



BARKHAM SQUARE, ARBORFIELD, WOKINGHAM

PHASE I DESK STUDY
FOR
CREST NICHOLSON PARTNERSHIPS STRATEGIC LAND

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Prepared for:
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This report has been prepared in accordance with GRM's Accredited Quality Procedures.

If you have any queries regarding this report please contact the project manager in the first instance.

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Issue	Description of Revision		Signature
DS.2 (updated Aug 2024)	Updated site plans including revised Concept Masterplan		



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1 INTRODUCTION

1.1 PREAMBLE

GRM Development Solutions Limited (GRM) has been appointed by Crest Nicholson Partnerships Strategic Land (Client) to undertake a Phase I Site Appraisal (desk study). The desk study and site inspection form Phase I of the assessment and allow the geotechnical and geo-environmental setting of the site to be determined and the identification of areas of particular concern that require targeted investigation.

This site appraisal is intended to provide information that will assist decision-making by identifying potential ground engineering and contamination issues.

GRM Standard Limitations of Reporting are provided in Appendix A of this report.

The Client proposes to develop the western half of the site with residential houses, a number of attenuation ponds and associated infrastructure. The proposed end use includes gardens and soft landscaping. The existing central watercourse and associated woodland will be retained, with the eastern half of the site comprising mainly Biodiversity offset land and SANG. A Concept Masterplan has been provided by the Client and is presented in Appendix B.

The Client has not informed GRM of any potential development hazards.

1.2 OBJECTIVES OF THE SITE APPRAISAL

The principal aims of the Phase I Site Appraisal (desk study) are as follows:

- a) Obtain information, from easily accessible sources, about the soil and groundwater conditions within the area of the site.
- b) Determine the possible ground related geotechnical and contamination hazards within the site boundaries that may affect the proposed development.
- c) Provide preliminary development recommendations.
- d) Provide advice on further works required for the cost-effective reduction of risks to the development and procedures likely to satisfy regulators.

Whilst every effort has been made to pre-empt the likely requirements of the Local Authority and the Environment Agency, they are likely to have specific requirements that will need to be discussed and addressed at a later date.

2 PHASE I DESK STUDY AND SITE OBSERVATIONS

2.1 INFORMATION SOURCES

In addition to the general sources of information listed in Appendix A (i) the Client has supplied the following information that has been used in the assessment of the site:

- The location of the site.
- Proposed development layout.

2.2 SITE DESCRIPTION

2.2.1 Geographical Setting

The site is located approximately 4km south west of Wokingham town centre. The National Grid Reference (NGR) for the approximate centre of the site is SU 776 663. A Site Location and Boundary Plan is presented in Appendix C.

The northern boundary is formed by hedgerows and trees with fields beyond, the western boundary by Langley Common Road and residential properties, the southern boundary by residential properties and an industrial estate, and the eastern boundary by Barkham Street and Commonfield Lane, in addition to hedgerows and trees with a farm property and fields beyond.

The topography of the site is undulating and generally sloping down towards either side of a stream, which bisects the site in a north east to south west orientation.

2.2.2 Site Inspection Observations

The Site Photographs and associated plan presented in Appendix D illustrate the salient observations made during a site inspection on the 27th of February.

The site is presently used as grazing land and covers an area of approximately 58 hectares. The ground surface was noted to be grassed throughout, with some areas vegetated with trees and hedgerows. Tree species such as ash, oak, poplar, hawthorn, goat willow, and crack willow were tentatively identified on site; however, it is recommended that an arboricultural specialist be consulted. A stream was noted to cross the approximate centre of the site, running south west to north east. The fields to the south east of the stream were noted to be generally dry and firm underfoot; however, the ground surface in the vicinity and to the north west of the stream was noted to be soft and generally waterlogged. Service covers were noted near the stream, indicating the presence of underground drainage. No further evidence of buried services was noted.

In addition to the stream, a pond was noted adjacent to the central part of the southern boundary, bounded to the north by an area of trees fenced off from the field. Other notable features include a wooden storage shed in the north eastern area, adjacent to

a gated entrance, and another gated entrance on the southern part of the eastern boundary, off Commonfield Lane. During the site walkover, evidence of badger setts were noted around the perimeter of the site, mainly within the areas designated as ancient woodland.

Significant Features identified during site inspection:
Trees – deepened foundations in association with cohesive strata. Existing wooden storage shed – requires removal. Stream – potential flood risk, receptor and pathway for contamination, potential receptor for siltation, indicator of shallow groundwater. Waterlogged ground – poor trafficability / investigation constraint / reduced bearing capacity in granular soils Evidence of buried services – disconnection, diversion or easement may be required. Pond – proposed to be retained on the development plan, receptor for contamination and siltation. Potential badger setts on-site – potential investigation and development constraint, ecological survey required.

2.3 HISTORICAL DEVELOPMENT OF THE SITE

A review of the available historical Ordnance Survey (OS) maps gives an insight into the development of the site and can highlight potential hazards. Extracts of the maps reviewed are provided in Appendix E.

On-site

The earliest map reviewed (1871) records the central part of the site as 'Kidgem Copse', densely vegetated with trees, with open fields to the east and west. A stream is recorded running through the area of trees, flowing from south to north. By 1960, Kidgem Copse is reduced significantly in size and is confined to the southern central area. The map for 1967 no longer records the copse, though a reduced area of trees is shown along the southern boundary and either side of the stream. Drains are also recorded in the north western part of the site and in the south eastern area, adjoining the stream.

The map for 2001 shows a large pond adjacent to the central southern boundary, just west of the stream. No further significant changes are recorded up to the latest map reviewed (2024).

Off-site

The earliest map reviewed shows the site to be surrounded by open fields, with Commonfield Lane to the south east and Langley Common Road to the north west. Maps issued since show the area surrounding the site has included wells associated with residential properties ~10m to the north west (1898-1967), a tank ~50m to the north east (1911-1969), a tank 150m to the south (1932-1967), a tank ~10m to the west

(from 1967), a tank ~20m to the south east (1933-1967), a sewage works to the immediate south (1967-1975), a rifle range to the immediate south (1975-2024), an educational facility to the immediate south west (1967-present), and a builders yard with a water tower ~15m to the south west (1967-present).

Significant Features identified on OS Maps:
Trees (existing field boundaries) – deepened foundations in association with cohesive strata.
On site stream – potential flood risk and receptor for site derived contamination, potential receptor for siltation.
Various tanks in surrounding area – potential sources of contamination. Migration potential considered to be very low given the anticipated geology.
Historical sewage works to the immediate south – potential source of contamination.
Off-site rifle range in close proximity – potential source of metals contamination in near surface soils.
Off-site builders yard – potential source of contamination (hydrocarbon).
Field drains – potential receptors for site derived contamination.

2.4 ANTICIPATED GEOLOGY

The BGS Geological Sheet for this area shows the site to be underlain by:

- Superficial Alluvium deposits comprising clay, silt, sand and gravel, along the course of the stream, but absent elsewhere on site.
- Solid geology of the London Clay Formation comprising clay, silt, and sand; throughout the site with the exception of the south eastern extents. London Clay can result in upgraded concrete requirements.
- Solid geology of the Bagshot Formation in the south eastern extents of the site, comprising sand.

The BGS holds borehole records close to the site, copies of which are presented in Appendix F. Locations of the boreholes are included within the Environmental Report presented in Appendix G (page 108). The BGS boreholes suggest limited thicknesses of made ground or topsoil, overlying clays, considered to be London Clay Formation to a maximum depth of 15m, where the base was not encountered. Locally, sand was recorded to a depth of 3.0m (base not proven) in a borehole located in the area to the south east, where Bagshot Formation sand is recorded. The cohesive strata are described as stiff grey silty clays with gravel and sand horizons in places at shallow depth. The deposits considered representative of Bagshot Formation were described as brown sand. It should be noted that some of the boreholes in the south recorded soft clay at shallow depth (up to circa 3m), which may indicate the presence of thin Superficial Deposits, not of sufficient thickness to appear on geological mapping, or potentially softened near surface strata of the London Clay Formation.

The dip of the local strata is not known; however is conjectured to be near horizontal. The site is not indicated to be directly affected by faulting.

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Significant Features identified from geological data:
Cohesive strata – deepened foundations in association with trees. Soft clay – reduced bearing capacity / deepened foundations. Granular deposits in association with shallow groundwater – potential reduced bearing capacity. Variable strata – deepened foundations, potential for springlines. London Clay – potential requirement for upgraded concrete due to associated aggressive ground conditions (on buried concrete).

2.5 HYDROGEOLOGICAL INFORMATION

No detailed information regarding the depths to groundwater is available; however, the groundwater level is likely to be subject to seasonal variations. The BGS borehole records report being dry during boring.

The Environment Agency has classified the underlying strata (Alluvium) as a Secondary A Aquifer. The London Clay Formation is an Unproductive stratum and the Bagshot Formation is classified as a Secondary A Aquifer.

It is possible that springlines will be present at the cohesive granular interface.

There are no recorded groundwater abstraction licenses within 500m of the site.

The information available at this stage suggests a groundwater table at depth.

Significant Features identified from hydrogeological data:
Secondary A Aquifers (Superficial and Solid Strata) – potential receptors for site derived contamination. Potential springlines – shallow groundwater, development constraint.

2.6 HYDROLOGICAL INFORMATION

Local surface water features include:

- A brook bisects the centre of the site flowing north east. Due to the gradient of the site sloping down towards it may be a viable receptor of site-derived contaminants and siltation.
- Additionally the drain present in the northeastern section of the site may be a viable receptor for site derived contamination and siltation.
- There is also a pond present on the southern part of the site next to the stream this may be a possible receptor for site-derived contamination and siltation.

There are no water abstraction licenses within 500m of the site.

Significant Features identified from hydrological data:
Stream – potential flood risk, potential receptor for site-derived contamination and siltation.
Drain – potential flood risk, potential receptor for site-derived contamination and siltation.
Pond – potential flood risk, potential receptor for site-derived contamination and siltation.

2.7 FLOOD RISK

Environment Agency data records parts of the site, confined to the immediate vicinity of the stream as Flood Zones (2 and 3). Ambient Risk Analytics data shows these areas to include zones designated as likely to flood at a rate of 1 in 30 years, with a depth of up to 1.0m. None of these designations are recorded throughout the remainder of the site.

The Ambient Risk Analytics dataset also indicates that the site is at negligible to moderate risk of groundwater flooding, with the lowest risk areas confined to topographical highs.

A Phase II ground investigation would provide information on the local groundwater regime so that the risk can be assessed by the project's infrastructure engineer. Any risk associated with the groundwater regime should be catered for within the development infrastructure design.

The site is within 250m of an indicative fluvial floodplain, the Environment Agency's Internet-based flood risk maps suggest there is a risk from river flooding.

A Flood Risk Assessment (FRA) is required for this site as it is over 1ha in size.

Significant Flood Risk Features identified:
Site in excess of 1ha – FRA required.
Stream – surface flood risk.
Potential for groundwater flooding – FRA required.

2.8 MINING

2.8.1 Coal

The site is not within an area recorded to require a Coal Authority mining report; and there are no shallow coal bearing strata recorded, therefore, the risk from coal mining is considered to be negligible.

2.8.2 Brine

The site is not within the area defined by the Brine Compensation Board and no readily soluble strata are recorded; therefore, the risk from dissolution is considered to be negligible.

2.8.3 Oil And Gas

GRM have conducted an on-line search, which has shown that the Oil and Gas Authority does not record the site to be within an on-shore licence area or a shale prospective area. Therefore the risk to the site of future oil and Gas extraction is considered negligible.

Significant Mining Risks:

None.

2.9 QUARRYING

A stone pit is recorded 33m south of the site and from the BGS aggregate information is likely to have extracted Superficial Alluvium deposits based on the local geology. There is no evidence of any extraction occurring on site in the past and due to the limited volumes of Alluvium present on site, it is considered very unlikely any future extraction will take place.

Significant Quarrying Risks:

None.

2.10 MINERAL RESOURCE PROTECTION

Whilst GRM can comment on the geological considerations regarding Mineral Resources, a legal expert should be commissioned concerning Mineral and Manorial Rights.

There are areas of the country where large reserves of aggregates and other minerals exist, which are actively being, or could potentially be, exploited as a valuable resource. A Mineral Risk Assessment is typically required when developments, particularly those that are large in size, is proposed in areas where large reserves do, or may, exist, to determine whether the mineral resource will be sterilised.

The BGS Aggregate Safeguarding Map/Plan for the county of Berkshire has been used to provide an initial assessment of the known reserves of aggregates in the area of the site.

Parts of the central area of the site lie within an area noted to contain superficial Alluvium which are used for the production of sand and gravel. The area of Alluvium that crosses the site is a relatively small 'outlier', with the mineral resource information

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from the BGS illustrating that more significant deposits are present to the north west, extending across extensive parts of the larger surrounding area. The deposits are regionally recorded to be up to 3m in thickness, although there is very little borehole information suitably close to the site to verify the local thickness.

The following information has been obtained from the BGS mineral resource information.

Superficial Alluvium is currently of economic importance as a source of sand and gravel. The Superficial Alluvium does not appear to have been extensively worked in Arborfield for the production of sand and gravel. Additionally, the joint Minerals and Waste Plan for Central and Eastern Berkshire which was adopted in 2022 does not have the site within an area of safeguarded sand and gravel resources, this may be due to the limited volume of viable deposits on the site. As the deposits are likely to be thin and such large areas of land would be required to maintain production, it is unlikely that the Alluvium will be used as a source of sand and gravel in the future.

Overall it is considered unlikely that the site is underlain by significant and easily exploitable reserves of sand and gravel and so a detailed Mineral Risk Assessment is unlikely to be required. However, this should be confirmed with the Minerals Officer.

Mineral Risk Assessment:

Low risk of further assessment being required. To be confirmed following intrusive investigation and consultation with the local Minerals Officer.

2.11 ENVIRONMENTAL INFORMATION

An Environmental Report has been acquired for the site. The full report is presented in Appendix G. A summary of the relevant information not included elsewhere in this report is presented below:

- No significant environmental hazards, that are considered likely to pose a potential risk to the site, have been identified from the available information.
- The remnant areas of Kidgem Copse, along the stream and in the southern part of the site are designated as ancient woodland.
- There are no recorded landfills within the vicinity of the site.

Significant Features identified from Environmental data:

Ancient woodland - development constraint, consultation with the Local Authority required.

2.12 ARCHAEOLOGY

Archaeological information has not been sought as part of this desk study and has not been identified as an issue by the Client. Some Local Authorities require at least an

initial archaeological appraisal for development sites. GRM can undertake such appraisals if required. Archaeological investigations occasionally reveal ground-related problems from ancient times (prior to the 1st Edition OS maps) and can occasionally cause foundation and contamination development hazards.

Archaeological Hazards:
Not assessed.

2.13 INVASIVE PLANT SPECIES/ECOLOGY

GRM is not a specialist in this topic and has not conducted such a survey; however, we will endeavour to report easily recognisable issues such as Japanese Knotweed, Giant Hogweed, badger setts when seen on site. During the site walkover, evidence of badger setts were noted around the perimeter of the site, mainly within the areas designated as ancient woodland.

Invasive Plant Species/Ecological Hazards:
Potential badger setts on-site – potential investigation and development constraint, ecological survey required.

2.14 RADON ASSESSMENT

The site has been assessed following the guidelines in 'Radon: guidance on protective measures for new dwellings (including supplementary advice for extensions, conversions and refurbishment projects)' (BR211 2023). The site is not within an area recorded to require radon protection measures.

Radon Hazard:
None.

2.15 UNEXPLODED ORDNANCE (UXO)

Based on freely available information from Zetica, the site is at low risk from UXO. Therefore, no additional assessment is considered necessary.

UXO Hazard:
None.

2.16 SUMMARY OF POTENTIAL GEOTECHNICAL/GENERAL HAZARDS

Potential geotechnical/general hazards have been identified in earlier sections and are summarised below.

Potential Hazard	Potential Consequence	Action
Rutting/softened surface strata	Poor trafficability	Temporary haul roads likely to be required
Locally variable strata	Deepened foundations	Ground investigation
Shallow groundwater flooding	Damage to property	Flood Risk Assessment required
Shrinkable clay/trees	Deepened foundations	Ground investigation plasticity testing/tree survey
Elevated levels of sulphate and / or acidic ground conditions	Danger to buried concrete	Soil testing and adoption of appropriate concrete specification
Ancient Woodland	Development constraint	Consultation with Local Authority
Granular strata in association with shallow groundwater	Reduced bearing capacity	Deepened and/or reinforced foundations
Existing wooden storage shed	Development constraint	Requires removal
Potential badger setts	Development and investigation constraint	Ecological survey
Off-site drain	Siltation	Surface water management scheme
Springs	Development constraint	Ground investigation
Stream	Flood risk	FRA
Groundwater	Flood risk	FRA
Buried services	Development constraint	Diversion, disconnection or easement
Site >1ha	FRA	FRA

Potential sources, pathways and receptors are summarised in the Phase I Conceptual Model in Section 3, which is based on current relevant guidance, the principles of which are set out in Appendix A (iii).

Where appropriate potential hazards to the proposed development are shown on the Hazard Plan (Ground Model) presented in Appendix H.

2.17 CONTAMINANTS OF CONCERN

In addition to the general contaminants listed in Appendix A (ii), the following site specific contaminants have been identified:

- Potential metal contamination in near surface soils due to adjacent rifle range.
- Unknown contaminants from historical off-site tanks (potential hydrocarbons).

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- Biological contaminants associated with the adjacent historical sewage treatment works.

Due to the site's current and past use as mainly pasture land, the risk from pesticides is considered negligible.

3 PHASE I CONCEPTUAL SITE MODEL

HUMAN HEALTH			
Source	Pathway	Receptor	Level of Risk
Potential localised soil contamination associated with existing storage shed, off-site rifle range, historical sewage works and historical tanks.	Indoor and outdoor inhalation of soil dust, the ingestion of, and dermal contact with, contaminated soil and soil dust, ingestion of vegetables that have taken up contamination and contaminated soil attached to vegetables.	Construction and Maintenance Workers.	Very Low.
		End users	
Alluvium.	Inhalation of ground gas.	End users.	Very Low.
Potential hydrocarbon contamination originating from off-site industrial activities.	Water pipes.	End users.	Very Low.

CONTROLLED WATERS			
Potential localised soil contamination associated with existing storage shed, off-site rifle range, historical sewage works and historical tanks.	Leaching of contaminants and vertical migration to the groundwater.	Secondary A Aquifers.	Very Low.
	Leaching of contaminants and lateral migration to surface waters.	Stream.	Very Low.

4 CONTAMINATION / REMEDIATION RECOMMENDATIONS

The risk from ground contamination is considered very low.

The risk from ground gas is considered to be very low.

Prior to development a ground investigation will be required, the scope of which is outlined in Section 6.

5 PRELIMINARY GEOTECHNICAL ASSESSMENT

It should be noted that the following comments and recommendations are based on the findings of this desk study which may not give a true indication of a soils actual engineering properties (i.e. stability, mass structure etc). Prior to development a ground investigation will be required to confirm the initial recommendations outlined below, the scope of which is outlined in Section 6. However, at this stage based on the desk based information available it is considered:

- The ground conditions are likely to comprise sand (around 15% of the site) in the south eastern extents and clay (around 85% of the site) throughout the remainder. Rock is not expected to be present at shallow depth.
- Providing soft or loose materials are not present, the site may be suitable for the use of traditional trench fill foundations.
- Due to the suspected presence of cohesive soils and the presence of trees, particularly around the margins of the site, allowance should be made for deepening foundations in accordance with NHBC standards. At this stage it should be assumed that 5-10% of plots will require some degree of deepening below minimum depth. Based on development proposals, it is considered that piled foundations are unlikely to be required for trees.
- Deepening of foundations due to the effect of trees should not be necessary in the south eastern parts of the site, due to the presence of granular soils.
- Due to the anticipated presence of soft near surface strata, an allowance should be made for suspended (beam and block or cast in-situ) floors throughout.
- Potentially aggressive ground conditions are expected and upgraded concrete should be allowed for in the London Clay.
- Given the anticipated geology the adoption of a soakaway drainage system is not considered suitable for the majority of the site; however, discreet areas of higher elevation underlain by granular deposits may be suitable; however, this could result in emergence of water downslope.
- Given the anticipated geology and near surface ground conditions, CBR values of between 2% and 4% are considered likely in the natural cohesive and ~5% in

the natural granular soils. Lower CBRs should be anticipated in the Alluvium and during periods of inclement weather.

- Due to shallow groundwater, an allowance should be made for shoring and dewatering for 50% of the site.
- Allowance should be made for disconnection, diversion or easement of buried services.

6 FURTHER INVESTIGATION

A Phase II ground investigation is recommended to determine more accurately the effect of the identified hazards on the development. Initially, this should include:

- A ground investigation designed to BS10175:2011 and BS5930:2015 and comprising window sampling, trial pitting, and potentially deeper boreholes (such as cable percussive) will be required to confirm ground conditions and collect samples for analysis. Based on a site area of 58 Ha and an investigation on a 50m grid, 210No. exploratory holes are envisaged.
- Chemical analysis of soils followed by risk assessment so that the risk to human health and controlled waters can be determined.
- Based on the Phase I Conceptual Model (Section 3) the ground gas risk has been assessed as low. A ground gas investigation designed to current guidance will be required to determine the ground gas regime beneath the site and allow any necessary mitigation measures to be recommended. At this stage allowance for 6 visits over 3 months should be made to assess potential liabilities.
- Geotechnical soils testing of the founding strata to assess its character and suitable grades of buried concrete.

Following your review of this document, a copy of it should be submitted to the Planning Department of the Local Authority for comment and approval prior to any ground investigation works being undertaken, as this is often a condition of planning.

7 CONCLUSIONS

This Phase I Site Appraisal has shown the site is suitable for the proposed development, assuming compliance with all the recommendations contained within this report.



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GENERAL APPRAISAL COMMENTS

i INFORMATION SOURCES

Where available the following sources have been used for the identification and assessment of potential ground hazards:

- Relevant British Standards
- British Geological Survey (BGS) Geology Map Scale 1:10,000 for local area
- British Geological Survey (BGS) Geology Map Scale 1:50,000/1:63,320
- BGS Memoir
- BGS Borehole Records: <https://mapapps2.bgs.ac.uk/geoindex/home.html>
- BGS online viewer: <https://geologyviewer.bgs.ac.uk>
- Magic Groundwater Vulnerability Maps
- Historical Ordnance Survey (OS) Maps
- Environmental Data Report
- Environment Agency Website: <http://www.environment-agency.gov.uk/>
- Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites, UKWIR, 2010.
- Coal Authority Records / Coal Mining Report
- DEFRA/Environment Agency Contaminated Land publications and DoE Industry Profiles
- BRE Guide BR211 (2023), 'Radon: Guidance on protective measures for new buildings (including supplementary advice for extensions, conversions and refurbishment projects)'
- UK HSA Radon Maps: <https://www.ukradon.org/information/ukmaps>
- CIRIA C665 'Assessing risks posed by hazardous ground gases to buildings'
- BS8485:2015 +A1: 2019, 'Code of Practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings'
- Other technical references used throughout this document are detailed in the text.

ii CONTAMINANTS OF CONCERN

The DoE Industry Profiles are normally used to assess likely contaminants from past land use and potential nearby industrial sources. For land uses where no profile is available, likely contaminants of concern are selected by GRM based on past experience of similar sites, a general screening suite of contaminants covered by CLEA and common contaminants from the Industry Profiles.

- | | | |
|------------|-------------------|--|
| · Arsenic | · Copper | · Water soluble sulphate |
| · Cadmium | · Nickel | · PAH (polycyclic aromatic hydrocarbons) |
| · Chromium | · Zinc | |
| · Lead | · Phenols | |
| · Mercury | · cyanide (total) | |
| · Selenium | · pH | |

Asbestos and PCBs are listed in the vast majority of profiles. PCBs are listed as the profiles expect electricity substations and switch boxes on all industrial sites. There is the potential for asbestos containing material to be mixed up with made ground, following any demolition works.

iii CONCEPTUAL MODEL METHODOLOGY

The consideration of contamination is based upon the principles of risk assessment, using the 'source-pathway-receptor' model in order to establish the presence, or potential presence, of a pollutant linkage.

To create a risk, contamination must have the potential to cause harm to susceptible targets or receptors such as humans, the water environment or the built environment. The potential for harm to occur requires three conditions to be satisfied to form a pollutant linkage:

- The presence of substances that may cause harm (SOURCE).
- The presence of a target which may be harmed (RECEPTOR).
- The existence of a plausible migration route between the source and the receptor (PATHWAY).

In the absence of a plausible pollutant linkage there is no risk. Where a potential linkage is identified in order for it not to pose a risk to the identified receptor it must be broken.

iv INTRUSIVE INVESTIGATION SAMPLING METHODOLOGY

The ground investigation (including fieldwork, sampling, monitoring and laboratory analyses) has been designed to identify and assess potential ground related problems and to allow cost effective solutions to be advised. It has been planned on the basis of the desk study, site inspection and the proposed development layout (where available). All fieldwork and soil descriptions were carried out in general accordance with relevant British Standards.

The exploratory holes have been positioned and advanced to depths to determine the general ground/groundwater/gas conditions below the site. A general grid pattern has been adopted, where possible, to provide sufficient information based on the current proposed layout scheme. Some holes have been targeted at particular hazards identified in the Phase I assessment. The resultant exploratory hole density is considered to be commensurate with the complexity of the site conditions and detail of information required for this phase of the investigation.

v GROUND GAS RISK ASSESSMENT METHODOLOGY

Gas monitoring programmes undertaken by GRM are designed to broadly comply with the recommendations outlined in CIRIA Report C665 'Assessing risks posed by hazardous ground gas to buildings' (2007) and BS8576 'Guidance on Investigations for ground gas – Permanent gases and Volatile Organic Compounds (VOCs) (2013).

To assess the risks posed by ground gases such as radon, carbon dioxide and methane, the relevant current guidance has been used. For radon the site has been assessed following the guidelines in 'Radon: guidance on protective measures for new dwellings (including supplementary advice for extensions, conversions and refurbishment projects) (BR211: 2023)'. For methane and carbon dioxide the primary guidance document used to determine if protection measures are required is *BS8485:2015 Code of practice for the design of protective measures from methane and carbon dioxide ground gases for new buildings*. This uses hazardous gas flow rates (Q_{hg}), which are gas concentrations multiplied by borehole flow rates, to derive a Gas Flow Rate (GSV) for the site. The gas regime is then determined based on the GSV and other limiting factors such as gas concentrations.

Where flow is not recorded during the monitoring a default flow rate of 0.1l/hr will be used in the assessment to produce a positive result.

vi HUMAN HEALTH RISK ASSESSMENT METHODOLOGY

Guidance contained in the Environment Agency's CLEA Reports has been used to assess the risks posed to human health.

For residential developments that include domestic gardens the default Tier 1 Assessment Criteria (TAC) for 'residential land with plant uptake' are used, i.e. a female with a start age class of one and an end age class of six. All pathways are considered including the consumption of home-grown vegetables.

For residential developments that do not include domestic gardens the default Tier 1 Assessment Criteria (TAC) for 'residential land without plant uptake' are used, i.e. a female with a start age class of one and an end age class of six. All pathways are considered except the consumption of home-grown vegetables. For commercial/industrial developments the default Tier 1 Assessment Criteria (TAC) for 'commercial/industrial' are used, i.e. a female with a start age class of sixteen and an end age class of eighteen. All pathways are considered except the consumption of home-grown vegetables.

The TAC used by GRM include Category 4 Screening Levels (C4SLs) published by DEFRA, values calculated by GRM using the CLEA v1.071 risk assessment, and values and Suitable for Use Levels (S4UL) developed by LQM/CIEH. The TAC used in the assessment are selected based on the lowest site specific SOM values returned as part of the chemical analysis.

Where soil chemical analysis results are found to exceed the TAC, Site-Specific Risk Assessments may be undertaken using the CLEA v1.071 risk assessment software using the age classes and pathways described above.

vii RISK TO SITE WORKERS – GENERAL COMMENTS

The risks to site workers are similar to those posed to site end users, although likely to be less severe due to the site workers' shorter exposure to the identified contamination. However, site workers (particularly groundworkers) are more likely to come into direct contact with contaminated soils due to the nature of their work. On this basis ground and construction workers should be provided with basic Personal Protective Equipment based on the site's general health and safety risk assessment, but including as a minimum safety footwear, gloves and overalls.

A site specific risk assessment should be carried out for all hazards identified within the ground investigation in accordance with current health and safety legislation. This assessment should identify any measures required to further reduce risks i.e. providing further Personal Protective Equipment, welfare facilities and if necessary preventing access to certain areas.

Demolition and dismantling of existing structures on the site must be carried out to a safe and acceptable standard, in accordance with current UK guidance and best practice. Whilst not ground related, asbestos and hazardous substances surveys should be conducted prior to any demolition.

Any unusual colours, odours and suspicious ground should be reported immediately to site management and then GRM.

Whilst this appraisal has considered the long-term effects of contamination, GRM can also help during the formulation of Health and Safety documentation, if required.

viii CONTROLLED WATERS RISK ASSESSMENT METHODOLOGY

Where the desk study and fieldwork do not reveal a potential source of contamination no leachate or groundwater testing will be performed. Where a potential source is identified the testing will comprise leachate testing on the material considered most likely to pose a risk, groundwater testing will be undertaken if water is present at shallow depth.

The UK Drinking Water Standards (UKDWS) or Environmental Quality Standards (EQS) are usually adopted for comparison with the leachate/groundwater test results. When the most sensitive receptor is considered to be the aquifer (groundwater) UKDWS will be adopted as the Initial Tier 1 screening values.

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Where the most sensitive receptor is a surface water feature the EQS values will be used as Initial Tier I Screening values.

ix CONSTRUCTION MATERIALS RISK ASSESSMENT METHODOLOGY

The 'screening levels' adopted for the assessment of risk to construction materials are taken from the following documents:

- UK Water Industry Research (UKWIR) Contamination thresholds for sub-surface water pipes, for the protection of buried pipes.
- Building Research Establishment (BRE) Special Digest SD1 (2005), 'Concrete in Aggressive Ground', for the protection of buried concrete.

x WASTE DISPOSAL, SITE WASTE MANAGEMENT PLANS AND MATERIAL MANAGEMENT PLANS

Under current Waste Management Regulations, waste soil materials produced from the site will require characterisation to enable it to be disposed of correctly.

The chemical analysis results included in this report should be provided to the relevant landfill operators to establish the characterisation of the waste, confirm its suitability for landfill disposal and provide estimated costings. If material is classified as hazardous, then the site will need to be registered with the Environment Agency prior to the movement of the waste. Depending on the receiving landfill's current permit, further chemical analysis, incorporating Waste Acceptance Criteria (WAC) leachate analysis, may be required.

All materials removed from the site will be classified as 'waste' and therefore must be removed by a suitably licensed carrier of waste. This applies whether or not the waste is contaminated. All waste removed to landfill will attract Landfill Tax.

The developer/builder is likely to be classed as the waste producer and therefore, has a duty of care to ensure that all waste is disposed of appropriately. This includes ensuring the waste carrier is licensed and disposes of the waste to a suitably licensed landfill site. They are also required to keep a paper trail from 'cradle to grave' including copies of the waste disposal tickets.

Efficient materials management on site is recommended as it can lead to significant cost savings when compared to the traditional side casting or single stockpile of arisings. GRM can assist in the production of Material Management Plans under the CL:AIRE Definition of Waste: Code of Practice. The DoWCoP enables:

- The direct transfer and re-use of clean naturally occurring soil materials between sites, and
- The re-use of both contaminated and uncontaminated materials on their site of origin and between sites within defined Cluster projects.

GRM can also undertake the role of Qualified Person and submit the DoW CoP project Declaration.

Likewise making the site as volume neutral as possible will reduce the costs of development. Whilst not a statutory requirement, Site Waste Management Plans allow better waste management practices, help to reduce the amount of waste produced and identify best environmental disposal options. Implementing a Site Waste Management Plan (SWMP) can reduce costs (increasing business profits) and maximise resource efficiency.

xi GEOTECHNICAL ASSESSMENT GENERAL COMMENTS

Where finished floor levels of proposed structures have not been provided by the Client, then for the purposes of initial assessment, GRM will assume that finished levels will not vary appreciably from the existing ground levels. If the depths of any underground engineering works (i.e. sewers, pumping stations etc.) are unknown they will not be taken in to account in the assessment and it will be assumed that any such works will not compromise foundation or ground stability.

Should the development proposals or finished levels be different from these assumptions then the comments/recommendations in the Geotechnical Assessment may require revising.

It should be noted that the results of window sampling and/or cable percussive boreholes may not give a true indication of a soils actual engineering properties (i.e. stability, mass structure etc). GRM consider that that prior to development trial pitting should be undertaken to confirm the recommendations in the Geotechnical Assessment.

xii GEOTECHNICAL ASSESSMENT – ENGINEERING GROUND TREATMENT

Near surface soils have the potential to be disturbed by weathering and site traffic. Precautions should always be taken to avoid this, as excessive disturbance may leads to more onerous floor slab designs, road cap thickness and increased amounts of off-site disposal etc.

Near surface soils may need treatment or reinforcing to allow safe movement of construction plant and labour. An assessment by the contractor should be undertaken once the type of machinery/plant needed to complete the development is known.

xiii GEOTECHNICAL ASSESSMENT – EXCAVATIONS

Excavation instability (over-break) can result in damage to existing services or structures (e.g. foundations, roads or boundary walls/fences) both on and off-site, as well as increased foundation concrete costs. In order to minimise this, all excavations deeper than 1.2m deep (or any excavation within 1.5m of any existing structure or service) should be supported. Full support should be provided to the full depth of all near vertically sided excavations in made ground, soft and very soft clays and granular soils. A reduction to intermediate support should be acceptable within firm and stiffer natural clays.

Wherever possible, man entry into excavations should be prevented; however, where this is not possible, entry to, and time spent in, excavations should be kept to a minimum.

The build program should be tailored to reflect the impact that deep excavations through potentially unstable strata can have on adjacent properties, so that they are not undermined.

All excavations on site should be in accordance with HSE guidelines and stability should be practically maintained at all times. Reference should be made to HSE construction information sheet No. 8 (Revision 1) 'Safety in Excavations'.

Care should be taken to ensure that falls from excavation faces do not adversely affect the integrity of foundation concrete.

If contaminated water enters excavations it should be removed and transported to an appropriate treatment facility by a suitably licensed carrier before construction begins.

xiv GEOTECHNICAL ASSESSMENT – SUBSTRUCTURES

Where practicable, existing buried construction should be fully removed; however, if this is not practicable all new foundations should be carried down to fully penetrate it and it should be broken well away from all new structures.

There may be existing structures and/or infrastructure in close proximity to the proposed development. New build foundations may be constructed next to pavements with existing underground services beneath them, or excavations may be required near existing footings associated with adjacent properties. These potential hazards need to be taken into consideration when designing foundations and the groundworker needs to be made aware of their potential impact during the redevelopment works. Foundations close to existing underground services or buildings may require alternative foundation techniques (such as piling) to protect the integrity of these structures.

The contractor for the works should carry them out in such a fashion so as to not cause excessive overbreak, concrete usage or undermine existing buildings/roads/ services that are to be retained.

xv **GEOTECHNICAL ASSESSMENT – SOAKAWAYS**

Soakaway testing in trial pits by GRM is broadly carried out in accordance with BRE DG 365 (2016). The testing comprises the excavation of a test pit to a suitable depth, and the placement of water into the pit. The level of water present is then monitored over time. For borehole installations, the permeability testing (falling head/rising head) is undertaken in accordance with BS5930.

If it is decided to proceed with the use of soakaway drainage, then the following general points should be noted:

- Soakaways should not be placed so that water can be discharged through potentially contaminated made ground.
- The Environment Agency may require soakaways to be sealed systems such that only roof run off falls to soakaway.
- Interceptors are likely to be required for soakaways for highway drainage. The adopting authority for the highways should be consulted at the earliest opportunity regarding the use of soakaways for highways drainage.
- Consideration of site levels and slopes should be taken into account during the design.
- The construction of all soakaways should be in accordance with the current building regulations.
- Soakaways should not be placed within 5m of a proposed building.
- Placement of soakaways needs to be considered so as to avoid ponding of water down slope.
- The base of a soakaway should not be below the highest recorded water level.
- The Environment Agency prefer 1m of dry soil to be present between the base of a soakaway and the water table to provide attenuation for contamination.

xvi **GEOTECHNICAL ASSESSMENT – FOUNDATIONS**

If soft or hard spots are encountered during foundation excavation then they should be replaced with suitably compacted material or the footings deepened to suitable strata, to avoid differential settlement.

If strata of differing bearing character (e.g. sand and clay) are encountered at foundation levels within the excavations for a single plot then the excavation depths should be altered as appropriate to ensure the foundations rest on a single stratum, or strata that will not induce differential settlement. Where this is impractical then GRM should be contacted to assess a reinforced concrete detail or an alternative foundation solution (e.g. piles or vibro-replacement).

NOTES ON LIMITATIONS

General

GRM Development Solutions Limited has prepared this report solely for the use of the Client and those parties with whom a warranty agreement had been executed, or with whom an assignment had been agreed. Should any third party wish to use or rely upon the contents of the report, written approval must be sought from GRM Development Solutions Limited; a charge may be levied against such approval.

GRM Development Solutions Limited accepts no responsibility or liability for:

- a) the consequences of this document being used for any purpose or project other than for which it was commissioned, and
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Phase I Environmental Audits/ Desk Studies

The work undertaken to provide the basis of this report comprised a study of available documented information from a variety of sources (including the Client), together with (where appropriate) a brief walk over inspection of the site and meetings and discussions with relevant authorities and other interested parties. The opinions given in this report have been dictated by the finite data on which they are based and are relevant only to the purpose for which the report was commissioned. The information reviewed should not be considered exhaustive and has been accepted in good faith as providing true and representative data pertaining to site conditions. Should additional information become available which may affect the opinions expressed in this report, GRM Development Solutions Limited reserves the right to review such information and as considered necessary and appropriate to modify the opinions accordingly. It should be noted that any risks identified in a Phase 1 report are perceived risks based on the information reviewed; actual risks can only be assessed following a physical investigation of the site.

Phase II Environmental Audits (Contamination Investigations)

The investigation of the site has been carried out to provide sufficient information concerning the type and degree of contamination, ground and groundwater conditions to allow a reasonable risk assessment to be made. The objectives of the investigation have been limited to establishing the risks associated with potential human targets, building materials, and controlled waters.

The amount of exploratory work and chemical testing undertaken has necessarily been restricted by the short timescale available, and the locations of exploratory holes have been restricted to the areas unoccupied by the building(s) on the site and by buried services. A more comprehensive investigation may be required if the site is to be redeveloped as, in addition to risk assessment, a number of important engineering and environmental issues need to be resolved.

For these reasons if costs have been included in relation to site remediation these must be considered as provisional only and must, in any event, be confirmed by a commercial adviser.

The exploratory holes undertaken, which investigate only a small volume of the ground in relation to the size of the site, can only provide a general indication of site conditions. Whilst exploratory testing is intended to gain an accurate representation of the site, the very nature of sampling and testing is such that it cannot ensure that all localised conditions are detected.

The risk assessment and opinions provided take in to consideration, inter alia, currently available guidance relating to acceptable contamination concentrations; no liability can be accepted for the retrospective effects of any future changes or amendments to these values.

Phase II Geo-environmental Investigations (Combined Geotechnical and Contamination Investigations)

The investigation of the site has been carried out to provide sufficient information concerning the type and degree of contamination, geotechnical characteristics, and ground and groundwater conditions to provide a reasonable assessment of the environment risks together with engineering and development implications. If costs have been included in relation to site development a commercial adviser must confirm these.

The exploratory holes undertaken, which investigate only a small volume of the ground in relation to the size of the site, can only provide a general indication of site conditions. The opinions provided and recommendations given in this report are based on the ground conditions apparent at the site for each of the exploratory holes. There may be exceptional ground conditions elsewhere on the site which have not been disclosed by this investigation and which have therefore not been taken into account in this report.

The comments made on groundwater conditions are based on observations made at the time the site work was conducted. It should be noted that groundwater levels will vary owing to seasonal, tidal and weather related effects. The scope of the investigation was selected on the basis of the specific development proposed by the Client and may be inappropriate to another form of development or scheme.



The risk assessment and opinions provided take in to consideration, inter alia, currently available guidance relating to acceptable contamination concentrations; no liability can be accepted for the retrospective effects of any future changes or amendments to these values.



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NOTES:

Approximate site boundary

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CLIENT:

**Crest Nicholson Partnerships
Strategic Land**

PROJECT:

**Barkham Square, Arborfield,
Wokingham**

TITLE:

Concept Masterplan

SCALE@SIZE:	ISSUE:
NTS	FINAL
DESIGN/DRAWN:	DATE:
RHC	Aug 2024
PROJECT No:	DRAWING No:
P10532	Figure 1

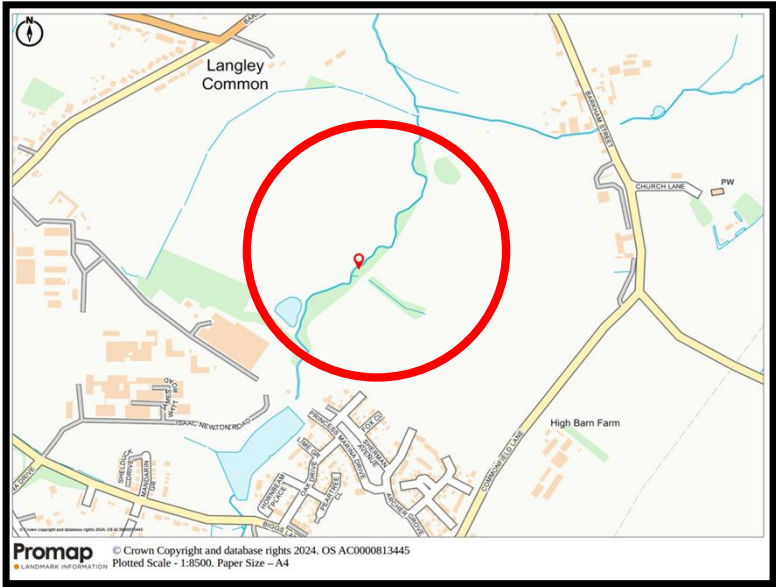
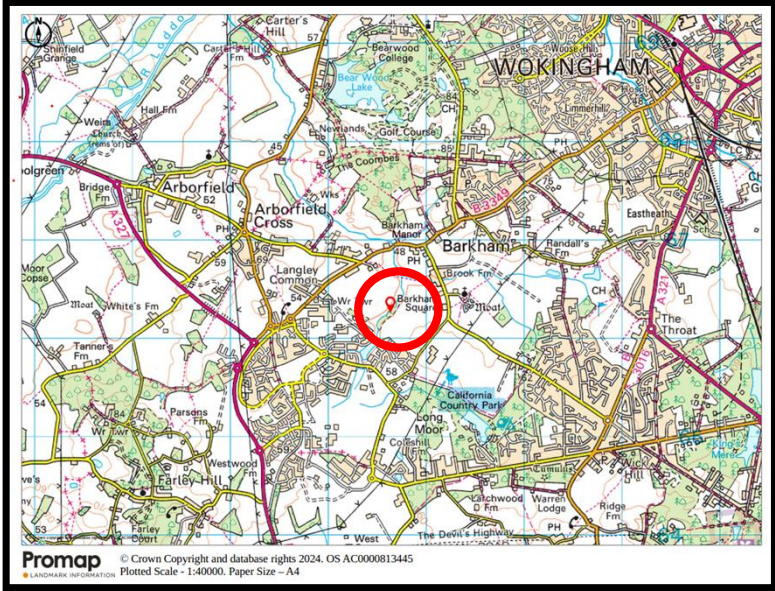
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- DO NOT SCALE
- NOTES:
-  Approximate site location
 -  Approximate site boundary



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CLIENT:
**Crest Nicholson Partnerships
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PROJECT:
**Barkham Square, Arborfield,
Wokingham**

TITLE:
Site Location and Boundary Plan

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RHC	Aug 2024
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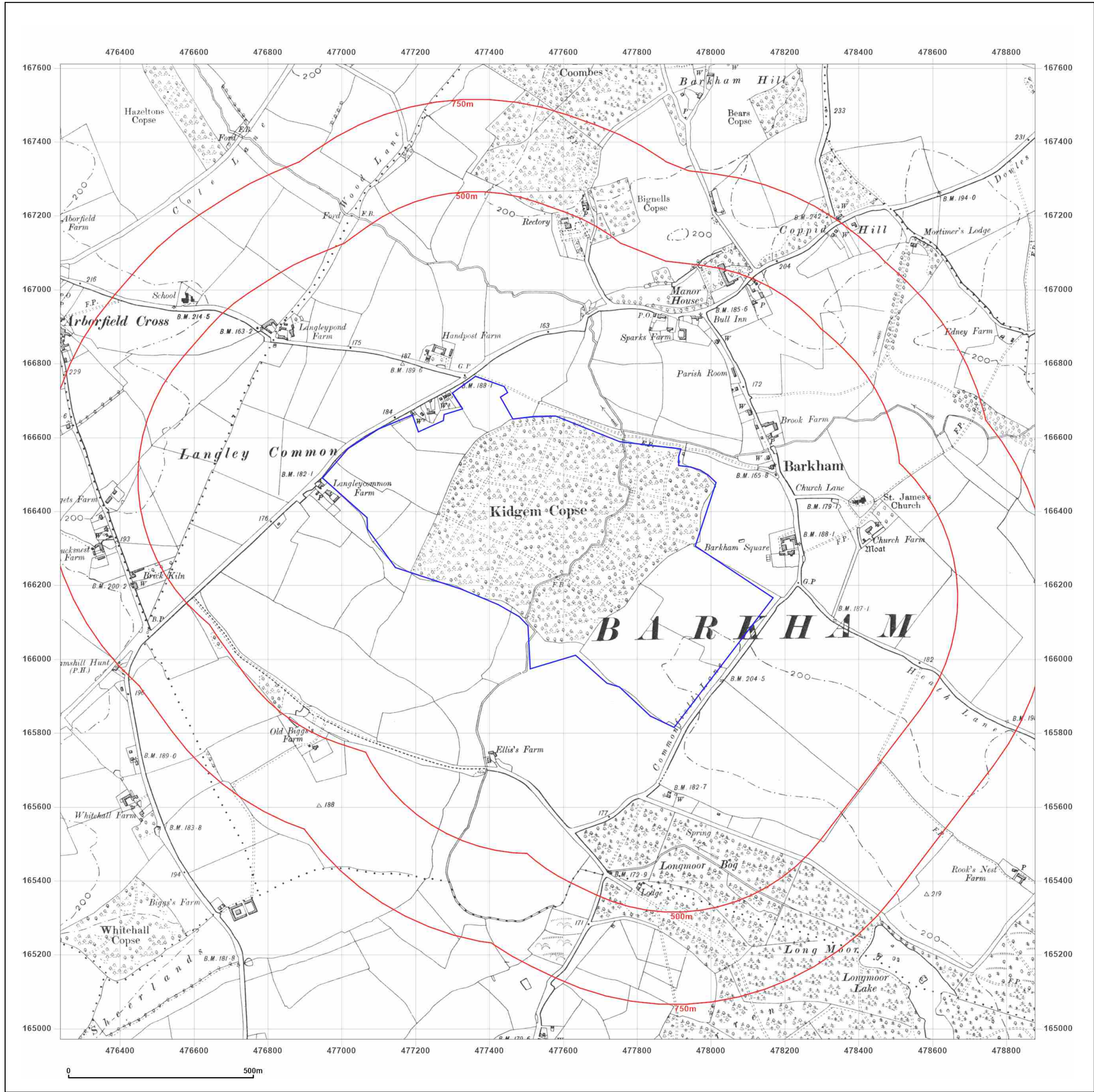
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Client Ref: EMS_927592_1150615
Report Ref: EMS-927592_1181345
Grid Ref: 477557, 166290

Map Name: County Series

Map date: 1898

Scale: 1:10,560

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Revised 1898
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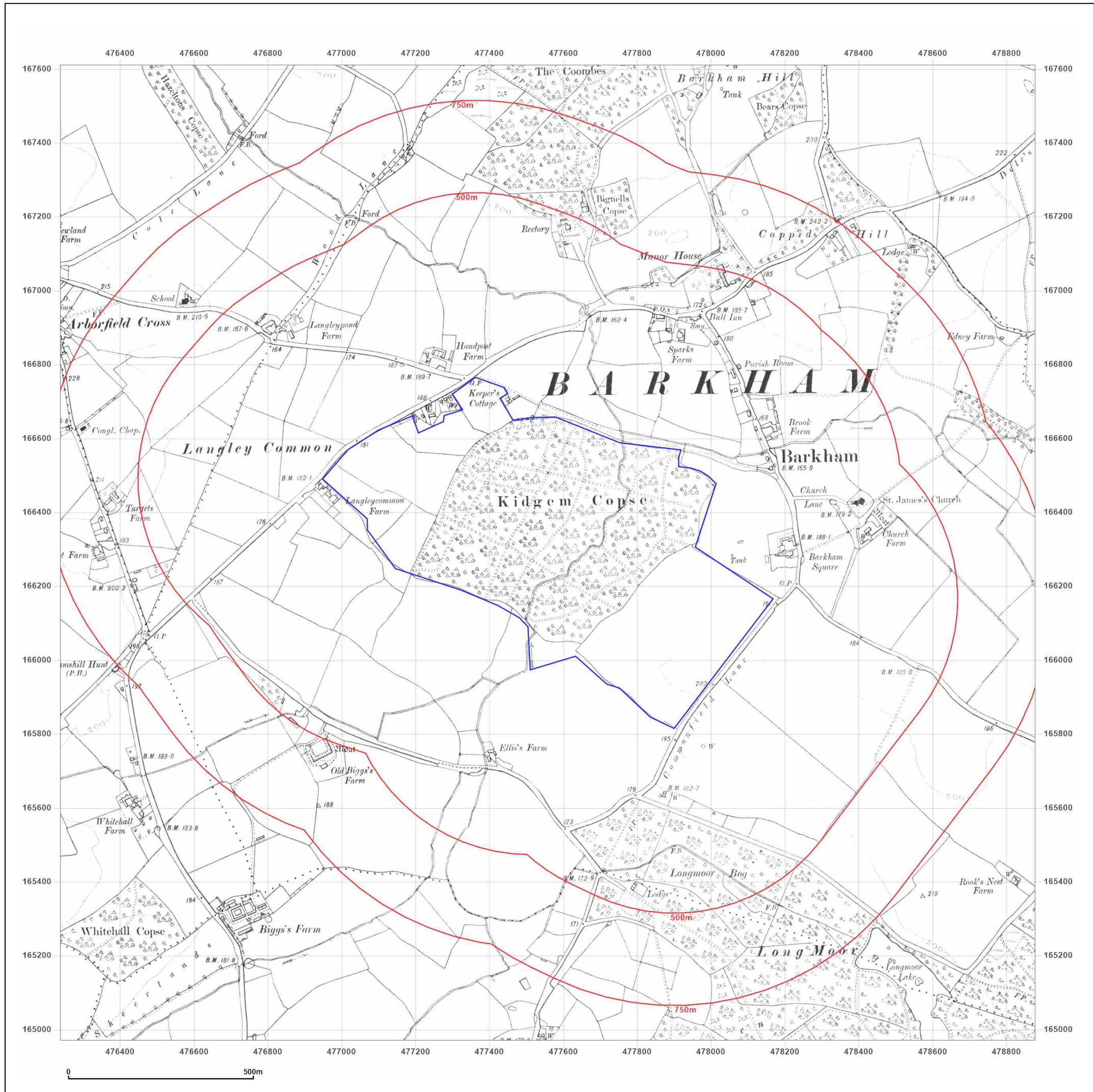


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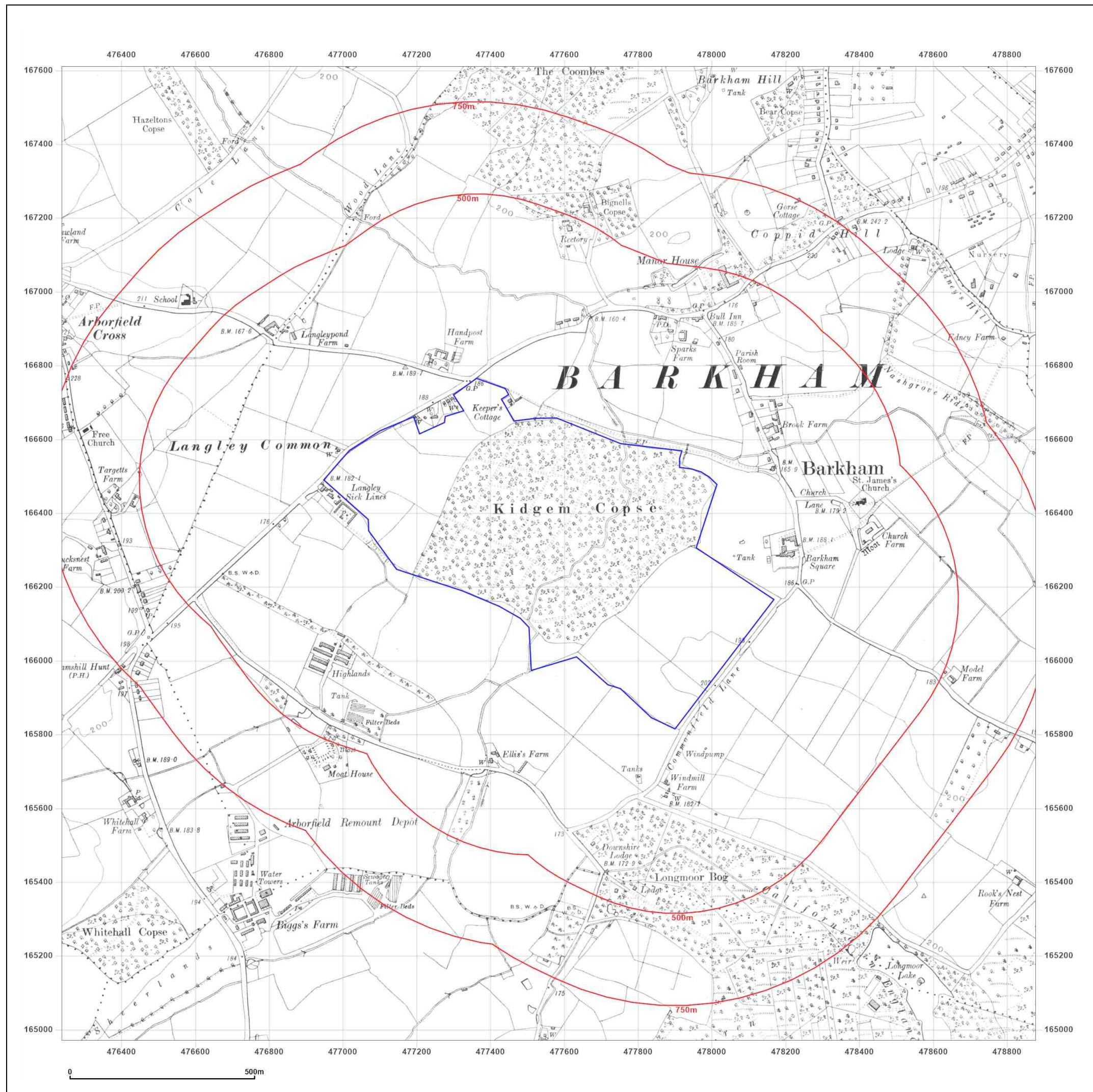


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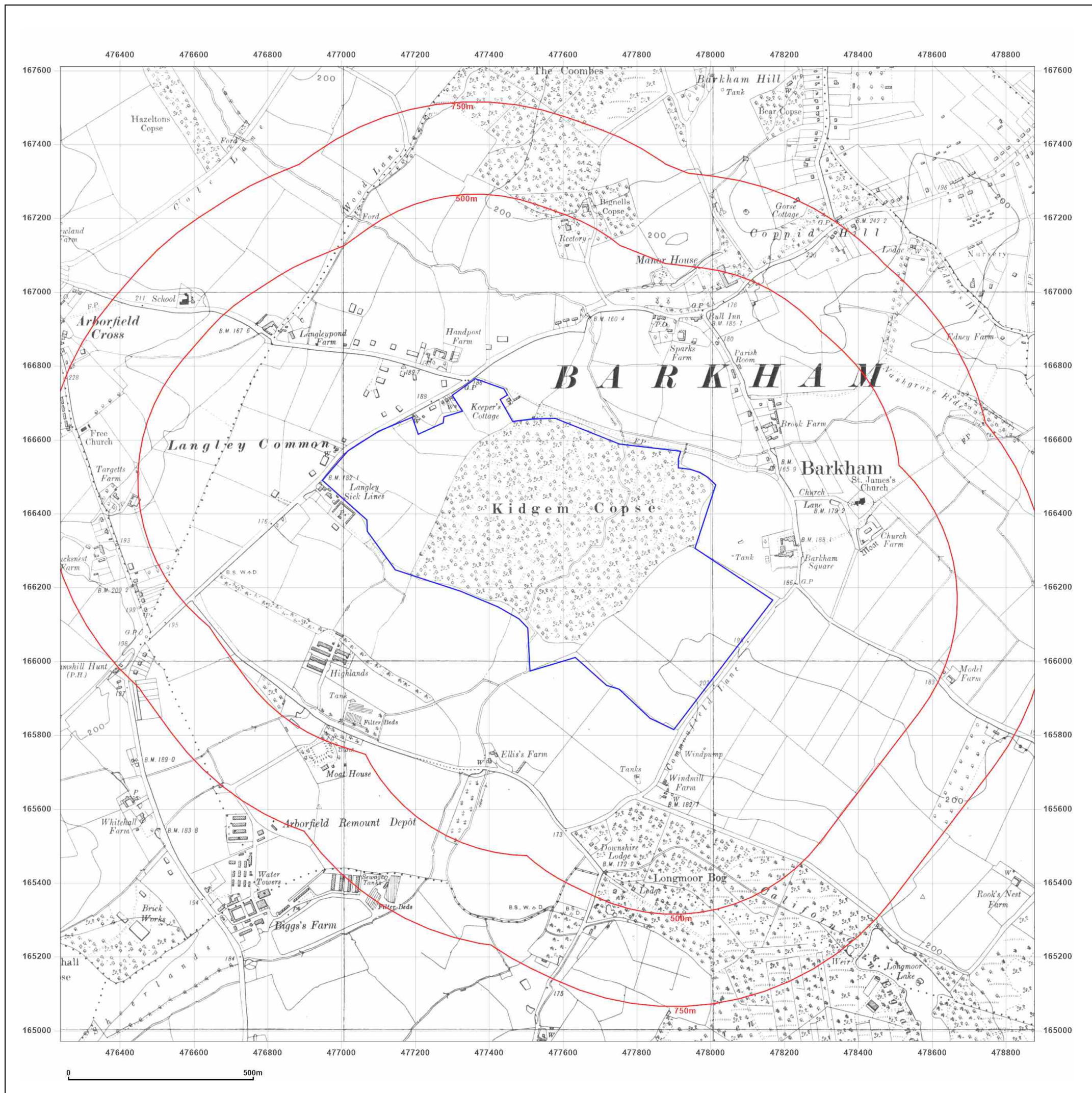


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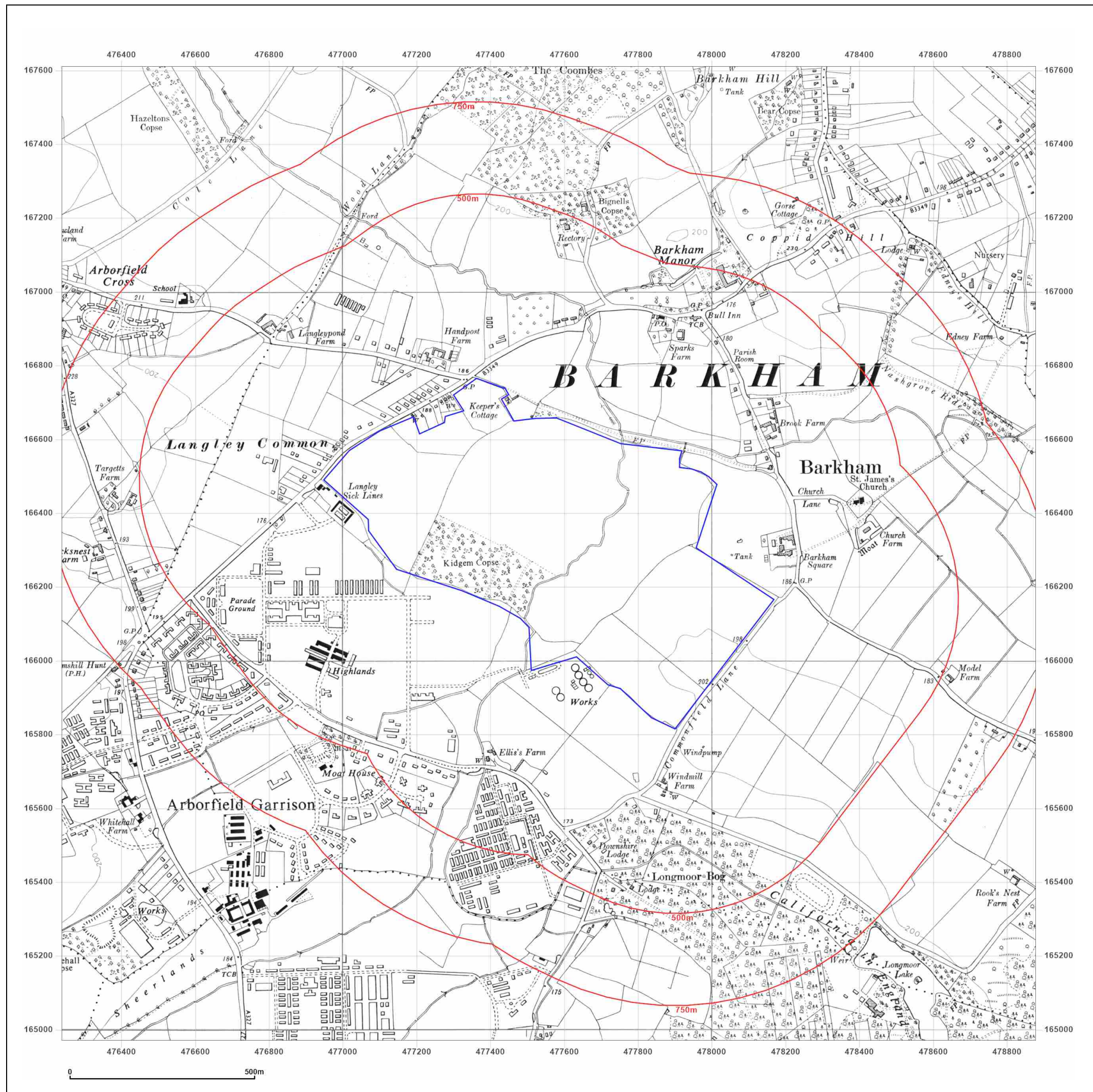


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Map Name: Provisional

Map date: 1960-1961

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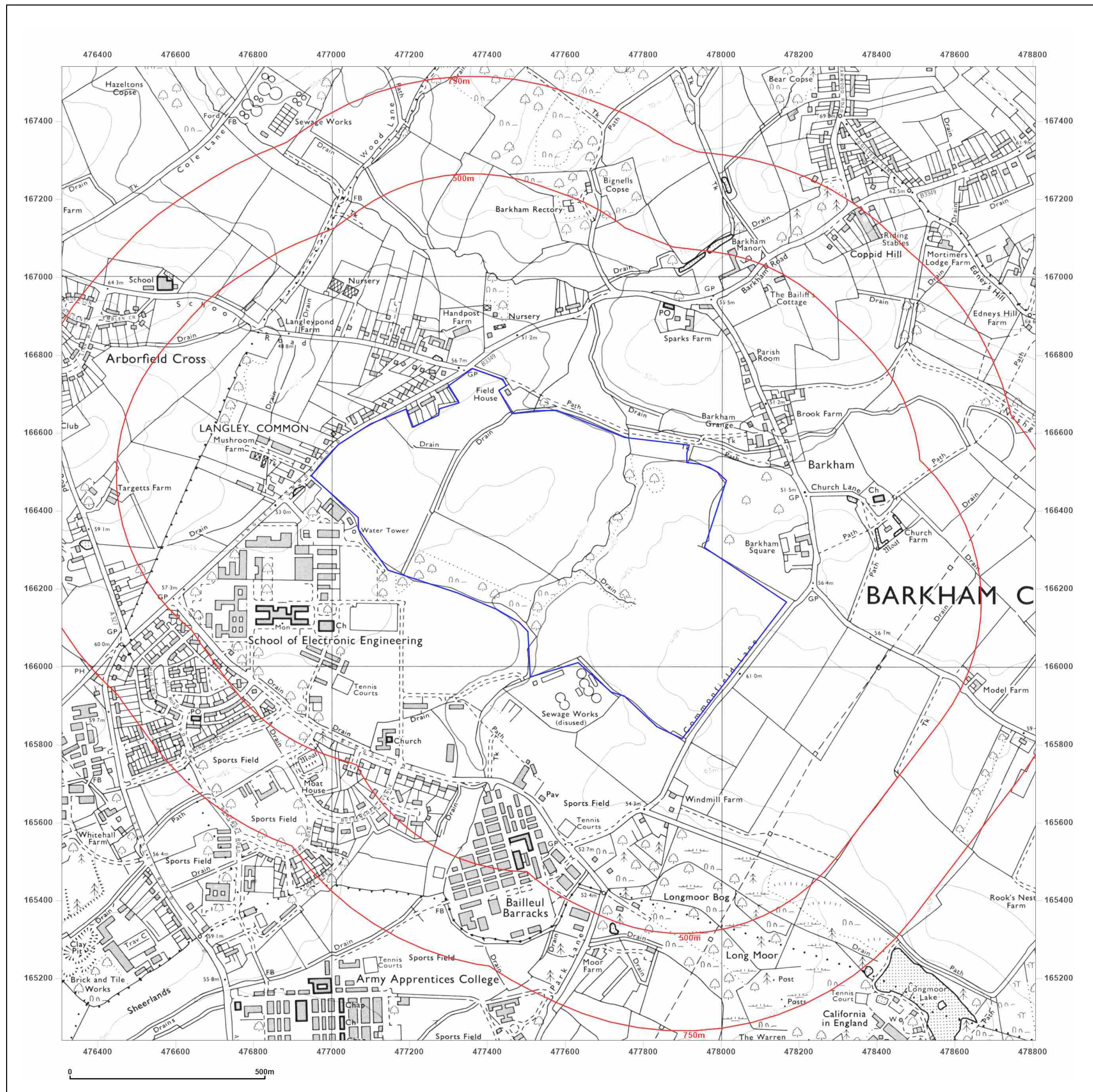


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Map Name: National Grid

Map date: 1969

Scale: 1:10,000

Printed at: 1:10,000



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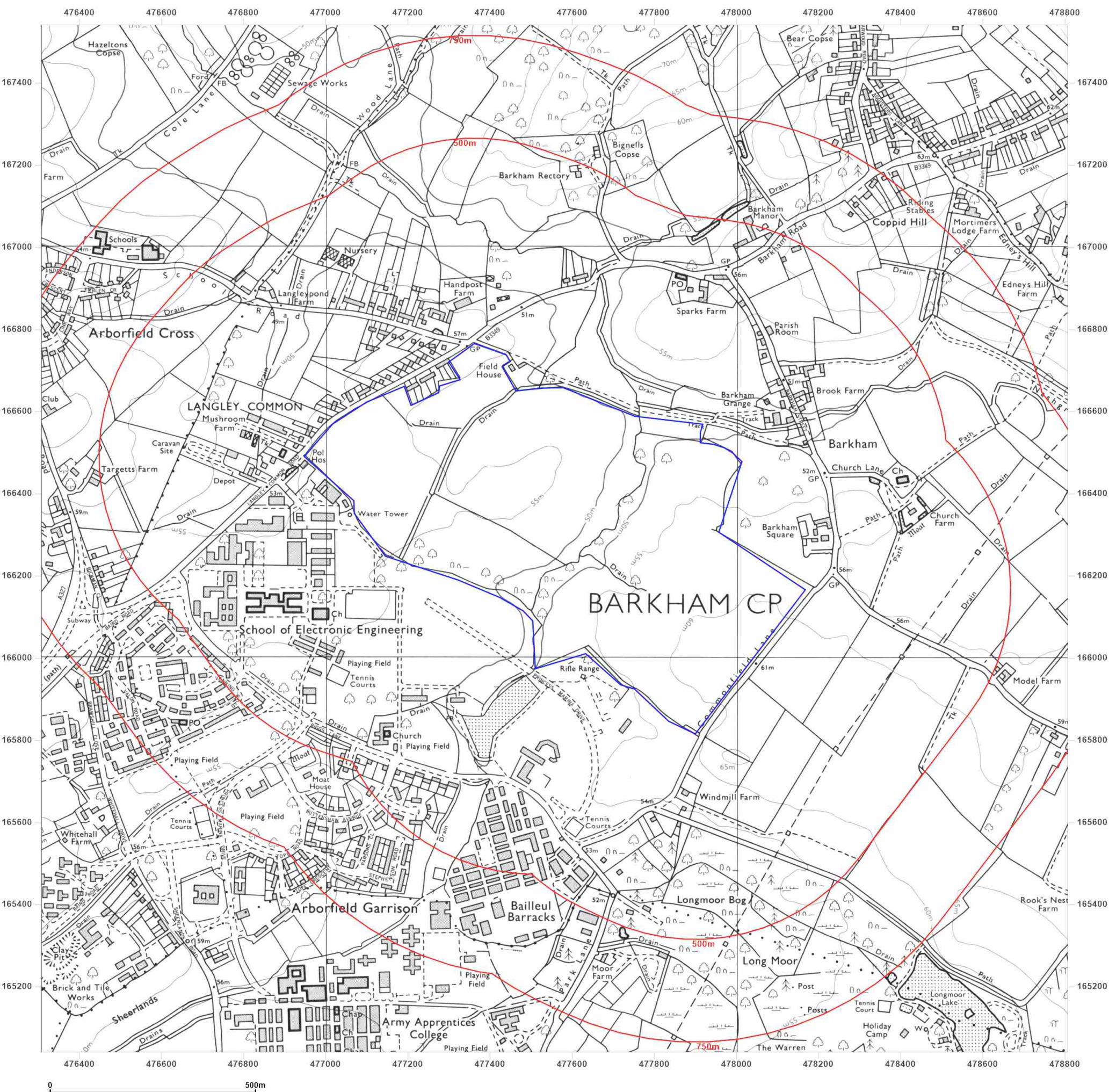


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Site Details:

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Square, Arborfield, Wokingham,
RG41 4TJ

Client Ref: EMS_927592_1150615
Report Ref: EMS-927592_1181345
Grid Ref: 477557, 166290

Map Name: National Grid

Map date: 1979

Scale: 1:10,000

Printed at: 1:10,000



Surveyed 1976
Revised 1979
Edition N/A
Copyright 1979
Levelled 1969



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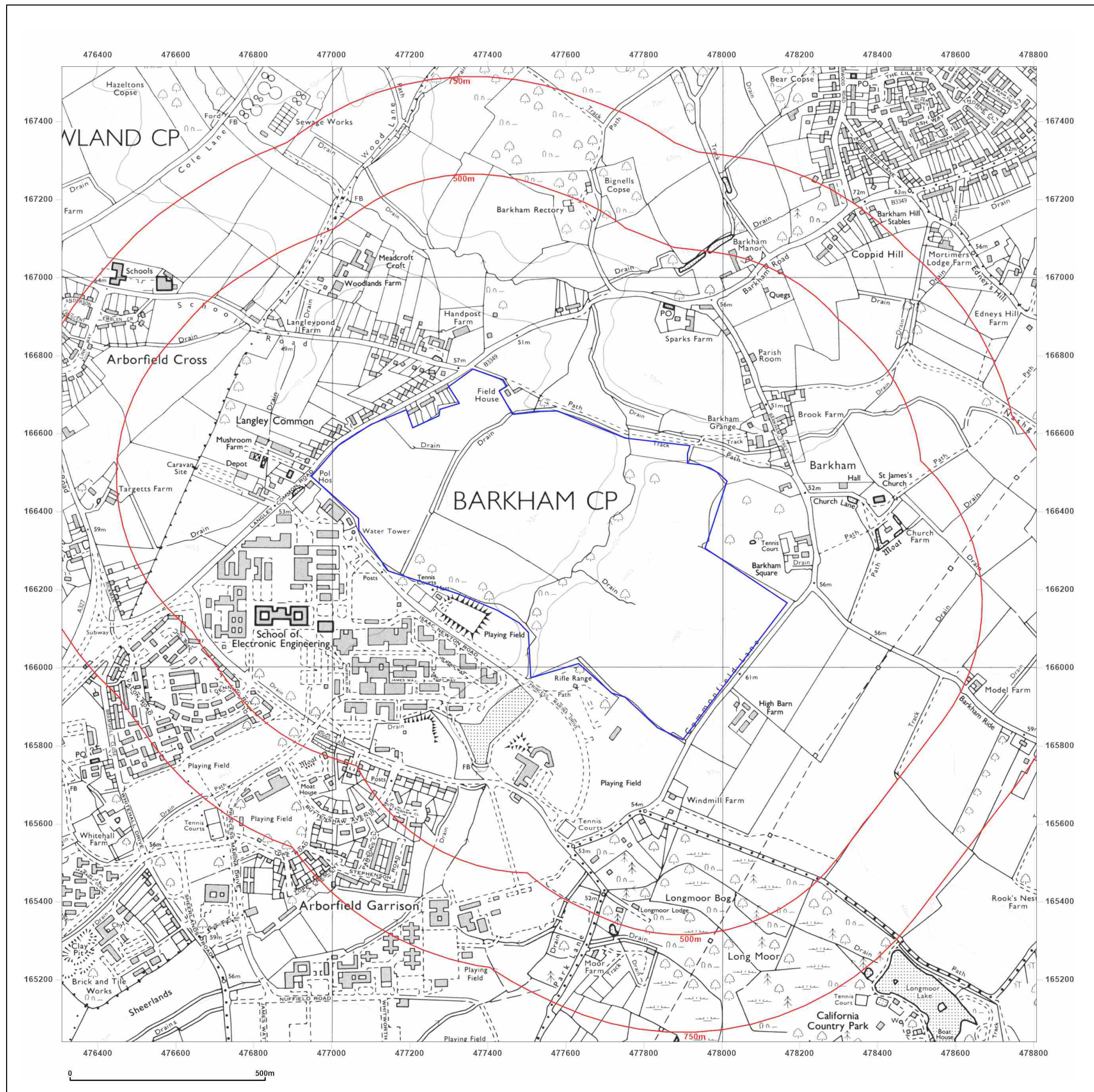


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Site Details:

Barkham Square, Barkham
Square, Arborfield, Wokingham,
RG41 4TJ

Client Ref: EMS_927592_1150615
Report Ref: EMS-927592_1181345
Grid Ref: 477557, 166290

Map Name: National Grid

Map date: 1988

Scale: 1:10,000

Printed at: 1:10,000



Surveyed 1988
Revised 1988
Edition N/A
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Site Details:

Barkham Square, Barkham
Square, Arborfield, Wokingham,
RG41 4TJ

Client Ref: EMS_927592_1150615
Report Ref: EMS-927592_1181345
Grid Ref: 477557, 166290

Map Name: National Grid

Map date: 2001

Scale: 1:10,000

Printed at: 1:10,000



2001



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Site Details:

Barkham Square, Barkham
Square, Arborfield, Wokingham,
RG41 4TJ

Client Ref: EMS_927592_1150615
Report Ref: EMS-927592_1181345
Grid Ref: 477557, 166290

Map Name: National Grid

Map date: 2010

Scale: 1:10,000

Printed at: 1:10,000



2010



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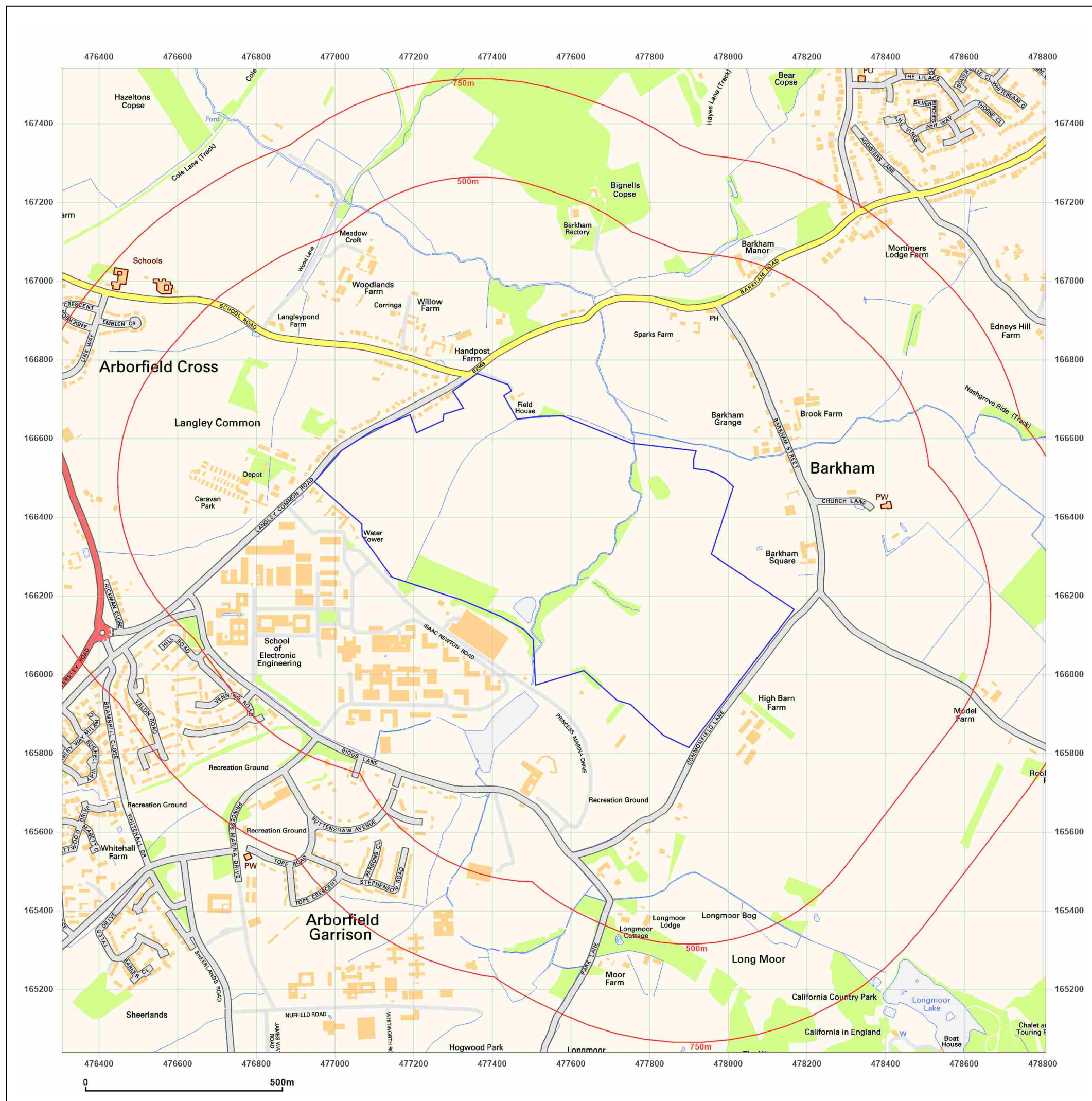


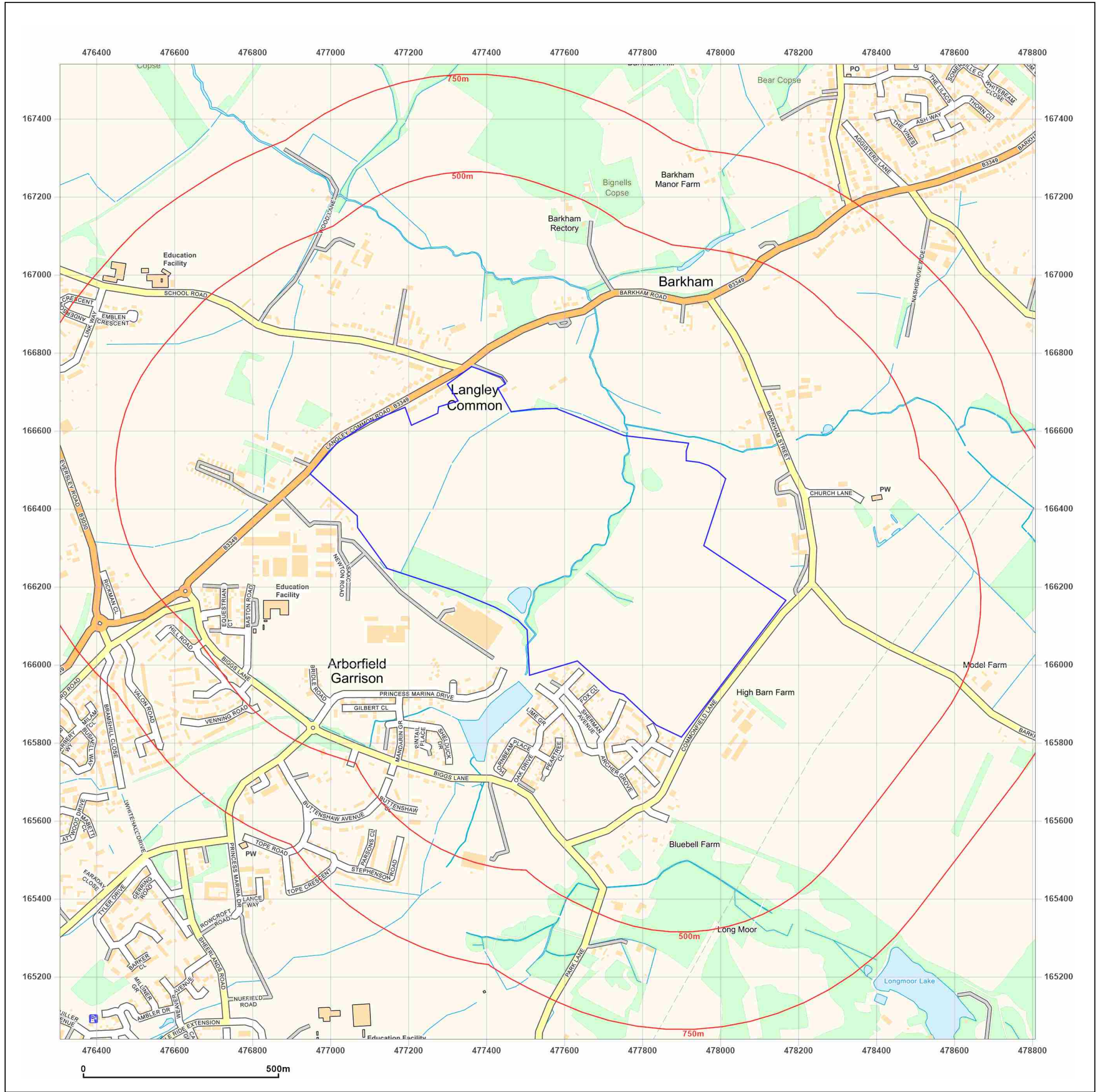
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Site Details:

Barkham Square, Barkham
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Client Ref: EMS_927592_1150615
Report Ref: EMS-927592_1181345
Grid Ref: 477557, 166290

Map Name: National Grid

Map date: 2024

Scale: 1:10,000

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A P P E N D I X F

Land Appraisal | Environmental | Geotechnical | Design | Mining | Inspections

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SU 76 NE/137

7742, 6692

137

BGS 19 Talisman Square, KENILWORTH, CV8 1JB. Tel: 01926 851113 Fax: 01926 851394		Job No. 6685	Site : CALDWELL NURSERIES, WOKINGHAM. Client : BRYANT COUNTRY HOMES LTD Engineer :		BOREHOLE LOG BH 2 Sheet 1 of 1 Scale 1:25						
Method Endrive Hand System.		Date 01/12/97 - 01/12/97		Drilling Crew Danetre Drilling		Logged By LC					
Dia (mm) 100		Coord		Ground Level m.							
Date & Casing Depth	Depth m.	Sample Type	Water Level	SPT N or Cu	M/C %	Depth m.	Description of Strata				
	0.10	D					TOPSOIL				
	0.40 - 0.60	D				0.40	Very stiff desiccated, friable grey brown mottled orange brown very silty CLAY.				
						0.60	Very stiff, desiccated, orange brown, very silty CLAY with occasional rootlets.				
	1.40 - 1.60	D,P		>250							
	1.80 - 1.90	D,P		>250							
	2.40 - 2.50	D,P		>250			-Becoming less desiccated with depth to 2.9m. -No rootlets below 2.4m.				
	3.10 - 3.50	D,P		150	28	2.90	Very stiff fissured brown silty CLAY				
	3.60 - 3.90	D,P		150							
01/12/97						4.00					
Remarks 1/ No groundwater encountered							GROUNDWATER				
							Struck	Cased	20 mins	Sealed	Remarks



SU 76 NE/138 7741, 6687 138

BGS		19 Talisman Square, KENILWORTH, CV8 1JB. Tel: 01926 851113 Fax: 01926 851394		Job No. 6685	Site : CALDWELL NURSERIES, WOKINGHAM. Client : BRYANT COUNTRY HOMES LTD Engineer :		BOREHOLE LOG BH 3 Sheet 1 of 1 Scale 1:25	
Method Endrive Hand System.		Date 01/12/97 - 01/12/97		Drilling Crew Danetre Drilling		Logged By LC		
Dia (mm) 100	Coord	Ground Level m.						
Date & Casing Depth	Depth m.	Sample Type	Water Level	SPT N or Cu	M/C %	Depth m.	Description of Strata	Legend
	0.10	D					TURF over TOPSOIL	
	0.50 - 0.60	D,P		100	30	0.30	Stiff, orange brown, mottled grey very silty CLAY.	
	1.10 - 1.30	D,P		150				
	1.80 - 1.90	D,P		150				
	2.30 - 2.40	D,P		100				
	2.70 - 2.90	D,P		100			Becoming fissured from 2.7m	
	3.50 - 3.90	D,P		100		3.30	Very stiff, fissured brown silty CLAY	
						4.00		
01/12/97								
Remarks 1/ No groundwater encountered.							GROUNDWATER	
							Struck	Cased



SU 76 NE /139

7744, 6688

139

IGES		19 Talisman Square, KENILWORTH, CV8 1JB. Tel: 01926 851113 Fax: 01926 851394		Job No. 6685		Site : CALDWELL NURSERIES, WOKINGHAM. Client : BRYANT COUNTRY HOMES LTD Engineer :		BOREHOLE LOG			
Method Endrive Hand System.		Date 01/12/97 - 01/12/97		Drilling Crew Danetre Drilling		Logged By LC		Sheet 1 of 1 Scale 1:25			
Dia (mm) 100		Coord		Ground Level m.							
Date & Casing Depth	Depth m.	Sample Type	Water Level	SPT N or Cu	M/C %	Depth m.	Description of Strata	Legend			
	0.10	D					TOPSOIL				
	0.60 - 0.70	D,P		>250		0.30	Very stiff, desiccated, grey brown very silty CLAY with occasional rootlets.				
	1.00 - 1.20	D,P		>250		0.95	Very stiff, desiccated, orange brown and grey very silty CLAY with occasional rootlets.				
	1.80 - 1.90	D,P		>250							
	2.30	D,P		>250							
	3.10 - 3.50	D,P		150			-No rootlets below 2.5m. -With no evidence of decication from 3.10m.				
						3.40	Very stiff fissured brown silty CLAY.				
						4.00					
Remarks 1/ No groundwater encountered							GROUNDWATER				
							Struck	Cased	20 mins	Sealed	Remarks



SU 76 NE 140 7743, 6686 140

IGES		19 Talisman Square, KENILWORTH, CV8 1JB. Tel: 01926 851113 Fax: 01926 851394		Job No. 6685		Site : CALDWELL NURSERIES, WOKINGHAM. Client : BRYANT COUNTRY HOMES LTD Engineer :		BOREHOLE LOG			
								BH 5			
Method Endrive Hand System.		Date 01/12/97 - 01/12/97		Drilling Crew Danetre Drilling		Logged By LC		Sheet 1 of 1 Scale 1:25			
Dia (mm) 100		Coord		Ground Level m.		Description of Strata					
Date & Casing Depth		Depth m.		Sample Type						Water Level	
		0.10		D							
		0.60 - 0.70		D,P		100					
		1.20 - 1.50		D,P		150					
		1.90		D,P		150					
		2.40 - 2.50		D,P		150					
		3.10 - 3.30		D,P		150					
		3.60 - 3.90		D,P		150					
01/12/97											
Remarks 1/ No groundwater encountered		GROUNDWATER									
		Struck		Cased		20 mins		Sealed		Remarks	



7775 6586 SU 76 NE 110

Holst Soil Engineering Limited

BOREHOLE LOG

Borehole No. 77

Contract No. SI1449/F2758
Location Arborfield
Client Department of the Environment
Method of Boring Auger
Diameter of Borehole 0.406

Sheet 1 of 1
Chainage
Ground Level 54.10m AOD.
Date 17.12.73

Description of Strata	Legend	Depth below G.L.(m)	Thickness of Strata(m)	Type of Sample	c KN/sq.m	φ deg	m.c. %	γ Kg/cum	N
TOPSOIL		0.20	0.20						
Soft brown sandy CLAY.		0.80	0.60						
Grey clayey SAND with very soft grey clay layers.		2.40	1.60						
Soft to firm grey silty CLAY.		3.00	0.60						

Type of Sample

☐ Undisturbed Sample φ Angle of Friction
☐ Disturbed Sample m.c. Moisture Content
Δ Water Sample γ Bulk Density
I Penetration Test N S.P.T. Value
c Apparent Cohesion

Remarks (Observations of Ground Water etc)

Water struck 2.50m
standing level after 2 hrs. 2.30m

Water levels are subject to seasonal or tidal variations and should not be taken as constant



7729 6619 SU 76 NE 54

Holst Soil Engineering Limited						Borehole No. 21	
BOREHOLE LOG							
Contract No. <u>SI1449/F2758</u>						Sheet <u>1</u> of <u>1</u>	
Location <u>Arborfield</u>						Chainage <u> </u>	
Client <u>Department of the Environment</u>						Ground Level <u>52.85m AOD.</u>	
Method of Boring <u>Percussion</u>						Date <u>12.12.73</u>	
Diameter of Borehole <u>0.15m</u>							

Description of Strata	Legend	Depth below G.L.(m)	Thickness of Strata(m)	Type of Sample	c KN/sq.m	φ deg	m.c. %	γ Kg/cum	N
MADE GROUND Brick fragments in clay.	[diagonal lines]	0.70	0.70	0.75					
Firm grey silty CLAY.	[x x x x x x x x]	2.00	1.30	[]	24	0	24.5	1990	
Firm brown sandy CLAY.	[dots]	4.00	2.00	[]					
Firm grey silty CLAY.	[x x x x x x x x]	6.00	2.00	[]	134	0	22.5	2040	

Type of Sample ☐ Undisturbed Sample φ Angle of Friction ☐ Disturbed Sample m.c. Moisture Content ☐ Water Sample γ Bulk Density ☐ Penetration Test N S.P.T. Value ☐ Apparent Cohesion c	Remarks (Observations of Ground Water etc) Water first struck 4.10m Water levels are subject to seasonal or tidal variations and should not be taken as constant
---	---



7738 6616 SU76 NE 55

Holst Soil Engineering Limited

BOREHOLE LOG

Borehole No.

22

Contract No. SI1449/F2758

Location Arborfield

Client Department of the Environment.

Method of Boring Percussion

Diameter of Borehole 0.15m

Sheet 1 of 1

Chainage

Ground Level 51.75m AOD.

Date 12.12.73

Description of Strata	Legend	Depth below G.L.(m)	Thickness of Strata(m)	Type of Sample	c KN/sq.m	ϕ deg	m.c. %	γ Kg/cum	N
MADE GROUND Brick fragments. in clay.		0.60	0.60	0.75					
Firm grey silty CLAY		2.30	1.70	2.50	24	0	27.6	1910	
Firm brown sandy CLAY		4.80	2.50	5.50	157	4	33.1	2050	
Firm grey silty CLAY.		6.00	1.20						

Type of Sample

☐ Undisturbed Sample ϕ Angle of Friction
☐ Disturbed Sample m.c. Moisture Content
☐ Water Sample γ Bulk Density
☐ Penetration Test N S.P.T. Value
☐ Apparent Cohesion c

Remarks (Observations of Ground Water etc)

Water first struck 2.80m

Water levels are subject to seasonal or tidal variations and should not be taken as constant



Holst Soil Engineering Limited

BOREHOLE LOG

Borehole No. 79

SU 76 NE 112

7786 6580

Contract No. SI1449/F2758

Location Arborfield

Client Department of the Environment

Method of Boring Auger

Diameter of Borehole 0.406m

Sheet 1 of 1

Chainage

Ground Level 57.20m AOD

Date 17.12.73

Description of Strata	Legend	Depth below G.L.(m)	Thickness of Strata(m)	Type of Sample	c KN/sq.m	ϕ deg	m.c. %	γ Kg/cum	N
TOPSOIL		0.30	0.30						
Brown SAND		3.00	2.70						

Type of Sample

☐ Undisturbed Sample ϕ Angle of Friction

☐ Disturbed Sample m.c. Moisture Content

Δ Water Sample γ Bulk Density

I Penetration Test N S.P.T. Value

c Apparent Cohesion

Remarks (Observations of Ground Water etc)

Water not encountered while boring
still dry after 2 hours.

Water levels are subject to seasonal or tidal variations and should not be taken as constant



7698 6645 SU76 NE 87

Holst Soil Engineering Limited

BOREHOLE LOG

Borehole No. 54

Contract No. SI1449/F2758
Location Arborfield
Client Department of the Environment
Method of Boring Auger (Mechanical)
Diameter of Borehole 0.406m

Sheet 1 of 1
Chainage
Ground Level 55.40m AOD
Date 19.12.73

Description of Strata	Legend	Depth below G.L.(m)	Thickness of Strata(m)	Type of Sample	c KN/sq.m	ϕ deg	m.c. %	γ Kg/cum	N
MADE GROUND Rock and brick fragments in clay.		0.50	0.50						
Soft to firm brown grey mottled silty sandy CLAY.		3.00	2.50						
Type of Sample ☐ Undisturbed Sample ϕ Angle of Friction ☐ Disturbed Sample m.c. Moisture Content ☐ Water Sample γ Bulk Density ☐ Penetration Test N S.P.T. Value ☐ Apparent Cohesion c Remarks (Observations of Ground Water etc) Water not encountered while boring Borehole backfilled. Water levels are subject to seasonal or tidal variations and should not be taken as constant									



770 / 6632 SU 76 NE 00

Holst Soil Engineering Limited

BOREHOLE LOG

Borehole No. 55

Contract No. SI1449/F2758
Location Arborfield
Client Department of the Environment
Method of Boring Auger
Diameter of Borehole 0.406m

Sheet 1 of 1
Chainage
Ground Level 57.50m AOD.
Date 19.12.73

Description of Strata	Legend	Depth below G.L.(m)	Thickness of Strata(m)	Type of Sample	c KN/sq.m	ϕ deg	m.c. %	γ Kg/cum	N
TOPSOIL and MADE GROUND Soft to firm brown grey mottled silty sandy CLAY.		0.30	0.30						
		3.00	2.70						
Type of Sample ☐ Undisturbed Sample ϕ Angle of Friction ☐ Disturbed Sample m.c. Moisture Content ☐ Water Sample γ Bulk Density I Penetration Test N S.P.T. Value c Apparent Cohesion Remarks (Observations of Ground Water etc) Not encountered while boring Borehole backfilled. Water levels are subject to seasonal or tidal variations and should not be taken as constant									



7720 6621 SU 76 NE 90

Holst Soil Engineering Limited

BOREHOLE LOG

Borehole No. 57

Contract No. SI1449/F2758
Location Arborfield
Client Department of the Environment
Method of Boring Auger
Diameter of Borehole 0.406m

Sheet 1 of 1
Chainage
Ground Level 54.75m AOD.
Date 19.12.73

Description of Strata	Legend	Depth below G.L.(m)	Thickness of Strata(m)	Type of Sample	c KN/sq.m	ϕ deg	m.c. %	γ Kg/cum	N
TOPSOIL		0.20	0.20						
Soft grey/brown mottled silty CLAY.		1.00	0.80						
Soft to firm brown grey mottled sandy CLAY with clayey sand lenses.		3.00	2.00						
Type of Sample ☐ Undisturbed Sample ϕ Angle of Friction ☐ Disturbed Sample m.c. Moisture Content ☐ Water Sample γ Bulk Density ☐ Penetration Test N S.P.T. Value ☐ Apparent Cohesion c Remarks (Observations of Ground Water etc) Not encountered while boring Borehole backfilled. Water levels are subject to seasonal or tidal variations and should not be taken as constant									



7746660 / SU 76 NE 99

Holst Soil Engineering Limited

BOREHOLE LOG

Borehole No. 66

Contract No. SI1449/F2758
Location Arborfield
Client Department of the Environment
Method of Boring Auger
Diameter of Borehole 0.406m

Sheet 1 of 1
Chainage
Ground Level 50.40m AOD.
Date 17.12.73

Description of Strata	Legend	Depth below G.L.(m)	Thickness of Strata(m)	Type of Sample	c KN/sq.m	ϕ deg	m.c. %	γ Kg/cum	N
MADE GROUND Brick fragments concrete stones in clay.		0.70	0.70						
MADE GROUND Stoney clay with peat.									
		2.00	1.30						
MADE GROUND Clayey gravel		2.50	0.50						
Soft brown/grey CLAY.		3.00	1.00						

Type of Sample
☐ Undisturbed Sample ϕ Angle of Friction
☐ Disturbed Sample m.c. Moisture Content
☐ Water Sample γ Bulk Density
☐ Penetration Test N S.P.T. Value
☐ Apparent Cohesion c

Remarks (Observations of Ground Water etc)

Water levels are subject to seasonal or tidal variations and should not be taken as constant



7733 6614 SU 76NE 56

Holst Soil Engineering Limited

BOREHOLE LOG

Borehole No. 23

Contract No. SI1449/F2758
Location. Arborfield
Client. Department of the Environment
Method of Boring. Percussion
Diameter of Borehole. 0.15m

Sheet 1 of 2
Chainage
Ground Level. 52.60m AOD.
Date. 11.12.73

Description of Strata	Legend	Depth below G.L.(m)	Thickness of Strata(m)	Type of Sample	c KN/sq.m	φ deg	m.c. %	γ Kg/cum	N
MADE GROUND - Clay topsoil and stones.		0.60	0.60						
Soft grey silty CLAY		2.00	1.40	0.75	35	0	28.7	1940	
Firm brown silty sandy CLAY		5.00	3.00	2.50	23	4	21.1	1980	
Firm grey silty CLAY		7.00	2.00	4.00	122	0	23.0	2030	
Stiff grey silty CLAY				5.50	189	3	23.1	2030	
log continued.....				7.00					
				8.50					
				10.00					

Type of Sample
☐ Undisturbed Sample φ Angle of Friction
☐ Disturbed Sample m.c. Moisture Content
☐ Water Sample γ Bulk Density
I Penetration Test N S.P.T. Value
c Apparent Cohesion

Remarks (Observations of Ground Water etc)

see water level chart.

Water levels are subject to seasonal or tidal variations and should not be taken as constant



Holst Soil Engineering Limited

BOREHOLE LOG

Borehole No. 23

Contract No. SI1449/F2758

Location Arborfield

Client Department of the Environment

Method of Boring Percussion

Diameter of Borehole 0.15m

Sheet 2 of 2

Chainage

Ground Level

Date

5076 26/56

Description of Strata	Legend	Depth below G.L.(m)	Thickness of Strata(m)	Type of Sample	c KN/sq.m	φ deg	m.c. %	γ Kg/cum	N
Stiff grey silty CLAY	— x —								
	x — x								
	x — x								
	x — x								
	x — x								
	x — x								
	x — x								
	x — x								
	x — x								
	x — x								
	x — x								
	x — x								
	x — x								
	x — x								
	x — x								
		11.50							
					193	0	24.4	2020	
		13.00							
		15.00							
		15.50	8.50						

Type of Sample

☐ Undisturbed Sample φ Angle of Friction

☐ Disturbed Sample m.c. Moisture Content

☐ Water Sample γ Bulk Density

☐ Penetration Test N S.P.T. Value

☐ Apparent Cohesion c

Remarks (Observations of Ground Water etc)

Water levels are subject to seasonal or tidal variations and should not be taken as constant



Holst Soil Engineering Limited

BOREHOLE LOG

Borehole No.

38

Contract No. SI1449/F2758

Location Arborfield

Client Department of the Environment

Method of Boring Percussion

Diameter of Borehole 0.20m

Sheet 1 of 2

Chainage

Ground Level 53.50m AOD

Date 7.12.73

Description of Strata	Legend	Depth below G.L.(m)	Thickness of Strata(m)	Type of Sample	c KN/sq.m	φ deg	m.c. %	γ Kg/cum	↑
TOPSOIL		0.20	0.20						
Soft to firm brown grey mottled silty sandy CLAY becoming stiff with depth				0.45					
				1.60	73	0	22.0	1960	
				2.60	122	0	21.8	2000	
		3.60	3.40						
stiff grey silty CLAY.				4.05					
				6.00	173	0	23.9	1980	
				7.70					
				9.20					
log continued....									

Type of Sample

☐ Undisturbed Sample
☐ Disturbed Sample
☐ Water Sample
☐ Penetration Test
☐ Apparent Cohesion

φ Angle of Friction
 m.c. Moisture Content
 γ Bulk Density
 N S.P.T. Value

Remarks (Observations of Ground Water etc)

borehole dry during boring
Standing level after 24 hrs 1.

Water levels are subject to seasonal or tidal variations and should not be taken as constant



Holst Soil Engineering Limited

BOREHOLE LOG

Borehole No. 38

Contract No. SI1449/F2758
Location Arbofield
Client Department of the Environment
Method of Boring Percussion
Diameter of Borehole 0.20m

Sheet 2 of 2
Chainage
Ground Level
Date

SU 76 NE 71

Description of Strata	Legend	Depth below G.L.(m)	Thickness of Strata(m)	Type of Sample	c KN/sq.m	φ deg	m.c. %	γ Kg/cum	N
Stiff grey silty CLAY.				10.70					
				12.20	155	8	19.1	2050	
				13.70					
				15.30					
		15.75	12.15						

Type of Sample
☐ Undisturbed Sample
☐ Disturbed Sample
☐ Water Sample
☐ Penetration Test
☐ Apparent Cohesion

φ Angle of Friction
 m.c. Moisture Content
 γ Bulk Density
 N S.P.T. Value

Remarks (Observations of Ground Water etc)

Water levels are subject to seasonal or tidal variations and should not be taken as constant



Holst Soil Engineering Limited

BOREHOLE LOG

Borehole No. 46

Contract No. SI1449/F2758
Location Arborfield
Client Dept. of the Environment
Method of Boring Percussion
Diameter of Borehole 0.15m

Sheet 1 of 2
Chainage
Ground Level 54.60m AUL
Date 11.12.73

Description of Strata	Legend	Depth below G.L.(m)	Thickness of Strata(m)	Type of Sample	c KN/sq.m	ϕ deg	m.c. %	γ Kg/cum	n
TOPSOIL		0.20	0.20						
Soft to firm brown grey mottled silty sandy CLAY				1.00					
				79	0	24.8	2010		
				2.50					
				48	0	22.9	2020		
		3.60	3.40						
Stiff grey silty CLAY becoming very stiff with depth.				4.00					
				131	0	21.9	2170		
				5.50					
				7.00					
				8.50					
				190	0	20.1	2200		
log contd.....				10.00					
Type of Sample ☐ Undisturbed Sample ☐ Disturbed Sample ☐ Water Sample ☐ Penetration Test ☐ Apparent Cohesion				Remarks (Observations of Ground Water etc) see water level chart. Water levels are subject to seasonal or tidal variations and should not be taken as constant					
ϕ Angle of Friction m.c. Moisture Content γ Bulk Density N S.P.T. Value									



BGS ID: 427034 : BGS Reference: SU76NE79
British National Grid (27700) : 477470,165780

Holst Soil Engineering Limited

BOREHOLE LOG

Borehole No.	46
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Contract No. SI1449/F2758
Location Arborfield
Client Department of the Environment
Method of Boring Percussion
Diameter of Borehole 0.15m SV

Sheet 2 of 2
Chainage
Ground Level
Date

Contact BGS: ngdc@bgs.ac.uk