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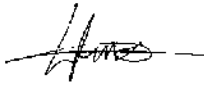
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Land off Pilling Lane, Preesall

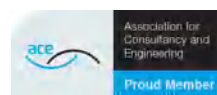
Phase 1 Geo-Environmental Investigation Report

For: Breck Homes Ltd



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1.0 INTRODUCTION

This Phase 1 Geo-Environmental Investigation report has been prepared at the request of Breck Homes Ltd. Instructions to proceed were received in January 2024. Phase 1 desk study work was undertaken in February 2024.

1.1 Site Location and Description

This report pertains to a c. 1.5 Ha site located to the south of Pilling Lane, Preesall, c. 1.3km north of Preesall Town Centre, at the approximate post code FY6 0HB. The National Ordnance Survey Grid Reference for the centre of the site is 336306E, 448617N.

The site currently comprises an undeveloped, vegetated area of land. The site is accessed from the north via a track between 66 and 68 Pilling Lane. At the time of the site walkover the site was being used as grazing for goats and sheep. The site is bound by residential properties to the north and west, and private gardens / vacant fields to the south and east. An aerial photo of the site is included below:



Figure 1: Aerial image of the site dated January 2024. Approximate site boundary highlighted in magenta. Looking north – north west.

A site location plan is contained in Appendix 2.

Proposed Development

This Phase 1 Geo-Environmental Investigation is to be used for submission to the Local Authority as part of a planning application. It is the client’s intention to develop the site into a low-rise residential development comprising 53 No. detached and semi-detached dwellings with associated private gardens, soft landscaping and access roads.

The proposed development plan is contained in Appendix 2 and an extract is shown below:



Figure 2: Extract of the proposed development plan.

1.2 Brief

The brief was to carry out a Phase 1 Geo-Environmental Investigation for the site based upon the proposed development outlined in Section 1.0. The site area is shown on the site location plan contained in Appendix 2.

The investigation was to include the following:

- a) Assess the probable ground conditions and contaminated land conditions on and below the site based on existing and historical site uses and relevant off-site activities, including a site walkover.
- b) Identify sources of contamination that may be present at the site using current contaminated land guidance and develop a conceptual site model for potential human health, ground gas and controlled waters receptors.
- c) Undertake a Preliminary Risk Assessment which will determine the requirement for further environmental (contaminated land) investigation and assessment.
- d) Design, on the basis of the anticipated ground conditions, appropriate ground investigation works and discuss potential development issues (i.e. sub-surface features – obstructions, infilling, compressible ground, faulting, mineral extraction, mining and land instability).

A report was to be provided to summarise findings and to provide recommendations.

The limitations of this investigation work and report are included in Appendix 1.

2.0 SCOPE OF INVESTIGATION WORKS

2.1 Walkover Survey

The site was visited on 2nd February 2024 in overcast weather conditions.

Photographs were taken of the site during the walkover survey and these photographs, together with a plan indicating their location and direction, are contained in Appendix 3.

2.2 Documentation

A combined Enviro + Geo Insight report (Ref: GS-XJE-9NH-U2U-5A6) was obtained from Groundsure, an environmental database company, which provides a list of recorded past and present activities at or adjacent to the site which could have an impact on the levels of contamination in the soils and groundwater at the site. As part of the desk study works, the below documents were obtained and examined. Unless otherwise stated, the documents are contained within the Groundsure Enviro + Geo Insight Report in Appendix 5:

a) Groundsure maps, all dated 2024 as follows:

- Historical Land Use map;
- Environmental Permits, Incidents and Registers map;
- Landfill and other Waste Sites map;
- Current Land Use map;
- Hydrogeology and Hydrology maps;
- Environment Agency / Natural Resources Wales flood maps;
- Designated Environmentally Sensitive Sites map;
- Geological maps and Ground Working map;
- Mining, Extraction & Natural Cavities map;
- Natural Ground Subsidence maps;
- Borehole Records map; and
- Railways and Tunnels map.

-
- b) Aerial photographs of the site dated August 2022, April 2019, July 2013, April 2010 and August 2000.
- c) Historical Ordnance Survey maps dated between 1848 and 2024, at scales of 1:1,250, 1:2,500, 1:10,000 and 1:10,560.
- d) The following sources were obtained and examined from the British Geological Survey (BGS). All items were copied under licence: [C18/01] British Geological Survey ©UKRI. All rights reserved:
- The BGS 1:50,000 solid and drift geological map (Sheet 66 dated 1975).
 - BGS boreholes from the local area (Ref: SD34NE 140 to 142).
- e) A Zetica UXO Risk Map was obtained and is included in Appendix 7.

3.0 FINDINGS

3.1 Walkover Survey

The walkover survey was carried out on 2nd February 2024 during overcast weather conditions. During the walkover survey the following features were noted.

The site currently comprises an open field, used for sheep, goat and chicken grazing. A fenced off section in the southwestern corner of the site exists as part of a residential garden. Dense vegetation is noted along the eastern and southern site boundaries and in the northwestern site corner. Further dense vegetation is present adjacent a drainage ditch located in the centre of the site, running parallel to the western site boundary. Further drainage ditches are present adjacent the western and southern site boundaries. The ground is noted to be grass underfoot and the eastern site boundary and the majority of the site was water-logged.



Figure 3: Photographs of the site entrance looking north.



Figure 4: Photographs of the dense vegetation adjacent to the drainage ditch in the centre of the site (left) and the water logged ground conditions on the eastern site boundary (right)

The topography of the site is generally flat. 3 No. mounds consisting of debris from tree clearance are noted in the southern site section. Drainage ditches are present along the western and southern site boundary as well as through the centre of the site though their depth is unknown.



Figure 5: Photographs showing a mound in the southern site section (left) and the drainage ditch along the western site boundary (right)

No overhead services are noted on site. A manhole was recorded along the track in the northern section of the site.

Established trees were noted across the site, particularly in the northwestern corner and along the eastern site boundary. Evidence of tree clearance is present, with mounds of branches and tree stumps observed in the centre of the site.



Figure 6: Photographs showing evidence of tree clearance in the centre of the site.

Contamination

A localised iridescent sheen within a waterlogged area of ground was noted on standing water in the northwestern site section, covering an area of less than c. 6cm². This is anticipated to be a naturally occurring bacterial sheen. Evidence of fly tipping was noted across the site, particularly in the northern site section where a possible fire pit and area of debris was noted containing red brick, concrete slabs, metal panels, plastic sheets, glass and ash. The drainage ditch on the western site boundary contained debris of polystyrene, plastic packaging and metal sheets.



Figure 7: Photograph showing evidence of fly tipping in the northern site section (left) and the debris observed in the drainage ditch on the western site boundary (right).

The site features plan is contained in Appendix 2. Additional walkover photographs and a photograph location plan are contained in Appendix 3.

3.2 Site History

The site development history has been researched by reference to historical maps, street plans and aerial photographs. The historical maps are included in Appendix 4 to this report and the principal observations, which are divided into on-site history and off-site history, are summarised below:

3.2.1 On-Site History

Date	Site Feature
1848 – 1930	On the earliest historical map, the site is recorded as open fields. Field boundaries are recorded to be present running parallel with the western and eastern site boundaries. A potential land drain or ditch is present in the western site area running parallel with the site boundary.
1930 - 1960	The site remains undeveloped but is subdivided into smaller fields or gardens. These field boundaries may be indicative of drainage channels.
1960 - present	4 No. small outbuildings are recorded in the northern site section. The site is no longer subdivided. A drain is recorded to be present along the western site section running parallel with the site boundary. Drains are also recorded running along the western and eastern site boundaries. Based on historical maps, the site has remained unchanged to the present day.



Figure 8: Extracts of the OS historical maps dated 1890 (left) and 2003 (right).

3.2.2 Off-Site History

Date	Site Feature	Distance (m)	Direction
1932 - 1989	A sewage disposal works is recorded in the 1930s. By the 1950s this is recorded as works. By the 1989 the works area is no longer recorded.	160	NW
1910 - 1951	Preesall Salt Mines, pumping station and associated boreholes are recorded c. 800m from the site.	800	SE

Given the agricultural and residential nature of the surrounding area, no other significant contaminative sources have been identified within 250m of the site.

3.2.3 LiDAR Data

LiDAR data for the site was obtained under Open Government licence from the DEFRA website. The data used is a 1m resolution digital terrain model (DTM) dated 2022. The LiDAR data shows the site is relatively level with an average surface level of c. 5.50m AOD. The data also highlights the presence of linear surface drains present on the site on the southern site section and through the centre of the site. These drainage features had previously been identified on historical mapping. Small stockpiles / mounds are also identified in the south eastern site section; these were identified as branches from tree clearance during the site walkover.

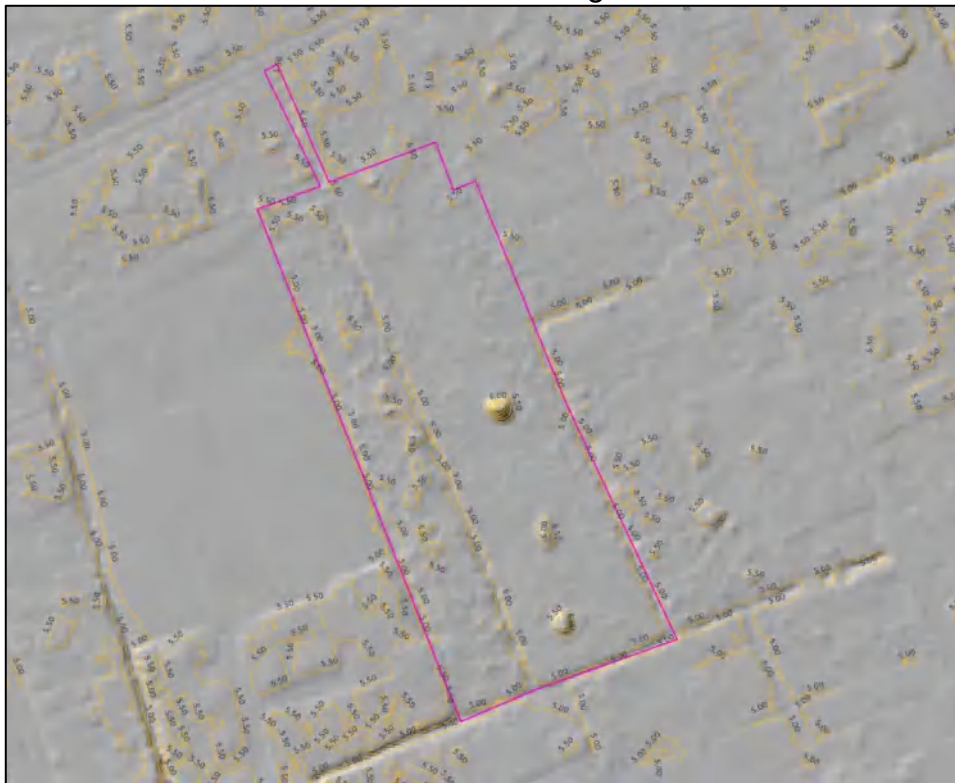


Figure 9: Image of a 1m DTM hillshade LiDAR of the site.

3.3 Geology

3.3.1 BGS Geological Map

The BGS 1:50,000 Solid and Drift Geological Map of the area (Sheet No: 66 dated 1975) indicate that the site is underlain by superficial deposits comprising **Blown Sand** which typically comprises sand transported by wind. This is anticipated to be underlain by **Tidal flat Deposits** typically comprising unconsolidated clay and silt.

The site is underlain by 2 No. recorded bedrock formations. The western site section is recorded to be underlain by the **Breckells Mudstone Formation** typically comprising reddish brown, structureless, commonly brecciated mudstone commonly with halite and gypsum. The eastern site section is underlain by the **Sherwood Sandstone** which typically comprises reddish yellow and brown sandstones.

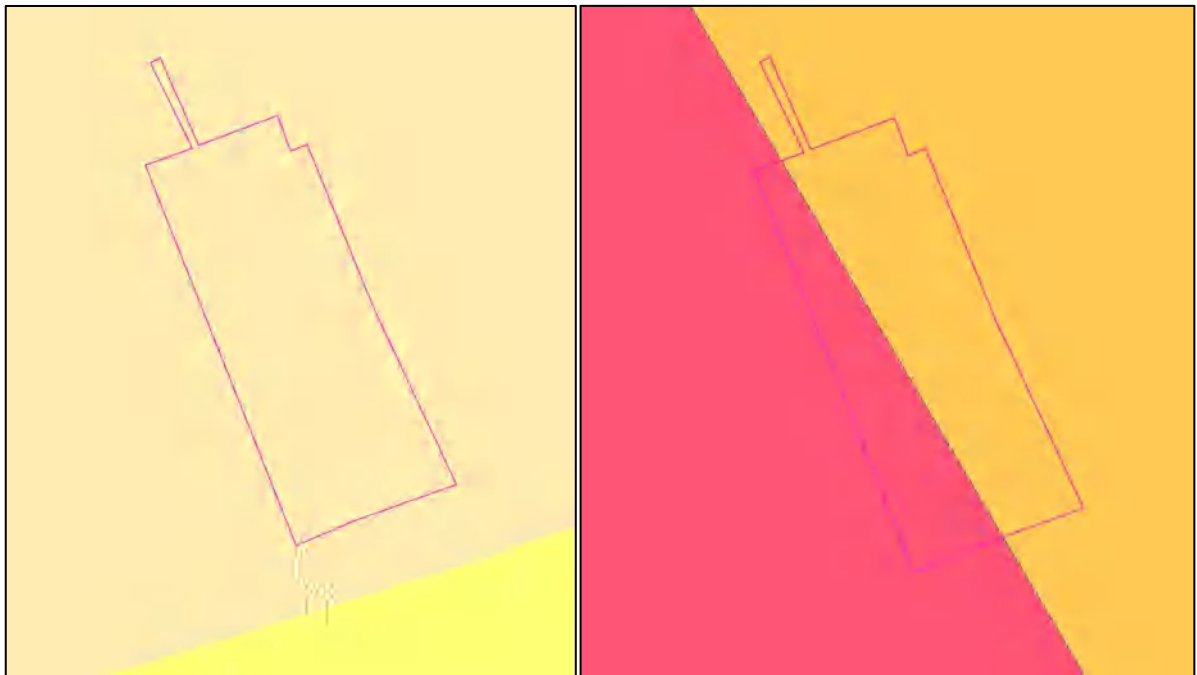


Figure 10: Extracts of the BGS 1:50,000 Drift (left) and Solid (right) Geological Maps. Cream = Blown Sand, Yellow = Tidal Flat Deposits. Pink = Breckells Mudstone Formation, Orange= Sherwood Sandstone Formation

The solid geological map indicates that a fault is present through the centre of the site. This fault is recorded as the Preesall fault which has a significant displacement of greater than 500m.

The BGS geological map of the area suggests the site lies within the eastern limb of the Preesall syncline. No dips are recorded in the area, but based on the geological structure it is anticipated that the bedrock dips to the west.

3.3.2 BGS Borehole Logs

There were no available BGS boreholes on the site. There were 3 No. BGS boreholes available in close proximity to the site within a comparable geological setting. The pertinent information from the borehole logs is outlined below:

BGS Borehole Reference: SD34NE140 – SD34NE142

These boreholes are located approximately c. 131m – 295m west of the site and were excavated to depths of between 1.60m to 6.35m bgl in 1980. The logs recorded the following pertinent information:

- **Topsoil** to a depth of 0.20m to 0.30m bgl, underlain by:
- **Blown Sand** comprising loose, brown, silty SAND to a depth of at least 6.35m bgl.

Water levels were recorded at depths of 1.30m to 1.50m bgl during construction of the boreholes.

The BGS borehole logs are contained in Appendix 6.

3.3.3 BGS Geohazards

Data Type	Details
Ground Stability Data	<ul style="list-style-type: none"> • The Potential for Shrinking or Swelling Clay Ground Stability Hazards is regarded as negligible. • The Potential for Running Sand Ground Stability Hazards is regarded as low. • The Potential for Compressible Ground Stability Hazards is regarded as negligible. • The Potential for Collapsible Ground Stability Hazards is regarded as negligible. • The Potential for Landslide Ground Stability Hazards is regarded as very low. • The Potential for Dissolution Ground Stability Hazards is regarded as low in the western site section and negligible in the eastern site section.

3.3.4 BGS Estimated Soil Chemistry

The BGS have estimated that the superficial deposits across the site to naturally comprise the following determinands:

- Arsenic: 15mg/kg
- Cadmium: 1.8mg/kg
- Chromium: 90mg/kg – 120mg/kg
- Nickel: 15mg/kg – 30mg/kg
- Lead: 100mg/kg
- Bioaccessible Lead: 60mg/kg

3.4 Mining

3.4.1 Coal Mining

The site does not lie within a Coal Authority Coal Mining Reporting Area. No coal mining features are anticipated on or in the vicinity of the site.

3.4.2 Non-Coal Mining

The Groundsure Enviro + Geo Insight report indicates that no non-coal mining is recorded to have taken place on site.

The Preesall Salt Mine is recorded on historical maps located c. 800m south east of the site. The Groundsure Enviro + Geo Insight report indicates that the Preesall Saltfield is present 435m south west of the site.

The Preesall salt mines comprised rock salt mining and brine pumping of the Preesall Halite Member. The mines were active from the 1870s and closed in the 1930s with brine pumping continuing until the 1980s. Historical subsidence as a result of salt mining have resulted in flashes (water filled hollows) occurring to the west of Preesall village (c.1.2km south west of the site).

The site is outside of the historical Preesall salt mining and brine extraction area. The eastern site section is underlain by the Sherwood Sandstone Member which is a non-

salt bearing stratum. The western site section is underlain by the Breckells Mudstone Formation which is noted to commonly contain halite and gypsum deposits. Although there are limited inclusions of halite and gypsum within the underlying mudstone, these were not of sufficient proportion for economical mining. The Preesall Halite Member was the primary target of the historical salt mining and brine extraction and is not recorded to have been mined beneath the site. The salt beds are anticipated to be present beneath the site at a depth of greater than 200m bgl based on the nearest BGS deep boreholes.

The aforementioned features are highlighted on the salt mining and brine features plan, included in Appendix 2. This plan shows that the salt and brine features occur a considerable distance to the south west of the site. An extract is included below:

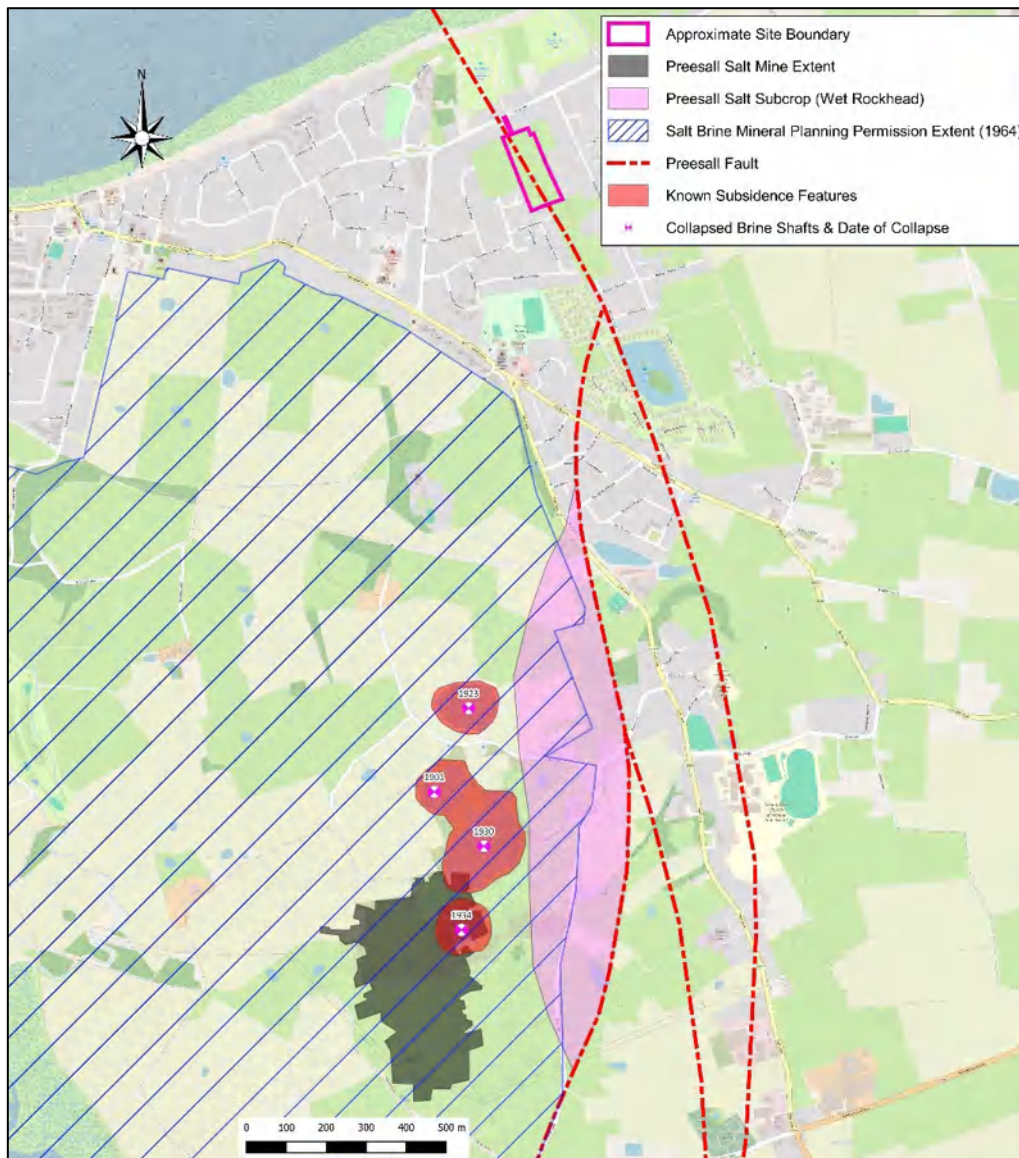


Figure 11: Extract of the Salt Mining & Brine Site Features Plan.

Given the distance and depth of salt deposits in relation to the site, the risk of halite dissolution is deemed low.

3.4.3 Historical Surface Excavations

No known historical surface excavations have been undertaken on the site. Ponds are recorded c. 100m north of the site on historical mapping. Ponds and filter beds associated with a sewage disposal works are recorded c. 115m north west of the site.

3.4.4 Mineral Safeguarding

Where mineral resources are present the mineral planning authority may designate areas as Mineral Safeguarding Areas (MSA) and Mineral Consultation Areas (MCA). These are aimed to safeguard mineral resource areas from unnecessary sterilization by non-mineral development. The BGS Mineral Resources maps designate the areas of potential mineral resources and where active / lapsed planning permission was granted for mineral extraction.

The BGS Mineral Resources Map for Lancashire and the Lancashire Minerals and Waste Local Plan indicates that the site does not lie within an area designated as containing mineral resources.

3.5 **Hydrology and Hydrogeology**

Environmental data relevant to the site and its immediately surrounding area has been obtained from sources available in the public domain. In addition, an environmental report was obtained from Groundsure. The Enviro + Geo Insight report and associated maps that have been inspected are presented in Appendix 5 and the principal observations in relation to waters and flooding have been summarised as follows:

Data Type	Details
Flooding	<ul style="list-style-type: none"> With respect to rivers and seas, the entirety of the site lies within Flood Zone 3. The flood map for planning is included in Appendix 8. Sea defences are present along the coast in this area but it is unclear what the implications will be for the proposed development. Localised areas of the site, primarily along the site boundaries are recorded to be susceptible to surface water flooding, the highest risk pertaining to a 1 in 30 year event with a floodwater depth of 0.10m to 0.30m. A BGS groundwater flooding susceptibility area has also been identified on site, however, the risk is deemed to be low.
Surface Water Features	<ul style="list-style-type: none"> 3 No. surface water features narrower than 5m are recorded to be present on site. It is anticipated that these features are open drains / ditches.
Surface Water Abstractions	<ul style="list-style-type: none"> There are no licensed surface water abstractions located on site or within 2km of the site.
Superficial Aquifer	<ul style="list-style-type: none"> The site is underlain by superficial deposits classified as a Secondary A Aquifer - <i>Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers.</i>
Bedrock Aquifer	<ul style="list-style-type: none"> The Breckells Mudstone Formation underlying the western portion of the site is classified as a Secondary B Aquifer - <i>mainly lower permeability layers that may store and yield limited amounts of groundwater through characteristics like thin cracks (called fissures) and openings or eroded layers.</i> The Sherwood Sandstone Formation is classified as a Principal Aquifer – <i>strategically important rock units that have high permeability and water storage capacity.</i>
Groundwater Abstractions	<ul style="list-style-type: none"> There are no recorded groundwater abstraction licenses located on site or within 2km of the site.
Source Protection Zones	<ul style="list-style-type: none"> There are no recorded Source Protection Zones recorded on site or within 500m of the site.
Nitrate Vulnerable Zones	<ul style="list-style-type: none"> There are no Nitrate Vulnerable Zones recorded on site or within 500m of the site.
Licensed Discharge Consents	<ul style="list-style-type: none"> There are no recorded licensed discharge consents to controlled waters located on site. 3 No. historical discharge consents have been revoked. All pertained to the discharge of miscellaneous emergency discharges into the River Irwell.
Pollution Incidents to Controlled Waters	<ul style="list-style-type: none"> There are no recorded pollution incidents to controlled waters located on site. There are 3 No. pollution incidents recorded within 500m of the site. These relate to sewage discharges 266m north of the site from 1980 to 1996, 272m north west of the site from 2004 to 2019 and 289m north west of the site between 1995 and 2004.

3.6 Hazardous Installations, Landfill and Waste

The following information relating to hazardous installations, landfill and waste obtained from the Groundsure Enviro + Geo Insight report, published information and the walkover survey can be summarised as follows:

Data Type	Details
Environment Agency Recorded Active Landfill Sites	<ul style="list-style-type: none"> There are no active Environment Agency recorded landfill sites located on site or within 500m of the site.
Environment Agency Recorded Historical Landfill Sites	<ul style="list-style-type: none"> There are no Environment Agency recorded historical landfill sites located on site. There are 2 No. Environmental Agency recorded historical landfill sites within 500m of the site. The nearest is located 238m south of the site at Willow Grove, Preesall.
BGS Recorded Historic Landfill Sites	<ul style="list-style-type: none"> There are no BGS recorded landfill sites located on site. A single BGS historical landfill is recorded 414m south of the site relating to Sandy Lane Tip, Preesall.
Local Authority Recorded Landfill Sites	<ul style="list-style-type: none"> There are no Local Authority recorded landfill sites located on site. 3 No. Local Authority recorded landfill sites located within 500m of the site, identified as refuse tips on 1967 mapping. The nearest Local Authority recorded historical landfill is 226m south of the site.
Local Authority Pollution Prevention and Control (Part A(2) and Part B Activities and Enforcements)	<ul style="list-style-type: none"> There are no Local Authority Part A2 or Part B Activities or Enforcements located on site or within 500m of the site.
Registered Radioactive Substances	<ul style="list-style-type: none"> There are no Registered Radioactive Substances recorded on site or within 500m of the site.
Registered Waste Treatment, Transfer or Disposal Sites	<ul style="list-style-type: none"> There are no waste exemptions recorded on site. There are 3 No. waste exemption sites recorded within 500m of the site. The nearest pertains to use of waste, spreading plant matter, burning of waste and deposition of waste from dredging on a farm 117m north east of the site.
Industrial Land Use	<ul style="list-style-type: none"> There are no current industrial land uses recorded on site. There are 12 No. recent industrial uses recorded within 500m of the site, the nearest is located 106m west and pertains to fences, gates and railways. There are no petrol / fuel station recorded within 500m of the site. There are no historical industrial site uses recorded on site. There are 13 No. historical industrial land uses recorded within 500m of the site. The nearest is 113m west of the site associated with sewage disposal works. Other industrial land uses within 500m of the site include: unspecified works, refuse heaps, grave yards, unspecified sheds, fire stations and police stations.
Dangerous Substances	<ul style="list-style-type: none"> There are no recorded discharges of dangerous substances on site or within 500m of the site.
Hazardous Building Materials	<ul style="list-style-type: none"> No hazardous building materials are anticipated on site.

3.7 Radon

A site-specific radon map is included in the Groundsure Enviro + Geo Insight report which finds that the site lies within an area where less than 1% of homes are above the Action Level and consequently, no radon protection measures are required.

3.8 Previous Ground Investigations

3.8.1 E3P Ground Investigation (On Site) 2023

E3P Ltd have previously undertaken a Phase 1 Desk Study and preliminary ground investigation on site in 2023. The ground investigation included the following activities:

- 19 No. mechanically excavated trial pits;
- 2 No. cable percussive boreholes to a depth of between 21.95m and 28.22m bgl;
- 13 No. dynamic sample boreholes to a depth of 4.00m to 5.45m bgl; and
- Installation of 6 No. ground gas and groundwater monitoring wells.

The typical ground conditions encountered were as follows:

- **Topsoil** comprising dark brown, slightly gravelly, slightly sandy CLAY to a depth of 0.50m bgl, underlain by:
- Localised **Made Ground** identified in 3 No. holes in the north east and south western site sections, interpreted to be reworked topsoil. Made Ground typically comprised dark brown, slightly gravelly, slightly sandy CLAY with gravel inclusions of brick, plastic and ceramic to a depth of 0.20m to 0.50m bgl, underlain by:
- **Blown Sand** comprising loose to medium dense, brownish grey, silty, fine to medium SAND to a depth of 5.00m to 6.50m bgl, underlain by:
- **Tidal Flat Deposits** comprising very soft, brown, clayey, very sandy SILT to a depth of 17.00m to 17.60m bgl, underlain by:

- **Glacial Till** comprising stiff, brown, slightly gravelly CLAY to a depth of at least 28.22m bgl.

A suspected sandstone boulder was encountered at a depth of 26.70m to 28.22m bgl at the base of the deepest cable percussive borehole (CP101). During the E3P investigation, groundwater was encountered at depths of 2.70m to 3.20m bgl.

Foundations

Given the presence of loose to medium dense Blown Sand to a depth of 5.00m to 6.50m bgl, underlain by extremely low strength silts to 17.00m bgl, traditional shallow foundations were not considered suitable on the site. E3P identified the underlying stiff, brown, slightly gravelly clay (Glacial Till) to be a suitable founding stratum at a depth of greater than 17.00m bgl.

In order to reach the Glacial Till deposits at depths of greater than 17.00m bgl, a piled foundation solution was recommended for the scheme. E3P also recommended the consideration of ground improvement techniques such as VSC or CMC, although the loadings of the proposed development and long term settlement would need further consideration. E3P also stated that a raft foundation solution may also be a viable for the proposed development.

Chemical Testing and Ground Gas Monitoring

Isolated Made Ground was identified as the only credible source of contamination. When tested for contaminants, no GAC exceedances were recorded within this material. This suggests that the isolated Made Ground would be chemically suitable for re-use, although the proportion of anthropogenic material may make this unsuitable for use within proposed gardens.

No GAC exceedances were recorded in tested soils in the E3P report. E3P stated that chemical analysis of the natural Topsoil and subsoil deposits indicate that these soils would be suitable for re-use within proposed private gardens subject to chemical validation samples to confirm this.

Of the reports available to IGE Consulting, the ground gas and groundwater monitoring was ongoing and not recorded.

3.8.2 Betts Geo Ground Investigation (West of Site) 2020

Betts Geo undertook a ground investigation immediately west of the site in 2020 to support a proposed housing development. The ground investigation included the following activities:

- 6 No. mechanically excavated trial pits across the site to a depth of 2.80m to 3.30m bgl;
- 5 No. dynamic sample boreholes to a depth of 4.00m to 5.45m bgl; and
- Installation of 5 No. ground gas and groundwater monitoring wells.

The typical ground conditions encountered were as follows:

- **Topsoil** comprising dark brown, very sandy CLAY to a maximum depth of 0.45m bgl, underlain by:
- **Blown Sand** comprising loose to medium dense, brown, slightly clayey, slightly silty, fine to coarse SAND to a depth of at least 4.00m bgl.

Made Ground with a strong organic odour was encountered in a single trial pit (TP05) in the eastern section of the investigation area (adjacent to the western boundary of the site). This material comprised loose, to medium dense, brown, very clayey SAND to a depth of 1.30m bgl. This material was interpreted to be associated with an historical drain.

Foundations

Given the presence of loose to medium dense sand at shallow depths on site, Betts recommended the use of reinforced strip foundations or raft foundations for the proposed low-rise housing development. Given the presence of a shallow tidal groundwater table, Betts recommended that if reinforced strip foundations were to be used, these should be designed based on 50kN/m².

Chemical Testing and Ground Gas Monitoring

No GAC exceedances for a *residential with home grown produce scenario* were identified in any of the soil samples sampled and tested (including the isolated Made Ground).

Ground gas and groundwater monitoring visits were undertaken following the ground investigation works. 6 No. visits were undertaken which recorded a shallow groundwater regime ranging from 0.11m to 1.18m bgl. The monitoring data also suggested that the groundwater on the site was influenced by the tides.

Over the 6 No. ground gas monitoring visits, only the first visit had response zones above the water table (not flooded). The first monitoring visit recorded elevated carbon dioxide above 5% in 3 No. wells. The maximum carbon dioxide reading was 10.3%. A gas flow of 0.1l/hr was recorded on this visit. A peak site carbon dioxide reading of 2.0% was recorded in subsequent visits, however it should be noted that all subsequent monitoring visits had flooded wells.

As a result of elevated carbon dioxide (maximum of 10.3%) recorded in a single visit, Betts classified the site as Characteristic Situation 2 with ground gas protection measures recommended.

3.9 Unexploded Ordnance (UXO)

The Zetica UXO risk map, contained in Appendix 7, indicates that the site lies within an area of low risk.

3.10 Animal Burial Sites

The Animal Health and Veterinary Laboratories Agency (AHVLA) no longer routinely respond to consultations relating to records of animal burial sites. Based upon a review of the site history it is considered unlikely that the site has been subject to recorded animal burials.

3.11 Archaeology

We do not anticipate that the site will be affected by archaeological issues, however consultation with the county archaeologist is recommended.

4.0 CONCLUSIONS

4.1 General

The majority of the site is undeveloped land with isolated areas of Made Ground anticipated. Based on the site history, no former developments, significant sources of contamination or ground obstruction are anticipated on the site.

4.2 Ground Conditions and Geotechnical Hazard Identification

The anticipated typical ground conditions across the site are as follows:

- **Topsoil** comprising dark brown, slightly gravelly, slightly sandy CLAY to a depth of 0.15m to 0.50m bgl, underlain by:
- Localised **Made Ground** comprising dark brown, slightly gravelly, slightly sandy CLAY with gravel of brick, plastic and ceramic to a depth of 0.20m to 0.50m bgl, underlain by:
- **Blown Sand** comprising loose to medium dense, brownish grey, silty, fine to medium SAND to a depth of 5.00m to 6.50m bgl, underlain by:
- **Tidal Flat Deposits** comprising very soft, brown, clayey, very sandy SILT to a depth of 17.00m to 17.60m bgl, underlain by:
- **Glacial Till** comprising stiff, brown, slightly gravelly CLAY to an estimated depth of 30.00m bgl, underlain by:
- **Breckells Mudstone Formation** (west of site) & **Sherwood Sandstone Formation** (east of site).

4.2.1 Geotechnical Hazard Identification

Potential geotechnical hazards based on the expected ground conditions that may require further consideration at the site are outlined below:

Factors	Remarks	Considerations	Hazard
Localised Made Ground	Although not anticipated to be widespread, Made Ground might be present in localised areas across site.	Made Ground may settle variably, have highly inconsistent bearing capacity and may suffer significant movements that may be problematic for foundations, externals and infrastructure elements without treatment. The presence of Made Ground may be problematic for foundations as there may be loose / soft spots within the Made Ground and it may not be suitable to utilise traditional foundations.	Low
Aggressive Ground and Groundwater	While the risk posed from the natural strata is anticipated to be very low, given the anticipated presence of localised Made Ground there is potential for aggressive ground conditions to be present on-site. The presence of tidal groundwater may also cause aggressive conditions.	Acidic ground / groundwater and sulfate may attack the concrete and steel used in foundations and react with aggregates. The oxidation of pyrite and other sulfides can also occur due to geotechnical activities. This can lead to the generation of high concentrations of sulfate and low pH that attacks construction materials and may lead to the precipitation of gypsum resulting in the heave of foundations and floor slabs. Pyrite oxidation can also be triggered by mixing susceptible materials with lime or cement resulting in high pH that can lead to the expansion of some sulfates that cause heave of stabilised soils.	Moderate
Shrink and Swell Clays	Established trees are present along the site boundaries and along field boundaries. The previous ground investigation works have not identified shallow, fine soils that would be susceptible to shrink and swell. However, fine soils may be present in localised areas.	Some types of ground (e.g., clay soils) can change volume due to changes in moisture content that may be induced by weather variations (e.g., drought), vegetation (e.g., growth or removal of trees) or man-made activities (e.g., changes to local drainage). This shrink / swell behaviour typically causes ground movement to a depth of approx. 3m potentially damaging building foundations, externals, pipes or services by differential movements.	Low
Compressible Deposits	Very soft, extremely low strength silts and clays are anticipated at depths of 5.00m to 17.00m bgl based on previous ground investigation works. These deposits may be highly compressible.	May cause significant or differential settlement of foundations if placed on compressible ground	Low to Moderate
Soft Spots	Soft spots may be present across the site associated with localised excavations i.e. previous ground investigations, tree removal and open land drains.	Soft spots may cause differential settlement of foundations therefore there will be a requirement for localised deepening of foundations where soft spots are present.	Low to Moderate

4.3 Sources of Contamination and Probable Contaminants

Based on the desk study information the following potentially contaminative on-site sources have been identified:

Potentially Contaminative Source	Associated Determinands	Remarks
Localised On-Site Made Ground	Unknown, anticipated to be metals, semi-metals, PAHs, TPH, asbestos. Ground Gas – carbon dioxide, methane, hydrogen sulfide, VOCs	Localised areas of Made Ground have been recorded on site during previous ground investigations. No elevated concentrations of tested contaminants were identified.
Fly Tipping	Unknown, anticipated to be metals, semi-metals, PAHs, TPH, asbestos.	Localised fly tipping was recorded around the site boundaries. This was identified at the surface and consisted of inert materials including plastics and brick.

No evidence has been recorded to confirm that the site has been used for crop cultivation at any point of its history. There is no evidence for the use of herbicides and pesticides therefore agricultural land use as a contaminative source will not be considered further at this site.

It should be noted that potentially contaminative unrecorded historical activities may have occurred (e.g. the use or deposition of Made Ground from off-site activities) and in this event, further contaminative sources may be present.

4.3.1 Unknowns

Following the desk study, the areas of uncertainty include the depth to bedrock, the presence and extent of any localised Made Ground, and the presence, depth and tidal nature of the groundwater regime.

4.4 Identified Pathways of Contamination

Human Health		Controlled Waters		Ground Gas	
A	Ingestion of dust and soil	A	Vertical migration through coarse Made Ground and coarse soils	A	Preferential migration along foundations & service ducts
B	Dermal contact with dust and soil	B	Lateral migration along low permeability natural soils & pooling at relative low points	B	Migration within groundwater
C	Inhalation (dust)	C	Vertical migration along future foundations and pooling at base	C	Ingress through cavity walls & floors
D	Inhalation (vapours)	D	Migration through porous bedrock	D	Inhalation
E	Consumption of homegrown produce	E	Overland flow		
F	Inhalation and oral backgrounds				

4.5 Identified Receptors of Contamination

Human Health receptors include the following:

- End Users (residential land use scenario);
- Construction workers; and
- The general public and adjacent site users.

Controlled waters receptors include the following:

- Groundwater contained within the underlying Secondary A Aquifer in the superficial deposits and underlying Secondary B and Principal Aquifers in the bedrock; and
- Surface Water – On-site drainage ditches.

Other receptors include the following:

- Subsurface plastic (e.g. potable plastic water pipe); and
- Building fabric (e.g. concrete foundations, etc).

4.6. Conceptual Model for Human Health Risk Assessment

A site conceptual model in the form of a linkage table for the purposes of a preliminary risk assessment for the human health of site occupants has been produced as a result of the probable contaminants, pathways and receptors identified above. A diagram of the site conceptual model is included as Appendix 2.

Conceptual Model for Human Health Assessment					
Sources of Contamination	Pathway	Receptor	Hazard (severity)	Likelihood	Risk
Localised Made Ground	A	End users	Effect on human health (Medium)	Low Likelihood: Widespread contamination is not anticipated based on the historical site use, walkover evidence and previous ground investigation works.	Low to Moderate
	B	General public		Following development, dermal, ingestion and inhalation pathways will be reduced across the majority of the site due to the presence of hardstanding (buildings and roads). However, private gardens and areas of soft landscaping will be at increased risk.	
C	Construction workers	Low Likelihood, reduced to Unlikely: Construction workers are at the highest risk due to acute interaction with soils, however, no significant widespread contamination is anticipated, only localised hotspots. Additionally, appropriate PPE and health and safety measures are anticipated to significantly reduce the risk, therefore the risk is mitigated to low.		Low	
E		Unlikely: No potential sources of VOCs have been identified. If localised contaminative hotspots of VOCs are present (i.e .from possible spillage from farming equipment), given their relative mobility and volatility VOCs are unlikely to remain at significant concentrations.		Low	
Fly Tipping	D	End users and general public	Unlikely: Construction workers at increased risk if any disturbance of soil occurs as this may generate a temporary increase in the release of soil vapours, however risk remains low given the lack of a source of VOCs.	Low	
		Construction workers		Low	

4.7 Conceptual Model for Ground Gas Risk Assessment

A conceptual model in the form of a linkage table for the purposes of a preliminary risk assessment for ground gas has been produced as a result of the probable contaminants, pathways and targets identified above as follows:

Conceptual Model for Ground Gas Risk Assessment					
Source	Pathway	Receptor	Hazard (severity)	Likelihood	Risk
Localised Made Ground	A	Human occupants	Effect on human health (Mild to Severe*)	<p>Unlikely: Made Ground is anticipated to be present on site in localised areas, however it is not considered a significant ground gas source as it is unlikely to contain putrescible / organic rich inclusions, therefore, the ground gas risk associated with the Made Ground is anticipated to be low. Based on the previous ground investigation works, the localised Made Ground is anticipated to be of a thin thickness (maximum recorded thickness of 0.50m).</p> <p>Natural deposits on site are not considered to be a ground gas risk.</p> <p>No significant off-site sources have been identified.</p>	Low
	B	Site Workers			
	C	Building and Structures	Damage to building (Mild to Severe*)		
	D				

*Due to the risk of explosion.

4.8 Conceptual Model for Controlled Waters Risk Assessment

A site conceptual model in the form of a linkage table for the purposes of a preliminary risk assessment for pollution of waters has been produced as a result of the probable contaminants, pathways and targets identified above as follows:

Conceptual Model for Controlled Waters Risk Assessment					
Source	Pathway	Receptor	Hazard (severity)	Likelihood of Occurrence	Risk
Localised Made Ground Fly Tipping	A	Groundwater within the Secondary A superficial deposits and Secondary B Aquifers and Principal Aquifer bedrock deposits	Effects to controlled waters (Mild)	Pre-Development Site Low Likelihood: No significant potential sources of contamination have been identified on site. Localised Made Ground may be present however is unlikely to contain mobile determinands at elevated concentrations.	Low
	C			The underlying Secondary A Aquifer within the superficial deposits is most at risk given coarse soils area anticipated. The underlying bedrock aquifers are anticipated to be protected by a significant thickness of low permeability Glacial Till from c. 17.00m bgl.	
	D			Post Development Site Unlikely: Following development there will be a significant increase in hardstanding (i.e. buildings and roads) across the site therefore vertical migration will be significantly reduced. Furthermore, if any contamination is encountered, then remedial measures may be undertaken for human health purposes (i.e. possible removal of source) further reducing the risk to controlled waters.	Very Low
	B			Open Ditches On Site	Effects to controlled waters: (Mild)
Post Development Site: Unlikely: Although the presence of hardstanding is likely to increase significantly following development, the risk remains low as any contamination is likely to be beneath hardstanding or beneath areas of soft landscaping / private gardens which will facilitate vertical migration rather than lateral migration to the surface water receptors.		Very Low			

4.9 Preliminary Risk Assessment Summary

Human Health

Based on the human health conceptual model the risk to human health is deemed low to moderate to end users and construction workers due to the presence of localised Made Ground. Although the risk to construction workers is increased due to their acute interaction with site soils, it is envisaged that with appropriate PPE and site management, risks to construction workers can be mitigated therefore the risk is reduced to low.

Ground Gas

Localised Made Ground is identified as a potential source of ground gas, however this has a recorded maximum thickness of 0.50m and was indicative of reworked topsoil. This localised Made Ground is not considered a significant ground gas source with a low generation potential. Based on the site history, the presence of unrecorded organic-rich and putrescible deposits is deemed unlikely. Based on the limited ground gas sources identified on site, the ground gas risk is deemed low.

Groundwater monitoring will be required for this site due to the presence of shallow groundwater across the site, therefore ground gas monitoring will be undertaken as a matter of course to confirm the low ground gas risk.

Controlled Waters

Although sensitive receptors have been identified on-site (Secondary A aquifer within the superficial deposits and Secondary B and Principal Aquifers in the bedrock at depth) no significant contaminative linkages exist, therefore the risk to controlled waters is deemed low.

If unrecorded contaminative sources are noted, the above conceptual models may require re-assessment.

4.10 Scope of Phase 2 Intrusive Geo-Environmental Ground Investigation

As a result of the preliminary risk assessment, a Phase 2 intrusive geo-environmental ground investigation should be carried out to quantify the identified risks. This intrusive ground investigation works should include the collection of appropriate samples, across the site for appropriate chemical testing as detailed above.

Furthermore, to determine the geotechnical and geological properties of the underlying ground conditions, appropriate intrusive works and associated testing should be undertaken. The rationale and aims for these Phase 2 environmental, geotechnical and geological investigative works are detailed below.

In order to provide adequate assessment in terms of both environmental and geotechnical site parameters, ground investigation works will be required on a spatial basis.

The proposed initial ground investigation works should comprise a programme of dynamic sampling boreholes, mechanically excavated trial pits and cone penetration testing (CPT). The CPT rig is proposed to gain deep ground information for either a raft or piled foundation design.

The rationale for the exploratory holes is discussed below:

- To allow the collection of samples from the Made Ground and natural deposits for chemical laboratory testing (solid samples) for an appropriate suite of determinands and to determine the suitable concrete classification in associated with relevant guidance e.g. BRE Special Digest 1;
- To determine the extent, composition and depth of any Made Ground deposits;
- To determine the nature, thickness and extent of superficial deposits, with in-situ measurements of geotechnical parameters through CPT;
- Enable geotechnical testing, including density testing (SPTs), hand shear vane (HSV) testing and undrained shear strengths of the underlying Made Ground and natural deposits for the purposes of sub-structure design; and

- To allow installation of groundwater monitoring wells and subsequently to allow groundwater and ground gas monitoring.

Based on the findings of the initial ground investigation works, further works may be required for detailed design including California Bearing Ratio determinations, testing for earthworks information and deep ground investigation to inform pile design.

5.0 RECOMMENDATIONS

- As a result of the information gathered and the risks identified in this report, there is a low to moderate risk to human health on the basis that feasible contaminative linkages have been identified for end users and construction workers in localised areas. The risk to controlled waters is deemed very low to low given the lack of significant contaminative linkages.
- Localised Made Ground (maximum thickness 0.50m bgl) is anticipated on site. Given the limited thickness and extent, this is not considered a significant ground gas source. Natural deposits on site are not considered to be a ground gas risk. No significant off-site sources have been identified. Consequently, the ground gas risk for the site is deemed low. No ground gas monitoring is considered necessary but given groundwater monitoring on the site will be required, ground gas monitoring could be undertaken as a matter of course.
- Due to geotechnical requirements, ground investigation works should be undertaken in order to determine the ground conditions with a greater degree of certainty and allow design of the proposed development, drainage, services and immediate external areas to be undertaken. It is therefore recommended that exploratory holes are constructed where access is permitted across the site.
- From the results of the Phase 2 ground investigation work – if this report identifies a potential risk and / or a requirement for further detailed site-specific assessment, a Phase 3 environmental investigation report and / or a Remedial Strategy (informing on potential remediation solutions) may be required.
- The nature and extent of the proposed targeted chemical and environmental testing should be confirmed, if time / commercial constraints allow, with the relevant Local Authority Environmental Health Officer and the Environment Agency prior to undertaking works on-site. Proceeding without agreement between regulatory authorities may result in further assessment being required.

-
- It should be noted that, if any visual or olfactory evidence of contamination is encountered during remediation or construction work, then the Local Authority Environmental Health Officer and Environment Agency should be contacted immediately in order to agree any necessary remediation measures.
 - Given the possibility of services on site, full service plans should be obtained prior to any intrusive ground investigation works.
 - Due to the presence of established trees on site, an arboricultural survey is recommended.
 - Given the site lies entirely within Flood Zone 3 it is recommended that a Flood risk Assessment (FRA) is undertaken to establish requirements for the proposed development.

APPENDIX 1

LIMITATIONS OF INVESTIGATION WORK AND REPORT AND CONTAMINATED LAND LEGISLATIVE FRAMEWORK

LIMITATIONS OF REPORT

This consultancy report was compiled and carried out by IGE Consulting Limited ('IGE') for the client, as defined in the main report (the 'client'), on the basis of a defined programme and scope of works and the terms of a contract between IGE and the client. IGE undertook this with all reasonable skill and care, taking into account the limits of the scope of works required by the client, the prevailing site conditions, the time scale involved and the resources, including financial and manpower resources, agreed between IGE and the client. IGE cannot accept responsibility to any parties whatsoever, following the issue of this report, for any matters arising which may be considered outwith the agreed scope of works.

Unless otherwise agreed this report has been prepared exclusively for the use and reliance of the client in accordance with generally accepted consulting practices. This report may not be relied upon, or transferred to, by any other party without the written agreement of its author. If a third party relies on this report, it does so wholly at its own and sole risk and IGE disclaims any liability to such parties.

It is IGE's understanding that this report is to be used for the purpose described in the 'Brief' section of this report. That purpose was a significant factor in determining the scope and the services to be provided. Should the purpose for which the report is used, or the proposed use of the site change, this report may no longer be valid and any further use of, or reliance upon the report in those circumstances by the client without IGE's review and advice shall be at the client's sole and own risk.

The information contained in this report is protected by disclosure under Part 3 of the Environmental Information Regulations 2004 pursuant to the provisions of Regulation 12(5) without the consent in writing of a Director of IGE.

This report is a function of the date it was written and should be read in light of any subsequent changes in legislation, statutory requirements and industry practices. Ground conditions can also change over time and further investigations or assessment should be made if there is any significant delay in acting on the findings of this report. The passage of time may result in changes in site conditions, regulatory or other legal provisions, technology or economic conditions which could render the report inaccurate or unreliable. The information and conclusions contained in this report should not be relied upon in the future without the written advice of IGE. In the absence of such written advice of IGE, reliance on the report in the future shall be at the client's own and sole risk. Should IGE be requested to review the report in the future, IGE shall be entitled to additional payment at the then existing rate or such other terms as may be agreed between IGE and the client.

The observations and conclusions described in this report are based solely upon the scope of works agreed between the client and IGE. IGE has not performed any observations, investigations, studies or testing not specifically set out or mentioned within this report. IGE is not liable for the existence of any condition, the discovery of which would require performance of services not otherwise contained in the agreed scope of works. For the avoidance of doubt, this report is strictly limited to the nature of contamination contained within the ground and groundwater at the site. The report does not cover environmental aspects such as air or noise pollution and ground vibrations and the like. In addition, ecological matters relating to wildlife, flora and fauna have not been investigated as part of this report. In particular, the site has not been inspected for the presence or otherwise of invasive species (e.g. Japanese Knotweed). It is recommended that the client appoints a specialist in this subject to carry out a detailed inspection / survey of the site if its presence is suspected. Where mention has been made to the suspected presence asbestos or asbestos-containing materials this is for indicative purposes only and does not constitute or replace full and proper surveys.

Throughout the report the term 'geotechnical' is used to describe aspects relating to the physical nature of the site (such as foundation requirements) and the term 'geo-environmental' is used to describe aspects relating to ground-related environmental issues (such as potential contamination). However, it should be appreciated that this is an integrated investigation and these two main aspects are inter-related. The geo-environmental sections are written in broad agreement with BS 10175:2011+A2 2017.

LIMITATIONS OF INVESTIGATION WORK

Desk Study References

This report is based upon IGE's observations of existing physical conditions at the site gained from a walkover survey of the site together with IGE's interpretation of information including documentation, obtained from third parties and from the client on the history and usage of the site. Reliance has been placed on this publicly available data obtained from the sources identified in the main report. When using the information, it has been assumed that it is correct. The findings and recommendations contained in this report are based in part upon information provided by third parties, and whilst IGE have no reason to doubt the accuracy and that it has been provided in full from those it was requested from, the items relied on have not been verified. No responsibility can be accepted for errors within third party items presented in this report. IGE did not attempt to independently verify the accuracy or completeness of information, documentation or materials received from the client or third parties, including laboratories and information services. IGE is not liable for any inaccurate information or conclusions, the discovery of which inaccuracies required the doing of any act including the gathering of any information which was not reasonably available to IGE and including the doing of any independent investigation of the information provided to IGE except when otherwise provided in the terms of the contract between the client and IGE.

Historical Mapping

Historical Ordnance Survey maps do not provide a comprehensive description of a site history. They provide details of the site from a date prior to the publication of the map (i.e. a snapshot in time). The period between map editions can be substantial (i.e. several decades). Not all map series are available for every date range in many areas of the UK and therefore there will be gaps in this mapped record for some sites. Potentially contaminative land uses could have been present and removed during such periods and may therefore not form a part of this particular record. In addition, there will be potentially contaminative land uses which are not identified on the map records such as small scale storage / use of hazardous materials, illegal / unlicensed waste disposal activities etc. Different map series identify different features utilising different symbols which can result in features that remain on-site being removed from maps. Some features are also not mapped for security reasons (e.g. airfields and other military installations). These areas are mostly shown as blank areas on historical maps.

Site Walkover

During the site walkover reasonable effort has been made to obtain an overview of the site conditions. However, during the site walkover no attempt has been made to enter areas of the site that are unsafe or present a risk to health and safety, are locked, barricaded, overgrown, or the location of the area has not been made known or accessible.

Flooding

Flooding in this report is defined as flooding caused by the sea, ditches, rivers, streams, ponds, lakes, reservoirs and the like. It does not extend to flooding caused by surcharged piped drainage systems and investigations into flooding of this nature are excluded from this report.

Extent of Contamination Studies

Site sensitivity assessments have been made based on available information at the time of writing and are ultimately for the decision of the regulatory authorities. The conclusions and recommendations sections of the report provide an overview and guidance only and should not be specifically relied upon without considering the context of the reporting in full. The conclusions resulting from this study are not necessarily indicative of future conditions or operating practices at or adjacent to the site.

Intrusive Investigation

Where field investigations have been carried out these have been restricted to a level of detail required to achieve the stated objectives of the work. Ground conditions can also be variable and as investigation excavations only allow examination of the ground at discrete locations, the potential exists for ground conditions to be encountered which are different to those considered in this report. The explored extent of the site area depends on the soil and groundwater conditions, together with the position of any current structures and underground facilities and natural and other activities on site. In addition, chemical analysis was carried out for a limited number of parameters, based on an understanding of the available operational and historical information, and it should not be inferred that other chemical species are not present.

The groundwater conditions entered on the exploratory hole records are those observed at the time of investigation. The normal speed of investigation usually does not permit the recording of an equilibrium water level for any one water strike. Moreover, groundwater levels are subject to seasonal variation or changes in local drainage conditions and higher groundwater levels may occur at other times of the year than were recorded during this investigation.

Exploratory Holes

Where exploratory holes have been carried out as part of this investigation, the spacing has been determined to provide a reasonable indication of the general ground conditions across the site, but the number has ultimately been limited by commercial constraints. The findings of the exploratory holes relate specifically to the exploratory hole locations and are no absolute guarantee of the ground conditions between such locations. Due allowance should be made for the possibility of variation in conditions between exploratory hole locations.

Extent of Contamination Testing

The extent of contaminated land testing carried out on samples obtained from the site has been determined in accordance with the latest legal guidance issued by the government to provide, with reasonable certainty, the probable general levels of contamination present on site that could pose a significant hazard to human health or waters. The extent of site investigation works including chemical testing has also been limited by reasonable commercial constraints. Although extensive testing of samples has been carried out, the volume of samples taken for testing are a minute fraction of the total volume of soils and groundwater present on site. Therefore, there is a residual risk that undetected pockets of contamination may be present on site, situated between testing locations.

When investigating or developing potentially contaminated land it is important to recognise that sub-surface conditions may vary spatially and temporally. The absence of certain ground, ground gas, contamination or groundwater conditions at the positions tested is not a guarantee that such conditions do not exist anywhere across the site. Site sensitivity assessments have been made based on available information at the time of writing and are ultimately for the decision of the regulatory authorities. The conclusions resulting from this study are not necessarily indicative of future conditions or operating practices at or adjacent to the site.

Extent of Geo-Environmental Studies

This report is strictly limited to the nature of contamination contained within the ground and groundwater at the site. The report does not cover environmental aspects such as air or noise pollution and ground vibrations and the like. In addition, ecological matters relating to wildlife, flora and fauna have not been investigated as part of this report. In particular, the site has not been inspected for the presence or otherwise of invasive species e.g. Japanese Knotweed. It is recommended that the Client appoints a specialist in this subject to carry out a detailed inspection / survey of the site if its presence is suspected. Where mention has been made to the identification asbestos or asbestos-containing materials this is for indicative purposes only and does not constitute or replace a full and proper survey. If an Unexploded Ordnance (UXO) report has been obtained within the report, it has been so on the basis of Health and Safety concerns and no assessment has been made other than transcribing the recommendations of the sub-contractor contained within the report. In terms of a potential contaminative source, unless ordnance has been manufactured / stored on site, UXOs will only be determined as a contaminative source following a positive identification on site.

PLANNING CONTEXT

The National Planning Policy Framework (NPPF, 2023) states that the purpose of the planning system is to contribute to the achievement of sustainable development. In order to do this the planning system has three overarching objectives, one of which directly relates to the potential for pollution and contaminated land:

- *'environmental objective - to contribute to protecting and enhancing our natural, built and historic environment; including making effective use of land, helping to improve biodiversity, using natural resources prudently, minimising waste and pollution, and mitigating and adapting to climate change, including moving to a low carbon economy'*.

In accordance with this environmental objective, Paragraph 124 clarifies that 'making effective use of land' includes to:

- *'give substantial weight to the value of using suitable brownfield land within settlements for homes and other identified needs, and support appropriate opportunities to remediate despoiled, degraded, derelict, contaminated or unstable land'*.

In accordance with this environmental objective, Paragraph 180 clarifies that 'conserving and enhancing the natural environment includes:

- *'preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability'; and*
- *'remediating and mitigating despoiled, degraded, derelict, contaminated and unstable land, where appropriate'.*

Paragraph 189 of the NPPF states that planning policies and decisions for developments should also ensure that:

- *'a site is suitable for its proposed use taking account of ground conditions and any risks arising from land instability and contamination. This includes risks arising from natural hazards or former activities such as mining, and any proposals for mitigation including land remediation (as well as potential impacts on the natural environment arising from that remediation)'; and,*
- *'after remediation, as a minimum, land should not be capable of being determined as contaminated land under Part IIA of the Environmental Protection Act 1990'; and*
- *'adequate site investigation information, prepared by a competent person, is available to inform these assessments'.*

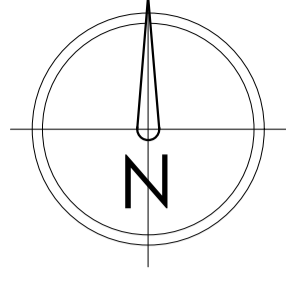
This report has been prepared and authorised by staff that are competent as defined in the NPPF.

APPENDIX 2

FIGURES AND DRAWINGS



Accommodation Schedule	
15No. 2b3p Bungalow	74 sq.m
14No. 2b4p House Types	68 sq.m
03No. 2b4p Corner House Types	68 sq.m
11No. 3b5p House Types	82 sq.m
10No. 4b6p House Types	100 sq.m
Total 53No. Units	
Site Area = 1.50 Hectares	



2b3p 74 Dormer Bungalow

2b4p 68 House Type
2b4p 68 Corner House Type

3b5p 82 House Type

4b6p 100 House Type

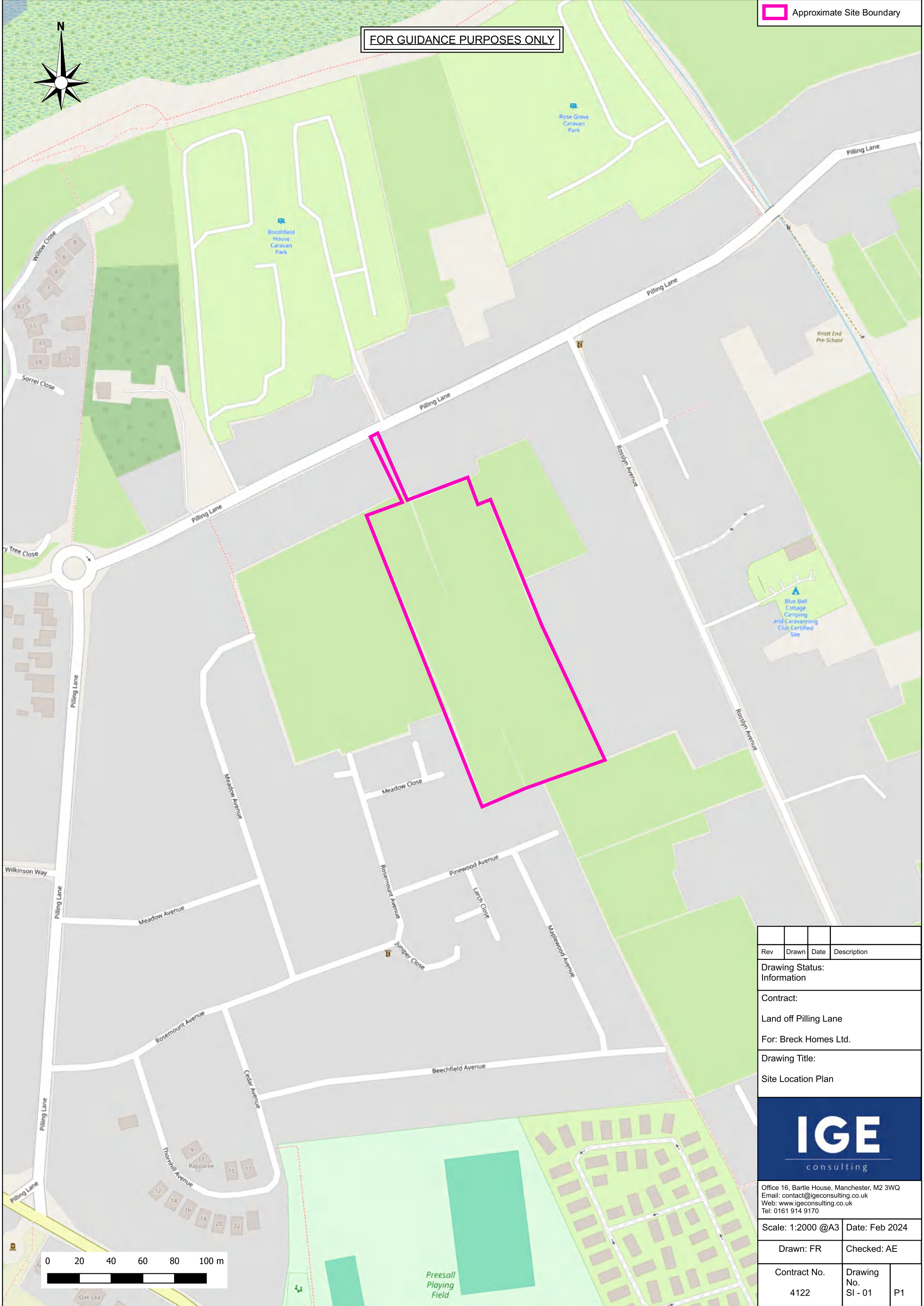
Site Density = 35 Units Per Hectare

Car Parking
2 Spaces for 2 & 3 Bedroom Units
3 Spaces for 4 Bedroom Units

REV	DATE	DRAWN	DESCRIPTION	APPROV	TRC
TITLE: PROPOSED SITE LAYOUT					
			Breck Homes 211 Scapellato Court Bamber Bridge Preston PR3 5AW Tel: 01524 587 000 Fax: 01524 587 001 www.breck.co.uk hello@breck.co.uk		
PROJECT: ROSEMOUNT AVENUE, PREESELL					
DATE:	SCALE:	JOB REF:	DRAWING NUMBER:	REV:	
FEB 24	1:500 @ A1	-	P01 - Proposed Site Layout	-	

FOR GUIDANCE PURPOSES ONLY

Approximate Site Boundary



Rev	Drawn	Date	Description

Drawing Status: Information

Contract: Land off Pilling Lane
For: Breck Homes Ltd.

Drawing Title: Site Location Plan

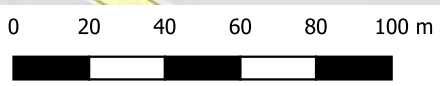


Office 16, Bartle House, Manchester, M2 3WQ
Email: contact@igeconsulting.co.uk
Web: www.igeconsulting.co.uk
Tel: 0161 914 9170

Scale: 1:2000 @A3 Date: Feb 2024

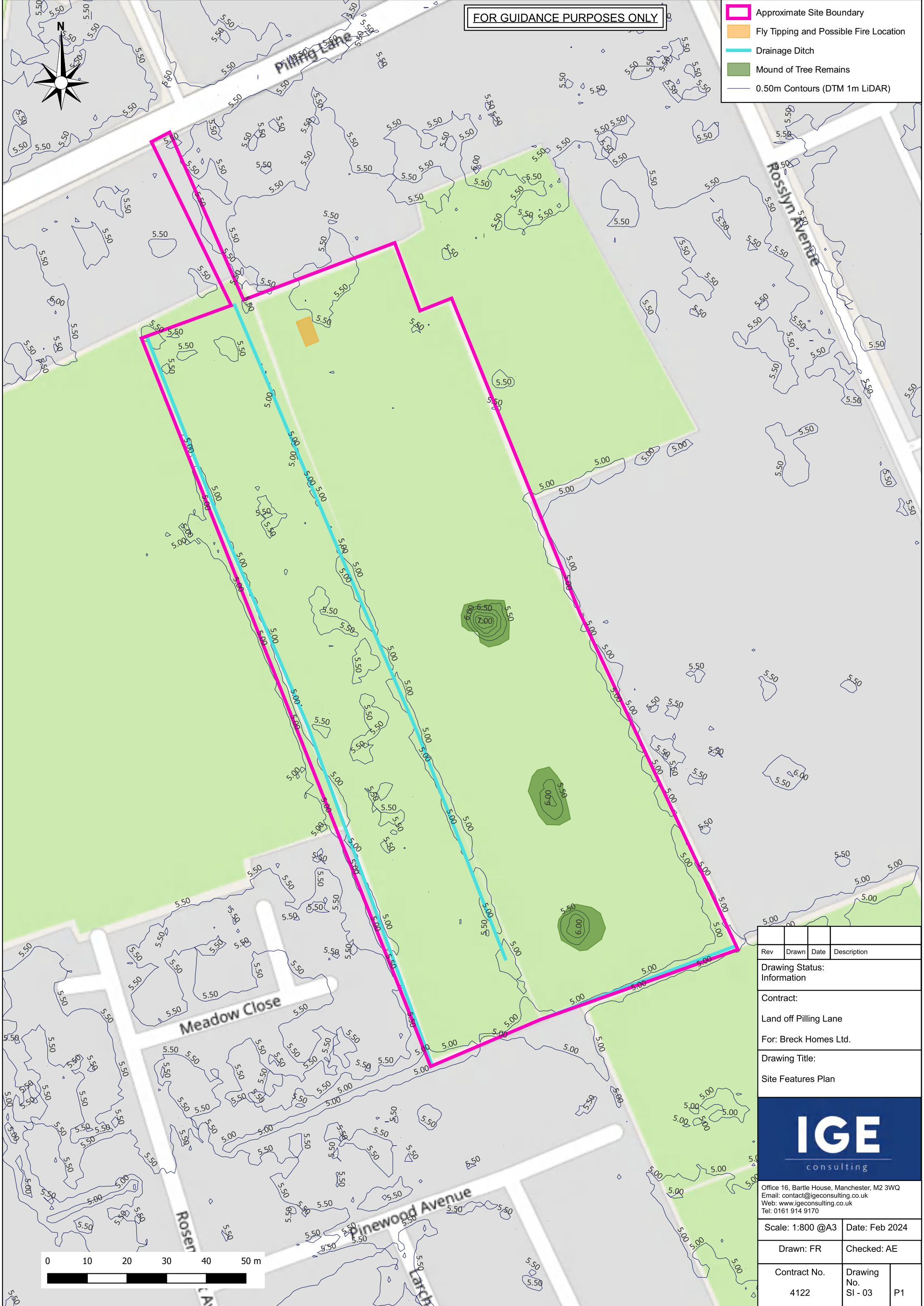
Drawn: FR Checked: AE

Contract No. 4122	Drawing No. SI - 01	P1
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FOR GUIDANCE PURPOSES ONLY

- Approximate Site Boundary
- Fly Tipping and Possible Fire Location
- Drainage Ditch
- Mound of Tree Remains
- 0.50m Contours (DTM 1m LiDAR)



Rev	Drawn	Date	Description

Drawing Status:
Information

Contract:
Land off Pilling Lane
For: Breck Homes Ltd.

Drawing Title:
Site Features Plan

IGE

consulting

Office 16, Bartle House, Manchester, M2 3WQ
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Web: www.igeconsulting.co.uk
Tel: 0161 914 9170

Scale: 1:800 @A3 Date: Feb 2024

Drawn: FR Checked: AE

Contract No. 4122	Drawing No. SI - 03	P1
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Notes

- 1 This drawing is indicative and not to scale.
- 2 This drawing is to be read in conjunction with all relevant Architects and Service Engineers drawings.

SOURCES

Sources
 1. Localised Made Ground
 2. Fly tipping

Secondary Sources
 3. Pooling beneath current and / or future foundations
 4. Pooling in relative low points above low permeability deposits.

Ground Gas Sources
 1. Localised Made Ground

PATHWAYS

Pathways To Human Health

- A. Ingestion of dust and soil
- B. Dermal contact with dust and soil
- C. Inhalation (dust)
- D. Inhalation (vapours)
- E. Consumption of homegrown produce
- F. Inhalation and oral backgrounds

Pathways To Controlled Waters

- A. Vertical migration through coarse Made Ground and coarse soils.
- B. Lateral migration along low permeability natural soils & pooling at relative low points.
- C. Vertical migration along future foundations and pooling at base.
- D. Migration through porous bedrock.
- E. Overland flow.

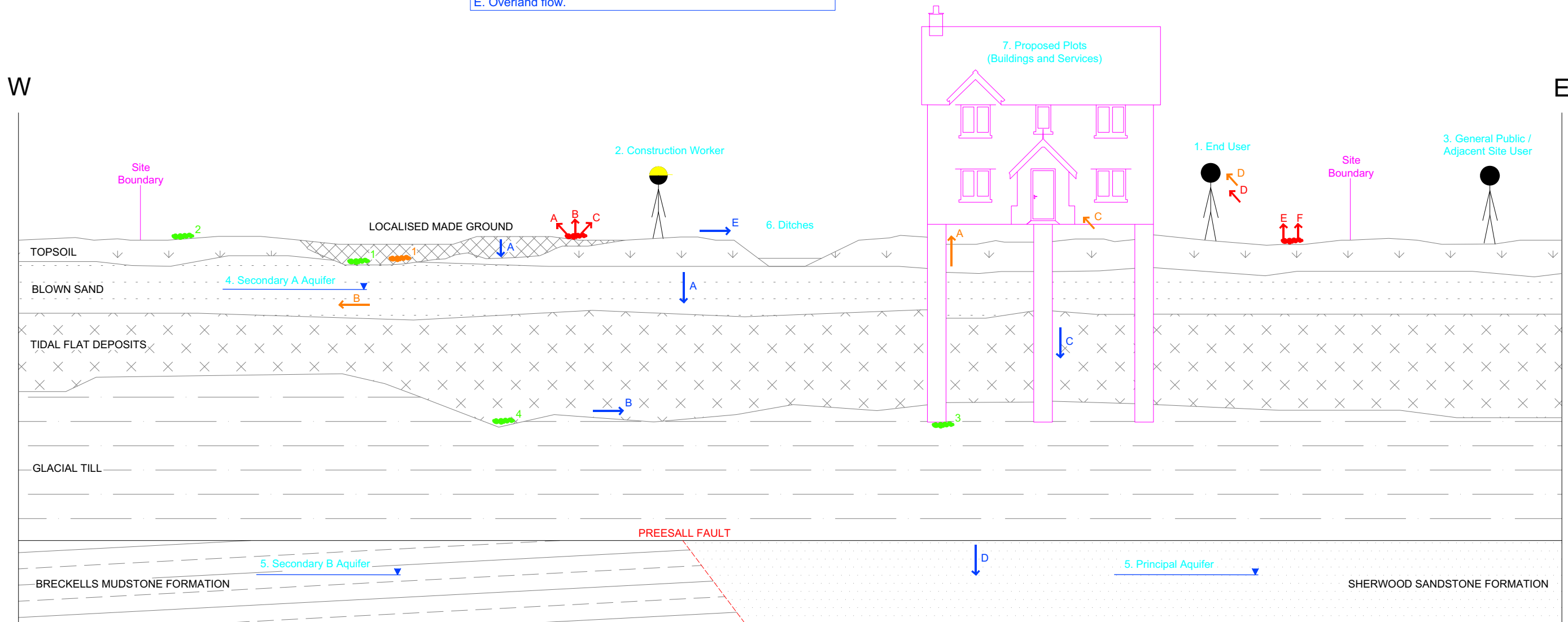
Ground Gas Pathways

- A. Preferential migration along foundations & service ducts.
- B. Migration within groundwater.
- C. Ingress through cavity walls and floors.
- D. Inhalation of ground gas and vapours

RECEPTORS

Receptors








- 1. End user
- 2. Construction workers
- 3. General public / adjacent site users
- 4. Secondary A aquifer in superficial deposits
- 5. Secondary B aquifer and Principal aquifer in bedrock
- 6. Surface water - on site ditches
- 7. Buildings and services

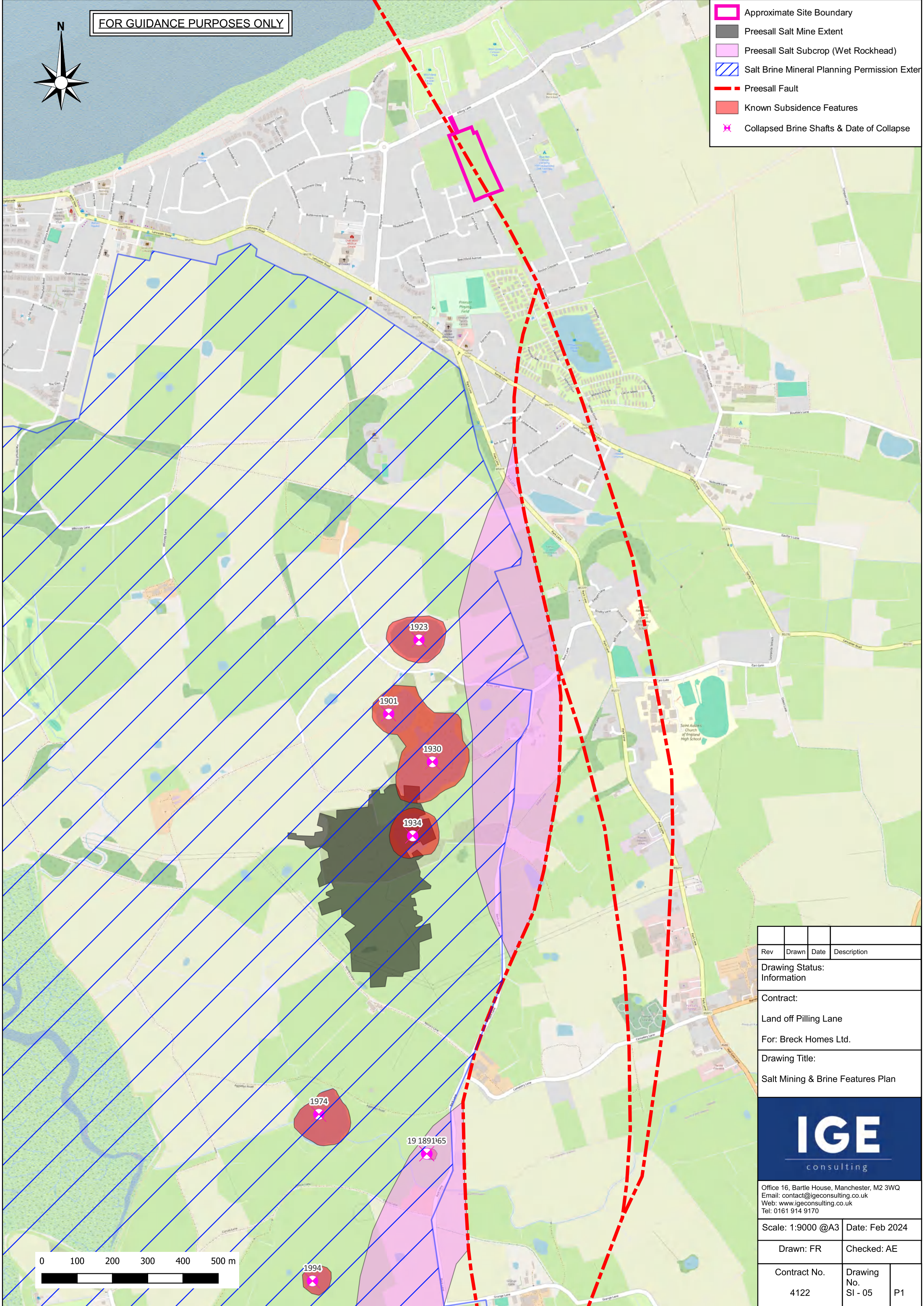


Rev	Drawn	Date	Description
Drawing Status			
INFORMATION			
Contract			
LAND OFF PILLING LANE			
FOR: BRECK HOMES LTD			
Drawing Title			
CONCEPTUAL SITE MODEL			
IGE consulting			
Office 16, Bartle House, Manchester, M2 3WQ email: contact@igeconsulting.co.uk web: www.igeconsulting.co.uk tel: 0161 914 9170			
Scale	NTS	Date	FEB 2024
Drawn	AS	Checked	AE
Contract No.	4122	Drawing No.	SI-04 P1

FOR GUIDANCE PURPOSES ONLY



-  Approximate Site Boundary
-  Preesall Salt Mine Extent
-  Preesall Salt Subcrop (Wet Rockhead)
-  Salt Brine Mineral Planning Permission Extent
-  Preesall Fault
-  Known Subsidence Features
-  Collapsed Brine Shafts & Date of Collapse



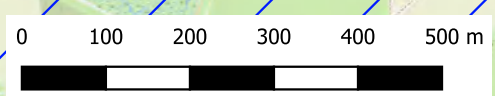
Rev	Drawn	Date	Description
Drawing Status: Information			
Contract: Land off Pilling Lane For: Breck Homes Ltd.			
Drawing Title: Salt Mining & Brine Features Plan			

IGE

consulting

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 Web: www.igeconsulting.co.uk
 Tel: 0161 914 9170

Scale: 1:9000 @A3	Date: Feb 2024
Drawn: FR	Checked: AE
Contract No. 4122	Drawing No. SI - 05 P1

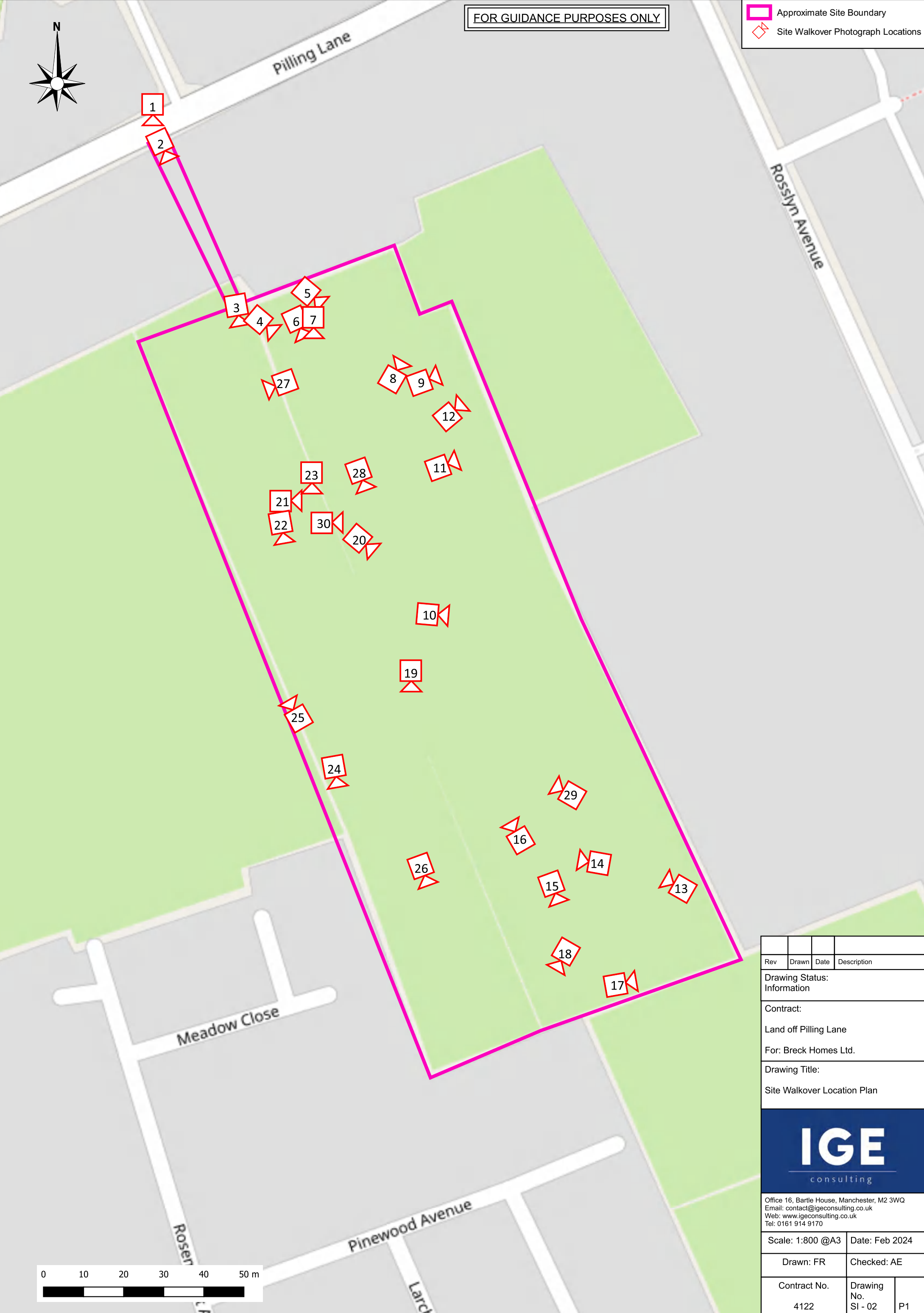


APPENDIX 3

WALKOVER SURVEY PHOTOGRAPHS AND PHOTOGRAPH LOCATION PLAN

FOR GUIDANCE PURPOSES ONLY

- Approximate Site Boundary
- Site Walkover Photograph Locations



Rev	Drawn	Date	Description
Drawing Status: Information			
Contract: Land off Pilling Lane For: Breck Homes Ltd.			
Drawing Title: Site Walkover Location Plan			
IGE consulting			
Office 16, Bartle House, Manchester, M2 3WQ Email: contact@igeconsulting.co.uk Web: www.igeconsulting.co.uk Tel: 0161 914 9170			
Scale: 1:800 @A3		Date: Feb 2024	
Drawn: FR		Checked: AE	
Contract No. 4122	Drawing No. SI - 02	P1	

SITE WALKOVER PHOTOGRAPHS – 2nd February 2024



Figure 1 - Photograph of the site entrance taken from Pilling Lane, looking south.



Figure 2 – The track providing access to the site.



Figure 3 – The northeastern site section, displaying the location of the debris pit.



Figure 4 - Photograph showing the terrain in the northern site section and the fenced off section of the northwestern corner.



Figure 5 – Photograph showing the northeastern site boundary ground conditions.



Figure 6 – Shows evidence of fly tipping including, ceramic tiles, red brick, concrete slabs, ash, plastic, metal sheets, wooden boards.

SITE WALKOVER PHOTOGRAPHS – 2nd February 2024



Figure 7 – Ash found adjacent to the debris pit.



Figure 8 – Displays the ground conditions of the northeastern corner of the site and debris of plastic and wood.



Figure 9 – Displays a section of the northeastern site boundary where a horse stable is located.



Figure 10 – A mound of wood debris noted in the centre of the site.



Figure 11 – Polystyrene and plastic bag litter observed on the eastern site boundary.



Figure 12 – Waterlogged ground conditions surrounding the stable on the northeastern site boundary.

SITE WALKOVER PHOTOGRAPHS – 2nd February 2024



Figure 13 – Fly tipping in the southeastern site section.



Figure 14 – Displays the topography across the southern section of the site.



Figure 15 – Shows a mound in the southern site section containing tree remains and organic matter.



Figure 16 –The centre of the site, looking north.



Figure 17 – Shows a ditch along the southern site boundary.



Figure 18 – The southwestern corner of the site showing fly tipping debris.

SITE WALKOVER PHOTOGRAPHS – 2nd February 2024



Figure 19 – Evidence of fly tipping in the centre of the site including metal containers, polystyrene and plastic bags.



Figure 20 – Displays the topography of the centre of the site.



Figure 21 – Displays the access path to the western section of the site, separated by dense vegetation.



Figure 22 – The western site section looking south.



Figure 23 – Shows water sheen anticipated to be a natural organic sheen.



Figure 24 – The ditch along the western site boundary containing plastic sheets, metal, red brick, polystyrene and cardboard.

SITE WALKOVER PHOTOGRAPHS – 2nd February 2024



Figure 25 – The ditch along the western site boundary containing plastic sheets, metal, red brick, polystyrene and cardboard, looking north.



Figure 26 – Displays a clearing in the dense vegetation in the southwestern site section for previous site investigation.



Figure 27 – Displays the northwestern site corner which has been segregated using wooden panels and corrugated metal sheets.



Figure 28 – Tracks through the centre of the site.



Figure 29 – Shows the topography of the northern section of the site.



Figure 30 – Evidence of previous ground investigation was noted across the site.

APPENDIX 4

HISTORICAL ORDNANCE SURVEY MAPS

Site Details:

58 MAYFIELD, PILLING LANE,
PREESALL, FY6 0HB

Client Ref: 4122_Pilling_Lane
Report Ref: GS-T9T-VI8-9ZR-AG5
Grid Ref: 336307, 448620

Map Name: County Series

Map date: 1890

Scale: 1:2,500

Printed at: 1:2,500



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Edition N/A
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Levelled N/A

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Revised 1890
Edition N/A
Copyright N/A
Levelled N/A

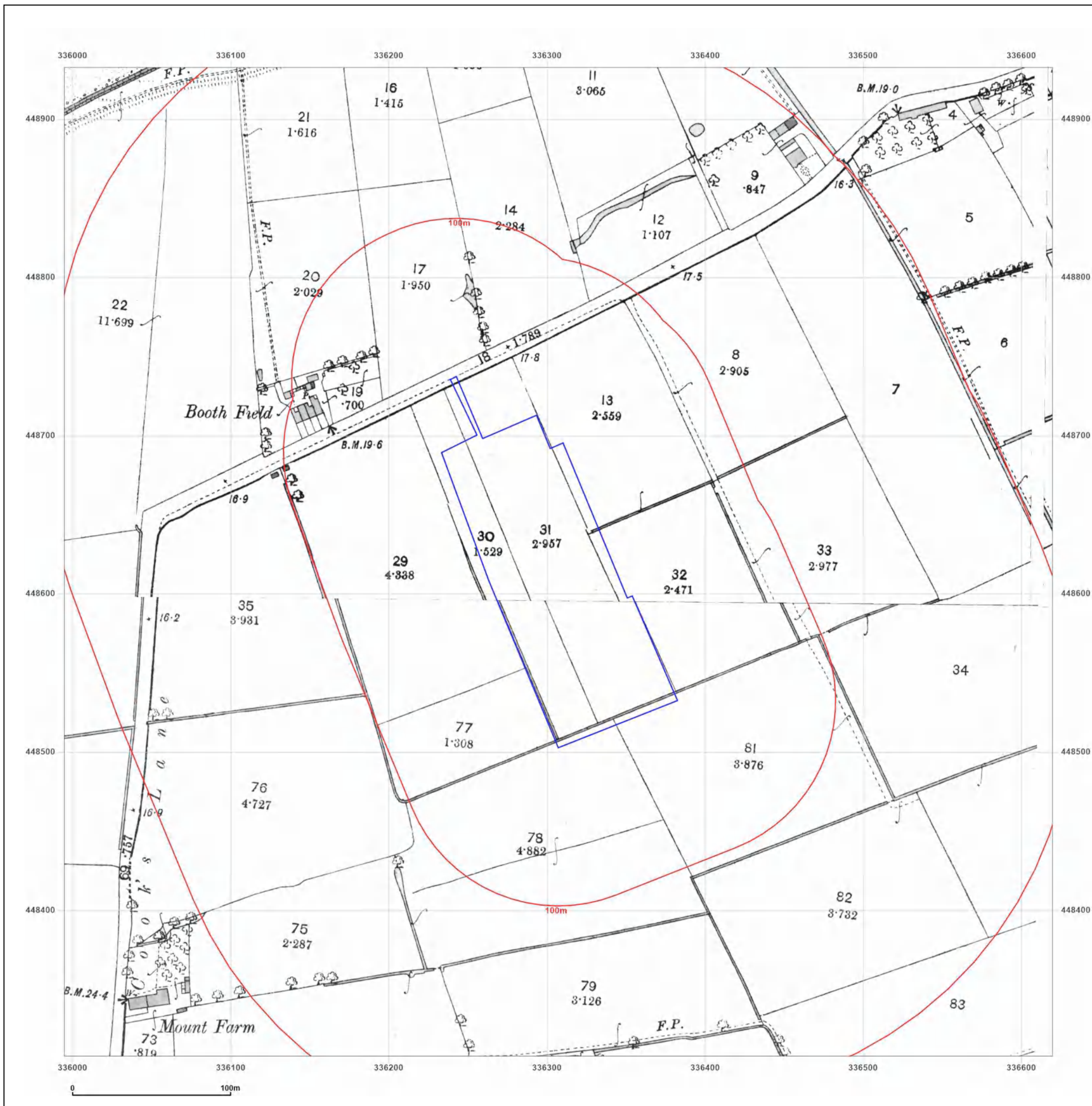


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Site Details:

58 MAYFIELD, PILLING LANE,
PREESALL, FY6 0HB

Client Ref: 4122_Pilling_Lane
Report Ref: GS-T9T-VI8-9ZR-AG5
Grid Ref: 336307, 448620

Map Name: County Series

Map date: 1912

Scale: 1:2,500

Printed at: 1:2,500



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Surveyed 1912
Revised 1912
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1912
Revised 1912
Edition N/A
Copyright N/A
Levelled N/A

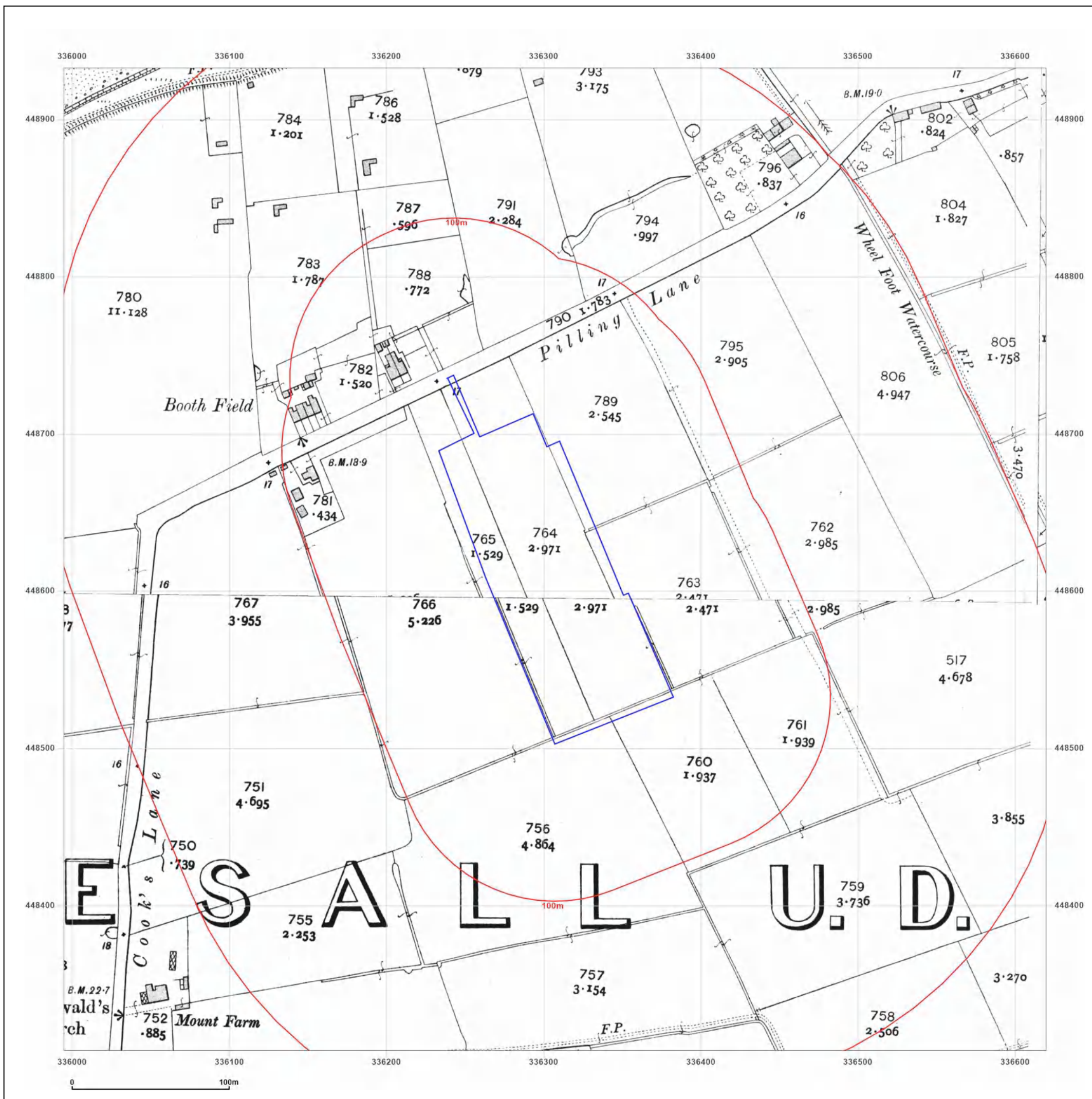


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Client Ref: 4122_Pilling_Lane
Report Ref: GS-T9T-VI8-9ZR-AG5
Grid Ref: 336307, 448620

Map Name: County Series

Map date: 1932

Scale: 1:2,500

Printed at: 1:2,500



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Edition N/A
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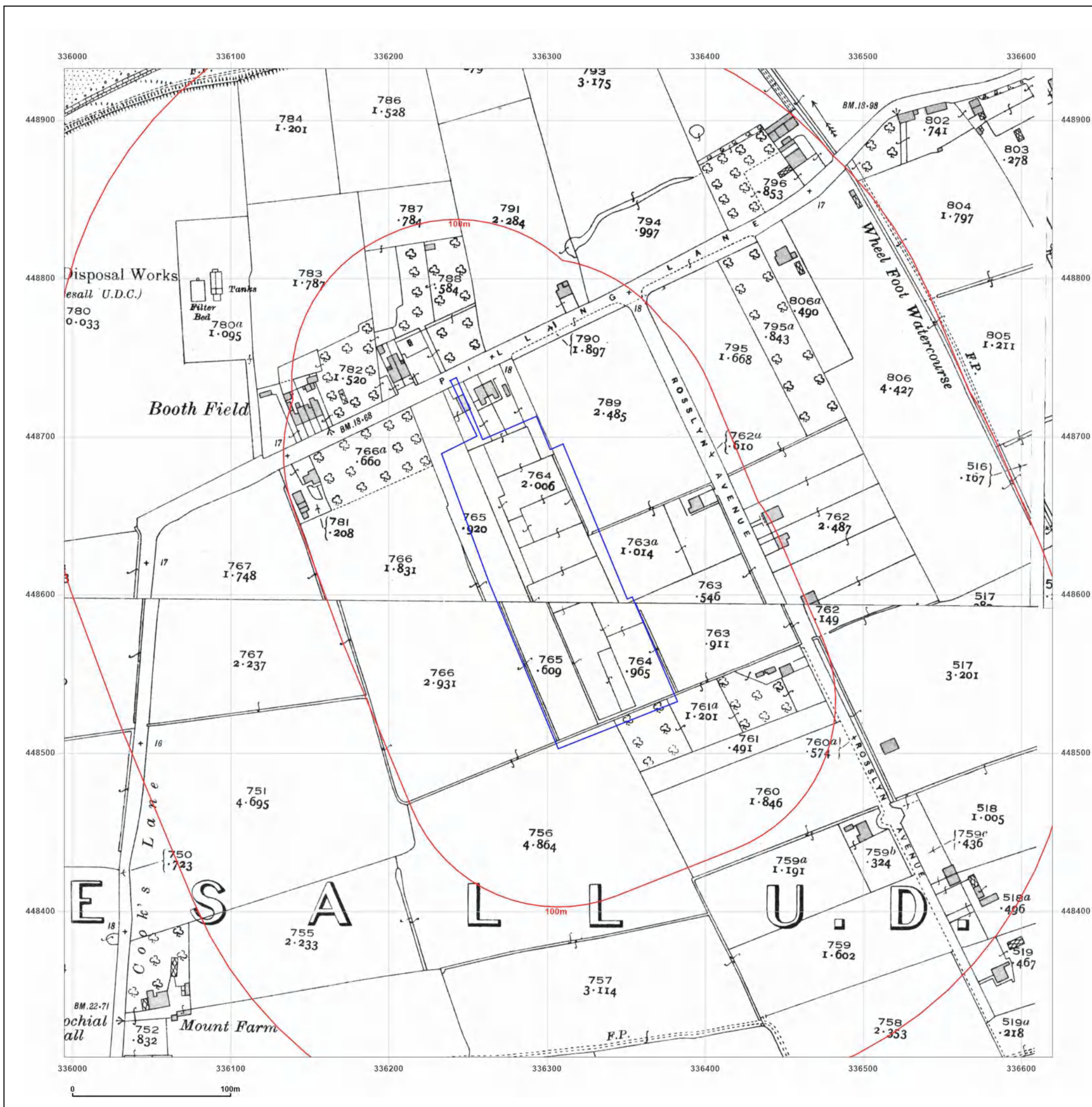


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Client Ref: 4122_Pilling_Lane
Report Ref: GS-T9T-VI8-9ZR-AG5
Grid Ref: 336307, 448620

Map Name: National Grid

Map date: 1960

Scale: 1:2,500

Printed at: 1:2,500



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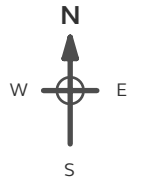
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Map Name: National Grid

Map date: 1967

Scale: 1:2,500

Printed at: 1:2,500



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Edition N/A
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Levelled 1960

Surveyed 1967
Revised 1967
Edition N/A
Copyright 1968
Levelled 1960

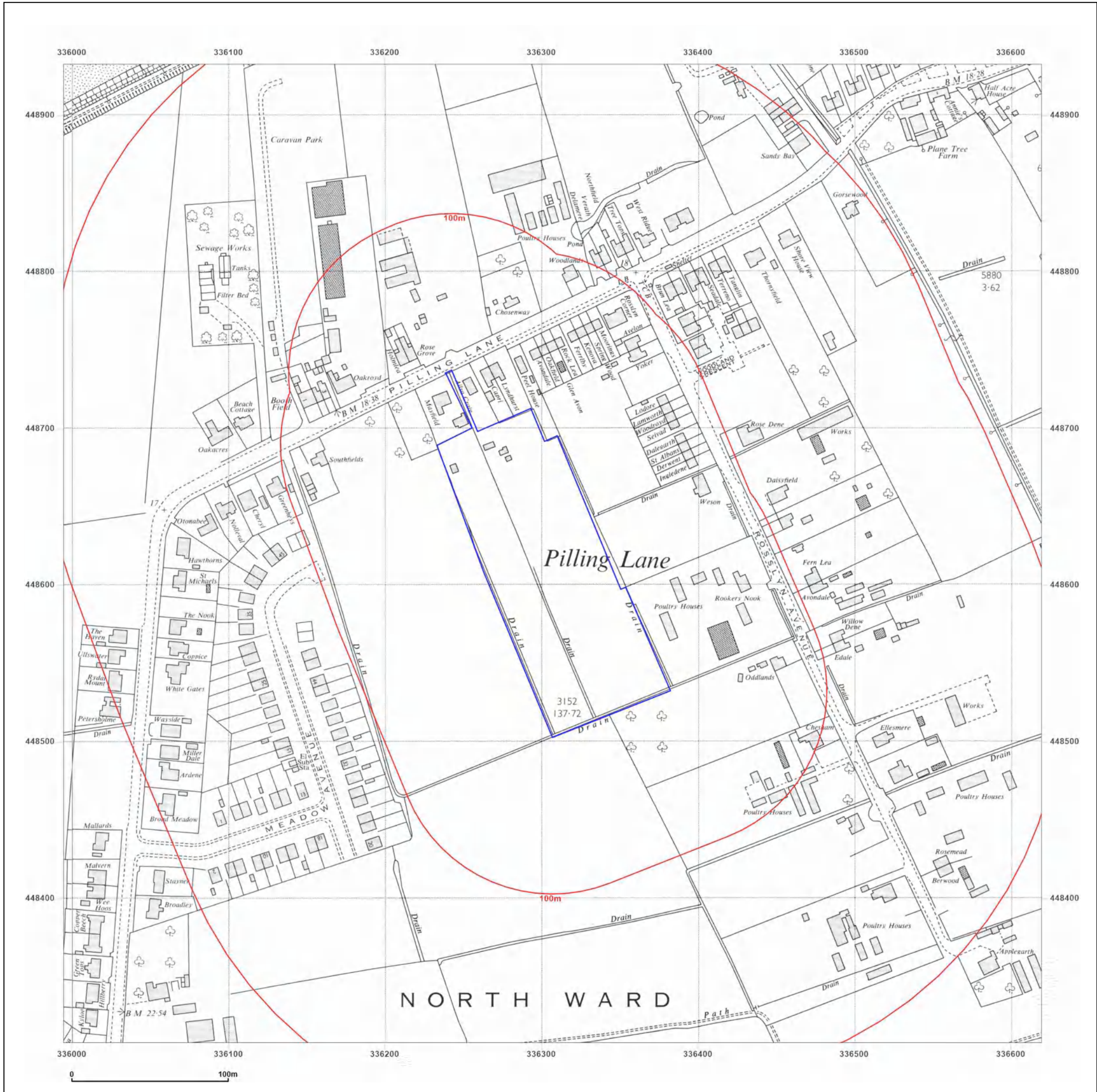


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Site Details:

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PRESALL, FY6 0HB

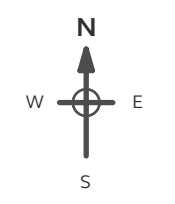
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Map Name: National Grid

Map date: 1979

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

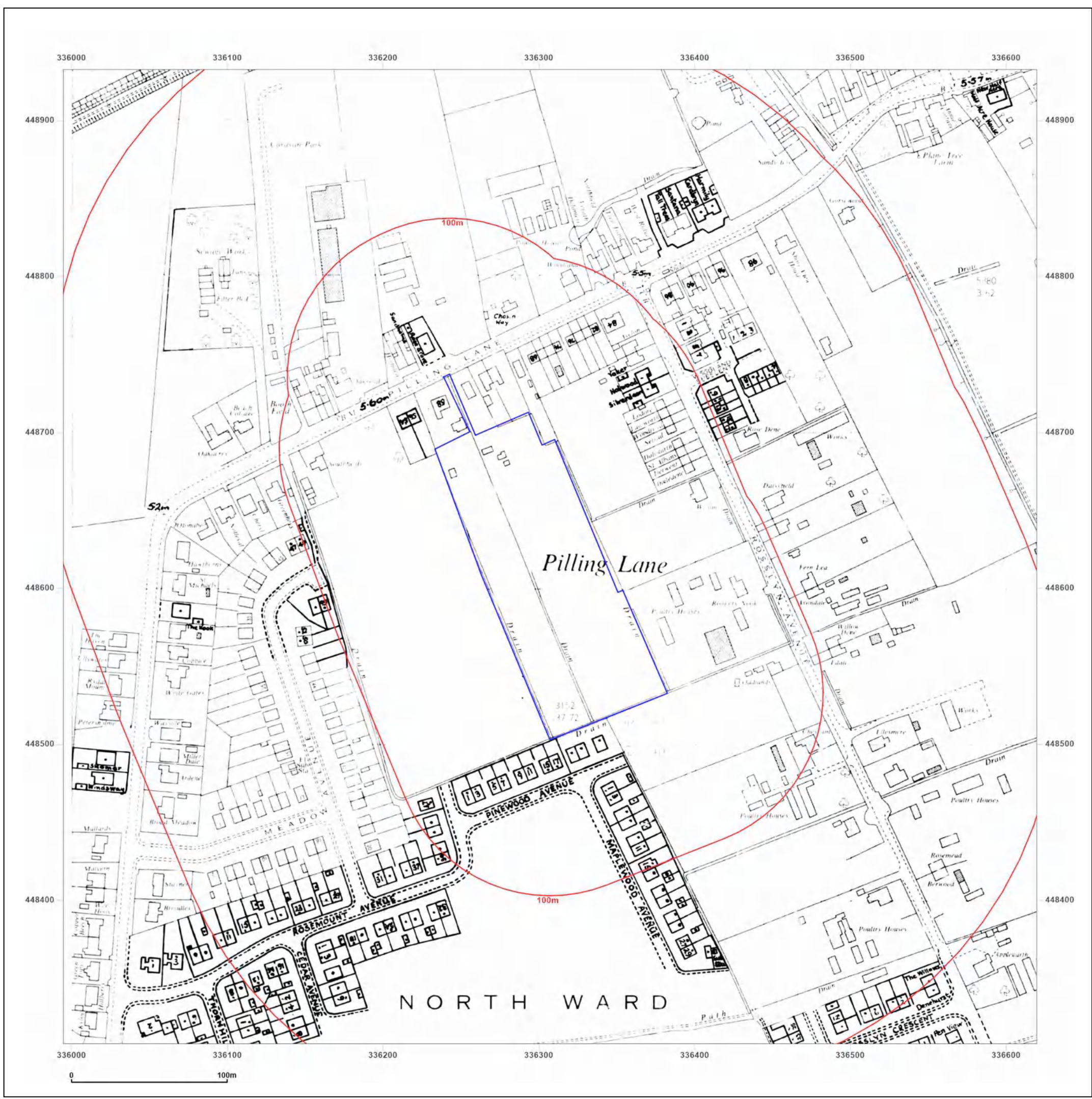


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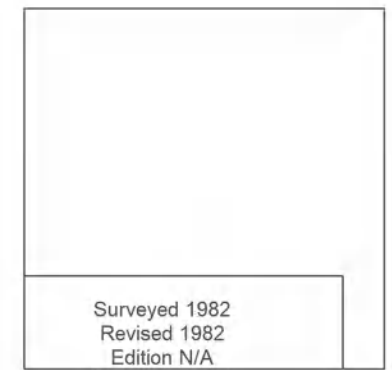
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Map Name: National Grid

Map date: 1984

Scale: 1:1,250

Printed at: 1:2,000



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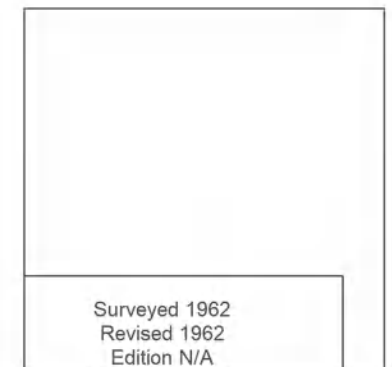
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Map Name: National Grid

Map date: 1986

Scale: 1:1,250

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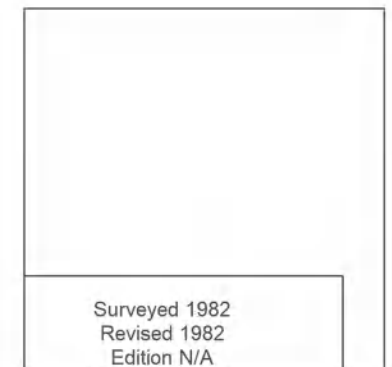
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Map Name: National Grid

Map date: 1986

Scale: 1:1,250

Printed at: 1:2,000



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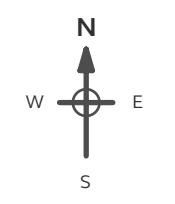
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Scale: 1:2,500

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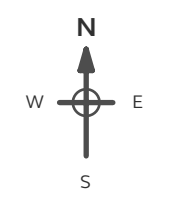
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Map Name: National Grid

Map date: 1991-1994

Scale: 1:1,250

Printed at: 1:2,000



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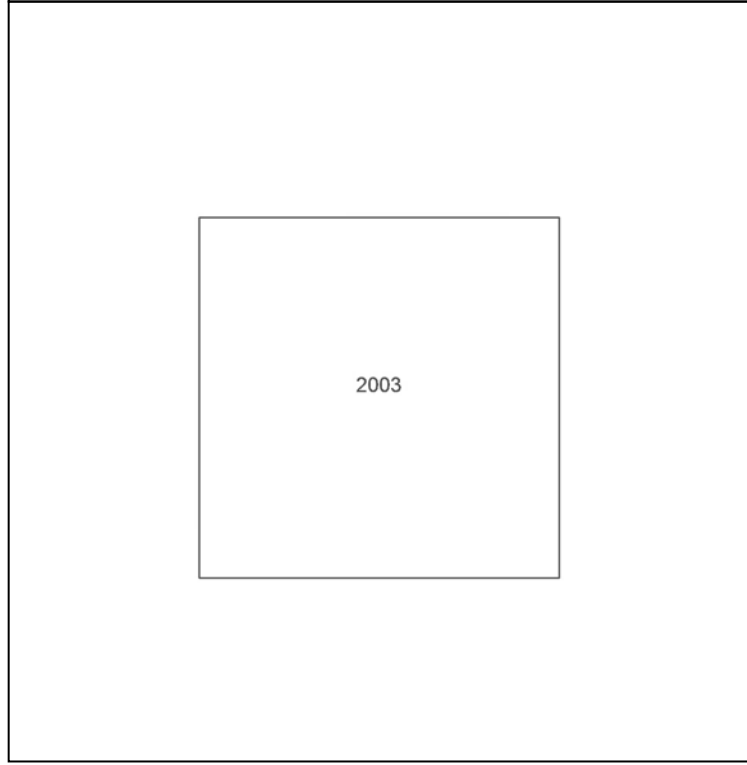
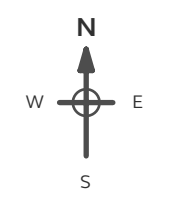
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Map date: 2003

Scale: 1:1,250

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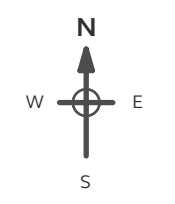
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Grid Ref: 336307, 448620

Map Name: County Series

Map date: 1848

Scale: 1:10,560

Printed at: 1:10,560



Surveyed 1845
Revised N/A
Edition 1848
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Levelled N/A

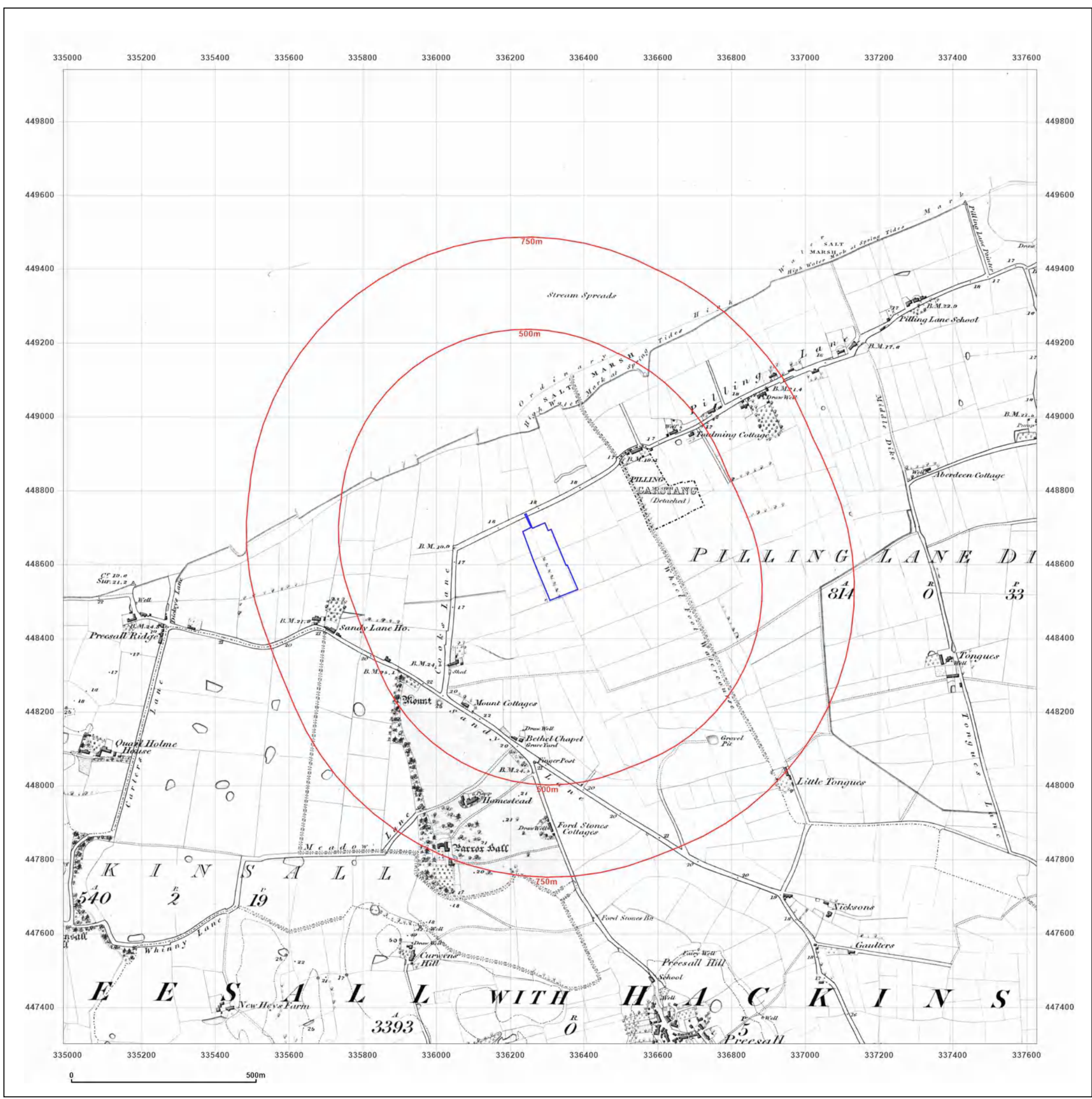


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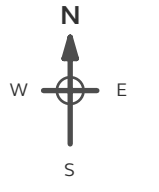
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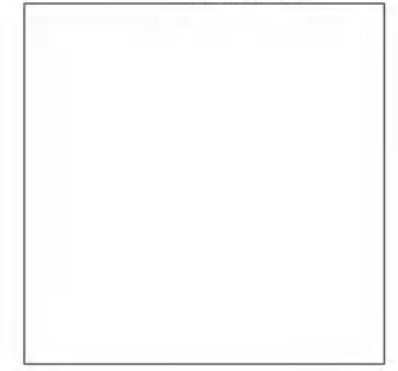
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Scale: 1:10,560

Printed at: 1:10,560



Surveyed 1845
Revised 1891
Edition N/A
Copyright N/A
Levelled N/A

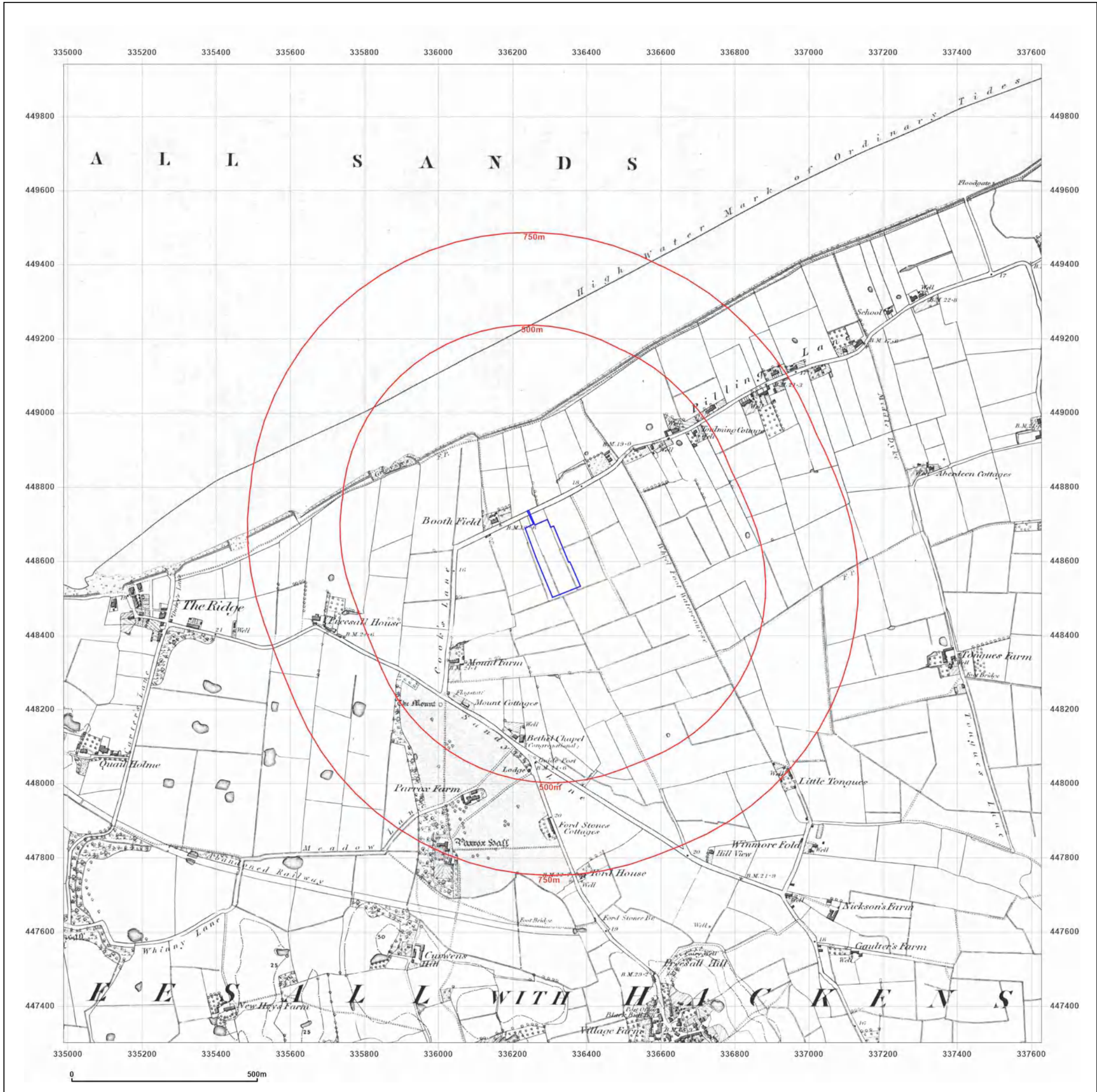


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Site Details:

58 MAYFIELD, PILLING LANE,
PREESALL, FY6 0HB

Client Ref: 4122_Pilling_Lane
Report Ref: GS-T9T-VI8-9ZR-AG5
Grid Ref: 336307, 448620

Map Name: County Series

Map date: 1910

Scale: 1:10,560

Printed at: 1:10,560



Surveyed 1845
Revised 1910
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1845
Revised 1910
Edition N/A
Copyright N/A
Levelled N/A

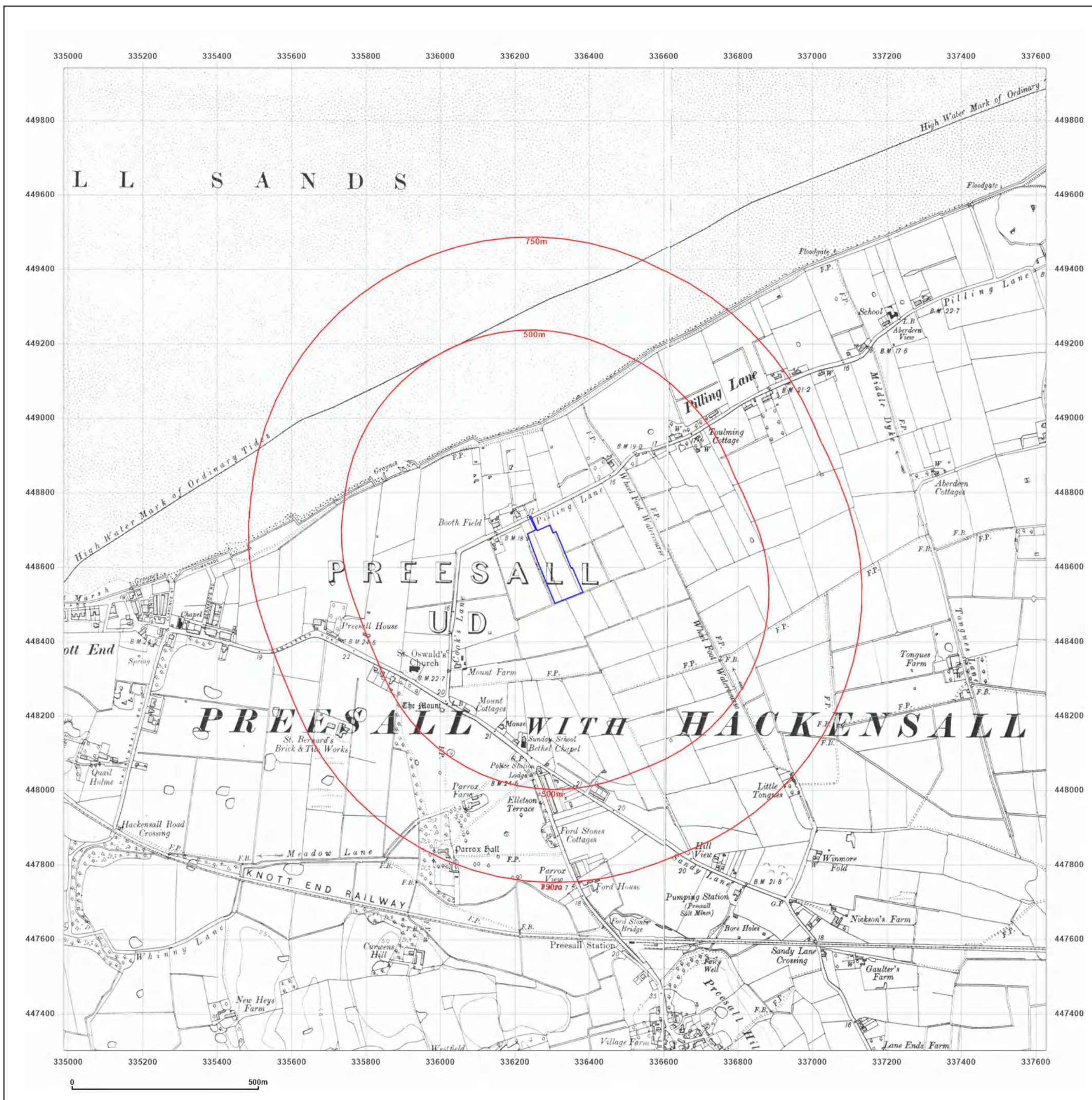


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Site Details:

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PREESALL, FY6 0HB

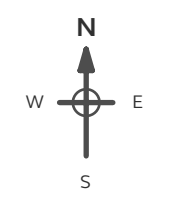
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Map Name: County Series

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Surveyed 1845
Revised 1910
Edition N/A
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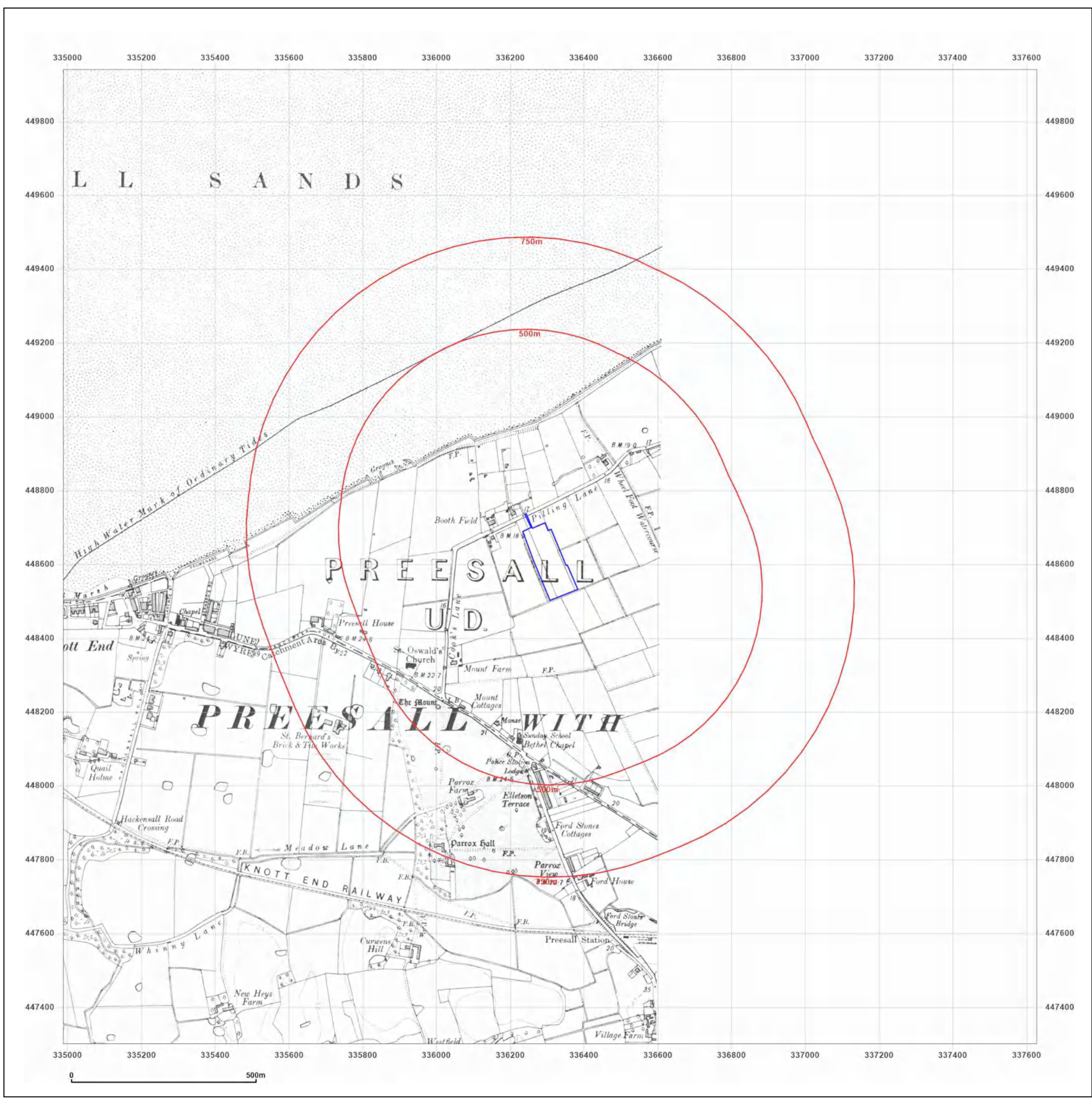


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Site Details:

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Map Name: County Series

Map date: 1930-1933

Scale: 1:10,560

Printed at: 1:10,560



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Revised 1930
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1845
Revised 1933
Edition N/A
Copyright N/A
Levelled N/A

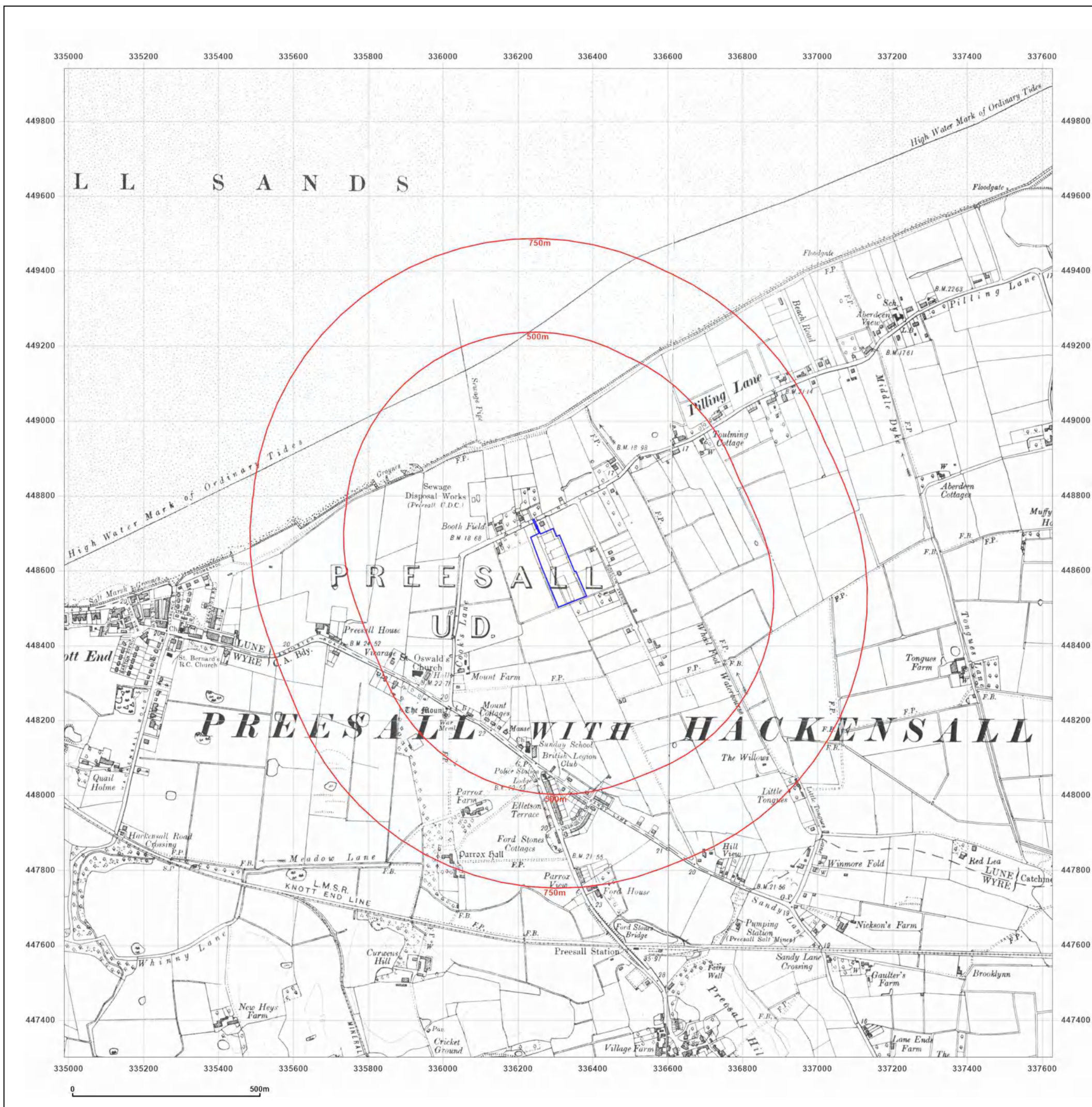


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Site Details:

58 MAYFIELD, PILLING LANE,
PREESALL, FY6 0HB

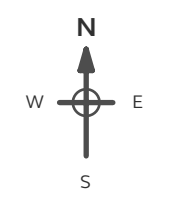
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Report Ref: GS-T9T-VI8-9ZR-AG5
Grid Ref: 336307, 448620

Map Name: County Series

Map date: 1938

Scale: 1:10,560

Printed at: 1:10,560



Surveyed 1845
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