

R. CARR GEOTECHNICAL SERVICES

Ref: 3852/21

**PROPOSED REDEVELOPMENT AT
THE CUSTOM HOUSE, THE TERRACE,
GRAVESEND, KENT DA12 2BW.**

**PHASE I GEO ENVIRONMENTAL DESK STUDY
AND PRELIMINARY RISK ASSESSMENT**



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Contents

	Page
1. Introduction	1
2. Topography	1
3. Geology	2
4. Hydrology and Hydrogeology	2
5. Site History	2
6. Environmental Information Search	4
7. Site Inspection	6
8. Conceptual Site Model	8
9. Preliminary Risk Assessment	9
10. Discussion/Recommendations	12

Fig 1 Plan of Proposed Development

Plates 1- 10

Appendix A Site History

Appendix B Environmental Information Search

The Custom House, The Terrace, Gravesend, Kent DA12 2BW.

1. Introduction

- 1.1 This report has been prepared following receipt of instructions from Mr M Keckes representing Mile Property Group, prospective developers of the site known as The Custom House, The Terrace, Gravesend.
- 1.2 The site is being considered for residential development involving the refurbishment and part demolition of existing buildings, together with the construction of new units. Plans for the proposed development are provided in Fig 1.
- 1.3 The purpose of this report is to identify and quantify contaminative and environment related issues which could affect the development, site workers and future users of the site.
- 1.4 This report provides a review of the history of the site and its surrounding area together with an environmental risk check and preliminary risk assessment in general compliance with the following guidelines:
 - Model Procedures for the Management of Land Contamination. Environment Agency Contaminated Land Report 11 (CLR 11)
 - GPLC1- Guiding Principles for Land Contamination. Environment Agency 2010
 - National Planning Policy Framework (NPPF) (2012)

2. Topography

- 2.1 The site is situated to the north of The Terrace at OS Land Ranger map reference TQ 652 743.
- 2.2 At this point, the general topography of the local area is sloping gently downhill from south to north.

3. Geology

- 3.1 Reference to the local Geological Survey sheet (no. 271: Dartford) has indicated that the site is underlain by the Seaford Chalk member of the White Chalk subgroup (formerly referred to as the Upper Chalk).
- 3.2 The White Chalk consists of soft, white, friable limestone that is 95% calcium carbonate and contains scattered nodular and tabular flint. The upper surface of the Chalk is often deeply convoluted and may contain solution pipes filled with more recent tertiary deposits.

4. Hydrology and Hydrogeology

- 4.1 The River Thames flows west to east within 20m to the north of the site.
- 4.2 Two ponds are situated within 250m to the east of the site.
- 4.3 The Chalk is the Principal Aquifer of the area with high groundwater vulnerability. A Principal Aquifer is defined by the Environment Agency as a “highly permeable formation with known or possible presence of significant fracturing”. These tend to be highly productive and capable of supporting public supply and other abstractions. Soil Classification: Soils of High Leaching Potential (U).

5. Site History

- 5.1 A search has been undertaken of historical Ordnance Survey Maps provided by the Kent County Archives and Promap websites. The following maps have been examined for the presence of on and off-site contamination, extracts of which are contained in Appendix A:
- 5.2 OS map scale 1:2500 1869:
On site: The Custom House is already in existence on the south end of the site. Linear buildings are also present within the site's northeast section and along its west boundary.

Off site: Buildings are in evidence alongside the east boundary of the site, an extensive area of unspecified open land probably comprising a military training area being denoted to the east and southeast of the buildings. Ornamental gardens are present to the west of the site and buildings of urban residential appearance are situated to the south. The shoreline of the Thames Estuary abuts the north end of the site, a pier extending north from the site boundary. A canal is denoted within 300m to the east.

5.3 OS map scale 1:2500 1899:

On site: The north boundary of the site has been slightly extended towards the shoreline, otherwise no significant change.

Off site: Buildings have been constructed on the west side of the open land to the southeast of the site, the area now being denoted as a recreation ground. Iron works are in evidence within 400m to the east.

5.4 OS map scale 1:2500 1909:

On site: No significant change.

Off site: Buildings have been constructed on the site of the gardens to the west. The pier extending from the site's north boundary is referred to as a causeway.

5.5 OS map scale 1:2500 1923:

On site: No significant change.

Off site: No significant change.

5.6 OS map scale 1:2500 1944:

On site: No significant change.

Off site: A building has been constructed on the east side of the recreation ground to the east of the site.

5.7 OS map scale 1:2500 1951:

On site: The row of buildings formerly present on the west side of the site has been reduced in length.

Off site: The land to the east has been redeveloped into an ornamental area containing two small ponds and is now referred to as Fort Gardens, its southeast

section remaining as a recreation ground.

5.8 OS map scale 1:10560 1966:

On site: No significant change.

Off site: Buildings adjacent to the northeast corner of the site are now denoted as a school. Otherwise no significant change.

5.9 OS map scale 1:10000 1980-1982:

On site: No significant change.

Off Site: No significant change.

6. Environmental Information Search

6.1 A search of environmental information has been carried out for the site by Landmark Information Group, who provide a database of environmental data. A summary of relevant information is provided as follows, full details of which are contained in Appendix C:

6.2 Potentially Contaminative Industrial Uses (Past Land Use)

Military Land. Map published date: 1899-1938	On Site
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6.3 Historical Tanks & Energy Facilities

Oil Industry Facilities. Map published date: 1954	34m
Tanks. Map published date: 1954	26m
Potential Tanks. Map published date: 1954	94m
Potential Tanks. Map published date: 1954-1976	100m
Electrical Sub Station Facilities Map published date: 1976	105m
Potential Tanks. Map published date: 1954	160m
Potential Tanks. Map published date: 1954	180m
Potential Tanks. Map published date: 1954	200m

Potential Tanks. Map published date: 1954	200m
Potential Tanks. Map published date: 1954	185m
Potential Tanks. Map published date: 1954	210m
Potential Tanks. Map published date: 1958	250m

6.4 Potentially Infilled Land

None identified within 250m of the site.

6.5 Registered Landfill Sites & Historic Landfill

None identified within 250m of the site.

6.6 Local Authority Pollution Prevention & Controls

None identified within 250m of the site.

6.7 Contemporary Trade Directory Entries

A large number of contemporary Trade Directory entries have been identified within the local area, a number of which relate to multiple entries from the same premises. Those within 150m are listed as follows:

Freight Forwarders	66m
Painting & Decorating Supplies	91m
Ports, Docks & Harbours	92m
Ports, Docks & Harbours	92m
Ports, Docks & Harbours	123m
Garage Services	129m
Tyre Dealers	129m
Engineers - General	129m
Garage Services	150m
Tool Design, Manufacture & Makers	129m
Car Body Repairs	129m
Pest & Vermin Control	146m
Pest & Vermin Control	146m
Pest & Vermin Control	146m

Freight Forwarders	146m
Cargo Handlers	146m
Engineering Services	146m

6.8 Flood Risk

Rivers or Sea	High
Surface Water	Low to Moderate
Groundwater	Low

6.9 Radon

Radon Potential	Lower Probability
Radon Protection Measures	None required

6.10 Environmental Constraints

Greater Thames Marshes	45m
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7. Site Inspection

- 7.1 An inspection of the site was undertaken on 25th February 2021 during dry, overcast weather conditions.
- 7.2 The site was situated within a predominantly residential area to the north of Gravesend town centre.
- 7.3 An historic, three-storey brick building known as The Custom House with a slate roof and incorporating a basement area was located on the front, southeast corner of the site (Plate 1). A three-storey projection extended from the rear of the building and a two-storey extension was present on its west elevation.
- 7.4 Steel railings were present along the front of the building alongside the public footpath, a brick wall approximately 1.5m in height forming the remainder of the

site's front boundary. A small area of paved garden with emergent weeds and Buddleia shrubs was present to the front of the side extension, enclosed by the boundary wall (Plate 2).

- 7.5 Access to the rear of the site was gained from its southwest corner via an open tarmac drive bordered on its west boundary with ornamental shrubs (Plate 3). A padlocked steel gate was located at the end of the drive.
- 7.6 Entry through the gate provided access to a larger expanse of gently sloping, tarmac surfacing with designated parking bays on its west side (Plate 4). An adjoining pair of historic, single-storey brick buildings under slate roofs were located on the east side of the tarmac surfacing. The buildings are understood to have previously contained a boat-building workshop. A two-storey former office building of more recent construction under a tiled roof was located on the west side of the site.
- 7.7 The front boundary wall extended through the central section of the site to the rear of the former workshop, enclosing the rear garden of The Customs House. The garden consisted mainly of lawn with ornamental trees and shrubs including a large Holly (Plate 5).
- 7.8 Tarmac surfacing extended beyond the former workshop and offices to the rear of the site (Plate 6), the north and west boundaries of which were formed by 2m to 3m high brick walls.
- 7.9 The east section of the site was separated by a brick wall approximately 3m in height which passed alongside the east elevation of the workshop to the site's rear boundary, an archway providing pedestrian access from the main area of tarmac onto a narrow section of concrete surfacing which extended from the rear of The Custom House to the north end of the site (Plate 7).
- 7.10 An elongate, single storey building which is understood to have originally comprised stabling for horses was present along the east side of the site. Emergent weeds and Buddleia shrubs were in evidence along the edges of the concrete surfacing, a disused cycle shed being located opposite the northwest end of the building (Plate

8). The flank walls of the buildings formed the east boundary of the site.

- 7.11 Steel flood gates and associated sheet piles were incorporated within site's north boundary, together with a flight of steps which provided access to the shore of the adjacent Thames Estuary (Plate 9).
- 7.12 A disused generator was located within the northwest corner of the site (Plate 10).
- 7.13 An area of private vehicular parking was situated beyond the west boundary of the site, a small public car park being present on the south side of The Terrace to the front of The Custom House. Residential properties of various ages and an ornamental public park were present to the east.
- 7.14 No visual or olfactory evidence of significant contamination was observed either on or in the vicinity of the site at the time of the inspection.

8. Conceptual Site Model

- 8.1 Local enquiries have revealed that The Custom House was constructed during 1815/1816 in order to instigate controls on shipping passing along the River Thames and to assess duties payable on cargoes. Buildings present to the rear of the site would probably have comprised accommodation for personnel and stabling for horses and were not necessarily directly associated with military activities on land to the east. An artillery fort which provided defence against the Thames occupied the latter area before being disarmed in the early part of the twentieth century. The fort was subsequently converted to public use, though it was temporarily utilised for military purposes during the Second World War.
- 8.2 Little change appears to have occurred to the site itself since its original development, the buildings having since supported office accommodation and a small boat building enterprise. The site is therefore considered to pose a low to moderate risk to receptors including human health, plant life, underground plastic water supply pipes and groundwater from the following sources of potential contamination:

- Toxic metals, polyaromatic hydrocarbons (PAH) and total petroleum hydrocarbons (TPH) possibly present within sub-base material beneath existing surfacing
- Possible localised hydrocarbon contamination (TPH) as a result of lubricant leakages from parked vehicles
- Possible localised metal, hydrocarbon and solvent contamination in the vicinity of the former boat-building workshop (e.g. iron, steel, lead paint, TPH and volatile organic compounds (VOC)
- Asbestos-containing material possibly present in existing buildings

8.3 A large number of contemporary potentially contaminative activities and historic installations have been identified by the Landmark report within the local area, the nearest being oil industry facilities and associated tanks within 40m to the east. The site is considered unlikely to have been impacted by these facilities as no significant spillages have been recorded and the underlying hydraulic gradient is anticipated to fall to the north, therefore any leakages would flow toward the adjacent river, rather than east toward the site. Other commercial activities within the area are considered too remote or inconsequential to have exerted any impact upon the site, which topographically is relatively isolated. A low risk has therefore been identified to the site from off-site sources of potential contamination.

8.4 No registered landfill sites have been identified within 250m of the site and the topography of the site does not imply the presence of significant quantities of made ground beneath its surface. Consequently the risk to the development from both on and off-site emissions of ground gas is considered to be low.

9. **Preliminary Risk Assessment**

9.1 A preliminary risk assessment has been defined utilising the available information. The risk from possible sources of contamination to receptors including the public, workers, future users and environment has been analysed using the Source – Pathway – Receptor model approach.

9.2 The main receptors considered in the following assessment are:

- Future users
- Occupants of surrounding buildings
- Groundwater and associated abstractions
- Site workers
- Building fabric
- Plants

Source	Hazard	Receptor	Pathway	Severity of impact	Risk	Action required to clarify and define mitigation, if necessary
Organic contaminants associated with made ground, vehicular parking & boat building e.g. TPH, PAH & VOC	Toxic and carcinogenic	Future Users	Inhalation, ingestion and skin contact	Serious	Low to moderate	Site investigation to clarify degree of risk. Removal of contaminated soil, if necessary.
		Adjoining site occupiers	Ditto	Moderate	Low	Minimise dust, avoid spillages.
		Site workers	Ditto	Serious	Low	Provision of protective clothing and equipment.
		Groundwater Drains & surface water	Leaching, permeable strata, drainage	Serious	Low to moderate	Site investigation to confirm degree of risk. Appropriate precautions with storage of contractor's fuel and lubricants during development.
Inorganic contaminants associated with made ground & boat building e.g. arsenic, lead, etc	Attack on plastic or rubber	Building Services and Fabric	Leaching and diffusion	Serious	Low to moderate	Site investigation to clarify degree of risk. Utilisation of upgraded supply pipes if necessary.
	Zootoxic	Future users	Inhalation, ingestion and skin contact	Serious	Low to moderate	Site investigation to clarify degree of risk. Removal of contaminated soil, if necessary.
		Local residents	Ditto	Moderate	Low	Minimise dust where possible
		Site Workers	Ditto	Moderate	Low	Provision of protective clothing/equipment. Minimise dust.
Phytotoxic metals e.g. copper, zinc	Phytotoxic	Groundwater	Leaching, permeable strata, groundwater	Serious	Low	Appropriate precautions with surface water drainage in areas of vehicular parking.
		Plants	Uptake	Serious	Low to moderate	Site investigation to clarify degree of risk. Removal of contaminated soil in garden areas and replacement with clean imported topsoil
		Groundwater	Leaching, permeable strata, groundwater	Serious	Low	Appropriate precautions with surface water drainage in areas of vehicular parking.
		Future Users	Air inhalation	Serious	Low	Removal by experienced contractor and appropriate disposal at licensed waste facility if discovered on site
Asbestos in existing buildings	Carcinogenic and Respiratory Irritant	Adjoining site occupiers	Ditto		Low	
Ground gases e.g. methane, carbon dioxide.	Asphyxiant, explosive	Site workers				
		Future Users	Service ducts	Serious	Low	No areas of landfill identified within 250m of site and significant depths of made ground not indicated by site topography.
		Adjoining site occupiers	Air inhalation			
		Site workers				

10. Discussion/Recommendations

10.1 Part IIA of the Environment Protection Act 1990 defines contaminated land as: "any land which appears to the local authority in whose area it is situated to be in such a condition, by reason of substances in, on or under the land that:-

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

"Harm" means harm to the health of living organisms or other interference with the ecological systems of which they form part, and in the case of man, includes harm to his property.

10.2 There are two steps in applying the definition of contaminated land:

- 1) Identification of a "contaminant", a "pathway" (or pathways) and a "receptor" with respect to the land in question.
- 2) Identification of a pollutant linkage and that the pollutant linkage:
 - a) is resulting in significant harm being caused to the receptor in the pollutant linkage.
 - b) presents a significant possibility of significant harm being caused to that receptor.
 - c) Is resulting in the pollution of controlled waters
 - d) Is likely to result in such pollution.

10.3 Under the Groundwater Regulations Act 1998, it is an offence to allow List I substances to enter groundwater. It is also an offence to allow List II substances to enter groundwater without prior consultation with the local authority.

10.4 Based on the available information the site is considered to present a low to moderate risk to human health, plant life, underground plastic water supply pipes and groundwater. It is therefore recommended that intrusive investigations involving shallow boreholes are undertaken in order to ascertain whether contamination exists beneath the site. Sections of the site to be particularly targeted should include areas of proposed garden and/or landscaping. Samples of soil obtained during the course of the investigations should then be tested for a suite of common

contaminants including speciated PAH, TPH fractions and VOCs.

- 10.5 An asbestos survey of the existing buildings is also recommended, followed by the removal of any asbestos-containing material by an experienced contractor to an appropriately licensed depository.
- 10.6 It should be noted that the site is located within 20m of the River Thames and is underlain by a Principal Aquifer. Every precaution should therefore be taken during the course of the development in order to prevent the escape and subsequent migration of pollutants into the nearby surface water receptor and underlying strata. Fuel and/or lubricants utilised by contractors' plant should be stored in a secure, preferably bunded area of the site.
- 10.7 This report should be made available to the Contaminated Land Officer of the Local Planning Authority for due consideration prior to the commencement of the development.

A handwritten signature in black ink, appearing to read 'R. Carr', followed by a horizontal line.

R. Carr BA (Hons) FGS

February 2021



Custom House, The Terrace, Gravesend.
Fig 1 Plan of Proposed Development.



Plate 1



Plate 2



Plate 3



Plate 4



Plate 5



Plate 6



Plate 7



Plate 8



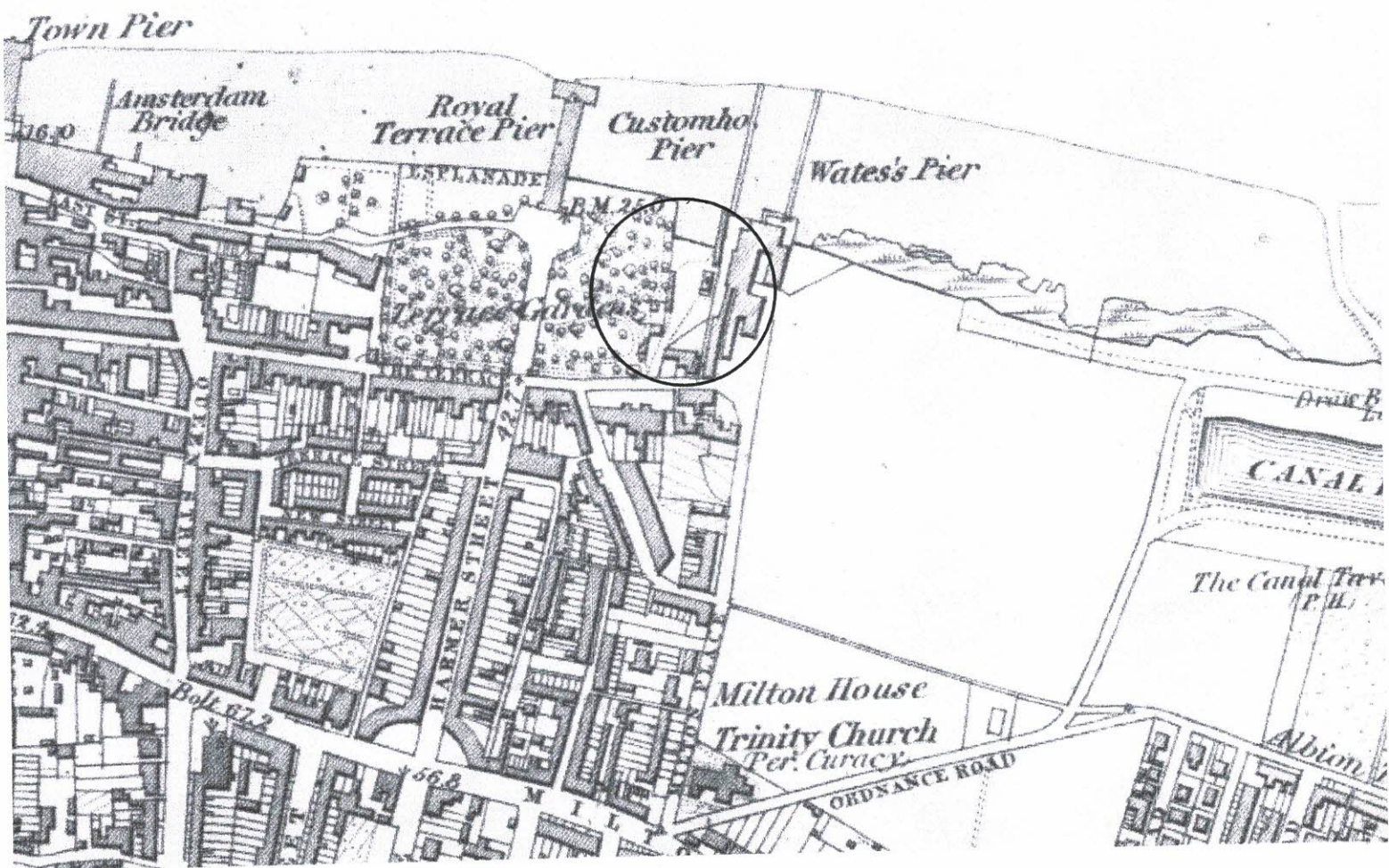
Plate 9



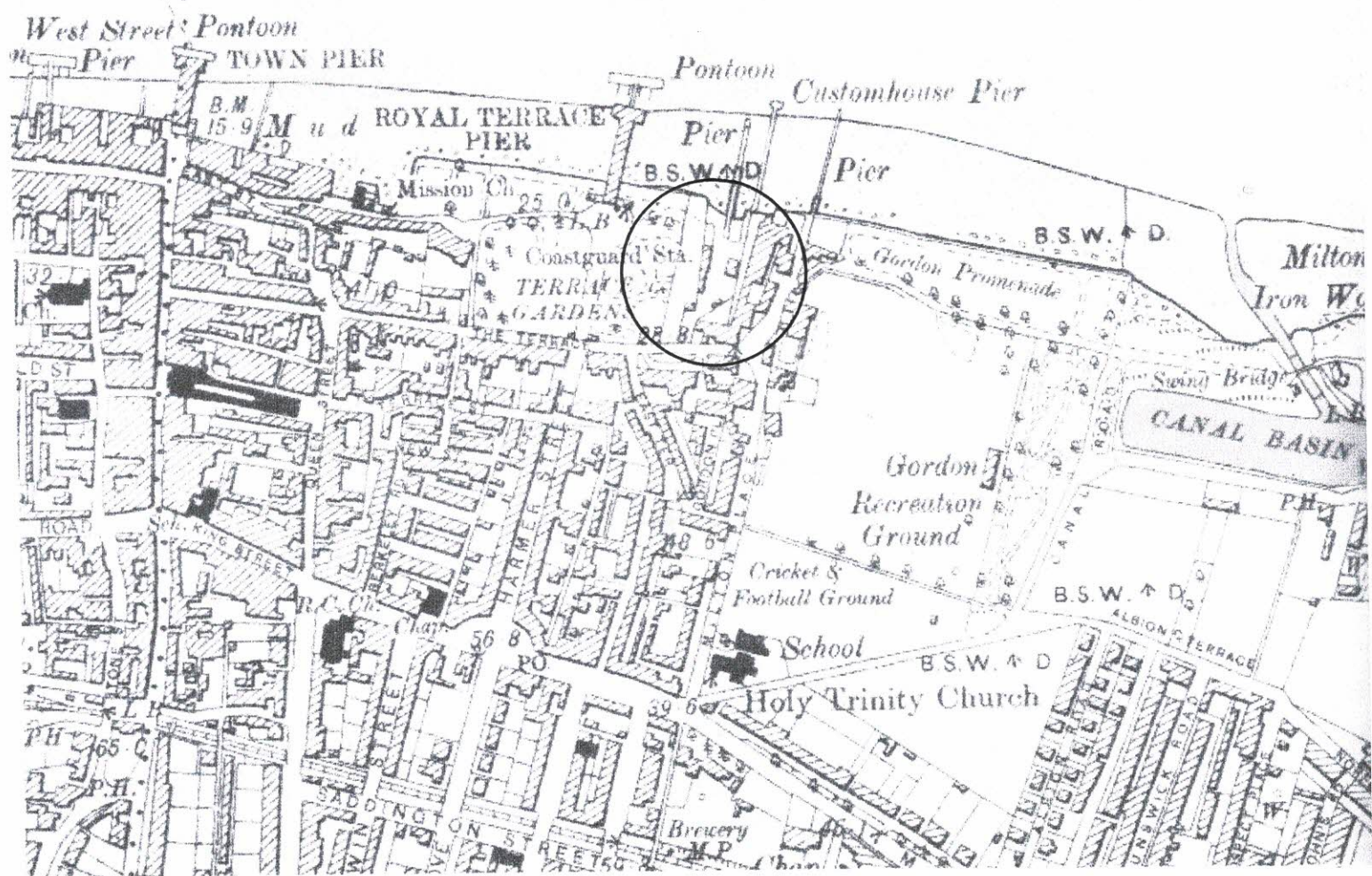
Plate 10

Appendix A

Site History

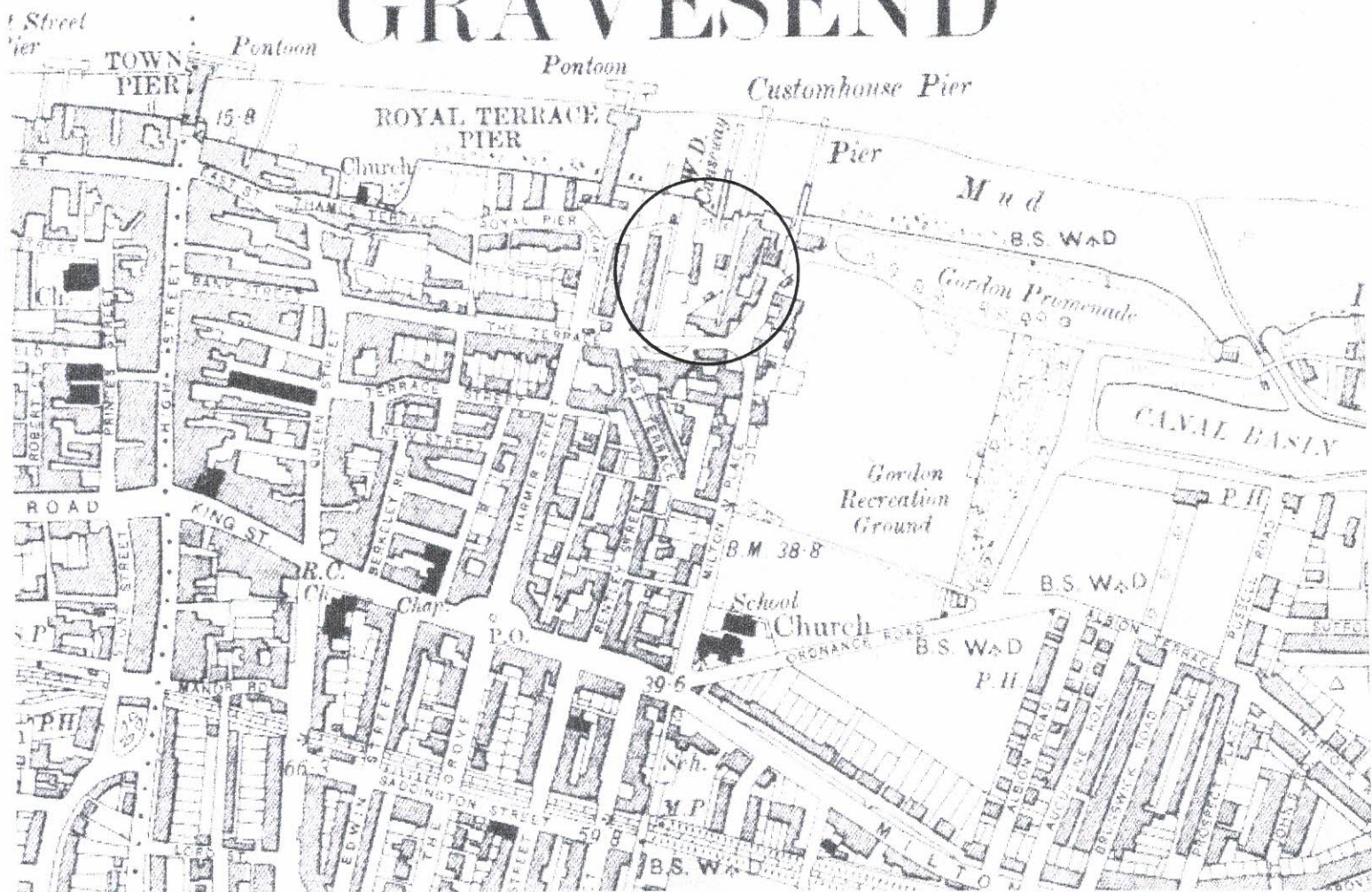


Custom House, The Terrace, Gravesend.
OS map scale 1:2500 1869.



Custom House, The Terrace, Gravesend.
OS map scale 1:2500 1899.

GRAVESEND



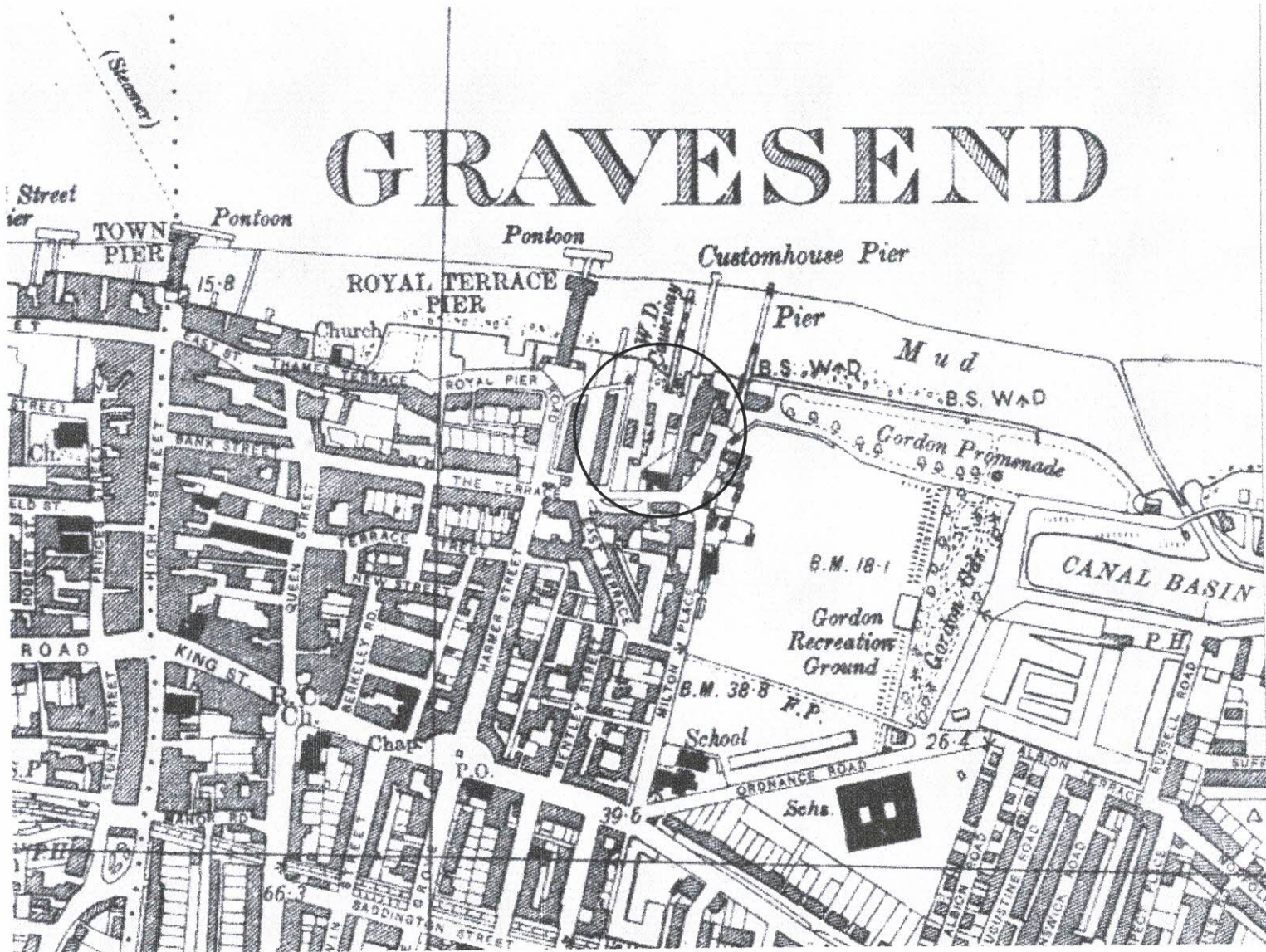
Custom House, The Terrace, Gravesend.
OS map scale 1:2500 1909.

GRAVESEND



Custom House, The Terrace, Gravesend.
OS map scale 1:2500 1923.

GRAVESEND

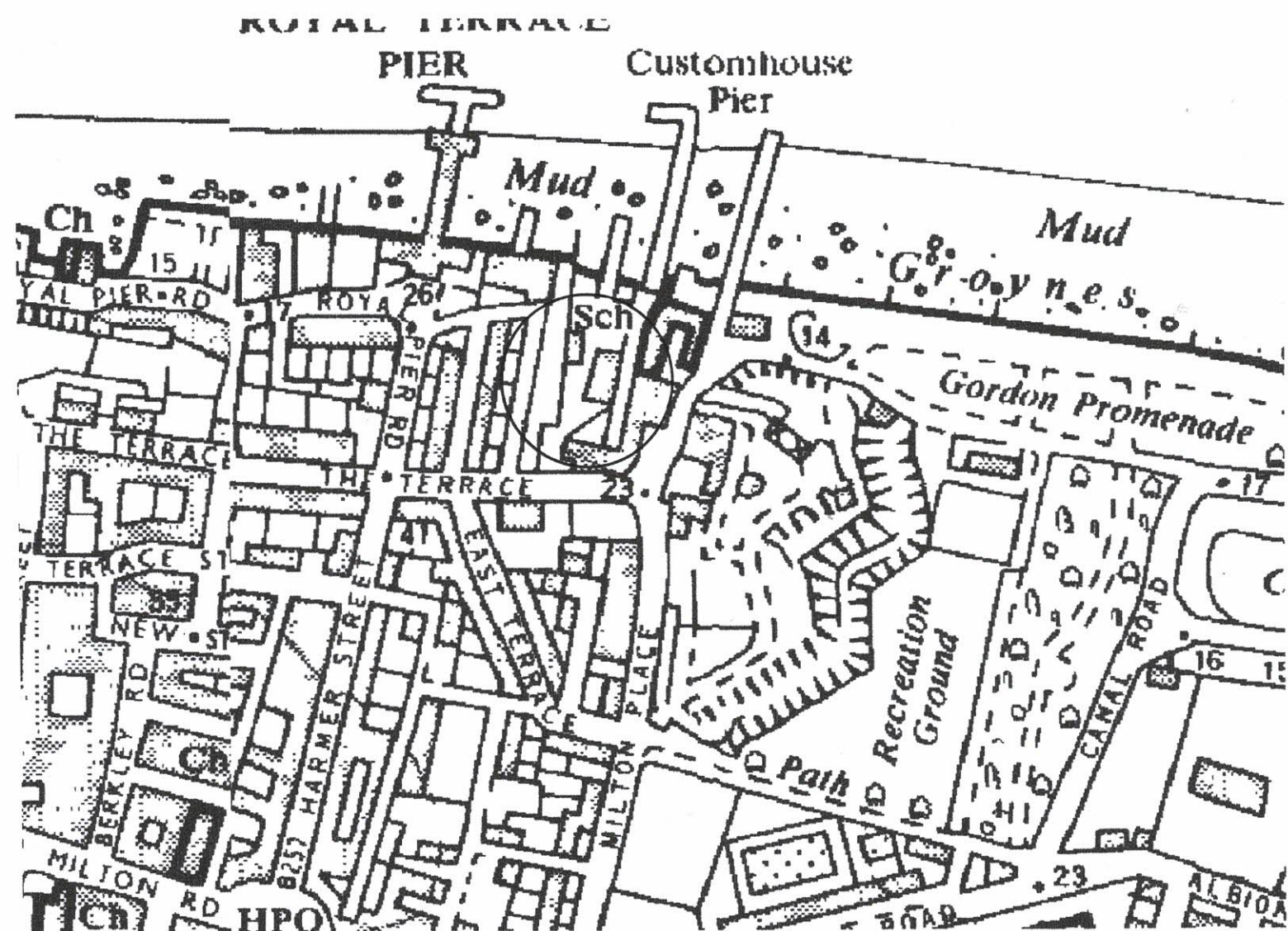


Custom House, The Terrace, Gravesend.
OS map scale 1:2500 1944.

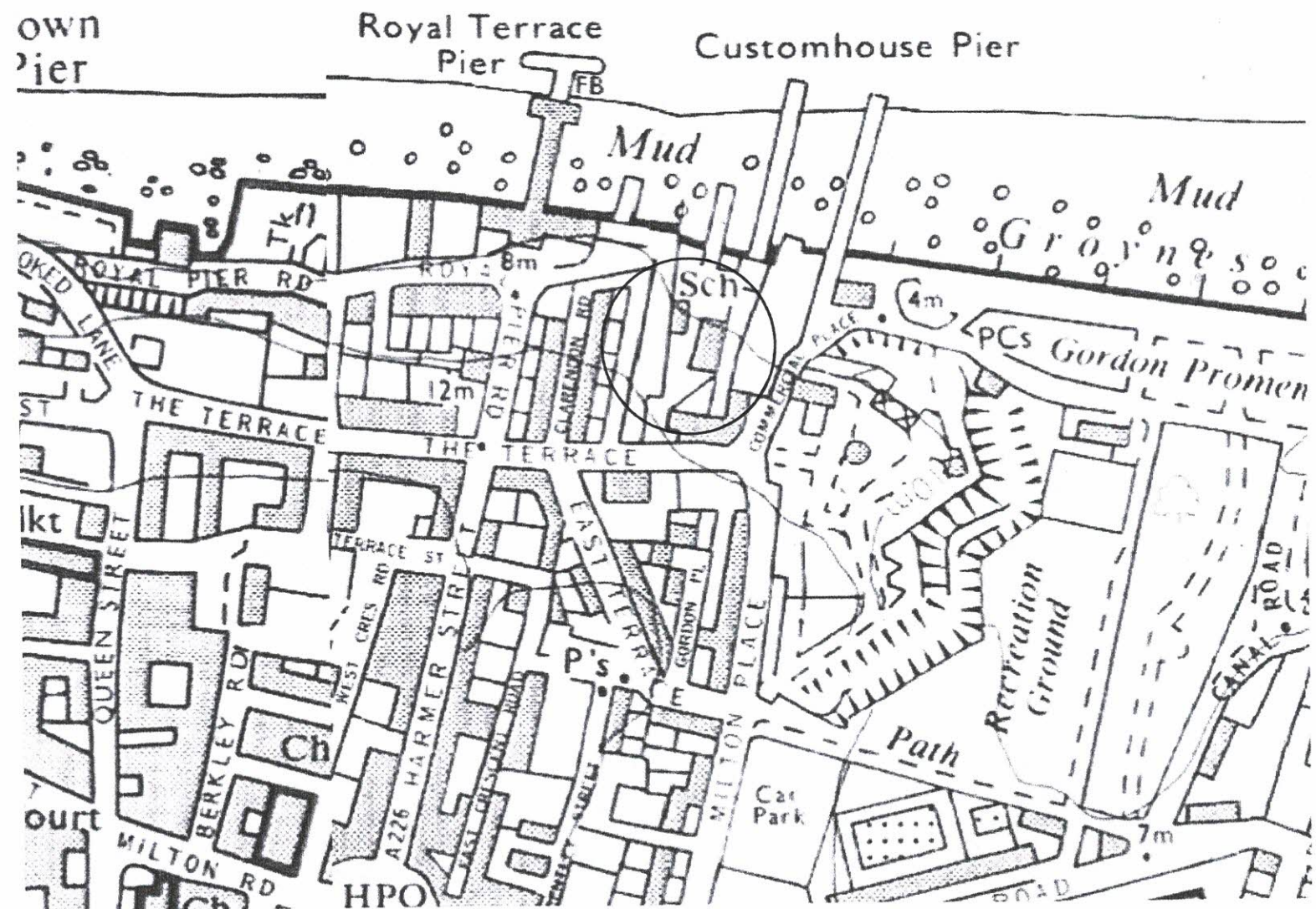
GRAVESEND



Custom House, The Terrace, Gravesend.
OS map scale 1:2500 1951.



Custom House, The Terrace, Gravesend.
OS map scale 1:10560 1966.



Custom House, The Terrace, Gravesend.
OS map scale 1:10000 1980-1982.