GEOENVIRONMENTAL DESK STUDY REPORT

Plot B
The Airfields
Deeside

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CONFIDENTIALITY STATEMENT

This report is addressed to and may be relied upon by the following:

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DOCUMENT HISTORY

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EXECUTIVE SUMMARY

Site Address	**Plot B, The Airfields, Deeside**
NGR	NGR 332560, 369979.
Current Site Use & Proposed Development	The site is irregular in shape and occupies an area of approximately 9.90 ha. Access to the site is via the road along the southern boundary of the site. The site comprises generally flat undeveloped, undulating grassland with some trees along the boundaries. It is proposed to develop the site for a commercial end-use.
Site History	Most of the plot, except for small building in the south of the site and a roadway, railway track and small building in the north-east of the site, which have all since been removed (as part of the Phase 1 remedial works), has remained undeveloped since the earliest OS mapping (1869).
Site Setting	**Geology** - No made ground is shown to be present on the site. The site is shown to be underlain by superficial deposits comprising Tidal Flat Deposits (clay, silt and sand). A fault, oriented north to south is shown to cross the eastern part of the site. To the west of the fault and to the south on the eastern side of the fault, the underlying bedrock comprises Pennie Middle Coal Measures strata. To the north side of the eastern side of the fault, the underlying bedrock comprises the Kinnerton Sandstone Formation. **Mining** - The site is not in an area affected by coal mining. **Hydrogeology** - The superficial deposits underlying the site are classified as a Secondary Undifferentiated Aquifer. The Pennine Middle Coal Measures bedrock, underlying the central, western and southern parts of the site is classified as a Secondary A Aquifer. The Kinnerton Sandstone Formation underlying the east and north-east of the site is classified as a Principal Aquifer. The site does not lie within 500m of an Environment Agency Groundwater Source Protection Zone (SPZ). There are four recorded active groundwater abstraction licenses within 2km of the site, the nearest is located approximately 1387m north-east of the site. There are no active potable water abstraction licences within 2km of the site. **Hydrology** - The GS report indicates that surface water features comprising an inland river, not influenced by normal tidal action are located within 10m of the northern, eastern and southern boundaries of the site. There are no recorded active surface water abstractions within 2km of the site. The annual risk of flooding from the rivers and the sea (RoFRaS) is low. Information on the EA website and presented in the GS report indicate that the site lies within an Environment Agency Zone Flood Zone 3. **Landfills and Waste** - There are no historical, active, or recently closed landfill sites within 500m of the site. There are records of seven active waste treatment, transfer, or disposal sites within 500m of the site. **Radon** – No radon protection measures are required.
Environmental Risk Assessment	Based on the proposed commercial end use and history of the site, the following potential pollutant linkages may be present: • Development and maintenance workers and site end users (employees) could come into contact with soils and groundwater containing elevated concentrations of potential contaminants and hazardous ground gases. • The underlying Secondary Undifferentiated Aquifer, Secondary A Aquifer and Principal Aquifer could become contaminated due to the leaching and migration of potential contaminants from any made ground. • Buildings and services could be affected by potential contaminants in any made ground; and, • Plants in landscape areas could be affected by phytotoxic elements within any made ground. These are based on current site conditions and do not consider exposure pathways following any remediation of the site. Based on the conceptual site model, the site should be considered to be low to moderate with respect to contamination. This designation will be largely dependent on the nature of the made ground and hazardous ground gases present on or adjacent to the site.
Preliminary Engineering Assessment	**Foundations** - Where natural strata of suitable allowable bearing capacity for the proposed development is encountered at a relatively shallow depth, then a shallow foundation solution, i.e. pad or strip/trenchfill, would be suitable. However, if the depth to a suitable founding strata is too great, then consideration could be given to ground treatment options, e.g. vibro-stone columns to increase the bearing capacity of the soils. Alternatively, consideration could be given to a deeper piled foundation solution. **Earthworks –** Based on the existing topography and development proposals, it is anticipated that levels may be required to be raised in order to service the proposed development and create a level development platform. Any earthworks should be carried out in accordance with the Manual of Contract Documents for Highway Works, Volume 1 Specification for Highway Works,

	Series 600 Earthworks. **Ground Floor Construction** - For a ground bearing floor slab, it is recommended that the formation level is proof rolled and inspected. Any soft or loose materials should be removed and replaced with suitably compacted granular materials. Any earthworks or ground improvement should be designed in order to achieve the specified allowable bearing capacity and limits on settlement for a ground bearing floor slab. **Groundwater** - The presence of groundwater will need to be assessed as part of any ground investigation. **Obstructions** - Based on the history of the site, no significant obstructions are anticipated. **Roads, Pavements and Hardstanding Surfaces** - It is recommended that, at this stage, a conservative bearing value for the subgrade is assumed until the nature of the sub-grade can be physically assessed. Any earthworks should be designed to achieve a suitable CBR value for the proposed development. **Chemical Attack on Buried Ground** - Samples of made and natural ground and groundwater should be obtained and submitted to the laboratory for testing in order to assess the sulphate content and acidity and hence the concrete class required for buried concrete to the latest standard.
Further Work Required	In order to further assess the potential geotechnical and environmental constraints to the proposed development, it is recommended that a phase 2 intrusive ground investigation is carried out.
This sheet is intended as a summary only of the assessment of the site in relation to ground condition. It does not provide a definitive engineering analysis.	

1.0 INTRODUCTION

1.1 Instruction

JPG (Leeds) Limited (JPG) has been instructed by Commercial Development Projects Limited to provide a geoenvironmental desk study report for a proposed commercial development on Plot B, The Airfields, Deeside.

1.2 Objectives

The main objective of the geoenvironmental desk study is to identify potential geotechnical and environmental issues that may represent constraints to the proposed development of the site.

1.3 Scope of Works

The scope of works for the desk study includes the following:

- Site inspection and description.
- Review of contemporary and historical Ordnance Survey publications and available aerial photographs.
- Consultations with regulatory authorities, where appropriate.
- Review of geological publications (including hydrology, hydrogeology, and soil survey publications, where appropriate).
- Review of the radon status of the site.
- An environmental database search.
- Outline environmental risk assessment.
- Preliminary engineering recommendations with respect to foundations, ground floor and pavement design.
- Recommendations for further work, where appropriate; and,
- Presentation of the findings in a tabular non-technical summary.

1.4 Location

Plot B forms part of a large mixed-use development at The Airfields, Deeside. It is proposed to develop this plot for a commercial end-use. The site is located in the northern part of The Airfields development, approximately 6km north-west of Chester; the approximate centre of Plot B is located at NGR 332560, 369979.

A site location plan is provided as Figure 1 in Appendix A.

1.5 Site Description and Topography

A site inspection was carried out by a JPG engineer on 7 March 2022.

The site is irregular in shape and occupies an area of approximately 9.90 ha. Access to the site is via the road along the southern boundary of the site.

The site comprises generally flat undeveloped, undulating grassland with some trees along the boundaries.

Adjacent land use comprises a large commercial unit to the east with the Chester Millennium Greenaway and smaller commercial units within Deeside Industrial Estate to the north. Surrounding land to the south and west is currently undeveloped.

The site is bound by a wooden post and wire fence to the north, east and west, and by an access road to the south.

An aerial photograph of the site is included as Figure 2 in Appendix A and selected photographs of the site are provided in Appendix B.

1.6 Development Proposals

It is proposed to develop the site for a commercial end-use.

At the present time, no fixed development plan has been provided.

1.7 Limitations

The general limitations to the nature of the investigation are outlined in Appendix D.

2.0 SITE HISTORY

2.1 Ordnance Survey Mapping

Historical maps for the site were obtained from GroundSure (GS). These have been reviewed in order to establish the previous uses of the site and identify any potentially contaminative historical uses or potential geotechnical constraints to the proposed development.

A summary of the relevant map information is provided in Table 2.1 and copies of the Ordnance Survey (OS) maps are provided in Appendix C.

Table 2.1 – Summary of Relevant Historical Map Information

Date(s) & Scale	Description
1869 1:10,560 **1869-70 1:2,500**	**The site comprises parts of two agricultural fields and includes field boundaries with hedges.** The surrounding land comprises mainly open agricultural fields. A Rifle Range is located to the north of the site. A well is located approximately 400m to the south-east of the site and there are some small buildings located approximately 300m to the north-west of the site.
1897-98, 1898 1:10,560 **1899 1:2,500**	**No significant changes are shown on the site.** The Great Central Railway extends immediately beyond the site's northern boundary. Further development of the railway has also occurred 500m to the west of the site, connecting the Great Central Railway to a north to south trending railway. Chester Junction is located approximately 400m to the west. Eastham Victoria Jubilee Bridge is located approximately 400m to the south-east of the site. The well is no longer shown to the south-east and 'Stone Cottages' are now present at this location. The Rifle Range is no longer present.
1913, 1914 1:10,560 **1911 1:2,500**	**A small building named 'Summerfield' is shown in the south of the site.** The small buildings to the north-west of the site have been developed and are shown to be 'Marsh Farm', a 'School' and 'Marsh Cottages'. Hawarden Bridge Steel Works is located approximately 750m to the south-west of the site.
1938, 1948 1:10,560	**The 'Summerfield' building is no longer shown (likely to have been demolished).** The Great Central Railway is now referred to as the 'London and North-East Railway'. A sewage works is shown approximately 400m to the south of the site. Garden City is located approximately 500m south of the site, beyond the sewage works. The 'Welsh Road' extends north-east to south-west, approximately 550m from the site.
1954 1:10,560	**No significant changes are shown on the site.** The land to the north of the site is shown to be an Airfield.
1960-63 1:10,560 **1964 1:2,500**	**A roadway, small section of railway track and a small building are shown in the north-eastern corner of the site.** The Airfield to the north of the site is now shown to be disused. The land to the east of the site has been developed and formed part of the Airfield when it was active. A large building is shown approximately 100m to the east of the site, with smaller buildings shown along the Welsh road. A drain is located immediately north of the site, between the northern boundary of the site and the railway line. The sewage works to the south is now referred to as 'works.'. The school to the north-west is no longer shown and Marsh Farm is shown as 'New Marsh Farm Cottages'.
1970 1:10,560 **1965, 1978-1983, 1983-1986, 1986-1988, 1986-1989 1:2,500** **1981 1:10,000**	**The railway track and small building are no longer shown in the north-east of the site.** The disused airfield to the north of the site has been developed with small buildings and associated roads with roundabouts and is referred to as 'Deeside Industrial Estate'. Garden City to the south of the site has been developed with housing.
1991, 1992, 1993, 1994, 1995 1:2,500 **1992 1:10,000** **1992 1:1,250**	**No significant changes are shown on the site.** The disused airfield to the north of the site has been developed with small buildings up to the railway line. There are three electricity sub-stations and a tank located approximately 100m to the north of the site.
2001, 2010 1:10,000	**The roadway is no longer shown in the north-east of the site.** The 'London and North-East Railway' to the north of the site is shown to have been dismantled and the drain which extended beyond the northern boundary is no longer shown. Some of the small buildings to the east of the site are no longer shown (likely to have been demolished). The drain beyond the northern boundary is no longer shown. There is a small water source trending east to west, located where the drain used to be.
2022 1:10,000	**No significant changes are shown on the site.** All of the buildings to the east of the site, up to the Welsh Road are no longer shown. A road

Date(s) & Scale	Description
	to the south of the site has been constructed connecting to the Welsh Road.

2.2 Historical Aerial Imagery

Available aerial imagery dating from December 1945 to September 2021 has been reviewed on Google Earth Pro, along with those provided in the GS report.

A summary of the aerial photography is provided in Table 2.2.

Table 2.2 – Summary of Aerial Photography Viewed on Google Earth Pro

Date(s) & Scale	Feature
December 1945	**The site is shown to support a large area of open grassland.**
November 2003	**The roadway and the footprint of the building is shown in the north-east of the site. Trees are present along some boundaries.** Land to the east shows one large building and several smaller buildings.
April 2005	**No significant changes are shown on the site.** No significant changes are shown beyond the site.
May 2011	**No significant changes are shown on the site.** The buildings to the east of the site are in the process of being demolished.
April 2015	**No significant changes are shown on the site.** The buildings to the east of the site have now been demolished and the land is used for HGV and car parking.
June 2018	**The land in the north-east of the site is shown to have been farmed and the former building footprint is becoming overgrown with trees.** The land to the east is no longer used for parking. A new access road has been constructed from the Welsh road extending east to west across the development.
April 2021	**The land in the north-east of the site has been disturbed by the construction of a drainage ditch between the site and the land to the west*.** A large distribution centre (Amazon) has been constructed immediately east of the site.

*Prior to construction, remedial works were carried out on as part of the Phase 1 works for the development to the east, which included the removal of the roadway, building footprint and a small section of railway track.

2.3 Summary of Site History

Most of the plot, except for small building in the south of the site and a roadway, railway track and small building in the north-east of the site, which have all since been removed (as part of the Phase 1 remedial works), has remained undeveloped since the earliest OS mapping (1869).

The surrounding area has been progressively developed to support commercial units to the north and east.

The Airfield to the north of the site was developed as Deeside Industrial Estate sometime between 1945 and 1985.

During the early 2010s, the commercial units to the east of the site were demolished. The land was then used briefly for vehicle storage until 2016. Between 2020 and 2021 an Amazon distribution centre was constructed immediately to the east of the site.

3.0 SITE SETTING

3.1 Geology

The GS Report and the following geological publications have been consulted:

- Geological Survey of Great Britain. Sheet 108, Flint, 1:50,000 Scale, Solid & Drift.
- BGS Onshore GeoIndex (http://mapapps2.bgs.ac.uk/geoindex/home.html).
- BGS, Lexicon of Named Rock Units.

No made ground is shown to be present on the site.

The site is shown to be underlain by superficial deposits comprising Tidal Flat Deposits (Clay, Silt and Sand).

A fault, oriented north to south is shown to cross the eastern part of the site.

To the west of the fault and to the south on the eastern side of the fault, the underlying bedrock comprises Pennie Middle Coal Measures strata. To the north side of the eastern side of the fault, the underlying bedrock comprises the Kinnerton Sandstone Formation.

The Pennine Middle Coal Measures generally comprise interbedded grey mudstone, siltstone pale grey sandstone and commonly coal seams.

The Kinnerton Sandstone Formation is described as red brown to yellow, generally pebble-free, fine to medium grained and cross-stratified sandstone.

Historical borehole information has been requested from the BGS.

3.2 Coal Mining

The site does not lie within a Coal Authority Coal Mining Reporting Area, i.e. the site is not in an area affected by coal mining.

3.3 Quarrying/Mineral Extraction

The GS Report provides information from the British Pits (BritPits) database, which records active and closed surface and underground mineral workings. There are no records within 500m of the site.

3.4 Hydrogeology

The superficial deposits underlying the site are classified as a Secondary Undifferentiated Aquifer. Secondary Undifferentiated Aquifers are generally assigned where it is not possible to attribute either category A or B to a rock type.

The Pennine Middle Coal Measures bedrock, underlying the central, western and southern parts of the site is classified as a Secondary A Aquifer. Secondary A Aquifers are generally described as permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers.

The Kinnerton Sandstone Formation underlying the east and north-east of the site is classified as a Principal Aquifer. Principal Aquifers are generally described as geology of high intergranular and/or fracture permeability, usually providing a high level of water storage and may support water supply/river base flow on a strategic scale.

The site is located in an area with a high risk of groundwater flooding. The susceptibility and the risk of groundwater flooding occurring at the site should be re-assessed based on site specific information.

The site does not lie within 500m of an Environment Agency Groundwater Source Protection Zone (SPZ).

There are four recorded active groundwater abstraction licenses within 2km of the site. Three of these records relate to licences held for the abstraction of groundwater for 'process water' (these are located 1387m north-east, 1664m north and 1806m north-east of the site). The other record relates to a licence held for the abstraction of groundwater for 'pollution remediation', this is located 1476m north of the site.

There are no active potable water abstraction licences within 2km of the site.

3.5 Hydrology

The GS report indicates that surface water features comprising an inland river, not influenced by normal tidal action are located within 10m of the northern, eastern and southern boundaries of the site.

The site lies within the Water Framework Directive (WFD) surface water body coastal catchment for the Dee Estuary.

There is one recorded active discharge consent to surface water within 500m of the site. This is located 250m to the south of the site and relates to 'Trade Discharges-Site Drainage' to the River Dee.

There are no recorded active surface water abstractions within 2km of the site.

There are no records of active pollutant releases to surface water (red list) within 500m of the site.

The are no records of pollutant releases to the public sewer within 500m of the site.

The annual risk of flooding from the rivers and the sea (RoFRaS) is low (less than 1 in 100, but greater than or equal to 1 in 1000).

Information on the EA website and presented in the GS report indicate that the site lies within an Environment Agency Zone Flood Zone 3.

The site is located in an area with a 1 in 30-year risk of surface water flooding occurring, at a depth of between 0.30m and 1.00m.

It is likely that a flood risk assessment will be required by the Local Authority as part of any planning application for the site.

3.6 Pollution Incidents

There are records of 13 Environment Agency recorded pollution incidents within 500m of the site. Three of these were recorded as either significant or major, these are summarised in Table 3.6 below.

Table 3.6 – Summary of Environment Agency Recorded Pollution Incidents with Significant Impacts

Distance & Direction	Incident Date	Incident Identification	Pollutant	Impacts
240m South	20/05/2021	2104408	Inert Materials and Waste. Soils and clay.	Water Impact: Category 2 (Significant)
350m East	04/02/2002	56931	Specific Waste Materials. Tyres.	Land Impact: Category 2 (Significant)
356m North-East	28/05/2020	2003726	Atmospheric Pollutants and Effects. Smoke.	Land Impact: Category 1 (Major) Air Impact: Category 1 (Major)

3.7 Environmental Permits and Registers

There are no recorded active Control of Major Accidents Hazard (COMAH) sites within 500m of the site.

There are no records of historical Integrated Pollution Control (IPC) authorisations within 500m of the site.

There are no recorded active Part A (1) licensed industrial activities within 500m of the site.

There are no recorded active Part A (2) licensed pollutant release installations within 500m of the site.

There is one recorded active Part B licensed pollutant release installation within 500m of the site. This is recorded 253m north-west of the site and refers to a permit for printing at Excelsior Technologies Limited.

There are no recorded active radioactive substance authorisations within 500m of the site.

There are no records of discharges of special category effluents to the public sewer within 500m of the site.

There are no active List 1 or List 2 Dangerous Substances Inventory Sites within 500m of the site.

There are no sites determined as Contaminated Land under Part 2A of the Environmental Protection Act (EPA) 1990 within 500m of the site.

3.8 Landfills and Waste

The GS report includes information on active and former landfill sites supplied by the EA/Natural Resource Wales, Local Authority and the BGS.

There are no historical, active, or recently closed landfill sites within 500m of the site.

There are records of seven active waste treatment, transfer, or disposal sites within 500m of the site. There are four active waste exemptions within 500m of the site.

3.9 Radon Risks

The Building Research Establishment publication BR211 states that the site is in a radon affected area, as between 1% and 3% of the homes are above the action level for radon gas. However, basic radon protective measures will not be necessary in the construction of new dwellings or extensions.

3.10 Additional Information

There are no records of historical petrol stations, garages, or military land within 500m of the site.

3.11 Previous Reports

There are several historical reports for the site and surrounding area which have been reviewed by JPG as part of this desk study.

4.0 ENVIRONMENTAL RISK ASSESSMENT

4.1 Introduction

The statutory definition of contaminated land is given in the Environmental Protection Act, Part 2A, Section 78, 1990, which was introduced by the Environment Act, Section 57, Department of Environment, 1995 and is defined as:

Land which appears to the Local Authority in whose area it is situated to be in such a condition, by reason of substances in, on or under the land that:

- Significant harm is being caused or there is a significant possibility of such harm being caused (where harm is defined as harm to health of living organisms or other interference with the ecological systems of which they form a part and, in the case of man, includes harm to his property); and/or
- Significant pollution of controlled waters is being caused, or there is a significant possibility of such pollution being caused (by the land).

The presence of contaminated materials on a site is generally only of concern if an actual or potentially unacceptable risk exists. The potential for harm to occur requires three conditions to be satisfied:

- Sources – The presence of substances (potential contaminants/pollutants), in or under the ground, that may cause harm or pollution.
- Receptors - The presence of a receptor which may be harmed, e.g. the water environment or humans, buildings, fauna and flora; and,
- Pathway - The existence of a linkage between the Source and the Receptor.

In summary, the presence of measurable concentrations of contaminants within the ground and subsurface environment does not automatically imply that a contamination problem exists, since contamination must be defined in terms of pollutant linkages and an unacceptable risk of harm to available receptors.

The nature and importance of both pathways and receptors, which are relevant to a particular site, will vary according to the sensitivity of the intended end use of the site and the site's characteristics and environmental setting.

Legislation and guidance on the assessment of contaminated sites acknowledges the need for a tiered risk-based approach. This is set out in the Environment Agency's manual Land contamination: risk management (LCRM), published in June 2019 and last updated on 19 April 2021. The LCRM outlines the following stages of risk assessment:

Tier 1: Preliminary risk assessment (PRA)	As part of this assessment, the overall site objectives are defined. Current and historical information about the site and the potential contaminants expected to be present are assessed and an outline conceptual model (CM) is developed. The risks are assessed qualitatively, and the findings reported in the PRA (or desk study). The report recommends what further works would be required in order to assess whether the site is suitable for its proposed use.
Tier 2: Generic quantitative risk assessment (GQRA)	The GQRA uses Generic Assessment Criteria and a standard set of generic assumptions based on specific end uses in order to assess the risks to receptors. It includes the collection of more detailed information including laboratory analysis of soil and water samples in order to inform and assess the risks.
Tier 3: Detailed quantitative risk assessment (DQRA)	If pollutant linkages are confirmed as part of the GQRA, these are known as relevant pollutant linkages (RPLs) and further detailed assessment is required. At this tier, detailed site-specific information is collected to estimate the risk or to develop site-specific assessment criteria (SSAC). This may include collecting information about the receptor.

This desk study report represents a Tier 1 Preliminary Risk Assessment.

4.2 Potential Sources

The following potentially contaminative sources may be present on or adjacent to the site:

- Residual made ground associated with the former buildings/infrastructure in the south and north-east of the site.
- Made ground associated with the former railway tracks to the north of the site.

Potential contaminants which could be present on the site are listed below:

- Metals, metalloids and their compounds.
- Inorganic compounds, e.g. arsenic.
- Asbestos fibres.
- Polycyclic aromatic hydrocarbons (PAH); and
- Hazardous ground gases.

4.3 Potential Pathways

Based on the available information and the proposed development of the site for a commercial end use, the following potential exposure pathways will require consideration, both during the redevelopment works and on completion of construction:

- Ingestion, inhalation and/or dermal contact with contaminated soil and groundwater.
- Inhalation of hazardous ground gases/asbestos fibres.
- Leaching/migration of potential contaminants from soil into groundwater via surface infiltration, drainage and/or groundwater flow.
- Permeation of water supply pipes and other services by organic and aggressive contaminants; and
- Uptake of contaminants by planting in landscape areas.

4.4 Potential Receptors

The potential receptors considered are:

- Development workers and future maintenance workers involved in excavations, e.g. foundations or where services are being installed or repaired following development.
- Future end users of the site, i.e. employees and staff.
- Adjacent site users, i.e. employees.
- Controlled Waters, i.e. the underlying Secondary Undifferentiated Aquifer in the superficial deposits, the underlying Secondary A Aquifer (Pennine Middle Coal Measures) in the west and south east and the Principal Aquifer (Kinnerton Sandstone Formation) in the north east.
- Buildings and infrastructure; and
- Planting in landscaped areas.

4.5 Pollutant Linkage Assessment

A potential pollutant linkage assessment has been completed and is summarised in the Conceptual Site Model, which is provided in Section 4.6. This is based on the proposed development of the site for a commercial end use.

Based on the proposed commercial end use and history of the site, the following potential pollutant linkages may be present:

- Development and maintenance workers and site end users (employees) could come into contact with soils and groundwater containing elevated concentrations of potential contaminants and hazardous ground gases.

- The underlying Secondary Undifferentiated Aquifer, Secondary A Aquifer and Principal Aquifer could become contaminated due to the leaching and migration of potential contaminants from any made ground.
- Buildings and services could be affected by potential contaminants in any made ground; and,
- Plants in landscape areas could be affected by phytotoxic elements within any made ground.

These are based on current site conditions and do not consider exposure pathways following any remediation of the site.

4.6 Conceptual Site Model & Risk Rating

The conceptual model is summarised in Table 4.6.

Table 4.6 Preliminary Conceptual Model

Source	Pathway	Receptor	Risk Rating	Comments
Residual made ground associated with the former buildings/ infrastructure in the south and north-east of the site. Made ground associated with the former railway tracks to the north of the site.	• Inhalation. • Ingestion. • Dermal contact.	**Future Site Users** • Future employees. • Maintenance workers.	Low/ Moderate	Ground investigation and sampling to establish levels of contamination present.
		Users During Development • Development workers.		
	• Inhalation. • Ingestion.	**Users of Surrounding Sites** • Employees of surrounding sites.	Low/ Moderate	Potential risk during construction from dust generation.
	• Leaching/ mobilisation of contaminants via surface water and groundwater flow	**Groundwater** • Secondary A Aquifer. • Principal Aquifer.	Low/ Moderate	Secondary A Aquifer and Principal Aquifer. Site not located in a groundwater Source Protection Zone. No nearby groundwater abstractions.
		Surface Water Features • Adjacent Inland Rivers.		No surface water abstractions within 2km.
Hazardous ground gases associated with the made ground.	• Inhalation.	**Future Site Users** • Future employees. • Maintenance workers. **Built Environment** • Buildings. • Infrastructure.	Low/ Moderate	Limited potential for significant thicknesses of made ground, based on the site history and current land use. Gas monitoring to be undertaken as part of ground investigation.
		Users During Development • Development Workers.	Low/ Moderate	Limited potential for significant thicknesses of made ground, based on the site history and current land use. Gas monitoring to be undertaken as part of ground investigation. Appropriate health and safety procedures to be in place during the construction phase of the development.
Areas of Phytotoxic Contamination	• Root uptake.	**Vegetation** • Proposed landscaping.	Low/ Moderate	Ground investigation and sampling to establish levels of any phytotoxic contamination present.
Aggressive Contaminants in Soil/Water	• Direct contact.	**Construction Materials** • Concrete.	Low /Moderate	Samples of made and natural ground should be obtained and submitted to the laboratory for testing in order to assess the sulphate content and acidity.
		Construction Materials • Services.		

4.7 Risk Classification

Based on the conceptual site model, the site should be considered to be **low to moderate** with respect to contamination. This designation will be largely dependent on the nature of the made ground and hazardous ground gases present on or adjacent to the site.

In order to assess further and classify the risks to human health, groundwater, surface water and buildings/services, a Phase 2 geoenvironmental ground investigation, to include a Tier 2 Generic Quantitative Risk Assessment, will be required. The Phase 2 geoenvironmental ground investigation will include chemical testing of soils, leachate and groundwater, as well as hazardous ground gas monitoring.

5.0 PRELIMINARY ENGINEERING ASSESSMENT

5.1 Development Proposals

It is proposed to develop the site for a commercial end-use.

At the present time, no fixed development plan has been provided.

5.2 Coal Mining Assessment

The site does not lie within a Coal Authority Coal Mining Reporting Area, i.e. the site is not in an area affected by coal mining.

5.3 Quarrying/Mineral Extraction

The GS Report provides information from the British Pits (BritPits) database, which records active and closed surface and underground mineral workings. There are no records within 500m of the site. The site will therefore not be affected by quarrying or mineral extraction.

5.4 Earthworks

Based on the existing topography and development proposals, it is anticipated that levels may be required to be raised in order to service the proposed development and create a level development platform.

Any earthworks should be carried out in accordance with the Manual of Contract Documents for Highway Works, Volume 1 Specification for Highway Works, Series 600 Earthworks.

5.5 Foundations

Based on the information provided in the GS report, geological maps and historical on-site borehole data, ground conditions below the site are likely to comprise localised made ground (topsoil) underlain by superficial Tidal Flat Deposits, comprising clay, silt and sand.

The selection of foundation type for the proposed development will be governed by the thickness of the made ground and the strength and settlement characteristics of the underlying natural strata.

Where natural strata of suitable allowable bearing capacity for the proposed development is encountered at a relatively shallow depth, then a shallow foundation solution, i.e. pad or strip/trenchfill, would be suitable.

However, if the depth to a suitable founding strata is too great, then consideration could be given to ground treatment options, e.g. vibro-stone columns to increase the bearing capacity of the soils. Alternatively, consideration could be given to a deeper piled foundation solution.

The advice of a specialist contractor will be required to confirm that ground conditions are suitable for ground improvement techniques and that adequate bearing values and tolerable settlements can be achieved.

5.6 Ground Floor Construction

For a ground bearing floor slab, it is recommended that the formation level is proof rolled and inspected. Any soft or loose materials should be removed and replaced with suitably compacted granular materials.

Any earthworks or ground improvement should be designed in order to achieve the specified allowable bearing capacity and limits on settlement for a ground bearing floor slab.

The advice of a specialist contractor will be required to confirm that ground conditions are suitable, and that adequate bearing values and tolerable settlements can be achieved.

The requirements of any ground gas protection measures will also need to be taken into consideration in relation to ground floor design and construction.

5.7 Groundwater

The presence of groundwater will need to be assessed as part of any ground investigation.

5.8 Obstructions

Based on the history of the site, no significant obstructions are anticipated.

5.9 Roads, Pavements and Hardstanding Surfaces

It is recommended that, at this stage, a conservative bearing value for the subgrade is assumed until the nature of the sub-grade can be physically assessed. Any earthworks should be designed to achieve a suitable CBR value for the proposed development.

5.10 Chemical Attack on Buried Ground

Samples of made and natural ground and groundwater should be obtained and submitted to the laboratory for testing in order to assess the sulphate content and acidity and hence the concrete class required for buried concrete to the latest standard.

6.0 FURTHER INVESTIGATIONS

In order to further assess the potential geotechnical and environmental constraints to the proposed development, it is recommended that a phase 2 intrusive ground investigation is carried out.

Appendix A Figures and Drawings

Figure 1 – Site Location Plan	
Site	**Plot B, The Airfields, Deeside**
Client	**Commercial Development Projects Limited**
Job Number	**4671**
Scale	**NTS**

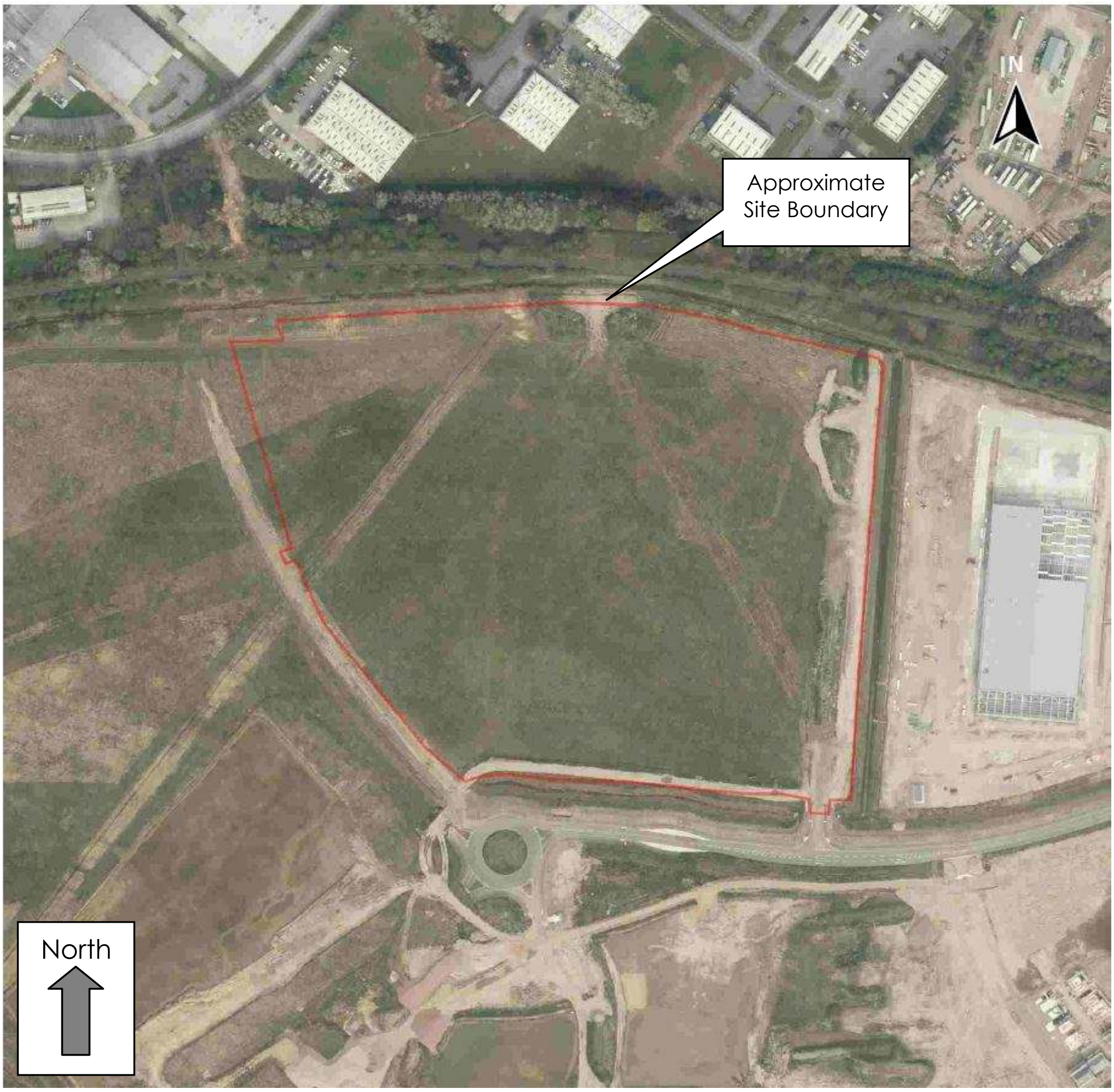


Figure 2 – Aerial Photograph	
Site	**Plot B, The Airfields, Deeside**
Client	**Commercial Development Projects Limited**
Job Number	**4671**
Scale	**NTS**

Appendix B Site Photographs

Photograph 1: View looking northeast across the site.

Photograph 2: View looking south across the site.

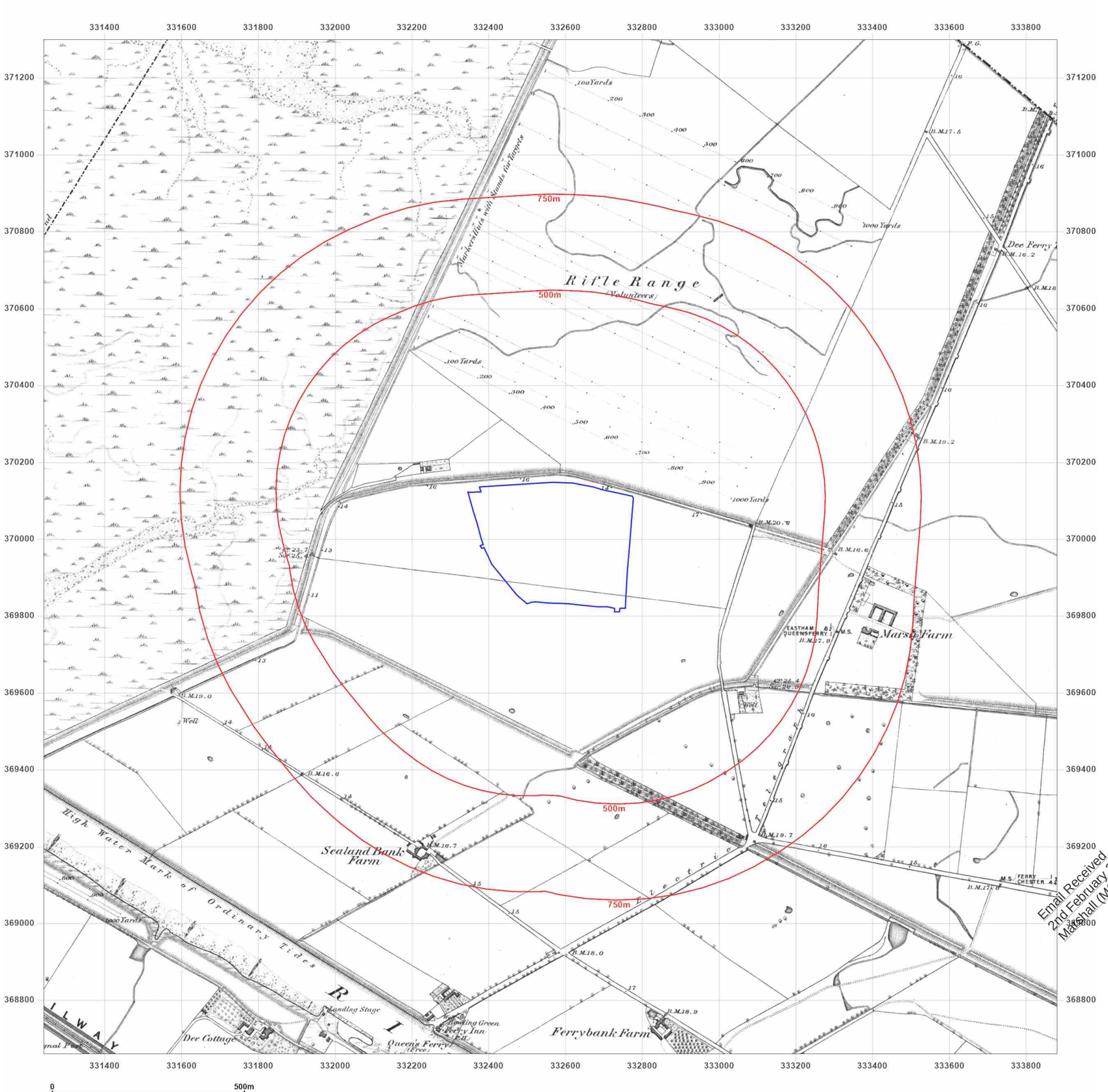
Photograph 3: View looking west across the site.

Photograph 4: View looking north towards the Swale, along the site's eastern boundary.

Photograph 5: View Looking north-west towards the north-western corner.

Photograph 6: View looking east towards the swale bordering the site's southern border.

Appendix C Historical Maps



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Report Ref: CMAPS-JPG-1041195-62914-270522HIS
Grid Ref: 332560, 369979

Map Name: County Series

Map date: **1869**

Scale: 1:10,560

Printed at: 1:10,560

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Surveyed 1869
Revised 1869
Edition N/A
Copyright N/A
Levelled N/A

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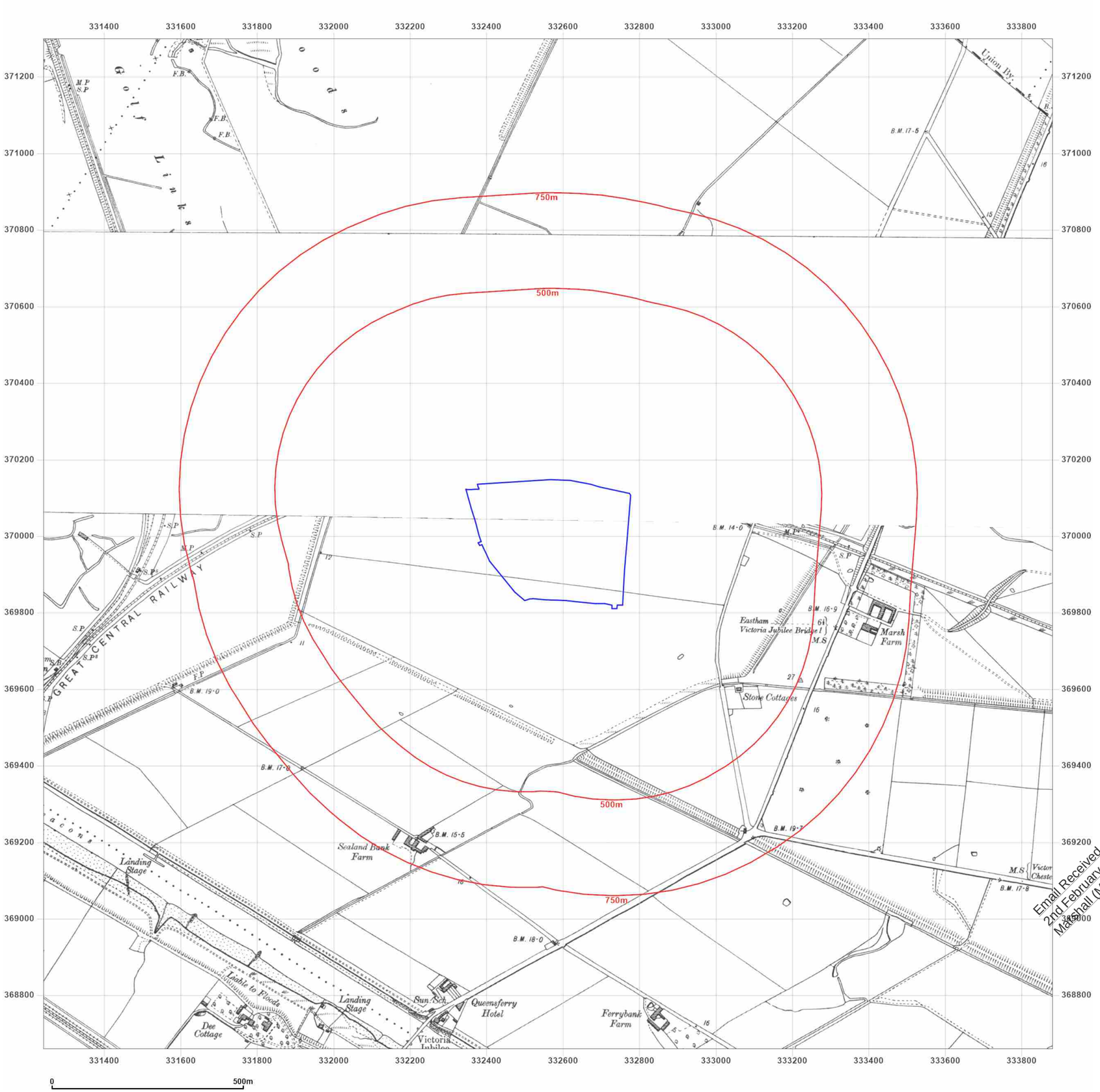

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Report Ref: CMAPS-JPG-1041195-62914-270522HIS
Grid Ref: 332560, 369979

Map Name: County Series

Map date: **1897-1898**

Scale: 1:10,560

Printed at: 1:10,560

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Revised 1897
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Copyright N/A
Levelled N/A

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Revised 1898
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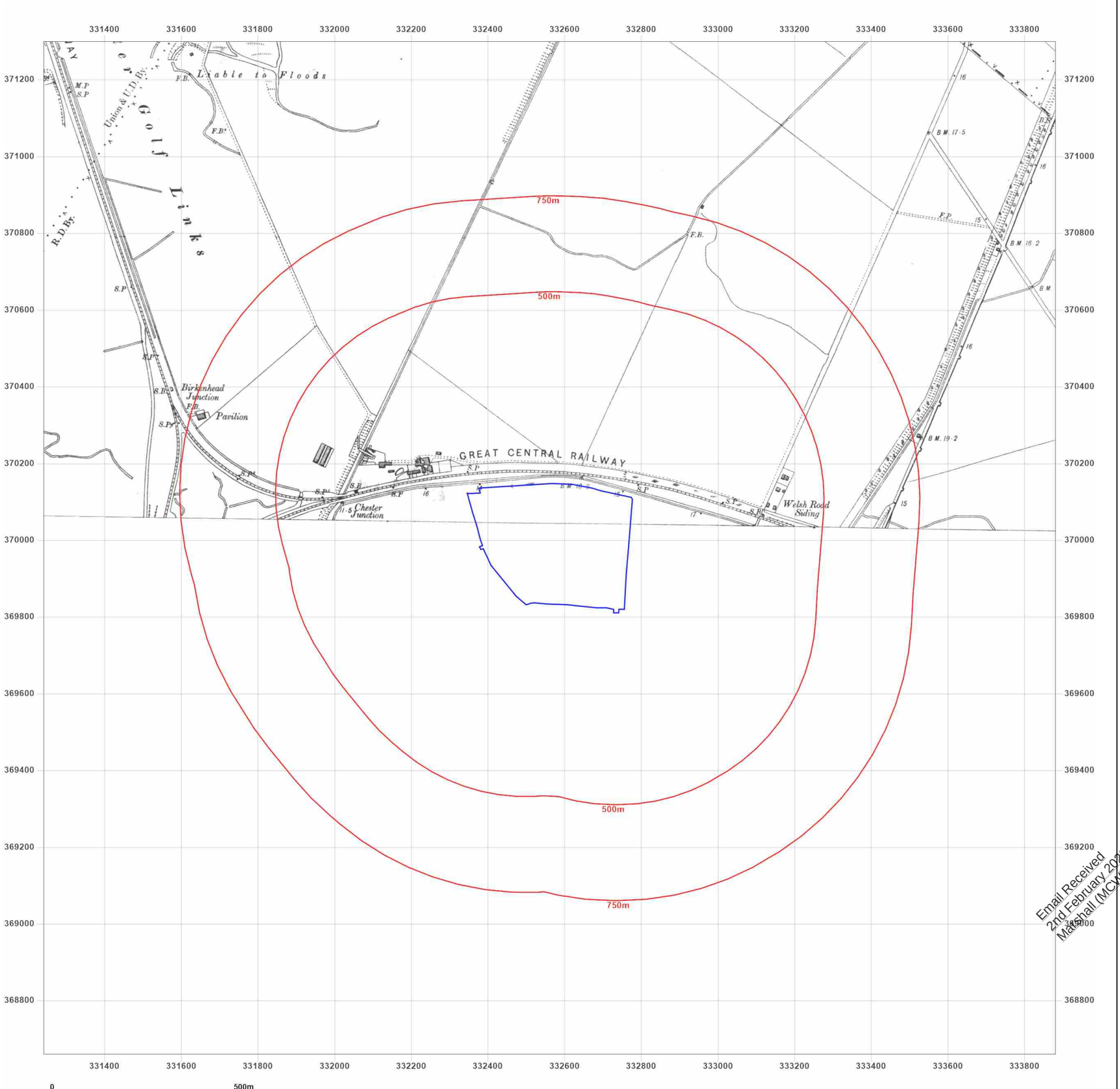

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Grid Ref: 332560, 369979

Map Name: County Series

Map date: **1898**

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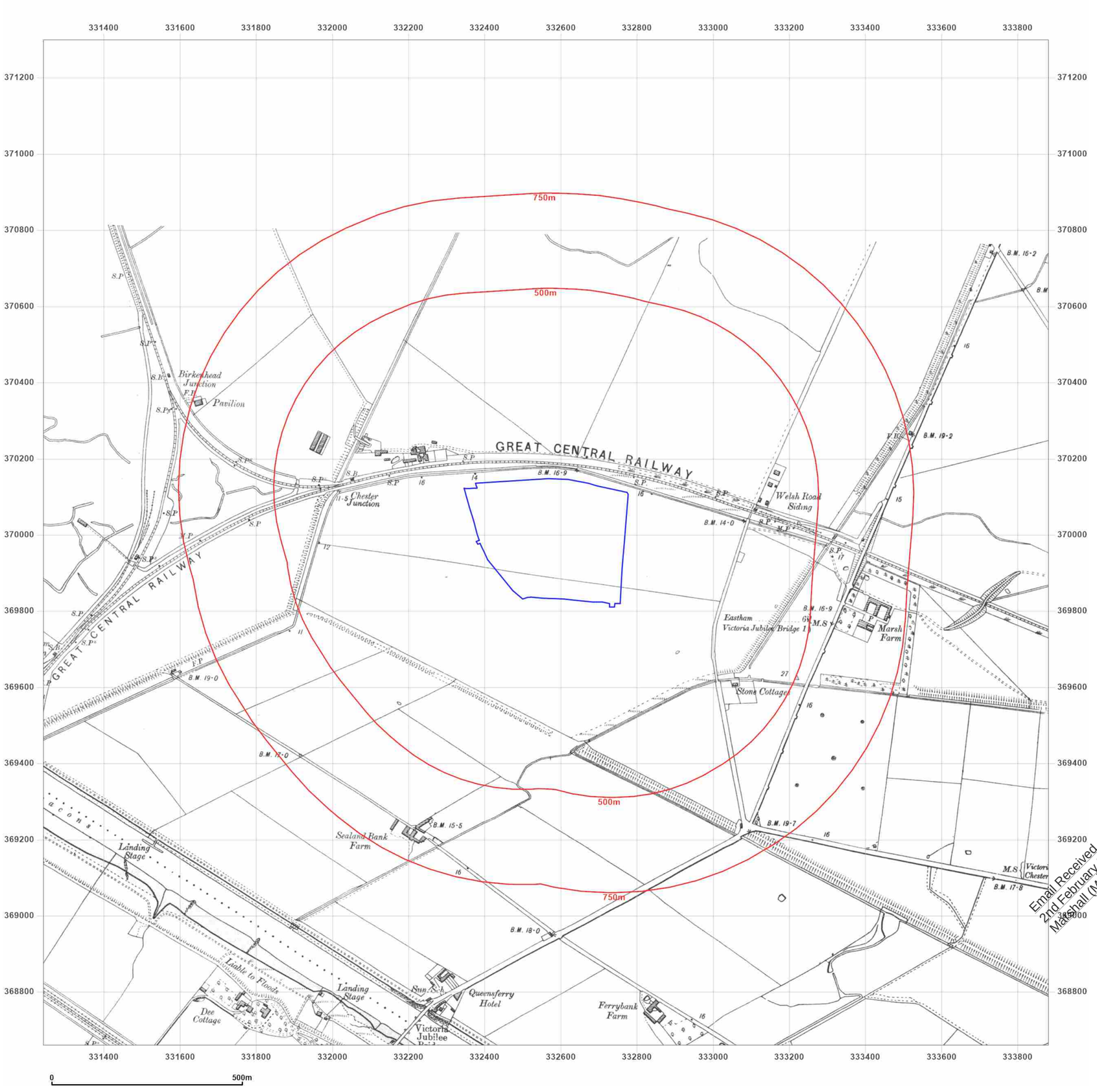

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Scale: 1:10,560

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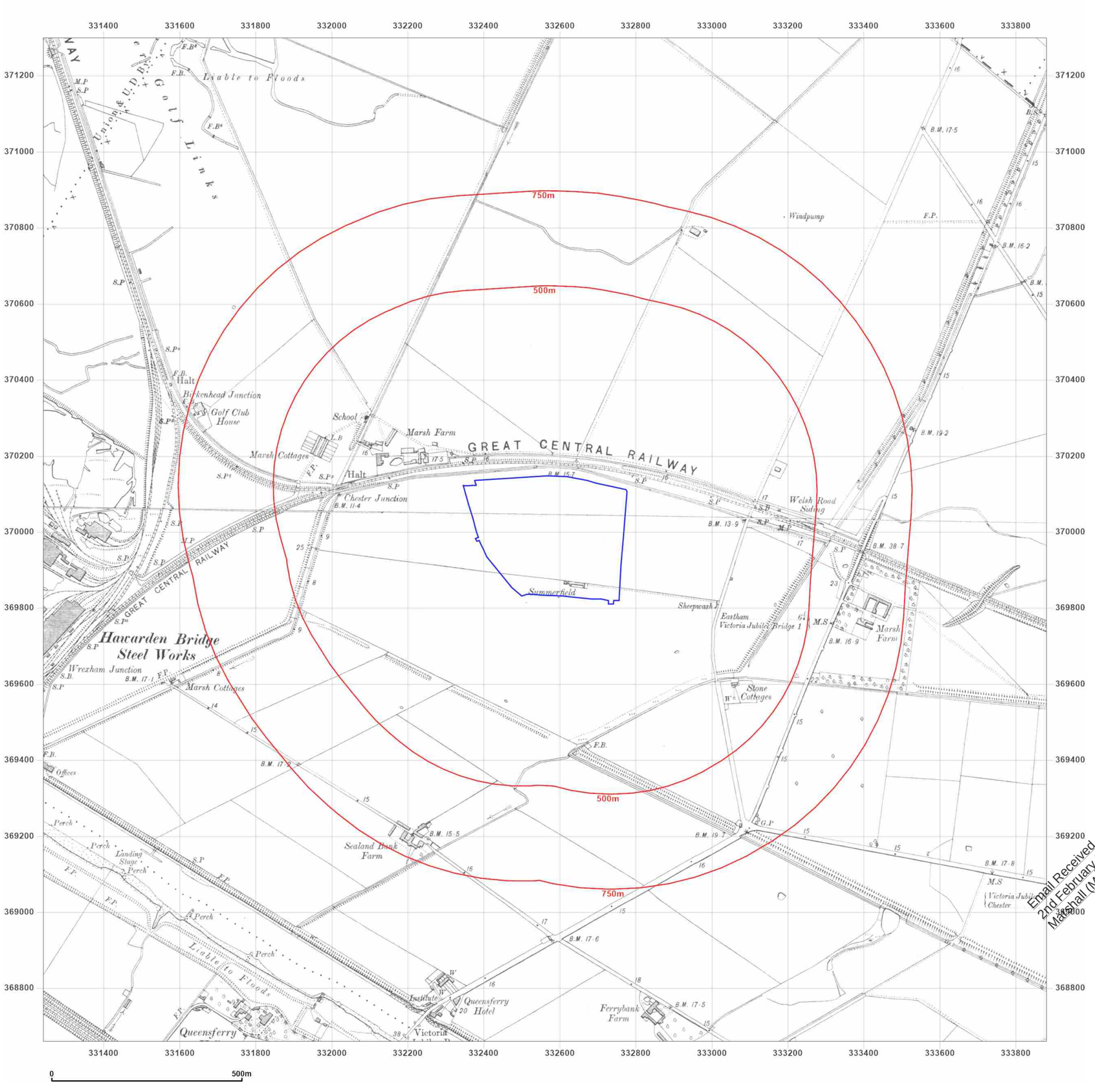

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Map Name: County Series

Map date: **1909-1913**

Scale: 1:10,560

Printed at: 1:10,560

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Revised 1913
Edition 1913
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Revised 1909
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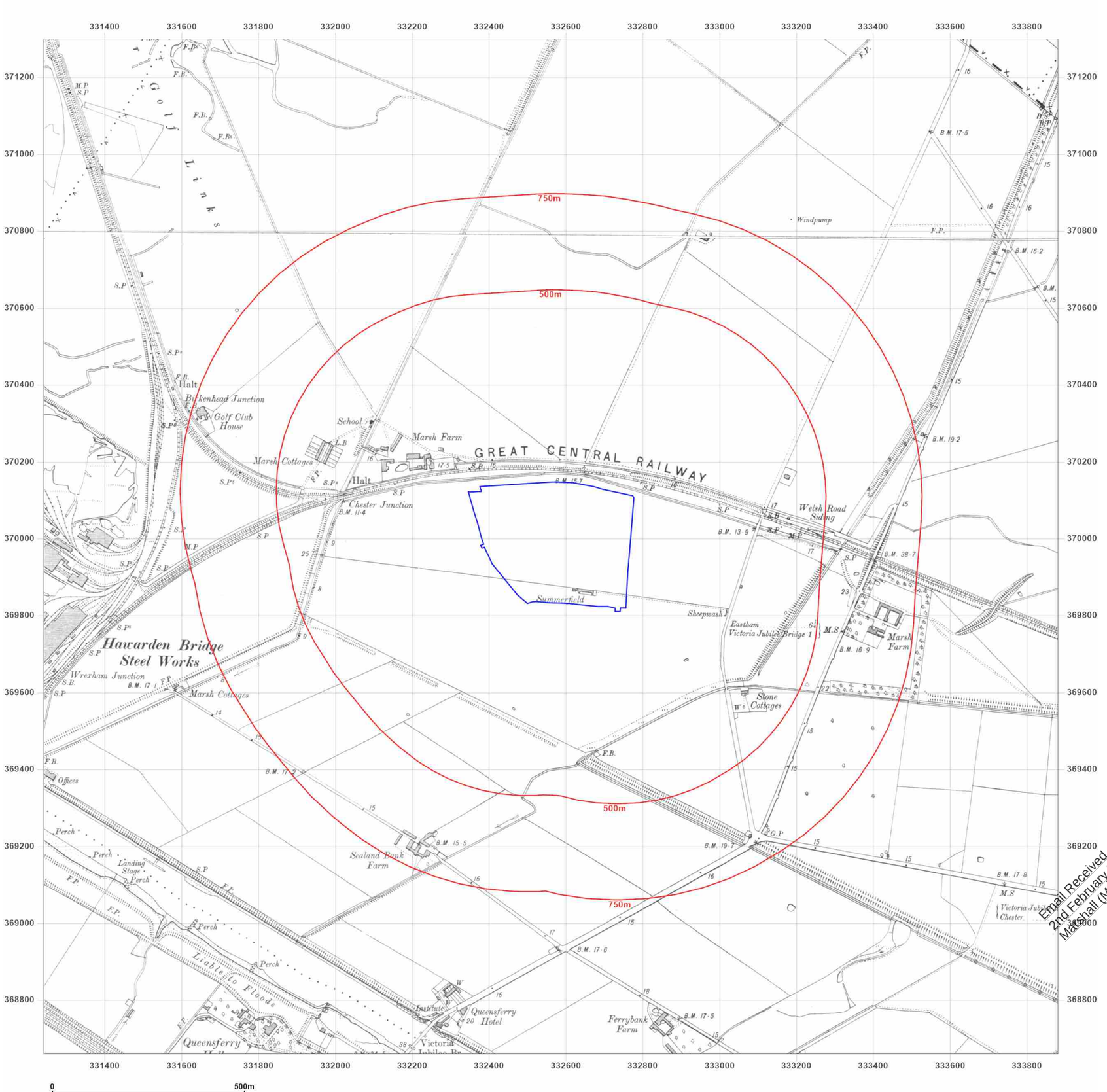

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Map Name: County Series

Map date: **1913-1914**

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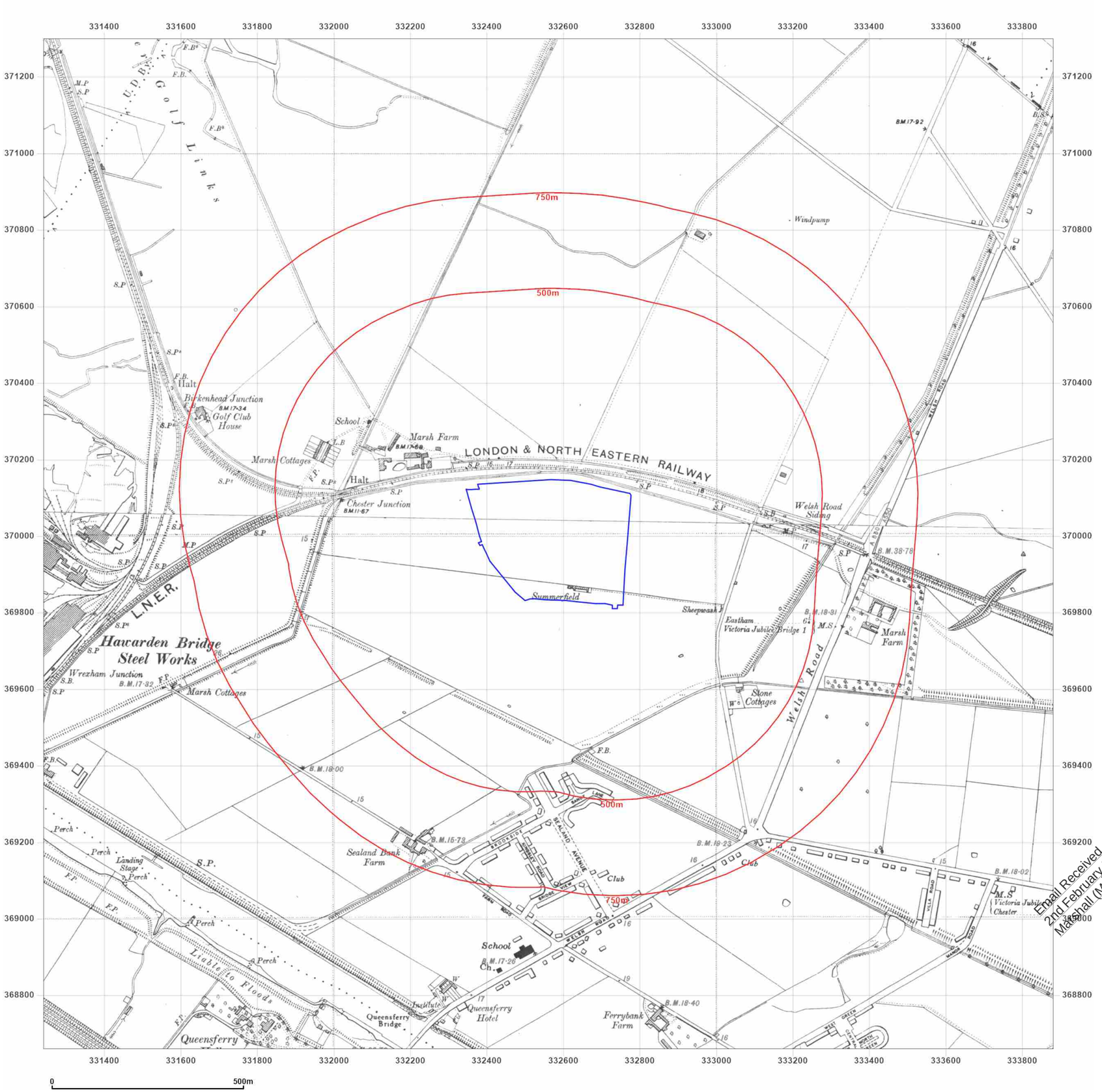

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Map Name: County Series

Map date: **1938**

Scale: 1:10,560

Printed at: 1:10,560

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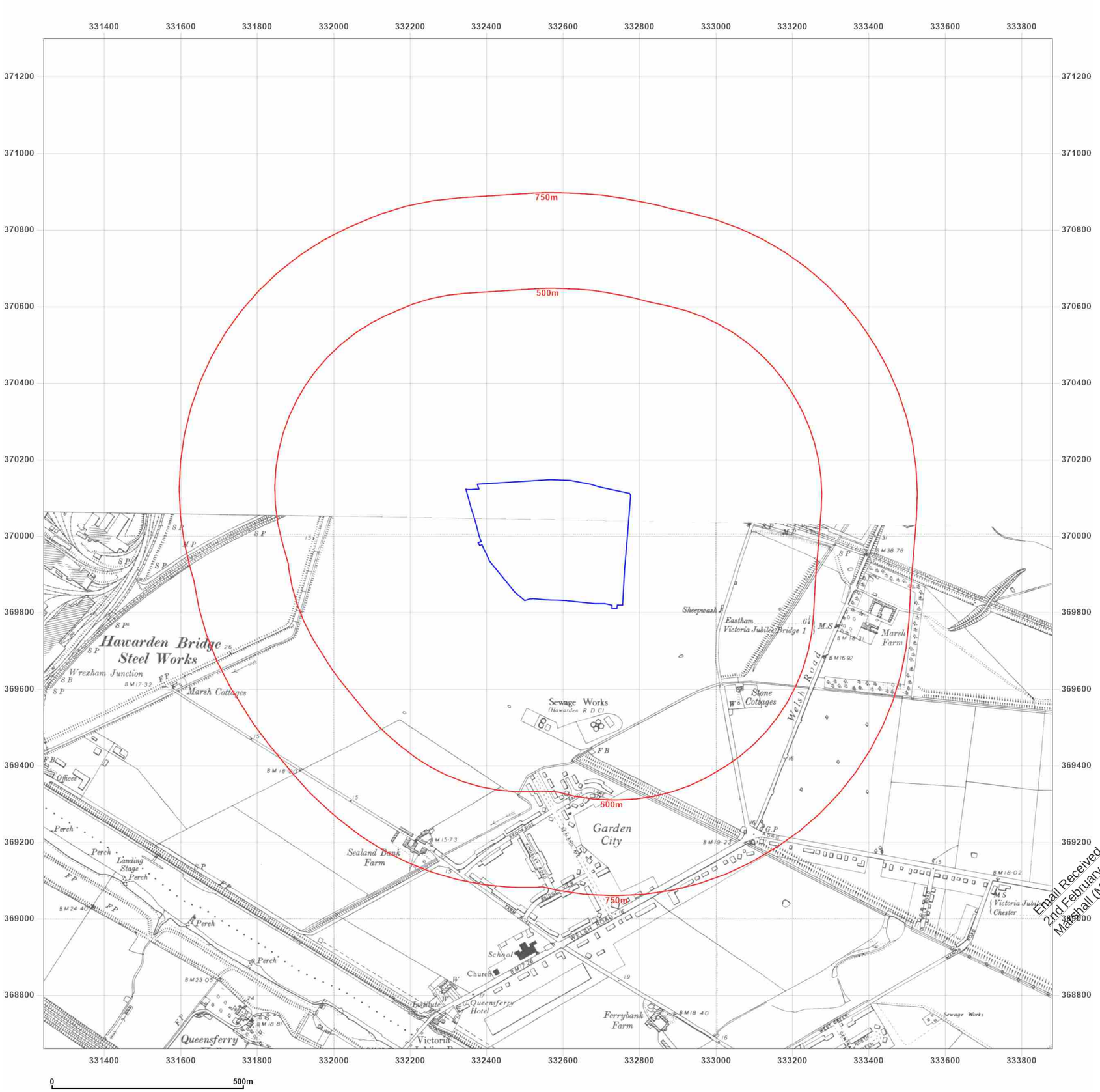

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Map Name: County Series

Map date: **1948**

Scale: 1:10,560

Printed at: 1:10,560

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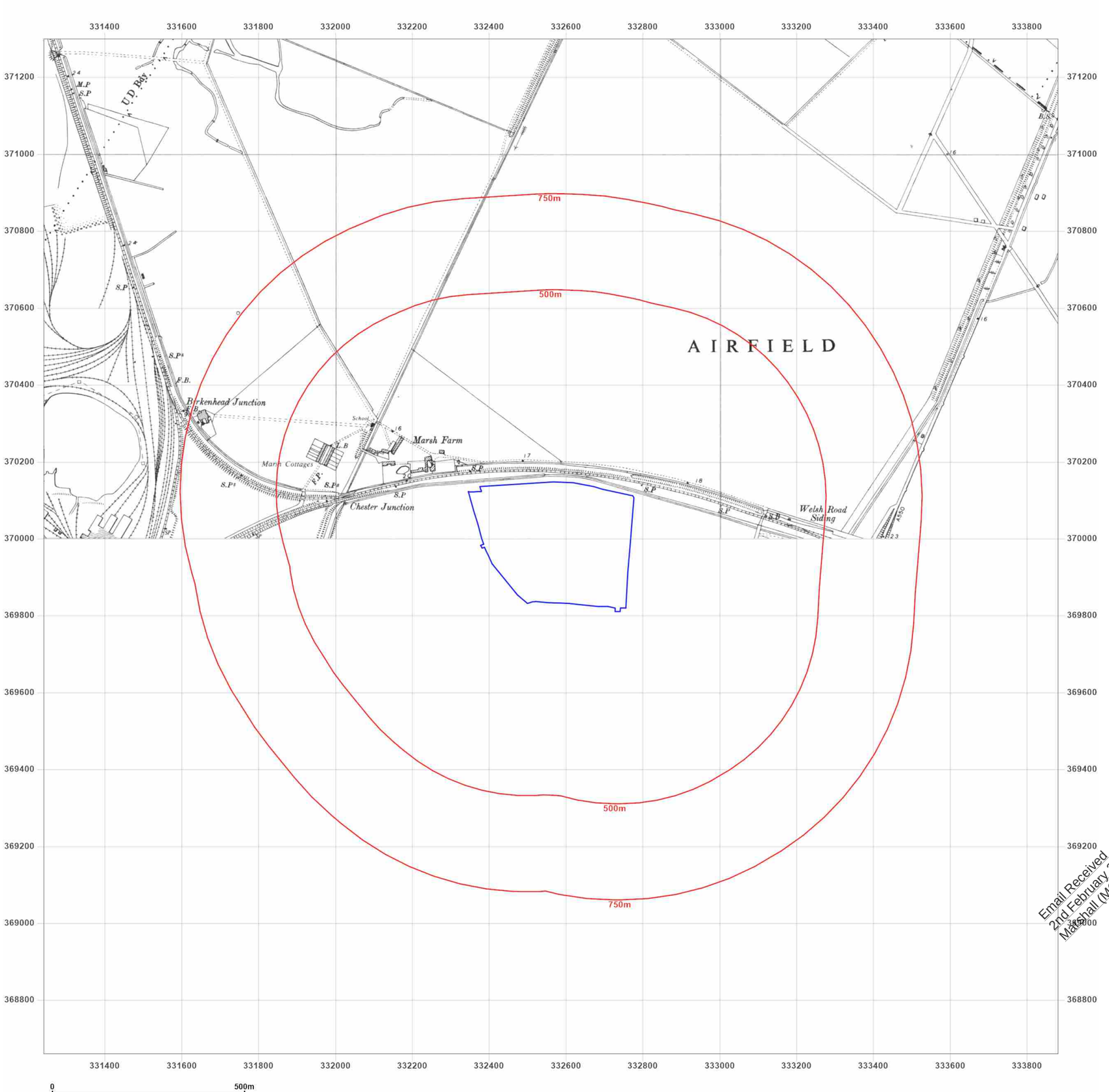

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Map Name: Provisional
Map date: **1954**
Scale: 1:10,560
Printed at: 1:10,560

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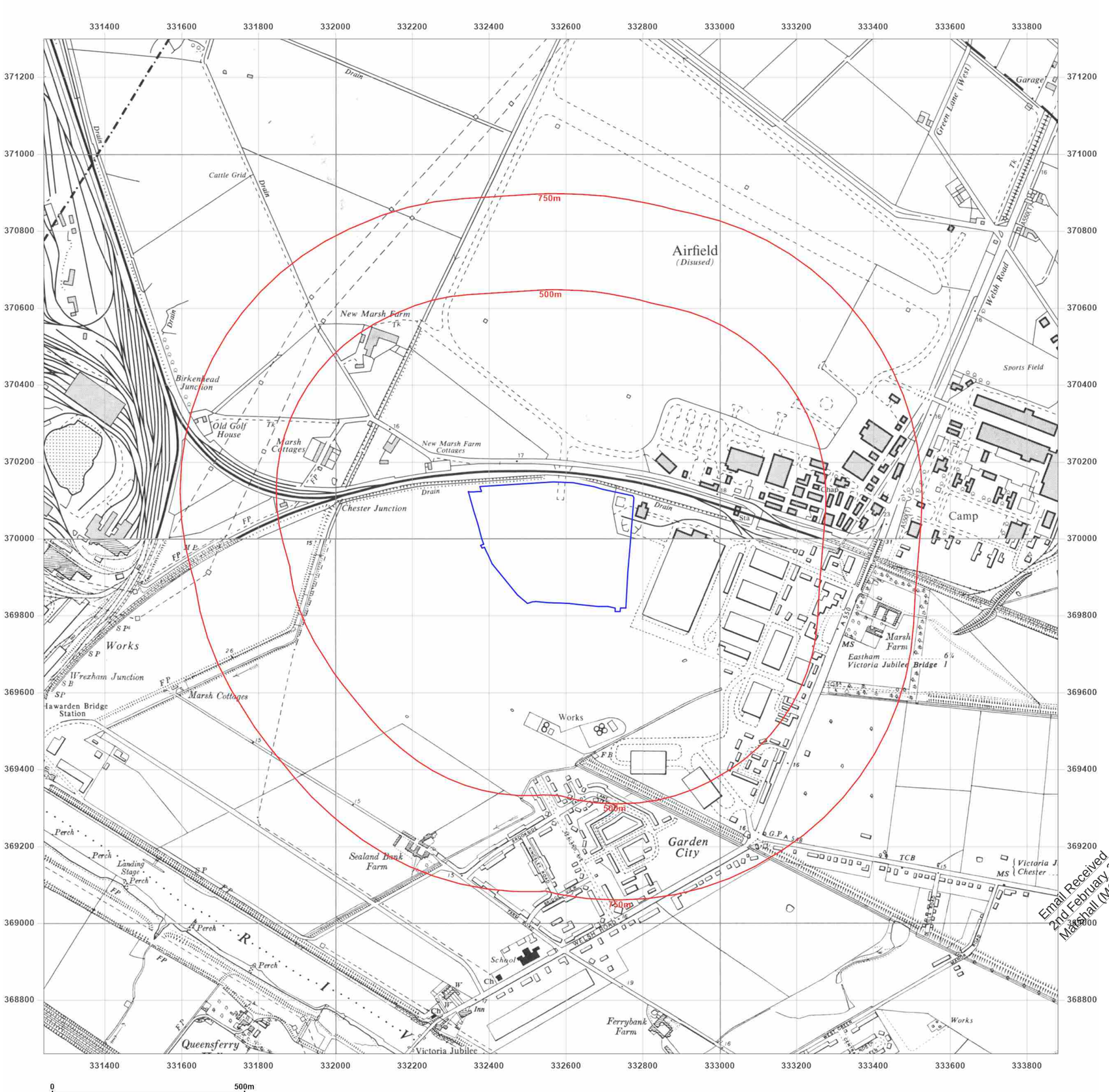

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Report Ref: CMAPS-JPG-1041195-62914-270522HIS
Grid Ref: 332560, 369979

Map Name: Provisional

Map date: **1960-1963**

Scale: 1:10,560

Printed at: 1:10,560

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Revised 1960
Edition N/A
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Surveyed N/A
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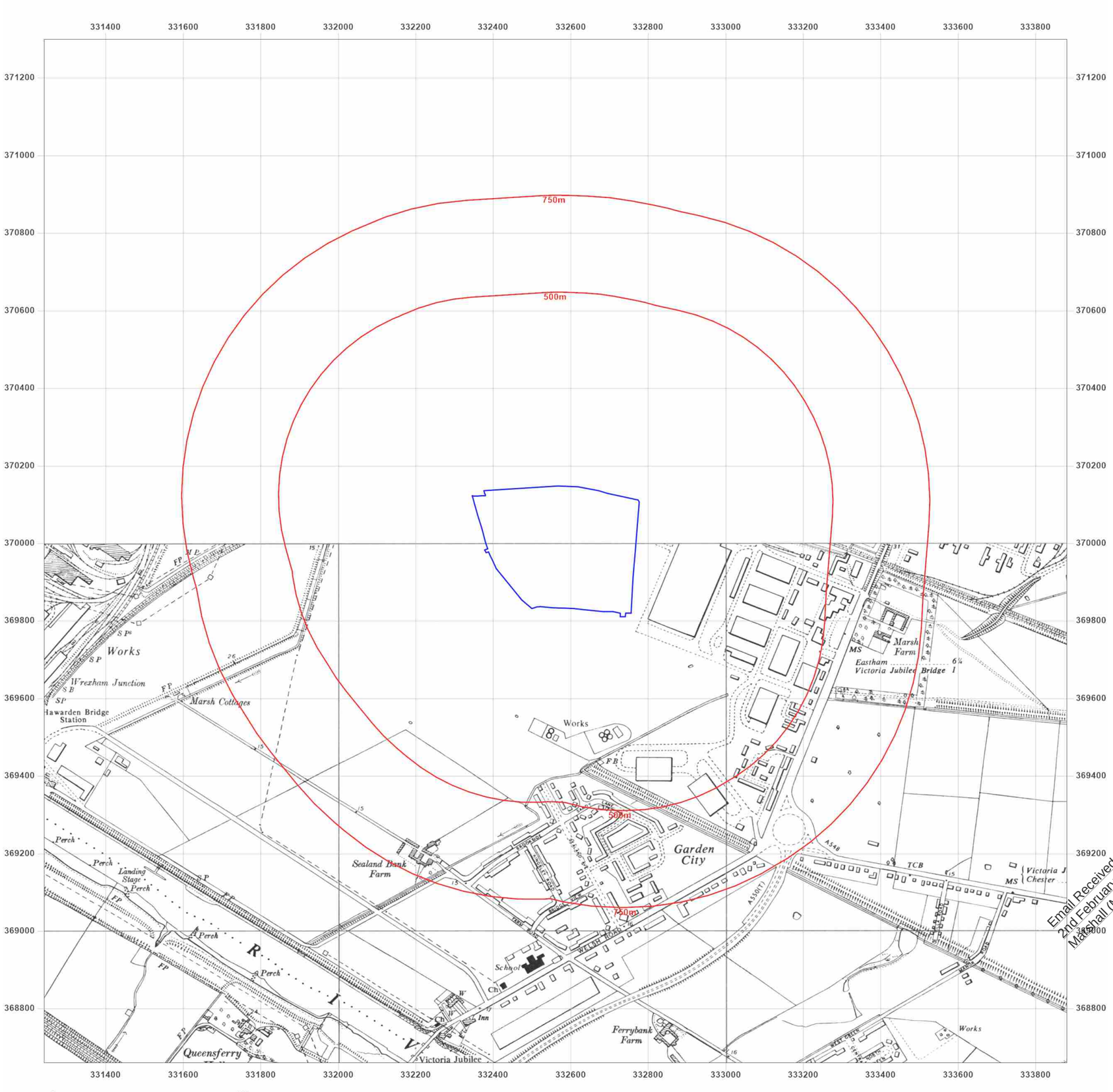

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Map Name: Provisional

Map date: **1963**

Scale: 1:10,560

Printed at: 1:10,560

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Report Ref: CMAPS-JPG-1041195-62914-270522HIS
Grid Ref: 332560, 369979

Map Name: Provisional

Map date: **1969-1970**

Scale: 1:10,560

Printed at: 1:10,560

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Surveyed 1965
Revised 1970
Edition N/A
Copyright 1970
Levelled N/A

Surveyed 1965
Revised 1968
Edition N/A
Copyright 1969
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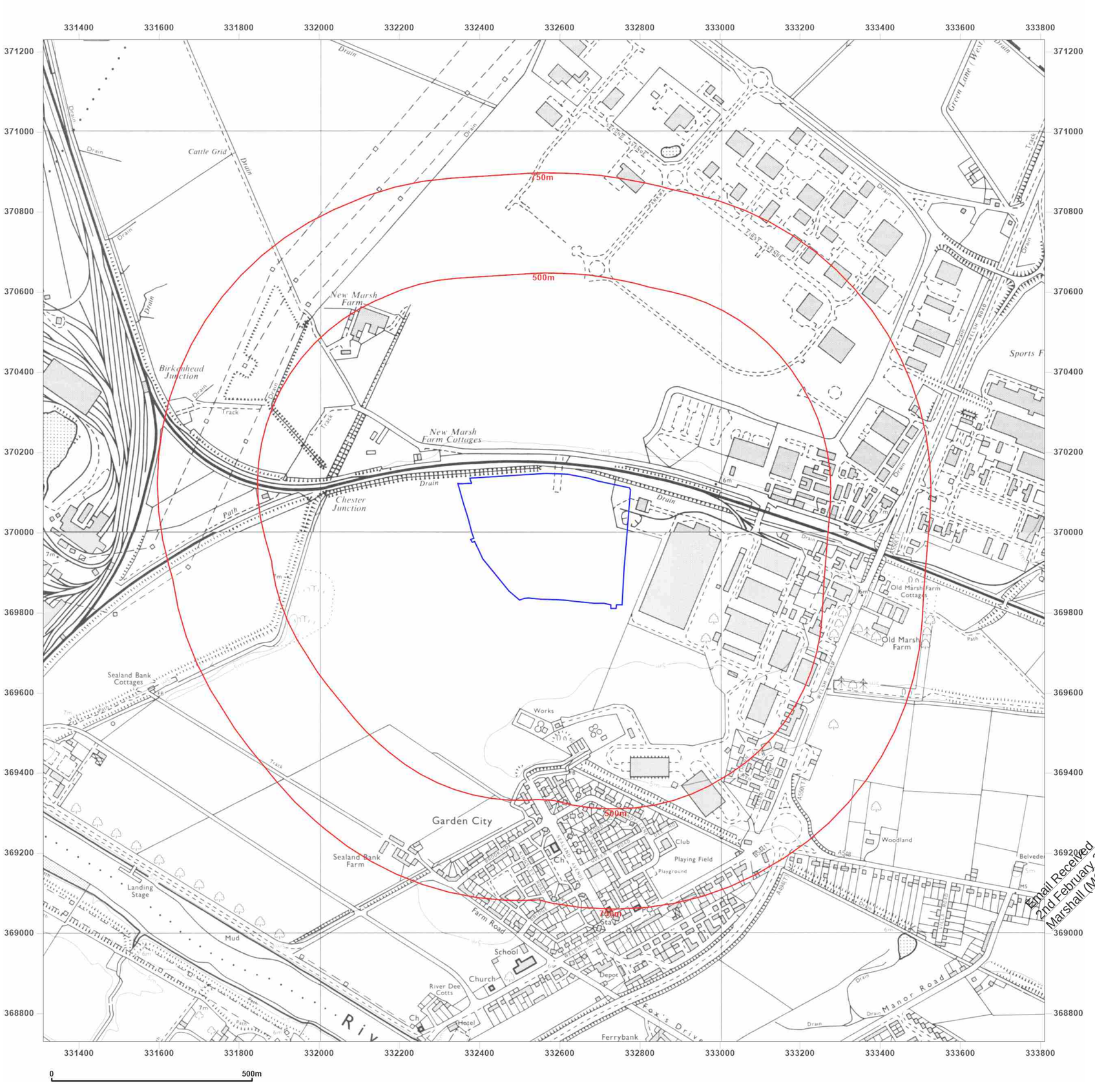

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Grid Ref: 332560, 369979

Map Name: National Grid

Map date: **1978-1981**

Scale: 1:10,000

Printed at: 1:10,000

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Surveyed 1981
Revised 1981
Edition N/A
Copyright N/A
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Surveyed 1969
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Copyright 1978
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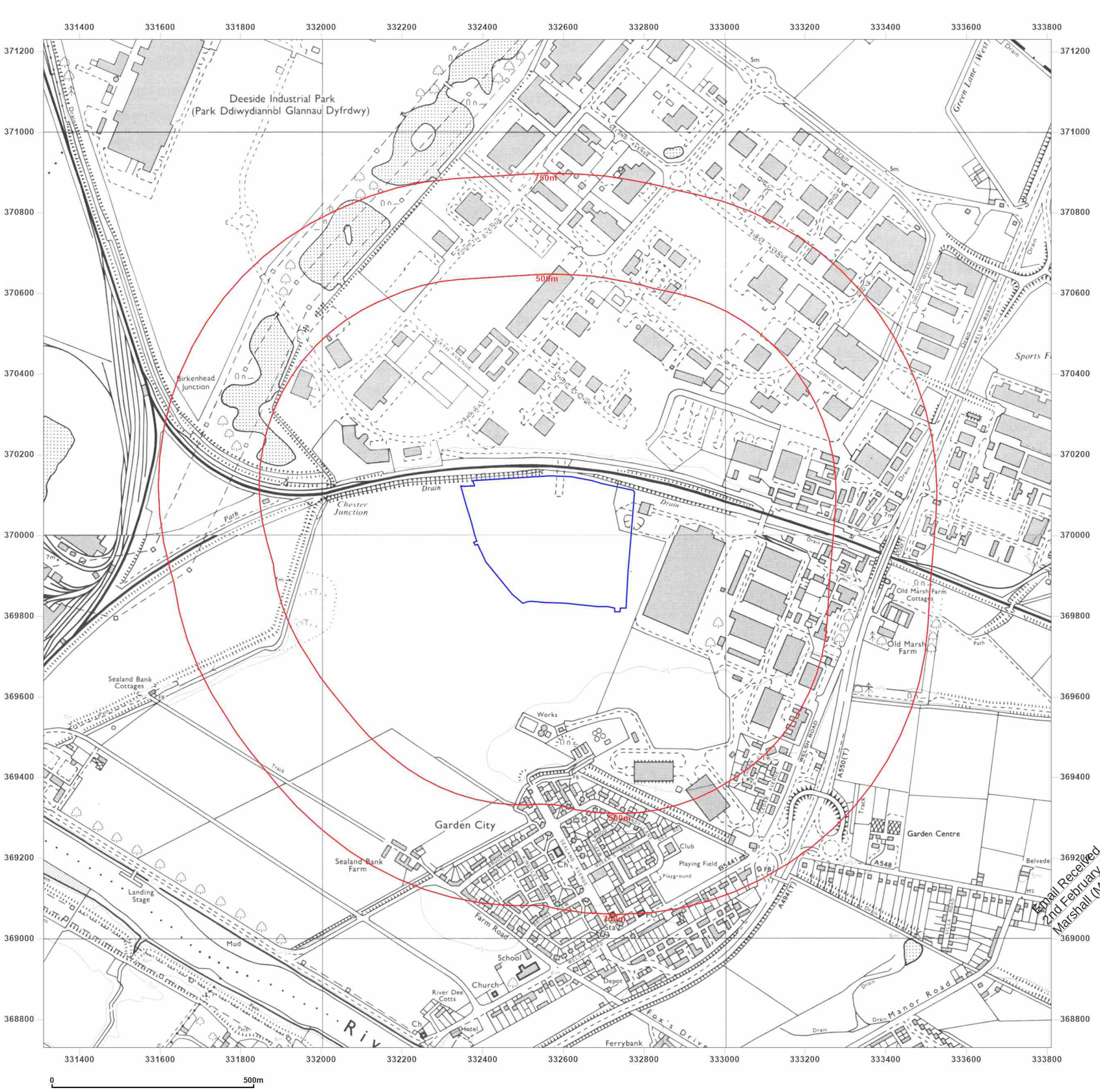

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Map Name: National Grid

Map date: **1989-1992**

Scale: 1:10,000

Printed at: 1:10,000

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Surveyed 1988
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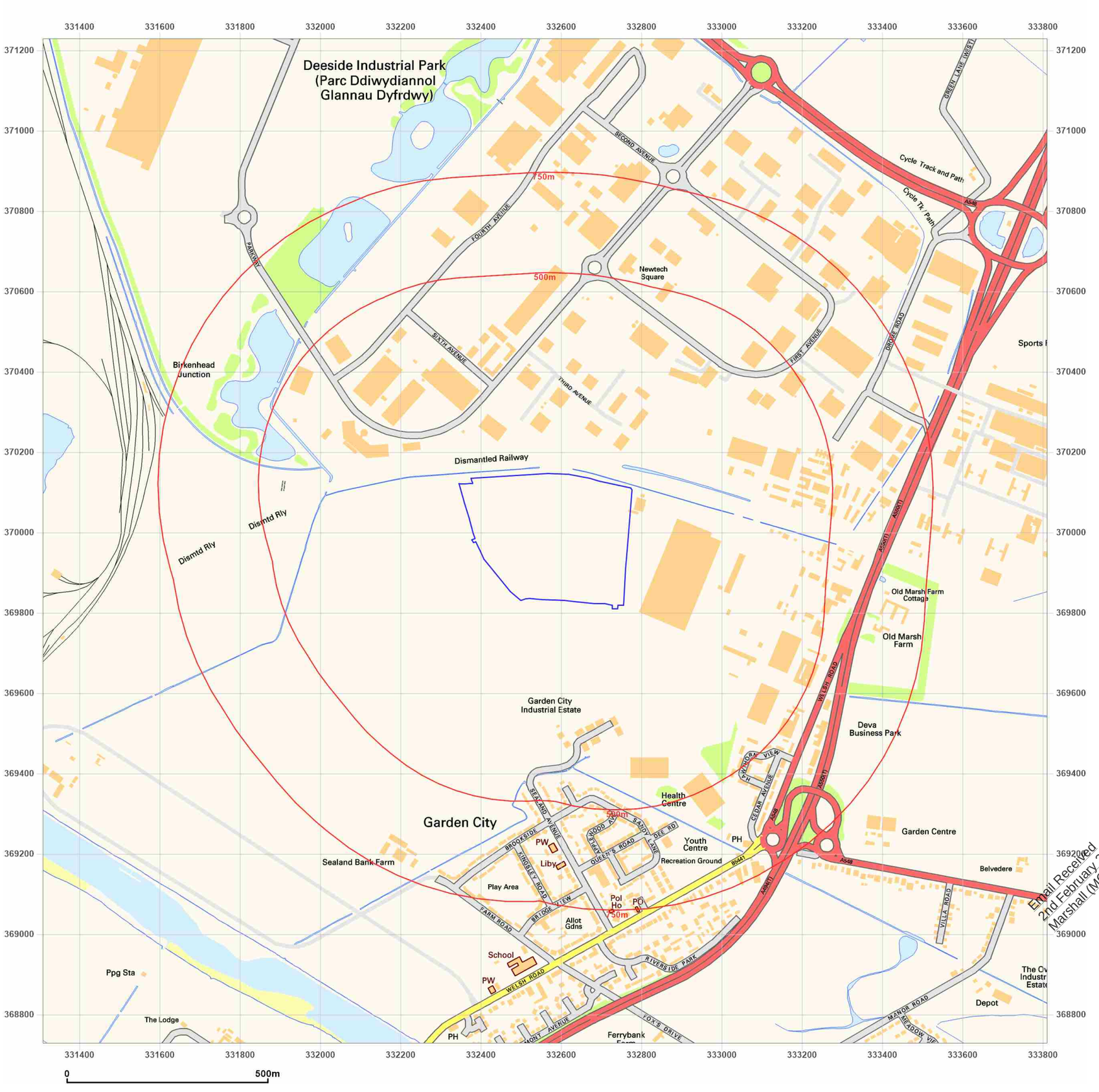

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Report Ref: CMAPS-JPG-1041195-62914-270522HIS
Grid Ref: 332560, 369979

Map Name: National Grid

Map date: **2001**

Scale: 1:10,000

Printed at: 1:10,000

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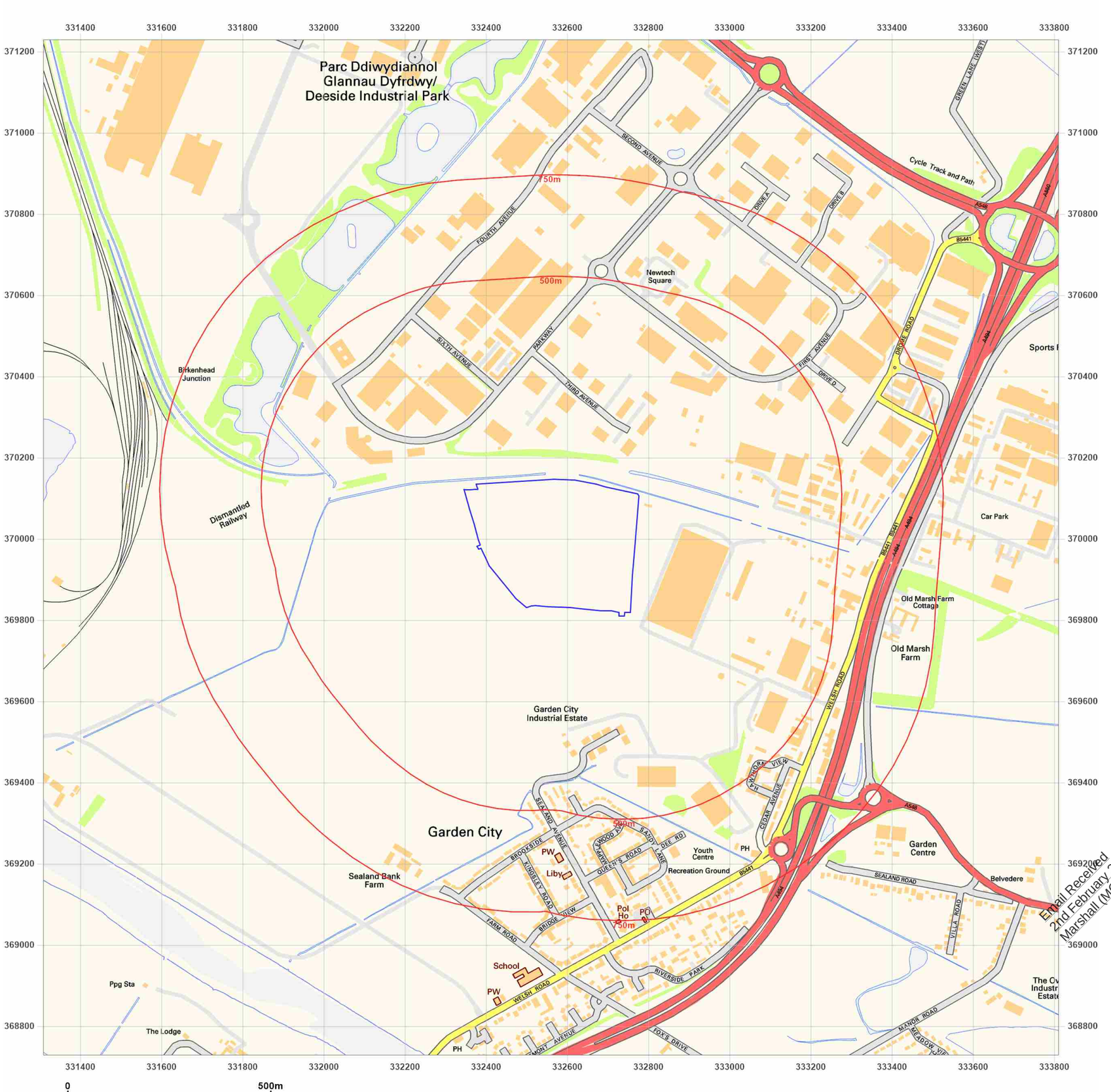

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Report Ref: CMAPS-JPG-1041195-62914-270522HIS
Grid Ref: 332560, 369979

Map Name: National Grid

Map date: **2010**

Scale: 1:10,000

Printed at: 1:10,000

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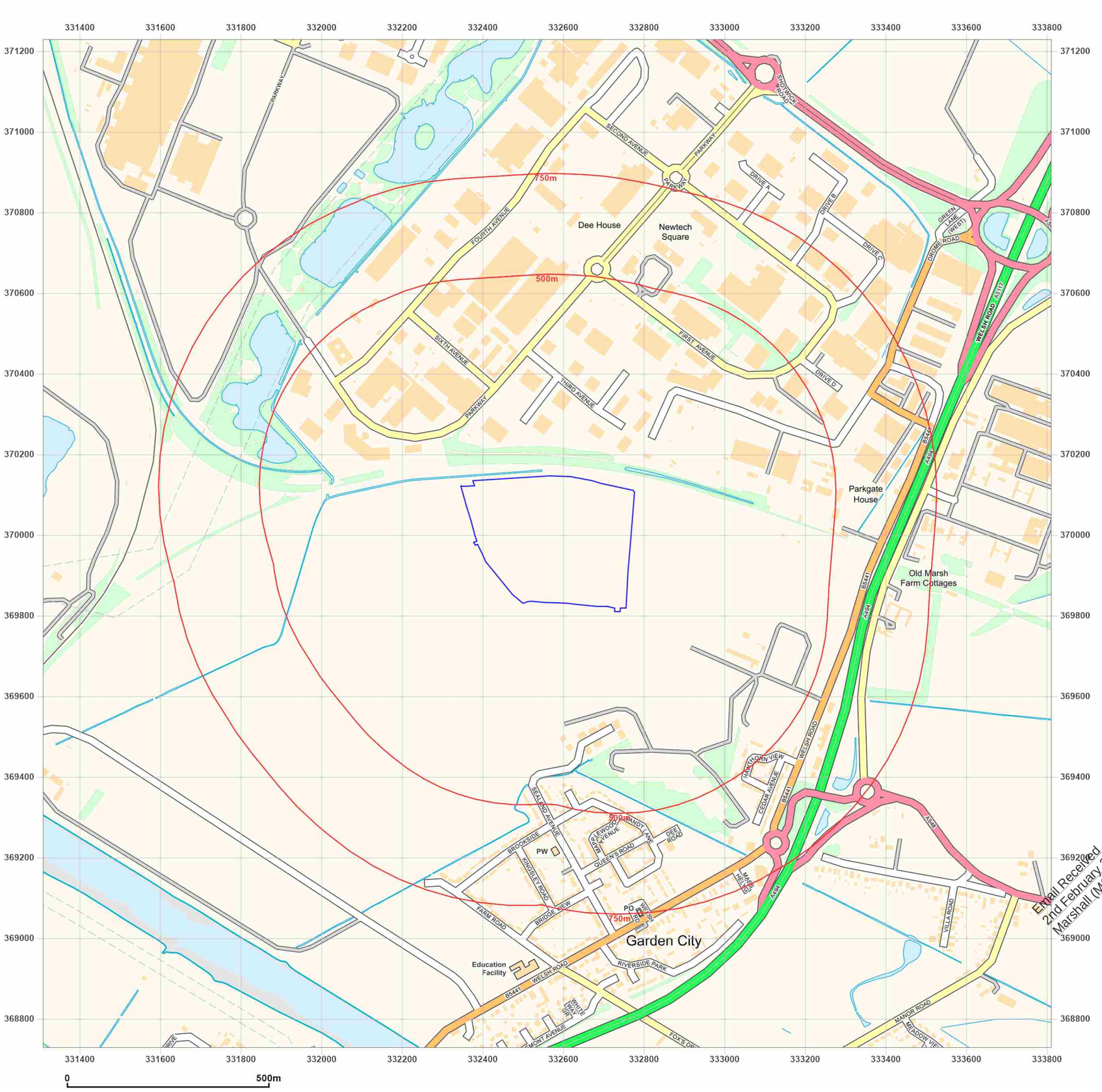

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Report Ref: CMAPS-JPG-1041195-62914-270522HIS
Grid Ref: 332560, 369979

Map Name: National Grid

Map date: **2022**

Scale: 1:10,000

Printed at: 1:10,000

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Appendix D Notes on Limitations

General
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JPG (Leeds) Ltd 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
b) this document to any third party with whom an agreement has not been executed.

Phase I Desk Study Reports
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, JPG (Leeds) Ltd reserves the right to review such information and, if warranted, to modify the opinions accordingly.

It should be noted that any risks identified in this report are perceived risks based on the information reviewed; actual risks can only be assessed following a physical investigation of the site.

Phase II Geo-Environmental 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 allow a reasonable assessment of the environmental risks together with engineering and development implications. The objectives of the investigation have been Ltd to establishing the risks associated with potential human targets, building materials, the environment (including adjacent land), and to surface and groundwater.

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 may need to be resolved.

For these reasons if costs have been included in relation to site remediation these must be considered as tentative only and must, in any event, be confirmed by a qualified quantity surveyor.

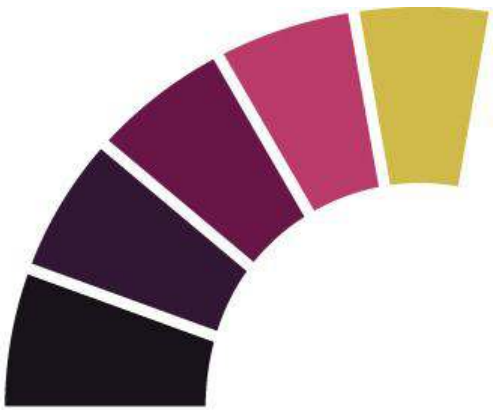
The exploratory holes undertaken, which investigate only a small volume of the ground in relation to the size of the site can only provide a general indication of site conditions. The opinions provided and recommendations given in this report are based on the ground conditions apparent at the site of 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 that site work was carried out. It should be noted that groundwater levels will vary owing to seasonal, tidal and weather-related effects.

The number of sampling points and the methods of sampling and testing do not preclude the existence of localised "hotspots" of contamination where concentrations may be significantly higher than those actually encountered.

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

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.



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