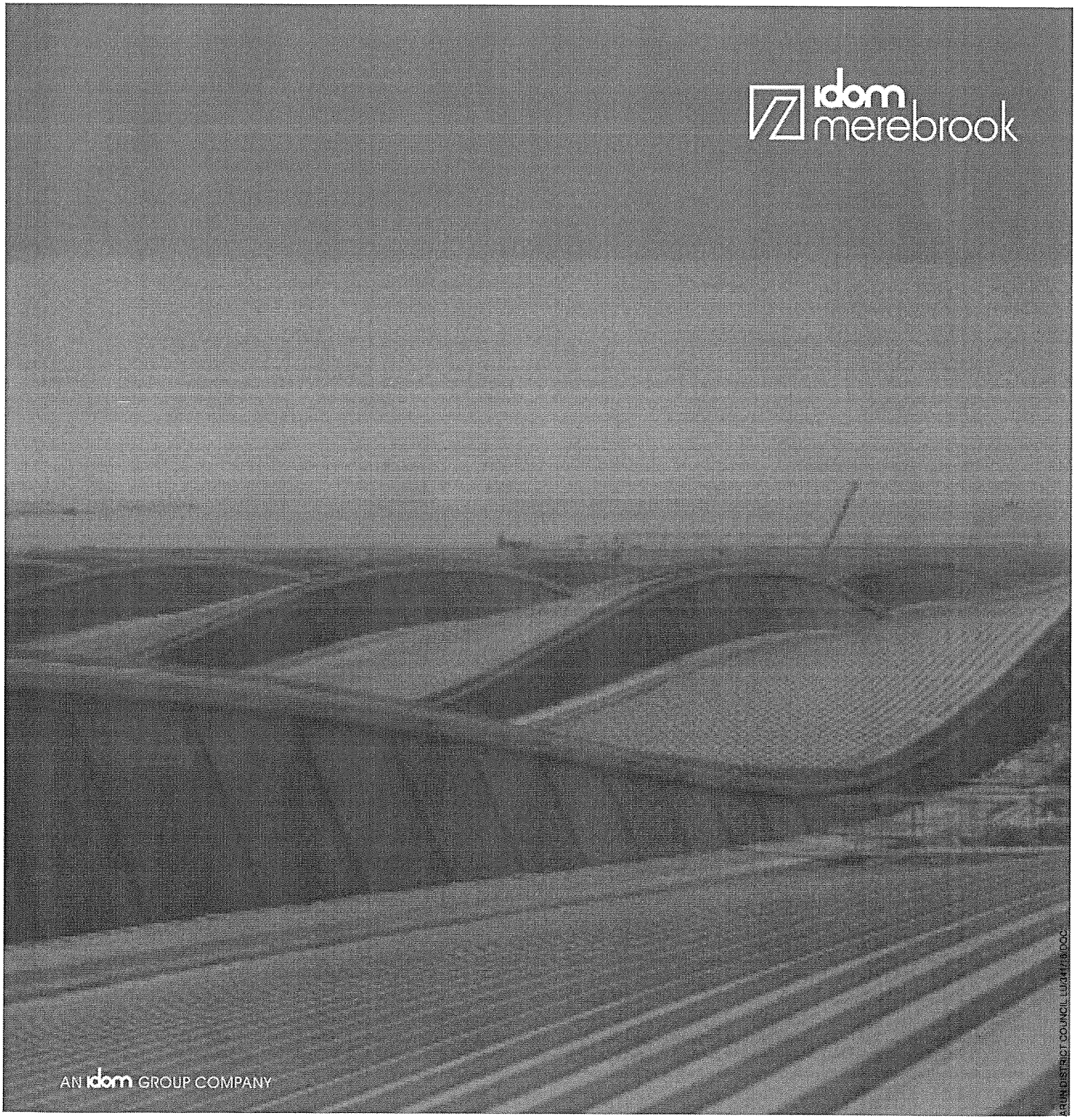
GEO-ENVIRONMENTAL ASSESSMENT
LITTLEHAMPTON SALES PLOT WEST SUSSEX
PERSIMMON HOMES
GEA-18426-14-69 REV B
NOVEMBER 2014



ARUN DISTRICT COUNCIL LU/341/18/DC

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LITTLEHAMPTON SALES PLOT
WEST SUSSEX
PERSIMMON HOMES
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NOVEMBER 2014

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Authors

Gareth O'Brien
Darren Ettritch

Issued by

[redacted]

Dr Lisa Horsley

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Report issued from

East Mill,
Bridgefoot,
Belper,
Derbyshire

Churchgate Court,
3 Church Road,
Whitchurch,
Cardiff

1 Leonard Place,
Westerham Road,
Keston
BR2 6HQ

[redacted]

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SECTION 1 INTRODUCTION

1.1 An area of land occupying approximately 79 hectares located to the north of Wick, Littlehampton is proposed for development for residential purposes. Idom Merebrook Limited (Merebrook) was originally commissioned by Persimmon Homes in early 2014 to undertake Phase 1 and Phase 2 site investigations of this wider site and to advise on the geo-environmental implications of redevelopment.

1.2 Persimmon propose to dispose of a subset of the site for development by others. The land parcel in question occupies an area of approximately 3.4 hectares and is shown in Appendix 1. This report contains geo-environmental information relevant this smaller land parcel.

1.3 The objectives of the investigation are to:

i. Assess surface and sub-surface ground conditions present at the site;

ii. Identify hazards associated with ground contamination which may place constraints on the site and the proposed development;

iii. Evaluate the risks associated with any identified hazards;

iv. Provide preliminary recommendations for the mitigation of any significant risks identified;

v. Identify the drainage capabilities of the underlying sub-surface ground conditions; and

vi. Provide preliminary geotechnical recommendations.

1.4 A Phase 1 (Non-intrusive Investigation) and a Phase 2a (Preliminary Exploratory Investigation) have been undertaken for the subject site.

1.5 This report presents the findings of the geo-environmental investigation and provides an interpretation of the geo-environmental conditions that exist at the site. The contaminative status of the site and the implications with respect to development have been interpreted in accordance with the current government guidance on source-pathway-receptor risk assessment. This report uses a Tier 1 risk assessment to ascribe a conservative qualitative appraisal of the hazards associated with the site.

1.6 This report has been prepared for Persimmon Homes for the sole purpose described above and no extended duty of care to any third party is implied or offered. Third parties making reference to the report should consult Persimmon Homes and Merebrook as to the extent to which the findings may be appropriate for their use.

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SECTION 2 PHASE 1 (NON-INTRUSIVE INVESTIGATION)

2.1 INTRODUCTION

The non-intrusive investigation has been conducted with reference to the documents and sources detailed in Table 1 below:

Table 1: Published Data and Information Sources

SOURCE DATA	GROUNDSURE DATA
BGS 1:50,000 Series Geological Sheet 317 / 332 (Chichester / Bognor)	Ordnance Survey (OS) historical maps scaled at 1:10,560, 1:10,000, 1:2,500 and 1:1,250 dated 1876 - 2012
BGS Geology of Britain 1:50,000 online maps	Water abstraction, discharge and pollution data
Radon: guidance on protection measures for new dwellings	Registered waste management sites
Environment Agency (EA) online data maps	Mining records and natural ground stability data
UK National Air Quality Archive, online	Protected areas of environmentally sensitive land use or conservation
Planning Records	Other relevant designations and/or authorisations and Trade Directory entries

2.1.2 The above sources are all authoritative and it is believed that they are reasonably reliable. However, independent verification of the information supplied has not necessarily been carried out and Merebrook cannot be held liable for inaccuracies or deficiencies in the information.

2.2 SITE LOCATION AND SETTING

2.2.1 The majority of the site comprises a small section of an operational nursery, located North of Toddington Lane, Wick, Littlehampton BN17 7PP, 2.1 km north of the centre of Littlehampton.

2.2.2 The site occupies an area of approximately 3.4 hectares. The site is located at National Grid Reference 503300, 104050 and indicated in Appendix 1 of this report.

2.2.3 At the time of the site investigation in early 2014, the site comprised three large operational glasshouses making up a part of a nursery managed by the Hall Hunter Partnership growing a variety of strawberries, raspberries and blackberries. These were heated by a kerosene powered heating system with large above ground storage tanks (ASTs) and associated boiler room identified toward the northern boundary of the site.

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2.2.3.1 The area surrounding the site boundary was occupied by further nursery glasshouses with associated ASTs, boiler rooms, chemical storage, canteen, offices, welfare facilities and staff accommodation.

2.2.4 The entire site is generally low-lying with a varying in topography identified on the site, indicating possible historic infilling to achieve current levels. The topography of the nursery areas lies at an elevation of three to five metres above Ordnance Datum (m aOD), sloping gently towards the low-lying floodplain located to the north of the site boundary (0 – 1 m aOD).

2.3 SITE HISTORY

2.3.1 The site history, based on a review of the historic and current maps, dating from 1876 to 2012 is summarised below. Potentially contaminative land uses are shown in **bold**. Copies of key maps used in this review are provided in Appendix 2

Table 2: Summary of the key features shown on historic maps

DATA SOURCE	SITE / SURROUNDINGS
1876 (1:10560 scale)	The map identifies the site as agricultural fields.
	The site is north of Toddington with several houses close to the southern boundary. The western branch of the London Brighton & South Coast **Railway** (LBSCR) is identified to the south of the site boundary. The surrounding land uses are predominantly agricultural. A windmill is identified to west of the wider site approx. 250 m from the subject site boundary, with a **blacksmiths** also identified to the west. Two **brickyards** are noted c. 350 m and 500 m south west of the site. A chapel and **cemetery** are identified 700 m south of the site. Several public houses / Inns are identified to the west of the site.
1896 (1:10560)	No apparent changes to the site.
	A windmill, with two associated large buildings, has been developed 300 m south of the site. Several amenities (church / chapel / school) have been identified in Wick 650m south of the site.
1910 (1:10560 scale).	No apparent changes to the site.
	An isolation hospital has been developed to the west of the wider site boundary, approx. 250 m from the subject site boundary. The large buildings 250 m southwest of the site are identified as a nursery. The brickfields have been extended 550 m from the site at their closest point.
1932 (1:10560 scale)	No apparent changes to the site.
	There has been further residential development southwest of the site in Wick. Allotment gardens have been established 400 m south of the site.
1938 (1:10560 scale)	No apparent changes to the site.
	No significant changes to the surrounding land use

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DATA SOURCE	SITE / SURROUNDINGS
1956 (1:10560 scale)	No apparent changes to the site.
	There has been significant residential development off site to the west and southwest with several residential estates developed along Lyminster Road. There has also been additional residential development further south, with the village of Wick now incorporated into Littlehampton.
1974 (1:10560 scale)	There has been significant development on site with **nursery** glasshouses marked together with a silo and some other small unlabelled structures.
	Land surrounding the subject site has also been developed for nursery land uses with **three nurseries** and a **farm** identified. One nursery, comprising five small glasshouses and associated buildings, is identified in the western portion of the wider site. Toddington farm and playing field has been developed to the east of the subject site. Another nursery, comprising four large and five smaller glasshouses and associated buildings has developed in the eastern portion of the wider site. Three reservoirs are identified in close proximity to the eastern nursery. There has been further agricultural development in the surrounding area. This includes another **nursery** c. 10 m south of the railway line and **Hollyacre farm** adjacent to the southern boundary of the site. A **poultry farm** is identified c. 400 m south of the site, directly east of the proposed access road. Another **poultry farm,** with associated depot and building, is identified c. 500 m southeast of the site. The allotment gardens have been extended and are now c. 200 m south of the site.
1981 (1:10560 scale)	No significant changes to the site.
	Four depots and a smaller reservoir are identified to the east of the subject site.
1992 (1:10560 scale)	No apparent changes to the site.
	The A259 road and associated flyover has been constructed south east of the site. There has been further residential development c. 800 m southeast of the site.
2002 (1:10560 scale)	No significant changes to the site.
	A school has been developed c. 300 m south of the site, directly east of the proposed access route.
2012 (1:10560 scale)	No apparent changes to the site.
	No significant changes to the site surroundings.

2.3.2 In summary, historic plans show that the majority of the site was historically undeveloped prior to 1974 when nurseries and a farm were constructed on and adjacent to the site. These nurseries have remained.

2.3.3 The nurseries located on the site are considered to represent a potentially contaminative land use due to kerosene storage, the use and storage of pesticides

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and herbicides and associated heating system for the glasshouses. These were commonly oil-powered and supported by asbestos lagged pipes.

2.3.4 Several potentially significant contaminative land uses are located within a 250 m radius of the site. These include the railway track adjacent to the south of the site boundary and the adjacent nursery uses and farm to the south of the site.

2.3.5 The current buildings on the site were constructed in the 1970's and therefore asbestos containing material (ACM) may have been used within the building fabric and boilers associated with the greenhouses and associated buildings. The site walkover also identified many of the building roofs were possibly made from ACM. An asbestos survey of the buildings has been carried out by Merebrook (report ref: AS-18426b-14-62).

2.3.6 Given the nature of the historical mapping process (scale, representation of conditions at discrete time intervals frequency etc.), any such maps and plans may not provide a comprehensive account of a site's history. Identification of pertinent land uses and associated potentially contaminative activities, may therefore be absent from mapping records.

2.4 GEOLOGY

2.4.1 The published geological map indicates the presence of made ground off-site 50 m to the north.

2.4.2 The published geological map indicates that superficial river terrace deposits (sand, silt and clay) are expected to be found.

2.4.3 The underlying bedrock geology beneath the site is expected to comprise Chalk from the New Pit Chalk Formation, which is typically between 35 – 50 m in thickness.

2.5 HYDROGEOLOGY

2.5.1 The site is located above a Secondary A aquifer associated with the drift deposits and a Principal bedrock aquifer associated with the underlying chalk formation.

2.5.2 The site is not located within a Groundwater Source Protection Zone and there are no potable water abstractions within the vicinity of the site. However, the site is located within a high vulnerability zone due to the presence of a major aquifer beneath the site.

2.5.3 The nearest groundwater abstraction licence to the site is located approximately 75 m to the west and is for water supply for crop growing. It is assumed that this licence will be revoked given that the area is part of the wider development site. There are two further abstraction licences for horticultural watering located approximately 250 m southeast of the site but outside the wider development boundary. These are assumed to remain active.

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2.6 HYDROLOGY

2.6.1 The Black Ditch River is located to the north of the wider site boundary approximately 350 m north of the current land parcel, flowing in a western direction before entering the River Arun approximately 2 km to the west. Numerous secondary / tertiary watercourses (surface water ditches) are identified to the north of the wider site boundary (approximately 200 m from the current site boundary) which drain into the Black Ditch River. Three reservoirs are located to the east of the site with one located approximately 10 m from the eastern site boundary.

2.6.2 There are four surface water abstraction licences from Black Ditch located to the north of the site.

2.6.3 The site is located in an area susceptible to flooding, although the site itself does not lie in an EA designated floodplain. According to the EA flood mapping a flood plain is identified associated with the small reservoir adjacent to the east of the site and associated with the Black Ditch River approximately 200 m north of the site.

2.6.4 The Environment Agency indicated that the site is located within a groundwater flooding zone with a very high susceptibility to groundwater flooding.

2.7 CURRENT SITE ISSUES

2.7.1 Potentially significant environmental issues have been investigated within relevant distances of the site, based on the database of records supplied by Groundsure. These relate to the following searches:

i. Water discharge or pollution incidents within 250 m of the site;

ii. Waste management sites within 250 m of the site;

iii. Statutory authorisations within 50 m of the site;

iv. Trade directory entries of possible contaminative use within 50 m of the site;

v. Special protection or conservation areas within 50 m of the site; and

vi. Any other relevant issues.

2.7.2 Potentially significant environmental issues identified by the above searches are summarised in Table 3 below.

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Table 3: Potentially significant environmental issues

ENVIRONMENTAL CATEGORY	DESCRIPTION
Water discharge or pollution incidents within 250 m	There are no discharge consents relating to the subject site. There have been five licenced discharge consents associated with adjacent land to the east, relating to sewage and surface water discharges. Three of these licences have since been revoked and two are historic consents. There have been two recorded pollution incidents in the vicinity of the site. The closest incident (150 m north but related to the same nursery) is related to historic diesel spillage in 2001 and was classified as having a minor impact and was unlikely to have impacted the surface water. An incident dating back to 2003 located 230 m to the west was also classed as minor/no impact.
Waste management sites within 250 m	There are no records of waste management relating to the subject site. A waste transfer / recycling facility is identified 250 m west of the site, located on Mill Lane.
Statutory authorisations within 50 m	There are no statutory authorisations within a 50 m radius of the site.
Trade directory entries of possible contaminative use within 50 m	There are numerous potentially contaminative land uses identified by trade directory entries relating to the nurseries and depot on the wider site. On the subject site this includes silos and on the wider site this includes: three tanks (ASTs etc.), three electrical features (substations, pylons etc.), three hoppers / silos, two storage depots, two vehicle repair features, one industrial repair, one chimney and a construction completion service.
Special protection or conservation areas within 50 m	There are no special protection or conservation areas within 50 m of the site.

2.8 INDICATIVE GROUND STABILITY HAZARDS

2.8.1 Groundsure data lists the following risk categories with regards to ground stability hazards:

i Shrink Swell – Low

ii Landslides – Very Low

iii Soluble Rocks – Very Low

iv Compressible Ground – Very Low;

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v. Collapsible Rocks – Low;

2.9 **RADON GAS**

2.9.1 Site specific radon information included in the Groundsure report states that 1 to 3% of properties are above the Action Level for radon however no protective measures are required in new dwellings.

2.10 **AIR QUALITY**

2.10.1 The site does not lie within a designated Air Quality Management Area (AQMA) for West Sussex.

2.11 **ECOLOGY**

2.11.1 Information from environmental and ecological datasets was obtained from a review of the MAGIC (Multi-Agency Geographic Information for the Countryside) website and the Groundsure report. The information indicated that the site is located within a Nitrate Vulnerable Zone (NVZ) due to the underlying highly vulnerable groundwater aquifer. The Black Ditch Floodplain located in the northern portion of the site is a designated as a Grazing Marsh BAP Priority Habitat.

2.12 **PREVIOUS INVESTIGATIONS**

2.12.1 Merebrook has not been provided with any previous site investigation data for the site.

2.13 **PRELIMINARY CONCEPTUAL SITE MODEL AND RISK ASSESSMENT**

2.13.1 From the Phase 1 assessment a preliminary site conceptual model and risk assessment have been produced using the framework established in Part IIA of the *Environmental Protection Act 1990* and detailed in Contaminated Land Report *CLR11 - Model Procedures for the Management of Land Contamination*.

2.13.2 Risk from contamination has been assessed using the source-pathway-receptor and pollutant linkage methodology, whereby a risk can only exist if a *"source-pathway-receptor"* pollutant linkage is present.

2.13.3 Potential Sources

i. Made Ground resulting from the historic development of the site to achieve current levels, including potential for soil gas / vapour;

ii. Soil and groundwater contamination associated with the storage of hydrocarbons on site. Contaminants include hydrocarbons, polycyclic aromatic hydrocarbons (PAHs) and heavy metals;

iii. Soil and groundwater contamination associated with the current and former use of the site as a nursery. This includes the use of herbicides and pesticides;

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iv. Soil and groundwater contamination from the adjacent railway track. Contaminants of concern include TPH, PAHs and heavy metals;

v. Asbestos containing materials (ACM) given the age of the current buildings and identification of potential ACMs during the site walkover; and

vi. Organic rich alluvial deposits located in the northern portion of the site, which may have the potential to generate soil gas.

2.13.4 Potential Pathways

i. Direct contact;

ii. Ingestion and inhalation of contaminated soil and dust;

iii. Vertical migration to the underlying Principal Aquifer;

iv. Lateral migration to surface water receptors (Black Ditch River and reservoirs);

v. Accumulation of ground gas vapour ingress into buildings and voids .

2.13.5 Potential Receptors

i. The general public and current site users,

ii. Residents of future development,

iii. Groundwater in underlying principal aquifer and secondary superficial aquifer,

iv. Surface water including the Black Ditch watercourse and reservoirs,

v. Construction workers,

vi. Adjacent land, and

vii. Infrastructure

2.13.6 Pollutant Linkages and Risk Ratings

2.13.7 From the Phase 1 assessment a preliminary site conceptual model has been produced as Table 4 which identifies the potential pollutant linkages. These have been used to inform the Phase 2 intrusive investigation presented in the subsequent sections.

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Table 4: Preliminary Conceptual Model

POSSIBLE POLLUTANT LINKAGE			RISK CHARACTERISATION
POTENTIAL SOURCES	**PATHWAYS**	**RECEPTORS**	
ON SITE Heavy metals and hydrocarbons (made ground) Current and historical storage of hydrocarbons on site (ASTs) Herbicides and pesticides OFF SITE Railway track adjacent to the southern boundary	Contact with contaminated soil	Human health (current users)	**Moderate risk identified** Potential for made ground which can contain elevated metals and hydrocarbons. Current and historical use of site as a nursery has identified the potential for contamination through the storage of hydrocarbons on site and the possible use of herbicides and pesticides.
	Ingestion and inhalation of contaminated soil and dust	Human health (current users)	
ON SITE Heavy metals and hydrocarbons (made ground) Current and historical storage of hydrocarbons on site (ASTs) Herbicides and pesticides OFF SITE Railway track adjacent to the southern boundary	Contact with contaminated soil	Human health (future residents and construction workers)	**Moderate risk identified** Potential for made ground which can contain elevated metals and hydrocarbons. Current and historical use of site as a nursery has identified the potential for contamination through the storage of hydrocarbons on site and the possible use of herbicides and pesticides.
	Ingestion and inhalation of contaminated soil and dust	Human health (future residents and construction workers)	
Asbestos (made ground and surface fragments)	Ingestion and inhalation of contaminated soil and dust	Human health (future residents and construction workers)	**Moderate risk identified** Potential for made ground to contain asbestos from infilling across the site Site walkover identified potential surface fragments in derelict part of the site
Contamination (all forms)	Vertical migration to aquifer	Controlled waters	**Moderate risk identified** Potential for contamination to affect underlying principal aquifer
Contamination (all forms)	Horizontal migration to surface water	Controlled waters	**Moderate risk identified** Several surface water receptors identified – numerous drainage channels from site to Black Ditch watercourse adjacent to northern boundary. Two reservoirs and a lake identified on site.
Hydrocarbons	Direct contact	Plastic water pipes	**Moderate risk identified** Cannot rule out presence of hydrocarbon contamination.

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POSSIBLE POLLUTANT LINKAGE			RISK CHARACTERISATION
POTENTIAL SOURCES	PATHWAYS	RECEPTORS	
Hazardous Gas/Vapours In soil	Ingress into buildings and voids	Human health (current site users, future residents and construction workers)	**Moderate risk identified** Potential for made ground which could act as source of hazardous gas. Cannot rule out fuel spillages as source of vapours. Organic rich alluvial deposits in the northern portion of the site have the potential to generate ground gas.

SECTION 3 SITE INVESTIGATION RATIONALE

3.1.1 A site investigation rationale for the wider development site was devised in accordance with the findings of the Phase 1 investigation and the resultant preliminary conceptual site model and risk assessment. Priority contaminants for the subject land parcel were identified as heavy metals, PAHs, petroleum hydrocarbons, asbestos, pesticides and herbicides.

3.1.2 Intrusive sampling locations were chosen on the basis of providing broad spatial coverage of the wider site and to target contaminative land uses on the site. This includes current and historical AST and boiler houses, vehicle maintenance units and areas of suspected infilling identified during the site walkover and Phase 1 desk study.

3.1.3 This report sets out those exploratory hole locations situated within the current land parcel proposed for sale and development by others but also makes reference to holes in the vicinity of the land parcel where these provide relevant information on the deeper geology and contaminative status.

3.2 SITE INVESTIGATION METHODS

3.2.1 An intrusive investigation was carried out by Merebrook from 27th January to 4th February 2014. Within the current land parcel this comprised the following scope of work:

i. Three shallow window sample boreholes (MWS14 to MWS16) to a depth of 3 m bgl; and

ii. Four shallow hand window sample probe holes (HWS3 to HWS6) to a depth of 3 m bgl.

3.2.2 The following exploratory holes from outside the land parcel have also been referred to in order to provide information on the deeper geology:

i. Two cable percussion borehole (MBH4 and MBH6) to 15 metres below ground level (m bgl).

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3.2.3 Exploratory hole locations are indicated on drawing MER18426-304-001 in Appendix 1. Logging of exploratory holes was undertaken by a Merebrook Officer. Exploratory hole logs are contained in Appendix 3.

3.2.4 Light cable percussion equipment was used to advance borehole MBH4 and MBH6. Standard Penetration Tests (SPTs) were performed at approximate one metre intervals. The tests involved driving a steel cone tipped series of rods into the ground over a distance of 450 mm using the repeated blows of a 63.5 kg weight allowed to free fall over a distance of 760 mm. The total number of blows required for the final 300 mm penetration (the 'N' value) is recorded on the window sample logs.

3.2.5 Groundwater monitoring wells were installed in MBH4 and MBH6 within the underlying Chalk strata.

3.2.6 A tracked windowless sampling rig was used to advance window samples MWS14 to MWS16. This comprised a rig-mounted drop hammer to drive a hollow steel barrel into the ground. The barrel is recovered along with a removable plastic sleeve, which lines the barrel and holds a core of soil which is retracted for logging and sampling. SPTs were performed at approximate 1 m intervals in all windowless sample holes.

3.2.7 Gas and groundwater monitoring installations were installed in window sampling borehole MWS16 to a depth of 3.0 m bgl.

3.2.8 Due to size restrictions and health and safety considerations, a hand-held window sampling rig was used to advance HWS3 to HWS6 in the glasshouses.

3.2.9 Gas monitoring installations were installed in HWS6 to a depth of 1.8 m bgl.

3.2.10 Representative soil samples were taken from various depths and strata to assess the contaminative status of the site. Soil samples were submitted to an MCERTS/ UKAS accredited laboratory for chemical analysis of a standard suite of potential contaminants which included TPH CWG, speciated PAHs and heavy metals. Selected samples were also tested for a broader range of site specific contaminants identified during the desk study which included pesticides, PCBs, asbestos, VOCs, SVOCs and WAC. The results are provided in Appendix 4.

3.2.11 A programme of geotechnical laboratory testing was performed on selected soil samples obtained from the boreholes, comprising classification and strength tests. Chemical testing was also undertaken to assess the aggressiveness of the ground with respect to buried concrete. The results are provided in Appendix 5.

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SECTION 4 GROUND CONDITIONS

4.1 SURFACE GROUND CONDITIONS

4.1.1 The areas where buildings are present in the operational nursery are generally covered in tarmac or concrete hard-standing. The perimeter of the glasshouse areas and the internal pathways are also covered by hard-standing, with the growing areas in the glasshouses and poly-tunnels generally surfaced by compacted silty clay. The areas between the glasshouses are generally surfaced by grass and variable clayey topsoil.

4.1.2 Trees and grass-covered areas are located to the north of the site. Significant infilling may have occurred in this area due to its proximity to the adjacent low-lying flood plain and this area is considered as a potential source of ground gas.

4.2 SUB-SURFACE GROUND CONDITIONS

4.2.1 The geological succession described in the Phase 1 desk study was generally confirmed during the site works.

4.2.2 A summary of the ground conditions encountered is presented in Table 5, whilst a more detailed assessment of the strata is contained in the following sections of the report.

Table 5: Summary of Sub-surface Ground Conditions

STRATA	DEPTH TO TOP RANGE (m bgl)	THICKNESS RANGE (m)
Topsoil (Made Ground)	0.0	0.0 – 0.2
Made Ground (MWS14 & MWS15)	0.1 – 0.2	0.0 – 0.6
River terrace deposits	0.0 – 0.8	1.6 - > 3.0
Chalk	1.6 - > 3.0	>20.0

4.2.3 Topsoil (Made Ground)

4.2.3.1 No undisturbed topsoil was encountered within the subject land parcel. Topsoil was encountered locally above made ground in the window sample holes up to 0.2 m thick.

4.2.4 Made Ground

4.2.4.1 Made ground was encountered on the subject site in MWS14 and MWS15 to 0.7 – 0.8 m bgl in between the glass houses and was granular in nature with inclusions of brick, tarmac and ash.

4.2.4.2 It is relevant to note that thicker deposits of made ground were encountered at several locations 200 m to the north of the site (MTP15 and MTP17) in close

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proximity to low-lying floodplain, where in-filling had occurred to achieve current levels. The thickness of this made ground ranged from 1.5 m to 2.5 m comprising of grey, gravelly sandy fill material with frequent red bricks. This deeper made ground is considered to represent a potential source of ground gas and will be assessed during the gas monitoring programme.

4.2.4.3 No field evidence of contamination was encountered in exploratory holes excavated within the subject land parcel or in neighbouring exploratory hole locations.

4.2.5 Natural Ground

4.2.5.1 The geological succession was generally confirmed during the site investigation with river terrace deposits of silt and clay encountered over chalk.

4.2.5.2 There was no evidence of visual or olfactory contamination in the majority of the samples retrieved from the natural strata.

4.2.5.3 Groundwater was encountered at both of the neighbouring borehole locations with groundwater strikes at 7.5 m bgl in MBH4 and 5.8 m bgl in MBH6. Groundwater was not encountered at any of the window sampling or hand window sampling locations during the site investigation.

4.2.5.4 Sieve analyses carried out on two samples of granular natural soil (from MBH4) described the material as yellow brown silty clayey sand. A sample of cohesive natural soil (from MBH6) was described as brown or grey brown and yellow brown gravelly sandy silty clay.

4.2.5.5 Atterberg limit tests carried out on a sample of superficial clay from MBH4 indicate that the soil can be classified as clay of low to intermediate plasticity. The plasticity index of the soil on the wider site was typically found to range between 13 and 21 %, and in accordance with NHBC guidelines, this soil is of low volume change potential. Moisture contents were also determined and ranged from 16 to 24 % on the wider site.

4.2.5.6 SPTs performed in the cohesive superficial deposits recorded 'N' values generally in the range 0 – 15, indicating the presence of very soft (extremely low strength) to firm (medium strength) ground conditions. SPTs undertaken within the chalk obtained 'N' values ranging from 11 to > 50, suggesting that the chalk is competent. Locally, 'N' values of between 3 and 7 were initially recorded in the chalk, suggesting softer conditions.

SECTION 5 PRELIMINARY GEOTECHNICAL RECOMMENDATIONS

5.1 FOUNDATIONS

5.1.1 At this stage a detailed proposed development layout is not available, however, it is understood that the wider development will include 1,260 residential properties,

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commercial and retail units, a school, and recreational and leisure facilities. The development will also include associated access roads, provision for parking and landscaped areas. The current land parcel is understood to be for low-rise residential development.

5.1.2 The ground investigation of the current land parcel has revealed localised made ground up to 0.6 m thick. On the wider site, made ground was of variable thicknesses (0.1 to 3.5 m thick), underlain by superficial deposits comprising a mixture of silts, sands and clays. The Upper Chalk was revealed beneath the subject site at depths of 1.6 to greater than 3 m. On the wider site the chalk was encountered at depths ranging from 1.0 to 5.0 m bgl. SPTs carried out in predominantly cohesive made ground revealed soft and firm conditions, whilst SPTs performed within cohesive superficial deposits revealed very soft to firm ground conditions, with locally stiff conditions at depth. SPTs performed within the chalk typically revealed the presence of competent ground.

5.1.3 Based on the ground conditions encountered beneath the subject land parcel, it is envisaged that for low-rise lightly loaded structures traditional strip / trench footings will be feasible across the site where superficial deposits (sand) are sufficiently competent or where chalk is present within 2.0 m of existing ground level. Based on exploratory holes undertaken within this parcel minimum depths of 1.5 m will apply in order to found below an upper horizon of loose sand.

5.1.4 Allowable bearing pressures of 125 kN/m² will be achievable for footings founded within medium dense sand.

5.1.5 Data provided in the Groundsure desk study report indicates that the possibility of dissolution of soluble rocks beneath the site is rated as negligible to very low. Although no evidence of infilled solution features or voids was observed during the site investigation, the possibility of their existence within the chalk formation should not be completely discounted. Therefore, the groundworks contractor should closely monitor the excavation of all footings for the possible presence of voids or infilled features.

5.2 EXCAVATIONS AND GROUNDWATER

5.2.1 Based on the ground conditions observed at the site, any shallow excavations have the potential to become unstable in the short term. Therefore, if man-entry is required, all excavations must be supported by shoring or otherwise battered back to a safe angle in order to protect the workforce from possible collapse.

5.2.2 Old foundations and buried structures associated with existing or previous buildings should be removed and the resulting excavations backfilled with suitable granular materials.

5.2.2.1 Groundwater was not encountered in any of the windowless sample holes undertaken during the recent site investigation. Groundwater strikes were recorded

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at depth in the boreholes with levels ranging from 5.8 to 7.5 m bgl. Based on this it is considered unlikely that water ingress will occur in shallow excavations.

5.3 FLOOR SLABS

5.3.1 Providing granular soils are present at shallow depth ground bearing floor slabs are considered to be feasible. If made ground and / or shrinkable natural soils are present and are greater than 600 mm thick, suspended floor slabs would need to be adopted.

5.4 BURIED CONCRETE

5.4.1 Recommendations given in BRE Special Digest 1:2005 *"Concrete in aggressive ground"* have been followed in order to give recommendations with respect to buried concrete.

5.4.2 Water soluble sulphate analysis was carried out on a total of 131 soil samples obtained from the wider site at depths of between 0.0 and 11.0 m bgl with soil pH determination also carried out on these samples. Water soluble sulphate contents ranged between 0.003 and 3.2 g/l. In accordance with BRE guidelines the characteristic value is calculated by determining the mean of the highest 20 % of results. In this case the characteristic value is 0.61 g/l. On this basis the Design Sulphate Class is DS-2.

5.4.3 The pH values in the soil samples varied between 6.0 and 9.4. The mean of the lowest 20 % of values is 6.8 which represents the characteristic value. Mobile groundwater conditions have been assumed and on this basis the Aggressive Chemical Environment for Concrete (ACEC) class for the site is AC-2.

5.5 ROADS AND PAVED AREAS

5.5.1 In the absence of *in situ* test data, it is recommended that for preliminary design purposes a California Bearing Ratio (CBR) value of < 2 % is assumed for roads / hardstanding at existing levels.

5.6 SOAKAWAYS

5.6.1 Shallow soakage tests were carried out in eight trial pits across the wider site dug using a rubber-tyred back hoe excavator. None of the soakage positions coincide with the footprint of the subject land parcel. STP1 and STP2 are closest to the site at approximately 150 m west. The sides and bases of the pits were squared off prior to filling with water from a 3000 gallon water tanker. Soakage tests were carried out over a maximum period of two and a half hours.

5.6.2 The trial pit soakage tests were performed as far as possible in accordance with BRE document 365. The accompanying data sheets show that the water level fell by a maximum of 1475 mm over a period of one hour in STP3 (test 1), whilst the minimum fall in water level of 280 mm was recorded in STP8 over a period of two hours.

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5.6.3 The BRE methodology for calculation of soil infiltration rate requires measurement of the volume outflowing from between 75 % and 25 % of the effective depth of the trial pit (height of water in the pit), i.e. three-quarters of the water should soak away. If, due to low levels of infiltration the water level does not fall from between 75 % to 25 % of the total water height, it may be possible to extrapolate from a curve derived from the plots of actual depth to water against time elapsed. The majority of soakage tests gathered sufficient data to enable extrapolation, whilst four tests did not achieve 75 % effective depth, therefore extrapolation was not possible for these tests. The table below provides a summary of infiltration rates recorded.

Table 7: Summary of soakage test infiltration rates

Soakage Test Location	Infiltration Rate (m/s)
STP1	1.4×10^{-6}
STP2	$10^{-7} - 10^{-8}$
STP3 – Test 1	1.4×10^{-5}
STP3 – Test 2	1.1×10^{-5}
STP4	$10^{-7} - 10^{-8}$
STP5	$10^{-7} - 10^{-8}$
STP6 – Test 1	4.9×10^{-6}
STP6 - Test 2	3.4×10^{-6}
STP7	4.9×10^{-6}
STP8	$10^{-7} - 10^{-8}$

5.6.4 The trial pit soakage tests demonstrate that the near surface soils are generally of relatively low permeability, therefore shallow soakaways may not be suitable at this site. Further testing could be undertaken to target specific areas where more granular soils are present at shallow depth, and taking into consideration proposed locations of soakaways.

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SECTION 6 ENVIRONMENTAL ASSESSMENT

6.1 SOIL QUALITY

6.1.1 A total of 114 soil samples from the wider site were submitted to the laboratory which included 94 samples submitted for a standard suite of analysis (TPH CWG, speciated PAHs and heavy metals) and 20 samples submitted for a broader more comprehensive suite of analysis (VOCs, SVOCs, cyanide, asbestos, metalloids). Selected samples were also analysed for a pesticide suite of analysis, PCBs and asbestos. This included 52 samples from natural ground and 62 samples from made ground / topsoil. Full details are available in the GEA report for the wider site.

6.1.2 Eight soil samples were analysed from within the current subject land parcel including two samples of made ground. The laboratory chemical analysis certificates are contained in Appendix 4. The results of the analysis are summarised in Table 8.

6.1.3 An initial screening exercise has been undertaken whereby contaminant concentrations recorded in soils have been assessed against Environment Agency published Soil Guideline Values (where available) for a residential setting where the possibility of consumption of homegrown produce exists. Where SGVs are not available, Generic Acceptance Criteria published by CIEH/LQM in 2009 have been used assuming soil organic matter of 1 %. For lead, the new DEFRA Category 4 Screening Level has been adopted.

6.1.4 An additional set of phytotoxin screening levels have been adopted from 'The Code of Agricultural Practice for the Protection of Soil' Ministry of Agriculture, Fisheries and Food (MAFF), 1993, which are protective of healthy plant growth.

Table 8: Summary of Soils Chemical Analysis Results

CONTAMINANT	UNITS	MAX	No of Tests	SCREENING LEVEL (SL)	No > SL*
HUMAN HEALTH RISK ASSESSMENT					
pH	-	7.1 – 7.8 (range)	8	5	0
Cyanide	$mg.kg^{-1}$	<1	7	-	0
Arsenic	$mg.kg^{-1}$	16	7	**32**	0
Cadmium	$mg.kg^{-1}$	0.3	7	**10**	0
Chromium (total)	$mg.kg^{-1}$	33	7	*627*	0
Hexavalent Chromium	$mg.kg^{-1}$	<4	7	*4.3*	0
Lead	$mg.kg^{-1}$	23	7	200	0
Mercury	$mg.kg^{-1}$	<0.3	7	**170**	0
Nickel	$mg.kg^{-1}$	25	7	**130**	0
Selenium	$mg.kg^{-1}$	<1	7	**350**	0
TPH Aliphatic >EC_5 - EC_6	$mg.kg^{-1}$	<0.1	7	*30*	0

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CONTAMINANT	UNITS	MAX	No of Tests	SCREENING LEVEL (SL)	No > SL*
TPH Aliphatic >EC_6 - EC_8	$mg.kg^{-1}$	<0.1	7	*73*	0
TPH Aliphatic >EC_8 - EC_{10}	$mg.kg^{-1}$	<0.1	7	*19*	0
TPH Aliphatic >EC_{10} - EC_{12}	$mg.kg^{-1}$	<1.0	7	*93*	0
TPH Aliphatic >EC_{12} - EC_{16}	$mg.kg^{-1}$	<2.0	7	*740*	0
TPH Aliphatic >EC_{16} - EC_{21}	$mg.kg^{-1}$	<8.0	7	*45000*	0
TPH Aliphatic >EC_{21} - EC_{35}	$mg.kg^{-1}$	<8.0	7	*45000*	0
TPH Aromatic >EC_5 - EC_7	$mg.kg^{-1}$	<0.1	7	*65*	0
TPH Aromatic >EC_7 - EC_8	$mg.kg^{-1}$	<0.1	7	*120*	0
TPH Aromatic >EC_8 - EC_{10}	$mg.kg^{-1}$	<0.1	7	*27*	0
TPH Aromatic >EC_{10} - EC_{12}	$mg.kg^{-1}$	<1.0	7	*69*	0
TPH Aromatic >EC_{12} - EC_{16}	$mg.kg^{-1}$	<2.0	7	*140*	0
TPH Aromatic >EC_{16} - EC_{21}	$mg.kg^{-1}$	<10	7	*250*	0
TPH Aromatic >EC_{21} - EC_{35}	$mg.kg^{-1}$	<10	7	*890*	0
Naphthalene	$mg.kg^{-1}$	<0.05	7	*1.5*	0
Acenaphthylene	$mg.kg^{-1}$	<0.2	7	*170*	0
Acenaphthene	$mg.kg^{-1}$	<0.1	7	*210*	0
Fluorene	$mg.kg^{-1}$	<0.2	7	*160*	0
Phenanthrene	$mg.kg^{-1}$	1.1	7	*92*	0
Anthracene	$mg.kg^{-1}$	0.22	7	*2300*	0
Fluoranthene	$mg.kg^{-1}$	1.9	7	*260*	0
Pyrene	$mg.kg^{-1}$	1.5	7	*560*	0
Benzo(a)anthracene	$mg.kg^{-1}$	0.77	7	*3.10*	0
Chrysene	$mg.kg^{-1}$	0.74	7	*6*	0
Benzo(b)fluoranthene	$mg.kg^{-1}$	0.78	7	*5.6*	0
Benzo(k)fluoranthene	$mg.kg^{-1}$	0.32	7	*8.5*	0
Benzo(a)pyrene	$mg.kg^{-1}$	0.53	7	*0.83*	0
Indeno(1,2,3-cd)pyrene	$mg.kg^{-1}$	0.3	7	*3.2*	0
Dibenz(a,h)anthracene	$mg.kg^{-1}$	<0.2	7	*0.76*	0
Benzo(ghi)perylene	$mg.kg^{-1}$	0.36	7	*44*	0
Organochlorine pesticides	$mg.kg^{-1}$	<0.01	4	-	-
Organophosphorous pesticides	$mg.kg^{-1}$	<0.01	4	-	-
Organonitrogen Pesticides	$mg.kg^{-1}$	<0.01	4	-	-
PHYTOTOXICITY RISK ASSESSMENT					
	Units	**Max**	**No of Test**	**Screening Level (SL)**	**No > SL**
Copper	$mg.kg^{-1}$	17	7	200	0
Nickel	$mg.kg^{-1}$	25	7	110	0
Zinc	$mg.kg^{-1}$	220	7	300	0

6.1.5 In summary, none of the contaminants of concern were identified in excess of the adopted screening levels. No significant soil contamination has been identified in the subject land parcel.

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6.2 GROUNDWATER

6.2.1 Groundwater level monitoring and sampling was undertaken on 11th February 2014. The monitoring wells at MBH1 – MBH6 had been installed during the site investigation to target any potential contamination from the site to the groundwater in the underlying Chalk aquifer. None of the deep monitoring wells are located within the current subject site however MBH4 and MBH6 are the closest wells. Resting waters levels were recorded across the site, varying from 1.890 m (MBH1) to 5.385 m (MBH6). Groundwater level data is presented in Table 9 below.

Table 9: Summary of groundwater levels

BH location	DTW (m bgl)	DTB (m bgl)
MBH1	1.890	8.230
MBH2	2.401	7.805
MBH3	1.758	6.930
MBH4	4.090	7.680
MBH5	3.470	8.010
MBH6	5.385	8.795

6.2.2 Groundwater was not encountered at any window sampling locations during the site investigation, and MWS16 was dry on the return monitoring visit. However groundwater was encountered in window sample wells on the wider site during the return monitoring visit. This varied with resting water levels of between 0.05 m (MWS29) to 2.210 m (MWS5) recorded in the eastern portion of the wider site, 1.01 m (MWS12) to 2.510 m (MWS06) recorded in in the central portion of the wider site and 2.60 m (MWS24) noted in the western portion of the wider site. The variation in levels between boreholes in close proximity has indicated pockets of perched groundwater are present beneath the site and that a continuous shallow groundwater body is not present. The groundwater level data is presented in Appendix 7.

6.2.3 Sampling was undertaken at MBH1 to MBH6 using a Waterra 12v Submersible Pump. Prior to sampling, three times the volume of the water in the monitoring wells was purged.

6.2.4 Samples were submitted to the laboratory for analysis of a typical contamination suite which included TPH CWG, speciated PAHs, heavy metals and pesticides. Screening levels for groundwater have been derived from the Maximum Allowable Concentrations (MAC) in the Water Supply (Water Quality) Regulations 2000 where prescribed, or for those determinands not included, the 1989 regulations. The laboratory chemical analysis certificate is contained in Appendix 6 and groundwater level data is contained in Appendix 7. A summary of groundwater contaminant concentrations is contained in Table 10.

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Table 10: Summary of Groundwater Chemical Analysis Results

CONTAMINANT	UNITS	MAX	MEAN	SCREEN LEVEL (SL)	>SL*
pH	-	7.2	7.09	6.5**	0
Arsenic	$mg.l^{-1}$	0.0084	0.006	0.01	0
Cadmium	$mg.l^{-1}$	<0.00008	<0.00008	0.005	0
Chromium (total)	$mg.l^{-1}$	<0.0004	<0.0004	0.05	0
Copper	$mg.l^{-1}$	0.007	0.0022	2	0
Lead	$mg.l^{-1}$	0.0011	0.001	0.025	0
Mercury	$mg.l^{-1}$	<0.0005	<0.0005	0.001	0
Nickel	$mg.l^{-1}$	0.028	0.0091	0.02	1
Selenium	$mg.l^{-1}$	<0.004	<0.004	0.01	0
Zinc	$mg.l^{-1}$	0.011	0.0089	5	0
Cyanide	$mg.l^{-1}$	<0.01	<0.01	0.05	0
Sulphate	$mg.l^{-1}$	114	50.38	250	0
TPH	$mg.l^{-1}$	0.74	0.0101	0.01	1
BTEX	$mg.l^{-1}$	<0.005	<0.005	-	0
PAH (total)	$mg.l^{-1}$	0.00288	0.000535	0.0001	1
Benzo(a)pyrene	$mg.l^{-1}$	<0.00001	<0.00001	0.00001	0
Naphthalene	$mg.l^{-1}$	0.0014	0.00147	-	-
Phenols***	$mg.l^{-1}$	<0.01	<0.01	0.0005	0

Notes: * Samples exceeding screen level
** Minimum value applies (i.e. most acid)
*** Not detected above screening level

6.2.5 The majority of the water samples returned concentrations below the screening levels and the results are not indicative of any site-wide pervasive contamination. Localised exceedences were encountered, however these were distant from the current land parcel (MBH1, MWS12).

6.3 HAZARDOUS GAS

6.3.1 Gas monitoring has been undertaken on six occasions between January and June 2014. Levels of methane, carbon dioxide and oxygen were recorded in each standpipe, together with associated parameters including borehole flow and ambient air pressure. The results of these gas monitoring rounds are contained in Appendix 8. Monitoring of the wider site included readings from two wells in the current subject land parcel and this assessment is based on readings from those two wells.

6.3.2 The monitoring rounds were undertaken at barometric pressures ranging from 993 to 1015 mb. No significant positive flow was recorded within wells installed within the current subject site. On the subject site, methane was recorded to a maximum of 0.1 % v/v and carbon dioxide was recorded to a maximum of 0.9 % v/v.

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6.3.3 On the wider site, localised gas risk has been identified in two areas. One of which is 200 m distant and associated with localised hydrocarbon contamination. The other is some 650 m away. These elevated risk areas are not considered likely to impact the current subject site.

SECTION 7 RISK ASSESSMENT

7.1.1 The potential sources of contamination at the site and the implications with respect to development have been interpreted in accordance with the current government guidance on source-pathway-receptor risk assessment.

7.1.2 No significant sources of contamination in soil, groundwater or gaseous form have been identified in the current subject site. Further comment is provided in the following sections to update the risk assessment for the subject site and with regard to the following receptors:

i. The general public and present site users,

ii. Residents of future development,

iii. Groundwater,

iv. Surface water,

v. Construction workers,

vi. Adjacent land, and

vii. Infrastructure.

7.1.3 In each case the existence of a pollutant linkage requires a pathway by which the receptor could be exposed to the source. A qualitative assessment of risk is thus considered in the first instance with respect to the site in its current condition and is summarised in the sections below.

7.2 The general public and present site users

7.2.1 No significant contamination has been identified with the potential to impact current site users and therefore the risk to current site users is **low**

7.2.1.1 Asbestos containing material (ACM) has not been noted on the current subject site but is known to be present on the wider site. No significant risks have been identified, however site managers should remain vigilant should any suspect material be identified.

7.2.1.2 Merebrook has been commissioned to undertake an asbestos management survey of the entire site (Merebrook report ref: AS-18426b-14-62). This report should be referenced in regards to the level of ACM across the site.

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7.3 **Residents of future development**

7.3.1 Soil contamination (chemical)

7.3.1.1 No significant contamination has been identified with the potential to impact future residents site users and therefore the risk to these receptors is **low**

7.3.2 Asbestos

7.3.2.1 Asbestos containing material (ACM) has not been noted on the current subject site but is known to be present on the wider site. No significant risks have been identified, however site managers and groundworkers should remain vigilant should any suspect material be identified.

7.3.2.2 Merebrook has been commissioned to undertake an asbestos management survey of the entire site (Merebrook report ref: AS-18426b-14-62). This report should be referenced in regards to the level of ACM across the site, demolition procedures and mitigation measures in order to avoid impacting soils during the works.

7.3.2.3 Hazardous Soil Gas/Vapours

7.3.2.4 CIRIA 665 and NHBC guidance has been followed to assess the recorded soil gas and flow conditions. Calculations suggest that the current subject land parcel would class as Green and has a negligible gassing regime. The current risk from hazardous soil / vapours is considered **Low**.

7.4 **Controlled waters**

7.4.1 The Phase 1 assessment indicated that the site lies above a Secondary A superficial aquifer, a Principal bedrock aquifer and is located within a highly vulnerable zone. The site is therefore considered a sensitive hydrogeological setting. However, no significant site based impact has been identified.

7.5 **Construction workers**

7.5.1 Potentially, construction workers are initially at the greatest risk from exposure to hazardous contamination due to excavation works and during the handling of materials including imported soils. Providing that dust levels are kept within statutory limits and appropriate health and safety procedures are adhered to during the construction phase, the levels of chemical contamination recorded across the majority of the site is not considered to present an acute risk to human health.

7.5.2 ACM was identified on the wider site during the site walkover and asbestos management survey. Potentially, further asbestos contamination may be identified during the demolition and redevelopment of the site. There is scope for hazardous dust to be created from the disturbance of ACM and therefore the risk is **low to moderate**.

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7.6 Any removal of suspected ACM should be undertaken by specially trained contractors and specific mitigating measures will be necessary for those undertaking any potential clearance of suspected ACM.

7.7 **Adjacent land**

7.7.1 No significant contamination impact to or from adjacent land is considered to be likely.

7.8 **Infrastructure**

7.8.1 No significant risks to health plant growth are considered to be present in the subject site.

7.8.2 No significant contamination with the potential to permeate to polymeric services has been identified within the subject site, however the utility provider should be contacted to determine their requirements with regard to water supply pipes.

7.8.3 Utility companies apply strict guideline levels on use of polymeric pipes and may consider some of the made ground unsuitable for typical plastic pipe materials to be used.

SECTION 8 UPDATED CONCEPTUAL MODEL

8.1 Following completion of phases 1 and 2 of the investigation and a qualitative risk assessment, the conceptual model for the site, with relation to pollutant linkages, has been updated. The revised model is presented in Table 11 below.

Table 11: Revised Conceptual Model

POSSIBLE POLLUTANT LINKAGE			RISK CHARACTERISATION
POTENTIAL SOURCES	**PATHWAYS**	**RECEPTORS**	
ON SITE Heavy metals and hydrocarbons (made ground) Current and historical storage of hydrocarbons on site (ASTs) pesticides	Contact with contaminated soil	Human health (current users)	**Low risk identified** No significant contamination identified. Areas are covered by hard standing therefore the current risk is low.
OFF SITE Railway track adjacent to the southern boundary	Ingestion and inhalation of contaminated soil and dust	Human health (current users)	

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POSSIBLE POLLUTANT LINKAGE			RISK CHARACTERISATION
POTENTIAL SOURCES	**PATHWAYS**	**RECEPTORS**	
ON SITE Heavy metals and hydrocarbons (made ground) Current and historical storage of hydrocarbons on site (ASTs) Herbicides and pesticides OFF SITE Railway track adjacent to the southern boundary	Contact with contaminated soil	Human health (future residents and construction workers)	**Low risk identified** No significant contamination identified.
	Ingestion and inhalation of contaminated soil and dust	Human health (future residents and construction workers)	
Asbestos (made ground and surface fragments)	Ingestion and inhalation of contaminated soil and dust	Human health (Current site users, future residents and construction workers)	**Low to Moderate risk identified** No significant contamination identified but potential for previously undiscovered ACM.
Contamination (all forms)	Vertical migration to aquifer	Controlled waters	**Low risk identified** No significant contamination identified in soils or local groundwater.
Contamination (all forms)	Horizontal migration to surface water	Controlled waters	**Low risk identified** No significant contamination identified in soils or local groundwater.
Hydrocarbons	Direct contact	Plastic water pipes	**Low risk identified** No significant contamination identified but consult utility provider.
Hazardous Gas/Vapours In soil	Ingress into buildings and voids	Human health (current site users, future residents and construction workers)	**Low risk identified** Preliminary monitoring suggests negligible gas regime. No radon protection required.

SECTION 9 PRELIMINARY REMEDIATION STRATEGY

9.1 The identified risks at the site can be mitigated by removal of either the source, pathway or receptor. With reference to the conceptual model for the site a remediation strategy, based on source or pathway removal, has been designed.

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9.2 No significant risks have been identified on the subject land parcel and no specific remediation strategy is required.

9.3 Gas monitoring has demonstrated that the current subject site has a negligible gassing regime and no gas protection measures are required. No radon protection measures are required.

9.4 Asbestos materials have been identified on the wider site and any asbestos in structures should be dealt with appropriately during the site clearance and demolition works.

9.5 It is recommended that any topsoil / sub soil retained for use in private gardens is subjected to verification and chemical testing prior to placement in rear gardens. If the results of the testing provide chemical concentrations in excess of the screening level then the material should be removed and replaced with clean materials from elsewhere on the site or from a proven validated sources. However, it is anticipated that much of it will be suitable for reuse on the site.

9.6 Material imported for the formation of domestic gardens and landscaped areas should be obtained from a validated source. The validation should incorporate an assessment of the provenance of the material and chemical analysis.

9.7 Specific risks to construction workers have not been identified as a result of contamination in the current land parcel. Adoption of appropriate Health and Safety procedures will ensure that any risks to operatives from hazardous materials at the site are minimised. Operatives should not be allowed to eat, drink or smoke on site except in designated areas and should be required to wash all exposed skin at the end of each shift. Operatives should be informed of the potential hazards at the site and should be required to report any observations of suspect material.

9.8 Materials, including waste soils which are not to be retained on site, should be removed and disposed of in accordance with all relevant statues including the *Environmental Protection Act 1990*, *The Controlled Waste Regulations 2012* as amended, *The Waste Regulations 2011* as amended, *The List of Wastes Regulations 2005* as amended, *The Hazardous Waste Regulations 2005* as amended, *The Waste Management Regulations 2006* and *The Environmental Permitting Regulations 2010* as amended.

9.9 It is recommended that this report is submitted to the regulators (Local Authority EHO and Planners, Environment Agency Planning Liaison and NHBC) for approval prior to commencement of the works.

9.10 Any observations of ground conditions atypical of those already described should be reported to Merebrook immediately so that an assessment of appropriate action can be made.

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APPENDIX 1 ▪ Drawings

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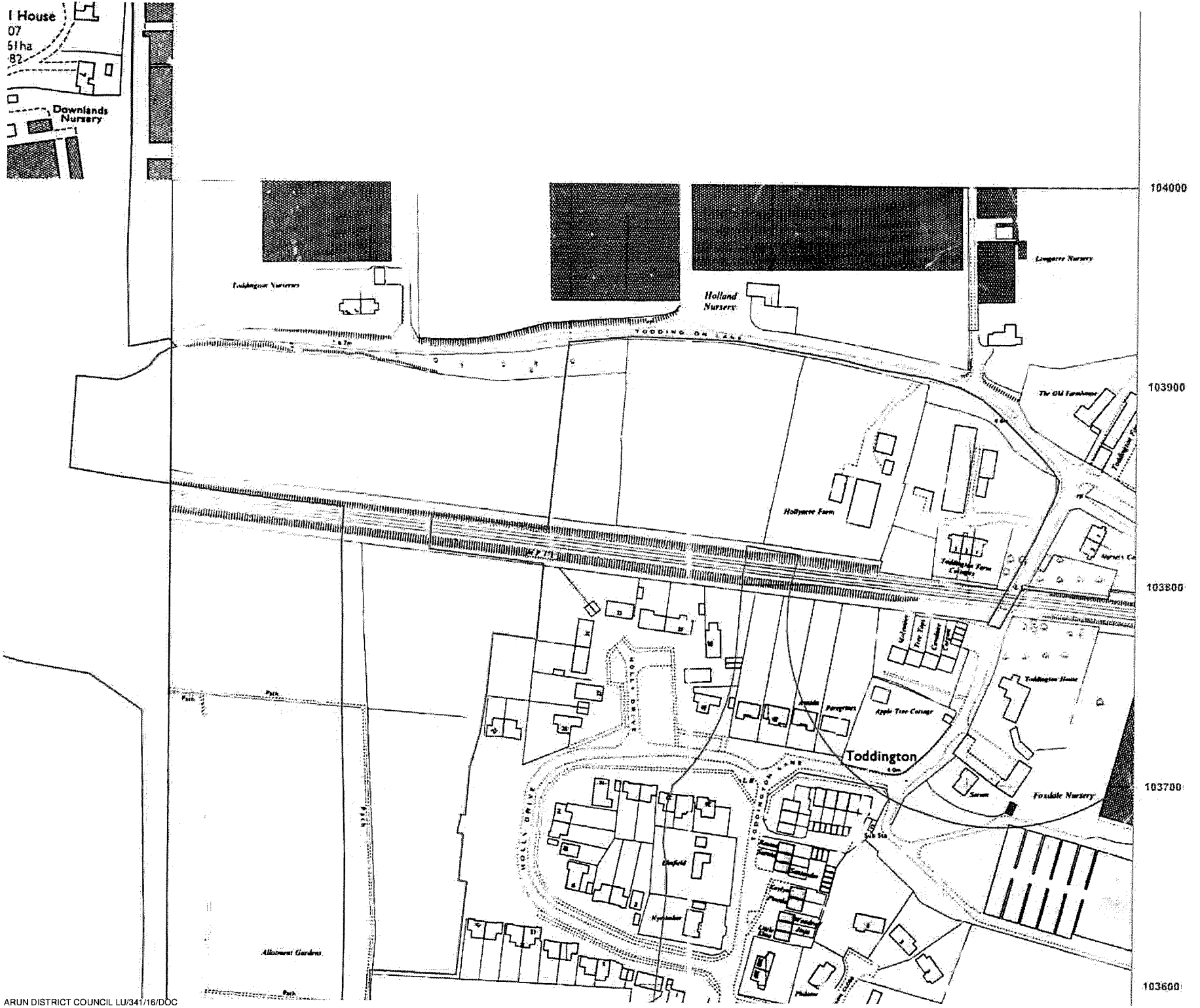
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SITE LOCATION PLAN (NTS)


MWS13
MTP17
MBH3
HWSref
MTP11
MTP10
MWS10
SP8
MWS9
HWS7
Plastic Tunnel
Zuider Zee Nurseries
MWS12
Depot
Cold Store
MTP13
MWS11
MTP19
MWS6
SP7
MBH1
MTP18
SP5
MWS7
MWS8
HWS8
HWS9
MWS1
MTP9
SP6
Pond
Reservoir
MWS5
MWS4
MWS3
MTP8
MTP7
HTP3
HWS10
MWS2
HTP2
HTP1
MWS27
MWS26
MBH2
SP4
MTP6
MWS25
MWS28
SP3
MTP4
MTP2
MWS29
MTP5
MTP3
MTP1
Black Ditch
Brain
Pond

APPENDIX 2 ▪ Historic Plans

ARUN DISTRICT COUNCIL LU/341/16/DOC



Wick, Littlehampton, W Sussex

Client Ref: 14-S52-F
Report Ref: HMD-154
Grid Ref: 503170,

Map Name: National

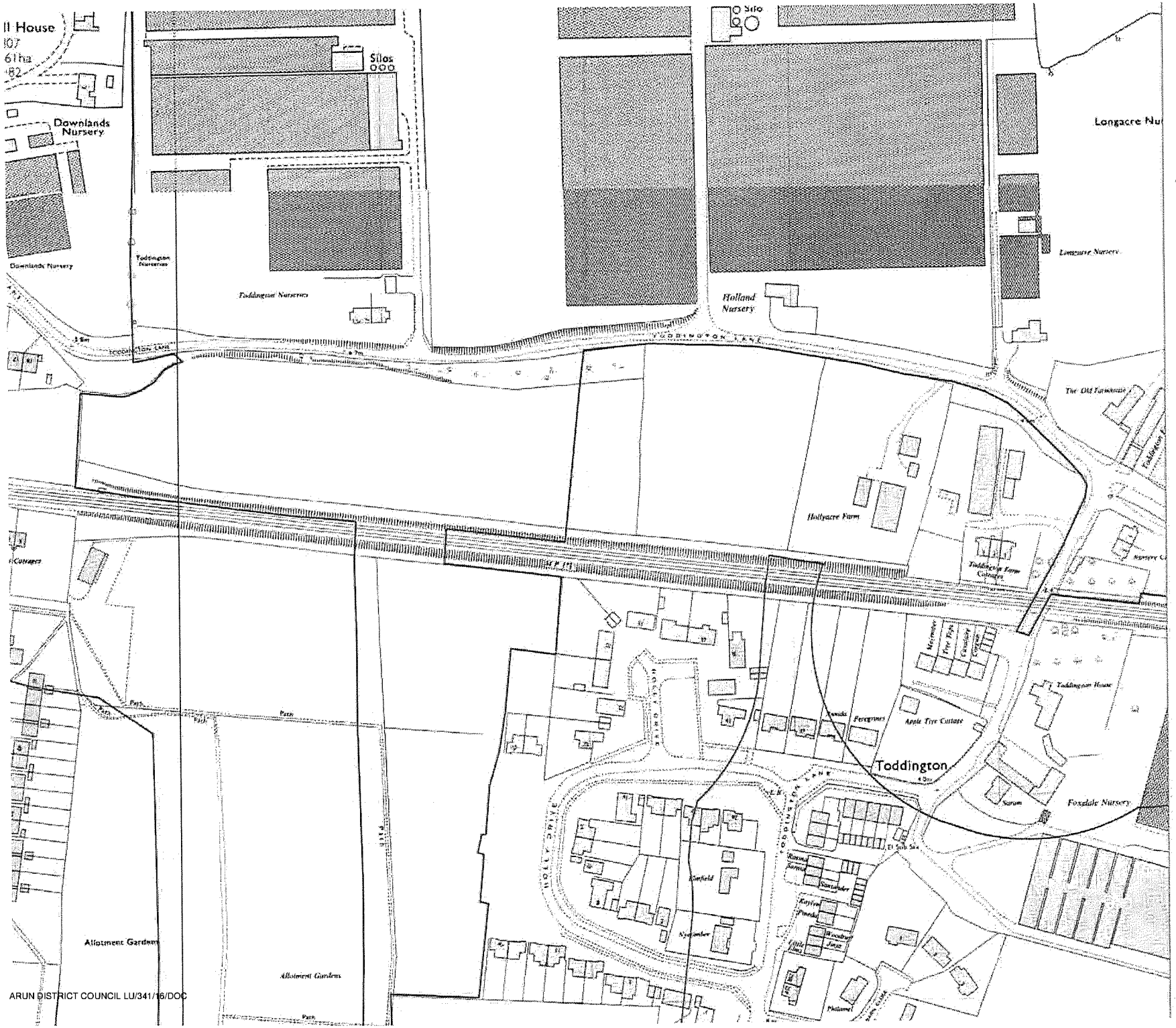
Map date: 1972

Scale: 1:2,500

Printed at: 1:2,500

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

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Wick, Littlehampton, Sussex

Client Ref: 14-S52-F
Report Ref: HMD-15
Grid Ref: 503170,

Map Name: National

Map date: 1970-197

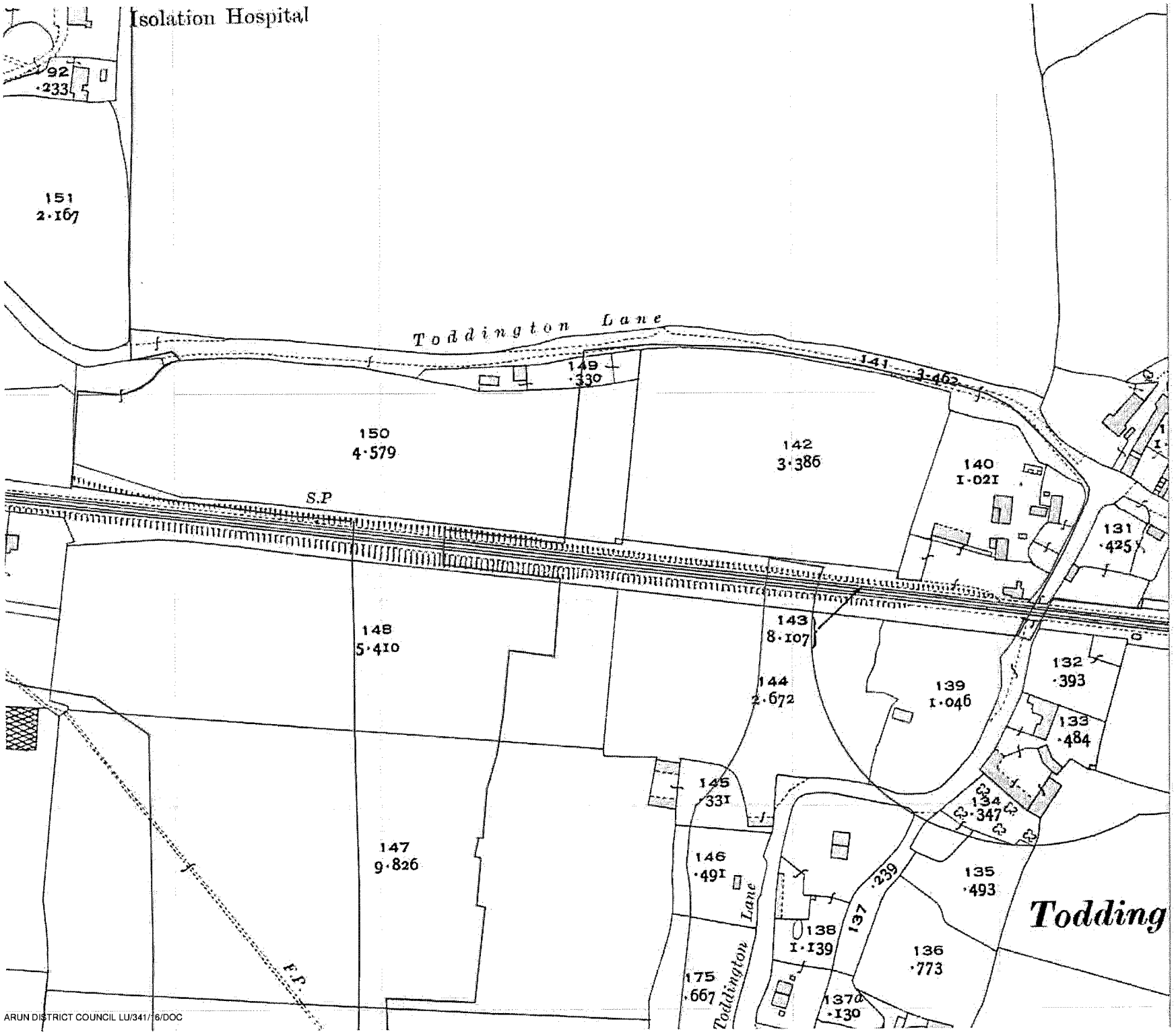
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Printed at: 1:2,500

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Revised
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Edition
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Wick, Littlehampton, W
Sussex

Client Ref: 14-S52-F
Report Ref: HMD-15
Grid Ref: 503170,

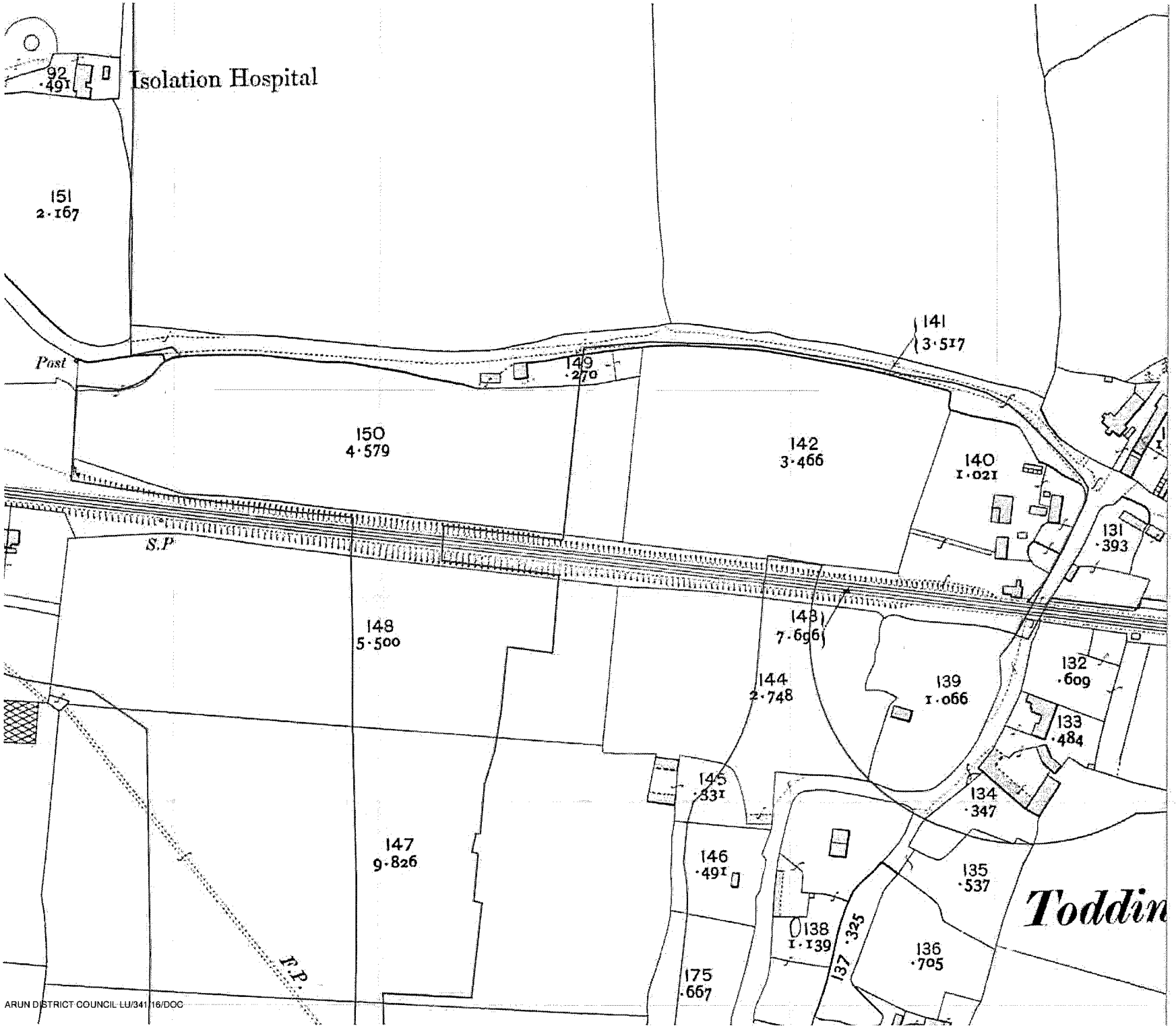
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Map date: 1932

Scale: 1:2,500

Printed at: 1:2,500

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Wick, Littlehampton, W
Sussex

Client Ref: 14-S52-F
Report Ref: HMD-154
Grid Ref: 503170,

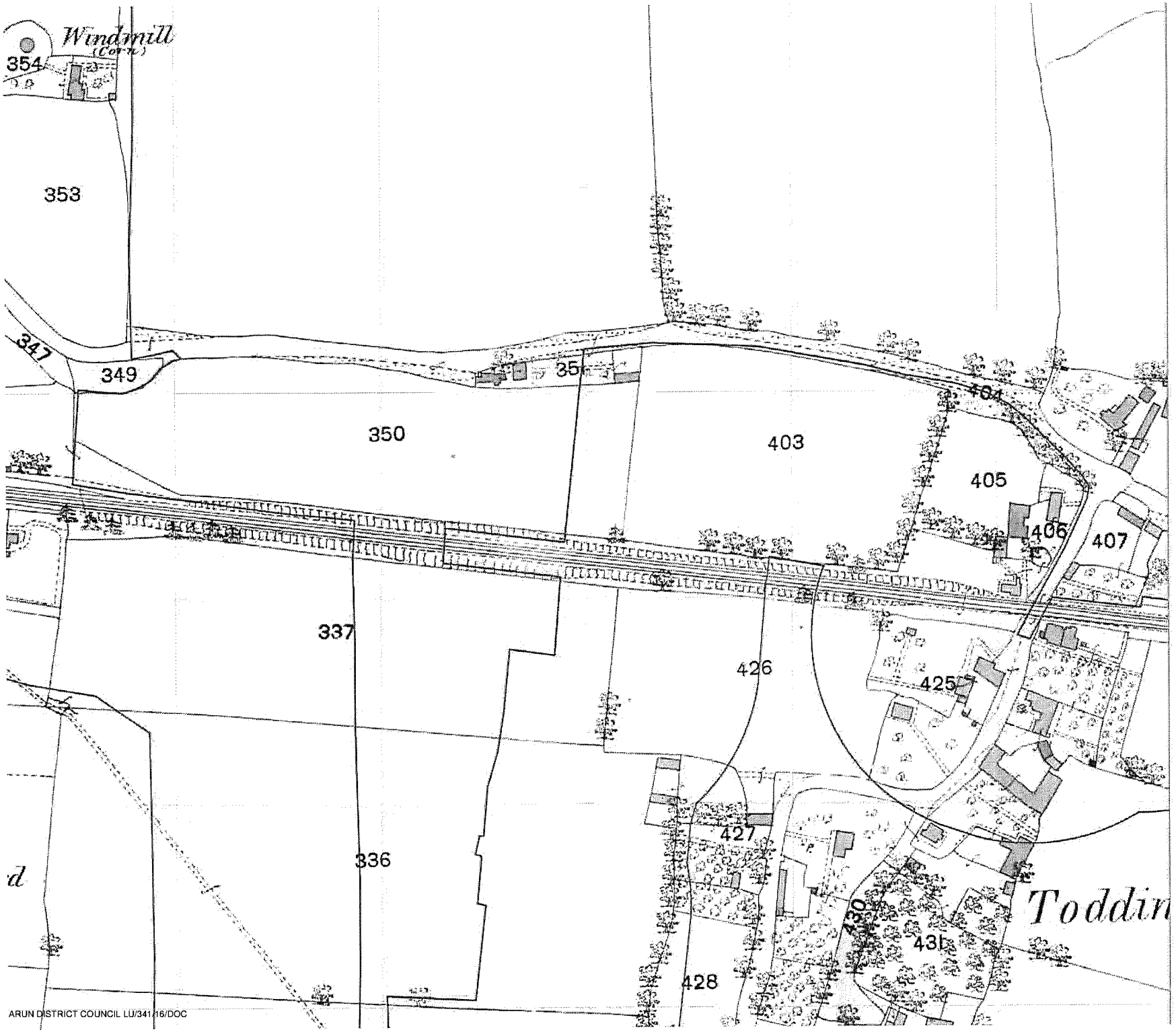
Map Name: County S

Map date: 1911

Scale: 1:2,500

Printed at: 1:2,500

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Wick, Littlehampton, W
Sussex

Client Ref: 14-S52-F
Report Ref: HMD-15
Grid Ref: 503170,

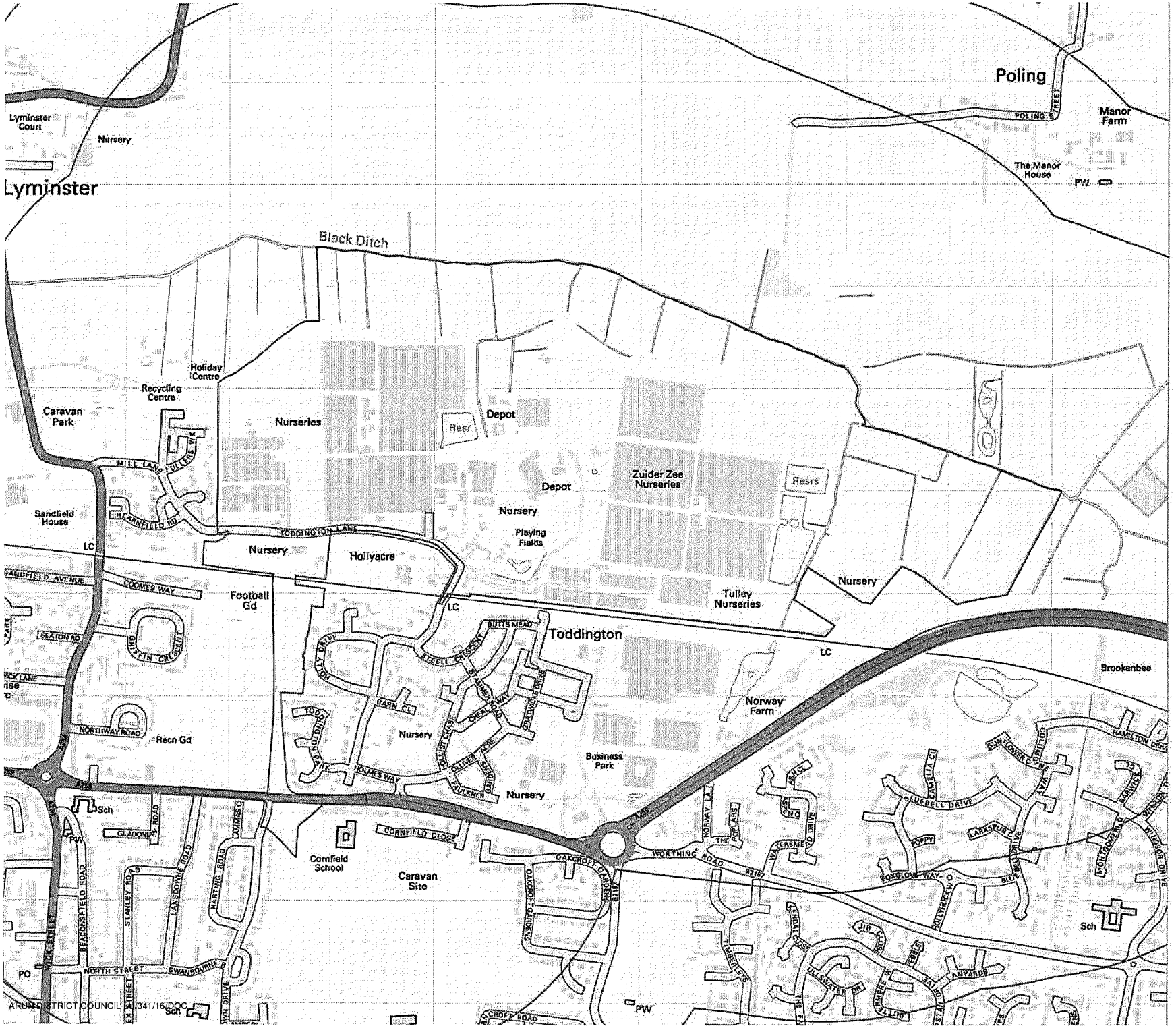
Map Name: County S

Map date: **1876**

Scale: 1:2,500

Printed at: 1:2,500

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Wick, Littlehampton, W
Sussex

Client Ref: 14-S52-F
Report Ref: HMD-15
Grid Ref: 503575,

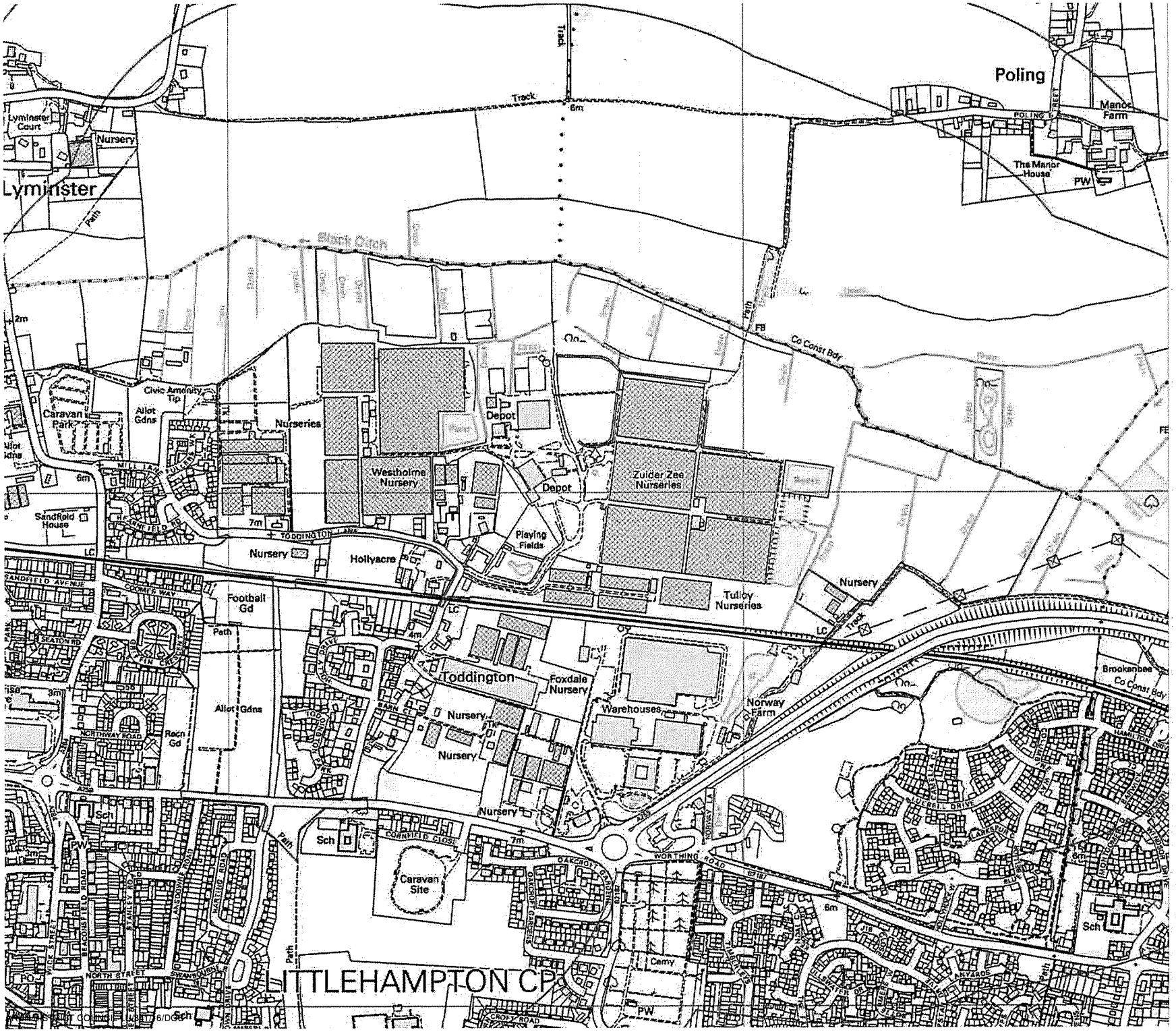
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Wick, Littlehampton, W
Sussex

Client Ref: 14-S52-F
Report Ref: HMD-15
Grid Ref: 503575,

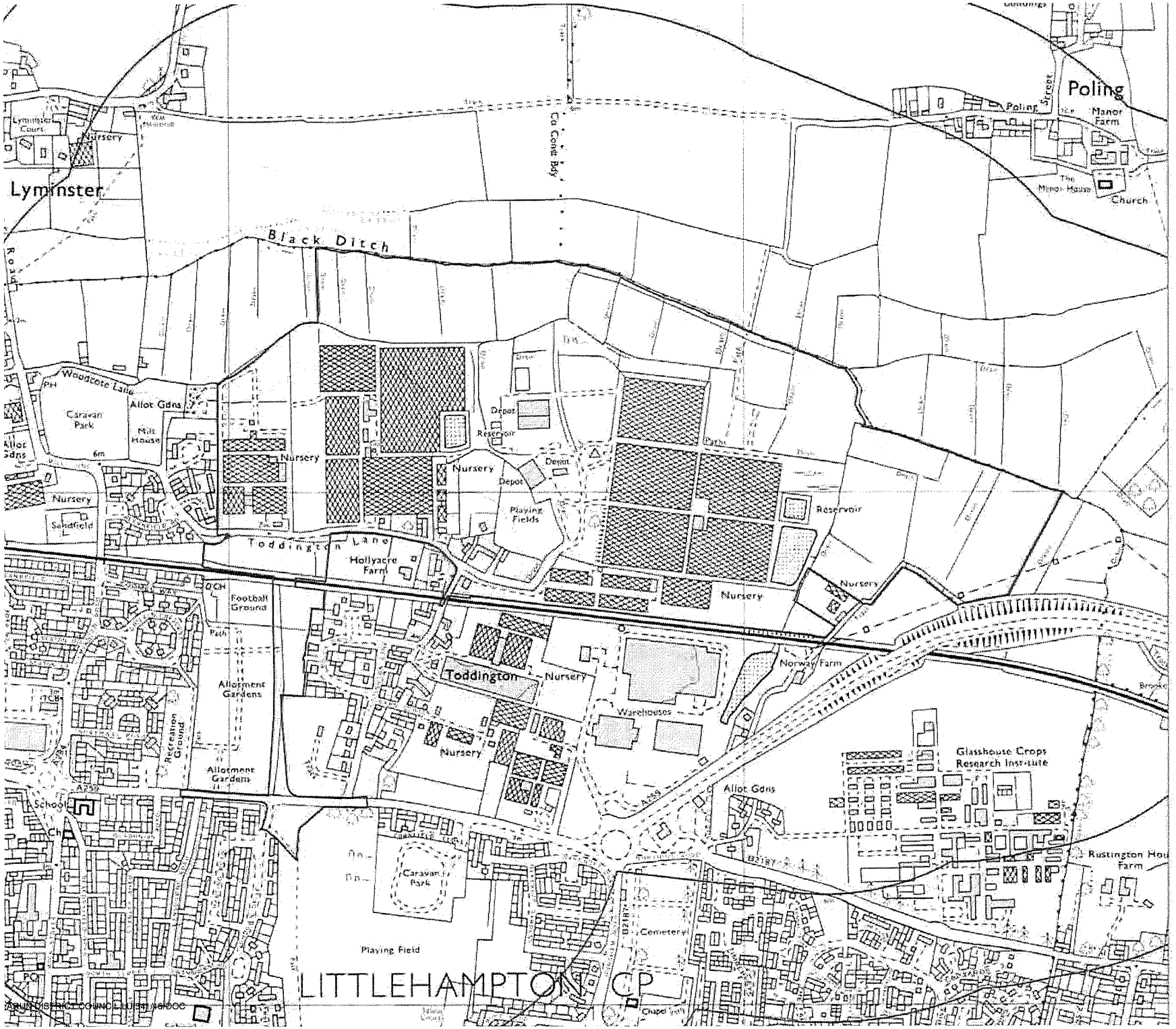
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Scale: 1:10,000

Printed at: 1:10,000

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Wick, Littlehampton, W
Sussex

Client Ref: 14-S52-F
Report Ref: HMD-15
Grid Ref: 503575,

Map Name: National

Map date: 1992

Scale: 1:10,000

Printed at: 1:10,000

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Edition N/A
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Wick, Littlehampton, W
Sussex

Client Ref: 14-S52-F
Report Ref: HMD-154
Grid Ref: 503575,

Map Name: National

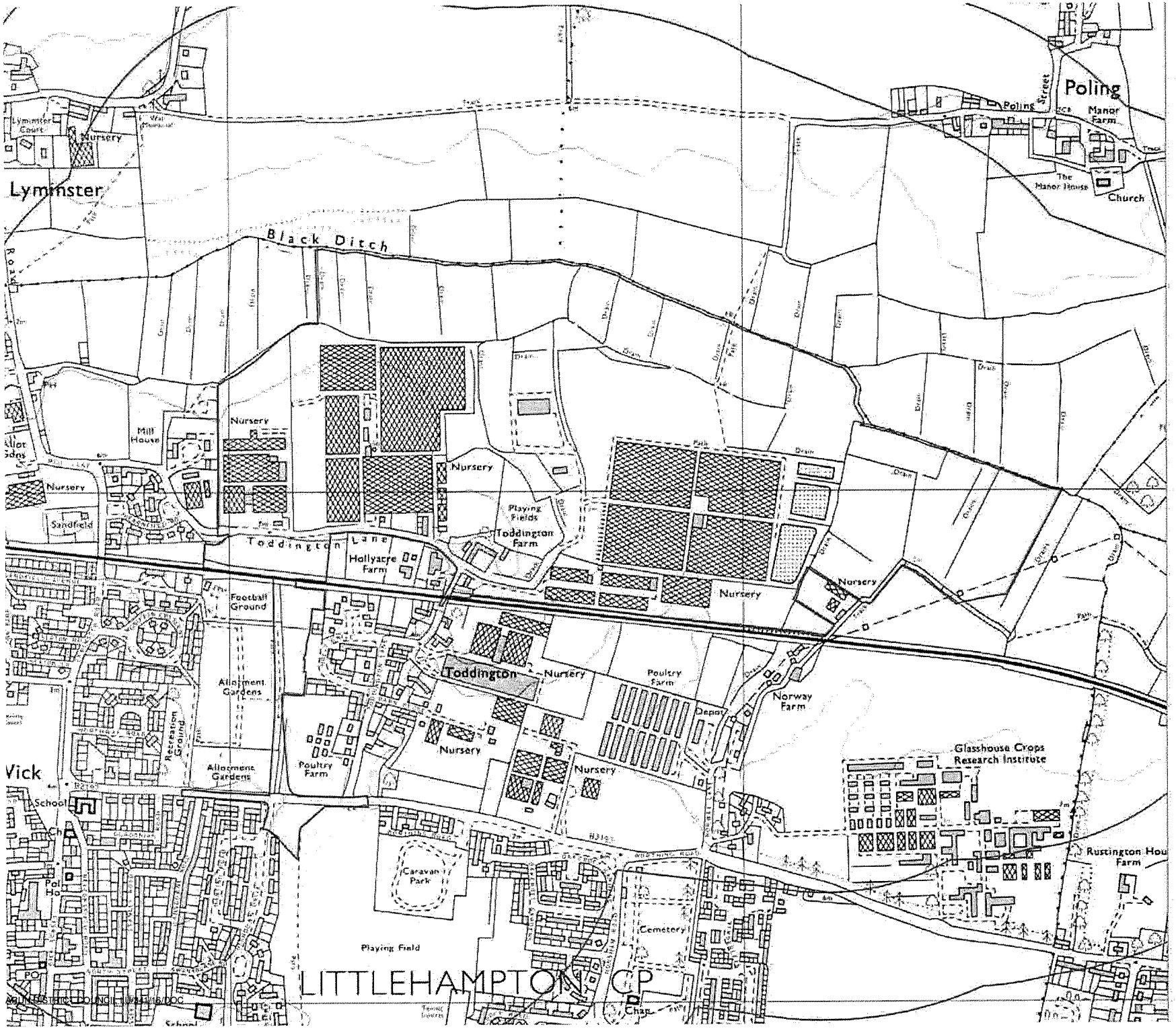
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Printed at: 1:10,000

Surveyed 1981
Revised 1981
Edition N/A
Copyright N/A
Levelled N/A

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Wick, Littlehampton, W Sussex

Client Ref: 14-S52-F
Report Ref: HMD-15
Grid Ref: 503575,

Map Name: National

Map date: **1974**

Scale: 1:10,000

Printed at: 1:10,000

Surveyed 1972
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Surveyed 1973
Revised 1974
Edition N/A
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Wick, Littlehampton, W
Sussex

Client Ref: 14-S52-F
Report Ref: HMD-154
Grid Ref: 503575,

Map Name: Provisior

Map date: **1957**

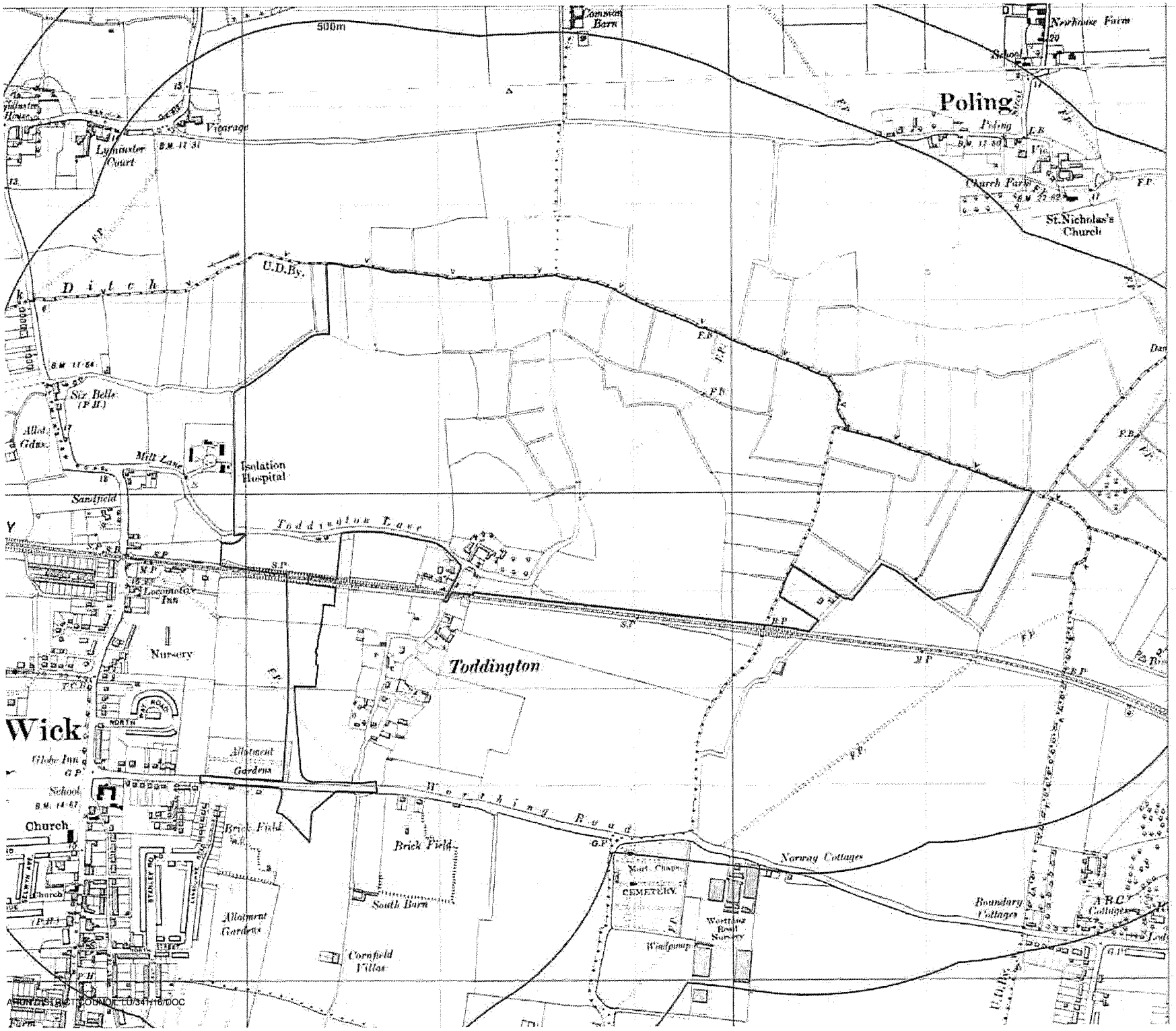
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Surveyed 1957
Revised 1957
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1875
Revised 1957
Edition N/A
Copyright N/A
Levelled N/A

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Sussex

Client Ref: 14-S52-F
Report Ref: HMD-15
Grid Ref: 503575,

Map Name: County S

Map date: **1938**

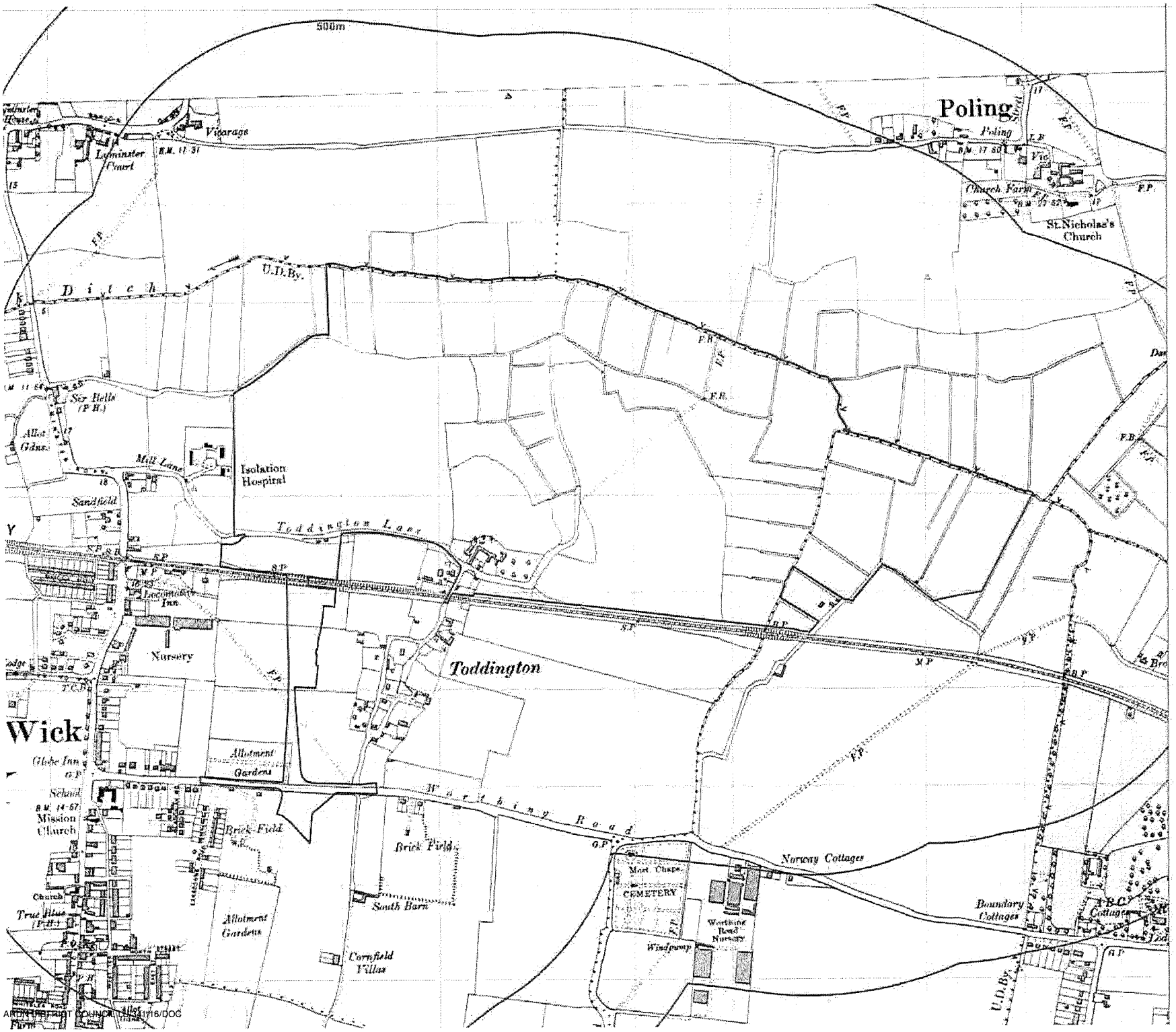
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Printed at: 1:10,560

Surveyed 187
Revised 1938
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 187
Revised 193
Edition N/A
Copyright N/
Levelled N/A

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Wick, Littlehampton, W
Sussex

Client Ref: 14-S52-F
Report Ref: HMD-15
Grid Ref: 503575,

Map Name: County S

Map date: 1932

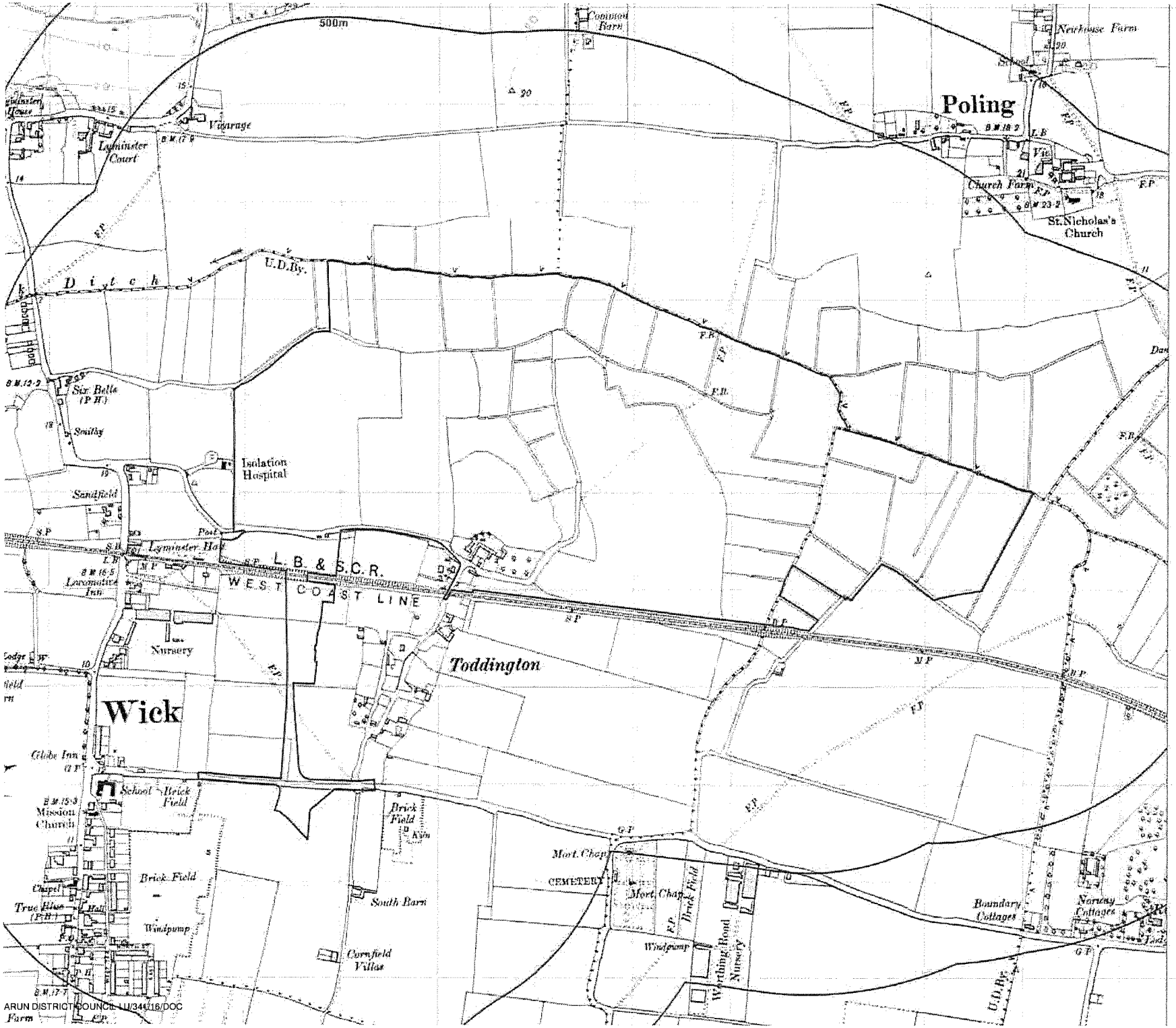
Scale: 1:10,560

Printed at: 1:10,560

Surveyed 187
Revised 193
Edition N/A
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Wick, Littlehampton, W
Sussex

Client Ref: 14-S52-F
Report Ref: HMD-154
Grid Ref: 503575,

Map Name: County S

Map date: **1910**

Scale: 1:10,560

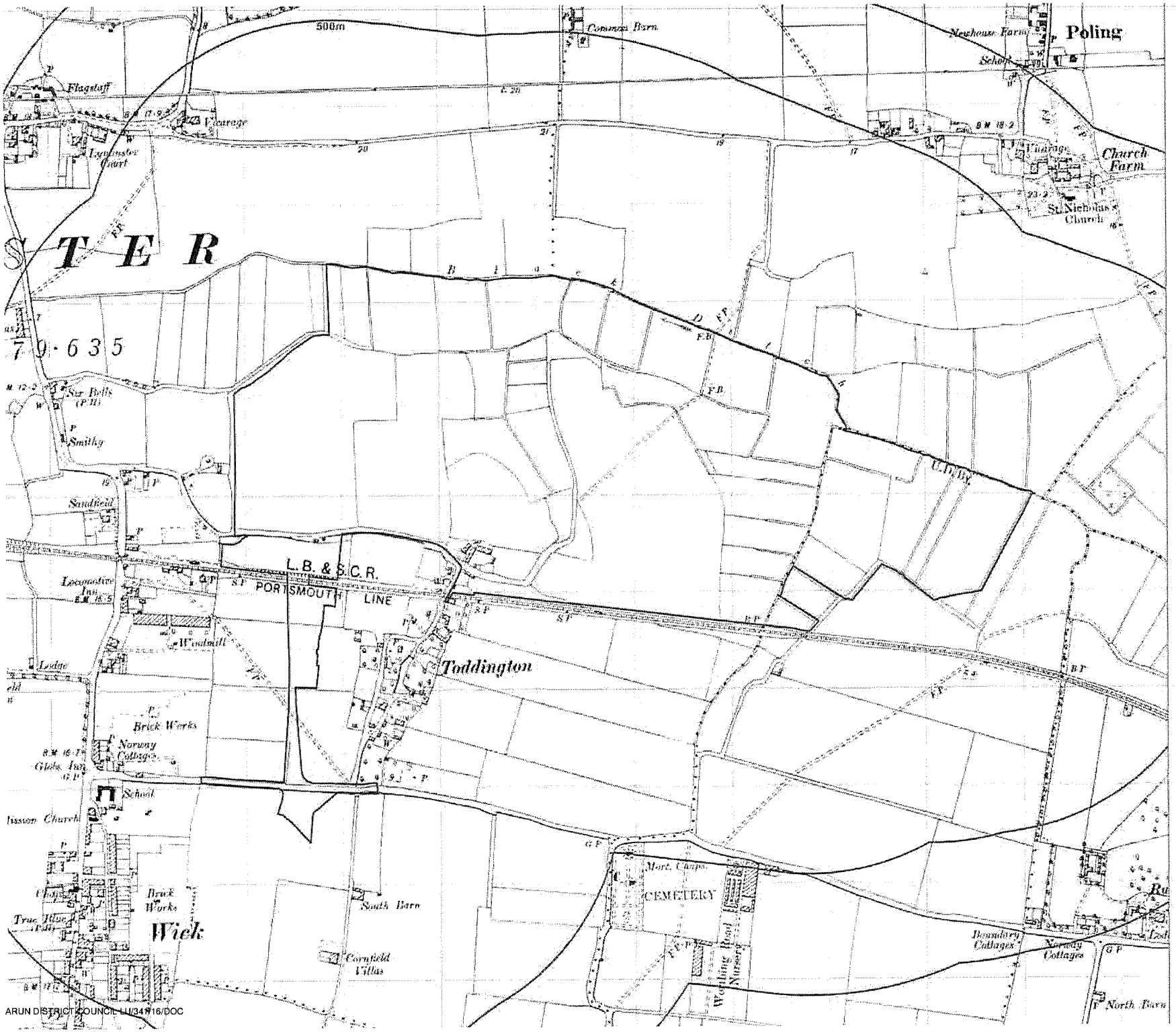
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Surveyed 1875
Revised 1910
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 187
Revised 191
Edition N/A
Copyright N/A
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ARUN DISTRICT COUNCIL 11/344/16/DOC



Wick, Littlehampton, W
Sussex

Client Ref: 14-S52-F
Report Ref: HMD-154
Grid Ref: 503575,

Map Name: County S

Map date: **1896**

Scale: 1:10,560

Printed at: 1:10,560

Surveyed 1876
Revised 1896
Edition N/A
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Levelled N/A

Surveyed 187
Revised 189
Edition N/A
Copyright N/A
Levelled N/A

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Wick, Littlehampton, W
Sussex

Client Ref: 14-S52-F
Report Ref: HMD-15
Grid Ref: 503575,

Map Name: County S

Map date: **1876**

Scale: 1:10,560

Printed at: 1:10,560

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APPENDIX 3 ▪ Exploratory Hole Logs

ARUN DISTRICT COUNCIL LU/341/16/DOC

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Merebrook Consulting Limited
Tel: 01773 829988
Fax: 01773 829393
email: consulting@merebrook.co.uk

Equipment and Methods Cable Percussive Drilling Rig			Borehole No **MBH4** Sheet 1 of 2
Project Name North Littlehampton	**Project No.** 18426	**Co-ords** -	**Hole Type** Cable
Location: North Littlehampton		**Level** 0.000	**Scale** 1:50
Client: Persimmon Homes		**Dates:** -	**Logged By** GOB

Well	Water Strike	Samples & In Situ Testing: Depth (m)	Type	Results	Depth in metres (thickness)	Legend	Stratum Description
		0.00-0.50	B		(0.50)		Made Ground comprising medium, brown / grey compact, sandy clayey gravel fill with frequent red brick fragments. Gravels are fine to coarse sub angular to sub rounded of mixed lithologies
		0.50	D,J		0.50		
		0.50-1.00	B				Orange / brown, soft to firm, clayey SAND with occasional gravels
		1.20	SPT	N=7 (1,1,1,2,2,2)			
		1.20-2.00	B				
		2.00	SPT	N=12			
		2.00	D,J	(2,2,2,2,3,5)	(3.50)		
		2.00-3.00	B				
		3.00	SPT	N=8			
		3.00	D,J	(1,2,2,2,2,2)			
		3.00-4.00	B				
		4.00	SPT	N=4 (1,1,1,1,1,1)	4.00		Structureless CHALK comprised of soft, white silt with fine to coarse sub angular to to sub rounded chalk clast gravels and cobbles with occasional flit gravels
		5.00	SPT	N=6 (1,2,1,2,1,2)			
		4.00-8.00	B				
		6.50	SPT	N=27 (4,5,6,6,7,8)			
	▽				(6.00)		
		8.00	SPT	N=25 (5,13,8,8,4,5)			
		9.50	SPT	N=40			
		8.00-11.00	B	(5,7,8,9,10,13)			
		Type		Results			Continued next sheet

1 2 3 4 5 6 7 8 9

Remarks: Undertaken by AC Soils (for Endeavour)

IVN - in-situ hand vane
IPP - in-situ pocket penetrometer
SPT - in-situ standard penetration test (spoon)
CPT - in-situ standard penetration test (cone)
PID - in-situ photoionization detector

D - small disturbed sample (tub)
J - amber glass jar (250ml)
V - amber glass jar (60ml)
B - bulk disturbed sample
U - small undisturbed sample

ARUN DISTRICT Holocene 1 1.GPJ 21/12/07 Standard Borehole Log v2 dated 27th Nov 03

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AN idom GROUP COMPANY
Merebrook Consulting Limited
Tel: 01773 829988
Fax: 01773 829393
email: consulting@merebrook.co.uk

Equipment and Methods
Cable Percussive Drilling Rig

Borehole No
MBH4
Sheet 2 of 2

Project Name	**Project No.**	**Co-ords**	**Hole Type**
North Littlehampton	18426	-	Cable
Location: North Littlehampton		**Level** 0.000	**Scale** 1:50
Client: Persimmon Homes		**Dates:** -	**Logged By** GOB

Well	Water Strike	Samples & In Situ Testing: Depth (m)	Type	Results	Depth in metres (thickness)	Legend	Stratum Description
					10.00		Strong very high desity white block CHALK with frequent flint cobbles
		11.00	SPT	N=50 (6,6,8,12,15,15)			
		12.50	SPT	N=50 (5,9,10,10,15,15)	(5.00)		
		11.00-14.50	B				
		14.50	SPT	50/150mm 150mm (10,15,25,25)			
					15.00		End of Borehole at 15.00 m
			Type	Results			

Remarks: Undertaken by AC Soils (for Endeavour)

IVN - in-situ hand vane
IPP - in-situ pocket penetrometer
SPT - in-situ standard penetration test (spoon)
CPT - in-situ standard penetration test (cone)
PID - in-situ photoionization detector

D - small disturbed sample (tub)
J - amber glass jar (250ml)
V - amber glass jar (60ml)
B - bulk disturbed sample
U - small undisturbed sample

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Fax: 01773 829393
email: consulting@merebrook.co.uk

Equipment and Methods
Cable Percussive Drilling Rig

Borehole No
MBH6
Sheet 1 of 2

Project Name
North Littlehampton

Project No.
18426

Co-ords
-

Hole Type
Cable

Location: North Littlehampton

Level
0.000

Scale
1:50

Client: Persimmon Homes

Dates: 29/01/2014-30/01/2014

Logged By
GOB

Well	Water Strike	Samples & In Situ Testing: Depth (m)	Type	Results	Depth in metres (thickness)	Legend	Stratum Description
					0.10		Tarmac
		0.00-0.50	B		(0.30)		Made Ground comprising brown / grey compact, sandy clayey gravel fill with frequent red brick fragments.
		0.50	D,J		0.40		
					(0.50)		Firm, brown sandy gravelly CLAY
		1.00	D,J		0.90		Orange / brown, soft to firm, clayey SAND with occasional gravels
		1.20	CPT	N=9 (1,2,2,3,2,2)			
		1.50	B				
		2.00	D,J				
		2.50	D		(3.50)		
		3.00	CPT	N=21			
		3.00	D,J	(3,4,4,5,6,6)			
		3.50	D				
		4.00	CPT	N=14			
		4.00	D,J	(2,3,3,3,4,4)			
		4.50	D		4.40		Structureless CHALK comprised of soft, white silt with fine to coarse sub angular to to sub rounded chalk clast gravels and cobbles with occasional flit gravels
		5.00	D,J				
		5.50	D				
	▽				(2.90)		
		6.00	CPT	N=19 (3,4,4,5,5,5)			
		7.00	D		7.30		Strong very high desity white block CHALK with frequent flint cobbles
		7.50	CPT	N=39 (6,7,9,9,10,11)			
		8.50	D				
		9.00	CPT	N=48 (8,9,9,11,14,14)			
		Type		Results			

Continued next sheet

Remarks: Undertaken by Jackson Drilling

IVN - in-situ hand vane
IPP - in-situ pocket penetrometer
SPT - in-situ standard penetration test (spoon)
CPT - in-situ standard penetration test (cone)
PID - in-situ photoionization detector

D - small disturbed sample (tub)
J - amber glass jar (250ml)
V - amber glass jar (60ml)
B - bulk disturbed sample
U - small undisturbed sample

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HoleBASE 3.1 (Bld 426.46) Standard Borehole Log v2 dated 27th Nov 03

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Fax: 01773 829393
email: consulting@merebrook.co.uk

Equipment and Methods
Cable Percussive Drilling Rig

Borehole No
MBH6
Sheet 2 of 2

Project Name
North Littlehampton

Project No.
18426

Co-ords
-

Hole Type
Cable

Location: North Littlehampton

Level
0.000

Scale
1:50

Client: Persimmon Homes

Dates: 29/01/2014-30/01/2014

Logged By
GOB

Well	Water Strike	Samples & In Situ Testing: Depth (m)	Type	Results	Depth in metres (thickness)	Legend	Stratum Description
		10.00	D				Strong very high desity white block CHALK with frequent flint cobbles
		10.50	CPT	50/295mm 295mm (9,11,11,13,14,12)	(7.70)		
		11.50	D				
		12.00	CPT	50/220mm 220mm (12,13,15,17,18)			
		13.00	D				
		13.50	CPT	50/215mm 215mm (11,14,17,18,15)			
		15.00	CPT	50/200mm 200mm (13,12,19,19,12)	15.00		End of Borehole at 15.00 m

11 12 13 14 15 16 17 18 19

Remarks: Undertaken by Jackson Drilling

IVN - in-situ hand vane
IPP - in-situ pocket penetrometer
SPT - in-situ standard penetration test (spoon)
CPT - in-situ standard penetration test (cone)
PID - in-situ photoionization detector

D - small disturbed sample (tub)
J - amber glass jar (250ml)
V - amber glass jar (60ml)
B - bulk disturbed sample
U - small undisturbed sample

ARUN DISTRICT COUNCIL Standard Borehole Log v2 dated 27th Nov 03

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Fax: 01773 829393
email: consulting@merebrook.co.uk

Equipment and Methods

Window Sample No
HWS3
Sheet 1 of 1

Project Name	**Project No.**	**Co-ords**	**Hole Type**
North Littlehampton	18426	0E - 0N	WLS
Location: North Littlehampton		**Level** 0.000	**Scale** 1:25
Client: Persimmon Homes		**Dates:** 29/01/2014	**Logged By** MSG

Well	Water Strike	Samples & In Situ Testing: Depth (m)	Type	Results	Depth in metres (thickness)	Legend	Stratum Description
		0.00-0.90	D,J		(0.90)		Firm brown SILT/CLAY with rare gravels. Gravels comprised coarse to fine, subangular to angular flints.
					0.90		
		0.90-1.60	D,J		(0.70)		Soft brown SILT/CLAY with rare gravels. Gravels comprised coarse to fine, subangular to angular flints.
		1.60	D,J		1.60		Orangish white silty clayey CHALK
					(1.40)		
					3.00		End of Window Sample at 3.00 m
			Type	Results			

1
2
3
4

Remarks:

IVN - in-situ hand vane
IPP - in-situ pocket penetrometer
SPT - in-situ standard penetration test
PID - in-situ photoionization detector

D - small disturbed sample (tub)
J - amber glass jar (250ml)
V - amber glass jar (60ml)
B - bulk disturbed sample

HoleBASE 3.1 (Bld 425.48) Standard Borehole Log v2 dated 27th Nov 03
ARUN DISTRICT COUNCIL LU/341/16/DOC

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Fax: 01773 829393
email: consulting@merebrook.co.uk

Equipment and Methods

Window Sample No
HWS4
Sheet 1 of 1

Project Name	**Project No.**	**Co-ords**	**Hole Type**
North Littlehampton	18426	0E - 0N	WLS
Location: North Littlehampton		**Level** 0.000	**Scale** 1:25
Client: Persimmon Homes		**Dates:** 29/01/2014	**Logged By** MSG

Well	Water Strike	Samples & In Situ Testing: Depth (m)	Type	Results	Depth in metres (thickness)	Legend	Stratum Description
		0.00-1.20	D,J,V		(1.20)		Soft brown SILT with occasional gravels. Gravels comprised coarse to fine, subangular to angular flints.
					1.20		
		1.20-2.00	D,J,V		(0.80)		Brown, firm silty CLAY
					2.00		
					(1.00)		Orangish white clayey silty CHALK
					3.00		End of Window Sample at 3.00 m
			Type	Results			

Remarks:

IVN - in-situ hand vane
IPP - in-situ pocket penetrometer
SPT - in-situ standard penetration test
PID - in-situ photoionization detector

D - small disturbed sample (tub)
J - amber glass jar (250ml)
V - amber glass jar (60ml)
B - bulk disturbed sample

HoleBASE 3.1 (Bld 426.46) Standard Borehole Log v2 dated 27th Nov 03

ARUN DISTRICT COUNCIL LU/341/16/DOC

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Tel: 01773 829988
Fax: 01773 829393
email: consulting@merebrook.co.uk

Equipment and Methods

Window Sample No
HWS5
Sheet 1 of 1

Project Name	**Project No.**	**Co-ords**	**Hole Type**
North Littlehampton	18426	0E - 0N	WLS
Location: North Littlehampton		**Level** 0.000	**Scale** 1:25
Client: Persimmon Homes		**Dates:** 29/01/2014	**Logged By** MSG

Well	Water Strike	Samples & In Situ Testing: Depth (m)	Type	Results	Depth in metres (thickness)	Legend	Stratum Description
		0.00-0.80	D,J		(0.80)		Yellowish brown sandy SILT with occasional gravels. Gravels comprised medium to fine, sub angular to angular flints.
					0.80		
		1.00-1.60	D,J		(1.00)		Yellowish brown sandy gravelly SILT
		1.60-2.00	D,J		1.80		Brown sandy SILT
					(1.20)		
					3.00		End of Window Sample at 3.00 m
			Type	Results			

Remarks:

IVN - in-situ hand vane
IPP - in-situ pocket penetrometer
SPT - in-situ standard penetration test
PID - in-situ photoionization detector

D - small disturbed sample (tub)
J - amber glass jar (250ml)
V - amber glass jar (60ml)
B - bulk disturbed sample

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email: consulting@merebrook.co.uk

Equipment and Methods

Window Sample No
HWS6
Sheet 1 of 1

Project Name North Littlehampton	**Project No.** 18426	**Co-ords** 0E - 0N	**Hole Type** WLS
Location: North Littlehampton		**Level** 0.000	**Scale** 1:25
Client: Persimmon Homes		**Dates:** 29/01/2014	**Logged By** MSG

Well	Water Strike	Samples & In Situ Testing: Depth (m)	Type	Results	Depth in metres (thickness)	Legend	Stratum Description
		0.00-0.80	D,J,V		(0.80)		Firm brown mottled grey SILT/CLAY becoming gravelly with depth. Gravels comprised coarse to fine, sunangular to angular flints
					0.80		Sandy gravelly CLAY
		1.20-1.80	D,J,V		(1.00)		
		1.60	D,J,V		1.80		End of Window Sample at 1.80 m

Remarks:

IVN - in-situ hand vane
IPP - in-situ pocket penetrometer
SPT - in-situ standard penetration test
PID - in-situ photoionization detector

D - small disturbed sample (tub)
J - amber glass jar (250ml)
V - amber glass jar (60ml)
B - bulk disturbed sample

HoleBASE 3.1 (Bld 426.46) Standard Borehole Log v2 dstod 27th Nov 03
ARUN DISTRICT COUNCIL LU/341/16/DOC

merebrook consulting
An idom group company
Merebrook Consulting Limited
Tel: 01773 829988
Fax: 01773 829393
email: consulting@merebrook.co.uk

Equipment and Methods
Window Sampling Drilling Rig

Window Sample No
MWS14
Sheet 1 of 1

Project Name
North Littlehampton

Project No.
18426

Co-ords
-

Hole Type
WS

Location: North Littlehampton

Level
0.000

Scale
1:25

Client: Persimmon Homes

Dates: 29/01/2014

Logged By
GOB

Well	Water Strike	Samples & In Situ Testing: Depth (m)	Type	Results	Depth in metres (thickness)	Legend	Stratum Description
					0.10		Grass over topsoil comprising of brown medium, slightly silty clay with frequent rootlets and occasional gravels
					(0.50)		Brown, dense, firm, clayey fine SAND
		0.50-0.70	D,J		0.60		
					0.70		Black / dark grey sandy gravel fill with occasional red brick fragment and ash
					(0.40)		Brown / grey firm, dense, clayey SAND with frequent flint and chalk gravels
		1.00	CPT	N=8 (2,2,2,2,2,2)	1.10		Brown, firm, dense, clayey silty SAND
		1.50-1.70	D,J		(1.30)		
		2.00	CPT	N=11 (3,2,2,3,3,3)			
					2.40		Structureless CHALK comprised of cream, sub angular to sub rounded, fine to coarse chalk gravels and cobbles in a soft to firm clayey sandy SILT matrix.
					(0.60)		
		3.00	CPT	N=14 (3,3,3,3,4,4)	3.00		End of Window Sample at 3.00 m
			Type	Results			

Remarks:

IVN - in-situ hand vane
IPP - in-situ pocket penetrometer
SPT - in-situ standard penetration test
PID - in-situ photoionization detector

D - small disturbed sample (tub)
J - amber glass jar (250ml)
V - amber glass jar (60ml)
B - bulk disturbed sample

HoleBASE 3.1 (Bid 425.48) Standard Borehole Log v2 dated 27th Nov 03
ARUN DISTRICT COUNCIL LU/341/16/DOC

merebrook consulting
AN idom GROUP COMPANY
Merebrook Consulting Limited
Tel: 01773 829988
Fax: 01773 829393
email: consulting@merebrook.co.uk

Equipment and Methods
Window Sampling Drilling Rig

Window Sample No
MWS15
Sheet 1 of 1

Project Name
North Littlehampton

Project No.
18426

Co-ords
-

Hole Type
WS

Location: North Littlehampton

Level
0.000

Scale
1:25

Client: Persimmon Homes

Dates: 29/01/2014

Logged By
GOB

Well	Water Strike	Samples & In Situ Testing: Depth (m)	Type	Results	Depth in metres (thickness)	Legend	Stratum Description
					0.20		Grass over topsoil comprising of brown medium to firm, slightly silty clay with frequent rootlets and occasional gravels
		0.50-0.70	D,J		(0.60)		Brown, dense clayey fine SAND with occasional red brick and tarmac fragments, rootlets and gravels.
		1.00	CPT	N=8 (2,2,2,2,2,2)	0.80		Brown slightly clayey, silty SAND
		1.50-1.70	D,J		(0.60)		
		2.00	CPT	N=11 (3,2,3,2,3,3)	1.40		Brown, firm, dense fine to medium SAND
		2.80-3.00	D,J		(1.60)		
		3.00	CPT	N=12 (3,3,3,3,3,3)	3.00		End of Window Sample at 3.00 m
			Type	Results			

Remarks:

IVN - in-situ hand vane
IPP - in-situ pocket penetrometer
SPT - in-situ standard penetration test
PID - in-situ photoionization detector

D - small disturbed sample (tub)
J - amber glass jar (250ml)
V - amber glass jar (60ml)
B - bulk disturbed sample

HoleBASE 3.1 (Bid 426.48) Standard Borehole Log v2 dated 27th Nov 03

ARUN DISTRICT COUNCIL LU/341/16/DOC

merebrook consulting
AN Idom GROUP COMPANY
Merebrook Consulting Limited
Tel: 01773 829988
Fax: 01773 829393
email: consulting@merebrook.co.uk

Equipment and Methods
Window Sampling Drilling Rig

Window Sample No
MWS16
Sheet 1 of 1

Project Name
North Littlehampton

Project No.
18426

Co-ords
-

Hole Type
WS

Location: North Littlehampton

Level
0.000

Scale
1:25

Client: Persimmon Homes

Dates: 29/01/2014

Logged By
GOB

Well	Water Strike	Samples & In Situ Testing: Depth (m)	Type	Results	Depth in metres (thickness)	Legend	Stratum Description
					0.10		Grass over topsoil comprising of brown medium to firm, slightly silty clay with frequent rootlets and occasional gravels
		0.30-0.50	D,J,V		(1.00)		Brown, dense, firm clayey SAND
		1.00	CPT	N=9 (1,2,2,2,2,3)	1.10		Brown, dense slightly clayey fine SAND
		1.50-1.70	D,J		(1.00)		
		2.00	CPT	N=14 (3,3,4,3,3,4)	2.10		Brown, soft, fine SAND with frequent fine to medium sub angular chalk gravels
					(0.80)		
		3.00	CPT	N=7 (1,2,2,2,2,1)	2.90		Structureless CHALK comprised of cream, sub angular to sub rounded, fine to coarse chalk gravels and cobbles in a medium to firm clayey sandy SILT matrix.
					3.00		End of Window Sample at 3.00 m
			Type	Results			

Remarks:

IVN - in-situ hand vane
IPP - in-situ pocket penetrometer
SPT - in-situ standard penetration test
PID - in-situ photoionization detector

D - small disturbed sample (tub)
J - amber glass jar (250ml)
V - amber glass jar (60ml)
B - bulk disturbed sample

HoleBASE 3.1 (Bld 426.46) Standard Borehole Log v2 dated 27th Nov 03

ARUN DISTRICT COUNCIL LU/341/16/DOC

APPENDIX 4 ▪ Laboratory Analysis Certificates

ARUN DISTRICT COUNCIL LU/341/16/DOC

C Oliveira
Merebrook
First Floor
1 Leonard Place
Westerham Road
Keston
BR2 6HQ

[redacted]

i2 Analytical Ltd.
7 Woodshots Meadow,
Croxley Green
Business Park,
Watford,
Herts,
WD18 8YS

[redacted]om

Analytical Report Number : 14-50810

Project / Site name:	North Littlehampton	**Samples received on:**	05/02/2014
Your job number:	18426	**Samples instructed on:**	11/02/2014
Your order number:	13-S2-FDO-LABS	**Analysis completed by:**	18/02/2014
Report Issue Number:	1	**Report issued on:**	18/02/2014
Samples Analysed:	66 soil samples		

Signed: [redacted]

Dr Claire Stone
Quality Manager
For & on behalf of i2 Analytical Ltd.

Rexona Rahman
Customer Services Manager
For & on behalf of i2 Analytical Ltd.

Other office located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

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The results included within the report are representative of the samples submitted for analysis.

ARUN DISTRICT COUNCIL LU/341/16/DOC

Analytical Report Number: 14-50810

Project / Site name: North Littlehampton

Your Order No: 13-S2-FDO-LABS

Lab Sample Number				315404	315405	315406	315407	315408
Sample Reference				MBH1	MBH1	MBH2	MBH2	MBH3
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.50	1.00	1.00	2.00	0.50
Date Sampled				27/01/2014	27/01/2014	28/01/2014	28/01/2014	28/01/2014
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	N/A	NONE	12	14	16	25	20
Total mass of sample received	kg	0.001	NONE	1.2	1.1	1.2	0.98	1.5
Asbestos in Soil Screen / Identification Name	Type	N/A	ISO 17025	-	-	-	-	-
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected	-	-	-
General Inorganics								
pH	pH Units	N/A	MCERTS	7.6	7.7	8.1	7.7	7.7
Electrical Conductivity	µS/cm	10	NONE	-	480	-	-	-
Total Cyanide	mg/kg	1	MCERTS	< 1	< 1	< 1	< 1	< 1
Complex Cyanide	mg/kg	1	NONE	-	< 1	-	-	-
Free Cyanide	mg/kg	1	NONE	-	< 1	-	-	-
Total Sulphate as SO_4	mg/kg	100	ISO 17025	-	290	-	-	-
Water Soluble Sulphate (Soil Equivalent)	g/l	0.0025	MCERTS	0.056	0.11	0.086	0.52	0.034
Water Soluble Sulphate as SO_4 (2:1)	mg/kg	2.5	MCERTS	56	110	86	520	34
Water Soluble Sulphate (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.028	0.054	0.043	0.26	0.017
Sulphide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Water Soluble Chloride (2:1)	mg/kg	5	MCERTS	-	9.9	-	-	-
Ammonium as NH_4	mg/kg	5	MCERTS	-	< 5.0	-	-	-
Organic Matter	%	0.1	MCERTS	0.8	-	0.1	0.8	2.3
Fraction Organic Carbon (FOC)	N/A	0.00001	NONE	-	0.0036	-	-	-
Total Organic Carbon (TOC)	%	0.1	MCERTS	-	0.4	-	-	-
Total Phenols								
Total Phenols (monohydric)	mg/kg	2	MCERTS	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Speciated PAHs								
Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthylene	mg/kg	0.2	MCERTS	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Acenaphthene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Fluorene	mg/kg	0.2	MCERTS	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Phenanthrene	mg/kg	0.2	MCERTS	0.38	< 0.20	< 0.20	< 0.20	< 0.20
Anthracene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Fluoranthene	mg/kg	0.2	MCERTS	0.54	< 0.20	< 0.20	< 0.20	< 0.20
Pyrene	mg/kg	0.2	MCERTS	0.43	< 0.20	< 0.20	< 0.20	< 0.20
Benzo(a)anthracene	mg/kg	0.2	MCERTS	0.21	< 0.20	< 0.20	< 0.20	< 0.20
Chrysene	mg/kg	0.05	MCERTS	0.20	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(b)fluoranthene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo(k)fluoranthene	mg/kg	0.2	MCERTS	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Benzo(a)pyrene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Indeno(1,2,3-cd)pyrene	mg/kg	0.2	MCERTS	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Dibenz(a,h)anthracene	mg/kg	0.2	MCERTS	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Total PAH								
Speciated Total EPA-16 PAHs	mg/kg	1.6	MCERTS	1.8	< 1.6	< 1.6	< 1.6	< 1.6

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ARUN DISTRICT COUNCIL LU/341/16/DOC

Analytical Report Number: 14-50810

Project / Site name: North Littlehampton
Your Order No: 13-S2-FDO-LABS

Lab Sample Number				315404	315405	315406	315407	315408
Sample Reference				MBH1	MBH1	MBH2	MBH2	MBH3
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.50	1.00	1.00	2.00	0.50
Date Sampled				27/01/2014	27/01/2014	28/01/2014	28/01/2014	28/01/2014
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Heavy Metals / Metalloids								
Antimony (aqua regia extractable)	mg/kg	1	ISO 17025	-	< 1.0	-	-	-
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	11	12	15	12	18
Barium (aqua regia extractable)	mg/kg	1	MCERTS	-	77	-	-	-
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	-	1.0	-	-	-
Boron (water soluble)	mg/kg	0.2	MCERTS	-	< 0.2	-	-	-
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	0.3	0.2	0.3
Chromium (hexavalent)	mg/kg	4	MCERTS	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	28	31	38	27	26
Cobalt (aqua regia extractable)	mg/kg	0.15	MCERTS	-	13	-	-	-
Copper (aqua regia extractable)	mg/kg	1	MCERTS	18	18	21	16	24
Iron (aqua regia extractable)	mg/kg	40	MCERTS	-	35000	-	-	-
Lead (aqua regia extractable)	mg/kg	2	MCERTS	17	16	16	11	23
Manganese (aqua regia extractable)	mg/kg	1	MCERTS	-	760	-	-	-
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Molybdenum (aqua regia extractable)	mg/kg	0.25	MCERTS	-	< 0.3	-	-	-
Nickel (aqua regia extractable)	mg/kg	2	MCERTS	23	25	40	26	26
Phosphorus (aqua regia extractable)	mg/kg	20	NONE	-	440	-	-	-
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Tin (aqua regia extractable)	mg/kg	1	MCERTS	-	1.1	-	-	-
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	-	42	-	-	-
Zinc (aqua regia extractable)	mg/kg	2	MCERTS	62	62	74	57	62
Calcium (aqua regia extractable)	mg/kg	20	NONE	-	6000	-	-	-
Magnesium (aqua regia extractable)	mg/kg	20	ISO 17025	-	3800	-	-	-
Potassium (aqua regia extractable)	mg/kg	20	NONE	-	2900	-	-	-
Sodium (aqua regia extractable)	mg/kg	20	NONE	-	170	-	-	-
Monoaromatics								
Benzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Toluene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Ethylbenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
p & m-xylene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
o-xylene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Petroleum Hydrocarbons								
Mineral Oil (C10 - C40)	mg/kg	10	NONE	-	< 10	-	-	-
TPH1 (C10 - C40)	mg/kg	10	MCERTS	-	< 10	-	-	-
TPH2 (C6 - C10)	mg/kg	0.1	NONE	-	< 0.1	-	-	-
TPH C6 - C40	mg/kg	10	NONE	-	< 10	-	-	-
TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	< 2.0	< 2.0	< 2.0	3.3	< 2.0
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	< 8.0	< 8.0	< 8.0	< 8.0	< 8.0
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	< 8.0	< 8.0	< 8.0	< 8.0	< 8.0
TPH-CWG - Aliphatic (EC5 - EC35)	mg/kg	10	MCERTS	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic (EC5 - EC35)	mg/kg	10	MCERTS	< 10	< 10	< 10	< 10	< 10

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ARUN DISTRICT COUNCIL LU/341/16/DOC

Analytical Report Number: 14-50810

Project / Site name: North Littlehampton

Your Order No: 13-S2-FDO-LABS

Lab Sample Number				315404	315405	315406	315407	315408
Sample Reference				MBH1	MBH1	MBH2	MBH2	MBH3
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.50	1.00	1.00	2.00	0.50
Date Sampled				27/01/2014	27/01/2014	28/01/2014	28/01/2014	28/01/2014
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
TPH (C10 - C25)	mg/kg	10	NONE	-	< 10	-	-	-

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ARUN DISTRICT COUNCIL LU/341/16/DOC

Analytical Report Number: 14-50810

Project / Site name: North Littlehampton
Your Order No: 13-S2-FDO-LABS

Lab Sample Number				315404	315405	315406	315407	315408
Sample Reference				MBH1	MBH1	MBH2	MBH2	MBH3
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.50	1.00	1.00	2.00	0.50
Date Sampled				27/01/2014	27/01/2014	28/01/2014	28/01/2014	28/01/2014
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
VOCs								
Chloromethane	µg/kg	4	ISO 17025	-	< 4.0	-	-	-
Chloroethane	µg/kg	2	ISO 17025	-	< 2.0	-	-	-
Bromomethane	µg/kg	6	ISO 17025	-	< 6.0	-	-	-
Vinyl Chloride	µg/kg	24	ISO 17025	-	< 24	-	-	-
Trichlorofluoromethane	µg/kg	5	ISO 17025	-	< 5.0	-	-	-
1,1-dichloroethene	µg/kg	7	MCERTS	-	< 7.0	-	-	-
1,1,2-Trichloro 1,2,2-Trifluoroethane	µg/kg	7	ISO 17025	-	< 7.0	-	-	-
Cis-1,2-dichloroethene	µg/kg	7	MCERTS	-	< 7.0	-	-	-
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	-	< 1.0	-	-	-
1,1-dichloroethane	µg/kg	6	MCERTS	-	< 6.0	-	-	-
2,2-Dichloropropane	µg/kg	6	NONE	-	< 6.0	-	-	-
Trichloromethane	µg/kg	7	MCERTS	-	< 7.0	-	-	-
1,1,1-Trichloroethane	µg/kg	7	MCERTS	-	< 7.0	-	-	-
1,2-dichloroethane	µg/kg	4	MCERTS	-	< 4.0	-	-	-
1,1-Dichloropropene	µg/kg	7	NONE	-	< 7.0	-	-	-
Trans-1,2-dichloroethene	µg/kg	7	NONE	-	< 7.0	-	-	-
Benzene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
Tetrachloromethane	µg/kg	7	MCERTS	-	< 7.0	-	-	-
1,2-dichloropropane	µg/kg	6	MCERTS	-	< 6.0	-	-	-
Trichloroethene	µg/kg	6	MCERTS	-	< 6.0	-	-	-
Dibromomethane	µg/kg	7	MCERTS	-	< 7.0	-	-	-
Bromodichloromethane	µg/kg	7	NONE	-	< 7.0	-	-	-
Cis-1,3-dichloropropene	µg/kg	7	ISO 17025	-	< 7.0	-	-	-
Trans-1,3-dichloropropene	µg/kg	8	ISO 17025	-	< 8.0	-	-	-
Toluene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
1,1,2-Trichloroethane	µg/kg	5	MCERTS	-	< 5.0	-	-	-
1,3-Dichloropropane	µg/kg	8	ISO 17025	-	< 8.0	-	-	-
Dibromochloromethane	µg/kg	2	ISO 17025	-	< 2.0	-	-	-
Tetrachloroethene	µg/kg	8	MCERTS	-	< 8.0	-	-	-
1,2-Dibromoethane	µg/kg	3	ISO 17025	-	< 3.0	-	-	-
Chlorobenzene	µg/kg	7	MCERTS	-	< 7.0	-	-	-
1,1,1,2-Tetrachloroethane	µg/kg	4	MCERTS	-	< 4.0	-	-	-
Ethylbenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
p & m-xylene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
Styrene	µg/kg	5	MCERTS	-	< 5.0	-	-	-
Tribromomethane	µg/kg	7	MCERTS	-	< 7.0	-	-	-
o-xylene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
1,1,2,2-Tetrachloroethane	µg/kg	5	MCERTS	-	< 5.0	-	-	-
Isopropylbenzene	µg/kg	7	NONE	-	< 7.0	-	-	-
Bromobenzene	µg/kg	11	MCERTS	-	< 11	-	-	-
N-Propylbenzene	µg/kg	5	ISO 17025	-	< 5.0	-	-	-
2-Chlorotoluene	µg/kg	11	NONE	-	< 11	-	-	-
4-Chlorotoluene	µg/kg	11	NONE	-	< 11	-	-	-
1,3,5-Trimethylbenzene	µg/kg	4	ISO 17025	-	< 4.0	-	-	-
Tert-Butylbenzene	µg/kg	4	NONE	-	< 4.0	-	-	-
1,2,4-Trimethylbenzene	µg/kg	5	ISO 17025	-	< 5.0	-	-	-
Sec-Butylbenzene	µg/kg	5	NONE	-	< 5.0	-	-	-
1,3-dichlorobenzene	µg/kg	7	ISO 17025	-	< 7.0	-	-	-
P-Isopropyltoluene	µg/kg	16	ISO 17025	-	< 16	-	-	-
1,2-dichlorobenzene	µg/kg	5	MCERTS	-	< 5.0	-	-	-
1,4-dichlorobenzene	µg/kg	8	MCERTS	-	< 8.0	-	-	-
Butylbenzene	µg/kg	4	NONE	-	< 4.0	-	-	-
1,2-Dibromo-3-chloropropane	µg/kg	7	ISO 17025	-	< 7.0	-	-	-
1,2,4-Trichlorobenzene	µg/kg	9	MCERTS	-	< 9.0	-	-	-
Hexachlorobutadiene	µg/kg	7	NONE	-	< 7.0	-	-	-
1,2,3-Trichlorobenzene	µg/kg	10	NONE	-	< 10	-	-	-

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ARUN DISTRICT COUNCIL LU/341/16/DOC

Analytical Report Number: 14-50810

Project / Site name: North Littlehampton
Your Order No: 13-S2-FDO-LABS

Lab Sample Number				315404	315405	315406	315407	315408
Sample Reference				MBH1	MBH1	MBH2	MBH2	MBH3
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.50	1.00	1.00	2.00	0.50
Date Sampled				27/01/2014	27/01/2014	28/01/2014	28/01/2014	28/01/2014
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
SVOCs								
Aniline	mg/kg	0.1	NONE	-	< 0.1	-	-	-
Phenol	mg/kg	0.2	ISO 17025	-	< 0.2	-	-	-
2-Chlorophenol	mg/kg	0.1	MCERTS	-	< 0.1	-	-	-
Bis(2-chloroethyl)ether	mg/kg	0.2	MCERTS	-	< 0.2	-	-	-
1,3-Dichlorobenzene	mg/kg	0.2	MCERTS	-	< 0.2	-	-	-
1,2-Dichlorobenzene	mg/kg	0.1	MCERTS	-	< 0.1	-	-	-
1,4-Dichlorobenzene	mg/kg	0.2	MCERTS	-	< 0.2	-	-	-
Bis(2-chloroisopropyl)ether	mg/kg	0.1	MCERTS	-	< 0.1	-	-	-
2-Methylphenol	mg/kg	0.3	MCERTS	-	< 0.3	-	-	-
Hexachloroethane	mg/kg	0.05	MCERTS	-	< 0.05	-	-	-
Nitrobenzene	mg/kg	0.3	MCERTS	-	< 0.3	-	-	-
4-Methylphenol	mg/kg	0.2	NONE	-	< 0.2	-	-	-
Isophorone	mg/kg	0.2	MCERTS	-	< 0.2	-	-	-
2-Nitrophenol	mg/kg	0.3	MCERTS	-	< 0.3	-	-	-
2,4-Dimethylphenol	mg/kg	0.3	MCERTS	-	< 0.3	-	-	-
Bis(2-chloroethoxy)methane	mg/kg	0.3	MCERTS	-	< 0.3	-	-	-
1,2,4-Trichlorobenzene	mg/kg	0.3	MCERTS	-	< 0.3	-	-	-
Naphthalene	mg/kg	0.1	ISO 17025	-	< 0.1	-	-	-
2,4-Dichlorophenol	mg/kg	0.3	MCERTS	-	< 0.3	-	-	-
4-Chloroaniline	mg/kg	0.1	NONE	-	< 0.1	-	-	-
Hexachlorobutadiene	mg/kg	0.1	MCERTS	-	< 0.1	-	-	-
4-Chloro-3-methylphenol	mg/kg	0.1	NONE	-	< 0.1	-	-	-
2,4,6-Trichlorophenol	mg/kg	0.1	MCERTS	-	< 0.1	-	-	-
2,4,5-Trichlorophenol	mg/kg	0.2	MCERTS	-	< 0.2	-	-	-
2-Methylnaphthalene	mg/kg	0.1	NONE	-	< 0.1	-	-	-
2-Chloronaphthalene	mg/kg	0.1	MCERTS	-	< 0.1	-	-	-
Dimethylphthalate	mg/kg	0.1	MCERTS	-	< 0.1	-	-	-
2,6-Dinitrotoluene	mg/kg	0.1	MCERTS	-	< 0.1	-	-	-
Acenaphthylene	mg/kg	0.2	ISO 17025	-	< 0.2	-	-	-
Acenaphthene	mg/kg	0.1	MCERTS	-	< 0.1	-	-	-
2,4-Dinitrotoluene	mg/kg	0.2	MCERTS	-	< 0.2	-	-	-
Dibenzofuran	mg/kg	0.2	MCERTS	-	< 0.2	-	-	-
4-Chlorophenyl phenyl ether	mg/kg	0.3	MCERTS	-	< 0.3	-	-	-
Diethyl phthalate	mg/kg	0.2	MCERTS	-	< 0.2	-	-	-
4-Nitroaniline	mg/kg	0.2	MCERTS	-	< 0.2	-	-	-
Fluorene	mg/kg	0.2	ISO 17025	-	< 0.2	-	-	-
Azobenzene	mg/kg	0.3	MCERTS	-	< 0.3	-	-	-
Bromophenyl phenyl ether	mg/kg	0.2	MCERTS	-	< 0.2	-	-	-
Hexachlorobenzene	mg/kg	0.3	MCERTS	-	< 0.3	-	-	-
Phenanthrene	mg/kg	0.2	ISO 17025	-	< 0.2	-	-	-
Anthracene	mg/kg	0.1	MCERTS	-	< 0.1	-	-	-
Carbazole	mg/kg	0.3	MCERTS	-	< 0.3	-	-	-
Dibutyl phthalate	mg/kg	0.2	MCERTS	-	< 0.2	-	-	-
Anthraquinone	mg/kg	0.3	MCERTS	-	< 0.3	-	-	-
Fluoranthene	mg/kg	0.2	MCERTS	-	< 0.2	-	-	-
Pyrene	mg/kg	0.2	ISO 17025	-	< 0.2	-	-	-
Butyl benzyl phthalate	mg/kg	0.3	ISO 17025	-	< 0.3	-	-	-
Benzo(a)anthracene	mg/kg	0.2	MCERTS	-	< 0.2	-	-	-
Chrysene	mg/kg	0.05	ISO 17025	-	< 0.1	-	-	-
Benzo(b)fluoranthene	mg/kg	0.1	ISO 17025	-	< 0.1	-	-	-
Benzo(k)fluoranthene	mg/kg	0.2	ISO 17025	-	< 0.2	-	-	-
Benzo(a)pyrene	mg/kg	0.1	MCERTS	-	< 0.1	-	-	-
Indeno(1,2,3-cd)pyrene	mg/kg	0.2	ISO 17025	-	< 0.2	-	-	-
Dibenz(a,h)anthracene	mg/kg	0.2	ISO 17025	-	< 0.2	-	-	-
Benzo(ghi)perylene	mg/kg	0.05	ISO 17025	-	< 0.1	-	-	-

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ARUN DISTRICT COUNCIL LU/341/16/DOC

Analytical Report Number: 14-50810

Project / Site name: North Littlehampton

Your Order No: 13-S2-FDO-LABS

Lab Sample Number				315404	315405	315406	315407	315408
Sample Reference				MBH1	MBH1	MBH2	MBH2	MBH3
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.50	1.00	1.00	2.00	0.50
Date Sampled				27/01/2014	27/01/2014	28/01/2014	28/01/2014	28/01/2014
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
PCBs by GC-MS								
PCB Congener 28	mg/kg	0.02	NONE	-	-	-	-	-
PCB Congener 52	mg/kg	0.02	NONE	-	-	-	-	-
PCB Congener 101	mg/kg	0.02	NONE	-	-	-	-	-
PCB Congener 118	mg/kg	0.02	NONE	-	-	-	-	-
PCB Congener 138	mg/kg	0.02	NONE	-	-	-	-	-
PCB Congener 153	mg/kg	0.02	NONE	-	-	-	-	-
PCB Congener 180	mg/kg	0.02	NONE	-	-	-	-	-
Total PCBs	mg/kg	0.3	NONE	-	-	-	-	-
Organochlorine Pesticides (OCP)								
Aldrin	mg/kg	0.01	NONE	< 0.01	-	-	-	< 0.01
Alpha-BHC(Lindane)	mg/kg	0.01	NONE	< 0.01	-	-	-	< 0.01
Beta-BHC(Lindane)	mg/kg	0.01	NONE	< 0.01	-	-	-	< 0.01
Chlordane (sum of cis & trans isomers)	mg/kg	0.01	NONE	< 0.01	-	-	-	< 0.01
DDD	mg/kg	0.01	NONE	< 0.01	-	-	-	< 0.01
DDE	mg/kg	0.01	NONE	< 0.01	-	-	-	< 0.01
DDT	mg/kg	0.01	NONE	< 0.01	-	-	-	< 0.01
Dieldrin	mg/kg	0.01	NONE	< 0.01	-	-	-	< 0.01
Endosulphan I	mg/kg	0.01	NONE	< 0.01	-	-	-	< 0.01
Endosulphan II	mg/kg	0.01	NONE	< 0.01	-	-	-	< 0.01
Endosulphan Sulphate	mg/kg	0.01	NONE	< 0.01	-	-	-	< 0.01
Endrin	mg/kg	0.01	NONE	< 0.01	-	-	-	< 0.01
Gamma-BHC	mg/kg	0.01	NONE	< 0.01	-	-	-	< 0.01
Heptachlor	mg/kg	0.01	NONE	< 0.01	-	-	-	< 0.01
Heptachlor epoxide	mg/kg	0.01	NONE	< 0.01	-	-	-	< 0.01
Hexachlorobenzene	mg/kg	0.01	NONE	< 0.01	-	-	-	< 0.01
Hexachlorocyclohexane	mg/kg	0.01	NONE	< 0.01	-	-	-	< 0.01
pp-Methoxychlor	mg/kg	0.01	NONE	< 0.01	-	-	-	< 0.01
Propyzamide	mg/kg	0.01	NONE	< 0.01	-	-	-	< 0.01
Organophosphorus Pesticides (OPP)								
Azinphos methyl	mg/kg	0.01	NONE	< 0.01	-	-	-	< 0.01
Diazinon	mg/kg	0.01	NONE	< 0.01	-	-	-	< 0.01
Dichlorvos	mg/kg	0.01	NONE	< 0.01	-	-	-	< 0.01
Dimethoate	mg/kg	0.01	NONE	< 0.01	-	-	-	< 0.01
Etion	mg/kg	0.01	NONE	< 0.01	-	-	-	< 0.01
Fenitrothion	mg/kg	0.01	NONE	< 0.01	-	-	-	< 0.01
Malathion	mg/kg	0.01	NONE	< 0.01	-	-	-	< 0.01
Mevinphos	mg/kg	0.01	NONE	< 0.01	-	-	-	< 0.01
Parathion	mg/kg	0.01	NONE	< 0.01	-	-	-	< 0.01
Pirimiphos methyl	mg/kg	0.01	NONE	< 0.01	-	-	-	< 0.01
Organonitrogen Pesticides (ONP)								
Atrazine	mg/kg	0.01	NONE	< 0.01	-	-	-	< 0.01
Simazine	mg/kg	0.01	NONE	< 0.01	-	-	-	< 0.01
Trietazine	mg/kg	0.01	NONE	< 0.01	-	-	-	< 0.01

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