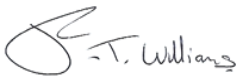


Phase II Site Investigation Report

220 Elgar Road South, Reading, RG2 0BW

On behalf of Abri

Report Reference: GWPR6540/SIR/June 2025			Status: Final
Issue	Prepared By	Checked By	Verified By
v.1.2			
	Natasha Kearn BSc (Hons) AMIEnvSc Senior Engineer	Miltiadis Mellios MSc(Eng) CGeol FGS MIEnvSc GMICE Principal Engineer	Francis Williams MGeol (Hons) FGS CEnv CGeol Director

Site Investigations | Environmental Consultants | Geotechnical Engineers

Table of Contents

.....	0
Table of Contents	i
1. INTRODUCTION	1
1.1. General	1
1.2. Aims of the Investigation	1
1.3. Conditions and Limitations	1
1.4. Technical Glossary	1
2. SITE SETTING	2
2.1. Site Location	2
2.2. Site Description	2
2.3. Proposed Development	2
2.4. Geology	2
2.5. Hydrogeology and Hydrology	2
2.6. Radon	3
2.7. Internet Search (Site Setting)	3
2.7.1. Available Unexploded Ordnance (UXO) Map Review	3
2.7.2. Historical Landfill Tool Review	3
2.8. Summary of Previous Desk Study	3
2.8.1. Sources	3
2.8.2. Pathways	4
2.8.3. Receptors	4
2.9. Preliminary Risk Assessment	5
3. SITE WORKS	9
3.1. Scope of Works	9
3.2. Sampling Procedures	9
4. ENCOUNTERED GROUND CONDITIONS	10
4.1. Soil Conditions	10
4.2. Roots Encountered	10
4.3. Groundwater Conditions	10
4.4. Obstructions	11
5. IN-SITU AND LABORATORY TESTING	12

5.1.	In-situ Strength Testing.....	12
5.2.	Geotechnical Laboratory Testing	12
5.2.1.	Atterberg Limit Testing	12
5.2.2.	Moisture Deficit Assessment	13
5.2.3.	Particle Size Distribution Testing	13
5.2.4.	Saturation Moisture Content of Chalk.....	13
6.	ENGINEERING CONSIDERATIONS.....	15
6.1.	Chalk Dissolution & Mining Risk Assessment.....	15
6.2.	Soil Characteristics and Foundation Considerations.....	17
6.3.	Shallow Foundations.....	17
6.4.	Piled Foundation	18
6.5.	Excavations and Stability.....	19
6.6.	Sub-Surface Concrete Design.....	19
6.7.	Roads and Hardstanding Design	19
6.7.1.	Anticipated CBR Values and Frost Susceptibility	19
6.8.	Surface Water Disposal	20
7.	CONTAMINATION RISK ASSESSMENT	22
7.1.	Results of the Preliminary Risk Assessment.....	22
7.2.	Sampling Locations	22
7.3.	Soil Risk Assessment	22
7.3.1.	Soil Assessment Criteria and Results	23
7.3.2.	Soil Assessment.....	25
7.3.3.	Water Supply Pipe Risk Assessment	26
7.4.	Groundwater Risk Assessment	27
7.4.1.	Background Information	27
7.4.2.	Level 2 (groundwater) Risk Assessment	28
7.5.	Ground Gas Risk Assessment.....	30
7.5.1.	Available Data	30
7.5.2.	Data Quality	31
7.5.3.	Risk Assessment	32
7.5.4.	Ground Gas Risk Assessment Summary.....	34
7.6.	Vapour Risk Assessment	34

7.6.1.	Soil Assessment.....	34
7.6.2.	Human Health Risk Assessment from Dissolved Contaminants	34
7.6.3.	Borehole Monitoring.....	35
7.7.	Updated Conceptual Site Model.....	35
8.	CONTAMINATION RECOMMENDATIONS AND REMEDIATION STRATEGY.....	39
8.1.	Soils	39
8.1.1.	450mm Reduce Dig.....	39
8.1.2.	150mm Anti-dig layer and Marker Membrane.....	40
8.1.3.	300mm Clean Capping of Soil	40
8.1.4.	Validation	40
8.1.5.	Water Supply Pipes	40
8.2.	Groundwater.....	40
8.3.	Ground Gas and Vapours	41
8.3.1.	Prior to Construction.....	42
8.3.2.	During Construction	42
8.3.3.	Verification.....	42
8.4.	Discovery Strategy	42
8.5.	Imported Material.....	42
8.6.	Waste Disposal.....	43
8.7.	Duty of Care	44
	FIGURES.....	1
	APPENDIX A: Conditions and Limitations.....	2
	APPENDIX B: Technical Glossary	5
	APPENDIX C: Trial Hole Logs	6
	APPENDIX D: Geotechnical Laboratory Testing	7
	APPENDIX E: Groundsure Datasheets and Maps	8
	APPENDIX F: Chemical Laboratory Testing	9
	APPENDIX G: Soil Assessment Criteria	10
	APPENDIX H: Asbestos Risk Assessment.....	11
	APPENDIX I: Ground-Gas Monitoring Results.....	12
	APPENDIX J: Waste Hazard Assessment	13

EXECUTIVE SUMMARY	
PROPOSED DEVELOPMENT	At the time of reporting, June 2025, the proposed development was understood to comprise the demolition of existing single storey building and erection of three storey building containing 16 dwellings together with associated soft landscaping, car parking, indoor cycle spaces and refuse.
GEOLOGY AND HYDROGEOLOGY	The British Geological Survey Solid and Drift Geology Map for the Reading area (Reading Sheet No. 268) revealed that the site was underlain by Worked Ground associated with the former brick and tile works extending to the west over bedrock deposits of the Lambeth Group over Seaford and Newhaven Chalk Formation. Superficial Alluvium was recorded in close proximity to the east and may be encountered on-site. The DEFRA online maps indicated that the site was located on Secondary A Aquifer associated with the bedrock Lambeth Group, underlain by a Principal Aquifer associated with the chalk. If Alluvium is encountered on-site these are classified as a Secondary A Aquifer. From analysis of hydrogeological and topographical maps the groundwater table was anticipated to be encountered at a moderate depth within the Lambeth Group and at depth within the Chalk. Perched water was also likely to be found within the Made Ground, especially after periods of intense or prolonged rainfall. It was considered that the groundwater was flowing westwards, towards the River Kennet and in alignment with local topography. The nearest surface water feature was recorded to be the River Kennet located ~100m north-west and 120m west. A drain connecting to the River Kennet was identified ~180m south. The site was not located within a Source Protection Zone.
VOLUME CHANGE POTENTIAL	Medium volume change potential should be adopted in design.
FOUNDATION DESIGN	It is recommended that post demolition the soils need to be further examined with some additional probes in the proposed locations of piles to a target minimum depth of 15m bgl, to ensure that in those exact locations, ground is properly assessed and designed in accordance with. This can be accompanied by some further boreholes, in order to define the profile further and also the depth of Made Ground in property locations. Based on the results of the intrusive investigation, a piled foundation scheme will be required. We expect minimum piling depths into competent chalk which is from approximately 9m bgl, based on the worst case (BH1). The final depth will need to be chosen by the piling specialist based on the results within this report. The final design should consider the results of the boreholes drilled and any additional future probes/boreholes. Some loss of concrete may be experienced. The construction of a piled foundation is a specialist job, and the advice of a reputable contractor, familiar with the type of ground and groundwater conditions encountered on this site, should be sought prior to finalising the foundation design. The actual pile working load will depend on the particular type of pile and method of installation adopted.
SUB-SURFACE CONCRETE	DS-1, AC-1 can be adopted for all soils.
CONTAMINATION	Based on the results of the intrusive works, chemical analyses and risk assessments undertaken, the following has been identified that requires further action:

	• Three contaminants (Benzo(a)pyrene, Benzo(b)fluoranthene, and Dibenzo(a,h)anthracene) have been found at an unacceptable concentrations within the soils across the site. • Asbestos has been identified in one location. • Gas, vapour and groundwater risk assessment to be provided as a revision to this report. An Asbestos Management Strategy should be put in place so that any potentially asbestos containing materials are identified and removed from site in a suitable manner to prevent cross-contamination. At this stage, due to the contamination identified in BH1 and BH2, it is recommended that either further testing is undertaken to delineate the contamination or a clean capping system is implemented for all soft landscaped areas. Details for the capping system can be found in Section 8.1. PCE can degrade to TCE and Chloromethane and the source of the vapours is considered to be from an off-site source. At this stage the vapour risk within the groundwater is at a level that needs further assessment/protection. This should either be through further groundwater sampling and monitoring or through installing a CS2 protection measures with a vapour membrane. Generic details will be provided within Section 8 but it is recommended once foundation plans are finalised that this risk assessment/remediation strategy is updated.
--	--

1. INTRODUCTION

1.1. General

Ground and Water Limited were instructed by Abri on the 24th March 2025 to conduct a Phase II Site Investigation on the site at 220 Elgar Road South, Reading, RG2 0BW. The scope of the investigation was detailed within the fee proposal QU-1424, dated the 6th March 2025.

1.2. Aims of the Investigation

The aim of this report was to supply the client and their designers with information regarding the ground conditions underlying the site to assist them in preparing an appropriate scheme for development.

The investigation was to be undertaken to provide parameters for the design of foundations by means of in-situ and laboratory geotechnical testing undertaken on soil samples recovered from trial holes.

A contamination assessment was to be undertaken following chemical laboratory testing on soil samples recovered from the site to enable recommendations for the safe redevelopment of the site and the protection of site workers, end-users and the public from any potential contamination identified. The assessment comprises a Tier 2 Generic Quantitative Risk Assessment, under Land Contamination Risk Management (LCRM).

This Site Investigation Report must be read in conjunction with the Soil Environment Services Ltd Desk Study Report referenced SES/MH/ER/1#1, December 2020.

The techniques adopted for the investigation were chosen considering the requirements of the client, anticipated ground conditions, and bearing in mind the nature of the site, limitations to site access and other logistical limitations.

1.3. Conditions and Limitations

This report has been prepared based on the terms, conditions and limitations outlined within Appendix A.

Reference has been made to a historical site investigation by another company. Ground and Water Limited cannot be held liable for any shortcomings.

This version of the report supersedes the previous version and includes a revised vapour, gas and groundwater risk assessment.

1.4. Technical Glossary

Generic technical terms and their description can be viewed within the glossary provided within Appendix B.

2. SITE SETTING

2.1. Site Location

The site comprised a ~0.14ha rectangular-shaped plot of land, orientated in a north to south direction, along the western side of Elgar Road South. The site was located in south Reading, central Berkshire.

The Easting Northing for the centre of the site was approximately 471502, 172109. A site location plan is given within Figure 1.

2.2. Site Description

At the time of site works, May 2025, the single storey building located in the centre of the site, formerly used as office space for a driving school, was dis-used. The west (rear) of the site was laid to bituminous hardstanding used as a car park and the east (front) was used as soft landscaping. The north of the site was the access road connecting the car park (west) and Elgar Road South (east of site).

2.3. Proposed Development

At the time of reporting, June 2025, the proposed development was understood to comprise the demolition of existing single storey building and erection of three storey building containing 16 dwellings together with associated soft landscaping, car parking, indoor cycle spaces and refuse.

The proposed development fell within Geotechnical Design Category 2 in accordance with Eurocode 7. The proposed development plan can be seen within Figure 2.

2.4. Geology

The British Geological Survey Solid and Drift Geology Map for the Reading area (Reading Sheet No. 268) revealed that the site was underlain by Worked Ground associated with the former brick and tile works extending to the west over bedrock deposits of the Lambeth Group over Seaford and Newhaven Chalk Formation. Superficial Alluvium was recorded in close proximity to the east and may be encountered on-site.

A BGS borehole record in similar geology ~210m north-east of the site (ref.: SU77SW910) noted interbedded red, brown and grey mottled silty sandy clays and light green clayey sands representing the Lambeth Group to a depth of 16.15m bgl overlying chalk with flints to the base of the borehole at 16.64m bgl. Groundwater seepages were noted at 9.6, 11.8, 16.15m bgl.

2.5. Hydrogeology and Hydrology

The DEFRA online maps indicated that the site was located on Secondary A Aquifer associated with the bedrock Lambeth Group, underlain by a Principal Aquifer associated with the chalk. If Alluvium is encountered on-site these are classified as a Secondary A Aquifer.

From analysis of hydrogeological and topographical maps the groundwater table was anticipated to be encountered at a moderate depth within the Lambeth Group and at depth within the Chalk. Perched water was also likely to be found within the Made Ground, especially after periods of intense or prolonged rainfall. It was considered that the groundwater was flowing westwards, towards the River Kennet and in alignment with local topography.

The nearest surface water feature was recorded to be the River Kennet located ~100m north-west and 120m west. A drain connecting to the River Kennet was identified ~180m south.

The site was not located within a Source Protection Zone.

Examination of the Environment Agency records showed that the site fell within a Flood Zone 1 (an area with a low probability of fluvial or coastal flooding). The site was not protected by flood defences or benefiting from flood storage.

2.6. Radon

A review of the freely available UK Health Security Agency radon database, UK Radon, indicated that the site was located within a 1km grid square, where the maximum radon potential of 1 – 3% was recorded for above ground structures. Basic radon protection measures are required in areas where more than 3% of houses are at or above the Action Level.

The site was in an area where a risk assessment was not required.

2.7. Internet Search (Site Setting)

2.7.1. Available Unexploded Ordnance (UXO) Map Review

A review of the data available on www.zeticauxo.com/ revealed the site was located within a low-risk area associated with unexploded ordnance (UXO), as indicated by having <15 bombs dropped per 1000 acres.

2.7.2. Historical Landfill Tool Review

A review of the data available on www.groundsure.io/ revealed that an area of Historical Landfilling was located adjacent to the south-west of the site. The landfill was recorded as Waterloo Meadows but no further details were given.

2.8. Summary of Previous Desk Study

2.8.1. Sources

On-site sources

- Site formed part of Waterloo Brick Works with associated kilns (1879 – c.1932) – **metals and PAHs,**
- Brick works replaced by research laboratory building (1958 – 1993) – **metals, asbestos, PAHs, TPHs,**
- Infilled land mapped, likely relating to the former brick works – **ground-gases.**

Off-site sources

- Kilns and brick works (1879-c.1932) extending north, east and south from site – **metals and PAHs (covered under on site sources in CSM),**
- Works/Industrial estate (1931-current) 123m west - **metals, PAHs, TPHs,**
- Engineering works (1932-c.1978) 63m east - **metals, PAHs, TPHs, VOCs/SVOCs,**
- Landfill (inert and industrial) adjacent to south-west - **ground-gases, leachates: metals, PAHs, TPHs, VOCs/SVOCs.** PFAS could be a source of contamination from the landfill, however, given the location of the landfill it is considered more likely that any contamination will have migrated towards the River Kennet or into the underlying aquifers. Given PFAS has limited volatility and high water solubility it is unlikely to pose a risk through the vapour pathway. Therefore, it is not considered any further investigation is required with respect of PFAS.

2.8.2. Pathways

Human Health:

- Direct ingestion of soil and soil derived dust;
- Dermal contact of soil and soil derived dust;
- Inhalation of dust (indoors and outdoors) with elevated concentration of determinands;
- Direct ingestion of groundwater;
- Inhalation of volatile vapour (indoors and outdoors);
- Inhalation of ground gases.; and
- Explosion.

The pathway for human health “soil and dust attached to homegrown vegetables/fruit” has been removed due to the proposed development falling under the “residential without homegrown produce” category.

Flora and Fauna

- Direct uptake of groundwater; and
- Direct uptake of contaminants in the soil.

Building Materials and Services

- Direct contact;
- Explosion.

Controlled Waters

- Vertical and lateral migration in permeable strata horizons;
- Via anthropogenic pathways (infilled ground and service runs);
- Surface water Runoff.

2.8.3. Receptors

Based on the proposed development, the potential receptors are presented below and comprise:

Human Health

- End users of the site (Residents/Future site visitors);
- Construction workers during redevelopment;
- Site operatives during maintenance works; and
- Neighbours and members of the public.

Flora and Fauna

- Vegetation within soft landscaped areas;
- Ecological Receptor (Waterloo Meadows adj. south-west).

Building Materials and Services

- Buildings;
- Buried concrete;
- Confined spaces; and
- Underground services (Water Pipes).

Controlled Waters

- Secondary A Aquifer (Lambeth Group)

- Principal Aquifer (Chalk); and
- River Kennet (From ~100m north-west).

2.9. Preliminary Risk Assessment

The tabulated Conceptual Site Model developed as part of the Soil Environment Services Ltd Desk Study Report referenced SES/MH/ER/1#1, December 2020 is outlined overleaf and adapted in accordance with Ground and Water's risk categorisation. For ease of reference and understanding, the risks have been classified within this risk assessment against four possible levels / categories, summarised in the table below. Any risk deemed to be negligible within the Preliminary Risk Assessment have been excluded from this report.

Risk Categories used in the Tabulated CSM	
Low Risk	Regarding this potential SPR linkage, the site is considered suitable for the proposed end-use and there is not considered to be an unacceptable risk to receptors. However, it is considered that further investigation to confirm this is recommended.
Moderate Risk	Regarding this potential SPR linkage, the site may not be suitable for the proposed end-use in its current condition and there may be an unacceptable risk to receptors. Further investigation is required to confirm this.
High Risk	Regarding this potential SPR linkage, the site is probably or certainly not suitable for proposed end-use and there is likely to be an unacceptable risk to receptors. Contaminants probably or certainly present and urgent action required in the short term.

Tabulated Conceptual Site Model – Pollutant Linkage Summary			(On-Site Sources)
Potential Sources	Potential Absorption Pathways	Potential Receptors	Risk Classification
Former brick works and kilns: - PAHs, and - Metals.	- Direct ingestion of soil and soil derived dust - Dermal contact of soil and soil derived dust - Inhalation of dust (indoors and outdoors) with elevated concentration of determinands - Direct ingestion of groundwater - Inhalation of volatile vapour (indoors and outdoors) - Direct uptake of groundwater - Direct uptake of determinands in the soil	Human Health - End Users (Residents/Future site visitors) - Construction workers during development - Site operatives during maintenance works - Neighbours and public	Moderate
		Flora and Fauna - Vegetation within soft landscaped areas - Ecological Receptor (Waterloo Meadows adj. south-west)	Moderate
	- Anthropogenic (man-made) pathways - Vertical and lateral migration in permeable strata - Surface water runoff	Controlled Waters - Secondary A Aquifer (Lambeth Group) - Principal Aquifer (Chalk); and - River Kennet (From ~100m north-west)	Low
Existing building, formerly used as laboratory: - Asbestos, - Metals, - PAHs, and - TPHs.	- Direct ingestion of soil and soil derived dust - Dermal contact of soil and soil derived dust - Inhalation of dust (indoors and outdoors) with elevated concentration of determinands - Direct ingestion of groundwater - Inhalation of volatile vapour (indoors and outdoors) - Direct uptake of groundwater - Direct uptake of determinands in the soil	Human Health - End Users (Residents/Future site visitors) - Construction workers during development - Site operatives during maintenance works - Neighbours and public	Moderate
		Flora and Fauna - Vegetation within soft landscaped areas - Ecological Receptor (Waterloo Meadows adj. south-west)	Low
	- Anthropogenic (man-made) pathways - Vertical and lateral migration in permeable strata - Surface water runoff	Controlled Waters - Secondary A Aquifer (Lambeth Group) - Principal Aquifer (Chalk); and - River Kennet (From ~100m north-west)	Low
Aggressive ground conditions with Made Ground and natural ground, including groundwater: - Sulphates, - PAH/TPH.	Direct contact with aggressive ground conditions	Building Materials and Services - Buried Concrete - Underground services (water pipes)	Moderate

Ground gases generated by infilled land and alluvium (if encountered): • Methane, • Carbon Dioxide, • Hydrogen Sulphide, and • Carbon Monoxide.	• Migration through anthropogenic & natural pathways • Inhalation of Asphyxiating gases • Explosion (methane only)	Human Health • End Users (Residents/Future site visitors) • Construction workers during development (especially in confined spaces) • Site operatives during maintenance works in confined spaces • Neighbours and public	Moderate
	• Migration through anthropogenic & natural pathways • Explosion (methane only)	Building Materials and Services • Buildings • Confined spaces • Underground services	Low

Tabulated Conceptual Site Model – Pollutant Linkage Summary (Off-Site Sources)			
Potential Sources	Potential Absorption Pathways	Potential Receptors	Risk Classification
Landfill leachate: - PAHs, - TPHs, - SVOCs/VOCs, and - Metals.	- Direct ingestion of soil and soil derived dust - Dermal contact of soil and soil derived dust - Inhalation of dust (indoors and outdoors) with elevated concentration of determinands - Direct ingestion of groundwater - Inhalation of volatile vapour (indoors and outdoors)	Human Health - End Users (Residents/Future site visitors) - Construction workers during development - Site operatives during maintenance works	Moderate
	Direct uptake of groundwater	Flora and Fauna Vegetation within soft landscaped areas	Low
Made Ground from nearby works incl. engineering works: - PAHs, - TPHs, - SVOCs/VOCs, - Sulphates, and - Metals.	- Direct ingestion of soil and soil derived dust - Dermal contact of soil and soil derived dust - Inhalation of dust (indoors and outdoors) with elevated concentration of determinands - Direct ingestion of groundwater - Inhalation of volatile vapour (indoors and outdoors)	Human Health - End Users (Residents/Future site visitors) - Construction workers during development - Site operatives during maintenance works	Low
	Direct uptake of groundwater	Flora and Fauna Vegetation within soft landscaped areas	Low
Aggressive ground conditions associated with impacted groundwater; - Sulphates, - PAH/TPH.	Direct contact with aggressive ground conditions	Building Materials and Services - Buried Concrete - Underground services (water pipes)	Moderate
Ground gases generated by landfill adj. to south-west: - Methane, - Carbon Dioxide, - Hydrogen Sulphide, and - Carbon Monoxide.	- Migration through anthropogenic & natural pathways - Inhalation of Asphyxiating gases - Explosion (methane only)	Human Health - End Users (Residents/Future site visitors) - Construction workers during development (especially in confined spaces) - Site operatives during maintenance works in confined spaces	Moderate
	- Migration through anthropogenic & natural pathways - Explosion (methane only)	Building Materials and Services - Buildings - Confined spaces - Underground services	Low

3. SITE WORKS

3.1. Scope of Works

Site works were undertaken on 2nd – 5th April 2025 and comprised the drilling of 2No. Cable Percussion Boreholes (BH1 – BH2) to a depth of 20.45m bgl. Standard Penetration Tests were carried out at 1.00m intervals to 5.00m bgl and every 1.50m thereafter. 5No. Windowless Sampler Borehole (WS1 – WS4 and WS4A) to a depth of 1.40 – 3.00m bgl. A combined ground-gas/groundwater monitoring standpipe, with an internal diameter of 50mm, was installed to 4.20 – 5.20m bgl within BH1 and BH2. The installation details can be viewed within the table below.

Combined Ground-gas and Groundwater Monitoring Well Construction					
Trial Hole	Depth of Installation (m bgl)	Thickness of slotted piping with gravel filter pack (m)	Depth of plain piping with bentonite seal (m bgl)	Response Zone (m bgl)	Piping internal diameter (mm)
BH1	5.20	3.00	2.20	2.20 – 5.20	50
BH2	4.20	2.00	2.20	2.20 – 4.20	50

The location of the trial hole locations can be seen within Figure 3.

Prior to commencing the ground investigation, a walkover survey was carried out to identify the presence of underground services and drainage. Where underground services/drainage were suspected and/or positively identified, the exploratory position was relocated away from these areas.

As a further precautionary measure, the borehole was hand excavated to 1.20m below the local ground level (bgl) and scanned with a Cable Avoidance Tool (CAT scanner) to minimise the risk to services.

Upon completion of the drilling works, the trial holes were backfilled and made good, in relation to the surrounding area.

3.2. Sampling Procedures

Small disturbed samples and environmental samples were recovered from the trial holes at the depths shown on the trial hole records. Soil samples were generally retrieved from each change of strata and/or at specific areas of concern. Samples were also taken at approximately 0.5m intervals during broad homogenous soil horizons.

A selection of samples were despatched to a laboratory for both geotechnical and chemical testing purposes.

4. ENCOUNTERED GROUND CONDITIONS

4.1. Soil Conditions

The trial holes were logged by a Ground and Water Limited representative, generally in accordance with BS EN 14688 'Geotechnical Investigation and Testing – Identification and Classification of Soil'. The chalk samples were logged in accordance with CIRIA 574.

The ground conditions encountered within the trial holes constructed on the site did generally conform to that anticipated from examination of the geology map. A capping of Made Ground was noted to overlie the bedrock Lambeth Group over Seaford and Newhaven Chalk Formation.

The succession of conditions and description of soils encountered in the trial holes in descending order is tabulated below.

Summary of Strata Encountered (BH1 – BH2, WS1 – WS4 and WS4A)			
Strata	Top Depth (m bgl)	Base Depth (m bgl)	Thickness (m)
BITUMINOUS HARDSTANDING (BH1, BH2, WS4 and WS4A).	GL	0.10 - 0.20	0.10 - 0.20
MADE GROUND (granular) (BH1, BH2, WS4A): Dark brown and black gravelly fine to medium SAND. Gravel is sub-angular to sub-rounded, fine to coarse, brick, ash, chalk and concrete.	0.10 - 0.20	2.00 – 2.50	1.90 – 2.30
MADE GROUND (cohesive) (WS1 – WS4): Dark brown sandy slightly gravelly CLAY. Gravel is sub-angular to subrounded, fine, brick and flint.	GL	0.30 – 1.90	0.30 – 1.90
LAMBETH GROUP (granular) (BH1, BH2, WS1 – WS2, WS4A): Brown and grey clayey medium SAND.	0.30 – 2.50	2.50 - 3.60	>0.50 – 2.30
LAMBETH GROUP (cohesive) (BH1, BH2, WS1 – WS3, WS4A): Orangish brown silty sandy CLAY with pockets of medium sand.	1.90 - 3.60	2.50 - 5.30	>0.30 - 1.70
SEAFORD AND NEWHAVEN CHALK FORMATION (BH1 and BH2 only): Off-white gravelly SILT. Gravel is fine to medium, medium density CHALK with occasional fine to medium flint. (Dm Chalk).	4.30 - 5.30	>20.45	>15.15 - >16.45

For details of the composition of the soils encountered at particular points, reference must be made to the individual trial hole logs within Appendix C of this report. A trial hole location plan can also be viewed within Figure 3.

4.2. Roots Encountered

No roots were noted during the intrusive investigation.

It must be noted that the chance of determining actual depth of root penetration through a narrow diameter borehole is low. Roots may be found to greater depths at other locations on the site, particularly close to trees and/or trees that have been removed both within the site and its close environs.

4.3. Groundwater Conditions

Groundwater strikes were noted between 2.00 – 4.45m bgl within the boreholes. It should be noted that groundwater strikes may be obscured by the drilling/excavation process. A summary of the groundwater observations during site works has been provided below.

Groundwater Strikes during Drilling		
Trial Hole	Groundwater reading (m bgl)	Depth after 20 minutes (m bgl)
BH1	3.00	2.76
BH2	2.80	2.77
	4.45	4.42
WS1	2.00	-
WS2	2.30	-
WS3	2.00	-
WS4	None	-
WS4A	2.00	-

Changes in groundwater level occur for a number of reasons including seasonal effects and variations in drainage. The investigation was undertaken in April – May 2025 when groundwater levels are likely to be falling from their annual maximum (highest elevation). Exact groundwater levels may only be determined through long term measurements from monitoring wells installed on-site.

Groundwater monitoring results will be provided as a revision to this report.

4.4. Obstructions

WS4 was terminated at 1.40m bgl due to possible concrete obstruction.

No other artificial or natural sub-surface obstructions were noted during construction of the trial holes.

5. IN-SITU AND LABORATORY TESTING

5.1. In-situ Strength Testing

Standard Penetration Tests (SPTs) were undertaken as part of the site investigation. The results of the SPT's have not been amended to consider hammer efficiency, rod lengths and overburden pressure in accordance with Eurocode 7. The test results are presented on the borehole logs within Appendix C. An interpretation of the in-situ geotechnical testing results is given in the table below.

Interpretation of In-situ Geotechnical Testing Results					
Strata	SPT "N" Blow Counts	Equivalent Undrained Shear Strength (Cu) (kPa) (Stroud (1974))	Soil Type		Trial Hole/s (m bgl)
			Granular (Density)	Cohesive (Cu)	
Made Ground	2 – 42	-	-	-	BH1/1.20 – 2.20 BH2/1.20 – 2.50
Loose Lambeth Group (Granular)	6 - 8	-	Loose	-	BH1/2.20 – 3.60 BH2/2.50 – 3.60
Soft Lambeth Group (Cohesive)	4 – 8	20 – 40	-	Low	BH1/3.60 – 5.30 BH2/3.60 – 4.30
Chalk	8 – 50	-	-	-	BH1/5.30 – 20.45 BH2/4.30 – 20.45

It must be noted that field measurements of undrained shear strength (Cu) are dependent on a number of variables including disturbance of sample, method of investigation and also the size of specimen or test zone.

5.2. Geotechnical Laboratory Testing

A programme of geotechnical laboratory testing, scheduled by Ground and Water Limited and carried out by an accredited geotechnical testing laboratory was undertaken on samples recovered. Details of the specific tests used in each case are given below.

Standard Methodology for Laboratory Geotechnical Testing		
Test	Standard	Number of Tests
Atterberg Limit Tests	BS1377:2016:Part 2:Clauses 3.2, 4.3 & 5	2
Particle Size Distribution Tests	BS1377:2016:Part 2:Clause 9	1
Determination of Saturation Moisture Content of Chalk	BS1377:2016:Part 2:Clause 3.3	2
Water Soluble Sulphate and pH Test	BS1377:2018:Part 3:Clause 5	1
BRE Special Digest 1 Tests	BRE Special Digest 1 "Concrete in Aggressive Ground (BRE, 2005).	2

5.2.1. Atterberg Limit Testing

A précis of Atterberg limit testing undertaken can be seen tabulated below. The test results are presented within Appendix D.

Atterberg Limit Tests Results Summary							
Stratum	Moisture Content (%)	Passing 425 µm sieve (%)	Modified PI (%)	Soil Class	Consistency Index (Ic)	Volume Change Potential	
						BRE	NHBC
Lambeth Group	17 – 33.3	100	25.00 – 33.00	CI – CH	Stiff	Medium	Medium
- NP – Non-plastic - BRE Volume Change Potential refers to BRE Digest 240 (based on Atterberg results) - Soil Classification based on British Soil Classification System. - Consistency Index (Ic) based on BS EN ISO 14688-2:2018.							

5.2.2. Moisture Deficit Assessment

The results of the Atterberg Limit tests were analysed to determine the Liquidity Index of the samples, to give an indication as to whether the samples recovered showed a moisture deficit as well assessing their degree of consolidation. Liquid Limit analyses were undertaken to assess whether there were any potentially significant moisture deficits within the samples tested.

No potential moisture deficits were recorded.

5.2.3. Particle Size Distribution Testing

The results of particle size distribution (PSD) testing undertaken show that the Lambeth Group have volume change potential in accordance with BRE240 and not with NHBC Standards Chapter 4.2. The results of the PSD testing can be viewed within Appendix D, and summarised below.

Particle Size Distribution Results Summary			
Stratum	Range Passing 63µm Sieve (%)	Volume Change Potential	
		BRE	NHBC
Lambeth Group	22	Yes	No
- Volume Change Potential refers to BRE Digest 240 (based on Grading test results). - Shrinkability refers to NHBC Standards Chapter 4.2 (based on Grading test results). - BRE 240 states that a soil has a volume change potential when the clay fraction exceeds 15%. Only the silt and clay combined fraction are determined by sieving therefore the volume change potential is estimated from the percentage passing the 63µm sieve. - NHBC Standards Chapter 4.2 states that a soil is shrinkable if the percentage of silt and clay passing the 63µm sieve is greater than 35% and the Plasticity Index is greater than 10%.			

5.2.4. Saturation Moisture Content of Chalk

The results of the saturation moisture content testing undertaken can be seen in the following table. The test results are presented within Appendix D.

Summary of Saturation Moisture Content Test Results					
Stratum	Moisture Content (%)	Saturation Moisture Content (%)	Bulk Density (Mg/m³)	Dry Density (Mg/m³)	CIRIA Dry Density Classification
Chalk – BH2/10.00m bgl	28	28	1.97	1.54	Low density
Chalk - BH1/14.00m bgl	23	23	2.04	1.65	Medium density
Density in accordance with CIRIA 574 Chapter 3.0, Table 3.7					

6. ENGINEERING CONSIDERATIONS

6.1. Chalk Dissolution & Mining Risk Assessment

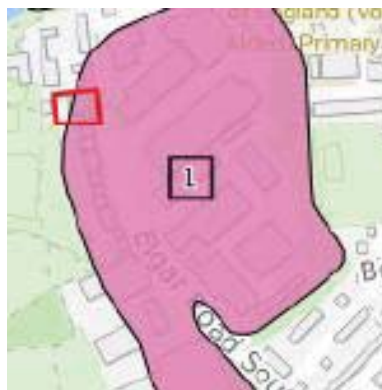
The presence of dissolution features on-site can prove problematic, as they often provide inconsistency within the underlying geology. Often formed during glacial and periglacial conditions, the depth and width of these features can vary substantially, often providing inconsistency in geological strength data.

If a dissolution feature is suspected, a geotechnical engineer and structural engineer should be contacted for suitable engineering designs, based on further works identifying and classifying the area the feature occupies.

Groundsure datasheets and historical mapping have been reviewed and can be viewed in Appendix E.

The Groundsure Geoinsight datasheets revealed the following information which may be pertinent to this risk assessment.

- Ground Dissolution of Soluble Rocks – The site was classified as a Low risk of ground dissolution of soluble rocks.
- Low Risk was described as “Soluble rocks are present within the ground. Some dissolution features may be present. Potential for difficult ground conditions are at a level where they may be considered, localised subsidence need not to be considered except in exceptional circumstances”.
- An on-site Class C Historical Mining area was identified. A Class C area was described as “Underground mine workings may have occurred in the past, or current mines may be operating to modern engineering standards. Potential for difficult ground conditions should be considered.”. However, these classifications are generally a precautionary statement attributed to all areas associated with chalk within the ground profile. Therefore, this does not identify any underground chalk features at the site location.
- 7No. Britpits records were noted within 250m radius of the site, 5No relate to Waterloo Kilns (which included this site boundary) 25m – 201m east/south-east and 2No. relate to Katesgrove Kilns 124 – 209m north, both for clay and shale surface workings.
- 30No. records of surface ground workings were noted, the closest was recorded 19m north-east of the site, and all were related to brick and tile works and associated pit/ground workings and heaps. 1No. did relate to the canal 94m north.
- The eastern portion of the site is mapped as Worked Ground, likely relating to the former Waterloo Kiln brick works.



- 10No. records were available for researched mining areas including on-site for stone.
- 1No. mining cavity was recorded within a 250m radius which related to Waterloo Kiln/Clackmans Field for chalk.
- No records of natural cavities or underground workings, were noted within a 250m radius. Some records however were noted further to the north-west.
- A review of the historical mapping shows the kilns in the south-west and east of the site associated with the Waterloo Kilns (brick, tile and drain pipe) which extends south and east. These were replaced by 1932 and the current existing building constructed by 1957. The workings relating to the Waterloo Kilns extended east and south-east, the buildings themselves were replaced by and engineering works in 1957 and eventually became part of an industrial estate.
- From a review of the data available on www.lidarfinder.com there was no evidence of potential depressions on site.
- The Edmonds Procedure (Edmonds, C.N., 2001. Predicting natural cavities in chalk. Geological Society, London, Engineering Geology Special Publications, 18(1), pp.29-38.); highlighted a moderate subsidence hazard classification.

The site investigation encountered a Made Ground overlying interbedded cohesive and granular soils of the Lambeth Group for the remaining depth of the windowless sample boreholes (maximum depth of 3.00m bgl) and to 4.3 – 5.30m bgl in the deeper boreholes where the chalk was noted for the remainder of the boreholes to 20.45m bgl. In-situ testing classified the Lambeth Group as having low undrained shear strength loose for the granular horizons.

The chalk appeared to be competent in general, however NSPTS of 8 were recorded within the chalk in BH1, from the interface down to a depth of ~8.00m bgl.

This risk assessment indicates that there is a risk from the dissolution of soluble rocks, based on the geology the site is at. It is considered therefore that the presence of natural cavities in this area should not be discounted.

In addition, the site was noted to be in a mining area, where parts of the site were potentially excavated and infilled. Made Ground of ~2.00 – 2.50m in thickness was recorded within a number of boreholes, which indicates some deep Made Ground is present on site and it does not appear to be in

a specific pattern.

It is recommended that post demolition the soils need to be further examined with some additional probes in the proposed locations of piles to a target minimum depth of 15m bgl, to ensure that in those exact locations, ground is properly assessed and designed in accordance with. This can be accompanied by some further boreholes, in order to define the profile further and also the depth of Made Ground in property locations.

6.2. Soil Characteristics and Foundation Considerations

A summary of the soil characteristics following the intrusive site investigation and laboratory testing and the relevant foundation considerations has been provided below. The following information from the ground investigation was considered pertinent to the design of foundations.

- Foundations should be taken through any Made Ground/Topsoil and either into, or onto a suitable underlying natural stratum of adequate bearing characteristics.
- Foundations should be designed in accordance with soils of medium volume change potential.
- Given the presence of cohesive soils at shallow depth, special foundation precautions may be required to prevent possible future shrinkage/swelling of the soils affecting the integrity of the faces of foundations (underfloor void diameter/compressible material/void formers etc.).
- In case of piling, the design of each structural element (slab/piles/beams) should be designed in accordance with the appropriate volume change potential of the respective bearing stratum. Special foundation precautions may be required to prevent possible future shrinkage/swelling of the soils affecting the integrity of the faces of foundations and/or structural element (underfloor void diameter/compressible material/void formers etc.).
- The loads of proposed foundations should not exceed the allowable bearing capacity of the soils they are founding upon.
- Foundations must not be placed within fresh root penetrated and/or desiccated soils with volume change potential. It is recommended that foundations are taken at least 300mm into non-fresh root penetrated strata if the soils have volume change potential, or into soils of no volume change potential.
- The influence of trees on or surrounding the site will need to be taken into account in final design (NHBC Standards Chapter 4.2) (tree rings).
- Any water ingress must be prevented from entering foundation trenches and excavations must be kept dry and either concreted or blinded as soon after excavation as possible. If water were allowed to accumulate within the excavation for even a short period of time, an increase in heave occur. The shear strength will also be reduced, resulting in lower bearing capacities, resulting in increased settlements. Instability issues may arise within the foundation trenches, in case of perched water being present.

6.3. Shallow Foundations

Based on the results of the ground investigation, piling is recommended as a foundation solution for this site. This will need to consider the chalk dissolution and mining risk assessment.

6.4. Piled Foundation

Based on the results of the intrusive investigation, a piled foundation scheme will be required.

We expect minimum piling depths into competent chalk which is from approximately 9m bgl, based on the worst case (BH1). The final depth will need to be chosen by the piling specialist based on the results within this report. The final design should consider the results of the boreholes drilled and any additional future probes/boreholes. Some loss of concrete may be experienced.

The construction of a piled foundation is a specialist job, and the advice of a reputable contractor, familiar with the type of ground and groundwater conditions encountered on this site, should be sought prior to finalising the foundation design. The actual pile working load will depend on the particular type of pile and method of installation adopted.

The foundation would comprise a piled foundation with reinforced ground beams or a piled slab. In general, for the cumulative pile capacity calculations, shaft friction over desiccated levels should be ignored and piles should not be terminated within desiccated soils where moisture recovery following tree removal could occur.

The piles will need to be designed in accordance with the volume change potential of the soils encountered, depth of desiccation and root penetration. Temporary casing may be required where the upper portion of the pile passes through the Made Ground, particularly where perched water is encountered, to prevent necking of the concrete.

Piling Groundwater Risk Assessment

Given the geology at the site, piling is the preferred method for foundations. As these may extend into the aquifer beneath the site, the potential for pathways to be present need to be considered.

Review of the Wilson and Mortimer paper *Piled foundations and pathways for ground gas migration in the UK* (ICE publishing – Environmental Geotechnics), indicates that any preferential pathways for ground gases or contaminated water created by piles needs consideration for ground conditions and the nature of the pile utilised.

An important consideration is the nature of the pile, whether it is a displacement or replacement pile. For there to be a preferential pathway for the movement of groundwater, a continuous open annulus is required around the piles installed. An open annulus will not form around piles during installation except for driven H and I piles. Cast in-situ piles are driven or bored and filled with wet concrete. The pressure exerted on the wet concrete will seal up any annulus around the pile, sealing any pathway.

The Environment Agency recommend that CFA piling is undertaken on any site where contamination may be expected.

Based on the above, the use of CFA piles or other cast in-situ piles should be adopted, which will not result in the downward migration of contamination within the groundwater.

6.5. Excavations and Stability

Shallow excavations in the Made Ground and Lambeth Group are likely to be marginally stable at best. Long, deep excavations, through these strata and into the underlying Chalk are likely to become unstable.

Unsupported earth faces formed during excavation may be liable to collapse without warning and suitable safety precautions should therefore be taken to ensure that such earth faces are adequately supported before excavations are entered by personnel.

6.6. Sub-Surface Concrete Design

Concrete to be placed in contact with soil or groundwater must be designed in accordance with the recommendations of Building Research Establishment Special Digest 1, 2005, '*Concrete in Aggressive Ground*' considering the pH of the soils. For the classification given below, the "mobile" and "brownfield" case was adopted given the geology encountered and the residential use of the site.

Made Ground

The water-soluble sulphates in the Made Ground was noted to be 6.58 - 141mg/l, with a pH of 8.4 – 10.1, from chemical and geotechnical laboratory testing.

According to BRE Special Digest 1, 2005, '*Concrete in Aggressive Ground*' a Sulphate Design Class of DS-1 should be used for sub-surface concrete in contact with the Made Ground. Table C1 of the Digest indicated an ACEC (Aggressive Chemical Environment for Concrete) classification of AC-1.

Lambeth Group

The water-soluble sulphates in the Lambeth Group was noted to be 1.86 – 13.7mg/l, with a pH of 8.2 – 8.7, from chemical laboratory testing. The total potential sulphate (3x total sulphur) was <0.015%, from chemical laboratory testing.

According to BRE Special Digest 1, 2005, '*Concrete in Aggressive Ground*' a Sulphate Design Class of DS-1 should be used for sub-surface concrete in contact with the Lambeth Group. Table C1 of the Digest indicated an ACEC (Aggressive Chemical Environment for Concrete) classification of AC-1.

Chalk

The water-soluble sulphates in the Chalk was noted to be 47.7mg/l, with a pH of 7.5, from chemical laboratory testing. The total potential sulphate (3x total sulphur) was 0.078%, from chemical laboratory testing.

According to BRE Special Digest 1, 2005, '*Concrete in Aggressive Ground*' a Sulphate Design Class of DS-1 should be used for sub-surface concrete in contact with the Chalk. Table C1 of the Digest indicated an ACEC (Aggressive Chemical Environment for Concrete) classification of AC-1.

6.7. Roads and Hardstanding Design

This section provides information relating to the construction of roads and hardstanding, for each strata encountered.

6.7.1. Anticipated CBR Values and Frost Susceptibility

Made Ground

Where roads and hardstanding are to be founded on Made Ground, a CBR value of 1% should be adopted, as a result of the variable nature of Made Ground in terms of consistency, strength and compressibility.

Lambeth Group (cohesive)

Roads and hardstanding constructed on the cohesive Lambeth Group should be designed based on a CBR value of 4.0%. This is based on reference to Table C1 of TRL1132 and average construction conditions. Based on wet conditions a CBR of 2.5% should be adopted, with dry conditions a CBR of 4.5% being applicable.

These clay-based soils (poorly drained) with plasticity indexes generally less than 20% are likely to be frost susceptible, due to their granular content.

Lambeth Group (granular)

Roads and hardstanding constructed on the granular Lambeth Group should be designed based on a CBR value of 15.0%. This is based on reference to Table C1 of TRL1132 and average construction conditions. Based on wet conditions a CBR of 10.0% should be adopted, with dry conditions a CBR of 20.0% being applicable.

These granular-based soils (poorly drained) with greater 10% of their content passing the 150µm sieve are likely to be non-frost susceptible.

All formation levels for roads and hardstanding should be proof rolled to highlight any soft areas which should then be dug out and replaced with selected granular material compacted in thin layers to a suitable specification.

6.8. Surface Water Disposal

Soakaway testing in accordance with BRE365 was beyond the scope of this investigation.

Any soakaways should be located sufficiently away from buildings and infrastructure, in order to prevent undermining foundations.

The submission of a Sustainable Urban Drainage Scheme (SUDS) is likely to be required for this site due to the proposed development decreasing the amounts of hardstanding.

Consultation with the Environment Agency must be sought regarding any use that may have an impact on groundwater resources, abstractions and surface water features/watercourses.

It should be noted that water discharge into the chalk may worsen / create dissolution features. Therefore, soakaways should be remote from structures and undertaken in accordance with available guidance.

A number of published information sources make reference to an appropriate distance at which a soakaway should be sited in relation to any building foundations in the vicinity:

- The British Standard BS8301 :1985 “Code of practice for building drainage” (1985), suggests

that: “A soakaway is not desirable nearer to a building than about 5 metres nor in such a position that the ground below foundations is likely to be adversely affected.”

- The Building Research Establishment Digest 365 “Soakaway design” (1991), suggests that “Soakaways should not normally be constructed closer than 5m to building foundations. In chalk or other soil and fill material subject to modification or instability, the advice of a specialist geotechnologist should be sought as to the advisability and siting of a soakaway”.

In addition, the distance a soakaway is located from any foundations can be informed by both the soakaway type and chalk density present at the site.

- The Kent County Council Soakaway Design Guide (July 2000) states that “Highway soakaways shall be situated the following minimum distances from dwellings (measured from the outside edge of the soakaway): (1) 5 metres for conventional perforated soakaway; (2) 10 metres for deep bored soakaway. In addition, adjacent soakaways of a similar type shall also be spaced a minimum of 10 metres apart.
 - CIRIA 574 states that soakaways should be sited at least 5-10m away from any structure, depending on the chalk density. Where the chalk present is of low or unknown density, soakaways should be sited at least 10m from any foundations, and where the chalk is of medium density or higher, any foundations should be sited at least 5m from any foundations.
-

7. CONTAMINATION RISK ASSESSMENT

7.1. Results of the Preliminary Risk Assessment

The tabulated Conceptual Site Model (CSM) developed by the Soil Environment Services Ltd Desk Study Report referenced SES/MH/ER/1#1, December 2020 is reproduced in section 2.8. For the complete information please see the Desk Study report.

No additional source of contamination, pathway or receptor was identified between the desk study and the ground investigation and as such, it was not necessary to modify the CSM.

In the UK, the assessment of risk from contamination follows the source-pathway-receptor (SPR) approach. For a risk to be present there must be a source of contamination, a receptor or receptors, and a pathway for contaminants to migrate or be absorbed. If there is a linkage between any given source and receptor, then a quantitative risk assessment is used to assess the significance or impact of the pollutant linkage.

7.2. Sampling Locations

The synopsis for the trial hole locations and their final depth can be seen tabulated below. A trial hole location plan is provided within Figure 3. The table also indicates whether any locations targeted a source of contamination as well as the proposed end-use. The proposed development can be seen in Figure 2.

Trial Hole Location Synopsis		
Trial Hole/Final Depth	Sampling Strategy	Proposed End-Use
BH1/20.45m	Close to building (geotechnical purposes)	Car park/hardstanding
BH2/20.45m	Targeted – close to landfill off-site	Soft Landscaping
WS1/3.00m	Targeted – Soft Landscaping	Soft Landscaping
WS2/3.00m	Targeted – Soft Landscaping	Soft Landscaping
WS3/3.00m	Targeted – Soft Landscaping	Soft Landscaping
WS4/1.40m	Targeted – Soft Landscaping	Soft Landscaping
WS4A/3.00m	Targeted – Soft Landscaping	Soft Landscaping

The investigation area totals approximately 1,400m² and with seven sampling locations, given an unknown hotspot shape, the sampling density means that a hotspot with an area of approximately 300m² and a radius of approximately 9.77m would be encountered (CLR 4).

7.3. Soil Risk Assessment

Sampling depths were chosen to reflect the receptor of concern (e.g. human health, controlled waters and vegetation). Samples where olfactory or visual evidence of contamination was present (BH1/0.20m bgl) underwent targeted scheduling. The remaining samples (BH1/0.80, BH2/0.50, WS3/0.20, WS1/0.20 and WS4A/0.20m bgl) were scheduled under a random strategy. The receptors relevant to the sampling depths are tabulated below.

Summary of Receptors per Sample Depth	
Depth	Receptors
Shallow Samples (< 0.75m bgl)	- End Users (Residents/Future site visitors) - Construction workers during development

	• Site operatives during maintenance works • Neighbours and public • Vegetation within soft landscaped areas (shallow rooted) • Secondary A Aquifer (Lambeth Group) • Principal Aquifer (Chalk); • Buried Concrete • Receiving landfill
Moderate Samples (0.75 – 1.50m bgl)	• Construction workers during development • Site operatives during maintenance works • Vegetation within soft landscaped areas (deep rooted) • Secondary A Aquifer (Lambeth Group) • Principal Aquifer (Chalk); • Buried Concrete • Receiving landfill • Underground services (water pipes)
Deep Samples (> 1.50m bgl)	• Buried Concrete

Chemical laboratory testing, scheduled by Ground and Water Limited, and carried out by I2 Analytical Limited, was undertaken on six samples of Made Ground. The samples were subjected to a combination of analysis that comprised:

- Asbestos screen;
- Semi-metals and heavy metals incl. Arsenic, Cadmium, Chromium (incl. Hexavalent Chromium), Copper, Lead, Mercury, Nickel, Selenium, Vanadium, Zinc;
- Polycyclic Aromatic Hydrocarbons (PAH's) incl. Naphthalene, Acenaphthylene, Acenaphthene, Fluorene, Phenanthrene, Anthracene, Fluoranthene, Pyrene, Benzo(a)anthracene, Chrysene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(a)pyrene, Indeno(1,2,3-cd)pyrene, Dibenz(a,h)anthracene, Benzo(ghi)perylene;
- Speciated TPH including full aliphatic/aromatic split; and
- BTEX compounds (Benzene, Toluene, Ethylbenzene, Xylene) and MTBE – used as marker compounds for Volatile Organic Compounds (VOCs).

A breakdown of the number of tests undertaken for each determinand is discussed in further sections. The chemical laboratory results are presented in Appendix F.

7.3.1. Soil Assessment Criteria and Results

At the time of reporting, May 2025, the proposed development was understood to comprise the demolition of existing single storey building and erection of three storey building containing 16 dwellings together with associated soft landscaping, car parking, indoor cycle spaces and refuse. Proposed site plans are provided as Figure 2.

Based on the proposed development, the results of the chemical laboratory testing were compared to the Generic Assessment Criteria (GAC) for a '**Residential without homegrown produce**' land-use scenario, as this was considered the most appropriate land-use scenario.

Where a contaminant of concern's GAC varies according to the Soil's Organic Matter (SOM), the SOM recorded for each uncontaminated soil type was used to derive the appropriate GAC for each soil type. A SOM value of 1%, the most conservative value, was utilised.

A summary of the analytical results and the comparison to the determinands adopted screening value are presented in the table below and overleaf.

Soil Contamination Test Results and Screening Values					
Determinand	Number of Samples	Minimum Concentration (mg/kg)	Maximum Concentration (mg/kg)	Adopted Screening Value (mg/kg)	Was the adopted screening value exceeded for relevant land-use scenario?
INORGANICS					
Asbestos	6	ND	D	ND	Yes - BH1/0.20 Amosite fibres <0.001%
Cyanide (total)	6	< 1	< 1	24	No
Phenols	6	< 1	< 1	750	No
METALS					
Arsenic	6	4.5	15	40	No
Boron	6	0.8	3.2	11,000	No
Cadmium	6	< 0.2	0.4	85	No
Chromium (III)	6	8	36	910	No
Chromium (Hexavalent)	6	< 1.8	< 1.8	6	No
Copper	6	12	61	7,100	No
Lead	6	20	82	310	No
Mercury	6	< 0.3	0.7	1.2	No
Nickel	6	9.2	29	180	No
Selenium	6	< 1	1.3	430	No
Vanadium	6	14	41	1,200	No
Zinc	6	38	200	40,000	No
TOTAL PETROLEUM HYDROCARBONS (TPHs)					
Aliphatic >C5 - C6	3	< 0.01	< 0.01	42	No
Aliphatic >C6 - C8	3	< 0.01	< 0.01	100	No
Aliphatic >C8 - C10	3	< 0.01	< 0.01	27	No
Aliphatic >C10 - C12	3	< 1	< 1	130	No
Aliphatic >C12 - C16	3	< 2	29	1,100	No
Aliphatic >C16 - C21	3	< 8	51	65,000	No
Aliphatic >C21 - C35	3	< 8	130		
Aliphatic >C35 - C40	3	<10	70	65,000	No
Aromatic >C5 - C7	3	< 0.01	< 0.01	370	No
Aromatic >C7 - C8	3	< 0.01	< 0.01	860	No
Aromatic >C8 - C10	3	< 0.02	< 0.02	47	No
Aromatic >C10 - C12	3	< 1	< 1	250	No
Aromatic >C12 - C16	3	< 2	7.4	1,800	No
Aromatic >C16 - C21	3	< 10	29	1,900	No
Aromatic >C21 - C35	3	15	290	1,900	No
Aromatic >C35 - C40	3	< 10	230	1,900	No
Benzene	3	< 0.005	< 0.005	0.38	No
Toluene	3	< 0.005	< 0.005	880	No
Ethylbenzene	3	< 0.005	< 0.005	83	No
m,p-Xylene	3	< 0.008	< 0.008	79	No

o-Xylene	3	< 0.005	< 0.005	88	No
POLYCYCLIC-AROMATIC HYDROCARBONS					
Acenaphthene	6	< 0.05	0.19	3,000	No
Acenaphthylene	6	< 0.05	2.1	2,900	No
Anthracene	6	< 0.05	1.7	31,000	No
Benzo(a)anthracene	6	0.1	9.4	11	No
Benzo(a)pyrene	6	0.11	12	3.2	Yes – BH2/0.50
Benzo(b)fluoranthene	6	0.13	14	3.9	Yes – BH2/0.50
Benzo(ghi)perylene	6	0.09	14	360	No
Benzo(k)fluoranthene	6	0.07	6.8	110	No
Chrysene	6	0.12	11	30	No
Dibenzo(a,h)anthracene	6	< 0.05	2.6	0.31	Yes – BH1/0.20 and BH2/0.50
Fluoranthene	6	0.22	16	1,500	No
Fluorene	6	< 0.05	0.31	2,800	No
Indeno(1,2,3-cd)pyrene	6	0.07	11	45	No
Naphthalene	6	< 0.05	0.33	2.6	No
Phenanthrene	6	0.15	4.5	1,300	No
Pyrene	6	0.19	14	3,700	No
MARKER FOR VOLATILE ORGANIC COMPOUND					
Methyl tert-butyl ether (MTBE)	3	< 0.005	< 0.005	73	No
The derivation of the Soil Assessment Criteria used within this report can be seen within Appendix G. The soil concentrations were typically compared to the LQM/CIEH Suitable for Use Levels (S4UL) (2014), based upon the assumption of 1% soil organic matter. A screening value for Lead is based on the Category 4 Screening Levels (C4SLs). Where no S4UL or C4SL is available for Cyanide, a SoBRA acute GAC is assigned. Where no S4UL or C4SL is available for MTBE, a CL:AIRE 2010 GAC is assigned. Where exceedances are noted, the trial hole and depth of sample is recorded.					

The proposed development includes areas of soft-landscaping, where shallow rooted vegetation may be exposed to aggressive ground conditions. The previous table compares the results of the laboratory analysis to GAC that is protective of Human Health and therefore different GAC is required for vegetation.

Soil Contamination Test Results and Screening Value					
Determinand	Number of Samples	Minimum Concentration (mg/kg)	Maximum Concentration (mg/kg)	Adopted Screening Value (mg/kg)	Was the adopted screening value exceeded for relevant land-use scenario?
Copper	6	12	61	200	No
Nickel	6	9.2	29	110	No
Zinc	6	38	200	300	No
The derivation of the Soil Assessment Criteria used within this report can be seen within Appendix G. The soil concentrations were compared to BS3882:2015 <i>Specification for Topsoil</i> and based on differing pH. For the purpose of conservatism, the pH of the soils have been assumed to be below 6 within this table. Where exceedances are noted, the trial hole and depth of sample is recorded.					

7.3.2. Soil Assessment

The comparison between the laboratory analysis and the assessment criteria indicates that there is an unacceptable risk to future receptors caused by exceedances of the following determinands: Benzo(a)pyrene; Benzo(b)fluoranthene; and Dibenzo(a,h)anthracene. The remaining determinands

were identified at below the adopted screening value and are not considered to represent an unacceptable risk to future receptors. Where an unacceptable risk to future receptors remains, mitigation is required.

The contamination was identified in BH1 and BH2, it is recommended that either further testing is undertaken to delineation the contamination or a clean capping system is implemented for all soft landscaped areas. Details will be provided in Section 8.1.

Asbestos

Asbestos was identified within one sample (BH1/0.20m) as amosite fibres. Quantification was undertaken on the sample and indicated that asbestos was present at < 0.001%.

A quantification risk assessment was carried out for the concentration recorded, in accordance with the guidance within CIRIA 733. The background, considerations taken, and the calculations can be seen in Appendix H. A summary of the results is shown in the table below.

Asbestos Risk Assessment				
Sample	Mesothelioma Accumulated Risk (fibres/ml.year)	Mesothelioma Risk	Lung Cancer Accumulated Risk (fibres/ml.year)	Lung Cancer Risk
BH1/0.20	0.00202	Between “about 2 (highest arguable 15) and “highest arguable becomes insignificant”	0.00144	Insignificant

Based on CIRIA Table 14.1 for Mesothelioma, the risk for BH1/0.20m bgl was considered to potentially pose a small risk and with Table 14.3 for Lung Cancer insignificant. **Given the asbestos was identified in the location that will be a car park/hardstanding, this can stay in-situ. However, given the PAH contamination, if further testing is undertaken for this it is recommended asbestos testing is undertaken as well or the clean capping system implemented.**

An **Asbestos Management Strategy** should be put in place so that any potentially asbestos containing materials are identified and removed from site in a suitable manner to prevent cross-contamination.

7.3.3. Water Supply Pipe Risk Assessment

As part of the proposed development it is expected that new water supply pipes will be installed at the site. Water supply pipes have the potential to be exposed to contaminants in the ground that can lead to unacceptable concentrations within the drinking water. If a risk is identified, specialist pipes that are protective of the drinking water are required.

A pipe selection risk assessment should be submitted to the water supply company as part of the development based on the supplier’s assessment criteria. An indication of whether there is likely to be a risk can be seen tabulated below, where the PE pipe thresholds are based on *UKWIR Contaminated Land Assessment Guidance, 2014*.

Pipe Selection Risk Assessment			
Determinand	PE Pipe Threshold (mg/kg)	Laboratory Analysis Range (mg/kg)	Was the Threshold Exceeded?

Total BTEX and MTBE	0.1	LOD	No
Total VOCs	0.5	LOD	No
Total SVOCs	2	Not tested	No
Phenols	2	LOD	No
TPH EC5 – EC10 (aliphatics and aromatics)	2	LOD	No
TPH EC10 – EC16 (aliphatics and aromatics)	10	LOD - <38.4	Yes – BH1
TPH EC16 – EC40 (aliphatics and aromatics)	500	<64 - 800	Yes – BH1
Naphthalene	5	LOD – 0.33	No

The results indicate that TPHs were above the threshold for the use of a PE pipe at the site in the location of BH1. It is recommended that once the location of any proposed water pipes are chosen further testing is undertaken to confirm this testing or alternative pipes i.e. barrier pipes will be required.

7.4. Groundwater Risk Assessment

In the UK, the water environment is protected under a number of regulatory regimes, mainly governed by the Environment Agency. The Environment Agency is consulted when there may be a risk to Controlled Waters, or where a pollution incident has occurred historically. The Water Framework Directive is implemented in various guises covering groundwater, surface water and drinking water supply. In addition to the water environment receptors, contaminated groundwater has the potential to cause unacceptable risk to human health through vapours.

7.4.1. Background Information

The DEFRA online maps indicated that the site was located on Secondary A Aquifer associated with the bedrock Lambeth Group, underlain by a Principal Aquifer associated with the chalk. If Alluvium is encountered on-site these are classified as a Secondary A Aquifer.

From analysis of hydrogeological and topographical maps the groundwater table was anticipated to be encountered at a moderate depth within the Lambeth Group and at depth within the Chalk. Perched water was also likely to be found within the Made Ground, especially after periods of intense or prolonged rainfall. It was considered that the groundwater was flowing westwards, towards the River Kennet and in alignment with local topography.

The nearest surface water feature was recorded to be the River Kennet located ~100m north-west and 120m west. A drain connecting to the River Kennet was identified ~180m south.

The site was not located within a Source Protection Zone.

During the site investigation, Made Ground was encountered to a maximum depth of 2.50m bgl, overlying sandy clay and clayey sand of the Lambeth Group to the base of the window sample boreholes (1.40-3.00m bgl). In the cable percussion boreholes chalk was encountered at 4.30 – 5.30m bgl to the base of the boreholes at 20.45m bgl. Groundwater strikes were noted between 2.00 – 4.45m bgl within the boreholes. It should be noted that groundwater strikes may be obscured by the drilling/excavation process. A summary of the groundwater observations during site works has been provided below.

Groundwater Strikes during Drilling		
Trial Hole	Groundwater reading (m bgl)	Depth after 20 minutes (m bgl)
BH1	3.00	2.76
BH2	2.80	2.77
	4.45	4.42
WS1	2.00	-
WS2	2.30	-
WS3	2.00	-
WS4	None	-
WS4A	2.00	-

Following the site investigation, 3No. return groundwater monitoring visits were undertaken. The groundwater levels can be seen below.

Depth of Groundwater within Trial Holes			
Trial Hole	Date	Depth of Groundwater (m bgl)	Depth of Standpipe (m bgl)
BH1	09/04/2025	3.49	-
BH2		1.74	-
BH1	16/05/2025	3.50	9.10
BH2		3.20	9.40
BH1	22/05/2025	3.20	9.10
BH2		3.10	9.40

During the monitoring rounds on the 16th May 2025 and 22nd May 2025, samples were recovered from both boreholes. During the first visit the samples were taken following the removal of three times the borehole volume in order to develop the well. Samples were collected within a series of plastic and glass bottles, glass vials and bottles with preservatives to meet the requirements of BS5667 and as requested by the laboratory.

7.4.2. Level 2 (groundwater) Risk Assessment

As the site is located on a Secondary A Aquifer of the Lambeth Group, it is considered that the aquifer may support base flow to rivers and surface water at a local level. It is therefore concluded that the most applicable screening values to be used is the Environmental Quality Standards (EQS), which are protective of ecology within the water. Where no EQS is available, other water quality standards have been noted within the table. A level 2 (groundwater) risk assessment compares the recorded concentration of a determinand to a pre-defined GAC (EQS, USEPA and UK drinking water standard).

The chemical laboratory results are presented in Appendix F and have been summarised within the table below and overleaf. Only determinands that have an appropriate screening value have been included within the table.

Due to the amount of solids in the first visit samples, it was not possible to filter the groundwater sample and therefore the metals testing was not possible. The below results for metals is from the second visit only.

Groundwater Contamination Test Results and Screening Values

Determinand	Minimum Concentration (µg/l)	Maximum Concentration (µg/l)	Adopted Screening Value (µg/l)	Was the adopted screening value exceeded?
INORGANICS				
pH	7.36	7.64	6.5 – 9.5 ⁵	No
Cyanide	< 50	< 50	1 ¹	Yes/Below LOD
Phenols	< 2	< 2	7.7 ¹	No
METALS				
Arsenic	1.33	1.36	50 ¹	No
Boron	199	206	750 ¹	No
Cadmium	< 0.08	< 0.08	0.08 – 0.25 ^{1,2}	No
Chromium (III)	< 1	< 1	4.7 ¹	No
Chromium (Hexavalent)	< 30	< 30	3.4 ¹	Yes/Below LOD
Copper	2.84	2.95	1 ^{1,4}	Yes
Lead	0.232	0.245	1.2 ¹	No
Mercury	< 0.01	< 0.01	0.07 ¹	No
Nickel	6.26	6.37	4 ¹	Yes
Selenium	2.15	2.18	7.5 ¹	No
Vanadium	1.77	1.98	86 ⁶	No
Zinc	5.47	9.41	10.9 ^{1,4}	No
PETROLEUM HYDROCARBONS				
Aliphatic >C5 – C6	<10	<10	15,000 ³	No
Aliphatic >C6 – C8	<10	<10		No
Aliphatic >C8 – C10	<10	<10	300 ³	No
Aliphatic >C10 – C12	<10	<10		No
Aliphatic >C12 – C16	<10	<500		No
Aliphatic >C16 – C21	<10	<500	Not derived	No
Aliphatic >C21 – C35	<10	<500	Not derived	No
Aromatic >EC5 – EC7	<10	<10	10 ³	No
Aromatic >EC7 – EC8	<10	<10	700 ³	No
Aromatic >EC8 – EC10	<10	<10	300 ³	No
Aromatic >EC10 – EC12	<10	<10	90 ³	No
Aromatic >EC12 – EC16	<10	<500		No
Aromatic >EC16 – EC21	<10	<500	90 ³	No
Aromatic >EC21 – EC35	<10	265		Yes
Total TPH	<10	265	10 ⁵¹	Yes
Benzene	< 1	< 1	10 ¹	No
Toluene	< 1	< 1	74 ¹	No
Ethylbenzene	< 1	< 1	300 ³	No
Xylene	< 1	< 1	15.5-63.6 ¹	No
POLYCYCLIC-AROMATIC HYDROCARBONS				
Anthracene	< 0.05	0.972	0.1 ¹	Yes
Benzo(a)pyrene	< 0.02	15.1	0.00017 ¹	Yes
Benzo(b)fluoranthene	< 0.05	20.2	7	Yes
Benzo(k)fluoranthene	< 0.05	7.43		Yes
Benzo(ghi)perylene	< 0.05	14	7	Yes
Dibenzo(a,h)anthracene	< 0.05	2.08	0.0025 ⁶	Yes
Fluoranthene	< 0.05	15.1	0.0063 ¹	Yes
Fluorene	< 0.05	0.178	290 ⁶	No
Indeno(1,2,3-cd)pyrene	< 0.05	14.5	7	Yes
Naphthalene	< 0.1	< 0.2	2 ¹	No

Total EPA-16 PAHs	< 0.82	127	0.1 ⁵	Yes
SEMI-/VOLATILE ORGANIC COMPOUND				
SVOCs	<10	<500	Above LOD?	No
Trichloromethane (Chloroform)	<1	9.67	790 ⁸	No
Trichloroethene	1.57	2.38	5.7 ⁸	No
Tetrachloroethene	15.3	61.8	34 ⁸	Yes
VOCs	<1	<3	Above LOD?	No
¹ Environmental Quality Standards (EQS) ² Screening value changes as a result of calcium carbonate concentration of aquifer ³ WHO Guidelines for drinking water quality, 2022 ⁴ Site specific threshold calculated based on the bio-availability per sample ⁵ UK Drinking Water Standards ⁶ United States Environmental Protection Agency ⁷ For the group of priority substances for PAH, the AA EQS in water refer to the concentration of Benzo(a)pyrene on the toxicity of which they are based. Benzo(a)pyrene can be considered as a marker for other PAH's, hence only Benzo(a)pyrene must be monitored for comparison with the AA EQS. ⁸ SoBRA GACgwap				

A level 2 (groundwater) risk assessment has been undertaken on the results from the investigation and has identified numerous exceedances within the groundwater at the site.

The level 2 (groundwater) risk assessment has been undertaken and found determinands that are likely to have a detrimental effect on the underlying aquifer and potentially impacting the surface water nearby. Given the former use of the site as a brick works and the infilled ground which extended off-site significantly, it is likely that the determinands are a combination of the historical use on-site and off-site. Given a significant proportion of the site will be occupied by the building footprint which will involve removal of soils for the foundation excavations and the removal of 450mm of soils for the capping system in the soft landscaped areas, the majority of the worst soils will be removed. The Tetrachloroethene exceedance will be discussed separately in the vapour risk assessment section in Section 7.6.

The findings of this risk assessment should be agreed with the Environment Agency.

7.5. Ground Gas Risk Assessment

A review of the Phase I desk study, has identified a source of ground gas on-site or within influencing distance of the site that warrants investigation through ground gas monitoring.

The investigation undertaken to date have identified the main sources of ground gases to be associated with the degradation of putrescible material within deep Made Ground/Infilled Land both on-site and off-site, where the off-site sources include the presence of a historical landfill adjacent to the south-west. Ground gases have the potential to migrate vertically through preferential pathways and build up within the proposed development, especially enclosed spaces on the ground floor. Based on the preceding information, ground gas monitoring was undertaken at the site.

7.5.1. Available Data

Spot Gas Monitoring

In order to assess the ground-gas risk, two combined ground-gas/groundwater monitoring standpipes were installed to a maximum depth of 4.20 – 5.20m bgl. The construction of the wells has been tabulated below.

Monitoring Well Construction				
Trial Hole	Piping internal diameter (mm)	Depth of Installation (m bgl)	Response Zone (m bgl)	Response Zone Strata
BH1	50	5.20	2.20 – 5.20	Lambeth Group
BH2	50	4.20	2.20 – 4.20	Lambeth Group

Spot monitoring using a GFM400 series gas analyser by a GGS representative was undertaken on 9th April 2025 and by Ground and Water on 16th and 22nd May 2025, the results are tabulated below and provided within Appendix I.

Spot Ground-Gas Monitoring Results							
Trial Hole	Highest CH ₄ (% v/v)	Highest CO ₂ (% v/v)	Lowest O ₂ (% v/v)	Highest H ₂ S (ppm)	Highest CO (ppm)	Highest Flow Rate (l/hr)	Shallowest Groundwater (m BGL)
BH1	0.10	4.30	10.30	<1	3	<0.10	3.49
BH2	0.20	0.40	20.10	<1	4	<0.10	1.74

Continuous Gas Monitoring

Continuous monitoring has been undertaken using Gas Sentinels installed on the monitoring wells installed in BH1 and BH2 over a 4 week period with two falling pressure scenarios captured. Where the reliability of the monitoring results will require consideration in line with CIRIA C665 and BS8485:2015+A1:2019, the table has been highlighted orange.

Continuous Ground-Gas Monitoring Results							
Trial Hole	Highest CH ₄ (% v/v)	Highest CO ₂ (% v/v)	Lowest O ₂ (% v/v)	Highest H ₂ S (ppm)	Highest CO (ppm)	Highest Flow Rate (l/hr)	Shallowest Groundwater (m BGL)
BH1	0.10	3.70	19.20	4	30	0.01	-
BH2	0.10	1.80	19.20	6	27	0.10	-

Methane was encountered at a maximum concentration of 0.20%v/v, carbon dioxide at a maximum concentration of 4.50%v/v. A maximum of positive flow was encountered within the boreholes at a maximum of 0.1l/hr. No wells were noted to be flooded.

7.5.2. Data Quality

A review was made of the quality of the available data for the site, which can be viewed in the table below. CIRIA Report C665 (2007), BS 8485:2015+A1:2019 and BS 8576:2013 stress the need for risk assessments to be based on good quality data and give guidance as to best practice in this respect.

Review of Data Quality			
Data Type	Current Understanding	UK Practice	Recommendation
Geological and hydro-	The CSM identified the site to be located on Made Ground (2.50m), overlying both permeable and	CIRA C665 & C659, Wilson and Card (1999) and BS 8485 recommend that geology and	The geological and hydrogeological model is understood to a standard

Review of Data Quality			
geological conditions	impermeable strata of the Lambeth Group over chalk. Groundwater has been encountered at shallow depth during drilling and during monitoring.	hydrogeology be fully understood.	that will not comprise the findings of the risk assessment. No further action required.
Monitoring period	The monitoring has been undertaken for a 4week period. Monitoring has been undertaken during a variety of atmospheric conditions including periods of falling, steady and rising pressure.	CIRIA C665 and BS 8576 recommends monitoring over a range of weather conditions. Concentrations of ground gas are likely to be highest during falling pressures, with sharp falls providing the worst-case results. In line with CIRIA C665 a minimum of 4No. monitoring visits are required.	Monitoring should be undertaken over a month period with between weekly and fortnightly readings. Continuous Monitoring was undertaken over a 4week period. Monitoring has been undertaken during atmospheric pressures of between 994 and 1033 mbar No further action required.
Gas data sets	Methane was detected at concentrations up to 0.20%v/v. Carbon dioxide concentrations were recorded up to 4.30%. Hydrogen sulphide was detected at a maximum of 6ppm and carbon monoxide and 30ppm. Monitoring revealed a maximum positive flow of 0.10l/hr.	Borehole flow velocity and borehole gas volume (methane and carbon dioxide) are required for ground gas flux categorisation. Modified Wilson and Card classification, CIRIA C665 (2007), BS8485:2015+A1:2019.	A suitable gas dataset is available for the risk assessment. No further action required.

7.5.3. Risk Assessment

Gas Monitoring Data

The ground gas monitoring undertaken to date has been reviewed and following any omissions caused by contradiction of the UK guidance (e.g. flooded wells), is deemed suitable for use in the risk assessment. The monitoring undertaken recorded methane concentrations of up to 0.20%v/v, carbon dioxide concentrations of up to 4.30%v/v and the maximum steady-state flow rate recorded was 0.1l/hr.

Based on the documentation presented in BS 8485:2015+A1:2019 “Code of practice for the characterisation and remediation from ground gas in affected developments”, the *hazardous gas flow rate* (Q_{hg}) should be calculated for each borehole using the equation below.

$$Q_{hg} = (C_{hg}/100) * q$$

Where: Q_{hg} is the measured hazardous gas concentration (in percentage volume-by-volume);
 q is the flow rate (in litres per hour) of combined gases found by direct measurement.

The hazardous gas flow rate has been calculated for each borehole, referred to as the Gas Screening Value (GSV) using the worst-case steady-state concentration and flow, from all monitoring to date. The results are presented within the table below. Following the generation of the GSV, a ground gas characteristic situation can be assigned to the borehole. This has also been included within the table below.

Hazardous Gas Flow Rate Assessment							
Trial Hole	CH ₄ (%v/v)	CO ₂ (%v/v)	Flow Rate (l/hr)	CH ₄ GSV (l/hr)	Characteristic Situation	CO ₂ GSV (l/hr)	Characteristic Situation
BH1	0.2 ¹	4.3	<0.1 ³	0.0002	CS1	0.0043	CS1
BH2	0.1 ¹	1.8	0.1	0.0001	CS1	0.0018	CS1

¹Where a value of 0.0 %v/v is detected the detection error is to be used of 0.2%v/v for methane.

²Where a value of 0.0 %v/v is detected the detection error is to be used of 0.1%v/v for carbon dioxide.

³Where a value of 0.0 l/hr is detected the detection error is to be used of 0.1 l/hr for flow.

⁴CS1 typically when <1% methane and <5% carbon dioxide otherwise *consider* an increase to CS2.

Based upon the available ground gas monitoring to date, the risk from ground gas is considered to be **very low (CS1)**, in accordance with BS8485:2015+A1:2019.

Consideration is required to any GSV that falls into the CS1 category, however the methane concentration is greater than 1% and/or the carbon dioxide concentration is greater than 5%. These locations are typical of sites where the hazardous gas concentration is significant, however marginal flow has been recorded during monitoring. It should be noted that consideration does not indicate that an increase is required. The monitoring results indicate that consideration is not required for an increase.

Assessing the sufficiency of the data is a requirement of BS 8576:2013, to determine whether further monitoring is required and the impact that this may have on the risk assessment. The current worst-case scenario is within BH1, which has identified a carbon dioxide GSV of 0.0043 l/hr. A GSV of 0.07 l/hr or above would result in an increase to Characteristic Situation CS2. Should the flow rate remain (1.0l/hr), a carbon dioxide concentration of 70% would be required to increase the classification to CS2. The understanding of the CSM indicates that this is unlikely to occur, however a slight increase may be plausible. Should the concentration of carbon dioxide remain constant (4.3%), a borehole flow rate of 1.62l/hr would be required to increase the classification to CS2. This increase in flow is possible within the understanding of the CSM but unlikely. A worst-case falling pressure has been noted during monitoring.

For Carbon Monoxide the WHO indoor air guidelines for Europe indicated anything above 6ppm over a 24hour period was an unacceptable level. OSHA (Occupational Safety and Health Administration) sets a safety limit of 50 ppm for an 8-hour exposure. The HSE has a Workplace Exposure Limit (WEL) for hydrogen sulphide of 5 ppm 8-hour time-weighted average (TWA) based on data indicating a shift towards anaerobic respiration at exposures to 10 ppm. The explosive range of hydrogen sulphide in air is 4.3 to 45%.

Carbon monoxide was recorded at a maximum of 30ppm and hydrogen sulphide was detected at 6ppm a concentration to warrant further assessment. Based on the risk assessment it is considered

unlikely carbon monoxide and hydrogen sulphide will pose a risk at the site, however, the protection measures to protect against the vapours would also protect against these.

7.5.4. Ground Gas Risk Assessment Summary

The ground gas monitoring and the derived GSVs have indicated that there is a very low risk from ground gases, equating to **Characteristic Situation CS1** across the site. Based on the risk assessment it is considered unlikely carbon monoxide and hydrogen sulphide will pose a risk at the site, however, the protection measures to protect against the vapours would also protect against these.

Therefore, based on the evidence available to date, the risk assessment for the site indicates that the site should be classified as **Characteristic Situation CS2**.

Boreholes can act as preferential pathways for ground gas and therefore prior to construction, all boreholes should be suitably decommissioned in line with Environment Agency guidance. This usually comprises pumping liquid grout down a tremie pipe to the base of the borehole, raising as the borehole fills.

The gas protection methods are outlined in BS8485:2015+A1:2019 and should be installed in line with CIRIA C735. The protection measures required are summarised within Section 8.3.

7.6. Vapour Risk Assessment

The CSM identified has not identified a significant source of contamination that may pose an unacceptable risk to receptors through vapours from an on-site source but there is from an off-site source.

7.6.1. Soil Assessment

In order to assess the potential for a vapour risk at the site, soil samples were sent to the laboratory for analysis (Appendix G). The testing suites included contaminants that may be present in the vapour phase (Mercury, Napthalene, TPHs and volatile Organic Compounds (VOCs)) taken within Made Ground samples.

All samples scheduled (3 - 6No.) identified contaminants that may pose a risk through the vapour pathway at concentrations lower than the laboratory limit of detection or below the respective relevant assessment criteria.

7.6.2. Human Health Risk Assessment from Dissolved Contaminants

In order to assess potential risk to site users, dissolved concentrations of potential contaminants have been compared to generic assessment criteria (GAC_{gwwap}) for assessing vapour risk to human health for volatile contaminants in groundwater for a residential end-use, published by the Society for Brownfield Risk Assessment (SoBRA). The table below and overleaf summarises the results of the laboratory analysis. Potential contaminants have been split into the groups presented in the SoBRA Report. Only determinands of concern that were detected in at least one sample over the monitoring period above the LOD where a SoBRA GAC_{gwwap} is published have been included. The results are included as Appendix G.

Groundwater Contamination Test Results			
Determinand	SoBRA GAC_{gwwap}	Laboratory Analysis Range	Was the GAC Exceeded?

	(µg/l)	(µg/l)	
POLYCYCLIC-AROMATIC HYDROCARBONS			
Acenaphthene	170,000	<0.05 - <0.1	No
Acenaphthylene	220,000	<0.05 – 0.95	No
Fluorene	210,000	<0.05 - 0.178	No
Naphthalene	220	<0.1 - <0.2	No
HALOGENATED ORGANICS			
Tetrachloroethene (PCE)	34	15.3 – 61.8	Yes – BH2 (1 st visit)
Trichloroethene (TCE)	5.7	1.57 – 2.38	No
Trichloromethane (Chloroform)	790	<1 – 9.67	No

The assessment of risk to human health from vapours associated with dissolved contaminants in groundwater summarised in the table above indicates that the majority of the determinands are significantly below the GACgwvap adopted. The exceptions to this being the measured concentration of Tetrachloroethene in BH2 during the first visit.

PCE can degrade to TCE and Chloromethane and the source of the vapours is considered to be from an off-site source. At this stage the vapour risk within the groundwater is at a level that needs further assessment/protection. This should either be through further groundwater sampling and monitoring or through installing a CS2 protection measures with a vapour membrane. Generic details will be provided within Section 8 but it is recommended once foundation plans are finalised that this risk assessment/remediation strategy is updated.

7.6.3. Borehole Monitoring

During the monitoring of the boreholes installed, an oil-water interface probe and Photoionization Detector (PID) was utilised. The interface probe did not identify any dense or light non-aqueous phase liquids (DNAPL / LNAPL) during any of the monitoring visits. The highest PID reading was 0ppm.

It should be noted that the PID result will provide an indication on the total VOC concentration and will not speciate the determinands.

7.7. Updated Conceptual Site Model

Following completion of the Phase 2 Site Investigation, the CSM, inclusive of associated risk, within Section 2.8 of this report was re-evaluated.

For ease of reference and understanding, the risks have been re-assigned within this risk assessment against three possible levels / categories, summarised in the table below.

Risk Categories used in the Tabulated CSM	
Low Risk	Regarding this potential SPR linkage, the site is considered suitable for the proposed end-use and there is not considered to be an unacceptable risk to receptors.
Moderate Risk	Regarding this potential SPR linkage, the site is suitable for the proposed end-use however remediation and/or further investigation is required.
High Risk	Regarding this potential SPR linkage, the site is not suitable for proposed end-use and there is an unacceptable risk to receptors. Urgent action required in the short term.

Tabulated Conceptual Site Model – Pollutant Linkage Summary			(On-Site Sources)
Potential Sources	Potential Absorption Pathways	Potential Receptors	Risk Classification
Former brick works and kilns: - PAHs, and - Metals.	- Direct ingestion of soil and soil derived dust - Dermal contact of soil and soil derived dust - Inhalation of dust (indoors and outdoors) with elevated concentration of determinands - Direct ingestion of groundwater - Inhalation of volatile vapour (indoors and outdoors) - Direct uptake of groundwater - Direct uptake of determinands in the soil	Human Health - End Users (Residents/Future site visitors) - Construction workers during development - Site operatives during maintenance works - Neighbours and public	Moderate – PAHs identified
	- Anthropogenic (man-made) pathways - Vertical and lateral migration in permeable strata - Surface water runoff	Flora and Fauna - Vegetation within soft landscaped areas - Ecological Receptor (Waterloo Meadows adj. south-west)	Low
	- Anthropogenic (man-made) pathways - Vertical and lateral migration in permeable strata - Surface water runoff	Controlled Waters - Secondary A Aquifer (Lambeth Group) - Principal Aquifer (Chalk); and - River Kennet (From ~100m north-west)	Low
Existing building, formerly used as laboratory: - Asbestos, - Metals, - PAHs, and - TPHs.	- Direct ingestion of soil and soil derived dust - Dermal contact of soil and soil derived dust - Inhalation of dust (indoors and outdoors) with elevated concentration of determinands - Direct ingestion of groundwater - Inhalation of volatile vapour (indoors and outdoors) - Direct uptake of groundwater - Direct uptake of determinands in the soil	Human Health - End Users (Residents/Future site visitors) - Construction workers during development - Site operatives during maintenance works - Neighbours and public	Moderate – asbestos and PAHs identified
	- Anthropogenic (man-made) pathways - Vertical and lateral migration in permeable strata - Surface water runoff	Flora and Fauna - Vegetation within soft landscaped areas - Ecological Receptor (Waterloo Meadows adj. south-west)	Low
	- Anthropogenic (man-made) pathways - Vertical and lateral migration in permeable strata - Surface water runoff	Controlled Waters - Secondary A Aquifer (Lambeth Group) - Principal Aquifer (Chalk); and - River Kennet (From ~100m north-west)	Low
Aggressive ground conditions with Made Ground and natural ground, including groundwater: - Sulphates, - PAH/TPH.	Direct contact with aggressive ground conditions	Building Materials and Services - Buried Concrete - Underground services (water pipes)	Low – DC-1, AC-1

Ground gases generated by infilled land and alluvium (if encountered): • Methane, • Carbon Dioxide, • Hydrogen Sulphide, and • Carbon Monoxide.	• Migration through anthropogenic & natural pathways • Inhalation of Asphyxiating gases • Explosion (methane only)	Human Health • End Users (Residents/Future site visitors) • Construction workers during development (especially in confined spaces) • Site operatives during maintenance works in confined spaces • Neighbours and public	Moderate – CS2
	• Migration through anthropogenic & natural pathways • Explosion (methane only)	Building Materials and Services • Buildings • Confined spaces • Underground services	Moderate – CS2

Tabulated Conceptual Site Model – Pollutant Linkage Summary			(Off-Site Sources)
Potential Sources	Potential Absorption Pathways	Potential Receptors	Risk Classification
Landfill leachate: - PAHs, - TPHs, - SVOCs/VOCs, and - Metals.	- Direct ingestion of soil and soil derived dust - Dermal contact of soil and soil derived dust - Inhalation of dust (indoors and outdoors) with elevated concentration of determinands - Direct ingestion of groundwater - Inhalation of volatile vapour (indoors and outdoors)	Human Health - End Users (Residents/Future site visitors) - Construction workers during development - Site operatives during maintenance works	Moderate - PAHs identified in soils and Tetrachloroethene (PCE) in GW
	Direct uptake of groundwater	Flora and Fauna Vegetation within soft landscaped areas	Low
Made Ground from nearby works incl. engineering works: - PAHs, - TPHs, - SVOCs/VOCs, - Sulphates, and - Metals.	- Direct ingestion of soil and soil derived dust - Dermal contact of soil and soil derived dust - Inhalation of dust (indoors and outdoors) with elevated concentration of determinands - Direct ingestion of groundwater - Inhalation of volatile vapour (indoors and outdoors)	Human Health - End Users (Residents/Future site visitors) - Construction workers during development - Site operatives during maintenance works	Moderate - PAHs identified in soils and Tetrachloroethene (PCE) in GW
	Direct uptake of groundwater	Flora and Fauna Vegetation within soft landscaped areas	Low
Aggressive ground conditions associated with impacted groundwater; - Sulphates, - PAH/TPH.	Direct contact with aggressive ground conditions	Building Materials and Services - Buried Concrete - Underground services (water pipes)	Low – DC-1, AC-1
Ground gases generated by landfill adj. to south-west: - Methane, - Carbon Dioxide, - Hydrogen Sulphide, and - Carbon Monoxide.	- Migration through anthropogenic & natural pathways - Inhalation of Asphyxiating gases - Explosion (methane only)	Human Health - End Users (Residents/Future site visitors) - Construction workers during development (especially in confined spaces) - Site operatives during maintenance works in confined spaces	Moderate – CS2
	- Migration through anthropogenic & natural pathways - Explosion (methane only)	Building Materials and Services - Buildings - Confined spaces - Underground services	Moderate – CS2

8. CONTAMINATION RECOMMENDATIONS AND REMEDIATION STRATEGY

Based on the results of the intrusive works, chemical analyses and risk assessments undertaken, the following has been identified that requires further action:

- Three contaminants (Benzo(a)pyrene, Benzo(b)fluoranthene, and Dibenzo(a,h)anthracene) have been found at unacceptable concentrations within the soils across the site.
- Asbestos has been identified in one location.
- PCE in the groundwater.

An Asbestos Management Strategy should be put in place so that any potentially asbestos containing materials are identified and removed from site in a suitable manner to prevent cross-contamination.

8.1. Soils

At this stage, due to the contamination identified in BH1 and BH2, it is recommended that either further testing is undertaken to delineate the contamination or a clean capping system is implemented for all soft landscaped areas.

Based on CIRIA Table 14.1 for Mesothelioma, the risk for BH1/0.20m bgl was considered to potentially pose a small risk and with Table 14.3 for Lung Cancer insignificant. Given the asbestos was identified in the location that will be a car park/hardstanding, this can stay in-situ. However, given the PAH contamination, if further testing is undertaken for this it is recommended asbestos testing is undertaken as well or the clean capping system implemented.

If further testing is not undertaken details for the engineered capping system that is recommended within all soft landscaped areas is as follows:

Based on the available information within this report it was proposed that the following remedial methodology should be undertaken within **all garden areas, including soft landscaping**:

- Reduce dig of 450mm;
- Placement of 150mm anti-dig layer, overlaid by a geotextile marker membrane;
- Placement of 300mm clean capping of soil;
- Validation of the clean capping system by a suitably trained Ground and Water Limited engineer.

Full liaison must be made with the statutory authority, prior to the implementation of this remediation strategy and/or removal of soils from the site. All works must be undertaken to meet their approval.

8.1.1. 450mm Reduce Dig

Made Ground should be removed from the locations to a minimum depth of 0.45m bgl to allow for the placement of the engineered capping system. On sites where levels are raised, the imported materials should be clean and validated, and can therefore enable a reduction in the reduce level dig. Should site levels be lowered, or natural soils encountered, samples of the natural soils should be sent to the laboratory for testing. If the soils are deemed suitable for use, the risk assessment should be revisited and a new remediation strategy agreed with the regulators.

Materials should be removed and stockpiled on an impermeable liner with raised edges and covered at all times. This contamination stockpile destined for removal from site should be stored away from imported soils to avoid cross-contamination. Materials to be removed off-site must be classified by carrying out Waste Acceptance Criteria (WAC) testing. A registered contractor must undertake the removal of waste. Consignment notes for the removal of waste must be obtained and kept for inclusion within the final validation Report.

8.1.2. 150mm Anti-dig layer and Marker Membrane

Following the excavation of the 450mm reduce dig, the void should be infilled with 150mm thick anti-dig layer comprising gap graded certified clean material (e.g. recycled crushed concrete), free from rebar and debris.

Following placement of the anti-dig layer a geotextile marker membrane should be placed to act as a barrier between the clean soils above and the anti-dig layer and contaminated soils below.

8.1.3. 300mm Clean Capping of Soil

The capping system should be at least 300mm in thickness within all garden areas and soft landscaping. It is recommended that at least the top 150mm of the clean capping should comprise suitable topsoil for use as a growing medium. It is a requirement that this should be no less than 100mm thick.

All subsoil and topsoil must be fit for purpose to ensure that the receptors cannot come into contact with determinands that could be detrimental to their health, see 'Imported Material' Section 4.8.

8.1.4. Validation

The remediation works outlined above will need to be inspected and independently validated by a Ground and Water Limited Engineer. All excavations will need to be inspected, documented and photographed.

The remediation works should be validated through a site visit and photographed by a suitably trained Ground and Water Limited Engineer following the 750mm reduce dig, placement of the no dig layer (prior to placement of the geotextile membrane) and after placement of the clean soils.

Validation holes should prove the depth of the clean cover to the marker membrane to ensure that it is present and enable the sampling of soils. Due to the design of the proposed development, 1 validation trial hole per area of soft-landscaping and a sample taken equating to 1 sample per 50m³ imported.

8.1.5. Water Supply Pipes

The results indicate that TPHs were above the threshold for the use of a PE pipe at the site in the location of BH1. It is recommended that once the location of any proposed water pipes are chosen further testing is undertaken to confirm this testing or alternative pipes i.e. barrier pipes will be required.

8.2. Groundwater

The level 2 (groundwater) risk assessment has been undertaken and found determinands that are likely to have a detrimental effect on the underlying aquifer and potentially impacting the surface

water nearby. Given the former use of the site as a brick works and the infilled ground which extended off-site significantly, it is likely that the determinands are a combination of the historical use on-site and off-site. Given a significant proportion of the site will be occupied by the building footprint which will involve removal of soils for the foundation excavations and the removal of 450mm of soils for the capping system in the soft landscaped areas, the majority of the worst soils will be removed. The Tetrachloroethene exceedance will be discussed separately in the vapour risk assessment section in Section 8.3 below.

8.3. Ground Gas and Vapours

Based on risk assessment undertaken, vapour protection measures will be required or further vapour risk assessment. If not further monitoring/testing is undertaken the following is required:

Characteristic Situation CS2 should be installed, where precautions to prevent the ingress of ground-gas/vapours are necessary. Type B buildings on CS2 classified sites require **3.5 points** worth of protection, in accordance with BS8485:2015+A1:2019. Points must be made up through a structural barrier, ventilation, and/or membrane, where at least two methods are incorporated.

An example of the gas protection measures that could be adopted are:

Cast in situ monolithic ground bearing raft or suspended floor slab (with minimal penetrations) (1 point)

In accordance with BS8485: Any raft or floor slab would need to ensure it is suitably reinforced to minimise potential cracking and must have limited penetrations caused by services. This reinforcement should be in accordance with Annex A, Section 2.2.2.

Passive sub-floor dispersal layer, typically no fine gravel or polystyrene (1.5 points):

In accordance with BS8485: The volume flow-through rate is governed by the size and number of side vents; for small to medium width buildings (up to 15 m wide – considered to be present onsite), the minimum area of side ventilation should be 1500mm²/m run of wall on at least two opposite sides. Where there are multiple internal obstructions to air flow (caused by beams), there should be four or five times the area of the side vents provided in the internal obstructions.

Gas/vapour Resistant Membrane (Visqueen vapour barrier or similar) meeting the criteria below (2 points):

- Sufficiently impervious to the gases (carbon monoxide and hydrogen sulphide) and vapours (PCE);
- Sufficiently durable to remain serviceable for the anticipated life of the building and duration of gas emissions;
- Sufficiently strong to withstand in-service stresses (e.g. settlement if placed below a floor slab);
- 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);
- Capable, after installation, of providing a complete barrier to the entry of the relevant gas;
- Verified by a suitably trained Engineer in accordance with CIRIA C735.

Please note any deviation from the above should meet the points criteria, as outlined within BS8485:2015+A1:2019. Gas/vapour protection measures should be suitably designed by a qualified professional following confirmation of the construction design.

8.3.1. Prior to Construction

Prior to construction of the buildings, the following should be undertaken:

- The decommissioning of all boreholes beneath the footprint of the building, in line with the EA guidance.
- Suitable design of ground gas/vapour protection measures.

8.3.2. During Construction

During construction of the structure, the following should be undertaken within each plot:

- Following the excavation and construction of foundations, a passive subfloor dispersal layer should be installed, complete with ventilation bricks.
- The subfloor dispersal layer should be verified by an appropriately trained Ground and Water Limited Engineer, and photographs obtained.
- Following installation of ventilation system, a gas resistant membrane (Visqueen Vapour barrier or similar) should be installed by a suitably qualified groundworker prior to pouring of the floor slab.
- The gas resistant membrane must be visually verified in accordance with CIRIA C735, by an appropriately trained Engineer, and photographs obtained of all components (overlaps, service entries, corners, repairs). This is required prior to pouring of the floor slab.
- The floor slab should be poured to prevent any damage or loss of integrity to the installed ground gas/vapour precautions.

8.3.3. Verification

- Following completion of all the verification works, outlined above, a report should be submitted to the local authority for approval. This should include as a minimum, verification photographs of the visual checks.

8.4. Discovery Strategy

There may be areas of contamination that have not been identified during the course of the intrusive investigation (e.g. underground storage tanks). Such occurrences may be discovered during the construction phases for the redevelopment of the site.

Groundworkers should be instructed to report to the Site Manager any evidence for such contamination; this may comprise visual indicators, such as fibrous materials within the soil, discolouration, or odours and emission. Upon discovery advice must be taken from a suitably qualified person and then the Local Authority will need to be informed.

8.5. Imported Material

It is required that clean soils will be brought onto site as part of the validation works. Any soil which is to be imported onto the site must undergo chemical analysis to prove that it is suitable for the purpose for which it is intended.

The soil must be fit for purpose and must either be supplied with traceable chemical laboratory test certificates or be tested, prior to placing (ideally) and after placing, to ensure that the future receptors (human health and vegetation) cannot come into contact with compounds that could be detrimental to their health. The compounds that are to be tested for are those given in the Generic Assessment Criteria, which can be viewed in Appendix G of this report.

8.6. Waste Disposal

The excavation of foundations and other soils is likely to produce waste which will require classification and then recycling or removal from site.

Under the Landfill (England and Wales) Regulations 2002 (as amended), prior to disposal, all waste must be classified as either: Inert; Non-hazardous; or Hazardous.

The Environment Agency's Hazardous Waste Technical Guidance (WM3) document outlines the methodology for classifying wastes. Once classified the waste can be removed to the appropriately licensed facilities, with some waste requiring pre-treatments prior to disposal.

Following the investigation, 6No. samples were submitted to the analytical laboratory to undergo a suite of testing for contamination testing, as discussed in the previous sections. Sampling depths were chosen to reflect the receptor of concern, human health, and typically comprised a surface or near surface sample and periodically to 1.00m bgl. Any horizon where olfactory or visual evidence of contamination was present was also sampled.

Based on a risk phase analysis of the chemical laboratory test results, in accordance with EC Hazardous Waste Directive and undertaken by Ground and Water Limited, all soil samples of Made Ground encountered on-site were NON-HAZARDOUS. The results of the assessment are given within Appendix J.

Soils containing asbestos are considered HAZARDOUS if the level of asbestos in the Made Ground is above the threshold of 0.1% or visual fragments can be observed. As quantification of the asbestos in the sample recovered from BH1/0.20m bgl was <0.001% (less than 0.1%) the Made Ground with asbestos detected in was NON-HAZARDOUS with respect to waste classification.

It is important to note that whilst we consider our in-house assessment tool to be an accurate interpretation of the requirements of WM3, therefore producing an initial classification in accordance with the guidance, this method classifies soils as either non-hazardous or hazardous and landfill operators have their own assessment tools and can often come to different conclusions. As a result, some landfill operators could refuse to take apparently suitable waste. It is recommended that the receiving landfill views the results of this assessment and the chemical laboratory results to determine their own classification.

In addition to the samples described above, 1No. sample was scheduled to undergo Waste Acceptance Criteria (WAC) testing with single batch leachate. The results indicate that the sample conformed to the Inert Waste Classification.

It should be noted that the receiving landfill may see the presence of Made Ground within the soils to be indicative of a non-hazardous classification despite the presence of the WAC testing certificates

indicating that it is inert. Therefore, it should be considered that all Made Ground is classified as Non-hazardous, subject to finalising with the receiving landfill.

Where contaminated soils are to be removed, they should be placed on an impermeable membrane (visqueen or similar) to ensure that no cross-contamination of soils occurs.

8.7. Duty of Care

Groundworkers must maintain a good standard of personal hygiene including the wearing of overalls, boots, gloves and eye protectors and the use of dust masks during periods of dry weather.

To prevent exposure to airborne dust by both the general public and construction personnel the site should be kept damp during dry weather and at other times when dust would be generated as a result of construction activities.

The site should be securely fenced at all times to prevent unauthorised access. Washing facilities should be provided and eating restricted to mess huts.

geotechnical and environmental consultants



FIGURES

2 The Long Barn, Norton Farm, Selborne Road, Alton, Hampshire GU34 3NB
0333 600 1221 enquiries@groundandwater.co.uk **groundandwater.co.uk**

Registered Office: Kineton House, 31 Horse Fair, Banbury, Oxfordshire OX16 0AE Registered in England No. 07032001



Site boundary

220 Elgar Road, South Reading RG2 0BW	
Abri	May 2025
Figure 1 – Site Location Plan	GWPR6540





220 Elgar Road, South Reading RG2 0BW

Abri

May 2025

Figure 2 – Proposed Development Plan

GWPR6540





- Site boundary
- Cable Percussion Borehole
- Window Sampler Borehole

220 Elgar Road, South Reading RG2 0BW	
Abri	May 2025
Figure 3 – Trial Hole Location Plan	GWPR6540



APPENDIX A: Conditions and Limitations

The ground is a product of continuing natural and artificial processes. As a result, the ground will exhibit a variety of characteristics that vary from place to place across a site, and also with time. Whilst a ground investigation will mitigate to a greater or lesser degree against the resulting risk from variation, the risks cannot be eliminated.

The report has been prepared on the basis of information, data and materials which were available at the time of writing. Accordingly, any conclusions, opinions or judgements made in the report should not be regarded as definitive or relied upon to the exclusion of other information, opinions and judgements.

The investigation, interpretations, and recommendations given in this report were prepared for the sole benefit of the client in accordance with their brief; as such these do not necessarily address all aspects of ground behaviour at the site. No liability is accepted for any reliance placed on it by others unless specifically agreed in writing.

Any decisions made by you, or by any organisation, agency or person who has read, received or been provided with information contained in the report (“you” or “the Recipient”) are decisions of the Recipient and we will not make, or be deemed to make, any decisions on behalf of any Recipient. We will not be liable for the consequences of any such decisions.

Current regulations and good practice were used in the preparation of this report. An appropriately qualified person must review the recommendations given in this report at the time of preparation of the scheme design to ensure that any recommendations given remain valid in light of changes in regulation and practice, or additional information obtained regarding the site.

Any Recipient must take into account any other factors apart from the Report of which they and their experts and advisers are or should be aware. The information, data, conclusions, opinions and judgements set out in the report may relate to certain contexts and may not be suitable in other contexts. It is your responsibility to ensure that you do not use the information we provide in the wrong context.

This report is based on readily available geological records, the recorded physical investigation, the strata observed in the works, together with the results of completed site and laboratory tests. Whilst skill and care has been taken to interpret these conditions likely between or below investigation points, the possibility of other characteristics not revealed cannot be discounted, for which no liability can be accepted. The impact of our assessment on other aspects of the development required evaluation by other involved parties.

The opinions expressed cannot be absolute due to the limitations of time and resources within the context of the agreed brief and the possibility of unrecorded previous in ground activities. The ground conditions have been sampled or monitored in recorded locations and tests for some of the more common chemicals generally expected. Other concentrations of types of chemicals may exist.

The conclusions and recommendations relate to 220 Elgar Road South, Reading, RG2 0BW.

Trial hole is a generic term used to describe a method of direct investigation. The term trial pit, borehole or window sampler borehole implies the specific technique used to produce a trial hole.

The depth to roots and/or of desiccation may vary from that found during the investigation. The client is responsible for establishing the depth to roots and/or of desiccation on a plot-by-plot basis prior to the construction of foundations. Where trees are mentioned in the text this means existing trees, recently removed trees (approximately 15 years to full recovery on cohesive soils) and those planned as part of the site landscaping.

Ownership of copyright of all printed material including reports, laboratory test results, trial pit and borehole log sheets, including drillers log sheets, remain with Ground and Water Limited. Licence is for the sole use of the client and may not be assigned, transferred or given to a third party.

Only our client may rely on this report and should this report or any information contained in it be provided to any third party we accept no responsibility to the third party for the contents of this report save to the extent expressly outlined by us in writing in a reliance letter addressed from us to the third party.

Recipients are not permitted to publish this report outside of their organisation without our express written consent.

APPENDIX B:

Technical Glossary

TECHNICAL GLOSSARY

The list of possible definitions within the report may be seen below. Please note that some definitions may not be relevant to this report.

HYDROGEOLOGY:

A **Principal Aquifer** is a layer of rock or drift deposits that have high intergranular and/or fracture permeability - meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale. In most cases, principal aquifers are aquifers previously designated as major aquifer.

Secondary (A) Aquifers consist of deposits with permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as Minor Aquifers.

Secondary (B) Aquifers consist of deposits with predominantly lower permeability layers with may stoke and yield limited amounts of groundwater due to localised features such as fissures, think permeable horizons and weathering. These are generally the water-bearing parts of the former non-aquifers.

Secondary Aquifers (Undifferentiated) are assigned in cases where it has not been possible to attribute either category A or B to a rock type. In most cases, this means that the layer in question has previously been designated as both a minor aquifer and non-aquifer in different locations due to the variable characteristics of the rock type.

Unproductive Strata are rock layers with low permeability that have negligible significance for water supply or river base flow. These were formerly classified as non-aquifers.

FLOOD ZONES:

Environment Agency Flood Zone 2, defined as; land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding; or land having between a 1 in 200 and 1 in 1,000 annual probability of sea flooding.

Environment Agency Flood Zone 3 shows the extent of a river flood with a 1 in 100 (1% or greater chance of occurring in any year or a sea flood with a 1 in 200 (0.5%) or greater chance of occurring in any year.

Environment Agency Flood Zone 3 area that benefits from flood defences, defined as; land and property in this flood zone would have a high probability of flooding without the local flood defences. These protect the area against a river flood with a 1% chance of happening each year, or a flood from the sea with a 0.5% chance of happening each year.

GROUNDWATER SOURCE PROTECTION ZONES (SPZS):

Inner Zone (SPZ1): This zone is 50 day travel time of pollutant to source with a 50 metres default minimum radius.

Outer Zone (SPZ2): This zone is 400 day travel time of pollutant to source. This has a 250 or 500 metres minimum radius around the source depending on the amount of water taken.

Total Catchment (SPZ3): This is the area around a supply source within which all the groundwater ends up at the abstraction point. This is the point from where the water is taken. This could extend some distance from the source point.

Zone of Special Interest (SPZ4): This zone is where local conditions require additional protection.

IN-SITU STRENGTH GEOTECHNICAL TESTING:

Windowless Sample and/or Cable Percussion and/or Rotary Boreholes provide samples of the ground for assessment but they do not give any engineering data. The standard penetration test (SPT) is an in-situ dynamic penetration test designed to provide information on the geotechnical engineering properties of soil. The test uses a thick-walled sample tube, with an outside diameter of 50mm and an inside diameter of 35mm, and a length of around 650mm. This is driven into the ground at the bottom of a borehole by blows from a slide hammer with a weight of 63.5kg falling through a distance of 760mm. The sample tube is driven 150mm into the ground and then the number of blows needed for the tube to penetrate each 75mm up to a depth of 450mm is recorded. The sum of the number of blows is termed the "standard penetration resistance" or the "N-value".

Dynamic Probing involves the driving of a metal cone into the ground via a series of steel rods. These rods are driven from the surface by a hammer system that lifts and drops a 63.5kg (SHDP) hammer onto the top of the rods through a set height, thus ensuring a consistent energy input. The number of hammer blows that are required to drive the cone down by each 100mm increment are recorded. These blow counts then provide a comparative assessment from which correlations have been published, based on dynamic energy, which permits engineering parameters to be generated. (The Dynamic Probe 'Super Heavy' (SHDP) Tests were conducted in accordance with BS 1377; 1990; Part 9, Clause 3.2).

APPENDIX C: Trial Hole Logs





Percussion Drilling Log

Project Name: 220 Elgar Road South,
Reading, RG2 0BW
Location: 220 Elgar Road South, Reading,
RG2 0BW

Client: Abri

Date: 02/04/2025 - 03/04/2025

Contractor:

Co-ords: E471489.00 N172106.00

Project No. : GWPR6540

Crew Name:

Drilling Equipment:

Borehole Number
BH1

Hole Type
CP

Level

Logged By
LB

Scale
1:50

Page Number
Sheet 3 of 3

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		20.00	SPT	N=49 (4,5/49 for 285mm)	20.45			Off-white gravelly SILT. Gravel is fine to medium, medium density CHALK with occasional fine to medium flint. (SEAFORD AND NEWHAVEN CHALK FORMATION). End of Borehole at 20.450m	21
									22
									23
									24
									25
									26
									27
									28
									29
									30

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation

Remarks

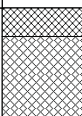
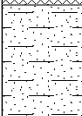
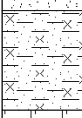
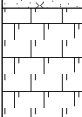
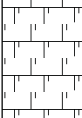
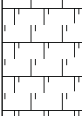
No roots noted.
Groundwater encountered at 3.00m bgl rising to 2.76m bgl after 20mins.





Percussion Drilling Log

Project Name: 220 Elgar Road South, Reading, RG2 0BW		Client: Abri		Date: 03/04/2025 - 04/04/2025	
Location: 220 Elgar Road South, Reading, RG2 0BW		Contractor:		Co-ords: E471484.00 N172093.00	
Project No. : GWPR6540		Crew Name:		Drilling Equipment:	
Borehole Number BH2	Hole Type CP	Level		Logged By LB	Scale 1:50
				Page Number Sheet 1 of 3	

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
	 	0.20	D	42 (1 for 75mm/42 for 225mm)	0.20		BITUMINOUS HARDSTANDING.	1	
		0.50	D		MADE GROUND: Dark brown and black gravelly fine to medium SAND. Gravel is sub-angular to sub-rounded, fine to coarse, brick, ash, chalk and concrete.				
		0.80	D						
		1.00	D						
		1.20	SPT						
		<u>Layer of red brick between 1.30 - 1.60m bgl.</u>							
		2.00	D	N=8 (2,2/2,2,2,2)	2.50			Brown and grey clayey medium SAND. (LAMBETH GROUP).	2
		2.50	SPT						
		3.00	D						
		3.50	SPT						
		4.00	D						
		4.50	SPT	N=12 (3,4/3,3,3,3)	3.60		Orangish brown silty sandy CLAY with pockets of medium sand. (LAMBETH GROUP).	3	
		5.00	D						
		5.50	SPT						
		6.00	D						
		7.50	SPT	N=23 (3,3/5,6,6,6)	4.30			Off-white gravelly SILT. Gravel is fine to medium, medium density CHALK with occasional fine to medium flint. (SEAFORD AND NEWHAVEN CHALK FORMATION).	4
		8.00	D						
		8.50	D						
		9.00	SPT						
9.50	D								
10.00	D	N=16 (2,3/4,4,4,4)				5			
10.50	D								
11.00	D								
11.50	D								
12.00	D								
12.50	D	N=25 (3,4/5,3,9,8)				6			
13.00	D								
13.50	D								
14.00	D								
14.50	D								
15.00	D	N=16 (2,3/4,4,4,4)				7			
15.50	D								
16.00	D								
16.50	D								
17.00	D								
17.50	D	N=25 (3,4/5,3,9,8)				8			
18.00	D								
18.50	D								
19.00	D								
19.50	D								
20.00	D	N=25 (3,4/5,3,9,8)				9			
20.50	D								
21.00	D								
21.50	D								
22.00	D								
22.50	D	N=16 (2,3/4,4,4,4)				10			
23.00	D								
23.50	D								
24.00	D								
24.50	D								

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation

Remarks No roots noted. Groundwater encountered at 2.80m bgl rising to 2.77m bgl after 20mins. Groundwater was also encountered at 4.45m bgl rising to 4.42m bgl after 20mins.	
--	---





Percussion Drilling Log

Project Name: 220 Elgar Road South, Reading, RG2 0BW	Client: Abri	Date: 03/04/2025 - 04/04/2025
Location: 220 Elgar Road South, Reading, RG2 0BW	Contractor:	Co-ords: E471484.00 N172093.00
Project No. : GWPR6540	Crew Name:	Drilling Equipment:

Borehole Number BH2	Hole Type CP	Level	Logged By LB	Scale 1:50	Page Number Sheet 3 of 3
------------------------	-----------------	-------	-----------------	---------------	-----------------------------

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					20.45			Off-white gravelly SILT. Gravel is fine to medium, medium density CHALK with occasional fine to medium flint. (SEAFORD AND NEWHAVEN CHALK FORMATION). End of Borehole at 20.450m	21
									22
									23
									24
									25
									26
									27
									28
									29
									30

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation

Remarks
No roots noted.
Groundwater encountered at 2.80m bgl rising to 2.77m bgl after 20mins. Groundwater was also encountered at 4.45m bgl rising to 4.42m bgl after 20mins.





Percussion Drilling Log

Project Name: 220 Elgar Road South, Reading, RG2 0BW		Client: Abri		Date: - 07/04/2025	
Location: 220 Elgar Road South, Reading, RG2 0BW		Contractor:		Co-ords: E471522.00 N172118.00	
Project No. : GWPR6540		Crew Name:		Drilling Equipment:	
Borehole Number WS1	Hole Type WLS	Level		Logged By LB	Scale 1:50
				Page Number Sheet 1 of 1	

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.20	D		0.30			MADE GROUND: Dark brown sandy slightly gravelly CLAY. Gravel is sub-angular to sub-rounded, fine, brick and flint. Orangish brown fine to medium SAND. (LAMBETH GROUP).	1
		0.50	D						
		0.80	D						
		1.00	D						
		1.50	D		2.50			Brown very sandy CLAY. Sand is medium (LAMBETH GROUP).	2
		2.00	D						
		2.50	D						
		3.00	D						
		End of Borehole at 3.000m					3		
									4
									5
									6
									7
									8
									9
									10

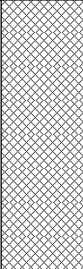
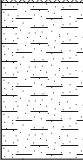
Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation

Remarks No roots noted. Groundwater encountered at 2.00m bgl.										
---	--	--	--	--	--	--	--	--	--	---



Percussion Drilling Log

Project Name: 220 Elgar Road South, Reading, RG2 0BW		Client: Abri		Date: - 07/04/2025	
Location: 220 Elgar Road South, Reading, RG2 0BW		Contractor:		Co-ords: E471526.00 N172094.00	
Project No. : GWPR6540		Crew Name:		Drilling Equipment:	
Borehole Number WS3	Hole Type WLS	Level	Logged By LB	Scale 1:50	Page Number Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.20	D					MADE GROUND: Dark brown sandy slightly gravelly CLAY. Gravel is sub-angular to sub-rounded, fine to coarse, brick and flint.	1
		0.50	D						
		0.80	D						
		1.00	D						
		1.50	D					Brown very sandy CLAY. Sand is medium (LAMBETH GROUP).	2
		2.00	D		1.90				
		2.50	D						
		3.00	D		3.00			End of Borehole at 3.000m	3
									4
									5
									6
									7
									8
									9
									10

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation

Remarks No roots noted. Groundwater encountered at 2.00m bgl.										
---	--	--	--	--	--	--	--	--	--	---



Percussion Drilling Log

Project Name: 220 Elgar Road South, Reading, RG2 0BW		Client: Abri		Date: - 07/04/2025	
Location: 220 Elgar Road South, Reading, RG2 0BW		Contractor:		Co-ords: E471493.00 N172097.00	
Project No. : GWPR6540		Crew Name:		Drilling Equipment:	
Borehole Number WS4	Hole Type WLS	Level	Logged By LB	Scale 1:50	Page Number Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.20	D		0.10			BITUMINOUS HARDSTANDING.	
		0.50	D					MADE GROUND: Dark brown sandy slightly gravelly CLAY. Gravel is sub-angular to sub- rounded, fine to coarse, brick and flint.	
		0.80	D		0.80				
		1.00	D					Dark red brick rubble, possible concrete obstruction at 1.40m bgl.	1
		1.30	D		1.40				
								End of Borehole at 1.400m	2
									3
									4
									5
									6
									7
									8
									9
									10

Hole Diameter		Casing Diameter		Chiselling				Inclination and Orientation			
Depth Base	Diameter	Depth Base	Diameter	Depth Top	Depth Base	Duration	Tool	Depth Top	Depth Base	Inclination	Orientation

Remarks No roots noted. No groundwater strikes encountered. Borehole was terminated at 1.40m bgl due to possible concrete obstruction.										
---	--	--	--	--	--	--	--	--	--	---

APPENDIX D: Geotechnical Laboratory Testing

Contract Number: 78223

Client Ref: **GWPR6540**

Date Received: **16-04-2025**

Client PO: **GWPR6540**

Date Completed: **30-04-2025**

Report Date: **30-04-2025**

Client: **Ground and Water Limited**

This report has been checked and approved by:

Contract Title: **220 Elgar Road South, Reading, RG2 0BW**

For the attention of: **Natasha Kearl**



Darren Bourne
Quality Senior Technician

Description	Qty
Determination of water content BS EN ISO 17892-1:2014 - @ Non Accredited Test	2
1 point Liquid & Plastic Limit.. BS EN ISO 17892-12 - * UKAS	2
Particle Size Distribution BS EN ISO 17892-4 : 5.1 - * UKAS	1
Saturated Moisture Content of chalk (SMC) BS 1377:1990 - Part 2 : 3.3 - * UKAS	2

Notes: Observations and Interpretations are outside the UKAS Accreditation

* - denotes test included in laboratory scope of accreditation

- denotes test carried out by approved contractor

@ - denotes non accredited tests

This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This test report/certificate shall not be reproduced except in full, without the approval of GEO Site & Testing Services Ltd. Any opinions or interpretations stated - within this report/certificate are excluded from the laboratories UKAS accreditation.

Approved Signatories:

Brendan Evans (Senior Office Administrator) - Darren Bourne (Quality Senior Technician) - Paul Evans (Director)

Richard John (Quality/Technical Manager) - Shaun Jones (Laboratory manager) - Shaun Thomas (Site Manager)

Wayne Honey (HR & HSE Manager)



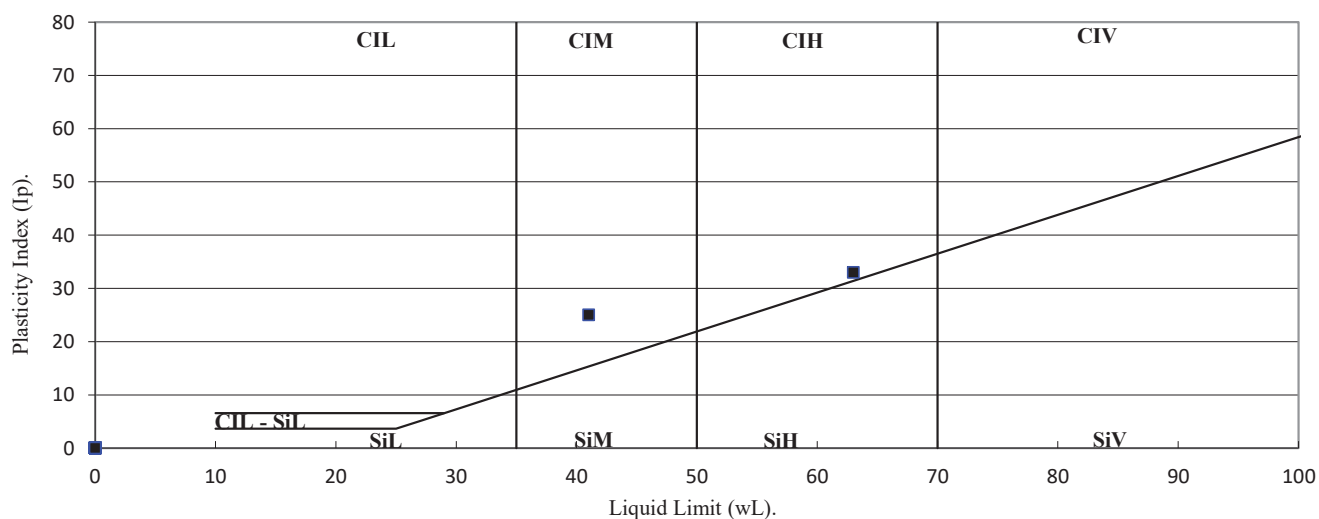
Contract Number	78223	
Project Name	220 Elgar Road South, Reading, RG2 0BW	
Date Tested	24/04/2025	
	DESCRIPTIONS	

[illegible]

Operator
Clayton. J

[illegible]

PLASTICITY CHART



Operator
Clayton. J

PARTICLE SIZE DISTRIBUTION
BS EN ISO 17892-4:2016
Wet Sieve, Clause 5.2

Contract Number **78223**

Borehole/Pit No. **WS3**

Project Name **220 Elgar Road South, Reading, RG2 0BW**

Sample No.

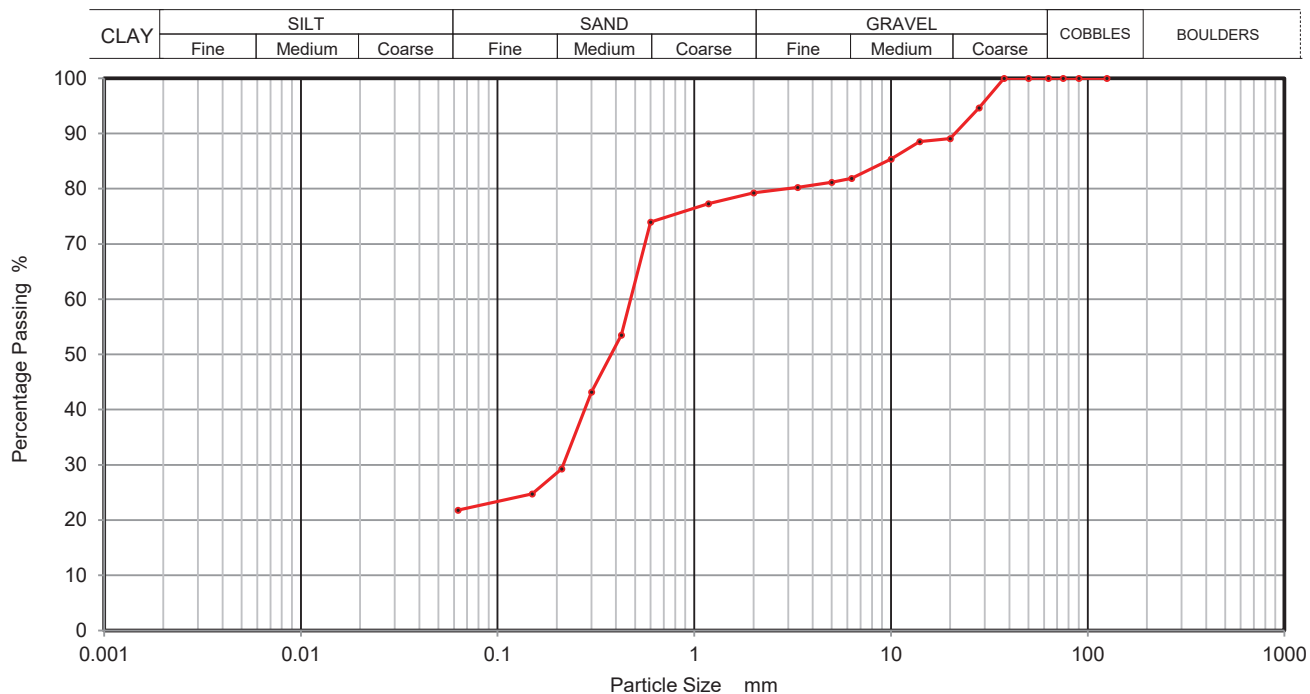
Sample Description **Brown fine to coarse gravelly silty/clay fine to coarse SAND**

Depth Top **1.50**

Depth Base

Date Tested **24/04/2025**

Sample Type **B**



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	95		
20	89		
14	89		
10	85		
6.3	82		
5	81		
3.35	80		
2	79		
1.18	77		
0.63	74		
0.425	54		
0.30	43		
0.20	29		
0.15	25		
0.063	22		

Sample Proportions	% dry mass
Cobbles	0
Gravel	21
Sand	57
Silt and Clay	22

Remarks

Preparation and testing in accordance with BS17892 unless noted below

Operator

Cameron. T

APPENDIX E:

Groundsure Datasheets and Maps

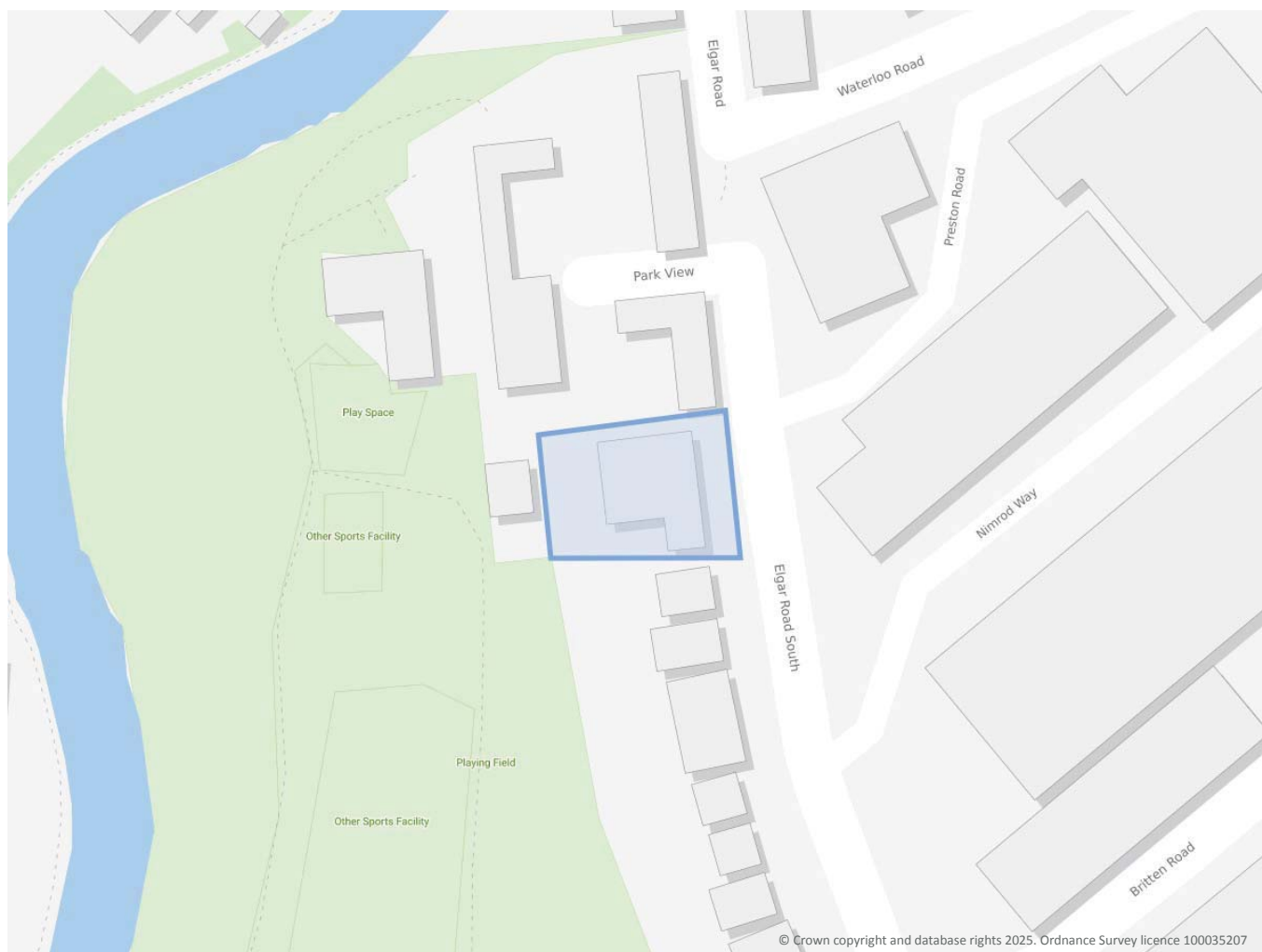
220, ELGAR ROAD SOUTH, READING, RG2 0BW

Order Details

Date: 14/05/2025
Your ref: GWPR6540
Our Ref: GS-LIP-E4W-BJN-FRA

Site Details

Location: 471501 172103
Area: 0.15 ha
Authority: [Reading Borough Council](#) ↗



[Summary of findings](#)

[p. 2 >](#) [Aerial image](#)

[p. 5 >](#)

[OS MasterMap site plan](#)

[p.10 >](#) [Insight User Guide](#) ↗

Summary of findings

Page	Section	Geology 1:10,000 scale >	On site	0-50m	50-250m	250-500m	500-2000m
11 >	1.1 >	10k Availability >	Identified (within 500m)				
12 >	1.2 >	Artificial and made ground (10k) >	1	0	3	4	-
14 >	1.3 >	Superficial geology (10k) >	0	1	1	0	-
15	1.4	Landslip (10k)	0	0	0	0	-
16 >	1.5 >	Bedrock geology (10k) >	1	0	2	2	-
17	1.6	Bedrock faults and other linear features (10k)	0	0	0	0	-
Page	Section	Geology 1:50,000 scale >	On site	0-50m	50-250m	250-500m	500-2000m
18 >	2.1 >	50k Availability >	Identified (within 500m)				
19 >	2.2 >	Artificial and made ground (50k) >	1	0	2	2	-
20	2.3	Artificial ground permeability (50k)	0	0	-	-	-
21 >	2.4 >	Superficial geology (50k) >	0	1	1	0	-
22 >	2.5 >	Superficial permeability (50k) >	Identified (within 50m)				
22	2.6	Landslip (50k)	0	0	0	0	-
22	2.7	Landslip permeability (50k)	None (within 50m)				
23 >	2.8 >	Bedrock geology (50k) >	1	0	2	2	-
24 >	2.9 >	Bedrock permeability (50k) >	Identified (within 50m)				
24	2.10	Bedrock faults and other linear features (50k)	0	0	0	0	-
Page	Section	Boreholes >	On site	0-50m	50-250m	250-500m	500-2000m
25 >	3.1 >	BGS Boreholes >	0	0	34	-	-
Page	Section	Natural ground subsidence >					
28 >	4.1 >	Shrink swell clays >	Moderate (within 50m)				
29 >	4.2 >	Running sands >	Low (within 50m)				
31 >	4.3 >	Compressible deposits >	Moderate (within 50m)				
33 >	4.4 >	Collapsible deposits >	Very low (within 50m)				
34 >	4.5 >	Landslides >	Very low (within 50m)				
35 >	4.6 >	Ground dissolution of soluble rocks >	Low (within 50m)				



Page	Section	Mining and ground workings >	On site	0-50m	50-250m	250-500m	500-2000m
37 >	5.1 >	BritPits >	0	1	6	9	-
42 >	5.2 >	Surface ground workings >	0	5	25	-	-
43	5.3	Underground workings	0	0	0	0	0
43	5.4	Underground mining extents	0	0	0	0	-
43 >	5.5 >	Historical Mineral Planning Areas >	0	0	0	1	-
44 >	5.6 >	Non-coal mining >	1	0	1	1	3
45 >	5.7 >	JPB mining areas >	Identified (within 0m)				
45	5.8	The Coal Authority non-coal mining	0	0	0	0	-
45 >	5.9 >	Researched mining >	1	1	7	1	-
46	5.10	Mining record office plans	0	0	0	0	-
46	5.11	BGS mine plans	0	0	0	0	-
46	5.12	Coal mining	None (within 0m)				
47	5.13	Brine areas	None (within 0m)				
47	5.14	Gypsum areas	None (within 0m)				
47	5.15	Tin mining	None (within 0m)				
47	5.16	Clay mining	None (within 0m)				
Page	Section	Ground cavities and sinkholes >	On site	0-50m	50-250m	250-500m	500-2000m
48	6.1	Natural cavities	0	0	0	0	-
49 >	6.2 >	Mining cavities >	0	0	1	4	24
50	6.3	Reported recent incidents	0	0	0	0	-
50	6.4	Historical incidents	0	0	0	0	-
Page	Section	Radon >					
51 >	7.1 >	Radon >	Less than 1% (within 0m)				
Page	Section	Soil chemistry >	On site	0-50m	50-250m	250-500m	500-2000m
53 >	8.1 >	BGS Estimated Background Soil Chemistry >	2	1	-	-	-
53	8.2	BGS Estimated Urban Soil Chemistry	0	0	-	-	-
53	8.3	BGS Measured Urban Soil Chemistry	0	0	-	-	-
Page	Section	Railway infrastructure and projects >	On site	0-50m	50-250m	250-500m	500-2000m



54	9.1	Underground railways (London)	0	0	0	-	-
54	9.2	Underground railways (Non-London)	0	0	0	-	-
55	9.3	Railway tunnels	0	0	0	-	-
<u>55</u> >	<u>9.4</u> >	<u>Historical railway and tunnel features</u> >	0	0	14	-	-
56	9.5	Royal Mail tunnels	0	0	0	-	-
<u>56</u> >	<u>9.6</u> >	<u>Historical railways</u> >	0	0	2	-	-
56	9.7	Railways	0	0	0	-	-
56	9.8	Crossrail 2	0	0	0	0	-
57	9.9	HS2	0	0	0	0	-



Recent aerial photograph



Capture Date: 30/04/2022

Site Area: 0.15ha



Recent site history - 2019 aerial photograph



Capture Date: 29/06/2019

Site Area: 0.15ha



Recent site history - 2013 aerial photograph

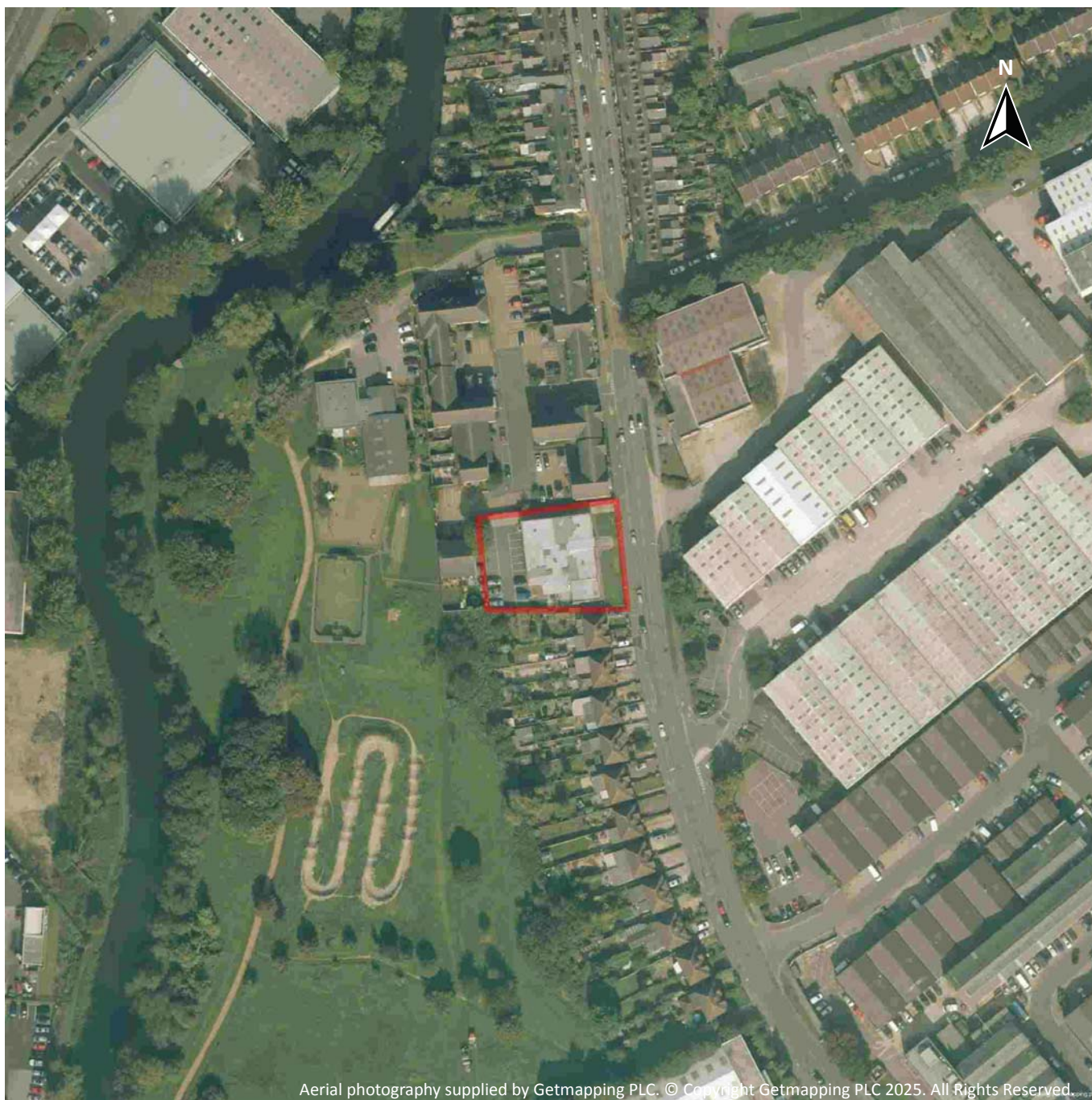


Capture Date: 08/07/2013

Site Area: 0.15ha



Recent site history - 2010 aerial photograph

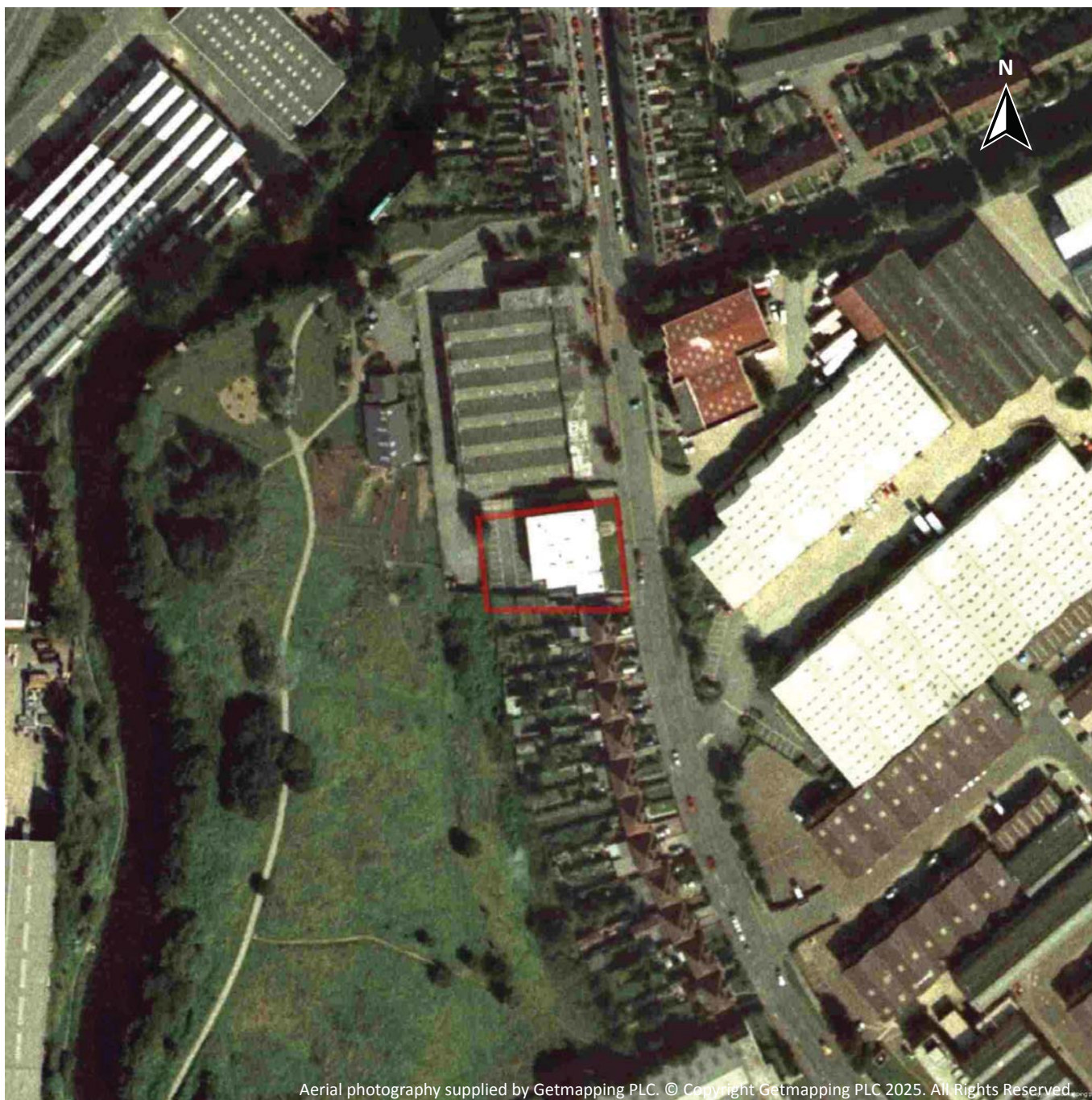


Capture Date: 22/09/2010

Site Area: 0.15ha



Recent site history - 1999 aerial photograph



Capture Date: 04/09/1999

Site Area: 0.15ha



OS MasterMap site plan



Site Area: 0.15ha



1 Geology 1:10,000 scale - Availability



— Site Outline
Search buffers in metres (m)

- Full coverage
- Partial coverage
- No coverage

1.1 10k Availability

Records within 500m

1

An indication on the coverage of 1:10,000 scale geology data for the site, the most detailed dataset provided by the British Geological Survey. Either 'Full', 'Partial' or 'No coverage' for each geological theme.

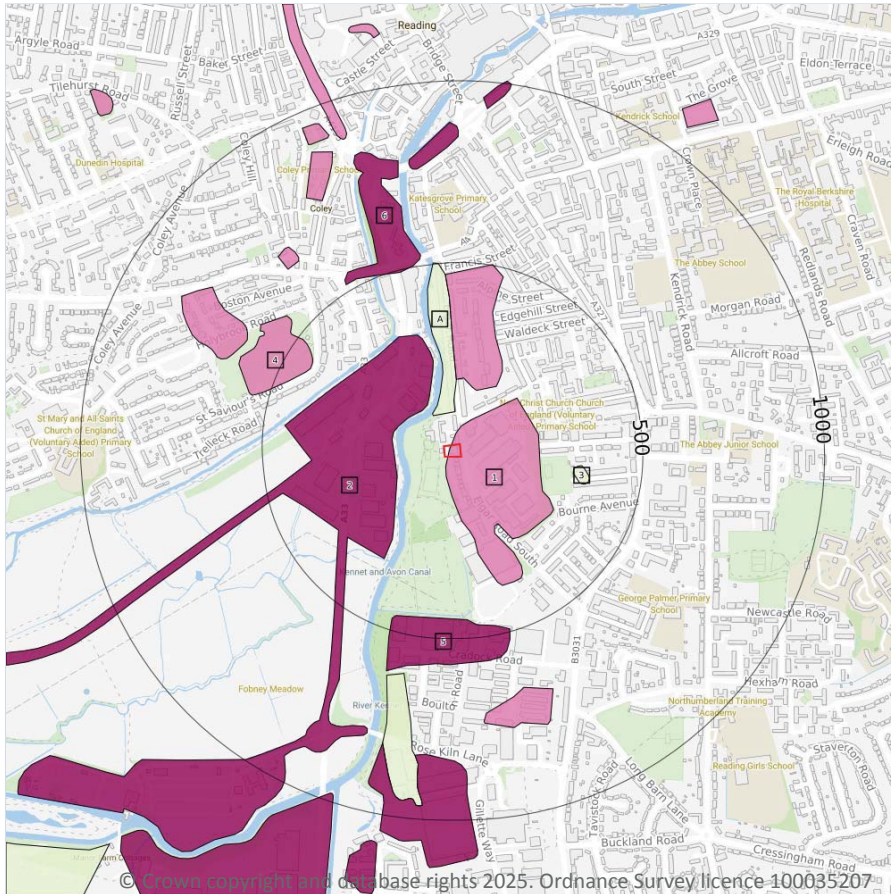
Features are displayed on the Geology 1:10,000 scale - Availability map on [page 11](#) >

ID	Location	Artificial	Superficial	Bedrock	Mass movement	Sheet No.
1	On site	Full	Full	Full	No coverage	SU77SW

This data is sourced from the British Geological Survey.



Geology 1:10,000 scale - Artificial and made ground



— Site Outline
Search buffers in metres (m)

- Reclaimed ground
- Made ground
- Worked ground
- Infilled ground
- Disturbed ground
- Landscaped ground

1.2 Artificial and made ground (10k)

Records within 500m

8

Details of made, worked, infilled, disturbed and landscaped ground at 1:10,000 scale. Artificial ground can be associated with potentially contaminated material, unpredictable engineering conditions and instability.

Features are displayed on the Geology 1:10,000 scale - Artificial and made ground map on [page 12](#) >

ID	Location	LEX Code	Description	Rock description
1	On site	WGR-VOID	Worked Ground (Undivided)	Void
A	88m N	WMGR-ARTDP	Infilled Ground	Artificial Deposit
2	115m NW	MGR-ARTDP	Made Ground (Undivided)	Artificial Deposit
A	155m N	WGR-VOID	Worked Ground (Undivided)	Void

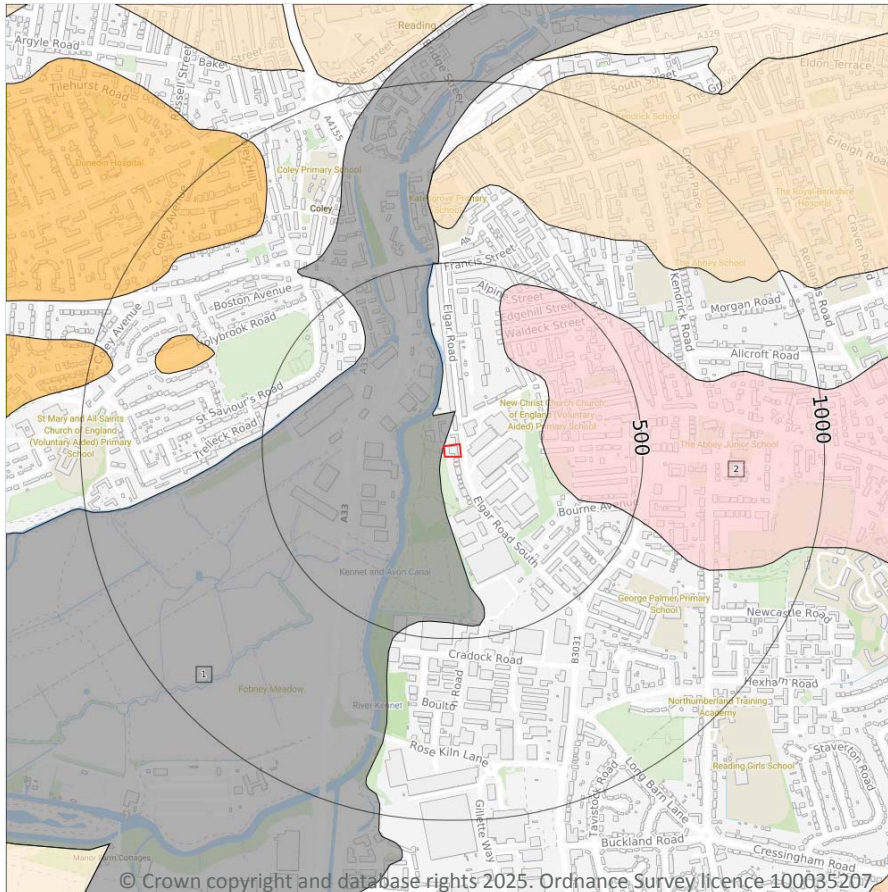


ID	Location	LEX Code	Description	Rock description
3	311m E	WMGR-ARTDP	Infilled Ground	Artificial Deposit
4	425m NW	WGR-VOID	Worked Ground (Undivided)	Void
5	444m S	MGR-ARTDP	Made Ground (Undivided)	Artificial Deposit
6	493m N	MGR-ARTDP	Made Ground (Undivided)	Artificial Deposit

This data is sourced from the British Geological Survey.



Geology 1:10,000 scale - Superficial



— Site Outline
Search buffers in metres (m)

Landslip (10k)

Superficial geology (10k)
Please see table for more details.

1.3 Superficial geology (10k)

Records within 500m

2

Superficial geological deposits at 1:10,000 scale. Also known as 'drift', these are the youngest geological deposits, formed during the Quaternary. They rest on older deposits or rocks referred to as bedrock.

Features are displayed on the Geology 1:10,000 scale - Superficial map on [page 14 >](#)

ID	Location	LEX Code	Description	Rock description
1	On site	ALV-Z	Alluvium - Silt (unlithified Deposits Coding Scheme)	Silt
2	225m E	BHT-XSV	Boyn Hill Gravel Member - Sand And Gravel	Sand And Gravel

This data is sourced from the British Geological Survey.



1.4 Landslip (10k)

Records within 500m

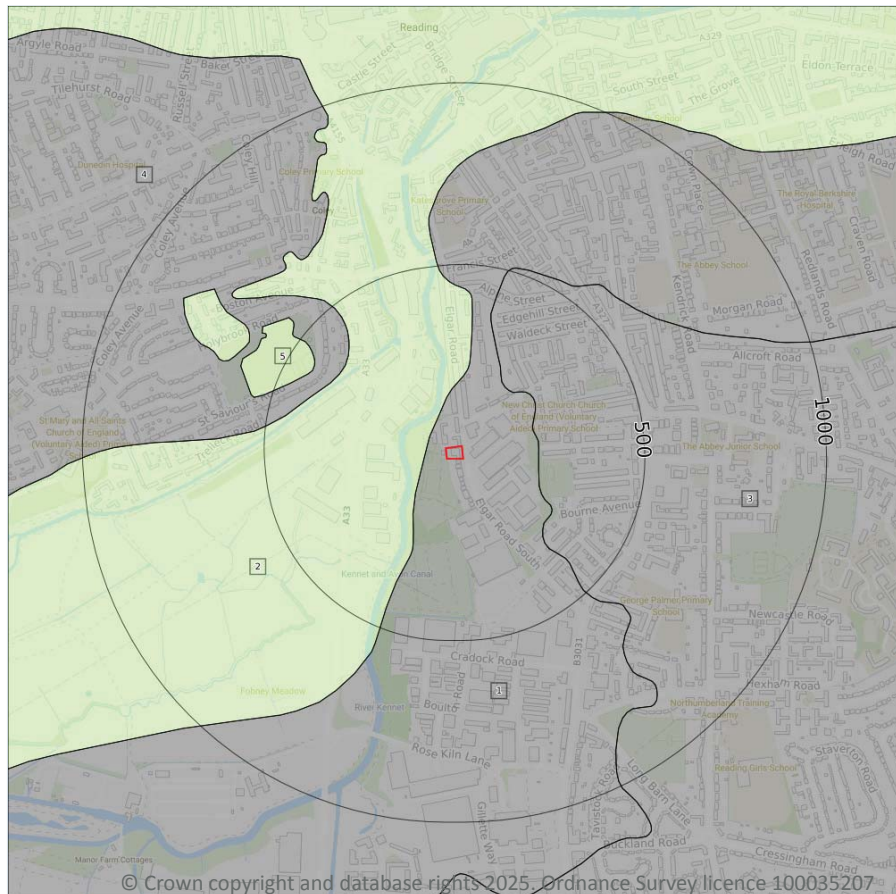
0

Mass movement deposits on BGS geological maps at 1:10,000 scale. Primarily superficial deposits that have moved down slope under gravity to form landslips. These affect bedrock, other superficial deposits and artificial ground.

This data is sourced from the British Geological Survey.



Geology 1:10,000 scale - Bedrock



— Site Outline
Search buffers in metres (m)
.... Bedrock faults and other linear features (10k)
Bedrock geology (10k)
Please see table for more details.

1.5 Bedrock geology (10k)

Records within 500m

5

Bedrock geology at 1:10,000 scale. The main mass of rocks forming the Earth and present everywhere, whether exposed at the surface in outcrops or concealed beneath superficial deposits or water.

Features are displayed on the Geology 1:10,000 scale - Bedrock map on [page 16](#) >

ID	Location	LEX Code	Description	Rock age
1	On site	LMBE-CLSISA	Lambeth Group - Clay, Silt And Sand	Paleocene Epoch
2	51m W	LSNCK-CHLK	Lewes Nodular Chalk Formation, Seaford Chalk Formation And Newhaven Chalk Formation (undifferentiated) - Chalk	Campanian Age - Turonian Age
3	201m NE	LC-CLSISA	London Clay Formation - Clay, Silt And Sand	Eocene Epoch



ID	Location	LEX Code	Description	Rock age
4	357m NW	LMBE- CLSISA	Lambeth Group - Clay, Silt And Sand	Paleocene Epoch
5	425m NW	LSNCK-CHLK	Lewes Nodular Chalk Formation, Seaford Chalk Formation And Newhaven Chalk Formation (undifferentiated) - Chalk	Campanian Age - Turonian Age

This data is sourced from the British Geological Survey.

1.6 Bedrock faults and other linear features (10k)

Records within 500m

0

Linear features at the ground or bedrock surface at 1:10,000 scale of six main types; rock, fault, fold axis, mineral vein, alteration area or landform. Features are either observed or inferred, and relate primarily to bedrock.

This data is sourced from the British Geological Survey.



2 Geology 1:50,000 scale - Availability



— Site Outline
Search buffers in metres (m)

☐ Geological map tile

2.1 50k Availability

Records within 500m

1

An indication on the coverage of 1:50,000 scale geology data for the site. Either 'Full' or 'No coverage' for each geological theme.

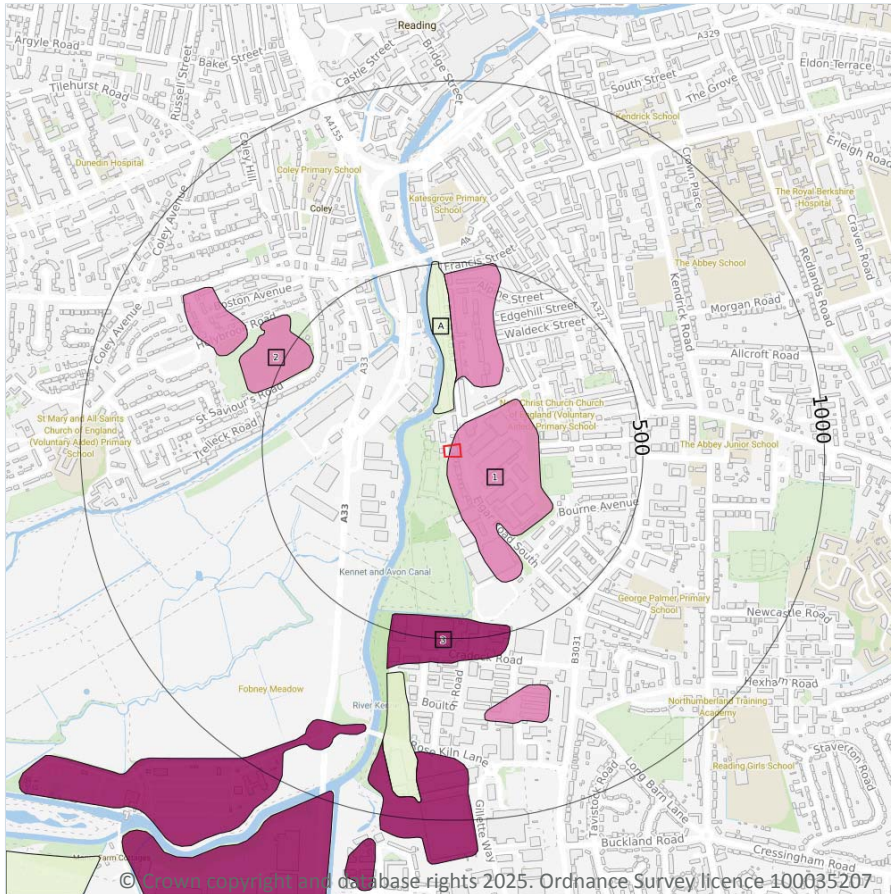
Features are displayed on the Geology 1:50,000 scale - Availability map on [page 18](#) >

ID	Location	Artificial	Superficial	Bedrock	Mass movement	Sheet No.
1	On site	Full	Full	Full	No coverage	EW268_reading_v4

This data is sourced from the British Geological Survey.



Geology 1:50,000 scale - Artificial and made ground



— Site Outline
Search buffers in metres (m)

- Made ground
- Worked ground
- Infilled ground
- Disturbed ground
- Landscaped ground

2.2 Artificial and made ground (50k)

Records within 500m

5

Details of made, worked, infilled, disturbed and landscaped ground at 1:50,000 scale. Artificial ground can be associated with potentially contaminated material, unpredictable engineering conditions and instability.

Features are displayed on the Geology 1:50,000 scale - Artificial and made ground map on [page 19](#) >

ID	Location	LEX Code	Description	Rock description
1	On site	WGR-VOID	WORKED GROUND (UNDIVIDED)	VOID
A	91m N	WMGR-ARTDP	INFILLED GROUND	ARTIFICIAL DEPOSIT
A	165m N	WGR-VOID	WORKED GROUND (UNDIVIDED)	VOID
2	429m NW	WGR-VOID	WORKED GROUND (UNDIVIDED)	VOID



ID	Location	LEX Code	Description	Rock description
3	439m S	MGR-ARTDP	MADE GROUND (UNDIVIDED)	ARTIFICIAL DEPOSIT

This data is sourced from the British Geological Survey.

2.3 Artificial ground permeability (50k)

Records within 50m

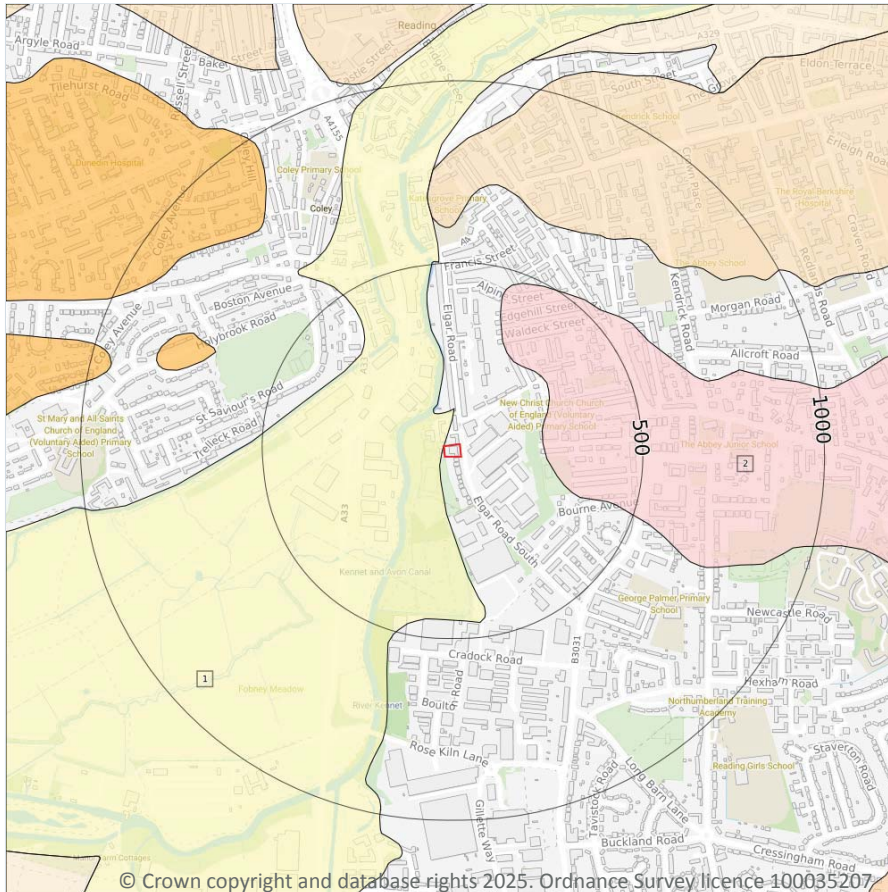
0

A qualitative classification of estimated rates of vertical movement of water from the ground surface through the unsaturated zone of any artificial deposits (the zone between the land surface and the water table).

This data is sourced from the British Geological Survey.



Geology 1:50,000 scale - Superficial



— Site Outline
Search buffers in metres (m)

 Landslip (50k)

Superficial geology (50k)
Please see table for more details.

2.4 Superficial geology (50k)

Records within 500m

2

Superficial geological deposits at 1:50,000 scale. Also known as 'drift', these are the youngest geological deposits, formed during the Quaternary. They rest on older deposits or rocks referred to as bedrock.

Features are displayed on the Geology 1:50,000 scale - Superficial map on [page 21](#) >

ID	Location	LEX Code	Description	Rock description
1	On site	ALV-XCZSV	ALLUVIUM	CLAY, SILT, SAND AND GRAVEL
2	228m E	BHT-XSV	BOYN HILL GRAVEL MEMBER	SAND AND GRAVEL

This data is sourced from the British Geological Survey.



2.5 Superficial permeability (50k)

Records within 50m**1**

A qualitative classification of estimated rates of vertical movement of water from the ground surface through the unsaturated zone of any superficial deposits (the zone between the land surface and the water table).

Location	Flow type	Maximum permeability	Minimum permeability
On site	Intergranular	High	Very Low

This data is sourced from the British Geological Survey.

2.6 Landslip (50k)

Records within 500m**0**

Mass movement deposits on BGS geological maps at 1:50,000 scale. Primarily superficial deposits that have moved down slope under gravity to form landslips. These affect bedrock, other superficial deposits and artificial ground.

This data is sourced from the British Geological Survey.

2.7 Landslip permeability (50k)

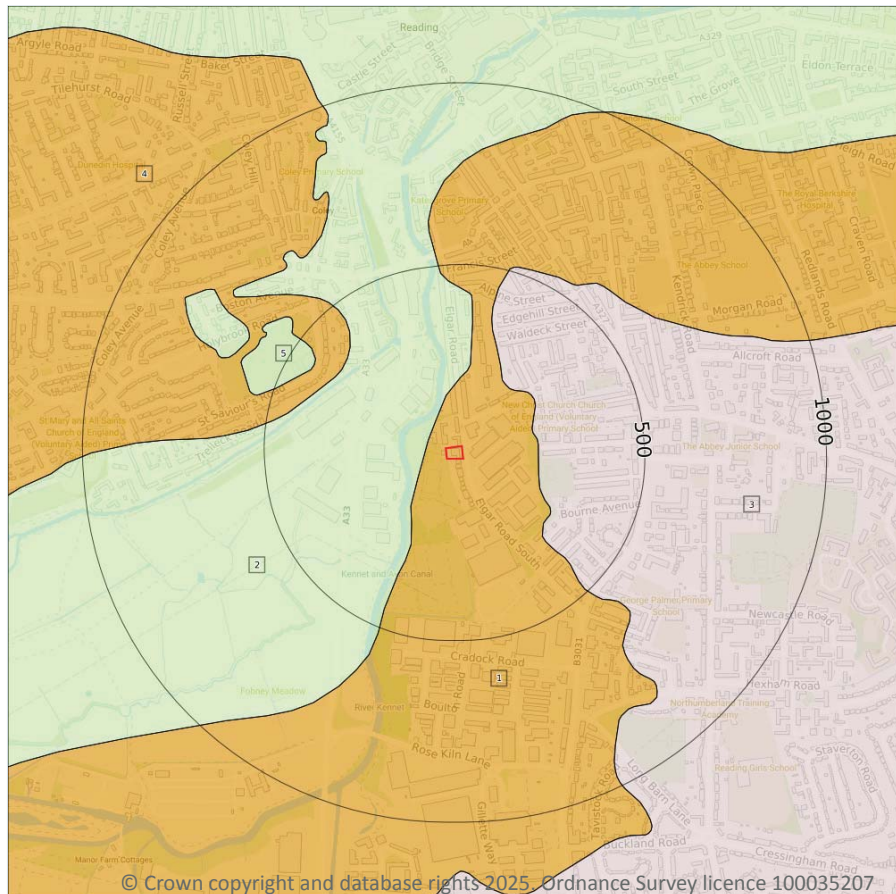
Records within 50m**0**

A qualitative classification of estimated rates of vertical movement of water from the ground surface through the unsaturated zone of any landslip deposits (the zone between the land surface and the water table).

This data is sourced from the British Geological Survey.



Geology 1:50,000 scale - Bedrock



— Site Outline
Search buffers in metres (m)

.... Bedrock faults and other linear features (50k)

Bedrock geology (50k)
Please see table for more details.

2.8 Bedrock geology (50k)

Records within 500m

5

Bedrock geology at 1:50,000 scale. The main mass of rocks forming the Earth and present everywhere, whether exposed at the surface in outcrops or concealed beneath superficial deposits or water.

Features are displayed on the Geology 1:50,000 scale - Bedrock map on [page 23](#) >

ID	Location	LEX Code	Description	Rock age
1	On site	LMBE-XCZS	LAMBETH GROUP - CLAY, SILT AND SAND	THANETIAN
2	53m W	SNCK-CHLK	SEAFORD CHALK FORMATION AND NEWHAVEN CHALK FORMATION (UNDIFFERENTIATED) - CHALK	CONIACIAN
3	199m E	LC-XCZS	LONDON CLAY FORMATION - CLAY, SILT AND SAND	YPRESIAN



ID	Location	LEX Code	Description	Rock age
4	359m NW	LMBE-XCZS	LAMBETH GROUP - CLAY, SILT AND SAND	THANETIAN
5	429m NW	SNCK-CHLK	SEAFORD CHALK FORMATION AND NEWHAVEN CHALK FORMATION (UNDIFFERENTIATED) - CHALK	CONIACIAN

This data is sourced from the British Geological Survey.

2.9 Bedrock permeability (50k)

Records within 50m	1
---------------------------	----------

A qualitative classification of estimated rates of vertical movement of water from the ground surface through the unsaturated zone of bedrock (the zone between the land surface and the water table).

Location	Flow type	Maximum permeability	Minimum permeability
On site	Mixed	Moderate	Very Low

This data is sourced from the British Geological Survey.

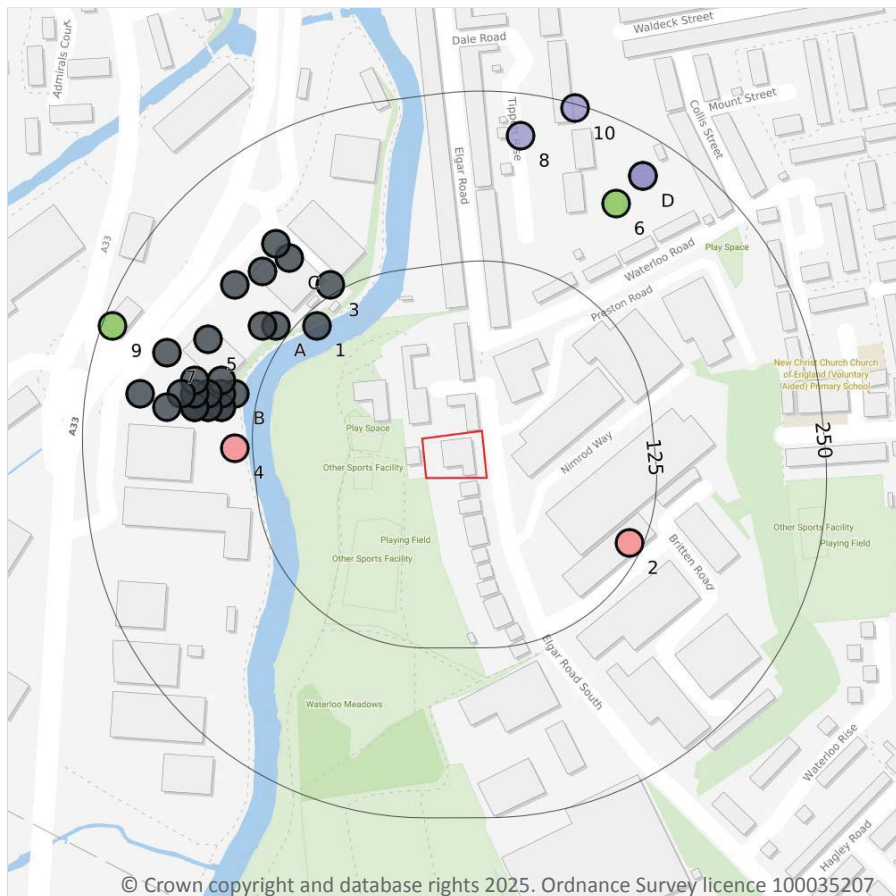
2.10 Bedrock faults and other linear features (50k)

Records within 500m	0
----------------------------	----------

Linear features at the ground or bedrock surface at 1:50,000 scale of six main types; rock, fault, fold axis, mineral vein, alteration area or landform. Features are either observed or inferred, and relate primarily to bedrock.

This data is sourced from the British Geological Survey.

3 Boreholes



— Site Outline
Search buffers in metres (m)

- Confidential
- 0 - 10m
- 10 - 30m
- 30m+
- Unknown

3.1 BGS Boreholes

Records within 250m

34

The Single Onshore Boreholes Index (SOBI); an index of over one million records of boreholes, shafts and wells from all forms of drilling and site investigation work held by the British Geological Survey. Covering onshore and nearshore boreholes dating back to at least 1790 and ranging from one to several thousand metres deep.

Features are displayed on the Boreholes map on [page 25 >](#)

ID	Location	Grid reference	Name	Length	Confidential	Web link
1	114m NW	471400 172200	ROSE KILN LANE READING 1	-	Y	N/A
2	115m SE	471630 172040	ELGAR ROAD READING	30.48	N	428835 ↗
3	132m NW	471410 172230	ROSE KILN LANE READING WS1	-	Y	N/A



ID	Location	Grid reference	Name	Length	Confidential	Web link
A	136m NW	471370 172200	ROSE KILN LANE READING WS5	-	Y	N/A
4	138m W	471340 172110	COOP PRESERVE WORKS COLEY	45.72	N	428174 ↗
B	142m W	471340 172150	ROSE KILN LANE READING WS2	-	Y	N/A
A	144m NW	471360 172200	ROSE KILN LANE READING WS7	-	Y	N/A
B	149m W	471330 172140	ROSE KILN LANE READING WS8	-	Y	N/A
B	149m W	471330 172140	ROSE KILN LANE READING WS13A	-	Y	N/A
B	151m W	471330 172150	ROSE KILN LANE READING WS3	-	Y	N/A
B	154m W	471330 172160	ROSE KILN LANE READING WS10	-	Y	N/A
B	159m W	471320 172140	ROSE KILN LANE READING 5	-	Y	N/A
B	159m W	471320 172140	ROSE KILN LANE READING WS14	-	Y	N/A
B	161m W	471320 172150	ROSE KILN LANE READING WS12	-	Y	N/A
C	165m NW	471380 172250	ROSE KILN LANE READING 2	-	Y	N/A
B	169m W	471310 172140	ROSE KILN LANE READING WS16	-	Y	N/A
B	169m W	471310 172140	ROSE KILN LANE READING WS18	-	Y	N/A
B	169m W	471310 172140	ROSE KILN LANE READING WS19	-	Y	N/A
C	170m NW	471360 172240	ROSE KILN LANE READING WS6	-	Y	N/A
B	171m W	471310 172150	ROSE KILN LANE READING WS17	-	Y	N/A
B	173m W	471310 172160	ROSE KILN LANE READING WS11	-	Y	N/A
5	174m NW	471320 172190	ROSE KILN LANE READING WS9	-	Y	N/A
C	178m NW	471340 172230	ROSE KILN LANE READING 3	-	Y	N/A
C	179m NW	471370 172260	ROSE KILN LANE READING WS4	-	Y	N/A
B	181m W	471300 172150	ROSE KILN LANE READING WS22	-	Y	N/A
B	189m W	471290 172140	ROSE KILN LANE READING WS20A	-	Y	N/A
6	194m NE	471620 172290	ELGAR ROAD READING 3	16.61	N	17088200 ↗
7	198m W	471290 172180	ROSE KILN LANE READING WS21	-	Y	N/A
B	210m W	471270 172150	ROSE KILN LANE READING 4	-	Y	N/A
8	219m N	471550 172340	ELGAR ROAD READING 1	9.6	N	17088195 ↗

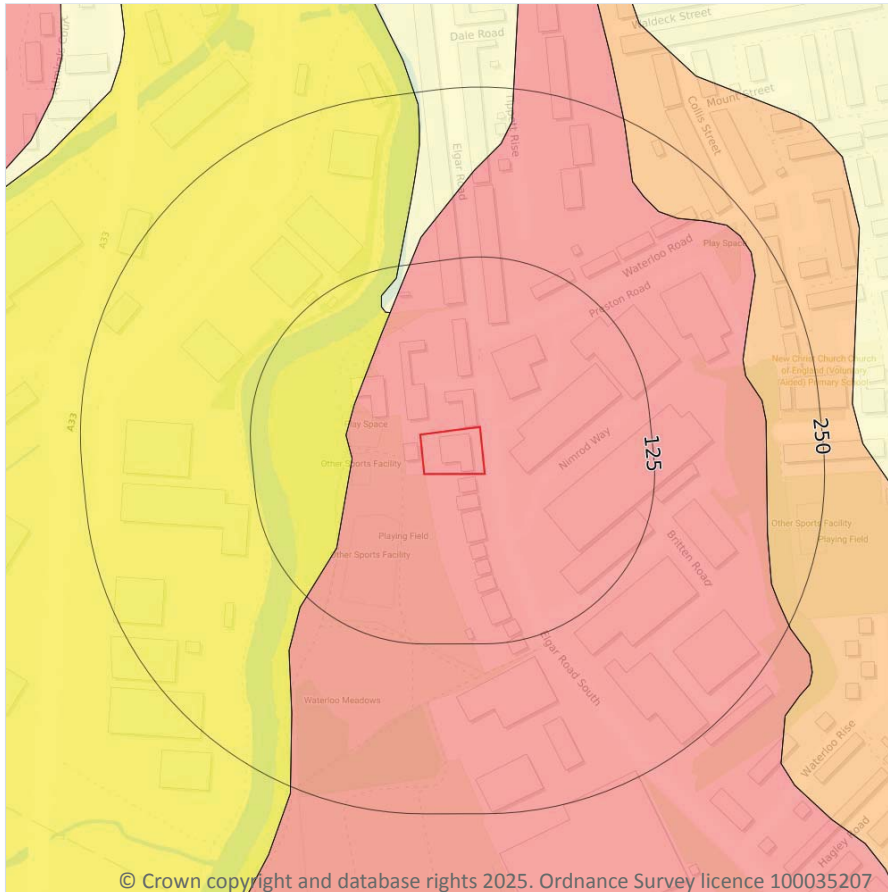


ID	Location	Grid reference	Name	Length	Confidential	Web link
D	222m NE	471640 172310	ELGAR ROAD READING 14	3.04	N	17088203 ↗
D	222m NE	471640 172310	ELGAR ROAD READING 15	4.57	N	17088204 ↗
9	242m W	471250 172200	ROSE KILN LANE A & B SITES BH3	20.0	N	15043597 ↗
10	247m N	471590 172360	ELGAR ROAD READING 2	9.9	N	17088199 ↗

This data is sourced from the British Geological Survey.



4 Natural ground subsidence - Shrink swell clays



— Site Outline
Search buffers in metres (m)

- ☐ No data
- ☐ Negligible
- ☐ Very low
- ☐ Low
- ☐ Moderate
- ☐ High

© Crown copyright and database rights 2025. Ordnance Survey licence 100035207

4.1 Shrink swell clays

Records within 50m

1

The potential hazard presented by soils that absorb water when wet (making them swell), and lose water as they dry (making them shrink). This shrink-swell behaviour is controlled by the type and amount of clay in the soil, and by seasonal changes in the soil moisture content (related to rainfall and local drainage).

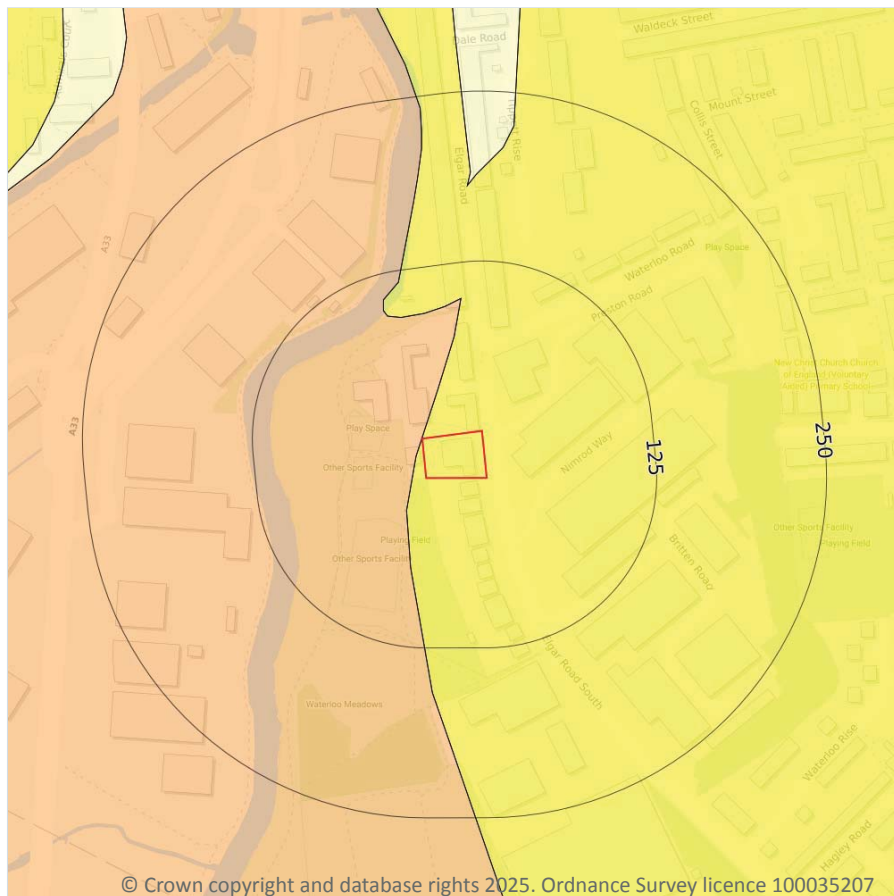
Features are displayed on the Natural ground subsidence - Shrink swell clays map on [page 28](#) >

Location	Hazard rating	Details
On site	Moderate	Ground conditions predominantly high plasticity.

This data is sourced from the British Geological Survey.



Natural ground subsidence - Running sands



— Site Outline
Search buffers in metres (m)

- ☐ No data
- ☐ Negligible
- ☐ Very low
- ☐ Low
- ☐ Moderate
- ☐ High

© Crown copyright and database rights 2025. Ordnance Survey licence 100035207

4.2 Running sands

Records within 50m

2

The potential hazard presented by rocks that can contain loosely-packed sandy layers that can become fluidised by water flowing through them. Such sands can 'run', removing support from overlying buildings and causing potential damage.

Features are displayed on the Natural ground subsidence - Running sands map on [page 29](#) >

Location	Hazard rating	Details
On site	Very low	Running sand conditions are unlikely. No identified constraints on land use due to running conditions unless water table rises rapidly.

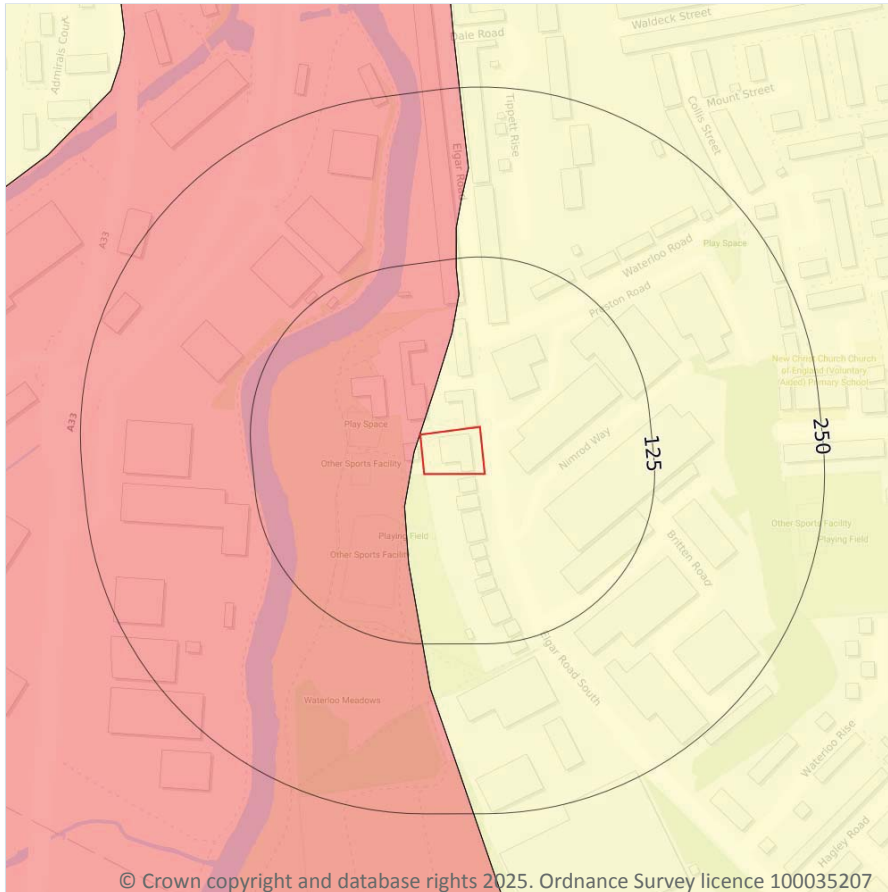


Location	Hazard rating	Details
On site	Low	Running sand conditions may be present. Constraints may apply to land uses involving excavation or the addition or removal of water.

This data is sourced from the British Geological Survey.



Natural ground subsidence - Compressible deposits



— Site Outline
Search buffers in metres (m)

- ☐ No data
- ☐ Negligible
- ☐ Very low
- ☐ Low
- ☐ Moderate
- ☐ High

4.3 Compressible deposits

Records within 50m

2

The potential hazard presented by types of ground that may contain layers of very soft materials like clay or peat and may compress if loaded by overlying structures, or if the groundwater level changes, potentially resulting in depression of the ground and disturbance of foundations.

Features are displayed on the Natural ground subsidence - Compressible deposits map on [page 31 >](#)

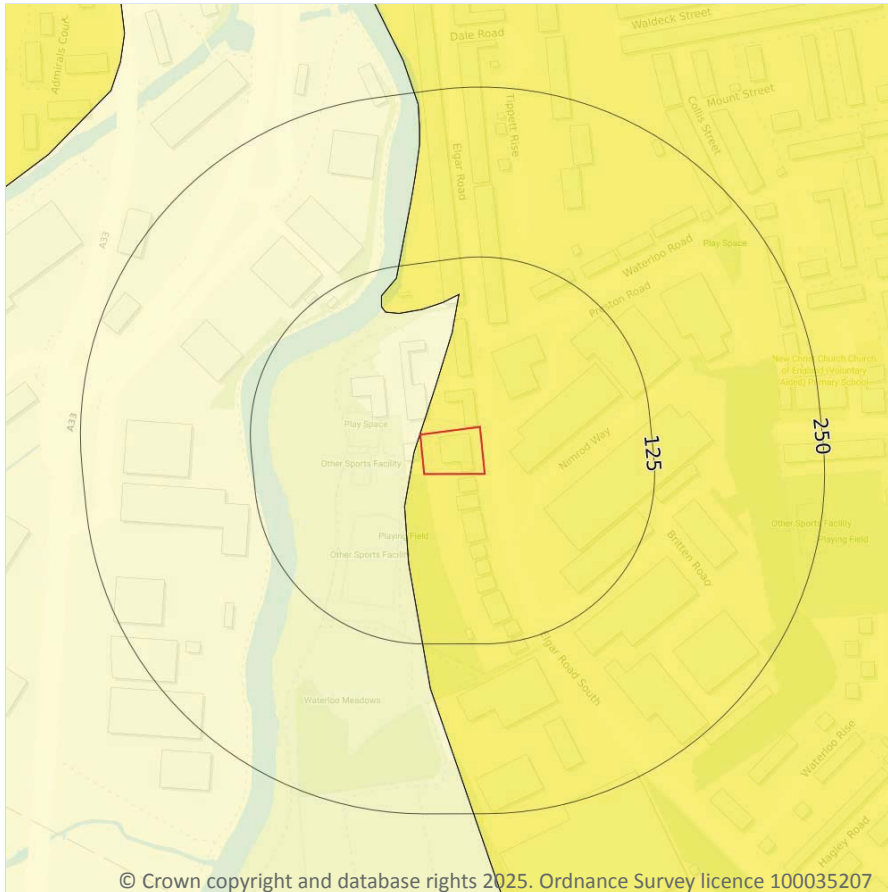
Location	Hazard rating	Details
On site	Negligible	Compressible strata are not thought to occur.
On site	Moderate	Compressibility and uneven settlement hazards are probably present. Land use should consider specifically the compressibility and variability of the site.



This data is sourced from the British Geological Survey.



Natural ground subsidence - Collapsible deposits



— Site Outline
Search buffers in metres (m)

- ☐ No data
- ☐ Negligible
- ☐ Very low
- ☐ Low
- ☐ Moderate
- ☐ High

© Crown copyright and database rights 2025. Ordnance Survey licence 100035207

4.4 Collapsible deposits

Records within 50m

2

The potential hazard presented by natural deposits that could collapse when a load (such as a building) is placed on them or they become saturated with water.

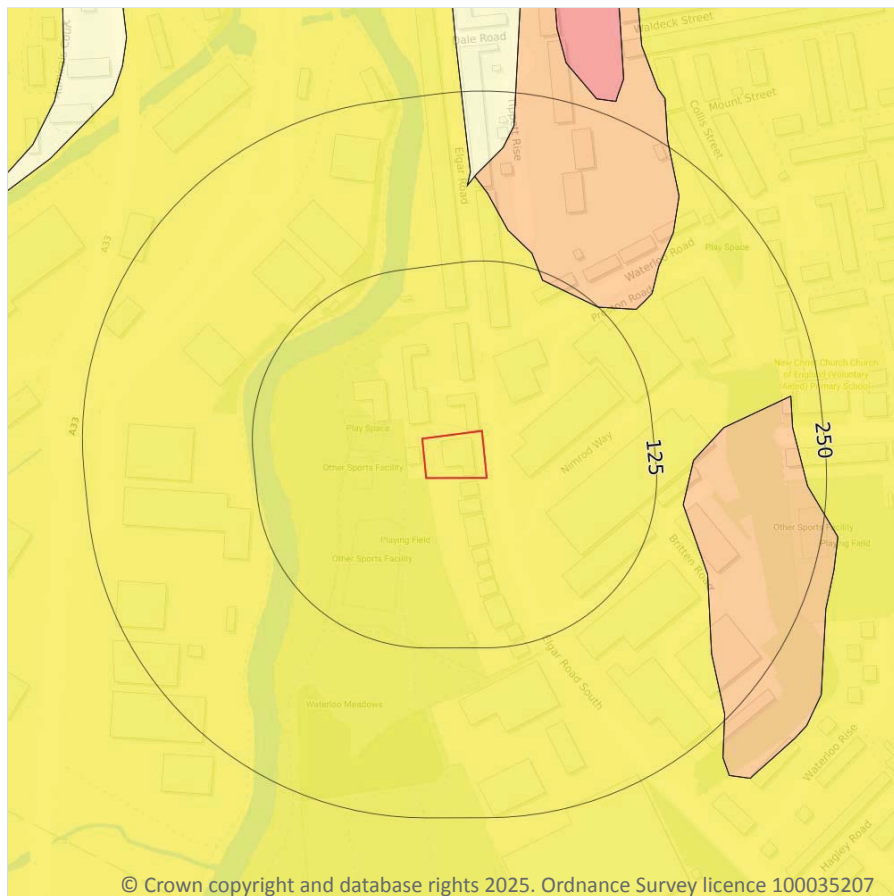
Features are displayed on the Natural ground subsidence - Collapsible deposits map on [page 33](#) >

Location	Hazard rating	Details
On site	Very low	Deposits with potential to collapse when loaded and saturated are unlikely to be present.
On site	Negligible	Deposits with potential to collapse when loaded and saturated are believed not to be present.

This data is sourced from the British Geological Survey.



Natural ground subsidence - Landslides



— Site Outline
Search buffers in metres (m)

- ☐ No data
- ☐ Negligible
- ☐ Very low
- ☐ Low
- ☐ Moderate
- ☐ High

4.5 Landslides

Records within 50m

1

The potential for landsliding (slope instability) to be a hazard assessed using 1:50,000 scale digital maps of superficial and bedrock deposits, combined with information from the BGS National Landslide Database and scientific and engineering reports.

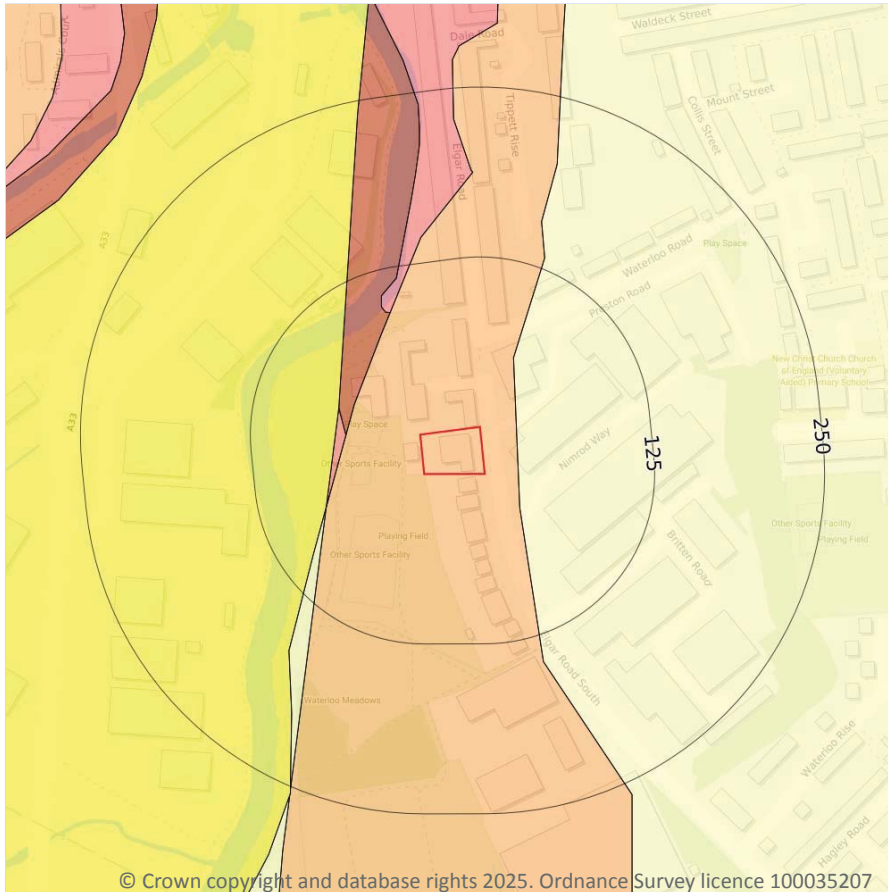
Features are displayed on the Natural ground subsidence - Landslides map on [page 34](#) >

Location	Hazard rating	Details
On site	Very low	Slope instability problems are not likely to occur but consideration to potential problems of adjacent areas impacting on the site should always be considered.

This data is sourced from the British Geological Survey.



Natural ground subsidence - Ground dissolution of soluble rocks



— Site Outline
Search buffers in metres (m)

- ☐ No data
- ☐ Negligible
- ☐ Very low
- ☐ Low
- ☐ Moderate
- ☐ High

4.6 Ground dissolution of soluble rocks

Records within 50m

2

The potential hazard presented by ground dissolution, which occurs when water passing through soluble rocks produces underground cavities and cave systems. These cavities reduce support to the ground above and can cause localised collapse of the overlying rocks and deposits.

Features are displayed on the Natural ground subsidence - Ground dissolution of soluble rocks map on [page 35](#)

Location	Hazard rating	Details
On site	Low	Soluble rocks are present within the ground. Some dissolution features may be present. Potential for difficult ground conditions are at a level where they may be considered, localised subsidence need not be considered except in exceptional circumstances.

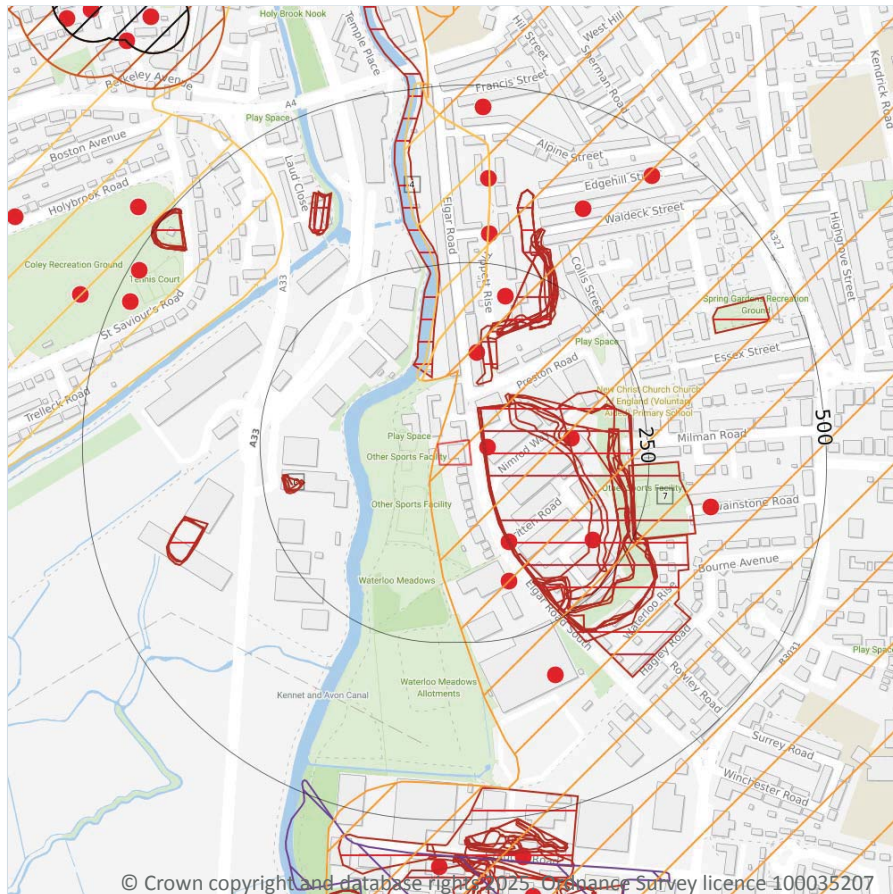


Location	Hazard rating	Details
25m E	Negligible	Soluble rocks are either not thought to be present within the ground, or not prone to dissolution. Dissolution features are unlikely to be present.

This data is sourced from the British Geological Survey.



5 Mining and ground workings



- Site Outline
- Search buffers in metres (m)
- BritPits
- ▤ Surface ground workings
- ▤ Underground workings
- ▤ Underground mining extents
- ▤ Historical mineral planning areas
- ▤ TCA non-coal mining
- Non Coal Mining
- ▤ Sporadic underground mining of restricted extent possible
- ▤ Localised small scale underground mining possible
- ▤ Small scale mining possible
- ▤ Underground mining known or likely within or in close proximity
- ▤ Underground mining known within or in very close proximity

5.1 BritPits

Records within 500m

16

BritPits (an abbreviation of British Pits) is a database maintained by the British Geological Survey of currently active and closed surface and underground mineral workings. Details of major mineral handling sites, such as wharfs and rail depots are also held in the database.

Features are displayed on the Mining and ground workings map on [page 37 >](#)



ID	Location	Details	Description
2	25m E	Name: Waterloo Kilns Address: Elgar Road, Katesgrove, READING, Berkshire Commodity: Clay & Shale Status: Ceased	Type: A surface mineral working. It may be termed Quarry, Delf, Delph, Gravel Pit, Sand Pit, Sand and Gravel Pit, Clay Pit, Pit, Opencast Coal Site or Surface Mine. It may be mapped as Worked Ground or Worked and Made Ground on BGS mapping. Status description: Site which has ceased to extract minerals. May be considered as 'Closed' by operator. May be considered to have 'Active', 'Dormant' or 'Expired' planning permissions by the Mineral Planning Authority.
5	120m SE	Name: Waterloo Kilns Address: The Mount, READING, Berkshire Commodity: Clay & Shale Status: Ceased	Type: A surface mineral working. It may be termed Quarry, Delf, Delph, Gravel Pit, Sand Pit, Sand and Gravel Pit, Clay Pit, Pit, Opencast Coal Site or Surface Mine. It may be mapped as Worked Ground or Worked and Made Ground on BGS mapping. Status description: Site which has ceased to extract minerals. May be considered as 'Closed' by operator. May be considered to have 'Active', 'Dormant' or 'Expired' planning permissions by the Mineral Planning Authority.
B	124m N	Name: Katesgrove Kilns Address: The Mount, READING, Berkshire Commodity: Clay & Shale Status: Ceased	Type: A surface mineral working. It may be termed Quarry, Delf, Delph, Gravel Pit, Sand Pit, Sand and Gravel Pit, Clay Pit, Pit, Opencast Coal Site or Surface Mine. It may be mapped as Worked Ground or Worked and Made Ground on BGS mapping. Status description: Site which has ceased to extract minerals. May be considered as 'Closed' by operator. May be considered to have 'Active', 'Dormant' or 'Expired' planning permissions by the Mineral Planning Authority.
C	144m E	Name: Waterloo Kilns Address: The Mount, READING, Berkshire Commodity: Clay & Shale Status: Ceased	Type: A surface mineral working. It may be termed Quarry, Delf, Delph, Gravel Pit, Sand Pit, Sand and Gravel Pit, Clay Pit, Pit, Opencast Coal Site or Surface Mine. It may be mapped as Worked Ground or Worked and Made Ground on BGS mapping. Status description: Site which has ceased to extract minerals. May be considered as 'Closed' by operator. May be considered to have 'Active', 'Dormant' or 'Expired' planning permissions by the Mineral Planning Authority.



ID	Location	Details	Description
6	172m SE	Name: Waterloo Kilns Address: The Mount, READING, Berkshire Commodity: Clay & Shale Status: Ceased	Type: A surface mineral working. It may be termed Quarry, Delf, Delph, Gravel Pit, Sand Pit, Sand and Gravel Pit, Clay Pit, Pit, Opencast Coal Site or Surface Mine. It may be mapped as Worked Ground or Worked and Made Ground on BGS mapping. Status description: Site which has ceased to extract minerals. May be considered as 'Closed' by operator. May be considered to have 'Active', 'Dormant' or 'Expired' planning permissions by the Mineral Planning Authority.
A	201m SE	Name: Waterloo Kilns Address: The Mount, READING, Berkshire Commodity: Clay & Shale Status: Ceased	Type: A surface mineral working. It may be termed Quarry, Delf, Delph, Gravel Pit, Sand Pit, Sand and Gravel Pit, Clay Pit, Pit, Opencast Coal Site or Surface Mine. It may be mapped as Worked Ground or Worked and Made Ground on BGS mapping. Status description: Site which has ceased to extract minerals. May be considered as 'Closed' by operator. May be considered to have 'Active', 'Dormant' or 'Expired' planning permissions by the Mineral Planning Authority.
B	209m N	Name: Katesgrove Kilns Address: The Mount, READING, Berkshire Commodity: Clay & Shale Status: Ceased	Type: A surface mineral working. It may be termed Quarry, Delf, Delph, Gravel Pit, Sand Pit, Sand and Gravel Pit, Clay Pit, Pit, Opencast Coal Site or Surface Mine. It may be mapped as Worked Ground or Worked and Made Ground on BGS mapping. Status description: Site which has ceased to extract minerals. May be considered as 'Closed' by operator. May be considered to have 'Active', 'Dormant' or 'Expired' planning permissions by the Mineral Planning Authority.
8	292m N	Name: Katesgrove Kilns Address: The Mount, READING, Berkshire Commodity: Clay & Shale Status: Ceased	Type: A surface mineral working. It may be termed Quarry, Delf, Delph, Gravel Pit, Sand Pit, Sand and Gravel Pit, Clay Pit, Pit, Opencast Coal Site or Surface Mine. It may be mapped as Worked Ground or Worked and Made Ground on BGS mapping. Status description: Site which has ceased to extract minerals. May be considered as 'Closed' by operator. May be considered to have 'Active', 'Dormant' or 'Expired' planning permissions by the Mineral Planning Authority.



ID	Location	Details	Description
9	319m SE	Name: Waterloo Kilns Address: The Mount, READING, Berkshire Commodity: Clay & Shale Status: Ceased	Type: A surface mineral working. It may be termed Quarry, Delf, Delph, Gravel Pit, Sand Pit, Sand and Gravel Pit, Clay Pit, Pit, Opencast Coal Site or Surface Mine. It may be mapped as Worked Ground or Worked and Made Ground on BGS mapping. Status description: Site which has ceased to extract minerals. May be considered as 'Closed' by operator. May be considered to have 'Active', 'Dormant' or 'Expired' planning permissions by the Mineral Planning Authority.
11	342m E	Name: Whitley Grove Gravel Pit Address: The Mount, READING, Berkshire Commodity: Gravel Status: Ceased	Type: A surface mineral working. It may be termed Quarry, Delf, Delph, Gravel Pit, Sand Pit, Sand and Gravel Pit, Clay Pit, Pit, Opencast Coal Site or Surface Mine. It may be mapped as Worked Ground or Worked and Made Ground on BGS mapping. Status description: Site which has ceased to extract minerals. May be considered as 'Closed' by operator. May be considered to have 'Active', 'Dormant' or 'Expired' planning permissions by the Mineral Planning Authority.
12	363m NE	Name: Ivy Bridge Brick Field Address: The Mount, READING, Berkshire Commodity: Clay & Shale Status: Ceased	Type: A surface mineral working. It may be termed Quarry, Delf, Delph, Gravel Pit, Sand Pit, Sand and Gravel Pit, Clay Pit, Pit, Opencast Coal Site or Surface Mine. It may be mapped as Worked Ground or Worked and Made Ground on BGS mapping. Status description: Site which has ceased to extract minerals. May be considered as 'Closed' by operator. May be considered to have 'Active', 'Dormant' or 'Expired' planning permissions by the Mineral Planning Authority.
13	370m N	Name: Katesgrove Kilns Address: The Mount, READING, Berkshire Commodity: Clay & Shale Status: Ceased	Type: A surface mineral working. It may be termed Quarry, Delf, Delph, Gravel Pit, Sand Pit, Sand and Gravel Pit, Clay Pit, Pit, Opencast Coal Site or Surface Mine. It may be mapped as Worked Ground or Worked and Made Ground on BGS mapping. Status description: Site which has ceased to extract minerals. May be considered as 'Closed' by operator. May be considered to have 'Active', 'Dormant' or 'Expired' planning permissions by the Mineral Planning Authority.



ID	Location	Details	Description
15	452m NE	Name: Ivy Bridge Brick Field Address: The Mount, READING, Berkshire Commodity: Clay & Shale Status: Ceased	Type: A surface mineral working. It may be termed Quarry, Delf, Delph, Gravel Pit, Sand Pit, Sand and Gravel Pit, Clay Pit, Pit, Opencast Coal Site or Surface Mine. It may be mapped as Worked Ground or Worked and Made Ground on BGS mapping. Status description: Site which has ceased to extract minerals. May be considered as 'Closed' by operator. May be considered to have 'Active', 'Dormant' or 'Expired' planning permissions by the Mineral Planning Authority.
16	469m N	Name: Katesgrove Kilns Address: The Mount, READING, Berkshire Commodity: Clay & Shale Status: Ceased	Type: A surface mineral working. It may be termed Quarry, Delf, Delph, Gravel Pit, Sand Pit, Sand and Gravel Pit, Clay Pit, Pit, Opencast Coal Site or Surface Mine. It may be mapped as Worked Ground or Worked and Made Ground on BGS mapping. Status description: Site which has ceased to extract minerals. May be considered as 'Closed' by operator. May be considered to have 'Active', 'Dormant' or 'Expired' planning permissions by the Mineral Planning Authority.
I	477m NW	Name: Coley Kilns Address: Coley, READING, Berkshire Commodity: Clay & Shale Status: Ceased	Type: A surface mineral working. It may be termed Quarry, Delf, Delph, Gravel Pit, Sand Pit, Sand and Gravel Pit, Clay Pit, Pit, Opencast Coal Site or Surface Mine. It may be mapped as Worked Ground or Worked and Made Ground on BGS mapping. Status description: Site which has ceased to extract minerals. May be considered as 'Closed' by operator. May be considered to have 'Active', 'Dormant' or 'Expired' planning permissions by the Mineral Planning Authority.
I	486m NW	Name: Coley Kilns Address: Coley, READING, Berkshire Commodity: Clay & Shale Status: Ceased	Type: A surface mineral working. It may be termed Quarry, Delf, Delph, Gravel Pit, Sand Pit, Sand and Gravel Pit, Clay Pit, Pit, Opencast Coal Site or Surface Mine. It may be mapped as Worked Ground or Worked and Made Ground on BGS mapping. Status description: Site which has ceased to extract minerals. May be considered as 'Closed' by operator. May be considered to have 'Active', 'Dormant' or 'Expired' planning permissions by the Mineral Planning Authority.

This data is sourced from the British Geological Survey.



5.2 Surface ground workings

Records within 250m

30

Historical land uses identified from Ordnance Survey mapping that involved ground excavation at the surface. These features may or may not have been subsequently backfilled.

Features are displayed on the Mining and ground workings map on [page 37](#) >

ID	Location	Land Use	Year of mapping	Mapping scale
A	19m NE	Brick and Tile Works	1938	1:10560
A	19m NE	Brick and Tile Works	1913	1:10560
A	21m NE	Brick and Tile Works	1938	1:10560
A	21m NE	Brick and Tile Works	1938	1:10560
A	22m NE	Brick and Tile Works	1933	1:10560
A	65m NE	Unspecified Ground Workings	1898	1:10560
B	80m N	Unspecified Ground Workings	1898	1:10560
C	86m NE	Unspecified Ground Workings	1913	1:10560
4	94m N	Canal	1938	1:10560
B	107m NE	Unspecified Ground Workings	1962	1:10560
A	136m E	Unspecified Pit	1962	1:10560
A	143m SE	Unspecified Ground Workings	1933	1:10560
B	147m N	Unspecified Ground Workings	1979	1:10000
B	154m N	Unspecified Ground Workings	1938	1:10560
B	154m N	Unspecified Ground Workings	1913	1:10560
B	154m N	Unspecified Pit	1938	1:10560
B	154m N	Unspecified Pit	1938	1:10560
B	154m N	Unspecified Ground Workings	1933	1:10560
B	178m NE	Unspecified Ground Workings	1979	1:10000
B	178m NE	Unspecified Ground Workings	1962	1:10560
B	178m NE	Unspecified Ground Workings	1973	1:10000
A	192m E	Unspecified Ground Workings	1938	1:10560
D	193m W	Unspecified Ground Workings	1933	1:10560



ID	Location	Land Use	Year of mapping	Mapping scale
A	193m E	Unspecified Ground Workings	1938	1:10560
A	193m E	Unspecified Ground Workings	1938	1:10560
D	196m W	Unspecified Heap	1938	1:10560
D	196m W	Unspecified Heap	1938	1:10560
D	197m W	Unspecified Ground Workings	1938	1:10560
A	214m E	Unspecified Ground Workings	1913	1:10560
7	222m E	Brick Works	1898	1:10560

This data is sourced from Ordnance Survey/Groundsure.

5.3 Underground workings

Records within 1000m

0

Historical land uses identified from Ordnance Survey mapping that indicate the presence of underground workings e.g. mine shafts.

This data is sourced from Ordnance Survey/Groundsure.

5.4 Underground mining extents

Records within 500m

0

This data identifies underground mine workings that could present a potential risk, including adits and seam workings. These features have been identified from BGS Geological mapping and mine plans sourced from the BGS and various collections and sources.

This data is sourced from Groundsure.

5.5 Historical Mineral Planning Areas

Records within 500m

1

Boundaries of mineral planning permissions for England and Wales. This data was collated between the 1940s (and retrospectively to the 1930s) and the mid 1980s. The data includes permitted, withdrawn and refused permissions.

Features are displayed on the Mining and ground workings map on [page 37 >](#)

ID	Location	Site Name	Mineral	Type	Planning Status	Planning Status Date
J	483m SW	Whitley Kiln	Sand, brickclay, bricks	Surface mineral working	Valid	05/06/47

This data is sourced from the British Geological Survey.

5.6 Non-coal mining

Records within 1000m

6

The potential for historical non-coal mining to have affected an area. The assessment is drawn from expert knowledge and literature in addition to the digital geological map of Britain. Mineral commodities may be divided into seven general categories - vein minerals, chalk, oil shale, building stone, bedded ores, evaporites and 'other' commodities (including ball clay, jet, black marble, graphite and chert).

Features are displayed on the Mining and ground workings map on [page 37 >](#)

ID	Location	Name	Commodity	Class	Likelihood
1	On site	Not available	Chalk	C	Underground mine workings may have occurred in the past, or current mines may be operating to modern engineering standards. Potential for difficult ground conditions should be considered.
3	93m NW	Not available	Chalk	B	Underground mine workings may have occurred in the past or current mines may be working at significant depth to modern engineering standards. Potential for difficult ground conditions are unlikely and are at a level where they need not be considered.
10	340m NW	Not available	Chalk	B	Underground mine workings may have occurred in the past or current mines may be working at significant depth to modern engineering standards. Potential for difficult ground conditions are unlikely and are at a level where they need not be considered.
L	622m NW	Ruby Court	Chalk	D	Underground mining is considered likely to have occurred within or close to the area. The location, extent and nature of mining should be considered in any site investigation. Potential for difficult ground conditions should be considered.
L	672m NW	Ruby Court	Chalk	E	Underground mining is known or considered likely within or very close to the area. The location, extent and nature of mining should be considered in any site investigation. Potential for difficult ground conditions should be considered.



ID	Location	Name	Commodity	Class	Likelihood
-	943m N	Not available	Chalk	B	Underground mine workings may have occurred in the past or current mines may be working at significant depth to modern engineering standards. Potential for difficult ground conditions are unlikely and are at a level where they need not be considered.

This data is sourced from the British Geological Survey.

5.7 JPB mining areas

Records on site

1

Areas which could be affected by former coal and other mining. This data includes some mine plans unavailable to the Coal Authority.

Location	Details
On site	Whilst outside of an area where The Coal Authority have information on coal mining activities, Johnson Poole & Bloomer (JPB) may have information such as mining plans and maps held within their archive that have occurred within 1km of this property. Please note, the plans held by JPB may also relate to non-mining records. Further details and a quote for services (if appropriate) can be obtained by emailing this report to enquiries.gs@jpb.co.uk .

This data is sourced from Johnson Poole and Bloomer.

5.8 The Coal Authority non-coal mining

Records within 500m

0

This data provides an indication of the potential zone of influence of recorded underground non-coal mining workings. Any and all analysis and interpretation of Coal Authority Data in this report is made by Groundsure, and is in no way supported, endorsed or authorised by the Coal Authority. The use of the data is restricted to the terms and provisions contained in this report. Data reproduced in this report may be the copyright of the Coal Authority and permission should be sought from Groundsure prior to any re-use.

This data is sourced from The Coal Authority.

5.9 Researched mining

Records within 500m

10

This data indicates areas of potential mining identified from alternative or archival sources, including; BGS Geological paper maps, Lidar data, aerial photographs (from World War II onwards), archaeological data services, websites, Tithe maps, and various text/plans from collected books and reports. Some of this data is approximate and Groundsure have interpreted the resultant risk area and, where possible, specific areas of risk have been captured.



Location	Mineral type
On site	Stone
27m E	Stone
88m N	Stone
156m N	Stone
174m NE	Unspecified
180m NE	Unspecified
185m NE	Unspecified
224m N	Stone
226m E	Stone
290m N	Stone

This data is sourced from Groundsure.

5.10 Mining record office plans

Records within 500m	0
----------------------------	----------

This dataset is representative of Mining Record Office and/or plan extents held by Groundsure and should be considered approximate. Where possible, plans have been located and any specific areas of risk they depict have been captured.

This data is sourced from Groundsure.

5.11 BGS mine plans

Records within 500m	0
----------------------------	----------

This dataset is representative of BGS mine plans held by Groundsure and should be considered approximate. Where possible, plans have been located and any specific areas of risk they depict have been captured.

This data is sourced from Groundsure.

5.12 Coal mining

Records on site	0
------------------------	----------

Areas which could be affected by past, current or future coal mining.

This data is sourced from the Coal Authority.

5.13 Brine areas

Records on site**0**

The Cheshire Brine Compensation District indicates areas that may be affected by salt and brine extraction in Cheshire and where compensation would be available where damage from this mining has occurred. Damage from salt and brine mining can still occur outside this district, but no compensation will be available.

This data is sourced from the Cheshire Brine Subsidence Compensation Board.

5.14 Gypsum areas

Records on site**0**

Generalised areas that may be affected by gypsum extraction.

This data is sourced from British Gypsum.

5.15 Tin mining

Records on site**0**

Generalised areas that may be affected by historical tin mining.

This data is sourced from Groundsure.

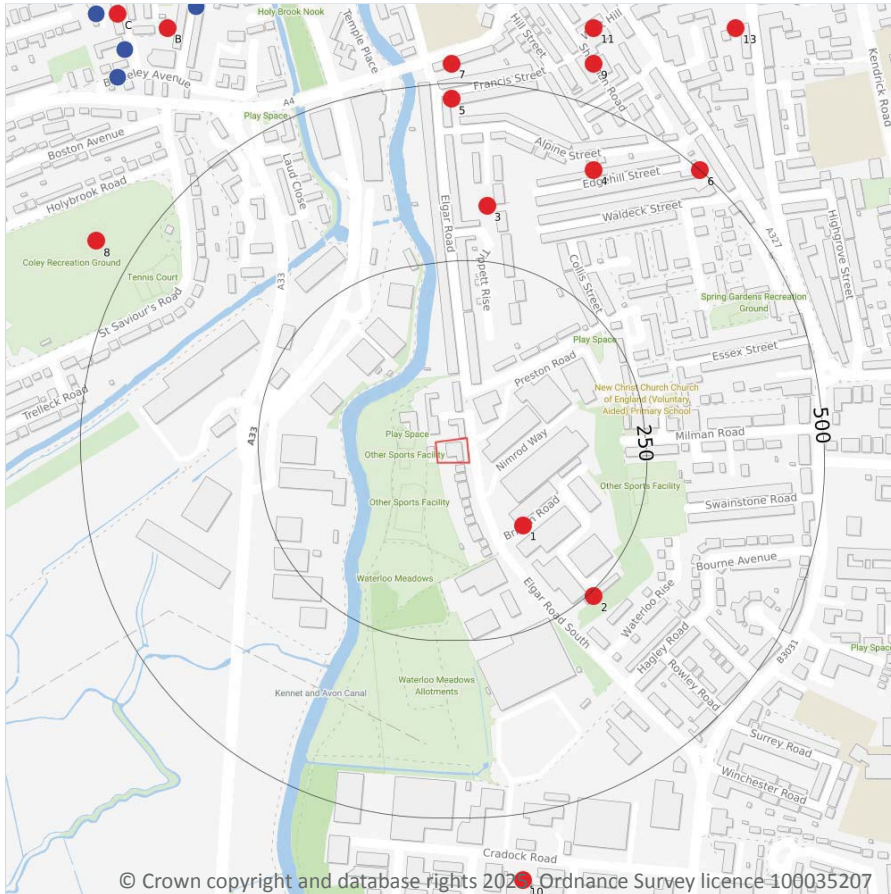
5.16 Clay mining

Records on site**0**

Generalised areas that may be affected by kaolin and ball clay extraction.

This data is sourced from the Kaolin and Ball Clay Association (UK).

6 Ground cavities and sinkholes



- Site Outline
- Search buffers in metres (m)
- Natural cavities (Area)
- Natural cavities (Point)
- Mining cavities
- Reported recent incidents
- Historical incidents

6.1 Natural cavities

Records within 500m

0

Industry recognised national database of natural cavities. Sinkholes and caves are formed by the dissolution of soluble rock, such as chalk and limestone, gulls and fissures by cambering. Ground instability can result from movement of loose material contained within these cavities, often triggered by water.

This data is sourced from Stantec UK Ltd.

6.2 Mining cavities

Records within 1000m

29

Industry recognised national database of mining cavities. Degraded mines may result in hazardous subsidence (crown holes). Climatic conditions and water escape can also trigger subsidence over mine entrances and workings.

Features are displayed on the Ground cavities and sinkholes map on [page 48 >](#)

ID	Location	Mine Address	Mineral
1	116m SE	Waterloo Kiln/clackmans Field, Reading, Berkshire	Chalk
2	257m SE	Waterloo Kiln, Reading, Berkshire	Chalk
3	329m N	Katesgrove Kilns (3), Reading, Berkshire	Chalk
4	418m NE	Ivy Lodge Brickfield/ Southampton Kiln, Reading, Berkshire	Chalk
5	478m N	Katesgrove Kilns (2), Reading, Berkshire	Chalk
6	500m NE	The Upper Kiln, Reading, Berkshire	Chalk
7	528m N	Katesgrove Kilns (1), Reading, Berkshire	Chalk
8	555m NW	Wheeler Works, Reading (Coley), Berkshire	Chalk
9	557m N	Shearmans Brick Kiln, Reading, Berkshire	Chalk
10	593m S	Whitley Kiln, Reading, Berkshire	Chalk
11	604m N	Shearmans Brick Kiln, Reading, Berkshire	Chalk
-	682m NE	Reading, Berkshire	Chalk
13	690m NE	The Old Orchard Kiln, Reading, Berkshire	Chalk
-	693m S	Rose Kiln, Reading, Berkshire	Chalk
B	695m NW	Coley Potteries, Reading (Coley), Berkshire	Chalk
C	751m NW	Lower Field, Reading (Coley), Berkshire	Chalk
-	797m NW	Ruby Court, Reading (Coley), Berkshire	Chalk
-	798m N	Reading, Berkshire	Chalk
-	800m NW	Avenue Works, Reading (Coley), Berkshire	Chalk
-	812m W	Reading (Coley), Berkshire	Chalk
-	834m NW	Castle Hill Kiln, Reading (Coley), Berkshire	Chalk
-	863m NW	Castle Crescent, Reading (Coley), Berkshire	Chalk
-	875m NW	Coley Hill, Reading (Coley), Berkshire	Chalk



ID	Location	Mine Address	Mineral
-	879m NE	Jubilee Square, Reading, Berkshire	Chalk
-	892m NW	Reading (Coley), Berkshire	Chalk
-	917m NW	Reading (Coley), Berkshire	Chalk
-	936m NW	Reading (Coley), Berkshire	Chalk
-	960m NW	Reading (Coley), Berkshire	Chalk
-	997m NW	Reading (Coley), Berkshire	Chalk

This data is sourced from Stantec UK Ltd.

6.3 Reported recent incidents

Records within 500m	0
----------------------------	----------

This data identifies sinkhole information gathered from media reports and Groundsure's own records. This data goes back to 2014 and includes relative accuracy ratings for each event and links to the original data sources. The data is updated on a regular basis and should not be considered a comprehensive catalogue of all sinkhole events. The absence of data in this database does not mean a sinkhole definitely has not occurred during this time.

This data is sourced from Groundsure.

6.4 Historical incidents

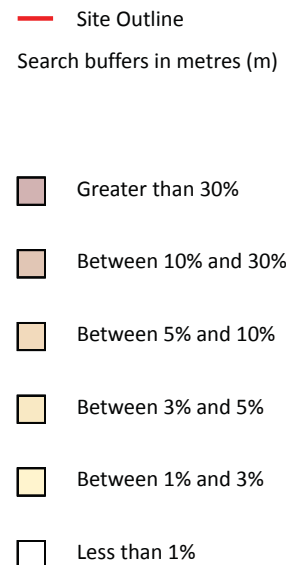
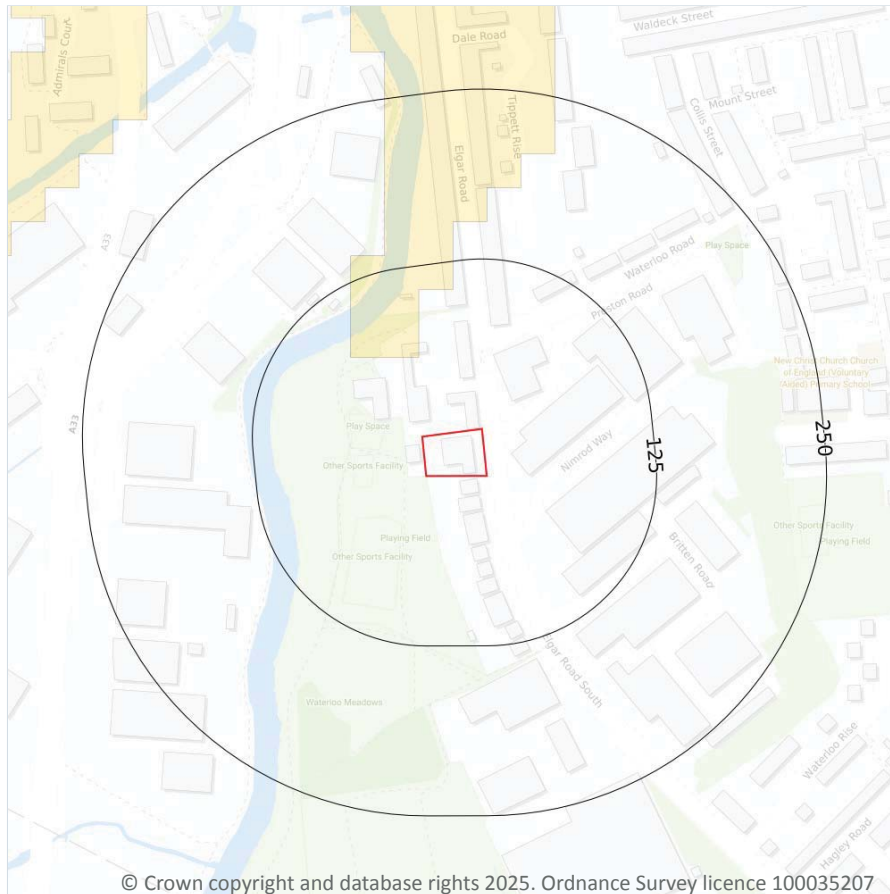
Records within 500m	0
----------------------------	----------

This dataset comprises an extract of 1:10,560, 1:10,000, 1:2,500 and 1:1,250 scale historical Ordnance Survey maps held by Groundsure, dating back to the 1840s. It shows shakeholes, deneholes and other 'holes' as noted on these maps. Dene holes are medieval chalk extraction pits, usually comprising a narrow shaft with a number of chambers at the base of the shaft. Shakeholes are an alternative name for suffusion sinkholes, most commonly found in the limestone landscapes of North Yorkshire but also extensively noted around the Brecon Beacons National Park.

Not all 'holes' noted on Ordnance Survey mapping will necessarily be present within this dataset.

This data is sourced from Groundsure.

7 Radon



7.1 Radon

Records on site

1

The Radon Potential data classifies areas based on their likelihood of a property having a radon level at or above the Action Level in Great Britain. The dataset is intended for use at 1:50,000 scale and was derived from both geological assessments and indoor radon measurements (more than 560,000 records). A minimum 50m buffer should be considered when searching the maps, as the smallest detectable feature at this scale is 50m. The findings of this section should supersede any estimations derived from the Indicative Atlas of Radon in Great Britain (1:100,000 scale).

Features are displayed on the Radon map on [page 51](#) >

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



This data is sourced from the British Geological Survey and UK Health Security Agency.



8 Soil chemistry

8.1 BGS Estimated Background Soil Chemistry

Records within 50m

3

The estimated values provide the likely background concentration of the potentially harmful elements Arsenic, Cadmium, Chromium, Lead and Nickel in topsoil. The values are estimated primarily from rural topsoil data collected at a sample density of approximately 1 per 2 km². In areas where rural soil samples are not available, estimation is based on stream sediment data collected from small streams at a sampling density of 1 per 2.5 km²; this is the case for most of Scotland, Wales and southern England. The stream sediment data are converted to soil-equivalent concentrations prior to the estimation.

Location	Arsenic	Bioaccessible Arsenic	Lead	Bioaccessible Lead	Cadmium	Chromium	Nickel
On site	15 - 25 mg/kg	No data	100 mg/kg	60 mg/kg	1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg
On site	15 - 25 mg/kg	No data	100 mg/kg	60 mg/kg	1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg
On site	15 mg/kg	No data	100 mg/kg	60 mg/kg	1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg

This data is sourced from the British Geological Survey.

8.2 BGS Estimated Urban Soil Chemistry

Records within 50m

0

Estimated topsoil chemistry of Arsenic, Cadmium, Chromium, Copper, Nickel, Lead, Tin and Zinc and bioaccessible Arsenic and Lead in 23 urban centres across Great Britain. These estimates are derived from interpolation of the measured urban topsoil data referred to above and provide information across each city between the measured sample locations (4 per km²).

This data is sourced from the British Geological Survey.

8.3 BGS Measured Urban Soil Chemistry

Records within 50m

0

The locations and measured total concentrations (mg/kg) of Arsenic, Cadmium, Chromium, Copper, Nickel, Lead, Tin and Zinc in urban topsoil samples from 23 urban centres across Great Britain. These are collected at a sample density of 4 per km².

This data is sourced from the British Geological Survey.



9 Railway infrastructure and projects



- Site Outline**
- Search buffers in metres (m)**
- Crossrail 2 Stations
 - Crossrail 2 Route
 - Crossrail 2 Worksites
 - Crossrail 2 Safeguarding
 - Crossrail 2 Headhouses
 - Railway stations
 - Active railways
 - Active tunnels
 - Abandoned railways
 - Historic railways
 - Historic tunnels
 - Underground stations
 - Underground Lines
 - Royal Mail tunnels
 - HS2 optimised route
 - HS2 Stations
 - HS2 Depots
 - HS2 Surface Safeguarding
 - HS2 Subsurface Safeguarding

9.1 Underground railways (London)

Records within 250m

0

Details of all active London Underground lines, including approximate tunnel roof depth and operational hours.

This data is sourced from publicly available information by Groundsure.

9.2 Underground railways (Non-London)

Records within 250m

0

Details of the Merseyrail system, the Tyne and Wear Metro and the Glasgow Subway. Not all parts of all systems are located underground. The data contains location information only and does not include a depth assessment.



This data is sourced from publicly available information by Groundsure.

9.3 Railway tunnels

Records within 250m

0

Railway tunnels taken from contemporary Ordnance Survey mapping.

This data is sourced from the Ordnance Survey.

9.4 Historical railway and tunnel features

Records within 250m

14

Railways and tunnels digitised from historical Ordnance Survey mapping as scales of 1:1,250, 1:2,500, 1:10,000 and 1:10,560.

Features are displayed on the Railway infrastructure and projects map on [page 54](#) >

Location	Land Use	Year of mapping	Mapping scale
174m NW	Railway Sidings	1957	1250
174m NW	Railway Sidings	1963	1250
174m NW	Railway Sidings	1938	10560
174m NW	Railway Sidings	1958	2500
175m NW	Railway Sidings	1933	10560
175m NW	Railway	1932	-
176m NW	Railway Sidings	1961	2500
177m NW	Railway Sidings	1938	10560
177m NW	Railway Sidings	1932	2500
184m NW	Railway	1911	-
185m W	Railway Sidings	1961	2500
187m NW	Railway Sidings	1962	10560
198m NW	Railway Sidings	1913	10560
205m NW	Railway Sidings	1971	2500

This data is sourced from Ordnance Survey/Groundsure.



9.5 Royal Mail tunnels

Records within 250m**0**

The Post Office Railway, otherwise known as the Mail Rail, is an underground railway running through Central London from Paddington Head District Sorting Office to Whitechapel Eastern Head Sorting Office. The line is 10.5km long. The data includes details of the full extent of the tunnels, the depth of the tunnel, and the depth to track level.

This data is sourced from Groundsure/the Postal Museum.

9.6 Historical railways

Records within 250m**2**

Former railway lines, including dismantled lines, abandoned lines, disused lines, historic railways and razed lines.

Features are displayed on the Railway infrastructure and projects map on [page 54 >](#)

Location	Description
207m NW	Abandoned
211m NW	Historical OSM

This data is sourced from OpenStreetMap.

9.7 Railways

Records within 250m**0**

Currently existing railway lines, including standard railways, narrow gauge, funicular, trams and light railways.

This data is sourced from Ordnance Survey and OpenStreetMap.

9.8 Crossrail 2

Records within 500m**0**

Crossrail 2 is a proposed railway linking the national rail networks in Surrey and Hertfordshire via an underground tunnel through London.

This data is sourced from publicly available information by Groundsure.



9.9 HS2

Records within 500m

0

HS2 is a proposed high speed rail network running from London to Manchester and Leeds via Birmingham. Main civils construction on Phase 1 (London to Birmingham) of the project began in 2019, and it is currently anticipated that this phase will be fully operational by 2026. Construction on Phase 2a (Birmingham to Crewe) is anticipated to commence in 2021, with the service fully operational by 2027. Construction on Phase 2b (Crewe to Manchester and Birmingham to Leeds) is scheduled to begin in 2023 and be operational by 2033.

This data is sourced from HS2 Ltd.



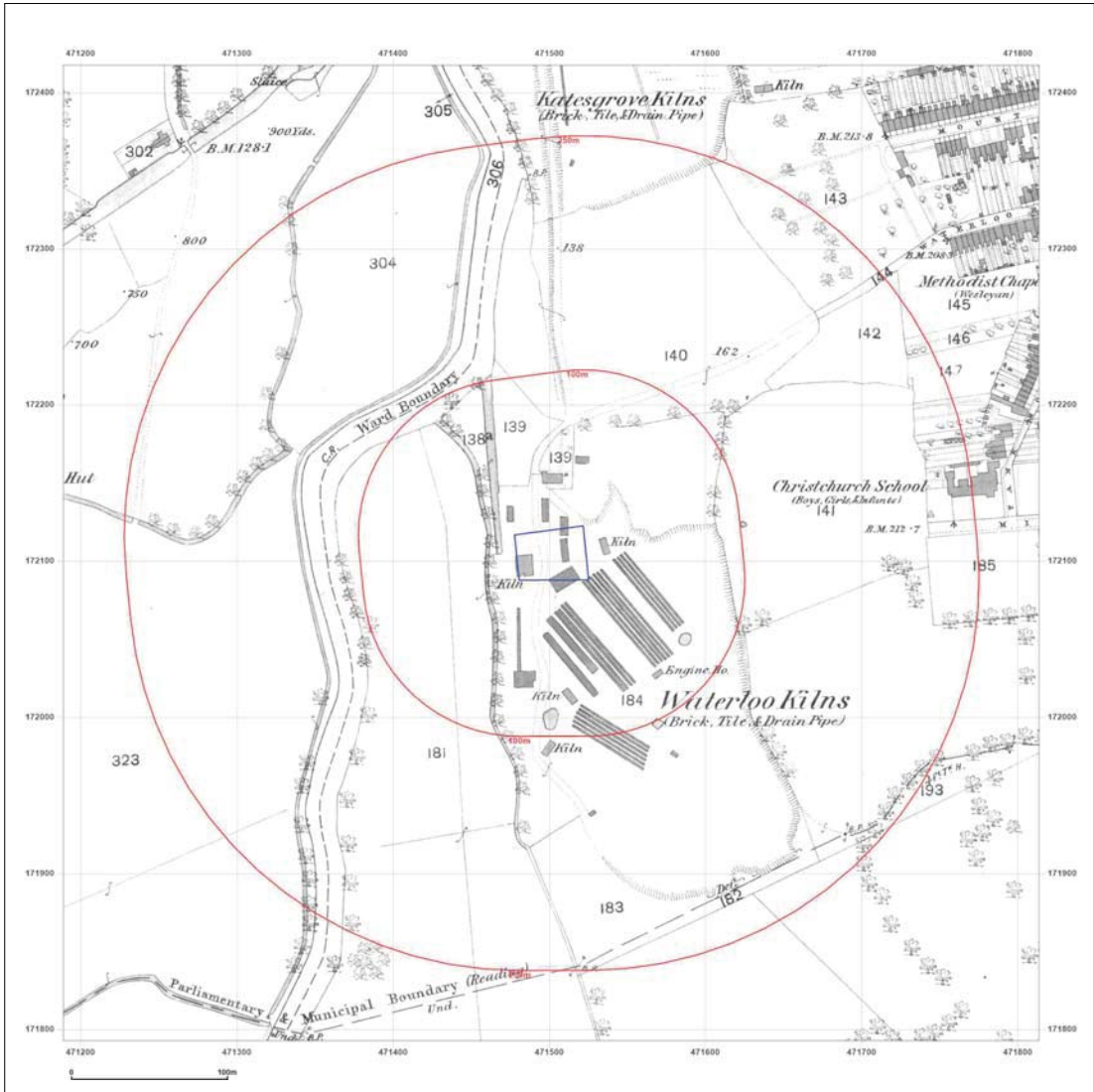
Data providers

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

Terms and conditions

Groundsure's Terms and Conditions can be accessed at this link: www.groundsure.com/terms-and-conditions-april-2023/ ↗.





Site Details: 220, ELGAR ROAD SOUTH, READING, RG2 0BW	
Client Ref:	GWPR6540
Report Ref:	GS-OQA-S8W-8F8-FEK
Grid Ref:	471501, 172105
Map Name:	County Series
Map date:	1879
Scale:	1:2,500
Printed at:	1:2,500



Surveyed 1879
Revised 1879
Edition N/A
Copyright N/A
Levelled N/A

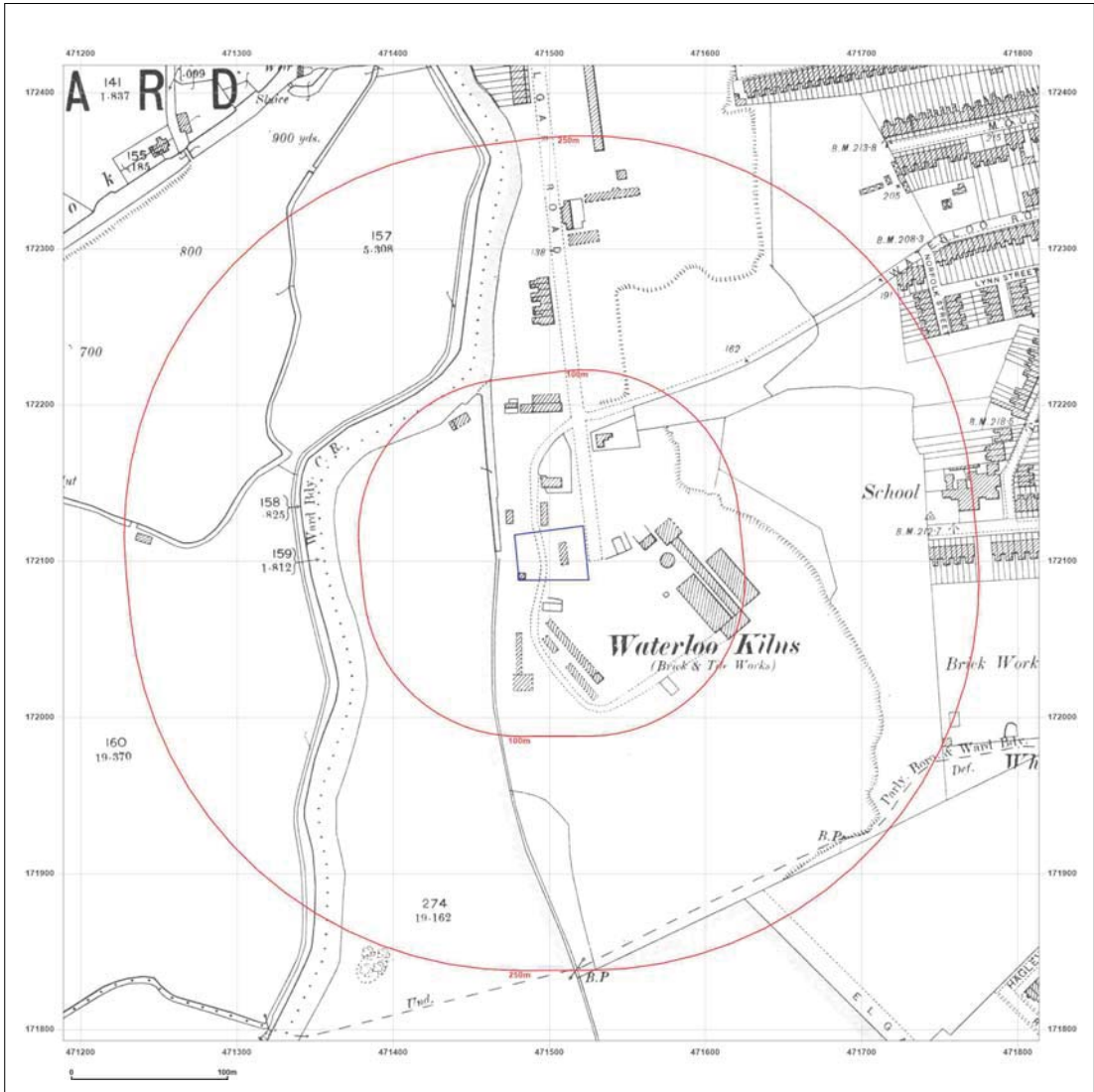


Produced by
Groundsure Insights
T: 08444 159000
E: info@groundsure.com
W: www.groundsure.com

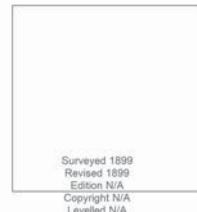
© Crown copyright and database rights 2024 Ordnance Survey 100035207

Production date: 14 May 2025

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



Site Details: 220, ELGAR ROAD SOUTH, READING, RG2 0BW	
Client Ref:	GWPR6540
Report Ref:	GS-OQA-S8W-8F8-FEK
Grid Ref:	471501, 172105
Map Name:	County Series
Map date:	1899
Scale:	1:2,500
Printed at:	1:2,500



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

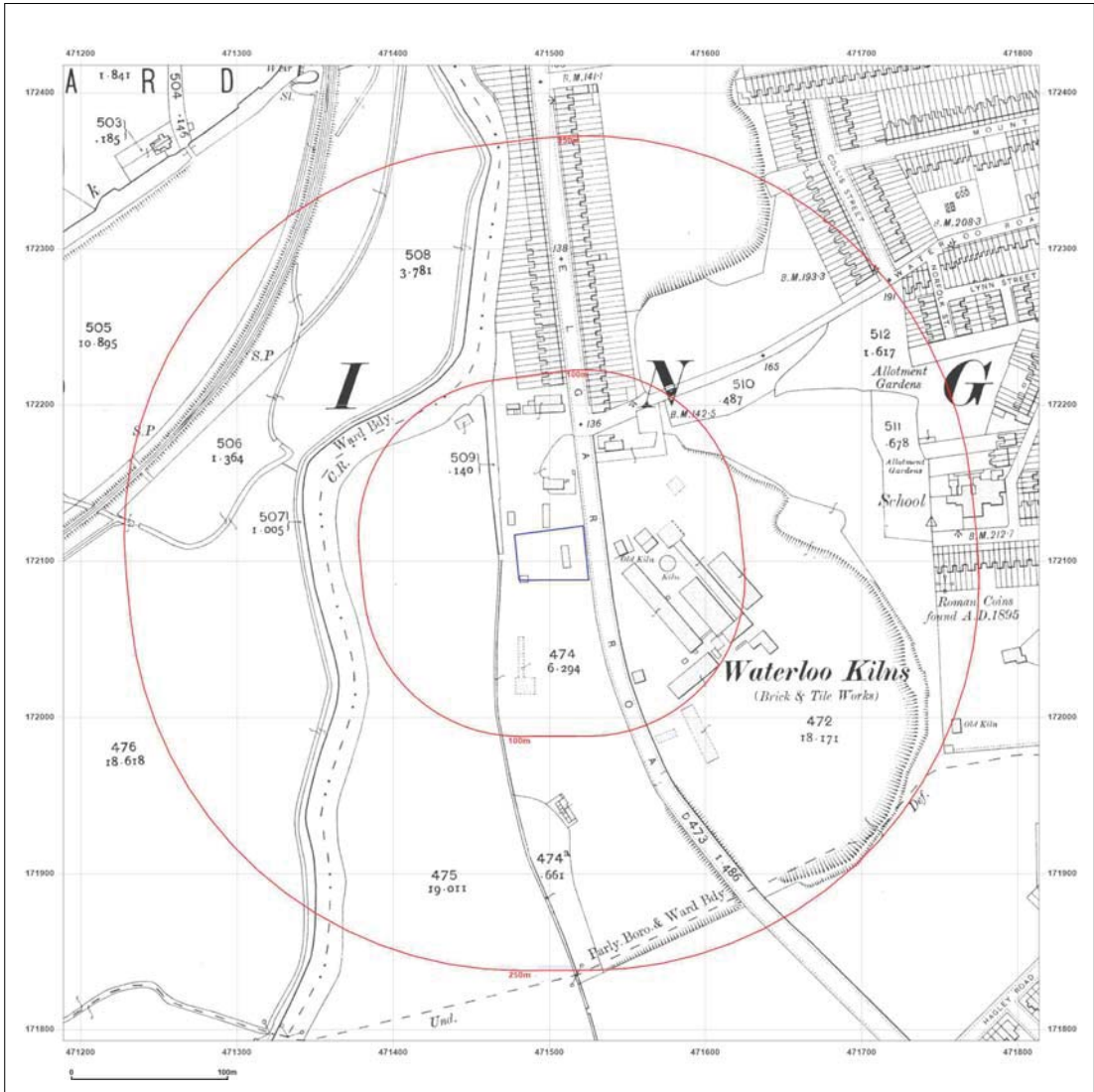


Produced by
Groundsure Insights
T: 08444 159000
E: info@groundsure.com
W: www.groundsure.com

© Crown copyright and database rights 2024 Ordnance Survey 100035207

Production date: 14 May 2025

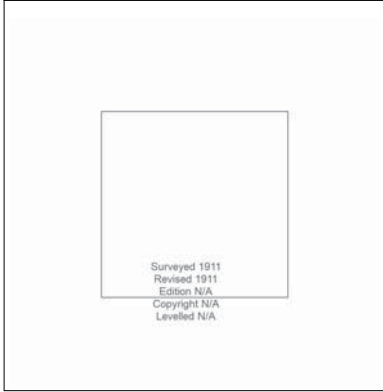
Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



Site Details:
220, ELGAR ROAD SOUTH,
READING, RG2 0BW

Client Ref: GWPR6540
Report Ref: GS-OQA-S8W-8F8-FEK
Grid Ref: 471501, 172105

Map Name: County Series
Map date: 1911
Scale: 1:2,500
Printed at: 1:2,500

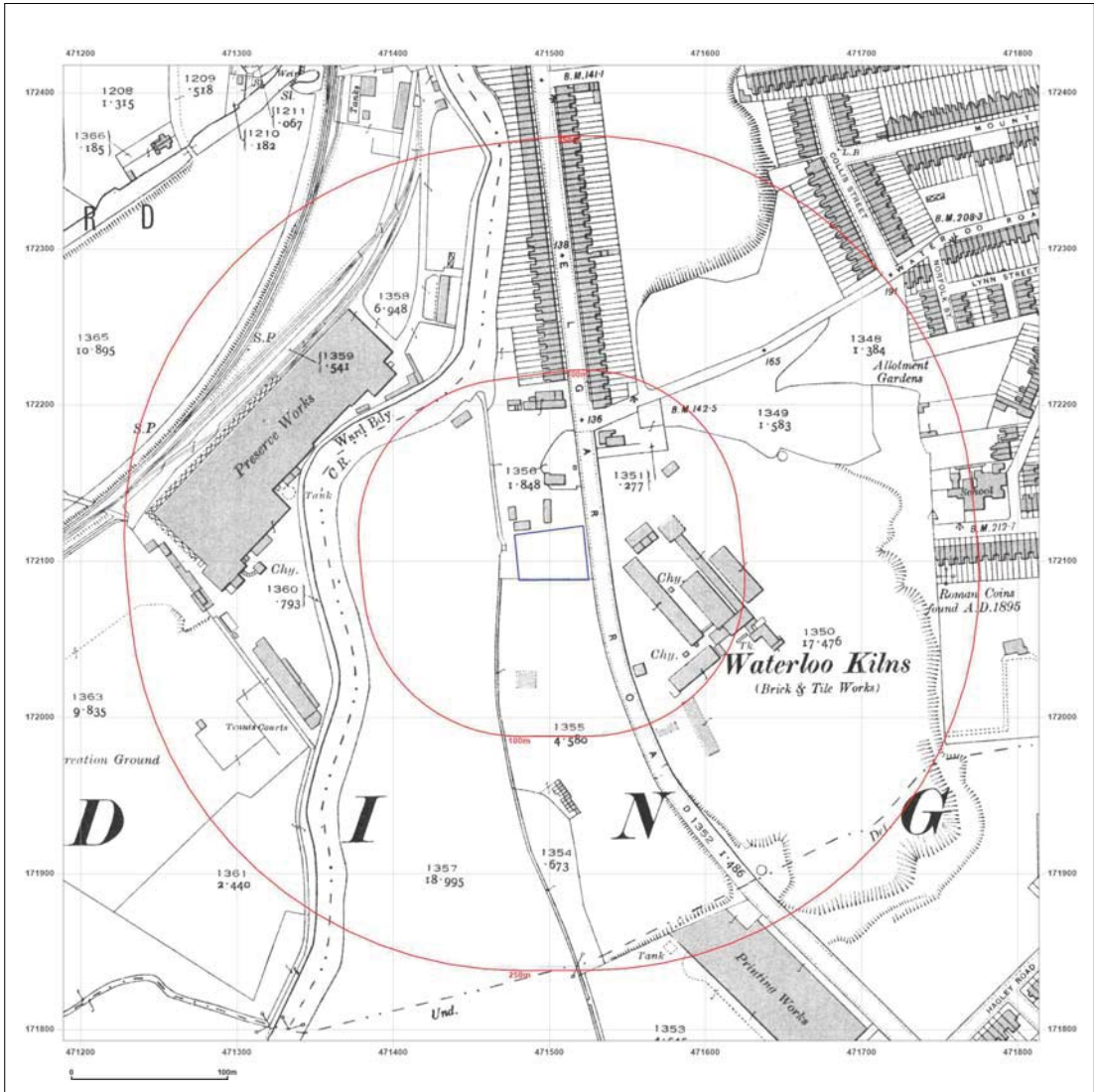


Powered by  Produced by
Groundsure Insights
T: 08444 159000
E: info@groundsure.com
W: www.groundsure.com

© Crown copyright and database rights 2024 Ordnance Survey 100035207

Production date: 14 May 2025

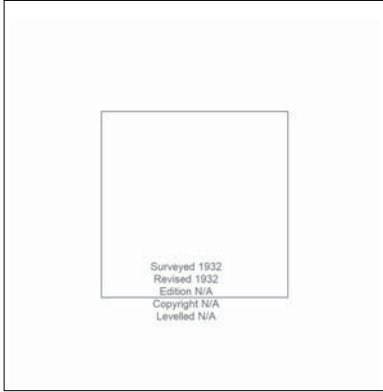
Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



Site Details:
220, ELGAR ROAD SOUTH,
READING, RG2 0BW

Client Ref: GWPR6540
Report Ref: GS-OQA-S8W-8F8-FEK
Grid Ref: 471501, 172105

Map Name: County Series
Map date: 1932
Scale: 1:2,500
Printed at: 1:2,500

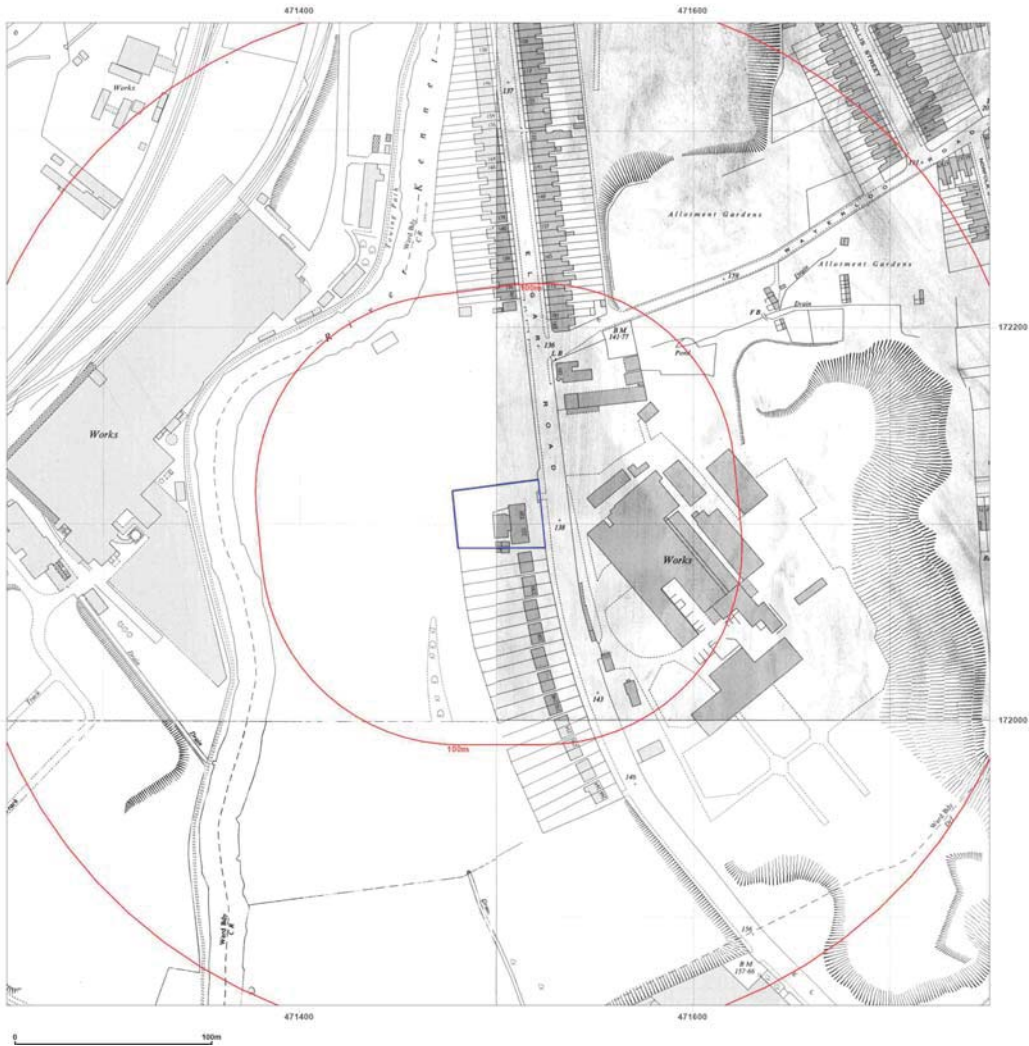


Powered by  Produced by
Groundsure Insights
T: 08444 159000
E: info@groundsure.com
W: www.groundsure.com

© Crown copyright and database rights 2024 Ordnance Survey 100035207

Production date: 14 May 2025

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



Site Details:
220, ELGAR ROAD SOUTH,
READING, RG2 0BW

Client Ref: GWPR6540
Report Ref: GS-OQA-S8W-8F8-FEK
Grid Ref: 471501, 172105

Map Name: National Grid
Map date: 1957-1958
Scale: 1:1,250
Printed at: 1:2,000



Surveyed 1957 Revised 1957 Edition N/A Copyright N/A Levelled 1951	Surveyed 1957 Revised 1957 Edition N/A Copyright N/A Levelled 1951
Surveyed N/A Revised N/A Edition N/A Copyright N/A Levelled N/A	Surveyed 1957 Revised 1957 Edition N/A Copyright N/A Levelled 1951



Produced by
Groundsure Insights
T: 08444 159000
E: info@groundsure.com
W: www.groundsure.com

© Crown copyright and database rights 2024 Ordnance Survey 100035207

Production date: 14 May 2025

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



Site Details:
220, ELGAR ROAD SOUTH,
READING, RG2 0BW

Client Ref: GWPR6540
Report Ref: GS-OQA-S8W-8F8-FEK
Grid Ref: 471501, 172105

Map Name: National Grid
Map date: 1957-1958
Scale: 1:1,250
Printed at: 1:2,000



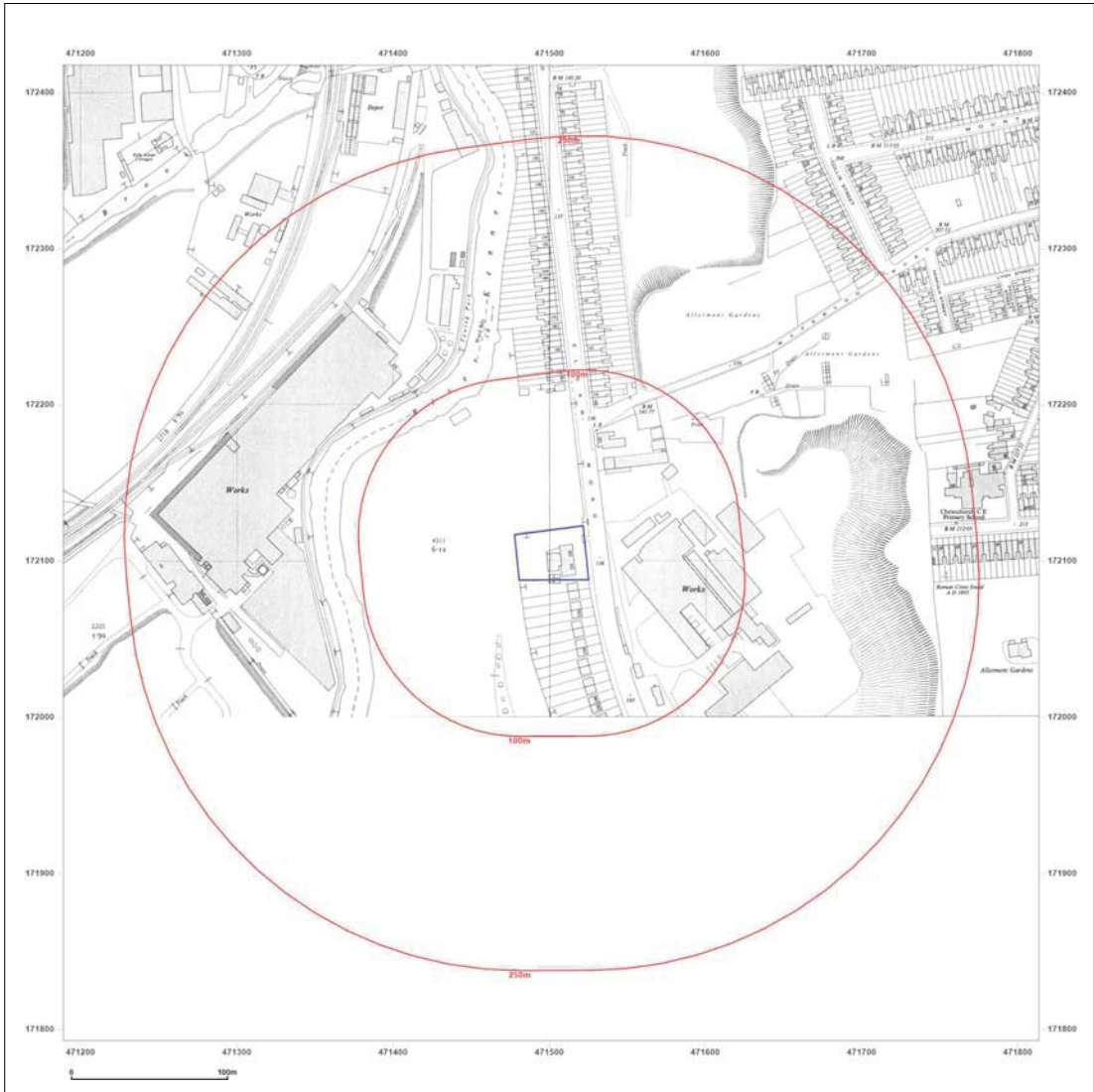
Surveyed N/A Revised N/A Edition N/A Copyright N/A Levelled N/A	Surveyed N/A Revised N/A Edition N/A Copyright N/A Levelled N/A
Surveyed 1957 Revised 1957 Edition N/A Copyright N/A Levelled 1951	Surveyed N/A Revised N/A Edition N/A Copyright N/A Levelled N/A

Powered by  Produced by
Groundsure Insights
T: 08444 159000
E: info@groundsure.com
W: www.groundsure.com

© Crown copyright and database rights 2024 Ordnance Survey 100035207

Production date: 14 May 2025

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



Site Details:
220, ELGAR ROAD SOUTH,
READING, RG2 0BW

Client Ref: GWPR6540
Report Ref: GS-OQA-S8W-8F8-FEK
Grid Ref: 471501, 172105

Map Name: National Grid
Map date: 1958
Scale: 1:2,500
Printed at: 1:2,500

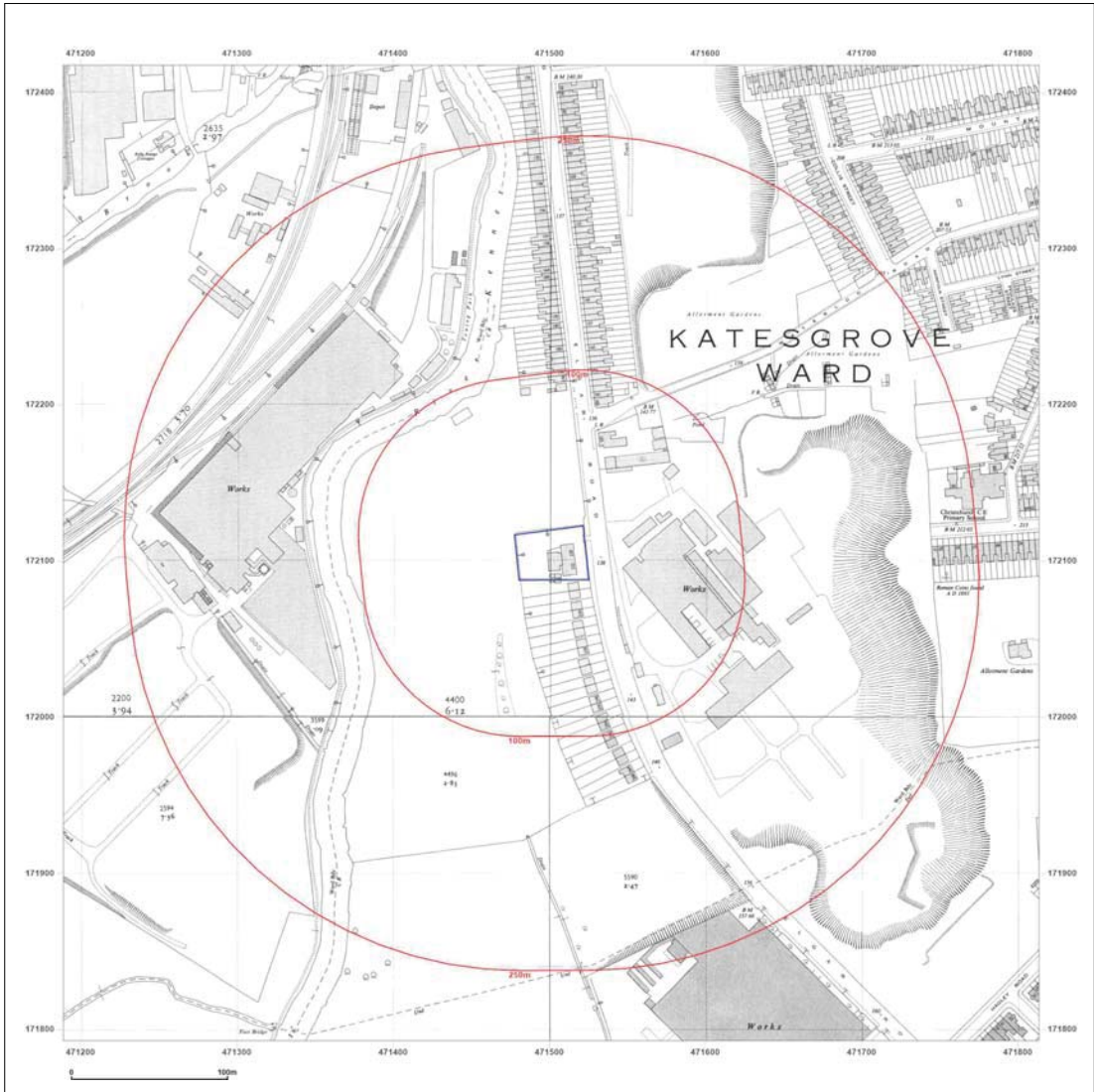


Surveyed 1957
Revised 1957
Edition 1958
Copyright N/A
Levelled 1951

Powered by
 Produced by
Groundsure Insights
T: 08444 159000
E: info@groundsure.com
W: www.groundsure.com

© Crown copyright and database rights 2024 Ordnance Survey 100035207

Production date: 14 May 2025
Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



Site Details:
220, ELGAR ROAD SOUTH,
READING, RG2 0BW

Client Ref: GWPR6540
Report Ref: GS-OQA-S8W-8F8-FEK
Grid Ref: 471501, 172105

Map Name: National Grid
Map date: 1958-1961
Scale: 1:2,500
Printed at: 1:2,500



Surveyed 1959
Revised 1959
Edition 1961
Copyright 1961
Levelled 1951

Surveyed 1957
Revised 1957
Edition 1958
Copyright N/A
Levelled 1951

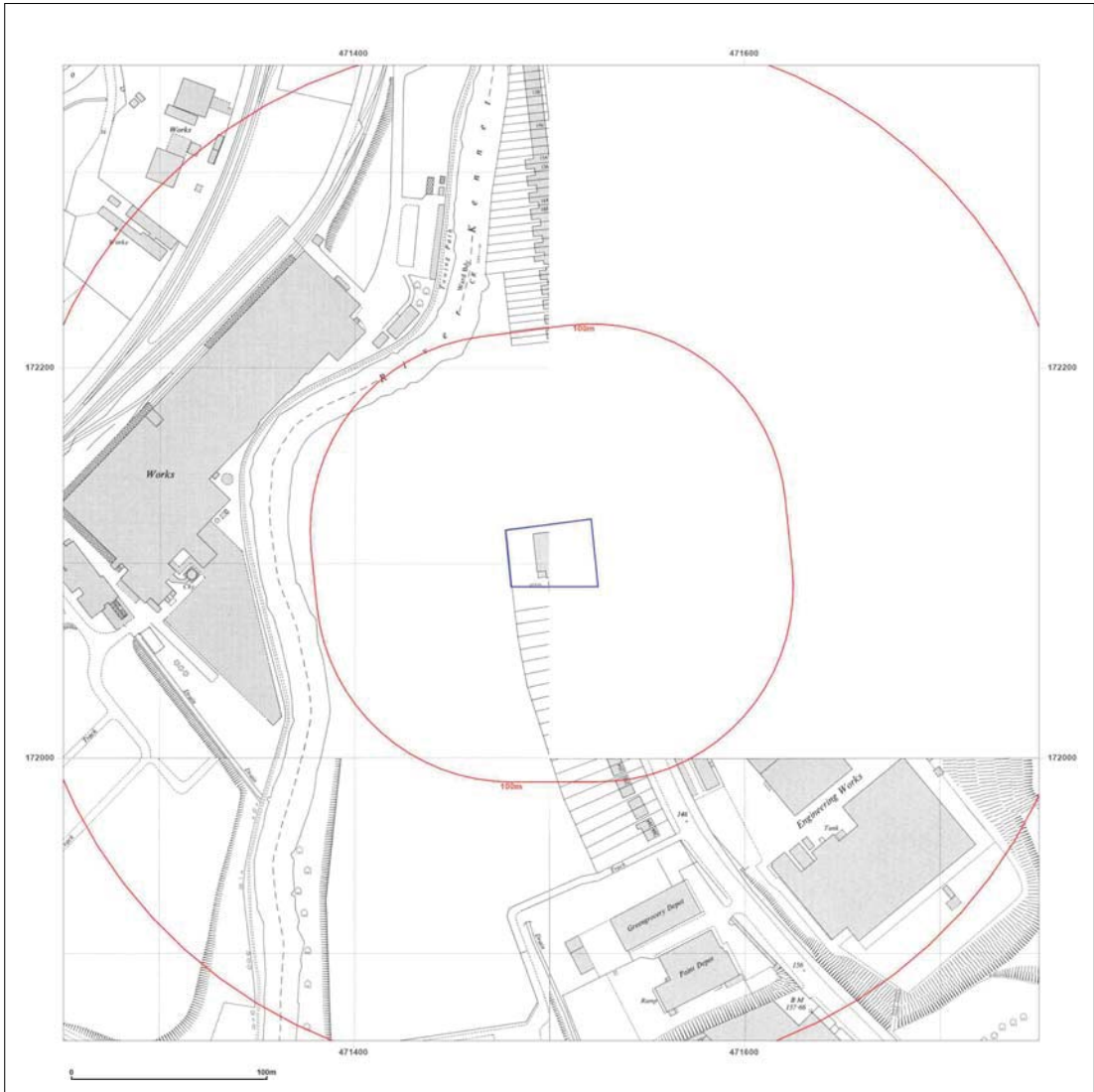
Powered by

Produced by
Groundsure Insights
T: 08444 159000
E: info@groundsure.com
W: www.groundsure.com

© Crown copyright and database rights 2024 Ordnance Survey 100035207

Production date: 14 May 2025

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



Site Details:
220, ELGAR ROAD SOUTH,
READING, RG2 0BW

Client Ref: GWPR6540
Report Ref: GS-OQA-S8W-8F8-FEK
Grid Ref: 471501, 172105

Map Name: National Grid
Map date: 1963-1966
Scale: 1:1,250
Printed at: 1:2,000

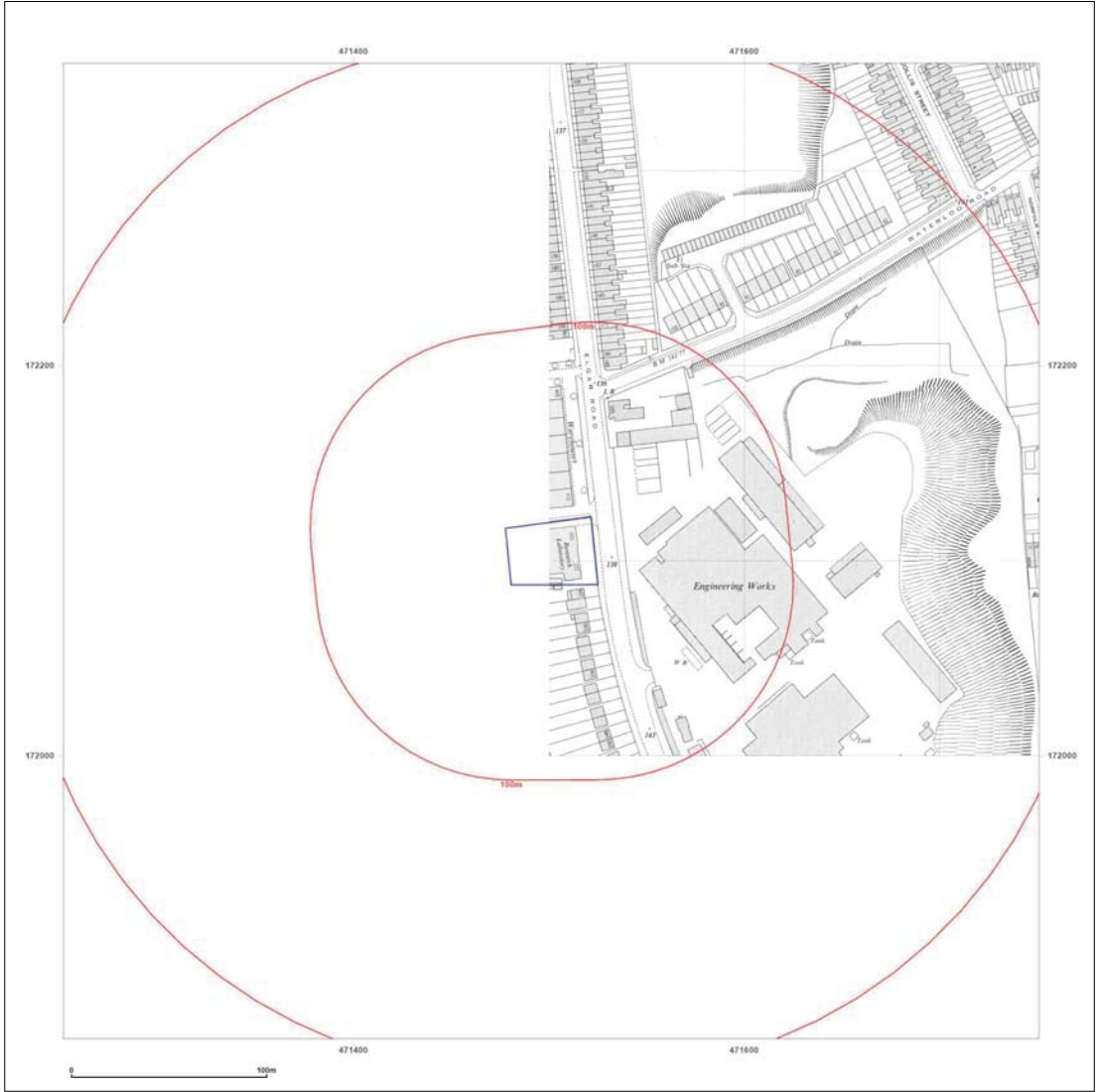
Surveyed 1963 Revised 1963 Edition N/A Copyright 1963 Levelled 1951	
Surveyed 1957 Revised 1965 Edition N/A Copyright 1966 Levelled 1951	Surveyed 1965 Revised 1965 Edition N/A Copyright 1966 Levelled 1951

Powered by  Produced by
Groundsure Insights
T: 08444 159000
E: info@groundsure.com
W: www.groundsure.com

© Crown copyright and database rights 2024 Ordnance Survey 100035207

Production date: 14 May 2025

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



Site Details:
220, ELGAR ROAD SOUTH,
READING, RG2 0BW

Client Ref: GWPR6540
Report Ref: GS-OQA-S8W-8F8-FEK
Grid Ref: 471501, 172105

Map Name: National Grid

Map date: 1969

Scale: 1:1,250

Printed at: 1:2,000



Surveyed 1968
Revised 1968
Edition N/A
Copyright 1969
Levelled 1951

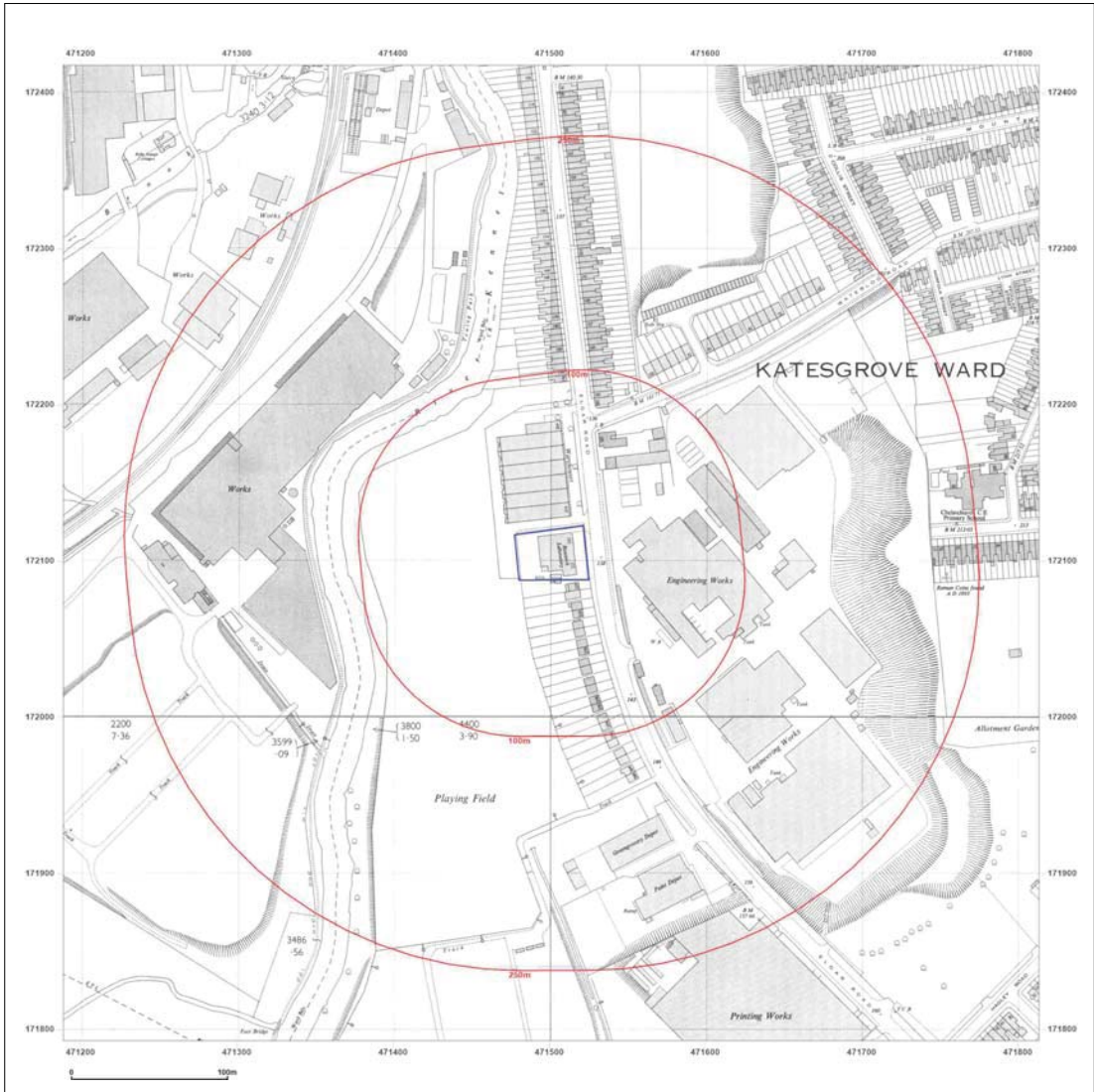


Produced by
Groundsure Insights
T: 08444 159000
E: info@groundsure.com
W: www.groundsure.com

© Crown copyright and database rights 2024 Ordnance Survey 100035207

Production date: 14 May 2025

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



Site Details: 220, ELGAR ROAD SOUTH, READING, RG2 0BW	
Client Ref:	GWPR6540
Report Ref:	GS-OQA-S8W-8F8-FEK
Grid Ref:	471501, 172105
Map Name:	National Grid
Map date:	1967-1971
Scale:	1:2,500
Printed at:	1:2,500

Surveyed 1968 Revised 1968 Edition N/A Copyright 1971 Levelled 1951	
Surveyed 1965 Revised 1965 Edition N/A Copyright 1967 Levelled 1951	

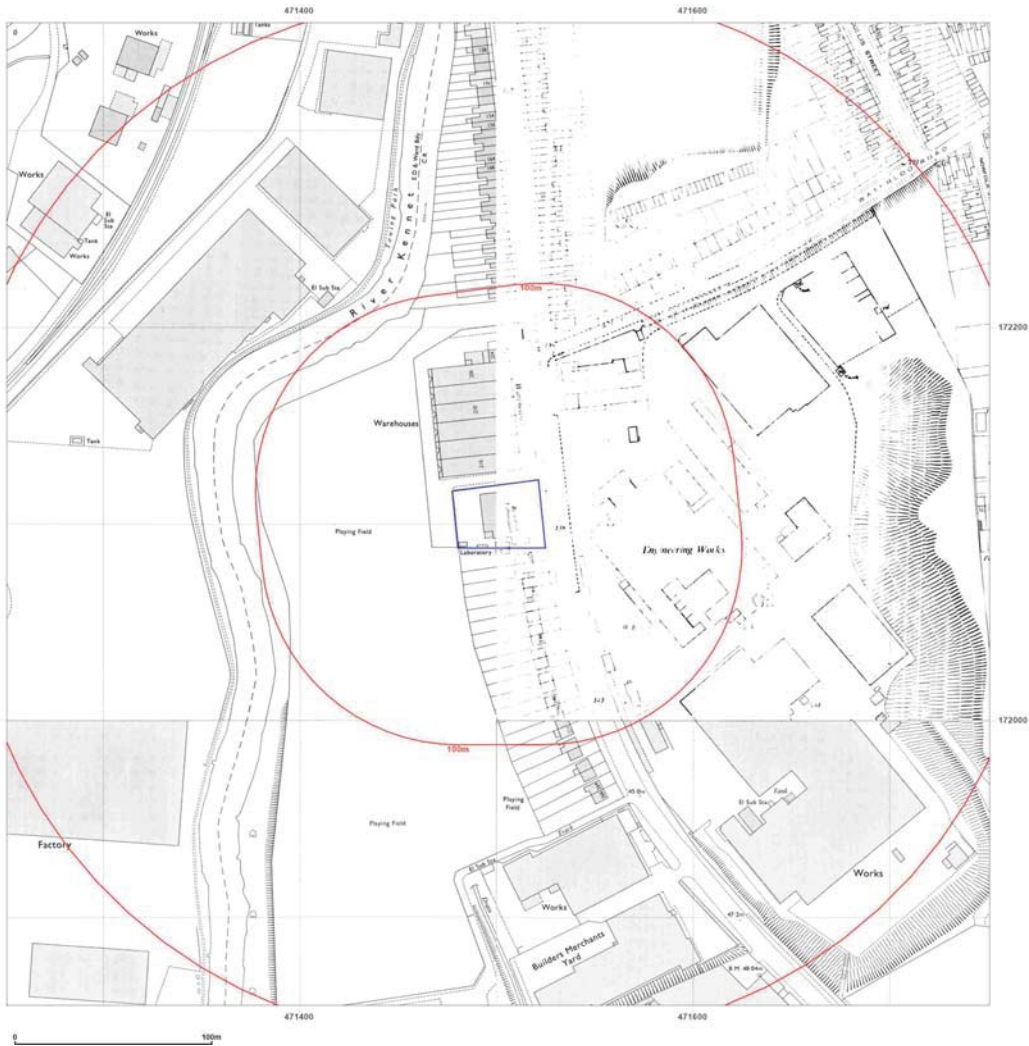


Produced by
Groundsure Insights
T: 08444 159000
E: info@groundsure.com
W: www.groundsure.com

© Crown copyright and database rights 2024 Ordnance Survey 100035207

Production date: 14 May 2025

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



Site Details:
220, ELGAR ROAD SOUTH,
READING, RG2 0BW

Client Ref: GWPR6540
Report Ref: GS-OQA-S8W-8F8-FEK
Grid Ref: 471501, 172105

Map Name: National Grid
Map date: 1972-1976
Scale: 1:1,250
Printed at: 1:2,000



Surveyed 1957 Revised 1975 Edition N/A Copyright 1976 Levelled 1973	Surveyed N/A Revised N/A Edition N/A Copyright N/A Levelled N/A
Surveyed 1957 Revised 1975 Edition N/A Copyright 1976 Levelled 1972	Surveyed 1957 Revised 1975 Edition N/A Copyright 1976 Levelled 1972

Powered by  Produced by
Groundsure Insights
T: 08444 159000
E: info@groundsure.com
W: www.groundsure.com

© Crown copyright and database rights 2024 Ordnance Survey 100035207

Production date: 14 May 2025
Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf