

R. CARR GEOTECHNICAL SERVICES

Ref: 3825/20

**PROPOSED REDEVELOPMENT AT
THE YARD, LOWER RANGE ROAD,
GRAVESEND, KENT DA12 2QL**

**PHASE 1 GEO ENVIRONMENTAL DESK STUDY AND
PHASE 2 REPORT ON SUBSOIL INVESTIGATIONS**



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R. Carr Geotechnical Services 9 The Mallows, Maidstone, Kent ME14 2PX

Tel: 07974 758617 email: RONCARR200@aol.com

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The Yard, Lower Range Road, Gravesend, Kent DA12 2QL

1. Introduction

- 1.1 This report has been prepared on behalf of Gravesend Church Houses Association following receipt of instructions from Mr J Green of Pellings Ltd.
- 1.2 The proposed development is understood to comprise a block of apartments with associated areas of vehicular parking and landscaping (Fig 1).
- 1.3 The site was the subject of a previous contamination assessment undertaken by R Carr Geotechnical Services carried out on 9th October 2014 on behalf of a prospective purchaser for the site (report reference: 3084/14 dated October 2014). The investigation comprised four boreholes advanced to depths of up to 3m with a portable window sampler and subsequent chemical testing of soil samples obtained from the boreholes. Made ground extending to depths of 2.5m and in excess of 3m was encountered beneath the site surface, deposits of naturally occurring Alluvium being penetrated at 2.5m at one location only. Ground water entry occurred between 1.8m and 2m.
- 1.4 The results of laboratory tests undertaken on soil samples obtained at depths of 0.3m beneath the site surface detected slightly elevated concentrations of Benzo(a)pyrene. Soil screening values have however subsequently been revised. Traces of Amosite asbestos fibres were also detected in the sample from BH4.
- 1.5 This report provides a Phase 1 Desk Study for the site, together with an environmental risk-check and preliminary risk assessment. Details of a Phase 2 Intrusive Investigation and Revised Risk Assessment are also included, 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*

2. Topography

- 2.1 The site is located on relatively level ground to the south of Lower Range Road (OS Land Ranger map reference TQ 663 738).

3. Geology

- 3.1 Reference to the local Geological Survey sheet (no. 271: Dartford) has indicated that the site is underlain by deposits of Alluvium, with exposures of Boyn Hill Gravel denoted in close proximity to the west. The Boyn Hill Gravel is in turn underlain by the White Chalk subgroup (formerly referred to as the Upper Chalk).
- 3.2 Alluvial deposits typically comprise fine-grained sediments of geologically recent origin. Occupying river valleys and coastal flats, the deposits are characterised by a high moisture content and may contain layers of compressible peat.
- 3.3 The Boyn Hill Gravel comprises part of the post-diversionary Thames River Terrace sequence, being sandy and clayey in part.
- 3.4 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 deposits.

4. Hydrology and Hydrogeology

- 4.1 Two ponds are located approximately 50m to the east of the site.
- 4.2 Subject to its constituents, the Alluvium is generally classified as a Non Aquifer. Such formations are generally regarded as containing insignificant quantities of groundwater.

- 4.3 The Boyn Hill Gravel is classified as a Secondary A Aquifer. These can be fractured or potentially fractured rocks that do not have a high primary permeability, or other formations of variable permeability including unconsolidated deposits. Although not producing large quantities of water for abstraction, they are important for local supplies and supplying base flows to rivers. Soil Classification: Soils of High Leaching Potential (H1).
- 4.4 The underlying 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 of historical Ordnance Survey Maps has been undertaken from the Promap website. The following maps were available and have been examined for the presence of on and off-site potential contamination, extracts of which are contained in Appendix A:
- 5.2 OS map scale 1:2500 1871-1890:
On Site: The site comprises undeveloped land located on Denton Marshes. Surface watercourses extend across the central area of the site and along its west boundary.
Off Site: The area surrounding the site is undeveloped with tracks extending east to west and south to north from the sites northwest corner. Ponds are denoted within 150m to the north and the northeast. Terraced houses and an adjacent orchard are located within 200m to the west.
- 5.3 OS map scale 1:2500 1897-1900:
On Site: No significant change
Off Site: Small quarries are in evidence within 25m and 150m to the west of the site. A tank is denoted within 100m to the north. The pond to the north has been infilled. The former track extending to the west of the site is now denoted as Lower Range Road, a row of terraced houses having been constructed along its north side and half way along its south side. Additional terraced housing has been developed within

200m to the west, including on the site of the former orchard.

5.4 OS map scale 1:2500 1907-1923:

On Site: No significant change.

Off Site: The tank is no longer in evidence to the north. Additional terraced houses extend to the end of Lower Range Road and within 150m to the southwest of the site

5.5 OS map scale 1:2500 1929-1952:

On Site: The perimeter of the site has now been defined by an extension to Lower Range Road along its north boundary and by raised ground along its south boundary. The on-site watercourses have been infilled.

Off Site: A school has been constructed within 50m from the west side of the site, the nearby quarry having been infilled. The east boundary of the school grounds now forms the west boundary of the site. Additional residential development has taken place within 25m to the northwest and within 250m to the southeast. Sewage works have been constructed within 250m to the east.

5.6 OS map scale 1:10560 1961:

On Site: No significant change. The site remains undeveloped with a public footpath passing northwest to southeast across its central area.

Off Site: A quarry is denoted within 250m to the south, otherwise little change.

5.7 OS map scale 1:10000: 1982.

On Site: The site is now clearly defined, a rectangular building being present in its northeast corner.

Off Site: Residential development now surrounds the north, southeast and west sides of the site, the former quarry to the south having been infilled. Additional buildings have been constructed along the site's west boundary. Works are denoted within 50m to the northeast. A pipeline extends southwest to northeast adjacent to the site's southeast boundary. Undeveloped land supporting a pond remains to the east.

5.8 The site is understood to have supported a builder's merchant and was subsequently utilised by a fencing contractor.

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 (Past Land Use)**

Factory or Works (1982)	47mNE
Sewage (1982)	238mE

6.3 **Historical Tanks & Energy Facilities**

Tanks (1978)	43mNE
Tanks (1978)	112mNE
Tanks (1978)	135mN
Electrical Substation Facilities (1978)	136mSE
Potential Tanks (1954)	151mSW

6.4 **Potentially Infilled Land (Non-Water)**

Unknown Filled Ground (Pit, quarry etc:1982)	35mW
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6.5 **Potentially Infilled Land (Water)**

Unknown Filled Ground (pond, marsh, river, stream, dock etc:1869)	10mNW
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6.6 **Environmental Pollution Incidents**

Land - Significant Incident: February 2004	82mNE
Water – Significant Impact: May 2004	206mE

6.7 **Historic Landfill**

Denton Comma Oil (included inert waste): 1976	112mNE
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6.8 Contemporary Trade Directory Entries

Builder's Merchants (Inactive)	On site
Lubricant Manufacturers & Distributors (Active)	190mNE
Asphalt & Coated Macadam Laying Contractors (Inactive)	173mW
Cleaning Services – Domestic (Inactive)	176mNW
Joinery Manufacturers (Inactive)	199mW
Cleaning Services - Domestic (Inactive)	199mS
Dairies (Inactive)	224mSW
Blinds, Awnings & Canopies (Inactive)	242mS
Garage Services (Active)	246mNW
Mechanical Engineers (Active)	249mNW

6.9 Flood Risk Screen

No potential flood risk has been identified to the site.

6.10 Energy & Infrastructure Screen

Existing or Proposed Wind Farms or Wind Turbines	Within 4km
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6.11 Radon

Lower Probability	No radon protection measures necessary.
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6.12 Environmental Constraints

Environmentally Sensitive Area (North Kent Marshes)	1m
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7. Site Inspection

- 7.1 An inspection of the site was undertaken in dry, overcast weather on 3rd November 2020.
- 7.2 The area surrounding the site consisted predominantly of residential properties of various ages. The offices of a lubricant manufacturing plant were situated within 50m to the northeast.
- 7.3 The site comprised an irregular area of relatively level ground enclosed on its north and east sides by steel railings (Plates 1). Padlocked steel gates and concrete blocks secured the entrance into the site from its northwest corner. A narrow tarmac road which had been blocked with fly-tipped rubbish passed alongside the north boundary of the site. The south and west boundaries of the site consisted of panelled timber fencing which had partially collapsed along the south boundary.
- 7.4 The site surface comprised part concrete, part tarmac with an area of unsurfaced gravelly soil in its central area. Large mounds of fly-tipped timber and domestic rubbish were present at the south end of the site and in its southeast corner (Plate 2 and Plate 3).
- 7.5 An open-ended skip containing brick rubble was located next to the site's north boundary (Plate 4), adjacent to the remains of a small timber building which appeared to have been destroyed by fire (Plate 5).
- 7.6 A steel incinerator was situated alongside the east boundary of the site (Plate 6).
- 7.7 Deciduous trees and bushes surrounded the east, south and west sides of the site, houses of relatively recent construction being present within the adjacent site to the west (Plate 7). A block of apartments occupied neighbouring land to the south.
- 7.8 Enclosed grazing land containing two horses was located beyond the east side of the site, two ponds of a temporary appearance being in evidence approximately 50m from the site boundary (Plate 8). An above-ground pipeline supported on concrete piers passed through the enclosure, in close proximity to the southeast corner of the

site.

8. Conceptual Site Model

8.1 Based upon the available information the site would appear to have comprised undeveloped land until its development during the latter part of the twentieth century. The site has supported a builder's yard and a fencing business but appears to have remained derelict since the previous intrusive investigation was undertaken during 2014. The site has been subjected to extensive fly-tipping comprising mainly domestic rubbish and a building formerly present upon the site has been destroyed by fire. A disused incinerator is present on the east side of the site. Although contributing to the untidy appearance of the site, fly-tipping and burning activities are considered unlikely to have had a major impact on the site as most of the site surface is covered by hard standing of a substantial appearance. Due to its former uses and information ascertained from the previous investigation the site is considered to pose a moderate risk to human health, plant life, groundwater and underground plastic services from the following sources of potential contamination:

- Localised organic contamination as a result of possible leakages and spillages from fly-tipped material and previous site activities e.g. petroleum hydrocarbons (TPH).
- Metals and organic contamination within made ground including arsenic, lead, polyaromatic hydrocarbons (PAH) and TPH.
- PAH as a result of fires and in the vicinity of the incinerator
- Asbestos-containing material within made ground and from demolished structures

8.2 A number of historic installations and contemporary commercial activities have been identified within the surrounding area, the majority of which are considered too remote or inconsequential to have impacted the site. A lubricant manufacturing business located within 50m to the northeast is also considered unlikely to have impacted the site as office buildings separated by a road provide a buffer between the subject site and the manufacturing plant. Otherwise, the site is topographically isolated from surrounding commercial activities. No off-site sources of potential

contamination have therefore been identified.

- 8.3 An historic landfill has been identified 112m to the northeast of the site. CIRIA report c665 states that gas generation on infilled land would be insignificant by thirty years and minimal by fifty years, therefore any gas generated during decomposition would have peaked and be in decline. Given the distance of the subject site from the landfill the risk from off-site emissions of ground gas is considered to be low. A moderate risk is however considered applicable from on-site emissions of ground gases possibly emanating from made ground present beneath the site surface and/or from deposits of peat that may exist within the underlying Alluvium.

9. Preliminary Risk Assessment

- 9.1 A Preliminary Risk Assessment has been defined utilising the available information. The risk from possible sources of contamination identified in Section 8 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 site activities, of leakages from lubricants from parked vehicles, made ground, fly-tipped material and fires e.g. TPH, PAH	Toxic and carcinogenic	Future Users	Inhalation, ingestion and skin contact	Serious	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	Moderate	Site investigation to confirm degree of risk Appropriate precautions with storage of fuel & lubricants used by contractors' plant during development.
Inorganic contaminants associated with site activities, made ground & fly-tipped material e.g. arsenic, lead	Attack on plastic or rubber Zootoxic	Building Services and Fabric	Leaching and diffusion	Serious	Moderate	Use of upgraded supply pipes if contamination discovered. Seek advice of local water authority if doubt arises.
		Future users	Inhalation, ingestion, and skin contact	Serious	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	Phytotoxic	Groundwater	Leaching, permeable strata, groundwater	Serious	Moderate	Site investigation to confirm degree of risk. Precautions with design of surface water drainage in new development.
		Plants	Uptake	Serious	Moderate	Removal of contaminated soil in areas of proposed garden if discovered and replacement with clean soil.
		Groundwater	Leaching, permeable strata, groundwater	Serious	Low	Precautions with design of surface water drainage within new development.
Asbestos within made ground & demolished structures	Carcinogenic and Respiratory Irritant	Future Users	Air inhalation	Serious	Low	Appropriate removal and disposal by experienced contractor if found to be present on site
		Adjoining site occupiers	Ditto		Low	
		Site workers	Ditto		Low	
Ground gases emanating from made ground and/or deposits of peat	Asphyxiant, explosive	Future Users	Service ducts	Serious	Moderate	Period of gas monitoring to characterise gas regime. Provision of gas protection measures within design of proposed development, if necessary.
		Adjoining site occupiers Site workers	Air inhalation			

10. Subsoil Investigations

- 10.1 A ground investigation comprising three boreholes advanced to a depth of 4m with a tracked windowless sampler was undertaken at the site on 23rd November 2020 (WS1-WS3). The boreholes were positioned in order to cover areas of the site not included in the previous investigation and to target areas of proposed landscaping. WS2 also targeted the vicinity of the incinerator. Disturbed samples of soil were retained for contamination analysis at the laboratory. Details of the soils encountered are provided within logs contained in Appendix C, but can be conveniently summarised as follows:

Depth	Stratum
Ground level – 0.1m/0.2m	Topsoil/compact granular surfacing
0.1m/0.2m – 1.8m/2.1m	Made Ground (FILL) – compact clay with fine to coarse brick and chalk gravel, occasional half bricks and pieces of carbon
1.8m/3m+	ALLUVIUM – soft, moist mottled CLAY

- 10.2 Slow groundwater seepages occurred in each borehole at depths of around 1.8m and 2m. The sides of WS1, WS2 and WS3 remained stable during the course of drilling.

Gas Monitoring

- 10.3 Standpipes were installed in boreholes WS1 and WS2 in order to ascertain whether the site is being impacted by emissions of ground gases emanating from the underlying made ground and the Alluvium. The wells were formed by the insertion of a partially slotted plastic pipe within the borehole, surrounded with shingle and provided with a bentonite seal, gas tap and temporary cover.
- 10.4 Monitoring has been undertaken on four occasions since the installation of the wells during periods of falling barometric pressure. Tests were undertaken with a GFM436 gas analyser, the following results being obtained

Date and Reference	Flow Rate (Litres/hr)	Weather and Pressure	Methane % V/V	Carbon Dioxide % V/V	Oxygen %V/V
27/11/20 WS1	0.0	Overcast with gentle breeze 1020 mb	0.0	5.8	11.7
WS2	0.0		0.0	0.6	19.8
04/12/20 WS1	0.0	Overcast with light showers 992mb	0.0	6.5	11.2
WS2	0.0		0.0	0.4	19.5
11/12/20 WS1	0.0	Overcast with gentle breeze 1002 mb	0.0	6.1	11.6
WS2	0.0		0.0	0.4	19.8
17/12/20 WS1	0.0	Sunny periods with gentle breeze 1014 mb	0.0	5.6	11.4
WS2	0.0		0.0	0.5	19.6

- 10.5 The available results of the gas monitoring have revealed no traces of methane and a maximum carbon dioxide concentration of 6.5% v/v. A Gas Screening Value (GSV) for the site has been calculated utilising the maximum recorded carbon dioxide concentration of 6.5% v/v and zero flow rate in compliance with guidance documents CIRIA, NHBC, CIEH and British Standards:

$$GSV = 6.5/100 \times 0.0 = 0.065 \text{ l/hr}$$

The GSV indicates a Characteristic Situation 2 (low risk) as defined by CIRIA Report C665 (Table 8.5: Modified Wilson & Card Classification). NHBC Classification: Amber 1.

11. Laboratory Testing

Geotechnical Tests

- 11.1 The results of the laboratory tests are provided in Appendix D. Atterberg classification tests undertaken on a sample of the Alluvium recovered from a depth of 2.5m in WS3 have categorised the subsoil as clay of very high plasticity (CV). Such soils may exhibit significant changes in volume as a result of fluctuations in moisture content.
- 11.2 Chemical analysis undertaken on a soil sample retrieved from a depth of 3m in

WS1 has determined soil pH of 8.3 with water soluble sulphate as 0.31 g/L (Class DS-1).

Contamination Tests

11.3 Near-surface samples of the Fill material 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, the upper tier samples being tested for a suite of common contaminants, speciated PAH, petroleum hydrocarbon fractions (TPH/CWG) and presence of asbestos. The results of the recent tests and those of the previous investigation have been compared with the following soil screening criteria for residential development:

- Contaminated Land Exposure Assessment Model (CLEA) (2015)
- LQM/CIEH S4ULs for Human Health Risk Assessment 2015
- SP1010 Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination – Policy Companion Document 2014

11.4 Elevated quantities of the following substances have been detected in the samples:

Determinand	Reference	Concentration (mg/kg)	Parameter (mg/kg)
Lead	WS2 (0.3m)	224	200 (SP1010)
Benzo(b)fluoranthene	WS3 (0.3m)	3.15	2.6-3.7 (LQM)*
Benzo(a)pyrene	BH2, WS1 (0.3m)	2.3, 2.59	2.2-3.0 (LQM)*
Dibenz(ah)anthracene	BH2 (0.3m)	0.6	0.24-0.3 (LQM)*

*1%-6% Soil Organic Matter

11.5 In addition Amosite asbestos fibres had been detected in the 0.3m sample from BH4 and Chrysotile asbestos bundles were present in the 0.3m sample from WS3.

11.6 Concentrations of the remaining substances present in the samples were within currently available soil screening criteria.

11.7 Leachate analysis has been undertaken on samples of the Alluvium recovered from

a depth of 2m in WS1 and WS3, the results of the tests having been compared with current UK Drinking Water Quality Standards (DWQS). Concentrations of contaminants detected in the samples were within currently available DWQS, TPH fractions being below laboratory detection levels.

12. Discussion/Recommendations

- 12.1 The investigation has confirmed the existence of Alluvial deposits beneath the site, overlain by a layer of made ground (Fill) extending approximately 1.8m to 2.1m below ground level. The Fill material comprises re-worked, naturally occurring soils with evidence of inert foreign debris such as brick fragments.
- 12.2 Groundwater seepages were encountered at the interface of the Fill material with the Alluvium. The hydrogeology of the site may however be prone to seasonal fluctuations throughout the year and groundwater levels could rise during periods of increased precipitation.

Foundations

- 12.3 Due to the existence of highly compressible Alluvium beneath the site the use of conventional trench-fill foundations is inappropriate for the proposed development. A piled foundation solution extended into the underlying, more competent strata is therefore recommended. In order to provide parameters for the design of piles it would be necessary to undertake a deeper borehole with a cable percussion drilling rig. NHBC Classification of the Alluvium: High Volume Change Potential.

Revised Risk Assessment

- 12.4 Slightly elevated concentrations of Lead and various PAH compounds which could pose a risk to human health and plant life have been detected within Fill material present beneath the site surface. Asbestos fibres have also been detected within the Fill at two locations. Remediation will therefore be necessary in areas of proposed garden and landscaping. Residues contained within PAH can also be deleterious to underground plastic water supply pipes.

- 12.5 Leachate testing has indicated low contaminant mobility, consequently the site is considered to pose a low risk to the water environment.
- 12.6 The available gas monitoring results have identified a Characteristic Situation 2 at the site as a result of elevated carbon dioxide emissions probably emanating from the underlying Fill material. Basic gas protection measures will therefore be necessary within the design of the proposed development.

Remediation Method Statement

- 12.7 In the first instance it will be necessary to remove all fly-tipped rubbish from the site to an appropriately licensed waste facility.
- 12.8 It is recommended that areas of proposed garden or landscaping should be excavated to a depth of 600mm below finished ground surface and replaced by clean, imported soil including a capping of at least 300mm topsoil which has been independently tested in order to ensure that it is free from contamination and suitable for use on the site.
- 12.9 Excavated soil should be removed from the site to a licensed depository. **The reduction in site level should be fully documented with photographic evidence for inclusion within a Closure Report for the site.**
- 12.10 Removal of the Fill is not considered necessary beneath the building footprint or areas of permanent hardstanding, as pathways for contaminants to reach end users will be eliminated.
- 12.11 Haulage transfer notes should be retained as evidence that contaminated soil has been removed from the site and for inclusion within the Closure Report.
- 12.12 Any asbestos-containing material discovered upon the site should be removed by an experienced contractor to an appropriately licensed waste facility.
- 12.13 Potable water supply pipes should be laid in trenches and surrounded with clean material. Otherwise upgraded pipes could be utilised. The advice of the local water

authority should be sought in the event that doubt arises over the suitability of materials.

12.14 Basic gas protection measures recommended by CIRIA C665 comprise either:

- Reinforced concrete cast in-situ floor slab (suspended, non-suspended or raft)
with at least 1200 g DPM² and underfloor venting with all joints and penetrations sealed
or
- Beam and block or pre-cast concrete and 2000 g DPM/reinforced gas membrane and underfloor venting with all joints and penetrations sealed.

Photographs documenting the installation of the gas protection measures should be retained for inclusion within the Closure Report.

12.15 Site workers should be provided with appropriate protective clothing and be informed that contamination exists beneath the site. It is also recommended that dust emissions are minimised as far as possible in order to safeguard both site workers and the occupants of adjacent houses.

12.16 Fuels and lubricants utilised by contractors' plant during the development should therefore be stored in a secure, preferably bunded area of the site in order to prevent the escape and subsequent migration of pollutants into the underlying strata and nearby surface waterbodies.

12.17 In the event that contamination not detected by the intrusive investigations is encountered during the course of the development, the nature of the contamination must be adequately assessed and dealt with in an appropriate manner. Evidence of contamination may include discoloured or malodorous soil and/or the presence of ash, clinker or asbestos fragments.

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

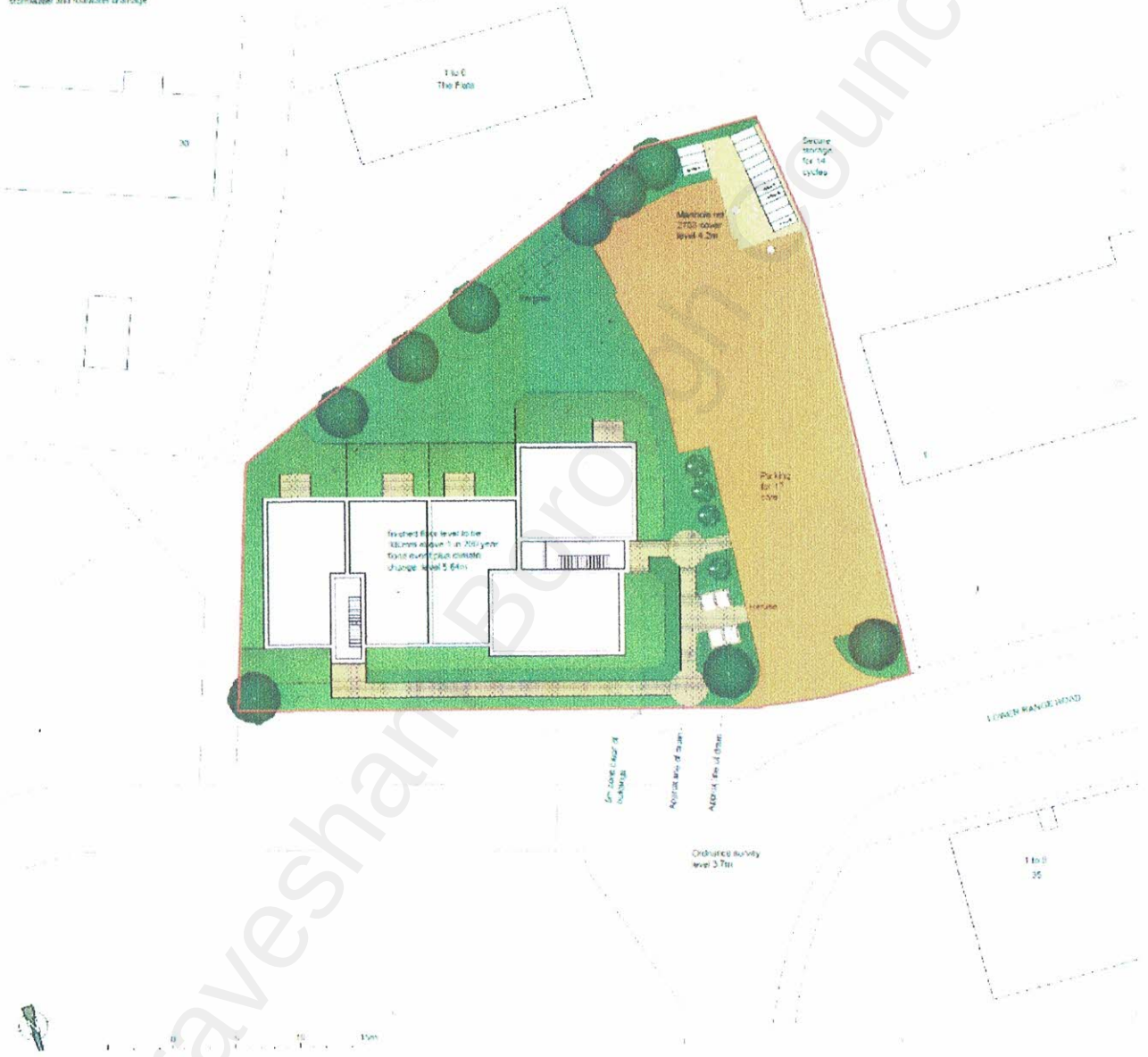
of the site. Although significant variations in ground conditions are considered unlikely, no responsibility can be accepted for any such variations that may exist beneath the site in hitherto uninvestigated areas.



R. Carr BA (Hons) FGS

December 2020

Elevation sea drainage strategy report
and enclosed drawings submitted with
the planning application for means of
stormwater and foulwater drainage



**The Yard, Lower Range Road, Gravesend.
Fig 1 Plan of Proposed Development.**



Plate 1



Plate 2



Plate 3



Plate 4



Plate 5



Plate 6



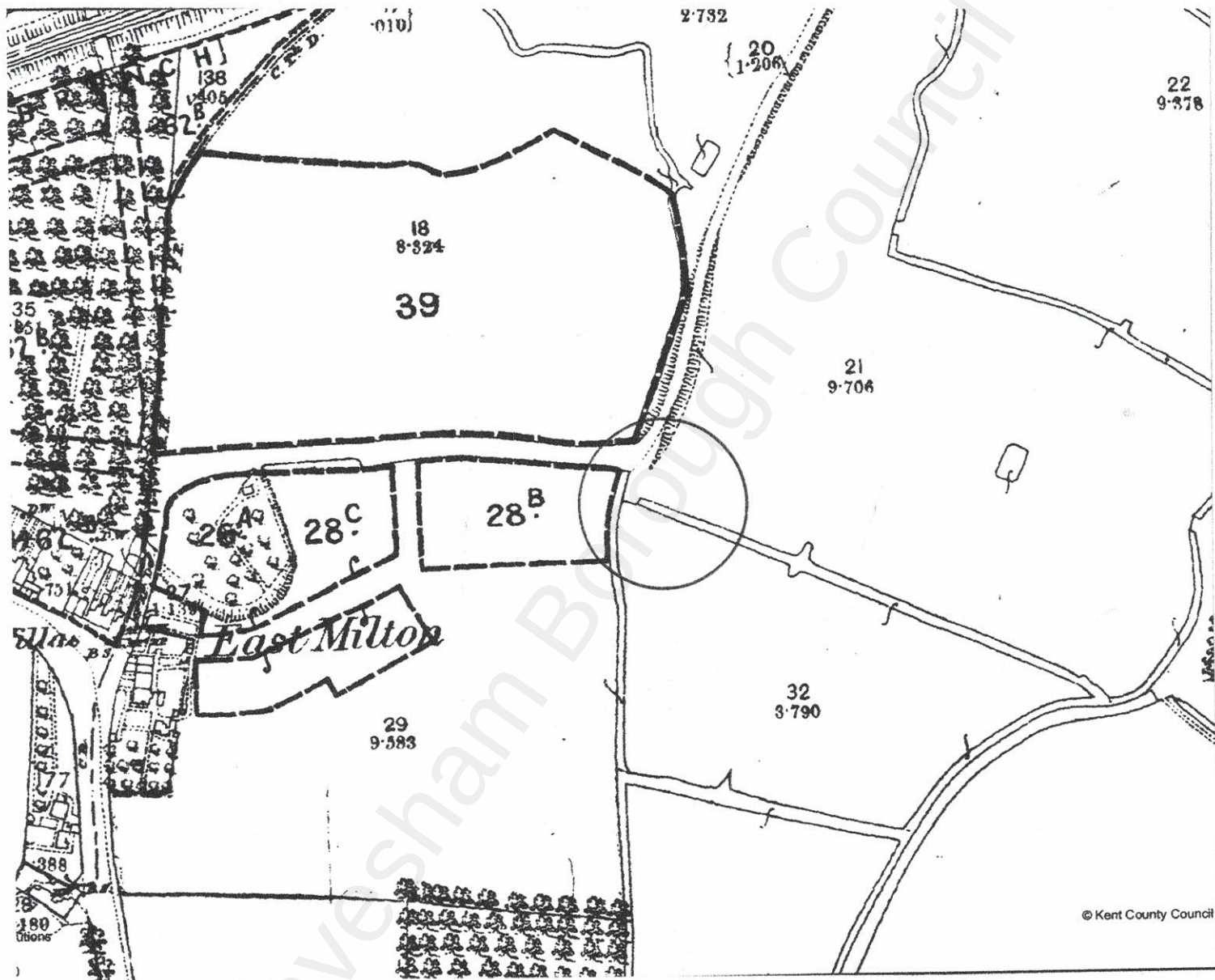
Plate 7



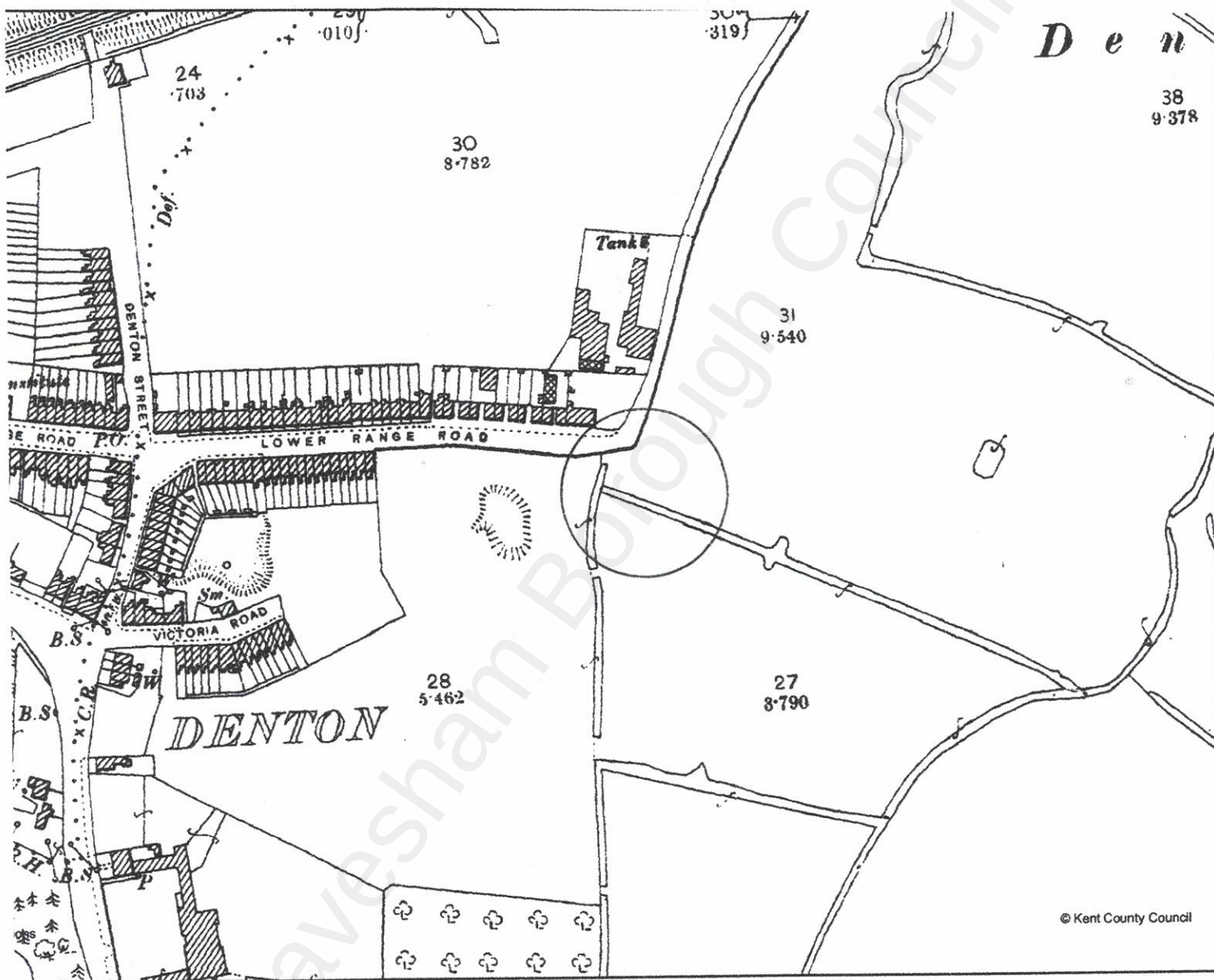
Plate 8

Appendix A

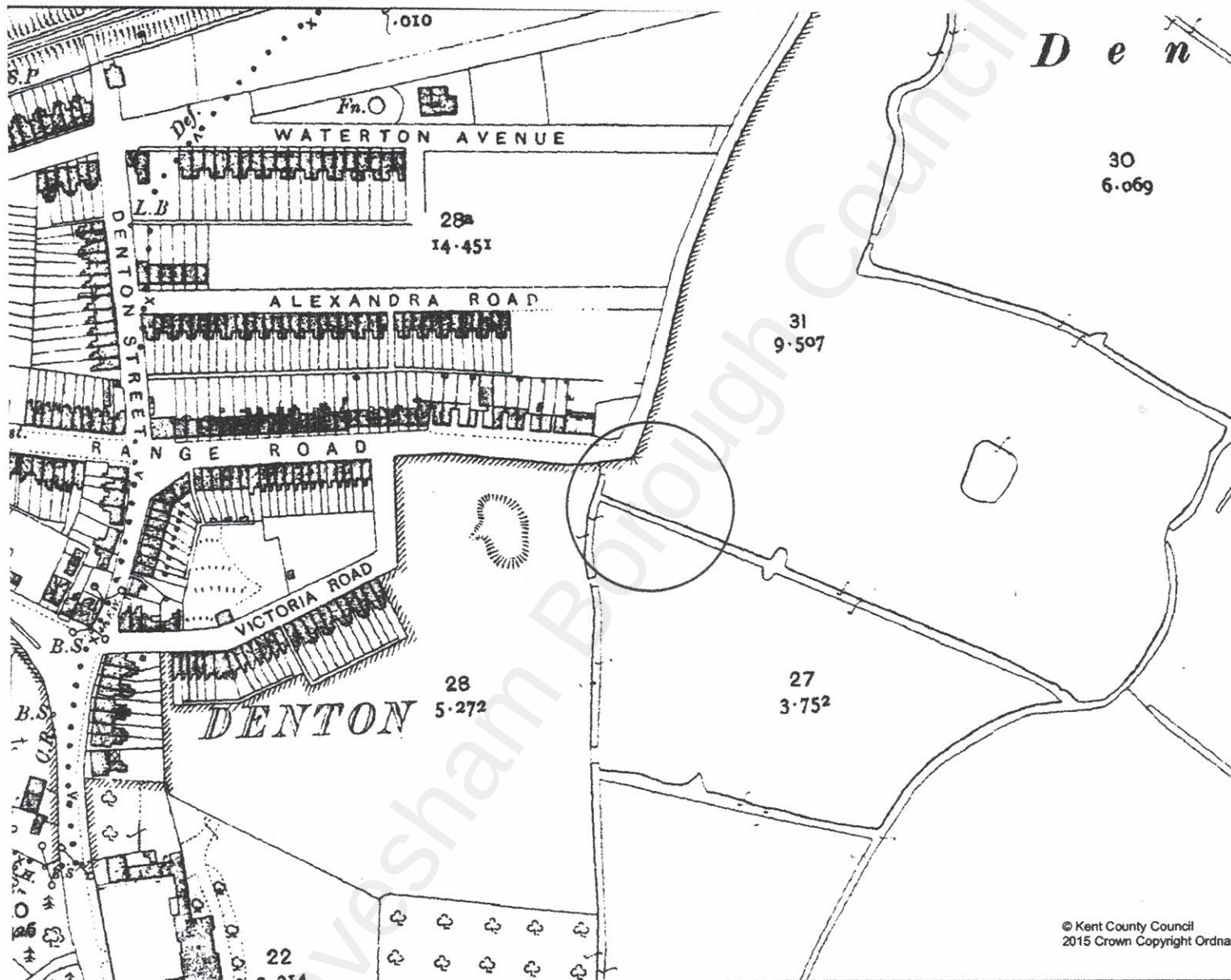
Site History



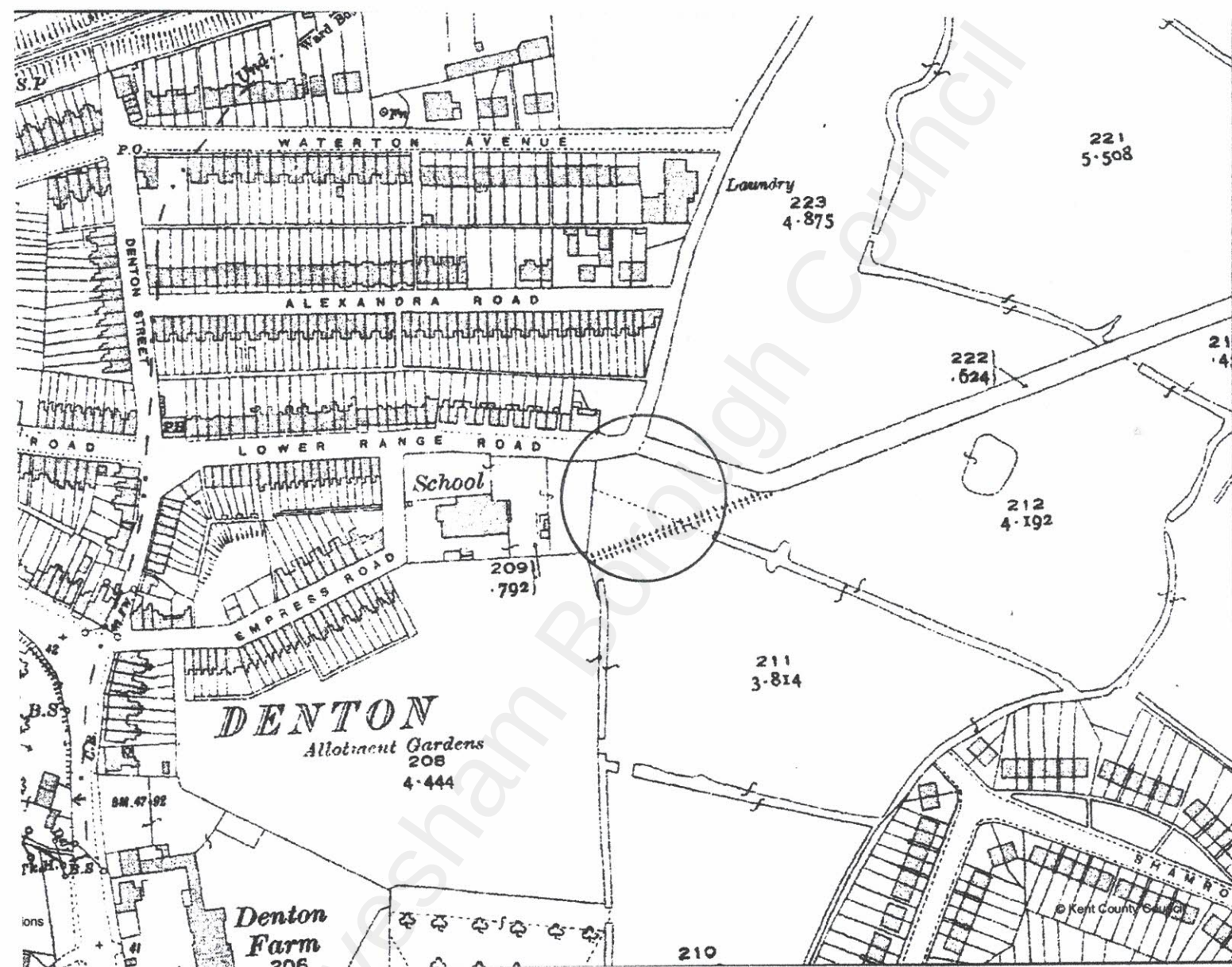
The Yard, Lower Range Road, Gravesend.
OS map scale 1:2500: 1871-1890.



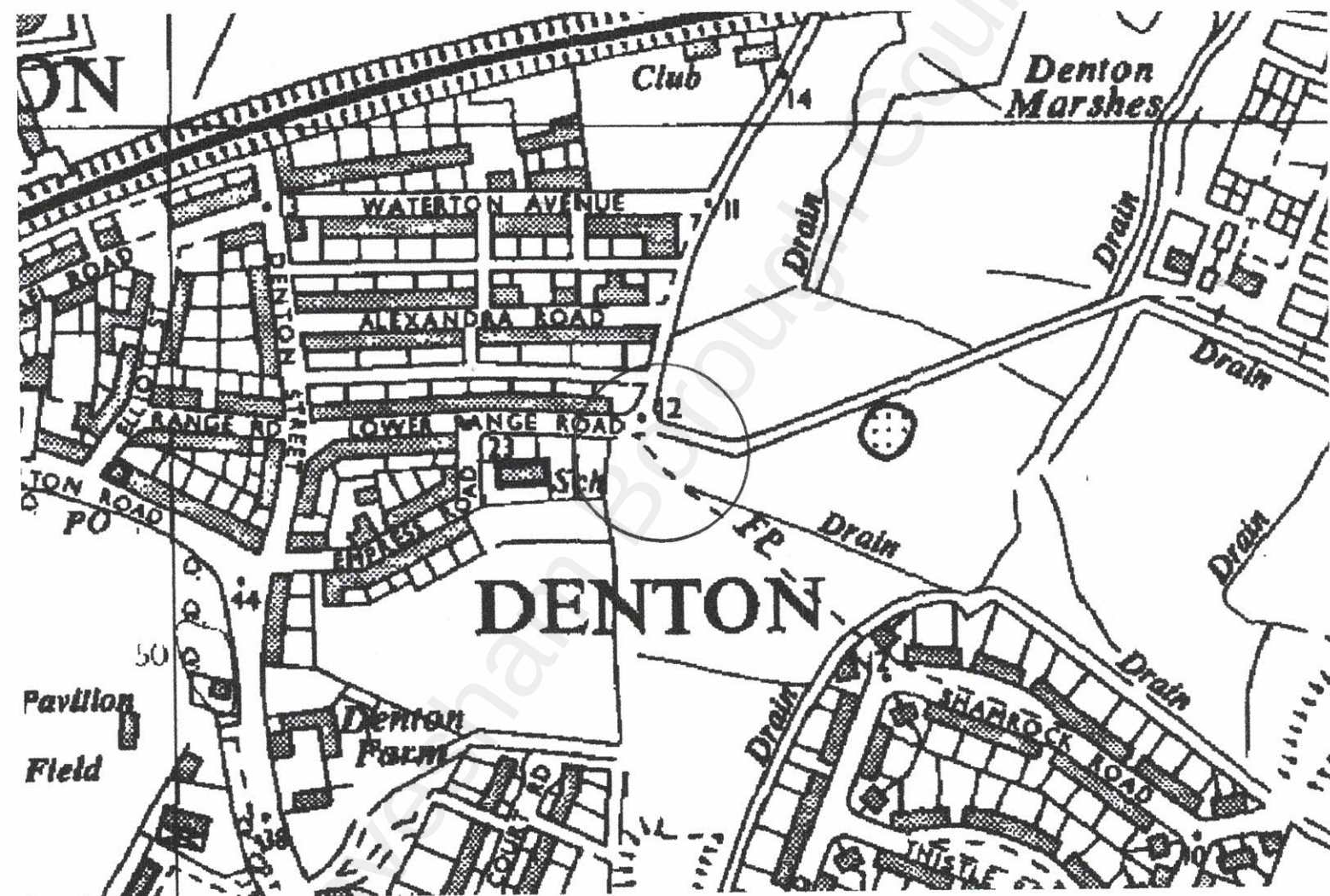
**The Yard, Lower Range Road, Gravesend.
OS map scale 1:2500: 1897-1900.**



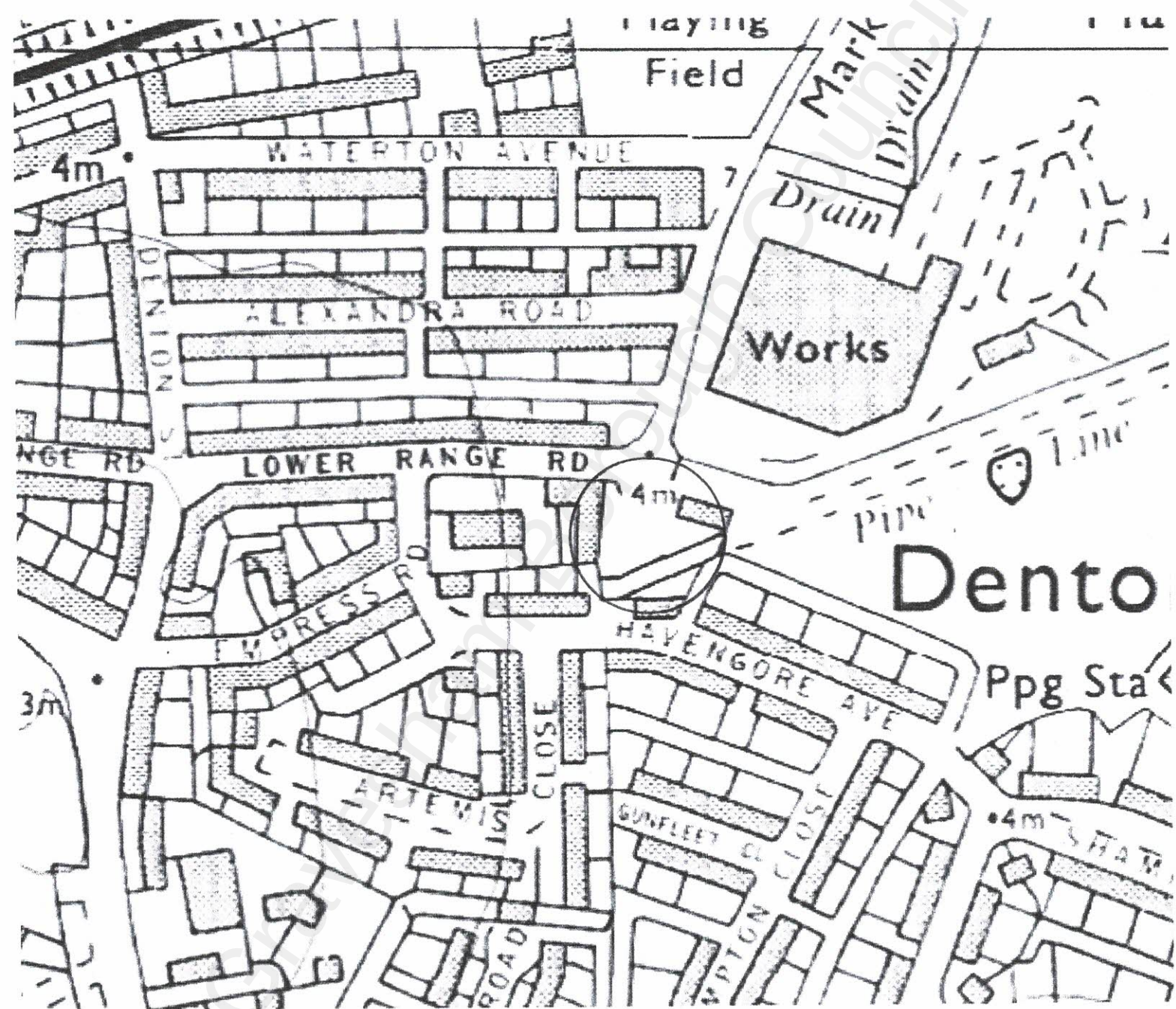
The Yard, Lower Range Road, Gravesend.
OS map scale 1:2500: 1907-1923.



The Yard, Lower Range Road, Gravesend.
OS map scale 1:2500: 1929-1952.



The Yard, Lower Range Road, Gravesend.
OS map scale 1:10560: 1961.



The Yard, Lower Range Road, Gravesend.
OS map scale 1:10000: 1982.