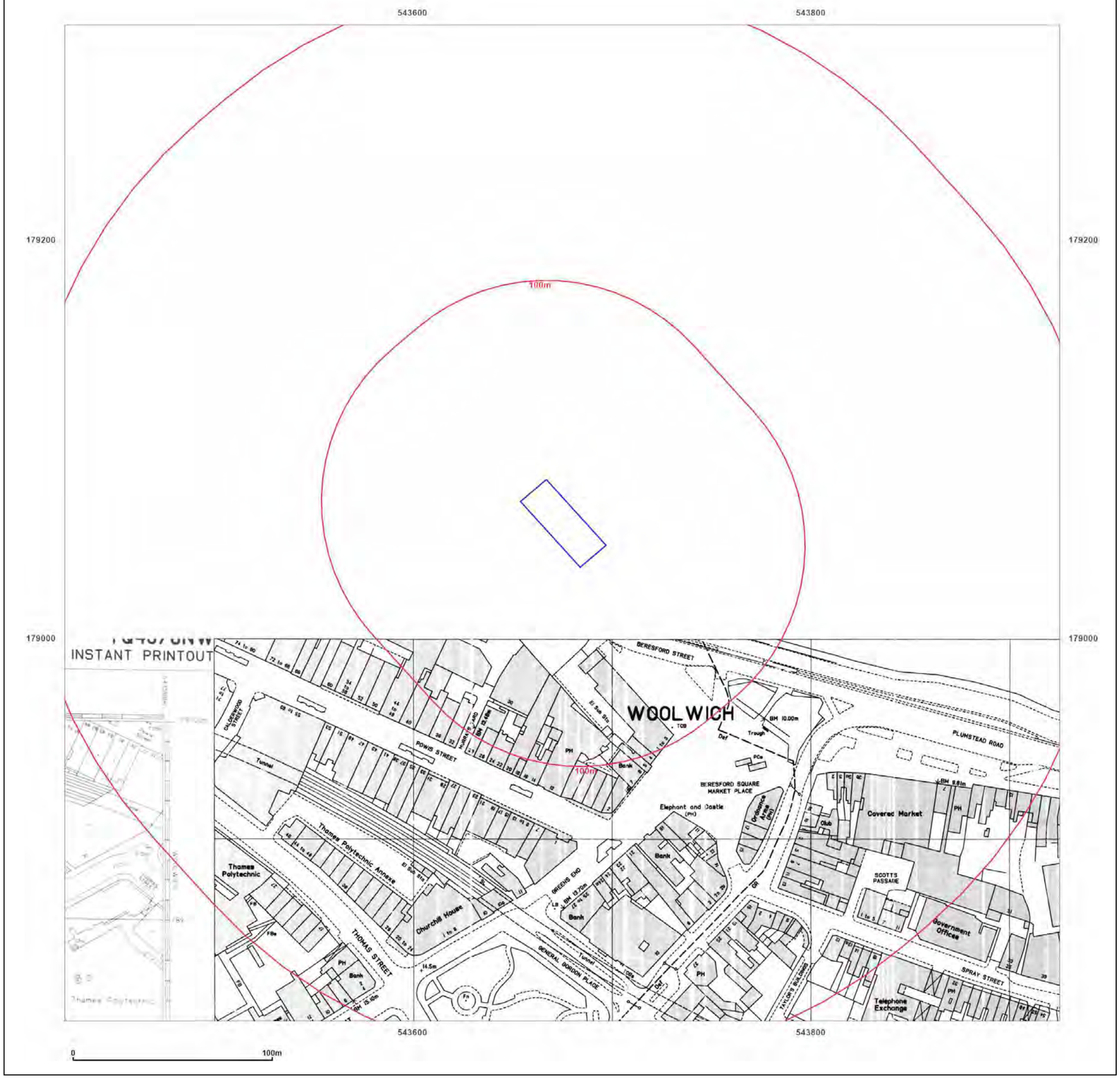

Groundsure INSIGHTS

Site Details:

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FORMER 81 TO 88,
BERESFORD STREET,
WOOLWICH, SE18 6BG

Client Ref: 21-237-FDO-22277
Report Ref: HMD-154-7652360
Grid Ref: 543675, 179058

Map Name: National Grid

Map date: **1989-1991**

Scale: 1:1,250

Printed at: 1:2,000

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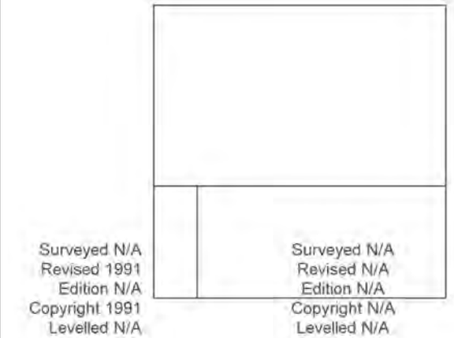

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Production date: 12 March 2021

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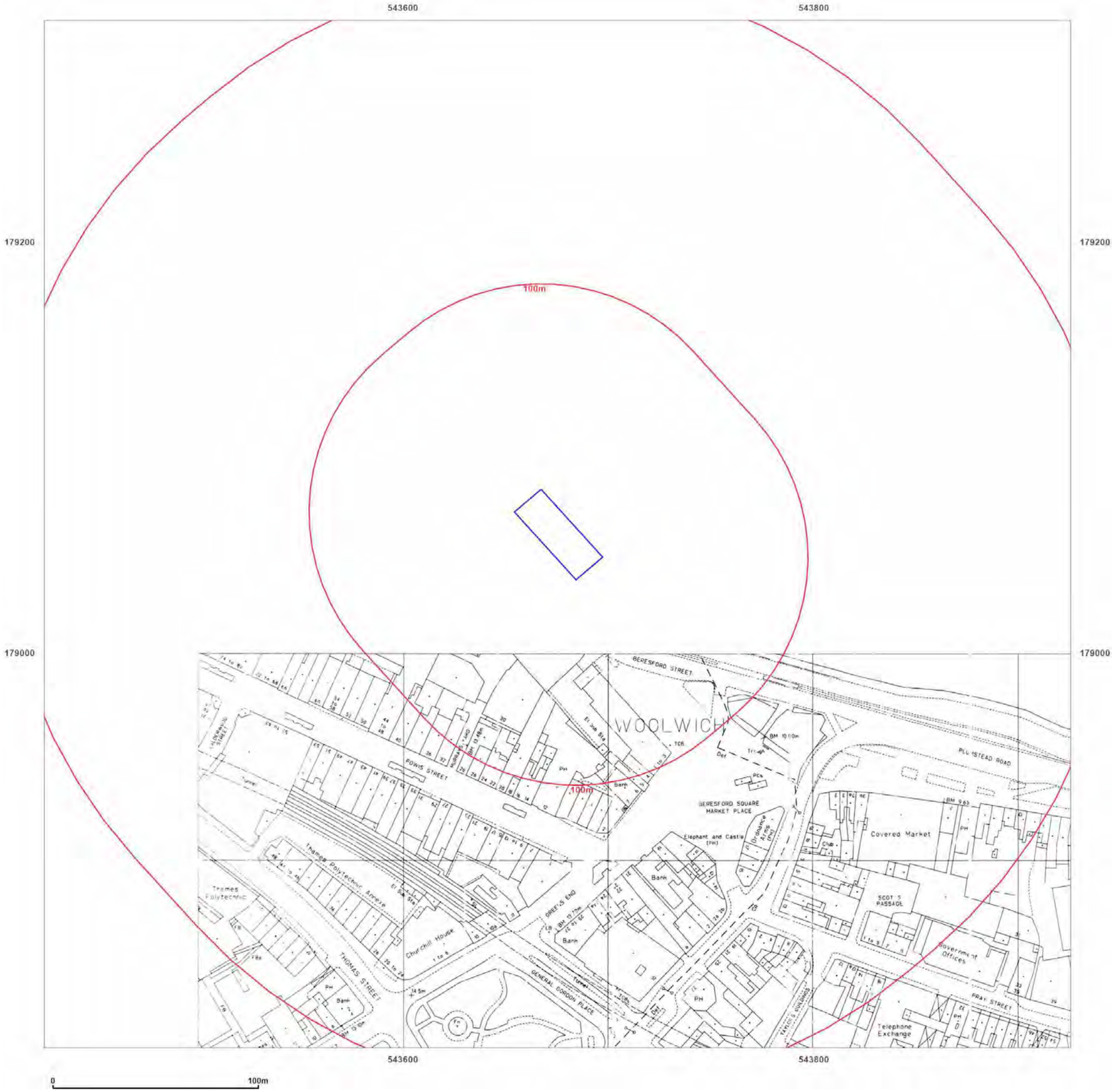

Groundsure INSIGHTS

Site Details:

DEVELOPMENT SITE AT
FORMER 81 TO 88,
BERESFORD STREET,
WOOLWICH, SE18 6BG

Client Ref: 21-237-FDO-22277
Report Ref: HMD-154-7652360
Grid Ref: 543675, 179058

Map Name: National Grid

Map date: **1991**

Scale: 1:1,250

Printed at: 1:2,000

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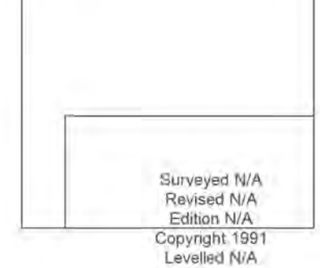

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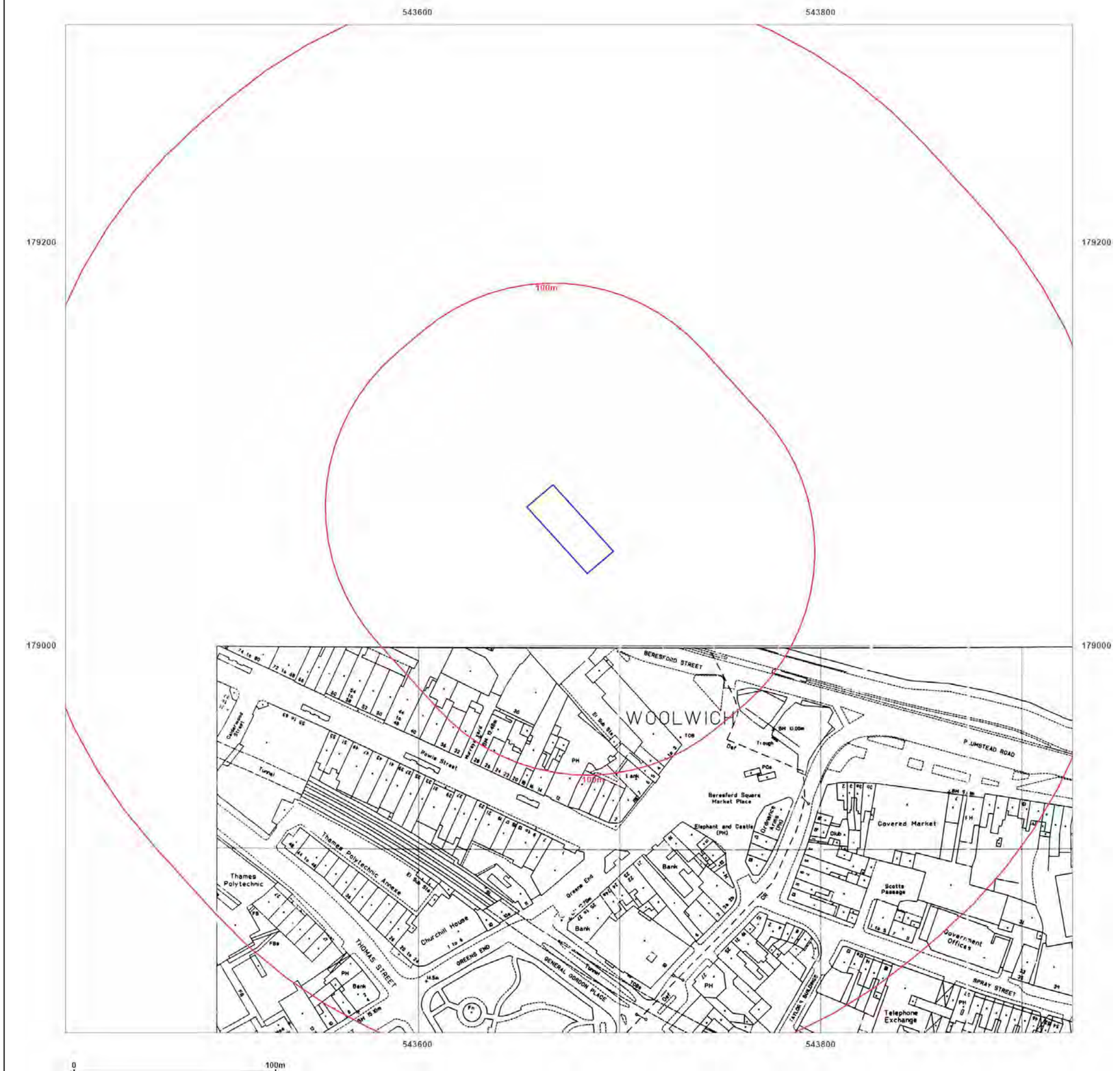

Groundsure INSIGHTS

Site Details:

DEVELOPMENT SITE AT
FORMER 81 TO 88,
BERESFORD STREET,
WOOLWICH, SE18 6BG

Client Ref: 21-237-FDO-22277
Report Ref: HMD-154-7652360
Grid Ref: 543675, 179058

Map Name: National Grid
Map date: **1992**
Scale: 1:1,250
Printed at: 1:2,000

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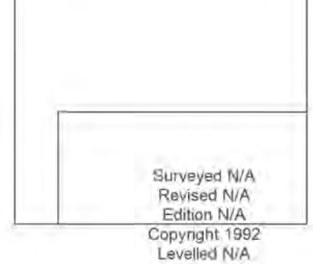

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Production date: 12 March 2021

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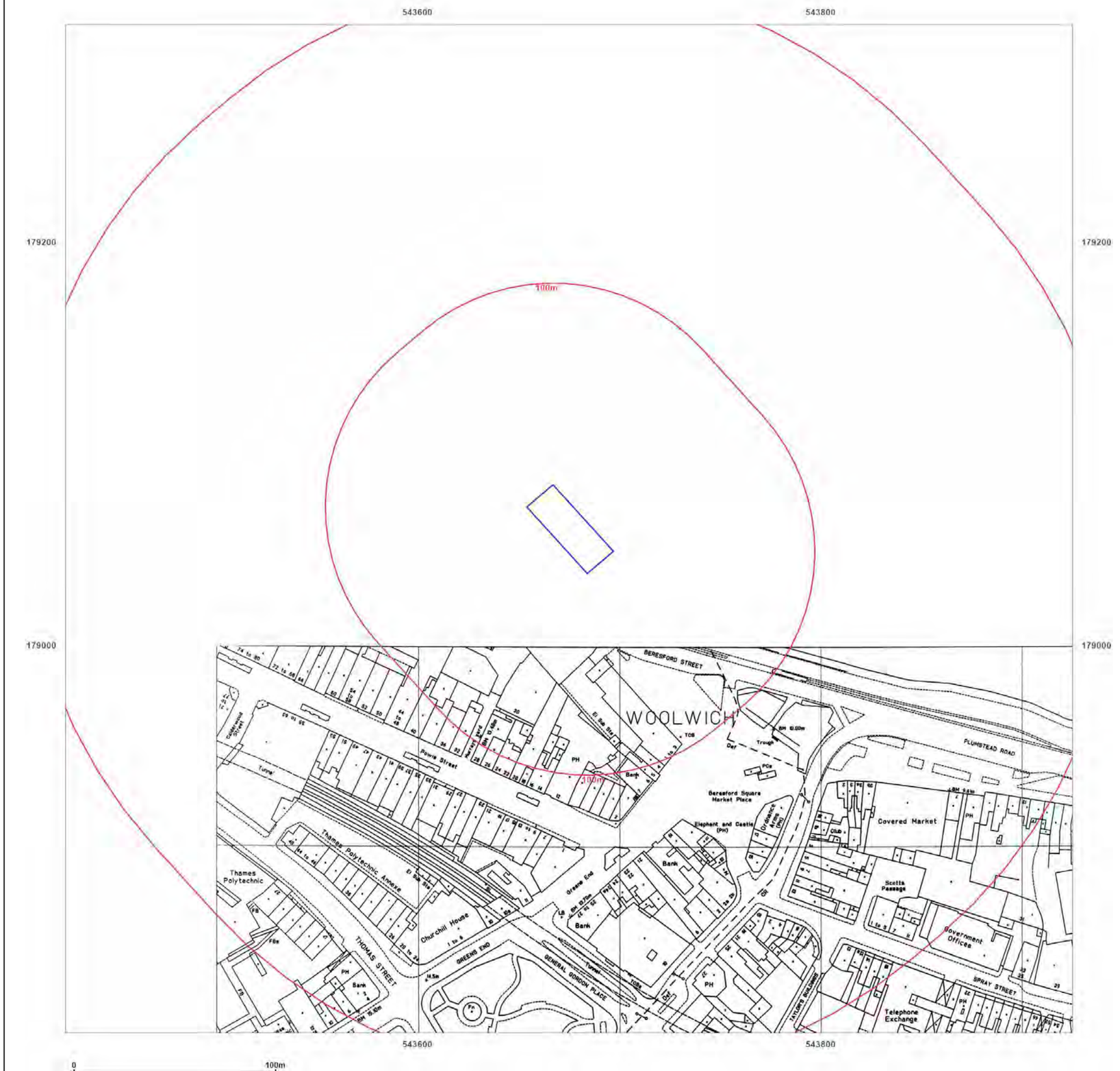

Groundsure INSIGHTS

Site Details:

DEVELOPMENT SITE AT
FORMER 81 TO 88,
BERESFORD STREET,
WOOLWICH, SE18 6BG

Client Ref: 21-237-FDO-22277
Report Ref: HMD-154-7652360
Grid Ref: 543675, 179058

Map Name: National Grid
Map date: **1992**
Scale: 1:1,250
Printed at: 1:2,000

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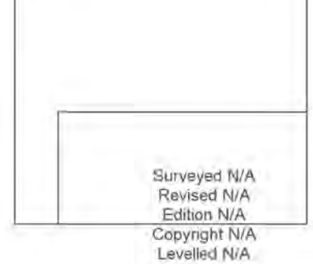

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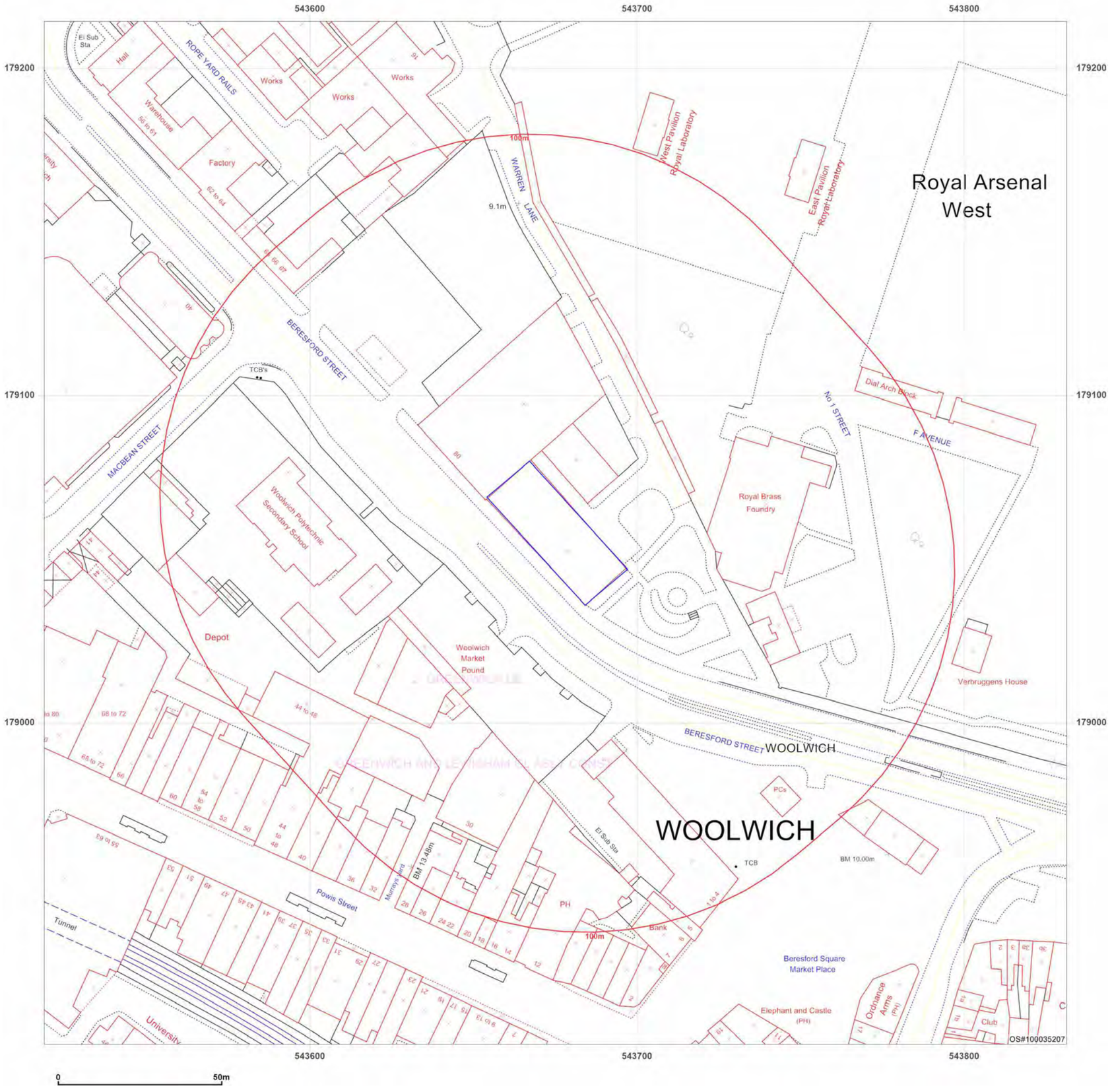

Groundsure INSIGHTS

Site Details:

DEVELOPMENT SITE AT
FORMER 81 TO 88,
BERESFORD STREET,
WOOLWICH, SE18 6BG

Client Ref: 21-237-FDO-22277
Report Ref: HMD-154-7652360
Grid Ref: 543675, 179058

Map Name: LandLine
Map date: **2003**
Scale: 1:1,250
Printed at: 1:1,250

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Groundsure INSIGHTS

Site Details:

DEVELOPMENT SITE AT
FORMER 81 TO 88,
BERESFORD STREET,
WOOLWICH, SE18 6BG

Client Ref: 21-237-FDO-22277
Report Ref: HMD-154-7652360
Grid Ref: 543675, 179058

Map Name: County Series

Map date: **1866**

Scale: 1:10,560

Printed at: 1:10,560

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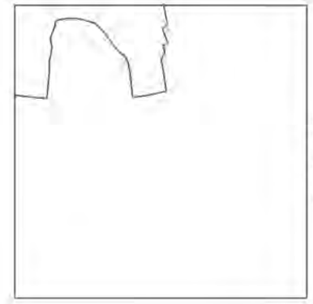

Surveyed 1866
Revised 1866
Edition N/A
Copyright N/A
Levelled N/A

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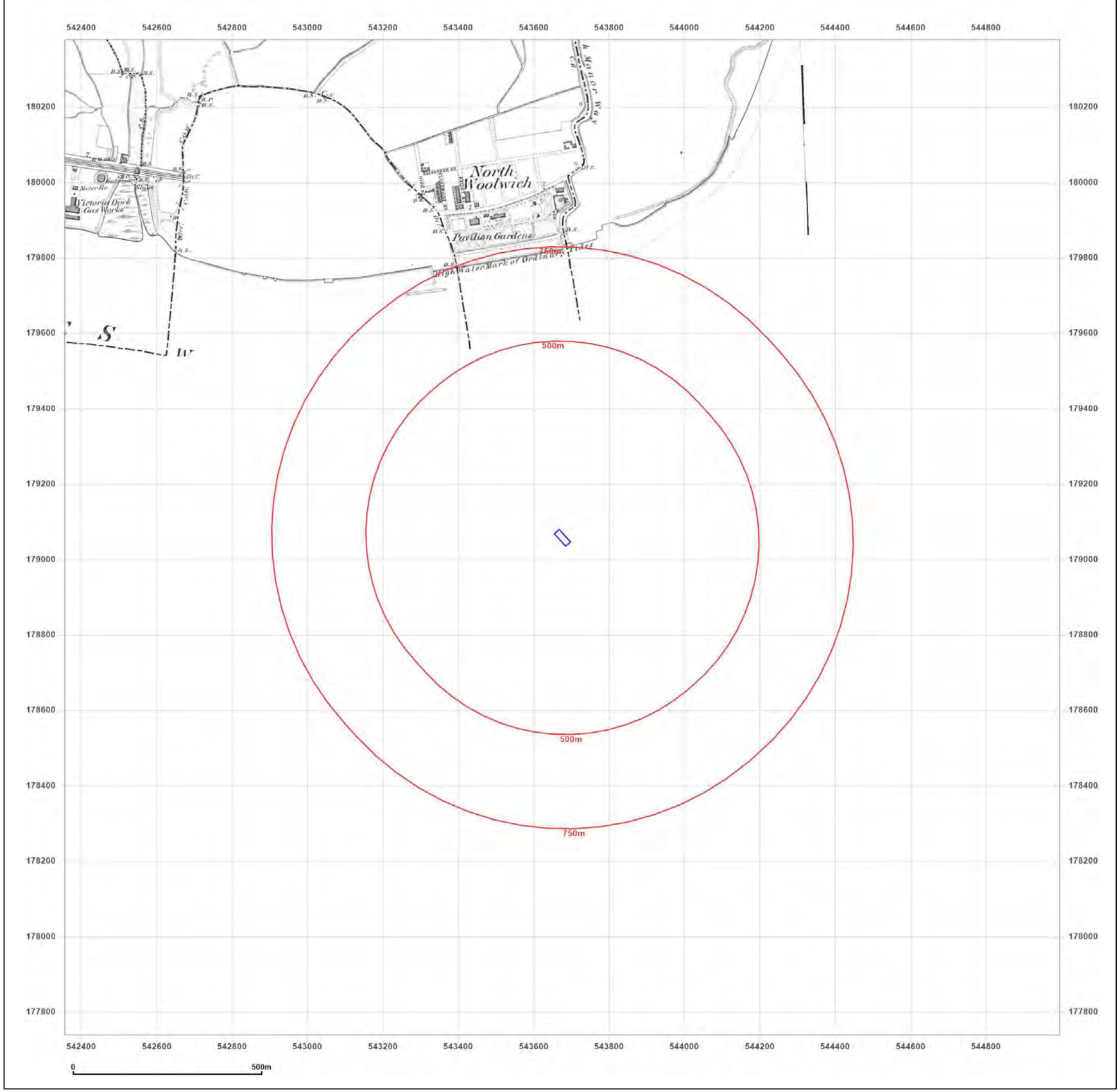

Groundsure INSIGHTS

Site Details:

DEVELOPMENT SITE AT
FORMER 81 TO 88,
BERESFORD STREET,
WOOLWICH, SE18 6BG

Client Ref: 21-237-FDO-22277
Report Ref: HMD-154-7652360
Grid Ref: 543675, 179058

Map Name: County Series

Map date: **1867**

Scale: 1:10,560

Printed at: 1:10,560

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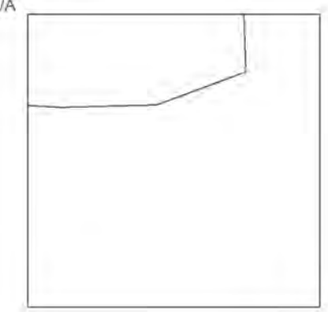
Surveyed 1867
Revised 1867
Edition N/A
Copyright N/A
Levelled N/A



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Production date: 12 March 2021

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Groundsure INSIGHTS

Site Details:

DEVELOPMENT SITE AT
FORMER 81 TO 88,
BERESFORD STREET,
WOOLWICH, SE18 6BG

Client Ref: 21-237-FDO-22277
Report Ref: HMD-154-7652360
Grid Ref: 543675, 179058

Map Name: County Series

Map date: **1882**

Scale: 1:10,560

Printed at: 1:10,560

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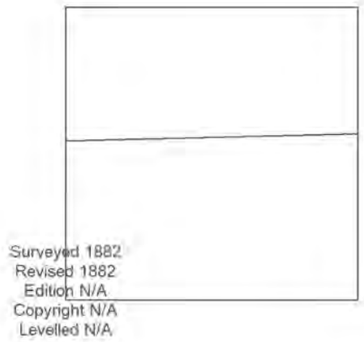

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Production date: 12 March 2021

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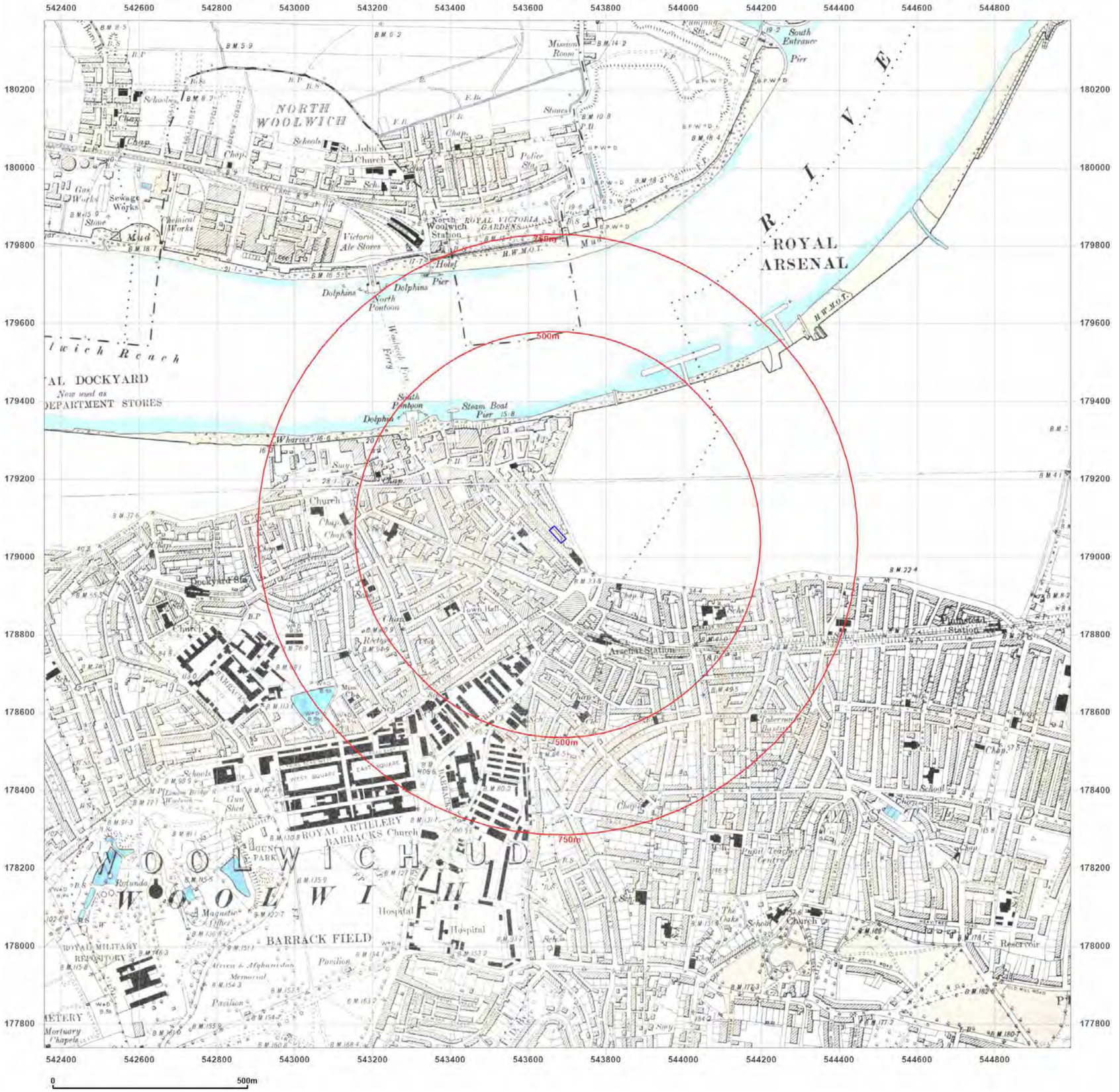


Groundsure INSIGHTS

Site Details:

DEVELOPMENT SITE AT
FORMER 81 TO 88,
BERESFORD STREET,
WOOLWICH, SE18 6BG

Client Ref: 21-237-FDO-22277
Report Ref: HMD-154-7652360
Grid Ref: 543675, 179058

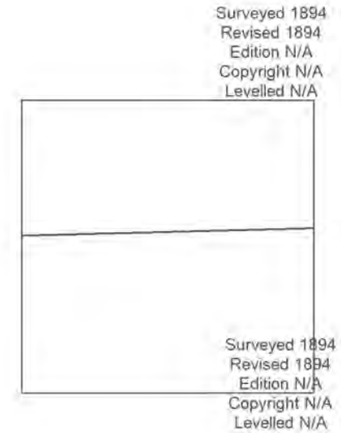
Map Name: County Series

Map date: **1894**

Scale: 1:10,560

Printed at: 1:10,560

N
W E
S



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Groundsure Insights
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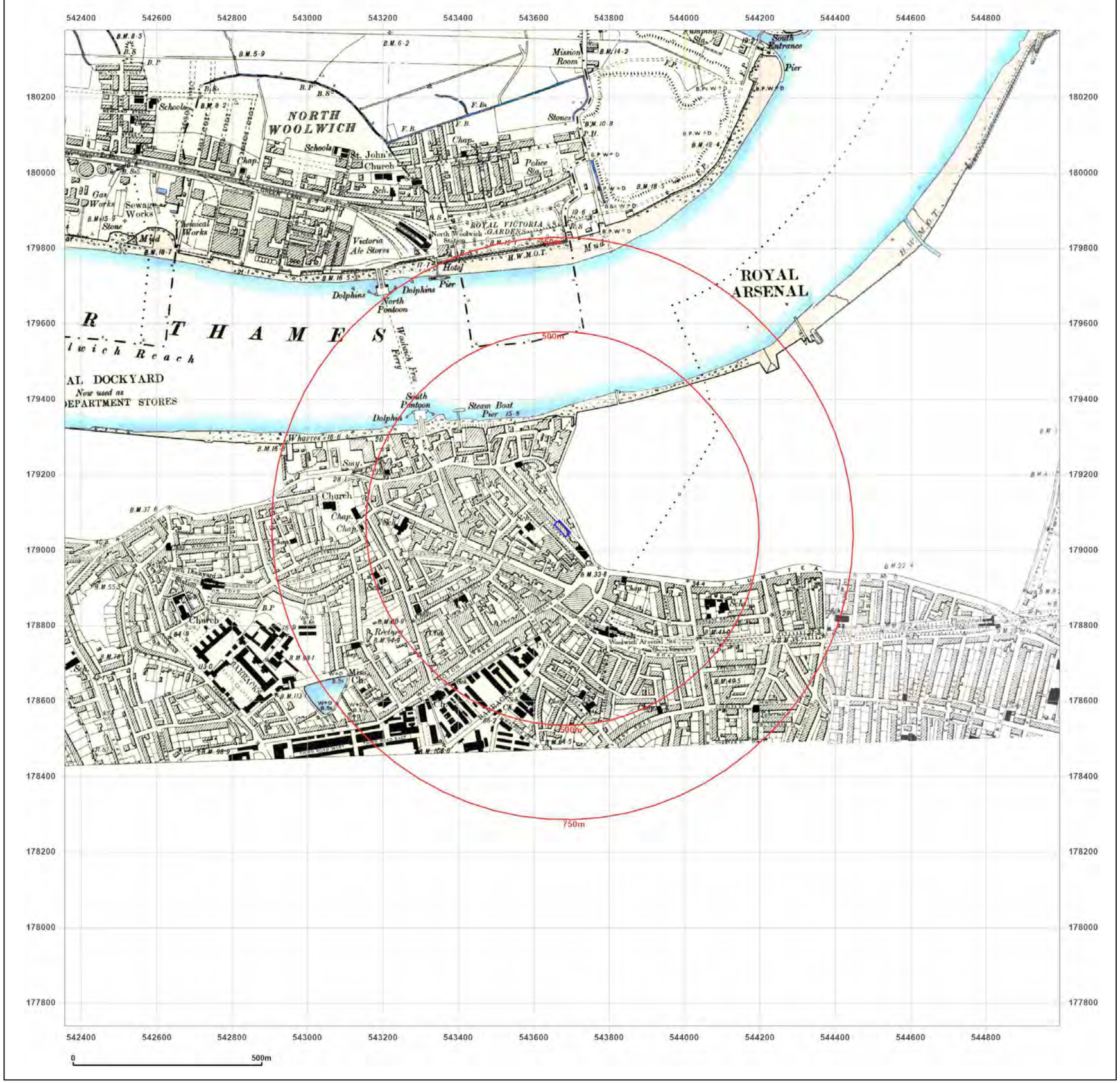
W: www.groundsure.com

Production date: 12 March 2021

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



Groundsure INSIGHTS

Site Details:

DEVELOPMENT SITE AT
FORMER 81 TO 88,
BERESFORD STREET,
WOOLWICH, SE18 6BG

Client Ref: 21-237-FDO-22277
Report Ref: HMD-154-7652360
Grid Ref: 543675, 179058

Map Name: County Series

Map date: **1895-1898**

Scale: 1:10,560

Printed at: 1:10,560

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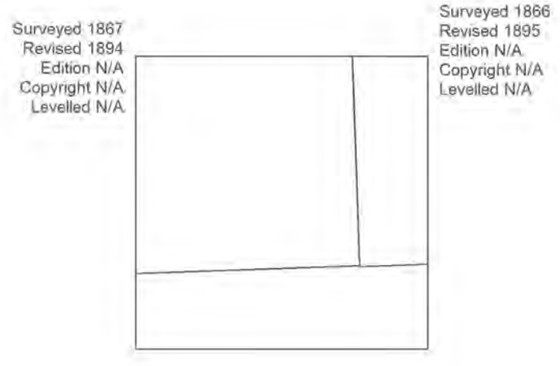

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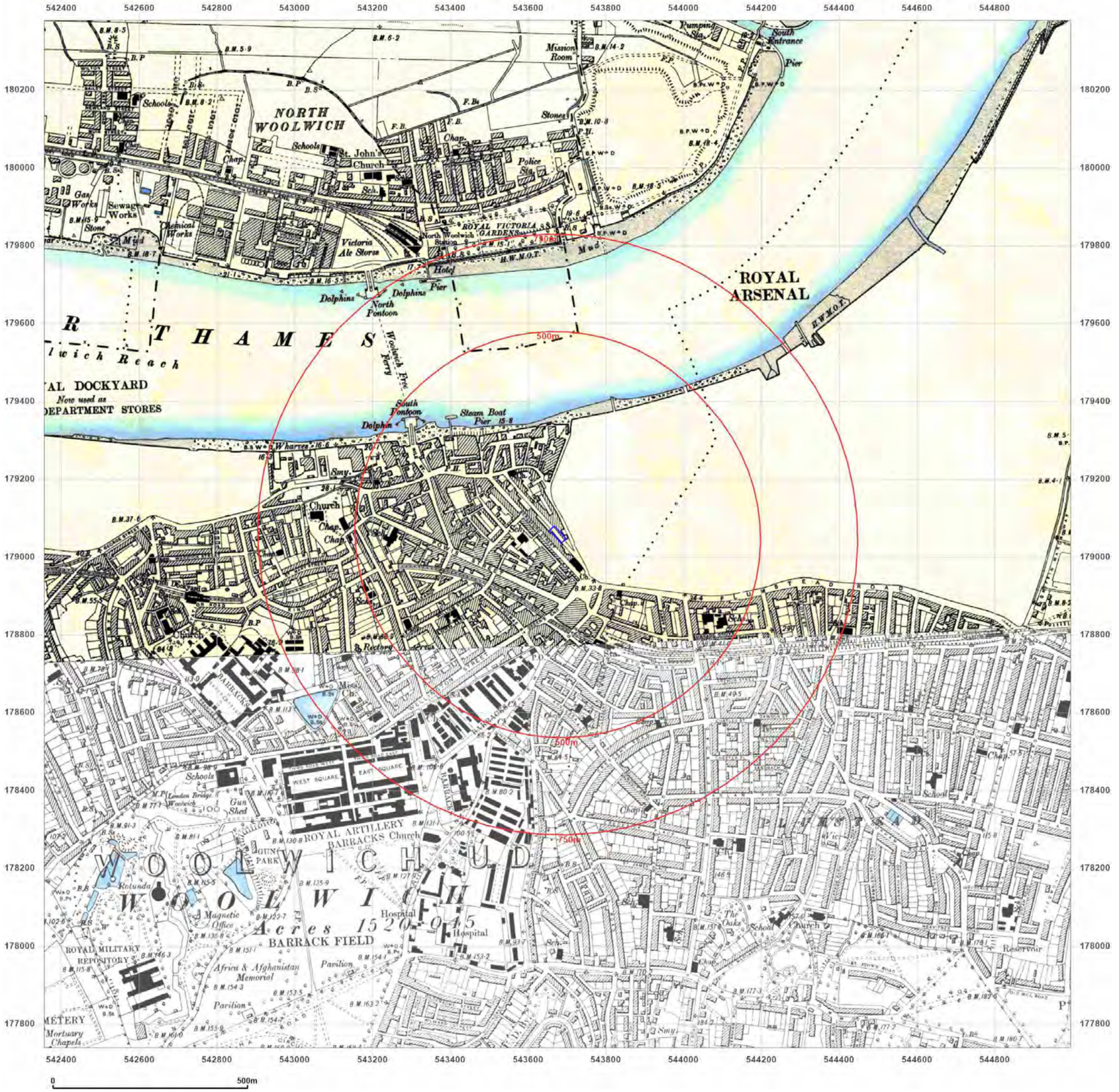
Production date: 12 March 2021

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



Groundsure INSIGHTS

Site Details:

DEVELOPMENT SITE AT
FORMER 81 TO 88,
BERESFORD STREET,
WOOLWICH, SE18 6BG

Client Ref: 21-237-FDO-22277
Report Ref: HMD-154-7652360
Grid Ref: 543675, 179058

Map Name: County Series

Map date: **1894-1899**

Scale: 1:10,560

Printed at: 1:10,560

N
W E
S

Surveyed 1866
Revised 1894
Edition 1899
Copyright N/A
Levelled N/A

Surveyed 1867
Revised 1894
Edition N/A
Copyright N/A
Levelled N/A

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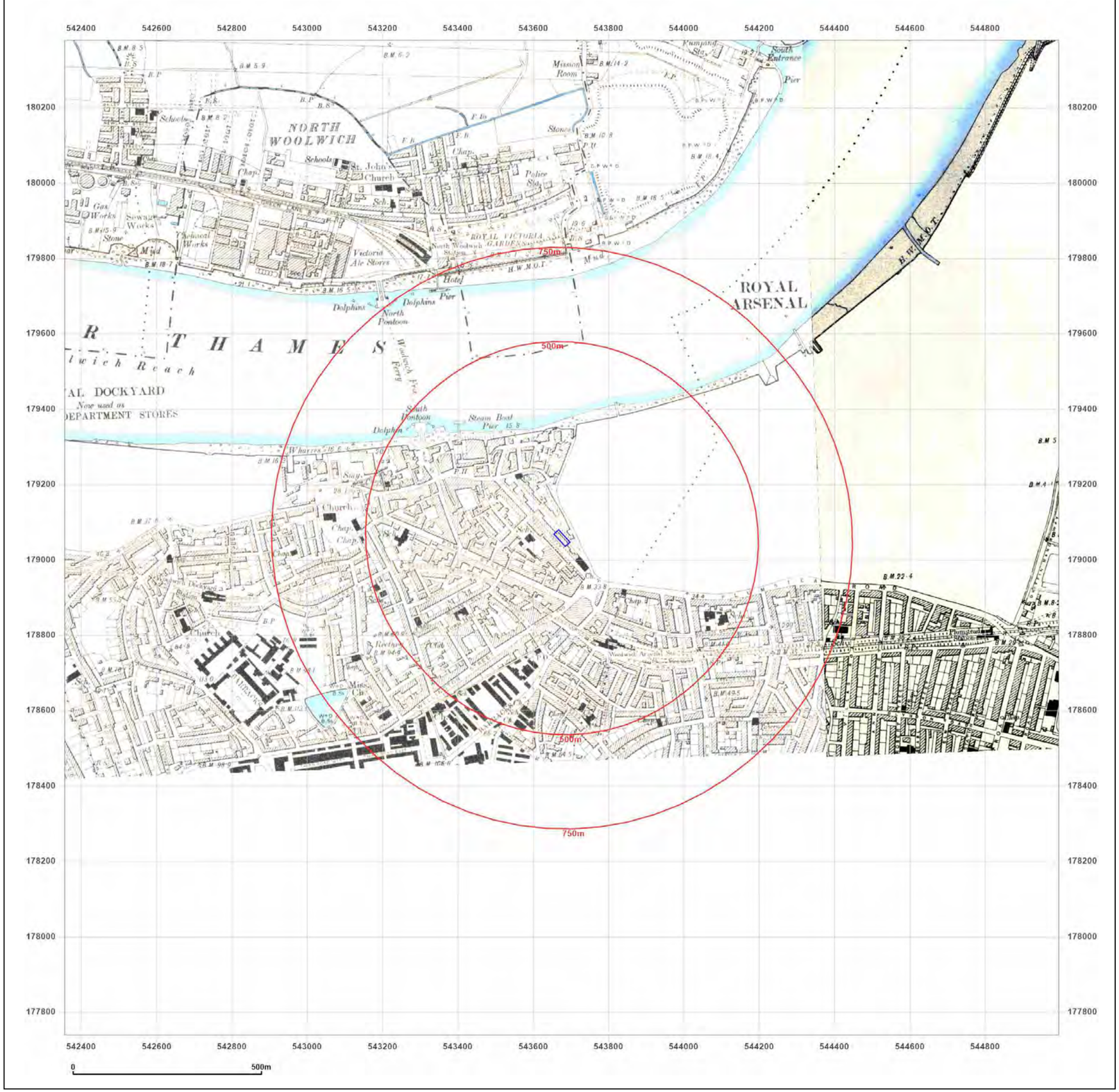


Groundsure INSIGHTS

Site Details:

DEVELOPMENT SITE AT
FORMER 81 TO 88,
BERESFORD STREET,
WOOLWICH, SE18 6BG

Client Ref: 21-237-FDO-22277
Report Ref: HMD-154-7652360
Grid Ref: 543675, 179058

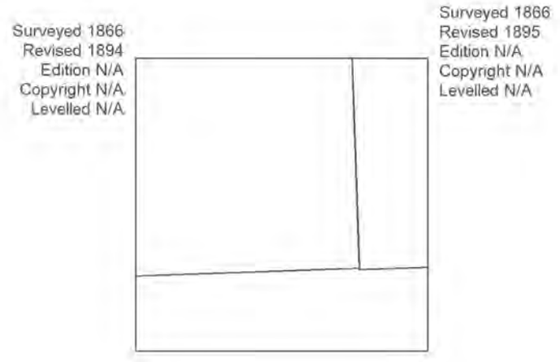
Map Name: County Series

Map date: **1894-1899**

Scale: 1:10,560

Printed at: 1:10,560

N
W E
S



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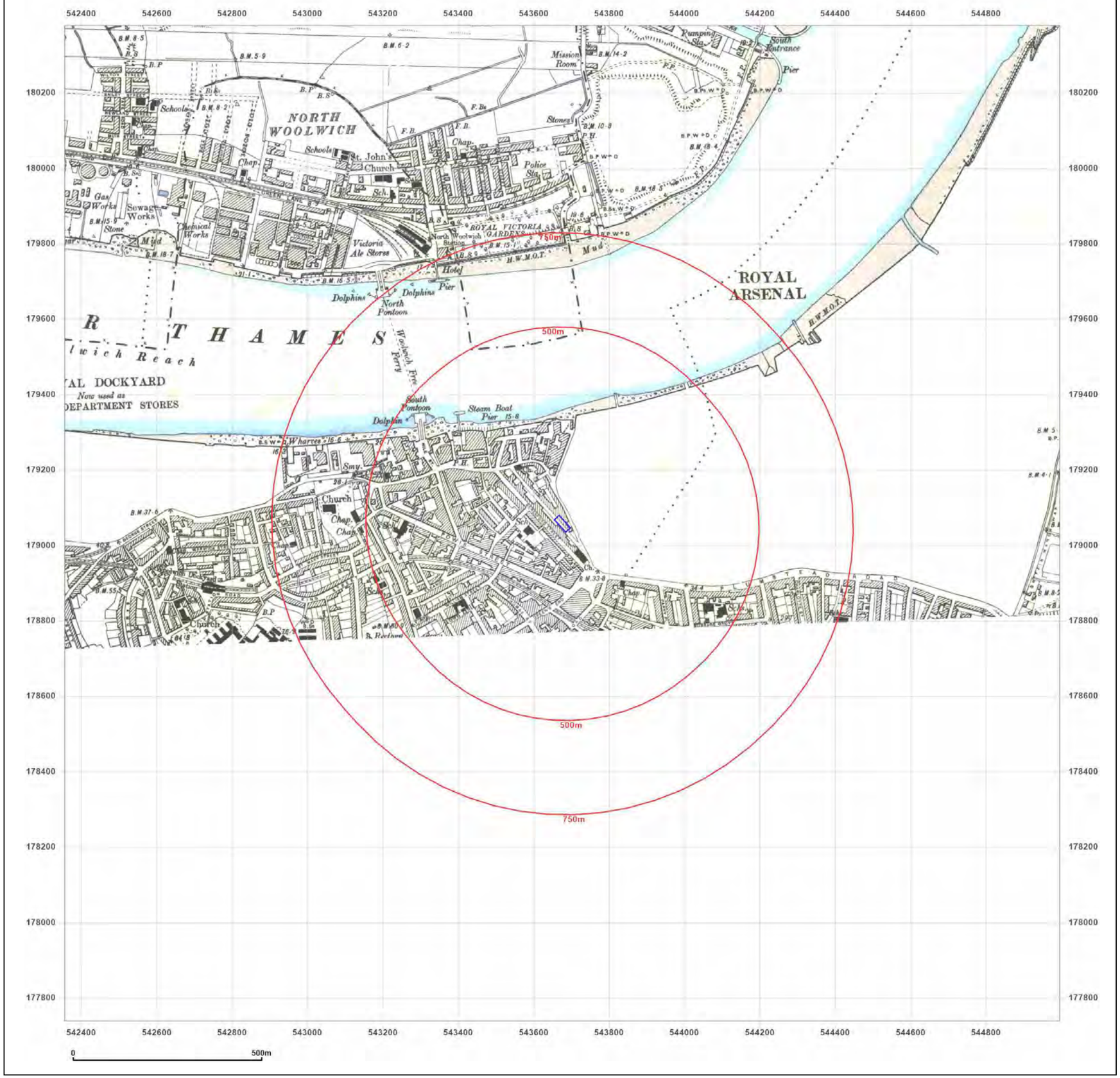
W: www.groundsure.com

Production date: 12 March 2021

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



Groundsure INSIGHTS

Site Details:

DEVELOPMENT SITE AT
FORMER 81 TO 88,
BERESFORD STREET,
WOOLWICH, SE18 6BG

Client Ref: 21-237-FDO-22277
Report Ref: HMD-154-7652360
Grid Ref: 543675, 179058

Map Name: County Series

Map date: **1899**

Scale: 1:10,560

Printed at: 1:10,560

N
W E
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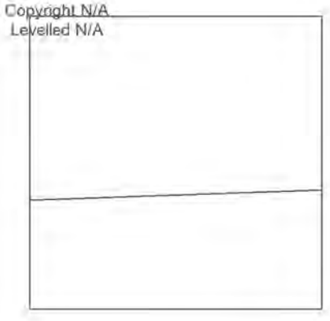
Surveyed 1867
Revised 1899
Edition N/A
Copyright N/A
Levelled N/A



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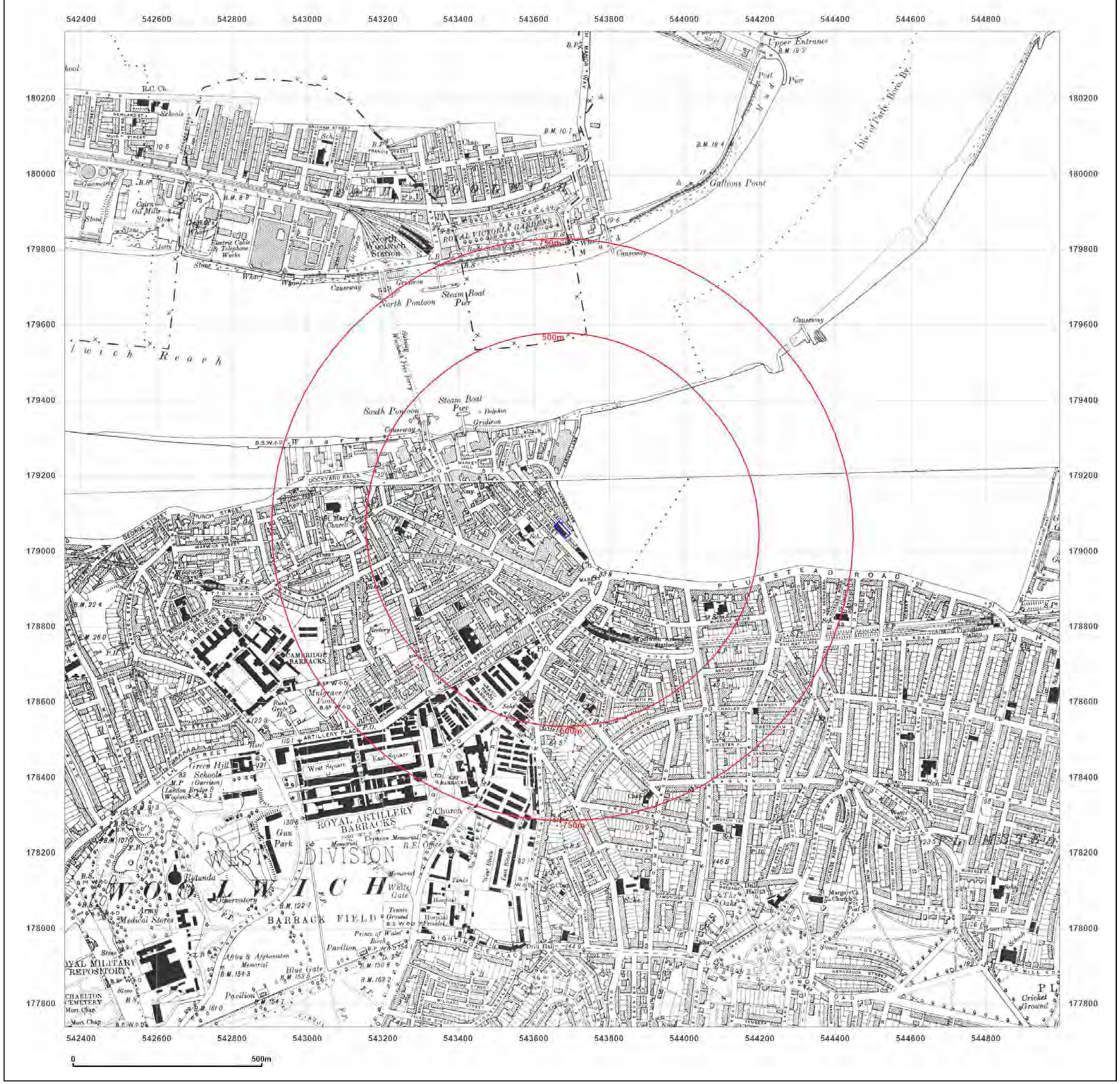
W: www.groundsure.com

Production date: 12 March 2021

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



Groundsure INSIGHTS

Site Details:

DEVELOPMENT SITE AT
FORMER 81 TO 88,
BERESFORD STREET,
WOOLWICH, SE18 6BG

Client Ref: 21-237-FDO-22277
Report Ref: HMD-154-7652360
Grid Ref: 543675, 179058

Map Name: County Series

Map date: **1920**

Scale: 1:10,560

Printed at: 1:10,560

N
W E
S

Surveyed 1872
Revised 1919
Edition 1920
Copyright N/A
Levelled N/A

Surveyed 1867
Revised 1914
Edition 1920
Copyright N/A
Levelled N/A

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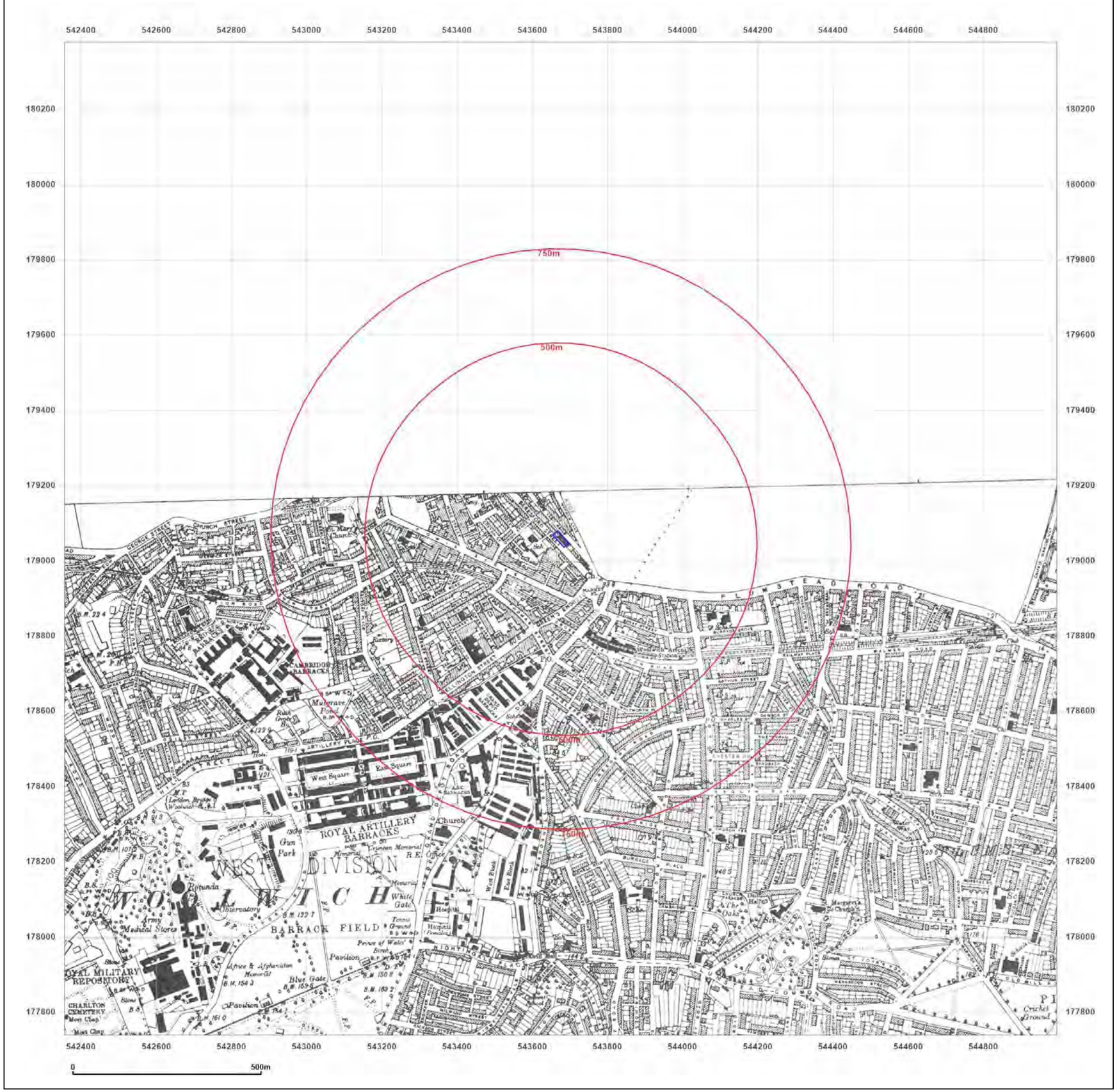
Production date: 12 March 2021

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



Groundsure INSIGHTS

Site Details:

DEVELOPMENT SITE AT
FORMER 81 TO 88,
BERESFORD STREET,
WOOLWICH, SE18 6BG

Client Ref: 21-237-FDO-22277
Report Ref: HMD-154-7652360
Grid Ref: 543675, 179058

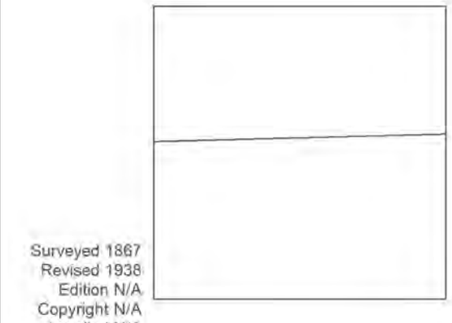
Map Name: County Series

Map date: **1938**

Scale: 1:10,560

Printed at: 1:10,560

N
W E
S



Surveyed 1867
Revised 1938
Edition N/A
Copyright N/A
Levelled N/A

Powered by OS

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Production date: 12 March 2021

Map legend available at:
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Groundsure INSIGHTS

Site Details:

DEVELOPMENT SITE AT
FORMER 81 TO 88,
BERESFORD STREET,
WOOLWICH, SE18 6BG

Client Ref: 21-237-FDO-22277
Report Ref: HMD-154-7652360
Grid Ref: 543675, 179058

Map Name: Provisional

Map date: **1948**

Scale: 1:10,560

Printed at: 1:10,560

N
W E
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Surveyed N/A
Revised 1948
Edition N/A
Copyright N/A
Levelled 1934

Surveyed N/A
Revised 1948
Edition N/A
Copyright N/A
Levelled N/A

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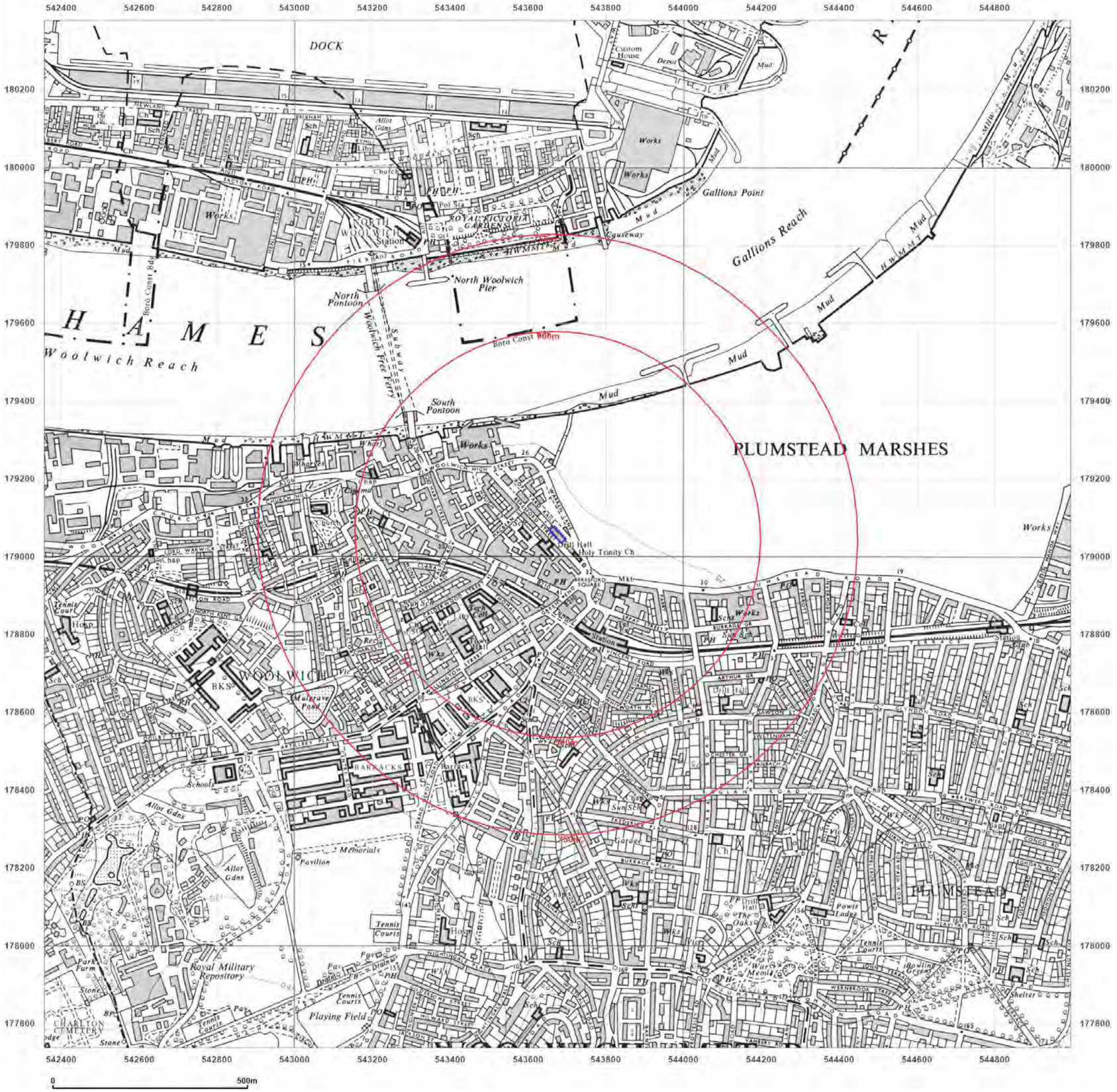
Production date: 12 March 2021

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



Groundsure INSIGHTS

Site Details:

DEVELOPMENT SITE AT
FORMER 81 TO 88,
BERESFORD STREET,
WOOLWICH, SE18 6BG

Client Ref: 21-237-FDO-22277
Report Ref: HMD-154-7652360
Grid Ref: 543675, 179058

Map Name: Provisional
Map date: **1962-1966**
Scale: 1:10,560
Printed at: 1:10,560

N
W E
S

Surveyed 1966
Revised 1966
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1962
Revised 1962
Edition N/A
Copyright N/A
Levelled N/A

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Production date: 12 March 2021

Map legend available at:
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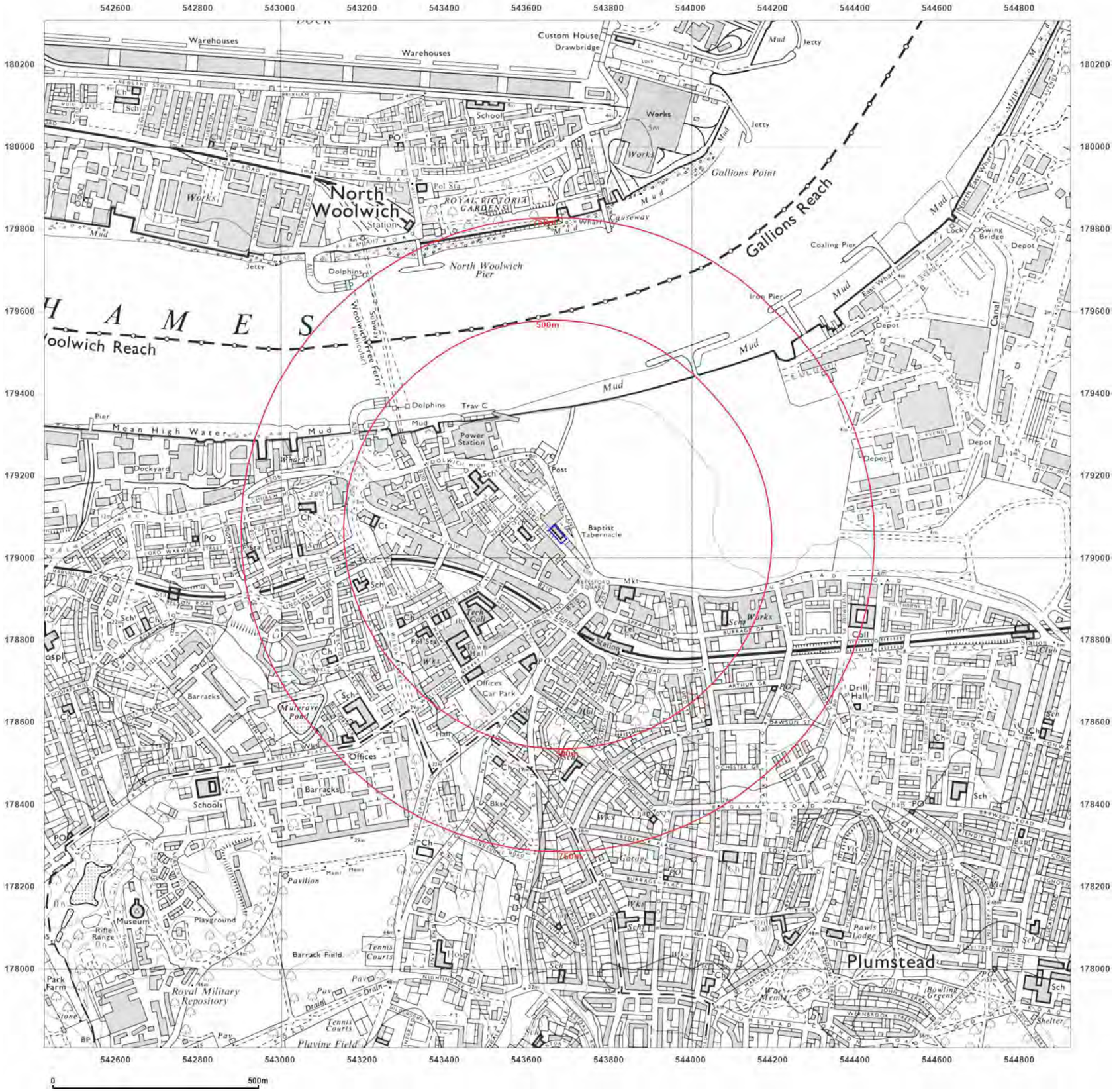

Groundsure INSIGHTS

Site Details:

DEVELOPMENT SITE AT
FORMER 81 TO 88,
BERESFORD STREET,
WOOLWICH, SE18 6BG

Client Ref: 21-237-FDO-22277
Report Ref: HMD-154-7652360
Grid Ref: 543675, 179058

Map Name: National Grid

Map date: **1974**

Scale: 1:10,000

Printed at: 1:10,000

N
W E
S

Surveyed 1973
Revised 1974
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1974
Revised 1974
Edition N/A
Copyright N/A
Levelled N/A

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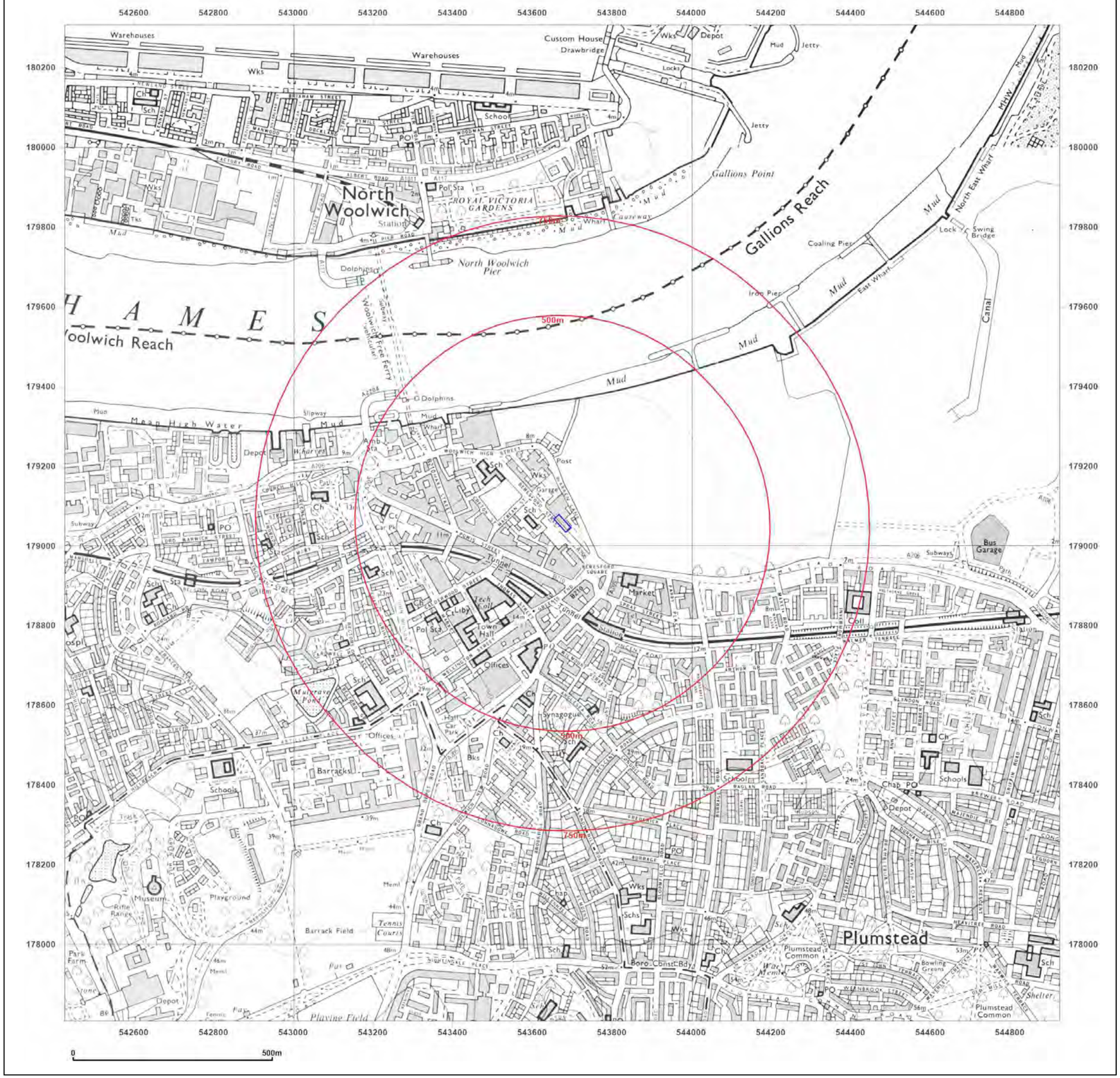
W: www.groundsure.com

Production date: 12 March 2021

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



Groundsure INSIGHTS

Site Details:

DEVELOPMENT SITE AT
FORMER 81 TO 88,
BERESFORD STREET,
WOOLWICH, SE18 6BG

Client Ref: 21-237-FDO-22277
Report Ref: HMD-154-7652360
Grid Ref: 543675, 179058

Map Name: National Grid

Map date: **1981-1982**

Scale: 1:10,000

Printed at: 1:10,000

N
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Surveyed 1981
Revised 1982
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1980
Revised 1981
Edition N/A
Copyright N/A
Levelled N/A

Powered by OS

Produced by
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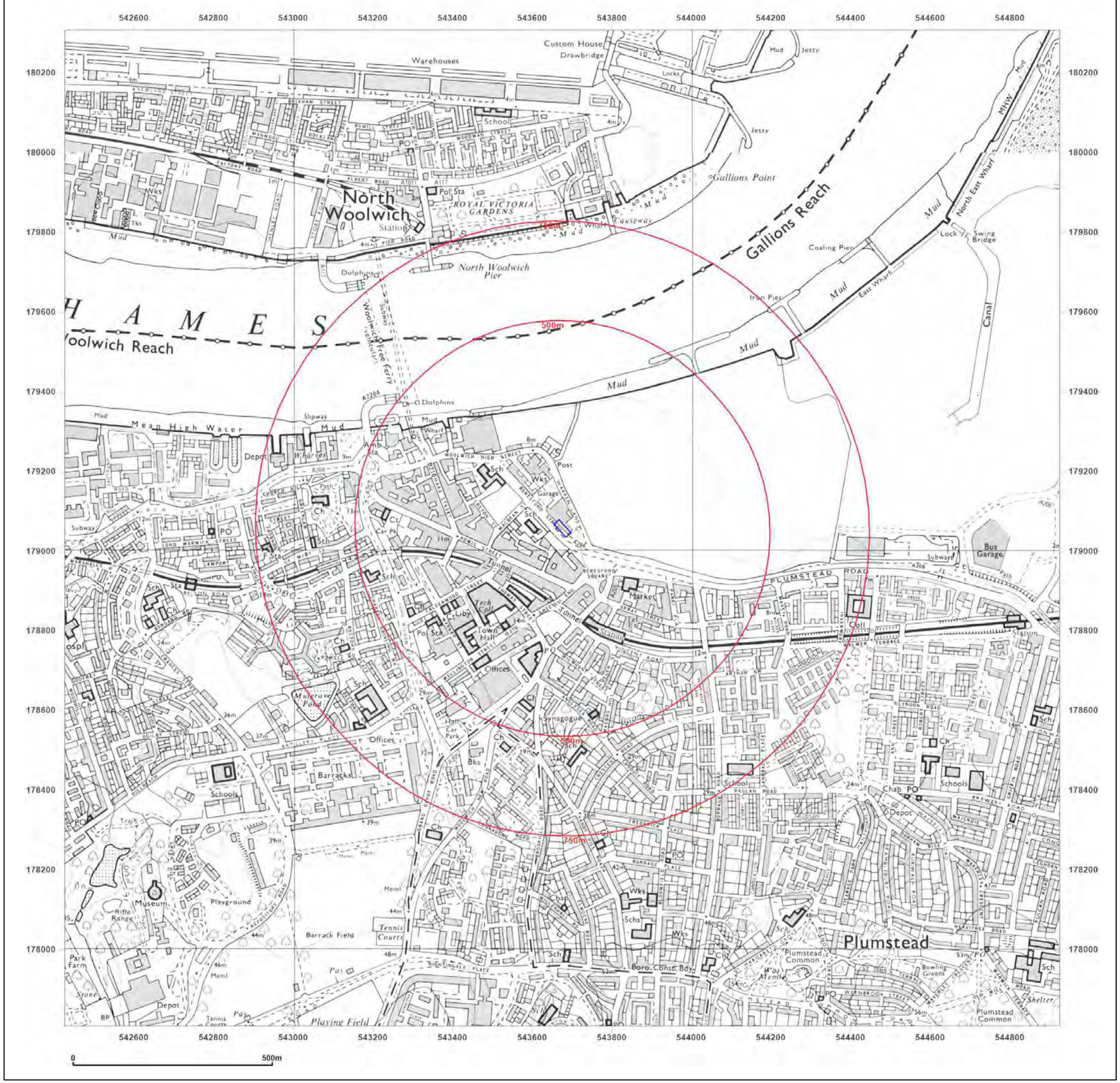
E: info@groundsure.com
W: www.groundsure.com

Production date: 12 March 2021

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



Groundsure INSIGHTS

Site Details:

DEVELOPMENT SITE AT
FORMER 81 TO 88,
BERESFORD STREET,
WOOLWICH, SE18 6BG

Client Ref: 21-237-FDO-22277
Report Ref: HMD-154-7652360
Grid Ref: 543675, 179058

Map Name: National Grid

Map date: **1988-1990**

Scale: 1:10,000

Printed at: 1:10,000

N
W E
S

Surveyed 1989
Revised 1990
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1980
Revised 1988
Edition N/A
Copyright N/A
Levelled N/A

Powered by OS

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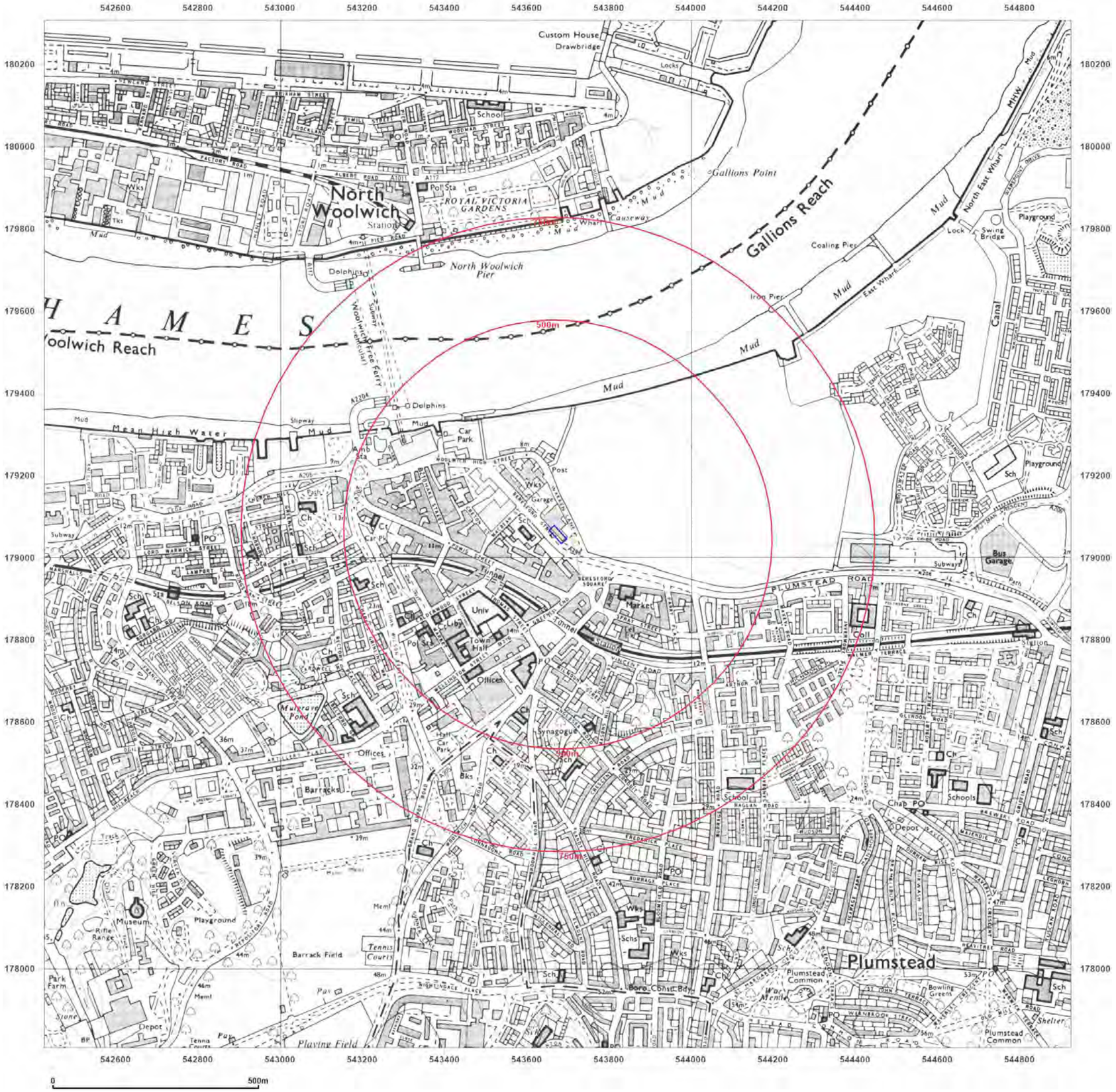
W: www.groundsure.com

Production date: 12 March 2021

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



Groundsure INSIGHTS

Site Details:

DEVELOPMENT SITE AT
FORMER 81 TO 88,
BERESFORD STREET,
WOOLWICH, SE18 6BG

Client Ref: 21-237-FDO-22277
Report Ref: HMD-154-7652360
Grid Ref: 543675, 179058

Map Name: National Grid

Map date: **1995**

Scale: 1:10,000

Printed at: 1:10,000

N
W E
S

Surveyed 1989
Revised 1995
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1980
Revised 1995
Edition N/A
Copyright N/A
Levelled N/A

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Groundsure INSIGHTS

Site Details:

DEVELOPMENT SITE AT
FORMER 81 TO 88,
BERESFORD STREET,
WOOLWICH, SE18 6BG

Client Ref: 21-237-FDO-22277
Report Ref: HMD-154-7652360
Grid Ref: 543675, 179058

Map Name: National Grid

Map date: **2001**

Scale: 1:10,000

Printed at: 1:10,000

N
W E
S

Powered by

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E: info@groundsure.com
W: www.groundsure.com

Production date: 12 March 2021

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf

Groundsure INSIGHTS

Site Details:

DEVELOPMENT SITE AT
FORMER 81 TO 88,
BERESFORD STREET,
WOOLWICH, SE18 6BG

Client Ref: 21-237-FDO-22277
Report Ref: HMD-154-7652360
Grid Ref: 543675, 179058

Map Name: National Grid

Map date: **2010**

Scale: 1:10,000

Printed at: 1:10,000

N
W E
S

Powered by OS

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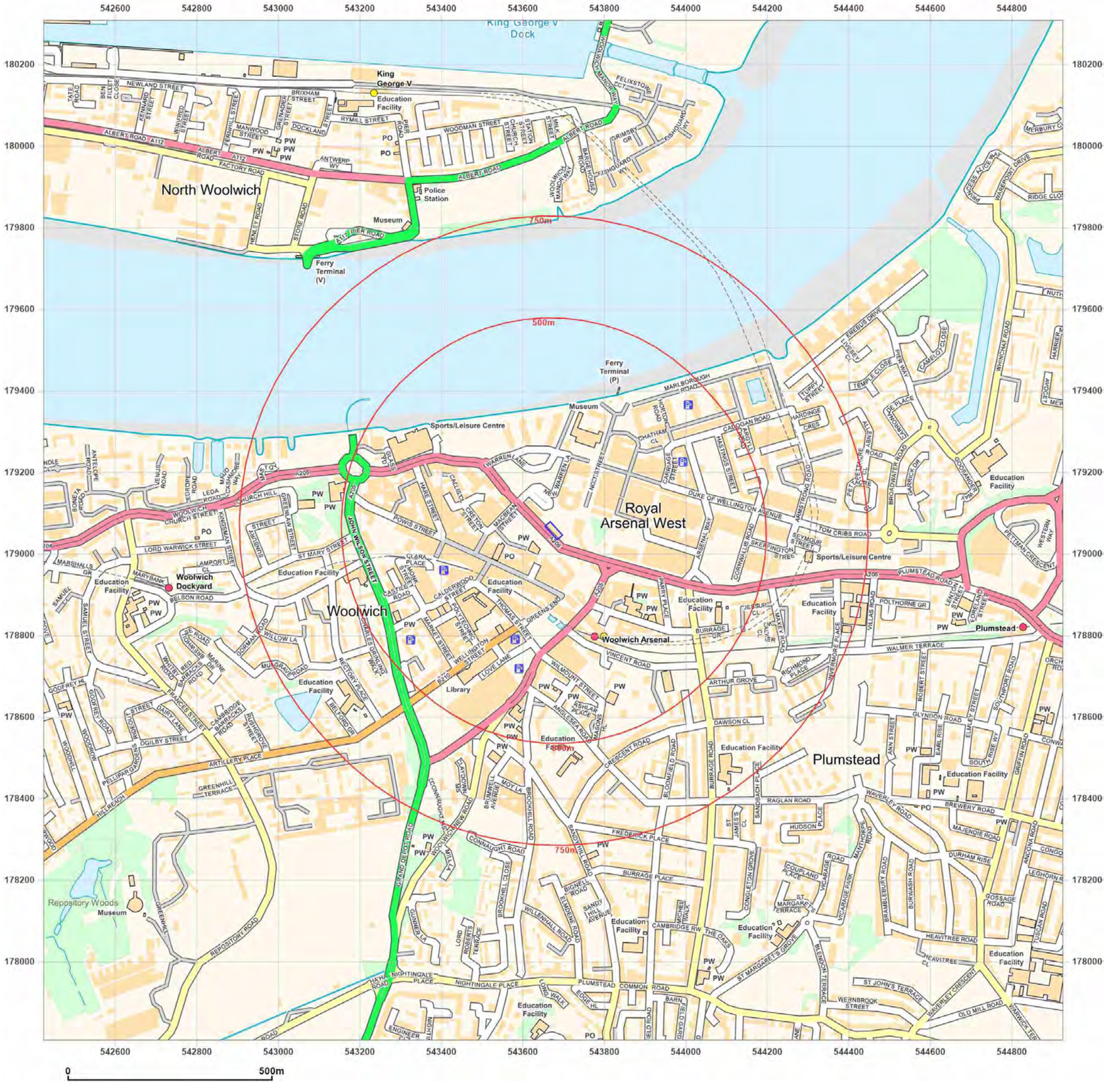
W: www.groundsure.com

Production date: 12 March 2021

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



Groundsure INSIGHTS

Site Details:

DEVELOPMENT SITE AT
FORMER 81 TO 88,
BERESFORD STREET,
WOOLWICH, SE18 6BG

Client Ref: 21-237-FDO-22277
Report Ref: HMD-154-7652360
Grid Ref: 543675, 179058

Map Name: National Grid
Map date: 2021
Scale: 1:10,000
Printed at: 1:10,000

N
W E
S

Powered by

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W: www.groundsure.com

Production date: 12 March 2021

Map legend available at:
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APPENDIX 3 ▪ Radon Potential Dataset Mapping

Groundsure
LOCATION INTELLIGENCE

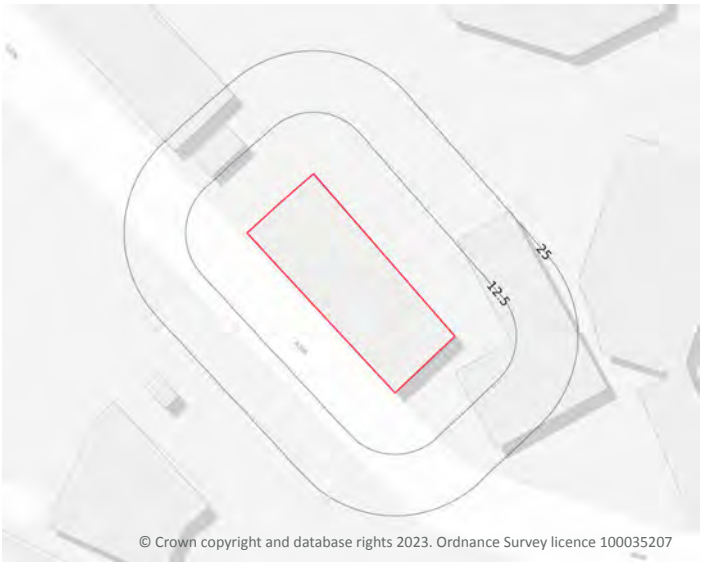
Radon Check

92 ROYAL SOVEREIGN HOUSE, BERESFORD STREET, WOOLWICH, SE18 6BF

Professional opinion

PASS

Site plan



Search results

Not in a radon affected area

Local levels of radon are considered normal.

However, if an underground room makes up part of the accommodation, the property should be tested regardless of radon Affected Area status.

Useful contacts

UK Health Security Agency (UKHSA) / UKRadon
Radon Survey
Chemical, Radiation and Environmental Hazards
Chilton, Didcot
Oxon
OX11 0RQ
https://www.ukradon.org/

UK Radon Association
http://www.radonassociation.co.uk/

Overview of findings and recommendations

Radon

No further action is recommended based on the identified local levels of radon.

However, all basement and cellar areas are considered at additional risk from high radon levels. If an underground room such as a cellar or basement makes up part of the living or working accommodation, the property should be tested regardless of radon Affected Area status.

It should be noted that although this report uses the best available data this assessment is an estimation and is not based upon measurements. It is possible to find high radon levels in properties anywhere in the country, even in lower risk areas, as radon is everywhere in varying concentrations.

Conveyancing Information Executive and our terms & conditions

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- Compliance with the Conveyancing Information Executive Standards will be a condition within the Conveyancing Information Executive Member's Terms and Conditions.
- Conveyancing Information Executive Members will promote the benefits of and deliver the Search to the agreed standards and in the best interests of the customer and associated parties.

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If you remain dissatisfied with the firm's final response, after your complaint has been formally considered, or if the firm has exceeded the response timescales, you may refer your complaint for consideration under The Property Ombudsman scheme (TPOs). The Ombudsman can award up to £5,000 to you if the Ombudsman finds that you have suffered actual financial loss and/or aggravation, distress or inconvenience as a result of your search provider failing to keep to the Standards.

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- acknowledge it within 5 working days of receipt
- normally deal with it fully and provide a final response, in writing, within 20 working days of receipt
- liaise, at your request, with anyone acting formally on your behalf

Complaints should be sent to:
Operations Director, Groundsure Ltd, Nile House, Nile Street, Brighton, BN1 1HW. Tel: 01273 257 755. Email: info@groundsure.com If you are not satisfied with our final response, or if we exceed the response timescales, you may refer the complaint to The Property Ombudsman scheme (TPOs): Tel: 01722 333306, E-mail: admin@tpos.co.uk We will co-operate fully with the Ombudsman during an investigation and comply with their final decision.

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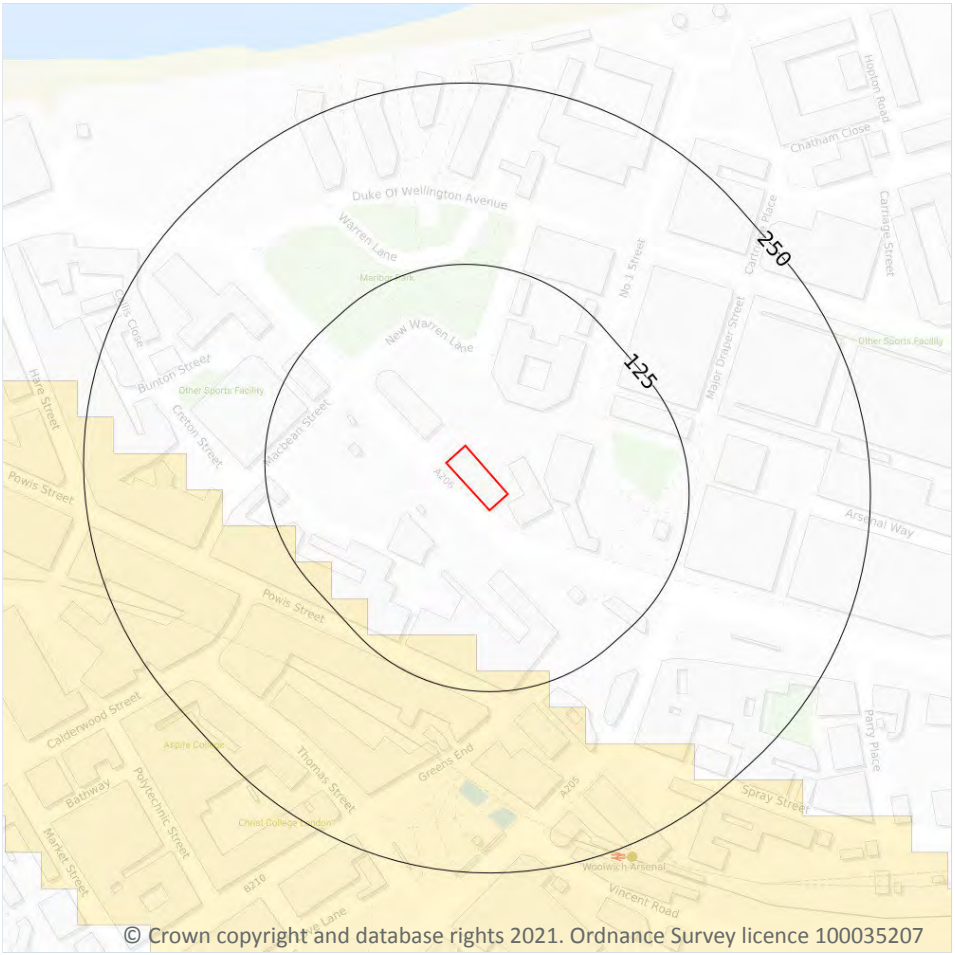
Data providers

Groundsure works with respected data providers to bring you the most relevant and accurate information in your Radon Check report. To find out who they are and their areas of expertise see https://www.groundsure.com/sources-reference.

19 Radon



19.1 Radon

Records on site	1

Estimated percentage of dwellings exceeding the Radon Action Level. This data is the highest resolution radon dataset available for the UK and is produced to a 75m level of accuracy to allow for geological data accuracy and a 'residential property' buffer. The findings of this section should supersede any estimations derived from the Indicative Atlas of Radon in Great Britain. The data was derived from both geological assessments and long term measurements of radon in more than 479,000 households.

Features are displayed on the Radon map on **page 113**

Location	Estimated properties affected	Radon Protection Measures required
On site	**Less than 1%**	**None****

This data is sourced from the British Geological Survey and Public Health England.

APPENDIX 4

- Exploratory Hole Logs
- BGS Borehole Logs

IDOM

Borehole Log

Borehole No. **MBH01**

Sheet 1 of 4

Project Name:	Beresford Street	Project No. 22277	Co-ords: 543693E - 179056N
Location:	Woolwich		Level (m): 10.65
Equipment:	Dando 2000		Dates: 03/07/2023

Scale 1:50

Logged By CMM

Checked By

Well	Wtr Strk	Sample and In Situ Testing: Depth (m)	Type	Results	Coring: FI	TCR	SCR	RQD	Depth (m)	Level (m)	Legend	Stratum Description
									0.10	10.55		Tarmac MADE GROUND
									0.30	10.35		Concrete MADE GROUND Loose, brown, gravelly very clayey SAND. Sand is fine to coarse. Gravel is fine to coarse, sub-angular to rounded of quartzite, chert, brick and carbonaceous fragments. MADE GROUND
		1.50	ES									
		1.50 - 1.95	D									
		1.50	SPT(S)	N=2 (1,0/0,1,0,1)								
		2.25	D						2.20	8.45		Medium dense, brown, very gravelly SAND. Sand is fine to coarse. Gravel is fine to coarse, rounded to sub-angular of flint, quartzite and siltstone. HEAD DEPOSITS
		2.50 - 2.95	B									
		2.50	SPT(C)	N=20 (4,5/5,6,5,4)								
		3.30	D						3.30	7.35		Medium dense, brown, slightly gravelly SAND. Sand is fine to coarse, gravel is fine to coarse, sub-rounded of chert, quartzite and flint. HEAD DEPOSITS
		3.30 - 3.50	B									
		3.50 - 3.95	D									
		3.50	SPT(S)	N=41 (4,6/6,8,13,14)					3.70	6.95		Dense, thinly bedded, light grey, fine to medium grained SAND with rare fine to medium gravel sized flint. THANET SAND FORMATION
		4.25	D									
		4.50 - 4.77	B						4.50	6.15		Very dense, thinly bedded, light grey, fine to medium gained SAND. THANET SAND FORMATION
		4.50	SPT(C)	50 (2,7/50 for 122mm)								
		5.50	D									
		6.00 - 6.29	D									
		6.00	SPT(S)	50 (3,8/50 for 136mm)								
		7.00	D									
		7.50 - 7.82	D									
		7.50	SPT(S)	50 (2,5/50 for 173mm)								
		8.50	D									
		9.00 - 9.35	D									
		9.00	SPT(S)	50 (4,8/50 for 201mm)								
		10.00	D									

Continued on Next Sheet

D = small disturbed sample (tub)
J = organic sample (amber glass jar)
V = volatile sample (amber glass vial)
B = bulk bag sample
SPT(C) = Standard Penetration Test (Cone)
SPT(S) = Standard Penetration Test (Split Spoon)

HSV = hand shear vane (kPa)
PP = pocket penetrometer (kg.cm2)
PID = photoionisation detector (ppm)
FI = fracture index
TCR = total core recovery
SCR = solid core recovery
RQD = rock quality designation

Remarks

Coordinates and levels, where indicated, must not be used for design purposes. The user is responsible for verifying all site and setting out dimensions.

Water struck at 18.00 m bgl, rose to 10.60 m bgl after 20 minutes.

IDOM

Borehole Log

Borehole No. **MBH01**

Sheet 2 of 4

Project Name:	Beresford Street	Project No. 22277	Co-ords: 543693E - 179056N
Location:	Woolwich		Level (m): 10.65
Equipment:	Dando 2000		Dates: 03/07/2023

Scale 1:50

Logged By CMM

Checked By

Well	Wtr Strk	Sample and In Situ Testing Depth (m)	Type	Results	Coring FI	TCR	SCR	RQD	Depth (m)	Level (m)	Legend	Stratum Description
	▼	10.50 - 10.83 10.50	D SPT(S)	50 (8,10/50 for 181mm)								Very dense, thinly bedded, light grey, fine to medium gained SAND. THANET SAND FORMATION
		11.50	D									
		12.00 - 12.35 12.00	D SPT(S)	50 (6,12/50 for 203mm)								
		13.00	D									
		13.50 - 13.93 13.50	D SPT(S)	N=50 (3,6/50 for 280mm)								
												Locally slightly clayey at 14.00 m bgl.
		14.50	D									
		15.00 - 15.36 15.00	D SPT(S)	50 (4,6/50 for 211mm)								
		16.00	D									
		16.50 - 16.95 16.50	D SPT(S)	N=16 (2,4/3,4,5,4)								*Medium dense at 16.50 m bgl.*
		17.50	D									
	▽	18.00 - 18.45 18.00	D SPT(S)	N=6 (1,0/0,2,2,2)					17.80	-7.15		Structureless comminuted CHALK comprising soft, white, slightly gravelly SILT. Gravels are fine to coarse, sub-angular to sub-rounded of flint. Grade Dm. UNDIFFERENTIATED CHALK
		18.50 - 19.50	B									
		19.50 - 19.95 19.50	D SPT(S)	N=4 (1,0/0,0,2,2)								
												Continued on Next Sheet

D = small disturbed sample (tub)
J = organic sample (amber glass jar)
V = volatile sample (amber glass vial)
B = bulk bag sample
SPT(C) = Standard Penetration Test (Cone)
SPT(S) = Standard Penetration Test (Split Spoon)

HSV = hand shear vane (kPa)
PP = pocket penetrometer (kg.cm2)
PID = photoionisation detector (ppm)
FI = fracture index
TCR = total core recovery
SCR = solid core recovery
RQD = rock quality designation

Remarks

Coordinates and levels, where indicated, must not be used for design purposes.
The user is responsible for verifying all site and setting out dimensions.

Water struck at 18.00 m bgl, rose to 10.60 m bgl after 20 minutes.

IDOM

Borehole Log

Borehole No. **MBH01**

Sheet 3 of 4

Project Name:	Beresford Street	Project No. 22277	Co-ords: 543693E - 179056N
Location:	Woolwich		Level (m): 10.65
Equipment:	Dando 2000		Dates: 03/07/2023

Scale 1:50

Logged By CMM

Checked By

Well	Wtr Strk	Sample and In Situ Testing			Coring				Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results	FI	TCR	SCR	RQD				
		20.50	D									Structureless comminuted CHALK comprising soft, white, slightly gravelly SILT. Gravels are fine to coarse, sub-angular to sub-rounded of flint. Grade Dm. UNDIFFERENTIATED CHALK
		21.00 - 21.45 21.00	D SPT(S)	N=6 (1,1/1,1,2,2)								
		22.00	D						22.00	-11.35		
		22.50 - 22.95 22.50	D SPT(S)	N=29 (3,5/6,7,8,8)								Extremely weak, medium density, white CHALK recovered as structureless comminuted CHALK. Comprising soft, white gravelly SILT. Gravels are fine to coarse, sub-angular to rounded of flint and clasts of chalk. Grade B4. UNDIFFERENTIATED CHALK
		23.50	D									
		24.00 - 24.65 24.00 - 24.65	B UF	Ublow=100								*U100 at 24.00 m bgl failed to recover any sample.*
		25.00	D									
		25.50 - 25.95 25.50	D SPT(S)	N=33 (5,7/9,7,8,9)								
		26.50	D									
		27.00 - 27.65 27.00 - 27.65	B UF	Ublow=100								*U100 at 27.00 m bgl failed to recovered sample; however, shoe sample comprised extremely weak, medium density CHALK. Very closely spaced bedding (5/10/30) infilled (1/3/10) with comminuted chalk.*
		28.00	D									
		28.50 - 28.95 28.50	D SPT(S)	N=32 (5,7/7,8,8,9)								
		29.50	D									
		30.00 - 30.65	B									Continued on Next Sheet

21 22 23 24 25 26 27 28 29 30

D = small disturbed sample (tub)
J = organic sample (amber glass jar)
V = volatile sample (amber glass vial)
B = bulk bag sample
SPT(C) = Standard Penetration Test (Cone)
SPT(S) = Standard Penetration Test (Split Spoon)

HSV = hand shear vane (kPa)
PP = pocket penetrometer (kg.cm2)
PID = photoionisation detector (ppm)
FI = fracture index
TCR = total core recovery
SCR = solid core recovery
RQD = rock quality designation

Remarks

Coordinates and levels, where indicated, must not be used for design purposes.
The user is responsible for verifying all site and setting out dimensions.

Water struck at 18.00 m bgl, rose to 10.60 m bgl after 20 minutes.

IDOM

Borehole Log

Borehole No. **MBH01**

Sheet 4 of 4

Project Name:	Beresford Street	Project No. 22277	Co-ords: 543693E - 179056N
Location:	Woolwich		Level (m): 10.65
Equipment:	Dando 2000		Dates: 03/07/2023

Scale 1:50

Logged By CMM

Checked By

Well	Wtr Strk	Sample and In Situ Testing Depth (m)	Type	Results	Coring FI	TCR	SCR	RQD	Depth (m)	Level (m)	Legend	Stratum Description
		30.00 - 30.65	UF	Ublow=100								Extremely weak, medium density, white CHALK recovered as structureless comminuted CHALK. Comprising soft, white gravelly SILT. Gravels are fine to coarse, sub-angular to rounded of flint and clasts of chalk. Grade B4. UNDIFFERENTIATED CHALK
												U100 at 30.00 m bgl failed to recover sample.
		31.00	D									
		31.50 - 31.95	D									
		31.50	SPT(S)	N=30 (5,6/7,7,8,8)								
		32.50	D									
		33.00 - 33.45	D									
		33.00	SPT(S)	N=31 (6,6/7,8,8,8)								
		34.00	D									
		34.50 - 34.74	D									
		34.50	SPT(S)	50 (25 for 106mm/50 for 131mm)								*Thin flint horizon encountered at 34.50 m bgl.*
		35.50	D									
		36.00 - 36.45	D									
		36.00	SPT(S)	N=36 (7,7/8,9,9,10)								
		37.00	D									
		37.50 - 37.95	D									
		37.50	SPT(S)	N=39 (6,8/8,9,10,12)								
		38.50	D									
		39.00 - 39.45	D									
		39.00	SPT(S)	N=43 (6,8/9,10,11,13)								
		40.00	D						40.00	-29.35		End of Borehole at 40.00m

D = small disturbed sample (tub)
J = organic sample (amber glass jar)
V = volatile sample (amber glass vial)
B = bulk bag sample
SPT(C) = Standard Penetration Test (Cone)
SPT(S) = Standard Penetration Test (Split Spoon)

HSV = hand shear vane (kPa)
PP = pocket penetrometer (kg.cm2)
PID = photoionisation detector (ppm)
FI = fracture index
TCR = total core recovery
SCR = solid core recovery
RQD = rock quality designation

Remarks

Coordinates and levels, where indicated, must not be used for design purposes.
The user is responsible for verifying all site and setting out dimensions.

Water struck at 18.00 m bgl, rose to 10.60 m bgl after 20 minutes.

IDOM

Borehole Log

Borehole No. **MBH201**

Sheet 1 of 4

Project Name:	Beresford Street	Project No. 22277	Co-ords: 543657E - 179080N
Location:	Woolwich		Level (m): 10.80
Equipment:	Dando 2000		Dates: 08/01/2024

Scale 1:50

Logged By JB/MC

Checked By CMM

Well	Wtr Strk	Sample and In Situ Testing: Depth (m)	Type	Results	Coring: FI	TCR	SCR	RQD	Depth (m)	Level (m)	Legend	Stratum Description
		0.20 - 0.40	B						0.15	10.65		Dark grey TARMACADAM hardstanding.
									0.50	10.30		MADE GROUND comprising grey and dark brown gravelly slightly clayey SAND with low cobble content. Sand is fine to coarse. Gravel is fine to coarse angular to subrounded of brick, concrete, flint, clinker, coal, chalk and rare glass. Cobbles are fine to medium subangular of concrete
		0.70 - 0.90	B						0.70	10.10		Grey CONCRETE.
		1.00	D									MADE GROUND comprising greyish brown sandy GRAVEL. Gravel is fine to medium angular to subrounded of concrete, flint and brick.
		1.20 - 1.65	D									
		1.20	SPT(S)	N=5 (1,0/0,1,2,2)								
		1.70 - 1.90	B						1.60	9.20		Dense, greyish brown sandy GRAVEL. Sand is medium to coarse. Sand is fine to coarse. Gravel is fine to medium, subrounded to rounded of flint. [HEAD DEPOSITS]
		2.00	D									
		2.00 - 2.45	B									
		2.00	SPT(C)	N=36 (5,8/8,8,10,10)								
		2.90	D						2.90	7.90		Loose yellowish brown silty gravelly SAND. Sand is fine to coarse. Gravel is fine to medium, subrounded to rounded of flint. [HEAD DEPOSITS]
		3.00 - 3.45	B									
		3.00	SPT(C)	N=10 (1,2/2,2,3,3)								
		3.80	D						3.80	7.00		Medium dense greyish brown slightly silty fine to medium SAND. [THANET SAND FORMATION]
		4.00 - 4.45	D									
		4.00	SPT(S)	N=21 (2,4/4,5,6,6)								
		4.75	D									
		5.00 - 5.45	D									*Becoming dense at 5.0 m bgl.*
		5.00	SPT(S)	N=30 (3,3/5,6,9,10)								
		5.75	D									
		6.00 - 6.45	D									
		6.00	SPT(S)	N=44 (1,4/7,11,11,15)								
		7.00	D									
		7.50 - 7.95	D									
		7.50	SPT(S)	N=39 (3,4/7,9,11,12)								
		8.50	D									
		9.00 - 9.45	D									
		9.00	SPT(S)	N=38 (1,3/7,9,10,12)								
		10.00	D									Continued on Next Sheet

D = small disturbed sample (tub)
J = organic sample (amber glass jar)
V = volatile sample (amber glass vial)
B = bulk bag sample
SPT(C) = Standard Penetration Test (Cone)
SPT(S) = Standard Penetration Test (Split Spoon)

HSV = hand shear vane (kPa)
PP = pocket penetrometer (kg.cm2)
PID = photoionisation detector (ppm)
FI = fracture index
TCR = total core recovery
SCR = solid core recovery
RQD = rock quality designation

Remarks

Coordinates and levels, where indicated, must not be used for design purposes.
The user is responsible for verifying all site and setting out dimensions.

IDOM

Borehole Log

Borehole No. **MBH201**

Sheet 2 of 4

Project Name:	Beresford Street	Project No. 22277	Co-ords: 543657E - 179080N
Location:	Woolwich		Level (m): 10.80
Equipment:	Dando 2000		Dates: 08/01/2024

Scale 1:50

Logged By JB/MC

Checked By CMM

Well	Wtr Strk	Sample and In Situ Testing Depth (m)	Type	Results	Coring FI	TCR	SCR	RQD	Depth (m)	Level (m)	Legend	Stratum Description
												Medium dense greyish brown slightly silty fine to medium SAND. [THANET SAND FORMATION]
		10.50 - 10.95 10.50	D SPT(S)	N=47 (4,8/9,11,13,14)								
		11.50	D									
		12.00 - 12.40 12.00	D SPT(S)	N=50 (5,7/50 for 247mm)								*Very dense between 12.00 and 13.50 m bgl.*
		13.00	D									
		13.50 - 13.88 13.50	D SPT(S)	N=50 (3,6/50 for 229mm)								
		14.50	D									
		15.00 - 15.45 15.00	D SPT(S)	N=47 (3,5/7,11,13,16)								
		16.00	D									
		16.50 - 16.95 16.50	D SPT(S)	N=32 (2,4/6,7,9,10)								
		17.50	D									
		18.00 - 18.45 18.00	D SPT(S)	N=23 (3,3/5,6,5,7)					17.90	-7.10		Structureless comminuted CHALK comprising soft, yellowish white, gravelly SILT with low cobble content. Gravels are fine to coarse, subangular to rounded of chalk and flint. Cobbles are fine to medium, subrounded to rounded of chalk and flint. Grade Dm. [UNDIFFERENTIATED CHALK]
		18.50 - 19.50	B									
		19.50 - 19.94 19.50	D SPT(S)	N=46 (7,18/18,11,9,8)								
												Continued on Next Sheet

11 12 13 14 15 16 17 18 19 20

D = small disturbed sample (tub)
J = organic sample (amber glass jar)
V = volatile sample (amber glass vial)
B = bulk bag sample
SPT(C) = Standard Penetration Test (Cone)
SPT(S) = Standard Penetration Test (Split Spoon)

HSV = hand shear vane (kPa)
PP = pocket penetrometer (kg.cm2)
PID = photoionisation detector (ppm)
FI = fracture index
TCR = total core recovery
SCR = solid core recovery
RQD = rock quality designation

Remarks

Coordinates and levels, where indicated, must not be used for design purposes.
The user is responsible for verifying all site and setting out dimensions.

IDOM

Borehole Log

Borehole No. **MBH201**

Sheet 3 of 4

Project Name:	Beresford Street	Project No. 22277	Co-ords: 543657E - 179080N
Location:	Woolwich		Level (m): 10.80
Equipment:	Dando 2000		Dates: 08/01/2024

Scale 1:50

Logged By JB/MC

Checked By CMM

Well	Wtr Strk	Sample and In Situ Testing			Coring				Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results	FI	TCR	SCR	RQD				
		20.50	D									Structureless comminuted CHALK comprising soft, yellowish white, gravelly SILT with low cobble content. Gravels are fine to coarse, subangular to rounded of chalk and flint. Cobbles are fine to medium, subrounded to rounded of chalk and flint. Grade Dm. [UNDIFFERENTIATED CHALK]
		21.00 - 21.45 21.00	D SPT(S)	N=21 (3,3/4,5,6,6)								
		22.00	D						22.00	-11.20		Structureless comminuted CHALK comprising very soft, white, gravelly SILT. Gravels are fine to coarse flint. Grade Dm. [UNDIFFERENTIATED CHALK]
		22.50 - 22.95 22.50	D SPT(S)	N=23 (2,3/5,5,6,7)								
		23.00 - 24.00	D						23.00	-12.20		Structureless CHALK comprising silty GRAVEL. Gravels are extremely weak, high density, white, medium to coarse subrounded chalk. Grade Dc. [UNDIFFERENTIATED CHALK]
		24.00 - 24.45 24.00	D SPT(S)	N=23 (8,5/5,5,6,7)								
		24.50 - 25.50	D						24.50	-13.70		Structureless CHALK comprising silty GRAVEL. Gravels are extremely weak, high density, white, medium to coarse subrounded chalk. Grade Dc. [UNDIFFERENTIATED CHALK]
		25.50 - 25.95 25.50	D SPT(S)	N=23 (4,5/5,5,6,7)								
		26.00 - 27.00	D									
		27.00 - 27.45 27.00	D SPT(S)	N=20 (3,4/4,5,5,6)								
		27.50 - 28.50	D									
		28.50 - 28.95 28.50	D SPT(S)	N=14 (4,3/3,4,3,4)								
		29.00 - 30.00	D									
		30.00 - 30.45	D									Continued on Next Sheet

21 22 23 24 25 26 27 28 29 30

D = small disturbed sample (tub)
J = organic sample (amber glass jar)
V = volatile sample (amber glass vial)
B = bulk bag sample
SPT(C) = Standard Penetration Test (Cone)
SPT(S) = Standard Penetration Test (Split Spoon)

HSV = hand shear vane (kPa)
PP = pocket penetrometer (kg.cm2)
PID = photoionisation detector (ppm)
FI = fracture index
TCR = total core recovery
SCR = solid core recovery
RQD = rock quality designation

Remarks

Coordinates and levels, where indicated, must not be used for design purposes.
The user is responsible for verifying all site and setting out dimensions.

IDOM

Borehole Log

Borehole No. **MBH201**

Sheet 4 of 4

Project Name:	Beresford Street	Project No. 22277	Co-ords: 543657E - 179080N
Location:	Woolwich		Level (m): 10.80
Equipment:	Dando 2000		Dates: 08/01/2024

Scale 1:50

Logged By JB/MC

Checked By CMM

Well	Wtr Strk	Sample and In Situ Testing: Depth (m)	Type	Results	Coring: FI	TCR	SCR	RQD	Depth (m)	Level (m)	Legend	Stratum Description
		30.00	SPT(S)	N=17 (3,3/4,5,4,4)								Structureless CHALK comprising silty GRAVEL. Gravels are extremely weak, high density, white, medium to coarse subrounded chalk. Grade Dc. [UNDIFFERENTIATED CHALK]
		30.50 - 31.50	D						30.50	-19.70		Structureless CHALK comprising soft, white gravelly SILT. Gravel is angular fine to coarse flint. Grade Dm. [UNDIFFERENTIATED CHALK]
		31.50 - 31.95	D									
		31.50	SPT(S)	N=27 (4,4/5,6,7,9)								
		32.00 - 33.00	D						32.00	-21.20		Structureless CHALK comprising silty GRAVEL. Gravels are extremely weak, high density, white, medium to coarse subrounded chalk. Grade Dc. [UNDIFFERENTIATED CHALK]
		33.00 - 33.45	D									
		33.00	SPT(S)	N=27 (4,5/5,7,7,8)								
		33.50 - 34.50	D									
		34.50 - 34.95	D									
		34.50	SPT(S)	N=33 (4,6/6,7,10,10)								
		35.00 - 36.00	D						35.00	-24.20		Structureless comminuted CHALK comprising soft, white, gravelly SILT. Gravels are fine to coarse, flint. Grade Dm. [UNDIFFERENTIATED CHALK]
		36.00 - 36.45	D						36.00	-25.20		Structureless CHALK comprising silty GRAVEL. Gravels are extremely weak, high density, white, medium to coarse subrounded chalk. Grade Dc. [UNDIFFERENTIATED CHALK]
		36.00	SPT(S)	N=34 (3,7/6,8,9,11)								
		36.50 - 37.50	D									
		37.50 - 37.95	D									
		37.50	SPT(S)	N=37 (5,8/8,8,10,11)								
		38.00 - 39.00	D						38.00	-27.20		Structureless comminuted CHALK comprising soft, white, gravelly SILT. Gravels are fine to coarse flint. Grade Dm. [UNDIFFERENTIATED CHALK]
		39.00 - 39.45	D									
		39.00	SPT(S)	N=39 (3,5/7,13,10,9)								
		39.50 - 40.00	D									
									40.00	-29.20		End of Borehole at 40.00m

31 32 33 34 35 36 37 38 39 40

D = small disturbed sample (tub)
J = organic sample (amber glass jar)
V = volatile sample (amber glass vial)
B = bulk bag sample
SPT(C) = Standard Penetration Test (Cone)
SPT(S) = Standard Penetration Test (Split Spoon)

HSV = hand shear vane (kPa)
PP = pocket penetrometer (kg.cm2)
PID = photoionisation detector (ppm)
FI = fracture index
TCR = total core recovery
SCR = solid core recovery
RQD = rock quality designation

Remarks

Coordinates and levels, where indicated, must not be used for design purposes.
The user is responsible for verifying all site and setting out dimensions.

IDOM

Windowless Sample Log

Borehole No. **MWS101**

Sheet 1 of 1

Project Name:	Beresford Street	Project No. 22277	Co-ords: 543651E - 179081N
Location:	Woolwich		Level (m): 10.80
Equipment:	Archway Competitor Dart		Dates: 08/01/2024

Scale 1:25

Logged By JB

Checked By CMM

Well	Wtr Strk	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.20	10.60		Dark grey TARMACADAM hardstanding.
		0.40	ES					MADE GROUND comprising light brown gravelly clayey SAND. Sand is fine to coarse. Gravel is fine to coarse, angular to subrounded of concrete, brick, flint, rare plastic and rare chalk.
		0.60	ES		0.50	10.30		MADE GROUND comprising greyish brown gravelly clayey SAND. Sand is fine to coarse. Gravel is fine to coarse subangular to subrounded of concrete, brick, flint, coal and rare glass.
					1.10	9.70		
		1.20	SPT()	N=10 (2,3/3,2,3,2)				MADE GROUND comprising red yellow and brown sandy GRAVEL. Gravel is fine to coarse, angular to subrounded of concrete and brick.
		1.30	ES					
					1.70	9.10		MADE GROUND comprising brown sandy gravelly clayey SILT. Gravel fine to coarse, angular to subrounded of concrete, brick and coal.
		1.80	ES		1.90	8.90		Grey CONCRETE.
		2.00	SPT()	50 (25 for 115mm/50 for 15mm)	2.00	8.80		End of Borehole at 2.00m

1 2 3 4 5

D = small disturbed sample (tub)
J = organic sample (amber glass jar)
V = volatile sample (amber glass vial)
B = bulk bag sample

SPT(C) = Standard Penetration Test (Cone)
SPT(S) = Standard Penetration Test (Split Spoon)
HSV = hand shear vane (kPa)
PP = pocket penetrometer (kg.cm2)
PID = photoionisation detector (ppm)

Remarks

Coordinates and levels, where indicated, must not be used for design purposes. The designer is responsible for verifying all site and setting out dimensions.

1) Borehole terminated on subsurface concrete slab. 2) Groundwater not encountered.

IDOM

Windowless Sample Log

Borehole No. **MWS102a**

Sheet 1 of 1

Project Name:	Beresford Street	Project No. 22277	Co-ords: 543656E - 179087N
Location:	Woolwich		Level (m): 10.85
Equipment:	Archway Competitor Dart		Dates: 08/01/2024

Scale 1:25

Logged By JB

Checked By CMM

Well	Wtr Strk	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.30	ES		0.19	10.66		Dark grey TARMACADAM hardstanding.
								MADE GROUND comprising brown sandy gravelly clayey SILT. Gravel is fine to coarse, angular to subangular of brick, concrete, flint, chalk, coal, rare clay pipe and rare glass.
					0.73	10.12		Grey CONCRETE.
					0.74	10.11		End of Borehole at 0.74m

1 2 3 4 5

D = small disturbed sample (tub)
J = organic sample (amber glass jar)
V = volatile sample (amber glass vial)
B = bulk bag sample

SPT(C) = Standard Penetration Test (Cone)
SPT(S) = Standard Penetration Test (Split Spoon)
HSV = hand shear vane (kPa)
PP = pocket penetrometer (kg.cm2)
PID = photoionisation detector (ppm)

Remarks

Coordinates and levels, where indicated, must not be used for design purposes. The designer is responsible for verifying all site and setting out dimensions.

1) Borehole terminated on subsurface concrete slab. 2) Groundwater not encountered.

IDOM

Windowless Sample Log

Borehole No. **MWS102b**

Sheet 1 of 1

Project Name:	Beresford Street	Project No. 22277	Co-ords:	543657E - 179088N	Scale 1:25
Location:	Woolwich		Level (m):	10.85	Logged By JB
Equipment:	Archway Competitor Dart		Dates:	08/01/2024	Checked By CMM

Well	Wtr Strk	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.21	10.64		Dark grey TARMACADAM hardstanding.
					0.40	10.45		MADE GROUND comprising brown sandy GRAVEL. Sand is coarse. Gravel is fine to medium subangular to rounded of flint.
								Orange drainage service pipe within gravel trench. Borehole terminated.
								End of Borehole at 0.40m

D = small disturbed sample (tub)
J = organic sample (amber glass jar)
V = volatile sample (amber glass vial)
B = bulk bag sample

SPT(C) = Standard Penetration Test (Cone)
SPT(S) = Standard Penetration Test (Split Spoon)
HSV = hand shear vane (kPa)
PP = pocket penetrometer (kg.cm2)
PID = photoionisation detector (ppm)

Remarks

Coordinates and levels, where indicated, must not be used for design purposes. The designer is responsible for verifying all site and setting out dimensions.

1) Borehole terminated above drainage service pipe. 2) Groundwater not encountered.

IDOM

Windowless Sample Log

Borehole No. **MWS102c**

Sheet 1 of 1

Project Name:	Beresford Street	Project No. 22277	Co-ords: 543659E - 179085N
Location:	Woolwich		Level (m): 10.85
Equipment:	Archway Competitor Dart		Dates: 08/01/2024

Scale 1:25

Logged By JB

Checked By CMM

Well	Wtr Strk	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.20	10.65		Dark grey TARMACADAM hardstanding.
		0.60	ES					MADE GROUND comprising brown sandy gravelly clayey SILT. Gravel is fine to coarse, angular to subangular of brick, concrete, flint, chalk, coal, rare metal and rare glass.
					0.73	10.12		Grey CONCRETE.
					0.74	10.11		End of Borehole at 0.74m

1 2 3 4 5

D = small disturbed sample (tub)
J = organic sample (amber glass jar)
V = volatile sample (amber glass vial)
B = bulk bag sample

SPT(C) = Standard Penetration Test (Cone)
SPT(S) = Standard Penetration Test (Split Spoon)
HSV = hand shear vane (kPa)
PP = pocket penetrometer (kg.cm2)
PID = photoionisation detector (ppm)

Remarks

Coordinates and levels, where indicated, must not be used for design purposes. The designer is responsible for verifying all site and setting out dimensions.

1) Borehole terminated on subsurface concrete slab. 2) Groundwater not encountered.

IDOM

Windowless Sample Log

Borehole No. **MWS103a**

Sheet 1 of 1

Project Name:	Beresford Street	Project No. 22277	Co-ords: 543663E - 179086N
Location:	Woolwich		Level (m): 10.75
Equipment:	Archway Competitor Dart		Dates: 08/01/2024

Scale 1:25

Logged By JB

Checked By CMM

Well	Wtr Strk	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.22	10.53		Dark grey TARMACADAM hardstanding.
		0.50	ES					MADE GROUND comprising brown, grey and black clayey gravelly SAND. Sand is fine to coarse. Gravel is fine to coarse, angular to subangular of brick, concrete, flint, chalk, coal, rare plastic, rare metal and rare glass.
								Weak hydrocarbon odour within arisings.
					0.64	10.11		Grey CONCRETE.
					0.65	10.10		End of Borehole at 0.65m

D = small disturbed sample (tub)
J = organic sample (amber glass jar)
V = volatile sample (amber glass vial)
B = bulk bag sample

SPT(C) = Standard Penetration Test (Cone)
SPT(S) = Standard Penetration Test (Split Spoon)
HSV = hand shear vane (kPa)
PP = pocket penetrometer (kg.cm2)
PID = photoionisation detector (ppm)

Remarks

Coordinates and levels, where indicated, must not be used for design purposes. The designer is responsible for verifying all site and setting out dimensions.

1) Borehole terminated on subsurface concrete slab. 2) Groundwater not encountered.

Windowless Sample Log

IDOM			Borehole No. MWS103b Sheet 1 of 2
Project Name: Beresford Street	Project No. 22277	Co-ords: 543665E - 179088N	Scale 1:25
Location: Woolwich		Level (m): 10.80	Logged By JB
Equipment: Archway Competitor Dart		Dates: 08/01/2024	Checked By CMM

Well	Wtr Strk	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.21	10.59		Dark grey TARMACADAM hardstanding.
								MADE GROUND comprising brown and grey gravelly clayey SAND. Sand is fine to coarse. Gravel is fine to coarse, angular to subangular of brick, concrete, flint, chalk, coal, clinker and rare plastic.
					0.64	10.16		Light grey CONCRETE.
		0.80	ES		0.75	10.05		MADE GROUND comprising light grey sandy GRAVEL. Gravel is fine to coarse, angular to subrounded of concrete, flint and rare brick.
		1.20	SPT()	N=19 (2,2/2,2,6,9)				
		1.50	ES		1.40	9.40		MADE GROUND comprising dark brown slightly gravelly, sandy clayey SILT. Gravel is fine to medium angular to subrounded of flint, rare brick and rare concrete.
		2.00	SPT()	N=18 (3,3/4,4,5,5)				
		2.20	ES		2.10	8.70		MADE GROUND comprising brownish grey sandy silty GRAVEL. Gravel is fine to coarse, angular to subrounded of flint, concrete and brick.
		2.70	ES		2.50	8.30		Orangish brown sandy clayey GRAVEL. Sand is coarse. Gravel is fine to medium angular to subrounded of flint. [HEAD DEPOSITS]
		3.00	SPT()	N=43 (7,9/9,11,11,12)				
		3.20	ES		3.10	7.70		Dense light yellowish brown fine to medium SAND. [THANET SAND FORMATION]
		4.00	SPT()	N=29 (5,6/5,8,7,9)				*Medium dense at 4.00 m bgl.*
		4.60	D					
					5.00	5.80		Continued on Next Sheet

D = small disturbed sample (tub)
J = organic sample (amber glass jar)
V = volatile sample (amber glass vial)
B = bulk bag sample

SPT(C) = Standard Penetration Test (Cone)
SPT(S) = Standard Penetration Test (Split Spoon)
HSV = hand shear vane (kPa)
PP = pocket penetrometer (kg.cm2)
PID = photoionisation detector (ppm)

Remarks

Coordinates and levels, where indicated, must not be used for design purposes. The designer is responsible for verifying all site and setting out dimensions.

1) Borehole terminated at target depth. 2) Groundwater not encountered.

IDOM

Windowless Sample Log

Borehole No. **MWS103b**

Sheet 2 of 2

Project Name:	Beresford Street	Project No. 22277	Co-ords: 543665E - 179088N
Location:	Woolwich		Level (m): 10.80
Equipment:	Archway Competitor Dart		Dates: 08/01/2024

Scale 1:25

Logged By JB

Checked By CMM

Well	Wtr Strk	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		5.00	SPT()	N=50 (8,9/50 for 275mm)				Dense light yellowish brown fine to medium SAND. [THANET SAND FORMATION] *Very dense at 5.00 m bgl.* End of Borehole at 5.00m

6

7

8

9

10

D = small disturbed sample (tub)
J = organic sample (amber glass jar)
V = volatile sample (amber glass vial)
B = bulk bag sample

SPT(C) = Standard Penetration Test (Cone)
SPT(S) = Standard Penetration Test (Split Spoon)
HSV = hand shear vane (kPa)
PP = pocket penetrometer (kg.cm2)
PID = photoionisation detector (ppm)

Remarks

Coordinates and levels, where indicated, must not be used for design purposes. The designer is responsible for verifying all site and setting out dimensions.

1) Borehole terminated at target depth. 2) Groundwater not encountered.

APPENDIX 5

- Soil Chemistry
- Summary Spreadsheet
- Laboratory Analysis Certificates

Callum Moller
Merebrook
Cromford Mills
Mill Lane
Cromford
Derbyshire
DE4 3RQ

e: cmoller@idom.com

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

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

Analytical Report Number : 23-43372

Project / Site name:	Beresford Street	**Samples received on:**	05/07/2023
Your job number:	22277	**Samples instructed on/ Analysis started on:**	06/07/2023
Your order number:	23 2 FDO LABS	**Analysis completed by:**	14/07/2023
Report Issue Number:	1	**Report issued on:**	14/07/2023
Samples Analysed:	1 soil sample		

Signed:

Joanna Wawrzeczko
Reporting Specialist
For & on behalf of i2 Analytical Ltd.

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

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

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

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

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

Analytical Report Number : 24-78055
Project / Site name: Beresford Street

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

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with dispersion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
D.O. for Gravimetric Quant if Screen/ID positive	Dependent option for Gravimetric Quant if Screen/ID positive scheduled.	In house asbestos methods A001 & A006.	A006-PL	D	NONE

For method numbers ending in 'UK or A' analysis have been carried out in our laboratory in the United Kingdom (WATFORD).
For method numbers ending in 'F' analysis have been carried out in our laboratory in the United Kingdom (East Kilbride).
For method numbers ending in 'PL or B' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.
Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

APPENDIX 6 ▪ Geotechnical Laboratory Certificates

TEST CERTIFICATE

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Tested in Accordance with: BS 1377-2: 1990

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

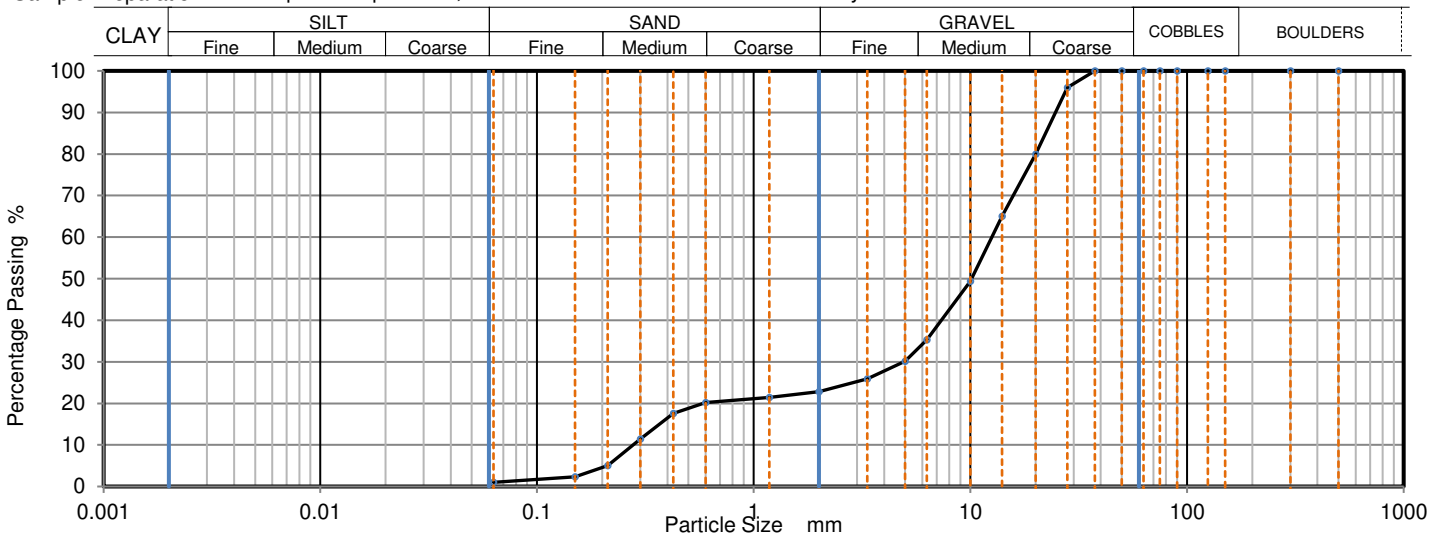
4041

Client:	Merebrook	Client Reference:	22277
Client Address:	Cromford Mills, Mill Lane, Cromford, Derbyshire, DE4 3RQ	Job Number:	23-44215-1
		Date Sampled:	Not Given
		Date Received:	07/07/2023
Contact:	Callum Moller	Date Tested:	18/07/2023
Site Address:	Beresford Street	Sampled By:	Client- Callum Moller

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

Test Results:

Laboratory Reference:	2743419	Depth Top [m]:	2.50
Hole No.:	MBH01	Depth Base [m]:	2.95
Sample Reference:	Not Given	Sample Type:	B
Sample Description:	Yellowish brown sandy GRAVEL		
Sample Preparation:	Sample was quartered, oven dried at 106 °C and broken down by hand.		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
500	100		
300	100		
150	100		
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	96		
20	80		
14	65		
10	49		
6.3	35		
5	30		
3.35	26		
2	23		
1.18	21		
0.6	20		
0.425	18		
0.3	11		
0.212	5		
0.15	2		
0.063	1		

Sample Proportions	% dry mass
Very coarse	0
Gravel	77
Sand	22
Fines <0.063mm	1

Grading Analysis		
D100	mm	37.5
D60	mm	12.6
D30	mm	4.93
D10	mm	0.278
Uniformity Coefficient		45
Curvature Coefficient		7

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

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

Remarks:

Signed:

Katarzyna Koziel
Reporting Specialist
for and on behalf of i2 Analytical Ltd

Date Reported: 21/07/2023

GF 100.23

TEST CERTIFICATE

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Tested in Accordance with: BS 1377-2: 1990

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

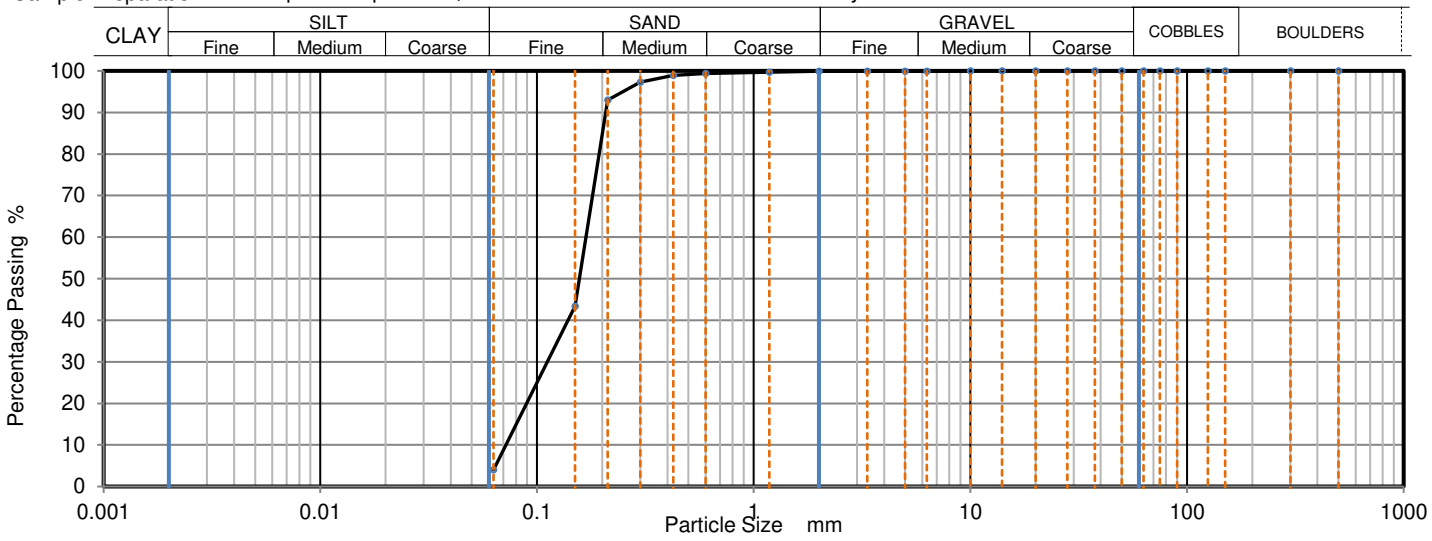
4041

Client:	Merebrook	Client Reference:	22277
Client Address:	Cromford Mills, Mill Lane, Cromford, Derbyshire, DE4 3RQ	Job Number:	23-44215-1
		Date Sampled:	Not Given
		Date Received:	07/07/2023
Contact:	Callum Moller	Date Tested:	18/07/2023
Site Address:	Beresford Street	Sampled By:	Client- Callum Moller

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

Test Results:

Laboratory Reference:	2743420	Depth Top [m]:	4.50
Hole No.:	MBH01	Depth Base [m]:	4.77
Sample Reference:	Not Given	Sample Type:	B
Sample Description:	Light brown SAND		
Sample Preparation:	Sample was quartered, oven dried at 106 °C and broken down by hand.		



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
500	100		
300	100		
150	100		
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	100		
6.3	100		
5	100		
3.35	100		
2	100		
1.18	100		
0.6	99		
0.425	99		
0.3	97		
0.212	93		
0.15	43		
0.063	5		

Sample Proportions	% dry mass
Very coarse	0
Gravel	0
Sand	95
Fines <0.063mm	5

Grading Analysis		
D100	mm	10
D60	mm	0.168
D30	mm	0.111
D10	mm	0.0709
Uniformity Coefficient		2.4
Curvature Coefficient		1

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

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

Remarks:

Signed:

Katarzyna Koziel
Reporting Specialist
for and on behalf of i2 Analytical Ltd

Date Reported: 21/07/2023

GF 100.23

SUMMARY REPORT

METHOD FOR SATURATION MOISTURE CONTENT OF CHALK

Tested in Accordance with: BS 1377-2: 1990: Clause 3.3

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

4041

Client: Merebrook

Client Address: Cromford Mills, Mill Lane,
Cromford, Derbyshire,
DE4 3RQ

Contact: Callum Moller

Site Address: Beresford Street

Client Reference: 22277
Job Number: 23-44215-1
Date Sampled: Not Given
Date Received: 07/07/2023
Date Tested: 20/07/2023
Sampled By: Client- Callum Moller

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

Test results

Laboratory Reference	Hole No.	Sample				Description	Remarks	SMC	Bulk density	Dry density	MC	Preparation
		Reference	Depth Top m	Depth Base m	Type			%	Mg/m3	Mg/m3	%	
2743421	MBH01	Not Given	24.00	24.65	B	White CHALK	Supplied lump of chalk fails to comply with volume requirements as per BS1377:2 Clause 3.3.5.1	33	1.89	1.43	33	
2743422	MBH01	Not Given	27.00	27.65	B	White CHALK	Supplied lump of chalk fails to comply with volume requirements as per BS1377:2 Clause 3.3.5.1	30	1.93	1.50	28	
2743423	MBH01	Not Given	30.00	40.65	B	White CHALK	Supplied lump of chalk fails to comply with volume requirements as per BS1377:2 Clause 3.3.5.1	27	1.97	1.56	26	

Note: SMC - Saturation Moisture Content; MC - Moisture Content

Comments:

Signed:

Katarzyna Koziel
Reporting Specialist
for and on behalf of i2 Analytical Ltd

Date Reported: 21/07/2023

GF 132.15

Callum Moller
Merebrook
Cromford Mills
Mill Lane
Cromford
Derbyshire
DE4 3RQ

e: cmoller@idom.com

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

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

Analytical Report Number : 23-44216

Project / Site name:	Beresford Street	**Samples received on:**	07/07/2023
Your job number:	22277	**Samples instructed on/ Analysis started on:**	10/07/2023
Your order number:	23-2-FDO-LABS	**Analysis completed by:**	21/07/2023
Report Issue Number:	1	**Report issued on:**	21/07/2023
Samples Analysed:	10 soil samples		

Signed:

Dominika Warjan
Reporting Specialist
For & on behalf of i2 Analytical Ltd.

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

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

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

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

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

Analytical Report Number: 23-44216
Project / Site name: Beresford Street
Your Order No: 23-2-FDO-LABS

Lab Sample Number				2743424	2743425	2743426	2743427	2743428
Sample Reference				MBH01	MBH01	MBH01	MBH01	MBH01
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				1.95	2.25	3.50-3.95	4.25	8.50
Date Sampled				Deviating	Deviating	Deviating	Deviating	Deviating
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Stone Content	%	0.1	NONE	< 0.1	97	< 0.1	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	12	0.38	14	18	21
Total mass of sample received	kg	0.001	NONE	0.3	0.3	0.3	0.3	0.3

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	8.3	8.7	8.6	8.7	8.8
Total Sulphate as SO4	%	0.005	MCERTS	0.072	0.017	0.166	0.117	0.069
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.076	0.0042	0.017	0.0098	0.0074
Water Soluble Chloride (2:1) (leachate equivalent)	mg/l	0.5	MCERTS	7.3	< 0.5	5.9	4.9	11
Total Sulphur	%	0.005	MCERTS	0.091	0.01	0.076	0.048	0.029
Water Soluble Nitrate (2:1) as N (leachate equivalent)	mg/l	2	NONE	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0

Heavy Metals / Metalloids

Magnesium (water soluble)	mg/kg	5	NONE	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Magnesium (leachate equivalent)	mg/l	2.5	NONE	< 2.5	< 2.5	< 2.5	< 2.5	< 2.5

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

Analytical Report Number: 23-44216
Project / Site name: Beresford Street
Your Order No: 23-2-FDO-LABS

Lab Sample Number				2743429	2743430	2743431	2743432	2743433
Sample Reference				MBH01	MBH01	MBH01	MBH01	MBH01
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				11.50	16.50-16.95	19.50-19.95	23.50	28.00
Date Sampled				Deviating	Deviating	Deviating	Deviating	Deviating
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	20	19	28	13	17
Total mass of sample received	kg	0.001	NONE	0.3	0.2	0.2	1	1

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	8.8	8.7	8.8	8.8	8.8
Total Sulphate as SO4	%	0.005	MCERTS	0.069	0.016	0.063	0.046	0.054
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.011	0.02	0.075	0.036	0.056
Water Soluble Chloride (2:1) (leachate equivalent)	mg/l	0.5	MCERTS	23	12	11	6.5	21
Total Sulphur	%	0.005	MCERTS	0.029	0.005	0.037	0.018	0.023
Water Soluble Nitrate (2:1) as N (leachate equivalent)	mg/l	2	NONE	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0

Heavy Metals / Metalloids

Magnesium (water soluble)	mg/kg	5	NONE	< 5.0	< 5.0	7.9	< 5.0	9.3
Magnesium (leachate equivalent)	mg/l	2.5	NONE	< 2.5	< 2.5	3.9	< 2.5	4.6

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

Analytical Report Number : 23-44216
Project / Site name: Beresford Street

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

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

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
2743424	MBH01	None Supplied	1.95	Brown clay and sand.
2743425	MBH01	None Supplied	2.25	Non Soil^^
2743426	MBH01	None Supplied	3.50-3.95	Brown sand.
2743427	MBH01	None Supplied	4.25	Brown sand.
2743428	MBH01	None Supplied	8.5	Brown sand.
2743429	MBH01	None Supplied	11.5	Brown sand.
2743430	MBH01	None Supplied	16.50-16.95	Brown sandy clay with gravel.
2743431	MBH01	None Supplied	19.50-19.95	White chalk.^^
2743432	MBH01	None Supplied	23.5	White chalk.^^
2743433	MBH01	None Supplied	28	White chalk.^^

Analytical Report Number : 23-44216
Project / Site name: Beresford Street

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

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS
Magnesium, water soluble, in soil	Determination of water soluble magnesium by extraction with water followed by ICP-OES.	In-house method based on TRL 447	L038-PL	D	NONE
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In house method.	L099-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Total Sulphate in soil as %	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES.	In house method.	L038-PL	D	MCERTS
Total Sulphur in soil as %	Determination of total sulphur in soil by extraction with aqua-regia, potassium bromide/bromate followed by ICP-OES.	In house method.	L038-PL	D	MCERTS
Water Soluble Nitrate (2:1) as N in soil	Determination of nitrate by reaction with sodium salicylate and colorimetry.	In-house method based on Examination of Water and Wastewatern & Polish Standard Method PN-82/C-04579.08, 2:1 extraction.	L078-PL	W	NONE
Chloride, water soluble, in soil	Determination of Chloride colorimetrically by discrete analyser.	In house method.	L082-PL	D	MCERTS

For method numbers ending in 'UK or A' analysis have been carried out in our laboratory in the United Kingdom (WATFORD).
For method numbers ending in 'F' analysis have been carried out in our laboratory in the United Kingdom (East Kilbride).
For method numbers ending in 'PL or B' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC
Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

^^unaccredited sample matrix

APPENDIX 7

- Field Monitoring Records
- Groundwater Level Data
- Hazardous Soil Gas Data

IDOM

GAS MONITORING RECORD ROUND 1

Location Reference	Time	Flow and Pressure Measurements				Gas Measurements									VOC Measurements		Dip Measurements		Comments
		Flow		Atmospheric Pressure	Differential Pressure	Methane Max	Methane Steady	Methane LEL	Carbon Dioxide Max	Carbon Dioxide Steady	Oxygen	Carbon Monoxide	Hydrogen Sulphide	Time Taken to Reach Steady State	Hexane	PID	Depth to Water	Depth to Base	
		max	steady																
		$l\ hr^{-1}$		mb	Pa	%	%	%	%	%	%	ppm	ppm	s	%	ppm	m bgl	m bgl	
MBH01	12:00	0.3	0	1019	0	0	0	0	4.7	4.7	17.3	0	0	-	0.003	nr	Dry	9.85	-
MBH201	-	-	-	-	-	-	-	-	-	-	-	-	nr	-	-	nr	-	-	-
MWS101	-	-	-	-	-	-	-	-	-	-	-	-	nr	-	-	nr	-	-	-
MWS102	-	-	-	-	-	-	-	-	-	-	-	-	nr	-	-	nr	-	-	-
MWS103b	-	-	-	-	-	-	-	-	-	-	-	-	nr	-	-	nr	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
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Weather:	Overcast	nr = not recorded	Gas Analyser	PID	Site:	81-88 Beresford Street, Woolwich
		Model:	-	-	Project Number:	22277
		Serial Number:	-	-	Monitored By:	Matthew Baylis
		Date of Last Calibration:	-	-	Date:	27/07/2023

GAS MONITORING RECORD ROUND 2

IDOM

Location Reference	Time	Flow and Pressure Measurements				Gas Measurements									VOC Measurements		Dip Measurements		Comments
		Flow		Atmospheric Pressure	Differential Pressure	Methane Max	Methane Steady	Methane LEL	Carbon Dioxide Max	Carbon Dioxide Steady	Oxygen	Carbon Monoxide	Hydrogen Sulphide	Time Taken to Reach Steady State	Hexane	PID	Depth to Water	Depth to Base	
		max	steady																
		$l\ hr^{-1}$		mb	Pa	%	%	%	%	%	%	ppm	ppm	s	%	ppm	m	m	
MBH01	14:00	0	0	1010	0	0	0	0	0.8	0.8	19.8	0	0		0.024	0	Dry	9.85	-
MBH201	-	-	-	-	-	-	-	-	-	-	-	-	nr		-	nr	-	-	-
MWS101	-	-	-	-	-	-	-	-	-	-	-	-	nr		-	nr	-	-	-
MWS102	-	-	-	-	-	-	-	-	-	-	-	-	nr		-	nr	-	-	-
MWS103b	-	-	-	-	-	-	-	-	-	-	-	-	nr		-	nr	-	-	-
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Weather:	Cloudy. Atmospheric pressure rising over last 24 hours	nr = not recorded	Gas Analyser	PID	Site:	81-88 Beresford Street, Woolwich
		Model:	-	-	Project Number:	22277
		Serial Number:	-	-	Monitored By:	Matthew Baylis
		Date of Last Calibration:	-	-	Date:	01/09/2023

GAS MONITORING RECORD ROUND 3

IDOM

Location Reference	Time	Flow and Pressure Measurements				Gas Measurements									VOC Measurements		Dip Measurements		Comments
		Flow		Atmospheric Pressure	Differential Pressure	Methane Max	Methane Steady	Methane LEL	Carbon Dioxide Max	Carbon Dioxide Steady	Oxygen	Carbon Monoxide	Hydrogen Sulphide	Time Taken to Reach Steady State	Hexane	PID	Depth to Water	Depth to Base	
		max	steady																
		$l\ hr^{-1}$		mb	Pa	%	%	%	%	%	%	ppm	ppm	s	%	ppm	m	m	
MBH01	09:15	0	0	1019	0	0	0	0	0.8	0.8	19.7	0	0		0.003	0	Dry	9.85	-
MBH201	-	-	-	-	-	-	-	-	-	-	-	-	nr		-	nr	-	-	-
MWS101	-	-	-	-	-	-	-	-	-	-	-	-	nr		-	nr	-	-	-
MWS102	-	-	-	-	-	-	-	-	-	-	-	-	nr		-	nr	-	-	-
MWS103b	-	-	-	-	-	-	-	-	-	-	-	-	nr		-	nr	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-
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Weather:	Sunny. Atmospheric pressure rising during the past 18 hours	nr = not recorded	Gas Analyser	PID	Site:	81-88 Beresford Street, Woolwich
		Model:	-	-	Project Number:	22277
		Serial Number:	-	-	Monitored By:	Finn Leahy
		Date of Last Calibration:	-	-	Date:	06/09/2023

GAS MONITORING RECORD ROUND 4

IDOM

Location Reference	Time	Flow and Pressure Measurements				Gas Measurements									VOC Measurements		Dip Measurements		Comments
		Flow		Atmospheric Pressure	Differential Pressure	Methane Max	Methane Steady	Methane LEL	Carbon Dioxide Max	Carbon Dioxide Steady	Oxygen	Carbon Monoxide	Hydrogen Sulphide	Time Taken to Reach Steady State	Hexane	PID	Depth to Water	Depth to Base	
		max	steady																
		$l\ hr^{-1}$		mb	Pa	%	%	%	%	%	%	ppm	ppm	s	%	ppm	m	m	
MBH01	09:30	0	0	1031	0	0	0	0	0.8	0.8	19.4	0	0		0	nr	9.82	9.89	-
MBH201	-	-	-	-	-	-	-	-	-	-	-	-	nr		-	nr	-	-	-
MWS101	09:45	0	0	1032	0	0	0	0	0.1	0.1	19.5	0	0		0	nr	Dry	1.85	-
MWS102	10:00	0	0	1032	0	0	0	0	0.4	0.4	19.5	0	0		0	nr	Dry	0.74	-
MWS103b	10:15	0	0	1032	0	0	0	0	0.2	0.2	18.3	0	0		0	nr	Dry	4.86	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-
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Weather:	Sunny with light cloud coverage. Cold temperature. Atmospheric pressure rising	nr = not recorded	Gas Analyser	PID	Site:	81-88 Beresford Street, Woolwich
		Model:	-	-	Project Number:	22277
		Serial Number:	-	-	Monitored By:	Joe Bertram
		Date of Last Calibration:	-	-	Date:	09/01/2024

GAS MONITORING RECORD ROUND 5

Location Reference	Time	Flow and Pressure Measurements				Gas Measurements									VOC Measurements		Dip Measurements		Comments
		Flow		Atmospheric Pressure	Differential Pressure	Methane Max	Methane Steady	Methane LEL	Carbon Dioxide Max	Carbon Dioxide Steady	Oxygen	Carbon Monoxide	Hydrogen Sulphide	Time Taken to Reach Steady State	Hexane	PID	Depth to Water	Depth to Base	
		max	steady																
		$l\ hr^{-1}$		mb	Pa	%	%	%	%	%	%	ppm	ppm	s	%	ppm	m	m	
MBH01	15:00	0	0	1008	0	0		0	1.2		17.1	0	0		0	nr	9.7	9.9	-
MBH02	15:15	0	0	1006	0	0		0	1.7		16.2	0	0		0	nr	9.5	10.4	-
MWS101	15:30	0	0	1005	0	0		0	0.2		16.9	0	0		0	nr	Dry	1.8	-
MWS102	15:40	0	0	1002	0	0		0	0.7		17.2	0	0		0	nr	Dry	0.7	-
MWS103b	-	-	-	-	-	-		-	-		-	-	nr		-	nr	-	-	Unable to access due to metal skip placed over borehole
-	-	-	-	-	-	-		-	-		-	-	-		-	-	-	-	-
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Weather:	Sunny with light cloud coverage. Cold temperature. Atmospheric pressure fallin	nr = not recorded	Gas Analyser	PID	Site:	81-88 Beresford Street, Woolwich
		Model:	GFM series	-	Project Number:	22277
		Serial Number:	12228	-	Monitored By:	Finn Leahy
		Date of Last Calibration:	17/10/2023	-	Date:	16/01/2024

GAS MONITORING RECORD ROUND 6

Location Reference	Time	Flow and Pressure Measurements				Gas Measurements									VOC Measurements		Dip Measurements		Comments
		Flow		Atmospheric Pressure	Differential Pressure	Methane Max	Methane Steady	Methane LEL	Carbon Dioxide Max	Carbon Dioxide Steady	Oxygen	Carbon Monoxide	Hydrogen Sulphide	Time Taken to Reach Steady State	Hexane	PID	Depth to Water	Depth to Base	
		max	steady																
		$l\ hr^{-1}$		mb	Pa	%	%	%	%	%	%	ppm	ppm	s	%	ppm	m	m	
MBH01	14:05	0	0	1029	0	0	0	0	0.9	0.9	19.1	0	0		0	nr	9.4	9.9	Light brown thick clay at base
MBH02	14:12	0.9	0	1029	0	0	0	0	1.3	1.3	18.3	0	0		0	nr	9.4	10.4	-
MWS101	-	-	-	-	-	-	-	-	-	-	-	-	nr		-	nr	-	-	-
MWS102	-	-	-	-	-	-	-	-	-	-	-	-	nr		-	nr	-	-	-
MWS103b	-	-	-	-	-	-	-	-	-	-	-	-	nr		-	nr	-	-	-
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Weather:	Overcast and cold with slight breeze	nr = not recorded	**Gas Analyser**	**PID**	**Site:**	81-88 Beresford Street, Woolwich
		Model:	GFM 435	-	**Project Number:**	22277
		Serial Number:	13702	-	**Monitored By:**	Sophie Newitt
		Date of Last Calibration:	27/07/2023	-	**Date:**	30/01/2024

APPENDIX 8 ▪ Gas Risk Assessment

MODIFIED WILSON AND CARD GAS CHARACTERISTIC SITUATION

SITE: 81-88 Beresford Street, Woolwich JOB NUMBER: 22277 15/02/2024

Modified Wilson and Card Classification

					BS 8485:2015+A1:2019 Gas Protection Scores - refer to standard for full guidance			
					Minimum Gas Protection Score Required			
Characteristic Situation	Risk Classification	Gas Screening Value Threshold (L hr^{-1})	Additional Factors	Typical Source of Generation	Type A Building	Type B Building	Type C Building	Type D Building
1	very low risk	<0.07	typically methane not to exceed 1% and/or carbon dioxide 5% otherwise consider increase to situation 2	natural soils with low organic content; 'typical' made ground	0	0	0	0
2	low risk	0.07 to <0.7	borehole air flow rate not to exceed 70 L hr^{-1} otherwise consider increase to situation 3	natural soils with high peat/organic content; 'typical' made ground	3.5	3.5	2.5	1.5
3	moderate risk	0.7 to <3.5		old landfill, inert waste, mineworking flooded	4.5	4	3	2.5
4	moderate to high risk	3.5 to <15	quantitative risk assessment required to evaluate scope of protective measures	mineworking susceptible to flooding, completed landfill	6.5 A)	5.5 A)	4.5	3.5
5	high risk	15 to <70		mineworking unflooded inactive with shallow workings near surface	hazard too high for this method to define protection measures	6 A)	5.5	4.5
6	very high risk	>70		recent landfill site	hazard too high for this method to define protection measures	hazard too high for this method to define protection measures	hazard too high for this method to define protection measures	6

BS 8485:2015+A1:2019 Gas Protection Measures - refer to standard for full guidance
Select two or more elements from the following three types of protection to achieve score (only one element per type permitted)

Structural Barrier	Score A)	Ventilation Measures		Score	Gas Resistant Membrane	Score
Precast suspended segmental subfloor (i.e. beam and block)	0	Pressure relief pathway (usually formed of low fines gravel or with a thin geocomposite blanket or strips terminating in a gravel trench external to the building)		0.5	Gas resistant membrane meeting all of the following criteria: 1. sufficiently impervious, both in the sheet material and in the sealing of sheets and sealing around sheet penetrations, to prevent any significant passage of methane and/or carbon dioxide through the membrane. *A membrane with a methane gas transmission rate <40.0 ml/day/m2/atm (average) for sheets and joints (tested in accordance with BS ISO 15105-1:2007 manometric method) is regarded as sufficiently impervious.* 2. sufficiently durable to remain serviceable for the anticipated life of the building and duration of gas emissions 3. sufficiently strong* to withstand the installation process and following trades until covered (e.g. penetration from steel fibres in fibre reinforced concrete, penetration of reinforcement ties, tearing due to working above it, dropping tools, etc) and to withstand in-service stresses (e.g. settlement if placed below a floor slab) 5. capable, after installation, of providing a complete barrier to the entry of the relevant gas 6. verified in accordance with CIRIA C735 * For example, reinforced LDPE (virgin polymer) membranes having a minimum mass per unit area of 370 g/m2 and not significantly less than 0.4 mm thickness between the reinforcement scrim (tested in accordance with Procedure D (2 mm diameter tip) of BS EN ISO 9863-1:2016) installed above floor slabs are considered sufficiently strong to meet the performance criteria (see also C.3). Thicker and more robust membranes or an additional membrane protection layer should be installed directly beneath cast-in-situ floor slabs	2
Cast in situ ground-bearing floor slab (with only nominal mesh reinforcement)	0.5	Passive sub floor dispersal layer	Very good performance E)	2.5		
			Good performance E)	1.5		
Cast in situ monolithic reinforced ground bearing raft or reinforced cast in situ suspended floor slab with minimal penetrations	1 or 1.5 B)	Active dispersal layer, usually comprising fans with active abstraction (suction) from a subfloor dilution layer, with roof level vents. The dilution layer may comprise a clear void or be formed of geocomposite or polystyrene void formers E)		1.5 to 2.5		
Basement floor and walls conforming to BS 8102:2009, Grade 2 waterproofing C) D)	2	Active positive pressurization by the creation of a blanket of external fresh air beneath the building floor slab by pumps supplying air to points across the central footprint of the building into a permeable layer, usually formed of a thin geocomposite blanket E)		1.5 to 2.5		
Basement floor and walls conforming to BS 8102:2009, Grade 3 waterproofing C) D)	2.5	Ventilated car park (floor slab of occupied part of the building under consideration is underlain by a basement or undercroft car park) F)		4		

Notes

A) The scores are conditional on breaches of floor slabs, etc., being effectively sealed

B) To achieve a score of 1.5 the raft or suspended slab should be well reinforced to control cracking and have minimal penetrations cast in

C) The score is conditional on the waterproofing being provided by a suitable structural barrier with the design and detailing of the walls and floor meeting the requirements for Type B protection. The score cannot be assigned for Type A (waterproof membrane) or Type C (drained cavity wall).

D) If a membrane is installed beneath and around the basement to provide Type A waterproofing (BS 8102:2009), it can be assigned a gas protection score in accordance with Table 7, if it meets all the criteria for a gas resistant membrane in that table

E) Refer to BS 8485:2015 Annex B to determine performance and assign score

F) Assumes that the car park is vented to deal with car exhaust fumes, designed to Buildings Regulations 2000, Approved Document F

Building Types

Type A

Private ownership with no building management controls on alterations to the internal structure, the use of rooms, the ventilation of rooms or the structural fabric of the building. Some small rooms present. Probably conventional building construction (rather than civil engineering). Examples include private housing and some retail premises.

FOR TYPE A BUILDINGS ACTIVE VENTILATION MEASURES ARE INAPPROPRIATE

Type B

Private or commercial property with central building management control of any alterations to the building or its uses but limited or no central building management control of the maintenance of the building, including the gas protection measures. Multiple occupancy. Small to medium size rooms with passive ventilation of rooms and other internal spaces throughout ground floor and basement areas. May be conventional building or civil engineering construction. Examples include managed apartments, multiple occupancy offices, some retail premises and parts of some public buildings (such as schools, hospitals, leisure centres) and parts of hotels.

Type C

Commercial building with central building management control of any alterations to the building or its uses and central building management control of the maintenance of the building, including the gas protection measures. Single occupancy of ground floor and basement areas. Small to large size rooms with active ventilation or good passive ventilation of all rooms and other internal spaces throughout ground floor and basement areas. Probably civil engineering construction. Examples include offices, some retail premises, and parts of some public buildings (such as schools, hospitals, leisure centres and parts of hotels).

Type D

Industrial style building having large volume internal space(s) that are well ventilated. Corporate ownership with building management controls on alterations to the ground floor and basement areas of the building and on maintenance of ground gas protective measures. Probably civil engineering construction. Examples are retail park sales buildings, factory shop floor areas, warehouses. (Small rooms within these style buildings should be separately categorized as Type B or Type C).

IDOM

IDOM Cromford Mills, Mill Lane, Matlock, Derbyshire DE4 3RQ
t +44 (0)1773 829 988 **e** info.derbyshire@idom.com **idom.com**
Registered in England No. 02740216 Registered office: as above