

R. CARR GEOTECHNICAL SERVICES

Ref: 3536/18

**PROPOSED REDEVELOPMENT AT
106 HIGH STREET, HYTHE,
KENT CT21 5LE.**

**PHASE I GEO-ENVIRONMENTAL DESK STUDY AND
REPORT ON PHASE 2 SUBSOIL INVESTIGATIONS**



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1. Introduction

- 1.1 This report has been prepared following receipt of instructions from Mr M Phillips of Architecture Design Ltd, representing the prospective developers of land located at 106 High Street, Hythe.
- 1.2 The proposed development comprises the demolition of a disused structure and extension with the conversion of an existing building to a two bedroomed house. Two new dwellings are also scheduled within the development (Fig 1).
- 1.3 The purpose of this report is to identify and quantify contaminative and environment-related issues that 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)
 - NHBC Part 4 Foundations 4.1 *Land Quality: Managing Ground Conditions*

The results of a subsequent intrusive ground investigation incorporating parameters for foundation design and a revised risk assessment are also included within the report.

2. Topography

- 2.1 The site is located to the south of the High Street at OS Land Ranger map reference TR 162 347.

2.2 At the site location ground surface is of a relatively level contour.

3. Geology

3.1 Reference to the local Geological Survey sheet (no. 315/316: Folkestone & Dover) has indicated that the site is underlain by Marine Alluvium.

3.2 Alluvial deposits typically comprise fine-grained sediments of geologically recent origin. Occupying river valleys and coastal flats, they are characterised by a high moisture content and may contain layers of highly compressible peat.

4. Hydrology and Hydrogeology

4.1 The Royal Military Canal passes roughly east to west approximately 50m to the south of the site.

4.2 The Marine Alluvium is classified as a Minor Aquifer (variably permeable). Although not producing large quantities of water for abstraction, such formations are important for local supplies and in supplying base flows to rivers. Soil Classification: Soils of High Leaching Potential (H1).

4.3 Reference to the Environment Agency website has indicated the presence of an industrial water abstraction for irrigation purposes at a golf club located approximately 700m to the southeast of the site.

5. Site History

5.1 A search has been undertaken of available historical Ordnance Survey Maps obtained from the Kent County Archives and Landmark websites. The following maps were examined for the presence of on and off-site potential contamination, extracts of which are contained in Appendix A:

5.2 OS map scale 1:1250 1871-1890:

On site: The north end of site already supports a mid-terrace building of possible residential appearance, a linear projection being attached to the south end of the

building. The rear section of the site comprises a narrow area of garden, a roughly square shaped building being present toward its south end.

Off Site: The site is located on the south side of Hythe High Street, being enclosed on its east and west sides by buildings of residential or commercial appearance and gardens. A cul-de-sac known as Prospect Street passes along the south end of the site. The Royal Military Canal is located some 50m to the south.

5.3 OS map scale 1:1250 1897-1900:

On site: No significant change.

Off Site: Prospect Street has been extended at its east end.

5.4 OS map scale 1:1250 1907-1923:

On site: No significant change.

Off Site: No significant change.

5.5 OS map scale 1:1250 1937-1938:

On site: No significant change.

Off Site: No significant change.

5.6 OS map scale 1:10560 1961:

On site: The building formerly located toward the south end of the site has been demolished. A building resembling a row of lock-up garages has been constructed in the site's southeast corner.

Off Site: No significant change.

5.7 OS map scale 1:1250 1981-1984:

On site: No significant change.

Off Site: Prospect Road has been constructed approximately 100m to the south of the site, adjacent to the canal. Electricity substation facilities are denoted within 250m to the northeast.

5.8 It is understood that the former dwelling located at the north end of the site currently functions as a charity shop.

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 B:

6.2 Potentially Contaminative Industrial Uses (Historical Land Use)

Military Land (1877-1946)	50mS
Electrical Substation Facilities (1985)	91mNE, 206mW
Potential Tanks (1958-1985)	146mW, 147mW (2), 249mW

6.3 Potentially Infilled Land

No areas of potentially infilled land have been identified within 250m of the site.

6.4 Contraventions

No contraventions have been identified within 250m of the site.

6.5 Waste/Landfill Sites

No waste management facilities, registered landfill sites or historic landfill sites have been identified within 250m of the site.

6.6 Local Authority Pollution Prevention & Controls

Dry Cleaners	179m W
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6.7 Contemporary Trade Directory Entries

Hi-Fi Equipment Manufacturers	4mW
Jewellery Manufacturers	19mN
Electrical Goods Sales & Manufacturers	76mW
T-Shirts	126mE
Confectionary Manufacturers	139mE

Railways	155mW
Dry Cleaners	178mW
Chemists & Pharmacists' suppliers	205mW
Paper & Pulp Mills	219mW
Carpet, Curtain & Upholstery Cleaners	236mW

6.8 **Flood Risk Screen**

A potential risk of river or coastal flooding has been identified to the site.

6.9 **Energy & Infrastructure Screen**

No Energy & Infrastructure projects have been identified within 250m of the site.

6.10 **Radon**

The site located within a lower probability radon area. No radon protective measures are considered necessary within the design of the development.

6.11 **Environmental Constraints**

No Environmental Constraints have been identified within 250m of the site.

7. **Site Inspection**

7.1 An inspection of the site was undertaken during inclement weather conditions on 31st January 2018, at the same time as an intrusive ground investigation was implemented.

7.2 The site was accessed from its south end via a narrow one-way street known as Prospect Road. Vehicular entry was possible directly from Prospect Road into the rear of the site. The site entrance also allowed vehicular access for residents of the neighbouring property to the east.

7.3 The site comprised a narrow strip of land located to the rear of 106 High Street, a historic terraced building of former residential appearance which is understood to currently function as a charity shop.

- 7.4 Ground surface at the site was of a relatively level contour, the majority of the ground surface consisting of shingle contained by a grid of plastic mesh (Plate 1). A series of drainage inspection chamber covers ran centrally from the north to the south end of the site.
- 7.5 The west boundary of the site comprised a stone wall approximately 0.75m in height whereas the east boundary consisted of a 1.5m high brick wall. An area of raised planting formed from timber sleepers was present alongside the site's east boundary (Plate 2).
- 7.6 A two-storey, rendered brick extension with a small, single-storey projection was located at the rear of charity shop, a narrow concrete footpath providing pedestrian access alongside the flank wall of the extension to the rear of the terrace (Plate 3). A Bay tree was located opposite the rear corner of the extension, within the neighbouring site to the east.
- 7.7 The southeast end of the site supported a brick building resembling three lock-up garages which appeared to be disused. The roof of the building was formed from corrugated sheets of asbestos-cement, the building being secured by locked timber doors (Plate 4). A dustbin was positioned alongside the front of the building. Two cars were parked on the shingle surfacing at the southwest end of the site, opposite the garage block.
- 7.8 The site was located within a predominantly residential area, the gardens of neighbouring properties being located alongside its east and west boundaries. A public car park was located opposite the site entrance, on the south side of Prospect Road.
- 7.9 No visual or olfactory evidence of significant contamination was observed on the site at the time of the inspection.

8. Conceptual Site Model

- 8.1 Base upon the available information, the north end of the site would appear to have

supported a terraced dwelling which has subsequently been converted to high street retail use. This building currently functions as a charity shop. The south section of the site appears to have originally comprised the rear garden and/or yard of the terraced dwelling and has subsequently been provided with shingle surfacing of relatively recent appearance. A brick building resembling three disused former lock-up garages is located at the southeast end of the site.

8.2 On-site sources of potential contamination identified to the site include:

- Petroleum hydrocarbon contamination (TPH) as a result of leakages and spillages of fuel and lubricants associated with parked vehicles and vehicle maintenance in the former garages
- Metals polynuclear aromatic hydrocarbons (PAH) and petroleum hydrocarbons ((TPH) possibly present within made ground beneath the site surface
- Asbestos-containing material present within the fabric of existing buildings

The site is therefore considered to pose a low to moderate risk to human health, plant life and plastic water services.

8.3 Several contemporary businesses have been identified within the vicinity of the site, the nearest being a manufacturer of Hi-Fi equipment. However the majority of local commercial activities comprise inconsequential high street businesses which are unlikely to have impacted the site. A dry cleaner and railway to the west are considered sufficiently remote from the site to be of any significant influence. Historic installations including military land, electricity substation facilities and potential tanks are also regarded as being sufficiently remote so as not to have impacted the site. No off-site sources of potential contamination have therefore been identified to the site.

8.4 A low risk has been identified to groundwater as any potential sources of contamination are likely to be superficial. No potable water abstractions have been identified within 500m of the site.

8.5 No registered landfill sites or infilled ground have been identified within 250m of the site. In the absence of a credible source of gas migration the risk to the site from

possible ground gas emissions is therefore considered to be low. The site is located within a lower probability radon area. Reappraisal of gas risk would become necessary if excessive quantities of made ground containing bio-degradable material were discovered beneath the site during the course of subsoil investigations.

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 leakages and spillages of fuel and lubricants and present in made ground e.g. PAH, TPH	Toxic and carcinogenic	Future Users	Inhalation, ingestion and skin contact	Serious	Low to moderate	Site investigation to confirm 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	Appropriate precautions with storage of fuel for contractors' plant during construction work.
Inorganic contaminants associated with made ground e.g. arsenic, lead	Attack on plastic or rubber	Building Services and Fabric	Leaching and diffusion	Serious	Low to moderate	Use of upgraded pipes if excessive PAH or TPH contamination discovered. Seek advice of local water authority if doubt arises over suitability of materials
		Future users	Inhalation, ingestion, and skin contact	Serious	Low to moderate	Site investigation to confirm 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. zinc, copper	Zootoxic	Groundwater	Leaching, permeable strata, groundwater	Serious	Low	Appropriate precautions with design of surface water drainage in new development.
		Plants	Uptake	Serious	Low to moderate	Site investigation to confirm degree of risk. Provision of clean topsoil in areas of planting, if necessary.
		Groundwater	Leaching, permeable strata, groundwater	Serious	Low	Appropriate precautions with design of surface water drainage in new development.
		Future Users	Air inhalation	Serious	Low	Dismantling and removal by experienced contractor.
Asbestos	Carcinogenic and Respiratory Irritant	Adjoining site occupiers	Ditto	Serious	Low	No biodegradable landfill or infilled ground identified within 250m of site. Reassessment if excessive quantities of made ground unexpectedly discovered beneath site.
Ground gases e.g. methane, carbon dioxide	Asphixiant, explosive	Site workers	Service ducts	Serious	Low	
		Future Users	Air inhalation	Serious	Low	

10. Subsoil Investigations

- 10.1 A ground investigation comprising three boreholes advanced to a maximum depth of 4m with a portable window was undertaken at the site on 31st January 2018. The boreholes were positioned in order to obtain an even coverage of the site including the vicinity of the garage building. Disturbed samples of soil were retained for subsequent laboratory testing. Details of the soils encountered are contained within the accompanying strata logs, but can be conveniently summarised as follows:

Depth	Stratum
Ground level – 0.1m/0.2m	Concrete/shingle surfacing
0.1m/0.2m – 1.6m/2.2m	FILL – very soft, moist silty and friable slightly sandy, silty clay with fine to coarse brick, chalk and mortar gravel and occasional medium flint gravel
1.6m – 2.7m (WS2 only)	FILL – firm clay with silty partings and scarce fine brick gravel
1.2m/3.1m – 3.8m	MARINE ALLUVIUM – very soft, moist, slightly organic silty CLAY and silty slightly sandy CLAY
3.8m – 4m+ (WS2 only)	?STORM GRAVEL BEACH DEPOSITS – medium dense, clayey, sandy, fine to medium subrounded flint GRAVEL

- 10.2 Groundwater was encountered at a depth of around 2m in WS1, a slow seepage being observed at a similar depth in WS3. A water strike was made at 3m in WS2. Standing water levels of 1.9m and 2.8m were recorded in WS1 and WS3 respectively ten and twenty minutes after completion of drilling. WS3 remained dry ten minutes after completion.

11. Laboratory Tests

- 11.1 Atterberg classification tests carried out on samples of soil recovered from a depth of 2.5m at the location of WS1 and 2m at the location of WS2 have categorised the alluvium as clay of very high and high plasticity (CV and CH). Such soils may exhibit significant changes in volume during periods of prolonged summer drought or in the vicinity of trees and shrubs.
- 11.2 Chemical testing undertaken on soil samples retrieved from WS1 at a depth of 1.5m and WS2 at 2.5m has determined soil pH as 7.1 to 7.2 and water soluble sulphate of 0.1 to 0.3 g/L (Class DS-1).

Contamination Tests

- 11.3 Samples of soil obtained from the boreholes at a depth of 0.3m were preserved in plastic containers and glass jars. The samples were transferred to an accredited laboratory within twenty four hours of the site work being undertaken, then tested for a suite of common contaminants including speciated PAH, petroleum hydrocarbon fractions (TPH/CWG) and presence of asbestos. The results of the tests have been compared with the following soil screening criteria for residential development:
- LQM/CIEH S4ULs for Human Health Risk Assessment 2015
 - Contaminated Land Exposure Assessment model (CLEA) 2015
 - SP1010 Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination – Policy Companion Document 2014
- 11.4 Elevated concentrations of lead ranging from 299 mg/kg to 776 mg/kg have been detected in each sample. The soil screening level for lead provided by SP1010 is 200 mg/kg.
- 11.5 Quantities of the remaining contaminants detected within the samples are well within the utilised soil screening criteria. TPH fractions were below laboratory detection levels and no traces of asbestos were observed within the samples.

12. Discussion/Recommendations

- 12.1 The investigation has confirmed the existence of Marine Alluvium beneath the site, locally overlain by a 1.8m to 2.7m layer of Fill material. The Fill comprises naturally derived materials which may well be derived from the excavation of the nearby Military Canal for defensive purposes against a possible French invasion at the beginning of the nineteenth century. Gravel encountered at 3.8m in WS2 possibly indicated the interface of underlying Storm Gravel Beach Deposits.
- 12.2 Groundwater was encountered at depths of 2m and 3m beneath the site surface, though the hydrogeology of the site may be susceptible to seasonal fluctuations in level.
- 12.3 Due to the low bearing capacity of the subsoil and its lateral instability as a result of underlying groundwater, trench-fill foundations are considered inappropriate for the development. It is therefore recommended that an alternative foundation solution such as a reinforced concrete raft designed by to a maximum allowable bearing pressure of 40 kN/m² should be adopted. Alternatively, piled foundations extended into underlying, competent strata could be utilised. In order to ascertain the depth of competent strata it would be necessary to undertake deeper boreholes and penetration tests with a cable percussion drilling rig.
- 12.4 As trees are present on the site boundary recommendations provided by NHBC publication Chapter 4.2 should be adhered to with regard to the depth and design of foundations and floor slabs. NHBC classification: High Volume Change Potential.
- 12.5 Sulphate determination has indicated that special precautions would not be necessary within underground concrete placed upon the site (see BRE Special Publication 1 (2005) "Concrete in Aggressive Ground").

Revised Risk Assessment

- 12.6 The results of the contamination analyses have detected elevated levels of lead

within Fill material present beneath the site which could pose a risk to receptors including human health and plant life. Remediation will therefore be necessary within any areas of garden or ornamental planting scheduled for the development.

- 12.7 The site is considered to pose a low risk to groundwater as water levels were generally around the base of the Fill material. Vertical migration of superficial contamination as a result of precipitation will be inhibited by the introduction of hardstanding and building footprints. In areas of proposed garden the effects of vertical leaching will be significantly reduced by removal of the upper 600mm soil layer. Both the Fill and the underlying alluvium comprise clay soil of relatively low permeability and no potable water abstractions have been identified within 500m of the site.
- 12.8 The risk to underground plastic services is considered to be low as PAH concentrations which can be deleterious to underground plastic pipes were relatively low and TPH concentrations were below laboratory detection levels.
- 12.9 The following ground gas risk assessment has been undertaken in compliance with the methodology proposed by CL:AIRE research bulletin RB17 (2012):
1. No credible off-site sources of gas migration have been identified
 2. No radon protection measures are required within the development.
 3. The average depth of made ground beneath the site is less than 3m.
 4. The Fill material comprises re-worked natural soils which do not produce methane and can only produce carbon dioxide.
 5. The total organic carbon content of the Fill is less than 6%

The site has therefore been characterised as CS1 and gas protection measures are not considered to be necessary within the design of the development.

Remediation Statement

- 12.10 In areas of proposed garden it is recommended that the Fill material is excavated to a depth of 600mm and removed from the site to an appropriately licensed waste depository. Haulage transfer notes should be retained as evidence that this procedure has been carried out and photographic documentation of the reduction

in site levels undertaken as work progresses for inclusion within a Closure Report for the site.

- 12.11 Remediation will not be necessary beneath building footprints or permanent hardstanding as pathways for contaminants to reach end users will be severed.
- 12.12 Following excavation of the Fill material to a depth of 600mm a geotextile should then be laid on the reduced ground surface, upon which should be placed clean, imported soil which has been tested in order to ensure that it is free from contamination and suitable for use on the site. At least the upper 300mm layer of imported soil should comprise topsoil.
- 12.13 Alternatively, areas of proposed garden could be replaced by permanent hard standing which would sever pollutant linkages between end users and contaminated soil. Raised planters could then be installed on the hardstanding in keeping with the area of raised planting currently present upon the site.
- 12.14 Asbestos containing material present within existing structures should be dismantled by an experienced contractor and removed from the site to an appropriately licensed depository.
- 12.15 Site workers should be provided with relevant protective clothing and equipment and dust emissions minimised as far as possible in order to safeguard both site workers and the occupants of nearby buildings.
- 12.16 In the event that contamination not detected by the recent investigation is encountered during the course of the development, the risk posed by the contamination should be adequately assessed and appropriate action implemented as necessary.
- 12.17 It should be noted that the site is located in close proximity to a surface watercourse and is underlain by a Minor 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 underlying strata or nearby surface water systems. Fuel and/or lubricants utilised by contractors' plant should

be stored in a secure, preferably bunded area of the site.

- 12.18 The findings and recommendations contained within this report should be made available to the Contaminated Land Officer of the Local Planning Authority prior to the commencement of the development.
- 12.19 This report has been prepared from information obtained at representative locations of the site. No responsibility can be accepted for variations in ground conditions that may exist beneath the site in hitherto uninvestigated areas.



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106 High Street Hythe.
Fig 1 Plan of Proposed Development.





Plate 1



Plate 2



Plate 3



Plate 4

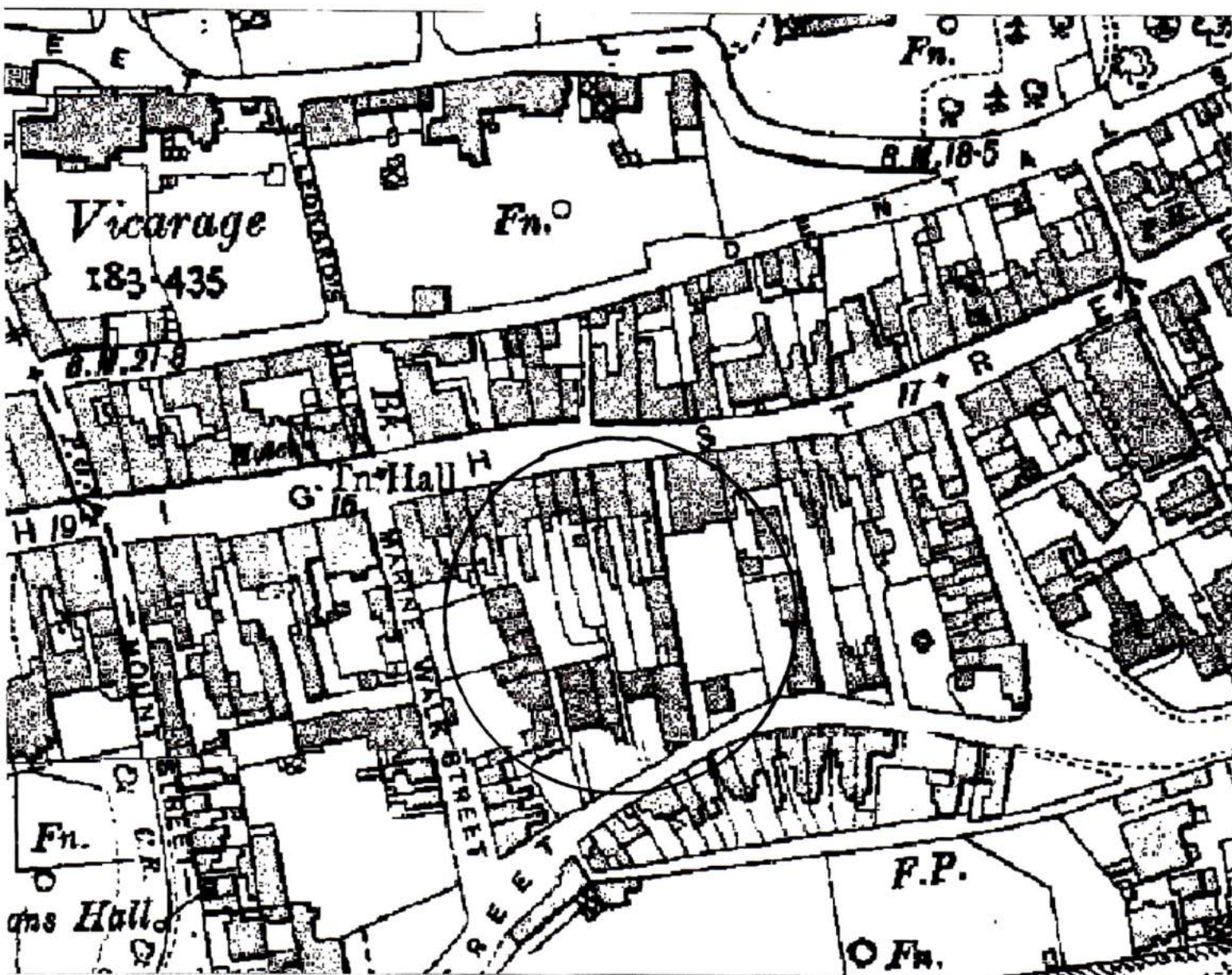
Appendix A

Site History



106 High Street Hythe.
OS map 1:1250 1871-1890.

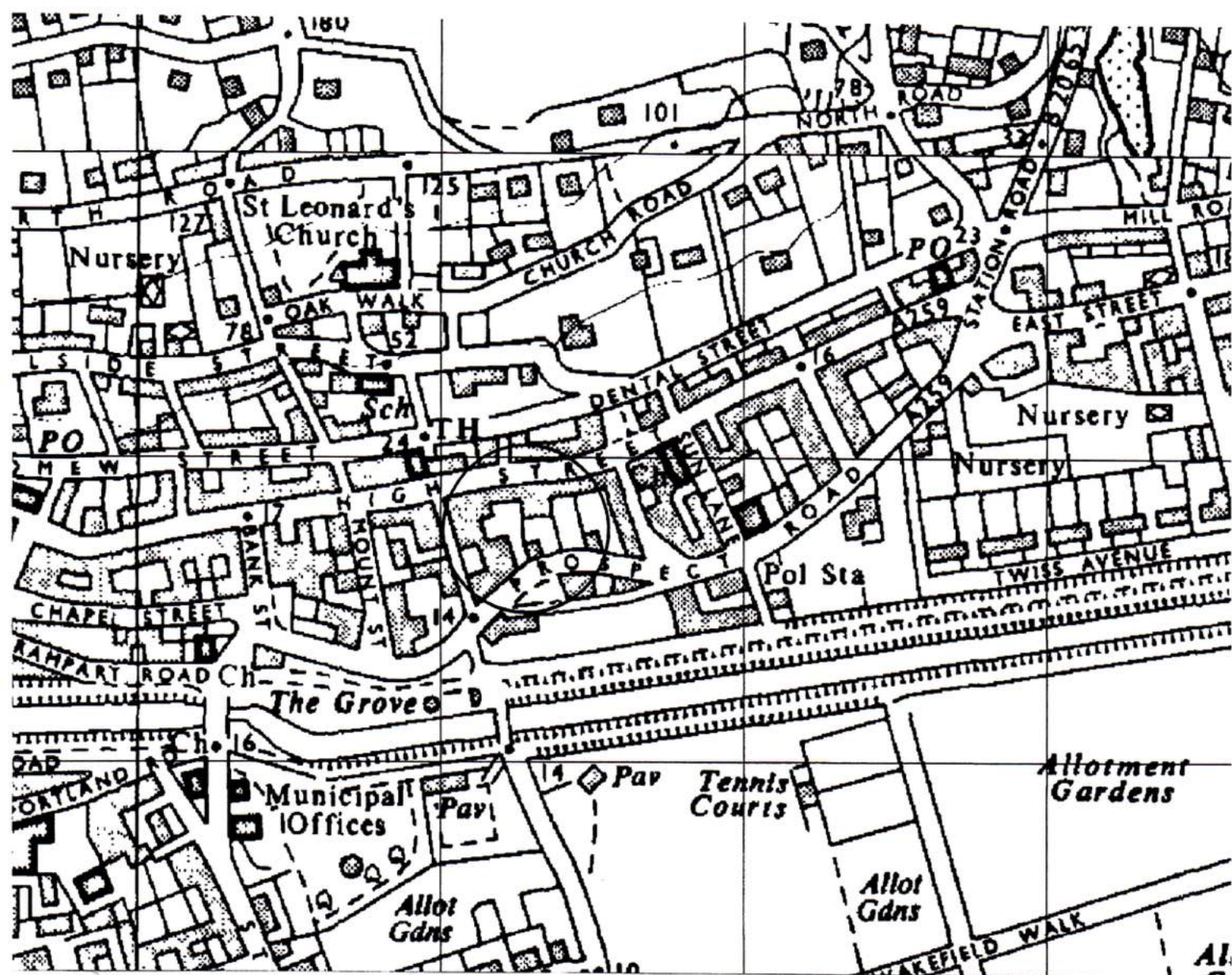




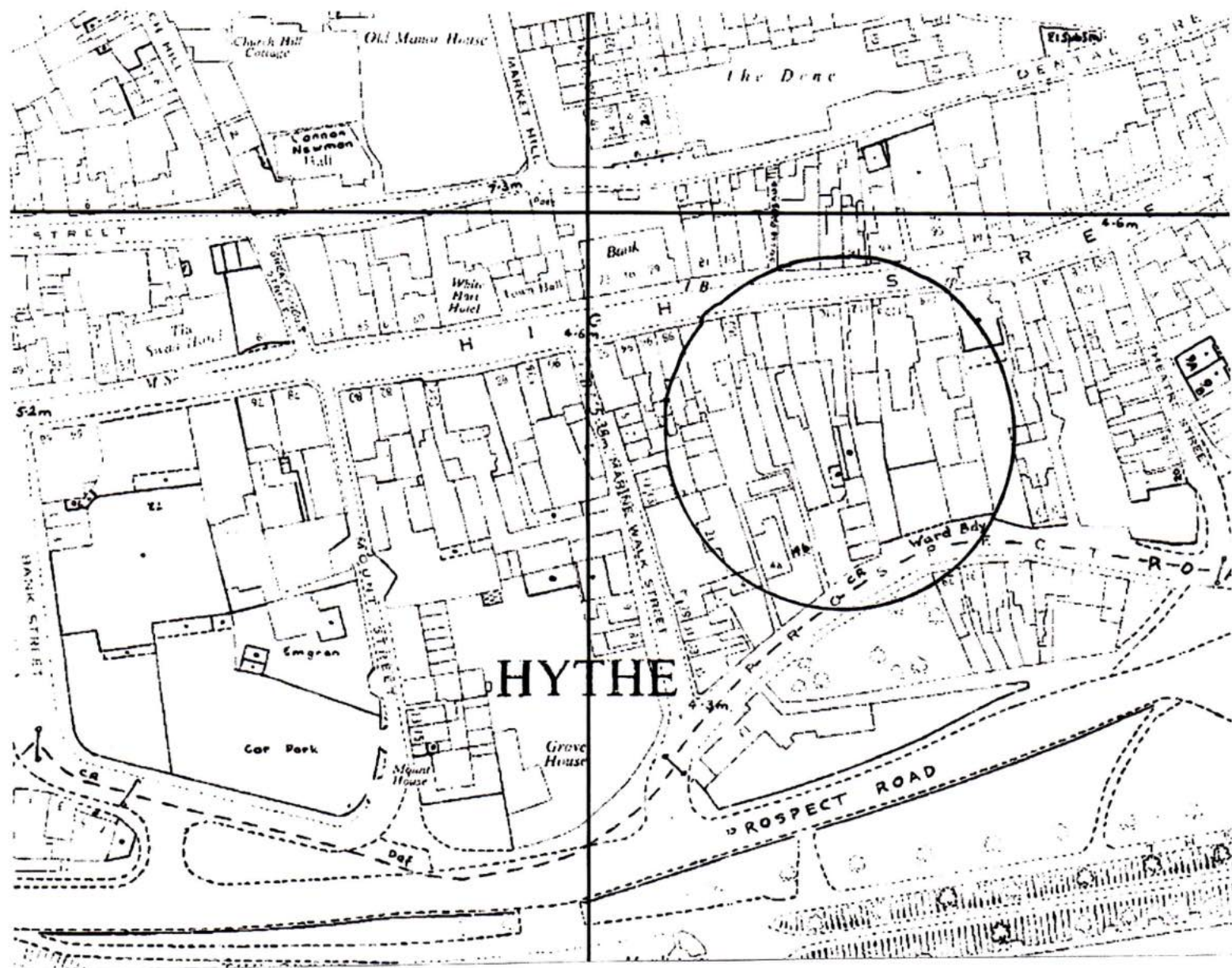
106 High Street Hythe.
OS map 1:1250 1907-1923.



106 High Street Hythe.
OS map 1:1250 1929-1952.



106 High Street Hythe.
OS map 1:10560 1961.



106 High Street Hythe.
OS map 1:1250 1981-1984.