Land to the North East of KGV Playing Fields, Cuffley

Geo-Environmental Phase 1 Desk Study

June 2015

KGV-GE1-2015-001

Lands Improvement

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Executive Summary

This Phase 1 Geo-Environmental Desk Study provides an assessment of the existing and historically recorded likely geotechnical and chemical characteristics of the soil and ground water environment for a proposed development on land to the north east of King George V Playing Fields in Cuffley, South-East Hertfordshire. The proposed development is to include up to 121 residential units and a playing field situated on a separate rectangular parcel of land to the south-west of the Site.

The Site is currently undeveloped and has historically been assigned as agricultural land. A review of historical mapping concluded there to be no potentially significant contaminative land uses identified within the Site boundary. However, the following uses are situated within the surrounding areas: a railway line adjacent to the eastern boundary of the Site, a former sewage works, a number of works to the north-east of the Site and a pumping station to the west. These land uses are further assessed within the Site Conceptual Model (SCM).

The Site is shown to be underlain by bedrock geology comprising clay, silt and sand belonging to the London Clay Formation which forms a Non Aquifer. Areas of superficial deposits identified on Site comprise sand and gravel, belonging to the Dollis Hill Gravel Member. The rectangular parcel to the south-west is shown to comprise clay, silt and sand belonging to the Lambeth Group and is underlain by a Minor Aquifer with soils of a Low Leaching Potential.

The Environment Agency's (EA) National Generalised Modelling (NGM) Flood Zones Plan indicates predicted flood envelopes of Main Rivers across the UK. The nearest watercourses located from the Site is Northaw Brook approximately 225m to the south. Flood Zone mapping identifies flooding along the brook, with flows seen to come out of bank during the 1 in 100 (1% AEP) and 1 in 1,000 year (0.1% AEP) events. However, the entire Site is shown to lie within Flood Zone 1; being an area of Low Probability of flooding, outside both the 1 in 100 (1% AEP) and 1 in 1,000 (0.1% AEP) year flood events.

An assessment of the Environmental Setting and Potential Contaminative Land Uses within 1,000m of the Site's boundary has been carried out within the desk study. The assessment considers the Source – Pathway – Receptor pollutant linkages and are outlined in the SCM. The potential contamination risk and likelihood of any linkages from the sources listed in the SCM are considered to be low to very low. Therefore it is considered that they are not prohibitive to the proposed development.

However in conclusion and ahead of development, the implementation of a comprehensive Phase II intrusive site investigation and ground conditions interpretation are recommended to confirm baseline conditions on the Site.

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1 Introduction

1.1 Brookbanks Consulting Ltd is appointed by Lands Improvement to complete a Phase 1 Geo-Environmental Desk Study for a proposed development on land to the north east of King George V Playing Fields, Cuffley.

1.2 The objective of the study is to research the likely geotechnical and chemical characteristics of the soil and ground water environment.

2 Background Information

Location & Details

2.1 The Site is located to the south of Cuffley, is 4.89ha in size and is currently in agricultural use. It is bound by existing residential development to the north and north-west; the grounds of Cuffley Primary School also adjoin the Site along its northern boundary. The railway line and Northaw Road East (B156) form strong eastern and western boundaries respectively. The southern boundary is defined by a mature hedgerow and tree belt lining the Hertfordshire Way footpath. Beyond the footpath to the south-west of the Site is King George V Playing Fields, which contains three sports pavilions, a recreation area with hard surfaced Multi Use Games Area (MUGA), sports pitches and a small area of formal play equipment.

2.2 The Site also includes a 0.63ha rectangular parcel of land, in agricultural use, which is located to the south-west of King George V Playing Fields. Northaw Road East forms the western boundary of the land, beyond which lies a small number of residential properties and building associated with agricultural use. Further agricultural land lies to the south whilst tennis courts, sports pavilions and a bowling green are located to the north-east and south-east of the Site.

2.3 The land is currently undeveloped and is not thought to have been historically subject to any significant built development. The Site location and boundary is shown indicatively on Figure 2a, below:

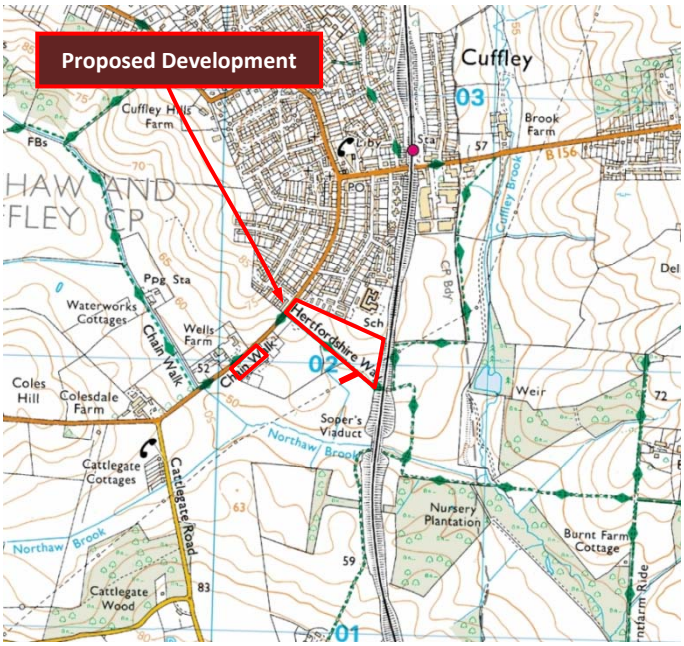

Figure 2a: Site location

Development Criteria

2.4 The proposed development is to comprise:

"Residential development of up to 121 dwellings, associated infrastructure and a change of use from agricultural land to an extension of the King George V playing fields. All matters reserved except for new vehicular access to serve the site, the provision of surface water discharge points and the levels of the development platforms".

Sources of Information

2.5 The following body was consulted during the study:

- Environmental Matters - Environment Agency

2.6 The following information has been gathered during the study:

- Environmental Search - Landmark Envirocheck Report, August 2014
- Published Geology - British Geological Survey

3 Historical Site Uses

3.1 In appraising the Site history, published Ordnance Survey maps have been reviewed dating from the late 19th Century up to the present day. A selection of large scale maps used in this report are contained within the Appendix.

3.2 Inspection of the Ordnance Survey maps has revealed that since the pre 1900's the Site has remained undeveloped and in agricultural use. There are no records identifying any major built development within the Site boundary.

3.3 The 1882 map shows the surrounding rural area to comprise mainly of agricultural fields with a number of farms, pockets of woodland and a nursery plantation. By 1898 a gravel pit is shown approximately 350m south of the Site and a number of old chalk pits are shown over 1km to the north and north-west of the Site.

3.4 The Great Northern Railway line (Enfield Branch Extension) which includes Soper's Viaduct, is shown to have been constructed by 1916. The railway line runs adjacent to the Site's eastern boundary and over the above mentioned gravel pit.

3.5 Northaw Pumping Station situated approximately 500m to the west of the Site is shown on the maps from around 1935. A sewage works is also shown approximately 600m north-east of the Site, however this is later shown to be a works by 1960. Additional buildings are shown at the works by 1974 and the area is currently in use as Soppers Road Industrial Area.

3.6 The adjacent school, to the north of the Site, is shown from around 1938 to the present day and the sports grounds, adjacent to the south of the Site's boundary is first shown by 1960. Also shown in that year are electricity pylons positioned within the vicinity of the Site carrying overhead lines which cross the south-eastern corner of the Site.

3.7 The village of Cuffley is shown to have expanded further south over the years, with development first shown to have occurred around 1935 approximately 50m north-west of the Site. Further development is shown in the 1970s and by 1988 residential properties are shown adjacent to the north of the Site's boundary.

3.8 Having reviewed the historical mapping there are no potentially significant contaminative land uses identified within the Site boundary. The following are situated within the surrounding areas: a railway line adjacent to the eastern boundary of the Site, a former sewage works and a number of works to the north-east of the Site and a pumping station to the west.

4 Recent & Current Site Usage

4.1 The Site is currently undeveloped. The historical map search suggests that the land has previously been assigned as agricultural land.

5 Ground Conditions

Geology

5.1 With reference to the British Geological Survey map, the Site is shown to be underlain by bedrock geology comprising clay, silt and sand belonging to the London Clay Formation. Areas of superficial deposits identified on Site comprise sand and gravel, belonging to the Dollis Hill Gravel Member. The Sites rectangular parcel to the south-west is shown to comprise clay, silt and sand belonging to the Lambeth Group. The published geology of the Site is shown below in Figure 5a:

Figure 5a: BGS Published Geology

5.2 BGS records include the following ground stability hazards on and within 250m of the Site:

- Collapsible ground stability — No Hazard*/Very Low*
- Compressible ground: — No Hazard*/ Moderate*
- Ground dissolution: — No Hazard*
- Landslide: — Very Low*/ Low*/ Moderate*
- Running sand: — No Hazard*/ Very Low*/ Low*
- Shrinking & Swelling: — Moderate*
- Shallow mining — No Hazard*

(* Indicates hazard on site or within 250m of the boundary)

Radon

5.3 The north-east of the Site is shown to be situated within a low probability area affected by radon, where less than 1% of homes are estimated to be above the action level.

5.4 It is reported that no radon protection measures are necessary for the construction of new developments within the Site.

Mining

5.5 The Site is not reported to be in an area affected by coal mining.

Minerals

5.6 A former **BGS Recorded Mineral Site** is recorded approximately 320m south of the Site at Soper's Farm Gravel Pit. The former opencast pit included the extraction of sand and gravel belonging to the London Clay Formation.

Natural Cavities

5.7 A swallow hole is recorded approximately 388m east of the Site, where the geology is described to consist of the following: Chalk Group, Lambeth Group and London Clay Formation.

5.8 However, the underlying bedrock and superficial geology at the Site comprises clay, silt, sand and gravel. BGS records indicate there to be a very low/ no hazard of collapsible ground stability and no hazard of ground dissolution, on or within 250m of the Site's boundary.

6 Hydrology

Flooding

6.1 The Environment Agency's (EA) National Generalised Modelling (NGM) Flood Zones Plan indicates predicted flood envelopes of Main Rivers across the UK. In many circumstances, the NGM is based on basic catchment characteristic data and modelling techniques. Where appropriate, more accurate Section 105 / SFRM models are produced using more robust analysis techniques.

6.2 The following watercourses are located within the proximity of the Site: Northaw Brook is approximately 225m to the south, Hempshill Brook is 400m to the west and Cuffley Brook is situated approximately 425m to the east. The Flood Zone mapping identifies flooding along these brooks, with flows seen to come out of bank during the 1 in 100 (1% AEP) and 1 in 1,000 year (0.1% AEP) events.

6.3 The nearest surface water feature to the Site is a land drain situated approximately 75m to the south and which flows into Northaw Brook.

6.4 The mapping shows that the entire Site lies within Flood Zone 1; being an area of Low Probability of flooding, outside both the 1 in 100 (1% AEP) and 1 in 1,000 (0.1% AEP) year flood events. This is illustrated on Figure 6a.

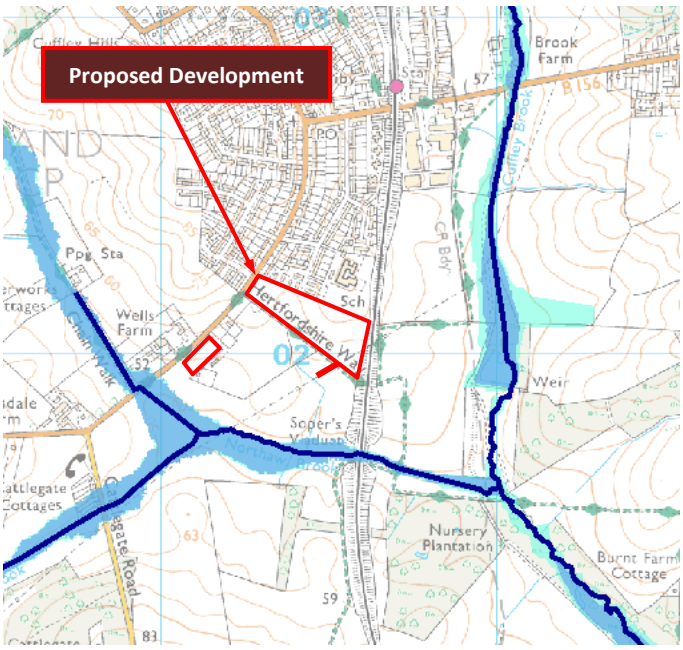

Figure 6a: EA Flood Zone Plan showing 1 in 100 & 1 in 1,000 year floodplain

Discharge Consents

6.5 There are no Discharge Consents recorded within 1,000m of the Site.

Water Quality

6.6 The Environment Agency currently monitor 40,000km of rivers across England. To help protect these areas each stretch of river is monitored and given a river quality grade. This is based upon the chemical quality of the water. The rivers are then graded from A to E with A representing a river with very good water quality and E, a river with very poor water quality.

6.7 To improve the quality of water bodies, new European legislation known as the Water Framework Directive (WFD) has been introduced to promote a new approach to water management through river basin planning. One aim of the Water Framework Directive is to improve the ecological health of inland and coastal waters and to prevent further deterioration. A requirement has been placed on nearly all inland and coastal waters to achieve 'Good' status by 2015.

6.8 Water quality information taken in the year 2000 indicates that the current ecological quality of Cuffley Brook is regarded as 'Moderate' (Grade D), however at the time of the assessment the chemical quality was not required.

6.9 There are no **River Quality Biology Sampling Points** situated within 1,000m of the Site.

Surfacewater Abstractions

6.10 There are no **Surfacewater Abstractions** recorded within 1,000m of the Site.

7 Hydrogeology

Groundwater Vulnerability

7.1 The clay, silt and sand bedrock underlying the Site belongs to the London Clay Formation which forms a Non Aquifer, whilst the Site's rectangular parcel to the south-west is shown to be underlain by a Minor Aquifer with soils of Low Leaching Potential. The groundwater vulnerability on Site is shown on Figure 7a.

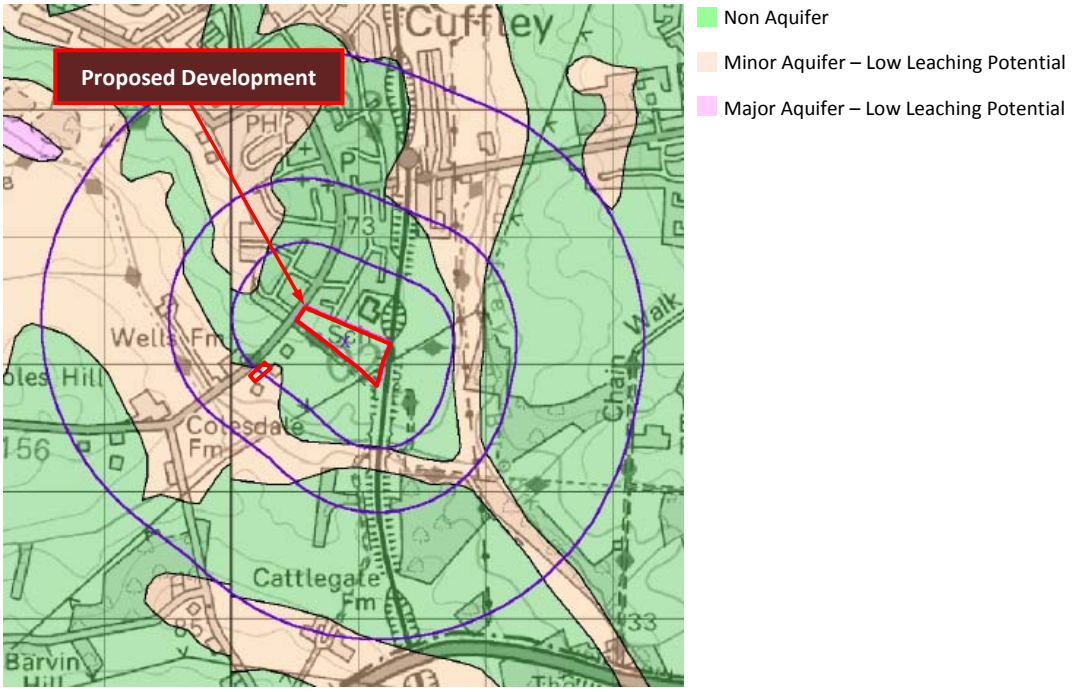

Figure 7a: Groundwater Vulnerability

7.2 Major Aquifers are fractured or potentially fractured rocks which have a high permeability and potential for groundwater storage. They are important as they may provide local water supplies at a strategic level and base flows to rivers.

Minor Aquifers are fractured or potentially fractured rocks, which do not have a high primary permeability, or other formations of variable permeability including unconsolidated deposits. Although not producing large quantities of water for abstraction, they are important for local supplies and in supplying base flow to rivers.

7.3 Non Aquifers are formations of negligible permeability, usually regarded to contain insufficient quantities of groundwater. However, groundwater flow through non aquifers is a possibility even if a low one.

Groundwater Abstractions

7.4 There are no Groundwater Abstractions recorded within 1,000m of the Site.

Source Protection Zones

7.5 There are no Source Protection Zones within 1,000m of the Site boundary.

8 Potential Contaminative Uses & Statutory Registers

8.1 Seven **Pollution Incidents to Controlled Waters** are reported within 1,000m of the Site, details of which are provided in Figure 8a.

Property Type	Incident Date	Receiving Water	Pollutant	Severity	Distance (m)	Direction
Not Given	Nov 1991	Not Given	Unknown Sewage	Category 3 - Minor	376	South West
Not Given	Feb 1992	Not Given	Chemicals - Unknown	Category 3 - Minor	446	North East
Not Given	March 1996	Not Given	Oils - Unknown	Category 3 - Minor	534	North East
Not Given	March 1996	Not Given	Unknown Sewage	Category 3 - Minor	536	North East
Not Given	July 1995	Not Given	Chemicals - Unknown	Category 3 - Minor	538	North East
Not Given	Aug 1993	Not Given	Miscellaneous - Unknown	Category 3 - Minor	717	North East
Not Given	June 1992	Not Given	Oils - Unknown	Category 3 - Minor	803	North East

Figure 8a: Pollution Incidents to Controlled Waters

8.2 There are two **Local Authority Pollution Prevention and Controls** within 1,000m of the Site. A Local Authority Air Pollution Control was issued to Sir William Burnett & Co (Timber) Ltd for the manufacture of timber and wood-based products, however this permit has since been revoked. The second is a Local Authority Pollution Prevention and Control issued in May 2007 to Lady Valet Dry Cleaners for their dry cleaning processes.

8.3 None of the following have been recorded within 1,000m of the Site boundary:

- Contaminated Land Register Entries and Notices
- Enforcement and Prohibition Notices
- Integrated Pollution Controls
- Integrated Pollution Prevention and Control
- Local Authority Integrated Pollution Prevention And Control
- Local Authority Pollution Prevention and Control Enforcements
- Prosecutions Relating to Authorised Processes
- Prosecutions Relating to Controlled Waters
- Registered Radioactive Substances
- Substantiated Pollution Incident Registers
- Water Industry Act Referrals

Hazardous Substances

8.4 There are no records of the following on or within a 1,000m radius of the Site boundary;

- Control of Major Accident Hazards Sites (COMAH)
- Explosive Sites
- Notification of Installations Handling Hazardous Substances (NIHHS)
- Planning Hazardous Substance Enforcements

8.5 There are nine **Contemporary Trade Directory Entries** recorded within 500m of the Site boundary and a further twenty seven entries (sixteen of which are active) recorded between 500 – 1,000m. Details of the first nine entries are shown below in Figure 8b:

Active	Inactive
Car Engine Turning & Diagnostic Services	Car Engine Turning & Diagnostic Services
Builders Merchants	Domestic Appliances – Servicing, repairs & parts
-	Damp & Dry Rot Control
-	Lifting Equipment
-	Printers
-	Lubricant Manufacturers & Distributors
-	Cladding Suppliers & Installers

Figure 8b: Contemporary Trade Directory Entries

8.6 There are two **Fuel Station Entries** recorded within 1,000m of the Site boundary. The first is Cuffley Service Station situated approximately 665m north-east of the Site. The second entry is Cuffley Motor Company, now obsolete, and was situated approximately 693m north-east of the Site.

Waste

8.7 Cattlegate Farm is recorded as a **Licensed Waste Management Facility (Location)**. There are two licences issued: one in October 2013 to Land Network (Potters Bar) Ltd for an open composting system, approximately 370m south of the Site. The other was issued in May 2012 to Willen Biogas Ltd for an anaerobic digestion facility (producing more than 75,000 tonnes per year), approximately 950m south of the Site.

8.8 There are no provided reports of the following within 1,000m of the Site boundary:

- BGS Recorded Landfill Sites
- Historic Landfill Sites
- Integrated Pollution Control Registered Waste Sites
- Licensed Waste Management Facilities (Boundaries)
- Local Authority Recorded Landfill Sites
- Registered Landfill Sites
- Registered Waste Transfer Sites
- Registered Waste Treatment or Disposal Sites

9 Environmental Setting

9.1 The Site is identified to lie within a surfacewater **Nitrate Vulnerable Zone** and is illustrated in Figure 9a.

9.2 The Site is located within the **Green Belt** as designated by the 2005 Welwyn Hatfield District Local Plan. The Green Belt extends south, east, west and into the adjoining administrative area of Broxbourne Borough. These areas are illustrated in Figure 9a.

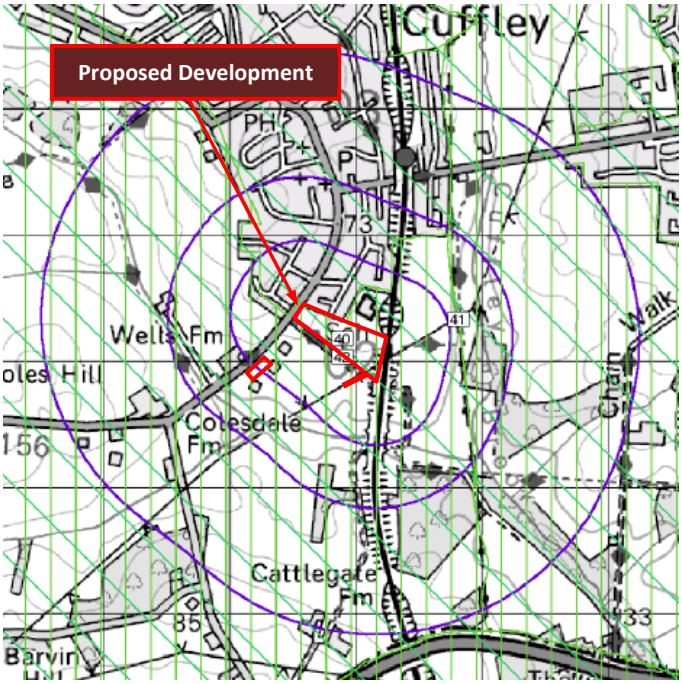

Figure 9a: Sensitive Land Uses

9.3 None of the following are reported within 500m of the Site boundary:

- Areas of Unadopted Green Belt
- Areas of Outstanding Natural Beauty
- Environmentally Sensitive Areas
- Forest Parks
- Local Nature Reserves
- Marine Nature Reserves
- National Nature Reserves
- National Parks
- Nitrate Sensitive Areas
- Ramsar Sites
- Sites of Special Scientific Interest
- Special Areas of Conservation
- Special Protection Areas

10 Site Conceptual Model

10.1 Guidance has been published by the Department of the Environment, Transport and the Regions (DETR Circular 02/2000) 'Environmental Protection Act 1990: Part 11A – Contaminated Land (20th March 2000) which promotes the 'suitable for use approach'. The DETR note 'The "suitable for use" approach focuses on the risks caused by land contamination. The approach recognises that the risks presented by any given level of contamination will vary greatly according to the use of the land and a wide range of other factors, such as the underlying geology of the site. Risks therefore need to be assessed on a site-by-site basis.

10.2 The "suitable for use" approach consists of three elements:

- Ensuring that land is suitable for its current use - in other words, identifying land where contamination is causing unacceptable risks to human health and the environment, assessed on the basis of the current use and

circumstances of the land, and returning such land to a condition where such risks no longer arise ("remediating" the land): the new contaminated land regime provides general machinery to achieve same.

- Ensuring that land is made suitable for any new use, as planning permission is given for that new use - in other words, assessing the potential risks from contamination, on the basis of the proposed future use and circumstances, before official permission is given) for the development and, where necessary to avoid unacceptable risk to human health and the environment, remediating the land before the new use commences; this is the role of the town and country planning and building control regimes.

- Limiting requirements for remediation to the work necessary to prevent unacceptable risks to human health or the environment in relation to the current use or future use of the land for which planning permission is being sought - in other words, recognising that the risks from contaminated land can be satisfactorily assessed only in the context of specific uses of the land (whether current or proposed), and that any attempt to guess what might be needed at some time in the future for other uses is likely to result either in premature work (thereby risking distorting social, economic and environmental priorities) or in unnecessary work (thereby wasting resources).

10.3 Also addressed within the DETR guidance is the issue of 'contaminated land'. 'Before the **Local Authority** can make the judgement that any land appears to be **Contaminated Land** on the basis that **Significant Harm** is being caused, or that there is a **Significant Possibility** of such harm being caused, the authority must therefore identify a **Significant Pollutant Linkage**.

10.4 This means that each of the following has been identified:

- A Contaminant
- A Pathway
- A Receptor

and that:

- The **Contaminant** is causing **Significant Harm** to **that Receptor.**

Or

- There is a **Significant Possibility** of such harm being caused by the **Contaminant to the Receptor**.

10.5 Where any of the three elements of the SPR are not present, there is no risk and therefore land cannot be classified as statutory 'contaminated land'.

10.6 In terms of controlled waters, DETR Circular 02/2000 notes the following:

"A.35 Section 78A (9) defines the pollution of controlled waters as: 'The entry into controlled waters of any poisonous, noxious or polluting matter or any solid waste matter'.

A.36 Before determining that pollution of controlled waters is being, or is likely to be, caused, the local authority should be satisfied that a substance is continuing to enter controlled waters or is likely to enter controlled waters. For this purpose, the local authority should regard something as being "likely" when they judge it more likely than not to occur.

A.37 Land should not be designated as contaminated land where:

(a) A substance is already present in controlled waters;

(b) Entry into controlled waters of that substance from land has ceased; and

(c) It is not likely that further entry will take place.

A.38 Substances should be regarded as having entered controlled waters where:

(a) They are dissolved or suspended in those waters; or

(b) If they are immiscible with water they have direct contact with those waters on or beneath the surface of the water.

A.39 The term "continuing to enter" should be taken to mean any entry additional to any which has already occurred."

10.7 In 2004 the Environment Agency published the 'Model Procedures for the Management of Land Contamination', CLR11, which provides the technical framework for applying a risk management process, based on the 'suitable for use' approach, when dealing with land affected by contamination.

10.8 In 2008, to enable the practical application of good practice of the EA's Model Procedures CLR11, R&D Publication 66 'Guidance for the Safe Development of Housing on Land Affected by Contamination' was published by the National House Builders Council (NHBC), the EA and the Chartered Institute of Environmental Health. Whilst written to be relevant to housing development it is also applicable to other forms of development where sites are land affected by contamination. The guidance describes in detail the process and activities involved for the identification and assessment of hazards for a Phase 1 assessment.

10.9 At Phase 1 stage, it is necessary to develop an initial conceptual site model to understand the possible relationships between contaminants, pathways and receptors. If a hazardous source, via an exposure pathway to a potential receptor can be established then there is a 'pollutant linkage', which is preliminarily risk assessed using parameters summarised in Table 10a, below. At this stage, the conceptual model is prepared without site specific soils, groundwater or gas testing and as such, the findings should be treated only as first and general indications of possible SPR linkages.

10.10 The primary potential sources of contamination at the Site are indicated below:

Agricultural Use	-	Soil and Water Contamination
Railway Line	-	Soil and Water Contamination
Former Sewage Works/ Works	-	Soil and Water Contamination
Pumping Station	-	Soil and Water Contamination

10.11 The potential receptors at the Site are:

- End users / site occupiers
- Adjacent users / occupiers
- Controlled waters
- Flora and fauna
- Buildings & construction materials

10.12 The potential pathways at the Site are primarily:

- Direct ingestion of soil / water / fruit or vegetable
- Inhalation of dust / vapours
- Direct skin contact with the ground / water
- Regression of plant growth due to phytotoxic contamination
- Vertical and lateral migration of contamination

10.13 While limited information is available at this stage the methodology has been developed to help identify the potential contamination risk and linkages. The severity of damaging effects and the likelihood of any linkage have been considered.

10.14 Given the potential consequence and likelihood, a risk rating is given, based on the following matrix:

Probability (Likelihood)	Consequence			
	Severe	**Moderate**	**Mild**	**Minor**
Highly Likely	Very High	High	Medium	Low
Likely	High	Medium	Medium/Low	Low
Possible	Medium	Medium/Low	Low	Very Low
Unlikely	Medium/Low	Low	Very Low	Very Low

Table 10a: Risk ratings

10.15 The risk ratings are described as follows:

Very High: There is a high probability that severe harm could arise to a designated receptor from an identified hazard at the site without appropriate remediation action.

High: Harm is likely to arise to a designated receptor from an identified hazard at the site without appropriate remediation action.

Medium: It is possible that without appropriate remediation action harm could arise to a designated receptor. It is relatively unlikely that any such harm would be severe, and if any harm were to occur it is more likely that such harm would be relatively mild.

Low: It is possible that harm could arise to a designated receptor from an identified hazard. It is likely that, at worst if any harm was realised any effects would be mild.

Very Low: The presence of an identified hazard does not give rise to the potential to cause harm to a designated receptor.

Source	Pathway	Receptor	Comment	Risk Rating	Potential Mitigation
Contaminated soils **On-Site:** • Agricultural **Off-Site:** • Agricultural • Railway Line • Sewage Pumping Station • Former Sewage Works / Works	Direct Ingestion & contact	Site workers & occupiers	Historically undeveloped site. Minor potential contamination threats within close proximity of the Site include agricultural use which may have included the use of pesticides and fertilizers and the adjacent railway line. An assessment of the soils will be required at the detailed design stage.	Low	-
	Inhalation of dust		Historically undeveloped site. On-site land uses do not suggest a significant potential for contamination.	Low	-
	Direct skin contact		Historically undeveloped site. Minor potential contamination threats within close proximity of the Site include agricultural use which may have included the use of pesticides and fertilizers and the adjacent railway line. An assessment of the soils will be required at the detailed design stage.	Low	-
	Vertical & lateral migration	Controlled waters	Site is situated on a Non Aquifer and is historically shown to be undeveloped. No open water bodies are present within the Site boundary.	Very Low	-
	Direct uptake	Flora	Historically undeveloped site. On-site use encourages plant growth.	Very Low	-
	Direct contact	Building materials	Historically undeveloped site. Agricultural land uses are not considered to have a detrimental impact on building materials.	Very Low	-
Contaminated Groundwater **On-Site:** • Agricultural **Off-Site:** • Agricultural • Railway Line • Sewage Pumping Station • Former Sewage Works / Works	Direct Ingestion & contact	Site workers & occupiers	Site is situated on a Non Aquifer, groundwater flow into site is unlikely and none of the surrounding off-site sources have the potential to detrimentally impact the proposed site.	Very Low	-
	Direct skin contact		Site is situated on a Non Aquifer, groundwater flow into site is unlikely and none of the surrounding off-site sources have the potential to detrimentally impact the proposed site.	Very Low	-
	Vertical & lateral migration	Controlled waters	Site is situated on a Non Aquifer, groundwater flow into site is unlikely and none of the surrounding off-site sources have the potential to detrimentally impact the proposed site.	Very Low	-
	Direct uptake	Flora	Site is situated on a Non Aquifer, groundwater flow into site is unlikely and none of the surrounding off-site sources have the potential to detrimentally impact the proposed site.	Very Low	-
	Direct contact	Building materials	Site is situated on a Non Aquifer, groundwater flow into site is unlikely and none of the surrounding off-site sources have the potential to detrimentally impact the proposed site.	Very Low	-
Elevated gas **On-Site:** None **Off-Site:** • Former Sewage Works / Works	Vertical & lateral migration	Site workers & occupiers	Historically undeveloped site that is situated on a Non Aquifer. The works are a potential source of gassing and an assessment of gas levels on Site will be required at the detailed design stage.	Low	-
		Adjacent occupiers	Historically undeveloped site that is situated on a Non Aquifer. The works are a potential source of gassing and an assessment of gas levels on Site will be required at the detailed design stage.	Low	-

Table 10b – Site SPR summary

11 Discussion & Summary

11.1 A review of readily available Site environmental data, including historical mapping and statutory registers has identified the following:

Agricultural land on Site and within the surrounding areas includes typical contaminants such as: nitrogen, potassium and phosphorous contained within fertilisers, chemicals from pesticides and herbicides, coliform and non-coliform bacteria from livestock waste and manure application and hydrocarbons (oil and fuel leakages from machinery). Further assessment of the Site's soils will be required at the detailed design stage to establish baseline conditions. This feature generally provides a *low* rating for risk, but may vary depending on the persistence of the chemicals used.

From around 1916 **The Great Northern Railway (Enfield Branch Extension) line** is shown adjacent to the Site's eastern boundary. Potential contaminants include: degreasing solvents, PCBs from engines and electrical equipment, heavy metals, oils and fuels. Further assessment of the Site's soils will be required at the detailed design stage to establish baseline conditions. However, development of a residential nature is shown either side of the railway line, to the north, in Cuffley. An embankment is positioned either side of the railway line which forms a physical barrier from potential contaminants, it is therefore considered that this feature provides a *low* rating for risk.

A **Sewage Pumping Station** is situated approximately 500m west of the Site's boundary. It is considered that this represents a *very low* risk to development as it is situated on the opposite side of Northaw Road East, which forms a physical barrier between the Site and any potential contaminants that may arise from potential leakages or flooding from the pumping station.

A **former Sewage Works** is shown approximately 600m north of the Site from around 1935 to 1960, after which it is shown to be a Works. Additional buildings are shown at the works by 1974 and the area is currently in use as Soppers Road Industrial Area. Potential contaminants associated with the former and current use of the area may include: heavy metals, inorganic/organic compounds, acids/alkalis, asbestos, pathogenic micro-organisms, methane, carbon dioxide and hydrogen sulphide. However, as these sources are a considerable distance from the Site's boundary, on the opposite side of the railway line, it is considered that the potential risk posed for contamination is *very low*.

There are no further former land uses identified on Site, apart from those mentioned above, that are potentially contaminative or likely to be prohibitive to the planned development.

11.2 Ahead of development, it is proposed to implement a comprehensive Phase II intrusive site investigation and ground conditions interpretation.

12 Limitations

12.1 The benefits of this report are provided solely to Lands Improvement Holdings Ltd. The conclusions and recommendations contained herein are limited to those given the general availability of background information and the planned usage of the site. Brookbanks Consulting Ltd do not confer any third party rights for the information contained in the report.

12.2 All distances referred to in this report are measured from the boundary of the planned development site unless otherwise advised.

12.3 Third party information has been used in the preparation of this report, which Brookbanks Consulting Ltd, by necessity assume is correct at the time of writing.

Appendix

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Historical Mapping Legends

Ordnance Survey County Series 1:10,560

Gravel Pit
Sand Pit
Other Pits
Quarry
Shingle
Orchard
Osiers
Reeds
Marsh
Mixed Wood
Deciduous
Brushwood
Fir
Furze
Rough Pasture
Arrow denotes flow of water
Trigonometrical Station
Site of Antiquities
Bench Mark
Pump, Guide Post, Signal Post
Well, Spring, Boundary Post
·285 Surface Level
Sketched Contour
Instrumental Contour
Main Roads
Fenced
Un-Fenced
Minor Roads
Fenced
Un-Fenced
Sunken Road
Raised Road
Road over Railway
Railway over River
Railway over Road
Level Crossing
Road over River or Canal
Road over Stream
Road over Stream
County Boundary (Geographical)
County & Civil Parish Boundary
Administrative County & Civil Parish Boundary
Co. Boro. Bdy. County Borough Boundary (England)
Co. Burgh Bdy. County Burgh Boundary (Scotland)
R.D. Bdy. Rural District Boundary
Civil Parish Boundary

Ordnance Survey Plan 1:10,000

Chalk Pit, Clay Pit or Quarry
Gravel Pit
Sand Pit
Disused Pit or Quarry
Refuse or Slag Heap
Lake, Loch or Pond
Dunes
Boulders
Coniferous Trees
Non-Coniferous Trees
Orchard
Scrub
Coppice
Bracken
Heath
Rough Grassland
Marsh
Reeds
Saltings
Building
Direction of Flow of Water
Shingle
Sand
Glasshouse
Pylon
Electricity Transmission Line
Pole
Sloping Masonry
Cutting
Embankment
Standard Gauge Multiple Track
Road Under
Road Over
Level Crossing
Foot Bridge
Standard Gauge Single Track
Siding, Tramway or Mineral Line
Narrow Gauge
Geographical County
Administrative County, County Borough or County of City
Municipal Borough, Urban or Rural District, Burgh or District Council
Borough, Burgh or County Constituency
Shown only when not coincident with other boundaries
Civil Parish
Shown alternately when coincidence of boundaries occurs

BP, BS	Boundary Post or Stone	Pol Sta	Police Station
Ch	Church	PO	Post Office
CH	Club House	PC	Public Convenience
F E Sta	Fire Engine Station	PH	Public House
FB	Foot Bridge	SB	Signal Box
Fn	Fountain	Spr	Spring
GP	Guide Post	TCB	Telephone Call Box
MP	Mile Post	TCP	Telephone Call Post
MS	Mile Stone	W	Well

1:10,000 Raster Mapping

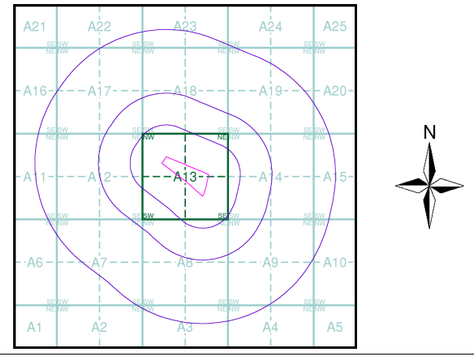
Gravel Pit
Refuse tip or slag heap
Rock
Rock (scattered)
Boulders
Boulders (scattered)
Shingle
Mud
Sand
Sand Pit
Slopes
Top of cliff
General detail
Underground detail
Overhead detail
Narrow gauge railway
Multi-track railway
Single track railway
County boundary (England only)
Civil, parish or community boundary
District, Unitary, Metropolitan, London Borough boundary
Constituency boundary
Area of wooded vegetation
Non-coniferous trees
Non-coniferous trees (scattered)
Coniferous trees
Coniferous trees (scattered)
Positioned tree
Orchard
Coppice or Osiers
Rough Grassland
Heath
Scrub
Marsh, Salt Marsh or Reeds
Water feature
Flow arrows
MHW(S) Mean high water (springs)
MLW(S) Mean low water (springs)
Telephone line (where shown)
Electricity transmission line (with poles)
BM 123.45 m Bench mark (where shown)
Triangulation station
Point feature (e.g. Guide Post or Mile Stone)
Pylon, flare stack or lighting tower
Site of (antiquity)
Glasshouse
General Building
Important Building

Brookbanks Consulting

Historical Mapping & Photography included:

Mapping Type	Scale	Date	Pg
Middlesex	1:10,560	1868	2
Middlesex	1:10,560	1882	3
Middlesex	1:10,560	1897 - 1898	4
Hertfordshire	1:10,560	1916 - 1920	5
Hertfordshire	1:10,560	1916	6
Hertfordshire	1:10,560	1935	7
Hertfordshire	1:10,560	1938	8
Hertfordshire	1:10,560	1938	9
Historical Aerial Photography	1:10,560	1945	10
Ordnance Survey Plan	1:10,000	1960	11
Ordnance Survey Plan	1:10,000	1970 - 1974	12
Ordnance Survey Plan	1:10,000	1973	13
Ordnance Survey Plan	1:10,000	1980 - 1989	14
Ordnance Survey Plan	1:10,000	1988	15
10K Raster Mapping	1:10,000	2006	16
VectorMap Local	1:10,000	2014	17

Historical Map - Slice A



Order Details

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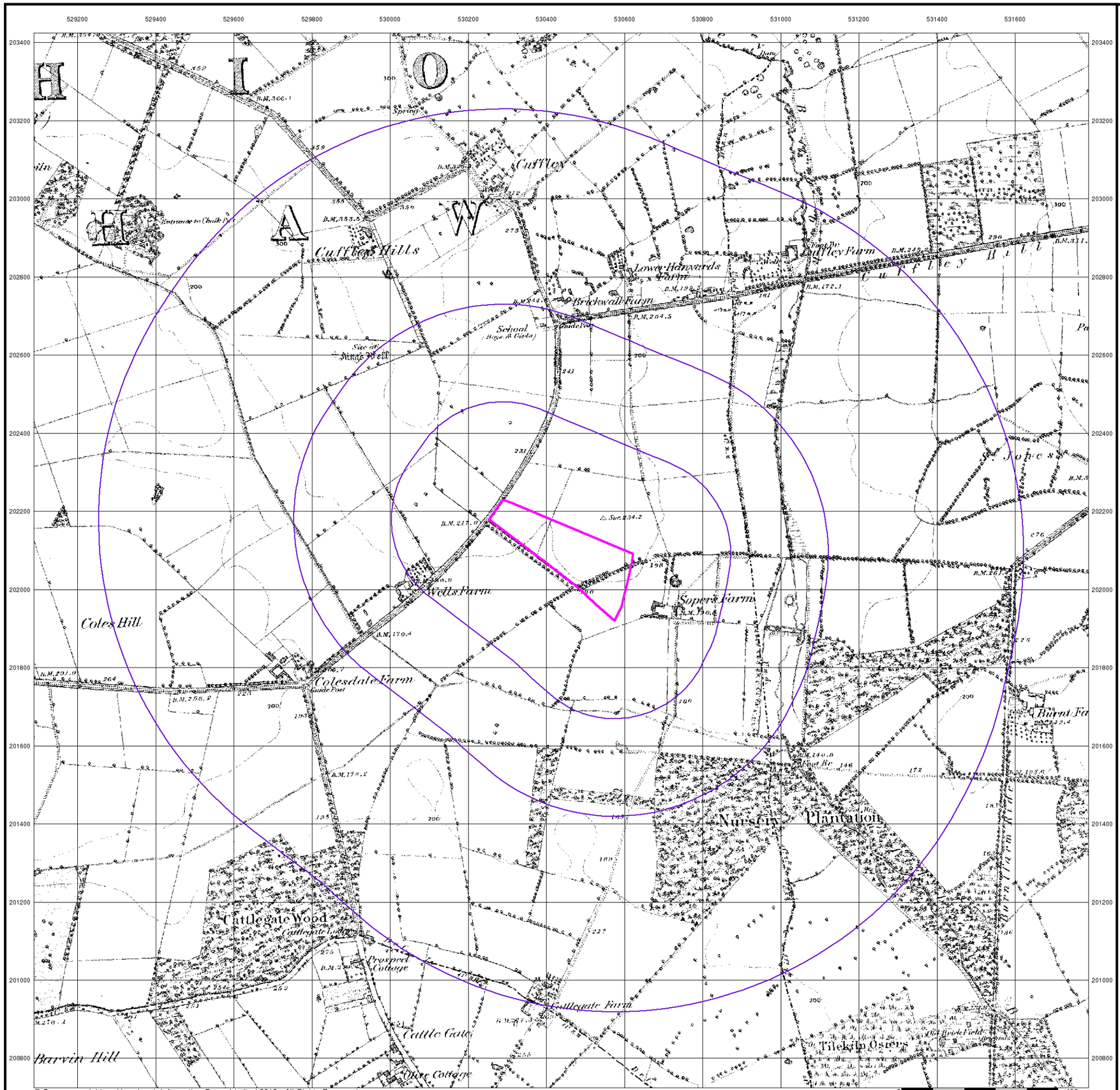
Customer Ref: 10316 Cuffley
National Grid Reference: 530450, 202090
Slice: A
Site Area (Ha): 4.4
Search Buffer (m): 1000

Site Details

Site at 530460, 202110

Landmark Information Group
Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk



Brookbanks Consulting

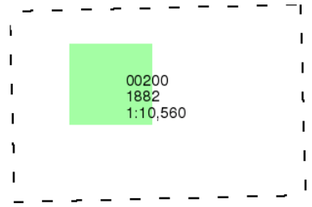
Middlesex

Published 1882

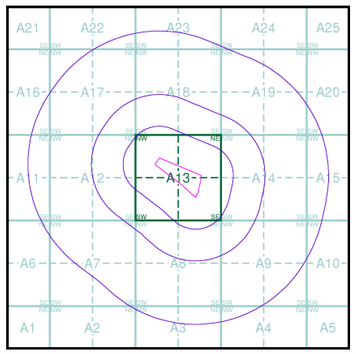
Source map scale - 1:10,560

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas; these maps were used to update the 1:10,560 maps. The published date given therefore is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas. In the late 1940`s, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)



Historical Map - Slice A



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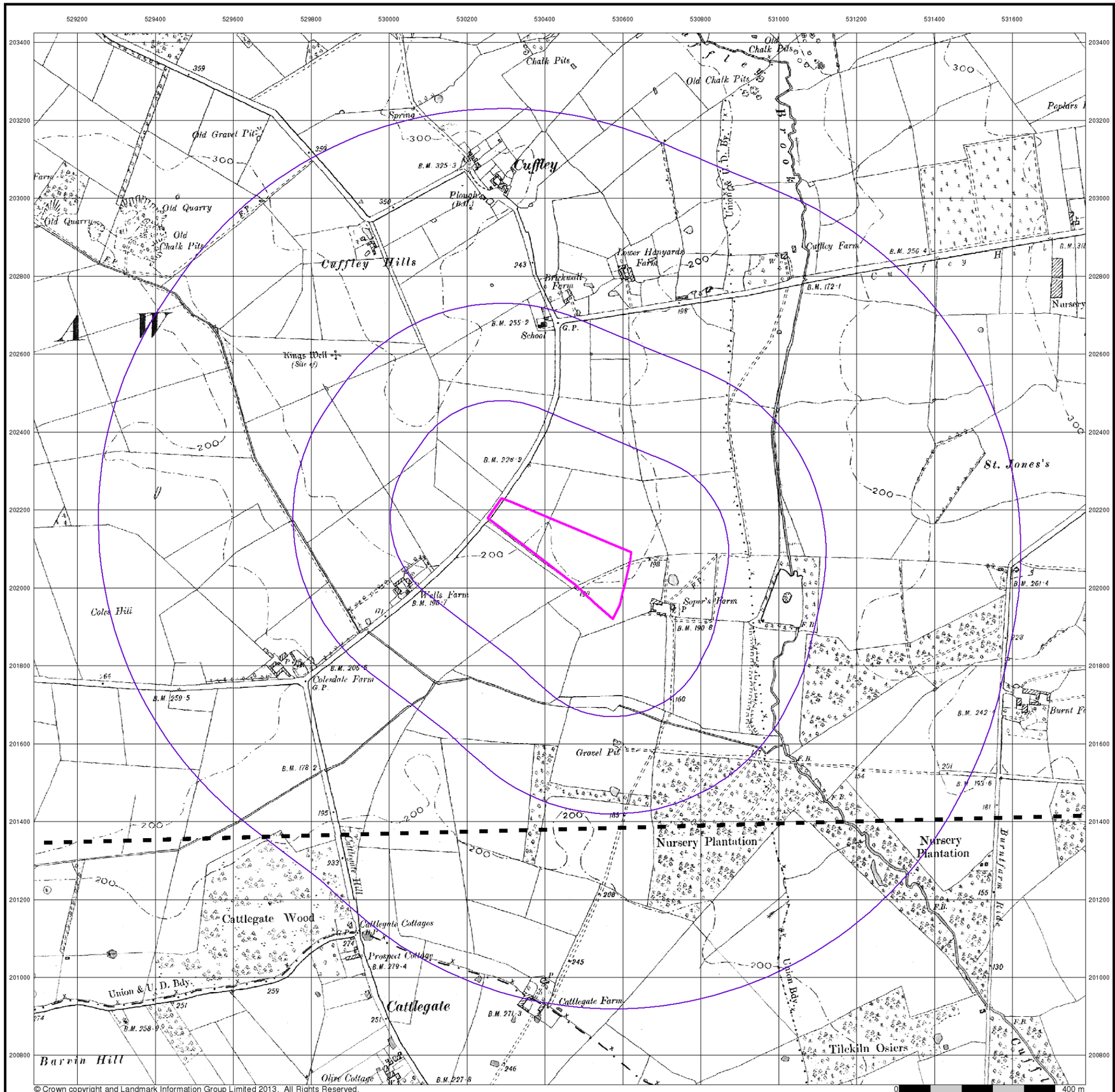


Brookbanks Consulting

Middlesex

Published 1897 - 1898

Source map scale - 1:10,560

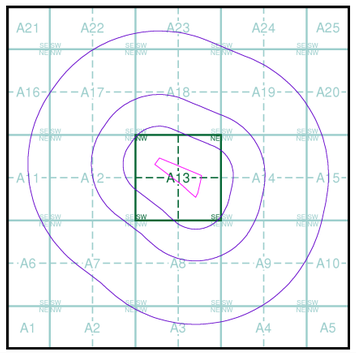
The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas; these maps were used to update the 1:10,560 maps. The published date given therefore is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas. In the late 1940`s, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)

002NW
1898
1:10,560

002SW
1897
1:10,560

Historical Map - Slice A



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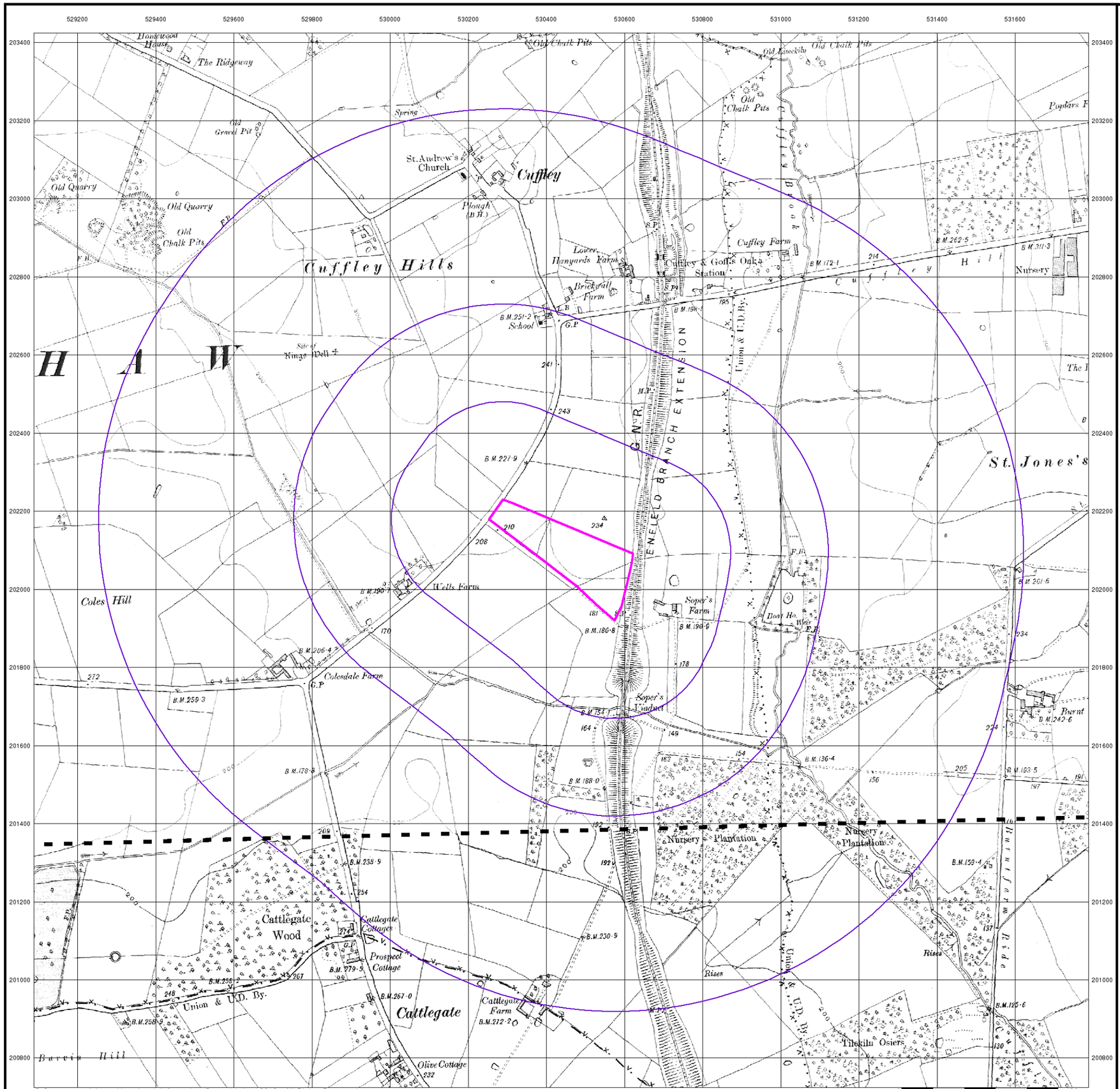

Brookbanks Consulting

Hertfordshire

Published 1916 - 1920

Source map scale - 1:10,560

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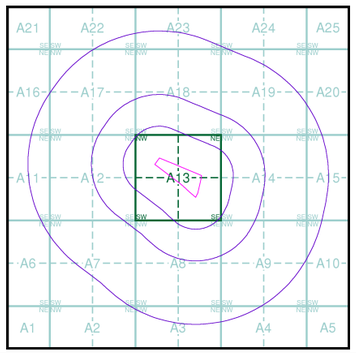
Map Name(s) and Date(s)

041NW
1916
1:10,560

041SW
1920
1:10,560

Historical Map - Slice A



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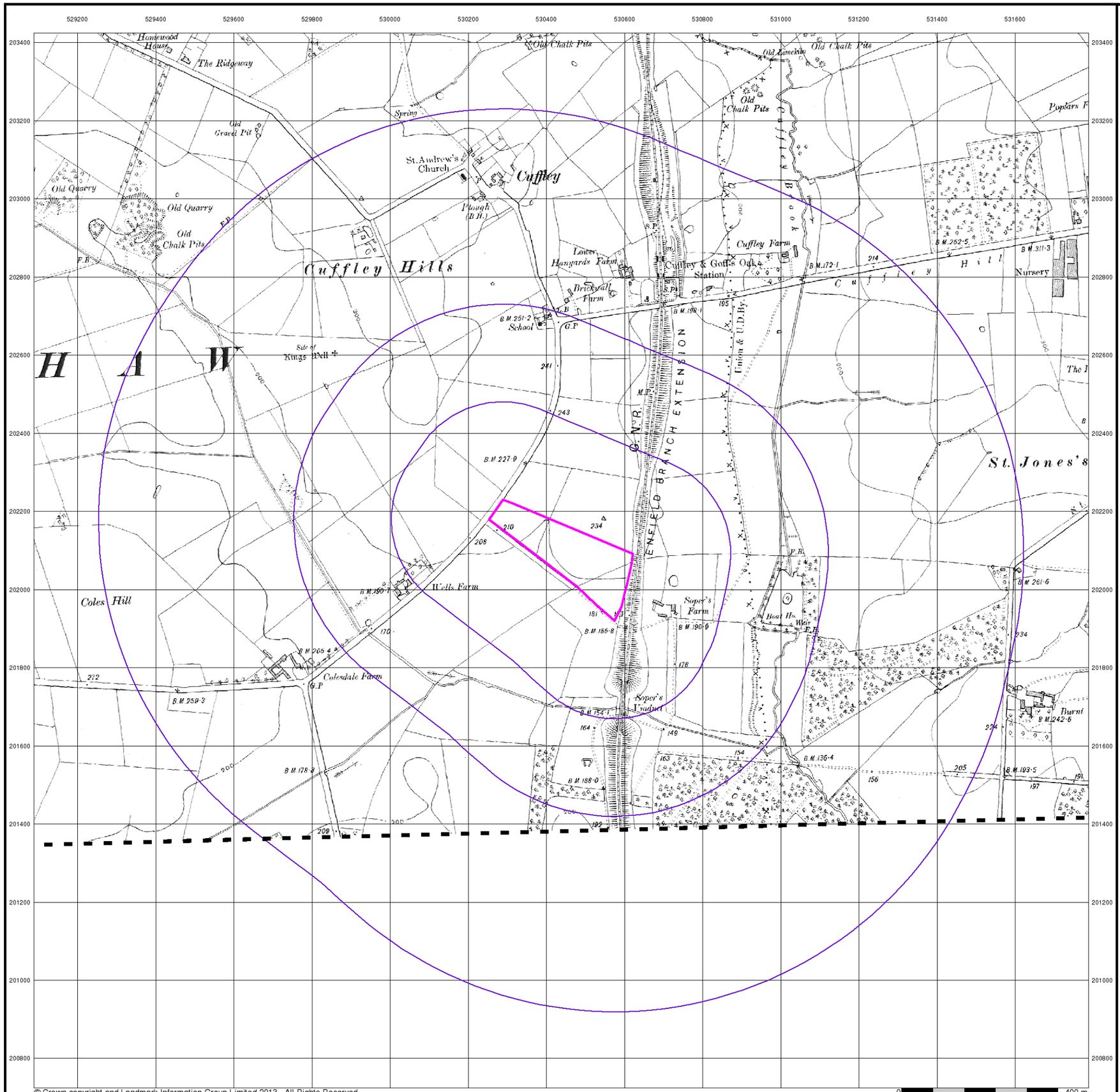

Brookbanks Consulting

Hertfordshire

Published 1916

Source map scale - 1:10,560

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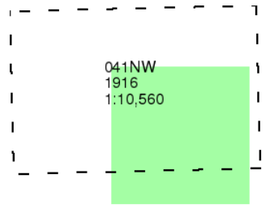
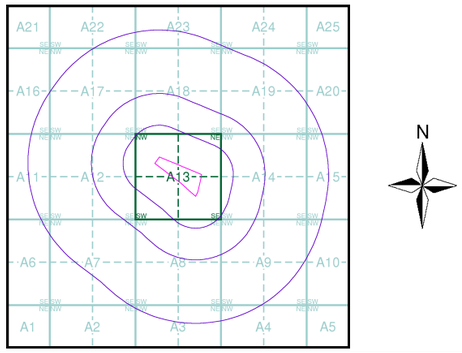


Historical Map - Slice A



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Site Area (Ha):	4.4
Search Buffer (m):	1000

Site Details

Site at 530460, 202110

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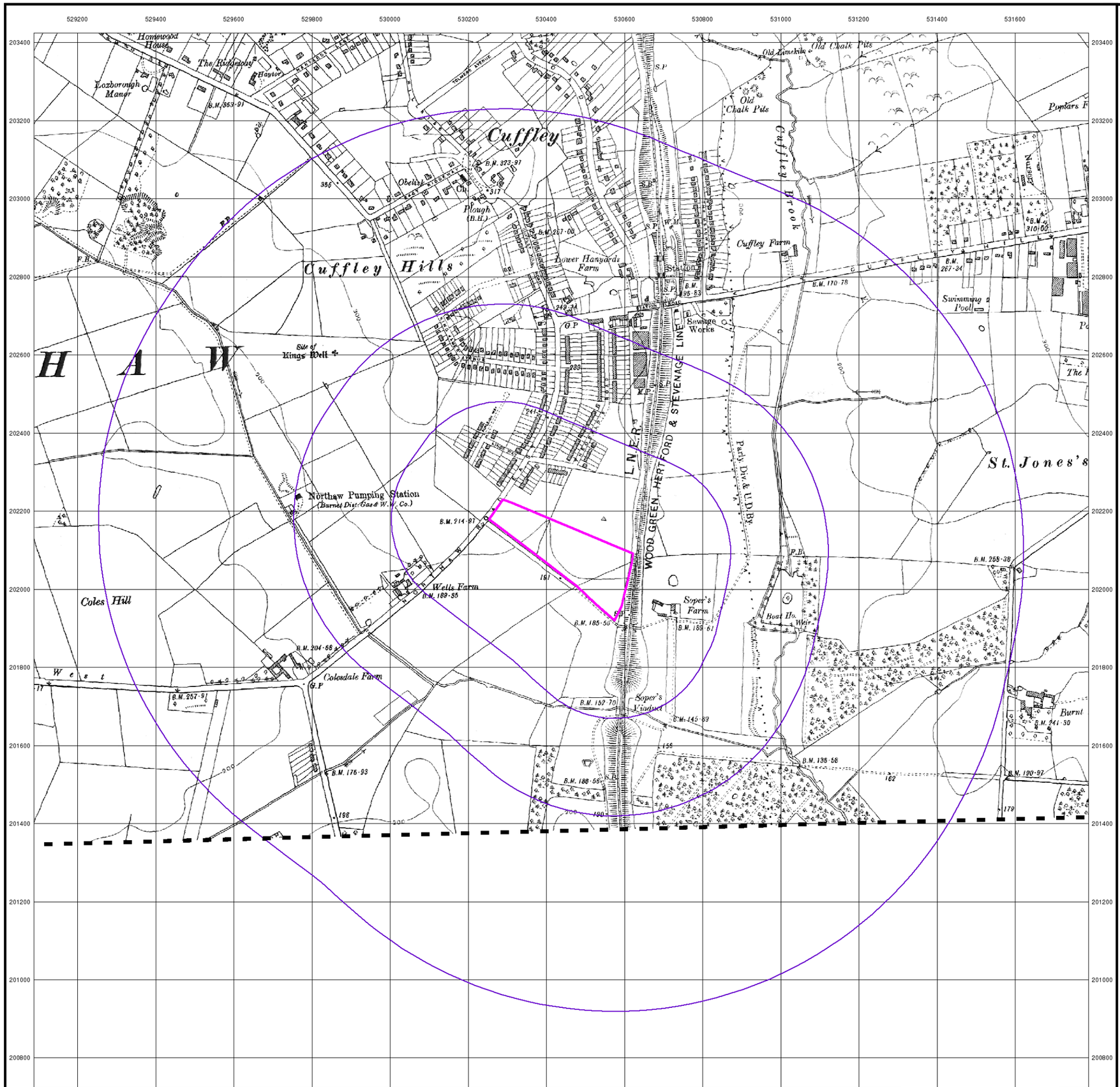

Brookbanks Consulting

Hertfordshire

Published 1935

Source map scale - 1:10,560

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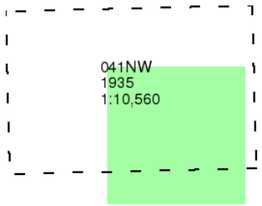
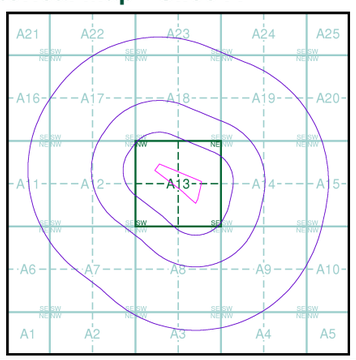
Map Name(s) and Date(s)



Historical Map - Slice A



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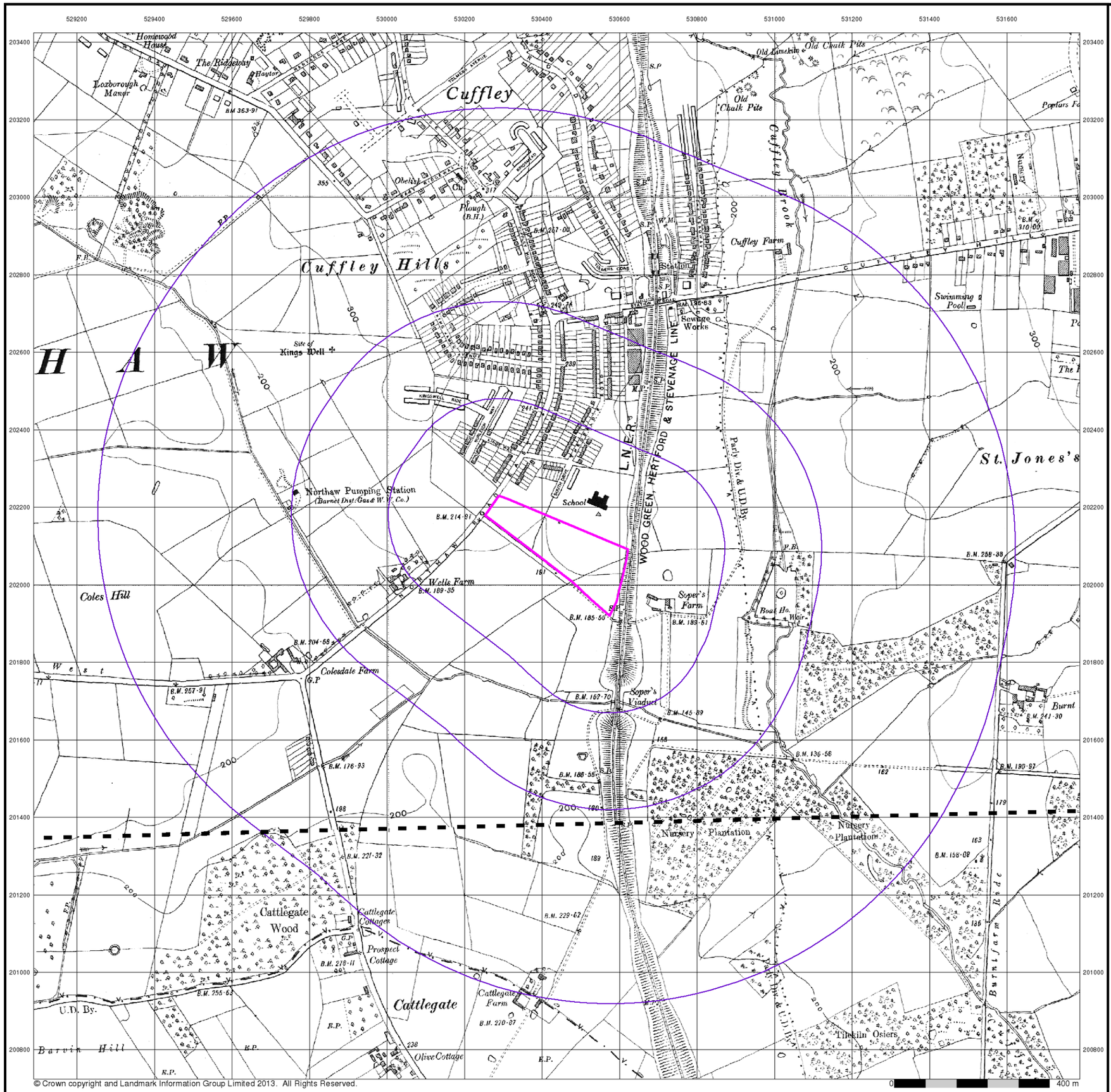

Brookbanks Consulting

Hertfordshire

Published 1938

Source map scale - 1:10,560

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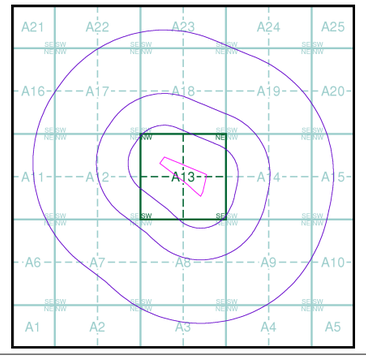
Map Name(s) and Date(s)

041NW
1938
1:10,560

041SW
1938
1:10,560

Historical Map - Slice A



Order Details

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National Grid Reference:	530450, 202090
Slice:	A
Site Area (Ha):	4.4
Search Buffer (m):	1000

Site Details

Site at 530460, 202110

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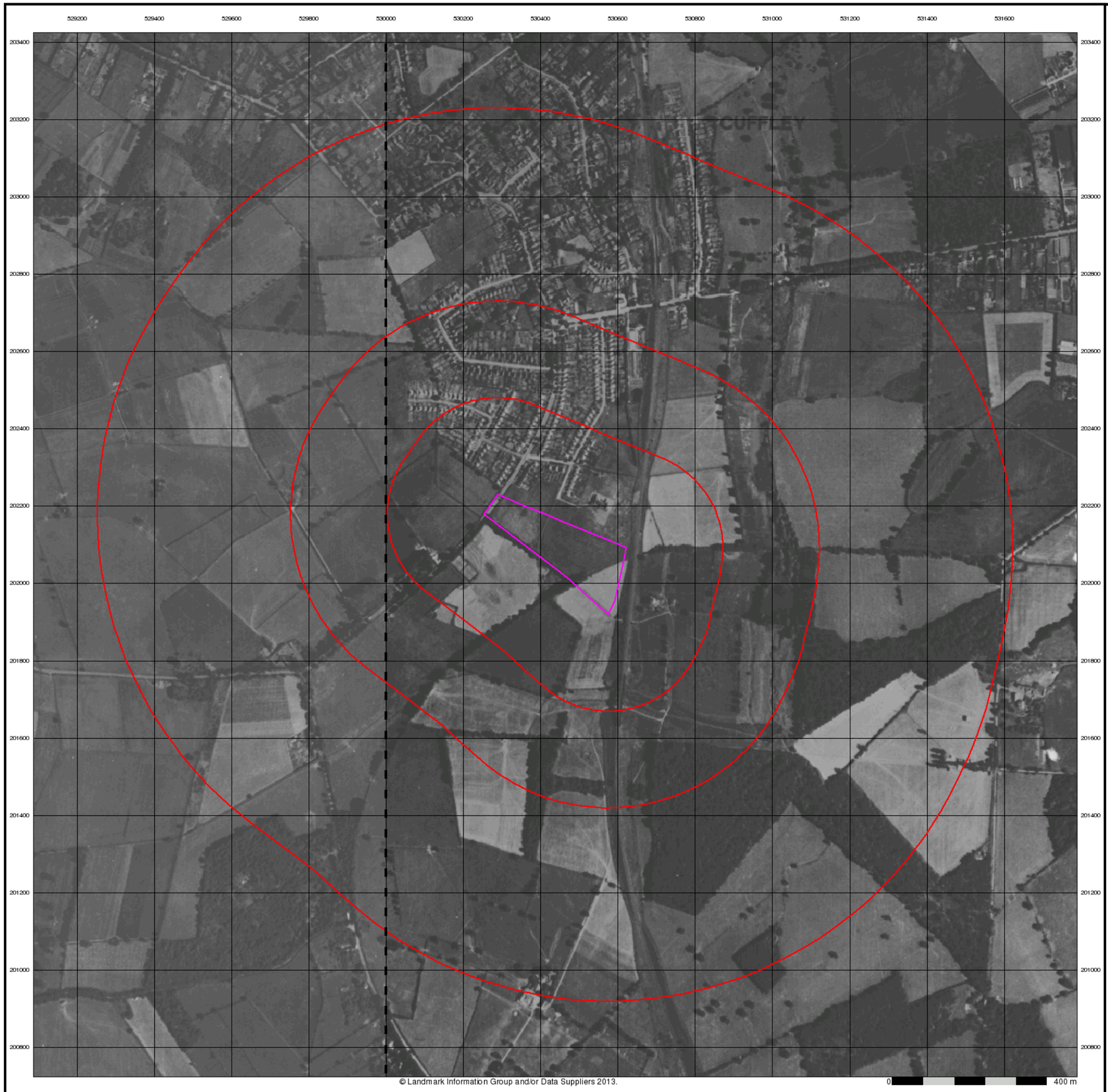


Brookbanks Consulting

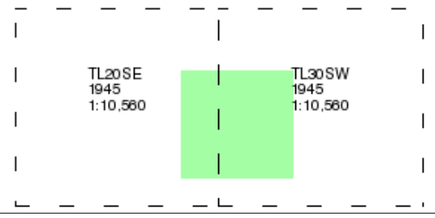
Historical Aerial Photography

Published 1945

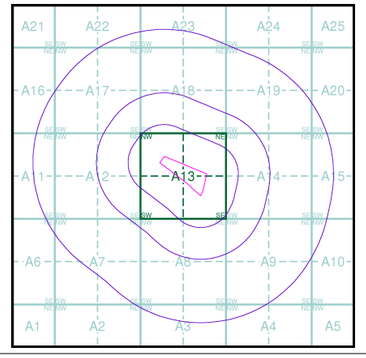
Source map scale - 1:10,560

The Historical Aerial Photos were produced by the Ordnance Survey at a scale of 1:1,250 and 1:10,560 from Air Force photography. They were produced between 1944 and 1951 as an interim measure, pending preparation of conventional mapping, due to post war resource shortages. New security measures in the 1950's meant that every photograph was re-checked for potentially unsafe information with security sites replaced by fake fields or clouds. The original editions were withdrawn and only later made available after a period of fifty years although due to the accuracy of the editing, without viewing both revisions it is not easy to spot the edits. Where available Landmark have included both revisions.

Map Name(s) and Date(s)



Historical Aerial Photography - Slice A



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Order Details

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Slice:	A
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