

# Great Yarmouth Third River Crossing

## Application for Development Consent Order

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## Document 6.6: EIA Scoping Report

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**Planning Act 2008**

**The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009 (as amended) (“APFP”)**

APFP regulation Number: 5(2)(a)

Planning Inspectorate Reference Number: TR010043

Author: Norfolk County Council

Document Reference: 6.6 – EIA Scoping Report

Version Number: 0 – Revision for Submission

Date: 30 April 2019



Norfolk County Council

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# GREAT YARMOUTH THIRD RIVER CROSSING

Environmental Impact Assessment Scoping Report







**Norfolk County Council**

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# **GREAT YARMOUTH THIRD RIVER CROSSING**

**Environmental Impact Assessment Scoping Report**

**TYPE OF DOCUMENT (VERSION) PUBLIC**

**PROJECT NO. 70041951**

**OUR REF. NO. 70041951-ENV-EIA SCOPING/A**

**DATE: MARCH 2018**

WSP  
The Forum  
Barnfield Road  
Exeter, Devon  
EX1 1QR  
Phone: +44 1392 229 700  
Fax: +44 1392 229 701  
WSP.com

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# QUALITY CONTROL

Issue/revision	First issue	Revision 1	Revision 2	Revision 3
Remarks	Rev A	Table text	Table text	Table text
Date	29 March 2018	Table text	Table text	
Prepared by	Jonathan Davey	Table text	Table text	
Signature	<b>Jonathan Davey</b>			
Checked by	Marcus Wood	Table text	Table text	Table text
Signature	<b>Marcus Wood</b>			
Authorised by	Marcus Wood	Table text	Table text	Table text
Signature	<b>Marcus Wood</b>			
Project number	70041951	Table text	Table text	Table text
Report number	70041951-ENV-EIA SCOPING/A			
File reference	\\uk.wspgroup.com\central data\Projects\62240xxx\62240375 - GYTRC\02 WIP\EI EIA and flood risk\03 Document\00 EIA Scoping Report			





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Appendix F: Protected Species
Appendix G: Heritage Desk Study
Appendix H: Health Assessment Matrix
Appendix I: Contaminated Land Desk Study



# 1 INTRODUCTION

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## 1.1 INTRODUCTION TO THIS REPORT AND THE PROPOSED SCHEME

- 1.1.1. WSP has been appointed by Norfolk County Council (NCC) to prepare a Scoping Report for the Environmental Impact Assessment (EIA) for the Great Yarmouth Third River Crossing (hereinafter referred to as the Proposed Scheme). This Report accompanies an application by NCC for a Scoping Opinion pursuant to Regulation 10(1) of the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (the Regulations)<sup>1</sup>. The purpose of the Report is to provide the documentation and information required to comply with Regulation 10(3)(a) to (c) together with further information and representations which NCC considers appropriate for the purposes of Regulation 10(3)(d).
- 1.1.2. The scheme promoter is NCC. The proposed scheme will be located in the area of Great Yarmouth Borough Council (GYBC).
- 1.1.3. The Proposed Scheme will provide a third crossing over the River Yare, creating a new, more direct link between the western and eastern parts of Great Yarmouth. Specifically, it will provide a connection between the Strategic Road Network (A47) and the South Denes Business Park, Enterprise Zone, Great Yarmouth Energy Park and the Outer Harbour, all of which are located on the South Denes Peninsular. The Proposed Scheme is described further in Chapter 3.

## 1.2 ENVIRONMENTAL IMPACT ASSESSMENT

- 1.2.1. The Proposed Scheme is a Nationally Significant Infrastructure Project (NSIP)<sup>2</sup> following a Direction from the Secretary of State.
- 1.2.2. As NCC will be the highway authority for the project (if constructed), section 22(2)(b) of the Planning Act 2008 precludes the project falling within Section 14. However on 26 January 2018, NCC formally requested the Secretary of State to use his power of direction under Section 35.
- 1.2.3. By letter of 26 February 2018, the Secretary of State stated that he was satisfied that the Proposed Scheme was nationally significant and directed that the Proposed Scheme, together with any matters associated with it, was to be treated as development for which development consent is required. This Direction is included in Appendix A.
- 1.2.4. The Proposed Scheme is therefore now subject to the consenting regime comprised in the Planning Act 2008 and associated subordinate legislation (including the Regulations). NCC therefore proposes, in due course, to make an application to the Secretary of State for an order granting development consent for the Proposed Scheme. To facilitate this, NCC has applied for a Scoping Opinion pursuant to Regulation 10(1) of the Regulations.
- 1.2.5. The process and content of EIA is summarised in Regulations 5(1) and (2) of the Regulations. EIA applies to "EIA Development" as defined by the Regulations. This comprises development of a description mentioned in Schedule 1 of the Regulations, or mentioned in Schedule 2 where the development is likely to have significant effects on the environment by virtue of factors such as its nature, size and location. The Proposed Scheme does

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<sup>1</sup> Note: where legislation referred to in this Report has been amended, the Report is to be read as referring to that legislation as amended.

<sup>2</sup> Strictly speaking, a project which is the subject of a section 35 direction is a 'project of national significance' rather than a 'NSIP' but there is no material difference in substantive or procedural terms between a DCO for such a project and a DCO for a 'NSIP'. Thus, for convenience, the Proposed Scheme will be referred to as a 'NSIP'

not fall within any Schedule 1 description, but it does fall within the following Schedule 2 description: the “construction of roads (unless included in Schedule 1)”.

- 1.2.6. Taking into account the above, and the criteria in Schedule 3 of the Regulations and having considered the nature of the Proposed Scheme and the sensitivity of the receiving environment, NCC is of the opinion that the development has the potential for significant effects upon the environment. NCC has therefore decided that it will provide an Environmental Statement (ES) in relation to the Proposed Scheme and has notified the Secretary of State of this pursuant to Regulation 8(1)(b). This event has determined for the purposes of the Regulations that the Proposed Scheme is EIA Development<sup>3</sup>.

## 1.3 SCOPING REPORT APPROACH

- 1.3.1. Scoping is an important part of the EIA process. It aims to assist the preparation of the ES by providing an opinion as to the scope of the information to be provided in the ES and the level of detail.
- 1.3.2. This Scoping Report considers and sets out currently anticipated likely effects on the environment using available baseline information and emerging design proposals that are available. Baseline surveys and consultation undertaken to date have been used to inform the methodologies proposed and this evidence is presented together with relevant reports appended as appropriate.
- 1.3.3. The required scope of an EIA is an evolving process and following the receipt of the Scoping Opinion, or a change in the Proposed Scheme or baseline knowledge, then adjustment to the scope of the EIA may be necessary. However, this Scoping Report, as well as the Scoping Opinion, will in any event remain important documents in the EIA process and will therefore be issued as a technical appendix to the ES.
- 1.3.4. Regulation 10(1) states that the request for a Scoping Opinion must include:
- a plan sufficient to identify the land (presented as drawing 62240375-GYTRC-Scoping Report Boundary-20180219, in Appendix B);
  - a description of the proposed development, including its location and technical capacity;
  - an explanation of the likely significant effects of the development on the environment; and
  - such other information or representations as the person making the request may wish to provide or make.
- 1.3.5. In accordance with advice presented in Advice Note 7, this report aims to present the Planning Inspectorate with the following information.

### *The Proposed Development:*

- an explanation of the approach to addressing uncertainty where it remains in relation to elements of the Proposed Development e.g. design parameters;
- referenced plans presented at an appropriate scale to convey clearly the information and all known features associated with the Proposed Development;

### *EIA Approach and Topic Areas:*

- an outline of the reasonable alternatives considered and the reasons for selecting the preferred option;

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<sup>3</sup> See Regulation 6(1) and 6(2)(a)



- a summary table depicting each of the aspects and matters that are requested to be scoped out allowing for quick identification of issues;
- a detailed description of the aspects and matters proposed to be scoped out of further assessment with justification provided;
- results of desktop and baseline studies where available and where relevant to the decision to scope in or out aspects or matters;
- aspects and matters to be scoped in, the report should include details of the methods to be used to assess impacts and to determine significance of effect e.g. criteria for determining sensitivity and magnitude;
- any avoidance or mitigation measures proposed, how they may be secured and the anticipated residual effects;

*Information Sources:*

- references to any guidance and best practice to be relied upon;
- evidence of agreements reached with consultation bodies (for example the statutory nature conservation bodies or local authorities); and
- an outline of the structure of the proposed ES.

## **1.4 STRUCTURE OF THIS REPORT**

1.4.1. The remainder of the scoping report is set out as follows:

- Chapter 2 describes the Proposed Scheme and the Site Location;
- Chapter 3 presents an assessment of Alternative Options;
- Chapter 4 provides details of consultation undertaken to date;
- Chapter 5 details the proposed approach to the EIA;
- Chapter 6 presents the proposed scope of the technical assessments to be included within the EIA;
- Chapter 7 provides a summary of the proposed Scope; and
- Chapter 8 presents references and a glossary.

1.4.2. This report is also supported by eight appendices, which are as follows:

- Appendix A: Planning Act 2008 Section 35 Direction
- Appendix B: Figures and Drawings
- Appendix C: Legislation
- Appendix D: Consultation Responses
- Appendix E: Preliminary Ecological Appraisal
- Appendix F: Protected Species

- Appendix G: Heritage Desk Study
- Appendix H: Health Assessment Matrix
- Appendix I: Contaminated Land Desk Study

## 1.5 DESIGN UNCERTAINTY

1.5.1. At the time of preparing the Scoping Report the Proposed Scheme design continues to be refined. The preferred design option, formerly identified as Option 32, has undergone further refinement since the Outline Business Case. At the time of writing it is recognised that:

- the land requirements of the Proposed Scheme are yet to be wholly finalised;
- a bascule bridge design solution is being progressed for the Proposed Scheme, although consideration is being given to a potential alternative swing bridge design. This alternative has therefore been included within the Scoping Report; and
- areas for ecological mitigation are yet to be determined.

1.5.2. It is considered unlikely that refinements to the Proposed Scheme, in the light of further work, will result in a materially different scheme and hence the description given in Section 2 is considered applicable to inform this report.

## 2 PROPOSED SCHEME

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### 2.1 THE NEED FOR THE PROPOSED SCHEME

- 2.1.1. The aim of the Proposed Scheme is to overcome the problems of poor access to the peninsula of Great Yarmouth, and the congestion that this causes.
- 2.1.2. The existing river crossings do not provide adequate access to the port and employment areas in the southern part of the peninsula. The lack of a direct bridge means that traffic is forced onto unsuitable routes within the town centre, including the historic South Quay. Congestion, especially on the Haven Bridge, causes delays and makes journey times unreliable. The importance of these issues is emphasised by the port's nationally significant role in the renewable energy sector and the offshore oil and gas industry, and its role as an International Gateway. Moreover, the mixture of port-related and local traffic makes it more difficult for people to access the town centre, seafront, and leisure facilities. The lack of a direct river crossing makes Great Yarmouth seem remote, and discourages inward investment. Bus users, cyclists and pedestrians have long, indirect journeys into the peninsula, which discourages commuting to work by more sustainable modes.
- 2.1.3. The Proposed Scheme is intended to improve connectivity and resilience substantially for all port activities. Moreover, the port and part of the peninsula have been designated as The Great Yarmouth Enterprise Zone, which has the potential to create 5,000 new jobs by 2025, alongside plans for 2,000 new homes and 20-30 hectares of employment development. Without a new crossing, the full potential for growth in the Enterprise Zone and Local Development Order may not be fully realised.
- 2.1.4. In his letter of 26 February 2018 (presented within Appendix A) the Secretary of State stated that he was satisfied that the Proposed Scheme was nationally significant for the following reasons:
- The port has a nationally significant role in the renewable energy sector and the offshore gas and oil industry and the scheme will substantially improve connectivity and resilience for port activities;
  - The scheme will support the delivery of existing and potential future renewable energy NSIPs,
  - Supports the port's role as an International Gateway
- 2.1.5. In addition, the Secretary of State recognised within the letter that the scheme will Improve the offer of the Port through better connectivity to the Enterprise Zone
- 2.1.6. Figure 1 shows the strategic location of the Proposed Scheme. The approximate position of the Proposed Scheme is marked in blue.



Enterprise Zone

Local Development Order

Proposed Third River Crossing

**Enterprise Zone:**  
 Energy businesses in this zone benefit from simplified planning, superfast broadband and rate relief for 5 years

**Local Development Order:**  
 Simplified planning process for businesses in energy, port and logistics sectors.

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**Great Yarmouth Energy Park**  
 At the heart of the port industrial area

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**South Denes Business Park**  
 Easy access to the river port and Outer Harbour

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**Peel Ports Great Yarmouth**  
 Modern, multi-purpose facility including deep water Outer Harbour to complement the existing river port

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**Beacon Park**  
 Approx 5 miles



Figure 1 – Strategic Location



## 2.2 LOCATION OF PROPOSED SCHEME

- 2.2.1. Figure 2, presented in Appendix B shows the location of the Proposed Scheme. Great Yarmouth is located at the mouth of the River Yare, one of the main waterways providing access to the Norfolk Broads. The river bisects Great Yarmouth, with the town centre, seafront, industrial areas and outer harbour located on the narrow, 4 km long, South Denes peninsula between the river and the sea, isolated from the rest of the town. To the west of the River Yare, Gorleston-on-Sea is just a few hundred metres away as the crow flies, but over 7km distant by road.
- 2.2.2. The Proposed Scheme will provide a third crossing of the River Yare, creating a direct link into the southern part of the peninsula. It will greatly improve access to the port, outer harbour, employment areas, the seafront and residential areas. It will connect the peninsula to the strategic road network via the A47 Harfrey's roundabout.
- 2.2.3. There are a number of designations affecting the Proposed Scheme. These are marked on the Environmental Constraints Plan presented as Figure 3. Key designations and features include, but are not limited to, the following:
- European Designation:
    - The Outer Thames Estuary Special Protected Area (SPA)
    - The Potential Extension Outer Thames Estuary Special Protected Area (pSPA), covering the River Yare and the River Bure
    - Breydon Water SPA and Ramsar
    - Great Yarmouth North Denes SPA
  - National Statutory Designation:
    - Breydon Water SSSI
    - Great Yarmouth North Denes SSSI
    - The Broads National Park<sup>4</sup>
  - Heritage Designations
    - Town Walls Scheduled Ancient Monument
    - Listed buildings (Grades I, II\* and II)
    - Conservation Areas – Four conservation areas identified within 1km of the Proposed Scheme:

## 2.3 PROPOSED SCHEME DESCRIPTION

- 2.3.1. A new highway crossing of River Yare, Great Yarmouth, connecting Harfrey's Roundabout to the west of the River Yare with South Denes Road to the east of the River Yare. The Proposed Scheme Boundary is shown in WSP drawing 62240375-GYTRC-Scoping Report Boundary-20180219, and the Proposed Scheme layout is shown in drawing 70041951-WSP-HAW-GYTRC-DR-D-0001-P01.1, both of which are presented in Appendix B.
- 2.3.2. A bascule bridge design solution is currently being progressed, as described within the following sections. Nevertheless, it should be noted that consideration is also being given a potential alternative swing bridge design

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<sup>4</sup> "Broads National Park" is the term used by the Broads Authority to refer to the Broads for branding and marketing purposes. Whilst the Broads is not a statutory national park, being governed principally by the Norfolk and Suffolk Broads Act 1988, it shares many of the statutory characteristics of a National Park and is treated by Government policy as a member of the national park family.

solution. This potential alternative design has been included within this Scoping Report and a description of this has also been provided.

- 2.3.3. The bascule bridge represents the preferred design solution for the Proposed Scheme. The swing bridge design is only likely to be progressed past the preliminary design stage, where a decision is made not to proceed with the preferred bascule solution. This decision will be informed by early contractor involvement. It is expected that a decision on the bridge design will be made prior to the submission consultation in summer 2018.

#### Bascule Bridge Design Solution

##### *Western Bank of the River Yare:*

- 2.3.4. On the western side of the river, a new roundabout will be constructed on William Adams Way, at the site of the existing junction with Suffolk Road, to the east of the A47 Harfrey's roundabout. William Adams Way will be realigned and widened between Harfrey's Roundabout and the new roundabout, and between the new roundabout and Beccles Road / Southtown Road.
- 2.3.5. From the new roundabout, a new dual carriageway road will be constructed leading eastwards towards the new river bridge. It will cross Southtown Road on a flyover.

##### *The New Bascule Bridge Crossing:*

- 2.3.6. A new bridge will be provided to carry the new dual carriageway road across the river. Traffic will be controlled by lifting barriers at either end of the bridge and queuing space will be provided. Facilities will be provided for cyclists and pedestrians.
- 2.3.7. The new bridge will comprise a single span, double leaf trunnion bascule (upward opening). Draft structural drawing 1076653-WSP-SGN-OPT32-DR-S-0001-P02, presented in Appendix B, shows the bascule bridge conceptual general arrangement. As stated in the drawing title, the bascule bridge design is currently conceptual, therefore design details, such as the location and design of bascule chambers are currently being progressed. It is anticipated that hydraulic and electrical equipment shall be housed in plant rooms. At this stage it is anticipated that two plant rooms will be required, one per bridge leaf.
- 2.3.8. Drawing 1076653-WSP-SGN-OPT32-DR-S-0001-P02 shows a vertical clearance of 5.6m between the water level at Mean High Water Springs (MHWS) and the bottom bridge deck. The Bascule bridge design will require the construction of piers and fenders, one at each embankment of the River Yare. Drawing 1076653-WSP-SGN-OPT32-DR-S-0001-P02 shows a 50m clearance between fenders in order to maintain a suitable navigation channel within the River Yare. The dimensions of the clearance envelope, along with other design details, will be update in future EIA document as the scheme design progresses.
- 2.3.9. The Proposed Scheme will include a control tower for the new lifting bridge, although at the time of writing the location and design of this control tower have not been determined.

##### *East Bank of the Yare:*

- 2.3.10. On the eastern side of the river, the new dual carriageway will connect to the A1243 South Denes Road, which is currently shown to be a new signal controlled junction.

##### *Cycle and Pedestrian Routes:*

- 2.3.11. As well as being an important link for vehicular traffic, the new bridge will provide opportunities for more journeys by cycle and on foot. The current scheme proposes the following:
- A footway and cycleway link from William Adams Way, across the new bridge, and linking to a new on carriageway cycle lane on Sutton Road;



- A new footway/cycleway link from the William Adams Way roundabout to Suffolk Road, and a new pedestrian crossing on Suffolk Road;
- A footway/cycleway link from William Adams Way to the Harfrey's roundabout; and
- Enhanced public realm.

#### Potential Alternative Bridge Design: Swing Bridge Option

- 2.3.12. At this stage of the project a potential alternative bridge design is being considered. This alternative design comprises a single leaf Swing Bridge. Draft structural drawing 1076653-WSP-SGN-OPT32A-SK-S-0001-P01, presented in Appendix B, shows the bridge design conceptual general arrangement of the Swing Bridge.
- 2.3.13. This alternative bridge leaf design would likely comprise an asymmetric span structure rotating around a pintle bearing. The current preliminary design for this alternative option shows the rotating mechanism located on a pier at the western River Bank. The swing span leaf would travel through 90° between open and closed positions. Drawing 1076653-WSP-SGN-OPT32A-SK-S-0001-P01 shows that, when open the bridge leaf would sit parallel to the quay wall along the western river bank.
- 2.3.14. A 50m clearance between fenders in order to maintain a suitable navigation channel within the River Yare. The vertical clearance between the bridge deck and MHWS is shown to be 7.3m.
- 2.3.15. As with the preferred bascule option, this drawing is preliminary. This design may be subject to change, however as previously stated, the swing bridge design is only likely to be progress if a decision is made not to proceed with the preferred bascule bridge solution.

## 3 ASSESSMENT OF ALTERNATIVES

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### 3.1 DEVELOPING OPTIONS

- 3.1.1. The Option Assessment Report (OAR) considered a range of locations for the Great Yarmouth Third River Crossing (GYTRC), as well as whether the crossing should be a bridge or tunnel. Three broad alignment corridors were considered: northern, central and southern. In each corridor, a high level and low level bridge option (on similar alignments) and a tunnel option were devised, giving nine different main options. Both the high and low level bridge options were to be for lifting bridges.
- 3.1.2. Results from the economic assessment carried out in the Option Assessment Report (OAR) showed that although the economic benefits of the tunnel option are nearly as high as those for the bridge options, its cost would be approximately three times that of the bridge confirming that a tunnel option is unlikely to become a viable solution.
- 3.1.3. A Stage 2 Assessment gave further consideration to the options which had emerged from the Stage 1 Assessment. As part of this assessment the proposed corridor for the new bridge crossing was identified, based upon commercial vessel movements and the number of bridge openings required.
- 3.1.4. The list of potential options was narrowed down to a selection of preferred options by removing those that did not make significant contributions to meeting the defined objectives, did not resolve the identified problems, or are not deliverable or feasible. Nine primary options were identified comprising variants of three different western tie-in forms and locations outlined in the OAR. These included:
- Option 4: A12 Harfrey's Roundabout tie-in; min 7.0m clearance; single carriageway
  - Option 5: A12 Harfrey's Roundabout tie-in; min 7.0m clearance; dual carriageway
  - Option 6: A12 Harfrey's Roundabout tie-in; min 7.0m clearance; 3-lane carriageway
  - Option 31: Suffolk Road tie-in; min 7.0m clearance; single carriageway
  - Option 32: Suffolk Road tie-in; min 7.0m clearance; dual carriageway
  - Option 33: Suffolk Road tie-in; min 7.0m clearance; 3-lane carriageway
  - Option 37: Southtown Road tie-in; min 3.0m clearance; single carriageway
  - Option 38: Southtown Road tie-in; min 3.0m clearance; dual carriageway
  - Option 39: Southtown Road tie-in; min 3.0m clearance; 3-lane carriageway
- 3.1.5. Following the development of the nine primary options, further operational appraisal was carried out to assess (i) value for money; (ii) the financial case; and (iii) the delivery case. The DfT Early Assessment Sifting Tool (EAST) was applied to reduce nine options down to the final three. The shortlisted options were subjected to preliminary operational testing using both SATURN and Paramics Discovery model platforms.
- 3.1.6. Options 32, 33 and 37 were recommended to be carried forward to next stage for further appraisal. Both options 32 and 33 met all specific, intermediate and operational objectives of the scheme and addressed a balance of benefits to both the local and strategic road network. Option 37, which is a two-lane low bridge that ties in at-grade to Southtown road, was to be carried forward as the low cost option.
- 3.1.7. Testing showed that all key indicators suggest that option 32 performs better than either option 33 or 37. Option 32 was forecast to provide the greatest potential benefit in terms of total travel distance and time saved across the modelled road network. In addition, Option 32 was also forecast to present the best operational performance at the junctions adjacent to the bridge, with the lowest levels of queueing and most efficient dissipation of these queues once the bridge re-opens for vehicular traffic.
- 3.1.8. Option 32 formed the basis for the Proposed Scheme, presented within this Scoping Report.

## 4 CONSULTATION

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### 4.1 CONSULTATION TO DATE

4.1.1. Previous consultations have been undertaken by NCC on the Third River Crossing scheme, the most recent of these being:

- Initial engagement consultations in January 2017:

The purpose of these consultations was to understand stakeholder views on congestion, to share the emerging proposals for the scheme and understand the level of support for it.

- Scheme development consultations in September/October 2017:

The purpose of these consultations was to present details of the Proposed Scheme to date and understand views on it.

### 4.2 INFORMAL CONSULTATION RESPONSES

4.2.1. NCC as Applicant has undertaken non-statutory consultation in advance of preparing the EIA scoping report, based upon information presented in the Outline Business Case<sup>5</sup> and Options Assessment report<sup>6</sup>.

4.2.2. Informal consultation responses have been received from Historic England, Natural England, The Broads Authority and the Environment Agency (EA). Consultation responses received to date are presented in Appendix D.

### 4.3 FUTURE CONSULTATION

4.3.1. Further consultation will be carried out in accordance with the requirements of the Regulations and the Planning Act 2008. It is intended to carry out statutory pre-application consultation during summer 2018 and Preliminary Environmental Information will be published and consulted on at that time.

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<sup>5</sup> Norfolk County Council (2017) Great Yarmouth Third River Crossing Outline Business Case. [online] available at <https://www.norfolk.gov.uk/roads-and-transport/major-projects-and-improvement-plans/great-yarmouth/third-river-crossing/outline-business-case-submission> (Accessed January 2018)

<sup>6</sup> Norfolk County Council (2017) Great Yarmouth Third River Crossing Options Assess. [online] available at <https://www.norfolk.gov.uk/roads-and-transport/major-projects-and-improvement-plans/great-yarmouth/third-river-crossing/outline-business-case-submission> (Accessed January 2018)

## 5 ENVIRONMENTAL IMPACT ASSESSMENT APPROACH

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- 5.1.1. Identification of the impacts and likely significant effects on the environment associated with the Proposed Scheme, and of the studies and assessments which it is intended should be undertaken to investigate them, has been largely informed by the National Networks National Policy Statement (NN NPS), which provides planning guidance for scheme promoters.
- 5.1.2. As stated in the NN NPS, Schedule 4 of the Infrastructure Planning (Environmental Impact Assessment) Regulations 2009 sets out the information that should be included in the environmental statement including a description of the likely significant effects of the proposed project on the environment, covering the direct effects and any indirect, secondary, cumulative, short, medium and long-term, permanent and temporary, positive and negative effects of the project, and also the measures envisaged for avoiding or mitigating significant adverse effects.
- 5.1.3. In addition, the Design Manual for Roads and Bridges (DMRB) provides guidance for all aspects of the planning, design and assessment of major road schemes. Volume 11 of the DMRB specifically addresses environmental assessment although it is acknowledged that the DMRB predates the current EIA Regulations.
- 5.1.4. The guidance in Volume 11 identifies impacts and effects which can be anticipated where a major road scheme is being introduced into the environment. The guidance has been used to enable the assessment team to establish which of these impacts and effects could potentially occur, and the specific nature of them for the Proposed Scheme. Where it has been concluded assessment is required, there is a description of the assessment considered appropriate and methods of assessment which are to be adopted.
- 5.1.5. The ES will aim to determine which potential effects of the Proposed Development are likely to be significant, both positive and negative, irrespective of duration. Direct effects will be assessed, together with (where relevant) indirect, secondary, cumulative and transboundary effects. Where possible effects will be assessed quantitatively.
- 5.1.6. The significance of effects will be assessed using one or more of the following criteria:
- international, national and local standards;
  - relationship with planning policy;
  - sensitivity of receiving environment;
  - reversibility and duration of effect;
  - inter-relationship between effects and cumulative effects; and
  - the results of the consultations
- 5.1.7. The significance of effects reflects the professional judgement of the technical specialist as to (i) the value or sensitivity of the affected receptor(s); and (ii) the nature and magnitude of the predicted changes.
- 5.1.8. It is proposed that the methodology and criteria used for the EIA be based upon the approach published in Volume 11, Section 2, Part 5 of the DMRB (HA 205/08), updated as necessary to take account of the 2017 EIA Regulations. Where individual topics depart from this approach, the alternative methodologies and terminology will be provided within the relevant chapter.
- 5.1.9. Environmental value and impact magnitude detailed within HA 205/08 are reproduced in Table 1 and Table 2 respectively.



Table 1 - Environmental Value (or Sensitivity) and Typical Descriptors

Value (sensitivity)	Typical Description
Very High	Very high importance and rarity, international scale and very limited potential for substitution.
High	High importance and rarity, national scale, and limited potential for substitution.
Medium	High or medium importance and rarity, regional scale, limited potential for substitution.
Low (or lower	Low or medium importance and rarity, local scale.
Negligible	Very low importance and rarity, local scale.

Table 2 - Magnitude of Impact and Typical Descriptors

Magnitude of impact	Typical criteria descriptors
Major	Loss of resource and/or quality and integrity of resource; severe damage to key characteristics, features or elements (Adverse).
	Large scale or major improvement of resource quality; extensive restoration or enhancement; major improvement of attribute quality (Beneficial).
Moderate	Loss of resource, but not adversely affecting the integrity; partial loss of/damage to key characteristics, features or elements (Adverse).
	Benefit to, or addition of, key characteristics, features or elements; improvement of attribute quality (Beneficial).
Minor	Some measurable change in attributes, quality or vulnerability; minor loss of, or alteration to, one (maybe more) key characteristics, features or elements (Adverse).
	Minor benefit to, or addition of, one (maybe more) key characteristics, features or elements; some beneficial impact on attribute or a reduced risk of negative impact occurring (Beneficial).
Negligible	Very minor loss or detrimental alteration to one or more characteristics, features or elements (Adverse).
	Very minor benefit to or positive addition of one or more characteristics, features or elements (Beneficial).

- 5.1.10. Using the level of sensitivity (value) and the magnitude of an impact, the significance of an effect can be determined using the Significance Matrix presented in Table 3. Using this approach it is possible that a large adverse impact on a feature or site of low importance will be of lesser significance than the same impact on a feature or site of high importance.
- 5.1.11. Descriptors of effect significance are presented in Table 4. Table 3 and Table 4 are also based upon the significance matrix and significance descriptions published by the DMRB in HA 205/08.
- 5.1.12. Again, where individual assessment sections deviate from these terms, the alternative terminology has been explained as appropriate within the relevant chapter.



**Table 3 - Significance of Effect Matrix**

<b>Importance / Sensitivity / Value</b>	<b>Very High</b>	Neutral	Slight	Moderate or Large	Large or Very Large	Very Large
	<b>High</b>	Neutral	Slight	Slight or Moderate	Moderate or Large	Large or Very Large
	<b>Medium</b>	Neutral	Neutral or Slight	Slight	Moderate	Moderate or Large
	<b>Low</b>	Neutral	Neutral or Slight	Neutral or Slight	Slight	Slight or Moderate
	<b>Negligible</b>	Neutral	Neutral	Neutral or Slight	Neutral or Slight	Slight
		<b>No change</b>	<b>Negligible</b>	<b>Minor</b>	<b>Moderate</b>	<b>Major</b>
<b>Magnitude of impact</b>						

**Table 4 - Descriptors of the Significance of Effect Categories**

<b>Significance Category</b>	<b>Typical descriptors of effect</b>
Very Large	Only adverse effects are normally assigned this level of significance. They represent key factors in the decision-making process. These effects are generally, but not exclusively, associated with sites or features of international, national or regional importance that are likely to suffer a most damaging impact and loss of resource integrity. However, a major change in a site or feature of local importance may also enter this category.
Large	These beneficial or adverse effects are considered to be very important considerations and are likely to be material in the decision-making process.
Moderate	These beneficial or adverse effects may be important, but are not likely to be key decision-making factors. The cumulative effects of such factors may influence decision-making if they lead to an increase in the overall adverse effect on a particular resource or receptor.
Slight	These beneficial or adverse effects may be raised as local factors. They are unlikely to be critical in the decision-making process, but are important in enhancing the subsequent design of the project.
Neutral	No effects or those that are beneath levels of perception, within normal bounds of variation or within the margin of forecasting error.

## 6 SCOPE OF TECHNICAL ASSESSMENTS

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### 6.1 INTRODUCTION

- 6.1.1. This chapter describes the methodology to be used within the EIA for each topic chapter. Each section also includes a description of the baseline data collected to date and the potential effects identified. The methodology takes into account the requirements of the DMRB Volume 11 together with guidance on environmental mitigation provided in DMRB Volume 10 and the guidance provided by the NN NPS. New and emerging guidance not yet incorporated into the DMRB is included in IANs.

### 6.2 AIR QUALITY

#### BASELINE CONDITIONS

- 6.2.1. The level of air pollution adjacent to roads and within urbanised areas is typically a function of vehicle emissions. Emissions of nitrogen oxides (NO<sub>x</sub>), including nitrogen dioxide (NO<sub>2</sub>) and particulate matter (PM<sub>10</sub> and PM<sub>2.5</sub>) from vehicles are of greatest concern with respect to human health.
- 6.2.2. Concentrations of these pollutants are most likely to approach their respective air quality limit values, established by European and UK legislation and prescribed in the UK Air Quality Strategy (AQS)<sup>7</sup> for the protection of human health and ecosystems, in proximity to the aforementioned areas. The review of the existing environment and subsequent air quality assessment scope will focus on these pollutants.
- 6.2.3. Information has been collected from the following sources to inform the review of existing air quality conditions:
- The GYBC Local Air Quality Management (LAQM) reports and published data.
  - Department for Environment, Food and Rural Affairs (Defra) mapped background air pollution concentrations specific to the Proposed Scheme.
  - Ordnance Survey (OS) mapping and address layer data to identify sensitive receptors in proximity to the Proposed Scheme and surrounding areas.

#### Local Air Quality Management Review

- 6.2.4. A review of the latest LAQM report published by GYBC – the 2016 Annual Status Report<sup>8</sup> – confirmed that there are no Air Quality Management Areas (AQMA) declared within the Borough, with no requirement for the Council to progress to further detailed assessment for any pollutant.
- 6.2.5. GYBC operates one automatic urban background monitoring site at Gorleston, located within 1km of the Proposed Scheme, which monitors ozone (O<sub>3</sub>), Nitrogen Oxides (NO<sub>x</sub>) and Particulate Matter to 10 microns (PM<sub>10</sub>). The previous five years' monitoring results for annual mean Nitrogen Dioxide (NO<sub>2</sub>) and PM<sub>10</sub> concentrations are presented in Table 5 Concentrations in all years are well below the respective annual mean limit values.

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<sup>7</sup> Defra (2007) The Air Quality Strategy for England, Scotland, Wales and Northern Ireland (Volumes 1 and 2)

<sup>8</sup> Great Yarmouth Borough Council (2016) Annual Status Report 2016

**Table 5 - Annual mean NO<sub>2</sub> and PM<sub>10</sub> data recorded at GYBC Urban Background Monitoring Station**

Site Name	Annual Mean Concentration (µg/m <sup>3</sup> )									
	2011*		2012*		2013*		2014*		2015*	
	NO <sub>2</sub>	PM <sub>10</sub>	NO <sub>2</sub>	PM <sub>10</sub>	NO <sub>2</sub>	PM <sub>10</sub>	NO <sub>2</sub>	PM <sub>10</sub>	NO <sub>2</sub>	PM <sub>10</sub>
Gorleston	20.0	21.7	18.8	19.9	18.2	20.7	17.1	16.6	16.8	16.8
Annual Mean NO <sub>2</sub> and PM <sub>10</sub> Limit value = 40 µg/m <sup>3</sup>										

\* The 1-hour mean NO<sub>2</sub> and 24-hour mean PM<sub>10</sub> standard was not breached in any of the years presented

- 6.2.6. GYBC operates a network of NO<sub>2</sub> diffusion tube monitoring sites, three of which are located within 1km of the Proposed Scheme and are presented in Table 6. Results obtained from these monitoring sites were well below the limit value (40µg/m<sup>3</sup>) for the five years 2011 – 2015.

**Table 6 - Annual mean NO<sub>2</sub> data recorded by diffusion tube monitoring within 1km of the Proposed Scheme**

Site Name	Site ID	Site Type	2015 Annual Bias-Adjusted NO <sub>2</sub> (µg/m <sup>3</sup> )				
			2011	2012	2013 <sup>2</sup>	2013	2015
9 Southgates Road	Diffusion Tube 6	Roadside	27.5	26.4	25.8	25.6	24.4
41 Southgates Road	Diffusion Tube 7	Roadside	24.3	23.8	20.8	22.9	20.9
Maltings House, Gorleston	Diffusion Tube 8_1	Co-location (x3 tubes) urban background	20.3	18.5	18.2	17.8	16.0
	Diffusion Tube 8_2		19.9	18.3	14.3	16.9	16.3
	Diffusion Tube 8_3		19.5	17.8	17.2	15.4	15.7
Annual mean limit value (µg/m <sup>3</sup> )			40				

#### Background Pollutant Concentrations

- 6.2.7. Defra publishes modelled background air pollutant data for the UK<sup>9</sup>, based on a 1x1km grid, which accounts for a multitude of local emissions sources including road vehicles, industrial installations, domestic sources and other transport modes, in addition to regional sources and imported emissions. The modelled background data is available for years 2015 to 2030 inclusive.
- 6.2.8. Background pollutant concentrations of NO<sub>2</sub>, NO<sub>x</sub>, PM<sub>10</sub> and PM<sub>2.5</sub> were obtained for the 1x1 km grid squares relative to the Proposed Scheme and surrounding area. These data are summarised in Table 7 for the current year (2016) and the proposed opening year (2023).

<sup>9</sup> DEFRA (2017) Air Pollution Background Maps. Available from: <http://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html>. [Accessed 01/12/2017]

**Table 7 - Defra mapped background annual mean concentrations ( $\mu\text{g}/\text{m}^3$ ) for each pollutant in current (2016) and future (2023) years**

Pollutant	Annual mean concentrations ( $\mu\text{g}/\text{m}^3$ )						Annual Mean Limit Value ( $\mu\text{g}/\text{m}^3$ )
	Maximum		Minimum		Average		
	2017	2023	2017	2023	2017	2023	
NO <sub>2</sub>	16.0	13.0	12.6	10.5	14.0	11.5	40
NO <sub>x</sub>	22.5	17.9	17.2	14.1	19.4	15.6	30*
PM <sub>10</sub>	17.7	17.0	14.1	13.5	15.7	15.0	40
PM <sub>2.5</sub>	13.2	12.6	9.9	9.4	11.2	10.7	25

6.2.9. All background concentrations contained as part of the intervention area are well below their respective annual mean health based limit values for NO<sub>2</sub>, PM<sub>10</sub> and PM<sub>2.5</sub>. Similarly, the annual mean limit NO<sub>x</sub> value set for the protection of vegetation and ecosystems is not exceeded.

#### Potentially Sensitive Receptors

6.2.10. The influence of vehicle emissions on ambient air quality is negligible beyond 200m of the respective road source, predominately due to horizontal and vertical atmospheric mixing. As such, an initial desk based review of potentially sensitive receptors to changes in air quality was undertaken to identify those located within 200m of the Proposed Scheme alignment and the likely affected links. This review was based on OS mapping and address layer data. Sensitive receptors as defined in the DMRB HA207/0710 include:

- The River Yare pSPA
- Residential dwellings;
- Designated ecological sites;
- Locations of the young and elderly;
- Hospitals; and
- Schools.

6.2.11. A summary of the sensitive receptor locations identified within 200m of the likely affected road network is presented in Table 8.

**Table 8 - Identified Potentially Sensitive Receptor Locations based on OS Mapping**

Property Type	Count
Residential	893
Designated Ecological Sites	0*
Education	2
Health Care (Hospitals, Care Homes)	0

\* No sites identified within 200m of the Proposed Scheme alignment. However, this will be revisited once traffic data are issued.

<sup>10</sup> Highways Agency (2007) Design Manual for Roads and Bridges Volume 11, Section 3, Part 1 Air Quality.

### Pollutant Climate Mapping Model

- 6.2.12. The Pollution Climate Mapping (PCM) model, operated by Defra, is collection of models designed to fulfil part of the UK's commitment to the requirements of EU Directive (2008/50/EC<sup>11</sup>) to report on the concentrations of particular pollutants in the atmosphere, which includes NO<sub>x</sub>, NO<sub>2</sub> and PM<sub>10</sub>.
- 6.2.13. The PCM model is used to produce the aforementioned 1x1km grid background pollutant concentrations, in addition to approximately 9,000 representative roadside pollutant values, thus accounting for vehicle emissions on the respective national roads.
- 6.2.14. The most relevant PCM road link to the Proposed Scheme is the A47, which intersects the proposed alignment at William Adams Way. The annual mean NO<sub>2</sub> concentrations predicted by the PCM model adjacent to the A47 are reported by Defra<sup>12</sup>:
- 2017 predicted NO<sub>2</sub> annual mean: 31.2 µg/m<sup>3</sup>
  - 2023 predicted NO<sub>2</sub> annual mean: 24.5 µg/m<sup>3</sup>
- 6.2.15. The PCM predicted concentrations are below the respective annual mean limit values in the current year (2018) and future year (2023).

### **POTENTIAL IMPACTS OF THE PROPOSED SCHEME**

- 6.2.16. Effects which would be likely to result from the implementation of the Proposed Scheme comprise:
- The generation and deposition of dust during construction;
  - Combustion engine emissions associated with construction-related traffic and construction plant operation;
  - Changes in concentrations of traffic related pollutants (NO<sub>x</sub>, NO<sub>2</sub>, PM<sub>10</sub>, PM<sub>2.5</sub>) where sensitive receptors are located or will be located in the vicinity of the Proposed Scheme, and parts of the existing road network that would be subject to changes in traffic flows and/or speeds, as a result of the implementation and future use of the Proposed Scheme (impacts on local air quality); and
  - Changes in the total emission of traffic-related pollutants associated with traffic using the Proposed Scheme and parts of the road network, which could be subject to changes in traffic flows and/or speeds across parts of the road network (regional emissions).

### Construction Phase

- 6.2.17. Activities such as earthworks and the transport of materials on haul routes during construction, will generate fugitive dust emissions, including fine particles (PM<sub>10</sub> and PM<sub>2.5</sub>). If transported beyond the boundary of site works, fugitive dust has the potential to adversely impact designated sites, residential areas and other sensitive receptors as a result in soiling of surfaces through deposition.
- 6.2.18. Residential properties on Queens Anne's Road and Southdown Road are located within close proximity to the application where there will be a clear risk of nuisance associated with deposition during construction. With regards to these sensitive receptors, there are well established mitigation measures, such as documented by the Institute of Air Quality Management (IAQM<sup>13</sup>), which are focussed on the control and mitigation of dust

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<sup>11</sup> The European Parliament and the Council of the European Union (2008) Ambient Air Quality Directive (2008/50/EC)

<sup>12</sup> Defra (2017) Pollution Climate Mapping. Available from: <https://uk-air.defra.gov.uk/library/no2ten/2017-no2-projections-from-2015-data> [Accessed 4/12/17]

<sup>13</sup> Institute of Air Quality Management (2014) Guidance on the assessment of dust from demolition and construction (v1.1)



generation and deposition. Such measures will ensure the likelihood of there being a significant environment effect in the context of the Regulations<sup>14</sup> is minimised.

- 6.2.19. Other potential impacts during construction can be associated with elevated concentrations of NO<sub>x</sub>, NO<sub>2</sub> and fine particles at sensitive receptors within 200m of exhaust emissions from non-road mobile machinery, construction vehicles and diesel generators.
- 6.2.20. A construction assessment following the methodology set out in IAQM Guidance on the Assessment of Dust from Demolition and Construction will be presented in the ES. In addition, based upon available construction vehicle and plant information at the time of production of the ES, assessment of construction emissions may be required.

#### Operational Phase

- 6.2.21. Operation phase air quality impacts will be associated with changes to vehicle flow characteristics, and thus emissions of NO<sub>x</sub>, NO<sub>2</sub>, PM<sub>10</sub> and PM<sub>2.5</sub>. This has the potential to result in localised impacts to air pollutant concentrations at identified sensitive receptors within 200m of road emission sources.
- 6.2.22. The River Yare pSPA is situated within the Proposed Scheme Boundary. Changes in vehicle emissions of NO<sub>x</sub> and NO<sub>2</sub> have the potential to impact designated ecological sites, particularly ecosystems and habitats sensitive to changes in nitrogen deposition and elevated concentrations of NO<sub>x</sub>. Air quality impacts of the Proposed Development are considered for all relevant ecological receptors, and the specific criteria used for the assessment of ecological effects should be presented in the ES, with reference to the Air Pollution Information System (APIS) where appropriate.
- 6.2.23. There is potential for impacts to regional emissions, including those of NO<sub>x</sub>, PM<sub>10</sub> and carbon dioxide (CO<sub>2</sub>), as a result of changes to vehicle flow characteristics across the affected road network. Whilst local air quality is characterised by pollutants with short term, immediate impacts, these pollutants can also travel longer distances, and can have impacts on a regional, national, or international scale. However, any change in mass emissions of these pollutants as a consequence of the Proposed Scheme are expected to be insignificant within the context of wider regional and national emissions totals.

## **PROPOSED ASSESSMENT METHODOLOGY**

#### Construction Phase

- 6.2.24. Taking into account the availability of well-established mitigation measures, where there is a risk of dust deposition at sensitive receptors close to the application site, it is not intended that further assessment should be undertaken. The ES will, however, detail the mitigation measures which would be adopted and secured by way of their inclusion within a Construction Environmental Management Plan (CEMP) for any construction contracts during implementation of the Proposed Scheme. These measures would be commensurate with the scale and duration of the activities and can be secured via a DCO Requirement (similar to a planning condition), which will ensure that there are no significant local air quality effects with respect to either fugitive dust or exhaust emissions.
- 6.2.25. A qualitative assessment of construction traffic emissions will be undertaken with reference to DMRB207/074, subject to data availability, which will incorporate the potential influence of exhaust emissions from non-road mobile machinery on local air quality.
- 6.2.26. The Proposed Scheme is in close proximity to a number of European and nationally designated ecological sites. The Proposed Scheme will have a direct effect upon the River Yare which has been designated as a pSPA. The

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<sup>14</sup> As defined within The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017

construction assessment will give specific consideration to the impact on such sites and inform the ecological impacts assessment.

#### Operation Phase: Local Air Quality Assessment

- 6.2.27. The assessment of local air quality and regional emissions impacts associated with the operation of the Proposed Scheme will be informed by the approaches detailed in DMRB HA207/074, with reference to respective Defra air quality technical guidance<sup>15</sup> and IAQM guidance<sup>16</sup>.
- 6.2.28. The local air quality assessment will involve screening of the Do Minimum (i.e. without the Proposed Scheme) and Do Something (i.e. with the Proposed Scheme) traffic data to identify any affected road links that adhere to the following criteria as provided by DMRB HA207/07:
- Road alignment will change by 5m or more; or
  - Daily traffic flows will change by 1,000 Average Annual Daily Traffic (AADT) or more; or
  - Heavy Duty Vehicle (HDV) flows will change by 200 AADT or more; or
  - Daily average speed will change by 10km/hr or more; or
  - Peak hour speed will change by 20km/hr or more.
- 6.2.29. At the time of writing, preliminary traffic data for the Proposed Scheme was not available to assess the number of affected road links. However, given the introduction and potential realignment of a number of roads, a detailed local air quality assessment will be undertaken.
- 6.2.30. Emissions inventory databases for each pollutant (NO<sub>x</sub>, PM<sub>10</sub>, PM<sub>2.5</sub>) will be developed for a minimum of three scenarios, based on traffic data provided for:
- Base year (e.g. 2017)
  - Do Minimum for opening year of Proposed Scheme (e.g. 2023)
  - Do Something for opening year of Proposed Scheme
- 6.2.31. The emissions databased will be developed using Defra's latest emission factor toolkit (currently EFTv8.0), which accounts for vehicle flow characteristics, such as:
- Link flow volumes as AADT;
  - Link average speed (km/hr);
  - Vehicle breakdown (e.g. percentage HDV's); and
  - Link length.
- 6.2.32. Each scenario emissions database will be entered into the Atmospheric Dispersion Modelling System ADMS-Roads v4.1 to enable prediction of pollutant concentrations at the identified sensitive receptor locations. The

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<sup>15</sup> Defra (2016) Local Air Quality Management Technical Guidance (TG16), London: Defra

<sup>16</sup> IAQM (2015) Guidance on land-use planning and development control: Planning for air quality v1



modelling exercise will utilise hourly sequential meteorological data from the most representative monitoring site in relation to the study area.

- 6.2.33. The base year model results will be verified in accordance with Defra's technical air quality guidance<sup>15</sup>. Model verification requires analysis of model outputs versus monitoring data for equivalent locations within the study area. Therefore, baseline air quality monitoring data is required that provides representative coverage of the area.
- 6.2.34. There is a network of three NO<sub>2</sub> diffusion tube monitoring locations operated by GYBC within 1km of the Proposed Scheme alignment, which do not provide adequate coverage of roads likely to be affected. As such, a scheme specific network of 40 sites has been established for a six month monitoring period commencing July 2017, covering a number of the likely affected road links. The locations of these tubes were agreed through consultation with the GYBC<sup>17</sup>. The final dataset of bias adjusted and annualised NO<sub>2</sub> concentrations at these locations will be reviewed and published at the PEIR stage.
- 6.2.35. The results of the baseline monitoring survey will inform the review of existing air quality conditions within the study area and enable a robust model verification of road emissions of NO<sub>x</sub> in the base year model scenario. The derived model verification factor will be applied to all subsequent model outputs of NO<sub>x</sub>/NO<sub>2</sub>.
- 6.2.36. With regards to model verification, final verification factors applied will be clearly stated within the ES, with full justification provided for the values adopted as part of the detailed explanation of the modelling work and assumptions.
- 6.2.37. As the GYBC continuous analyser at Gorleston monitors real-time PM<sub>10</sub> levels and is located within 1km of the Proposed Scheme alignment, data from this site will be used to derive a model verification factor for PM<sub>10</sub>. In the absence of specific PM<sub>2.5</sub> monitoring data, the PM<sub>10</sub> verification factor will be applied for this fraction of fine particulate matter also.
- 6.2.38. Current information available from Defra stipulates that concentrations of NO<sub>2</sub> are not reducing as expected, meaning future projected reductions in vehicle NO<sub>x</sub>/NO<sub>2</sub> emissions are considered too optimistic. To account for this, Highways England has published Interim Advice Note (IAN) 170/12v3 (2013) - Updated air quality advice on the assessment of future NO<sub>x</sub> and NO<sub>2</sub> projections for users of DMRB Volume 11, Section 3, Part 1 Air Quality<sup>18</sup>.
- 6.2.39. The IAN 170/12v3 guidance presents a methodology for the verified modelled NO<sub>2</sub> concentrations to be adjusted to account for the long term NO<sub>2</sub> profiles. This approach will be adopted for the Proposed Scheme air quality impact assessment.
- 6.2.40. The results of the atmospheric dispersion modelling at each identified sensitive receptor will be compared to the respective air quality limit values to evaluate the potential for exceedances in all scenarios.

#### **Operation Phase: Regional Emissions**

- 6.2.41. Screening of the Do Minimum and Do Something traffic data will be completed to identify any affected road links that adhere to the following criteria as provided by DMRB HA207/07<sup>19</sup>:

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<sup>17</sup> Email communications between Alex Crayton (WSP) and David Addy (Great Yarmouth Borough Council) between 5<sup>th</sup> June- 18<sup>th</sup> July 2017.

<sup>18</sup> Highways England 2012 Interim Advice Note 170/12 v3 Updated air quality advice on the assessment of future NO<sub>x</sub> and NO<sub>2</sub> projections for users of DMRB Volume 11, Section 3, Part 1 'Air Quality.

<sup>19</sup> Department for Transport (2011) Design Manual for Roads and Bridges Volume 11, Section 3, Part 1 (HD207/07) Air Quality. [online] available at: <http://www.standardsforhighways.co.uk/ha/standards/dmr/vol11/section3/ha20707.pdf> (Accessed November 2017)



- A change of more than 10% in AADT; or
  - A change of more than 10% to the number of heavy duty vehicles; or
  - A change in daily average speed or more than 20 km/hr.
- 6.2.42. The regional emissions assessment will focus on total annual mass emissions on NO<sub>x</sub>, PM<sub>10</sub> and CO<sub>2</sub> associated with the same scenarios as assessed for local air quality impacts, in addition to:
- Design year for Do Minimum (e.g. opening year + 15 years); and
  - Design year for Do Something.
- 6.2.43. Traffic data for affected road links in each scenario would be entered into Defra's EFT v8.0, enabling the calculation of total annual mass emissions of the respective vehicle exhaust species. This would allow the magnitude of change in emissions, as a consequence of the Proposed Scheme operation, to be predicted.
- 6.2.44. In the absence of specific significance criteria for assessing changes in regional emissions, the results of the assessment will be evaluated within the context of total regional road emissions data published by the National Atmospheric Emissions Inventory (NAEI).

#### Operational Phase: Significance

- 6.2.45. The A47 and A11 are part of the Strategic Road Network managed by Highways England, as such the NN NPS, may apply to the Proposed Scheme. The NN NPS states that whilst total PM10 and NO<sub>x</sub> emissions may be expected to increase slightly from the delivery of investment on the Strategic Road Network, this needs to be seen in the context of projected reductions in emissions over time as the result of tighter vehicle emissions standards and greater uptake of electric and other ultra-low emissions vehicles.
- 6.2.46. The NN NPS general principles of assessment state that environmental benefits and adverse impacts should be considered at national, regional and local levels. The ES will detail the likely significant effects of the Proposed Scheme on air quality.

#### Significance: Local Air Quality Effects

- 6.2.47. The magnitude of change of predicted concentrations at each receptor location, as a result of the Proposed Scheme, will be derived through analysis of the Do Something versus Do Nothing scenario data in the opening year of the Proposed Scheme. The significance of potential changes to local air quality will be determined with reference to the criteria provided by IAQM and Highways England<sup>20</sup>.
- 6.2.48. The IAQM provides magnitude of change criteria that are equivalent to a percentage of the respective annual mean NO<sub>2</sub> and PM<sub>10</sub> limit values (40 µg/m<sup>3</sup>) described as the Air Quality Assessment Level (AQAL). An 'impact descriptor' is then assigned to each modelled receptor, dependent on the predicted annual mean concentration in the Do Something scenario relative to the national limit value. The IAQM magnitude of change criteria and impact descriptors framework is replicated in Table 9.

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<sup>20</sup> Highways England (2013) Interim Advice Note 174/13 Updated advice for evaluating significant local air quality effects for users of DMRB Volume 11, Section 3, Part 1 'Air Quality (HA207/07)

**Table 9 – IAQM Impact Descriptors for Individual Receptors**

Long Term Average Concentration at Receptor in Assessment Year (% of AQAL presented as concentration in $\mu\text{g}/\text{m}^3$ )	% Change in concentration relative to Air Quality Assessment Level (AQAL)			
	1	2-5	6-10	>10
75% or less of AQAL $\leq 30$	Negligible	Negligible	Slight	Moderate
76-94% of AQAL (30.4 to 37.6)	Negligible	Slight	Moderate	Moderate
95-102% of AQAL (38 to 40.8)	Slight	Moderate	Moderate	Substantial
110% or more of AQAL ( $\geq 44$ )	Moderate	Substantial	Substantial	Substantial

6.2.49. The Highways England guidance adopts the same magnitude of change criteria for  $\text{NO}_2$  and  $\text{PM}^{10}$  but focusses on receptors that exceed the annual mean limit value. Changes in pollutant concentration greater than one percent of the limit value (i.e.  $>0.4\mu\text{g}/\text{m}^3$ ) – based on the Do Minimum versus Do Something opening year model results – are compared with guideline bands that inform the potential significance of the Proposed Scheme. The magnitude of change criteria for  $\text{NO}_2$  and  $\text{PM}^{10}$  is replicated in Table 10.

**Table 10 - Magnitude of Change Criteria (as published in IAN 174/13<sup>21</sup>)**

Magnitude of Change in Concentration	Value of Change in Annual Average $\text{NO}_2$ and $\text{PM}_{10}$
Large ( $>4$ )	Greater than full MoU value of 10 % of the air quality objective ( $4\mu\text{g}/\text{m}^3$ ).
Medium ( $>2$ to 4)	Greater than half of the MoU ( $2\mu\text{g}/\text{m}^3$ ), but less than the full MoU ( $4\mu\text{g}/\text{m}^3$ ) of 10% of the air quality objective.
Small ( $>0.4$ to 2)	More than 1% of objective ( $0.4\mu\text{g}/\text{m}^3$ ) and less than half of the MoU i.e. 5% ( $2\mu\text{g}/\text{m}^3$ ). The full MoU is 10% of the air quality objective ( $4\mu\text{g}/\text{m}^3$ ).
Imperceptible ( $\leq 0.4$ )	Less than or equal to 1% of objective ( $0.4\mu\text{g}/\text{m}^3$ ).

6.2.50. The guideline band ranges set the upper level of likely non-significance and the lower level of likely significance. Between these two levels are the ranges where likely significance is more uncertain and greater onus is afforded to professional judgement.

6.2.51. The magnitude of change criteria and associated impacts will be adjusted accordingly to facilitate analysis of the predicted  $\text{PM}_{2.5}$  concentrations at each receptor.

<sup>21</sup> Highways England (2010) Interim Advice Note 174/13 Evaluation of significant local air quality effect., former Highways Agency, November 2010 [online] Available at: <http://www.standardsforhighways.co.uk/ha/standards/ians/pdfs/ian174.pdf> Accessed January 2018

- 6.2.52. The overall significance of the Proposed Scheme will be determined using professional judgement, as informed by the outcomes of the detailed dispersion modelling and associated analysis within the context of both the IAQM and Highways England guidance.

### **ASSUMPTIONS AND LIMITATIONS**

- 6.2.53. Preliminary traffic data for the Proposed Scheme is not currently available to assess the number of affected road links.
- 6.2.54. In the absence of specific PM<sub>2.5</sub> monitoring data, the PM<sub>10</sub> verification factor will be applied for this fraction of fine particulate matter also.

## 6.3 ACOUSTICS

### BASELINE CONDITIONS

6.3.1. At the time of writing, surveys of the existing noise climate have yet to be completed, therefore a high level review of the route alignment of the Proposed Scheme has been undertaken to give an indication of the potential impact of the scheme. The modelled Do-Minimum Opening Year is considered to represent the baseline scenario for this assessment.

6.3.2. A study area has been adopted in line with DfT Transport Analysis Guidance, Table A.2b, Appendix A, January 2014. The study area is a boundary 300 m from the carriageway edge of the Proposed Scheme.

#### Potentially Sensitive Receptors

6.3.3. There are no Defra Noise Important Areas within the study area.

6.3.4. The River Yare pSPA has been identified within the study area.

6.3.5. An initial desk-based review of sensitive receptors, in line with HD213/11<sup>22</sup>, has been undertaken to identify those located within 300 m of the Proposed Scheme alignments. This review was based on Ordnance Survey (OS) AddressBase Plus data.

6.3.6. As an indication of the potential impact, receptor counts are split into distance bands. Receptors located closer to the Proposed Scheme are expected to experience higher adverse impact. The number of receptors within each study area banding are presented in Table 11.

**Table 11 - Number of acoustic receptors within each study area banding**

Distance Band	Residential	Education	Health Facility	Care Home	Community Facility
0 m to 50 m	129	1	0	0	1
50 m to 100 m	239	1	0	0	2
100 m to 150 m	280	0	0	0	3
150 m to 200 m	245	0	0	0	0
200 m to 250 m	213	0	0	1	4
250 m to 300 m	245	1	0	0	1
Totals	1351	3	0	1	11

6.3.7. Non-residential sensitive receptors include:

- The Kings Centre, Queen Annes Road
- Great Yarmouth and Waveney Mind Community Allotments

<sup>22</sup> Department for Transport (2011) Design Manual for Roads and Bridges Volume 11, Section 3, Part 7 (HD213/11). [online] available at: <http://www.standardsforhighways.co.uk/ha/standards/dmrb/vol11/section3/hd21311.pdf> (Accessed November 2017)

- Great Yarmouth and Gorleston Allotment Association Allotments;
- Great Yarmouth Day Centre, Suffolk Road
- Alpha Centre, Alpha Road
- Avery Lodge Nursing Home, Southtown Road
- St. James Church, Admiralty Road
- Great Yarmouth Primary Academy, Dickens Avenue

## POTENTIAL IMPACTS OF THE PROPOSED SCHEME

- 6.3.8. Potential noise and vibration impacts can occur during construction (temporary) and operation (permanent).
- 6.3.9. The risk and severity of potential construction impacts occurring is typically a function of the proximity of the activity to receptor, and the nature and duration of the activity.
- 6.3.10. Operation impacts occur due to changes in carriageway alignment, traffic flow, traffic speed and infrastructure.

## PROPOSED ASSESSMENT METHODOLOGY

- 6.3.11. Noise Policy Statement for England (NPSE)<sup>23</sup> guidance has been incorporated in both the construction and operation assessment methods. The following guidance documents promote the application of (i) lowest-observed-adverse-effect level (LOAEL); and Significant Observed Adverse Effect Level (SOAEL):
- The Professional Planning Guidance (ProPG)<sup>24</sup> issued in May 2017 by a Working Group of the Institute of Acoustics, the Association of Noise Consultants and the Chartered Institute of Environmental Health. Although this document is primarily concerned with existing noise sources impacting on new residential development rather than new noise sources impacting on existing residential development, it emphasises the need to take into account the SOAEL, as defined in NPSE, in any noise assessment.
  - A guidance document produced by Highways England specifically for their current Smart Motorways Programme. This document, titled “Smart Motorways Programme: Design Guide: Annex E5.04 – Noise Assessment Methodology (EnvTN09)”, is dated August 2017. Although this document was specifically produced for the Smart Motorways project, it does show the direction of travel and current thinking about how Highways England (and presumably, therefore, the Department of Transport) consider that noise assessments should be undertaken. The document states that it “is not intended to replace the guidance contained within HD213/11” but also states that “it is intended to cover areas of the assessment methodology that have emerged as recent best practice for Highways England schemes”.

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<sup>23</sup> Department for Environment, Food and Rural Affairs, (2010), Noise Policy Statement for England (NPSE). [online] available at: [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/69533/pb13750-noise-policy.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/69533/pb13750-noise-policy.pdf) (Accessed November 2017).

<sup>24</sup> Institute of Acoustics, the Association of Noise Consultants and the Chartered Institute of Environmental Health (2017) ProPG: Planning and Noise Professional Practice Guidance on Planning and Noise.



### Construction

- 6.3.12. The assessment of predicted noise and vibration impacts takes into account the guidance set out in the NPSE and the guidance contained within BS 5228-1<sup>25</sup> and BS 5228-2<sup>26</sup>.
- 6.3.13. It is noted that LOAEL and SOAEL in the NPSE is defined in terms of observed health effects based on the magnitude of the noise levels, i.e. absolute levels. In BS 5228 impacts are defined in terms of existing ambient noise level and change in noise levels. To date, there has been no official guidance published on how to reconcile these two methodologies.
- 6.3.14. The approach adopted for this assessment has been to use both the NPSE and BS 5228 methods and to consider the results in combination to provide an overall assessment. This approach is described in more detail below.
- 6.3.15. The assessment will focus on potential impacts associated with different phases of construction, these would typically include:
  - Site preparation and earthworks;
  - Compound construction;
  - Bridge construction, including piling; and
  - Road paving;
- 6.3.16. Consultation with NCC and GYBC will be undertaken as part of the scoping exercise to agree an appropriate level of assessment.
- 6.3.17. Prediction of noise levels from construction activities will follow BS 5228-1 guidance. Machinery source sound level data will also be taken from BS 5228-1.
- 6.3.18. The criteria for the assessment of potential significance of noise effects is presented in Table 12. Ambient noise is the all-encompassing noise in a given situation at a given time, usually composed of sound from many sources near and far, but excluding site (construction) noise. Site noise is the noise originating from the construction site. Total noise ( $L_{Aeq,T}$ ) is ambient noise plus site noise.

**Table 12 - Construction Noise Thresholds of Potential Adverse Effects at Dwellings,  $L_{Aeq,T}$  (dB)**

Period	Time	LOAEL	SOAEL
Daytime weekday, Saturdays, Sundays	07:00 - 19:00	70	75
Night-time	23:00 - 07:00	50	55

Note 1: A significant effect is indicated where total noise level (pre-construction ambient noise plus site noise) exceeds LOAEL or SOAEL for a period of ten or more days of working in any 15 consecutive days or for a total number of days exceeding 40 in any six consecutive months.

Note 2: If the pre-construction ambient noise is greater than LOAEL and less than SOAEL, then a potential observed effect is indicated if the total noise level (pre-construction ambient plus site noise) for the period

<sup>25</sup> The British Standards Institution 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites. Noise

<sup>26</sup> The British Standards Institution 5228-2:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites. Vibration

Period	Time	LOAEL	SOAEL
<p>increases by more than 3 dB, and subject to the SOAEL limit. A potential significant observed effect is indicated if the total noise level (pre-construction ambient plus site noise) exceeds the SOAEL.</p> <p>Note 3: If the pre-construction ambient noise level exceeds the SOAEL, then a potential significant observed effect is indicated if the total noise level (pre-construction ambient noise plus site noise) for the period increases by more than 3 dB due to site noise.</p>			

- 6.3.19. The adopted construction noise threshold value for the SOAEL is based on the BS 5228-1 ABC method Category C threshold noise levels, Advisory Leaflet 72: 1976 (as reproduced in BS 5228-1), and takes into account emerging Highways England guidance related to the Smart Motorways Programme.
- 6.3.20. The adopted threshold value for the LOAEL is based on the BS 5228-1 ABC method Category B threshold noise levels, Advisory Leaflet 72: 1976 (as reproduced in BS 5228-1), and takes into account emerging Highways England guidance related to the Smart Motorways Programme.
- 6.3.21. If, following completion of surveys, pre-construction ambient noise levels around the Proposed Scheme are found to be significantly lower than levels given in Table 12 then the levels can be modified to allow a meaningful assessment.
- 6.3.22. The assessment of potential construction phase impacts is used to define appropriate mitigation measures that should be implemented through a CEMP, which are commensurate to the scale and duration of the activities.
- 6.3.23. Where site noise levels are expected to exceed the SOAEL after the contractor has applied best practicable means to the provision of mitigation, special dispensation may be sought to complete required works, the contractor may apply to the local authority for prior consent under Section 61 of the Control of Pollution Act 1974 (CoPA).
- 6.3.24. The criteria for the assessment of potential significance of vibration effects is presented in Table 13.

**Table 13 - Construction Vibration Thresholds of Potential Adverse Effects at Dwellings, PPV (mm/s)**

Period	Time	LOAEL	SOAEL
Day and Night	00:00 – 00:00	1.0	10.0

- 6.3.25. The adopted construction vibration threshold value for the SOAEL is based on BS 5228-2. Vibration at this level is likely to be intolerable for any more than a very brief exposure. The level is also in line with emerging Highways England guidance related to the Smart Motorways Programme. The onset of cosmetic damage in buildings due to vibration is greater than the SOAEL.
- 6.3.26. The adopted construction vibration threshold value for the LOAEL is based on the BS 5228-2 guidance on human response to vibration. This is the vibration level that is likely to cause complaint, but can be tolerated if prior warning and explanation is given. The level is also in line with emerging Highways England guidance related to the Smart Motorways Programme.

Operation

- 6.3.27. The assessment of predicted noise impacts takes into account the guidance set out in the NPSE and the guidance contained within DMRB HD 213/11.
- 6.3.28. It is noted that LOAEL and SOAEL in the NPSE is defined in terms of observed health effects based on the magnitude of the noise levels, i.e. absolute levels. Whereas, in DMRB HD 213/11, impacts are defined in terms of change in noise levels. To date, there has been no official guidance published on how to reconcile these two methodologies.

- 6.3.29. The proposed approach for this assessment is to use both the NPSE and DMRB methods individually and then to consider the results in combination to provide an overall assessment that is consistent with the conventions set out in the IEMA Guidelines on Noise Impact Assessment, which is based on a semantic scale using the terms negligible, minor, moderate or major impact.
- 6.3.30. The numerical values used to define the No Observed Effect Level (NOEL), LOAEL and SOAEL are shown in Table 14.

**Table 14 - Traffic noise levels and significance**

Traffic Noise Level, LA10,18h (dB)*	Effect Level
≤54.4	NOEL
54.5 to 67.5	LOAEL
≥67.5	SOAEL
* Façade level, 06.00 to 24.00 hours	

- 6.3.31. The adopted threshold value for the SOAEL is based on the 'Relevant Noise Level', as set out in the Noise Insulation Regulations 1975 (NIR). This is the level of noise that would (provided that other criteria are met) trigger entitlement to the provision of sound insulated glazing (and, where necessary, ventilation) for residential properties located within 300 m of a new road scheme. The Relevant Noise Level specified in the NIR is 68 dB LA10,18h, although the regulations require that noise levels calculated to be between 67.5 and 67.9 dB are rounded up to 68 dB.
- 6.3.32. The adopted threshold value for the LOAEL is based on guidance contained within the WHO Guidelines for Community Noise. This states that the lowest observed threshold for the onset of community annoyance occurs for situations where the outside free-field noise level exceeds 50 dB LAeq,16h (07.00 to 23.00 hours). This uses a different noise measure, LAeq,16h which is used as a general measure of noise from all sources, and time period to that used to quantify road traffic noise, LA10,18h (06.00 to 24.00 hours). Where road traffic noise dominates conversion from LAeq,16h to LA10,18h uses the relationship set out in TAG Unit A3 Environmental Impact Appraisal (LAeq,16h = LA10,18h - 2 dB) with a further addition of 2.5 dB applied to account for the conversion from a free-field noise level to a façade noise level, in accordance with the Calculation of Road Traffic Noise (CRTN).
- 6.3.33. The noise Effect Levels set out in the above table are based on the absolute noise level. In terms of the change in noise level as a result of a new road scheme, DMRB HD 213/11 states "in terms of permanent impacts, a change of 1 dB(A) in the short-term (e.g. when a project is opened) is the smallest that is considered perceptible. In the long-term, a 3 dB(A) change is considered perceptible. Such increases in noise should be mitigated if possible".
- 6.3.34. Therefore, for the purposes of this assessment, the following road traffic noise change thresholds have been used, to indicate the potential for a significant effect to arise:
- ≥ ±1 dB LA10,18h in the Do-Minimum Opening Year to Do-Something Opening Year (short term); and
  - ≥ ±3 dB LA10,18h in the Do-Minimum Opening Year to Do-Something Design Year (long term).
- 6.3.35. In addition to the above, emerging guidance from Highways England (not included in HD 213/11 or any Interim Advice Note) suggests that in the long term an increase of 1 dB LA10,18h where the Do-Minimum Opening Year noise level is already above the SOAEL should be considered as a potentially significant change. In other words a lower threshold should apply where road traffic noise levels are particularly high.
- 6.3.36. The approach taken for this assessment is to analyse the change in all noise levels for both short term and long term scenarios. Where no individual change exceeds the thresholds bulleted above, then it is assumed that there would most likely be no significant adverse effect. However, where noise levels exceed the stated thresholds, this provides an indication that there is potential for a significant adverse effect which triggers the



need to consider mitigation. In these instances, the predicted noise levels will be considered in more detail and, where necessary, mitigation measures will be explored.

- 6.3.37. Where long term significant adverse effects are identified, the traffic flow data for the Do-Minimum Design Year scenario will be interrogated to assist in determining whether the effects are as a result of the Proposed Scheme itself, or are rather a result of general traffic growth or other developments. Table 15 summarises the classification of magnitude of noise impacts associated with short and long term changes in noise levels, as set out in DMRB HD 213/11. Both adverse and beneficial changes are considered in the assessment.

**Table 15 - Classification of Magnitude of Noise Impacts**

Short-term Noise Change, LA10, 18h (dB)	Long-term Noise Change, LA10, 18h (dB)	Magnitude of Impact
0.0	0.0	No change
0.1 – 0.9	0.1 – 2.9	Negligible
1.0 – 2.9	3.0 – 4.9	Minor
3.0 – 4.9	5.0 – 9.9	Moderate
5.0+	10.0+	Major

- 6.3.38. In order to reconcile the different assessment methodologies set out in the NPSE and DMRB HD 213/11, consideration has been given to the current convention, as set out in the IEMA Guidelines on Noise Impact Assessment<sup>27</sup> (Table 7-14 Impact from the change in sound levels, source HS2 Phase 1 Environmental Statement), to classify the magnitude of identified impacts using the following categories:

- Negligible;
- Minor;
- Moderate; or
- Major.

- 6.3.39. Where the threshold between each of these categories is determined based on the guidance contained within the available standards and guidance documents.
- 6.3.40. For the purposes of classifying the overall noise impact against this semantic scale, the guidance contained within the NPSE and DMRB HD 213/11 has been combined in the manner shown in Tables 16 and 17.
- 6.3.41. Table 16 relates to the potential short-term impact (based on Do-Something compared against Do-Minimum in the opening year of the Proposed Scheme) and Table 17 relates to the potential long-term impact (based on Do-Something in the future assessment year, taken to be 15 year after the opening year compared against Do-Minimum in the year of opening) The overall impact classification (negligible, minor, moderate or major) applies to situations where there is a beneficial impact as well as to situations where there is an adverse impact.
- 6.3.42. In Tables 16 and 17, 'Noise Level' refers to the Do-Something LA10,18h (06.00 to 24.00 hours) road traffic façade noise level predicted at 1 metre from the sensitive receptor building.

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<sup>27</sup> Institute of Environmental Management and Assessment (2014). Guidelines for Noise Impact Assessment [online] Available at: <http://bailey.persona-pi.com/Public-Inquiries/LCY-Appeal/Core%20Documents/CD8/CD8.2.15%20IEMA%20guidelines.pdf> (Accessed January 2018)

**Table 16 - Significance criteria for operational traffic noise based on short-term noise change**

Noise Increase, LA10,18h dB	Noise Level < LOAEL	Noise Level > LOAEL and < SOAEL	Noise Level > SOAEL
<0.9	Negligible	Negligible	Negligible
1.0 – 2.9	Negligible	Minor	Minor
3.0 – 4.9	Negligible	Moderate	Moderate
>5.0	Negligible	Major	Major

**Table 17 - Significance criteria for operational traffic noise based on long-term noise change**

Noise Increase, LA10,18h dB	Noise Level < LOAEL	Noise Level > LOAEL and < SOAEL	Noise Level > SOAEL
<0.9	Negligible	Negligible	Negligible
1.0 – 2.9	Negligible	Negligible	Minor
3.0 – 4.9	Negligible	Minor	Moderate
5.0 – 9.9	Negligible	Moderate	Major
>10.0	Negligible	Major	Major

6.3.43. The assessment method detailed above for the Proposed Scheme is broadly consistent with the guidance contained within EnvTN09. Although EnvTN09 was produced specifically for the Smart Motorways scheme, it is considered, in the absence of any other guidance on how to reconcile the requirements of NPSE and DMRB HD 213/11, to represent current best practice for the assessment of noise impacts associated with new road schemes.

6.3.44. It should also be noted that the assessment methodology detailed above is based on daytime (06.00 to 24.00 hours) traffic noise levels. For most roads, the diurnal patterns in road traffic flows are such that noise levels during the night-time (00.00 to 06.00 hours) are approximately 10 dB lower than those during the daytime. The threshold criteria for LOAEL and SOAEL would also be approximately 10 dB lower. An assessment of daytime noise levels against the significance criteria detailed above is therefore considered to be sufficient to provide an overall assessment that would be equally applicable to the night-time period.

## ASSUMPTIONS AND LIMITATIONS

6.3.45. At this stage it has not been possible to undertake a quantitative or monetised assessment of the potential impacts.

6.3.46. At the time of writing, surveys of the existing noise climate have yet to be completed.

6.3.47. The modelled Do-Minimum Opening Year is considered to represent the baseline scenario for this assessment. A noise model of the Proposed Scheme and surrounding area has not yet been completed.

6.3.48. Measurement locations representative of nearby noise sensitive receptors will be agreed in consultation with NCC and GYBC. The measured levels will inform the construction noise assessment and therefore surveys will cover proposed construction hours, using attended short-term and/or non-attended measurements. Measurements are proposed for Spring 2018.

## 6.4 NATURE CONSERVATION

### BASELINE CONDITIONS

6.4.1. This section is informed by the Preliminary Ecological Assessment (PEA) report and Protected Species Survey Report, which are presented in Appendix E and F respectively. The Protected Species Survey Report, presented in Appendix F, details specific surveys for water vole and bats, which were undertaken to identify changes to known biodiversity resources and include both designated and non-designated sites.

6.4.2. The appraisal considered two study areas:

- Desk study of European designated sites: Special Protection Areas (SPAs), potential SPAs (pSPAs), SACs, candidate SACs (cSACs), potential SACs (pSACs) and Ramsar sites within 2 km of the Scheme, extended accordingly where there are potential hydrological connections present and up to 30 km where bats are a qualifying feature of a SAC, cSAC or pSAC;
- Desk study of statutorily designated sites, including National Nature Reserves (NNRs), Local Nature Reserves (LNRs) and Sites of Special Scientific Interest (SSSIs) and non-statutorily designated sites including Local Wildlife Sites (LWSs) within 2 km of the Scheme;
- Desk study records of protected and notable species up to 2 km from the project site; and
- Extended Phase 1 Habitat Verification Survey within a 500 m corridor of the Scheme

6.4.3. The surveys have been undertaken with reference to the following guidance:

- TAG Unit A3 Chapters 5 and 9 (which also references DMRB Volume 11 Section 3 Part 4)<sup>28</sup>;
- 'Guidelines for Ecological Impact Assessment in the UK' (Chartered Institute for Ecological and Environmental Management (CIEEM), 2006 and 2016<sup>29</sup>); and
- DMRB Volume 11 Section 4 Assessment of the Implications (of Highways and/or Road Projects) on European Sites (including Appropriate Assessment)<sup>30</sup>.

6.4.4. Discussions with Natural England, the EA and the Marine Management Organisation (MMO) are ongoing in relation to surveys in respect of the marine environment.

#### Statutory Designated Sites:

6.4.5. The Broad Study Area includes the Outer Thames Estuary Special Protection Area (SPA) which is within 2km of the Proposed Scheme. This site is designated because it supports 38% of the Great British population of red-throated diver *Gavia stellata*, which is listed on Annex 1 of the EU Birds Directive.

6.4.6. The following designated sites that could be impacted by the Proposed Scheme have been identified within the proposed study area:

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<sup>28</sup> Department for Transport (2015). TAG Unit A3 Environment Impact Appraisal Chapters 5 and 9. [online] Available at: [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/638648/TAG\\_unit\\_a3\\_envir\\_imp\\_app\\_dec\\_15.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/638648/TAG_unit_a3_envir_imp_app_dec_15.pdf) (Accessed January 2018)

<sup>29</sup> Chartered Institute of Ecology and Environmental Management (2006) Guidelines for Ecological Impacts Assessment in the United Kingdom CIEEM. Winchester. Ratcliffe, D.A (Ed.) (1977) A Nature Conservation Review. Cambridge University Press

<sup>30</sup> DMRB (1993) Design manual for roads and bridges (DMRB) Volume 11 Environmental Assessment [online] available at: <http://www.standardsforhighways.co.uk/dmrb/vol11/section3.htm> (Accessed November 2017).



#### *Outer Thames Estuary Extension Special Protected Area*

- 6.4.7. The boundary of the Outer Thames Estuary SPA is located approximately 500 metres to the east of the Proposed Scheme. The Outer Thames Estuary SPA lies along the east coast of England, predominantly in the coastal waters of the southern North Sea between the Thames Estuary and the east Norfolk coast. It covers an area of c. 3,924km<sup>2</sup>, classified for the protection of wintering red-throated diver. This area supports the largest aggregations of wintering red-throated diver in the UK, 38% of the GB population. The foraging areas protected for little tern *Sterna albifrons* and common tern *Sterna hirundo*, enhance the protection afforded to their feeding and nesting areas in the adjacent coastal SPAs.
- 6.4.8. The area of the SPA contains areas of shallow and deeper water, with high tidal current streams and a range of mobile sediments, including several shallow sandbanks. Much of the area is less than 20m water depth, extending into the 20-50 m depth contour towards the eastern boundary of the SPA.
- 6.4.9. It is noted, the River Yare and River Bure are currently marked as a potential SPA (pSPA). This stretch of the Yare has the potential to be included within the Outer Thames Estuary SPA. In the 2015 Outer Thames Estuary SPA Departmental Brief, produced by Natural England and the Joint Nature Conservation Committee (JNCC), it is proposed that the boundary of the Outer Thames Estuary SPA is extended to include these watercourses. The inclusion of the River Yare channel, to abut the eastern boundary of the existing Breydon Water SPA, and the lower River Bure, has been proposed to provide continuous SPA coverage for common terns foraging from this SPA. The pSPA will be treated as a confirmed SPA when assessing the potential ecological effects upon on River Yare. This includes the potential effects of constructing piers within the river and the potential effects upon the Conservation Objectives of the pSPA.

#### *Breydon Water:*

- 6.4.10. Breydon Water is located approximately 2.2km to the north/northwest of the Proposed Scheme and has been designated as (i) a Special Protected Area (SPA); (ii) a Ramsar; and (iii) a Site of Special Scientific Interest (SSSI).
- 6.4.11. The SSSI citation describes Breydon Water as an inland tidal estuary at the mouth of the River Yare and its confluence with the rivers Bure and Waveney. Extensive areas of mud are exposed at low tide and these form the only intertidal flats occurring on the east coast of Norfolk. Large numbers of wildfowl and waders are attracted to an abundant food supply when on passage and during the winter months. Several wintering wildfowl reach nationally important population levels and the site occupies a key position on the east coast for these species and for migrating birds. Rare species are regularly recorded. There is also considerable botanical interest with small areas of saltmarsh, reedbeds and brackish water communities in the surrounding borrow dykes. The invertebrate fauna is rich and includes one scarce species of snail.

#### *Great Yarmouth North Denes:*

- 6.4.12. The designations of Great Yarmouth North Denes are located approximately 3.2km to the north/northeast of the Proposed Scheme at their closest point. This areas has been designated as a SPA and a SSSI.
- 6.4.13. The site consists of a dune system on the east coast of Norfolk between Great Yarmouth and Caister and is an important example of an accreting “ness” or promontory. It supports a full successional sequence of vegetation from pioneer to mature types; foredune, mobile dune, semi-fixed dune and dry acid dune grassland are all represented, the latter being particularly extensive. The largest United Kingdom breeding colony of the rare Little Tern is located on the foreshore.

#### *The Broads National Park:*

- 6.4.14. The Broads National Park is located approximately 1km to the northwest of the Proposed Scheme at its closest point. The Norfolk and Suffolk Broads is Britain's largest protected wetland and third largest inland waterway, with the status of a national park. Birds are in particular abundance like teal and wigeon, reed and sedge warblers. The marsh harrier has made a comeback and bittern numbers have also increased in recent years.

Around 230 nationally important invertebrates (mini-beasts) can be found in the Broads including Britain's largest butterfly, the swallowtail, and the rare Norfolk hawk dragonfly.

Non-Statutory Designated Sites:

*Breydon Water:*

In addition to the statutory designations describes in paragraphs 6.4.10 and 6.4.11, Breydon water has also been designated as an RSPB Reserve.

Species Records:

- 6.4.15. The review of existing records of species within 2km of the Proposed Scheme identified the following;
- 6.4.16. Records exist of natterjack toad *Epidalea calamita*, common lizard *Zootoca vivipara*, slow-worm *Anguis fragilis*, water vole *Arvicola amphibious*, otter *Lutra lutra* and badger *Meles meles* within 2km of the Proposed Scheme.
- 6.4.17. Seven species of bats have been recorded within 2km of the Proposed Scheme. These are common pipistrelle *Pipistrellus pipistrellus*, soprano pipistrelle *Pipistrellus pygmaeus*, Nathusius' pipistrelle *Pipistrellus nathusii*, serotine *Eptesicus serotinus*, Daubenton's bat *Myotis daubentonii*, noctule *Nyctalus noctula* and brown long-eared bat *Plecotus auritus*.
- 6.4.18. A large number of bird species have been recorded within 2km of the Proposed Scheme. These include fifty species included on Schedule 1 Part 1 of the Wildlife and Countryside Act 1981 (as amended) which are protected at all times of the year.
- 6.4.19. Biological Records of several priority species (S41 Natural Environment and Rural Communities (NERC) Act 2006 as amended) have been recorded within 2km of the Proposed Scheme. Species recorded include goat moth *Cossus cossus*, common toad *Bufo bufo*, hedgehog *Erinaceus europaeus* and brown hare *Lepus europaeus*.

Site Survey: Habitats

- 6.4.20. The types and extent of habitats identified within 200m of the Proposed Scheme alignments are described in Table 18 below, and shown in the Great Yarmouth Third River Crossing: Preliminary Ecological Appraisal (Mouchel, 2016).

**Table 18 - Habitats identified within 200m of the Proposed Scheme alignment**

Habitat	Description
River Yare	The proposed bridge will cross the River Yare. At this location the river is tidally influenced. Mud and silt, typically associated with this habitat are likely to support benthic invertebrate communities and fish stocks. As stated in paragraph 6.4.9 common terns are known to forage on the River Yare. It is noted that this stretch of the Yare is in use as a working port.
Amenity Grassland	Southtown Common recreation ground lies to the south of William Adams Way. This area contains amenity grassland dominated by perennial rye-grass <i>Lolium perenne</i> , with some white clover <i>Trifolium repens</i> , ribwort plantain <i>Plantago lanceolata</i> and common dandelion <i>Taraxacum officinale</i> also present.
Arable (Allotments)	The area to the east of Suffolk Road contains several allotments which, in addition to scattered native tree species, contained varieties of arable crops and introduced garden plants.

Habitat	Description
Hard standing & Buildings	The area to the east of the river Yare is well built up with roads, industrial buildings and concrete storage space for materials being shipped. Butterfly bush <i>Buddleja davidii</i> , creeping thistle and ragwort <i>Jacobaea vulgaris</i> were seen to be growing amongst the concrete.
Hedgerow	There are several species poor hedgerows surrounding properties east of the River Yare.
Scattered broad-leaved trees	A mixture of broadleaf trees are present in the margins of Southtown Common, as well as bordering William Adams Way to the north and south. Pedunculate oak <i>Quercus robur</i> , beech <i>Fagus sylvatica</i> , poplar <i>Populus spp.</i> , willow <i>Salix spp.</i> , hawthorn <i>Crataegus monogyna</i> , sweet chestnut <i>Castanea sativa</i> and horse chestnut <i>Aesculus hippocastanum</i> are all present alongside ash <i>Fraxinus excelsior</i> and elder <i>Sambucus nigra</i> .
Wet ditch	<p>The north and west of Southtown Common is bordered by a ditch containing standing water. The banks are covered by common nettle <i>Urtica dioica</i>, bramble <i>Rubus fruticosus</i>, great willowherb <i>Epilobium hirsutum</i>, dog rose <i>Rosa canina</i> and creeping thistle <i>Cirsium arvense</i>.</p> <p>To the north of William Adams Way and to the west of Suffolk road, is a wet ditch and associated scrub habitat. The ditch passes under William Adams Way and runs north away from the road. The area around the ditch contains willow, great willowherb, bramble, common nettle, hawthorn, poplar and field bindweed <i>Convolvulus arvensis</i> and hogweed <i>Heracleum sphondylium</i>.</p>

#### Site Survey: Species

- 6.4.21. A summary of species potential and results of surveys undertaken to date within the study is provided below in Table 19.

**Table 19 - Species potential and results of surveys undertaken to date**

Species	Description
Aquatic Ecology	The River Yare has the potential to support a range of aquatic species and communities including fish and benthic invertebrates. Aquatic ecological assessment work is yet to commence, however it has been identified as a future survey requirement.
Amphibians	<p>There are areas of terrestrial habitat within 250m of the Proposed Scheme that are suitable for use by amphibians. This includes the land on the northern and western edge of Southtown Common, which also includes a ditch containing standing water. The ditch passes under William Adams Way and runs north beneath Queen Anne's Road before running north-west. As the ditches are linked underneath the two roads, they are considered in this assessment to be one water body.</p> <p>There is a small pond at TG523058. This and the surrounding habitat of grassland, scrub and woodland is suitable for use by amphibians.</p>
Reptiles	The majority of the site is made up of either short and open sward or hard open concrete urban areas and is of negligible value for reptiles. The allotments south of Queen Anne's Road at TG523058 provide habitat suitable for use by reptiles including a mix of tall ruderal vegetation and rough sward amongst areas of compost and logs that could be used as refugia.
Birds	Trees and areas of scrub within and adjacent to the Proposed Scheme are suitable for use by nesting birds. Old brick buildings where access is possible through broken windows and other gaps provide suitable nesting sites for pigeons.

Species	Description
	The mosaic of urban areas with scattered ruderal vegetation provides some suitable habitat for black redstarts.
Water Vole	The drainage ditches associated with the A47 provide suitable habitat for water vole. During the August 2017 survey, only the ditch south of William Adams Way was surveyed due to safety concerns in accessing the northern ditch. Evidence of water vole activity was found including feeding remains and droppings.
Bats	<p>Thirteen structures were assessed for their suitability to support roosting bats. Ten were assessed as having Low Roost Suitability, and two as having Negligible Roost Suitability. One building was inaccessible.</p> <p>Foraging habitats such as open water, domestic gardens and allotments within the vicinity of the Proposed Scheme were fragmented and unconnected. This foraging habitat is of low suitability for use by foraging and commuting bats.</p> <p>Two transects were undertaken in July and August 2017. No bats were recorded along Transect 1. This was likely to be a result of the absence of vegetation and high levels of artificial lighting. One species of bat was recorded along Transect 2: common pipistrelle <i>Pipistrellus pipistrellus</i>. Four bat passes recorded commuting bats along the northern edge of Southtown Common, where it meets William Adams Way. No bat foraging activity was recorded.</p>

## POTENTIAL IMPACTS OF THE PROPOSED SCHEME

- 6.4.22. The DMRB recognises a number of nature conservation resources which could potentially be affected by the construction and future use of a road scheme of the type proposed. These comprise designated and non-designated sites, important habitats and habitat-types and protected and notable species.
- 6.4.23. Taking into account the intended design form and likely construction requirements of the Proposed Scheme, and the data derived from the desk studies, PEA and the species specific surveys undertaken to date, impacts which could result from implementation and future use of the Proposed Scheme have been identified. These are described below and will form the focus of the assessments which are yet to be undertaken.
- Direct loss of wildlife habitats through land-take;
  - Direct loss of river banks/bed/aquatic habitats, through the construction of the bridge structure, including areas that fall within the River Yare pSPA;
  - Potential for impacts upon the Conservation Objectives of the pSPA for bridge works, in terms of any piers, will be located within the pSPA.
  - Killing, injuring and disturbance of protected species during construction;
  - Fragmentation of retained habitats and/or severance of wildlife corridors;
  - Wildlife fatalities as a direct result of severance of foraging routes, breeding sites or territories;
  - Temporary reduction in water quality through sedimentation caused by construction works within the River Yare, with consequent impacts upon aquatic habitats, aquatic species and conservation designations;
  - Contamination of watercourses through accidental spillage of fuels/chemicals with consequent impacts upon aquatic habitats, aquatic species and conservation designations;
  - Contamination of watercourses and/or waterbodies associated with road related run-off. Consequent impacts upon aquatic habitats, aquatic species and conservation designations;



- Contamination of watercourses as a result of mobilisation of existing ground contamination. Consequent impacts upon aquatic habitats, aquatic species and conservation designations;
- Disturbance of nocturnal animals, such as bats, where road lighting introduces a new light source;
- Disturbance of wildlife as a result of increased noise and vibration; and
- Potential contamination of nearby habitats, watercourses and designated sites as a result of a reduction in air quality (including construction related dust).

## PROPOSED ASSESSMENT METHODOLOGY

### Impact Assessment Guidelines

6.4.24. The assessments will be based on the methods outlined in the following guidance:

- The DMRB Volume 11, Section 3, Part 4 Ecology and Nature Conservation<sup>30</sup>
- IAN 130/10 – Ecology and Nature Conservation: Criteria for Impact Assessment, Highways Agency (2010)<sup>31</sup>; and
- Guidelines for Ecological Impact Assessment in the United Kingdom published by the Chartered Institute of Ecology and Environmental Management (CIEEM) (2006 and 2016)<sup>29</sup>

6.4.25. Establishment of the baseline environment for nature conservation will involve a review of the existing information relating to designated and non-designated sites, habitats and fauna and consultation with NCC.

6.4.26. A number of surveys are proposed to be undertaken to verify and update baseline information on habitats and fauna. These comprise:

- Water vole surveys
- Bat roost surveys
- Black redstart breeding surveys
- Aquatic ecology

6.4.27. The surveys have been undertaken with reference to the following guidance:

- TAG Unit A3 Chapters 5 and 9 (which also references DMRB Volume 11 Section 3 Part 4);
- 'Guidelines for Ecological Impact Assessment in the UK' (Chartered Institute for Ecological and Environmental Management (CIEEM), 2016);
- DMRB Volume 11 Section 4 Assessment of the Implications (of Highways and/or Road Projects) on European Sites (including Appropriate Assessment);
- Bat Conservation Trust (2016). Bat Surveys for Professional Ecologists: Good Practice Guidelines, 3rd Edition. Bat Conservation Trust, London;

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<sup>31</sup> Highways England (2010). Interim Advice Note 130/10 - Ecology and Nature Conservation: Criteria for Impact Assessment Interim Advice Note 130/10. Highway England



- Strachan R and Moorhouse T (2006). Water Vole Conservation Handbook, 2nd Edition. Wildlife Conservation Research Unit (WildCRU), Oxford University; and
- Bibby C., N. Burgess, D. Hill & S. Mustoe (2000). Bird Census Techniques: 2nd edition. Academic Press.

- 6.4.28. Assessment of the significance of impacts on sites, habitats and species will be informed by the guidance provided in the Guidelines for Ecological Impact Assessment (CIEEM 2006 and 2016). These guidelines determine the ecological value of identified assets based on their geographic influence which ranges from sites of international importance to those within the local and immediate zone of influence of the Proposed Scheme. Those assets with a geographic value at the local level or above will be subject to detailed assessment, as will receptors of lesser value that are subject to some form of legal protection or which can act in combination to result in a cumulative impact.
- 6.4.29. Criteria relating to confidence, magnitude, extent, duration, reversibility and timing will be considered in combination with value to determine impact significance.
- 6.4.30. IAN 130/10 provides a methodology for the consideration of significance of effects (for those receptors identified as requiring detailed assessment). Potential impacts will be characterised through the:
- Probability of occurrence: certain, probable, unlikely;
  - Complexity: whether direct, indirect, cumulative;
  - Extent: area measures and percentage of total loss;
  - Size: description of level of severity of influence;
  - Duration: permanent or temporary in ecological terms;
  - Timing and frequency: important seasonal and/or life-cycle constraints and any relationship with frequency considered; and as being
  - Reversible or not reversible; and/or
  - Positive (beneficial) or negative (adverse).
- 6.4.31. Significance of effects will be deduced from assessing the value of the receptors against any residual impact (taking into account mitigation). In line with the guidelines set out within the DMRB, significance will be addressed as neutral, slight, moderate, large or very large (refer to Table 20).

**Table 20 – Significance Descriptors for Ecological Receptors**

Significance	Typical descriptors
Very large	An impact on one or more receptor(s) of international, European, UK or national value
Large	An impact on one or more receptor(s) of regional value
Moderate	An impact on one or more receptor(s) of county value
Slight	An impact on one or more receptor(s) of local value
Neutral	No significant impacts on key nature conservation receptors

- 6.4.32. The assessment of impacts upon nature conservation will be undertaken as shown in Table 21 although as suggested in the CIEEM guidelines, a determination of significance ought to be determined based upon professional experience.

**Table 21 – Nature Conservation Matrix of Significance**

Magnitude of Impact	Biodiversity Value				
	International/ European	UK / National	Regional	County	Local
<b>Major Negative</b>	Very Large Adverse	Very Large Adverse	Large Adverse	Moderate Adverse	Slight Adverse
<b>Intermediate Negative</b>	Large Adverse	Large Adverse	Moderate Adverse	Slight Adverse	Slight Adverse
<b>Minor Negative</b>	Moderate Adverse	Moderate Adverse	Slight Adverse	Slight Adverse	Slight Adverse
<b>Neutral</b>	Neutral	Neutral	Neutral	Neutral	Neutral
<b>Positive</b>	Very Large Beneficial	Large Beneficial	Moderate Beneficial	Slight Beneficial	Slight Beneficial

6.4.33. Based on the findings of the assessments, mitigation measures leading to avoidance, reduction or compensation of adverse effects will be identified prior to an evaluation of the effects of impacts. Typical mitigation measures could include wildlife fencing, compensatory planting, habitat creation, adoption of working practices and programming to avoid or reduce disturbance.

#### Habitats Regulations Assessment

6.4.34. Pursuant to the Conservation of Habitats and Species Regulations 2017<sup>32</sup> an assessment will be undertaken of the Proposed Scheme's effects on the Breydon Water SPA and Ramsar site, the Great Yarmouth North Denes SPA and the Outer Thames Estuary SPA (including the River Yare pSPA) (the European Sites) in accordance with the four stage process, summarised below. It is proposed that Information relating to HRA will not duplicated in the ES but will be cross-referenced within the ecology chapter as appropriate.

#### *Stage 1:*

6.4.35. Identify whether it is likely that the Proposed Scheme, either alone or in combination with other plans and projects, will have a significant effect on any of the European Sites. The threshold is a very low one and the conclusion will be affirmative unless significant effects can be excluded on the basis of objective evidence.

#### *Stage 2:*

6.4.36. If there is an affirmative conclusion at Stage 1, an Appropriate Assessment will be undertaken to assess the effect of the Proposed Scheme, either alone or in combination with other plans and projects, on the integrity of the European Sites in view of their conservation objectives.

6.4.37. Mitigation measures incorporated within the Proposed Scheme design will be taken into account, however if there remains a reasonable risk that the Proposed Scheme could adversely affect the integrity of any of the European Sites, Development Consent can only be given if stages 3 and 4 of the HRA are followed.

6.4.38. *Stage 3:*

6.4.39. Examine alternative solutions to achieve the objectives of the project where adverse effects are identified.

#### *Stage 4:*

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<sup>32</sup> S.I. 2017/1012

- 6.4.40. Where it is concluded under Stage 3 that no alternative solution exists and where adverse impacts remain, the final stage is to assess whether the Proposed Scheme must be carried out for imperative reasons of over-riding public interest (IROPI) and, if so, whether compensatory measures needed to maintain the overall coherence of the European site network can be achieved.

### **ASSUMPTIONS AND LIMITATIONS**

- 6.4.41. The PEA survey work was undertaken during October 2016, which is outside of the optimal season for carrying out botanical surveys (April to September inclusive). Nevertheless, it is considered that the survey work undertaken was sufficient to be able to map the habitats and ecological features present.



## 6.5 CULTURAL HERITAGE

### BASELINE CONDITIONS

- 6.5.1. The study area which has been adopted for the assessment of cultural heritage features extends to 500m around the Proposed Scheme for non-designated cultural heritage assets, and 1km around the scheme options for designated assets. Areas impacted by traffic noise will also be taken into account. There is scope for the study area to be reduced for further stages of assessment, however a larger study area allows any cultural heritage assets to be considered within their wider context. For this area, the following has been undertaken:
- Data has been gathered on designated heritage assets from the National Heritage List for England.
  - Conservation Area data have been obtained from the relevant local authority websites.
  - Details of non-designated heritage assets have been gathered from the Norfolk Historic Environment Record (NHER)<sup>33</sup>.
  - A preliminary historic landscape assessment was made based on modern mapping, readily available aerial photography and Historic Landscape Characterisation (HLC) data obtained from NHER
  - A preliminary assessment of the archaeological potential of the study area.
- 6.5.2. Initial value assessments have been made for each cultural heritage asset following the guidance set out in DMRB volume 11, Section 3, Part 2 (HA 208/07)<sup>34</sup>.
- 6.5.3. A Cultural Heritage Desk Based Assessment has been produced for the Proposed Scheme. This is presented within Appendix G.
- 6.5.4. There are no World Heritage Sites, Registered Parks and Gardens, Registered Battlefields or Protected Wreck sites within 1km of the Proposed Scheme options. There are 45 Listed Buildings and one Scheduled Monument within 1km of the Proposed Scheme. The Listed Buildings consist of (i) one Grade I, (ii) two Grade II\*; and (iii) forty Grade II. The Scheduled Monument and the majority of the listed buildings will be screened from the Proposed Scheme by topography, vegetation and existing structures. The Scheduled Monument is the medieval defensive town walls. The listed buildings represent a mixture of domestic, religious, industrial and leisure uses and mainly date to the post-medieval period. The proposed scheme is not located within a Conservation Area, although the following four conservation areas have been identified within 1km of the Proposed Scheme. These are (i) Camperdown (ii) Gorleston Conservation Area Extensions; (iii) King Street; and (iv) Seafront.
- 6.5.5. There are a further 90 non-designated heritage assets recorded on the NHER. The vast majority of these assets represent World War II structures, camps and bomb crater sites, with the remaining sites comprising finds and structures which reflect the important Naval and shipping history of the town. The majority of the remaining recorded assets date to the post medieval period. Within the wider study area there is evidence of buried urban and riverfront remains dating to the Medieval period, as well as a single findspot of a Neolithic scraper.
- 6.5.6. A deposit model for soils in Great Yarmouth has been created by the Great Yarmouth Archaeological Map project using data from 142 boreholes which were drilled by the Norfolk County Laboratory. The model shows that the area where Great Yarmouth now stands started out as the mouth of a large estuary. Since the last Ice Age, a south bound current has laid a spit of sand across the north of the estuary, from the north end to the

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<sup>33</sup> Norfolk County Council Historic Environmental Record 2015-2018 [online] Available at: <https://www.norfolk.gov.uk/libraries-local-history-and-archives/archaeology-and-historic-environment/historic-environment-record> Accessed January 2018

<sup>34</sup> Highways England (2007) Design Manual for Roads and Bridges, Cultural Heritage, Volume 11, Section 3, Part 2 [online] available at: <http://www.standardsforhighways.co.uk/dmr/vol11/section3/ha20807.pdf> (Accessed November 2017).

south. The sand spit blocked off the estuary, leading to the formation of the peat in the Broads. The sand spit was breached by the sea, and left as either a low tidal island or a shoal until about 1300 years ago, gradually rising to become permanently dry. When it was first occupied, probably at some point during the tenth century, it was a low lying sand bank about 1m above sea level. Throughout the first centuries of habitation, large drifts of windblown sand buried dwellings and shifted sand dunes, and by the time the walls were built around the medieval town in the 13th and 14th centuries the ground level was over 1m higher.

- 6.5.7. The boreholes and evidence from archaeological excavations in the area suggest the presence of buried medieval shorelines (evidence of this has been found just outside the 500m study area at the site of the Power Station during its construction).
- 6.5.8. The medieval walled town lies to the north of the Proposed Scheme options, just outside the 500m study area. The boundary of the medieval town is represented by the well preserved remains of the defensive walls, built in the 13<sup>th</sup> century and now designated as a Scheduled Monument. The southern end of the town wall lies approximately 600m north of the Proposed Scheme and extends for distance of around 2km northwards. Within the study area, the remains of boats have been found on an earlier buried shoreline at around 3m below the current ground level. An old landing place was also recorded below the Town Hall site in 1887.
- 6.5.9. All of the above suggests that buried medieval deposits may survive deep below the current ground level on either side of the River Yare within the study area.
- 6.5.10. As stated above, the vast majority of features within the study area date to the Modern period, and specifically the period of the Second World War. Most, if not all, of these features recorded on the NHER have since been demolished and replaced by modern development.
- 6.5.11. The town was first bombed during World War I in 1915 (the first aerial bombardment in the UK) however, the majority of wartime features date to World War II. During this time the town suffered extensive bombing by the Luftwaffe as it was one of the last significant places German bombers could drop bombs before returning to base. Despite this, two-thirds of the medieval town wall survived. At least 43 air raid shelters are recorded on the NHER within the 500m study area, along with Anti-Aircraft batteries, pill boxes, gun emplacements, barbed wire obstructions, blast walls, beach defences, anti-tank defences and military camps. There are also at least 12 recorded bomb craters. The presence of these known bomb craters and historic bombing activity suggests a significant risk of unexploded ordnance, particularly in softer riverbed deposits.
- 6.5.12. The majority of the built heritage remains within the study area are listed buildings. The area has undergone substantial industrial redevelopment in the 20th century. Earlier buildings are now isolated, although still maintain visual and/or transport links to the wharfs and river. The listed buildings consist of a mixture of uses, but a number of these are related to the Naval Hospital which dates from 1806 and was built to treat the sick and wounded from the North Sea Fleet which was engaged in war with France. Great Yarmouth was an important naval base throughout the Napoleonic Wars, and Admiral Lord Horatio Nelson is known to have landed at Great Yarmouth on three occasions. Following Nelson's death, funds were raised to erect a monument in the town, 30 years before a monument was erected in Trafalgar Square. The monument is also a listed building, and lies within the study area. It is 144 feet high and can be seen from some parts of the study area.
- 6.5.13. There are no designated landscapes within the study area. Historic Landscape Characterisation (HLC) has been completed for the surrounding area, however this study specifically excluded an analysis of the areas within the town and village development limits. Therefore, although the smaller villages were considered as a part of a wider landscape context and character, no specific townscape or urban character assessments were undertaken. Some areas have had Historic Landscape Character completed as part of the Norfolk County Council HER Character Area Report. The study area falls across two different character types, with a linear strip of Coastal - Managed Wetland to the east of the study area. This land was previously Unimproved Intertidal land. There are also small blocks of Coastal - Drained Enclosure to the west, which were previously Coastal - Managed Wetland, Unimproved Marine Marsh or Brackish Fen.
- 6.5.14. Based on a preliminary study, the historic landscape of the study area is dominated by the late 19th and 20th century residential, industrial and commercial townscape, with the largely modern riverfront and harbour. The beach front is very strongly differentiated from the surrounding townscape with its 19th and 20th century leisure and tourist-focused landscape. These combined landscape types illustrate the evolution of Great Yarmouth in



the recent past but are not readily indicative of the medieval or early post medieval history of the town. There are some indications of the earlier history of the settlement preserved in the street layout in the northern parts of town around Market Street.

#### Value of Receptors

- 6.5.15. All designated and non-designated heritage assets within the study area are listed in the Cultural Heritage Desk Based Assessment presented within Appendix G. The majority of the known archaeological remains found within the study area have been allocated a negligible to low value as they consist of WWII defensive sites which are no longer extant. A single non-designated asset has been assessed as of medium value due to its age and rarity, the Church, Priory, Leper Hospital (HER ref MNF66695).
- 6.5.16. There is a reasonable potential to uncover previously unknown heritage assets within the study area, and this may include the buried former shoreline dating to the medieval period. If discovered within the study area, this asset would be of up to high value.
- 6.5.17. The non-designated built heritage assets are of low to medium value however, most are listed buildings of medium to high value.

### **POTENTIAL IMPACTS OF THE PROPOSED SCHEME**

- 6.5.18. The majority of the impacts upon the cultural heritage assets will occur during the construction phase. Development activities such as piling, stripping of overburden or hardstanding, landscaping, ground compaction access, service installation, stockpiling and storage may all have a negative effect on cultural heritage assets. These construction related impacts could lead to the following effects upon the Historic Environment:
- Permanent complete or partial loss of an archaeological feature or deposit as a result of ground excavation;
  - Permanent or temporary loss of the physical and/or visual integrity of a feature, monument, building or group of monuments;
  - Damage to resources as a result of ground excavation;
  - Damage to resources due to compaction, desiccation or waterlogging; and
  - Damage to resources as a result of ground vibration caused by construction.
- 6.5.19. There will also be a number of assets which may be adversely affected during operation. These will mainly be setting issues resulting from the introduction of new infrastructure, and the resulting increase in noise from vehicles using the new crossing.
- 6.5.20. Initial assessment suggests that there would be a potential physical impact to one known archaeological asset, the site of a railway which is no longer in use and a potential setting impact to the setting of the Dolphin Public House, a Grade II listed building. These are marked as assets 88 and 89 respectively in the Cultural Heritage Desk Based Assessment in Appendix G.
- 6.5.21. The assessment to date suggests the potential presence of unknown heritage assets in the form of a buried medieval shoreline and associated features or finds. The Proposed Scheme has the potential to impact upon these remains if they are present as a result of the engineering solutions required for the bridge supports. Previous dredging activities cannot be taken as an indication of archaeological sterility, as the depth of deposits is unknown.

## PROPOSED ASSESSMENT METHODOLOGY

- 6.5.22. The assessment will involve reference to Annexes 5, 6 and 7 of the Design Manual for Roads and Bridges (DMRB), HA208/07<sup>35</sup> (Cultural Heritage) including consideration of the value of cultural heritage assets, examination of the magnitude of impact and assessment of the significance of effect of the Proposed Scheme.
- 6.5.23. The study area for the cultural heritage assessment will be defined according to the sensitivities of the cultural heritage assets in the receiving environment and the potential impacts of the Proposed Scheme. This could extend to the visual envelope of the works as defined by the Townscape and Visual impact assessment (Section 6.6).

### Fieldwork

- 6.5.24. Impacts to the cultural heritage assets can be minimised or eliminated via appropriate mitigation. A full desk based assessment should be carried out, including a site visit to assess impacts, as well as opportunities for enhancement, in more detail.
- 6.5.25. Intrusive evaluation investigations in and around the River Yare have the potential to be challenging due to waterlogged conditions and depths of deposits and have the potential to adversely impact on the programme and costs for the proposed scheme. A separate palaeoenvironmental desk-based assessment will be prepared in order to understand the potential and significance of the palaeoenvironmental resource. This would draw on existing information, including that gathered for Great Yarmouth Archaeological Map, as well as the results of ground investigation works undertake as part of the application. The assessment work could be supplemented by a programme of non-intrusive survey, such as a marine geophysical survey, pending the results of the palaeoenvironmental desk-based assessment and access to river crossing. The assessment report will also provide an overview of options for further evaluation, where required.
- 6.5.26. DMRB Volume 10, Section 6, Part 1<sup>36</sup> states that 'The fundamental aim of archaeological mitigation is to avoid impacts on nationally important or highly significant remains. If this is not possible then such remains should be archaeologically recorded in order to 'preserve by record' the significant aspects of the site'. Preservation in situ of nationally important or highly significant remains which may be affected by the Proposed Scheme options is the preferred option, however, where this is not possible then alternative options will be investigated. Should no acceptable options be identified which would allow for the preservation of a site, detailed excavation (the scope of which will be agreed with the Norfolk Historic Environment Team) should be carried out in order to further our understanding of the site affected.
- 6.5.27. The area surrounding the river consists of an urban townscape with very little open ground that is not covered by active roads or buildings. This makes any non-intrusive archaeological investigation problematic as techniques available would be limited by the presence of hardstanding.
- 6.5.28. An important note for any intrusive investigation of the area is the high risk of previously unknown unexploded ordnance (UXO). Due to the history of this location, the soft surrounding ground surface, and the abundance of known bomb craters within the study area; any staff working on-site must be made aware of the likelihood of discovering UXO's and be given proper training before works can commence. It would also be recommended that a UXO specialist be present during all intrusive works to give their expertise if any such objects are found. While heritage surveys may aid in the identification of potential UXO, it cannot be seen as a replacement for specialist survey.

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<sup>35</sup> Highways England (2009) Design Manual for Roads and Bridges Volume 11, Section 3, Part 2 (HD 208/07) Cultural Heritage, former Highways Agency, November 2009

<sup>36</sup> Highways England (2009) Design Manual for Roads and Bridges Volume 11, Section 6, Part 1 (HD 75/01) Trunk Roads and Archaeological Mitigation, former Highways Agency, November 2009



- 6.5.29. The Proposed Scheme may result in an impact on the setting of at least one Grade II listed building. Consultation should be undertaken with Historic England and the Norfolk Historic Environment Team to discuss appropriate mitigation options to reduce this impact.
- 6.5.30. No recorded historic landscapes will be impacted upon to a significant degree by the Proposed Scheme however, a new bridge structure may have an impact on the riverfront or 19th century townscape and further work should be done to assess this.
- 6.5.31. As defined by DMRB, the works including both a cultural heritage and palaeoenvironmental desk-based assessment constitute a “simple assessment”, however options will be explored to see where this can be supplemented with information drawn from further evaluation work, where possible.

Value of Cultural Heritage Assets

- 6.5.32. Assessment of the value of cultural heritage assets will involve consideration of how far the asset(s) contribute to an understanding of the past, through their individual or group qualities, either directly or potentially. These are professional judgements, but they are also guided by legislation, national policies, acknowledged standards, designations, criteria and priorities. The assessment of value (also referred to as significance) will be undertaken in line with DMRB guidance, and in compliance with the NPPF and the following relevant professional guidelines: Chartered Institute for Archaeologists (ClfA) Standard and Guidance for Historic Environment Desk-based Assessment (2014)<sup>37</sup> and ClfA Code of Conduct (2014)<sup>38</sup>

The DMRB recommends the adoption of six ratings for value in relation to archaeological remains and built heritage: very high, high, medium, low, negligible and unknown. Definitions for each rating are outlined in Tables 22 and 23.

**Table 22 - Factors for assessing the value of archaeological remains**

Value	Example
<b>Very High</b>	World Heritage Sites (including nominated sites) Assets of acknowledged international importance Assets that can contribute significantly to acknowledged international research objectives
<b>High</b>	Scheduled Monuments (including proposed sites) Undesignated assets of scheduled quality and importance Assets that can contribute significantly to acknowledged national research objectives
<b>Medium</b>	Designated or undesignated assets that contribute to regional research objectives
<b>Low</b>	Designated and undesignated assets of local importance Assets compromised by poor preservation and/or poor survival of contextual associations Assets of limited value, but with potential to contribute to local research objectives
<b>Negligible</b>	Assets with very little or no surviving archaeological interest
<b>Unknown</b>	The importance of the resource has not been ascertained

<sup>37</sup> Chartered Institute for Archaeologists (2014) Standard Guidance for Historic Environment Desk Based Assessment [online] Available at: [http://www.archaeologists.net/sites/default/files/ClfAS&GDBA\\_2.pdf](http://www.archaeologists.net/sites/default/files/ClfAS&GDBA_2.pdf) Accessed January 2018

<sup>38</sup> Chartered Institute for Archaeologists (2014) Code of Conduct [online] Available at: <https://www.archaeologists.net/sites/default/files/CodesofConduct.pdf> Accessed January 2018



**Table 23 - Criteria for establishing the value of built heritage assets**

<b>Value</b>	<b>Example</b>
<b>Very High</b>	International importance i.e. World Heritage Sites.
<b>High</b>	National importance i.e. listed buildings at Grade I and II* Scheduled Ancient Monuments with standing remains, conservation areas containing very important buildings and undesignated structures of clear national importance.
<b>Medium</b>	Regional importance i.e. listed buildings at Grade II, conservation areas containing buildings that contribute significantly to its historic character, historic townscape with important integrity in their buildings, or built settings and undesignated structures of clear regional importance.
<b>Low</b>	Local importance i.e. undesignated assets of modest quality in their fabric or historical association and historic townscape of limited historic integrity (including buildings and structures included in local list prepared by local authority).
<b>Negligible</b>	Assets of no architectural or historical note
<b>Unknown</b>	Assets with some hidden i.e. inaccessible potential for historic or architectural significance.

Magnitude of Impact

- 6.5.33. Assessment of the magnitude of impact of the Proposed Scheme on cultural heritage assets will involve consideration of the degree of change that would be experienced by the asset and its setting if the Proposed Scheme were to be completed as compared with a 'do nothing' situation. The assessment will take into account any mitigation that is part of the design.
- 6.5.34. The DMRB recommends the adoption of six ratings for magnitude of impact: no change, negligible, minor adverse, moderate and major. Factors for assessing the magnitude of impact are summarised in Table 24.

**Table 24 - Factors for assessing the magnitude of impact**

<b>Magnitude of Impact</b>	<b>Example</b>
<b>Major</b>	Change to most or all aspects of a cultural heritage asset, such that the resource is totally altered Comprehensive changes to setting
<b>Moderate</b>	Clear alteration to many aspects of a cultural heritage asset Considerable change to setting that affect the character of the asset
<b>Minor</b>	Slight alteration to cultural heritage asset. Sight alteration to setting
<b>Negligible</b>	Very minor changes to cultural heritage assets and their setting
<b>No Change</b>	No change to cultural heritage assets and their setting

Significance of Effect

- 6.5.35. Assessment of the significance of effect of the Proposed Scheme on cultural heritage assets combines the value of the resource and the magnitude of the impact (incorporating the agreed mitigation), for each cultural heritage asset.
- 6.5.36. The DMRB recommends the adoption of five ratings for significance of effect: neutral, slight, moderate, large and very large. The matrix for establishing significance of effect matrix is summarised in Table 25.

**Table 25 - Significance of cultural heritage effects**

<b>Magnitude of Impact</b>	<b>Major</b>	Neutral	Slight	Moderate/ Large	Large/ Very Large	Major
	<b>Moderate</b>	Neutral	Slight	Moderate/ Slight	Moderate/ Large	Large/ Very Large
	<b>Minor</b>	Neutral	Slight/Neutral	Slight	Moderate	Moderate/ Large
	<b>Negligible</b>	Neutral	Slight/Neutral	Slight/Neutral	Slight	Moderate/ Slight
	<b>No Change</b>	Neutral	Neutral	Slight/Neutral	Slight/Neutral	Slight
		<b>Neutral</b>	<b>Slight</b>	<b>Moderate</b>	<b>Large</b>	<b>Very Large</b>
		<b>Value</b>				

## ASSUMPTIONS AND LIMITATIONS

- 6.5.37. The data used to compile this assessment includes secondary information derived from a variety of sources. The assumption is made that this data is reasonably accurate.
- 6.5.38. This assessment draws upon the records held on the National Heritage List for England<sup>39</sup> and Norfolk Historic Environment Record. The data does not represent a full record of all surviving archaeological receptors, but a record of the discovery of a wide range of archaeological and historical components of the historic environment. The information held within it is not complete and does not preclude the subsequent discovery of further elements of the historic environment that are, at present, unknown.

<sup>39</sup> <https://historicengland.org.uk/listing/the-list/>

## 6.6 TOWNSCAPE AND VISUAL IMPACTS

### BASELINE CONDITIONS

- 6.6.1. This section identifies relevant designations and describes the baseline environment for townscape character of the study area.

#### Statutory Designated Sites

- 6.6.2. The Broads National Park boundary lies approximately 1km to the north west of the site and 1.5km to the north where it borders the Haven Bridge crossing within Great Yarmouth. The Broads cover a large area of gentle low lying landscape of lakes and rivers and views south into Great Yarmouth from the edge of the National Park typically comprise a low distant townscape skyline.

#### *Relevant Non Statutory Sites*

- 6.6.3. The Great Yarmouth Townscape Heritage Initiative (THI) centred on the King Street and St George's area within the town centre to the north of the Proposed Scheme. Views from within the area would be heavily contained by surrounding buildings.
- 6.6.4. There are a number of Conservation Areas associated with the urban environment of Great Yarmouth, none of which are located within the Proposed Scheme extents but would potentially afford views and be influenced by the Proposed Scheme. The closest of which being 'Hall Quay and South Quay' which follows the River Yare south of Haven Bridge.

#### Townscape Baseline

- 6.6.5. The townscape of the study area lies within the low lying urban environment of Great Yarmouth, which is bisected in a north/south orientation by the River Yare and is described below:
- 6.6.6. Within a very flat broader landscape, the study area to the west of the river consists of a mixed and fragmented urban fringe environment with no distinctive features, while large scale industrial and maritime activities tend to occupy the river bank to the east. The townscape of the study corridor either side of the river has a general run down semi derelict feel, due to the presence of many empty properties. The river corridor itself is characterised by an open aspect across the wide waterfront with areas that comprise hard standing following the banks of the river, which on the western bank is utilised as a public waterfront space. Building heights are broadly similar throughout the area, typically of no more than three storeys with the skyline of Great Yarmouth along the river occasionally punctuated by taller industrial towers or tanks.
- 6.6.7. The east bank of the river comprises an incoherent pattern of buildings with a variety of different sized warehouses, depots and industrial units while facilities comprising large tanks, storage areas and associated warehouses and offices act to contain views in and out of the river corridor. Some of the older warehouses and buildings have historical and architectural merit but are interspersed by new development and industrial infrastructure which offer limited architectural merit.
- 6.6.8. The properties overlooking the western bank of the river mainly comprise Victorian red brick terraces in small rows, interspersed with commercial premises, disused land parcels or overlooking an industrial riverfront environment. The residential properties most relevant to the Proposed Scheme are situated along Queen Anne's Road and Southtown Road.
- 6.6.9. Beyond Southtown Road and approaching the A47 there is less awareness of the industrial waterfront and more vegetation becomes apparent as it lines short sections of William Adams Way and Suffolk Road. There is also no distinctive townscape pattern apart from rows of properties fronting the river corridor, beyond which is a mix of land uses and scattered layout of commercial buildings while a more distinctive residential pattern beginning to the south of William Adams Way. There is also a prominent belt of conifers to the rear of Queen Anne's Road. Small pockets of green space are interspersed amongst the industrial/domestic land use either side of William Adams Way and provide a break from the surrounding commercial townscape. This includes Southtown



Common, which is located to the south of Beccles Road and adjacent to the A47 which is used as a recreation ground and is bounded by mature deciduous vegetation on the north and east sides to screen it from the busy road network.

- 6.6.10. The townscape quality of the study area would be considered to be typical to the region and important only at a local level with few distinctive features. There is a lack of pattern to the built environment and with human interaction with the study area tending to be limited to the use of vehicles and limited use of waterfront spaces.

## POTENTIAL IMPACTS OF THE PROPOSED SCHEME

- 6.6.11. The Guidelines for Landscape and Visual Impact Assessment (GLVIA) Third Edition<sup>40</sup>, identifies the importance of townscape and visual amenity, and sets out guidance on how development can influence and change the way in which these inter-related aspects are perceived. Major development such as that being proposed, will inevitably result in impacts on the townscape character of the area within which they are located, and on views experienced by residents and visitors to the area.

### Potential Impacts

- 6.6.12. The introduction of the Proposed Scheme will result in a new prominent feature of a noticeably different scale and form within the immediate urban fabric of Great Yarmouth, resulting in the removal or modification to existing townscape features and potential fragmentation of the current land use patterns.
- 6.6.13. The introduction of the visually prominent structure within the context of the river, supporting roads and associated traffic will also change existing views, where it either intrudes into or obstructs an existing view in whole or in part.
- 6.6.14. It has, therefore, been concluded that townscape character and visual impact assessments should be undertaken to establish to what extent the introduction of the Proposed Scheme and its traffic would affect the quality and value of the existing townscape and existing views.

## PROPOSED ASSESSMENT METHODOLOGY

- 6.6.15. A methodology for the assessment of townscape character and visual amenity will be prepared and agreed with representatives from the Great Yarmouth Borough Council. The key components of the methodology have been set out in the following paragraphs. Both assessments will be based on the guidance provided in GLVIA (Third Edition)<sup>40</sup>, published by the Landscape Institute and the Institute of Environmental Management and Assessment (IEMA, 2013). Reference will also be made to guidance provided in:
- Highways England IAN 135/10<sup>41</sup> – Landscape Effects; and
  - Natural England's, An Approach to Landscape Character Assessment (October 2014)<sup>42</sup>.
- 6.6.16. The study area for townscape effects will be established following guidance provided in Guidelines for Landscape and Visual Impact Assessment (3rd Edition) (GLVIA), the study area being defined as the area through which existing townscape character may change or be influenced, or visual receptors potentially

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<sup>40</sup> Landscape Institute and Institute of Environmental Management and Assessment (April 2013) Guidelines for Landscape and Visual Impact Assessment 3rd Edition, London: Routledge

<sup>41</sup> Highways England (2010) Interim Advice Note 135/10 Landscape and Visual Effects Assessment, former Highways Agency, November 2010

<sup>42</sup> Natural England (2014) An Approach to Landscape Character Assessment. [online] Available at: [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/396192/landscape-character-assessment.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/396192/landscape-character-assessment.pdf) (Accessed January 2018)

impacted as a direct result of the construction and operation of the scheme. This will be identified through a combination of 3-D modelling and site work within a provisionally identified study area of 3km, to be agreed with GYBC, beyond which the potential for significant townscape or visual effects are not anticipated to arise due to the context, scale and nature of the development.

#### Townscape Character

- 6.6.17. The townscape character assessment will be based on the identification of the sensitivity of the townscape within the proposed study area, and the magnitude of impact within the townscape that will result from the construction and operation of the Proposed Scheme and the effect that this will have on the perception of townscape.

#### Baseline Environment and Sensitivity

- 6.6.18. The identification and evaluation of the existing townscape and visual context of the study area and wider area will involve the following tasks:

- Desk based analysis of OS mapping relating to landform, built form, vegetation, settlement patterns and the drainage regime in the wider area;
- Desk based analysis of aerial photography for the area;
- Preliminary review of the townscape units/types and relevant designations (e.g. Conservation Areas, Registered Parks and Gardens);
- Site surveys and identification of townscape units/types. Site recording involved annotation of 1:1,250 and 1:25,000 scale OS plans defining the units and the key elements determining character;
- Development and agreement of representative/key viewpoints to be assessed for potential effects on visual amenity;
- Site photography to illustrate character units, notable views / viewpoints and key landscape elements; and
- Drafting and description of local townscape character units within the context of the broader assessment and associated with the Proposed Scheme and wider setting including an evaluation of their quality, value and sensitivity to change in the context of the proposed form of development.

- 6.6.19. For townscape character, evaluation of the sensitivity to change will be based on the structure, quality and value of the existing townscape, and the extent to which it is considered as being capable of accepting change in the form of the Proposed Scheme. Sensitivity will be rated as being high, moderate or low. Magnitude of impact will be based on the extent to which the Proposed Scheme would be likely to emerge as a new component in the landscape and change the relationship between components that currently constitute character. The sensitivity of the receiving townscape and the magnitude of impact will be assessed to determine a significance of effect rating.

#### Visual Impact

- 6.6.20. Establishment of the existing visual context for the Proposed Scheme will involve consideration of the information relating to existing townscape character established during the townscape character baseline assessment, the definition of a Zone of Theoretical Visibility (ZTV) for the Proposed Scheme, and the identification of visual receptors (represented by key viewpoints) within the visual envelope that will contribute to the definition of the study area.

- 6.6.21. The ZTV will be identified and refined through a combination of 3-D modelling and site work within a study area to be a 3km radius around the Proposed Scheme, beyond which the potential for significant effects are not anticipated to arise due to the scale and nature of the Proposed Scheme.

- 6.6.22. The following tasks will be undertaken:



- Identification of key viewpoints that are representative of views from visual receptors, comprising residential properties and other sensitive locations used and visited by the public within the ZTV;
- Desk and site based appraisal of existing and predicted views for the identified viewpoint;
- Identification of mitigation in light of the identified impacts; and
- Evaluation of the order of impact for each viewpoint taking into account the sensitivity of the associated receptor and magnitude of the impact to determine if there would be a significant effect on the environment.

6.6.23. Key Viewpoints plotted via the desk based review and validated through site survey include the following:

- Residential clusters and individual properties;
- Roads with views of the site; and
- Recreational and public access areas, including footpaths and other rights of way.

6.6.24. Sensitivity to change will be primarily based on the type of receptor (dwelling, place of work, footpath), and will be qualified by the degree to which the receptor would be exposed to potential views of the structure.

6.6.25. Magnitude of impact considers the extent of the Proposed Scheme that is visible, the percentage of the existing view newly occupied by the Proposed Scheme and the viewing distance from the receptor to the Proposed Scheme.

6.6.26. The prime criteria used to evaluate visual effects, will relate to the extent to which existing views associated with Key Viewpoints (such as residents, users of public facilities and visitors to open space and public areas) will change, taking into account mitigation measures.

6.6.27. The identification of the resulting effects will be established through an evaluation of the sensitivity of the baseline and the magnitude of the impact likely to occur as a result of the Proposed Scheme. Where appropriate, cumulative visual effects on the baseline environment will also be taken into account in respect of the Proposed Scheme and consented development within the study area.

#### Artificial Lighting

It is anticipated that the full extent of the Proposed Development will be lit, therefore the potential impacts of artificial lighting are to be assessed in the ES. The ES will be supported by a isolux contour plans to determine that extent of light spill from street lighting and amenity lighting, proposed within the scheme deign.

The assessment of views of the new crossing will include consideration of both day time and night time views, and will assess light spill issues and potential effects associated with the visual amenity.

#### Conclusions

6.6.28. The preliminary review of baseline and likely geographical extent is reasonably constrained although prior to undertaking an appraisal of the Proposed Scheme and nature of the resulting impacts it is premature to make a determination of significance.

## 6.7 WATER ENVIRONMENT

### BASELINE CONDITIONS

- 6.7.1. A desk study comprised a review of various information sources in order to obtain information relating to the water environment assembled from other studies and designated and non-designated sites. Information sources which have informed the desk study review include:
- 6.7.2. Following the production of the Stage 1 Assessment and the Stage 2 Scoping Report, the following surveys and assessments have been completed, and are drawn upon for this assessment:
- Great Yarmouth Third Yare Crossing, Stage 2 Environmental Impact Assessment Report 2009
  - Great Yarmouth Third River Yare Crossing, Water and Sediment Quality Sampling and Analyses July 2009
  - Great Yarmouth Third River Yare Crossing, Geotechnical and Geo-environmental Interpretative Report, February 2008
  - Great Yarmouth Third River Crossing, Sediment Modelling, February 2008
- 6.7.3. Further data collected for this assessment has been obtained from the following sources:
- Environment Agency 'What's in My Backyard' Online Mapper<sup>43</sup>;
  - Ordnance Survey Opendata<sup>44</sup>; and
  - Defra's online GIS portal MAGIC<sup>45</sup>
- 6.7.4. The study area has been defined as the physical area of the Proposed Scheme under consideration and a buffer of 1km either side of the route alignments; and any surface water receptors, such as water dependent conservation sites located within the River Yare between Breydon Water to the north and the mouth of the river to the south, as illustrated on Figure 4, in Appendix B.
- 6.7.5. This study area is considered to be appropriate for the assessment of indirect effects, based on the professional judgement and knowledge of the area.

#### Surface Water

- 6.7.6. The water bodies within the study areas are shown on Figure 4. The site is dominated by the tidally influenced River Yare which flows north to south through the centre of the site and enters the sea through a gap in the spit of land, at Gorleston-on-Sea. The tidal extent of the River Yare reaches 15 km upstream, with a spring tidal range of approximately 2.2 m.
- 6.7.7. A series of drains and ditches connecting the main river to the mudflat and marsh areas exists between the upstream tidal extent and the proposed crossing sites. The majority of these mudflats fall within Breydon Water, which is an internationally important RSPB nature reserve, and designated as a SPA, SSSI and is on the List of Wetlands of International Importance (Ramsar Site). This and other designated sites linked to the water environment are discussed in detail in Section 6.4. The boundaries of these designated sites are shown on Figure 3.

<sup>43</sup> <http://apps.environment-agency.gov.uk/wiyby/default.aspx>

<sup>44</sup> <https://www.ordnancesurvey.co.uk/business-and-government/products/opendata.html>

<sup>45</sup> <http://www.natureonthemap.naturalengland.org.uk/MagicMap.aspx>



- 6.7.8. A river confluence between the River Bure and the River Yare is located 2.1 km upstream from the Proposed Scheme. The River Waveney also joins the River Yare 8.2 km upstream. The distance to the River Waveney is considered sufficient such that no impact is likely to result from the Proposed Scheme and therefore the River Waveney confluence is not included in this assessment. Surface water from land and roads is managed through a number of drainage systems which also appear to flow into the River Yare. No other rivers or streams enter the River Yare between the Proposed Scheme and the harbour mouth.
- 6.7.9. The River Yare is approximately 85 m wide at the site of the proposed crossing, with normal spring tide discharge in the region of 400 m<sup>3</sup>/s and velocities of around 2 m/s. As part of the sediment modelling study in 2008, discharge rates of the River Yare within the study area were calculated. The discharge time series ranged from -160 m<sup>3</sup>/s (ebb tide) to 200 m<sup>3</sup>/s (flood tide). Within the study area, recorded river velocities ranged between 0.25 to 2.0 m/s.
- 6.7.10. Under the Water Framework Directive (WFD), the EA has determined that River Yare lies within the 'Bure & Waveney & Yare & Lothing' surface water body (GB510503410700), classified as a heavily modified, transitional water body.

#### Hydrogeology

- 6.7.11. The superficial deposits underlying the site are classified by the EA as a Secondary A aquifer; permeable layers capable of supporting water supplies at a local rather than strategic scale. The bedrock is classified as a Principal aquifer; having high intergranular and/or fracture permeability and usually providing a high level of water storage.
- 6.7.12. Groundwater levels in close proximity to the Proposed Scheme ranged between 0.77 and 2.83 m below ground level (BGL) based on monitoring data from a one month monitoring in 2008. The direction of groundwater flow is unclear from these monitoring results, although it is likely to be tidally influenced. There is likely to be connectivity between the river level and the surrounding shallow groundwater.

#### Groundwater Vulnerability

- 6.7.13. The entire study area is designated by the Environment Agency as Major Aquifer High; able to easily transmit pollution to groundwater. They are characterised by high leaching soils and the absence of low permeability superficial deposits.

#### Groundwater Quality

- 6.7.14. Under the WFD, the EA has determined the study area lies within the 'Broadland Rivers Chalk & Crag' groundwater body (GB40501G400300), classified as holding a 'Poor' status for both quantitative and chemical classifications based on the 2015 dataset. The main pressures were either from agricultural and rural land management or 'no sector responsible'. This waterbody is linked to protected areas under the Drinking Water Directive although the study area does not lie within a drinking water safeguard zone.
- 6.7.15. The Site Investigation Factual Report (NCC, October 2007) indicates that in 2007 there was groundwater contamination within the study area when compared to drinking water standards, notably arsenic, boron, nickel, selenium, nitrate, sulphate, cyanide and benzo(a)pyrene.

#### Water Quality

- 6.7.16. Water and sediment samples were collected from the River Yare during a site investigation in November and December 2007.
- 6.7.17. The water quality results for the River Yare were compared to the standards set out in the current documents at the time. Parameters which exceeded the Environmental Quality Standards (EQS) included copper, Biological Oxygen Demand (BOD) and Total Suspended Solids.
- 6.7.18. The Environment Agency's method for classifying river water quality is known as the General Quality Assessment (GQA) scheme. Nutrient, biological and chemical GQAs provide an accurate and consistent



assessment of the state of water quality and changes in this state over time, describing quality in terms of parameters which detect the most common types of pollution.

- 6.7.19. The chemical GQA is defined by standards for BOD, dissolved oxygen (DO) and ammonia, and indicates if the river is affected by waste water discharges and run-off from rural areas containing organic material. Water samples collected at the site in 2007 showed that the River Yare was classified between Grades A (very good) and B (good) at that time. High BOD was observed during a spring tide, together with low DO saturation levels and high turbidity, but these outcomes were not observed during neap tides.
- 6.7.20. The river system is likely to be subject to high loading of sediment and organic material during large flood tides. The nutrient GQA is defined by standards for orthophosphate and nitrate. Results showed nutrient levels within Grades 1 (very low) and 2 (low).

#### Sediment Quality

- 6.7.21. Sediment samples were collected from the River Yare during a site investigation in November and December 2007. Grab and sediment samples were taken in the vicinity of and to the south of the Proposed Scheme and were tested for a range of heavy metals and polyaromatic hydrocarbons (PAHs). Core sediment samples exceeded Probable Effect Levels (PEL) standards for dibenzo(a,h)anthracene and phenanthrene. Sediments exceeding PEL standards suggest that remobilisation of these sediments could cause frequent adverse biological effects. Threshold Effect Levels (TEL) standards were exceeded for the majority of heavy metals and PAHs in the core and grab samples collected in the same area. Exceedance of TEL standards suggests that remobilisation could result in an occasional adverse biological effect.
- 6.7.22. The sediments of the River Yare were contaminated with both inorganic and organic substances. The spatial distribution of the organic and inorganic contamination shows that there is a higher level of contamination around the tunnel crossing location compared to the bridge crossing locations.

#### Abstractions and Discharges

- 6.7.23. Within 1 kilometre of the Proposed Scheme can be found the following licenced water abstractions:
- one large licenced tidal water abstraction to the south (< 2500 cubic metres per day), abstracting from the River Yare; and
  - one medium sized groundwater abstraction to the northwest (>100 – 2499 cubic metres per day).
- 6.7.24. There are no Source Protection Zones (SPZ) within the study area of the Proposed Scheme.
- 6.7.25. The locations of these abstractions are shown on Figure 4.
- 6.7.26. There are known to be discharges within the study area to the River Yare. The consents include sewerage, trade effluent, storm overflow discharges and site drainage. Contaminants associated with these processes include faecal material, bleaches and cleaning products.

#### Road Drainage

- 6.7.27. Existing road drainage for the surrounding roads consists of a series of gullies and drains, discharging to ditches and balancing ponds. No information is currently available on the road drainage catchment area or discharge location, but it is assumed that the ditches eventually discharge to the River Yare.

#### Flooding

- 6.7.28. The Proposed Scheme predominantly lies within floodplain cited by the Environment Agency (EA) as Flood Zone 3 (defined as land having a 1 in 100 or greater annual probability of river flooding (1%) or land having a 1 in 200 or greater annual probability of sea flooding (0.5%)), with this typically adjacent and relatively close to the



banks of the River Yare and Great Yarmouth Harbour. Flood Zone 3 is the highest risk zone defined by the EA (EA, 2016). Flood zones at the location are shown in Figure 4.

- 6.7.29. Smaller areas of EA Flood Zone 2 are also within the study area (defined as land having between a 1 in 100 and 1 in 1000 annual probability of river flooding (1% – 0.1%) or land having between a 1 in 200 and 1 in 1000 annual probability of sea flooding (0.5% – 0.1%)), primarily for the Proposed Scheme at Sutton Road and Swanston Road, where the route connects into the existing road network (EA, 2016).
- 6.7.30. The EA Flood Map for Planning<sup>46</sup> does not show any defences in Great Yarmouth however the EA have supplied WSP with a map and crest level information for the defences along the River Yare through Great Yarmouth that consist of quay walls, which are higher in level than the land behind them (EA reference: EAN/2017/48225).
- 6.7.31. Areas within the Proposed Scheme boundary are subject to a medium risk of surface water flooding according to the EA surface water maps. Flooding from sewers will be considered as part of this assessment and may be an issue given the urban nature of the Proposed Scheme site. There is no risk of flooding from reservoirs to the Proposed Scheme shown on the EA reservoir flooding map. The EA groundwater vulnerability map shows the Proposed Scheme rests on a 'Major Aquifer High', as such there is a potential for groundwater flooding.

## POTENTIAL IMPACTS OF THE PROPOSED SCHEME

- 6.7.32. The potential impacts and methodologies adopted to assess them are largely based on guidance provided in DMRB HD 45/09 (Highways Agency, 2009)<sup>47</sup>.

### Potential Impacts on Surface Water

- 6.7.33. The potential significant impacts considered are:
- Pollution during construction due to increased generation and release of sediments and suspended solids, and increased risk of accidental spillage of pollutants such as oil, fuel and concrete associated with construction activities and site storage requirements;
  - Pollution during road operation due to contaminants within routine road run-off. A broad range of potential pollutants, such as hydrocarbons i.e. fuel and lubricants, fuel additives, metal from corrosion of vehicles, de-icer and gritting material, can accumulate on road surfaces. These can subsequently be washed off the road surface during rainfall events, polluting the receiving surface water bodies;
  - Pollution during road operation due to accidental spillage. On all roads, there is a risk that accidents or vehicle fires may lead to an acute pollution incident. Where commercial vehicles are involved, potential pollutants that may be spilled could range from hazardous chemicals to milk, alcoholic beverages, organic sludges and detergents. Spilled materials may drain from the road surface, polluting the receiving surface water bodies;
  - Alterations to the hydromorphology (fluvial geomorphological) regime, such as increased erosion, deposition and channel migration processes. These changes can occur as a result of channel modification associated with the new crossing structures, increased road surface drainage, and outfalls. A reduction in hydromorphological diversity can subsequently impact on water quality and biodiversity;
  - Loss or change to surface water supplies due to degradation of water quality, changes in drainage patterns or disruption to supply infrastructure due to the route options;

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<sup>46</sup> Environment Agency flood map for planning, <https://flood-map-for-planning.service.gov.uk/> accessed September 25<sup>th</sup>, 2017

<sup>47</sup> Design Manual for Roads and Bridges Volume 11, Section 3, Part 10 (HD 45/09) Road Drainage and the Water Environment, former Highways Agency, November 2009

- Loss of standing waters where the route options would be constructed through or close to existing ponds.

#### Potential Impacts on Groundwater

6.7.34. The potential significant impacts considered are:

- Pollution of groundwater and aquifers as a result of construction activities, such as excavation of deep cuttings; piling creating preferential pathways for contamination transmission to groundwaters, and seepage of spillages through ground profiles;
- Groundwater pollution during road operation due to contaminants within routine road run-off, where groundwater infiltration is proposed as part of the drainage strategy for the route options;
- Groundwater pollution during road operation due to accidental spillage;
- Direct loss or changes to groundwater aquifers and groundwater supported public and private water supplies, either below the footprint of the route options, or as a result of changes to groundwater flows and levels associated with the dewatering of deep cuttings and foundation excavations or piling into the aquifer;
- Indirect loss or change to surface water receptors, as a result of dewatering of groundwater aquifers; and
- Loss or changes to Groundwater Dependent Terrestrial Ecosystems (GWDTEs), including peatland habitats, either below the footprint of the route options as a result of severance of habitat, or as a result of changes to groundwater flows and levels associated with dewatering activities.

#### Potential Impacts of Flooding

- 6.7.35. Increase in flood risk caused by the Proposed Scheme, both within the vicinity of the route options and also elsewhere in the catchment is possible. This can involve a number of interrelated factors including:
- 6.7.36. Increases in water level due to Proposed Scheme within the channel or floodplain;
- 6.7.37. Loss of floodplain storage due to road infrastructure occupying areas which were previously available for flood storage or flows;
- 6.7.38. Impediment of water flow caused by road infrastructure crossing existing drainage channels, causing potential blockage and altering local catchment area boundaries;
- 6.7.39. The increase in surface water runoff due to any increase in impermeable area as a result of the Proposed Scheme;
- Groundwater flooding;
  - Risk of flooding from sewers; and
  - Risk of flooding from artificial sources.

### **PROPOSED ASSESSMENT METHODOLOGY**

- 6.7.40. The road drainage and the water environment assessment will involve the following key tasks:
- Consultations with the relevant statutory and non-statutory bodies to establish the principal water environment issues associated with the study area;
  - Detailed desk studies and field surveys to ascertain the current baseline conditions on site;
  - Assessment of the potential impacts related to the construction and operation of the Proposed Scheme;



- Identification of measures to avoid, minimise or mitigate predicted impacts.

6.7.41. The assessment will focus upon defining the characteristics and subsequent potential impacts upon the surface water and groundwater receptors, including the wider hydrological catchments as categorised by the EA under the WFD. This hydrological catchment-based approach enables due consideration to be given to both individual locations where interactions occur and any cumulative impacts within larger water body areas.

#### Scoped Out Impacts

6.7.42. The specific characteristics of the Proposed Scheme enable particular impacts to be considered as highly unlikely to occur. Based on professional judgement and taking account of water environment characteristics and scheme design, the following items are not intended to be considered further, thus enabling focus upon the more likely impacts on the water environment (as discussed in the following subheadings):

- Loss of standing water - scoped out due to the scale of the Proposed Scheme, the urban setting of the study area and the lack of standing water bodies below or adjacent to the Proposed Scheme;
- Loss or change to Groundwater Dependent Terrestrial Ecosystems - scoped out due to the urban setting of the study area and the lack of such ecosystems below or adjacent to the options under development; and
- Changes to groundwater level or flows impact due to cuttings and related dewatering - scoped out as no cuttings are anticipated for this particular project, due to local topography, urban setting and flood risk characteristics.

#### Construction Pollution

6.7.43. Evaluation of the potential for pollution of surface waters as a result of spillage and of the release of sediments into watercourses or water bodies will involve a review of areas where construction would be required within or in close proximity (i.e. within 50m) to surface watercourses and water bodies.

6.7.44. Mobilisation of potentially contaminated sediments during construction will also be considered in terms of local receptors and also Breydon Water designated site to the north; this will be informed by sediment transport modelling that will be undertaken for the Proposed Scheme and sediment sampling to determine levels of contamination.

6.7.45. The potential for pollution of groundwaters/aquifers is greatest where piling through contaminated land or sediments is proposed. In addition groundwater vulnerability is classified as high for this area and therefore groundwater is more at risk from accidental spillage.

#### Pollution from Routine Run-off

6.7.46. DMRB HD 45/09 (Highways Agency, 2009) specifies procedures for the assessment of pollution impacts from routine run-off on surface waters, known as 'Method A'.

6.7.47. The Method A assessment comprises two separate elements:

- HAWRAT Assessment: the Highways Agency Water Risk Assessment Tool (HAWRAT) is a Microsoft Excel application designed to assess the short-term risks related to the intermittent nature of road run-off. It assesses the acute and chronic pollution impacts on aquatic ecology associated with soluble and sediment-bound pollutants, respectively; and
- EQS Assessment: EQS are the maximum permissible annual average concentrations of potentially hazardous chemicals, as defined under the WFD. The long-term risks over the period of one year are assessed through comparison of the annual average concentration of pollutants discharged with the published EQS for those pollutants.

- 6.7.48. To carry out these assessments a variety of baseline and drainage design information is required, including; traffic volumes, areas of impermeable and permeable road surfaces to be drained, proposed treatment train, receiving watercourse dimensions and flow data, water hardness, presence of sensitive sites (considered as international / national designated conservation sites) and in-stream structures or features which may influence the flow.
- 6.7.49. However, Method A was developed for assessment of discharges into freshwater bodies rather than transitional water such as the River Yare, with such water bodies having different characteristics, receptors and baseline conditions due to tidal influence and dilution factors. Therefore, the appropriate method of assessment for routine run-off shall require discussion and agreement with the EA.
- 6.7.50. The assessment method for groundwater is known as 'Method C', applied to drainage design features designed to discharge to groundwater specifically. The Method C assessment comprises a risk assessment procedure based on the source-pathway-receptor model, which considers the following parameters: traffic density, rainfall, soakaway design and geometry, depth to groundwater table, groundwater flow type, aquifer grain size and aquifer lithology.

#### Pollution from Accidental Spillage

- 6.7.51. The DMRB document HD 45/09 (Highways Agency, 2009)<sup>47</sup> specifies procedures for the assessment of pollution impacts from accidental spillage, known as 'Method D'. A summary of the methodology is provided below, with full details provided in HD 45/09<sup>47</sup>.
- 6.7.52. The assessment takes the form of a risk assessment, where the risk is expressed as the annual probability of a serious pollution incident occurring. This risk is the product of two probabilities:
- The probability that an accident will occur, resulting in a serious spillage of a polluting substance on the carriageway; and
  - The probability that, if such a spillage did occur, the polluting substance would reach the receiving water body and cause a serious pollution incident.
- 6.7.53. The probability of a serious spillage occurring is dependent on a variety of factors; namely, traffic volumes, percentage of heavy goods vehicles in the traffic volumes, whether the road is motorway, rural or urban trunk road, the road type categories within the road drainage catchment under assessment (i.e. 'no junction', 'slip road', 'cross road' or 'roundabout'), and the length of each road type within the catchment.
- 6.7.54. The probability of a serious spillage subsequently causing a serious pollution incident is dependent on the receiving surface water body and the response time of the emergency services; i.e., less than 20 minutes, less than one hour, or greater than one hour.
- 6.7.55. However, as for Method A, Method D was developed for assessment of discharges into freshwater bodies rather than the transitional water of the River Yare with associated tidal influence and dilution factors. Therefore, the appropriate method of assessment for accidental spillage shall require discussion and agreement with the Environment Agency.

#### Hydromorphological Changes

- 6.7.56. A hydromorphological assessment will be undertaken which will include sediment transport modelling of the Proposed Scheme to understand the impact of the presence of the bridge infrastructure on the hydromorphology of the River Yare. It will discuss the potential effects on river bed scour/erosion, sediment deposition and implications for Breydon Water designated site to the north from potential changes to sediment deposition patterns.



Loss or change to groundwater aquifers and supported water supplies

- 6.7.57. An assessment of the potential impacts of the Proposed Scheme on groundwater quality and quantity will be undertaken with respect to identified groundwater abstractions including licenced activities and private water supplies, and other groundwater dependent receptors.

Indirect loss or change to surface water receptors

- 6.7.58. Surface water bodies such as streams, lakes and wetlands can receive or recharge groundwater, with movement likely between the two receptors. Any changes to groundwater as a result of dewatering may indirectly impact surface water bodies and result in changes to surface water flow. The impact on surface water receptors shall be assessed qualitatively.

Impact Assessment Criteria

- 6.7.59. The predicted significance of impacts on surface waters and groundwater will be based on the importance or sensitivity of the relevant waterbody and the magnitude of the impact from the Proposed Scheme, as recommended in DMRB document HD 45/09 (Highways Agency, 2009<sup>47</sup>).
- 6.7.60. The importance or sensitivity of the waterbodies will be evaluated taking into account their quality, rarity, scale and substitutability. The criteria used will be based on the guidance and examples given in HD 45/09, Table A4.3.
- 6.7.61. The magnitude of the various impacts is evaluated taking into account the extent of loss and effects on integrity of the relevant waterbody attributes. The criteria used will be based on the guidance and examples given in HD 45/09, Table A4.4.
- 6.7.62. The estimation of the impact significance will be derived by combining the estimated importance of the affected waterbodies and the magnitude of the impacts, taking into account mitigation and the guidance provided in HD 45/09, Table A4.5 and this is provided as Table 26.

**Table 26 - Impact Magnitude/Significance Matrix**

		Magnitude Of Impact			
		Negligible	Minor	Moderate	Major
Importance of Attribute	Very High	Neutral	Moderate/ Large	Large/ Very High	Very Large
	High	Neutral	Slight/ Moderate	Moderate/ Large	Large/ Very Large
	Medium	Neutral	Slight	Moderate	Large
	Low	Neutral	Neutral	Slight	Slight/ Moderate

- 6.7.63. Where there is more than one option for significance rating, professional judgement shall be used to determine the significance for the particular impact.

Water Framework Directive Assessment

- 6.7.64. A WFD Assessment will be undertaken to assess the Proposed Scheme against the key objectives of the water framework directive. A WFD scoping exercise will be undertaken and consulted on with the EA.

## Flood Risk

- 6.7.65. The main source of flooding to the site of the Proposed Scheme is believed to be tidal. This forms a largely separate assessment from the rest of the Water Environment topic. It is therefore proposed that Flooding is presented within the ES as a stand-alone chapter. This is shown in the proposed structure for the ES, presented in Table 53.
- 6.7.66. A Flood Risk Assessment (FRA) will be carried out in accordance with the National Planning Policy Framework (NPPF)<sup>48</sup> and the NPPF Planning Practice Guidance (PPG). The objectives of the FRA are to:
- Assess the risk to the Proposed Scheme from all potential sources of flooding;
  - Establish the existing and future flood risk to the Proposed Scheme;
  - Consider flood risk to the Proposed Scheme site during construction;
  - Assess the potential impacts of the Proposed Scheme on flood risk elsewhere; and
  - Determine appropriate mitigation measures to manage flooding issues post development in a sustainable way.
- 6.7.67. As previously stated, the main source of flooding to the site of the Proposed Scheme is believed to be tidal. A 1D-2D ISIS-TUFLOW hydraulic model has been provided by the EA for use in this assessment. The model has been reviewed and a decision has been made to develop a new 2D TUFLOW model focussed on Great Yarmouth for the purposes of this assessment. The existing EA model includes representation of a large part of the Broadlands river system, it is not necessary to model this as part of this assessment. The 2D only model developed for this assessment will focus on the River Yare through Great Yarmouth and be used to model the impact of the Proposed Scheme on flood risk within Great Yarmouth. A suite of sensitivity tests will be undertaken to determine the impact of a variety of parameters on the model results, including roughness values representing land use with the model, fluvial inflows and tidal levels.
- The model will be used to investigate two scenarios:
  - Baseline – to establish the existing flood risk to the Proposed Scheme site; and
  - Proposed Scheme – to establish the impact of the Proposed Scheme on flooding elsewhere.
- 6.7.68. The water levels predicted by the model for the Proposed Scheme scenario will be compared to the predicted water levels for the baseline scenario. This will determine the impact of the Proposed Scheme on flood levels in Great Yarmouth. Three flood design events will be investigated using the flood model developed for the Proposed Scheme; these are: the 5% Annual Exceedance Probability (AEP) event, the 0.5% AEP event (tidal Flood Zone 3) and the 0.1% AEP event (tidal Flood Zone 2). Model runs will be undertaken for each design event with and without climate change allowances applied to determine present day flood risk in Great Yarmouth and predicted future flood risk.
- 6.7.69. In order to apply a climate change allowance to each of the design events being modelled, future sea level rise will be calculated using five different methods from a range of guidance sources and the maximum increase in sea level rise calculated will be used to represent the climate change events. The five guidance datasets/tables that will be considered are:

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<sup>48</sup> Department for Communities and Local Government, National Planning Policy Framework (2012) [Accessed online: https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/6077/2116950.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/6077/2116950.pdf) [07 September 2017]

- National Planning Policy Framework (NPPF)<sup>48</sup> – Table 3;
- UK Climate Change Projections, (UKCP09) 50% high emissions;
- UKCP09 95% high emissions;
- UKCP09 95% medium emissions; and
- Upper End allowance, Table 5 (Adapting to Climate Change).

6.7.70. The impact of and resilience to future flooding will be considered and mitigation against future flood risk up to and including the 0.5% AEP plus climate change event will be recommended as necessary. If it is determined that the Proposed Scheme is considered to be safety critical then it will also be assessed against the H++ UKCP09 estimates (high risk, low probability) for sea level rise to assess a credible maximum scenario. It is not expected that the design or mitigation will be provided to this level but the Proposed Scheme will be assessed against this scenario to understand the full picture of risk.

6.7.71. There is potentially a risk of flooding to the Proposed Scheme from other sources such as surface water flooding, groundwater inundation, risk of flooding from sewers and flooding from artificial sources. A review of all available data including the available EA mapping, local reports of flooding, photographs and sewer/service plans will be carried out to assess the risk. Calculations will be undertaken as part of the FRA to determine the greenfield runoff rate from the Proposed Scheme site and the runoff rate following construction of the Proposed Scheme. The volume of storage required as part of the Proposed Scheme in order to limit runoff from the site to the greenfield rate will be calculated and reported within the FRA.

Impact Assessment Criteria:

6.7.72. Table 27 shows how a given increase in flood depth from the baseline scenario to the post-development scenario will be classified in terms of impact. A minimal increase in flood depth ( $\leq 0.02\text{m}$ ) between the two scenarios is classified as a negligible impact because this is within the tolerance of the hydraulic model used to predict flood risk to Great Yarmouth and would not significantly increase flood risk to receptors.

**Table 27 - Classification of Magnitude of Flooding Impacts**

Magnitude of Impact	Change in depth (m)
No Change	0
Negligible	$>0.0 - \leq 0.02$
Moderate	$>0.02 - \leq 0.3$
Major	0.3+ OR Flooding in areas that were previously not flooding.

Table 28 within the NPPF PPG for flood risk and coastal change classifies receptors in terms of their flood risk vulnerability<sup>49</sup>.

The need for flood mitigation is dependent on the magnitude of impact and the vulnerability of the receptor(s) that are affected by any increase in flood depth. Table 28 - Significance of Flood Impact overleaf compares the magnitude of impact and receptors to demonstrate when mitigation is required and the need for flood mitigation as part of the Proposed Scheme will be assessed using these parameters.

<sup>49</sup> <https://www.gov.uk/guidance/flood-risk-and-coastal-change#Table-2-Flood-Risk-Vulnerability-Classification>



**Table 28 - Significance of Flood Impact**

Magnitude of Impact	Receptor Sensitivity				
	Water Compatible	Less Vulnerable	More Vulnerable	Highly Vulnerable	Essential Infrastructure
No Change	No mitigation required	No mitigation required	No mitigation required	No mitigation required	No mitigation required
Negligible	No mitigation required	No mitigation required	No mitigation required	Mitigation	Mitigation
Moderate	No mitigation required	Mitigation	Mitigation	Mitigation	Mitigation
Major	No mitigation required	Mitigation	Mitigation	Mitigation	Mitigation

All mitigation measures will be decided in consultation with the EA.



## 6.8 CLIMATE CHANGE

### BASELINE CONDITIONS

- 6.8.1. The greenhouse gas (GHG) assessment is not restricted by geographical area but instead includes any increase or decrease in emissions as a result of the Proposed Scheme. This includes:
- Construction and decommissioning emissions in the area of the Proposed Scheme footprint but also related to the transport of materials to and from the site, their manufacturing and disposal; and
  - Operational emissions resulting from the Proposed Scheme infrastructure but also emissions, or any reduction in emissions, which result from the end-use of the Proposed Scheme (vehicle movements) and any consequent shifts in transport modes/patterns which may occur.
- 6.8.2. The study will use the air quality assessment to inform consideration of the end-user emissions. For the greenhouse gas assessment, the areas from which the construction materials are sourced in the UK is also included.
- 6.8.3. For the resilience assessment, the UK Climate Projections (UKCP0956) programme<sup>51</sup> currently provides probabilistic projections for the whole of the UK, at regional level and at local level. This assessment will adopt the local level projections, which are set out by UKCP09 using a 25km<sup>2</sup> grid. The grid reference for the projections used in this assessment is Area 1517 and contains the anticipated geographical extent of the Proposed Scheme.

#### Greenhouse Gas Emissions

- 6.8.4. In the baseline (do nothing) scenario, GHG emissions occur constantly and widely as a result of human and natural activity including energy consumption (fuel, power), industrial processes, land use and land use change – both in the area of the Proposed Scheme but also more widely. The GHG assessment will only consider where the Proposed Scheme results in additional or avoided emissions in comparison to the baseline scenario and its assumed evolution.
- 6.8.5. The total end-user GHG emissions from traffic flows in the ‘do nothing’ (baseline) scenario have not yet been modelled, however, this will be completed as part of the air quality assessment, in accordance with the Design Manual for Roads and Bridges, Volume 11, Section 3, Part 1 Air Quality; HA 207/07<sup>50</sup>. The modelling will include the total GHG emissions for all vehicles covered by the traffic model, including the strategic and local road network in the area of the Proposed Scheme and its surrounding region.

#### Climate Resilience

- 6.8.6. The baseline for the climate resilience assessment is summarised in Table 29 and comprises the recent historical (1961 to 1990) as well as the future projections for key climate parameters. All figures are taken from the UK Climate Projections<sup>51</sup> which cover the UK split into a grid of 5 kilometre squares. Future projections are provided for the 2020s (corresponding to the construction period) and the 2080s (during the operational design life of the Proposed Scheme).

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<sup>50</sup> Design Manual for Roads and Bridges, Volume 11, Section 3, Part 1 Air Quality (HA 207/07), former Highways Agency, May 2007.

<sup>51</sup> UK Climate Projections 2009, produced by British Atmospheric Data Centre, Environment Agency, Marine Climate Change Impacts Partnership, Met Office, National Oceanography Centre, Newcastle University, Tyndall Centre, University of East Anglia, 2009.

**Table 29 - Baseline (historical and future) climate data for the study area (Location 1517)**

Climate Category	Climate parameter With recent baseline (1961-1990)		Projection for 2020s <sup>52</sup> (2010-2039)			Projection for 2050s (2040-2069)			Projection for 2080s (2070-2099)		
			Med (50%)	High (50%)	Range	Med (50%)	High (50%)	Range	Med (50%)	High (50%)	Range
Temperature [°C]	Mean daily winter min	1.2	2.7	2.8	1.7 to 3.7	3.6	4.0	2.0 to 5.7	4.5	5.3	2.5 to 8.0
	Mean winter daily	3.9	5.2	5.2	4.3 to 6.0	6.0	6.4	4.8 to 7.7	6.9	7.5	5.2 to 9.5
	Change on coldest winter day	N/A	+1.3	+1.3	-0.1 to +2.8	+1.7	+2.0	-0.1 to +4.3	+2.0	+2.4	+0.2 to +5.5
	Mean daily summer max	19.8	21.4	21.3	20.4 to 22.6	22.7	23.1	20.7 to 25.5	23.9	25.0	10.0 to 28.8
	Mean summer daily	15.6	17.0	16.9	16.2 to 17.9	18.0	18.3	16.5 to 20.1	19.0	19.8	16.7 to 22.6
	Change on warmest summer day	N/A	+0.9	+1.2	-1.6 to +4.0	+1.8	+2.3	-1.5 to +7.0	+2.6	+3.4	-2.2 to +10.3
Rainfall [mm/day]	Winter mean daily	1.7	1.8	1.8	1.6 to 1.9	1.8	1.9	1.7 to 2.2	2.0	2.1	1.7 to 2.6
	Summer mean daily	1.6	1.5	1.6	1.3 to 1.9	1.3	1.3	1.1 to 1.7	1.3	1.2	1.0 to 1.7
	% change on wettest winter day	N/A	+5.1%	+5.6%	-4.4% to +18.9%	+11.3 %	+10.2 %	-5.2% to +26.5%	+15.9 %	+19.1 %	-0.9% to +42.1%

6.8.7. The environmental assessment topics for the Proposed Scheme will take into account the potential for in-combination impacts and effects in relation to these climate change projections.

## POTENTIAL IMPACTS OF THE PROPOSED SCHEME

### Greenhouse Gas Assessment

- 6.8.8. The impacts of GHGs relate to their contribution to global warming and climate change. These impacts are global and cumulative in nature, with every tonne of GHG contributing to climate change impacts upon natural and human systems.
- 6.8.9. GHGs are natural and man-made gases occurring in the atmosphere, which absorb and emit infrared radiation thereby maintaining the Sun's energy within the Earth's atmosphere. There is an overwhelming scientific consensus that the major increase in the concentration of GHGs from man-made sources is contributing to global warming and climate change.
- 6.8.10. The seven main GHGs defined by the Kyoto Protocol are carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, sulphur hexafluoride and nitrogen trifluoride. In combination, these GHG emissions are commonly expressed in terms of carbon dioxide equivalents according to their relative global warming potential. For this reason the shorthand 'carbon' may be used to refer to GHGs.

<sup>52</sup> Note - projections for medium and high emissions scenario and 50% probability level. Projection range for low emission scenario at 10% probability level to high emission scenario at 90% probability level.

6.8.11. The assessment approach considers the likely magnitude of GHG emissions (or avoided emissions) in comparison to the baseline scenario with no scheme development. It considers emissions throughout the lifecycle of the Proposed Scheme including:

- Construction stage e.g. embodied emissions associated with materials, transportation of materials to site and waste/arising from site, and the construction process;
- Operation e.g. operation of lighting and controls, maintenance and replacement of original materials, as well as emissions (or avoided emissions) from end-user vehicles; and
- End of life (decommissioning) stage e.g. deconstruction and management of materials, arisings and waste.

Climate Resilience

6.8.12. Table 30 presents the potential impacts of climate change during the construction and operation period. These are not exhaustive and further assessment is required to identify extent of impacts.

**Table 30 - Potential impacts during construction and operation**

Phase of scheme	Climate event	Impact (hazards or benefits)
Construction	Increased temperatures, prolonged periods of hot weather	Warm and dry conditions exacerbate dust generation and dispersion, health risks to construction workers
	Increased precipitation, and intense periods of rainfall	Flooding of works and soil erosion Increased risk of contamination of waterbodies Disruption to supply of materials and goods
Operation	Increased precipitation, especially in Winter	Flooding Water scour causing structural damage Weakening or wash-out of structural soils Change in ground water level and soil moisture
	Temperature extremes	Stress on structures Stress on surfaces e.g. difficulties with maintaining required texture depth during construction and operation. Challenges for maintenance regimes

Design Mitigation/Enhancement

*Greenhouse Gas Emissions*

6.8.13. A range of design, mitigation and enhancement measures may be available as the Proposed Scheme progresses through detailed design and into construction and operation. These include:

- Design optimisation to reduce the requirement for construction materials, substitute construction elements for lower-carbon alternatives (e.g. changing the design and materials for a bridge) and reduce the requirement for earth movements to/from and within the construction site.
- Specification of materials and products with reduced embodied GHG emissions including through material substitution, recycled or secondary content and from renewable sources;

- Recovery and re-use / recycling of site arisings (ideally, on-site); and
- Selection and engagement of materials suppliers and construction contractors taking into account their policies and commitments to reduction of GHG emissions, including embodied emission in materials.

#### *Climate Resilience*

6.8.14. A range of design, mitigation and enhancement measures may be available as this Proposed Scheme progresses through detailed design and into construction and operation. These include:

- Design optimisation to remove particular scheme elements away from the source of a climate hazard e.g. moving sensitive infrastructure away from/above flood risk hotspots.
- Specification of materials and products which are more resilient to identified climate risks (e.g. heat resistant pavement materials, bridge bearings and Mechanical and Electrical equipment);
- Adoption of construction procedures to avoid particular climate impacts e.g. avoiding dust impacts due to earth movements during dry, windy periods by stopping work or enhanced mitigation (wetting).
- Adoption of scheme operation practices and systems to reduce or prevent potential impacts during the operational lifetime e.g. intelligent weather warning systems.

#### Residual Effects

6.8.15. It is not expected that there will be significant residual effects in terms of GHG emissions or climate change resilience. This assertion will be tested as part of the Proposed Scheme environmental assessment.

## **PROPOSED ASSESSMENT METHODOLOGY**

### Methodology - Greenhouse Gas Assessment

6.8.16. The GHG scoping assessment has been based on the following guidance:

- IEMA's EIA guide to Assessing GHG emissions and evaluating their significance<sup>53</sup>
- TAG Unit A3 Environmental Impact Appraisal (DfT, 2015). Chapter 4 Greenhouse Gases<sup>54</sup>; and
- PAS 2080:2016 Carbon management in infrastructure<sup>55</sup>.

6.8.17. There are no specific criteria for assessing the significance of GHG emissions of highways schemes. A judgement is however made regarding the likely magnitude of emissions and the need for further assessment.

6.8.18. There are multiple GHG emission sources associated with each lifecycle stage of the Proposed Scheme. At this stage, limited information is available to assess GHGs during construction and operation. For example, a materials bill of quantities is not available and traffic modelling is not yet available.

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<sup>53</sup> IEMA (2017) *EIA guide to Assessing GHG emissions and evaluating their significance*, [\[Link\]](#)

<sup>54</sup> Department for Transport (2015). TAG Unit A3 Environment Impact Appraisal Chapters 4 Greenhouse Gases. [online] Available at: [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/638648/TAG\\_unit\\_a3\\_envir\\_imp\\_app\\_dec\\_15.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/638648/TAG_unit_a3_envir_imp_app_dec_15.pdf) (Accessed January 2018)

<sup>55</sup> BSI (2016) *PAS 2080:2016 Carbon management in infrastructure* [\[Link\]](#)

Table 31, therefore, presents the key emissions sources associated with each lifecycle stage of the Proposed Scheme.

**Table 31 - Lifecycle stages and key emissions sources**

Lifestyle stage		Key GHG source	Scope in/out
Construction	Product stage (manufacture and transport of raw materials to suppliers)	Manufacture and supply of materials (e.g. aggregate and asphalt) for: <ul style="list-style-type: none"> <li>- New dual carriageway and flyover across Southtown Road</li> <li>- New roundabout</li> <li>- Realignment of William Adams Way</li> <li>- New cycleway and footway on bridge.</li> <li>- New signal controlled junction</li> </ul> Manufacture and supply of materials (e.g. steel, reinforced concrete) for, 55m for single span lifting bridge; including steel deck, 3 longitudinal steel box beams per leaf (x2), Piers (reinforced concrete box structures on reinforced concrete piles), approach embankments and retaining walls.	Scope in
	Construction process stage (transport of materials and arisings to/from site; construction process, earth movements)	Emissions from construction activity including: <ul style="list-style-type: none"> <li>Constructing bridge superstructure</li> <li>Delivery and laying of materials for dual carriageway, roundabout, cycleway and footway.</li> <li>Export and disposal of site excavations</li> <li>Delivery and installation of drainage, barriers, signs and lighting.</li> </ul>	Scope in
	Land use, land use change and forestry	No significant land take or emissions.	Scope out
Operation	End-user emissions (regional traffic flows)	Vehicles using highways infrastructure. Change in end-user emissions expected from the surrounding network	Include in air quality assessment
	Operation and maintenance	Lighting expected to be efficient LED units providing some reduction in emissions compared to the baseline.	Scope out
	Repair, replacement, refurbishment	There will be an increase in emissions from road and bridge maintenance and refurbishment requirements proportional to the increase in the carriageway pavement area.	Scope out

6.8.19. The end of life stage has been scoped out as the expected timescales for decommissioning are so far into the future that there is insufficient certainty about the likelihood, type or scale of emissions activity.

*Emissions Calculation*

6.8.20. Emissions calculations will be completed within an industry recognised carbon calculation tool which focuses on emissions throughout the project lifecycle. For this particular assessment, Highways England’s carbon tool will be used. Values will be reported as tonnes of carbon dioxide equivalents (tCO<sub>2</sub>e).

### Significance of Effects

- 6.8.21. At this stage, there is not enough information available to determine the level of magnitude or significance of emissions of the Proposed Scheme and, therefore, a detailed assessment will be undertaken during the environmental assessment.

### Methodology - Climate Resilience

- 6.8.22. The assessment approach is based on the following guidance:
- 6.8.23. IEMA's Environmental Impact Assessment guide to Climate Change Resilience and Adaptation<sup>56</sup>.
- 6.8.24. The impacts in relation to climate resilience relate to how the changing climate may affect the Proposed Scheme itself, both in terms of construction and operation of the infrastructure, its ability to function and the end-users.
- 6.8.25. The Proposed Scheme comprises construction of a new dual carriageway and lifting bridge over the River Yare, a new roundabout, new cycleway and footway for which there is potential for significant effects.
- 6.8.26. Climate resilience with respect to the functioning and capacity of the Proposed Scheme drainage system as well as the risk of flooding is considered as part of the separate chapter on Road Drainage and the Water Environment (Section 6.7).
- 6.8.27. The process for assessing the risk of climate change effects to potentially vulnerable receptors (Table 32) will be applied to the construction and operational phases of the Proposed Scheme.

**Table 32 - Potential vulnerable scheme receptors**

Receptor	Aspects
<b>Geotechnics</b>	Erosion
	Stability of earthworks and compaction
	Earthworks construction across existing landslip
	Increased scour and erosion of earthworks
	Stability of slopes, change in water levels/pore pressure
	Drainage ditches
<b>Pavements</b>	Design of foundations
	Materials integrity, specification and construction details
	Construction - laying surface dressing, microsurfacing, temperature susceptible materials
	Skid resistance
	Maintenance
<b>Restricting network use</b>	High winds
	Flooding
<b>Restraint systems</b>	Renewal and repair
	Stability

<sup>56</sup> Environmental Impact Assessment Guide to Climate Change Adaptation and Resilience, IEMA, 2015.

<b>Receptor</b>	<b>Aspects</b>
<b>Signs and signals</b>	Renewal and repair
<b>Soft estate</b>	Landscape, ecology
<b>Structures (including gantries)</b>	Thermal actions (loads) applied to superstructure
	Wind actions (loads) applied to superstructure
	Increased thermal range giving rise to increased earth pressures for integral bridges
	Earth pressures used in design affected by change in ground water level
	Foundation settlement affected by change in ground water level
	Design for increased scour risk for foundations
	Design of structure drainage
	Use of temperature sensitive components or materials in construction or rehabilitation (for example, epoxies used in fibre reinforced plastic strengthening)
	Design, management and maintenance of bearings and expansion joints
	Climatic constraints on construction and maintenance activities
	Optimum timing of maintenance interventions, in response to changes in deterioration rates

## ASSUMPTIONS AND LIMITATIONS

- 6.8.28. The scoping assessment has been completed based on the currently available information regarding the scale and nature of the Proposed Scheme. The type and volume of materials required from the Proposed Scheme (to consider construction emissions) is not available and no information is yet available on the quantities of materials in construction elements such as major structures (e.g. roundabouts and bridges). This information will be required to assess the embodied carbon associated with the Proposed Scheme. No information is yet available to estimate the emissions from the construction process (e.g. from vehicles and construction plant).
- 6.8.29. No modelling of regional traffic emissions was available at the time of scoping and therefore it is not possible to determine the scale of any potential increase or reduction. However, this will be completed as part of the air quality assessment.



## 6.9 PEOPLES AND COMMUNITIES

### BASELINE CONDITIONS

#### Population

- 6.9.1. The Proposed Scheme is located within Great Yarmouth, within Norfolk. The resident population was estimated to be 99,200 (totalling 49,000 males and 50,200 females) in 2016 based on the Office of National Statistics (ONS) NOMIS report<sup>57</sup>. There are a lower proportion of individuals aged 16-64 in Great Yarmouth (58.7%), compared with the averages across the East of England region (61.5%) and Great Britain (63.1%).

#### Deprivation

- 6.9.2. The Index of Multiple Deprivation (IMD) is the official measure of relative deprivation for small areas in England and ranks every small area in England from 1 (most deprived area) to 32,844 (least deprived area).
- 6.9.3. The IMD combines information from seven domains to produce an overall relative measure of deprivation. The domains are combined using the following weights:
- Income Deprivation (22.5%);
  - Employment Deprivation (22.5%);
  - Education, Skills and Training Deprivation (13.5%);
  - Health Deprivation and Disability (13.5%);
  - Crime (9.3%);
  - Barriers to Housing and Services (9.3%); and
  - Living Environment Deprivation (9.3%).
- 6.9.4. In the IMD 2015, Great Yarmouth was ranked 29 in England out of 326 local authorities and, as such, is one of the most deprived areas in England. The Proposed Scheme is located within two Lower Layer Super Output Areas (LSOAs): Great Yarmouth 006A and Great Yarmouth 007B. The eastern extent of the Proposed Scheme is located in Great Yarmouth 006A LSOA, which is in the top 10% most deprived areas in the UK. The western extent of the Proposed Scheme is located in the Great Yarmouth 007B LSOA and is amongst the 20% most deprived neighbourhoods in England.

#### Employment and Local Economy

- 6.9.5. There are a number of local businesses located within the Site and surrounding area. Local businesses, including Kings Centre and Simpsons New and Used Motorhomes, are located off Queen Anne's Road. Businesses are also located off Suffolk Road, including, but not limited to, Space 4 U Storage Ltd and Great Yarmouth Day Services. Harfrey's Industrial Estate is situated immediately west of the A47 / Williams Adam Way roundabout. To the east of the River Yare, an industrial area is located adjacent to the river.
- 6.9.6. In Great Yarmouth, the proportion of individuals aged 16-64 who were estimated to be economically active in 2016 was 77.9% (47,300 people), compared with an average of 79.1% (437, 600 people) in Norfolk, 80.2% in

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<sup>57</sup> Office for National Statistics, 2017, NOMIS official labour market statistics

the East of England and 78% across Great Britain. In 2015, there was an estimated 38,000 jobs in Great Yarmouth, with 60.5% full time and 42.1% part time.

- 6.9.7. In 2015, the job density levels (i.e. the ratio of total jobs to the population aged 16-64) was 0.71 in Great Yarmouth and 0.8 in Norfolk. This is lower than the averages across the East of England region (0.81) and Great Britain (0.83) and indicates less availability of employment opportunities within Great Yarmouth.
- 6.9.8. Table 33 details the estimated employee jobs by industry sector in 2016. In Great Yarmouth, the highest proportion of employee jobs are in the Human Health and Social Work Activities (Sector Q) at 21.1%. This is a greater proportion than the average across Norfolk (15%), the East of England region (11.8%) and Great Britain (13.3%). The construction industry (Sector F) constitutes 3.9% of the workforce (approximately 1,500 jobs) in Great Yarmouth, which is slightly lower than the regional average (5.3%) and national average (4.6%).

**Table 33 - Overview of estimated employee by jobs by industry sector (2016)**

Industry sector	Great Yarmouth	Norfolk	East of England	Great Britain
B: Mining and quarrying	0.9	0.2	0.1	0.2
C : Manufacturing	7.9	9.5	8.0	8.1
D : Electricity, gas, steam and air conditioning supply	0.2	0.1	0.2	0.4
E : Water supply; sewerage, waste management and remediation activities	1.2	0.8	0.7	0.7
F : Construction	3.9	5.3	5.5	4.6
G : Wholesale and retail trade; repair of motor vehicles and motorcycles	15.8	17.3	16.8	15.3
H : Transportation and storage	3.9	3.9	5.1	4.9
I : Accommodation and food service activities	15.8	8.1	6.6	7.5
J : Information and communication	0.8	1.9	3.9	4.2
K : Financial and insurance activities	0.7	3.6	2.4	3.6
L : Real estate activities	0.5	1.3	1.4	1.6
M : Professional, scientific and technical activities	7.9	5.6	8.7	8.6
N : Administrative and support service activities	5.3	8.6	11.3	9.0
O : Public administration and defence; compulsory social security	2.4	4.5	3.5	4.3
P : Education	7.9	8.9	9.1	8.9
Q : Human health and social work activities	21.1	15.0	11.8	13.3
R : Arts, entertainment and recreation	4.6	3.1	2.7	2.5
S : Other service activities	1.3	1.9	2.0	2.1

NOMIS, ONS

### Land Uses and Planning Policy

- 6.9.9. The Agricultural Land Classification map (2011)<sup>58</sup> identifies the Proposed Scheme and the surrounding area as land predominately in urban use. The land uses within the Proposed Scheme boundary comprise a mix of residential properties to the west of River Yare, and industrial/commercial land to the east of River Yare, including South Denes Car and 4x4 Centre, Perenco as well as an industrial storage area. Grade 3 and Grade 4 agricultural land have been identified to the west and to the north of Great Yarmouth (and the Proposed Scheme) respectively. Local businesses and community facilities are also situated within the Site and surrounding area (see Paragraphs 6.9.5, 6.9.13 and 6.9.14).
- 6.9.10. The area between William Adams Way and Queen Anne's Road is allocated as an Open Amenity Space (REC11) in the Great Yarmouth Borough Council Local Plan (2015). The Proposed Scheme also includes a part of a Safeguarded Employment Area (CS6) to the north of Queen's Anne Road and a Safeguarded Employment Area (CS6) to the east of River Yare. A further Safeguarded Employment Area (CS6) is also located to the south of Southtown Road, albeit this falls outside of the Application Site.

### Private Assets

- 6.9.11. Land within the Application Site and surrounding areas is in a mixture of private and public ownership. Private landholdings are owned by a mixture of companies such as SLA Property Company Limited and Simpsons Garage Limited. There are also residential properties owned by NCC within the site. The public sector land holdings are owned by Highways England, NCC and GYBC.
- 6.9.12. The Proposed Scheme extent also includes a section of the River Yare used for berthing and as a navigation channel for Port and for leisure vessels. The channel is maintained by the port operator Peel Ports.

### Community Facilities

- 6.9.13. The following community facilities have been identified within 2km of the Proposed Scheme:
- Two secondary schools and six primary schools. The closest being Great Yarmouth Primary Academy, located approximately 600 m east of the Proposed Scheme.
  - Seven general practitioners (GP) surgeries with the closest located approximately 1.3 km north of the Proposed Scheme.
  - 17 Places of Worship with the closest being located approximately 360 m north-east of the Proposed Scheme.
  - Three post offices with the closest being situated just over 1 km north-east of the Proposed Scheme.
  - Nine care homes with St Augustine's Place being situated approximately 600 m south of the Proposed Scheme.
  - Two fire stations with the closest located approximately 305 m to the north of the proposals (Gorleston Fire Station).
  - A range of public food stores and shopping facilities.
  - A number of sports facilities, dentists, pharmacies and opticians.

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<sup>58</sup> Defra (2017) *MAGIC Interactive Map* [online] <http://magic.defra.gov.uk/MagicMap.aspx> Accessed March 2017



- 6.9.14. There are no hospitals located within 2 km of the Proposed Scheme. It should also be noted that there are Roots Mind Allotments and Great Yarmouth and Gorleston Allotment Association Allotments located immediately south of the Proposed Scheme.
- 6.9.15. Southtown Common Recreation Ground is a key community receptor; it is located to the south of William Adams Way. Allotment gardens are located to the south-west of the recreation ground. Harfrey's Industrial Estate is located directly west of the A47 / Williams Adam Way roundabout, offering a range of shops and also a gym.

#### Recreational Activities

- 6.9.16. Within the vicinity of the Site, there is the Southdown Common Recreation Ground, Community Mind Allotments and the allotment gardens to the south-west of the recreation ground. There are no water activity centres within the immediate vicinity of the Proposed Scheme; however the potential for water sports (including canoeing, rowing and kayaking) along the River Yare will be identified through consultation with local groups.
- 6.9.17. The Great Yarmouth sea front is located approximately 510m to the east of the Proposed Scheme at its closest point. There are numerous recreational attractions along the beach, including Pleasure Beach, a scenic railway and Pleasure Beach Gardens. Pleasure Beach offers family rides and attractions and is located approximately 460 m east of the most eastern extent of the Proposed Scheme.
- 6.9.18. The Great Yarmouth Open Space Study (Open Space Audits and Local Standards)<sup>59</sup> identified that there is 5.63ha of open space per 1,000 people in the Southtown and Cobholm ward and 4.38ha per 1,000 people in the Nelson ward. Across all wards, the total area of open space per ward ranges from 2.77 ha to 77.93ha. .
- 6.9.19. In general, the quality of open space in the Borough is very high. The average quality of outdoor sports facilities meets the proposed standard and for most types of sport there is sufficient supply. However, there are local variations and deficiencies in rural areas which were identified in the study. The average amenity greenspace is considered sufficient for the Borough. Sports facilities are considered to be well maintained across the Borough, but issues were identified with the ancillary facilities which require improvements (e.g. changing rooms and floodlighting). Outdoor sports facilities are considered to be accessible with most of the facilities catchment population within 0.5 mile radius, and many are accessible by public transport.

#### Highway Network and Public Routes

- 6.9.20. Sustrans Cycle Route 517 is located within the Proposed Scheme and runs alongside Southtown Road and Malthouse Lane, which both join with William Adams Way. There are a number of Public Rights of Way (PRoW) located within the surrounding area, mainly located to the east of the site, around Harfrey's Industrial Estate (see Figure 5). There is also a footway over William Adams Way, which provides access to Southtown Common Recreation Ground.
- 6.9.21. The main roads in the vicinity of the site includes the A47 which is located immediately west of the Proposed Scheme. The A47 is a key road in Great Yarmouth and connects the area to Norwich and other areas to the west. The A143 is located south of the Proposed Scheme, and links Great Yarmouth with areas in the south-west such as Bury St Edmunds.

#### Sensitive Receptors

- Economic receptors, i.e. individuals of working age and businesses;

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<sup>59</sup> Great Yarmouth Borough Council (2013) Open Space Study Part 1 Open space Audits and Local Standards [online] Available at <https://www.great-yarmouth.gov.uk/CHttpHandler.ashx?id=1237&p=0> (Accessed January 2018)

- Recreational receptors, including terrestrial (e.g. users / visitors to the Southtown Common Recreational Ground) and marine activities (e.g. users of the River Yare);
- Private and public sector landholdings;
- Non-motorised user receptors, including pedestrian and cyclists users of the local PRow and non-designated public routes; and
- Vehicle user receptors, including drivers along the highway network.

## POTENTIAL IMPACTS OF THE PROPOSED SCHEME

### Insignificant Effects

- 6.9.22. Whilst limited elements of the construction phase will require the employment of specialist contractors, it is assumed that the majority of the construction workforce will be from the region (east of England) and the resources and skills necessary to construct the Proposed Scheme are available. Given the large majority of workers will reside close to the site it is anticipated that a high proportion of construction workers will continue to reside within their current locations. Therefore, there is unlikely to be a significant increase in workers moving into the local area and associated increased demand for local services (e.g. education, healthcare or community facilities) or on recreational / open space. Therefore, this will not be considered further within the ES.
- 6.9.23. Given the nature of the Proposed Scheme (i.e. highways infrastructure), there are unlikely to be any significant changes to demands for local services, accommodation and recreational open space during the operation phase. Therefore, this will not be considered further within the ES.
- 6.9.24. Site security arrangements for the Proposed Scheme will be provided in accordance with the requirements of the Construction (Design and Management) Regulations 2015 and appropriate security (CCTV / security personnel) will be provided on-site. Therefore, effects in relation to crime and perception of crime will not be considered further within the ES.
- 6.9.25. It is anticipated that there will be temporary blockade / partial closure of the roads surrounding the site for health and safety purposes during the construction phase. However, given the location of the site, it is not anticipated that these full or partial closures could cause a significant reduction in footfall for businesses, for example off Queen Anne's Road. Therefore, this will not be considered further within the ES.
- 6.9.26. Once operational, the Proposed Scheme will not involve changes further in land use, in terms of demolition or refurbishment. Therefore, changes in private and public landholdings during the operational will not be considered in the ES.
- 6.9.27. Once complete, it is anticipated that the design of the Proposed Scheme will incorporate measures to minimise changes in sediment and hydromorphological changes to the River Yare and the wider Norfolk coast, which could affect off-site recreational resources (e.g. beaches). As such, no significant changes to off-site leisure resources are anticipated from the Proposed Scheme and this will not be considered further as part of the ES.
- 6.9.28. Effects in relation to quality of surroundings and sense of place will be considered, where appropriate within Cultural Heritage Chapter and Townscape and Visual Chapter.
- 6.9.29. Effects in relation to health will be considered, as appropriate, within chapters covering Acoustics, Air Quality, Water Environment and Geology and Soils.
- 6.9.30. The potential for disturbance, disruption and reduction in amenity of residents during construction will be considered in in relation Chapters assessing Acoustics, Air Quality and Townscape and Visual, as appropriate.



## Construction Phase

### *Generation of direct, indirect and induced employment opportunities:*

- 6.9.31. The construction of the Proposed Scheme is likely to generate direct jobs through spend during this phase. In addition, construction phase activities are likely to lead to an increase in spending in the local economy by contractors. This increase in spend can be attributed to the sourcing of local supplies (indirect employment across wider supply chains) and local spend by on-site workers (induced employment) within and outside of their working hours. Therefore, direct, indirect and induced employment opportunities during the construction phase will be considered within the ES.

### *Loss of private and public land:*

- 6.9.32. It is anticipated that a number of properties will be demolished to accommodate the Proposed Scheme. This includes residential properties and allotment land to the west of the River Yare. To the east of River Yare, the Proposed Scheme will require land that currently owned by South Denes Car and 4x4 Centre, Perenco as well as an industrial storage area. The potential effect of the Proposed Scheme on land use and directly affected businesses will therefore be considered in the ES.

### *Changes in accessibility for commercial marine activities;*

- 6.9.33. Construction activities within the River Yare, associated with piers and the placement of the bridge, have the potential to affect vessel transport and Port operations. Construction of the new bridge will introduce a new structure within the River Yare which will reduce the width of the existing navigation channel.
- 6.9.34. The Proposed Scheme will result in the loss of quay spaces.
- 6.9.35. The Proposed Scheme is likely to result in additional delays to recreational vessels wishing to navigate the River Yare during both construction and operation.

### *Changes in driver stress and delay:*

- 6.9.36. It is anticipated that temporary road blockages and diversions would be required during the construction of the Proposed Scheme. It is anticipated that these diversions could, temporarily, increase driver stress delay and stress for vehicle receptors. Therefore, potential effects on driver stress during construction will be assessed within the ES.

### *Changes in accessibility and amenity value of public routes and recreational resources:*

- 6.9.37. It is anticipated that the Proposed Scheme will cause temporary disruption and change in accessibility for public routes and recreational resources (both terrestrial and marine). Changes in accessibility and amenity value of public routes and recreational resources will be considered within the ES.
- 6.9.38. The Proposed Scheme is likely to result in additional delays to recreational vessels wishing to navigate the River Yare during both construction and operation.

## Operational Effects

### *Increase in economic activity due to improved connectivity:*

- 6.9.39. During operation, the Proposed Scheme would provide a vehicular link across the River Yare, with the current crossing located approximately 1.5 km north of the proposals. Therefore, the Proposed Scheme would link the communities to the west and east of River Yare, which could increase footfall for businesses and generate positive effects on local businesses and the economy. Therefore, an increase in economic activity due to improved connectivity will be considered within the ES.

*Changes in accessibility for commercial marine activities;*

- 6.9.40. Once complete, the piers and the placement of the bridge, have the potential to affect vessel transport and Port operations.

*Changes in driver stress and delay:*

- 6.9.41. During operation, the Proposed Scheme is anticipated to provide a positive effect on driver stress and delay as the Proposed Scheme aims to improve journey times and reliability by providing an additional river crossing. As such, the potential effects of the Proposed Scheme on driver stress and delay during operation will be considered further within the ES.

*Changes in accessibility and the amenity value of public routes and recreational resources:*

- 6.9.42. It is anticipated that the Proposed Scheme will enhance connectivity for public routes and recreational resources (both terrestrial and marine) in the vicinity of the Proposed Scheme. Therefore, changes in accessibility and amenity value of public routes and recreational resources will be considered within the ES.

Potential Effects

- 6.9.43. Construction Phase:

- Generation of direct employment opportunities;
- Generation of indirect and induced employment opportunities;
- Loss of private and public land;
- Changes in accessibility for commercial marine activities;
- Changes in driver stress and delay;
- Changes in accessibility and the amenity value of public routes and recreational resources.

- 6.9.44. Operational Effects:

- Increase in economic activity due to improved connectivity;
- Changes in accessibility for commercial marine activities;
- Change in driver delay and stress;
- Changes in accessibility and the amenity value of public routes and recreational resources.

## **PROPOSED ASSESSMENT METHODOLOGY**

Investigations

- 6.9.45. A more detailed desktop review will be undertaken in order to build on the baseline section of this Chapter. The review will cover the following sources:

- Office of National Census data (2015);
- NOMIS<sup>57</sup>
- Indices of Multiple Deprivation;



- Norfolk County Council definitive map;
- MAGIC<sup>58</sup>;
- OS maps; and
- NCC and GYBC reports, such as the Open Space Study<sup>59</sup>.

- 6.9.46. A site visit will also be undertaken to gain a better understanding of the baseline conditions, in particular the existing amenity value of the Site.
- 6.9.47. Where appropriate information from other studies, such as Non-Motorised User Context and Audit reports, Economic Impact Report and Vessel Simulation Modelling, will be used to inform the baseline and assessment of likely significant environmental effects.
- 6.9.48. Each effect will have a specific study area proportionate and appropriate to the anticipated geographic area of change. The anticipated study areas are indicated below, but these will be defined and developed further as part of the ES.

#### Consultation

- 6.9.49. Consultation will be undertaken with the relevant officers at NCC to discuss the detailed scope and methodology for the assessment of the Proposed Scheme. Local businesses, community organisations and recreational organisations will also be consulted to gain a greater understanding of the baseline conditions and the approach and methodology for the assessment.

#### Generation of direct, indirect and induced employment opportunities

- 6.9.50. The assessment of likely significant effects relating to employment opportunities during construction phase will use publicly available sources (i.e. Census 2011 and NOMIS). At this stage, it is considered that the local level study area will comprise Great Yarmouth and the regional level study area will comprise Norfolk.
- 6.9.51. In order to estimate the number of jobs that would be created during the construction phase, the total cost of the Proposed Scheme will be divided by the average output per year for construction workers in the area. These figures will be evaluated against the total number of employees in Industry Sector F (Construction) within the local and regional level study areas to determine the magnitude of change. This figure will be offset against the number of jobs that might be lost / displaced as a consequence of the need to relocate any affected businesses (albeit such jobs may be in a different sector).
- 6.9.52. The generation of indirect and induced employment opportunities associated with the construction phase of the Proposed Scheme will be calculated using a multiplier that is based on the anticipated linkages associated with the Proposed Scheme (i.e. 1.5 based on the multipliers set out in the Additionality Guide). As it will not be possible to isolate the Industry Sector where the impact may occur, the figures will be evaluated against the total number of employees in all Industry Sectors within the local and regional levels to determine the magnitude of change.

#### Loss of private and public land

- 6.9.53. The assessment for the construction and operation phases will be undertaken in accordance with the principles set out in the DMRB, Volume 11, Section 2, Part 6 'Land Use'<sup>60</sup>.

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<sup>60</sup> Design Manual for Roads and Bridges, Volume 11, Section 3, Part 6 Land Use, former Highways Agency, August 2001



6.9.54. The assessment will focus on the importance of the land (i.e. whether it is imperative to a business operation), the availability of alternative land within the vicinity and proportion of the land-take as an overall of each land holding.

6.9.55. The study area used for the assessment will be the land within and immediately adjacent to the Site itself.

#### Changes in accessibility for commercial marine activities

6.9.56. A qualitative assessment of effects related to change in access for commercial marine activities will be undertaken for the construction and operational phases. This will focus on the potential disruption to operations within the River Yare and Port operations. The assessment will draw upon the vessel simulation modelling, which will allow a virtual navigation of a vessel through the River Yare to test how the Proposed Scheme interacts with Port operations.

6.9.57. The study area used for the assessment will be determined through the vessel simulation modelling.

#### Change in driver delay and stress

6.9.58. The assessment will be in accordance with DMRB, Volume 11, Section 3, Part 9 'Vehicle Travellers'<sup>61</sup> and will consider changes in driver delay and stress. The qualitative assessment during the construction and operation phases will be focussed on the anticipated delay (in terms of time) for vehicle receptors to travel through the study area, which will comprise roads within and immediately surrounding the Site.

6.9.59. Changes in driver stress, defined as the adverse mental and physiological effects experienced by a vehicle traveller traversing a road network, will also be considered. The qualitative assessment during the construction and operation phases will take into account the road layout, junction frequency, speed and flow per lane.

#### Changes to accessibility and amenity value of public routes and recreational resources

6.9.60. The assessment of changes to accessibility and amenity value of public routes and recreational routes will be undertaken in accordance with DMRB Volume 11, Section 3, Part 8 'Pedestrians, Cyclists, Equestrians and Community Effects' and IAN 195/16 'Cycle Traffic and the Strategic Road Network'<sup>62</sup>.

6.9.61. The qualitative assessment of changes to accessibility will focus on disruption to routes due to construction activities / vehicles and increases in journey length / decrease of the route /recreational resource. During the operational phase, the assessment will evaluate changes to the availability of routes and access to the recreational resource within the immediate area of the Site.

6.9.62. The DMRB defines amenity value as the relative 'pleasantness' of an experience and notes a number of factors which contribute to this, including receptor's exposure to traffic – noise, dirt and air quality – and the effect of the Proposed Scheme itself. Noise, dirt and air quality will be dealt with elsewhere in the ES, and therefore will not be considered as part of this assessment.

6.9.63. The qualitative assessment of amenity value will focus on changes to fear / safety associated within the below:

- The current condition of the route / recreational resource (e.g. width of route etc.);

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<sup>61</sup> Design Manual for Roads and Bridges, Volume 11, Section 3, Part 9 Vehicle Travellers, former Highways Agency, June 1993

<sup>62</sup> Design Manual for Roads and Bridges, Volume 11, Section 3, Part 8 Pedestrians, Cyclists, Equestrians and Community Effects, former Highways Agency, June 1993

- Distance of the route / recreational resource from the works / the Proposed Scheme;
- The presence of any barriers between the users of the route / recreational resource and associated plant / traffic; and
- Changes to other conditions required for recreational activities (e.g. flow rate of the River Yare).

Increase in economic activity due to improved connectivity

- 6.9.64. A qualitative assessment of effects related to an increase in economic activity due to greater connectivity will be based on the implementation of the Proposed Scheme. The assessment will consider the potential effects on enhanced access for local businesses and industrial estates (including Harfrey's Industrial Estate) and reduction in journey times / delay. This will take into account the Economic Impact Report prepared for the Proposed Scheme.

## **ASSUMPTIONS AND LIMITATIONS**

- 6.9.65. The assessment will rely upon the use of secondary data within calculations and assumptions to generate an understanding of the likely significant effects resulting from the Proposed Scheme. As such, there are limitations associated with the secondary data applied in each case.
- 6.9.66. No user counts / surveys of the local routes will be undertaken as part of the Peoples and Communities assessment. However, where appropriate, information from the Non-Motorised User Context and Audit reports will be used to inform the assessment of effects.

## 6.10 HEALTH

### BASELINE CONDITIONS

- 6.10.1. This section sets out baseline conditions in relation to health, comprising sensitive receptors, local population and facilities information, and indicators of the status of the local health profile.

#### Study Area

- 6.10.2. The study area for the health baseline will be within the districts of Nelson, Southtown and Cobholm and Claydon. The area considered for potential direct impacts on health will be based on a 500m radius from the Proposed Scheme red line boundary.
- 6.10.3. The study area for the assessment of health will also need to take into account other topic assessments which have health-related impacts and the outcome of consultation with local health stakeholders.

#### Baseline Health Profile

- 6.10.4. The Public Health England (PHE) Health Profiles<sup>63</sup> for each local authority area compare the indicators of a number of population health statistics for each area with the national average. The information for Great Yarmouth is listed below.

#### *Population Health:*

- 6.10.5. The PHE profile indicates that excess weight in children and adults are both slightly higher than the national average. Life expectancy at birth for both male and female are slightly lower than the national average. Mortality rates for under 75 year olds from cardiovascular diseases and cancer are both higher than the national average. The PHE data therefore indicates that the population health within the study area is worse than the national average.

**Table 34 - Indicators of Population Health for Great Yarmouth Compared with England**

Indicator	Period	Great Yarmouth	England Value
Obese children (Year 6)	2015-16	20.8	19.8
Excess Weight in Adults	2015-16	66.2	61.3
Life Expectancy at birth – Males	2013-15	78.2	79.5
Life Expectancy at birth – Females	2013-15	82.4	83.1
Under 75 Mortality: Cardiovascular	2011-15	79.6	73.5
Under 75 Mortality: Cancer	2011-15	154.8	136.8

<sup>63</sup> Public Health England (2017) Great Yarmouth District Health Profile 2017 [online] Available at <http://fingertipsreports.phe.org.uk/health-profiles/2017/e07000145.pdf> Accessed January 2018



*Health Inequality:*

- 6.10.6. The profile indicates that the difference in life expectancy between the most and least deprived areas is high. If there was no inequality in life expectancy, the difference would be zero. The PHE data therefore indicates that there is health inequality in Great Yarmouth.

**Table 35 - Difference in life expectancy in Great Yarmouth between most and least deprived areas 2013**

Indicator	Male	Female
Life expectancy gap between most and least deprived areas	9.1 years	7.0 years

*Deprivation:*

- 6.10.7. The profile indicates that deprivation for the study area is higher compared to the national average. The PHE health profile data indicates that Nelson, Southtown and Cobholm and Claydon are more deprived areas than the national average.

**Table 36 - Indicator of Deprivation for the Study Area Compared with England**

Indicator	Period	Nelson	Southtown & Cobholm	Claydon	Great Yarmouth	England Value
Deprivation (Index of Multiple Deprivation)	2015	71.9	45	41.3	32.4	21.8

*Lifestyle:*

- 6.10.8. The profile indicates that smoking prevalence in Great Yarmouth is slightly higher than the national average. The percentage of physically active adults is lower in Great Yarmouth in comparison to the national average. The PHE data therefore indicates that the adult population in Great Yarmouth has a worse approach to lifestyle behaviour when compared to the national average.

**Table 37 - Indicators of Lifestyle for Adults in Great Yarmouth Compared with England**

Indicator	Period	Great Yarmouth	England Value
Smoking Prevalence in Adults	2016	15.7	15.5
Percentage of Physically Active Adults	2015-16	56.9	64.9

*Children:*

- 6.10.9. The proportion of children in low income families in Great Yarmouth is higher than the national average. The incidence of obesity amongst children in Great Yarmouth is slightly higher than the national average. The GCSEs achieved in Great Yarmouth are lower than the national average. The PHE health data therefore indicates that the level of health and education of children in Great Yarmouth is lower than the national average.

**Table 38 - Indicators of Childhood Health in Great Yarmouth Compared with England**

Indicator	Period	Great Yarmouth	England Value
Children in Low Income Families (under 16s)	2014	25.8	20.1
Obese Children (Year 6)	2015/16	20.8	19.8
GCSEs Achieved	2015/16	48.7	57.8

*Collisions Risk:*

- 6.10.10. The population of Great Yarmouth appears to experience a lower number of fatalities or instances of being seriously injured on roads than the national average. The PHE data therefore indicates that roads in Great Yarmouth are safer than the national average.

**Table 39 - Indicator of Collision Risk in Great Yarmouth Compared with England**

Indicator	Period	Great Yarmouth	England Value
Killed and Seriously Injured on Roads	2013-2015	30.9	38.5

Receptors

- 6.10.11. Receptors for potential health effects include:

- 893 residential properties;
- River Yare;
- Great Yarmouth Primary Academy;
- Frank Stone Court (Nursing home);
- Avery Lodge (Nursing home);
- Southtown Common Recreation Ground;
- Pleasure Beach;
- Footpath No.5 in Parish of Great Yarmouth and Gorleston;
- National Cycle Network 517;
- England Coast Path Stretch 2;
- Norfolk Coast Path;
- Peggotty Road Community Centre; and
- The Redeemed Christian Church of God.

**POTENTIAL IMPACTS OF THE PROPOSED SCHEME**

- 6.10.12. A number of potential construction impacts which may have adverse impacts on health were identified:

- Temporary impacts relating to dust and construction noise;
- Potential temporary closures or diversions of PRow may affect different populations disproportionately or in different ways. For example, population from lower incomes will be more likely to walk to and from their destinations, making them more sensitive to changes in these routes;
- Potential temporary closures or diversions of roads and bus route may affect different populations disproportionately or in different ways. For example, older people, people with disabilities, pregnant women and families with young children will be more likely to travel through vehicles and public transport, making them more sensitive to changes in these routes. Furthermore, two fire stations are located within the 500m



study area and are likely to affect by route diversion, make fire rescue services more sensitive to changes in these routes due to increase journey time; and

- Potential temporary closures or diversions of cycle route may affect cyclist adversely due to increase journey time.
- Indirect effects from transportation and storage of materials and waste.

6.10.13. However, these impacts would be managed through standard environmental and traffic management practices during construction. They are unlikely to be significant. Furthermore, construction impacts are also addressed in relation to People & Communities, Air Quality and Noise assessments in this Scoping Report.

6.10.14. During operation, a number of potentially positive impacts on health were identified. These include increased connectivity; mobility; encourage walking and cycling; reduce and minimise road injuries; provide access to public transport, health care, social facilities and for people with mobility problems or a disability; improve access to natural and open spaces; provide access to local employment and training opportunities; and incorporate sustainable urban drainage techniques.

6.10.15. Although no negative effects were identified, there were a number of uncertain impacts which could result in negative effects on health. These comprise:

- Community severance – although communities will be better connected by provision of an additional bridge, the demolition of residences can affect people through stress, relocation and then potential loss of their local community networks;
- Air quality impacts from road traffic;
- Loss of local biodiversity;
- Increase in crime depending on design

## PROPOSED ASSESSMENT METHODOLOGY

6.10.16. An initial health screening and scoping assessment was completed using the London Healthy Urban Development Unit (HUDU) screening tool<sup>64</sup> (Appendix F.1). This was undertaken so that the potential health effects could be identified and considered early on in project development. The exercise identifies potentially affected populations, including vulnerable groups, in addition to aspects of the project which may give rise to effects on health. Where there is potential for effects on health, issues to be considered during scoping and subsequent assessment are also identified.

6.10.17. Appendix H shows the results of the screening and scoping exercise.

6.10.18. A number of potentially vulnerable groups were identified:

- Gender (include pregnancy & maternity), pregnant women and those with young families would be temporarily adversely affected due to the restricted access and public transport;

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<sup>64</sup> London Healthy Urban Development Unit (2017) Rapid Health Impact Assessment Tool Third Edition [online] Available at: <https://www.healthyrbandevelopment.nhs.uk/wp-content/uploads/2017/05/HUDU-Rapid-HIA-Tool-3rd-edition-April-2017.pdf> Accessed January 2018

- Religion & Belief, the Proposed Scheme may potentially anticipate a temporary adverse air quality and noise impact on users of the church during construction due to the close proximity of the church to the Proposed Scheme;
- Children and Young People (Age 0-19), potential temporary adverse air quality and noise impacts are anticipated during construction due to the close proximity of a primary school to the Proposed Scheme;
- Older People (Age 50+), would be temporary adversely affected due to the restricted access;
- Disability, would be temporarily adversely affected due to the restricted access and public transport; and
- Public Services, a potential temporary adverse impact is anticipated due to the increase journey time for fire rescue services.

6.10.19. Potential effects on health arising from air quality and noise would be covered under these respective sections of this report. The People and Communities assessment will also cover potential impacts on community severance, loss of property, economic benefits and community facilities. Impacts on landscape and nature conservation are unlikely to affect health given the existing urban nature of the environment and retention of open space. It is therefore proposed that a stand-alone health chapter is scoped out of the EIA as potential impacts are either positive, unlikely to be significant or are already being assessed within other Environmental Topic Chapters.



## 6.11 MATERIALS

- 6.11.1. This section considers the implications of the Proposed Scheme on the consumption of materials resources (which includes recovered site arisings), and the generation and disposal of waste. It sets out the proposed methodology and identifies those impacts that can be scoped out of the EIA.
- 6.11.2. The assessment methodology proposed in this assessment is based on guidance set out in IAN 153/11 (Highways Agency, 2011) Environmental Assessment of Material Resources<sup>65</sup>. IAN153/11<sup>66</sup> sets out the process and information required for the assessment of significant effects from material resources and waste.
- 6.11.3. Materials resources are defined in IAN 153/11 as "the materials and construction products required for the construction, improvement and maintenance of the road network. Materials resources include primary raw materials such as aggregates and minerals, and manufactured construction products. Many material resources will originate off site, purchased as construction products, and some will arise on site such as excavated soils or recycled road planings".
- 6.11.4. IAN 153/11 does not include a definition of waste, however the EU Waste Framework Directive<sup>67</sup> defines it as "any substance or object that the holder discards or intends or is required to discard".

### BASELINE CONDITIONS

- 6.11.5. The primary study area comprises the Application Site boundary, as shown in Drawing 62240375-GYTRC-Scoping Report Boundary-20180219, which is presented in Appendix B.
- 6.11.6. The secondary study area extends to the availability of construction and recovered material resources within the East of England (Hertfordshire, Bedfordshire, Cambridgeshire, Essex, Norfolk and Suffolk) and the UK, and the capacity of waste management facilities in the East of England.
- 6.11.7. The operation and maintenance of the current infrastructural assets owned by NCC (highways, parking areas, lighting, pavements and kerbing – for example) within the boundary of the Proposed Scheme will require the consumption of some material resources, and will generate arisings that may need to be disposed of as waste.
- 6.11.8. Sections 6.11.9 to 6.11.29 describe baseline material consumption and waste disposal for these current assets, and provide a regional / national information and data in the context of which subsequent environmental impact assessment will be undertaken.

#### Material Resources

##### *Materials currently required*

- 6.11.9. The operation and maintenance of the current infrastructural assets within the Proposed Scheme boundary are likely to require a small number of specialist components (for example, light bulbs, signage steelwork, kerbstones) as well as some bulk products (asphalt for minor re-surfacing) for routine works and repairs.
- 6.11.10. The current consumption of construction and other material resources within the Site is, however, deemed negligible.

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<sup>65</sup> Highways Agency (2011) Interim Advice Note (IAN) 153/11 – Guidance on the Environmental Assessment of Material Resources [\[Link\]](#)

<sup>66</sup> Interim Advice Note (IAN) 153/11 (2011) Guidance on the Environmental Assessment of Material Resources, Volume 11 [online] available at: <http://www.standardsforhighways.co.uk/ians/pdfs/ian153.pdf> (Accessed November 2017).

<sup>67</sup> The EU Waste Framework Directive, European Directive 2006/12/EC, as amended by Directive 2008/98/EC. [\[Link\]](#)



6.11.11. The do-minimum option (no scheme pursued) is not expected to change the current consumption of material resources within the Proposed Scheme Footprint.

*UK and regional perspective: availability of construction materials*

Table 40 provides a summary of the availability of the main construction materials in the East of England and the UK, as required to deliver typical highways and bridge schemes. The overview provides a context in which the assessment of impacts and significant effects from material consumption on the Proposed Scheme can be undertaken.

**Table 40 - Construction materials available in the East of England and the UK**

Material type		Availability (2015 data unless otherwise stated)	
		East of England	UK
Aggregate	Sand and gravel *	11.6Mt	58.1Mt (to Q3 2015)
	Permitted crushed rock *	456,000t (2016)	98.5Mt
Recycled and secondary aggregate (as part of 'Aggregate', above) *		(not available)	63Mt
Ready-mix concrete +		1.4Mm3	25.2Mm3
Asphalt *		2.3Mt	26.3Mt
Concrete blocks #		(confidential)	72.9Mm3
Steel +		(not available)	11Mt
# stocks	+ production	* sales	

6.11.12. Currently, data for the East of England regarding materials typically required for highways and bridge construction, are incomplete; accordingly, a full picture of resource availability in the region cannot be obtained.

6.11.13. However, the availability of all construction materials in the UK indicates that stocks / production / sales remain buoyant. Using UK data as a proxy, in combination with information that is available for the East of England, the sensitivity of materials availability for the Proposed Scheme is assessed to be low.

Site Arisings

*Site Arisings Currently Generated:*

6.11.14. Current routine operation and maintenance works on current infrastructural assets within the Proposed Scheme boundary (roads, roundabouts, junctions) are likely to generate negligible volumes of site arisings.

6.11.15. The do-minimum option (no scheme pursued) is not expected to change the volume or type of site arisings generated within the footprint of the Proposed Scheme.

*National and Regional Perspective: Transfer, Recovery and Recycling:*

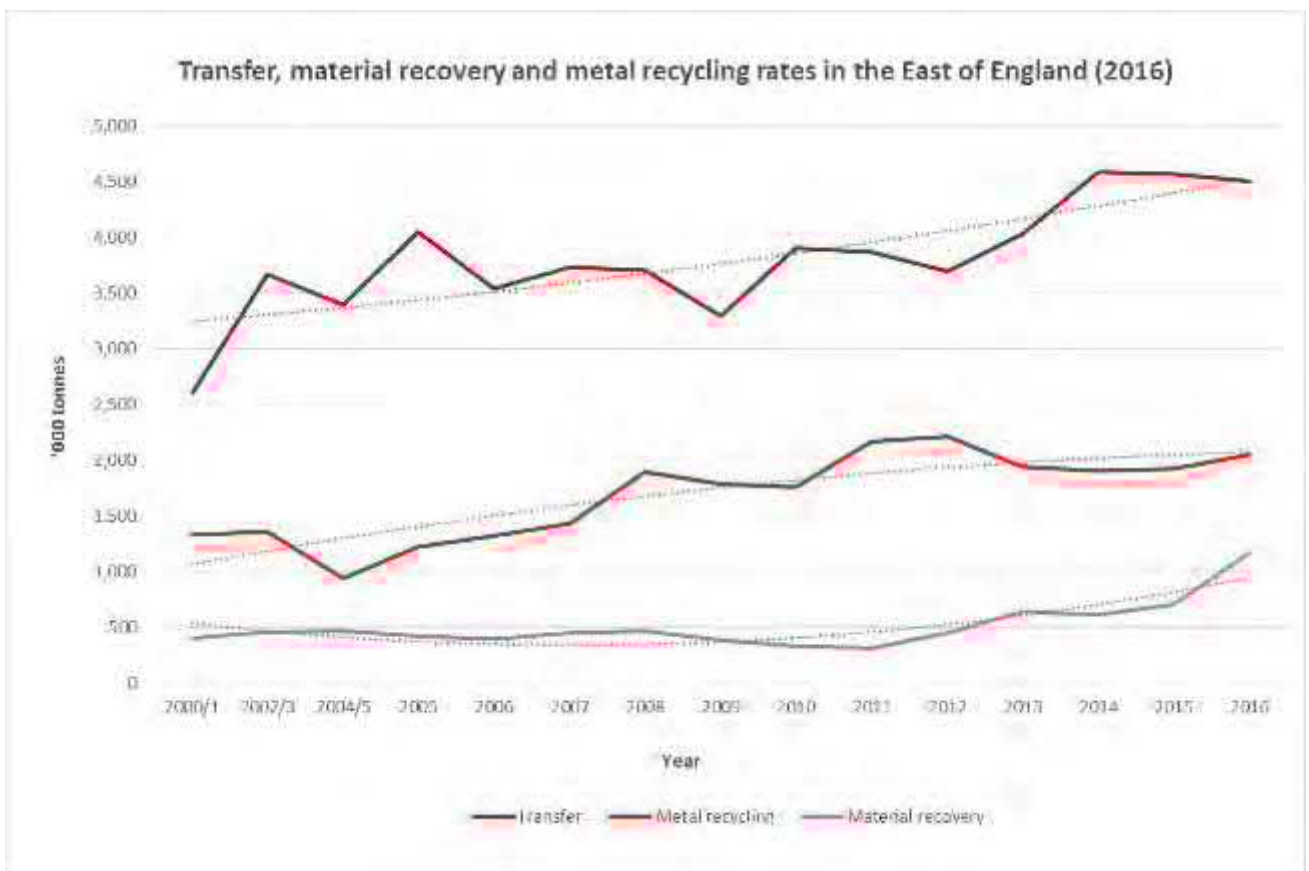
6.11.16. Defra data (Table 40) shows that within England, the recovery rate for non-hazardous construction and demolition arisings has remained above 90% since 2010. This exceeds the EU target of 70%, which the UK must meet by 2020.

6.11.17. No regional data for construction, demolition and excavation production or recovery rates are currently available for the East of England.

**Table 41 - Non-hazardous construction and demolition arisings and recovery in England**

Year	Generation (Mt)	Recovery (Mt)	Recovery rate (%)
2010	43.9	39.7	90.5%
2011	44.1	39.9	90.6%
2012	45.3	41.3	91.1%
2013	46.3	42.1	91.1%
2014	49.1	44.9	91.4%

6.11.18. Figure 7 shows that rates of material transfer (non-civic), recovery and metal recycling within the East of England continue to rise steadily. Since 2011, rates for material recovery have increased notably. Data provided include all waste types in the region and hence will include, but are not specific to, construction, demolition and excavation arisings.



**Figure 7 – Transfer, material recovery and metal recycling in the North East of England**

6.11.19. Available data demonstrate that the upward trends for transfer, recovery and metal recycling within the East of England remain consistent. Data indicate that there is likely to be regional infrastructure and capacity for the transfer and recovery for construction, demolition and excavation arisings from the Proposed Scheme. Construction and demolition recovery trends across England (Table 36) demonstrate further capacity in this context.

6.11.20. The availability of materials recovery infrastructure in the East, and across England, suggests that there is strong potential to divert from landfill site arisings generated by the Proposed Scheme. Both the importance (positive value) of this infrastructure, and (hence) the potential to maximise the re-use / recycling value of site arisings, are assessed to be high.

## Waste Generation and Disposal

### *Waste currently generated and disposed of:*

- 6.11.21. The operation and maintenance of the infrastructural assets currently within the Proposed Scheme boundary are likely to generate small volumes of waste from routine highway maintenance, in combination with littering, light replacement, signage replacement, and replacement of reflective road studs (cats' eyes). The anticipated effects of disposing of this waste are deemed negligible in the context of available regional capacity.

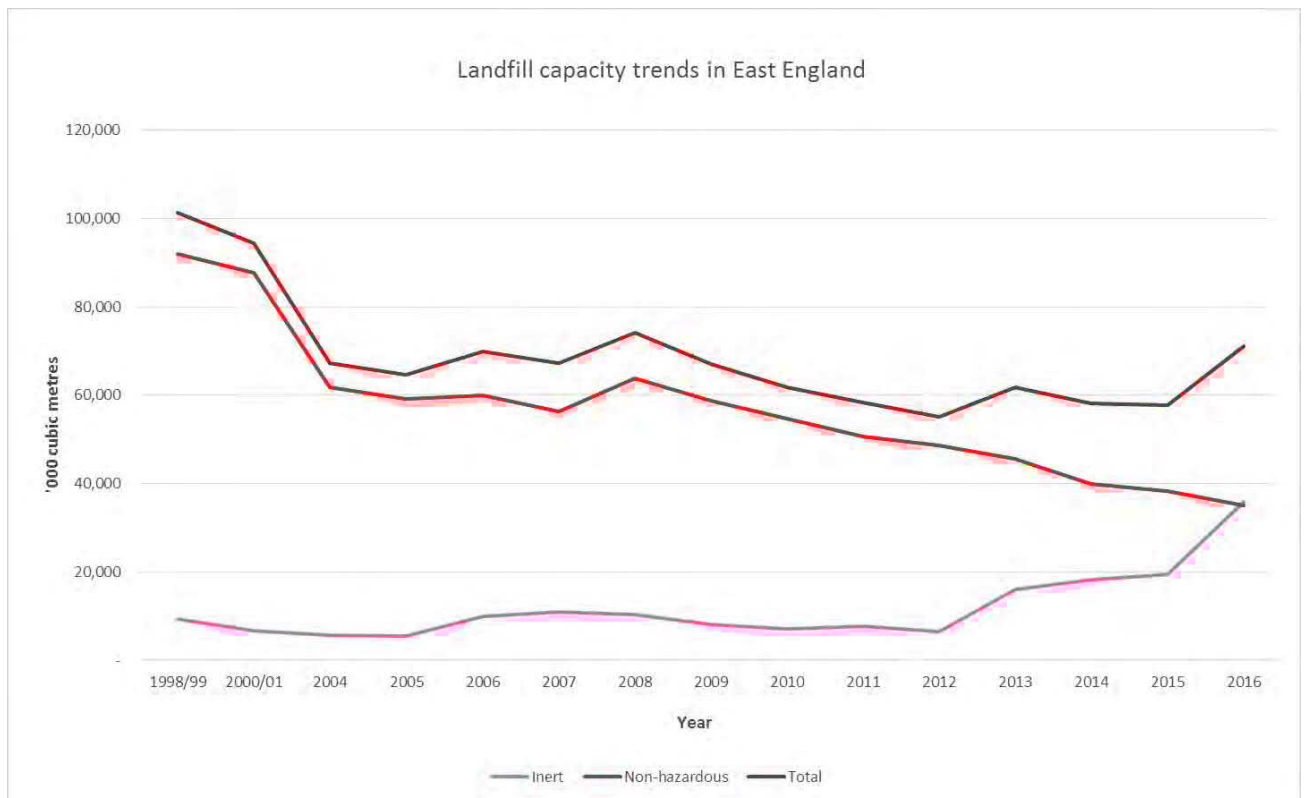
### *Regional perspective: remaining landfill capacity:*

- 6.11.22. At the end of 2016, the East of England had 45 active landfill sites with 58.2Mm<sup>3</sup> of remaining capacity. Table 42 summarises the Environment Agency data relating to these landfill types.

**Table 42 - Landfill capacity in the East of England (2016)**

Landfill type		Number of sites	Remaining capacity (M m <sup>3</sup> , end of 2016)
Inert		22	36.0
Non-hazardous	Non Hazardous	19	28.6
	Non Hazardous with Stable Non-Reactive Hazardous Waste Cell	4	6.5
Hazardous		0	0.0
Total remaining capacity		45	71.1

- 6.11.23. Environment Agency data confirm that at the end of 2016, remaining landfill capacity in the East of England was: 36.0Mm<sup>3</sup> for inert (up 16.4Mt from 2015) and 35.1Mm<sup>3</sup> for non-hazardous (3Mt down from 2015). No regional remaining capacity for hazardous waste was recorded.
- 6.11.24. Using the most up to date information available, trends for baseline regional landfill capacity are detailed in Figure 8 overleaf.
- 6.11.25. Due to the fact that a significant increase in inert landfill site capacity was recorded in 2016 for the East of England region (16.4Mt or 84%), incorporating forecasting data and trend lines for remaining void space to the first year of operation, has not been possible for this waste type.
- 6.11.26. Simple forecasting calculations (using the MSEXcel forecast function) shows that non-hazardous landfill capacity may (in the absence of future provision) decrease as much as 56% by 2023/24 (the first year of scheme operation).
- 6.11.27. No new capacity for hazardous waste (currently absent) is expected in the region.
- 6.11.28. Individually, the sensitivity of different landfill capacity types is assessed to be inert (negligible), non-hazardous (high) and total (low). On average, the sensitivity of landfill capacity is assessed to be medium.



**Figure 8 - East of England Remaining Landfill Capacity (2000/1-2016)**

## POTENTIAL IMPACTS OF THE PROPOSED SCHEME

- 6.11.29. The Proposed Scheme has the potential to consume material resources (including those recovered from site arisings), and produce and dispose of waste, during the demolition, site preparation and construction phases of delivery.
- 6.11.30. The associated potential environmental impacts (both direct and indirect) will occur during these lifecycle phases. Impacts arising further into the operational lifecycle are expected to be negligible, and hence (as described in Table 43) have been scoped out of this assessment.
- 6.11.31. The effects associated with the described impacts include those associated with the production, processing, consumption and disposal of material resources. These effects are likely to occur on-site, off-site within the UK and, potentially, internationally.
- 6.11.32. It is important to note that direct and indirect impacts and effects as a result of the transportation of material resources and waste to and from site, will not be assessed within the Material Resources chapter. Instead, they will be considered in the Air Quality, People and Communities, Noise, Water & Drainage, and Climate chapters, as appropriate to these specialist topics. Similarly, issues concerning land contamination and resource sterilisation will be assessed within the Geology & Soils chapter.
- 6.11.33. In response to the requirements set out in IAN 153/11 (paragraph 3.2.1 of the guidance), a summary of the potential for material resource consumption and waste generation and disposal to generate significant environmental effects, is provided in Table 43. Where appropriate, the potential influence of recovering and reusing/recycling site arisings is also included within Table 43.

**Table 43 - Potential impacts and significant effects of consuming material resources and disposing of waste**

Element	Use of materials resources	Production and disposal of waste
Demolition	No potential significant effects identified with regards to the consumption of material resources during demolition.	<ul style="list-style-type: none"> <li>■ Waste in this phase of the works would be produced during the demolition (on the west side of the River Yare) of residential buildings and associated assets on Queen Anne’s Road and Southampton Road, and during the demolition of a large non-residential building (warehouse) adjacent to Cromwell Court.</li> <li>■ Demolition waste would also be generated in the breaking out of highways and junctions on (particularly) Queen’s Anne Road and Suffolk Road to the west of the River Yare, and in works required on the east of the river to a non-residential property (a warehouse and concreted external area).</li> </ul> <p>Wastes generated during demolition are likely to include:</p> <ul style="list-style-type: none"> <li>■ brick, mortar, concrete, steel, timber, tiles and glass;</li> <li>■ broken out concrete, cut steel and road surface planings;</li> <li>■ hazardous or contaminated material found on or beneath the Proposed Scheme; and</li> <li>■ other demolition wastes.</li> <li>■ As far as possible, it would be expected that arisings from demolition would be reused and / or recycled on or off site, with beneficial effect. Where diverting site arisings from landfill is not possible, the impacts associated with disposing of waste would be adverse, permanent and direct.</li> <li>■ The potential for significant effects from waste disposal is associated with the commensurate reduction in landfill capacity, and any indirect effects that result (greenhouse gas emissions, water consumption, water pollution – among others). Landfill capacity is increasingly considered a sensitive receptor in the UK.</li> <li>■ The demolition of buildings, highways and associated assets is likely to result in a considerable volume of arisings, a proportion of which (after the potential for reuse and recycling has been maximised) may need to be disposed of.</li> </ul>

Element	Use of materials resources	Production and disposal of waste
<p>Site remediation and preparation</p>	<ul style="list-style-type: none"> <li>■ Timber and steel products will be required for the erection of perimeter fencing and temporary barriers as part of the site preparation phase.</li> <li>■ It is also expected that material resources (concrete, steel, formwork, other) will be required during the stabilisation, laying out and making safe of areas adjacent to the River Yare, ready for construction of the new river embankments, retaining walls and bridge.</li> <li>■ Temporary stockpile and construction areas may also be required, and could necessitate the consumption of aggregate and stone for ground improvements prior to use by heavy plant and equipment.</li> <li>■ Impacts associated with material resource consumption at this stage are likely to be adverse, permanent and direct.</li> <li>■ In combination with other lifecycle stages (particularly construction of the Proposed Scheme), there is potential to generate significant adverse effects from material resource consumption during site remediation and preparation.</li> </ul>	<ul style="list-style-type: none"> <li>■ Where demolition waste needs to be disposed of, and in combination with other the on-site phases, there is potential for significant adverse effects.</li> </ul> <p>Wastes likely to be generated during site preparation include:</p> <ul style="list-style-type: none"> <li>■ vegetation and other above ground materials produced by site clearance;</li> <li>■ paving, kerbing, bitumen and sub-base material;</li> <li>■ surplus non-highway subsoil material;</li> <li>■ hazardous or contaminated material found on or beneath the Proposed Scheme.</li> <li>■ The presence or extent of any hazardous or contaminated substances is currently unknown, but will be informed by Ground Investigation.</li> <li>■ There is potential for considerable waste to be produced and disposed of during site preparation works; associated impacts would be adverse, permanent and direct. Some impacts could be precluded where arisings e.g. subsoil and kerbing, can be diverted from landfill.</li> <li>■ Where waste from site remediation and preparation does need to be disposed of, there is potential for significant adverse effects.</li> </ul>
<p>Proposed Scheme construction</p>	<ul style="list-style-type: none"> <li>■ Material resources will be required for the construction of the Proposed Scheme, including (but not limited to): local road realignment and development, alterations to roundabouts and junctions, the construction of the new embankments and retaining walls (7m) on either side of the River Yare, and the construction of the double leaf trunnion bridge.</li> </ul> <p>Construction materials required are anticipated to include:</p> <ul style="list-style-type: none"> <li>■ Bulk materials for earthworks (volumes will be dependent on the cut and fill balance);</li> <li>■ Road and pedestrian paving and kerbing materials, including sub-base and bituminous materials;</li> </ul>	<ul style="list-style-type: none"> <li>■ Waste is anticipated to be generated during the construction of the Proposed Scheme, particularly during the construction of new roads, roundabouts and junctions, and in the digging out and construction of the new river embankments.</li> </ul> <p>It is anticipated that the following wastes would be generated:</p> <ul style="list-style-type: none"> <li>■ Timber and steel from formwork and fencing;</li> <li>■ Concrete, bricks, aggregate and steel waste;</li> <li>■ Road paving materials including sub-base and bituminous materials;</li> <li>■ Hazardous or contaminated material found or generated on site;</li> </ul>

Element	Use of materials resources	Production and disposal of waste
	<ul style="list-style-type: none"> <li>■ Steel for bridge structures and sheet piling;</li> <li>■ Concrete including for pre-cast and prefabricated elements, especially for the new embankments, retaining walls and bridge structure;</li> <li>■ Bricks, sand and aggregate;</li> <li>■ Timber and steel for fencing and formwork;</li> <li>■ New street furniture, signage and lighting;</li> <li>■ Cabling; and</li> <li>■ Other general construction materials.</li> <li>■ The volumes of material resources required for the Proposed Scheme will be ascertained during environmental impact assessment. Volumes of bulk earthworks, road paving, steel, concrete and aggregate are expected to be significant.</li> </ul> <p>The main impacts as a result of the use of materials are the consumption of natural resources. Impacts would be considered adverse, direct and permanent, and would result in the following effects:</p> <ul style="list-style-type: none"> <li>■ depletion of natural resources and local / regional stocks; and</li> <li>■ degradation of the natural environment.</li> <li>■ Based on the scale and nature of the works it is anticipated that the consumption of material resources has the potential to have significant adverse effects.</li> </ul>	<ul style="list-style-type: none"> <li>■ Surplus cabling;</li> <li>■ Redundant street furniture, signage and lighting;</li> <li>■ General construction waste e.g. packaging, ducting, damaged goods.</li> <li>■ The volumes of waste likely to be generated and disposed of as result of the Proposed Scheme will be identified and assessed during environmental impact assessment.</li> <li>■ Impacts as a result of waste generation would be adverse and direct, and are generally accepted to be permanent in nature. The resultant adverse effects would be a reduction in landfill void capacity, and any indirect effects that result (greenhouse gas emissions, water consumption, water pollution – among others).</li> <li>■ It is expected that a programme commitment to reuse or recycle site arisings will be established – making use of these resources either within, or outside, the Proposed Scheme boundary. Where this is not possible, disposal is likely to be required.</li> <li>■ Based on the scale and nature of the works, it is anticipated that there is potential for significance adverse effects from the generation and disposal of waste.</li> </ul>
<p>Operation and maintenance of asset</p>	<p>In the first year of operation, minor amendments and changes to the Proposed Scheme assets may be required. Depending on the extent of these changes, the potential to consume material resources (including recovered site arisings), and produce and dispose of waste may be required. Where these changes can be forecast for the first year of operation, they will be included in the environmental impact assessment.</p> <p>The extent of changes within the first year of operation is not currently known, but professional judgement would indicate that there are unlikely to be significant effects.</p> <p>Similarly, and beyond the first year of operation, it is predicted that there will no significant effects. This element has therefore been scoped out of the assessment.</p>	

Design Mitigation/Enhancement

- 6.11.34. Specific design, mitigation and enhancement measures to avoid and mitigate adverse impacts from materials consumption and the generation and disposal of waste, and to encourage beneficial outcomes from the recovery and reuse of site arisings, may include those set out in Table 44.
- 6.11.35. Measures that have been (or will be) adopted, will be identified during subsequent assessment stages.

**Table 44 - Potential design, mitigation and enhancement measures**

Element	Enhancement and mitigation measures	Application lifecycle stage	Monitoring
Material resources	Identification and specification of materials that can be acquired responsibly, in accordance with BES 6001 Responsible Sourcing of Construction Products. <sup>68</sup>	Design, construction	Incorporate on engineering plans configurations and layouts that show how the most effective use of materials can be achieved. Maintain records of materials that were acquired in accordance with BES 6001 Responsible Sourcing of Construction Products.
	Design for resource optimisation: simplifying layout and form, using standard sizes, balancing cut and fill, maximising the use of renewable materials, and materials with recycled or secondary content, and setting net importation as a Proposed Scheme goal.	Design	
	Design for off-site construction: maximising the use of pre-fabricated structures and components, encouraging a process of assembly rather than construction	Design	
	Design for the future: considering how materials can be designed to be more easily adapted over an asset lifetime, and how deconstructability and demountability of elements can be maximised decommissioning/ at end-of-first-life.	Design	
Site arisings	Design for recovery and reuse: identifying, securing and using materials at their highest value, whether they already exist on site, or are sourced from other schemes.	Design	Incorporate on engineering plans configurations and layouts that show how the most effective use of site arisings can be achieved. Implement a regime of comparing and contrasting data on site arisings in a Design Site Waste Management Plan (forecast), with construction data (actuals)
	Identify opportunities to minimise the export and import of materials.	Design, construction	
	Working to a proximity principle, ensuring arisings generated are handled, stored, managed and re-used or recycled as close as possible to the point of origin.	Design, construction	
	Identify areas for stockpiling and storing arisings that will minimise quality degradation and leachate, and will minimise damage and loss.	Design, construction	

<sup>68</sup> British Research Establishment (BRE) BES 6001 The Framework Standard for Responsible Sourcing of Construction Products (Version 3.1 2014) [\[link\]](#)



Element	Enhancement and mitigation measures	Application lifecycle stage	Monitoring
	Ensure potential arisings and waste are properly characterised before or during design, to maximise the potential for highest value reuse.	Design	
	Capture information and data on site arisings recovered and diverted from landfill, by developing a Design Site Waste Management Plan once a preferred option has been selected.	Design	
	Implement a Materials Management Plan in accordance with the CL:AIRE 69 Definition of Waste: Code of Practice.	Construction	
Waste to landfill	Engage early with contractors to identify possible enhancement and mitigation measures, and to identify opportunities to reduce waste through collaboration and regional synergies.	Design, Procurement	Implement a regime of comparing and contrasting data on waste in a Design Site Waste Management Plan (forecast), with construction data (actuals) Ensure all legal documentation (waste carrier registration, landfill licence, waste transfer documentation) associated with the management of construction and operational materials, site arisings and waste is recorded and retained.
	Capture information and data on waste sent to landfill, by developing a Design Site Waste Management Plan once a preferred option has been selected.	Design	

### Residual Effects

- 6.11.36. It is anticipated that, with the implementation of effective mitigation measures, including designing out waste, and implementing a Construction Environmental Management Plan (CEMP), Site Waste Management Plan (SWMP) and Materials Management Plan (MMP) on site, that there would be no significant residual effects associated with material resources.
- 6.11.37. This assertion will be tested fully as part of the Proposed Scheme environmental impact assessment.

### **PROPOSED ASSESSMENT METHODOLOGY**

- 6.11.38. The primary guidance that will be used to inform the assessment process is IAN153/11 Environmental Assessment of Material Resources.
- 6.11.39. As the proposed works comprise demolition works, highway alterations and the generation of a new river crossing with associated infrastructure, the Proposed Scheme is classed as a 'large local major scheme'; this aligns with the IAN153/11 guidance definition of 'complex improvement and large new construction works'. In

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<sup>69</sup> CL:AIRE is the acronym for 'Contaminated Land: Applications in Real Environments'



accordance with the requirements for complex works set out in the guidance, a detailed assessment of material resources shall be undertaken.

6.11.40. As stated in Table 44, the consumption of material resources and production / disposal of waste beyond the first year of Proposed Scheme operation, has been scoped out because forecasts anticipate negligible impacts and effects.

6.11.41. As part of the environmental impact assessment, the following tasks will be carried out:

- relevant waste legislation, policies and guidance will be reviewed to identify material use and waste management objectives, commitments and targets;
- the likely types of material resources (including site arisings) and waste will be identified, and quantities estimated for the Proposed Scheme; for waste, inert and non-inert forecasts will be made;
- impacts will be evaluated against the regional and national materials markets and the capacity of regional (or if appropriate, national) waste infrastructure;
- opportunities to eliminate, reduce, re-use, recycle or recover material resources, site arisings and (potential) waste, will be identified through a review of the Proposed Scheme (including proposed building materials, construction methods and design, where available) and in accordance with industry best practice; and
- identification of viable circular economy opportunities in design and construction will be made.

6.11.42. The Environmental Statement will take into account the nature of impacts (adverse/beneficial, permanent/temporary, direct/indirect) from material resources and waste. Significance of effects will be determined using Table 2.4 in DMRB Volume 11 Section 2 Part 5 HA 205/08<sup>70</sup> whilst also taking into account the requirements of the national and local policy documents.

6.11.43. The main outputs from the detailed assessment will be:

- the identification of the environmental impacts and the significance of effects associated with material resources (including site arisings) and waste; and
- the measures which will be implemented to eliminate or mitigate impacts, and to fulfil resource efficiency and circular economy opportunities.

## **ASSUMPTIONS AND LIMITATIONS**

6.11.44. No assumptions have been made within the preparation of this assessment.

### Limitations: availability of baseline data

6.11.45. Baseline data and information for the assessment are (unless otherwise stated) only available to 2016.

6.11.46. UK landfill operators can claim commercial confidentiality for their data at time of submission; data for sites with a commercial confidentiality in place are unavailable for the analyses presented in this assessment.

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<sup>70</sup> Design Manual for Roads and Bridges Volume 11, Section 2, Part 5: H205/08, former Highways Agency, August 2008

Limitations: availability of CDE data

- 6.11.47. The Department of the Environment, Food and Rural Affairs has been consulted to determine whether generation and recovery rates for Construction, Demolition and Excavation (CDE) arisings were available by English region.
- 6.11.48. Defra confirmed that it does not publish Construction Demolition Excavation figures at a regional level, and only national (England) data are accessible through the publically available Waste Data Interrogator Database<sup>71</sup>; the database is held and operated by the Environment Agency. It was quoted that:
- 6.11.49. *“The methodology used to generate these figures is complex, in order to take into account the inherent double-counting and data gaps that are present within waste system data, and it would not be feasible to reproduce these on a regional basis.”*
- 6.11.50. Until such a time that Construction, Demolition and Excavation generation and recovery rates by region are available, transfer (non-civic), recovery and metal recycling data (available through the Waste Data Interrogator Database) will be used as the closest possible proxy.

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<sup>71</sup> Environment Agency, Waste Interrogator Database [\[link\]](#)



## 6.12 GEOLOGY AND SOILS

### BASELINE CONDITIONS

#### Designated Sites

- 6.12.1. There are no geologically designated sites within 500m of the Proposed Scheme.

#### Bedrock Geology

- 6.12.2. Published geology as detailed on the British Geological Survey (BGS) website<sup>72</sup> indicates the bedrock geology underlying the site is sand and gravel of the Crag Group.

#### Superficial Geology

- 6.12.3. The BGS website also indicates that the site is underlain by superficial deposits comprising peat in the south west, clay and silt in the north, sand and gravel in the east beyond the River Yare and clay and silt within the River Yare.

#### Soils and Sediment

- 6.12.4. The nature of onsite soils is undetermined. A ground investigation is currently being undertaken to characterise these. The SoilsCapes website (<http://www.landis.org.uk/soilscapes/>) indicates the soils to the west of the river and a thin strip to the east of the river are comprised of loamy and clayey soils of coastal flats with naturally high groundwater. The bulk of the soils to the east of the river are classified as freely draining slightly acid sandy soils. Beyond this, adjacent to the sea front are sand dune soils. However, due to previous development across the site, it is unlikely that significant amounts of naturally occurring soils are present and made ground is more likely to be prevalent.

#### Potentially Contaminated Sites

- 6.12.5. WSP prepared an Environmental Desk Study Report, reference 62240375-016-R01 dated July 2017 (a separate report to this Scoping Report) presented in Appendix I, which includes a review of information from a GroundSure Report. This records that no locations within the site are determined as contaminated land under Part 2A legislation, but does record a number of historical ground workings, as well as industrial uses; all of which may have introduced contaminated material on to site, including a gasworks, boat building, an icehouse, fish canning, oilskin production, iron works, rope works, printing works, shoe factory and unspecified wharf /quay.
- 6.12.6. There is one record of an Environment Agency licensed waste site present onsite – waste transfer station for household, commercial and industrial waste, operated by Thurtle Walter. In addition, there are eight others within 250m, the closest being 13m to the south west.
- 6.12.7. Mott Macdonald Ltd report the findings of a ground investigation in their 2009 Simple Environmental Assessment report and this identified no significant contamination was identified, however, the interpretative report including the sampling rationale and strategy was not available for review.

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<sup>72</sup> <http://www.bgs.ac.uk/>

- 6.12.8. As a result of the industrial heritage of the area including the waterfront / docks, there is the potential for contaminated sediments to be present within the River Yare which could be mobilised during construction and operation. Mott Macdonald Ltd undertook sediment sampling as reported in their 2009 Simple Environmental Assessment report and this identified sediments with concentrations of contaminants in excess of the CCME (Canadian Sediment Quality Guidelines for the Protection of Aquatic Life 1999) and the CEFAS (Centre for Environment Fisheries and Aquaculture Science) screening values.

## POTENTIAL IMPACTS OF THE PROPOSED SCHEME

- 6.12.9. As no designated sites exist within the study area, impacts to important geological sites are considered unlikely.
- 6.12.10. The construction of the Proposed Scheme could establish potential pathways whereby contaminants / pollutants associated with construction activities, and other contaminated land, could have an impact on sensitive receptors, such as (i) human beings; (ii) watercourses; (iii) aquifers; (iv) aquatic habitats, including those associated with the River Yare pSPA, and other interconnected designations; (v) terrestrial habitats and protected species.
- 6.12.11. The hydrogeology and hydrology of the site indicates that there is a mechanism (termed a source-pathway-receptor linkage) which could allow the local groundwater environment and soils to be impacted by the Proposed Scheme. The introduction of large structures and associated earthworks as part of the permanent works, could potentially result in localised impacts on human health and/or groundwater.

## PROPOSED ASSESSMENT METHODOLOGY

- 6.12.12. There is the potential for disturbance of existing contaminated land (including river bed sediments) and the possibility that construction could potentially establish pathways between pollutants and receptors. It is therefore intended that impacts on geology and soils will form part of the assessments within the ES.
- 6.12.13. The assessment will be based upon the guidance presented in DMRB Volume 11 Section 3 Part 11 Geology and Soils<sup>73</sup>, although for geology and soils DMRB does not provide any specific methods of assessment or scales of measurement for either the value / sensitivity of the receptor or the magnitude of the impact. Assessment procedures contained within BS10175:2011<sup>74</sup> and CLR11<sup>75</sup> including an assessment of risk classification for the source-pathway-receptor protocol based on CIRIA C552<sup>76</sup> will be used in a phased approach together with professional judgement.
- 6.12.14. Specific consultation with the Environment Agency and Environmental Health Officers (EHOs) will be undertaken to identify any potentially contaminated sites.
- 6.12.15. A ground investigation is currently underway at the time of writing and will include a risk assessment which will assess the potential contaminant linkages identified in the desk study report.
- 6.12.16. This will allow the development of an updated site conceptual model to clarify potential source-pathway-receptor linkages, and assist with the assessment of potential impacts on groundwater.

### Significance of Effects

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<sup>73</sup> The Highways Agency et al, (1993), Design Manual for Roads and Bridges, Volume 11, Section 3, Part 11, Geology and Soils.

<sup>74</sup> British Standards Institution (2011). BS 10175:2011 Code of Practice for the Investigation of Contaminated Land.

<sup>75</sup> The Environment Agency (2004). Model Procedures for the Management of Land Contamination. Contaminated Land Report 11.

<sup>76</sup> CIRIA (2001). C552. Contaminated Land Risk Assessment. A guide to good practice.

- 6.12.17. The significance of the effects of the Proposed Scheme may have on soil, geology and geomorphology attributes and contaminated land receptors will be assessed in accordance with the DMRB guidance on the basis of the severity of the consequence, should the hazard be realised, and the probability that the hazard will be realised.
- 6.12.18. A Phase 1 Preliminary Risk Assessment (PRA) will be undertaken to establish baseline conditions within the study area. This will comprise a desk-based review of all relevant information including historical mapping and any available ground investigation reports and, if necessary, a walkover survey to inspect the study area and obtain recent photography.
- 6.12.19. Information from the PRA will be used to develop a preliminary Conceptual Site Model (CSM) which will identify potential 'source-pathway-receptor' contaminant linkages and associated estimated levels of risk.
- 6.12.20. The tables used to classify consequence and probability and the matrix used to determine the level of risk, reproduced from CIRIA C552: Contaminated Land: A Guide to Good Practice, are presented in Table 45, Table 46 and Table 47.

**Table 45 - Qualitative Risk Assessment – Classification of Consequence**

Classification	Definition
Severe	Short term (acute) risks to human health, likely to result in significant harm. Short-term risk of pollution of sensitive water resource. A short-term risk to a particular ecosystem, or organism forming part of such ecosystem.
Medium	Chronic damage to human health (significant harm). Pollution of sensitive water resources. A significant change in a particular ecosystem, or organism forming part of such ecosystem.
Mild	Pollution of non-sensitive water resources. Significant damage to crops, buildings, structures and services.
Minor	Damage to sensitive buildings/structures/services or to the environment. Harm, not necessarily significant, which may result in a financial loss, or expenditure to resolve. Non-permanent health effects to human health. Easily repairable effects of damage to buildings, structures and services.

**Table 46 - Qualitative Risk Assessment – Classification of Probability**

Classification	Definition
High Likelihood	There is a pollution linkage and an event that appears very likely in the short term, and/or almost inevitable over the long term, or there is evidence at the receptor of harm or pollution.
Likely	It is probable that an event will occur. Whilst not inevitable, it is possible in the short term, and likely over the long term.
Low Likelihood	Circumstances are possible under which an event could occur, but it is not certain that (even over a long time period) such an event would occur.
Unlikely	It is improbable that an event would occur, even in the very long term.

**Table 47 - Qualitative Risk Assessment – Determination of Risk Level**

		Severity			
		Severe	Medium	Mild	Minor
Probability	High Likelihood	Very High Risk	High Risk	Moderate Risk	Moderate / Low Risk
	Likely	High Risk	Moderate Risk	Moderate / Low Risk	Low Risk

<b>Low Likelihood</b>	Moderate Risk	Moderate / Low Risk	Low Risk	Very Low Risk
<b>Unlikely</b>	Moderate / Low Risk	Low Risk	Very Low Risk	Very Low Risk

- 6.12.21. The significance of the effects of the Proposed Scheme may have on soil, geology and geomorphology attributes and contaminated land receptors will be assessed in accordance with the DMRB guidance on the basis of the severity of the consequence, should the hazard be realised, and the probability that the hazard will be realised.
- 6.12.22. The outcome of the contaminated land assessment will inform the EIA and form part of the ES. If a detailed assessment is required this is likely to involve intrusive Phase 2 ground investigation works. These would be completed in accordance with BS10175:2011+A1:2013 'Investigation of potentially contaminated sites: Code of practice'. Following the intrusive works, quantitative risk assessments would be undertaken and a revised CSM developed.
- 6.12.23. If plausible contaminant linkages are present, it may be necessary to develop a remediation strategy. Implementation of the remediation strategy would be followed by validation works and production of a closure report.



## 6.13 TRAFFIC AND TRANSPORT

### BASELINE CONDITIONS

#### Existing Highway Network

- 6.13.1. Great Yarmouth is connected to Norwich by rail, and by the A47 road which is part of the Strategic Road Network (SRN). It is linked to Lowestoft by rail, and by the A47 (formerly the A12) 3 also part of the SRN. The other important road is the A143 to Bury St Edmunds which terminates in the town.

#### Access

- 6.13.2. Through traffic on the A47 crosses the River Yare on the Breydon Bridge, to the north of the town centre. Access to the peninsula from the south and from the western part of the town is provided by (i) Breydon Bridge and Acle New Road; and (ii) the Haven Bridge which leads directly into the town centre, also at the northern end of the peninsula. Both are single carriageway lifting bridges. There are no crossings further south to give more direct access to the peninsula. As a result, the main industrial areas and deep water outer harbour are up to 4 km from the nearest bridge. Access to the sea-front is similarly constrained, with all vehicles, cyclists and pedestrians having to use the bridges at the northern end.

#### Congestion

- 6.13.3. Currently, the existing river crossings do not provide adequate access to the port and employment areas in the southern part of the peninsula. The lack of a direct bridge means that traffic is forced onto unsuitable routes within the town centre, including the historic South Quay. Congestion, especially on the Haven Bridge, causes delays and makes journey times unreliable. The mixture of port-related and local traffic makes it more difficult for people to access the town centre, seafront, and leisure facilities. The lack of a direct river crossing makes Great Yarmouth seem remote, and discourages inward investment.
- 6.13.4. A survey of local residents (Survey for the Great Yarmouth and Gorleston Area Transport Strategy) in 2009 identified traffic congestion as the most serious transport problem to be tackled, by a considerable margin,
- 6.13.5. As it can be quite difficult to measure congestion in absolute terms, a range of survey results, open source data, and model investigations have been used to illustrate the severity of queuing and delay on town centre roads. In support of the OBC, detailed classified traffic counts and queue length surveys were undertaken at key locations in the vicinity of the Haven Bridge and town centre on Thursday 15 October 2015.
- 6.13.6. This provided evidence that congestion is a very real problem for people in Great Yarmouth, not just a perception. This queuing is associated with the high volumes of traffic using the Haven Bridge and nearby roads. Journey times were shown to be significantly longer in peak periods than in the off-peak.
- 6.13.7. Congestion is a problem in peak periods throughout the year, but also occurs during the summer when many tourists visit the town centre, pleasure beach and seafront attractions.
- 6.13.8. Congestion affects bus users and cyclists, as well as car users. Pedestrians are also affected by the long traffic signal cycle times needed to handle demand at junctions.

#### Public Transport

- 6.13.9. The main bus terminus is at the Market Gates shopping centre. Frequent delays at the Haven Bridge, and congestion associated with the traffic signals at either end of the bridge, pose particular problems for scheduled bus services in the area. When the Haven Bridge is raised, for river traffic, buses can be delayed for up to 20 minutes. Services may have to be cancelled, and delays can affect services throughout the day.
- 6.13.10. Efforts are being made to encourage tourists to use bus services from the holiday villages of Hemsby, Caister-on-Sea and Hopton, but it is difficult to grow this trade when services are badly affected by congestion.



- 6.13.11. Two existing bus routes penetrate part of the way into the South Denes area. In common with routes into the town centre, these services are affected by congestion at the existing bridges.

#### Pedestrians and Cycling

- 6.13.12. Pedestrians and cyclists also have to use the Haven Bridge to access the town centre, seafront and employment areas. A dedicated off road cycle route has recently been provided as part of the improvements to Marine Parade; there is an on-road route on Southtown Road on the west side of the river and a network of advisory or traffic calmed routes on both sides. However, it is possible that a lack of a more direct access into the peninsula also means that most journeys are longer than they could be, discouraging people from walking or cycling to work.

#### Traffic Collisions

- 6.13.13. In the five years from 2011 to 2015, there were 394 recorded collisions in the Great Yarmouth area, involving 489 casualties. Of the 489 casualties, 99 (20%) were pedestrians and 50 (10%) were cyclists with 72 casualties (15%) involving motorcycle accidents. There are clusters of accidents on the approaches to the existing bridges, including at North Quay.
- 6.13.14. On Pasteur Road and Bridge Road, accidents are grouped around the Pasteur Road/Thamesfield Way roundabout (three slight) and the Bridge Road link between Southtown Road and Hall Quay signals (one fatal, two serious, four slight). Of greatest concern is the prevalence of accidents on Bridge Road (seven). Six of these involved vulnerable road users suggesting problems in this motor vehicle dominated environment around the existing crossing of the River Yare.
- 6.13.15. The accident rate on Southtown Road is around three times the national average for 'other urban roads'. Accidents are scattered but tend to occur at junctions (Gordon Road and Bridge Station Road). The accident rate on South Quay and Southgates is just under twice the national average for urban A roads. Accidents are generally scattered, with clusters on Nottingham Way and Queen's Road, which are more heavily trafficked side roads.
- 6.13.16. It is notable that the number of accidents at the Southtown Road/William Adams Way roundabout is almost twice that of the nearby Pasteur Road roundabout. The large 80m diameter and wide circulatory carriageway without traffic signals may generate higher entry and circulatory speeds. Accidents are mainly "failure to give way" and tail end collisions.

## **POTENTIAL IMPACTS**

- 6.13.17. The Proposed Scheme is likely to have the following traffic and transport effects that have the potential to be significant:
- Increased traffic flows during construction: there will be an increase in traffic flows on local roads during construction, including a temporary increase in Heavy Goods Vehicles (HGV) movements; and
  - Redistributed traffic flows post-construction: there will be a redistribution of traffic flows on the surrounding road network post-construction, and, without mitigation, an associated potential for increased pedestrian severance, driver stress and delay, and collisions on the redistribution route.
- 6.13.18. The introduction of the Proposed Scheme will not in itself generate any additional traffic although providing the bridge as an alternative route to the current crossing options, will result in a redistribution of traffic and these impacts will be assessed.
- 6.13.19. The potential impacts of the Proposed Scheme with regards to traffic are likely to be predominantly positive, with journey time savings, vehicle operating cost savings, reduced congestion, enhanced journey time reliability, collision and casualty savings, and an increase in the use of more active modes of travel.



- 6.13.20. One of the main aims of providing the Proposed Scheme is to unlock land for regeneration which is currently constrained by congestion on the local highway network. New development will lead to an increase in overall travel and trip making.
- 6.13.21. More people will need to travel to work, the regenerated sites will need to be serviced and goods will have to be transported in and out.
- 6.13.22. Whilst the additional trips from new developments are not directly related to the DCO application for the new crossing, they are a by-product of the new crossing therefore the anticipated impact should be assessed within the ES. It is anticipated that the new crossing and associated infrastructure improvements will meet the demand for the additional trips by all modes without putting additional pressure on the existing transport networks.
- 6.13.23. There will be a potential impact on the area during construction, including an increase in HGV movements for the duration of construction. This impact will be assessed within the ES.

## PROPOSED ASSESSMENT METHODOLOGY

- 6.13.24. A Transport Assessment (TA), which will assess the impact of the Proposed Scheme on the capacity of highway infrastructure, will be scoped with NCC and key stakeholders, and submitted in support of the DCO.
- 6.13.25. The ES will summarise the findings of the TA and will focus on likely significant environmental effects upon the local community, such as severance, driver delay or an increased collision rate. The ES will:
- Address changes to local traffic flows during the construction phase and once the Proposed Scheme is completed and operational;
  - Address potential disruption to local pedestrians, cyclists and road vehicle users during the construction phase; and
  - Provide information on transport conditions both before and after the Proposed Scheme is built, including changes in relative accessibility of the local area by foot, bicycle, and public transport.
- 6.13.26. The ES will take account of paragraphs 32 to 36 of the NPPF (2012)<sup>77</sup> and the IEMA Guidelines for the Environmental Assessment of Road Traffic (1993)<sup>78</sup>. Close consultation will be undertaken with key stakeholders, including Highways England, NCC and GYBC.
- 6.13.27. Further desk studies and site visits will be undertaken to identify key features of the existing road and pedestrian/cycle networks in the vicinity of the Proposed Scheme and to obtain data on existing collision rates and identify existing public transport services.
- 6.13.28. Traffic surveys will be undertaken at key junctions and links surrounding the Proposed Scheme, if sufficient existing data is unavailable. It is anticipated that the majority of data will be available from existing survey data and the strategic model for the area, which was used to support the OBC, and was scrutinised for use by the Department for Transport (DfT). The forecast years of assessment will be agreed with NCC when the detail of the modelling is scoped.

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<sup>77</sup> Department for Communities and Local Government, National Planning Policy Framework (2012) Promoting Sustainable Transport Paragraphs 32 to 36 [online] Available at: [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/60777/2116950.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/60777/2116950.pdf) Accessed January 2018

<sup>78</sup> Institute of Environmental Management and Assessment (1993) Guidelines for the Assessment of Road Traffic [online] Available at: <http://www.devon.gov.uk/core-doc-t2-guidelines-for-the-environmental-assessment-of-road-traffic.pdf> Accessed January 2018

- 6.13.29. The reassignment of traffic onto the Proposed Scheme will be taken from the strategic SATURN model, which is a highway assignment model.
- 6.13.30. An assessment of the impact of the redistribution of traffic on local junctions will be completed using appropriate software (such as JUNCTIONS8 and LINSIG) at the individual junctions, to determine where any additional mitigation is required based on capacity results (Ratio of Flow to Capacity (RFC), Degree of Saturation (DoS), Practical Reserve Capacity (PRC), as appropriate for the software type), delays and expected queue lengths.
- 6.13.31. The assessments will include forecast year scenarios for the year of opening and 15 years after opening and these scenarios will include traffic growth associated with planned / committed development.
- 6.13.32. The impacts on pedestrian and cycle connections, and improved public transport services/routes will also be reviewed within the ES.

Significance of Effect

- 6.13.33. The significance of traffic and transport effects on sensitive receptors will be determined by combining the sensitivity of identified receptors with the predict magnitude of change.
- 6.13.34. The IEMA Guidelines identify that the most discernible environmental impacts of traffic are noise, severance, pedestrian delay and intimidation and they provide additional information on how those impacts should be assessed:
- 6.13.35. “At low flows, increases in traffic of around 30% can double the delay experienced by pedestrians attempting to cross a road (DOT, 1983). Whether this is significant in absolute terms requires further consideration (see 3.19). Severance and intimidation are, however, much more sensitive to traffic flow and the Department of Transport, in its MEA, has assumed that 30%, 60% and 90% changes in traffic levels should be considered as “slight”, “moderate” and “substantial” impacts respectively.”

In order to undertake a relative assessment of the increase in road traffic, the criteria outlined in Table 48 and Table 49 will be used to determine the magnitude of impact and receptor sensitivity respectively. However, consideration should also be given to the local characteristics, such as the volume of traffic, pavement widths and availability of crossing facilities.

**Table 48 - Magnitude of Traffic Impact Criteria**

<b>Change in Traffic Flow</b>	<b>Magnitude of Impact</b>
Change in Total Traffic or HGV flows of over 90%	Major
Change in Total Traffic or HGV flows of 60% – 90%	Moderate
Change in Total Traffic or HGV flows of 30% - 60%	Minor
Change in Total Traffic or HGV flows of less than 30%	Negligible

**Table 49 - Sensitivity of Traffic Receptors**

<b>Receptor sensitivity</b>	<b>Receptor Type</b>
Major	Receptors of greatest sensitivity to traffic flow: schools, colleges, playgrounds, accident black spots, retirement homes, urban/residential roads without footways that are used by pedestrians.
Moderate	Traffic flow sensitive receptors including: congested junctions, doctors surgeries, hospitals, shopping areas with roadside frontage, roads with narrow footways, unsegregated cycle ways, community centre, parks, recreational facilities.

Minor	Receptors with some sensitivity to traffic flow: places of worship, public open space, nature conservation areas, listed buildings, tourist attractions and residential areas with adequate footway provision.
Negligible	Receptors with low sensitivity to traffic flow and those with sufficient distance from affected roads and junctions.

6.13.36. The magnitude of change and sensitivity of the receptor will then be compared in order to determine the overall traffic effect significance, as shown in Table 50.

**Table 50 - Determination of Significance of Traffic Effects**

Sensitivity of Receptor	Magnitude of Effect			
	Negligible	Minor	Moderate	Major
Major	Minor	Moderate	Major	Major
Moderate	Negligible	Minor	Moderate	Major
Minor	Negligible	Negligible	Minor	Moderate
Negligible	Negligible	Negligible	Negligible	Minor

6.13.37. The potential effects will be considered to determine the level of significance, either major, moderate, minor or of negligible significance. Effects of major and moderate significance are considered to be significant in EIA terms.

## 6.14 CUMULATIVE EFFECTS

- 6.14.1. The EIA Regulations require that, in assessing the effects of a particular development proposal, consideration will also be given to the cumulative effects that may arise from the Proposed Scheme in conjunction with other existing and/or approved projects.
- 6.14.2. Cumulative impacts may arise as a result of a number of different factors and combined changes. Cumulative impacts can be defined as:
- 6.14.3. *“the additional changes caused by a Proposed Development in conjunction with other similar developments as the combined effect of a set of developments, taken together. In practice ‘effects’ and ‘impacts’ are used interchangeably.”*
- 6.14.4. *These generally fall into three categories:-*
- (i) Cumulative effects arising from the combination of the different environmental topics as outlined in the Environmental Statement;*
  - (ii) Cumulative effects arising from a range of developments (projects), occurring at different locations or over a period of time. Separately, such individual projects may not create an unacceptable degree of adverse impact but collectively the results may potentially be significant;*
  - (iii) Cumulative effects caused by the project in conjunction with other developments that occurred in the past, present or are likely to occur in the foreseeable future.*
- 6.14.5. As identified in the second point above, cumulative or combined effects are those that are likely to arise when the Proposed Development is considered in relation to other foreseeable developments (projects) either located in the immediate vicinity or that have a relationship with similar environmental resource. Individually the impact of a Proposed Development may be of minor magnitude but when combined with the impact from other projects could increase the overall significance of an effect on an environmental resource. The results of this process enable the Local Planning Authority to ensure that this and any future developments are mutually compatible and remain within the environmental capacity of the area considered.
- 6.14.6. The NN NPS states at Paragraph 4.16 that when considering significant cumulative effects, any ES should provide information on how the effects of the proposal would combine and interact with the effects of other development (including projects for which consent has been granted, as well as those already in existence).
- 6.14.7. Guidance offered within Advice Note 17<sup>79</sup> identifies a four stage process to the Cumulative Effect Assessment (CEA) process and the ES will include a CEA that follows this approach, outlined in Table 51 below.

**Table 51 – Cumulative Effects Assessment Stages**

<b>CEA Stage</b>	<b>Main Activities</b>
Stage 1 – Establishing a zone of influence for the Proposed Scheme and identifying a long list of ‘other development’,	Identifying a long list of ‘other development’ that is proposed in the vicinity of the proposed scheme.
Stage 2 – Identify a shortlist of ‘other development’.	Identifying the nature of the ‘other development’ and assessing whether there is the potential for significant cumulative effects.

<sup>79</sup> Advice note seventeen: Cumulative effects assessment relevant to nationally significant infrastructure projects; The Planning Inspectorate, December 2015

CEA Stage	Main Activities
Stage 3 – Information gathering	Collation of information on the ‘other development’ identified at Stage 2
Stage 4 - Assessment	Assessing

6.14.8. As acknowledged by the Planning Inspectorate in their advice note on CEA the information that is available on which a robust CEA can be undertaken on future development is likely to be proportional to the status of the development.

*Stage 1*

6.14.9. The following schemes have been identified as being of suitable scope to be included in Stage 2 as they could affect some environmental aspects cumulatively with the Proposed Scheme:

- Great Yarmouth and Lowestoft Enterprise Zone;
- Lake Lothing Third River Crossing;
- Great Yarmouth Tidal Barrier;
- East Anglia Array Windfarm;
- Beacon Park Enterprise Zone;
- Great Yarmouth Waterfront Area;
- South Denes Enterprise Zone and Energy Park; and
- A47 Great Yarmouth Vauxhall, Harfrey’s and Gapton Junctions.

*Stage 2*

6.14.10. Development identified within Stage 1 will be screened to identify whether its location and attributes is worthy of greater consideration.

*Stage 3*

6.14.11. Available information on the status of the Stage 2 developments will be collated and used as the basis of the Stage 4 assessment.

*Stage 4*

6.14.12. The operational phase impacts assessments undertaken for air quality and noise, along with some aspects of the road drainage calculations, will include cumulative effects in so far that the traffic data that they are based upon includes both future development and natural traffic growth. CEA for noise and air quality impacts within the ES will focus construction phase of the Proposed Scheme. In addition, the flood risk assessment for the Proposed Scheme will likewise adopt a worst case approach through excluding the Great Yarmouth Tidal Barrier from the assessment model.

## 7 SUMMARY

### 7.1 ENVIRONMENTAL TOPICS FOR INCLUSION IN THE ES

7.1.1. Confirmation of the environmental topics that are scoped into the assessment, and a summary of the proposed assessment scope, are provided in Table 52.

**Table 52 – Proposed environmental topics to be scoped into / out of the EIA**

Topic	Scoped in / out	Summary
Air Quality (Section 6.2)	Scoped in	<p>Effects which would be likely to result from the implementation of the Proposed Scheme include the generation and deposition of dust during construction ((PM<sub>10</sub> and PM<sub>2.5</sub>), the combustion engine emissions associated with construction-related traffic and construction plant operation, changes in concentration so traffic related pollutants NO<sub>x</sub>, NO<sub>2</sub>, PM<sub>10</sub>, PM<sub>2.5</sub>) where sensitive receptors are located or will be located in the vicinity of the Proposed Scheme and changes in the total emission of traffic related pollutants.</p> <p>It is proposed that the risk of dust deposition at sensitive receptors close to the application site is scoped out due to the availability of well-established mitigation measures. However, details of the mitigation measures will be given for inclusion within a Construction Environmental Management Plan (CEMP).</p>
Acoustics (Section 6.3)	Scoped in	<p>Potential noise and vibration impacts can occur during construction (temporary) and operation (permanent). The risk and severity of potential construction impacts occurring is typically a function of the proximity of the activity to receptor, and the nature and duration of the activity.</p> <p>Operation impacts occur due to changes in carriageway alignment, traffic flow, traffic speed and infrastructure.</p>
Nature Conservation (Section 6.4)	Scoped in	<p>A number of nature conservation resources which could potentially be affected by the construction and future use of a road scheme of the type proposed. These comprise designated and non-designated sites, important habitats and habitat-types and protected and notable species.</p> <p>Specific impact as a result of the Proposed Scheme on nature conservation include killing, injuring and disturbance of protected species during construction, fragmentation of retained habitats and/or severance of wildlife corridors, contamination of watercourse through accidental spillage of fuels/chemicals and disturbance of nocturnal animals, such as bats, where road lighting introduces a new light source.</p>
Cultural Heritage (Section 6.5)	Scoped in	<p>The majority of the impacts upon the cultural heritage assets will occur during the construction phase. Development activities such as piling, stripping of overburden or hardstanding, landscaping, ground compaction access and may all have a negative effect on cultural heritage assets. Potential impacts include permanent complete or partial loss of an archaeological feature or deposit as a result of ground excavation and permanent or temporary loss of the physical and/or visual integrity of a feature, monument, building or group of monuments.</p> <p>Initial assessment suggests that there would be a potential physical impact to one known archaeological asset, the site of a railway which is no longer in use (asset 88) and a potential setting impact to the setting of the Dolphin Public House, a Grade II listed building (asset 89). Additionally, the assessment to</p>

		date suggests the potential presence of unknown heritage assets in the form of a buried medieval shoreline and associated features or finds.
Townscape and Visual (Section 6.6)	Scoped in	The introduction of the Proposed Scheme will result in a new prominent feature of a noticeably different scale and form within the immediate urban fabric of Great Yarmouth, resulting in the removal or modification to existing townscape features and potential fragmentation of the current land use patterns. The introduction of the visually prominent structure within the context of the river, supporting roads and associated traffic will also change existing views, where it either intrudes into or obstructs an existing view in whole or in part.
Water Environment (Section 6.7)	Scoped in	<p>The Scoping Report has identified several potential impacts on the water environment.</p> <p>Potential significant impacts considered include pollution during construction due to increased generation and release of sediments and suspended solids, and increased risk of accidental spillage of pollutants such as oil, fuel and concrete, alterations to the hydromorphology (fluvial geomorphological) regime, such as increased erosion, deposition and channel migration processes, groundwater pollution during road operation due to contaminants within routine road run-off and an increase in flood risk caused by the Proposed Scheme, both within the vicinity of the route options and also elsewhere in the catchment is possible.</p> <p>Based upon the Water Environment Characteristics it is proposed that the following elements are scoped out:</p> <ul style="list-style-type: none"> <li>▪ Loss of standing water</li> <li>▪ Loss or change to Groundwater Dependent Terrestrial Ecosystems</li> <li>▪ Changes to groundwater level or flows impact due to cuttings and related dewatering</li> </ul> <p>Flood Risk: The main source of flooding for the scheme is thought to be tidal. It is proposed that this assessment is presented in a separate standalone chapter.</p>
Climate (Section 6.8)	Scoped in	<p>The assessment approach considers the likely magnitude of GHG emissions (or avoided emissions) in comparison to the baseline scenario with no scheme development. During construction, the Proposed Scheme could have the potential to contribute to GHG emissions from construction activities as well as from the manufacturing and supply of materials.</p> <p>At this stage, there is not enough information available to determine the level of magnitude or significance of emissions of the Proposed Scheme and, therefore, a detailed assessment will be undertaken during the environmental assessment.</p>
People and Communities (Section 6.9)	Scoped in	The Proposed Scheme is located within Great Yarmouth, within Norfolk. The Proposed Scheme may result in the generation of direct, indirect and induced employment opportunities, loss of private and public land, changes in driver stress and delay and changes in accessibility and amenity value of public routes and recreational resources.
Health (Section 6.10)	Scoped out	Potential effects on health arising from air quality and noise would be covered under these respective sections of this report. The People and Communities assessment will also cover potential impacts on community severance, loss of property, economic benefits and community facilities. Impacts on landscape and nature conservation are unlikely to affect health given the existing urban nature of the environment and retention of open space.



		It is proposed that a separate health assessment is scoped out for the Great Yarmouth Third River Crossing as potential impacts are either positive, unlikely to be significant or are already assessed.
Materials (Section 6.11)	Scoped in	The Proposed Scheme has the potential to consume material resources (including those recovered from site arisings), and produce and dispose of waste, during the demolition, site preparation and construction phases of delivered.  The associated potential environmental impacts (both direct and indirect) will occur during these lifecycle phases. Impacts arising further into the operational lifecycle are expected to be negligible, and hence have been scoped out of this assessment.
Geology and Soils (Section 6.12)	Scoped in	As no designated sites exist within the study area, impacts to important geological sites are considered unlikely.  The hydrogeology and hydrology of the site indicates that there is a mechanism (termed a source-pathway-receptor linkage) which could allow the local groundwater environment and soils to be impacted by the Proposed Scheme. The introduction of large structures and associated earthworks as part of the permanent works could potentially result in localised impacts on human health and/or groundwater.
Traffic and Transport (Section 6.13)	Scoped in	The Proposed Scheme is likely to have several traffic and transport effects, which have the potential to be significant.  For example, there will be an increase in traffic flows on local roads during construction, including a temporary increase in Heavy Goods Vehicles (HGV) movements. This impact will be assessed further in the ES. Additionally, there will be a redistribution of traffic flows on the surrounding road network post-construction, and, without mitigation, an associated potential for increased pedestrian severance, driver stress and delay, and collisions on the redistribution route.
Cumulative Effects (Section 6.14)	Scoped in	There are a number of approved developments that have the potential to result in cumulative effects, in conjunction with the Proposed Development.  It is therefore proposed that an assessment of Cumulative effects is scoped into the EIA.

## 7.2 PROPOSED STRUCTURE OF ES

7.2.1. It is proposed that the ES be comprised of three volumes:

- Volume 1 will contain the main written statement of the ES
- Volume 2 will contain the Technical Appendix
- Volume 3 will contain the Figures.

7.2.2. These three volumes will be accompanied by a Non-Technical Summary of the ES.

7.2.3. The intended chapter layout for the Volume 1 of the ES is presented in Table 53.

**Table 53 – Proposed Chapter Contents for ES Volume 1: Written Statement**

<b>Chapter</b>	<b>Title</b>
<b>1</b>	<b>Introduction</b> Including: - Purpose of the report - Overview of the Project
<b>2</b>	<b>Environmental Impact Assessment Approach</b> - The requirement for an EIA; - Approach to Scoping - Legislative and Policy Context for the Proposed Scheme - The Structure of the Environmental Statement
<b>3</b>	<b>Proposed Scheme</b> Including: - Need for the Proposed scheme - Project Objectives - Site Location and Description - Proposed Scheme Description
<b>4</b>	<b>Assessment of Alternatives</b> Including: - Alternative options considered - Options selection process - Reasons for discounting options
<b>5</b>	<b>Consultation</b>
<b>6</b>	<b>Air Quality</b>
<b>7</b>	<b>Acoustics</b>
<b>8</b>	<b>Nature Conservation</b>
<b>9</b>	<b>Cultural Heritage</b>
<b>10</b>	<b>Townscape and Visual Impacts</b>
<b>11</b>	<b>Water Environment</b>
<b>12</b>	<b>Flooding</b>
<b>13</b>	<b>Climate Change</b>
<b>14</b>	<b>People and Communities</b>
<b>15</b>	<b>Materials</b>
<b>15</b>	<b>Geology and Soils</b>
<b>16</b>	<b>Traffic and Transport</b>
<b>17</b>	<b>Cumulative Effects</b>
<b>18</b>	<b>Summary</b>

Chapter	Title
19	References and Glossary

### 7.3 PROPOSED TECHNICAL CHAPTER LAYOUT

It is proposed that the following layout is applied to each of the technical chapters:

- Introduction  
Introduction to the technical chapter.
- Assessment Methodology  
Details of the assessment methodologies to be applied to assess importance/sensitivity of assets/features, the magnitude of potential impacts and the predicted significance of effects.
- Baseline Conditions  
Description of the current existing baseline conditions at the Application Site as per the data that has been collected.
- Potential Significant Effects  
Text identifying the potential significant effects of the Proposed Scheme after embedded mitigation
- Mitigation  
Details of measures required to mitigate the effects of the Proposed Development. These should be split into construction and operational effects.
- Residual Effects  
Description of the effects following the implementation of Mitigation Measures.

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#### Chapter 6: Scope of Technical Assessments

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## 8.2 GLOSSARY

**Table 54 – Glossary of Terms**

AADT	Average Annual Daily Traffic
ADMS	Atmospheric Dispersion Model System
AEP	Annual Exceedance Probability
AQMA	Air Quality Management Areas
BCR	Benefit to Cost Ratio
BGL	Below Ground Level
BGS	British Geological Survey
BOD	Biological Oxygen Demand
BS	British Standard
CCME	Canadian Sediment Quality Guidelines for the Protection of Aquatic Life
CDE	Construction, Demolition and Excavation
CEFAS	Centre for Environment Fisheries and Aquaculture Science
CEMP	Construction Environmental Management Plan
CEMP	Construction Environmental Management Plan
CIEEM	Chartered Institute for Ecological and Environmental Management
CIRIA	Construction Industry Research and Information Association
CoPA	Control of Pollution Act 1974
CRTN	Calculation of Road Traffic Noise
CSM	Conceptual Site Model
dB	Decibel
DCO	Development Consent Order
Defra	Department for Environment, Food and Rural Affairs
DfT	Department for Transport
DMRB	Design Manual for Roads and Bridges
DO	Dissolved Oxygen
DoS	Degree of Saturation
EA	Environment Agency
EAST	Early Assessment Sifting Tool
EFT	Emission Factor Toolkit



EHOs	Environmental Health Officers
EIA	Environmental Impact Assessment
EQS	Environmental Quality Standards
ES	Environmental Statement
EU	European Union
FRA	Flood Risk Assessment
GHG	Greenhouse Gas
GIS	Geographic Information System
GLVIA	Guidelines for Landscape and Visual Impact Assessment
GP	General Practitioners
GQA	General Quality Assessment
GQA	General Quality Assessment
GWDTE	Groundwater Dependent Terrestrial Ecosystem
GYBC	Great Yarmouth Borough Council
GYTRC	Great Yarmouth Third River Crossing
HAWRAT	Highways Agency Water Risk Assessment Tool
HDV	Heavy Duty Vehicle
HGV	Heavy Goods Vehicles
HLC	Historic Landscape Characterisation
HUDU	Healthy Urban Development Unit
IAN	Interim Advice Note
IAQM	Institute of Air Quality Management
IEMA	Institute of Environmental Management and Assessment
IMD	Indices of Multiple Deprivation
IROPI	imperative reasons of over-riding public interest
JNCC	Joint Nature Conservation Committee
LAQM	Local Air Quality Management
LOAEL	Lowest-observed-adverse-effect level
LSOAs	Lower Layer Super Output Areas
MMP	Materials Management Plan
NAEI	National Atmospheric Emissions Inventory

NCC	Norfolk County Council
NERC	Natural Environment and Rural Communities
NHER	Norfolk Historic Environment Record
NIR	Noise Insulation Regulations 1975
NN NPS	National Policy Statement for National Networks
NOEL	No Observed Effect Level
NOx	Nitrogen Oxides
NPSE	Noise Policy Statement for England
NSIP	Nationally Significant Infrastructure Project
O3	Ozone
OAR	Option Assessment Report
OBC	Outline Business Case
ONS	Office of National Statistics
OS	Ordnance Survey
PAH	Polyaromatic Hydrocarbons
PCM	Pollution Climate Mapping
PEA	Preliminary Ecological Appraisal
PEIR	Preliminary Environmental Information Report
PEL	Probable Effect Levels
PHE	Public Health England
PM10	Particulate Matter to 10 microns
PM2.5	Particulate Matter to 2.5 microns
PPG	National Planning Practice Guidance
PRA	Preliminary Risk Assessment
PRC	Practical Reserve Capacity
ProPG	Professional Planning Guidance
PRoW	Public Rights of Way
pSPA	Potential Special Protection Area
RFC	Ratio of Flow to Capacity
SAC	Special Areas of Conservation
SOAEL	Significant Observed Adverse Effect Level



SPA	Special Protection Area
SPZ	Source Protection Zones
SRN	Strategic Road Network
SSSI	Site of Special Scientific Interest
SWMP	Site Waste Management Plan
tCO2e	Tonnes of Carbon Dioxide Equivalents
TEL	Threshold Effect Levels
THI	Townscape Heritage Initiative
UK	United Kingdom
UKCP09	UK Climate Change Projections
UXO	Unexploded Ordnance
WFD	Water Framework Directive
ZTV	Zone of Theoretical Visibility



# Appendix A

SECRETARY OF STATE DIRECTION







**Department  
for Transport**

Department for Transport  
Great Minster House  
33 Horseferry Road  
London  
SW1P 4DR  
Tel: 0300 330 3000

Web Site: [www.gov.uk/df](http://www.gov.uk/df)

Mr [REDACTED]  
Major Projects (Highways) Team  
Manager  
Planning and Economy  
Norfolk County Council  
County Hall  
Martineau Lane  
Norwich  
Norfolk  
NR1 2DH

Our Ref:  
Your Ref:

DATE 26<sup>th</sup> February 2018

Environment, Transport & Development Dept	
FAO .....	
21 MAR 2018	
Onto.....	
Action.....	
File.....	
PEM Ref .....	

Dear Mark,

**DIRECTION BY THE SECRETARY OF STATE UNDER SECTION 35 OF THE PLANNING ACT 2008 RELATING TO THE GREAT YARMOUTH THIRD RIVER CROSSING. NORFOLK.**

By letter to the Secretary of State received on 29<sup>th</sup> January 2018, Norfolk County Council formally requested that the Secretary of State exercise the power vested in the Secretary of State under section 35 of the Planning Act 2008 ("the Act") to direct that the proposed scheme set out in the Norfolk County Council's letter and known as the Great Yarmouth Third River Crossing, as well as any associated matters, be treated as development for which development consent is required.

The Secretary of State is satisfied that:

- the development does not currently fall within the definition of a "nationally significant infrastructure project" and therefore it is appropriate to consider use of the power in section 35; and
- Norfolk County Council's request constitutes a "qualifying request" in accordance with section 35(10) of the Act.

The Secretary of State has made a decision within the primary deadline set out in section 35A(2) and wishes to convey that decision.

Having considered the details of the Great Yarmouth Third River Crossing set out in the request, the Secretary of State is of the view that this development by itself is nationally significant, for the reasons set out in the Annex below.

Accordingly, as the Secretary of State is satisfied that the proposed Great Yarmouth Third Rive Crossing is nationally significant, THE SECRETARY OF STATE DIRECTS that development, together with any matters associated with it, is to be treated as development for which development consent is required.



In addition, the Secretary of State further directs that any proposed application in relation to the Great Yarmouth Third River Crossing is to be treated as a proposed application for which development consent is required.

This direction is given without prejudice to the Secretary of State's consideration of any application for development consent which is made in relation to the Great Yarmouth Third River Crossing.

Signed by

A large black rectangular redaction box covering the signature of the official.A small black rectangular redaction box covering the name of the official.

A Civil Servant in the Department for Transport  
For and On Behalf of the Secretary of State

26<sup>th</sup> February 2018

## **ANNEX A**

### **REASONS FOR THE DECISION TO ISSUE THE DIRECTION**

The Secretary of State is of the opinion that the Great Yarmouth Third River Crossing is of national significance for the following reasons:

- The Port has a nationally significant role in the renewable energy sector and the offshore gas and oil industry and the scheme will substantially improve connectivity and resilience for port activities;
- The scheme will support the delivery of existing and potential renewable energy NSIPs,
- Supports the Port's role as an International Gateway

In addition the scheme will

- Improve the offer of the Port through better connectivity to the Enterprise Zone

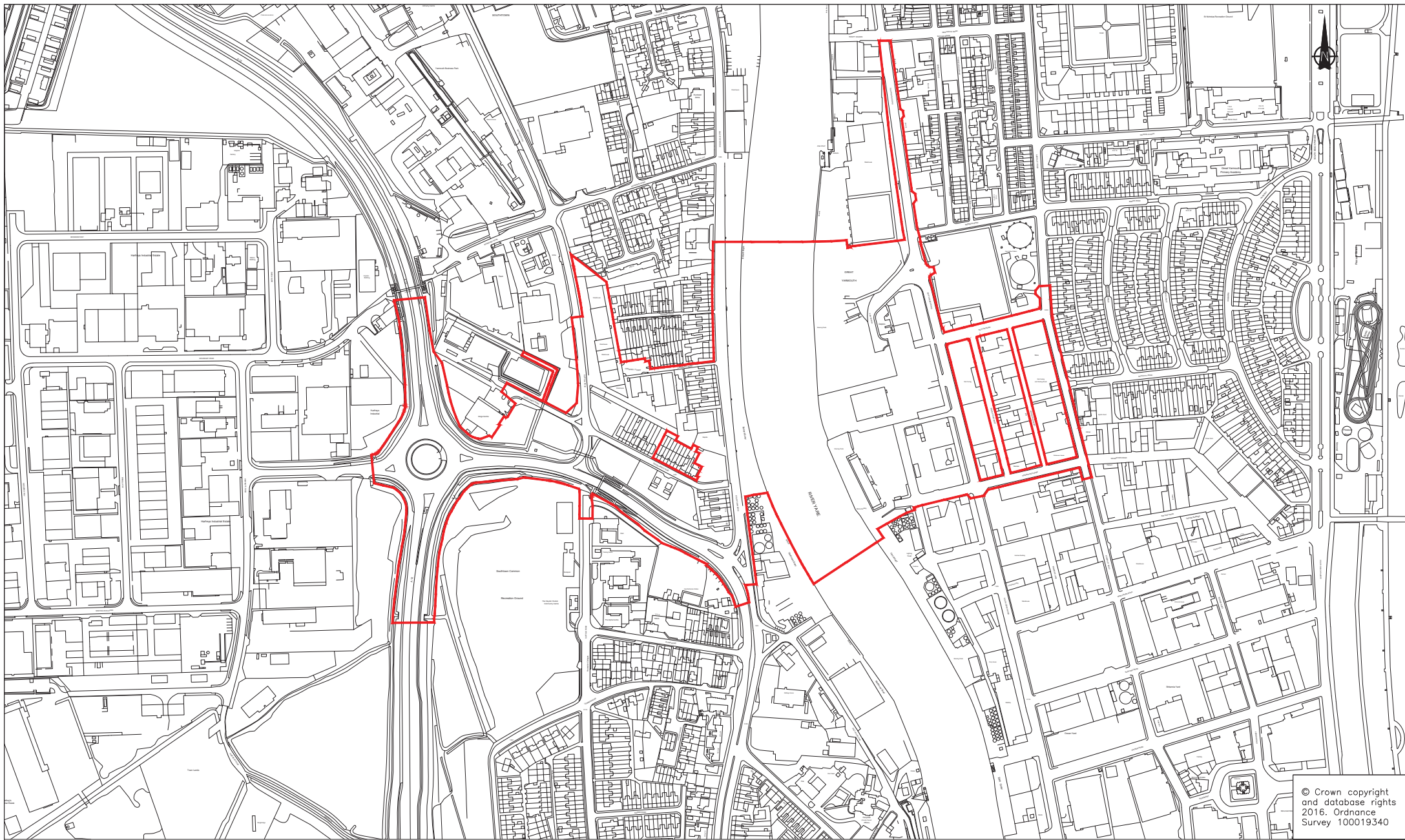


# Appendix B

DRAWINGS AND FIGURES







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Survey 100019340

KEY  
— EXTENT OF WORKS BOUNDARY

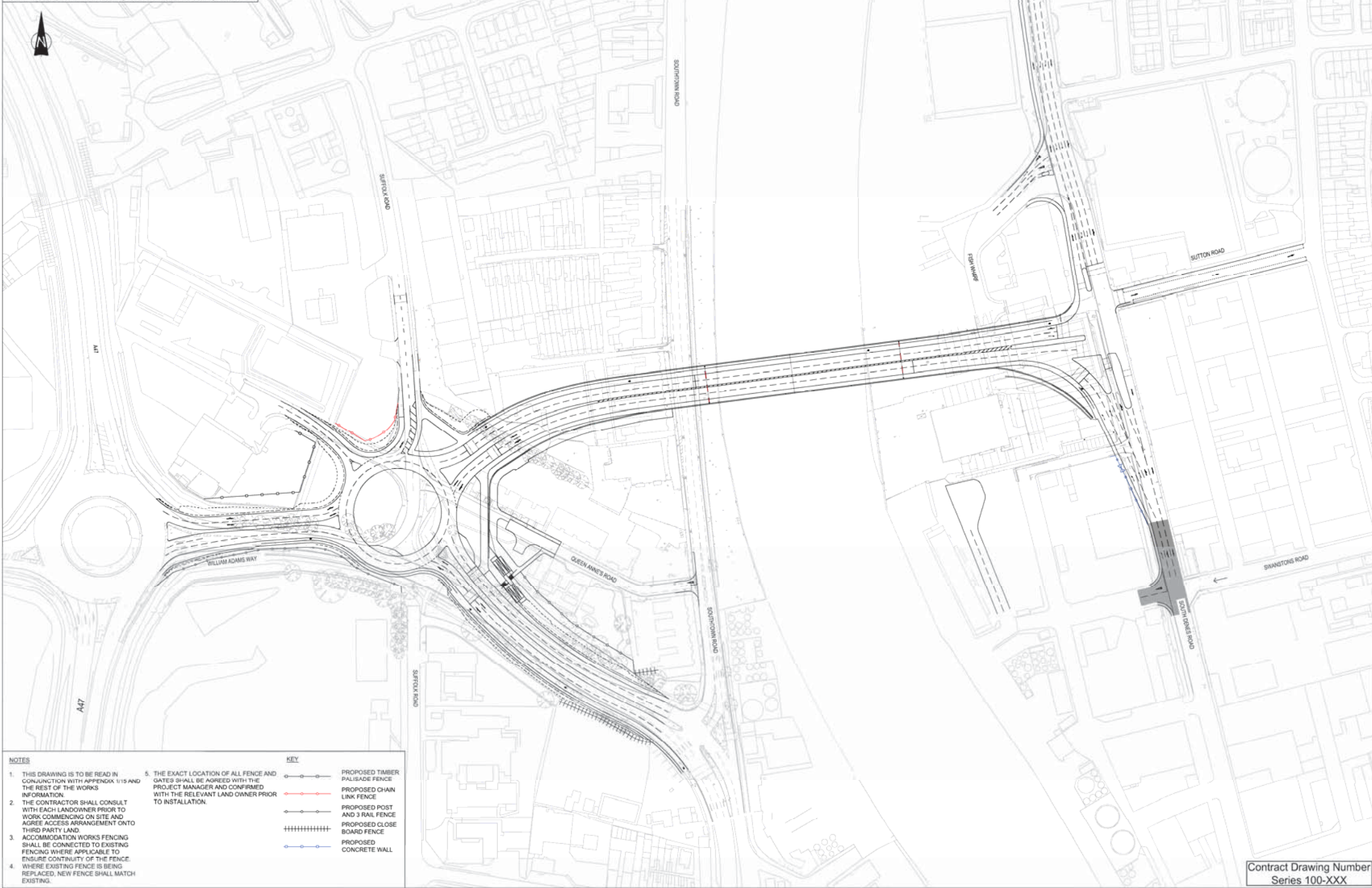


Tom McCabe  
Executive Director of  
Community and Environmental Services  
Norfolk County Council  
County Hall, Martineau Lane  
Norwich NR1 2SG

DRAWING TITLE  
GREAT YARMOUTH - THIRD RIVER CROSSING  
SCOPING REPORT BOUNDARY

REV.	DESCRIPTION	CHECKED	DATE

DESIGNED BY	INITIALS	DATE	DRAWING No.
DE	DE	FEB 18	10240375-01710-Scoping Report Boundary-20180219
DRAWN BY	DPP	FEB 18	PROJECT TITLE
CHECKED BY	YS	FEB 18	GREAT YARMOUTH THIRD RIVER CROSSING
APPROVED BY	MD	FEB 18	SCALE FILE No.
			1:2000 @ A1 0001



- NOTES**
1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH APPENDIX 1/15 AND THE REST OF THE WORKS INFORMATION.
  2. THE CONTRACTOR SHALL CONSULT WITH EACH LANDOWNER PRIOR TO WORK COMMENCING ON SITE AND AGREE ACCESS ARRANGEMENT ONTO THIRD PARTY LAND.
  3. ACCOMMODATION WORKS FENCING SHALL BE CONNECTED TO EXISTING FENCING WHERE APPLICABLE TO ENSURE CONTINUITY OF THE FENCE.
  4. WHERE EXISTING FENCE IS BEING REPLACED, NEW FENCE SHALL MATCH EXISTING.
  5. THE EXACT LOCATION OF ALL FENCE AND GATES SHALL BE AGREED WITH THE PROJECT MANAGER AND CONFIRMED WITH THE RELEVANT LAND OWNER PRIOR TO INSTALLATION.

KEY	
	PROPOSED TIMBER PALISADE FENCE
	PROPOSED CHAIN LINK FENCE
	PROPOSED POST AND 3 RAIL FENCE
	PROPOSED CLOSE BOARD FENCE
	PROPOSED CONCRETE WALL

**Norfolk County Council**  
at your service

Mike Jackson  
Director of Planning and Transportation  
Norfolk County Council  
County Hall, Martineau Lane  
Norwich NR1 2SG

**wsp**

62-64 Hills Road  
Cambridge  
CB2 1LA, UK  
T+ 44 (0) 1223 558 050 F+ 44 (0) 1223 558 051  
www.wsp.com

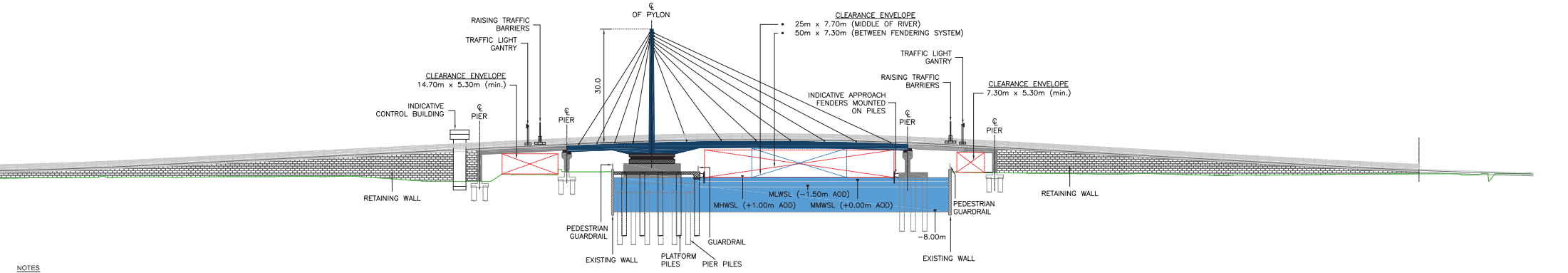
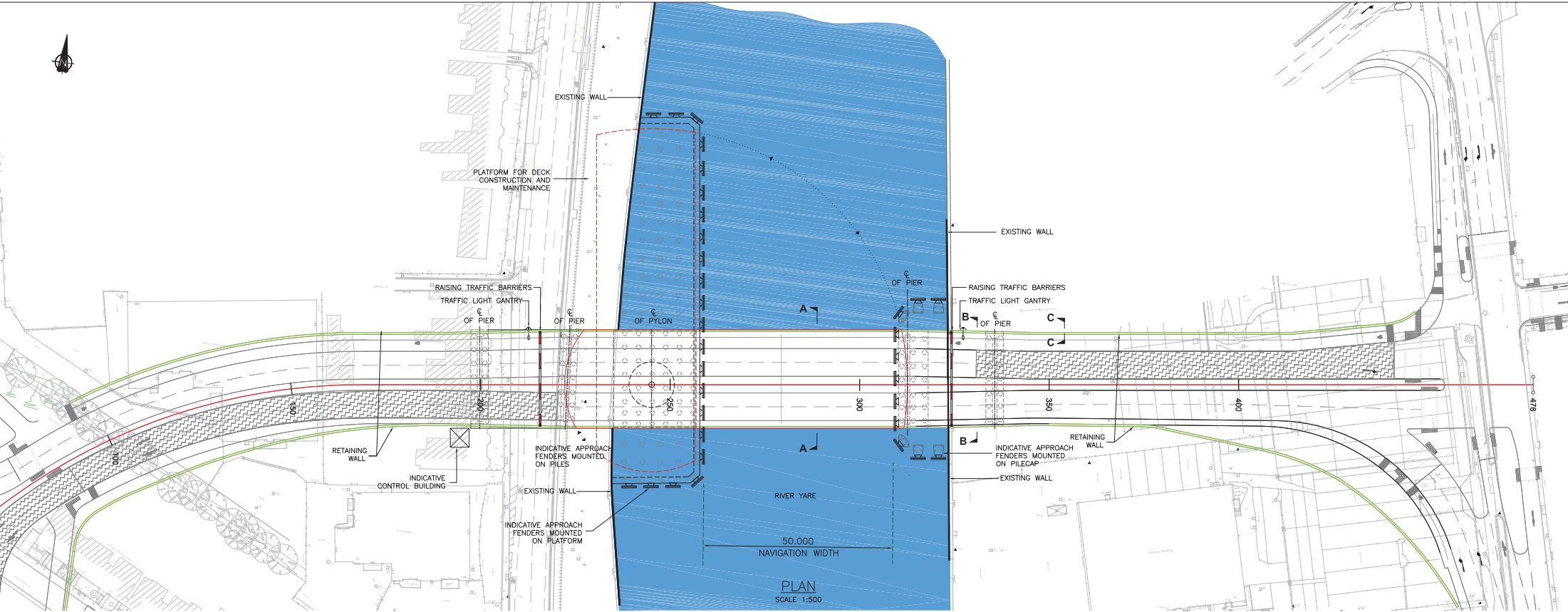
DRAWING TITLE

ACCOMMODATION WORKS PLAN

REV.	DESCRIPTION	CHECKED	DATE

DESIGNED BY	INITIALS	DATE	DRAWING No.
DPP		03.18	70041951-WSP-HAW-GYTRC-DR-D-0001
DRAWN BY	EL	03.18	PROJECT TITLE
CHECKED BY	MO	03.18	GREAT YARMOUTH
APPROVED BY	YS	03.18	THIRD RIVER CROSSING
			SCALE 1:1000 @ A1
			FILE No. XXXXX

Contract Drawing Number  
Series 100-XXX



- NOTES**
1. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE STATED.
  2. ALL LEVELS ARE IN METRES UNLESS OTHERWISE STATED.
  3. ALL CHAINAGES ARE IN METRES UNLESS OTHERWISE STATED.
  4. FOUNDATION ARRANGEMENTS ARE INDICATIVE AND TO BE CONFIRMED.
  5. EXISTING WALL TO BE MAINTAINED/ REINSTATED IN CASE OF DAMAGE.

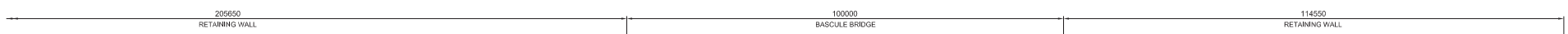
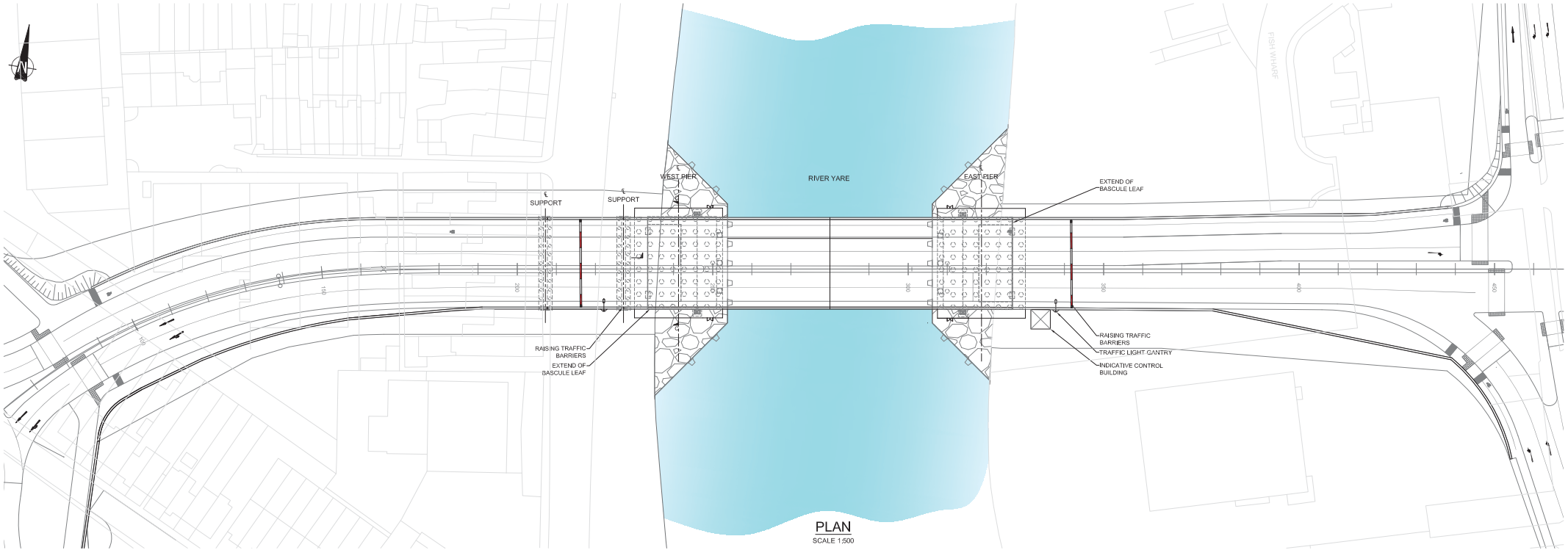
**Norfolk County Council**  
**Tom McCabe**  
 Executive Director of  
 Community and Environmental Services  
 Norfolk County Council  
 County Hall, Martineau Lane  
 Norwich NR1 2SG

**DRAWING TITLE**  
 GREAT YARMOUTH THIRD RIVER CROSSING  
 OPTION 32A - SWING BRIDGE OPTION  
 CONCEPTUAL GENERAL ARRANGEMENT - SHEET 1 OF 2

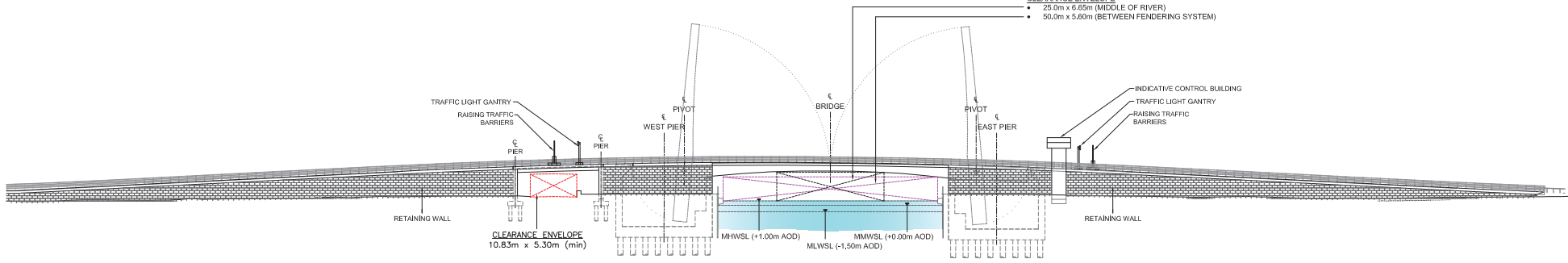
REV.	DESCRIPTION	DRAWN BY	CHECKED	DATE
P01	AMENDMENTS OF RIGHT SUPPORT OF WEST UNDERPASS	EE	GS	19-01-18
P02	AMENDMENTS ON DOLPHIN WALL AND FENDERING SYSTEM	EE	GS	23-01-18
P03	RIGHT SUPPORT OF SWING SPAN AND SWING SPAN LENGTH AMENDED.	EE	GS	16-02-18

DESIGNED BY	INITIALS	DATE	DRAWING No.
DESIGNED BY	EE	15-01-18	1076653-WSP-SGN-OPT32A-SK-S-0001
DRAWN BY	EE	15-01-18	PROJECT TITLE
CHECKED BY	GS	16-01-18	GREAT YARMOUTH THIRD RIVER CROSSING
APPROVED BY	GS	16-01-18	SCALE AS SHOWN FILE No.





- CLEARANCE ENVELOPE**
- 25.0m x 6.55m (MIDDLE OF RIVER)
  - 50.0m x 5.80m (BETWEEN FENDERING SYSTEM)



CHAINAGE	PROPOSED LEVELS	EXISTING LEVELS	LEVEL DIFFERENCE
0.000	1.705	1.705	0.000
10.000	1.922	1.705	0.217
20.000	3.262	0.690	2.562
30.000	3.647	0.918	2.629
40.000	4.109	1.044	3.065
50.000	4.659	0.966	3.643
60.000	5.109	1.299	3.810
70.000	5.609	1.268	4.341
80.000	6.109	1.307	4.712
90.000	6.609	1.595	5.045
100.000	7.109	1.694	5.415
110.000	7.609	1.768	5.841
120.000	8.073	1.530	6.143
130.000	8.478	1.938	6.540
140.000	8.824	1.677	7.147
150.000	9.112	1.608	7.453
160.000	9.340	2.421	6.919
170.000	9.510	4.287	9.797
180.000	9.821	4.334	9.925
190.000	9.673	4.339	10.012
200.000	9.666	4.316	9.983
210.000	9.881	4.334	9.924
220.000	9.477	4.308	9.794
230.000	9.293	4.317	9.610
240.000	9.051	4.302	9.353
250.000	8.751	4.285	9.008
260.000	8.391	4.227	6.164
270.000	7.973	2.954	5.998
280.000	7.498	1.925	5.570
290.000	6.996	1.779	5.216
300.000	6.498	1.732	4.764
310.000	5.996	1.742	4.253
320.000	5.498	1.471	4.024
330.000	4.998	1.486	3.510
340.000	4.498	1.447	3.049
350.000	3.996	1.594	2.412
360.000	3.501	1.685	1.816
370.000	3.048	1.742	1.306
380.000	2.645	1.815	0.830
390.000	2.299	1.602	0.667
400.000	1.987	1.896	0.091
410.000	1.682	1.982	0.000

**ELEVATION A-A**  
SCALE 1:500

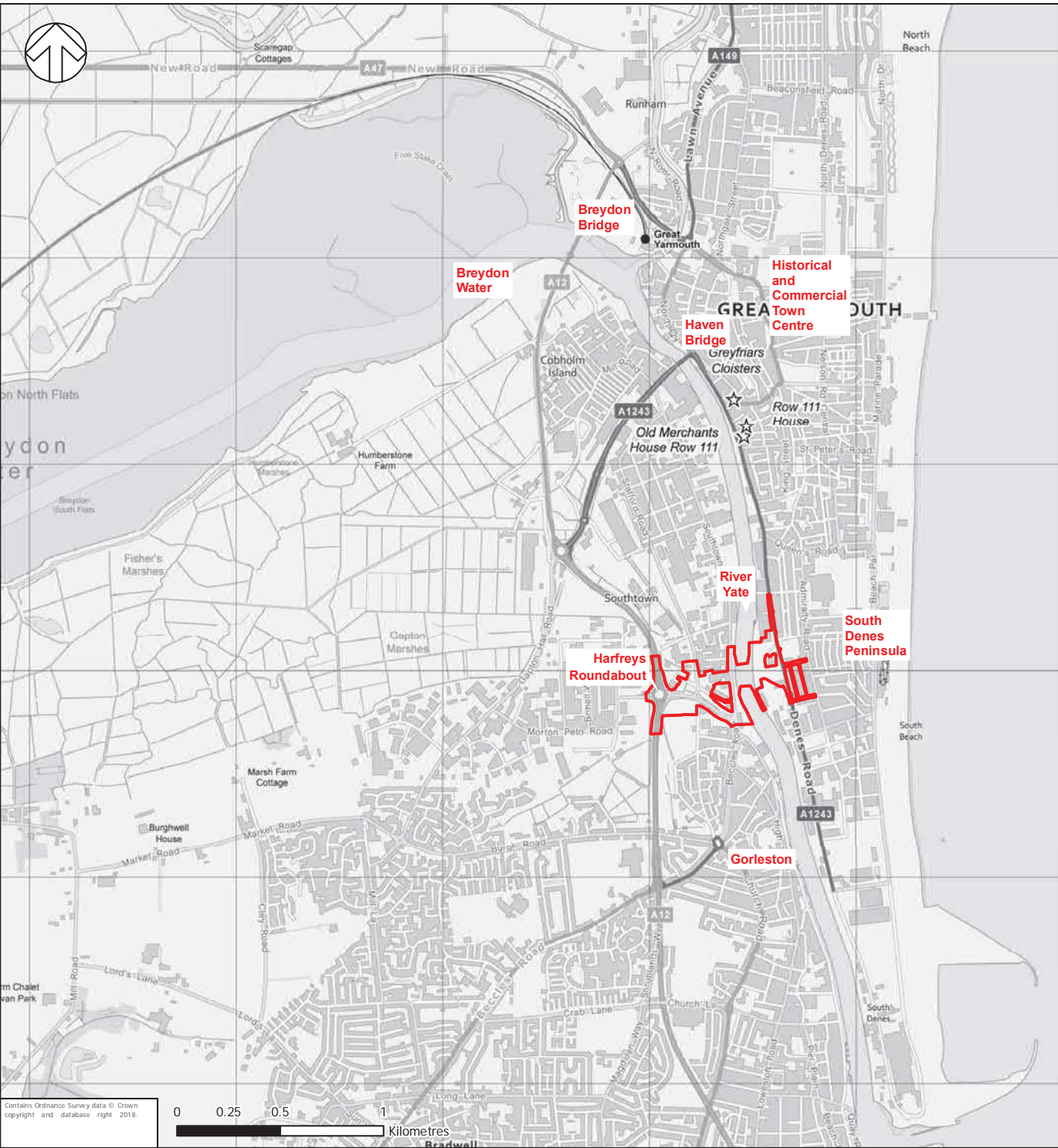


**Tom McCabe**  
Executive Director of  
Community and Environmental Services  
Norfolk County Council  
County Hall, Martineau Lane  
Norwich NR1 2SG


**DRAWING TITLE**  
GREAT YARMOUTH THIRD RIVER CROSSING  
BASCULE BRIDGE OPTION32 - CONCEPTUAL GENERAL ARRANGEMENT  
SHEET 1 OF 2

REV.	DESCRIPTION	DRAWN BY	CHECKED	DATE
P01	RETAINING WALL PATTERN AND LENGTH AMENDED.	EE	GS	16-02-18
P02	CLEARANCE ENVELOPE ADDED ON THE WEST UNDERPASS AND BASCULE SPAN, AND WATER LEVELS AMENDED.	EE	GS	26-02-18

DESIGNED BY	INITIALS	DATE	DRAWING No.
AH	AH	15.03.17	1076653-WSP-SGN-OPT32-DR-S-0001
DRAWN BY	OW	15.03.17	PROJECT TITLE
CHECKED BY	SA	15.03.17	GREAT YARMOUTH THIRD RIVER CROSSING
APPROVED BY	GS	15.03.17	SCALE AS SHOWN FILE No.

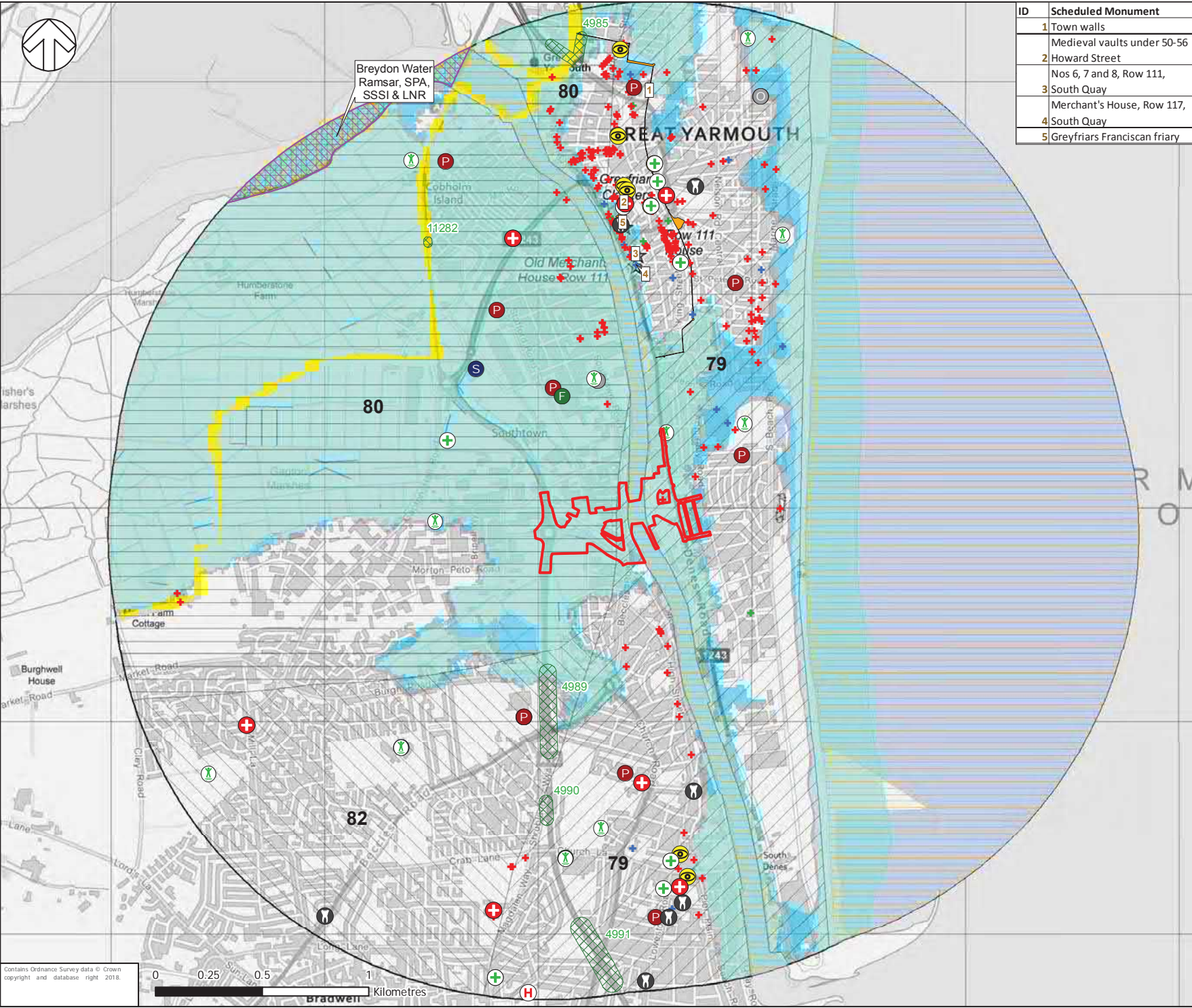


— Site Boundary



TITLE:  
GREAT YARMOUTH  
THIRD RIVER CROSSING  
PROPOSED SCHEME LOCATION

FIGURE No:  
**FIGURE 2**



ID	Scheduled Monument
1	Town walls
	Medieval vaults under 50-56
2	Howard Street
	Nos 6, 7 and 8, Row 111,
3	South Quay
	Merchant's House, Row 117,
4	South Quay
	Greyfriars Franciscan friary

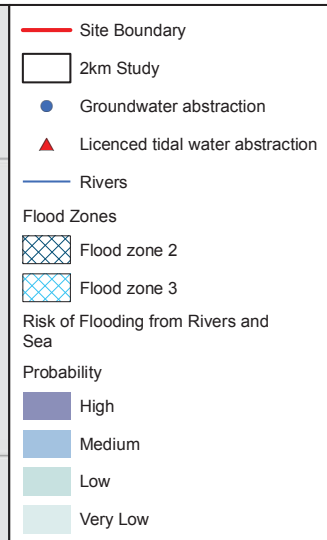
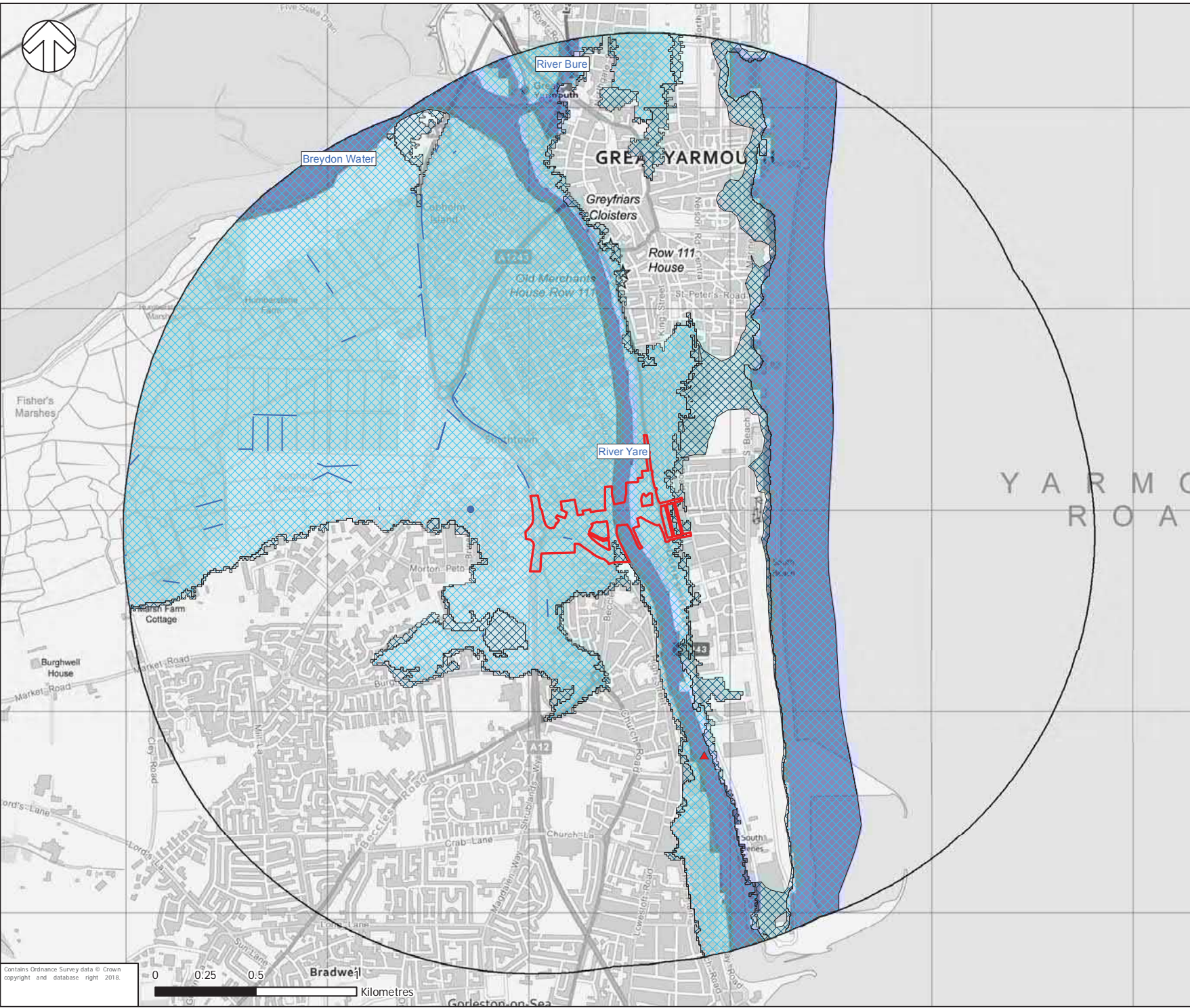
- Site Boundary
- 2km Study Area
- Air Quality and Noise
- H Hospital (No A and
- + GP Practice
- + Pharmacy
- D Dentist
- @ Optician
- Y Sports and Fitness
- P Primary
- S Secondary
- F Further Education
- O Other Educational Facility
- Noise Important Areas
- Historic Environment
- + Grade I Listed Building
- + Grade II\* Listed Buildings
- + Grade II Listed Building
- Scheduled Monument
- Townscape
- North East Norfolk and Flegg
- Suffolk Coast and Heaths (LCA49)
- The Broads (LCA80)
- Broads National Park
- Biodiversity
- Ramar
- Special Protection Areas
- Potential Special Protection Areas
- Site of Special Scientific Interest
- Local Nature Reserve
- Water Environment
- Flood zone 2
- Flood zone 3
- Rivers
- Watercourse



TITLE:  
**GREAT YARMOUTH  
 THIRD RIVER CROSSING  
 ENVIRONMENTAL CONSTRAINTS  
 PLAN**

FIGURE No:  
**FIGURE 3**

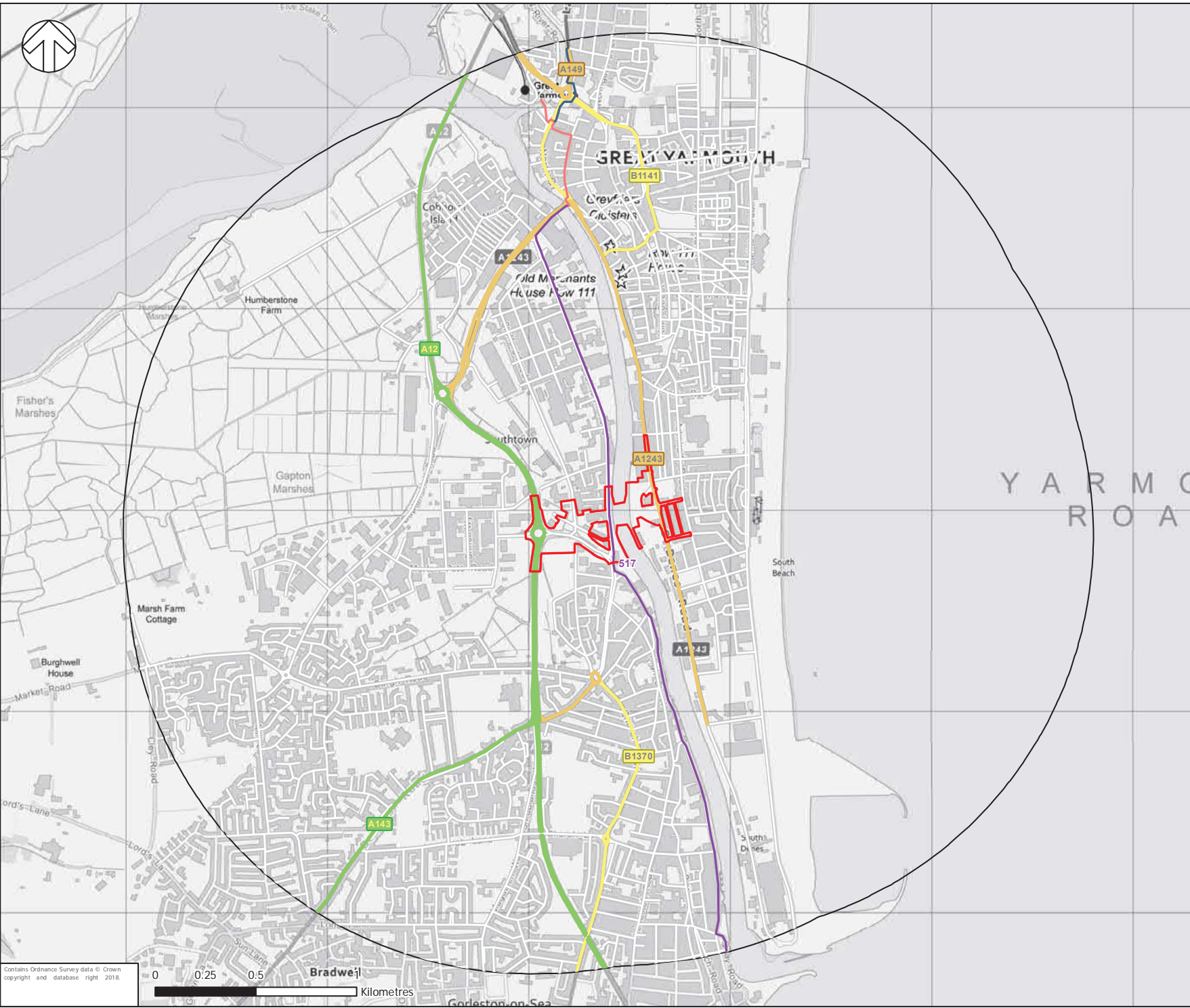




TITLE:  
**GREAT YARMOUTH  
 THIRD RIVER CROSSING  
 WATER ENVIRONMENT**

FIGURE No:  
**FIGURE 4**



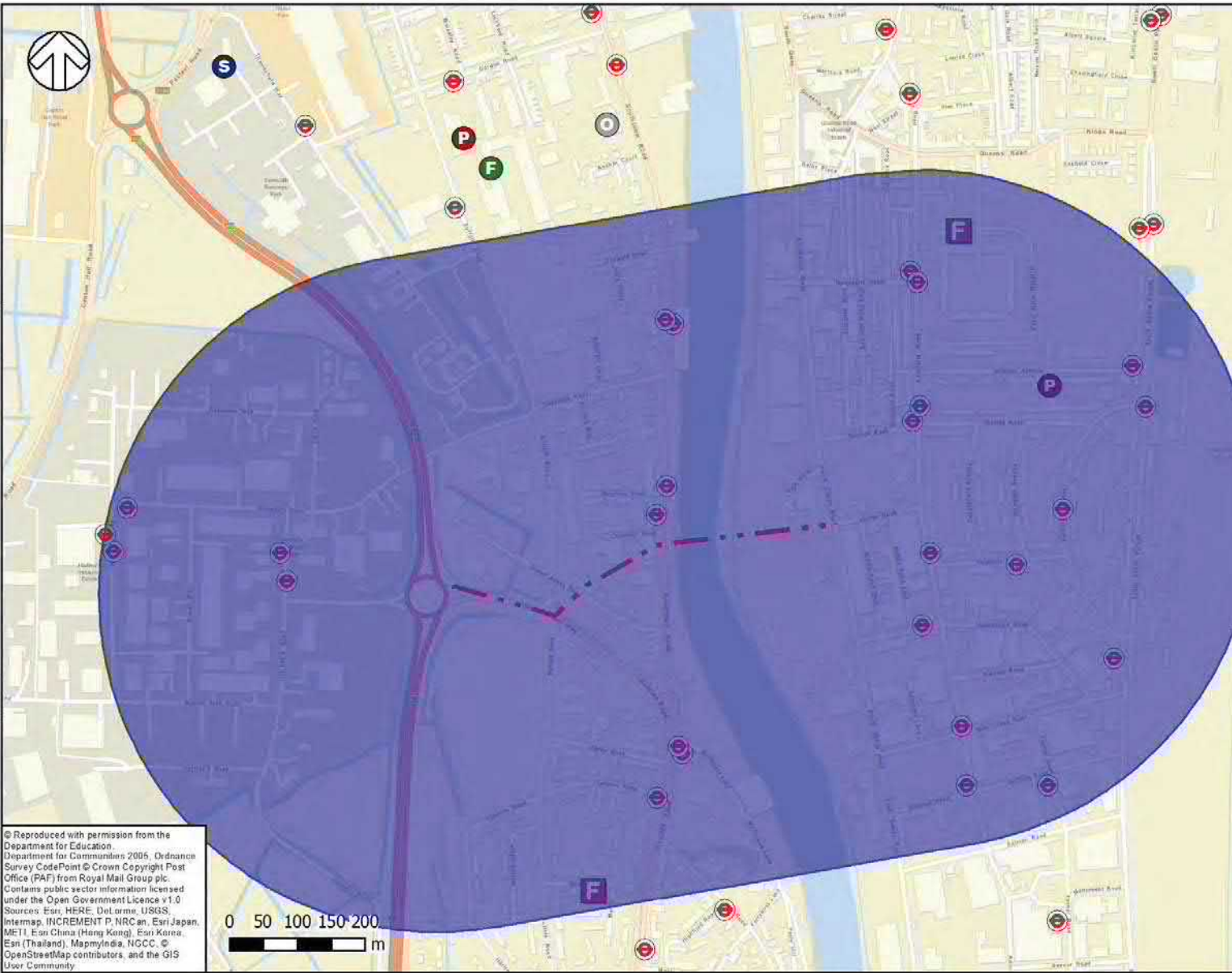


- Site Boundary
- 2km Study
- Road Network
- Primary Road
- A Road
- B Road
- Minor Road
- Local Street
- Sustrans Cycle Routes
- Norfolk Coast Cycle
- NCN Link Route
- National Route



TITLE:  
**GREAT YARMOUTH  
 THIRD RIVER CROSSING  
 PUBLIC RIGHTS OF WAY**

FIGURE No:  
**FIGURE 5**




**Key**

- - - Proposed Scheme
- P** Primary Schools
- S** Secondary Schools
- F** Further Education
- O** Other Educational Facilities
- F** Fire Stations
- B** Bus Stops

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 Sources: Esri, HERE, DeLorme, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), MapmyIndia, NGCC, © OpenStreetMap contributors, and the GIS User Community

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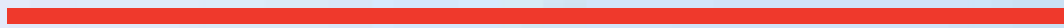
TITLE  
 Great Yarmouth Health Constraints Map

FIGURE No:  
 Figure 6



# Appendix C

LEGISLATION



WSP



## NATIONAL PLANNING POLICY

The following is a list of national planning policy sources which will be taken into account in the EIA.

- National Policy Statement for National Networks (NN NPS) (Department for Transport 2014);
- National Planning Policy Framework (NPPF) (Communities and Local Government 2012);
- National Planning Practice Guidance (PPG) (available online).

## LOCAL PLANNING POLICY

The following is a list of relevant local planning policy which will be taken into account in the EIA.

- Great Yarmouth Core Strategy 2013- 2030
- Great Yarmouth Waterfront Area Action Plan
- The Norfolk Local Transport Plan for 2026
- Great Yarmouth and Gorleston Area Transportation Strategy 2009
- New Anglia Strategic Economic Plan (SEP)

## OTHER POLICIES, GUIDANCE AND DATA SOURCES

The following list includes other relevant policy and guidance documents that will inform the EIA.

- Planning Inspectorate Advice Notes:
  - Advice Note 3: EIA Notification and Consultation
  - Advice Note 7: Preliminary Environmental Information, Screening and Scoping
  - Advice Note 9; Rochdale Envelope
  - Advice Note 10; Habitat Regulations Assessment relevant to Nationally Significant Infrastructure Projects
  - Advice Note 17; Cumulative Effects Assessment
  - Advice Note 18; The Water Framework Directive
- Communities and Local Government; Pre-Application Guidance (2015)
- National Infrastructure Plan 2014;
- The Natural Choice: securing the value of nature (Natural Environment White Paper, “NEWP”) (Defra 2011);
- Biodiversity 2020: A strategy for England’s wildlife and ecosystem services (Natural England 2011);
- Noise Policy Statement for England (Department for Environment, Food and Rural Affairs 2010);
- Noise Action Plan: Roads (Including Major Roads) (Defra 2014);
- Environmental Noise (England) Regulations 2006, as amended;



- The National Adaptation Programme. Making the country resilient to a changing climate (Department for Environment, Food and Rural Affairs “Defra” 2013);
- UK Climate Change Risk Assessment (Defra 2017);
- Climate Resilient Infrastructure: Preparing for a Changing Climate (Defra 2011);
- The Carbon Plan: Delivering our low carbon future (Department of Energy and Climate Change 2011);
- Interim Advice Note (IAN) 195/16 Cycle Traffic and the Strategic Road Network<sup>80</sup>;
- Guidelines for Landscape and Visual Impact Assessment (3rd Edition, Landscape Institute and Institute of Environmental Assessment and Management 2013);
- Handbook for Cycle Friendly Design (Sustrans 2014);
- Technical Standards for the design, maintenance and operation of Sustainable Drainage Systems (Defra)

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<sup>80</sup> Interim Advice Note (IAN) 195/16 (2011) Cycle Traffic and the strategic Road Network [online] available at: <http://www.standardsforhighways.co.uk/ha/standards/ians/pdfs/ian195.pdf> (Accessed January 2018).



# Appendix D

INFORMAL CONSULTATION RESPONSES





## Broad, Gavin

---

**From:** [REDACTED]  
**Sent:** 13 October 2017 13:26  
**To:** Great Yarmouth 3rd River Crossing  
**Subject:** Broads Authority Response to consultation  
**Attachments:** 2017\_07\_25 Revised A1 Poster.pdf; habi-sabi swift and bat refuge prospectus.pdf

Many thanks for allowing us an extension to the consultation. Planning Committee today endorsed the representation below.

The Broads Authority supports the scheme.

We do have some comments that we would like you to consider.

From a navigation point of view there needs to be a safe waiting point, particularly for small vessels (motor cruisers, rather than the Ports shipping vessels), while waiting to cross under the proposed new bridge. Current provision is very poor at Haven Bridge with a climb up a long slippery ladder to tie up vessels. This provision could take the form of pontoons (particularly downstream of the proposed new bridge) to allow safe mooring of vessels while waiting.

The Lake Lothing equivalent consultation included much information about the environmental considerations of the bridge when in place and during construction. It is not obvious where this information is for the Great Yarmouth scheme. Please find some general biodiversity related comments below. In addition, we request that the Senior Ecologist at the Broads Authority is contacted to discuss the project. A similar meeting was held with Suffolk County Council regarding the Lake Lothing crossing and this was very productive.

- What surveys have been undertaken relating to biodiversity, for example in relation to bats?
- What is the timeframe for the Environment Statement to be completed please?
- This development is next to the Broads and within some of the UK's most important biodiversity habitats that people cherish. Within the Environment Statement we would request the scheme to be very positive and explicit about bat and nesting bird enhancement and recommend that something similar to the habi-sabi is installed to ensure that this scheme is evidencing meeting its mitigation and enhancement targets. (see example designs attached)

Access and waterways comments:

- With regards to the bridge structure, a 4.5m air draft when closed (infinite when opened) would be acceptable in principle to the Broads Authority as Navigation Authority. This is also true of the span of the bridge between the supporting pylons. As this is shown as 50m, this is well outside the minimum width requirement.
- With regards to the access, no Public Rights of Way are affected by these proposals. The bridge is stated to not exceed a max gradient of 5% (1:20) which is in accordance with the design standard. There is a cycle route crossing the development area but this has been incorporated into the landscaping design and poses no problems with regards to access issues.

[REDACTED]  
Planning Policy Officer  
[REDACTED]

Broads Authority, Yare House, 62-64 Thorpe Road. Norwich NR1 1RY

[REDACTED]  
[www.broads-authority.gov.uk](http://www.broads-authority.gov.uk)



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---

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██████████  
Project Manager  
Great Yarmouth Third River Crossing  
Major Projects Team  
Norfolk County Council  
County Hall, Floor 2  
Martineau Road  
Norwich  
NR1 2DH

**Our ref:**  
**Your ref:**  
**Date:** 3rd November 2017

Dear ██████████

Great Yarmouth Third River Crossing Stage 2 Consultations

Thank you for inviting us to comment on the proposal for a third river crossing at Great Yarmouth. As previously discussed, we did not receive the original invitation and so we apologise that we have not been able to respond within your published timeframe. In terms of our overall response to your proposal, we have not identified any issues at this stage that present any irresolvable conflict with our objectives. This is based on the limited information available and careful consideration must be given to the environmental constraints as the proposal is developed further.

The document has made little reference to the environmental assessments that will be required to progress the proposal through the consenting process for an application of this scale and complexity. Therefore, we have considered the proposal and offer our comments below as a preliminary opinion for this project based on our outline assessment of the constraints for the site. We have indicated the areas for consideration and the relevant study or evidence that will be required as the scheme design progresses and will be necessary to inform decision making for development consent. The areas for further consideration are: how the proposal might be affected by or impact on the proposals for a tidal barrier, assessment and management of flood risk, impacts on the water environment, biodiversity and contaminated land.

We would be pleased to provide bespoke advice such as reviewing assessments and modelling advice based on our standard hourly rate as the scheme progresses

### **Proposed Tidal Barrier and Flood Risk**

#### **Tidal Barrier**

The Environment Agency project manager for the Great Yarmouth Tidal Defences (Epoch 2 – 2016-2021) project met with David Allfrey from NCC in May this year to discuss the Third River Crossing. The purpose of the meeting was to share background information about both of the projects. The proposed bridge location will affect around 100m of river frontage on wall 80 on the west bank (Bollard Quay) and wall 22 on the

Environment Agency  
Cobham Road, Ipswich, Suffolk, IP3 9JD.

██████████  
[www.gov.uk/environment-agency](http://www.gov.uk/environment-agency)

Cont/d..



east bank. The Third River Crossing project is looking to narrow the river from one or other, or both sides, which would go in front of the current flood defences. Given the uncertainty concerning the details of both projects at that stage we agreed that we would keep each other updated on progress. Once we know our preferred options we can then then discuss how the projects overlap, possible constraints and opportunities.

### **Flood Risk**

Our maps show the site lies wholly within tidal Flood Zone 3 defined by the 'Planning Practice Guidance: Flood Risk and Coastal Change' as having a high probability of flooding. A proposal such as this for a significant new bridge crossing can be classed as "essential infrastructure" specifically essential transport infrastructure (including mass evacuation routes) which has to cross the area at risk. This is defined in [Table 2: Flood Risk Vulnerability Classification](#) of the Planning Practice Guidance. This classification should be checked with the planning authority as they will make the final decision on the classification.

To comply with national policy the application is required to pass the Sequential and Exception Tests and be supported by a site specific Flood Risk Assessment (FRA). It has not been stated if this proposal will fall under a Nationally Significant Infrastructure Project (NSIP). If this proposal is considered an NSIP the [National Policy Statement for National Networks](#) should be referred to as well as the National Planning Policy Framework (NPPF) and Planning Practice Guidance (PPG) discussed above.

### Flood Risk Assessment

The FRA should consider the risk to the proposed crossing itself. It should be noted that Table 3 of the PPG states that essential infrastructure located within Flood Zone 3a should be designed and constructed to remain operational and safe in times of flood.

As well as the risk posed to the bridge itself any off-site impacts that may be caused as a result of the new crossing displacing flood storage, or changing flow pathways in the event of flooding must be considered. We note that the proposals appear to narrow the channel which could have an impact upon flood risk. Any land raising within the floodplain such as bridge ramps or abutments could also have an impact and remove floodplain storage and should be considered. It is important to ensure that the proposed crossing does not increase flood risk elsewhere and where possible reduces flood risk overall in line with Paragraph 102 of the National Planning Policy Framework (NPPF). If there is likely to be an impact elsewhere mitigation will be required potentially in the form of compensatory storage.

### Flood Modelling

In order to undertake this assessment flood modelling will be required. The Environment Agency hold a number of flood models which will be of use. The Great Yarmouth Model undertaken by Halcrow on behalf of the environment Agency was completed in 2011. The model itself and any outputs (flood levels and extents) and reports can be requested from us. Please be aware that we are in the process of updating this modelling. The new Essex Norfolk and Suffolk Coastal Modelling (2017) will replace the 2011 model. This is still in the process of being finalised but should be used if available. This information can be requested by emailing our Customers and Engagement Team on [Enquiries\\_EastAnglia@environment-agency.gov.uk](mailto:Enquiries_EastAnglia@environment-agency.gov.uk). This information is free of charge. For further information on our flood map products please visit our website at: [www.environment-agency.gov.uk/research/planning/93498.aspx](http://www.environment-agency.gov.uk/research/planning/93498.aspx).

The FRA should consider a range of events over the lifetime of the proposed crossing. As a minimum the 5% (1 in 20), 0.5% (1 in 200) and 0.1% (1 in 1000) annual probability

flood events should be considered both with and without an allowance for climate change. As Great Yarmouth is defended the residual risk of a breach of these defences will also need to be considered. The FRA may also need to consider the impact of any significant temporary works which may be required to facilitate the installation of the crossing to ensure this does not increase flood risk. This is usually considered by obtaining our flood models and re running them to produce a before and after scenario. The FRA should illustrate and discuss any changes shown by this modelling as a result of the crossing in order to determine if mitigation is required. If flood modelling is undertaken this will need to be submitted to us for review.

### Climate Change

Our current climate change guidance for Flood Risk Assessments is available on our website. Another important document to refer to is our Adapting to Climate Change: Advice for flood and Coastal Erosion Risk Management Authorities guidance document. If the proposal is considered a NSIP the NPS for National Networks should also be considered. This refers to other climate change allowances that need to be considered in a FRA for this kind of development. You should refer to paragraphs 4.41 – 4.44 of the National Networks NPS. It is important that the impact of and resilience to future flooding is considered and mitigation against future flood risk elsewhere is implemented where necessary. Section 4.41 of the NPS states that if transport infrastructure has safety-critical elements and the design life of the asset is 60 years or greater, the applicant should apply the UK Climate Projections 2009 (UKCP09) high emissions scenario against the 2080's projections at the 50% probability level.

It is therefore important to determine if the bridge has safety-critical elements or is considered safety critical as this will inform the climate change allowances that need to be considered and if you need to assess the high emissions climate change scenario. If these allowances are relevant and the bridge is considered safety-critical the FRA should provide details of whether these allowances are higher or lower than the standard tidal allowances. The highest levels should then be used to inform the design and mitigation of the crossing.

According to the NPS document if the bridge is considered safety critical the high emissions scenario and H++ scenario also needs to be assessed. Safety critical elements of the design should be assessed against the H++ estimates (high risk, low probability scenario) for sea level rise to assess a credible maximum scenario. We would not normally expect the design or mitigation to be provided to this level but the crossing should be assessed against this scenario to understand the picture of risk.

The UKCP09 relative sea level rise projections are available for various emission scenarios on the UKCP09 user interface on their website. Please be aware that the next set of climate change projections (UKCP18) replacing UKCP09 is due in 2018.

### Environmental Permit for Flood Risk Activities

Under the Environmental Permitting Regulations (EPR) for England and Wales (2016) an environmental permit for flood risk activities may be required for work in, under, over or within 8m of a fluvial main river or flood defence structure or culvert or within 16m of a tidal main river or flood defence structure or culvert. The proposed third crossing will cross the main river known as the River Yare.

The Environmental Permitting Regulations take a risk based approach that enables us to focus regulatory effort towards activities with highest flood or environmental risk. Lower risk activities can be excluded or exempt and only higher risk activities will require a permit. The bridge crossing itself will require a bespoke permit. Any other

facilitating works may fall under one or more of the following:

- An Exclusion
- An Exemption
- A Standard Rules Permit
- A Bespoke Permit

Application forms and further information can be found at:

<https://www.gov.uk/guidance/flood-risk-activities-environmental-permits>.

If you require further advice please email [FDCENS@environment-agency.gov.uk](mailto:FDCENS@environment-agency.gov.uk).

## **Water Environment and the Water Framework Directive**

Our concerns for the water environment are to protect both surface and groundwater that may be receiving bodies for any sources of contamination. In addition to this there is an overriding obligation for all public bodies to seek to improve the status of water bodies to 'good' under the provisions of the Water Framework Directive.

### **Water Framework Directive (WFD)**

The obligations of WFD extend to all public bodies and require an absolute responsibility to ensure no deterioration of a waterbody; overlaying this is a requirement to strive for improvement and this should underpin all elements of environmental assessment involving a water body. WFD applies to both surface and groundwater bodies. It will be necessary to undertake a preliminary assessment to fully understand the potential direct and indirect impacts on waterbodies both in the immediate vicinity of the proposed development and on wider waterbodies such as aquifers and river catchments together with options for mitigation and improvement.

### **Surface Water**

Hydromorphological assessment – The development is expected to require narrowing of the tidal waterbody which will result in changes to the channel hydromorphology. This will require modelling and provision of evidence to demonstrate that this kind of modification will not cause a WFD deterioration.

Road Drainage and water environment – Plans should be in place to deal with surface water drainage issues created by new highways. This should include appropriate sustainable drainage systems (SuDS) to filter pollutants and prevent deterioration in the status of the receiving waterbodies. Any scheme for drainage should have appropriate number of treatments steps to protect both surface and groundwater receiving bodies. The use of SuDS may also provide an opportunity to incorporate new wetland habitat to promote biodiversity.

### **Groundwater**

#### **Environmental Setting**

The geology in the area of the proposed bridge crossing is comprised of the North Denes Formation on the east bank. This superficial sand and gravel deposit is designated as Secondary A aquifer. On the west bank the superficial deposits comprise of the Breydon Formation, a peat deposit considered to be unproductive. The bedrock beneath the proposal area is the Crag Formation, a principal aquifer. The site is not within a Source Protection Zone (SPZ).

#### **Groundwater Protection**

We would wish to be consulted on any proposals to drill investigative boreholes into the river to ensure sufficient pollution prevention measures are taken to protect the

underlying aquifer.

A piling risk assessment will need to be undertaken. Piling or any other foundation designs using penetrative methods can result in risks to groundwater, for example, pollution / turbidity, risk of mobilising contamination, drilling through different aquifers and creating preferential pathways. Therefore, it should be demonstrated that any proposed piling will not result in contamination of groundwater.

### **Biodiversity**

The document makes little reference to the assessments that will be required to preserve the biodiversity of the site area as the proposal moves forward. In addition to the requirements mentioned previously the following key environmental considerations should be included in your assessments:

#### **Nature Conservation**

You should identify the likely significant effects of the proposed scheme on the biodiversity of the area, during constructional and operational phases. You should include statutory designated and non-designated sites, protected habitats, and impacts on legally protected species. Assessments should also consider impacts in relation to the distance from the site – Main (within 500m), Broad (2km), Extended (30km).

#### **Phase 1 Habitat Survey**

This should include both desk study and field studies. The desk study should identify the locations of any protected species records, Natura 2000 sites, SSSIs and non-statutory nature conservation sites (County Wildlife Sites, Local wildlife sites) within a 2km radius. Field study to identify and map habitat present within the study area, and assess their suitability to support protected species.

#### **Habitats Regulations Assessments (HRA) Screening**

This is required to assess the proposed scheme in relation to the requirements of the Habitats Regulations. It should also include consideration of compensatory measures.

### **Contaminated Land**

The area of interest is in a predominantly industrial area and therefore a preliminary risk assessment (PRA) will need to be submitted as part of the planning application. The PRA should identify all previous uses of the land, potential contaminants associated with those uses and develop a conceptual model of the site including sources, pathways and receptors. The PRA will need to be followed up by a site investigation which will provide information for a detailed assessment of risk to all receptors, including those off site.

The results of the site investigation and risk assessment will enable an options appraisal and remediation strategy to be developed which will give full details of the remediation required. A verification report, providing all the data collected, will then need to be submitted to demonstrate remedial targets have been met and the works have been completed as set out in the remedial strategy.

I trust that you have found this information useful. As stated previously, we would be pleased to provide tailored advice and we would be interested to know which consenting route you consider to be most appropriate at this stage.

Yours sincerely

[Redacted]

[Redacted]

**Planning Specialist**

[Redacted]

[Redacted]

[Redacted]



Historic England

EAST OF ENGLAND OFFICE

██████████  
Norfolk County Council: Community and  
Environment Services  
County Hall  
Martineau Lane  
NORWICH  
Norfolk  
NR1 2DH

████████████████████  
Our ref: PA00572687  
Your ref: HI/MP/PKA018/GB

4 October 2017

Dear ██████████

### Pre-application Advice

#### **GREAT YARMOUTH THIRD RIVER CROSSING - STAGE 2 CONSULTATION, GREAT YARMOUTH, NORFOLK**

Thank you for seeking Historic England's pre application advice on the proposal for a third river crossing for Great Yarmouth. This is part of a wider consultation on the scheme development.

The crossing is proposed at the southern end of the river. It lies not far from Nelson's Column and to the south of the conservation area. The Nelson Monument a prominent landmark, listed grade I. Dating from 1817-19 it reflects Nelson's achievements and associations with the town and was a precursor to the more famous monument in Trafalgar Square. The design reflects the predominance of the classical style in this period and its functional role as a seamount. Its location was deliberately exposed to enhance its value as the latter. To the north of the site is the wooden scenic railway which opened in 1932. It is the second oldest scenic railway in the country and one of only six roller coasters built before the Second World War to survive. It is the major surviving ride from the Pleasure Beach, one of the earliest seaside amusement parks in the country and an important part of the outstanding collection of nineteenth and twentieth century entertainment buildings in Great Yarmouth. It was listed at grade II last year.

The design of the bridge has yet to be developed but would need to open to allow vessels along the river. A bascule bridge with a clearance of 4.5 meters at high tide is therefore proposed. An alternative option of a cable stayed swing bridge is also set out.



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*Historic England will use the information provided by you to evaluate any applications you make for statutory or quasi-statutory consent, or for grant or other funding. Information provided by you and any information obtained from other sources will be retained in all cases in hard copy form and/or on computer for administration purposes and future consideration where applicable.*

The impact of the new bridge and new road network on the setting and significance of Nelson's Column and the conservation area and other elements of the historic environment should be fully considered. Detailed information about the setting of heritage assets can be found in the Planning Practice Advice Note 3 The Setting of Heritage Assets. As a tall structure, the setting of the column extends over a wide area. The impact of the height of the bridge (in both a closed and open position) on the significance of the column should be considered. It would be helpful for the impact of both bridge design options to be assessed. The design should aim to avoid or minimise any harm in line with planning policy.

Previous work in the area of the proposed development has highlighted the potential for buried archaeological remains and deposits to be preserved spanning the prehistoric period to the present day. This includes deposits of palaeoenvironmental interest, such as peat, that may preserve organic archaeological remains such as wood, pollen, plant remains, shells and insect remains that can provide information about how the landscape and the environment may have changed over time, as well as potentially providing information on the activities that were carried out in the area. A heritage statement will therefore be required in order to understand the archaeological potential of the area affected by the development, and how the proposed works would impact on the remains. This may highlight the need for additional work to be carried out, such as a borehole survey, deposit model and assessments being carried out to understand the deposits that are present, the remains that are present (artefacts and palaeoenvironmental remains) and their potential to address archaeological questions. Additional information about the approaches and techniques that could be used, and the remains that could be investigated can be found in the following Historic England guidance documents:

Environmental Archaeology (2011): <https://historicengland.org.uk/images-books/publications/environmental-archaeology-2nd/>

Geoarchaeology (2015): <https://historicengland.org.uk/images-books/publications/geoarchaeology-earth-sciences-to-understand-archaeological-record/>

### Next Steps

We hope this initial advice is helpful in highlighting the historic environment issues that Historic England considers important. Please do contact me if you would like to discuss this further. If you would like further guidance on the archaeological issues, please contact the Historic England Science Advisor for the East of England, Zoe Outram ([zoe.outram@historicengland.org.uk](mailto:zoe.outram@historicengland.org.uk) [<mailto:zoe.outram@historicengland.org.uk>](mailto:zoe.outram@historicengland.org.uk)).



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Historic England

EAST OF ENGLAND OFFICE

Yours sincerely

[Redacted signature]

[Redacted name]

Principal Inspector of Historic Buildings and Areas

[Redacted contact information]



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[Redacted website URL]  
[HistoricEngland.org.uk](http://HistoricEngland.org.uk)



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Date: 06 October 2017  
Our ref: 224829  
Your ref: HI/MP/PKA018/GB



[Gy3rc@nارfolk.gov.uk](mailto:Gy3rc@nارfolk.gov.uk)

**BY EMAIL ONLY**

Customer Services  
Hornbeam House  
Crewe Business Park  
Electra Way  
Crewe  
Cheshire CW1 6GJ

T 0300 060 3900

Dear [REDACTED]

### **Planning consultation: Great Yarmouth Third River Crossing Stage 2 Consultation**

Thank you for your consultation dated and received by Natural England on 24 August 2017.

Natural England is a non-departmental public body. Our statutory purpose is to ensure that the natural environment is conserved, enhanced, and managed for the benefit of present and future generations, thereby contributing to sustainable development.

Natural England has reviewed the pre-application request that has been sent to us by your authority. As you may be aware, Natural England has introduced an improved service to provide discretionary advice related to planning proposals, supported by the introduction of charges – our Discretionary Advice Service (DAS).

Based on the consultation sent to Natural England by your authority and in accordance with Natural England's DAS requirements, Natural England can provide advice on the following areas:

#### **European and Nationally Designated Sites and Protected Landscapes**

Designated sites that may be impacted upon by the proposed development include:

- Breydon Water Special Protected Area
- Breydon Water Ramsar
- Breydon Water Site of Special Scientific Interest
- Great Yarmouth North Denes Special Protected Area
- Great Yarmouth North Denes Special Scientific Interest
- Outer Thames Estuary Extension Special Protected Area
- The Broads National Park

We acknowledge from the documents available at this stage that the proposal is to develop a third river crossing over the River Yare, Great Yarmouth. This use presents a number of potential impact pathways to the designated site features including:

- Noise disturbance (birds)
- Changes to recreation patterns at designated sites
- Runoff from the bridge (water quality)
- Landscape and visual impacts

The above listed SPA's are classified in accordance with Article 4 of the EC Birds Directive, they are classified for rare and vulnerable birds and regularly occurring migratory species. The noise and visual impact of the proposed development may effect these species and cause displacement. We suggest that potential disturbance to designated features are assessed.

Great Yarmouth is a popular seaside destination and improvements to the transport network may generate additional tourism and increase recreational pressure on sensitive sites such as Great Yarmouth and North Denes SPA. We suggest increased visitor pressure and potential impacts to designated sites are considered.

Runoff from the bridge into the River Yare may indirectly impact designated sites, specifically Breyon Water. We advise that potential impacts on water quality and controls for runoff and pollution are explored.

In addition, we feel landscape and visual impacts should be taken into account with reference to the likely effects on the special qualities of The Broads National Park.

Natural England advise that these potential impact pathways are considered within the application. We suggest a habitats regulation assessment to consider how the proposed development may impact designated sites. We recommend that the potential impacts on the features for which the SSSI is notified is also considered as some are different to the European site features. The [Conservation objectives](#) for each European site explain how the site should be restored and/or maintained and may be helpful in assessing what, if any, potential impacts a plan or project may have.

Please refer to our [standing advice](#) on protected species.

If the developer requires substantive pre-application advice in addition to that provided above, Natural England advises that the applicant/developer consults Natural England directly, so that they have the opportunity to express an interest in using DAS.

The first step is for the developer to fill out a simple form, so we can register their interest, and make sure they have the right adviser for their case. Please visit our website (<http://www.naturalengland.org.uk/ourwork/planningdevelopment/spatialplanning/das/default.aspx>) for more information and a downloadable request form [here](#) .

Yours sincerely

  
Norfolk and Suffolk





# Appendix E

PRELIMINARY ECOLOGICAL APPRAISAL





# **GREAT YARMOUTH THIRD RIVER CROSSING**

## **Preliminary Ecological Appraisal**

October 2016

*Produced for*



*Prepared by*



Unit 2180  
1<sup>st</sup> Floor  
Thorpe Park  
Century Way  
Leeds  
LS15 8ZB  
UK



## Document Control Sheet

Project Title            Great Yarmouth Third River Crossing

Report Title            Preliminary Ecological Appraisal

Report ref no.

Revision                1

Status                  Final

Control Date            October 2016

### Record of Issue

Issue	Status	Author	Date	Check	Date	Authorised	Date
1	Final	D. Lovett	20/10/16	R. Bailey	21/10/16	A. Bascombe	24/10/16

### Distribution

Date	Organisation	Contact	Format	Copies



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# 1 Introduction

## 1.1 Background

Mouchel was commissioned by Norfolk County Council to undertake a Preliminary Ecological Appraisal (PEA) of land at the proposed site of the Great Yarmouth Third River Crossing. The site has been identified by Norfolk County Council as the site of a future link to cross the River Yare.

This report presents the results of the PEA undertaken in September 2016. This report identifies ecological constraints located up to 1km from the site and makes recommendations for further survey work and/or avoidance or mitigation measures as appropriate.

## 1.2 Site Location

The scheme proposals would change the existing William Adams Way so that the crossing ties in directly with the A12, in the centre of Great Yarmouth, to the west of the river. On the west of the river, there are several residential properties as well as parkland and allotments. The crossing ties in to South Denes Road (the A1243) on the east of the river, with the land here being used by several industrial complexes.

## 1.3 Study Objectives

A study area, extending up to 1km from the site of the proposed scheme was surveyed in order to determine impacts and likely constraints to the proposed scheme. The study set out to:

- Consult records of statutory protected sites within 1km of the proposed scheme;
- Identify habitats and species present or likely to be present that are ecologically important and/or have legal protection;
- Identify invasive species that might be present on site.

## 2 Methods

### 2.1 Desk Study

The Norfolk Biodiversity Information Service (NBIS) was consulted to gather information on records of species and nature conservation designations from within the study area.

A review of the Multi-Agency Geographic Information for the Countryside<sup>1</sup> online resource was also undertaken to gather information on statutory nature conservation designations within the study area.

### 2.2 Field Survey

A walkover survey, undertaken broadly in accordance *with Phase 1 Habitat Survey Methodology*<sup>2</sup>, was carried out on 28<sup>th</sup> and 29<sup>th</sup> September 2016. Habitat types were identified and mapped, with target notes made to identify features of interest. The suitability of habitats within the study area to support legally protected, valuable or controlled species was assessed with incidental field signs or sightings of species recorded as seen.

### 2.3 Limitations

Survey work was undertaken during October, which is outside of the optimal season for carrying out botanical surveys (April to September inclusive). Nevertheless, it is considered that the survey work undertaken was sufficient to be able to map the habitats and ecological features present.

---

<sup>1</sup> *Multi-Agency Geographic Information for the Countryside (MAGIC, 2016)*. [www.magic.gov.uk](http://www.magic.gov.uk) [accessed 18 March 2016].

<sup>2</sup> *Joint Nature Conservancy Council (JNCC) (2007). Handbook for Phase 1 Habitat Survey – A Technique for Environmental Audit*. Peterborough, UK

## 3 Results

### 3.1 Desk Study Results

#### 3.1.1 Statutory Designated Sites

The Outer Thames Estuary Special Protection Area (SPA) is within 2km of the proposed scheme. This site is designated because it supports 38% of the Great British population of red-throated diver *Gavia stellate*, which is listed on Annex 1 of the EU Birds Directive.

#### 3.1.2 Non-Statutory Designated Sites

There are no non-statutory designated sites within 2km of the proposed scheme.

#### 3.1.3 Species

The information returned from the desk study contained a record of one moth, the goat moth *Cossus cossus*, which is a UK Biodiversity Action Priority (BAP) species.

#### 3.1.4 Amphibians

One record of natterjack toad *Epidalea calamita* was returned. This record was for Gorleston on Sea and is undated.

There are three records for common toad *Bufo bufo*, the most recent being dated March 1999. These records are for Southtown Common, approximately 800m west of the proposed scheme.

#### 3.1.5 Reptiles

There are four records for common lizard *Zootoca vivipara*, the most recent being from Southtown Common in June 2008.

There are two records for slow-worm *Anguis fragilis*, the most recent of which was from grid reference TG52530771 in August 2008.

#### 3.1.6 Mammals

There are fourteen records of water vole *Arvicola amphibius* from within 2km of the proposed scheme, the most recent being from December 2012.

There are three records of otter *Lutra lutra* within 2km of the proposed scheme, the most recent for a site by the name of Coopers in October 2011.

There are multiple records of bat species within 2km of the study area, many of which are from within the footprint of the proposed scheme. The most recent of these are described in the table below.

Species	Number of Records	Most Recent Record
Common pipistrelle, <i>Pipistrellus pipistrellus</i>	5	June 2015
Soprano pipistrelle, <i>Pipistrellus pygmaeus</i>	1	May 2015
Nathusius' pipistrelle, <i>Pipistrellus nathusii</i>	2	May 2015
Serotine, <i>Eptesicus serotinus</i>	1	May 2015
Daubenton's bat, <i>Myotis daubentonii</i>	1	May 2015
Noctule, <i>Nyctalus noctula</i>	3	May 2015
Brown long-eared bat, <i>Plecotus auritus</i>	1	May 2015

There are eight records of hedgehog *Erinaceus europaeus*, the most recent being from September 2009. Brown hare *Lepus europaeus*, has also been recorded within 2km of the proposed scheme, in August 2013.

There is one record of badger *Meles meles* within 2km of the proposed scheme, dating from September 2014.

### 3.1.7 Birds

A large number of bird species have been recorded within 2km of the proposed scheme. These include 50 species included on Schedule 1 Part 1 of the Wildlife and Countryside Act 1981 (as amended) which are protected at all times of the year.

## 3.2 Field Survey Assessments

### 3.2.1 Habitat Assessments

A plan showing the habitats identified within the site is shown in Figure 1.

#### 3.2.1.1 William Adams Way and Suffolk Road

Southtown Common recreation ground lies to the south of William Adams Way. This area contains amenity grassland dominated by perennial rye-grass *Lolium perenne*, with some white clover *Trifolium repens*, ribwort plantain *Plantago lanceolata* and common dandelion *Taraxacum officinale* also present.

To the north and west, the common is bordered by a ditch containing standing water. The banks are covered by common nettle *Urtica dioica*, bramble *Rubus fruticosus*, great willowherb *Epilobium hirsutum*, dog rose *Rosa canina* and creeping thistle *Cirsium arvense*.

A mixture of broadleaf trees are present in the margins of the common, as well as bordering William Adams Way to the north and south. Pedunculate oak *Quercus robur*, beech *Fagus sylvatica*, poplar *Populus* spp., willow *Salix* spp., hawthorn

*Crataegus monogyna*, sweet chestnut *Castanea sativa* and horse chestnut *Aesculus hippocastanum* are all present alongside ash *Fraxinus excelsior* and elder *Sambucus nigra*.

To the north of William Adams Way and to the west of Suffolk road, is an area of wet scrub. The ditch passes under William Adams Way and runs north away from the road. The area around the ditch contains willow, great willowherb, bramble, common nettle, hawthorn, poplar and field bindweed *Convolvulus arvensis* and hogweed *Heracleum sphondylium*.

The area to the east of Suffolk Road contains several allotments which, in addition to the native species already listed, contained varieties of arable crops and introduced garden plants.

The trees and scrub in this area are suitable for use by nesting birds. Overall, the habitats around William Adams Way and Suffolk Road are of low ecological value.

#### **3.2.1.2 South Denes Road**

The area to the east of the River Yare is well built up with roads, industrial buildings and concrete storage space for materials being shipped. Butterfly bush *Buddleja davidii*, creeping thistle and ragwort *Jacobaea vulgaris* were seen to be growing amongst the concrete.

The hedgerows and trees surrounding the site of the proposed scheme are suitable for nesting birds (an active woodpigeon nest was seen during the survey). Overall, the hedgerows are of low ecological value.

There are many old buildings in states of disrepair to the east of the river. These buildings may provide roosting sites for bats.

### **3.2.2 Species Assessments**

#### **3.2.2.1 Amphibians**

There are areas of terrestrial habitat within 250m of the proposed scheme that are suitable for use by amphibians. This includes the land on the northern and western edge of Southtown Common, which also includes a ditch with standing water. The ditch passes under William Adams Way and runs north beneath Queen Anne's Road before running north-west. As the ditches are linked underneath the two roads, they are considered here as one water body.

There is a small pond at TG523058. This and the surrounding habitat of grassland, scrub and woodland is suitable for use by amphibians.

#### **3.2.2.2 Reptiles**

The majority of the study area is made up of either short and open sward or hard open concrete urban areas and is of negligible value for reptiles. The allotments south of Queen Anne's Road at TG523058 provide habitat suitable for use by reptiles including



a mix of tall ruderal vegetation and rough sward amongst areas of compost and logs that could be used as refugia.

#### 3.2.2.3 Mammals

There are several structures within 100m of the proposed scheme that may be suitable for use by roosting bats. There are two uninhabited and poorly maintained houses at TG524058 as well as old brick buildings at TG524057 on the west side of the River Yare.

On the east side a disused pub at TG525060, a smokery at TG52606 and empty, damaged buildings at TG526059 offer further possible roosting sites for bats.

The drainage ditches associated with the A12 provide suitable habitat for water vole.

#### 3.2.2.4 Birds

Bird species recorded within the site during the survey include wood pigeon *Columba palumbus*, magpie *Pica pica*, carrion crow *Corvus corone*, house sparrow *Passer domesticus*, blue tit *Cyanistes caeruleus* and robin *Erithacus rubecula*.

Trees and areas of scrub within and adjacent to the proposed scheme are suitable for use by nesting birds. Old brick buildings where access is possible through broken windows and other gaps provide suitable nesting sites for pigeons.

The mosaic of urban areas with scattered ruderal vegetation provides some suitable habitat for black redstarts.

## 4 Evaluation & Recommendations

### 4.1 Statutory Designated and Non-Statutory Protected Sites

The Outer Thames Estuary SPA is within 2km of the proposed scheme. Screening for Habitats Regulations Assessment is strongly recommended.

### 4.2 Habitats

The study area is largely comprised of urban areas, with areas of improved grassland, scattered trees, scrub and standing water. These habitats are of low biodiversity value.

### 4.3 Species

#### 4.3.1 Amphibians and Reptiles

Overall, amphibians and reptiles are unlikely to be present. Although small areas of habitat that is suitable to provide foraging, shelter and hibernation areas exist, the study area is located within a predominantly urban environment and is not connected to areas of suitable offsite habitat. Accordingly, no further work in respect of amphibians and reptiles is recommended.

Both water bodies were assessed using the Habitat Suitability Index (HSI) to estimate their suitability for supporting breeding great crested newts (Table 1). The scores of 0.49 (ditches) and 0.52 (pond) indicate that great crested newts are unlikely to use these ponds and further surveys are therefore not recommended.

#### 4.3.2 Birds

Black redstart is listed on Schedule 1 of the Wildlife and Countryside Act 1981 (as amended). This species is recorded as breeding within Norfolk and Suffolk and further surveys are recommended to determine the presence of this species with regards to the location of the proposed scheme.

Areas of scrub and woodland which are present are suitable for use by breeding birds. No further surveys are recommended, however, in order to minimise the risk of disturbing breeding birds, the removal of woody vegetation should ideally be undertaken outside of the breeding season (typical breeding bird season is March to July inclusive). If tree and vegetation removal has to take place during this period, the vegetation should be checked prior to removal for the presence of nests by an appropriately experienced ecologist. If nests that are in use are present, it may be necessary to delay work in immediate proximity to the nest until the young have fledged.

#### 4.3.3 Mammals

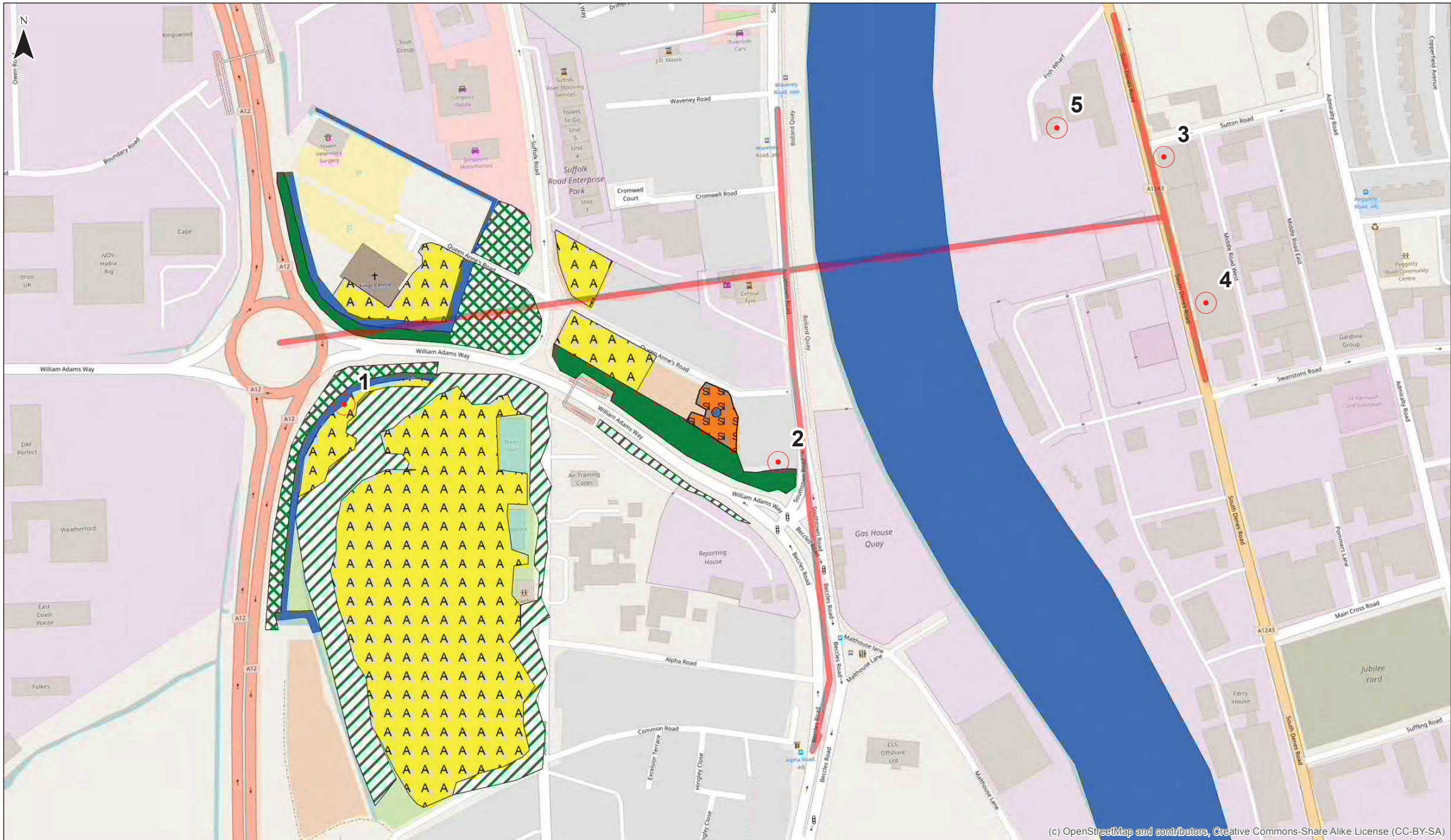
The buildings within the site are either to be purchased for demolition or will be subject to disturbance during the construction of the proposed scheme. It is recommended that further surveys are undertaken to confirm the presence or absence of bats within these buildings.

The wider area supports water voles and the ditches associated with the A12 are suitable to support this species. Further surveys are therefore recommended.

The habitats within the site, and the surrounding residential gardens, are suitable to support hedgehogs. It is recommended that a watching brief is maintained during the works to protect individual hedgehogs that may be present.

## 5 Figures

Figure 1 – Habitat Map



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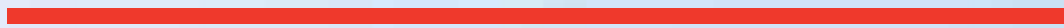
**Legend**

- Target Notes
- Great Yarmouth River Crossing
- Amenity Grasslands
- Water
- Neutral Grassland: Semi-improved
- Scrub: Dense/Continuous
- Woodland: Broad-leave Plantation
- Woodland: Semi-natural

Client		Norfolk County Council			
Project		The Great Yarmouth Third River Crossing (GYTRC)			
Drawing Title		GYTRC Phase 1 Habitat Survey			
Version		A		First Issue	
Amendment					
Drawing Date		06/12/2016		09/12/2016	
Review Date					
Approved Date					
Scale (at A3 size)		1:2,407			
Office		Puddle Dock		Tel 020 7822 2497	
Purpose of Issue		Information			
Drawing Number		Page 1 of 1			

# Appendix F

PROTECTED SPECIES REPORT







Norfolk County Council

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# GREAT YARMOUTH THIRD RIVER CROSSING

Protected Species Survey Report









Norfolk County **Council**

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# **GREAT YARMOUTH THIRD RIVER CROSSING**

Protected Species Survey Report

**TYPE OF DOCUMENT (VERSION) PUBLIC**

**PROJECT NO. 62240375**

**OUR REF. NO. 002**

**DATE: NOVEMBER 2017**

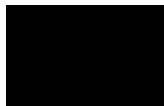
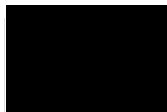
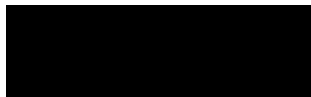
WSP  
Three White Rose Office Park  
Millshaw Park Lane  
Leeds  
LS11 0DL  
Phone: +44 113 395 6200  
Fax: +44 113 395 6201  
WSP.com

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# QUALITY CONTROL

Issue/revision	First issue	Revision 1	Revision 2	Revision 3
Remarks				
Date	21.08.2017			
Prepared by	David Lovett			
Signature				
Checked by	Becky Bailey			
Signature				
Authorised by	Andy Bascombe			
Signature				
Project number				
Report number				
File reference				





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## ***FIGURES***

No table of figures entries found.

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## ***APPENDICES***

No table of contents entries found.



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# 1 INTRODUCTION

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## 1.1 PROJECT BACKGROUND

- 1.1.1. WSP (formerly Mouchel) was commissioned by Norfolk County Council to undertake water vole and bat surveys for the Great Yarmouth Third River Crossing project, in order to assess the likely effects of the scheme on these species.

## 1.2 THE SITE

- 1.2.1. The Great Yarmouth Third River Crossing will be located in the centre of Great Yarmouth. It will cross the River Yare linking William Adams Way on the west side of the river to the A1243 South Denes Road on the east side. The area through which the scheme passes comprises mostly urbanised land, with small areas of vegetation present in the form of gardens, allotments and Southtown Common Recreation Ground.

## 1.3 OBJECTIVES

- 1.3.1. The proposed river crossing construction may require building demolition and the removal of vegetation, as well as the modification and/or destruction of water courses and adjacent bank habitats.
- 1.3.2. Water vole surveys were undertaken to identify whether water voles are present, to provide an estimate of the population size and to assess the effect of these activities on water voles.
- 1.3.3. Similarly, bat surveys sought to identify which bat species are present, how bats use habitats within the site and whether bat roosts are present and likely to be affected by the proposals.
- 1.3.4. The following activities were undertaken:
- A review of bat and water vole records from the local ecological data centre;
  - A preliminary ecological assessment to identify suitable features that may be used by water voles as well as features suitable for roosting bats and features that provide suitable habitat for foraging and commuting;
  - Field survey to search for evidence of water vole in suitable habitats within the footprint of the proposed scheme; and,
  - Walked transects to identify the locations of important bat foraging and commuting habitats.

## 2 METHODOLOGY

### 2.1 DESK STUDY

#### SPECIES RECORDS

- 2.1.1. In 2016 the Norfolk Biodiversity Information Service (NBIS) was consulted to obtain bat and water vole records within 2km of the proposed scheme (the study area) from the last 10 years. This was undertaken as part of an earlier stage assessment.
- 2.1.2. The Multi-Agency Geographic Information for the Countryside (MAGIC) service was also used to obtain records of water vole and bat licences granted within this area.

### 2.2 PRELIMINARY ECOLOGICAL ASSESSMENT

#### WATER VOLE ASSESSMENT

- 2.2.1. Surveys performed by Mouchel Limited for Norfolk County Council in 2016, identified two watercourses that have the potential to support water voles. These watercourses are the two ditches associated with the A12 at the western extent of the proposed scheme.

#### BAT ASSESSMENT

- 2.2.2. Surveys performed by Mouchel Limited for Norfolk County Council in 2016 identified six built structures as having potential to support roosting bats. In 2017 these structures and all others within the footprint of the scheme were re-assessed using the assessment criteria as prescribed in the Bat Conservation Trust's (BCT) *Bat Surveys for Professional Ecologists - Good Practice Guidelines* (Collins, 2016) to determine whether the structures remained in the same condition. In total, thirteen built structures were assessed for their potential to support roosting bats.
- 2.2.3. Each structure was inspected from ground level to look for features that bats could use for roosting (Potential Roost Features or PRFs) such as damaged brickwork, missing mortar, missing roof tiles, damaged barge boards and loose guttering. Using guidance from Collins, 2016, the structures were identified as having negligible, low, moderate or high suitability to support roosting bats (see Table 1).

**Table 1 - Assessment criteria for structures which could support roosting bats**

Suitability	Roosting Habitat Description
Negligible	Negligible habitat features on site likely to be used by bats.
Low	A structure with one or more potential roost sites that could be used by individual bats opportunistically. However, these potential roost sites do not provide enough space, shelter, protection, appropriate conditions and/or suitable surrounding habitat to be used on a regular basis or by larger numbers of bats.
Moderate	A structure with one or more potential roost sites that could be used by bats due to their size, shelter, protection, conditions and surrounding habitat but unlikely to support a roost of high conservation status.
High	A structure with one or more potential roost sites that are obviously suitable for use by larger numbers of bats on a more regular basis and potentially for longer periods of time due to their size, shelter, protection, conditions and surrounding habitat.

- 2.2.4. Using guidance from Collins, 2016, the habitats within the site were identified as having either Negligible, Low, Moderate or High suitability habitat for bats (see Table 2).

**Table 2 - Guidelines for assessing bat habitat on development sites**

<b>Suitability</b>	<b>Commuting &amp; Foraging Habitat</b>
Negligible	Negligible habitat features on site likely to be used by commuting or foraging bats.
Low	Habitat that could be used by small numbers of commuting bats such as gappy hedgerows or un-vegetated stream, but isolated i.e. not very well connected by other habitat to the surrounding landscape. Suitable but isolated habitat that could be used by small numbers of foraging bats such as a lone tree (not in a parkland situation) or a patch of scrub.
Moderate	Continuous habitat connected to the wider landscape that could be used by bats for commuting such as lines of trees and scrub or linked back gardens. Habitat that is connected to the wider landscape that could be used by bats for foraging such as trees, scrub, grassland or water.
High	Continuous, high-quality habitat that is well connected to the wider landscape that likely to be used regularly by commuting bats such as river valleys, streams, hedgerows, lines of trees and woodland edge. High-quality habitat that is well connected to the wider landscape that is likely to be used regularly by foraging bats such as broadleaved woodland, tree-lined watercourses and grazed parkland. Site is close to and connected to known roosts.

## 2.3 FIELD SURVEYS

### WATER VOLE SURVEYS

- 2.3.1. A survey was undertaken in August 2017 to search for evidence of water vole. The areas surveyed for water voles are shown in Appendix A.
- 2.3.2. The surveys followed standard methods described in The Water Vole Mitigation Handbook (2016) and were undertaken under suitable conditions by experienced surveyors. The surveys were carried out during the water vole breeding season (March to October in south-east England), which is an optimal survey time for this species.
- 2.3.3. Where accessible, the banks of the watercourses were surveyed from within the channel. Surveyors systematically searched along each bank and any evidence of water vole was recorded when found. Where surveyors were unable to access the watercourse channel, evidence was searched for from the top of the banks, using binoculars as required.

### BAT ACTIVITY SURVEYS

- 2.3.4. The following surveys, based on recommended methods published in Bat Conservation Trust Guidelines (Collins, 2016), were carried out in August 2017.
- 2.3.5. Two walked transects routes were designed to cover the west and east side of river Yare. The routes covered the majority of the site and incorporated all assessed built structures as well as adjacent habitats that may be used by bats for foraging and commuting. These transects are shown in Appendix B.
- 2.3.6. Bat activity surveys are undertaken in order to observe, listen for, record bats in flight away from their roost, commuting, feeding or socialising at dusk and dawn. Hand-held Batbox Duet detectors and a Song Meter SM4BAT FS recorder were used. During these walked transects, surveyors walked at a constant speed, recording information on any bats seen or heard on detectors. Information recorded included bat species, behaviour, flight direction, number of bats and number of passes. Surveyors stopped at pre-determined



“listening points” along each transect for 3-5 minutes to record bat activity at a single location. Each walked transect was undertaken by two experienced ecologists.

- 2.3.7. Sounds recorded with the Song Meter SM4BAT FS during the surveys were analysed using AnalookW software to confirm the species of bats recorded and their activity. In case of doubt on the species, a bat calls guide *British Bat Calls: A Guide to Species Identification* (Russ, 2012) was used to help the identification. Bat activity levels were assessed in terms of the number of bat passes occurring.

## **2.4 ASSESSMENT OF CONSERVATION IMPORTANCE**

- 2.4.1. The conservation importance of water vole and bats was assessed using the Chartered Institute for Ecology and Environmental Management’s Guidelines on Ecological Impact Assessment (EclA) in the UK and Ireland (CIEEM, 2016).
- 2.4.2. The importance of bat roosts and commuting and foraging habitat was evaluated based on the rarity, distribution, species and numbers of bats recorded and the way they use the site.

## 3 RESULTS

### 3.1 DESK STUDY

#### SPECIES RECORDS

- 3.1.1. The desk study identified no granted EPS licences for bats and water vole within 2km of the proposed scheme (see Table 3).
- 3.1.2. The Norfolk Biodiversity Information Service returned thirteen records of bat species within 2km of the proposed scheme (see Table 3) and fourteen records of water vole within 2km of the proposed scheme (see Table 4).

**Table 3 - Records of bats within 2km of the Third River Crossing**

Species	Date	number of records	Distance From Scheme
Common pipistrelle (Pipistrellus pipistrellus)	June 2015	5	~2km south-west
Soprano pipistrelle (Pipistrellus pygmaeus)	May 2015	1	~2km south-west
Nathusis' Pipistrelle (Pipistrellus nathusii)	May 2015	2	~2km south-west
Serotine (Eptesicus serotinus)	May 2015	1	~2km south-west
Daubenton's bat (Myotis daubentonii)	May 2015	1	~2km south-west
Noctule (Nyctalus noctula)	May 2015	3	~2km south-west
Brown long-eared bat (Plecotus auritus)	May 2015	1	~2km south-west

**Table 4 - Records of water voles within 2km of the Third River Crossing**

Date	Number of records	Location	Distance From Scheme
26/04/2011	1	TG512075	~2km north-west
18/12/2012	1	TG504059	~2km west
17/07/1968	1	TG5204	-
01/05/2009	1	TG519060	~600m west

Date	Number of records	Location	Distance From Scheme
2007	1	TG5133106699	~1.5km north-west
05/06/2008	5	TG520057	~300m south-west
1997	1	TG518078	~2km north

## 3.2 PRELIMINARY ECOLOGICAL ASSESSMENT

### WATER VOLE

- 3.2.1. The two water courses associated with the A12 were assessed for their suitability to support water voles. The two water courses were wet ditches with areas of open water and thickly vegetated banks. The north ditch banks are covered by common nettle *Urtica dioica*, bramble *Rubus fruticosus*, great willowherb *Epilobium hirsutum*, dog rose *Rosa canina* and creeping thistle *Cirsium arvense*. The southern ditch is of similar species composition, but additionally supports field bindweed *Convolvulus arvensis* and hogweed *Heracleum sphondylium*. Both ditches were approximately 1m in depth and heavily silted.

### BATS

- 3.2.2. Thirteen structures were assessed for their suitability to support roosting bats. Table 5 shows the details of the assessment such as building type, features present and BCT category.
- 3.2.3. Foraging habitats such as open water, domestic gardens and allotments within were found to be fragmented and unconnected. This foraging habitat is considered to be of low suitability for use by foraging and commuting bats.





**Table 5 - Structures with features which could support roosting bats**

<b>Structure</b>	<b>Structure Type</b>	<b>Distance</b>	<b>Features</b>	<b>Roost Suitability</b>
B1	Brick built disused public house	Within footprint	Some lifted roof tiles Gaps around boarded up window fittings present Missing mortar on roof corner	Low
B2	South Denes Car Centre – corrugated metal workshop and brick car sales room	Within footprint	Slightly lifted roof apex	Negligible
B3	Sutton Road residential property	Within footprint	-	Negligible
B4	Industrial brick building south of Sutton Road	Within footprint	Missing mortar in walls Missing tiles on roof	Low
B5	Brick building on edge of docks	Within footprint	No access	No access
B6	Industrial building with three hipped asbestos roofs	Within footprint	Several small gaps in middle roof ridge	Low
T1	Terrace at west end of Queen Anne's Road	Within footprint	-	Low
T2	Terrace centre of Queen Anne's Road	Within footprint	Several small gaps in roof Cracked tile at roof apex	Low
T3	Terrace at east	Within footprint	-	Low



Structure	Structure Type	Distance	Features	Roost Suitability
	end of Queen Anne's Road			
T4	Terrace on Southdown Road	Within footprint	Slipped tiles on roof of number 181	Low
T5	Terrace south of Cromwell Road	Within footprint	Small gaps and cracks in roof	Low
T6	Terrace north of Cromwell Road	Within footprint	-	Low
T7	Terrace south of Waveney Road	Within footprint	-	Low

### 3.3 FIELD SURVEYS

#### WATER VOLE SURVEYS

- 3.3.1. During the August 2017 survey, only the ditch south of William Adams Way was surveyed due to safety concerns in accessing the northern ditch. Evidence of water vole activity was found and is summarised in Table 6.

**Table 6 - Water vole survey results**

Location	Record type
TG52139 05869	Feeding remains, cut stems
TG52139 05869	5 droppings
TG52127 05872	1 dropping
TG52120 05866	Several droppings and feeding remains

#### BAT ACTIVITY SURVEYS

- 3.3.2. Two transects were undertaken in July and August 2017. The routes of the transects are shown in Appendix B. Survey details and weather conditions are shown in Table 7.

**Table 7 - Survey type, date and weather conditions for both transects**

Transect Number	Survey Records	Survey 1
1	Survey Type and Date	Dusk Transect 31.07.17
	Weather Conditions	20°C, dry, CC 2/8, BF 1/8
2	Survey Type and Date	Dusk Transect 01.08.17
	Weather Conditions	17°C, dry, CC 5/8, BF 0/8

\*CC= Cloud Cover; BF= Beaufort scale

#### TRANSECT 1

- 3.3.3. No bats were recorded along Transect 1. This is likely due to the absence of vegetation and high levels of artificial lighting.

#### TRANSECT 2

- 3.3.4. One species of bat was recorded along Transect 2: common pipistrelle *Pipistrellus pipistrellus*.
- 3.3.5. Four bat passes were recorded commuting along the northern edge of Southtown Common, where it meets William Adams Way. No foraging activity was recorded.

## **4 DISCUSSION AND EVALUATION**

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### **4.1 WATER VOLES**

- 4.1.1. The survey work undertaken has confirmed the presence of water vole within the study area, with feeding remains and water vole droppings being found. However, due to limitations in the survey methodology, it is not possible at this time to estimate the population density of water voles in the study area.

### **4.2 BAT ROOSTS**

- 4.2.1. All structures assessed were given a low potential of supporting a bat roost. The low level of bat activity recorded during the transect surveys suggests that the likelihood of a roost being present within the footprint of the proposed scheme is low.

### **4.3 COMMUTING AND FORAGING BATS**

- 4.3.1. The activity surveys showed that one species of bat uses the site for commuting and/or foraging.
- 4.3.2. Only one species of bat was recorded; the common pipistrelle. This species was observed commuting along the northern edge of Southtown Common Recreation Ground. This area contains mature trees, shrubs and open grassland as well as being subject to lower levels of artificial lighting.
- 4.3.3. The field survey showed that the bat population within the site consists of a low number of a single bat species. The site is assessed as being of importance only within the zone of influence of the proposed scheme for conservation of foraging and commuting bats.

## 5 CONCLUSION AND RECOMMENDATIONS

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### 5.1 OVERVIEW – WATER VOLES

- 5.1.1. The water vole is protected within the UK from capture, killing, injury and disturbance and their places of shelter protected from damage, having access blocked or destruction, under the Wildlife and Countryside Act 1981 (as amended) (WCA, 1981). It is the client's responsibility to apply for a development licence through Natural England for activities that would constitute an offence under these legislations.
- 5.1.2. Two water courses will be affected by the proposed scheme for the Great Yarmouth Third River Crossing. The proposed scheme has the potential to result in negative impacts on water vole, including the damage and/or disturbance of water vole burrows along the length of the proposed scheme, which would constitute an offence under English legislation.
- 5.1.3. Accordingly, it is recommended that water voles are considered during the design phase with as much of the banks being retained and protected as reasonably possible. Where the proposals are likely to result in the loss, damage or disturbance of water vole habitats, it is likely that a licence will be required from Natural England in order to facilitate the works. A licence to disturb water vole may be required for works within 10m of a burrow, even if the burrow itself is retained.
- 5.1.4. Any licence application will likely include the requirement for a detailed mitigation strategy to avoid and/or minimise impacts on water vole. These may include measures such as careful timing of works, temporary displacement of water voles and provision of new areas of suitable habitat etc.
- 5.1.5. It is recommended that update surveys are undertaken once a final design has been produced to allow an accurate assessment of the impacts on water voles and inform any licence application which may be required. Surveys should also be undertaken prior to the commencement of construction works to check for the presence of any new burrows which may be affected.

### 5.2 OVERVIEW - BATS

- 5.2.1. All species of bats within the UK are protected from killing, injury and disturbance and their roosts protected from damage or destruction under the Conservation of Habitats and Species Regulations 2010 (Habitats Regulations, 2010). Their places of rest and shelter are also protected from disturbance and obstruction under the Wildlife and Countryside Act 1981 (as amended) (WCA, 1981). It is the client's responsibility to apply for a development licence through Natural England for activities that would constitute an offence under these legislations.
- 5.2.2. Several structures will be demolished during the construction of the Great Yarmouth Third River Crossing. It is unlikely that bats use these structures as roosts due to the high levels of disturbance from human activities taking place within the structures and high levels of artificial lighting as well as the structures not being well connected to more suitable foraging habitat. However, the possibility of bats using these structures cannot be entirely ruled out and internal inspections are recommended for any structures that are to be removed prior to construction beginning.

## 6 LIMITATIONS

---

### 6.1 WATER VOLE

- 6.1.1. It was not possible for surveyors to enter the channel of the water courses due to the depth making it unsafe to do so. Thick vegetation meant that only the south bank of the channel south of William Adams Way could be surveyed. Further survey work should be undertaken at a later date in order to cover the areas not yet surveyed.

### 6.2 BATS

- 6.2.1. It was not possible to assess every building from all angles due to the buildings being privately owned properties. However, as the activity surveys returned very low numbers of bats, this is not considered to be a limitation on the conclusions of this report.
- 6.2.2. Emergence and re-entry surveys will be undertaken at a later stage. The presence of roosts in trees within the site cannot be accurately determined until these surveys are completed.

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- HMSO (Her Majesty's Stationary Office) (2010). The Conservation of Habitats and Species Regulations 2010 as amended (the Habitat Regulations)
- Russ, J. (2012). British bat calls: A guide to species identification. Exeter: Pelagic Publishing.



Three White Rose Office Park  
Millshaw Park Lane  
Leeds  
LS11 0DL

[wsp.com](http://wsp.com)



**LEGEND:**

- Water vole survey area
- Droppings
- Feeding remains

**Phase 1 habitats**

- A1.1.1 - Broadleaved woodland - semi-natural
- A1.1.2 - Broadleaved woodland - plantation
- A2.1 - Scrub - dense/continuous
- G1.1 - Standing water - eutrophic

STATUS:

FOR INFORMATION ONLY

WSP, 6 Devonshire Square  
London, EC2M 4YE  
Tel: +44 (0) 20 7337 1700  
www.wsp.com

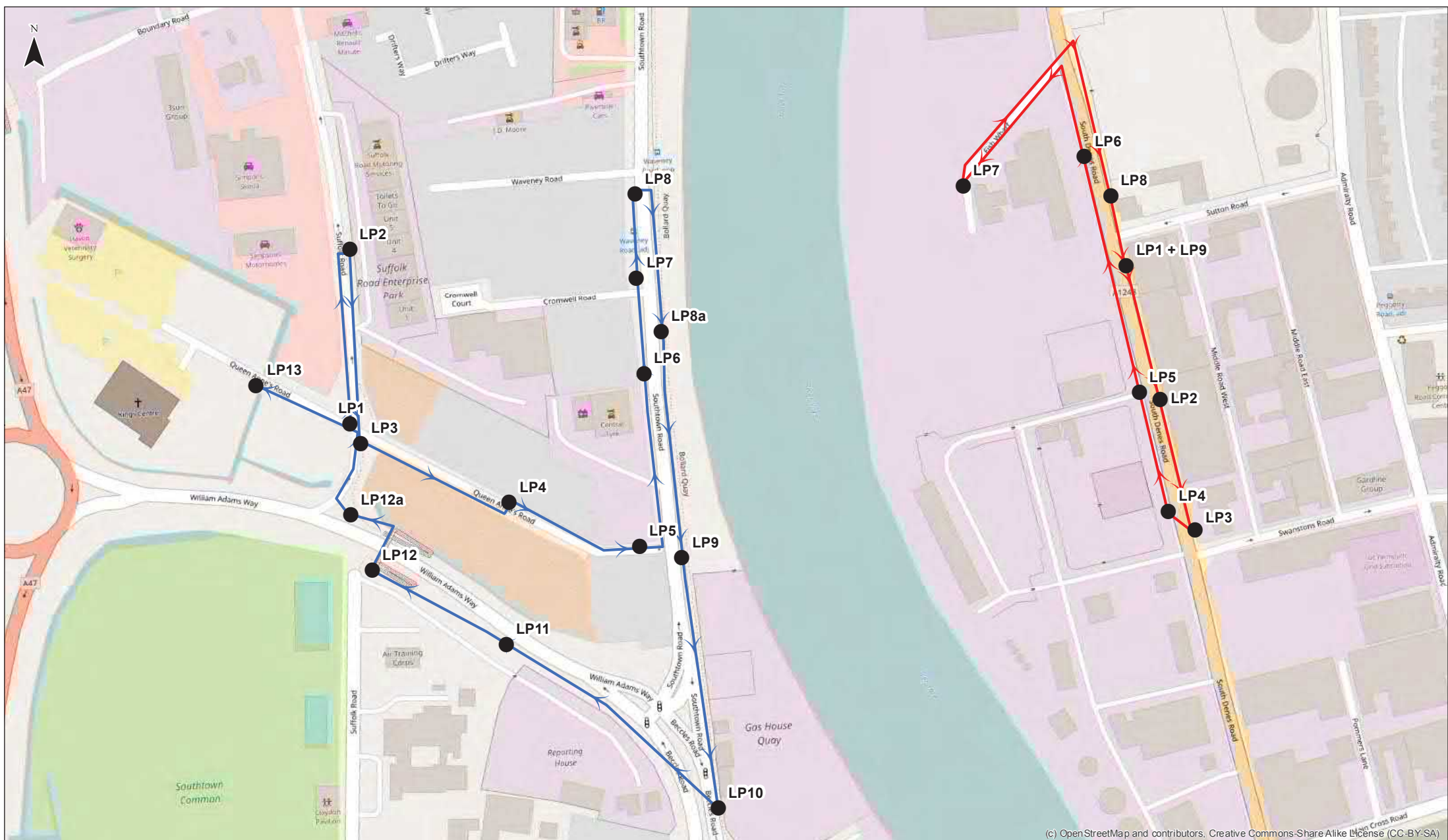
CLIENT: Norfolk County Council

PROJECT: Great Yarmouth Third River Crossing

TITLE: Water Vole Survey

SCALE @A3: 1:1,600	CHECKED: LE	APPROVED: BB	
OGIS FILE:	DRAWN: 06/11/2017	DATE: 06/11/17	
PROJECT No: 62240375	DRAWING No:	REV: 0.1	





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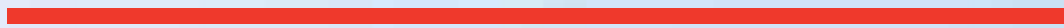
### Legend

- Listening Point
- East Transect
- West Transect

Client		Norfolk County Council		
Project		Great Yarmouth Third River Crossing		
Drawing Title		Bat Survey Transects		
Office	White Rose	Scale (at A3 size)		1:1,900
Version	A	Purpose of Issue		Information
Amendment		First Issue	23/08/17	24/08/17
Drawing Date		23/08/17	JR	LE
Review Date		24/08/17	LE	RB
Approved Date		25/08/17	RB	
Office		Tel		020 7822 2497
Drawing Number		Page 1 of 1		

# Appendix G

HERITAGE DESK STUDY





REPORT N° 62240375-017-DBA

# GREAT YARMOUTH THIRD RIVER CROSSING

CULTURAL HERITAGE DESK BASED  
ASSESSMENT

PUBLIC

JULY 2017

# GREAT YARMOUTH THIRD RIVER CROSSING

## CULTURAL HERITAGE DESK BASED ASSESSMENT

**Norfolk County Council**

**Draft (V0.1)  
Public**

Project no: 62240375-017

Date: July 2017

K. Brown

**WSP**




St Johns House  
2-10 Queen Street  
Manchester  
M2 5JB

Tel: 0161 832 4542

**[www.wsp.com](http://www.wsp.com)**

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# QUALITY MANAGEMENT

ISSUE/REVISION	FIRST ISSUE	REVISION 1	REVISION 2	REVISION 3
Remarks				
Date	18/07/2017			
Prepared by	K Brown			
Signature				
Checked by	V Anderton-Johnson			
Signature				
Authorised by	S Hales			
Signature				
Project number	62240375-017			
Report number	62240375-017-DBA			
File reference				

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# PRODUCTION TEAM

## CLIENT

Function	Name
Function	Name
Function	Name

## WSP

Function	Name
Function	Name
Function	Name

## SUBCONSULTANTS

Function	Name
Function	Name
Function	Name

---

## LIMITATIONS

This report is presented to Norfolk County Council in respect of the “Great Yarmouth Third River Crossing” proposed development and may not be used or relied on by any other person. It may not be used by Norfolk County Council in relation to any other matters not covered specifically by the agreed scope of this Report.

Notwithstanding anything to the contrary contained in the report, WSP is obliged to exercise reasonable skill, care and diligence in the performance of the services required by Norfolk Country Council and WSP shall not be liable except to the extent that it has failed to exercise reasonable skill, care and diligence, and this report shall be read and construed accordingly.

This report has been prepared by WSP. No individual is personally liable in connection with the preparation of this report. By receiving this report and acting on it, the client or any other person accepts that no individual is personally liable whether in contract, tort, for breach of statutory duty or otherwise.



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## A P P E N D I C E S

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APPENDIX B:	HERITAGE ASSET PLAN

# 1 INTRODUCTION

## 1.1 PROJECT BACKGROUND

WSP have been commissioned by Norfolk County Council to undertake a cultural heritage Desk Based Assessment (DBA) to assess the heritage impact of the proposed works as part of the Great Yarmouth Third River Crossing.

This document will identify the known heritage resources and likely types of archaeological remains which may be encountered and the predicted impacts of the development upon them.

## 1.2 SITE DESCRIPTION

The proposed scheme is located approximately 800m to the south of the town centre of Great Yarmouth and sits at approximately 1.2m AOD. It consists of a new bridge that will be constructed between the A12 and South Denes Road, crossing the River Yare and improvements to the existing roads in this area. The roads are surrounded by industrial land, interspersed with smaller areas of residential and recreational land to the east and west of the river.

The site is centred at TG 52469 05894.

## 1.3 PLANNING BACKGROUND

This assessment has been carried out to support an Outline Business Case (OBC) for the construction of the Great Yarmouth Third River Crossing.

The requirement for a heritage statement is outlined in Policy 128 of the National Planning Policy Framework (NPPF) which outlines the need to identify and assess all heritage assets, their significance and the impact the proposals may have upon them (where possible). The assessment has been undertaken in accordance with the Chartered Institute for Archaeologists' Standards and Guidance for Historic Environment Desk-Based Assessments (CIfA 2014).

# 2

## AIMS AND OBJECTIVES

The objectives of this desk-based assessment are to:

- à provide an assessment of appropriate records, cartographic and written sources in order to identify known heritage assets and where possible, quantify, the size, complexity and potential of any below ground archaeology issues;
- à provide a preliminary assessment of the potential impact of the proposed works to both known and unknown archaeological assets,
- à provide a preliminary assessment of the potential impact of the proposed works to built heritage within the study area,
- à advise on the requirement for, and scope of, any further work likely to be required to support any future planning applications; and
- à to inform future budgets and programmes.

The desk based assessment forms the first stage of an iterative process of a cultural heritage assessment which will be considered alongside wider scheme issues during development of the scheme design. As part of any future detailed design process, further archaeological investigations may be required to assess the extent, character and significance of buried remains.

It is necessary to assess the significance of any such archaeological interest and the likely impact of any proposed re-development upon the significance of any heritage assets, where possible, in accordance with Policy 128 of the National Planning Policy Framework.

# 3

## LEGISLATIVE CONTEXT

### 3.1 NATIONAL, REGIONAL AND LOCAL POLICY

#### PLANNING (LISTED BUILDINGS AND CONSERVATION AREAS (P(LBCA)) ACT 1990

3.1.1 Section 1 of the P(LBCA) Act defines a listed building as a 'building which is for the time being included in a list compiled or approved by the Secretary of State under that section. For the purpose of the Act any object or structure fixed to the building, which, since on or before 1 July 1948, has formed part of the land and is comprised within the curtilage of the building is treated as part of the building. 'Building' is defined as including any structure or erection and any part of a building'. The key elements of this Act relevant to this assessment are outlined below:

- à Section 66 places a responsibility upon the decision-maker in determining applications for planning permission for a Scheme that affects a listed building or its setting to have special regard to the desirability of preserving the building or its setting or any features of special architectural or historic interest which it possesses; and
- à Section 72 of the Act places a duty upon the decision maker in determining applications for planning permission within conservation areas to pay special attention to the desirability of preserving or enhancing the character or appearance of that area.

#### HEDGEROWS REGULATIONS 1997

3.1.2 The Hedgerow Regulations Act presents the following criteria for determining important hedgerows (archaeology and history):

- à The hedgerow marks the boundary, or part of the boundary, of at least one historic parish or township and for this purpose "historic" means existing before 1850;
- à The hedgerow incorporates an archaeological feature which is: (a) included in the schedule of monuments compiled by the Secretary of State under section 1 (schedule of monuments) of the Ancient Monuments and Archaeological Areas Act 1979(7); or (b) recorded at the relevant date in a Sites and Monuments Record (Now Historic Environment Record);
- à The hedgerow is: (a) is situated wholly or partly within an archaeological site included or recorded as mentioned in paragraph 2 or on land adjacent to and associated with such a site; and (b) is associated with any monument or feature on that site;
- à The hedgerow: (a) marks the boundary of a pre-1600 AD estate or manor recorded at the relevant date in a Sites and Monuments Record or in a document held at that date at a Record Office; or (b) is visibly related to any building or other feature of such an estate or manor;
- à The hedgerow is: (a) recorded in a document held at the relevant date at a Record Office as an integral part of a field system pre-dating the Inclosure Acts(8); or (b) is part of, or visibly related to, any building or other feature associated with such a system, and that system is (i) substantially complete; or (ii) is of a pattern which is recorded in a document prepared before the relevant date by a local planning authority, within the meaning of the 1990 Act(9), for the purposes of development control within the authority's area, as a key landscape characteristic.

## NATIONAL PLANNING POLICY FRAMEWORK (NPPF)

- 3.1.3 National planning policies on the conservation of the historic environment are set out in the NPPF (DCLG, March 2012). Sites of archaeological or cultural heritage significance that are valued components of the historic environment and merit consideration in planning decisions are grouped as 'heritage assets'. The NPPF states that "heritage assets are an irreplaceable resource" the conservation of which can bring "wider social, cultural, economic and environmental benefits."<sup>1</sup> . It also states that the "significance of any heritage assets affected including any contribution made by their setting... should be understood in order to assess the potential impact<sup>2</sup>. In addition to standing remains, heritage assets of archaeological interest can comprise sub-surface remains and, therefore, assessments should be undertaken for a site with potential below-ground archaeological deposits.
- 3.1.4 NPPF draws a distinction between designated heritage assets and other remains considered to be of lesser significance; "great weight should be given to the asset's conservation. Substantial harm to or loss of a Grade II listed building, park or garden should be exceptional. Substantial harm to or loss of designated heritage assets of the highest significance, including scheduled monuments, protected wreck sites, battlefields, Grade I and II\* listed buildings and Grade I and II\* registered parks and gardens and World Heritage Sites, should be wholly exceptional."<sup>3</sup>. Therefore, preservation in situ is the preferred course in relation to such sites unless exceptional circumstances exist.
- 3.1.5 It is normally accepted that non-designated heritage assets will be preserved by record, in accordance with their significance and the magnitude of the harm to or loss of the asset as a result of the proposals to "avoid or minimise conflict between the heritage asset's conservation and any aspect of the proposals."<sup>4</sup>. Non-designated heritage assets of archaeological interest will also be subject to the policies reserved for designated heritage assets if they are of equivalent significance to Scheduled Monuments<sup>5</sup>.

## GREAT YARMOUTH LOCAL PLAN (ADOPTED 2015)

The policies in the Local Plan relates to the protection and enhancement of the historic environment and is relevant for the proposed development. Policy CS10: Safeguarding local heritage assets deals with development affecting Scheduled Monuments, Listed Buildings, Parks and gardens and Conservation Areas, and their settings, as well as regionally and locally important archaeological sites.

## 3.2 STANDARDS AND GUIDANCE

The archaeological assessment has been undertaken using guidance from with Volume 11, section 3, part 2 of the Design Manual for Roads and Bridges (DMRB HA 208/07), and the standards and guidance for desk based assessments set by the Chartered Institute for Archaeologists (CIfA 2014) which sets out supplementary policies and guidance on heritage.

The assessment has been undertaken using appropriate methods and practices which satisfy the stated aims of the project, which comply with the Code of Conduct and other relevant by-laws of the CIfA.

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<sup>1</sup> NPPF Section 12, paragraph 126

<sup>2</sup> op cit, 128.

<sup>3</sup> op cit, 132

<sup>4</sup> op cit, 129

<sup>5</sup> op cit, 132

# 4 METHODOLOGY

This desk study has been undertaken to investigate, as far as is reasonable and practical, the character and extent of any known or potential heritage assets within a study area. The study area for designated assets is within 1km of the scheme, for non-designated assets are within a study area of 500m.

The assessment has been informed by a review of all available archaeological records; historical documentary evidence; cartographic evidence and photographic material. This has involved a consultation of the following sources:

- à Historic England - for all records relating to known designated heritage assets.
- à Norfolk Historic Environment Record (HER) - for all records relating to known heritage assets and secondary source material including archaeological investigation reports and aerial photographs;
- à Norfolk Archives - for historic documentary evidence relating to the site, including both primary and secondary sources;
- à National, regional and local planning policy;
- à Other readily available online sources such as Google Earth.

The solid and drift geology for the site has been identified based on that recorded by the British Geological Survey.

A site visit of the proposed scheme was conducted, where access and safety allowed, to allow for a consideration of the study area, the possible identification of landscape and archaeological features and factors that may have had an impact on buried remains (i.e. drains, services etc). The site walkover was undertaken on the 14th July 2017. Photographs were taken using a digital camera. Access was limited to public rights of way.

The assessment of the value of cultural heritage assets which make up the baseline environment has involved reference to the guidance provided in Annexes 5, 6 and 7 of the DMRB HA208/07. The annexes identify factors which it is appropriate to consider during the evaluation of cultural heritage assets. The guidance recommends the adoption of six ratings for value in relation to archaeology and built heritage: very high, high, medium, low, negligible and unknown. See tables 1 and 2 below.

**Table 4-1: Criteria for Assessing the Value of Archaeological Assets**

VALUE	EXAMPLE
Very High	World Heritage Sites (including nominated sites)
	Assets of acknowledged international importance
	Assets that can contribute significantly to acknowledged international research objectives
High	Scheduled Monuments (including proposed sites)
	Undesignated assets of scheduled quality and importance
	Assets that can contribute significantly to acknowledged national research objectives
Medium	Designated or undesignated assets that contribute to regional research objectives
Low	Designated and undesignated assets of local importance
	Assets compromised by poor preservation and/or poor survival of contextual associations
	Assets of limited value, but with potential to contribute to local research objectives
Negligible	Assets with very little or no surviving archaeological interest
Unknown	The importance of the resource has not been ascertained

**Table 4-2: Criteria for Establishing the Value of Built Heritage Assets**

<b>VALUE</b>	<b>STATUS AND DEFINITION</b>
Very High	International importance i.e. World Heritage Sites.
High	National importance i.e. listed buildings at Grade I and II* Scheduled Ancient Monuments with standing remains, conservation areas containing very important buildings and undesignated structures of clear national importance.
Medium	Regional importance i.e. listed buildings at Grade II, conservation areas containing buildings that contribute significantly to its historic character, historic townscape with important integrity in their buildings, or built settings and undesignated structures of clear regional importance.
Low	Local importance i.e. undesignated assets of modest quality in their fabric or historical association and historic townscape of limited historic integrity (including buildings and structures included in local list prepared by local authority).
Negligible	Assets of no architectural or historical note
Unknown	Assets with some hidden i.e. inaccessible potential for historic or architectural significance.

The assessment of the magnitude of the impact has involved the reference to the guidance provided in Annexes 5, 6 and 7 of the DMRB HA208/07. See table 3 below which is an amalgamation of the tree tables which are found in the above annexes.

**Table 4-3: Assessing the magnitude of impacts**

<b>FACTORS IN THE ASSESSMENT OF MAGNITUDE OF IMPACTS</b>	
Major	Changes to most or all key archaeological materials or key historic building elements such that the resource is totally altered. Change to most or all key historic landscape elements, parcels or components: extreme visual effects: gross change of noise or change to sound quality: fundamental changes to use or access: resulting in total change to historic landscape character unit. Comprehensive changes to setting.
Moderate	Changes to many key archaeological materials or key historic building elements, such that the resource is clearly modified. Changes to many key historic landscape elements, parcels or components, visual change to many key aspects of the historic landscape, noticeable differences in noise or sound quality, considerable changes to use or access: resulting in moderate changes to historic landscape character. Considerable changes to setting that affect the character of the asset.
Minor	Changes to key archaeological materials or key historic building elements, such that the asset is slightly altered. Changes to few key historic landscape elements, parcels or components, slight visual changes to few key aspects of historic landscape, limited changes to noise levels or sound quality; slight changes to use or access: resulting in limited changes to historical landscape character. Slight changes to setting.
Negligible	Very minor changes to archaeological materials, historic buildings elements, or setting. Very minor changes to key historic landscape elements, parcels or compounds, virtually unchanged visual effects, very slight changes in noise levels or sound quality; very slight changes to use or access; resulting in very small change to historic landscape character.



## FACTORS IN THE ASSESSMENT OF MAGNITUDE OF IMPACTS

No Change	No change to fabric or setting.
	No change to elements, parcels or components; no visual or audible changes; no changes arising from in amenity or community factors.

The overall significance of impact has involved the use of the matrices provided in Annexes 5, 6 and 7 of the DMRB HA208/07 to establish an overall rating for each asset. This is subject to adjustment using professional judgement. Please see the matrix below.

**Table 4-4: Significance of Impact**

	NO CHANGE	NEGLIGIBLE	MINOR	MODERATE	MAJOR
Very high	neutral	Slight	moderate or large	large or very large	very large
High	neutral	Slight	moderate or slight	moderate or large	large or very large
Medium	neutral	neutral or slight	slight	moderate	moderate or large
Low	neutral	neutral or slight	neutral or slight	slight	slight or moderate
Negligible	neutral	Neutral	neutral or slight	neutral or slight	slight

All features identified through the research have been plotted on a site plan (Appendix B) in GIS and the site numbers correspond with the reference numbers in the gazetteer (Appendix A).

A PDF copy of the approved final report will also be deposited with the Norfolk Historic Environment Record.

# 5

## SITE DESCRIPTION

### 5.1 PROPOSED SCHEME DESCRIPTION

The addition of a new bridge and road alterations are proposed for the site crossing the River Yare, running from the extant A12 and South Deres Road. The scheme aims to provide a much needed additional link across the River Yare, connecting the strategic road network and wider urban area to the southern part of Great Yarmouth, which is a key economic growth hub and Enterprise Zone. The land surrounding the scheme is primarily industrial, with some small areas of residential throughout the study area, towards Southtown to the west and the pleasure beach to the east.

### 5.2 SITE VISIT

A site visit was conducted on 14.07.17. Weather conditions were bright with cloud cover and some rain. Visibility was generally good, although some views were blocked by buildings and vegetation. Access was restricted to public rights of way. This did not affect the confidence of the assessment.

The purpose of the site visit was to assess the visual impact of the development on the heritage assets within the study area with particular regard to the designated assets in areas close to the proposed development, and also to identify any potential previously unknown heritage assets.

The study area consists of the proposed bridge over the River Yare and associated road improvements in the surrounding area.

No previously unknown sites were identified during the walkover survey. Existing development may have affected the survival of any below ground remains, although there may be archaeology present at deeper levels.

### 5.3 GEOLOGY

The scheme is situated on bedrock geology of Crag Group - Sand and Gravel. This is sedimentary bedrock that formed approximately 0 to 5 million years ago in the Quaternary and Neogene periods. The local environment was previously dominated by shallow seas. These rocks were formed in shallow seas with mainly siliciclastic sediments (comprising of fragments or clasts of silicate minerals) deposited as mud, silt, sand and gravel.

The site has multiple superficial geological deposits. The River Yare has overlying superficial deposits of Tidal River or Creek Deposits - Clay and Silt. These are superficial deposits formed up to 2 million years ago in the Quaternary Period. These rocks were formed in shoreline environments with sediments deposited in beaches and barrier islands.

The western banks of the River Yare has superficial deposits of Happisburgh Glacigenic Formation - Sand. These are superficial deposits that were formed up to 3 million years ago in the Quaternary Period. The local environment was previously dominated by ice age conditions. These rocks were formed in shoreline environments with sediments deposited in beaches and barrier islands.

The eastern banks of the river comprise of superficial deposits of North Denes Formation - Sand and Gravel. These are superficial deposits formed up to 2 million years ago in the Quaternary Period. These rocks were formed in shoreline environments with sediments deposited in beaches and barrier islands.

# 6

## HISTORICAL AND ARCHAEOLOGICAL BACKGROUND

### 6.1 INTRODUCTION

The location of the designated heritage assets from the National Heritage List for England (NHLE) which lie within the site and within a 1km radius from the boundary and un-designated heritage assets taken from the Norfolk Historic Environment Record (HER) which lie within the site and within a 500m radius from the boundary are tabled in the Gazetteer and indicated in Figure 1 in the appendices of this report. A total of 136 assets have been identified. These are listed individually in the Gazetteer (Appendix A).

### 6.2 HISTORICAL AND ARCHAEOLOGICAL OVERVIEW

#### DESIGNATED ASSETS

There are no World Heritage Sites, Registered Parks and Gardens, Registered Battlefields or Protected Wreck sites within 1km of the proposed scheme options. There are 45 Listed Buildings and one Scheduled Monument within 1km. The Listed Buildings consist of 1 Grade I, 4 Grade II\* and 40 Grade II. The majority of the Listed Buildings and the Scheduled Monument will be screened from the proposed development by topography, vegetation and existing structures. The Scheduled Monument is the medieval defensive town walls. The Listed Buildings represent a mixture of domestic, religious, industrial and leisure uses and mainly date to the late post-medieval period. The study area overlaps four Conservation Areas, listed below:

- à Camperdown
- à Gorleston Conservation Area Extensions
- à King Street
- à Seafrost

#### KNOWN HERITAGE ASSETS

The assets within the study area are described in the context of a timeline of archaeological periods from prehistoric through to modern. The location of the recorded sites and features can be cross referenced with Figure 1 (Appendix B) and the Gazetteer (Appendix A). For reference, all assets are listed in Table 4 with an assessment of their value.

The time periods discussed can be broadly divided as follows:

- à Prehistoric:
  - < Palaeolithic 250,000 – 10,000 BC
  - < Mesolithic 10,000 – 4,000 BC
  - < Neolithic 4,000 – 2,500 BC
  - < Bronze Age 2,500 – 700 BC
  - < Iron Age 800 BC – AD 43
- à Roman AD 43 – 410
- à Early Medieval AD 410 - 1066
- à Medieval AD 1066 – 1540
- à Post-Medieval AD 1540 – 1900
- à Modern AD 1900 to 2050

## PREHISTORIC

The landscape surrounding the site has consisted primarily of shorelines up to the medieval period, and as such there has been little evidence of any prehistoric activity identified within the study area. A single Neolithic scraper (Asset Number 42) has been recovered at the junction of Boundary Road and Suffolk Road during construction works for a petrol tank. Further evidence of prehistoric activity in the study area may be buried beneath later shoreline deposits.

## ROMAN AND EARLY MEDIEVAL

As with evidence of prehistoric activity, the landscape surrounding the site has consisted of primarily shorelines up to the medieval period. Therefore, for the same reason, there has been no evidence of any Roman or early medieval activity identified within the study area.

## MEDIEVAL

The boundary of the medieval walled town lies to the north of the Proposed Scheme options, approximately 600m north of the proposed scheme. The extent of the medieval town is represented by the well preserved remains of the defence walls (Asset Number 136) which is designated as a Scheduled Monument. Construction of the walls began in the late 13<sup>th</sup> century, although they have been subjected to periodic remodelling, including during the refortification of the town in the 17<sup>th</sup> century during the Civil War.

Just outside the 500m study area for undesignated sites, within the medieval walled town area, the remains of boats have been found on a buried shoreline at around 3m below the current ground level. An old landing place was also recorded below the Town Hall site in 1887. This suggests that buried medieval deposits may survive deep below the current ground level on either side of the River Yare within the study area.

There are two further medieval assets within the study area:

The remains of the house of the Austin Friars comprising a church, priory and leper hospital are located on Burnt Lane (Asset Number 121). This friary was founded in the 13th century, although the earliest known buildings date to the 15th century. Much of the priory has now been destroyed, although the west gate is recorded to have still been standing up to the beginning of the last century. Remains from the structures have been recovered from the surrounding area, and some of the building materials have been re-used. The area has now been redeveloped as housing.

In 2013, a watching brief revealed beam slots and post holes associated with a late medieval timber-framed building located on Burnt Lane (Asset Number 123). Finds recovered from these features included late medieval brick, roof tile and wall plaster that could be high status. The beam slots and post holes described the south western corner of a medieval timber structure. The area has now been redeveloped as housing.

## POST-MEDIEVAL

There are 51 post-medieval assets within the study area, principally 19th century houses and also including villas and a lodge, both mileposts and boundary posts and two churches. There are also industrial areas with railways, a coal power station, gas works, potteries, fish curing works, workshop ranges, utility blocks and a rope walk.

There is one Grade I Listed Building within the study area. Nelsons Monument (Asset Number 132), also known as the Norfolk Pillar, was the first of the Nelson columns, being erected in 1817, and comprises a figure of Britannia standing on top of a Doric column which faces towards Nelson's birthplace. The monument has recently been restored, and located within an industrial area. This asset may be inter-visible with the scheme.

There are 4 Grade II\* Listed buildings of post medieval date. These consist of Great Yarmouth Potteries (Asset Number 23), formerly listed as Trinity Place fish curing house, which was built in the 19th century against the town walls. This asset may be inter-visible with the scheme.

The Winter gardens (Asset Number 36) are located on South Beach Parade, and were originally designed and constructed in Torquay in the late 1800s before being relocated to Great Yarmouth in 1904. The building comprises a single storey structure of cast iron framing and glass.

St Nicholas Hospital Main Entrance Range (Asset Number 51) Main Block (Asset Number 52), walls and railings (Asset Number 53) and South Block (Asset Number 54) form a naval hospital built for casualties from the North Sea squadron in the Napoleonic War, with the entrance range comprising guard rooms, an archway and service rooms. The main block became a naval barracks in 1818 and subsequently a general hospital. This asset may be inter-visible with the scheme.

A Grade II Listed Gasworks (Asset Number 70) lies to the north east of the scheme. The gasometer was originally built at another site, but collapsed and was rebuilt here in 1885. An old map shows this was the site of a steam engine before the gasometer was built. This asset may be inter-visible with the scheme.

Grade II Listed Buildings Providence Villa (Asset Number 112), 96 and 95 High Road (Asset Numbers 113 and 114) and Ahoy and Manby House (Asset Number 115) sit to the south of the scheme. These assets may be inter-visible with the scheme.

There are 7 undesignated assets which date to the post medieval period consisting of industrial assets such as railways (Asset Numbers 88 and 95) and a rope walk (Asset Number 10), as well as a maltings which was later used as a prison (Asset Number 110), a boundary post (Asset Number 125) and a ditch (Asset Number 2).

## MODERN

There are 79 modern assets located within the study area. One of these is Grade II Listed. The Dolphin Public House (Asset Number 89), formerly known as Fish Wharf Refreshment Room, is a public house built in 1900. This asset is within the sightline of the proposed development.

The town was first bombed during World War I in 1915 and this event represents the first aerial bombardment in the UK, however the majority of wartime features date to World War II. During this time the town suffered extensive bombing by the Luftwaffe as it was the last significant place the German bombers could drop bombs before returning home. However, despite this, two-thirds of the medieval town wall survived.

Other modern assets in the study area date to the Second World War, and consist of primarily military structures and associated assets. There are 12 bomb craters and one bomb site within the study area, which may indicate the possibility of further, potentially unexploded, ordnance. There are also 43 air raid shelters, anti-tank defences, three pillboxes, eight road blocks, two military buildings and multiple other assets including spigot mortar engagements, a barracks (Asset Number 13), barbed wire obstructions, weapons pits, a blast wall (Asset Number 103), a fire station (Asset Number 111) and an ambulance station (Asset Number 131).

Most of these features recorded on the NHER have since been demolished, with modern development having removed all trace.

## HISTORIC LANDSCAPE

There are no designated landscapes within the study area.

Historic Landscape Characterisation (HLC) has been completed for the surrounding area, however this study specifically excluded an analysis of the areas within the town and village

development limits. Therefore, although the smaller villages were considered as a part of a wider landscape context and character, no specific townscape or urban character assessments were undertaken.

Some areas have had Historic Landscape Character completed as part of the Norfolk County Council HER Character Area Report. The study area falls across two different character types, with a linear strip of Coastal - Managed Wetland to the east of the study area. This land was previously Unimproved Intertidal land. There are also small blocks of Coastal - Drained Enclosure to the west, which were previously Coastal - Managed Wetland, Unimproved Marine Marsh or Brackish Fen.

### **6.3 ARCHAEOLOGICAL POTENTIAL**

The study area has undergone extensive development as it forms part of the urban centre of Great Yarmouth. This development is likely to have disturbed any potential archaeological remains to the level of modern building foundations. The river itself has seen various alterations and may have been dredged, which would affect what could be uncovered during the course of any works.

Due to the presence of several WWII defensive structures within close vicinity to the site, there is the potential to uncover any underground remains or previously unknown WWII sites during the course of works. There are also numerous recorded bomb craters located close to the proposed site, the possibility of unknown unexploded ordinances should be considered. There is also a 19th century railway located to the east end of the proposed works, which may be uncovered.

There is generally a moderate potential for previously undiscovered remains of up to high value to be uncovered during the proposed works.

# 7

## STATEMENT OF IMPACT

### ARCHAEOLOGY AND HISTORIC LANDSCAPE

The majority of the potential impacts upon cultural heritage assets would occur during the construction phase. Development activities such as groundworks, topsoil stripping, landscaping, ground compaction access, service installation, stockpiling and storage will all have a negative effect on the cultural heritage assets. These construction related impacts could lead to the following effects upon the Historic Environment:

- à Permanent complete or partial loss of an archaeological feature or deposit as a result of ground excavation;
- à Permanent or temporary loss of the physical and/or visual integrity of a feature, monument, building or group of monuments;
- à Damage to resources as a result of ground excavation;
- à Damage to resources due to compaction, desiccation or waterlogging; and
- à Damage to resources as a result of ground vibration caused by construction.

There could also be a number of sites which may be adversely affected during operation. These are mainly setting issues resulting from the introduction of new infrastructure, and the resulting increase in noise from vehicles using the new crossing.

There could be minor changes to the historic landscape setting but these would be negligible in magnitude.

### POTENTIAL SOURCES OF IMPACT

The assessment to date suggests the presence of currently unknown heritage assets in the form of a buried medieval shoreline. The proposed works have the potential to impact upon these remains, if present, due to the engineering solutions required for the bridge supports and the potential requirement for excavation works associated with existing infrastructure.

Not enough is known about buried remains in the scheme area, further work is required to quantify potential impacts.

### HISTORIC BUILDINGS

There could be a visual impact from the new bridge to the immediate setting of at least twelve Listed Buildings:

- à A Gas Works (Asset Number 70) of medium value may suffer a minor impact as it could be inter-visible with the scheme, resulting in minor significance. The magnitude of this impact is dependent on the design of the bridge; at present there is a minor impact but depending on proposed bridge elements further impacts may occur and should be reassessed.
- à The Dolphin Public House (Asset Number 89) of medium value may suffer a minor impact as it is within the sight line of the scheme, resulting in minor significance. The magnitude of this impact is dependent on the design of the bridge; at present there is a minor impact but depending on proposed bridge elements further impacts may occur and should be reassessed.
- à St Nicholas Hospital (Asset Numbers 51, 52, 53, 54 and 55) of medium to high value may suffer a minor impact as it would be inter-visible with the scheme, resulting in minor significance. The magnitude of this impact is dependent on the design of the bridge; at present there is a minor impact but depending on proposed bridge elements further impacts may occur and should be reassessed.

- à The Great Yarmouth Potteries (Asset Number 23) of high value may suffer a minor impact as it would be inter-visible with the scheme, resulting in minor significance. The magnitude of this impact is dependent on the design of the bridge; at present there is a minor impact but depending on proposed bridge elements further impacts may occur and should be reassessed.
- à Medium value assets Providence Villa (Asset Number 112), 96 and 95 High Road (Asset Numbers 113 and 114) and Ahoy and Manby House (Asset Number 115) may all suffer a minor impact as it would be inter-visible with the scheme, resulting in minor significance. The magnitude of this impact is dependent on the design of the bridge; at present there is a minor impact but depending on proposed bridge elements further impacts may occur and should be reassessed.

Parts of the study area overlap four Conservation Areas; Camperdown, Gorleston Conservation Area Extensions, King Street and Seafront. The magnitude of this impact is dependent on the design of the bridge; at present there is a no impact but depending on proposed bridge elements further impacts may occur and these should likewise be reassessed.



# 8

## RECOMMENDATIONS

Impacts to the cultural heritage assets can be minimised or eliminated via appropriate mitigation.

DMRB Volume 10, Section 6, Part 1 states that 'The fundamental aim of archaeological mitigation is to avoid impacts on nationally important or highly significant remains. If this is not possible then such remains should be archaeologically recorded in order to 'preserve by record' the significant aspects of the site'. Preservation in situ of nationally important or highly significant remains which may be affected by the proposed scheme options is the preferred option, however, where this is not possible or appropriate then alternative options will be investigated. Should no acceptable options be identified which would allow for the preservation of a site, detailed excavation (the scope of which will be agreed with the Norfolk Historic Environment Team) should be carried out in order to further our collective understanding of the site affected.

As there is the potential for previously unknown archaeological remains, in the form of a buried former medieval shoreline, it would be necessary to carry out archaeological investigations in order to establish the presence or absence and character of any features within the proposed footprint of the chosen option. The appropriate technique, scope and scale for investigation should be agreed with the Norfolk Historic Environment Team, but may include archaeological trial trenching, specialist dredging, auguring or dive surveys.

There is also potential for visual impacts on 12 Listed Buildings, it is recommended that these impacts are considered in the design process. This may involve consultation with Historic England, Conservation Officers and the Norfolk Historic Environment Team to discuss appropriate mitigation options which would reduce the visual impact on affected buildings. Once the design has been finalised, impacts should be reassessed.

No recorded historic landscapes will be impacted upon by the proposed options, although there are a number of Conservation Areas within the wider study area. Appropriate mitigation would include design of lighting, surfacing and screening in line with those utilised within the Conservation Areas.

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# Appendix A

**GAZETTEER**

Appendix A - Gazetteer

Site no.	HER/NHLE Ref	Grid ref	Site type	Description	Designation	Period	Value
1	MNF49675 (NHER)	TG 5170 0621	Bomb Crater	A line of ten WWII bomb craters visible as earthworks on 1940s aerial photographs. Recent aerial photographs and OS mapping suggest the sites is now partially under Harfreys Industrial Estate and waste ground, and the craters have presumably been levelled.	HER	Modern (WWII)	Low
2	MNF49172 (NHER)	TG 5164 0606	Ditch, Bank	A disused drain which probably dates to the post medieval period visible on 1940s aerial photographs. It was probably associated with the drainage of Southtown marches in the post medieval period, but has now been built over.	HER	Post medieval	Low
3	MNF49672 (NHER)	TG 5175 0607	Bomb Crater	A WWII bomb crater visible as an earthwork on 1940s aerial photographs. The site has now been built over.	HER	Modern (WWII)	Low
4	MNF49610 (NHER)	TG 5174 0589	Bomb Crater	A WWII bomb crater visible as an earthwork on 1940s aerial photographs. The site has now been built over.	HER	Modern (WWII)	Low
5	MNF49606 (NHER)	TG 5190 0593	Bomb Crater	A WWII bomb crater visible as an earthwork on 1940s aerial photographs. The site has now been built over.	HER	Modern (WWII)	Low
6	MNF49603 (NHER)	TG 5199 0587	Bomb Crater	A WWII bomb crater visible as an earthwork on 1940s aerial photographs. The site has now been built over.	HER	Modern (WWII)	Low
7	MNF48761 (NHER)	TG 5200 0600	Pillbox	A possible WWII pillbox is visible as an extant structure on 1940s aerial photographs. If it was a pillbox, it would have formed part of a chain of anti-invasion defences sites along the landward side of Great Yarmouth to protect the town and transport links. The structure was removed in 1945. An industrial park now occupies the site.	HER	Modern (WWII)	Low
8	MNF49697 (NHER)	TG 5209 0601	Air Raid Shelter	Three WWII air raid shelters visible on 1940s aerial photographs. They appear to have been within some sort of industrial site and are likely to have	HER	Modern (WWII)	Low

Site no.	HER/NHLE Ref	Grid ref	Site type	Description	Designation	Period	Value
				been industrial shelters for the site workers. The shelters have since been levelled and built over.			
9	MNF49681 (NHER)	TG 5212 0645	Bomb Crater, Spigot Mortar Emplacement	A pit dating to WWII which is possibly a bomb crater or a spigot mortar emplacement is visible as an earthwork on 1940s aerial photographs. If it was a mortar emplacement it may have been associated with the possible military training area 40m to the SE. The site has been levelled and built over.	HER	Modern (WWII)	Low
10	MNF49738 (NHER)	TG 5216 0644	Ropery, Ropewalk	A ropewalk is marked at this location on the OS 1 <sup>st</sup> edition map. It is one of several which once existed at Great Yarmouth. The site has since been levelled and mostly built over.	HER	Post medieval	Low
11	MNF32661 (NHER)	TG 5206 0632	Pillbox	A WWII type 24 pillbox survives on land at which is now Yarmouth Business Park in Southtown. It was visited on the ground in 1995. It was part of a line of anti-invasion defences cited to protect the landward side of Great Yarmouth.	HER	Modern (WWII)	Low
12	NHLE ref 1245813	TG 52303 06872	Building	Workshop range north of Number 244A. Range of outbuildings constructed for Admiralty barrack use in 1855. It was in commercial use from 1891 and converted to light engineering works in 1971. Built of red brick under Welsh slate roofs.	Listed (Grade II)	Post medieval	Medium
13	NHLE ref 1245811	TG 52303 06872	Barracks	Militia Barracks, built in 1853-5. Converted to light engineering works in 1971.	Listed (Grade II)	Post medieval	Medium
14	NHLE ref 1393268	TG 52313 06850	Offices	Utility block immediately east of No 244A Southtown Road. Smithy and Carpenters shop dating to 1806-1810 to designs of James Wyatt for the Ordnance Board. Converted to light engineering works in 1971.	Listed (Grade II)	Post medieval	Medium
15	NHLE ref 1245812	TG 52313 06850	Offices	Utility block immediately east of No 244A Southtown Road. Ancillary building to the naval arsenal by James Wyatt in 1806. Now light engineering works.	Listed (Grade II)	Post medieval	Medium

Site no.	HER/NHLE Ref	Grid ref	Site type	Description	Designation	Period	Value
16	NHLE ref 1245814	TG 52314 06828	Arsenal	244B Southtown Road. Naval arsenal, built 1806 by James Wyatt. Now used as light engineering works. This building was the actual armoury and had until 1829 a fireproof stone roof.	Listed (Grade II)	Post medieval	Medium
17	NHLE ref 1245815	TG 52280 06827	Lodge	245 Southtown Road was the North Lodge to the former naval arsenal, shown as 'Clerk of the Cheques' House' in 1810. Built of 1806-10 by James Wyatt for the Ordnance Board. Altered probably in 1891 when the site was relinquished by the Admiralty for commercial use.	Listed (Grade II)	Post medieval	Medium
18	NHLE ref 1245810	TG 52281 06806	House	244 Southtown Road was a storekeepers house to the naval arsenal. It was built in 1806 by James Wyatt and formed the south lodge to the complex. It is now commercial offices.	Listed (Grade II)	Post medieval	Medium
19	NHLE ref 1245807	TG 52201 06797	Wall	Boundary wall to south of number 66, built early 19 <sup>th</sup> century of tarred red brick	Listed (Grade II)	Post medieval	Medium
20	NHLE ref 1245808	TG 52201 06794	Wall	Boundary wall to south of number 67, built early 19 <sup>th</sup> century of brick.	Listed (Grade II)	Post medieval	Medium
21	NHLE ref 1245809 MNF48074 (NHER)	TG 52328 06490	House	83 & 84 Southtown Road. A pair of late 18 <sup>th</sup> century houses with 19 <sup>th</sup> century alterations. The houses are separated by an arched passageway with cast iron gates.	Listed (Grade II) & HER	Post medieval	Medium
22	NHLE ref 1096791	TG 52766 06976	Fish curing works	Tower fish curing works, built in 1880 in red brick with some stone to the south and east ranges. It is a triangular site with 3 ranges of buildings around a yard. The managers house and office occupies the west end of the north range. Inside the complex, the brine tanks are still intact.	Listed (Grade II)	Post medieval	Medium
23	NHLE ref 1245561	TG 52727 06909	Fish curing works, pottery production site.	Fish Curing works, then converted to the Great Yarmouth potteries. Built early 19 <sup>th</sup> century against the town walls of 1285-95 to the east. Built of brick and flint with timber interior partitioning.	Listed (Grade II*)	Post medieval	High
24	NHLE ref 1246059	TG 52885 06854	Terrace	41-46 Nelson Road South. Terrace of 6 houses built in the mid-19 <sup>th</sup> century, all were converted into a hotels in the 20 <sup>th</sup> century. Built of gault brick with	Listed (Grade II)	Post medieval	Medium

Site no.	HER/NHLE Ref	Grid ref	Site type	Description	Designation	Period	Value
				stuccoed and rusticated ground floors with slate and concrete tile roofs.			
25	NHLE ref 1246584	TG 53034 06937	Hotel	The Royal Hotel opened in 1840. The façade and large rear extensions were added in 1877 by JB Pearce. It is of stuccoed red brick with a slate roof. Charles Dickens apparently stayed here in 1848-9 while writing David Copperfield.	Listed (Grade II)	Post medieval	Medium
26	NHLE ref 1096805	TG 53004 06878	Terrace, Hotel	Donna Doone Hotel (Nos 1, 1A & 2), Neptune Hotel (Nos 9-11) and Sienna Lodge Hotel (Nos 17-18). Terrace of houses, now including 3 hotels, which were built in 1844-47 of gault brick and partly stuccoed and colourwashed.	Listed (Grade II)	Post medieval	Medium
27	NHLE ref 1245564	TG 53002 06910	Terrace	11-16 Wellington Road. Terrace of houses built in the early 1840s of gault brick.	Listed (Grade II)	Post medieval	Medium
28	NHLE ref 1245566	TG 53020 06885	Arch	Wellington Arch is an archway forming the north entrance to the Victoria estate and was built in 1846 by John Brown. It was restored in 1980. It is built of gault brick with rendered details.	Listed (Grade II)	Post medieval	Medium
29	NHLE ref 1245563	TG 53041 06894	Terrace	3, 4 and 5 Waterloo Road. Terrace of 3 houses built in the mid-19 <sup>th</sup> century of gault brick.	Listed (Grade II)	Post medieval	Medium
30	NHLE ref 1246583	TG 53051 06878	Hotel	Cavendish Hotel, formerly known as Brandon Mansions Hotel. Originated as a terrace of houses built in 1844 by Farrants & Turrel. Built of stuccoed brick with slate and concrete tile roof.	Listed (Grade II)	Post medieval	Medium
31	NHLE ref 1096806	TG 52991 06832	Terrace	The Embassy Hotel (Nos 38-41). Terrace of houses, part now a hotel, built in 1844-7 of gault brick.	Listed (Grade II)	Post medieval	Medium
32	NHLE ref 1271805	TG 53016 06832	Arch	Wellington Mews Arch is a monumental arch forming the entrance to the mews behind Kimberley Terrace. It was built in 1847 of gault brick.	Listed (Grade II)	Post medieval	Medium

Site no.	HER/NHLE Ref	Grid ref	Site type	Description	Designation	Period	Value
33	NHLE ref 1271269	TG 53022 06805	Terrace	Carlton Hotel (Nos 1-5). Terrace of houses, part now a hotel. It was laid out from 1841 as the first part of the Victoria Building Company's estate under the overall direction of Thomas Marsh Nelson. Built of stuccoed brick with slate roofs.	Listed (Grade II)	Post medieval	Medium
34	NHLE ref 1096787	TG 52980 06784	Terrace	Mayflower Hotel (No 5), St Georges Hotel (Nos 7-8). Terrace of 8 houses, now 2 hotels. Built in 1844 of stuccoed brick with concrete and tile roofs.	Listed (Grade II)	Post medieval	Medium
35	NHLE ref 1271606	TG 53006 06732	Assembly Rooms	Masonic Royal Assembly Rooms built 1863 by HH Collins. It partly burnt out in 1870 and became the masonic lodge under patronage of HRH Prince of Wales. It is built of gault brick with slate roofs.	Listed (Grade II)	Post medieval	Medium
36	NHLE ref 1271608	TG 53148 06762	Winter Gardens	The Winter Gardens were designed and constructed in Torquay by John Watson and William Harvey between 1878 and 1881 at a cost of £12783. It was relocated to Great Yarmouth in 1904.	Listed (Grade II*)	Post medieval	High
37	NHLE ref 1271607	TG 53034 06684	House	Shadingfield Lodge, formerly a house, now a hotel. Built 1862-5 by AW Morant and altered internally in 1953 by AW Ecclestone. Built of gault brick under slate roofs.	Listed (Grade II)	Post medieval	Medium
38	MNF48764 (NHER)	TG 5223 0633	Air Raid Shelter, Bomb Crate, Defence work, gun emplacement, military training site, practice trench.	A WWII military site, comprising various features and defences including air raid shelters, slit trenches, bomb craters and possibly a searchlight emplacement. The precise function of the site is unclear, although the variety of installations and the disorganised layout would suggest a military training site. Much of the site has been built over and no features are no longer visible on the ground or on modern aerial photographs.	HER	Modern (WWII)	Low
39	MNF49703 (NHER)	TG 5228 0636	Air Raid Shelter	A possible air raid shelter dating to WWII visible as an earthwork mound (presumably covering a structure) on 1940s aerial photographs. Its size and shape suggest a private shelter, possibly an Anderson shelter. No trace of the structure survives above ground today.	HER	Modern (WWII)	Low



Site no.	HER/NHLE Ref	Grid ref	Site type	Description	Designation	Period	Value
40	MNF49678 (NHER)	TG 5214 0617	Bomb Crater	Two WWII bomb craters are visible as earthworks on 1940s aerial photographs. The site has now been levelled and built over.	HER	Modern (WWII)	Low
41	MNF48763 (NHER)	TG 5219 0615	Roadblock, anti-tank block	A group of WWI anti invasion defences, comprising two road blocks and a possible pillbox, are visible on aerial photographs taken in 1944. They were situated on the western edge of the inhabited part of Southtown. They were removed in 1945 and no trace of them exists today.	HER	Modern (WWII)	Low
42	MNF12936 (NHER)	TG 5222 0617	Findspot	In 1977 a Neolithic scraper was found during building work. It was found at a depth of 4.2m.	HER	Modern (WWII)	Low
43	MNF49679 (NHER)	TG 5231 0616	Bomb Crater	A probable WWII bomb crater visible on 1940s aerial photographs. The site has since been levelled and built over.	HER	Modern (WWII)	Low
44	MNF48762 (NHER)	TG 5231 0610	Spigot Emplacement Mortar	A WWII spigot mortar emplacement is visible as an extant structure and earthwork on 1940s aerial photographs. It appears to have been associated with two roadblocks and other defences. It appears that site has been levelled.	HER	Modern (WWII)	Low
45	MNF48800 (NHER)	TG 5259 0655	Hut, Civil Defence Building	A hut or temporary building, probably related to civil defence or shelter during WWII was visible as an extant structure on 1940s aerial photographs. It was removed soon after the end of the war.	HER	Modern (WWII)	Low
46	MNF49709 (NHER)	TG 5262 0642	Air Raid Shelter	Six probable air raid shelters dating to WWII visible as structures and earthworks on 1940s aerial photographs. These were most likely private shelters and may have been Anderson shelters. There is no evidence of these structures above ground today.	HER	Modern (WWII)	Low
47	MNF46372 (NHER)	TG 5267 0646	Air Raid Shelter	A WWII air raid shelter is visible as an extant earth covered structure on 1940s aerial photographs. Its size and location within a light industrial yard would suggest it was placed to protect the local workforce. The site has been levelled and built over.	HER	Modern (WWII)	Low

Site no.	HER/NHLE Ref	Grid ref	Site type	Description	Designation	Period	Value
48	NHLE ref 1245981	TG 52716 06548	Church	Parish church of St James. The nave and chancel date to 1870-78 by JP Seddon. The aisles date to 1902-8 by Bottle & Olley. Built of cut and knapped flint with red brick dressings.	Listed (Grade II)	Post medieval	Medium
49	MNF4340 (NHER)	TG 5283 0642	Barracks, Hospital, Royal Naval Hospital	St Nicholas's Hotel, also known as the Royal Naval Hospital, was built between 1809 to 1811. It was used as a military barracks between 1818 to 1854, but subsequently reverted to its original use as a Naval hospital. The buildings were surround a courtyard in which a greenhouse built around 1890, used to stand. In 1815 seven sailors and seventeen Waterloo soldiers were apparently buried in the courtyard. The burials were reported to have been excavated in 1979. During WWII the hospital was used as a Naval information centre and administrative quarters, named HMS Watchful. The surviving hospital buildings have been restored and converted into flats and houses.	HER	Modern (WWII)	Low
50	MNF46399 (NHER)	TG 5278 0651	Air Raid Shelter	A large WWII air raid shelter is visible as an extant earth covered structure on 1940s aerial photographs. It lay within the grounds of the former St James School, directly adjacent to the main school building as was presumably intended for use by the pupils and teachers of the school.	HER	Modern (WWII)	Low
51	NHLE ref 1245984	TG 52840 06464	Hospital	St Nicholas Hospital Main Entrance Range. These buildings consisted of guard rooms, archway and service rooms to the naval hospital, now general storage and kitchens to St Nicholas' Hospital. Of yellow stock brick with Portland stone dressings and slate roof.	Listed (Grade II*)	Post medieval	High
52	NHLE ref 1245983	TG 52890 06400	Naval hospital	St Nicholas Hospital, formerly Naval Hospital. Built in 1809-11 by William Pilkington under supervision of Edward Holl, Architect to the Navy Board. It became naval barracks in 1818 and subsequently a general hospital. It is of yellow brick laid in Flemish bond with dressings of Portland stone. It is on a quadrangle plan with single depth wards, with a west chapel. Each of the four wings is linked by a single storey quadrant passageway.	Listed (Grade II*)	Post medieval	High

Site no.	HER/NHLE Ref	Grid ref	Site type	Description	Designation	Period	Value
53	NHLE ref 1245986	TG 52926 06371	Wall, Railings	St Nicholas Hospital Walls and Railings dating to 1811 with mid-20 <sup>th</sup> century insertions and repairs. By Edward Holl and William Pilkington, architects at the Navy Board. They are of brick and cast-iron. The walls run around the west, south and east sides of the site.	Listed (Grade II)	Post medieval	Medium
54	NHLE ref 1245985	TG 52845 06289	Hospital	St Nicholas Hospital South Block. This was an Isolation wing to the Naval Hospital, now St Nicolas' Hospital. It was built c.1809-11 by William Pilkington, supervised by Edward Holl, Architect to the Navy Board. It is of yellow stock brick under slate roofs. It is of one storey.	Listed (Grade II)	Post medieval	Medium
55	NHLE ref 1245982	TG 52778 06286	Mortuary, Chapel	St Nicholas Hospital CSSD store. Formerly a mortuary and chapel dating to c.1810, now dis-used. It is of various shades of red brick with a hipped slate roof. It is rectangular and single depth in plan.	Listed (Grade II)	Post medieval	Medium
56	MNF57307 (NHER)	TG 52550 06356	Naval storehouse	The surviving section of a sail loft and storehouse which was constructed in 1798 for the Royal Navy.	HER	Modern (WWII)	Low
57	MNF49707 (NHER)	TG 5269 0636	Air Raid Shelter	Three probable air raid shelters dating to WWII are visible as earthworks with structural elements on 1940s aerial photographs. These were probably private shelters. The site has since been redeveloped as housing and shelters have presumably been levelled.	HER	Modern (WWII)	Low
58	MNF48794 (NHER)	TG 5299 0641	Air Raid Shelter, Barrage Balloon Site, Hut	WWII military activity and installations are visible as extant buildings, structures and earthworks on aerial photographs from the 1940s. They were located immediately east of the Royal Naval Hospital and may also have been under Naval control during the war. There is no evidence on the ground that these features still exist.	HER	Modern (WWII)	Low
59	MNF46973 (NHER)	TG 5316 0636	Barbed Wire Obstruction, Trench, Pillbox	A group of WWII anti invasion defences is visible as extant structures, buildings and earthworks on 1940s aerial photographs. The defences, which are visible on Great Yarmouth seafront stretching from Wellington Pier to the Pleasure Beach, formed part	HER	Modern (WWII)	Low

Site no.	HER/NHLE Ref	Grid ref	Site type	Description	Designation	Period	Value
				of a longer line of defences which extended all the way along the seafront. There is no evidence that any trace of the defences survives today.			
60	MNF46981 (NHER)	TG 5306 0627	Roadblock	A WWII road block is visible as a structure on 1940s aerial photographs. It appears to have been removed some time before the end of the war.	HER	Modern (WWII)	Low
61	MNF46982 (NHER)	TG 5306 0622	Roadblock	A WWII road block is visible as a structure on 1940s aerial photographs. A small structure to its west, which appears to be surrounded by a blast wall, may have been an associated defensive building. The road block seems to have been removed some time before the end of the war.	HER	Modern (WWII)	Low
62	MNF47003 (NHER)	TG 5304 0616	Air Raid Shelter	Nine small WWII air raid shelters, at least some of which were probably Anderson shelters, visible as earthworks and structures on 1940s aerial photographs. There is no evidence to suggest that any remains survive above ground.	HER	Modern (WWII)	Low
63	MNF46989 (NHER)	TG 5306 0611	Roadblock	A WWII road block is visible as a structure on 1940s aerial photographs. As with other examples, they appear to have been removed before the end of the year.	HER	Modern (WWII)	Low
64	MNF47007 (NHER)	TG 5306 0606	Air Raid Shelter	A large WWII air raid shelter is visible as an arrangement of structures and earthworks on 1940s aerial photographs. It was levelled after the end of the war.	HER	Modern (WWII)	Low
65	MNF41610 (NHER)	TG 53137 06006	Fairground Ride	The 'scenic railway' was built in 1932, and is one of only a few examples in the world of an early wooden roller coaster, and may be the oldest outside of the USA.	HER	Modern	Low
66	MNF47061 (NHER)	TG 5278 0620	Air Raid Shelter	Two small WWII air raid shelters which could have been Anderson shelters or a similar design, are visible on 1940s aerial photographs. There is no evidence that any remains of the shelters survive above ground.	HER	Modern (WWII)	Low
67	MNF47065 (NHER)	TG 5279 0625	Air Raid Shelter	A group of earthwork mounds with structural elements, probably WWII air raid shelters, visible on 1940s aerial photographs. There is no evidence	HER	Modern (WWII)	Low

Site no.	HER/NHLE Ref	Grid ref	Site type	Description	Designation	Period	Value
				that any remains of these survive above ground today.			
68	MNF47063 (NHER)	TG 5285 0625	Air Raid Shelter	A group of earthwork mounds with structural elements, probably WWII air raid shelters, visible on 1940s aerial photographs. There is no evidence that any remains of these survive above ground today.	HER	Modern (WWII)	Low
69	MNF47000 (NHER)	TG 5295 0623	Air Raid Shelter	Four WWII air raid shelters visible as earth covered structures on 1940s aerial photographs. They all lay within the grounds of what is now Greenacre First and Middle Schools and were probably constructed for the use of its staff and pupils. These were levelled since the end of the war.	HER	Modern (WWII)	Low
70	NHLE ref 1096789 MNF32731 (NHER)	TG 52739 06149	Gas Works	Excellent example of a gasometer with ornate finials to the uprights of the frame which is braced with a lattice pattern. The gasometer was built at another site, but collapsed and was rebuilt here in 1885. An old map shows this was the site of a steam engine before the gasometer was built.	Listed (Grade II) & HER	Post medieval	Medium
71	MNF47033 (NHER)	TG 5281 0611	Air Raid Shelter	Five small WWII air raid shelters, at least some of which were Anderson shelters, visible as earthworks and structures on 1940s aerial photographs. There is no evidence to suggest any remains survive above ground today.	HER	Modern (WWII)	Low
72	MNF47029 (NHER)	TG 5287 0609	Air Raid Shelter	Eleven small WWII air raid shelters, at least some of which were probably Anderson shelters, visible as earthworks and structures on 1940s aerial photographs. There is no evidence that any remains survive above ground today.	HER	Modern (WWII)	Low
73	MNF47024 (NHER)	TG 5295 0609	Air Raid Shelter	Fifteen small WWII air raid shelters, at least some of which were probably Anderson shelters, visible as earthworks and structures on 1940s aerial photographs. There is no evidence that any remains survive above ground today.	HER	Modern (WWII)	Low

Site no.	HER/NHLE Ref	Grid ref	Site type	Description	Designation	Period	Value
74	MNF47008 (NHER)	TG 5301 0602	Air Raid Shelter	Two small WWII air raid shelters, at least one of which was probably an Anderson shelter, visible as earthworks and structures on 1940s aerial photographs. There is no evidence that any remains survive above ground today.	HER	Modern (WWII)	Low
75	MNF46991 (NHER)	TG 5306 0600	Roadblock	WWII road block visible as a structure on 1940s aerial photographs. As with other examples, this one appears to have been removed some time before the end of the war.	HER	Modern (WWII)	Low
76	MNF46960 (NHER)	TG 5316 0564	Weapons Pit, Emplacement	Gun	HER	Modern (WWII)	Low
77	MNF4328 (NHER)	TG 530 059	Battery	The South Star Battery was built in 1782. A magazine for storing gunpowder was added in 1793. The battery was restored and reconstructed several times and was still in use in 1914 when it was being used as a barracks. The site is now under Harbord Crescent east of battery road.	HER	Modern (WWII)	Low
78	MNF47009 (NHER)	TG 5305 0594	Air Raid Shelter	Five small WWII air raid shelters, at least some of which were probably Anderson shelters, are visible as earthworks and structures on 1940s aerial photographs. There is no evidence that anything of these remains above ground today.	HER	Modern (WWII)	Low
79	MNF47048 (NHER)	TG 5297 0595	Air Raid Shelter	Five small WWII air raid shelters, at least some of which were Anderson shelters are visible as earthworks on 1940s aerial photographs. There is no evidence that anything of these remains above ground today.	HER	Modern (WWII)	Low
80	MNF46992 (NHER)	TG 5305 0589	Roadblock	A WWII road block is visible as a structure on 1940s aerial photographs. This was removed some time before the end of the war.	HER	Modern (WWII)	Low

Site no.	HER/NHLE Ref	Grid ref	Site type	Description	Designation	Period	Value
81	MNF47012 (NHER)	TG 5303 0586	Air Raid Shelter	A small WWII air shelter, possibly an Anderson shelter, is visible as an earthwork on aerial photographs taken in 1945. There is no evidence that any remains of these survive above ground today.	HER	Modern (WWII)	Low
82	MNF46932 (NHER)	TG 5302 0584	Air Raid Shelter	Three WWII air raid shelters visible as earthworks and structures on 1940s aerial photographs. The site has been built over and the shelters probably levelled.	HER	Modern (WWII)	Low
83	MNF47081 (NHER)	TG 5254 0619	Military building	A group of probable WWII buildings visible as extant structures on wartime aerial photographs. All or some of the buildings might be military in origin and relate to the defence of Great Yarmouth or the naval base that was established at the town. Alternatively, they might relate to industrial activity at the quayside during the war years. The buildings have been since levelled and redeveloped in the post war period.	HER	Modern (WWII)	Low
84	MNF47068 (NHER)	TG 5259 0618	Bomb Crater	Two WWII bomb craters are visible as earthworks on 1940s aerial photographs. The intended target was probably the gas works 50m to the southeast. The site has since been levelled since the end of the war.	HER	Modern (WWII)	Low
85	MNF47071 (NHER)	TG 5263 0617	Gas Holder	A WWII air raid shelter and a former gas holder, the latter possibly used as an emergency water supply tank, and visible as extant earthworks and structures on 1940s aerial photographs. The site has since been levelled.	HER	Modern (WWII)	Low
86	MNF62069 (NHER)	TG 5253 0609	Salt Store, Ice House	Icehouse and salt stores visible on the 1 <sup>st</sup> edition ordnance survey map. The buildings have all since been demolished.	HER	Post medieval	Low
87	MNF47036 (NHER)	TG 5257 0582	Barbed obstruction, building	WWI defences, comprising a circuit of fencing and barbed wire as well as several small buildings, visible on 1940s aerial photographs. These were laid out along the quayside and around the former fish wharf buildings. They were removed after the end of the war.	HER	Modern (WWII)	Low

Site no.	HER/NHLE Ref	Grid ref	Site type	Description	Designation	Period	Value
88	MNF13576 (NHER)	TG 52364 07247	Railway	During the mid and late 19 <sup>th</sup> century a series of railway lines were constructed within Great Yarmouth town. One section linked Vauxhall station to Beach Station, North Quay and the fishmarket, whilst the second linked Ballast Quay and North Pier. At first the trains were horse drawn, but after 1883 engines were used. The railways were closed at various times from 1927 onwards and many of the routes are now covered by modern development, although some features do survive in places.	HER	Post medieval	Low
89	NHLE ref 1096829 MNF38779 (NHER)	TG 52587 06039	Public House	The Dolphin Public House was built between 1900 and 1904. It was designed by J.W. Cockrill and features his distinctive use of red brick over concrete and decorative tiles. The decorative tiles feature marine subjects.	Listed (Grade II), & HER	Modern	Medium
90	MNF48439 (NHER)	TG 5229 0597	Roadblock	A group of WWII anti invasion defences comprising anti-tank blocks, a type 24 pillbox and a spigot mortar emplacement, are visible as extant buildings, structures and earthworks on 1940s aerial photographs. In the post war period the site was levelled and built over, and there is no evidence that any part of the defences still survives.	HER	Modern (WWII)	Low
91	MNF48445 (NHER)	TG 5239 0588	Roadblock	A group of WWII anti invasion defences, comprising a substantial road block and tank trap protected by two or three pillboxes are visible on 1940s aerial photographs. The defences were removed before August 1945.	HER	Modern (WWII)	Low
92	MNF47054 (NHER)	TG 5287 0594	Air Raid Shelter	A small WWII air raid shelter, possibly an Anderson shelter, visible as an earthwork on 1940s aerial photographs. It lay in the back garden of a house and was probably a private shelter. There is no evidence to suggest that any remains above ground today.	HER	Modern (WWII)	Low
93	MNF61853 (NHER)	TG 5275 0584	Coal Fired Power Station	Great Yarmouth Electricity Works was Great Yarmouth's first power station using steam engines and steam turbines to provide power to industry, transport, public lighting and domestic use. It was	HER	Post medieval	Low



Site no.	HER/NHLE Ref	Grid ref	Site type	Description	Designation	Period	Value
				decommissioned in 1958 and part of the building (although not original parts) still remain.			
94	MNF47044 (NHER)	TG 5280 0585	Military Building	A WWII structure, possibly a military building such as a guardhouse or sentry box, visible as an extant building on 1940s aerial photographs. It was demolished by 1951.	HER	Modern (WWII)	Low
95	MNF13576 (NHER)	TG 52364 07247	Railway	Railway lines constructed in the mid to late 19 <sup>th</sup> century, no longer extant.	HER	Post medieval	Low
96	MNF49602 (NHER)	TG 5234 0576	Bomb Crater	A probable WWI bomb crater visible as a partially backfilled earthwork on 1940s aerial photographs. The site has since been levelled and resurfaced.	HER	Modern (WWII)	Low
97	MNF49685 (NHER)	TG 5237 0573)	Air Raid Shelter	A WWII air raid shelter visible as an earthwork and structure on 1940s aerial photographs. Its small size and location within a garden suggest that it was a private shelter. The site has since been built over and the shelter probably levelled.	HER	Modern (WWII)	Low
98	MNF49691 (NHER)	TG 5232 0570	Air Raid Shelter	A WWI air raid shelter is visible as an earthwork on 1940s aerial photographs, It lay within what appears to have been an industrial site and its size suggests that it was an industrial shelter. The site has since been levelled and built over.	HER	Modern (WWII)	Low
99	MNF49598 (NHER)	TG 5196 0561	Bomb Crater	A probable WWII bomb crater is visible on an earthwork and disturbed ground on 1940s aerial photographs. Recent aerial photographs show that the site may still survive as a slight earthwork.	HER	Modern (WWII)	Low
100	MNF19084 & MNF19949 (NHER)	TG 5207 0537	Pillbox, Anti Aircraft Battery	A WWII Light Anti Aircraft Battery is visible as a group of earthworks, structures and buildings on aerial photographs and has also been partially recorded on the ground, It comprised a Bofors gun emplacement, a Type 22 pillbox, a possible earthwork gun emplacement and a variety of ancillary structures and huts. Many of the structures were removed at the end of the war, the pillbox was demolished in 1991 during the	HER	Modern (WWII)	Low

Site no.	HER/NHLE Ref	Grid ref	Site type	Description	Designation	Period	Value
				construction of the A12(T) on top of the former railway embankment.			
101	MNF49686 (NHER)	TG 5234 0564	Air Raid Shelter	A probable WWII air raid shelter visible as an earthwork on 1940s aerial photographs. There is no evidence to suggest that anything survives above ground today.	HER	Modern (WWII)	Low
102	MNF49688 (NHER)	TG 5239 0564	Air Raid Shelter	A probable WWII air raid shelter visible as an earthwork on 1940s aerial photographs. There is no evidence to suggest that anything survives above ground today.	HER	Modern (WWII)	Low
103	MNF49687 (NHER)	TG 5241 0561	Blast Wall, Air Raid Shelter	A probable surface level air raid shelter is visible as an extant building on 1940s aerial photographs. It has since been levelled and built over.	HER	Modern (WWII)	Low
104	MNF49578 (NHER)	TG 5227 0558	Air Raid Shelter	Two possible WWI air raid shelters visible as earthworks on 1940s aerial photographs. The area has since been levelled.	HER	Modern (WWII)	Low
105	MNF49689 (NHER)	TG 5218 0548	Air Raid Shelter	A large WWI air raid shelter is visible as an earthwork and associated structures on 1940s aerial photographs. This was probably a public shelter. The site has since been levelled and built over.	HER	Modern (WWII)	Low
106	MNF49561 (NHER)	TG 5219 0543	Air Raid Shelter	Twelve probably WWII air raid shelters visible as earthworks and structures. The site has since been levelled.	HER	Modern (WWII)	Low
107	MNF48435 (NHER)	TG 5223 0544	Bomb Site, Water Tank	A static emergency water supply tank, dating to WWII, is visible as an extant structure on 1940s aerial photographs taken in 1944. It is one of several such tanks positioned around Great Yarmouth for use by fire fighters after bombing raids. It was located on what was probably a bomb site but had been removed by 1945.	HER	Modern (WWII)	Low
108	MNF49514 (NHER)	TG 5228 0545	Air Raid Shelter	A probable WWII air raid shelter visible as an earthwork on 1940s aerial photographs. There is no evidence that anything remains above ground today.	HER	Modern (WWII)	Low

Site no.	HER/NHLE Ref	Grid ref	Site type	Description	Designation	Period	Value
109	MNF49567 (NHER)	TG 5233 0550	Air Raid Shelter	Two probable WWII air photographs visible on aerial photographs. The site has since been levelled.	HER	Modern (WWII)	Low
110	MNF15149 (NHER)	TG 525 055	Prison, Maltings	A post medieval maltings, dating from the early 19 <sup>th</sup> century. The maltings were said to have been used as a prison during the Napoleonic War. The buildings were demolished in the 1980s after being damaged by fire.	HER	Post medieval	Low
111	MNF48433 (NHER)	TG 5252 0550	Fire Station, Air Raid Shelter, Broadcasting Transmitter	Structures and buildings visible on 1940s aerial photographs. These may have represented WWII civil defence buildings. No traces of these structures are visible today.	HER	Modern (WWII)	Low
112	NHLE ref 1246973 MNF47922 (NHER)	TG 52570 05433	House	Providence Villa, built in 1843. It is built of red brick with a gault brick façade. There is a date plaque on the house which reads <i>Providence Villa I &amp; S L, 1843</i> .	Listed (Grade II), & HER	Post medieval	Medium
113	NHLE ref 1246972 MNF47923 (NHER)	TG 52575 05424	House	96 High Road was built around 1830s. It is mainly constructed of red brick but has a gault brick façade.	Listed (Grade II), & HER	Post medieval	Medium
114	NHLE ref 1246971 MNF48137 (NHER)	TG 52579 05414	Terraced House	95 High Road was once two early 19 <sup>th</sup> century terraced houses, but is now one house. It is constructed of gault brick and is of two storeys with a black glazed pantile roof.	Listed (Grade II), & HER	Post medieval	Medium
115	NHLE ref 1246970 MNF48136 (NHER)	TG 52610 05354	House	Ahoy and Manby House (86 and 87 High Road) are a pair of red brick houses built in the 1840s. Most of the structures are colourwashed. On no 86 there is an inscriptions stating that Captain G W Manby F.R.S, the inventor of life saving apparatus) lived in the house and dies there is 1854.	Listed (Grade II), & HER	Post medieval	Medium
116	MNF66695, MNF10562 (NHER)	TG 5250 0530	Church, Priory, Leper Hospital	This is the site of a large Augustinian Friary and church. The friary was founded in the 13 <sup>th</sup> century and was dissolved in 1538. Human skeletons have been found here since the 18 <sup>th</sup> century and excavations have revealed the presence of structures on the site. Remains of the friary buildings have also been incorporated into buildings to the north and south of Burnt Lane.	HER	Medieval	Medium

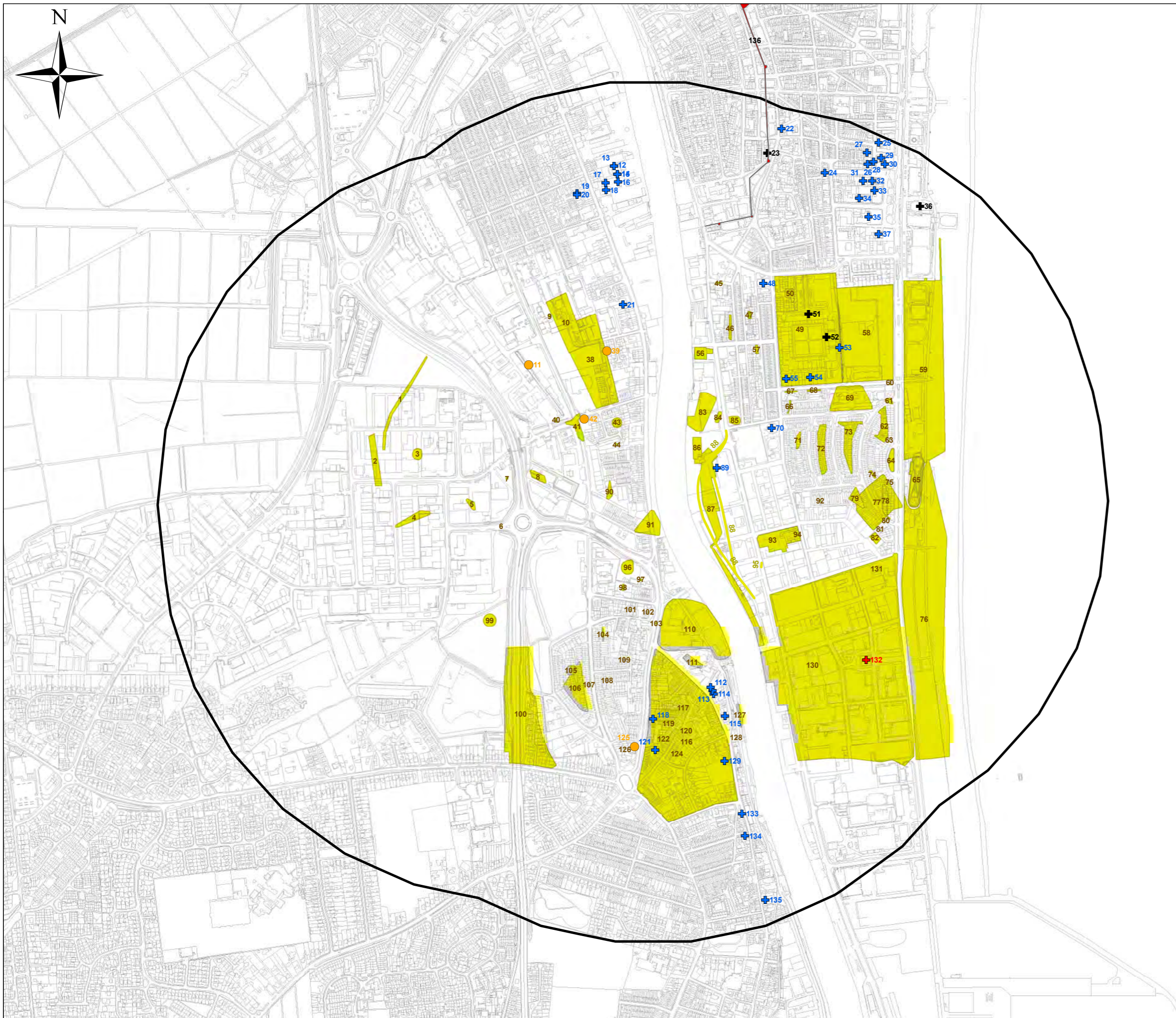
Site no.	HER/NHLE Ref	Grid ref	Site type	Description	Designation	Period	Value
117	MNF49505 (NHER)	TG 5249 0537	Air Raid Shelter	Two probable WWII air raid shelters are visible as earthworks and structures on 1940s aerial photographs. There is no evidence to suggest that any part of the shelters now survives above ground.	HER	Modern (WWII)	Low
118	NHLE ref 1096790 MNF47939 (NHER)	TG 52411 05346	Methodist Chapel	Southtown and Gorleston Methodist Church is a late 19 <sup>th</sup> century red brick Methodist church which was extended in 1901. It has a gault brick façade under a slate roof and is of a single storey.	Listed (Grade II), & HER	Post medieval	Medium
119	MNF49503 (NHER)	TG 5245 0533	Air Raid Shelter	Two probable WWII air raid shelters visible as earthworks on 1940s aerial photographs. There is no evidence to suggest anything survives above ground today.	HER	Modern (WWII)	Low
120	MNF49506 (NHER)	TG 5250 0531	Air Raid Shelter	Possible WWII air raid shelter visible as an earthwork on 1940s aerial photographs. The site has since been built over.	HER	Modern (WWII)	Low
121	NHLE ref 1096804	TG 52417 05260	Friary	Remains of the house of the Austin Friary. This building dates to the 15 <sup>th</sup> century, but the Friary was founded in 1311. It is of flint and brick. The surviving remains consist of a short stretch of wall with part of a 15 <sup>th</sup> century chafered 4 centred brick arch.	Listed (Grade II)	Medieval	Medium
122	MNF49502 (NHER)	TG 5244 0528	Air Raid Shelter	Five probable WWII air raid shelters visible as earthworks and structures on 1940s aerial photographs. There is no evidence to suggest that anything survives above ground today.	HER	Modern (WWII)	Low
123	MNF66634 (NHER)	TG 5244 0527	Beam Slot, Timber Framed Building	A watching brief in 2013 revealed beam slots and post holes associated with a late medieval timber-framed building. Finds recovered from these features included late medieval brick, roof tile and wall plaster.	HER	Uncertain	Low
124	MNF49500 (NHER)	TG 5247 0525	Air Raid Shelter	Five probable WWII air raid shelters visible as earthworks and structures on 1940s aerial photographs. There is nothing to suggest that anything remains above ground today.	HER	Modern (WWII)	Low
125	MNF39960 (NHER)	TG 5236 0527	Boundary Post	A cast iron boundary post which is probably dated to 1819. It is inscribed ' <i>The Bounds of Gorleston and Southtown</i> '.	HER	Post medieval	Low

Site no.	HER/NHLE Ref	Grid ref	Site type	Description	Designation	Period	Value
126	MNF49513 (NHER)	TG 5233 0526	Air Raid Shelter	A probable air raid shelter dating to WWII is visible as a structure on 1940s aerial photographs. The site has since been levelled.	HER	Modern (WWII)	Low
127	MNF32655 (NHER)	TG 5264 0535	Gun emplacement	A group of WWII defences, comprising a tower for a light anti-aircraft gun, a spigot mortar emplacement and a possible air raid shelter, are visible as extant structures and earthworks on aerial photographs. The tower was demolished in the post war period and there is no evidence that any trace of the defences now survives at the site.	HER	Modern (WWII)	Low
128	MNF61540 (NHER)	TG 5264 0529	Findspot	An archaeological evaluation in August 2010 revealed an alluvial deposit and a residual sherd of late 18 <sup>th</sup> to late 19 <sup>th</sup> century pottery.	HER	Modern (WWII)	Low
129	NHLE ref 1246974	TG 52608 05230	House	Koolunga House, formerly known as Wishbone. The house has now been split into flats. It is dated 1826 and built of gault brick with slate roof.	Listed (Grade II)	Post medieval	Medium
130	MNF46945, MNF46934 (NHER)	TG 5291 0550	Military training site, weapons pit, pillbox	Evidence of WWII military activity, including anti invasion defences, is visible on 1940s aerial photographs as groups of earthworks, buildings and structures. These extended across a large area of South Denes, from Main Cross Road in the north to an area of open ground (now a caravan park) to the south. They included areas of pit digging, weapons pits, possible pillboxes, a possible air raid shelter, spigot mortar emplacements, barbed wire and anti-tank scaffolding. The majority of these features were removed by 1945.	HER	Modern (WWII)	Low
131	MNF46925 (NHER)	TG 5302 0576	Ambulance station	Two buildings are visible on 1940s aerial photographs. The precise function of the buildings is not clear, but they could have been a WWII ambulance station. One of these buildings may still survive as a garage building.	HER	Modern (WWII)	Low
132	NHLE ref 1246057	TG 52999 05508	Monument	Nelsons Monument, also known as Norfolk Pillar. Constructed in 1817-19 by William Wilkins. It was the first monument in England to Admiral Lord Nelson (Nelson's Column in London was 1840s,	Listed (Grade I)	Post medieval	High

Site no.	HER/NHLE Ref	Grid ref	Site type	Description	Designation	Period	Value
				but the column in Dublin was of 1808). The monument consists of fluted Greek Doric column on a square pedestal standing on a raised plinth.			
133	NHLE ref 1246978	TG 52657 05084	Milepost	Milepost in front of No 245 High Street. It is made of cast iron and dated 1828. It is triangular casting with a broach into a flat top.	Listed (Grade II)	Post medieval	Low
134	NHLE ref 1246977	TG 52665 05022	House	235 High Street is an early 19 <sup>th</sup> century house of rendered and colourwashed brick. It has a slate roof and is of 2 storeys with a dormer attic.	Listed (Grade II)	Post medieval	Medium
135	NHLE ref 1246975	TG 52721 04845	Public House	The Short Blue Public House was built in the early 18 <sup>th</sup> century and altered in the 20 <sup>th</sup> century. It is built of stuccoed brick and colourwashed. It has a pantile roof which is black glazed to the front.	Listed (Grade II)	Post medieval	Medium
136	NHLE ref 1003782	TG 52560 06702 to TG 51779 08524	Town Walls	The Medieval Town Wall of Great Yarmouth runs from the river Bure to the banks of the River Yare and is about 23 feet (7m) high and 2238 (680m) long. It is constructed from knapped flint on a flagstone base, cut into a moat. Building started in 1284 and was completed in the late 14 <sup>th</sup> century.	Scheduled Monument	Medieval	High

# Appendix B

**HERITAGE ASSET PLAN**



**KEY**

- Undesignated Site Location
  - Undesignated Site (Line)
  - Undesignated Site (Region)
  - 1KM Designated Boundary
- Great Yarmouth Listed Building Grade**
- + I
  - + II
  - + II\*
- Scheduled Monument (Town Walls)

A		IW 24/07/2017	KB 25/07/2017	RA 25/07/2017
Ver	Amendments	Originated by and date	Checked by and date	Approved by and date

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The most publicly available up to date Historic England and EA GIS Data can be obtained from [HistoricEngland.org.uk](https://data.gov.uk/data/search) & <https://data.gov.uk/data/search>



**Client**

**Project**  
**Great Yarmouth Thrid River Corsing**

**Drawing Title**  
**Heritage Assets Plan**

**Drawing No.**  
**Appendix B**

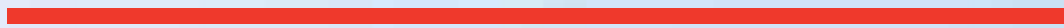
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**Purpose :** Information





# Appendix H

HEALTH ASSESSMENT MATRIX



## INTRODUCTION

This screening & scoping exercise has been undertaken so that potential health effects are identified and considered early in project development. The exercise identifies potentially affected populations, including vulnerable groups, in addition to aspects of the project which may give rise to effects on health. Where there is potential for effects on health, issues to be considered during scoping and subsequent assessment are also identified.

## METHODOLOGY

Section 1 of the matrix sets out the project details and the information available at this stage of project development. For example, early in the project development information may include a route corridor, a range of road or non-road transport options and baseline desk-studies. As the project develops, more design details may be available in addition to environmental assessments.

Section 2 identifies a broad study area and communities likely to be affected. This can be refined later as the Proposed Scheme develops if required. This section identifies potential groups affected by health inequalities.

Section 3 screens health impacts in relation to road schemes. It is based on the London Healthy Urban Development Unit (HUDU) method for rapid assessment<sup>81</sup>. At this stage no assessment is undertaken and the matrix seeks only to identify potential negative health issues where a 'No' response is recorded (and positive for a 'Yes' response). Table 0.1 below sets out the responses which are recorded to each question. The final column identifies potential issues for scoping.

### Matrix for Section 3

Response to Section 3	
N - No	A negative response indicates that there is potentially a negative effect on health. These effects in particular should be considered further at scoping. Reference should be made to other environmental topics where applicable.
Y - Yes	A positive response indicates that there is potentially a positive effect on health.
N/A	Some questions may not be applicable to a particular scheme, for instance because there is no open space.
?	The response is uncertain, possibly due to limited information at the stage of assessment. The questions can be revisited as the design and assessment progresses.

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<sup>81</sup> NHS London, Healthy Urban Development Unit, January 2013, *HUDU Planning for Health Rapid Health Impact Assessment Tool*.



## SCREENING

### Section 1: Proposal Details

Name of project:	Great Yarmouth Third River Crossing Scheme		
Date of Screening	23/11/2017	Name of assessor:	Sheri Shai
Brief description of proposal:			
<p>The Great Yarmouth Third River Crossing is a proposed new bridge over the River Yare in Norfolk. In Yarmouth, there is an outer harbour (South Dense peninsula between the River Yare and the sea), providing England's premier offshore support port. The South Denes Business Park, Enterprise Zone and Great Yarmouth Energy Park are located at the southern end of the peninsula. There are two existing single carriageway lifting bridge, Breydon Bridge and Haven Bridge providing direct access to the northern and to the centre of peninsula.</p> <p>The key issues of the two existing crossings at Great Yarmouth are:</p> <ul style="list-style-type: none"><li>■ No crossings further south to provide direct access to the south of peninsula;</li><li>■ Main industrial areas and deep water outer harbour are up to 4km from the nearest bridge; and</li><li>■ Access to the seafront for all vehicles, cyclists and pedestrians are constrained at the northern end.</li></ul> <p>The Proposed Scheme aims to create a direct link into the southern part of the peninsula to improve access to the port, outer harbour, employment areas, seafront and residential areas.</p> <p>The proposed Great Yarmouth Third River Crossing will provide a four lane high level bridge, tie-in to Suffolk Road via a roundabout to the west and traffic signals to the east at South Denes Road. There is a proposed demolition of an existing footbridge directly adjacent to the Southtown Common Recreation Ground.</p>			
Information used for screening:			
Public Health England (PHE) Health Profiles (2016) ( <a href="http://www.localhealth.org.uk/">http://www.localhealth.org.uk/</a> )			
Great Yarmouth Borough Profile (2016) ( <a href="https://www.great-yarmouth.gov.uk/CHttpHandler.ashx?id=988&amp;p=0">https://www.great-yarmouth.gov.uk/CHttpHandler.ashx?id=988&amp;p=0</a> )			
Google Mapping Data ( <a href="https://www.google.co.uk/maps/search/greatyarmouth">https://www.google.co.uk/maps/search/greatyarmouth</a> )			
Norfolk County Council Definitive Map, Great Yarmouth Borough Council ( <a href="https://www.norfolk.gov.uk/out-and-about-in-norfolk/public-rights-of-way/map-and-statement-of-public-rights-of-way-in-norfolk/definitive-statements">https://www.norfolk.gov.uk/out-and-about-in-norfolk/public-rights-of-way/map-and-statement-of-public-rights-of-way-in-norfolk/definitive-statements</a> )			
Norfolk Coast Cycleway ( <a href="https://maps.norfolk.gov.uk/trails/?tc=PRO/905#">https://maps.norfolk.gov.uk/trails/?tc=PRO/905#</a> )			

## Section 2: Populations Affected

### Brief description of geographic area and populations affected

The Great Yarmouth Third River Crossing is located within the county of Norfolk.. The surrounding area is primarily urban. There are a number of commercial receptors within the 500m study area including Yarmouth Business Park and Harfrey's Industrial Estate, located to the north and west of the Proposed Scheme; a number of residential receptors within the 500m study area; and recreational receptors such as Southtown Common Recreation Ground located immediately to the south of the Proposed Scheme and Pleasure Beach located approximately 400m to the east of the Proposed Scheme. There is a primary school Great Yarmouth Primary Academy located approximately 250m north east. Two fire stations are located approximately 350m south and 400m north of the Proposed Scheme.

The Proposed Scheme lies within three districts in Great Yarmouth, including Nelson, Southtown and Cobholm and Claydon. In 2015, the total number of population were 23,103 people in the three districts (Nelson has a population of 9,370 people; Southtown and Cobholm have a population of 5,823; and Claydon has a population of 7,910).

Of this population, 50.3% of which are male and 49.7% are female (51.5% of male and 48.5% of female in Nelson; 51.9% male and 49.1% female in Southtown and Cobholm; and 48.4% male and 51.6% female in Claydon).

The majority of population in 2015 were age 25-64 year old age group (50.7%), followed by age under 16 year olds (20.7%) (Majority age group in Nelson were age 25-64 (51.8%) followed by under 16 (22.6%); majority age group in Southtown and Cobholm were age 25-64 (51.6%) followed by age under 16 (23.7%); and age 25-64 (48.9%) and followed by age under 16 (19.7%) in Claydon).

In 2015, there were a total of 12.1% of the population are classified as not 'White UK' followed by Black and Minority Ethnic Group (BME) with 4.7% and 2.48% of the population that cannot speak English well or at all (In Nelson, 20.6% of the population are classified as not 'White UK' followed by BME with 7.8% and 5.2% of the population that cannot speak English well or at all; In Southtown and Cobholm, 12.3% of the population are classified as not 'White UK' followed by BME with 4.3% and 2.2% of the population that cannot speak English well or at all; and In Claydon, 4% of the population are classified as not 'White UK' followed by BME with 2.2% and 0.4% of the population that cannot speak English well or at all).

In 2011, 86.59% of the population in the three districts were classified as 'White British'. The second largest group was 'White Other' with 7.38%, followed by 'African/Caribbean', 'Asian', 'Other' and White Irish' with 2.85%, 1.95%, 0.92% and 0.31% respectively. In general, Health and Care in the three districts in 2015 were significantly worse than England average, with 22.5% population in Nelson; 17.9% population in Southtown and Cobholm; and 24.1% population in Claydon with limited long term illness or disability.

The Index of Multiple Deprivation (IMD) 2015 is the official measure of relative deprivation. It measures a broad concept of deprivation using a combination of information relating to: Income; Employment Health and Disability; Education Skills and Training; Barriers to Housing and Services; and Crime and Living Environment to create an overall measure of deprivation. Great Yarmouth ranked 29th and scored 32.4 (Nelson scored 71.9; Southtown and Cobholm scored 45; and Claydon scored 41.3). The three districts are classified as significantly worse than England for Income Deprivation, Child Deprivation and Older People in Deprivation. Great Yarmouth also considered having the highest proportion of its Lower Super Output Areas (LSOAs) in Norfolk county, to be in most deprived 10% of LSOAs nationally. The study area is located within 1st and 2nd National Deprivation Decile rank (where 1 being the most deprived and 10 is least deprived). These indicate that the study area is severely deprived. Baseline data also indicates that health in the area is worse than the national average. Life expectancy and levels of physical activity are lower, obesity and incidence of cardiovascular disease and cancer higher (for under 75's). The health section of the scoping report has full details.

Are the following groups likely to be differentially affected: (also refer to EqIA if available)		
Group	Tick appropriate	Comment
Gender (incl pregnancy & maternity)	✓	Footpath No.3, 5, 6, 7 and 7a (in Parish of Great Yarmouth & Gorleston) is located within the study area where footpath No.5 is located within the proposed extent of works boundary. There are a number of bus stops located within the study area where three of them located within the proposed extent of works boundary. Closure and diversion for footpath and bus route could potentially occur during construction and the footbridge located immediately north of Southtown Common Recreation Ground would be removed permanently. Pregnant women and those with young families would be temporarily adversely affected due to the restricted access and public transport.
Religion & Belief	✓	The Redeemed Christian Church of God is situated approximately 200m south east of the Proposed Scheme. The proposed bridge may potentially anticipate a temporary adverse air quality and noise impact on users of the church during construction due to the close proximity of the church to the Proposed Scheme.
Ethnicity & Race		The population in the district of Nelson, Southtown and Cobholm and Claydon are predominantly 'White British'. The Proposed Scheme will not impact people differently depending on their ethnicity or race.
Age: Children and Young People: 0-19	✓	Great Yarmouth Primary Academy is located approximately 250m north east of the Proposed Scheme. Potential temporary adverse air quality and noise impacts are anticipated during construction due to the close proximity of the school to the Proposed Scheme.
Age: Older People: 50+	✓	No health facilities within the study area. Two nursing homes, Avery Lodge (approximately 300m north) and Frank Stone Court (approximately 350m north east) within the study area. Closure and diversion of the footpath and bus route could potentially occur during construction phase and footbridge located immediately north of Southtown Common Recreation Ground would be removed permanently. Older people would be temporary adversely affected due to the restricted access.
Disability	✓	Closure and diversion for footpath and bus route would potentially occur during construction and the footbridge located immediately north of Southtown Common Recreation Ground will be removed permanently, where disabled people would be temporarily adversely affected due to the restricted access and public transport.
People in areas of deprivation		It is considered unlikely that the Proposed Scheme will disproportionately affect people within the study area. The Proposed Scheme has the potential to increase connectivity between residential areas and employment areas, potentially increase local employment, training opportunities and tourist access.
Other (Public services)	✓	Two fire stations are located approximately 350m south and 400m north of the Proposed Scheme. Closure and diversion of roads could potentially occur during construction phase. A temporary adverse impact is anticipated due to the increase journey time which would need to be incorporated into a traffic management plan

### Section 3: Screening for Health Impacts

Screening Criteria	Y/ N/ N/A?	Comment	Potential health issue for scoping (if N)
Does the proposal enable and encourage walking?	Y	<p>There may be a temporary adverse impact on pedestrians due to the permanent closure of footbridge and the temporary closure and diversion of footpath and bus stops.</p> <p>However, there will be new footway on the proposed bridge, two new signalised crossing (one of those to replace the demolished footbridge) and one new pedestrian crossing which would increase access near the Proposed Scheme vicinity during operation.</p>	An increase in physical activity helps to prevent chronic diseases, reduce risk of premature death and improve mental health.
Does the proposal enable and encourage cycling?	Y	<p>There may be a temporary adverse impact on cyclists using National Cycle Route 517 during construction phase due to the potential closure and diversion of cycle route.</p> <p>However, the proposed 2 way cycleway on the bridge will enable cyclist to access to the south of the peninsula directly and potentially enable shorter journey times during operation.</p>	
Does the proposal include traffic management and/or safety measures to help reduce and minimise road injuries?	Y	There will be a proposed new roundabout and signal controlled junction located immediately to the east of the Proposed Scheme. This will potentially improve traffic management to reduce and minimise road injuries during operation.	Design can affect the risk of road traffic injuries.
Does the proposal provide access to public transport?	Y	<p>There may be a temporary adverse impact on bus users due to the potential closure and diversion of bus route / bus stops.</p> <p>However, while the proposal does not include explicit provision for public transport, it will reduce congestion and therefore improve connectivity for motorists between nearby districts that have existing public transport facilities.</p>	Opportunities for all groups to travel including those without access to a car,
Does the proposal connect with existing communities, i.e. layout and movement which avoids physical barriers and severance?	?	<p>There will be an impact on residents living in properties located on Queen Anne's Road and Southtown Road due to the demolition work.</p> <p>The existing communities are currently connected by two existing Breydon Bridge and Haven Bridge. The Proposed Scheme will improve and provide a</p>	Friendship and supportive networks in a community can help to reduce depression and levels of chronic illness as well as speed recovery after illness and improve wellbeing.

### Section 3: Screening for Health Impacts

		direct connection of existing communities, namely connecting Southtown and Cobholm and Claydon to Nelson.	Fragmentation of social structures can lead to communities demarcated by socio-economic status, age and/or ethnicity, which can lead to isolation, insecurity and a lack of cohesion.
Does the proposal provide access to healthcare services or facilities?	Y	There are a number of existing healthcare services and facilities in the nearby communities. The Proposed Scheme aim to improve connectivity and access for local residents.	Access to good quality health and social care, education and community facilities has an effect on human health.
Does the proposal provide access to other social infrastructure, e.g. schools, social care and community facilities?	Y	Operation of the third bridge will provide direct access and potentially minimise journey time for residents accessing social and recreational facilities, notably Southtown Common Recreation Ground (immediate to the south), Great Yarmouth Primary Academy (250m north east) and Pleasure Beach (400m east).	
Does the proposal provide access for people with mobility problems or a disability?	Y	There will be a temporary adverse impact for people with reduced mobility or disabilities during construction due to the potential closure and diversion of PRoW and bus route / stops. Appropriate diversion or alternative route should be provided and clear sign-posting.  The proposed replacement of existing footbridge (stairs only access) to new signalised crossing will benefit people with mobility problems or disabilities during operation.	For those with mobility problems, including older people, poor access to local services could limit opportunities for social interaction and lead to isolation and depression.
Does the proposal aim to reduce construction impacts such as dust, noise, vibration and odours?	Y	It is unknown at this stage what measures will be in place to manage and mitigate construction impacts. Construction related impacts of the proposals, such as those relating to noise and air quality, will be assessed at a later stage and it is expected that they will be either mitigated or appropriately managed through the implementation of environmental management plans during construction.	The quality of the local environment can have a significant impact on physical and mental health (also see below)
Does the proposal reduce air pollution caused by traffic?	?	The impact on local air quality is not yet known. The Proposed Scheme will increase traffic at the crossing but will also reduce congestion in north of Great	Poor air quality is linked to incidence of chronic lung disease (chronic



### Section 3: Screening for Health Impacts

		Yarmouth by diverting a portion of the traffic to the third bridge.	bronchitis or emphysema) and heart conditions and asthma levels of among children.
Does the proposal minimise noise pollution caused by traffic?	?	The impact on local noise levels is not yet known. The Proposed Scheme will increase traffic at the crossing but will also reduce congestion by diverting a portion of the traffic to the third bridge.	Noise pollution can have a detrimental impact on health resulting in sleep disturbance, cardiovascular and psycho-physiological effects.
Does the proposal retain and enhance existing open space, natural vegetation and landscapes?	N/A	The current land use within the Proposed Scheme vicinity is urban area. The Proposed Scheme will retain the Southtown Common Recreation Ground.	Access to open/green space can lead to more physical activity and reduce levels of heart disease, strokes and other ill-health problems that are associated with both sedentary occupations and stressful lifestyles. Physical activity is particularly important for children's health. There is growing evidence that access to open spaces and nature can help to maintain or improve mental health.
Does the proposal improve access to natural and open spaces?	Y	The proposed replacement of existing footbridge (stairs only access) to new signalised crossing can benefit people with mobility problems or disabilities to access from the north to Southtown Common Recreation Ground.	
Does the proposal maintain or enhance biodiversity?	?	The ecological assessment has not yet been completed.	
Does the proposal incorporate elements to help design out crime?	?	There is insufficient design information available at this stage of the assessment.	Design that promotes natural surveillance and social interaction can help to reduce crime and the 'fear of crime', both of which impacts on mental wellbeing.
Does the proposal provide access to local employment and training opportunities, including temporary construction jobs?	Y	<p>The Proposed Scheme aims to increase connectivity to employment areas, namely the South Dense Business Park, Enterprise Zone and Great Yarmouth Energy Park. It will potentially increase local employment and training opportunities.</p> <p>During construction phase, the Proposed Scheme can create job opportunities. A proportion of these workers could be from the local area, although this would not be confirmed until the construction contracts are confirmed at a later date.</p>	<p>Employment and income is a key determinant of health and wellbeing. Unemployment generally leads to poverty, illness and a reduction in personal and social esteem.</p> <p>Works aids recovery from physical and mental illnesses.</p>



### Section 3: Screening for Health Impacts

Does the proposal make best use of existing land and material resources?	?	There is insufficient design information available at this stage of the assessment. However, waste and materials will be assessed as part of design.	Reducing or minimising waste including disposal, processes for construction as well as encouraging recycling at all levels can improve human health directly and indirectly by minimising environmental impact, such as air pollution.
Does the proposal incorporate sustainable urban drainage techniques?	Y	SuD's are proposed including collecting off-run from the bridge structure and hard surfaces; drainage ditches are to be configured; and the carriageway run-off will drain to SuD's features.	Increased flood risk can affect mental health.

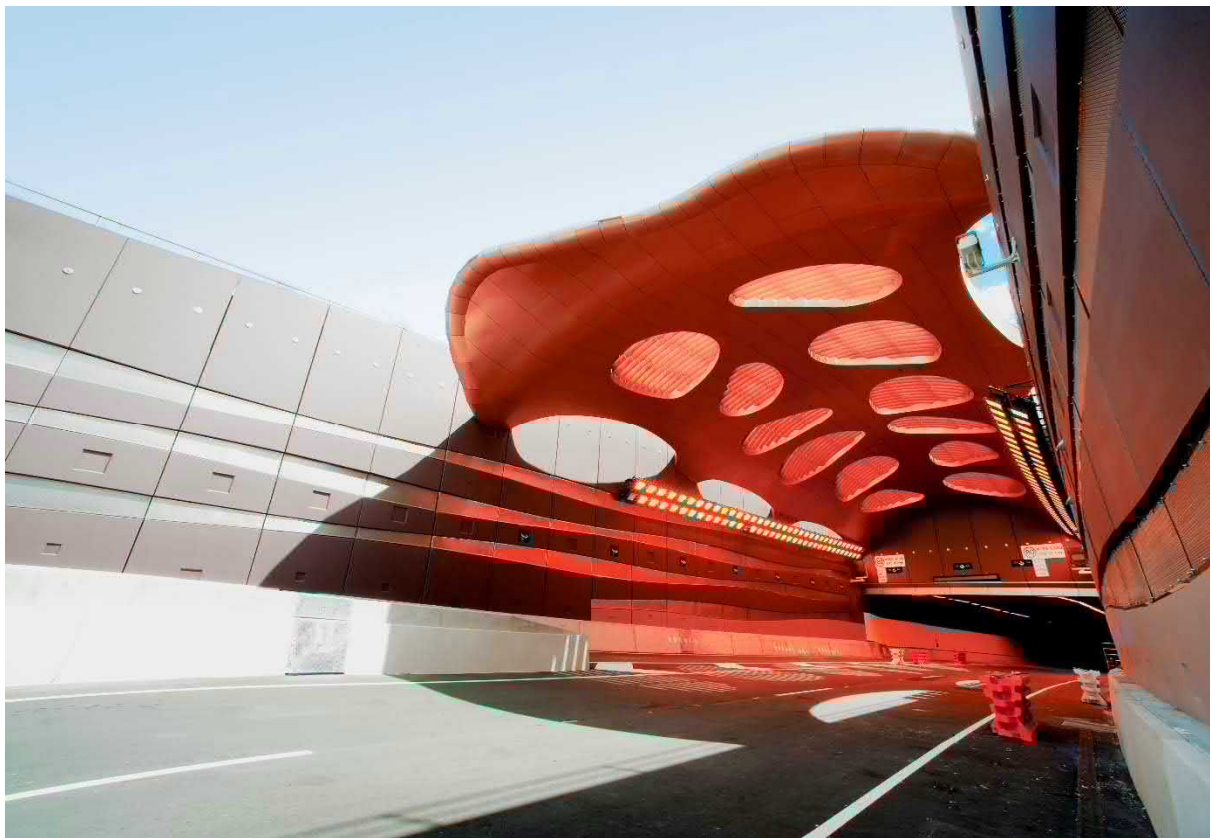
# Appendix I

**CONTAMINATED LAND DESK STUDY**





# GREAT YARMOUTH 3RD CROSSING INTERPRETATIVE ENVIRONMENTAL DESK STUDY REPORT







# GREAT YARMOUTH 3RD CROSSING

## INTERPRETATIVE ENVIRONMENTAL DESK STUDY REPORT

FIRST ISSUE

62240375  
6<sup>TH</sup> JULY 2017

WSP


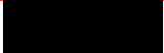

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# QUALITY MANAGEMENT

ISSUE/REVISION	FIRST ISSUE	REVISION 1	REVISION 2	REVISION 3
Remarks				
Date	July 2017			
Prepared by	Neil Balderstone			
Signature				
Checked by	Dave Watts			
Signature				
Authorised by	Dave Watts			
Signature				
Project number	62240375			
Report number	62240375-016-R01			
File reference				



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# SIGNATURES

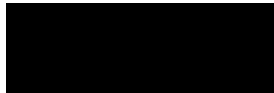
PREPARED BY



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Neil Balderstone  
Senior Environmental Geologist

REVIEWED BY



---

Dave Watts  
Principal Environmental Consultant

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62240375/016/01. SITE LOCATION.

62240375/016/02. STUDY AREA BOUNDARY.

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## *APPENDICES*

- A** PHOTOS
- B** GROUNDSURE REPORT
- C** SITE HISTORY
- D** ZETICA UXO RISK
- E** RISK CLASSIFICATION MATRICES





# 1 INTRODUCTION

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## 1.1 TERMS OF REFERENCE

WSP Ltd were commissioned by Norfolk County Council (NCC) to prepare an Interpretative Environmental Desk Study in relation to the proposed Great Yarmouth Third Crossing. This report assesses the potential environmental risks, constraints and liabilities associated with the proposed development.

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## 1.2 DEVELOPMENT PROPOSALS / LEGISLATIVE CONTEXT

The site will be subject to redevelopment works which will include a new bridge and associated highways and new junction arrangements.

The presence of contaminants which may pose a risk to human health or the environment is a material planning consideration. For planning it should be considered whether the site is suitable for its new use, and the responsibility for securing a safe development (including cumulative effects of pollution on health, and the potential sensitivity of the proposed development to adverse effects from pollution), rests with the developer and/or landowner. Planning is concerned with the site's proposed use not its current use.

Section 57 of the Environment Act 1995, adds Part 2A (ss.78A-18YC) to the Environmental Protection Act 1990 and contains the legislative framework for identifying and dealing with contaminated land. Where development is undertaken on land which may be affected by contamination, the National Planning Policy Framework, paragraphs 120 to 122 considers pollution and remediation.

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## 1.3 SCOPE OF REPORT

The objective of this study is to assess the potential environmental risks, constraints and liabilities associated with the site in respect of potential redevelopment.

The scope of work comprises:-

- A site walkover undertaken by a suitably qualified Geo-Environmental Scientist,
- An interpretation of the information obtained from a Groundsure Report,
- A preliminary assessment of potential geo-environmental risks following the methodology of CLR11,
- Recommendations for further investigation/actions if required.

## 2 DESK STUDY RESEARCH

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### 2.1 SITE LOCATION

The irregular shaped site is located either side of the River Yare, immediately south of Great Yarmouth town centre. The site is bounded to the north by Boundary Road and Newcastle Road, to the east by Exmouth Road and Admiralty Road, to the south by Swanston's Road and Alpha Road, and to the west by Harfrey's Road.

The site area covers approximately 43ha and is centered on National Grid reference 652320, 306005.

Drawing 62240375/016/OD/01 presents the site location and Drawing 62240375/016/OD/02 presents the study area boundary.

It should be noted that the study area boundary for this report covers a wider area than that indicated on Drawing 62240375/016/OD/02. This is to encompass a suitable Rochdale Envelope in the early stages of the project and will be refined as necessary as the project progresses.

---

### 2.2 SITE SETTING AND DESCRIPTION

A site walkover was undertaken by a qualified WSP Geo-Environmental Engineer on 12th July 2017. Photographs and a photograph location plan are presented in Appendix A.

The flat site is split into two unequal parts by the River Yare which flows from north to south through the site.

The eastern part of the site is densely developed, predominantly with commercial / industrial properties including oil / gas storage sites, an operating port facility with associated hard standing and warehouses / depots. Other uses include residential properties (predominantly in the northern part of the area), a petrol filling station and car dealership.

The western part of the site includes a hard standing quayside, the major A12 dual carriageway, William Adams Way highway, residential properties, commercial properties including car and caravan sales, a petrol station, oil and gas storage facilities, docks and port facilities; military properties (air training corps), community facilities and public open space and allotments.

No invasive species were noted during the walkover, however the survey was not undertaken by a trained ecologist.

---

### 2.3 ADJACENT LAND USE

The table below summarises the adjacent land uses.

**Table 2.1** Summary of Adjacent Land Uses

Direction	Surrounding Land Use
North	Predominantly commercial / industrial with some residential properties on the west side of the river and predominantly residential properties with a few commercial properties on the east side of the river.
East	Predominantly residential properties with occasional commercial properties and a community centre.
South	Commercial / industrial properties on the east side of the river and residential properties, commercial properties and a recreation ground on the west side of the river.
West	Commercial / industrial properties.

---

## 2.4 ENVIRONMENTAL DESIGNATIONS AND ECOLOGY

The site is wholly located within a nitrate vulnerable zone. Two other environmentally sensitive areas are located within 500m of the site:-

- Outer Thames Estuary, 465m to the east,
- Broads, 392m to the west,

---

## 2.5 SITE HISTORY

The on-site history has been assessed from a review of historical Ordnance Survey maps from the GroundSure report presented in Appendix B. A summary is presented below. A more detailed site history, including the adjacent and surrounding land is presented in Appendix C.

For simplicity, the site has been split into two areas – east of the River Yare and west of the River Yare.

---

### 2.5.1 EASTERN SITE AREA

The earliest map provided by GroundSure dated 1883 indicates the eastern area of the site to be densely developed predominantly with commercial / industrial properties including a gasworks, boat building yard and an icehouse. Some residential properties were marked but generally the area is dominated by industry. This eastern area of the site has generally remained a commercial / industrial area up to the present day. Various industries have been present including fish canning, oilskin production, chemical factory and unspecified depots, warehouses and factories.

---

### 2.5.2 WESTERN SITE AREA

The earliest map provided by GroundSure dated 1883 indicates the western area of the site to be less developed than the eastern area. The majority of the development was present adjacent to the River Yare and comprised a mix of residential properties and commercial / industrial sites such as an iron works, rope walk, gas works and malhouses. Beyond, towards the western boundary was agricultural land.

By 1906, a railway line running north south was constructed towards the western boundary and by 1926 / 1927, formal gardens and allotments are present towards the centre of the site. A shoe factory is marked adjacent to Queen Anne's Road in 1949 and by 1966 is relabelled as a printing works.

By 1978 the railway line had been dismantled and commercial / industrial units had started to be developed in the far west of the site and beyond. By 1988 the former rail route had started to be redeveloped as a dual carriageway and by 2002 the current major highway routes had been established.

---

## 2.6 GEOLOGY

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### 2.6.1 SUPERFICIAL

The British Geological Survey website ([www.bgs.ac.uk](http://www.bgs.ac.uk)) indicates the site is underlain by a variety of superficial deposits:-

- South west - peat of the Breydon Formation,
- North – clay and silt of the Breydon Formation,
- Eastern part beyond the River Yare – sand and gravel of the North Denes Formation.
- Within the River Yare - Clay and silt tidal river or creek deposits.

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## 2.6.2 SOLID

The British Geological Survey website ([www.bgs.ac.uk](http://www.bgs.ac.uk)) indicates the bedrock underlying the site is sand and gravel of the Crag Group.

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## 2.6.3 GROUND WORKINGS

GroundSure records a number of historical ground workings on site, all associated with the quay /wharf immediately adjacent to the River Yare.

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## 2.6.4 BGS BOREHOLES

GroundSure records 107 borehole records within the site boundary but some are confidential and cannot be viewed on the BGS website – [www.bgs.ac.uk](http://www.bgs.ac.uk). A summary of the locations within the likely route corridor is presented below.

**Table 2.2**      **Table 1 - Example**

BOREHOLE REF	LOCATION	SUMMARY
TG50NW27	Close to junction between William Adams Way and Suffolk Road.	Made ground to 2m depth overlying silt, sand and clay.
TG50NW164	Close to junction between William Adams Way and Suffolk Road.	Ash fill to approximately 4ft 6' depth overlying clay (with peat layers) sand and gravel.
TG50NW429	Close to junction between William Adams Way and Suffolk Road.	Fill to 1.05m depth overlying clay, sand, silt and peat.
TG50NW26	Close to junction between William Adams Way and Suffolk Road.	Made ground to 1,2m depth overlying silt, sand, clay (with peat) and gravel.
TG50NW185	Close to junction between William Adams Way and Suffolk Road.	Made ground to approximately 1ft depth overlying clay, silt, sand, peat and gravel.
TG50NW28	Close to junction between William Adams Way and Suffolk Road.	Topsoil overlying clay, peat and sand.
TG50NW472	William Adams Way close to A12 roundabout	Topsoil overlying clay, sand, silt and peat.
TG50NW29	Close to junction of Suffolk Road and Queen Annes Road.	Topsoil overlying clay, sand, silt and peat.
TG50NW184	Junction of Queen Annes Road and Suffolk Road.	Made ground to approximately 3ft 6 depth overlying clay, sand, silt , peat and gravel.
TG50NW4	Adjacent to Suffolk Road, north of Queen Annes Road	Made ground to 1.07m depth overlying clay, sand, silt, peat and gravel.
TG50NW582	Southtown Road, adjacent to the River Yare.	300mm thickness of asphalt and concrete over made ground to 2.2m depth. Underlying natural strata is sand and gravel,

BOREHOLE REF	LOCATION	SUMMARY
TG50NW587	Southtown Road, adjacent to the River Yare.	300mm thickness of asphalt and concrete over made ground to 3.0m depth. Underlying natural strata is silt, sand and gravel
TG50NW581	Southtown Road, adjacent to the River Yare.	200mm thickness of asphalt and concrete over made ground to 2.2m depth. Underlying natural strata is sand and gravel.
TG50NW586	Southtown Road, adjacent to the River Yare.	400mm thickness of asphalt and concrete over made ground to 2.2m depth. Underlying natural strata is silt (with peat), sand and gravel
TG50NW368	Quayside on the eastern side of the River Yare.	180mm thickness of reinforced concrete over made ground to 1.2m depth. Underlying natural strata is sand and silt.
TG50NW342	Quayside on the eastern side of the River Yare.	300mm thickness of reinforced concrete over made ground to 6.6m depth. Underlying natural strata is sand and gravel.
TG50NW344	Quayside on the eastern side of the River Yare.	300mm thickness of reinforced concrete over made ground to 1.0m depth. Underlying natural strata is sand and gravel.

## 2.7 HYDROGEOLOGY

The superficial deposits underlying the site to the east of the River Yare are classified as a Secondary (A) Aquifer with permeable layers. These are defined by the Environment Agency as permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers.

The superficial deposits underlying the site to the west of the River Yare are classified as unproductive.

The underlying bedrock is classified as a Principal Aquifer. These are defined by the Environment Agency as layers of rock or drift deposits that have high intergranular and/or fracture permeability - meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale.

The GroundSure report indicates the site is not within a Source Protection Zone.

There are no groundwater abstraction points on site but there is one approximately 71m from the north-west corner;-

- Licence no. AN/034/0015/020 expires in 2030 and is authorised for a maximum daily volume of 210m<sup>3</sup> and an annual volume of 60,000m<sup>3</sup>. The abstraction is authorised for laundry use.

## 2.8 HYDROLOGY

The River Yare is the only watercourse recorded on site and within 500m of the site.

There are no active surface water abstraction licences within 2km of the site. There is one historical abstraction licence 443m to the north that expired in 2015 (licence no. AN/034/0015/013)

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

---

## 2.9 WASTE MANAGEMENT FACILITIES

No active Environment Agency landfill sites are present within 1km of the site.

One historic Environment Agency landfill site is present within 1km of the site;-

- Site reference WD709a, approximately 451m to the west. Licenced to accept inert, industrial, commercial and household waste and operated by Great Yarmouth Council. The last record of the site held by GroundSure is dated 1974.

No BGS/DoE non-operational landfill sites are present within 1km of the site.

No Local Authority recorded landfill sites within 1km of the site.

GroundSure records one Environment Agency licensed waste site onsite and eight sites within 250m (although there are multiple records for each);-

- On site (south west corner) - waste management licence 71429; EA/EPR/CP3094NZ/V003. Household, commercial and industrial waste transfer station for between 25,000t and 75,000t, operated by Thurtle Walter.
  - 13m from the south west corner – waste management licence 71417; EA/EPR/FP3394NJ/A001. Household, commercial and industrial waste transfer station for less than 25,000t, operated by Folkes Plant and Aggregate Ltd.
  - 53m from the south west corner – waste management licence 70532; EA/EPR/YP3229NB/A001. Special waste transfer station for greater than 75,000t, operated by Paul Clements.
  - 108m from the south east corner – waste management licence 71491; EA/EPR/AB3801UE/S002. Asbestos waste transfer station. Licence surrendered in 2016.
  - 150m from the south west corner – waste management licence 103802; EA/EPR/EB3535AM/V002. Inert and excavation waste transfer and treatment for less than 25,000t, operated by E E Green and Son Ltd.
  - 163m from the north west corner – waste management licence 70505; EA/EPR/KP3898VU/V002. Special waste transfer station for less than 25,000t, operated by Biffa Waste Services Ltd.
  - 183m from the north west corner – waste management licence 70536; EA/EPR/YP3799NF/V002. Special waste transfer station for less than 25,000t, operated by C+L Waste Oil Collection.
  - 229m from the north west corner – waste management licence 70535; EA/EPR/YP3199NQ/S004. Special waste transfer station. Licence surrendered in 2007.
- 

## 2.10 ENVIRONMENTAL PERMITS, INCIDENTS AND REGISTERS

Records of active environmental permits or registers on site and within 250m are detailed below.

---

### 2.10.1 PART A(1) AND IPPC AUTHORISED ACTIVITIES

No records on site, but there are three active records within 250m each with multiple entries;-

- 167m from the north west corner – Great Yarmouth Wm Resource Centre, EPR/yp3637rm. Operated by Augean North Sea Services Ltd. Records are present for three different processes – disposal or recovery of hazardous waste; disposal of greater than 50t / day of non-hazardous waste involving physio-chemical treatment; and temporary storage of hazardous waste.
- 187m from the northern boundary – Great Yarmouth Oil Reclamation Facility, EPR/np3038mb, WP3437RY. Operated by C&L Waste Oil Collection. Records are present for two different processes - disposal or recovery of hazardous waste; and temporary storage of hazardous waste.

---

### **2.10.2 LIST 2 DANGEROUS SUBSTANCES INVENTORY SITES**

No active records on site but one active record within 250m of the site is reported by GroundSure:-

- 44m from the north west corner – UK Waste Management Ltd, authorised for chromium, copper, lead, nickel, zinc discharged to the North Sea.

---

### **2.10.3 PART A(2) AND PART B ACTIVITIES AND ENFORCEMENTS**

Three current permits are recorded on site and five current permits within 250m of the site:-

- Part B permit - L J Steward for unloading of petrol into storage at service station, South Quay Service Station Southgate Road.
- Part B permit - L J Steward for unloading of petrol into storage at service station, Southtown Road Service Station Southtown Road.
- Part B permit – CEBO (UK) Ltd for use of bulk cement at Gas House, Quay North, Malthouse Lane.  
There are a further five permits within 250m for various processes – use of bulk cement (4 permits) and one permit for 'other metal process'.

---

### **2.10.4 LICENSED DISCHARGE CONSENTS**

There are four active consents on sites for discharge to the River Yare and three consents within 250m of the site for discharge to the River Yare. A number of on and offsite revoked records are reported by GroundSure but these are not listed here.

- Three onsite records relate to water company discharge - sewage discharge from storm overflow (two records) and sewage discharge pumping station (one record).
- One onsite record relates to a trade discharge for site drainage (contaminated surface water).
- Two offsite records – 41m east and 189m south east relate to sewage discharge for final / treated effluent (not water company related).
- One offsite record 203m to the south east relates to water company sewage discharge from storm overflow.

---

### **2.10.5 WATER INDUSTRY REFERRALS**

Two on site records (Weatherford UK Ltd and Great Yarmouth Port Company) and two offsite records within 250m (Total Reclaim Systems Ltd 13m south east and Biffa Waste Services Ltd 167m north) are reported by GroundSure.

---

### **2.10.6 PLANNING HAZARDOUS SUBSTANCE CONSENTS AND ENFORCEMENTS**

One approved record is reported on site for Transco Plc. No further details are provided.

---

### **2.10.7 COMAH AND NIHHS SITES**

There are two on site records and one off site record:-

- British Gas historical NIHHS site located on the east side of the site.
- Asco UK Ltd current COMAH site located on site close to the southern boundary adjacent to the River Yare.
- Asco UK Ltd current COMAH site located 15m to the south adjacent to the east bank of the River Yare.

---

## 2.10.8 NATIONAL INCIDENTS RECORDING SYSTEM, LIST 2

Three on site pollution incidents and one off site incident within 250m are recorded;-

- The three on site incidents related to pollution from food and drink (minor water impact), inorganic chemical or product (no impact) and tyres (minor land impact).
  - The offsite incident was 230m to the south and related to solvents (minor air impact).
- 

## 2.11 NATURAL GROUND HAZARDS

The table below summarises the natural ground subsidence findings presented in the GroundSure report.

**Table 2.3** Summary of Natural Ground Hazards

Natural Hazard	Hazard Potential
Shrink Swell Clay	Negligible – majority of the site. Low – narrow corridor in the centre of the site associated with the River Yare.
Landslides	Very Low
Dissolution of Soluble Rocks	Negligible
Compressible Ground	Very Low – majority of the site. Moderate - narrow corridor in the centre of the site associated with the River Yare. Negligible – far eastern part of the site. High – Two distinct areas on the southern boundary to the west of the River Yare.
Collapsible Deposits	Negligible
Running Sand	Very Low - majority of the site. Moderate – narrow corridor in the centre of the site associated with the River Yare.

---

## 2.12 MINING, EXTRACTION AND NATURAL CAVITIES

The site is not in an area likely to be affected by historical mining, coal mining, non-coal mining, natural cavities, brine extraction, gypsum extraction, tin mining or clay mining.

---

## 2.13 RADON

The GroundSure report indicates the site is not in a radon affected area and any new buildings if required as part of the proposed development do not require radon protection measures.



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## 2.14 PART 2A DETERMINATION

GroundSure does not record any sites determined as contaminated land under Part2A of the Environmental Protection Act 1990.

---

## 2.15 UNEXPLODED ORDNANCE

A review of the potential for unexploded ordnance (UXO) has been obtained from Zetica Ltd and is presented in Appendix D. The assessment indicates the Great Yarmouth area is a high bomb risk.

---

## 2.16 EXISTING REPORTS

WSP Ltd have not been made aware of any existing reports within the study area related to contaminated land.

---

## 2.17 BURIED SERVICES

A review of buried services is beyond the scope of this report but it should be noted that given the dense development history of the site, buried and overhead services are highly to be present. Any intrusive works undertaken in this area must take precautions to avoid contacting / damaging any services.

# 3 PRELIMINARY ASSESSMENT

## 3.1 GROUND MODEL

The site is generally level and densely developed. Published geology indicates superficial deposits comprise peat (south west), clay and silt (north), sand / gravel (east) and clay / silt tidal river / creek deposits within the River Yare. Bedrock underlying the site is sand and gravel of the Crag Group.

Historical mapping indicates the eastern half of the site, particularly the areas either side of the River Yare have been developed by industry since at least 1883. Some residential properties have been present and the far western area was developed later compared to the eastern part of the site. Identified historical industry includes 3 gasworks, boat building, icehouse, iron works, railways, maltings, rope walk, saw mill / timber yard, allotments, oilskin works, fish caning, various unspecified depots, warehouses and factories, numerous unspecified sites with tanks, shoe factory and printing works. Many of these historical uses could have resulted in potentially significant sources of contamination being present.

## 3.2 POTENTIAL CONTAMINANT LINKAGES

### 3.2.1 POTENTIAL SOURCES

The table below summarises the potential sources of contamination.

**Table 3.1 Potential Sources**

Ref.	Primary Source	Expected Distribution	Likely Contaminants
S1	Potentially Contaminated Made Ground	Made ground is expected site wide, but contamination is likely to be in discontinuous pockets associated with differing historic industrial uses.	Heavy metals, asbestos, hydrocarbons, polychlorinated biphenyls, organotins and organochloride pesticides, ammonia, polyaromatic hydrocarbons, volatile and semi-volatile organic compounds.
S2	Potentially Contaminated Silt	Within the River Yare or immediately adjacent within the historic quayside area. Potential for mobilisation during the construction works or scoured due to changes in waterflow post construction.	Heavy metals, organotins, polychlorinated biphenyls, hydrocarbons, organochloride pesticides, ammonia, polyaromatic hydrocarbons, volatile and semi-volatile organic compounds.

---

### 3.2.2 POTENTIAL RECEPTORS

The table below details the potential receptors.

**Table 3.2 Potential Receptors**

Ref.	Receptor	Description
R1	Site users	Pedestrians and maintenance workers
R2	Adjacent site users	Residents (including children) and users of nearby properties (visitors and employees)
R3	Controlled waters	Principal and Secondary (A) aquifers and surface watercourses
R4	On site infrastructure / ecology	Buildings, foundations, buried services and ecology (eg trees and plants in landscaping areas)
R5	Marine ecology	Vertebrates and invertebrates within the River Yare and the adjacent sea.

---

### 3.2.3 POTENTIAL PATHWAYS

The table below details the potential pathways.

**Table 3.3 Potential Pathways**

Ref.	Pathway	Description
P1	Direct contact	Soil contaminants could come into direct contact with the site users.
P2	Ingestion	Soil derived contaminants could be ingested.
P3	Inhalation of fugitive dust	During dry dusty conditions, contaminated dust could be inhaled by site users and adjacent site users.
P4	Leaching and vertical / lateral migration of contaminants	Contaminants could leach and migrate into the underlying aquifers and the surface watercourse including as a result of construction activities such as piling.
P5	Migration and inhalation of landfill / ground gas	Ground / landfill gas could be generated by fill materials

### 3.3 RISK EVALUATION

Each potential contaminant linkage is identified in Table 3.3 below. This assumes redevelopment with no remediation. An evaluation of the risk that each contaminant linkage poses to the project has been undertaken in general accordance with CIRIA guidance document C552, 2001. Risk classification matrices are presented in Appendix D.

The evaluation and the resultant actions identified are based on the available information presented within this report. Once the final design is known it may be necessary to review the risk evaluation.

During development, there is a potential for short term risk to construction workers and the general public. These should be assessed and mitigated by the construction Contractor under the CDM 2015 Regulations.

The table below details the potential pathways.

**Table 3.4 Summary of Potential Contaminant Linkages**

1. Hazard Identification	2. Hazard Assessment		3. Risk Estimation		4. Risk Evaluation	5. Managing the Risks
CONTAMINANT SOURCE	RECEPTOR	PATHWAY	CONSEQUENCE OF RISK BEING REALISED	PROBABILITY OF RISK BEING REALISED	CLASSIFICATION	DISCUSSION / ACTION REQUIRED
S1. Potentially Contaminated Made Ground	R1. Site Users	P1. Direct Contact	Medium	Unlikely	Low	From the previous uses across the site, an environmental ground investigation is considered necessary and is likely to be required by the Planners. It may be possible to incorporate this into any geotechnical investigation to assess ground conditions for foundation design, which may reduce costs.
		P2. Ingestion	Medium	Unlikely	Low	
		P3. Inhalation Of Fugitive Dust	Medium	Low	Moderate	
		P5. Migration And Inhalation Of Landfill / Ground Gas	Minor	Unlikely	Very Low	
	R2. Adjacent Site Users	P3. Inhalation Of Fugitive Dust	Medium	Low	Moderate	
		P4. Leaching And Vertical / Lateral Migration Of Contaminants	Severe	Likely	High	
	R4. Site Infrastructure	P1. Direct Contact	Mild	Likely	Moderate / Low	
	R5. Marine Ecology		Severe	Likely	High	
		P2. Ingestion	Severe	Likely	High	
		P4. Leaching And Vertical / Lateral Migration Of Contaminants	Severe	Likely	High	
S2. Potentially Contaminated Silt	R3. Controlled Waters	P4. Leaching And Vertical / Lateral Migration Of Contaminants	Severe	Likely	High	
	R4. Site Infrastructure	P1. Direct Contact	Mild	Low	Low	
	R5. Marine Ecology		Severe	Likely	High	

		P2. Ingestion	Severe	Likely	High	
		P4. Leaching And Vertical / Lateral Migration Of Contaminants	Severe	Likely	High	

---

### 3.4 POTENTIAL WASTE AND SUSTAINABILITY CONSIDERATIONS

The site is proposed to be redeveloped for a new bridge and associated highway. Detailed designs are not available at this stage, but surplus soils may be generated during the redevelopment works. It is possible that these would need to be disposed of offsite to a suitably licensed facility if they cannot be proven to meet the requirements for re-use within the development under a Materials Management Plan.

---

### 3.5 SAFETY, HEALTH AND ENVIRONMENTAL CONSIDERATIONS

With respect to any proposed ground investigation, the site should be classified in accordance with the SISG “Guideline Notes for the Safe Investigation by Drilling of Landfills and Contaminated Land”. This document makes recommendations for carrying out site investigation on landfills and potentially contaminated ground. Appendix IV of the guidance sets out a record of assessment for potentially contaminated sites, to be completed as part of the ground investigation contract.

Site personnel involved with any intrusive works, including site investigations or maintenance works should be appropriately qualified with experience of working on potentially contaminated sites. Those working in close proximity to fill materials should wear appropriate personal protective equipment. A reasonable standard of hygiene should be maintained.

# 4 CONCLUSIONS

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## 4.1 KEY FINDINGS

The desk study has indicated that the site was reasonably well developed by the late 1800's with some residential properties but mostly commercial / industrial development, particularly the area immediately bounding the River Yare.

The site is expected to be underlain by demolition and fill material which could be contaminated. Ground gas / landfill gas may be generated by the fill material and could migrate to impact adjacent site users and infrastructure.

From the information reviewed above, contaminated made ground is expected but is unlikely to be sufficiently contaminated or sufficiently widespread to pose a significant constraint for an infrastructure project such as this.

Due to the potential for contaminated made ground and / or silts to be present on site derived from a variety of former industrial uses, the potential for environmental liabilities are considered to be; **high** for controlled waters and marine ecology receptors and in the range **Moderate** to **Very Low** for site users, adjacent site users and infrastructure receptors. The high risks are associated with the controlled waters and marine ecology receptors. It is unknown if remedial works have occurred during redevelopment at any of the potentially contaminative sites such as the iron works or the gas works and this could reduce the potential for environmental liabilities.

# 5 RECOMMENDATIONS

---

## 5.1 GROUND INVESTIGATION

A ground investigation is likely to be required to inform the Environmental Statement, the planning process and outline / detailed design. It is possible that, to reduce costs, works could be incorporated into a geotechnical investigation for foundation design. The ground investigation should include sampling and chemical testing of the major strata encountered including the silts within the Lake.

Any intrusive works must take into account the likelihood that asbestos and / or unexploded ordnance may be encountered.

---

## 5.2 URGENT ACTIONS

No urgent actions are considered necessary.

## 6 LIMITATIONS

Only publically accessible areas were assessed during the walkover.

This report is presented to Norfolk County Council in respect of the proposed Great Yarmouth and may not be used or relied on by any other person or by the client in relation to any other matters not covered specifically by the scope of this Report.

Notwithstanding anything to the contrary contained in the report, WSP Limited is obliged to exercise reasonable skill, care and diligence in the performance of the services required by Norfolk County Council and WSP Limited shall not be liable except to the extent that it has failed to exercise reasonable skill, care and diligence, and this report shall be read and construed accordingly.

This report has been prepared by WSP Limited. No individual is personally liable in connection with the preparation of this report. By receiving this report and acting on it, the client or any other person accepts that no individual is personally liable whether in contract, tort, for breach of statutory duty or otherwise.

The brief includes an assessment of the previous site usage by review of the sources identified in this report. These effectively provide snapshots of the site through time and although a consistent sequence of site usage has been deduced from these records, the possibility of some activity carried out on the site not being identified on these records cannot be excluded.

New information, changed practices or new legislation may necessitate revised interpretation of the report after the date of its submission.



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NOTES



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CHKD: NB	PRELIMINARY DRAWING	
APPD: DW	EXTERNAL ISSUE	✓
DATE: 24/7/17	AS-BUILT	
SUITABILITY		

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AGENT



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Site Location

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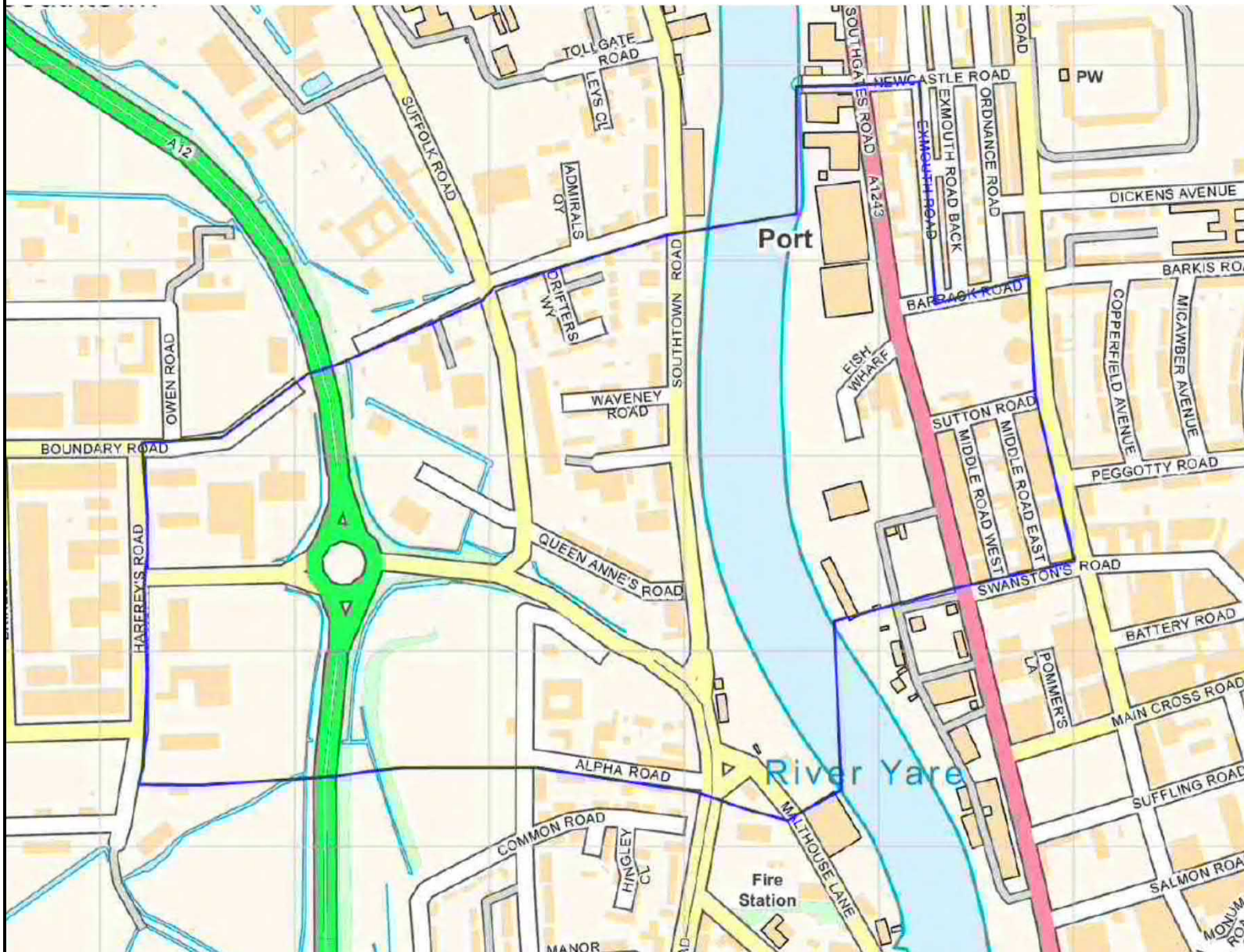
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 STUDY AREA BOUNDARY

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SCHEME NAME  
Great Yarmouth Third Crossing

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Study Area Boundary

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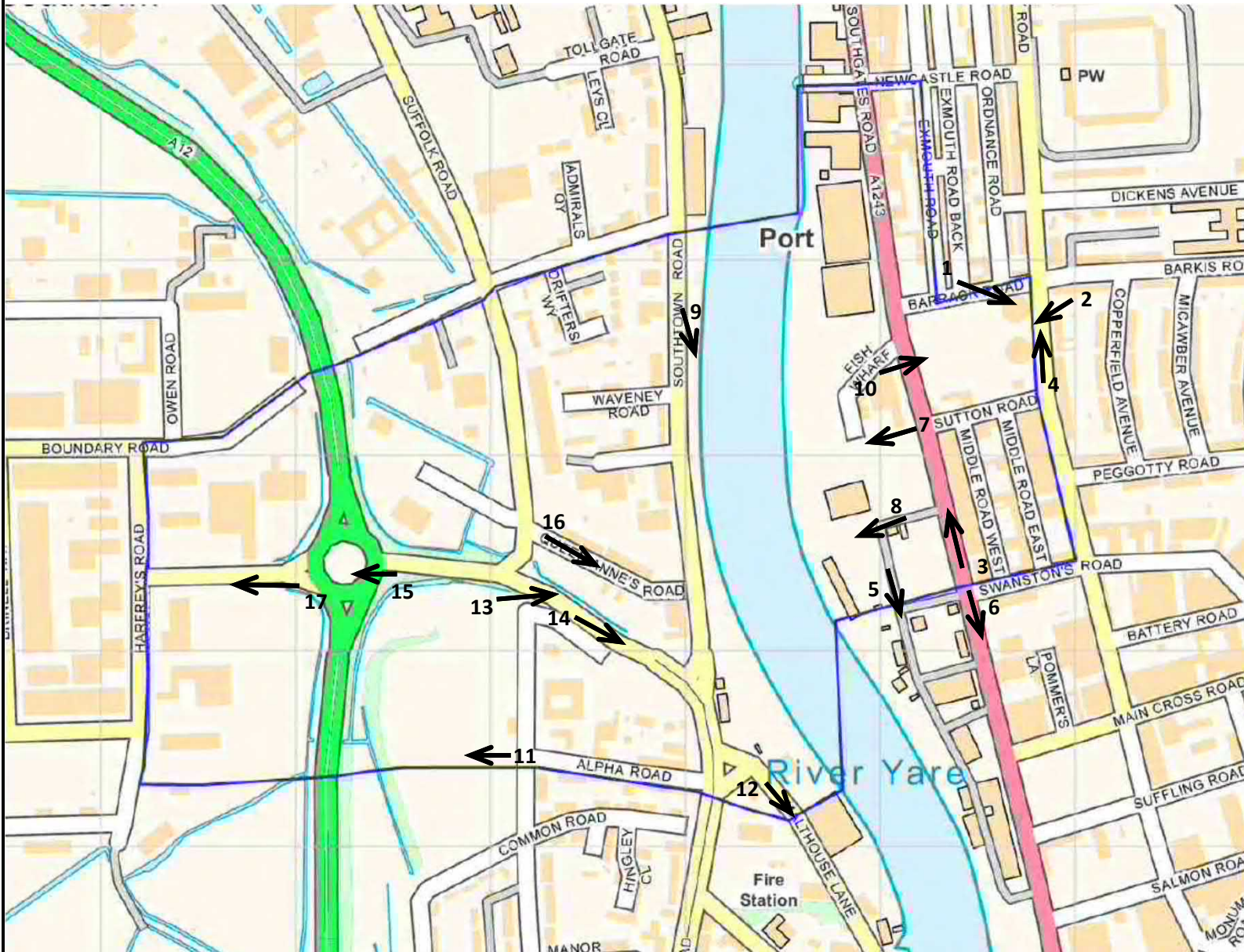
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A


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A	DR	L	016/02
LOCATION	TYPE	ROLE	NUMBER



# APPENDIX A - PHOTOS

NOTES



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LOCATION	TYPE   ROLE   NUMBER





# APPENDIX A - PHOTO LOG

## GREAT YARMOUTH THIRD CROSSING PHOTOGRAPH LOG

Photograph 1



Photograph 2



GREAT YARMOUTH THIRD CROSSING  
PHOTOGRAPH LOG

Photograph 3



Photograph 4



GREAT YARMOUTH THIRD CROSSING  
PHOTOGRAPH LOG

Photograph 5



Photograph 6



GREAT YARMOUTH THIRD CROSSING  
PHOTOGRAPH LOG

Photograph 7



Photograph 8



GREAT YARMOUTH THIRD CROSSING  
PHOTOGRAPH LOG

Photograph 9



Photograph 10



GREAT YARMOUTH THIRD CROSSING  
PHOTOGRAPH LOG

Photograph 11



Photograph 12



GREAT YARMOUTH THIRD CROSSING  
PHOTOGRAPH LOG

Photograph 13



Photograph 14



GREAT YARMOUTH THIRD CROSSING  
PHOTOGRAPH LOG

Photograph 15



Photograph 16





GREAT YARMOUTH THIRD CROSSING  
PHOTOGRAPH LOG

Photograph 17





# APPENDIX B - GROUNDSURE REPORT



CENTREMAPS

Open Space, Upper Interfields,  
Worcester, WR14 1UT

Groundsure Reference: CMAPS-CM-636391-16287-030717EDR

Your Reference: 16287

Report Date 3 Jul 2017

Report Delivery Method: Email - pdf

## Enviro Insight

Address: ,

Dear Sir/ Madam,

Thank you for placing your order with Groundsure. Please find enclosed the **Groundsure Enviro Insight** as requested.

If you need any further assistance, please do not hesitate to contact our helpline on 01886 832972 quoting the above CENTREMAPS reference number.

Yours faithfully,

CENTREMAPS

Enc.  
Groundsure Enviroinsight

Address: ,  
Date: 3 Jul 2017  
Reference: CMAPS-CM-636391-16287-030717EDR  
Client: CENTREMAPS



Aerial Photograph Capture date: 16-Apr-2014  
Grid Reference: 652320,306005  
Site Size: 43.58ha

Report Reference: CMAPS-CM-636391-16287-030717EDR  
Client Reference: 16287

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# Overview of Findings

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<b>Section 1: Historical Industrial Sites</b>	On-site	0-50	51-250	251-500
1.1 Potentially Contaminative Uses identified from 1:10,000 scale mapping	104	25	64	92
1.2 Additional Information – Historical Tank Database	176	28	71	93
1.3 Additional Information – Historical Energy Features Database	92	33	37	53
1.4 Additional Information – Historical Petrol and Fuel Site Database	0	0	0	0
1.5 Additional Information – Historical Garage and Motor Vehicle Repair Database	28	2	30	8
1.6 Potentially Infilled Land	23	2	18	38
<b>Section 2: Environmental Permits, Incidents and Registers</b>	On-site	0-50m	51-250	251-500
2.1 Industrial Sites Holding Environmental Permits and/or Authorisations				
2.1.1 Records of historic IPC Authorisations	0	0	0	0
2.1.2 Records of Part A(1) and IPPC Authorised Activities	0	0	21	0
2.1.3 Records of Red List Discharge Consents	0	0	0	0
2.1.4 Records of List 1 Dangerous Substances Inventory sites	1	0	0	1
2.1.5 Records of List 2 Dangerous Substances Inventory sites	0	2	2	5
2.1.6 Records of Part A(2) and Part B Activities and Enforcements	3	2	5	6
2.1.7 Records of Category 3 or 4 Radioactive Substances Authorisations	0	0	1	0
2.1.8 Records of Licensed Discharge Consents	15	3	8	15
2.1.9 Records of Water Industry Referrals	2	1	1	0
2.1.10 Records of Planning Hazardous Substance Consents and Enforcements within 500m of the study site	1	0	1	0
2.2 Records of COMAH and NIHHS sites	2	1	0	0
2.3 Environment Agency/Natural Resources Wales Recorded Pollution Incidents				
2.3.1 National Incidents Recording System, List 2	3	0	1	9
2.3.2 National Incidents Recording System, List 1	0	0	0	0
2.4 Sites Determined as Contaminated Land under Part 2A EPA 1990	0	0	0	0



Section 3: Landfill and Other Waste Sites	On-site	0-50m	51-250	251-500	501-1000	1000-1500
<b>3.1 Landfill Sites</b>						
3.1.1 Environment Agency/Natural Resources Wales Registered Landfill Sites	0	0	0	0	0	Not searched
3.1.2 Environment Agency/Natural Resources Wales Historic Landfill Sites	0	0	0	1	0	1
3.1.3 BGS/DoE Landfill Site Survey	0	0	0	0	0	0
3.1.4 Records of Landfills in Local Authority and Historical Mapping Records	0	0	0	0	0	0
<b>3.2 Landfill and Other Waste Sites Findings</b>						
3.2.1 Operational and Non-Operational Waste Treatment, Transfer and Disposal Sites	2	0	11	1	Not searched	Not searched
3.2.2 Environment Agency/Natural Resources Wales Licensed Waste Sites	2	3	15	5	5	5

Section 4: Current Land Use	On-site	0-50m	51-250	251-500
4.1 Current Industrial Sites Data	106	47	167	Not searched
4.2 Records of Petrol and Fuel Sites	2	0	0	1
4.3 National Grid Underground Electricity Cables	0	0	0	0
4.4 National Grid Gas Transmission Pipelines	0	0	0	0

Section 5: Geology	
5.1 Are there any records of Artificial Ground and Made Ground present beneath the study site?	Yes
5.2 Are there any records of Superficial Ground and Drift Geology present beneath the study site?	Yes
5.3 For records of Bedrock and Solid Geology beneath the study site see the detailed findings section.	

Section 6: Hydrogeology and Hydrology	0-500m					
6.1 Are there any records of Strata Classification in the Superficial Geology within 500m of the study site?	Yes					
6.2 Are there any records of Strata Classification in the Bedrock Geology within 500m of the study site?	Yes					
	On-site	0-50m	51-250	251-500	501-1000	1000-2000
6.3 Groundwater Abstraction Licences (within 2000m of the study site)	0	0	1	0	0	1
6.4 Surface Water Abstraction Licences (within 2000m of the study site)	0	0	0	1	0	0
6.5 Potable Water Abstraction Licences (within 2000m of the study site)	0	0	0	0	0	0
6.6 Source Protection Zones (within 500m of the study site)	0	0	0	0	Not searched	Not searched
6.7 Source Protection Zones within Confined Aquifer	0	0	0	0	Not searched	Not searched
6.8 Groundwater Vulnerability and Soil Leaching Potential (within 500m of the study site)	2	0	0	1	Not searched	Not searched

## Section 6: Hydrogeology and Hydrology

0-500m

	On-site	0-50m	51-250	251-500	501-1000	1000-1500
6.9 Is there any Environment Agency/Natural Resources Wales information on river quality within 1500m of the study site?	No	No	No	No	No	No
6.10 Detailed River Network entries within 500m of the site	1	0	0	0	Not searched	Not searched
6.11 Surface water features within 250m of the study site	Yes	Yes	Yes	Not searched	Not searched	Not searched

## Section 7: Flooding

7.1 Are there any Environment Agency Zone 2 floodplains within 250m of the study site?	Yes					
7.2 Are there any Environment Agency/Natural Resources Wales Zone 3 floodplains within 250m of the study site	Yes					
7.3 What is the Risk of flooding from Rivers and the Sea (RoFRaS) rating for the study site?	High					
7.4 Are there any Flood Defences within 250m of the study site?	No					
7.5 Are there any areas benefiting from Flood Defences within 250m of the study site?	No					
7.6 Are there any areas used for Flood Storage within 250m of the study site?	No					
7.7 What is the maximum BGS Groundwater Flooding susceptibility within 50m of the study site?	Limited potential					
7.8 What is the BGS confidence rating for the Groundwater Flooding susceptibility areas?	Low					

## Section 8: Designated Environmentally Sensitive Sites

	On-site	0-50m	51-250	251-500	501-1000	1000-2000
8.1 Records of Sites of Special Scientific Interest (SSSI)	0	0	0	0	0	3
8.2 Records of National Nature Reserves (NNR)	0	0	0	0	0	0
8.3 Records of Special Areas of Conservation (SAC)	0	0	0	0	0	0
8.4 Records of Special Protection Areas (SPA)	0	0	0	1	0	1
8.5 Records of Ramsar sites	0	0	0	0	0	1
8.6 Records of Ancient Woodlands	0	0	0	0	0	0
8.7 Records of Local Nature Reserves (LNR)	0	0	0	0	0	1
8.8 Records of World Heritage Sites	0	0	0	0	0	0
8.9 Records of Environmentally Sensitive Areas	0	0	0	1	0	1

Section 8: Designated Environmentally Sensitive Sites	On-site	0-50m	51-250	251-500	501-1000	1000-2000
8.10 Records of Areas of Outstanding Natural Beauty (AONB)	0	0	0	0	0	0
8.11 Records of National Parks	0	0	0	0	1	1
8.12 Records of Nitrate Sensitive Areas	0	0	0	0	0	0
8.13 Records of Nitrate Vulnerable Zones	1	0	0	0	0	1
8.14 Records of Green Belt land	0	0	0	0	0	0

## Section 9: Natural Hazards

9.1 What is the maximum risk of natural ground subsidence?	High
9.1.1 What is the maximum Shrink-Swell hazard rating identified on the study site?	Low
9.1.2 What is the maximum Landslides hazard rating identified on the study site?	Low
9.1.3 What is the maximum Soluble Rocks hazard rating identified on the study site?	Negligible
9.1.4 What is the maximum Compressible Ground hazard rating identified on the study site?	High
9.1.5 What is the maximum Collapsible Rocks hazard rating identified on the study site?	Very Low
9.1.6 What is the maximum Running Sand hazard rating identified on the study site?	Moderate
9.2 Radon	
9.2.1 Is the property in a Radon Affected Area as defined by the Health Protection Agency (HPA) and if so what percentage of homes are above the Action Level?	The property is not in a Radon Affected Area, as less than 1% of properties are above the Action Level.
9.2.2 Is the property in an area where Radon Protection are required for new properties or extensions to existing ones as described in publication BR211 by the Building Research Establishment?	No radon protective measures are necessary.

## Section 10: Mining

10.1 Are there any coal mining areas within 75m of the study site?	No
10.2 Are there any Non-Coal Mining areas within 50m of the study site boundary?	No
10.3 Are there any brine affected areas within 75m of the study site?	No

# Using this report

The following report is designed by Environmental Consultants for Environmental Professionals bringing together the most up-to-date market leading environmental data. This report is provided under and subject to the Terms & Conditions agreed between Groundsure and the Client. The document contains the following sections:

## 1. Historical Industrial Sites

Provides information on past land uses that may pose a risk to the study site in terms of potential contamination from activities or processes. Potentially Infilled Land features are also included. This search is conducted using radii of up to 500m.

## 2. Environmental Permits, Incidents and Registers

Provides information on Regulated Industrial Activities and Pollution Incidents as recorded by Regulatory Authorities, and sites determined as Contaminated Land. This search is conducted using radii up to 500m.

## 3. Landfills and Other Waste Sites

Provides information on landfills and other waste sites that may pose a risk to the study site. This search is conducted using radii up to 1500m.

## 4. Current Land Uses

Provides information on current land uses that may pose a risk to the study site in terms of potential contamination from activities or processes. These searches are conducted using radii of up to 500m. This includes information on potentially contaminative industrial sites, petrol stations and fuel sites as well as high pressure gas pipelines and underground electricity transmission lines.

## 5. Geology

Provides information on artificial and superficial deposits and bedrock beneath the study site.

## 6. Hydrogeology and Hydrology

Provides information on productive strata within the bedrock and superficial geological layers, abstraction licenses, Source Protection Zones (SPZs) and river quality. These searches are conducted using radii of up to 2000m.

## 7. Flooding

Provides information on river and coastal flooding, flood defences, flood storage areas and groundwater flood areas. This search is conducted using radii of up to 250m.

## 8. Designated Environmentally Sensitive Sites

Provides information on the Sites of Special Scientific Interest (SSSI), National Nature Reserves (NNR), Special Areas of Conservation (SAC), Special Protection Areas (SPA), Ramsar sites, Local Nature Reserves (LNR), Areas of Outstanding Natural Beauty (AONB), National Parks (NP), Environmentally Sensitive Areas, Nitrate Sensitive Areas, Nitrate Vulnerable Zones and World Heritage Sites and Scheduled Ancient Woodland. These searches are conducted using radii of up to 2000m.

## 9. Natural Hazards

Provides information on a range of natural hazards that may pose a risk to the study site. These factors include natural ground subsidence and radon..

## 10. Mining

Provides information on areas of coal and non-coal mining and brine affected areas.

## 11. Contacts

This section of the report provides contact points for statutory bodies and data providers that may be able to provide further information on issues raised within this report. Alternatively, Groundsure provide a free Technical Helpline (08444 159000) for further information and guidance.

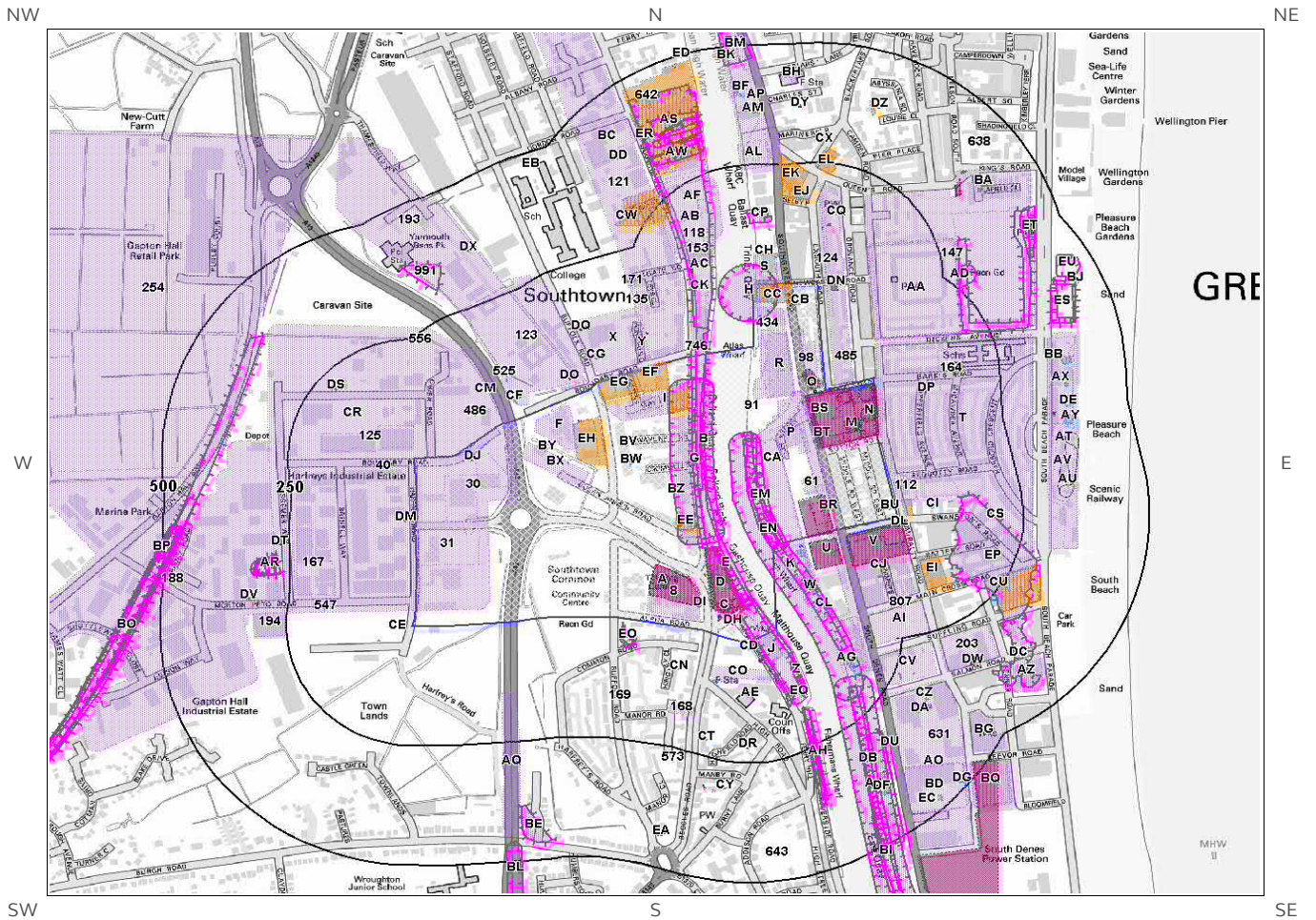
### Note: Maps

Only certain features are placed on the maps within the report. All features represented on maps found within this search are given an identification number. This number identifies the feature on the mapping and correlates it to the additional information provided below. This identification number precedes all other information and takes the following format -Id: 1, Id: 2, etc. Where numerous features on the same map are in such close proximity that the numbers would obscure each other a letter identifier is used instead to represent the features. (e.g. Three features which overlap may be given the identifier "A" on the map and would be identified separately as features 1A, 3A, 10A on the data tables provided).

Where a feature is reported in the data tables to a distance greater than the map area, it is noted in the data table as "Not Shown".

All distances given in this report are in Metres (m). Directions are given as compass headings such as N: North, E: East, NE: North East from the nearest point of the study site boundary.

# 1. Historical Land Use



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# 1. Historical Industrial Sites

## 1.1 Potentially Contaminative Uses identified from 1:10,000 scale Mapping

The systematic analysis of data extracted from standard 1:10,560 and 1:10,000 scale historical maps provides the following information:

Records of sites with a potentially contaminative past land use within 500m of the search boundary: 285

ID	Distance [m]	Direction	Use	Date
1F	0	On Site	Unspecified Depot	1978
2BX	0	On Site	Sawmills	1904
3A	0	On Site	Unspecified Tank	1952
4A	0	On Site	Unspecified Tank	1978
5A	0	On Site	Unspecified Tank	1988
6A	0	On Site	Unspecified Tank	1938
7A	0	On Site	Gasometer	1904
8	0	On Site	Unspecified Commercial/Industrial	1978
9B	0	On Site	Quay	1978
10B	0	On Site	Quay	1988
11B	0	On Site	Quay	1952
12C	0	On Site	Unspecified Tank	1952
13C	0	On Site	Unspecified Tank	1884
14C	0	On Site	Unspecified Tanks	1946
15C	0	On Site	Gasometer	1904
16C	0	On Site	Unspecified Tanks	1938
17D	0	On Site	Unspecified Commercial/Industrial	1938
18C	0	On Site	Gasometer	1884
19D	0	On Site	Gas Works	1904
20D	0	On Site	Unspecified Commercial/Industrial	1946
21C	0	On Site	Unspecified Tank	1952
22D	0	On Site	Unspecified Commercial/Industrial	1952
23D	0	On Site	Gas Works	1884
24D	0	On Site	Quay	1904
25D	0	On Site	Quay	1946
26E	0	On Site	Quay	1988
27E	0	On Site	Quay	1978
28F	0	On Site	Unspecified Depot	1988
29I	0	On Site	Iron Works	1884
30	0	On Site	Unspecified Factory	1978
31	0	On Site	Unspecified Works	1978
32A	0	On Site	Gas Holder Station	1988

33EN	0	On Site	Unspecified Wharf	1988
34D	0	On Site	Quay	1938
35B	0	On Site	Quay	1938
36D	0	On Site	Quay	1938
37B	0	On Site	Quay	1938
38G	0	On Site	Quay	1946
39G	0	On Site	Quay	1904
40	0	On Site	Industrial Estate	1988
41H	0	On Site	Quay	1978
42H	0	On Site	Quay	1988
43I	0	On Site	Iron Works	1901
44C	0	On Site	Gasometers	1901
45D	0	On Site	Gas Works	1901
46J	0	On Site	Quay	1938
47J	0	On Site	Quay	1938
48J	0	On Site	Malthouses	1884
49J	0	On Site	Unspecified Works	1988
50J	0	On Site	Quay	1978
51J	0	On Site	Malthouse	1904
52J	0	On Site	Malthouse	1946
53K	0	On Site	Unspecified Wharf	1946
54K	0	On Site	Unspecified Wharf	1904
55K	0	On Site	Fish Wharf	1938
56L	0	On Site	Railway Sidings	1938
57DK	0	On Site	Unspecified Wharf	1978
58L	0	On Site	Railway Sidings	1904
59L	0	On Site	Railway Sidings	1946
60BR	0	On Site	Railway Sidings	1946
61	0	On Site	Unspecified Depot	1988
62EM	0	On Site	Unspecified Wharf	1884
63M	0	On Site	Unspecified Tank	1946
64M	0	On Site	Gasometer	1904
65M	0	On Site	Unspecified Tank	1938
66M	0	On Site	Unspecified Tank	1952
67M	0	On Site	Unspecified Tank	1884
68M	0	On Site	Gasometer	1901
69M	0	On Site	Unspecified Commercial/Industrial	1946
70M	0	On Site	Gas Works	1904
71N	0	On Site	Unspecified Tank	1988
72N	0	On Site	Unspecified Tank	1978
73M	0	On Site	Unspecified Commercial/Industrial	1938
74P	0	On Site	Unspecified Depot	1988
75M	0	On Site	Gas Works	1884
76M	0	On Site	Unspecified Commercial/Industrial	1952

77M	0	On Site	Gas Works	1901
78M	0	On Site	Unspecified Depot	1988
79M	0	On Site	Gas Holder Station	1978
80O	0	On Site	Unspecified Tanks	1946
81O	0	On Site	Gasometers	1904
82P	0	On Site	Railway Sidings	1952
83P	0	On Site	Railway Sidings	1978
84O	0	On Site	Unspecified Tanks	1938
85O	0	On Site	Unspecified Tank	1952
86O	0	On Site	Unspecified Tank	1952
87O	0	On Site	Gasometer	1884
88O	0	On Site	Gasometer	1901
89O	0	On Site	Unspecified Tank	1988
90O	0	On Site	Unspecified Tank	1978
91	0	On Site	Ice House	1901
92Q	0	On Site	Unspecified Tank	1904
93Q	0	On Site	Unspecified Tank	1946
94Q	0	On Site	Unspecified Tank	1938
95Q	0	On Site	Unspecified Tank	1884
96Q	0	On Site	Unspecified Tanks	1901
97Q	0	On Site	Unspecified Tank	1884
98	0	On Site	Unspecified Commercial/Industrial	1901
99R	0	On Site	Unspecified Warehouse	1978
100R	0	On Site	Boat Building Yard	1884
101R	0	On Site	Unspecified Warehouse	1988
102R	0	On Site	Boat Building Yards	1901
103J	0	On Site	Malthouses	1901
104S	0	N	Unspecified Stores	1901
105S	2	N	Unspecified Stores	1884
106DN	3	N	Rope Walk	1901
107T	5	E	Militia Barracks	1901
108N	5	E	Drill Shed	1901
109W	6	E	Unspecified Commercial/Industrial	1988
110T	7	E	Barracks	1904
111N	7	E	Drill Shed	1884
112	8	E	Hospital	1904
113U	10	S	Unspecified Works	1978
114U	10	S	Unspecified Works	1988
115X	10	N	Timber Yard	1988
116V	11	S	Unspecified Commercial/Industrial	1946
117V	12	S	Unspecified Depot	1978
118	12	N	Unspecified Mill	1952
119V	13	S	Unspecified Commercial/Industrial	1938



120V	15	S	Unspecified Works	1952
121	16	N	Barracks	1901
122CJ	17	S	Electric Works	1904
123	18	NW	Unspecified Depot	1978
124	20	E	Rope Walk	1884
125	25	N	Unspecified Warehouses	1978
126W	42	E	Fish Wharf	1952
127X	42	N	Engine House	1904
128Y	42	N	Engine House	1946
129Y	45	N	Engine House	1938
130AB	52	N	Dock	1946
131CO	53	S	Malthouse	1978
132CK	55	N	Sawmills	1884
133W	67	E	Railway Sidings	1884
134W	70	E	Unspecified Tank	1988
135	70	N	Rope Walk	1901
136Z	73	SE	Quay	1946
137Z	73	SE	Quay	1904
138AA	76	N	Hospital	1904
139AA	76	N	Hospital	1946
140AA	79	N	Hospital	1938
141AC	79	W	Sawmills	1904
142CL	80	E	Unspecified Tanks	1988
143AB	81	W	Sawmills	1938
144AC	81	W	Sawmills	1946
145AC	81	W	Sawmills	1901
146AA	81	N	Hospital	1884
147	82	N	Naval Hospital	1901
148AD	84	N	Hospital	1988
149AD	84	N	Hospital	1978
150AD	84	N	Hospital	1952
151AE	98	S	Fire Station	1978
152AE	98	S	Fire Station	1988
153	99	NW	Timber Yard	1884
154AC	100	NW	Timber Yard	1901
155AF	100	NW	Timber Shed	1978
156AF	100	NW	Timber Shed	1988
157AB	108	NW	Timber Yard	1904
158EP	117	E	Sand Pit	1884
159AG	119	E	Unspecified Commercial/Industrial	1988
160AB	121	NW	Timber Yard	1901
161EQ	124	SE	Quay	1988
162CP	127	N	Dry Docks	1904
163AB	130	NW	Timber Yard	1884
164	131	E	Barracks	1884

165AQ	146	S	Railway Sidings	1938
166AG	150	SE	Unspecified Tanks	1988
167	158	W	Unspecified Warehouses	1978
168	160	S	Corn Mill	1884
169	162	S	Corn Windmill	1901
170AJ	164	SE	Quay	1946
171	167	N	Rope Walk	1884
172AH	169	SE	Quay	1978
173AH	169	SE	Quay	1988
174AH	170	SE	Unspecified Quay	1901
175AH	172	SE	Quay	1904
176AH	172	SE	Quay	1946
177AF	174	NW	Boat Building Yard	1901
178AI	175	S	Unspecified Depot	1988
179AI	175	S	Unspecified Factory	1978
180AF	185	NW	Boat Building Yard	1884
181DB	188	SE	Quay	1978
182AJ	188	SE	Quay	1952
183AK	203	NE	Unspecified Ground Workings	1938
184AK	203	NE	Unspecified Ground Workings	1938
185CV	205	E	Unspecified Depot	1988
186AH	230	SE	Quay	1938
187AH	230	SE	Quay	1938
188	236	W	Industrial Estate	1988
189AL	239	N	Timber Yard	1901
190AW	240	NW	Unspecified Commercial/Industrial	1901
191AL	240	N	Timber Yard	1884
192AD	249	NE	Unspecified Pit	1901
193	250	N	Unspecified Depot	1978
194	252	W	Unspecified Warehouse	1978
195AM	258	N	Unspecified Commercial/Industrial	1988
196AM	258	N	Unspecified Commercial/Industrial	1978
197AN	259	N	Railway Sidings	1978
198AN	259	N	Railway Sidings	1988
199AO	261	SE	Unspecified Factory	1988
200AO	261	SE	Unspecified Factory	1978
201AP	264	N	Railway Sidings	1988
202AP	264	N	Railway Sidings	1978
203	266	S	Unspecified Factory	1952
204AR	269	W	Unspecified Pit	1901
205AQ	270	S	Railway Station	1938
206AQ	271	S	Railway Station	1946

207AQ	271	S	Railway Station	1904
208DF	277	SE	Quay	1988
209AR	279	W	Unspecified Pit	1884
210AR	280	W	Unspecified Pit	1904
211AR	280	W	Unspecified Pit	1946
212AR	291	W	Unspecified Heap	1938
213AR	291	W	Unspecified Heap	1938
214AS	295	N	Dry Dock	1988
215AS	295	N	Dry Dock	1978
216DU	296	SE	Paddock	1901
217AR	298	W	Unspecified Pit	1952
218AT	301	E	Unspecified Commercial/Industrial	1952
219AT	301	E	Unspecified Commercial/Industrial	1988
220AT	301	E	Unspecified Commercial/Industrial	1978
221AV	302	E	Railway Sidings	1946
222DC	303	SE	Refuse Heap	1884
223AU	311	E	Railway Sidings	1988
224AU	311	E	Railway Sidings	1978
225AV	311	E	Railway Sidings	1952
226AS	316	N	Dry Docks	1938
227AS	316	N	Dry Docks	1938
228AW	317	NW	Ice House	1901
229AS	329	N	Dry Docks	1904
230AS	329	N	Dry Docks	1946
231AX	332	E	Railway Sidings	1938
232AX	332	E	Unspecified Commercial/Industrial	1938
233AS	345	N	Unspecified Works	1952
234BB	351	E	Unspecified Tank	1938
235AS	362	NW	Timber Yard	1884
236AS	364	NW	Timber Yard	1901
237BP	367	W	Cuttings	1884
238AY	371	E	Unspecified Tank	1978
239AY	371	E	Unspecified Tank	1988
240BA	371	NE	Telegraph House	1901
241AZ	373	SE	Unspecified Works	1952
242AZ	373	SE	Unspecified Works	1978
243AZ	373	SE	Unspecified Works	1988
244BA	374	NE	Telegraph House	1884
245BB	375	E	Unspecified Tanks	1978
246BB	375	E	Unspecified Tanks	1988
247BC	378	NW	Unspecified Works	1978
248BC	378	NW	Unspecified Works	1988
249BD	379	SE	Ice Factory	1946

250BD	380	SE	Unspecified Factory	1952
251BD	381	SE	Ice Factory	1938
252BE	382	S	Unspecified Pit	1904
253BE	382	S	Unspecified Pit	1946
254	387	W	Marshes	1901
255BK	390	N	Railway Sidings	1884
256BF	394	N	Unspecified Tanks	1988
257BF	394	N	Unspecified Tanks	1978
258ET	397	NE	Unspecified Heap	1952
259BG	416	SE	Unspecified Works	1988
260BG	416	SE	Unspecified Works	1978
261BH	418	N	Fire Station	1978
262BH	418	N	Fire Station	1988
263BI	436	SE	Quay	1938
264BI	436	SE	Quay	1938
265BO	436	W	Cuttings	1901
266BJ	442	NE	Boat House	1938
267BJ	444	NE	Boat House	1946
268BK	448	N	Railway Sidings	1988
269BK	448	N	Railway Sidings	1978
270BM	448	N	Railway Sidings	1938
271BL	458	S	Unspecified Heap	1978
272BL	458	S	Unspecified Heap	1988
273BN	461	N	Quay	1904
274BM	461	N	Railway Sidings	1946
275BN	461	N	Quay	1946
276BM	461	N	Railway Sidings	1904
277BO	463	W	Cuttings	1938
278BO	464	W	Cuttings	1904
279BO	464	W	Cuttings	1946
280BP	469	W	Cuttings	1952
281BQ	474	SE	Net Works	1946
282BQ	475	SE	Net Works	1938
283BK	476	N	Railway Building	1938
284BQ	477	SE	Unspecified Works	1952
285BO	496	W	Cuttings	1952

## 1.2 Additional Information – Historical Tank Database

The systematic analysis of data extracted from High Detailed 1:1,250 and 1:2,500 scale historical maps provides the following information.

Records of historical tanks within 500m of the search boundary:

368

ID	Distance (m)	Direction	Use	Date
286BR	0	On Site	Tanks	1949
287BR	0	On Site	Tanks	1949
288M	0	On Site	Unspecified Tank	1927
289O	0	On Site	Unspecified Tank	1927
290O	0	On Site	Unspecified Tank	1949
291O	0	On Site	Unspecified Tank	1949
292O	0	On Site	Unspecified Tank	1966
293M	0	On Site	Unspecified Tank	1949
294M	0	On Site	Unspecified Tank	1949
295M	0	On Site	Unspecified Tank	1963
296M	0	On Site	Unspecified Tank	1927
297M	0	On Site	Unspecified Tank	1966
298M	0	On Site	Tanks	1949
299M	0	On Site	Tanks	1963
300M	0	On Site	Tanks	1949
301O	0	On Site	Gasometer	1887
302O	0	On Site	Unspecified Tank	1927
303O	0	On Site	Gasometer	1966
304O	0	On Site	Gasometer	1949
305O	0	On Site	Gasometer	1949
306O	0	On Site	Gasometer	1963
307O	0	On Site	Unspecified Tank	1927
308N	0	On Site	Tanks	1966
309N	0	On Site	Unspecified Tank	1966
310M	0	On Site	Gasometer	1887
311M	0	On Site	Unspecified Tank	1927
312M	0	On Site	Gasometer	1949
313M	0	On Site	Gasometer	1966
314M	0	On Site	Gasometer	1949
315M	0	On Site	Gasometer	1963
316M	0	On Site	Unspecified Tank	1927
317M	0	On Site	Unspecified Tank	1949
318M	0	On Site	Unspecified Tank	1963
319M	0	On Site	Unspecified Tank	1949
320N	0	On Site	Unspecified Tank	1949
321BT	0	On Site	Unspecified Tank	1966
322Q	0	On Site	Unspecified Tank	1966
323BS	0	On Site	Unspecified Tank	1966
324Q	0	On Site	Unspecified Tank	1927
325Q	0	On Site	Gasometers	1887
326L	0	On Site	Unspecified Tank	1949

327L	0	On Site	Unspecified Tank	1957
328L	0	On Site	Unspecified Tank	1949
329Q	0	On Site	Unspecified Tank	1966
330BS	0	On Site	Unspecified Tank	1963
331BS	0	On Site	Unspecified Tank	1949
332BT	0	On Site	Unspecified Tank	1949
333BT	0	On Site	Unspecified Tank	1963
334BT	0	On Site	Unspecified Tank	1949
335Q	0	On Site	Unspecified Tank	1963
336Q	0	On Site	Unspecified Tank	1949
337BS	0	On Site	Unspecified Tank	1949
338BS	0	On Site	Unspecified Tank	1963
339BS	0	On Site	Unspecified Tank	1949
340Q	0	On Site	Unspecified Tank	1963
341L	0	On Site	Unspecified Tank	1958
342Q	0	On Site	Unspecified Tank	1949
343N	0	On Site	Unspecified Tank	1963
344N	0	On Site	Unspecified Tank	1949
345O	0	On Site	Unspecified Tank	1927
346O	0	On Site	Gasometer	1966
347O	0	On Site	Gasometer	1949
348BS	0	On Site	Gas Works	1887
349O	0	On Site	Gas Holder	1996
350O	0	On Site	Gasometer	1963
351O	0	On Site	Gasometer	1949
352M	0	On Site	Gasometer	1966
353M	0	On Site	Gas Holder	1996
354N	0	On Site	Unspecified Tank	1949
355N	0	On Site	Unspecified Tank	1963
356BS	0	On Site	Gas Works	1963
357N	0	On Site	Gas Holder Station	1996
358BS	0	On Site	Gas Works	1949
359M	0	On Site	Gas Works	1966
360BU	0	On Site	Unspecified Tank	1968
361BU	0	On Site	Unspecified Tank	1968
362Q	0	On Site	Unspecified Tank	1949
363Q	0	On Site	Unspecified Tank	1949
364BS	0	On Site	Gas Works	1949
365N	0	On Site	Unspecified Tank	1949
366E	0	On Site	Unspecified Tank	1990
367BZ	0	On Site	Unspecified Tank	1990
368BW	0	On Site	Tanks	1990
369BV	0	On Site	Unspecified Tank	1990
370BV	0	On Site	Unspecified Tank	1990
371BW	0	On Site	Tanks	1990
372N	0	On Site	Gas Holder Station	1984

373M	0	On Site	Gas Holder	1984
374O	0	On Site	Gas Holder	1984
375N	0	On Site	Gas Holder Station	1990
376O	0	On Site	Gas Holder	1990
377M	0	On Site	Gas Holder	1990
378Q	0	On Site	Gasometers	1883
379O	0	On Site	Gasometer	1883
380O	0	On Site	Gas Works	1883
381M	0	On Site	Gasometer	1883
382O	0	On Site	Unspecified Tank	1905
383M	0	On Site	Unspecified Tank	1905
384BX	0	On Site	Unspecified Tank	1949
385BX	0	On Site	Unspecified Tank	1951
386BX	0	On Site	Unspecified Tank	1963
387BY	0	On Site	Unspecified Tank	1949
388BY	0	On Site	Unspecified Tank	1951
389BY	0	On Site	Unspecified Tank	1963
390BX	0	On Site	Unspecified Tank	1963
391BX	0	On Site	Unspecified Tank	1949
392BX	0	On Site	Unspecified Tank	1951
393BV	0	On Site	Unspecified Tank	1996
394BV	0	On Site	Unspecified Tank	1975
395BW	0	On Site	Tanks	1996
396BW	0	On Site	Tanks	1975
397A	0	On Site	Gasholder	1949
398A	0	On Site	Unspecified Tank	1958
399A	0	On Site	Gasholder	1968
400A	0	On Site	Unspecified Tank	1927
401A	0	On Site	Gasholder	1949
402A	0	On Site	Gasholder	1976
403A	0	On Site	Gasholder	1967
404BZ	0	On Site	Unspecified Tank	1976
405BZ	0	On Site	Unspecified Tank	1996
406E	0	On Site	Unspecified Tank	1968
407E	0	On Site	Unspecified Tank	1967
408E	0	On Site	Unspecified Tank	1996
409E	0	On Site	Unspecified Tank	1949
410E	0	On Site	Unspecified Tank	1949
411D	0	On Site	Tanks	1949
412D	0	On Site	Tanks	1949
413E	0	On Site	Unspecified Tank	1968
414E	0	On Site	Unspecified Tank	1967
415D	0	On Site	Unspecified Tank	1968
416D	0	On Site	Unspecified Tank	1967
417C	0	On Site	Gasometer	1949
418D	0	On Site	Unspecified Tank	1968

419D	0	On Site	Unspecified Tank	1967
420C	0	On Site	Tanks	1927
421C	0	On Site	Gasometers	1887
422D	0	On Site	Gas Works	1887
423C	0	On Site	Gasometer	1949
424C	0	On Site	Tanks	1958
425C	0	On Site	Gasometers	1949
426C	0	On Site	Gasometers	1968
427C	0	On Site	Gasometers	1967
428D	0	On Site	Gas Works	1949
429D	0	On Site	Gas Works	1968
430D	0	On Site	Gas Works	1949
431D	0	On Site	Gas Works	1967
432H	0	On Site	Unspecified Tank	1949
433H	0	On Site	Unspecified Tank	1963
434	0	On Site	Unspecified Tank	1966
435CA	0	On Site	Unspecified Tank	1949
436CA	0	On Site	Unspecified Tank	1966
437CA	0	On Site	Unspecified Tank	1963
438CA	0	On Site	Unspecified Tank	1949
439CB	0	On Site	Unspecified Tank	1963
440BR	0	On Site	Unspecified Tank	1949
441BR	0	On Site	Unspecified Tank	1958
442BR	0	On Site	Unspecified Tank	1957
443BR	0	On Site	Unspecified Tank	1949
444BY	0	On Site	Unspecified Tank	1949
445BX	0	On Site	Unspecified Tank	1949
446BX	0	On Site	Unspecified Tank	1949
447CB	0	On Site	Unspecified Tank	1949
448BZ	0	On Site	Unspecified Tank	1986
449A	0	On Site	Gas Holder Station	1986
450A	0	On Site	Gas Holder	1986
451BW	0	On Site	Tanks	1986
452BV	0	On Site	Unspecified Tank	1986
453C	0	On Site	Gasometers	1883
454D	0	On Site	Gas Works	1883
455CB	0	On Site	Unspecified Tank	1927
456CB	0	On Site	Unspecified Tank	1966
457CB	0	On Site	Unspecified Tank	1949
458H	0	On Site	Unspecified Tank	1928
459H	0	On Site	Unspecified Tank	1949
460CC	0	On Site	Unspecified Tank	1928
461CC	0	On Site	Unspecified Tank	1905
462CD	9	S	Unspecified Tank	1968
463CD	10	S	Unspecified Tank	1968
464K	21	S	Tanks	1990



465K	22	S	Tanks	1984
466K	24	S	Tanks	1990
467CE	30	W	Unspecified Tank	1990
468CE	30	W	Unspecified Tank	1985
469CF	30	NW	Tanks	1996
470CF	30	NW	Unspecified Tank	1990
471CF	30	NW	Unspecified Tank	1990
472V	32	S	Unspecified Tank	1949
473V	33	S	Unspecified Tank	1949
474CF	38	NW	Unspecified Tank	1986
475V	38	S	Tanks	1958
476U	39	S	Tanks	1968
477CF	39	NW	Unspecified Tank	1975
478U	39	S	Tanks	1968
479V	39	S	Tanks	1957
480CF	40	NW	Unspecified Tank	1990
481CF	40	NW	Unspecified Tank	1990
482U	40	S	Tanks	1981
483U	40	S	Tanks	1990
484U	40	S	Tanks	1984
485	44	E	Unspecified Tank	1966
486	44	NW	Unspecified Tank	1980
487CG	46	N	Tanks	1996
488CG	47	N	Tanks	1990
489CG	47	N	Tanks	1990
490S	53	N	Tanks	1996
491S	55	N	Tanks	1966
492S	55	N	Tanks	1984
493S	55	N	Tanks	1990
494CH	62	N	Unspecified Tank	1949
495CH	62	N	Unspecified Tank	1949
496CH	62	N	Unspecified Tank	1963
497CI	70	E	Tanks	1949
498CE	70	SW	Unspecified Tank	1964
499CE	70	SW	Unspecified Tank	1955
500CI	70	E	Tanks	1949
501W	71	E	Tanks	1990
502CE	71	SW	Unspecified Tank	1978
503CE	73	SW	Unspecified Tank	1990
504CE	73	SW	Unspecified Tank	1985
505CM	73	NW	Unspecified Tank	1978
506CJ	74	S	Unspecified Tank	1927
507CK	79	W	Tanks	1951
508CK	79	W	Tanks	1963
509CK	80	W	Unspecified Tank	1949
510CK	80	W	Unspecified Tank	1949

511CK	80	W	Unspecified Tank	1949
512CL	80	E	Tanks	1990
513CL	80	E	Tanks	1984
514CM	82	NW	Unspecified Tank	1975
515CJ	87	S	Tanks	1958
516CJ	87	S	Tanks	1968
517CJ	87	S	Tanks	1949
518CJ	87	S	Tanks	1949
519CJ	87	S	Tanks	1968
520CJ	87	S	Tanks	1957
521CN	87	S	Unspecified Tank	1958
522CN	87	S	Unspecified Tank	1949
523CN	88	S	Unspecified Tank	1949
524CO	90	S	Unspecified Tank	1968
525	91	NW	Unspecified Tank	1975
526CO	91	S	Unspecified Tank	1967
527CO	91	S	Unspecified Tank	1976
528CL	94	E	Tanks	1990
529CI	107	E	Unspecified Tank	1957
530CI	107	E	Unspecified Tank	1968
531CI	107	E	Unspecified Tank	1949
532CI	107	E	Unspecified Tank	1949
533CI	107	E	Unspecified Tank	1968
534CI	107	E	Unspecified Tank	1958
535CP	111	N	Unspecified Tank	1949
536CP	112	N	Unspecified Tank	1963
537CP	112	N	Unspecified Tank	1949
538CJ	112	S	Unspecified Tank	1968
539CJ	112	S	Unspecified Tank	1968
540CJ	112	S	Unspecified Tank	1981
541CJ	113	S	Unspecified Tank	1984
542CQ	145	N	Tanks	1966
543CQ	145	N	Tanks	1975
544CR	149	NW	Unspecified Tank	1980
545CR	149	NW	Unspecified Tank	1985
546AG	150	SE	Tanks	1990
547	170	W	Unspecified Tank	1990
548AG	174	SE	Unspecified Tank	1990
549CS	191	E	Unspecified Tank	1981
550CS	191	E	Unspecified Tank	1990
551CS	191	E	Unspecified Tank	1984
552CS	191	E	Unspecified Tank	1968
553CS	192	E	Unspecified Tank	1968
554CT	215	S	Unspecified Tank	1927
555CT	215	S	Unspecified Tank	1905
556	230	NW	Unspecified Tank	1985

557CU	244	SE	Unspecified Tank	1968
558CU	244	SE	Unspecified Tank	1968
559CU	248	SE	Tanks	1968
560CU	248	SE	Tanks	1968
561CU	251	SE	Unspecified Tank	1958
562CU	251	SE	Unspecified Tank	1949
563CU	252	SE	Unspecified Tank	1957
564CU	252	SE	Unspecified Tank	1949
565CV	258	E	Tanks	1981
566CV	259	E	Tanks	1968
567CV	259	E	Tanks	1949
568CV	259	E	Tanks	1958
569CV	259	E	Tanks	1957
570CV	259	E	Tanks	1968
571CV	259	E	Tanks	1949
572CV	260	E	Tanks	1984
573	276	S	Unspecified Tank	1927
574CU	283	SE	Unspecified Tank	1968
575CU	283	SE	Unspecified Tank	1964
576CU	283	SE	Unspecified Tank	1971
577CW	285	NW	Unspecified Tank	1928
578CW	285	NW	Unspecified Tank	1887
579CW	285	NW	Unspecified Tank	1905
580CV	286	E	Unspecified Tank	1958
581CV	286	E	Unspecified Tank	1949
582CV	287	E	Unspecified Tank	1957
583CV	287	E	Unspecified Tank	1949
584CX	292	N	Unspecified Tank	1975
585CX	292	N	Unspecified Tank	1966
586CX	292	N	Unspecified Tank	1990
587CX	292	N	Unspecified Tank	1990
588CY	304	S	Unspecified Tank	1968
589CY	304	S	Unspecified Tank	1972
590CY	304	S	Unspecified Tank	1968
591CY	304	S	Unspecified Tank	1990
592CY	311	S	Unspecified Tank	1949
593CY	314	S	Unspecified Tank	1949
594CY	314	S	Unspecified Tank	1953
595CY	314	S	Tanks	1972
596CZ	321	SE	Unspecified Tank	1981
597CZ	322	SE	Unspecified Tank	1984
598DA	326	SE	Tanks	1967
599DA	326	SE	Tanks	1968
600CZ	328	SE	Unspecified Tank	1981
601CZ	330	SE	Unspecified Tank	1984
602AM	358	N	Tanks	1928

603DB	364	SE	Unspecified Tank	1927
604DB	366	SE	Unspecified Tank	1967
605AY	367	E	Unspecified Tank	1970
606DC	371	SE	Unspecified Tank	1981
607DC	371	SE	Unspecified Tank	1990
608DC	371	SE	Unspecified Tank	1984
609DD	373	NW	Tanks	1968
610DD	374	NW	Tanks	1987
611DD	374	NW	Tanks	1987
612BB	374	E	Unspecified Tank	1963
613BB	374	E	Unspecified Tank	1949
614BB	375	E	Unspecified Tank	1949
615DE	376	E	Unspecified Tank	1949
616AX	376	E	Unspecified Tank	1990
617DE	376	E	Unspecified Tank	1963
618DE	376	E	Unspecified Tank	1949
619AX	377	E	Unspecified Tank	1963
620AX	377	E	Unspecified Tank	1949
621DD	377	NW	Tanks	1968
622DD	377	NW	Tanks	1968
623AX	377	E	Unspecified Tank	1949
624AX	377	E	Unspecified Tank	1970
625BB	388	E	Tanks	1990
626BB	389	E	Unspecified Tank	1970
627BF	392	N	Tanks	1968
628DD	393	NW	Unspecified Tank	1968
629DD	394	NW	Unspecified Tank	1987
630DD	394	NW	Unspecified Tank	1987
631	395	SE	Unspecified Tank	1990
632DF	398	SE	Tanks	1976
633BF	412	N	Unspecified Tank	1987
634BF	412	N	Unspecified Tank	1987
635AJ	416	SE	Tanks	1976
636AJ	416	SE	Tanks	1976
637BF	422	N	Unspecified Tank	1968
638	429	NE	Unspecified Tank	1905
639BH	438	N	Unspecified Tank	1954
640BH	438	N	Unspecified Tank	1966
641BH	439	N	Unspecified Tank	1963
642	439	NW	Unspecified Tank	1968
643	445	S	Unspecified Tank	1905
644BD	467	SE	Unspecified Tank	1949
645EC	467	SE	Unspecified Tank	1949
646BD	468	SE	Tanks	1968
647BD	472	SE	Tanks	1990
648BD	477	SE	Tanks	1949

649BD	478	SE	Tanks	1949
650DG	479	SE	Tanks	1968
651DG	479	SE	Tanks	1967
652BQ	487	SE	Tanks	1967
653ED	493	N	Unspecified Tank	1968

### 1.3 Additional Information – Historical Energy Features Database

The systematic analysis of data extracted from High Detailed 1:1,250 and 1:2,500 scale historical maps provides the following information.

Records of historical energy features within 500m of the search boundary:

215

ID	Distance (m)	Direction	Use	Date
654DH	0	On Site	Electricity Substation	1976
655DH	0	On Site	Electricity Substation	1968
656DH	0	On Site	Electricity Substation	1967
657DH	0	On Site	Electricity Substation	1986
658DH	0	On Site	Electricity Substation	1976
659DH	0	On Site	Electricity Substation	1949
660DH	0	On Site	Electricity Substation	1968
661D	0	On Site	Gas Works	1949
662D	0	On Site	Gas Works	1967
663D	0	On Site	Gas Works	1949
664D	0	On Site	Gas Works	1968
665C	0	On Site	Gasometers	1887
666C	0	On Site	Gasometers	1967
667C	0	On Site	Gasometer	1949
668C	0	On Site	Gasometers	1968
669C	0	On Site	Gasometers	1949
670C	0	On Site	Gasometer	1949
671DI	0	On Site	Electricity Substation	1996
672A	0	On Site	Gas Distribution Station	1996
673DI	0	On Site	Electricity Substation	1976
674A	0	On Site	Gas Distribution Station	1976
675DI	0	On Site	Electricity Substation	1967
676A	0	On Site	Gas Distribution Station	1990
677A	0	On Site	Gas Holder Station	1986
678DI	0	On Site	Electricity Substation	1990
679DI	0	On Site	Electricity Substation	1968
680A	0	On Site	Gasholder	1949
681A	0	On Site	Gasholder	1967
682A	0	On Site	Gasholder	1976
683A	0	On Site	Gas Holder	1986

684A	0	On Site	Gasholder	1949
685A	0	On Site	Gasholder	1968
686D	0	On Site	Electricity Substation	1996
687D	0	On Site	Electricity Substation	1990
688L	0	On Site	Electricity Works	1968
689L	0	On Site	Electricity Works	1968
690L	0	On Site	Electricity Works	1981
691L	0	On Site	Electricity Works	1984
692DJ	0	On Site	Electricity Substation	1980
693DJ	0	On Site	Electricity Substation	1978
694M	0	On Site	Gas Works	1887
695DH	0	On Site	Electricity Substation	1986
696DH	0	On Site	Electricity Substation	1996
697DH	0	On Site	Electricity Substation	1990
698N	0	On Site	Gas Holder Station	1996
699M	0	On Site	Gasometer	1887
700DH	0	On Site	Electricity Substation	1967
701DH	0	On Site	Electricity Substation	1949
702D	0	On Site	Gas Works	1887
703DI	0	On Site	Electricity Substation	1986
704F	0	On Site	Electricity Substation	1986
705F	0	On Site	Electricity Substation	1996
706M	0	On Site	Gas Holder	1996
707N	0	On Site	Electricity Substation	1996
708O	0	On Site	Gasometer	1887
709O	0	On Site	Gasometer	1949
710O	0	On Site	Gasometer	1966
711O	0	On Site	Gasometer	1949
712O	0	On Site	Gas Holder	1996
713O	0	On Site	Gasometer	1949
714O	0	On Site	Gasometer	1966
715O	0	On Site	Gasometer	1963
716O	0	On Site	Gasometer	1949
717Q	0	On Site	Gasometers	1887
718M	0	On Site	Gas Works	1963
719M	0	On Site	Gas Works	1966
720M	0	On Site	Gasometer	1963
721M	0	On Site	Gasometer	1949
722M	0	On Site	Gasometer	1949
723M	0	On Site	Gasometer	1966
724M	0	On Site	Gasometer	1966
725F	0	On Site	Electricity Substation	1990
726O	0	On Site	Gasometer	1963
727M	0	On Site	Gas Holder	1984
728O	0	On Site	Gas Holder	1984
729C	0	On Site	Gasometers	1883

730N	0	On Site	Gas Holder Station	1990
731O	0	On Site	Gas Holder	1990
732M	0	On Site	Gas Holder	1990
733N	0	On Site	Electricity Substation	1990
734D	0	On Site	Gas Works	1883
735DJ	0	On Site	Electricity Substation	1985
736M	0	On Site	Gas Works	1949
737M	0	On Site	Gas Works	1949
738Q	0	On Site	Gasometers	1883
739O	0	On Site	Gasometer	1883
740O	0	On Site	Gas Works	1883
741M	0	On Site	Gasometer	1883
742F	0	On Site	Electricity Substation	1990
743N	0	On Site	Gas Holder Station	1984
744N	0	On Site	Electricity Substation	1984
745DJ	0	On Site	Electricity Substation	1978
746	10	N	Electricity Substation	1951
747DK	13	S	Electricity Substation	1981
748DK	13	S	Electricity Substation	1990
749DK	13	S	Electricity Substation	1984
750V	13	S	Electricity Works	1949
751DL	13	S	Electricity Substation	1949
752U	14	S	Electricity Works	1968
753DL	14	S	Electricity Works	1968
754DL	14	S	Electricity Works	1968
755U	14	S	Electricity Works	1968
756DL	15	S	Electricity Works	1981
757DL	15	S	Electricity Works	1984
758V	15	S	Electricity Works	1949
759DL	15	S	Electricity Substation	1949
760U	15	S	Electricity Works	1981
761U	15	S	Electricity Works	1984
762U	15	S	Electricity Works	1990
763DM	18	W	Electricity Substation	1978
764DM	20	W	Electricity Substation	1985
765DM	20	W	Electricity Substation	1990
766DN	28	E	Electricity Substation	1996
767DN	29	E	Electricity Substation	1990
768DN	29	E	Electricity Substation	1984
769DO	34	NW	Electricity Substation	1996
770DO	35	NW	Electricity Substation	1986
771DO	35	NW	Electricity Substation	1990
772DO	35	NW	Electricity Substation	1990
773DO	35	NW	Electricity Substation	1975
774DO	35	NW	Electricity Substation	1968
775CO	39	SE	Electricity Substation	1968

776CO	39	SE	Electricity Substation	1968
777CO	39	SE	Electricity Substation	1984
778CO	39	SE	Electricity Substation	1981
779Y	59	N	Electricity Substation	1986
780Y	59	N	Electricity Substation	1990
781Y	64	N	Electricity Substation	1975
782Y	67	N	Electricity Substation	1996
783DP	98	E	Electricity Substation	1990
784DP	98	E	Electricity Substation	1984
785DP	99	E	Electricity Substation	1949
786DP	99	E	Electricity Substation	1996
787DP	99	E	Electricity Substation	1949
788CQ	110	N	Electricity Substation	1990
789CQ	110	N	Electricity Substation	1984
790DQ	112	N	Electricity Substation	1986
791DQ	112	N	Electricity Substation	1990
792DQ	112	N	Electricity Substation	1990
793DQ	113	N	Electricity Substation	1996
794CQ	118	N	Electricity Substation	1996
795CQ	120	N	Electricity Substation	1975
796CQ	120	N	Electricity Substation	1990
797CQ	120	N	Electricity Substation	1990
798AC	120	W	Electricity Substation	1949
799AC	121	W	Electricity Substation	1949
800AC	121	W	Electricity Substation	1975
801AC	121	W	Electricity Substation	1951
802AC	121	W	Electricity Substation	1968
803AC	124	W	Electricity Substation	1986
804AC	124	W	Electricity Substation	1990
805AC	124	W	Electricity Substation	1990
806AC	125	W	Electricity Substation	1996
807	180	S	Electricity Substation	1990
808DS	210	NW	Electricity Substation	1978
809DR	214	S	Electricity Substation	1968
810DR	214	S	Electricity Substation	1990
811DR	214	S	Electricity Substation	1967
812DR	214	S	Electricity Substation	1976
813DS	215	NW	Electricity Substation	1978
814DS	215	NW	Electricity Substation	1980
815DS	215	NW	Electricity Substation	1985
816DT	267	W	Electricity Substation	1985
817DT	267	W	Electricity Substation	1990
818DU	290	SE	Electricity Substation	1990
819DU	291	SE	Electricity Substation	1968
820DU	291	SE	Electricity Substation	1976
821DU	291	SE	Electricity Substation	1967



822CY	308	S	Electricity Substation	1972
823CY	312	S	Electricity Substation	1990
824BA	327	NE	Electricity Substation	1949
825DV	328	W	Electricity Substation	1985
826DV	328	W	Electricity Substation	1990
827DV	328	W	Electricity Substation	1978
828BA	328	NE	Electricity Substation	1975
829BA	328	NE	Electricity Substation	1954
830BA	331	NE	Electricity Substation	1949
831BA	333	NE	Electricity Substation	1990
832BA	333	NE	Electricity Substation	1990
833CZ	333	SE	Electricity Substation	1976
834DW	335	SE	Electricity Substation	1968
835DW	335	SE	Electricity Substation	1981
836DW	335	SE	Electricity Substation	1984
837DW	335	SE	Electricity Substation	1990
838DW	336	SE	Electricity Substation	1968
839AY	349	E	Electricity Substations	1970
840AY	349	E	Electricity Substation	1949
841AY	349	E	Electricity Substation	1949
842AM	358	N	Electricity Substation	1954
843AM	359	N	Electricity Substation	1949
844AM	359	N	Electricity Substation	1949
845DX	361	NW	Electricity Substation	1978
846DX	361	NW	Electricity Substation	1980
847DX	361	NW	Electricity Substation	1985
848DY	366	N	Electricity Substation	1975
849DY	366	N	Electricity Substation	1990
850DY	366	N	Electricity Substation	1990
851ER	368	NW	Electricity Substation	1968
852AS	370	NW	Electricity Substation	1987
853AS	370	NW	Electricity Substation	1987
854AS	370	NW	Electricity Substation	1990
855AS	381	NW	Electricity Substation	1987
856AS	381	NW	Electricity Substation	1987
857AS	381	NW	Electricity Substation	1990
858DZ	383	N	Electricity Substation	1990
859DZ	383	N	Electricity Substation	1975
860EA	426	S	Electricity Substation	1972
861EA	426	S	Electricity Substation	1990
862EB	466	N	Electricity Substation	1990
863EB	466	N	Electricity Substation	1987
864EB	466	N	Electricity Substation	1987
865EC	470	SE	Electricity Substation	1990
866	476	SE	Electricity Works	1990
867ED	479	N	Electricity Substation	1990

## 1.4 Additional Information – Historical Petrol and Fuel Site Database

The systematic analysis of data extracted from High Detailed 1:1,250 and 1:2,500 scale historical maps provides the following information.

Records of historical petrol stations and fuel sites within 500m of the search boundary: 0

Database searched and no data found.

## 1.5 Additional Information – Historical Garage and Motor Vehicle Repair Database

The systematic analysis of data extracted from High Detailed 1:1,250 and 1:2,500 scale historical maps provides the following information.

Records of historical garage and motor vehicle repair sites within 500m of the search boundary: 68

ID	Distance (m)	Direction	Use	Date
869I	0	On Site	Garage	1963
870EE	0	On Site	Garage	1976
871EE	0	On Site	Garage	1967
872EE	0	On Site	Garage	1986
873EF	0	On Site	Garage	1975
874EF	0	On Site	Garage	1968
875EG	0	On Site	Garage	1975
876EG	0	On Site	Garage	1968
877EE	0	On Site	Garage	1990
878I	0	On Site	Garage	1951
879I	0	On Site	Garage	1949
880I	0	On Site	Garage	1986
881I	0	On Site	Garage	1990
882I	0	On Site	Garage	1975
883I	0	On Site	Garage	1968
884EE	0	On Site	Garage	1968
885EF	0	On Site	Garage	1986
886EF	0	On Site	Garage	1968
887EH	0	On Site	Garage	1996
888I	0	On Site	Garage	1996
889CC	0	On Site	Garage	1996
890EE	0	On Site	Garage	1996
891EH	0	On Site	Garage	1986
892EH	0	On Site	Garage	1990
893EH	0	On Site	Garage	1990

894CC	0	On Site	Garage	1966
895CC	0	On Site	Garage	1990
896CC	0	On Site	Garage	1984
897BU	15	E	Motor Repair Works	1968
898BU	16	E	Motor Repair Works	1968
899EI	93	SE	Garage	1958
900EI	93	SE	Boat Repair Yard	1968
901EI	94	SE	Boat Repair Yard	1968
902EI	126	SE	Garage	1957
903EI	126	SE	Garage	1949
904EJ	170	N	Garage	1990
905EJ	172	N	Garage	1975
906EJ	172	N	Garage	1966
907EK	177	N	Garage	1975
908EK	177	N	Garage	1954
909EK	189	N	Garage	1966
910EK	193	N	Garage	1949
911EK	194	N	Garage	1990
912EK	194	N	Garage	1990
913EK	199	N	Garage	1949
914EK	200	N	Garage	1963
915CW	219	NW	Garage	1963
916CW	223	NW	Garage	1987
917CW	223	NW	Garage	1987
918EL	227	N	Garage	1966
919EL	227	N	Garage	1954
920EL	228	N	Garage	1990
921EL	232	N	Garage	1963
922CW	232	NW	Garage	1949
923CW	232	NW	Garage	1968
924CW	232	NW	Garage	1957
925CU	234	SE	Garage	1971
926CU	235	SE	Garage	1990
927CU	241	SE	Garage	1964
928CU	241	SE	Garage	1968
929EL	261	N	Garage	1990
930EL	261	N	Garage	1990
931AS	286	N	Shipbuilding and Repairing Yard	1987
932AS	286	N	Shipbuilding and Repairing Yard	1987
933AS	286	N	Shipbuilding and Repairing Yard	1990
934DZ	365	N	Garage	1954
935DZ	365	N	Garage	1949
936DZ	365	N	Garage	1963

## 1.6 Potentially Infilled Land

Records of Potentially Infilled Features from 1:10,000 scale mapping within 500m of the study site: 81

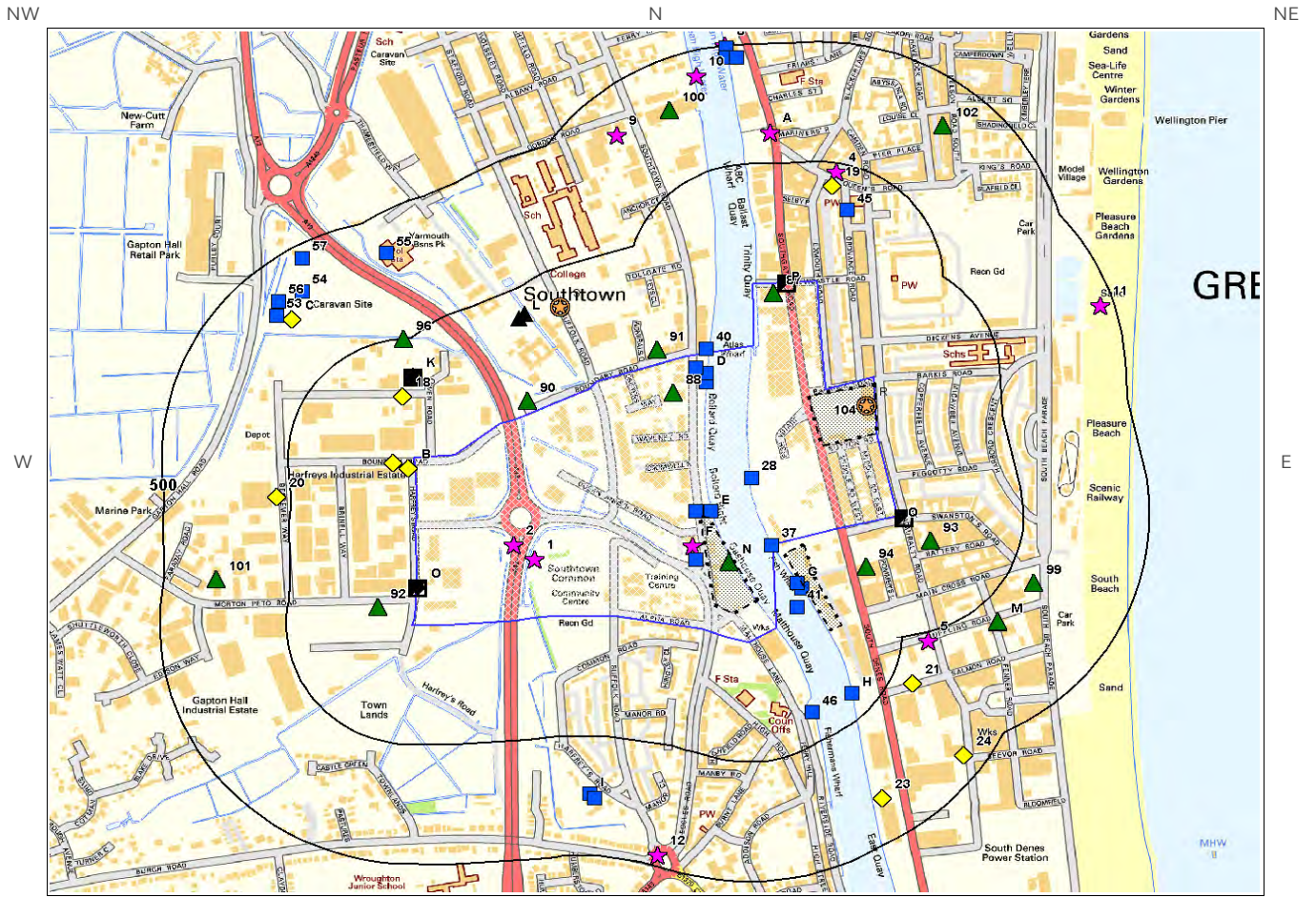
The following Historical Potentially Infilled Features derived from the Historical Mapping information is provided by Groundsure:

ID	Distance(m)	Direction	Use	Date
937J	0	On Site	Quay	1938
938J	0	On Site	Quay	1938
939K	0	On Site	Unspecified Wharf	1946
940J	0	On Site	Quay	1978
941DK	0	On Site	Unspecified Wharf	1978
942D	0	On Site	Quay	1904
943D	0	On Site	Quay	1946
944E	0	On Site	Quay	1978
945E	0	On Site	Quay	1988
946D	0	On Site	Quay	1938
947D	0	On Site	Quay	1938
948EM	0	On Site	Unspecified Wharf	1884
949B	0	On Site	Quay	1952
950EN	0	On Site	Unspecified Wharf	1988
951B	0	On Site	Quay	1988
952B	0	On Site	Quay	1978
953B	0	On Site	Quay	1938
954B	0	On Site	Quay	1938
955G	0	On Site	Quay	1946
956K	0	On Site	Unspecified Wharf	1904
957G	0	On Site	Quay	1904
958H	0	On Site	Quay	1978
959H	0	On Site	Quay	1988
960EO	15	S	Pond	1884
961EO	15	S	Pond	1901
962AB	52	N	Dock	1946
963Z	73	SE	Quay	1946
964Z	73	SE	Quay	1904
965EP	117	E	Sand Pit	1884
966EQ	124	SE	Quay	1988
967CP	127	N	Dry Docks	1904
968AJ	164	SE	Quay	1946
969AH	169	SE	Quay	1988
970AH	169	SE	Quay	1978
971AH	172	SE	Quay	1904
972AH	172	SE	Quay	1946
973AJ	188	SE	Quay	1952
974DB	188	SE	Quay	1978

975AK	203	NE	Unspecified Ground Workings	1938
976AK	203	NE	Unspecified Ground Workings	1938
977AH	230	SE	Quay	1938
978AH	230	SE	Quay	1938
979AD	249	NE	Unspecified Pit	1901
980AR	269	W	Unspecified Pit	1901
981DF	277	SE	Quay	1988
982AR	279	W	Unspecified Pit	1884
983AR	280	W	Unspecified Pit	1904
984AR	280	W	Unspecified Pit	1946
985AR	291	W	Unspecified Heap	1938
986AR	291	W	Unspecified Heap	1938
987AS	295	N	Dry Dock	1988
988ER	295	N	Dry Dock	1978
989AR	298	W	Unspecified Pit	1952
990DC	303	SE	Refuse Heap	1884
991	306	NW	Pond	1952
992ER	316	N	Dry Docks	1938
993ER	316	N	Dry Docks	1938
994AS	329	N	Dry Docks	1904
995AS	329	N	Dry Docks	1946
996BP	367	W	Cuttings	1884
997ES	371	E	Pond	1938
998ES	372	E	Pond	1946
999BE	382	S	Unspecified Pit	1946
1000BE	382	S	Unspecified Pit	1904
1001ES	385	E	Pond	1988
1002ES	385	E	Pond	1978
1003ET	397	NE	Unspecified Heap	1952
1004EU	421	NE	Boating Lake	1988
1005EU	421	NE	Boating Lake	1978
1006BI	436	SE	Quay	1938
1007BI	436	SE	Quay	1938
1008BO	436	W	Cuttings	1901
1009BL	458	S	Unspecified Heap	1988
1010BL	458	S	Unspecified Heap	1978
1011BN	461	N	Quay	1904
1012BN	461	N	Quay	1946
1013BO	463	W	Cuttings	1938
1014BO	464	W	Cuttings	1946
1015BO	464	W	Cuttings	1904
1016BP	469	W	Cuttings	1952
1017BO	496	W	Cuttings	1952



# 2. Environmental Permits, Incidents and Registers Map



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- |  |                               |  |  |  |   |
|--|-------------------------------|--|--|--|---|
|  | Site Outline                  |  | Recorded Pollution Incident                                    |  | RAS 3 & 4 Authorisations                      |
|  | Dangerous Substances (List 1) |  | Part A(1) Authorised Processes and Historic IPC Authorisations |  | Part A(2) and Part B Authorised Processes     |
|  | Dangerous Substances (List 2) |  | Water Industry Referrals                                       |  | COMAH / NIHS Sites                            |
|  | Licensed Discharge Consents   |  | Sites Determined as Contaminated Land                          |  | Hazardous Substance Consents and Enforcements |
|  | Red List Discharge Consents   |  |  |  |   |

# 2. Environmental Permits, Incidents and Registers

## 2.1 Industrial Sites Holding Licences and/or Authorisations

Searches of information provided by the Environment Agency/Natural Resources Wales and Local Authorities reveal the following information:

### 2.1.1 Records of historic IPC Authorisations within 500m of the study site:

0

Database searched and no data found.

### 2.1.2 Records of Part A(1) and IPPC Authorised Activities within 500m of the study site:

21

The following Part A(1) and IPPC Authorised Activities are represented as points on the Environmental Permits, Incidents and Registers Map:

ID	Distance (m)	Direction	NGR	Details
113K	167	N	651840 306180	Operator: Biffa Waste Services Ltd Installation Name: Great Yarmouth Wm Resource Centre Epr/rp3636sr Process: DISPOSAL OR RECOVERY OF HAZARDOUS WASTE WITH A CAPACITY EXCEEDING 10 TONNES PER DAY INVOLVING PHYSICO-CHEMICAL TREATMENT Permit Number: JP3336EE Original Permit Number: RP3636SR EPR Reference: - Issue Date: 15/1/2014 Effective Date: 15/1/2014 Last date noted as effective: 2017-04-01 Status: Superseded
114K	167	N	651840 306180	Operator: Biffa Waste Services Ltd Installation Name: Great Yarmouth Wm Resource Centre Epr/rp3636sr Process: DISPOSAL OR RECOVERY OF HAZ WASTE WITH CAPACITY EXCEEDING 10 TONNES PER DAY INVOLVING BLENDING OR MIXING PRIOR TO SUBMISSION TO ANY OF THE OTHER ACTIVITIES LISTED IN THIS SECTION OR IN SECTION 5.1 Permit Number: JP3336EE Original Permit Number: RP3636SR EPR Reference: - Issue Date: 15/1/2014 Effective Date: 15/1/2014 Last date noted as effective: 2017-04-01 Status: Superseded
115K	167	N	651840 306180	Operator: Biffa Waste Services Ltd Installation Name: Great Yarmouth Wm Resource Centre Epr/rp3636sr Process: DISPOSAL OF > 50 T/D NON-HAZARDOUS WASTE (> 100 T/D IF ONLY AD) INVOLVING PHYSICO-CHEMICAL TREATMENT Permit Number: JP3336EE Original Permit Number: RP3636SR EPR Reference: - Issue Date: 15/1/2014 Effective Date: 15/1/2014 Last date noted as effective: 2017-04-01 Status: Superseded

ID	Distance (m)	Direction	NGR	Details
116K	167	N	651840 306180	Operator: Biffa Waste Services Ltd Installation Name: Great Yarmouth Wm Resource Centre Epr/rp3636sr Process: TEMPORARY STORAGE OF HAZ WASTE NOT UNDER S 5.2 PENDING ACTIVITIES LISTED IN S 5.1, 5.2, 5.3 AND PARAGRAPH (B) OF THIS SECTION WITH A TOTAL CAPACITY > 50 TONNES, EXCL TEMP STORAGE WHERE GENERATED Permit Number: JP3336EE Original Permit Number: RP3636SR EPR Reference: - Issue Date: 15/1/2014 Effective Date: 15/1/2014 Last date noted as effective: 2017-04-01 Status: Superseded
117K	167	N	651840 306180	Operator: Biffa Waste Services Ltd Installation Name: Great Yarmouth Wm Resource Centre Epr/rp3636sr Process: ASSOCIATED PROCESS Permit Number: JP3336EE Original Permit Number: RP3636SR EPR Reference: - Issue Date: 15/1/2014 Effective Date: 15/1/2014 Last date noted as effective: 2017-04-01 Status: Superseded
118K	167	N	651840 306180	Operator: Biffa Waste Services Ltd Installation Name: Great Yarmouth Wm Resource Centre Epr/rp3636sr Process: DISPOSAL OR RECOVERY OF HAZARDOUS WASTE WITH A CAPACITY EXCEEDING 10 TONNES PER DAY INVOLVING PHYSICO- CHEMICAL TREATMENT Permit Number: JP3336EE Original Permit Number: RP3636SR EPR Reference: - Issue Date: 15/1/2014 Effective Date: 15/1/2014 Last date noted as effective: 2017-04-01 Status: Superseded
119K	167	N	651840 306180	Operator: Biffa Waste Services Ltd Installation Name: Great Yarmouth Wm Resource Centre Epr/rp3636sr Process: OTHER WASTE DISPOSAL; WASTE OILS >10 T/D Permit Number: RP3636SR Original Permit Number: RP3636SR EPR Reference: - Issue Date: 29/6/2006 Effective Date: 29/6/2006 Last date noted as effective: 2017-04-01 Status: Superseded
120K	167	N	651840 306180	Operator: Biffa Waste Services Ltd Installation Name: Great Yarmouth Wm Resource Centre Epr/rp3636sr Process: OTHER WASTE DISPOSAL; NON-HAZARDOUS WASTE >50T/D BY PHYSICO-CHEMICAL TREATMENT Permit Number: RP3636SR Original Permit Number: RP3636SR EPR Reference: - Issue Date: 29/6/2006 Effective Date: 29/6/2006 Last date noted as effective: 2017-04-01 Status: Superseded
121K	167	N	651840 306180	Operator: Biffa Waste Services Ltd Installation Name: Great Yarmouth Wm Resource Centre Epr/rp3636sr Process: OTHER WASTE DISPOSAL; HAZARDOUS WASTE >10T/D Permit Number: RP3636SR Original Permit Number: RP3636SR EPR Reference: - Issue Date: 29/6/2006 Effective Date: 29/6/2006 Last date noted as effective: 2017-04-01 Status: Superseded
122K	167	N	651840 306180	Operator: Biffa Waste Services Ltd Installation Name: Great Yarmouth Wm Resource Centre Epr/rp3636sr Process: OTHER WASTE DISPOSAL; HAZARDOUS WASTE >10T/D Permit Number: RP3636SR Original Permit Number: RP3636SR EPR Reference: - Issue Date: 29/6/2006 Effective Date: 29/6/2006 Last date noted as effective: 2017-04-01 Status: Superseded



ID	Distance (m)	Direction	NGR	Details
123K	167	N	651840 306180	<p>Operator: Augean North Sea Services Limited</p> <p>Installation Name: Great Yarmouth Wm Resource Centre Epr/zp3637rm</p> <p>Process: DISPOSAL OR RECOVERY OF HAZ WASTE WITH CAPACITY EXCEEDING 10 TONNES PER DAY INVOLVING BLENDING OR MIXING PRIOR TO SUBMISSION TO ANY OF THE OTHER ACTIVITIES LISTED IN THIS SECTION OR IN SECTION 5.1</p> <p>Permit Number: ZP3637RM Original Permit Number: ZP3637RM EPR Reference: - Issue Date: 28/4/2016 Effective Date: 28/4/2016 Last date noted as effective: 2017-04-01 Status: Transfer Effective</p>
124K	167	N	651840 306180	<p>Operator: Augean North Sea Services Limited</p> <p>Installation Name: Great Yarmouth Wm Resource Centre Epr/zp3637rm</p> <p>Process: DISPOSAL OF &gt; 50 T/D NON-HAZARDOUS WASTE (&gt; 100 T/D IF ONLY AD) INVOLVING PHYSICO-CHEMICAL TREATMENT</p> <p>Permit Number: ZP3637RM Original Permit Number: ZP3637RM EPR Reference: - Issue Date: 28/4/2016 Effective Date: 28/4/2016 Last date noted as effective: 2017-04-01 Status: Transfer Effective</p>
125K	167	N	651840 306180	<p>Operator: Augean North Sea Services Limited</p> <p>Installation Name: Great Yarmouth Wm Resource Centre Epr/zp3637rm</p> <p>Process: TEMPORARY STORAGE OF HAZ WASTE NOT UNDER S 5.2 PENDING ACTIVITIES LISTED IN S 5.1, 5.2, 5.3 AND PARAGRAPH (B) OF THIS SECTION WITH A TOTAL CAPACITY &gt; 50 TONNES, EXCL TEMP STORAGE WHERE GENERATED</p> <p>Permit Number: ZP3637RM Original Permit Number: ZP3637RM EPR Reference: - Issue Date: 28/4/2016 Effective Date: 28/4/2016 Last date noted as effective: 2017-04-01 Status: Transfer Effective</p>
126K	167	N	651840 306180	<p>Operator: Augean North Sea Services Limited</p> <p>Installation Name: Great Yarmouth Wm Resource Centre Epr/zp3637rm</p> <p>Process: ASSOCIATED PROCESS</p> <p>Permit Number: ZP3637RM Original Permit Number: ZP3637RM EPR Reference: - Issue Date: 28/4/2016 Effective Date: 28/4/2016 Last date noted as effective: 2017-04-01 Status: Transfer Effective</p>
127K	167	N	651840 306180	<p>Operator: Augean North Sea Services Limited</p> <p>Installation Name: Great Yarmouth Wm Resource Centre Epr/zp3637rm</p> <p>Process: DISPOSAL OR RECOVERY OF HAZARDOUS WASTE WITH A CAPACITY EXCEEDING 10 TONNES PER DAY INVOLVING PHYSICO-CHEMICAL TREATMENT</p> <p>Permit Number: ZP3637RM Original Permit Number: ZP3637RM EPR Reference: - Issue Date: 28/4/2016 Effective Date: 28/4/2016 Last date noted as effective: 2017-04-01 Status: Transfer Effective</p>
128L	187	NW	652050 306300	<p>Operator: C &amp; L Waste Oil Collection Limited</p> <p>Installation Name: Great Yarmouth Oil Reclamation Facility Epr/np3038mb</p> <p>Process: DISPOSAL OR RECOVERY OF HAZARDOUS WASTE WITH A CAPACITY EXCEEDING 10 TONNES PER DAY INVOLVING PHYSICO-CHEMICAL TREATMENT</p> <p>Permit Number: WP3437RY Original Permit Number: NP3038MB EPR Reference: - Issue Date: 27/4/2016 Effective Date: 27/4/2016 Last date noted as effective: 2017-04-01 Status: Effective</p>

ID	Distance (m)	Direction	NGR	Details
129L	187	NW	652050 306300	<p>Operator: C &amp; L Waste Oil Collection Limited            Installation Name: Great Yarmouth Oil Reclamation Facility Epr/np3038mb            Process: TEMPORARY STORAGE OF HAZ WASTE NOT UNDER S 5.2            PENDING ACTIVITIES LISTED IN S 5.1, 5.2, 5.3 AND PARAGRAPH (B) OF THIS SECTION WITH A TOTAL CAPACITY &gt; 50 TONNES, EXCL TEMP STORAGE WHERE GENERATED</p> <p>Permit Number: WP3437RY            Original Permit Number: NP3038MB            EPR Reference: -            Issue Date: 27/4/2016            Effective Date: 27/4/2016            Last date noted as effective: 2017-04-01            Status: Effective</p>
130L	192	NW	652060 306310	<p>Operator: C &amp; L Waste Oil Collection Limited            Installation Name: C &amp; L Waste Oil Collection            Process: RECOVERY OF WASTE; CLEANING/REGENERATING CARBON ETC BY REMOVING SCHEDULED SUBSTANCES</p> <p>Permit Number: NP3038MB            Original Permit Number: NP3038MB            EPR Reference: -            Issue Date: 17/10/2007            Effective Date: 17/10/2007            Last date noted as effective: 2011-08-08            Status: Effective</p>
131L	192	NW	652060 306310	<p>Operator: C &amp; L Waste Oil Collection Limited            Installation Name: Great Yarmouth Oil Reclamation Facility Epr/np3038mb            Process: TEMPORARY STORAGE OF HAZ WASTE NOT UNDER S 5.2            PENDING ACTIVITIES LISTED IN S 5.1, 5.2, 5.3 AND PARAGRAPH (B) OF THIS SECTION WITH A TOTAL CAPACITY &gt; 50 TONNES, EXCL TEMP STORAGE WHERE GENERATED</p> <p>Permit Number: FP3934ER            Original Permit Number: NP3038MB            EPR Reference: -            Issue Date: 10/12/2013            Effective Date: 10/12/2013            Last date noted as effective: 2017-04-01            Status: Superseded</p>
132L	192	NW	652060 306310	<p>Operator: C &amp; L Waste Oil Collection Limited            Installation Name: Great Yarmouth Oil Reclamation Facility Epr/np3038mb            Process: OTHER WASTE DISPOSAL; WASTE OILS &gt;10 T/D</p> <p>Permit Number: NP3038MB            Original Permit Number: NP3038MB            EPR Reference: -            Issue Date: 17/10/2007            Effective Date: 17/10/2007            Last date noted as effective: 2017-04-01            Status: Superseded</p>
133L	192	NW	652060 306310	<p>Operator: C &amp; L Waste Oil Collection Limited            Installation Name: Great Yarmouth Oil Reclamation Facility Epr/np3038mb            Process: DISPOSAL OR RECOVERY OF HAZARDOUS WASTE WITH A CAPACITY EXCEEDING 10 TONNES PER DAY INVOLVING PHYSICO-CHEMICAL TREATMENT</p> <p>Permit Number: FP3934ER            Original Permit Number: NP3038MB            EPR Reference: -            Issue Date: 10/12/2013            Effective Date: 10/12/2013            Last date noted as effective: 2017-04-01            Status: Superseded</p>

### 2.1.3 Records of Red List Discharge Consents (potentially harmful discharges to controlled waters) within 500m of the study site:

0

Database searched and no data found.

### 2.1.4 Records of List 1 Dangerous Substances Inventory Sites within 500m of the study site:

2

The following List 1 Dangerous Substance Inventory Site records are represented as points on the Environmental Permits, Incidents and Registers Map:

ID	Distance (m)	Direction	NGR	Details	
14O	0	On Site	651850 305740	Name: Weatherford Uk Limited Status: Not Active Receiving Water: Na	Authorised Substances: Mercury (other), Cadmium
15C	376	NW	651600 306300	Name: Biffa Waste Services Ltd Status: Active Receiving Water: Na	Authorised Substances: Mercury (other), Cadmium, Carbon tetrachloride, Aldrin, Dieldrin, Endrin, Hexachlorobenzene, Hexachlorobutadiene, Trichlorobenzene, Total DDT

### 2.1.5 Records of List 2 Dangerous Substance Inventory Sites within 500m of the study site:

9

The following List 2 Dangerous Substance Inventory Site records are represented as points on the Environmental Permits, Incidents and Registers Map:

ID	Distance (m)	Direction	NGR	Details	
16B	15	W	651830 305990	Name: Great Yarmouth Cardboard Box Company Status: Not Active Receiving Water: Na	Authorised Substances: pH
17B	44	W	651800 306000	Name: U K Waste Management Limited Status: Active Receiving Water: North Sea	Authorised Substances: Chromium, Copper, Lead, Nickel, Zinc
18	129	N	651820 306140	Name: Edeco Petroleum Services Ltd Status: Not Active Receiving Water: Na	Authorised Substances: pH
19	200	N	652670 306580	Name: Blackfriars Brewery Status: Not Active Receiving Water: Na	Authorised Substances: pH
20	278	W	651570 305930	Name: Superior Linen Service Ltd Status: Not Active Receiving Water: Na	Authorised Substances: pH
21	294	SE	652830 305540	Name: Asco Uk Ltd Status: Not Active Receiving Water: Na	Authorised Substances: pH

ID	Distance (m)	Direction	NGR	Details	
22C	376	NW	651600 306300	Name: Biffa Waste Services Ltd Status: Active Receiving Water: Na	Authorised Substances: Arsenic, Chromium, Copper, Cyanide, Dichlorvos, Lead, Nickel, pH, Tributyltin, Triphenyltin, Zinc, Atrazine & Simazine, Azinphos-methyl, Endosulphan, Fenitrothion, Malathion, Trifluralin, Phenol
23	414	SE	652770 305300	Name: Co-operative Cleaners Ltd Status: Active Receiving Water: Na	Authorised Substances: pH
24	456	SE	652930 305390	Name: C-mac Microcircuits Limited Status: Not Active Receiving Water: Na	Authorised Substances: pH

### 2.1.6 Records of Part A(2) and Part B Activities and Enforcements within 500m of the study site:

16

The following Part A(2) and Part B Activities are represented as points on the Environmental Permits, Incidents and Registers Map:

ID	Distance (m)	Direction	NGR	Details	
87	0	On Site	652554 306353	Address: L J Steward, South Quay Service Station, Southgate Road, N1 3HU Process: Unloading of Petrol into Storage at Service Stations Status: Current Permit Permit Type: Part B	Enforcement: No Enforcements Notified Date of Enforcement: No Enforcements Notified Comment: No Enforcements Notified
88	0	On Site	652355 306146	Address: L J Steward, Southtown Road Service Station, Southtown Road, NR31 0JZ Process: Unloading of Petrol into Storage at Service Stations Status: Current Permit Permit Type: Part B	Enforcement: No Enforcements Notified Date of Enforcement: No Enforcements Notified Comment: No Enforcements Notified
89N	0	On Site	652465 305791	Address: CEBO (UK) Ltd, Gas House Quay North, Malthouse Lane, Gorleston, Norfolk, NR31 0GY Process: Use of Bulk Cement Status: Current Permit Permit Type: Part B	Enforcement: No Enforcements Notified Date of Enforcement: No Enforcements Notified Comment: No Enforcements Notified
90	24	NW	652066 306129	Address: Cemex UK Materials Ltd, Boundary Road, NR31 0LW Process: Use of Bulk Cement Status: Current Permit Permit Type: Part B	Enforcement: No Enforcements Notified Date of Enforcement: No Enforcements Notified Comment: No Enforcements Notified
91	26	N	652324 306236	Address: Jewson, Boundary Road, Great Yarmouth, Norfolk, NR31 0JY Process: timber process Status: Historical Permit Permit Type: Part B	Enforcement: No Enforcements Notified Date of Enforcement: No Enforcements Notified Comment: No Enforcements Notified
92	74	W	651771 305697	Address: C & H Quickmix Ltd, Morton Peto Road, Great Yarmouth, Norfolk, NR31 0LT Process: Use of Bulk Cement Status: Current Permit Permit Type: Part B	Enforcement: No Enforcements Notified Date of Enforcement: No Enforcements Notified Comment: No Enforcements Notified

ID	Distance (m)	Direction	NGR	Details
93	86	SE	652865 305835	Address: British Metal Treatments Ltd, 40 Battery Road, Great Yarmouth, NR30 3NN Process: Other Metal Processes Status: Current Permit Permit Type: Part B Enforcement: No Enforcements Notified Date of Enforcement: No Enforcements Notified Comment: No Enforcements Notified
94	94	S	652738 305781	Address: Haliburton Manufacturing & Services Ltd, Berth 1A, South Denes Road, Great Yarmouth, NR30 3PF Process: Use of Bulk Cement Status: Current Permit Permit Type: Part B Enforcement: No Enforcements Notified Date of Enforcement: No Enforcements Notified Comment: No Enforcements Notified
95K	165	N	651839 306178	Address: UK Waste Management, Bessemer Way, Great Yarmouth, Norfolk, NR31 0LX Process: waste oil burning process Status: Historical Permit Permit Type: Part B Enforcement: No Enforcements Notified Date of Enforcement: No Enforcements Notified Comment: No Enforcements Notified
96	245	N	651821 306257	Address: Hope Construction Materials, Harfreys Industrial Estate, Bessemer Way, Great Yarmouth, NR31 0LX Process: Use of Bulk Cement Status: Current Permit Permit Type: Part B Enforcement: No Enforcements Notified Date of Enforcement: No Enforcements Notified Comment: No Enforcements Notified
97M	299	SE	652998 305667	Address: East Bilney Coachworks Ltd, Fenner Road, Great Yarmouth, Norfolk, NR30 3PS Process: Respraying of Road Vehicles process Status: Current Permit Permit Type: Part B Enforcement: No Enforcements Notified Date of Enforcement: No Enforcements Notified Comment: No Enforcements Notified
98M	300	SE	652998 305666	Address: Halls Group Ltd, Operate at Fenner Road, Great Yarmouth, NR30 3PS Process: Respraying of Road Vehicles process Status: Historical Permit Permit Type: Part B Enforcement: No Enforcements Notified Date of Enforcement: No Enforcements Notified Comment: No Enforcements Notified
99	305	SE	653069 305748	Address: Constitution Motors Ltd, South Beach Parade, Great Yarmouth, NR30 3QN Process: Waste oil Burner Status: Historical Permit Permit Type: Part B Enforcement: No Enforcements Notified Date of Enforcement: No Enforcements Notified Comment: No Enforcements Notified
100	395	NW	652348 306736	Address: Yeoman Bulk Cargoes, Yeoman Wharf, Southtown Road, Great Yarmouth, Norfolk, NR31 0JJ Process: bulk handling of coal Status: Historical Permit Permit Type: Part B Enforcement: No Enforcements Notified Date of Enforcement: No Enforcements Notified Comment: No Enforcements Notified
101	398	W	651449 305756	Address: Coastground Ltd, Morton Peto Road, Great Yarmouth, Norfolk, NR31 0LT Process: Metal coating process Status: Current Permit Permit Type: Part B Enforcement: No Enforcements Notified Date of Enforcement: No Enforcements Notified Comment: No Enforcements Notified
102	405	NE	652889 306703	Address: Baldwin, Albert Road, Great Yarmouth, NR30 3HP Process: waste oil burning process Status: Historical Permit Permit Type: Part B Enforcement: No Enforcements Notified Date of Enforcement: No Enforcements Notified Comment: No Enforcements Notified

### 2.1.7 Records of Category 3 or 4 Radioactive Substances Authorisations:

1

The following RAS Licence (3 or 4) records are represented as points on the Environmental Permits, Incidents and Registers Map:

ID	Distance (m)	Direction	NGR	Address	Operator	Type	Permission Number	Dates	Status
134K	167	N	651840 306180	Tube Care Inspection Ltd, Bessemer Way,harfeys Industrial Estate, Great Yarmouth, Norfolk, NR31 0LX	Tube Care Inspection Ltd	Keeping And Use Of Radioactive Materials (was Rsa60 Section 1).	BS0329	Date of Approval:20/5/2002 Effective from:20/5/2002 Last date of update:2015-01-01	Revoked/cancelled

### 2.1.8 Records of Licensed Discharge Consents within 500m of the study site:

41

The following Licensed Discharge Consents records are represented as points on the Environmental Permits, Incidents and Registers Map:

ID	Distance (m)	Direction	NGR	Details
25D	0	On Site	652420 306190	Address: BOUNDARY RD PS SSO, BOUNDARY RD, GREAT YARMOUTH, NR31 Effluent Type: SEWAGE DISCHARGES - PUMPING STATION - WATER COMPANY Permit Number: AW4TS1735 Permit Version: 2 Receiving Water: River Yare Status: POST NRA LEGISLATION WHERE ISSUE DATE > 31-AUG-89 (HISTORIC ONLY) Issue date: 13/12/1991 Effective Date: 13-Dec-1991 Revocation Date: 15/10/1999
26D	0	On Site	652420 306170	Address: BOUNDARY ROAD STORM PUMPING STATION, GREAT YARMOUTH, NORFOLK, NR31 0JY Effluent Type: SEWAGE DISCHARGES - STW STORM OVERFLOW/STORM TANK - WATER COMPANY Permit Number: AEETS12173 Permit Version: 1 Receiving Water: TIDAL RIVER YARE Status: POST NRA LEGISLATION WHERE ISSUE DATE > 31-AUG-89 (HISTORIC ONLY) Issue date: 15/10/1999 Effective Date: 15-Oct-1999 Revocation Date: -
27D	0	On Site	652420 306170	Address: BOUNDARY ROAD STORM PUMPING STATION, GREAT YARMOUTH, NORFOLK, NR31 0JY Effluent Type: SEWAGE DISCHARGES - PUMPING STATION - WATER COMPANY Permit Number: AEETS03291/12173 Permit Version: 1 Receiving Water: RIVER YARE Status: NEW CONSENT (WRA 91, S88 & SCHED 10 AS AMENDED BY ENV ACT 1995) Issue date: 21/10/2002 Effective Date: 16-Oct-2002 Revocation Date: 16/10/2002
28	0	On Site	652510 305970	Address: SUTTON ROAD OUTFALL, GREAT YARMOUTH Effluent Type: SEWAGE DISCHARGES - UNSPECIFIED - WATER COMPANY Permit Number: AW4TS1389 Permit Version: 1 Receiving Water: River Yare T Status: PRE NRA LEGISLATION WHERE ISSUE DATE < 01-SEP-89 (HISTORIC ONLY) Issue date: 14/10/1987 Effective Date: 14-Oct-1987 Revocation Date: 30/06/1994

ID	Distance (m)	Direction	NGR	Details	
29E	0	On Site	652430 305900	Address: SOUTHTOWN/COBHAM OUTFALL, SOUTHTOWN ROAD, GREAT YARMOUTH, NORFOLK, NR31 0LF Effluent Type: SEWAGE DISCHARGES - PUMPING STATION - WATER COMPANY Permit Number: AEETS03293/12171 Permit Version: 1	Receiving Water: R.YARE Status: NEW CONSENT (WRA 91, S88 & SCHED 10 AS AMENDED BY ENV ACT 1995) Issue date: 21/02/2003 Effective Date: 27-Jan-2003 Revocation Date: 01/04/2005
30E	0	On Site	652430 305900	Address: SOUTHTOWN/COBHAM OUTFALL, SOUTHTOWN ROAD, GREAT YARMOUTH, NORFOLK, NR31 0LF Effluent Type: SEWAGE DISCHARGES - SEWER STORM OVERFLOW - WATER COMPANY Permit Number: AEETS12171 Permit Version: 2	Receiving Water: TIDAL RIVER YARE Status: POST NRA LEGISLATION WHERE ISSUE DATE > 31-AUG-89 (HISTORIC ONLY) Issue date: 24/03/2005 Effective Date: 01-Apr-2005 Revocation Date: -
31E	0	On Site	652430 305900	Address: SOUTHTOWN/COBHAM OUTFALL, SOUTHTOWN ROAD, GREAT YARMOUTH, NORFOLK, NR31 0LF Effluent Type: SEWAGE DISCHARGES - PUMPING STATION - WATER COMPANY Permit Number: AEETS12171 Permit Version: 2	Receiving Water: TIDAL RIVER YARE Status: POST NRA LEGISLATION WHERE ISSUE DATE > 31-AUG-89 (HISTORIC ONLY) Issue date: 24/03/2005 Effective Date: 01-Apr-2005 Revocation Date: -
32E	0	On Site	652430 305900	Address: SOUTHTOWN/COBHAM OUTFALL, SOUTHTOWN ROAD, GREAT YARMOUTH, NORFOLK, NR31 0LF Effluent Type: SEWAGE DISCHARGES - PUMPING STATION - WATER COMPANY Permit Number: AEETS03293/12171 Permit Version: 1	Receiving Water: R.YARE Status: NEW CONSENT (WRA 91, S88 & SCHED 10 AS AMENDED BY ENV ACT 1995) Issue date: 21/02/2003 Effective Date: 27-Jan-2003 Revocation Date: 01/04/2005
33E	0	On Site	652430 305900	Address: SOUTHTOWN/COBHAM OUTFALL, SOUTHTOWN ROAD, GREAT YARMOUTH, NORFOLK, NR31 0LF Effluent Type: SEWAGE DISCHARGES - PUMPING STATION - WATER COMPANY Permit Number: AEETS12171 Permit Version: 1	Receiving Water: TIDAL RIVER YARE Status: POST NRA LEGISLATION WHERE ISSUE DATE > 31-AUG-89 (HISTORIC ONLY) Issue date: 15/10/1999 Effective Date: 15-Oct-1999 Revocation Date: 31/03/2005
34E	0	On Site	652400 305900	Address: SOUTHTOWN COMMON OUTFALL DRAINAGE S, GREAT YARMOUTH, NR31 Effluent Type: MISCELLANEOUS DISCHARGES - SURFACE WATER Permit Number: AW4TS348X Permit Version: 1	Receiving Water: River Yare Status: PRE NRA LEGISLATION WHERE ISSUE DATE < 01-SEP-89 (HISTORIC ONLY) Issue date: 25/01/1963 Effective Date: 25-Jan-1963 Revocation Date: 07/06/1991
35E	0	On Site	652430 305900	Address: SOUTHTOWN/COBHAM OUTFALL, SOUTHTOWN ROAD, GREAT YARMOUTH, NORFOLK, NR31 0LF Effluent Type: SEWAGE DISCHARGES - PUMPING STATION - WATER COMPANY Permit Number: AEETS12171 Permit Version: 1	Receiving Water: TIDAL RIVER YARE Status: POST NRA LEGISLATION WHERE ISSUE DATE > 31-AUG-89 (HISTORIC ONLY) Issue date: 15/10/1999 Effective Date: 15-Oct-1999 Revocation Date: 31/03/2005
36E	0	On Site	652430 305900	Address: SOUTHTOWN/COBHAM OUTFALL, SOUTHTOWN ROAD, GREAT YARMOUTH, NORFOLK, NR31 0LF Effluent Type: SEWAGE DISCHARGES - UNSPECIFIED - WATER COMPANY Permit Number: AW4TS1387 Permit Version: 1	Receiving Water: River Yare T Status: REVOKED (WRA 91, S88 & SCHED 10 AS AMENDED BY ENV ACT 1995) Issue date: 14/10/1987 Effective Date: 14-Oct-1987 Revocation Date: 22/03/2002
37	0	On Site	652550 305830	Address: FISH WHARF OUTFALL, GREAT YARMOUTH Effluent Type: SEWAGE DISCHARGES - UNSPECIFIED - WATER COMPANY Permit Number: AW4TS1385 Permit Version: 1	Receiving Water: River Yare T Status: PRE NRA LEGISLATION WHERE ISSUE DATE < 01-SEP-89 (HISTORIC ONLY) Issue date: 14/10/1987 Effective Date: 14-Oct-1987 Revocation Date: 16/02/1998

ID	Distance (m)	Direction	NGR	Details	
38F	0	On Site	652400 305800	Address: GT YARMOUTH CORPORATION, BOUNDARY ROAD Effluent Type: SEWAGE DISCHARGES - UNSPECIFIED - WATER COMPANY Permit Number: AW4TS721X Permit Version: 1	Receiving Water: River Yare Status: PRE NRA LEGISLATION WHERE ISSUE DATE < 01-SEP-89 (HISTORIC ONLY) Issue date: 09/07/1971 Effective Date: 09-Jul-1971 Revocation Date: 16/02/1998
39D	0	On Site	652400 306200	Address: YEOMAN WHARF, SOUTHTOWN RD, GREAT YARMOUTH, NORFOLK, NR31 OJX Effluent Type: TRADE DISCHARGES - SITE DRAINAGE (CONTAM SURFACE WATER, NOT WASTE SIT Permit Number: PRETS8519 Permit Version: 1	Receiving Water: tidal River Yare Status: POST NRA LEGISLATION WHERE ISSUE DATE > 31-AUG-89 (HISTORIC ONLY) Issue date: 25/10/1993 Effective Date: 25-Oct-1993 Revocation Date: -
40	8	N	652420 306240	Address: BOUNDARY ROAD PS SSO, BOUNDARY ROAD, GREAT YARMOUTH, NR31 Effluent Type: SEWAGE DISCHARGES - STW STORM OVERFLOW/STORM TANK - WATER COMPANY Permit Number: AW4TS1735 Permit Version: 1	Receiving Water: River Yare Status: PRE NRA LEGISLATION WHERE ISSUE DATE < 01-SEP-89 (HISTORIC ONLY) Issue date: 08/11/1988 Effective Date: 08-Nov-1988 Revocation Date: 12/12/1991
41	41	E	652600 305700	Address: SOUTH DENES RD, GT.YARMOUTH, NORFOLK (FERRY STEPS PLANT) Effluent Type: SEWAGE DISCHARGES - FINAL/TREATED EFFLUENT - NOT WATER COMPANY Permit Number: PR4TS385 Permit Version: 1	Receiving Water: Tidal River Yare Status: PRE NRA LEGISLATION WHERE ISSUE DATE < 01-SEP-89 (HISTORIC ONLY) Issue date: 24/03/1986 Effective Date: 24-Mar-1986 Revocation Date: -
42G	43	E	652600 305750	Address: YARMOUTH MARINE BASE, SOUTH DENES, GT YARMOUTH, NR30 3LX Effluent Type: TRADE DISCHARGES - SITE DRAINAGE Permit Number: PRETS4620 Permit Version: 1	Receiving Water: Tidal River Yare Status: POST NRA LEGISLATION WHERE ISSUE DATE > 31-AUG-89 (HISTORIC ONLY) Issue date: 16/12/1991 Effective Date: 16-Dec-1991 Revocation Date: -
43G	53	E	652610 305740	Address: FISH WHARF PS, GREAT YARMOUTH Effluent Type: MISCELLANEOUS DISCHARGES - EMERGENCY DISCHARGES Permit Number: AEETS2306 Permit Version: 1	Receiving Water: Tidal R Yare Status: POST NRA LEGISLATION WHERE ISSUE DATE > 31-AUG-89 (HISTORIC ONLY) Issue date: 02/01/1990 Effective Date: 02-Jan-1990 Revocation Date: 30/04/1992
44G	53	E	652610 305740	Address: FISH WHARF PS, GREAT YARMOUTH Effluent Type: MISCELLANEOUS DISCHARGES - EMERGENCY DISCHARGES Permit Number: AEETS1650 Permit Version: 1	Receiving Water: - Status: POST NRA LEGISLATION WHERE ISSUE DATE > 31-AUG-89 (HISTORIC ONLY) Issue date: 15/09/1990 Effective Date: 15-Sep-1990 Revocation Date: 08/04/1991
45	159	N	652700 306530	Address: SALMON ROAD, GREAT YARMOUTH, NR30 3QS Effluent Type: SEWAGE DISCHARGES - UNSPECIFIED - WATER COMPANY Permit Number: AW4TS1374 Permit Version: 1	Receiving Water: River Yare T Status: PRE NRA LEGISLATION WHERE ISSUE DATE < 01-SEP-89 (HISTORIC ONLY) Issue date: 14/10/1987 Effective Date: 14-Oct-1987 Revocation Date: 16/02/1998
46	189	SE	652630 305480	Address: FISHERMEN'S QUAY, GORLESTON, GT.YARMOUTH. Effluent Type: SEWAGE DISCHARGES - FINAL/TREATED EFFLUENT - NOT WATER COMPANY Permit Number: PR4TS137 Permit Version: 1	Receiving Water: The Tidal River Yare Status: PRE NRA LEGISLATION WHERE ISSUE DATE < 01-SEP-89 (HISTORIC ONLY) Issue date: 23/04/1985 Effective Date: 23-Apr-1985 Revocation Date: -



ID	Distance (m)	Direction	NGR	Details	
47H	203	SE	652710 305520	Address: SUFFLING ROAD PUMPING STATION, SUFFLING ROAD, GREAT YARMOUTH, NORFOLK, NR30 3PQ Effluent Type: SEWAGE DISCHARGES - PUMPING STATION - WATER COMPANY Permit Number: AEETS12169 Permit Version: 1	Receiving Water: TIDAL RIVER YARE Status: POST NRA LEGISLATION WHERE ISSUE DATE > 31-AUG-89 (HISTORIC ONLY) Issue date: 15/10/1999 Effective Date: 15-Oct-1999 Revocation Date: 22/02/2002
48H	203	SE	652710 305520	Address: SUFFLING ROAD PUMPING STATION, SUFFLING ROAD, GREAT YARMOUTH, NORFOLK, NR30 3PQ Effluent Type: SEWAGE DISCHARGES - SEWER STORM OVERFLOW - WATER COMPANY Permit Number: AEETS12169 Permit Version: 2	Receiving Water: TIDAL RIVER YARE Status: POST NRA LEGISLATION WHERE ISSUE DATE > 31-AUG-89 (HISTORIC ONLY) Issue date: 23/02/2002 Effective Date: 23-Feb-2002 Revocation Date: -
49H	203	SE	652710 305520	Address: SUFFLING ROAD PUMPING STATION, SUFFLING ROAD, GREAT YARMOUTH, NORFOLK, NR30 3PQ Effluent Type: SEWAGE DISCHARGES - PUMPING STATION - WATER COMPANY Permit Number: AEETS12169 Permit Version: 2	Receiving Water: TIDAL RIVER YARE Status: POST NRA LEGISLATION WHERE ISSUE DATE > 31-AUG-89 (HISTORIC ONLY) Issue date: 23/02/2002 Effective Date: 23-Feb-2002 Revocation Date: -
50H	203	SE	652710 305520	Address: SUFFLING ROAD PUMPING STATION, SUFFLING ROAD, GREAT YARMOUTH, NORFOLK, NR30 3PQ Effluent Type: SEWAGE DISCHARGES - PUMPING STATION - WATER COMPANY Permit Number: AEETS12169 Permit Version: 1	Receiving Water: TIDAL RIVER YARE Status: POST NRA LEGISLATION WHERE ISSUE DATE > 31-AUG-89 (HISTORIC ONLY) Issue date: 15/10/1999 Effective Date: 15-Oct-1999 Revocation Date: 22/02/2002
51I	371	S	652190 305310	Address: ATCHIN TAN, HARFREYS ROAD, GORLESTON, GT. YARMOUTH, NORFOLK Effluent Type: UNSPECIFIED Permit Number: PRELF03747 Permit Version: 1	Receiving Water: - Status: POST NRA LEGISLATION WHERE ISSUE DATE > 31-AUG-89 (HISTORIC ONLY) Issue date: 30/10/1990 Effective Date: 30-Oct-1990 Revocation Date: 01/10/1996
52I	381	S	652200 305300	Address: HARFREYS ROAD, GT YARMOUTH, NORFOLK Effluent Type: UNSPECIFIED Permit Number: PR4LF268 Permit Version: 1	Receiving Water: Soakaway Status: PRE NRA LEGISLATION WHERE ISSUE DATE < 01-SEP-89 (HISTORIC ONLY) Issue date: 27/09/1985 Effective Date: 27-Sep-1985 Revocation Date: 01/10/1996
53	403	NW	651570 306310	Address: GAPTON HALL TRAVELLERS SITE, GAPTON HALL ROAD, GREAT YARMOUTH, NORFOLK, NR31 0NL Effluent Type: SEWAGE DISCHARGES - FINAL/TREATED EFFLUENT - NOT WATER COMPANY Permit Number: PRENF19844 Permit Version: 1	Receiving Water: DITCH TRIB OF TIDAL R. YARE Status: NEW CONSENT (WRA 91, S88 & SCHED 10 AS AMENDED BY ENV ACT 1995) Issue date: 24/02/2006 Effective Date: 24-Feb-2006 Revocation Date: -
54	412	NW	651620 306360	Address: CVAN SITE GAPTONHALL RD, GREAT YARMOUTH, NORFOLK Effluent Type: MISCELLANEOUS DISCHARGES - SURFACE WATER Permit Number: PRENF07708 Permit Version: 1	Receiving Water: Trib River Yare Status: POST NRA LEGISLATION WHERE ISSUE DATE > 31-AUG-89 (HISTORIC ONLY) Issue date: 06/02/1991 Effective Date: 06-Feb-1991 Revocation Date: -

ID	Distance (m)	Direction	NGR	Details	
55	422	NW	651787 306440	Address: POLICE CUSTODY CENTRE, THAMESFIELD WAY, GREAT YARMOYTH, ,, NORFOLK, NR31 0DH Effluent Type: SEWAGE DISCHARGES - FINAL/TREATED EFFLUENT - NOT WATER COMPANY Permit Number: EPREP3120GR Permit Version: 1	Receiving Water: TRIB OF THE RIVER YARE Status: NEW ISSUED UNDER EPR 2010 Issue date: 12/08/2010 Effective Date: 12-Aug-2010 Revocation Date: -
56	423	NW	651574 306340	Address: GAPTON HALL ROAD & LAND OF A12, GREAT YARMOUTH, NORFOLK, NR31 0LZ Effluent Type: SEWAGE & TRADE COMBINED - UNSPECIFIED Permit Number: PRENF20271 Permit Version: 1	Receiving Water: TRIB RIVER YARE Status: NEW CONSENT, (WATER INDUSTRY ACT 1991, SECTION 166) Issue date: 31/08/2006 Effective Date: 31-Aug-2006 Revocation Date: -
57	473	NW	651620 306430	Address: GAPTON HALL TRAVELLERS SITE, GAPTON HALL ROAD, GREAT YARMOUTH, NORFOLK, NR31 0NL Effluent Type: SEWAGE DISCHARGES - FINAL/TREATED EFFLUENT - NOT WATER COMPANY Permit Number: PRENF19845 Permit Version: 1	Receiving Water: DITCH TRIB OF TIDAL R. YARE Status: NEW CONSENT (WRA 91, S88 & SCHED 10 AS AMENDED BY ENV ACT 1995) Issue date: 24/02/2006 Effective Date: 24-Feb-2006 Revocation Date: -
58J	474	N	652480 306850	Address: BRYANTS QUAY SPS, GREAT YARMOUTH Effluent Type: SEWAGE DISCHARGES - SEWER STORM OVERFLOW - WATER COMPANY Permit Number: AW4TS1408 Permit Version: 1	Receiving Water: River Yare T Status: REVOKED (WRA 91, S88 & SCHED 10 AS AMENDED BY ENV ACT 1995) Issue date: 14/10/1987 Effective Date: 14-Oct-1987 Revocation Date: 22/03/2002
59J	475	N	652460 306850	Address: BRYANTS QUAY OUTFALL, GREAT YARMOUTH Effluent Type: SEWAGE DISCHARGES - UNSPECIFIED - WATER COMPANY Permit Number: AW4TS1388 Permit Version: 1	Receiving Water: River Yare T Status: REVOKED (WRA 91, S88 & SCHED 10 AS AMENDED BY ENV ACT 1995) Issue date: 14/10/1987 Effective Date: 14-Oct-1987 Revocation Date: 22/03/2002
60J	495	N	652460 306870	Address: BRYANTS QUAY PUMPING STATION, SOUTH QUAY, GREAT YARMOUTH, NORFOLK, NR30 2RW Effluent Type: SEWAGE DISCHARGES - PUMPING STATION - WATER COMPANY Permit Number: AEETS12175 Permit Version: 2	Receiving Water: TIDAL RIVER YARE Status: POST NRA LEGISLATION WHERE ISSUE DATE > 31-AUG-89 (HISTORIC ONLY) Issue date: 11/01/2000 Effective Date: 11-Jan-2000 Revocation Date: -
61J	495	N	652460 306870	Address: BRYANTS QUAY PUMPING STATION, SOUTH QUAY, GREAT YARMOUTH, NORFOLK, NR30 2RW Effluent Type: SEWAGE DISCHARGES - STW STORM OVERFLOW/STORM TANK - WATER COMPANY Permit Number: AEETS12175 Permit Version: 2	Receiving Water: TIDAL RIVER YARE Status: POST NRA LEGISLATION WHERE ISSUE DATE > 31-AUG-89 (HISTORIC ONLY) Issue date: 11/01/2000 Effective Date: 11-Jan-2000 Revocation Date: -
62J	495	N	652460 306870	Address: BRYANTS QUAY PUMPING STATION, SOUTH QUAY, GREAT YARMOUTH, NORFOLK, NR30 2RW Effluent Type: SEWAGE DISCHARGES - PUMPING STATION - WATER COMPANY Permit Number: AEETS12175 Permit Version: 1	Receiving Water: TIDAL RIVER YARE Status: POST NRA LEGISLATION WHERE ISSUE DATE > 31-AUG-89 (HISTORIC ONLY) Issue date: 15/10/1999 Effective Date: 15-Oct-1999 Revocation Date: 10/01/2000

ID	Distance (m)	Direction	NGR	Details	
63J	495	N	652460 306870	Address: BRYANTS QUAY PUMPING STATION, SOUTH QUAY, GREAT YARMOUTH, NORFOLK, NR30 2RW Effluent Type: SEWAGE DISCHARGES - PUMPING STATION - WATER COMPANY Permit Number: AEETS12175 Permit Version: 1	Receiving Water: TIDAL RIVER YARE Status: POST NRA LEGISLATION WHERE ISSUE DATE > 31-AUG-89 (HISTORIC ONLY) Issue date: 15/10/1999 Effective Date: 15-Oct-1999 Revocation Date: 10/01/2000
64J	495	N	652460 306870	Address: BRYANTS QUAY PUMPING STATION, SOUTH QUAY, GREAT YARMOUTH, NORFOLK, NR30 2RW Effluent Type: SEWAGE DISCHARGES - PUMPING STATION - WATER COMPANY Permit Number: AEETS03290/12175 Permit Version: 1	Receiving Water: RIVER YARE Status: NEW CONSENT (WRA 91, S88 & SCHED 10 AS AMENDED BY ENV ACT 1995) Issue date: 01/10/2002 Effective Date: 05-Sep-2002 Revocation Date: 01/10/2002
65J	495	N	652460 306870	Address: BRYANTS QUAY PUMPING STATION, SOUTH QUAY, GREAT YARMOUTH, NORFOLK, NR30 2RW Effluent Type: SEWAGE DISCHARGES - PUMPING STATION - WATER COMPANY Permit Number: AEETS03290/12175 Permit Version: 1	Receiving Water: RIVER YARE Status: NEW CONSENT (WRA 91, S88 & SCHED 10 AS AMENDED BY ENV ACT 1995) Issue date: 01/10/2002 Effective Date: 05-Sep-2002 Revocation Date: 01/10/2002

## 2.1.9 Records of Water Industry Referrals (potentially harmful discharges to the public sewer) within 500m of the study site:

4

The following Water Industry Referral records are represented as points on the Environmental Permits, Incidents and Registers Map:

ID	Distance (m)	Direction	Address	Permission reference	Local Authority	First Date Received	Last Date Received	Status
135 O	0	On Site	WEATHERFORD UK LIMITED, HARFREY'S ROAD, HARFREY'S IND EST, GREAT YARMOUTH, NORFOLK, NR31 0LS	CA3653	GREAT YARMOUTH BOROUGH COUNCIL	01-Jul-2010	08-Oct-2016	EFFECTIVE
136 P	0	On Site	GREAT YARMOUTH PORT COMPANY, ATLAS TERMINAL, SOUTHGATES ROAD, GREAT YARMOUTH, NORFOLK, NR30 3LL	SCE0092C 2	NORFOLK	01-Jan-2015	08-Oct-2016	EFFECTIVE
137 Q	13	SE	TOTAL RECLAIM SYSTEMS LIMITED, TOTAL RECLAIM HOUSE, ADMIRALTY ROAD, GREAT YARMOUTH, NORFOLK, NR30 3PU	SCE0097C 2	NORFOLK	04-Jan-2013	08-Oct-2016	EFFECTIVE
138 K	167	N	BIFFA WASTE SERVICES LTD, BESSEMER WAY, HARFEYS IND EST, GREAT YARMOUTH, NORFOLK, NR31 0LX	BL8830	GREAT YARMOUTH BOROUGH COUNCIL	01-Jun-2003	08-Oct-2016	EFFECTIVE

## 2.1.10 Records of Planning Hazardous Substance Consents and Enforcements within 500m of the study site:

2

The following records are represented as points on the Environmental Permits, Incidents and Registers Map:

ID	Distance (m)	Direction	Application Reference Number	NGR	Application Status	Application Date	Address	Details	Details of Enforcement Action
139R	0	On Site	No Details	652738 306121	Approved	No Details	Transco Plc, Southgates Road, Great Yarmouth, NR30 3DR	No Details	Enforcement: No Enforcements Notified Date of Enforcement: No Enforcements Notified Comment: No Enforcements Notified
140S	171	NW	HSC/0001	652131 306327	Historical Consent	20/06/1994	Ventureforth Estates Ltd, Ventureforth House, Great Yarmouth Business Park, Suffolk Road, Great Yarmouth	Storage of ammonium nitrate.	Enforcement: No Enforcements Notified Date of Enforcement: No Enforcements Notified Comment: No Enforcements Notified

## 2.2 Dangerous or Hazardous Sites

Records of COMAH & NIHHS sites within 500m of the study site:

3

The following COMAH & NIHHS Authorisation records provided by the Health and Safety Executive are represented as polygons or buffered points on the Environmental Permits, Incidents and Registers Map:

ID	Distance (m)	Direction	Company	Address	Operational Status	Tier
104	0	On Site	British Gas	British Gas, Southgates Road, Great Yarmouth	Historical NIHHS Site	-
105N	0	On Site	Asco UK Limited	Asco UK Limited, Gas House Quay, Southtown Road, Great Yarmouth, Norfolk, NR30 3LX	Current COMAH Site	COMAH Lower Tier Operator
106G	15	S	ASCO UK Limited	ASCO UK Limited, Great Yarmouth, South Denes, Great Yarmouth, Norfolk, NR30 3LX	Current COMAH Site	COMAH Lower Tier Operator

## 2.3 Environment Agency/Natural Resources Wales Recorded Pollution Incidents

### 2.3.1 Records of National Incidents Recording System, List 2 within 500m of the study site:

13

The following NIRS List 2 records are represented as points on the Environmental Permits, Incidents and Registers Map:

ID	Distance (m)	Direction	NGR	Details	
1	0	On Site	652080 305800	Incident Date: 23-Mar-2002 Incident Identification: 67348 Pollutant: General Biodegradable Materials and Wastes Pollutant Description: Food and Drink	Water Impact: Category 3 (Minor) Land Impact: Category 4 (No Impact) Air Impact: Category 4 (No Impact)
2	0	On Site	652038 305831	Incident Date: 17-Sep-2003 Incident Identification: 190491 Pollutant: Inorganic Chemicals/Products Pollutant Description: Other Inorganic Chemical or Product	Water Impact: Category 4 (No Impact) Land Impact: Category 4 (No Impact) Air Impact: Category 4 (No Impact)
3F	0	On Site	652393 305828	Incident Date: 22-Aug-2003 Incident Identification: 184276 Pollutant: Specific Waste Materials: Specific Waste Materials Pollutant Description: Tyres: Vehicles and Vehicle Parts	Water Impact: Category 4 (No Impact) Land Impact: Category 3 (Minor) Air Impact: Category 4 (No Impact)
4	230	N	652677 306610	Incident Date: 19-Jul-2003 Incident Identification: 175140 Pollutant: Organic Chemicals/Products Pollutant Description: Solvents	Water Impact: Category 4 (No Impact) Land Impact: Category 4 (No Impact) Air Impact: Category 3 (Minor)
5	268	S	652860 305630	Incident Date: 03-Nov-2002 Incident Identification: 118445 Pollutant: Sewage Materials Pollutant Description: Storm Sewage	Water Impact: Category 3 (Minor) Land Impact: Category 4 (No Impact) Air Impact: Category 4 (No Impact)
6A	314	N	652546 306692	Incident Date: 22-Nov-2001 Incident Identification: 44483 Pollutant: Atmospheric Pollutants and Effects: Contaminated Water Pollutant Description: Smoke: Firefighting Run-Off	Water Impact: Category 4 (No Impact) Land Impact: Category 4 (No Impact) Air Impact: Category 3 (Minor)
7A	314	N	652546 306692	Incident Date: 22-Nov-2001 Incident Identification: 44483 Pollutant: Atmospheric Pollutants and Effects Pollutant Description: Smoke	Water Impact: Category 4 (No Impact) Land Impact: Category 4 (No Impact) Air Impact: Category 3 (Minor)
8A	314	N	652546 306692	Incident Date: 22-Nov-2001 Incident Identification: 44483 Pollutant: Contaminated Water Pollutant Description: Firefighting Run-Off	Water Impact: Category 4 (No Impact) Land Impact: Category 4 (No Impact) Air Impact: Category 3 (Minor)
9	412	NW	652242 306687	Incident Date: 05-Apr-2002 Incident Identification: 69833 Pollutant: General Biodegradable Materials and Wastes Pollutant Description: Animal and Vegetable Oil	Water Impact: Category 4 (No Impact) Land Impact: Category 4 (No Impact) Air Impact: Category 4 (No Impact)
10	447	N	652400 306810	Incident Date: 10-Jan-2002 Incident Identification: 51678 Pollutant: Oils and Fuel Pollutant Description: Gas and Fuel Oils	Water Impact: Category 3 (Minor) Land Impact: Category 4 (No Impact) Air Impact: Category 4 (No Impact)

ID	Distance (m)	Direction	NGR	Details	
11	471	E	653200 306330	Incident Date: 21-Nov-2002 Incident Identification: 122176 Pollutant: Oils and Fuel Pollutant Description: Mixed/Waste Oils	Water Impact: Category 1 (Major) Land Impact: Category 1 (Major) Air Impact: Category 4 (No Impact)
12	477	S	652323 305182	Incident Date: 11-Sep-2001 Incident Identification: 30255 Pollutant: Agricultural Materials and Wastes Pollutant Description: Solid Manure	Water Impact: Category 4 (No Impact) Land Impact: Category 4 (No Impact) Air Impact: Category 4 (No Impact)
13J	500	N	652457 306874	Incident Date: 16-Nov-2002 Incident Identification: 121239 Pollutant: Sewage Materials Pollutant Description: Crude Sewage	Water Impact: Category 3 (Minor) Land Impact: Category 4 (No Impact) Air Impact: Category 4 (No Impact)

### 2.3.2 Records of National Incidents Recording System, List 1 within 500m of the study site:

0

Database searched and no data found.

### 2.4 Sites Determined as Contaminated Land under Part 2A EPA 1990

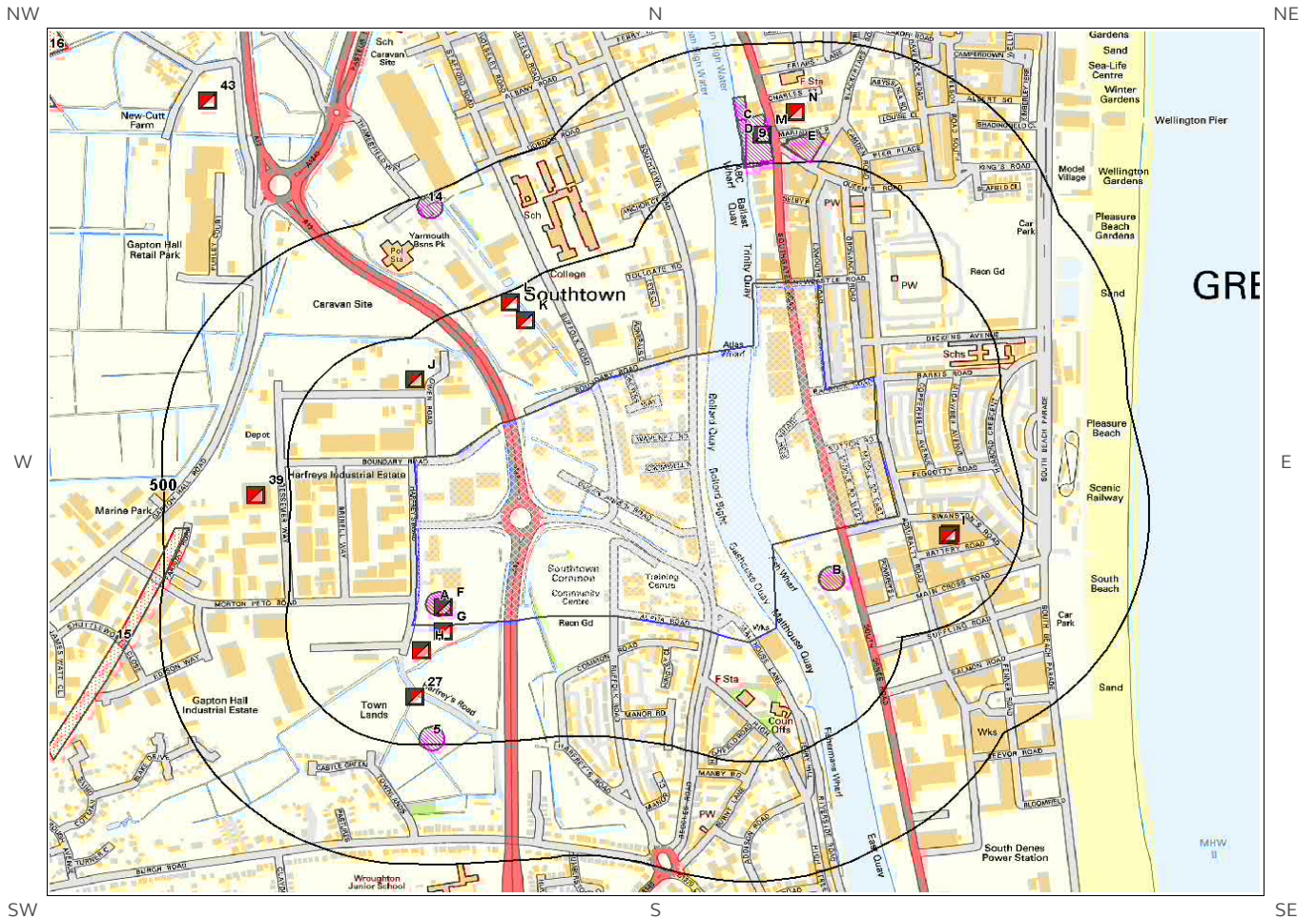
How many records of sites determined as contaminated land under Section 78R of the Environmental Protection Act 1990 are there within 500m of the study site?

0










Database searched and no data found.



# 3. Landfill and Other Waste Sites Map



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- |   |                        |   |                           |   |   |
|---|------------------------|---|---------------------------|---|---|
|  | Site Outline           |  | EA/NRW Active Landfill    |  | Historic and Planned Waste Sites                    |
|  | 250 Search Buffers (m) |  | EA/NRW Historic Landfill  |  | EA/NRW Licensed Waste Site                          |
|  | 500 Search Buffers (m) |  | BGS / DoE Survey Landfill |  | Local Authority/Historical Mapping Landfill Records |



# 3. Landfill and Other Waste Sites

## 3.1 Landfill Sites

3.1.1 Records from Environment Agency/Natural Resources Wales landfill data within 1000m of the study site:

0

Database searched and no data found.

3.1.2 Records of Environment Agency/Natural Resources Wales historic landfill sites within 1500m of the study site:

2

The following landfill records are represented as either points or polygons on the Landfill and Other Waste Sites map:

ID	Distance (m)	Direction	NGR	Details	
15	451	W	651200 305600	Site Address: Gapton Hall Site, Between Harfeys Road and Burgh Road, Great Yarmouth Waste Licence: - Site Reference: WD 709a Waste Type: Inert, Industrial, Commercial, Household Environmental Permitting Regulations (Waste) Reference: -	Licence Issue: Licence Surrendered: Licence Holder Address: - Operator: County Council Licence Holder: Great Yarmouth Council First Recorded: 30-Jun-1973 Last Recorded: 31-Dec-1974
16	1020	NW	650900 307300	Site Address: Cobholm Tip, Farm Lane, Humberstone, Great Yarmouth, Norfolk Waste Licence: Yes Site Reference: WD 506, WR 764, NFK/LS/060/0 Waste Type: Inert, Industrial, Commercial, Household Environmental Permitting Regulations (Waste) Reference: AZ1/L/VIN001	Licence Issue: 02-Jan-1974 Licence Surrendered: Licence Holder Address: Humberstone Farm, Southtown, Great Yarmouth, Norfolk Operator: Gt Yarmouth Borough Council Licence Holder: W H Vincent First Recorded: 31-May-1905 Last Recorded: 31-Dec-1995

3.1.3 Records of BGS/DoE non-operational landfill sites within 1500m of the study site:

0

Database searched and no data found.

### 3.1.4 Records of Landfills from Local Authority and Historical Mapping Records within 1500m of the study site:

0

Database searched and no data found.

## 3.2 Other Waste Sites

### 3.2.1 Records of waste treatment, transfer or disposal sites within 500m of the study site:

14

The following waste treatment, transfer or disposal sites records are represented as points on the Landfill and Other Waste Sites map:

ID	Distance (m)	Direction	NGR	Details		
1A	0	On Site	651890 305707	Type of Site: Waste Recycling Centre Site Address: East Coast Waste, Harfreys Road, Harfreys Industrial Estate, GREAT YARMOUTH, Norfolk, NR31 0LS	Planning Application Reference: 06/07/0901/F Date: -	Further Details: Scheme comprises raise roof of waste recycling centre. An application (ref: 06/07/0901/F) for detailed planning permission was granted by Great Yarmouth B.C. Planning decision obtained Data Source: Historic Planning Application Data Type: Point
2A	0	On Site	651890 305707	Type of Site: Waste Recycling Centre Site Address: East Coast Waste, Harfreys Road, Harfreys Industrial Estate, GREAT YARMOUTH, Norfolk, NR31 0LS	Planning Application Reference: 06/07/0901/F Date: -	Further Details: Scheme comprises raise roof of waste recycling centre. An application (ref: 06/07/0901/F) for detailed planning permission was granted by Great Yarmouth B.C. Planning decision obtained Data Source: Historic Planning Application Data Type: Point

ID	Distance (m)	Direction	NGR	Details	
3B	74	S	652669 305759	Type of Site: Waste Transfer Station Site Address: 52 South Denes Road, GREAT YARMOUTH, Norfolk, NR30 3PR	Planning Application Reference: 6/95/593/F Date: -  Further Details: Comprises the installation of four new tanks totalling 82,000 gals for a new waste transfer station. Scheme comprises the installation of four new tanks totalling 82,000 gals for a new waste transfer station to control waste and cleaning within a containment area. This will include security fencing, loading areas and bollards. NEW INFORMATION: We are now advised that the land will be sold with the advantage of planning approval. An application (ref: 6/95/593/F) for Detailed Planning permission was submitted to Great Yarmouth B.C. on 3rd July 1995. Data Source: Historic Planning Application Data Type: Point
4B	74	S	652670 305759	Type of Site: Waste Transfer Station Site Address: ASCO UK Ltd, South Denes Road, GREAT YARMOUTH, Norfolk, NR30 3QF	Planning Application Reference: 06/98/0582/F Date: 01/05/1999  Further Details: Construction of a waste transfer station. The work will involve the construction of a waste transfer station which will include a recycling centre. Also included is a main storage building with roller shutters, laboratory, changing rooms, mess and powerwash bays, portable buildings, toilets, offices and storage tanks. An application (ref: 06/98/0582/F) for Detailed Planning permission was granted by Great Yarmouth B.C. on 4th September 1998. Data Source: Historic Planning Application Data Type: Point

ID	Distance (m)	Direction	NGR	Details		
5	212	S	651877 305425	Type of Site: Waste Transfer Station Site Address: Harfreys Road Industrial Site, GREAT YARMOUTH, Norfolk, NR30	Planning Application Reference: 98/0011 Date: 01/05/1998	Further Details: Improvements to works included 4 bulk storage tanks 2 x 5,000 gallons and 1 x 10,000 gallons and 1 x 12,000 gallons. Relocation of canopy tent and re-concreting of part of the yard with a new drainage system. Improvements to works included 4 bulk store tanks 2 x 5,000 gallons and 1 x 10,000 gallons and 1 x 12,000 gallons. Relocation of canopy tent and re-concreting of part of the yard with a new drainage system. NEW INFORMATION: Detailed plans approved by Norfolk County Council on the 3rd March, 1998. An application (ref: 98/0011) for Detailed Planning permission was granted by Great Yarmouth B.C. on 3rd March 1998. Data Source: Historic Planning Application Data Type: Point
6D	242	N	652491 306670	Type of Site: Scrap Iron Works Site Address: N/A	Planning Application Reference: N/A Date: 1967	Further Details: N/A Data Source: Historic Mapping Data Type: Polygon
7C	242	N	652495 306663	Type of Site: Scrap Iron Works Site Address: N/A	Planning Application Reference: N/A Date: 1987	Further Details: N/A Data Source: Historic Mapping Data Type: Polygon
8C	242	N	652495 306663	Type of Site: Scrap Iron Works Site Address: N/A	Planning Application Reference: N/A Date: 1987	Further Details: N/A Data Source: Historic Mapping Data Type: Polygon
9	242	N	652527 306675	Type of Site: Scrap Iron Works Site Address: N/A	Planning Application Reference: N/A Date: 1975	Further Details: N/A Data Source: Historic Mapping Data Type: Polygon
10D	242	N	652527 306675	Type of Site: Scrap Iron Works Site Address: N/A	Planning Application Reference: N/A Date: 1966	Further Details: N/A Data Source: Historic Mapping Data Type: Polygon
11E	249	N	652613 306663	Type of Site: Scrap Metal & Paper Merchants Site Address: N/A	Planning Application Reference: N/A Date: 1954	Further Details: N/A Data Source: Historic Mapping Data Type: Polygon
12E	249	N	652613 306663	Type of Site: Scrap Metal & Paper Merchants Site Address: N/A	Planning Application Reference: N/A Date: 1966	Further Details: N/A Data Source: Historic Mapping Data Type: Polygon
13E	250	N	652613 306663	Type of Site: Scrap Metal & Paper Merchants Site Address: N/A	Planning Application Reference: N/A Date: 1963	Further Details: N/A Data Source: Historic Mapping Data Type: Polygon

ID	Distance (m)	Direction	NGR	Details	
14	450	N	651873 306538	Type of Site: Recycling Centre (Conversion) Site Address: Premier Recycling, Thamesfield Way, Great Yarmouth Business Park, GREAT YARMOUTH, Norfolk, NR31 0DN	Planning Application Reference: 06/06/0399/F Date: -  Further Details: Scheme comprises change of use to allow for metal recycling operations to be included into allowed uses. An application (ref: 06/06/0399/F) for Detailed Planning permission was submitted to Great Yarmouth B.C. on 5th May 2006. Data Source: Historic Planning Application Data Type: Point

### 3.2.2 Records of Environment Agency/Natural Resources Wales licensed waste sites within 1500m of the study site:

35

The following waste treatment, transfer or disposal sites records are represented as points on the Landfill and Other Waste Sites map:

ID	Distance (m)	Direction	NGR	Details	
17F	0	On Site	651900 305700	Site Address: Lindgreat Yard, Harfreys Road, Great Yarmouth, Norfolk, NR31 0LS Type: Household, Commercial & Industrial Waste T Stn Size: >= 25000 tonnes < 75000 tonnes Environmental Permitting Regulations (Waste) Licence Number: THU005 EPR reference: - Operator: Thurtle Walter Waste Management licence No: 71429 Annual Tonnage: 25000.0	Issue Date: 08/04/2005 Effective Date: - Modified: - Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Issued Site Name: Lindgreat Yard Correspondence Address: Mr Gary Thurtle, Lindgreat Yard, Harfreys Road, Great Yarmouth, Norfolk, NR31 0LS
18F	0	On Site	651900 305700	Site Address: W T Waste, Harfreys Road, Harfreys Ind Est, Great Yarmouth, Norfolk, NR31 0LS Type: Household, Commercial & Industrial Waste T Stn Size: < 25000 tonnes Environmental Permitting Regulations (Waste) Licence Number: THU005 EPR reference: EA/EPR/CP3094NZ/V003 Operator: Thurtle Walter Waste Management licence No: 71429 Annual Tonnage: 25000.0	Issue Date: 08/04/2005 Effective Date: - Modified: 27/10/2014 Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Modified Site Name: W T Waste Correspondence Address: -
19G	13	S	651900 305650	Site Address: Folkes Plant And Aggregate, Harfrey's Road, Harfrey's Industrial Est, Great Yarmouth, Norfolk, NR31 0LS Type: Household, Commercial & Industrial Waste T Stn Size: < 25000 tonnes Environmental Permitting Regulations (Waste) Licence Number: FOL001 EPR reference: EA/EPR/FP3394NJ/A001 Operator: Folkes Plant & Aggregate Ltd Waste Management licence No: 71417 Annual Tonnage: 24999.0	Issue Date: 13/07/2005 Effective Date: - Modified: - Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Issued Site Name: Folkes Plant And Aggregate Correspondence Address: -

ID	Distance (m)	Direction	NGR	Details
20G	13	S	651900 305650	<p>Site Address: Land Off Harfreys Road, Harfreys Indus Est, Great Yarmouth, Norfolk, NR31 9PY</p> <p>Type: 75kte HCl Waste TS + treatment Size: &lt; 25000 tonnes</p> <p>Environmental Permitting Regulations (Waste) Licence Number: FOL001 EPR reference: EA/EPR/FP3394NJ/V002 Operator: Folkes Plant &amp; Aggregates Limited</p> <p>Waste Management licence No: 71417 Annual Tonnage: 24999.0</p> <p>Issue Date: 13/07/2005 Effective Date: - Modified: 22/10/2014 Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Modified</p> <p>Site Name: Folkes Transfer Station Correspondence Address: -</p>
21G	13	S	651900 305650	<p>Site Address: Harfrey's Road, Harfrey's Industrial Est, Great Yarmouth, Norfolk, NR31 0LS</p> <p>Type: Household, Commercial &amp; Industrial Waste T Stn Size: &lt; 25000 tonnes</p> <p>Environmental Permitting Regulations (Waste) Licence Number: FOL001 EPR reference: - Operator: Folkes Plant &amp; Aggregate Limited</p> <p>Waste Management licence No: 71417 Annual Tonnage: 24999.0</p> <p>Issue Date: 13/07/2005 Effective Date: - Modified: - Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Issued</p> <p>Site Name: Folkes Plant And Aggregate Correspondence Address: W. A. S. Ltd, P O Box 151, Lowestoft, Suffolk, NR32 3ZQ</p>
22H	53	S	651857 305610	<p>Site Address: Hafreys Industrial Estate, Hafreys Road, Great Yarmouth, Norfolk, NR31 0JR</p> <p>Type: Special Waste Transfer Station Size: &gt;= 75000 tonnes</p> <p>Environmental Permitting Regulations (Waste) Licence Number: MRP001 EPR reference: - Operator: Clements P</p> <p>Waste Management licence No: 70532 Annual Tonnage: 0.0</p> <p>Issue Date: 04/01/1990 Effective Date: - Modified: - Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Issued</p> <p>Site Name: Great Yarmouth Correspondence Address: 74, Southdown Road, Great Yarmouth, Norfolk, NR31 0JR</p>
23H	53	S	651857 305610	<p>Site Address: Harfreys Industrial Estate, Harfreys Road, Great Yarmouth, Norfolk, NR31 0LS</p> <p>Type: Special Waste Transfer Station Size: &gt;= 75000 tonnes</p> <p>Environmental Permitting Regulations (Waste) Licence Number: MRP001 EPR reference: EA/EPR/YP3299NB/A001 Operator: Clements Paul</p> <p>Waste Management licence No: 70532 Annual Tonnage: 62500.0</p> <p>Issue Date: 04/01/1990 Effective Date: - Modified: - Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Issued</p> <p>Site Name: Great Yarmouth Correspondence Address: -</p>
24I	108	SE	652900 305850	<p>Site Address: Hendee House, Battery Road, Great Yarmouth, Norfolk, NR30 3NN</p> <p>Type: Asbestos Waste Transfer Station Size: &lt; 25000 tonnes</p> <p>Environmental Permitting Regulations (Waste) Licence Number: EAS147 EPR reference: EA/EPR/AB3801UE/S002 Operator: East Coast Insulations Limited</p> <p>Waste Management licence No: 71491 Annual Tonnage: 0.0</p> <p>Issue Date: 10/11/2006 Effective Date: 14/11/2013 Modified: 17/03/2011 Surrendered Date: 03/05/2016 Expiry Date: - Cancelled Date: - Status: Surrendered</p> <p>Site Name: Hendee House Correspondence Address: -</p>

ID	Distance (m)	Direction	NGR	Details
25I	108	SE	652900 305850	<p>Site Address: Hendee House, Battery Road, Great Yarmouth, Norfolk, NR30 3NN</p> <p>Type: Asbestos Waste Transfer Station Size: &lt; 25000 tonnes</p> <p>Environmental Permitting Regulations (Waste) Licence Number: LEA002 EPR reference: EA/EPR/VP3494NV/V002 Operator: Mr Rodney John Lear And Mrs Pamela Margaret Lear Waste Management licence No: 71491 Annual Tonnage: 3650.0</p> <p>Issue Date: 10/11/2006 Effective Date: - Modified: 17/03/2011 Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Modified Site Name: Hendee House Correspondence Address: -</p>
26I	111	E	652905 305855	<p>Site Address: Hendee House, Battery Road, Great Yarmouth, Norfolk, NR30 3NW</p> <p>Type: Special Waste Transfer Station Size: &lt; 25000 tonnes</p> <p>Environmental Permitting Regulations (Waste) Licence Number: LEA002 EPR reference: VP3494NV/A001 Operator: R J Lear And P M Lear Waste Management licence No: 71491 Annual Tonnage: 3650.0</p> <p>Issue Date: 10/11/2006 Effective Date: - Modified: - Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Issued Site Name: Hendee House, Battery Road Correspondence Address: -</p>
27	150	S	651843 305513	<p>Site Address: Hafrey's Road Transfer Station, Hafrey's Road, Townlands, Great Yarmouth, Norfolk, NR31 8JL</p> <p>Type: Inert &amp; excavation Waste TS + treatment Size: &lt; 25000 tonnes</p> <p>Environmental Permitting Regulations (Waste) Licence Number: GRE397 EPR reference: EA/EPR/EB3535AM/V002 Operator: E E Green &amp; Son Ltd Waste Management licence No: 103802 Annual Tonnage: 74999.0</p> <p>Issue Date: 23/01/2012 Effective Date: - Modified: 01/05/2015 Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Modified Site Name: Hafrey's Road Transfer Station Correspondence Address: -</p>
28J	163	N	651844 306177	<p>Site Address: Unit 2, Bessemer Way, Hafreys Industrial Estate, Great Yarmouth, NR31 0LX</p> <p>Type: Special Waste Transfer Station Size: &lt; 25000 tonnes</p> <p>Environmental Permitting Regulations (Waste) Licence Number: UKW001 EPR reference: - Operator: U K Waste Management Ltd Waste Management licence No: 70505 Annual Tonnage: 0.0</p> <p>Issue Date: 01/05/1992 Effective Date: - Modified: - Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Issued Site Name: Great Yarmouth Correspondence Address: Head Office, Coronation Road, Cressex, High Wycombe, HP12 3TZ</p>
29J	163	N	651844 306177	<p>Site Address: Unit 2, Bessemer Way, Hafreys Industrial Estate, Great Yarmouth, Norfolk, NR31 0LX</p> <p>Type: Special Waste Transfer Station Size: &lt; 25000 tonnes</p> <p>Environmental Permitting Regulations (Waste) Licence Number: UKW003 EPR reference: EA/EPR/KP3898VU/V002 Operator: Biffa Waste Services Ltd Waste Management licence No: 70505 Annual Tonnage: 4999.0</p> <p>Issue Date: 01/05/1992 Effective Date: - Modified: 02/04/2012 Surrendered Date: 0 Expiry Date: - Cancelled Date: - Status: Modified Site Name: Biffa Waste Services Ltd Correspondence Address: -</p>

ID	Distance (m)	Direction	NGR	Details
30J	163	N	651844 306177	<p>Site Address: Unit 2, Bessemer Way, Hareys Industrial Estate, Great Yarmouth, Norfolk, NR31 0LX</p> <p>Type: Special Waste Transfer Station Size: &lt; 25000 tonnes</p> <p>Environmental Permitting Regulations (Waste) Licence Number: AUG012 EPR reference: EA/EPR/EB3001TS/T001 Operator: Augean North Sea Services Limited</p> <p>Waste Management licence No: 70505 Annual Tonnage: 4999.0</p> <p>Issue Date: 01/05/1992 Effective Date: 19/04/2016 Modified: 02/04/2012 Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Transferred Site Name: Great Yarmouth Waste Management Resource Centre Correspondence Address: -</p>
31K	183	NW	652062 306301	<p>Site Address: Yarmouth Business Park, Suffolk Road, Great Yarmouth, Norfolk, NR31 0ER</p> <p>Type: Special Waste Transfer Station Size: &lt; 25000 tonnes</p> <p>Environmental Permitting Regulations (Waste) Licence Number: MIT001 EPR reference: EA/EPR/YP3799NF/V002 Operator: Mitchell Cliff</p> <p>Waste Management licence No: 70536 Annual Tonnage: 5000.0</p> <p>Issue Date: 03/09/1991 Effective Date: - Modified: 26/01/2006 Surrendered Date: 0 Expiry Date: - Cancelled Date: - Status: Modified Site Name: C + L Waste Oil Collection Correspondence Address: -</p>
32K	183	NW	652062 306301	<p>Site Address: Yarmouth Business Park, Thamesfield Way, Great Yarmouth, Norfolk, NR31 0DN</p> <p>Type: Special Waste Transfer Station Size: &lt; 25000 tonnes</p> <p>Environmental Permitting Regulations (Waste) Licence Number: MIT001 EPR reference: EA/EPR/YP3799NF/V003 Operator: Mitchell C B</p> <p>Waste Management licence No: 70536 Annual Tonnage: 5000.0</p> <p>Issue Date: 03/09/1991 Effective Date: - Modified: 10/05/2016 Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Modified Site Name: Great Yarmouth Oil Reclamation Facility Correspondence Address: -</p>
33L	229	NW	652033 306339	<p>Site Address: Yarmouth Business Park, Suffolk Road, Great Yarmouth, Norfolk, NR31 0ER</p> <p>Type: Special Waste Transfer Station Size: &lt; 25000 tonnes</p> <p>Environmental Permitting Regulations (Waste) Licence Number: MRE001 EPR reference: - Operator: Brown E W</p> <p>Waste Management licence No: 70535 Annual Tonnage: 0.0</p> <p>Issue Date: 03/09/1991 Effective Date: - Modified: - Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Issued Site Name: Great Yarmouth Correspondence Address: Brookfields Business Centre, Cottenham, Cambridge, CB4 8PS</p>
34L	229	NW	652033 306339	<p>Site Address: Yarmouth Business Park, Suffolk Road, Great Yarmouth, Norfolk, NR31 0ER</p> <p>Type: Special Waste Transfer Station Size: &lt; 25000 tonnes</p> <p>Environmental Permitting Regulations (Waste) Licence Number: MA001 EPR reference: - Operator: Malary Environmental Services Ltd</p> <p>Waste Management licence No: 70535 Annual Tonnage: 0.0</p> <p>Issue Date: 03/09/1991 Effective Date: 01/07/2004 Modified: 01/07/2004 Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Modified Site Name: Yarmouth Business Park Correspondence Address: D Stapleton, Brookfield Business Centre, Unit B1, Twenty Pence Road, Cottenham, Cambridge, CB4 8PS</p>



ID	Distance (m)	Direction	NGR	Details
35L	229	NW	652033 306339	<p>Site Address: Yarmouth Business Park, Suffolk Road, Great Yarmouth, Norfolk, NR31 0ER Type: Special Waste Transfer Station Size: &lt; 25000 tonnes Environmental Permitting Regulations (Waste) Licence Number: MAL001 EPR reference: EA/EPR/YP3199NQ/S004 Operator: Malary Ltd Waste Management licence No: 70535 Annual Tonnage: 0.0</p> <p>Issue Date: 03/09/1991 Effective Date: 23/11/2006 Modified: 01/07/2004 Surrendered Date: 14/03/2007 Expiry Date: - Cancelled Date: - Status: Surrendered Site Name: Yarmouth Business Park Correspondence Address: -</p>
36L	229	NW	652033 306339	<p>Site Address: Yarmouth Business Park, Suffolk Road, Great Yarmouth, Norfolk, NR31 0ER Type: Special Waste Transfer Station Size: &lt; 25000 tonnes Environmental Permitting Regulations (Waste) Licence Number: MA001 EPR reference: - Operator: Malary Environmental Services Ltd Waste Management licence No: 70535 Annual Tonnage: 0.0</p> <p>Issue Date: 03/09/1991 Effective Date: 01/07/2004 Modified: 01/07/2004 Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Modified Site Name: Yarmouth Business Park Correspondence Address: Brookfield Business Centre, Unit B1, Twentypence Road, Cottenham, Cambridge, CB4 8PS</p>
37M	310	N	652531 306688	<p>Site Address: 132b, South Quay, Great Yarmouth, Norfolk, NR30 3LD Type: Metal Recycling Site (mixed MRS's) Size: &gt;= 75000 tonnes Environmental Permitting Regulations (Waste) Licence Number: MAY001 EPR reference: EA/EPR/AP3999NE/V002 Operator: Mayer Parry ( East Anglia ) Ltd Waste Management licence No: 70493 Annual Tonnage: 78000.0</p> <p>Issue Date: 23/08/1993 Effective Date: - Modified: 11/12/1992 Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Modified Site Name: Great Yarmouth Correspondence Address: -</p>
38M	310	N	652531 306688	<p>Site Address: South Quay, Great Yarmouth, Norfolk, NR30 3LD Type: Metal Recycling Site (mixed MRS's) Size: &gt;= 75000 tonnes Environmental Permitting Regulations (Waste) Licence Number: MAY001 EPR reference: - Operator: Mayer Parry East Anglia Ltd Waste Management licence No: 70493 Annual Tonnage: 0.0</p> <p>Issue Date: 23/08/1993 Effective Date: - Modified: - Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Issued Site Name: Great Yarmouth Correspondence Address: 111, Fordham Road, Snailwell, Newmarket, Suffolk, CB8 7ND</p>
39	319	W	651529 305936	<p>Site Address: Bessemer Way, Hafreys Industrial Estate, Great Yarmouth, Norfolk, NR31 0LX Type: Household, Commercial &amp; Industrial Waste T Stn Size: &lt; 25000 tonnes Environmental Permitting Regulations (Waste) Licence Number: TRA001 EPR reference: EA/EPR/YP3699NT/S002 Operator: Transmit Containers Ltd Waste Management licence No: 70534 Annual Tonnage: 432.0</p> <p>Issue Date: 06/12/1990 Effective Date: - Modified: - Surrendered Date: 14/11/2003 Expiry Date: - Cancelled Date: - Status: Surrendered Site Name: Great Yarmouth Correspondence Address: -</p>

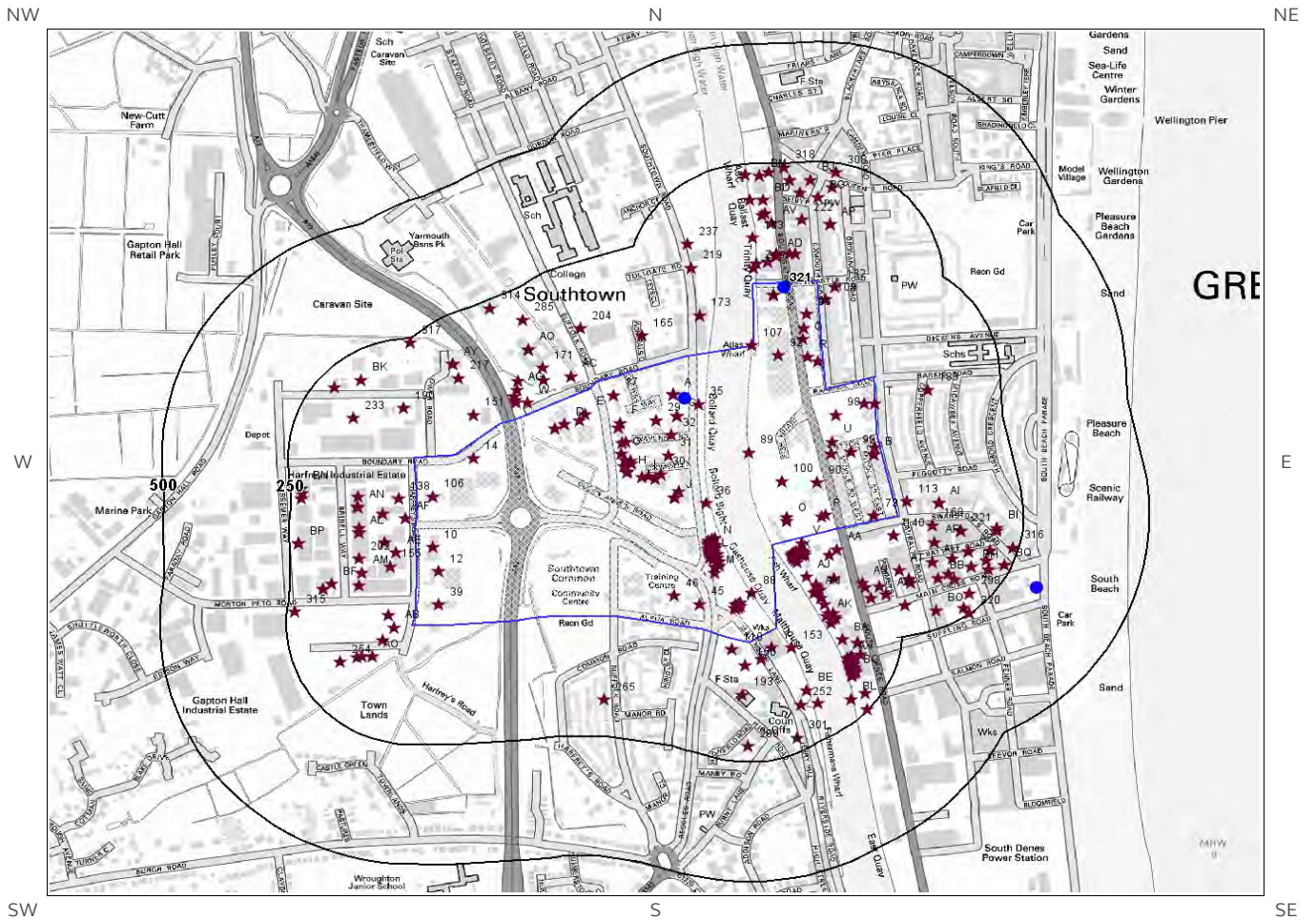
ID	Distance (m)	Direction	NGR	Details
40N	354	N	652597 306735	<p>Site Address: G A Car Spares, 127/129, South Quay, Great Yarmouth, Norfolk, NR30 3LD</p> <p>Type: Vehicle Depollution Facility &lt;5000 tps</p> <p>Size: &lt; 25000 tonnes</p> <p>Environmental Permitting Regulations (Waste) Licence Number: ALL136</p> <p>EPR reference: EA/EPR/JB3537RX/A001</p> <p>Operator: Allard Michael</p> <p>Waste Management licence No: 104491</p> <p>Annual Tonnage: 4999.0</p> <p>Issue Date: 31/07/2012</p> <p>Effective Date: -</p> <p>Modified: -</p> <p>Surrendered Date: -</p> <p>Expiry Date: -</p> <p>Cancelled Date: -</p> <p>Status: Issued</p> <p>Site Name: G A Car Spares</p> <p>Correspondence Address: -</p>
41N	354	N	652597 306735	<p>Site Address: G &amp; A Car Spares, 127 - 129, South Quay, Great Yarmouth, Norfolk, NR30 3LD</p> <p>Type: Vehicle Depollution Facility &lt;5000 tps</p> <p>Size: &lt; 25000 tonnes</p> <p>Environmental Permitting Regulations (Waste) Licence Number: GAC002</p> <p>EPR reference: EA/EPR/CB3702FS/V002</p> <p>Operator: G &amp; A Car Spares Limited</p> <p>Waste Management licence No: 104491</p> <p>Annual Tonnage: 4999.0</p> <p>Issue Date: 31/07/2012</p> <p>Effective Date: 06/06/2015</p> <p>Modified: 18/08/2016</p> <p>Surrendered Date: -</p> <p>Expiry Date: -</p> <p>Cancelled Date: -</p> <p>Status: Modified</p> <p>Site Name: G &amp; A Car Spares</p> <p>Correspondence Address: -</p>
Not shown	766	W	651080 305911	<p>Site Address: D&amp;j Metals, Vanguard Road, Gapton Hall Ind Est, Great Yarmouth, Norfolk, NR31 0NT</p> <p>Type: Metal Recycling Site (mixed MRS's)</p> <p>Size: &gt;= 25000 tonnes &lt; 75000 tonnes</p> <p>Environmental Permitting Regulations (Waste) Licence Number: DOU001</p> <p>EPR reference: EA/EPR/RP3099NN/A001</p> <p>Operator: Mr Douglas Victor Gray And Mr John Gray</p> <p>Waste Management licence No: 70504</p> <p>Annual Tonnage: 24999.0</p> <p>Issue Date: 22/02/1995</p> <p>Effective Date: -</p> <p>Modified: -</p> <p>Surrendered Date: -</p> <p>Expiry Date: -</p> <p>Cancelled Date: -</p> <p>Status: Issued</p> <p>Site Name: Great Yarmouth</p> <p>Correspondence Address: -</p>
43	853	NW	651432 306761	<p>Site Address: Land / Premises At, High Mill Link Road, Cobholm, Great Yarmouth, Norfolk, NR31 0DL</p> <p>Type: Metal Recycling Site (Vehicle Dismantler)</p> <p>Size: &lt; 25000 tonnes</p> <p>Environmental Permitting Regulations (Waste) Licence Number: DOC001</p> <p>EPR reference: EA/EPR/KP3694NT/A001</p> <p>Operator: Docwra Mike</p> <p>Waste Management licence No: 71385</p> <p>Annual Tonnage: 2499.0</p> <p>Issue Date: 25/11/2004</p> <p>Effective Date: -</p> <p>Modified: -</p> <p>Surrendered Date: -</p> <p>Expiry Date: -</p> <p>Cancelled Date: -</p> <p>Status: Issued</p> <p>Site Name: Mike Docwra Car Breakers</p> <p>Correspondence Address: -</p>
Not shown	874	W	650971 305888	<p>Site Address: Vanguard Road, Gapton Hall Ind Est, Great Yarmouth, Norfolk, NR31 0NT</p> <p>Type: Metal Recycling Site (mixed MRS's)</p> <p>Size: &gt;= 25000 tonnes &lt; 75000 tonnes</p> <p>Environmental Permitting Regulations (Waste) Licence Number: DOU001</p> <p>EPR reference: -</p> <p>Operator: D &amp; J Metals</p> <p>Waste Management licence No: 70504</p> <p>Annual Tonnage: 0.0</p> <p>Issue Date: 22/02/1995</p> <p>Effective Date: -</p> <p>Modified: -</p> <p>Surrendered Date: -</p> <p>Expiry Date: -</p> <p>Cancelled Date: -</p> <p>Status: Issued</p> <p>Site Name: Great Yarmouth</p> <p>Correspondence Address: Vanguard Road, Gapton Hall Ind. Est, Great Yarmouth, Norfolk, NR31 0NT</p>

ID	Distance (m)	Direction	NGR	Details	
Not shown	874	W	650971 305888	<p>Site Address: Vanguard Road, Gapton Hall Ind Estate, Great Yarmouth, Norfolk, NR31 ONT</p> <p>Type: Household, Commercial &amp; Industrial Waste T Stn</p> <p>Size: &lt; 25000 tonnes</p> <p>Environmental Permitting Regulations (Waste) Licence Number: GRA001</p> <p>EPR reference: -</p> <p>Operator: Gray Douglas Victor</p> <p>Waste Management licence No: 71237</p> <p>Annual Tonnage: 0.0</p>	<p>Issue Date: 13/11/1998</p> <p>Effective Date: -</p> <p>Modified: -</p> <p>Surrendered Date: -</p> <p>Expiry Date: -</p> <p>Cancelled Date: -</p> <p>Status: Issued</p> <p>Site Name: Great Yarmouth</p> <p>Correspondence Address: Vanguard Road, Gapton Hall Ind Estate, Great Yarmouth, Norfolk, NR31 ONT</p>
Not shown	874	W	650971 305888	<p>Site Address: Land / Premises At, Vanguard Road, Gapton Hall Ind Estate, Great Yarmouth, Norfolk, NR31 ONT</p> <p>Type: 75kte HCI Waste TS + asbestos</p> <p>Size: &lt; 25000 tonnes</p> <p>Environmental Permitting Regulations (Waste) Licence Number: GRA001</p> <p>EPR reference: EA/EPR/DP3699LH/V003</p> <p>Operator: Gray Douglas Victor</p> <p>Waste Management licence No: 71237</p> <p>Annual Tonnage: 24999.0</p>	<p>Issue Date: 13/11/1998</p> <p>Effective Date: -</p> <p>Modified: 19/03/2009</p> <p>Surrendered Date: -</p> <p>Expiry Date: -</p> <p>Cancelled Date: -</p> <p>Status: Modified</p> <p>Site Name: D And J Metals</p> <p>Correspondence Address: -</p>
Not shown	1329	SE	653041 304410	<p>Site Address: Technical Waste Management Centre, South Denes Road, Great Yarmouth, Norfolk, NR30 3LY</p> <p>Type: Special Waste Transfer Station</p> <p>Size: &lt; 25000 tonnes</p> <p>Environmental Permitting Regulations (Waste) Licence Number: ASC002</p> <p>EPR reference: -</p> <p>Operator: A S C O ( U K ) Ltd</p> <p>Waste Management licence No: 71257</p> <p>Annual Tonnage: 0.0</p>	<p>Issue Date: 24/01/2001</p> <p>Effective Date: -</p> <p>Modified: -</p> <p>Surrendered Date: -</p> <p>Expiry Date: -</p> <p>Cancelled Date: -</p> <p>Status: Issued</p> <p>Site Name: Great Yarmouth</p> <p>Correspondence Address: Offshore Supply Base, South Denes Road, Great Yarmouth, Norfolk, NR30 3LY</p>
Not shown	1329	SE	653041 304410	<p>Site Address: Technical Waste Management Centre, South Denes Road, Great Yarmouth, Norfolk, NR30 3LY</p> <p>Type: Special Waste Transfer Station</p> <p>Size: &lt; 25000 tonnes</p> <p>Environmental Permitting Regulations (Waste) Licence Number: ASC002</p> <p>EPR reference: -</p> <p>Operator: A S C O ( U K ) Ltd</p> <p>Waste Management licence No: 71257</p> <p>Annual Tonnage: 24999.0</p>	<p>Issue Date: 24/01/2001</p> <p>Effective Date: -</p> <p>Modified: -</p> <p>Surrendered Date: -</p> <p>Expiry Date: -</p> <p>Cancelled Date: -</p> <p>Status: Issued</p> <p>Site Name: Great Yarmouth</p> <p>Correspondence Address: Offshore Supply Base, South Denes Road, Great Yarmouth, Norfolk, NR30 3LY</p>
Not shown	1329	SE	653041 304410	<p>Site Address: Technical Waste Management Centre, South Denes Road, Great Yarmouth, Norfolk, NR30 3LY</p> <p>Type: Special Waste Transfer Station</p> <p>Size: &lt; 25000 tonnes</p> <p>Environmental Permitting Regulations (Waste) Licence Number: ENV230</p> <p>EPR reference: EA/EPR/QP3898NL/T002</p> <p>Operator: Enviroco Ltd</p> <p>Waste Management licence No: 71257</p> <p>Annual Tonnage: 24999.0</p>	<p>Issue Date: 24/01/2001</p> <p>Effective Date: 13/03/2008</p> <p>Modified: -</p> <p>Surrendered Date: -</p> <p>Expiry Date: -</p> <p>Cancelled Date: -</p> <p>Status: Transferred</p> <p>Site Name: Great Yarmouth</p> <p>Correspondence Address: -</p>

ID	Distance (m)	Direction	NGR	Details
Not shown	1359	SE	653066 304389	<p>Site Address: Great Yarmouth Technical Waste Management Centre, Berths 2-4, South Denes Road, Great Yarmouth, Norfolk, NR30 3QF</p> <p>Type: Physical Treatment Facility Size: &lt; 25000 tonnes</p> <p>Environmental Permitting Regulations (Waste) Licence Number: ENV230 EPR reference: EA/EPR/PP3532UT/V005 Operator: Enviroco Limited Waste Management licence No: 71257 Annual Tonnage: 24999.0</p> <p>Issue Date: 24/01/2001 Effective Date: 13/03/2008 Modified: 25/01/2016 Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Modified</p> <p>Site Name: Great Yarmouth Technical Waste Management Centre Correspondence Address: -</p>
Not shown	1359	SE	653066 304389	<p>Site Address: Great Yarmouth Technical Waste Management Centre, Berths 2-4, South Denes Road, Great Yarmouth, Norfolk, NR30 3QF</p> <p>Type: Physical Treatment Facility Size: &lt; 25000 tonnes</p> <p>Environmental Permitting Regulations (Waste) Licence Number: ENV230 EPR reference: EA/EPR/PP3532UT/V004 Operator: Enviroco Ltd Waste Management licence No: 71257 Annual Tonnage: 24999.0</p> <p>Issue Date: 24/01/2001 Effective Date: 13/03/2008 Modified: 16/05/2013 Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Modified</p> <p>Site Name: Great Yarmouth Technical Waste Management Centre Correspondence Address: -</p>




# 4. Current Land Use Map




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Site Outline

 Current Industrial Sites

 Electricity Transmission Cables

 Search Buffers (m)

 Petrol & Fuel Sites

 Gas Transmission Pipelines

# 4. Current Land Uses

## 4.1 Current Industrial Data

Records of potentially contaminative industrial sites within 250m of the study site: 320

The following records are represented as points on the Current Land Uses map.

ID	Distance (m)	Direction	Company	NGR	Address	Activity	Category
1H	0	On Site	Simpsons Skoda	652263 305982	Simpsons Skoda, Unit 1, Suffolk Road, Great Yarmouth, NR31 0LN	New Vehicles	Motoring
2D	0	On Site	3 Sun Group	652140 306084	3 Sun Group, 3sun House, Boundary Road, Great Yarmouth, NR31 0FB	Electronic Equipment	Industrial Products
3A	0	On Site	Kirkley Tyres & Wheels	652355 306146	Kirkley Tyres & Wheels, 126, Southtown Road, Great Yarmouth, NR31 0JZ	Vehicle Repair, Testing and Servicing	Repair and Servicing
4A	0	On Site	BP Service Station	652355 306146	BP Service Station, 126, Southtown Road, Great Yarmouth, NR31 0JZ	Petrol and Fuel Stations	Road and Rail
5B	0	On Site	Stalwart Signs & Industrial Supplies Ltd	652752 306021	Stalwart Signs & Industrial Supplies Ltd, Anglian House, Admiralty Road, Great Yarmouth, NR30 3DY	Special Purpose Machinery and Equipment	Industrial Products
6B	0	On Site	Discount Sheds & Stables	652752 306021	Discount Sheds & Stables, Anglian House, Admiralty Road, Great Yarmouth, NR30 3DY	Garden Goods	Consumer Products
7F	0	On Site	Suffolk Road Motoring Services	652250 306086	Suffolk Road Motoring Services, Unit 8-9, Suffolk Road, Great Yarmouth, NR31 0LN	Vehicle Repair, Testing and Servicing	Repair and Servicing
8C	0	On Site	J D Moore	652362 306101	J D Moore, 128, Southtown Road, Great Yarmouth, NR31 0LA	Vehicle Repair, Testing and Servicing	Repair and Servicing
9C	0	On Site	Southtown Cars	652362 306101	Southtown Cars, 128, Southtown Road, Great Yarmouth, NR31 0LA	Secondhand Vehicles	Motoring
10	0	On Site	L G Perfect	651878 305826	L G Perfect, Harfreys Road, Great Yarmouth, NR31 0JL	Vehicle Repair, Testing and Servicing	Repair and Servicing
11R	0	On Site	Afordable Cars	652621 306224	Afordable Cars, 41a, Southgates Road, Great Yarmouth, NR30 3LL	Secondhand Vehicles	Motoring
12	0	On Site	Weatherford UK	651890 305776	Weatherford UK, Harfreys Road, Great Yarmouth, NR31 0LS	Special Purpose Machinery and Equipment	Industrial Products
13E	0	On Site	Pumping Station	652180 306105	Pumping Station, NR31	Water Pumping Stations	Industrial Features

ID	Distance (m)	Direction	Company	NGR	Address	Activity	Category
14	0	On Site	Electricity Sub Station	651959 306013	Electricity Sub Station, NR31	Electrical Features	Infrastructure and Facilities
15D	0	On Site	Depot	652121 306075	Depot, NR31	Container and Storage	Transport, Storage and Delivery
16E	0	On Site	Electricity Sub Station	652169 306091	Electricity Sub Station, NR31	Electrical Features	Infrastructure and Facilities
17	0	On Site	Mitchells Renault	652238 306144	Mitchells Renault, Suffolk Road, Great Yarmouth, NR31 0LN	Vehicle Repair, Testing and Servicing	Repair and Servicing
18F	0	On Site	Warehouse	652246 306076	Warehouse, NR31	Container and Storage	Transport, Storage and Delivery
19G	0	On Site	Warehouse	652253 306022	Warehouse, NR31	Container and Storage	Transport, Storage and Delivery
20G	0	On Site	Works	652254 306045	Works, NR31	Unspecified Works Or Factories	Industrial Features
21G	0	On Site	Depot	652257 305997	Depot, NR31	Container and Storage	Transport, Storage and Delivery
22G	0	On Site	Warehouse	652260 306010	Warehouse, NR31	Container and Storage	Transport, Storage and Delivery
23G	0	On Site	Tank	652262 306047	Tank, NR31	Tanks (Generic)	Industrial Features
24H	0	On Site	Works	652265 305985	Works, NR31	Unspecified Works Or Factories	Industrial Features
25H	0	On Site	Tank	652271 306007	Tank, NR31	Tanks (Generic)	Industrial Features
26I	0	On Site	Warehouse	652293 305974	Warehouse, NR31	Container and Storage	Transport, Storage and Delivery
27I	0	On Site	Works	652306 305976	Works, NR31	Unspecified Works Or Factories	Industrial Features
28I	0	On Site	Works	652320 305970	Works, NR31	Unspecified Works Or Factories	Industrial Features
29	0	On Site	Works	652322 306092	Works, NR31	Unspecified Works Or Factories	Industrial Features
30	0	On Site	Depot	652330 305980	Depot, NR31	Container and Storage	Transport, Storage and Delivery
31	0	On Site	Works	652345 306019	Works, NR31	Unspecified Works Or Factories	Industrial Features
32	0	On Site	Works	652351 306061	Works, NR31	Unspecified Works Or Factories	Industrial Features
33J	0	On Site	Peter Doidge	652359 305931	Peter Doidge, Southtown Road, Great Yarmouth, NR31 0LA	Vehicle Parts and Accessories	Motoring
34J	0	On Site	Tank	652366 305943	Tank, NR31	Tanks (Generic)	Industrial Features
35	0	On Site	Quay	652406 306126	Quay, NR31	Moorings and Unloading Facilities	Water
36	0	On Site	Quay	652420 305919	Quay, NR31	Moorings and Unloading Facilities	Water
37J	0	On Site	Depot	652358 305931	Depot, NR31	Container and Storage	Transport, Storage and Delivery
38G	0	On Site	Tank	652272 306002	Tank, NR31	Tanks (Generic)	Industrial Features

ID	Distance (m)	Direction	Company	NGR	Address	Activity	Category
39	0	On Site	East Coast Waste	651890 305707	East Coast Waste, Harfreys Road, Great Yarmouth, NR31 0LS	Construction and Tool Hire	Hire Services
40A	0	On Site	Southtown Service Station	652355 306146	Southtown Service Station, 126, Southtown Road, Great Yarmouth, NR31 0JZ	Petrol and Fuel Stations	Road and Rail
41K	0	On Site	Tank	652479 305698	Tank, NR31	Tanks (Generic)	Industrial Features
42K	0	On Site	Tank	652477 305700	Tank, NR31	Tanks (Generic)	Industrial Features
43K	0	On Site	Tank	652482 305704	Tank, NR31	Tanks (Generic)	Industrial Features
44K	0	On Site	Tank	652489 305704	Tank, NR31	Tanks (Generic)	Industrial Features
45	0	On Site	Electricity Sub Station	652408 305708	Electricity Sub Station, NR31	Electrical Features	Infrastructure and Facilities
46	0	On Site	Gas Distribution Station	652358 305726	Gas Distribution Station, NR31	Gas Features	Infrastructure and Facilities
47L	0	On Site	Tank	652428 305809	Tank, NR31	Tanks (Generic)	Industrial Features
48M	0	On Site	Electricity Sub Station	652438 305774	Electricity Sub Station, NR31	Electrical Features	Infrastructure and Facilities
49L	0	On Site	Tank	652437 305786	Tank, NR31	Tanks (Generic)	Industrial Features
50M	0	On Site	Tank	652448 305789	Tank, NR31	Tanks (Generic)	Industrial Features
51L	0	On Site	Tank	652447 305798	Tank, NR31	Tanks (Generic)	Industrial Features
52L	0	On Site	Tank	652435 305804	Tank, NR31	Tanks (Generic)	Industrial Features
53L	0	On Site	Tank	652434 305820	Tank, NR31	Tanks (Generic)	Industrial Features
54L	0	On Site	Tank	652428 305805	Tank, NR31	Tanks (Generic)	Industrial Features
55L	0	On Site	Tank	652439 305805	Tank, NR31	Tanks (Generic)	Industrial Features
56L	0	On Site	Tank	652439 305825	Tank, NR31	Tanks (Generic)	Industrial Features
57L	0	On Site	Tank	652425 305831	Tank, NR31	Tanks (Generic)	Industrial Features
58L	0	On Site	Tank	652432 305811	Tank, NR31	Tanks (Generic)	Industrial Features
59L	0	On Site	Tank	652435 305811	Tank, NR31	Tanks (Generic)	Industrial Features
60L	0	On Site	Tank	652439 305812	Tank, NR31	Tanks (Generic)	Industrial Features
61L	0	On Site	Tank	652427 305815	Tank, NR31	Tanks (Generic)	Industrial Features
62L	0	On Site	Tank	652431 305816	Tank, NR31	Tanks (Generic)	Industrial Features
63L	0	On Site	Tank	652425 305824	Tank, NR31	Tanks (Generic)	Industrial Features



ID	Distance (m)	Direction	Company	NGR	Address	Activity	Category
64L	0	On Site	Tank	652429 305825	Tank, NR31	Tanks (Generic)	Industrial Features
65L	0	On Site	Tank	652439 305832	Tank, NR31	Tanks (Generic)	Industrial Features
66L	0	On Site	Tank	652430 305832	Tank, NR31	Tanks (Generic)	Industrial Features
67N	0	On Site	Tank	652433 305836	Tank, NR31	Tanks (Generic)	Industrial Features
68N	0	On Site	Tank	652425 305840	Tank, NR31	Tanks (Generic)	Industrial Features
69N	0	On Site	Tank	652434 305841	Tank, NR31	Tanks (Generic)	Industrial Features
70N	0	On Site	Tank	652437 305846	Tank, NR31	Tanks (Generic)	Industrial Features
71O	0	On Site	Broadland Fuels	652580 305882	Broadland Fuels, Fishwharf, Great Yarmouth, NR30 3LX	Fuel Distributors and Suppliers	Household, Office, Leisure and Garden
72O	0	On Site	Depot	652581 305889	Depot, NR30	Container and Storage	Transport, Storage and Delivery
73	0	On Site	Works	652752 305893	Works, NR30	Unspecified Works Or Factories	Industrial Features
74K	0	On Site	Tank	652485 305706	Tank, NR31	Tanks (Generic)	Industrial Features
75L	0	On Site	Tank	652434 305832	Tank, NR31	Tanks (Generic)	Industrial Features
76K	0	On Site	Tank	652489 305711	Tank, NR31	Tanks (Generic)	Industrial Features
77L	0	On Site	Tank	652426 305819	Tank, NR31	Tanks (Generic)	Industrial Features
78L	0	On Site	Tank	652443 305812	Tank, NR31	Tanks (Generic)	Industrial Features
79N	0	On Site	Tank	652432 305845	Tank, NR31	Tanks (Generic)	Industrial Features
80L	0	On Site	Tank	652443 305805	Tank, NR31	Tanks (Generic)	Industrial Features
81K	0	On Site	Tank	652484 305700	Tank, NR31	Tanks (Generic)	Industrial Features
82L	0	On Site	Tank	652424 305835	Tank, NR31	Tanks (Generic)	Industrial Features
83K	0	On Site	Tank	652484 305710	Tank, NR31	Tanks (Generic)	Industrial Features
84N	0	On Site	Tank	652429 305836	Tank, NR31	Tanks (Generic)	Industrial Features
85P	0	On Site	Works	652649 305892	Works, NR30	Unspecified Works Or Factories	Industrial Features
86P	0	On Site	Electricity Sub Station	652658 305895	Electricity Sub Station, NR30	Electrical Features	Infrastructure and Facilities
87K	0	On Site	Tank	652479 305707	Tank, NR31	Tanks (Generic)	Industrial Features
88	0	On Site	Gashouse Quay	652510 305731	Gashouse Quay, NR31	Moorings and Unloading Facilities	Water
89	0	On Site	Fish Wharf	652506 306025	Fish Wharf, NR30	Moorings and Unloading Facilities	Water

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90	0	On Site	Works	652640 305962	Works, NR30	Unspecified Works Or Factories	Industrial Features
91S	0	On Site	BP Service Station	652554 306353	BP Service Station, Southgates Road, Great Yarmouth, NR30 3LL	Petrol and Fuel Stations	Road and Rail
92	0	On Site	Warehouse	652564 306228	Warehouse, NR30	Container and Storage	Transport, Storage and Delivery
93Q	0	On Site	Depot	652613 306262	Depot, NR30	Container and Storage	Transport, Storage and Delivery
94Q	0	On Site	Score Group Plc	652614 306284	Score Group Plc, 33-36, Southgates Road, Great Yarmouth, NR30 3LL	Seals, Tapes, Taps and Valves	Industrial Products
95	0	On Site	Works	652619 306314	Works, NR30	Unspecified Works Or Factories	Industrial Features
96R	0	On Site	Depot	652643 306215	Depot, NR30	Container and Storage	Transport, Storage and Delivery
97U	0	On Site	Depot	652670 306047	Depot, NR30	Container and Storage	Transport, Storage and Delivery
98	0	On Site	Depot	652678 306104	Depot, NR30	Container and Storage	Transport, Storage and Delivery
99	0	On Site	Factory	652708 306026	Factory, NR30	Unspecified Works Or Factories	Industrial Features
100	0	On Site	Depot	652571 305965	Depot, NR30	Container and Storage	Transport, Storage and Delivery
101T	0	On Site	Electricity Sub Station	652755 306127	Electricity Sub Station, NR30	Electrical Features	Infrastructure and Facilities
102B	0	On Site	Works	652755 306035	Works, NR30	Unspecified Works Or Factories	Industrial Features
103S	0	On Site	South Quay Service Station	652554 306353	South Quay Service Station, Southgates Road, Great Yarmouth, NR30 3LL	Petrol and Fuel Stations	Road and Rail
104T	0	On Site	Gas Holder Station	652734 306128	Gas Holder Station, NR30	Gas Features	Infrastructure and Facilities
105U	0	On Site	H S Fishing 2000 Ltd	652669 306023	H S Fishing 2000 Ltd, Sutton Road, Great Yarmouth, NR30 3NA	Fish, Meat and Poultry Products	Foodstuffs
106	0	On Site	Noritake Itron	651879 305932	Noritake Itron, Vantage House, Harfreys Road, Great Yarmouth, NR31 0LS	Electrical Components	Industrial Products
107	2	N	Atlas Wharf	652511 306249	Atlas Wharf, NR30	Moorings and Unloading Facilities	Water
108V	11	S	Electricity Sub Station	652611 305835	Electricity Sub Station, NR30	Electrical Features	Infrastructure and Facilities
109	13	E	Factory	652657 306344	Factory, NR30	Unspecified Works Or Factories	Industrial Features
110	22	S	C L S Offshore	652471 305612	C L S Offshore, Maltings House, Malthouse Lane, Gorleston, Great Yarmouth, NR31 0GY	Special Purpose Machinery and Equipment	Industrial Products
111A F	23	W	Electricity Sub Station	651824 305887	Electricity Sub Station, NR31	Electrical Features	Infrastructure and Facilities
112W	24	NW	Tank	652066 306129	Tank, NR31	Tanks (Generic)	Industrial Features

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113	24	E	Southgates UK	652817 305922	Southgates UK, Oilmar House, Admiralty Road, Great Yarmouth, NR30 3NG	Vehicle Repair, Testing and Servicing	Repair and Servicing
114V	24	S	Tank	652599 305818	Tank, NR30	Tanks (Generic)	Industrial Features
115V	25	S	Tank	652595 305816	Tank, NR30	Tanks (Generic)	Industrial Features
116V	25	S	Tank	652604 305818	Tank, NR30	Tanks (Generic)	Industrial Features
117V	25	S	Tank	652608 305819	Tank, NR30	Tanks (Generic)	Industrial Features
118V	26	S	Tank	652613 305820	Tank, NR30	Tanks (Generic)	Industrial Features
119V	26	S	Tank	652592 305814	Tank, NR30	Tanks (Generic)	Industrial Features
120V	28	S	Tank	652597 305813	Tank, NR30	Tanks (Generic)	Industrial Features
121V	29	S	Tank	652594 305812	Tank, NR30	Tanks (Generic)	Industrial Features
122V	29	S	Tank	652590 305810	Tank, NR30	Tanks (Generic)	Industrial Features
123V	30	S	Tank	652609 305815	Tank, NR30	Tanks (Generic)	Industrial Features
124V	30	S	Tank	652615 305816	Tank, NR30	Tanks (Generic)	Industrial Features
125V	30	S	Tank	652605 305813	Tank, NR30	Tanks (Generic)	Industrial Features
126V	31	S	Tank	652599 305811	Tank, NR30	Tanks (Generic)	Industrial Features
127Y	31	SE	Works	652551 305617	Works, NR31	Unspecified Works Or Factories	Industrial Features
128V	32	S	Tank	652612 305813	Tank, NR30	Tanks (Generic)	Industrial Features
129W	33	NW	Tank	652044 306129	Tank, NR31	Tanks (Generic)	Industrial Features
130Z	33	N	Trinity Quay	652515 306411	Trinity Quay, NR30	Moorings and Unloading Facilities	Water
131X	34	S	Tank	652592 305806	Tank, NR30	Tanks (Generic)	Industrial Features
132	34	E	Electricity Sub Station	652676 306372	Electricity Sub Station, NR30	Electrical Features	Infrastructure and Facilities
133X	35	S	Tank	652610 305810	Tank, NR30	Tanks (Generic)	Industrial Features
134X	35	S	Tank	652616 305811	Tank, NR30	Tanks (Generic)	Industrial Features
135A B	37	W	Tank	651803 305659	Tank, NR31	Tanks (Generic)	Industrial Features
136X	37	S	Tank	652599 305805	Tank, NR30	Tanks (Generic)	Industrial Features
137X	37	S	Tank	652594 305803	Tank, NR30	Tanks (Generic)	Industrial Features

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138	37	W	Fine Line Communications	651811 305928	Fine Line Communications, Logic House, Harfreys Road, Great Yarmouth, NR31 0LS	Radar and Telecommunications Equipment	Industrial Products
139W	38	NW	Tank	652042 306134	Tank, NR31	Tanks (Generic)	Industrial Features
140	38	S	Electricity Sub Station	652793 305851	Electricity Sub Station, NR30	Electrical Features	Infrastructure and Facilities
141A C	39	NW	Electricity Sub Station	652153 306184	Electricity Sub Station, NR31	Electrical Features	Infrastructure and Facilities
142A E	41	W	Harfreys Industrial Estate	651806 305816	Harfreys Industrial Estate, NR31	Business Parks and Industrial Estates	Industrial Features
143Y	41	SE	Electricity Sub Station	652529 305593	Electricity Sub Station, NR31	Electrical Features	Infrastructure and Facilities
144A A	41	S	Tank	652680 305822	Tank, NR30	Tanks (Generic)	Industrial Features
145X	42	S	Tank	652597 305799	Tank, NR30	Tanks (Generic)	Industrial Features
146Z	42	N	Travelling Crane	652520 306420	Travelling Crane, NR30	Travelling Cranes and Gantries	Industrial Features
147Z	45	N	Trinity House Depot	652542 306423	Trinity House Depot, NR30	Container and Storage	Transport, Storage and Delivery
148X	45	E	Tank	652600 305795	Tank, NR30	Tanks (Generic)	Industrial Features
149W	46	NW	Tank	652040 306142	Tank, NR31	Tanks (Generic)	Industrial Features
150	47	S	Eastern Monitoring Services	652498 305580	Eastern Monitoring Services, Malthouse Lane, Gorleston, Great Yarmouth, NR31 0GW	Electronic Equipment	Industrial Products
151	48	NW	Tank	651959 306104	Tank, NR31	Tanks (Generic)	Industrial Features
152A A	49	S	Works	652665 305810	Works, NR30	Unspecified Works Or Factories	Industrial Features
153	49	SE	Malthouse Quay	652589 305617	Malthouse Quay, NR31	Moorings and Unloading Facilities	Water
154A B	52	W	C A H Quickmix	651791 305685	C A H Quickmix, Morton Peto Road, Great Yarmouth, NR31 0LT	Concrete Products	Industrial Products
155	53	W	S S C S	651794 305786	S S C S, Harfreys Road, Great Yarmouth, NR31 0LS	Lifting and Handling Equipment	Industrial Products
156A C	55	NW	K S D Fabrication Ltd	652099 306177	K S D Fabrication Ltd, Yarmouth Business Park, Thamesfield Way, Great Yarmouth, NR31 0DN	Metals Manufacturers, Fabricators and Stockholders	Industrial Products
157A D	56	N	Tank	652560 306435	Tank, NR30	Tanks (Generic)	Industrial Features
158A G	57	NW	Works	652045 306156	Works, NR31	Unspecified Works Or Factories	Industrial Features
159A D	59	N	Tank	652560 306438	Tank, NR30	Tanks (Generic)	Industrial Features
160A D	61	N	E U	652597 306440	E U, 19, Southgates Road, Great Yarmouth, NR30 3LJ	Vehicle Parts and Accessories	Motoring

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161A D	61	N	Works	652585 306441	Works, NR30	Unspecified Works Or Factories	Industrial Features
162A D	62	N	Tank	652560 306441	Tank, NR30	Tanks (Generic)	Industrial Features
163AJ	63	E	Hardy Craske Fuels	652619 305765	Hardy Craske Fuels, Old Customs House Marine Base, Great Yarmouth, NR30 3LX	Fuel Distributors and Suppliers	Household, Office, Leisure and Garden
164A E	63	W	Atam Group Ltd	651783 305837	Atam Group Ltd, Unit B, Harfreys Road, Great Yarmouth, NR31 0LS	Civil Engineers	Engineering Services
165	67	N	Electricity Sub Station	652293 306269	Electricity Sub Station, NR31	Electrical Features	Infrastructure and Facilities
166A B	67	SW	Tank	651779 305633	Tank, NR31	Tanks (Generic)	Industrial Features
167A F	68	W	C & M Hydraulics	651779 305896	C & M Hydraulics, Da Vinci House, Harfreys Road, Great Yarmouth, NR31 0LS	Hydraulic Engineers	Engineering Services
168	72	E	P K M Sign Studios	652869 305873	P K M Sign Studios, 15, Swanston's Road, Great Yarmouth, NR30 3NQ	Signs	Industrial Products
169A G	73	NW	Conveyor	652047 306175	Conveyor, NR31	Conveyors	Industrial Features
170A H	77	E	Tank	652635 305731	Tank, NR30	Tanks (Generic)	Industrial Features
171	79	NW	Mast	652096 306202	Mast, NR31	Telecommunications Features	Infrastructure and Facilities
172A H	80	E	Tank	652638 305733	Tank, NR30	Tanks (Generic)	Industrial Features
173	81	N	Warehouse	652408 306312	Warehouse, NR31	Container and Storage	Transport, Storage and Delivery
174A H	82	E	Tank	652639 305748	Tank, NR30	Tanks (Generic)	Industrial Features
175A H	84	E	Tank	652641 305745	Tank, NR30	Tanks (Generic)	Industrial Features
176A H	84	E	Tank	652642 305735	Tank, NR30	Tanks (Generic)	Industrial Features
177A H	86	E	Tank	652643 305741	Tank, NR30	Tanks (Generic)	Industrial Features
178AI	86	E	Wing Mirrors World	652881 305918	Wing Mirrors World, Unit 9, Swanston's Road, Great Yarmouth, NR30 3NQ	Vehicle Parts and Accessories	Motoring
179AI	86	E	Spray N Go	652881 305918	Spray N Go, Unit 9, Swanston's Road, Great Yarmouth, NR30 3NQ	Vehicle Repair, Testing and Servicing	Repair and Servicing
180A H	87	E	Tank	652645 305737	Tank, NR30	Tanks (Generic)	Industrial Features
181A H	89	E	Tank	652647 305721	Tank, NR30	Tanks (Generic)	Industrial Features
182A R	91	SE	Works	652873 305837	Works, NR30	Unspecified Works Or Factories	Industrial Features
183	96	N	Ballast Quay	652513 306474	Ballast Quay, NR30	Moorings and Unloading Facilities	Water
184A H	97	E	Tank	652656 305707	Tank, NR30	Tanks (Generic)	Industrial Features

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185AJ	99	S	Works	652674 305761	Works, NR30	Unspecified Works Or Factories	Industrial Features
186AK	99	E	Tank	652659 305683	Tank, NR30	Tanks (Generic)	Industrial Features
187AK	102	E	Tank	652662 305688	Tank, NR30	Tanks (Generic)	Industrial Features
188AO	103	SW	J W Munnings Ltd	651759 305598	J W Munnings Ltd, 1 Munnings Court, Harfreys Road, Great Yarmouth, NR31 0LS	Construction and Tool Hire	Hire Services
189	104	E	Electricity Sub Station	652859 306156	Electricity Sub Station, NR30	Electrical Features	Infrastructure and Facilities
190	107	N	Simmons Edeco Europe Ltd	651821 306118	Simmons Edeco Europe Ltd, Bessemer Way, Great Yarmouth, NR31 0LX	Special Purpose Machinery and Equipment	Industrial Products
191AK	107	E	Warehouse	652668 305668	Warehouse, NR30	Container and Storage	Transport, Storage and Delivery
192AK	109	E	Tank	652669 305675	Tank, NR30	Tanks (Generic)	Industrial Features
193	109	S	Gorleston Fire Station	652491 305518	Gorleston Fire Station, High Road, Gorleston, Great Yarmouth, NR31 0PJ	Fire Brigade Stations	Central and Local Government
194AM	109	W	S P P Digital	651738 305773	S P P Digital, Morton Peto Road, Great Yarmouth, NR31 0LT	Published Goods	Industrial Products
195AT	112	S	Nelson Works	652803 305778	Nelson Works, NR30	Unspecified Works Or Factories	Industrial Features
196AK	112	E	Tank	652672 305678	Tank, NR30	Tanks (Generic)	Industrial Features
197AK	112	E	Tank	652672 305688	Tank, NR30	Tanks (Generic)	Industrial Features
198AL	113	W	Maverick Engineering Ltd	651732 305857	Maverick Engineering Ltd, 9-11, Brinell Way, Great Yarmouth, NR31 0LU	Industrial Engineers	Engineering Services
199AL	113	W	L V Shipping Ltd	651732 305857	L V Shipping Ltd, 9-11, Brinell Way, Great Yarmouth, NR31 0LU	Distribution and Haulage	Transport, Storage and Delivery
200AL	113	W	East Coast Pipe	651732 305867	East Coast Pipe, Unit 8, Brinell Way, Great Yarmouth, NR31 0LU	Electrical Equipment Repair and Servicing	Repair and Servicing
201AM	114	W	Survitec Survival Craft	651732 305747	Survitec Survival Craft, Unit 16, Brinell Way, Great Yarmouth, NR31 0LU	Marine Engineers and Services	Engineering Services
202	114	W	Softstart UK	651732 305803	Softstart UK, 14, Brinell Way, Great Yarmouth, NR31 0LU	Electrical Equipment Repair and Servicing	Repair and Servicing
203AK	116	E	Tank	652676 305681	Tank, NR30	Tanks (Generic)	Industrial Features
204	116	N	Electricity Sub Station	652172 306284	Electricity Sub Station, NR31	Electrical Features	Infrastructure and Facilities
205AN	118	W	Enterprise Rent-A-Car	651731 305910	Enterprise Rent-A-Car, Units 4-5, Brinell Way, Great Yarmouth, NR31 0LU	Vehicle Hire and Rental	Hire Services
206AK	118	E	Tank	652678 305677	Tank, NR30	Tanks (Generic)	Industrial Features

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207A U	118	SE	Works	652869 305796	Works, NR30	Unspecified Works Or Factories	Industrial Features
208A N	118	W	Applus R T D	651730 305932	Applus R T D, 1-2, Brinell Way, Great Yarmouth, NR31 0LU	Industrial Engineers	Engineering Services
209A N	119	W	Stuga	651730 305911	Stuga, Unit 4, Brinell Way, Great Yarmouth, NR31 0LU	Tools Including Machine Shops	Industrial Products
210A O	120	SW	Hubble	651739 305598	Hubble, 2 Munnings Court, Harfreys Road, Great Yarmouth, NR31 0LS	General Construction Supplies	Industrial Products
211A S	121	S	Regional Scaffolding	652729 305752	Regional Scaffolding, Canada Buildings, South Denes Road, Great Yarmouth, NR30 3PF	Construction and Tool Hire	Hire Services
212A P	122	N	Electricity Sub Station	652667 306502	Electricity Sub Station, NR30	Electrical Features	Infrastructure and Facilities
213A P	123	N	Electricity Sub Station	652667 306503	Electricity Sub Station, NR30	Electrical Features	Infrastructure and Facilities
214A Q	125	NW	Barford Hire Ltd	652068 306240	Barford Hire Ltd, Yarmouth Business Park, Suffolk Road, Great Yarmouth, NR31 0ER	Vehicle Hire and Rental	Hire Services
215A Q	125	NW	Pat's Floorings	652068 306240	Pat's Floorings, Yarmouth Business Park, Thamesfield Way, Great Yarmouth, NR31 0DN	Construction Completion Services	Construction Services
216A V	127	N	Works	652551 306505	Works, NR30	Unspecified Works Or Factories	Industrial Features
217	127	NW	Survitec Group	651930 306180	Survitec Group, Unit 8, Owen Road, Great Yarmouth, NR31 0NA	Workwear	Industrial Products
218A O	128	SW	M D F Transport Ltd	651729 305597	M D F Transport Ltd, 3 Munnings Court, Harfreys Road, Great Yarmouth, NR31 0LS	Distribution and Haulage	Transport, Storage and Delivery
219	128	W	Electricity Sub Station	652391 306411	Electricity Sub Station, NR31	Electrical Features	Infrastructure and Facilities
220A R	129	E	Pinstripe Distribution Ltd	652925 305861	Pinstripe Distribution Ltd, Midas Building, Swanston's Road, Great Yarmouth, NR30 3NQ	Distribution and Haulage	Transport, Storage and Delivery
221	129	E	Gold Cockerel Books	652925 305861	Gold Cockerel Books, Midas Building, Swanston's Road, Great Yarmouth, NR30 3NQ	Published Goods	Industrial Products
222	130	N	Works	652610 306511	Works, NR30	Unspecified Works Or Factories	Industrial Features
223A S	130	S	A B Trade Supplies	652734 305743	A B Trade Supplies, Canada Building, South Denes Road, Great Yarmouth, NR30 3PF	General Construction Supplies	Industrial Products
224B A	132	E	Electricity Sub Station	652691 305634	Electricity Sub Station, NR30	Electrical Features	Infrastructure and Facilities
225A T	132	S	Hy-tek Engineering Services Ltd	652821 305760	Hy-tek Engineering Services Ltd, 3, Main Cross Road, Great Yarmouth, NR30 3PD	Precision Engineers	Engineering Services

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226A T	132	S	Toucam Engineers Ltd	652821 305760	Toucam Engineers Ltd, 3, Main Cross Road, Great Yarmouth, NR30 3PD	Fuel Distributors and Suppliers	Household, Office, Leisure and Garden
227A S	136	S	Displaypro	652764 305744	Displaypro, Display House, Main Cross Road, Great Yarmouth, NR30 3NZ	Office and Shop Equipment	Industrial Products
228A U	140	SE	Depot	652909 305803	Depot, NR30	Container and Storage	Transport, Storage and Delivery
229A T	141	S	Works	652826 305753	Works, NR30	Unspecified Works Or Factories	Industrial Features
230B E	142	SE	Crane	652620 305528	Crane, NR31	Travelling Cranes and Gantries	Industrial Features
231A V	144	N	Warehouse	652532 306522	Warehouse, NR30	Container and Storage	Transport, Storage and Delivery
232A V	146	N	S T M Rewinds Ltd	652536 306524	S T M Rewinds Ltd, A B C Wharf, Southgates Road, Great Yarmouth, NR30 3LQ	Vehicle Repair, Testing and Servicing	Repair and Servicing
233	148	NW	Tank	651721 306097	Tank, NR31	Tanks (Generic)	Industrial Features
234B B	153	SE	Warehouse	652881 305762	Warehouse, NR30	Container and Storage	Transport, Storage and Delivery
235A X	153	SE	Tank	652701 305595	Tank, NR30	Tanks (Generic)	Industrial Features
236A W	155	S	Depot	652777 305728	Depot, NR30	Container and Storage	Transport, Storage and Delivery
237	156	NW	Subsea Protection Systems	652383 306461	Subsea Protection Systems, Holmes Wharf 225, Southtown Road, Great Yarmouth, NR31 0JJ	Concrete Products	Industrial Products
238A W	156	S	Warehouse	652748 305720	Warehouse, NR30	Container and Storage	Transport, Storage and Delivery
239A X	156	SE	Tank	652705 305597	Tank, NR30	Tanks (Generic)	Industrial Features
240A Y	157	NW	Survival-one	651919 306209	Survival-one, Performance House Unit 6-7, Owen Road, Great Yarmouth, NR31 0NA	Special Purpose Machinery and Equipment	Industrial Products
241A U	157	SE	Nelson Works	652901 305772	Nelson Works, NR30	Unspecified Works Or Factories	Industrial Features
242A Y	157	NW	P V S Holdings	651919 306209	P V S Holdings, Unit 6 & 7 Owen Road, Great Yarmouth, NR31 0NA	Garden Goods	Consumer Products
243A Z	158	SE	Micro Engineering Ltd	652939 305818	Micro Engineering Ltd, Battery Road, Great Yarmouth, NR30 3NN	Precision Engineers	Engineering Services
244A Z	158	SE	B W Refrigeration & Air Conditioning Ltd	652939 305818	B W Refrigeration & Air Conditioning Ltd, Battery Road, Great Yarmouth, NR30 3NN	Construction Completion Services	Construction Services
245A X	159	SE	Tank	652706 305593	Tank, NR30	Tanks (Generic)	Industrial Features
246A X	159	SE	Tank	652703 305586	Tank, NR30	Tanks (Generic)	Industrial Features
247A X	160	E	Tank	652709 305598	Tank, NR30	Tanks (Generic)	Industrial Features



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248A X	162	SE	Tank	652707 305588	Tank, NR30	Tanks (Generic)	Industrial Features
249A X	162	SE	Tank	652704 305582	Tank, NR30	Tanks (Generic)	Industrial Features
250B A	162	E	D P Services & Supplies Ltd	652720 305626	D P Services & Supplies Ltd, Ferry House, South Denes Road, Great Yarmouth, NR30 3PJ	Container and Storage	Transport, Storage and Delivery
251B A	162	E	Ebrex UK Ltd	652720 305626	Ebrex UK Ltd, Ferry House, South Denes Road, Great Yarmouth, NR30 3PJ	Distribution and Haulage	Transport, Storage and Delivery
252	163	SE	Great Yarmouth	652608 305498	Great Yarmouth, A1243 South Denes Road And Riverside Road, Barrack Estate, NR31	Ferries and Ferry Terminals	Water
253A X	163	SE	Tank	652711 305594	Tank, NR30	Tanks (Generic)	Industrial Features
254	163	SW	East Coast Insulations Ltd	651695 305587	East Coast Insulations Ltd, Munnings Court, Harfreys Road, Great Yarmouth, NR31 0LS	Recycling, Reclamation and Disposal	Recycling Services
255A X	165	SE	Tank	652709 305584	Tank, NR30	Tanks (Generic)	Industrial Features
256A X	165	SE	Tank	652706 305578	Tank, NR30	Tanks (Generic)	Industrial Features
257A X	165	SE	Tank	652712 305590	Tank, NR30	Tanks (Generic)	Industrial Features
258A X	168	SE	Tank	652712 305585	Tank, NR30	Tanks (Generic)	Industrial Features
259BF	168	W	D N V Gl	651679 305750	D N V Gl, Cooke House, Morton Peto Road, Great Yarmouth, NR31 0LT	Marine Engineers and Services	Engineering Services
260A X	168	SE	Tank	652707 305575	Tank, NR30	Tanks (Generic)	Industrial Features
261A X	168	SE	Tank	652710 305580	Tank, NR30	Tanks (Generic)	Industrial Features
262A X	170	SE	Tank	652707 305570	Tank, NR30	Tanks (Generic)	Industrial Features
263A X	171	SE	Tank	652714 305581	Tank, NR30	Tanks (Generic)	Industrial Features
264A X	171	SE	Tank	652711 305575	Tank, NR30	Tanks (Generic)	Industrial Features
265	172	S	Advanced Machinery Relocations Ltd	652217 305508	Advanced Machinery Relocations Ltd, 18, Suffolk Road, Gorleston, Great Yarmouth, NR31 0QB	Construction Completion Services	Construction Services
266B B	173	SE	Equipment Supply Co G Y Ltd	652911 305759	Equipment Supply Co G Y Ltd, Nelson Works, Main Cross Road, Great Yarmouth, NR30 3NZ	General Construction Supplies	Industrial Products
267A X	173	SE	Tank	652711 305572	Tank, NR30	Tanks (Generic)	Industrial Features
268B C	174	SE	Tank	652709 305566	Tank, NR30	Tanks (Generic)	Industrial Features
269B C	174	SE	Tank	652715 305576	Tank, NR30	Tanks (Generic)	Industrial Features

ID	Distance (m)	Direction	Company	NGR	Address	Activity	Category
270B D	175	N	Warehouse	652533 306553	Warehouse, NR30	Container and Storage	Transport, Storage and Delivery
271A X	175	E	Factory	652727 305602	Factory, NR30	Unspecified Works Or Factories	Industrial Features
272B D	175	N	Abc Wharf	652508 306553	Abc Wharf, NR30	Moorings and Unloading Facilities	Water
273B G	175	N	Works	652643 306558	Works, NR30	Unspecified Works Or Factories	Industrial Features
274B E	176	SE	Landing Stage	652643 305502	Landing Stage, NR31	Moorings and Unloading Facilities	Water
275B C	176	SE	Tank	652712 305567	Tank, NR30	Tanks (Generic)	Industrial Features
276A X	177	SE	Tank	652716 305573	Tank, NR30	Tanks (Generic)	Industrial Features
277B C	177	SE	Tank	652710 305562	Tank, NR30	Tanks (Generic)	Industrial Features
278B C	179	SE	Tank	652713 305564	Tank, NR30	Tanks (Generic)	Industrial Features
279B C	179	SE	Tank	652710 305558	Tank, NR30	Tanks (Generic)	Industrial Features
280B H	179	SE	Warehouse	652945 305786	Warehouse, NR30	Container and Storage	Transport, Storage and Delivery
281A X	179	SE	Tank	652717 305569	Tank, NR30	Tanks (Generic)	Industrial Features
282B C	181	SE	Tank	652717 305565	Tank, NR30	Tanks (Generic)	Industrial Features
283A W	185	S	Electricity Sub Station	652814 305705	Electricity Sub Station, NR30	Electrical Features	Infrastructure and Facilities
284BF	185	W	S M S Auto Care Ltd	651661 305738	S M S Auto Care Ltd, Unit 2 Cooke House, Morton Peto Road, Great Yarmouth, NR31 0LT	Vehicle Repair, Testing and Servicing	Repair and Servicing
285	186	NW	C & L Waste Oil Collection Ltd	652057 306302	C & L Waste Oil Collection Ltd, Yarmouth Business Park, Thamesfield Way, Great Yarmouth, NR31 0DN	Recycling, Reclamation and Disposal	Recycling Services
286B G	187	N	J R Pitchers Ltd	652606 306568	J R Pitchers Ltd, 5, Selby Place, Great Yarmouth, NR30 3LG	Vehicle Repair, Testing and Servicing	Repair and Servicing
287B K	195	NW	Tube Care Inspection Ltd	651736 306176	Tube Care Inspection Ltd, Bessemer Way, Great Yarmouth, NR31 0LX	General Construction Supplies	Industrial Products
288A Z	197	E	Kingsway Tyres	652982 305819	Kingsway Tyres, Battery Road, Great Yarmouth, NR30 3NN	Vehicle Parts and Accessories	Motoring
289BI	197	E	Shopkit	652995 305867	Shopkit, Unit 1-3, Swanston's Road, Great Yarmouth, NR30 3NQ	Precision Engineers	Engineering Services
290B H	198	SE	Warehouse	652975 305799	Warehouse, NR30	Container and Storage	Transport, Storage and Delivery
291BI	198	E	Depot	652996 305861	Depot, NR30	Container and Storage	Transport, Storage and Delivery
292B G	199	N	Queen's Road Business Centre	652671 306579	Queen's Road Business Centre, NR30	Business Parks and Industrial Estates	Industrial Features

ID	Distance (m)	Direction	Company	NGR	Address	Activity	Category
293BL	208	SE	Quay	652707 305509	Quay, NR30	Moorings and Unloading Facilities	Water
294BO	211	S	Depot	652877 305695	Depot, NR30	Container and Storage	Transport, Storage and Delivery
295BH	212	SE	Warehouse	652980 305780	Warehouse, NR30	Container and Storage	Transport, Storage and Delivery
296BJ	213	N	Works	652628 306595	Works, NR30	Unspecified Works Or Factories	Industrial Features
297BJ	215	N	Pertwee & Back Ltd - Ford	652585 306594	Pertwee & Back Ltd - Ford, Southgates Road, Great Yarmouth, NR30 3LF	Vehicle Repair, Testing and Servicing	Repair and Servicing
298	216	SE	Kirklands Ltd	652942 305730	Kirklands Ltd, Kirklands House, Main Cross Road, Great Yarmouth, NR30 3NZ	Workwear	Industrial Products
299	216	S	Electricity Sub Station	652504 305411	Electricity Sub Station, NR31	Electrical Features	Infrastructure and Facilities
300BK	218	NW	Electricity Sub Station	651684 306162	Electricity Sub Station, NR31	Electrical Features	Infrastructure and Facilities
301	220	SE	Carl J Harrison Piano Services	652601 305428	Carl J Harrison Piano Services, 3, Ferry Hill, Gorleston, Great Yarmouth, NR31 0PD	Sports and Leisure Equipment Repair	Repair and Servicing
302BL	221	SE	Depot	652736 305522	Depot, NR30	Container and Storage	Transport, Storage and Delivery
303BM	225	N	Warehouse	652525 306603	Warehouse, NR30	Container and Storage	Transport, Storage and Delivery
304BN	228	W	D T S Solutions	651619 305949	D T S Solutions, Unit 17, Bessemer Way, Great Yarmouth, NR31 0LX	Radar and Telecommunications Equipment	Industrial Products
305BM	228	N	Wharf	652498 306605	Wharf, NR30	Moorings and Unloading Facilities	Water
306BN	228	W	Engraphics Ltd	651619 305939	Engraphics Ltd, Unit 16, Bessemer Way, Great Yarmouth, NR31 0LX	Signs	Industrial Products
307BN	230	W	Smart Buy Tools	651619 305928	Smart Buy Tools, Unit 15, Bessemer Way, Great Yarmouth, NR31 0LX	Tools Including Machine Shops	Industrial Products
308	230	N	Great Yarmouth Coach Works	652677 306610	Great Yarmouth Coach Works, 15, Queens Road, Great Yarmouth, NR30 3HT	New Vehicles	Motoring
309BO	232	SE	C & C Sheds & Timber	652931 305700	C & C Sheds & Timber, Suffling Road, Great Yarmouth, NR30 3QP	Garden Goods	Consumer Products
310BM	233	N	Works	652544 306611	Works, NR30	Unspecified Works Or Factories	Industrial Features
311BP	233	W	Securicom Services	651612 305834	Securicom Services, Unit 6, Bessemer Way, Great Yarmouth, NR31 0LX	Electronic Equipment	Industrial Products
312BP	233	W	Id Asbestos Ltd	651612 305834	Id Asbestos Ltd, Unit 6, Bessemer Way, Great Yarmouth, NR31 0LX	Recycling, Reclamation and Disposal	Recycling Services
313BQ	235	SE	Lacons Brewery	653011 305789	Lacons Brewery, The Courtyard, Main Cross Road, Great Yarmouth, NR30 3NZ	Alcoholic Drinks	Foodstuffs

ID	Distance (m)	Direction	Company	NGR	Address	Activity	Category
314	235	NW	B L I Technologies Ltd	651991 306327	B L I Technologies Ltd, Northland Energy Services UK Limited Yarmouth Business Park, Suffolk Road, Great Yarmouth, NR31 0ER	Distribution and Haulage	Transport, Storage and Delivery
315	236	W	Scantech Offshore	651605 305692	Scantech Offshore, Scantech House, Morton Peto Road, Great Yarmouth, NR31 0LT	Special Purpose Machinery and Equipment	Industrial Products
316	237	E	Yarmouth Rewinds	653027 305826	Yarmouth Rewinds, Swanston's Road, Great Yarmouth, NR30 3NQ	Vehicle Repair, Testing and Servicing	Repair and Servicing
317	241	N	Hopper	651835 306254	Hopper, NR31	Hoppers and Silos	Farming
318	242	N	Nelson Garage	652574 306621	Nelson Garage, Southgates Road, Great Yarmouth, NR30 3LF	Vehicle Repair, Testing and Servicing	Repair and Servicing
319BL	246	SE	Depot	652739 305488	Depot, NR30	Container and Storage	Transport, Storage and Delivery
320	247	SE	Depot	652942 305689	Depot, NR30	Container and Storage	Transport, Storage and Delivery

## 4.2 Petrol and Fuel Sites

Records of petrol or fuel sites within 500m of the study site:

3

The following petrol or fuel site records provided by Catalist are represented as points on the Current Land Use map:

ID	Distance (m)	Direction	NGR	Company	Address	LPG	Status
321	0	On Site	652574 306370	BP	South Quay Service Station, Southgates Road, Southgates Road, Trinity Square, Great Yarmouth, Norfolk, NR30 3LL	No	Open
322A	0	On Site	652377 306137	BP	Southtown Service Station, 126, Southtown Road, Southtown Road, Great Yarmouth, Norfolk, NR31 0JZ	No	Open
323B Q	314	SE	653075 305741	Obsolete	South Beach Service Station, South Beach Parade, South Beach Parade, Great Yarmouth, Norfolk, NR30 3QN	Not Applicable	Obsolete

### 4.3 National Grid High Voltage Underground Electricity Transmission Cables

This dataset identifies the high voltage electricity transmission lines running between generating power plants and electricity substations. The dataset does not include the electricity distribution network (smaller, lower voltage cables distributing power from substations to the local user network). This information has been extracted from databases held by National Grid and is provided for information only with no guarantee as to its completeness or accuracy. National Grid do not offer any warranty as to the accuracy of the available data and are excluded from any liability for any such inaccuracies or errors.

Records of National Grid high voltage underground electricity transmission cables within 500m of the study site: 0

Database searched and no data found.

---

### 4.4 National Grid High Pressure Gas Transmission Pipelines

This dataset identifies high-pressure, large diameter pipelines which carry gas between gas terminals, power stations, compressors and storage facilities. The dataset does not include the Local Transmission System (LTS) which supplies gas directly into homes and businesses. This information has been extracted from databases held by National Grid and is provided for information only with no guarantee as to its completeness or accuracy. National Grid do not offer any warranty as to the accuracy of the available data and are excluded from any liability for any such inaccuracies or errors.

Records of National Grid high pressure gas transmission pipelines within 500m of the study site: 0

Database searched and no data found.

---

# 5. Geology

## 5.1 Artificial Ground and Made Ground

The database has been searched on site, including a 50m buffer.

Lex Code	Description	Rock Type
MGR-ARTDP	MADE GROUND (UNDIVIDED)	ARTIFICIAL DEPOSIT
MGR-ARTDP	MADE GROUND (UNDIVIDED)	ARTIFICIAL DEPOSIT

## 5.2 Superficial Ground and Drift Geology

The database has been searched on site, including a 50m buffer.

Lex Code	Description	Rock Type
NRD-XSV	NORTH DENES FORMATION	SAND AND GRAVEL
BRYD-P	BREYDON FORMATION	PEAT
BRYD-XCZ	BREYDON FORMATION	CLAY AND SILT
BRYD-XCZ	BREYDON FORMATION	CLAY AND SILT
TRD-XCZ	TIDAL RIVER OR CREEK DEPOSITS	CLAY AND SILT
HPGL-S	HAPPISBURGH GLACIGENIC FORMATION	SAND
BSA-S	BLOWN SAND	SAND

## 5.3 Bedrock and Solid Geology

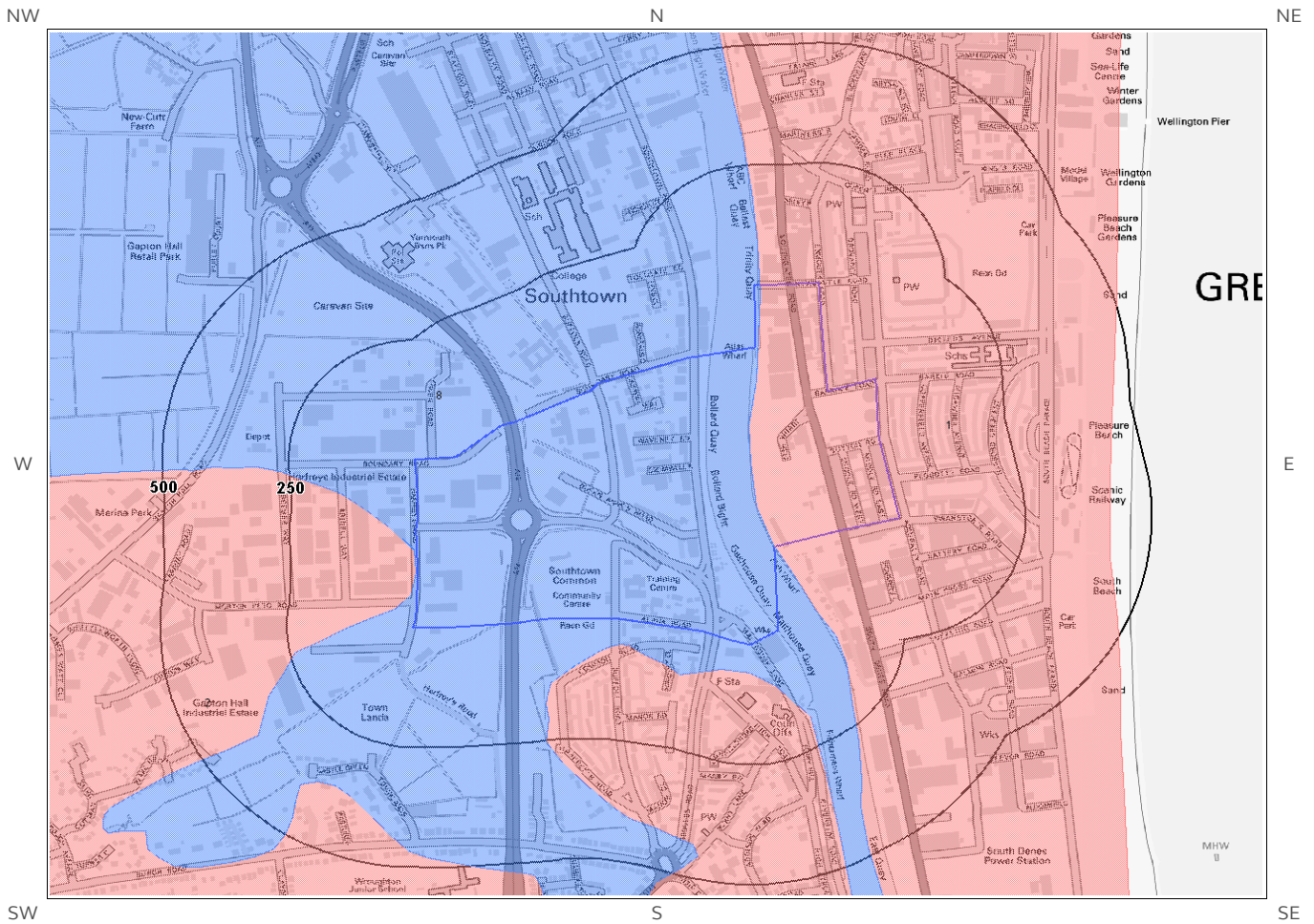
The database has been searched on site, including a 50m buffer.

Lex Code	Description	Rock Type
CRAg-XSV	CRAg GROUP	SAND AND GRAVEL

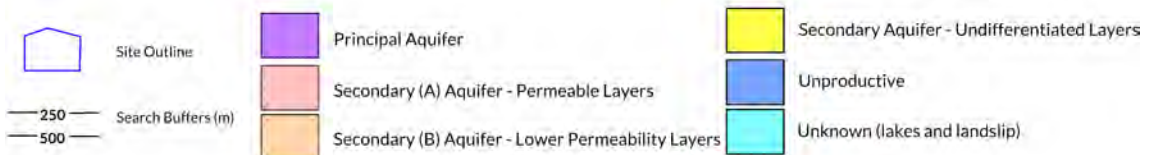
(Derived from the BGS 1:50,000 Digital Geological Map of Great Britain)

# 6 Hydrogeology and Hydrology

## 6a. Aquifer Within Superficial Geology

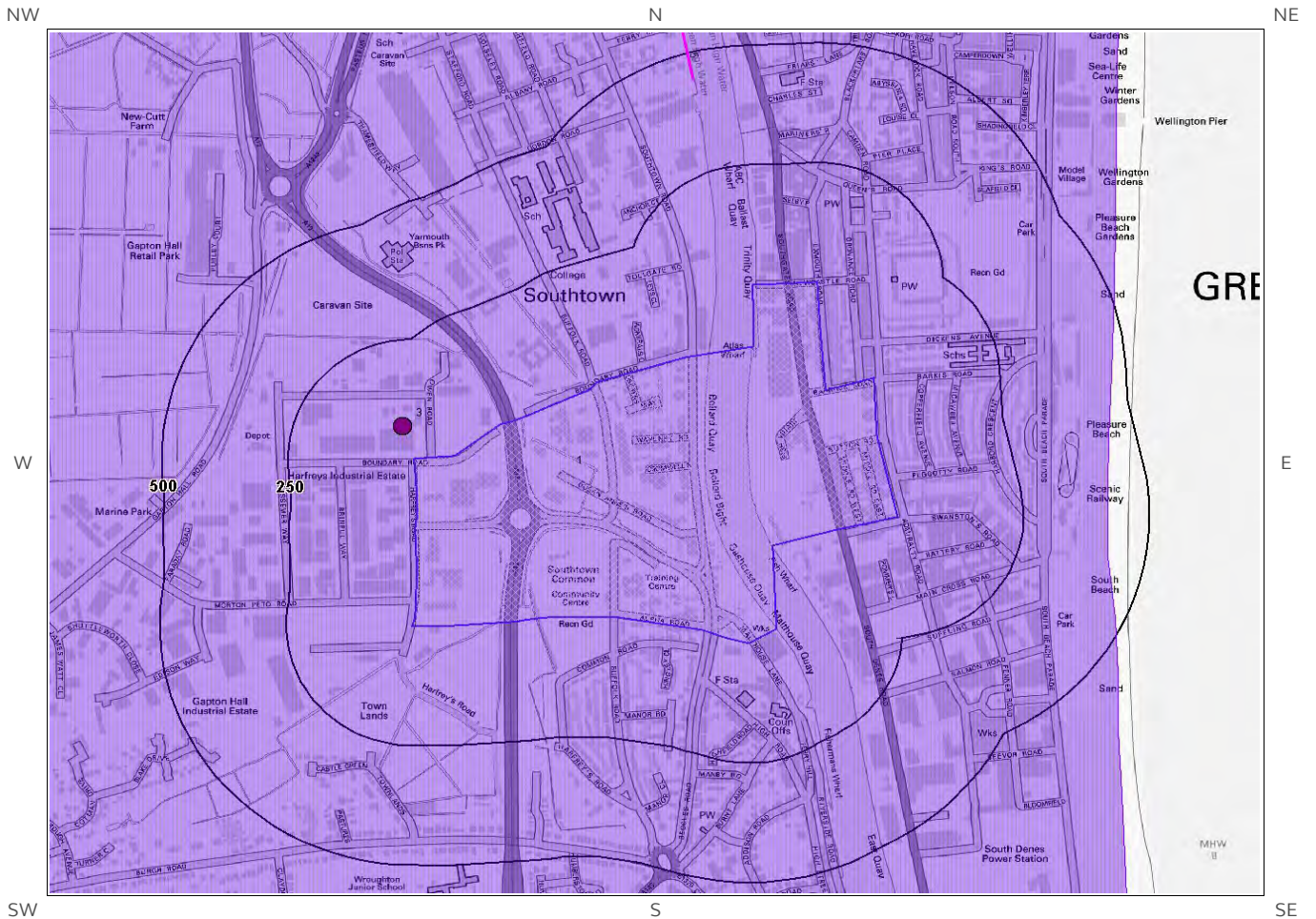


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# 6b. Aquifer Within Bedrock Geology and Abstraction Licenses



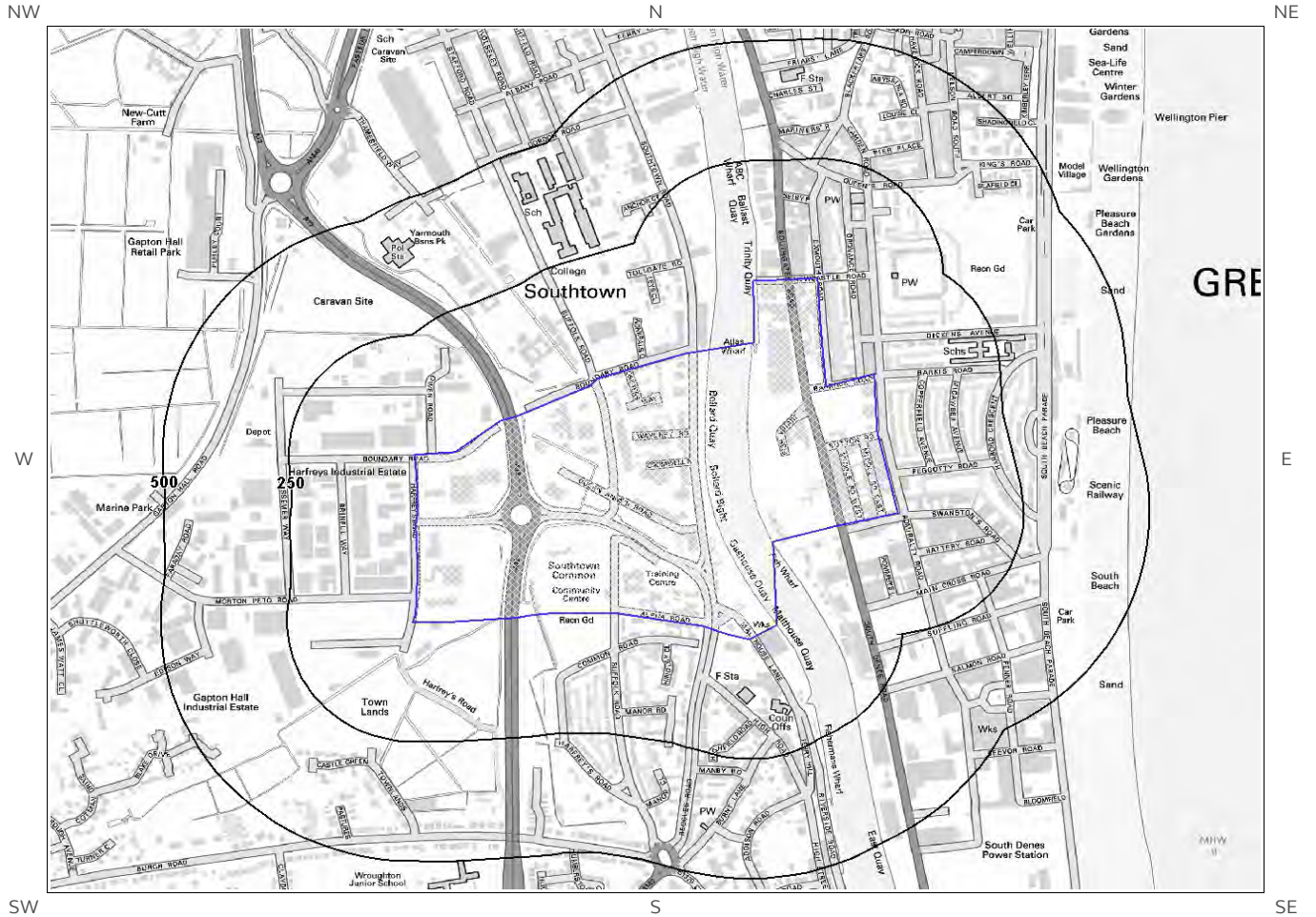
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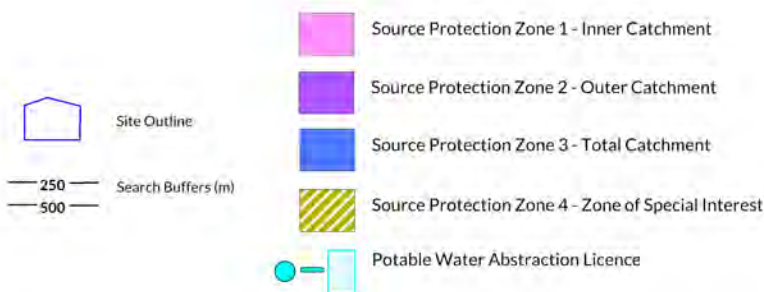




# 6c. Hydrogeology – Source Protection Zones and Potable Water Abstraction Licenses

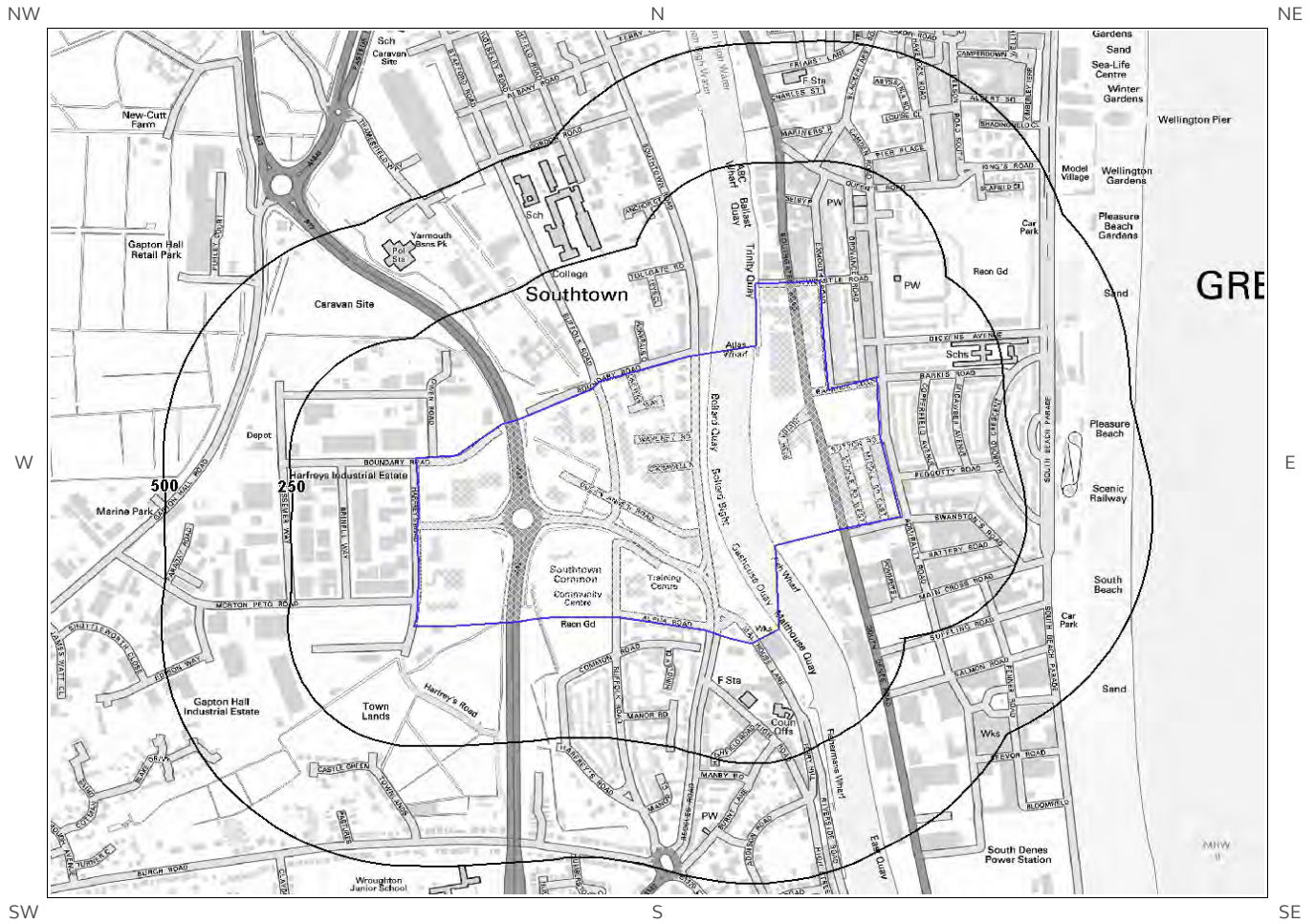


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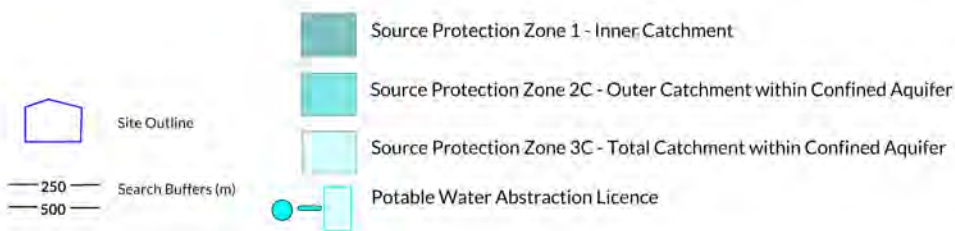




# 6d. Hydrogeology – Source Protection Zones within confined aquifer

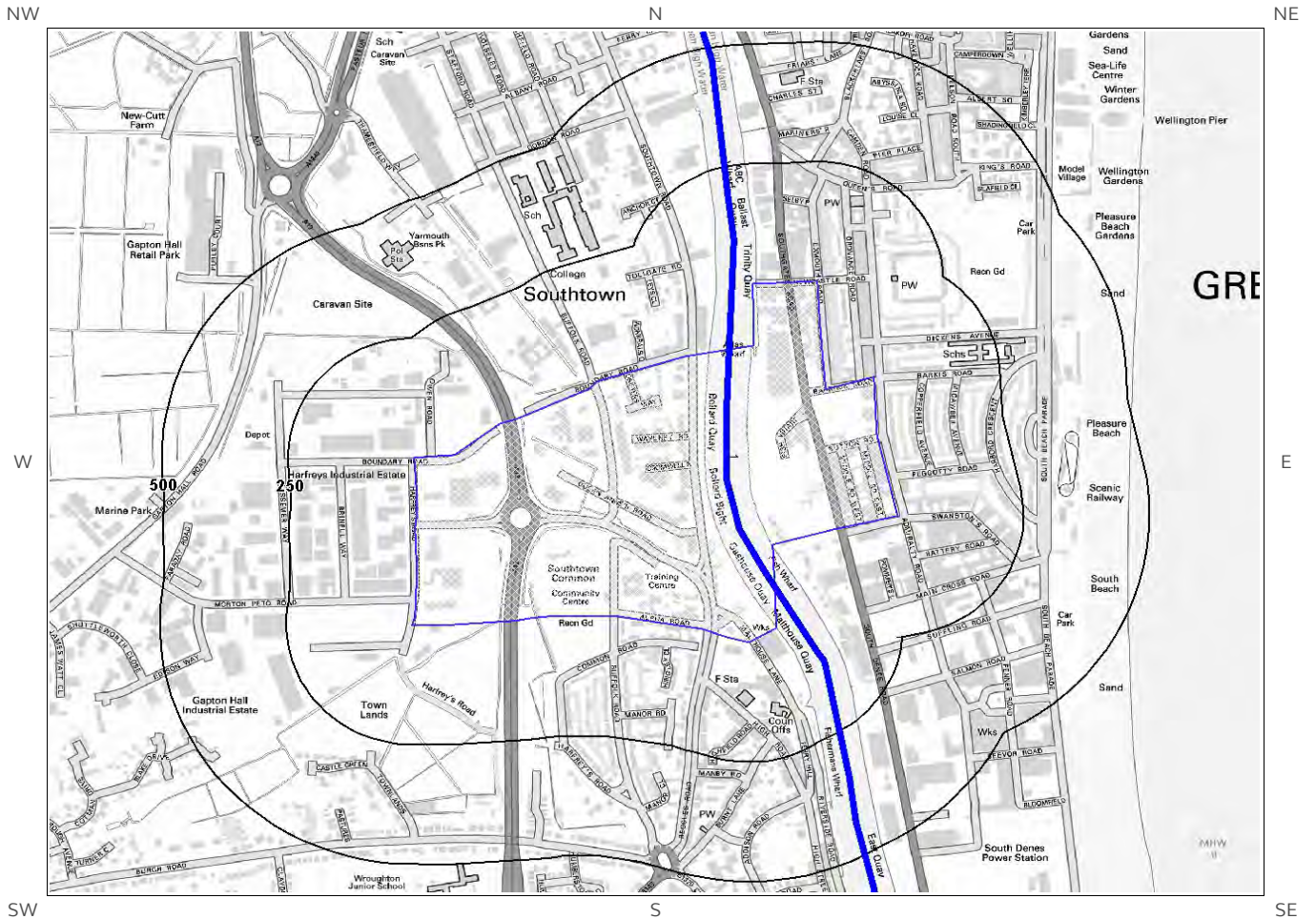


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# 6e. Hydrology – Detailed River Network and River Quality



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# 6. Hydrogeology and Hydrology

## 6.1 Aquifer within Superficial Deposits

Are there records of strata classification within the superficial geology at or in proximity to the property? Yes

From 1 April 2010, the Environment Agency/Natural Resources Wales's Groundwater Protection Policy has been using aquifer designations consistent with the Water Framework Directive. For further details on the designation and interpretation of this information, please refer to the Groundsure Enviro Insight User Guide.

The following aquifer records are shown on the Aquifer within Superficial Geology Map (6a):

ID	Distance (m)	Direction	Designation	Description
1	0	On Site	Secondary A	Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers
8	0	On Site	Unproductive	These are rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow
2	3	W	Secondary A	Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers

## 6.2 Aquifer within Bedrock Deposits

Are there records of strata classification within the bedrock geology at or in proximity to the property? Yes

From 1 April 2010, the Environment Agency/Natural Resources Wales's Groundwater Protection Policy has been using aquifer designations consistent with the Water Framework Directive. For further details on the designation and interpretation of this information, please refer to the Groundsure Enviro Insight User Guide.

The following aquifer records are shown on the Aquifer within Bedrock Geology Map (6b):

ID	Distance (m)	Direction	Designation	Description
1	0	On Site	Principal	Geology of high intergranular and/or fracture permeability, usually providing a high level of water storage and may support water supply/river base flow on a strategic scale. Generally principal aquifers were previously major aquifers

## 6.3 Groundwater Abstraction Licences

Are there any Groundwater Abstraction Licences within 2000m of the study site?

Yes

The following Abstraction Licences records are represented as points, lines and regions on the Aquifer within Bedrock Geology Map (6b):

ID	Distance (m)	Direction	NGR	Details	
3	71	N	651820 306080	Status: Active Licence No: AN/034/0015/020 Details: Laundry Use Direct Source: Ground Water Source Of Supply Point: Wellpoints At The Laundry, Portland Lane, Great Yarmouth Data Type: Point Name: Camplings Limited	Annual Volume (m <sup>3</sup> ): 60000 Max Daily Volume (m <sup>3</sup> ): 210 Original Application No: NPS/WR/024446 Original Start Date: 1/12/2016 Expiry Date: 31/3/2030 Issue No: 1 Version Start Date: 1/12/2016 Version End Date:
Not shown	1187	NE	653140 307460	Status: Historical Licence No: 7/34/15/*G/0220 Details: Make-Up or Top Up Water Direct Source: Ground Water Source Of Supply Point: Wellpoint At Gt Yarmouth Data Type: Point Name: B & M LEISURE	Annual Volume (m <sup>3</sup> ): - Max Daily Volume (m <sup>3</sup> ): - Original Application No: - Original Start Date: 1/3/1997 Expiry Date: - Issue No: 100 Version Start Date: 1/3/1997 Version End Date:

## 6.4 Surface Water Abstraction Licences

Are there any Surface Water Abstraction Licences within 2000m of the study site?

Yes

The following Surface Water Abstraction Licences records are represented as points, lines and regions on the Aquifer within Bedrock Geology Map (6b):

ID	Distance (m)	Direction	NGR	Details	
5	443	N	652372 306914	Status: Historical Licence No: AN/034/0015/013 Details: Hydraulic Testing Direct Source: Surface Water Source Of Supply Point: River Yare At Berth 28, Great Yarmouth Data Type: Line Name: INTERSERVE CONSTRUCTION LIMITED	Annual Volume (m <sup>3</sup> ): 4000 Max Daily Volume (m <sup>3</sup> ): 100 Application No: NPS/WR/014706 Original Start Date: 16/12/2013 Expiry Date: 31/3/2015 Issue No: 1 Version Start Date: 16/12/2013 Version End Date:

## 6.5 Potable Water Abstraction Licences

Are there any Potable Water Abstraction Licences within 2000m of the study site?

No

Database searched and no data found.

## 6.6 Source Protection Zones

Are there any Source Protection Zones within 500m of the study site?

No

Database searched and no data found.

---

## 6.7 Source Protection Zones within Confined Aquifer

Are there any Source Protection Zones within the Confined Aquifer within 500m of the study site?

No

Historically, Source Protection Zone maps have been focused on regulation of activities which occur at or near the ground surface, such as prevention of point source pollution and bacterial contamination of water supplies. Sources in confined aquifers were often considered to be protected from these surface pressures due to the presence of a low permeability confining layer (e.g. glacial till, clay). The increased interest in subsurface activities such as onshore oil and gas exploration, ground source heating and cooling requires protection zones for confined sources to be marked on SPZ maps where this has not already been done.

Database searched and no data found.

---

## 6.8 Groundwater Vulnerability and Soil Leaching Potential

Is there any Environment Agency/Natural Resources Wales information on groundwater vulnerability and soil leaching potential within 500m of the study site?

Yes

Distance (m)	Direction	Classification	Soil Vulnerability Category	Description
0	On Site	Major Aquifer/High Leaching Potential	HU	Soil information for urban areas and restored mineral workings. These soils are therefore assumed to be highly permeable in the absence of site-specific information.
0	On Site	Major Aquifer/High Leaching Potential	HU	Soil information for urban areas and restored mineral workings. These soils are therefore assumed to be highly permeable in the absence of site-specific information.
487	W	Major Aquifer/High Leaching Potential	H1	Soils which readily transmit liquid discharges because they are shallow or susceptible to rapid flow directly to rock, gravel or groundwater.

---

## 6.9 River Quality

Is there any Environment Agency/Natural Resources Wales information on river quality within 1500m of the study site?

No

Database searched and no data found.

---

6.9.2 Chemical Quality:

Database searched and no data found.

---

**6.10 Detailed River Network**

Are there any Detailed River Network entries within 500m of the study site? Yes

The following Detailed River Network records are represented on the Hydrology Map (6e):

ID	Distance (m)	Direction	Details
1	0	On Site	River Name: River Yare Welsh River Name: - Alternative Name: - River Type: Primary River Main River Status: Currently Undefined

---

## 6.11 Surface Water Features

Are there any surface water features within 250m of the study site?

Yes

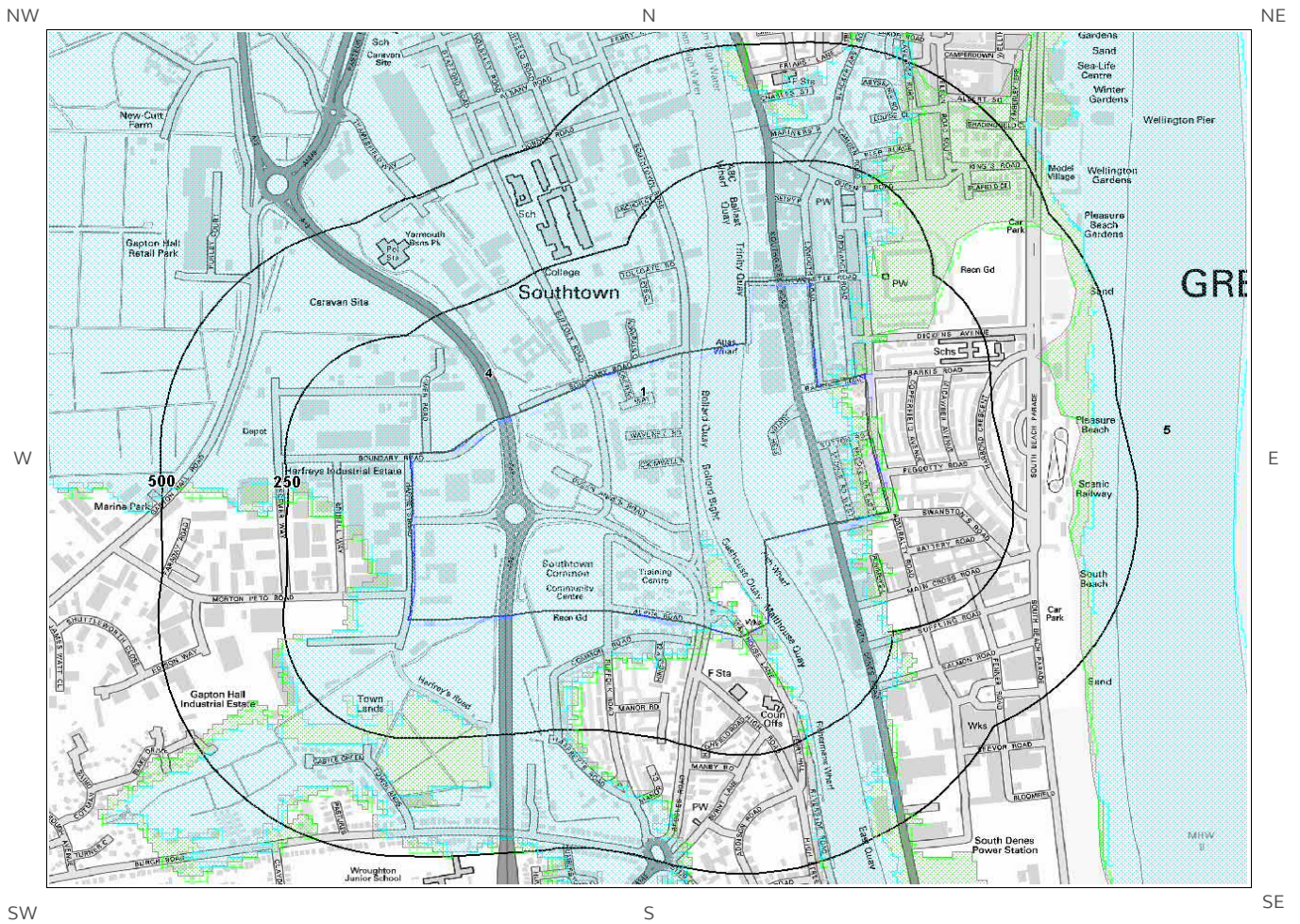
The following surface water records are not represented on mapping:

Distance (m)	Direction
0	On Site
0	On Site
0	On Site
0	On Site
0	On Site
0	On Site
0	On Site
0	On Site
17	NW
25	NW
29	N
37	NW
52	NW
74	SW
105	NW
118	S
143	S
158	NW
176	S





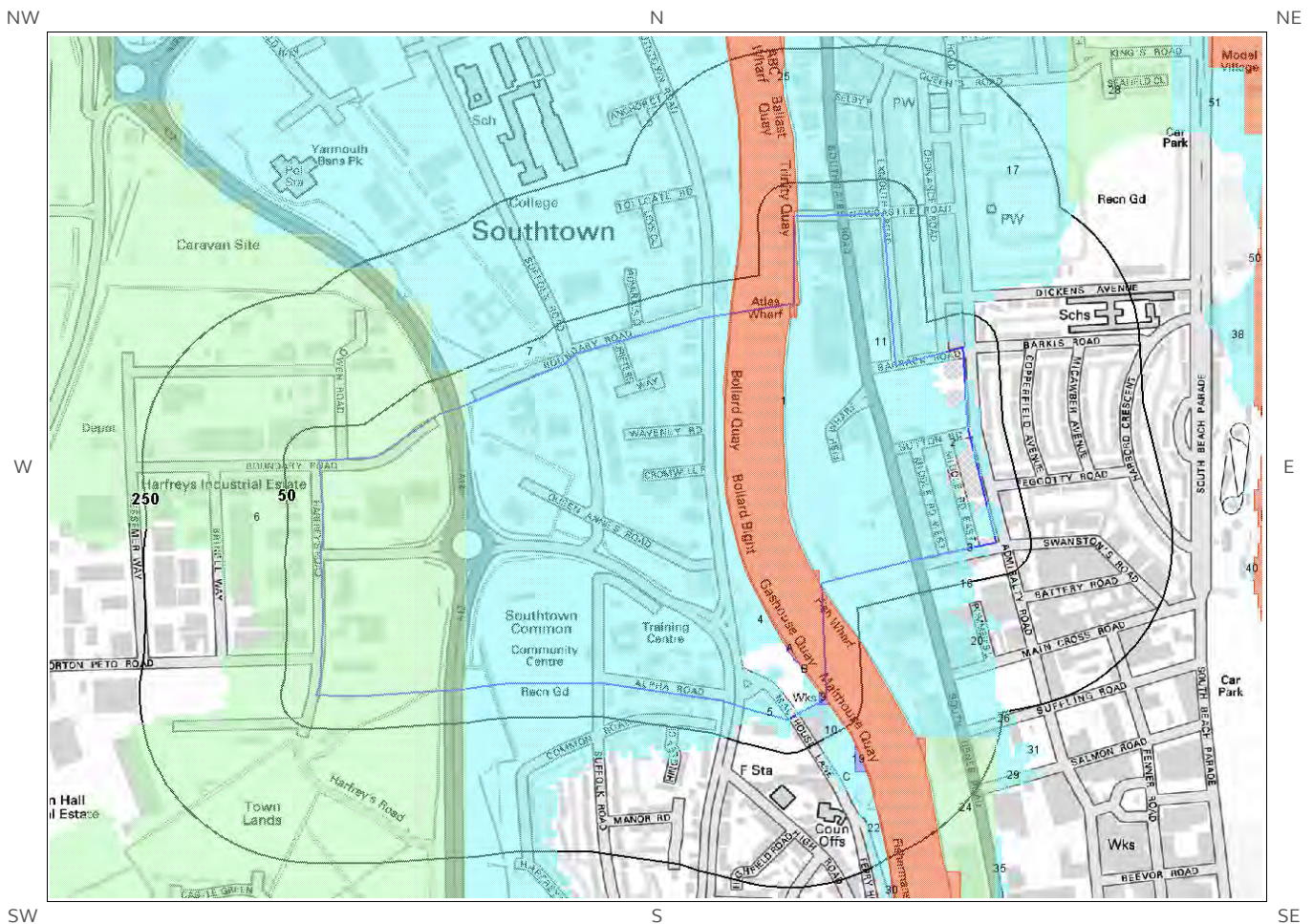
# 7a. Environment Agency/Natural Resources Wales Flood Map for Planning (from rivers and the sea)



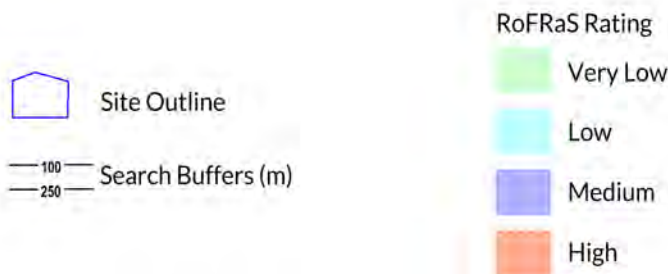
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# 7b. Environment Agency/Natural Resources Wales Risk of Flooding from Rivers and the Sea (RoFRaS) Map



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# 7 Flooding

## 7.1 River and Coastal Zone 2 Flooding

Is the site within 250m of an Environment Agency/Natural Resources Wales Zone 2 floodplain? **Yes**

Environment Agency/Natural Resources Wales Zone 2 floodplains estimate the annual probability of flooding as between 1 in 1000 (0.1%) and 1 in 100 (1%) from rivers and between 1 in 1000 (0.1%) and 1 in 200 (0.5%) from the sea. Any relevant data is represented on Map 7a – Flood Map for Planning:

ID	Distance (m)	Direction	Update	Type
1	0	On Site	19-Jun-2017	Zone 2 - (Fluvial /Tidal Models)

## 7.2 River and Coastal Zone 3 Flooding

Is the site within 250m of an Environment Agency/Natural Resources Wales Zone 3 floodplain? **Yes**

Zone 3 shows the extent of a river flood with a 1 in 100 (1%) or greater chance of occurring in any year or a sea flood with a 1 in 200 (0.5%) or greater chance of occurring in any year. Any relevant data is represented on Map 7a – Flood Map for Planning.

ID	Distance (m)	Direction	Update	Type
1	0	On Site	19-Jun-2017	Zone 3 - (Fluvial Models)

## 7.3 Risk of Flooding from Rivers and the Sea (RoFRaS) Flood Rating

What is the highest risk of flooding onsite? **High**

The Environment Agency/Natural Resources Wales RoFRaS database provides an indication of river and coastal flood risk at a national level on a 50m grid with the flood rating at the centre of the grid calculated and given above. The data considers the probability that the flood defences will overtop or breach by considering their location, type, condition and standard of protection.

RoFRaS data for the study site indicates the property is in an area with a High (1 in 30 or greater) chance of flooding in any given year.

Any relevant data within 250m is represented on the RoFRaS Flood map. Data to 50m is reported in the table below.

ID	Distance (m)	Direction	RoFRaS flood Risk
1	0.0	On Site	Low
2	0.0	On Site	Low

3	0.0	On Site	Low
4	0.0	On Site	Low
5	0.0	On Site	Low
6	0.0	On Site	Very Low
7	0.0	On Site	Low
8B	0.0	On Site	Low
9	0.0	On Site	Medium
10	0.0	On Site	Low
11	0.0	On Site	Low
12A	0.0	On Site	Medium
13A	0.0	On Site	Medium
14B	0.0	On Site	Medium
15B	0.0	On Site	Medium
16	0.0	On Site	High
17	5.0	E	Low
18	30.0	S	Low

---

## 7.4 Flood Defences

Are there any Flood Defences within 250m of the study site? No  
Database searched and no data found.

---

## 7.5 Areas benefiting from Flood Defences

Are there any areas benefiting from Flood Defences within 250m of the study site? No

---

## 7.6 Areas benefiting from Flood Storage

Are there any areas used for Flood Storage within 250m of the study site? No

---

## 7.7 Groundwater Flooding Susceptibility Areas

7.7.1 Are there any British Geological Survey groundwater flooding susceptibility areas within 50m of the boundary of the study site? Yes

Does this relate to Clearwater Flooding or Superficial Deposits Flooding? Clearwater Flooding

Notes: Groundwater flooding may either be associated with shallow unconsolidated sedimentary aquifers which overlie unproductive aquifers (Superficial Deposits Flooding), or with unconfined aquifers (Clearwater Flooding).

### 7.7.2 What is the highest susceptibility to groundwater flooding in the search area based on the underlying geological conditions?

Limited potential

Where limited potential for groundwater flooding to occur is indicated, this means that although given the geological conditions there may be a groundwater flooding hazard, unless other relevant information, e.g. records of previous flooding, suggests groundwater flooding has occurred before in this area, you need take no further action in relation to groundwater flooding hazard.

---

## 7.8 Groundwater Flooding Confidence Areas

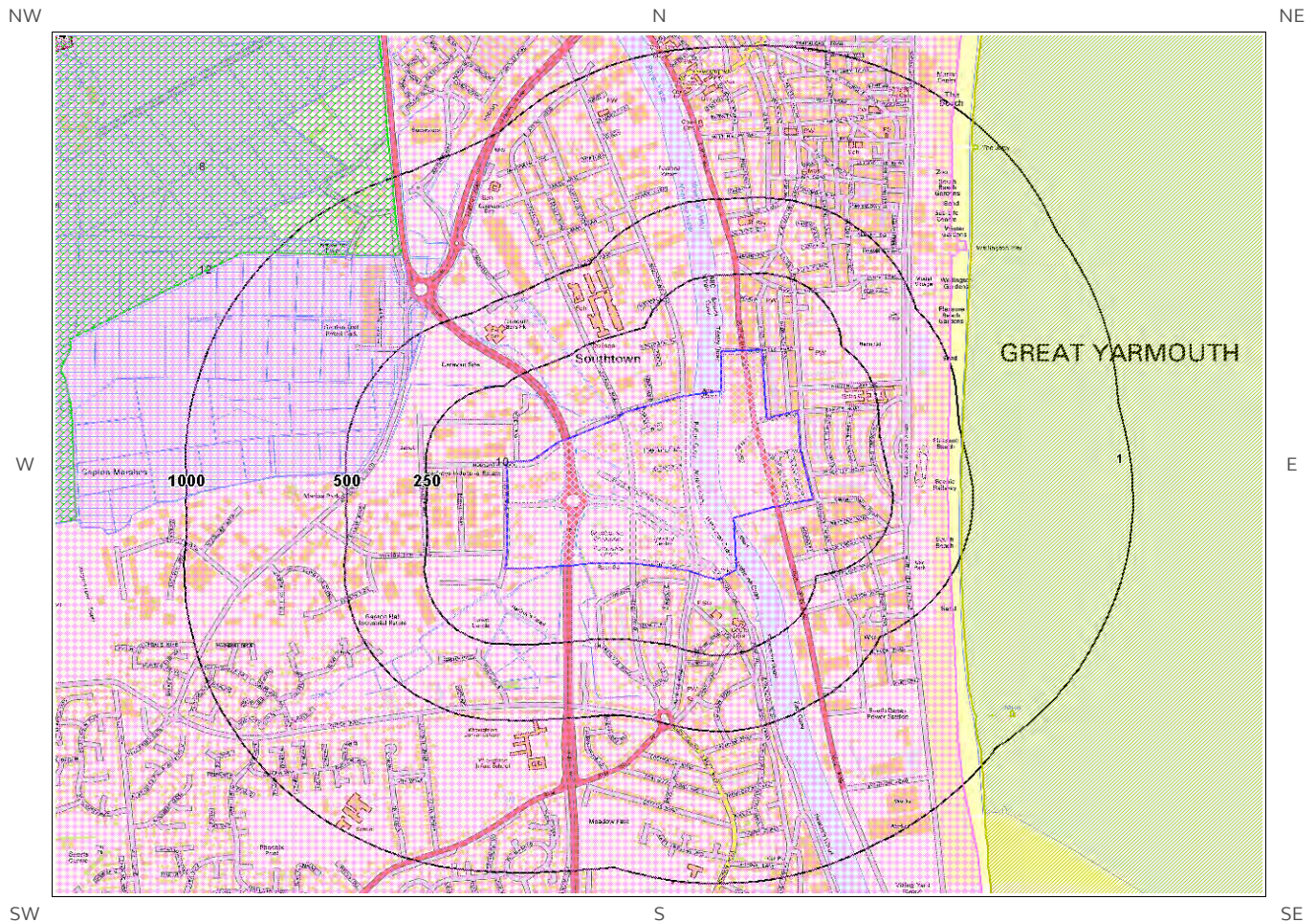
What is the British Geological Survey confidence rating in this result?

Low

Notes: Groundwater flooding is defined as the emergence of groundwater at the ground surface or the rising of groundwater into man-made ground under conditions where the normal range of groundwater levels is exceeded.

The confidence rating is on a threefold scale - Low, Moderate and High. This provides a relative indication of the BGS confidence in the accuracy of the susceptibility result for groundwater flooding. This is based on the amount and precision of the information used in the assessment. In areas with a relatively lower level of confidence the susceptibility result should be treated with more caution. In other areas with higher levels of confidence the susceptibility result can be used with more confidence.

# 8. Designated Environmentally Sensitive Sites Map



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# 8. Designated Environmentally Sensitive Sites

Presence of Designated Environmentally Sensitive Sites within 2000m of the study site? Yes

## 8.1 Records of Sites of Special Scientific Interest (SSSI) within 2000m of the study site:

3

The following Site of Special Scientific Interest (SSSI) records provided by Natural England/Natural Resources Wales are represented as polygons on the Designated Environmentally Sensitive Sites Map:

ID	Distance (m)	Direction	SSSI Name	Data Source
Not shown	1794	NW	Breydon Water	Natural England
4	1848	NW	Breydon Water	Natural England
Not shown	1949	NW	Breydon Water	Natural England

## 8.2 Records of National Nature Reserves (NNR) within 2000m of the study site:

0

Database searched and no data found.

## 8.3 Records of Special Areas of Conservation (SAC) within 2000m of the study site:

0

Database searched and no data found.

## 8.4 Records of Special Protection Areas (SPA) within 2000m of the study site:

2

The following Special Protection Area (SPA) records provided by Natural England/Natural Resources Wales are represented as polygons on the Designated Environmentally Sensitive Sites Map:

ID	Distance (m)	Direction	SPA Name	Data Source
1	465	E	Outer Thames Estuary	Natural England

ID	Distance (m)	Direction	SPA Name	Data Source
2A	1794	NW	Breydon Water	Natural England

### 8.5 Records of Ramsar sites within 2000m of the study site:

1

The following Ramsar records provided by Natural England/Natural Resources Wales are represented as polygons on the Designated Environmentally Sensitive Sites Map:

ID	Distance (m)	Direction	Ramsar Site Name	Ramsar Site Status	Data Source
6A	1794	NW	Breydon Water	Listed	Natural England

### 8.6 Records of Ancient Woodland within 2000m of the study site:

0

Database searched and no data found.

### 8.7 Records of Local Nature Reserves (LNR) within 2000m of the study site:

1

The following Local Nature Reserve (LNR) records provided by Natural England/Natural Resources Wales are represented as polygons on the Designated Environmentally Sensitive Sites Map:

ID	Distance (m)	Direction	LNR Name	Data Source
7	1797	NW	Breydon Water	Natural England

### 8.8 Records of World Heritage Sites within 2000m of the study site:

0

Database searched and no data found.



## 8.9 Records of Environmentally Sensitive Areas within 2000m of the study site:

2

The following Environmentally Sensitive Area records produced by DEFRA are represented as polygons on the Designated Environmentally Sensitive Sites Map:

ID	Distance (m)	Direction	ESA Name	Data Source
12	392	W	Broads	Natural England
Not shown	1839	W	Broads	Natural England

## 8.10 Records of Areas of Outstanding Natural Beauty (AONB) within 2000m of the study site:

0

Database searched and no data found.

## 8.11 Records of National Parks (NP) within 2000m of the study site:

2

The following National Park records provided by Natural England/Natural Resources Wales are represented as polygons on the Designated Environmentally Sensitive Sites Map:

ID	Distance (m)	Direction	NP Name	Data Source
8	754	NW	The Broads	Natural England
Not shown	1839	W	The Broads	Natural England

## 8.12 Records of Nitrate Sensitive Areas within 2000m of the study site:

0

Database searched and no data found.

### 8.13 Records of Nitrate Vulnerable Zones within 2000m of the study site:

2

The following Nitrate Vulnerable Zone records produced by DEFRA are represented as polygons on the Designated Environmentally Sensitive Sites Map:

ID	Distance (m)	Direction	NVZ Name	Data Source
10	0	On Site	Existing	DEFRA
Not shown	1839	W	Existing	DEFRA

### 8.14 Records of Green Belt land within 2000m of the study site:

0

Database searched and no data found.

# 9. Natural Hazards Findings

## 9.1 Detailed BGS GeoSure Data

BGS GeoSure Data has been searched to 50m. The data is included in tabular format. If you require further information on geology and ground stability, please obtain a **Groundsure Geo Insight**, available from our **website**. The following information has been found:

### 9.1.1 Shrink Swell

What is the maximum Shrink-Swell\* hazard rating identified on the study site? Low

The following natural subsidence information provided by the British Geological Survey is not represented on mapping:

Hazard
Ground conditions predominantly medium plasticity. Do not plant trees with high soil moisture demands near to buildings. For new build, consideration should be given to advice published by the National House Building Council (NHBC) and the Building Research Establishment (BRE). There is a possible increase in construction cost to reduce potential shrink-swell problems. For existing property, there is a possible increase in insurance risk, especially during droughts or where vegetation with high moisture demands is present.

### 9.1.2 Landslides

What is the maximum Landslide\* hazard rating identified on the study site? Low

The following natural subsidence information provided by the British Geological Survey is not represented on mapping:

Hazard
Possibility of slope instability problems after major changes in ground conditions. Consideration should be given to stability if changes to drainage or excavations take place. Possible increase in construction cost to reduce potential slope stability problems. Existing property no significant increase in insurance risk due to natural slope instability problems.

### 9.1.3 Soluble Rocks

What is the maximum Soluble Rocks\* hazard rating identified on the study site? Negligible

The following natural subsidence information provided by the British Geological Survey is not represented on mapping:

Hazard
Soluble rocks are present, but unlikely to cause problems except under exceptional conditions. No special actions required to avoid problems due to soluble rocks. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with soluble rocks.

\* This indicates an automatically generated 50m buffer and site.

### 9.1.4 Compressible Ground

What is the maximum Compressible Ground\* hazard rating identified on the study site?

High

The following natural subsidence information provided by the British Geological Survey is not represented on mapping:

---

**Hazard**

Very significant potential for compressibility problems. Avoid large differential loadings of ground. Do not drain or de-water ground near the property without technical advice. For new build consider possibility of compressible ground in ground investigation, construction and building design. Consider effects of groundwater changes. Construction may not be possible at economic cost. For existing property probable increase in insurance risk from compressibility especially if water conditions or loading of the ground change significantly.

---

### 9.1.5 Collapsible Rocks

What is the maximum Collapsible Rocks\* hazard rating identified on the study site?

Very Low

The following natural subsidence information provided by the British Geological Survey is not represented on mapping:

---

**Hazard**

Deposits with potential to collapse when loaded and saturated are unlikely to be present. No special ground investigation required or increased construction costs or increased financial risk due to potential problems with collapsible deposits.

---

### 9.1.6 Running Sand

What is the maximum Running Sand\*\* hazard rating identified on the study site?

Moderate

The following natural subsidence information provided by the British Geological Survey is not represented on mapping:

---

**Hazard**

Significant potential for running sand problems with relatively small changes in ground conditions. Avoid large amounts of water entering the ground (for example through pipe leakage or soak-aways). Do not dig (deep) holes into saturated ground near the property without technical advice. For new build consider the consequences of soil and groundwater conditions during and after construction. For existing property possible increase in insurance risk from running sand, for example, due to water leakage, high rainfall events or flooding.

---

## 9.2 Radon

### 9.2.1 Radon Affected Areas

Is the property in a Radon Affected Area as defined by the Health Protection Agency (HPA) and if so what percentage of homes are above the Action Level?      The property is not in a Radon Affected Area, as less than 1% of properties are above the Action Level.

---



---

\* This indicates an automatically generated 50m buffer and site.



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## 9.2.2 Radon Protection



Is the property in an area where Radon Protection are required for new properties or extensions to existing

ones as described in publication BR211 by the Building Research Establishment?

No radon protective measures are necessary.

# 10. Mining

## 10.1 Coal Mining

Are there any coal mining areas within 75m of the study site?

No

Database searched and no data found.

---

## 10.2 Non-Coal Mining

Are there any Non-Coal Mining areas within 50m of the study site boundary?

No

Database searched and no data found.

---

## 10.3 Brine Affected Areas

Are there any brine affected areas within 75m of the study site?

No

Guidance: No Guidance Required.

---

# Contact Details

## CENTREMAPS

Telephone: 01886 832972  
Groundsure@centremaps.co.uk  
Open Space, Upper Interfields, Malvern, Worcester, WR14 1UT



## British Geological Survey Enquiries

Kingsley Dunham Centre  
Keyworth, Nottingham NG12 5GG  
Tel: 0115 936 3143.  
Fax: 0115 936 3276.  
Email:

Web: [www.bgs.ac.uk](http://www.bgs.ac.uk)

BGS Geological Hazards Reports and general geological enquiries:  
[enquiries@bgs.ac.uk](mailto:enquiries@bgs.ac.uk)



**Environment Agency**  
National Customer Contact Centre, PO Box 544  
Rotherham, S60 1BY  
Tel: 03708 506 506

Web: [www.environment-agency.gov.uk](http://www.environment-agency.gov.uk)  
Email: [enquiries@environment-agency.gov.uk](mailto:enquiries@environment-agency.gov.uk)



**Public Health England**  
Public information access office  
Public Health England, Wellington House  
133-155 Waterloo Road, London, SE1 8UG  
[www.gov.uk/phe](http://www.gov.uk/phe)  
Email: [enquiries@phe.gov.uk](mailto:enquiries@phe.gov.uk)  
Main switchboard: 020 7654 8000



**The Coal Authority**  
200 Lichfield Lane  
Mansfield  
Notts NG18 4RG  
Tel: 0345 7626 848  
DX 716176 Mansfield 5  
[www.coal.gov.uk](http://www.coal.gov.uk)



**Ordnance Survey**  
Adanac Drive, Southampton  
SO16 0AS  
Tel: 08456 050505



**Local Authority**  
Authority: Great Yarmouth Borough Council  
Phone: 01493 856 100  
Web: <http://www.great-yarmouth.gov.uk>  
Address: Town Hall, Hall Plain, Great Yarmouth, Norfolk, NR30 2QF

**Gemapping PLC**  
Virginia Villas, High Street, Hartley Witney,  
Hampshire RG27 8NW  
Tel: 01252 845444





# Groundsure

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Acknowledgements: Site of Special Scientific Interest, National Nature Reserve, Ramsar Site, Special Protection Area, Special Area of Conservation data is provided by, and used with the permission of, Natural England who retain the Copyright and Intellectual Property Rights for the data.

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# Standard Terms and Conditions

Groundsure's Terms and Conditions can be viewed online at this link:  
<https://www.groundsure.com/terms-and-conditions-sept-2016>



CENTREMAPS

Open Space, Upper Interfields,  
Worcester, WR14 1UT

Report Reference: CMAPS-CM-636391-16287-  
030717GEO

Your Reference: 16287

Report Date 3 Jul 2017

Report Delivery Method: Email - pdf

## Geo Insight

Address: ,

Dear Sir/ Madam,

Thank you for placing your order with Groundsure. Please find enclosed the **Groundsure Geo Insight** as requested.

If you need any further assistance, please do not hesitate to contact our helpline on 01886 832972 quoting the above CENTREMAPS reference number.

Yours faithfully,

CENTREMAPS

Enc.  
Groundsure Geo Insight

Address: ,  
Date: 3 Jul 2017  
Reference: CMAPS-CM-636391-16287-030717GEO  
Client: CENTREMAPS

NW N NE



SW S SE

Aerial Photograph Capture date: 16-Apr-2014  
Grid Reference: 652320,306005  
Site Size: 43.58ha

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# Overview of Findings

The Groundsure Geo Insight provides high quality geo-environmental information that allows geo-environmental professionals and their clients to make informed decisions and be forewarned of potential ground instability problems that may affect the ground investigation, foundation design and possibly remediation options that could lead to possible additional costs.

The report is based on the BGS 1:50,000 and 1:10,000 Digital Geological Map of Great Britain, BGS Geosure data; BRITPITS database; Non-coal mining data and Borehole Records, Coal Authority data including brine extraction areas, PBA non-coal mining and natural cavities database, Johnson Poole and Bloomer mining data and Groundsure's unique database including historical surface ground and underground workings.

For further details on each dataset, please refer to each individual section in the report as listed. Where the database has been searched a numerical result will be recorded. Where the database has not been searched '-' will be recorded.

## Section 1: Geology 1:10,000 Scale

1.1 Artificial Ground	1.1 Is there any Artificial Ground/ Made Ground present beneath the study site at 1:10,000 scale?	Yes
1.2 Superficial Geology and Landslips	1.2.1 Is there any Superficial Ground/Drift Geology present beneath the study site at 1:10,000 scale?*	No
	1.2.2 Are there any records of landslip within 500m of the study site boundary at 1:10,000 scale?	No
1.3 Bedrock, Solid Geology and Faults	1.3.1 For records of Bedrock and Solid Geology beneath the study site* see the detailed findings section.	
	1.3.2 Are there any records of faults within 500m of the study site boundary at 1:10,000 scale?	No

## Section 2: Geology 1:50,000 Scale

2.1 Artificial Ground	2.1.1 Is there any Artificial Ground/ Made Ground present beneath the study site?	Yes
	2.1.2 Are there any records relating to permeability of artificial ground within the study site*boundary?	Yes
2.2 Superficial Geology and Landslips	2.2.1 Is there any Superficial Ground/Drift Geology present beneath the study site?*	Yes
	2.2.2 Are there any records of permeability of superficial ground within 500m of the study site?	Yes
	2.2.3 Are there any records of landslip within 500m of the study site boundary?	No
	2.2.4 Are there any records relating to permeability of landslips within the study site* boundary?	No

## Section 2: Geology 1:50,000 Scale

### 2.3 Bedrock, Solid Geology and Faults

2.3.1 For records of Bedrock and Solid Geology beneath the study site\* see the detailed findings section.

2.3.2 Are there any records relating to permeability of bedrock ground within the study site boundary?

Yes

2.3.3 Are there any records of faults within 500m of the study site boundary?

No

## Section 3: Radon

### 3. Radon

3.1 Is the property in a Radon Affected Area as defined by the Health Protection Agency (HPA) and if so what percentage of homes are above the Action Level?

The property is not in a Radon Affected Area, as less than 1% of properties are above the Action Level.

3.2 Radon Protection

No radon protective measures are necessary.

## Section 4: Ground Workings

	On-site	0-50m	51-250	251-500	501-1000
4.1 Historical Surface Ground Working Features from Small Scale Mapping	11	1	12	Not Searched	Not Searched
4.2 Historical Underground Workings from Small Scale Mapping	0	0	0	0	0
4.3 Current Ground Workings	1	2	0	1	4

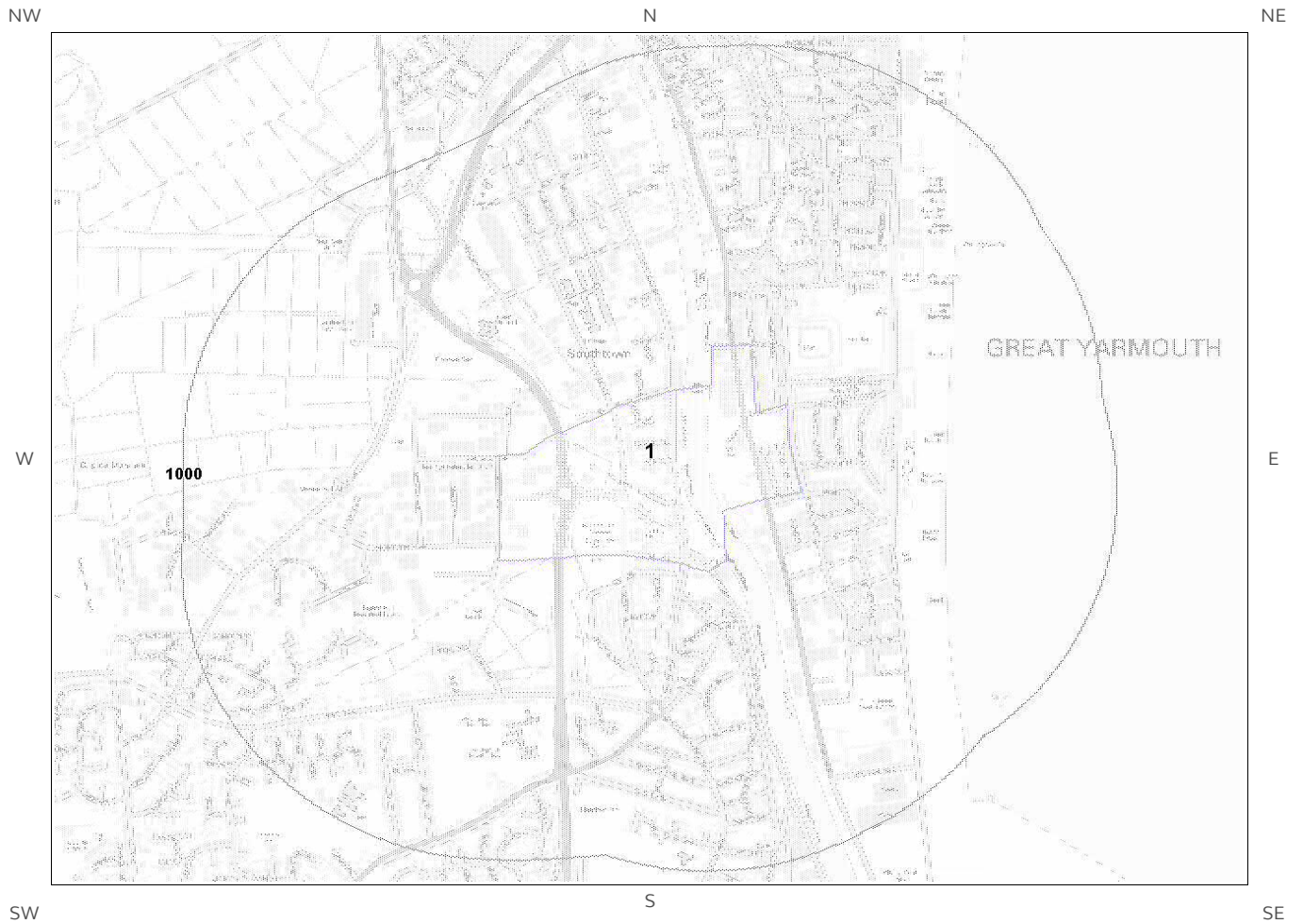
## Section 5: Mining, Extraction & Natural Cavities

	On-site	0-50m	51-250	251-500	501-1000
5.1 Historical Mining	0	0	0	0	0
5.2 Coal Mining	0	0	0	0	0
5.3 Johnson Poole and Bloomer Mining Area	0	0	0	0	0
5.4 Non-Coal Mining*	0	0	0	0	0
5.5 Non-Coal Mining Cavities	0	0	0	0	0
5.5 Natural Cavities	0	0	0	0	0

Section 5: Mining, Extraction & Natural Cavities	On-site	0-50m	51-250	251-500	501-1000
5.6 Brine Extraction	0	0	0	0	0
5.7 Gypsum Extraction	0	0	0	0	0
5.8 Tin Mining	0	0	0	0	0
5.9 Clay Mining	0	0	0	0	0
<b>Section 6: Natural Ground Subsidence</b>					
6.1 Shrink-Swell Clay	Low				
6.2 Landslides	Low				
6.3 Ground Dissolution of Soluble Rocks	Negligible				
6.4 Compressible Deposits	High				
6.5 Collapsible Deposits	Very Low				
6.5 Running Sand	Moderate				
<b>Section 7: Borehole Records</b>					
7 BGS Recorded Boreholes	107	33	77		
<b>Section 8: Estimated Background Soil Chemistry</b>					
8 Records of Background Soil Chemistry	16	3	0		
<b>Section 9: Railways and Tunnels</b>					
9.1 Tunnels	0	0	0	Not Searched	
9.2 Historical Railway and Tunnel Features	31	6	21	Not Searched	
9.3 Historical Railways	3	0	0	Not Searched	
9.4 Active Railways	0	0	0	Not Searched	
9.5 Railway Projects	0	0	0	0	

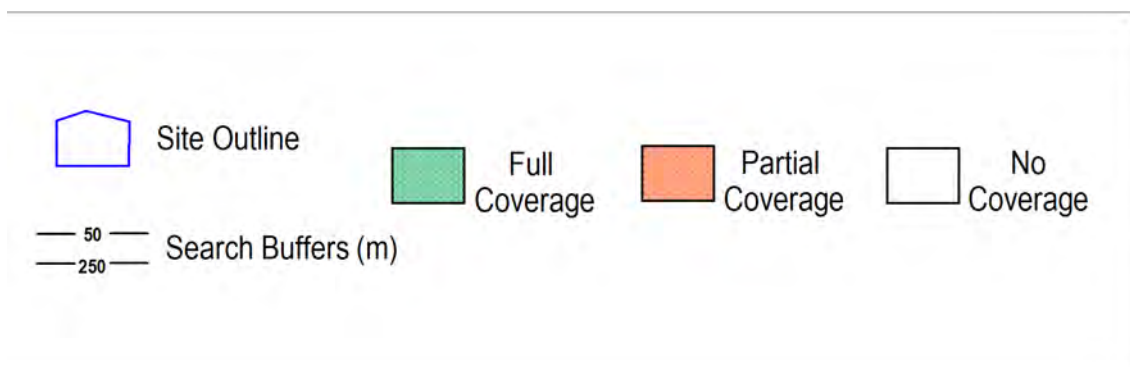


# 1:10,000 Scale Availability



1\_10,000 Availability Legend

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# Availability of 1:10,000 Scale Geology Mapping

The following information represents the availability of the key components of the 1:10,000 scale geological data.

ID	Distance	Artificial Coverage	Superficial Coverage	Bedrock Coverage	Mass Movement Coverage
1	0.0	No deposits are mapped	No coverage	No coverage	No coverage

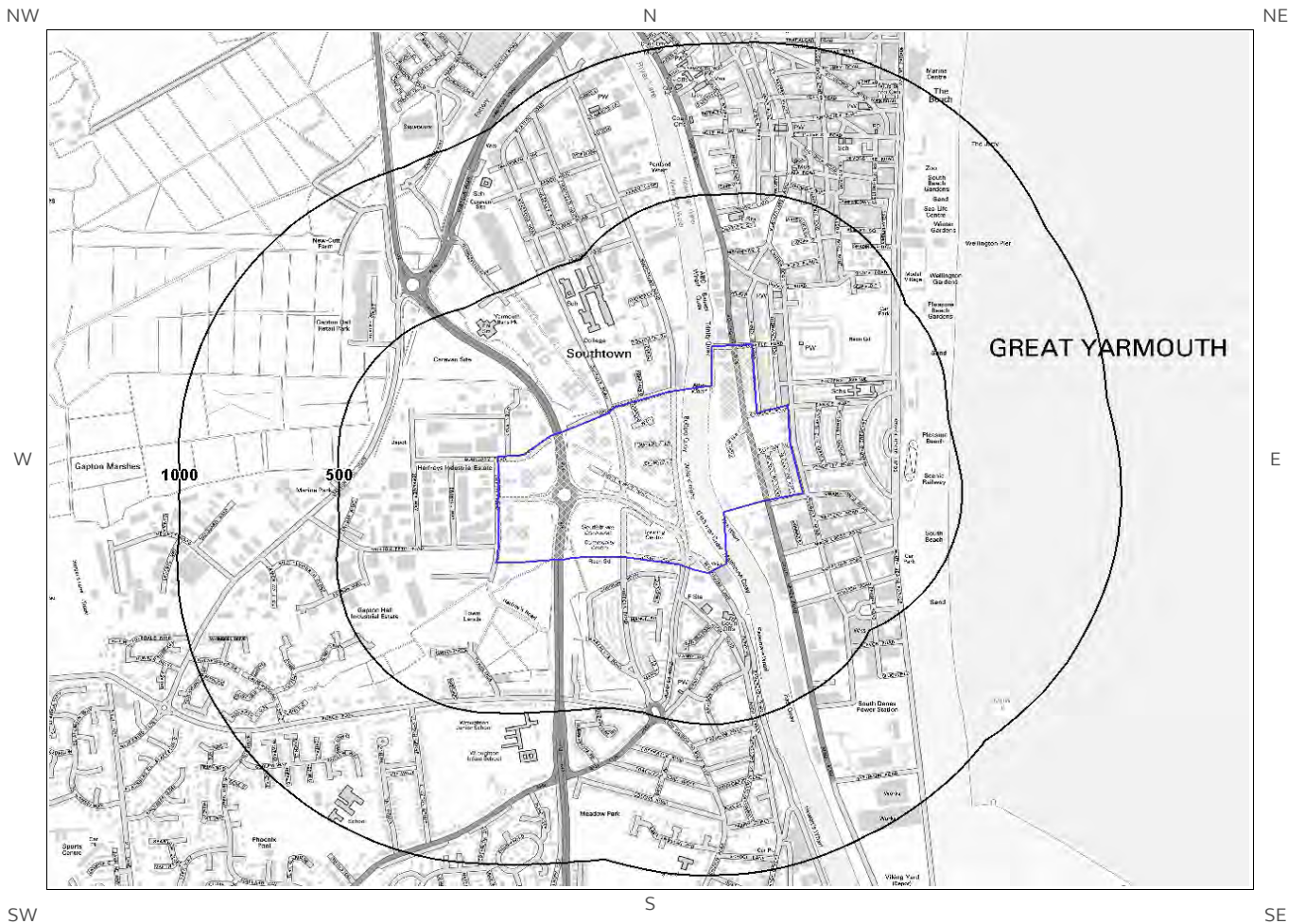
Guidance: The 1:10,000 scale geological interpretation is the most detailed generally available from BGS and is the scale at which most geological surveying is carried out in the field. The database is presented as four types of geology (artificial, mass movement, superficial and bedrock), although not all themes are mapped or available on every map sheet. Therefore a coverage layer showing the availability of the four themes is presented above.

The definitions of coverage are as follows:

Geology	Full Coverage	Partial Coverage	No Coverage
Bedrock	The whole tile has been mapped	Some but not all the tile has been mapped	No coverage
Superficial	The whole tile has been mapped	Some but not all of the tile has been mapped	No coverage
Artificial	Some deposits are mapped on this tile	-	No deposits are mapped
Mass Movement	Some deposits are mapped on this tile	-	No coverage

# 1 Geology (1:10,000 scale).

# 1.1 Artificial Ground Map (1:10,000 scale)



**Artificial Ground Legend**

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# 1. Geology 1:10,000 scale

## 1.1 Artificial Ground

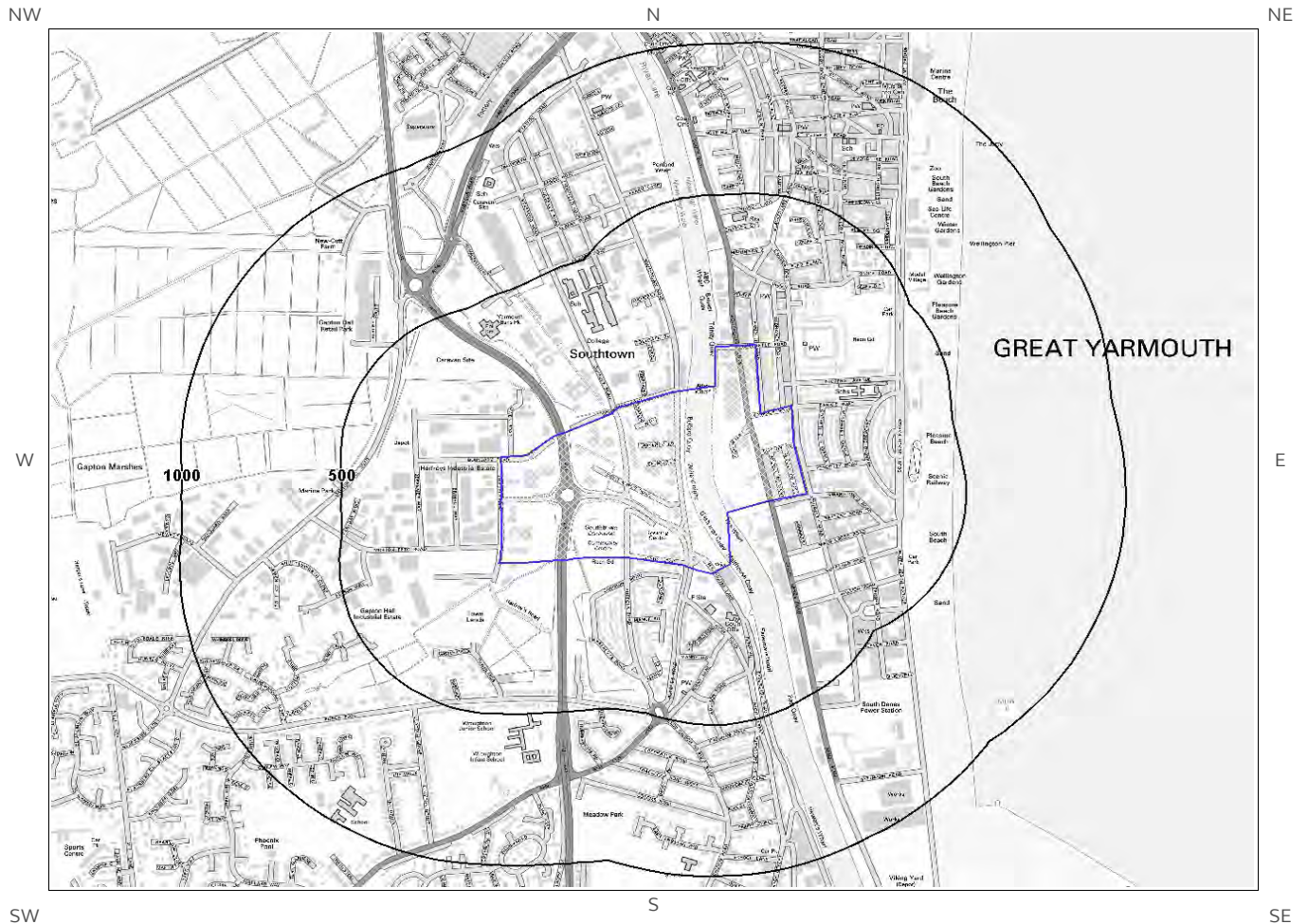
The following geological information represented on the mapping is derived from 1:10,000 scale BGS Geological mapping.

Are there any records of Artificial/ Made Ground within 500m of the study site boundary at 1:10,000 scale? No

Database searched and no data found.




---

# 1.2 Superficial Deposits and Landslips Map (1:10,000 scale)



Artificial Ground Legend

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-  Site Outline
-  500
-  1000 Search Buffers (m)

# 1.2 Superficial Deposits and Landslips

The following geological information represented on the mapping is derived from 1:10,000 scale BGS Geological mapping

## 1.2.1 Superficial Deposits/ Drift Geology

Are there any records of Superficial Deposits/ Drift Geology within 500m of the study site boundary at 1:10,000 scale? No

Database searched and no data found.

---

## 1.2.2 Landslip

Are there any records of Landslip within 500m of the study site boundary at 1:10,000 scale? No

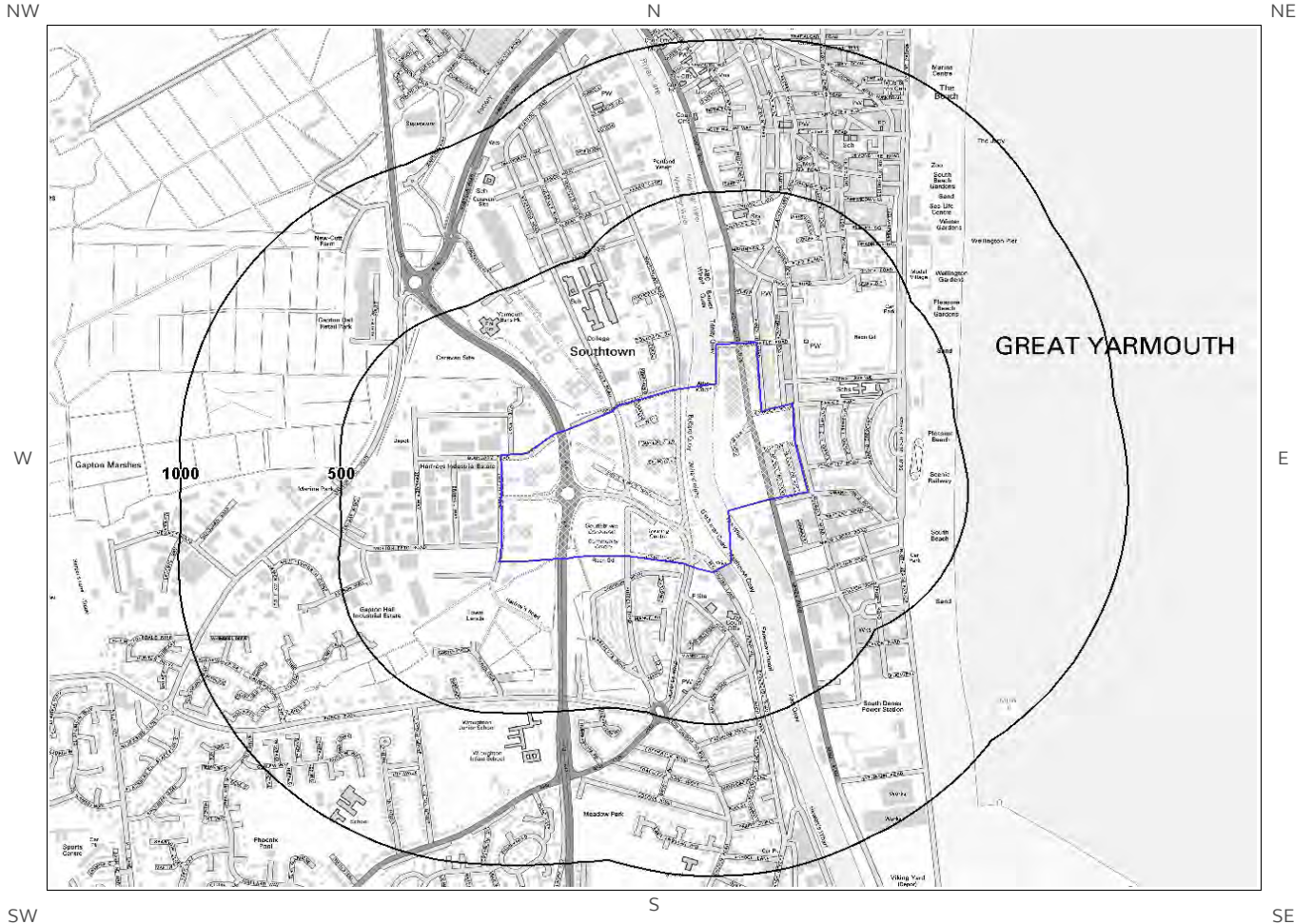
Database searched and no data found.

The geology map for the site and surrounding area are extracted from the BGS Digital Geological Map of Great Britain at 1:10,000 scale

This Geology shows the main components as discrete layers, these are: Artificial / Made Ground, Superficial / Drift Geology and Landslips. These are all displayed with the BGS Lexicon code for the rock unit and BGS sheet number. Not all of the main geological components have nationwide coverage.

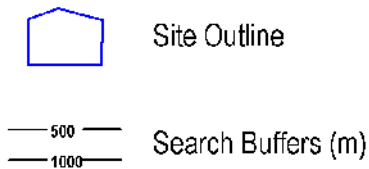
---

# 1.3 Bedrock and Faults Map (1:10,000 scale)



**Bedrock and Faults Legend**

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## 1.3 Bedrock and Faults

The following geological information represented on the mapping is derived from 1:10,000 scale BGS Geological mapping.

### 1.3.1 Bedrock/ Solid Geology

Records of Bedrock/Solid Geology within 500m of the study site boundary at 1:10,000 scale.

Database searched and no data found at this scale.

---

### 1.3.2 Faults

Are there any records of Faults within 500m of the study site boundary at 1:10,000 scale? No

Database searched and no data found at this scale.

The geology map for the site and surrounding area are extracted from the BGS Digital Geological Map of great Britain at 1:10,000 scale.

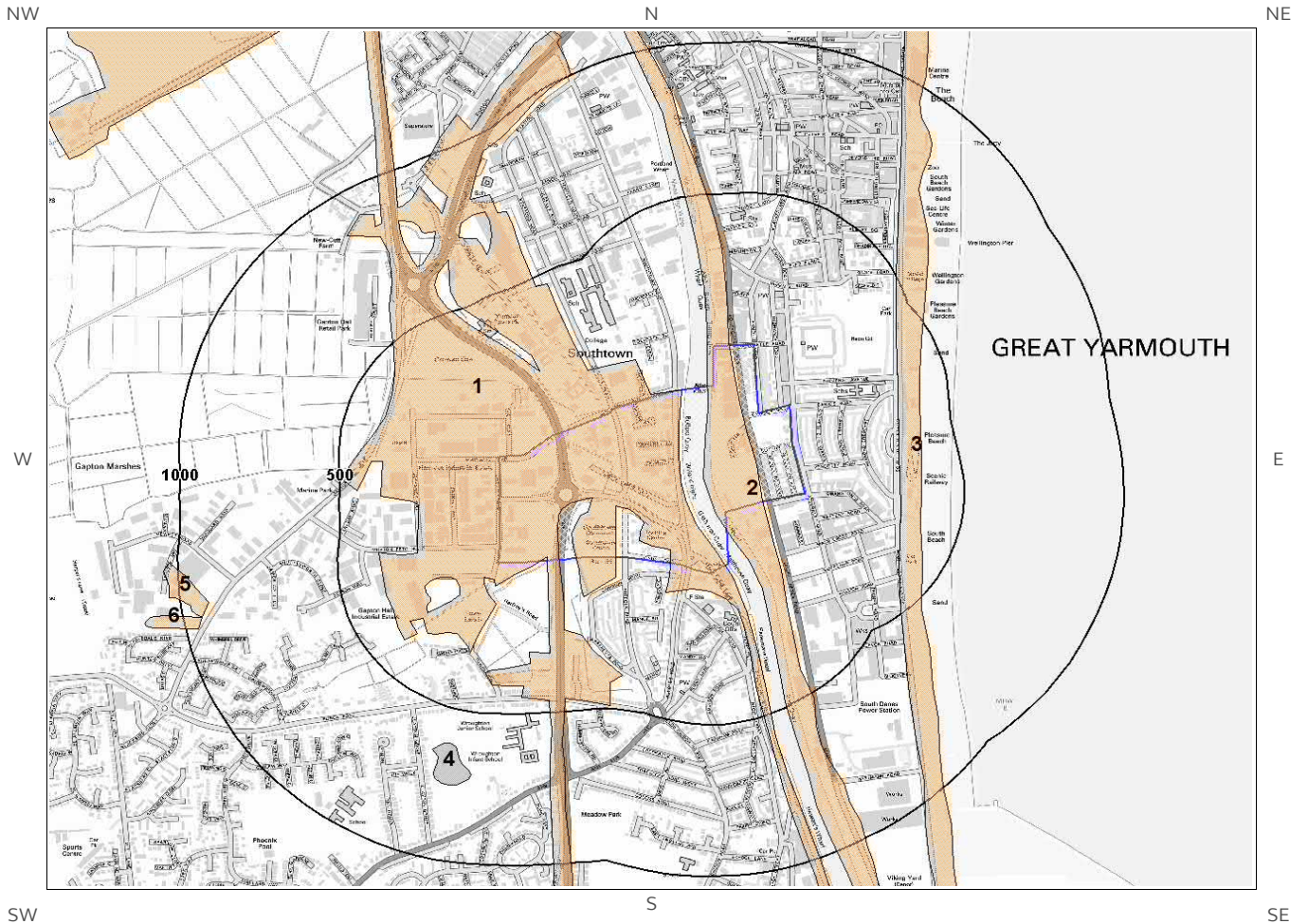
This Geology shows the main components as discrete layers, these are: Bedrock/ Solid Geology and linear features such as Faults. These are all displayed with the BGS Lexicon code for the rock unit and BGS sheet number. Not all of the main geological components have nationwide coverage.

---



# 2 Geology 1:50,000 Scale

## 2.1 Artificial Ground Map



**Ground Workings Legend**

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## 2. Geology 1:50,000 scale

### 2.1 Artificial Ground

The following geological information represented on the mapping is derived from 1:50,000 scale BGS Geological mapping, Sheet No: 162

#### 2.1.1 Artificial/ Made Ground

Are there any records of Artificial/ Made Ground within 500m of the study site boundary? Yes

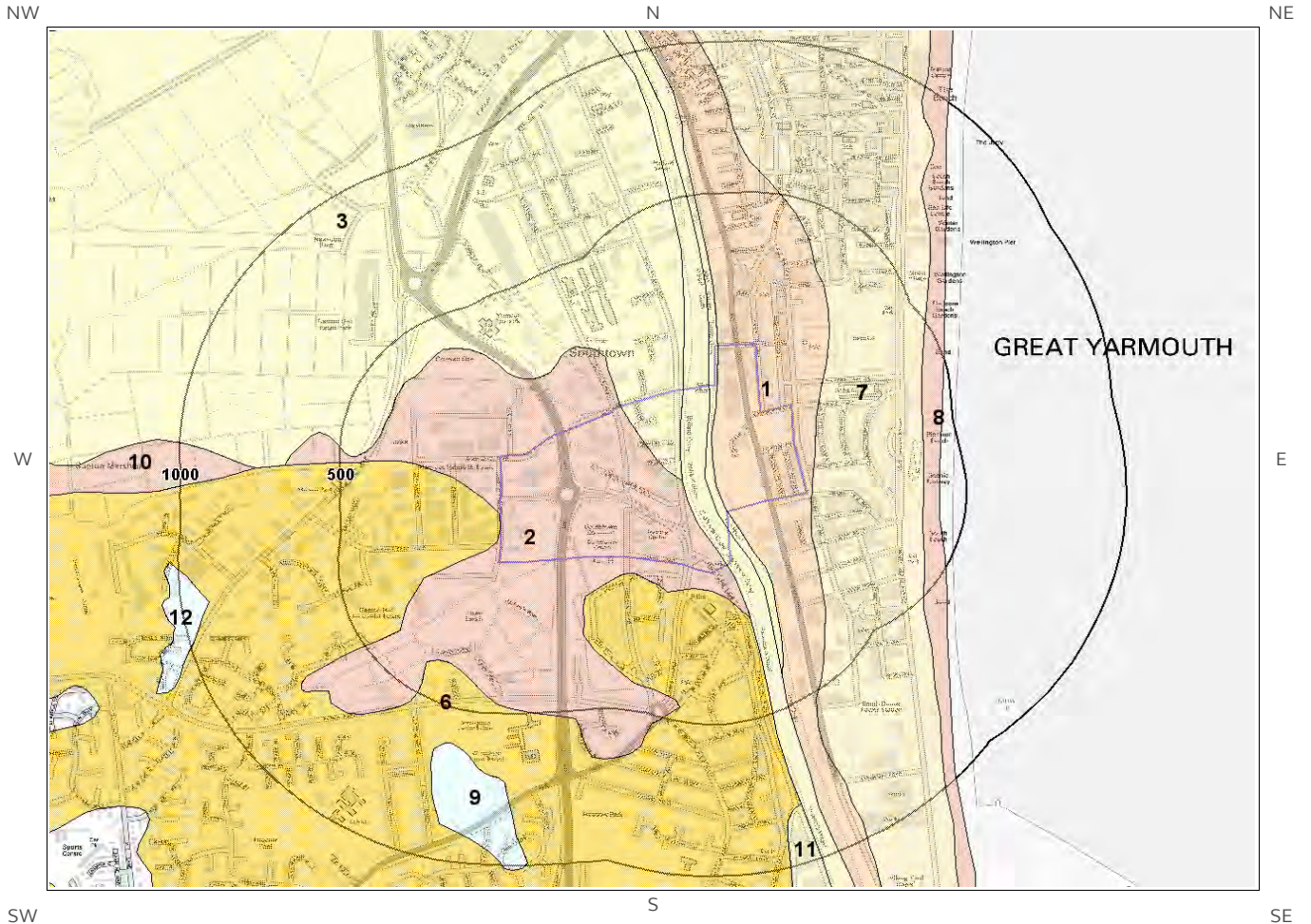
ID	Distance (m)	Direction	LEX Code	Description	Rock Description
1	0.0	On Site	MGR-ARTDP	MADE GROUND (UNDIVIDED)	ARTIFICIAL DEPOSIT
2	0.0	On Site	MGR-ARTDP	MADE GROUND (UNDIVIDED)	ARTIFICIAL DEPOSIT
3	300.0	E	MGR-ARTDP	MADE GROUND (UNDIVIDED)	ARTIFICIAL DEPOSIT

#### 2.1.2 Permeability of Artificial Ground

Are there any records relating to permeability of artificial ground within the study site boundary? Yes




Distance (m)	Direction	Flow Type	Maximum Permeability	Minimum Permeability
0.0	On Site	Mixed	Very High	Low
0.0	On Site	Mixed	Very High	Low

# 2.2 Superficial Deposits and Landslips Map (1:50,000 scale)



**Ground Workings Legend**

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-  Site Outline
-  500
-  1000
- Search Buffers (m)

# 2.2 Superficial Deposits and Landslips

## 2.2.1 Superficial Deposits/ Drift Geology

Are there any records of Superficial Deposits/ Drift Geology within 500m of the study site boundary? Yes

ID	Distance	Direction	LEX Code	Description	Rock Description
1	0.0	On Site	NRD-XSV	NORTH DENES FORMATION	SAND AND GRAVEL
2	0.0	On Site	BRYD-P	BREYDON FORMATION	PEAT
3	0.0	On Site	BRYD-XCZ	BREYDON FORMATION	CLAY AND SILT
4	0.0	On Site	BRYD-XCZ	BREYDON FORMATION	CLAY AND SILT
5	0.0	On Site	TRD-XCZ	TIDAL RIVER OR CREEK DEPOSITS	CLAY AND SILT
6	3.0	W	HPGL-S	HAPPISBURGH GLACIGENIC FORMATION	SAND
7	16.0	E	BSA-S	BLOWN SAND	SAND
8	366.0	E	MBD-XSV	MARINE BEACH DEPOSITS	SAND AND GRAVEL

## 2.2.2 Permeability of Superficial Ground

Are there any records relating to permeability of superficial ground within the study site boundary? Yes

Distance (m)	Direction	Flow Type	Maximum Permeability	Minimum Permeability
0.0	On Site	Mixed	Low	Very Low
0.0	On Site	Intergranular	Low	Very Low
0.0	On Site	Mixed	Low	Very Low
0.0	On Site	Mixed	Low	Very Low
0.0	On Site	Intergranular	Very High	High
3.0	W	Intergranular	High	High
16.0	E	Intergranular	High	High

### 2.2.3 Landslip

Are there any records of Landslip within 500m of the study site boundary?

No

Database searched and no data found.

The geology map for the site and surrounding area are extracted from the BGS Digital Geological Map of Great Britain at 1:50,000 scale.

This Geology shows the main components as discrete layers, there are: Artificial/ Made Ground, Superficial/ Drift Geology and Landslips. These are all displayed with the BGS Lexicon code for the rock unit and BGS sheet number. Not all of the main geological components have nationwide coverage.

---

### 2.2.4 Landslip Permeability

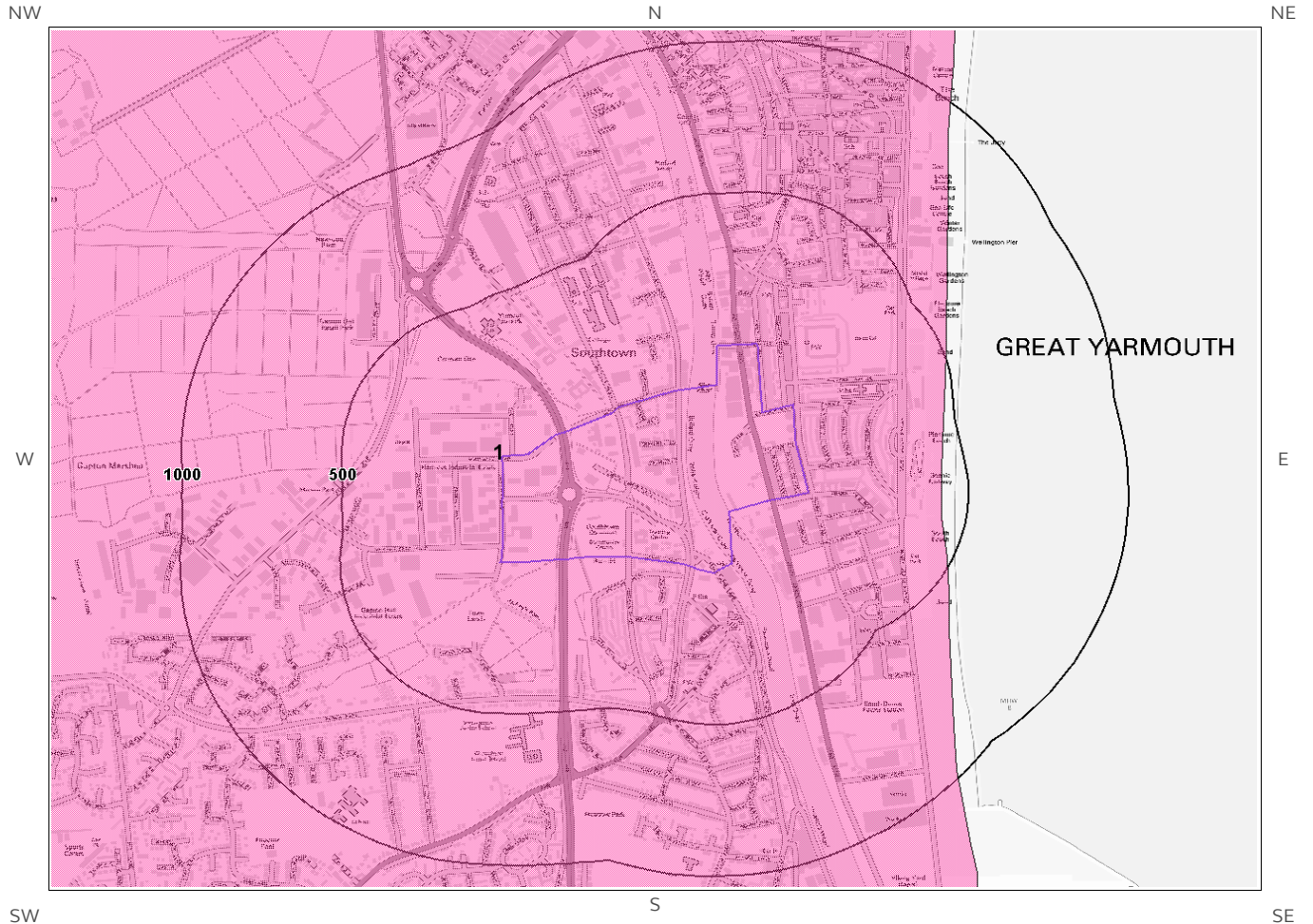
Are there any records relating to permeability of landslips within the study site boundary?

No

Database searched and no data found.




---

# 2.3 Bedrock and Faults Map (1:50,000 scale)



**Ground Workings Legend**

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-  Site Outline
  -  500
  -  1000
- Search Buffers (m)

## 2.3 Bedrock, Solid Geology & Faults

The following geological information represented on the mapping is derived from 1:50,000 scale BGS Geological mapping, Sheet No: 162

### 2.3.1 Bedrock/Solid Geology

Records of Bedrock/Solid Geology within 500m of the study site boundary:

ID	Distance	Direction	LEX Code	Rock Description	Rock Age
1	0.0	On Site	CRAG-XSV	CRAG GROUP - SAND AND GRAVEL	-

### 2.3.2 Permeability of Bedrock Ground

Are there any records relating to permeability of bedrock ground within the study site boundary? Yes

Distance	Direction	Flow Type	Maximum Permeability	Minimum Permeability
0.0	On Site	Intergranular	Very High	High

### 2.3.3 Faults

Are there any records of Faults within 500m of the study site boundary? No

Database searched and no data found.

The geology map for the site and surrounding area are extracted from the BGS Digital Geological Map of Great Britain at 1:50,000 scale.

This Geology shows the main components as discrete layers, these are: Bedrock/Solid Geology and linear features such as Faults. These are all displayed with the BGS Lexicon code for the rock unit and BGS sheet number. Not all of the main geological components have nation wide coverage.

# 3 Radon Data

## 3.1 Radon Affected Areas

Is the property in a Radon Affected Area as defined by the Health Protection Agency (HPA) and if so what percentage of homes are above the Action Level?      The property is not in a Radon Affected Area, as less than 1% of properties are above the Action Level.

---

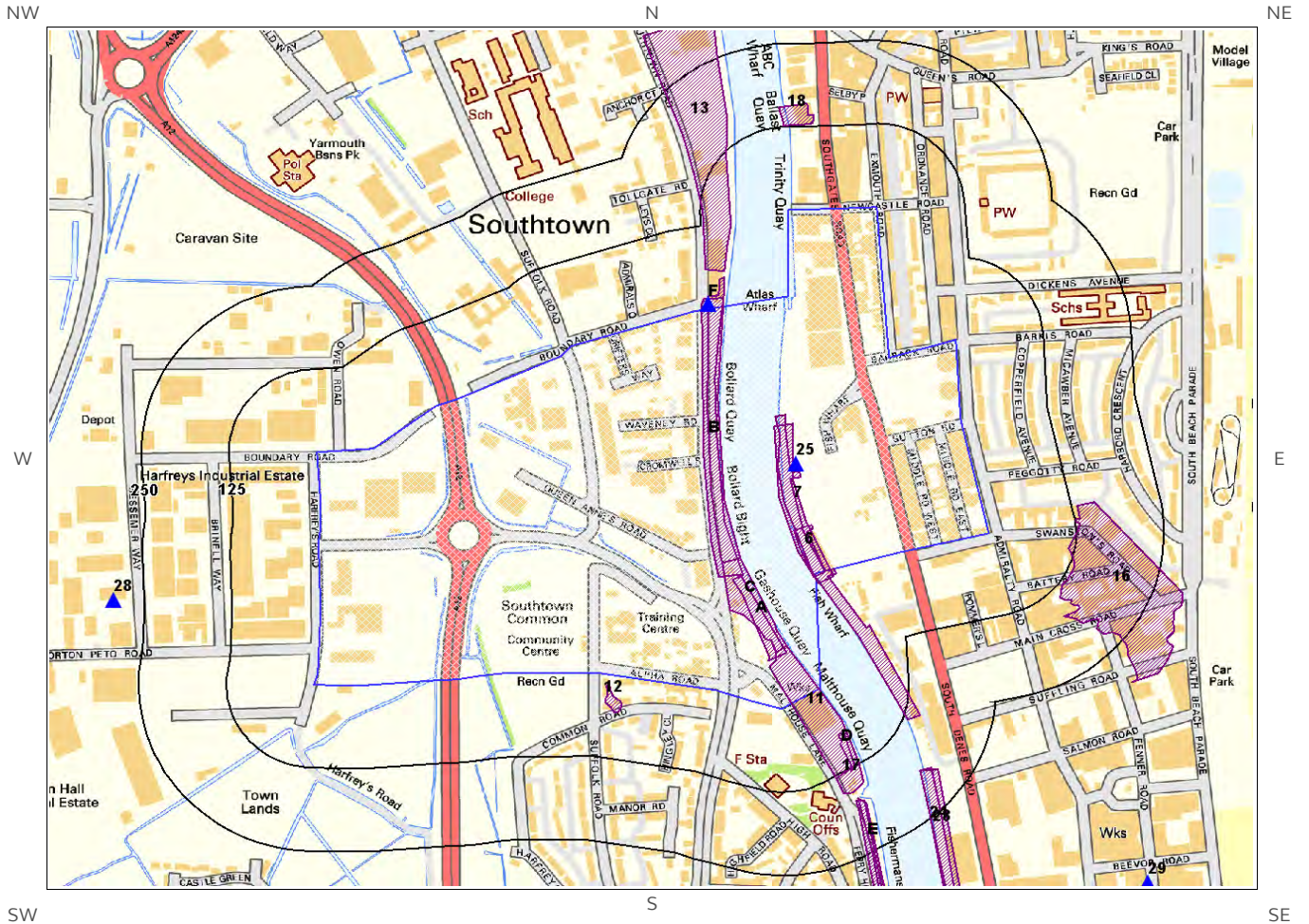
## 3.2 Radon Protection

Is the property in an area where Radon Protection are required for new properties or extensions to existing ones as described in publication BR211 by the Building Research Establishment?      No radon protective measures are necessary.

---


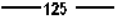
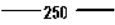





# 4 Ground Workings Map



Ground Workings Legend

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-  Site Outline
-  125 Search Buffers (m)
-  250 Search Buffers (m)
-  Historic Surface Ground Workings
-  Historic Underground Workings
-  Current Ground Workings

# 4 Ground Workings

## 4.1 Historical Surface Ground Working Features derived from Historical Mapping

This dataset is based on Groundsure's unique Historical Land Use Database derived from 1:10,560 and 1:10,000 scale historical mapping

Are there any Historical Surface Ground Working Features within 250m of the study site boundary?  Yes

ID	Distance (m)	Direction	NGR	Use	Date
1B	0.0	On Site	652403 306035	Quay	1952
2A	0.0	On Site	652474 305764	Quay	1904
3A	0.0	On Site	652474 305764	Quay	1946
4B	0.0	On Site	652408 306062	Quay	1988
5B	0.0	On Site	652408 306062	Quay	1978
6	0.0	On Site	652545 305863	Unspecified Wharf	1988
7	0.0	On Site	652518 305936	Unspecified Wharf	1884
8C	0.0	On Site	652466 305783	Quay	1988
9C	0.0	On Site	652466 305783	Quay	1978
10	0.0	On Site	652556 305840	Unspecified Wharf	1978
11	0.0	On Site	652552 305622	Quay	1978
12	15.0	S	652266 305643	Pond	1884
13	52.0	N	652371 306479	Dock	1946
14D	73.0	SE	652596 305561	Quay	1946
15D	73.0	SE	652596 305561	Quay	1904
16	117.0	E	652990 305803	Sand Pit	1884
17	124.0	SE	652602 305523	Quay	1988
18	127.0	N	652526 306521	Dry Docks	1904
19E	169.0	SE	652639 305395	Quay	1978
20E	169.0	SE	652639 305395	Quay	1988
21E	172.0	SE	652636 305385	Quay	1904

ID	Distance (m)	Direction	NGR	Use	Date
22E	172.0	SE	652636 305385	Quay	1946
23	188.0	SE	652776 305268	Quay	1952
24	188.0	SE	652742 305367	Quay	1978

## 4.2 Historical Underground Working Features derived from Historical Mapping

This data is derived from the Groundsure unique Historical Land Use Database. It contains data derived from 1:10,000 and 1:10,560 historical Ordnance Survey Mapping and includes some natural topographical features (Shake Holes for example) as well as manmade features that may have implications for ground stability. Underground and mining features have been identified from surface features such as shafts. The distance that these extend underground is not shown.

Are there any Historical Underground Working Features within 1000m of the study site boundary? No

Database searched and no data found.

## 4.3 Current Ground Workings

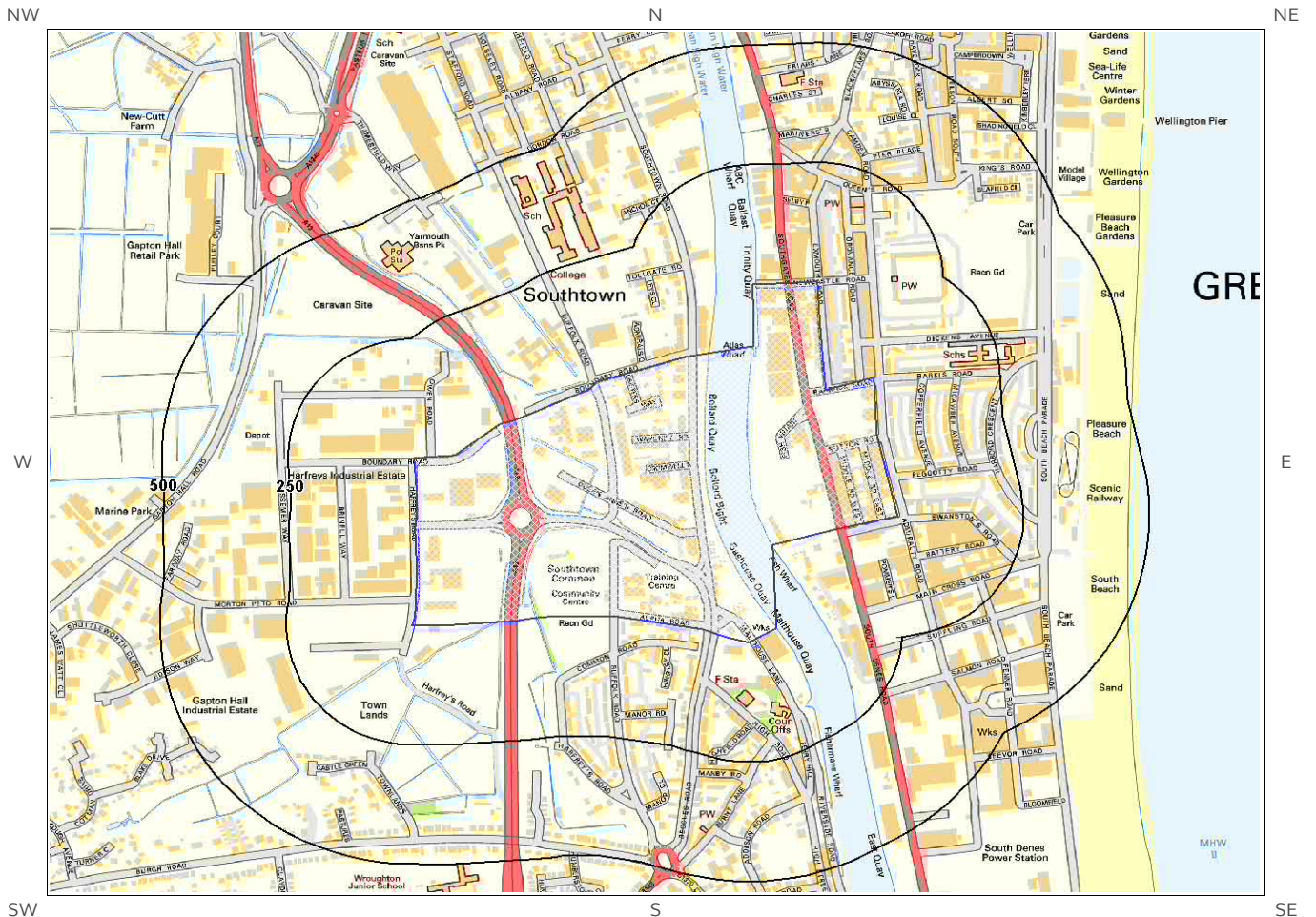
This dataset is derived from the BGS BRITPITS database covering active; inactive mines; quarries; oil wells; gas wells and mineral wharves; and rail deposits throughout the British Isles.

Are there any BGS Current Ground Workings within 1000m of the study site boundary? Yes

The following Current Ground Workings information is provided by British Geological Survey:

ID	Distance (m)	Direction	NGR	Commodity Produced	Pit Name	Type of working	Status
25	0.0	On Site	652525 305995	Crushed Rock	Berth 4 Great Yarmouth Docks	Sea, river or canal wharf where mineral commodities are unloaded and stored	Active
26F	6.0	N	652400 306235	Crushed Rock	Great Yarmouth Wharf	Sea, river or canal wharf where mineral commodities are unloaded and stored	Inactive
27F	6.0	N	652400 306235	Secondary	Great Yarmouth Wharf	Sea, river or canal wharf where mineral commodities are unloaded and stored	Inactive
28	294.0	W	651553 305790	Sand & Gravel	Harfrey's Farm Pit	A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site	Ceased
29	549.0	SE	653026 305365	Sand	Nelson Sand Pit	A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site	Ceased
Not shown	686.0	S	651666 304999	Clay & Shale	Lilypit Cottage Pit	A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site	Ceased
Not shown	766.0	S	651860 304897	Clay & Shale	Lily Pit	A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site	Ceased
Not shown	911.0	N	652250 307250	Secondary	Yeoman Wharf	Sea, river or canal wharf where mineral commodities are unloaded and stored	Active

# 5 Mining, Extraction & Natural Cavities Map



Mining, Extraction and Natural Cavities Legend

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# 5 Mining, Extraction & Natural Cavities

## 5.1 Historical Mining

This dataset is derived from Groundsure unique Historical Land-use Database that are indicative of mining or extraction activities.

Are there any Historical Mining areas within 1000m of the study site boundary? No

Database searched and no data found.

---

## 5.2 Coal Mining

This dataset provides information as to whether the study site lies within a known coal mining affected area as defined by the coal authority.

Are there any Coal Mining areas within 1000m of the study site boundary? No

Database searched and no data found.

---

## 5.3 Johnson Poole and Bloomer

This dataset provides information as to whether the study site lies within an area where JPB hold information relating to mining.

Are there any JPB Mining areas within 1000m of the study site boundary? No

The following information provided by JPB is not represented on mapping: Database searched and no data found.

---

## 5.4 Non-Coal Mining

This dataset provides information as to whether the study site lies within an area which may have been subject to non-coal historic mining.

Are there any Non-Coal Mining areas within 1000m of the study site boundary? No

Database searched and no data found.

---

## 5.5 Non-Coal Mining Cavities

This dataset provides information from the Peter Brett Associates (PBA) mining cavities database (compiled for the national study entitled “Review of mining instability in Great Britain, 1990” PBA has also continued adding to this database) on mineral extraction by mining.

Are there any Non-Coal Mining cavities within 1000m of the study site boundary? No

Database searched and no data found.

---

## 5.6 Natural Cavities

This dataset provides information based on Peter Brett Associates natural cavities database.

Are there any Natural Cavities within 1000m of the study site boundary? No

Database searched and no data found.

---

## 5.7 Brine Extraction

This data provides information from the Coal Authority issued on behalf of the Cheshire Brine Subsidence Compensation Board.

Are there any Brine Extraction areas within 1000m of the study site boundary? No

Database searched and no data found.

---

## 5.8 Gypsum Extraction

This dataset provides information on Gypsum extraction from British Gypsum records.

Are there any Gypsum Extraction areas within 1000m of the study site boundary? No

Database searched and no data found.

---

## 5.9 Tin Mining

This dataset provides information on tin mining areas and is derived from tin mining records. This search is based upon postcode information to a sector level..

Are there any Tin Mining areas within 1000m of the study site boundary? No

Database searched and no data found.

---

This dataset provides information on Kaolin and Ball Clay mining from relevant mining records.

Are there any Clay Mining areas within 1000m of the study site boundary?

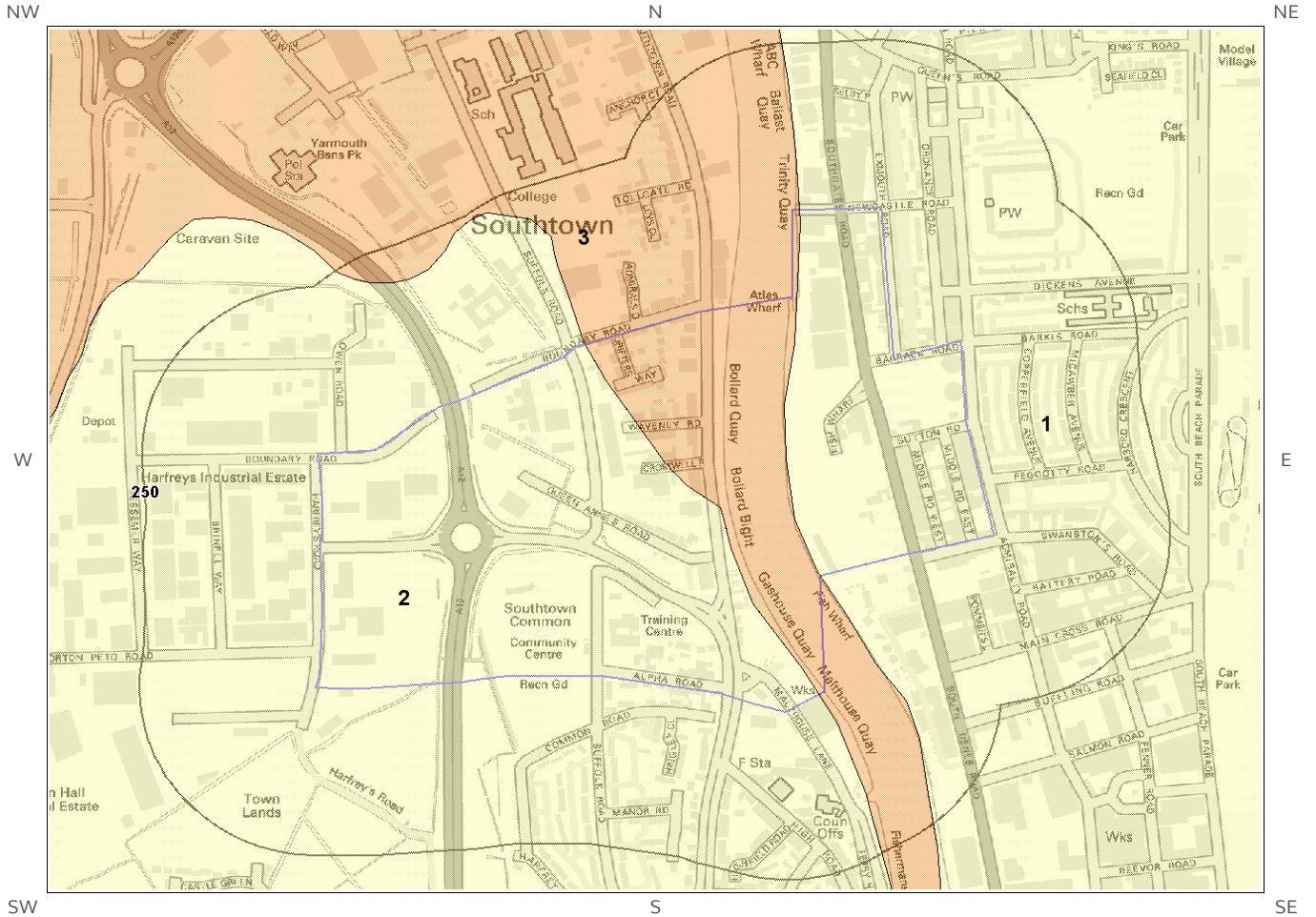
No

Database searched and no data found.

---

# 6 Natural Ground Subsidence

## 6.1 Shrink-Swell Clay Map



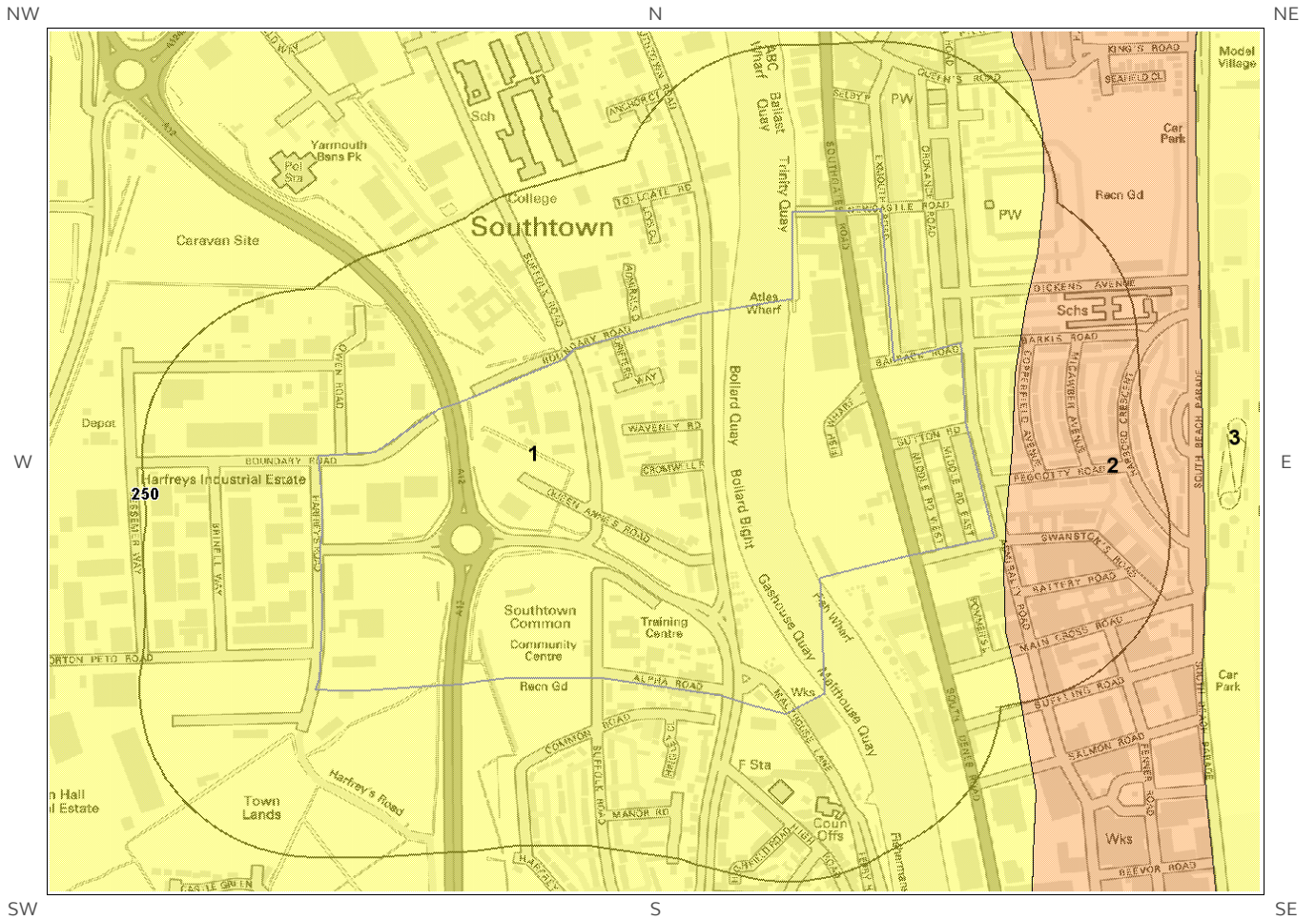
Shrink Swell Clay Legend

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# 6.2 Landslides Map

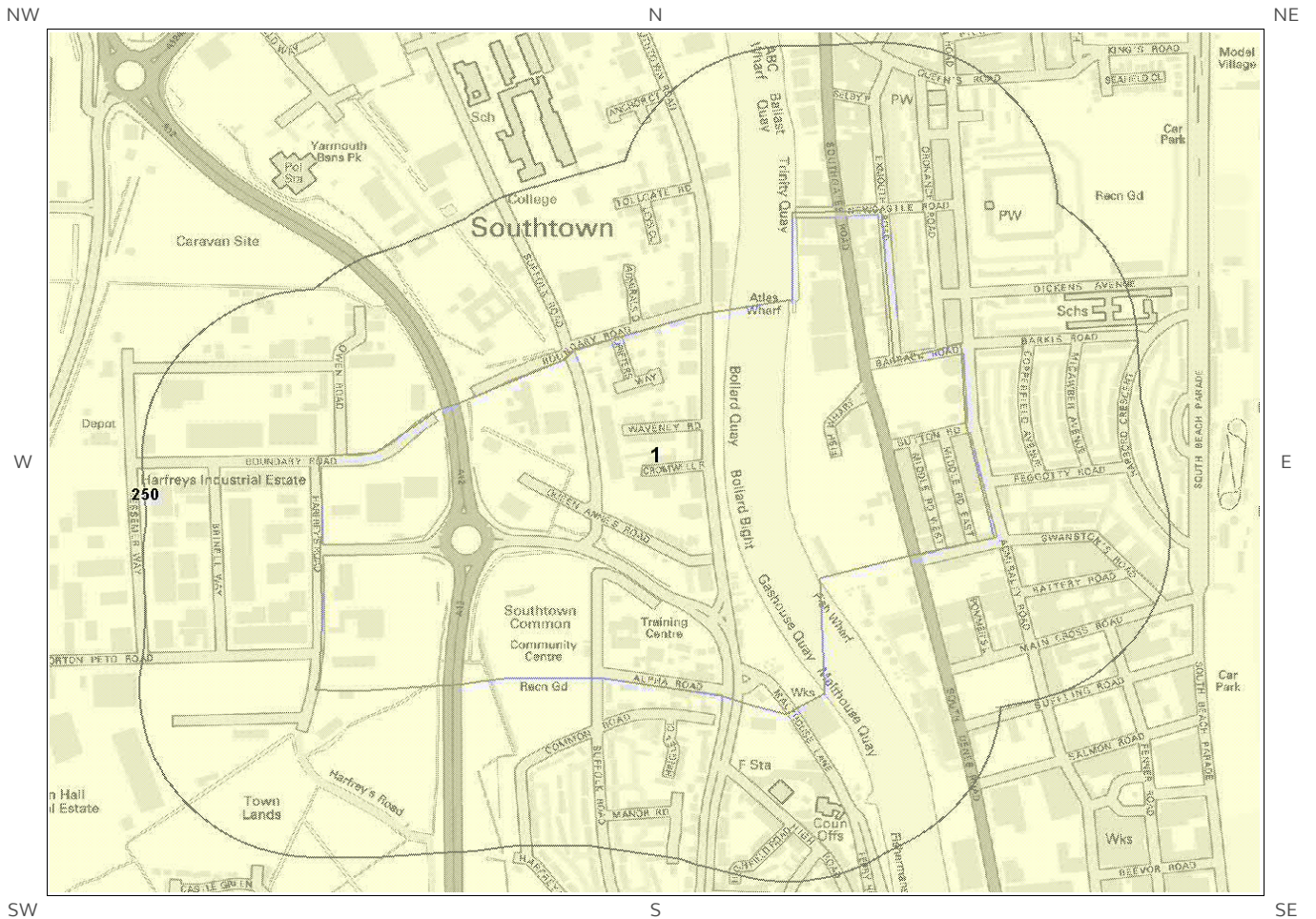


Landslides Legend

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# 6.3 Ground Dissolution of Soluble Rocks Map

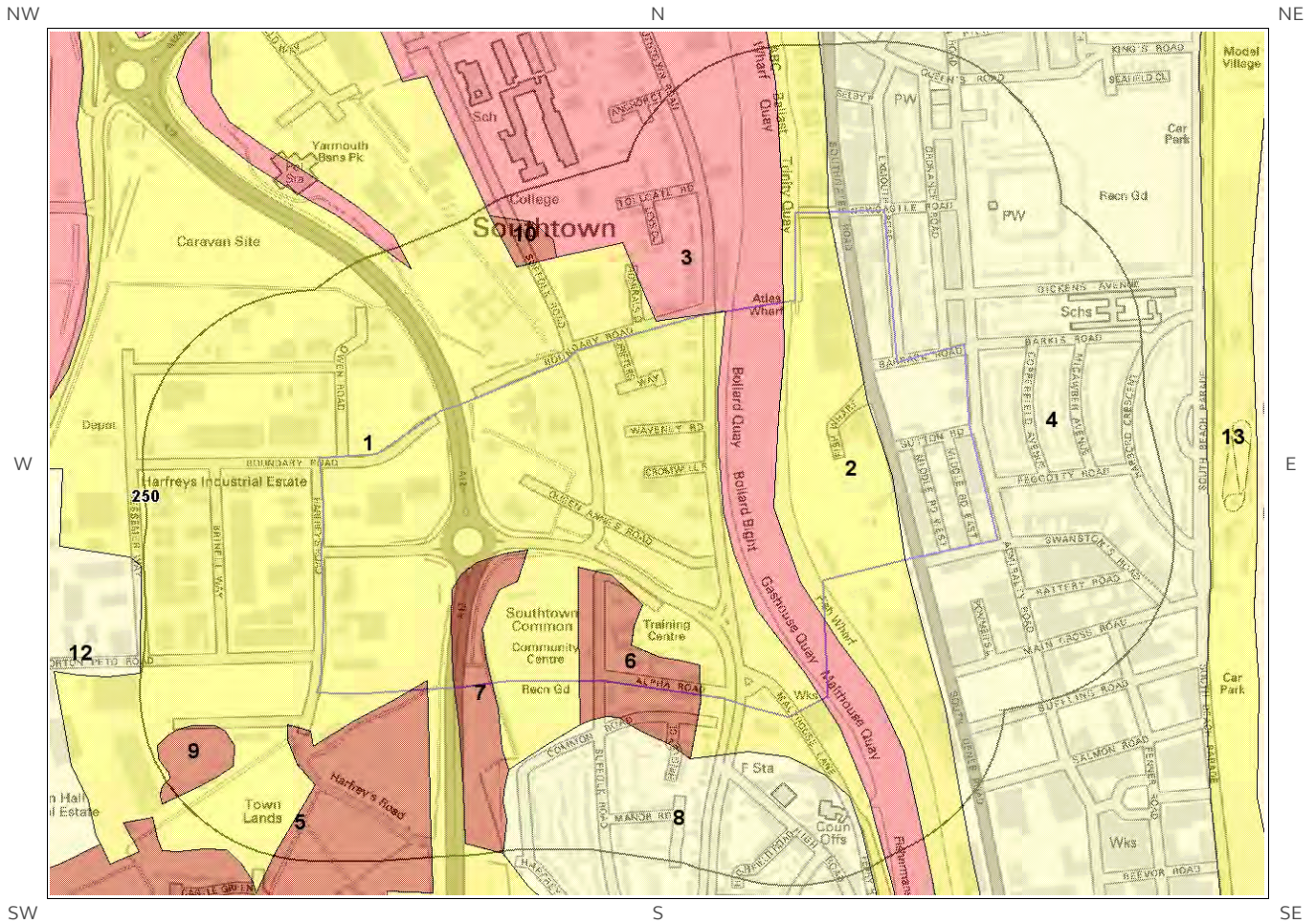


**Ground Dissolution Soluble Rocks Legend**

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# 6.4 Compressible Deposits Map

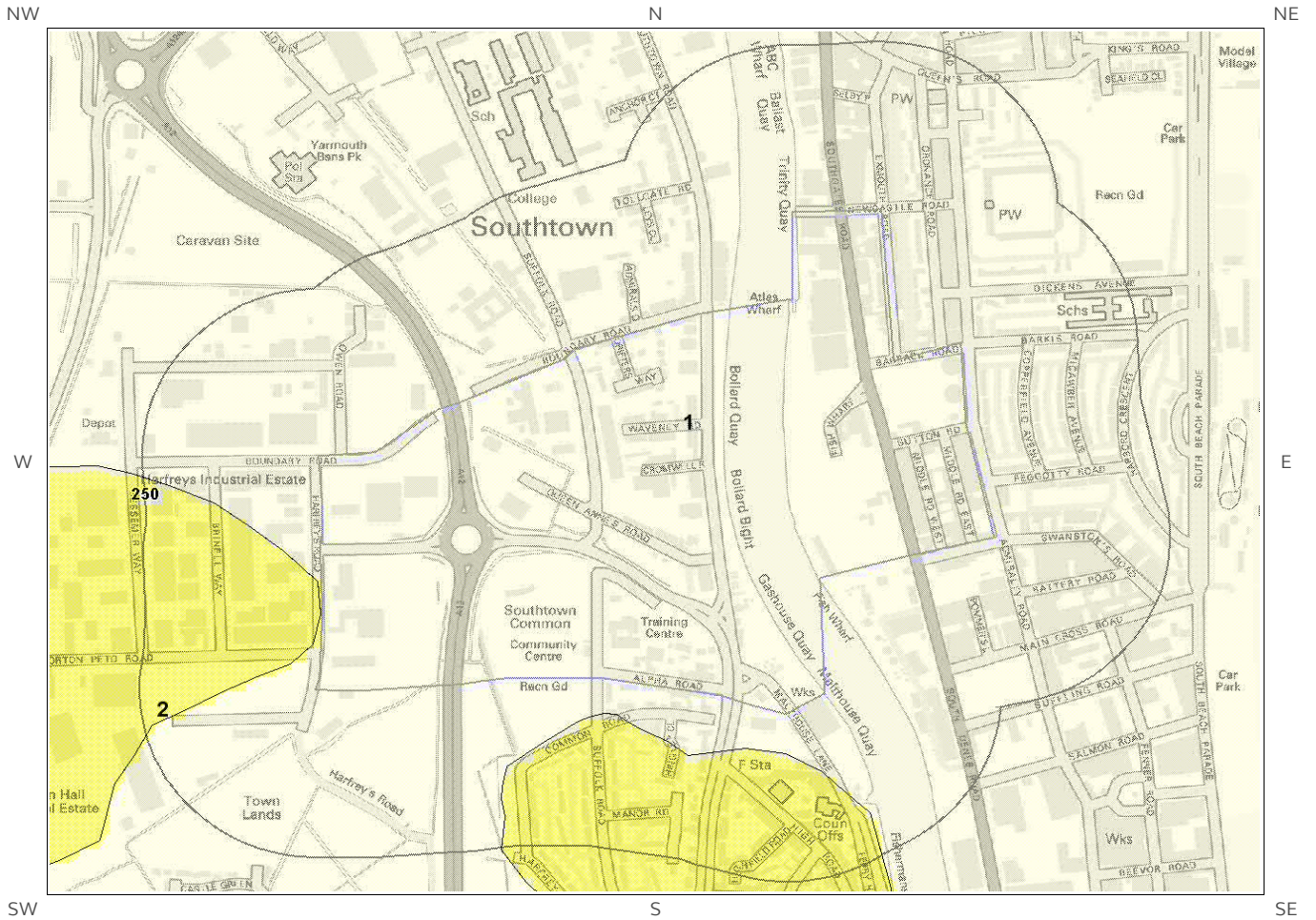


Compressible Deposits Legend

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# 6.5 Collapsible Deposits Map

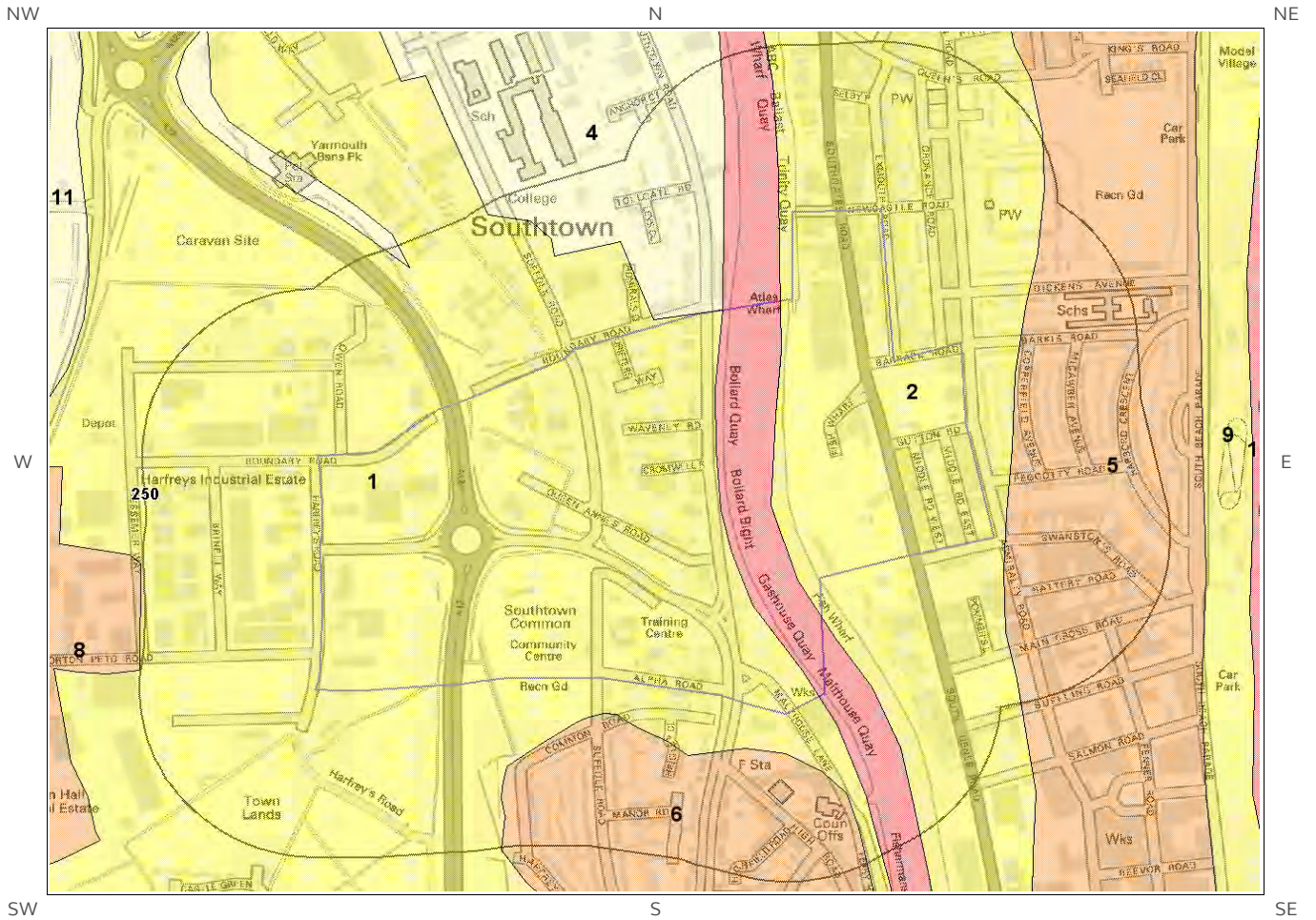


**Collapsible Deposits Legend**

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# 6.6 Running Sand Map



Running Sand Legend

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# 6 Natural Ground Subsidence

The National Ground Subsidence rating is obtained through the 6 natural ground stability hazard datasets, which are supplied by the British Geological Survey (BGS).

The following GeoSure data represented on the mapping is derived from the BGS Digital Geological map of Great Britain at 1:50,000 scale.

What is the maximum hazard rating of natural subsidence within the study site\*\* boundary? High

## 6.1 Shrink-Swell Clays

The following Shrink Swell information provided by the British Geological Survey:

ID	Distance (m)	Direction	Hazard Rating	Details
1	0.0	On Site	Negligible	Ground conditions predominantly non-plastic. No special actions required to avoid problems due to shrink-swell clays. No special ground investigation required, and increased construction costs or increased financial risks are unlikely likely due to potential problems with shrink-swell clays.
2	0.0	On Site	Negligible	Ground conditions predominantly non-plastic. No special actions required to avoid problems due to shrink-swell clays. No special ground investigation required, and increased construction costs or increased financial risks are unlikely likely due to potential problems with shrink-swell clays.
3	0.0	On Site	Low	Ground conditions predominantly medium plasticity. Do not plant trees with high soil moisture demands near to buildings. For new build, consideration should be given to advice published by the National House Building Council (NHBC) and the Building Research Establishment (BRE). There is a possible increase in construction cost to reduce potential shrink-swell problems. For existing property, there is a possible increase in insurance risk, especially during droughts or where vegetation with high moisture demands is present.

\* This includes an automatically generated 50m buffer zone around the site

The following Landslides information provided by the British Geological Survey:

ID	Distance (m)	Direction	Hazard Rating	Details
1	0.0	On Site	Very Low	Slope instability problems are unlikely to be present. No special actions required to avoid problems due to landslides. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with landslides.
2	16.0	E	Low	Possibility of slope instability problems after major changes in ground conditions. Consideration should be given to stability if changes to drainage or excavations take place. Possible increase in construction cost to reduce potential slope stability problems. Existing property - no significant increase in insurance risk due to natural slope instability problems.

### 6.3 Ground Dissolution of Soluble Rocks

The following Ground Dissolution information provided by the British Geological Survey:

ID	Distance (m)	Direction	Hazard Rating	Details
1	0.0	On Site	Negligible	Soluble rocks are present, but unlikely to cause problems except under exceptional conditions. No special actions required to avoid problems due to soluble rocks. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with soluble rocks.

### 6.4 Compressible Deposits

The following Compressible Deposits information provided by the British Geological Survey:

ID	Distance (m)	Direction	Hazard Rating	Details
1	0.0	On Site	Very Low	Very low potential for compressible deposits to be present. No special actions required to avoid problems due to compressible deposits. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with compressible deposits.
2	0.0	On Site	Very Low	Very low potential for compressible deposits to be present. No special actions required to avoid problems due to compressible deposits. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with compressible deposits.
3	0.0	On Site	Moderate	Significant potential for compressibility problems. Avoid large differential loadings of ground. Do not drain or de-water ground near the property without technical advice. For new build - consider possibility of compressible ground in ground investigation, construction and building design. Consider effects of groundwater changes. Extra construction costs are likely. For existing property - possible increase in insurance risk from compressibility, especially if water conditions or loading of the ground change significantly.

ID	Distance (m)	Direction	Hazard Rating	Details
4	0.0	On Site	Negligible	No indicators for compressible deposits identified. No special actions required to avoid problems due to compressible deposits. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with compressible deposits.
5	0.0	On Site	High	Very significant potential for compressibility problems. Avoid large differential loadings of ground. Do not drain or de-water ground near the property without technical advice. For new build - consider possibility of compressible ground in ground investigation, construction and building design. Consider effects of groundwater changes. Construction may not be possible at economic cost. For existing property - probable increase in insurance risk from compressibility especially if water conditions or loading of the ground change significantly.
6	0.0	On Site	High	Very significant potential for compressibility problems. Avoid large differential loadings of ground. Do not drain or de-water ground near the property without technical advice. For new build - consider possibility of compressible ground in ground investigation, construction and building design. Consider effects of groundwater changes. Construction may not be possible at economic cost. For existing property - probable increase in insurance risk from compressibility especially if water conditions or loading of the ground change significantly.
7	0.0	On Site	High	Very significant potential for compressibility problems. Avoid large differential loadings of ground. Do not drain or de-water ground near the property without technical advice. For new build - consider possibility of compressible ground in ground investigation, construction and building design. Consider effects of groundwater changes. Construction may not be possible at economic cost. For existing property - probable increase in insurance risk from compressibility especially if water conditions or loading of the ground change significantly.
8	50.0	S	Negligible	No indicators for compressible deposits identified. No special actions required to avoid problems due to compressible deposits. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with compressible deposits.

## 6.5 Collapsible Deposits

The following Collapsible Rocks information provided by the British Geological Survey:

ID	Distance (m)	Direction	Hazard Rating	Details
1	0.0	On Site	Negligible	No indicators for collapsible deposits identified. No actions required to avoid problems due to collapsible deposits. No special ground investigation required, or increased construction costs or increased financial risk due to potential problems with collapsible deposits.
2	3.0	W	Very Low	Deposits with potential to collapse when loaded and saturated are unlikely to be present. No special ground investigation required or increased construction costs or increased financial risk due to potential problems with collapsible deposits.

## 6.6 Running Sands

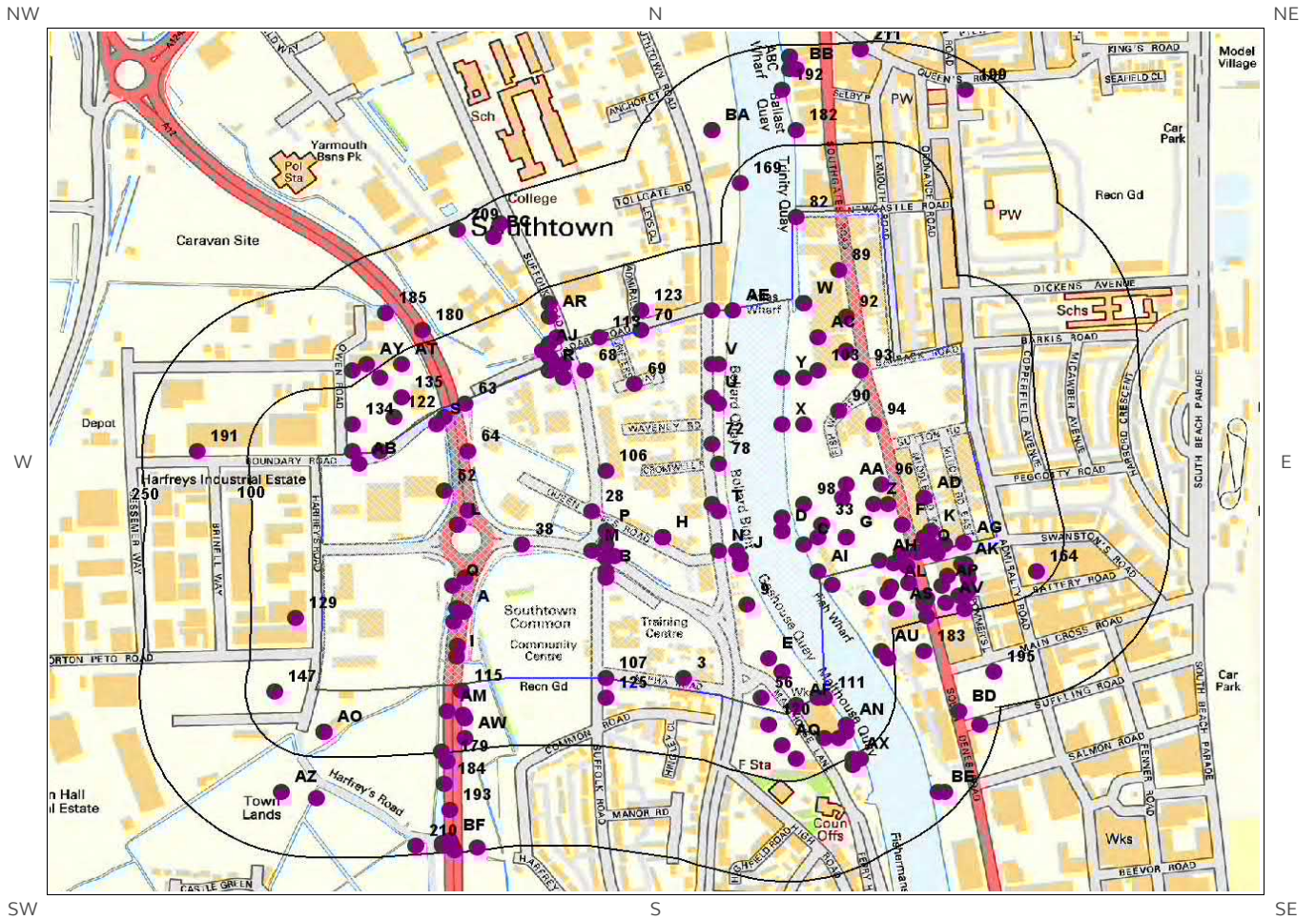
The following Running Sands information provided by the British Geological Survey:

ID	Distance (m)	Direction	Hazard Rating	Details
1	0.0	On Site	Very Low	Very low potential for running sand problems if water table rises or if sandy strata are exposed to water. No special actions required, to avoid problems due to running sand. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with running sand.



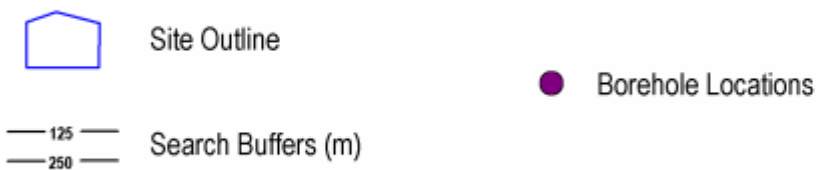
ID	Distance (m)	Direction	Hazard Rating	Details
2	0.0	On Site	Very Low	Very low potential for running sand problems if water table rises or if sandy strata are exposed to water. No special actions required, to avoid problems due to running sand. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with running sand.
3	0.0	On Site	Moderate	Significant potential for running sand problems with relatively small changes in ground conditions. Avoid large amounts of water entering the ground (for example through pipe leakage or soak-aways). Do not dig (deep) holes into saturated ground near the property without technical advice. For new build - consider the consequences of soil and groundwater conditions during and after construction. For existing property - possible increase in insurance risk from running sand, for example, due to water leakage, high rainfall events or flooding.
4	1.0	N	Negligible	No indicators for running sand identified. No special actions required to avoid problems due to running sand. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with running sand.
5	16.0	E	Low	Possibility of running sand problems after major changes in ground conditions. Normal maintenance to avoid leakage of water-bearing services or water bodies (ponds, swimming pools) should reduce likelihood of problems due to running sand. For new build - consider possibility of running sand into trenches or excavations if water table is high or sandy strata are exposed to water. Avoid concentrated water inputs to site. Unlikely to be an increase in construction costs due to potential for running sand. For existing property - no significant increase in insurance risk due to running sand problems is likely.
6	50.0	S	Low	Possibility of running sand problems after major changes in ground conditions. Normal maintenance to avoid leakage of water-bearing services or water bodies (ponds, swimming pools) should reduce likelihood of problems due to running sand. For new build - consider possibility of running sand into trenches or excavations if water table is high or sandy strata are exposed to water. Avoid concentrated water inputs to site. Unlikely to be an increase in construction costs due to potential for running sand. For existing property - no significant increase in insurance risk due to running sand problems is likely.

# 7 Borehole Records Map



Borehole Records Legend

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# 7 Borehole Records

The systematic analysis of data extracted from the BGS Borehole Records database provides the following information.

Records of boreholes within 250m of the study site boundary:

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ID	Distance (m)	Direction	NGR	BGS Reference	Drilled Length	Borehole Name
1Q	0.0	On Site	652033 305818	TG50NW45	5.0	A47 GORLESTON RELIEF ROAD
2A	0.0	On Site	652049 305780	TG50NW43	6.2	A47 GORLESTON RELIEF ROAD
3	0.0	On Site	652360 305680	TG50NW332	7.62	GT YAR BOR CNCL ALPHA ROAD 27
4AI	0.0	On Site	652550 305840	TG50NW590	15.0	FISHWHARF ZAPATA QUAY 2
5B	0.0	On Site	652250 305840	TG50NW164	24.38	GT YAR BOROUGH COUNCIL YARE TUNNEL 7
6J	0.0	On Site	652440 305860	TG50NW583	15.5	BOLLARD QUAY 6
7M	0.0	On Site	652230 305870	TG50NW185	6.71	GT YAR BOROUGH COUNCIL DRAINAGE SCHEME 3
8C	0.0	On Site	652530 305880	TG50NW591	15.0	FISHWHARF ZAPATA QUAY 3
9	0.0	On Site	652450 305790	TG50NW840	10.0	GAS QUAY GT YARMOUTH 1
10A	0.0	On Site	652038 305785	TG50NW374	2.3	A12 GORLESTON RELIEF RD GT YAR S BY PASS
11B	0.0	On Site	652250 305830	TG50NW27	12.0	A47 GT YARMOUTH WESTERN BY PASS 237
12C	0.0	On Site	652550 305890	TG50NW592	15.5	FISHWHARF ZAPATA QUAY 4
13H	0.0	On Site	652330 305890	TG50NW1008	18.28	CENTRAL ELECTRICITY BOARD GORLESTON
14D	0.0	On Site	652500 305900	TG50NW892	20.0	SOUTHGATES RD GT YARMOUTH 3
15D	0.0	On Site	652500 305900	TG50NW891	20.0	SOUTHGATES RD GT YARMOUTH 2
16D	0.0	On Site	652500 305900	TG50NW893	20.0	SOUTHGATES RD GT YARMOUTH 4
17A	0.0	On Site	652034 305764	TG50NW32	7.05	A47/A12 GORLESTON RELIEF ROAD
18L	0.0	On Site	652040 305910	TG50NW13	20.12	GORING CEB GREAT YARMOUTH
19I	0.0	On Site	652038 305712	TG50NW386	14.3	A12/A47 GORLESTON RELIEF RD REPORT
20E	0.0	On Site	652480 305710	TG50NW942	8.0	GAS HOUSE QUAY GT YARMOUTH 3
21F	0.0	On Site	652670 305910	TG50NW570	-1.0	FISH QUAY TRIAL PIT PS22

ID	Distance (m)	Direction	NGR	BGS Reference	Drilled Length	Borehole Name
22E	0.0	On Site	652500 305690	TG50NW792	10.0	MALTHOUSE QUAY GT YARMOUTH 7
23D	0.0	On Site	652500 305920	TG50NW571	-1.0	FISH QUAY TRIAL PIT PS23
24G	0.0	On Site	652590 305890	TG50NW17/C	17.37	HIPPERSON & SON ELECTRICITY POWER STN
25F	0.0	On Site	652700 305890	TG50NW109	-1.0	CEGB 132 KV TRANSFORMER SITE GT YAR DKM 3
26G	0.0	On Site	652590 305890	TG50NW998	17.1	ELECTRICAL POWER STATION GREAT YARMOUTH NO 1
27H	0.0	On Site	652330 305890	TG50NW995	13.71	CENTRAL ELECTRICITY BOARD GORLESTON
28	0.0	On Site	652230 305930	TG50NW184	7.01	GT YAR BOROUGH COUNCIL DRAINAGE SCHEME 2
29T	0.0	On Site	652410 305930	TG50NW582	15.5	BOLLARD QUAY 5
30K	0.0	On Site	652710 305900	TG50NW108	-1.0	CEGB 132 KV TRANSFORMER SITE GT YAR DKM 2
31I	0.0	On Site	652040 305728	TG50NW44	6.2	A47 GORLESTON RELIEF ROAD
32D	0.0	On Site	652500 305900	TG50NW890	20.0	SOUTHGATES RD GT YARMOUTH 1
33	0.0	On Site	652555 305910	TG50NW162	36.58	GT YAR BOROUGH COUNCIL YARE TUNNEL 5
34O	0.0	On Site	652700 305870	TG50NW110	-1.0	CEGB 132 KV TRANSFORMER SITE GT YAR DKM 4
35N	0.0	On Site	652410 305870	TG50NW588	20.0	BOLLARD QUAY 11
36J	0.0	On Site	652435 305870	TG50NW163	36.58	GT YAR BOROUGH COUNCIL YARE TUNNEL 6
37K	0.0	On Site	652710 305880	TG50NW107	-1.0	CEGB 132 KV TRANSFORMER SITE GT YAR DKM 1
38	0.0	On Site	652130 305880	TG50NW472	15.0	A12 GT YARMOUTH WESTERN BY-PASS 318
39G	0.0	On Site	652590 305890	TG50NW17/B	14.02	HIPPERSON & SON ELECTRICITY POWER STN
40P	0.0	On Site	652250 305900	TG50NW29	10.0	A47 GT YARMOUTH WESTERN BY PASS 239
41L	0.0	On Site	652040 305910	TG50NW1026	17.67	CENTRAL ELECTRICITY BOARD GREAT YARMOUTH
42L	0.0	On Site	652040 305910	TG50NW1005	20.11	CENTRAL ELECTRICITY BOARD GREAT YARMOUTH
43M	0.0	On Site	652250 305860	TG50NW26	11.0	A47 GT YARMOUTH WESTERN BY PASS 236
44N	0.0	On Site	652440 305850	TG50NW180	9.15	GT YAR BOROUGH COUNCIL SEWERAGE WORKS 14
45O	0.0	On Site	652668 305865	TG50NW1057	8.0	ADMIRALTY ROAD GREAT YARMOUTH 210

ID	Distance (m)	Direction	NGR	BGS Reference	Drilled Length	Borehole Name
46B	0.0	On Site	652262 305862	TG50NW429	7.6	A12 GT YAR W BY PASS DOT REPORT
47P	0.0	On Site	652250 305880	TG50NW28	11.5	A47 GT YARMOUTH WESTERN BY PASS 238
48Q	0.0	On Site	652050 305830	TG50NW46	4.5	A47 GORLESTON RELIEF ROAD
49L	0.0	On Site	652054 305931	TG50NW428	17.0	A12 GT YAR W BY PASS DOT REPORT
50H	0.0	On Site	652330 305890	TG50NW1009	24.38	CENTRAL ELECTRICITY BOARD GORLESTON
51AH	0.0	On Site	652638 305856	TG50NW1050	17.0	ADMIRALTY ROAD GREAT YARMOUTH 202
52L	0.0	On Site	652040 305910	TG50NW1006	16.76	CENTRAL ELECTRICITY BOARD GREAT YARMOUTH
53G	0.0	On Site	652590 305890	TG50NW17/A	17.07	HIPPERSON & SON ELECTRICITY POWER STN
54H	0.0	On Site	652330 305890	TG50NW12	18.29	GORING CEG GREAT YARMOUTH
55AF	0.0	On Site	652520 305640	TG50NW793	19.0	MALTHOUSE QUAY GT YARMOUTH 8
56	0.0	On Site	652470 305650	TG50NW795	10.5	MALTHOUSE QUAY GT YARMOUTH 10
57K	0.0	On Site	652730 305880	TG50NW1063	4.0	ADMIRALTY ROAD GREAT YARMOUTH WS 106
58O	0.0	On Site	652691 305868	TG50NW1053	8.5	ADMIRALTY ROAD GREAT YARMOUTH 205
59AG	0.0	On Site	652757 305882	TG50NW1065	5.0	ADMIRALTY ROAD GREAT YARMOUTH WS 108
60AB	0.0	On Site	651900 306000	TG50NW687	0.9	BGS AUGR HL 162 GAPTON MARSHES
61S	0.0	On Site	652010 306060	TG50NW467	2.5	A12 GT YARMOUTH WESTERN BY-PASS 235
62	0.0	On Site	652020 305960	TG50NW226	11.8	GT YAR BOR CNCL A12 WESTERN BY PASS
63	0.0	On Site	652050 306090	TG50NW466	24.3	A12 GT YARMOUTH WESTERN BY-PASS 234
64	0.0	On Site	652054 306020	TG50NW430	11.3	A12 GT YAR W BY PASS DOT REPORT
65R	0.0	On Site	652170 306140	TG50NW308	-1.0	GT YAR BOR CNCL HIGH MILL RD CPT 11
66R	0.0	On Site	652190 306150	TG50NW181	14.8	GT YAR BOROUGH COUNCIL SEWERAGE WORKS 25
67R	0.0	On Site	652190 306130	TG50NW306	-1.0	GT YAR BOR CNCL HIGH MILL RD CPT 9
68	0.0	On Site	652220 306140	TG50NW183	7.01	GT YAR BOROUGH COUNCIL DRAINAGE SCHEME 1
69	0.0	On Site	652290 306120	TG50NW307	-1.0	GT YAR BOR CNCL HIGH MILL RD CPT 10
70	0.0	On Site	652300 306200	TG50NW310	-1.0	GT YAR BOR CNCL HIGH MILL RD CPT 13
71S	0.0	On Site	652020 306070	TG50NW468	25.0	A12 GT YARMOUTH WESTERN BY-PASS 235A
72	0.0	On Site	652400 306030	TG50NW586	20.0	BOLLARD QUAY 9
73U	0.0	On Site	652400 306100	TG50NW908	25.0	SOUTHTOWN RD GT YARMOUTH 1

ID	Distance (m)	Direction	NGR	BGS Reference	Drilled Length	Borehole Name
74V	0.0	On Site	652400 306150	TG50NW585	15.5	BOLLARD QUAY 8
75T	0.0	On Site	652400 305940	TG50NW587	11.5	BOLLARD QUAY 10
76U	0.0	On Site	652410 306090	TG50NW580	15.5	BOLLARD QUAY 3
77V	0.0	On Site	652410 306150	TG50NW579	15.0	BOLLARD QUAY 2
78	0.0	On Site	652410 306000	TG50NW581	15.0	BOLLARD QUAY 4
79AE	0.0	On Site	652430 306230	TG50NW578	15.5	BOLLARD QUAY 1
80Y	0.0	On Site	652500 306130	TG50NW341	20.5	GREAT YARMOUTH FLOOD DEFENCES 1
81X	0.0	On Site	652500 306060	TG50NW342	22.1	GREAT YARMOUTH FLOOD DEFENCES 2
82	0.0	On Site	652520 306370	TG50NW928	26.0	TRINITY QUAY GT YARMOUTH 2
83W	0.0	On Site	652530 306240	TG50NW934	20.0	SOUTHGATES RD GT YARMOUTH 12
84W	0.0	On Site	652530 306240	TG50NW935	20.0	SOUTHGATES RD GT YARMOUTH 13
85W	0.0	On Site	652530 306240	TG50NW933	20.0	SOUTHGATES RD GT YARMOUTH 11
86X	0.0	On Site	652530 306060	TG50NW344	25.0	GREAT YARMOUTH FLOOD DEFENCES 4
87Y	0.0	On Site	652530 306130	TG50NW343	25.0	GREAT YARMOUTH FLOOD DEFENCES 3
88R	0.0	On Site	652170 306140	TG50NW210	18.5	GT YAR COUNCIL STH TOWN PUMPING STN 2A
89	0.0	On Site	652580 306290	TG50NW276	-1.0	GT YAR BOR CNCL SOUTHGATE ROAD 2047A
90	0.0	On Site	652580 306080	TG50NW573	-1.0	FISH QUAY TRIAL PIT PS25
91AA	0.0	On Site	652590 305970	TG50NW577	-1.0	FISH QUAY TRIAL PIT PP4
92	0.0	On Site	652590 306220	TG50NW279	-1.0	GT YAR BOR CNCL SOUTHGATE ROAD 2047D
93	0.0	On Site	652610 306140	TG50NW277	-1.0	GT YAR BOR CNCL SOUTHGATE ROAD 2047B
94	0.0	On Site	652630 306060	TG50NW572	-1.0	FISH QUAY TRIAL PIT PS24
95Z	0.0	On Site	652630 305940	TG50NW576	-1.0	FISH QUAY TRIAL PIT PP3
96	0.0	On Site	652640 305970	TG50NW574	-1.0	FISH QUAY TRIAL PIT PP1
97Z	0.0	On Site	652650 305940	TG50NW575	-1.0	FISH QUAY TRIAL PIT PP2
98	0.0	On Site	652530 305940	TG50NW368	3.0	GREAT YARMOUTH FLOOD DEFENCES TP 12
99AA	0.0	On Site	652585 305950	TG50NW161	24.38	GT YAR BOROUGH COUNCIL YARE TUNNEL 4
100A D	0.0	On Site	652700 305950	TG50NW996	9.4	SUTTON ROAD GREAT YARMOUTH

ID	Distance (m)	Direction	NGR	BGS Reference	Drilled Length	Borehole Name
101A B	0.0	On Site	651930 306020	TG50NW1081	5.0	TRAVIS PERKINS GREAT YARMOUTH WS102
102A C	0.0	On Site	652550 306190	TG50NW1046	30.34	GREAT YARMOUTH (FISHWHARF OFF SOUTH DENES ROAD) 3
103	0.0	On Site	652550 306140	TG50NW1045	30.32	GREAT YARMOUTH (FISHWHARF OFF SOUTH DENES ROAD) 2
104A C	0.0	On Site	652590 306170	TG50NW1044	30.45	GREAT YARMOUTH (FISHWHARF OFF SOUTH DENES ROAD) 1A
105A D	0.0	On Site	652700 305950	TG50NW23	9.45	SUTTON RD GT YARMOUTH
106	0.0	On Site	652250 305990	TG50NW4	7.01	GREAT YARMOUTH NO 4
107	0.0	S	652250 305680	TG50NW331	7.62	SUFFOLK ROAD 26
108A E	1.0	N	652400 306230	TG50NW584	20.0	BOLLUAY QUAY 7
109A F	1.0	SE	652550 305650	TG50NW353	25.0	GREAT YARMOUTH FLOOD DEFENCES 13
110A B	4.0	N	651890 306020	TG50NW1076	20.2	TRAVIS PERKINS GREAT YARMOUTH 101
111	6.0	SE	652560 305650	TG50NW350	20.0	GREAT YARMOUTH FLOOD DEFENCES 10
112A G	6.0	S	652719 305867	TG50NW1048	8.2	ADMIRALTY ROAD GREAT YARMOUTH 102
113	7.0	N	652240 306190	TG50NW309	-1.0	GT YAR BOR CNCL HIGH MILL RD CPT 12
114A H	7.0	S	652658 305852	TG50NW1070	4.0	ADMIRALTY ROAD GREAT YARMOUTH WS 201
115	10.0	S	652045 305662	TG50NW41	7.8	A47 GORLESTON RELIEF ROAD
116R	11.0	NW	652170 306160	TG50NW209	15.25	GT YAR COUNCIL STH TOWN PUMPING STN 1A
117R	11.0	NW	652170 306160	TG50NW182	15.25	GT YAR BOROUGH COUNCIL SEWERAGE WORKS 26
118AI	14.0	S	652570 305820	TG50NW281	-1.0	GT YAR BOR CNCL FISH WHARF B12
119O	15.0	S	652676 305848	TG50NW1051	14.4	ADMIRALTY ROAD GREAT YARMOUTH 203
120	23.0	S	652480 305610	TG50NW796	10.0	MALTHOUSE QUAY GT YARMOUTH 11
121AJ	24.0	NW	652160 306170	TG50NW179	18.3	GT YAR BOROUGH COUNCIL SEWERAGE WORKS 11
122	26.0	NW	651950 306070	TG50NW1079	18.5	TRAVIS PERKINS GREAT YARMOUTH 104
123	28.0	N	652300 306230	TG50NW3	10.67	GREAT YARMOUTH NO 3
124AJ	29.0	NW	652170 306180	TG50NW212	15.0	GT YAR COUNCIL SUFFOLK RD SEWERAGE 5
125	30.0	S	652250 305650	TG50NW5	7.62	GREAT YARMOUTH NO 5
126AJ	30.0	NW	652180 306190	TG50NW178	18.3	GT YAR BOROUGH COUNCIL SEWERAGE WORKS 10

ID	Distance (m)	Direction	NGR	BGS Reference	Drilled Length	Borehole Name
127A K	31.0	S	652754 305850	TG50NW1067	4.0	ADMIRALTY ROAD GREAT YARMOUTH WS 110
128A K	31.0	S	652760 305851	TG50NW1068	4.0	ADMIRALTY ROAD GREAT YARMOUTH WS 111
129	38.0	W	651810 305770	TG50NW958	-1.0	HARFREYS ROAD GR T YARMOUTH 1
130AL	39.0	S	652653 305817	TG50NW1054	9.0	ADMIRALTY ROAD GREAT YARMOUTH 207
131A M	40.0	S	652025 305630	TG50NW31	9.5	A47/A12 GORLESTON RELIEF ROAD
132AL	41.0	S	652679 305822	TG50NW1052	13.1	ADMIRALTY ROAD GREAT YARMOUTH 204
133A K	43.0	S	652734 305833	TG50NW1066	4.0	ADMIRALTY ROAD GREAT YARMOUTH WS 109
134	44.0	N	651890 306060	TG50NW1080	6.0	TRAVIS PERKINS GREAT YARMOUTH WS101
135	45.0	NW	651960 306100	TG50NW1084	5.0	TRAVIS PERKINS GREAT YARMOUTH WS105
136AL	46.0	S	652649 305809	TG50NW1071	4.0	ADMIRALTY ROAD GREAT YARMOUTH WS 202
137A K	46.0	S	652762 305836	TG50NW1069	4.0	ADMIRALTY ROAD GREAT YARMOUTH WS 112
138AL	47.0	S	652620 305800	TG50NW287	-1.0	GT YAR BOR CNCL FISH WHARF B22
139A Q	47.0	S	652500 305580	TG50NW797	15.5	MALTHOUSE QUAY GT YARMOUTH 12A
140A M	47.0	S	652048 305625	TG50NW42	8.0	A47 GORLESTON RELIEF ROAD
141A M	52.0	S	652050 305620	TG50NW385	12.0	A12 GORLESTON RELIEF RD GT YAR S BY PASS
142A K	53.0	S	652763 305829	TG50NW1064	1.0	ADMIRALTY ROAD GREAT YARMOUTH WS 107
143A P	56.0	S	652726 305818	TG50NW1047	8.0	ADMIRALTY ROAD GREAT YARMOUTH 101
144A N	56.0	SE	652590 305610	TG50NW349	20.0	GREAT YARMOUTH FLOOD DEFENCES 9
145A N	59.0	SE	652560 305590	TG50NW794	19.0	MALTHOUSE QUAY GT YARMOUTH 9A
146A R	59.0	NW	652170 306220	TG50NW211	27.0	GT YAR COUNCIL SUFFOLK RD SEWERAGE 4
147	59.0	W	651780 305660	TG50NW225	10.7	GT YAR BOR CNCL A12 WESTERN BY PASS
148A O	63.0	S	651850 305600	TG50NW923	20.0	HARFREYS RD GT YARMOUTH 1
149A O	63.0	S	651850 305600	TG50NW924	20.0	HARFREYS RD GT YARMOUTH 2
150A O	63.0	S	651850 305600	TG50NW925	20.0	HARFREYS RD GT YARMOUTH 3
151A O	63.0	S	651850 305600	TG50NW926	20.0	HARFREYS RD GT YARMOUTH 4
152A N	64.0	SE	652590 305600	TG50NW75	1.2	GT YARMOUTH FLOOD DEFENCES POSFORD PAVRY C15
153A P	68.0	S	652700 305800	TG50NW946	20.0	SOUTH DENES ROAD 1
154A P	68.0	S	652700 305800	TG50NW947	15.5	SOUTH DENES ROAD 2



ID	Distance (m)	Direction	NGR	BGS Reference	Drilled Length	Borehole Name
155A Q	68.0	S	652520 305560	TG50NW798	10.0	MALTHOUSE QUAY GT YARMOUTH 13
156A N	68.0	SE	652580 305590	TG50NW352	25.0	GREAT YARMOUTH FLOOD DEFENCES 12
157A P	70.0	S	652705 305799	TG50NW1055	8.0	ADMIRALTY ROAD GREAT YARMOUTH 208
158A P	70.0	S	652764 305812	TG50NW1062	4.0	ADMIRALTY ROAD GREAT YARMOUTH WS 105
159A S	74.0	S	652662 305783	TG50NW1049	15.35	ADMIRALTY ROAD GREAT YARMOUTH 201
160A P	75.0	S	652750 305804	TG50NW1060	4.0	ADMIRALTY ROAD GREAT YARMOUTH WS 103
161A R	76.0	NW	652170 306240	TG50NW177	9.15	GT YAR BOROUGH COUNCIL SEWERAGE WORKS 9
162A P	76.0	S	652758 305804	TG50NW1061	4.0	ADMIRALTY ROAD GREAT YARMOUTH WS 104
163A S	77.0	S	652700 305790	TG50NW569	-1.0	FISH QUAY TRIAL PIT PS21
164	79.0	SE	652860 305840	TG50NW589	15.0	FISHWHARF ZAPATA QUAY 1
165A V	81.0	S	652731 305793	TG50NW1059	4.0	ADMIRALTY ROAD GREAT YARMOUTH WS 102
166A U	82.0	E	652640 305720	TG50NW871	10.0	FISH WHARF GT YARMOUTH 1
167A W	82.0	S	652050 305590	TG50NW39	5.0	A47/A12 GORLESTON RELIEF ROAD
168A T	85.0	NW	651960 306150	TG50NW1078	16.2	TRAVIS PERKINS GREAT YARMOUTH 103
169	86.0	NW	652440 306420	TG50NW927	22.0	TRINITY QUAY GT YARMOUTH 1
170A T	87.0	NW	651930 306130	TG50NW1082	5.0	TRAVIS PERKINS GREAT YARMOUTH WS103
171A U	91.0	E	652650 305710	TG50NW872	10.0	FISH WHARF GT YARMOUTH 2
172A S	95.0	S	652704 305773	TG50NW1056	8.0	ADMIRALTY ROAD GREAT YARMOUTH 209
173A V	96.0	S	652758 305784	TG50NW1058	4.0	ADMIRALTY ROAD GREAT YARMOUTH WS 101
174A W	100.0	S	652016 305570	TG50NW40	6.1	A47 GORLESTON RELIEF ROAD
175A X	104.0	SE	652600 305560	TG50NW76	2.4	GT YARMOUTH FLOOD DEFENCES POSFORD PAVRY C16
176A X	109.0	SE	652610 305560	TG50NW348	20.0	GREAT YARMOUTH FLOOD DEFENCES 8
177A X	113.0	SE	652600 305550	TG50NW351	25.5	GREAT YARMOUTH FLOOD DEFENCES 11
178A Y	114.0	NW	651910 306150	TG50NW1083	5.0	TRAVIS PERKINS GREAT YARMOUTH WS104
179	115.0	S	652025 305555	TG50NW384	14.7	A12 GORLESTON RELIEF RD GT YAR S BY PASS
180	118.0	N	651990 306200	TG50NW227	11.5	GT YAR BOR CNCL A12 WESTERN BY PASS
181A Y	118.0	NW	651890 306140	TG50NW1077	23.0	TRAVIS PERKINS GREAT YARMOUTH 102
182	122.0	N	652520 306500	TG50NW786	20.0	SOUTHGATES RD GT YARMOUTH 3

ID	Distance (m)	Direction	NGR	BGS Reference	Drilled Length	Borehole Name
183	142.0	E	652700 305720	TG50NW568	-1.0	FISH QUAY TRIAL PIT PS20
184	148.0	S	652020 305522	TG50NW30	6.2	A47/A12 GORLESTON RELIEF ROAD
185	161.0	NW	651938 306226	TG50NW431	13.0	A12 GT YAR W BY PASS DOT REPORT
186A Z	161.0	S	651790 305510	TG50NW971	7.7	HARFREYS FARM GT YARMOUTH 13
187A Z	163.0	S	651840 305500	TG50NW959	9.0	HARFREYS FARM GT YARMOUTH 1
188B A	167.0	NW	652400 306500	TG50NW895	2.0	INSPECTORATE QUAY GT YAR' 2
189B A	167.0	NW	652400 306500	TG50NW896	25.0	INSPECTORATE QUAY GT YAR' 2A
190B A	167.0	NW	652400 306500	TG50NW894	25.0	INSPECTORATE QUAY GT YAR' 1
191	173.0	W	651670 306020	TG50NW686	1.2	BGS AUGR HL 161 GAPTON MARSHES
192	183.0	N	652500 306560	TG50NW789	25.7	SOUTHGATES RD GT YARMOUTH 1
193	187.0	S	652028 305483	TG50NW383	12.3	A12 GORLESTON RELIEF RD GT YAR S BY PASS CPT 129
194B D	191.0	E	652750 305630	TG50NW567	-1.0	EAST QUAY TRIAL PIT PS19
195	197.0	S	652800 305690	TG50NW283	-1.0	GT YAR BOR CNCL FISH WHARF B14
196B C	203.0	NW	652090 306340	TG50NW176	9.15	GT YAR BOROUGH COUNCIL SEWERAGE WORKS 8
197B B	212.0	N	652520 306590	TG50NW785	17.3	SOUTHGATES RD GT YARMOUTH 2
198B B	212.0	N	652510 306590	TG50NW784	20.0	SOUTHGATES RD GT YARMOUTH 1
199	214.0	NE	652760 306560	TG50NW196	6.1	GT YAR BOR CNCL MAVERS RD PUMPING STN 23
200B C	215.0	NW	652100 306360	TG50NW213	15.4	GT YAR COUNCIL SUFFOLK RD SEWERAGE 6
201B E	217.0	SE	652720 305510	TG50NW991	25.0	GREAT YARMOUTH SALMON ROAD 4
202B D	224.0	E	652780 305610	TG50NW993	10.5	GREAT YARMOUTH SALMON ROAD 5
203B E	224.0	SE	652730 305510	TG50NW992	25.25	GREAT YARMOUTH SALMON ROAD 4A
204B F	232.0	S	652028 305438	TG50NW388	1.5	A12/A47 GORLESTON RELIEF RD REPORT
205B B	232.0	N	652510 306610	TG50NW790	3.0	SOUTHGATES RD GT YARMOUTH 2
206B B	232.0	N	652510 306610	TG50NW791	26.0	SOUTHGATES RD GT YARMOUTH 2A
207B F	236.0	S	652018 305434	TG50NW37	0.6	A47/A12 GORLESTON RELIEF ROAD
208B F	236.0	S	652030 305434	TG50NW373	0.8	A12 GORLESTON RELIEF RD GT YAR S BY PASS
209	237.0	NW	652040 306350	TG50NW214	15.4	GT YAR COUNCIL SUFFOLK RD SEWERAGE 7

ID	Distance (m)	Direction	NGR	BGS Reference	Drilled Length	Borehole Name
210	237.0	S	651980 305430	TG50NW961	8.0	HARFREYS FARM GT YARMOUTH 3
211	239.0	N	652610 306620	TG50NW274	-1.0	GT YAR BOR CNCL QUEENS RD B18
212B F	239.0	S	652032 305431	TG50NW387	1.8	A12/A47 GORLESTON RELIEF RD REPORT
213B F	240.0	S	652020 305430	TG50NW224	6.4	GT YAR BOR CNCL A12 WESTERN BY PASS DKM2
214B F	240.0	S	652018 305429	TG50NW38	10.0	A47/A12 GORLESTON RELIEF ROAD
215B F	241.0	S	652030 305429	TG50NW401	1.8	A12/A47 GORLESTON RELIEF RD REPORT
216B F	246.0	S	652068 305427	TG50NW389	8.05	A12/A47 GORLESTON RELIEF RD REPORT
217B F	249.0	S	652035 305422	TG50NW372	4.3	A12 GORLESTON RELIEF RD GT YAR S BY PASS

The borehole records are available using the hyperlinks below: Please note that if the donor of the borehole record has requested the information be held as commercial-in-confidence, the additional data will be held separately by the BGS and a formal request must be made for its release.



- #1Q: [scans.bgs.ac.uk/sobi\\_scans/boreholes/519577](https://scans.bgs.ac.uk/sobi_scans/boreholes/519577)
- #2A: [scans.bgs.ac.uk/sobi\\_scans/boreholes/519575](https://scans.bgs.ac.uk/sobi_scans/boreholes/519575)
- #3: [scans.bgs.ac.uk/sobi\\_scans/boreholes/519864](https://scans.bgs.ac.uk/sobi_scans/boreholes/519864)
- #4Al: [scans.bgs.ac.uk/sobi\\_scans/boreholes/520122](https://scans.bgs.ac.uk/sobi_scans/boreholes/520122)
- #5B: [scans.bgs.ac.uk/sobi\\_scans/boreholes/519696](https://scans.bgs.ac.uk/sobi_scans/boreholes/519696)
- #6J: [scans.bgs.ac.uk/sobi\\_scans/boreholes/520115](https://scans.bgs.ac.uk/sobi_scans/boreholes/520115)
- #7M: [scans.bgs.ac.uk/sobi\\_scans/boreholes/519717](https://scans.bgs.ac.uk/sobi_scans/boreholes/519717)
- #8C: [scans.bgs.ac.uk/sobi\\_scans/boreholes/520123](https://scans.bgs.ac.uk/sobi_scans/boreholes/520123)
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- #10A: [scans.bgs.ac.uk/sobi\\_scans/boreholes/519906](https://scans.bgs.ac.uk/sobi_scans/boreholes/519906)
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- #14D: [scans.bgs.ac.uk/sobi\\_scans/boreholes/520424](https://scans.bgs.ac.uk/sobi_scans/boreholes/520424)
- #15D: [scans.bgs.ac.uk/sobi\\_scans/boreholes/520423](https://scans.bgs.ac.uk/sobi_scans/boreholes/520423)
- #16D: [scans.bgs.ac.uk/sobi\\_scans/boreholes/520425](https://scans.bgs.ac.uk/sobi_scans/boreholes/520425)
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- #27H: [scans.bgs.ac.uk/sobi\\_scans/boreholes/520527](https://scans.bgs.ac.uk/sobi_scans/boreholes/520527)
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- #36J: [scans.bgs.ac.uk/sobi\\_scans/boreholes/519695](https://scans.bgs.ac.uk/sobi_scans/boreholes/519695)
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- #42L: [scans.bgs.ac.uk/sobi\\_scans/boreholes/520537](https://scans.bgs.ac.uk/sobi_scans/boreholes/520537)
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- #51AH: [scans.bgs.ac.uk/sobi\\_scans/boreholes/18092181](https://scans.bgs.ac.uk/sobi_scans/boreholes/18092181)
- #52L: [scans.bgs.ac.uk/sobi\\_scans/boreholes/520538](https://scans.bgs.ac.uk/sobi_scans/boreholes/520538)
- #53G: [scans.bgs.ac.uk/sobi\\_scans/boreholes/519547](https://scans.bgs.ac.uk/sobi_scans/boreholes/519547)
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- #59AG: [scans.bgs.ac.uk/sobi\\_scans/boreholes/18092809](https://scans.bgs.ac.uk/sobi_scans/boreholes/18092809)
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- #62: [scans.bgs.ac.uk/sobi\\_scans/boreholes/519758](https://scans.bgs.ac.uk/sobi_scans/boreholes/519758)



- #63: [scans.bgs.ac.uk/sobi\\_scans/boreholes/519998](https://scans.bgs.ac.uk/sobi_scans/boreholes/519998)
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- #135: scans.bgs.ac.uk/sobi\_scans/boreholes/18403325
- #136AL: scans.bgs.ac.uk/sobi\_scans/boreholes/18092826
- #137AK: scans.bgs.ac.uk/sobi\_scans/boreholes/18092818
- #139AQ: scans.bgs.ac.uk/sobi\_scans/boreholes/520329
- #140AM: scans.bgs.ac.uk/sobi\_scans/boreholes/519574
- #141AM: scans.bgs.ac.uk/sobi\_scans/boreholes/519917
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- #193: scans.bgs.ac.uk/sobi\_scans/boreholes/519915



- #196BC: [scans.bgs.ac.uk/sobi\\_scans/boreholes/519708](https://scans.bgs.ac.uk/sobi_scans/boreholes/519708)
  - #197BB: [scans.bgs.ac.uk/sobi\\_scans/boreholes/520317](https://scans.bgs.ac.uk/sobi_scans/boreholes/520317)
  - #198BB: [scans.bgs.ac.uk/sobi\\_scans/boreholes/520316](https://scans.bgs.ac.uk/sobi_scans/boreholes/520316)
  - #199: [scans.bgs.ac.uk/sobi\\_scans/boreholes/519728](https://scans.bgs.ac.uk/sobi_scans/boreholes/519728)
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  - #201BE: [scans.bgs.ac.uk/sobi\\_scans/boreholes/520523](https://scans.bgs.ac.uk/sobi_scans/boreholes/520523)
  - #202BD: [scans.bgs.ac.uk/sobi\\_scans/boreholes/520525](https://scans.bgs.ac.uk/sobi_scans/boreholes/520525)
  - #203BE: [scans.bgs.ac.uk/sobi\\_scans/boreholes/520524](https://scans.bgs.ac.uk/sobi_scans/boreholes/520524)
  - #204BF: [scans.bgs.ac.uk/sobi\\_scans/boreholes/519920](https://scans.bgs.ac.uk/sobi_scans/boreholes/519920)
  - #205BB: [scans.bgs.ac.uk/sobi\\_scans/boreholes/520322](https://scans.bgs.ac.uk/sobi_scans/boreholes/520322)
  - #206BB: [scans.bgs.ac.uk/sobi\\_scans/boreholes/520323](https://scans.bgs.ac.uk/sobi_scans/boreholes/520323)
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  - #208BF: [scans.bgs.ac.uk/sobi\\_scans/boreholes/519905](https://scans.bgs.ac.uk/sobi_scans/boreholes/519905)
  - #209: [scans.bgs.ac.uk/sobi\\_scans/boreholes/519746](https://scans.bgs.ac.uk/sobi_scans/boreholes/519746)
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  - #212BF: [scans.bgs.ac.uk/sobi\\_scans/boreholes/519919](https://scans.bgs.ac.uk/sobi_scans/boreholes/519919)
  - #213BF: [scans.bgs.ac.uk/sobi\\_scans/boreholes/519756](https://scans.bgs.ac.uk/sobi_scans/boreholes/519756)
  - #214BF: [scans.bgs.ac.uk/sobi\\_scans/boreholes/519570](https://scans.bgs.ac.uk/sobi_scans/boreholes/519570)
  - #215BF: [scans.bgs.ac.uk/sobi\\_scans/boreholes/519933](https://scans.bgs.ac.uk/sobi_scans/boreholes/519933)
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  - #217BF: [scans.bgs.ac.uk/sobi\\_scans/boreholes/519904](https://scans.bgs.ac.uk/sobi_scans/boreholes/519904)
-



# 8 Estimated Background Soil Chemistry

Records of background estimated soil chemistry within 250m of the study site boundary:

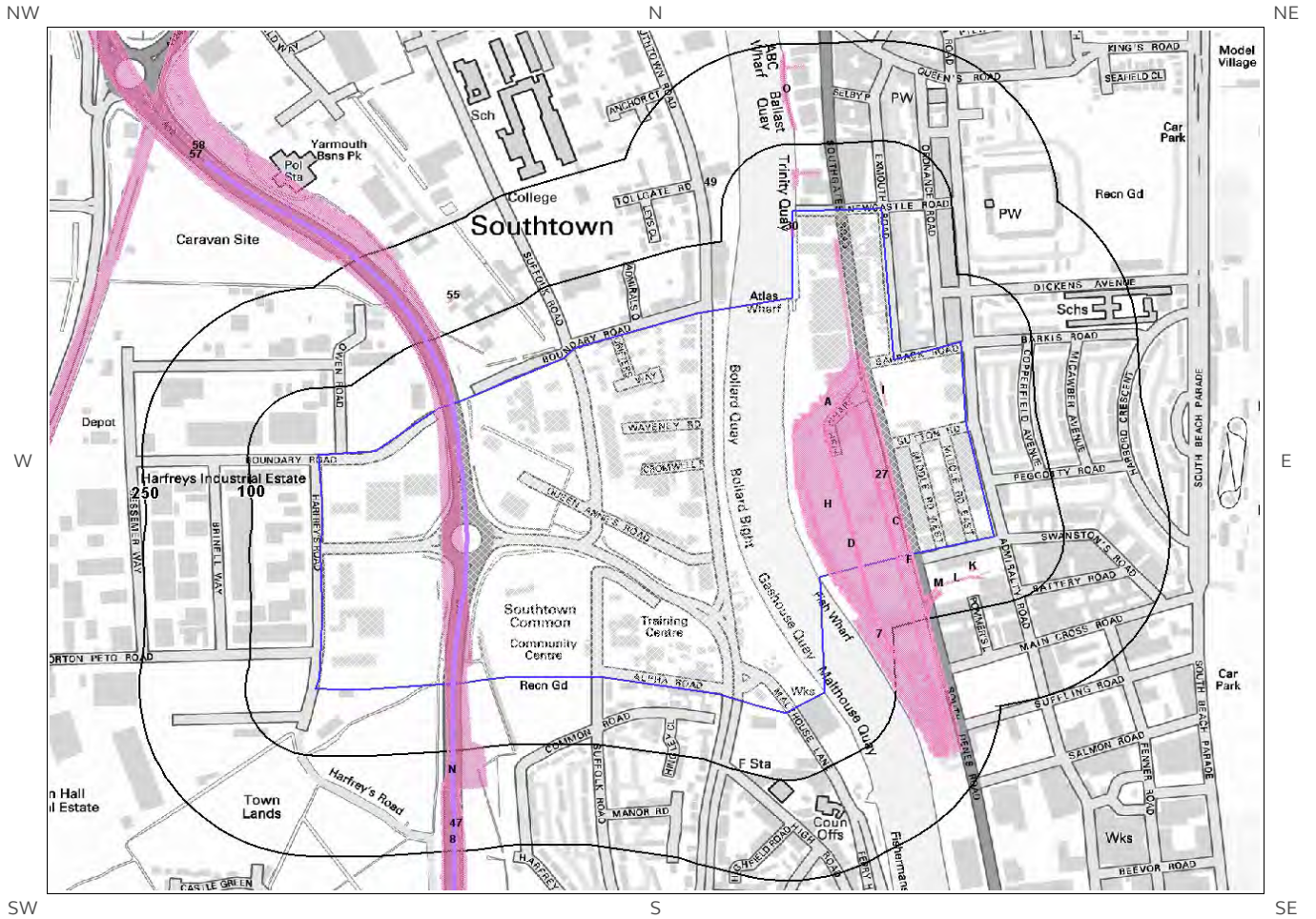
19

For further information on how this data is calculated and limitations upon its use, please see the Groundsure Geo Insight User Guide, available on request.

Distance (m)	Direction	Sample Type	Arsenic (As)	Cadmium (Cd)	Chromium (Cr)	Nickel (Ni)	Lead (Pb)
0.0	On Site	RuralSoil	25 - 35 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	30 - 45 mg/kg	<100 mg/kg
0.0	On Site	RuralSoil	25 - 35 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	30 - 45 mg/kg	<100 mg/kg
0.0	On Site	RuralSoil	25 - 35 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	30 - 45 mg/kg	<100 mg/kg
0.0	On Site	RuralSoil	<15 mg/kg	<1.8 mg/kg	40 - 60 mg/kg	15 - 30 mg/kg	<100 mg/kg
0.0	On Site	RuralSoil	25 - 35 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	30 - 45 mg/kg	<100 mg/kg
0.0	On Site	RuralSoil	<15 mg/kg	<1.8 mg/kg	20 - 40 mg/kg	<15 mg/kg	<100 mg/kg
0.0	On Site	RuralSoil	<15 mg/kg	<1.8 mg/kg	40 - 60 mg/kg	15 - 30 mg/kg	<100 mg/kg
0.0	On Site	RuralSoil	<15 mg/kg	<1.8 mg/kg	40 - 60 mg/kg	15 - 30 mg/kg	<100 mg/kg
0.0	On Site	RuralSoil	25 - 35 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	30 - 45 mg/kg	<100 mg/kg
0.0	On Site	RuralSoil	25 - 35 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	30 - 45 mg/kg	<100 mg/kg
0.0	On Site	RuralSoil	<15 mg/kg	<1.8 mg/kg	20 - 40 mg/kg	<15 mg/kg	<100 mg/kg
0.0	On Site	RuralSoil	25 - 35 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	30 - 45 mg/kg	<100 mg/kg
0.0	On Site	RuralSoil	25 - 35 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	30 - 45 mg/kg	<100 mg/kg
0.0	On Site	RuralSoil	<15 mg/kg	<1.8 mg/kg	40 - 60 mg/kg	15 - 30 mg/kg	<100 mg/kg
0.0	On Site	RuralSoil	25 - 35 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	30 - 45 mg/kg	<100 mg/kg
0.0	On Site	RuralSoil	<15 mg/kg	<1.8 mg/kg	40 - 60 mg/kg	15 - 30 mg/kg	<100 mg/kg
3.0	W	RuralSoil	<15 mg/kg	<1.8 mg/kg	20 - 40 mg/kg	<15 mg/kg	<100 mg/kg
16.0	E	RuralSoil	<15 mg/kg	<1.8 mg/kg	20 - 40 mg/kg	<15 mg/kg	<100 mg/kg
48.0	E	RuralSoil	<15 mg/kg	<1.8 mg/kg	20 - 40 mg/kg	<15 mg/kg	<100 mg/kg

\*As this data is based upon underlying 1:50,000 scale geological information, a 50m buffer has been added to the search radius.

# 9 Railways and Tunnels Map



**Railways and Tunnels Legend**

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- Site Outline
- High Speed 2
- Crossrail 1
- Railway Track (OpenStreetMap)
- High Speed 2 Revised Proposed Route
- Railway Tunnel (OS Mapping)
- Railway and/or Tunnel Feature from Historical Mapping
- Abandoned or Dismantled Railway (OpenStreetMap)
- Railway Track (OS Mapping)
- Search Buffers (m)
- Search Buffers (m)

# 9 Railways and Tunnels

## 9.1 Tunnels

This data is derived from OpenStreetMap and provides information on the possible locations of underground railway systems in the UK - the London Underground, the Tyne & Wear Metro and the Glasgow Subway.

Have any underground railway lines been identified within the study site boundary? No

Have any underground railway lines been identified within 250m of the study site boundary? No

Database searched and no data found.

*Any records that have been identified are represented on the Railways and Tunnels Map.*

---

This data is derived from Ordnance Survey mapping and provides information on the possible locations of railway tunnels forming part of the UK overground railway network.

Have any other railway tunnels been identified within the site boundary? No

Have any other railway tunnels been identified within 250m of the site boundary? No

Database searched and no data found.

*Any records that have been identified are represented on the Railways and Tunnels Map.*

---

## 9.2 Historical Railway and Tunnel Features

This data is derived from Groundsure's unique Historical Land-use Database and contains features relating to tunnels, railway tracks or associated works that have been identified from historical Ordnance Survey mapping.

Have any historical railway or tunnel features been identified within the study site boundary? Yes

Have any historical railway or tunnel features been identified within 250m of the study site boundary? Yes

ID	Distance (m)	Direction	NGR	Details	Date
1D	0	On Site	652582 305858	Railway Sidings	1946
2B	0	On Site	652582 305860	Railway Sidings	1904
3A	0	On Site	652564 306095	Railway Sidings	1978
4C	0	On Site	652661 305900	Railway Sidings	1946
5A	0	On Site	652564 306095	Railway Sidings	1952
6	0	On Site	652583 305858	Railway Sidings	1938

ID	Distance (m)	Direction	NGR	Details	Date
9E	0	On Site	652580 305840	Railway Sidings	1958
10F	0	On Site	652683 305838	Railway Sidings	1958
11B	0	On Site	652626 305950	Railway Sidings	1927
12C	0	On Site	652662 305924	Railway Sidings	1981
13D	0	On Site	652558 305882	Railway Sidings	1981
14H	0	On Site	652540 306032	Railway Sidings	1887
15G	0	On Site	652567 306085	Railway Sidings	1966
16E	0	On Site	652580 305840	Railway Sidings	1949
17E	0	On Site	652580 305840	Railway Sidings	1968
18E	0	On Site	652580 305839	Railway Sidings	1957
19E	0	On Site	652580 305839	Railway Sidings	1949
20E	0	On Site	652580 305839	Railway Sidings	1968
21F	0	On Site	652683 305838	Railway Sidings	1968
22F	0	On Site	652683 305837	Railway Sidings	1968
23F	0	On Site	652683 305837	Railway Sidings	1957
24F	0	On Site	652683 305838	Railway Sidings	1949
25F	0	On Site	652683 305837	Railway Sidings	1949
26G	0	On Site	652567 306085	Railway Sidings	1949
27	0	On Site	652641 305980	Railway Sidings	1905
28I	0	On Site	652643 306106	Railway Sidings	1949
29H	0	On Site	652585 305922	Railway Sidings	1883
30	0	On Site	652515 306351	Railway Sidings	1905
31	0	On Site	n/a	Railway	1946
32I	0	On Site	652643 306106	Railway Sidings	1963
33I	0	On Site	652643 306106	Railway Sidings	1949
34J	33	N	652516 306425	Railway Sidings	1928
35J	37	N	652521 306429	Railway Sidings	1949
36K	40	S	652771 305842	Railway Sidings	1958
37K	40	S	652771 305842	Railway Sidings	1949

ID	Distance (m)	Direction	NGR	Details	Date
38K	42	S	652772 305841	Railway Sidings	1949
39K	42	S	652772 305841	Railway Sidings	1957
40L	51	S	652777 305830	Railway Sidings	1958
41L	51	S	652777 305830	Tramway Sidings	1949
42K	52	S	652777 305829	Railway Sidings	1957
43K	52	S	652777 305829	Railway Sidings	1949
44M	54	S	652722 305817	Tramway Sidings	1949
45M	54	S	652718 305816	Railway Sidings	1957
7	67	E	652638 305740	Railway Sidings	1884
46N	97	S	652033 305537	Railway Sidings	1958
47	111	S	652044 305396	Railway Sidings	1927
48N	112	S	652033 305529	Railway Sidings	1905
49	117	W	652398 306417	Railway Sidings	1928
50	117	E	652706 305621	Railway Sidings	1905
51O	122	N	652505 306558	Railway Sidings	1966
52O	122	N	652505 306558	Railway Sidings	1975
53O	122	N	652505 306558	Railway Sidings	1954
54O	127	N	652505 306558	Railway Sidings	1949
55	141	NW	652035 306248	Railway Sidings	1968
8	146	S	652035 305381	Railway Sidings	1938
56	163	N	652500 306574	Railway Sidings	1928
57	235	N	n/a	Railway	1906
58	243	N	n/a	Railway	1906

*Any records that have been identified are represented on the Railways and Tunnels Map.*

### 9.3 Historical Railways

This data is derived from OpenStreetMap and provides information on the possible alignments of abandoned or dismantled railway lines in proximity to the study site.

Have any historical railway lines been identified within the study site boundary? Yes

Have any historical railway lines been identified within 250m of the study site boundary? Yes

Distance (m)	Direction	Status
0	On Site	Abandoned
0	On Site	Abandoned
0	On Site	Dismantled

Multiple sections of the same track may be listed in the detail above  
*Any records that have been identified are represented on the Railways and Tunnels Map.*

### 9.4 Active Railways

These datasets are derived from Ordnance Survey mapping and OpenStreetMap and provide information on the possible locations of active railway lines in proximity to the study site.

Have any active railway lines been identified within the study site boundary? No

Have any active railway lines been identified within 250m of the study site boundary? No

Database searched and no data found.

Multiple sections of the same track may be listed in the detail above  
*Any records that have been identified are represented on the Railways and Tunnels Map.*

### 9.5 Railway Projects

These datasets provide information on the location of large scale railway projects High Speed 2 and Crossrail 1 .

Is the study site within 5km of the route of the High Speed 2 rail project? No

Is the study site within 500m of the route of the Crossrail 1 rail project? No

*Further information on proximity to these routes, the project construction status and associated works can be obtained through the purchase of a Groundsure HS2 and Crossrail 1 Report.*

The route data has been digitised from publicly available maps by Groundsure. The route as provided relates to the Crossrail 1 project only, and does not include any details of the Crossrail 2 project, as final details of the route for Crossrail 2 are still under consultation.

Please note that this assessment takes account of both the original Phase 2b proposed route and the amended route proposed in 2016. As the Phase 2b route is still under consultation, Groundsure are providing information on both options until the final route is formally confirmed. Practitioners should take account of this uncertainty when advising clients.

# Contact Details

## CENTREMAPS

Telephone: 01886 832972  
Groundsure@centremaps.co.uk  
Open Space, Upper Interfields, Malvern, Worcester, WR14 1UT



## British Geological Survey Enquiries

Kingsley Dunham Centre  
Keyworth, Nottingham NG12 5GG  
Tel: 0115 936 3143.  
Fax: 0115 936 3276.  
Email: [enquiries@bgs.ac.uk](mailto:enquiries@bgs.ac.uk)  
Web: [www.bgs.ac.uk](http://www.bgs.ac.uk)

BGS Geological Hazards Reports and general geological enquiries



## British Gypsum

British Gypsum Ltd  
East Leake  
Loughborough  
Leicestershire  
LE12 6HX



## The Coal Authority

200 Lichfield Lane  
Mansfield  
Notts NG18 4RG  
Tel: 0345 7626 848  
DX 716176 Mansfield 5  
[www.coal.gov.uk](http://www.coal.gov.uk)



## Public Health England

Public information access office  
Public Health England, Wellington House  
133-155 Waterloo Road, London, SE1 8UG  
<https://www.gov.uk/government/organisations/public-health-england>  
Email: [enquiries@phe.gov.uk](mailto:enquiries@phe.gov.uk)  
Main switchboard: 020 7654 8000



## Johnson Poole & Bloomer Limited

Harris and Pearson Building, Brettel Lane  
Brierley Hill, West Midlands  
DY5 3LH  
Tel: +44 (0) 1384 262 000  
Email: [enquiries.gs@jpb.co.uk](mailto:enquiries.gs@jpb.co.uk)  
Website: [www.jpb.co.uk](http://www.jpb.co.uk)



## Ordnance Survey

Adanac Drive, Southampton  
SO16 0AS  
Tel: 08456 050505  
Website: <http://www.ordnancesurvey.co.uk/>



## Getmapping PLC

Virginia Villas, High Street, Hartley Witney,  
Hampshire RG27 8NW  
Tel: 01252 845444  
Website: <http://www1.getmapping.com/>



---

**Peter Brett Associates**  
Caversham Bridge House  
Waterman Place  
Reading  
Berkshire RG1 8DN  
Tel: +44 (0)118 950 0761 E-mail: [reading@pba.co.uk](mailto:reading@pba.co.uk)  
Website: <http://www.peterbrett.com/home>



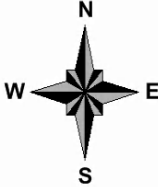
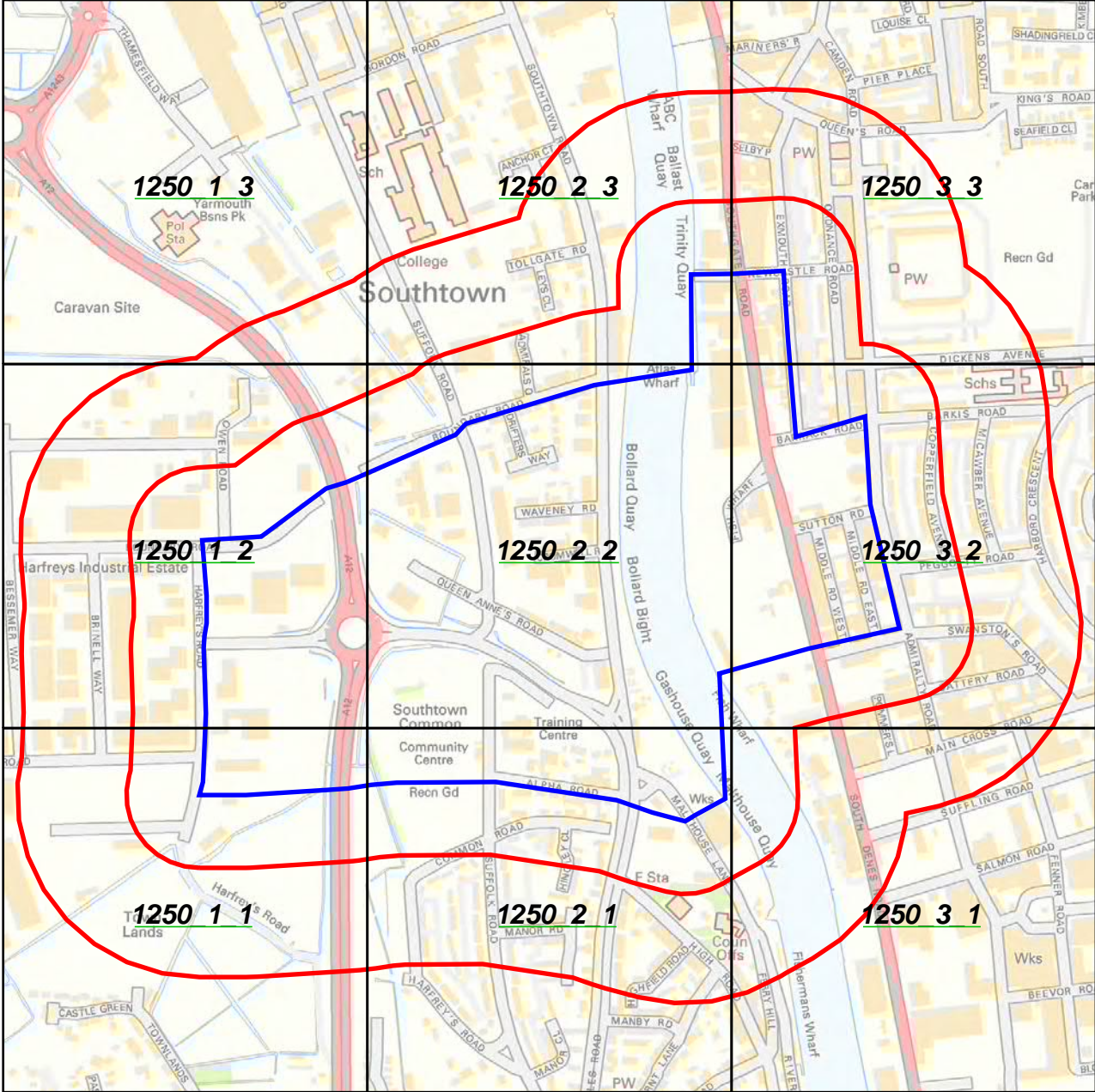
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Site Details:

Client Ref: 16287  
Report Ref: CMAPS-CM-636391-16287-030717HIS\_1250scale  
Grid Ref: 651819, 305504

Map Name: National Grid

Map date: 1953-1955

Scale: 1:1,250

Printed at: 1:2,000



Surveyed 1955 Revised 1955 Edition N/A Copyright N/A Levelled 1946	Surveyed 1949 Revised 1953 Edition N/A Copyright N/A Levelled 1946
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Site Details:

Client Ref: 16287  
Report Ref: CMAPS-CM-636391-16287-030717HIS\_1250scale  
Grid Ref: 651819, 305504

Map Name: National Grid

Map date: 1956-1958

Scale: 1:1,250

Printed at: 1:2,000



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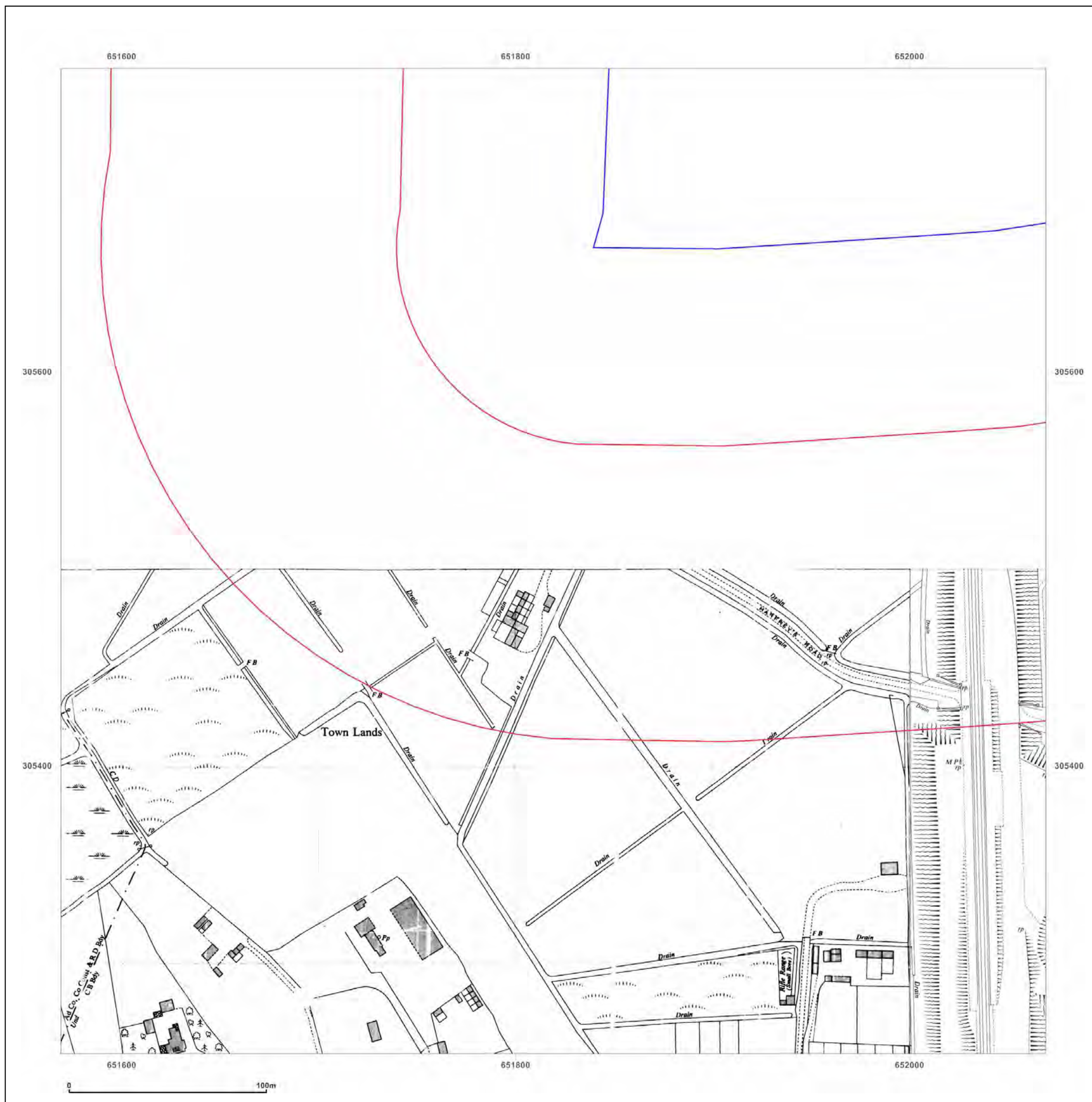


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Site Details:

Client Ref: 16287  
Report Ref: CMAPS-CM-636391-16287-030717HIS\_1250scale  
Grid Ref: 651819, 305504

Map Name: National Grid

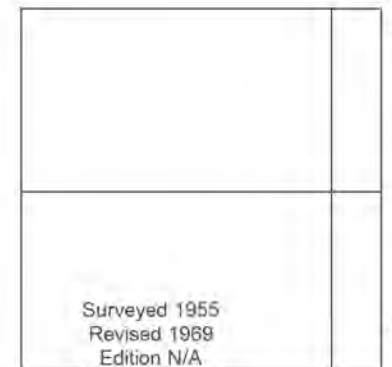
Map date: 1967-1970

Scale: 1:1,250

Printed at: 1:2,000



Surveyed 1949  
Revised 1966  
Edition N/A  
Copyright 1967  
Levelled 1958



Surveyed 1955  
Revised 1969  
Edition N/A  
Copyright 1970  
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Site Details:

Client Ref: 16287  
Report Ref: CMAPS-CM-636391-16287-030717HIS\_1250scale  
Grid Ref: 651819, 305504

Map Name: National Grid

Map date: 1976-1978

Scale: 1:1,250

Printed at: 1:2,000



Surveyed 1978  
Revised 1978  
Edition N/A  
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Surveyed 1949  
Revised 1975  
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Site Details:

Client Ref: 16287  
Report Ref: CMAPS-CM-636391-16287-030717HIS\_1250scale  
Grid Ref: 651819, 305504

Map Name: National Grid

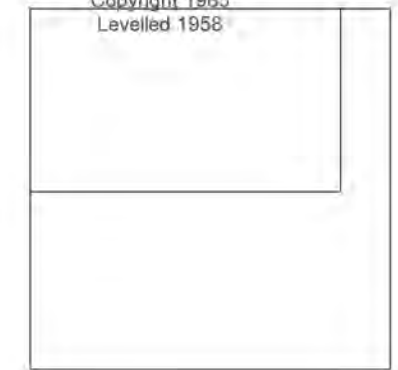
Map date: 1985

Scale: 1:1,250

Printed at: 1:2,000



Surveyed 1958  
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Edition N/A  
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Report Ref: CMAPS-CM-636391-16287-030717HIS\_1250scale  
Grid Ref: 651819, 305504

Map Name: National Grid

Map date: 1986-1990

Scale: 1:1,250

Printed at: 1:2,000



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Surveyed 1958 Revised 1990 Edition N/A Copyright 1990 Levelled 1958	Surveyed 1958 Revised 1990 Edition N/A Copyright 1990 Levelled 1958



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Site Details:

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Report Ref: CMAPS-CM-636391-16287-030717HIS\_1250scale  
Grid Ref: 651819, 305504

Map Name: National Grid

Map date: 1990-1994

Scale: 1:1,250

Printed at: 1:2,000



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**Client Ref:** 16287  
**Report Ref:** CMAPS-CM-636391-16287-030717HIS\_1250scale  
**Grid Ref:** 651819, 306004

**Map Name:** National Grid

**Map date:** 1975-1978

**Scale:** 1:1,250

**Printed at:** 1:2,000



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Surveyed 1978 Revised 1978 Edition N/A Copyright 1978 Levelled 1958	Surveyed N/A Revised N/A Edition N/A Copyright N/A Levelled N/A



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**Site Details:**

**Client Ref:** 16287  
**Report Ref:** CMAPS-CM-636391-16287-030717HIS\_1250scale  
**Grid Ref:** 651819, 306004

**Map Name:** National Grid

**Map date:** 1976-1980

**Scale:** 1:1,250

**Printed at:** 1:2,000



Surveyed 1956  
Revised 1980  
Edition N/A  
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Levelled 1956

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Edition N/A  
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Revised 1975  
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Site Details:

Client Ref: 16287  
Report Ref: CMAPS-CM-636391-16287-030717HIS\_1250scale  
Grid Ref: 651819, 306004

Map Name: National Grid

Map date: 1985-1990

Scale: 1:1,250

Printed at: 1:2,000



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Revised 1986  
Edition N/A  
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Edition N/A  
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**Site Details:**

**Client Ref:** 16287  
**Report Ref:** CMAPS-CM-636391-16287-030717HIS\_1250scale  
**Grid Ref:** 651819, 306004

**Map Name:** National Grid

**Map date:** 1990-1994

**Scale:** 1:1,250

**Printed at:** 1:2,000



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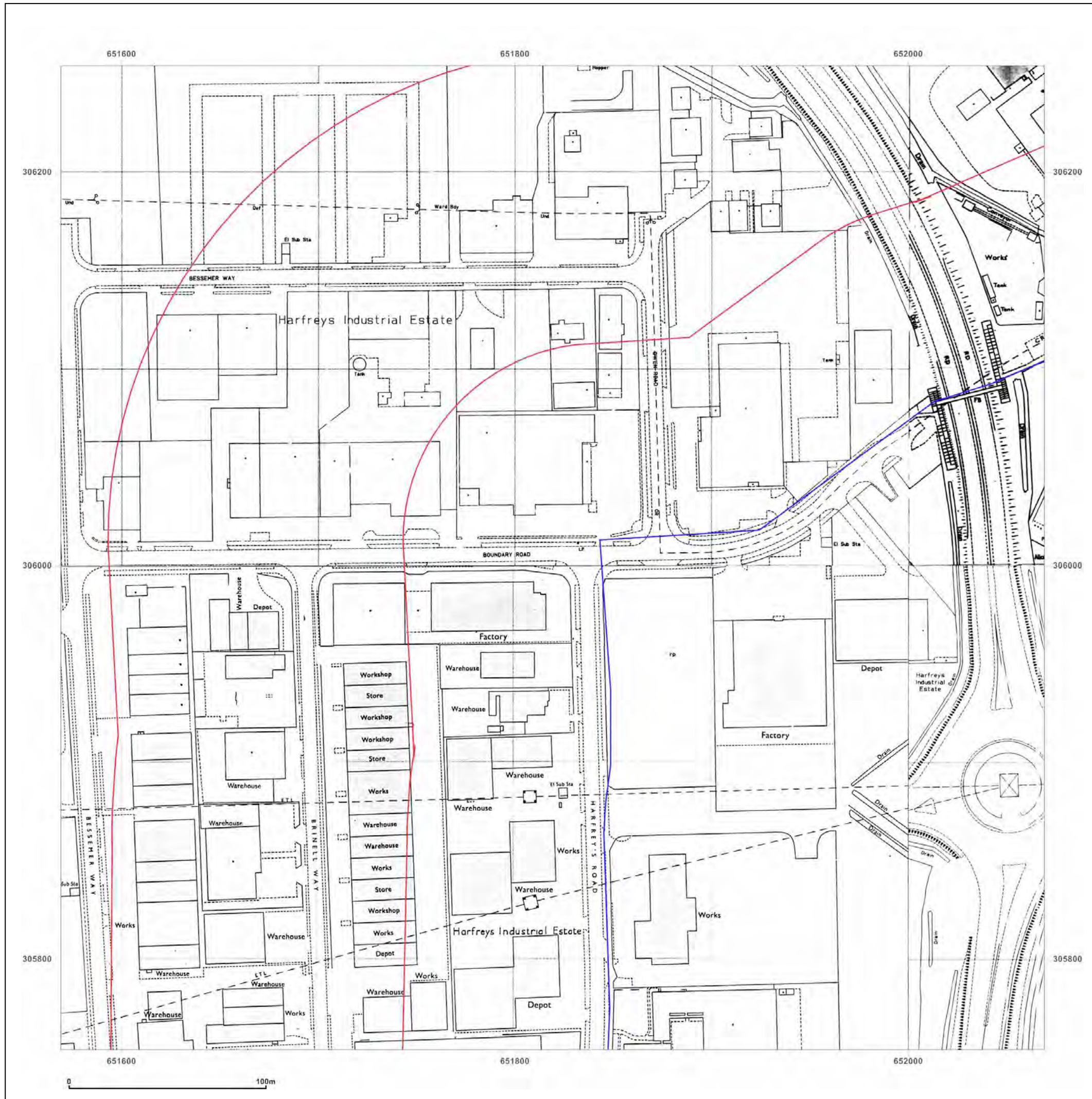


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**Site Details:**

**Client Ref:** 16287  
**Report Ref:** CMAPS-CM-636391-16287-030717HIS\_1250scale  
**Grid Ref:** 651819, 306004

**Map Name:** National Grid  
**Map date:** 1985-1994  
**Scale:** 1:1,250  
**Printed at:** 1:2,000



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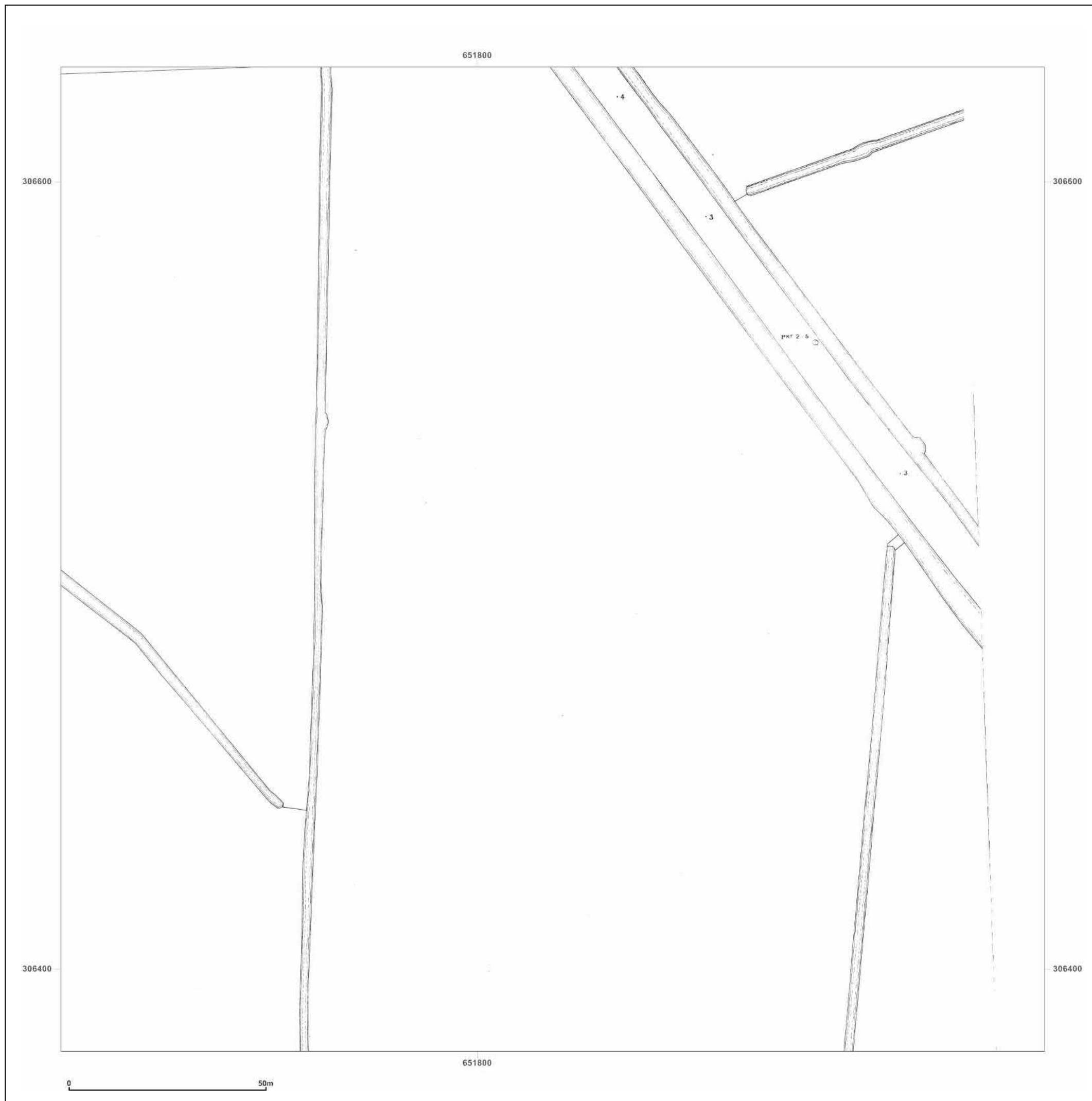


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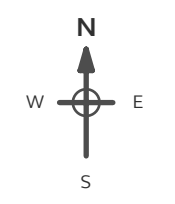
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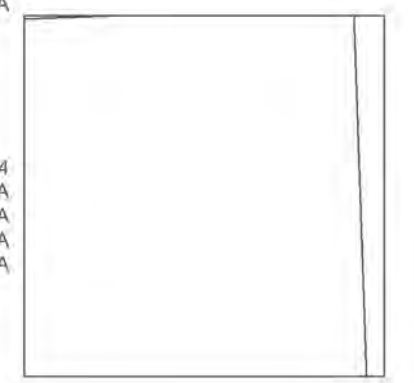
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**Report Ref:** CMAPS-CM-636391-16287-030717HIS\_1250scale  
**Grid Ref:** 651819, 306504

**Map Name:** County Series Town Plan  
**Map date:** 1884-1885  
**Scale:** 1:500  
**Printed at:** 1:1,000



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 Edition N/A  
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Surveyed 1884  
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Report Ref: CMAPS-CM-636391-16287-030717HIS\_1250scale  
Grid Ref: 651819, 306504

Map Name: National Grid

Map date: 1949

Scale: 1:1,250

Printed at: 1:2,000



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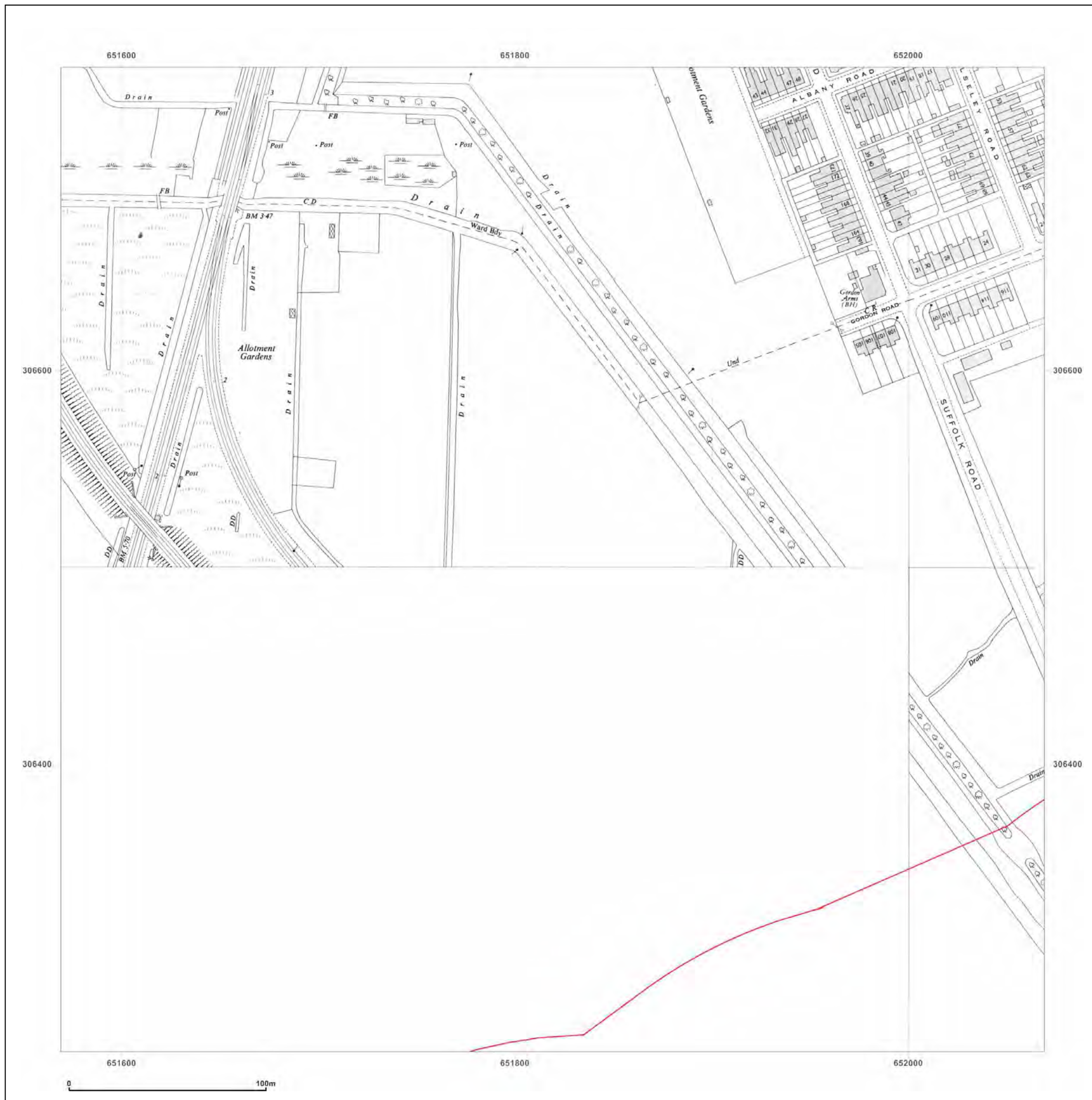


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Site Details:

Client Ref: 16287  
Report Ref: CMAPS-CM-636391-16287-030717HIS\_1250scale  
Grid Ref: 651819, 306504

Map Name: National Grid

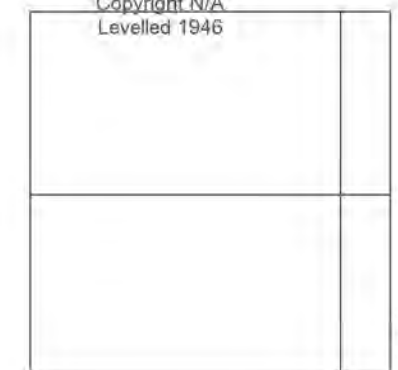
Map date: 1951

Scale: 1:1,250

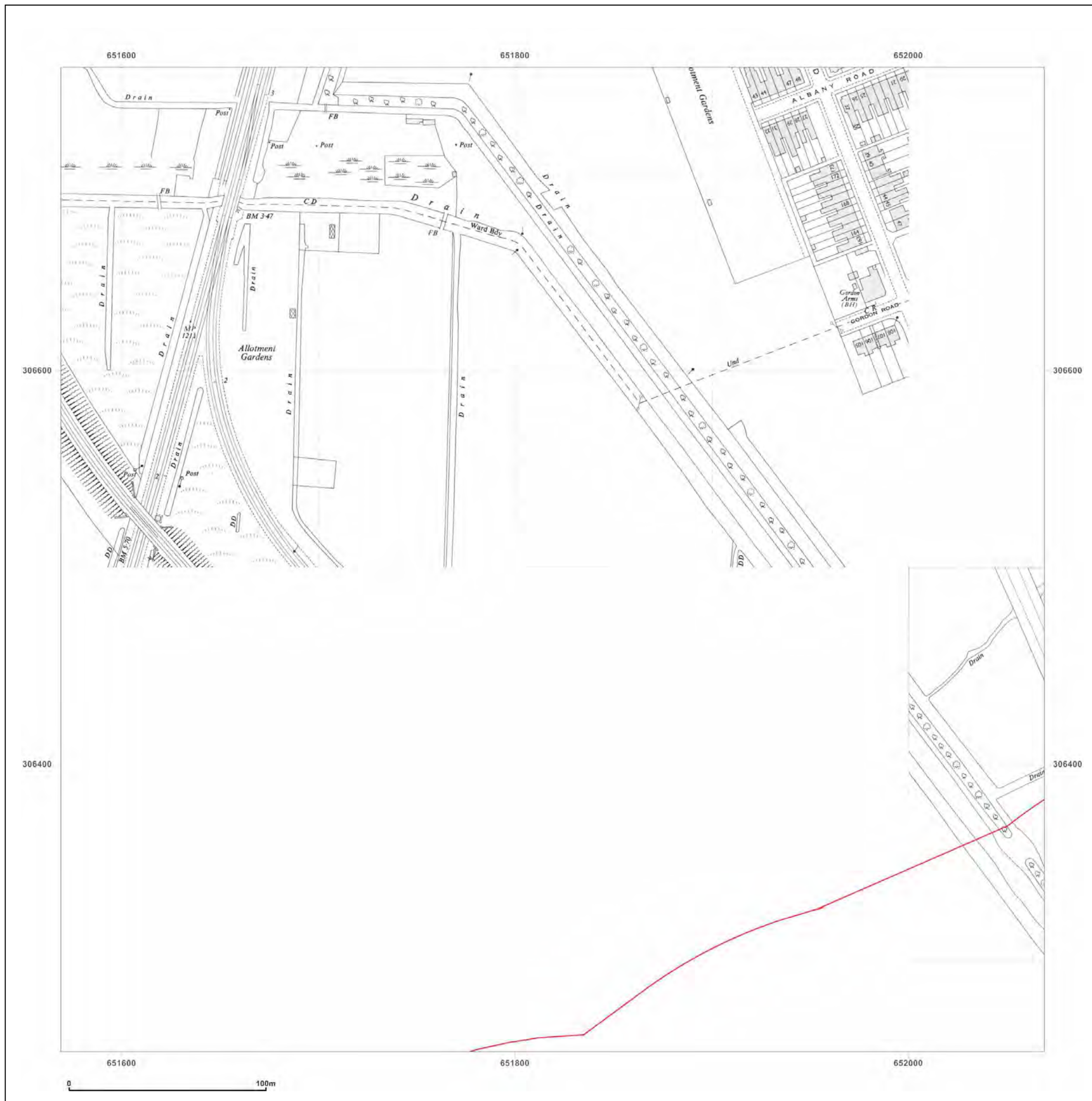
Printed at: 1:2,000



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**Site Details:**

**Client Ref:** 16287  
**Report Ref:** CMAPS-CM-636391-16287-030717HIS\_1250scale  
**Grid Ref:** 651819, 306504

**Map Name:** National Grid

**Map date:** 1968

**Scale:** 1:1,250

**Printed at:** 1:2,000



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Revised 1967  
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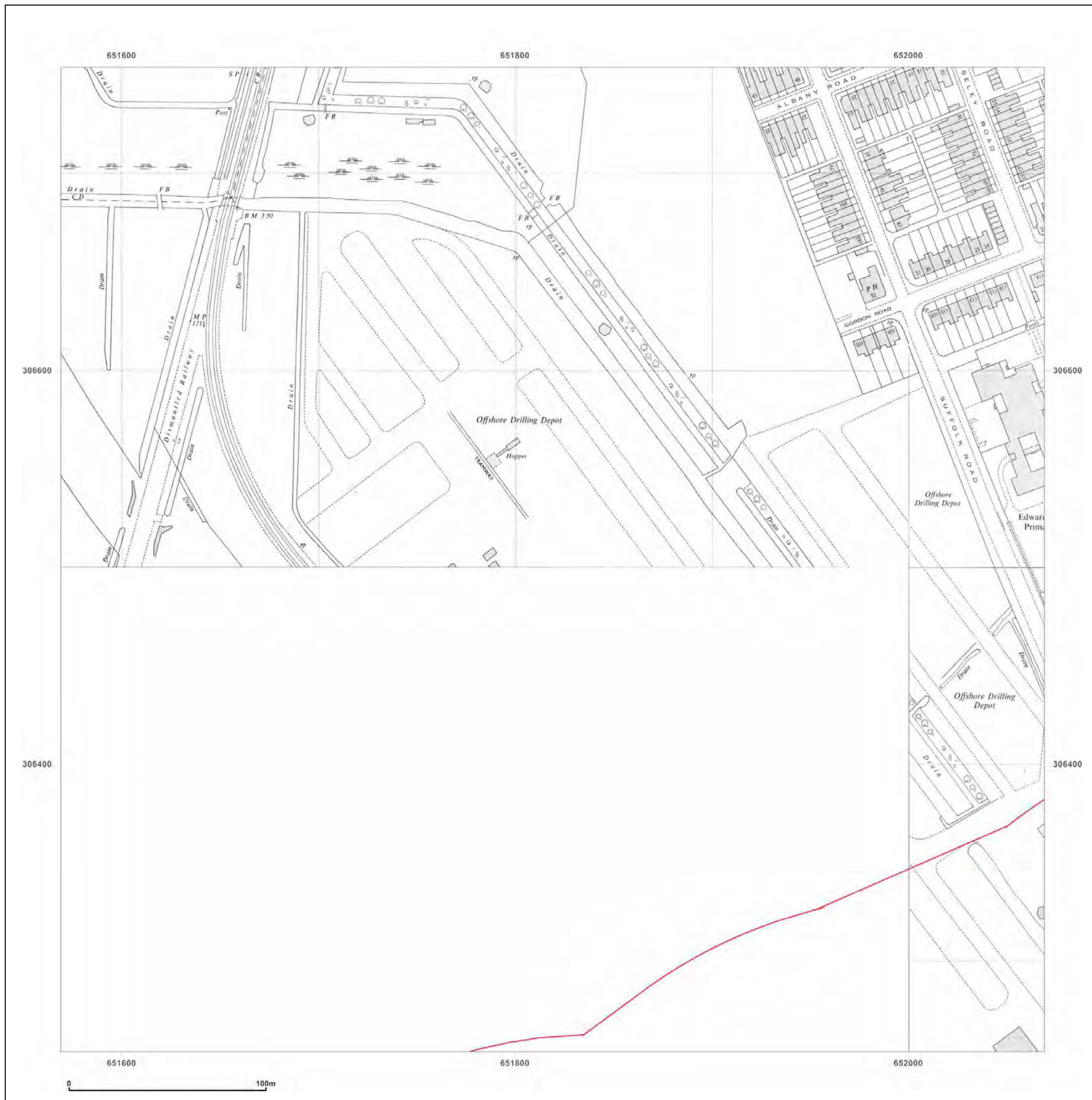


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Site Details:

Client Ref: 16287  
Report Ref: CMAPS-CM-636391-16287-030717HIS\_1250scale  
Grid Ref: 651819, 306504

Map Name: National Grid

Map date: 1975-1978

Scale: 1:1,250

Printed at: 1:2,000



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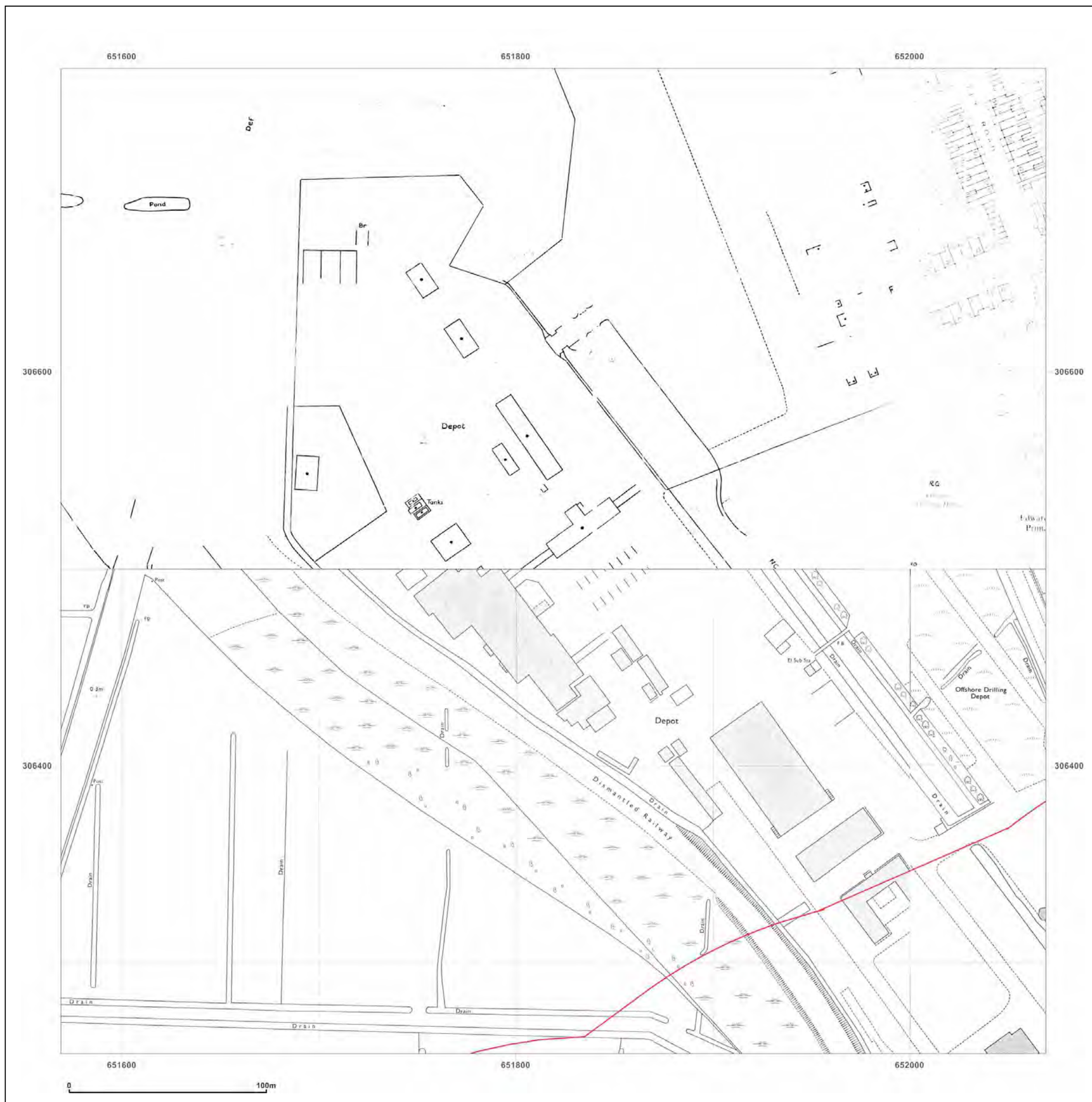


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**Site Details:**

**Client Ref:** 16287  
**Report Ref:** CMAPS-CM-636391-16287-030717HIS\_1250scale  
**Grid Ref:** 651819, 306504

**Map Name:** National Grid

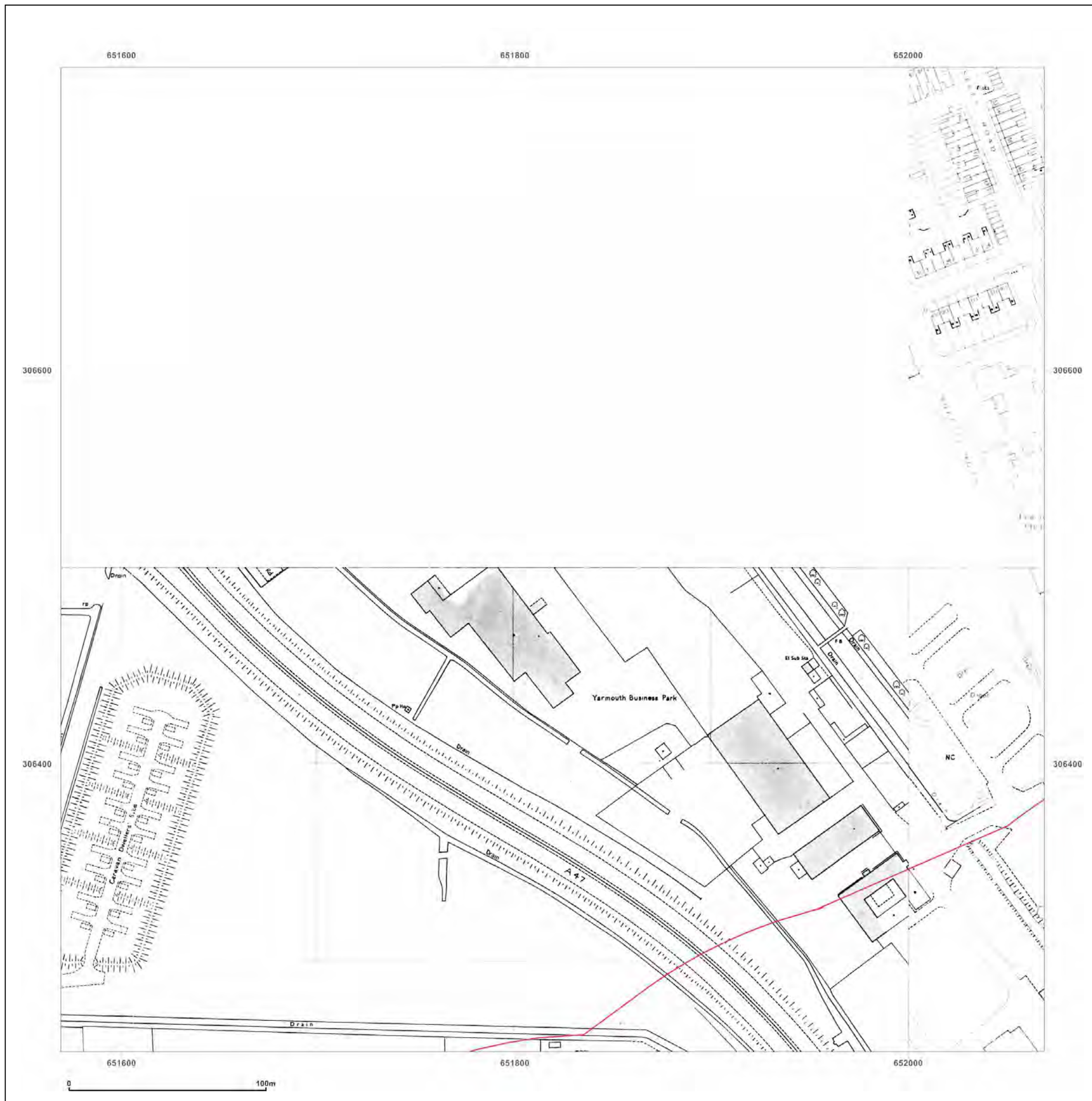
**Map date:** 1978-1980

**Scale:** 1:1,250

**Printed at:** 1:2,000



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Surveyed 1956 Revised 1980 Edition N/A Copyright 1980 Levelled 1956	Surveyed N/A Revised N/A Edition N/A Copyright N/A Levelled N/A



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Site Details:

Client Ref: 16287  
Report Ref: CMAPS-CM-636391-16287-030717HIS\_1250scale  
Grid Ref: 651819, 306504

Map Name: National Grid

Map date: 1986-1990

Scale: 1:1,250

Printed at: 1:2,000



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Site Details:

Client Ref: 16287  
Report Ref: CMAPS-CM-636391-16287-030717HIS\_1250scale  
Grid Ref: 651819, 306504

Map Name: National Grid

Map date: 1985-1990

Scale: 1:1,250

Printed at: 1:2,000



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Site Details:

Client Ref: 16287  
Report Ref: CMAPS-CM-636391-16287-030717HIS\_1250scale  
Grid Ref: 651819, 306504

Map Name: National Grid

Map date: 1994

Scale: 1:1,250

Printed at: 1:2,000



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Edition N/A  
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Site Details:

Client Ref: 16287  
Report Ref: CMAPS-CM-636391-16287-030717HIS\_1250scale  
Grid Ref: 651819, 306504

Map Name: National Grid

Map date: 1989-1994

Scale: 1:1,250

Printed at: 1:2,000



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<p>Surveyed N/A Revised N/A Edition N/A Copyright 1994 Levelled N/A</p>	<p>Surveyed 1958 Revised 1990 Edition N/A Copyright 1990 Levelled 1958</p>



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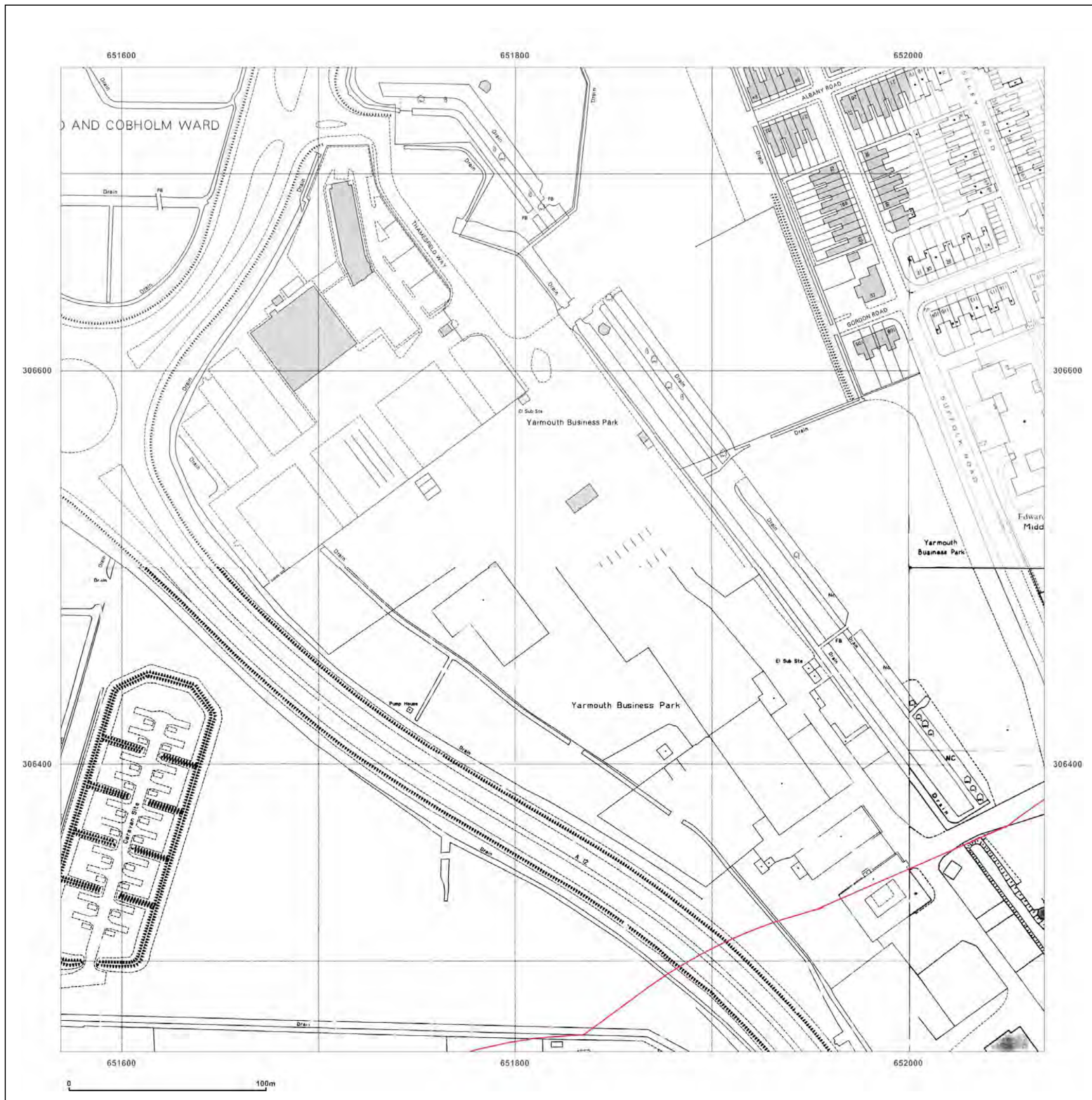


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**Site Details:**

**Client Ref:** 16287  
**Report Ref:** CMAPS-CM-636391-16287-030717HIS\_1250scale  
**Grid Ref:** 652319, 305504

**Map Name:** County Series Town Plan

**Map date:** 1885

**Scale:** 1:500

**Printed at:** 1:1,000



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 Edition N/A  
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**Site Details:**

Client Ref: 16287  
 Report Ref: CMAPS-CM-636391-16287-030717HIS\_1250scale  
 Grid Ref: 652319, 305504

Map Name: National Grid

Map date: 1949

Scale: 1:1,250

Printed at: 1:2,000



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 Edition N/A  
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Surveyed 1949  
 Revised 1949  
 Edition N/A  
 Copyright N/A  
 Levelled 1946

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 Edition N/A  
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 Revised 1949  
 Edition N/A  
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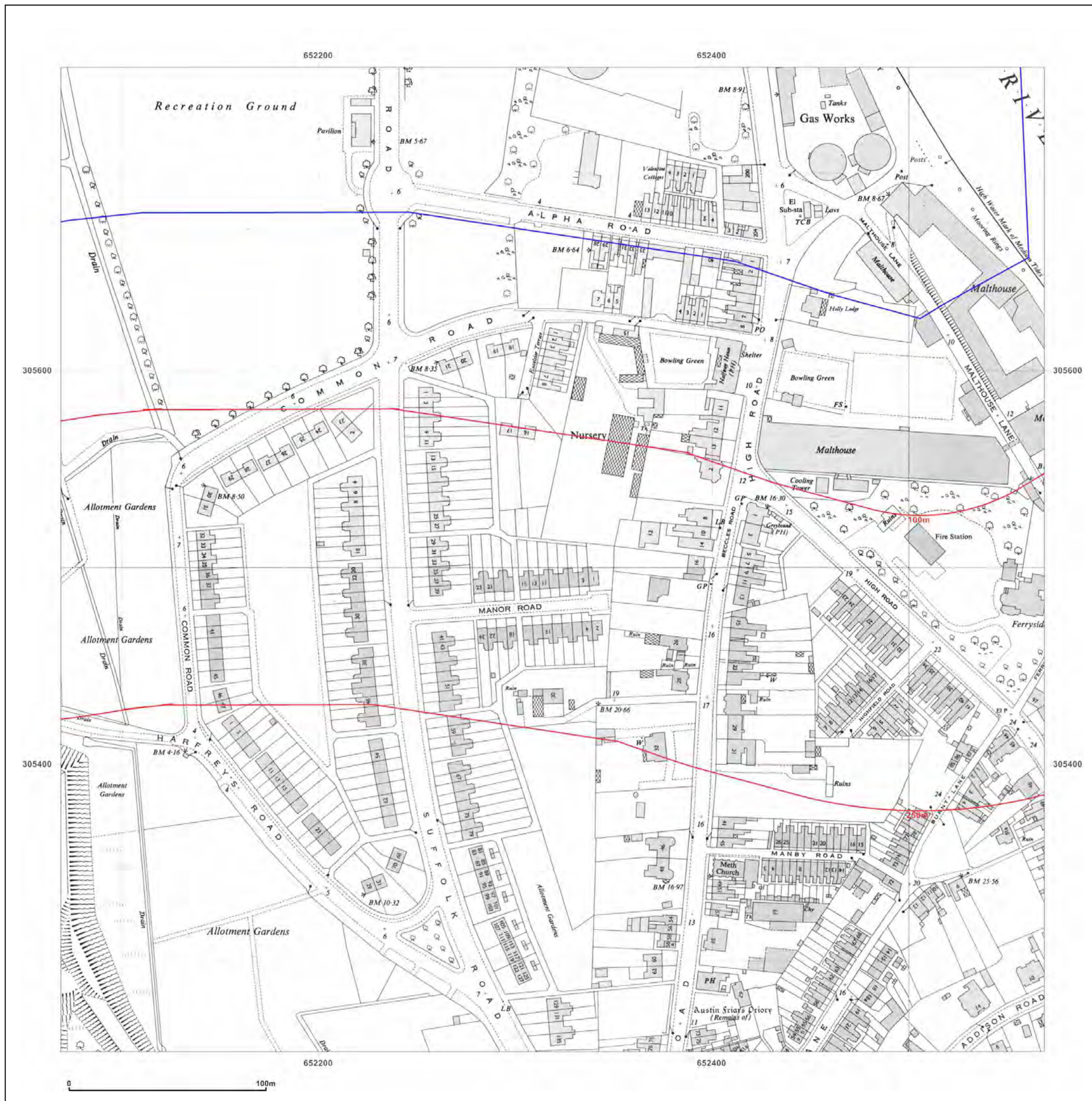


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Site Details:

Client Ref: 16287  
Report Ref: CMAPS-CM-636391-16287-030717HIS\_1250scale  
Grid Ref: 652319, 305504

Map Name: National Grid

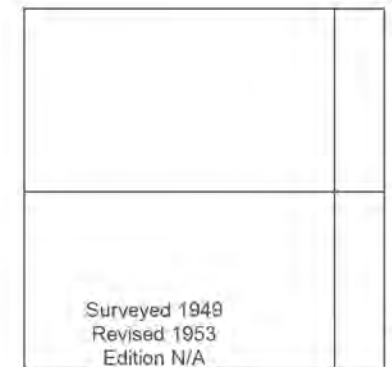
Map date: 1953-1957

Scale: 1:1,250

Printed at: 1:2,000



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Revised 1957  
Edition N/A  
Copyright N/A  
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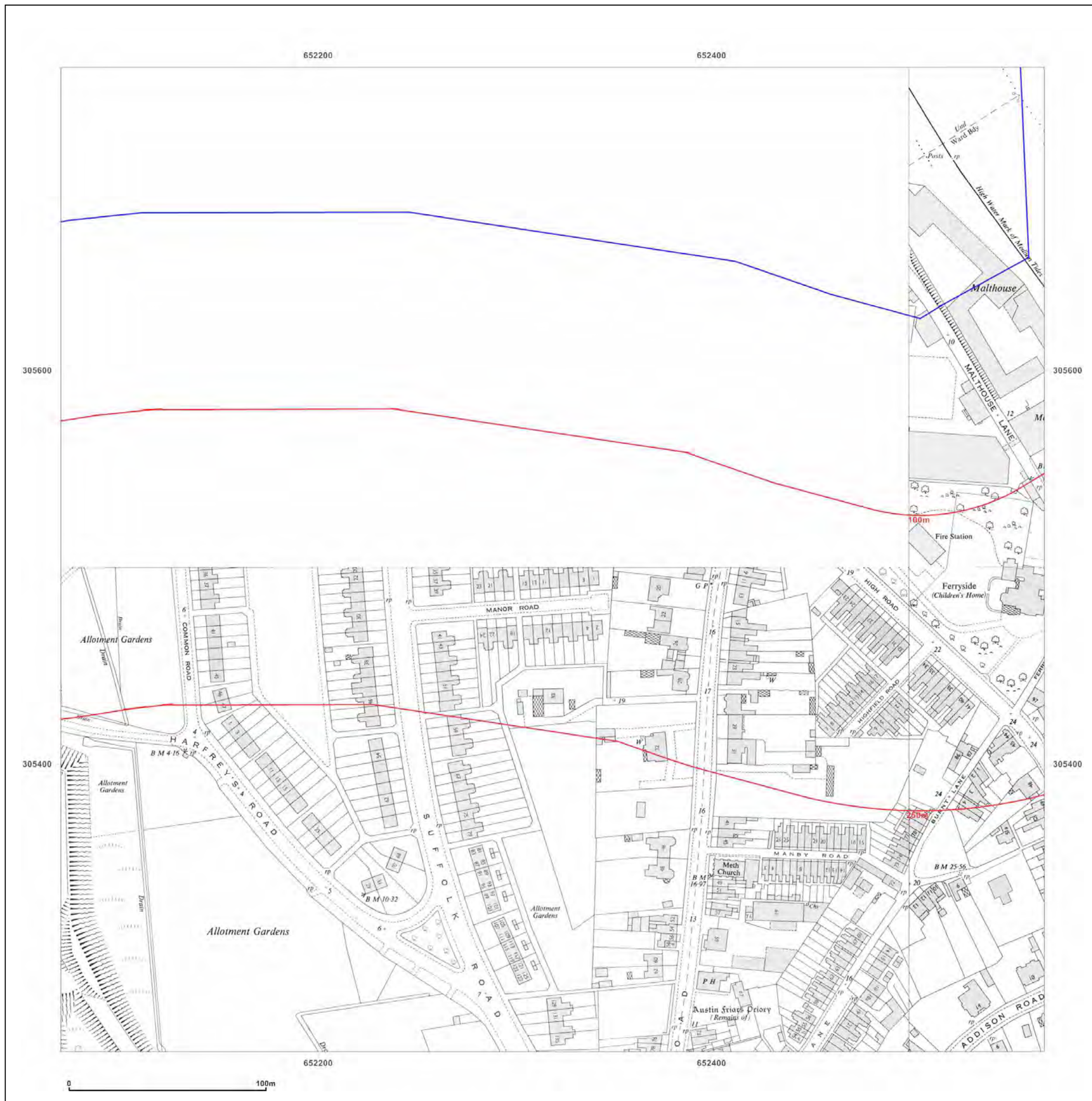


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Site Details:

Client Ref: 16287  
Report Ref: CMAPS-CM-636391-16287-030717HIS\_1250scale  
Grid Ref: 652319, 305504

Map Name: National Grid

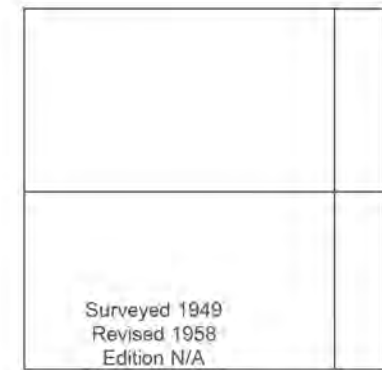
Map date: 1958

Scale: 1:1,250

Printed at: 1:2,000



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Edition N/A  
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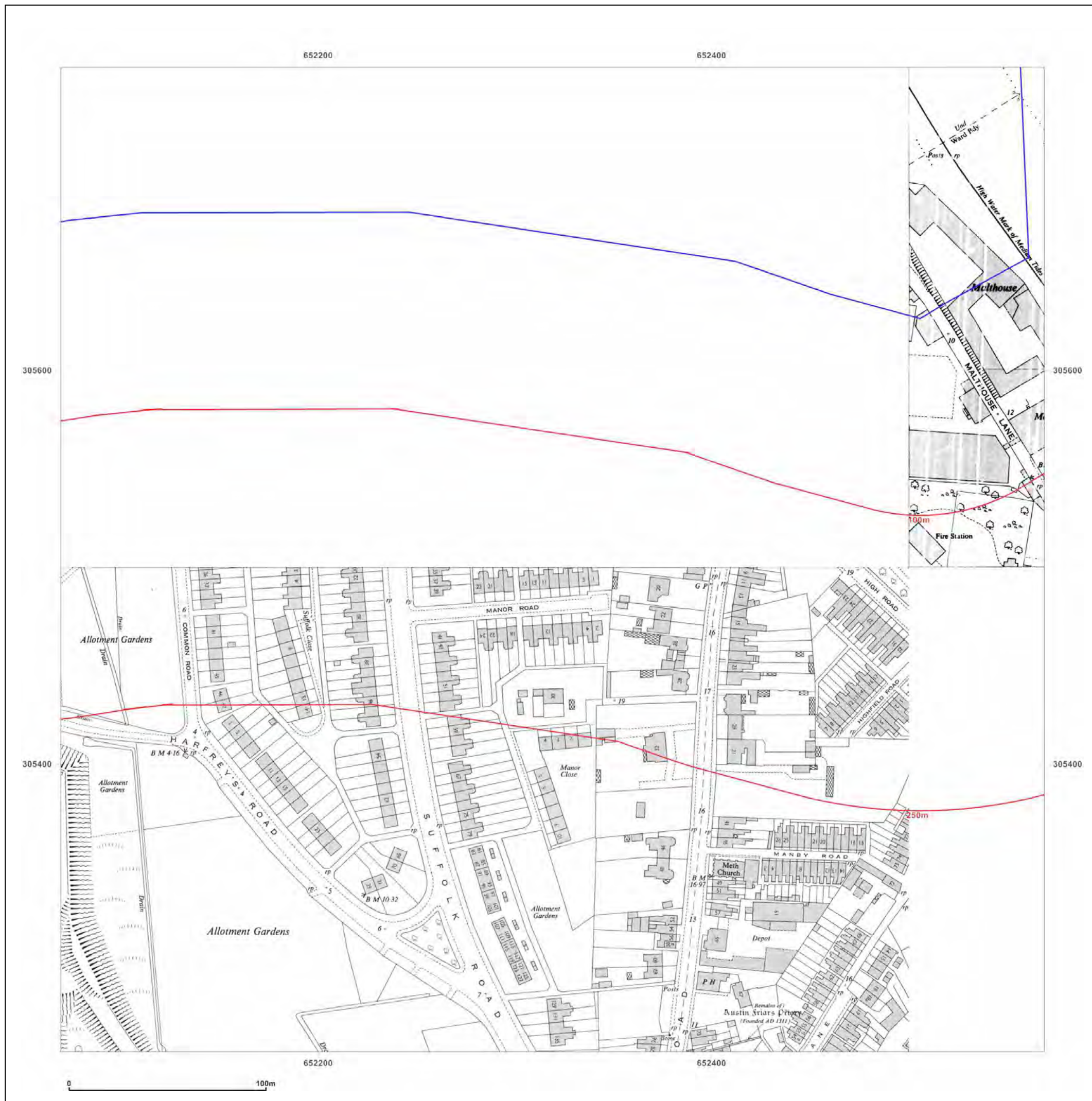


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Site Details:

Client Ref: 16287  
Report Ref: CMAPS-CM-636391-16287-030717HIS\_1250scale  
Grid Ref: 652319, 305504

Map Name: National Grid

Map date: 1967-1968

Scale: 1:1,250

Printed at: 1:2,000



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Edition N/A  
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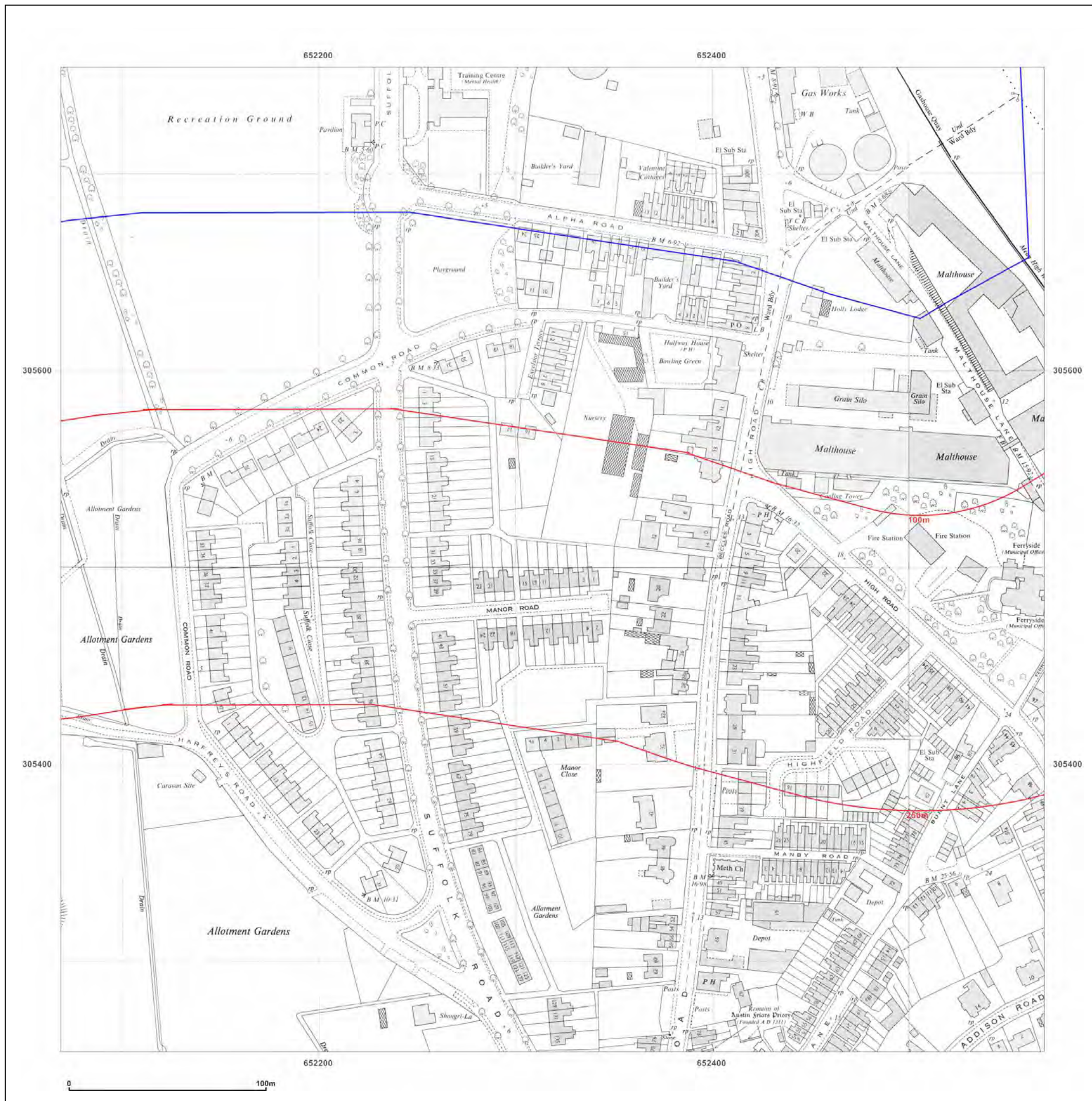


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Client Ref: 16287  
Report Ref: CMAPS-CM-636391-16287-030717HIS\_1250scale  
Grid Ref: 652319, 305504

Map Name: National Grid

Map date: 1968-1972

Scale: 1:1,250

Printed at: 1:2,000



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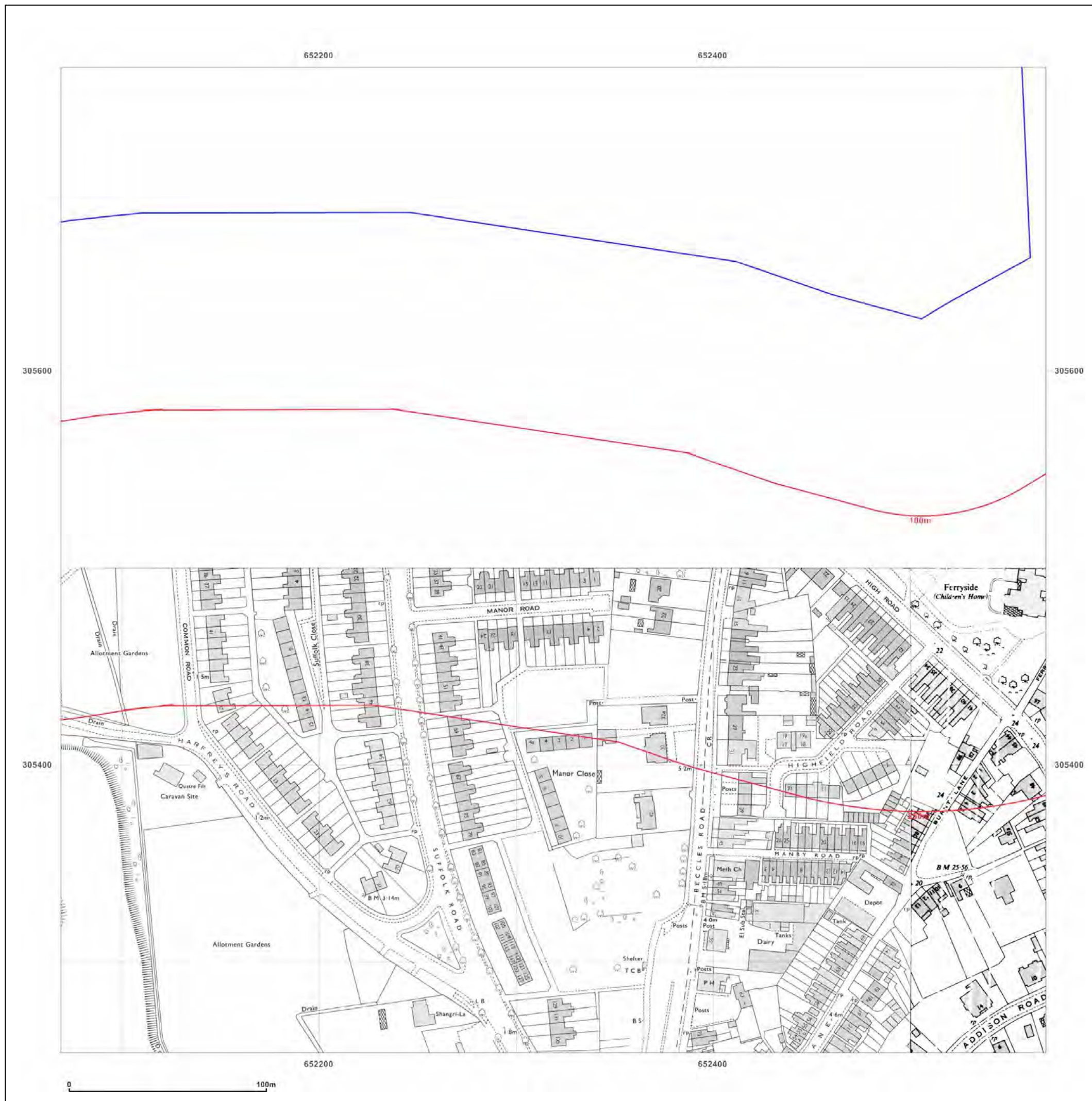


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Site Details:

Client Ref: 16287  
Report Ref: CMAPS-CM-636391-16287-030717HIS\_1250scale  
Grid Ref: 652319, 305504

Map Name: National Grid

Map date: 1975-1977

Scale: 1:1,250

Printed at: 1:2,000



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Edition N/A  
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Site Details:

Client Ref: 16287  
Report Ref: CMAPS-CM-636391-16287-030717HIS\_1250scale  
Grid Ref: 652319, 305504

Map Name: National Grid

Map date: 1976-1981

Scale: 1:1,250

Printed at: 1:2,000



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**Site Details:**

**Client Ref:** 16287  
**Report Ref:** CMAPS-CM-636391-16287-030717HIS\_1250scale  
**Grid Ref:** 652319, 305504

**Map Name:** National Grid

**Map date:** 1984-1986

**Scale:** 1:1,250

**Printed at:** 1:2,000



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 Revised 1984  
 Edition N/A  
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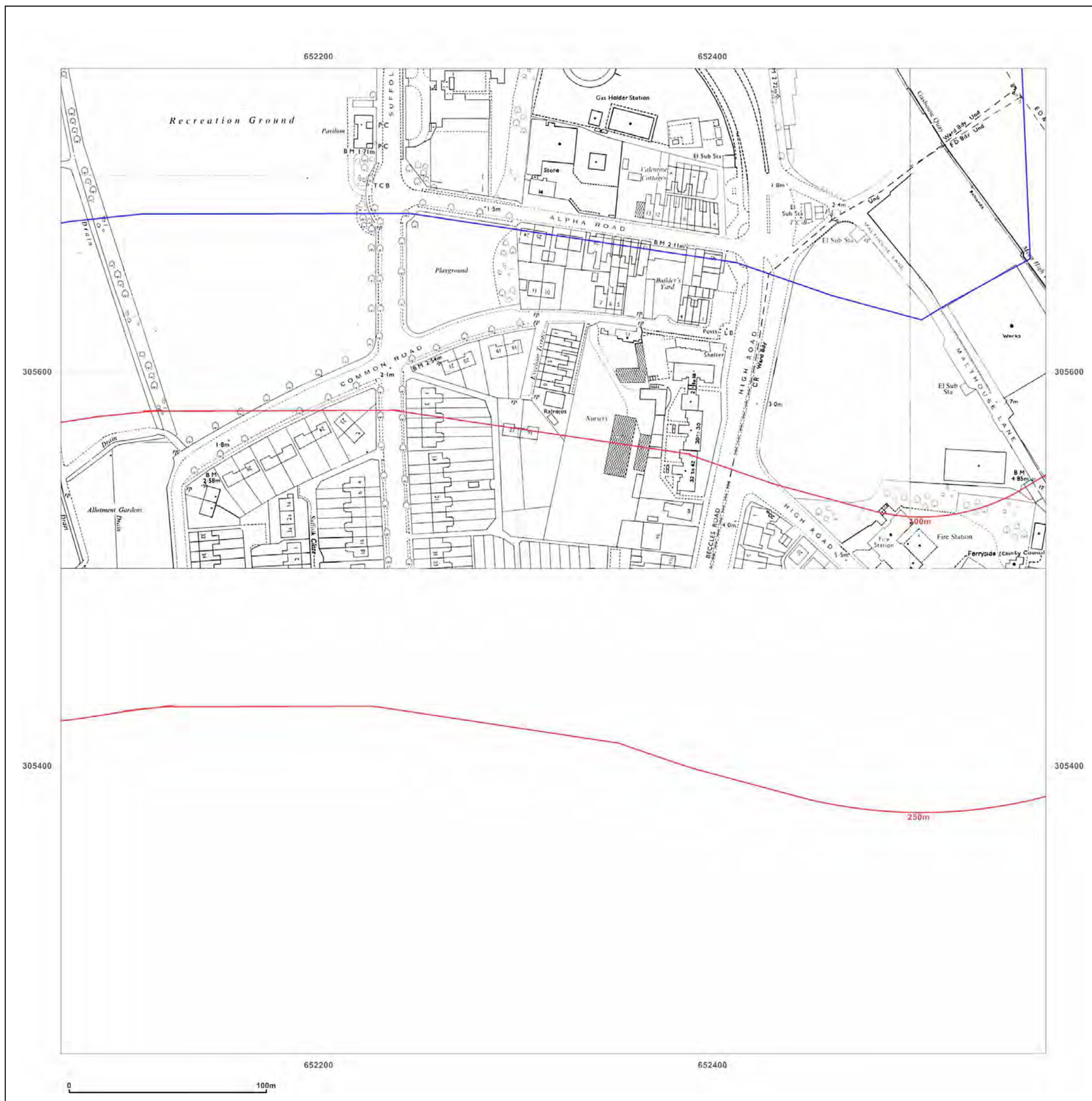


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Site Details:

Client Ref: 16287  
Report Ref: CMAPS-CM-636391-16287-030717HIS\_1250scale  
Grid Ref: 652319, 305504

Map Name: National Grid

Map date: 1990

Scale: 1:1,250

Printed at: 1:2,000



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Site Details:

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Report Ref: CMAPS-CM-636391-16287-030717HIS\_1250scale  
Grid Ref: 652319, 305504

Map Name: National Grid

Map date: 1994

Scale: 1:1,250

Printed at: 1:2,000



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Revised N/A  
Edition N/A  
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Revised N/A  
Edition N/A  
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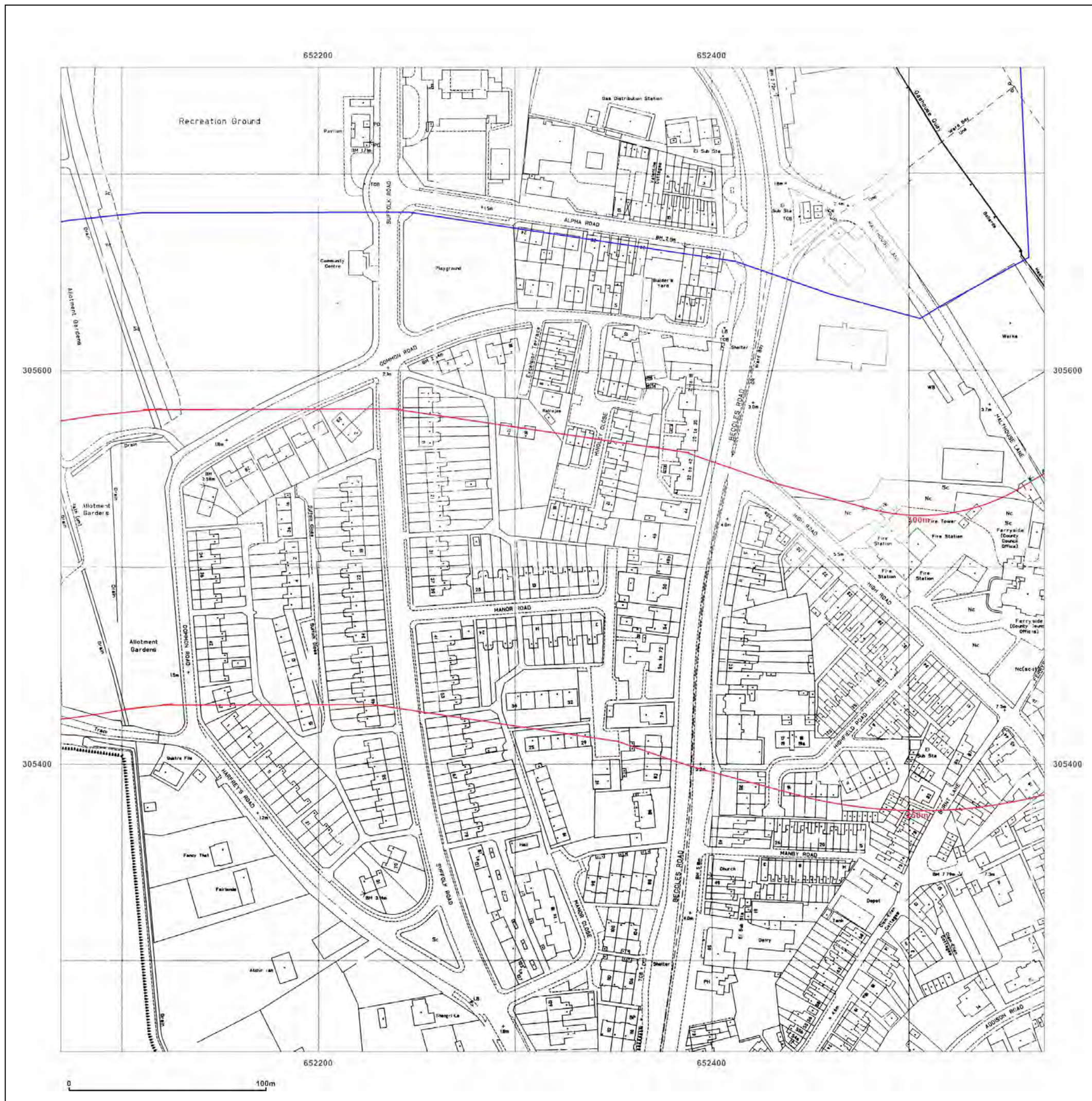


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652200

652400



652200

652400



Site Details:

Client Ref: 16287  
Report Ref: CMAPS-CM-636391-16287-030717HIS\_1250scale  
Grid Ref: 652319, 306004

Map Name: County Series Town Plan

Map date: 1885

Scale: 1:500

Printed at: 1:1,000



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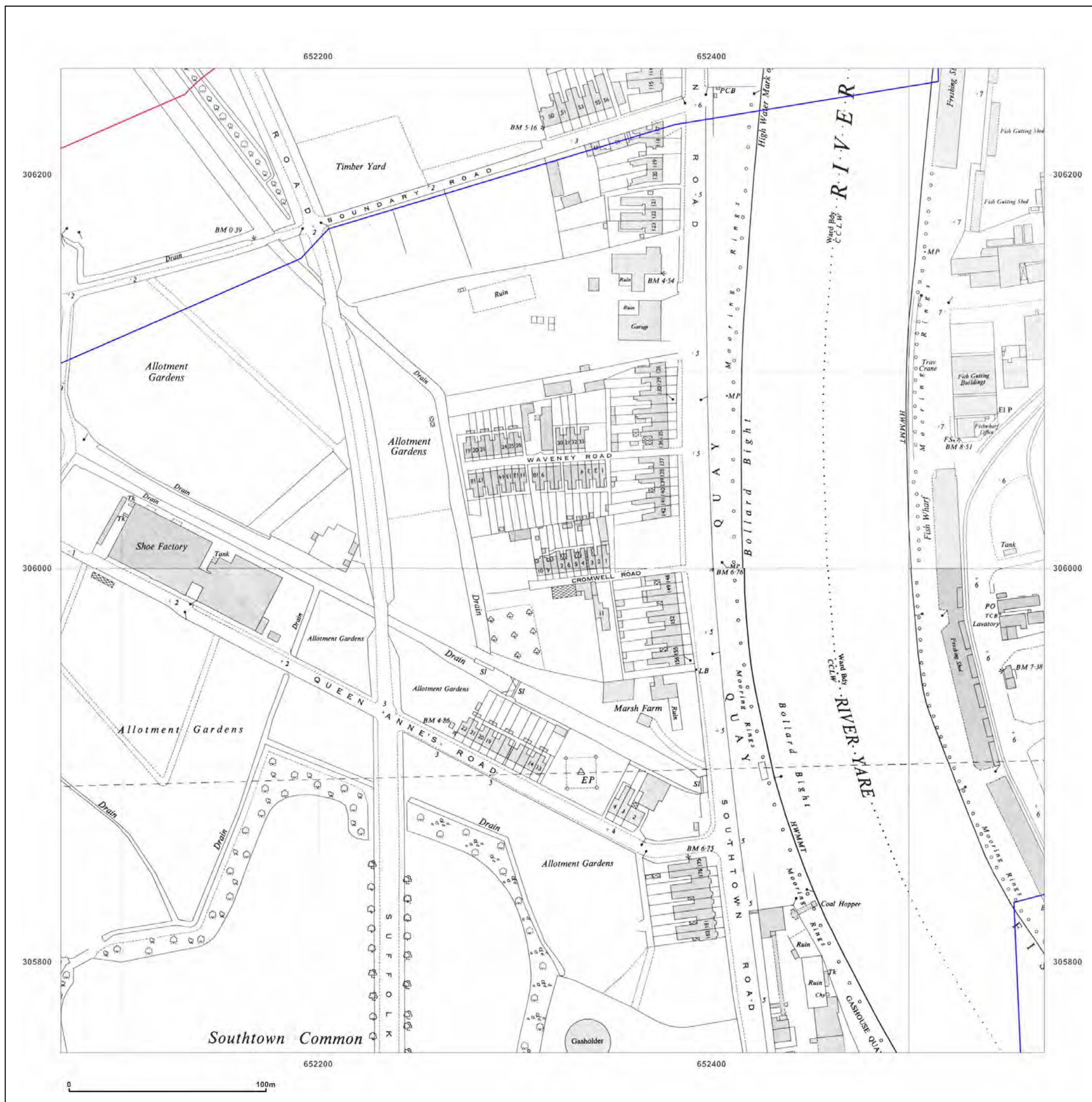


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 Report Ref: CMAPS-CM-636391-16287-030717HIS\_1250scale  
 Grid Ref: 652319, 306004

Map Name: National Grid

Map date: 1949

Scale: 1:1,250

Printed at: 1:2,000



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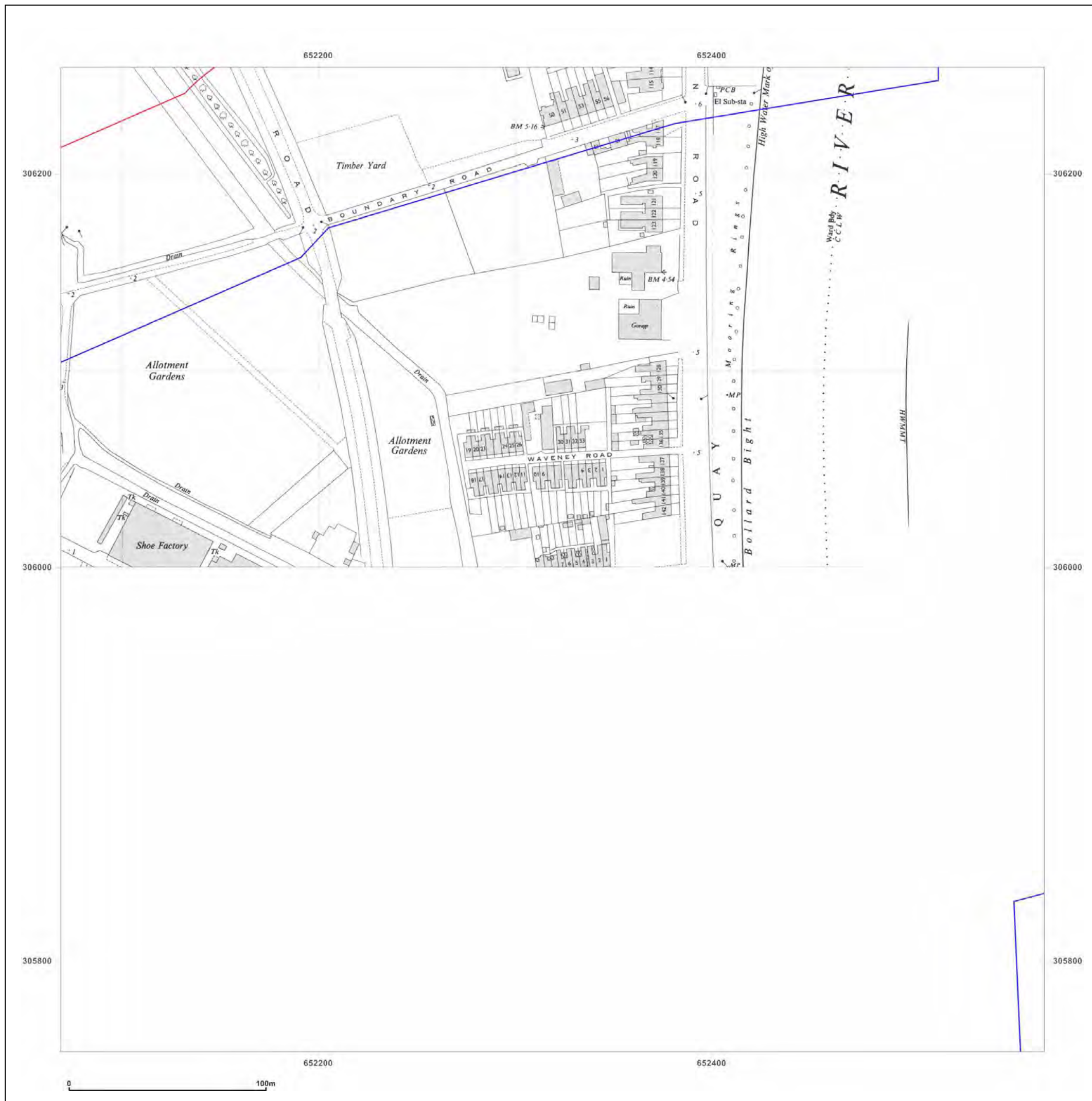


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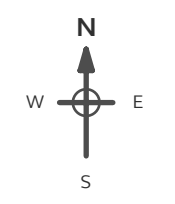
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**Site Details:**

Client Ref: 16287  
 Report Ref: CMAPS-CM-636391-16287-030717HIS\_1250scale  
 Grid Ref: 652319, 306004

Map Name: National Grid  
 Map date: 1951  
 Scale: 1:1,250  
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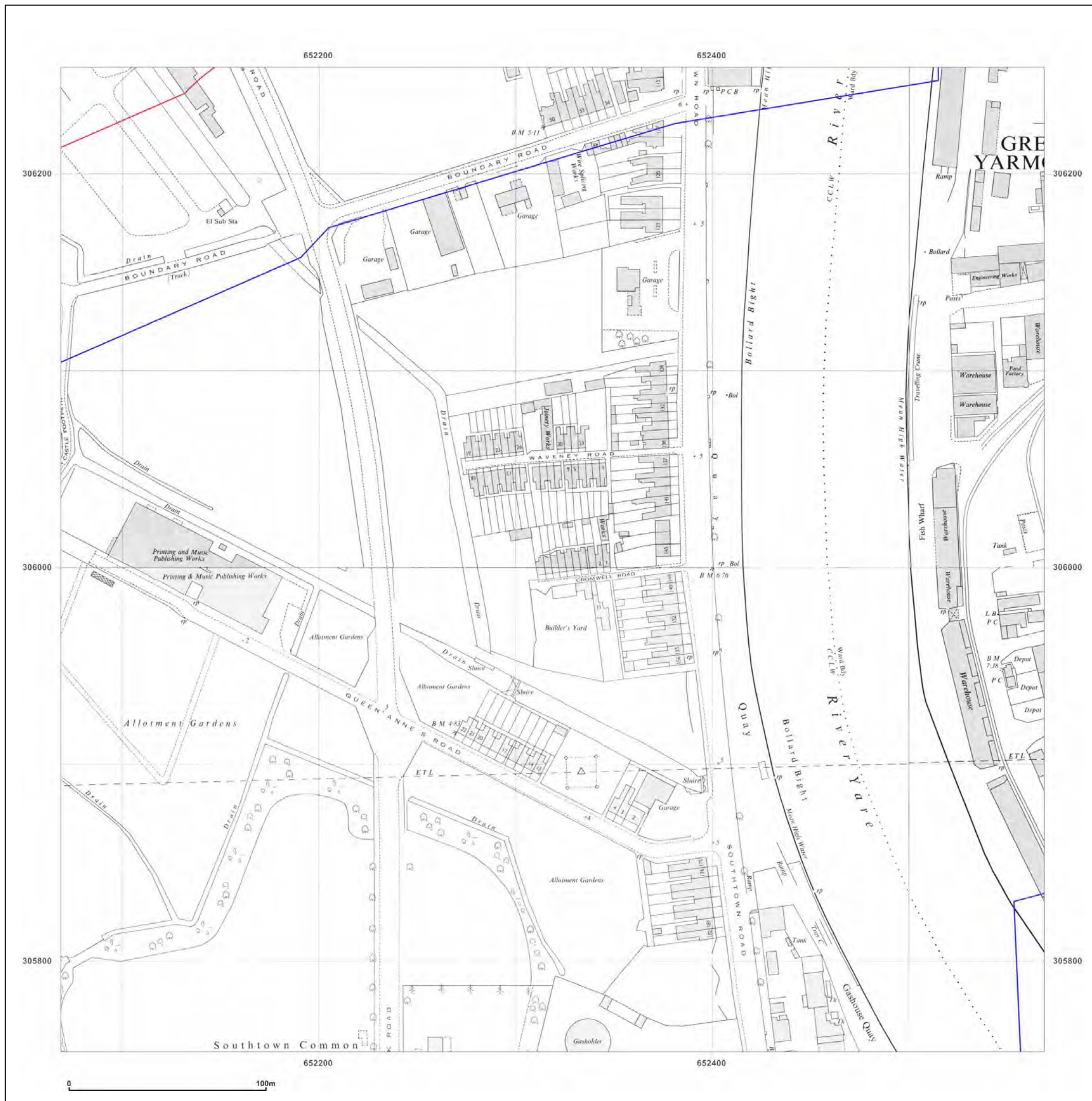


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Site Details:

Client Ref: 16287  
Report Ref: CMAPS-CM-636391-16287-030717HIS\_1250scale  
Grid Ref: 652319, 306004

Map Name: National Grid

Map date: 1966-1968

Scale: 1:1,250

Printed at: 1:2,000



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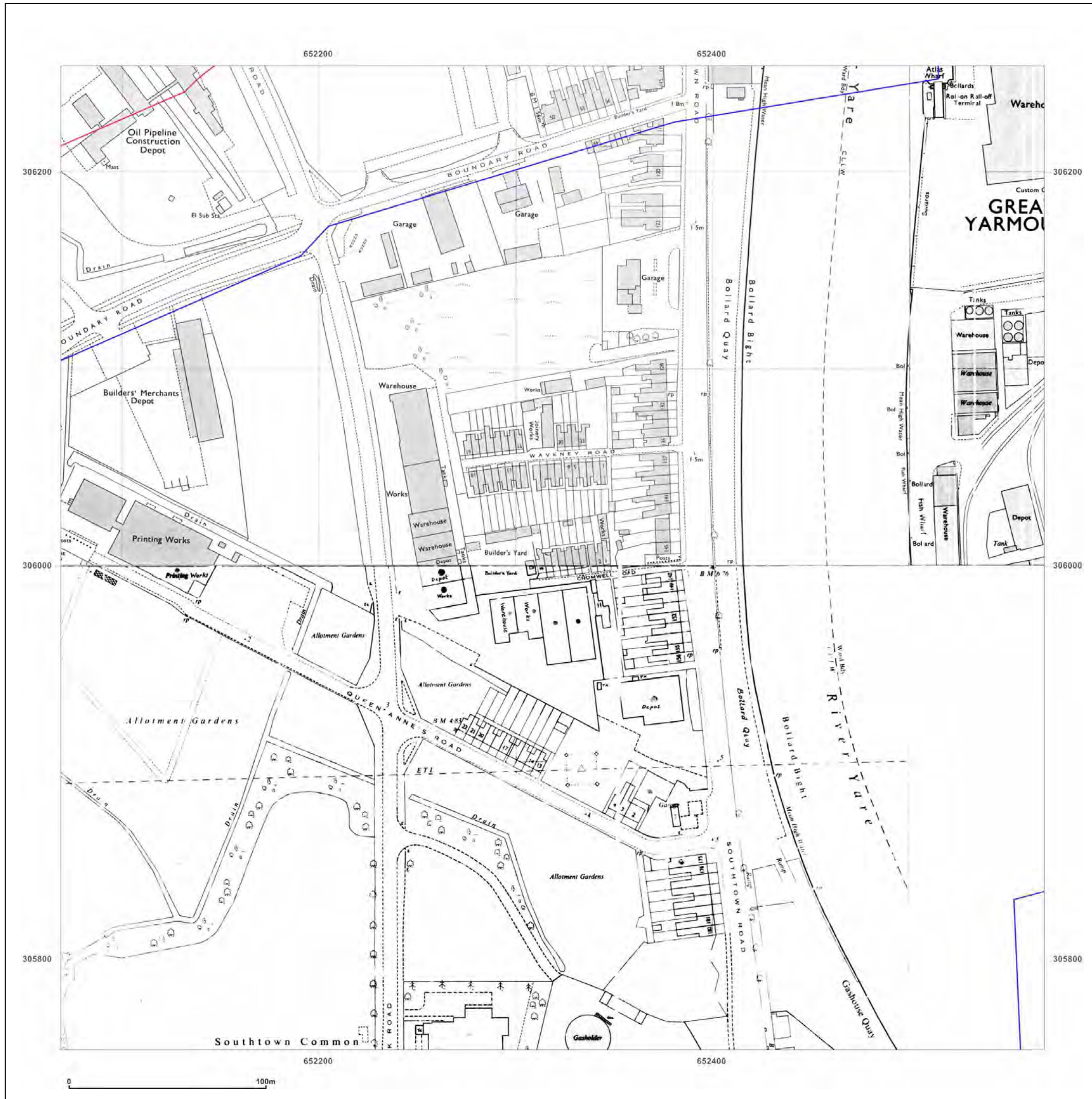


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**Site Details:**

**Client Ref:** 16287  
**Report Ref:** CMAPS-CM-636391-16287-030717HIS\_1250scale  
**Grid Ref:** 652319, 306004

**Map Name:** National Grid

**Map date:** 1970-1975

**Scale:** 1:1,250

**Printed at:** 1:2,000



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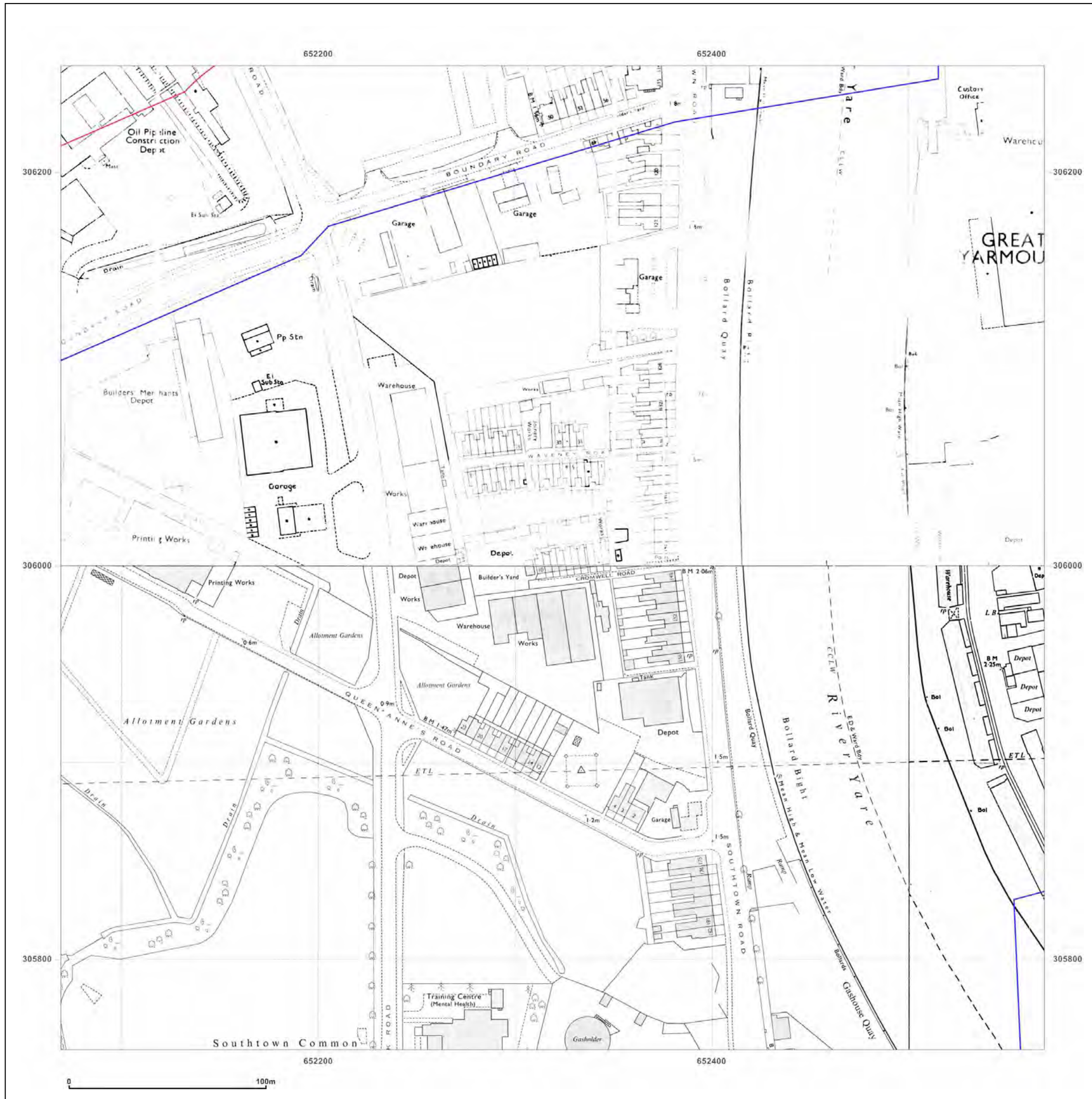
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 Report Ref: CMAPS-CM-636391-16287-030717HIS\_1250scale  
 Grid Ref: 652319, 306004

Map Name: National Grid

Map date: 1976-1981

Scale: 1:1,250

Printed at: 1:2,000



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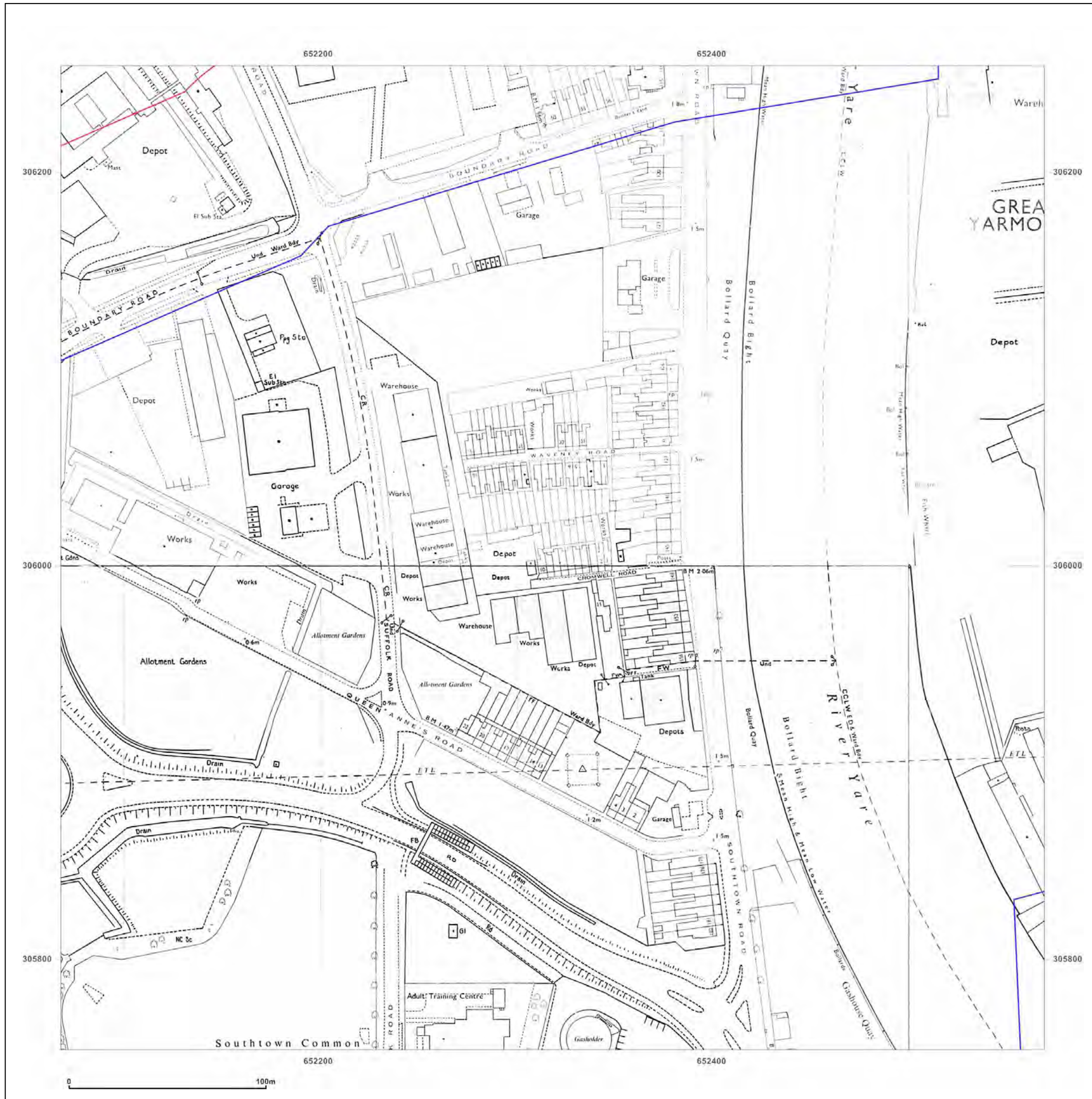


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**Site Details:**

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**Report Ref:** CMAPS-CM-636391-16287-030717HIS\_1250scale  
**Grid Ref:** 652319, 306004

**Map Name:** National Grid

**Map date:** 1984-1986

**Scale:** 1:1,250

**Printed at:** 1:2,000



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**Grid Ref:** 652319, 306004

**Map Name:** National Grid

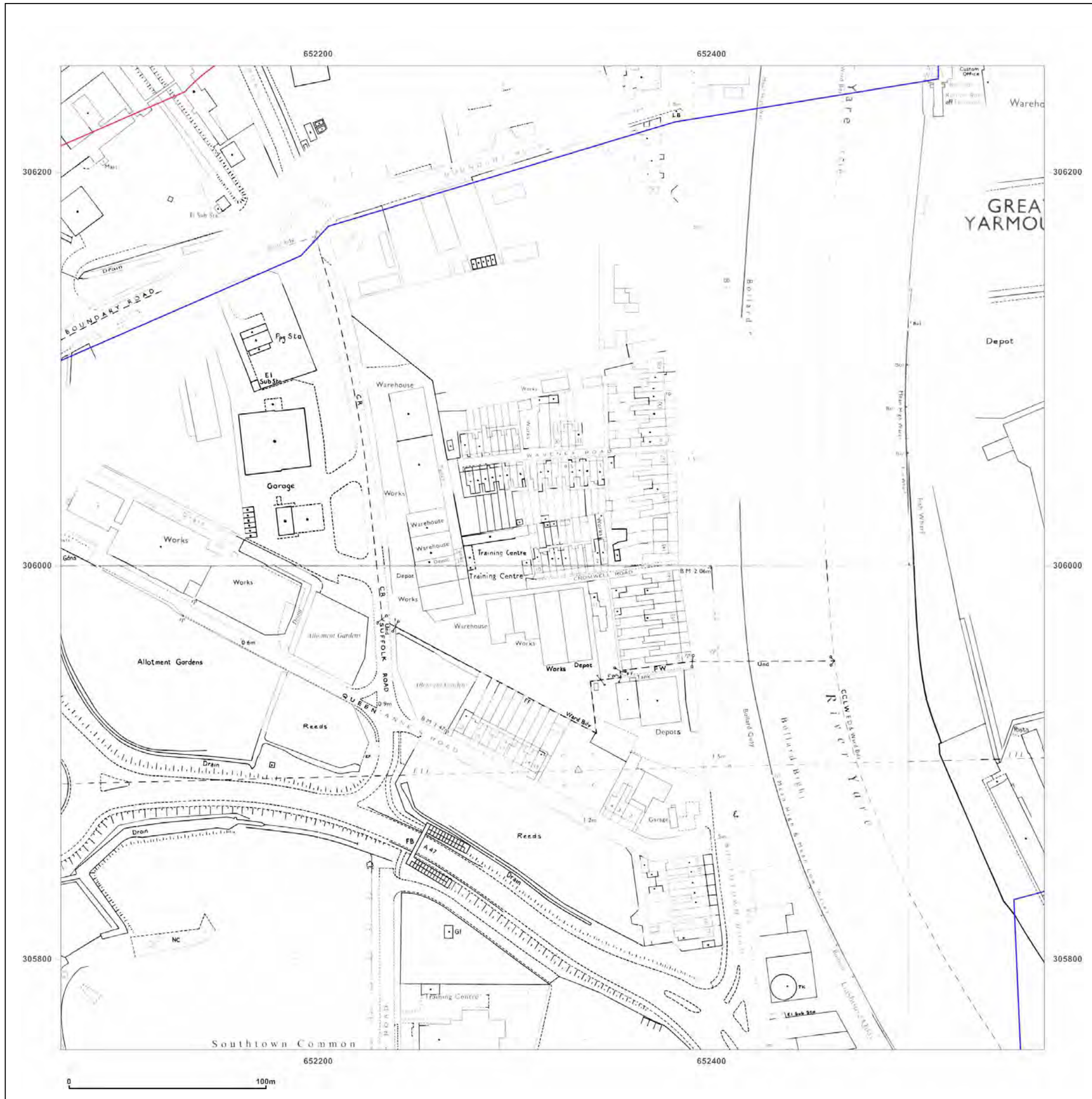
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Site Details:

Client Ref: 16287  
Report Ref: CMAPS-CM-636391-16287-030717HIS\_1250scale  
Grid Ref: 652319, 306004

Map Name: National Grid

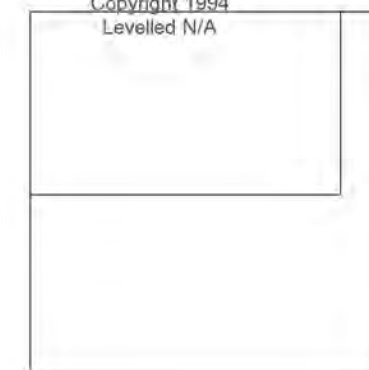
Map date: 1994

Scale: 1:1,250

Printed at: 1:2,000



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**Report Ref:** CMAPS-CM-636391-16287-030717HIS\_1250scale  
**Grid Ref:** 652319, 306004

**Map Name:** National Grid

**Map date:** 1990-1994

**Scale:** 1:1,250

**Printed at:** 1:2,000



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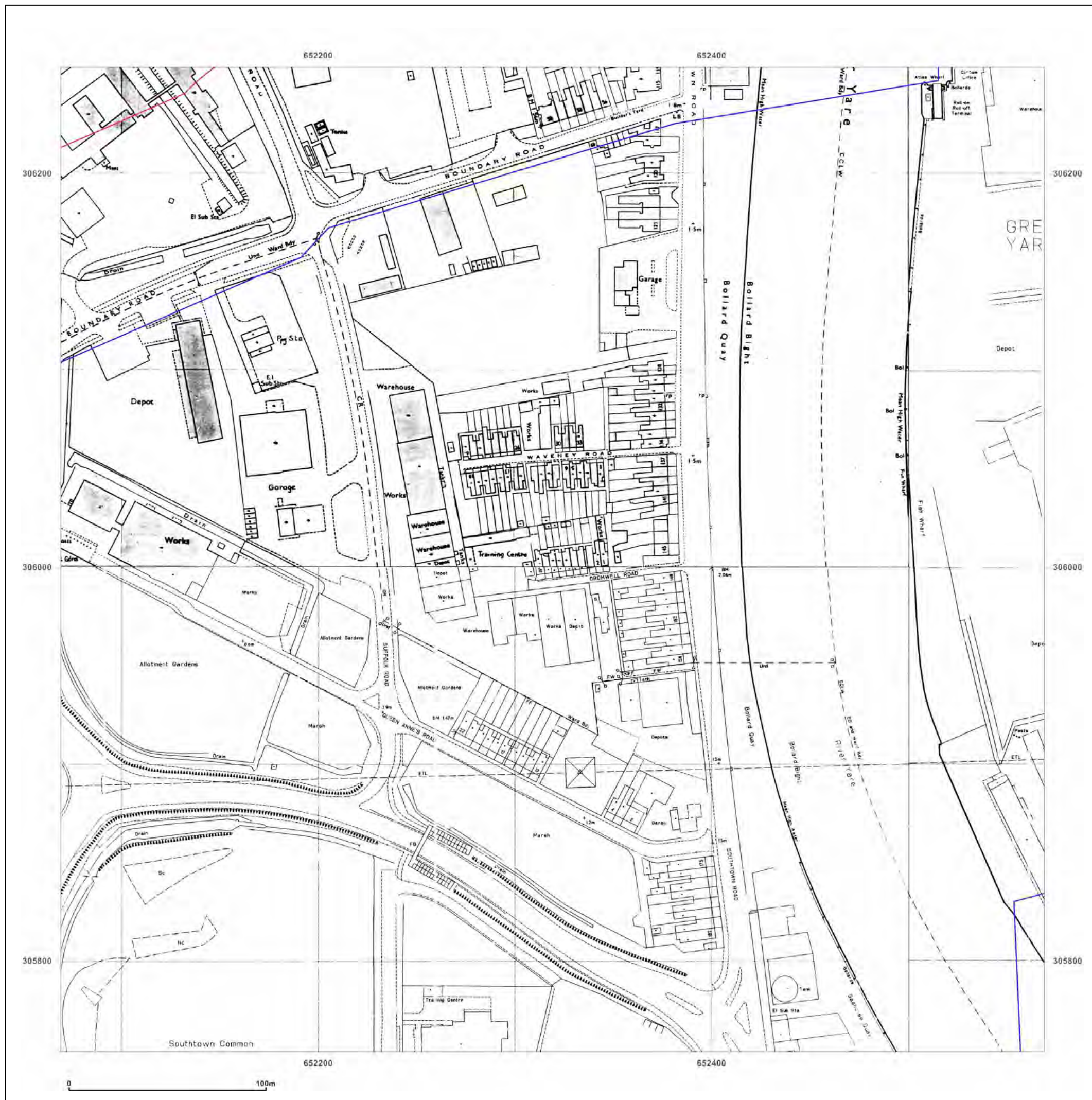


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**Site Details:**

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**Grid Ref:** 652319, 306504

**Map Name:** National Grid

**Map date:** 1949

**Scale:** 1:1,250

**Printed at:** 1:2,000



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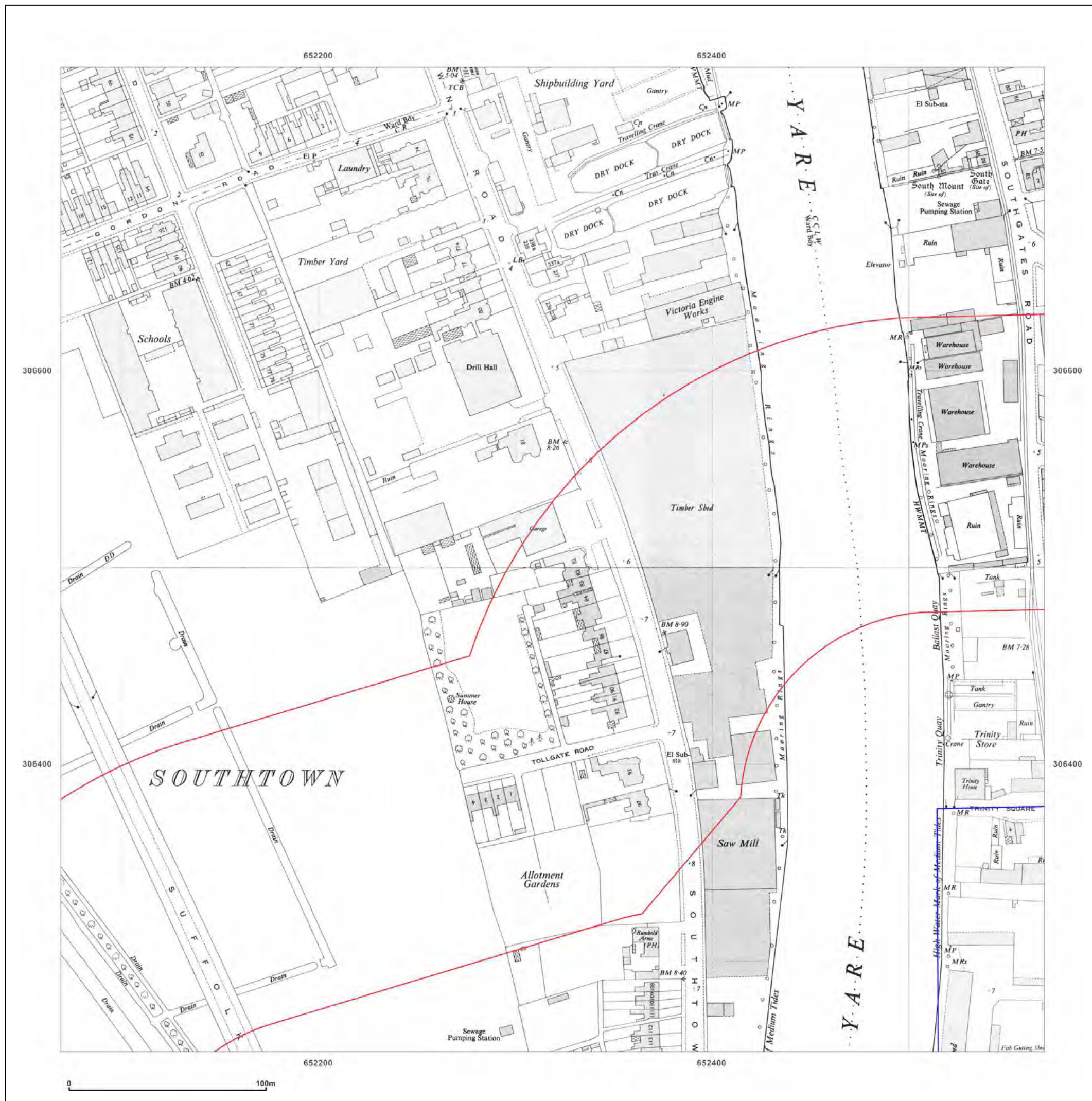


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Site Details:

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Report Ref: CMAPS-CM-636391-16287-030717HIS\_1250scale  
Grid Ref: 652319, 306504

Map Name: National Grid

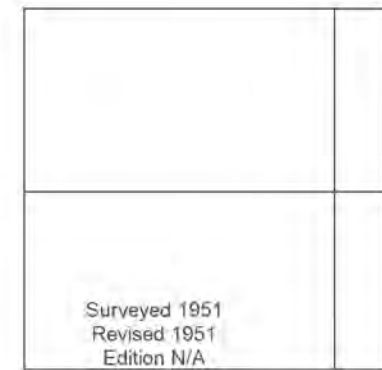
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Scale: 1:1,250

Printed at: 1:2,000



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Site Details:

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Report Ref: CMAPS-CM-636391-16287-030717HIS\_1250scale  
Grid Ref: 652319, 306504

Map Name: National Grid

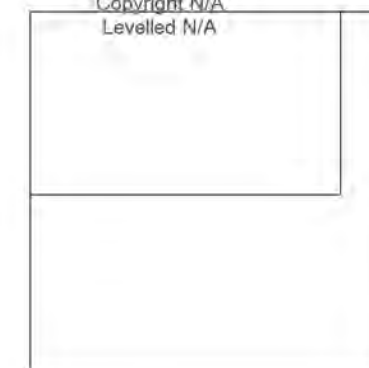
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Scale: 1:1,250

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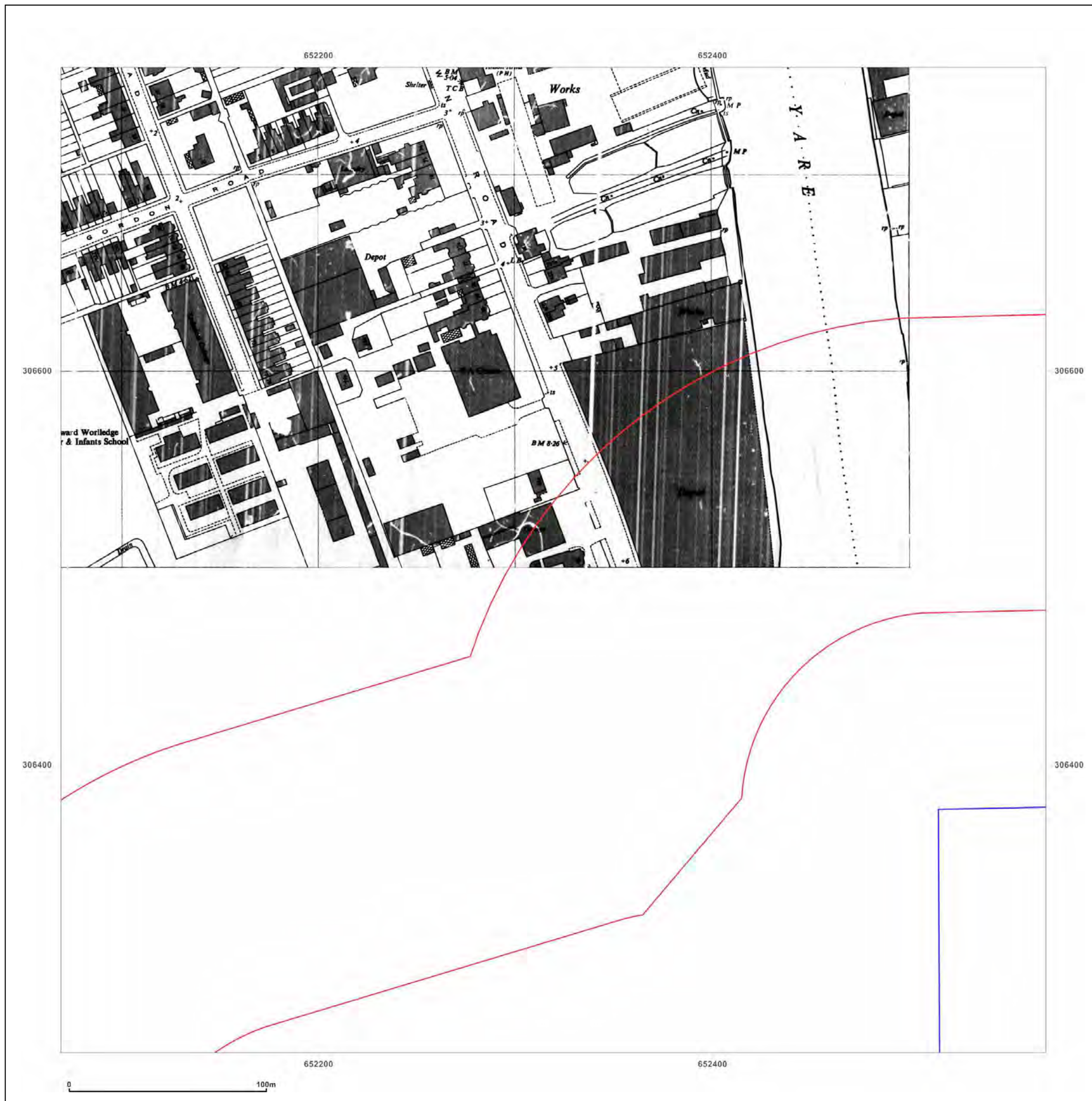


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**Site Details:**

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**Report Ref:** CMAPS-CM-636391-16287-030717HIS\_1250scale  
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**Map Name:** National Grid  
**Map date:** 1966-1968  
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**Site Details:**

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**Grid Ref:** 652319, 306504

**Map Name:** National Grid

**Map date:** 1970-1975

**Scale:** 1:1,250

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Surveyed 1949 Revised 1975 Edition N/A Copyright 1975 Levelled 1958	Surveyed N/A Revised N/A Edition N/A Copyright N/A Levelled N/A



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Report Ref: CMAPS-CM-636391-16287-030717HIS\_1250scale  
Grid Ref: 652319, 306504

Map Name: National Grid

Map date: 1975-1978

Scale: 1:1,250

Printed at: 1:2,000



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**Site Details:**

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**Report Ref:** CMAPS-CM-636391-16287-030717HIS\_1250scale  
**Grid Ref:** 652319, 306504

**Map Name:** National Grid

**Map date:** 1986-1990

**Scale:** 1:1,250

**Printed at:** 1:2,000



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 Revised 1990  
 Edition N/A  
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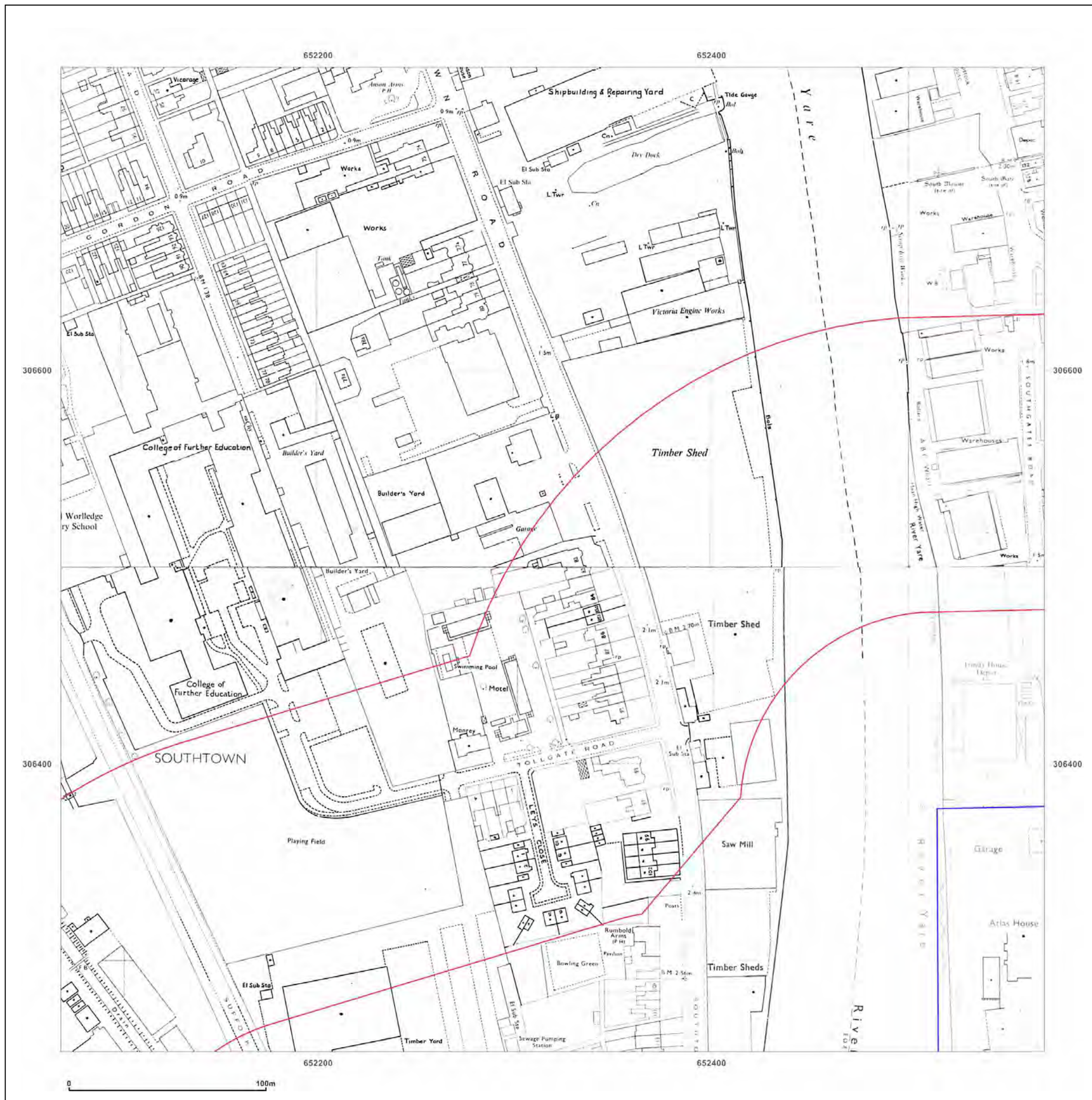


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Site Details:

Client Ref: 16287  
Report Ref: CMAPS-CM-636391-16287-030717HIS\_1250scale  
Grid Ref: 652319, 306504

Map Name: National Grid

Map date: 1984-1990

Scale: 1:1,250

Printed at: 1:2,000



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Report Ref: CMAPS-CM-636391-16287-030717HIS\_1250scale  
Grid Ref: 652319, 306504

Map Name: National Grid

Map date: 1990-1994

Scale: 1:1,250

Printed at: 1:2,000



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Client Ref: 16287  
Report Ref: CMAPS-CM-636391-16287-030717HIS\_1250scale  
Grid Ref: 652319, 306504

Map Name: National Grid

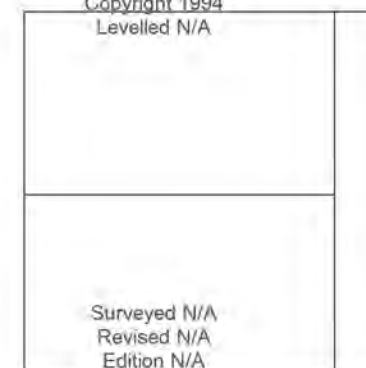
Map date: 1994

Scale: 1:1,250

Printed at: 1:2,000



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Site Details:

Client Ref: 16287  
Report Ref: CMAPS-CM-636391-16287-030717HIS\_1250scale  
Grid Ref: 652819, 305504

Map Name: County Series Town Plan

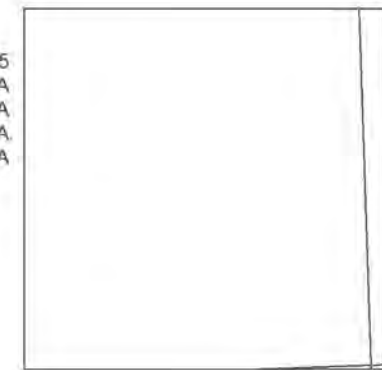
Map date: 1884-1885

Scale: 1:500

Printed at: 1:1,000



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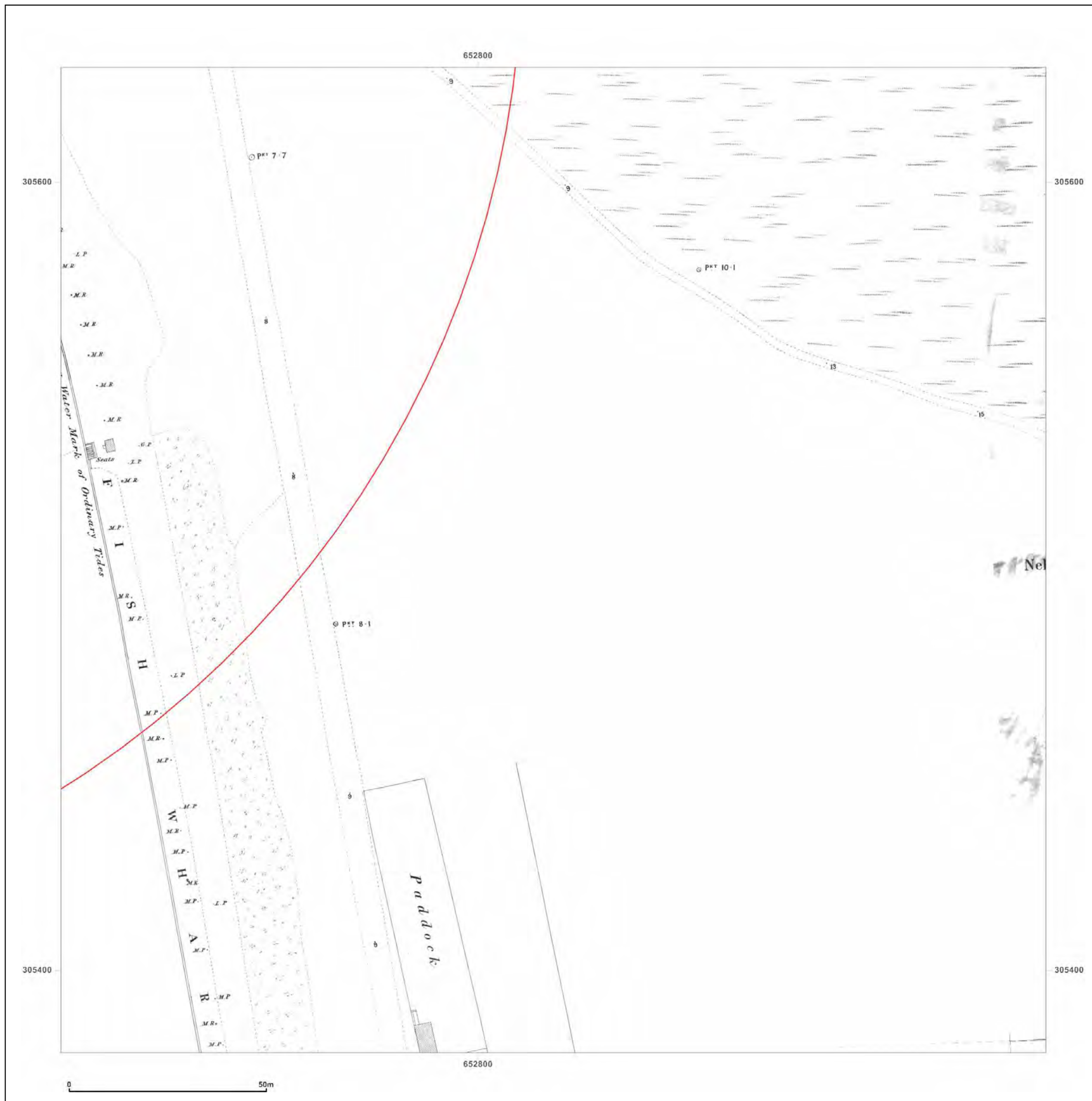


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Site Details:

Client Ref: 16287  
Report Ref: CMAPS-CM-636391-16287-030717HIS\_1250scale  
Grid Ref: 652819, 305504

Map Name: National Grid

Map date: 1949

Scale: 1:1,250

Printed at: 1:2,000



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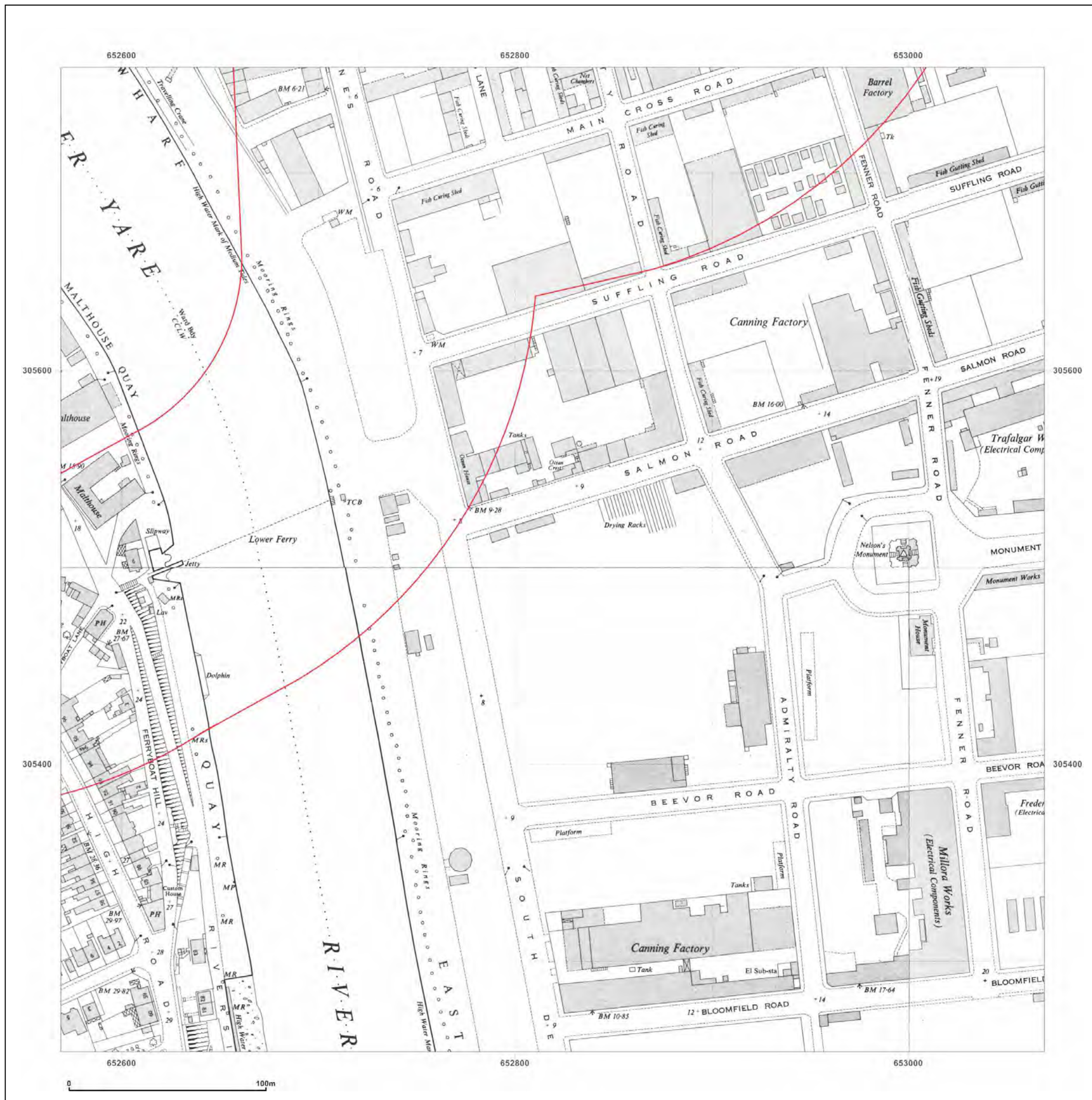


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**Site Details:**

**Client Ref:** 16287  
**Report Ref:** CMAPS-CM-636391-16287-030717HIS\_1250scale  
**Grid Ref:** 652819, 305504

**Map Name:** National Grid

**Map date:** 1957-1958

**Scale:** 1:1,250

**Printed at:** 1:2,000



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Site Details:

Client Ref: 16287  
Report Ref: CMAPS-CM-636391-16287-030717HIS\_1250scale  
Grid Ref: 652819, 305504

Map Name: National Grid

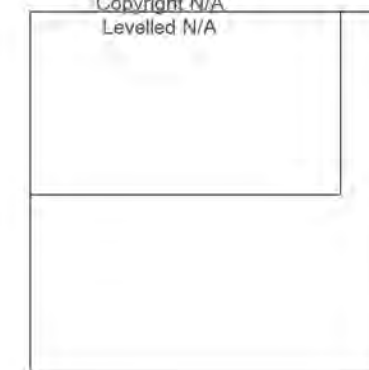
Map date: 1958

Scale: 1:1,250

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Site Details:

Client Ref: 16287  
Report Ref: CMAPS-CM-636391-16287-030717HIS\_1250scale  
Grid Ref: 652819, 305504

Map Name: National Grid

Map date: 1964-1968

Scale: 1:1,250

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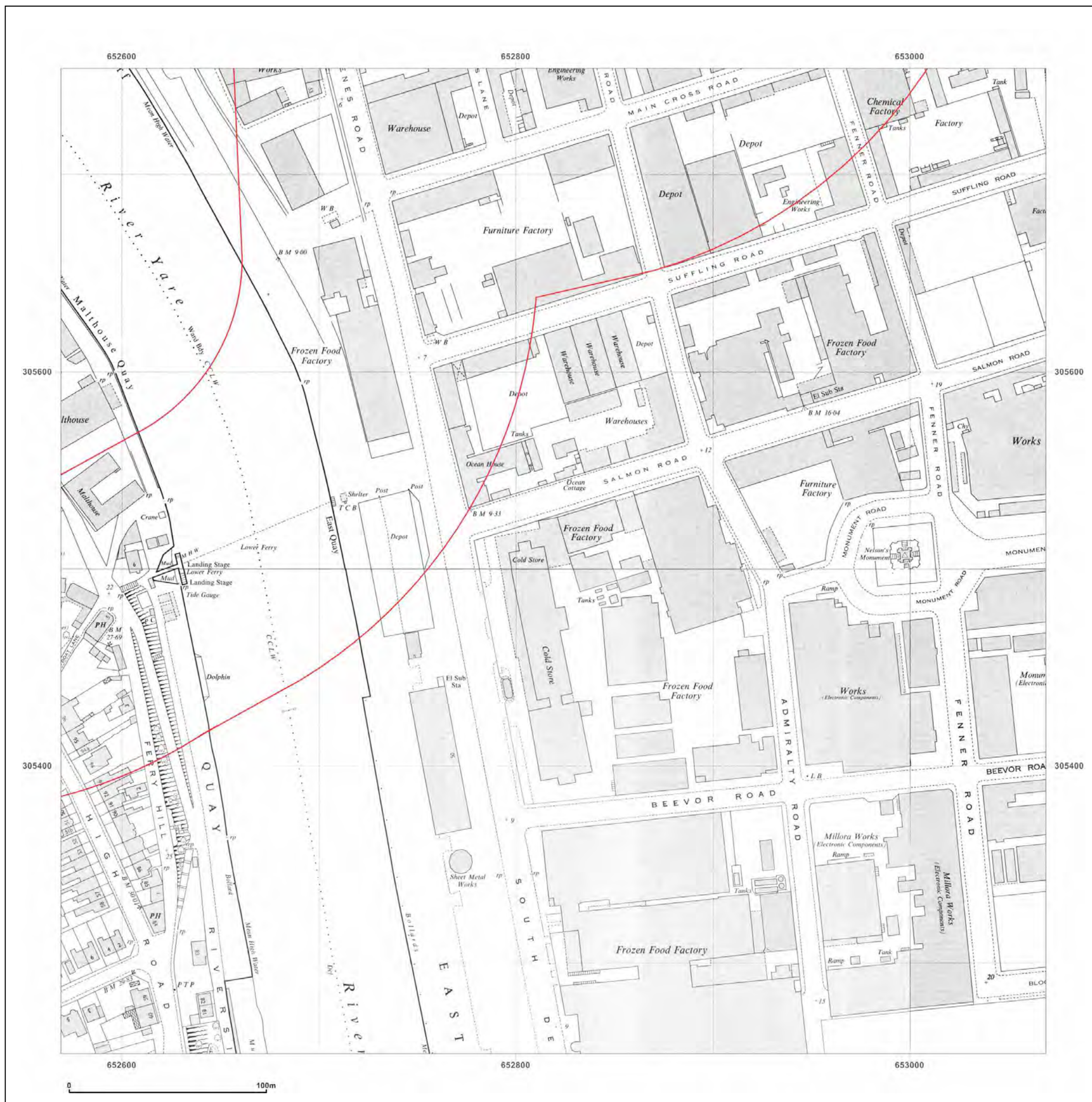


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Site Details:

Client Ref: 16287  
Report Ref: CMAPS-CM-636391-16287-030717HIS\_1250scale  
Grid Ref: 652819, 305504

Map Name: National Grid

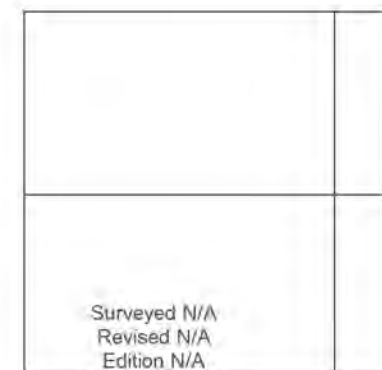
Map date: 1968-1971

Scale: 1:1,250

Printed at: 1:2,000



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Site Details:

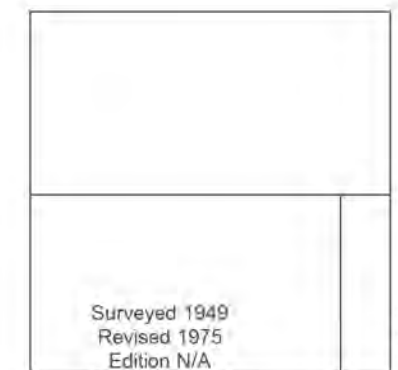
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Grid Ref: 652819, 305504

Map Name: National Grid

Map date: 1975-1976

Scale: 1:1,250

Printed at: 1:2,000



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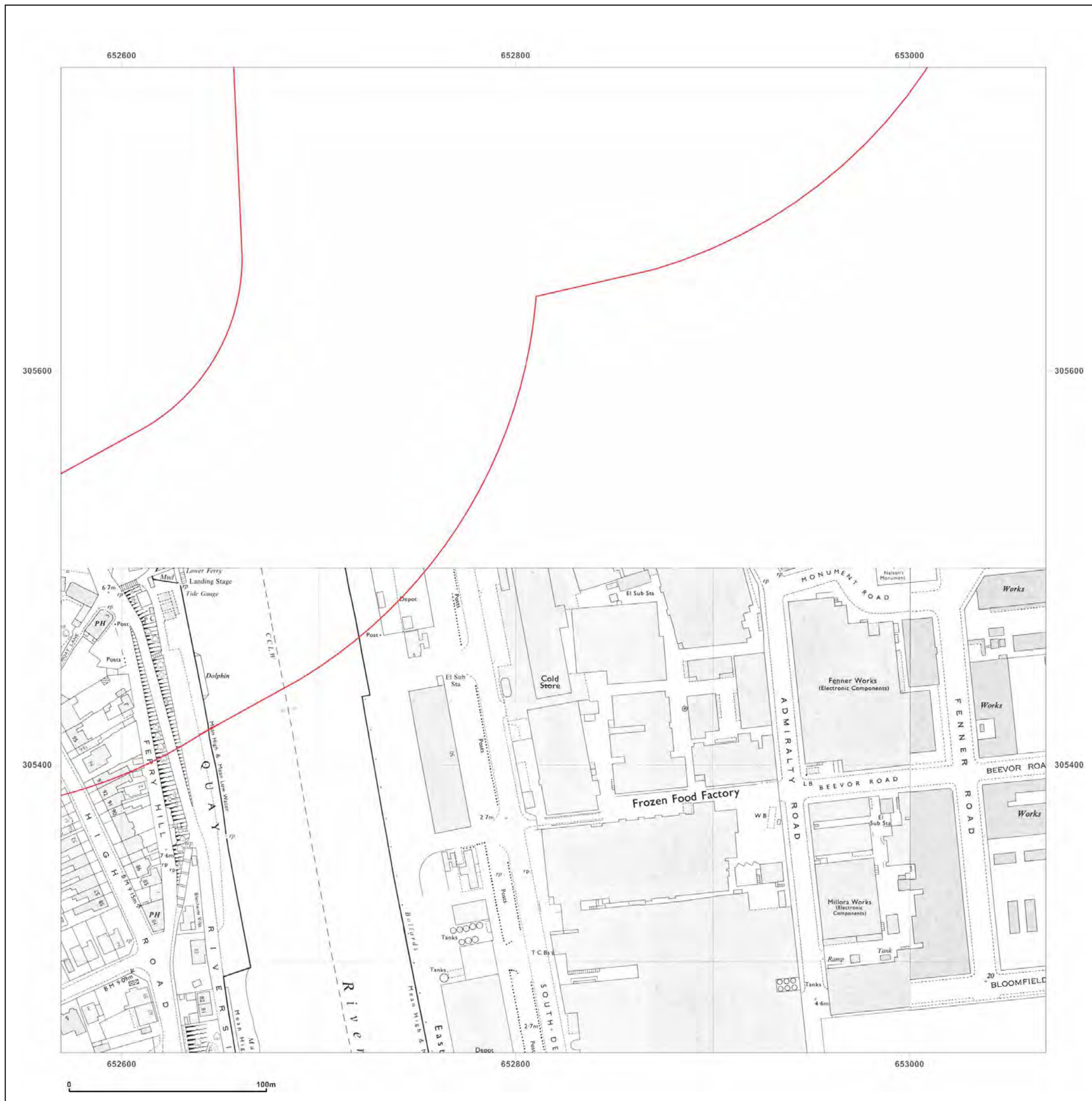


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Site Details:

Client Ref: 16287  
Report Ref: CMAPS-CM-636391-16287-030717HIS\_1250scale  
Grid Ref: 652819, 305504

Map Name: National Grid

Map date: 1981

Scale: 1:1,250

Printed at: 1:2,000



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Site Details:

Client Ref: 16287  
Report Ref: CMAPS-CM-636391-16287-030717HIS\_1250scale  
Grid Ref: 652819, 305504

Map Name: National Grid

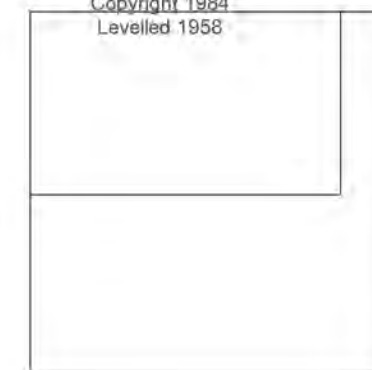
Map date: 1984

Scale: 1:1,250

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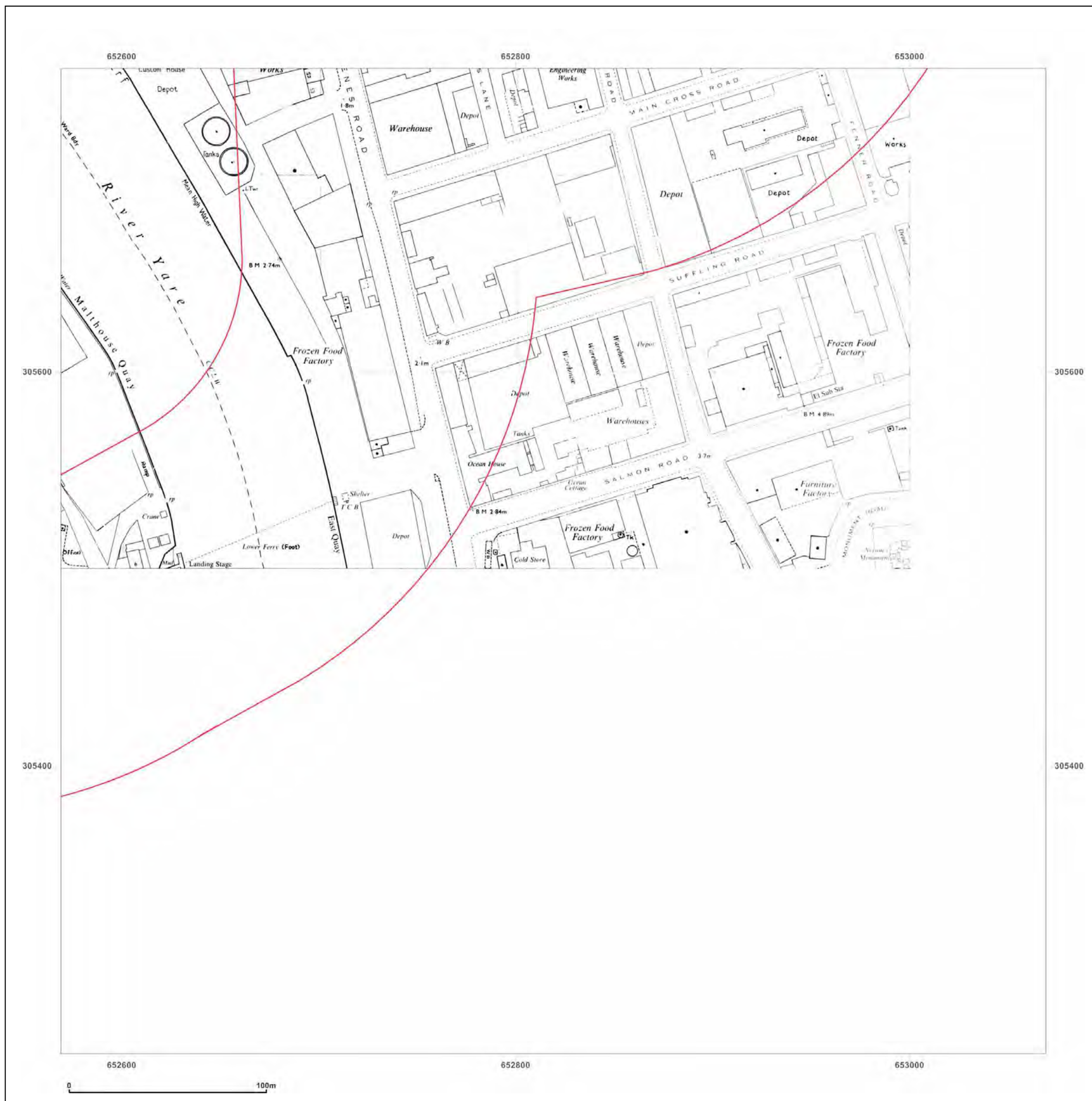


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**Site Details:**

**Client Ref:** 16287  
**Report Ref:** CMAPS-CM-636391-16287-030717HIS\_1250scale  
**Grid Ref:** 652819, 305504

**Map Name:** National Grid

**Map date:** 1990

**Scale:** 1:1,250

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**Site Details:**

**Client Ref:** 16287  
**Report Ref:** CMAPS-CM-636391-16287-030717HIS\_1250scale  
**Grid Ref:** 652819, 305504

**Map Name:** National Grid

**Map date:** 1994

**Scale:** 1:1,250

**Printed at:** 1:2,000



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**Site Details:**

**Client Ref:** 16287  
**Report Ref:** CMAPS-CM-636391-16287-030717HIS\_1250scale  
**Grid Ref:** 652819, 306004

**Map Name:** County Series Town Plan

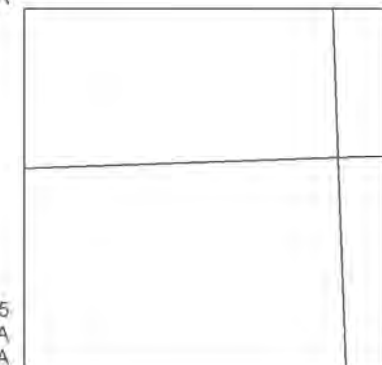
**Map date:** 1885

**Scale:** 1:500

**Printed at:** 1:1,000



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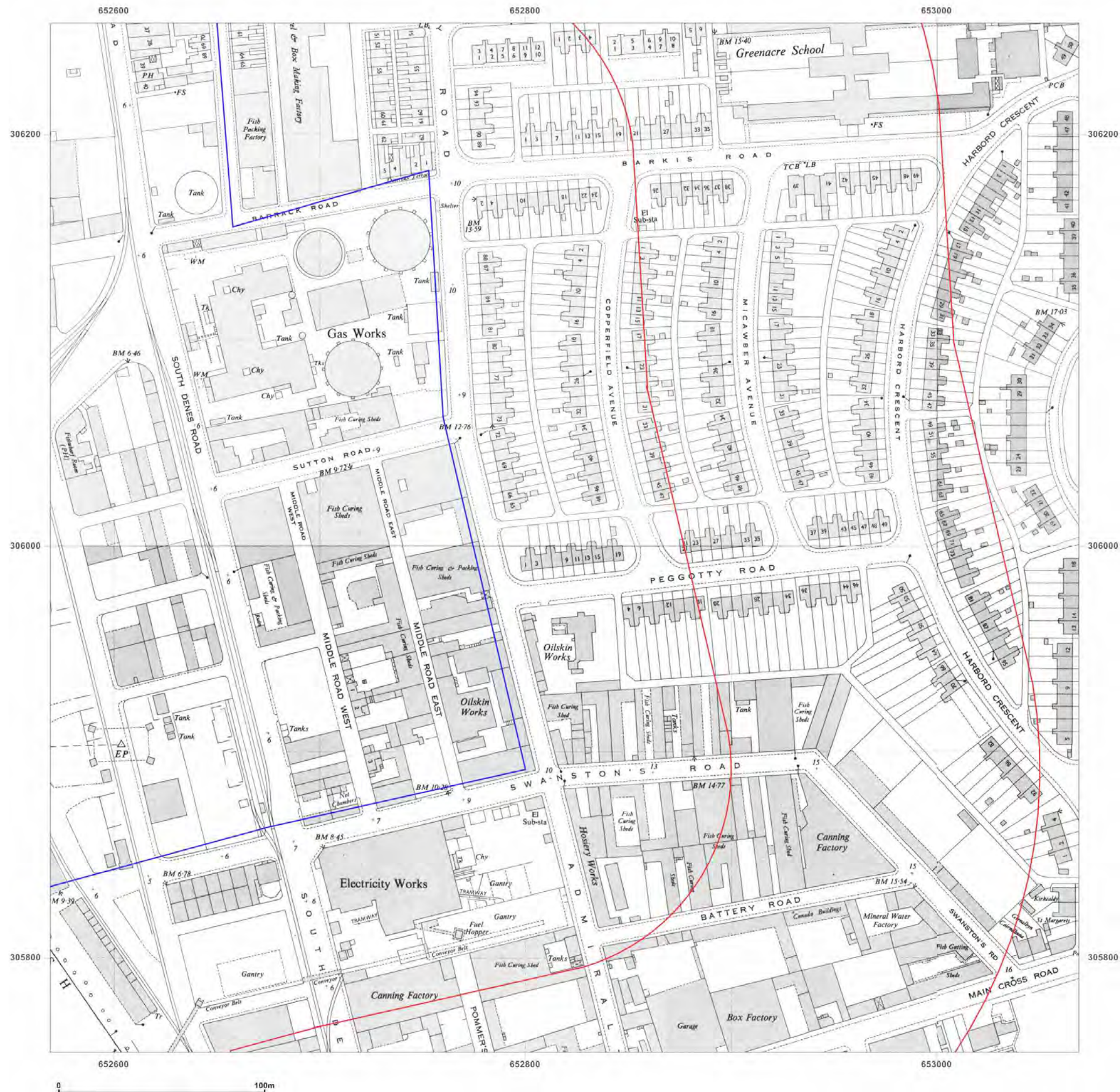
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 Grid Ref: 652819, 306004

Map Name: National Grid

Map date: 1949

Scale: 1:1,250

Printed at: 1:2,000



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Surveyed 1949  
 Revised 1949  
 Edition N/A  
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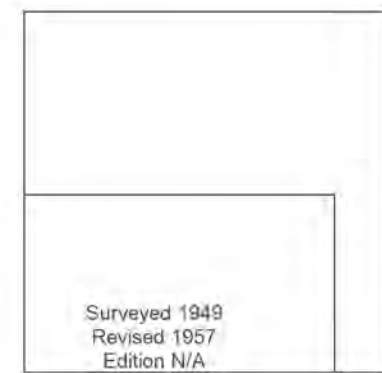
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**Grid Ref:** 652819, 306004

**Map Name:** National Grid

**Map date:** 1957

**Scale:** 1:1,250

**Printed at:** 1:2,000



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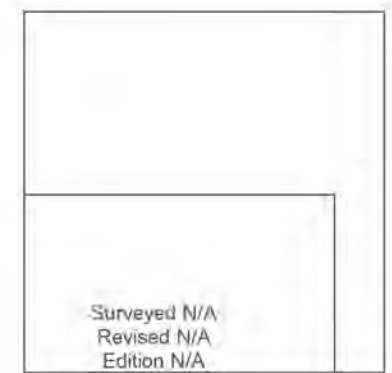
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Grid Ref: 652819, 306004

Map Name: National Grid

Map date: 1958

Scale: 1:1,250

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**Site Details:**

**Client Ref:** 16287  
**Report Ref:** CMAPS-CM-636391-16287-030717HIS\_1250scale  
**Grid Ref:** 652819, 306004

**Map Name:** National Grid  
**Map date:** 1964-1968  
**Scale:** 1:1,250  
**Printed at:** 1:2,000



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**Site Details:**

**Client Ref:** 16287  
**Report Ref:** CMAPS-CM-636391-16287-030717HIS\_1250scale  
**Grid Ref:** 652819, 306004

**Map Name:** National Grid

**Map date:** 1970-1971

**Scale:** 1:1,250

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**Client Ref:** 16287  
**Report Ref:** CMAPS-CM-636391-16287-030717HIS\_1250scale  
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**Map Name:** National Grid

**Map date:** 1978-1981

**Scale:** 1:1,250

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**Site Details:**

Client Ref: 16287  
 Report Ref: CMAPS-CM-636391-16287-030717HIS\_1250scale  
 Grid Ref: 652819, 306004

Map Name: National Grid

Map date: 1984

Scale: 1:1,250

Printed at: 1:2,000



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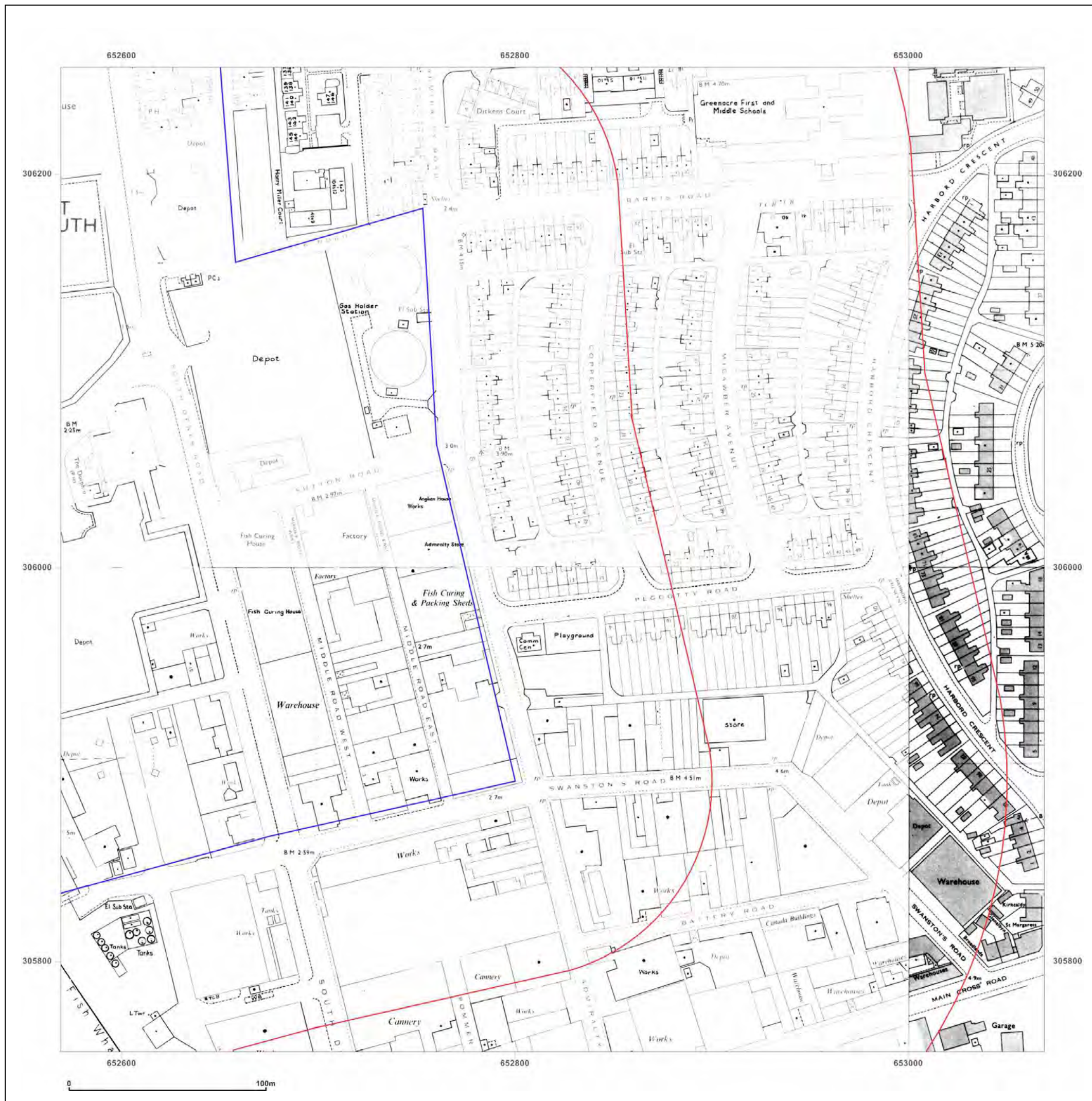
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**Site Details:**

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**Grid Ref:** 652819, 306004

**Map Name:** National Grid

**Map date:** 1990

**Scale:** 1:1,250

**Printed at:** 1:2,000



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**Site Details:**

**Client Ref:** 16287  
**Report Ref:** CMAPS-CM-636391-16287-030717HIS\_1250scale  
**Grid Ref:** 652819, 306004

**Map Name:** National Grid

**Map date:** 1994

**Scale:** 1:1,250

**Printed at:** 1:2,000



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Site Details:

Client Ref: 16287  
Report Ref: CMAPS-CM-636391-16287-030717HIS\_1250scale  
Grid Ref: 652819, 306504

Map Name: County Series Town Plan

Map date: 1885

Scale: 1:500

Printed at: 1:1,000



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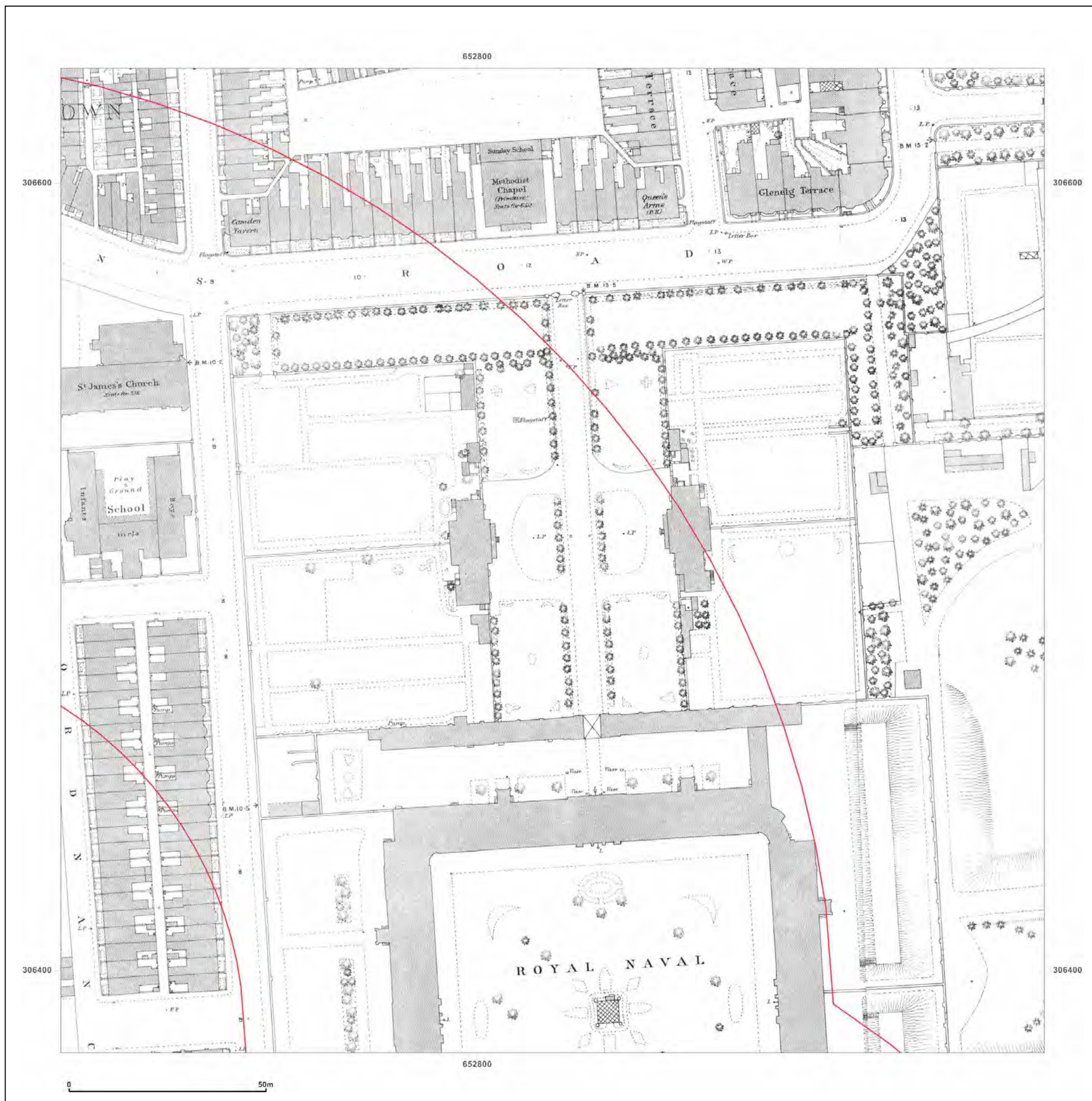


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Client Ref: 16287  
Report Ref: CMAPS-CM-636391-16287-030717HIS\_1250scale  
Grid Ref: 652819, 306504

Map Name: National Grid

Map date: 1949

Scale: 1:1,250

Printed at: 1:2,000



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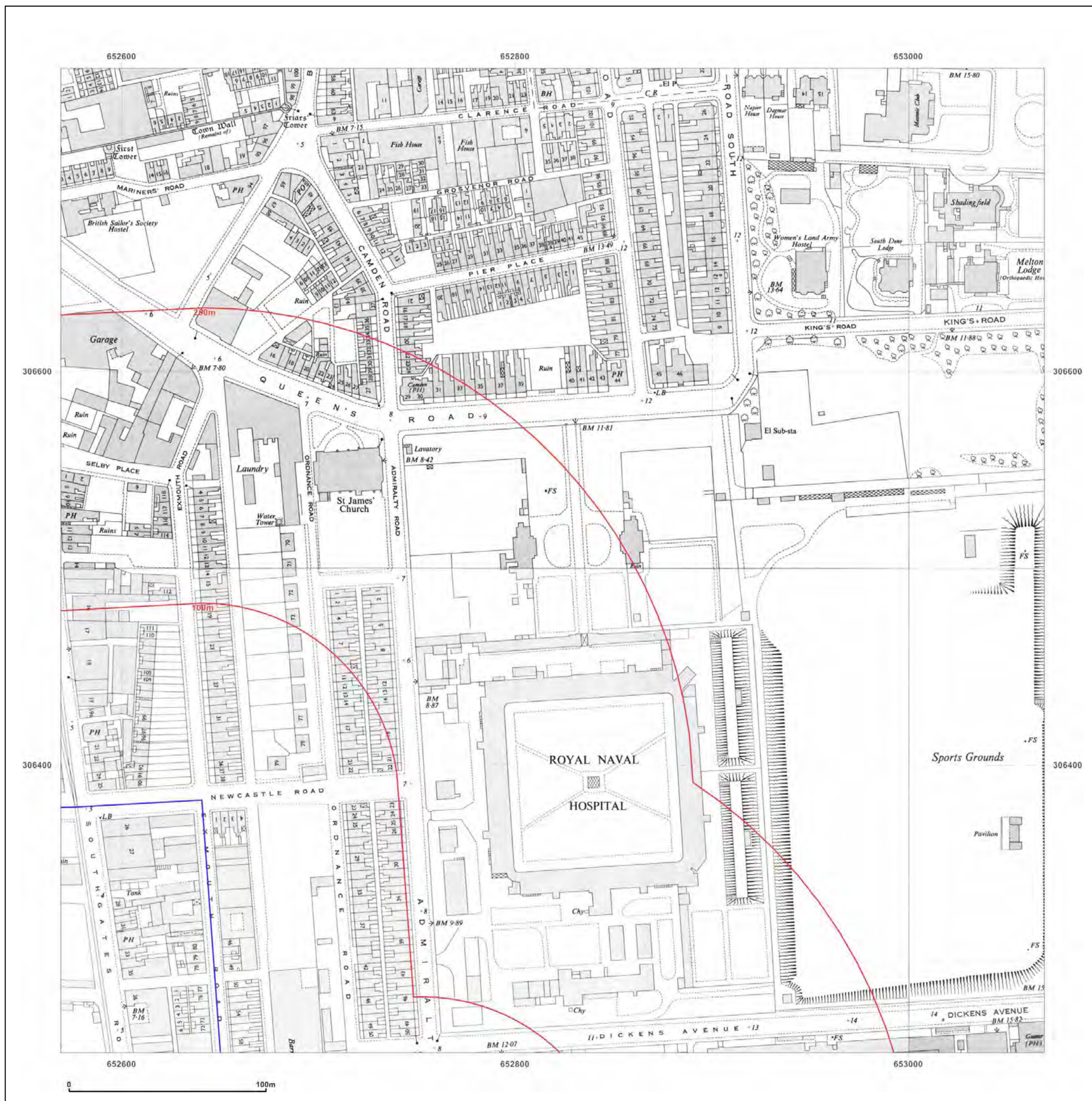


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Production date: 03 July 2017

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Site Details:

Client Ref: 16287  
Report Ref: CMAPS-CM-636391-16287-030717HIS\_1250scale  
Grid Ref: 652819, 306504

Map Name: National Grid

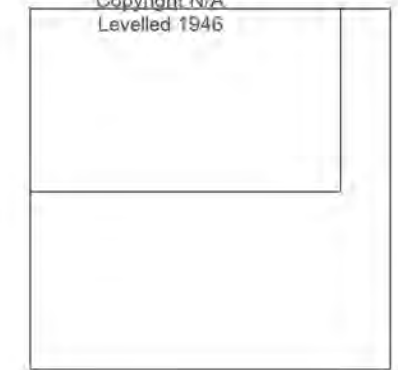
Map date: 1954

Scale: 1:1,250

Printed at: 1:2,000



Surveyed 1949  
Revised 1954  
Edition N/A  
Copyright N/A  
Levelled 1946



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Site Details:

Client Ref: 16287  
Report Ref: CMAPS-CM-636391-16287-030717HIS\_1250scale  
Grid Ref: 652819, 306504

Map Name: National Grid

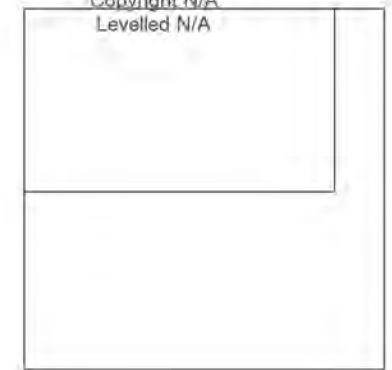
Map date: 1955

Scale: 1:1,250

Printed at: 1:2,000



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



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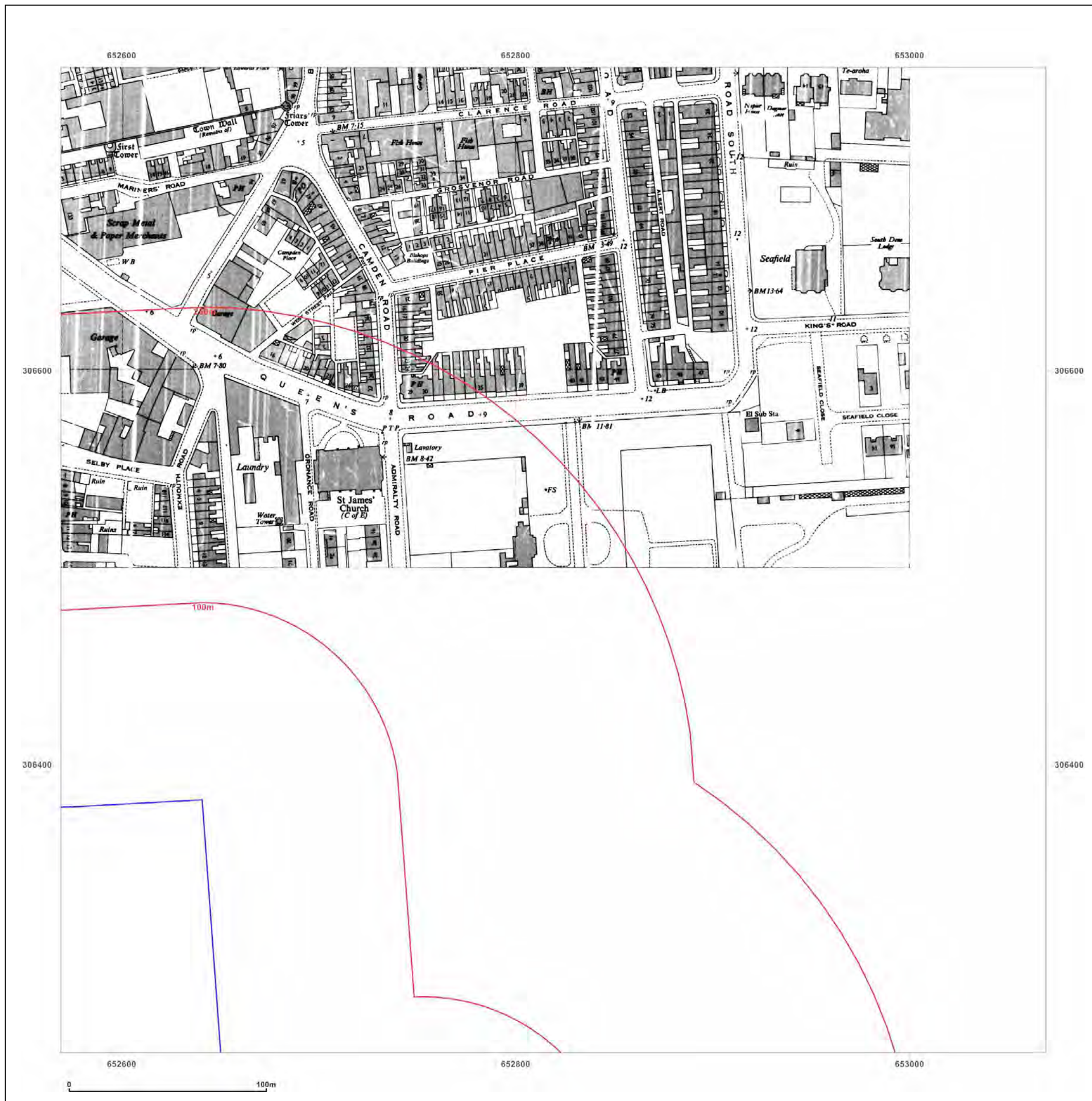


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Site Details:

Client Ref: 16287  
Report Ref: CMAPS-CM-636391-16287-030717HIS\_1250scale  
Grid Ref: 652819, 306504

Map Name: National Grid

Map date: 1964-1966

Scale: 1:1,250

Printed at: 1:2,000



Surveyed 1949  
Revised 1966  
Edition N/A  
Copyright 1966  
Levelled 1958

Surveyed 1949  
Revised 1963  
Edition N/A  
Copyright 1964  
Levelled 1958

Surveyed 1949  
Revised 1964  
Edition N/A  
Copyright 1966  
Levelled 1958



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Production date: 03 July 2017

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**Site Details:**

**Client Ref:** 16287  
**Report Ref:** CMAPS-CM-636391-16287-030717HIS\_1250scale  
**Grid Ref:** 652819, 306504

**Map Name:** National Grid

**Map date:** 1970-1973

**Scale:** 1:1,250

**Printed at:** 1:2,000



<p>Surveyed N/A          Revised N/A          Edition N/A          Copyright N/A          Levelled N/A</p>	<p>Surveyed 1948          Revised 1969          Edition N/A          Copyright N/A          Levelled N/A</p>
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Site Details:

Client Ref: 16287  
Report Ref: CMAPS-CM-636391-16287-030717HIS\_1250scale  
Grid Ref: 652819, 306504

Map Name: National Grid

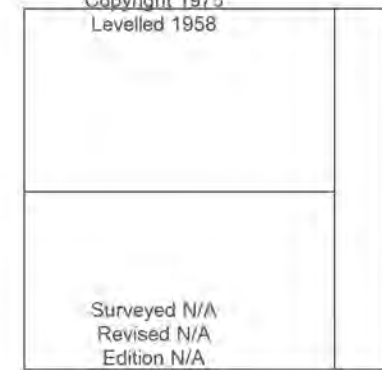
Map date: 1975-1978

Scale: 1:1,250

Printed at: 1:2,000



Surveyed 1949  
Revised 1975  
Edition N/A  
Copyright 1975  
Levelled 1958



Surveyed N/A  
Revised N/A  
Edition N/A  
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Site Details:

Client Ref: 16287  
Report Ref: CMAPS-CM-636391-16287-030717HIS\_1250scale  
Grid Ref: 652819, 306504

Map Name: National Grid

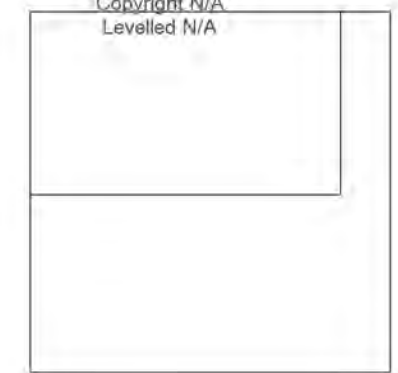
Map date: 1978

Scale: 1:1,250

Printed at: 1:2,000



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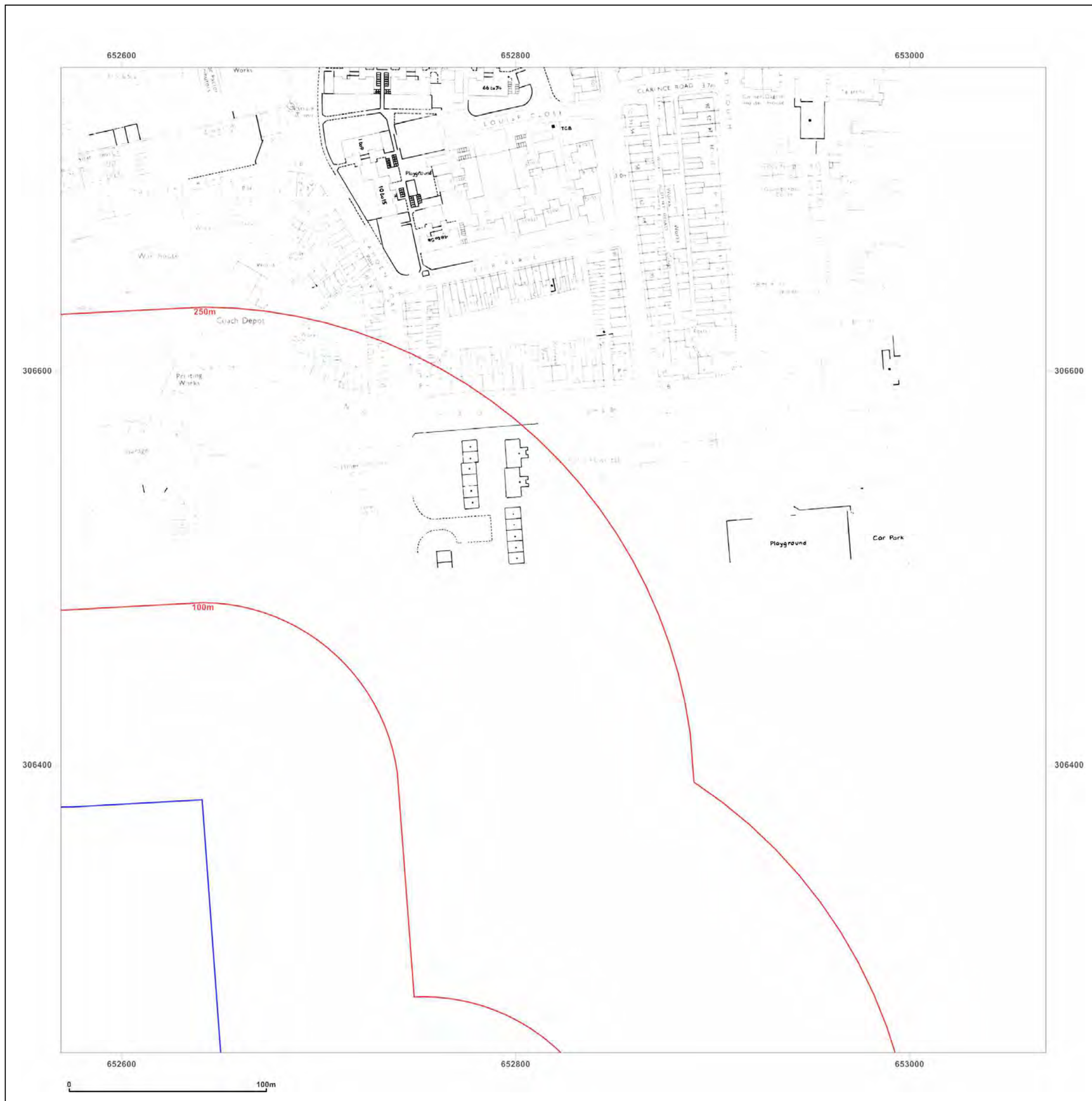


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Site Details:

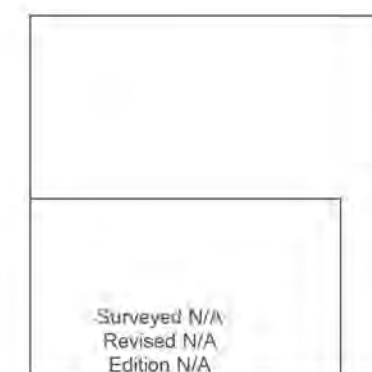
Client Ref: 16287  
Report Ref: CMAPS-CM-636391-16287-030717HIS\_1250scale  
Grid Ref: 652819, 306504

Map Name: National Grid

Map date: 1984

Scale: 1:1,250

Printed at: 1:2,000



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**Site Details:**

Client Ref: 16287  
 Report Ref: CMAPS-CM-636391-16287-030717HIS\_1250scale  
 Grid Ref: 652819, 306504

Map Name: National Grid

Map date: 1990

Scale: 1:1,250

Printed at: 1:2,000



Surveyed 1958  
 Revised 1990  
 Edition N/A  
 Copyright 1990  
 Levelled 1958

Surveyed 1958  
 Revised 1990  
 Edition N/A  
 Copyright 1990  
 Levelled 1958

Surveyed N/A  
 Revised N/A  
 Edition N/A  
 Copyright 1990  
 Levelled 1958

Surveyed 1958  
 Revised 1990  
 Edition N/A  
 Copyright 1990  
 Levelled 1958



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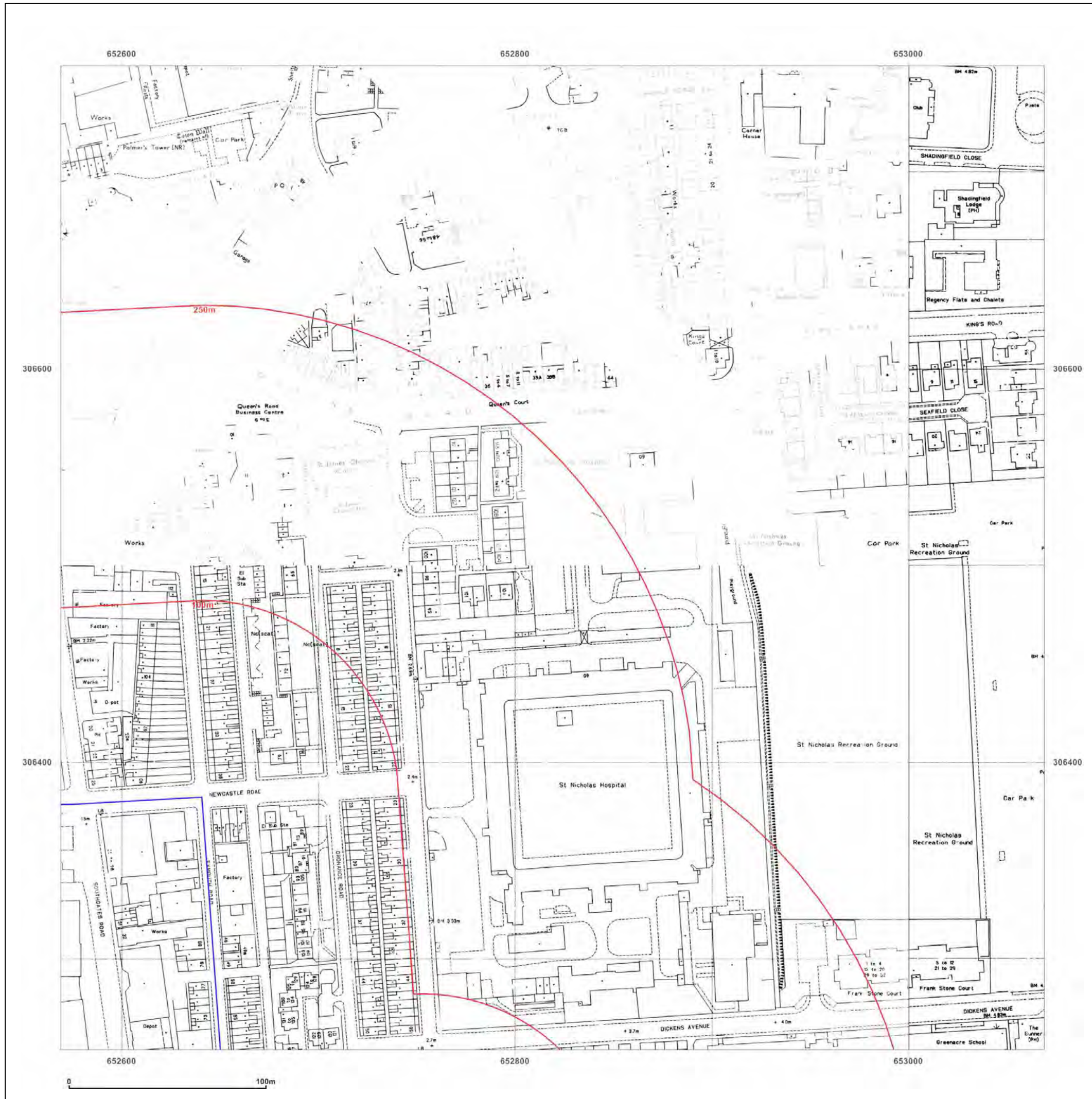
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Site Details:

Client Ref: 16287  
Report Ref: CMAPS-CM-636391-16287-030717HIS\_1250scale  
Grid Ref: 652819, 306504

Map Name: National Grid

Map date: 1990-1994

Scale: 1:1,250

Printed at: 1:2,000



Surveyed N/A Revised N/A Edition N/A Copyright 1990 Levelled 1968	Surveyed N/A Revised N/A Edition N/A Copyright 1994 Levelled N/A
Surveyed N/A Revised N/A Edition N/A Copyright 1994 Levelled N/A	Surveyed N/A Revised N/A Edition N/A Copyright 1994 Levelled N/A



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Site Details:

Client Ref: 16287  
Report Ref: CMAPS-CM-636391-16287-030717HIS\_1250scale  
Grid Ref: 652819, 306504

Map Name: National Grid

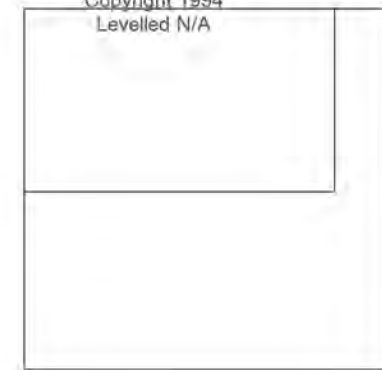
Map date: 1994

Scale: 1:1,250

Printed at: 1:2,000



Surveyed N/A  
Revised N/A  
Edition N/A  
Copyright 1994  
Levelled N/A



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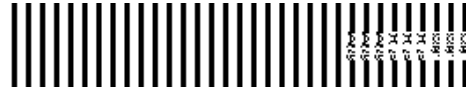
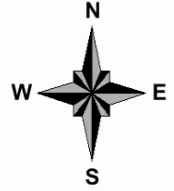
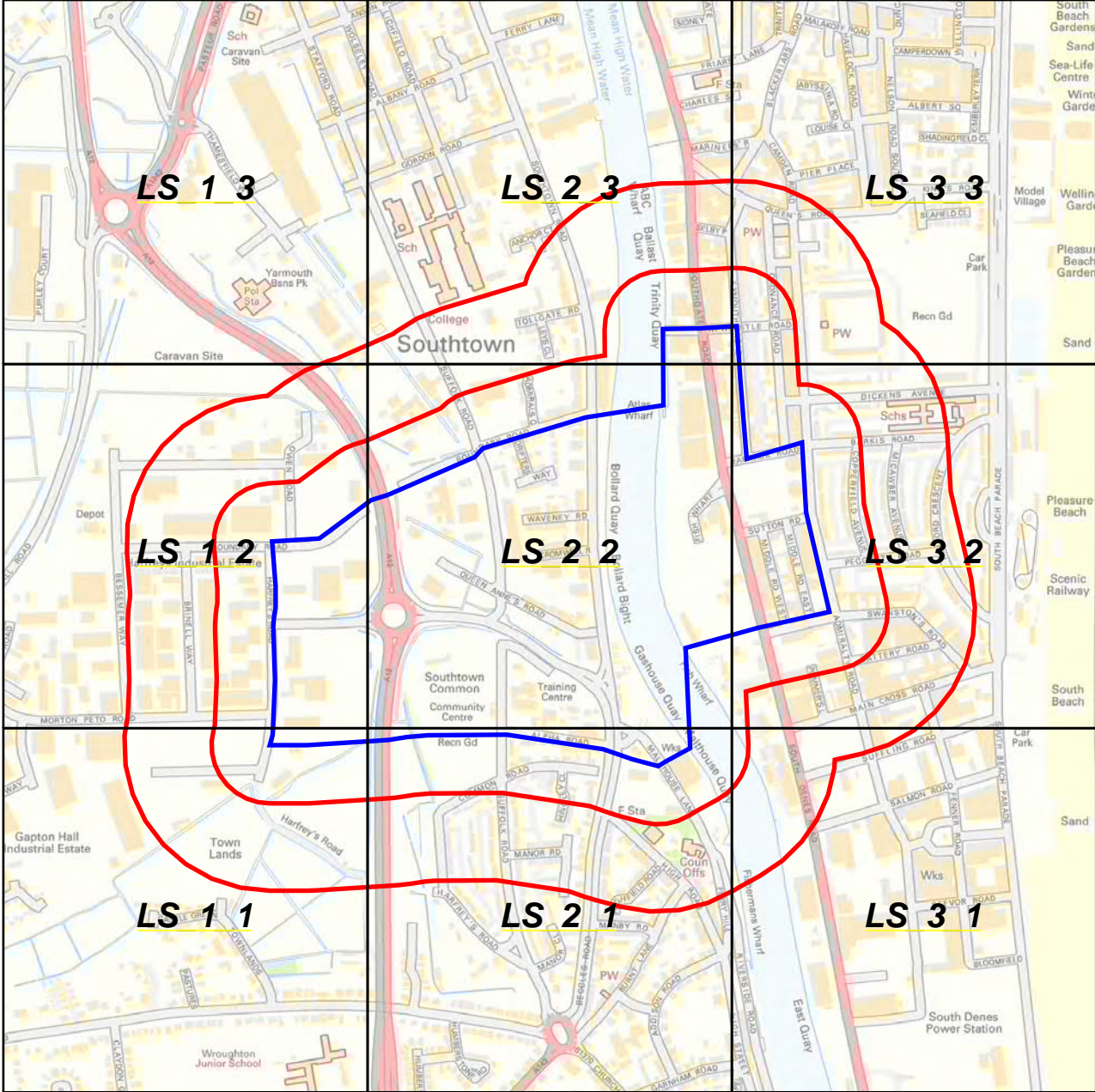
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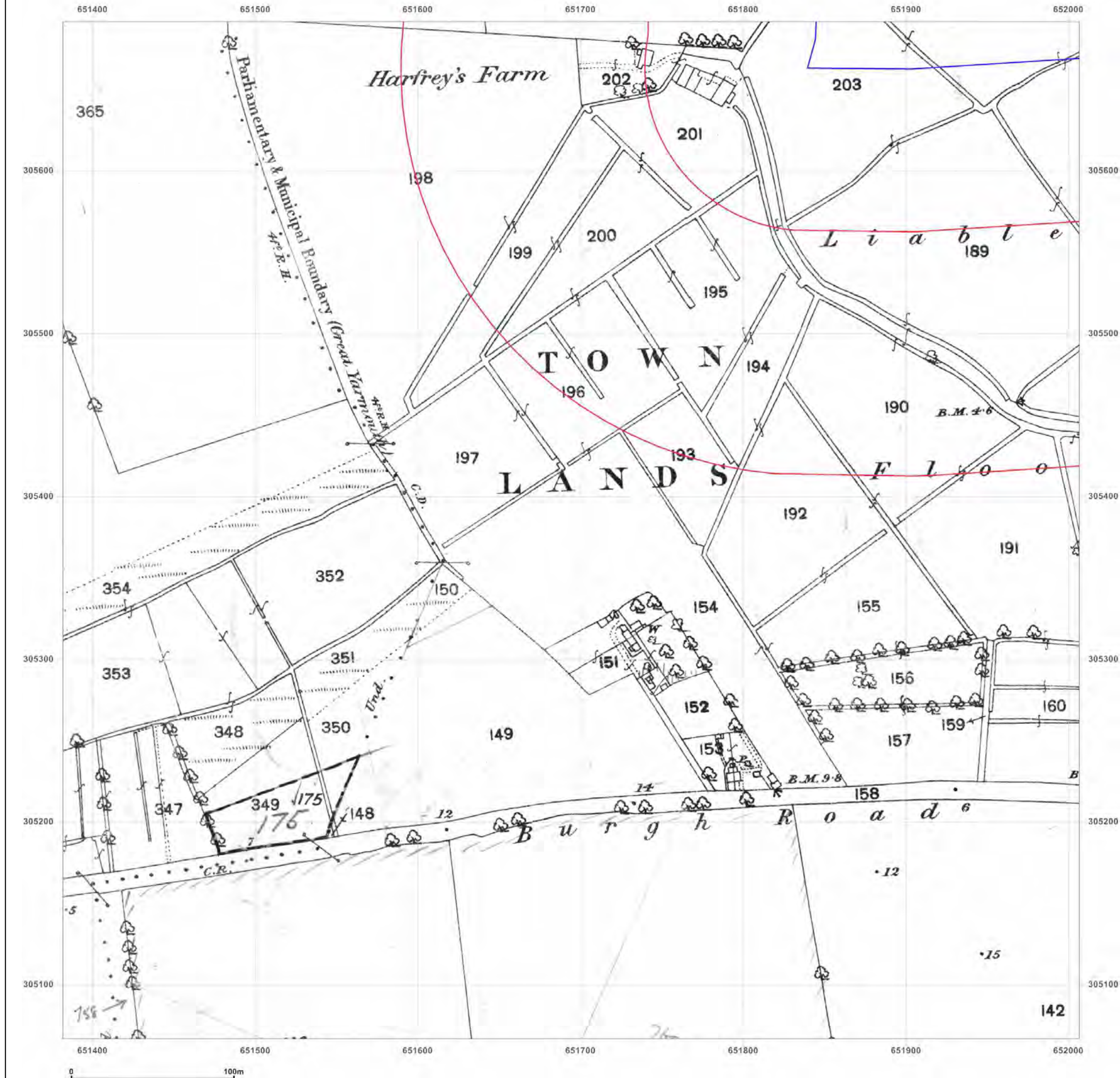
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Production date: 03 July 2017

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Site Details:

Client Ref: 16287  
Report Ref: CMAPS-CM-636391-16287-030717HIS\_LS\_1\_  
Grid Ref: 651694, 305379

Map Name: County Series

Map date: 1883

Scale: 1:2,500

Printed at: 1:2,500



Surveyed 1883  
Revised 1883  
Edition N/A  
Copyright N/A  
Levelled N/A



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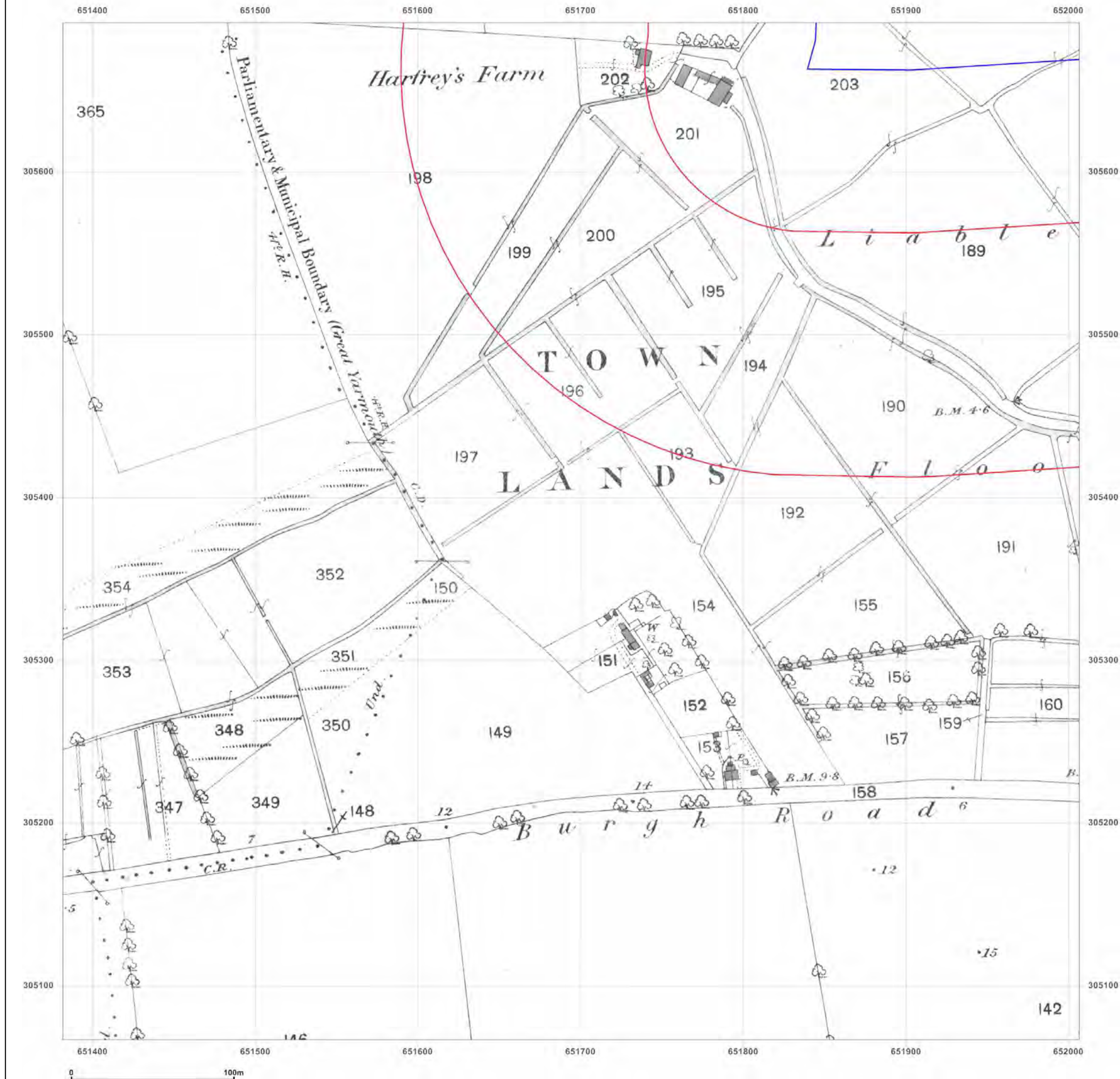


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Site Details:

Client Ref: 16287  
Report Ref: CMAPS-CM-636391-16287-030717HIS\_LS\_1\_1  
Grid Ref: 651694, 305379

Map Name: County Series

Map date: 1887

Scale: 1:2,500

Printed at: 1:2,500



Surveyed 1887  
Revised 1887  
Edition N/A  
Copyright N/A  
Levelled N/A



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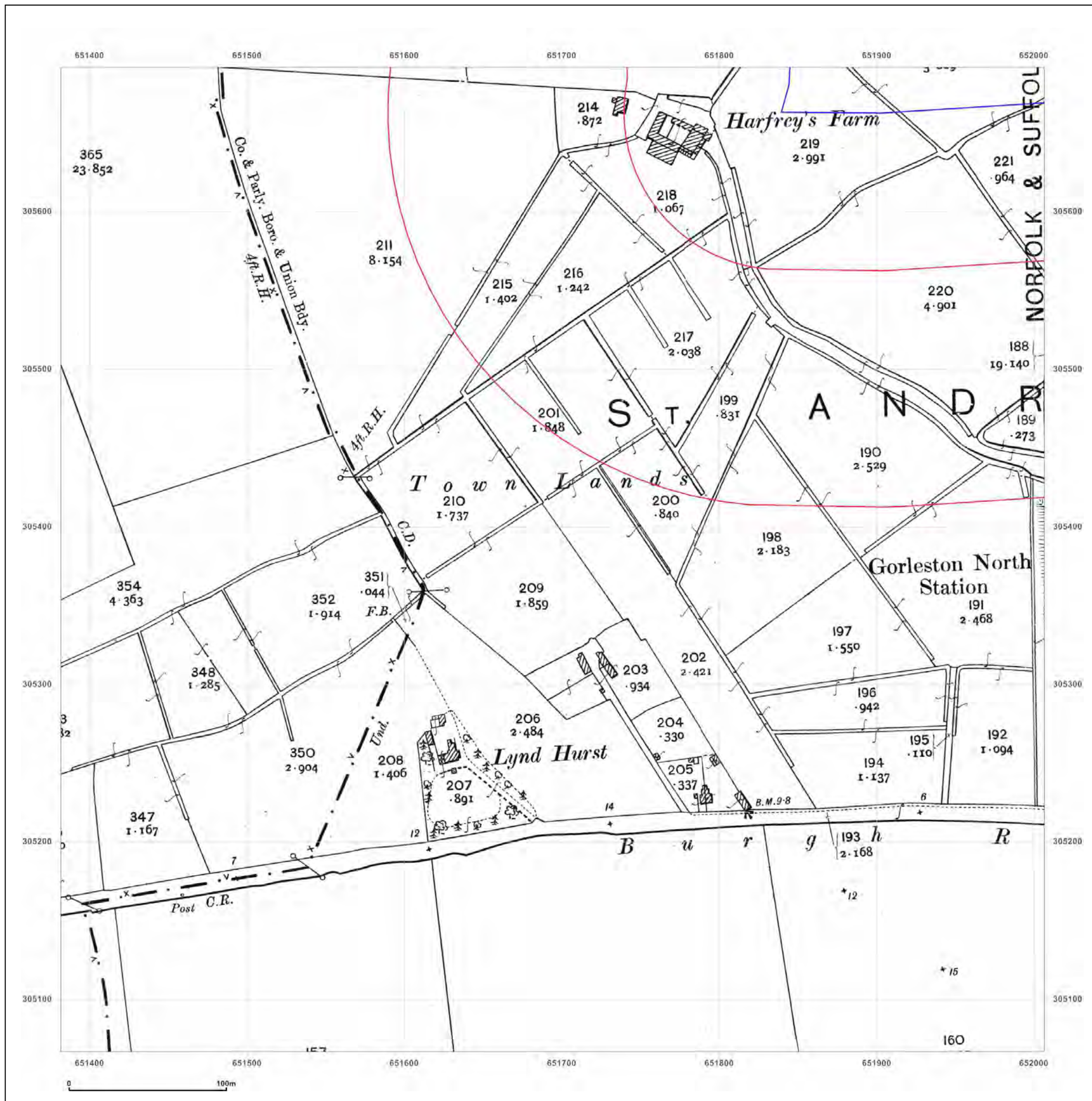


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Site Details:

Client Ref: 16287  
Report Ref: CMAPS-CM-636391-16287-030717HIS\_LS\_1\_  
Grid Ref: 651694, 305379

Map Name: County Series

Map date: 1906

Scale: 1:2,500

Printed at: 1:2,500



Surveyed 1883  
Revised 1904  
Edition 1906  
Copyright N/A  
Levelled N/A



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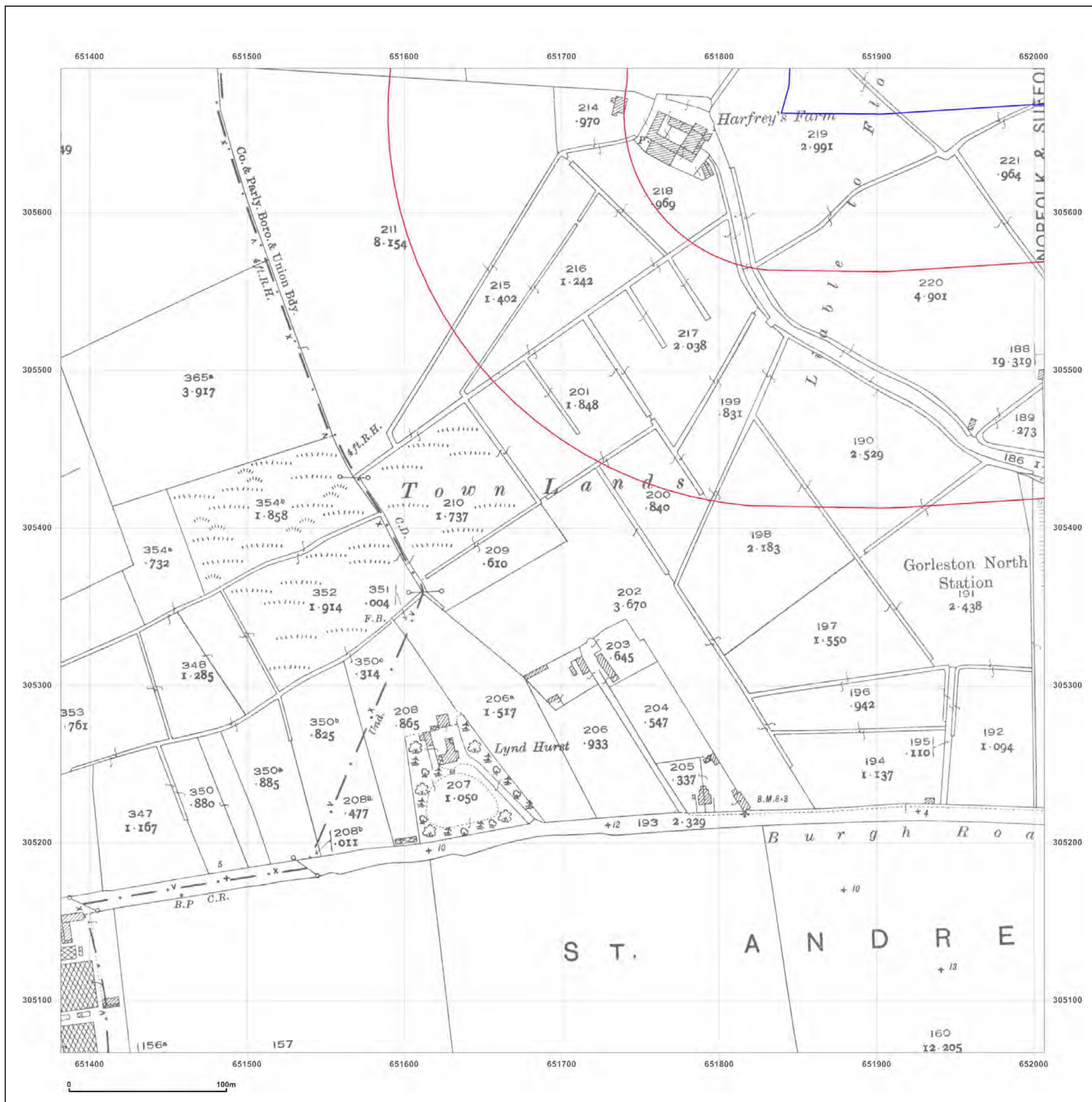


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Site Details:

Client Ref: 16287  
Report Ref: CMAPS-CM-636391-16287-030717HIS\_LS\_1\_  
Grid Ref: 651694, 305379

Map Name: County Series

Map date: 1927

Scale: 1:2,500

Printed at: 1:2,500



Surveyed 1927  
Revised 1927  
Edition N/A  
Copyright N/A  
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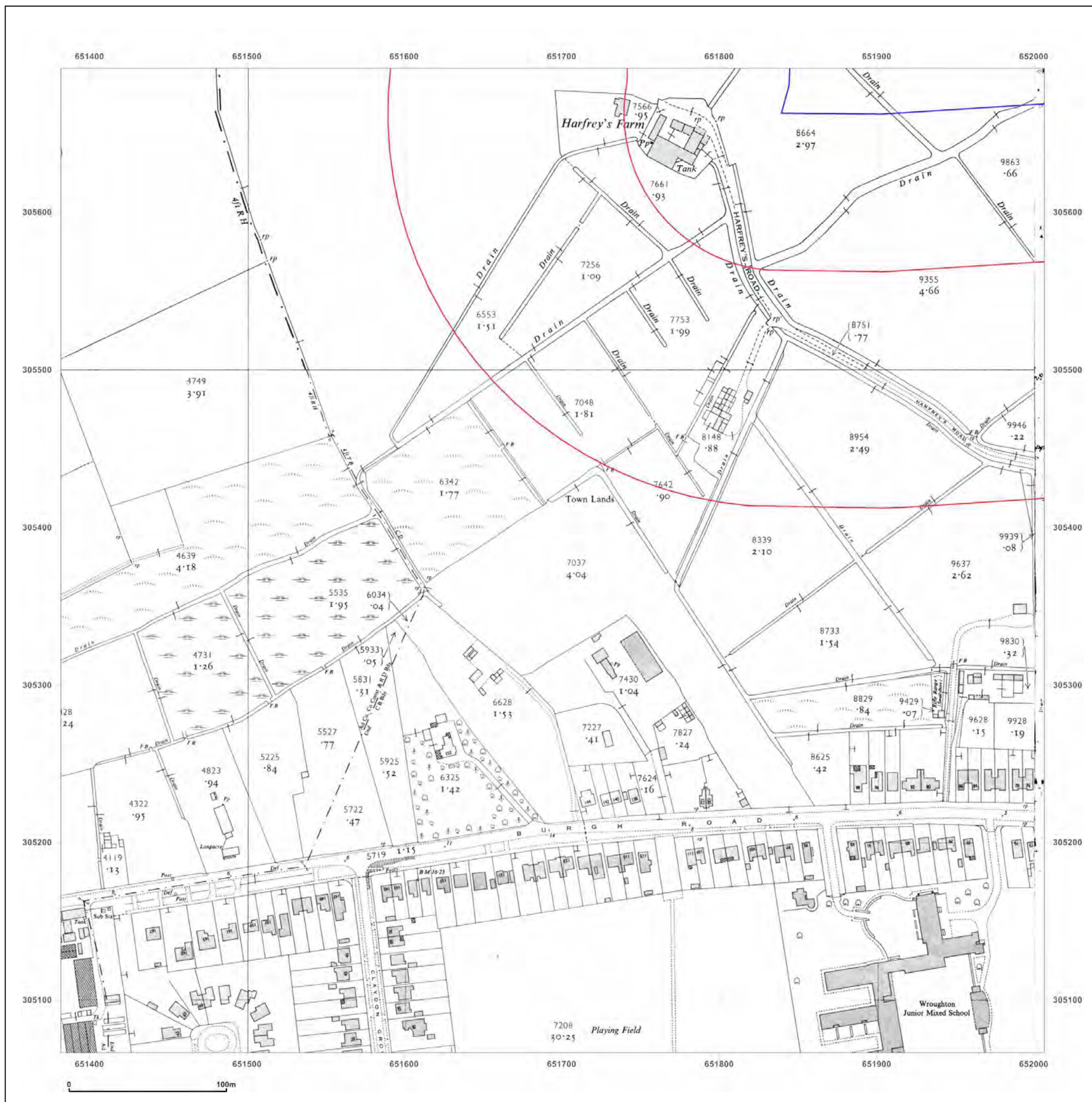


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Site Details:

Client Ref: 16287  
Report Ref: CMAPS-CM-636391-16287-030717HIS\_LS\_1\_  
Grid Ref: 651694, 305379

Map Name: National Grid

Map date: 1951-1955

Scale: 1:2,500

Printed at: 1:2,500



Surveyed 1955  
Revised 1955  
Edition 1957  
Copyright N/A  
Levelled 1946

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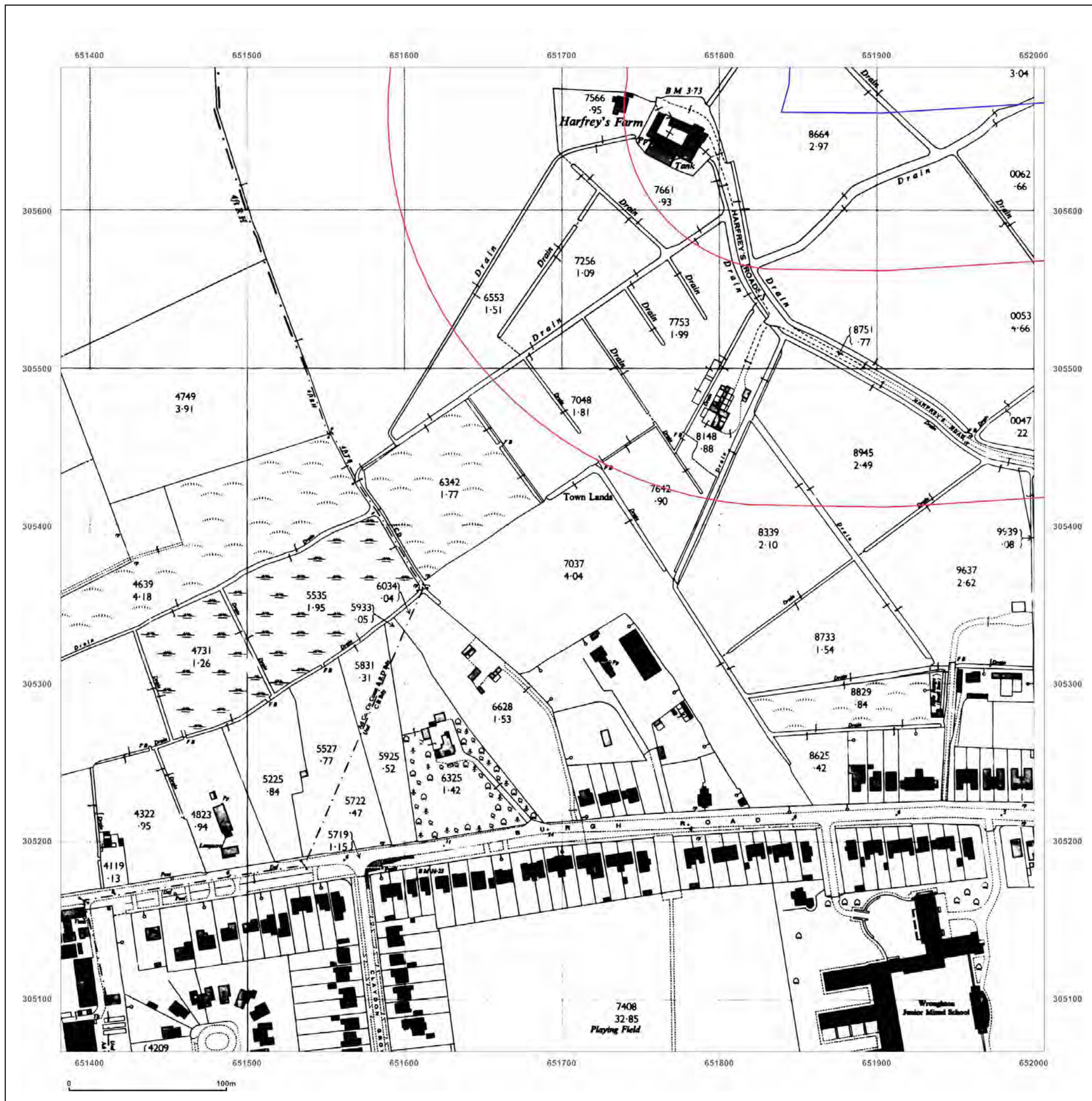


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**Site Details:**

Client Ref: 16287  
 Report Ref: CMAPS-CM-636391-16287-030717HIS\_LS\_1\_  
 Grid Ref: 651694, 305379

Map Name: National Grid

Map date: 1965

Scale: 1:2,500

Printed at: 1:2,500



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



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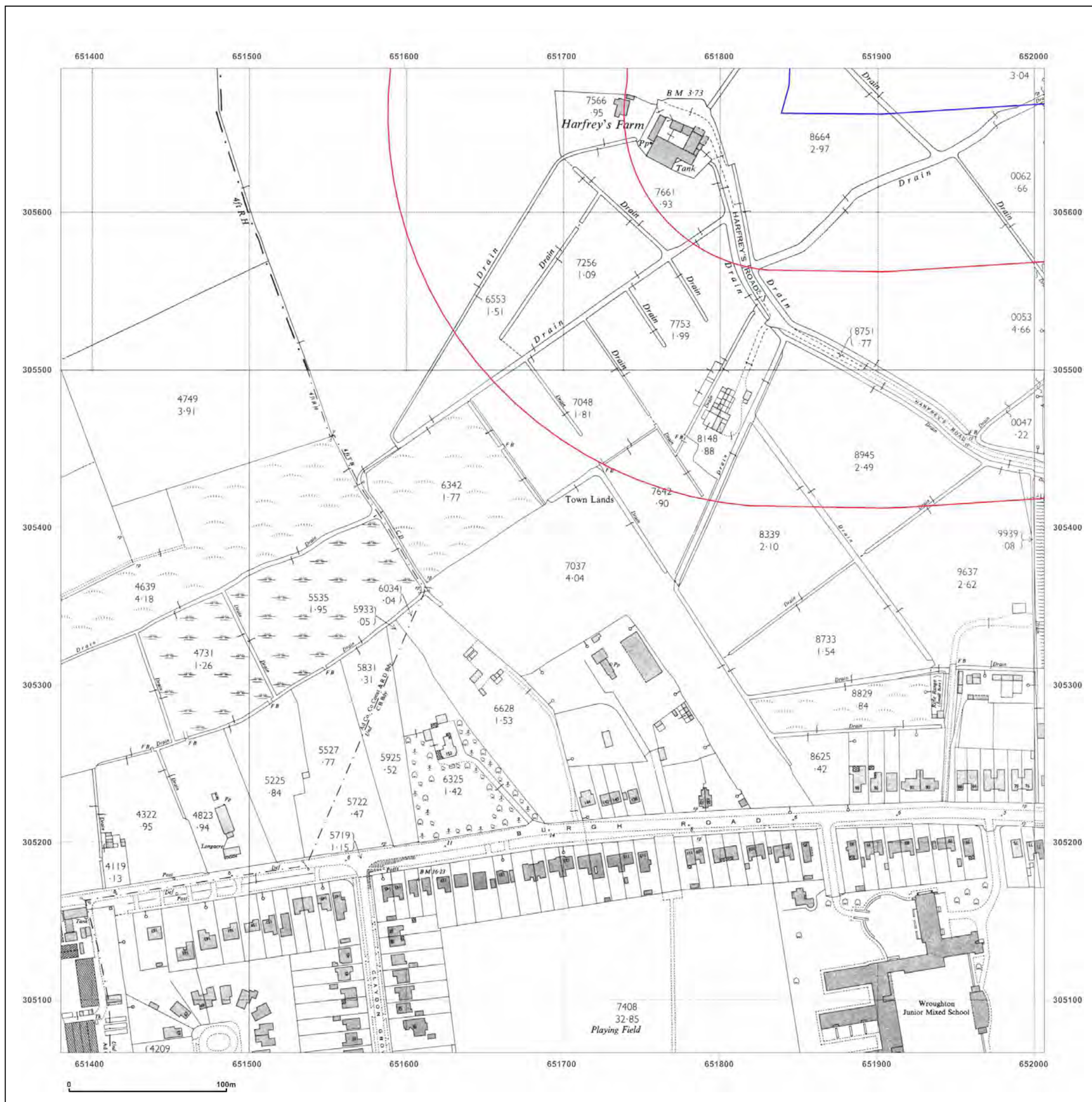
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**Site Details:**

**Client Ref:** 16287  
**Report Ref:** CMAPS-CM-636391-16287-030717HIS\_LS\_1\_  
**Grid Ref:** 651694, 305379

**Map Name:** National Grid

**Map date:** 1964-1968

**Scale:** 1:2,500

**Printed at:** 1:2,500



Surveyed 1964  
 Revised 1964  
 Edition 1965  
 Copyright 1965  
 Levelled 1958



Surveyed 1968  
 Revised 1968  
 Edition N/A  
 Copyright 1969  
 Levelled 1958



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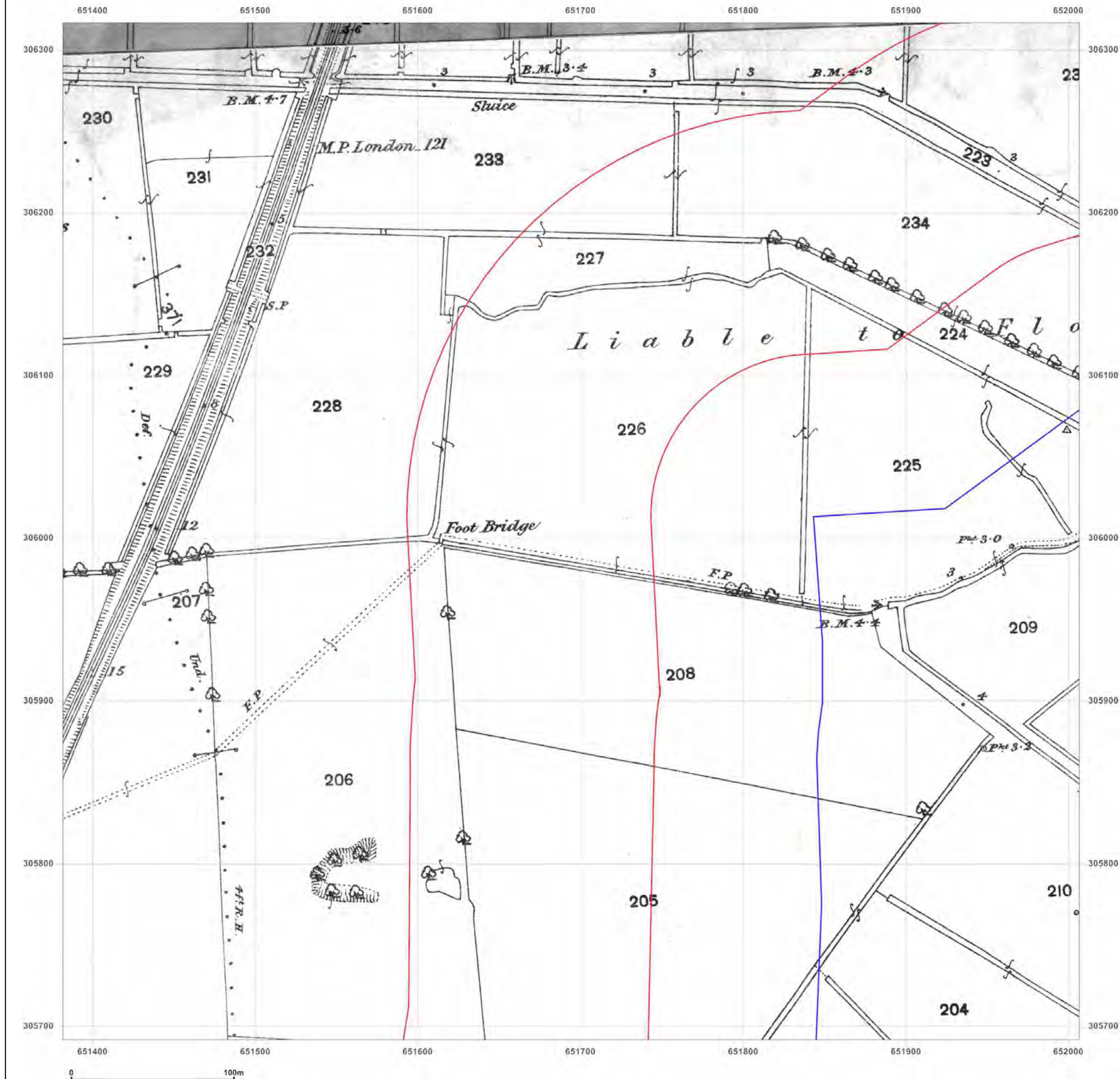


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Site Details:

Client Ref: 16287  
Report Ref: CMAPS-CM-636391-16287-030717HIS\_LS\_1\_2  
Grid Ref: 651694, 306004

Map Name: County Series

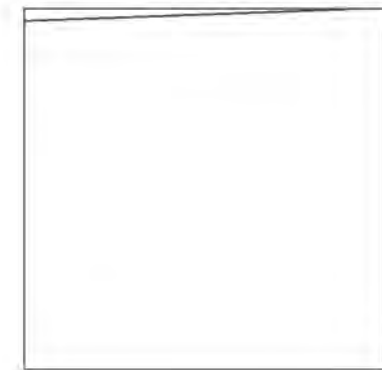
Map date: 1883

Scale: 1:2,500

Printed at: 1:2,500



Surveyed N/A  
Revised N/A  
Edition N/A  
Copyright N/A  
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Surveyed 1883  
Revised 1883  
Edition N/A  
Copyright N/A  
Levelled N/A



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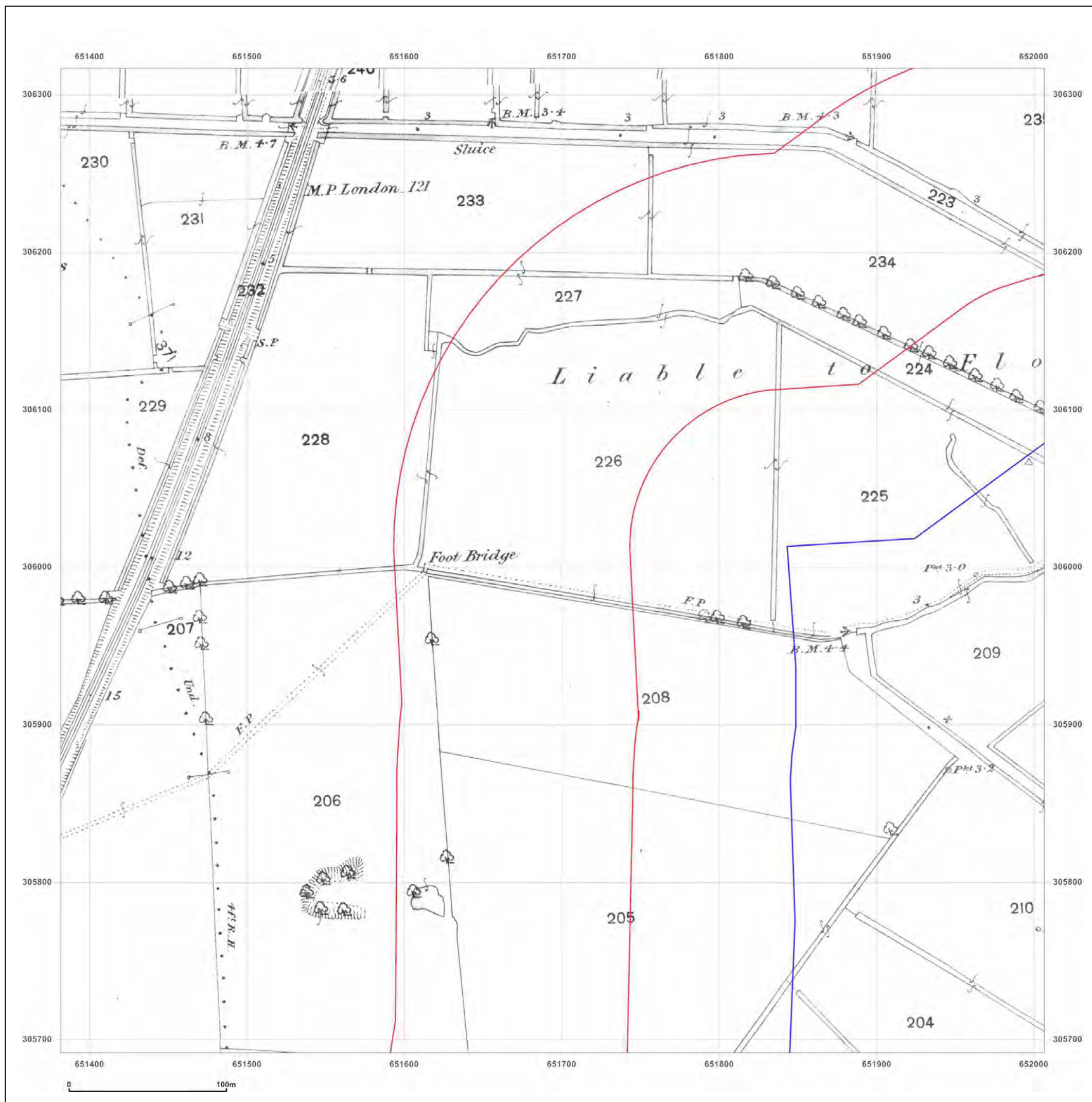


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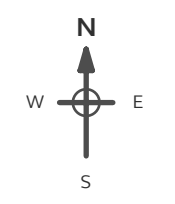
To view map legend click here [Legend](#)



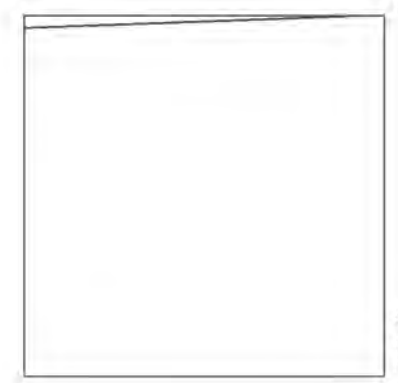
Site Details:

Client Ref: 16287  
Report Ref: CMAPS-CM-636391-16287-030717HIS\_LS\_1\_2  
Grid Ref: 651694, 306004

Map Name: County Series  
Map date: 1887  
Scale: 1:2,500  
Printed at: 1:2,500



Surveyed 1887  
Revised 1887  
Edition N/A  
Copyright N/A  
Levelled N/A



Surveyed 1887  
Revised 1887  
Edition N/A  
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**Site Details:**

**Client Ref:** 16287  
**Report Ref:** CMAPS-CM-636391-16287-030717HIS\_LS\_1\_2  
**Grid Ref:** 651694, 306004

**Map Name:** County Series

**Map date:** 1905-1906

**Scale:** 1:2,500

**Printed at:** 1:2,500



Surveyed 1905  
 Revised 1905  
 Edition N/A  
 Copyright N/A  
 Levelled N/A

Surveyed 1883  
 Revised 1904  
 Edition 1906  
 Copyright N/A  
 Levelled N/A



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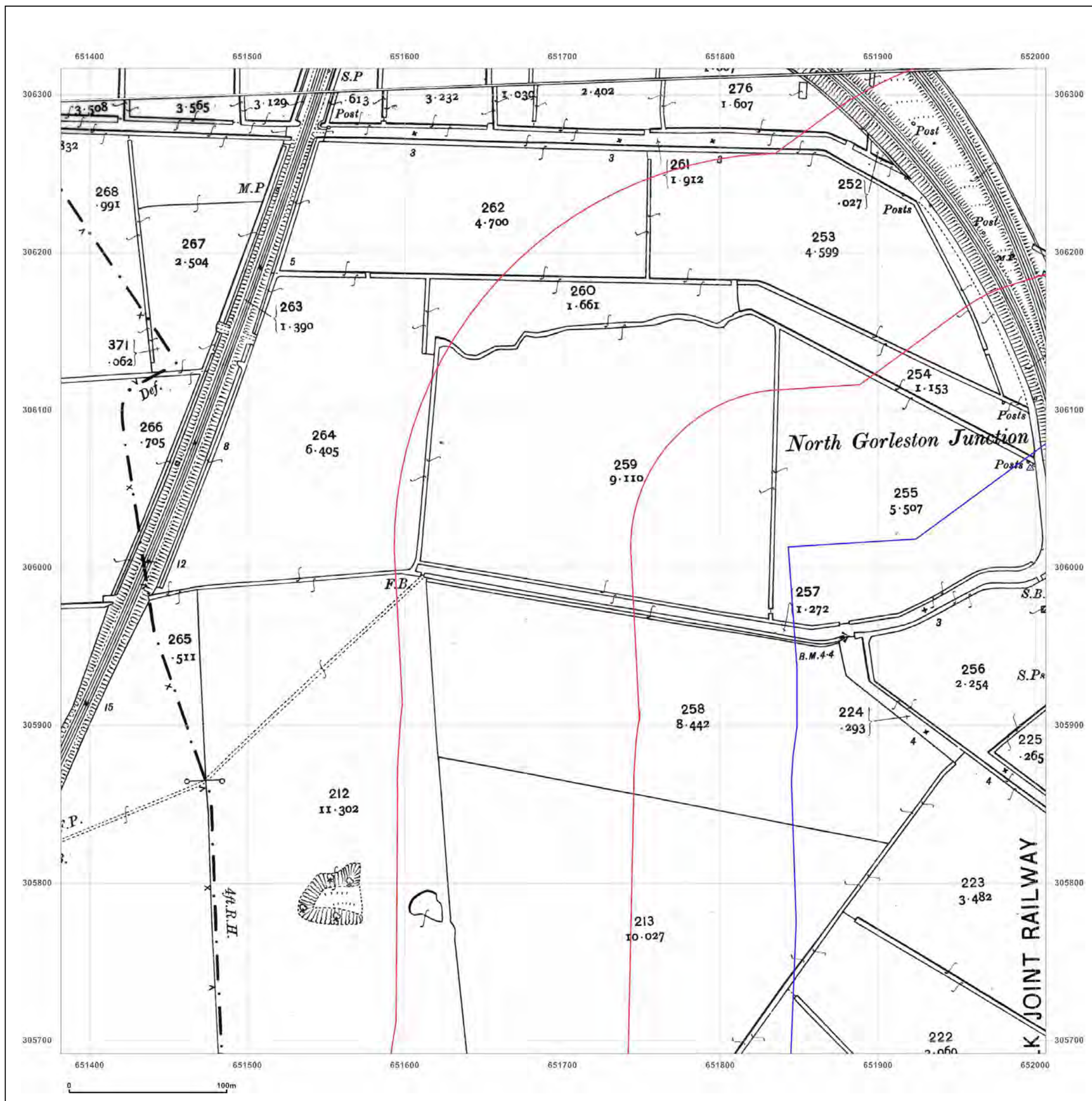


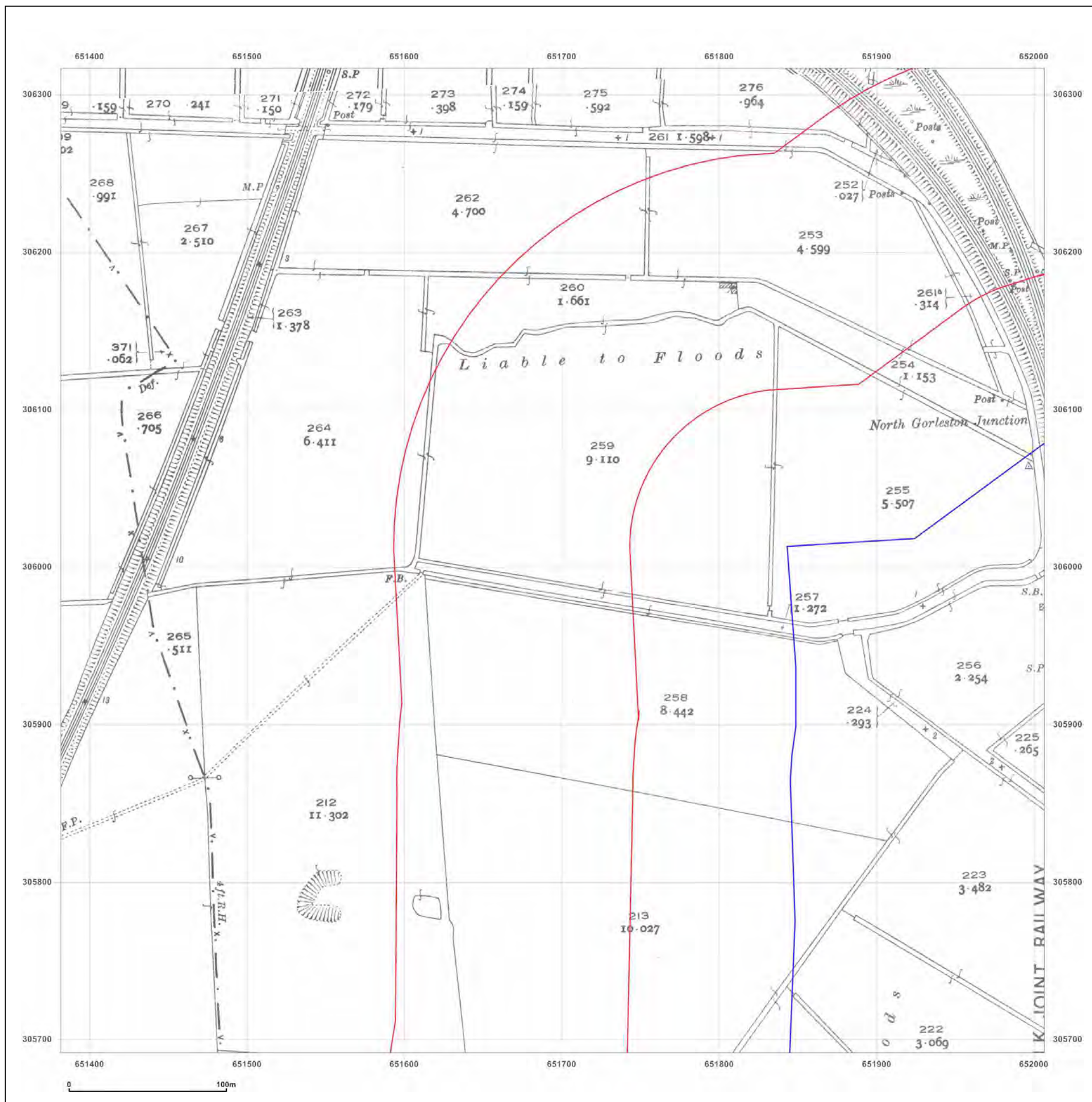
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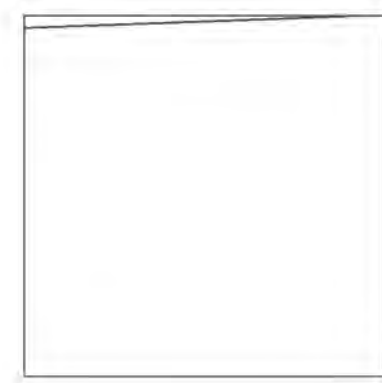


Client Ref: 16287  
 Report Ref: CMAPS-CM-636391-16287-030717HIS\_LS\_1\_2  
 Grid Ref: 651694, 306004

Map Name: County Series  
 Map date: 1927-1928  
 Scale: 1:2,500  
 Printed at: 1:2,500



Surveyed 1928  
 Revised 1928  
 Edition N/A  
 Copyright N/A  
 Levelled N/A



Surveyed 1927  
 Revised 1927  
 Edition N/A  
 Copyright N/A  
 Levelled N/A



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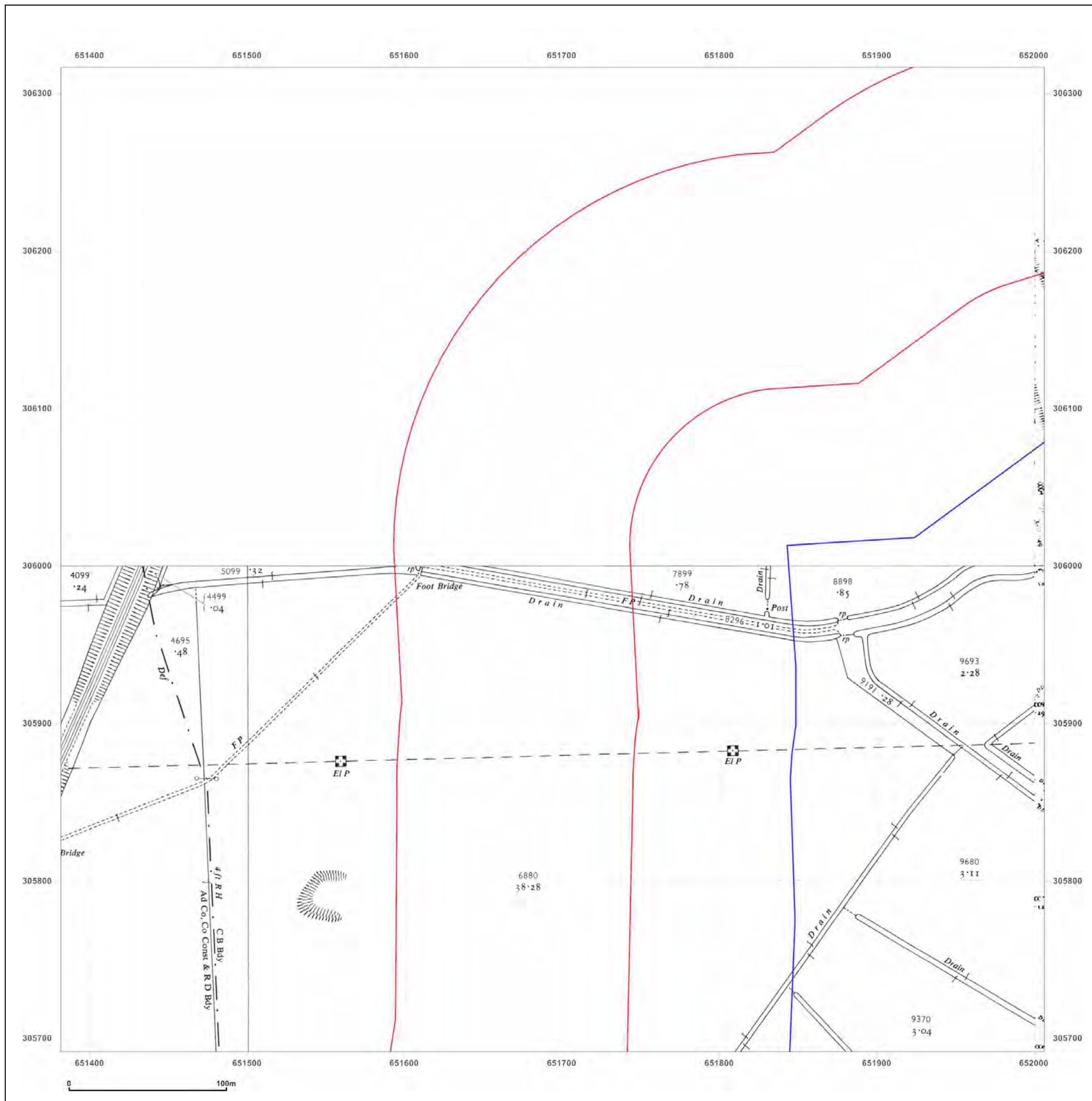


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**Site Details:**

**Client Ref:** 16287  
**Report Ref:** CMAPS-CM-636391-16287-030717HIS\_LS\_1\_2  
**Grid Ref:** 651694, 306004

**Map Name:** National Grid

**Map date:** 1951-1955

**Scale:** 1:2,500

**Printed at:** 1:2,500



Surveyed N/A	Revised N/A	Edition N/A	Copyright N/A	Levelled N/A
Surveyed 1955	Revised 1955	Edition 1957	Copyright N/A	Levelled 1946
Surveyed N/A	Revised N/A	Edition N/A	Copyright N/A	Levelled N/A



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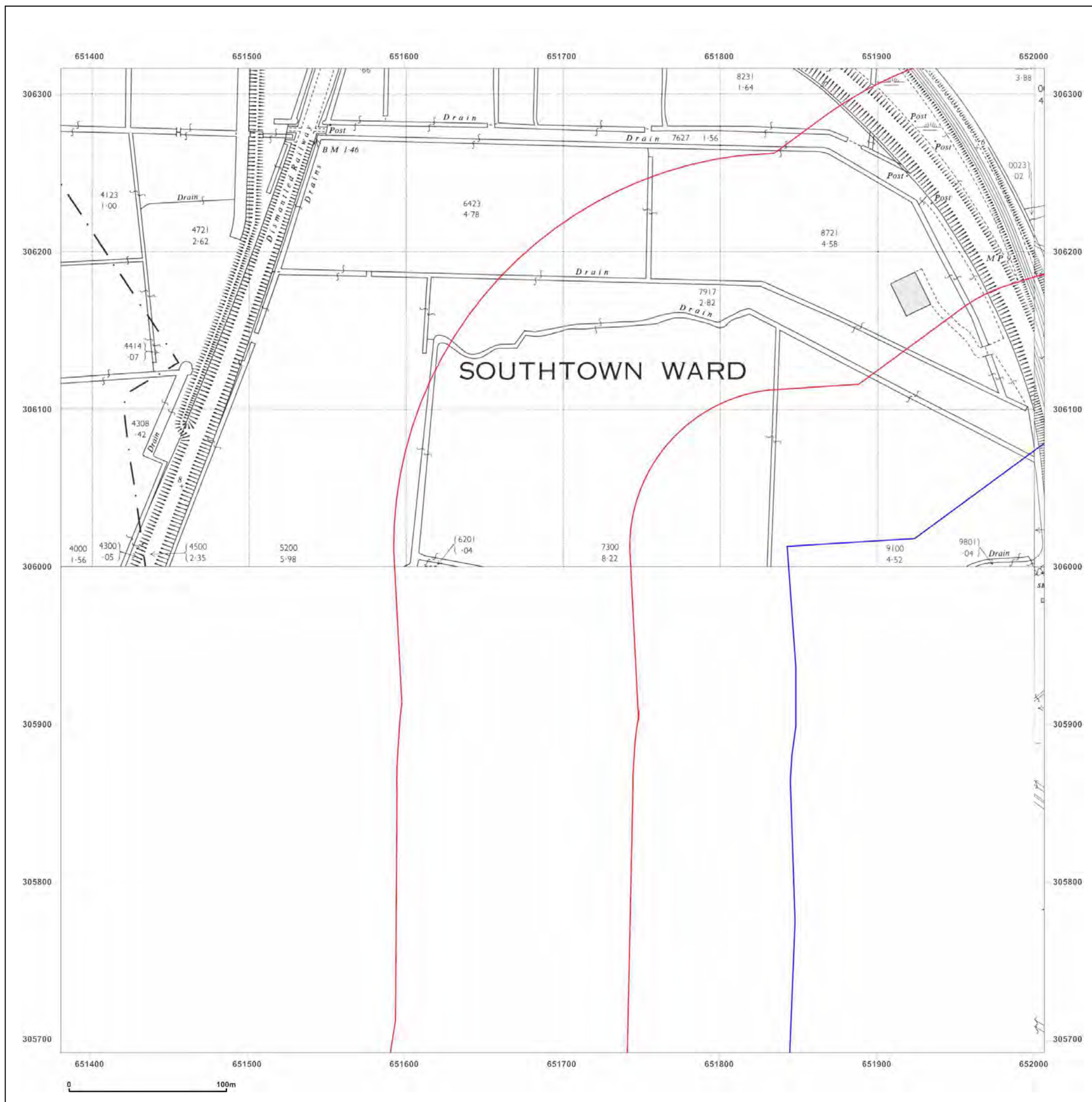


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**Site Details:**

**Client Ref:** 16287  
**Report Ref:** CMAPS-CM-636391-16287-030717HIS\_LS\_1\_2  
**Grid Ref:** 651694, 306004

**Map Name:** National Grid

**Map date:** 1958-1963

**Scale:** 1:2,500

**Printed at:** 1:2,500



Surveyed 1962  
Revised 1962  
Edition 1964  
Copyright 1964  
Levelled 1958

Surveyed 1963  
Revised 1963  
Edition 1965  
Copyright 1965  
Levelled 1958



Surveyed 1958  
Revised 1958  
Edition 1960  
Copyright 1960  
Levelled 1946



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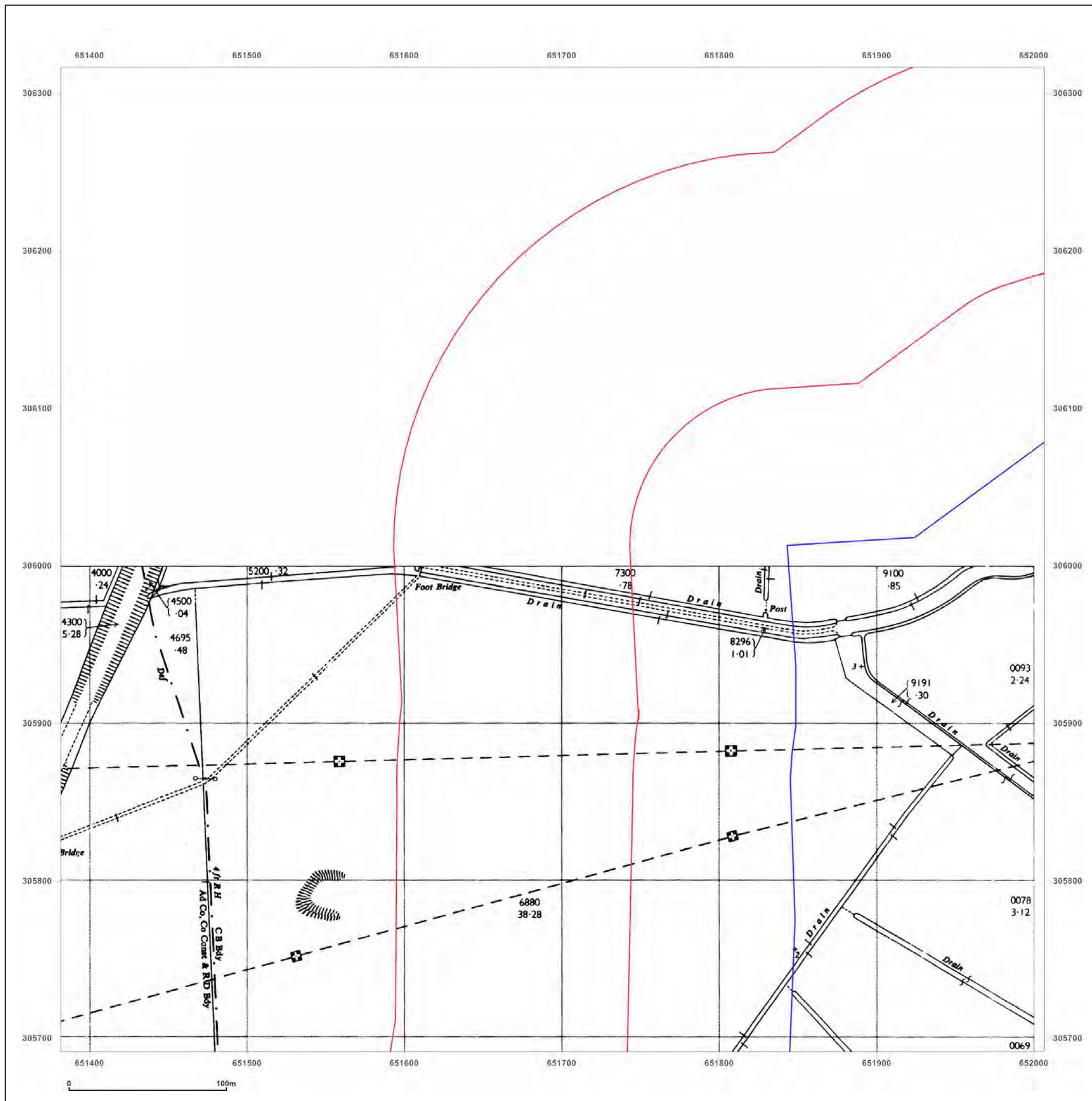


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**Site Details:**

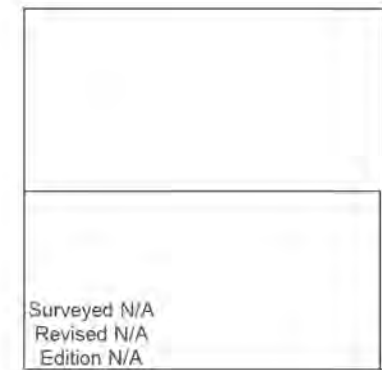
Client Ref: 16287  
 Report Ref: CMAPS-CM-636391-16287-030717HIS\_LS\_1\_2  
 Grid Ref: 651694, 306004

Map Name: National Grid

Map date: 1965

Scale: 1:2,500

Printed at: 1:2,500



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 Revised N/A  
 Edition N/A  
 Copyright N/A  
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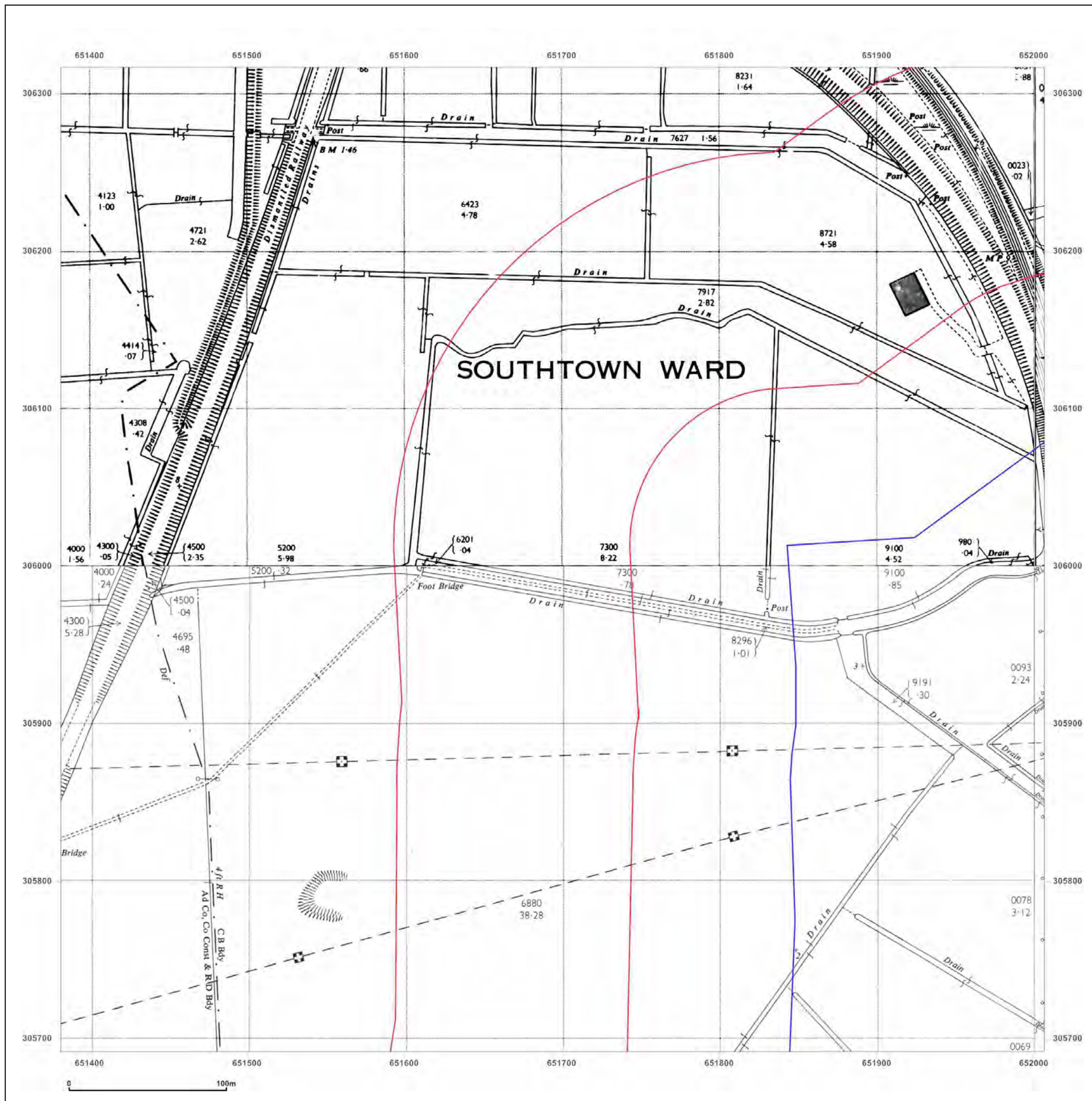
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**Site Details:**

Client Ref: 16287  
 Report Ref: CMAPS-CM-636391-16287-030717HIS\_LS\_1\_2  
 Grid Ref: 651694, 306004

Map Name: National Grid

Map date: 1964-1968

Scale: 1:2,500

Printed at: 1:2,500



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



Surveyed 1964  
 Revised 1964  
 Edition 1965  
 Copyright 1965  
 Levelled 1958

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

Surveyed 1968  
 Revised 1968  
 Edition N/A  
 Copyright 1969  
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Site Details:

Client Ref: 16287  
Report Ref: CMAPS-CM-636391-16287-030717HIS\_LS\_1\_2  
Grid Ref: 651694, 306004

Map Name: National Grid

Map date: 1978

Scale: 1:2,500

Printed at: 1:2,500



Surveyed 1978  
Revised 1978  
Edition N/A  
Copyright 1978  
Levelled N/A



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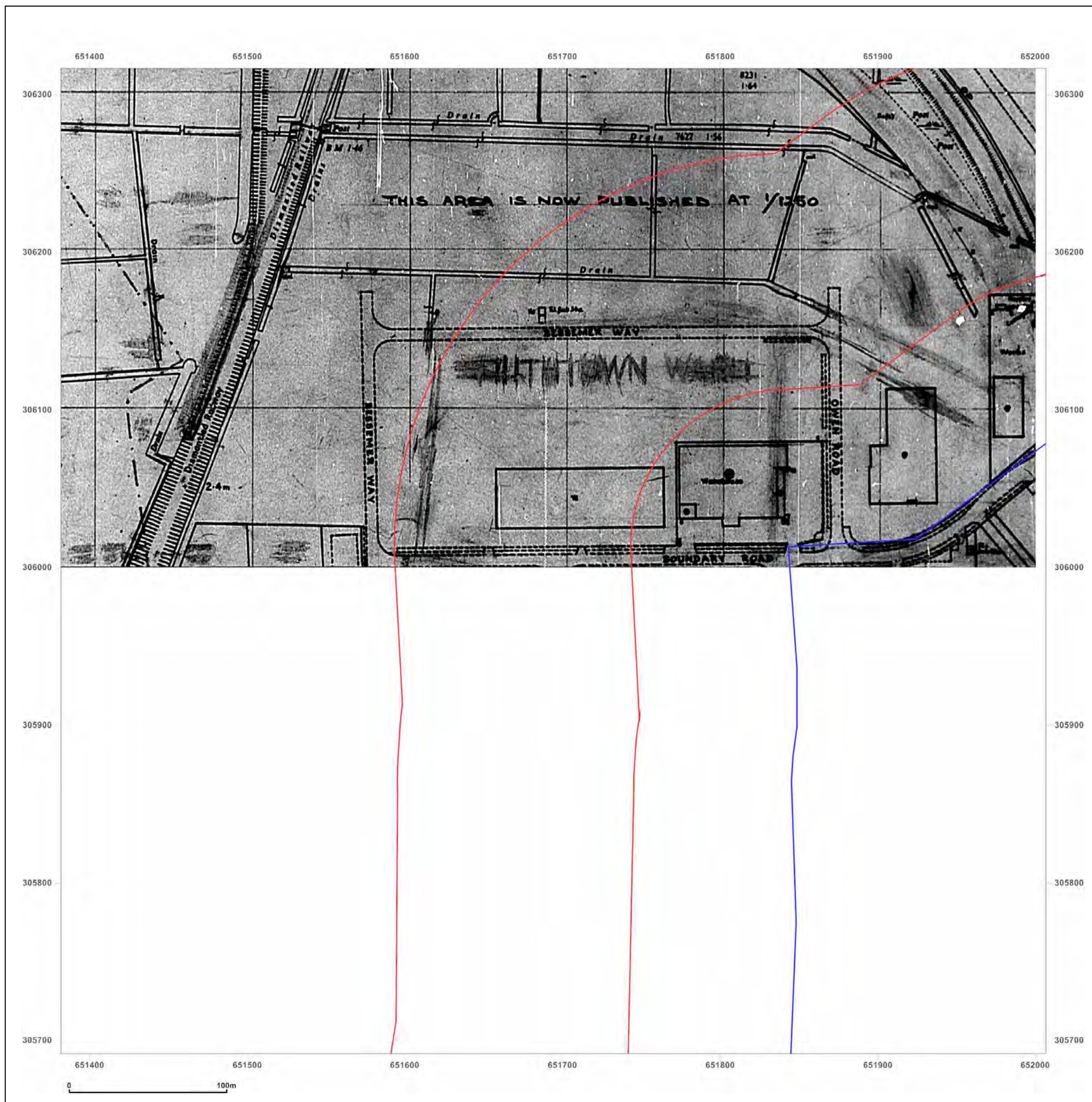


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Site Details:

Client Ref: 16287  
Report Ref: CMAPS-CM-636391-16287-030717HIS\_LS\_1\_3  
Grid Ref: 651694, 306630

Map Name: County Series

Map date: 1883

Scale: 1:2,500

Printed at: 1:2,500



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

Surveyed 1883  
Revised 1883  
Edition N/A  
Copyright N/A  
Levelled N/A



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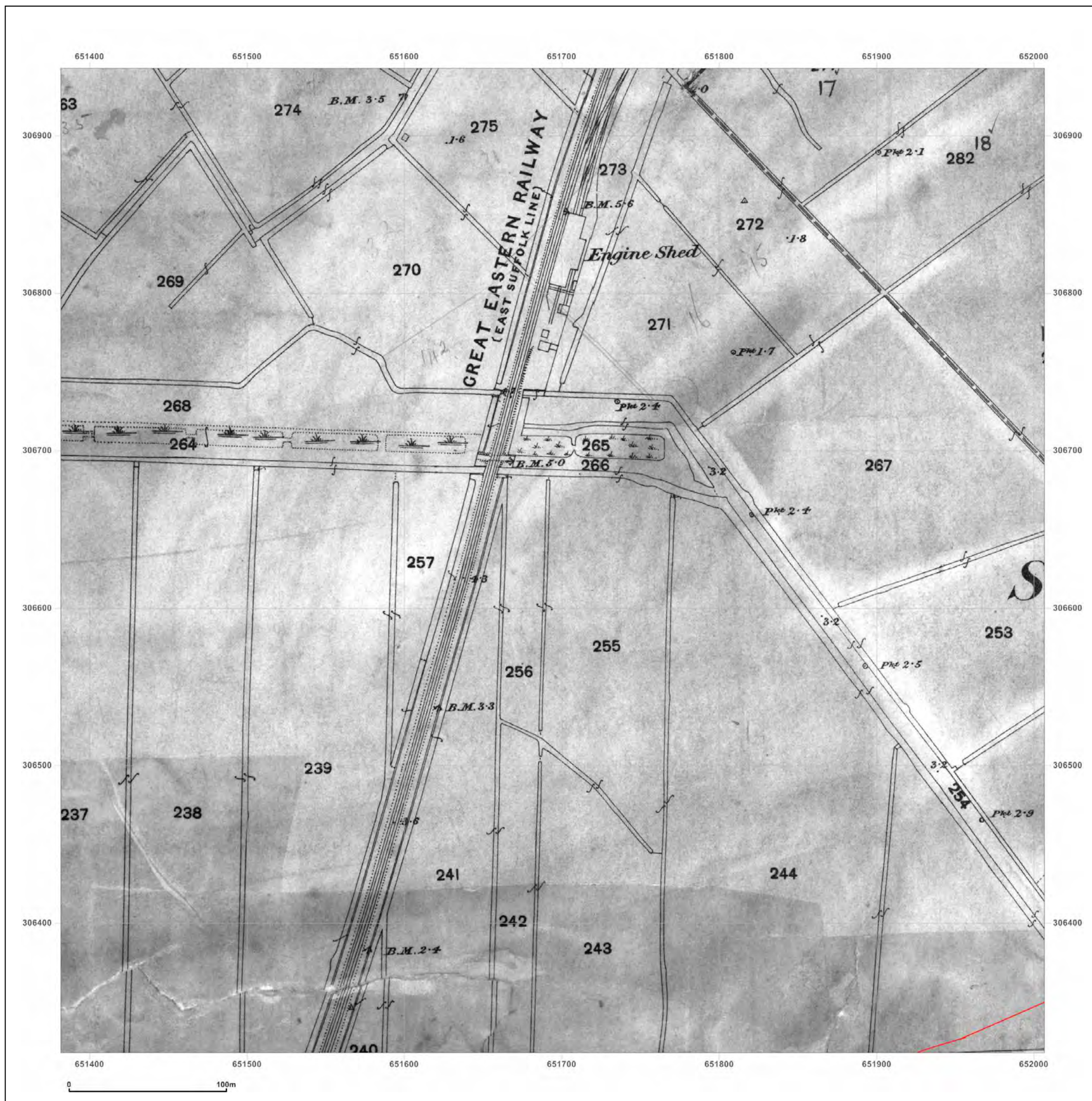


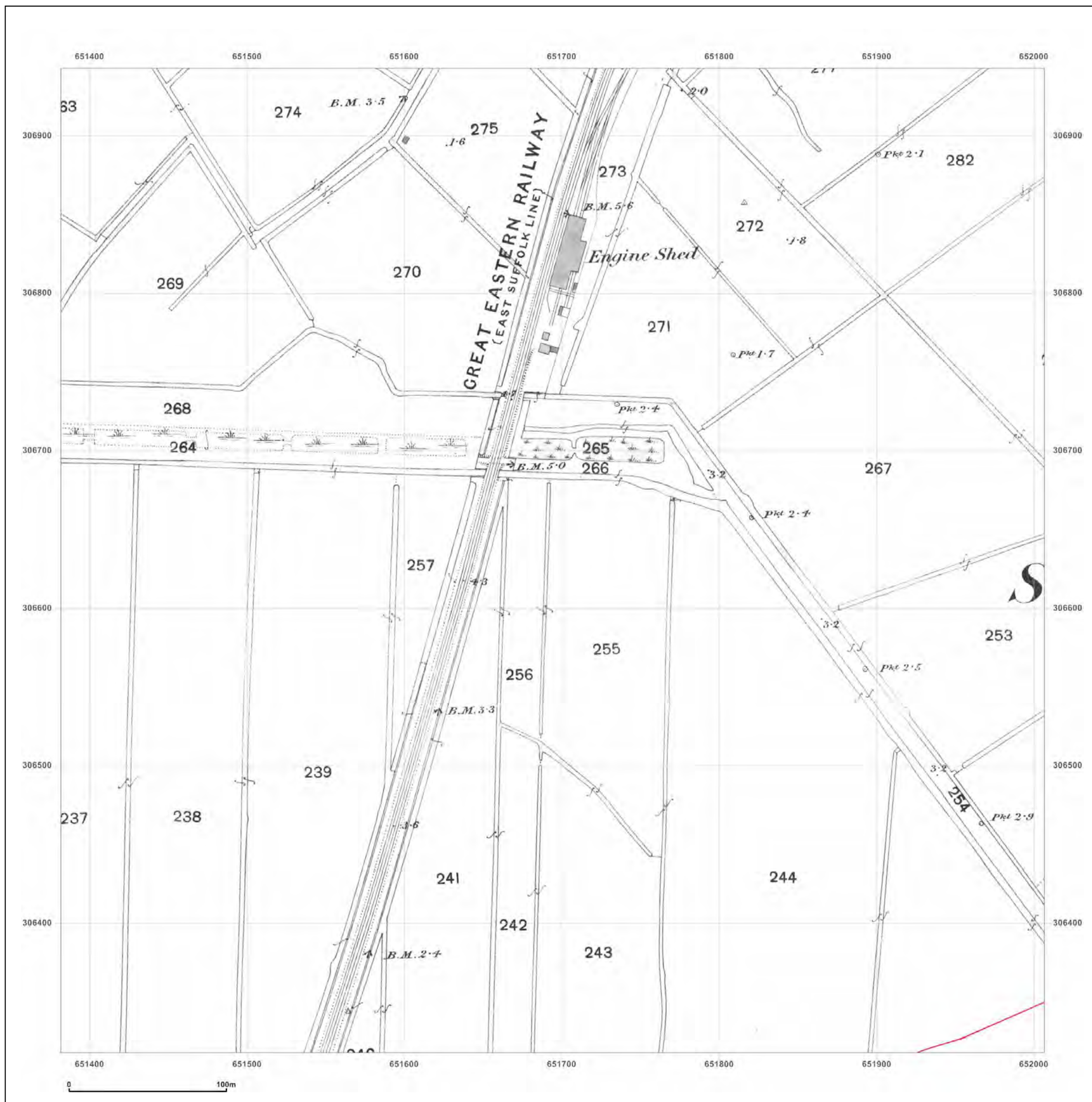
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**Site Details:**

**Client Ref:** 16287  
**Report Ref:** CMAPS-CM-636391-16287-030717HIS\_LS\_1\_3  
**Grid Ref:** 651694, 306630

**Map Name:** County Series

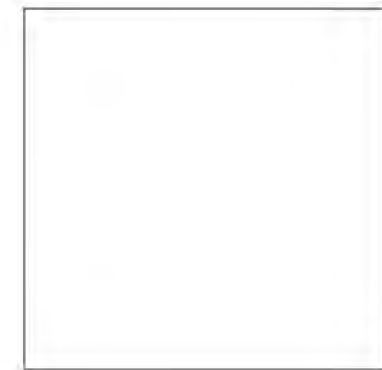
**Map date:** 1887

**Scale:** 1:2,500

**Printed at:** 1:2,500



Surveyed 1887  
Revised 1887  
Edition N/A  
Copyright N/A  
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Surveyed 1887  
Revised 1887  
Edition N/A  
Copyright N/A  
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**Site Details:**

**Client Ref:** 16287  
**Report Ref:** CMAPS-CM-636391-16287-030717HIS\_LS\_1\_3  
**Grid Ref:** 651694, 306630

**Map Name:** County Series

**Map date:** 1905-1906

**Scale:** 1:2,500

**Printed at:** 1:2,500



Surveyed 1905  
 Revised 1905  
 Edition N/A  
 Copyright N/A  
 Levelled N/A

Surveyed 1883  
 Revised 1904  
 Edition 1906  
 Copyright N/A  
 Levelled N/A



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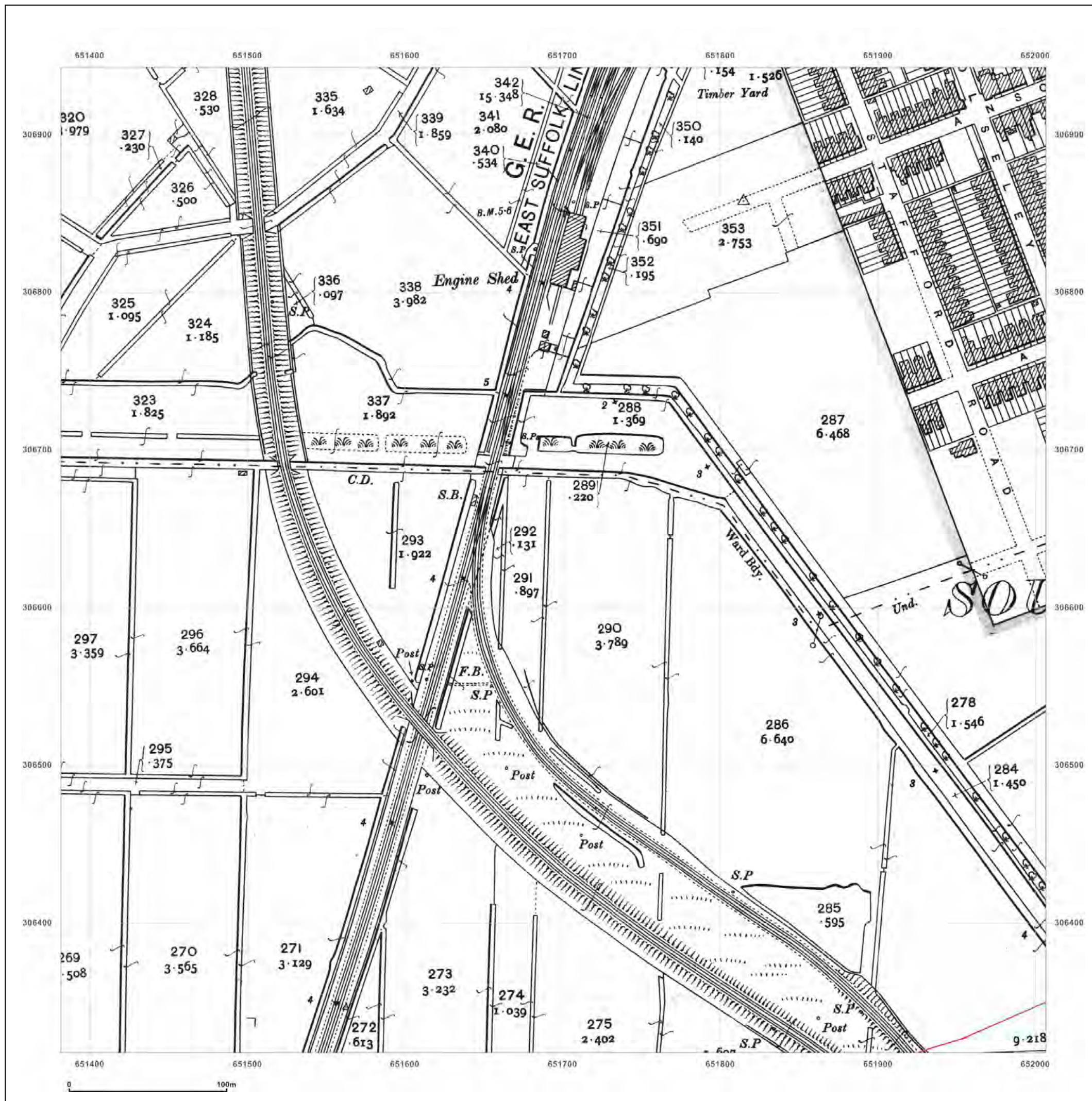


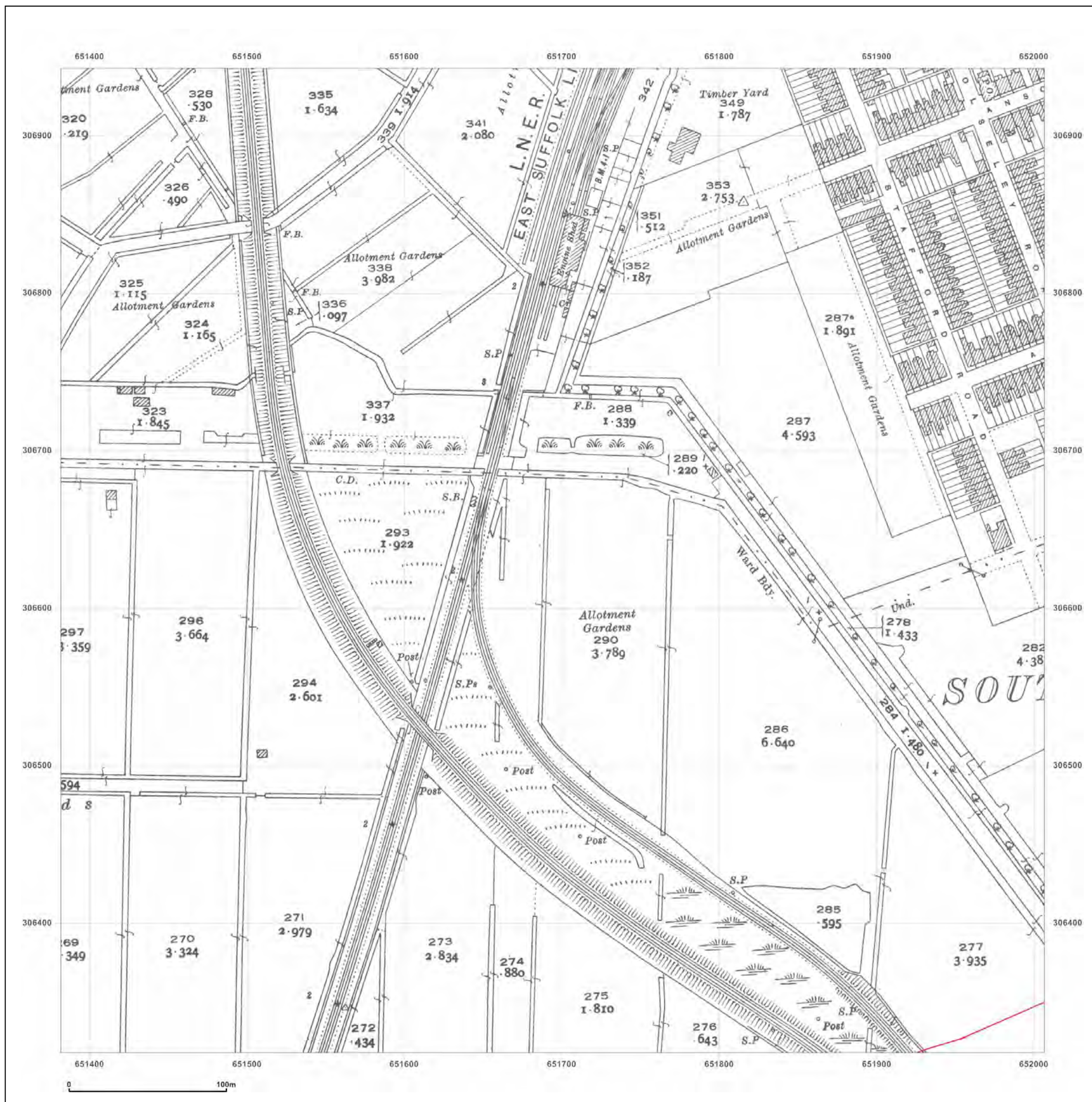
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**Site Details:**

Client Ref: 16287  
 Report Ref: CMAPS-CM-636391-16287-030717HIS\_LS\_1\_3  
 Grid Ref: 651694, 306630

Map Name: County Series

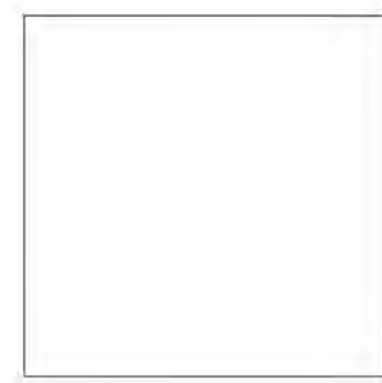
Map date: 1927-1928

Scale: 1:2,500

Printed at: 1:2,500



Surveyed 1928  
 Revised 1928  
 Edition N/A  
 Copyright N/A  
 Levelled N/A



Surveyed 1927  
 Revised 1927  
 Edition N/A  
 Copyright N/A  
 Levelled N/A



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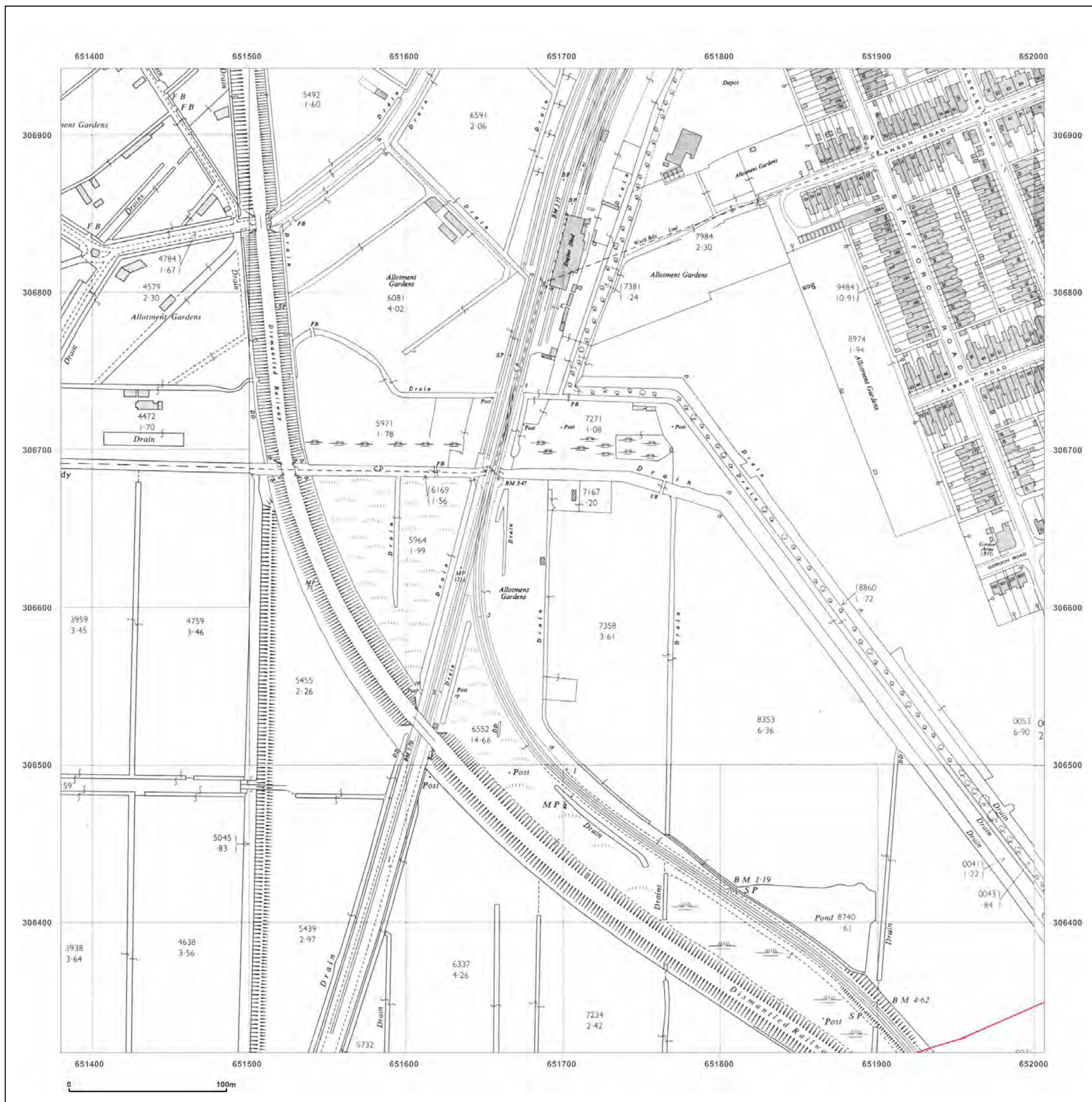


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**Site Details:**

**Client Ref:** 16287  
**Report Ref:** CMAPS-CM-636391-16287-030717HIS\_LS\_1\_3  
**Grid Ref:** 651694, 306630

**Map Name:** National Grid

**Map date:** 1962-1963

**Scale:** 1:2,500

**Printed at:** 1:2,500



Surveyed 1962  
 Revised 1962  
 Edition 1964  
 Copyright 1964  
 Levelled 1958

Surveyed 1963  
 Revised 1963  
 Edition 1965  
 Copyright 1965  
 Levelled 1958



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Site Details:

Client Ref: 16287  
 Report Ref: CMAPS-CM-636391-16287-030717HIS\_LS\_1\_3  
 Grid Ref: 651694, 306630

Map Name: National Grid

Map date: 1964-1965

Scale: 1:2,500

Printed at: 1:2,500



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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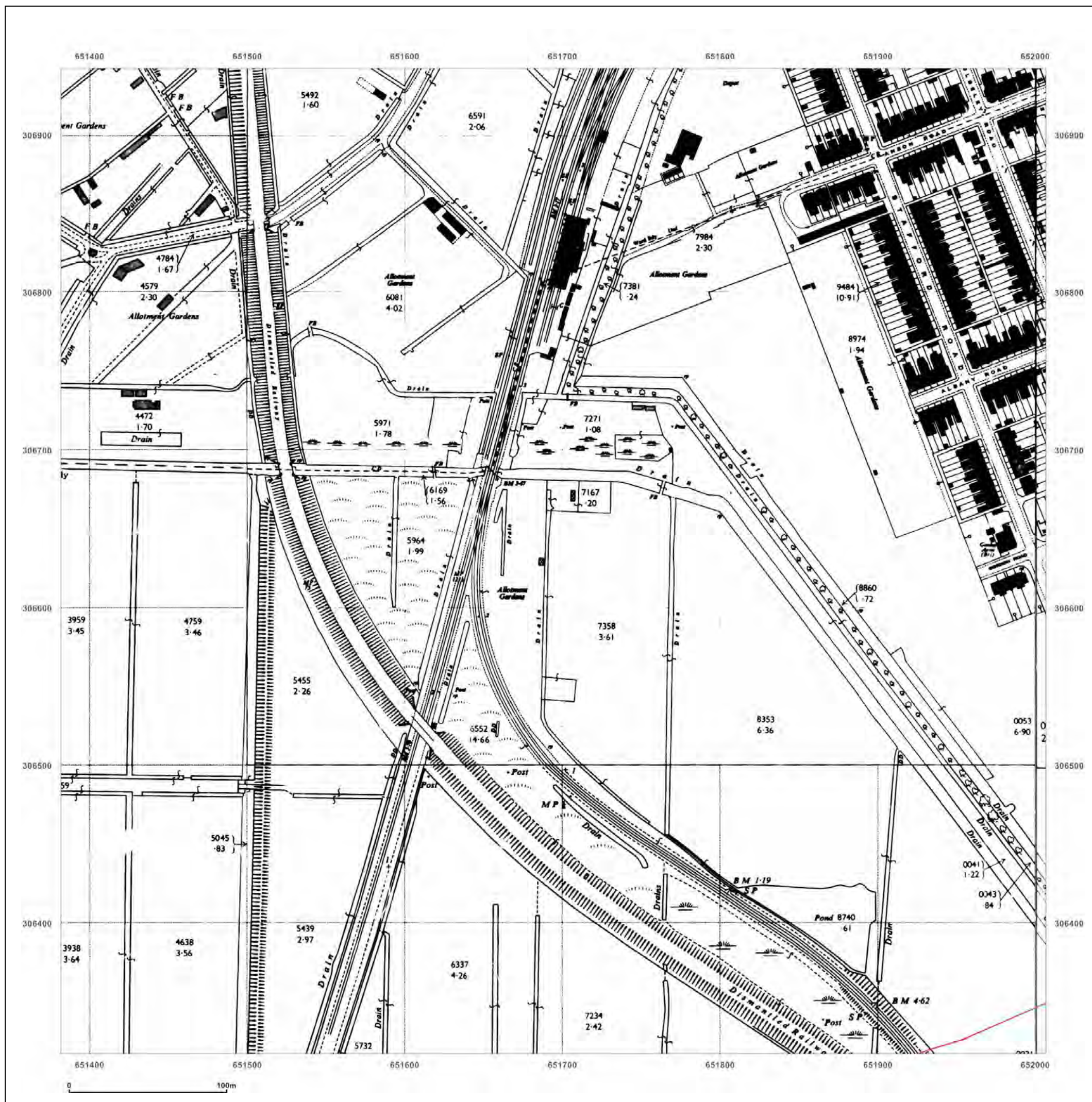


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Site Details:

Client Ref: 16287  
Report Ref: CMAPS-CM-636391-16287-030717HIS\_LS\_1\_3  
Grid Ref: 651694, 306630

Map Name: National Grid

Map date: 1978

Scale: 1:2,500

Printed at: 1:2,500



Surveyed 1978  
Revised 1978  
Edition N/A  
Copyright 1978  
Levelled N/A



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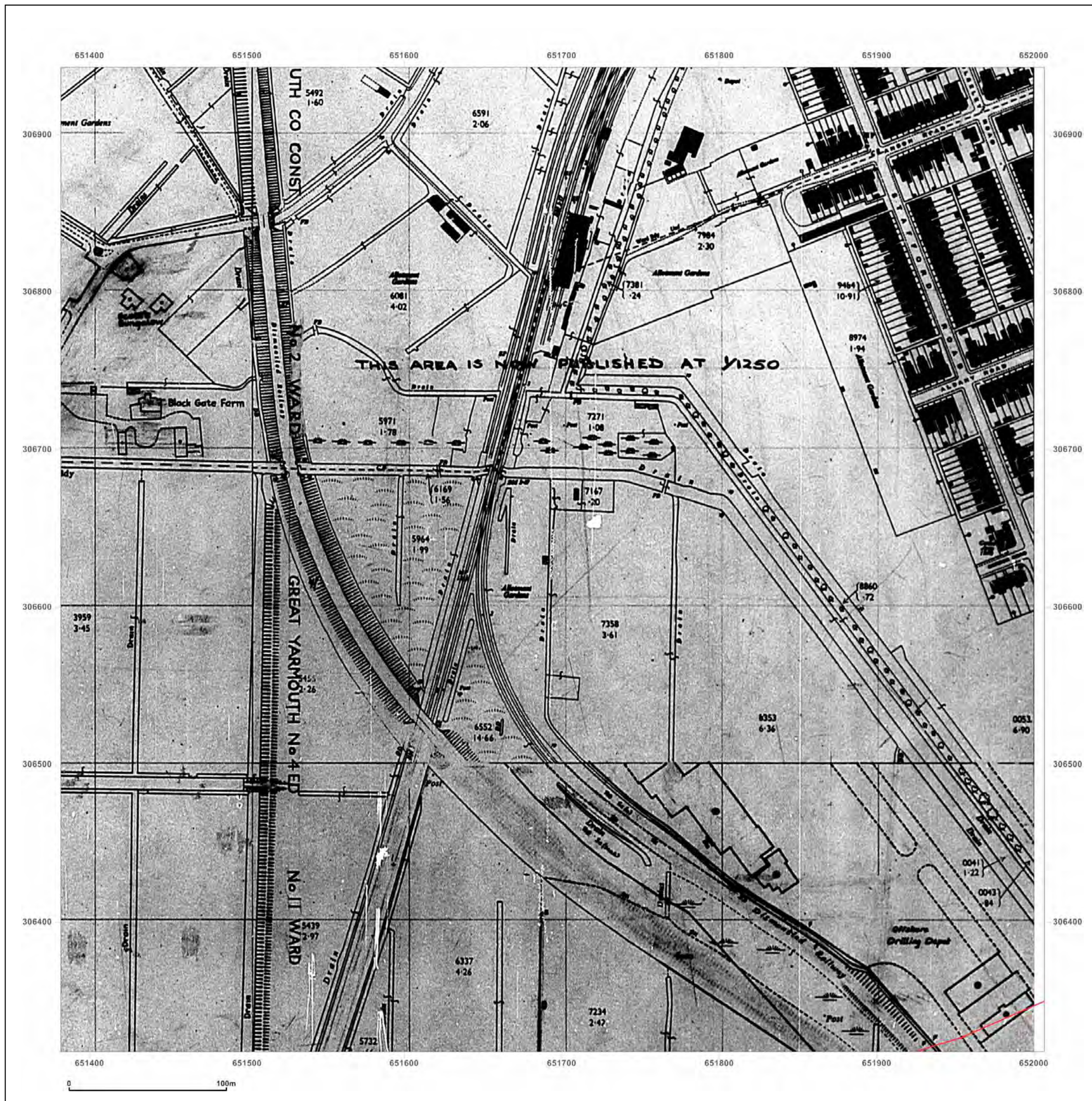


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Site Details:

Client Ref: 16287  
 Report Ref: CMAPS-CM-636391-16287-030717HIS\_LS\_2\_  
 Grid Ref: 652319, 305379

Map Name: County Series

Map date: 1883

Scale: 1:2,500

Printed at: 1:2,500



Surveyed 1883  
 Revised 1883  
 Edition N/A  
 Copyright N/A  
 Levelled N/A



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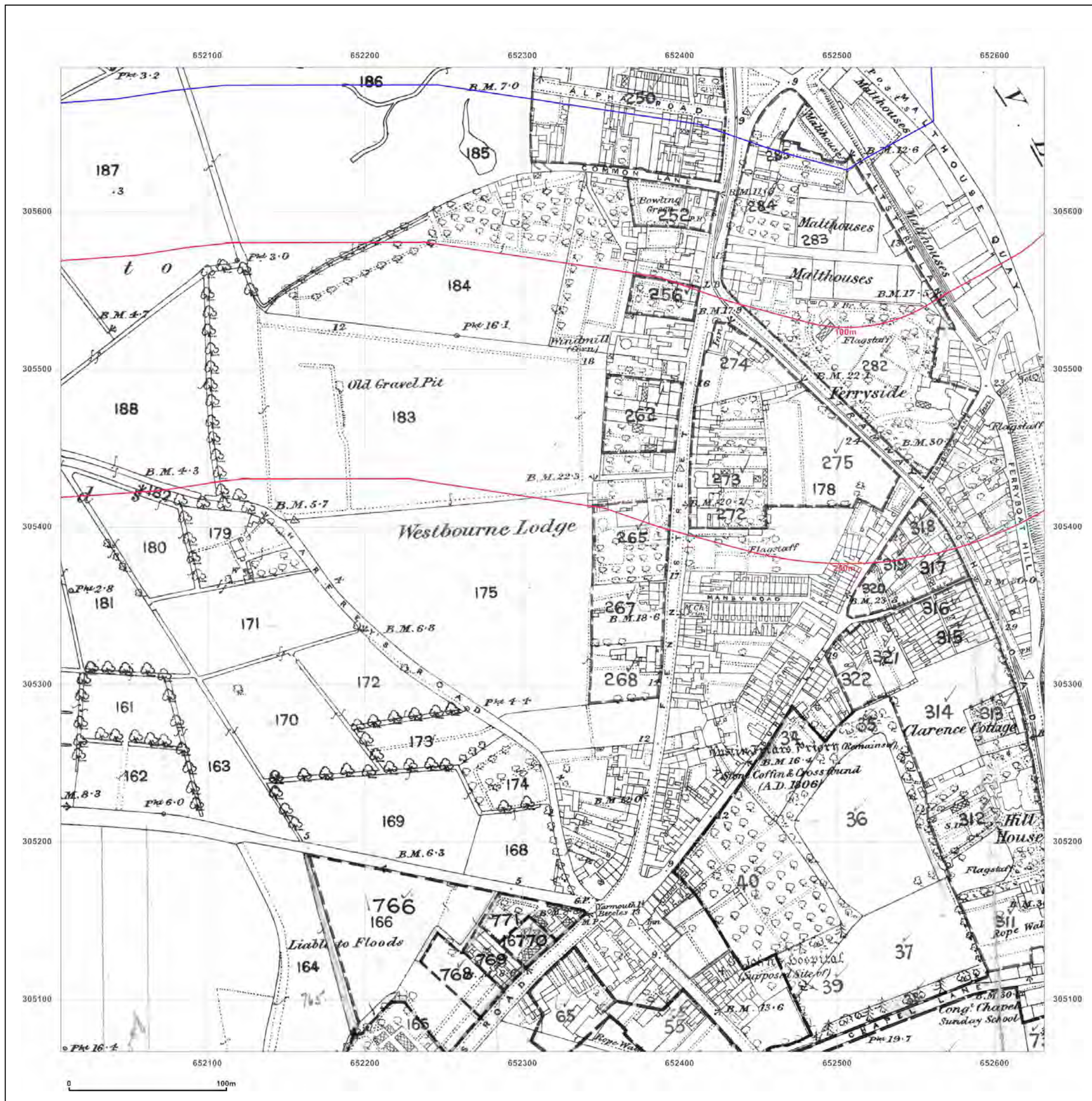


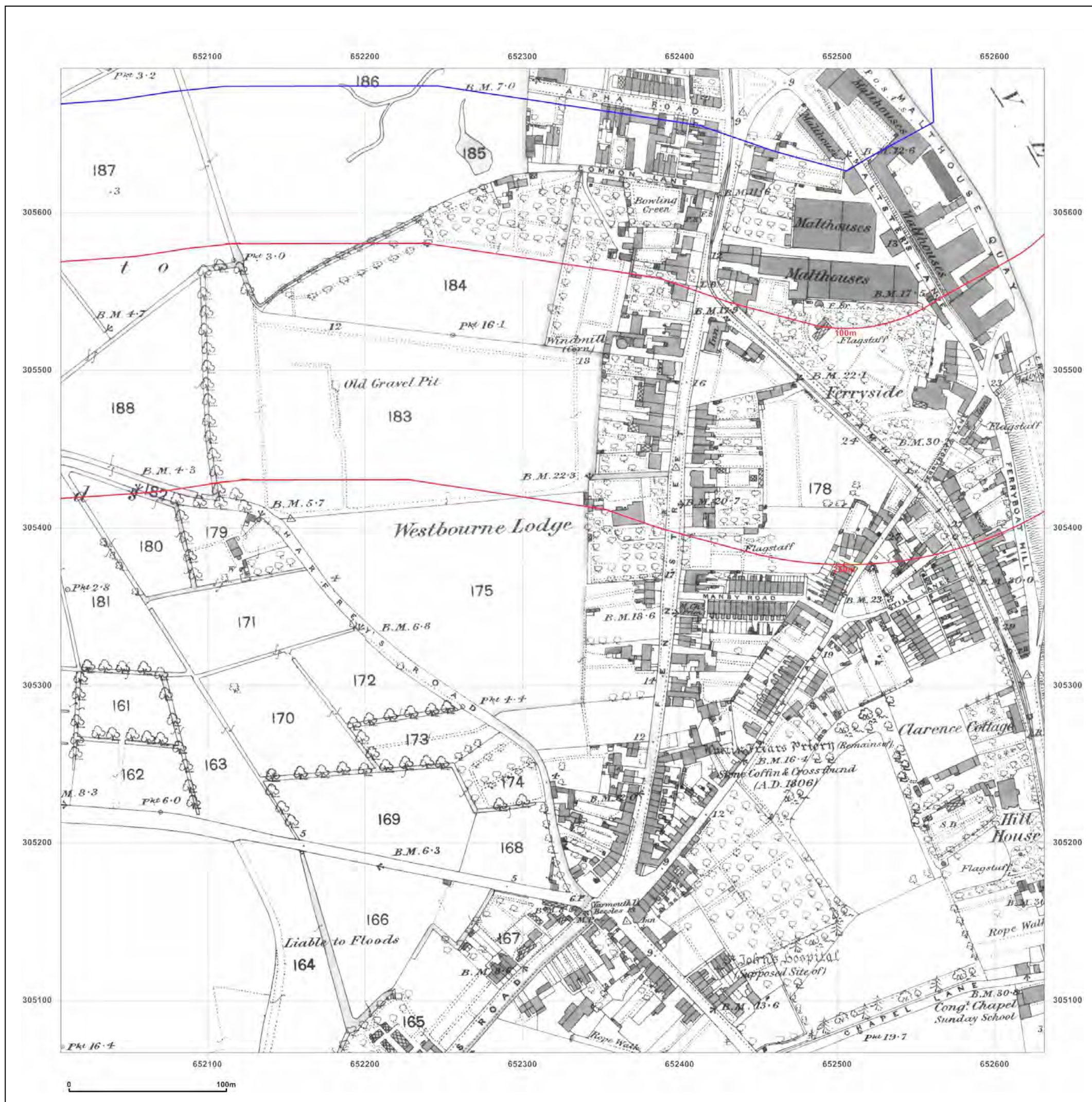
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**Site Details:**

Client Ref: 16287  
 Report Ref: CMAPS-CM-636391-16287-030717HIS\_LS\_2\_1  
 Grid Ref: 652319, 305379

Map Name: County Series

Map date: 1887

Scale: 1:2,500

Printed at: 1:2,500



Surveyed 1887  
 Revised 1887  
 Edition N/A  
 Copyright N/A  
 Levelled N/A



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Site Details:

Client Ref: 16287  
 Report Ref: CMAPS-CM-636391-16287-030717HIS\_LS\_2\_  
 Grid Ref: 652319, 305379

Map Name: County Series

Map date: 1906

Scale: 1:2,500

Printed at: 1:2,500



Surveyed 1883  
 Revised 1904  
 Edition 1906  
 Copyright N/A  
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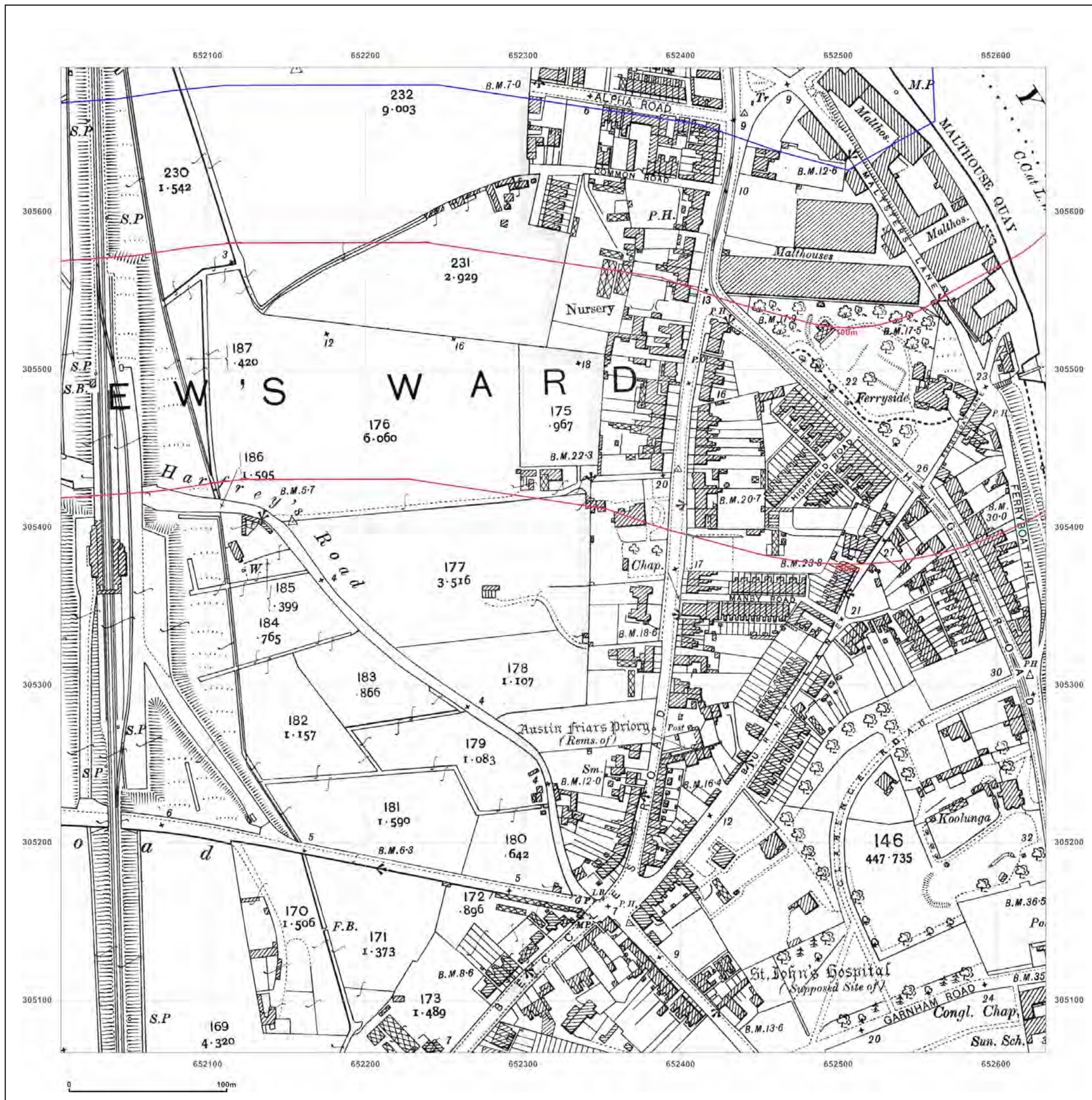


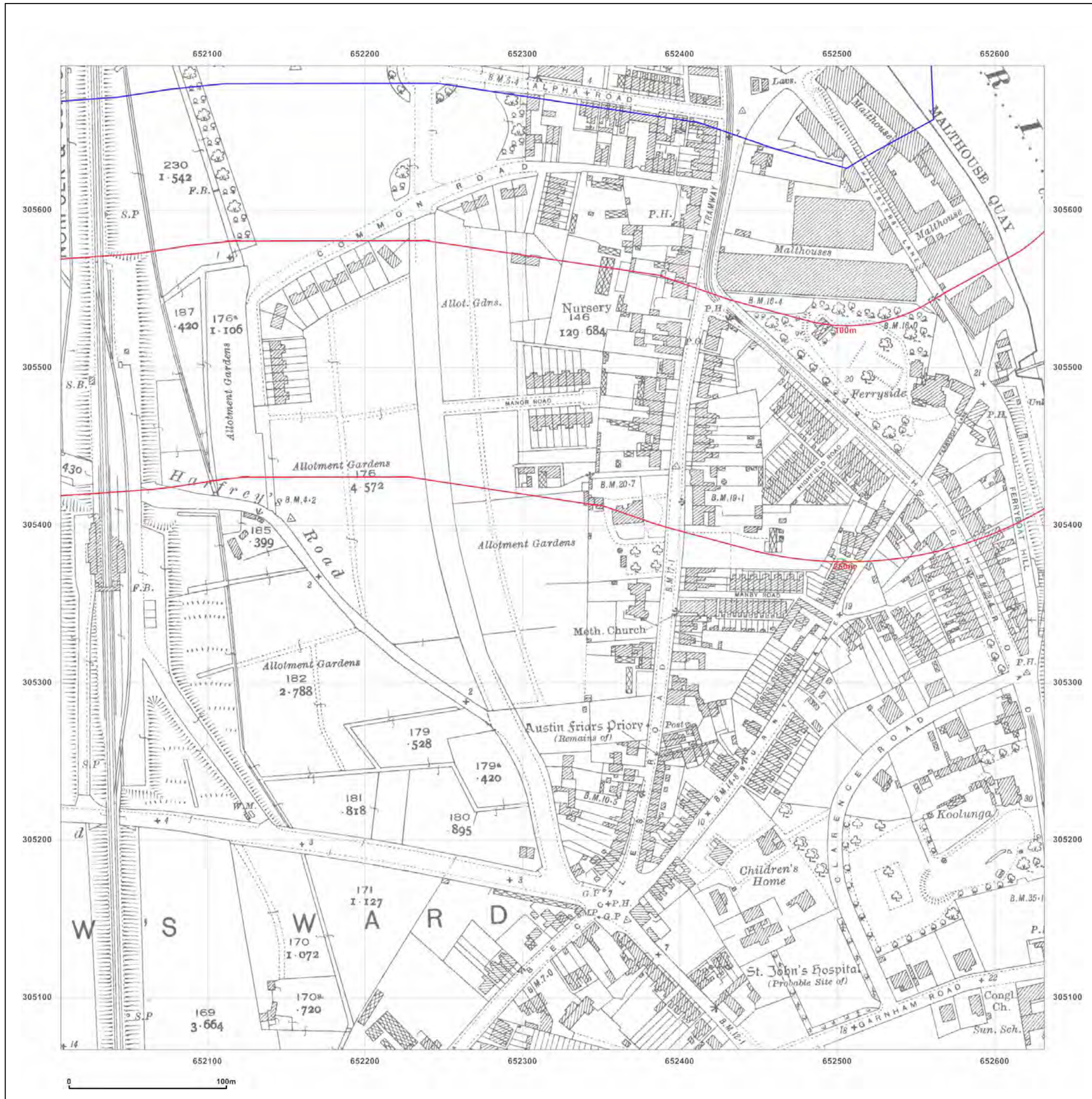
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**Site Details:**

Client Ref: 16287  
 Report Ref: CMAPS-CM-636391-16287-030717HIS\_LS\_2\_1  
 Grid Ref: 652319, 305379

Map Name: County Series

Map date: 1927

Scale: 1:2,500

Printed at: 1:2,500



Surveyed 1927  
 Revised 1927  
 Edition N/A  
 Copyright N/A  
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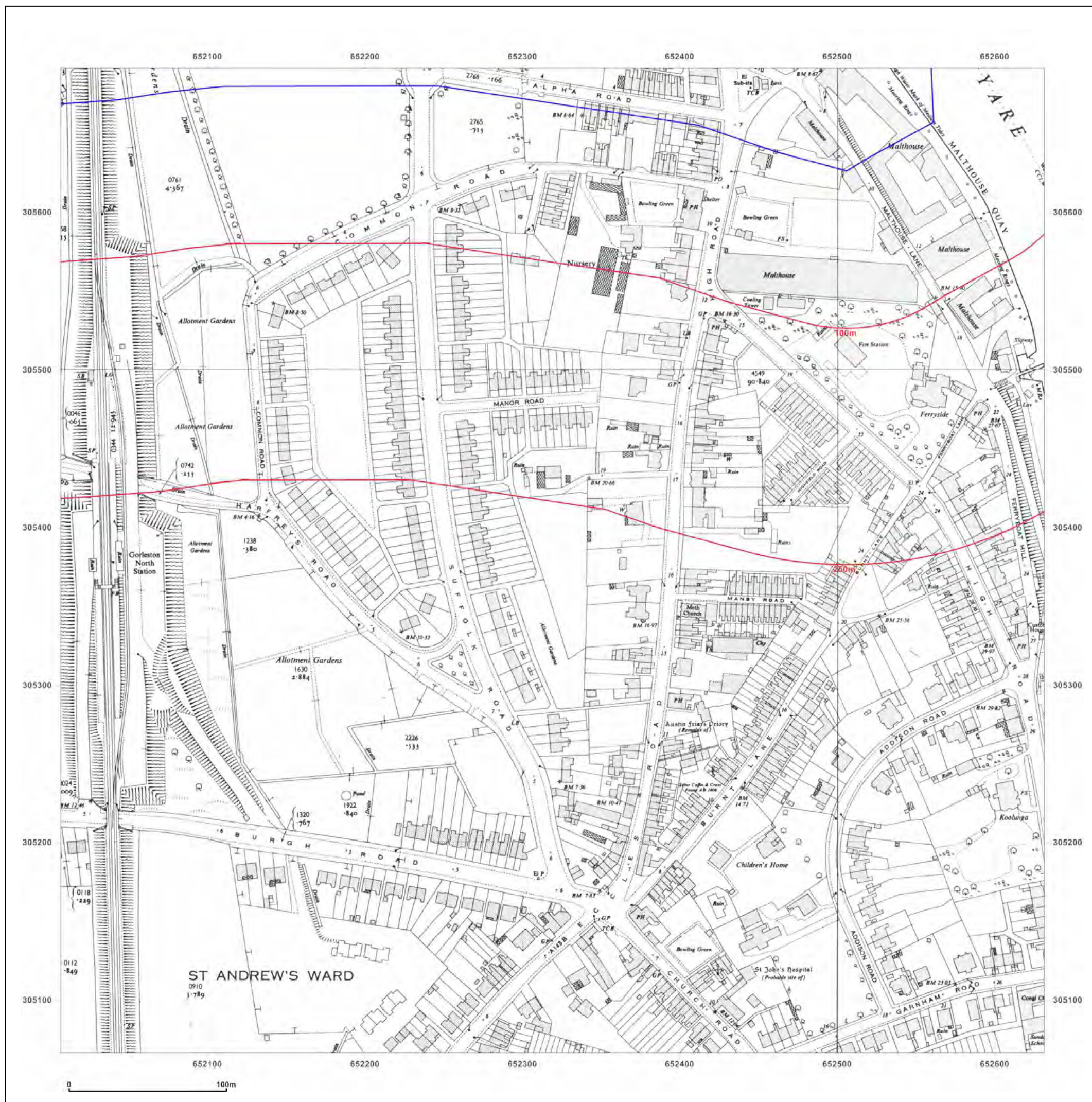


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**Site Details:**

Client Ref: 16287  
 Report Ref: CMAPS-CM-636391-16287-030717HIS\_LS\_2\_1  
 Grid Ref: 652319, 305379

Map Name: National Grid

Map date: 1949

Scale: 1:2,500

Printed at: 1:2,500



Surveyed 1949  
 Revised 1949  
 Edition N/A  
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Site Details:

Client Ref: 16287  
Report Ref: CMAPS-CM-636391-16287-030717HIS\_LS\_2\_1  
Grid Ref: 652319, 305379

Map Name: National Grid

Map date: 1951

Scale: 1:2,500

Printed at: 1:2,500



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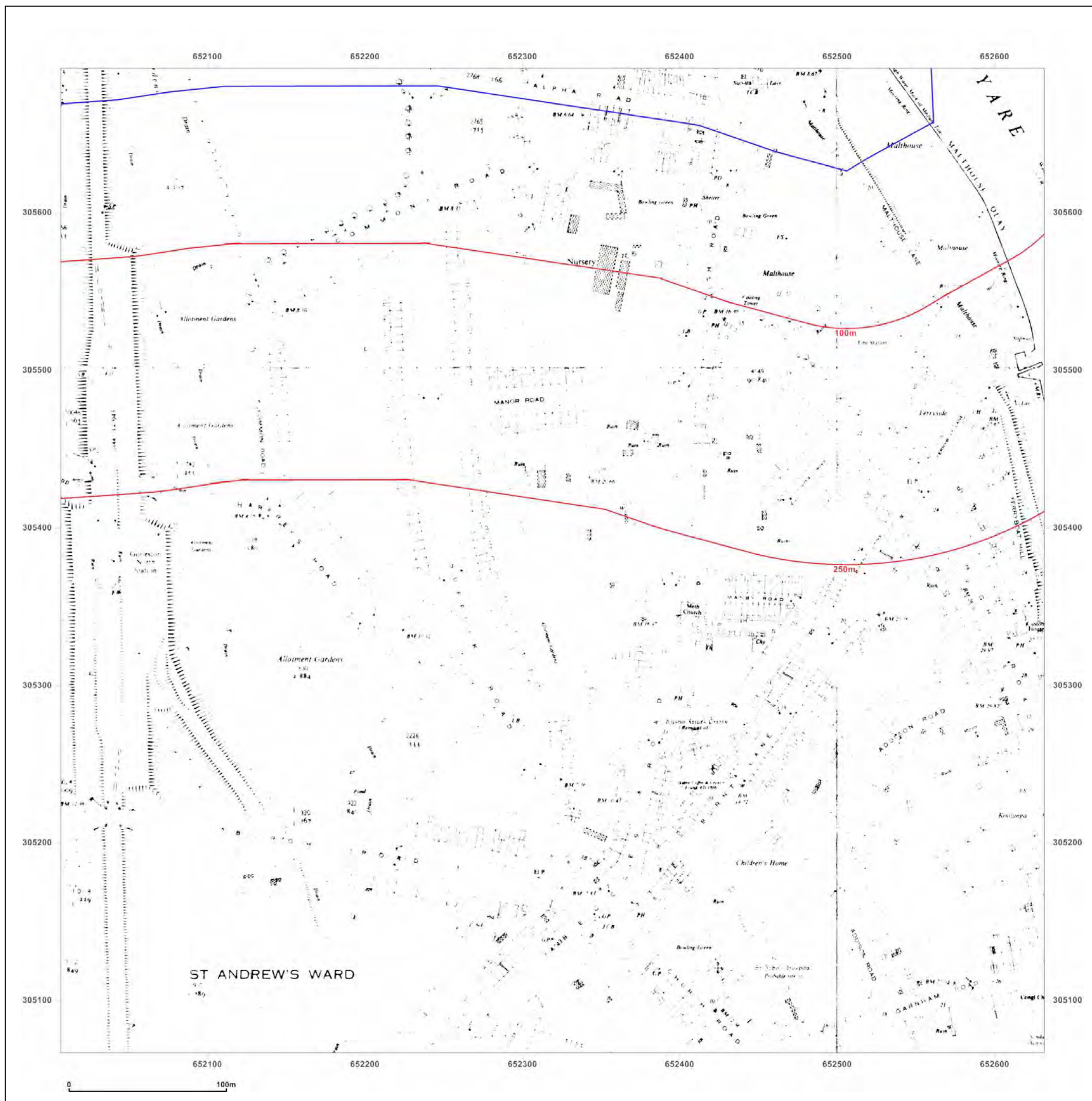


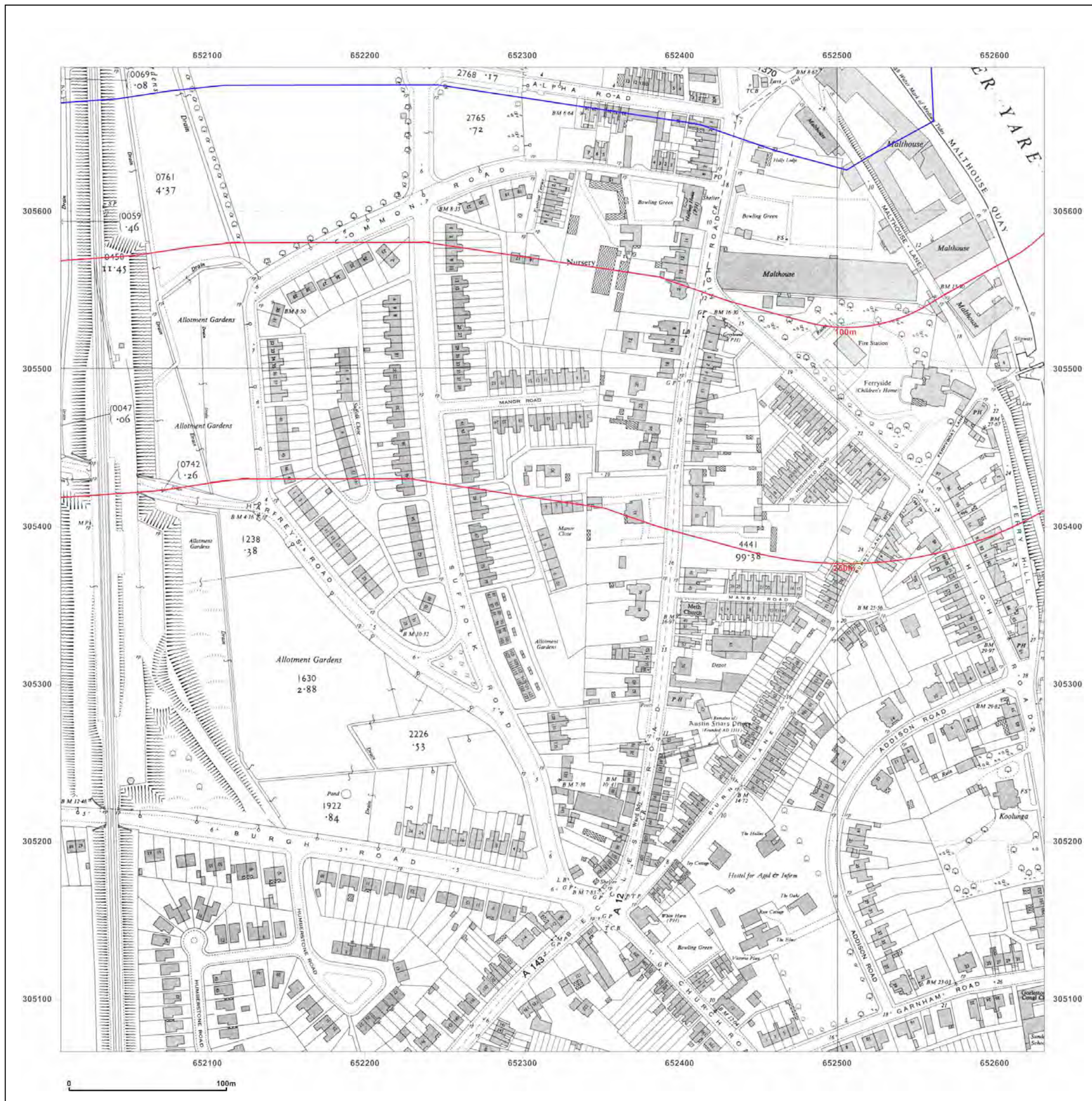
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Site Details:

Client Ref: 16287  
Report Ref: CMAPS-CM-636391-16287-030717HIS\_LS\_2\_1  
Grid Ref: 652319, 305379

Map Name: National Grid

Map date: 1958

Scale: 1:2,500

Printed at: 1:2,500



Surveyed 1958  
Revised 1958  
Edition 1960  
Copyright 1960  
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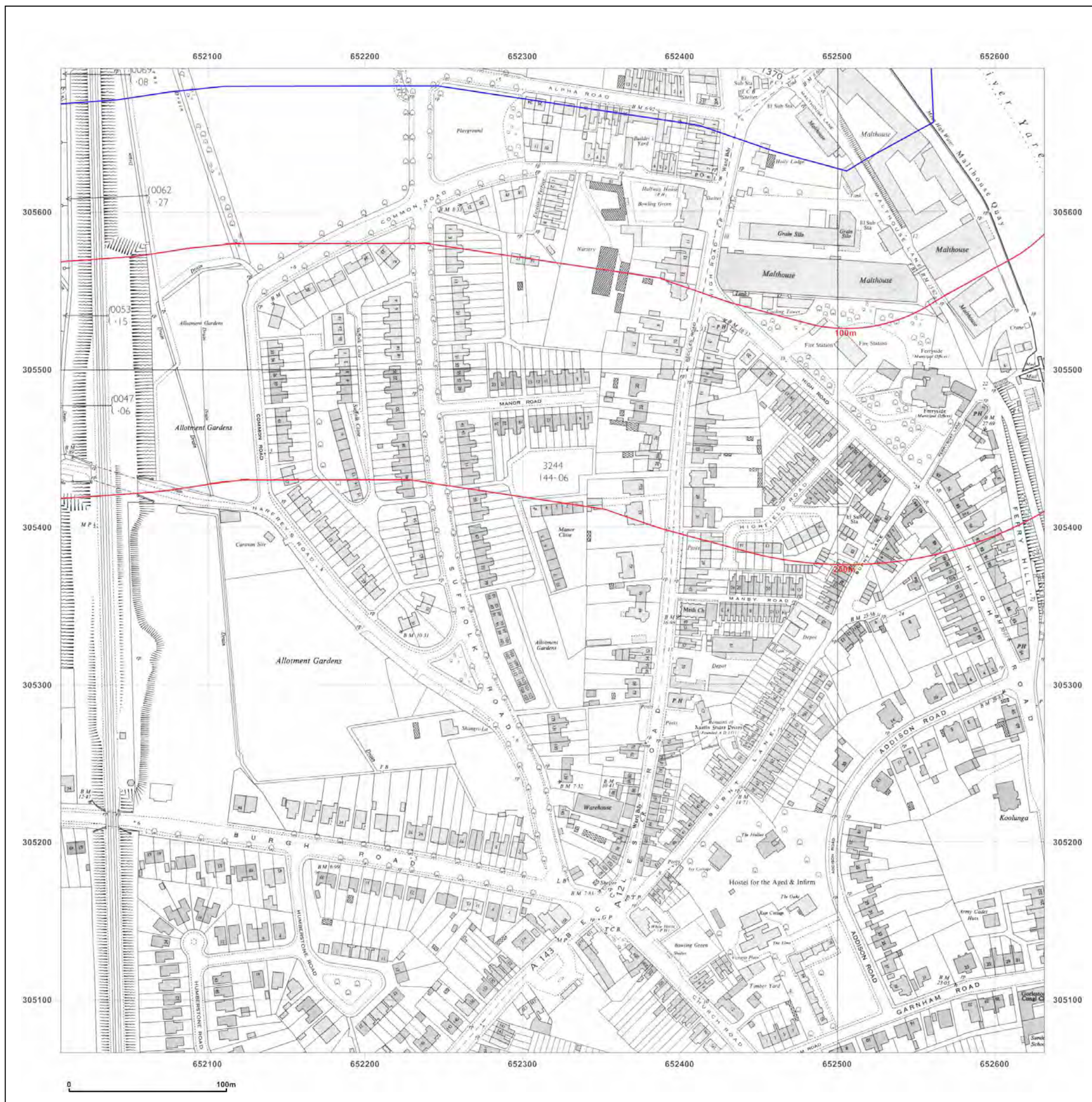
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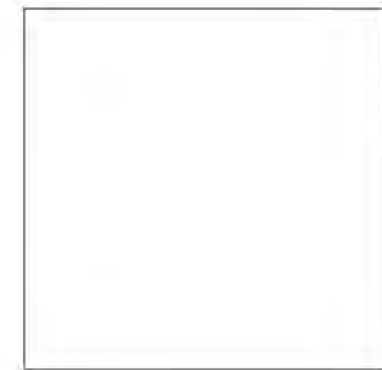
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**Report Ref:** CMAPS-CM-636391-16287-030717HIS\_LS\_2\_1  
**Grid Ref:** 652319, 305379

**Map Name:** National Grid

**Map date:** 1968

**Scale:** 1:2,500

**Printed at:** 1:2,500



Surveyed 1968  
 Revised 1968  
 Edition N/A  
 Copyright 1969  
 Levelled 1958



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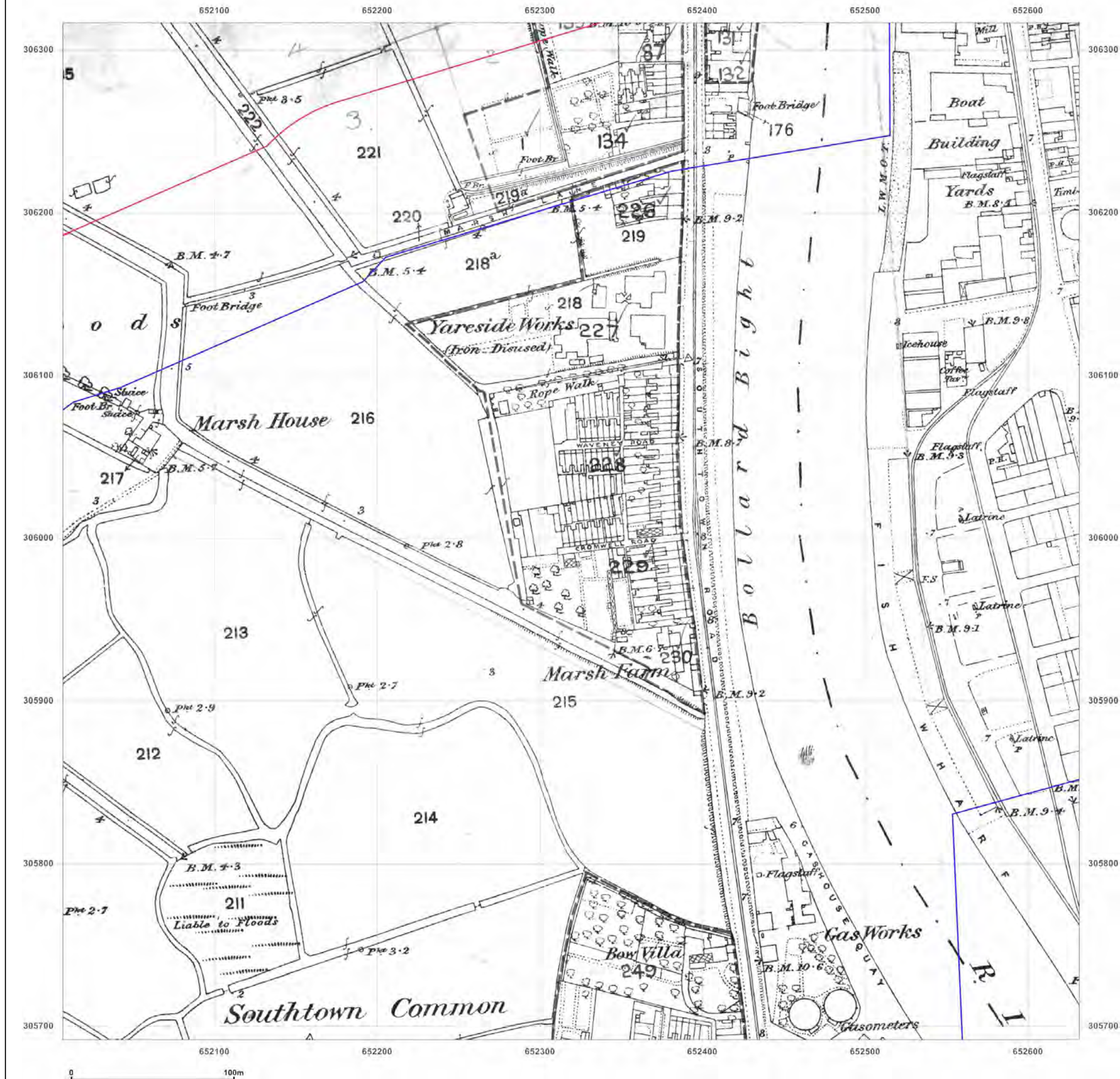


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**Site Details:**

Client Ref: 16287  
 Report Ref: CMAPS-CM-636391-16287-030717HIS\_LS\_2\_2  
 Grid Ref: 652319, 306004

Map Name: County Series

Map date: 1883

Scale: 1:2,500

Printed at: 1:2,500



Surveyed 1883  
 Revised 1883  
 Edition N/A  
 Copyright N/A  
 Levelled N/A



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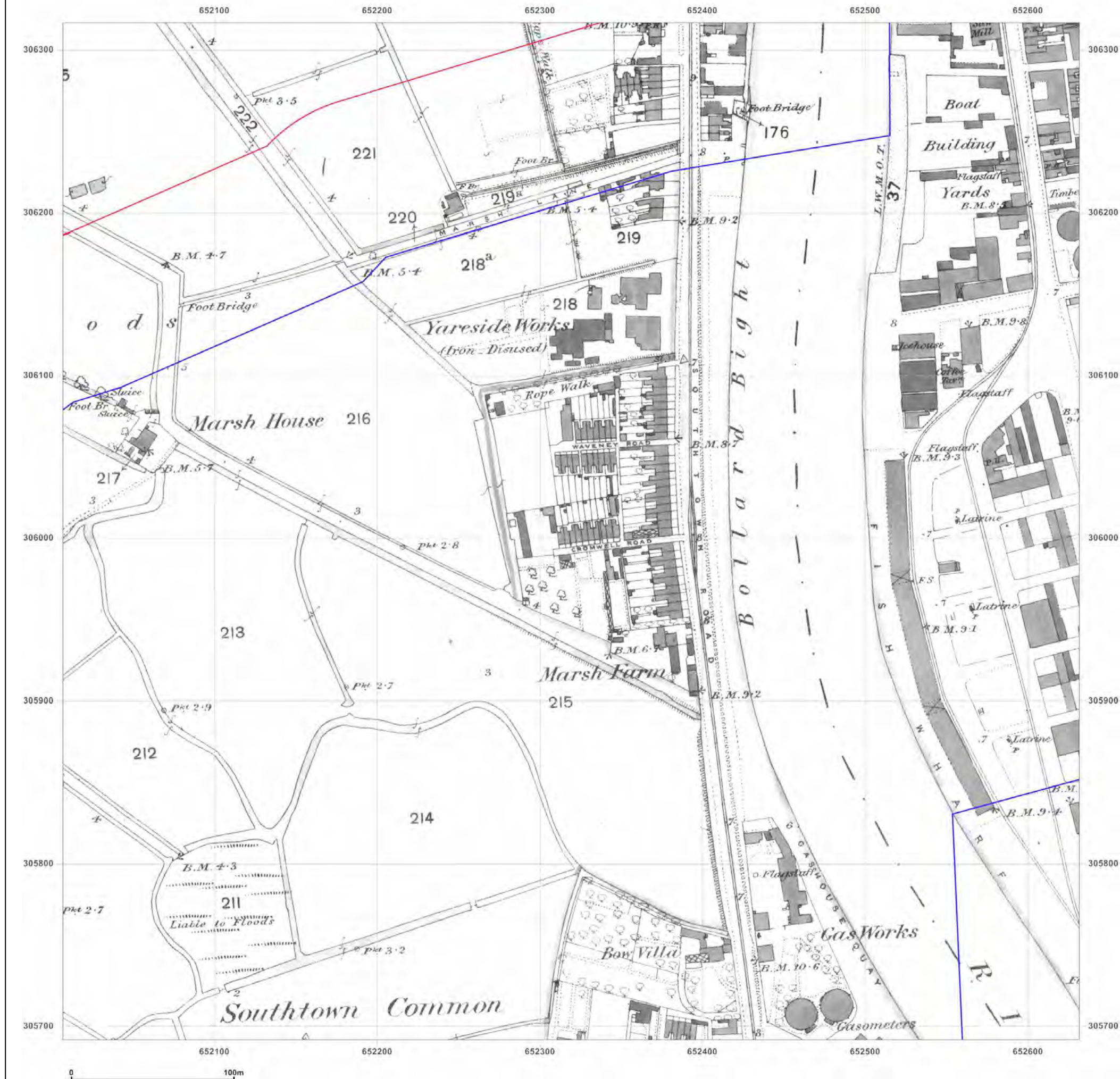


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Site Details:

Client Ref: 16287  
Report Ref: CMAPS-CM-636391-16287-030717HIS\_LS\_2\_2  
Grid Ref: 652319, 306004

Map Name: County Series

Map date: 1887

Scale: 1:2,500

Printed at: 1:2,500



Surveyed 1887  
Revised 1887  
Edition N/A  
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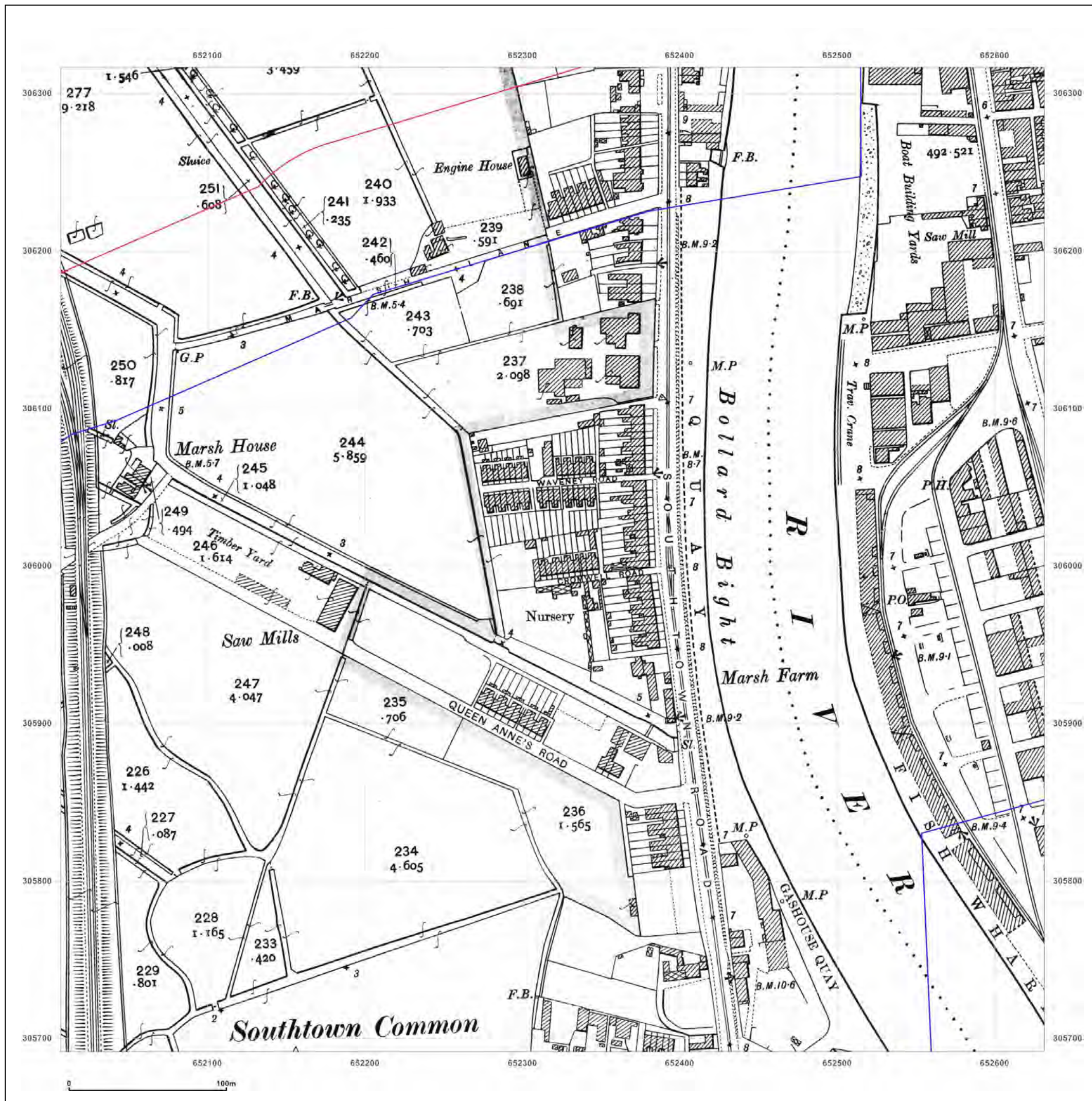


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**Site Details:**

Client Ref: 16287  
 Report Ref: CMAPS-CM-636391-16287-030717HIS\_LS\_2\_2  
 Grid Ref: 652319, 306004

Map Name: County Series

Map date: 1906

Scale: 1:2,500

Printed at: 1:2,500



Surveyed 1883  
 Revised 1904  
 Edition 1906  
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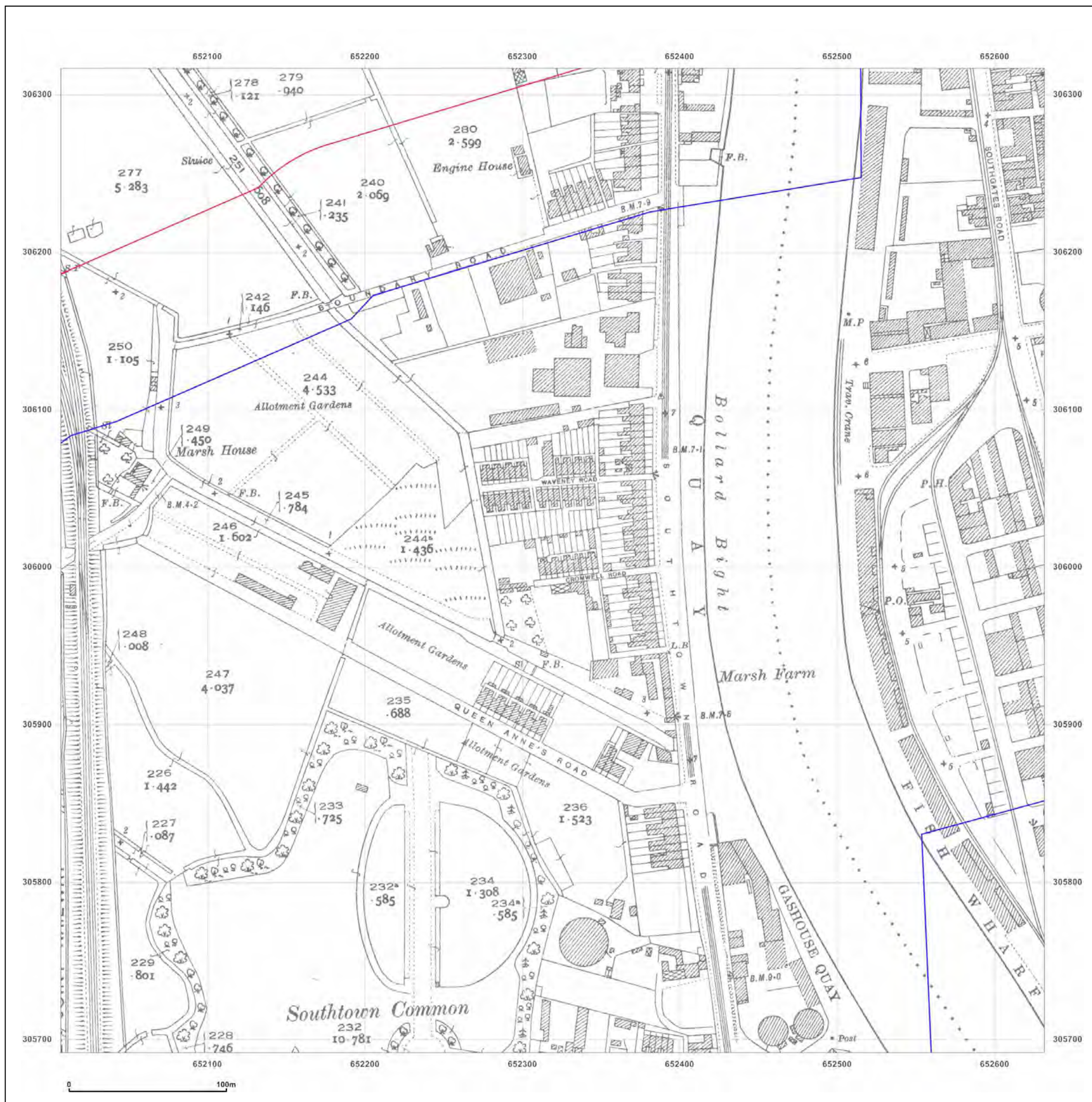


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**Site Details:**

Client Ref: 16287  
 Report Ref: CMAPS-CM-636391-16287-030717HIS\_LS\_2\_2  
 Grid Ref: 652319, 306004

Map Name: County Series  
 Map date: 1927  
 Scale: 1:2,500  
 Printed at: 1:2,500



Surveyed 1927  
 Revised 1927  
 Edition N/A  
 Copyright N/A  
 Levelled N/A



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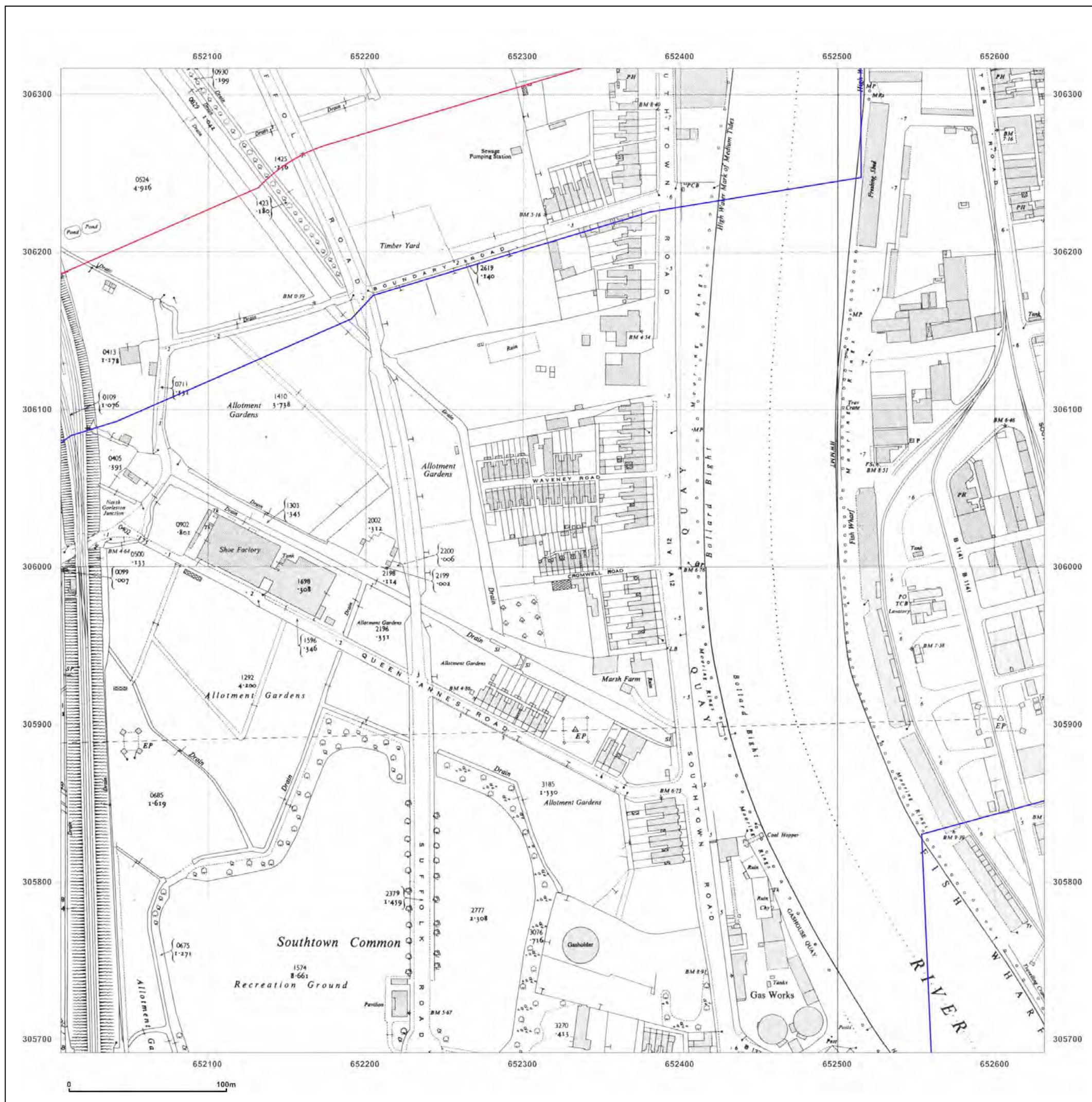


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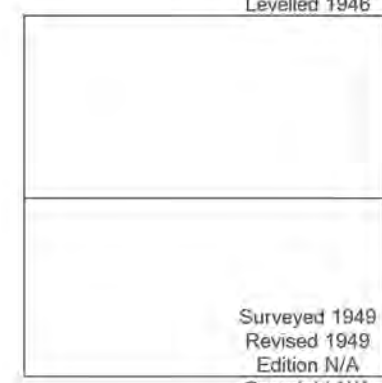
**Site Details:**

Client Ref: 16287  
 Report Ref: CMAPS-CM-636391-16287-030717HIS\_LS\_2\_2  
 Grid Ref: 652319, 306004

Map Name: National Grid  
 Map date: 1949  
 Scale: 1:2,500  
 Printed at: 1:2,500



Surveyed 1949  
 Revised 1949  
 Edition N/A  
 Copyright N/A  
 Levelled 1946



Surveyed 1949  
 Revised 1949  
 Edition N/A  
 Copyright N/A  
 Levelled 1946



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Site Details:

Client Ref: 16287  
Report Ref: CMAPS-CM-636391-16287-030717HIS\_LS\_2\_2  
Grid Ref: 652319, 306004

Map Name: National Grid

Map date: 1951

Scale: 1:2,500

Printed at: 1:2,500



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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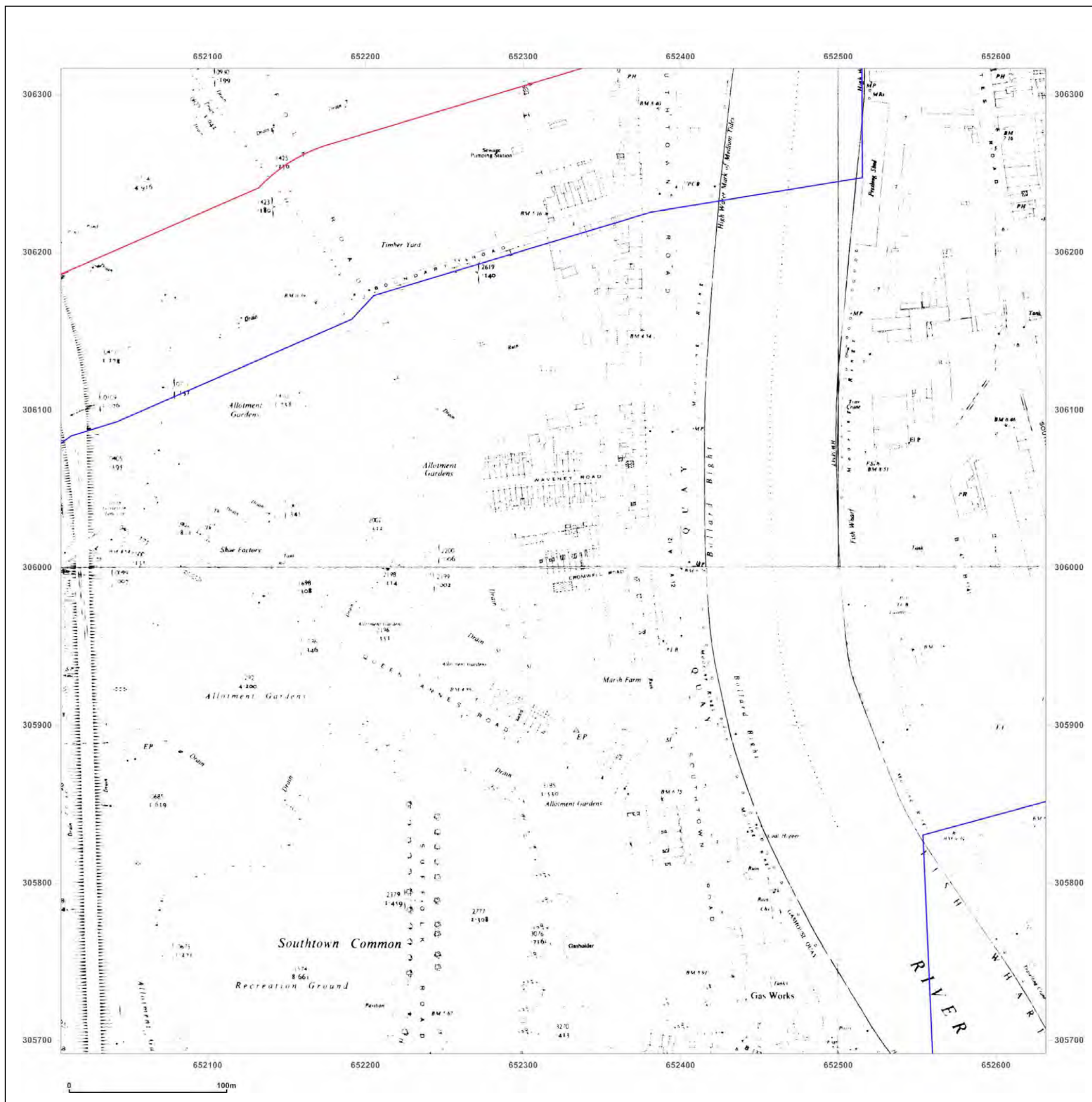


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Site Details:

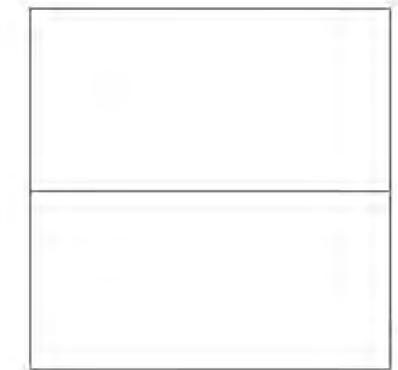
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Report Ref: CMAPS-CM-636391-16287-030717HIS\_LS\_2\_2  
Grid Ref: 652319, 306004

Map Name: National Grid

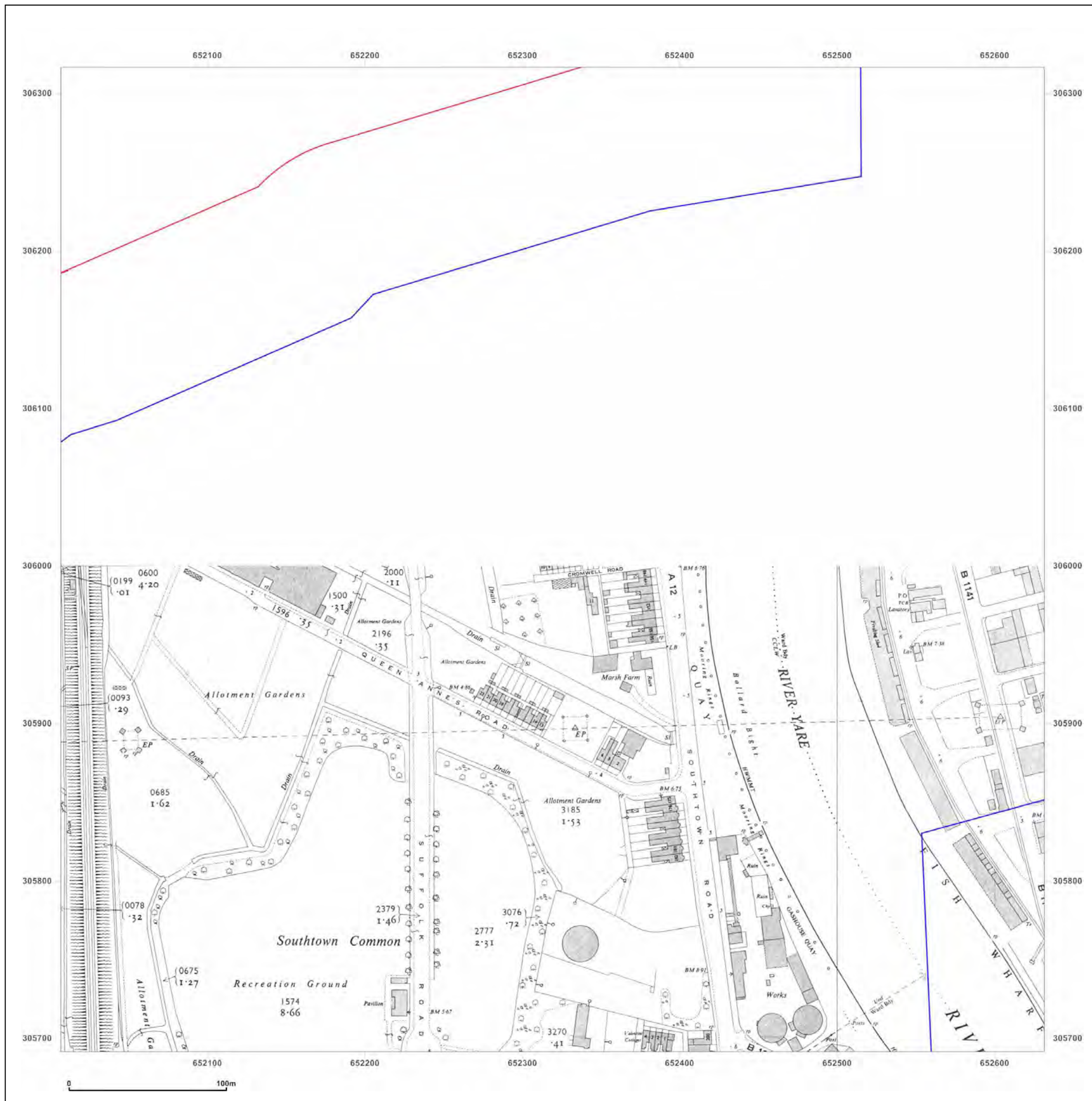
Map date: 1958

Scale: 1:2,500

Printed at: 1:2,500



Surveyed 1958  
Revised 1958  
Edition 1960  
Copyright 1960  
Levelled 1946



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Site Details:

Client Ref: 16287  
Report Ref: CMAPS-CM-636391-16287-030717HIS\_LS\_2\_2  
Grid Ref: 652319, 306004

Map Name: National Grid

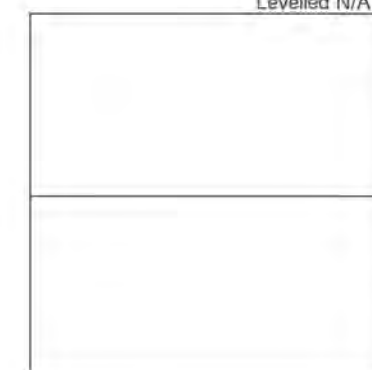
Map date: 1965

Scale: 1:2,500

Printed at: 1:2,500



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



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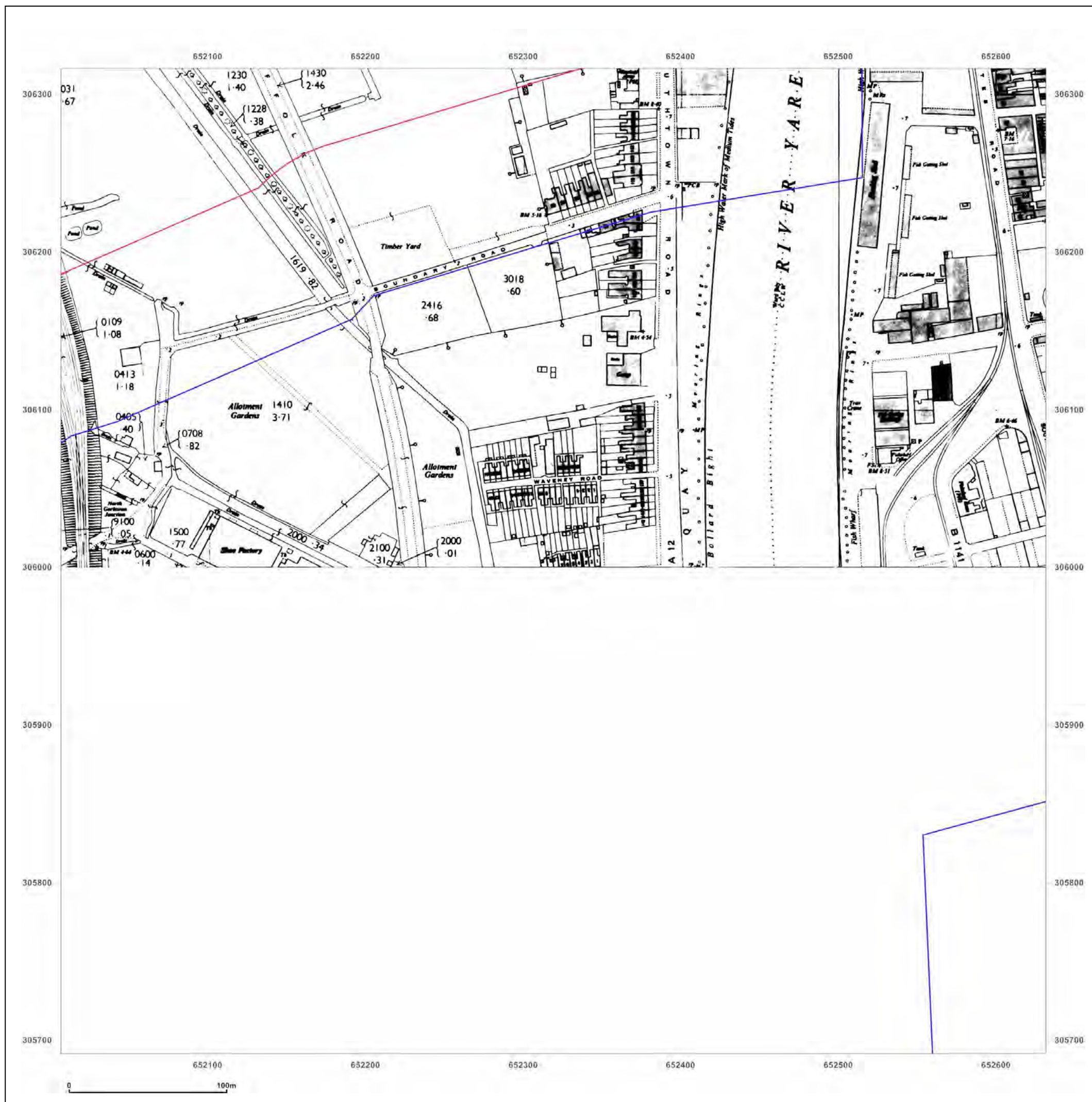


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Site Details:

Client Ref: 16287  
Report Ref: CMAPS-CM-636391-16287-030717HIS\_LS\_2\_2  
Grid Ref: 652319, 306004

Map Name: National Grid

Map date: 1963-1968

Scale: 1:2,500

Printed at: 1:2,500



Surveyed 1963  
Revised 1963  
Edition 1965  
Copyright 1965  
Levelled 1958

Surveyed 1968  
Revised 1968  
Edition N/A  
Copyright 1969  
Levelled 1958



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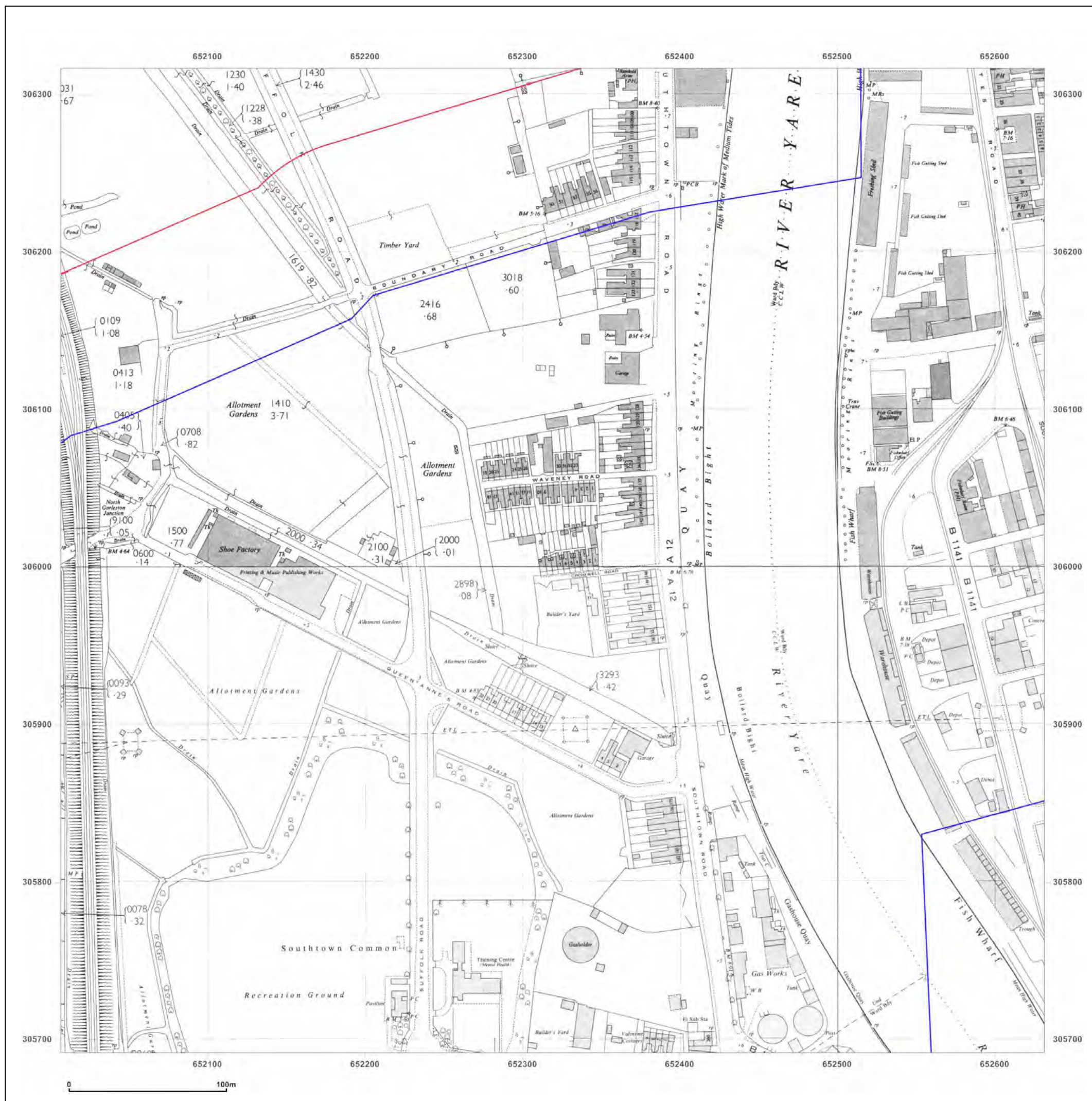


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Site Details:

Client Ref: 16287  
Report Ref: CMAPS-CM-636391-16287-030717HIS\_LS\_2\_3  
Grid Ref: 652319, 306630

Map Name: County Series

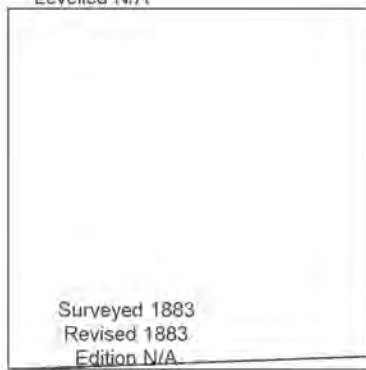
Map date: 1883

Scale: 1:2,500

Printed at: 1:2,500



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



Surveyed 1883  
Revised 1883  
Edition N/A  
Copyright N/A  
Levelled N/A



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**Site Details:**

**Client Ref:** 16287  
**Report Ref:** CMAPS-CM-636391-16287-030717HIS\_LS\_2\_3  
**Grid Ref:** 652319, 306630

**Map Name:** County Series

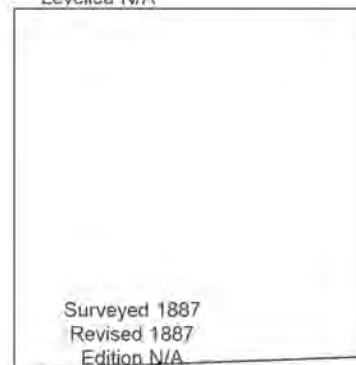
**Map date:** 1887

**Scale:** 1:2,500

**Printed at:** 1:2,500



Surveyed 1887  
Revised 1887  
Edition N/A  
Copyright N/A  
Levelled N/A



Surveyed 1887  
Revised 1887  
Edition N/A  
Copyright N/A  
Levelled N/A



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**Site Details:**

**Client Ref:** 16287  
**Report Ref:** CMAPS-CM-636391-16287-030717HIS\_LS\_2\_3  
**Grid Ref:** 652319, 306630

**Map Name:** County Series

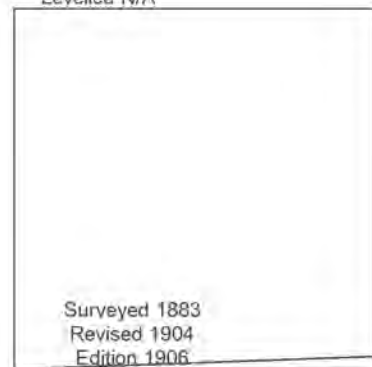
**Map date:** 1905-1906

**Scale:** 1:2,500

**Printed at:** 1:2,500



Surveyed 1905  
Revised 1905  
Edition N/A  
Copyright N/A  
Levelled N/A



Surveyed 1883  
Revised 1904  
Edition 1906  
Copyright N/A  
Levelled N/A



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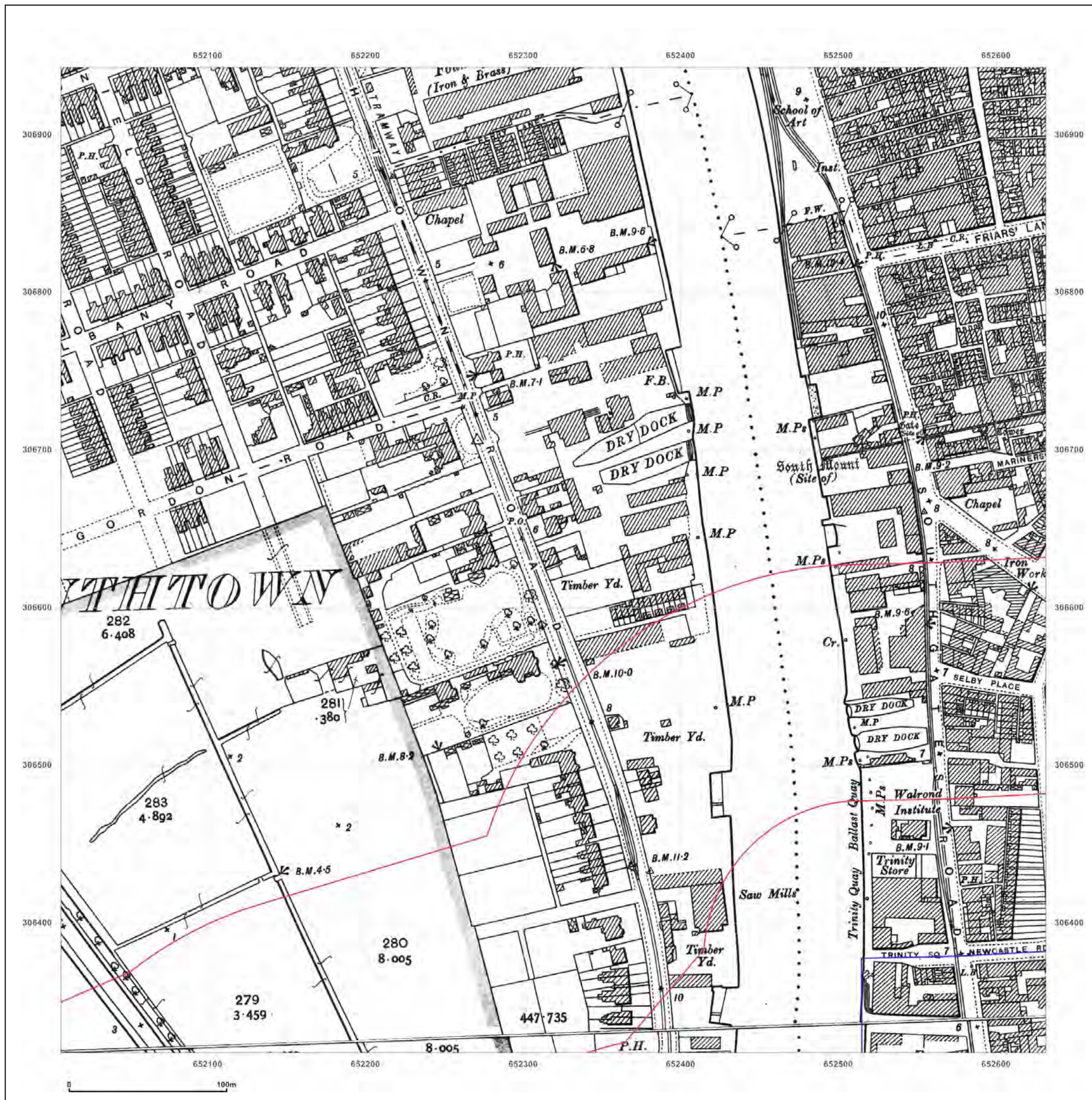


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**Site Details:**

**Client Ref:** 16287  
**Report Ref:** CMAPS-CM-636391-16287-030717HIS\_LS\_2\_3  
**Grid Ref:** 652319, 306630

**Map Name:** County Series

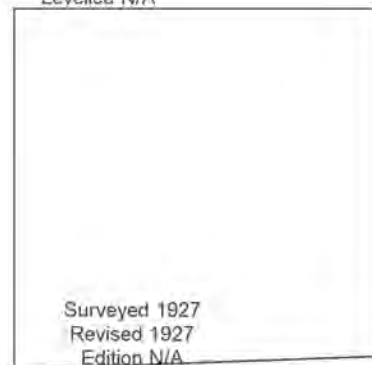
**Map date:** 1927-1928

**Scale:** 1:2,500

**Printed at:** 1:2,500



Surveyed 1928  
 Revised 1928  
 Edition N/A  
 Copyright N/A  
 Levelled N/A



Surveyed 1927  
 Revised 1927  
 Edition N/A  
 Copyright N/A  
 Levelled N/A



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**Site Details:**

**Client Ref:** 16287  
**Report Ref:** CMAPS-CM-636391-16287-030717HIS\_LS\_2\_3  
**Grid Ref:** 652319, 306630

**Map Name:** National Grid

**Map date:** 1949

**Scale:** 1:2,500

**Printed at:** 1:2,500



Surveyed 1949  
 Revised 1949  
 Edition N/A  
 Copyright N/A  
 Levelled 1946



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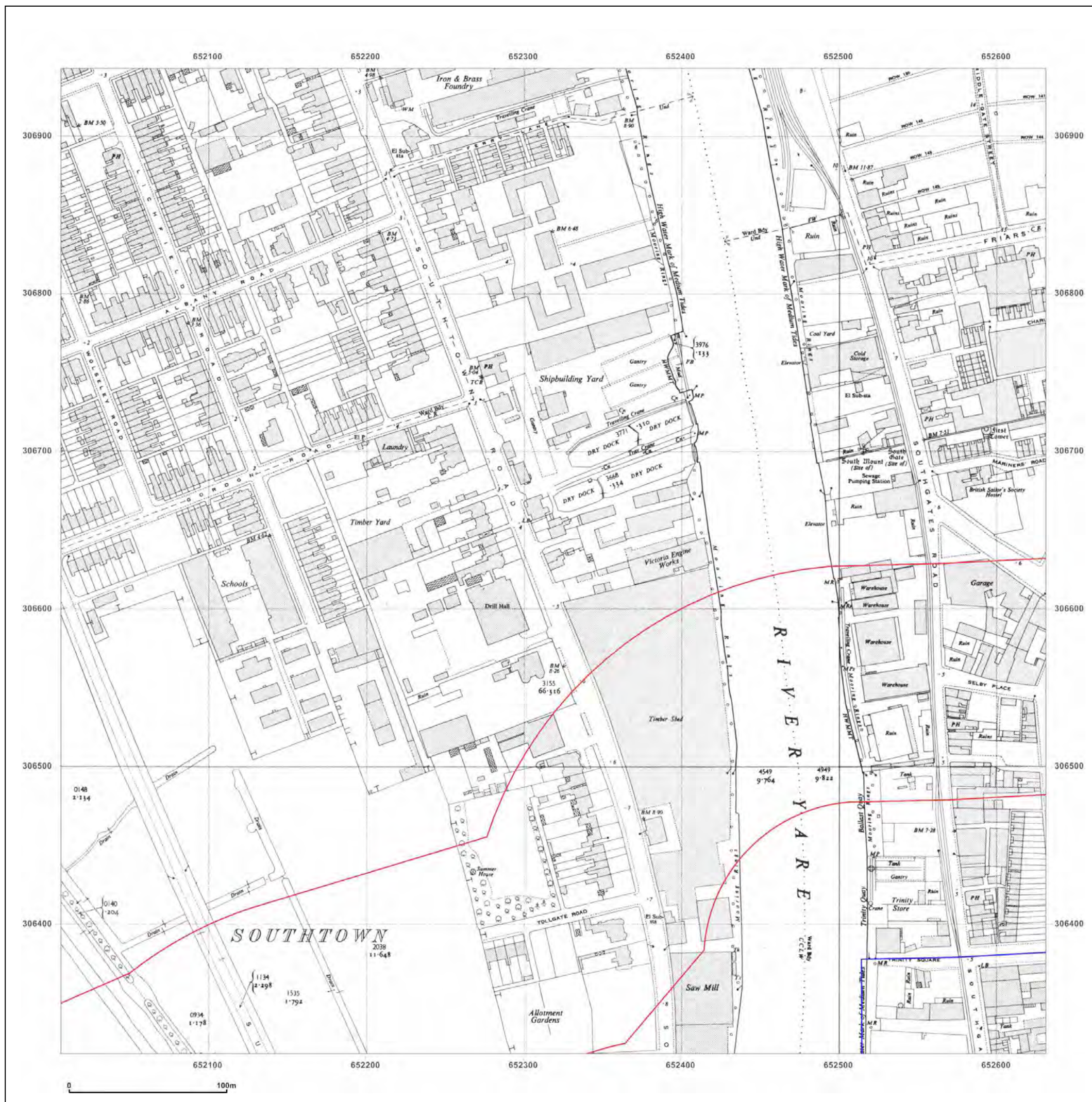


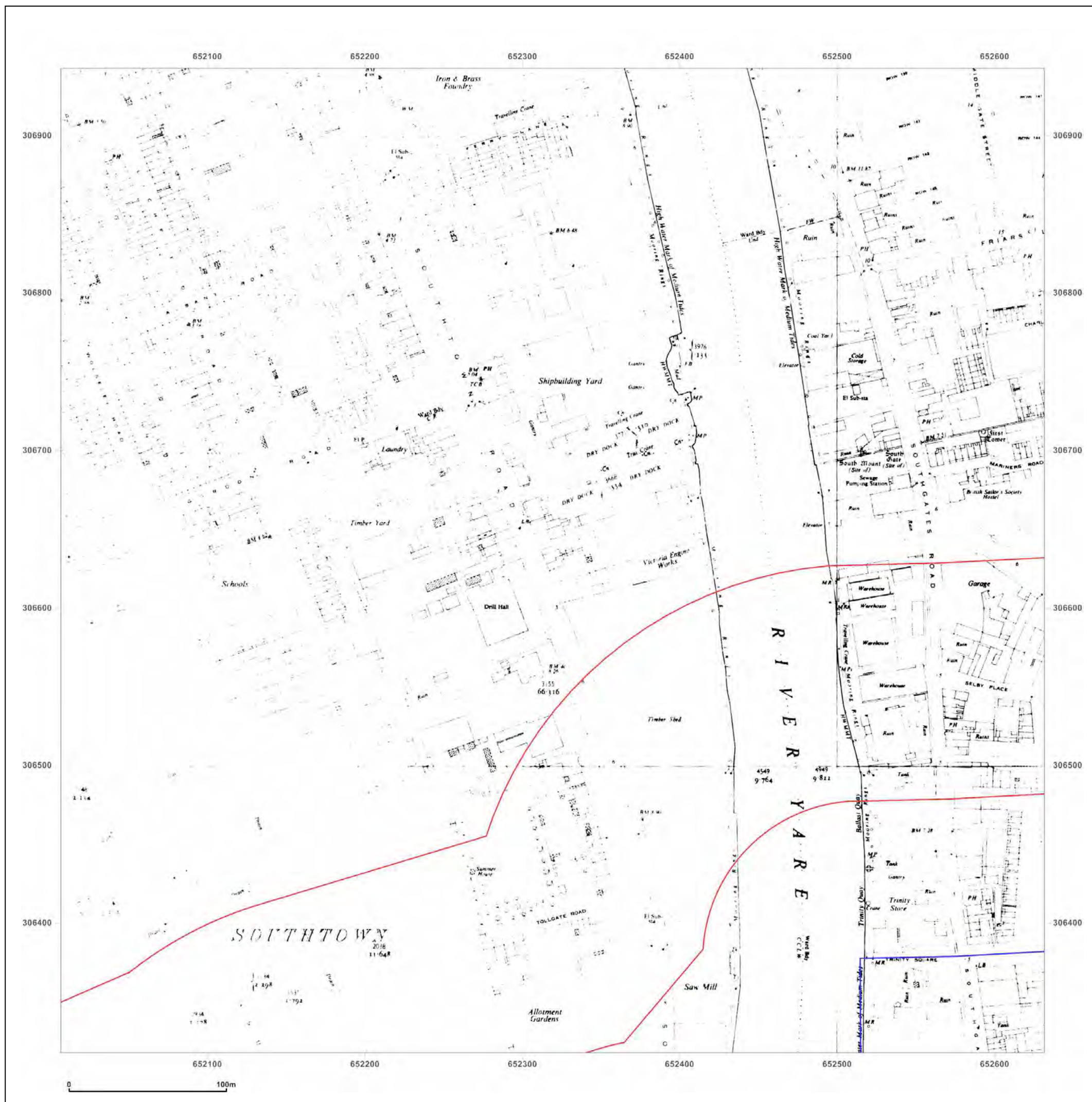
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Site Details:

Client Ref: 16287  
Report Ref: CMAPS-CM-636391-16287-030717HIS\_LS\_2\_3  
Grid Ref: 652319, 306630

Map Name: National Grid  
Map date: 1951  
Scale: 1:2,500  
Printed at: 1:2,500



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



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**Site Details:**

**Client Ref:** 16287  
**Report Ref:** CMAPS-CM-636391-16287-030717HIS\_LS\_2\_3  
**Grid Ref:** 652319, 306630

**Map Name:** National Grid

**Map date:** 1963

**Scale:** 1:2,500

**Printed at:** 1:2,500



Surveyed 1963  
 Revised 1963  
 Edition 1965  
 Copyright 1985  
 Levelled 1958



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Site Details:

Client Ref: 16287  
Report Ref: CMAPS-CM-636391-16287-030717HIS\_LS\_2\_3  
Grid Ref: 652319, 306630

Map Name: National Grid

Map date: 1965

Scale: 1:2,500

Printed at: 1:2,500



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



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**Site Details:**

Client Ref: 16287  
Report Ref: CMAPS-CM-636391-16287-030717HIS\_LS\_3\_1  
Grid Ref: 652945, 305379

Map Name: County Series

Map date: 1883

Scale: 1:2,500

Printed at: 1:2,500



Surveyed 1883  
Revised 1883  
Edition N/A  
Copyright N/A  
Levelled N/A



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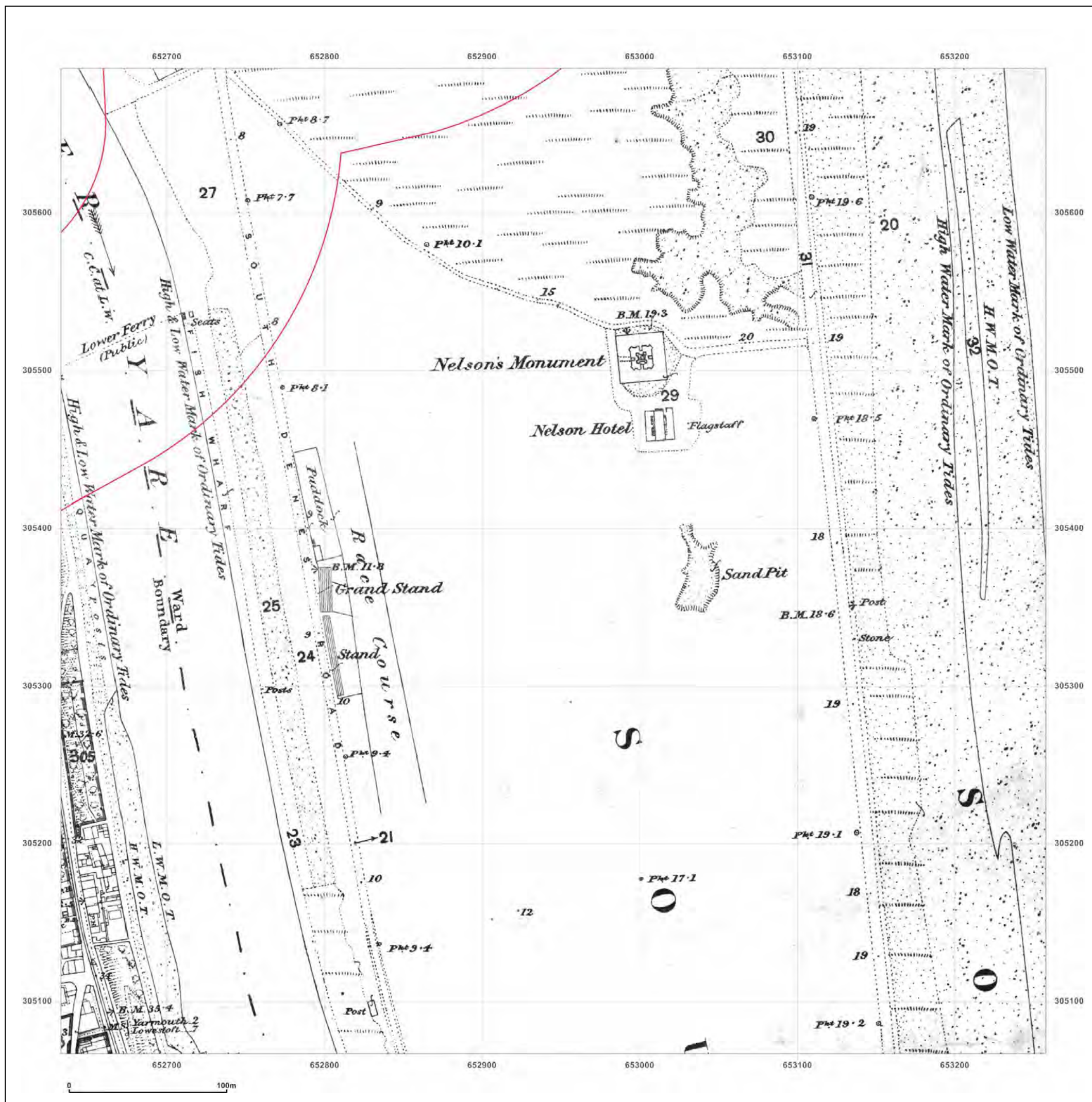


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**Site Details:**

**Client Ref:** 16287  
**Report Ref:** CMAPS-CM-636391-16287-030717HIS\_LS\_3\_1  
**Grid Ref:** 652945, 305379

**Map Name:** County Series

**Map date:** 1887

**Scale:** 1:2,500

**Printed at:** 1:2,500



Surveyed 1887  
 Revised 1887  
 Edition N/A  
 Copyright N/A  
 Levelled N/A



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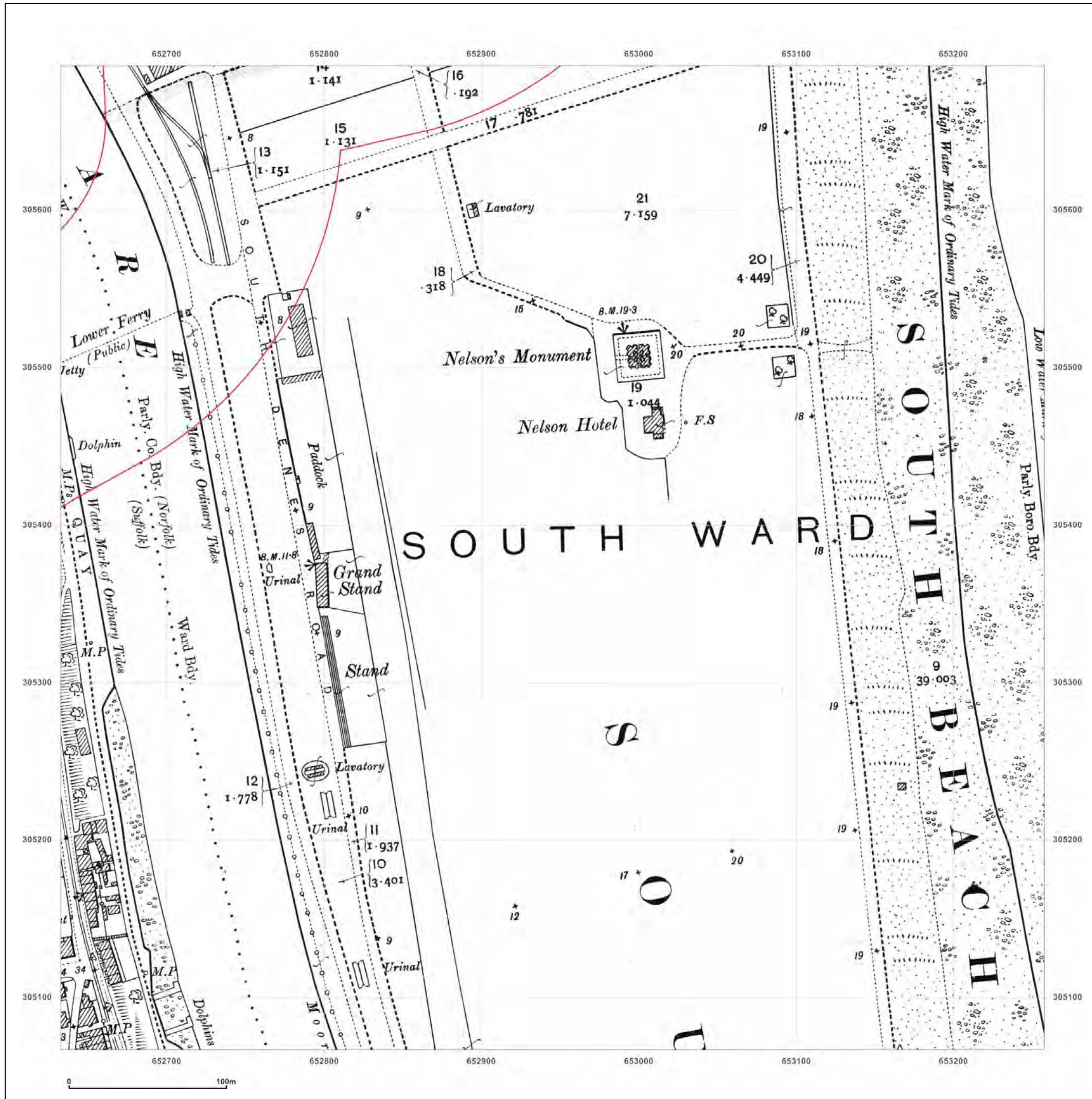


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**Site Details:**

Client Ref: 16287  
 Report Ref: CMAPS-CM-636391-16287-030717HIS\_LS\_3\_  
 Grid Ref: 652945, 305379

Map Name: County Series

Map date: 1906

Scale: 1:2,500

Printed at: 1:2,500



Surveyed 1883  
 Revised 1904  
 Edition 1906  
 Copyright N/A  
 Levelled N/A



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**Site Details:**

**Client Ref:** 16287  
**Report Ref:** CMAPS-CM-636391-16287-030717HIS\_LS\_3\_1  
**Grid Ref:** 652945, 305379

**Map Name:** County Series

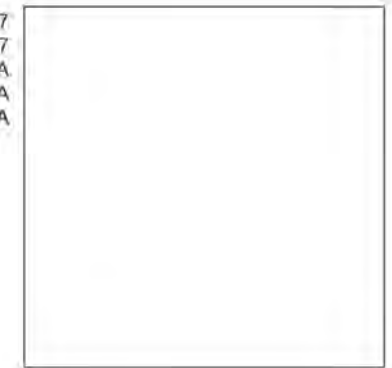
**Map date:** 1927

**Scale:** 1:2,500

**Printed at:** 1:2,500



Surveyed 1927  
 Revised 1927  
 Edition N/A  
 Copyright N/A  
 Levelled N/A



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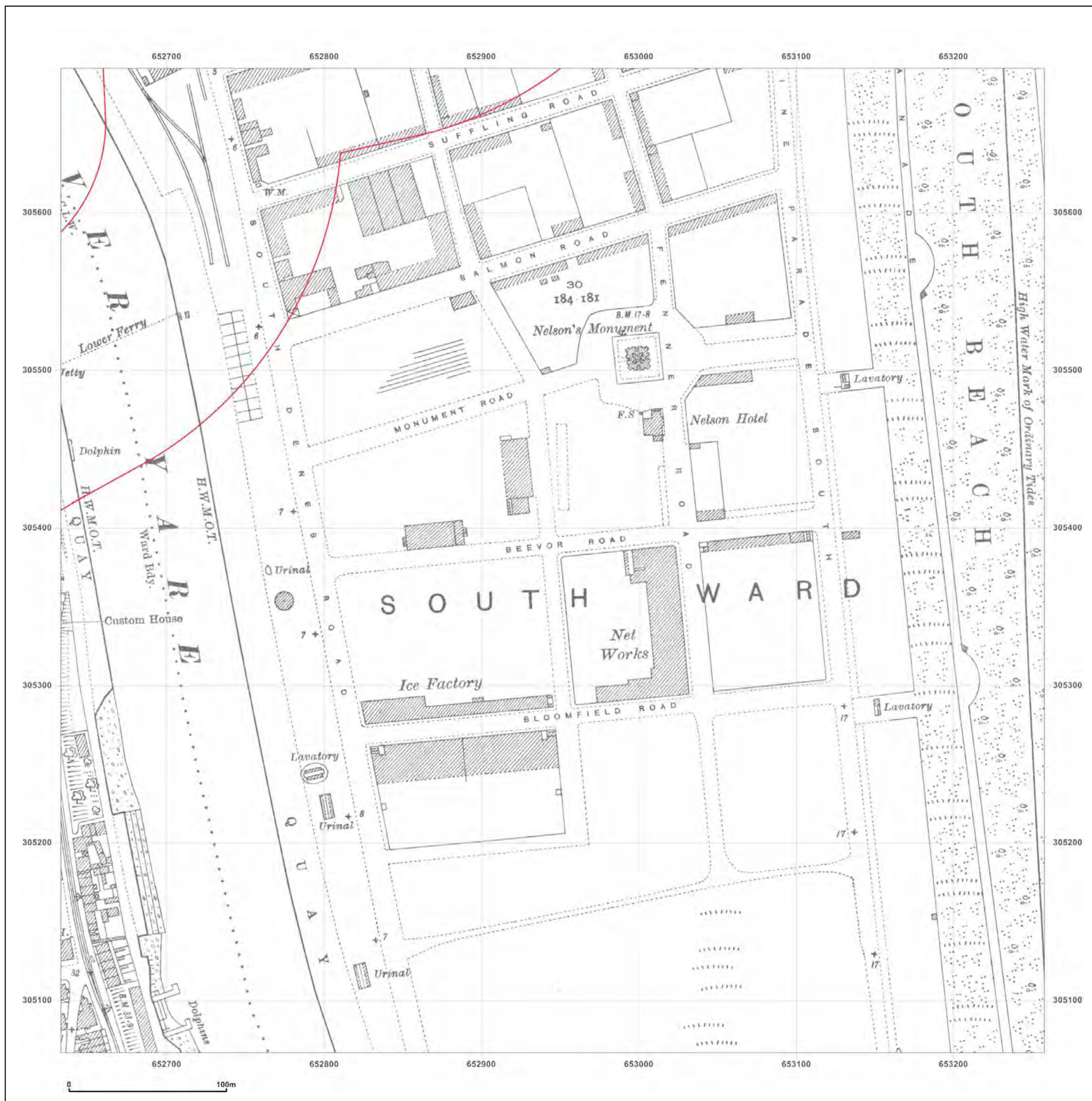


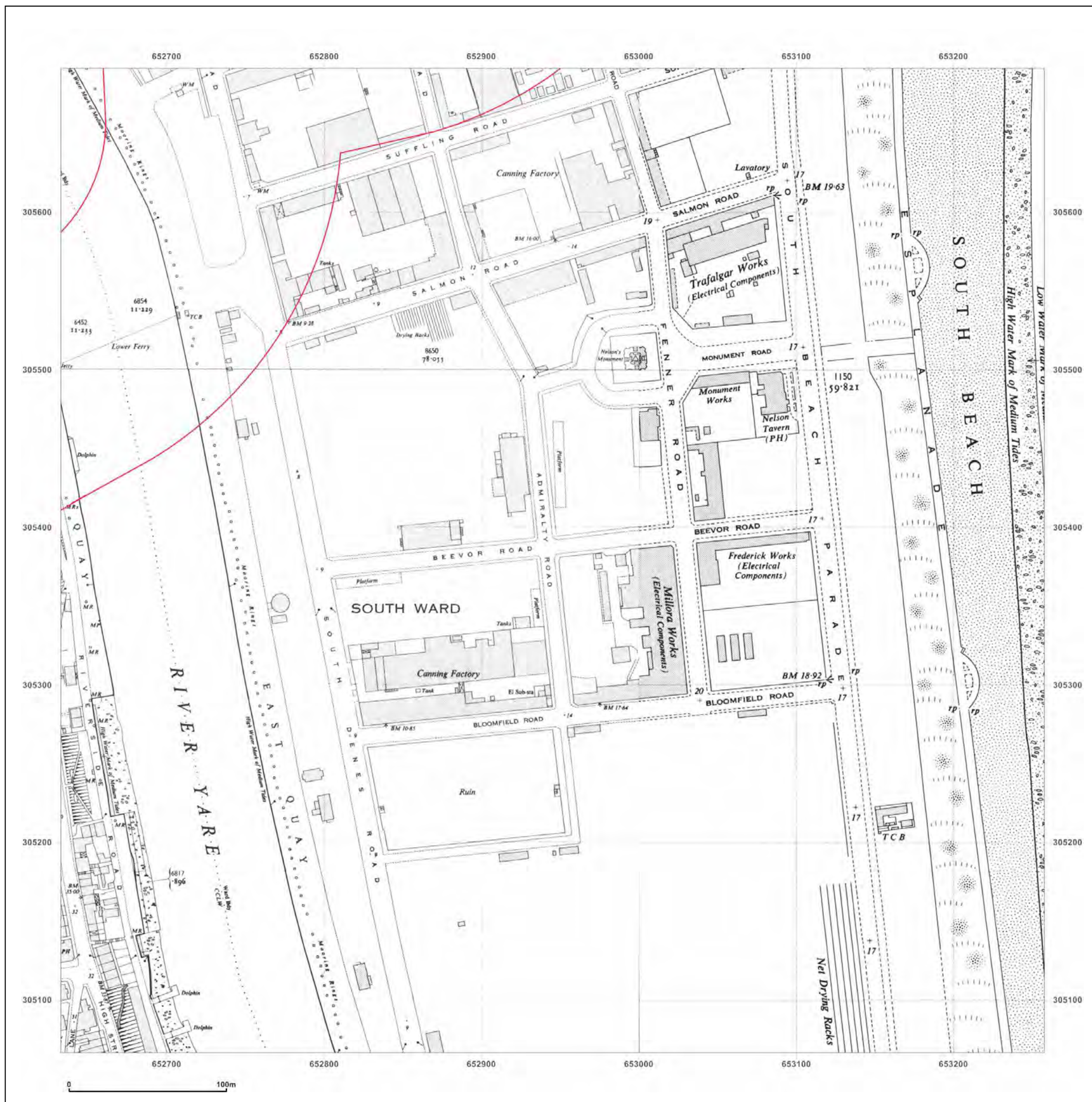
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**Site Details:**

Client Ref: 16287  
 Report Ref: CMAPS-CM-636391-16287-030717HIS\_LS\_3\_1  
 Grid Ref: 652945, 305379

Map Name: National Grid

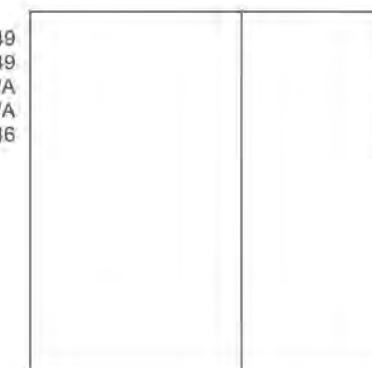
Map date: 1949

Scale: 1:2,500

Printed at: 1:2,500



Surveyed 1949  
 Revised 1949  
 Edition N/A  
 Copyright N/A  
 Levelled 1946



Surveyed 1949  
 Revised 1949  
 Edition N/A  
 Copyright N/A  
 Levelled 1946



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Site Details:

Client Ref: 16287  
Report Ref: CMAPS-CM-636391-16287-030717HIS\_LS\_3\_1  
Grid Ref: 652945, 305379

Map Name: National Grid

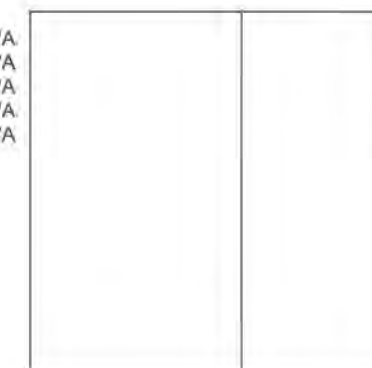
Map date: 1950-1951

Scale: 1:2,500

Printed at: 1:2,500



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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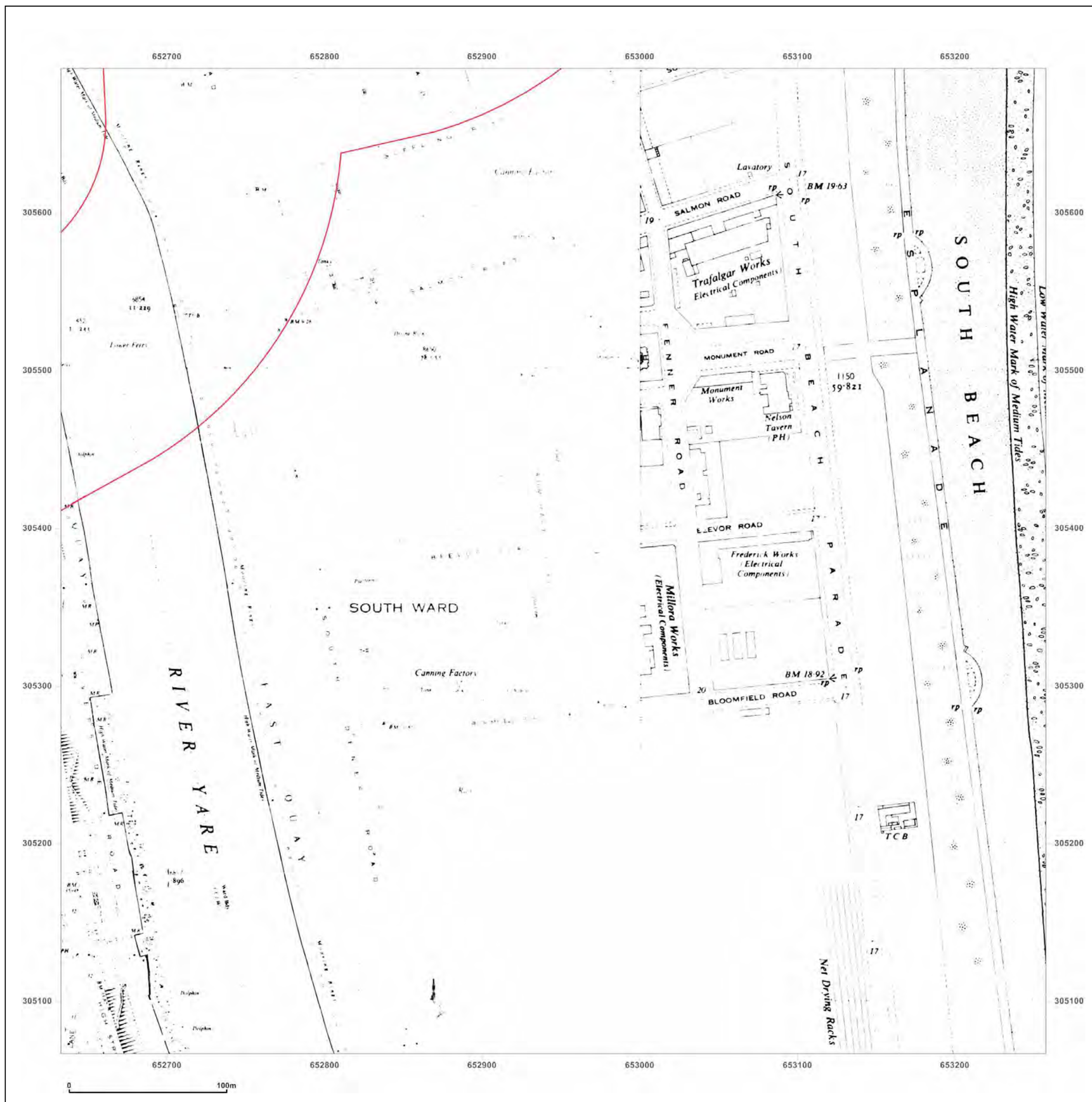


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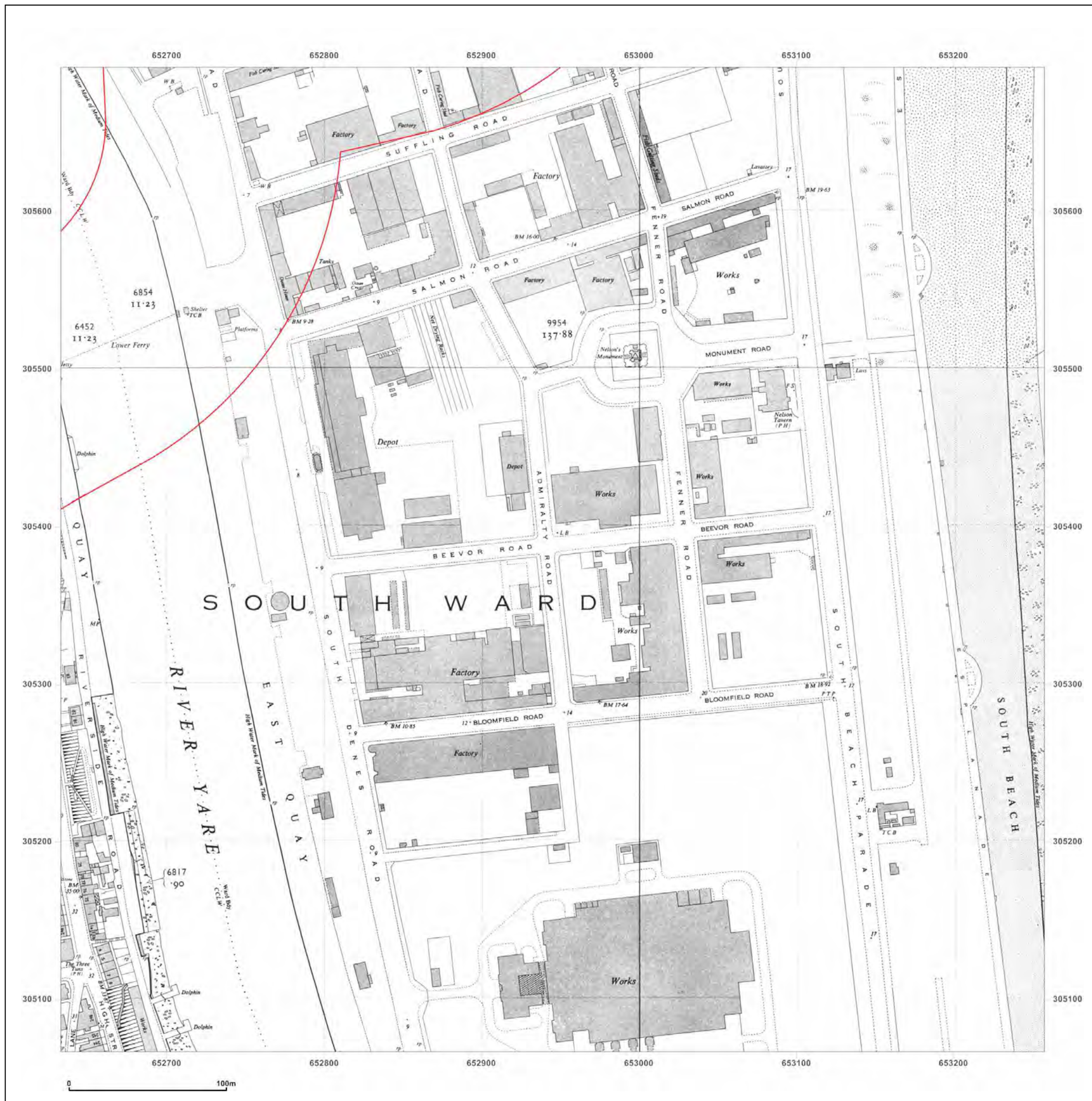
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Production date: 03 July 2017

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**Site Details:**

**Client Ref:** 16287  
**Report Ref:** CMAPS-CM-636391-16287-030717HIS\_LS\_3\_1  
**Grid Ref:** 652945, 305379

**Map Name:** National Grid

**Map date:** 1958

**Scale:** 1:2,500

**Printed at:** 1:2,500



Surveyed 1958  
 Revised 1958  
 Edition 1960  
 Copyright 1960  
 Levelled 1946



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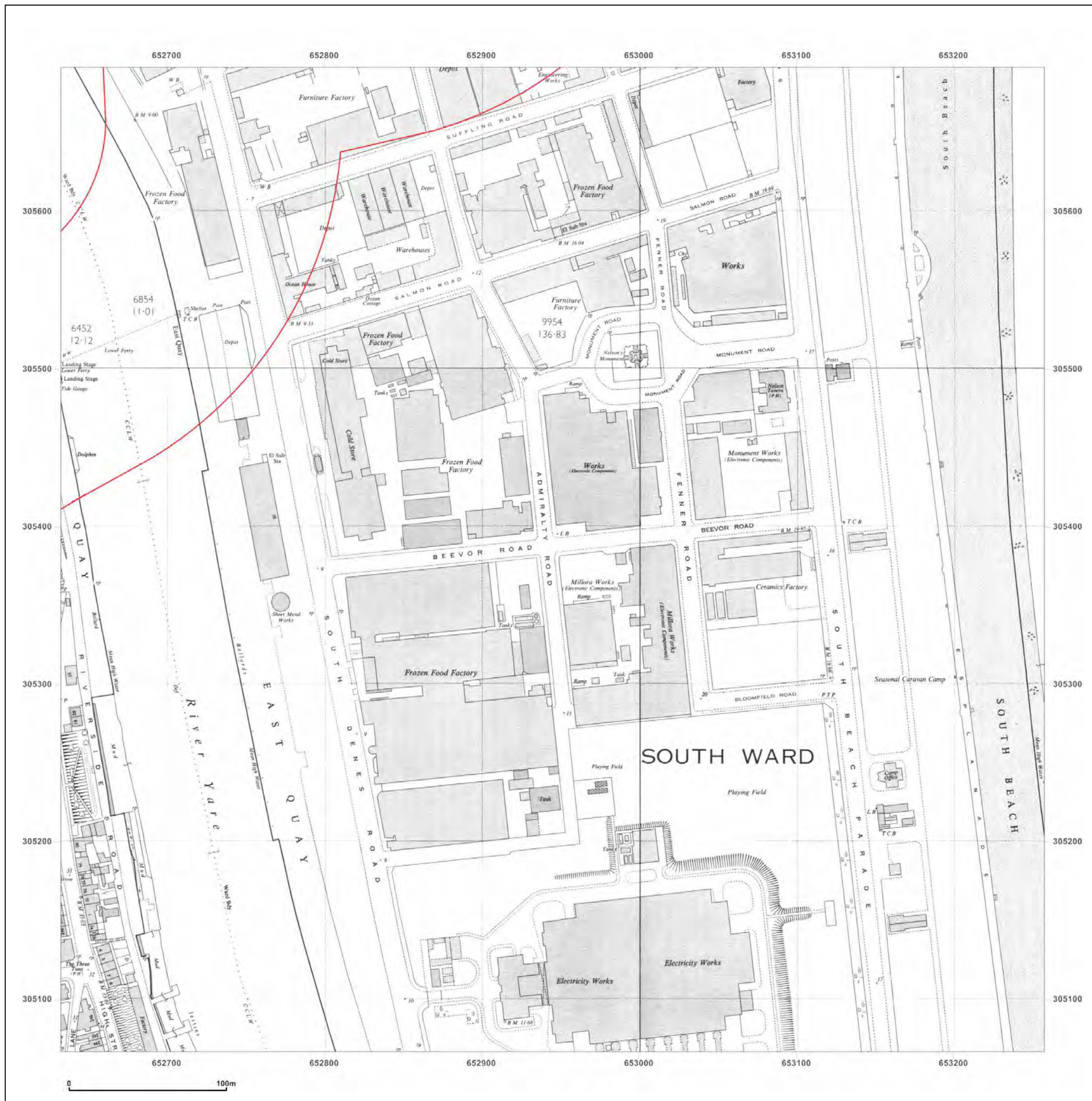


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Client Ref: 16287  
 Report Ref: CMAPS-CM-636391-16287-030717HIS\_LS\_3\_1  
 Grid Ref: 652945, 305379

Map Name: National Grid

Map date: 1968

Scale: 1:2,500

Printed at: 1:2,500



Surveyed 1968  
 Revised 1968  
 Edition N/A  
 Copyright 1969  
 Levelled 1958



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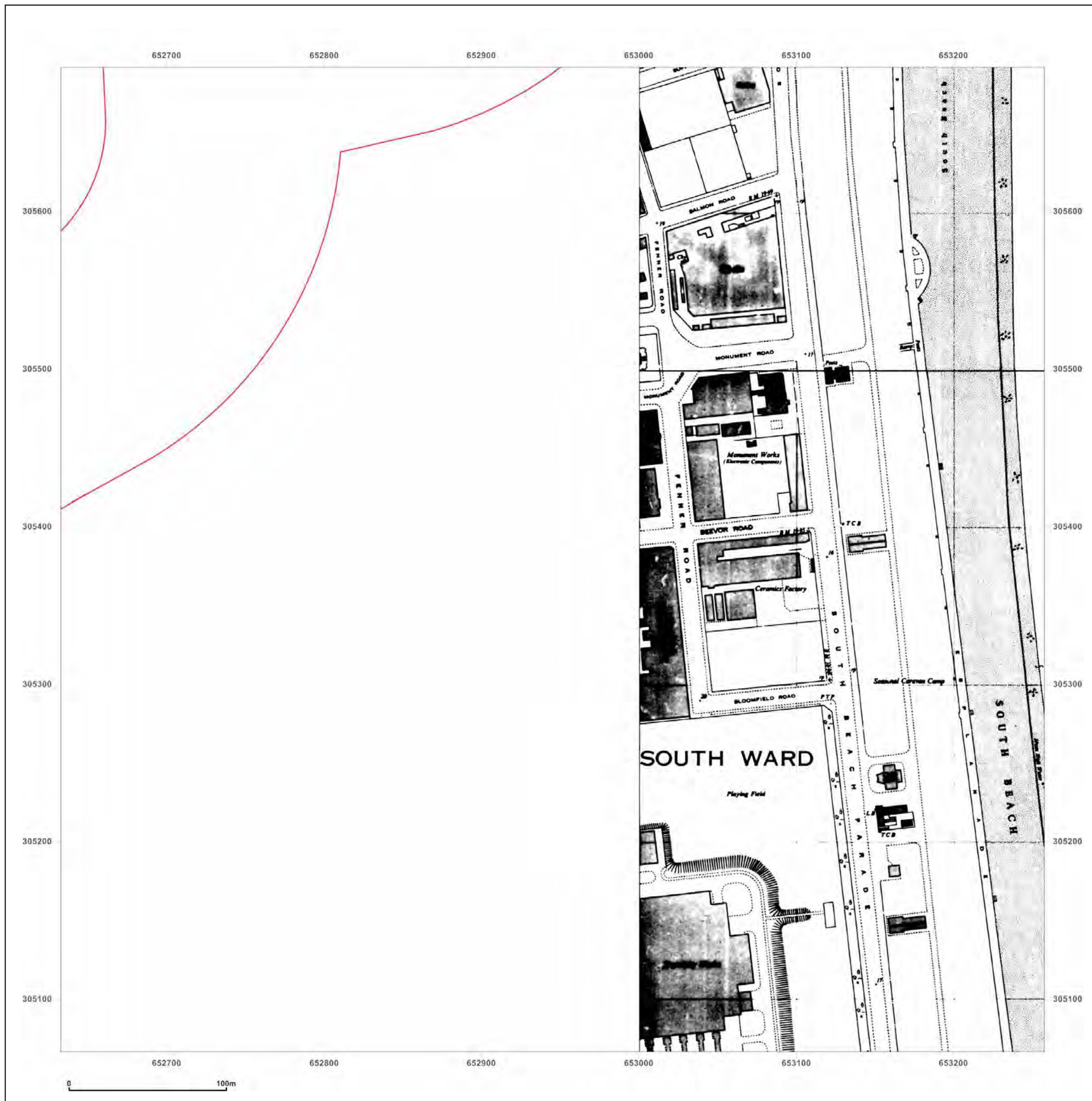


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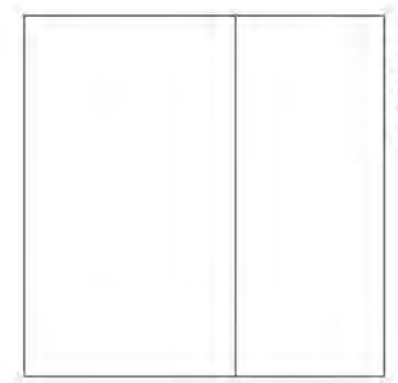
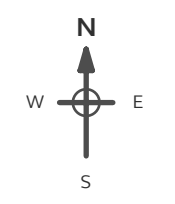
To view map legend click here [Legend](#)



**Site Details:**

Client Ref: 16287  
 Report Ref: CMAPS-CM-636391-16287-030717HIS\_LS\_3\_1  
 Grid Ref: 652945, 305379

Map Name: National Grid  
 Map date: 1969  
 Scale: 1:2,500  
 Printed at: 1:2,500



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



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**Site Details:**

**Client Ref:** 16287  
**Report Ref:** CMAPS-CM-636391-16287-030717HIS\_LS\_3\_1  
**Grid Ref:** 652945, 305379

**Map Name:** National Grid

**Map date:** 1969

**Scale:** 1:2,500

**Printed at:** 1:2,500



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



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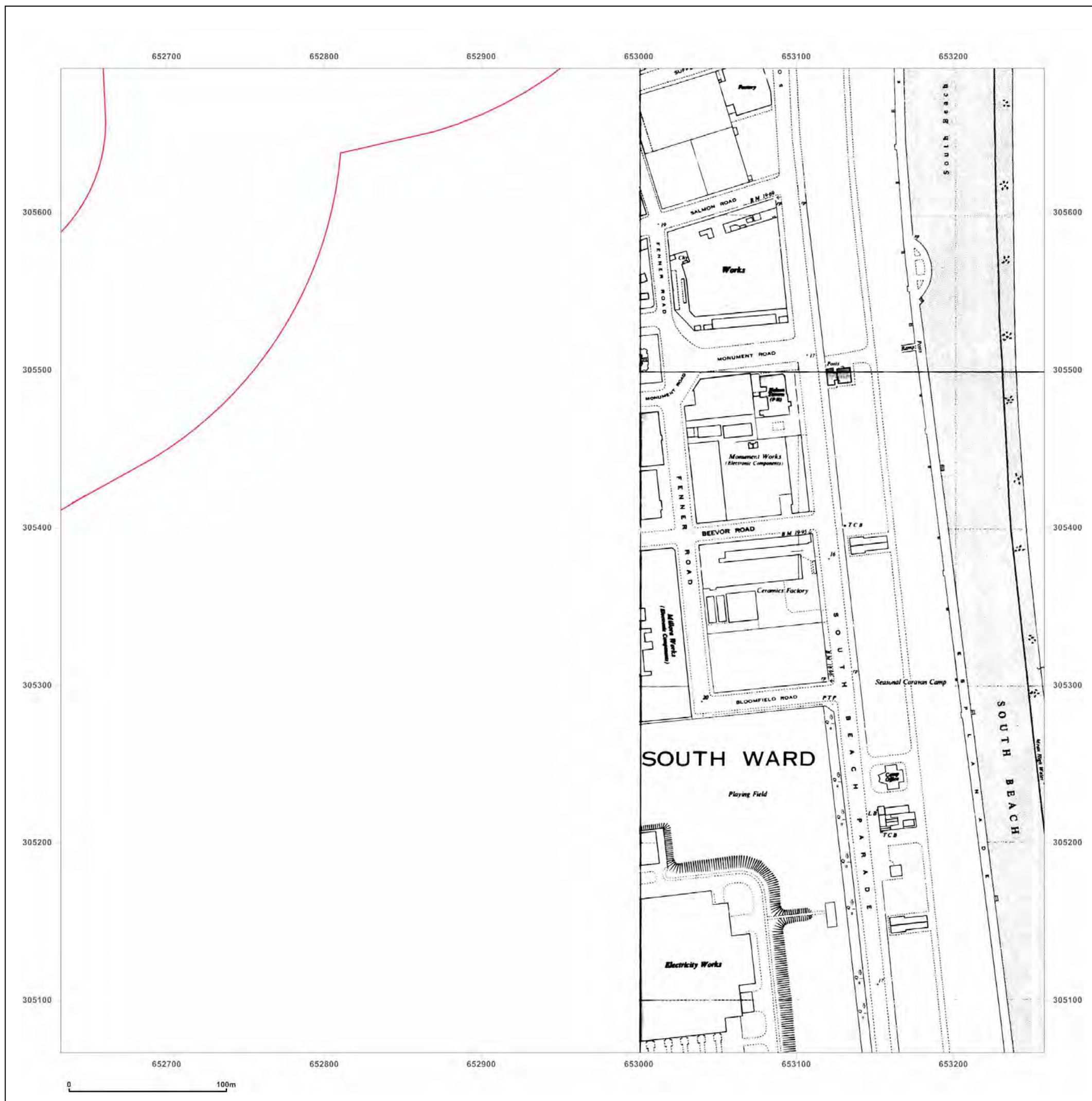


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**Site Details:**

**Client Ref:** 16287  
**Report Ref:** CMAPS-CM-636391-16287-030717HIS\_LS\_3\_2  
**Grid Ref:** 652945, 306004

**Map Name:** County Series

**Map date:** 1883

**Scale:** 1:2,500

**Printed at:** 1:2,500



Surveyed 1883  
 Revised 1883  
 Edition N/A  
 Copyright N/A  
 Levelled N/A



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Site Details:

Client Ref: 16287  
Report Ref: CMAPS-CM-636391-16287-030717HIS\_LS\_3\_2  
Grid Ref: 652945, 306004

Map Name: County Series

Map date: 1887

Scale: 1:2,500

Printed at: 1:2,500



Surveyed 1887  
Revised 1887  
Edition N/A  
Copyright N/A  
Levelled N/A



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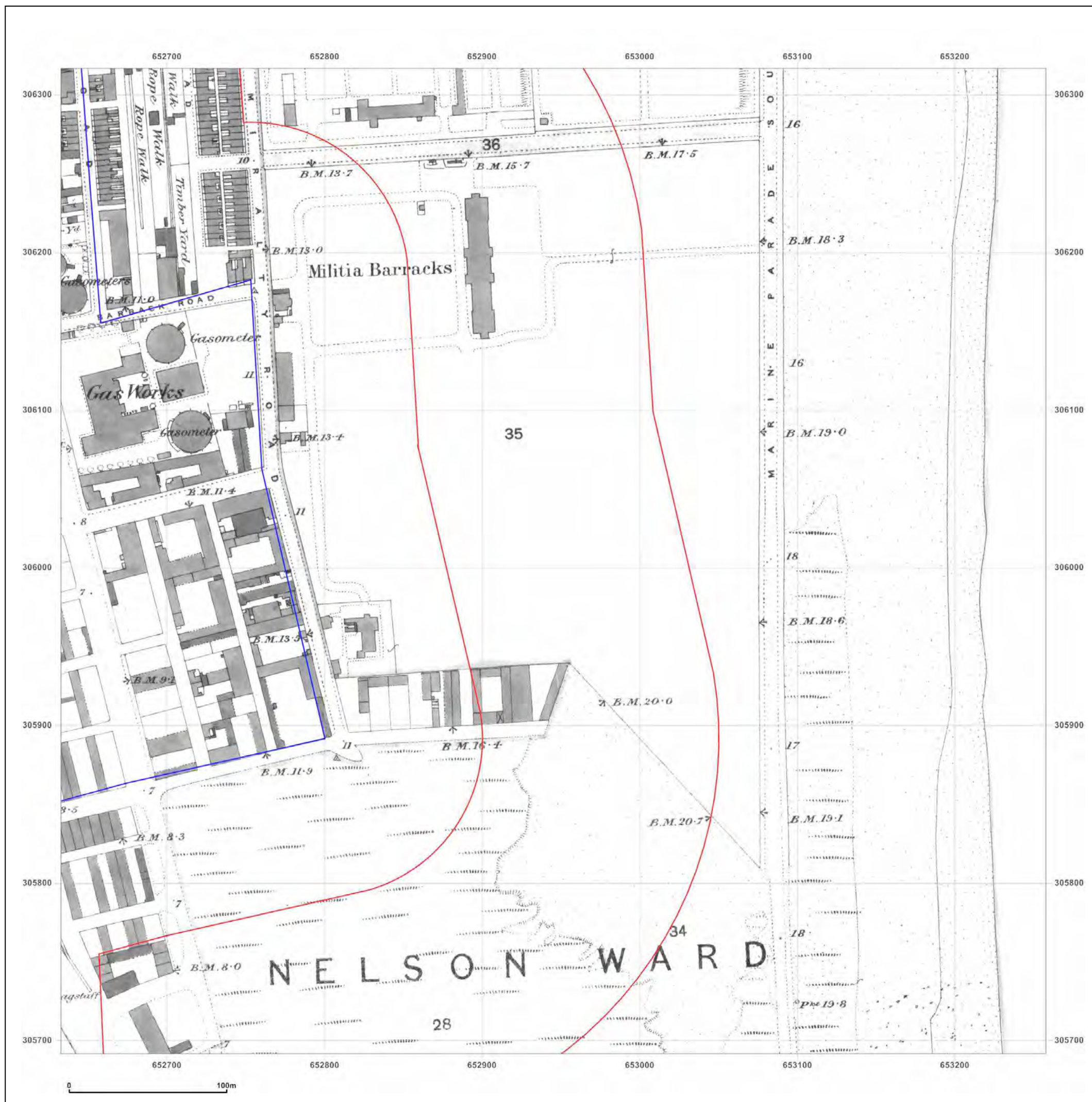


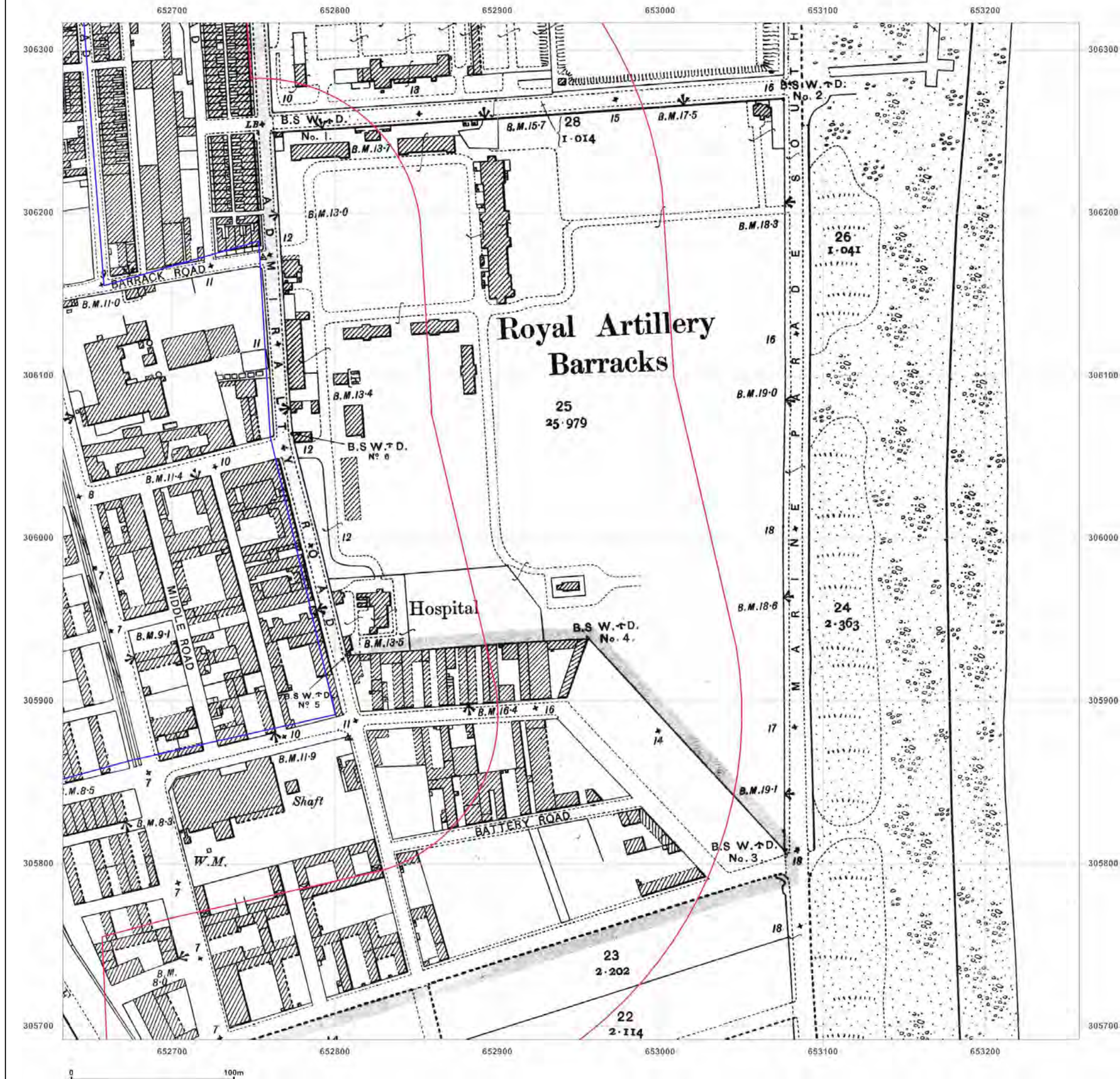
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**Site Details:**

Client Ref: 16287  
 Report Ref: CMAPS-CM-636391-16287-030717HIS\_LS\_3\_2  
 Grid Ref: 652945, 306004

Map Name: County Series

Map date: 1906

Scale: 1:2,500

Printed at: 1:2,500



Surveyed 1883  
 Revised 1904  
 Edition 1906  
 Copyright N/A  
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Site Details:

Client Ref: 16287  
Report Ref: CMAPS-CM-636391-16287-030717HIS\_LS\_3\_2  
Grid Ref: 652945, 306004

Map Name: County Series

Map date: 1927

Scale: 1:2,500

Printed at: 1:2,500



Surveyed 1927  
Revised 1927  
Edition N/A  
Copyright N/A  
Levelled N/A



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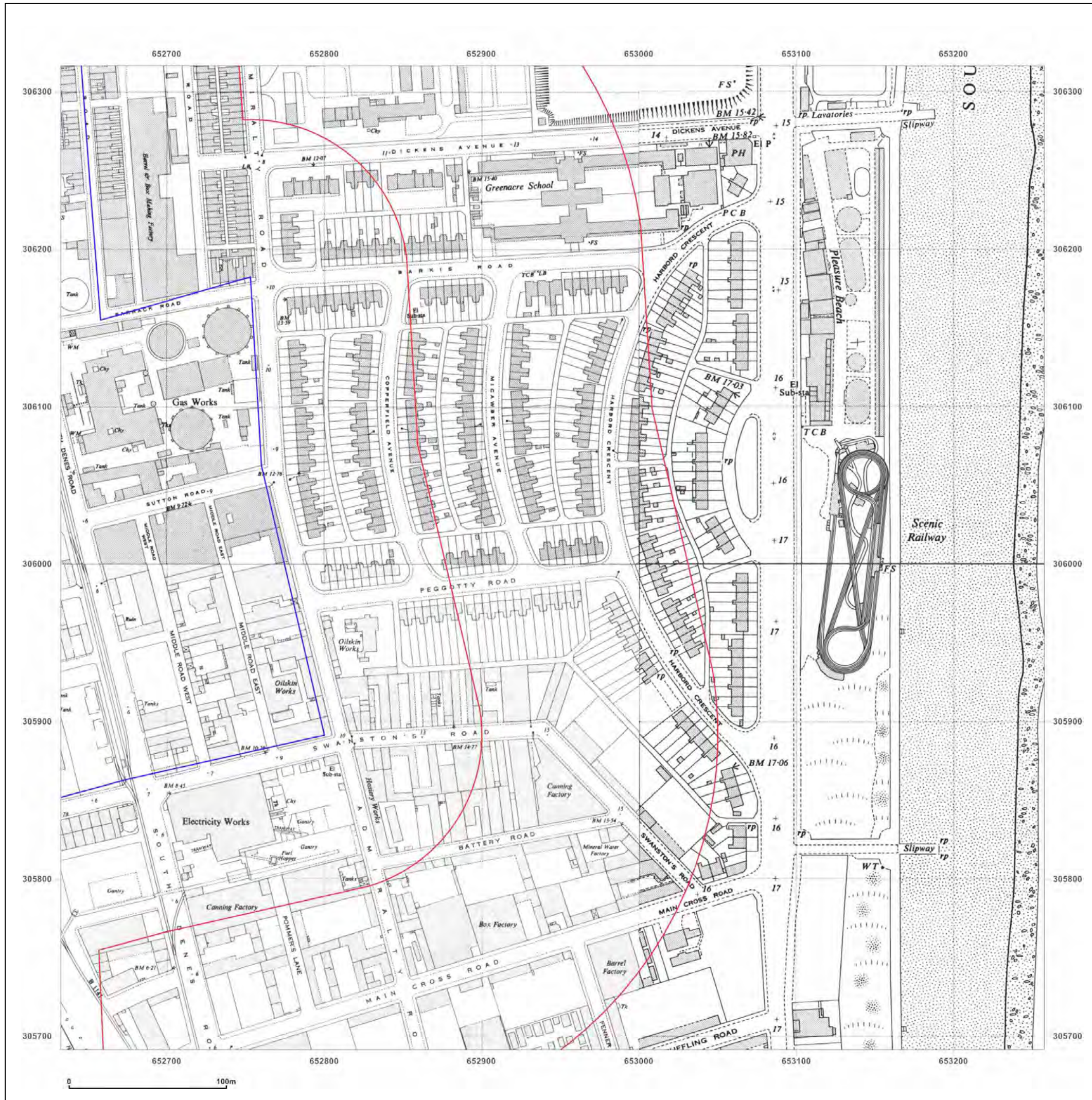
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**Site Details:**

**Client Ref:** 16287  
**Report Ref:** CMAPS-CM-636391-16287-030717HIS\_LS\_3\_2  
**Grid Ref:** 652945, 306004

**Map Name:** National Grid

**Map date:** 1949

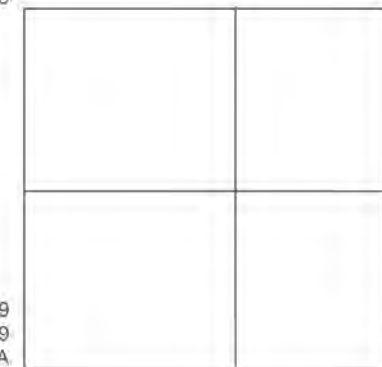
**Scale:** 1:2,500

**Printed at:** 1:2,500



Surveyed 1949  
Revised 1949  
Edition N/A  
Copyright N/A  
Levelled 1946

Surveyed 1949  
Revised 1949  
Edition N/A  
Copyright N/A  
Levelled 1946



Surveyed 1949  
Revised 1949  
Edition N/A  
Copyright N/A  
Levelled 1946

Surveyed 1949  
Revised 1949  
Edition N/A  
Copyright N/A  
Levelled 1946



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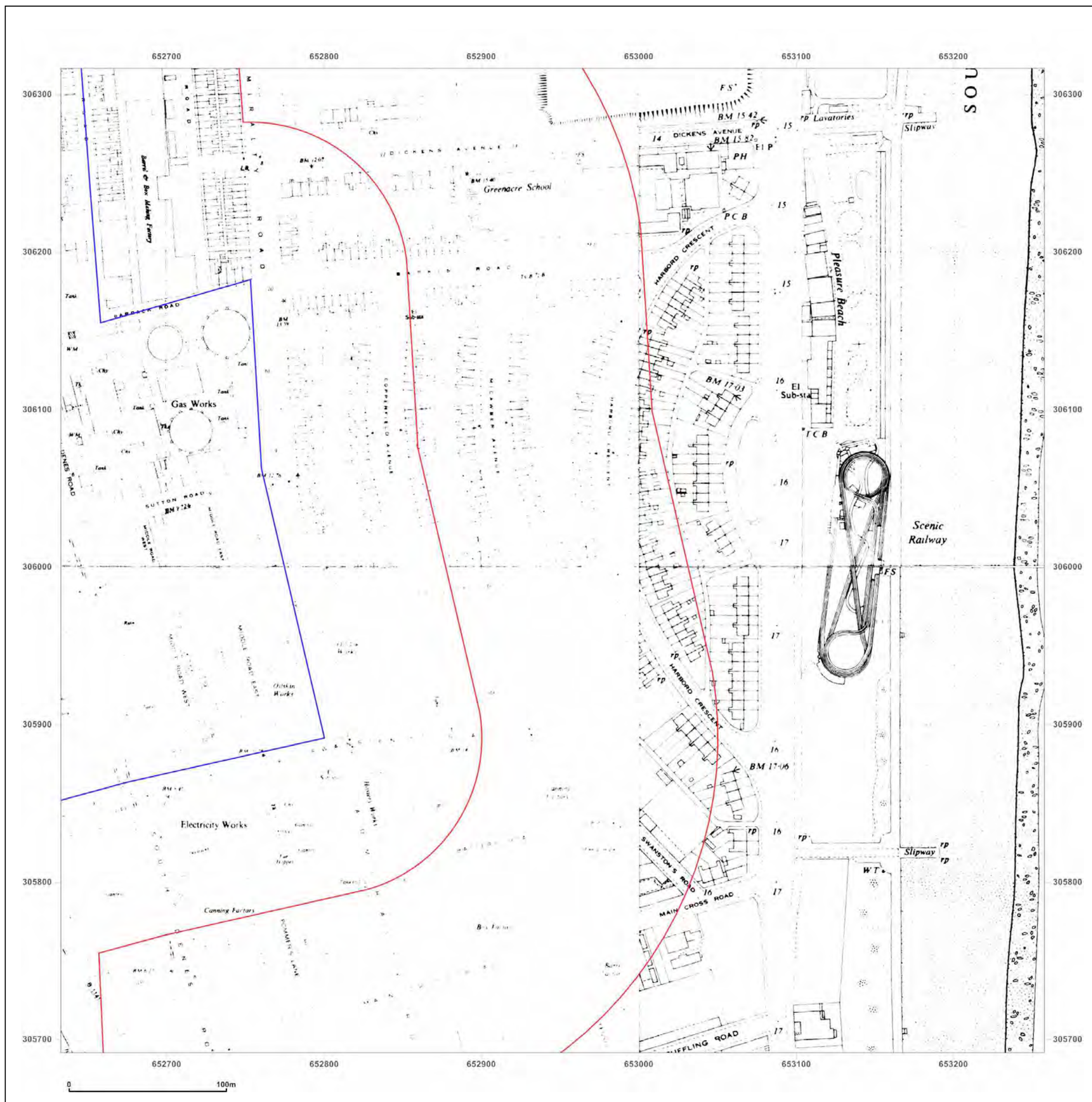


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**Site Details:**

**Client Ref:** 16287  
**Report Ref:** CMAPS-CM-636391-16287-030717HIS\_LS\_3\_2  
**Grid Ref:** 652945, 306004

**Map Name:** National Grid

**Map date:** 1950-1951

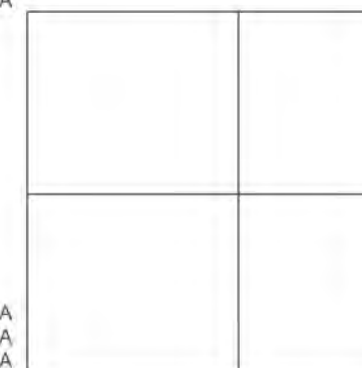
**Scale:** 1:2,500

**Printed at:** 1:2,500



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

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



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

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 Revised N/A  
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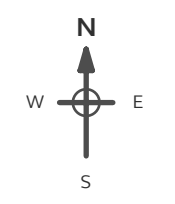
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**Site Details:**

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**Report Ref:** CMAPS-CM-636391-16287-030717HIS\_LS\_3\_2  
**Grid Ref:** 652945, 306004

**Map Name:** National Grid  
**Map date:** 1958  
**Scale:** 1:2,500  
**Printed at:** 1:2,500



Surveyed 1958  
 Revised 1958  
 Edition 1960  
 Copyright 1960  
 Levelled 1946



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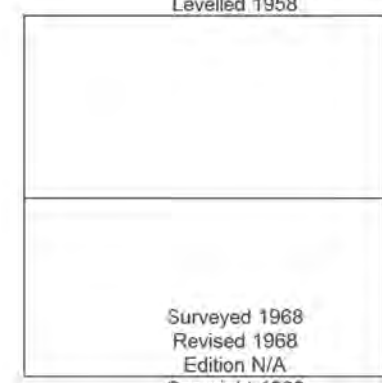
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 Report Ref: CMAPS-CM-636391-16287-030717HIS\_LS\_3\_2  
 Grid Ref: 652945, 306004

Map Name: National Grid  
 Map date: 1963-1968  
 Scale: 1:2,500  
 Printed at: 1:2,500



Surveyed 1963  
 Revised 1963  
 Edition 1965  
 Copyright 1965  
 Levelled 1958



Surveyed 1968  
 Revised 1968  
 Edition N/A  
 Copyright 1969  
 Levelled 1958



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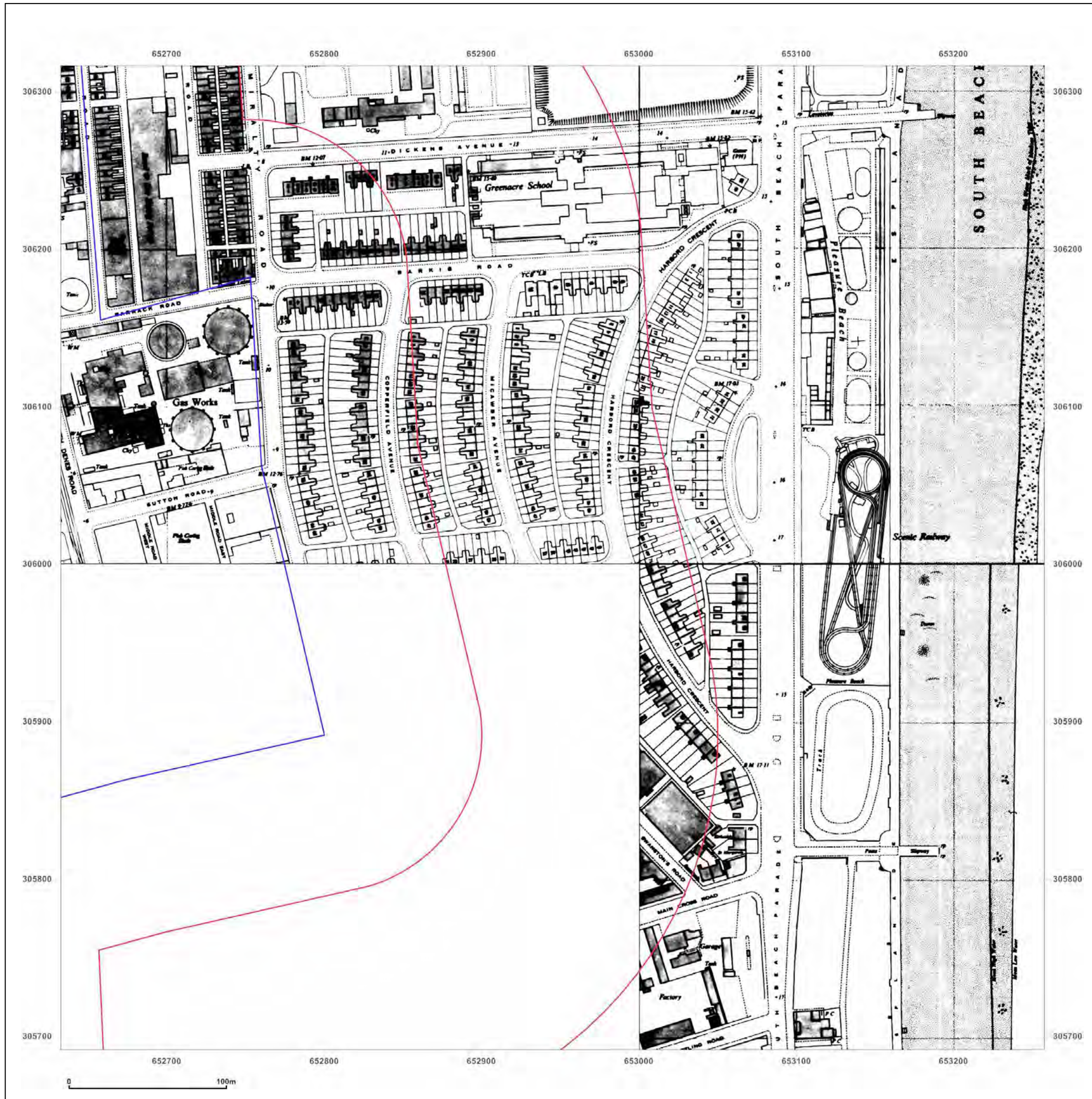


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Site Details:

Client Ref: 16287  
Report Ref: CMAPS-CM-636391-16287-030717HIS\_LS\_3\_2  
Grid Ref: 652945, 306004

Map Name: National Grid

Map date: 1965-1969

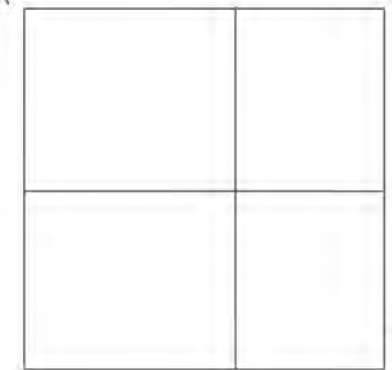
Scale: 1:2,500

Printed at: 1:2,500



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



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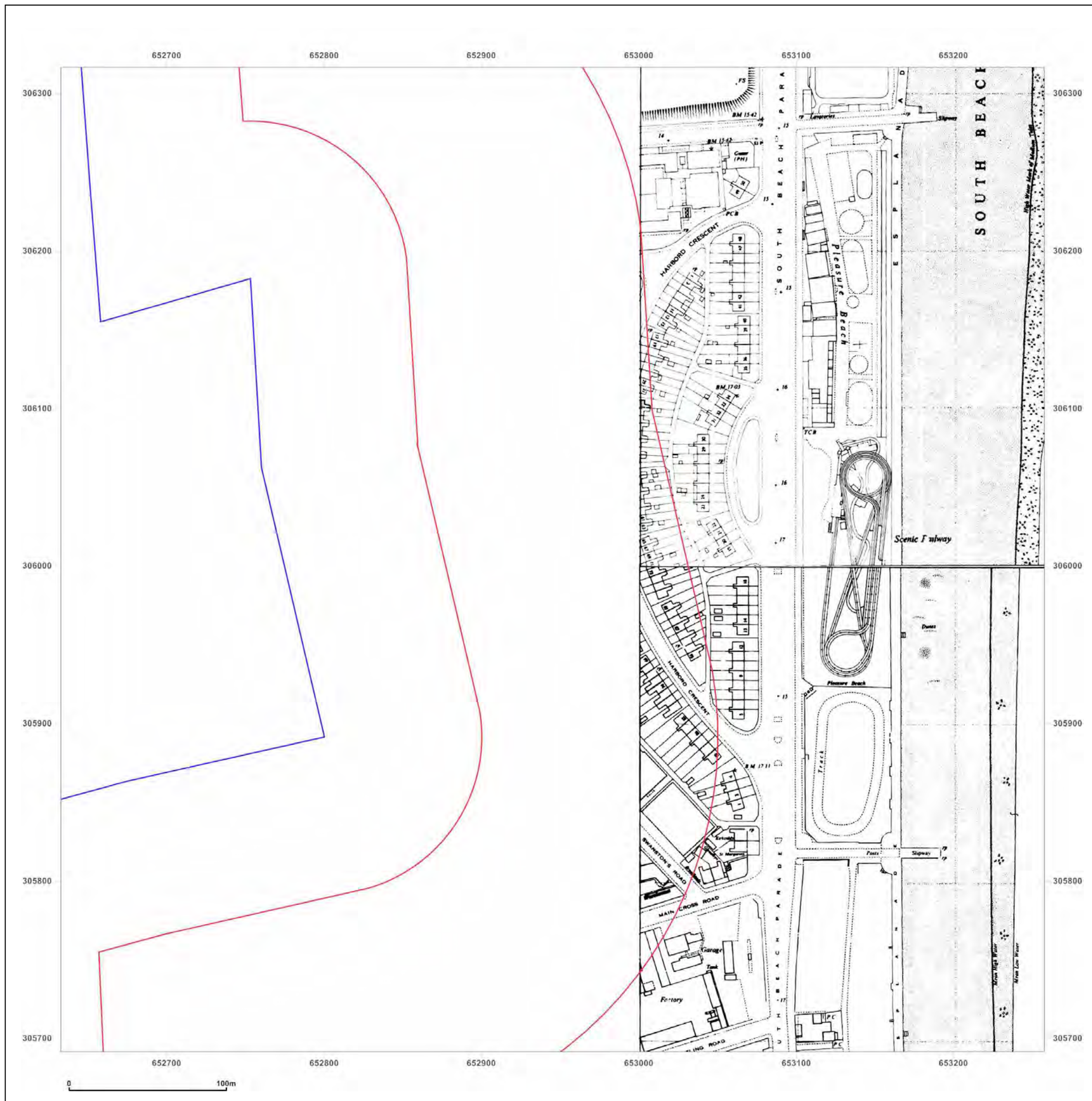


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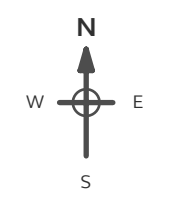
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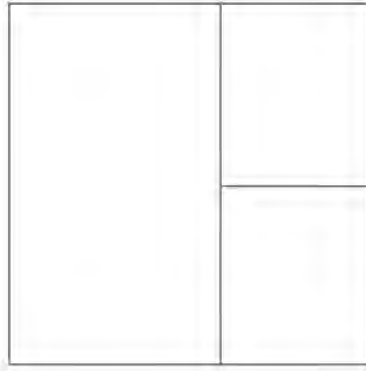
**Site Details:**

**Client Ref:** 16287  
**Report Ref:** CMAPS-CM-636391-16287-030717HIS\_LS\_3\_2  
**Grid Ref:** 652945, 306004

**Map Name:** National Grid  
**Map date:** 1965-1969  
**Scale:** 1:2,500  
**Printed at:** 1:2,500



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



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 Revised N/A  
 Edition N/A  
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**Site Details:**

Client Ref: 16287  
 Report Ref: CMAPS-CM-636391-16287-030717HIS\_LS\_3\_3  
 Grid Ref: 652945, 306630

Map Name: County Series  
 Map date: 1883  
 Scale: 1:2,500  
 Printed at: 1:2,500



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

Surveyed 1883  
 Revised 1883  
 Edition N/A  
 Copyright N/A  
 Levelled N/A

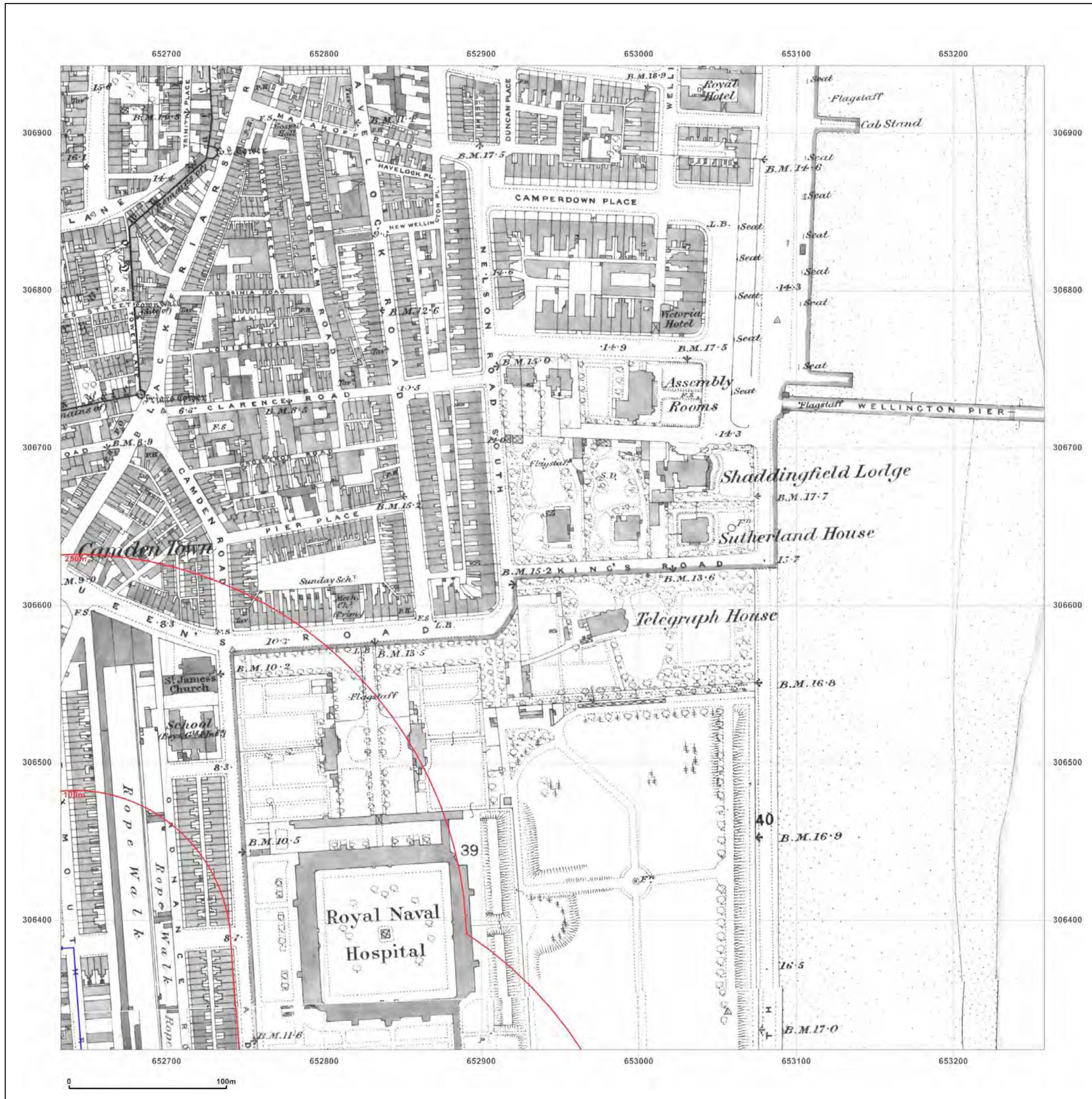
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**Site Details:**

**Client Ref:** 16287  
**Report Ref:** CMAPS-CM-636391-16287-030717HIS\_LS\_3\_3  
**Grid Ref:** 652945, 306630

**Map Name:** County Series

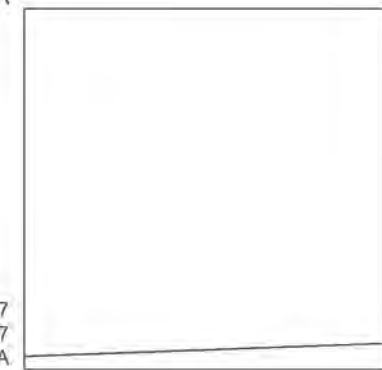
**Map date:** 1887

**Scale:** 1:2,500

**Printed at:** 1:2,500



Surveyed 1887  
Revised 1887  
Edition N/A  
Copyright N/A  
Levelled N/A



Surveyed 1887  
Revised 1887  
Edition N/A  
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**Site Details:**

Client Ref: 16287  
Report Ref: CMAPS-CM-636391-16287-030717HIS\_LS\_3\_3  
Grid Ref: 652945, 306630

Map Name: County Series

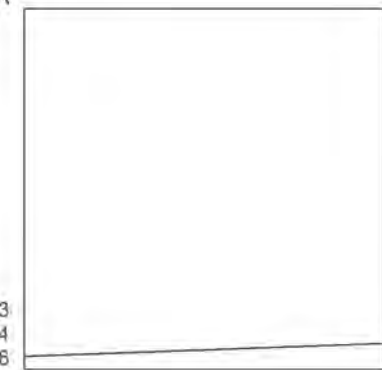
Map date: 1905-1906

Scale: 1:2,500

Printed at: 1:2,500



Surveyed 1905  
Revised 1905  
Edition N/A  
Copyright N/A  
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Surveyed 1883  
Revised 1904  
Edition 1906  
Copyright N/A  
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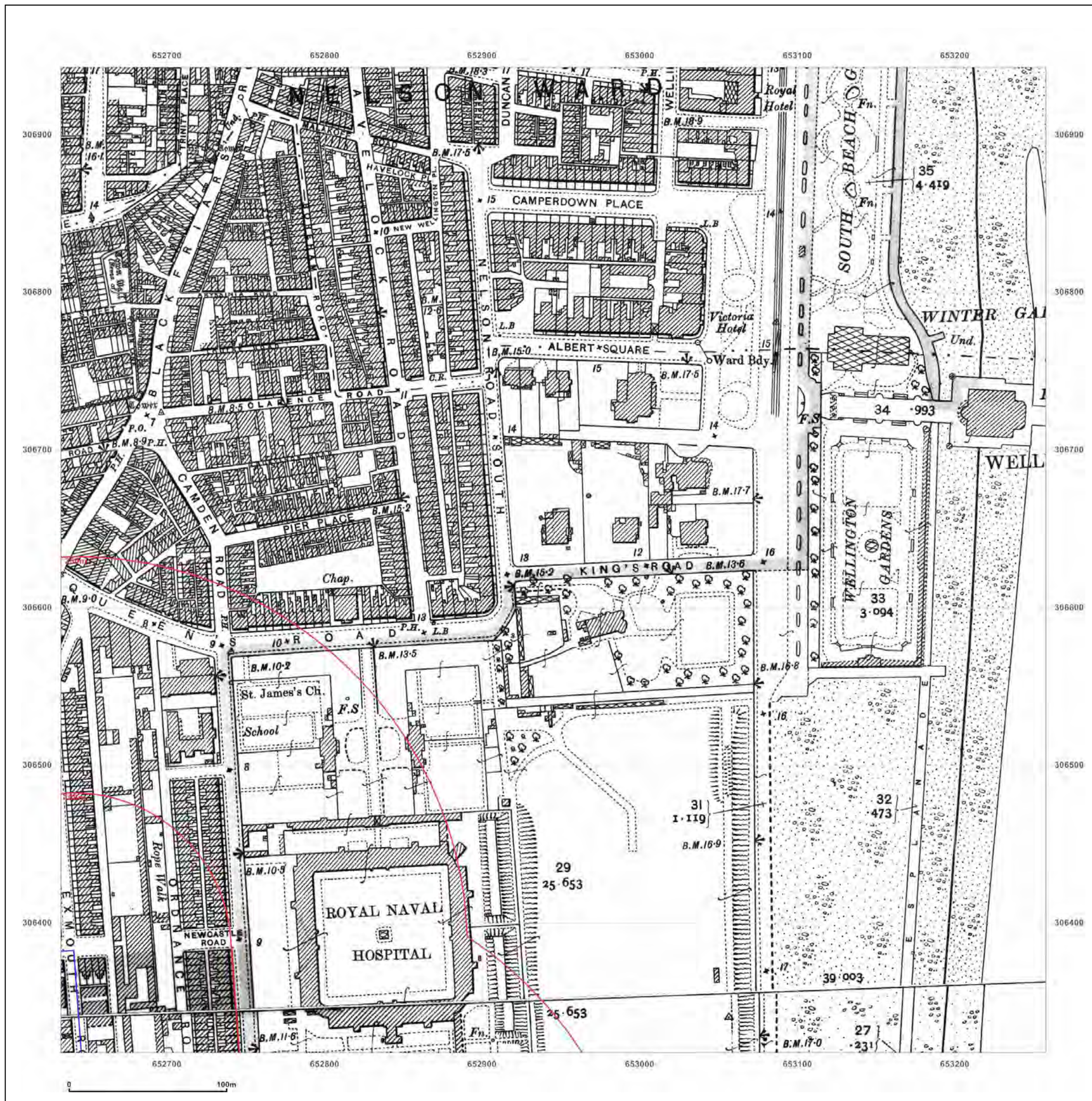


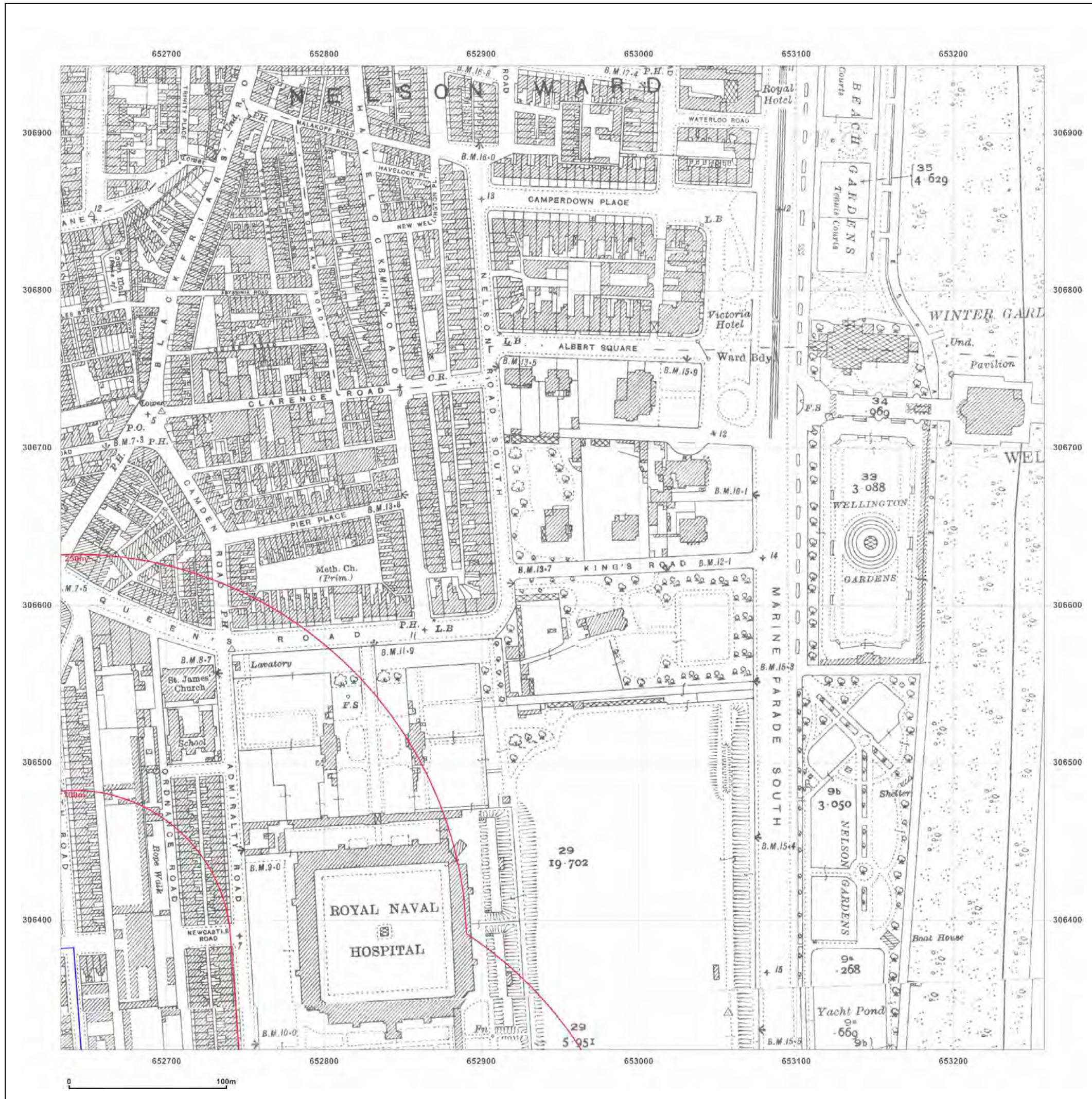
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Site Details:

Client Ref: 16287  
Report Ref: CMAPS-CM-636391-16287-030717HIS\_LS\_3\_3  
Grid Ref: 652945, 306630

Map Name: County Series

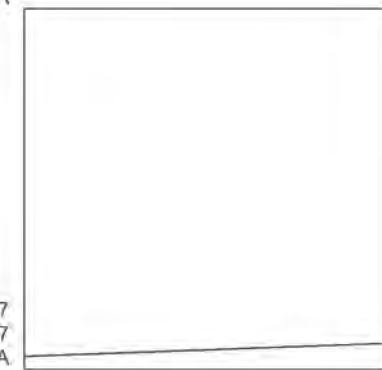
Map date: 1927-1928

Scale: 1:2,500

Printed at: 1:2,500



Surveyed 1928  
Revised 1928  
Edition N/A  
Copyright N/A  
Levelled N/A



Surveyed 1927  
Revised 1927  
Edition N/A  
Copyright N/A  
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Site Details:

Client Ref: 16287  
Report Ref: CMAPS-CM-636391-16287-030717HIS\_LS\_3\_3  
Grid Ref: 652945, 306630

Map Name: National Grid

Map date: 1949

Scale: 1:2,500

Printed at: 1:2,500



Surveyed 1949  
Revised 1949  
Edition N/A  
Copyright N/A  
Levelled 1946



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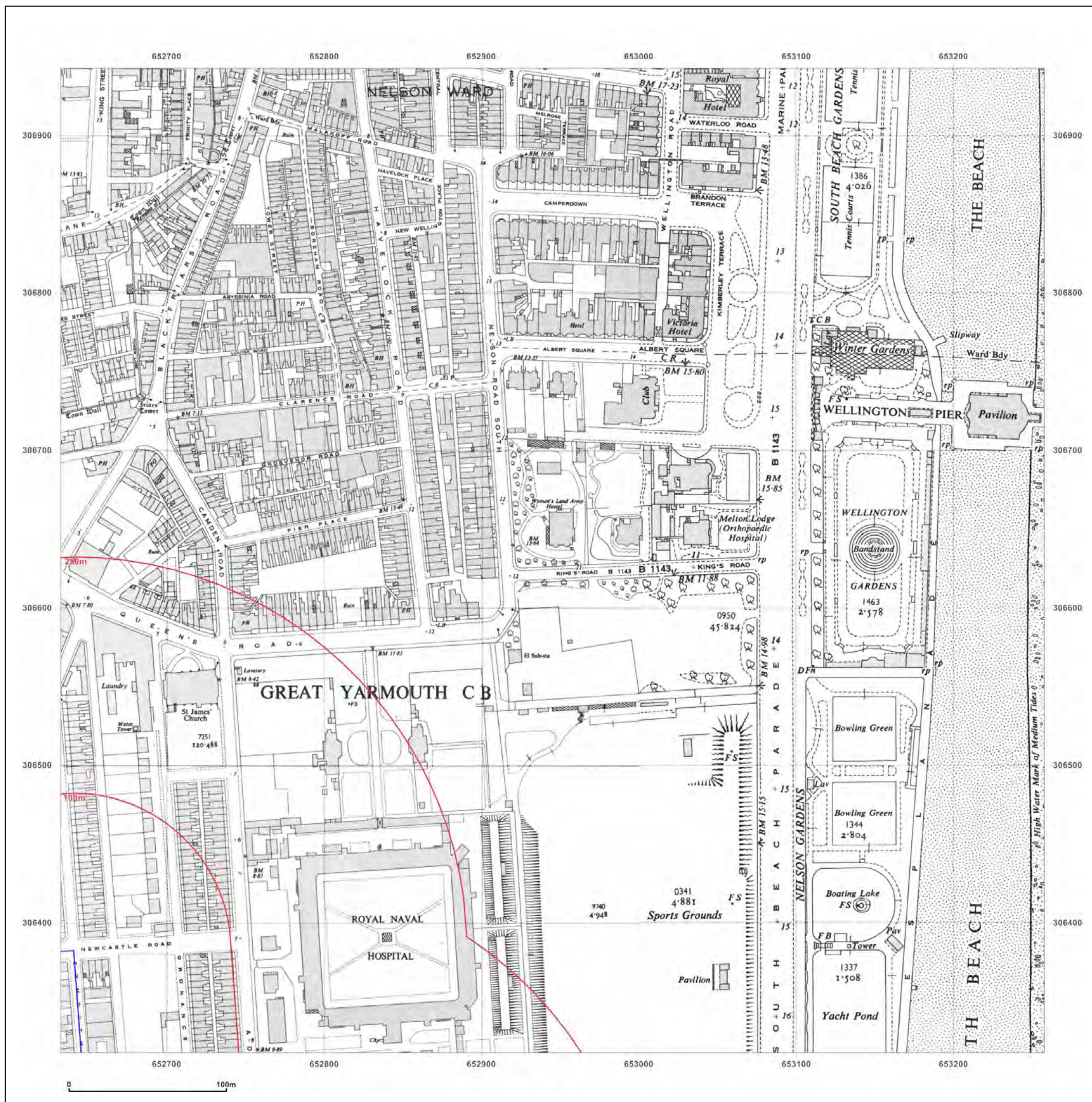


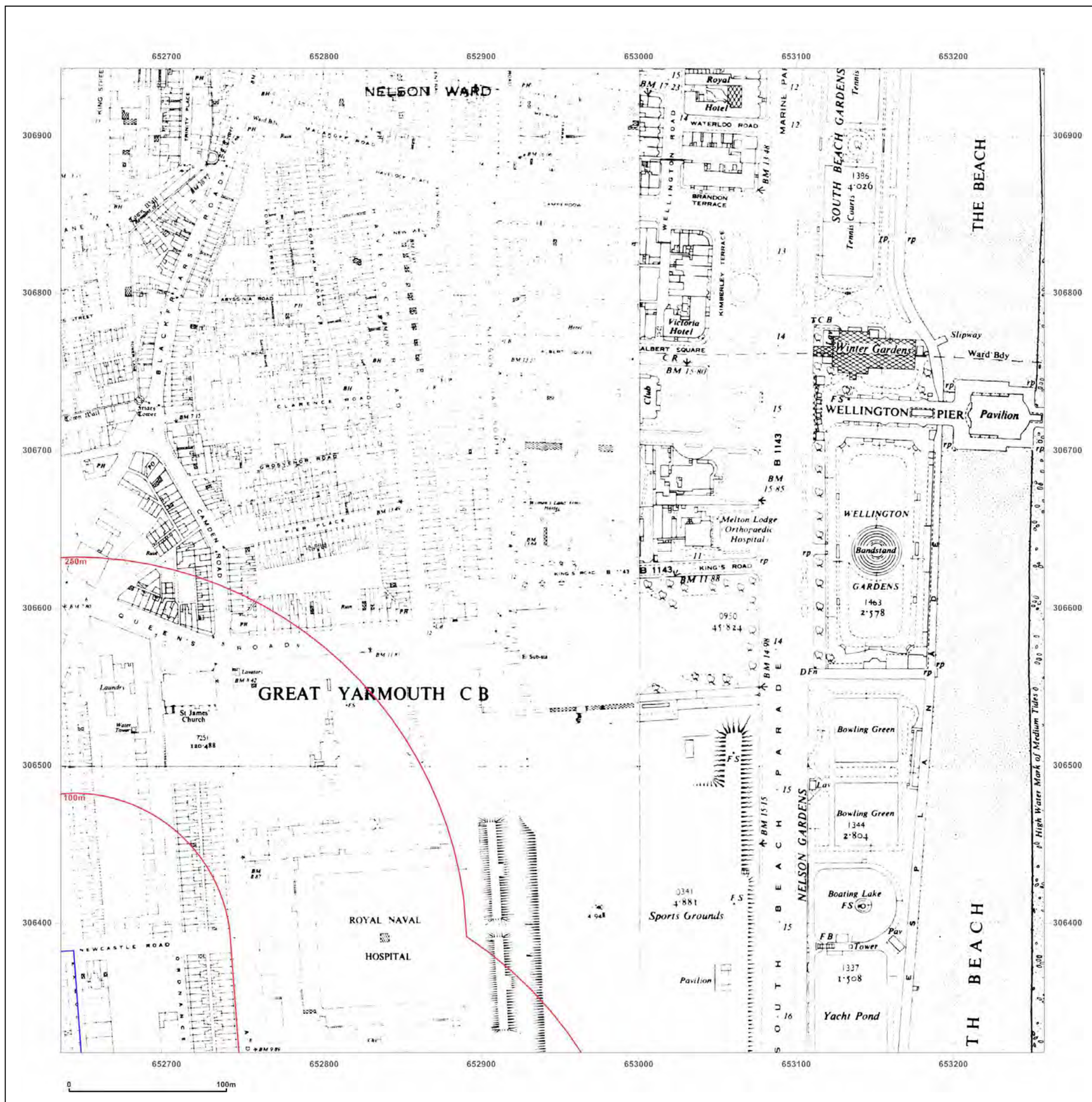
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Site Details:

Client Ref: 16287  
Report Ref: CMAPS-CM-636391-16287-030717HIS\_LS\_3\_3  
Grid Ref: 652945, 306630

Map Name: National Grid

Map date: 1950-1951

Scale: 1:2,500

Printed at: 1:2,500



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



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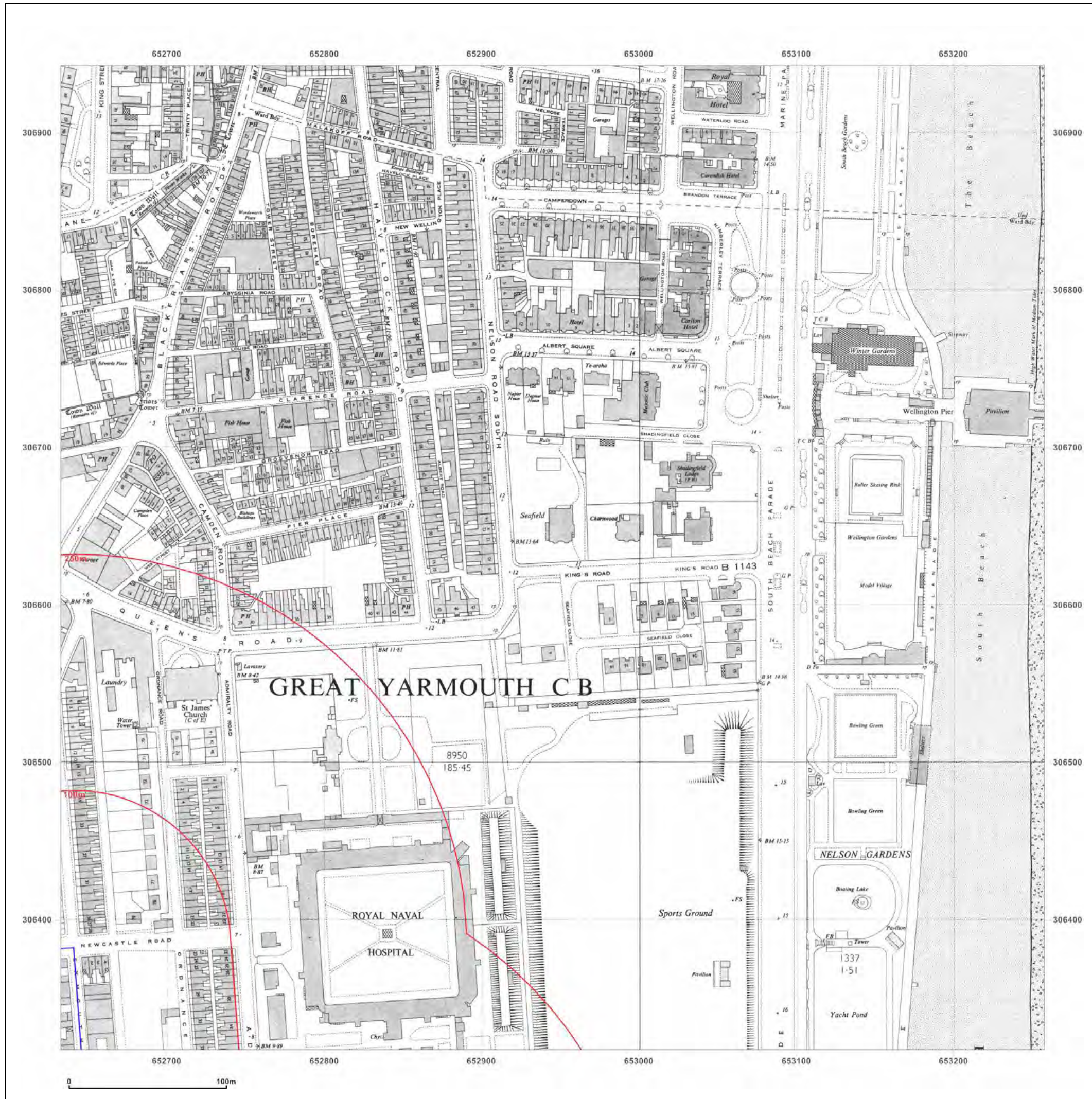


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Site Details:

Client Ref: 16287  
Report Ref: CMAPS-CM-636391-16287-030717HIS\_LS\_3\_3  
Grid Ref: 652945, 306630

Map Name: National Grid

Map date: 1963

Scale: 1:2,500

Printed at: 1:2,500



Surveyed 1963  
Revised 1963  
Edition 1965  
Copyright 1965  
Levelled 1958



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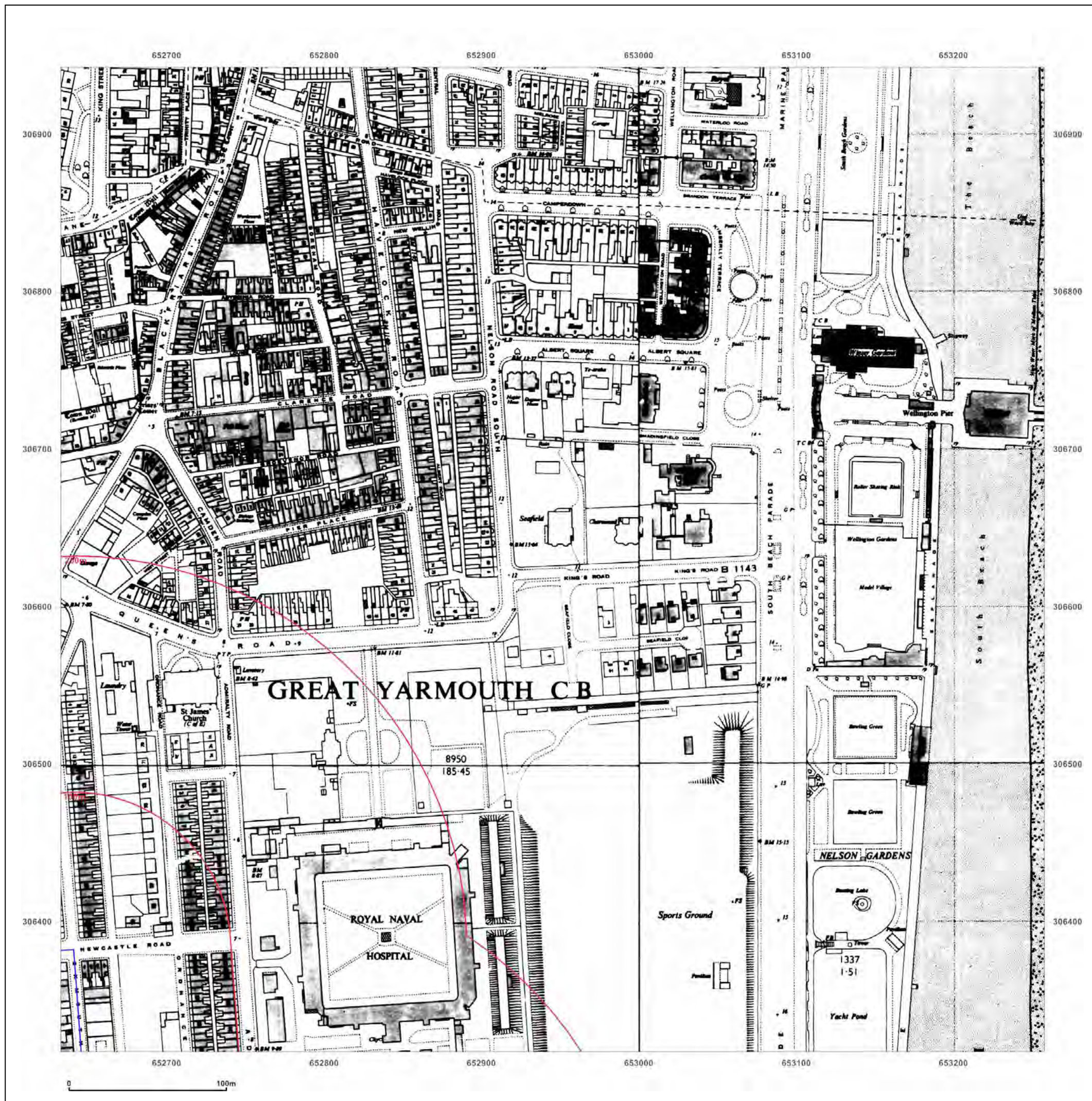


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**Site Details:**

Client Ref: 16287  
Report Ref: CMAPS-CM-636391-16287-030717HIS\_LS\_3\_3  
Grid Ref: 652945, 306630

Map Name: National Grid  
Map date: 1965  
Scale: 1:2,500  
Printed at: 1:2,500



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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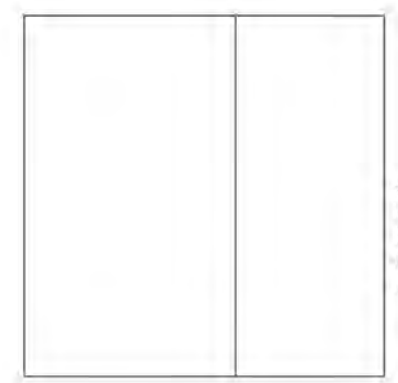
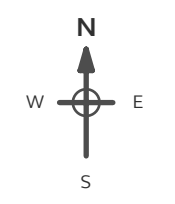
To view map legend click here [Legend](#)



**Site Details:**

Client Ref: 16287  
 Report Ref: CMAPS-CM-636391-16287-030717HIS\_LS\_3\_3  
 Grid Ref: 652945, 306630

Map Name: National Grid  
 Map date: 1965  
 Scale: 1:2,500  
 Printed at: 1:2,500



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



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Site Details:

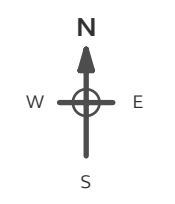
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Report Ref: CMAPS-CM-636391-16287-030717HIS  
Grid Ref: 652320, 306005

Map Name: County Series

Map date: 1883-1886

Scale: 1:10,560

Printed at: 1:10,560



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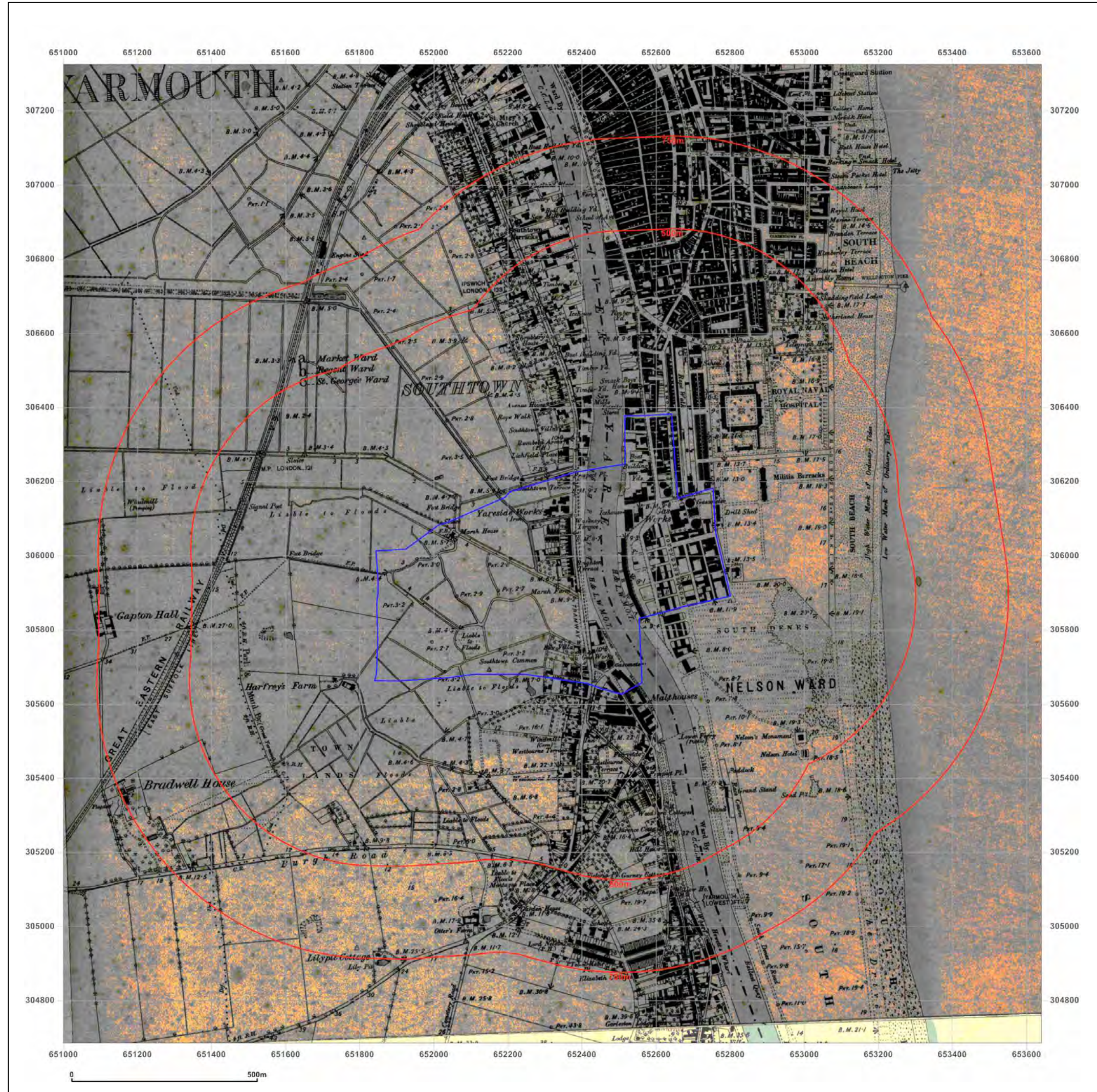


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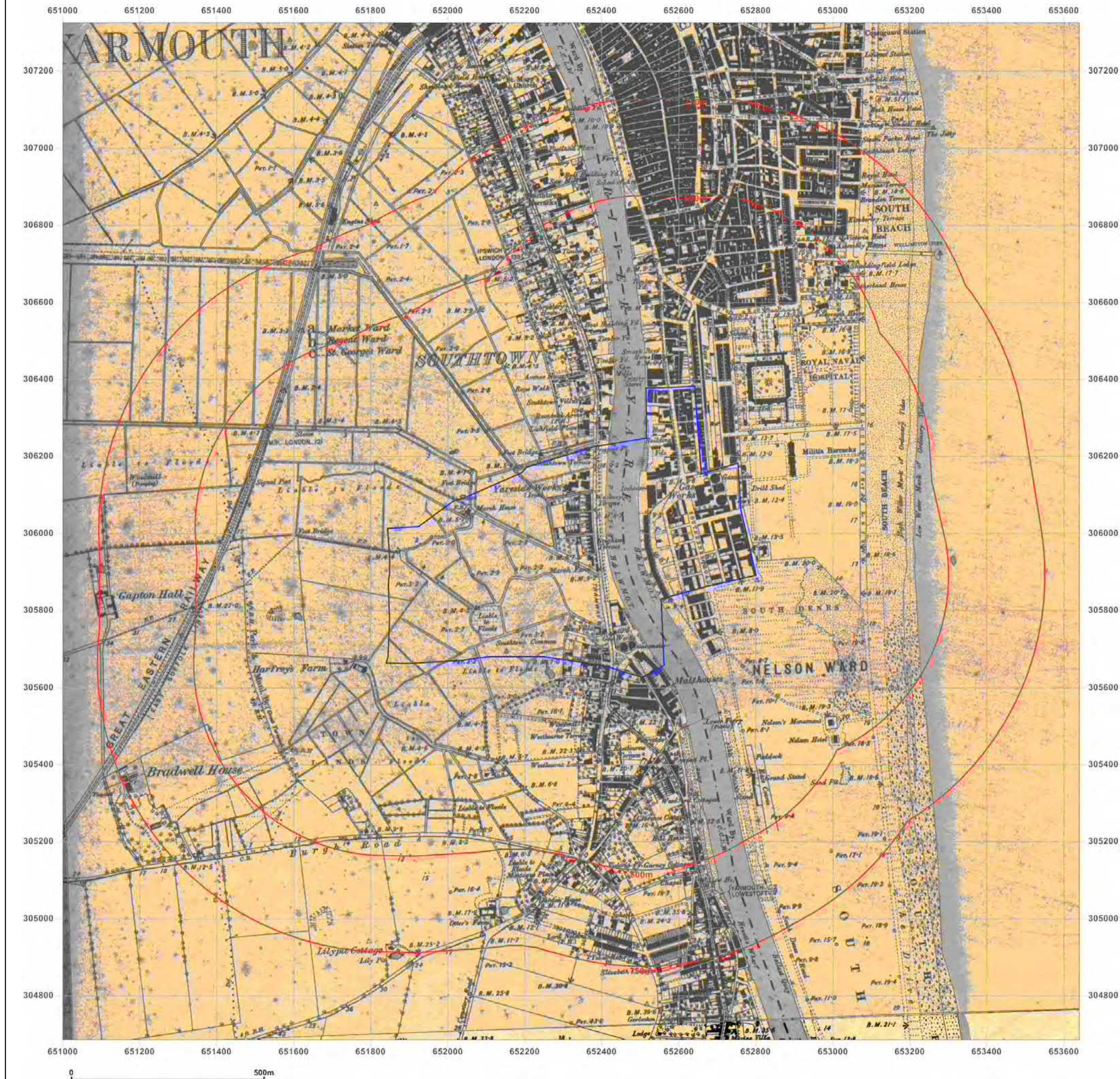
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Site Details:

Client Ref: 16287  
Report Ref: CMAPS-CM-636391-16287-030717HIS  
Grid Ref: 652320, 306005

Map Name: County Series

Map date: 1884-1888

Scale: 1:10,560

Printed at: 1:10,560



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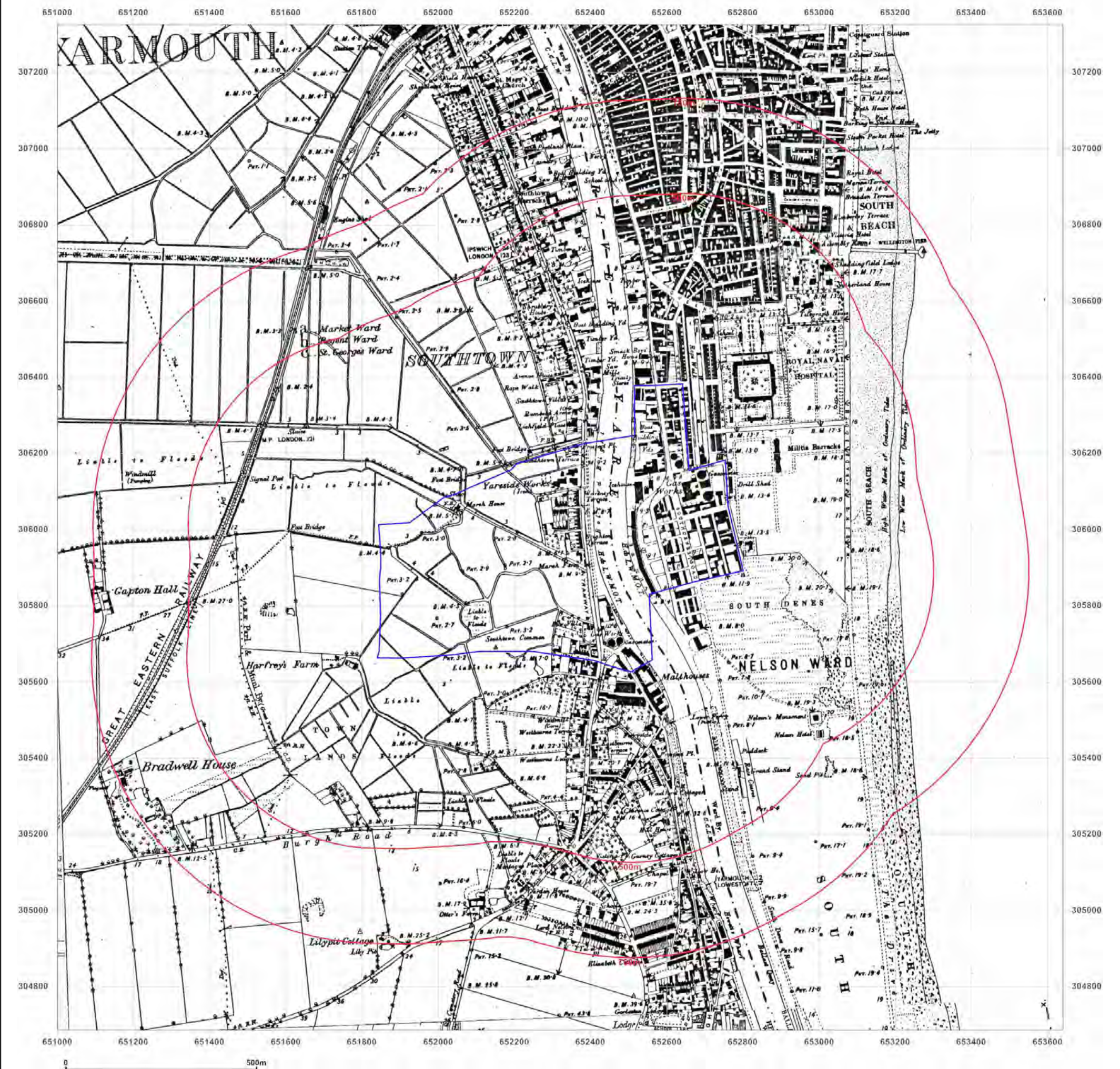


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Report Ref: CMAPS-CM-636391-16287-030717HIS  
Grid Ref: 652320, 306005

Map Name: County Series

Map date: 1901-1904

Scale: 1:10,560

Printed at: 1:10,560



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Edition N/A  
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Site Details:

Client Ref: 16287  
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Grid Ref: 652320, 306005

Map Name: County Series

Map date: 1905

Scale: 1:10,560

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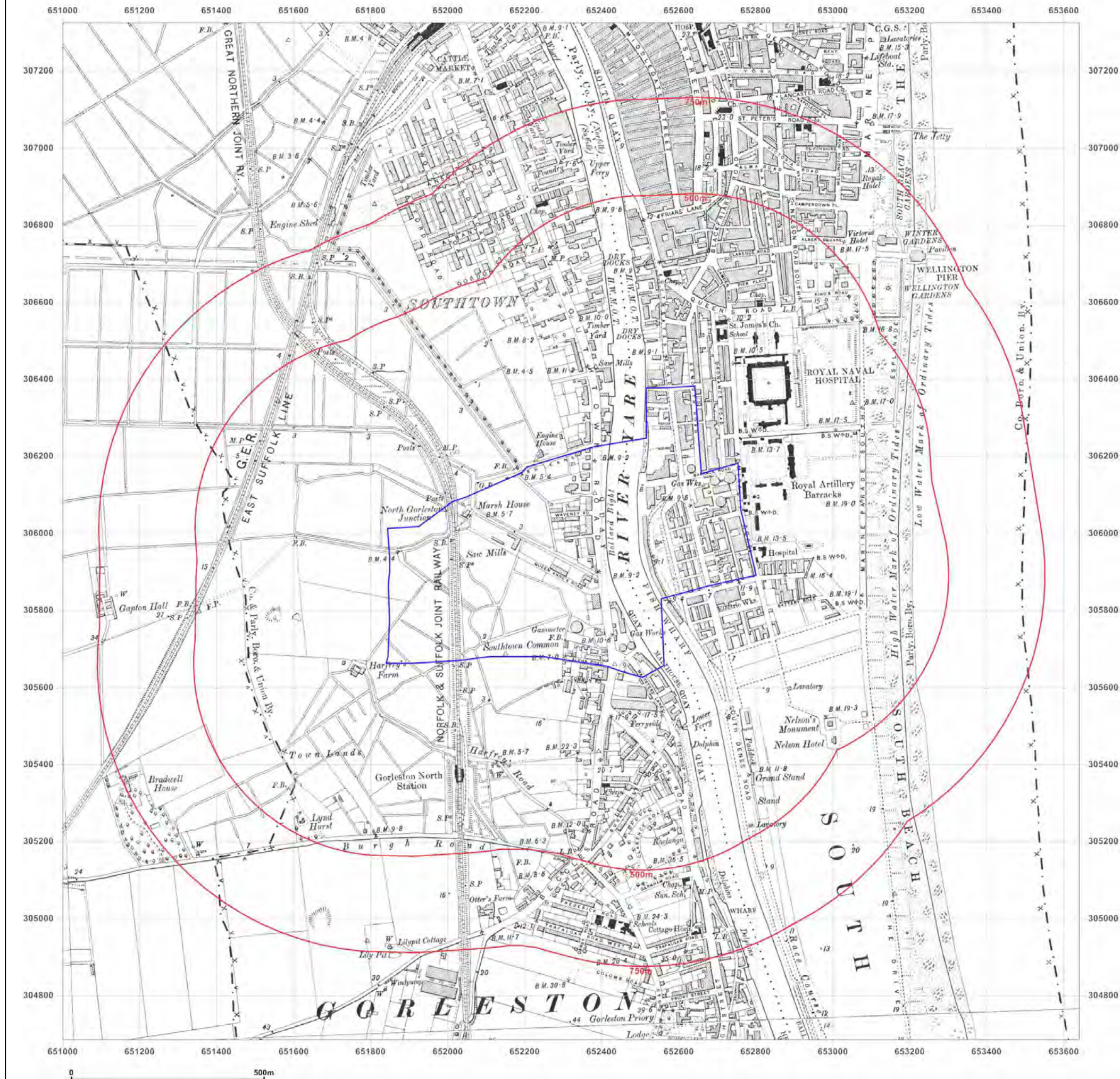
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Grid Ref: 652320, 306005

Map Name: County Series

Map date: 1904-1906

Scale: 1:10,560

Printed at: 1:10,560



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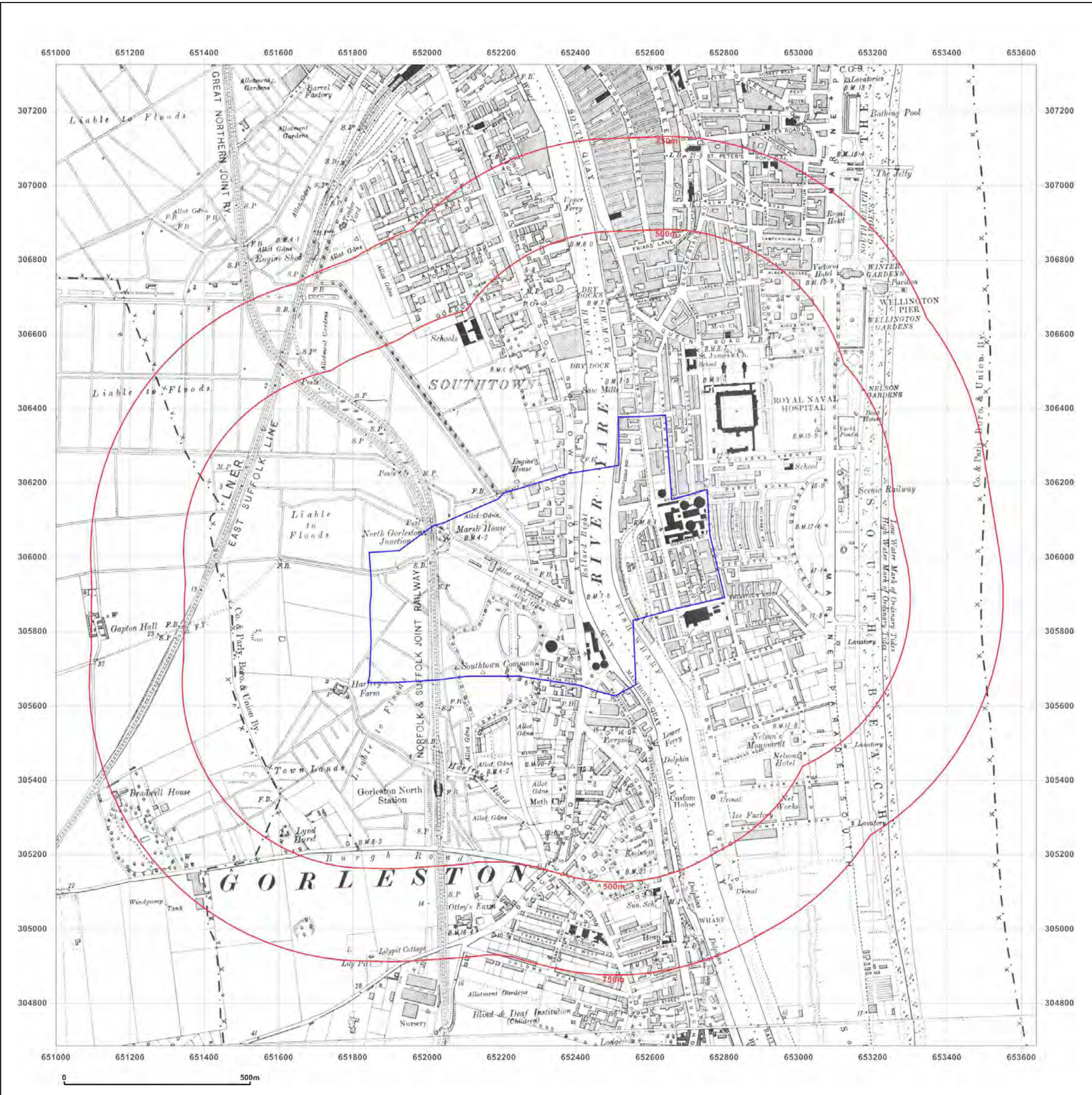


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Grid Ref: 652320, 306005

Map Name: County Series

Map date: 1926-1928

Scale: 1:10,560

Printed at: 1:10,560



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Surveyed 1883 Revised 1926 Edition N/A Copyright N/A Levelled N/A	



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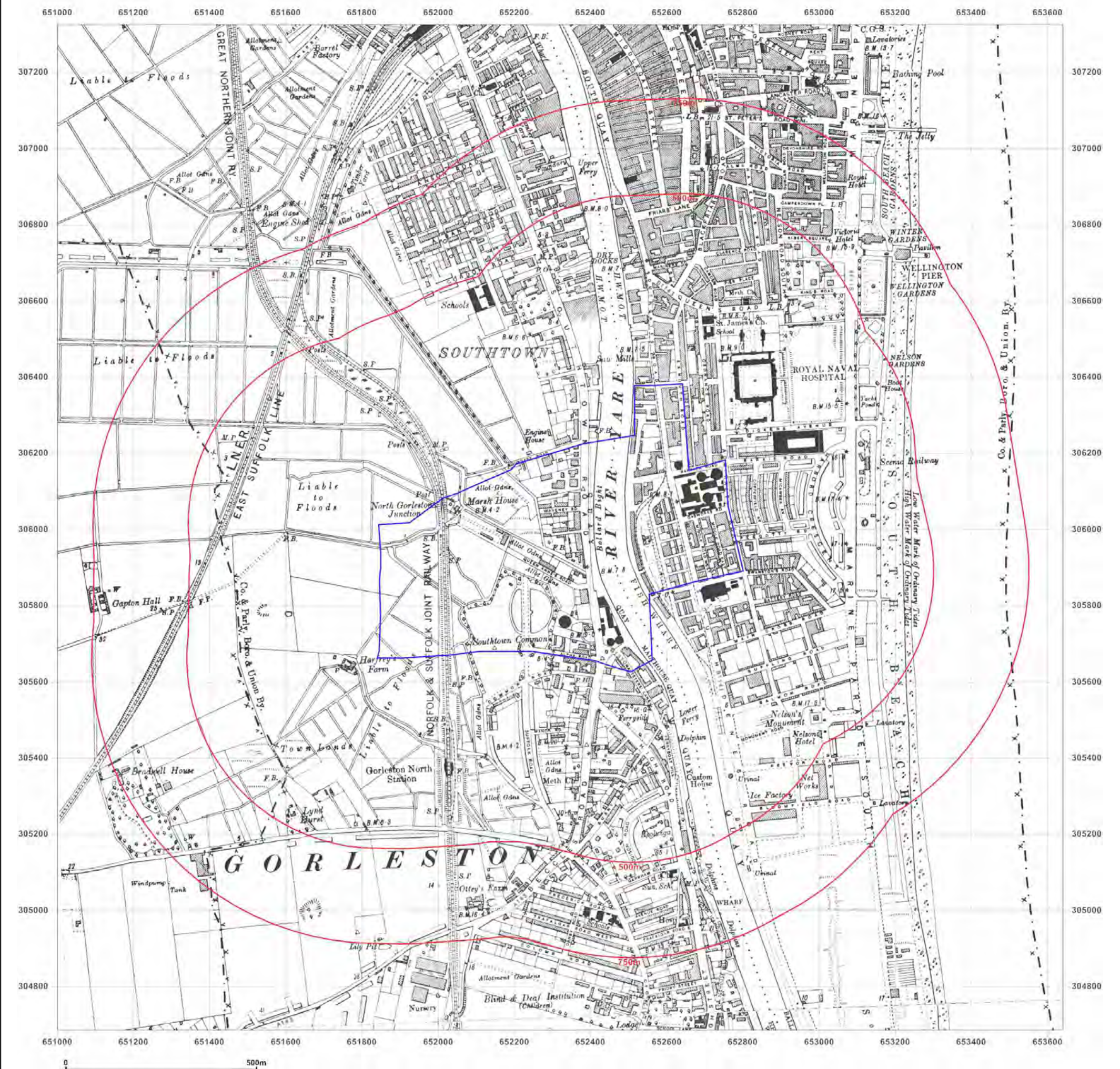


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Grid Ref: 652320, 306005

Map Name: County Series

Map date: 1938

Scale: 1:10,560

Printed at: 1:10,560



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Grid Ref: 652320, 306005

Map Name: County Series

Map date: 1938

Scale: 1:10,560

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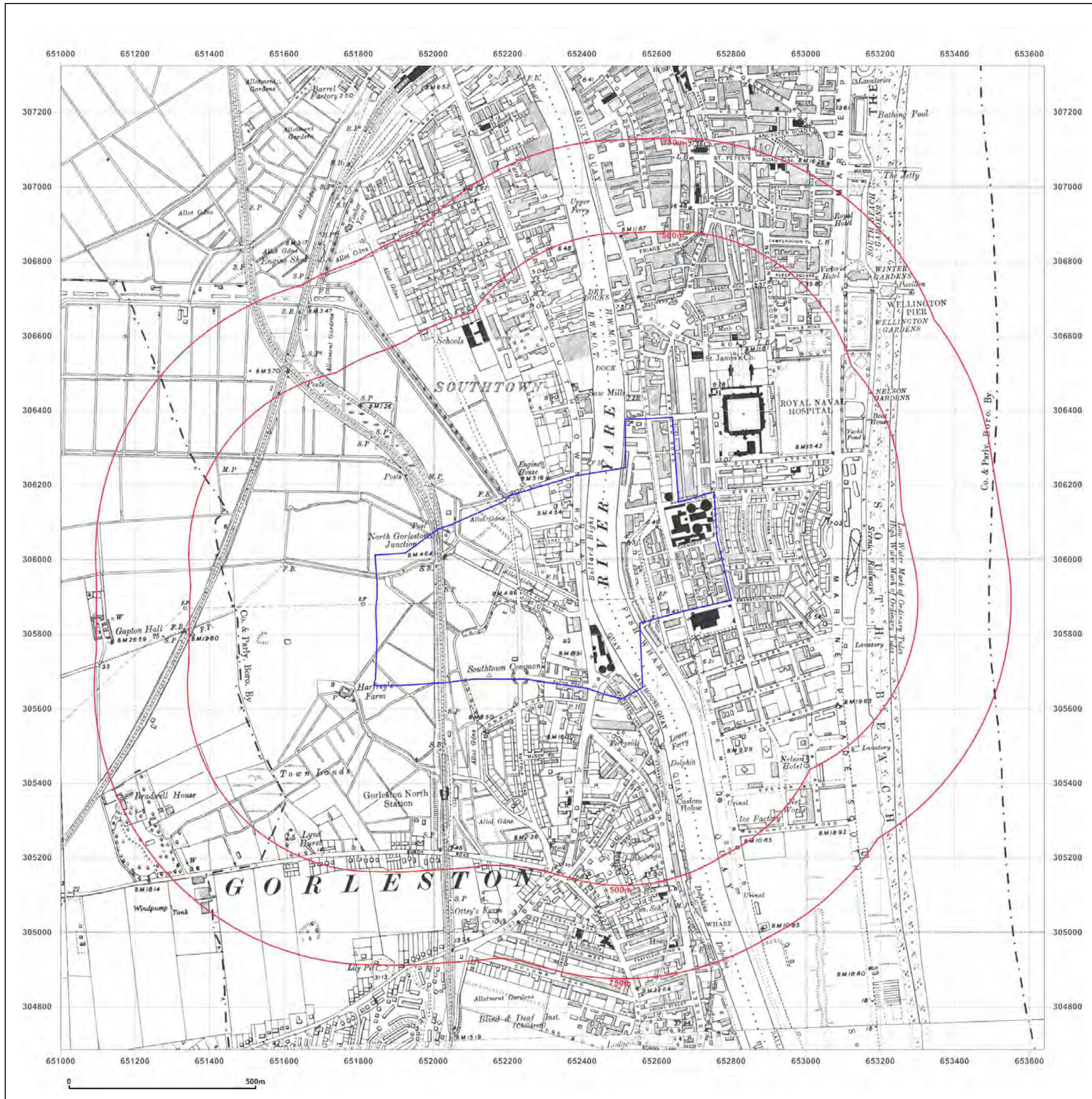


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Map Name: County Series

Map date: 1946

Scale: 1:10,560

Printed at: 1:10,560



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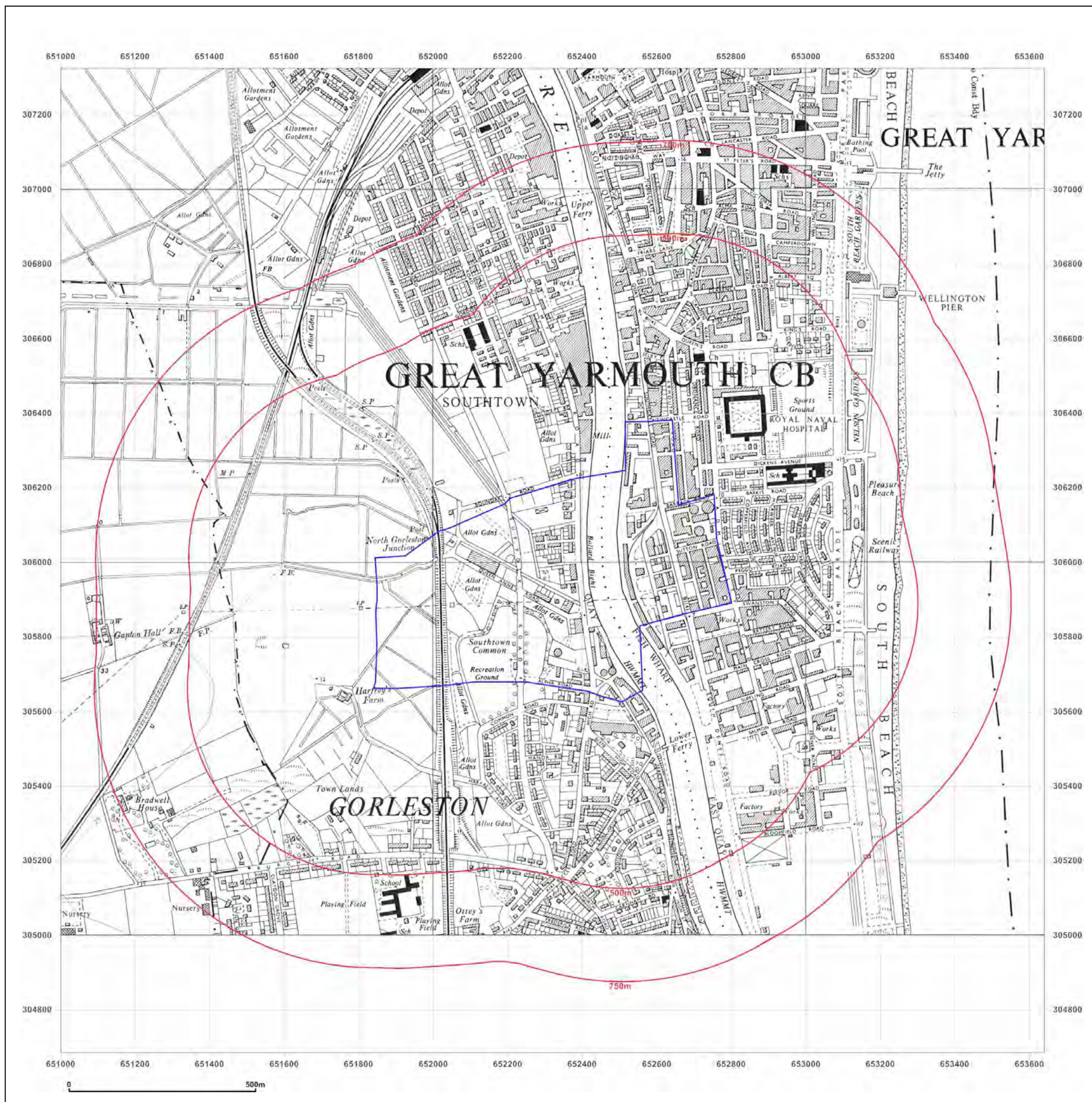
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Site Details:

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Report Ref: CMAPS-CM-636391-16287-030717HIS  
Grid Ref: 652320, 306005

Map Name: Provisional

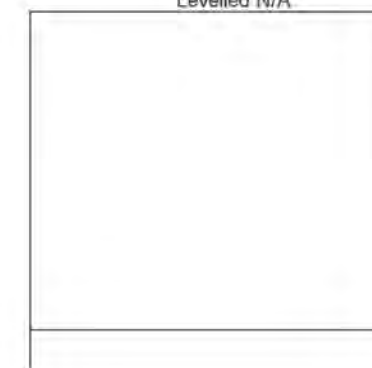
Map date: 1958

Scale: 1:10,560

Printed at: 1:10,560



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Edition N/A  
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Site Details:

Client Ref: 16287  
Report Ref: CMAPS-CM-636391-16287-030717HIS  
Grid Ref: 652320, 306005

Map Name: National Grid

Map date: 1978-1981

Scale: 1:10,000

Printed at: 1:10,000



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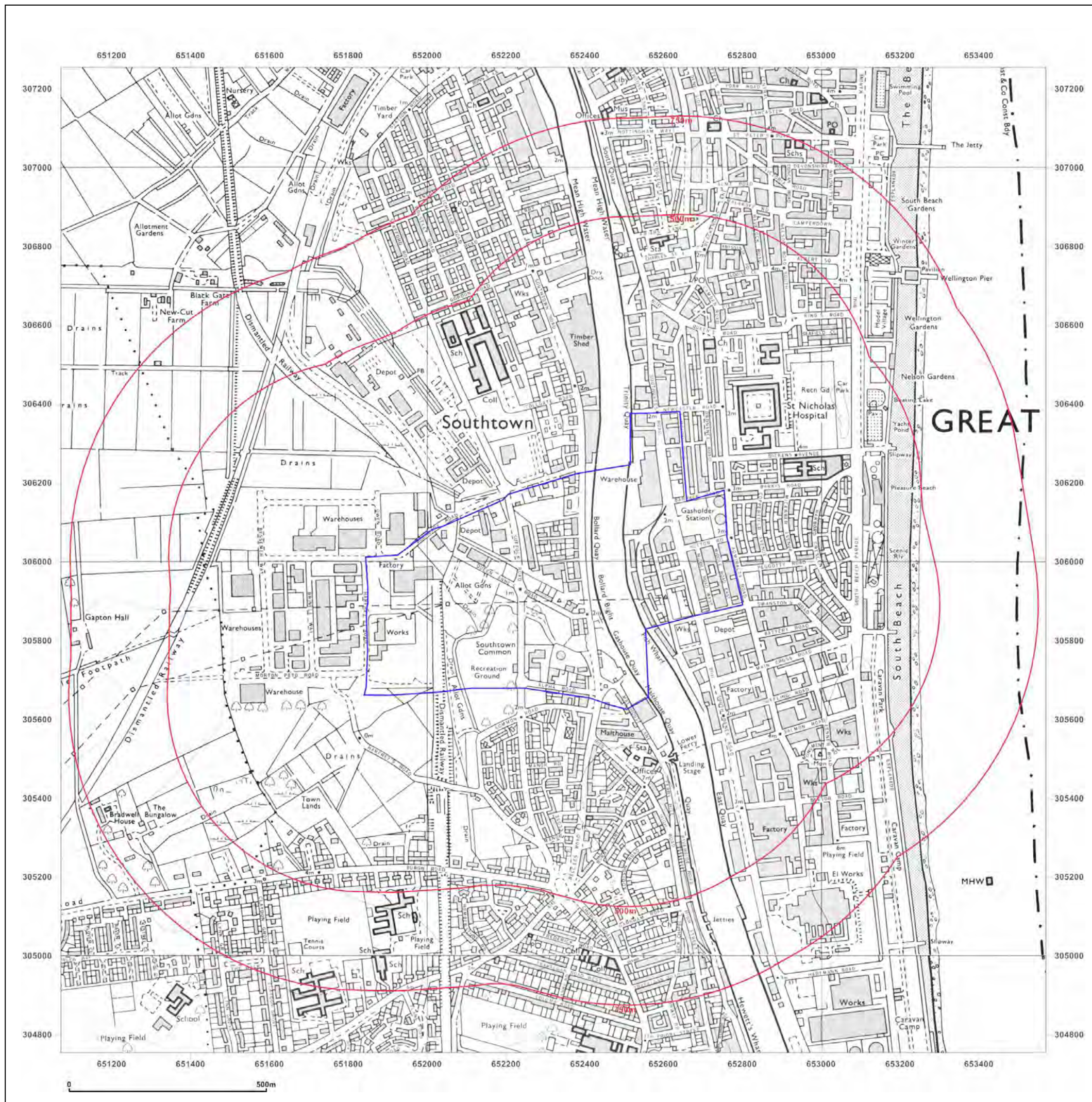


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Site Details:

Client Ref: 16287  
Report Ref: CMAPS-CM-636391-16287-030717HIS  
Grid Ref: 652320, 306005

Map Name: National Grid

Map date: 1988

Scale: 1:10,000

Printed at: 1:10,000



Surveyed 1984  
Revised 1988  
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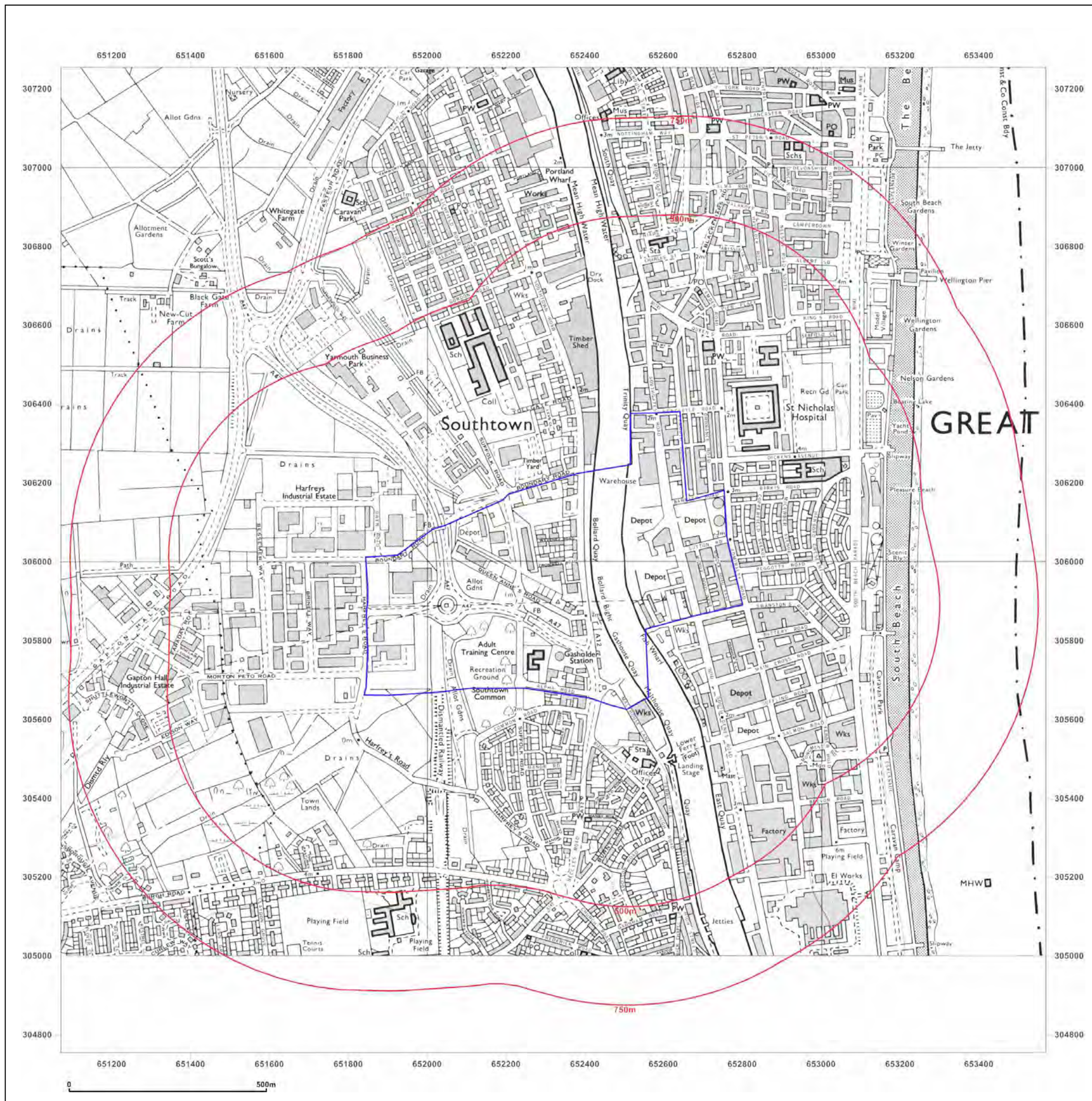


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Site Details:

Client Ref: 16287  
Report Ref: CMAPS-CM-636391-16287-030717HIS  
Grid Ref: 652320, 306005

Map Name: National Grid

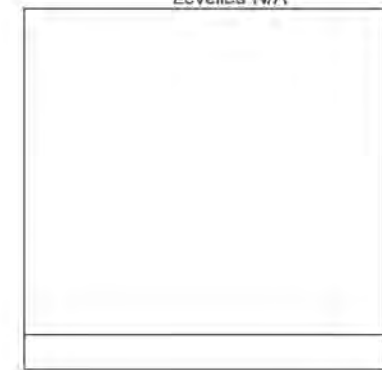
Map date: 1988

Scale: 1:10,000

Printed at: 1:10,000



Surveyed 1984  
Revised 1988  
Edition N/A  
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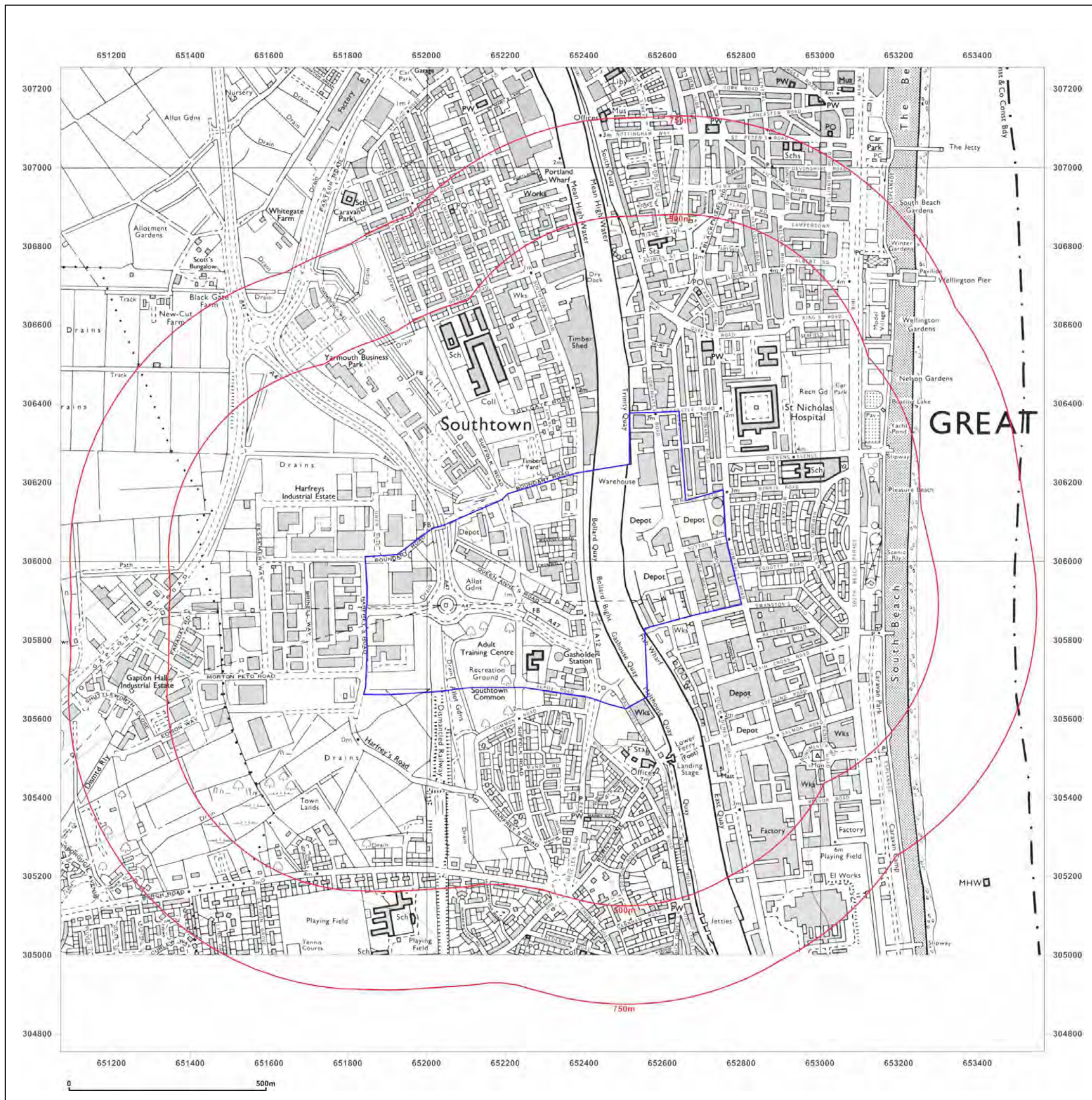


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**Site Details:**

Client Ref: 16287  
 Report Ref: CMAPS-CM-636391-16287-030717HIS  
 Grid Ref: 652320, 306005

Map Name: 1:10,000 Raster

Map date: 2002

Scale: 1:10,000

Printed at: 1:10,000



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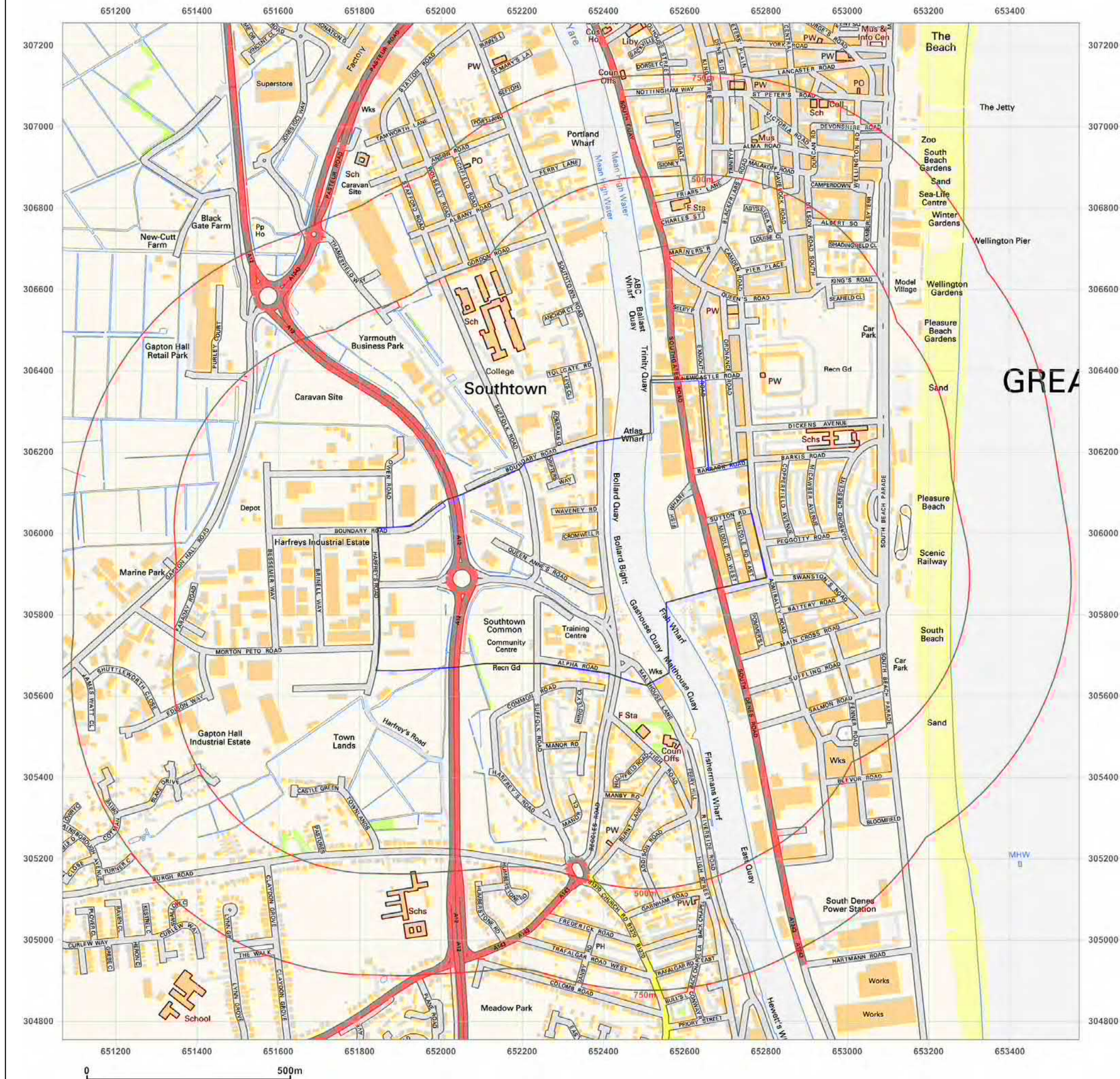
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Site Details:

Client Ref: 16287  
Report Ref: CMAPS-CM-636391-16287-030717HIS  
Grid Ref: 652320, 306005

Map Name: National Grid

Map date: 2010

Scale: 1:10,000

Printed at: 1:10,000



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**Site Details:**

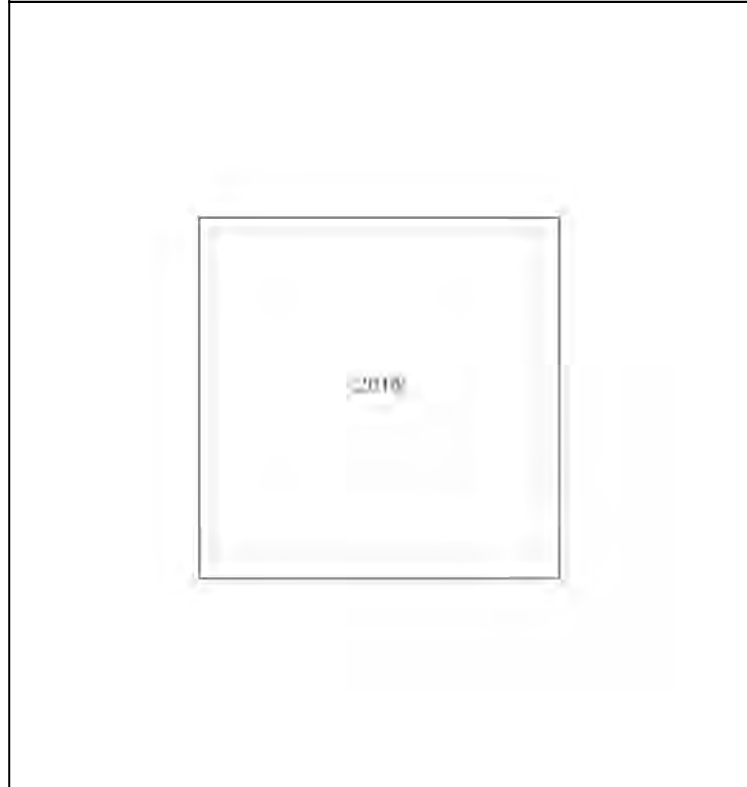
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**Grid Ref:** 652320, 306005

**Map Name:** National Grid

**Map date:** 2014

**Scale:** 1:10,000

**Printed at:** 1:10,000



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# APPENDIX C - SITE HISTORY

## GYTRC Site History

Map	Scale.	On Site	Off Site
1883	1:10,560	<p>The eastern area is fully developed. Labelled buildings includes gasworks, gasometer, boat building yard and icehouse.</p> <p>In the western area, only the land closest to the waterfront is developed. Elsewhere to the west is agricultural land. Site uses in the developed area are labelled as iron works, residential properties, farm, gas works and gasometer.</p>	<p>The surrounding land immediately adjacent to the River Yare is developed with the land closest to the river occupied by industry including saw mills, timber yard, boat building, icehouse and a malthouse. In the eastern area, away from the river towards the sea is the Royal Naval Hospital, militia barracks, a rope walk, residential properties to the north east and open land to the south east. On the western side of the river , the development is less with residential properties and open land beyond.</p>
1883	1:2,500	<p>Rail lines are marked on the eastern area quayside.</p> <p>A number of malthouses are marked on the southern boundary of the western site areas waterfront. A rope walk is marked adjacent to the iron works.</p>	<p>Land uses to the south include malthouses, residential properties, a windmill and an old gravel pit.</p>
1884	1:10,560	No significant changes.	No significant changes.
1887	1:2,500	No significant changes.	No significant changes.
1901	1:10,560	No significant changes.	No significant changes.
1904-1906	1:10,560	No significant changes.	No significant changes.
1905	1:10,560	<p>Railway line marked at the western end of the site running north south. Saw mill labelled towards the site centre. New gasometer marked on the southern boundary. Boat yard, ice house and iron works no longer labelled.</p>	<p>The militia barracks is now labelled as the Royal Artillery Barracks. Some additional development towards the west. The railway line that crosses site continues to the north and south off site.</p>
1906	1:2,500	A travelling crane is labelled on the eastern area waterfront.	
1926	1:10,560	<p>None of the previous industry is labelled but the gasometers are still identified from their outline. Formal gardens are marked on the western central part of the site.</p>	<p>The Barracks are no longer marked and appear to have been replaced by residential properties. Further residential development in all directions except to the west. Allotments are marked to the south.</p>
1927	1:2,500	Allotment gardens are marked within the western area.	No significant changes.
1938	1:10,560	No significant changes.	No significant changes.
1946	1:10,560	No significant changes.	No significant changes.
1949	1:1,250 / 1:2,000	<p>An oilskin works is labelled in the eastern area together with fish canning factories and various tanks on unlabelled sites.</p> <p>In the western area, the gasworks close to the southern boundary includes two gas holders and tanks. The saw mill is now labelled as a shoe factory.</p>	<p>An electricity works is labelled adjacent to the southern boundary of the eastern area. An oilskin works is labelled adjacent to the east boundary and a barrel and box making factory is labelled adjacent to the northern boundary.</p>
1951	1:2,500	No significant changes.	No significant changes.

Map	Scale.	On Site	Off Site
1958	1:10,560	No significant changes.	No significant changes.
1958	1:2,500	No significant changes.	No significant changes.
1965	1:2,500	Partial coverage. Fish canning factories labelled in the eastern area waterfront.	No significant changes.
1963-1968	1:2,500	In the eastern area, a haulage depot is marked adjacent to the gas works and one of the fish curing factories is now labelled as a chemical factory. In the western area, the shoe factory is partly labelled as a printing and music publishing works.	No significant changes.
1966-1968	1:1,250 / 1:2,000	Along the northern boundary, three garages are marked.	No significant changes.
1970-1975	1:1,250 / 1:2,000	A builders merchants is marked towards the north west corner.	An oil pipeline construction depot is marked close to the north west corner.
1975-1977	1:1,250 / 1:2,000	The two gas holders on the southern boundary gasworks are no longer marked and the site is labelled as a depot.	No significant changes.
1976-1981	1:1,250 / 1:2,000	No significant changes.	No significant changes.
1978	1:10,000	Former boat building yard in the east area is now developed as a warehouse. The gasworks in the west area adjacent to the River Yare is no longer marked but one gas holder is marked nearby. Factory and works have been developed on the western boundary. The railway line towards the western boundary is marked as dismantled.	The hospital has been renamed St Nicholas Hospital. Significant development in most directions; – to the south east development appears to be commercial industrial; to the north a school and depots are now marked and the saw mill is now labelled as a timber shed; to the west a large number of commercial / industrial buildings and now marked with three labelled as warehouses. The railway to the north and south is labelled as dismantled.
1975-1978	1:1,250 / 1:1,2000	Precast concrete works labelled in the north west corner of the site.	At this scale, the commercial / industrial buildings are labelled as factory, warehouse, works, store, workshop and depot. No further indication of use is provided. A works adjacent to the north west corner of the site includes a number of tanks.
1984-1986	1:1,250 / 1:1,2000	No significant changes.	Two large tanks are marked close to the southern boundary of the eastern area.
1988	1:10,000	Some layout changes have occurred in the eastern area and three depots are labelled. Two gas holders are still marked. In the western area, the route of the railway is being developed as a dual carriageway and the large roundabout currently in the centre of the site is marked including the spur roads off to the east and west. Formal gardens are now marked as a recreation ground but do also include an adult training centre.	The commercial / industrial buildings to the west are labelled as Harfreys Industrial Estate and the depots to the north are now marked as Yarmouth Business Park. A dual carriageway follows the route of the former railway offsite to the north west.

<b>Map</b>	<b>Scale.</b>	<b>On Site</b>	<b>Off Site</b>
1990	1:1,250 / 1:1,2000	The gas holder towards the southern boundary is no longer marked and the site is labelled as a gas distribution station.	The two large tanks close to the southern boundary of the eastern areas are now surrounded by multiple smaller tanks.
1990-1994	1:1,250 / 1:1,2000	No significant changes.	No significant changes.
1994	1:1,250 / 1:1,2000	No significant changes.	No significant changes.
2002	1:10,000	The dual carriageway on the former railway line is now complete. Some changes to buildings.	The dual carriageway on the former railway now continues offsite to the south.
2010	1:10,000	No significant changes.	No significant changes.
2014	1:10,000	No significant changes.	No significant changes.



## NORFOLK

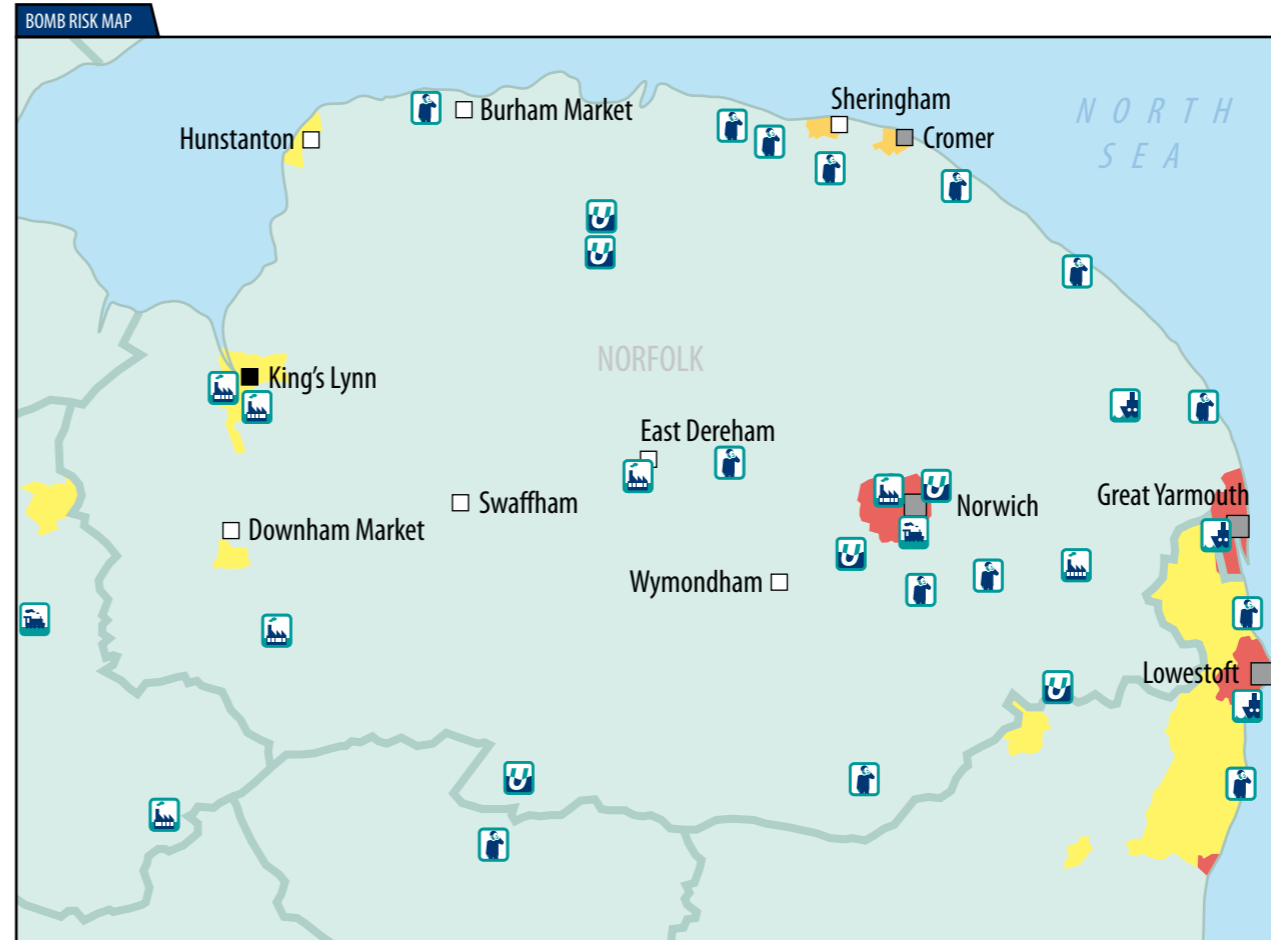
DENSITY OF BOMBS PER BOROUGH			
Borough	High explosive	Anti-personnel	Incendiary
Cromer	48	0	4
Downham Market	17	0	0
East Dereham	26	0	0
Great Yarmouth	910	9	19
King's Lynn	71	0	33
Hunstanton	16	0	0
Norwich	561	0	110
Sheringham	31	0	4
Swaffham	30	0	0
Wymondham	66	2	10

On average, 10% of high explosive and 50% of incendiary bombs failed to explode.

BOMB TONNAGE	
■	>1000
■	>500
■	>100
■	> 0
□	unverified

BOMB RISK	
■	high
■	moderate
■	low

OTHER WWII TARGETS	
■	military
■	transport
■	utilities
■	industry
■	docks
■	other



The information in this regional UXB risk map is derived from a number of sources and should be read in conjunction with the "Users' Guide" (printed overleaf). Zetica cannot guarantee the accuracy or completeness of the information or data.

This map covers regions of coast with beaches, estuaries and alike. Further consideration of the bomb risk is required in these areas. The often inaccessible nature and changing ground conditions (e.g. movement of silt that may contain ordnance) means that historical bombing records for these areas are often poor or inaccurate and further assessment of the bomb risk may be required as part of a site specific study.

### A FOUR-STEP PROCESS



Risk assessment and method statement from a qualified explosive ordnance clearance (EOC) operative.



Surface geophysical survey to allow shallow groundwork.



MAGCONE detects UXBs and obstructions on piling layout to the no-risk depth.



Detected UXBs can be dealt with by our EOC engineers and a Clearance Certificate issued for the site.

# BOMB MAP USERS' GUIDE

## Sources of information and explanation of bomb risk

### Why?

Unexploded bombs (UXB) still present a risk to construction projects long after the end of the Second World War (WWII). UXBs often entered the ground unnoticed at high velocity and penetrated to a depth of several metres. Here they remain – vulnerable to disturbances from construction work. Beyond the depth of shallow excavation work, the greatest risk is to piling, drilling and probing crews. A piling rig could repeatedly hit a UXBs with considerable force before the crew realises an obstruction has been impacted. It could then be up to 72 hours before the detonator activates.

### Who?

The responsibility for avoiding UXB risk usually lies with construction companies or house builders particularly those who are redeveloping urban sites. In addition, project engineering or environmental consultants are expected to advise their clients of a site's history. Other interested parties include those organisations whose employees are physically at most risk from intrusive works, normally piling companies, drillers or probing operators.

### How?

UXB risk should be assessed for every site, but especially those in known heavily bombed areas or those situated near war-time strategic installations that were priority targets for enemy aircraft, for example, airfields. Zetica's regional bomb risk map is therefore a first point of reference from which the relative, potential abundance of UXBs can be judged. Consultants then advise their clients that an ordnance-risk desk study is required, which they may obtain from external sources. Construction companies or house builders who assess their own risk could choose to come direct to Zetica.

### When?

Do not wait for the piling or drilling company to be on site before thinking about UXB risk – it will inevitably cause delays and higher costs. Request the regional bomb risk map from Zetica as soon as a site is being considered, and then use it to help you or your clients to decide if an ordnance-risk desk study is required.

### Where?

Maps can be obtained for any county in England, Scotland, Wales or Northern Ireland – or for any London borough. They can help determine the areas that were most heavily bombed – but no part of the country should be considered 100% safe from UXB risk. Even remote rural areas can have a high risk if, for example, they were locations for decoy airfields or beacons that were lit to fool enemy pilots into thinking they had located a burning city that had been successfully hit by others in the raid.

### How to use this regional map

This map is designed to give you an indication of the potential risk from UXBs in your area. If you are conducting work that involves excavation, piling or other disturbance of the ground, then you should use the map to identify the category of risk for your site.

The risk boundaries are a guide, compiled from data based on the political areas for which records are held; being just outside a high-risk area does not mean there is no UXB risk. You should use the map to assist in your decision of whether to investigate the UXB risk further.

### Information on the regional risk remaining from UXBs in the UK

Zetica has built the largest UXB database of its kind in the UK. It includes a unique digital library of bomb census data, and maps showing key strategic points and bombing densities from the First and Second World Wars. The main sources of information include records from central government (Public Records Office), the Ministry of Defence, and the German Luftwaffe.

Using information from this database, Zetica has published maps of UXB risk on a regional, county and borough scale. The maps indicate relative degrees of UXB risk based on available records for bombing densities and known targeted areas for regions within the UK. The risk is broken down into individual boroughs, towns or cities. The data are based on the historical boroughs and are then overlaid onto the modern map. It is important to note that more-detailed research may be required for individual sites, particularly where proximity to a potential WWII target means the local risk may be higher.

### High risk

Areas designated as high risk are those that show a high density of bombing hits (50+ bombs per 1000 acres) and abundant potential WWII targets. In high-risk regions, further action to mitigate UXB risk is considered essential.

### Moderate risk

Moderate-risk regions are those that show a bomb density of between 11 and 50 bombs per 1000 acres and that may contain potential WWII targets. Action to mitigate the risk is considered essential, albeit more likely that a reduced scope of work is required compared with that needed for high-risk regions.

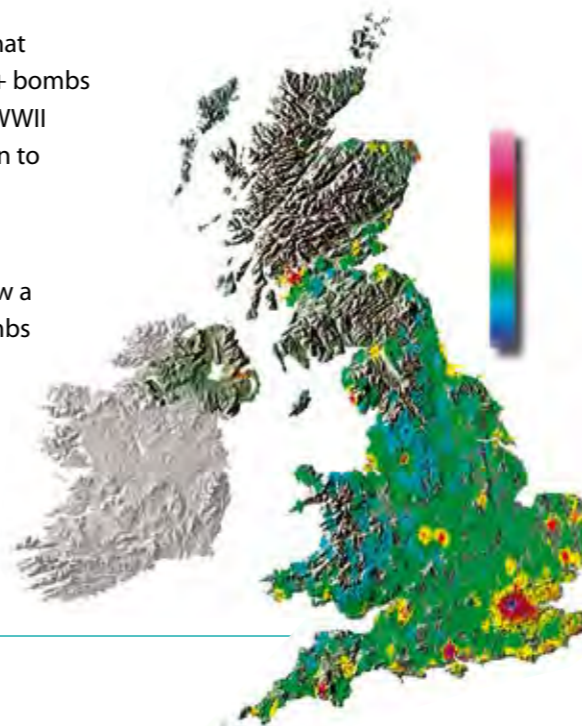
### Low risk

Low-risk regions are those with a bombing density of up to 10 bombs per 1000 acres. These areas are considered to have a significant but low UXB risk. In general, further action to mitigate the risk is considered prudent, although not essential. Care is required when assessing the risk for specific sites where the risk may be higher because of local wartime activity.

### Other WWII targets

Other regions with the risk of UXBs are key strategic points as defined by the government during WWII as representing potential enemy targets. Where these exist outside areas mapped as high, moderate or low risk, a site-specific assessment of the UXB risk may be required.

### Relative UXB risk across UK



### What to do if...

#### ...you have a site that has a potential UXB risk

In the absence of current legislation requiring you to address the risk from UXBs, your responsibilities under health and safety legislation and regulations such as construction design and management require that you address all identified risks. The first stage is to request further advice from a professional adviser such as Zetica, or to gain more site-specific information by commissioning an ordnance-risk desk study. Then a strategy to deal with the risk can be established that is tailored to your proposed work.

#### ...you find a suspect item or require advice

If during site works you find a suspect (ordnance-related) item, it is very important that you do not touch or move it (even if it has already been moved by an excavator). If it is clearly ordnance related, then dial 999 and ask for the police. Ensure that the area around the item is kept as clear as possible without placing yourself at risk. If you are unsure and do not wish to cause undue alarm, or you just require some advice, then you can call Zetica. We have experienced qualified UXB specialists on hand who can offer support and advice during any site works.

More-detailed procedures should be established in advance if you are in an area where the risk of finding a UXB is shown to be significant (moderate to high).

#### Site-specific desktop studies

Zetica is able to provide high-quality, site-specific UXB risk information for any residential, industrial or commercial property in the UK. These desktop studies provide details of the bombing density within an area and for the site itself, in order to indicate the risks of UXBs still being present. A risk assessment is provided to facilitate informed decision making on whether any further risk mitigation measures are required.

# APPENDIX E - RISK CLASSIFICATION MATRICES

## Consequence of Risk Being Realised (based on C552 CIRIA, 2001)

Consequence of risk being realised			
Classification	Category	Definition	Examples
<b>Severe</b> short-term (acute) risks only	Humans	Short-term (acute) risk to human health likely to result in "significant harm" as defined by the Environment Protection Act 1990, Part 2A.	High concentrations of cyanide on the surface of an informal recreation area.
	Controlled Waters	Short-term risk of pollution (note: Water Resources Act contains no scope for considering significance of pollution) of sensitive water resource.	Major spillage of contaminants from site into controlled water.
	Property	Catastrophic damage to buildings/property.	Explosion causing building collapse (can also equate to a short-term human health risk if buildings are occupied).
	Ecological System	A short-term risk to a particular ecosystem, or organism forming part of such ecosystem.	
<b>Medium</b> chronic (long-term) risks; "significant harm"	Humans	Chronic damage to Human Health ("significant harm" as defined in Defra 2006).	Concentrations of a contaminant from site exceed the generic, or site-specific assessment criteria
	Controlled Waters	Pollution of sensitive water resources (note: Water Resources Act contains no scope for considering significance of pollution).	Leaching of contaminants from a site into a major or minor aquifer.
	Ecological System	A significant change in a particular ecosystem	Death of a species within a designated nature reserve.
<b>Mild</b> chronic (long-term) risks; less sensitive receptors	Controlled Waters	Pollution of non-sensitive water resources.	Pollution of non-classified groundwater.
	Property	Significant damage to buildings, structures and services ("significant harm" as defined in Circular on Contaminated Land, Defra, 2006). Damage to sensitive buildings/structures/services	Damage to building rendering it unsafe to occupy (e.g., foundation damage resulting in instability)
	Ecological System	Significant damage to crops. Damage to the environment.	
<b>Minor</b> chronic (long-term) risks; mild	Financial / project	Harm, although not necessarily significant harm, which may result in a financial loss, or expenditure to resolve.	
	Humans	Non-permanent health effects to human health (easily prevented by means such as personal protective clothing, etc).	The presence of contaminants at such concentrations that protective equipment is required during site works.
	Property	Easily repairable effects of damage to buildings, structures and services	The loss of plants in a landscaping scheme. Discolouration of concrete.

## Probability of Risk Being Realised (C552 CIRIA, 2001)

Probability of risk being realised	
Classification	Definition
<b>High Likelihood</b>	There is a pollution linkage and an event that either appears very likely in the short term and almost inevitable over the long term, or there is evidence at the receptor of harm or pollution.
<b>Likely</b>	There is a pollution linkage and all the elements are present and in the right place, which means that it is probable that an event will occur. Circumstances are such that an event is not inevitable, but possible in the sort term and likely over the long term.
<b>Low Likelihood</b>	There is a pollution linkage and circumstances are possible under which an event could occur. However, it is by no means certain that even over a longer period such event would take place, and is less likely in the shorter term.
<b>Unlikely</b>	There is a pollution linkage but circumstances are such that it is improbable that an event would occur even in the very long term.

## Risk Classification Matrix (C552 CIRIA, 2001)

		Consequence			
(CIRIA C552, 2001, page 82)		Severe	Medium	Mild	Minor
Probability	High Likelihood	Very High	High	Moderate	Moderate/Low
	Likely	High	Moderate	Moderate/Low	Low
	Low Likelihood	Moderate	Moderate/Low	Low	Very Low
	Unlikely	Moderate/Low	Low	Very Low	Very Low

## Risk Classification Definitions (C552 CIRIA, 2001)

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





The Forum  
Barnfield Road  
Exeter, Devon  
EX1 1QR

[wsp.com](http://wsp.com)