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ENVIRONMENT GROUP - LAND

FORMAL HOLDINGS LTD
ELLESMERE MARINA

PHASE I GEO-ENVIRONMENTAL ASSESSMENT REPORT

ENVIRONMENT - LAND

Formal Holdings Ltd
Ellesmere Marina

Phase I Geo-Environmental Assessment Report

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Version 1	June 2013	Final, issued prior to receipt of EA correspondence
Version 2	July 2013	Final, issued upon receipt of EA correspondence

EXECUTIVE SUMMARY

Site Setting	The site is irregular in shape and occupies an area of approximately 30 hectares. The site consists of grassed agricultural fields, several of which were occupied by a herd of cows during the site walkover. The site is relatively undulating, with several steeper gradients (hillocks) present in the western portion of the site. The Shropshire Union Canal bounds the site to the south.
Site History	Limited potential sources of contamination have been identified based on the review of historical mapping for the site area. The use of the site as agricultural land could potentially represent a source of pesticide and herbicide contamination to the soil underlying the site, and small scale spillages of fuel associated with agricultural machinery may have occurred, although any impact is likely to be highly localised. The most significant potential off site source of contamination identified within the historical review is a sewage works which is present immediately to the north of the site; part of which is indicated to have been disused by 1995.
Regulatory Setting	The majority of consents and permits discussed within the regulatory review are considered unlikely to have had a detrimental impact on the site, when they are considered in the context of the conceptual ground model. The exception is a historic household waste landfill listed as 126m to the north east of the site, which could result in elevated leachate migrating towards the site area, although gas monitoring undertaken at this landfill did not encounter elevated ground gas concentrations. The sewage works, also identified within the historical review, could represent a potential source of contamination to the site environment, especially given its close proximity to the northern site boundary.
Geological Setting	The superficial deposits underlying the majority of the site are indicated to consist of Glacial Till. Glaciofluvial Deposits and Alluvium are however indicated to outcrop in the western end of the site. The historical ground investigation carried out in the east of the site encountered variable deposits, ranging from granular to cohesive in nature. The solid geology indicated to be underlying the entire site area is indicated to be the Wilmslow Sandstone Formation. The Glacial Till is indicated by the EA to be an Unproductive Aquifer, the Glaciofluvial Deposits and Alluvium are classified as a Secondary A Aquifers, and the Sandstone as a Principal Aquifer.
Geotechnical Appraisal	Traditional foundation solutions founding in the superficial deposits may be suitable for lightly loaded residential properties. Should higher loads be anticipated associated with proposed new buildings, alternative founding methods may be necessary, such as ground improvement or piling. The depth to groundwater should be determined across the site area, as this will potentially impact the choice of foundations adopted within new buildings. Significant earthworks are likely to take place in order to enable the proposed development to proceed. This is likely to involve the excavation of significant quantities of soil to form the marina, with this material likely being used elsewhere on the site. Given the variability

	of soil conditions encountered historically in the east of the site, detailed investigations including soil classification / analysis will be required, in order to determine the properties of soils at the site and their suitability for earthworks. It is recommended that the location of the existing sewer pipe is identified in the east of the site and any easements associated with this feature be established; or whether it needs diverting around the new development.
Environmental Appraisal	Limited potential sources of historic contamination have been identified at the site. The use of the site as agricultural land could potentially represent a source of pesticides and herbicides to the soil underlying the site, and small scale spillages of fuel associated with agricultural machinery may have occurred, although any impact is likely to be highly localised. The naturally organic soil beneath the site could potentially represent a source of ground gas contamination. Based on the proposed end use of the site the pollution linkage assessment combined with the historical knowledge of the site has indicated that the site represents a low/moderate risk to human health, and a low/moderate risk to controlled waters.
Recommendations	A Phase II intrusive ground investigation should be undertaken in order to assess the potential pollutant linkages identified and establish the shallow ground conditions for geotechnical design purposes.
This summary should be read in conjunction with BWB's full report (ref.BMW2025/01/V2) and reflects an assessment of the Site based on information received by BWB at the time of production.	

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1.0 INTRODUCTION

Instruction

1.1 BWB Consulting (BWB) was instructed by Formal Holdings Ltd (the Client) to carry out a Geo-Environmental review at the site referred to as Ellesmere Marina, Ellesmere. Details of the project brief are included in BWB proposal reference GA/RC/BMW2025, dated June 2013.

Objectives

1.2 The report has been completed to present pertinent information into the environmental risk and liabilities associated with the site. It has been completed to fulfil the requirements of a preliminary risk assessment in accordance with CLR11 "Model Procedures for the Management of Land Contamination". The objectives of the report are to:

- Assess historical activities at the site with respect to their potential impact on the site environment;
- Characterise the environmental setting of the site, identify migration pathways and vulnerable receptors for contamination originating at the site, focusing on potential soil and groundwater liabilities;
- Assess historical and current surrounding land use in relation to known or potential off-site contamination issues that may impact the subject property;
- Develop a preliminary conceptual site model (CSM); and
- Assess potential environmental and geotechnical liabilities associated with the site.

1.3 Details of the BWB approach and legal framework for the appraisal of contaminated land are presented in **Appendix 1**.

Limitations

1.4 The assessments and interpretation have been made in line with legislation and guidelines in force at the time of writing, representing best practice at that time.

1.5 All of the comments and opinions contained in this report, including any conclusions, are based on the information obtained by BWB during our investigations.

1.6 There may be other conditions prevailing on the site which have not been disclosed by this investigation and which have not been taken into account by this report. Responsibility cannot be accepted for conditions not revealed by the investigation.

1.7 Any diagram or opinion of the possible configuration of the findings is conjectural and given for guidance only and confirmation of intermediate ground conditions should be considered if deemed necessary.

1.8 Except as otherwise requested by the Client, BWB is not obliged and disclaims any obligation to update the report for events taking place after:

a) the date on which this assessment was undertaken; and

b) the date on which the final report is delivered.

1.9 BWB makes no representation whatsoever concerning the legal significance of its findings or to other legal matters referred to in the following report.

1.10 This report has been prepared for the sole use of Formal Holdings Ltd. No other third parties may rely upon or reproduce the contents of this report without the written permission of BWB. If any unauthorised third party comes into possession of this report they rely on it at their own risk and the authors do not owe them any Duty of Care or Skill.

2.0 THE SITE

Site Location

2.1 The site is located to the south of Ellesmere, Shropshire, and is approximately centred at national grid reference 339480, 334060. The location of the site is shown in **Figure 1**.

Figure 1 - Site Location Plan

Site Description

2.2 Photographs from the site visit are presented in **Appendix 2**. A representative of BWB undertook a site walkover on 26th June 2013.

2.3 The site is irregular in shape and occupies an area of approximately 31 hectares. The site consists of grassed agricultural fields, several of which were occupied by a herd of cows during the site walkover. The site is relatively undulating, with several steeper gradients (hillocks) present in the western portion of the site.

2.4 The site boundary is formed by a network of hedgerows and fence lines. The Shropshire Union Canal is present immediately to the south and east of the site, with agricultural fields beyond. Agricultural fields are also present to the west and north of the western part of the site. A sewage works and residential development plot was present to the north of the eastern part of the site.

2.5 A water filled stream/ditch was present in the southern part of the site, roughly central along the southern boundary, entering into the site from the direction of the Canal.

2.6 At several locations the Canal was noted to be topographically elevated against the adjacent site area, by up to 2m-3m in places. This indicates that the Canal is lined and is therefore unlikely to be in significant continuity with groundwater underlying the site area.

2.7 Along the southern boundary, towards the eastern end of the site, a pipeline (presumably sewage/wastewater) was present crossing over the Canal. It is likely that this passes beneath the site, heading towards the sewage works from the southern site boundary.

Proposed Development

2.8 The proposed development is anticipated to comprise a mixed use development incorporating a new hotel, leisure facilities, pub/restaurant, log cabin/ touring caravan site and marina (and associated facilities). An indicative proposed masterplan is included as **Figure 2**.

3.0 SITE HISTORY

Ordnance Survey Plans

3.1 Historical Ordnance Survey (OS) mapping for the site area has been reviewed. These maps and plans date from 1874 OS County Series to the most recent 2012 OS Plans. The historical plans reviewed have been reproduced in **Appendix 3**. The key points of the historical development of the site and surrounding area are summarised below in **Table 1**.

Table 1 - Key Points of Site Development History

Dates	On Site	Surrounding Area
1877 - 1973	The site is indicated to consist of agricultural land on the earliest plans, inferred by the presence of field boundaries. A ***small stream*** (Newnes Brook) is shown to pass through the western part of the site, however by 1900 this has been diverted into a manmade ditch/culvert, which passes through the site to the south west of where the stream was formerly located. There is a field drain present in the southern central area of the site. There is a small rectangular structure present in the eastern part of the site on the earliest plan, however this is not shown on subsequent mapping. By 1938 a ***small stream*** is indicated to be present along the northern boundary of the eastern half of the site, flowing in a south westerly direction.	By the earliest plan the ***Shropshire Union Canal*** is present immediately to the south of the site. Ellesmere is located approximately 300m to the north of the eastern part of the site, and a **GAS WORKS** is located approximately 200m north of the site, beyond which is a **FOUNDRY and TIMBER YARD**. By 1900 an **ENGINEERING WORKS** is present immediately to the south east of the site beyond the Canal. By 1924 the **GAS WORKS** is no longer labelled, and the **FOUNDRY** is now labelled as a Cheese Factory. By 1949 several unlabelled circular features are shown to the north of the eastern part of the site.
1974 – 2012	There are no additional significant changes to the site area.	By 1974 a **SEWAGE WORKS** is present to the north of the site (including tanks and filter beds), where the circular features were previously shown. The **CHEESE FACTORY** has also significantly expanded in area by this time. By 1995 the eastern part of the **SEWAGE WORKS** is labelled as being disused. By 1979 a ***school*** has been constructed 100m to the north. By 2012, Ellesmere Business Park has been constructed on land approximately 100m north of the western part of the site.

SOURCES IN BOLD AND CAPS ***Receptors bold and italics***

Aerial Photographs

3.2 An aerial photograph provided within the Groundsure Report, reproduced as **Appendix 4** (and also presented as **Figure 1**), shows the site in its current condition, consisting of agricultural land.

Operational / Company Records

3.3 No operational or company records have been reviewed as part of this assessment.

Previous Investigation Reports

3.4 BWB have been provided with the following report pertaining to the site area:

- Murray Rix Geotechnical, Report on a Ground Investigation for a Proposed Marina, Ellesmere, Shropshire, Ref: GEOREP/10-301R(A), dated January 2011.

3.5 The ground investigation was carried out in the eastern part of the site considered as part of this assessment, and consisted of the advancement of 8no. window sampler boreholes to a maximum depth of 4.45m below ground level (bgl).

3.6 Ground conditions in the investigation area consisted of topsoil (sometimes peaty) to a maximum depth of 0.85m bgl, overlying variable cohesive and granular strata. Groundwater was encountered at shallow depths, generally ranging between 0.1m and 1.0m bgl.

3.7 The Report states that a careful assessment of cut and fill quantities will have to be made once exact layout and proposed construction is decided for the Marina. The Report states that due to the variable nature of materials encountered, some may not be ideal for earthworks operations, and specialist plant and machinery may be needed to minimise problems, such as deformation and rutting of softer cohesive materials.

3.8 It was determined that a characteristic strength for the glacial clays at the site was 35kPa, and for a 0.6m strip footing, a preliminary design bearing resistance of 70kPa would be acceptable. This was based on worst case ground conditions recorded during the investigative works, and it should be possible to justify greater bearing pressures if stronger materials were present in the areas of foundation excavations.

3.9 It was determined that ground bearing floor slabs would likely be adequately founded on natural soils at the site, other than more organic soils, however floor slabs may have to be raised above flood levels.

3.10 The results of soluble sulphate and pH determination indicated that Design Sulphate Class DS-1 and ACEC Class AC-2z should be used for concrete design.

4.0 REGULATORY REVIEW

Permits Consents and Authorisations

4.1 The factors that could influence the environmental status of the site are described below in **Tables 2 and 3**. A full listing of these factors, including discharge consents, pollution incidences and other environmental information, is included in the Groundsure EnviroInsight Report (ref: HMD-214-912194), which is presented in **Appendix 4**.

Table 2 - Regulatory Review

Feature	No. within 1km of site boundary	Closest to site*	Comments
Records of List 2 Dangerous Substances Inventory Sites	1, listed as being present on site.	This is listed as 'Ellesmere Wharf Meadow Wrw Fe', and is listed as 'not active'.	This is shown to be present on the northern site boundary near to the location of the Sewage Works, and therefore likely relates to this off site premise.
Current Industrial Sites Data	22, 4 within 50m and 18 between 51m and 250m.	The nearest entry relates to a 'works' 20m north west.	Other entries relate to the sewage works 21m north west, a depot 45m south east, a tank 65m north west and a waste collection company located 96m north east. These nearby industrial sites have the potential to act as sources of contamination, although it is considered unlikely that they would have resulted in significant contamination migrating to the site environment.

*All directions and distances pertain to the site boundary and are approximate.

Landfilling and Waste Management

4.2 Details of landfill sites and waste management facilities are summarised in **Table 3** overleaf.

Table 3 – Landfill and Waste Management Sites

Feature	No. within 1km of site boundary	Closest to site*	Comments
EA Historic Landfill Sites	2, 1 between 51m and 250m and 1 between 501m and 1km.	126m north east, relates to a household waste site at Birch Road, Ellesmere.	The EA website indicates that waste was last accepted at this site on 31st December 1974, and the waste was from dwellings of various types, including houses, caravans, houseboats, campsites, prisons, and wastes from schools, colleges and universities. The waste is indicated to have been buried. Given the proximity of this site, there is potential for elevated ground gas and leachate concentrations to migrate towards the site from this historic facility.
Non-operational Landfill Sites	1 between 501m and 1km.	579m east of the site, relates to an inert landfill at The Moors, Ellesmere.	The EA website indicates that the waste was buried, and included waste which remains largely unaltered once buried such as glass, concrete, bricks, tiles, soil and stones. The site was operational for just over 1 month, in 1984. This is considered unlikely to have impacted the site, given its distance from the site and the nature of materials indicated to have been deposited.
EA Licensed Waste Sites	2 between 501m and 1km.	674m north of the site, relates to a vehicle depollution facility at Elder Road, Cobridge.	This is considered unlikely to have significantly impacted the site, given its distance from the site.

Regulatory Correspondence

4.3 BWB have made enquiries with Shropshire County Council and the Environment Agency (EA) regarding information they may hold for the site and surrounding area. The correspondence received is included as **Appendix 5**.

Shropshire County Council Correspondence

4.4 Their records indicate there is one landfill present within 500m of the site boundary, which was last filled in December 1974. This corresponds with the regulatory information included within **Table 3** above, and relates to the site at Birch Road, Ellesmere. Their records indicate that a gas survey encountered negligible methane concentrations at this site, and only background levels of carbon dioxide.

4.5 The Council have not identified the site as potentially contaminated land under Part IIA of the Environmental Protection Act 1990. The Council do not possess details of any Part A2 or Part B processes located within 250m of the site, and they are not aware of any instances of nuisances associated with the site or surrounding premises.

EA Correspondence

4.6 EA records indicate that there is one historic landfill site within 500m of the site, referred to as Birches Road, Ellesmere. The last input at the landfill was 31 December 1974, and the waste type was household waste. As described above, a gas survey at the site recorded negligible levels of methane and only background levels of carbon dioxide.

4.7 The EA confirm that the site does not lie within a Source Protection Zone, and the nearest private water supply is located 580m from the site. The EA indicate that they would expect shallow groundwater to be present within the superficial deposits at the site. They do not hold specific records of groundwater depth in the area of the site however.

5.0 PUBLISHED GEOLOGICAL SETTING

Geology

5.1 The following information sources have been referred to in assessing the expected ground conditions at the site:

- Groundsure GeoInsight Report reference HMD-214-912195 (**Appendix 4**);
- BGS Geological Map No. 138 1:50,000 Edition; and
- British Geological Society (BGS) website (www.bgs.ac.uk).

5.2 Made ground associated with the sewage works is expected to be present immediately to the north and along the central north boundary. Made ground deposits associated with the construction of the Shropshire Union Canal are also anticipated to be present along the southern boundary of the site.

5.3 The superficial deposits underlying the majority of the site are indicated to consist of Glacial Till. Glaciofluvial Deposits and Alluvium are however indicated to outcrop in the western end of the site. The historical ground investigation carried out in the east of the site encountered variable deposits, ranging from granular to cohesive in nature with peat deposits noted to be present in the near surface materials. A BGS borehole (ref SJ33SE17) from a location approximately 150m to the north of the site, indicates Glacial Deposits to be present to at least 27m depth bgl.

5.4 The solid geology indicated to be underlying the entire site area is indicated to be the Wilmslow Sandstone Formation.

Hydrogeology

5.5 The Glacial Till is indicated by the EA to be an Unproductive Aquifer. These are deposits with low permeability that have negligible significance for water supply or river base flow. Historic ground investigation works however indicate groundwater to be present at shallow depth within these deposits, typically between 0.1m and 1.0m depth. The Glaciofluvial Deposits and Alluvium in the west of the site are both classified as Secondary A Aquifers, which are deposits capable of supplying water supplies at a local rather than a strategic scale, and in some cases forming an important source of base flows to rivers.

5.6 The Sandstone is classified by the EA as a Principal Aquifer. This is geology of high inter-granular and/or fracture permeability, usually providing a high level of water storage and may support water supply/river base flow on a strategic scale.

5.7 The site is not located within an EA designated Source Protection Zone (SPZ).

5.8 Numerous discharge consents are listed on and in the vicinity of the site, however only one of these is listed as being to groundwater. This is located 447m west of the site, and relates to sewage discharges via soakaway.

5.9 There are 2 no. groundwater abstractions listed within 1km of the site, the closest of which to the site relates to a potable supply. This is listed as being located 766m south of the site, at Ellesmere College. The other entry, listed as 981m south west of the site, is for 'general farming & domestic' purposes.

Hydrology

5.10 The Newnes Brook passes through the western part of the site. A Tertiary River also passes along the northern boundary and through the central part of the site, part of which is present in a culvert. The Shropshire Union Canal bounds the site to the south. The biological quality of the Canal was classified as Grade D (fair) in 2007, whilst the chemical quality was classified as both Grades A (very good) and B (good); all at a location 47m east of the site.

5.11 13 no. discharge consents are attributed to the site area, all of which relate to sewage or trade discharges. The majority of these are indicated to be located on the site boundary adjacent to the sewage works, and likely relate to this off site premise. One consent is indicated to be present in the western part of the site however, it is unclear which of the listed discharge consents this relates to.

5.12 There is one pollution incident to surface water listed in the vicinity of the site. This occurred 172m to the north of the site, and was classified as a Category 2 Incident (Significant), relating to a release of agricultural materials and wastes, in 2001.

5.13 There are 2 no. surface water abstractions listed within 1km of the site, both 150m north west and relating to general washing, and evaporative cooling.

5.14 The site is indicated to be in an area which the EA consider to be at risk from flooding and extreme surface water flooding, however this matter is being addressed by the BWB Flood Risk Team under separate cover.

Ground Gas

5.15 The historic ground investigation identified that some of the shallow cohesive deposits were organic in nature. These organic deposits could potentially represent a source of elevated ground gas concentrations, which could potentially impact end users of the site redevelopment.

5.16 There is also a historic landfill located within 150m of the site, which accepted potentially deleterious material. This could potentially result in elevated landfill gas concentrations migrating towards the site area, although the likelihood of this occurring is considered to be low.

5.17 According to the British Geological Survey and National Geoscience Information Service, the property is not in a radon affected area, as less than 1% of properties are above the action level. At this probability the BGS and National Geoscience advise that no radon protective measures are necessary in the construction of new dwellings or extensions.

5.18 Although the site is not in an area where Radon protection measures are required, the Health Protection Agency have advised (HPA 2008a) that all new buildings, extensions, conversions and refurbished buildings in the UK include basic radon protection measures. It is therefore recommended that all proposed buildings should therefore be designed to include basic radon protection measures.

6.0 GEOTECHNICAL EVALUATION

Ground Workings, Mining and Mineral Extraction

6.1 The Groundsure Report indicates ground workings to be present on site, however these relate to the sewage works and the canal, both of which bound the site to the north and south respectively.

6.2 Two sand pits are indicated to have been present in the vicinity of the site, one located 253m north east of the site, and the other located 485m west of the site. A limestone working is indicated to have been present 262m south west of the site.

6.3 The site is not located within an area where belowground coal mining has taken place historically.

Natural Ground Subsidence

6.4 **Table 4** below provides a summary of the information relating to natural ground subsidence at the site as taken from the Groundsure Report.

Table 4 – Natural Ground Subsidence Hazard Ratings

Hazard	Hazard Rating
Shrink or Swell Clays	Very low
Landslides	Very low
Ground Dissolution of Soluble Rocks	Null
Compressible Deposits	High
Collapsible Deposits	Very low
Running Sands	Low

6.5 The findings of the previous ground investigation have indicated shallow cohesive deposits to have low plasticity index values which are considered to correspond to the Groundsure Report identified very low risk of shrink/ swell clays.

6.6 The information indicates there is a high risk of compressible deposits in the site area. This is confirmed by the soft organic and peaty cohesive deposits encountered during the historic ground investigation in the east of the site area.

Foundation Solutions

6.7 Whilst the previous ground investigation has indicated that shallow spread foundations may provide bearing capacities up to 70kN/m^2, given the variability of soils, presence of shallow groundwater and organic content of soils, these bearing capacities may not be achievable. Therefore shallow spread foundations may locally require deepening into competent strata or an alternative founding solution may need to be considered. Intrusive investigation should establish the shallow soil conditions and variability across the entire site area and to assess the preliminary foundation solutions for the proposed development, as well as depth to groundwater across the site, as this will potentially impact upon the type of foundations utilised at the site.

6.8 Should higher loads be anticipated with proposed new buildings, alternative founding methods may be necessary, such as ground improvement, a ground engineered solution or piling.

Floor Slabs

6.9 Due to the abundance of organic deposits, ground bearing floor slabs are unlikely to be suitable without prior treatment or removal of the soft organic cohesive deposits. The presence of these deposits across the site should be determined as part of future investigative assessment works.

Earthworks

6.10 Significant earthworks are likely to take place in order to enable the proposed development to proceed. This is likely to involve the excavation of significant quantities of soil to form the marina, with this material likely being used elsewhere on the site. Given the variability of soil conditions encountered historically in the east of the site, detailed investigations including soil classification / analysis will be required, in order to determine the properties of soils at the site and their suitability for earthworks.

6.11 The historical reports indicates that the near surface deposits are unlikely to be suitable for reuse as an engineered material in their current state, and consideration should be given to stabilising these deposits to provide suitable working platforms and enhance the geotechnical performance of these materials. Additionally, given the presence of shallow groundwater and soft deposits, earthwork structures may be subject to significant settlement and it will be necessary to expose competent strata before adopting these works.

6.12 Further consideration should be given to the structural integrity of the adjacent canal, and excavations/ earthworks should ensure that they do not undermine the existing canal.

Drainage

6.13 Based on the shallow groundwater conditions indicated by the historic ground investigation report, soakaway drainage is unlikely to be a suitable drainage solution for the proposed development. This should be confirmed during intrusive investigation works across the wider site area.

Excavations

6.14 Due to the presence of shallow groundwater, excavations may be prone to rapid inundation and significant dewatering of excavations, especially during the construction of the proposed marina, may be required. Excavations may also be prone to instability and may require temporary shoring.

Buried Concrete Attack

6.15 As part of the intrusive site investigation works, shallow soil samples should be tested for sulphate content in order to determine appropriate measures to mitigate buried concrete attack.

6.16 Historic investigation in the east of the site indicated that Design Sulphate Class DS-1 and ACEC Class AC-2z should be used for concrete design.

7.0 PRELIMINARY ENVIRONMENTAL RISK ASSESSMENT

Introduction

7.1 The risk posed by any contaminants in soil or groundwater will depend on the nature of the hazard, the probability of exposure, the pathway by which exposure occurs, and the likely effects on the receptors. A contaminant is defined as a substance that has the potential to cause harm, while a risk is considered to exist if such a substance is present in sufficient concentration to cause harm and a pathway exists for a receptor to be exposed to the substance.

7.2 The following sections discuss all the identified potential on and off site sources, pathways and receptors in the context of the proposed development and plausible pollutant linkages, which may represent a risk to identified receptors such as human health and/or controlled waters from the data gained from the desk study. At this stage the assessment is qualitative and aimed to determine all pollutant linkages, irrespective of significance or allowing for uncertainty.

7.3 Three impact potentials exist for any given site, these are:

- The site impacting upon itself;
- The site impacting on its surroundings; and
- The surroundings impacting on the site.

7.4 All three impacts need to be considered in a risk assessment.

Sources

7.5 Based on the desk study review including a review of historical mapping, regulatory information and a site visit the following sources of contamination have been identified:

On Site

- Farming activities – Potential contaminants may include lead and petroleum hydrocarbons in diesel leaks and spills; pesticides and herbicides from crop spraying; and
- Elevated ground gas associated with naturally organic soils underlying the site.

Off Site

- Sewage works located to the north of the site. Potential contaminants could include heavy metals, solvents, pesticides, hydrocarbons, PCBs, ground gas and pathogens; and
- Landfill 126m north east of the site, potential contaminants could include leachable contaminants (depending on materials deposited). Low ground gas levels were identified historically at this landfill, and the site is therefore unlikely to be impacted by migration of elevated ground gas concentrations stemming from the landfill.

Pathways

7.6 A pathway is defined as a mechanism or route by which a contaminant comes into contact with, or otherwise affects a receptor. Pathways by which the

identified receptors may be impacted upon in the context of the proposed development are identified as follows:

- Ingestion;
- Skin contact;
- Inhalation;
- Direct contact by buried structures;
- Leaching of soluble contamination into groundwater
- Saturated zone flow through Secondary A Aquifer / Principal Aquifer;
- Overland surface water run-off; and
- Accumulation of potentially asphyxiating/explosive gas within confined spaces.

7.7 Whilst the Glacial Till is classified as an Unproductive Aquifer, historic site investigation works have indicated this to be partly granular in nature, and as such could potentially act as a pathway for contaminant migration.

Receptors

7.8 Receptors are defined as people, living organisms, ecological systems, controlled waters, atmosphere, structures and utilities that could be adversely affected by contaminant(s).

Human Health

- Site end users; and
- Ground workers.

Controlled Waters

- Secondary A Aquifer and Principal Aquifer beneath the site and in the surrounding area; and
- Shropshire Union Canal (although this is unlikely to be in continuity with groundwater underlying the site).
- Newnes Brook and Tertiary River

Construction Materials

- Buried concrete structures (e.g. foundations); and
- Water utility pipes.

Environmental Risk Assessment

7.9 The preliminary CSM is a hypothesis of the nature and sources of contamination, potential receptors that may be the recipient of contamination arising from those sources and any pathways that may exist, thus creating a plausible source-pathway-receptor pollutant linkage (hazard), set within the context of the ground and groundwater model and proposed end use of the site.

7.10 The classification system is presented in **Appendix 6**. The preliminary CSM is presented in **Table 7** and in **Figure 3.**

7.11 No significance or uncertainty is attributed to any pollutant linkage identified at this stage. Based on the preliminary CSM for the site, an environmental risk assessment has been undertaken. A simple matrix can provide a consistent basis for decision-making. It should of course be used with caution, recognising the

over-simplification that it will normally represent. The probability and consequences are defined according to parameters relevant to the situation; the boundaries of risk acceptability (and tolerability, where relevant) indicated on the matrix provided in **Table 5** can be tailored to the factors influencing the significance of the risk. Individual situations are mapped onto the matrix to provide a ready and consistent indication of their acceptability or tolerability. The classifications of probability and consequence are included as **Appendix 6**.

Table 5 – Risk Classification Matrix

		Consequence			
		Severe (Sv)	Medium (Md)	Mild (Mi)	Minor (Mr)
Probability	High (Hi)	Very high risk	High Risk	Moderate Risk	Moderate/low risk
	Likely (Li)	High risk	Moderate risk	Moderate/low risk	Low risk
	Low likelihood (Lw)	Moderate risk	Moderate/low risk	Low risk	Very low risk
	Unlikely (Ul)	Moderate/low risk	Low risk	Very low risk	Very low risk

After CIRIA Report C552, Contaminated Land Risk Assessment A Guide to Good Practice, 2001

7.12 These attributes are evaluated qualitatively against individual hazard assessments to determine the likelihood of a given hazard occurring. The risk evaluations for each plausible pollutant linkage are given in the penultimate three columns of **Table 7**.

7.13 Based on the previous activities that have taken place on site (notably agricultural uses) and the surrounding area (most notably the sewage works to the north of the site) the pollution linkage assessment combined with the historical knowledge of the site and its geological setting has indicated that the site represents a low risk to controlled waters set in the context of the proposed development.

7.14 Based on the proposed end use of the site the pollution linkage assessment combined with the historical knowledge of the site has indicated that the site represents a moderate/low risk to human health set in the context of the proposed development. It is considered likely that should contamination be identified at the site, then basic remedial measures will be sufficient to mitigate risks to sensitive receptors. In the event that isolated hotspots of contamination be identified more intensive remedial measures may be required, however this should be assessed further during intrusive investigation works at the site.

7.15 These ratings are set against the categories provided in **Table 6**.

Table 6 - Classification of Risk

Very high risk (Vh)	There is a high probability that severe harm could arise to a designated receptor from an identified hazard, OR, there is evidence that severe harm to a designated receptor is currently happening. This risk, if realised, is likely to result in a substantial liability. Urgent investigation (if not undertaken already) and remediation are likely to be required.
High risk (Hi)	Harm is likely to arise to a designated receptor from an identified hazard. Realisation of the risk is likely to present a substantial liability. Urgent investigation (if not undertaken already) is required and remedial works may be necessary in the short-term and are likely over the longer-term.
Moderate risk (Md)	It is possible that harm could arise to a designated receptor from an identified hazard. However, it is either relatively unlikely that any such harm would be severe, or if any harm were to occur it is more likely that the harm would be relatively mild. Investigation (if not already undertaken) is normally required to clarify the risk and to determine the potential liability. Some remedial works may be required in the longer-term.
Low risk (Lw)	It is possible that harm could arise to a designated receptor from an identified hazard, but it is likely that this harm, if realised, would at worst normally be mild.
Very low risk (Vl)	There is a low possibility that harm could arise to a receptor. In the event of such harm being realised it is not likely to be severe.

After CIRIA Report C552, Contaminated Land Risk Assessment A Guide to Good Practice, 2001

Table 7 - Summary of Significant Pollution Linkages

Source	Pathway	Receptor	Con	Prob	Risk	Mitigation/Investigation
Onsite sources - Potentially elevated lead, TPH, herbicide, pesticide concentrations in shallow soil deposits.	Direct contact, ingestion, and inhalation.	Long term – Residents, users of proposed development.	Md	Lw	M/L	Soil samples should be retrieved from across the site area during intrusive investigation works, and submitted for laboratory analysis to confirm its suitability for use.
		Short term - Construction workers / maintenance staff.	Mr	Lw	VL	
	Leaching and vertical migration through unsaturated zone.	Short term –Secondary A Aquifer underlying the site.	Mi	Lw	L	The chemical analysis of shallow groundwater samples should form part of future site investigation works at the site, in order to determine contaminant concentrations and potential impact upon controlled water receptors.
		Short term – Principal Aquifer underlying the site.	Md	Ul	L	
	Leaching and horizontal flow within underlying groundwater.	Short term –Secondary A Aquifer off site.	Mi	Ul	VL	
		Short term –Principal Aquifer off site.	Md	Ul	L	
		Long term – Shropshire Union Canal	Mi	Ul	VL	
Onsite sources – Potential ground gas from naturally organic soils.	Migration into buildings through foundation cracks, service entry points.	Long term - Confined spaces in buildings, residents	Sv	Lw	M/L	Gas monitoring wells should be installed at the site in order to determine risks associated with elevated ground gas concentrations upon the future site development and requirement for gas protection measures. Basic gas protection measures are likely to be sufficient in mitigating risk to end users

Source	Pathway	Receptor	Con	Prob	Risk	Mitigation/Investigation
Offsite sources – contaminants associated with sewage works and former landfill.	Inhalation of volatile vapours or ground gas in outdoor or indoor air generated from contaminated soil and groundwater beneath the site.	Short term: Construction workers and visitors to the site.	Mr	Ul	VL	Gas and groundwater monitoring wells should be located within the site boundary adjacent to the sewage works, to determine whether any contaminants (including elevated ground gas concentrations) are migrating to the site.
		Long term: Future residents, site users.	Sv	Ul	M/L	
	Direct contact, ingestion and inhalation with impacted groundwater	Long term – Residents, users of proposed development.	Md	Ul	L	
		Short term - Construction workers / maintenance staff.	Mr	Ul	VL	
VH = Very High, H = High, M = Moderate, M/L = Moderate/Low, L = Low, VL = Very Low KEY: Sv = Severe, Md = Medium, Mi = Mild, Mr = Minor Hi = High, Li = Likely, Lw = Low Likelihood, Ul = Unlikely						

8.0 ENVIRONMENTAL LIABILITY ASSESSMENT

Statutory Liability

8.1 The contaminated land regime has implications for those who cause or knowingly permit land to be contaminated, or who own or occupy land that is contaminated.

8.2 Contaminated land is defined in Section 78A(2) of Part 2A of the Environmental Protection Act 1990 as: "Any 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 land, that:

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

8.3 Harm is defined in Section 78(4) of the Environmental Protection Act 1990 as: "Harm to the health of living organisms or other interference with ecological systems of which they form part and, in the case of man, includes harm to property."

8.4 Once an area of land has been identified as contaminated land, appropriate persons will be identified as being responsible for the cost of cleaning up the land by the enforcing authority. The appropriate person will be liable for all or part of the remediation of the land. Two classes of appropriate person have been identified:

- Class A appropriate persons are those who cause or knowingly permit the pollutants to be in, on or under the land.
- Class B appropriate persons are the owners(s) or occupier(s) of the land.

8.5 Where no Class A appropriate persons can be identified, then Class B appropriate persons may become liable.

8.6 Based on the information contained in this report, it is the opinion of BWB that the site in its current form represents a **low** risk with respect to environmental considerations, under the assessment requirements outlined in Part IIA Environmental Protection Act 1990.

Third Party Liability

8.7 Based on the information contained in this report, it is the opinion of BWB that the potential for legal action by surrounding landowners based on the potential for contamination to migrate offsite is considered to be **low**.

Public Relations

8.8 Based on the information contained in this report, it is the opinion of BWB that the site presents a **low** risk to the Client's business activities and also the site's environmental status resulting in adverse environmental publicity due to the potential presence of contaminants.

Development Implications

Environmental

8.9 Given the potential sources of contamination identified, ground investigation works will be required prior to redevelopment in order to establish the presence of ground gas, shallow soil and groundwater contamination beneath the site.

8.10 The requirement for remedial measures at the site can only be assessed upon completion of intrusive site investigation works, however based upon the findings of the Phase I review, basic remedial measures (such as topsoil capping and basic gas protection measures) are likely to be sufficient in mitigating potential risks to sensitive receptors in proposed residential areas.

Geotechnical

8.11 The principal development implications at the site are considered to comprise the presence of shallow groundwater, resulting in potential inundation and collapse of excavations and the requirement for dewatering during construction activities.

8.12 Near surface deposits are unlikely to be suitable for shallow spread foundations, therefore alternative founding solutions including ground improvement to permit the use of shallow spread foundations or piles may be required.

8.13 Significant quantities of soil, excavated as part of the Marina construction may not be suitable for use as engineered fill and may require modification/ stabilisation using lime or cement. Further consideration will need to be given to accessing the site, especially as the near surface deposits are expected to exhibit low subgrade performance.

8.14 As part of the site scrape/ earthworks, large volumes of organic material and peat may be generated. This material may not be suitable for use as engineered fill, and it may potentially not be suitable for disposal off site due to its high organic content. It is therefore recommended that a soil volumetric assessment is completed in order to determine the volumes of material available for earthworks, and the requirement to import additional materials.

8.15 Careful consideration of the sensitive structures, including the adjacent canal will need to be considered during construction sequencing.

8.16 It is recommended that the location of the existing sewer pipe is identified in the east of the site and any easements associated with this feature be established; or whether it needs diverting around the new development.

Waste Management

8.17 All hazardous and non-hazardous wastes generated from the site that are destined for landfill must undergo pre-treatment to reduce the volume or hazardous nature of the waste or facilitate its handling or enhance recovery. Treatment may comprise any physical, thermal, chemical or biological processes, including sorting, that changes the characteristics of the waste. There are exemptions to the regulations where treatment is not technically feasible or where feasible treatment techniques would not reduce the hazardous nature or volume of material going to landfill.

8.18 A site waste management plan (SWMP) must be produced by the main contractor prior to the commencement of the project. The SWMP should describe the volumes and types of waste that are likely to be produced during a project and should set out the actions for recycling, recovery, re-use and disposal for each waste stream.

9.0 CONCLUSIONS AND RECOMMENDATIONS

Conclusions

Ground Conditions

9.1 The superficial deposits underlying the majority of the site are indicated to consist of Glacial Till comprising low shear strength clays with sand bands and organic deposits. Glaciofluvial Deposits and Alluvium are however indicated to outcrop in the western end of the site. The historical ground investigation carried out in the east of the site encountered variable deposits, ranging from granular to cohesive in nature.

9.2 The solid geology indicated to be underlying the entire site area is indicated to be the Wilmslow Sandstone Formation.

9.3 The Glacial Till is indicated by the EA to be an Unproductive Aquifer, the Glaciofluvial Deposits and Alluvium are classified as a Secondary A Aquifers, and the Sandstone as a Principal Aquifer.

Environmental

9.4 Limited potential sources of historic contamination have been identified at the site. The use of the site as agricultural land and a slurry spreading area could potentially represent a source of heavy metals, pesticides and herbicides to the soil underlying the site, and small scale spillages of fuel associated with agricultural machinery may have occurred, although any impact is likely to be highly localised. The naturally organic soil beneath the site could potentially represent a source of ground gas contamination.

9.5 The most significant potential off site source of contamination identified within the historical review is a sewage works which is still present immediately to the north of the site.

9.6 The majority of consents and permits discussed within the regulatory review are considered unlikely to have had a detrimental impact on the site, when they are considered in the context of the conceptual ground model. The exception is a historic household waste landfill listed as 126m to the north east of the site, which could result in elevated leachate migrating towards the site area, although gas monitoring undertaken at this landfill did not encounter elevated ground gas concentrations.

9.7 Based on the proposed end use of the site the pollution linkage assessment combined with the historical knowledge of the site has indicated that the site represents a low/moderate risk to human health, and a low risk to controlled waters.

Geotechnical

9.8 Traditional foundation solutions founding in the superficial deposits may be suitable for lightly loaded residential properties. Should higher loads be anticipated associated with proposed new buildings, alternative founding methods may be necessary, such as ground improvement or piling. The depth to groundwater should be determined across the site area, as this will potentially impact the choice of foundations adopted within new buildings.

9.9 Significant earthworks are likely to take place in order to enable the proposed development to proceed. This is likely to involve the excavation of significant quantities of soil to form the marina, with this material likely being used elsewhere on the site. Given the variability of soil conditions encountered historically in the east of the site, detailed investigations including soil classification / analysis will be required, in order to determine the properties of soils at the site and their suitability for earthworks.

9.10 Based on the shallow groundwater conditions indicated by the historic ground investigation report, soakaway drainage is unlikely to be a suitable drainage solution for the proposed development.

9.11 It is recommended that the location of the existing sewer pipe is identified in the east of the site and any easements associated with this feature be established; or whether it needs diverting around the new development.

Recommendations

9.12 A Phase II geo-environmental site investigation should be undertaken to assess the environmental status of the site and quantify the identified potential contaminant linkages. The stated aims of the investigation should include assessing the site in relation to the preliminary conceptual site model developed for the site.

9.13 Based on the recommendations of CIRIA document C665, assuming a very low generation potential and high sensitivity development, six gas monitoring events should be undertaken at the site over a three month period, in order to determine potential risks to end users of the site from potential elevated ground gas concentrations.

9.14 The ground investigation should aim to characterise the geology beneath the site including strength properties of the near surface deposits in order to aid foundation, floor slab and pavement design requirements, and gain information for drainage and earthworks design.

BWB Consulting Ltd **July 2013**

FIGURES

FIGURE 2

DEVELOPMENT MASTERPLAN

Ellesmere Business Park
Depot
Surgery
Newnes Brook
The Lakelands School
Tennis Court
Playground
Sewage Works
Recent Residential development adjacent to site
Recent Residential Proposals adjacent to site under consideration
RESIDENTIAL Approx 27.5 Acre's (11 Hectares) - Residential NB includes approx 1 hectare for POS
TOURING CARAVANS Approx 5 Acre's (2 Hectares)
LOG CABINS Approx 5 Acre's (2 Hectares)
GARDEN CENTRE Approx 11 Acre's (4.3 hectares)
External Sales Areas
Restaurant terrace
Covered Sales
Service Yard
NEW MARINA 188 Boat Spaces
WORKSHOP
FACILITIES BUILDING
HOTEL
LEISURE / SPA
TENNIS COURTS
BOWLING GREEN
PUB / RESTAURANT
Internal layout to be adjusted to suit roundabout location as shown
Shropshire Union Canal Llangollen Branch
Beech House
Pond
NORTH
0 5m 25m 75m

Canalside Tourist Development

Ellesmere Development

MASTERPLAN

The Carriage Building, Bruton Way, Gloucester, GL1 1DG T: 03333 405 500 E: mail@robertslimbrick.com

Date: 13.6.13 Scale: 1:1250@A0 Dwg No: 5614 SK25 rev F

Subject to correct printing. See top left

Roberts Limbrick ARCHITECTS

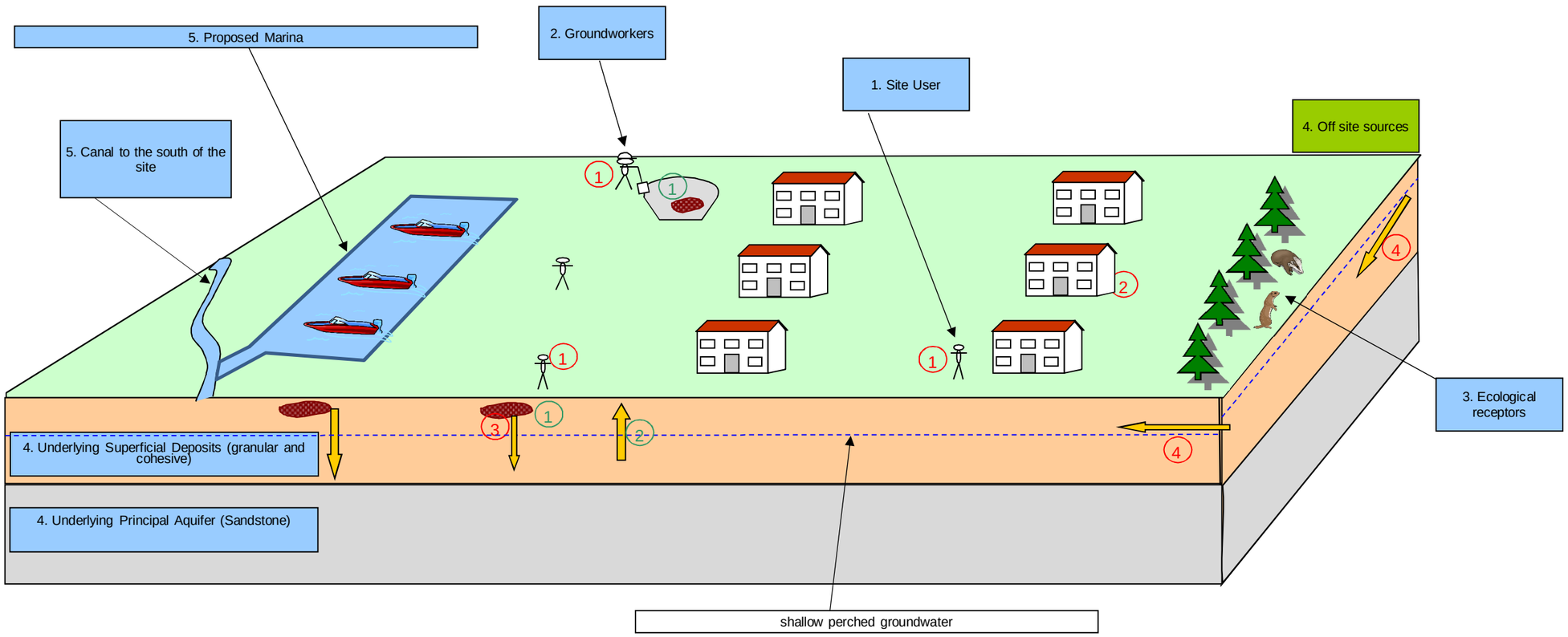
FIGURE 3

CONCEPTUAL SITE MODEL

Sources
1. Potential contamination within shallow soils, stemming from historical land use of site (inc. TPH, pesticides, herbicides).
2. Off site sources (including the sewage works).

Pathways
1. Direct contact, ingestion and inhalation of soil particulates.
2. Inhalation of vapours (indoor).
3. Leaching.
4. Migration of contaminants from off site sources.

Receptors
1.Future residents.
2. Groundworkers.
3. Ecological receptors.
4. Underlying Aquifers.
5. Surface water courses.



Client: Formal Holdings Ltd Site: Ellesmere Marina	BWB CONSULTANCY | ENVIRONMENT INFRASTRUCTURE | BUILDINGS	**Figure 3 - Preliminary Conceptual Site Model**	**SCALE**: Not to Scale PROJECT No.: BMW2025	**DATE**: June 2013 DRAWN: TCH CHECKED: DLJ

APPENDICES

APPENDIX 1

LEGAL FRAMEWORK

Legislative Background

Environmental liabilities and risks have been evaluated in terms of a source - pathway - target relationship in accordance with the approach set out in the 1995 Environment Act, The Contaminated Land (England) Regulations 2000 and the DETR circular 02/2000 Environmental Protection Act 1990: Part IIA Contaminated Land. Contaminated land is defined within the legislative framework as land which is in such condition by reason of substances in, on or under the land that:

a) significant harm is being caused or there is a significant possibility of such harm being caused;
b) significant pollution of controlled waters is being or is likely to be caused.

The potential for harm is based on the presence of three factors:

- Source: Substances that are potential contaminants or pollutants that may cause harm;
- Pathway: A potential route by which contaminants can move from the source to the receptor; and
- Receptor or target: A receptor that may be harmed, for example the water environment, humans, water, flora and fauna.

Where a source, pathway and target are all present a pollutant linkage exists and there is potential for harm to be caused. Therefore, 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 unacceptable risk of harm.

The nature and importance of both pathways and receptors, which are relevant to a particular site, will vary according to the intended use of the site, its characteristics and its surroundings.

The key principle which underpins this approach is the 'suitable for use' criterion. This requires remedial action only where contamination is considered to pose unacceptable actual or potential risks to health or the environment and appropriate and cost effective remediation techniques exist, taking into account the actual or intended use of the site.

Guidance

BWB Consulting Ltd is a registered Engineering Practice and is regulated by the Institution of Civil Engineers.

This report has been prepared in accordance with:

- Contamination and Environmental Matters - Their implications for Property Professionals (2nd Edition RICS Nov 2003)
- BSI, BS8485, 2007 Code of Practice for the characterisation and remediation from ground gas in hazardous developments.

- BSI BS10175, 2011 Investigation of Potentially Contamianted Sites: Code of Practice
- Brownfields – Managing the development of previously developed land – A client's guide, CIRIA Report C578 2002
- Building Research Establishment BRE211, 2007, Guidance on Protective Measure for New Buildings.
- BRE, 2005, Special Digest 1 Concrete in Aggressive Ground, 3rd Edition.
- CIRIA Report C665, 2007, Assessing Risks Posed by Hazardous Ground Gases to Buildings.
- Department for Environment, Food and Rural Affairs, Environmental Protection Act 1990: Part 2A Contaminated Land Statutory Guidance April 2012
- Department for Environment, Food and Rural Affairs, 2012, National Planning Policy Framework.
- Department for Environment, Food and Rural Affairs Guidelines for Environmental Risk Assessment and Management, Green Leaves III, November 2011
- Environment Agency technical advice to third parties on Pollution of Controlled Waters for Part IIA of the EPA1990, May 2002
- Environment Agency; Guiding Principles for Land Contamination, March 2011
- Environment Agency, 2004, CLR11, Model Procedures for the Management of Land Contamination.
- Environment Agency, 2009, Updated technical Background to the CLEA Model, Report SC050021/SR3.
- Environment Agency; Groundwater Protection; Policy and Practice, 2008
- Environment Agency, 2006, Remedial targets methodology, Hydrogeological Risk Assessment for Land Contamination
- EA, NHBC, CIEH; Guidance for the Safe Development of Housing on Land Affected by Contamination R&D Publication 66: 2008 Volumes 1 & 2
- HMSO, 2000, Environmental Protection Act 1990 Part IIA,
- Contaminated Land.
- HMSO, 2000, UK Drinking Water Standards.
- NHBC, 2007, Guidance on the Evaluation of Development Proposals on Sites where Methane and Carbon Dioxide are present.

And any other protocols advised by DEFRA and the EA and guidance's prepared by BSI, CIRIA, BURA, and other industry advisory bodies including BS5930 and BS10175.

Judicial Precedents and Legislation

The following non-exhaustive list of legislative framework documents has been considered in the compilation of this document.

- The Environment Act (1995)
- The Environment Protection Act (1990)
- The Water Resources Act (1991)
- The Radioactive Substances Act (1993)

- The Pollution Prevention and Control (England and Wales) Regulations (2000)
- The Contaminated Land (England) Act (2000)
- The Environment Act 1995 (Commencement No.16 and Saving Provision) (England) Order (2000)
- The Contaminated Land (England) (Amendment) Regulations (2001)
- The Landfill Regulations (England and Wales) Regulations (2002)
- The Landfill (England and Wales) (Amendment) Regulations (2004)
- Rylands v Fletcher - Private Nuisance, Escape
- Health and Safety at Work Act
- The Building Regulations 1991, Part C of Schedule 1
- The controlled Waste Regulations 1992
- Special Waste Regulations 1996.

Neither the list of guidance documents nor the list of judicial precedents and legislation should be considered exclusive or comprehensive. There are approximately 85 individual items of legislation regulating contaminated land work. BWB makes every effort to ensure that all are adhered to in the preparation and presentation of this report.

APPENDIX 2

SITE PHOTOGRAPHS

Photo 1 View north from the south eastern part of the site.

Photo 2 View north from the central southern site boundary

Photo 3 View north from the south western corner of the site

Photo 4 View south from the north western corner of the site

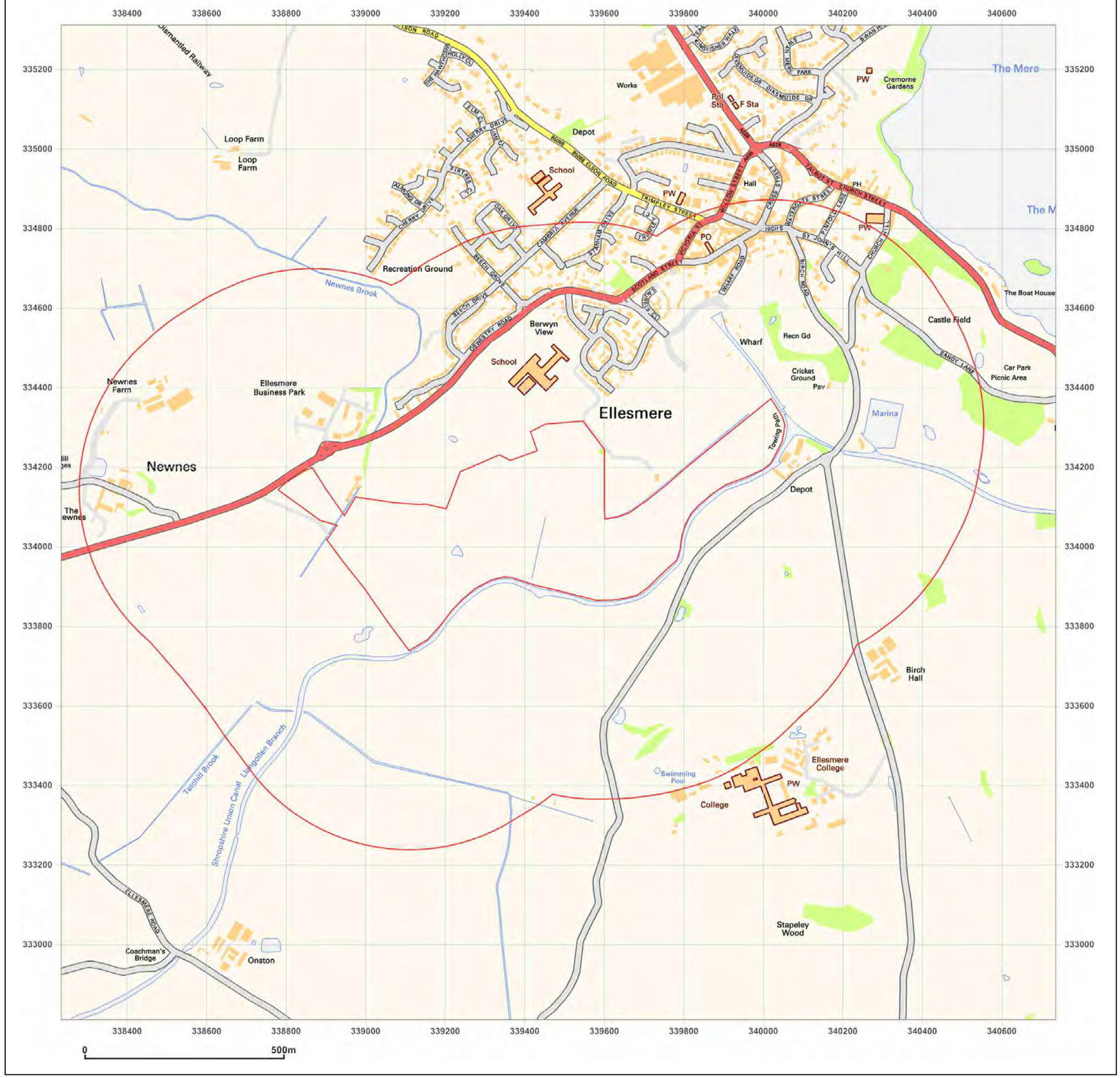
Photo 5 Canal junction to the south east of the site

Photo 6 Pipe crossing canal immediately south of the site (to the south of sewage works)

Photo 7 Steps down from canal to the site, indicating elevation of canal above site

APPENDIX 3

HISTORICAL ORDNANCE SURVEY PLANS



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Report Ref: HMD-214-912193
Grid Ref: 339485, 334061

Map Name: National Grid

Map date: **2012**

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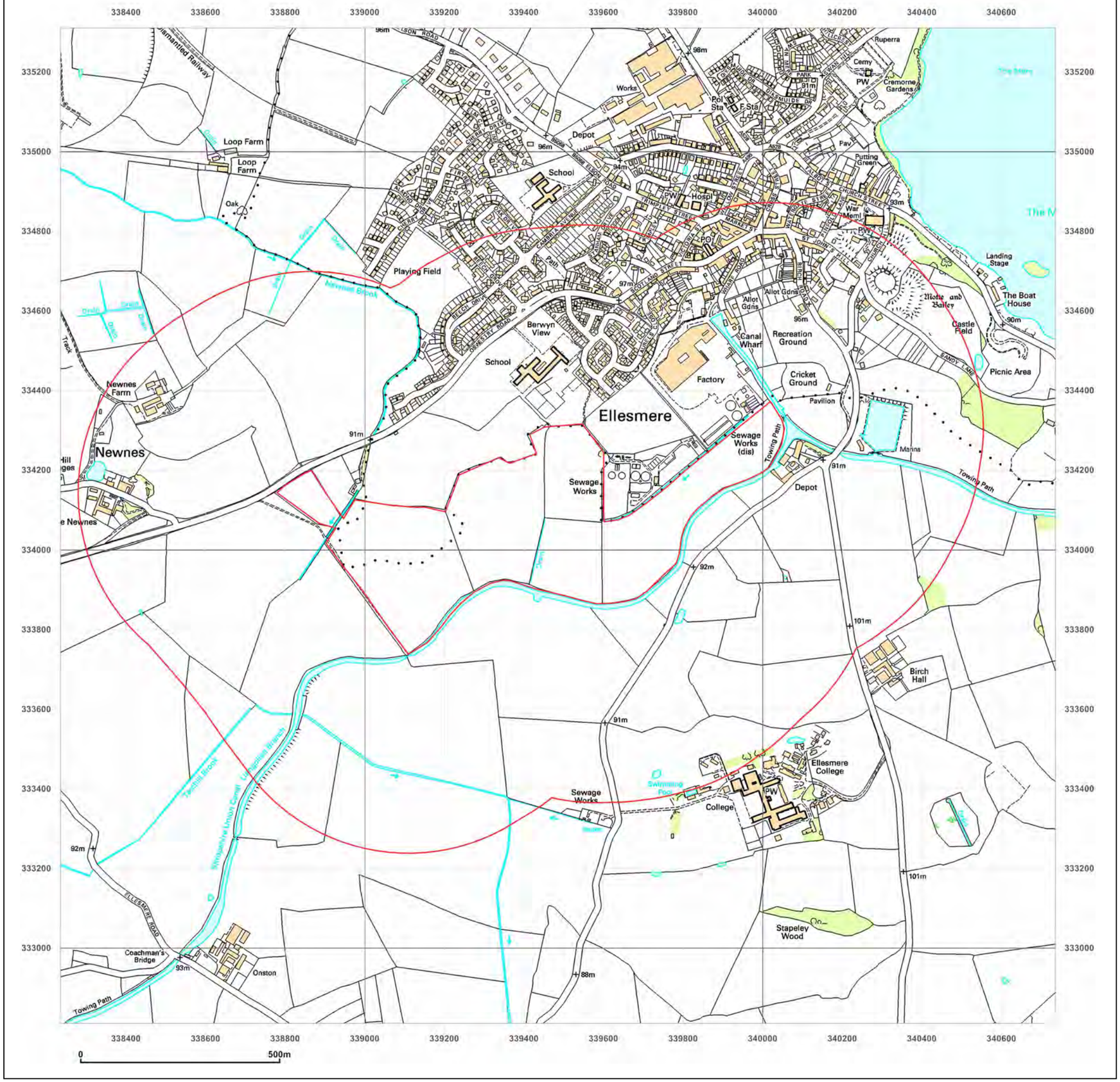

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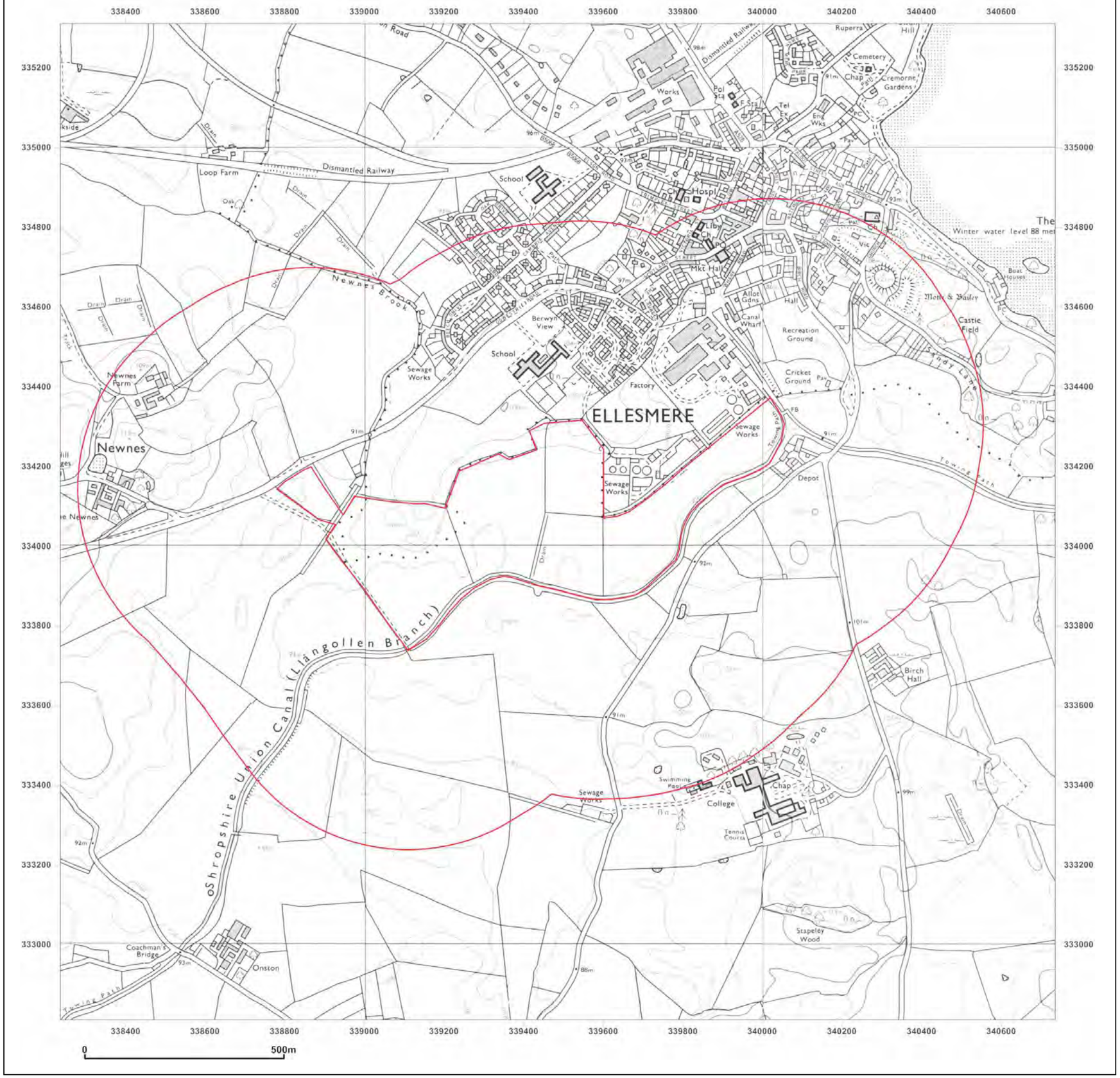

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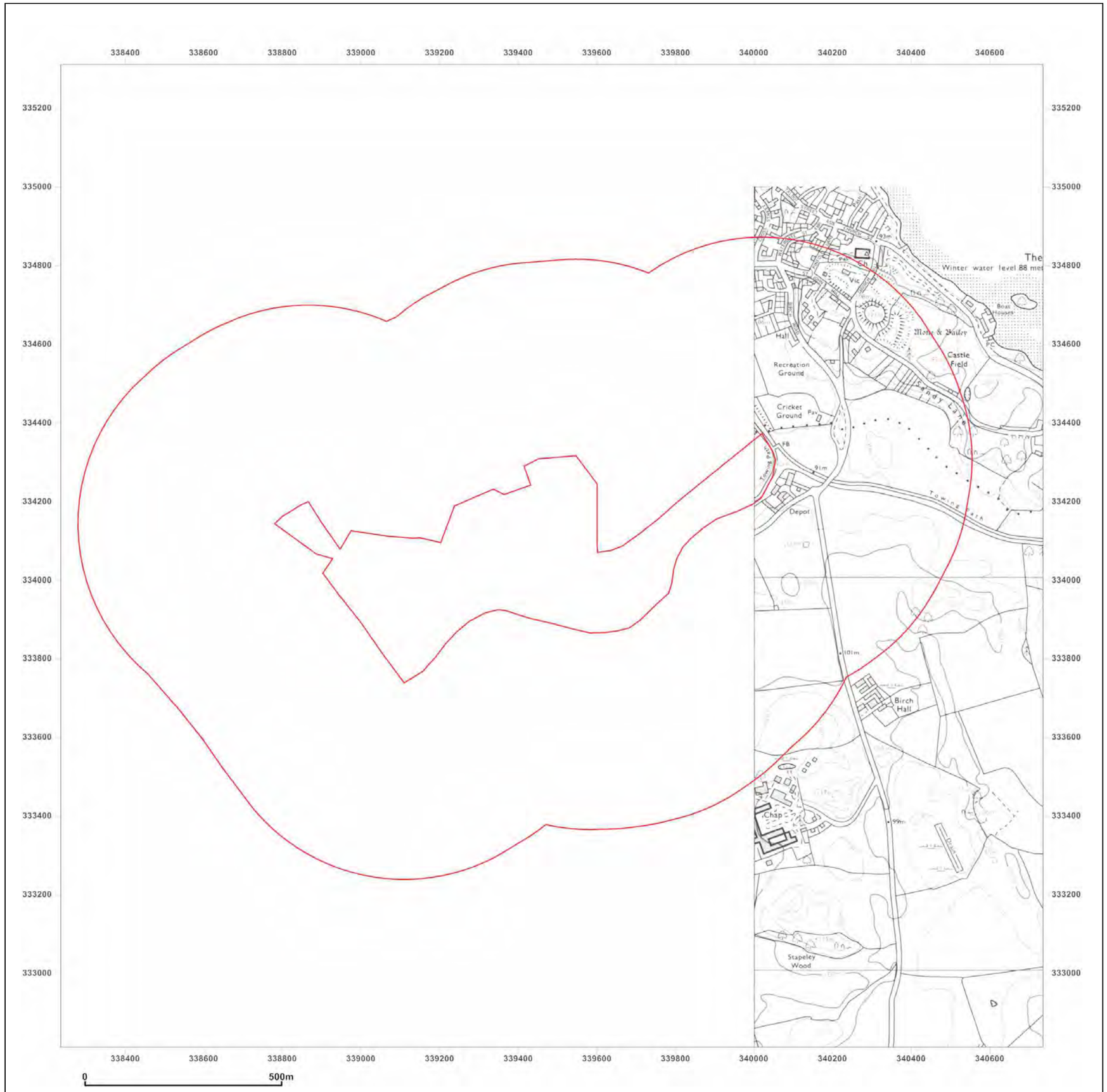

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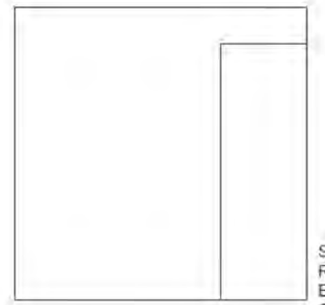

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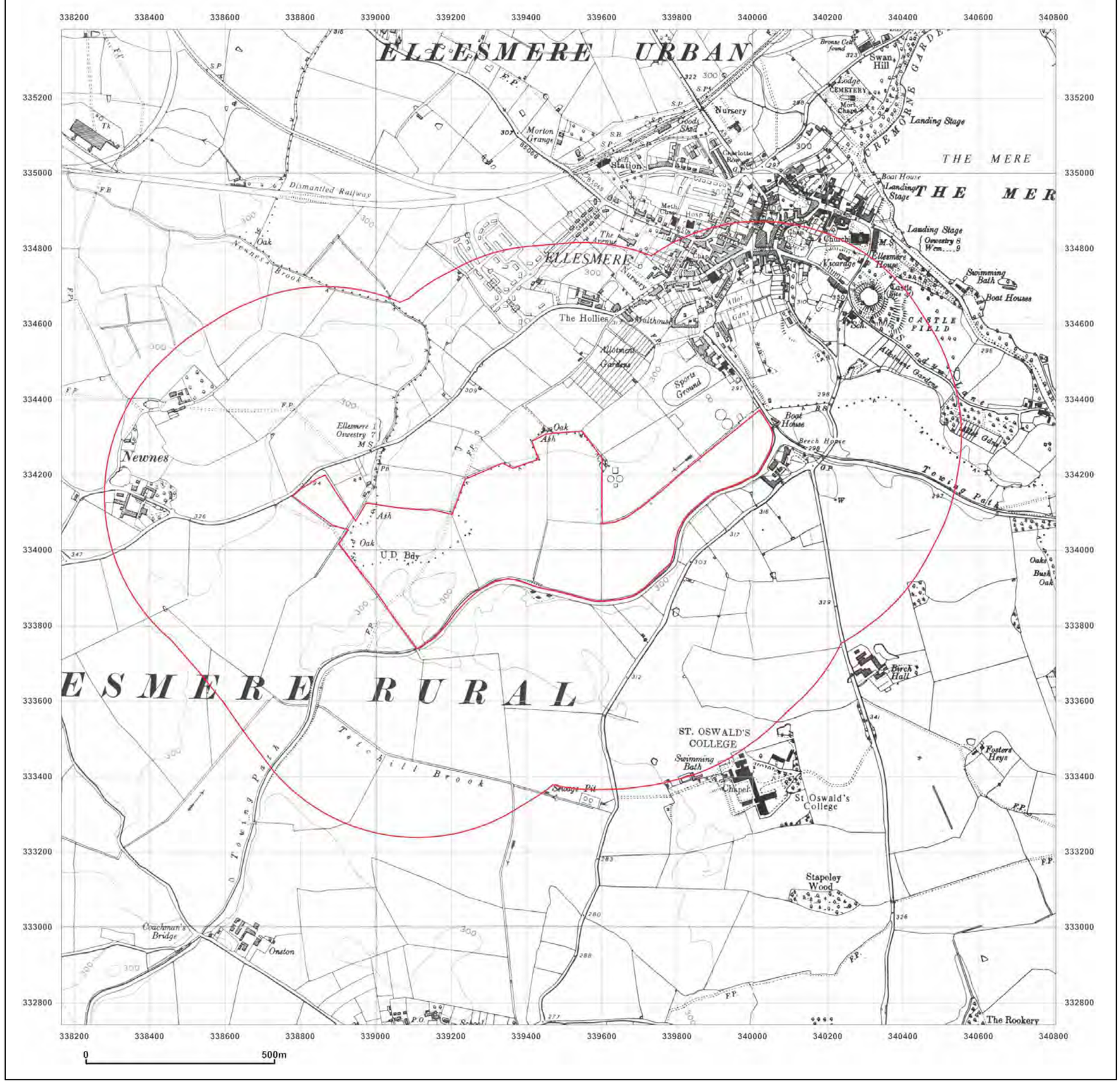

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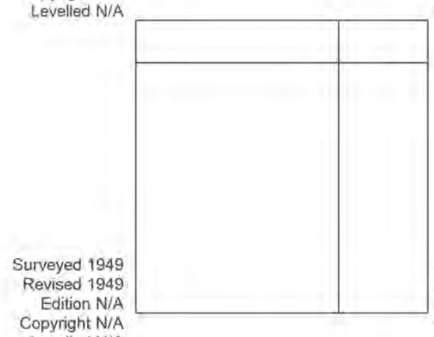

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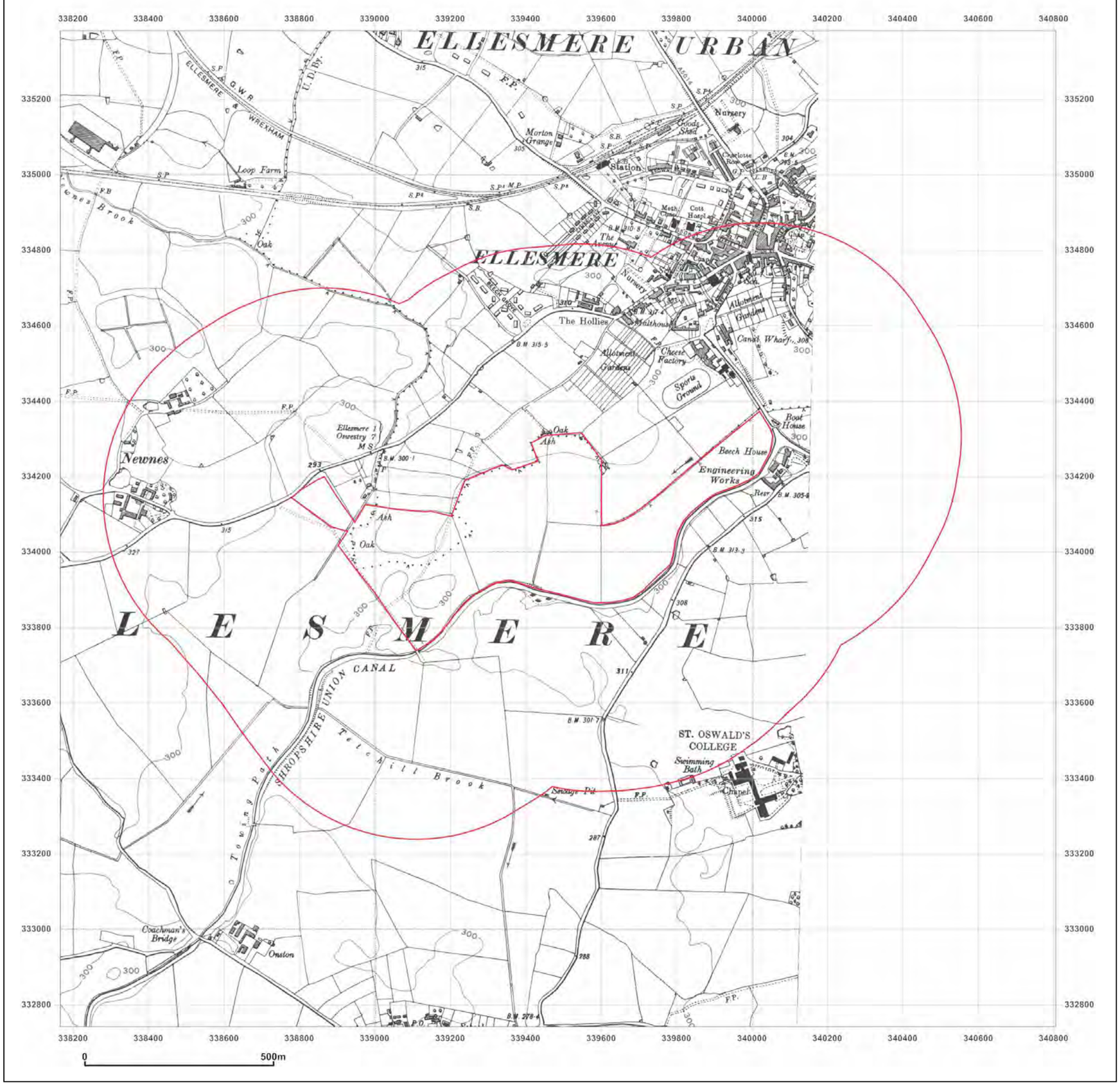

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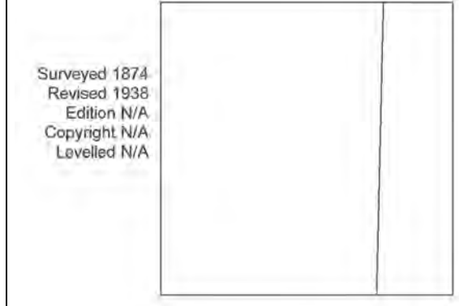

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Production date: 06 June 2013

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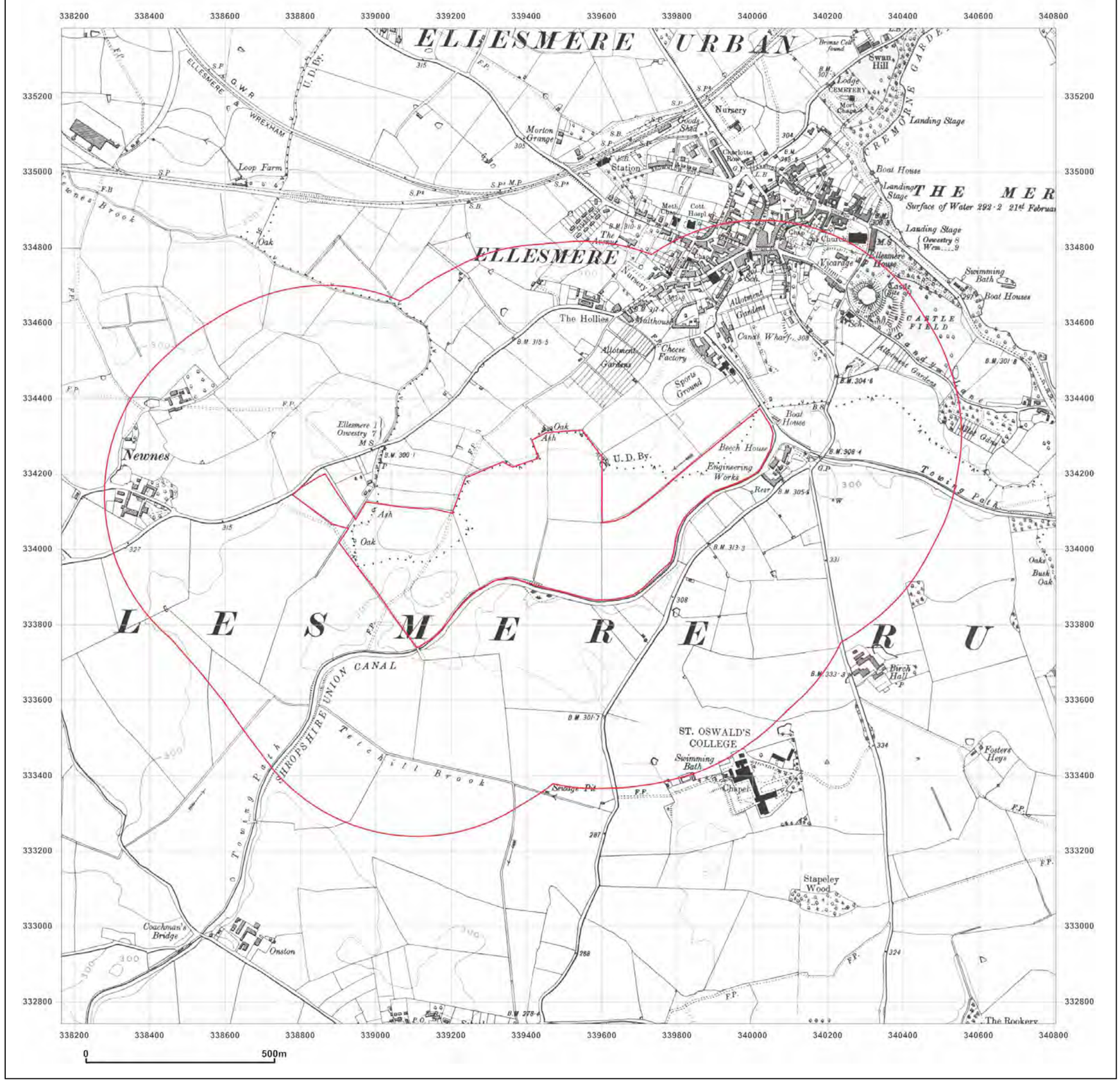

GroundSure
ENVIRONMENTAL INSIGHT

Site Details:

Ellesmere Marina, Shropshire,

Client Ref: BMW2025/NE12/877
Report Ref: HMD-214-912193
Grid Ref: 339485, 334061

Map Name: County Series

Map date: **1929**

Scale: 1:10,560

Printed at: 1:10,560

N
W E
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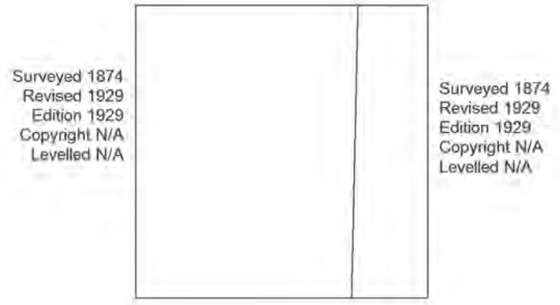

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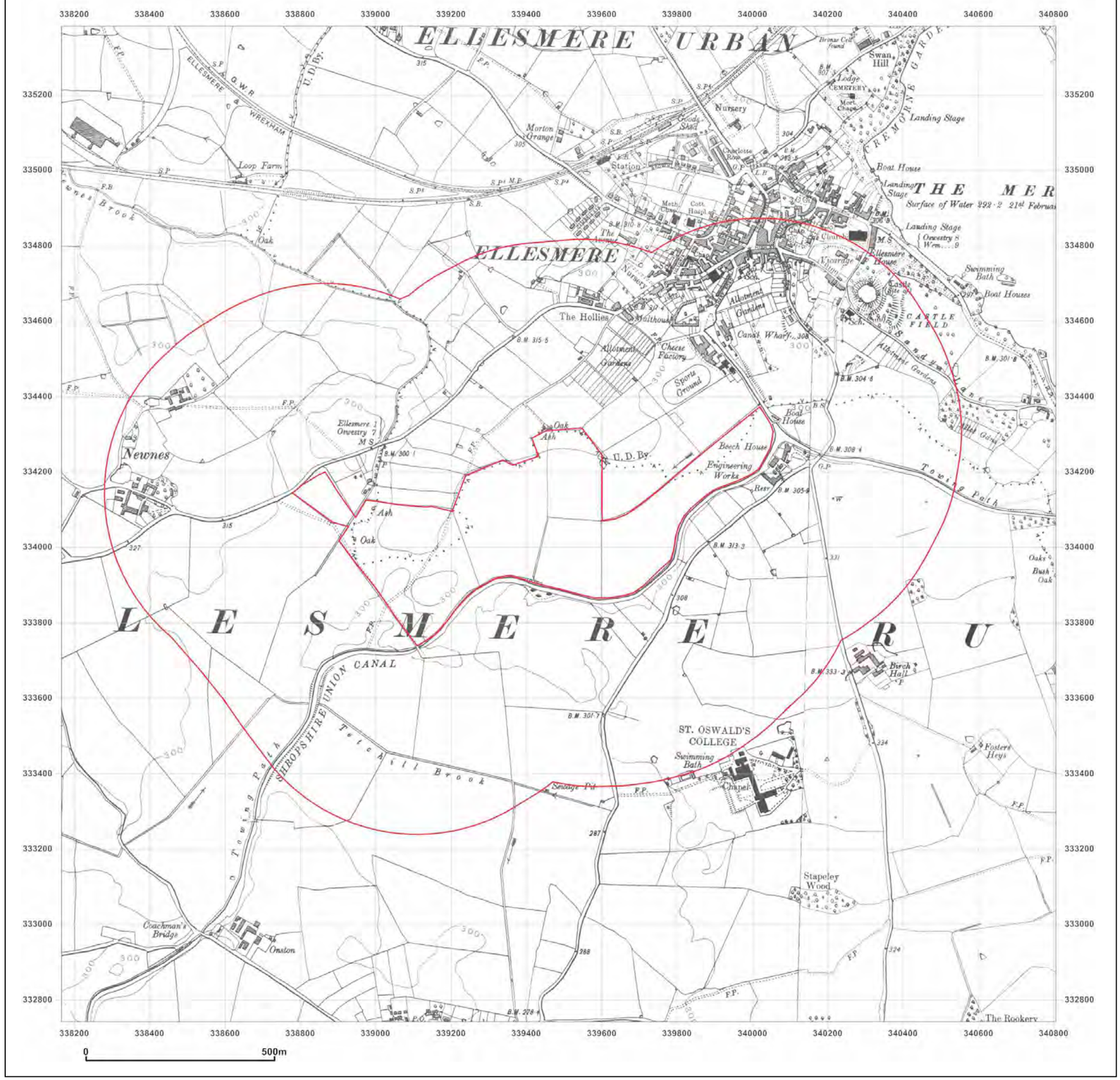
E: info@groundsure.com
W: www.groundsure.com

Production date: 06 June 2013

To view map legend click here *Legend*



GroundSure
ENVIRONMENTAL INSIGHT

Site Details:

Ellesmere Marina, Shropshire,

Client Ref: BMW2025/NE12/877
Report Ref: HMD-214-912193
Grid Ref: 339485, 334061

Map Name: County Series

Map date: **1924**

Scale: 1:10,560

Printed at: 1:10,560

N
W E
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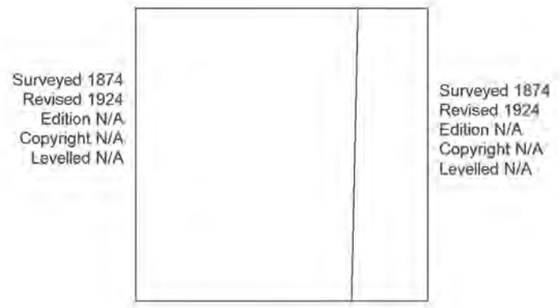

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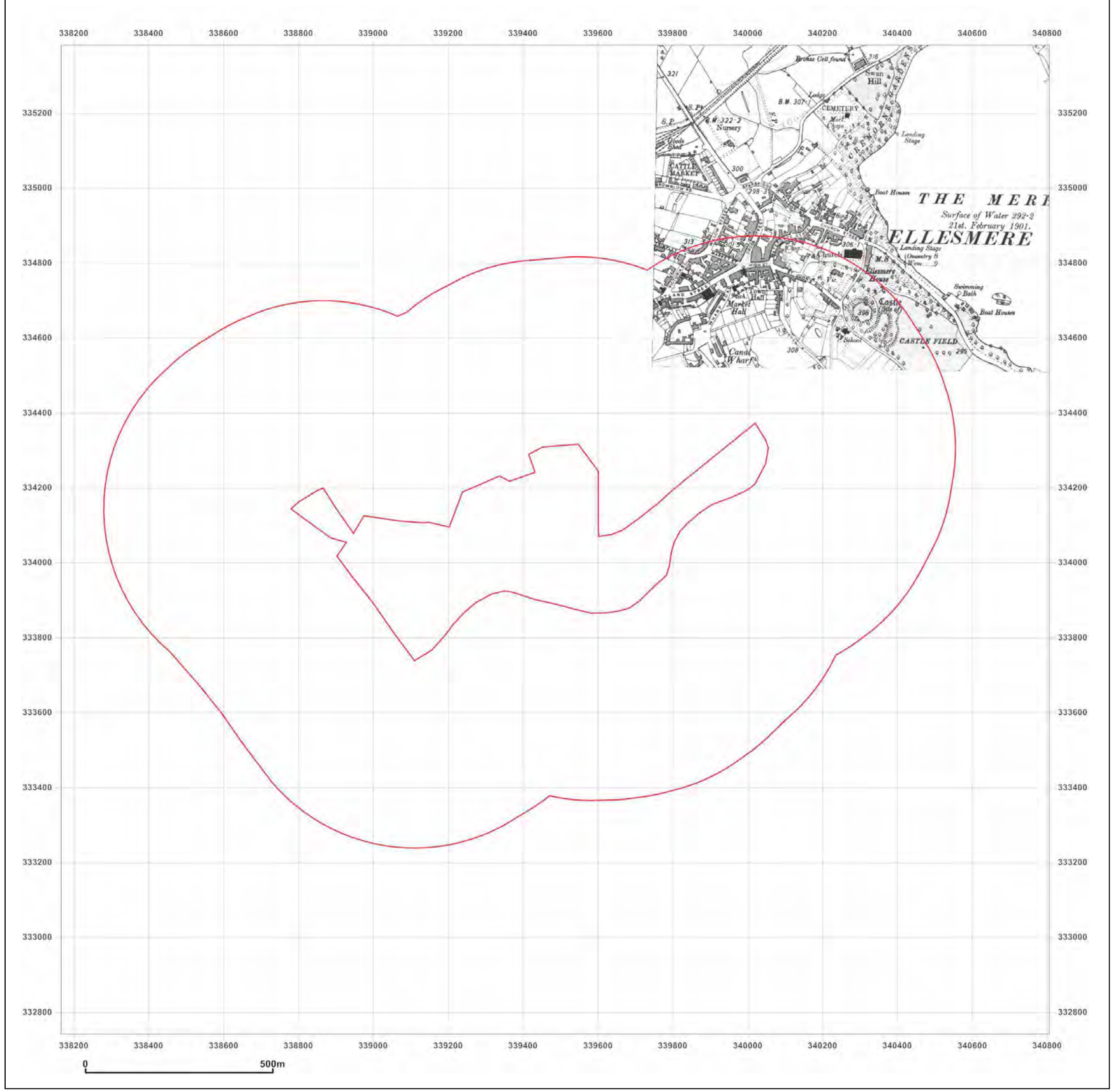
Production date: 06 June 2013

To view map legend click here *Legend*



GroundSure
ENVIRONMENTAL INSIGHT

Site Details:

Ellesmere Marina, Shropshire,

Client Ref: BMW2025/NE12/877
Report Ref: HMD-214-912193
Grid Ref: 339485, 334061

Map Name: County Series

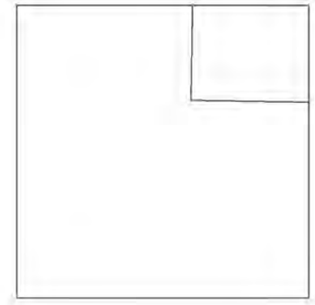
Map date: **1914**

Scale: 1:10,560

Printed at: 1:10,560

N
W E
S

Surveyed 1872
Revised 1914
Edition N/A
Copyright N/A
Levelled N/A



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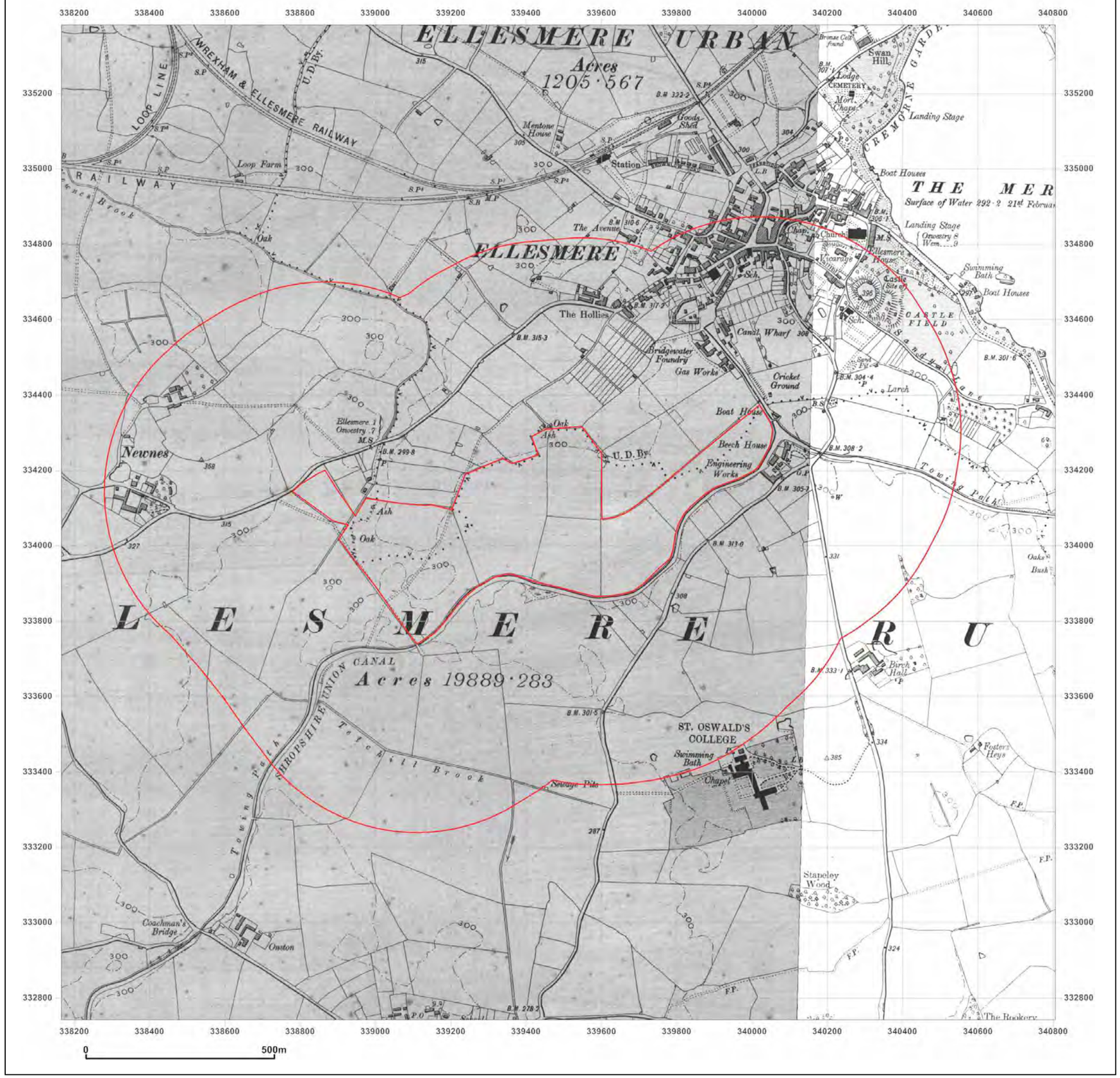
W: www.groundsure.com

Production date: 06 June 2013

To view map legend click here *Legend*



GroundSure
ENVIRONMENTAL INSIGHT

Site Details:

Ellesmere Marina, Shropshire,

Client Ref: BMW2025/NE12/877
Report Ref: HMD-214-912193
Grid Ref: 339485, 334061

Map Name: County Series

Map date: **1900**

Scale: 1:10,560

Printed at: 1:10,560

N
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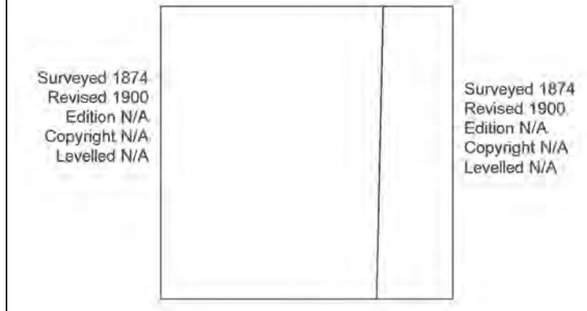

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W: www.groundsure.com

Production date: 06 June 2013

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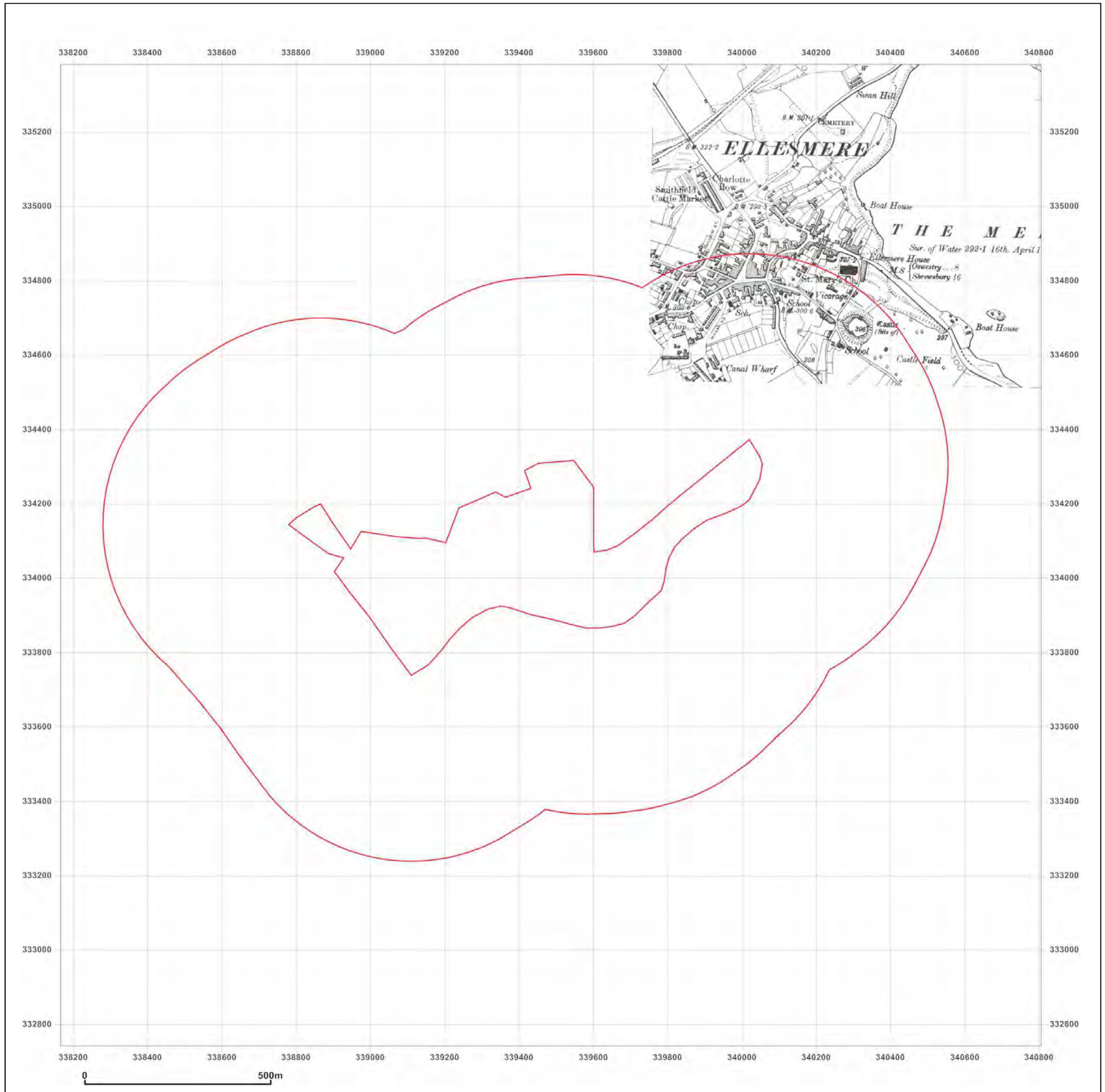


GroundSure
ENVIRONMENTAL INSIGHT

Site Details:

Ellesmere Marina, Shropshire,

Client Ref: BMW2025/NE12/877
Report Ref: HMD-214-912193
Grid Ref: 339485, 334061

Map Name: County Series

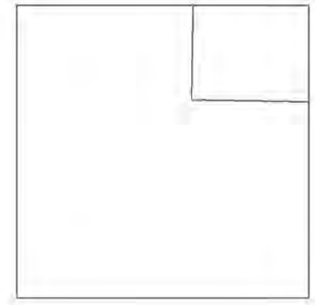
Map date: **1898**

Scale: 1:10,560

Printed at: 1:10,560

N
W E
S

Surveyed 1873
Revised 1898
Edition N/A
Copyright N/A
Levelled N/A



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W: www.groundsure.com

Production date: 06 June 2013

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GroundSure
ENVIRONMENTAL INSIGHT

Site Details:

Ellesmere Marina, Shropshire,

Client Ref: BMW2025/NE12/877
Report Ref: HMD-214-912193
Grid Ref: 339485, 334061

Map Name: County Series

Map date: **1874**

Scale: 1:10,560

Printed at: 1:10,560

N
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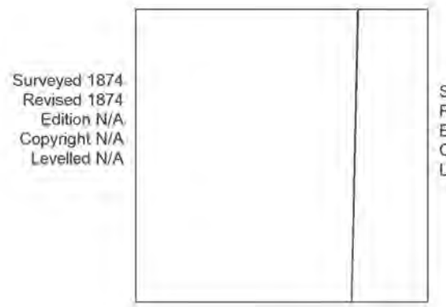
S



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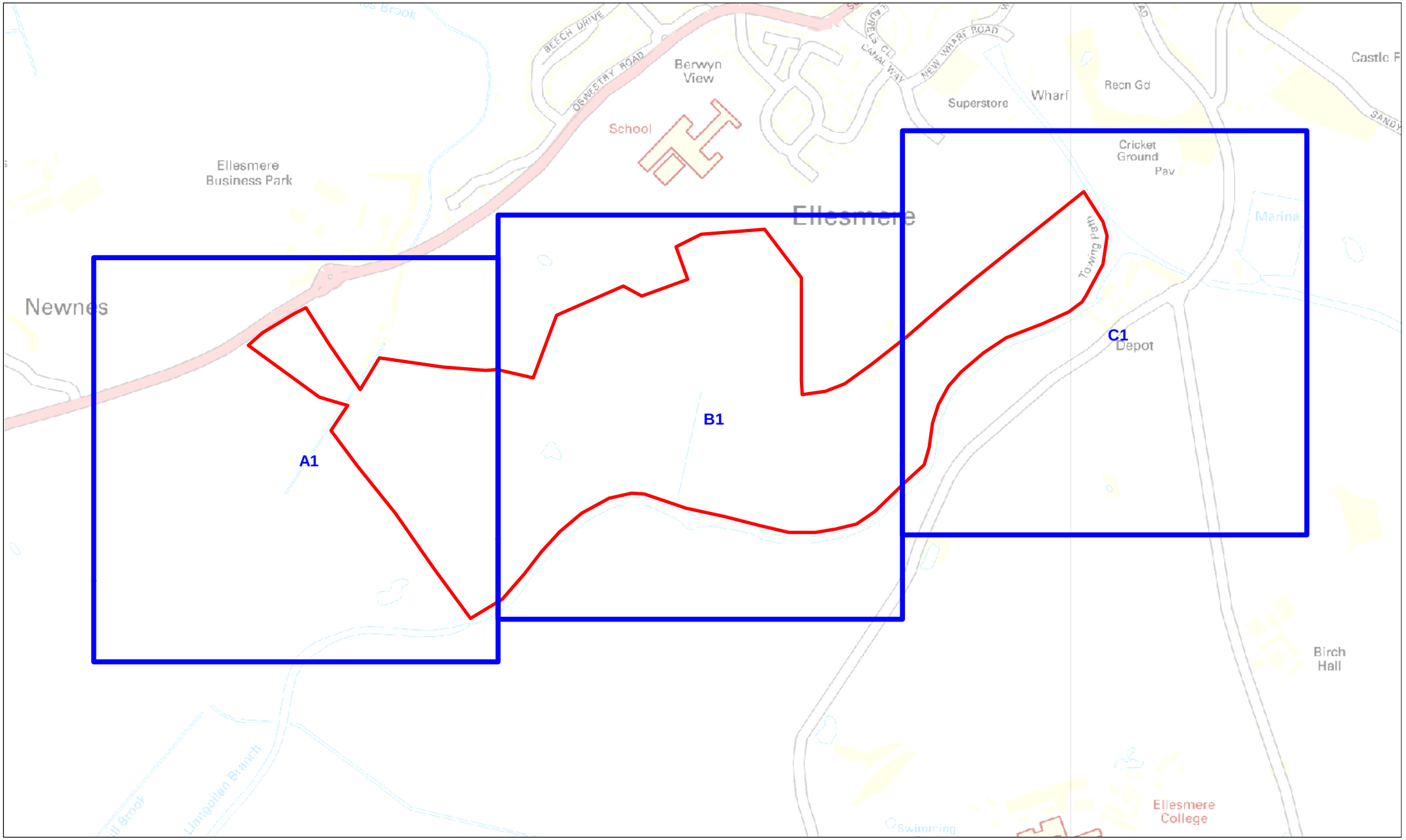
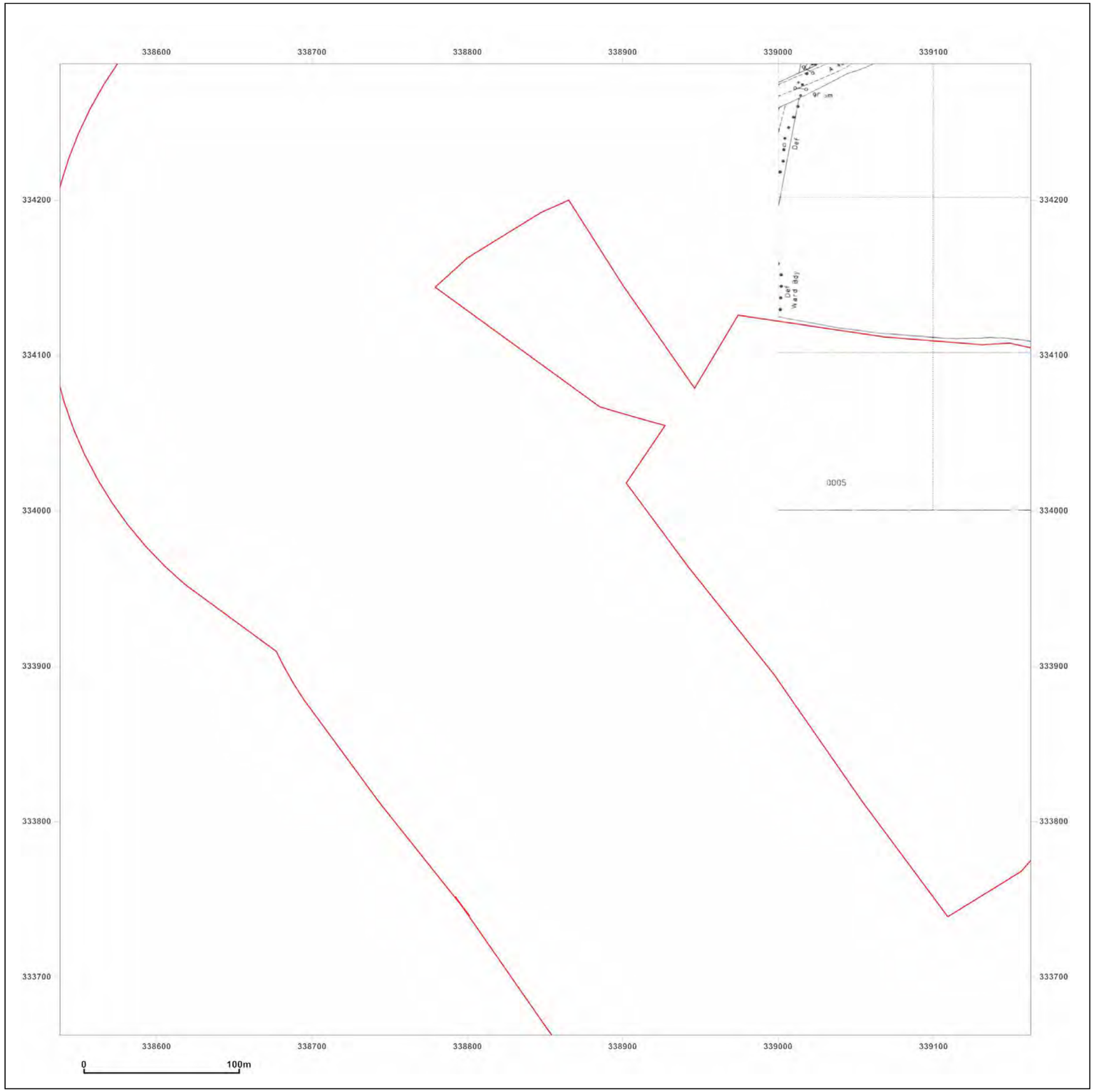
W: www.groundsure.com

Production date: 06 June 2013

To view map legend click here *Legend*


Berwyn View
School
Ellesmere Business Park
Ellesmere
Newnes
Superstore
Wharf
Recn Gd
Cricket Ground
Pav
Marina
Towing Path
C1
Depot
A1
B1
Birch Hall
Ellesmere College
Swimming
BEECH DRIVE
ORMESTRY ROAD
NEW WHARF ROAD
CANAL WAY
Llangollen Branch



GroundSure
ENVIRONMENTAL INSIGHT

Site Details:

Ellesmere Marina, Shropshire,

Client Ref: BMW2025/NE12/877
Report Ref: HMD-214-912193_LS_A1
Grid Ref: 338850, 333975

Map Name: National Grid

Map date: **1995**

Scale: 1:2,500

Printed at: 1:2,500

N
W E
S

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

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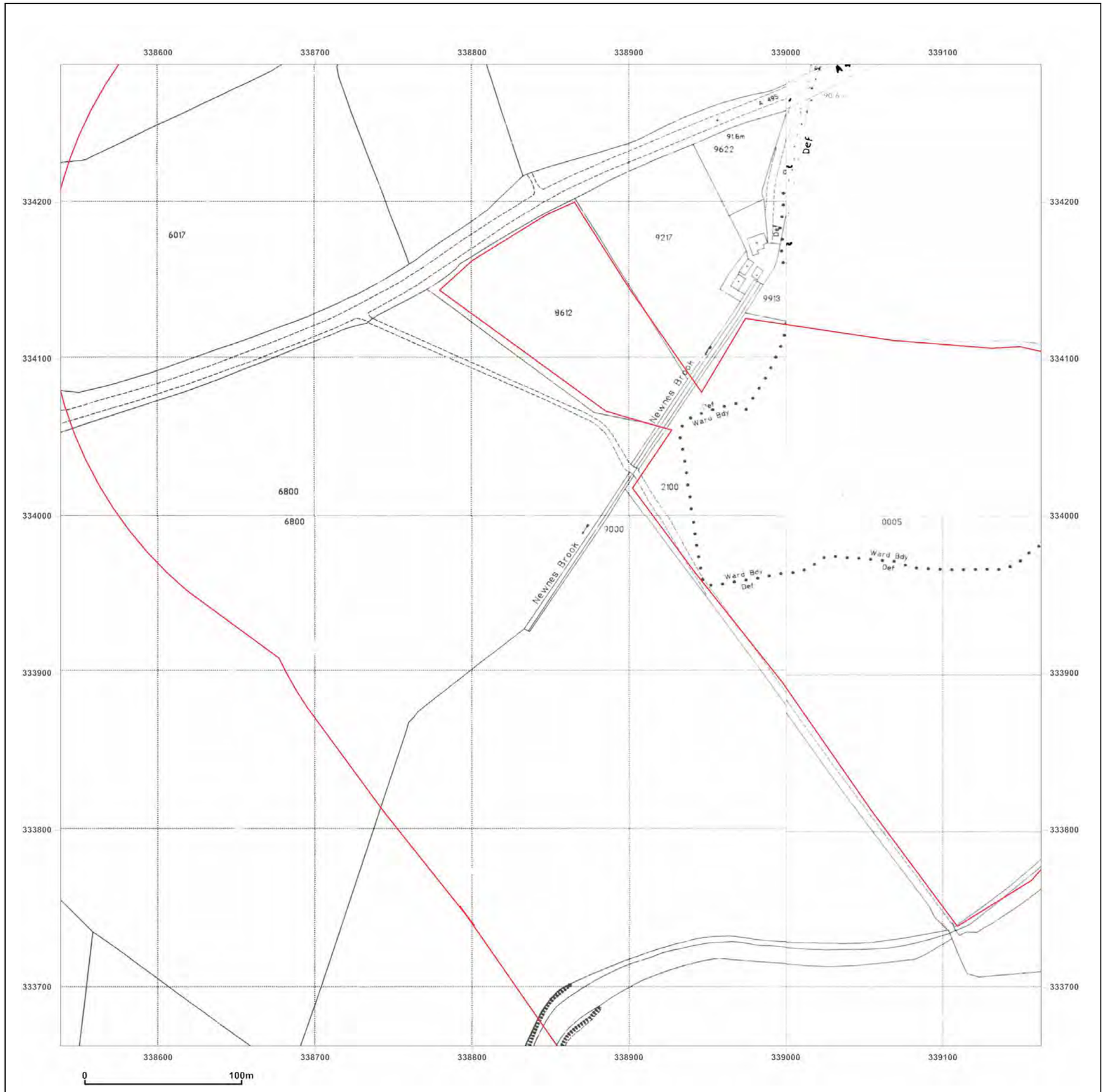
W: www.groundsure.com

Production date: 06 June 2013

To view map legend click here *Legend*



GroundSure
ENVIRONMENTAL INSIGHT

Site Details:

Ellesmere Marina, Shropshire,

Client Ref: BMW2025/NE12/877
Report Ref: HMD-214-912193_LS_A1
Grid Ref: 338850, 333975

Map Name: National Grid

Map date: **1991-1995**

Scale: 1:2,500

Printed at: 1:2,500

N
W E
S

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

Surveyed N/A
Revised N/A
Edition N/A
Copyright 1991
Levelled 1969

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

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

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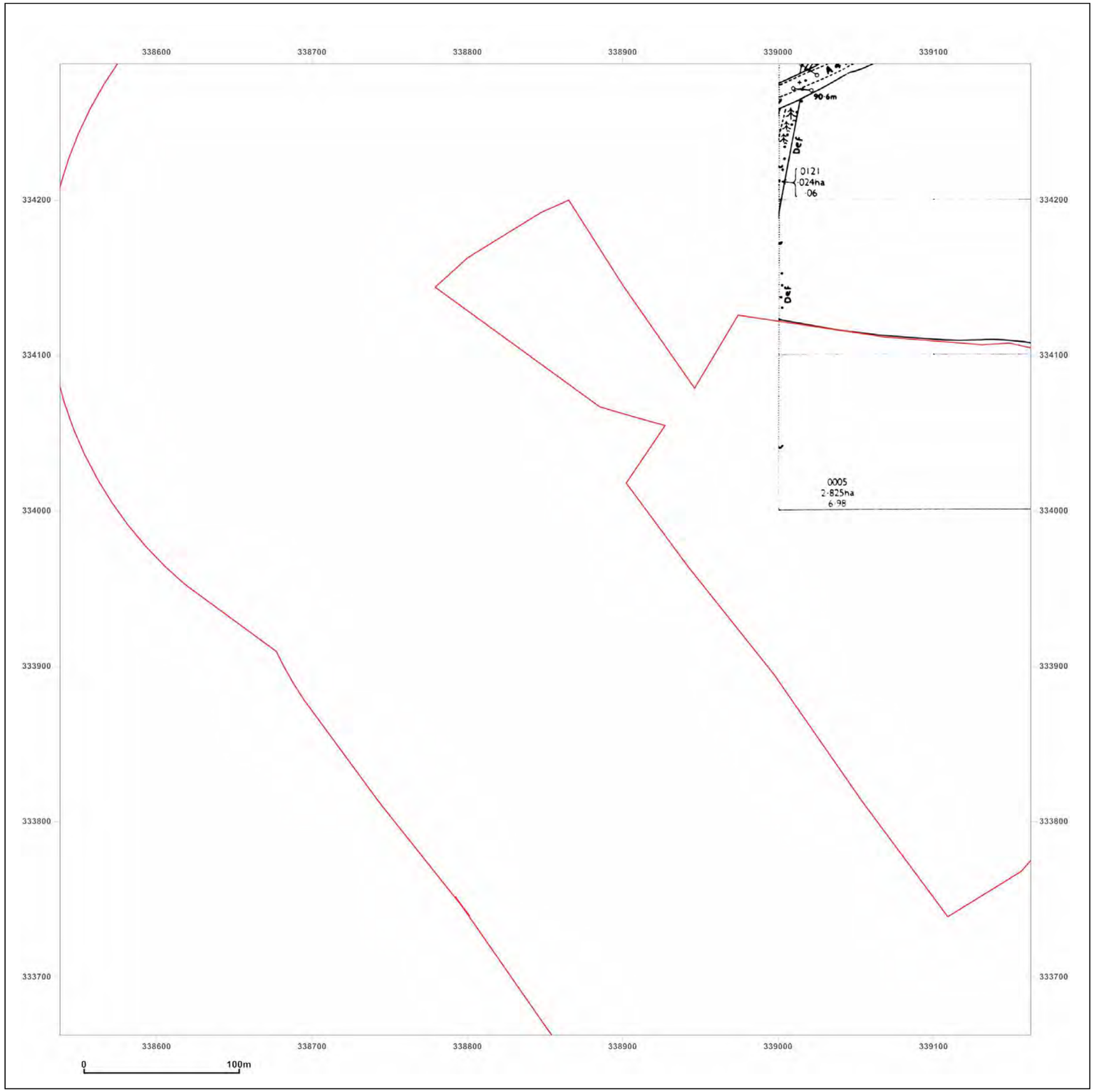
W: www.groundsure.com

Production date: 06 June 2013

To view map legend click here *Legend*



GroundSure
ENVIRONMENTAL INSIGHT

Site Details:

Ellesmere Marina, Shropshire,

Client Ref: BMW2025/NE12/877
Report Ref: HMD-214-912193_LS_A1
Grid Ref: 338850, 333975

Map Name: National Grid

Map date: **1991**

Scale: 1:2,500

Printed at: 1:2,500

N
W E
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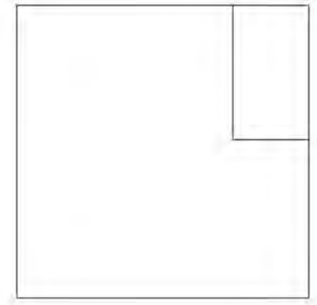
Surveyed 1969
Revised 1991
Edition N/A
Copyright 1991
Levelled 1969



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Production date: 06 June 2013

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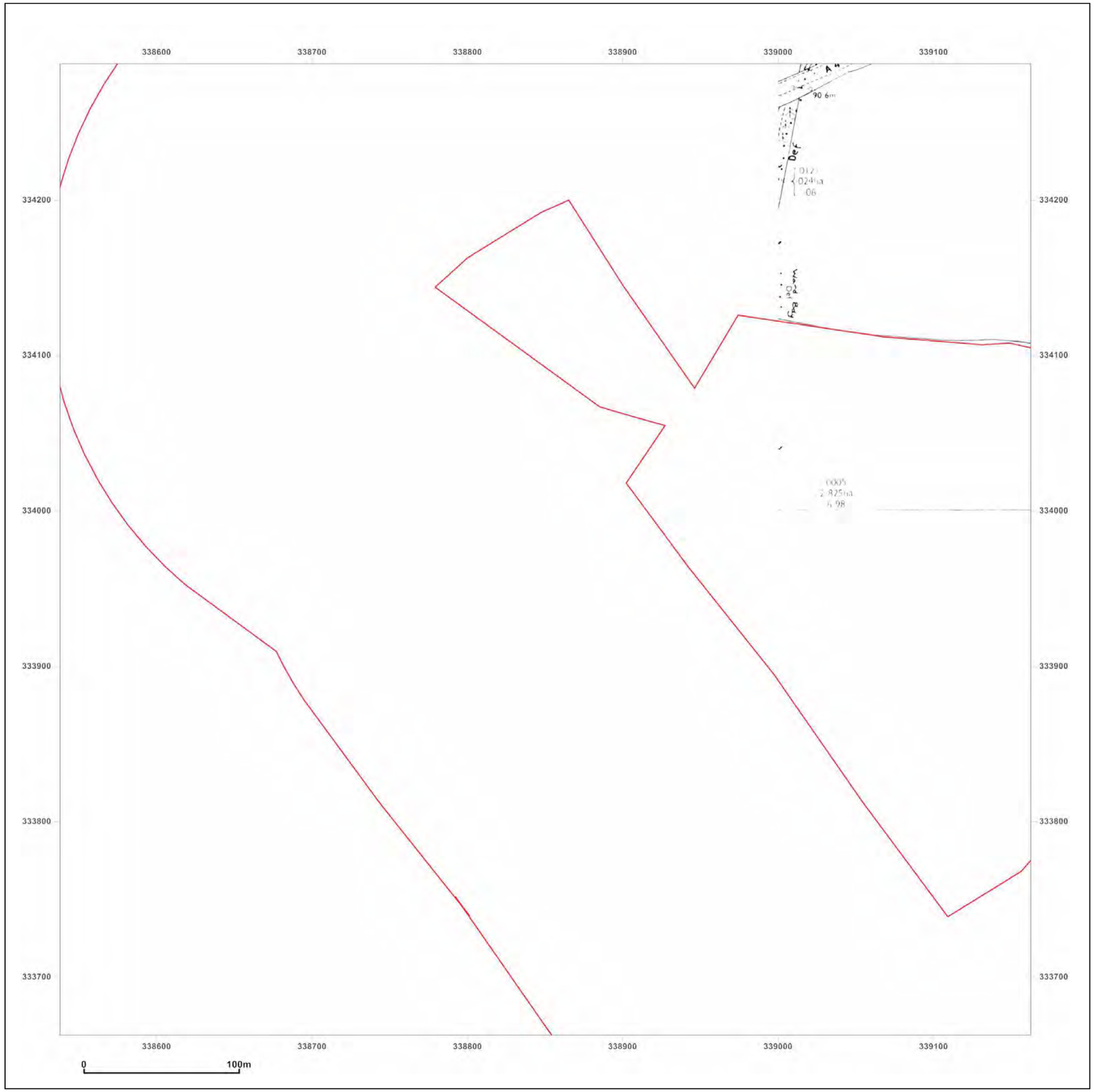

GroundSure
ENVIRONMENTAL INSIGHT

Site Details:

Ellesmere Marina, Shropshire,

Client Ref: BMW2025/NE12/877
Report Ref: HMD-214-912193_LS_A1
Grid Ref: 338850, 333975

Map Name: National Grid

Map date: **1988**

Scale: 1:2,500

Printed at: 1:2,500

N
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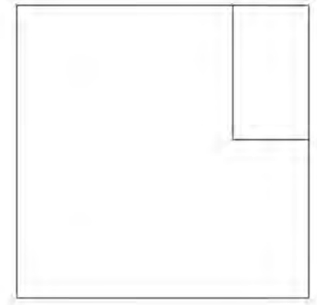
Surveyed 1969
Revised 1988
Edition N/A
Copyright 1988
Levelled 1969



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W: www.groundsure.com

Production date: 06 June 2013

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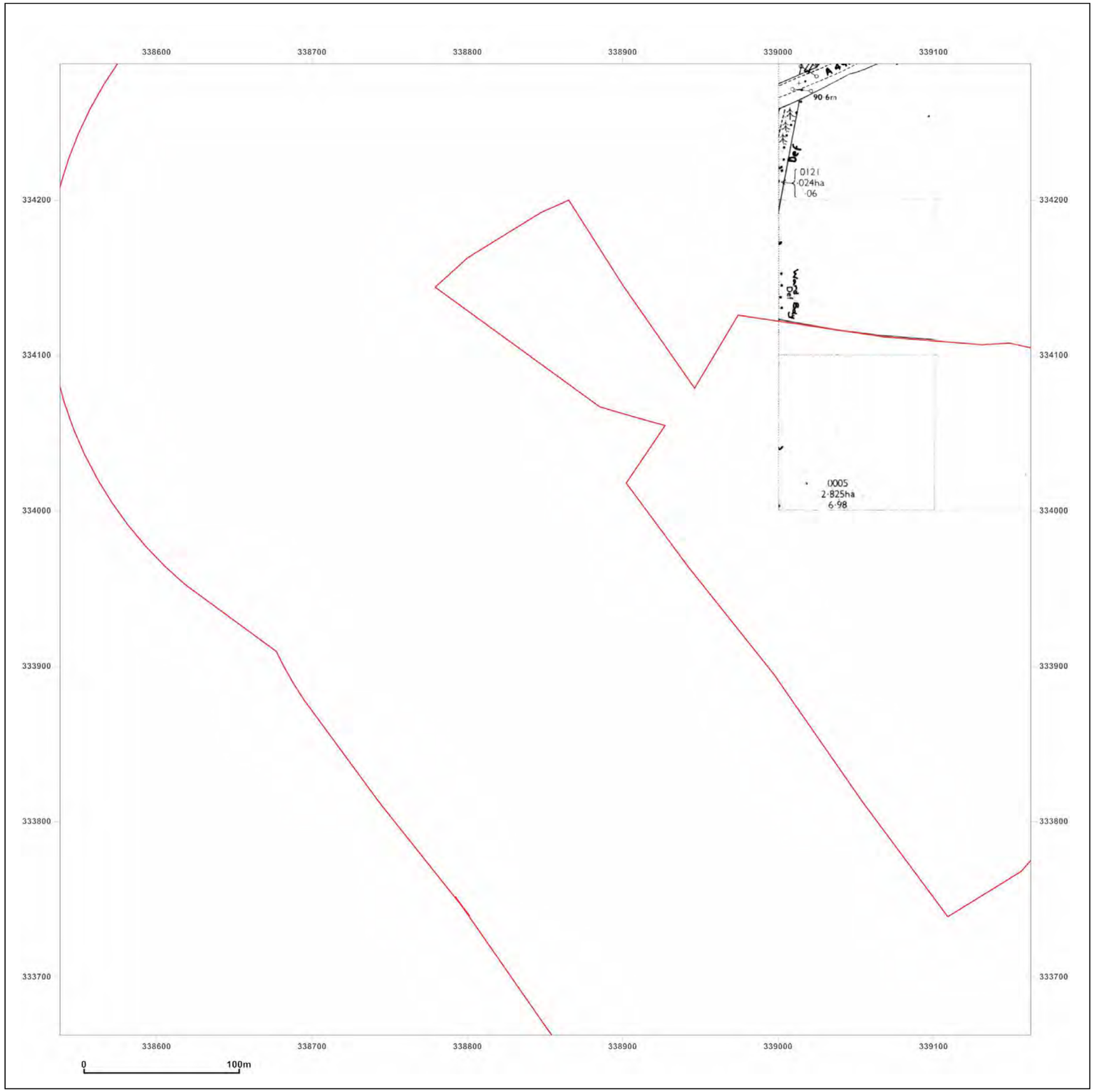


GroundSure
ENVIRONMENTAL INSIGHT

Site Details:

Ellesmere Marina, Shropshire,

Client Ref: BMW2025/NE12/877
Report Ref: HMD-214-912193_LS_A1
Grid Ref: 338850, 333975

Map Name: National Grid

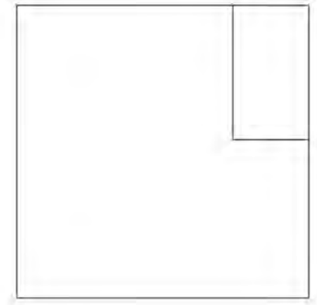
Map date: **1985**

Scale: 1:2,500

Printed at: 1:2,500

N
W E
S

Surveyed 1969
Revised 1985
Edition N/A
Copyright 1985
Levelled 1969



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Production date: 06 June 2013

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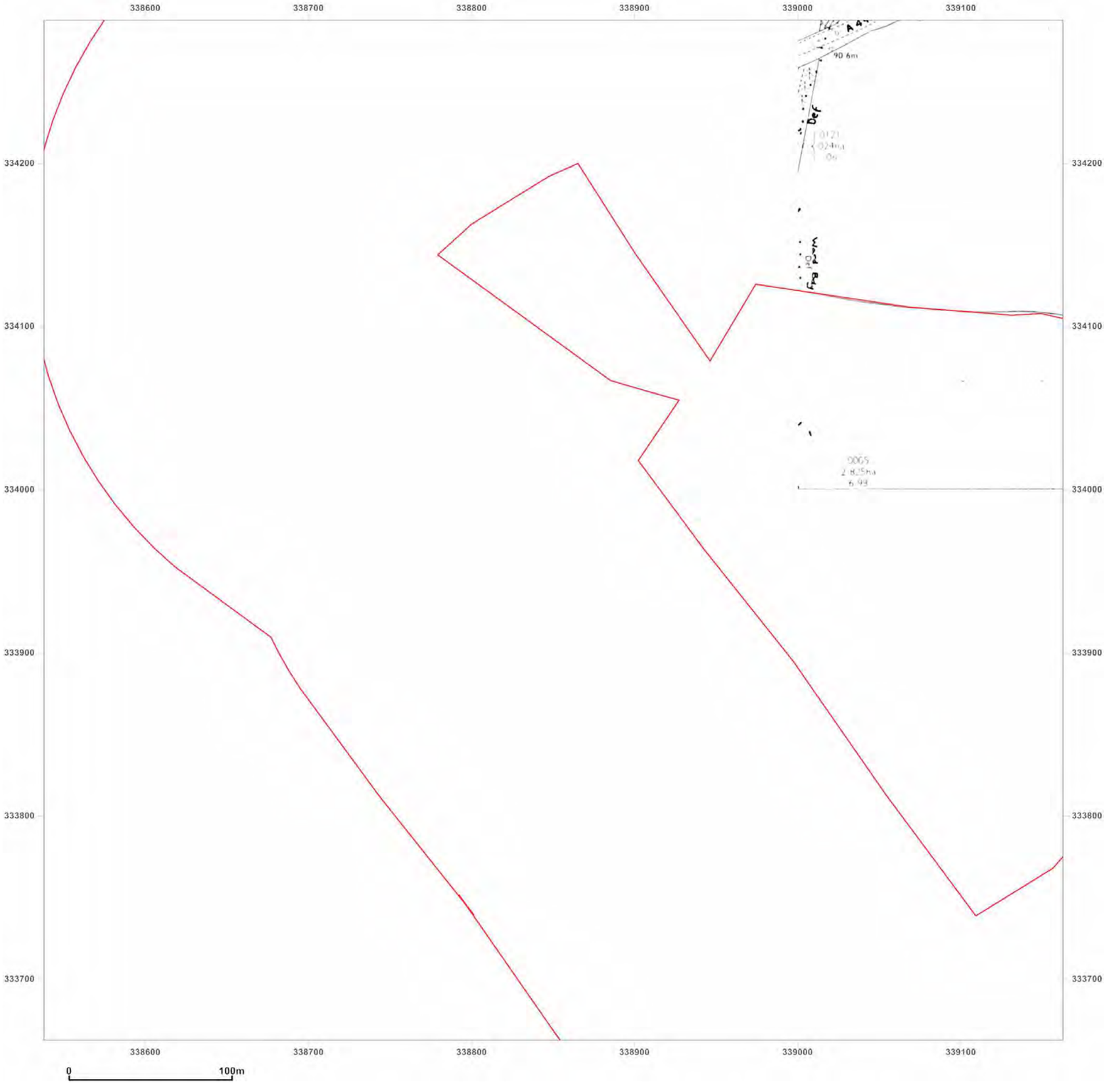


GroundSure
ENVIRONMENTAL INSIGHT

Site Details:

Ellesmere Marina, Shropshire,

Client Ref: BMW2025/NE12/877
Report Ref: HMD-214-912193_LS_A1
Grid Ref: 338850, 333975

Map Name: National Grid

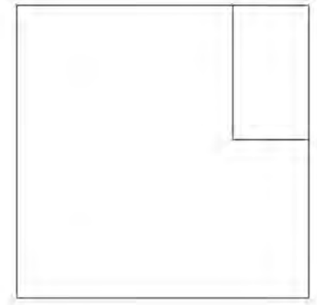
Map date: **1985**

Scale: 1:2,500

Printed at: 1:2,500

N
W E
S

Surveyed 1969
Revised 1985
Edition N/A
Copyright 1985
Levelled 1969



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W: www.groundsure.com

Production date: 06 June 2013

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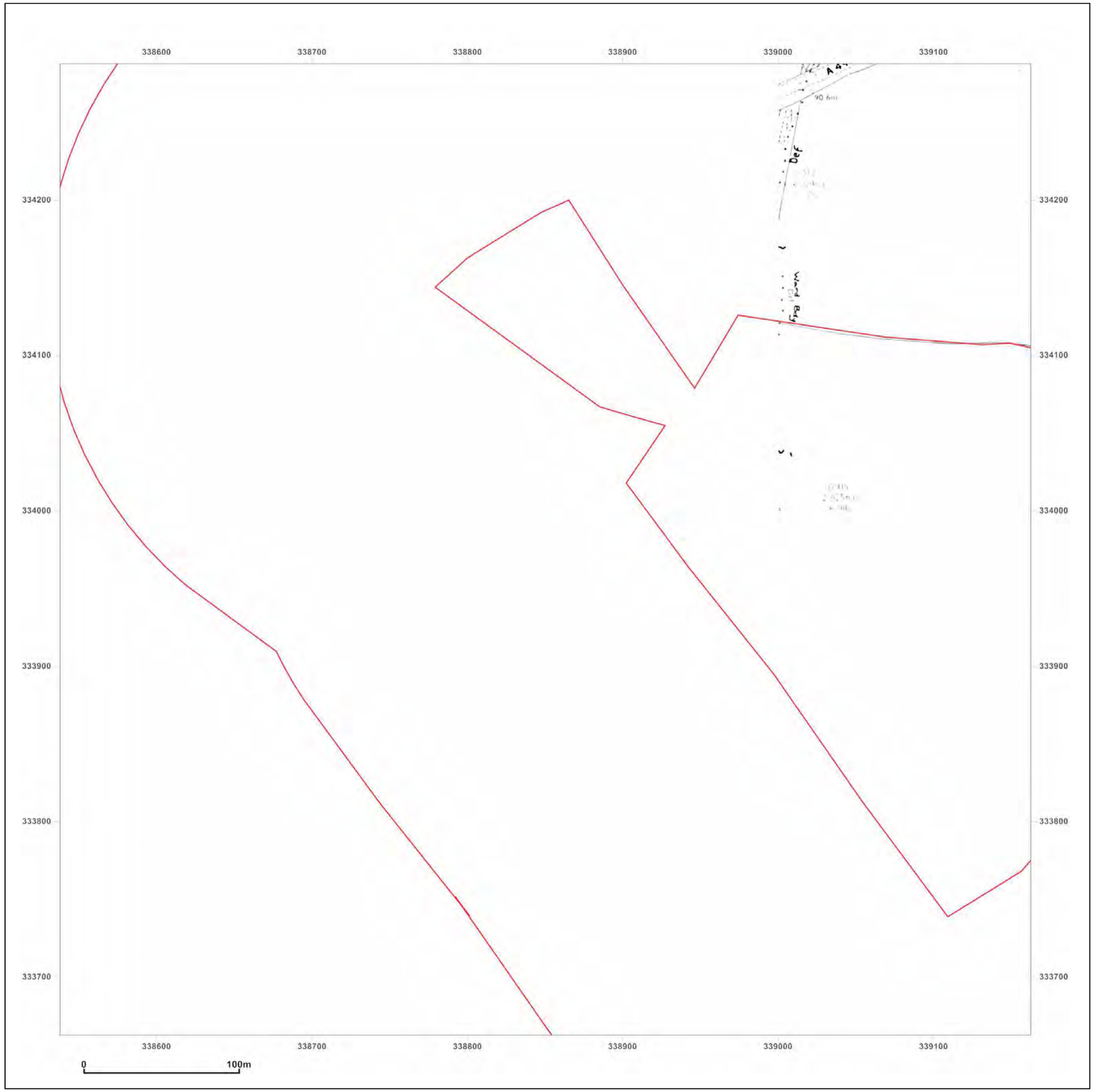


GroundSure
ENVIRONMENTAL INSIGHT

Site Details:

Ellesmere Marina, Shropshire,

Client Ref: BMW2025/NE12/877
Report Ref: HMD-214-912193_LS_A1
Grid Ref: 338850, 333975

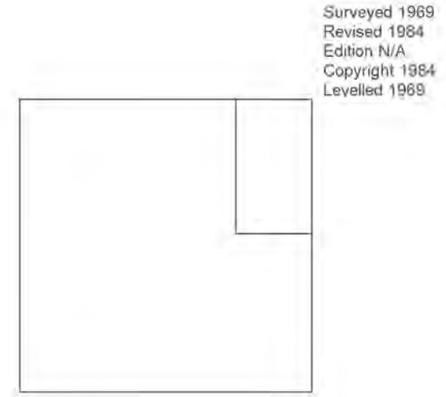
Map Name: National Grid

Map date: **1984**

Scale: 1:2,500

Printed at: 1:2,500

N
W E
S



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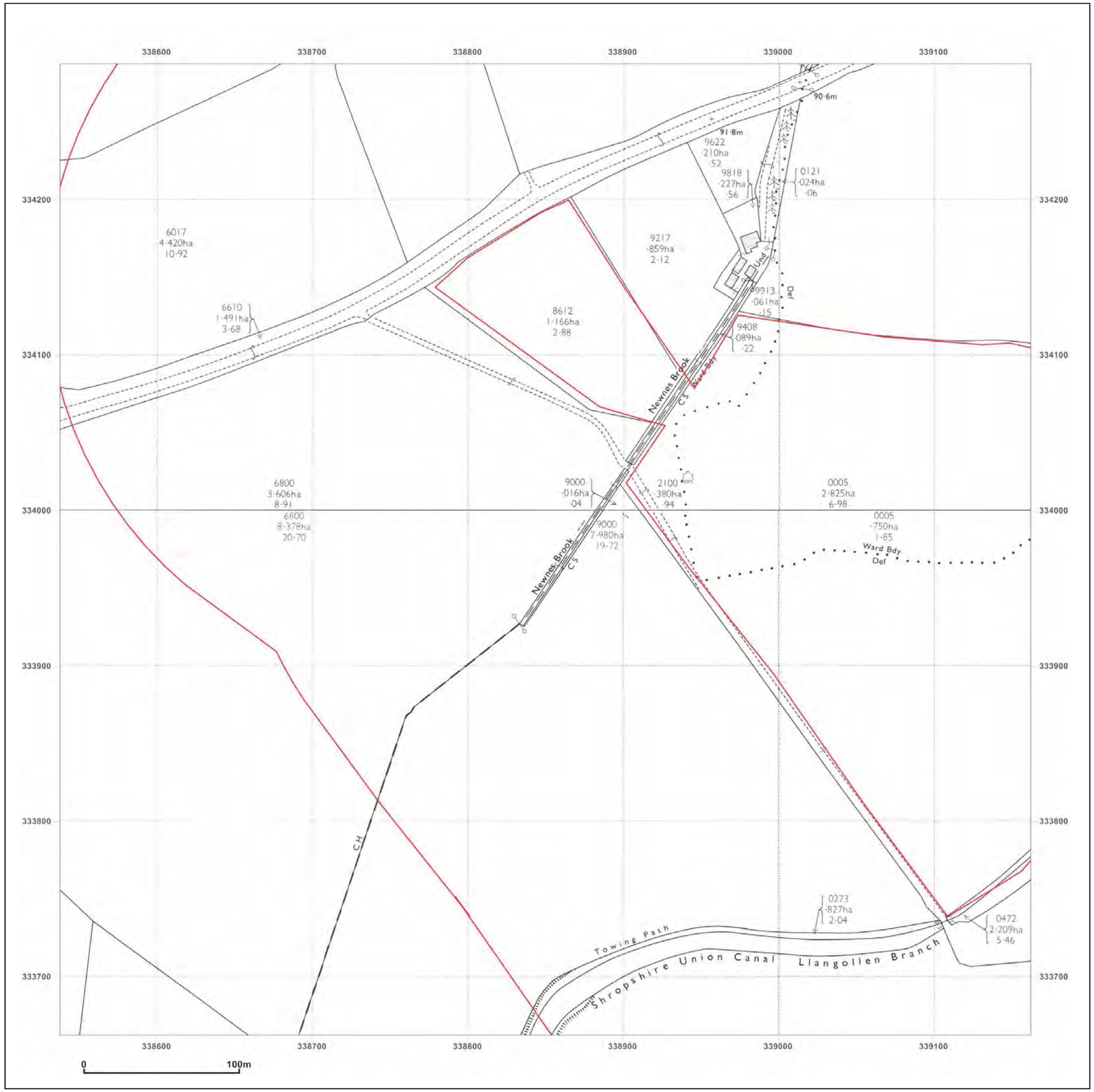
W: www.groundsure.com

Production date: 06 June 2013

To view map legend click here *Legend*



GroundSure
ENVIRONMENTAL INSIGHT

Site Details:

Ellesmere Marina, Shropshire,

Client Ref: BMW2025/NE12/877
Report Ref: HMD-214-912193_LS_A1
Grid Ref: 338850, 333975

Map Name: National Grid

Map date: **1974**

Scale: 1:2,500

Printed at: 1:2,500

N
W E
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Surveyed 1974
Revised 1974
Edition N/A
Copyright 1976
Levelled 1969

Surveyed 1974
Revised 1974
Edition N/A
Copyright 1975
Levelled 1969

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Production date: 06 June 2013

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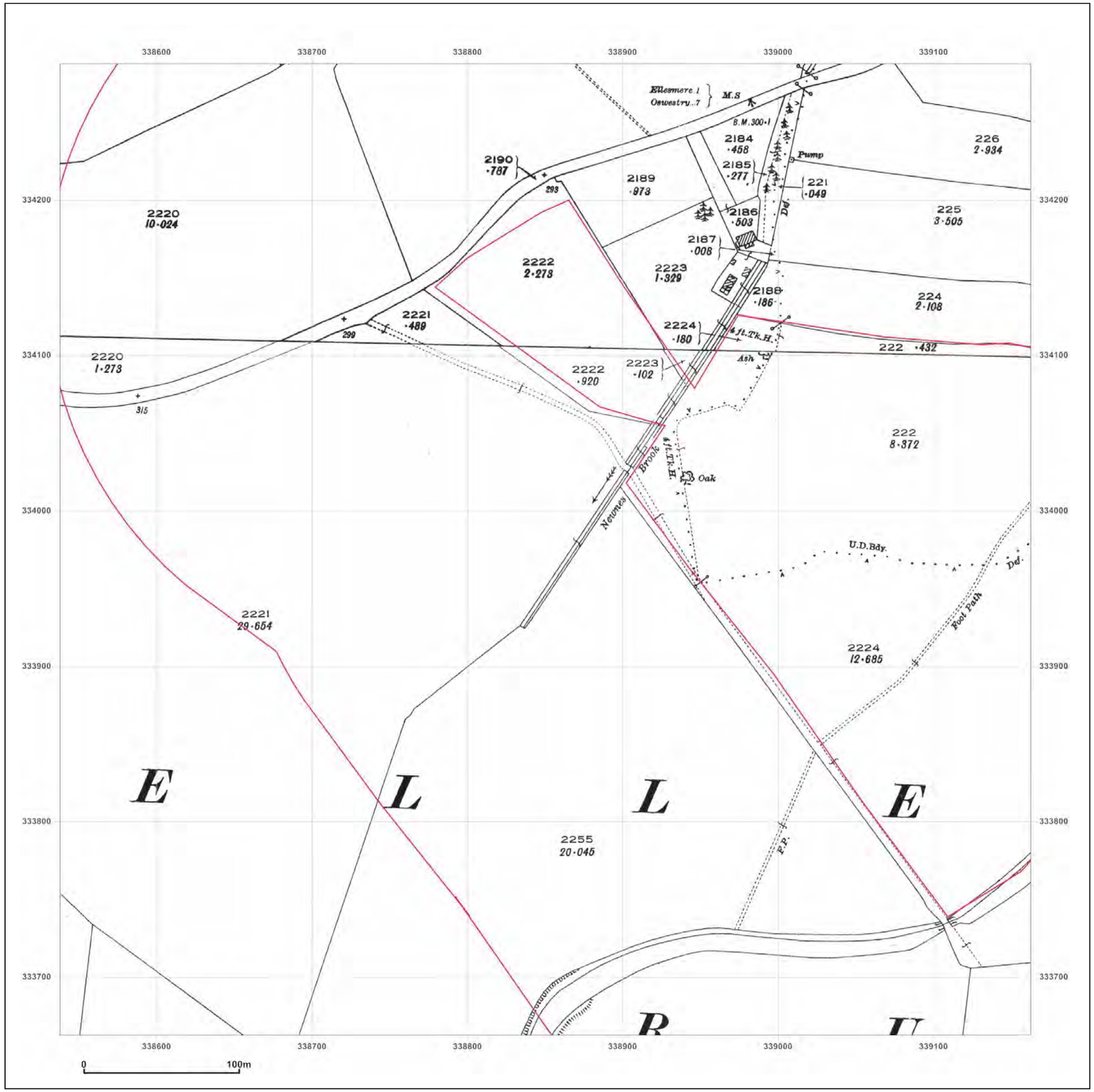

GroundSure
ENVIRONMENTAL INSIGHT

Site Details:

Ellesmere Marina, Shropshire,

Client Ref: BMW2025/NE12/877
Report Ref: HMD-214-912193_LS_A1
Grid Ref: 338850, 333975

Map Name: County Series

Map date: **1926**

Scale: 1:2,500

Printed at: 1:2,500

N
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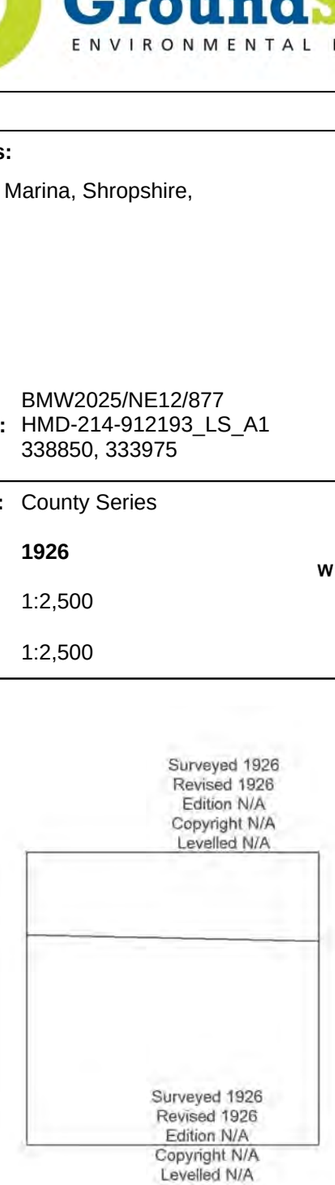

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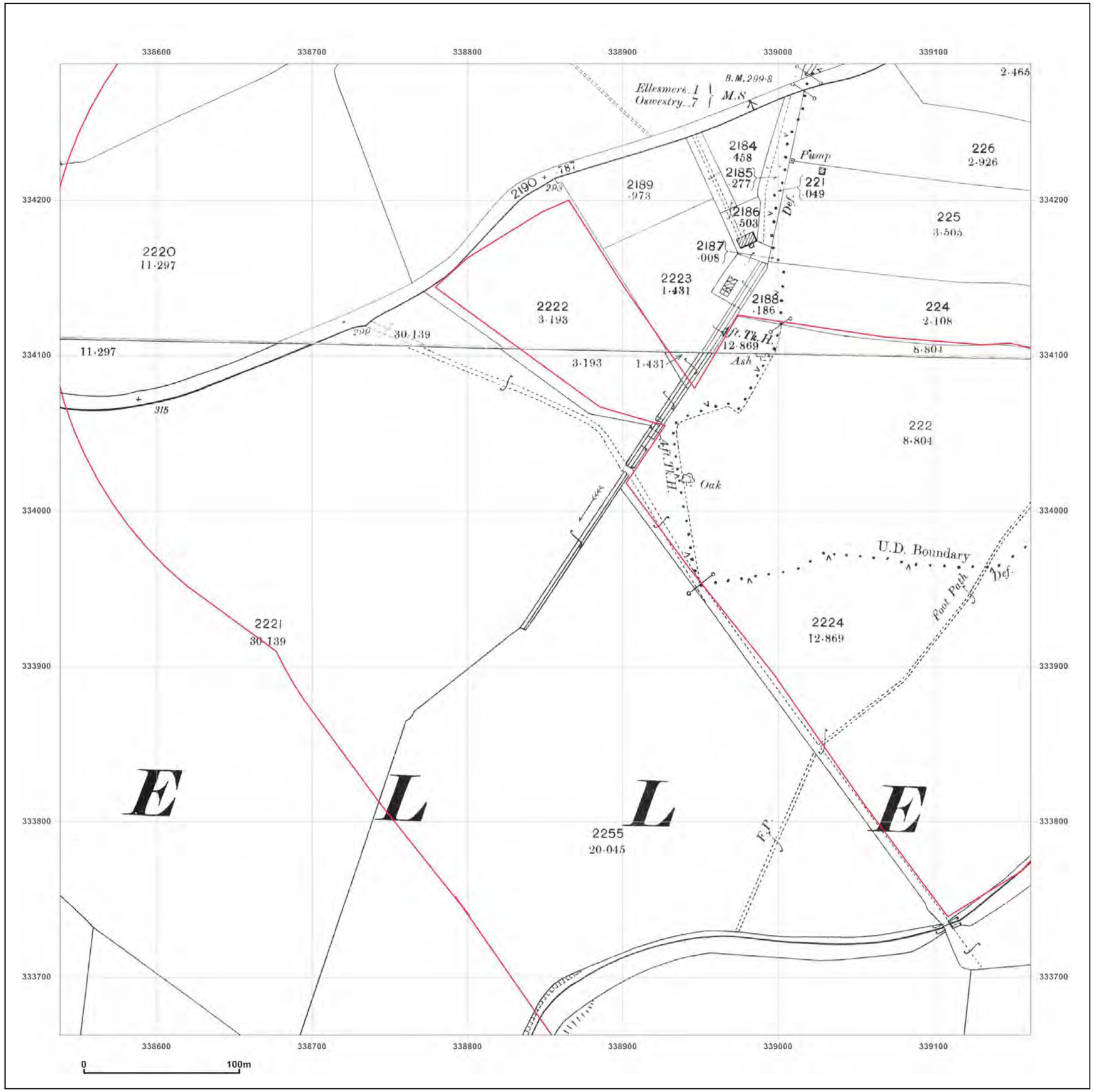
W: www.groundsure.com

Production date: 06 June 2013

To view map legend click here *Legend*



GroundSure
ENVIRONMENTAL INSIGHT

Site Details:

Ellesmere Marina, Shropshire,

Client Ref: BMW2025/NE12/877
Report Ref: HMD-214-912193_LS_A1
Grid Ref: 338850, 333975

Map Name: County Series

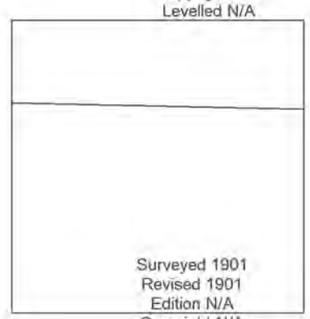
Map date: **1901**

Scale: 1:2,500

Printed at: 1:2,500

N
W E
S

Surveyed 1901
Revised 1901
Edition N/A
Copyright N/A
Levelled N/A



Surveyed 1901
Revised 1901
Edition N/A
Copyright N/A
Levelled N/A

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Produced by
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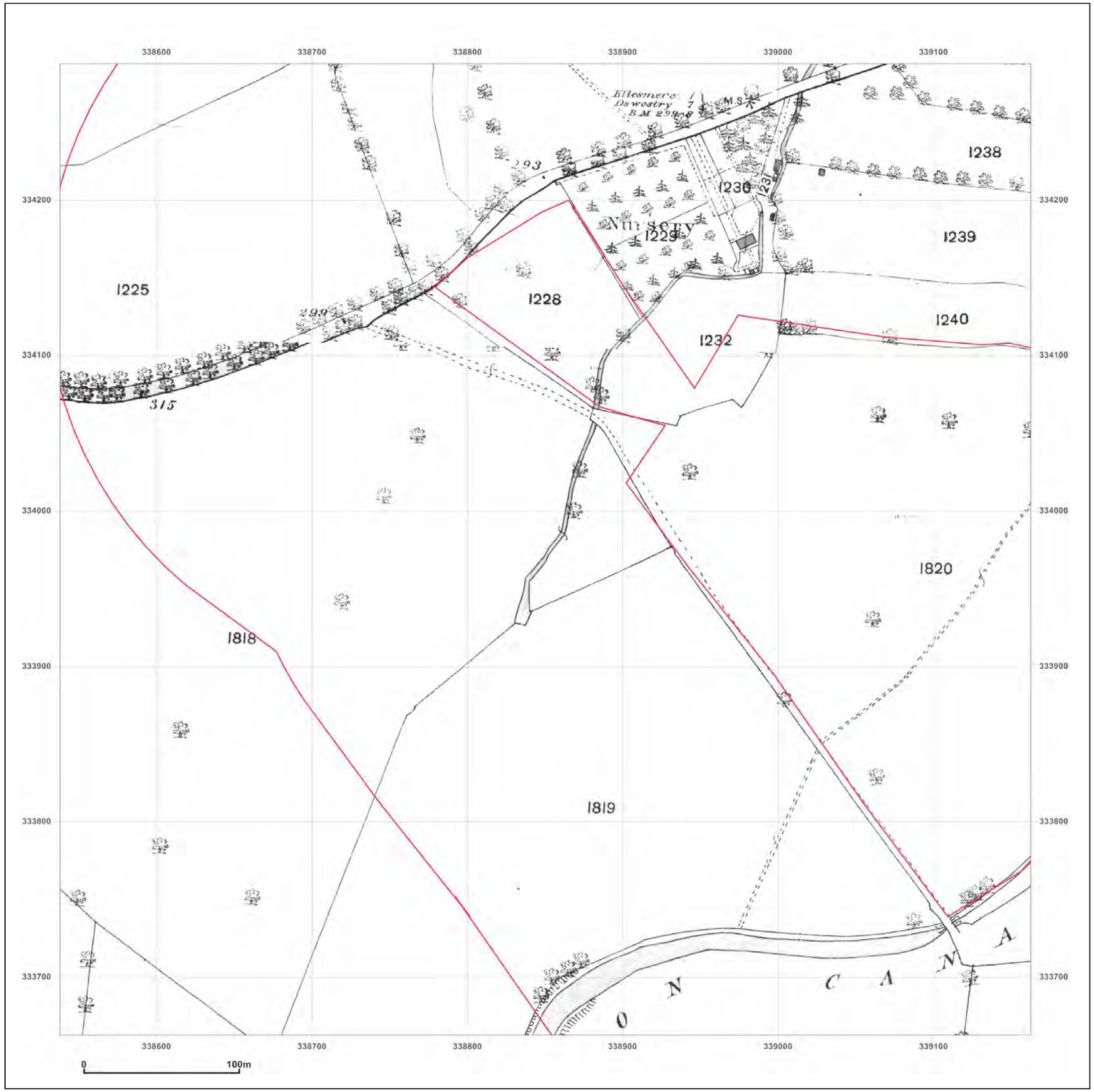
W: www.groundsure.com

Production date: 06 June 2013

To view map legend click here *Legend*



GroundSure
ENVIRONMENTAL INSIGHT

Site Details:

Ellesmere Marina, Shropshire,

Client Ref: BMW2025/NE12/877
Report Ref: HMD-214-912193_LS_A1
Grid Ref: 338850, 333975

Map Name: County Series

Map date: **1876-1877**

Scale: 1:2,500

Printed at: 1:2,500

N
W E
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Surveyed 1877
Revised 1877
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1876
Revised 1876
Edition N/A
Copyright N/A
Levelled N/A

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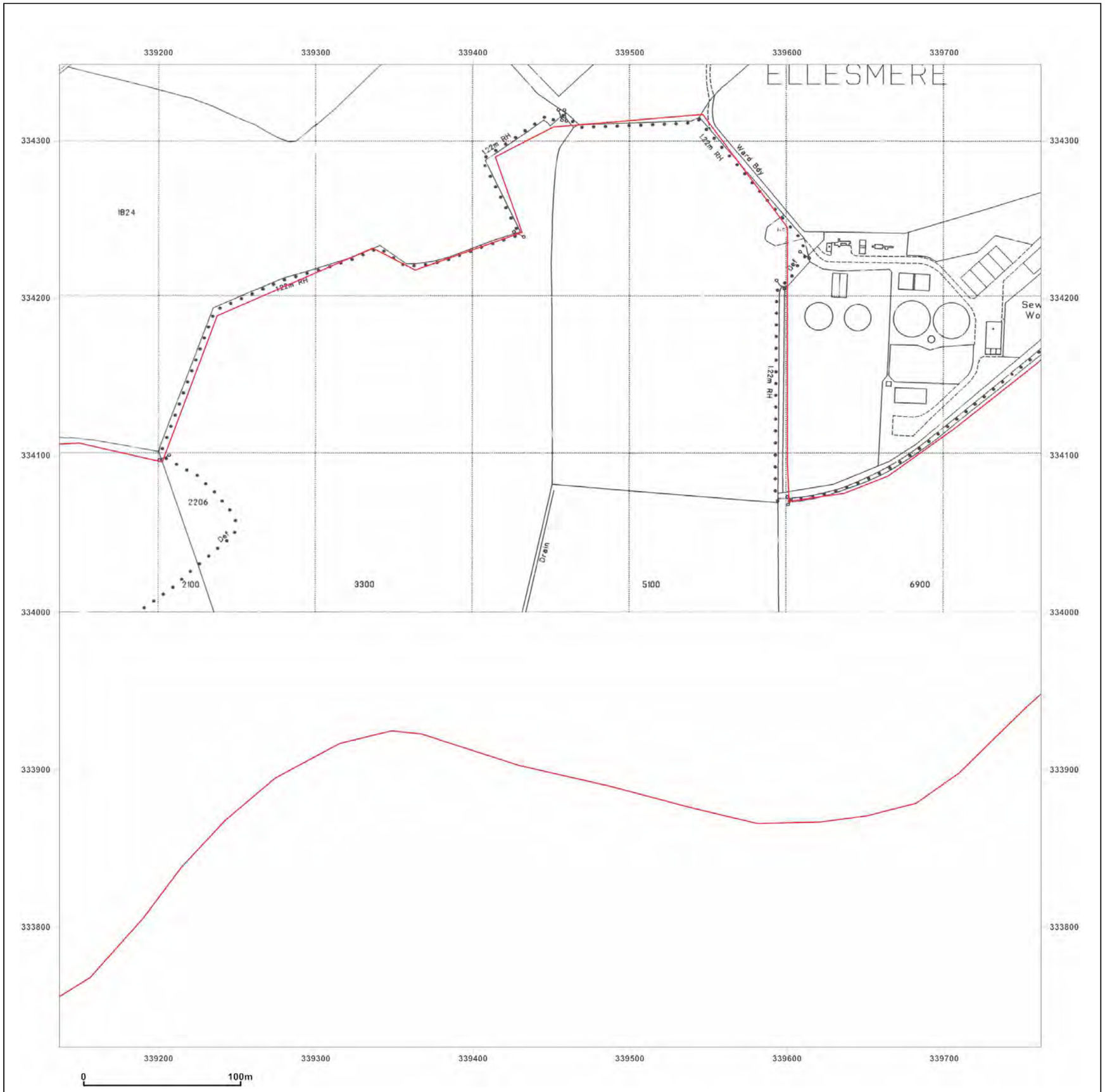
W: www.groundsure.com

Production date: 06 June 2013

To view map legend click here *Legend*



GroundSure
ENVIRONMENTAL INSIGHT

Site Details:

Ellesmere Marina, Shropshire,

Client Ref: BMW2025/NE12/877
Report Ref: HMD-214-912193_LS_B1
Grid Ref: 339449, 334036

Map Name: National Grid

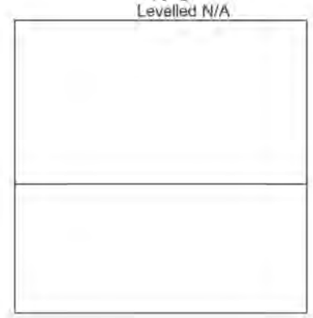
Map date: **1995**

Scale: 1:2,500

Printed at: 1:2,500

N
W E
S

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



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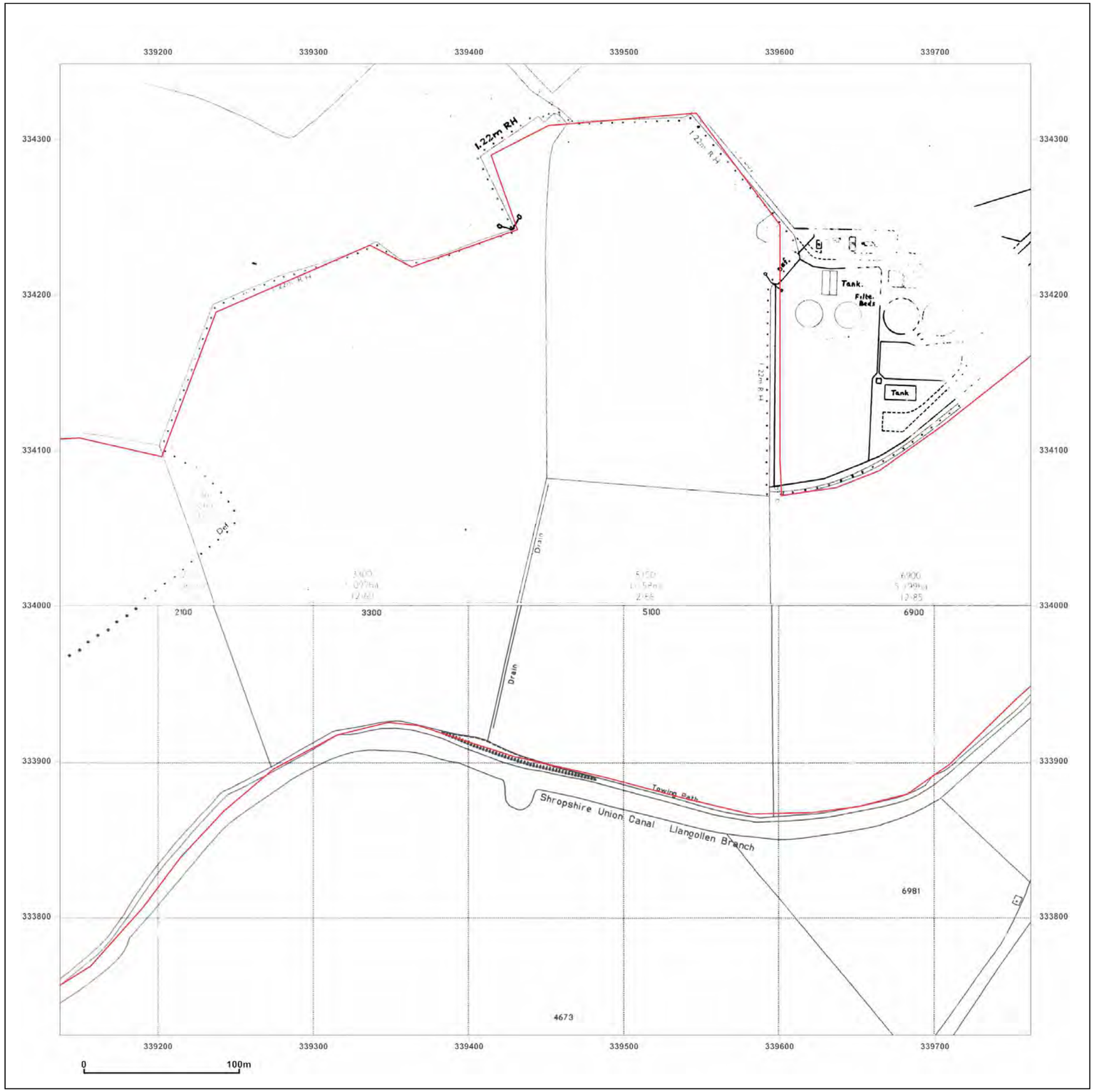
T: 08444 159000
E: info@groundsure.com
W: www.groundsure.com

Production date: 06 June 2013

To view map legend click here *Legend*



GroundSure
ENVIRONMENTAL INSIGHT

Site Details:

Ellesmere Marina, Shropshire,

Client Ref: BMW2025/NE12/877
Report Ref: HMD-214-912193_LS_B1
Grid Ref: 339449, 334036

Map Name: National Grid

Map date: **1991-1995**

Scale: 1:2,500

Printed at: 1:2,500

N
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Surveyed N/A
Revised N/A
Edition N/A
Copyright 1991
Levelled 1969

Surveyed N/A
Revised N/A
Edition N/A
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ENVIRONMENTAL INSIGHT

Site Details:

Ellesmere Marina, Shropshire,

Client Ref: BMW2025/NE12/877
Report Ref: HMD-214-912193_LS_B1
Grid Ref: 339449, 334036

Map Name: National Grid

Map date: **1991**

Scale: 1:2,500

Printed at: 1:2,500

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Surveyed 1969
Revised 1991
Edition N/A
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Production date: 06 June 2013

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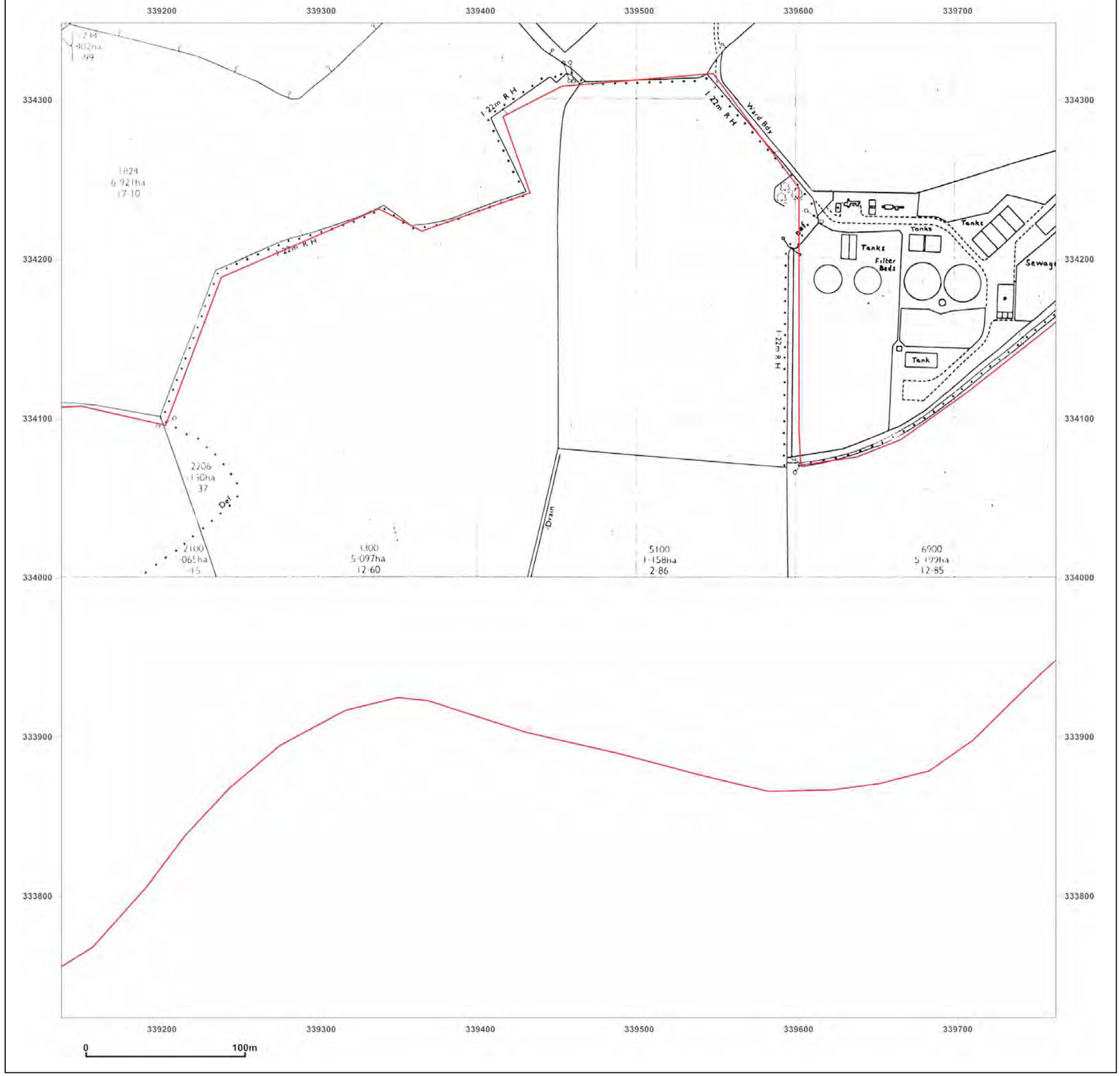

GroundSure
ENVIRONMENTAL INSIGHT

Site Details:

Ellesmere Marina, Shropshire,

Client Ref: BMW2025/NE12/877
Report Ref: HMD-214-912193_LS_B1
Grid Ref: 339449, 334036

Map Name: National Grid

Map date: **1988**

Scale: 1:2,500

Printed at: 1:2,500

N
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Surveyed 1969
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Edition N/A
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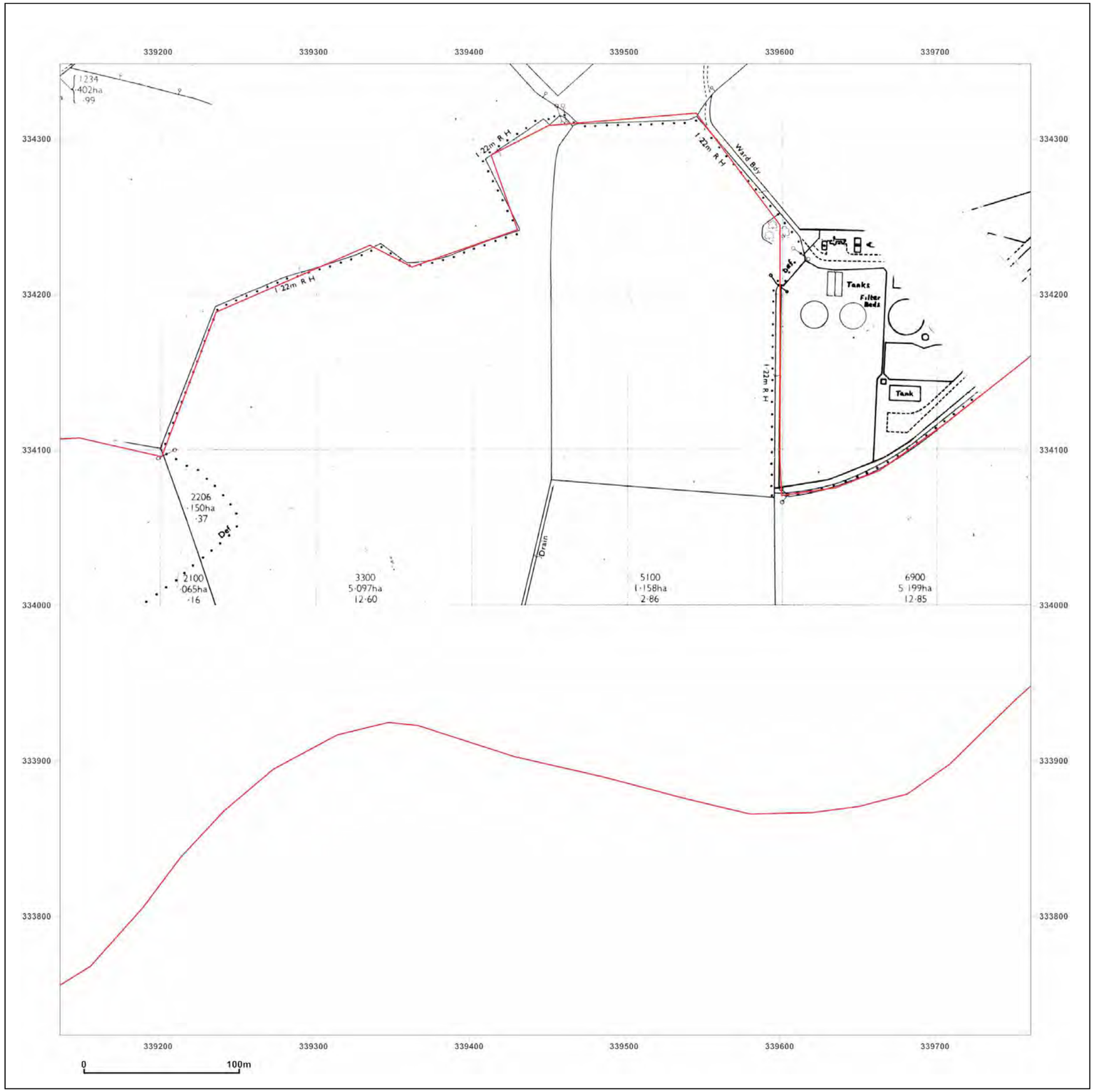

GroundSure
ENVIRONMENTAL INSIGHT

Site Details:

Ellesmere Marina, Shropshire,

Client Ref: BMW2025/NE12/877
Report Ref: HMD-214-912193_LS_B1
Grid Ref: 339449, 334036

Map Name: National Grid

Map date: **1985**

Scale: 1:2,500

Printed at: 1:2,500

N
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Production date: 06 June 2013

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GroundSure
ENVIRONMENTAL INSIGHT

Site Details:

Ellesmere Marina, Shropshire,

Client Ref: BMW2025/NE12/877
Report Ref: HMD-214-912193_LS_B1
Grid Ref: 339449, 334036

Map Name: National Grid

Map date: **1985**

Scale: 1:2,500

Printed at: 1:2,500

N
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Surveyed 1969
Revised 1985
Edition N/A
Copyright 1985
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Production date: 06 June 2013

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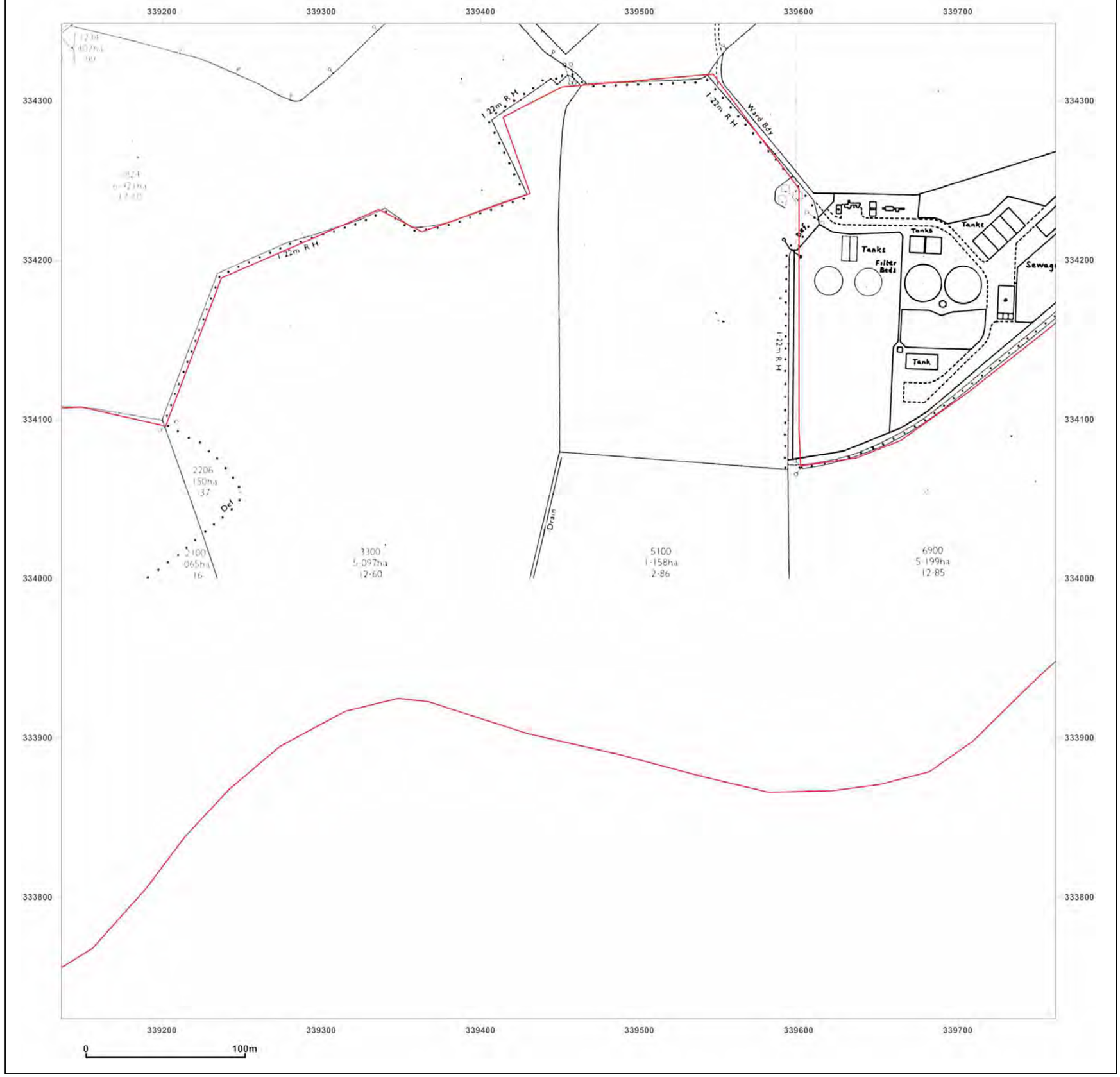

GroundSure
ENVIRONMENTAL INSIGHT

Site Details:

Ellesmere Marina, Shropshire,

Client Ref: BMW2025/NE12/877
Report Ref: HMD-214-912193_LS_B1
Grid Ref: 339449, 334036

Map Name: National Grid

Map date: **1984**

Scale: 1:2,500

Printed at: 1:2,500

N
W E
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Surveyed 1969
Revised 1984
Edition N/A
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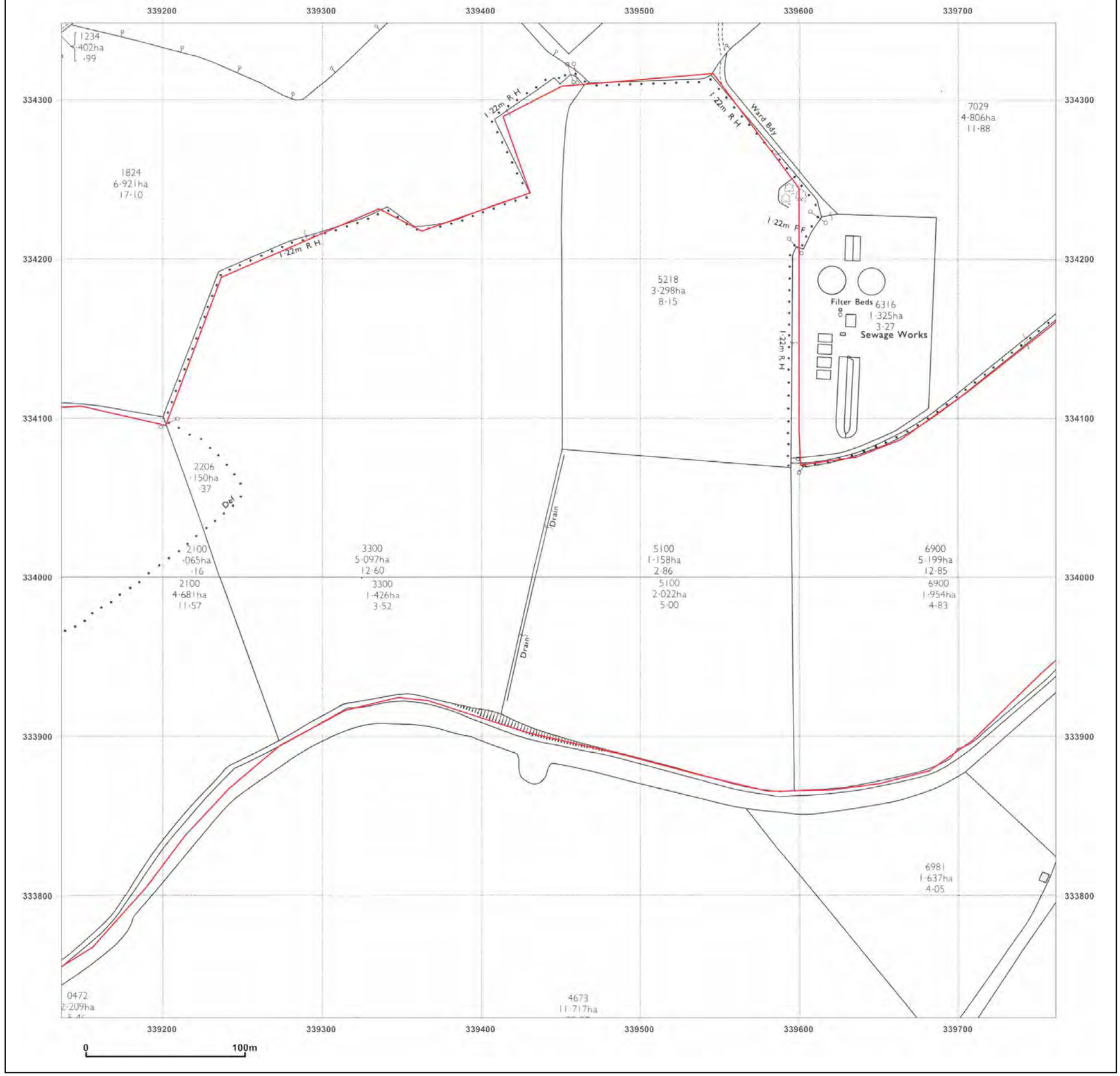
Production date: 06 June 2013

To view map legend click here *Legend*



GroundSure
ENVIRONMENTAL INSIGHT

Site Details:

Ellesmere Marina, Shropshire,

Client Ref: BMW2025/NE12/877
Report Ref: HMD-214-912193_LS_B1
Grid Ref: 339449, 334036

Map Name: National Grid

Map date: **1974**

Scale: 1:2,500

Printed at: 1:2,500

N
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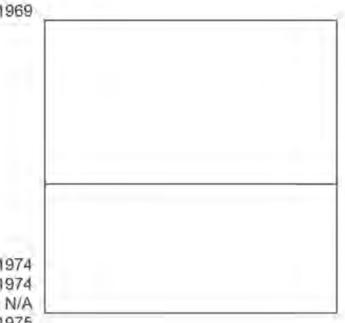
Surveyed 1974
Revised 1974
Edition N/A
Copyright 1976
Levelled 1969



Surveyed 1974
Revised 1974
Edition N/A
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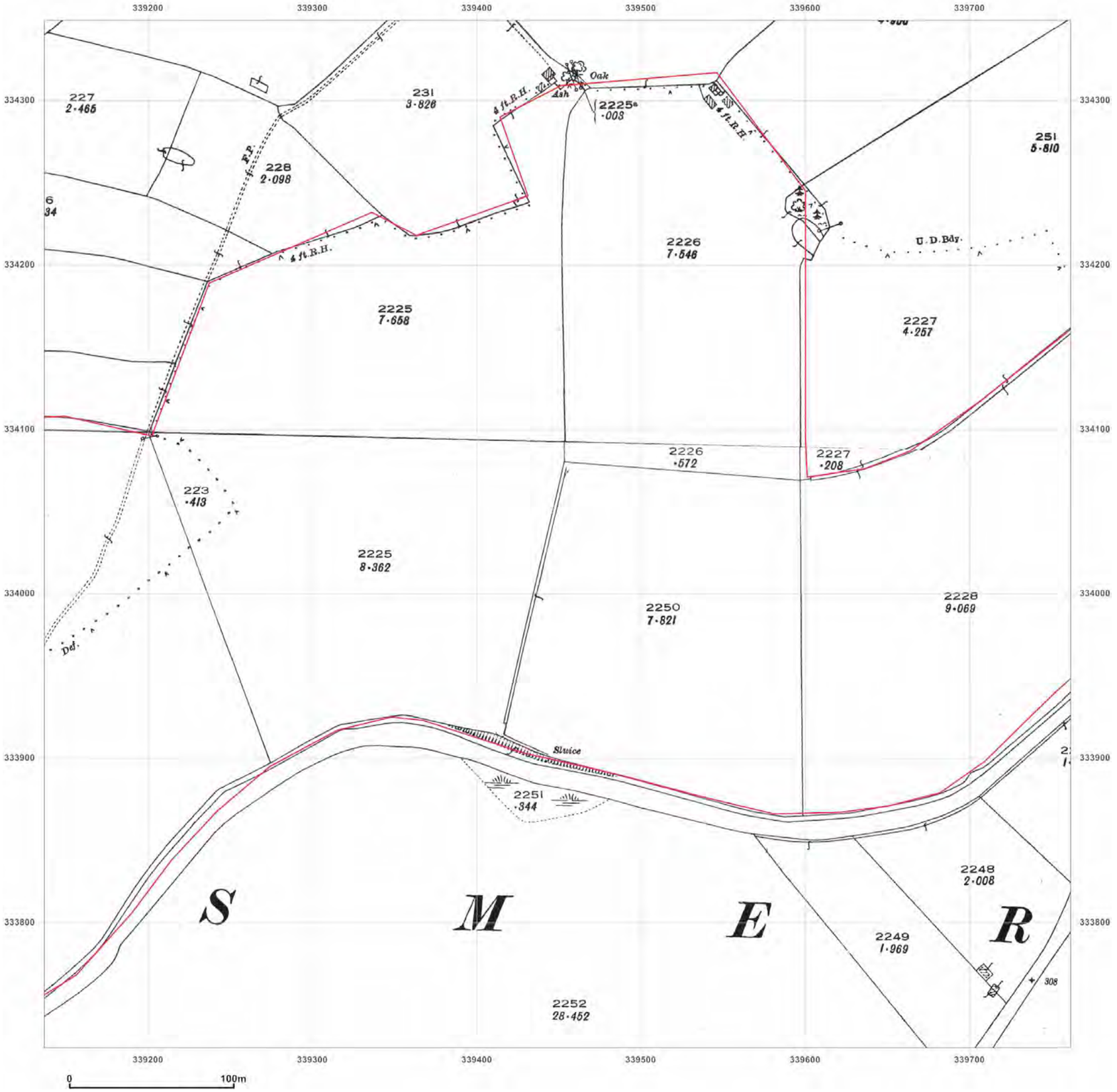
Production date: 06 June 2013

To view map legend click here *Legend*



GroundSure
ENVIRONMENTAL INSIGHT

Site Details:

Ellesmere Marina, Shropshire,

Client Ref: BMW2025/NE12/877
Report Ref: HMD-214-912193_LS_B1
Grid Ref: 339449, 334036

Map Name: County Series

Map date: **1926**

Scale: 1:2,500

Printed at: 1:2,500

N
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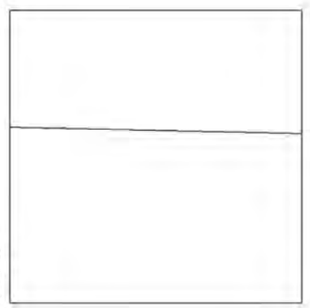
Surveyed 1926
Revised 1926
Edition N/A
Copyright N/A
Levelled N/A



Surveyed 1926
Revised 1926
Edition N/A
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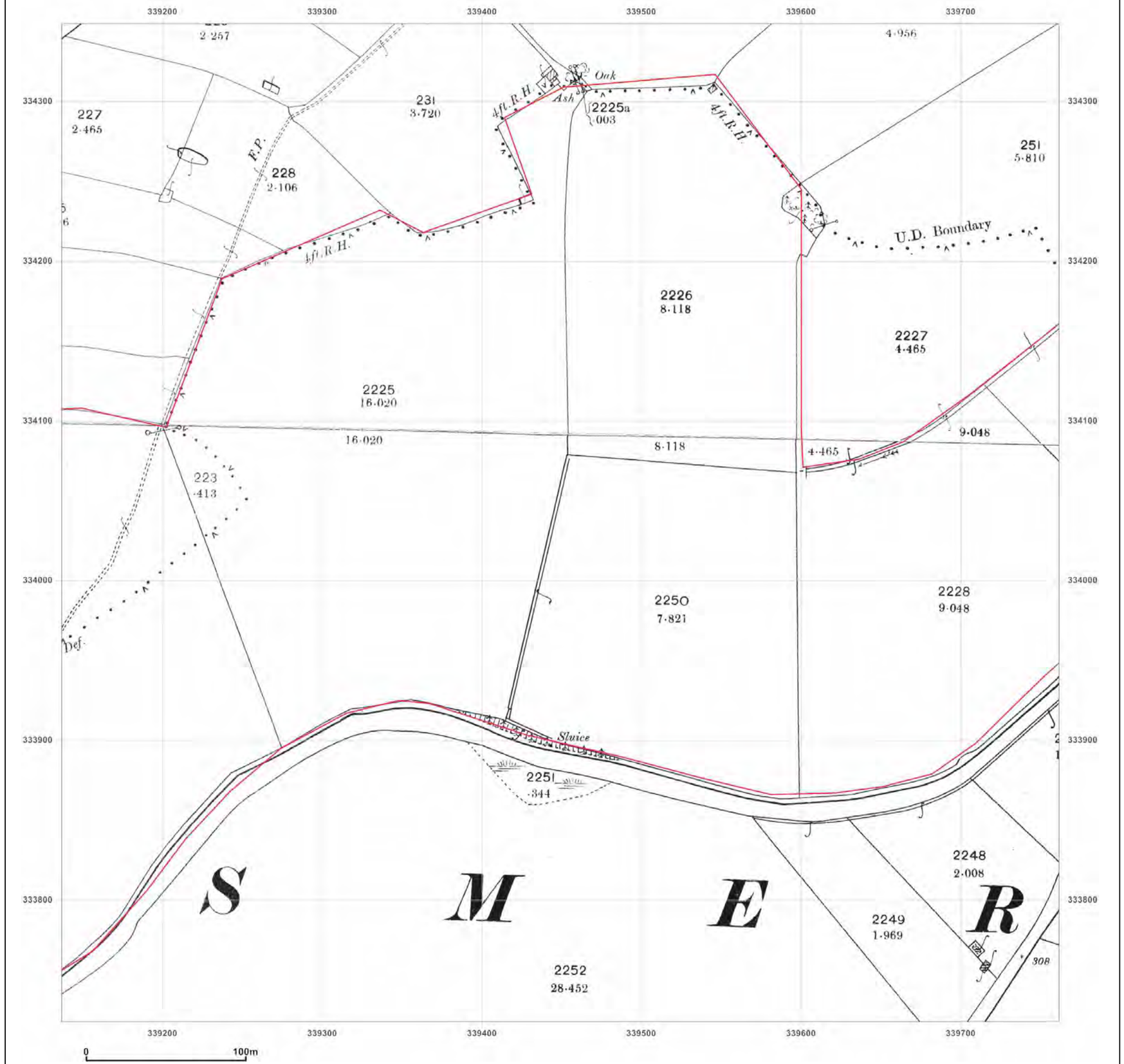

GroundSure
ENVIRONMENTAL INSIGHT

Site Details:

Ellesmere Marina, Shropshire,

Client Ref: BMW2025/NE12/877
Report Ref: HMD-214-912193_LS_B1
Grid Ref: 339449, 334036

Map Name: County Series

Map date: **1901**

Scale: 1:2,500

Printed at: 1:2,500

N
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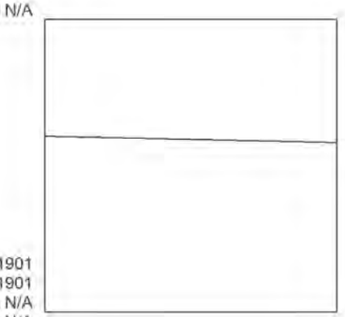
Surveyed 1901
Revised 1901
Edition N/A
Copyright N/A
Levelled N/A



Surveyed 1901
Revised 1901
Edition N/A
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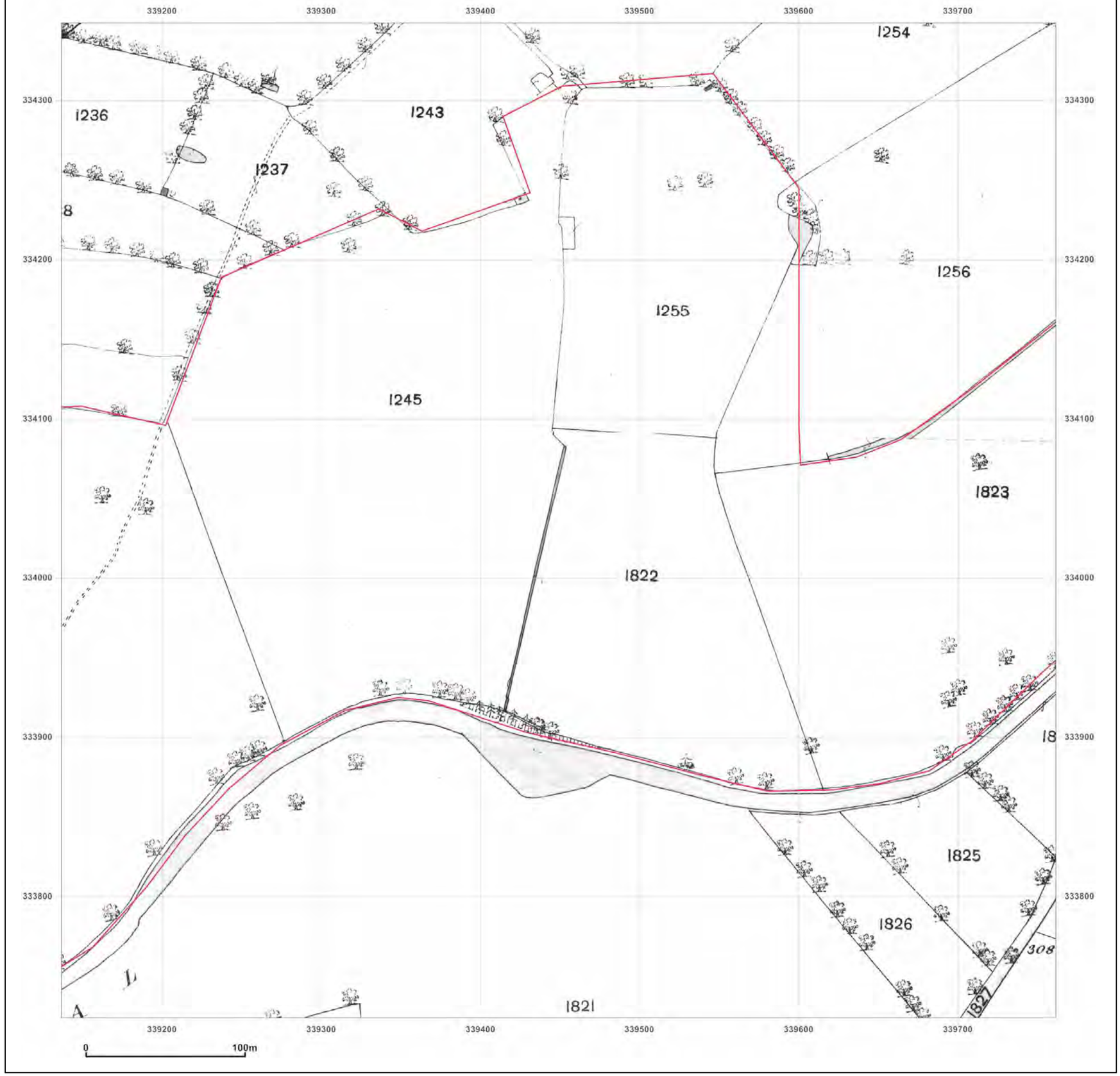

GroundSure
ENVIRONMENTAL INSIGHT

Site Details:

Ellesmere Marina, Shropshire,

Client Ref: BMW2025/NE12/877
Report Ref: HMD-214-912193_LS_B1
Grid Ref: 339449, 334036

Map Name: County Series

Map date: **1876-1877**

Scale: 1:2,500

Printed at: 1:2,500

N
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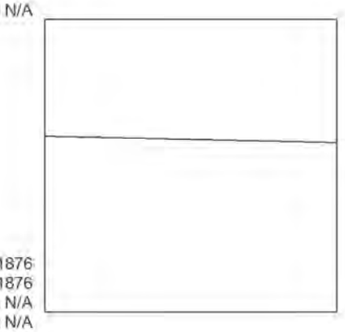
Surveyed 1877
Revised 1877
Edition N/A
Copyright N/A
Levelled N/A



Surveyed 1876
Revised 1876
Edition N/A
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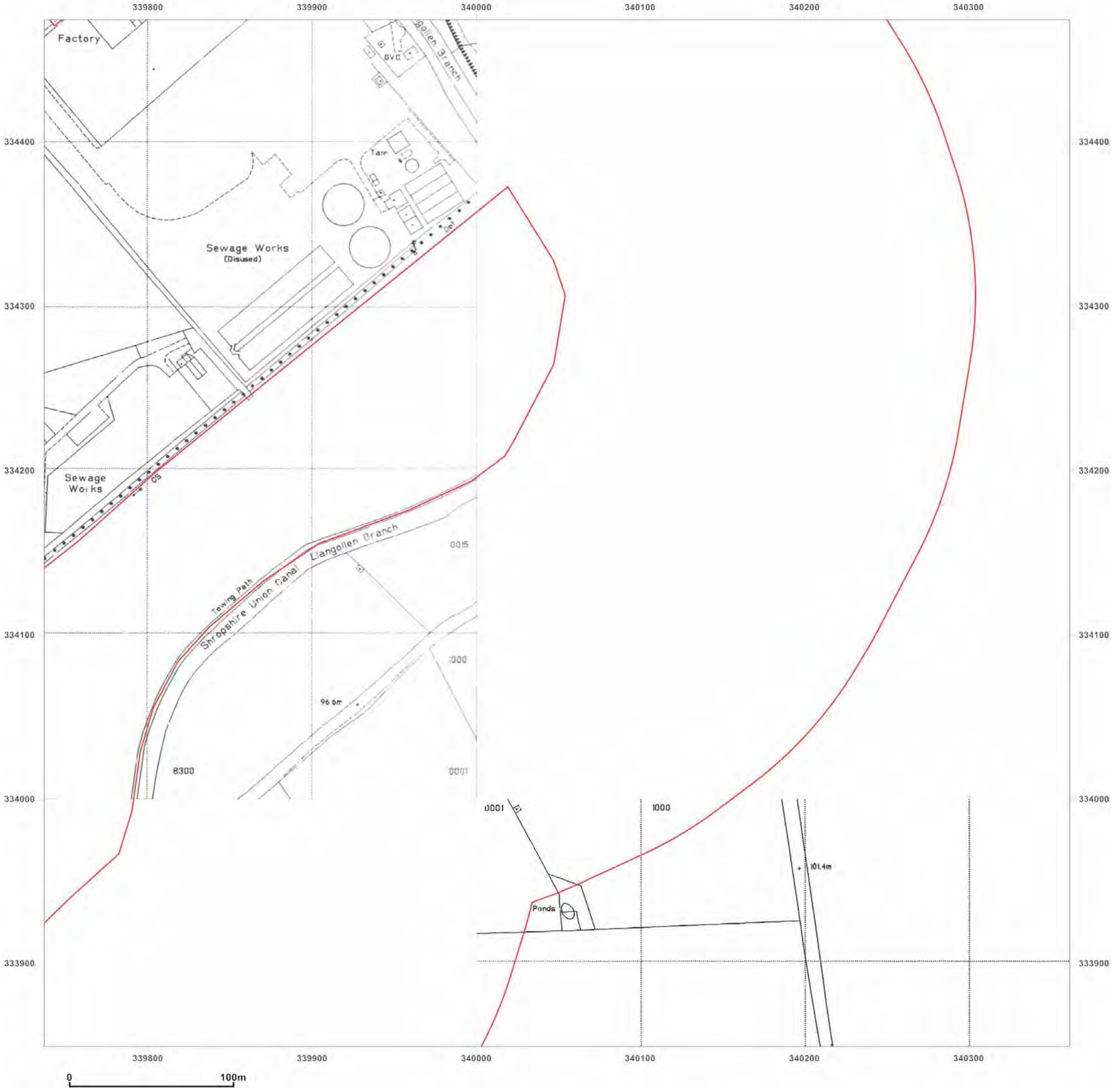

GroundSure
ENVIRONMENTAL INSIGHT

Site Details:

Ellesmere Marina, Shropshire,

Client Ref: BMW2025/NE12/877
Report Ref: HMD-214-912193_LS_C1
Grid Ref: 340049, 334162

Map Name: National Grid

Map date: **1995**

Scale: 1:2,500

Printed at: 1:2,500

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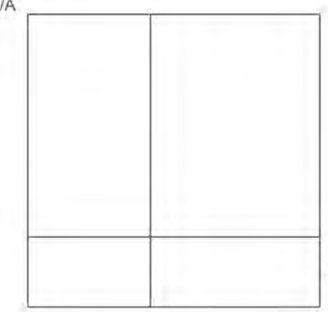
Surveyed N/A
Revised N/A
Edition N/A
Copyright N/A
Levelled N/A



Surveyed 1995
Revised N/A
Edition N/A
Copyright N/A
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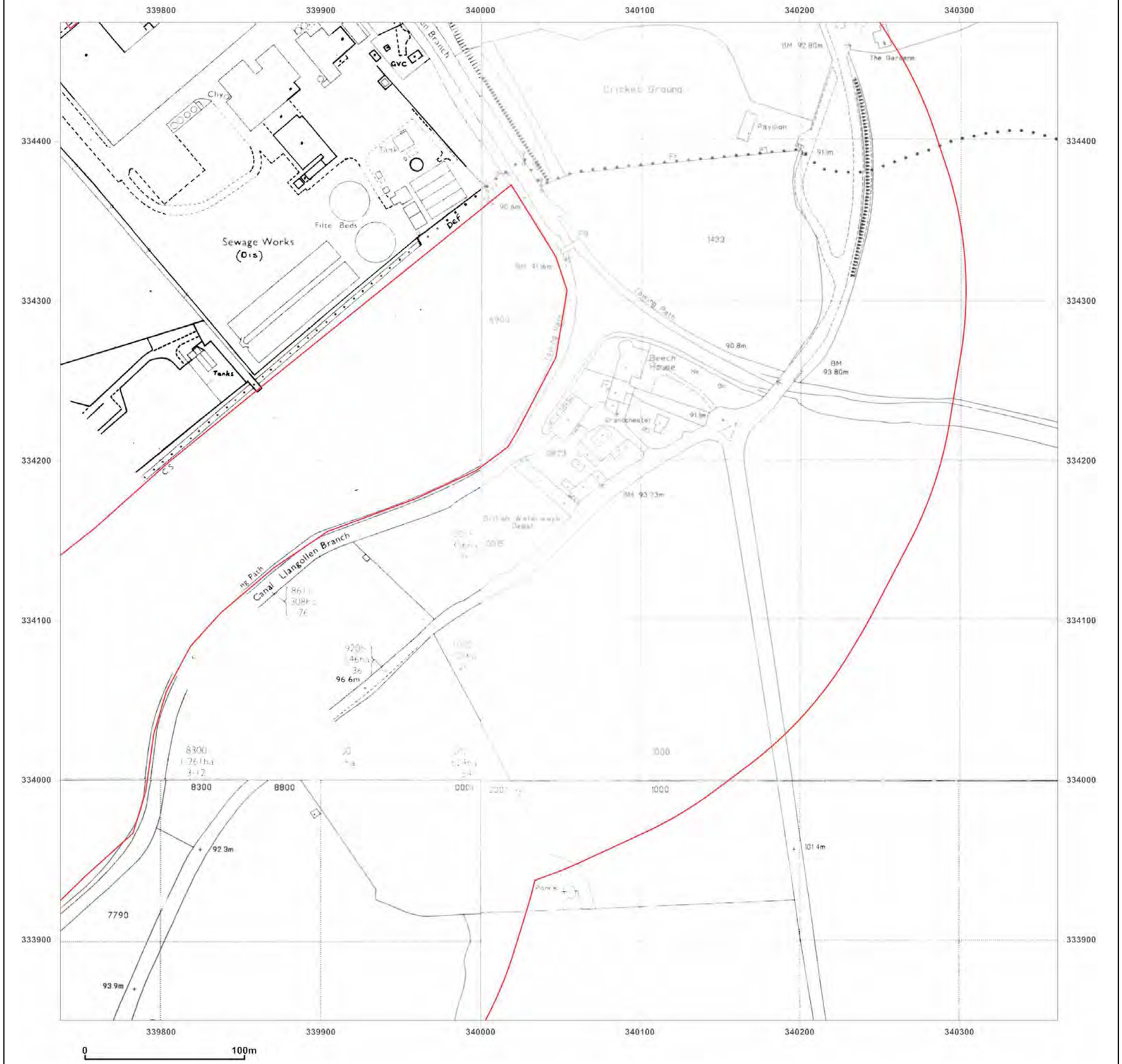

GroundSure
ENVIRONMENTAL INSIGHT

Site Details:

Ellesmere Marina, Shropshire,

Client Ref: BMW2025/NE12/877
Report Ref: HMD-214-912193_LS_C1
Grid Ref: 340049, 334162

Map Name: National Grid

Map date: **1991-1995**

Scale: 1:2,500

Printed at: 1:2,500

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Surveyed N/A
Revised N/A
Edition N/A
Copyright 1991
Levelled 1969

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

Surveyed N/A
Revised N/A
Edition N/A
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Revised N/A
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GroundSure
ENVIRONMENTAL INSIGHT

Site Details:

Ellesmere Marina, Shropshire,

Client Ref: BMW2025/NE12/877
Report Ref: HMD-214-912193_LS_C1
Grid Ref: 340049, 334162

Map Name: National Grid

Map date: **1991-1995**

Scale: 1:2,500

Printed at: 1:2,500

N
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Surveyed 1969
Revised 1991
Edition N/A
Copyright 1991
Levelled 1969

Surveyed N/A
Revised N/A
Edition N/A
Copyright 1995
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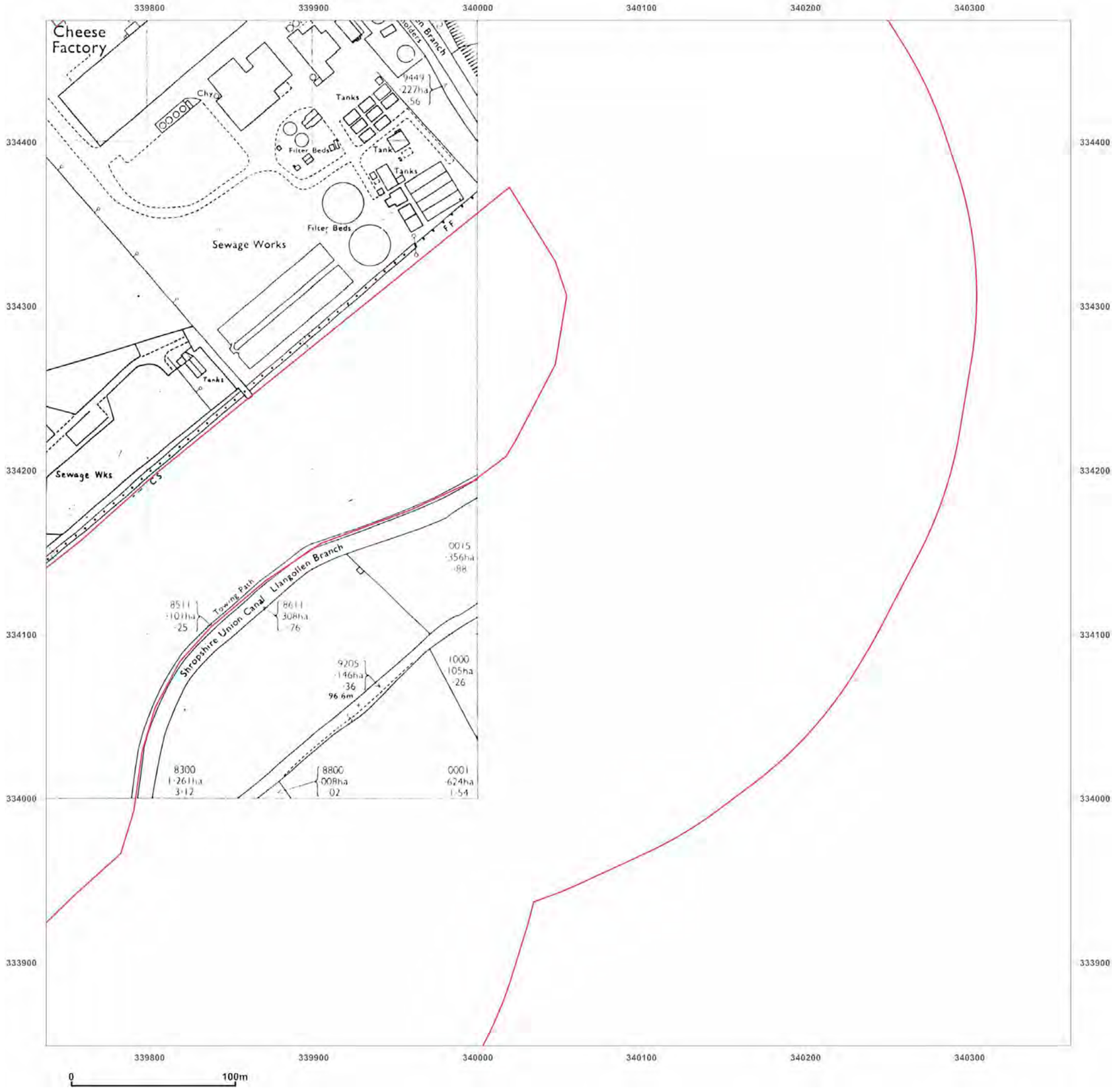

GroundSure
ENVIRONMENTAL INSIGHT

Site Details:

Ellesmere Marina, Shropshire,

Client Ref: BMW2025/NE12/877
Report Ref: HMD-214-912193_LS_C1
Grid Ref: 340049, 334162

Map Name: National Grid

Map date: **1988**

Scale: 1:2,500

Printed at: 1:2,500

N
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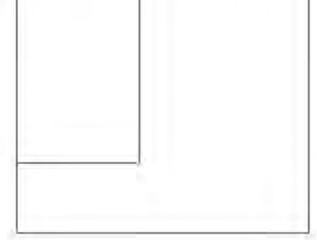
Surveyed 1969
Revised 1888
Edition N/A
Copyright 1988
Levelled 1969



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GroundSure
ENVIRONMENTAL INSIGHT

Site Details:

Ellesmere Marina, Shropshire,

Client Ref: BMW2025/NE12/877
Report Ref: HMD-214-912193_LS_C1
Grid Ref: 340049, 334162

Map Name: National Grid

Map date: **1985**

Scale: 1:2,500

Printed at: 1:2,500

N
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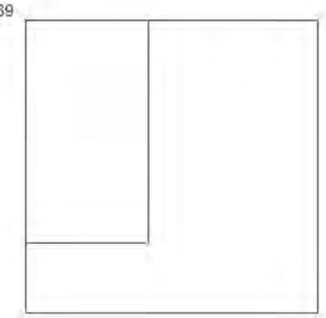
Surveyed 1969
Revised 1985
Edition N/A
Copyright 1985
Levelled 1969



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Production date: 06 June 2013

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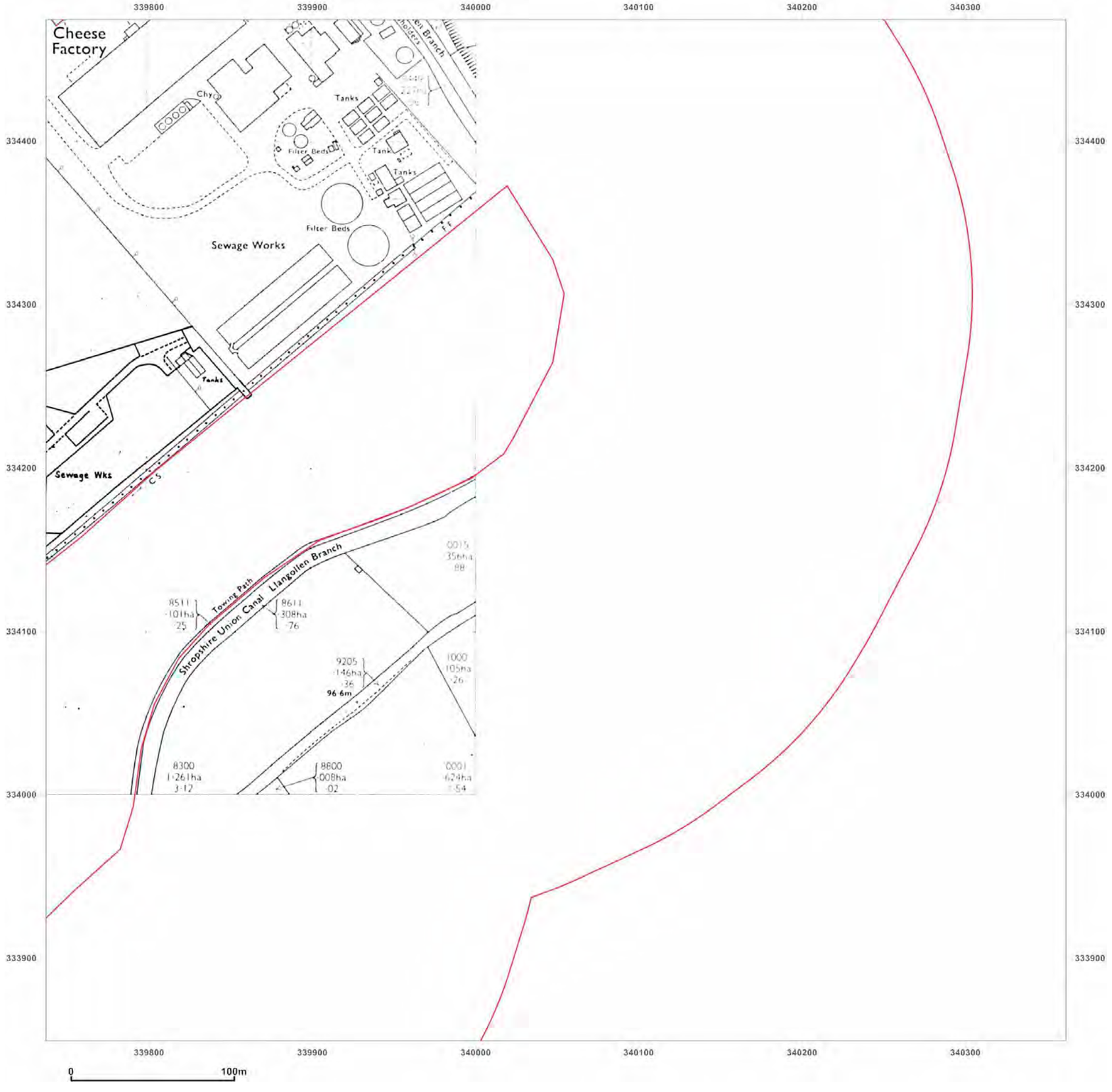

GroundSure
ENVIRONMENTAL INSIGHT

Site Details:

Ellesmere Marina, Shropshire,

Client Ref: BMW2025/NE12/877
Report Ref: HMD-214-912193_LS_C1
Grid Ref: 340049, 334162

Map Name: National Grid

Map date: **1985**

Scale: 1:2,500

Printed at: 1:2,500

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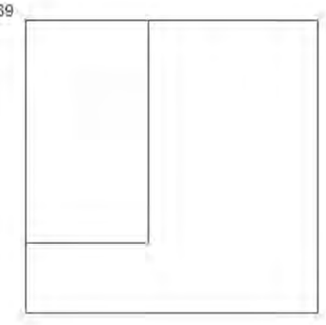
Surveyed 1969
Revised 1985
Edition N/A
Copyright 1985
Levelled 1969



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Production date: 06 June 2013

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GroundSure
ENVIRONMENTAL INSIGHT

Site Details:

Ellesmere Marina, Shropshire,

Client Ref: BMW2025/NE12/877
Report Ref: HMD-214-912193_LS_C1
Grid Ref: 340049, 334162

Map Name: National Grid

Map date: **1984**

Scale: 1:2,500

Printed at: 1:2,500

N
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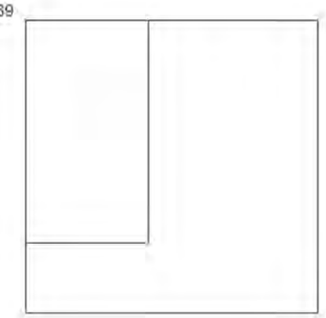
Surveyed 1969
Revised 1984
Edition N/A
Copyright 1984
Levelled 1969



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Production date: 06 June 2013

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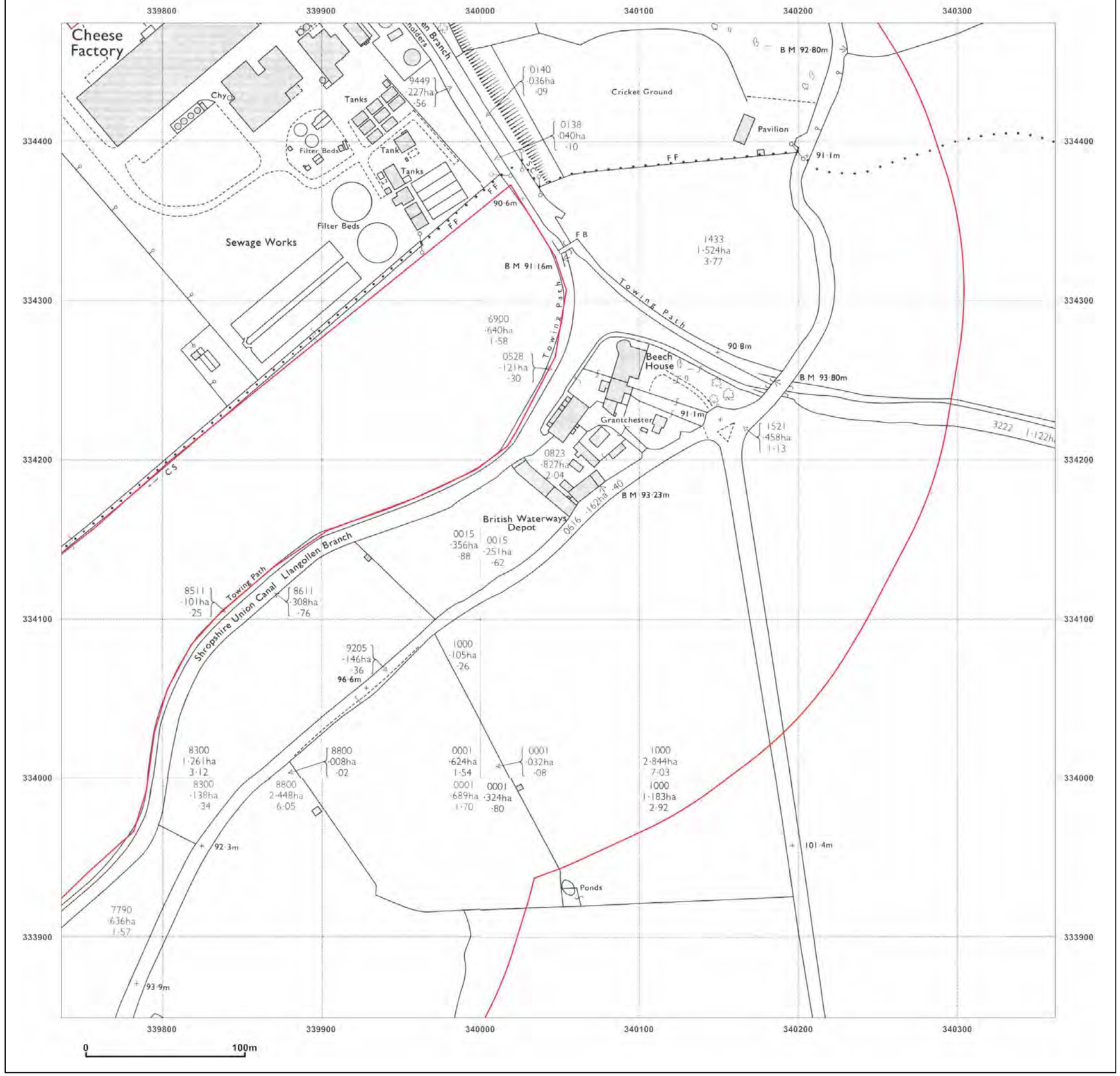

GroundSure
ENVIRONMENTAL INSIGHT

Site Details:

Ellesmere Marina, Shropshire,

Client Ref: BMW2025/NE12/877
Report Ref: HMD-214-912193_LS_C1
Grid Ref: 340049, 334162

Map Name: National Grid

Map date: **1974**

Scale: 1:2,500

Printed at: 1:2,500

N
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Surveyed 1974
Revised 1974
Edition N/A
Copyright 1976
Levelled 1969

Surveyed 1974
Revised 1974
Edition N/A
Copyright 1976
Levelled 1969

Surveyed 1974
Revised 1974
Edition N/A
Copyright 1975
Levelled 1969

Surveyed 1974
Revised 1974
Edition N/A
Copyright 1976
Levelled 1969

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Production date: 06 June 2013

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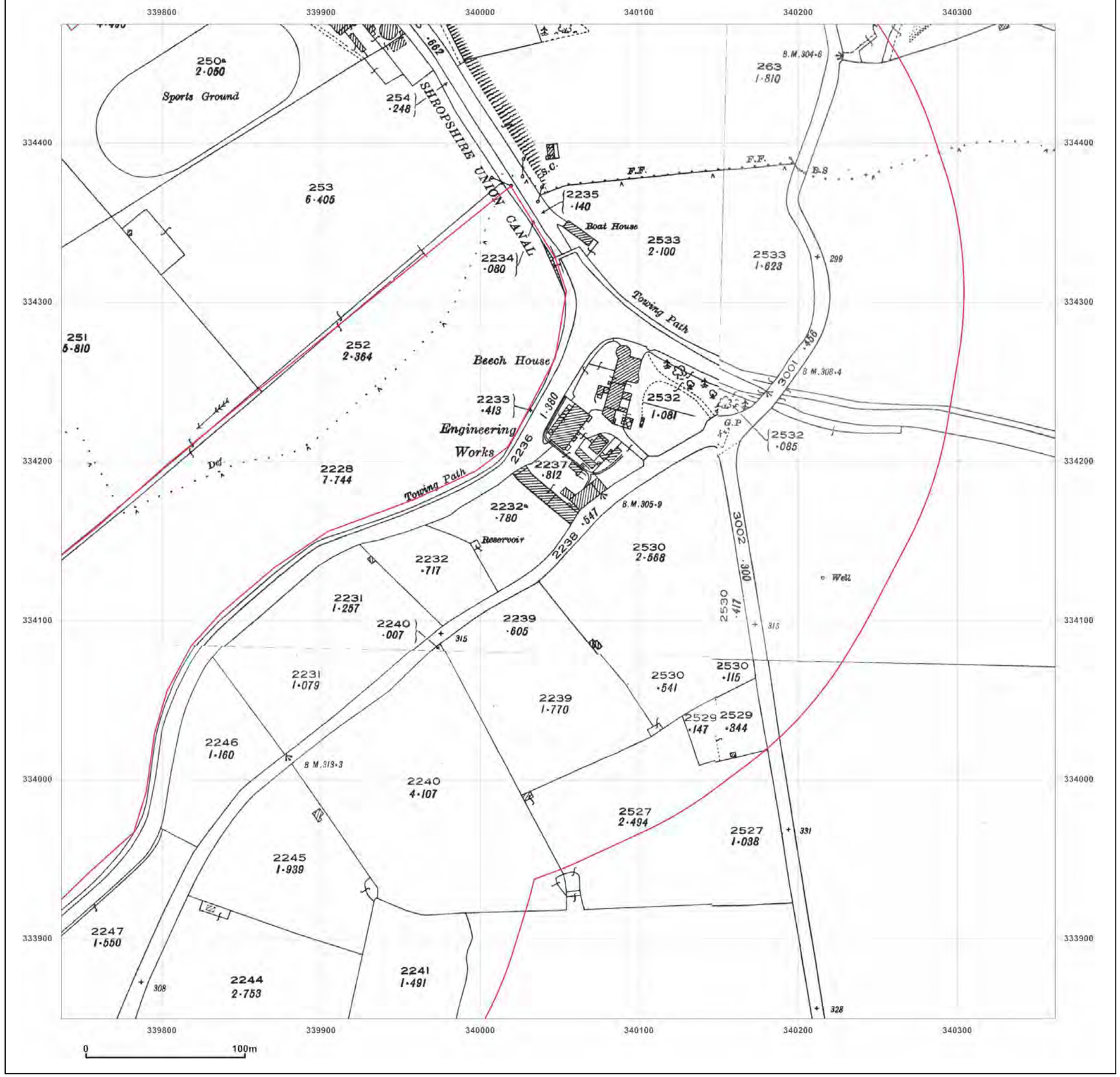

GroundSure
ENVIRONMENTAL INSIGHT

Site Details:

Ellesmere Marina, Shropshire,

Client Ref: BMW2025/NE12/877
Report Ref: HMD-214-912193_LS_C1
Grid Ref: 340049, 334162

Map Name: County Series

Map date: **1926**

Scale: 1:2,500

Printed at: 1:2,500

N
W E
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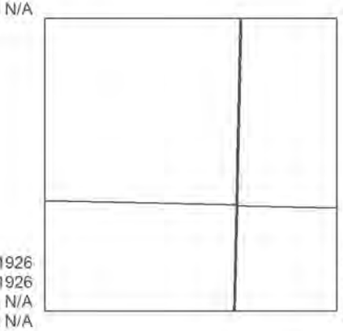
Surveyed 1926
Revised 1926
Edition N/A
Copyright N/A
Levelled N/A



Surveyed 1926
Revised 1926
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1926
Revised 1926
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1926
Revised 1926
Edition N/A
Copyright N/A
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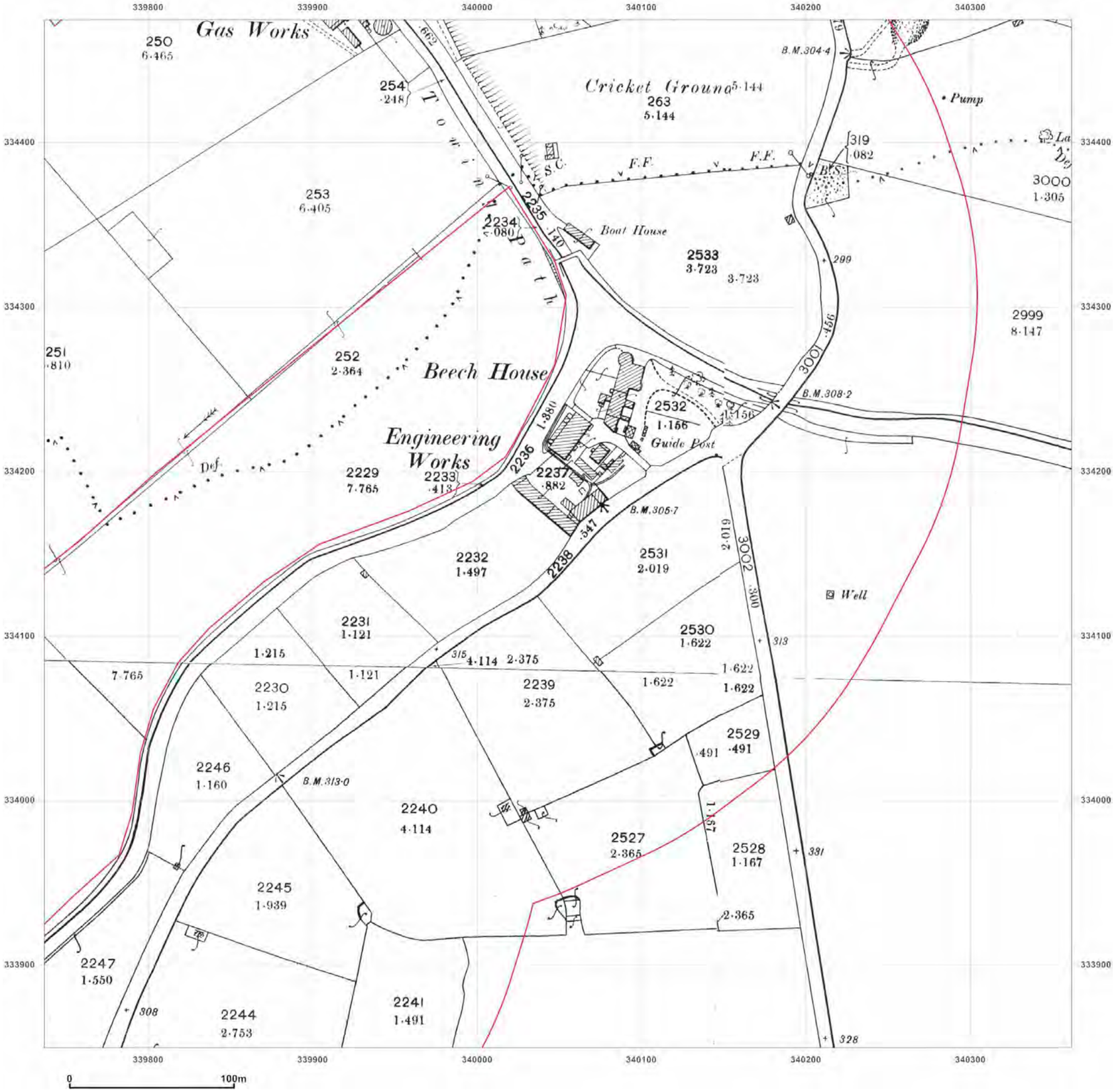

GroundSure
ENVIRONMENTAL INSIGHT

Site Details:

Ellesmere Marina, Shropshire,

Client Ref: BMW2025/NE12/877
Report Ref: HMD-214-912193_LS_C1
Grid Ref: 340049, 334162

Map Name: County Series

Map date: **1901**

Scale: 1:2,500

Printed at: 1:2,500

N
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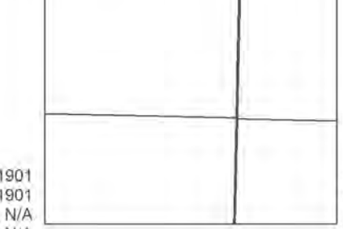
Surveyed 1901
Revised 1901
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1901
Revised 1901
Edition N/A
Copyright N/A
Levelled N/A



Surveyed 1901
Revised 1901
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1901
Revised 1901
Edition N/A
Copyright N/A
Levelled N/A

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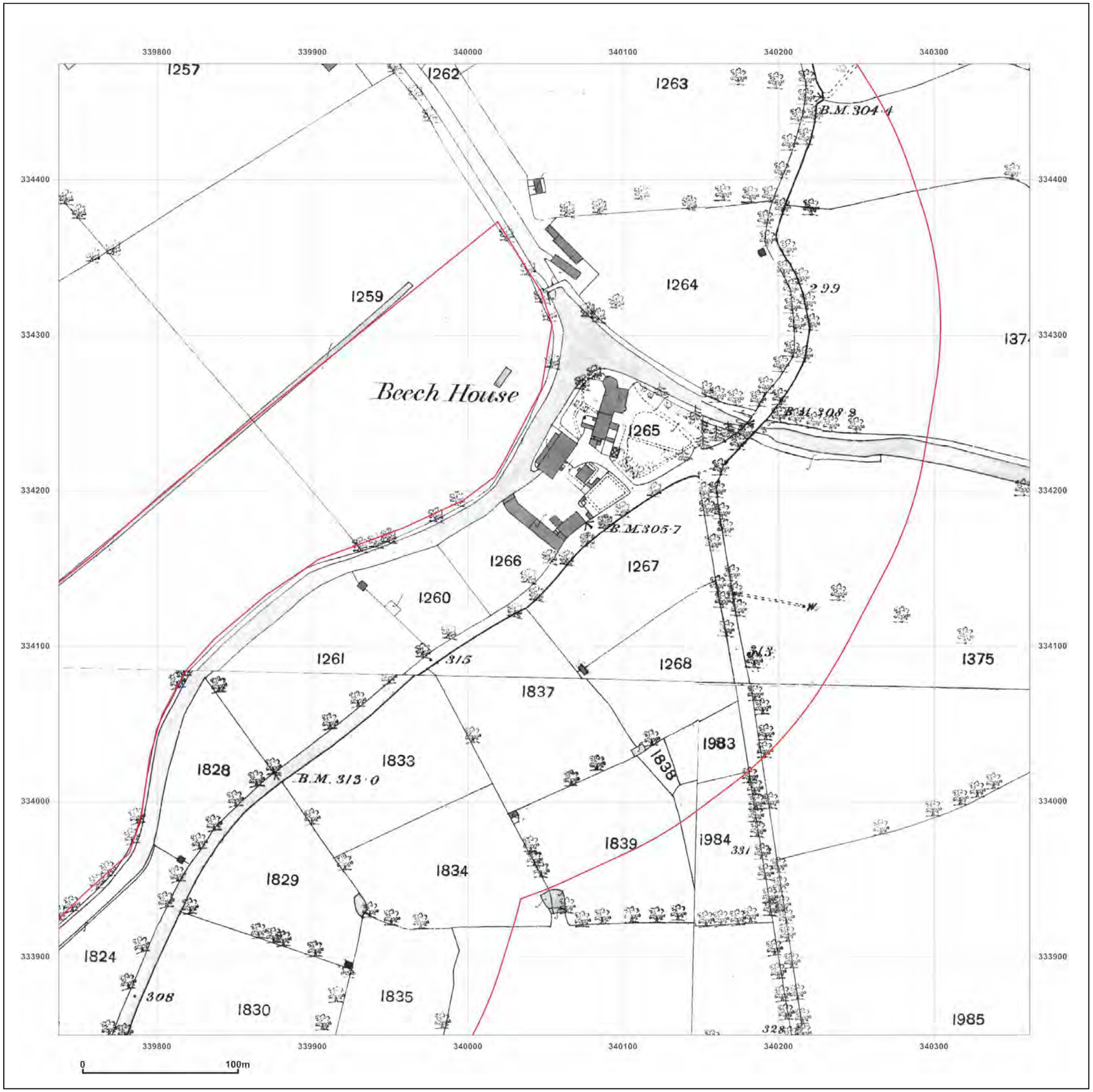

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Site Details:

Ellesmere Marina, Shropshire,

Client Ref: BMW2025/NE12/877
Report Ref: HMD-214-912193_LS_C1
Grid Ref: 340049, 334162

Map Name: County Series

Map date: **1875-1877**

Scale: 1:2,500

Printed at: 1:2,500

N
W E
S

Surveyed 1877
Revised 1877
Edition N/A
Copyright N/A
Levelled N/A

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Revised 1877
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Copyright N/A
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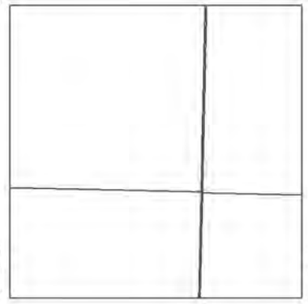

Surveyed 1876
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