

# GROUND ENGINEERING

Newark Road, Peterborough PE1 5UA

**REPORT ON A SITE INVESTIGATION**  
**AT**  
**RECTORY FARM BUILDINGS**  
**MAIN STREET**  
**LOWER BENEFIELD**

**Report Reference C15307**

**On behalf of:**

**Best Asset Limited**  
Unit 12  
Cottingham Way  
Thrapston  
Kettering NN14 4PL

*April 2021*

*C15307 Rectory Farm, Lower Benefield*

## **CONTENTS**

Introduction	Page 1
Location, Topography and Geology of the Site	Page 2
Site History	Page 4
Summary of Environmental Data	Page 6
Preliminary Risk Assessment	Page 9
Site Work	Page 12
Geotechnical Laboratory Testing	Page 15
Chemical Laboratory Testing	Page 16
Ground Conditions	Page 17
Comments on the Ground Conditions in Relation to Foundation Design and Construction	Page 20
Comments on Soil Permeability	Page 25
Comments on Soil Chemical Testing	Page 26
Groundwater Quality Assessment	Page 31
Soil Gas	Page 32
Updated Conceptual Model	Page 33
Comments on Ground Contamination in Relation to Proposed Residential Development	Page 35

## **FIGURES**

Site Location Plan	Figure 1
Site Layout Plan	Figure 2
Exploratory Hole Location Plan	Figure 3
Exploratory Hole Location Plan Superimposed on Proposed Development	Figure 4
Head Deposit and Made Ground Superimposed on Proposed Development	Figure 5

## **APPENDICES**

Historical Maps	Appendix 1
Database Information	Appendix 2
Records of Exploratory Holes	Appendix 3
Laboratory Geotechnical Test Results	Appendix 4
Laboratory Chemical Test Results	Appendix 5
Concrete Requirements Against Sulphate Attack	Appendix 6

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**INTRODUCTION**

Ground Engineering Limited was instructed by the client, Best Asset Limited, to carry out an intrusive ground investigation to establish the ground conditions at Rectory Farm Buildings, Main Street, Lower Benefield. The work is in preparation for future redevelopment comprising three barn conversions and two new houses.

The scope of the site investigation comprised desk study research; six window sample boreholes, four trial pits, two soakaway tests, and geotechnical and chemical testing on recovered samples to determine the nature of the underlying soil. Assessment of slope stability is outside the scope of this investigation.

This report provides the findings of the investigation and makes recommendations for the design of traditional foundations together with comments on the risk of soil contamination being present beneath the site.

## **LOCATION, TOPOGRAPHY AND GEOLOGY OF THE SITE**

Rectory Farm is situated in the Northamptonshire village of Lower Benefield, which is located about 5km to the west of Oundle and 9km to the east of Corby.

Rectory Farm Buildings, which comprise the site are located on the corner of Main Street (A427) and Causin Way, Lower Benefield as shown in Figure 1. The approximate National Grid Reference at the centre of the site is SP 9893 8865.

The site is about 80m wide by 100m long and comprises the farm buildings and yard space to the north of Rectory Farm farmhouse, which fronts onto Causin Way. Access to the site could be gained from Causin Way to the south and Main Street (A427) to the east.

The site layout is shown in Figure 2, which identifies ten barns and two silos that have been lettered A to K. The majority of the barns were constructed with steel or concrete frames with steel, timber or asbestos containing material (ACM) sheet cladding and corrugated ACM roofing. Barn H was constructed from stone and brick, and a mixture of tile and corrugated ACM roofing. Between Buildings G and H was an empty 7m long by 1m wide bunded area where surface mounted tanks could have historically been located.

Whilst there were no trees identified within the site, some mature Sycamore, Leyland Cypress and Pine trees were observed along the eastern edge.

The site was located on a hillside/valley side where the south-western corner stood at 68mOD. An eastward flowing stream is located some 60m to the north. The land falls by about 8m, over a distance of 125m, to the north-east corner of the site which stands at about 60mOD. The Rectory Farm Buildings are positioned on individual terraced areas standing at between 65mOD and 66mOD within the south-western half, and between 64mOD and 60mOD in the eastern half. The terraced areas are connected by sloping areas of hardstanding surfaced by concrete and stone.

The geological map at 1:50,000 scale, Sheet 171, indicates the site to be directly underlain primarily by the solid geology of the Blisworth Clay Formation. On the higher ground

to the south-west the Blisworth Clay Formation is respectively overlain by the Cornbrash, Kellaways Formation and Oxford Clay Formation, which laterally occur over a relatively short distance due to the sloping nature of the hillside. The Blisworth Limestone, which underlies the Blisworth Clay Formation, is shown beneath the valley floor directly to the north of the site.

## SITE HISTORY

Research into the site history involved reference to historical Ordnance Survey (OS) maps, aerial photographs, and internet research. Selected extracts are presented in Appendix 1 and described below:

<i>OS Map Extract</i>	<i>Description</i>
<b>1885</b> OS County Series Scale 1:10,560 <b>Figure A</b>	The site lies within the rural village of Lower Benefield and lies on the corner of two roads.  The maps show the site to be occupied by Rectory Farm, which comprised as set of buildings and a pump, within the south-eastern corner of the site. The remaining two-thirds of the site is undeveloped and occupied by fields.
<b>1886</b> OS County Series Scale 1:2500 <b>Figure B</b>	
<b>1900</b> OS County Series Scale 1:2500 <b>Figure C</b>	There is a new open-sided barn structure located between the buildings and directly to the east of the pump. There are no other changes to the site.
<b>1926</b> OS County Series Scale 1:2500 <b>Figure D</b>	Apart from an extension to the open-sided barn structure, the site appears as shown in the previous map.
<b>1950</b> OS County Series Scale 1:10,560 <b>Figure E</b>	The site appears as shown in the previous map.
<b>1970</b> OS Sheet SP9888/9988 Scale 1:2500 <b>Figure F</b>	There is new development, comprising five new barn buildings and yard space on the land directly to the north of the original farm buildings.
<b>1993</b> OS Sheet SP9888/9988 Scale 1:2500 <b>Figure G</b>	Apart from the extension of the open-sided barn to the west and two new barns along the northern margin the site appears as shown in the previous map.

<i><b>OS Map Extract</b></i>	<i><b>Description</b></i>
<b>1999</b> Aerial Photograph On Page 12, Appendix 2  <b>2003</b> OS Sheet SP98NE Scale 1:10,000 <b>Figure H</b>	The site appears as shown in the previous map.
<b>2010</b> OS Sheet SP98NE Scale 1:10,000 <b>Figure I</b>	The site appears as shown in the previous map.
<b>2011 &amp; 2016</b> Aerial Photographs On Pages 10 & 9, Appendix 2	The site appears as shown in the previous map.
<b>2019</b> Aerial Photograph On Page 8, Appendix 2  <b>2021</b> OS Sheet SP98NE Scale 1:10,000 <b>Figure J</b>	The site appears as shown in the previous map.

### **Historical Summary**

The site was established within the limits of Rectory Farm prior to 1885, the date of the first edition of the OS County Series maps. At this time the farm buildings occupied the south-eastern corner and remained largely unchanged through to the 1950s/60s when five new barns were constructed on the northern part of the site. Between 1970 and 1993 the westernmost open-sided barn was extended, and two new barns constructed along the northern margin of the site, bringing the site layout to the current configuration.

## **SUMMARY OF ENVIRONMENTAL DATA**

Appendix 2 contains information derived from Environmental Databases for a radius of up to 2000m from the site. The information covers datasets held by the Groundsure with contributors including the local authority, the Environment Agency, British Geological Survey, Ordnance Survey and the Coal Authority and the results, within a radius of 250m, are summarised below:

<b>Historical Industrial Sites</b>	<b>On Site</b>	<b>0-50m</b>	<b>51 - 250m</b>
Historical Industrial Land Uses	0	0	3
Historical Tanks	0	0	0
Historical Energy Features Database	0	0	0
Historical Petrol and Fuel Site Database	0	0	0
Historical Garages	0	0	0
Historical Military Land	0	0	0
<b>Landfill and Other Waste Sites</b>	<b>On Site</b>	<b>0-50m</b>	<b>51 - 250m</b>
Landfill Sites	0	0	0
Waste Sites	0	0	0
Waste Exemptions	7	0	2
<b>Current Industrial Land Uses</b>	<b>On Site</b>	<b>0-50m</b>	<b>51 - 250m</b>
Recent Industrial Land Uses	0	0	1
Current or Recent Petrol Stations	0	0	0
Electricity Cables	0	0	0
Gas Pipelines	0	0	0
Sites Determined as Contaminated Land	0	0	0
Permits/Authorisations	0	0	0
Pollution Discharge	0	0	1
Dangerous Substances	0	0	0
Pollution Incidents	0	0	0
Pollutions Inventories	0	0	0
<b>Hydrogeology</b>	<b>On Site</b>	<b>0-50m</b>	<b>51 - 250m</b>
Superficial Aquifer	Identified (within 500m)		
Bedrock Aquifer	Identified (within 500m)		
Groundwater Vulnerability	Identified (within 50m)		
Groundwater Abstractions	0	0	0
Surface Water Abstractions	0	0	0
Potable Abstractions	0	0	0
Source Protection Zones	0	0	0
<b>Hydrology</b>	<b>On Site</b>	<b>0-50m</b>	<b>51 - 250m</b>
Water Network (OS MasterMap)	0	0	8
Surface Water Features	0	0	11



<b>River and Coastal Flooding</b>	<b>On Site</b>	<b>0-50m</b>	<b>51 - 250m</b>
Risk of Flooding from Rivers and Sea	Medium (within 50m)		
Historical Flood Events	0	0	0
Flood Defences	0	0	0
Areas Benefiting from Flood Defences	0	0	0
Flood storage areas	0	0	0
Flood Zone 2	Identified (within 50m)		
Flood Zone 3	Identified (within 50m)		
<b>Surface Water Flooding</b>			
Surface Water Flooding	1 in 30 year, 0.3m-1.0m (within 50m)		
<b>Groundwater Flooding</b>			
Groundwater Flooding	Negligible (within 50m)		
<b>Designated Environmentally Sensitive Sites</b>			
Environmentally sensitive sites	3	0	0
<b>Natural Hazards</b>			
<b>Hazard</b>			
Shrinking or Swelling Clay	Moderate (within 50m)		
Running Sand	Negligible (within 50m)		
Compressible Ground	Negligible (within 50m)		
Collapsible Deposits	Very Low (within 50m)		
Landslides	Very Low (within 50m)		
Ground Dissolution of Soluble Rocks	Very Low (within 50m)		
<b>Mining, Ground Workings &amp; Natural Cavities</b>			
Natural Cavities	0	0	0
Surface Ground Workings	0	0	10
Underground Mining	0	0	0
<b>Radon</b>			
The property is not in a Radon Affected Area, as between less than 1% of properties are above the action level. The site lies within an area where No radon protection measures are necessary.			

### **Database Summary**

There are no historical industrial land uses on the site and three records of unspecified heaps located 154m to 157m to the east dated 1927 and 1950.

There are seven waste exemption registered to Rectory Farm relating to the storage, treatment or disposal of agricultural waste. There are two other exemptions relating to the storing of farm sludge some 187m to 192m to the north-west of the site.

There is a licensed discharge to controlled waters located 132m to the east of the site.

The site to be directly underlain by primarily by the solid geology of the Blisworth Clay Formation which is Unproductive in terms of aquifer classification. On the higher ground to the south-west the Blisworth Clay Formation is respectively overlain by the Cornbrash (Secondary A Aquifer), Kellaways Formation (Secondary A Aquifer) and Oxford Clay Formation (Secondary B Aquifer), which laterally occur over a relatively short distance due to the sloping nature of the hillside. The Blisworth Limestone (a Principal Aquifer), which underlies the Blisworth Clay Formation, is shown beneath the valley floor directly to the north of the site.

The nearest watercourse is a stream recorded as being 58m to the north of the site.

The site, due to its elevation, appears to be outside the flood zone associated with this watercourse.

The property is not in a Radon Affected Area, as less than 1% of properties are above the action level. The site lies within an area where no radon protection measures are necessary.

## PRELIMINARY RISK ASSESSMENT

Potential sources of contamination present on or beneath the site would relate primarily to; the historical use of the site; possible damaged drainage; the presence of contaminated soil; and the potential presence of soil gas beneath the site.

In order to assess the risks associated with the presence of ground contamination the linkages between the sources and potential receptors to contamination need to be established and evaluated. This is in accordance with the Environmental Protection Act 1990, which provides a statutory definition of Contaminated Land. To fall within this definition it is necessary that, as a result of the condition of the land, substances may be present on or under the land such that

- *Significant harm is being caused or there is a significant possibility of such harm being caused; or*
- *Pollution of controlled waters is being, or is likely to be, caused*

There are three principal factors that are assessed whilst undertaking a qualitative risk assessment for any site. These are the presence of a contamination source, the existence of migration pathways and the presence of a sensitive target(s). It should be noted that it is necessary for each element of source, pathway and target to be present in order for exposure of a human or environmental receptor to occur.

UK Government guidance on the assessment of contaminated land, requires risk to human health and the environment to be reviewed using source pathway target relationships. If each of these elements is present, the linkage provides a potential risk to the identified targets.

*Contaminants* or *potential pollutants* identified as *sources* in relation to the identified previous uses are listed overleaf in Table 1.

**Table 1: Identified Potential Contaminant Sources**

<i>Contaminant Source</i>	<i>Comments</i>
Existing Buildings	The existing buildings may include asbestos containing materials (ACM).
Drainage Beneath Site and Historical Surface Mounted Fuel Tanks	Effluent from leaking drains would provide a contaminant source. Between Buildings 7 and 8 was an empty 7m long by 1m wide bunded area where surface mounted fuel tanks could have historically been located.
Soil Beneath Site	Contamination may be present within any made ground materials on the site.
Soil Gas	Potential soil gas generated from any made ground present.
Ground Contamination Outside Site Boundary	Ground contamination migrating from adjoining sites.

A **Pathway** is defined as one or more routes through which a receptor is being, or could be, exposed to, or affected by, a given contaminant.

Potential **Target or Receptors** fall within the categories of Human Health, Water Environment, Flora and Fauna, and Building Materials.

There are a number of possible pathways for the contaminants identified on the site to impact human and/or environmental receptors and these are summarised in Tables 2 and 3.

**Table 2: Human Receptors and Pathways**

<i>Human Receptor-Mechanism</i>	<i>Typical Exposure Pathway</i>
Human Inhalation	Breathing Dust and Fumes Breathing Gas emissions
Human Ingestion	Eating -contaminated soil, for example by small children -produce grown on contaminated soil Ingesting dust or soil on vegetables Drinking contaminated water
Human Contact	Direct skin contact with contamination Direct skin contact with contaminated liquids

**Table 3: Water Receptors and Pathways**

<i>Receptor-Water Environment</i>	<i>Typical Exposure Pathway</i>
The site and immediate surroundings are indicated to be directly underlain by the solid geology of the Blisworth Clay Formation, which is Unproductive in terms of aquifer classification. The underlying Blisworth Limestone is a Principal Aquifer.	Surface infiltration of atmospheric waters into the soils beneath the site could wash or dissolve potential contaminants and migrate to underlying groundwater. Contamination leads to restriction/prevention of use as a resource, for example, drinking water, and can have secondary impacts on other resources, which depend on it.
The nearest watercourse is a stream recorded 58m to the north of the site.	Surface infiltration of atmospheric waters into the soils beneath the site could wash or dissolve potential contaminants and laterally migrate. Contamination leads to a restriction/prevention of use: -as drinking water resource -for amenity use Effects on aquatic life

## Preliminary Conceptual Model

Assessment of the potential linkage between ground contamination sources, human and environmental receptors have been assessed based on the desk study research documented in the preceding sections of this report.

A generalised preliminary conceptual model is presented below in Table 4.

**Table 4: Preliminary Conceptual Model Relative to Proposed Development**

Receptors	Pathway	Estimated Potential for Linkage with Contaminant Sources				
		Buildings	Historical Tanks/ Drainage Beneath Site	Soil Beneath Site	Soil Gas	Ground Contamination Outside Site Boundary
Human Health – site and ground workers	Ingestion and Inhalation of contaminated Soil, Dust and Vapour	High likelihood	Low likelihood	Low likelihood	Low likelihood	Low likelihood
Human Health – users of completed development	Ingestion and Inhalation of contaminated Soil, Dust and Vapour	High likelihood	Low likelihood	Low likelihood	Low likelihood	Low likelihood
Water Environment	Migration through ground into surface water or surrounding groundwater	Unlikely	Low likelihood	Low likelihood	Low likelihood	Low likelihood
Flora	Vegetation on site growing on contaminated soil	Unlikely	Low likelihood	Low likelihood	Unlikely	Unlikely
Building Materials	Contact with contaminated soil	Unlikely	Low likelihood	Low likelihood	Unlikely	Unlikely
<b>Key to Table 4 Estimated Potential for Linkage with Contaminant Source</b>	<b>Definition</b>					
High likelihood	There is a pollution linkage and an event that either appears very likely in the short term and almost inevitable over the long term, or there is evidence at the receptor of harm or pollution.					
Likely	There is a pollution linkage and all the elements are present and in the right place, which means that it is probable that an event will occur. Circumstances are such that an event is not inevitable, but possible in the short term and likely over the long term.					
Low likelihood	There is a pollution linkage and circumstances are possible under which an event could occur. However, it is by no means certain that even over a longer period such an event would take place, and is less likely in the shorter term.					
Unlikely	There is a pollution linkage but circumstances are such that it is improbable that an event would occur even in the very long term.					
NA	Not Applicable					

## **SITE WORK**

The site work was carried out on 16 March 2021. The works comprised six window sample boreholes (WS1 to WS6); four machine excavated trial pits (TP1 to TP4) and two soakaway tests (TP1 and TP3) at locations shown in Figure 2.

The exploratory hole records have been produced in accordance with British Standard BS5930:2015+A1:2020 'Code of Practice for Site Investigations' and are given in Appendix 3. The records provide the descriptions and depths of the various strata encountered, details of standpipe installations, samples taken, and the groundwater conditions observed during excavation, boring and on completion. The results of hand vane testing have also been presented as applicable on the exploratory hole records.

Service plans were consulted and a cable avoidance tool (CAT) was used to check for the absence of buried services prior to boring.

Ground surface levels at each borehole and trial pit location have been interpolated using a site survey plan provided by the client and are provided on the respective records in Appendix 3.

### **Window Sample Boreholes (WS1 to WS6)**

The window sample boreholes were started with the excavation, using hand tools, of service inspection pits to a depth of 1.20m in order to ensure the absence of buried services. Representative small disturbed samples of soil were taken from each starter pit.

The window sample boreholes were formed by a small track-mounted window sampling and super heavy dynamic probing rig and taken to depths of 2.00m and 5.45m respectively. The window sampling equipment consisted of drive-in sample tubes of specially constructed and strengthened steel, lined with a plastic core-liner. The barrels were initially of 87mm internal diameter and were reduced in diameter with successive barrels with increasing

depth. Upon extraction, a continuous 'undisturbed' profile of the soil was obtained within the plastic liners. Water samples were recovered when a sufficient quantity entered the borehole.

The standard penetration test (SPT) was carried out at regular intervals in order to allow the assessment of the relative in-situ density or stiffness of the ground. The test was made by driving a split-barrel sampler (SPT(S)) into the soils at the base of the borehole by means of an automatic trip hammer weighing 63.50kg falling freely through 750mm. The penetration resistance was determined as the number of blows required to drive the tool the final 300mm of a total penetration of 450mm into the soil ahead of the borehole. The SPT penetration results have been included within a table following the borehole records.

On completion soil gas and groundwater monitoring installations were fitted into WS1, WS3 and WS5. The installations comprised standpipes fitted to depths of between 2.00m and 4.00m with a silica gravel surround to a depth of 1.00m. A bentonite seal was inserted between 0.50m and 1.00m depth, above which the tube was sealed by a gas valve and a surface protective cover was fixed in concrete. The remaining boreholes were backfilled with silica gravel.

### **Trial Pits (TP1 to TP4) & Soakaway Tests (TP1 & TP3)**

The trial pits were excavated to depth of 2.20m to 3.50m using a JCB 3cx excavator. The exposed strata in the trial pits were sampled and logged by a geotechnical engineer, and representative small and bulk disturbed samples were taken throughout the depth of each pit. On completion trial pits TP2 and TP4 were backfilled with the arisings.

Soakaway tests were carried out in trial pits TP1 and TP3 in general accordance with BRE Digest 365 in order to allow the assessment of the soil infiltration rate. Water for the test was provided via hoses from a water tanker. The tests were performed within the 1.90m to 2.50m long, by 0.60m wide excavations, with vertical sides trimmed square to the base between 2.30m and 2.70m depth. The pits were then filled with clean water to a level of about 1.00m below the ground surface. The rate of water dissipation from the test pit was measured by recording the depth of water at frequent time intervals. Due to the very slow rate of water infiltration, only one

filling was undertaken at each position during the single day allocated for this testing and the results are provided following the trial pit records to the rear of this report. Following completion of the soakaway tests the remaining water was bailed out and the pits backfilled with compacted layers of the arisings.

### **Return Visits to Site**

Return visits to site were undertaken on 22 and 28 April and 5 May 2021 to monitor the standpipe installations (WS1, WS3 and WS5) for depth to groundwater and the concentrations of methane, carbon dioxide and oxygen. Measurement was carried out using a Gasdata GFM430, which also recorded the atmospheric pressure and flow rate. The monitoring results are presented on and following the borehole records in Appendix 3. Water samples were also recovered for future chemical analysis.



## **GEOTECHNICAL LABORATORY TESTING**

Samples recovered from the exploratory holes were tested in accordance with the recommendations of British Standard BS1377:1990 & 2016 'Methods of Tests for Soils for Civil Engineering Purposes' and other industry standards. The results of testing are presented on Laboratory Summary Sheets in Appendix 4.

### **Soil Moisture Content**

The moisture content of selected samples were determined and the results are reported as the percentage water content with respect to the dry mass of soil.

### **Atterberg Limit Tests**

The liquid and plastic limits, and plasticity index, were determined for selected specimens for the purpose of engineering soil classification. The results are quoted as the percentage water with respect to the dry weight of soil.

### **Sulphate and pH Testing**

Selected soil samples were tested to determine their pH-values and aqueous sulphate contents in order to provide advice on assessing the aggressive chemical environment in relation to buried concrete.

## **CHEMICAL LABORATORY TESTING**

Selected soil and water samples were submitted to a UKAS Accredited Laboratory who carried out a suite of tests which encompassed a wide range of potential contaminants outlined by the Environment Agency (EA) and National House Building Council (NHBC) document R&D 66; 2008 'Guidance for the Safe Development of Housing on Land Affected by Contamination'.

Tests were carried out to screen the samples for the following potential contaminants: total arsenic, total cadmium, total chromium, hexavalent chromium, total lead, total mercury, total selenium, water soluble boron, total copper, total nickel, total zinc, total cyanides, free cyanides, soluble sulphate, sulphides and pH-value, phenols and polycyclic aromatic hydrocarbons (PAH), including benzo[a]pyrene, and petroleum hydrocarbons (TPH). Selected samples were screened for the presence of asbestos.

The results of chemical testing are presented in Appendix 5.

## **GROUND CONDITIONS**

The strata encountered in the exploratory holes comprised between about 0.20m and 1.80m thickness of made ground that was directly underlain by a Head Deposit or the anticipated weathered solid geology. On the higher ground within the south-western part of the site the Kellaways Formation overlies the Cornbrash (Limestone) Formation. The base of the Cornbrash is believed to be at about 61mOD and overlies the Blisworth Clay Formation, which is present beneath the made ground and Head Deposit within the north-eastern half of the site.

Two soil profiles depicting the strata encountered in the boreholes and trial pits across this sloping and terraced site is presented to the rear of the exploratory hole records.

Areas where an increased thickness of made ground and Head Deposit are identified in Figure 5.

### **Made Ground**

Made ground was present with a thickness between 0.20m and 1.80m.

The thickest deposits (1.70m to 1.80m) of made ground were encountered in TP2 and TP4, which were located within a terraced area, in the vicinity of Buildings D, F and G within the north-eastern part of the site. Below the 0.20m thick concrete hardstanding and 0.20m thick sand and gravel sub-base, within trial pit TP2, the made ground comprised firm locally soft, brown, grey brown and grey, slightly gravelly clay fill. Boulder size pockets of soft, grey brown, organic clay were also encountered. The gravel fraction comprised mainly flint with occasional quartzite and ash. Trial pit TP4, which was located at the top of a 2.00m embankment, encountered sand, gravel and cobbles of macadam and concrete to 0.30m below which was a 0.60m thick layer of sand and gravel of limestone. This was underlain at 0.90m depth by firm, grey, slightly organic clay fill, which was present to 1.80m.

Made ground with a thickness of between 1.00m and 1.30m was encountered in TP1, WS2 and WS3, which were situated around Buildings A, B and E within the north-western

part of the site. The surface layers, to 0.60m depth within TP1 comprised dark brown, brown and grey, sand and gravel of angular limestone and brick. These were underlain by dark grey, silty clay fill to 1.10m. Within WS2 and WS3 the made ground comprised soft, brown and dark brown, slightly sandy, slightly gravelly clay fill to 0.30m to 0.40m depth. This was underlain by firm brown and grey brown, slightly gravelly clay fill. The gravel fraction comprised angular brick, concrete, limestone and ash.

The remaining exploratory holes encountered made ground with a thickness of between 0.20m and 0.30m (WS1, WS4, WS5, WS6) and 0.60m (TP3). Borehole WS6 was located in an area of lawn and encountered a 0.30m thick layer of made ground/layer comprising soft, grey brown, slightly gravelly clay where the gravel fraction comprised limestone and ash. Boreholes WS1, WS4 and WS5 encountered a 0.10m to 0.15m thick surface of macadam or concrete over clay or sand and gravel fill. Trial pit TP3 encountered a 0.20m thick surface layer of concrete over sand, gravel and cobbles of brick and concrete rubble to 0.40m below which, firm grey silty clay fill was encountered to 0.60m depth.

### **Head Deposit**

A superficial Head Deposit ('hillwash') was observed in boreholes WS2 and WS4 to depths at least 2.45m (63.70mOD & 61.95mOD) and to 2.40m (61.10mOD) below ground level in WS3. The Head Deposit comprised a weathered metastable mass of the Blisworth Clay Formation which has moved downslope through a process of solifluction during glacial climatic conditions. These deposits were encountered as variably soft and firm layers of grey mottled brown clay, and orange brown and grey mottled, slightly sandy, slightly gravelly clay, where the gravel fraction comprised fragments of fossiliferous limestone.

### **Kellaways Formation and Cornbrash Formation**

The solid geology of the Kellaways Formation was encountered below the made ground in WS1 and TP1 (western end of site) and in WS5 and WS6 (south-eastern corner of site)

depths between 0.20m and 1.10m below ground. The Kellaways Formation comprised firm, locally fissured, grey mottled brown clay which became stiff at 3.00m in WS1.

Layers of limestone were encountered as obstructions at the base of WS1 (3.40m-3.42m), WS5 (2.30m-2.33m) and WS6 (2.30m-2.39m) leading to these holes being abandoned. This layer of limestone is expected to comprise the underlying Cornbrash Formation which has been estimated to occur within a horizon ranging between 62.90mOD and 61.50mOD.

### **Blisworth Clay Formation**

The solid geology of the Blisworth Clay Formation was encountered below both the made ground and Head Deposit at depths between 0.60m and 2.40m below ground surface and below about 61.10mOD. The Blisworth Clay comprised a sequence of firm, locally fissured, grey mottled brown clay which became stiff at a depth 3.50m in WS3. The remaining borehole and trial pits were completed at depths between 2.20m and 5.45m within firm or stiff Blisworth Clay.

### **Groundwater**

Water seepages were encountered emanating from the made ground in TP2 at depths between 0.50m to 1.60m. Trial pit TP2 was dry on completion at a depth of 3.50m in the Blisworth Clay. A water seepage was observed at the base of WS4 at 2.45m, which was completed within a slightly sandy clay Head Deposit. Groundwater was not encountered in any of the other boreholes or trial pits which were all dry on completion at between 2.20m and 5.45m depth.

Return monitoring visits, on 22, 28 April and 5 May 2021, measured standpipe water levels standing between 1.59m and 2.72m below ground surface.

### **Observations**

A slight petroleum odour and some black staining was noticed in soil samples recorded between 1.90m and 2.15m depth in WS5 which was located in Building I (Figure 2).

**COMMENTS ON THE GROUND CONDITIONS IN RELATION TO FOUNDATION  
DESIGN AND CONSTRUCTION**

The work is in preparation for future redevelopment comprising three barn conversions (buildings 1 to 3) and two new houses (buildings 4 and 5) as shown in Figure 4.

From the findings in the exploratory holes it is anticipated that:

- Building 1 is underlain by less than 1.0m thickness of made ground over Kellaways Formation.
- Building 2 is underlain by 0.5m to 2.0m thickness of made ground over Blisworth Clay.
- Building 3 is underlain by less than 1.0m thickness of made ground over the Head Deposit, which rests on the Blisworth Clay at depths in the order of 2.5m to 3.5m.
- Building 4 is underlain by 1.0m to 2.0m thickness of made ground over the Head Deposit, which rests on the Blisworth Clay at depths in the order of 2.5m.
- Building 5 is underlain by less than 1.0m thickness of made ground over the Head Deposit, which rests on the Kellaways Formation at depths in the order of 1.0m to 3.5m.

The made ground is considered unsuitable as a founding stratum and spread foundations should not be placed in the made ground, topsoil or any soft, very soft, loose or highly compressible materials. Large scale processes of natural sedimentation allow a certain degree of confidence to be placed in the absence of important variation of the engineering properties of natural soils across sites. By contrast, made ground, whose history is not completely known, must, despite any amount of investigation, inevitably present the possibility of conditions existing which could not be accepted when considering the material as a bearing stratum.

Lightly loaded traditional footings should be taken through the made ground and placed within the Head Deposits or the underlying Blisworth Clay. For higher loadings, or as an alternative to deep footings, consideration should also be given to piled foundations taken through any remnant Cornbrash (limestone rock) Formation into the underlying Blisworth Clay Formation. The layer of Cornbrash has been estimated to occur within a horizon ranging between 62.90mOD and 61.50mOD. Further ground investigation comprising deep boreholes would be required to

enable the design of piled foundations across the site.

### **Depth of Strip and Pad Foundations**

The depth of the footings would need to be deep enough to protect against the effects of soil desiccation or soil heave, which could be caused by trees and hedgerows around the site.

According to laboratory testing the near surface clays have modified plasticity indices of between 35% and 48%, which indicates a medium to high volume change potential, according to the National House Building Council (NHBC) Standards Chapter 4.2 “Building near Trees” (2021). Guidance on the necessary foundation depths relating to tree species, distance and soil plasticity can be determined from the latter document, which should also be consulted where new planting is proposed.

In order to address any potential future shrinkage or heave effects, a high-volume change potential has been assumed for the Head Deposit and Blisworth Clay. At an open position well away from the influence of trees and shrubs a minimum foundation depth of 1.00m below original ground level would be required for foundations in order to avoid the zone of seasonal volume change in accordance with the above document. In view that the site has been filled and terraced, the original ground surface level is considered to be the interface between the made ground and the underlying Head Deposit and Blisworth Clay.

The following minimum foundation depths would be considered appropriate for footings located at specified distances from trees such as Sycamore and Leyland Cypress.

	<b>NHBC Appendix 4.2 Foundation depth below original ground level at specified distance from tree</b>					
	<b>1m</b>	<b>5m</b>	<b>10m</b>	<b>14m</b>	<b>18m</b>	<b>20m</b>
Minimum foundation depths for moderate water demand trees such as Sycamore	2.35m	2.05m	1.55m	1.25m	1.00m	1.00m
Minimum foundation depths for high water demand trees such as Leyland Cypress	>2.50m	2.50m	1.45m	1.00m	1.00m	1.00m

It is recommended that a full survey of tree species is completed prior to final foundation design and also appropriately deepened foundations should be adopted in areas where trees have been removed.

Foundations should be suitably designed to prevent excessive movement due to heave.

### **Shallow Foundation Bearing Pressures**

The following allowable bearing pressures, which incorporate a factor of safety of 3.0 against general shear failure in clay, should be considered for foundations taken through the made ground and placed within the Head Deposit and Blisworth Clay Formation at a depth between 1.00m and 3.50m below the existing ground surface.

<b>Table 5: Allowable Bearing Pressures for settlement of less than 25mm</b>				
<b>Stratum</b>	<b>Foundation Depth bgl</b>	<b>Pad Footing</b>		<b>Strip Footing</b>
		<b>1.0m wide</b>	<b>2.0m wide</b>	<b>1m wide</b>
Soft and Firm Clay Head Deposit	1.00m	50kN/m <sup>2</sup>	35kN/m <sup>2</sup>	35kN/m <sup>2</sup>
Soft and Firm Clay Head Deposit	2.00m	55kN/m <sup>2</sup>	40kN/m <sup>2</sup>	40kN/m <sup>2</sup>
Soft and Firm Clay Head Deposit	3.00m	60kN/m <sup>2</sup>	45kN/m <sup>2</sup>	45kN/m <sup>2</sup>
Firm Clay Kellaways Formation & Blisworth Clay Formation	1.00m	100kN/m <sup>2</sup>	90kN/m <sup>2</sup>	85kN/m <sup>2</sup>
Firm Clay Kellaways Formation & Blisworth Clay Formation	2.00m	110kN/m <sup>2</sup>	100kN/m <sup>2</sup>	90kN/m <sup>2</sup>
Firm Clay Kellaways Formation & Blisworth Clay Formation	3.00m - 4.00m	120kN/m <sup>2</sup>	110kN/m <sup>2</sup>	100kN/m <sup>2</sup>

Settlements would not be expected to exceed 25mm at these pressures.



### **Floor Slab**

For areas of the site where the made ground is less than 1m thick ground bearing floor slabs could be considered provided that prior construction, all of the made ground or natural ground should be proof rolled to identify any soft or loose spots, which should be removed and replaced with geotechnically suitable granular fill. Differential settlements across a ground bearing floor slab are likely to occur where the slab crosses from firm onto soft clay onto granular fill. The effects of such differential settlement could be reduced locally by the incorporation of adequate reinforcement. It is recommended that any filled material beneath the floor slab should be properly engineered to minimise differential settlement.

For areas where the made ground exceeds 1m thickness a suspended floor should be considered.

It is also recommended that all areas which lie within the zone of influence of the trees, should be inspected and any root infested clay, is removed and replaced with well graded, compacted coarse grained fill material in accordance with the recommendations in NHBC Standards Chapter 4.2. Suspended floors with voids, in accordance with Table 7 of the latter document, should also be used in situations where heave could occur within the area bounded by the foundations.

### **Foundation Excavations and Groundwater**

Following preparation the base of foundation excavations should be inspected to ensure that the condition of the soil complies with that assumed in design. Should pockets of inferior material be present, they should be removed and replaced with well graded hardcore or lean mix concrete. Water should be excluded from foundation excavations, otherwise rapid and significant loss of bearing capacity may occur. The excavated surface should be protected from deterioration and a blinding layer of concrete used where foundations are not completed without delay.

Excavations that penetrate layers of made ground and Head Deposit should be

expected to be unstable and should not be relied upon to stand unsupported even in the short term. Safety precautions should not be neglected especially where personnel are to enter excavations, when close side support will be required in order to maintain excavation stability.

It is expected that shallow excavations could encounter water seepages, which would be more prevalent following periods of wet weather due to surface infiltration. It is likely that water ingress within shallow excavations in the short term could be controlled by screened sump pump techniques.

### **Buried Concrete**

Tests on samples of Head Deposit and Blisworth Clay, to determine the risk of sulphate attack on buried concrete indicate levels that fall into Class DS-1 as defined by Table C2 of BRE Special Digest 1, 2005. The pH results indicate acidic to slightly alkaline ground conditions with pH values ranging between 4.4 and 7.9.

Due to the low pH value of 4.4, for the purposes of design an Aggressive Chemical Environment for Concrete (ACEC) Class of AC-4z should be considered when specifying a Design Chemical Class (DC Class) for concrete used within footings or piles on this site.

An extract of Table C2, Aggressive Chemical Environment for Concrete (ACEC) site classification, from BRE Special Digest 1, 2005 is presented in Appendix 6.

## **COMMENTS ON SOIL PERMEABILITY**

The results of the soakaway tests in TP1 indicate an infiltration rate of  $6.90 \times 10^{-7}$  m/s for the Clay Kellaways Formation and indicates a poor drainage potential in accordance with BS8004:1986, Section Six Figure 6.

The infiltration rate from the soakaway tests in TP2 could not be calculated due to the lack of a discernible drop in test water level within the Blisworth Clay.

In conclusion, soakaways are not expected to be feasible, due to the poor to practically impervious drainage potential of the Kellaways Formation and Blisworth Clay.

## **COMMENTS ON SOIL CHEMICAL TESTING**

The results of the laboratory chemical testing on near surface soil samples have primarily been compared to soil screening values (SSVs) produced by Land Quality Management Limited (LQM) and the Chartered Institute for Environmental Health (CIEH) presented in their document 'The LQM/CIEH S4ULs for Human Health Risk Assessment: 2015 (Publication Number S4UL3608)'. The LQM/CIEH S4ULs are intended for use in assessing the potential risks posed to human health by contaminants in soil and are transparently-derived and cautious 'trigger values' above which further assessment of the risks or remedial action may be needed. The S4ULs (Suitable for Use Levels) have been derived, in accordance with UK legislation and Environment Agency policy, using a modified version of the Environment Agency CLEA 1.06 software.

Reference has also been given to ATRISKsoil soil screening values produced by Atkins Limited and provided under licence to Ground Engineering Limited. Atkins SSVs have been derived in line with the Environment Agency 2009 guidance using the CLEA 1.071 software. With the absence of a S4UL for cyanide the ATRISKsoil SSV has been used as the soil screening criteria within this report.

In 2014 the Department for Environment Food and Rural Affairs (DEFRA) published, in their document SP1010, Category 4 Screening Levels (C4SL) for several contaminants including lead. The C4SL represent screening levels below which the land could be considered suitable for a specified use and definitely not contaminated land in respect of those determinands. With the absence of S4UL for lead the C4SL has been used as the soil screening criteria within this report.

For each contaminant the adopted soil screening criteria have been calculated for the following land uses:

- Residential use with home grown produce
- Residential use without home grown produce
- Residential parks and open space

The intended purpose of the SSVs are as “intervention values” in the regulatory framework for assessment of human health risks in relation to land use. These values are not binding standards but are intended to inform judgements about the need for action to ensure that a new use of land does not pose any unacceptable risks to the health of the intended users.

Tables 8 & 9 compare the test results for the made ground with the SSVs in relation to the specified uses. The number of test results, which exceed these values, are also provided.

**Table 8: Comparison of Chemical Test Results for Near Surface Soil with Soil Screening Values (SSV)**

Determinand	Number of Samples	Min Value (mg/kg)	Max Value (mg/kg)	Number of Samples Exceeding SSV for:			Measured 95 <sup>th</sup> Percentile (mg/kg)	Soil Screening Values (SSV) (1% SOM)			
				Residential with home grown produce	Residential without home grown produce	Residential Parks Public Open Space (mg/kg)		Assessment Method	Residential with home grown produce (mg/kg)	Residential without home grown produce (mg/kg)	Residential Parks Public Open Space (mg/kg)
Organic matter	8	0.52%	6.9%	-	-	-	-	-	-	-	-
Arsenic	8	8.1	24	0	0	0	22.27	S4UL	37	40	79
Cadmium	8	<0.10	0.67	0	0	0	0.49	S4UL	11	85	120
Total Chromium	8	19	30	0	0	0	27.21	S4UL	910	910	1,500
Hexavalent Chromium	8	<0.50	<0.50	0	0	0	0.50	S4UL	6	6	7.7
Lead	8	15	200	0	0	0	104.51	C4SL	200	310	630
Mercury	8	<0.10	0.39	0	0	0	0.27	S4UL	11	15	40
Selenium	8	<0.20	0.52	0	0	0	0.37	S4UL	250	430	1100
Nickel	8	9.4	32	0	0	0	25.31	S4UL	130	180	230
Phenols	8	<0.30	0.80	0	0	0	0.48	S4UL	120	440	1300
Copper	8	13	31	0	0	0	25.94	S4UL	2400	7100	12,000
Zinc	8	39	310	0	0	0	176.14	S4UL	3700	40,000	81,000
Free Cyanide	8	<0.50	<0.50	0	0	0	<0.50	ATRISK	34	34	34

Notes

S4UL and C4SL for metals were derived using 6% SOM. These values are not sensitive to SOM and would also be applicable for 1% SOM and 2.5% SOM

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ATRISKsoil SSVs produced by Atkins Limited and provided under licence to Ground Engineering Limited

**Table 9: Comparison of PAH Chemical Test Results for Near Surface Soil with Soil Screening Values (SSV)**

Determinand	Number of Samples	Min Value (mg/kg)	Max Value (mg/kg)	Number of Samples Exceeding SSV for:			Measured 95 <sup>th</sup> Percentile (mg/kg)	Soil Screening Values (SSV) (1% SOM)			
				Residential with home grown produce	Residential without home grown produce	Residential Parks Public Open Space		Assessment Method	Residential with home grown produce (mg/kg)	Residential without home grown produce (mg/kg)	Residential Parks Public Open Space (mg/kg)
Acenaphthene	8	<0.10	0.45	0	0	0	0.28	S4UL	210	3000	15,000
Acenaphthylene	8	<0.10	0.35	0	0	0	0.23	S4UL	170	2900	15,000
Anthracene	8	<0.10	0.78	0	0	0	0.36	S4UL	2400	3100	74,000
Benzo[a]anthracene	8	<0.10	4.1	0	0	0	1.60	S4UL	7.2	11	29
Benzo[a]pyrene	8	<0.10	3.9	1	1	0	1.54	S4UL	2.2	3.2	5.7
Benzo[b]fluoranthene	8	<0.10	5.9	1	1	0	2.35	S4UL	2.6	3.9	7.1
Benzo[g,h,i]perylene	8	<0.10	3.4	0	0	0	1.38	S4UL	320	360	640
Benzo[k]fluoranthene	8	<0.10	3.3	0	0	0	1.35	S4UL	77	110	190
Chrysene	8	<0.10	4.5	0	0	0	1.84	S4UL	15	30	57
Dibenzo[a,h]anthracene	8	<0.10	1.9	2	2	0	0.81	S4UL	0.24	0.31	0.57
Fluoranthene	8	<0.10	8.0	0	0	0	3.16	S4UL	280	1500	3100
Fluorene	8	<0.10	0.64	0	0	0	0.33	S4UL	170	2800	9900
Indeno[1,2,3-cd]pyrene	8	<0.10	2.8	0	0	0	1.17	S4UL	27	45	82
Naphthalene	8	<0.10	1.4	0	0	0	0.75	S4UL	2.3	2.3	4900
Phenanthrene	8	<0.10	3.8	0	0	0	1.75	S4UL	95	1300	3100
Pyrene	8	<0.10	8.2	0	0	0	3.28	S4UL	620	3700	7400

Notes

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ATRISKsoil SSVs produced by Atkins Limited and provided under licence to Ground Engineering Limited

## **Discussion of Results**

With the exception of polycyclic aromatic hydrocarbons (PAH) in two of the eight samples tested, none of the determinand concentrations exceeded the respective SSV for residential with home grown produce, residential without home grown produce end use or residential parks and open space usage.

A sample of clay fill recovered from WS2, which contained ash fragments, contained elevated concentrations of benzo[a]pyrene, benzo[b]fluoranthene and dibenzo[a,h]anthracene, which exceeded the SSVs for residential with home grown produce, and residential without home grown produce end use.

A sample of sand and gravel made ground, taken from TP1, which contained brick, concrete and limestone had an elevated concentration of dibenzo[a,h]anthracene which exceeded the SSV for residential with home grown produce, residential without home grown produce end use, and residential parks and open space usage.

No asbestos was encountered in nine soil samples screened for its presence.

Whilst a slight petroleum odour and some black staining was noticed in soil samples recorded between 1.90m and 2.15m depth in WS5, which was located in Building I, as shown in Figures 2 and 3. The results of chemical analysis on samples of soil taken at 0.40m, 0.60m, 1.20m and 2.00m gave concentrations of less than 10mg/kg which indicates that the petroleum contamination at this position should not present a problem to the proposed development. It should however be noted that the source of petroleum could be due to a historic spillage or leaking drain at a separate location to WS5.



## **GROUNDWATER QUALITY ASSESSMENT**

Water samples were recovered from the standpipes in WS1 and WS2 and tested for a wide range of potential contaminants including metals, phenols, PAHs and TPH. The primary assessment tool employed for the generic screening of samples for the protection of ‘Controlled Waters’ comprised the Statutory Instrument 2016 No.614 which supersedes Statutory Instrument 2000 No.3184 ‘The Water Supply (Water Quality) Regulations 2000’. The latter document amends the 1991 version, which provides a standard of 10µg/l for dissolved or emulsified hydrocarbons represented by total petroleum hydrocarbons (TPH) in the chemical analysis. There is no amendment indicated in Statutory Instrument 2000 No.3184 and consequently with the absence of an amendment or update we refer to the 1991 standard, which is generally accepted within the industry. In summary Table 10 compares the chemical test results on water samples with the adopted water screening criteria (WSC). All of the results were below the WSC.

**Table 10: Comparison of Chemical Test Results, on water recovered from borehole WS3 with Water Supply Regulations**

<b>Determinand</b>	<b>No of Samples</b>	<b>Value</b>	<b>No of Samples Exceeding WSC</b>	<b>WSC The Water Supply (Water Quality) Regulations 1989-2016 Maximum Concentration/Value for Consumers Taps</b>
<b>pH value</b>	1	7.6	0/1	6.5 minimum 9.0 maximum
<b>Arsenic (total) µg/l</b>	1	<0.20	0/1	10 µg/l
<b>Boron (Water Soluble) µg/l</b>	1	130	0/1	1000 µg/l
<b>Cadmium (total) µg/l,</b>	1	<0.12	0/1	5.0 µg/l
<b>Chromium (total) µg/l</b>	1	6.2	0/1	50 µg/l
<b>Copper (total) µg/l</b>	1	2.1	0/1	2000 µg/l
<b>Cyanide (total) mg/l</b>	1	<0.050	0/1	0.05 mg/l
<b>Lead (total) µg/l</b>	1	<0.5	0/1	10 µg/l
<b>Mercury (total) µg/l</b>	1	<0.05	0/1	1.0 µg/l
<b>Selenium (total) µg/l</b>	1	0.6	0/1	10 µg/l
<b>Nickel (total) µg/l</b>	1	3.1	0/1	20 µg/l
<b>Zinc (total) µg/l</b>	1	4.8	0/1	5000 µg/l
<b>Sulphate (soluble) mg/l</b>	1	74	0/1	250 mg/l
<b>Phenols mg/l</b>	1	<0.030	-/1	0.0005 mg/l
<b>PAHs µg/l</b>	1	<0.20	-/1	0.10 µg/l
<b>TPH µg/l</b>	1	<10	0/1	10 µg/l

## **SOIL GAS**

Soil gas and water monitoring of the standpipes WS1, WS3 and WS5 was conducted on 22 & 28 April and 5 May 2021.

Concentrations of less than 0.1% by volume methane was encountered with carbon dioxide concentrations between less than 0.1% and 4.7% by volume. Oxygen levels of between 20.2% and 21.5% were typically measured with a depleted level of 16.9% corresponding to the elevated carbon dioxide result.

The results indicate a Gas Screening Value (GSV) of 0.0001/hr for methane and 0.00471/hr for carbon dioxide.

The results fall into Characteristic Situation 1 as defined by BS8485:2015+A1:2019 'Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings'.

## UPDATED CONCEPTUAL MODEL

A generalised conceptual model, updated following the intrusive works, monitoring and testing, is presented below in Table 11 and follows the comparison of consequence against probability presented in CIRIA 552.

**Table 11: Updated Conceptual Model & Risk Assessment Relative to Construction and Future Development**

Source	Pathway	Receptor	Probability of risk being realised	Consequence of risk being realised	Risk Classification
<b>Asbestos in Buildings</b>	Inhalation of Dust	Human Health Demolition/Construction Workers	High	Severe	Very High Risk
<b>Fuel/oil tanks &amp; Damaged Drainage</b>	Ingestion and Inhalation of contaminated Soil, Dust and Vapour	Human Health Groundworkers	Low Likelihood	Mild	Low Risk
		Human Health Site Users if exposed at surface within residential gardens	Low Likelihood	Mild	Low Risk
		Human Health Site Users if exposed at surface within communal landscaping	Low Likelihood	Mild	Low Risk
		Human Health Site Users if present beneath permanent hardstanding/roads	Unlikely	Mild	Very Low Risk
	Migration through ground into surface water or groundwater	Water Environment	Unlikely	Medium	Low Risk
<b>Soil Beneath Site</b>	Ingestion and Inhalation of contaminated Soil, Dust and Vapour	Human Health Groundworkers	Low Likelihood	Mild	Low Risk
		Human Health Site Users if exposed at surface	Low Likelihood	Medium	Moderate/Low Risk
		Human Health Site Users if present beneath permanent hardstanding/roads	Unlikely	Mild	Very Low Risk
	Migration through ground into surface water or groundwater	Water Environment	Unlikely	Minor	Very Low Risk

Source	Pathway	Receptor	Probability of risk being realised	Consequence of risk being realised	Risk Classification
Soil Gas	Inhalation of Soil Gas	Human Health Groundworkers	Unlikely	Mild	Very Low Risk
		Human Health Site Users	Unlikely	Mild	Very Low Risk
Ground Contamination Outside Site boundary	Ingestion and Inhalation of contaminated Soil, Dust and Vapour	Human Health Groundworkers	Unlikely	Mild	Very Low Risk
		Human Health Site Users	Unlikely	Mild	Very Low Risk
	Migration through ground into surface water or groundwater	Water Environment	Unlikely	Mild	Very Low Risk

<b>Key to Table 11 Risk</b>	<b>Definition</b>
<b>Very High risk</b>	There is a high probability that severe harm could arise to a designated receptor from an identified hazard, or there is evidence that severe harm to a designated receptor is currently happening. The risk, if realised, is likely to result in a substantial liability. Urgent investigation (if not undertaken already) and remediation are likely to be required.
<b>High risk</b>	Harm is likely to arise to a designated receptor from an identified hazard. Realisation of the risk is likely to present a substantial liability. Urgent investigation (if not undertaken already) and remedial works may be necessary in the short term and likely over the long term.
<b>Moderate risk</b>	It is possible that harm could arise to a designated receptor from an identified hazard. However, it is either relatively unlikely that any such harm would be severe, or if any harm were to occur it is more likely that the harm would be relatively mild.
<b>Low risk</b>	It is possible that harm could arise to a designated receptor from an identified hazard, but it is likely that this harm, if realised, would at worst normally be mild.
<b>Very Low risk</b>	There is a low possibility that harm could arise to a receptor. In the event of such harm being realised it is not likely to be severe.

## **COMMENTS ON GROUND CONTAMINATION IN RELATION TO PROPOSED RESIDENTIAL REDEVELOPMENT**

The ground investigation works have been carried out in advance of proposed new residential development comprising three barn conversions (buildings 1 to 3) and two new houses (buildings 4 and 5) as shown in Figure 4. The completed dwellings are scheduled to include peripheral areas of hardstanding and private gardens.

This investigation may not have revealed the full depth or extent of made ground or contamination on the site and appropriate professional advice should be sought if subsequent site works reveal materials that appear to be contaminated.

Anticipated exposure scenarios relating to the site and future use, in the context of the conceptual model, are discussed as follows.

### **Asbestos in Existing Buildings**

The majority of the barns were constructed with steel or concrete frames with steel, timber or asbestos containing material (ACM) sheet cladding and corrugated ACM roofing. Barn H was constructed from stone and brick and a mixture of tile and corrugated ACM roofing. It would be recommended that an asbestos survey is conducted prior to any demolition or building works. Asbestos presents a very high risk and consequently suitable precautions, in line with current best practice, should be put in place to protect workers from the effects of asbestos material, during demolition or building works. Care should be taken to during demolition to ensure that asbestos fragments or fibres are not spread onto other areas of the site or get mixed into the soil.

### **Contamination Risk - Drainage**

Redundant foul drain runs should be removed from beneath the site and precautions should ensure that any remaining effluent is directly disposed of off-site. The integrity of existing drainage should be checked, and damaged sections replaced prior to re-use within the development. The latter measures should reduce the future likelihood of contaminants affecting human health and water environment from low to very low.

### **Contamination Risk – Petroleum Pollution**

A slight petroleum odour and some black staining was noticed in soil samples recorded between 1.90m and 2.15m depth in WS5, which was located in the south-eastern corner of the site by Building I as shown in Figures 2 and 3. Whilst the petroleum contamination at this position is not considered to present a problem to the proposed development it should be noted that the source of petroleum could be due to a historic spillage, leaking drains, or could be related to the possible historical storage of fuel between buildings G and H (Figure 2). Consequently, a watching brief should be maintained and appropriate professional advice should be sought if subsequent site works reveal materials that appear to be contaminated.

### **Contamination Risk - Near Surface Soil**

The sand/gravel and clay made ground was found to locally contain slightly elevated concentrations of PAHs. This type of made ground, which was encountered around Buildings A, B and E within the north-western part of the site is considered unsuitable for reuse at the surface within residential garden areas.

### **Human Health - Construction Workers**

No special precautions would be required during the development of the site by workers who may come into contact with the soil during groundworks, providing standard precautions are adopted which should generally include the procedures given by the Health and Safety Executive (The Blue Book).

For the protection of these workers during groundworks the following is recommended:

- a) Limit repeated or prolonged skin contact with soils by wearing gloves with sleeves rolled down.
- b) Washing facilities should be made available to groundworkers, so as to minimise the potential for inadvertent ingestion of soil.
- c) If any soils are revealed which are different to those encountered by this ground investigation, the advice of a specialist should be sought in view of classifying the material and ascertaining its risk to groundworkers.

### **Human Health – Residential Usage**

The sand/gravel and clay made ground was found to locally contain slightly elevated concentrations of PAHs. This type of made ground, which was encountered around Buildings A, B and E within the north-western part of the site is considered unsuitable for reuse at the surface within residential garden areas.

In view of the variable distribution of made ground across this sloping and terraced site further testing should be employed to check the suitability of the near surface soils within the proposed garden areas.

In instances where the near surface soil is unsuitable, consideration should be given to using an adequately thick, clean capping layer to break the pathway between the end users and the contaminants (source) contained within the made ground.

In the absence of further testing for garden areas it would be recommended that the underlying natural ground be exposed, or in deeper areas the made ground should be removed to a minimum depth 0.60m and replaced with an equivalent thickness of clean inert soil.

All gardens areas should be inspected prior to final capping to ensure that unsuitable materials have not been inadvertently placed in the garden or landscaped areas during the preceding stages of redevelopment works.

All imported soils will be certified 'clean' fill and should be suitable for use in accordance with UK legislation and Environment Agency policy.

### **Methane and Carbon Dioxide Soil Gas**

According to database information, there are no landfills within 250m of the site and the composition of the underlying natural soil would suggest a very low hazard potential. The soil gas monitoring results fall into Characteristic Situation 1 (very low risk) as defined by BS8485:2015+A1:2019 'Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings'.

In conclusion, gas protection measures are not considered necessary in relation to methane and carbon dioxide soil gases.




**Off-Site Disposal of Soil Arisings**

The results of chemical analysis are provided in Appendix 5 and can be used within the suite of information necessary for basic characterisation of the soil destined for landfill. Excavated material and excess spoil should always be classified prior to removal from site as required by 'Duty of Care' (Environmental Protection Act, 1990) legislation. This means that material has to be given a proper description and waste classification prior to removal. Basic characterisation is the responsibility of the waste producer and compliance checking and on-site verification are generally the responsibility of the landfill operator. The landfill operator will need to liaise with the waste producer as the approach relies on the information from basic characterisation.

The clean arisings from the underlying natural soils, excluding peat and topsoil, across this site should fall under the EWC code 17 05 04 inert category.

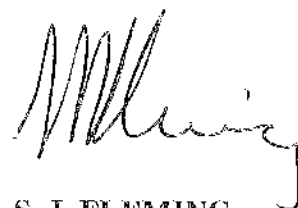
**GROUND ENGINEERING LIMITED**



**J. H. GIBB**

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**Senior Geo-Environmental Engineer**



**S. J. FLEMING**

M.Sc., M.C.S.M., C.Geol., F.G.S.

**Director**

# Figures

**Figure 1: Site Location Plan**

**Figure 2: Site Layout Plan**

**Figure 3: Exploratory Hole Location Plan**

**Figure 4: Exploratory Hole Location Plan  
Superimposed on Proposed Development**

**Figure 5: Head Deposit and Made Ground  
Superimposed  
on Proposed Development**

# Site Location Plan

Figure 1

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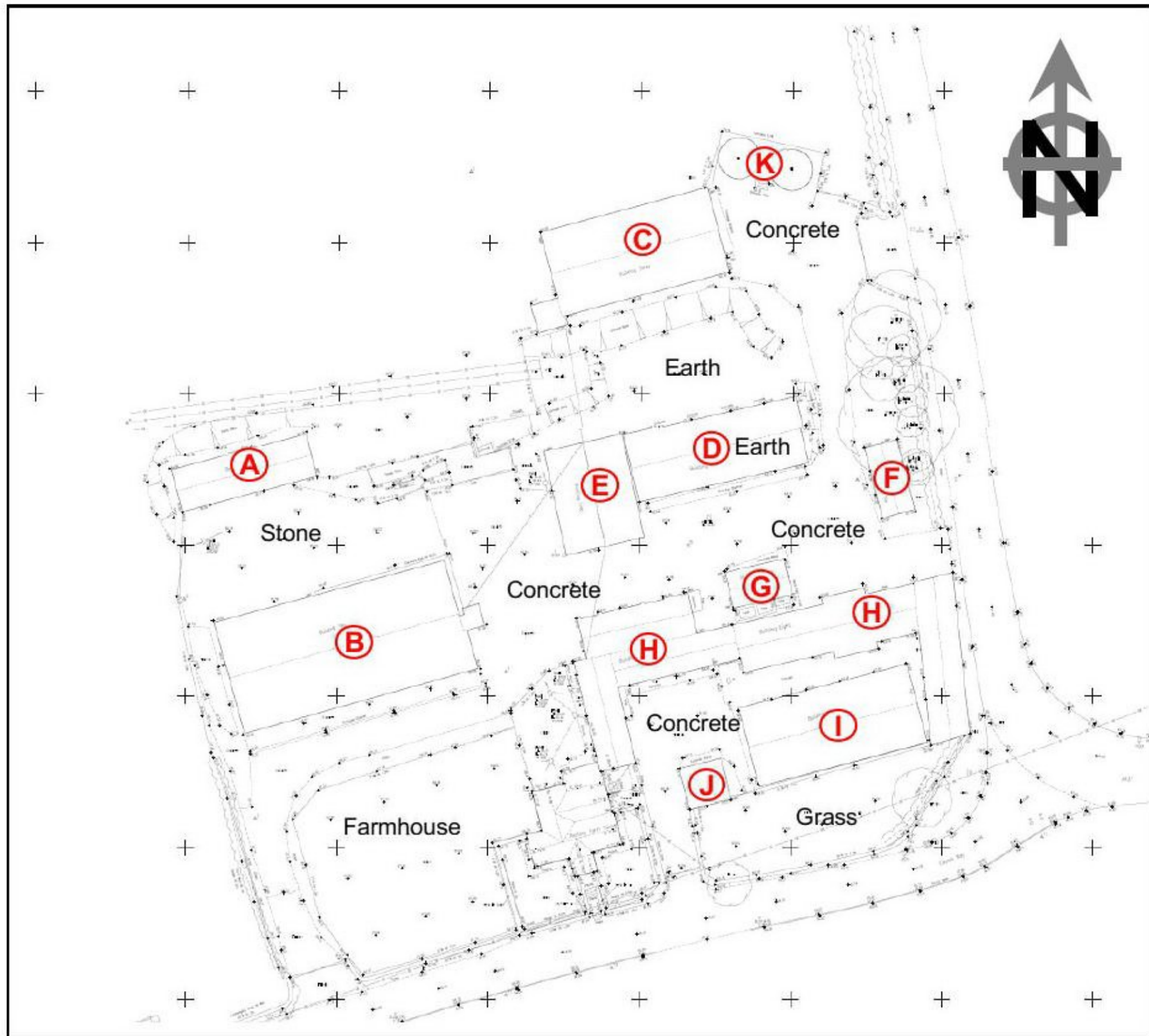
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# Site Layout Plan

Figure 2



## KEY

Building	Description
A	Barn - Steel frame, timber side cladding and ACM corrugated roof.
B	Barn - Steel frame, brick/steel side cladding and ACM corrugated roof.
C	Barn - Steel frame, steel and ACM sheet side cladding and ACM corrugated roof.
D	Barn - Steel frame, steel and ACM sheet side cladding and ACM corrugated roof.
E	Barn - Steel/Concrete frame, Brick and ACM sheet side cladding and ACM corrugated roof.
F	Barn - Timber frame, timber side cladding and ACM corrugated roof.
G	Barn - Block constructed with ACM corrugated roof. Between Buildings 7 and 8 is an empty 7m long by 1m wide bunded area where surface mounted tanks could have historically been located.
H	Barn - Stone and brick constructed with ACM corrugated roof.
I	Barn - Concrete frame, timber sheet side cladding & stone wall and ACM corrugated roof.
J	Barn - Stone and brick constructed with ACM corrugated roof.
K	Corrugated metal silos.

ACM = Asbestos containing material

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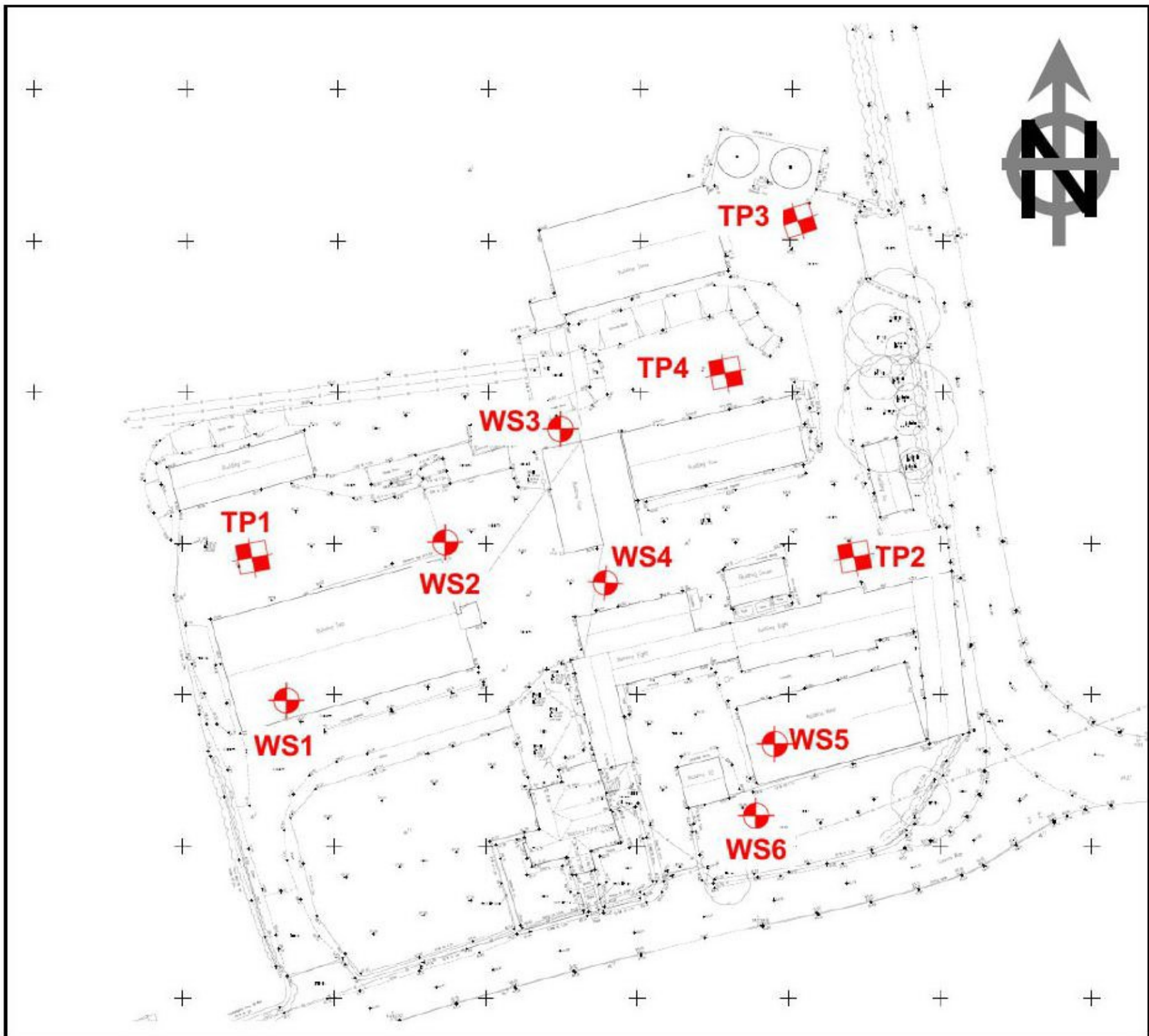
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# Exploratory Hole Location Plan

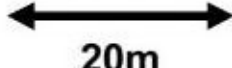
Figure 3



**KEY**

-  Trial Pits TP1 to TP4
-  Boreholes WS1 to WS6

**Scale**

 20m

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Lower Benefield**

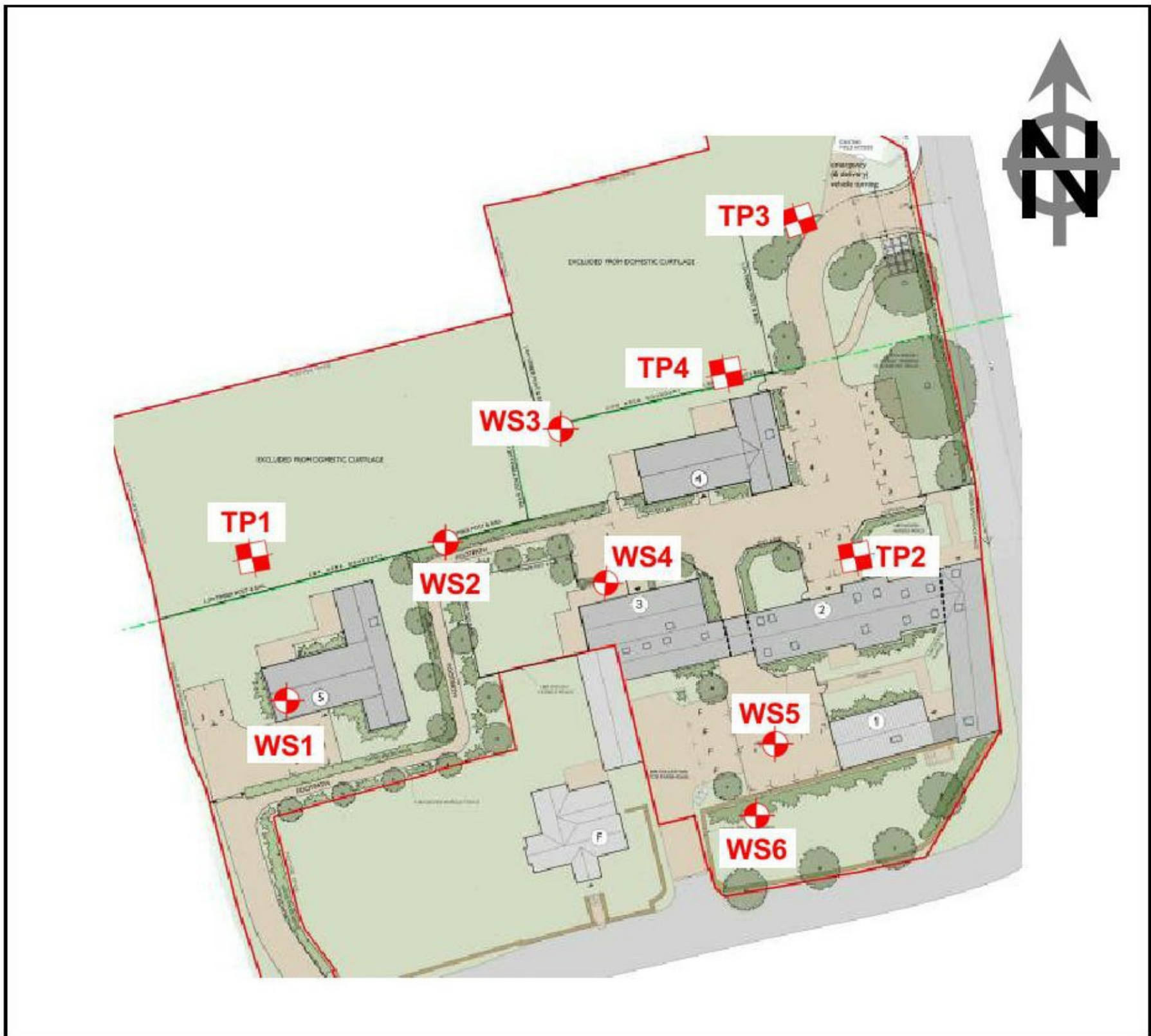
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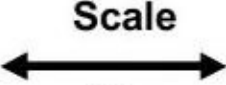
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**KEY**

 Trial Pits TP1 to TP4
 

 Boreholes WS1 to WS6
 Scale

↔  
20m

Proposed Barn Conversions - Buildings 1, 2 and 3  
 New Build Houses – Buildings 4 and 5

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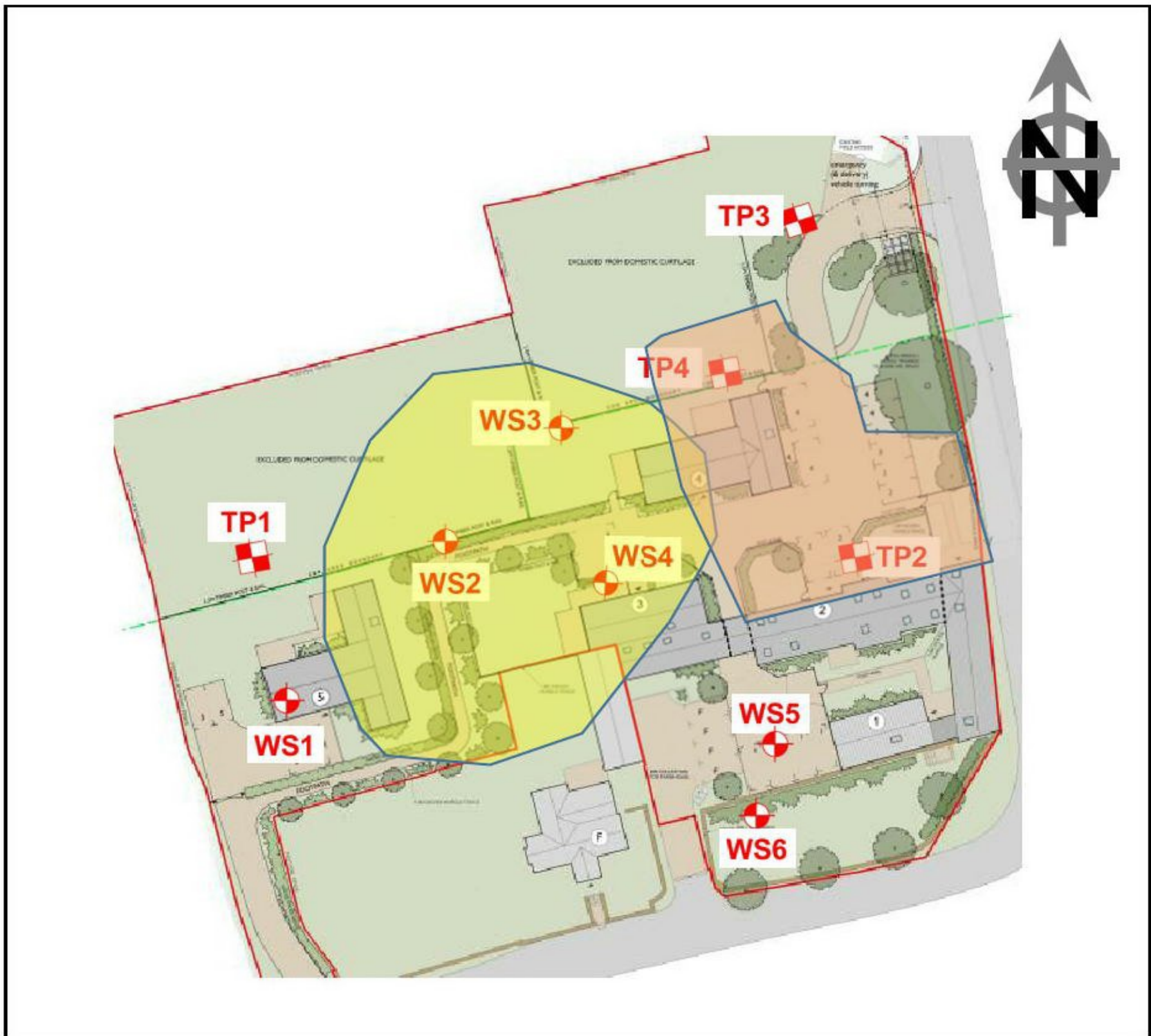
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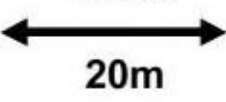
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**KEY**

-  Trial Pits TP1 to TP4
-  Boreholes WS1 to WS6

**Scale**  
  
 20m

Proposed Barn Conversions - Buildings 1, 2 and 3  
 New Build Houses – Buildings 4 and 5

-  Made Ground Approximately 1m to 2m thick
-  Head Deposit Approximately 2m to 3m thick

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# Appendix 1

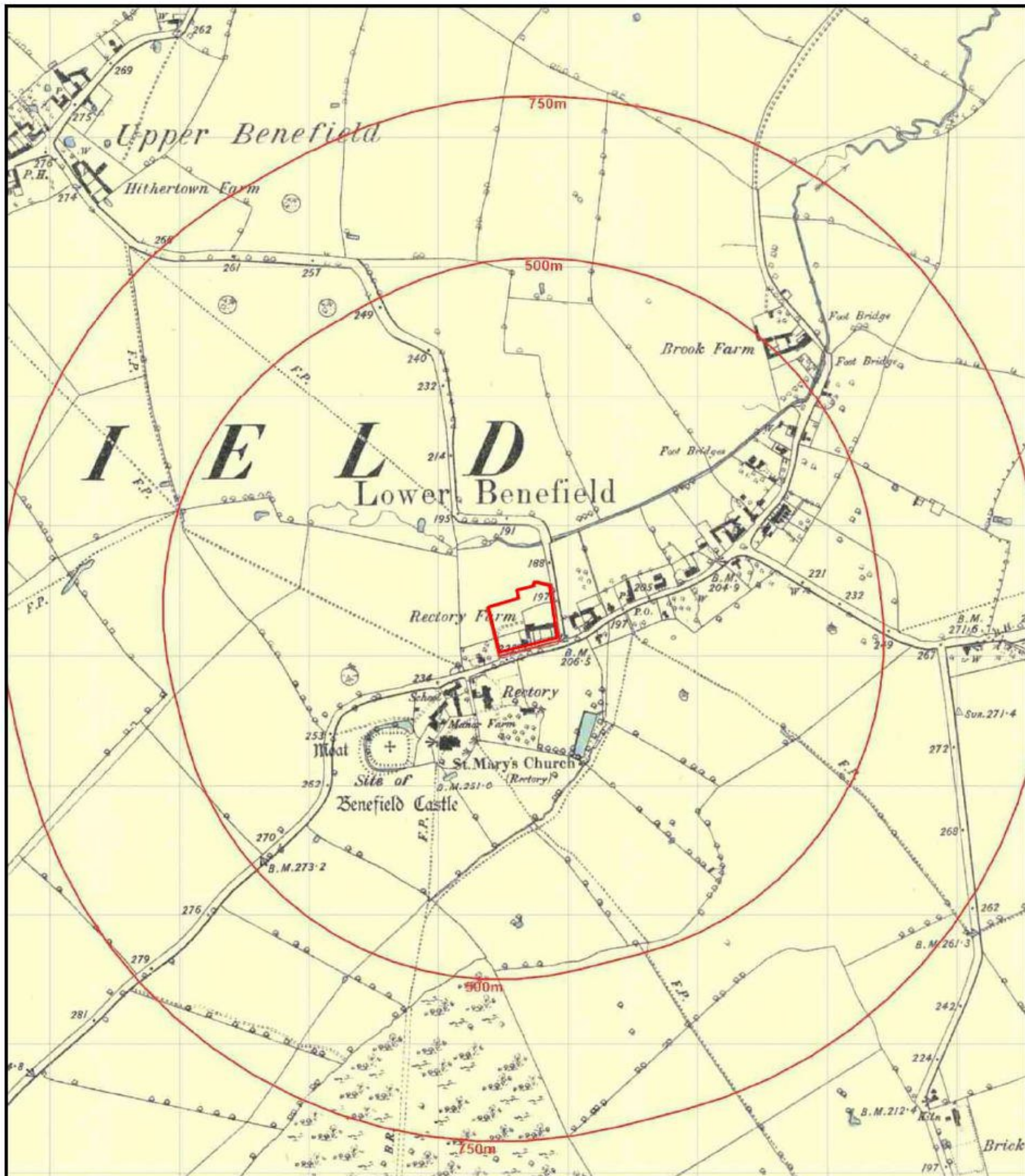
## Historical Maps



# Site History

Figure A

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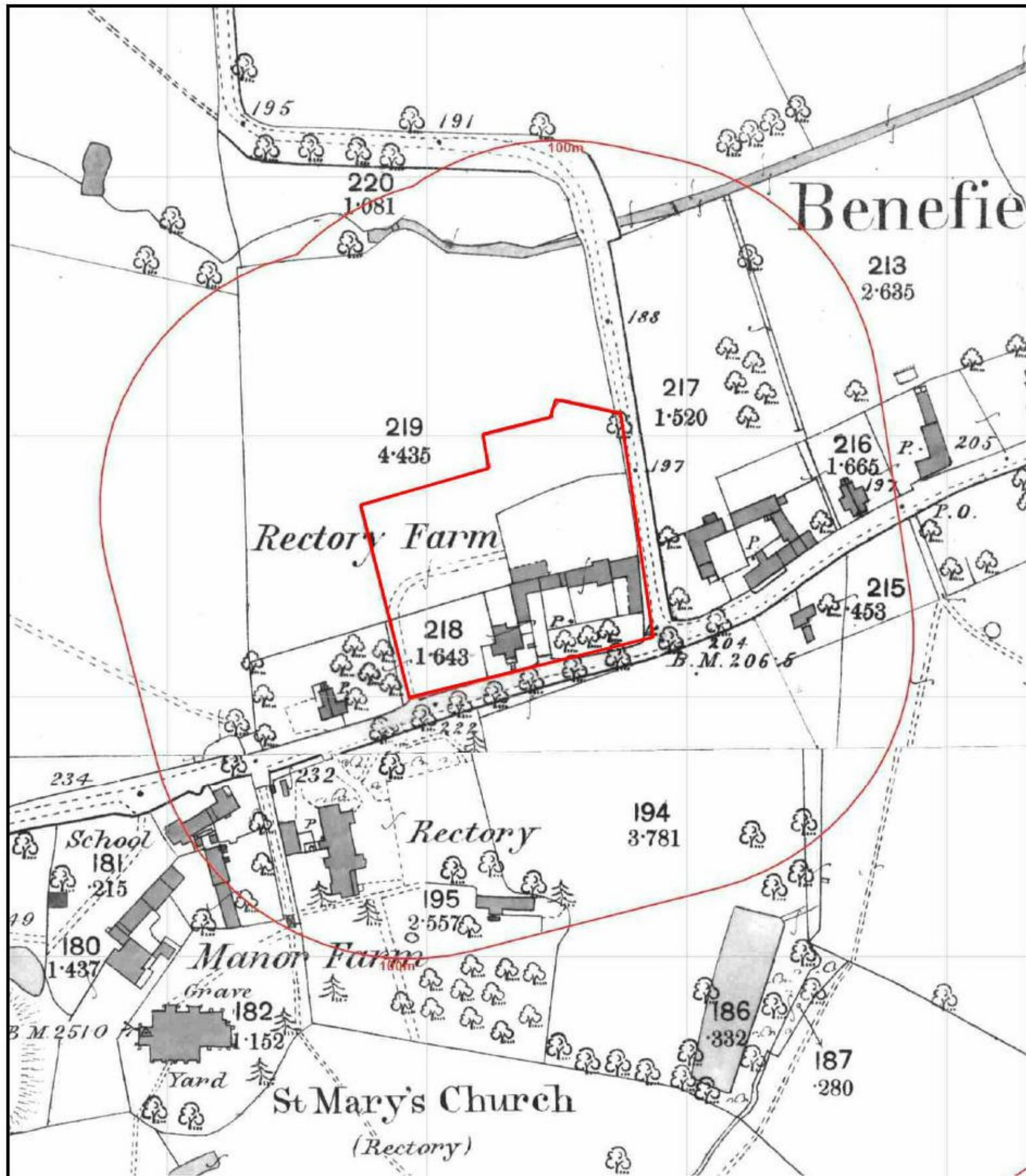
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# Site History

Figure B

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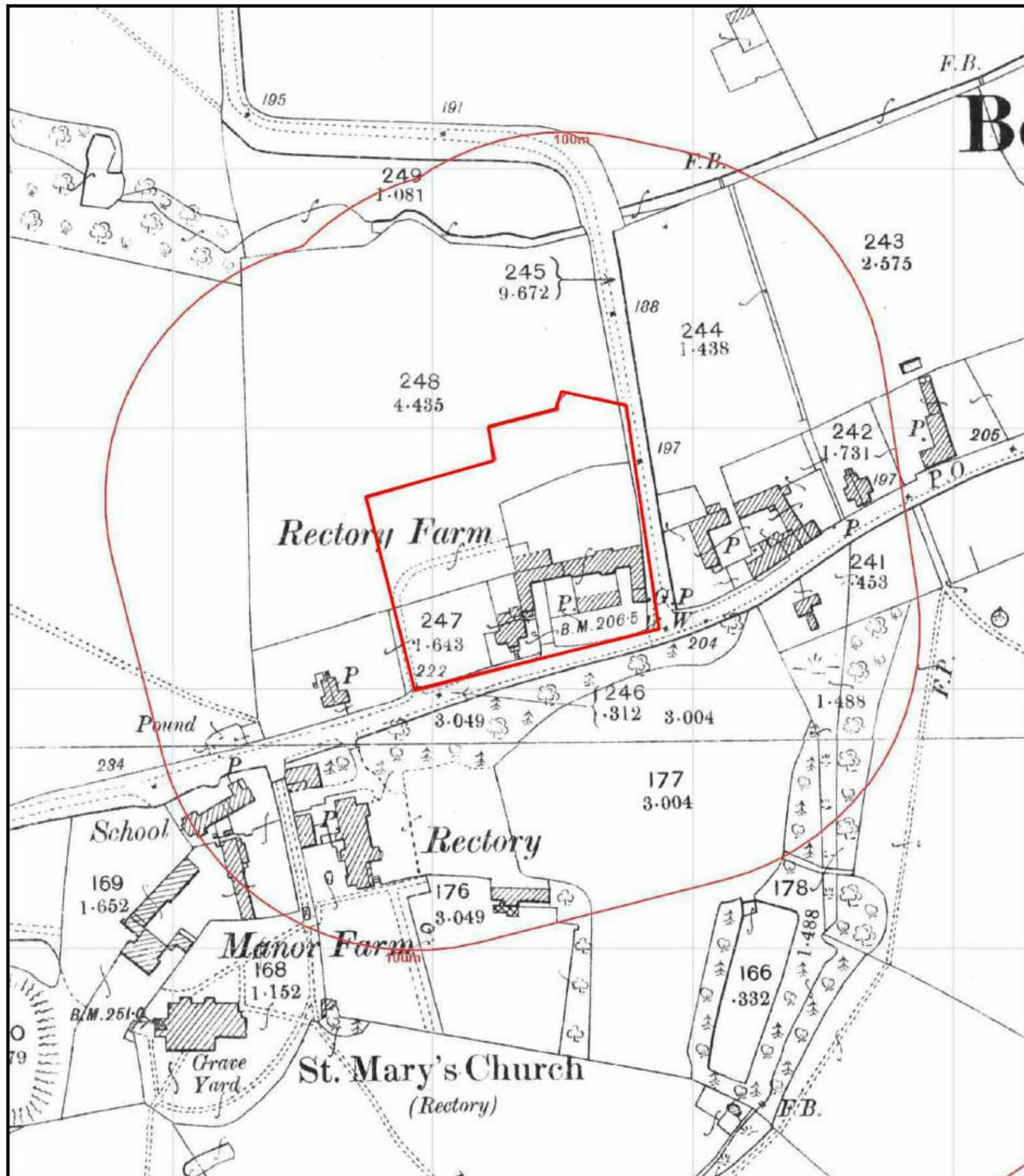
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# Site History

Figure C

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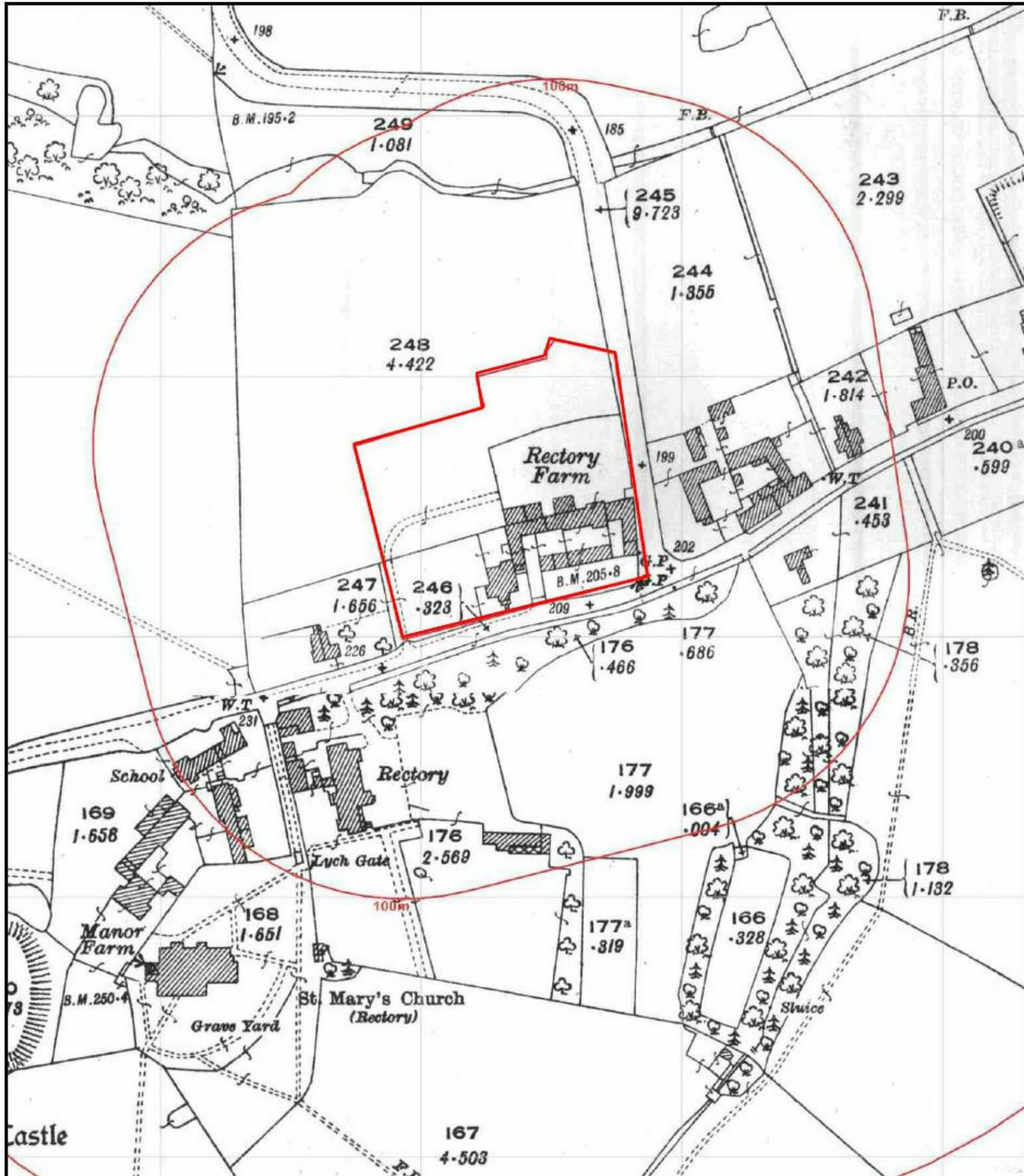
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# Site History

Figure D

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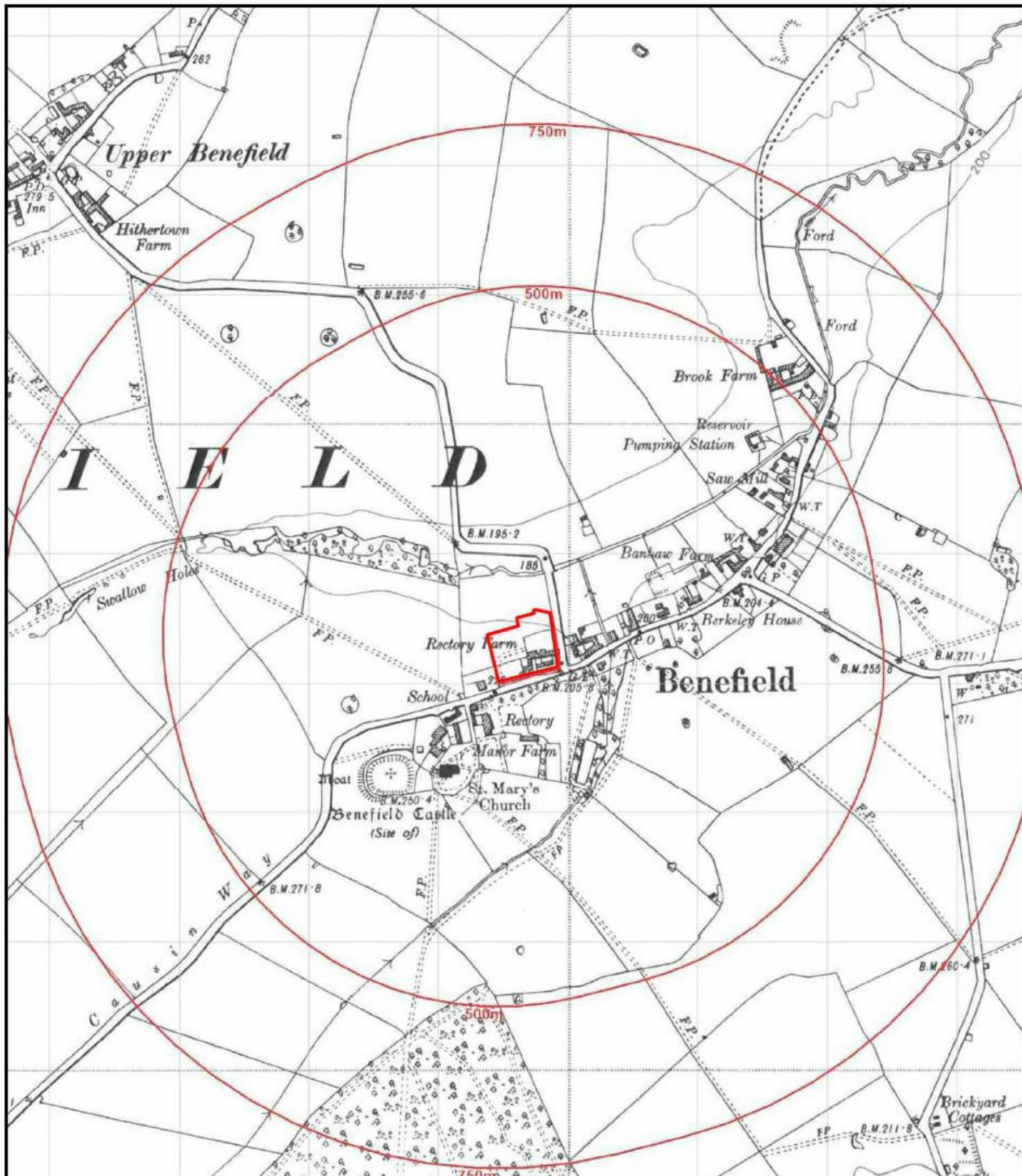
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# Site History

Figure E

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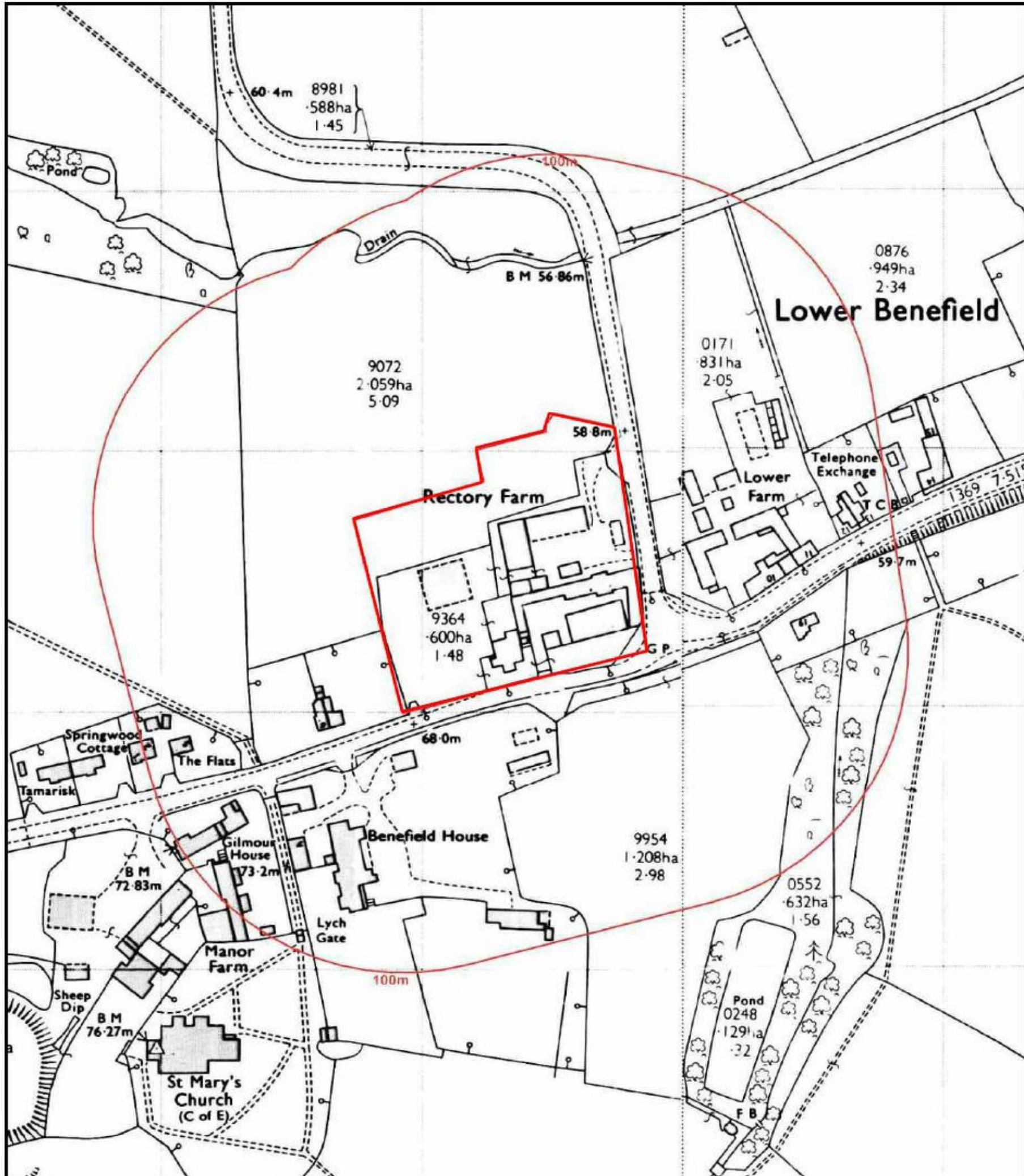
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# Site History

Figure F

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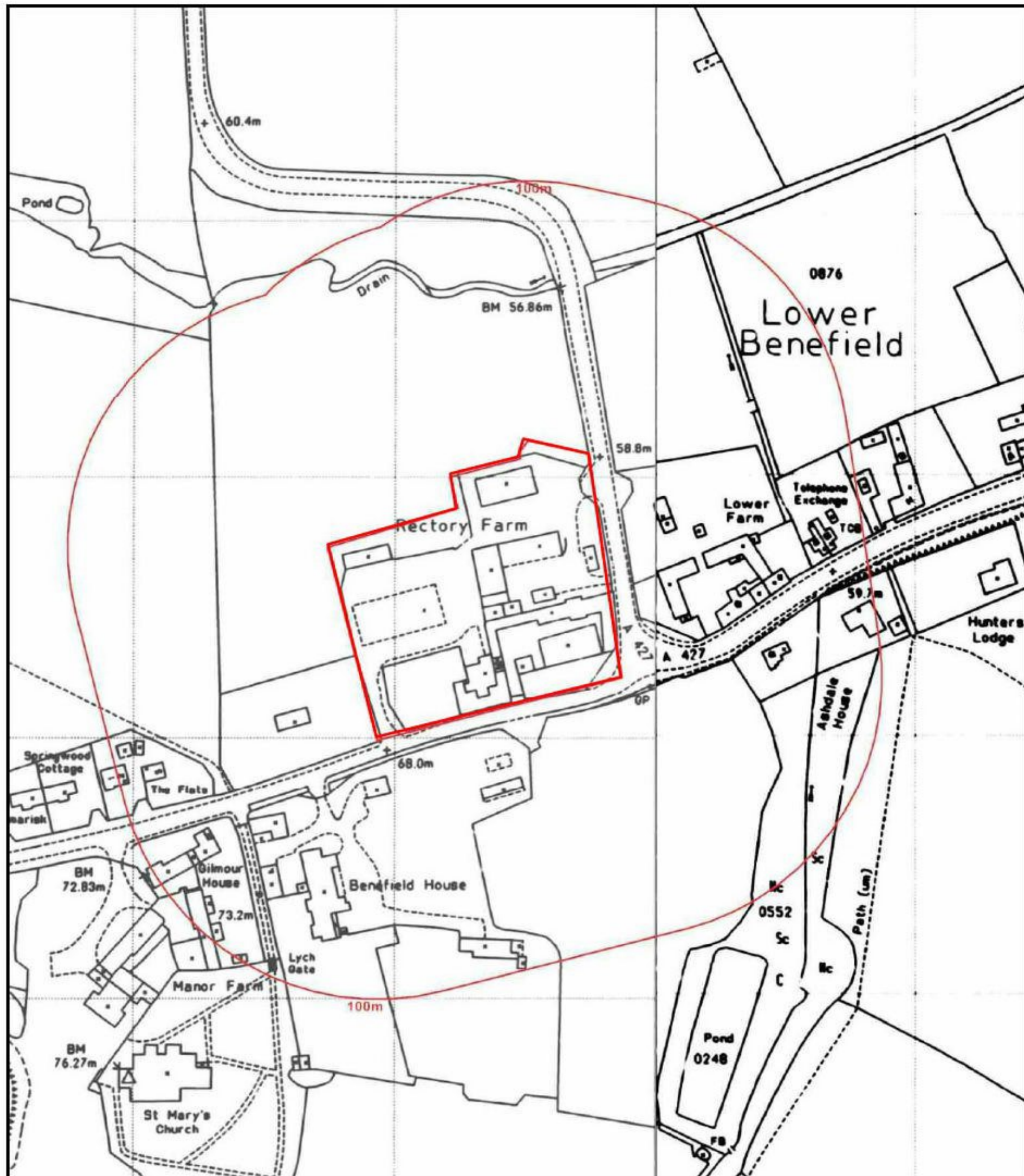
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# Site History

Figure G

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# Site History

Figure H

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# Site History

Figure I

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# Site History

Figure J

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**Project No.**

**C15307**

# Appendix 2

## Database Information

RECTORY FARM BUILDINGS, MAIN STREET, LOWER BENEFIELD, PE8 5AF

**Order Details**

**Date:** 03/03/2021  
**Your ref:** C15307  
**Our Ref:** GS-7624105  
**Client:** Ground Engineering Limited

**Site Details**

**Location:** 498935 288653  
**Area:** 0.85 ha  
**Authority:** [East Northamptonshire Council](#)



**Summary of findings**

p. 2

**Aerial image**

p. 8

**OS MasterMap site plan**

p.13

[groundsure.com/insightuserguide](https://groundsure.com/insightuserguide)

Contact us with any questions at:

[info@groundsure.com](mailto:info@groundsure.com)

08444 159 000

## Summary of findings

Page	Section	Past land use	On site	0-50m	50-250m	250-500m	500-2000m
<b>14</b>	<b>1.1</b>	<b><u>Historical industrial land uses</u></b>	0	0	3	6	-
15	1.2	Historical tanks	0	0	0	0	-
15	1.3	Historical energy features	0	0	0	0	-
16	1.4	Historical petrol stations	0	0	0	0	-
16	1.5	Historical garages	0	0	0	0	-
16	1.6	Historical military land	0	0	0	0	-
Page	Section	Past land use - un-grouped	On site	0-50m	50-250m	250-500m	500-2000m
<b>17</b>	<b>2.1</b>	<b><u>Historical industrial land uses</u></b>	0	0	4	9	-
18	2.2	Historical tanks	0	0	0	0	-
18	2.3	Historical energy features	0	0	0	0	-
19	2.4	Historical petrol stations	0	0	0	0	-
19	2.5	Historical garages	0	0	0	0	-
Page	Section	Waste and landfill	On site	0-50m	50-250m	250-500m	500-2000m
20	3.1	Active or recent landfill	0	0	0	0	-
20	3.2	Historical landfill (BGS records)	0	0	0	0	-
21	3.3	Historical landfill (LA/mapping records)	0	0	0	0	-
21	3.4	Historical landfill (EA/NRW records)	0	0	0	0	-
21	3.5	Historical waste sites	0	0	0	0	-
21	3.6	Licensed waste sites	0	0	0	0	-
<b>21</b>	<b>3.7</b>	<b><u>Waste exemptions</u></b>	7	0	2	9	-
Page	Section	Current industrial land use	On site	0-50m	50-250m	250-500m	500-2000m
<b>24</b>	<b>4.1</b>	<b><u>Recent industrial land uses</u></b>	0	0	1	-	-
25	4.2	Current or recent petrol stations	0	0	0	0	-
25	4.3	Electricity cables	0	0	0	0	-
25	4.4	Gas pipelines	0	0	0	0	-
25	4.5	Sites determined as Contaminated Land	0	0	0	0	-



25	4.6	Control of Major Accident Hazards (COMAH)	0	0	0	0	-	
26	4.7	Regulated explosive sites	0	0	0	0	-	
26	4.8	Hazardous substance storage/usage	0	0	0	0	-	
26	4.9	Historical licensed industrial activities (IPC)	0	0	0	0	-	
26	4.10	Licensed industrial activities (Part A(1))	0	0	0	0	-	
26	4.11	Licensed pollutant release (Part A(2)/B)	0	0	0	0	-	
27	4.12	Radioactive Substance Authorisations	0	0	0	0	-	
<b>27</b>	<b>4.13</b>	<b><u>Licensed Discharges to controlled waters</u></b>	0	0	1	0	-	
27	4.14	Pollutant release to surface waters (Red List)	0	0	0	0	-	
27	4.15	Pollutant release to public sewer	0	0	0	0	-	
28	4.16	List 1 Dangerous Substances	0	0	0	0	-	
28	4.17	List 2 Dangerous Substances	0	0	0	0	-	
28	4.18	Pollution Incidents (EA/NRW)	0	0	0	0	-	
28	4.19	Pollution inventory substances	0	0	0	0	-	
28	4.20	Pollution inventory waste transfers	0	0	0	0	-	
29	4.21	Pollution inventory radioactive waste	0	0	0	0	-	
Page	Section	Hydrogeology	On site	0-50m	50-250m	250-500m	500-2000m	
<b>30</b>	<b>5.1</b>	<b><u>Superficial aquifer</u></b>	Identified (within 500m)					
<b>32</b>	<b>5.2</b>	<b><u>Bedrock aquifer</u></b>	Identified (within 500m)					
<b>34</b>	<b>5.3</b>	<b><u>Groundwater vulnerability</u></b>	Identified (within 50m)					
<b>36</b>	<b>5.4</b>	<b><u>Groundwater vulnerability- soluble rock risk</u></b>	Identified (within 0m)					
36	5.5	Groundwater vulnerability- local information	None (within 0m)					
<b>37</b>	<b>5.6</b>	<b><u>Groundwater abstractions</u></b>	0	0	0	0	1	
38	5.7	Surface water abstractions	0	0	0	0	0	
38	5.8	Potable abstractions	0	0	0	0	0	
38	5.9	Source Protection Zones	0	0	0	0	-	
39	5.10	Source Protection Zones (confined aquifer)	0	0	0	0	-	
Page	Section	Hydrology	On site	0-50m	50-250m	250-500m	500-2000m	
<b>40</b>	<b>6.1</b>	<b><u>Water Network (OS MasterMap)</u></b>	0	0	8	-	-	



<a href="#">41</a>	<a href="#">6.2</a>	<a href="#"><u>Surface water features</u></a>	0	0	10	-	-
<a href="#">41</a>	<a href="#">6.3</a>	<a href="#"><u>WFD Surface water body catchments</u></a>	1	-	-	-	-
<a href="#">42</a>	<a href="#">6.4</a>	<a href="#"><u>WFD Surface water bodies</u></a>	0	0	1	-	-
<a href="#">42</a>	<a href="#">6.5</a>	<a href="#"><u>WFD Groundwater bodies</u></a>	1	-	-	-	-
Page	Section	River and coastal flooding	On site	0-50m	50-250m	250-500m	500-2000m
<a href="#">43</a>	<a href="#">7.1</a>	<a href="#"><u>Risk of Flooding from Rivers and Sea (RoFRaS)</u></a>	Medium (within 50m)				
44	7.2	Historical Flood Events	0	0	0	-	-
44	7.3	Flood Defences	0	0	0	-	-
44	7.4	Areas Benefiting from Flood Defences	0	0	0	-	-
44	7.5	Flood Storage Areas	0	0	0	-	-
<a href="#">45</a>	<a href="#">7.6</a>	<a href="#"><u>Flood Zone 2</u></a>	Identified (within 50m)				
<a href="#">46</a>	<a href="#">7.7</a>	<a href="#"><u>Flood Zone 3</u></a>	Identified (within 50m)				
Page	Section	Surface water flooding					
<a href="#">47</a>	<a href="#">8.1</a>	<a href="#"><u>Surface water flooding</u></a>	1 in 30 year, 0.1m - 0.3m (within 50m)				
Page	Section	Groundwater flooding					
<a href="#">49</a>	<a href="#">9.1</a>	<a href="#"><u>Groundwater flooding</u></a>	Negligible (within 50m)				
Page	Section	Environmental designations	On site	0-50m	50-250m	250-500m	500-2000m
<a href="#">50</a>	<a href="#">10.1</a>	<a href="#"><u>Sites of Special Scientific Interest (SSSI)</u></a>	0	0	0	1	2
51	10.2	Conserved wetland sites (Ramsar sites)	0	0	0	0	0
51	10.3	Special Areas of Conservation (SAC)	0	0	0	0	0
51	10.4	Special Protection Areas (SPA)	0	0	0	0	0
51	10.5	National Nature Reserves (NNR)	0	0	0	0	0
52	10.6	Local Nature Reserves (LNR)	0	0	0	0	0
<a href="#">52</a>	<a href="#">10.7</a>	<a href="#"><u>Designated Ancient Woodland</u></a>	0	0	0	1	5
52	10.8	Biosphere Reserves	0	0	0	0	0
53	10.9	Forest Parks	0	0	0	0	0
53	10.10	Marine Conservation Zones	0	0	0	0	0
53	10.11	Green Belt	0	0	0	0	0
53	10.12	Proposed Ramsar sites	0	0	0	0	0



53	10.13	Possible Special Areas of Conservation (pSAC)	0	0	0	0	0
54	10.14	Potential Special Protection Areas (pSPA)	0	0	0	0	0
54	10.15	Nitrate Sensitive Areas	0	0	0	0	0
<b>54</b>	<b>10.16</b>	<b><u>Nitrate Vulnerable Zones</u></b>	1	0	0	0	0
<b>55</b>	<b>10.17</b>	<b><u>SSSI Impact Risk Zones</u></b>	2	-	-	-	-
<b>57</b>	<b>10.18</b>	<b><u>SSSI Units</u></b>	0	0	0	1	2
Page	Section	Visual and cultural designations	On site	0-50m	50-250m	250-500m	500-2000m
59	11.1	World Heritage Sites	0	0	0	-	-
60	11.2	Area of Outstanding Natural Beauty	0	0	0	-	-
60	11.3	National Parks	0	0	0	-	-
<b>60</b>	<b>11.4</b>	<b><u>Listed Buildings</u></b>	1	1	9	-	-
<b>61</b>	<b>11.5</b>	<b><u>Conservation Areas</u></b>	1	0	0	-	-
<b>62</b>	<b>11.6</b>	<b><u>Scheduled Ancient Monuments</u></b>	0	0	1	-	-
62	11.7	Registered Parks and Gardens	0	0	0	-	-
Page	Section	Agricultural designations	On site	0-50m	50-250m	250-500m	500-2000m
<b>63</b>	<b>12.1</b>	<b><u>Agricultural Land Classification</u></b>	Grade 3 (within 250m)				
64	12.2	Open Access Land	0	0	0	-	-
64	12.3	Tree Felling Licences	0	0	0	-	-
64	12.4	Environmental Stewardship Schemes	0	0	0	-	-
<b>64</b>	<b>12.5</b>	<b><u>Countryside Stewardship Schemes</u></b>	0	0	1	-	-
Page	Section	Habitat designations	On site	0-50m	50-250m	250-500m	500-2000m
<b>66</b>	<b>13.1</b>	<b><u>Priority Habitat Inventory</u></b>	0	1	7	-	-
67	13.2	Habitat Networks	0	0	0	-	-
67	13.3	Open Mosaic Habitat	0	0	0	-	-
67	13.4	Limestone Pavement Orders	0	0	0	-	-
Page	Section	Geology 1:10,000 scale	On site	0-50m	50-250m	250-500m	500-2000m
<b>68</b>	<b>14.1</b>	<b><u>10k Availability</u></b>	Identified (within 500m)				
69	14.2	Artificial and made ground (10k)	0	0	0	0	-
<b>70</b>	<b>14.3</b>	<b><u>Superficial geology (10k)</u></b>	0	0	1	3	-





71	14.4	Landslip (10k)	0	0	0	0	-
<b>72</b>	<b>14.5</b>	<b><u>Bedrock geology (10k)</u></b>	4	0	2	0	-
73	14.6	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
<b>74</b>	<b>15.1</b>	<b><u>50k Availability</u></b>	Identified (within 500m)				
75	15.2	Artificial and made ground (50k)	0	0	0	0	-
75	15.3	Artificial ground permeability (50k)	0	0	-	-	-
<b>76</b>	<b>15.4</b>	<b><u>Superficial geology (50k)</u></b>	0	0	1	2	-
77	15.5	Superficial permeability (50k)	None (within 50m)				
77	15.6	Landslip (50k)	0	0	0	0	-
77	15.7	Landslip permeability (50k)	None (within 50m)				
<b>78</b>	<b>15.8</b>	<b><u>Bedrock geology (50k)</u></b>	4	0	2	0	-
<b>79</b>	<b>15.9</b>	<b><u>Bedrock permeability (50k)</u></b>	Identified (within 50m)				
79	15.10	Bedrock faults and other linear features (50k)	0	0	0	0	-
Page	Section	Boreholes	On site	0-50m	50-250m	250-500m	500-2000m
<b>80</b>	<b>16.1</b>	<b><u>BGS Boreholes</u></b>	0	1	1	-	-
Page	Section	Natural ground subsidence					
<b>81</b>	<b>17.1</b>	<b><u>Shrink swell clays</u></b>	Moderate (within 50m)				
<b>83</b>	<b>17.2</b>	<b><u>Running sands</u></b>	Negligible (within 50m)				
<b>84</b>	<b>17.3</b>	<b><u>Compressible deposits</u></b>	Negligible (within 50m)				
<b>85</b>	<b>17.4</b>	<b><u>Collapsible deposits</u></b>	Very low (within 50m)				
<b>86</b>	<b>17.5</b>	<b><u>Landslides</u></b>	Very low (within 50m)				
<b>87</b>	<b>17.6</b>	<b><u>Ground dissolution of soluble rocks</u></b>	Very low (within 50m)				
Page	Section	Mining, ground workings and natural cavities	On site	0-50m	50-250m	250-500m	500-2000m
89	18.1	Natural cavities	0	0	0	0	-
90	18.2	BritPits	0	0	0	0	-
<b>90</b>	<b>18.3</b>	<b><u>Surface ground workings</u></b>	0	0	10	-	-
90	18.4	Underground workings	0	0	0	0	0
<b>91</b>	<b>18.5</b>	<b><u>Historical Mineral Planning Areas</u></b>	3	1	0	0	-



91	18.6	Non-coal mining	0	0	0	0	0
91	18.7	Mining cavities	0	0	0	0	0
<b>92</b>	<b>18.8</b>	<b><u>JPB mining areas</u></b>	<b>Identified (within 0m)</b>				
92	18.9	Coal mining	None (within 0m)				
92	18.10	Brine areas	None (within 0m)				
92	18.11	Gypsum areas	None (within 0m)				
93	18.12	Tin mining	None (within 0m)				
93	18.13	Clay mining	None (within 0m)				
Page	Section	Radon					
<b>94</b>	<b>19.1</b>	<b><u>Radon</u></b>	<b>Less than 1% (within 0m)</b>				
Page	Section	Soil chemistry	On site	0-50m	50-250m	250-500m	500-2000m
<b>95</b>	<b>20.1</b>	<b><u>BGS Estimated Background Soil Chemistry</u></b>	4	2	-	-	-
95	20.2	BGS Estimated Urban Soil Chemistry	0	0	-	-	-
96	20.3	BGS Measured Urban Soil Chemistry	0	0	-	-	-
Page	Section	Railway infrastructure and projects	On site	0-50m	50-250m	250-500m	500-2000m
97	21.1	Underground railways (London)	0	0	0	-	-
97	21.2	Underground railways (Non-London)	0	0	0	-	-
97	21.3	Railway tunnels	0	0	0	-	-
97	21.4	Historical railway and tunnel features	0	0	0	-	-
97	21.5	Royal Mail tunnels	0	0	0	-	-
98	21.6	Historical railways	0	0	0	-	-
98	21.7	Railways	0	0	0	-	-
98	21.8	Crossrail 1	0	0	0	0	-
98	21.9	Crossrail 2	0	0	0	0	-
98	21.10	HS2	0	0	0	0	-



## Recent aerial photograph



Capture Date: 15/05/2019

Site Area: 0.85ha



## Recent site history - 2016 aerial photograph



Capture Date: 06/07/2016

Site Area: 0.85ha



## Recent site history - 2011 aerial photograph



Capture Date: 29/09/2011

Site Area: 0.85ha



## Recent site history - 2010 aerial photograph



Capture Date: 03/06/2010

Site Area: 0.85ha



## Recent site history - 1999 aerial photograph

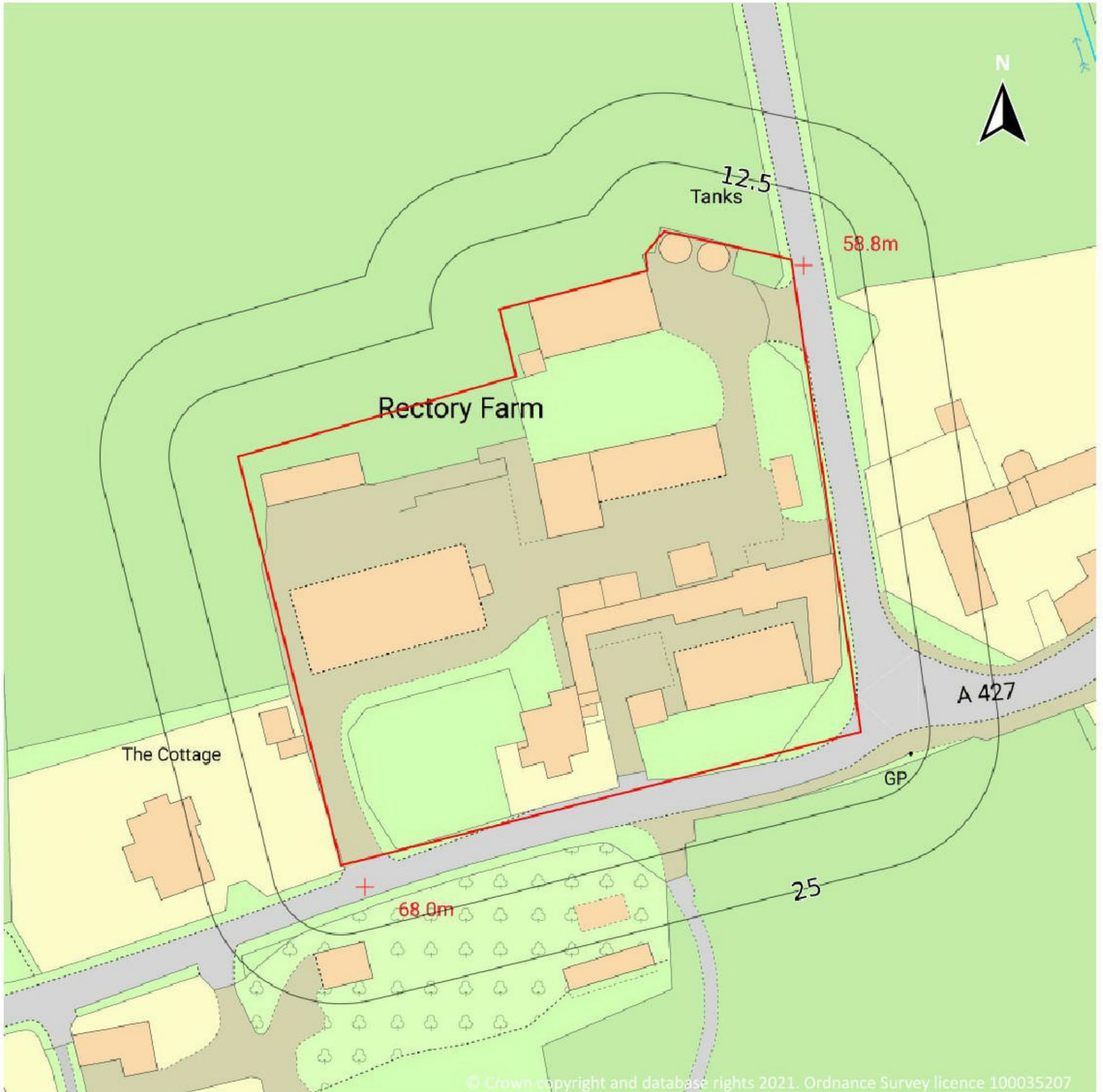


Capture Date: 23/07/1999

Site Area: 0.85ha



## OS MasterMap site plan

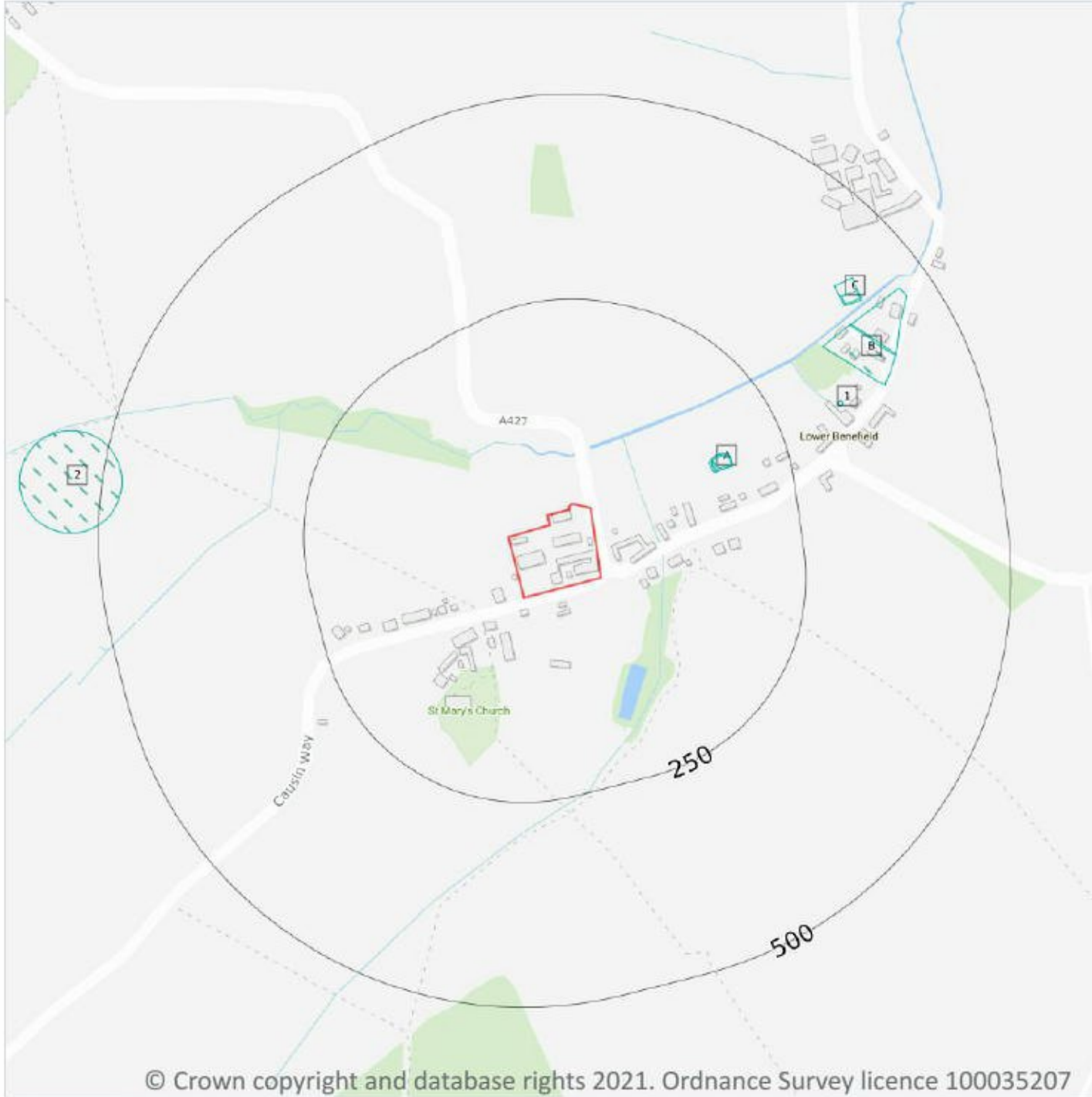


Site Area: 0.85ha





# 1 Past land use



**— Site Outline**

**Search buffers in metres (m)**

**Historical industrial land uses**

## 1.1 Historical industrial land uses

**Records within 500m**

**9**

Potentially contaminative land use features digitised from historical Ordnance Survey mapping at 1:10,000 and 1:10,560 scale, intelligently grouped into contiguous features. To prevent misrepresentation of the size of historical features at any given time, features are only grouped if they have similar geometries within immediately preceding or succeeding map editions. See section 2 for a breakdown of grouping if required. Grouped and the original un-grouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

Features are displayed on the Past land use map on **page 14**

ID	Location	Land use	Dates present	Group ID
A	154m E	Unspecified Heap	1927	1818030

ID	Location	Land use	Dates present	Group ID
A	157m E	Unspecified Heap	1950	1815504
A	157m E	Unspecified Heap	1950	1805367
1	327m NE	Unspecified Tank	1885 - 1899	1825940
B	345m NE	Unspecified Mill	1950	1758915
B	387m NE	Sawmill	1927 - 1950	1821094
C	396m NE	Pumping Station	1927 - 1950	1817467
C	398m NE	Pumping Station	1899	1815724
2	476m W	Unspecified Holes	1971	1833447

*This data is sourced from Ordnance Survey / Groundsure.*

## 1.2 Historical tanks

<b>Records within 500m</b>	<b>0</b>
----------------------------	----------

Tank features digitised from historical Ordnance Survey mapping at high-detail 1:1,250 and 1:2,500 scale, intelligently grouped into contiguous features. To prevent misrepresentation of the size of historical features at any given time, features are only grouped if they have similar geometries within immediately preceding or succeeding map editions. See section 2 for a breakdown of grouping if required. Grouped and the original ungrouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

*This data is sourced from Ordnance Survey / Groundsure.*

## 1.3 Historical energy features

<b>Records within 500m</b>	<b>0</b>
----------------------------	----------

Energy features digitised from historical Ordnance Survey mapping at high-detail 1:1,250 and 1:2,500 scale, intelligently grouped into contiguous features. To prevent misrepresentation of the size of historical features at any given time, features are only grouped if they have similar geometries within immediately preceding or succeeding map editions. See section 2 for a breakdown of grouping if required. Grouped and the original ungrouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

*This data is sourced from Ordnance Survey / Groundsure.*

## 1.4 Historical petrol stations

Records within 500m

0

Petrol stations digitised from historical Ordnance Survey mapping at high-detail 1:1,250 and 1:2,500 scale, intelligently grouped into contiguous features. To prevent misrepresentation of the size of historical features at any given time, features are only grouped if they have similar geometries within immediately preceding or succeeding map editions. See section 2 for a breakdown of grouping if required. Grouped and the original ungrouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

*This data is sourced from Ordnance Survey / Groundsure.*

## 1.5 Historical garages

Records within 500m

0

Garages digitised from historical Ordnance Survey mapping at high-detail 1:1,250 and 1:2,500 scale, intelligently grouped into contiguous features. To prevent misrepresentation of the size of historical features at any given time, features are only grouped if they have similar geometries within immediately preceding or succeeding map editions. See section 2 for a breakdown of grouping if required. Grouped and the original ungrouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

*This data is sourced from Ordnance Survey / Groundsure.*

## 1.6 Historical military land

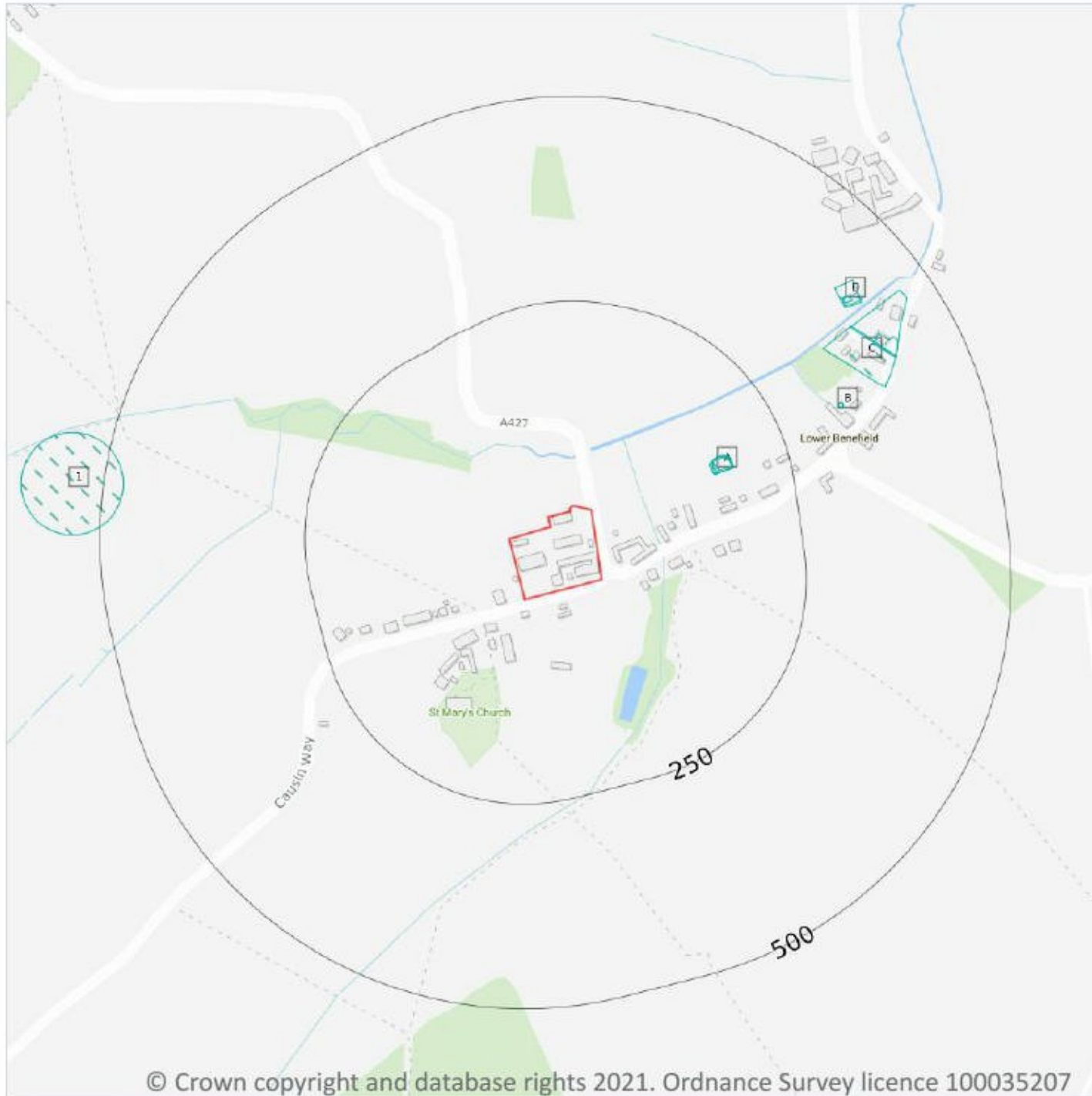
Records within 500m

0

Areas of military land digitised from multiple sources including the National Archives, local records, MOD records and verified other sources, intelligently grouped into contiguous features.

*This data is sourced from Ordnance Survey / Groundsure / other sources.*

## 2 Past land use - un-grouped



— Site Outline

Search buffers in metres (m)

Historical industrial land uses

### 2.1 Historical industrial land uses

**Records within 500m** **13**

Potentially contaminative land use features digitised from historical Ordnance Survey mapping at 1:10,000 and 10,560 scale. Any records shown are available intelligently grouped in section 1. Grouped and the original un-grouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

Features are displayed on the Past land use - un-grouped map on **page 17**

ID	Location	Land Use	Date	Group ID
A	154m E	Unspecified Heap	1927	1818030
A	154m E	Unspecified Heap	1927	1818030
A	157m E	Unspecified Heap	1950	1815504

ID	Location	Land Use	Date	Group ID
A	157m E	Unspecified Heap	1950	1805367
B	327m NE	Unspecified Tank	1899	1825940
B	327m NE	Unspecified Tank	1885	1825940
C	345m NE	Unspecified Mill	1950	1758915
C	387m NE	Sawmill	1927	1821094
D	396m NE	Pumping Station	1950	1817467
D	398m NE	Pumping Station	1899	1815724
C	399m NE	Sawmill	1950	1821094
D	400m NE	Pumping Station	1927	1817467
1	476m W	Unspecified Holes	1971	1833447

*This data is sourced from Ordnance Survey / Groundsure.*

## 2.2 Historical tanks

<b>Records within 500m</b>	<b>0</b>
----------------------------	----------

Tank features digitised from historical Ordnance Survey mapping at high-detail 1:1,250 and 1:2,500 scale. Any records shown are available intelligently grouped in section 1. Grouped and the original un-grouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

*This data is sourced from Ordnance Survey / Groundsure.*

## 2.3 Historical energy features

<b>Records within 500m</b>	<b>0</b>
----------------------------	----------

Energy features digitised from historical Ordnance Survey mapping at high-detail 1:1,250 and 1:2,500 scale. Any records shown are available intelligently grouped in section 1. Grouped and the original un-grouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

*This data is sourced from Ordnance Survey / Groundsure.*

## 2.4 Historical petrol stations

Records within 500m

0

Petrol stations digitised from historical Ordnance Survey mapping at high-detail 1:1,250 and 1:2,500 scale. Any records shown are available intelligently grouped in section 1. Grouped and the original un-grouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

*This data is sourced from Ordnance Survey / Groundsure.*

## 2.5 Historical garages

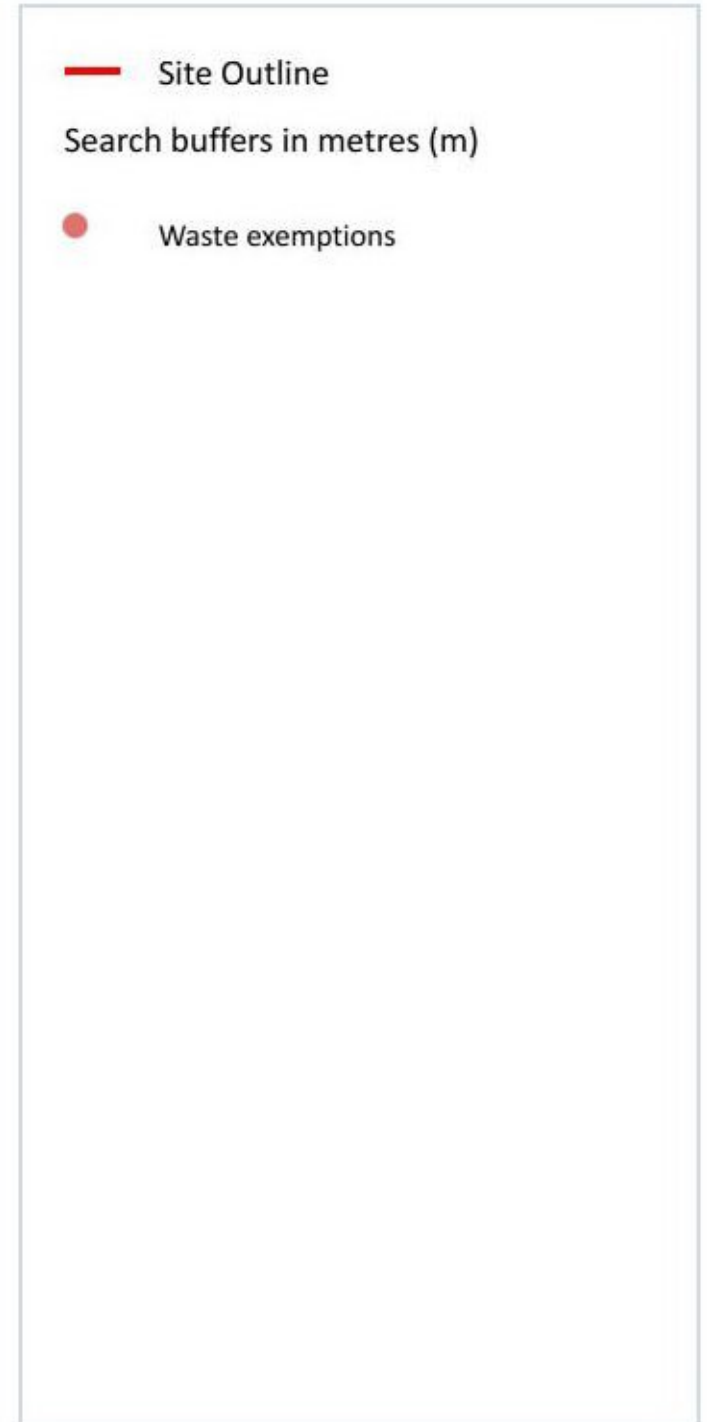
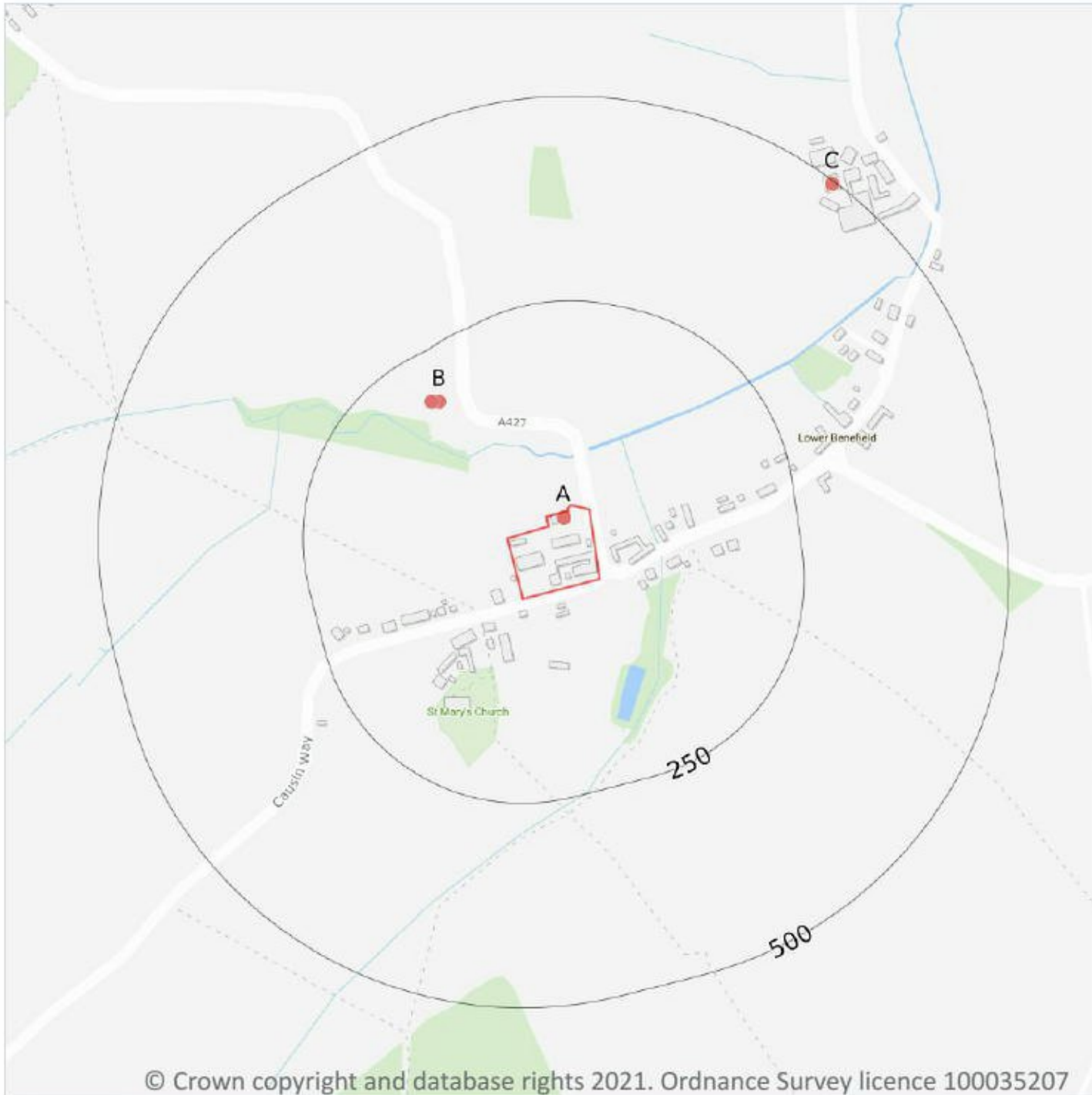
Records within 500m

0

Garages digitised from historical Ordnance Survey mapping at high-detail 1:1,250 and 1:2,500 scale. Any records shown are available intelligently grouped in section 1. Grouped and the original un-grouped features can be cross-referenced across sections 1 and 2 using the 'Group ID'.

*This data is sourced from Ordnance Survey / Groundsure.*

## 3 Waste and landfill



### 3.1 Active or recent landfill

Records within 500m

0

Active or recently closed landfill sites under Environment Agency/Natural Resources Wales regulation.

*This data is sourced from the Environment Agency and Natural Resources Wales.*

### 3.2 Historical landfill (BGS records)

Records within 500m

0

Landfill sites identified on a survey carried out on behalf of the DoE in 1973. These sites may have been closed or operational at this time.

*This data is sourced from the British Geological Survey.*

### 3.3 Historical landfill (LA/mapping records)

Records within 500m

0

Landfill sites identified from Local Authority records and high detail historical mapping.

*This data is sourced from the Ordnance Survey/Groundsure and Local Authority records.*

### 3.4 Historical landfill (EA/NRW records)

Records within 500m

0

Known historical (closed) landfill sites (e.g. sites where there is no PPC permit or waste management licence currently in force). This includes sites that existed before the waste licensing regime and sites that have been licensed in the past but where a licence has been revoked, ceased to exist or surrendered and a certificate of completion has been issued.

*This data is sourced from the Environment Agency and Natural Resources Wales.*

### 3.5 Historical waste sites

Records within 500m

0

Waste site records derived from Local Authority planning records and high detail historical mapping.

*This data is sourced from Ordnance Survey/Groundsure and Local Authority records.*

### 3.6 Licensed waste sites

Records within 500m

0

Active or recently closed waste sites under Environment Agency/Natural Resources Wales regulation.

*This data is sourced from the Environment Agency and Natural Resources Wales.*

### 3.7 Waste exemptions

Records within 500m

18

Activities involving the storage, treatment, use or disposal of waste that are exempt from needing a permit. Exemptions have specific limits and conditions that must be adhered to.

Features are displayed on the Waste and landfill map on **page 20**



ID	Location	Site	Reference	Category	Sub-Category	Description
A	On site	Rectory Farm PETERBOROUGH PE8 5AF	EPR/ZF0331PT /A001	Disposing of waste exemption	Agricultur al Waste Only	Deposit of waste from dredging of inland waters
A	On site	Rectory Farm PETERBOROUGH PE8 5AF	EPR/ZF0331PT /A001	Disposing of waste exemption	Agricultur al Waste Only	Disposal by incineration
A	On site	Rectory Farm PETERBOROUGH PE8 5AF	EPR/ZF0331PT /A001	Disposing of waste exemption	Agricultur al Waste Only	Burning waste in the open
A	On site	Rectory Farm PETERBOROUGH PE8 5AF	EPR/ZF0331PT /A001	Storing waste exemption	Agricultur al Waste Only	Storage of waste in a secure place
A	On site	Rectory Farm PETERBOROUGH PE8 5AF	EPR/ZF0331PT /A001	Treating waste exemption	Agricultur al Waste Only	Treatment of waste in a biobed or biofilter
A	On site	Rectory Farm PETERBOROUGH PE8 5AF	EPR/ZF0331PT /A001	Treating waste exemption	Agricultur al Waste Only	Treatment of waste wood and waste plant matter by chipping, shredding, cutting or pulverising
A	On site	Rectory Farm PETERBOROUGH PE8 5AF	EPR/ZF0331PT /A001	Using waste exemption	Agricultur al Waste Only	Use of waste in construction
B	187m NW	-	WEX079333	Storing waste exemption	On a farm	Storage of sludge
B	192m NW	-	WEX257838	Storing waste exemption	On a farm	Storage of sludge
C	495m NE	BROOK FARM, LOWER BENEFIELD, PETERBOROUGH, PE8 5AE	WEX014620	Disposing of waste exemption	On a farm	Deposit of waste from dredging of inland waters
C	495m NE	BROOK FARM, LOWER BENEFIELD, PETERBOROUGH, PE8 5AE	WEX014620	Disposing of waste exemption	On a farm	Deposit of agricultural waste consisting of plant tissue under a Plant Health notice
C	495m NE	BROOK FARM, LOWER BENEFIELD, PETERBOROUGH, PE8 5AE	WEX014620	Disposing of waste exemption	On a farm	Burning waste in the open
C	495m NE	BROOK FARM, LOWER BENEFIELD, PETERBOROUGH, PE8 5AE	WEX014620	Treating waste exemption	On a farm	Treatment of waste wood and waste plant matter by chipping, shredding, cutting or pulverising
C	495m NE	BROOK FARM, LOWER BENEFIELD, PETERBOROUGH, PE8 5AE	WEX014620	Using waste exemption	On a farm	Use of waste in construction

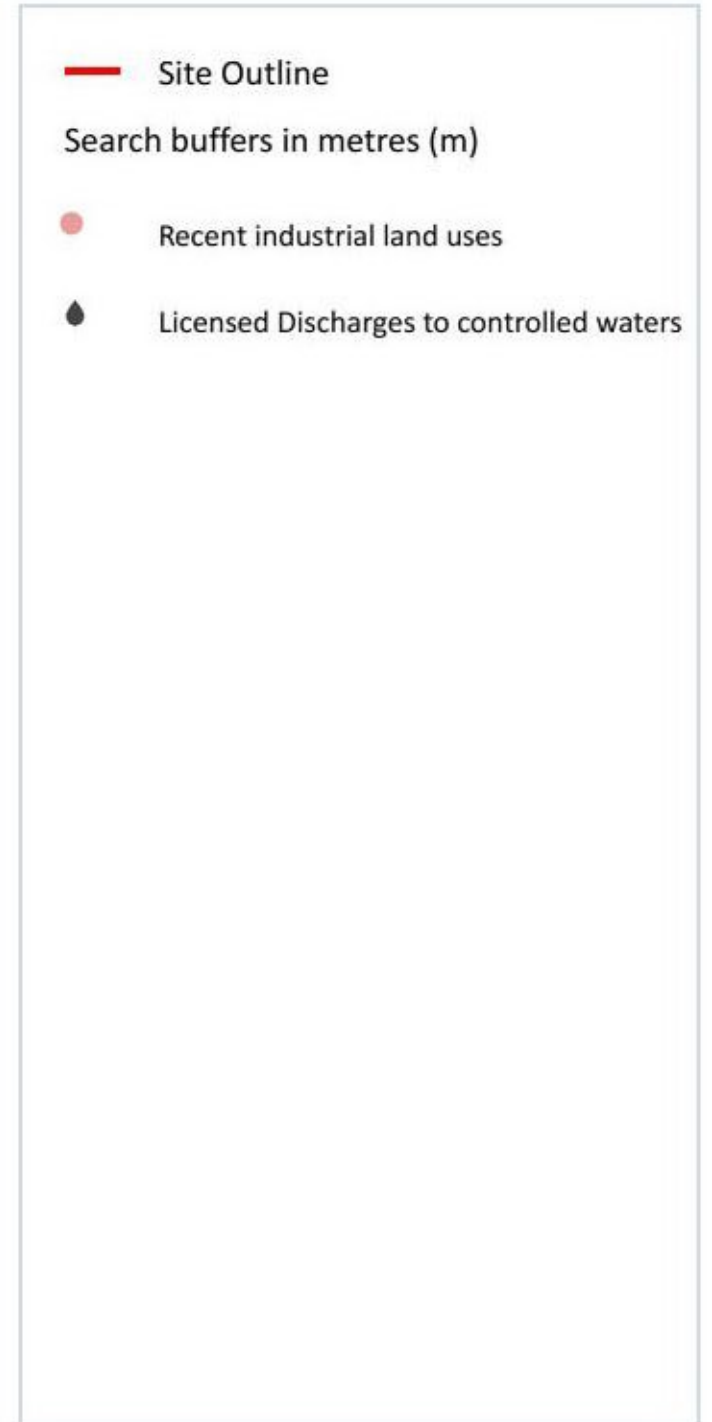
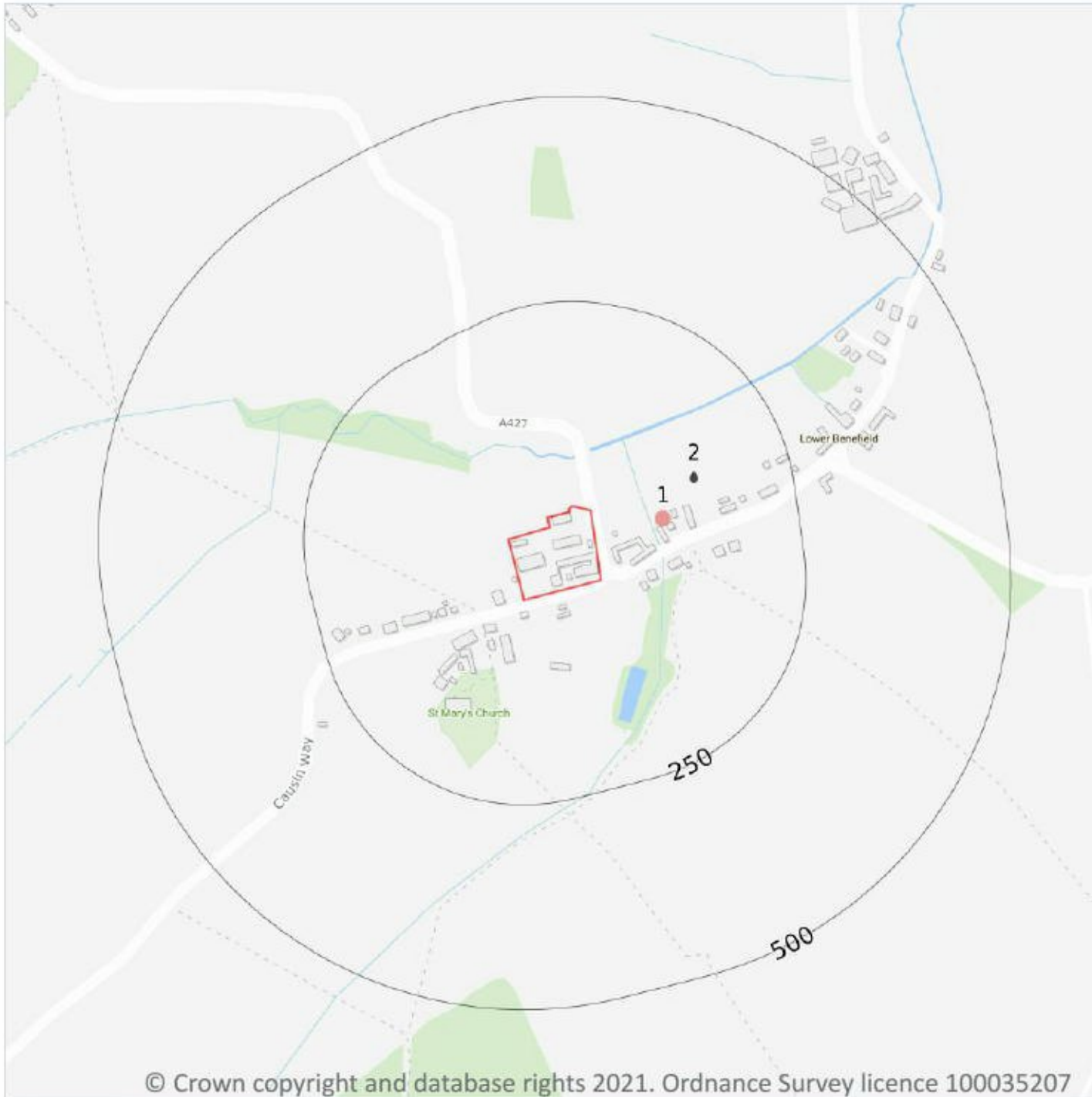


ID	Location	Site	Reference	Category	Sub-Category	Description
C	495m NE	BROOK FARM, LOWER BENEFIELD, PETERBOROUGH, PE8 5AE	WEX014620	Using waste exemption	On a farm	Spreading waste on agricultural land to confer benefit
C	495m NE	BROOK FARM, LOWER BENEFIELD, PETERBOROUGH, PE8 5AE	WEX014620	Using waste exemption	On a farm	Incorporation of ash into soil
C	495m NE	BROOK FARM, LOWER BENEFIELD, PETERBOROUGH, PE8 5AE	WEX014620	Using waste exemption	On a farm	Burning of waste as a fuel in a small appliance
C	495m NE	BROOK FARM, LOWER BENEFIELD, PETERBOROUGH, PE8 5AE	WEX014620	Using waste exemption	On a farm	Use of waste for a specified purpose

*This data is sourced from the Environment Agency and Natural Resources Wales.*



## 4 Current industrial land use



### 4.1 Recent industrial land uses

**Records within 250m** **1**

Current potentially contaminative industrial sites.

Features are displayed on the Current industrial land use map on **page 24**

ID	Location	Company	Address	Activity	Category
1	86m E	Telephone Exchange	Northamptonshire, PE8	Telecommunications Features	Infrastructure and Facilities

*This data is sourced from Ordnance Survey.*

## 4.2 Current or recent petrol stations

Records within 500m

0

Open, closed, under development and obsolete petrol stations.

*This data is sourced from Experian.*

## 4.3 Electricity cables

Records within 500m

0

High voltage underground electricity transmission cables.

*This data is sourced from National Grid.*

## 4.4 Gas pipelines

Records within 500m

0

High pressure underground gas transmission pipelines.

*This data is sourced from National Grid.*

## 4.5 Sites determined as Contaminated Land

Records within 500m

0

Contaminated Land Register of sites designated under Part 2a of the Environmental Protection Act 1990.

*This data is sourced from Local Authority records.*

## 4.6 Control of Major Accident Hazards (COMAH)

Records within 500m

0

Control of Major Accident Hazards (COMAH) sites. This data includes upper and lower tier sites, and includes a historical archive of COMAH sites and Notification of Installations Handling Hazardous Substances (NIHHS) records.

*This data is sourced from the Health and Safety Executive.*

## 4.7 Regulated explosive sites

<b>Records within 500m</b>	<b>0</b>
----------------------------	----------

Sites registered and licensed by the Health and Safety Executive under the Manufacture and Storage of Explosives Regulations 2005 (MSER). The last update to this data was in April 2011.

*This data is sourced from the Health and Safety Executive.*

## 4.8 Hazardous substance storage/usage

<b>Records within 500m</b>	<b>0</b>
----------------------------	----------

Consents granted for a site to hold certain quantities of hazardous substances at or above defined limits in accordance with the Planning (Hazardous Substances) Regulations 2015.

*This data is sourced from Local Authority records.*

## 4.9 Historical licensed industrial activities (IPC)

<b>Records within 500m</b>	<b>0</b>
----------------------------	----------

Integrated Pollution Control (IPC) records of substance releases to air, land and water. This data represents a historical archive as the IPC regime has been superseded.

*This data is sourced from the Environment Agency and Natural Resources Wales.*

## 4.10 Licensed industrial activities (Part A(1))

<b>Records within 500m</b>	<b>0</b>
----------------------------	----------

Records of Part A(1) installations regulated under the Environmental Permitting (England and Wales) Regulations 2016 for the release of substances to the environment.

*This data is sourced from the Environment Agency and Natural Resources Wales.*

## 4.11 Licensed pollutant release (Part A(2)/B)

<b>Records within 500m</b>	<b>0</b>
----------------------------	----------

Records of Part A(2) and Part B installations regulated under the Environmental Permitting (England and Wales) Regulations 2016 for the release of substances to the environment.

*This data is sourced from Local Authority records.*



## 4.12 Radioactive Substance Authorisations

Records within 500m

0

Records of the storage, use, accumulation and disposal of radioactive substances regulated under the Radioactive Substances Act 1993.

*This data is sourced from the Environment Agency and Natural Resources Wales.*

## 4.13 Licensed Discharges to controlled waters

Records within 500m

1

Discharges of treated or untreated effluent to controlled waters under the Water Resources Act 1991.

Features are displayed on the Current industrial land use map on **page 24**

ID	Location	Address	Details	
2	132m E	TELEPHONE EXCHANGE AT LOWER BENEFIE, NORTHANTS	Effluent Type: UNSPECIFIED Permit Number: PR5LF3834 Permit Version: 1 Receiving Water: Land	Status: PRE NRA LEGISLATION WHERE ISSUE DATE 01-SEP-89 (HISTORIC ONLY) Issue date: 03/06/1982 Effective Date: 03/06/1982 Revocation Date: 09/09/1997

*This data is sourced from the Environment Agency and Natural Resources Wales.*

## 4.14 Pollutant release to surface waters (Red List)

Records within 500m

0

Discharges of specified substances under the Environmental Protection (Prescribed Processes and Substances) Regulations 1991.

*This data is sourced from the Environment Agency and Natural Resources Wales.*

## 4.15 Pollutant release to public sewer

Records within 500m

0

Discharges of Special Category Effluents to the public sewer.

*This data is sourced from the Environment Agency and Natural Resources Wales.*

## 4.16 List 1 Dangerous Substances

Records within 500m

0

Discharges of substances identified on List I of European Directive E 2006/11/EC, and regulated under the Environmental Damage (Prevention and Remediation) Regulations 2015.

*This data is sourced from the Environment Agency and Natural Resources Wales.*

## 4.17 List 2 Dangerous Substances

Records within 500m

0

Discharges of substances identified on List II of European Directive E 2006/11/EC, and regulated under the Environmental Damage (Prevention and Remediation) Regulations 2015.

*This data is sourced from the Environment Agency and Natural Resources Wales.*

## 4.18 Pollution Incidents (EA/NRW)

Records within 500m

0

Records of substantiated pollution incidents. Since 2006 this data has only included category 1 (major) and 2 (significant) pollution incidents.

*This data is sourced from the Environment Agency and Natural Resources Wales.*

## 4.19 Pollution inventory substances

Records within 500m

0

The pollution inventory (substances) includes reporting on annual emissions of certain regulated substances to air, controlled waters and land. A reporting threshold for each substance is also included. Where emissions fall below the reporting threshold, no value will be given. The data is given for the most recent complete year available.

*This data is sourced from the Environment Agency and the Scottish Environment Protection Agency.*

## 4.20 Pollution inventory waste transfers

Records within 500m

0

The pollution inventory (waste transfers) includes reporting on annual transfers and recovery/disposal of controlled wastes from a site. A reporting threshold for each waste type is also included. Where releases fall below the reporting threshold, no value will be given. The data is given for the most recent complete year available.

*This data is sourced from the Environment Agency and the Scottish Environment Protection Agency.*



## 4.21 Pollution inventory radioactive waste

Records within 500m

0

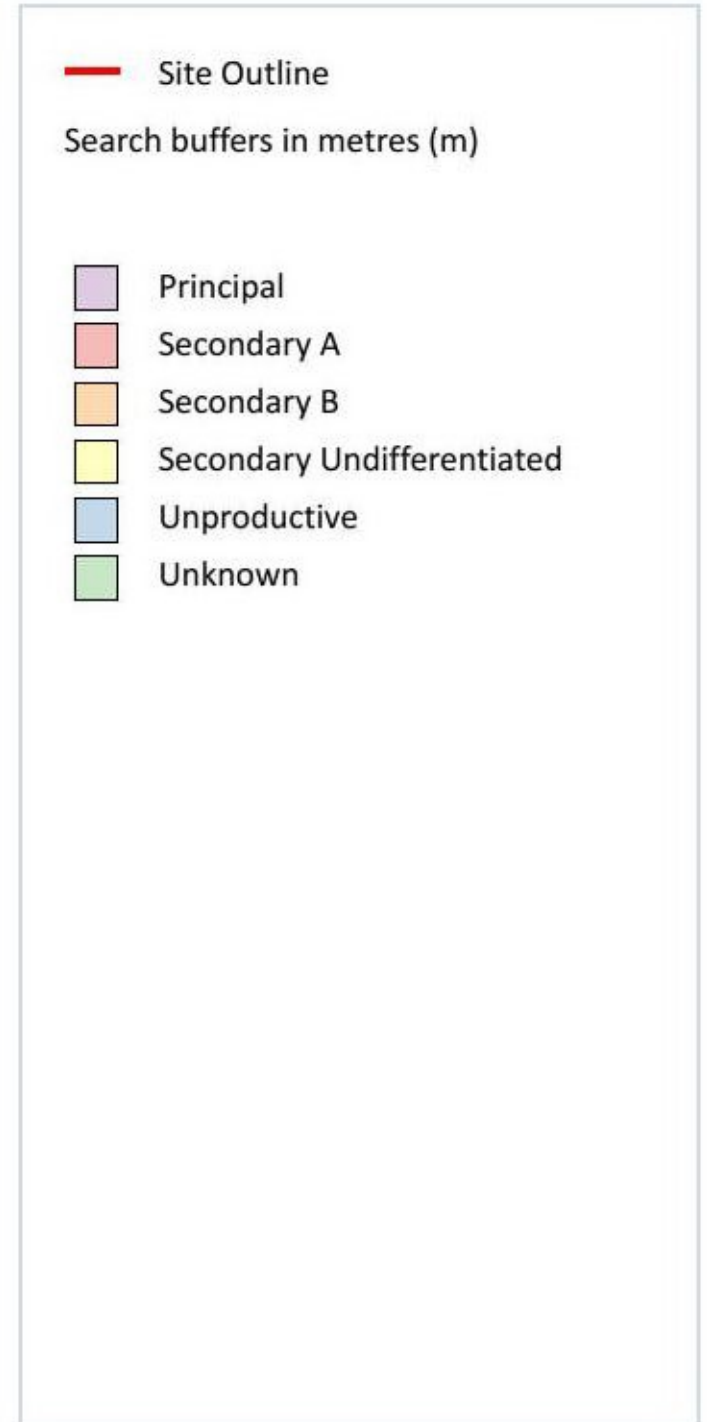
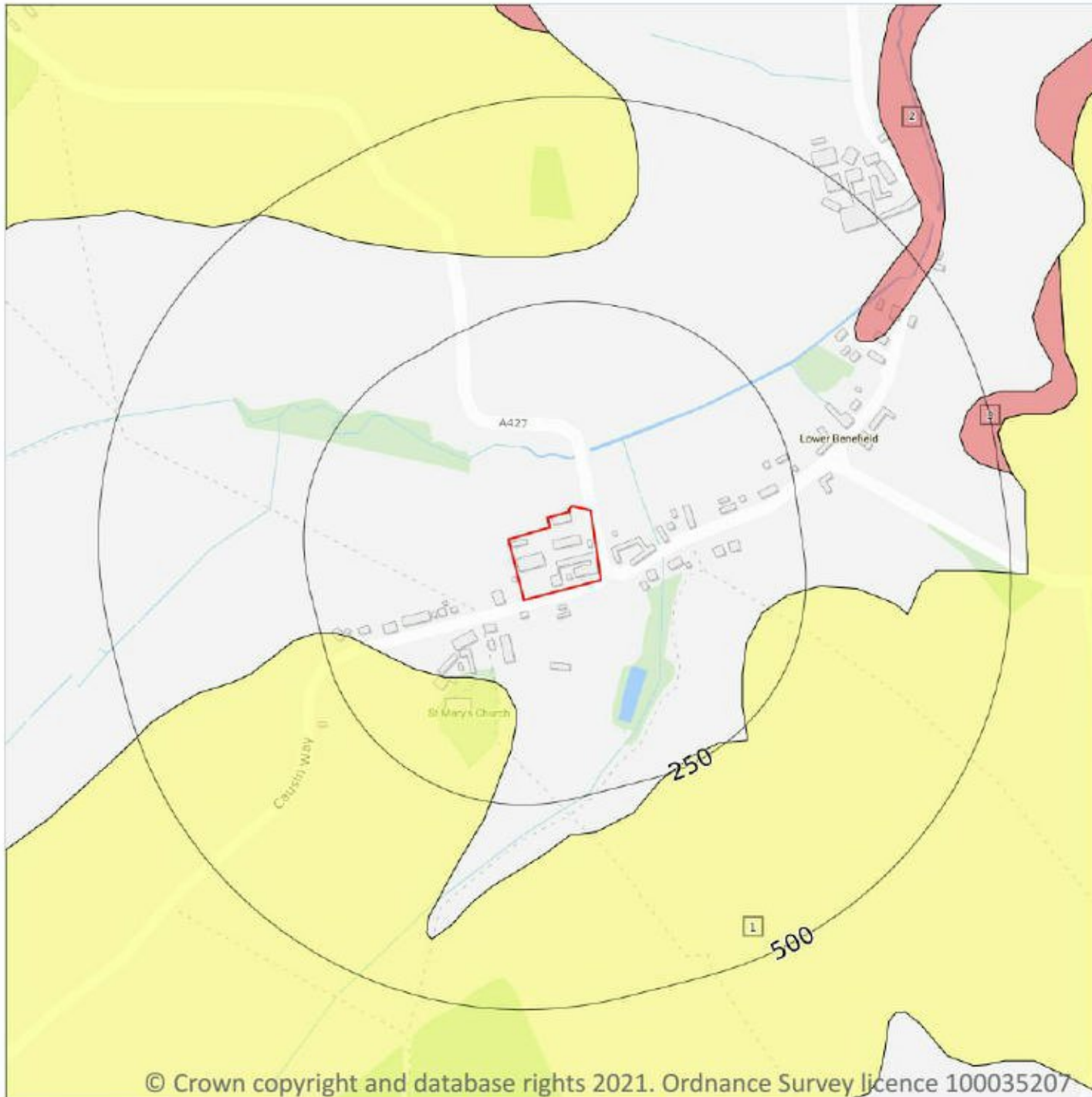
The pollution inventory (radioactive wastes) includes reporting on annual releases of radioactive substances from a site, including the means of release. Where releases fall below the reporting threshold, no value will be given. The data is given for the most recent complete year available.

*This data is sourced from the Environment Agency and the Scottish Environment Protection Agency.*





## 5 Hydrogeology - Superficial aquifer



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### 5.1 Superficial aquifer

**Records within 500m**

**3**

Aquifer status of groundwater held within superficial geology.

Features are displayed on the Hydrogeology map on **page 30**

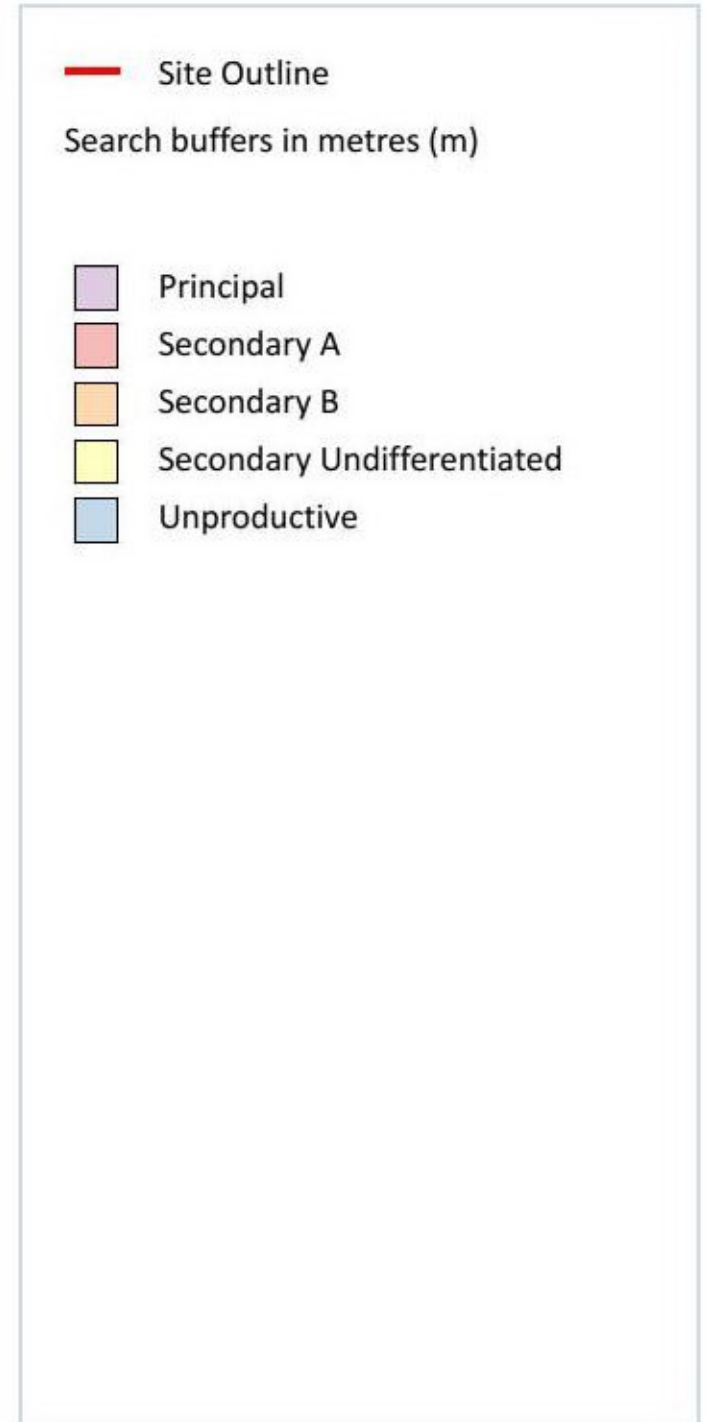
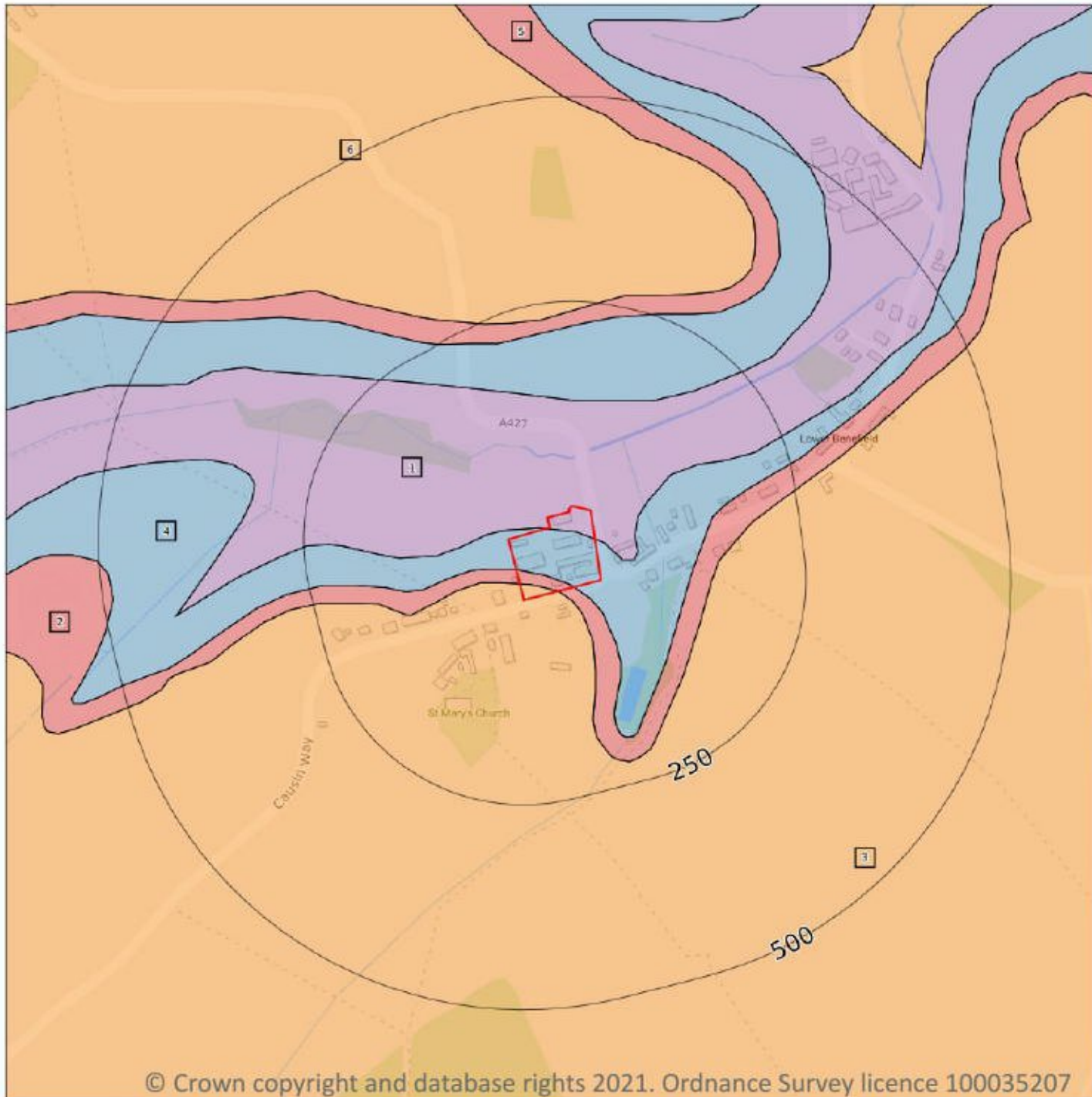
ID	Location	Designation	Description
1	106m S	Secondary Undifferentiated	Assigned where it is not possible to attribute either category A or B to a rock type. In general these layers have previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type
2	386m NE	Secondary A	Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers

ID	Location	Designation	Description
3	459m E	Secondary A	Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers

*This data is sourced from the British Geological Survey, the Environment Agency and Natural Resources Wales.*



## Bedrock aquifer



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### 5.2 Bedrock aquifer

Records within 500m

6

Aquifer status of groundwater held within bedrock geology.

Features are displayed on the Bedrock aquifer map on **page 32**

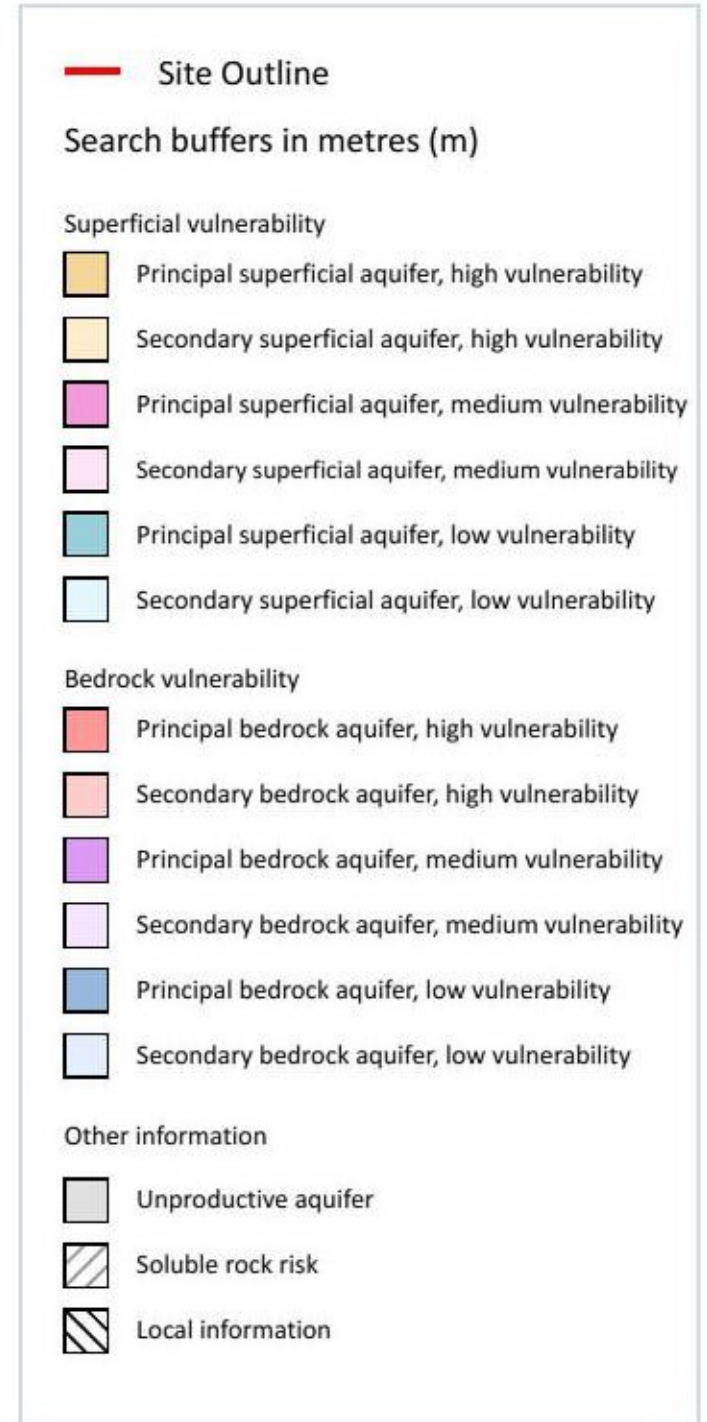
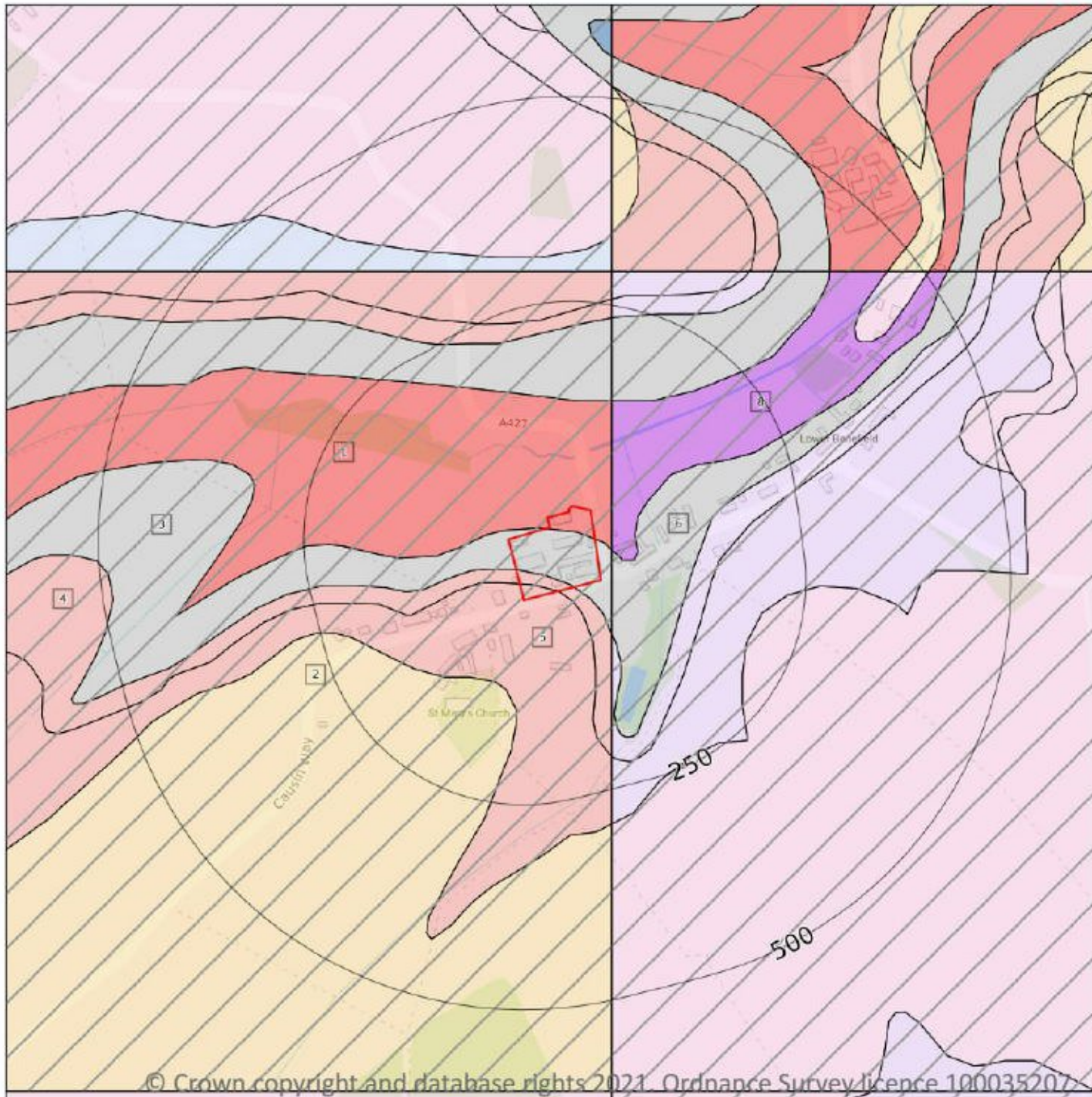
ID	Location	Designation	Description
1	On site	Principal	Geology of high intergranular and/or fracture permeability, usually providing a high level of water storage and may support water supply/river base flow on a strategic scale. Generally principal aquifers were previously major aquifers
2	On site	Secondary A	Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers

ID	Location	Designation	Description
3	On site	Secondary B	<b>Predominantly lower permeability layers which may store/yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering. These are generally the water-bearing parts of the former non-aquifers</b>
4	On site	Unproductive	<b>These are rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow</b>
5	214m N	Secondary A	Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers
6	230m N	Secondary B	Predominantly lower permeability layers which may store/yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering. These are generally the water-bearing parts of the former non-aquifers

*This data is sourced from the British Geological Survey, the Environment Agency and Natural Resources Wales.*



## Groundwater vulnerability



### 5.3 Groundwater vulnerability

Records within 50m

6

An assessment of the vulnerability of groundwater to a pollutant discharged at ground level based on the hydrological, geological, hydrogeological and soil properties within a one kilometre square grid. Groundwater vulnerability is described as High, Medium or Low as follows:

- High - Areas able to easily transmit pollution to groundwater. They are likely to be characterised by high leaching soils and the absence of low permeability superficial deposits.
- Medium - Intermediate between high and low vulnerability.
- Low - Areas that provide the greatest protection from pollution. They are likely to be characterised by low leaching soils and/or the presence of superficial deposits characterised by a low permeability.

Features are displayed on the Groundwater vulnerability map on **page 34**

ID	Location	Summary	Soil / surface	Superficial geology	Bedrock geology
1	On site	<b>Summary Classification:</b> Principal bedrock aquifer - High Vulnerability <b>Combined classification:</b> Productive Bedrock Aquifer, No Superficial Aquifer	<b>Leaching class: High</b> <b>Infiltration value: 40-70%</b> <b>Dilution value:</b> <300mm/year	<b>Vulnerability: -</b> <b>Aquifer type: -</b> <b>Thickness: 3-10m</b> <b>Patchiness value: &lt;90%</b> <b>Recharge potential: Low</b>	<b>Vulnerability: High</b> <b>Aquifer type: Principal</b> <b>Flow mechanism: Well</b> <b>connected fractures</b>
3	On site	<b>Summary Classification:</b> Unproductive aquifer (may have productive aquifer beneath) <b>Combined classification:</b> Unproductive Bedrock Aquifer, No Superficial Aquifer	<b>Leaching class: High</b> <b>Infiltration value: 40-70%</b> <b>Dilution value:</b> <300mm/year	<b>Vulnerability: -</b> <b>Aquifer type: -</b> <b>Thickness: 3-10m</b> <b>Patchiness value: &lt;90%</b> <b>Recharge potential: Low</b>	<b>Vulnerability:</b> <b>Unproductive</b> <b>Aquifer type:</b> <b>Unproductive</b> <b>Flow mechanism: Well</b> <b>connected fractures</b>
4	On site	<b>Summary Classification:</b> Secondary bedrock aquifer - High Vulnerability <b>Combined classification:</b> Productive Bedrock Aquifer, No Superficial Aquifer	<b>Leaching class: High</b> <b>Infiltration value: 40-70%</b> <b>Dilution value:</b> <300mm/year	<b>Vulnerability: -</b> <b>Aquifer type: -</b> <b>Thickness: 3-10m</b> <b>Patchiness value: &lt;90%</b> <b>Recharge potential: Low</b>	<b>Vulnerability: High</b> <b>Aquifer type: Secondary</b> <b>Flow mechanism: Well</b> <b>connected fractures</b>
5	On site	<b>Summary Classification:</b> Secondary bedrock aquifer - High Vulnerability <b>Combined classification:</b> Productive Bedrock Aquifer, No Superficial Aquifer	<b>Leaching class: High</b> <b>Infiltration value: 40-70%</b> <b>Dilution value:</b> <300mm/year	<b>Vulnerability: -</b> <b>Aquifer type: -</b> <b>Thickness: 3-10m</b> <b>Patchiness value: &lt;90%</b> <b>Recharge potential: Low</b>	<b>Vulnerability: High</b> <b>Aquifer type: Secondary</b> <b>Flow mechanism: Well</b> <b>connected fractures</b>
6	13m E	<b>Summary Classification:</b> Unproductive aquifer (may have productive aquifer beneath) <b>Combined classification:</b> Unproductive Bedrock Aquifer, No Superficial Aquifer	<b>Leaching class:</b> Intermediate <b>Infiltration value: 40-70%</b> <b>Dilution value:</b> <300mm/year	<b>Vulnerability: -</b> <b>Aquifer type: -</b> <b>Thickness: 3-10m</b> <b>Patchiness value: &lt;90%</b> <b>Recharge potential: Low</b>	<b>Vulnerability:</b> <b>Unproductive</b> <b>Aquifer type:</b> <b>Unproductive</b> <b>Flow mechanism: Well</b> <b>connected fractures</b>
8	18m E	<b>Summary Classification:</b> Principal bedrock aquifer - Medium Vulnerability <b>Combined classification:</b> Productive Bedrock Aquifer, No Superficial Aquifer	<b>Leaching class:</b> Intermediate <b>Infiltration value: 40-70%</b> <b>Dilution value:</b> <300mm/year	<b>Vulnerability: -</b> <b>Aquifer type: -</b> <b>Thickness: 3-10m</b> <b>Patchiness value: &lt;90%</b> <b>Recharge potential: Low</b>	<b>Vulnerability: Medium</b> <b>Aquifer type: Principal</b> <b>Flow mechanism: Well</b> <b>connected fractures</b>

*This data is sourced from the British Geological Survey, the Environment Agency and Natural Resources Wales.*



## 5.4 Groundwater vulnerability- soluble rock risk

**Records on site****1**

This dataset identifies areas where solution features that enable rapid movement of a pollutant may be present within a 1km grid square.

ID	Maximum soluble risk category	Percentage of grid square covered by maximum risk
2	<b>Significant soluble rocks are likely to be present. Problems unlikely except with considerable surface or subsurface water flow.</b>	25.0%

*This data is sourced from the British Geological Survey and the Environment Agency.*

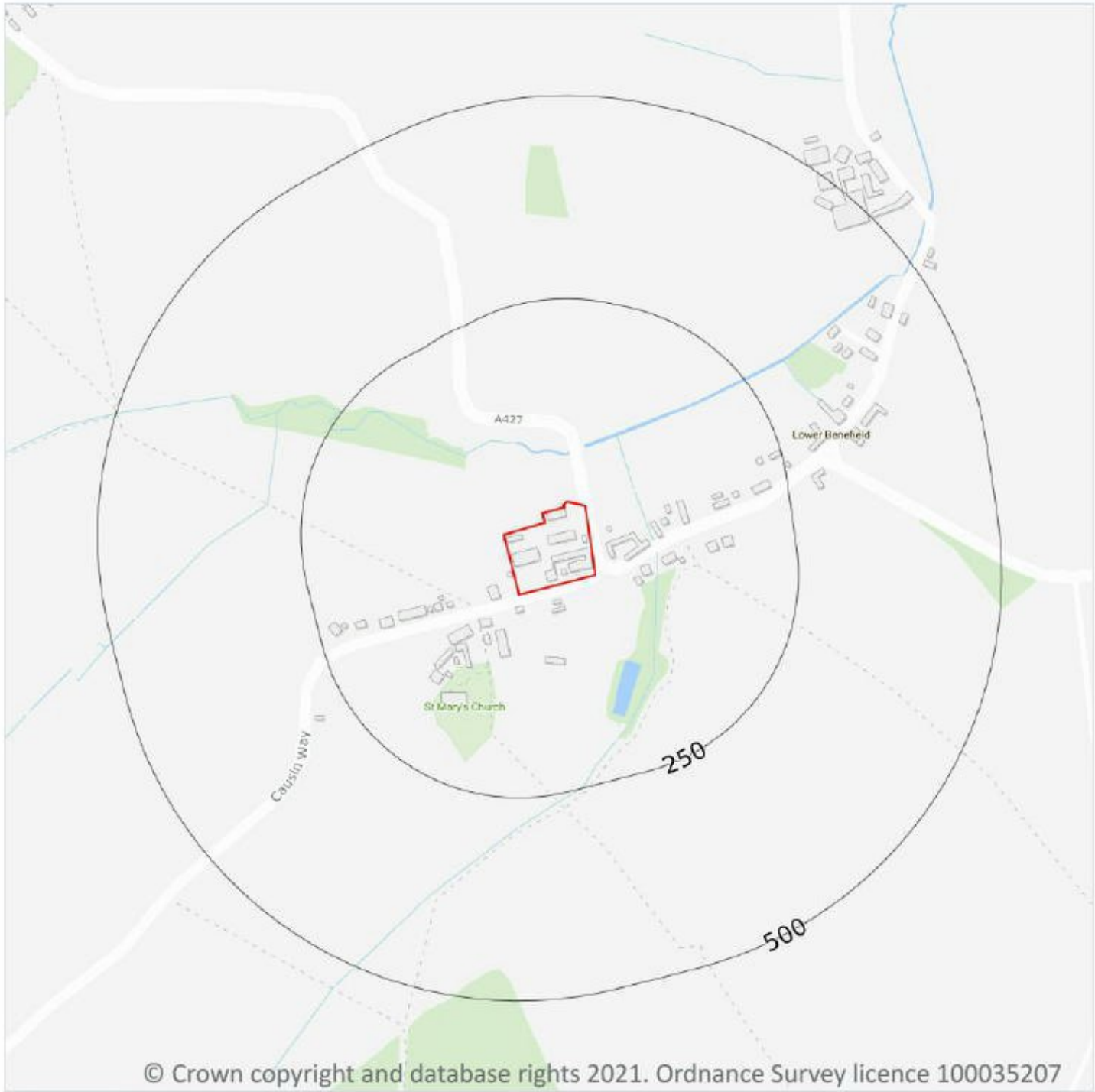
## 5.5 Groundwater vulnerability- local information

**Records on site****0**

This dataset identifies areas where additional local information affecting vulnerability is held by the Environment Agency. Further information can be obtained by contacting the Environment Agency local Area groundwater team through the Environment Agency National Customer Call Centre on 03798 506 506 or by email on [enquiries@environment-agency.gov.uk](mailto:enquiries@environment-agency.gov.uk).

*This data is sourced from the British Geological Survey and the Environment Agency.*

# Abstractions and Source Protection Zones



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## 5.6 Groundwater abstractions

**Records within 2000m** **1**

Licensed groundwater abstractions for sites extracting more than 20 cubic metres of water a day and includes active and historical records. The data may be for a single abstraction point, between two points (line data) or a larger area.

Features are displayed on the Abstractions and Source Protection Zones map on **page 37**



ID	Location	Details	
-	1565m SE	Status: Historical Licence No: 5/32/09/*G/0140 Details: General Farming & Domestic Direct Source: GROUND WATER SOURCE OF SUPPLY Point: BOREHOLE, CHURCHFIELD FARM Data Type: Point Name: F R BERRIDGE & SON Easting: 500330 Northing: 287820	Annual Volume (m <sup>3</sup> ): - Max Daily Volume (m <sup>3</sup> ): - Original Application No: - Original Start Date: 01/01/1966 Expiry Date: - Issue No: 100 Version Start Date: 01/01/1966 Version End Date: -

*This data is sourced from the Environment Agency and Natural Resources Wales.*

## 5.7 Surface water abstractions

<b>Records within 2000m</b>	<b>0</b>
-----------------------------	----------

Licensed surface water abstractions for sites extracting more than 20 cubic metres of water a day and includes active and historical records. The data may be for a single abstraction point, a stretch of watercourse or a larger area.

*This data is sourced from the Environment Agency and Natural Resources Wales.*

## 5.8 Potable abstractions

<b>Records within 2000m</b>	<b>0</b>
-----------------------------	----------

Licensed potable water abstractions for sites extracting more than 20 cubic metres of water a day and includes active and historical records. The data may be for a single abstraction point, a stretch of watercourse or a larger area.

*This data is sourced from the Environment Agency and Natural Resources Wales.*

## 5.9 Source Protection Zones

<b>Records within 500m</b>	<b>0</b>
----------------------------	----------

Source Protection Zones define the sensitivity of an area around a potable abstraction site to contamination.

*This data is sourced from the Environment Agency and Natural Resources Wales.*

## 5.10 Source Protection Zones (confined aquifer)

Records within 500m

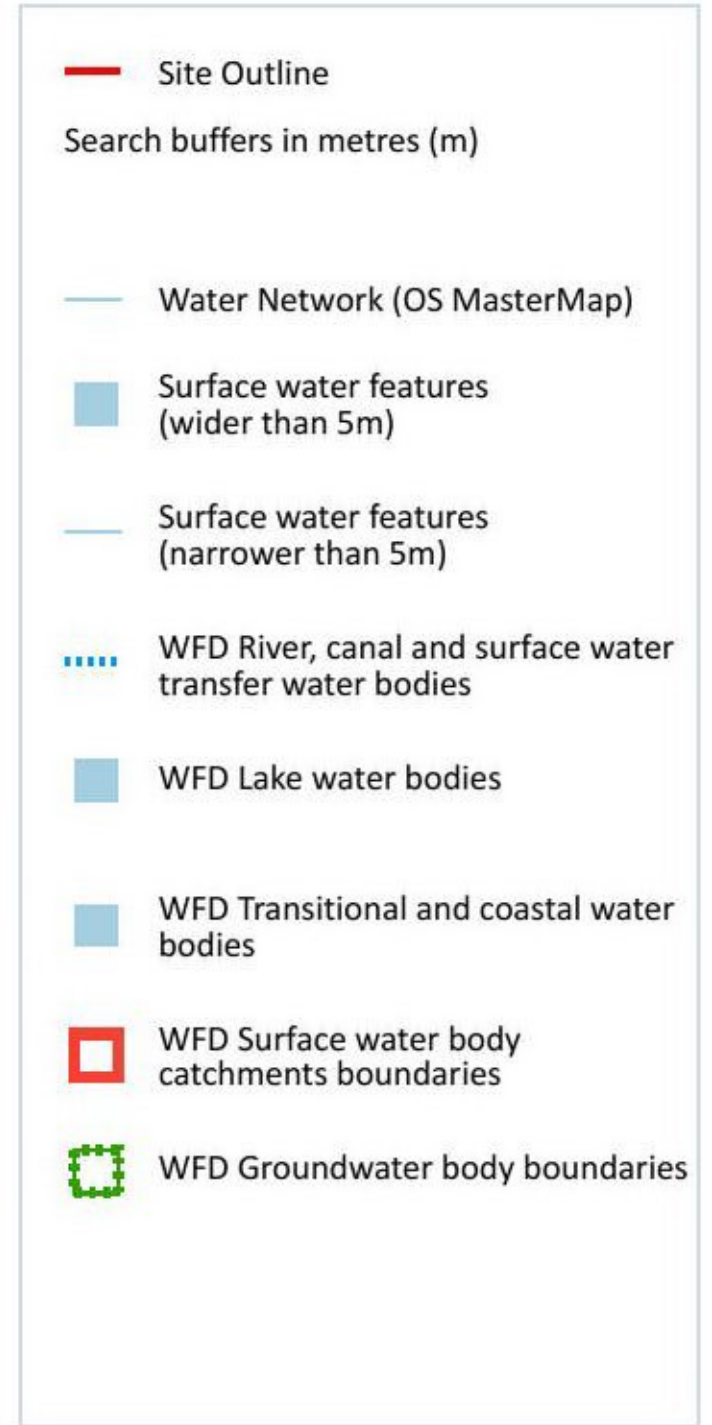
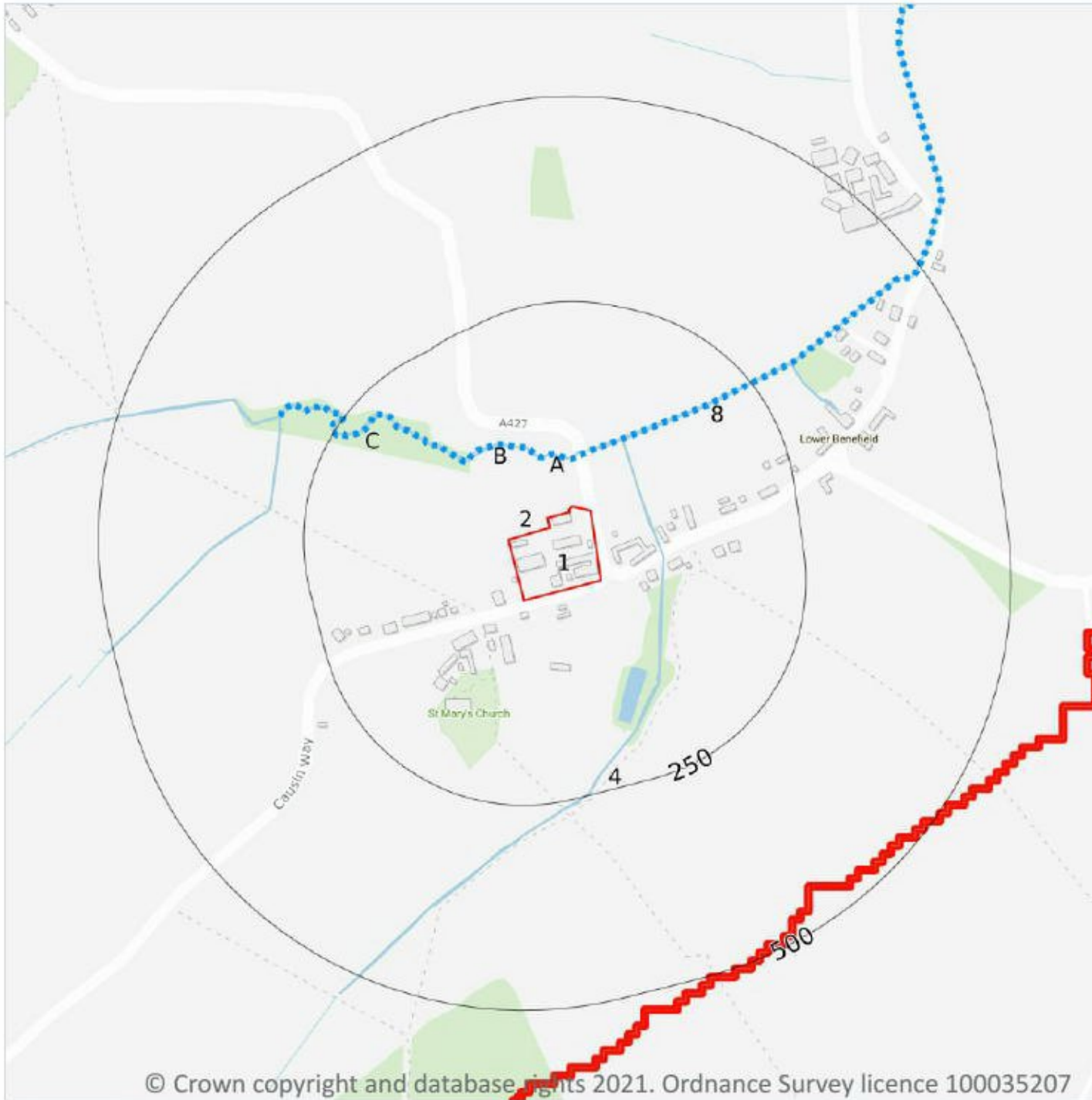
0

Source Protection Zones in the confined aquifer define the sensitivity around a deep groundwater abstraction to contamination. A confined aquifer would normally be protected from contamination by overlying geology and is only considered a sensitive resource if deep excavation/drilling is taking place.

*This data is sourced from the Environment Agency and Natural Resources Wales.*



## 6 Hydrology



### 6.1 Water Network (OS MasterMap)

Records within 250m

8

Detailed water network of Great Britain showing the flow and precise central course of every river, stream, lake and canal.

Features are displayed on the Hydrology map on **page 40**

ID	Location	Type of water feature	Ground level	Permanence	Name
A	58m N	Inland river not influenced by normal tidal action.	On ground surface	Watercourse contains water year round (in normal circumstances)	-

ID	Location	Type of water feature	Ground level	Permanence	Name
4	63m E	Inland river not influenced by normal tidal action.	On ground surface	Watercourse contains water year round (in normal circumstances)	-
A	66m N	Inland river not influenced by normal tidal action.	Underground	Watercourse contains water year round (in normal circumstances)	-
A	71m N	Inland river not influenced by normal tidal action.	On ground surface	Watercourse contains water year round (in normal circumstances)	-
B	93m NW	Inland river not influenced by normal tidal action.	On ground surface	Watercourse contains water year round (in normal circumstances)	-
8	96m NE	Inland river not influenced by normal tidal action.	On ground surface	Watercourse contains water year round (in normal circumstances)	-
C	108m NW	Inland river not influenced by normal tidal action.	On ground surface	Watercourse contains water year round (in normal circumstances)	-
B	108m NW	Inland river not influenced by normal tidal action.	On ground surface	Watercourse contains water year round (in normal circumstances)	-

*This data is sourced from the Ordnance Survey.*

## 6.2 Surface water features

<b>Records within 250m</b>	<b>10</b>
----------------------------	-----------

Covering rivers, streams and lakes (some overlap with OS MasterMap Water Network data in previous section) but additionally covers smaller features such as ponds. Rivers and streams narrower than 5m are represented as a single line. Lakes, ponds and rivers or streams wider than 5m are represented as polygons.

Features are displayed on the Hydrology map on **page 40**

*This data is sourced from the Ordnance Survey.*

## 6.3 WFD Surface water body catchments

<b>Records on site</b>	<b>1</b>
------------------------	----------

The Water Framework Directive is an EU-led framework for the protection of inland surface waters, estuaries, coastal waters and groundwater through river basin-level management planning. In terms of surface water, these basins are broken down into smaller units known as management, operational and water body catchments.



Features are displayed on the Hydrology map on **page 40**

ID	Location	Type	Water body catchment	Water body ID	Operational catchment	Management catchment
2	On site	River WB catchment	Glaphorn Brook	GB105032045250	Middle Nene	Nene

*This data is sourced from the Environment Agency and Natural Resources Wales.*

## 6.4 WFD Surface water bodies

<b>Records identified</b>	<b>1</b>
---------------------------	----------

Surface water bodies under the Directive may be rivers, lakes, estuary or coastal. To achieve the purpose of the Directive, environmental objectives have been set and are reported on for each water body. The progress towards delivery of the objectives is then reported on by the relevant competent authorities at the end of each six-year cycle. The river water body directly associated with the catchment listed in the previous section is detailed below, along with any lake, canal, coastal or artificial water body within 250m of the site. Click on the water body ID in the table to visit the EA Catchment Explorer to find out more about each water body listed.

Features are displayed on the Hydrology map on **page 40**

ID	Location	Type	Name	Water body ID	Overall rating	Chemical rating	Ecological rating	Year
3	58m N	River	Glaphorn Brook	<a href="#">GB105032045250</a>	Poor	Good	Poor	2016

*This data is sourced from the Environment Agency and Natural Resources Wales.*

## 6.5 WFD Groundwater bodies

<b>Records on site</b>	<b>1</b>
------------------------	----------

Groundwater bodies are also covered by the Directive and the same regime of objectives and reporting detailed in the previous section is in place. Click on the water body ID in the table to visit the EA Catchment Explorer to find out more about each groundwater body listed.

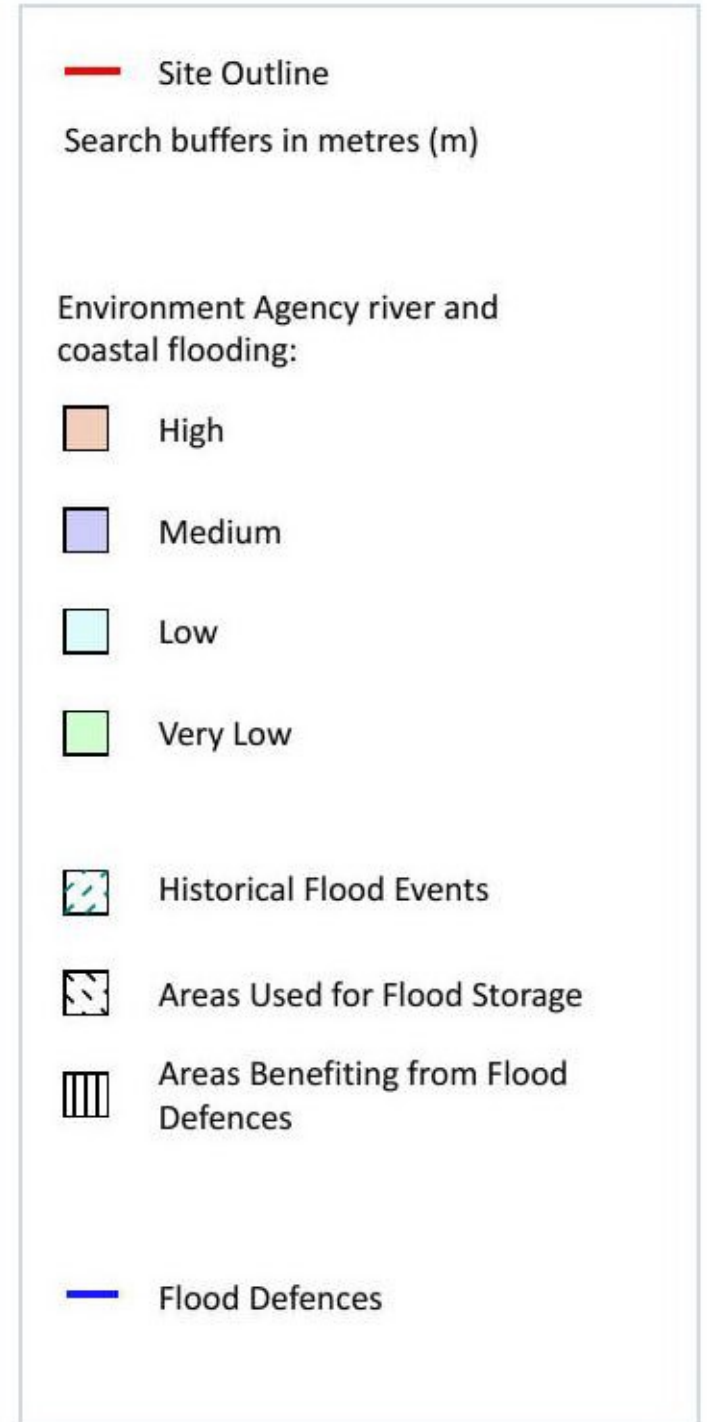
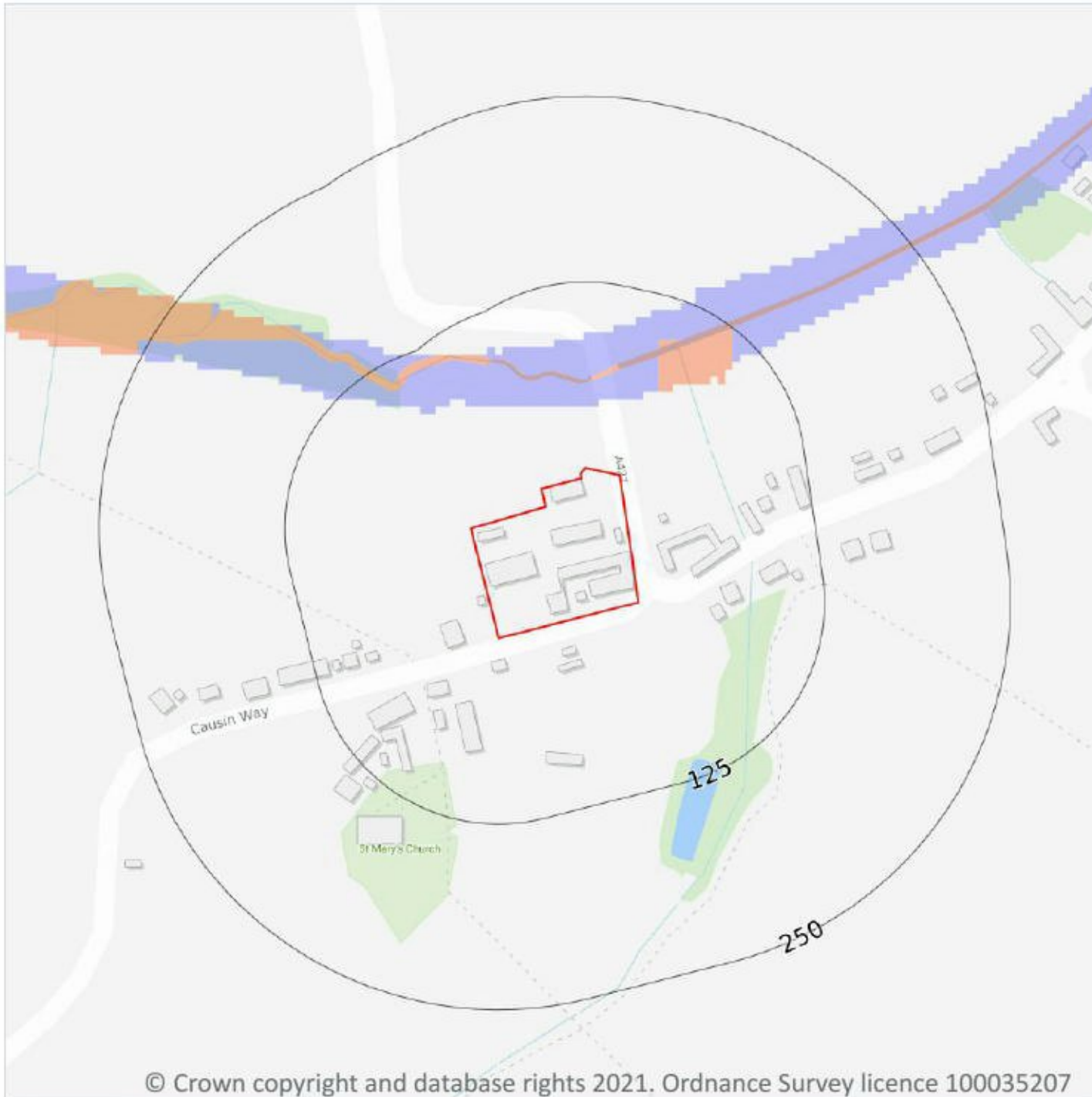
Features are displayed on the Hydrology map on **page 40**

ID	Location	Name	Water body ID	Overall rating	Chemical rating	Quantitative	Year
1	On site	Nene Northampton Sands	<a href="#">GB40501G445400</a>	Poor	Poor	Good	2015

*This data is sourced from the Environment Agency and Natural Resources Wales.*



## 7 River and coastal flooding



### 7.1 Risk of Flooding from Rivers and Sea (RoFRaS)

Records within 50m

1

The chance of flooding from rivers and/or the sea in any given year, based on cells of 50m. Each cell is allocated one of four flood risk categories, taking into account flood defences and their condition; Very low (less than 1 in 1000 chance in any given year), Low (less than 1 in 100 but greater than or equal to 1 in 1000 chance), Medium (less than 1 in 30 but greater than or equal to 1 in 100 chance) or High (greater than or equal to 1 in 30 chance).

Features are displayed on the River and coastal flooding map on **page 43**

Distance	RoFRaS flood risk
On site	N/A
0 - 50m	Medium

*This data is sourced from the Environment Agency and Natural Resources Wales.*

## 7.2 Historical Flood Events

Records within 250m

0

Records of historic flooding from rivers, the sea, groundwater and surface water. Records began in 1946 when predecessor bodies started collecting detailed information about flooding incidents, although limited details may be included on flooding incidents prior to this date. Takes into account the presence of defences, structures, and other infrastructure where they existed at the time of flooding, and includes flood extents that may have been affected by overtopping, breaches or blockages.

*This data is sourced from the Environment Agency and Natural Resources Wales.*

## 7.3 Flood Defences

Records within 250m

0

Records of flood defences owned, managed or inspected by the Environment Agency and Natural Resources Wales. Flood defences can be structures, buildings or parts of buildings. Typically these are earth banks, stone and concrete walls, or sheet-piling that is used to prevent or control the extent of flooding.

*This data is sourced from the Environment Agency and Natural Resources Wales.*

## 7.4 Areas Benefiting from Flood Defences

Records within 250m

0

Areas that would benefit from the presence of flood defences in a 1 in 100 (1%) chance of flooding each year from rivers or 1 in 200 (0.5%) chance of flooding each year from the sea.

*This data is sourced from the Environment Agency and Natural Resources Wales.*

## 7.5 Flood Storage Areas

Records within 250m

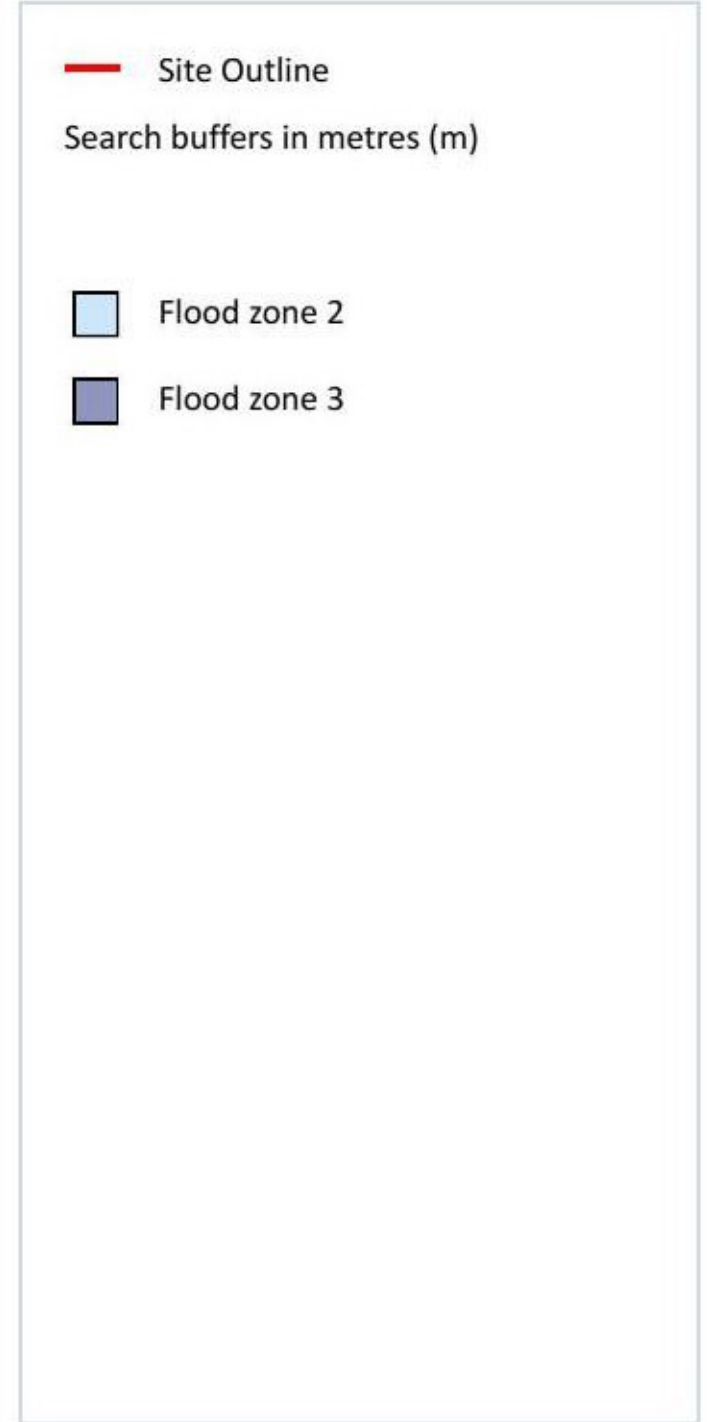
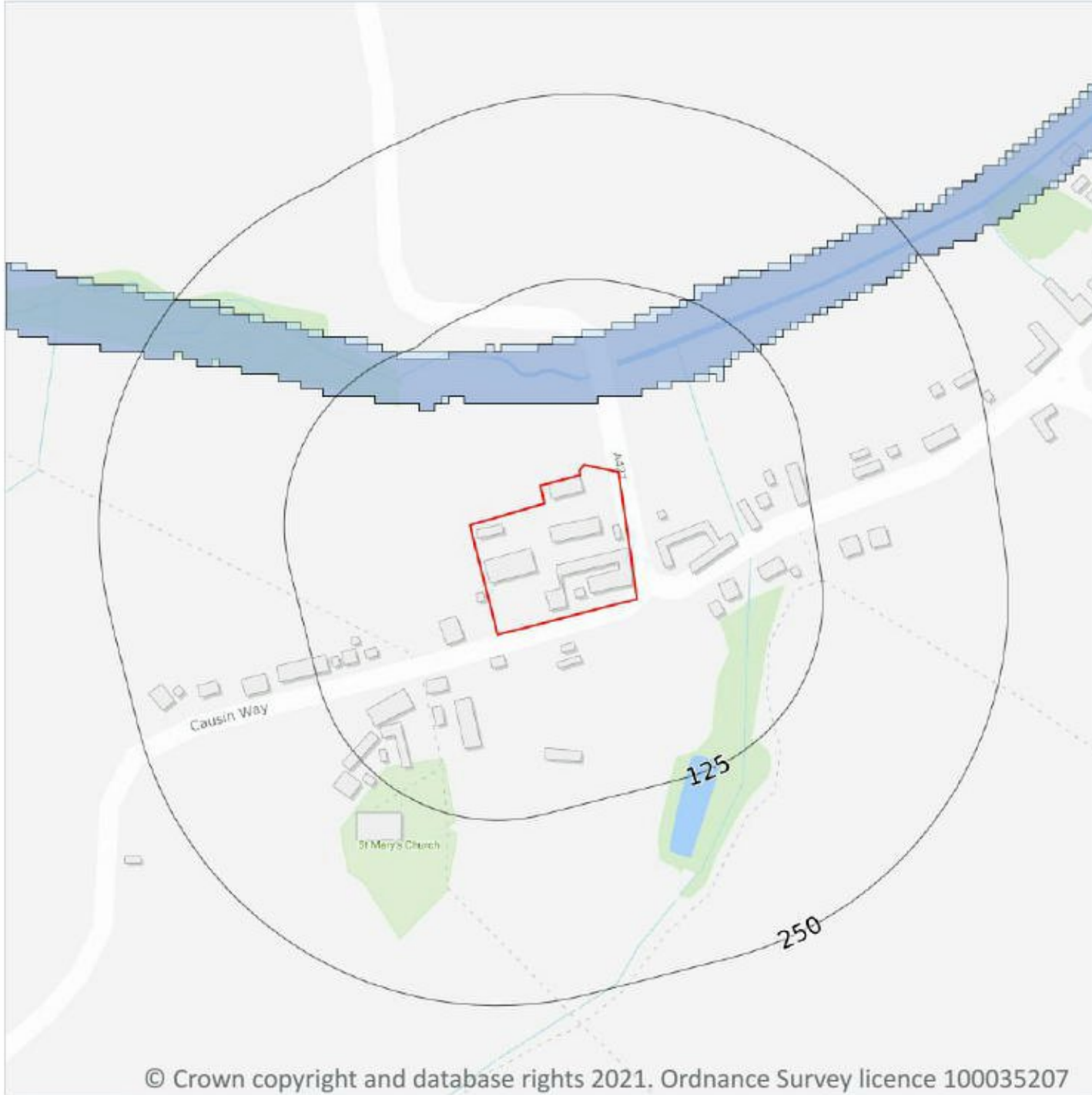
0

Areas that act as a balancing reservoir, storage basin or balancing pond to attenuate an incoming flood peak to a flow level that can be accepted by the downstream channel or to delay the timing of a flood peak so that its volume is discharged over a longer period.

*This data is sourced from the Environment Agency and Natural Resources Wales.*



## River and coastal flooding - Flood Zones



### 7.6 Flood Zone 2

Records within 50m

1

Areas of land at risk of flooding, when the presence of flood defences are ignored. Covering land between Flood Zone 3 (see next section) and the extent of the flooding from rivers or the sea with a 1 in 1000 (0.1%) chance of flooding each year.

Features are displayed on the River and coastal flooding map on **page 43**

Location	Type
41m N	Zone 2 - (Fluvial /Tidal Models)

*This data is sourced from the Environment Agency and Natural Resources Wales.*



## 7.7 Flood Zone 3

### Records within 50m

**1**

Areas of land at risk of flooding, when the presence of flood defences are ignored. Covering land with a 1 in 100 (1%) or greater chance of flooding each year from rivers or a 1 in 200 (0.5%) or greater chance of flooding each year from the sea.

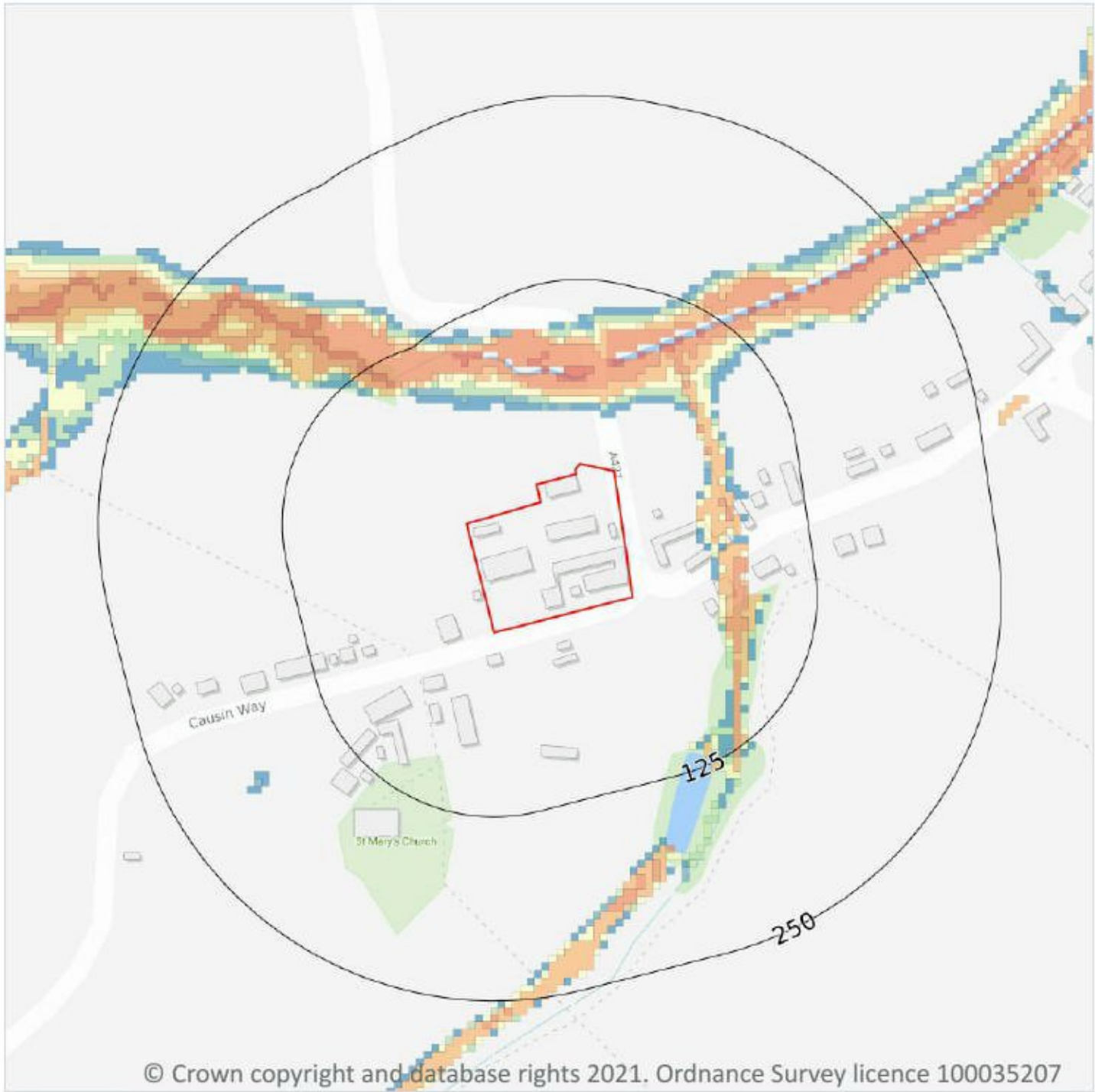
Features are displayed on the River and coastal flooding map on **page 43**

Location	Type
41m N	Zone 3 - (Fluvial Models)

*This data is sourced from the Environment Agency and Natural Resources Wales.*



## 8 Surface water flooding



### 8.1 Surface water flooding

Highest risk on site	Negligible
Highest risk within 50m	1 in 30 year, 0.1m - 0.3m

Ambiental Risk Analytics surface water (pluvial) FloodMap identifies areas likely to flood as a result of extreme rainfall events, i.e. land naturally vulnerable to surface water ponding or flooding. This data set was produced by simulating 1 in 30 year, 1 in 100 year, 1 in 250 year and 1 in 1,000 year rainfall events. Modern urban drainage systems are typically built to cope with rainfall events between 1 in 20 and 1 in 30 years, though some older ones may flood in a 1 in 5 year rainfall event.

Features are displayed on the Surface water flooding map on **page 47**

The data shown on the map and in the table above shows the highest likelihood of flood events happening at the site. Lower likelihood events may have greater flood depths and hence a greater potential impact on a site.

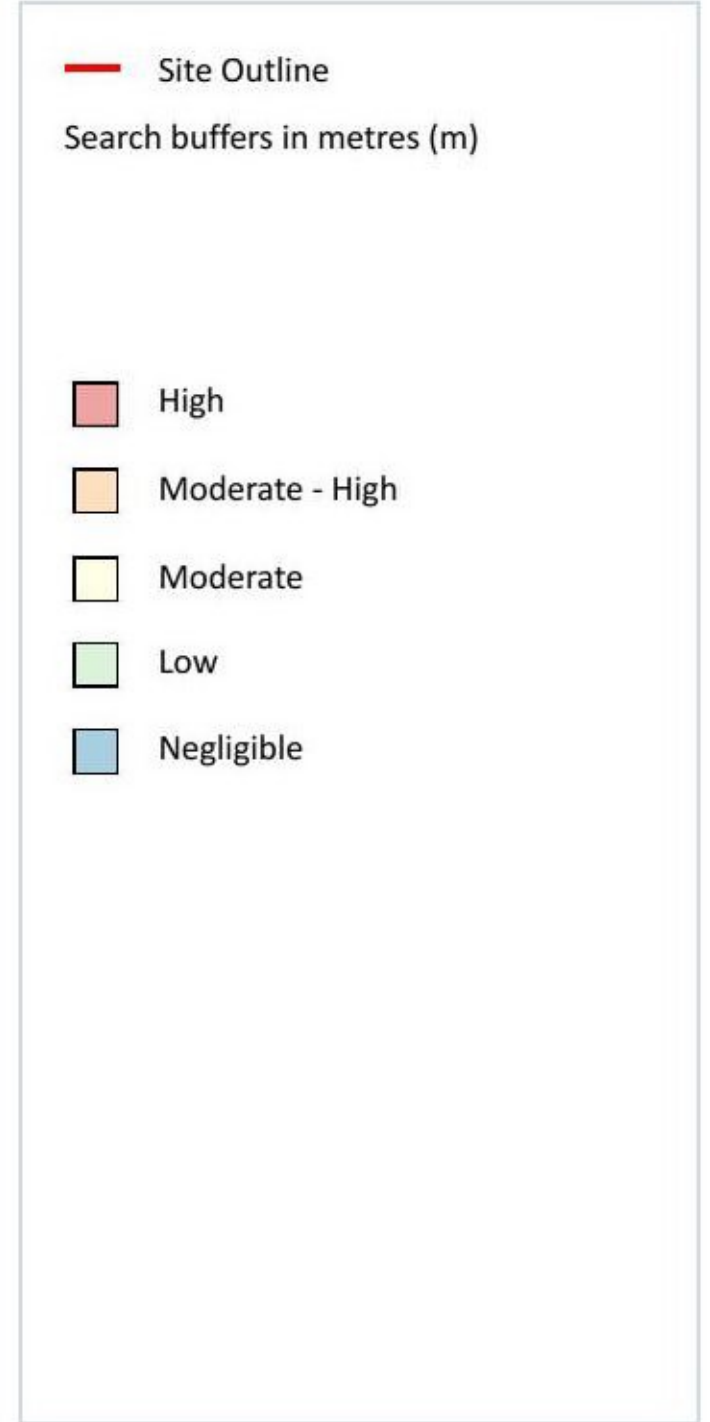
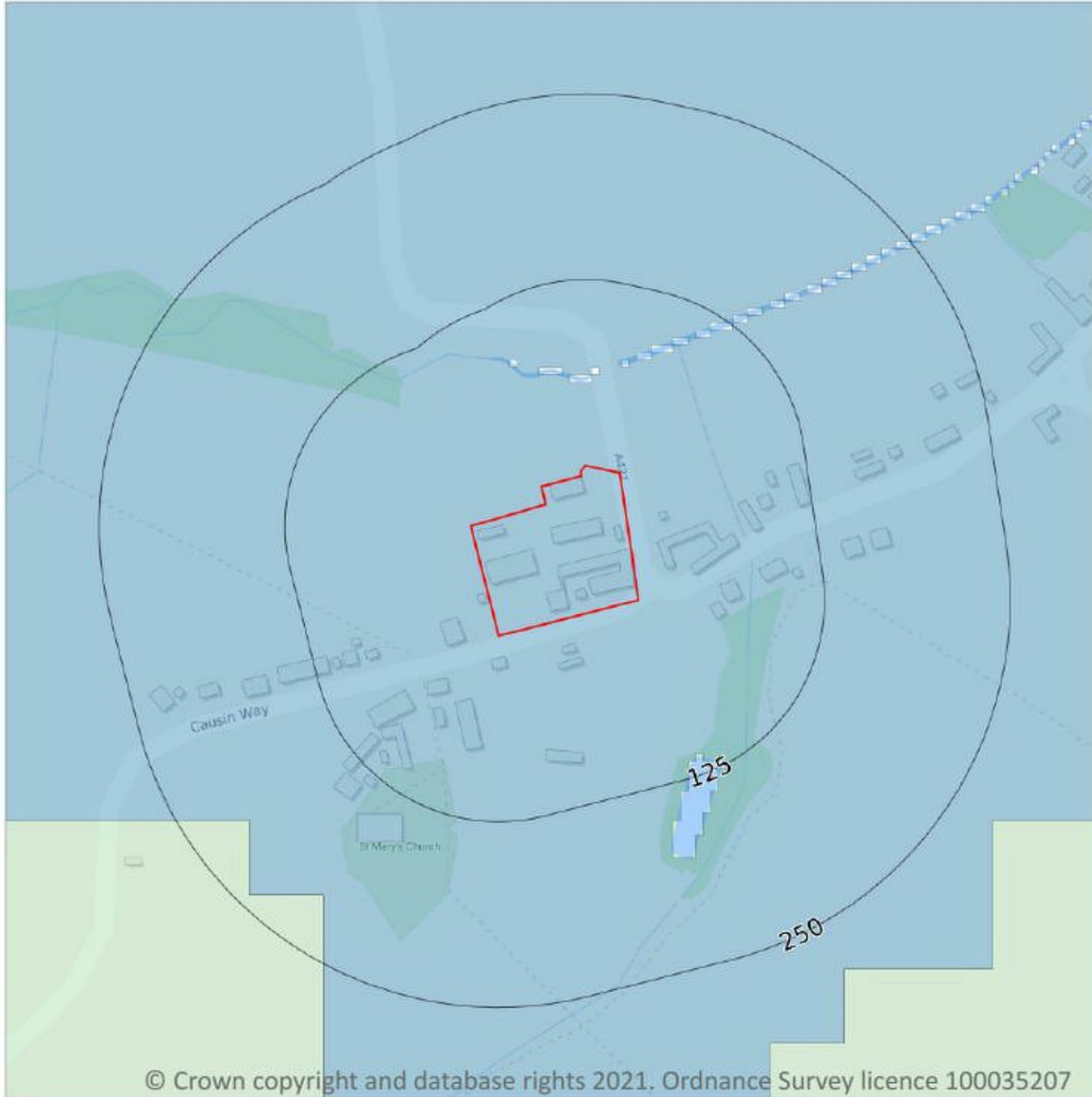
The table below shows the maximum flood depths for a range of return periods for the site.

Return period	Maximum modelled depth
1 in 1000 year	Negligible
1 in 250 year	Negligible
1 in 100 year	Negligible
1 in 30 year	Negligible

*This data is sourced from Ambiantal Risk Analytics.*



## 9 Groundwater flooding



### 9.1 Groundwater flooding

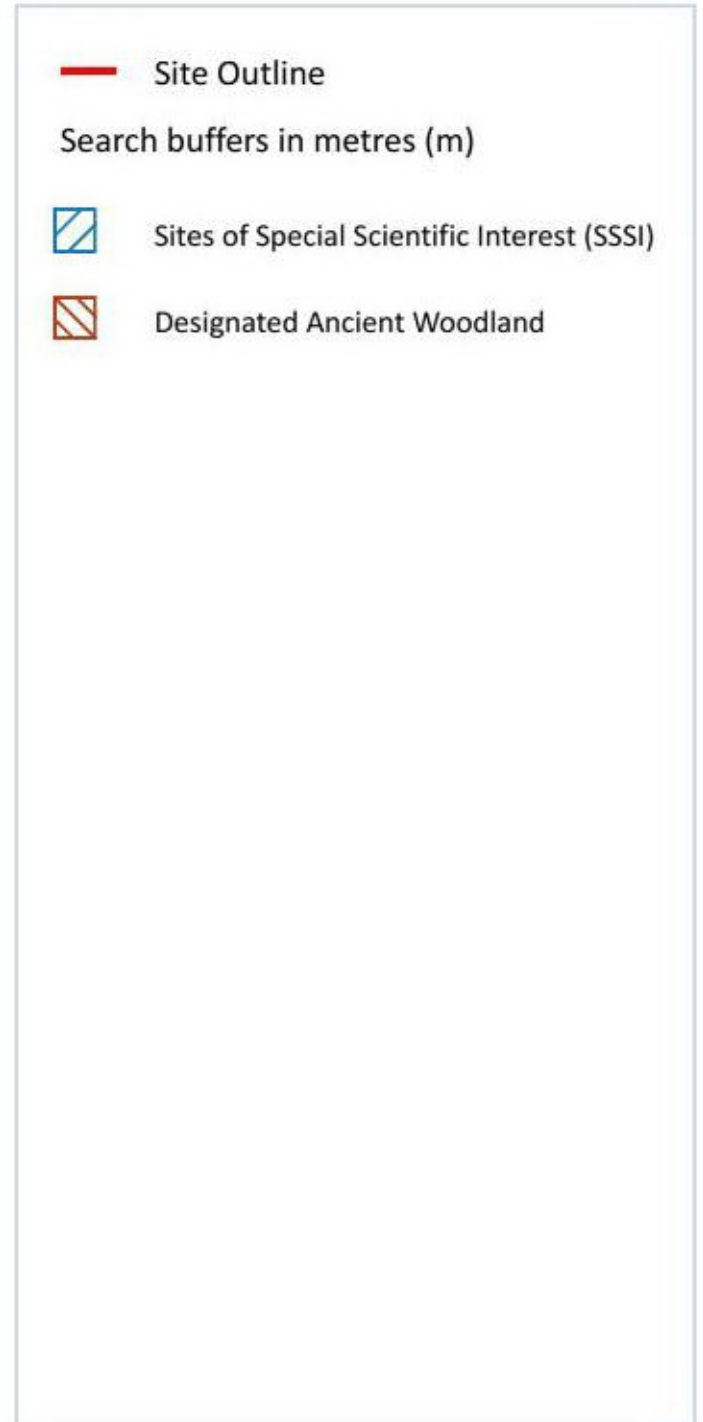
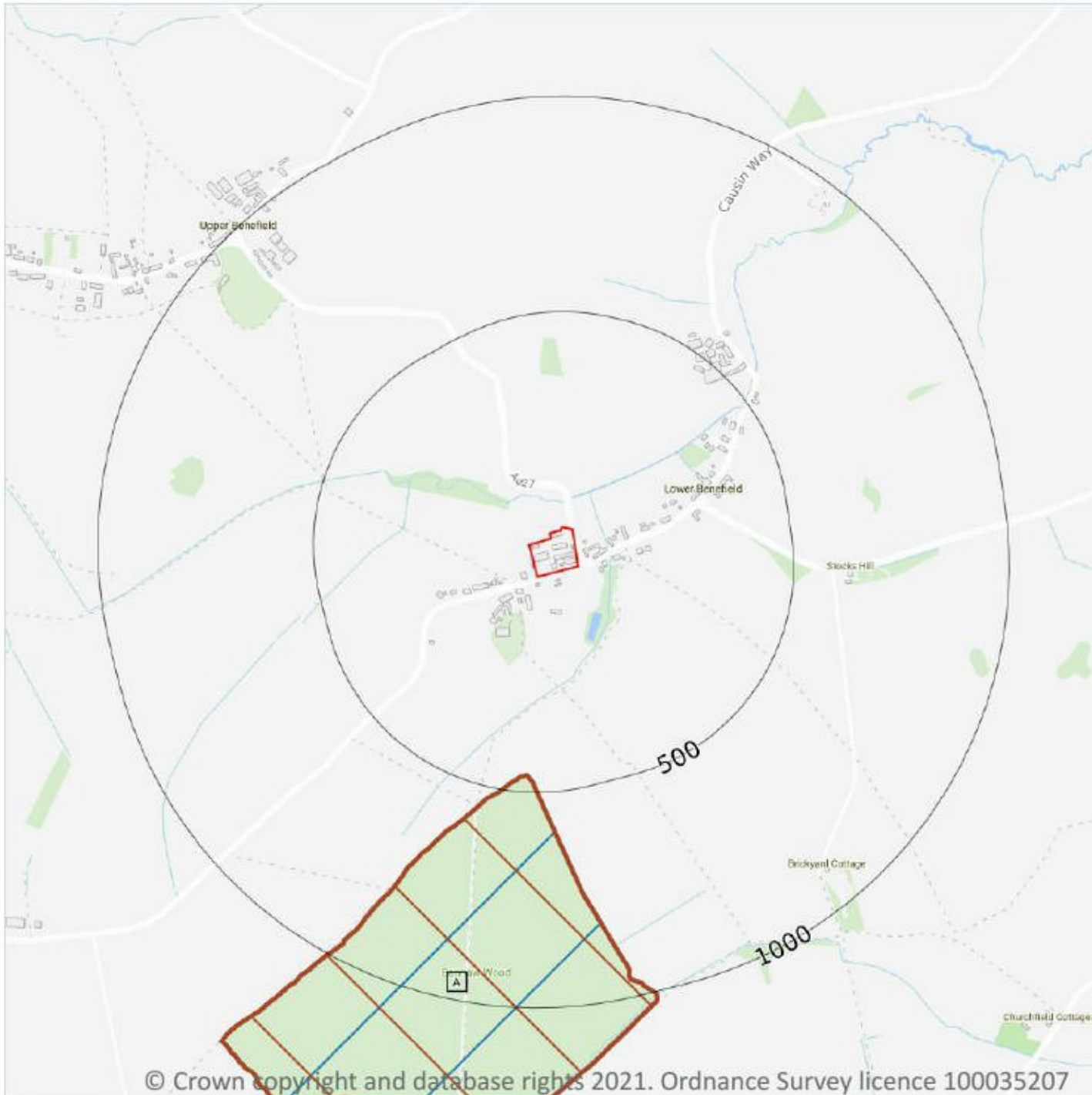
Highest risk on site	Negligible
Highest risk within 50m	Negligible

Groundwater flooding is caused by unusually high groundwater levels. It occurs when the water table rises above the ground surface or within underground structures such as basements or cellars. Groundwater flooding tends to exhibit a longer duration than surface water flooding, possibly lasting for weeks or months, and as a result it can cause significant damage to property. This risk assessment is based on a 1 in 100 year return period and a 5m Digital Terrain Model (DTM).

Features are displayed on the Groundwater flooding map on **page 49**

*This data is sourced from Ambiental Risk Analytics.*

## 10 Environmental designations



### 10.1 Sites of Special Scientific Interest (SSSI)

Records within 2000m

3

Sites providing statutory protection for the best examples of UK flora, fauna, or geological or physiographical features. Originally notified under the National Parks and Access to the Countryside Act 1949, SSSIs were re-notified under the Wildlife and Countryside Act 1981. Improved provisions for the protection and management of SSSIs were introduced by the Countryside and Rights of Way Act 2000 (in England and Wales) and (in Scotland) by the Nature Conservation (Scotland) Act 2004 and the Wildlife and Natural Environment (Scotland) Act 2010.

Features are displayed on the Environmental designations map on **page 50**

ID	Location	Name	Data source
A	461m S	Banhaw, Spring and Blackthorn's Woods	Natural England

ID	Location	Name	Data source
-	1721m W	Banhaw, Spring and Blackthorn's Woods	Natural England
-	1920m NE	Glaphorn Cow Pasture	Natural England

*This data is sourced from Natural England, Natural Resources Wales and Scottish Natural Heritage.*

## 10.2 Conserved wetland sites (Ramsar sites)

<b>Records within 2000m</b>	<b>0</b>
-----------------------------	----------

Ramsar sites are designated under the Convention on Wetlands of International Importance, agreed in Ramsar, Iran, in 1971. They cover all aspects of wetland conservation and wise use, recognizing wetlands as ecosystems that are extremely important for biodiversity conservation in general and for the well-being of human communities. These sites cover a broad definition of wetland; marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, and even some marine areas.

*This data is sourced from Natural England, Natural Resources Wales and Scottish Natural Heritage.*

## 10.3 Special Areas of Conservation (SAC)

<b>Records within 2000m</b>	<b>0</b>
-----------------------------	----------

Areas which have been identified as best representing the range and variety within the European Union of habitats and (non-bird) species listed on Annexes I and II to the Directive. SACs are designated under the EC Habitats Directive.

*This data is sourced from Natural England, Natural Resources Wales and Scottish Natural Heritage.*

## 10.4 Special Protection Areas (SPA)

<b>Records within 2000m</b>	<b>0</b>
-----------------------------	----------

Sites classified by the UK Government under the EC Birds Directive, SPAs are areas of the most important habitat for rare (listed on Annex I to the Directive) and migratory birds within the European Union.

*This data is sourced from Natural England, Natural Resources Wales and Scottish Natural Heritage.*

## 10.5 National Nature Reserves (NNR)

<b>Records within 2000m</b>	<b>0</b>
-----------------------------	----------

Sites containing examples of some of the most important natural and semi-natural terrestrial and coastal ecosystems in Great Britain. They are managed to conserve their habitats, provide special opportunities for scientific study or to provide public recreation compatible with natural heritage interests.

*This data is sourced from Natural England, Natural Resources Wales and Scottish Natural Heritage.*

## 10.6 Local Nature Reserves (LNR)

<b>Records within 2000m</b>	<b>0</b>
-----------------------------	----------

Sites managed for nature conservation, and to provide opportunities for research and education, or simply enjoying and having contact with nature. They are declared by local authorities under the National Parks and Access to the Countryside Act 1949 after consultation with the relevant statutory nature conservation agency.

*This data is sourced from Natural England, Natural Resources Wales and Scottish Natural Heritage.*

## 10.7 Designated Ancient Woodland

<b>Records within 2000m</b>	<b>6</b>
-----------------------------	----------

Ancient woodlands are classified as areas which have been wooded continuously since at least 1600 AD. This includes semi-natural woodland and plantations on ancient woodland sites. 'Wooded continuously' does not mean there is or has previously been continuous tree cover across the whole site, and not all trees within the woodland have to be old.

Features are displayed on the Environmental designations map on **page 50**

ID	Location	Name	Woodland Type
A	461m S	Banhaw Wood	Ancient & Semi-Natural Woodland
-	1515m E	Silley Coppice	Ancient & Semi-Natural Woodland
-	1721m W	Spring/cockendale Woods	Ancient & Semi-Natural Woodland
-	1750m E	Crow Coppice	Ancient Replanted Woodland
-	1888m SE	Stoke/oundle Woods	Ancient & Semi-Natural Woodland
-	1896m SE	Stoke/oundle Woods	Ancient Replanted Woodland

*This data is sourced from Natural England, Natural Resources Wales and Scottish Natural Heritage.*

## 10.8 Biosphere Reserves

<b>Records within 2000m</b>	<b>0</b>
-----------------------------	----------

Biosphere Reserves are internationally recognised by UNESCO as sites of excellence to balance conservation and socioeconomic development between nature and people. They are recognised under the Man and the Biosphere (MAB) Programme with the aim of promoting sustainable development founded on the work of the local community.

*This data is sourced from Natural England, Natural Resources Wales and Scottish Natural Heritage.*

## 10.9 Forest Parks

Records within 2000m

0

These are areas managed by the Forestry Commission designated on the basis of recreational, conservation or scenic interest.

*This data is sourced from the Forestry Commission.*

## 10.10 Marine Conservation Zones

Records within 2000m

0

A type of marine nature reserve in UK waters established under the Marine and Coastal Access Act (2009). They are designated with the aim to protect nationally important, rare or threatened habitats and species.

*This data is sourced from Natural England, Natural Resources Wales and Scottish Natural Heritage.*

## 10.11 Green Belt

Records within 2000m

0

Areas designated to prevent urban sprawl by keeping land permanently open.

*This data is sourced from the Ministry of Housing, Communities and Local Government.*

## 10.12 Proposed Ramsar sites

Records within 2000m

0

Ramsar sites are areas listed as a Wetland of International Importance under the Convention on Wetlands of International Importance especially as Waterfowl Habitat (the Ramsar Convention) 1971. The sites here supplied have a status of 'Proposed' having been identified for potential adoption under the framework.

*This data is sourced from Natural England.*

## 10.13 Possible Special Areas of Conservation (pSAC)

Records within 2000m

0

Special Areas of Conservation are areas which have been identified as best representing the range and variety within the European Union of habitats and (non-bird) species listed on Annexes I and II to the Directive. SACs are designated under the EC Habitats Directive. Those sites supplied here are those with a status of 'Possible' having been identified for potential adoption under the framework.

*This data is sourced from Natural England and Natural Resources Wales.*





## 10.14 Potential Special Protection Areas (pSPA)

<b>Records within 2000m</b>	<b>0</b>
-----------------------------	----------

Special Protection Areas (SPAs) are areas designated (or 'classified') under the European Union Wild Birds Directive for the protection of nationally and internationally important populations of wild birds. Those sites supplied here are those with a status of 'Potential' having been identified for potential adoption under the framework.

*This data is sourced from Natural England.*

## 10.15 Nitrate Sensitive Areas

<b>Records within 2000m</b>	<b>0</b>
-----------------------------	----------

Areas where nitrate concentrations in drinking water sources exceeded or was at risk of exceeding the limit of 50 mg/l set by the 1980 EC Drinking Water Directive. Voluntary agricultural measures as a means of reducing the levels of nitrate were introduced by DEFRA as MAFF, with payments being made to farmers who complied. The scheme was started as a pilot in 1990 in ten areas, later implemented within 32 areas. The scheme was closed to further new entrants in 1998, although existing agreements continued for their full term. All Nitrate Sensitive Areas fell within the areas designated as Nitrate Vulnerable Zones (NVZs) in 1996 under the EC Nitrate Directive (91/676/EEC).

*This data is sourced from Natural England.*

## 10.16 Nitrate Vulnerable Zones

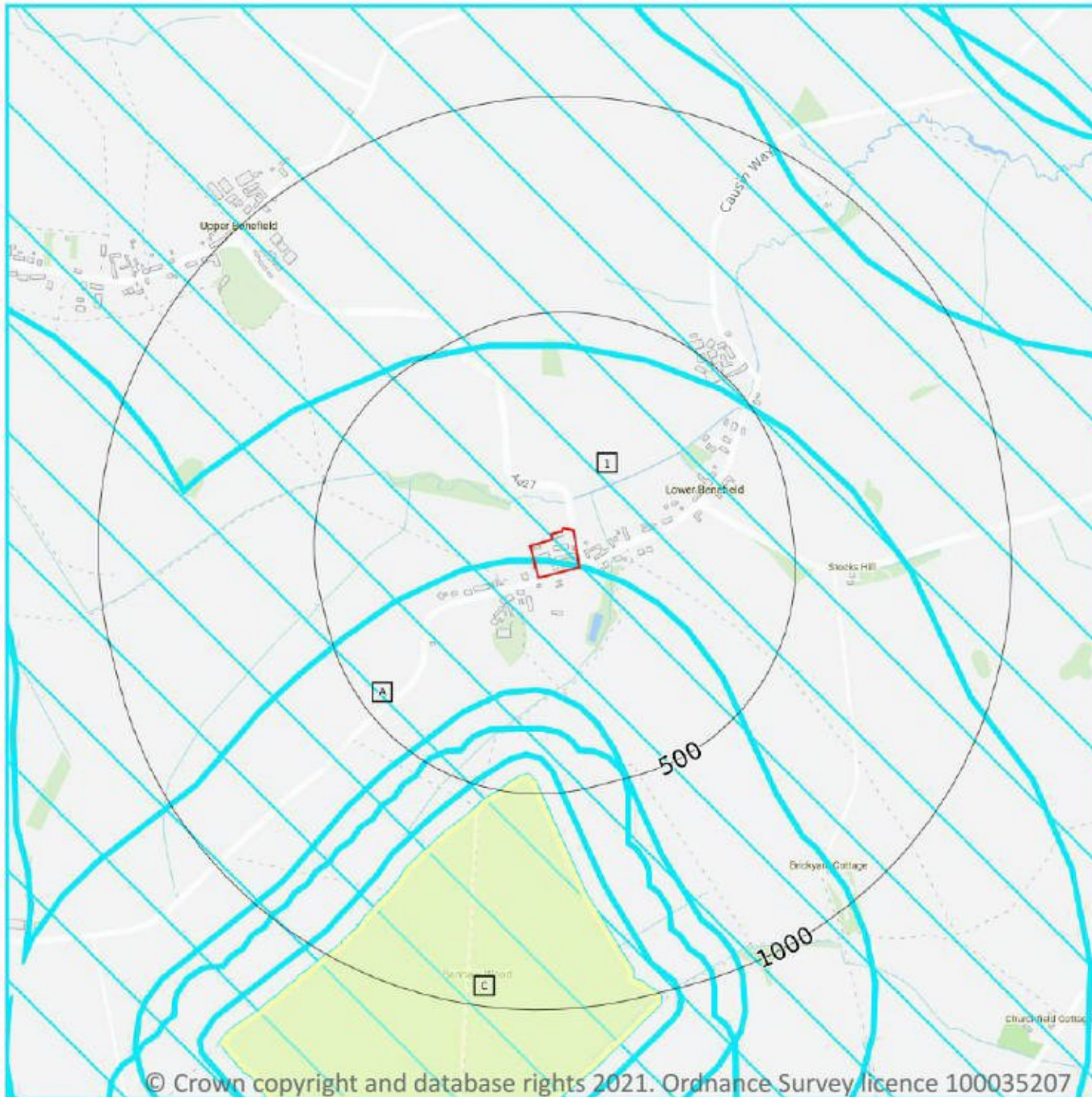
<b>Records within 2000m</b>	<b>1</b>
-----------------------------	----------

Areas at risk from agricultural nitrate pollution designated under the EC Nitrate Directive (91/676/EEC). These are areas of land that drain into waters polluted by nitrates. Farmers operating within these areas have to follow mandatory rules to tackle nitrate loss from agriculture.

Location	Name	Type	NVZ ID	Status
On site	River Nene NVZ	Surface Water	S382	Existing

*This data is sourced from Natural England and Natural Resources Wales.*

## SSSI Impact Zones and Units



### 10.17 SSSI Impact Risk Zones

Records on site	<b>2</b>
-----------------	----------

Developed to allow rapid initial assessment of the potential risks to SSSIs posed by development proposals. They define zones around each SSSI which reflect the particular sensitivities of the features for which it is notified and indicate the types of development proposal which could potentially have adverse impacts.

Features are displayed on the SSSI Impact Zones and Units map on **page 55**

ID	Location	Type of developments requiring consultation
1	On site	<p><b>Infrastructure - Pipelines, pylons and overhead cables. Any transport proposal including road, rail and by water (excluding routine maintenance). Airports, helipads and other aviation proposals</b></p> <p><b>Wind and Solar - Solar schemes with footprint &gt; 0.5ha, all wind turbines</b></p> <p><b>Minerals, Oil and Gas - Planning applications for quarries, including: new proposals, Review of Minerals Permissions (ROMP), extensions, variations to conditions etc. Oil &amp; gas exploration/extraction.</b></p> <p><b>Residential - Residential development of 100 units or more.</b></p> <p><b>Rural residential - Any residential development of 50 or more houses outside existing settlements/urban areas.</b></p> <p><b>Air pollution - Any industrial/agricultural development that could cause AIR POLLUTION (incl: industrial processes, livestock &amp; poultry units with floorspace &gt; 500m<sup>2</sup>, slurry lagoons &gt; 200m<sup>2</sup> &amp; manure stores &gt; 250t).</b></p> <p><b>Combustion - General combustion processes &gt;20MW energy input. Incl: energy from waste incineration, other incineration, landfill gas generation plant, pyrolysis/gasification, anaerobic digestion, sewage treatment works, other incineration/ combustion</b></p> <p><b>Waste - Landfill. Incl: inert landfill, non-hazardous landfill, hazardous landfill.</b></p> <p><b>Composting - Any composting proposal with more than 500 tonnes maximum annual operational throughput. Incl: open windrow composting, in-vessel composting, anaerobic digestion, other waste management.</b></p> <p><b>Water supply - Large infrastructure such as warehousing / industry where net additional gross internal floorspace is &gt; 1,000m<sup>2</sup> or any development needing its own water supply</b></p>
A	On site	<p><b>Infrastructure - Pipelines, pylons and overhead cables. Any transport proposal including road, rail and by water (excluding routine maintenance). Airports, helipads and other aviation proposals</b></p> <p><b>Wind and Solar - Solar schemes with footprint &gt; 0.5ha, all wind turbines</b></p> <p><b>Minerals, Oil and Gas - Planning applications for quarries, including: new proposals, Review of Minerals Permissions (ROMP), extensions, variations to conditions etc. Oil &amp; gas exploration/extraction.</b></p> <p><b>Residential - Residential development of 100 units or more.</b></p> <p><b>Rural residential - Any residential development of 50 or more houses outside existing settlements/urban areas.</b></p> <p><b>Air pollution - Any development that could cause AIR POLLUTION (incl: industrial/commercial processes, livestock &amp; poultry units, slurry lagoons/manure stores).</b></p> <p><b>Combustion - All general combustion processes. Incl: energy from waste incineration, other incineration, landfill gas generation plant, pyrolysis/gasification, anaerobic digestion, sewage treatment works, other incineration/ combustion.</b></p> <p><b>Waste - Mechanical and biological waste treatment, inert landfill, non-hazardous landfill, hazardous landfill, household civic amenity recycling facilities construction, demolition and excavation waste, other waste management</b></p> <p><b>Composting - Any composting proposal. Incl: open windrow composting, in-vessel composting, anaerobic digestion, other waste management.</b></p> <p><b>Water supply - Large infrastructure such as warehousing / industry where net additional gross internal floorspace is &gt; 1,000m<sup>2</sup> or any development needing its own water supply</b></p>

*This data is sourced from Natural England.*



## 10.18 SSSI Units

<b>Records within 2000m</b>	<b>3</b>
-----------------------------	----------

Divisions of SSSIs used to record management and condition details. Units are the smallest areas for which Natural England gives a condition assessment, however, the size of units varies greatly depending on the types of management and the conservation interest.

Features are displayed on the SSSI Impact Zones and Units map on **page 55**

ID: C  
 Location: 461m S  
 SSSI name: Banhaw, Spring and Blackthorn's Woods  
 Unit name: Banhaw Wood  
 Broad habitat: Broadleaved, Mixed And Yew Woodland - Lowland  
 Condition: Unfavourable - Recovering  
 Reportable features:

Feature name	Feature condition	Date of assessment
Lowland mixed deciduous woodland	Unfavourable - Recovering	02/08/2013

ID: -  
 Location: 1721m W  
 SSSI name: Banhaw, Spring and Blackthorn's Woods  
 Unit name: Spring And Cockendale Woods  
 Broad habitat: Broadleaved, Mixed And Yew Woodland - Lowland  
 Condition: Unfavourable - Recovering  
 Reportable features:

Feature name	Feature condition	Date of assessment
Lowland mixed deciduous woodland	Unfavourable - Recovering	02/08/2013

ID: -  
 Location: 1920m NE  
 SSSI name: Glapthorn Cow Pasture  
 Unit name: Whole Site  
 Broad habitat: Broadleaved, Mixed And Yew Woodland - Lowland  
 Condition: Unfavourable - Recovering  
 Reportable features:

Feature name	Feature condition	Date of assessment
Lowland mixed deciduous woodland	Unfavourable - Recovering	16/06/2011

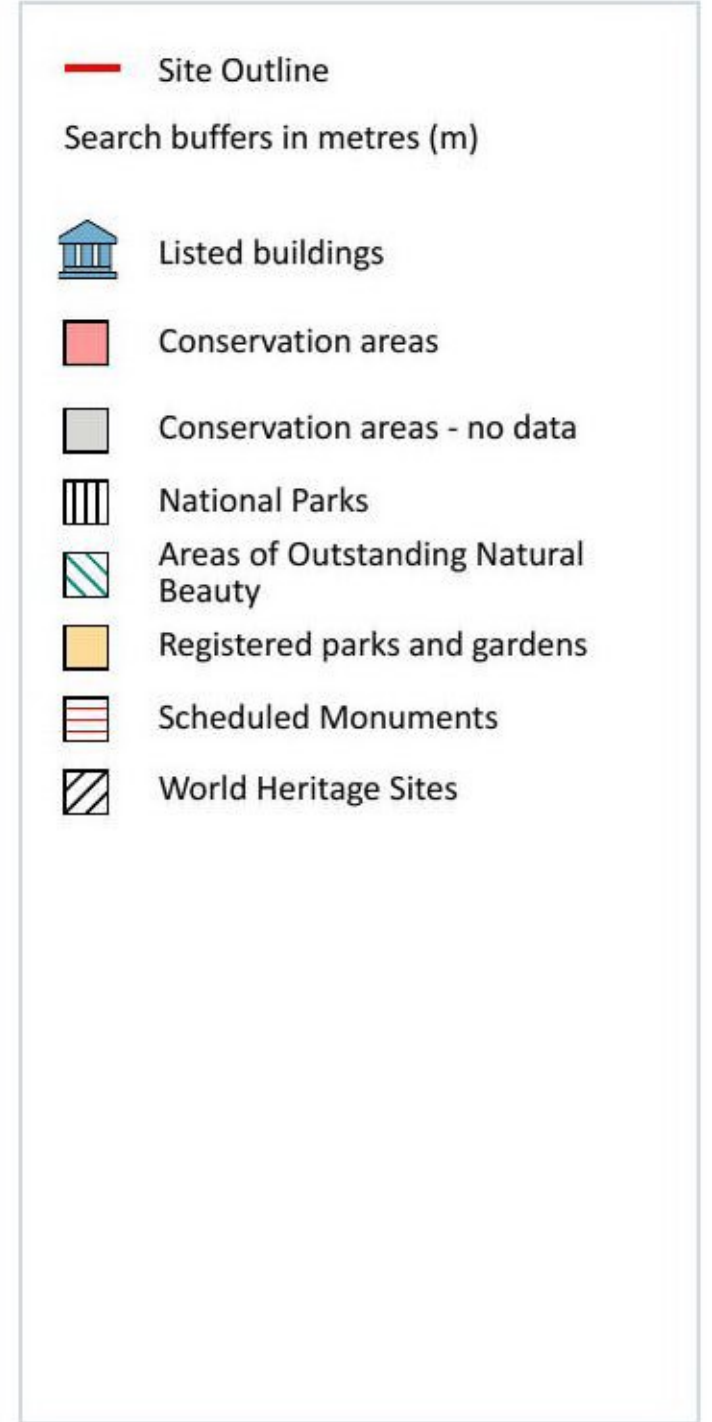
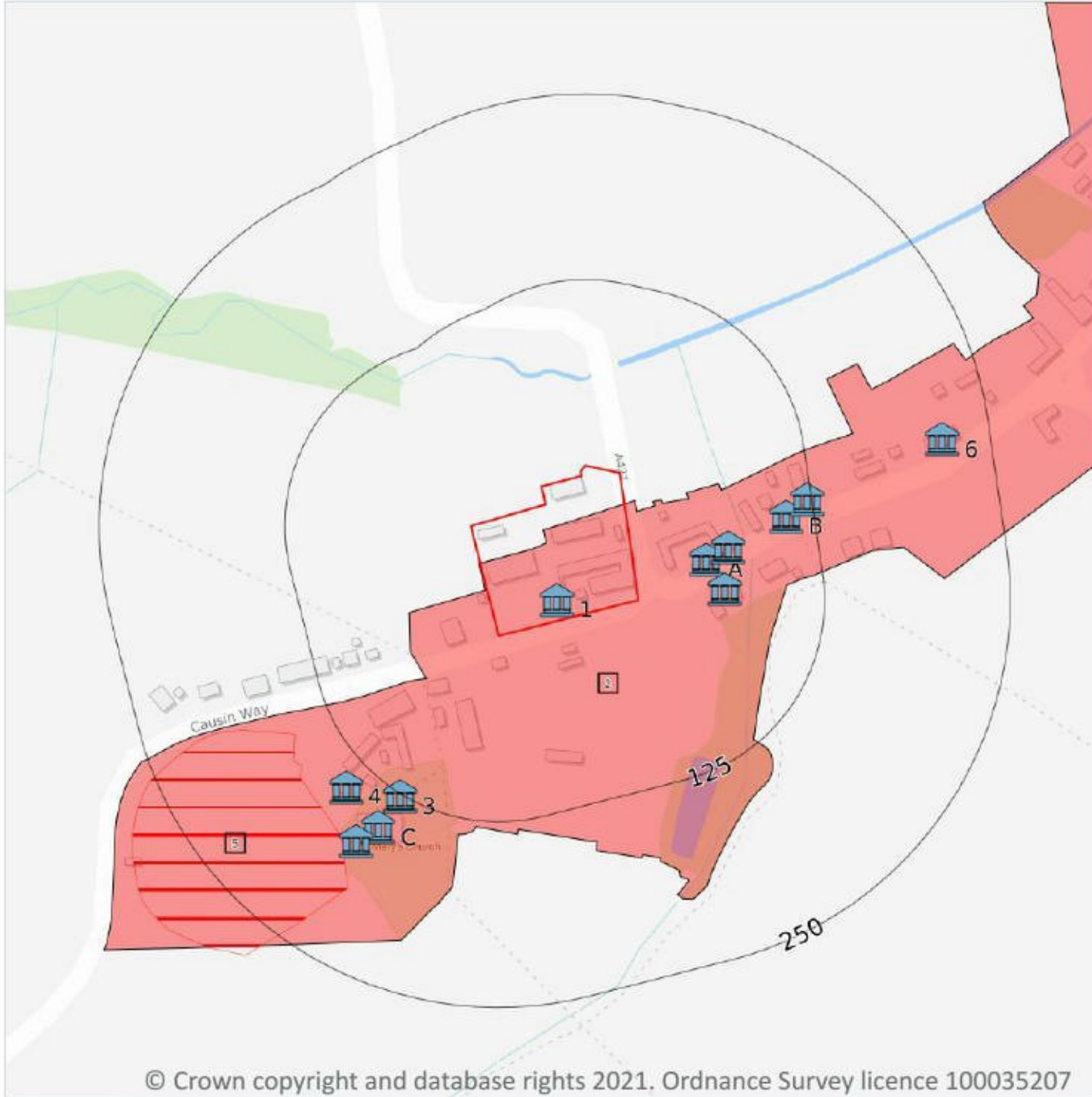


Feature name	Feature condition	Date of assessment
Populations of nationally scarce butterfly species - Strymonidia pruni, Black Hairstreak	Favourable	16/06/2011

*This data is sourced from Natural England and Natural Resources Wales.*



## 11 Visual and cultural designations



### 11.1 World Heritage Sites

Records within 250m

0

Sites designated for their globally important cultural or natural interest requiring appropriate management and protection measures. World Heritage Sites are designated to meet the UK's commitments under the World Heritage Convention.

*This data is sourced from Historic England, Cadw and Historic Environment Scotland.*

## 11.2 Area of Outstanding Natural Beauty

Records within 250m

0

Areas of Outstanding Natural Beauty (AONB) are conservation areas, chosen because they represent 18% of the finest countryside. Each AONB has been designated for special attention because of the quality of their flora, fauna, historical and cultural associations, and/or scenic views. The National Parks and Access to the Countryside Act of 1949 created AONBs and the Countryside and Rights of Way Act, 2000 added further regulation and protection. There are likely to be restrictions to some developments within these areas.

*This data is sourced from Natural England, Natural Resources Wales and Scottish Natural Heritage.*

## 11.3 National Parks

Records within 250m

0

In England and Wales, the purpose of National Parks is to conserve and enhance landscapes within the countryside whilst promoting public enjoyment of them and having regard for the social and economic well-being of those living within them. In Scotland National Parks have the additional purpose of promoting the sustainable use of the natural resources of the area and the sustainable social and economic development of its communities. The National Parks and Access to the Countryside Act 1949 established the National Park designation in England and Wales, and The National Parks (Scotland) Act 2000 in Scotland.

*This data is sourced from Natural England, Natural Resources Wales and the Scottish Government.*

## 11.4 Listed Buildings

Records within 250m

11

Buildings listed for their special architectural or historical interest. Building control in the form of 'listed building consent' is required in order to make any changes to that building which might affect its special interest. Listed buildings are graded to indicate their relative importance, however building controls apply to all buildings equally, irrespective of their grade, and apply to the interior and exterior of the building in its entirety, together with any curtilage structures.

Features are displayed on the Visual and cultural designations map on **page 59**

ID	Location	Name	Grade	Reference Number	Listed date
1	On site	Rectory Farmhouse And Attached Farmbuildings, Benefield, East Northamptonshire, Northamptonshire, PE8	II	1040221	11/01/1988
A	49m E	Number 10 Messuage Farmhouse And Attached Outbuilding, Benefield, East Northamptonshire, Northamptonshire, PE8	II	1040217	13/08/1987
A	59m E	9, Lower Benefield, Benefield, East Northamptonshire, Northamptonshire, PE8	II	1371960	11/01/1988



ID	Location	Name	Grade	Reference Number	Listed date
A	65m E	11, Lower Benefield, Benefield, East Northamptonshire, Northamptonshire, PE8	II	1371961	11/01/1988
B	106m E	K6 Telephone Kiosk Immediately South West Of Number 14, Benefield, East Northamptonshire, Northamptonshire, PE8	II	1374885	18/11/1992
B	122m E	14 And 15, Lower Benefield, Benefield, East Northamptonshire, Northamptonshire, PE8	II	1040218	11/01/1988
3	127m SW	War Memorial, Benefield, East Northamptonshire, Northamptonshire, PE8	II	1061357	10/06/2002
4	145m SW	Manor Farmhouse, Benefield, East Northamptonshire, Northamptonshire, PE8	II	1189061	23/05/1967
C	152m SW	Church Of St Mary, Benefield, East Northamptonshire, Northamptonshire, PE8	II*	1189042	23/05/1967
C	168m SW	Church Of St Mary, Chest Tomb 1 Metre South West Of South Aisle, Benefield, East Northamptonshire, Northamptonshire, PE8	II	1371963	11/01/1988
6	218m E	Berkeley House, Benefield, East Northamptonshire, Northamptonshire, PE8	II	1189022	23/05/1967

*This data is sourced from English Heritage, Cadw and Historic Environment Scotland.*

## 11.5 Conservation Areas

### Records within 250m

**1**

Local planning authorities are obliged to designate as conservation areas any parts of their own area that are of special architectural or historic interest, the character and appearance of which it is desirable to preserve or enhance. Designation of a conservation area gives broader protection than the listing of individual buildings. All the features within the area, listed or otherwise, are recognised as part of its character. Conservation area designation is the means of recognising the importance of all factors and of ensuring that planning decisions address the quality of the landscape in its broadest sense.

Features are displayed on the Visual and cultural designations map on **page 59**

ID	Location	Name	District	Date of designation
<b>2</b>	<b>On site</b>	<b>Lower Benefield</b>	<b>East Northamptonshire</b>	<b>07/10/1977</b>

*This data is sourced from English Heritage, Cadw and Historic Environment Scotland.*





## 11.6 Scheduled Ancient Monuments

Records within 250m

1

A scheduled monument is an historic building or site that is included in the Schedule of Monuments kept by the Secretary of State for Digital, Culture, Media and Sport. The regime is set out in the Ancient Monuments and Archaeological Areas Act 1979. The Schedule of Monuments has c.20,000 entries and includes sites such as Roman remains, burial mounds, castles, bridges, earthworks, the remains of deserted villages and industrial sites. Monuments are not graded, but all are, by definition, considered to be of national importance.

Features are displayed on the Visual and cultural designations map on **page 59**

ID	Location	Ancient monument name	Reference number
5	152m SW	Benefield Castle	1015535

*This data is sourced from English Heritage, Cadw and Historic Environment Scotland.*

## 11.7 Registered Parks and Gardens

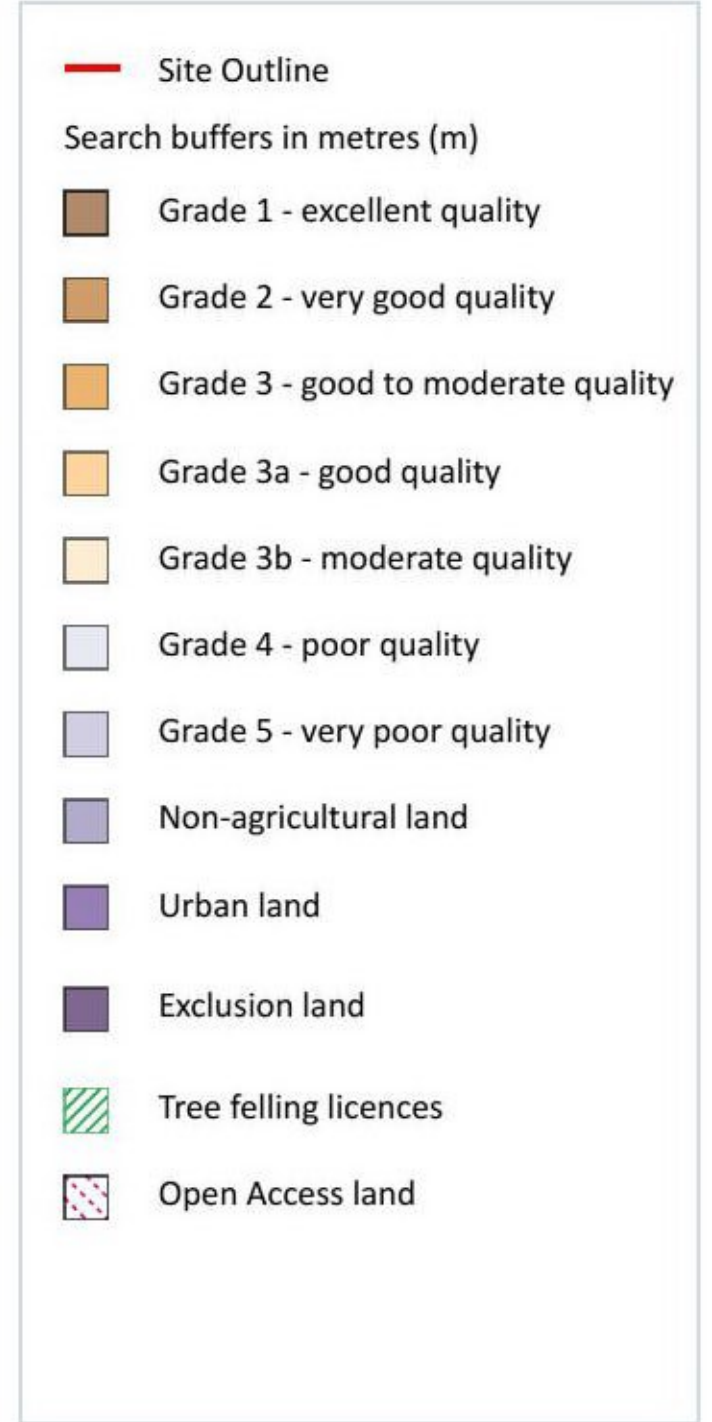
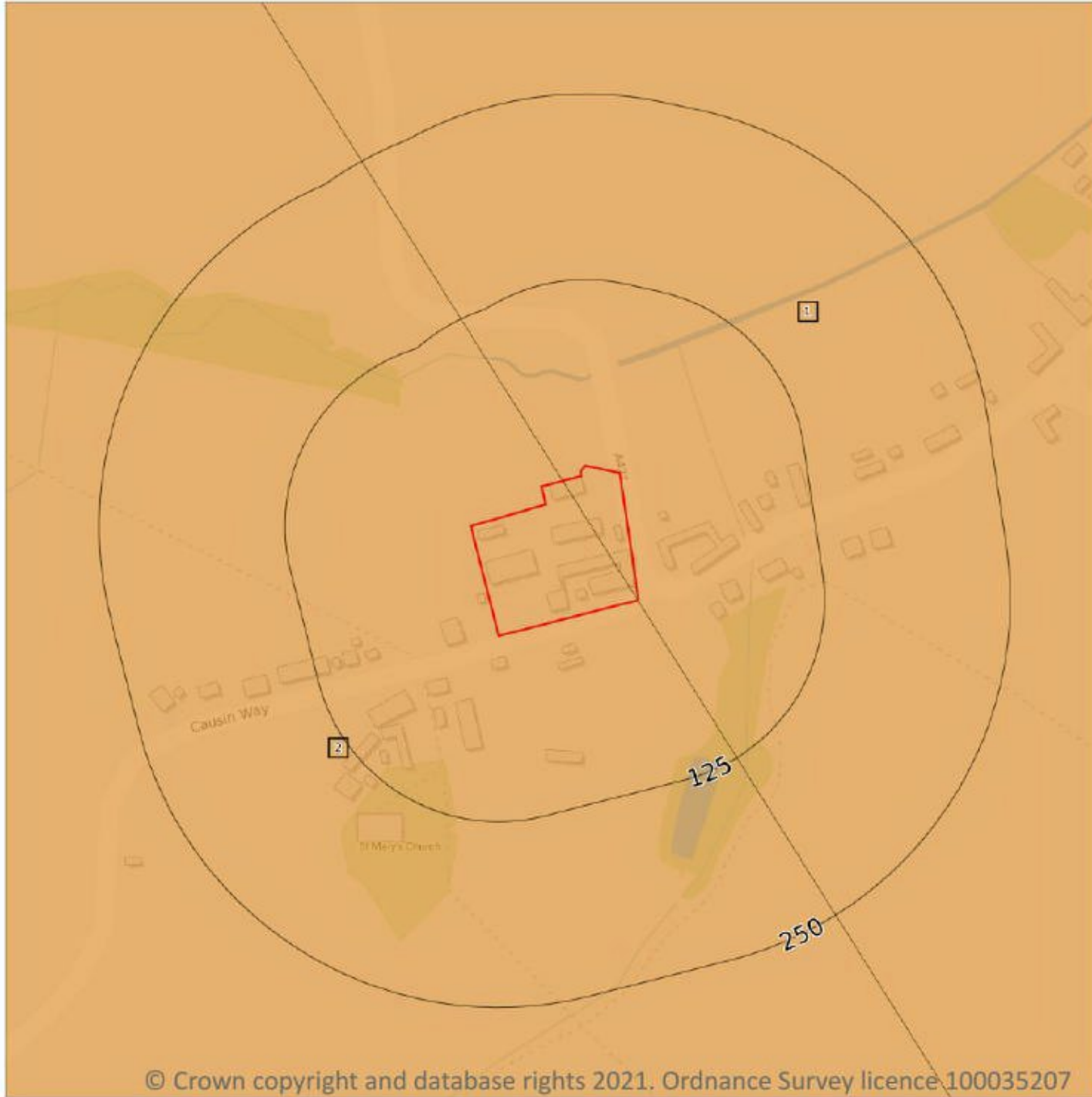
Records within 250m

0

Parks and gardens assessed to be of particular interest and of special historic interest. The emphasis being on 'designed' landscapes, rather than on planting or botanical importance. Registration is a 'material consideration' in the planning process, meaning that planning authorities must consider the impact of any proposed development on the special character of the landscape.

*This data is sourced from English Heritage, Cadw and Historic Environment Scotland.*

## 12 Agricultural designations



### 12.1 Agricultural Land Classification

Records within 250m

2

Classification of the quality of agricultural land taking into consideration multiple factors including climate, physical geography and soil properties. It should be noted that the categories for the grading of agricultural land are not consistent across England, Wales and Scotland.

Features are displayed on the Agricultural designations map on **page 63**

ID	Location	Classification	Description
1	On site	Grade 3	Good to moderate quality agricultural land. Land with moderate limitations which affect the choice of crops, timing and type of cultivation, harvesting or the level of yield. Where more demanding crops are grown yields are generally lower or more variable than on land in Grades 1 and 2.

ID	Location	Classification	Description
2	On site	Grade 3	Good to moderate quality agricultural land. Land with moderate limitations which affect the choice of crops, timing and type of cultivation, harvesting or the level of yield. Where more demanding crops are grown yields are generally lower or more variable than on land in Grades 1 and 2.

*This data is sourced from Natural England.*

## 12.2 Open Access Land

<b>Records within 250m</b>	<b>0</b>
----------------------------	----------

The Countryside and Rights of Way Act 2000 (CROW Act) gives a public right of access to land without having to use paths. Access land includes mountains, moors, heaths and downs that are privately owned. It also includes common land registered with the local council and some land around the England Coast Path. Generally permitted activities on access land are walking, running, watching wildlife and climbing.

*This data is sourced from Natural England and Natural Resources Wales.*

## 12.3 Tree Felling Licences

<b>Records within 250m</b>	<b>0</b>
----------------------------	----------

Felling Licence Application (FLA) areas approved by Forestry Commission England. Anyone wishing to fell trees must ensure that a licence or permission under a grant scheme has been issued by the Forestry Commission before any felling is carried out or that one of the exceptions apply.

*This data is sourced from the Forestry Commission.*

## 12.4 Environmental Stewardship Schemes

<b>Records within 250m</b>	<b>0</b>
----------------------------	----------

Environmental Stewardship covers a range of schemes that provide financial incentives to farmers, foresters and land managers to look after and improve the environment.

*This data is sourced from Natural England.*

## 12.5 Countryside Stewardship Schemes

<b>Records within 250m</b>	<b>1</b>
----------------------------	----------

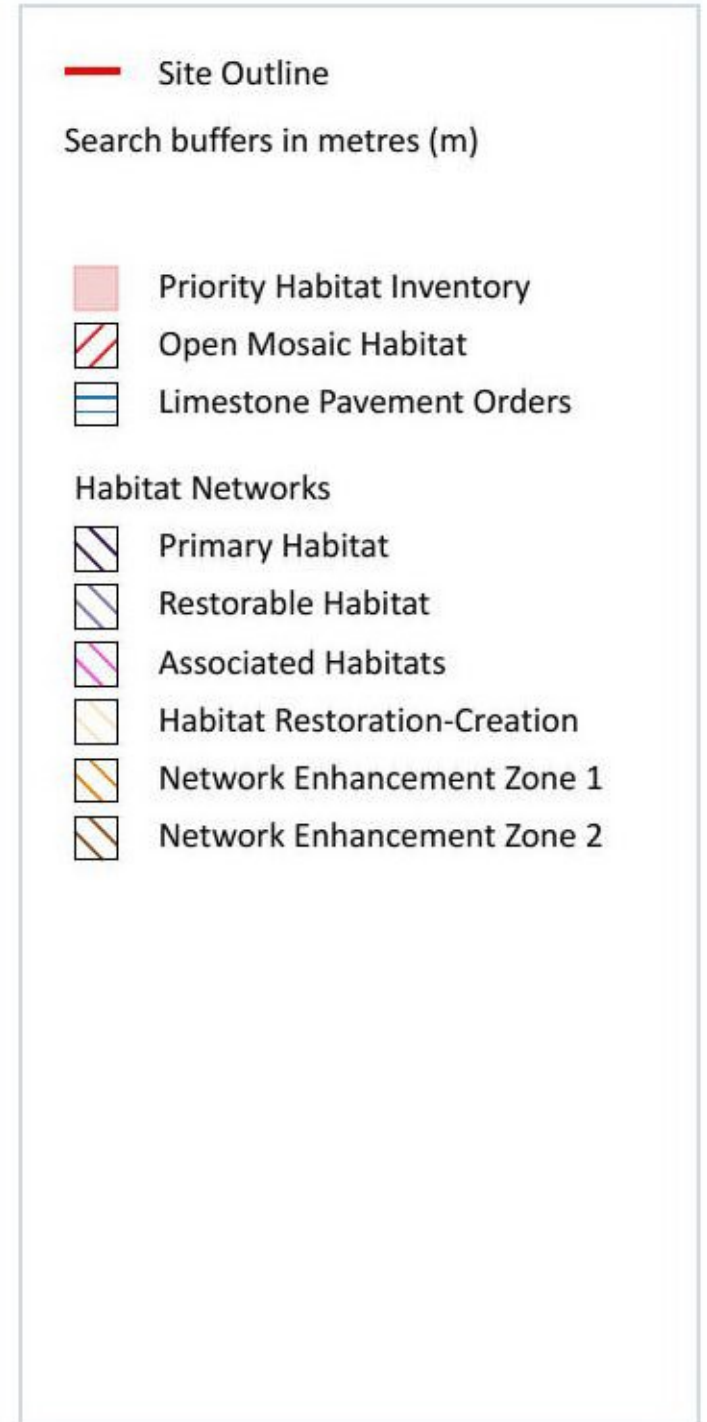
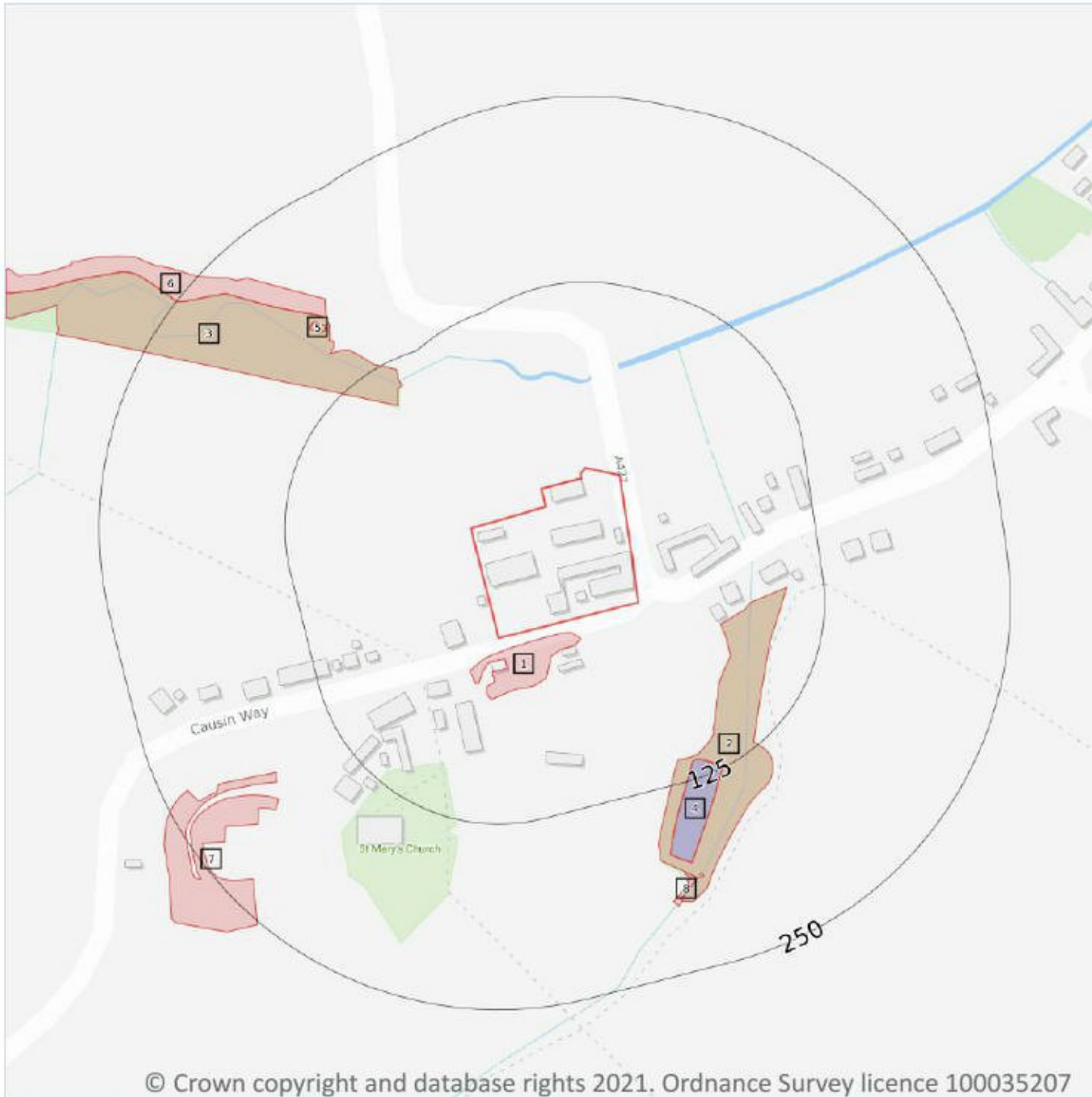
Countryside Stewardship covers a range of schemes that provide financial incentives to farmers, foresters and land managers to look after and improve the environment. Main objectives are to improve the farmed environment for wildlife and to reduce diffuse water pollution.

Location	Reference	Scheme	Start Date	End Date
92m NW	115211	Countryside Stewardship (Higher Tier)	01/01/2016	31/12/2020

*This data is sourced from Natural England.*



## 13 Habitat designations



### 13.1 Priority Habitat Inventory

Records within 250m

8

Habitats of principal importance as named under Natural Environment and Rural Communities Act (2006) Section 41.

Features are displayed on the Habitat designations map on **page 66**

ID	Location	Main Habitat	Other habitats
1	7m S	Traditional orchard	Main habitat: TORCH (INV > 50%)
2	57m E	Deciduous woodland	Main habitat: DWOOD (INV > 50%)
3	96m NW	Deciduous woodland	Main habitat: DWOOD (INV > 50%)
4	113m S	Deciduous woodland	Main habitat: DWOOD (INV > 50%)

ID	Location	Main Habitat	Other habitats
5	165m NW	Deciduous woodland	Main habitat: DWOOD (INV > 50%)
6	172m NW	Deciduous woodland	Main habitat: DWOOD (INV > 50%)
7	175m SW	No main habitat but additional habitats present	Main habitat: DWOOD (INV > 50%)
8	184m S	Deciduous woodland	Main habitat: DWOOD (INV > 50%)

*This data is sourced from Natural England.*

## 13.2 Habitat Networks

<b>Records within 250m</b>	<b>0</b>
----------------------------	----------

Habitat networks for 18 priority habitat networks (based primarily, but not exclusively, on the priority habitat inventory) and areas suitable for the expansion of networks through restoration and habitat creation.

*This data is sourced from Natural England.*

## 13.3 Open Mosaic Habitat

<b>Records within 250m</b>	<b>0</b>
----------------------------	----------

Sites verified as Open Mosaic Habitat. Mosaic habitats are brownfield sites that are identified under the UK Biodiversity Action Plan as a priority habitat due to the habitat variation within a single site, supporting an array of invertebrates.

*This data is sourced from Natural England.*

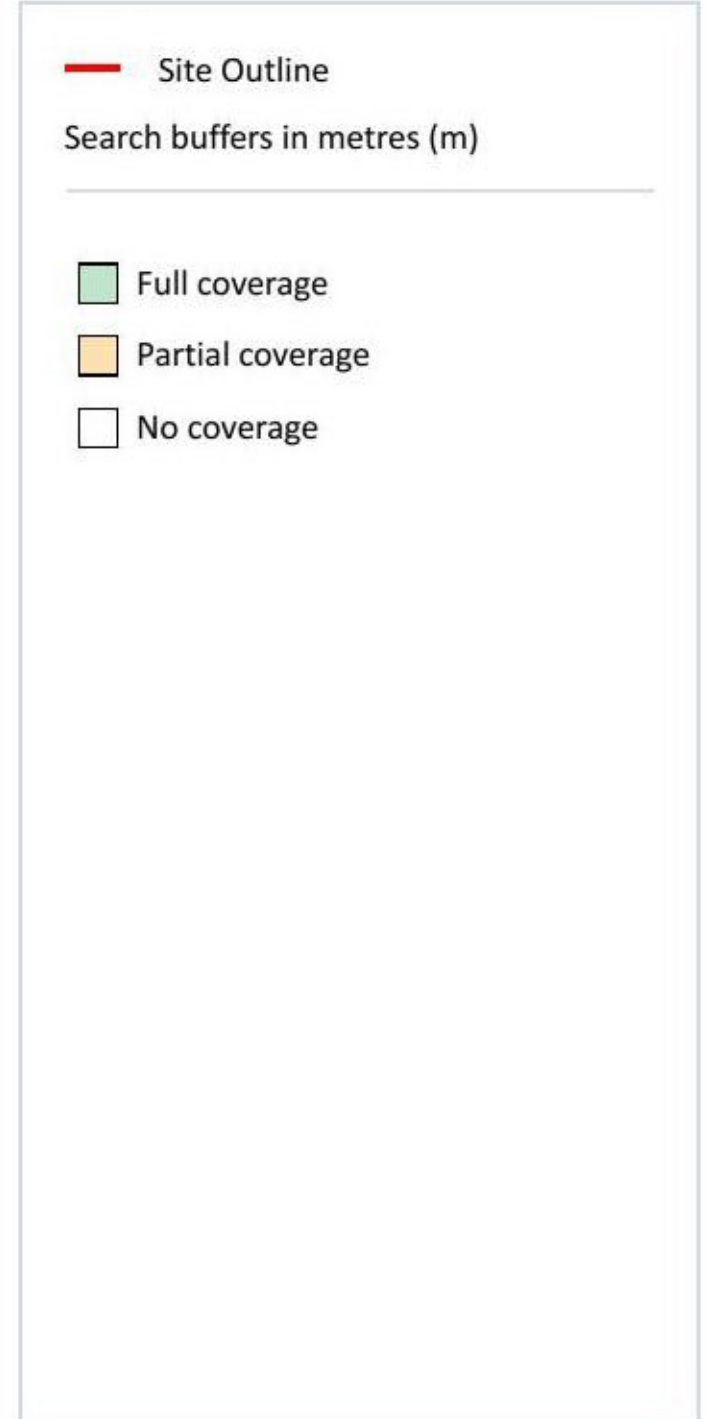
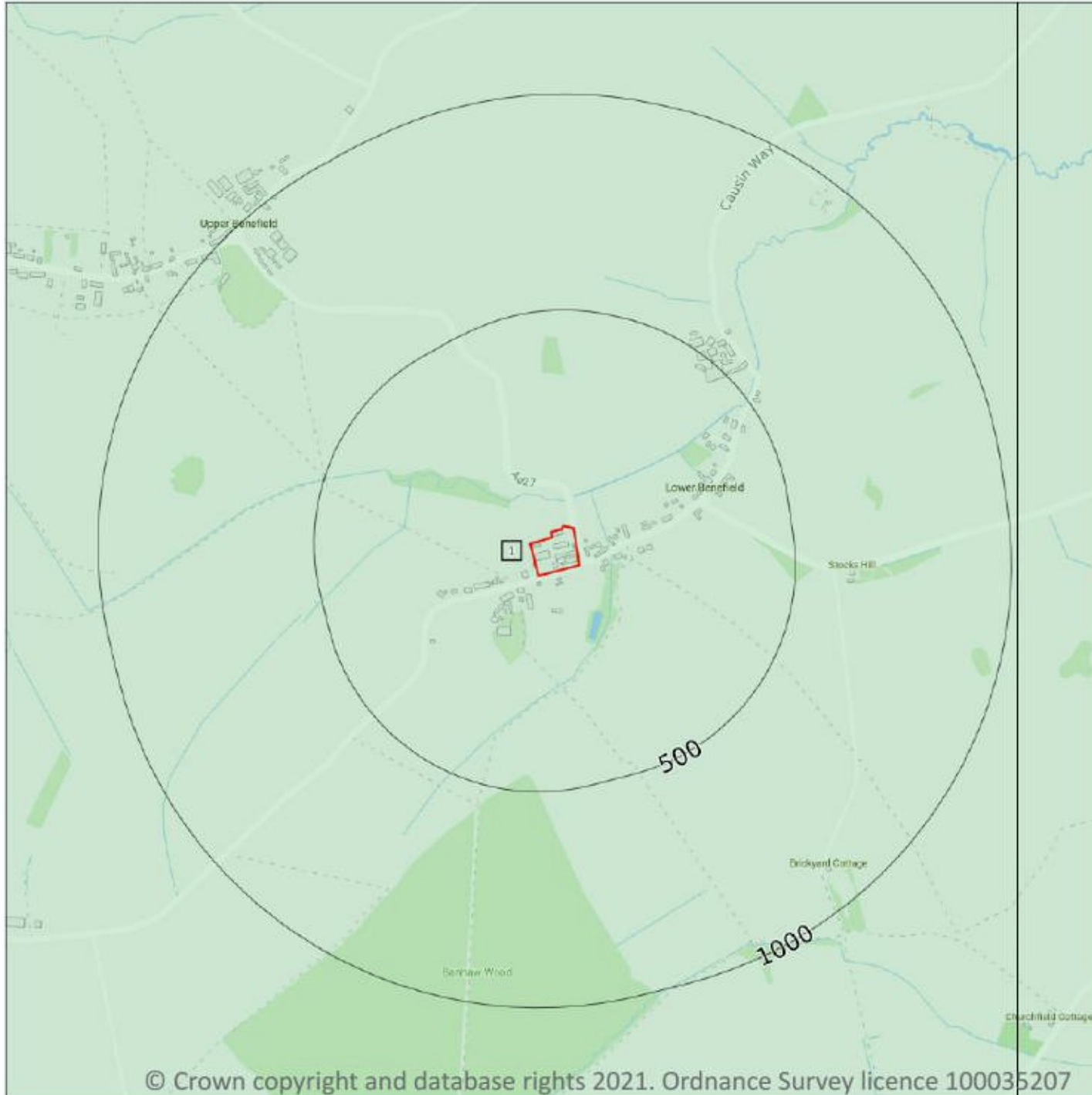
## 13.4 Limestone Pavement Orders

<b>Records within 250m</b>	<b>0</b>
----------------------------	----------

Limestone pavements are outcrops of limestone where the surface has been worn away by natural means over millennia. These rocks have the appearance of paving blocks, hence their name. Not only do they have geological interest, they also provide valuable habitats for wildlife. These habitats are threatened due to their removal for use in gardens and water features. Many limestone pavements have been designated as SSSIs which affords them some protection. In addition, Section 34 of the Wildlife and Countryside Act 1981 gave them additional protection via the creation of Limestone Pavement Orders, which made it a criminal offence to remove any part of the outcrop. The associated Limestone Pavement Priority Habitat is part of the UK Biodiversity Action Plan priority habitat in England.

*This data is sourced from Natural England.*

## 14 Geology 1:10,000 scale - Availability



### 14.1 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 68**

ID	Location	Artificial	Superficial	Bedrock	Mass movement	Sheet No.
1	On site	Full	Full	Full	No coverage	SP98NE

*This data is sourced from the British Geological Survey.*

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

### 14.2 Artificial and made ground (10k)

Records within 500m

0

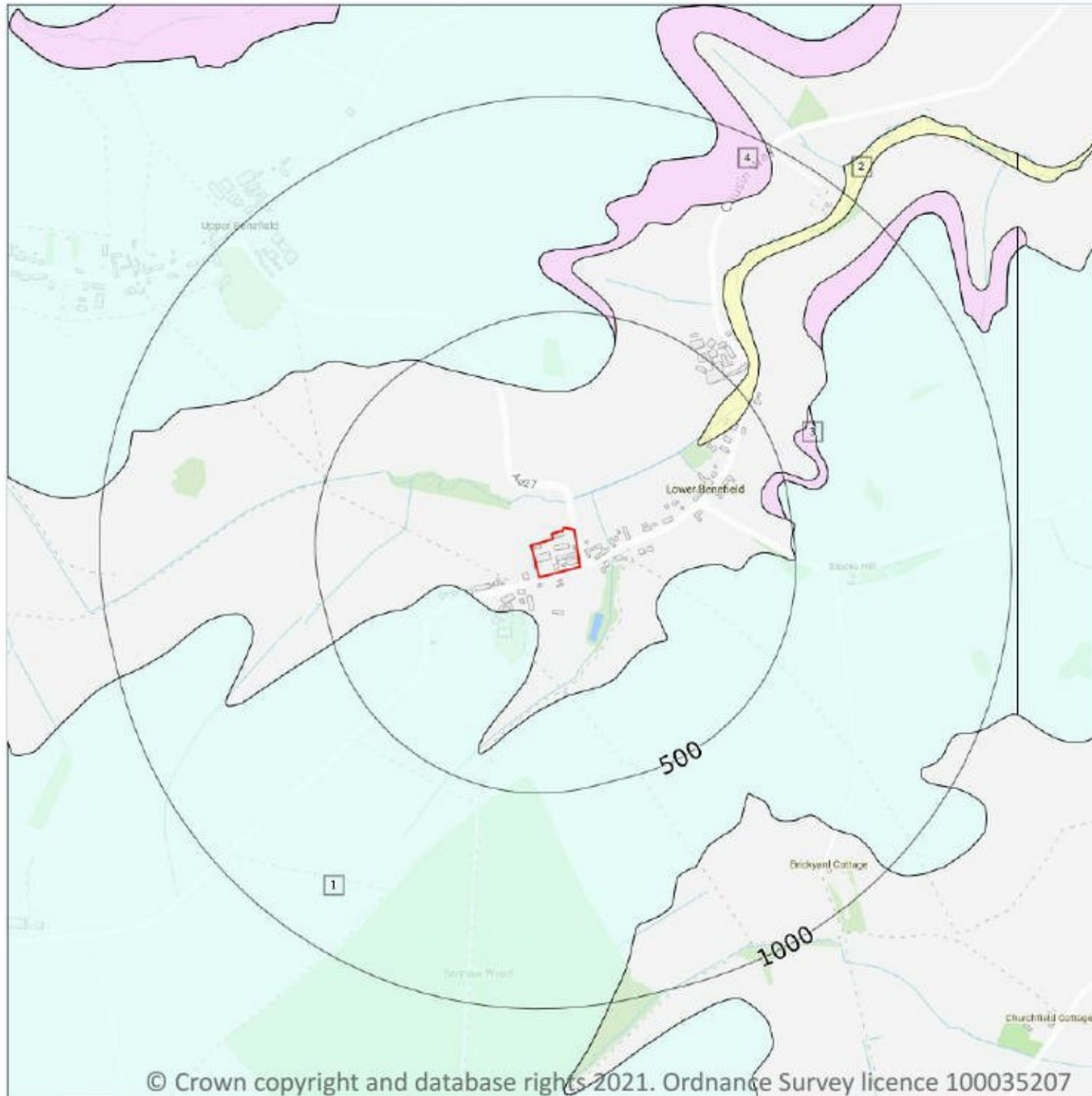
Details of made, worked, infilled, disturbed and landscaped ground at 1:10,000 scale. Artificial ground can be associated with potentially contaminated material, unpredictable engineering conditions and instability.

*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.

### 14.3 Superficial geology (10k)

**Records within 500m** **4**

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 70**

ID	Location	LEX Code	Description	Rock description
1	88m SW	TILMP-DMTN	Till, Mid Pleistocene - Diamicton	Diamicton
2	348m NE	ALV-XCZSV	Alluvium - Clay, Silt, Sand And Gravel	Clay, Silt, Sand And Gravel
3	439m E	GFDMP-XSV	Glaciofluvial Deposits, Mid Pleistocene - Sand And Gravel	Sand And Gravel

ID	Location	LEX Code	Description	Rock description
4	449m N	GFDMP-XSV	Glaciofluvial Deposits, Mid Pleistocene - Sand And Gravel	Sand And Gravel

*This data is sourced from the British Geological Survey.*

## 14.4 Landslip (10k)

**Records within 500m**

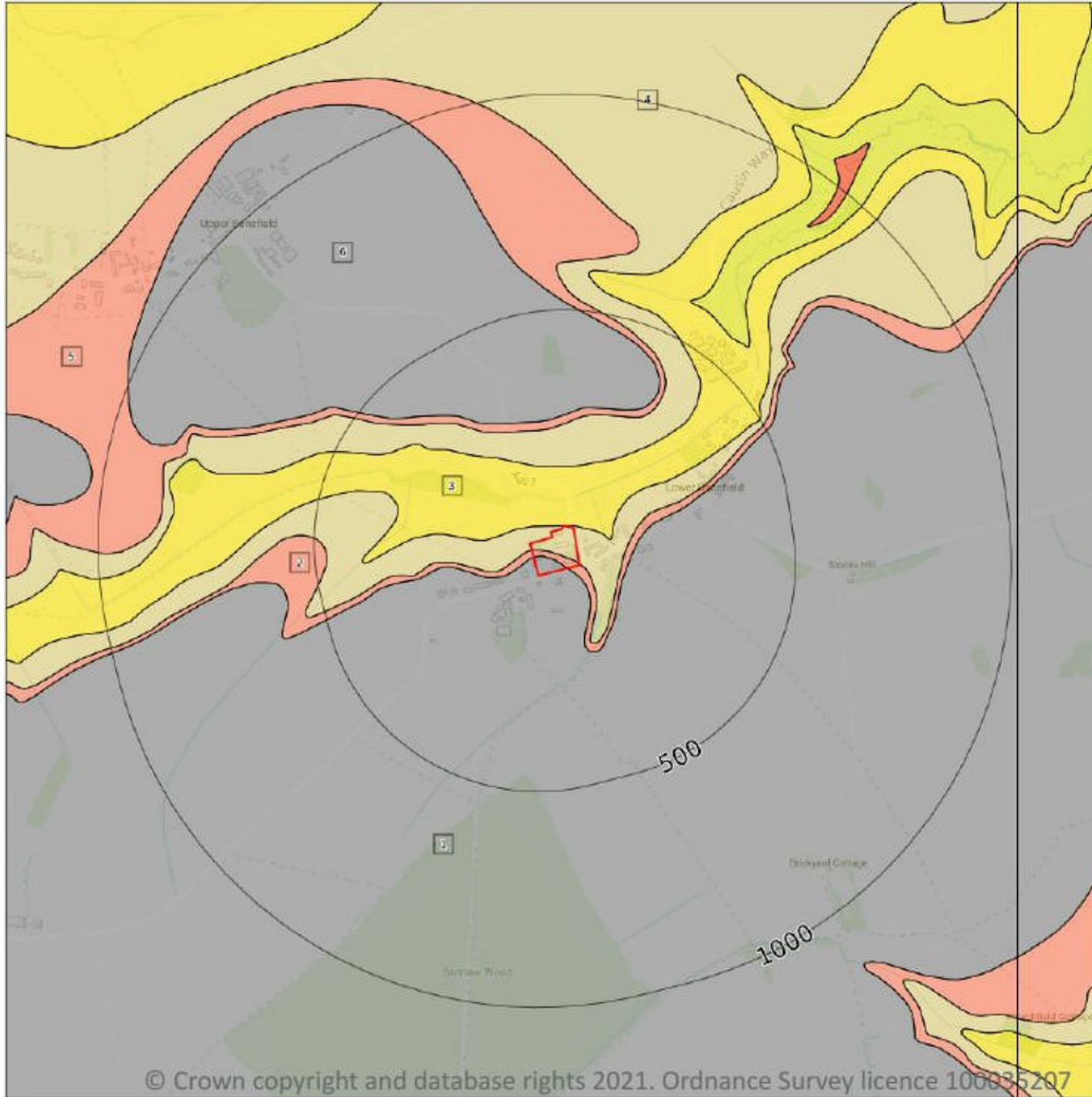
**0**

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.

### 14.5 Bedrock geology (10k)

Records within 500m

6

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 72**

ID	Location	LEX Code	Description	Rock age
1	On site	KLOX-MDST	Kellaways Formation And Oxford Clay Formation (undifferentiated) - Mudstone	Oxfordian Age - Callovian Age
2	On site	CB-LMST	Cornbrash Formation - Limestone	Callovian Age - Bathonian Age
3	On site	BWL-LMST	Blisworth Limestone Formation - Limestone	Bathonian Age



ID	Location	LEX Code	Description	Rock age
4	On site	BWC-MDST	Blisworth Clay Formation - Mudstone	Bathonian Age
5	227m N	CB-LMST	Cornbrash Formation - Limestone	Callovian Age - Bathonian Age
6	247m N	KLOX-MDST	Kellaways Formation And Oxford Clay Formation (undifferentiated) - Mudstone	Oxfordian Age - Callovian Age

*This data is sourced from the British Geological Survey.*

## 14.6 Bedrock faults and other linear features (10k)

<b>Records within 500m</b>	<b>0</b>
----------------------------	----------

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.*

## 15 Geology 1:50,000 scale - Availability



**— Site Outline**

Search buffers in metres (m)

Geological map tile

### 15.1 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 74**

ID	Location	Artificial	Superficial	Bedrock	Mass movement	Sheet No.
1	On site	Full	Full	Full	Full	EW171_kettering_v4

*This data is sourced from the British Geological Survey.*

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

### 15.2 Artificial and made ground (50k)

Records within 500m

0

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.

*This data is sourced from the British Geological Survey.*

### 15.3 Artificial ground permeability (50k)

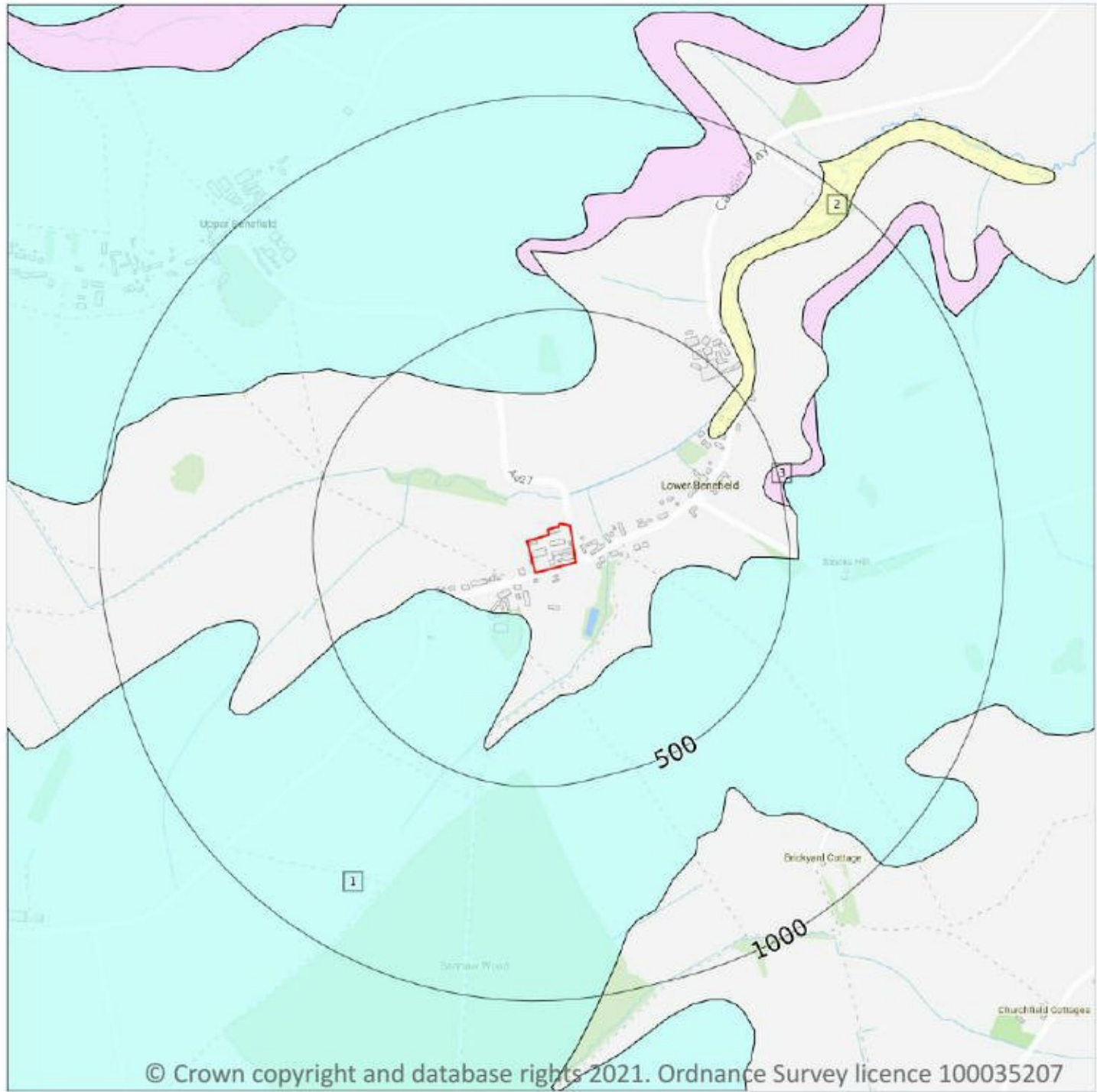
Records within 50m

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.

### 15.4 Superficial geology (50k)

**Records within 500m** **3**

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 76**

ID	Location	LEX Code	Description	Rock description
1	106m S	ODT-DMTN	OADBY MEMBER	DIAMICTON
2	386m NE	ALV-XCZSV	ALLUVIUM	CLAY, SILT, SAND AND GRAVEL
3	459m E	GFDMP-XSV	GLACIOFLUVIAL DEPOSITS, MID PLEISTOCENE	SAND AND GRAVEL

*This data is sourced from the British Geological Survey.*

## 15.5 Superficial 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 superficial deposits (the zone between the land surface and the water table).

*This data is sourced from the British Geological Survey.*

## 15.6 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.*

## 15.7 Landslip permeability (50k)

Records within 50m

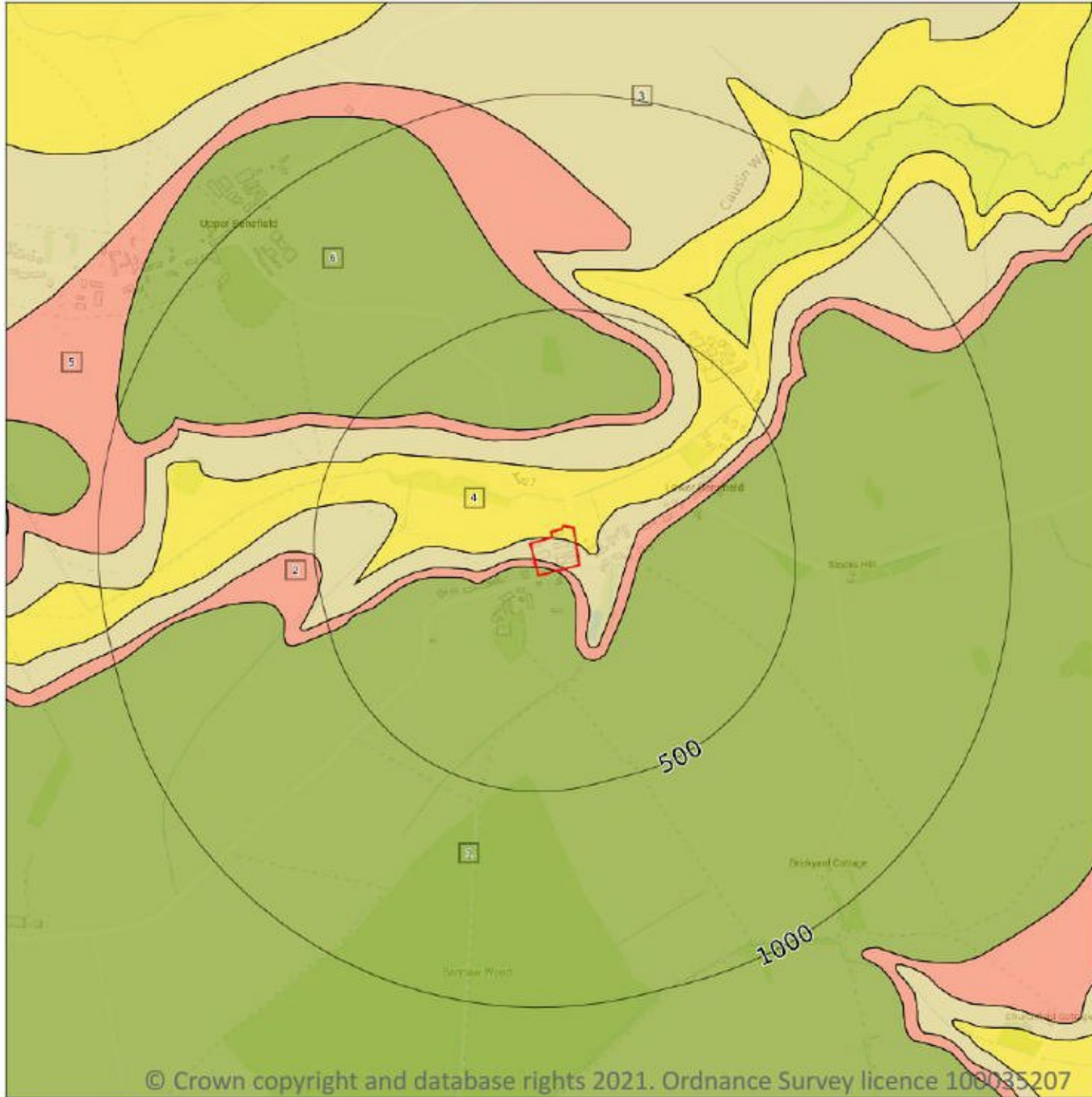
0

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.

### 15.8 Bedrock geology (50k)

Records within 500m

6

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 78**

ID	Location	LEX Code	Description	Rock age
1	On site	KLOX-MDSS	KELLAWAYS FORMATION AND OXFORD CLAY FORMATION (UNDIFFERENTIATED) - MUDSTONE, SILTSTONE AND SANDSTONE	CALLOVIAN
2	On site	CB-LMST	CORNBRASH FORMATION - LIMESTONE	BATHONIAN
3	On site	BWC-MDST	BLISWORTH CLAY FORMATION - MUDSTONE	BATHONIAN



ID	Location	LEX Code	Description	Rock age
4	On site	BWL-LMST	BLISWORTH LIMESTONE FORMATION - LIMESTONE	BATHONIAN
5	214m N	CB-LMST	CORNBRASH FORMATION - LIMESTONE	BATHONIAN
6	230m N	KLOX-MDSS	KELLAWAYS FORMATION AND OXFORD CLAY FORMATION (UNDIFFERENTIATED) - MUDSTONE, SILTSTONE AND SANDSTONE	CALLOVIAN

*This data is sourced from the British Geological Survey.*

## 15.9 Bedrock permeability (50k)

<b>Records within 50m</b>	<b>4</b>
---------------------------	----------

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	Fracture	Very High	Very High
On site	Mixed	Moderate	Very Low
On site	Fracture	Low	Very Low
On site	Fracture	Very High	High

*This data is sourced from the British Geological Survey.*

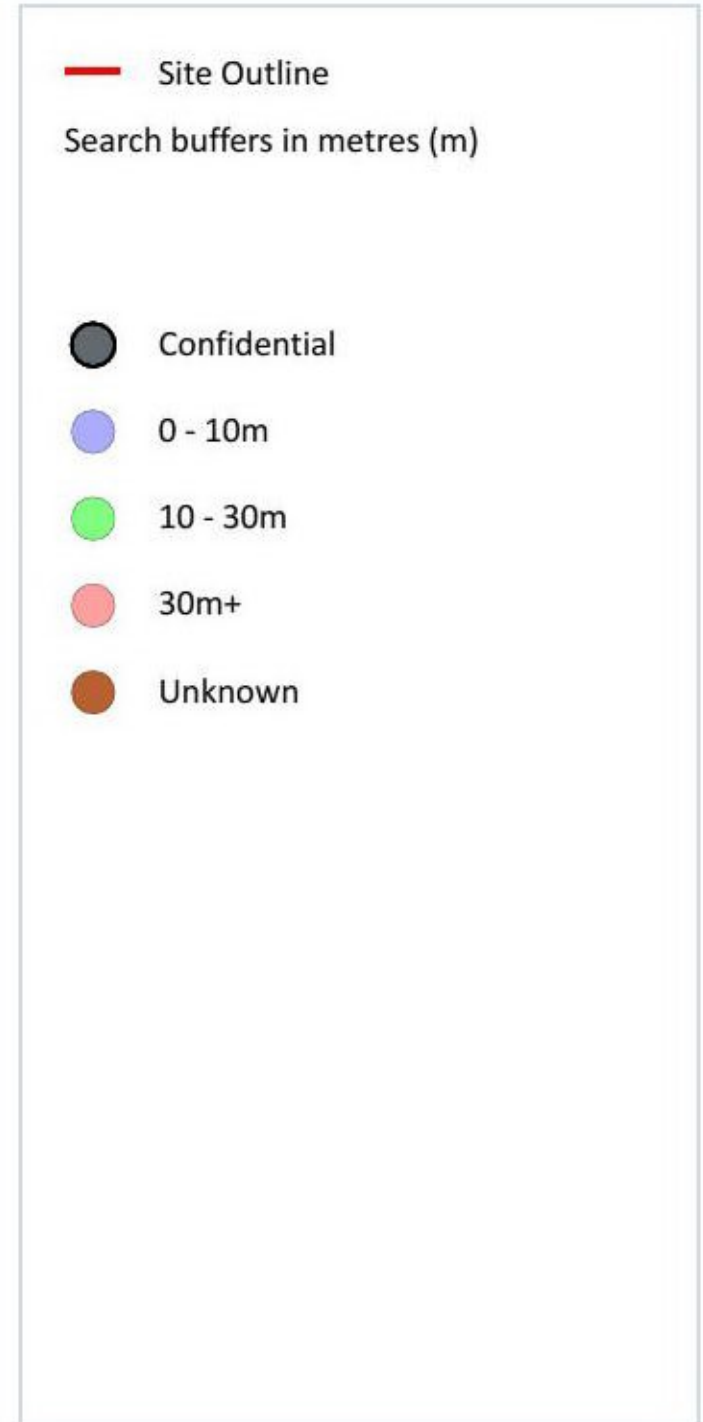
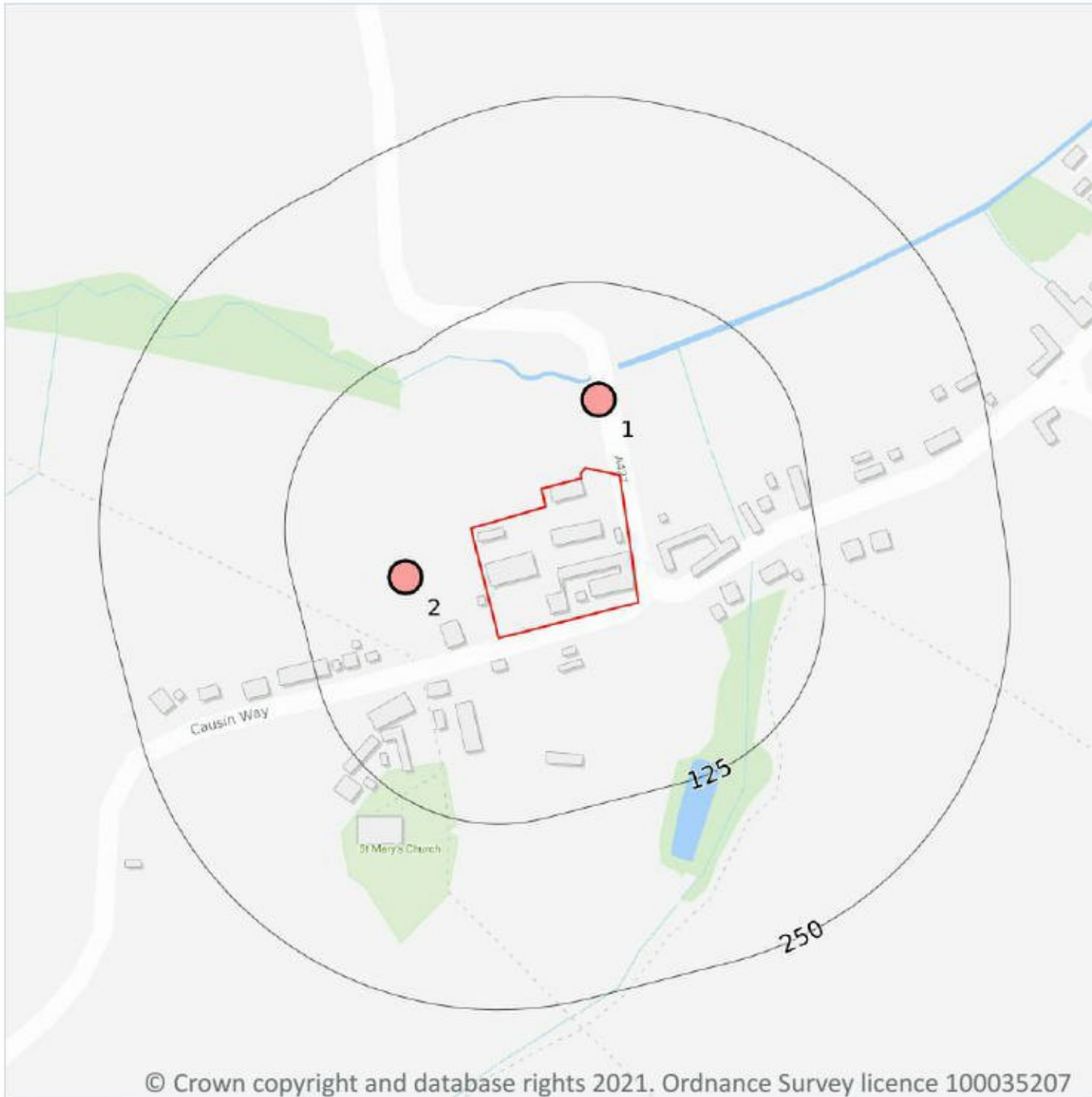
## 15.10 Bedrock faults and other linear features (50k)

<b>Records within 500m</b>	<b>0</b>
----------------------------	----------

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.*

## 16 Boreholes



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### 16.1 BGS Boreholes

Records within 250m

2

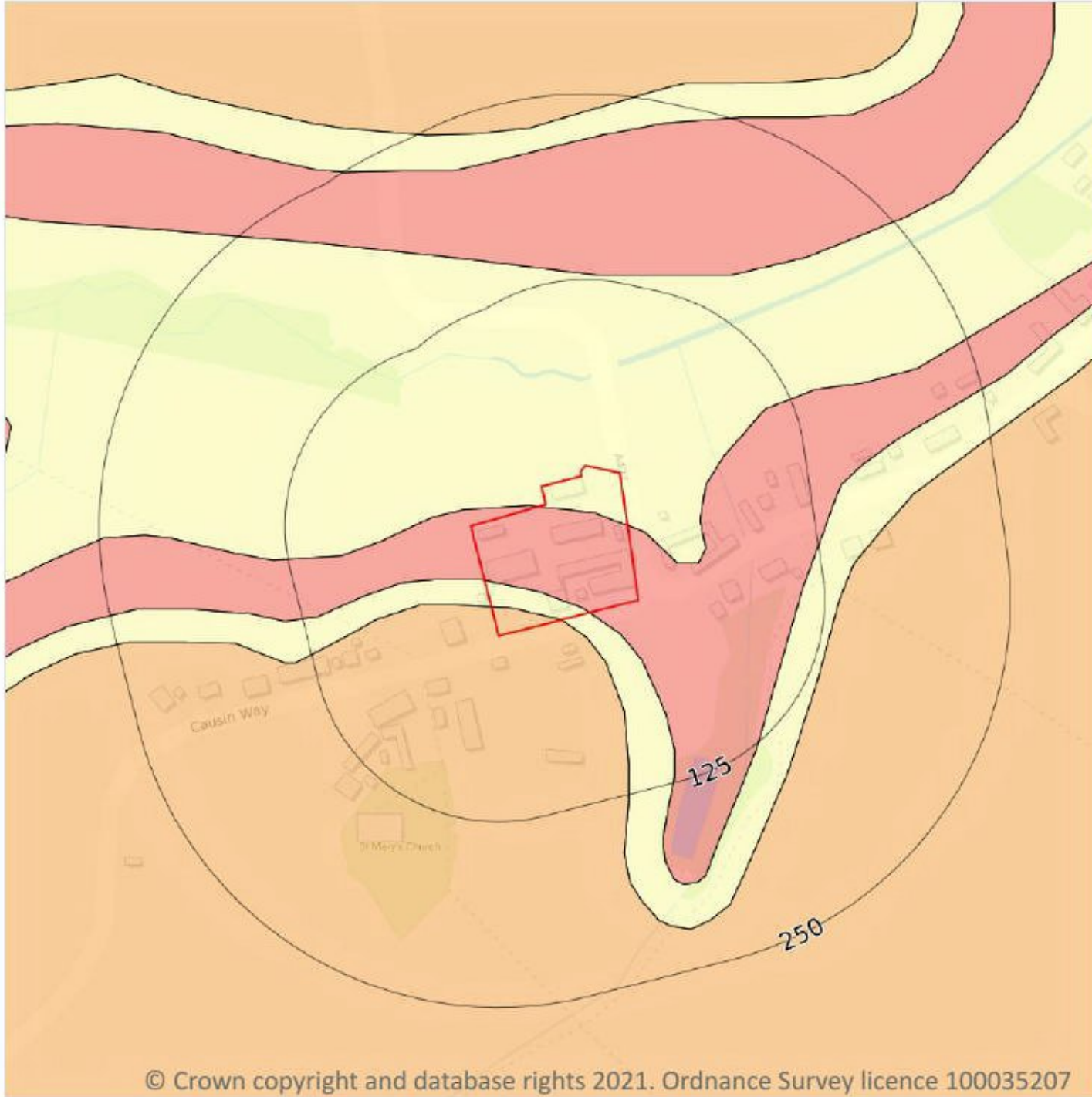
The Single Onshore Boreholes Index (SOBI); an index of over one million records of boreholes, shafts and wells from all forms of drilling and site investigation work held by the British Geological Survey. Covering onshore and nearshore boreholes dating back to at least 1790 and ranging from one to several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

Features are displayed on the Boreholes map on **page 80**

ID	Location	Grid reference	Name	Length	Confidential	Web link
1	47m N	498960 288760	RECTORY FARM XLV111 21.60T/7597	31.39	N	<a href="#">363845</a>
2	51m W	498830 288640	RECTORY FARM XLV111 10.0.80/7559	37.49	N	<a href="#">363849</a>

*This data is sourced from the British Geological Survey.*

## 17 Natural ground subsidence - Shrink swell clays



### 17.1 Shrink swell clays

Records within 50m

3

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).

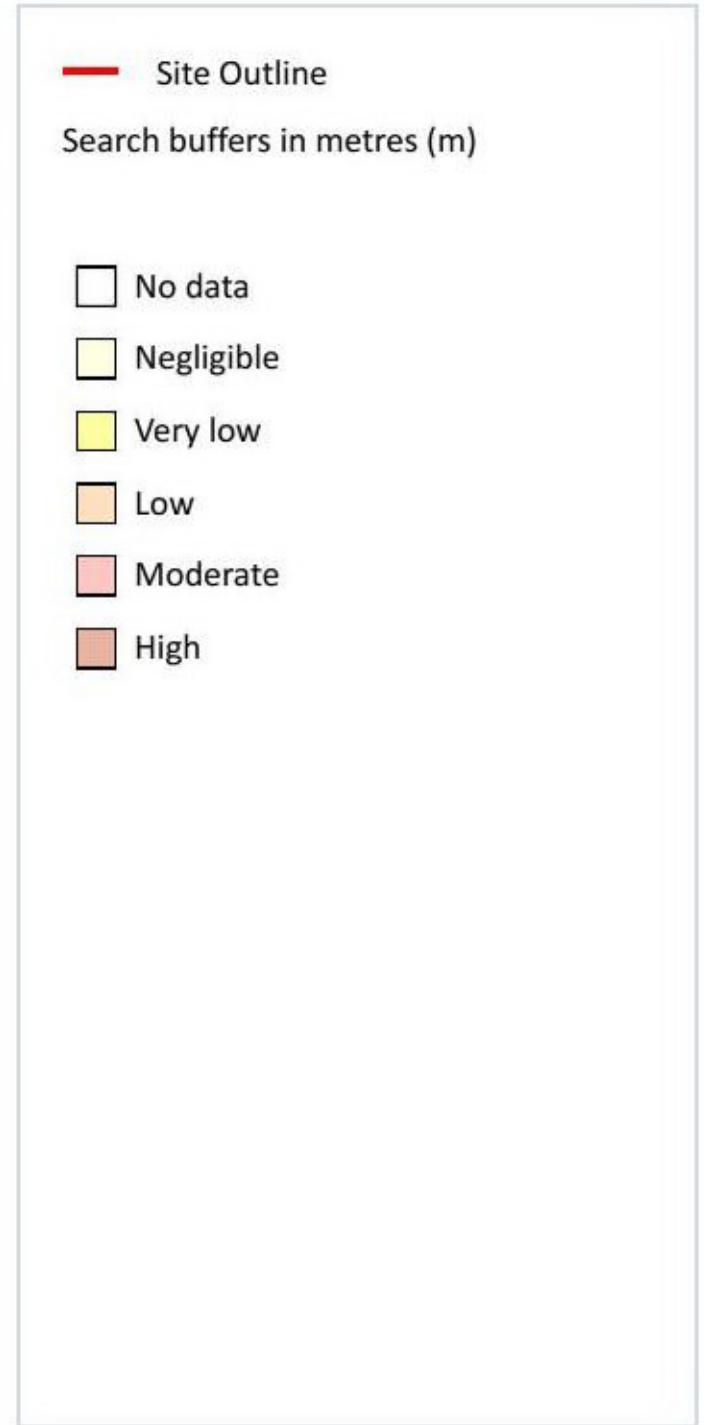
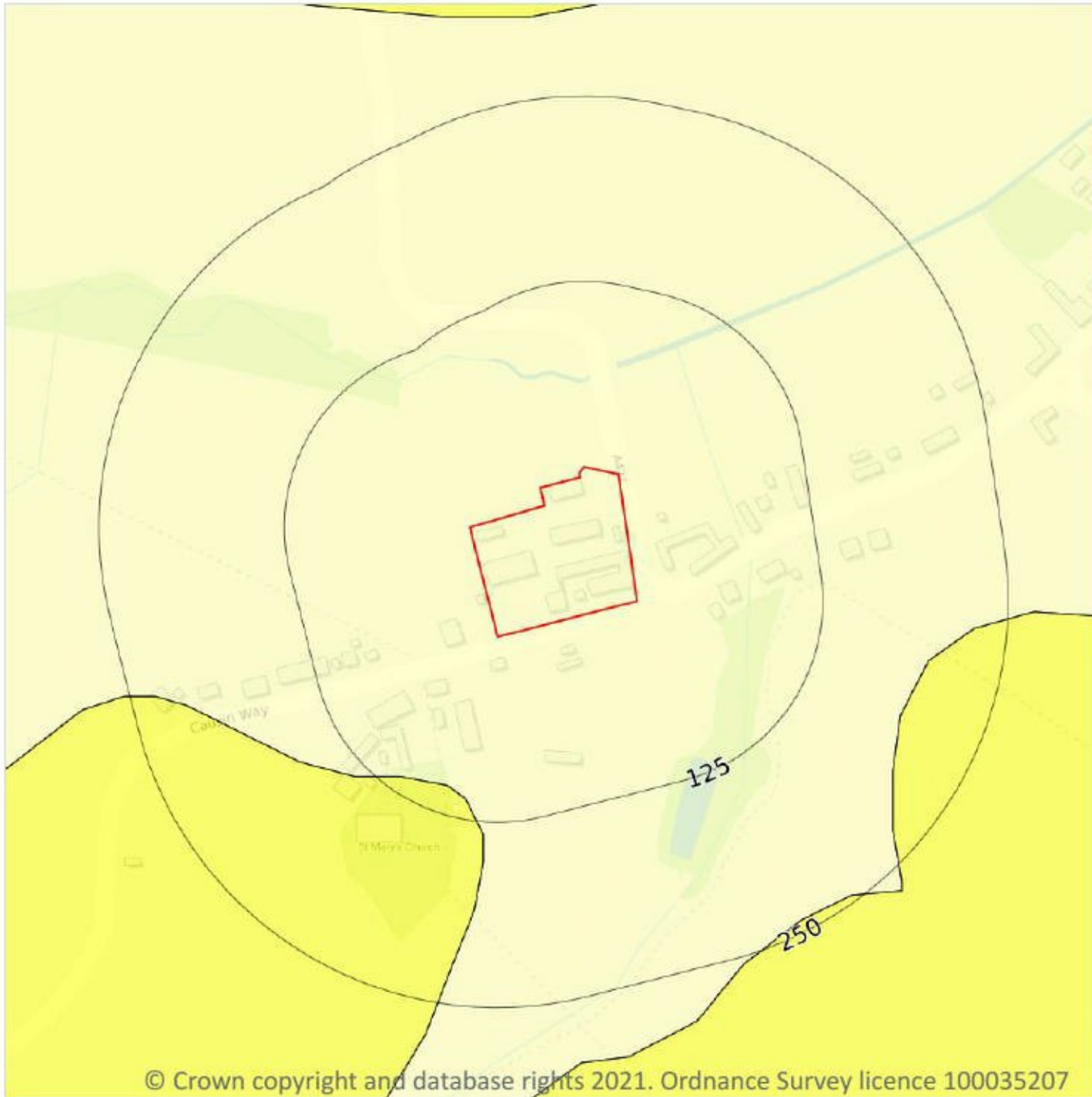
Features are displayed on the Natural ground subsidence - Shrink swell clays map on **page 81**

Location	Hazard rating	Details
On site	Negligible	Ground conditions predominantly non-plastic.
On site	Low	Ground conditions predominantly medium plasticity.
On site	Moderate	Ground conditions predominantly high plasticity.

*This data is sourced from the British Geological Survey.*



## Natural ground subsidence - Running sands



### 17.2 Running sands

Records within 50m

1

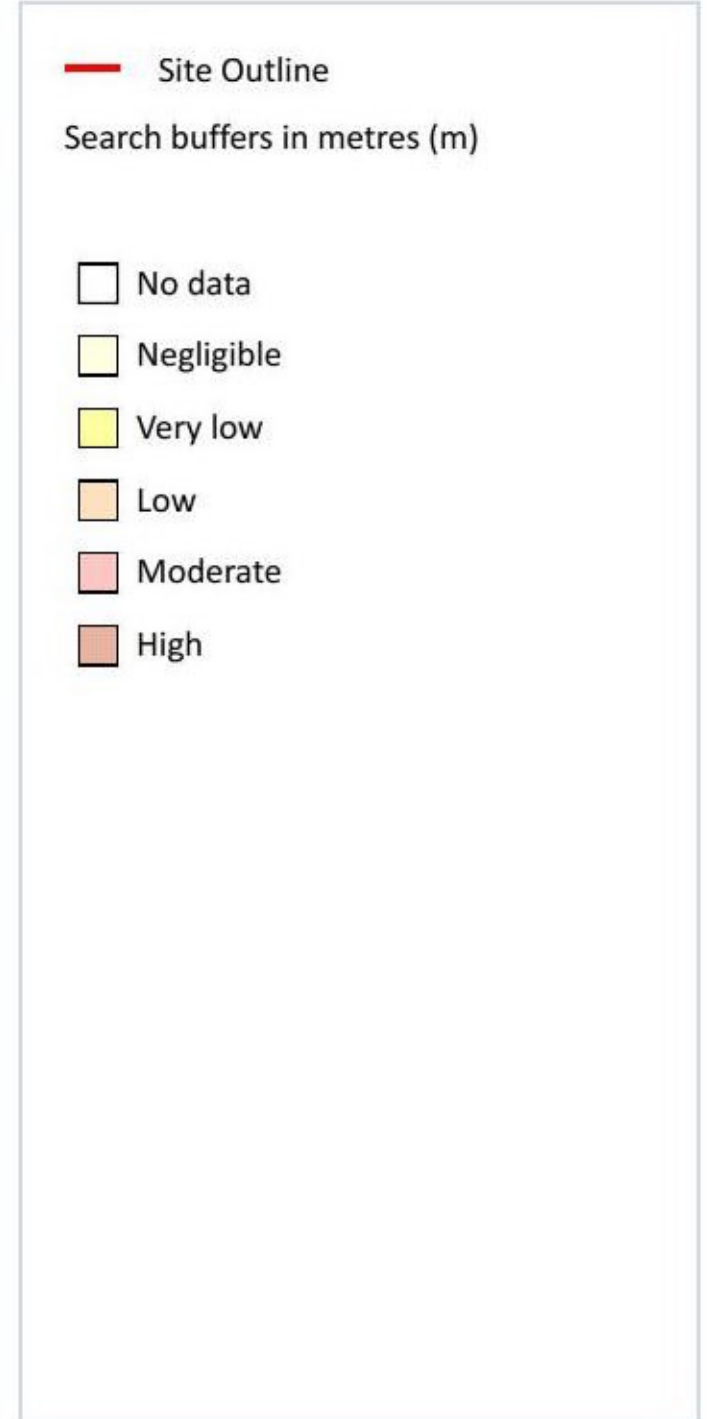
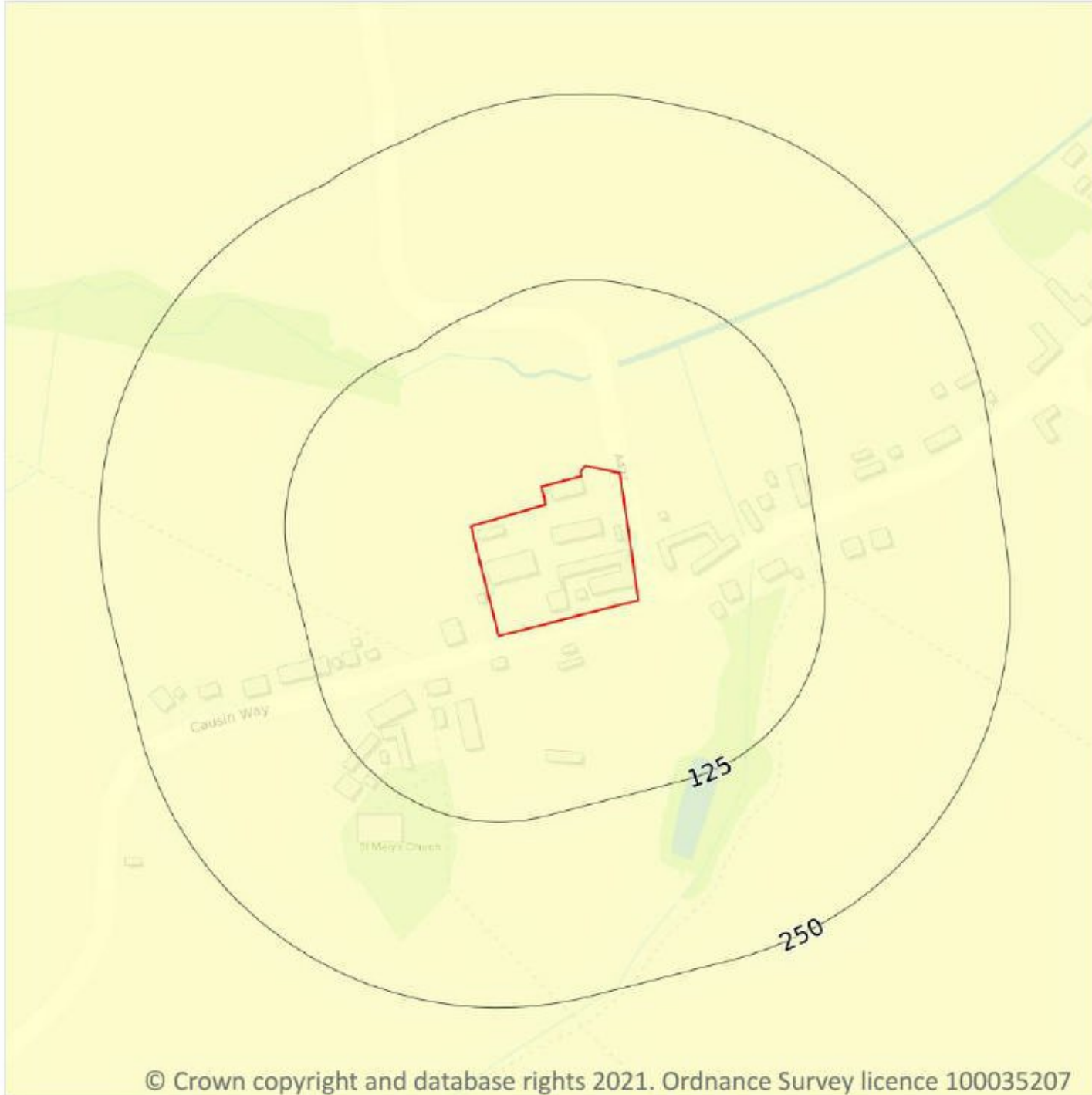
The potential hazard presented by rocks that can contain loosely-packed sandy layers that can become fluidised by water flowing through them. Such sands can 'run', removing support from overlying buildings and causing potential damage.

Features are displayed on the Natural ground subsidence - Running sands map on **page 83**

Location	Hazard rating	Details
On site	Negligible	Running sand conditions are not thought to occur whatever the position of the water table. No identified constraints on lands use due to running conditions.

*This data is sourced from the British Geological Survey.*

## Natural ground subsidence - Compressible deposits



### 17.3 Compressible deposits

Records within 50m

1

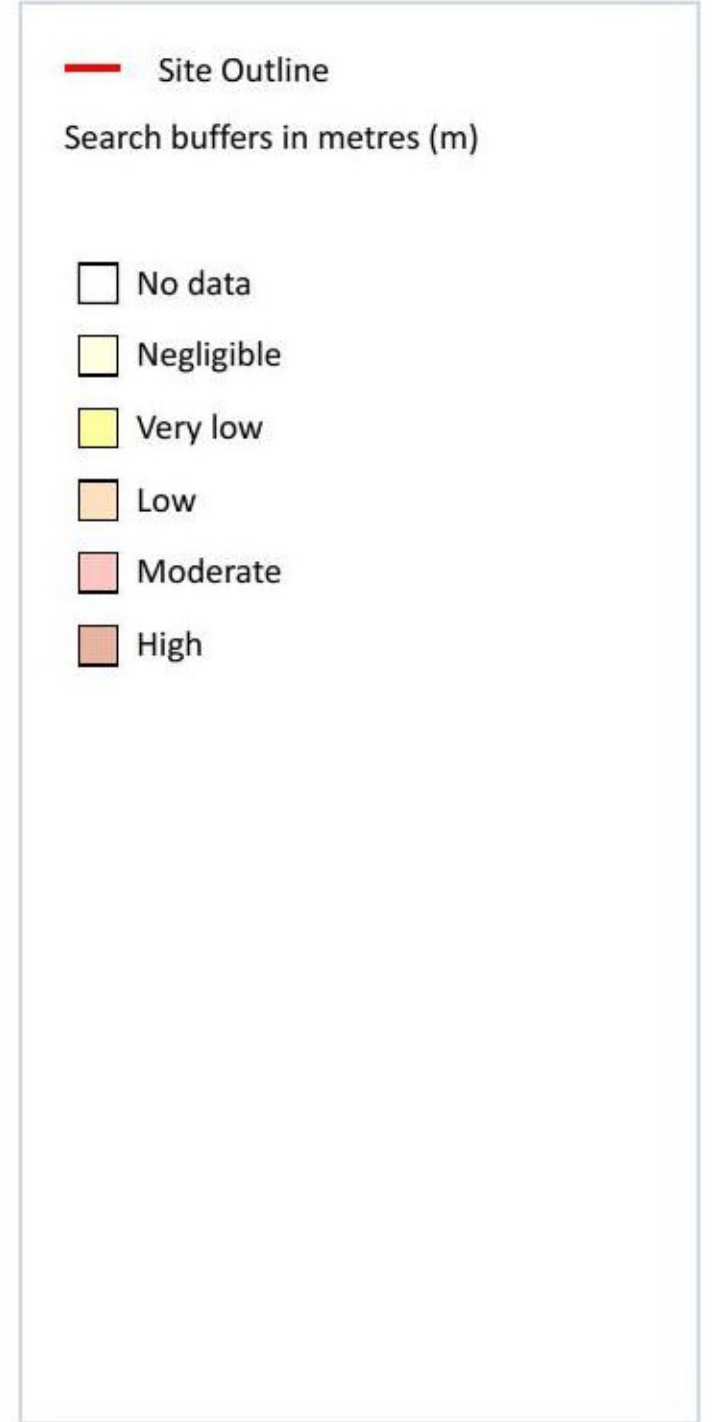
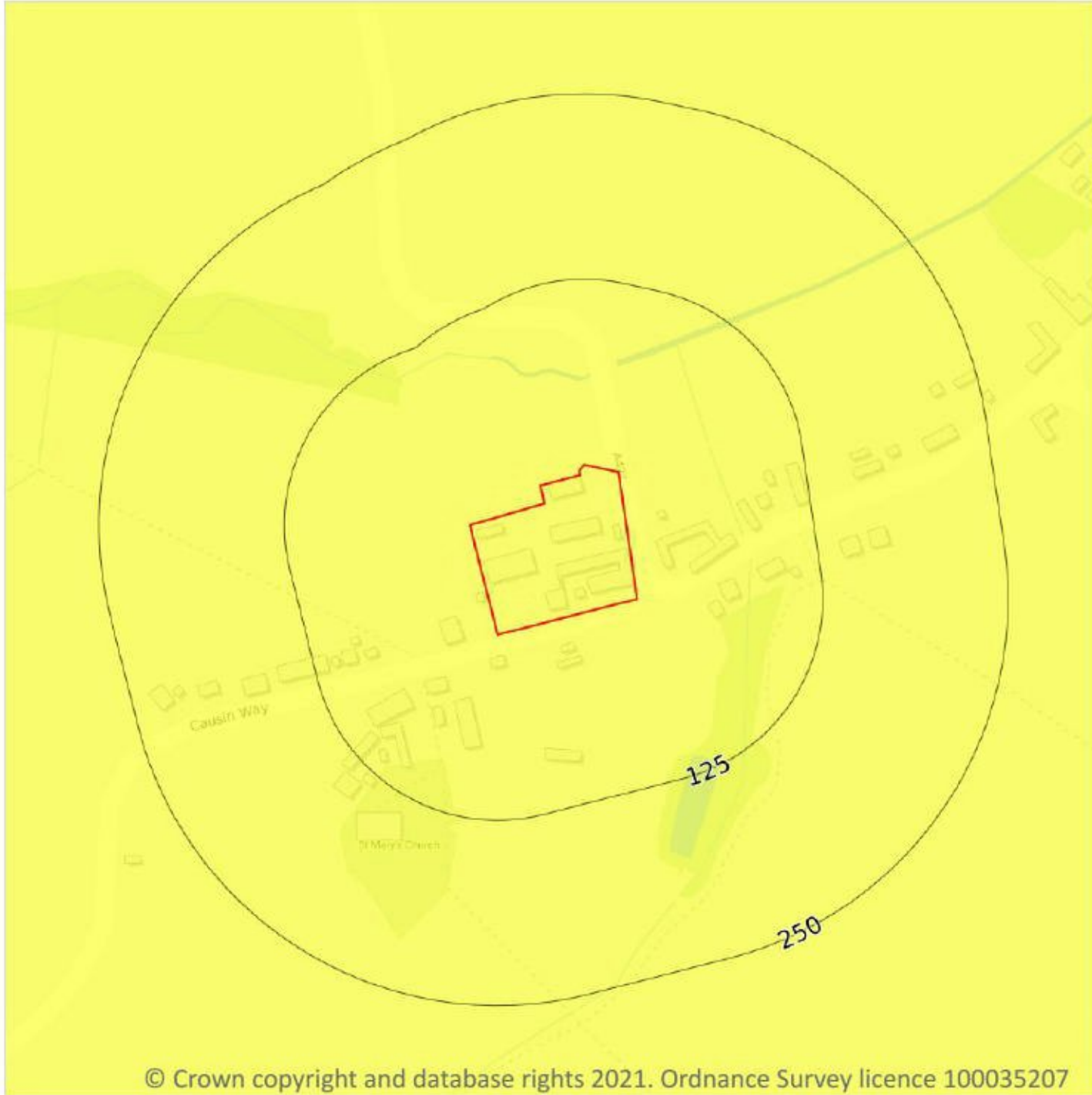
The potential hazard presented by types of ground that may contain layers of very soft materials like clay or peat and may compress if loaded by overlying structures, or if the groundwater level changes, potentially resulting in depression of the ground and disturbance of foundations.

Features are displayed on the Natural ground subsidence - Compressible deposits map on **page 84**

Location	Hazard rating	Details
On site	Negligible	Compressible strata are not thought to occur.

*This data is sourced from the British Geological Survey.*

## Natural ground subsidence - Collapsible deposits



### 17.4 Collapsible deposits

Records within 50m

1

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.

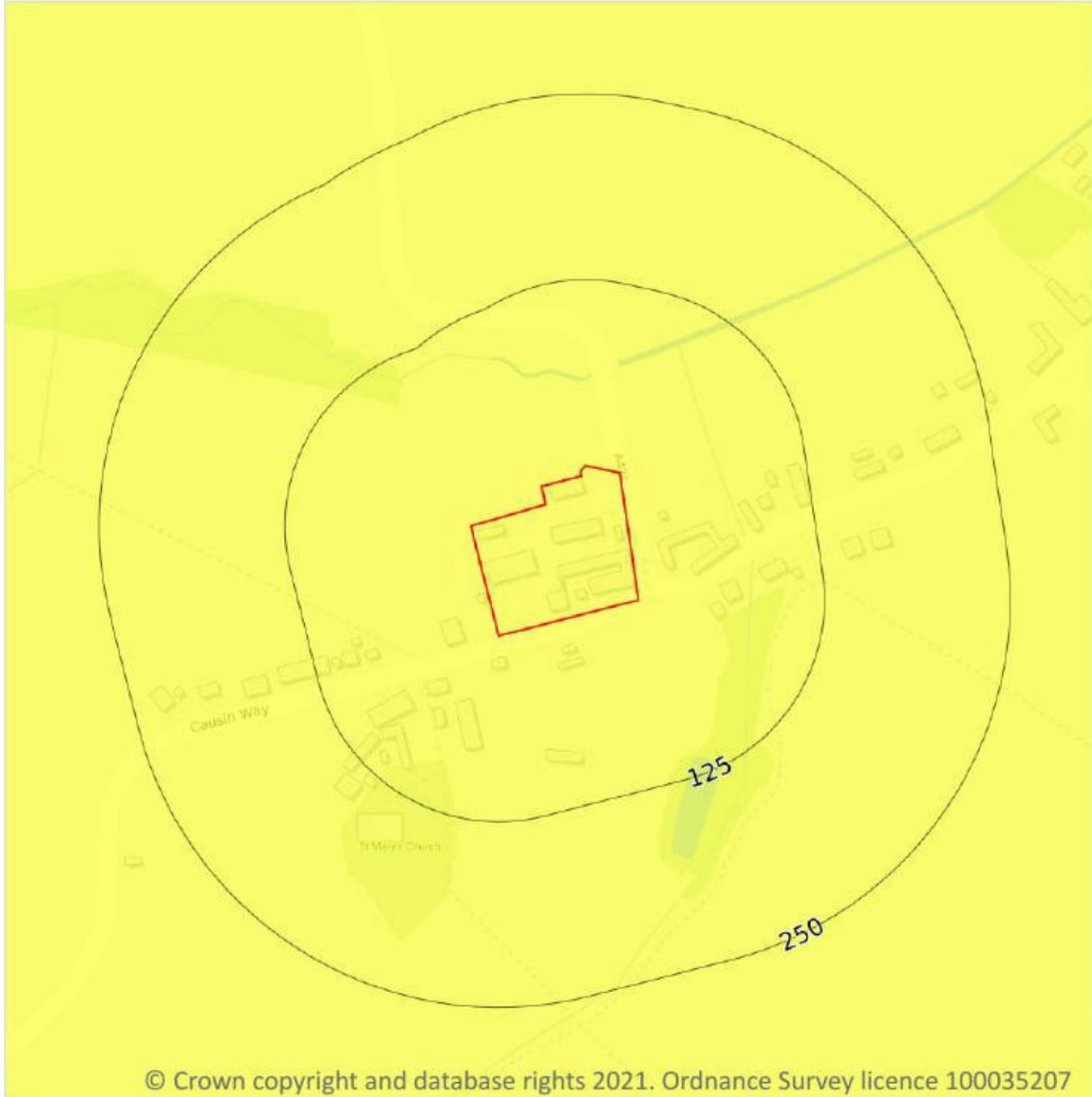
Features are displayed on the Natural ground subsidence - Collapsible deposits map on **page 85**

Location	Hazard rating	Details
On site	Very low	Deposits with potential to collapse when loaded and saturated are unlikely to be present.

*This data is sourced from the British Geological Survey.*



## Natural ground subsidence - Landslides



### 17.5 Landslides

Records within 50m

1

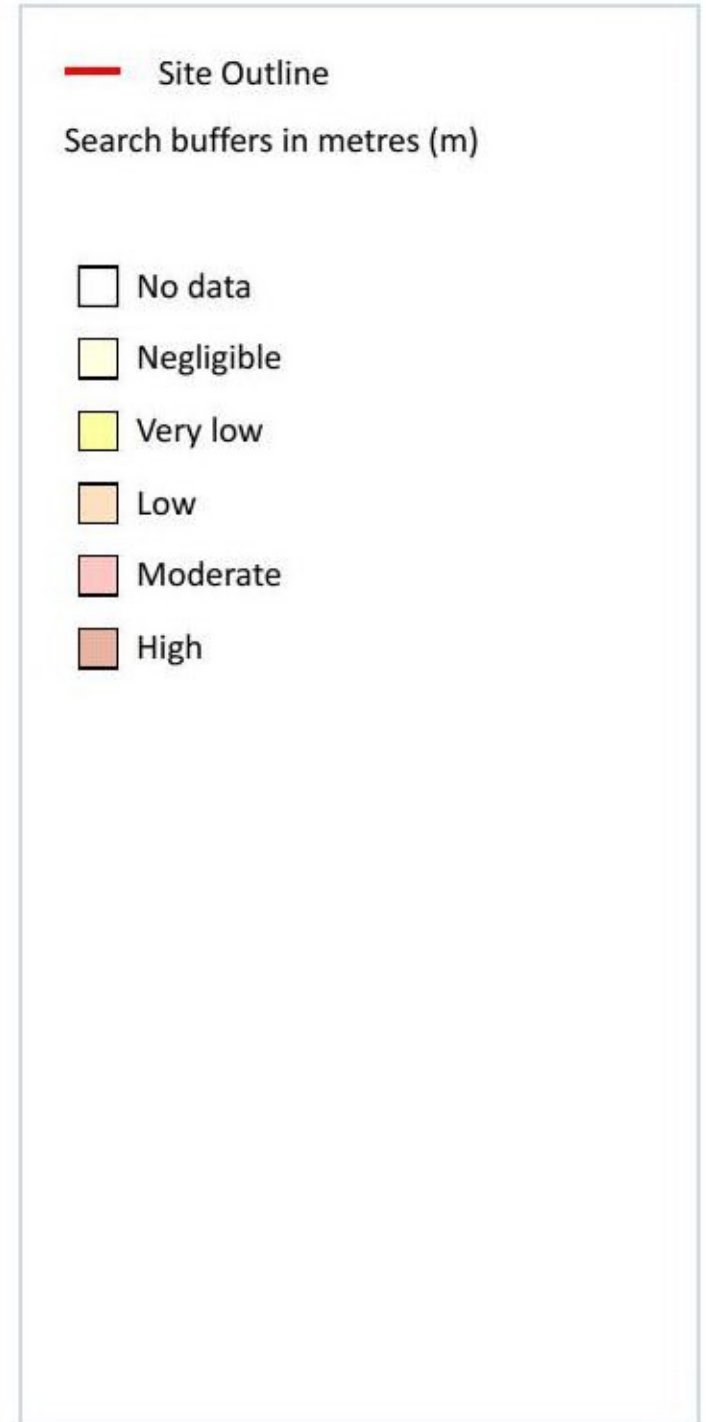
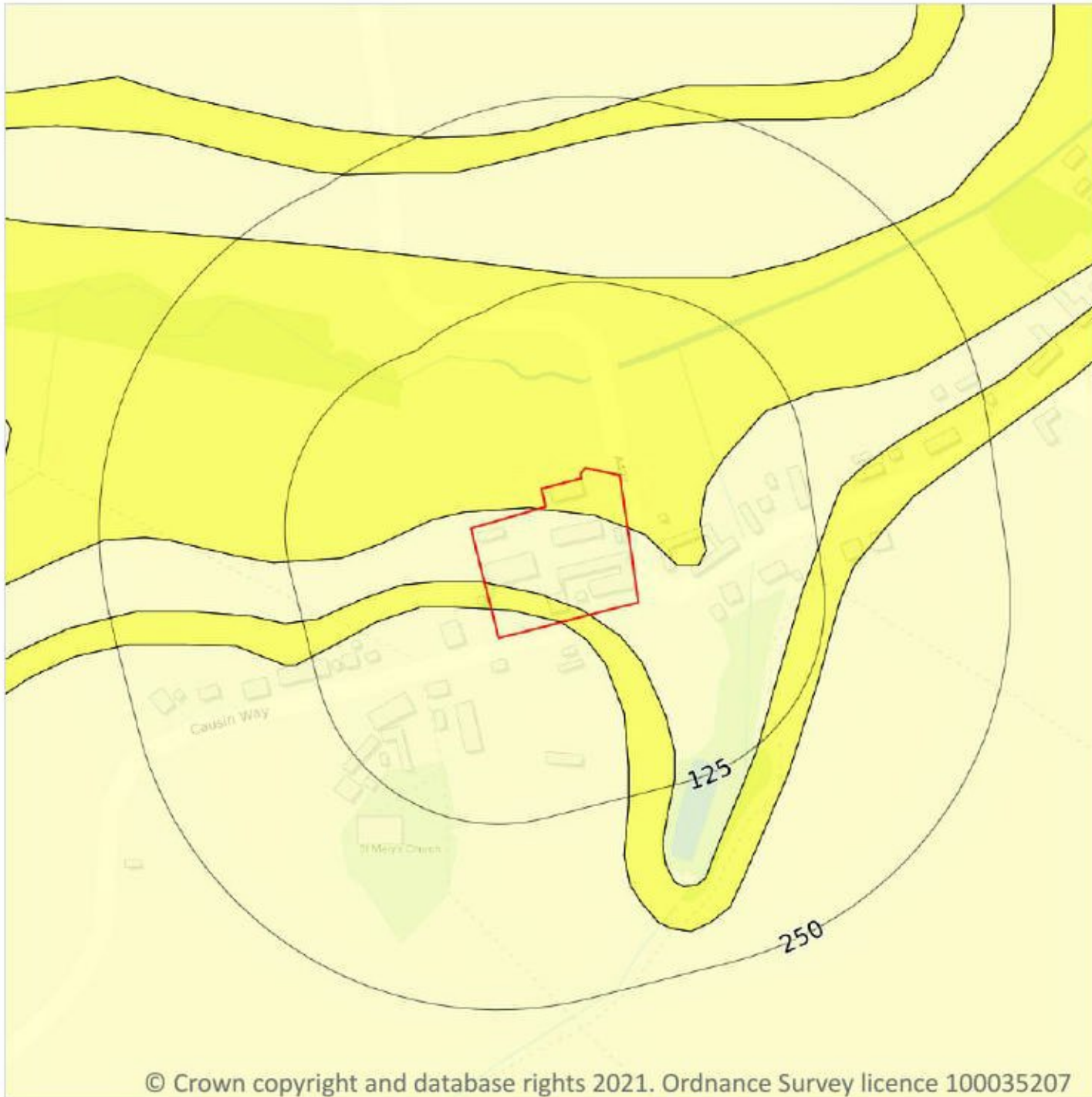
The potential for landsliding (slope instability) to be a hazard assessed using 1:50,000 scale digital maps of superficial and bedrock deposits, combined with information from the BGS National Landslide Database and scientific and engineering reports.

Features are displayed on the Natural ground subsidence - Landslides map on **page 86**

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



### 17.6 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 87**

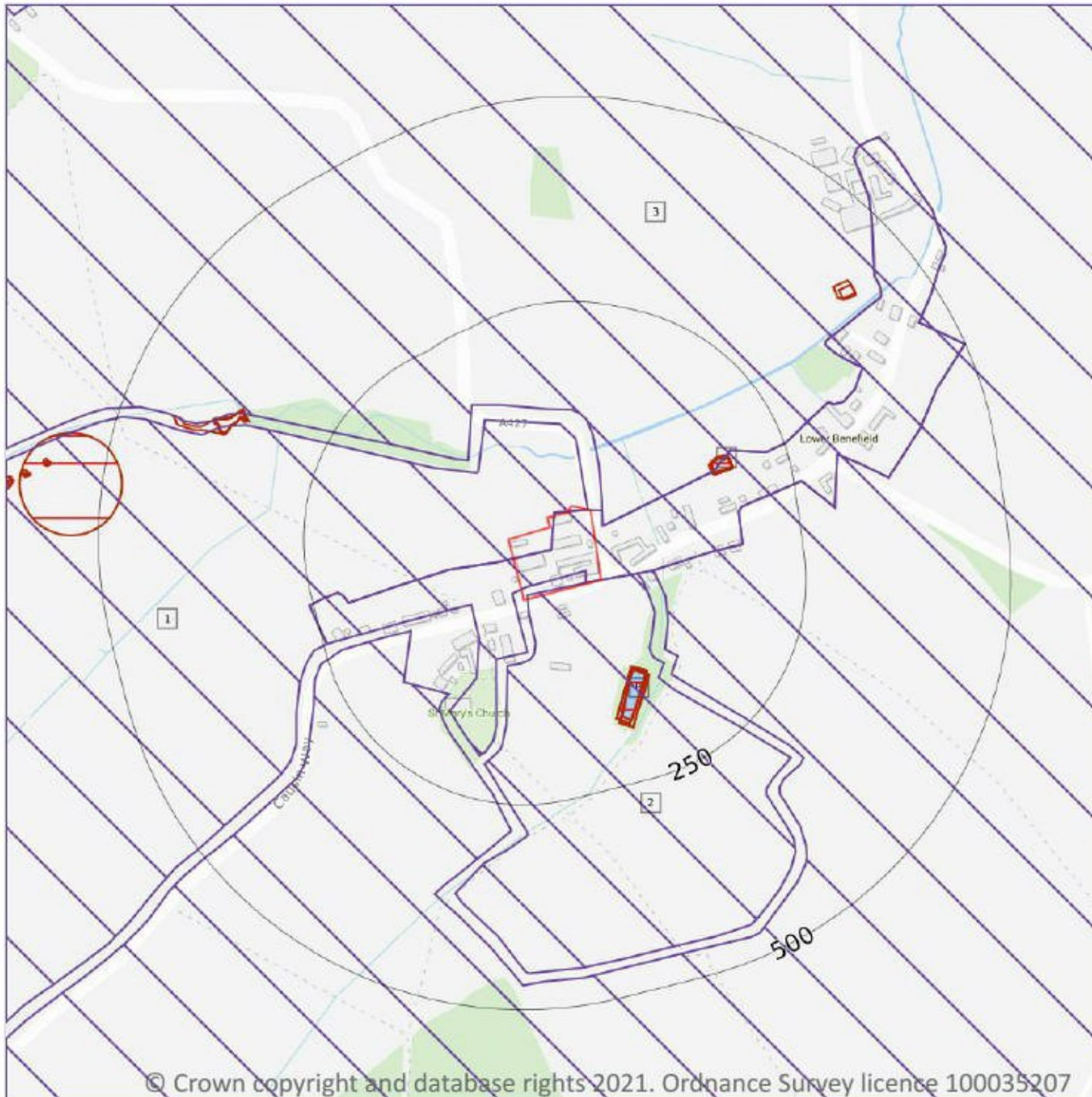
Location	Hazard rating	Details
On site	Negligible	Soluble rocks are either not thought to be present within the ground, or not prone to dissolution. Dissolution features are unlikely to be present.

Location	Hazard rating	Details
On site	Very low	<b>Soluble rocks are present within the ground. Few dissolution features are likely to be present. Potential for difficult ground conditions or localised subsidence are at a level where they need not be considered.</b>

*This data is sourced from the British Geological Survey.*



## 18 Mining, ground workings and natural cavities



### 18.1 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 Peter Brett Associates (PBA).*

## 18.2 BritPits

<b>Records within 500m</b>	<b>0</b>
----------------------------	----------

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.

*This data is sourced from the British Geological Survey.*

## 18.3 Surface ground workings

<b>Records within 250m</b>	<b>10</b>
----------------------------	-----------

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, ground workings and natural cavities map on **page 89**

ID	Location	Land Use	Year of mapping	Mapping scale
B	112m S	Pond	1950	1:10560
B	112m S	Pond	1899	1:10560
B	112m S	Pond	1885	1:10560
B	115m S	Pond	1971	1:10000
B	115m S	Pond	1950	1:10560
B	115m S	Pond	1927	1:10560
A	154m E	Unspecified Heap	1927	1:10560
A	154m E	Unspecified Heap	1927	1:10560
A	157m E	Unspecified Heap	1950	1:10560
A	157m E	Unspecified Heap	1950	1:10560

*This data is sourced from Ordnance Survey/Groundsure.*

## 18.4 Underground workings

<b>Records within 1000m</b>	<b>0</b>
-----------------------------	----------

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.*

## 18.5 Historical Mineral Planning Areas

<b>Records within 500m</b>	<b>4</b>
----------------------------	----------

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, ground workings and natural cavities map on **page 89**

ID	Location	Site Name	Mineral	Type	Planning Status	Planning Status Date
1	On site	Brigstock and Benefield	Ironstone	Surface mineral working	Application	Not available
2	On site	Benfield and Stoke Doyle	Ironstone	Surface mineral working	Application	Not available
A	On site	Benfield and Stoke Doyle	Ironstone	Surface mineral working	Withdrawn	20/9/74
3	11m E	Benfield and Stoke Doyle	Ironstone	Surface mineral working	Application	Not available

*This data is sourced from the British Geological Survey.*

## 18.6 Non-coal mining

<b>Records within 1000m</b>	<b>0</b>
-----------------------------	----------

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).

*This data is sourced from the British Geological Survey.*

## 18.7 Mining cavities

<b>Records within 1000m</b>	<b>0</b>
-----------------------------	----------

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.

*This data is sourced from Peter Brett Associates (PBA).*

## 18.8 JPB mining areas

Records on site

1

Areas which could be affected by former coal 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) have information such as mining plans and maps held within their archive of mining activities that have occurred within 1km of this property. Further details and a quote for services can be obtained by emailing this report to <a href="mailto:enquiries.gs@jpb.co.uk">enquiries.gs@jpb.co.uk</a> .

*This data is sourced from Johnson Poole and Bloomer.*

## 18.9 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.*

## 18.10 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.*

## 18.11 Gypsum areas

Records on site

0

Generalised areas that may be affected by gypsum extraction.

*This data is sourced from British Gypsum.*

## 18.12 Tin mining

Records on site

0

Generalised areas that may be affected by historical tin mining.

*This data is sourced from Mining Searches UK.*

## 18.13 Clay mining

Records on site

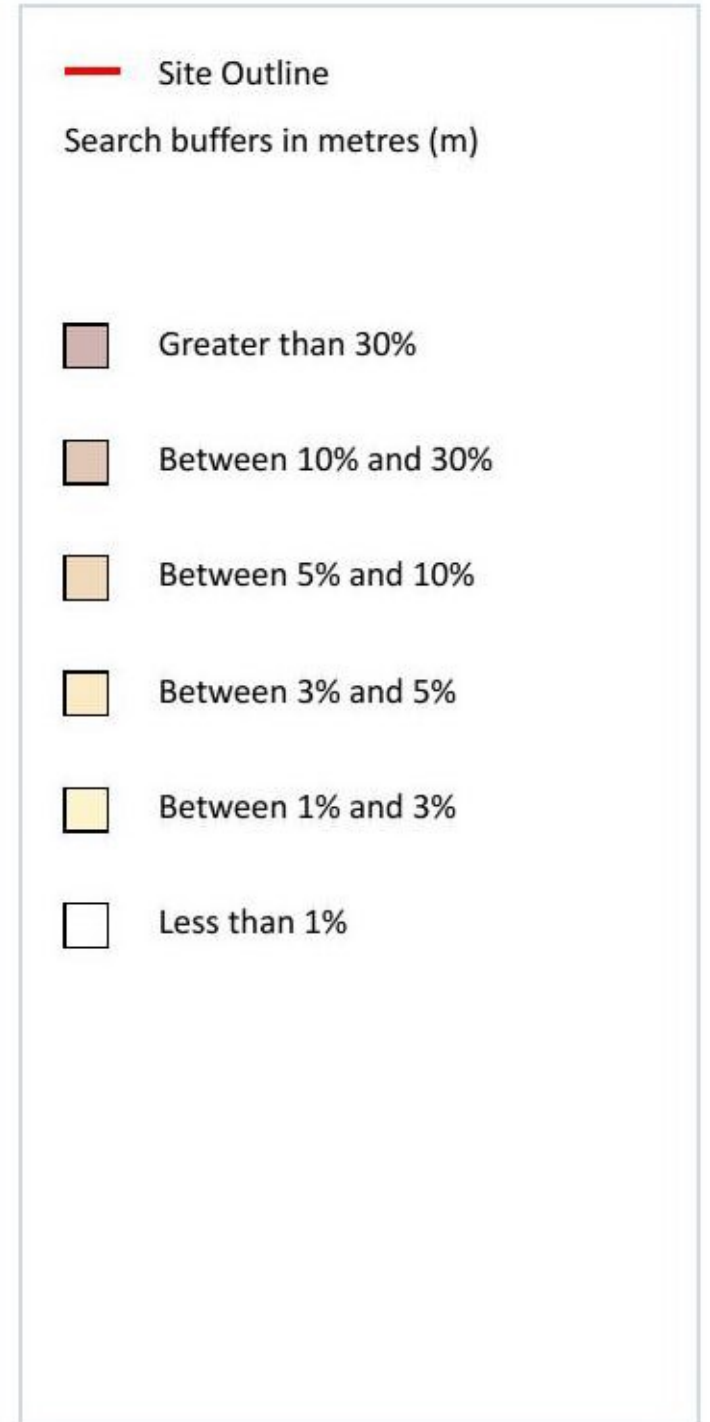
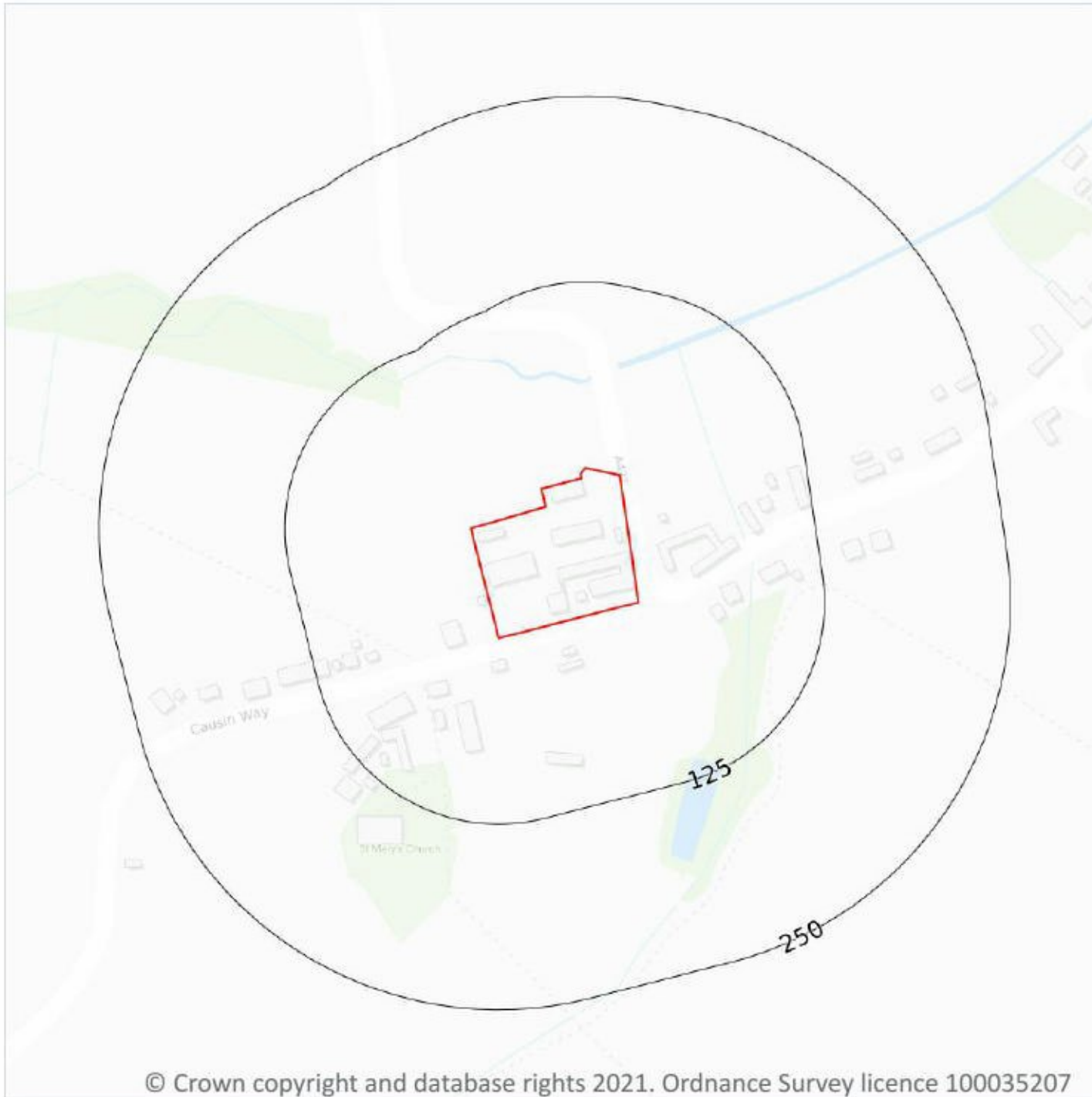
0

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

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



## 19 Radon



### 19.1 Radon

#### Records on site

1

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

Features are displayed on the Radon map on **page 94**

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

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

## 20 Soil chemistry

### 20.1 BGS Estimated Background Soil Chemistry

Records within 50m

6

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 km<sup>2</sup>. 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 km<sup>2</sup>; 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	90 - 120 mg/kg	30 - 45 mg/kg
On site	15 - 25 mg/kg	No data	100 mg/kg	60 mg/kg	1.8 mg/kg	60 - 90 mg/kg	30 - 45 mg/kg
On site	15 mg/kg	No data	100 mg/kg	60 mg/kg	1.8 mg/kg	60 - 90 mg/kg	30 - 45 mg/kg
On site	15 mg/kg	No data	100 mg/kg	60 mg/kg	1.8 mg/kg	60 - 90 mg/kg	30 - 45 mg/kg
13m E	15 mg/kg	No data	100 mg/kg	60 mg/kg	1.8 mg/kg	60 - 90 mg/kg	30 - 45 mg/kg
19m NE	15 mg/kg	No data	100 mg/kg	60 mg/kg	1.8 mg/kg	60 - 90 mg/kg	30 - 45 mg/kg

*This data is sourced from the British Geological Survey.*

### 20.2 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 km<sup>2</sup>).

*This data is sourced from the British Geological Survey.*



## 20.3 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 km<sup>2</sup>.

*This data is sourced from the British Geological Survey.*



## 21 Railway infrastructure and projects

### 21.1 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.*

### 21.2 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.*

### 21.3 Railway tunnels

Records within 250m

0

Railway tunnels taken from contemporary Ordnance Survey mapping.

*This data is sourced from the Ordnance Survey.*

### 21.4 Historical railway and tunnel features

Records within 250m

0

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.

*This data is sourced from Ordnance Survey/Groundsure.*

### 21.5 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.*

## 21.6 Historical railways

**Records within 250m**

**0**

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

*This data is sourced from OpenStreetMap.*

## 21.7 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.*

## 21.8 Crossrail 1

**Records within 500m**

**0**

The Crossrail railway project links 41 stations over 100 kilometres from Reading and Heathrow in the west, through underground sections in central London, to Shenfield and Abbey Wood in the east.

*This data is sourced from publicly available information by Groundsure.*

## 21.9 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.*

## 21.10 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: <https://www.groundsure.com/terms-and-conditions-jan-2020/>.



# **Appendix 3**

**Records of  
Boreholes WS1 to WS6  
Trial Pits TP1 to TP4  
Schematic Cross-Sections  
Soakaway Test Results  
Results of gas/water monitoring**

# GROUND ENGINEERING

L I M I T E D  
Tel: 01733-566568  
www.groundengineering.co.uk

Site: RECTORY FARM, LOWER BENEFIELD

WINDOW SAMPLE  
WS1

Date: 16/03/21

Hole Size: 87mm dia to 2.00m  
77mm dia to 3.00m  
67mm dia to 3.40m

Ground Level: 66.10m. O.D.

Samples and in-situ Tests			(Date) Water	Inst.	Description of Strata	Legend	Depth m	O.D. Level m
Depth m	Type	Result						
0.20	D1				MADE GROUND - MACADAM.		0.10	66.00
0.40-0.80 0.40	B1 D2				MADE GROUND - Firm, brown and orange brown, gravelly CLAY. Gravel of angular limestone.		0.20	65.90
0.80	D3				Firm, grey mottled brown CLAY.			
1.10	D4				(KELLAWAYS FORMATION)			
1.20 1.20-2.00 1.35-1.65	D5 U1 S	N7						
2.00 2.00-3.00 2.15-2.45	D6 U2 S	N12			Firm, dark grey mottled brown CLAY.		2.00	64.10
					(KELLAWAYS FORMATION)			
3.00 3.00-3.40 3.15-3.45	D7 U3 S	N21			Stiff, dark grey CLAY.		3.00	63.10
					(KELLAWAYS FORMATION)			
3.40 3.40-3.42	D8 S	50*			Obstruction possible limestone Hole abandoned at 3.40m depth		3.40	62.70

REMARKS 1. Starter pit excavated from 0.00m to 1.20m depth  
2. Gas monitoring standpipe installed to 3.40m depth

Project No  
15307

Scale 1:25  
Page 1/1

KEY

- D - Disturbed Sample
- B - Bulk Sample
- U - Undisturbed Sample
- W - Water Sample
- vs - Water Strike
- vc - Depth to Water on completion
- J - Jar Sample
- MP - Mackintosh Probe
- V - Vane Shear Test
- Cohesion ( ) kPa
- R ( ) - Hand Penetrometer
- Cohesion ( ) kPa
- vs - Standpipe Level

Groundwater Strikes						Groundwater Observations			
Depth m						Depth m			
No	Struck	Rose to	Rate	Cased	Sealed	Date	Hole	Casing	Water
						16/03/21	3.40		dry
						22/04/21	3.40	1.00	2.72
						28/04/21	3.40	1.00	2.59



GROUND ENGINEERING LIMITED Tel: 01733-568566 www.groundengineering.co.uk			Site: RECTORY FARM, LOWER BENEFIELD				WINDOW SAMPLE WS2		
			Date: 16/03/21	Hole Size: 77mm dia to 1.60m 67mm dia to 2.45m		Ground Level: 65.00m. O.D.			
Samples and in-situ Tests			(Date) Water	Description of Strata		Logond	Depth m	O.D. Level m	
Depth m	Type	Result							
0.20	D1			MADE GROUND - Soft, dark brown, slightly sandy, slightly gravelly CLAY. Gravel of angular limestone.		[Cross-hatched pattern]	0.30	64.70	
0.60	D2			MADE GROUND - Firm, brown and grey brown, slightly gravelly, silty CLAY. Gravel of angular brick and ash.					
0.90	D3					[Cross-hatched pattern]	1.30	63.70	
1.10	D4								
1.20 1.20-1.60 1.35-1.65	D5 U1 S	N7		Firm, locally soft, grey and brown mottled CLAY.					
1.60-2.00	U2			(HEAD DEPOSIT)		[Horizontal line pattern]	2.45	62.55	
2.00	D6								
2.15-2.45	S	N7							
				Hole completed at 2.45m depth					
REMARKS 1. Starter pit excavated from 0.00m to 2.00m depth							Project No 15307		
							Scale 1:25	Page 1/1	
KEY			Groundwater Strikes				Groundwater Observations		
D - Disturbed Sample B - Bulk Sample U - Undisturbed Sample W - Water Sample ∇ - Water Strike ∇c - Depth to Water on completion J - Jar Sample MP - Mackintosh Probe V - Vane Shear Test Cohesion ( ) kPa P( ) - Hand Penetrometer Cohesion ( ) kPa ∇s Standpipe Level			Depth m No Struck   Rose to   Rate   Cased   Sealed				Date   Hole   Depth m   Water Casing		
			16/03/21   2.45				dry		

# GROUND ENGINEERING

L I M I T E D  
Tel: 01733-666566  
www.groundengineering.co.uk

Site: RECTORY FARM, LOWER BENEFIELD

WINDOW SAMPLE  
WS3

Date: 16/03/21

Hole Size: 82mm dia to 2.00m  
77mm dia to 3.00m  
57mm dia to 5.45m

Ground Level: 63.50m. O.D.

Samples and in-situ Tests			(Date) Water	Inst.	Description of Strata	Legend	Depth m	O.D. Level m
Depth m	Type	Result						
0.30	D1				MADE GROUND - Soft, brown, gravelly, silty CLAY.		0.40	63.10
0.40-0.70	B1				MADE GROUND - Firm, brown, slightly gravelly, silty CLAY. Gravel of angular brick and concrete.		1.00	62.50
0.60	D2							
0.90	D3				Firm, grey and brown mottled CLAY.		1.30	62.20
1.10	D4				(HEAD DEPOSIT)			
1.20	D5				Soft, orange brown and grey mottled, slightly sandy, slightly gravelly CLAY. Gravel of angular fossiliferous limestone.		2.40	61.10
1.20-2.00	U1							
1.35-1.65	S	N5			(HEAD DEPOSIT)			
2.00	D6				Firm, grey, locally mottled brown CLAY.		3.50	60.00
2.00-3.00	U2							
2.15-2.45	S	N5			(BLISWORTH CLAY FORMATION)			
3.00	D7				Stiff, friable, dark grey mottled green brown CLAY.		5.00	58.50
3.00-4.00	U3							
3.15-3.45	S	N12			(BLISWORTH CLAY FORMATION)			
4.00	D8							
4.00-5.00	U4							
4.15-4.45	S	N25						
5.00	D9							

REMARKS 1. Starter pit excavated from 0.00m to 1.20m depth  
2. Gas monitoring standpipe installed to 4.00m depth

Project No  
15307

Scale 1:25 Page 1/2

KEY

D - Disturbed Sample J - Jar Sample  
B - Bulk Sample MP - Mackintosh Probe  
U - Undisturbed Sample V - Vane Shear Test  
W - Water Sample Cohesion ( ) kPa  
∇ Water Strike P( ) - Hand Penetrometer  
∇c Depth to Water on completion Cohesion ( ) kPa  
∇s Standpipe Level

Groundwater Strikes

Groundwater Strikes						
Depth m						
No	Struck	Rose to	Rate	Cased	Sealed	Date
						16/03/21
						22/04/21
						28/04/21

Groundwater Observations

Groundwater Observations			
Depth m			
Date	Hole	Casing	Water
16/03/21	5.45		dry
22/04/21	4.00	1.00	1.77
28/04/21	4.00	1.00	1.77



<b>GROUND ENGINEERING</b> L I M I T E D Tel: 01733-566566 www.groundengineering.co.uk			Site: RECTORY FARM, LOWER BENEFIELD				WINDOW SAMPLE WS4	
			Date: 16/03/21		Hole Size: 87mm dia to 2.45m		Ground Level: 64.40m. O.D.	
Samples and In-situ Tests			(Date) Water	Description of Strata	Logond	Depth m	O.D. Level m	
Depth m	Type	Result						
0.30	D1			MADE GROUND - CONCRETE.		0.10	64.30	
0.60	D2			MADE GROUND - Firm, brown, slightly gravelly CLAY. Gravel of angular limestone.		0.30	64.10	
0.90	D3			(HEAD DEPOSIT)				
1.10	D4							
1.20	D5							
1.20-2.00	U1	N7						
1.35-1.65	S							
2.00	D6			(HEAD DEPOSIT)		1.90	62.50	
2.15-2.45	S	N11		Firm, orange brown, slightly sandy, silty CLAY.				
				(HEAD DEPOSIT)		2.45	61.95	
				Hole completed at 2.45m depth				

REMARKS 1. Starter pit excavated from 0.00m to 1.20m depth						Project No 15307	
						Scale 1:25	Page 1/1

<b>KEY</b> D - Disturbed Sample B - Bulk Sample U - Undisturbed Sample W - Water Sample ∇ - Water Strike ∇c - Depth to Water on completion J - Jar Sample MP - Mackintosh Probe V - Vane Shear Test Cohesion ( ) kPa P ( ) - Hand Penetrometer Cohesion ( ) kPa ∇s - Standpipe Level	Groundwater Strikes					Groundwater Observations			
	Depth m					Date			
	No	Struck	Rose to	Rate	Casod	Scalod	Hole	Casing	Water
						16/03/21	2.45		2.45

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Site: RECTORY FARM, LOWER BENEFIELD

WINDOW SAMPLE  
WS5

Date: 16/03/21

Hole Size: 87mm dia to 2.30m

Ground Level: 64.40m. O.D.

Samples and In-situ Tests			(Date) Water	Inst.	Description of Strata	Legend	Depth m	O.D. Level m
Depth m	Type	Result						
0.10	D1				MADE GROUND - CONCRETE.		0.05	64.35
					MADE GROUND - Loose, light brown SAND AND GRAVEL of sandstone.		0.20	64.20
0.40-0.80	B1 D2				Firm, fissured, grey CLAY.			
0.80	D3				(KELLAWAYS FORMATION)			
1.20	D4							
1.20-2.00	U1	N20						
1.35-1.65	S							
2.00	D5				Firm, friable, dark brown and orange brown, shaly CLAY. Has slight petroleum odour and localised black staining. (KELLAWAYS FORMATION)		1.90	62.50
2.15-2.33	S	50*			Obstruction possible limestone. (CORNBASH FORMATION)		2.30	62.10
					Hole abandoned at 2.30m depth		2.33	62.07

REMARKS 1. Starter pit excavated from 0.00m to 1.20m depth  
2. Gas monitoring standpipe installed to 2.30m depth  
3. Evidence of petroleum impacted soil between 1.90m and 2.15m depth

Project No  
15307

Scale 1:25 Page 1/1

KEY	
D - Disturbed Sample	J - Jar Sample
B - Bulk Sample	MP - Mackintosh Probe
U - Undisturbed Sample	V - Vane Shear Test
W - Water Sample	Cohesion ( ) kPa
∇ - Water Strike	P( ) - Hand Penetrometer
∇c - Depth to Water on completion	Cohesion ( ) kPa
	∇s - Standpipe Level

Groundwater Strikes						Groundwater Observations			
Depth m						Depth m			
No	Struck	Rose to	Rate	Cased	Sealed	Date	Hole	Casing	Water
						16/03/21	2.30		dry
						22/04/21	2.30	1.00	2.10
						28/04/21	2.30	1.00	2.15

Samples and in-situ Tests			(Date) Water	Description of Strata	Legend	Depth m	O. D. Level m
Depth m	Type	Result					
0.20	D1			MADE GROUND - Turf over soft, grey brown, slightly gravelly CLAY. Gravel of angular limestone and ash.		0.30	64.60
0.40	B1			Firm, fissured, grey CLAY.			
0.40	B2						
0.80	D3			(KELLAWAYS FORMATION)			
1.10	D4						
1.20	D5						
1.20-2.00	U1	N9		Brown, gravelly SAND. Gravel of angular limestone. (KELLAWAYS FORMATION)		1.45	63.45
1.35-1.65	S			Firm, fissured, grey and yellow brown CLAY.		1.46	63.44
2.00	D6			(KELLAWAYS FORMATION)			
2.15-2.39	S	77*		Obstruction possible limestone. (CORNBRAsh FORMATION) Hole abandoned at 2.45m depth		2.30	62.60
						2.39	62.51

REMARKS 1. Starter pit excavated from 0.00m to 1.20m depth

Project No  
15307

Scale  
1:25

Page  
1/1

KEY

- D - Disturbed Sample
- B - Bulk Sample
- U - Undisturbed Sample
- W - Water Sample
- ∇ - Water Strike
- ∇c - Depth to Water on completion
- J - Jar Sample
- MP - Mackintosh Probe
- V - Vane Shear Test
- Cohesion ( ) kPa
- P ( ) - Hand Penetrometer
- Cohesion ( ) kPa
- ∇s - Standpipe Level

Groundwater Strikes

Depth m						
No	Struck	Rose to	Rate	Casod	Sealed	

Groundwater Observations

Depth m			
Date	Hole	Casing	Water
16/03/21	2.39		dry

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Site: RECTORY FARM, LOWER BENEFIELD

TRIAL PIT  
 TP1

Date: 16/03/21

Pit Size: 1.90m L x 0.60m W x 2.30m D.

Ground Level: 65.30m. O.D.

Samples and in-situ Tests			(Date) Water	Description of Strata	Legend	Depth m	O.D. Level m
Depth m	Type	Result					
0.00	D1			MADE GROUND - Dark brown SAND AND GRAVEL. Gravel of Limestone.		0.05	65.25
0.15	D2			MADE GROUND - Light brown SAND AND GRAVEL. Gravel of limestone.		0.25	65.05
0.40	D3			MADE GROUND - Brown and grey brown SAND, GRAVEL AND COBBLES of angular concrete, limestone and brick.		0.60	64.70
0.65	D4			MADE GROUND - Firm, grey, silty CLAY.		1.10	64.20
1.20	B1			Firm, grey mottled brown CLAY.			
1.40	V1	(55)		(KELLAWAYS FORMATION)			
2.00	B2						
2.00	V2	(51)					
				Pit completed to 2.30m depth		2.30	63.00

**KEY**

- D - Disturbed Sample
- B - Bulk Sample
- U - Undisturbed Sample
- R - Root Sample
- W - Water Sample
- ES - Environmental Sample
- ☒ - Water Strike
- ☒ - Water Rise
- ☒c - Level on completion
- MP - Macintosh Probe
- P( ) - Hand Penetrometer
- Cohesion ( ) kPa
- V - Vane Shear Test
- Cohesion ( ) kPa

REMARKS 1. Pit dry  
 2. Pit sides stable

Project No  
 15307

Scale Page  
 1:25 1/1

# GROUND ENGINEERING

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Site: RECTORY FARM, LOWER BENEFIELD

TRIAL PIT  
TP2

Date: 16/03/21

Pit Size: 3.00m L x 0.60m W x 3.50m D.

Ground Level: 63.20m. O.D.

Samples and in-situ Tests			(Date) Water	Description of Strata	Legend	Depth m	O.D. Level m
Depth m	Type	Result					
0.30	D1		1 ▽	MADE GROUND - CONCRETE.		0.20	63.00
0.45	D2			MADE GROUND - Brown clayey SAND AND GRAVEL. Gravel of limestone.		0.40	62.80
1.20 1.20	B1A B1B			MADE GROUND - Firm, locally soft, brown, grey brown and grey, slightly gravelly CLAY with boulder size pockets of soft, dark grey brown, organic, silty clay. Gravel of angular flint, rare quartzite and ash.		1.60 1.70	61.60 61.50
1.65	B3		K-1	MADE GROUND - Brown and dark grey cobbles of angular to sub-rounded LIMESTONE.		1.60	61.60
2.20	B4			Firm, shaly, brown and grey brown CLAY with fossil bivalve fragments.  (BLISWORTH CLAY FORMATION)		1.70	61.50
2.40	V1	(65)		Firm, grey locally mottled grey brown CLAY.  (BLISWORTH CLAY FORMATION)		2.30	60.90
2.90	B5			Firm, dark grey and grey mottled CLAY.  (BLISWORTH CLAY FORMATION)		2.80	60.40
3.50	B6			Pit completed at 3.50m depth		3.50	59.70

**KEY**

- D - Disturbed Sample
- B - Bulk Sample
- U - Undisturbed Sample
- R - Root Sample
- W - Water Sample
- ES - Environmental Sample
- ▽ - Water Strike
- ▽ - Water Rise
- ▽c - Level on completion
- MP - Mackintosh Probe
- P( ) - Hand Penetrometer Cohesion ( ) kPa
- V - Vane Shear Test Cohesion ( ) kPa

**REMARKS**

1. Pit sides unstable to 1.70m depth
2. Water seepages between 0.50m and 1.60m depth
3. Rare dead roots between 2.30m and 2.50m depth
4. Pit dry on completion

Project No  
15307

Scale Page  
1:25 1/1



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Site: RECTORY FARM, LOWER BENEFIELD

TRIAL PIT  
 TP3

Date: 16/03/21

Pit Size: 2.50m L x 0.60m W x 2.70m D.

Ground Level: 60.50m. O.D.

Samples and in-situ Tests			(Date) Water	Description of Strata	Legend	Depth m	O. D. Level m
Depth m	Type	Result					
0.30	D1			MADE GROUND - CONCRETE.		0.20	60.30
0.50	B1			MADE GROUND - Brown SAND, GRAVEL AND COBBLES of brick and concrete rubble.		0.40	60.10
0.50	D2			MADE GROUND - Firm, grey, silty CLAY.		0.60	59.90
1.10	B2			Firm, grey mottled brown CLAY.  (BLISWORTH CLAY FORMATION)		1.40	59.10
2.10	B3			Firm, grey CLAY.  (BLISWORTH CLAY FORMATION)		2.70	57.80
Pit completed at 2.70m depth							

**KEY**

- D - Disturbed Sample
  - B - Bulk Sample
  - U - Undisturbed Sample
  - R - Root Sample
  - W - Water Sample
  - ES - Environmental Sample
  - ∇ - Water Strike
  - ∇ - Water Rise
  - ∇c - Level on completion
  - MP - Mackintosh Probe
  - P( ) - Hand Penetrometer
  - V - Vane Shear Test
- Cohesion ( ) kPa  
 Cohesion ( ) kPa

**REMARKS**

1. Pit dry
2. Pit sides stable

Project No  
 15307

Scale | Page  
 1:25 | 1/1

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
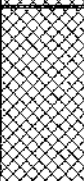



Site: RECTORY FARM, LOWER BENEFIELD

TRIAL PIT  
TP4

Date: 16/03/21

Pit Size: 2.50m L x 0.60m W x 2.20m D.

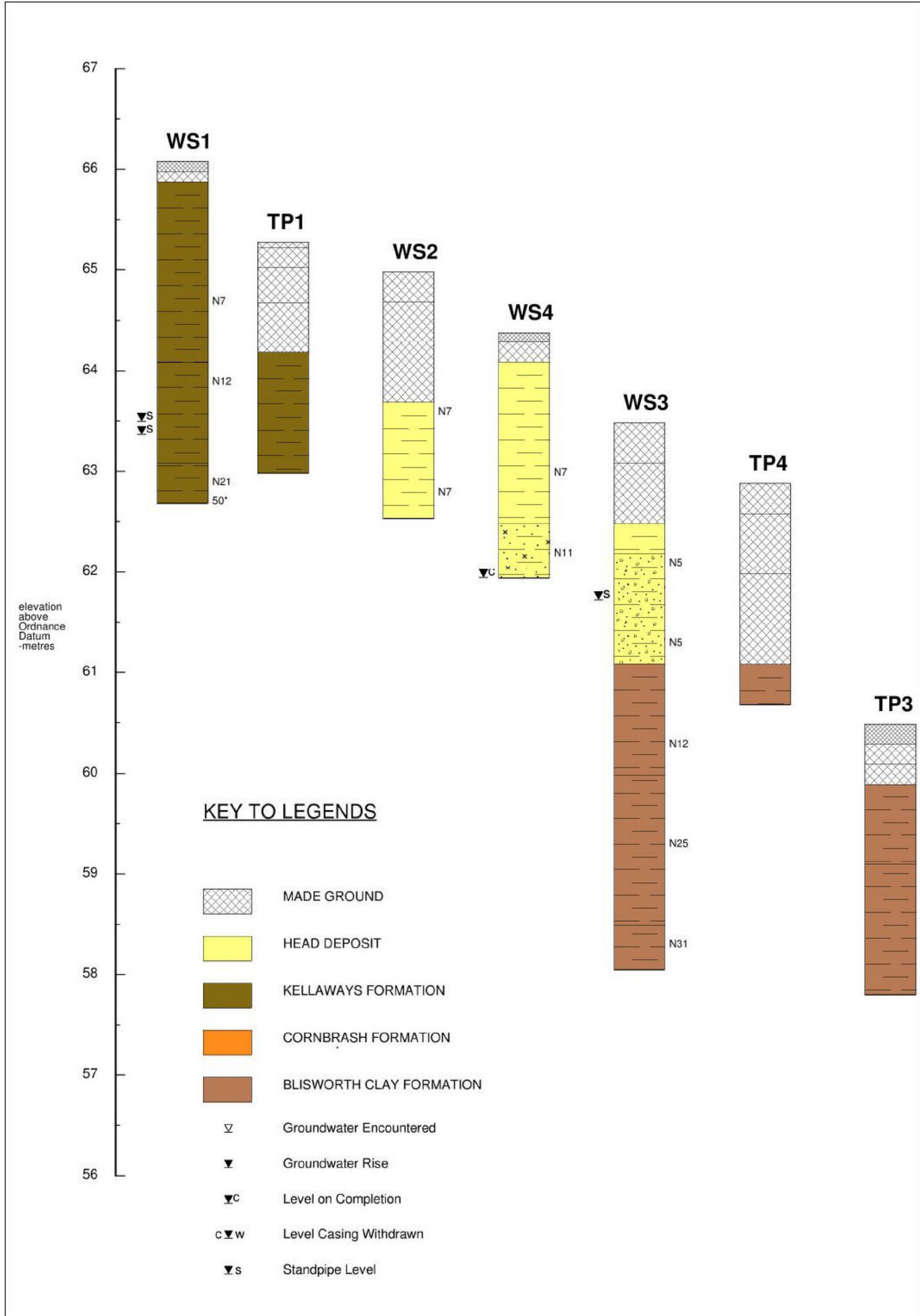
Ground Level: 62.90m. O.D.

Samples and in-situ Tests			(Date) Water	Description of Strata	Legend	Depth m	O.D. Level m
Depth m	Type	Result					
0.05	D1			MADE GROUND - Black, clayey, silty SAND AND GRAVEL, COBBLES AND BOULDERS OF macadam and concrete.		0.30	62.60
0.50	D2			MADE GROUND - Light brown SAND AND GRAVEL. Gravel of angular limestone.		0.90	62.00
1.60	B1			MADE GROUND - Firm, grey, silty, slightly organic CLAY.		1.80	61.10
2.00	B2			Firm, grey and brown mottled CLAY. (BLISWORTH CLAY FORMATION)		2.20	60.70
				Pit completed at 2.20m depth			

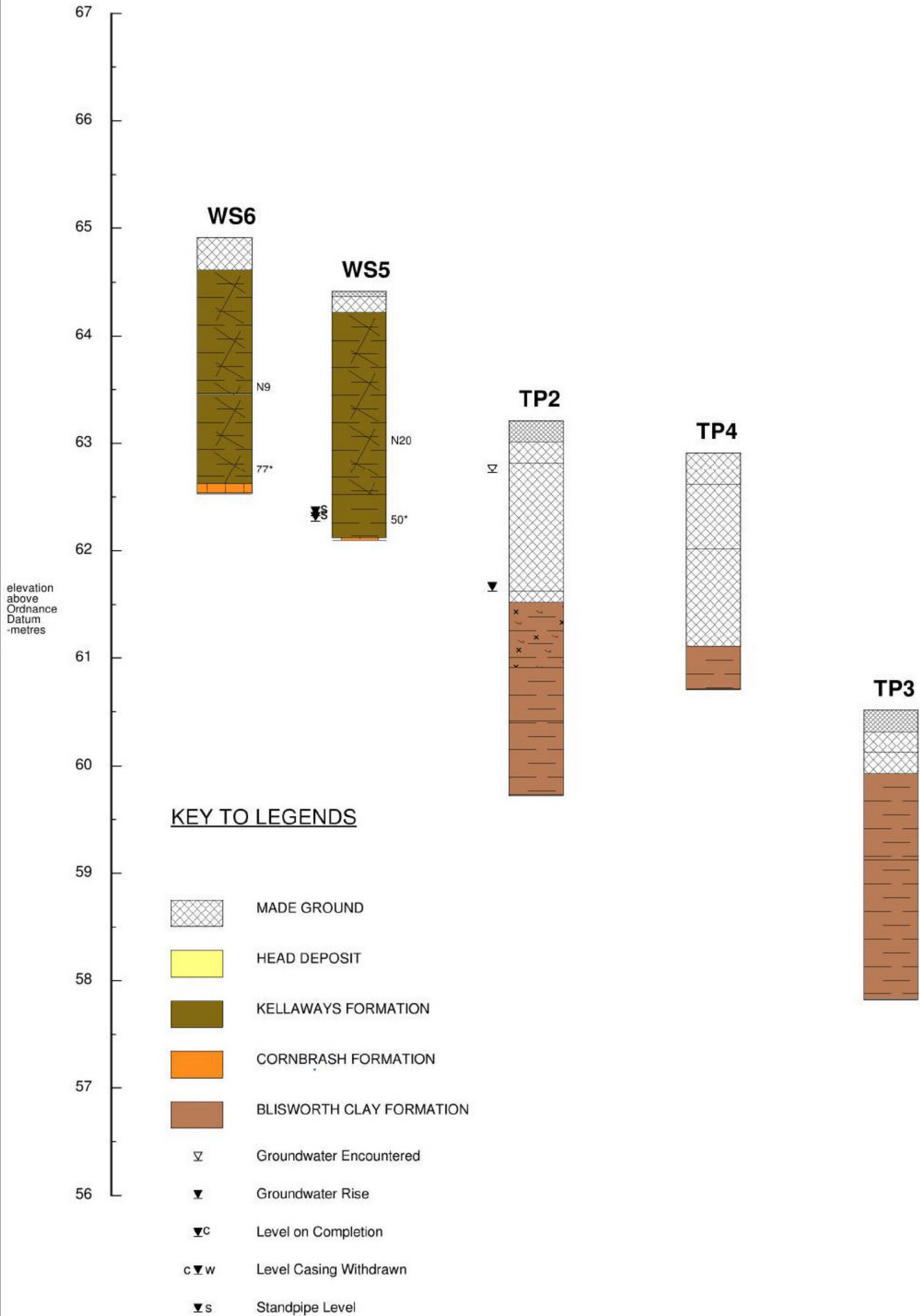
- KEY**
- D - Disturbed Sample
  - B - Bulk Sample
  - U - Undisturbed Sample
  - R - Root Sample
  - W - Water Sample
  - ES - Environmental Sample
  - ▽ - Water Strike
  - ▽ - Water Rise
  - ▽c - Level on completion
  - MP - Mackintosh Probe
  - P( ) - Hand Penetrometer
  - V - Vane Shear Test
- Cohesion ( ) kPa  
Cohesion ( ) kPa

- REMARKS**
1. Pit sides unstable to 1.80m depth
  2. Pit dry on completion

Project No 15307	
Scale 1:25	Page 1/1



<b>Project : Rectory Farm, Lower Benefield</b>  <b>Client : Best Asset Limited</b>	<b>GROUND ENGINEERING LIMITED</b> Tel : 01733 566566	Soil Profile	Project No <b>C15307</b>
		Fig No.	Vertical Scale 1:50



**Project : Rectory Farm, Lower Benefield**

**GROUND ENGINEERING LIMITED**

**Soil Profile**

**Project No**

**C15307**

**Client : Best Asset Limited**

Tel : 01733 566566

**Fig No.**

**Vertical Scale  
1:50**

# SOAKAWAY TEST RESULTS

## BRE DIGEST 365 - SOIL INFILTRATION RATE

Project: Rectory Farm Buildings, Main Street, Lower Benefield

Project No: C15307

Sheet No: 1/1

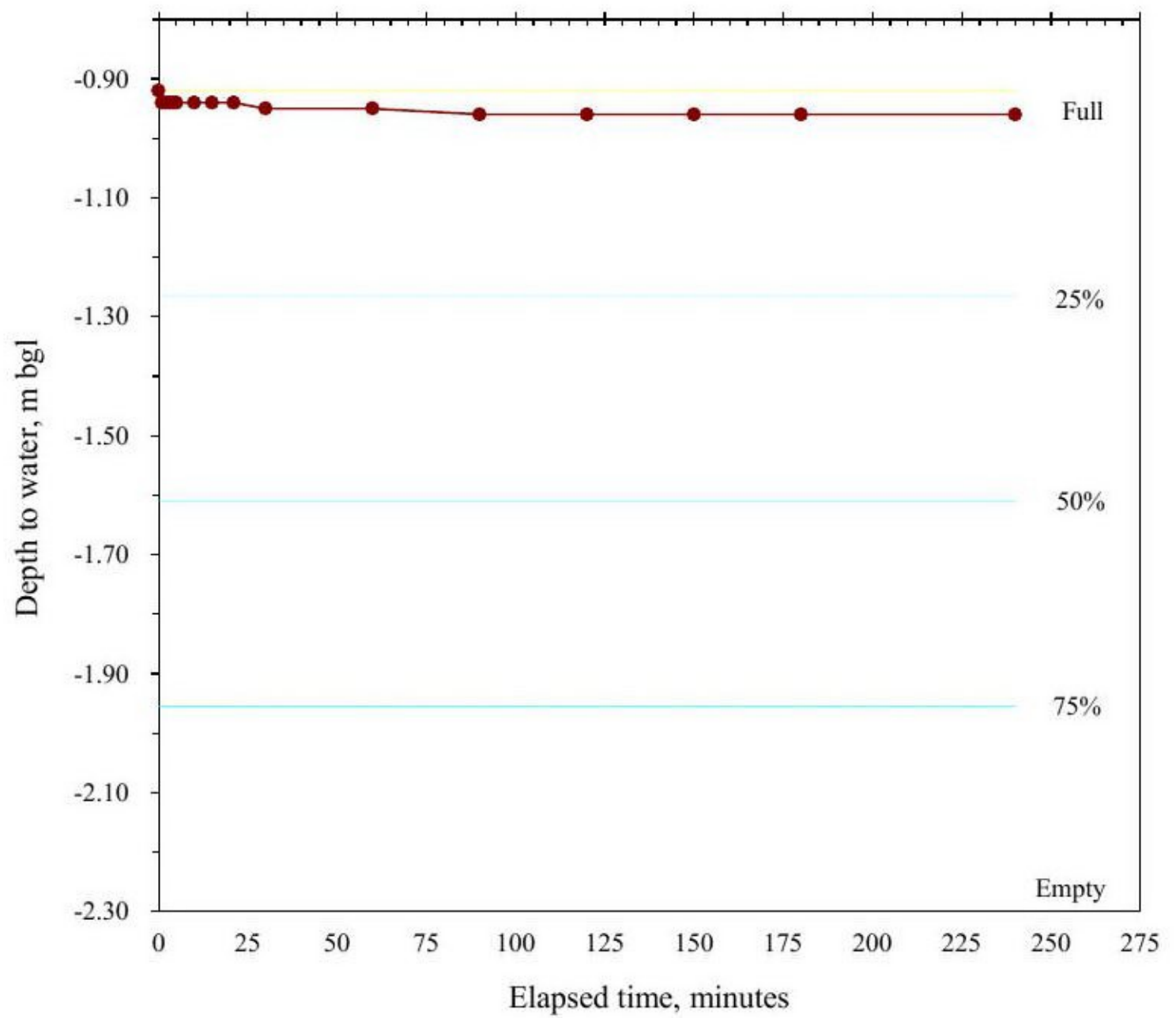
Trial Pit: TP1  
 Depth: 2.30  
 Length: 1.90  
 Width: 0.60

Description of Stratum under test: Firm grey and brown CLAY

Depth to water prior to test: 2.30m  
 (below ground level)

**DEPTH TO WATER vs ELAPSED TIME**

Elapsed Time min	Depth to Water m
0.00	0.92
1.00	0.94
2.00	0.94
3.00	0.94
4.00	0.94
5.00	0.94
10.00	0.94
15.00	0.94
21.00	0.94
30.00	0.95
60.00	0.95
90.00	0.96
120.00	0.96
150.00	0.96
180.00	0.96
240.00	0.96



All dimensions given in metres

$$f = (V_{75} - V_{25}) / A_{50}(T_{75} - T_{25})$$

$V_{75} - V_{25} = 0.79$   
 $A_{50} = 4.59$   
 $T_{75} - T_{25} = 4140$  (Extrapolated)

Extrapolated Soil Infiltration Rate  $f = \mathbf{6.90E-07}$  m/s

# SOAKAWAY TEST RESULTS

## BRE DIGEST 365 - SOIL INFILTRATION RATE

Project: Rectory Farm Buildings, Main Street, Lower Benefield

Project No: C15307

Sheet No: 1/1

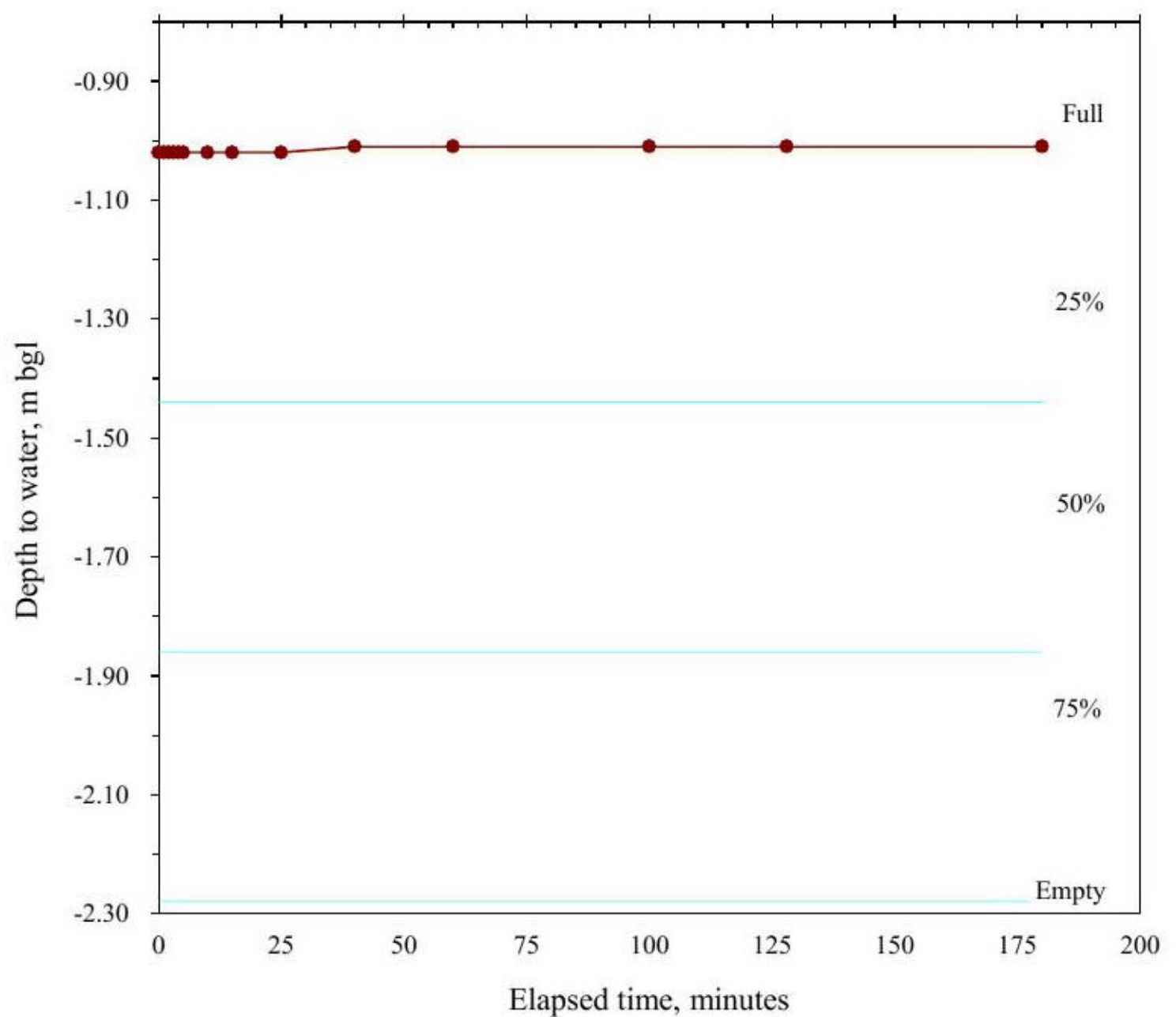
Trial Pit: TP3  
 Depth: 2.50  
 Length: 2.70  
 Width: 0.60

Description of Stratum under test: Firm grey and brown CLAY

Depth to water prior to test: 2.70m  
 (below ground level)

**DEPTH TO WATER vs ELAPSED TIME**

Elapsed Time min	Depth to Water m
0.00	1.02
1.00	1.02
2.00	1.02
3.00	1.02
4.00	1.02
5.00	1.02
10.00	1.02
15.00	1.02
25.00	1.02
40.00	1.01
60.00	1.01
100.00	1.01
128.00	1.01
180.00	1.01



All dimensions given in metres

$$f = (V75 - V25) / A50(T75 - T25)$$

V75-V25 = 1.36  
 A50 = 7.16  
 T75-T25 =

Extrapolated Soil Infiltration Rate **f =**  
**Not calculated because there was no fall in water level**

# GROUND ENGINEERING LIMITED

## Groundwater/Gas Monitoring Record

Site: Rectory Farm Buildings, Main Street, Lower Benefield

Report Ref: C15307

Date	Borehole No.	Methane (% v/v)		Carbon Dioxide (% v/v)		Oxygen (% v/v)		Flow Rate (l/hr)	Atmosph. Pressure (mb)	Depth of Well (m bgl)	Depth to Groundwater (m bgl)
		Peak	Steady	Peak	Steady	Min.	Max.				
22/04/21	WS1	<0.1	<0.1	0.7	0.7	20.2	20.2	<0.1	1021	3.40	2.72
28/04/21	WS1	<0.1	<0.1	0.8	0.8	20.8	20.8	<0.1	1001	3.40	2.59
05/05/21	WS1	<0.1	<0.1	0.7	0.7	21.5	21.5	<0.1	1001	3.40	2.38
22/04/21	WS3	<0.1	<0.1	0.7	0.7	20.4	20.4	<0.1	1021	4.00	2.72
28/04/21	WS3	<0.1	<0.1	0.9	0.9	20.3	20.3	<0.1	1001	4.00	1.77
05/05/21	WS3	<0.1	<0.1	1.3	1.3	20.7	20.7	<0.1	1001	4.00	1.59
22/04/21	WS5	<0.1	<0.1	0.2	0.2	20.9	20.9	<0.1	1021	2.30	2.10
28/04/21	WS5	<0.1	<0.1	4.7	4.7	16.9	16.9	<0.1	1001	2.30	2.15
05/05/21	WS5	<0.1	<0.1	0.1	0.1	20.9	20.9	<0.1	1001	2.30	2.10

# **Appendix 4**

## **Laboratory Geotechnical Test Results**



# LABORATORY TEST RESULTS

CONTRACT RECTORY FARM, LOWER BENEFIELD

Bore-hole	Sample	Depth m	Classification				Density		Triaxial Compression					Sulphates (SO <sub>4</sub> )			Remarks	
			Liquid Limit %	Plastic Limit %	Plasticity Index %	Moisture Content %	Bulk Mg/m <sup>3</sup>	Dry Mg/m <sup>3</sup>	Type	Principal Stress Difference kPa	Cell Pressure kPa	Shear Strength kPa	Angle of Shear Resistance degrees	Soil Total Dry Wt. %	Aqueous Extract mg/l	Water mg/l		pH
WS1	U1A	1.50	74	26	48	35								206			7.7	SOIL CLASSIFICATION = CV 1% retained on 425µm sieve
WS3	U1A	1.30	68	25	43	39								294			7.6	SOIL CLASSIFICATION = CH 3% retained on 425µm sieve
WS4	U1A	1.50	74	25	49	40								119			7.9	SOIL CLASSIFICATION = CV 0% retained on 425µm sieve
WS6	U1A	1.50	65	30	35	36								252			4.4	SOIL CLASSIFICATION = CH 0% retained on 425µm sieve

U - UNDISTURBED SAMPLE  
D - DISTURBED SAMPLE  
B - BULK SAMPLE  
W - WATER SAMPLE

C.U. - CONSOLIDATED UNDRAINED  
C.D. - CONSOLIDATED DRAINED  
Q. - IMMEDIATE UNDRAINED  
Q.M. - IMMEDIATE UNDRAINED MULTISTAGE

Aqueous Extract 2:1 Water:Soil

15307

**GROUND ENGINEERING**

L I M I T E D

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# **Appendix 5**

## **Laboratory Chemical Test Results**



# Final Report

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**Report No.:** 21-08853-1

**Initial Date of Issue:** 25-Mar-2021

**Client:** Ground Engineering Limited

**Client Address:** Newark Road  
Peterborough  
Cambridgeshire  
PE1 5UA

**Contact(s):** John Gibb

**Project:** C15307 REctory Farm, Lower Benefield

**Quotation No.:** **Date Received:** 19-Mar-2021

**Order No.:** **Date Instructed:** 19-Mar-2021

**No. of Samples:** 14

**Turnaround (Wkdays):** 5 **Results Due:** 25-Mar-2021

**Date Approved:** 25-Mar-2021

**Approved By:**  


**Details:** Glynn Harvey, Technical Manager

---

## Results - Soil

Project: C15307 REctory Farm, Lower Benefield

Client: Ground Engineering Limited	Chemtest Job No.:	21-08853	21-08853	21-08853	21-08853	21-08853	21-08853	21-08853	21-08853		
Quotation No.	Chemtest Sample ID.:	1183590	1183591	1183592	1183593	1183594	1183595	1183596	1183597		
Order No.	Client Sample Ref.	D3	D2	D1	D2	D1	D1	D2	D2		
	Sample Location	TP1	TP2	TP3	TP3	TP4	WS1	WS2	WS3		
	Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL		
	Top Depth (m)	0.40	0.45	0.30	0.50	0.50	0.20	0.60	0.60		
	Date Sampled	18-Mar-2021	16-Mar-2021	16-Mar-2021	16-Mar-2021	18-Mar-2021	18-Mar-2021	16-Mar-2021	16-Mar-2021		
	Asbestos Lab	DURHAM	DURHAM	DURHAM	N-TRAN-D	DURHAM	DURHAM	DURHAM	DURHAM		
Determinand	Accred.	SOP	Units	LOD							
pH	V	2010		4.0	7.7	7.9		7.3	8.1	8.0	8.7
Moisture	N	2030	%	0.020	18	20		32	21	28	25
Stones and Removed Water etc	N	2030	%	0.020	< 0.020	< 0.020		< 0.020	< 0.020	< 0.020	< 0.020
Boron (Hot Water Soluble)	V	2120	mg/kg	0.40	1.7	0.76		1.2	0.74	0.68	2.1
Sulphate (2% Water Soluble) as SO4	V	2120	g/l	0.010	0.82	0.21		0.091	0.038	0.014	0.368
Cyanide (Free)	V	2300	mg/kg	0.50	< 0.50	< 0.50		< 0.50	< 0.50	< 0.50	< 0.50
Cyanide (Total)	V	2300	mg/kg	0.50	2.0	1.0		< 0.50	< 0.50	< 0.50	< 0.50
Sulphide (Easily Liberatable)	N	2325	mg/kg	0.50	110	7.4		22	8.5	22	9.4
Arsenic	V	2450	mg/kg	1.0	24	17		18	21	19	24
Cadmium	V	2450	mg/kg	0.10	0.87	0.16		0.87	0.20	0.67	0.35
Chromium	V	2450	mg/kg	1.0	28	25		30	19	23	25
Copper	V	2450	mg/kg	0.50	17	17		28	13	28	31
Mercury	V	2450	mg/kg	0.10	0.21	0.18		0.23	0.24	0.39	0.19
Nickel	V	2450	mg/kg	0.50	23	17		32	11	19	30
Lead	V	2450	mg/kg	0.50	150	30		57	15	120	200
Selenium	V	2450	mg/kg	0.20	< 0.20	< 0.20		0.52	< 0.20	< 0.20	< 0.20
Zinc	V	2450	mg/kg	0.50	310	85		93	99	160	150
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50	< 0.50		< 0.50	< 0.50	< 0.50	< 0.50
Organic Matter	V	2825	%	0.40	2.3	0.57		8.9	4.3	8.2	4.3
Acenaphthene	V	2700	mg/kg	0.10	0.45	< 0.10		< 0.10	< 0.10	0.40	< 0.10
Acenaphthylene	V	2700	mg/kg	0.10	0.35	< 0.10		< 0.10	< 0.10	0.31	< 0.10
Anthracene	V	2700	mg/kg	0.10	0.22	< 0.10		< 0.10	< 0.10	0.79	< 0.10
Benzo[a]anthracene	V	2700	mg/kg	0.10	0.83	< 0.10		< 0.10	< 0.10	4.1	< 0.10
Benzo[a]pyrene	V	2700	mg/kg	0.10	0.71	< 0.10		< 0.10	< 0.10	3.9	< 0.10
Benzo[b]fluoranthene	V	2700	mg/kg	0.10	1.4	< 0.10		< 0.10	< 0.10	5.9	< 0.10
Benzo[k]fluoranthene	V	2700	mg/kg	0.10	0.84	< 0.10		< 0.10	< 0.10	3.4	< 0.10
Benzo[k]perylene	V	2700	mg/kg	0.10	0.85	< 0.10		< 0.10	< 0.10	3.3	< 0.10
Chrysene	V	2700	mg/kg	0.10	1.3	< 0.10		< 0.10	< 0.10	4.5	< 0.10
Dibenz[a,h]Anthracene	V	2700	mg/kg	0.10	0.58	< 0.10		< 0.10	< 0.10	1.9	< 0.10
Fluoranthene	V	2700	mg/kg	0.10	1.4	< 0.10		< 0.10	< 0.10	8.0	0.75
Fluorene	V	2700	mg/kg	0.10	0.34	< 0.10		< 0.10	< 0.10	0.64	< 0.10
Indeno[1,2,3-c,d]Pyrene	V	2700	mg/kg	0.10	0.87	< 0.10		< 0.10	< 0.10	2.8	< 0.10
Naphthalene	V	2700	mg/kg	0.10	1.4	< 0.10		< 0.10	< 0.10	1.1	< 0.10
Phenanthrene	V	2700	mg/kg	0.10	2.1	< 0.10		< 0.10	< 0.10	3.8	< 0.10
Pyrene	V	2700	mg/kg	0.10	1.3	< 0.10		< 0.10	< 0.10	8.2	0.91
Total PAHs	V	2700	mg/kg	2.0	15	< 2.0		< 2.0	< 2.0	53	< 2.0
Total Phenols	V	2920	mg/kg	0.30	0.80	< 0.30		< 0.30	< 0.30	< 0.30	< 0.30
ACM Type	C	2192		N/A	-	-		-	-	-	-

## Results - Soil

**Project: C15307 REctory Farm, Lower Benefield**

Client: Ground Engineering Limited	Chemtest Job No.:		21-08853	21-08853	21-08853	21-08853	21-08853	21-08853	21-08853	21-08853		
Quotation No.	Chemtest Sample ID.:		1183590	1183591	1183592	1183593	1183594	1183595	1183596	1183597		
Order No.	Client Sample Ref.		D3	D2	D1	D2	D1	D1	D2	D2		
	Sample Location		TP1	TP2	TP3	TP3	TP4	WS1	WS2	WS3		
	Sample Type		SO L	SO L	SOIL	SO L	SO L	SO L	SOIL	SOIL		
	Top Depth (m)		0.40	0.45	0.30	0.50	0.50	0.20	0.60	0.60		
	Date Sampled		18-Mar-2021	16-Mar-2021	16-Mar-2021	16-Mar-2021	18-Mar-2021	18-Mar-2021	16-Mar-2021	16-Mar-2021		
	Asbestos Lab		DURHAM	DURHAM	DURHAM	N-TRAN-D	DURHAM	DURHAM	DURHAM	DURHAM		
Determinand	Accred.	SOP	Units	LOD								
Asbestos Identification	U	2192		N/A	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected		No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected
ACM Detection Stage	U	2192		N/A	-	-	-		-	-	-	-
Soil Colour	N	2040		N/A	Brown	Brown		Brown	Brown	Brown	Brown	Brown
Other Material	N	2040		N/A	Stones	Stones		None	Stones	Stones	Stones	Stones
Soil Texture	N	2040		N/A	Sand	Clay		Clay	Clay	Sand	Sand	Sand
Total TPH >C6-C40	N	2870	mg/kg	10	<10	<10		<10		<10	130	420

## Results - Soil

Project: C15307 REctory Farm, Lower Benefield

Client: Ground Engineering Limited	Chemtest Job No.:		21-08853	21-08853	21-08853	21-08853	21-08853	21-08853
Quotation No.	Chemtest Sample ID.:		1183598	1183599	1183600	1183601	1183602	1183603
Order No.	Client Sample Ref.		D2	D1	D2	D3	D4	D5
	Sample Location		WS4	WS5	WS5	WS5	WS5	WS5
	Sample Type		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
	Top Depth (m)		0.60	0.10	0.40	0.60	1.20	2.00
	Date Sampled		18-Mar-2021	18-Mar-2021	16-Mar-2021	18-Mar-2021	16-Mar-2021	16-Mar-2021
	Asbestos Lab		DURHAM		DURHAM			
Determinand	Accred.	SOP	Units	LOD				
pH	V	2010		4.0	8.3		8.4	
Moisture	N	2030	%	0.020	21	18	26	28
Stones and Removed Water etc	N	2030	%	0.020	< 0.020		< 0.020	
Boron (Hot Water Soluble)	V	2120	mg/kg	0.40	0.55		< 0.40	
Sulphate (2% Water Soluble) as SO4	V	2120	g/l	0.010	0.085		< 0.010	
Cyanide (Free)	V	2300	mg/kg	0.50	< 0.50		< 0.50	
Cyanide (Total)	V	2300	mg/kg	0.50	< 0.50		< 0.50	
Sulphide (Easily Liberatable)	N	2325	mg/kg	0.50	28		27	
Arsenic	V	2450	mg/kg	1.0	20		87	
Cadmium	V	2450	mg/kg	0.10	0.14		< 0.10	
Chromium	V	2450	mg/kg	1.0	24		26	
Copper	V	2450	mg/kg	0.50	17		21	
Mercury	V	2450	mg/kg	0.10	< 0.10		< 0.10	
Nickel	V	2450	mg/kg	0.50	19		34	
Lead	V	2450	mg/kg	0.50	48		20	
Selenium	V	2450	mg/kg	0.20	< 0.20		0.48	
Zinc	V	2450	mg/kg	0.50	62		41	
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50		< 0.50	
Organic Matter	V	2825	%	0.40	1.0		0.52	
Acenaphthene	V	2700	mg/kg	0.10	< 0.10		< 0.10	
Acenaphthylene	V	2700	mg/kg	0.10	< 0.10		< 0.10	
Anthracene	V	2700	mg/kg	0.10	< 0.10		< 0.10	
Benzo[a]anthracene	V	2700	mg/kg	0.10	< 0.10		< 0.10	
Benzo[a]pyrene	V	2700	mg/kg	0.10	< 0.10		< 0.10	
Benzo[b]fluoranthene	V	2700	mg/kg	0.10	< 0.10		< 0.10	
Benzo[g,h,i]perylene	V	2700	mg/kg	0.10	< 0.10		< 0.10	
Benzo[k]fluoranthene	V	2700	mg/kg	0.10	< 0.10		< 0.10	
Chrysene	V	2700	mg/kg	0.10	< 0.10		< 0.10	
Dibenz[a,h]Anthracene	V	2700	mg/kg	0.10	< 0.10		< 0.10	
Fluoranthene	V	2700	mg/kg	0.10	< 0.10		< 0.10	
Fluorene	V	2700	mg/kg	0.10	< 0.10		< 0.10	
Indeno[1,2,3-c,d]Pyrene	V	2700	mg/kg	0.10	< 0.10		< 0.10	
Naphthalene	V	2700	mg/kg	0.10	< 0.10		< 0.10	
Phenanthrene	V	2700	mg/kg	0.10	< 0.10		< 0.10	
Pyrene	V	2700	mg/kg	0.10	< 0.10		< 0.10	
Total PAHs	V	2700	mg/kg	2.0	< 2.0		< 2.0	
Total Phenols	V	2920	mg/kg	0.30	< 0.30		< 0.30	
ACM Type	C	2192		N/A	-		-	

## Results - Soil

**Project: C15307 REctory Farm, Lower Benefield**

Client: Ground Engineering Limited	Chemtest Job No.:		21-08853	21-08853	21-08853	21-08853	21-08853	21-08853	21-08853
Quotation No.	Chemtest Sample ID.:		1183598	1183599	1183600	1183601	1183602	1183603	1183603
Order No.	Client Sample Ref.		D2	D1	D2	D3	D4	D5	D5
	Sample Location		WS4	WS5	WS5	WS5	WS5	WS5	WS5
	Sample Type		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
	Top Depth (m)		0.60	0.10	0.40	0.60	1.20	2.00	2.00
	Date Sampled		18-Mar-2021	18-Mar-2021	16-Mar-2021	18-Mar-2021	16-Mar-2021	16-Mar-2021	16-Mar-2021
	Asbestos Lab		DURHAM		DURHAM				
Determinand	Accred.	SOP	Units	LOD					
Asbestos Identification	U	2192		N/A	No Asbestos Detected		No Asbestos Detected		
ACM Detection Stage	U	2192		N/A	-		-		
Soil Colour	N	2040		N/A	Brown	Brown	Grey	Grey	Grey
Other Material	N	2040		N/A	Stones	Stones	Stones	Stones	Stones
Soil Texture	N	2040		N/A	Sand	Clay	Clay	Clay	Clay
Total TPH >C6-C40	N	2870	mg/kg	10	<10	130	<10	<10	<10

## Test Methods

SOP	Title	Parameters included	Method summary
2010	pH Value of Soils	pH	pH Meter
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2040	Soil Description(Requirement of MCERTS)	Soil description	As received soil is described based upon BS5930
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2192	Asbestos	Asbestos	Polarised light microscopy / Gravimetry
2300	Cyanides & Thiocyanate in Soils	Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate	Alkaline extraction followed by colorimetric determination using Automated Flow Injection Analyser.
2325	Sulphide in Soils	Sulphide	Steam distillation with sulphuric acid / analysis by 'Aquakem 600' Discrete Analyser, using N,N-dimethyl-p-phenylenediamine.
2450	Acid Soluble Metals in Soils	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.
2490	Hexavalent Chromium in Soils	Chromium [VI]	Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide.
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2670	Total Petroleum Hydrocarbons (TPH) in Soils by GC-FID	TPH (C6–C40); optional carbon banding, e.g. 3-band – GRO, DRO & LRO*TPH C8–C40	Dichloromethane extraction / GC-FID
2700	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-FID	Acenaphthene; Acenaphthylene; Anthracene; Benzo[a]Anthracene; Benzo[a]Pyrene; Benzo[b]Fluoranthene; Benzo[ghi]Perylene; Benzo[k]Fluoranthene; Chrysene; Dibenzo[ah]Anthracene; Fluoranthene; Fluorene; Indeno[123cd]Pyrene; Naphthalene; Phenanthrene; Pyrene	Dichloromethane extraction / GC-FID (GC-FID detection is non-selective and can be subject to interference from co-eluting compounds)
2920	Phenols in Soils by HPLC	Phenolic compounds including Resorcinol, Phenol, Methylphenols, Dimethylphenols, 1-Naphthol and Trimethylphenols>Note: chlorophenols are excluded.	60:40 methanol/water mixture extraction, followed by HPLC determination using electrochemical detection.



## **Report Information**

### **Key**

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U	UKAS accredited
M	MCERTS and UKAS accredited
N	Unaccredited
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
T	This analysis has been subcontracted to an unaccredited laboratory
I/S	Insufficient Sample
U/S	Unsuitable Sample
N/E	not evaluated
<	"less than"
>	"greater than"
SOP	Standard operating procedure
LOD	Limit of detection

Comments or interpretations are beyond the scope of UKAS accreditation

The results relate only to the items tested

Uncertainty of measurement for the determinands tested are available upon request

None of the results in this report have been recovery corrected

All results are expressed on a dry weight basis

The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols

For all other tests the samples were dried at < 37°C prior to analysis

All Asbestos testing is performed at the indicated laboratory

Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

### **Sample Deviation Codes**

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A - Date of sampling not supplied

B - Sample age exceeds stability time (sampling to extraction)

C - Sample not received in appropriate containers

D - Broken Container

E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

### **Sample Retention and Disposal**

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All soil samples will be retained for a period of 45 days from the date of receipt

All water samples will be retained for 14 days from the date of receipt

Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:

[customerservices@chemtest.com](mailto:customerservices@chemtest.com)



# Final Report

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**Report No.:** 21-13474-1  
**Initial Date of Issue:** 29-Apr-2021  
**Client:** Ground Engineering Limited  
**Client Address:** Newark Road  
Peterborough  
Cambridgeshire  
PE1 5UA  
**Contact(s):** John Gibb  
**Project:** C15307 Rectory Farm, Lower  
Benefield, Northamptonshire

<b>Quotation No.:</b>		<b>Date Received:</b>	26-Apr-2021
<b>Order No.:</b>	C15307	<b>Date Instructed:</b>	26-Apr-2021
<b>No. of Samples:</b>	1		
<b>Turnaround (Wkdays):</b>	5	<b>Results Due:</b>	30-Apr-2021
<b>Date Approved:</b>	29-Apr-2021		

**Approved By:**

**Details:** Glynn Harvey, Technical Manager

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## Results - Water

**Project: C15307 Rectory Farm, Lower Benefield, Northamptonshire**

Client: Ground Engineering Limited		Chemtest Job No.:		21-13474	
Quotation No.		Chemtest Sample ID.:		1186893	
Order No. C15307		Client Sample Ref.:		W1	
		Sample Location:		WS3	
		Sample Type:		WATER	
		Top Depth (m):		1.77	
		Date Sampled:		22-Apr-2021	
Determinand	Accred.	SOP	Units	LOD	
pH	✓	1010		N/A	7.8
Boron (Dissolved)	✓	1455	µg/l	10.0	130
Sulphate	✓	1220	mg/l	1.0	74
Cyanide (Free)	✓	1300	mg/l	0.050	< 0.050
Cyanide (Total)	✓	1300	mg/l	0.050	< 0.050
Sulphide	✓	1325	mg/l	0.050	[E] < 0.050
Arsenic (Dissolved)	✓	1455	µg/l	0.20	< 0.20
Cadmium (Dissolved)	✓	1455	µg/l	0.12	< 0.12
Chromium (Dissolved)	✓	1455	µg/l	0.50	8.2
Copper (Dissolved)	✓	1455	µg/l	0.50	2.1
Mercury (Dissolved)	✓	1455	µg/l	0.05	< 0.05
Nickel (Dissolved)	✓	1455	µg/l	0.50	3.1
Lead (Dissolved)	✓	1455	µg/l	0.50	< 0.50
Selenium (Dissolved)	✓	1455	µg/l	0.50	0.60
Zinc (Dissolved)	✓	1455	µg/l	3.0	4.8
Acenaphthene	N	1700	µg/l	0.010	< 0.010
Acenaphthylene	N	1700	µg/l	0.010	< 0.010
Anthracene	N	1700	µg/l	0.010	< 0.010
Benzo[a]anthracene	N	1700	µg/l	0.010	< 0.010
Benzo[a]pyrene	N	1700	µg/l	0.010	< 0.010
Benzo[b]fluoranthene	N	1700	µg/l	0.010	< 0.010
Benzo[g]herylene	N	1700	µg/l	0.010	< 0.010
Benzo[k]fluoranthene	N	1700	µg/l	0.010	< 0.010
Chrysene	N	1700	µg/l	0.010	< 0.010
Dibenz[a,h]Anthracene	N	1700	µg/l	0.010	< 0.010
Fluoranthene	N	1700	µg/l	0.010	< 0.010
Fluorene	N	1700	µg/l	0.010	< 0.010
Indeno[1,2,3-c,d]Pyrene	N	1700	µg/l	0.010	< 0.010
Naphthalene	N	1700	µg/l	0.010	< 0.010
Phenanthrene	N	1700	µg/l	0.010	< 0.010
Pyrene	N	1700	µg/l	0.010	< 0.010
Total PAHs	N	1700	µg/l	0.20	< 0.20
Total Phenols	✓	1920	mg/l	0.030	< 0.030
Total Hardness as CaCO3	✓	1270	mg/l	15	400
Aliphatic TPH >C5-C6	N	1875	µg/l	0.10	< 0.10
Aliphatic TPH >C8-C8	N	1875	µg/l	0.10	< 0.10
Aliphatic TPH >C8-C10	N	1875	µg/l	0.10	< 0.10
Aliphatic TPH >C10-C12	N	1875	µg/l	0.10	< 0.10

## Results - Water

**Project: C15307 Rectory Farm, Lower Benefield, Northamptonshire**

<b>Client: Ground Engineering Limited</b>	<b>Chemtest Job No.:</b>		21-13474		
Quotation No.	<b>Chemtest Sample ID.:</b>		1186893		
Order No. C15307	Client Sample Ref.:		W1		
	Sample Location:		WS3		
	Sample Type:		WATER		
	Top Depth (m):		1.77		
	Date Sampled:		22-Apr-2021		
Determinand	Accred.	SOP	Units	LOD	
Aliphatic TPH >C12-C16	\	1875	µg/l	0.10	< 0.10
Aliphatic TPH >C16-C21	\	1875	µg/l	0.10	< 0.10
Aliphatic TPH >C21-C35	\	1875	µg/l	0.10	< 0.10
Aliphatic TPH >C35-C44	\	1875	µg/l	0.10	< 0.10
Total Aliphatic Hydrocarbons	\	1875	µg/l	5.0	< 5.0
Aromatic TPH >C5-C7	\	1875	µg/l	0.10	< 0.10
Aromatic TPH >C7-C8	\	1875	µg/l	0.10	< 0.10
Aromatic TPH >C8-C10	\	1875	µg/l	0.10	< 0.10
Aromatic TPH >C10-C12	\	1875	µg/l	0.10	< 0.10
Aromatic TPH >C12-C18	\	1875	µg/l	0.10	< 0.10
Aromatic TPH >C18-C21	\	1875	µg/l	0.10	< 0.10
Aromatic TPH >C21-C35	\	1875	µg/l	0.10	< 0.10
Aromatic TPH >C35-C44	\	1875	µg/l	0.10	< 0.10
Total Aromatic Hydrocarbons	\	1875	µg/l	5.0	< 5.0
Total Petroleum Hydrocarbons	\	1875	µg/l	10	< 10

## Deviations

In accordance with UKAS Policy on Deviating Samples TPS 63, Chemtest have a procedure to ensure 'upon receipt of each sample a competent laboratory shall assess whether the sample is suitable with regard to the requested test(s)'. This policy and the respective holding times applied, can be supplied upon request. The reason a sample is declared as deviating is detailed below. Where applicable the analysis remains UKAS/MCERTs accredited but the results may be compromised.

<b>Sample:</b>	<b>Sample Ref:</b>	<b>Sample ID:</b>	<b>Sample Location:</b>	<b>Sampled Date:</b>	<b>Deviation Code(s):</b>	<b>Containers Received:</b>
1186693	W1		WS3	22-Apr-2021	B	Coloured Winchester 1000ml
1186693	W1		WS3	22-Apr-2021	B	Plastic Bottle 1000ml

## Test Methods

SOP	Title	Parameters included	Method summary
1010	pH Value of Waters	pH	pH Meter
1220	Anions, Alkalinity & Ammonium in Waters	Fluoride; Chloride; Nitrite; Nitrate; Total; Oxidisable Nitrogen (TON); Sulfate; Phosphate; Alkalinity; Ammonium	Automated colorimetric analysis using 'Aquakem 600' Discrete Analyser.
1270	Total Hardness of Waters	Total hardness	Calculation applied to calcium and magnesium results, expressed as mg l-1 CaCO3 equivalent.
1300	Cyanides & Thiocyanate in Waters	Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate	Continuous Flow Analysis.
1325	Sulphide in Waters	Sulphides	Automated colorimetric analysis by 'Aquakem 600' Discrete Analyser using N,N-dimethyl-pphenylenediamine.
1455	Metals in Waters by ICP-MS	Metals, including: Antimony; Arsenic; Barium; Beryllium; Boron; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Tin; Vanadium; Zinc	Filtration of samples followed by direct determination by inductively coupled plasma mass spectrometry (ICP-MS).
1675	TPH Aliphatic/Aromatic split in Waters by GC-FID(cf. Texas Method 1006 / TPH CWG)	Aliphatics: >C5-C6, >C6-C8, >C8- C10, >C10-C12, >C12-C16, >C16-C21, >C21-C35, >C35- C44Aromatics: >C5-C7, >C7-C8, >C8- C10, >C10-C12, >C12-C16, >C16- C21, >C21- C35, >C35- C44	Pentane extraction / GCxGC FID detection
1700	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Waters by GC-FID	Acenaphthene; Acenaphthylene; Anthracene; Benzo[a]Anthracene; Benzo[a]Pyrene; Benzo[b]Fluoranthene; Benzo[ghi]Perylene; Benzo[k]Fluoranthene; Chrysene; Diben[ah]Anthracene; Fluoranthene; Fluorene; Indeno[123cd]Pyrene; Naphthalene; Phenanthrene; Pyrene	Dichloromethane extraction / GC-FID (GC-FID detection is non-selective and can be subject to interference from co-eluting compounds)
1920	Phenols in Waters by HPLC	Phenolic compounds including: Phenol, Cresols, Xylenols, Trimethylphenols Note: Chlorophenols are excluded.	Determination by High Performance Liquid Chromatography (HPLC) using electrochemical detection.

## **Report Information**

### **Key**

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U	UKAS accredited
M	MCERTS and UKAS accredited
N	Unaccredited
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
T	This analysis has been subcontracted to an unaccredited laboratory
I/S	Insufficient Sample
U/S	Unsuitable Sample
N/E	not evaluated
<	"less than"
>	"greater than"
SOP	Standard operating procedure
LOD	Limit of detection

Comments or interpretations are beyond the scope of UKAS accreditation

The results relate only to the items tested

Uncertainty of measurement for the determinands tested are available upon request

None of the results in this report have been recovery corrected

All results are expressed on a dry weight basis

The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols

For all other tests the samples were dried at < 37°C prior to analysis

All Asbestos testing is performed at the indicated laboratory

Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

### **Sample Deviation Codes**

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A - Date of sampling not supplied

B - Sample age exceeds stability time (sampling to extraction)

C - Sample not received in appropriate containers

D - Broken Container

E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

### **Sample Retention and Disposal**

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All soil samples will be retained for a period of 45 days from the date of receipt

All water samples will be retained for 14 days from the date of receipt

Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:

[customerservices@chemtest.com](mailto:customerservices@chemtest.com)

# **Appendix 6**

## **Concrete Requirements Against Sulphate Attack**



**TABLE C2 – AGGRESSIVE CHEMICAL ENVIRONMENT FOR CONCRETE**

**(ACEC) CLASSIFICATION FOR BROWNFIELD LOCATIONS<sup>a</sup>**

Table C2 – Aggressive Chemical Environment for Concrete (ACEC) Classification for Brownfield Locations								
Sulfate and magnesium						Groundwater		ACEC
Design Sulfate Class for location	2:1 water/soil extract <sup>b</sup>		Groundwater		Total potential sulfate <sup>c</sup>	Static water	Mobile water	Class for location
1	2	3	4	5	6	7	8	9
	(SO <sub>4</sub> mg/l)	(Mg mg/l)	(SO <sub>4</sub> mg/l)	(Mg mg/l)	(SO <sub>4</sub> %)	(pH) <sup>d</sup>	(pH) <sup>d</sup>	
DS-1	< 500		< 400		< 0.24	≥ 2.5		AC-1s
							> 6.5 <sup>d</sup>	AC-1
							5.5–6.5	AC-2z
							4.5–5.5	AC-3z
							2.5–4.5	AC-4z
DS-2	500–1500		400–1400		0.24–0.6	> 5.5		AC-1s
							> 6.5	AC-2
							2.5–5.5	AC-2s
							5.5–6.5	AC-3z
							4.5–5.5	AC-4z
						2.5–5.5	AC-5z	
DS-3	1600–3000		1500–3000		0.7–1.2	> 5.5		AC-2s
							> 6.5	AC-3
							2.5–5.5	AC-3s
							5.5–6.5	AC-4
							2.5–5.5	AC-5
DS-4	3100–6000	≤ 1200	3100–6000	≤ 1000	1.3–2.4	> 5.5		AC-3s
							> 6.5	AC-4
							2.5–5.5	AC-4s
							2.5–6.5	AC-5
DS-4m	3100–6000	> 1200 <sup>e</sup>	3100–6000	> 1000 <sup>e</sup>	1.3–2.4	> 5.5		AC-3s
							> 6.5	AC-4m
							2.5–5.5	AC-4ms
							2.5–6.5	AC-5m
DS-5	> 6000	≤ 1200	> 6000	≤ 1000	> 2.4	> 5.5		AC-4s
							2.5–5.5	AC-5
DS-5m	> 6000	> 1200 <sup>e</sup>	> 6000	> 1000 <sup>e</sup>	> 2.4	> 5.5		AC-4ms
							2.5–5.5	AC-5m

**Notes**

- a Brownfield locations are those sites, or parts of sites, that might contain chemical residues produced by or associated with industrial production (Section C5.1.3).
- b The limits of Design Sulfate Classes based on 2:1 water/soil extracts have been lowered from previous Digests (Box C7).
- c Applies only to locations where concrete will be exposed to sulfate ions (SO<sub>4</sub>), which may result from the oxidation of sulfides such as pyrite, following ground disturbance (Appendix A1 and Box C8).
- d An additional account is taken of hydrochloric and nitric acids by adjustment to sulfate content (Section C5.1.3).
- e The limit on water-soluble magnesium does not apply to brackish groundwater (chloride content between 12 000 mg/l and 17 000 mg/l). This allows 'm' to be omitted from the relevant ACEC classification. Seawater (chloride content about 18 000 mg/l) and stronger brines are not covered by this table.

**Explanation of suffix symbols to ACEC Class**

- Ⓢ Suffix 's' indicates that the water has been classified as static.
- Ⓩ Concrete placed in ACEC Classes that include the suffix 'z' have primarily to resist acid conditions and may be made with any of the cements in Table D2 on page 42.
- Ⓜ Suffix 'm' relates to the higher levels of magnesium in Design Sulfate Classes 4 and 5.

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