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SITE INVESTIGATION REPORT

THE COTTAGE
COWBIT DROVE
WEST PINCHBECK
SPALDING
LINCOLNSHIRE

Report Reference C14565

On behalf of:-

Andrew & Zoe Chamberlain
Dyke Side
112 Star Lode Drove
West Pinchbeck
Spalding
Lincolnshire
PE11 3TD

November 2018

ANDREW & ZOE CHAMBERLAIN

SITE INVESTIGATION REPORT

FOR

PROPOSED NEW DWELLING

AT

THE COTTAGE

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INTRODUCTION

The clients, Andrew & Zoe Chamberlain, propose to build a new dwelling and outbuildings at The Cottage, Cowbit Drove, West Pinchbeck in Lincolnshire. The proposed building loads were not known at the time of report writing, however they were anticipated to be lightly loaded.

Ground Engineering Limited was commissioned by the client to carry out a site investigation to determine the nature and geotechnical properties of the underlying soils, and provide information for the design and construction of the foundations. A desk study checking past uses and a contamination assessment were also included within the scope of this report.

LOCATION, TOPOGRAPHY AND GEOLOGY OF THE SITE

The site of the proposed house is located on the western side of Cowbit Drove, approximately 200m to the north of its junction with Star Lode Drove, West Pinchbeck, near Spalding in Lincolnshire. West Pinchbeck is approximately 5km north-west of Spalding. The National Grid Reference for the centre of the site is TF 1841 2659 and its location is shown on a plan following this report text.

The rectangular site is approximately 140m long fronting Cowbit Drove, extends 55m west, and is accessed from Cowbit Drove to the east. The site contained The Cottage, a late 19th Century dwelling, and a number of derelict barns. Semi-mature trees were present within the site and along site boundaries, including Black Poplar, Yew and Hawthorn, with Cherry trees and a coniferous tree evident along the eastern boundary with Cowbit Drove.

The plot stands at an elevation of approximately 3mOD, on generally level ground within the Lincolnshire Fens.

The geological map for the area, sheet 144 at 1:50,000 scale, shows the site to be underlain by superficial Terrington Beds, now named Tidal Flat Deposits, covering glacial deposits and the solid geology of the Oxford Clay Formation at depth. The site is in an area of land reclaimed by 1206, and is 450m west of New Fen Dyke/Dozen's Bank, a drainage and reclamation feature.

HISTORY OF THE SITE

Research into the site history involved reference to historical Ordnance Survey (OS) maps, photographs and information obtained from the internet. The map extracts studied are presented in the desk study map section, Appendix 1, and are described below. Distances are approximate.

<i>Map Extract</i>	<i>Description</i>
1887 Lincolnshire Sheet 83NE Scale 1:10,560 Figure A	The south-eastern corner of the site has a house and outbuildings within an enclosure on the eastern side of a field fronting Cowbit Drove to the east. Drains are shown along the field boundaries.
1888 Lincolnshire Sheet 83.7 Scale 1:2500 Figure B	The site and immediate surrounding area appear unchanged.
1904 Lincolnshire Sheet 83.7 Scale 1:2500 Figure C	The enclosure within the eastern part of the site has been extended northwards. A well is denoted near the house in the southern part of the site. A new dwelling in an enclosure is shown on the adjacent plot to the south.
1950 Lincolnshire Sheet 83NE Scale 1:10,560 Figure D	The south-eastern part of the site area remains developed with a house and outbuildings, and two new outbuildings are shown adjacent the western enclosure boundary.
1977 Sheet TF1826 Scale 1:2500 Figure E	An additional open-sided outbuilding is shown in the south-eastern part of the site. A Nursery with glasshouses is shown 80m south-east of the site. The enclosure is no longer defined.
1983 Sheet TF12NE Scale 1:10,000 Figure F	The site and immediate surrounding area appear unchanged.
1994 Sheet TF1826 Scale 1:2500 Figure G	The site and immediate surrounding area appear unchanged.
2002 Raster Map Scale 1:10,000 Figure H	The site and immediate surrounding area appear generally unchanged, however the dwelling on the plot to the south of the site is no longer shown.

<i>Map Extract</i>	<i>Description</i>
2010 Sheets TF12NE Scale 1:10,000 Figure I	The site and immediate surrounding area appear unchanged.
2016 GroundSure Aerial Photograph of Site (Appendix 2)	The site remained developed with a house and outbuildings. Trees are evident between outbuildings, along the western edge of the enclosure to the west of the house, and along the eastern boundary. A rectangular stack (of bales?) is evident in the north-eastern part of the site. A field is evident immediately west and north of the site.
2018 Sheet TF1826 Not to Scale Figure J	The site remained developed as before. A silo is shown at the Nursery to the south-east.

Summary of Historical Information

The Ordnance Survey map of 1887 showed that the site was developed with a house and outbuilding, in the southern part of an enclosure on the eastern side of a field. Additional outbuildings had been constructed by the 1950s, and the house and outbuildings have remained on the site to the present day.

The outbuildings were derelict at the time of this investigation, and there were self-seeded, semi-mature trees between the outbuildings at the time of this investigation in September 2018. Photographs of the site walkover are presented following the plans.

A Nursery with glasshouses had been constructed to the south-east of the site between 1950 and 1977, which remained to the present day.

SUMMARY OF ENVIRONMENTAL DATA

Appendix 2 contains information derived from Environmental Databases for a radius of up to 2,000m from the site. The information covers datasets held by Groundsure with contributors including the local authority, the Environment Agency (EA), British Geological Survey, Ordnance Survey and the Coal Authority and the results, within a radius of 250m, are summarised below:

1. Historical Industrial Sites	On-Site	0 - 250m
Potentially Contaminative Uses (1:10,000 mapping)	0	1
Historical Tank Database	0	0
Historical Energy Features Database	0	0
Historical Petrol & Fuel Site Database	0	0
Historical Garage & Motor Vehicle Repair Database	0	0
Potentially Infilled Land	0	0
2. Environmental Permits, Incidents and Registers	On-Site	0 - 250m
Sites Holding Environmental Permits/Authorisations	0	1
Records of COMAH and NIHHS Sites	0	0
Environment Agency Recorded Pollution Incidents	0	0
Sites Determined as Contaminated Land under Part IIA EPA 1990	0	0
3. Landfill and Other Waste Sites	On-Site	0 - 250m
Landfill Sites	0	0
Landfill and Other Waste Sites	0	0
4. Current Land Use	On-Site	0 - 250m
Current Industrial Sites Data	0	2
Records of Petrol and Fuel Sites	0	0
Underground High Pressure Oil and Gas Pipelines	0	0
5. Geology		
Artificial Ground or Made Ground records	No	
Superficial Ground and Drift Geology records	Yes	
6. Hydrogeology and Hydrology	On-Site	0 - 250m
Productive strata within superficial geology	No	
Productive strata within solid geology	No	
Groundwater Abstraction Licences	0	0
Surface Water Abstraction Licences	0	0
Potable Water Abstraction Licences	0	0
Source Protection Zones	1	1
River Quality Data	No	No
Water Network Entries	0	72
Surface Water Features	Yes	Yes

7. Flooding					
Environment Agency indicative Zone 2 floodplains within 250m of site				Yes	
Environment Agency indicative Zone 3 floodplains within 250m of site				Yes	
Risk of flooding from rivers & the sea (RoFRaS) rating				High	
Flood defences within 250m of site				No	
Any areas benefitting from flood defences within 250m of site				No	
Flood storage areas within 250m of site				No	
Maximum BGS groundwater flooding susceptibility within 50m of site				Not prone	
BGS confidence rating for groundwater susceptibility areas				Not applicable	
8. Designated Environmentally Sensitive Sites				On Site	0 - 250m
Environmentally sensitive sites (Nitrate vulnerable zone)				1	0
9. Natural Hazards (on site)					
Hazard	Negligible	Very Low	Low	Moderate	High
Shrinking or Swelling Clay	-	-	On-site	-	-
Landslides	-	On-site	-	-	-
Soluble rocks	On-site	-	-	-	-
Compressible Ground	-	-	-	On-site	-
Collapsible Rocks	On-site	-	-	-	-
Running Sand	-	-	-	On-site	-
9.2. Radon					
The property is not in a Radon Affected Area, as less than 1% of properties are above the action level. No Radon Protective Measures are required for new properties or extensions.					
10. Mining					
Coal mining areas within 75m of site			No		
Non coal-mining areas within 50m of site			No		
Brine affected areas within 75m of study site			No		

Database Summary

A historical nursery is identified to the south-east of the site. There are no historical tanks, energy features, petrol, fuel or garage sites within 250m of the site. There is a discharge consent recorded 186m to the south-west of the site, for final/treated effluent. There are no pollution incidents or registered entries on, or within 250m of the site. There are no landfills or other waste sites on, or within 250m of the site, nor areas of potentially infilled land identified.

The superficial Tidal Flat Deposits beneath the site is classified by the Environment Agency (EA) as an 'Unproductive stratum'. The underlying solid geology Oxford Clay Formation is also classified by the EA as an 'Unproductive stratum'. There are no groundwater abstractions within 250m of the site. The site is within a Zone 2 (outer catchment) source protection zone.

Water features (drains) are recognised 1m south of the site, around the field boundaries, and along road edges around the site. The site is within a Zone 2 and Zone 3 floodplain. The site has a medium risk of flooding.

The site is within a nitrate vulnerable zone.

There is a moderate hazard to the site from compressible ground and running sand; a low hazard from shrinking and swelling clay; a very low hazard from landslides; and a negligible hazard from soluble rocks and collapsible rocks. The site is not within an area where underground mining may have occurred, and is not within a brine affected area.

The site is not in a radon affected area and no radon protection measures are required for new properties on the site.

PRELIMINARY RISK ASSESSMENT

Potential sources of contamination present on or beneath the site would relate primarily to; the historical use of the site; the presence of contaminated soil; and the potential presence of hazardous or ground gas beneath the site.

In order to assess the risks associated with the presence of ground contamination the linkages between the sources and potential receptors to contamination need to be established and evaluated. This is in accordance with the Environmental Protection Act 1990, which provides a statutory definition of Contaminated Land. To fall within this definition it is necessary that, as a result of the condition of the land, substances may be present on or under the land such that;

- *Significant harm is being caused or there is a significant possibility of such harm being caused; or*
- *Pollution of controlled waters is being, or is likely to be, caused.*

There are three principal factors that are assessed whilst undertaking a qualitative risk assessment for any site. These are the presence of a contamination source, the existence of migration pathways and the presence of a sensitive target(s). It should be noted that it is necessary for each element of source, pathway and target to be present in order for exposure of a human or environmental receptor to occur.

UK Government guidance on the assessment of contaminated land, requires risk to human health and the environment to be reviewed using source ÷ pathway ÷ target relationships. If each of these elements is present, the linkage provides a potential risk to the identified targets.

Contaminants or ***potential pollutants*** identified as ***sources*** in relation to the identified previous uses are listed overleaf in Table 1.

Table 1: Identified Potential Contaminant Sources

<i>Contaminant Source</i>	<i>Comments</i>
Drainage/former buildings	Former drains could provide a contaminant source. The existing buildings may have had asbestos containing materials within them.
Soil Beneath Site	Contamination may be present within any made ground materials on the site.
Soil Gas	Potential soil gas generated from made ground, or natural soils.
Ground Contamination Outside Site Boundary	Ground contamination migrating from adjoining sites, such as the Nursery to the south-east.

A ***Pathway*** is defined as one or more routes through which a receptor is being, or could be, exposed to, or affected by, a given contaminant.

Potential ***Target or Receptors*** fall within the categories of Human Health, Water Environment, Flora and Fauna, and Building Materials.

There are a number of possible pathways for the contaminants identified on the site to impact human and/or environmental receptors and these are summarised in Tables 2 and 3.

Table 2: Human Receptors and Pathways

<i>Human Receptor-Mechanism</i>	<i>Typical Exposure Pathway</i>
Human Inhalation	Breathing Dust and Fumes Breathing Gas emissions
Human Ingestion	Eating -contaminated soil, for example by small children -produce grown on contaminated soil Ingesting dust or soil on vegetables Drinking contaminated water
Human Contact	Direct skin contact with contamination Direct skin contact with contaminated liquids

Table 3: Water Receptors and Pathways

<i>Receptor-Water Environment</i>	<i>Typical Exposure Pathway</i>
Groundwater The superficial Tidal Flat Deposits are indicated by the EA to be an "Unproductive stratum". The solid geology Oxford Clay Formation is also indicated to be an "Unproductive stratum". The site is within a Zone 2 (outer catchment) Source Protection Zone.	Surface infiltration of atmospheric waters into the soils beneath the site could wash or dissolve potential contaminants and migrate to underlying groundwater. Contamination leads to restriction/prevention of use as a resource, for example, drinking water, and can have secondary impacts on other resources, which depend on it.
Surface Water The nearest drain is recorded 1m south of the site.	Surface infiltration of atmospheric waters into the soils beneath the site could wash or dissolve potential contaminants and laterally migrate. Contamination leads to a restriction/prevention of use: -as drinking water resource -for amenity use Effects on aquatic life.

Preliminary Conceptual Model

Assessment of the potential linkage between ground contamination sources, human and environmental receptors have been assessed based on the desk study research documented in the preceding sections of this report.

A generalised preliminary conceptual model is presented below in Table 4.

Table 4: Preliminary Conceptual Model Relative to Residential Development

Receptors	Pathway	Estimated Potential for Linkage with Contaminant Sources			
		Drainage/ Buildings	Soil Beneath Site	Soil Gas	Ground Contamination Outside Site Boundary
Human Health i ground or construction workers	Ingestion and Inhalation of contaminated Soil, Dust and Vapour	Likely	Low likelihood	Low likelihood	Low likelihood
Human Health i end users	Ingestion and Inhalation of contaminated Soil, Dust and Vapour	Low likelihood	Low likelihood	Low likelihood	Low likelihood
Water Environment	Migration through ground into surface water or surrounding groundwater	Low likelihood	Low likelihood	Unlikely	Unlikely
Flora	Vegetation on site growing on contaminated soil	Low likelihood	Low likelihood	Low likelihood	Unlikely
Building Materials	Contact with contaminated soil	Low likelihood	Low likelihood	Low likelihood	Low likelihood
Key to Table 4 Estimated Potential for Linkage with Contaminant Source		Definition			
High likelihood		There is a pollution linkage and an event that either appears very likely in the short term and almost inevitable over the long term, or there is evidence at the receptor of harm or pollution.			
Likely		There is a pollution linkage and all the elements are present and in the right place, which means that it is probable that an event will occur. Circumstances are such that an event is not inevitable, but possible in the short term and likely over the long term.			
Low likelihood		There is a pollution linkage and circumstances are possible under which an event could occur. However, it is by no means certain that even over a longer period such an event would take place, and is less likely in the shorter term.			
Unlikely		There is a pollution linkage but circumstances are such that it is improbable that an event would occur even in the very long term.			
N/A		Not Applicable.			

SITE WORK

The site work conducted on 7th and 14th September 2018 comprised a single cable percussion borehole (BH1) and four hand augered boreholes trial pits (HA1 to HA4). The positions are shown on the exploratory hole location plan following this report text.

Public utility service drawings were sourced and consulted prior to determining the exploratory hole positions. The service drawings sourced by Ground Engineering Limited are available on request. Prior to excavation, a service scan was made at each position using a CAT (Cable Avoidance Tool) to check for the absence of detectable buried services that may otherwise have been damaged by the investigation.

The exploratory hole records, presented following the plans, give the descriptions and depths of the various strata encountered, details of all samples taken, in-situ tests and the groundwater conditions observed during and on completion of boring, and subsequent monitoring of the standpipe.

Cable Percussive Borehole

Borehole BH1 was sunk using a standard cable percussive drilling rig on 14th September 2018. Prior to the start of boring, an inspection pit was dug to 1.20m below ground level using hand tools to ensure the absence of buried services.

The borehole was then advanced to a depth of 15.00m below ground level using weighted shell and claycutter tools working initially within 150mm diameter steel casing.

Representative small and bulk disturbed samples of soil were taken from the boring tools at regular intervals throughout the depth of the boreholes. Water samples were taken once sufficient water had entered the boreholes.

A standard penetration test (SPT) was undertaken in order to give an indication of the in-situ density of the material. The test was made by driving a split spoon (S) attachment into the soil at the base of the borehole by means of an automatic trip hammer weighing 63.50kg falling freely through 760mm. The penetration resistance was determined as the number of blows

is required to drive the tool the final 300mm of a total penetration of 450mm into the soil ahead of the borehole. The SPT test is fully described in BS EN22476:3:2005 and the result of this test is presented on the borehole record.

On completion, the borehole was backfilled with arisings and the surface reinstated.

Hand Augered Boreholes

Four hand augered boreholes, HA1 to HA4, were undertaken to depths between 1.00m and 3.00m. The exposed strata were sampled and recorded by a Geoenvironmental Engineer. Representative disturbed samples of soil were taken at regular intervals throughout the depth of each borehole for subsequent laboratory tests.

Samples of made ground were taken within polycarbonate pots and amber glass jars pending possible contamination testing.

A Mackintosh Probe (MP) was used to provide an indication of the density of sand and gravel soils. The 25mm diameter solid cone point of the probe was screwed onto the rods and driven into the ground by repeated blows of a 4.5kg slide hammer with a fall of 0.30m. The blow counts for each 0.30m driven or, alternatively the depth driven for 100 blows were recorded.

On completion of borehole HA1, a gas and groundwater monitoring standpipe was installed to a depth of 3.00m. The pipe was perforated to within 1.00m of ground level and the annulus backfilled with pea gravel. A bentonite seal was placed from ground surface to 1.00m depth and a gas tap fitted. A protective stopcock cover was concreted in place at ground level above the installation.

On completion, the other boreholes were backfilled with arisings and the surface reinstated.

Gas Monitoring

As part of the investigation three return visits were made to site on 19th and 26th September, and 3rd October 2018, when the standpipe installed within borehole HA1 was monitored for a standing groundwater level and for landfill type gases.

The results of the monitoring visits are presented following the exploratory hole records.

LABORATORY WORK

The samples were inspected in the laboratory and assessments of the soil characteristics have been taken into account during preparation of the borehole records. The soil descriptions have been made in accordance with BS5930:2015. The geotechnical test results, undertaken in accordance with BS1377:1990 & 2016, are presented following the exploratory hole records. The chemical test results follow the geotechnical test results.

The moisture content and index properties of selected soil samples were determined as a guide to soil classification and behaviour. The liquid limit was determined by a cone penetrometer.

The particle size distribution of a selected soil sample was determined by sieve analysis. Results of this test is given as a particle size distribution curve.

Test specimens were prepared at full diameter from selected undisturbed samples. Immediate undrained triaxial compression tests were performed under single, or multi-stage confining cell pressures. The moisture content and bulk density of each specimen was also determined. The apparent cohesion results have been plotted against depth with the hand vane results in Figure 1.

In clay soils, an immediate assessment of the apparent soil cohesion was made using a hand shear vane (V). The average of three readings was recorded at each position. The apparent cohesion results have been plotted against depth in Figure 1.

An indication of the swelling and settlement characteristics of a selected sample was obtained from the consolidation apparatus or oedometer. The test was performed on a specimen approximately 19mm thick, contained in a steel ring. The specimen was saturated and the swelling pressure balanced and measured prior to applying a constant load with drainage allowed at both ends. When primary compression was complete, the load was increased and this repeated for four increments of load. The sample was then unloaded. The rate and total amount of consolidation were continually monitored using a computer controlled E.L.E. Datasystem 7 Unit. The results were plotted and analysed by the computer for each increment of load to obtain

the coefficients of compressibility (mv), and of consolidation (cv), which govern the amount and rate of settlement respectively.

Selected samples of soil were analysed to determine the concentration of soluble sulphates. The pH values were also determined.

Chemical analysis of four soil samples recovered from the exploratory holes was undertaken, by an independent laboratory, primarily for characterisation purposes. The samples were tested for a suite encompassing a wide range of potential contaminants outlined by the Environment Agency (EA) and National House Building Council (NHBC) document R&D 66; 2008 'Guidance for the Safe Development of Housing on Land Affected by Contamination'. In addition, four selected samples were tested for Total Petroleum Hydrocarbons (TPH).

GROUND CONDITIONS

The ground conditions have been plotted as a soil profile in Figure 2. The ground conditions comprised a surface layer of made ground, underlain by the expected superficial Tidal Flat Deposits including sand, organic clay and peat, glacial deposits, and in turn the solid geology Oxford Clay Formation at depth, which was proved to at least the base of the deepest exploratory hole at a depth of 15.00m. Groundwater was recorded in the monitoring standpipe at approximately 2.00m depth.

Made Ground

A surface layer of concrete was present in HA1 to 0.05m depth. Made ground was encountered beneath the hardstanding where present, or from surface, to depths between 0.30m and 0.60m. The made ground generally comprised grey, dark brown and brown, slightly gravelly, sandy silt fill, varying to firm, dark brown and black, slightly gravelly, silty, clay fill (BH1). The gravel fraction comprised angular to sub-rounded flint, brick, mortar, ash, coal and igneous rock.

Tidal Flat Deposits/Lower Peat

Beneath the made ground at depths below 0.30m to 0.60m, was a medium dense, orange brown and grey, silty fine sand, which was encountered to depths of 1.70m in HA1 and 1.80m in BH1. Boreholes HA2, HA3 and HA4 were completed within the sand at 1.00m depth.

Beneath the sand in BH1 and HA1 at 1.70m or 1.80m depth, soft becoming very soft below 2.50m depth, grey, organic clay, with part decayed root fragments and pockets of organic matter, was encountered to depths of at least 3.00m (HA1) and to 5.30m (BH1). These deposits were considered to represent Tidal Flat Deposits.

At 5.30m to 5.90m depth in BH1, firm, black, fibrous peat was encountered, covering soft and very soft, green-grey, silty, organic clay to 7.00m depth, and a second layer of peat was met at 7.00m to 7.40m depth. These deposits were considered to represent Tidal Flat Deposits and Lower Peat.

Crowland Bed

Beneath the Tidal Flat Deposits/Lower Peat, at 7.40m depth in BH1, soft, grey, slightly gravelly, sandy, silty clay was met to 7.80m depth. The gravel fraction comprised angular to rounded flint and sandstone. At 7.80m to 8.60m depth, stiff, grey and brown, silty clay was met, with occasional gravel size calcareous concretions. These deposits were considered to represent superficial Crowland Bed.

Abbey Gravel

Beneath the Crowland Bed at 8.60m depth, a 0.20m thick layer of brown, gravelly sand was met. The gravel fraction comprised angular to rounded flint. This deposit was considered to represent the superficial Abbey Gravel.

Glacial Till

Beneath the Abbey Gravel, at 8.80m to 13.00m depth, superficial Glacial Till was present and consisted of very stiff, brown and grey, slightly gravelly, silty clay. The gravel comprised sub-angular to rounded chalk and flint.

Oxford Clay Formation

Beneath the Glacial Till at 13.00m depth, to at least the base of the borehole at 15.00m depth, the anticipated solid geology of the Oxford Clay Formation was met. The Oxford Clay comprised very stiff, fissured to stiff, grey, silty clay.

Groundwater

Groundwater was met as a seepage at 2.70m depth in HA1 in the Tidal Flat Deposits, and at 8.60m depth in BH1 on entering the Abbey Gravel. During monitoring of the standpipe in HA1, groundwater was recorded at between 1.93m and 2.05m below ground level.

Observations

Live roots were observed in most of the boreholes, and to a maximum depth of 0.65m in HA1.

Evidence of Contamination

The made ground encountered during this investigation was not noted to have olfactory or visual evidence of fuel contamination. The made ground contained fragments of brick, mortar, ash, coal. No asbestos containing materials were noted in the soils during this investigation, or during testing.

COMMENTS ON THE GROUND CONDITIONS IN RELATION TO FOUNDATION DESIGN AND CONSTRUCTION

The proposed development is understood to comprise construction of a new dwelling, stables, storage building and manège, replacing an existing dwelling and derelict outbuildings.

The investigation confirmed the site to be covered by a thin layer of made ground, resting on the expected superficial Tidal Flat Deposits. The made ground soils had variable bearing properties and were found to a maximum depth of 0.60m. The made ground should be avoided as a bearing stratum. The proposed development loads were not known at the time of report writing, but they were anticipated to be light.

The typically medium dense, orange brown, silty fine sand Tidal Flat Deposits, could offer adequate support for lightly loaded traditional strip foundations, but underlying potentially shrinkable clays and trees may locally preclude this.

Traditional Foundations

Foundations should be extended through any made ground, which was locally found to a maximum 0.60m depth.

A sample of the silty fine sand Tidal Flat Deposits had a modified plasticity index of 6%, and the result indicates these soils are non-shrinkable. The silty fine sand of the Tidal Flat Deposits was encountered at below 0.30m to 0.60m depth, which could provide a suitable founding stratum. This stratum would be classed as non-shrinkable and where present could enable foundations to be cast at a minimum foundation depth of 0.60m.

Samples of the underlying organic clays below 1.70m depth have modified plasticity indices of 43% and 54%, and the results indicate these soils are high plasticity clays having a high volume change potential based on NHBC Standards Chapter 4.2 'Building near trees' (2018).

Semi-mature trees including Black Poplar, Yew and Hawthorn were present within the site and along site boundaries, with Cherry trees and a coniferous tree evident along the eastern boundary with Cowbit Drove. Where clay strata underlie sand reference should be made to paragraph 4.2.9 of the NHBC Chapter 4.2 for recommendation on foundation depth. With clay soils present below 1.70m depth; a fully mature Black Poplar tree would need to be at least 17m from the dwelling; a fully mature Hawthorn tree 6m away; a fully mature Leyland Cypress 6m away; a fully mature Yew tree 1m away; and a fully mature Orchard Cherry tree 1m away, for the adoption of foundations in the sand at 0.60m depth. Live roots were encountered to a maximum depth of 0.65m, however roots are likely to be deeper closer to trees.

In summary, foundations for the new dwellings will need to be a minimum of 0.60m deep, but if high loads or deepened foundations are required then piled foundations are recommended.

Bearing Capacity

It is recommended that foundations are extended through made ground to bear within the medium dense, silty fine sand Tidal Flat Deposits present below 0.60m depth, which could provide a suitable founding stratum. It is not recommended that foundations are extended into the underlying soft and very soft, organic clay Tidal Flat Deposits, encountered below 1.70m depth, as these have very poor bearing properties with anticipated total and differential settlement anticipated to be high.

The naturally deposited sand has a limited allowable bearing pressure of 85kN/m² for foundations up to 1.20m wide, which has been limited to avoid overstressing the underlying clay. This bearing pressure should limit immediate settlement to 25mm, although greater total and differential settlements will occur where the foundations straddle different soil types (clay or sand) or extend to different depths.

Piled Foundations

Alternatively piled foundations may provide an economical solution to support the proposed buildings, and would avoid differential settlements beneath foundations, particularly

where the building is to be positioned close to trees where the thickness of underlying non-shrinkable soil is of inadequate thickness. The underlying glacial deposits, and solid geology Oxford Clay, below any root affected clay and very soft organic clay or peat, would provide a suitable pile bearing stratum. The advice of a specialist piling contractor should be sought with regard to suitable methods of pile installation. Bored or Continuous Flight Augered (CFA) piles are likely to be best suited to these ground conditions. Vibrations from driven piles could be potentially damaging to nearby structures, particularly where they are supported by shallow footings.

Preliminary working loads for a single bored pile may be estimated for preliminary cost and design purposes using the pile bearing coefficients given over page, which are based on the following assumptions;

1. The ultimate load on a pile would be the sum of the adhesion in clay, acting on the shaft of the pile together with the end bearing load.
2. The shaft adhesion within made ground or any root affected clay should be ignored. Piles within the zone of roots from existing or former trees should be sleeved or fully reinforced in order to withstand the uplift pressures. Similarly the sides of pile caps or ground beams should also be protected by compressible or void forming material.
3. The adhesion acting on the shaft of a pile is a function (0.5) of the values of apparent cohesion within the clay, presented on the laboratory summary sheets and in Figure 1. The adhesion assumes that the very soft organic soils would not be surcharged by surface or floor loadings. If these soils are surcharged then negative shaft adhesion would need to be considered. In coarse-grained strata, the shaft friction would be a function of the in-situ test results presented on the borehole record, and the effective overburden pressure.
4. The end bearing load would be a function (9.0) of the average cohesion of the clay at the level of the pile base (Figure 1). In coarse-grained strata, the end bearing would be a function of the in-situ test results presented on the borehole record, and the effective overburden pressure.
5. A factor of safety of at least 2.0 would be used to assess the working load and if test loading of selected piles were not practical, the factor of safety would be increased to at least 2.5.

Item	Ultimate Pile Bearing Value (kN/m ²)
Friction/adhesion in made ground or desiccated clay	Ignored
Adhesion in Tidal Flat Deposit & soft Crowland Bed sand/clay, 1.00m to 7.80m	10
Adhesion in stiff Crowland Bed/Glacial Till, 7.80m to 13.00m	60
Adhesion in Oxford Clay, 13.00m to 15.00m	75
End bearing in Till/sand and gravel, 7.80m to 13.00m	1100
End bearing in Oxford Clay, below 13.00m	1350

Based on these coefficients it is estimated that a single 300mm diameter bored pile, installed to 10.00m depth, would have a working load of 105kN (F=2.5).

Larger diameter piles would have increased working loads. For example, the same 10.00m length pile at 450mm diameter would have a working load of 180kN (F=2.5).

These values assume that negative skin adhesion resulting from surcharging of the compressible Tidal Flat Deposits is not generated. If surcharge loads are to be applied to the ground around the piles, for example by a ground bearing floor slab it would be necessary to reduce the estimated working loads of the piles by negative skin friction due to the consolidation of the very soft organic clays around the pile shaft.

The final design of piles should be undertaken by a piling specialist.

Excavations

The made ground together with the underlying soils should be easily removed within foundation excavations for the proposed new dwelling and outbuildings, however remnant foundations may require the use of a breaker to remove. The sides of excavations within the made ground and silty sand soils, may be unstable and should not be relied upon to stand unsupported.

Excavations could be expected to encounter groundwater at approximately 1.95m depth, and should reflect the water level in adjacent drainage ditches. The groundwater levels may fluctuate seasonally and such inflows would locally be accompanied by 'running sand' conditions and resulting instability. Care should be taken not to excavate below the water table in

the absence of suitable side support and groundwater control, such as dewatering via screened sumps. The silty sand Tidal Flat Deposits are prone to loosening and deterioration in the presence of water, with loss of their limited bearing properties. Care should be taken to keep the excavations dry.

Statutory safety precautions should not be neglected and excavations especially those where personnel are to enter, will need to be supported, or have battered sides where space permits. All excavations should be undertaken in accordance with CIRIA Report 97 *Trenching Practice*

Floor Slabs

The proposed floor slabs could be ground bearing in the absence of thick made ground or root affected clay. The floor sub-grade should be inspected on completion to ensure that the condition of the soil complies with that assumed in design, with any soft spots, or hard spots, being removed and replaced with suitable well-graded coarse-grained fill and the formation proof rolled.

Where the floor slabs are within the zones of influence of either extant or recently removed trees, the root affected clay should be removed and replaced with well compacted non-shrinkable material or the slabs suspended using the sub-floor gaps recommended in Table 7 of the NHBC Standards Chapter 4.2 (2018).

Sulphate Conditions

Sulphate analysis of selected samples of silty sand Tidal Flat Deposits at shallow depth yielded soluble sulphate concentrations within Design Sulphate Class DS-1 of the BRE Special Digest 1, Table C1 (2005), presented in Appendix 3. The pH results of the samples were between 7.6 and 8.4 indicating alkaline conditions.

Sulphate analysis of selected samples of the underlying organic clay Tidal Flat Deposits, yielded soluble sulphate concentrations within Sulphate Design Class DS-2, and with a

result of DS-5 for a sample of peat at depth. The pH results of the organic clay were 7.4 and 7.8 indicating alkaline conditions, and 5.1 for the peat indicating acidic conditions.

These results indicate an Aggressive Chemical Environment for Concrete (ACEC) Class of AC-1 for buried concrete in the silty sand Tidal Flat Deposits, Class AC-5 for foundations deepened into the organic clay and peat. These ACEC Classes should be considered when specifying a Design Chemical Class (DC Class) for buried concrete on this site, as detailed in the above cited BRE document.

COMMENTS ON THE SOIL CHEMICAL TEST RESULTS

The results of the laboratory chemical testing on near surface soil samples have primarily been compared to soil screening values (SSVs) produced by Land Quality Management Limited (LQM) and the Chartered Institute for Environmental Health (CIEH) presented in their document 'The LQM/CIEH S4ULs for Human Health Risk Assessment: 2015 (Publication Number S4UL3608)'. The LQM/CIEH S4ULs are intended for use in assessing the potential risks posed to human health by contaminants in soil and are transparently-derived and cautious 'trigger values' above which further assessment of the risks or remedial action may be needed. The S4ULs (Suitable for Use Levels) have been derived, in accordance with UK legislation and Environment Agency policy, using a modified version of the Environment Agency CLEA 1.06 software.

Reference has also been given to ATRISKsoil soil screening values produced by Atkins Limited and provided under licence to Ground Engineering Limited. Atkins SSVs have been derived in line with the Environment Agency 2009 guidance using the CLEA 1.04 and 1.06 software. With the absence of a S4UL for cyanide the ATRISKsoil SSV has been used as the soil screening criteria within this report.

In 2014 the Department for Environment Food and Rural Affairs (DEFRA) published, in their document SP1010, Category 4 Screening Levels (C4SL) for several contaminants including lead. The C4SL represent screening levels below which the land could be considered suitable for a specified use and definitely not contaminated land in respect of those determinands. With the absence of S4UL for lead the C4SL has been used as the soil screening criteria within this report.

For each contaminant the adopted soil screening criteria have been calculated for the following land uses:

- Residential use with home grown produce
- Residential use without home grown produce
- Commercial and industrial usage

The intended purpose of the SSVs are as 'intervention values' in the regulatory framework for assessment of human health risks in relation to land use. These values are not binding standards, but are intended to inform judgements about the need for action to ensure that a new use of land does not pose any unacceptable risks to the health of the intended users.

Table 5 compares the test results for the made ground with the SSVs in relation to the specified uses. The number of test results, which exceed these values, are also provided.

Table 5: Comparison of Chemical Test Results with SSVs for Made Ground

Determinand	Number of Samples	Min Value mg/kg	Max Value mg/kg	Number of Samples Exceeding SSV for			Assessment Method	Soil Screening Criteria 2.5% SOM		
				Residential with home grown produce	Residential without home grown produce	Commercial/ Industrial		Residential with home grown produce mg/kg	Residential without home grown produce mg/kg	Commercial/ Industrial mg/kg
Organic Matter	4	2.8%	13%	-	-	-	-	-	-	-
Arsenic	4	9.7	25	0	0	0	S4UL	37	40	640
Cadmium	4	0.21	0.47	0	0	0	S4UL	11	85	190
Chromium (III)*	4	15	17	0	0	0	S4UL	910	910	8600
Chromium (VI)	4	<0.50	<0.50	0	0	0	S4UL	6	6	33
Lead	4	36	140	0	0	0	C4SL	200	310	2330
Mercury	4	<0.10	0.22	0	0	0	S4UL	11	15	320
Selenium	4	0.23	0.62	0	0	0	S4UL	250	430	12,000
Nickel	4	14	28	0	0	0	S4UL	130	180	980
Phenols	4	<0.30	<0.30	0	0	0	S4UL	200	690	690
Benzo[a]pyrene	4	0.40	4.2	0	0	0	C4SL	5.0	5.3	76
Copper	4	14	55	0	0	0	S4UL	2400	7100	68,000
Zinc	4	82	160	0	0	0	S4UL	3700	40,000	730,000
Free Cyanide	4	<0.50	<0.50	0	0	0	ATRISK	34	34	34

Notes

*The concentration of Trivalent Chromium is assumed to be equivalent to the Total Chromium concentration. This is because most naturally occurring chromium is in the trivalent (chromic) state.

S4UL and C4SL for metals were derived using 6% SOM. These values are not sensitive to SOM and would also be applicable for 1% SOM and 2.5% SOM.

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ATRISKsoil SSVs produced by Atkins Limited and provided under licence to Ground Engineering Limited.

Discussion of Soil Results

Levels of all elements and compounds in the samples tested were within the associated soil screening values for both residential end uses and for a commercial/industrial end use.

The made ground encountered during this investigation was not noted to have olfactory or visual evidence of fuel contamination. Total petroleum hydrocarbon (TPH) concentrations of between less than 10mg/kg (below laboratory detection limit) and 170mg/kg were recorded in the samples of made ground tested, which are not considered significant.

No asbestos containing materials (ACM) were noted within the near surface soils.

The results indicate that the near surface soils on this site would be considered suitable for retention/re-use in the proposed residential development.

SOIL GAS MONITORING RESULTS

As part of the investigation three return visits were made to site on 19th and 26th September, and 3rd October 2018, to record the concentrations of landfill type gases (methane, carbon dioxide, oxygen) in the HA1 standpipe. The results are presented following the exploratory hole records.

The recorded concentrations of methane were less than 0.1%.

The recorded concentrations of carbon dioxide were between 4.2% and 4.4%. The recorded oxygen concentrations were between 15.6% and 18.5%. The in-situ measurements generally confirmed a negligible gas emission rate with a maximum recorded flow rate of 0.1l/hr.

Based on the measured maximum flow rate of 0.1l/hr, the results give a Gas Screening Value (GSV) of 0.0044l/hr. This GSV falls within the modified Wilson and Card Characteristic Situation 1 or 'Green' classification of the NHBC traffic light system, as defined by the Construction Industry Research and Information Association, CIRIA Report C665, 'Assessing risks posed by hazardous ground gasses to buildings'. These results indicate no gas precautions measures are necessary.

UPDATED CONCEPTUAL MODEL

Assessment of the potential linkage between ground contamination sources, human and environmental receptors have been assessed based on the desk study research and the intrusive ground investigation documented in the preceding sections of this report.

A generalised conceptual model relative to the existing site and proposed continued residential use of the site is presented in Table 6 below.

Table 6: General Conceptual Model Relative to Future Residential Development

Receptors	Pathway	Estimated Potential for Linkage with Contaminant Sources			
		Drainage	Soil	Soil Gas	Off-Site Sources
Human Health i groundworkers	Ingestion and Inhalation of contaminated Soil, Dust and Vapour	Low	Low	Moderate	Very Low
Human Health i users of completed development	Ingestion and Inhalation of contaminated Soil, Dust and Vapour	N/A	Low	Low	Very Low
Water Environment	Migration through ground into surface water or groundwater	Low	Very Low	Very Low	Very Low
Flora	Vegetation on site growing on contaminated soil	Very Low	Very Low	Very Low	Very Low
Building Materials	Contact with contaminated soil	Very Low	Very Low	Very Low	Very Low

<u>Key to Table 6 Risk</u>	Definition
Very High	There is a high probability that severe harm could arise to a designated receptor from an identified hazard, or, there is evidence that severe harm to a designated receptor is currently happening. The risk, if realised, is likely to result in a substantial liability. Urgent investigation (if not undertaken already) and remediation are likely to be required.
High	Harm is likely to arise to a designated receptor from an identified hazard. Realisation of the risk is likely to present a substantial liability. Urgent investigation (if not undertaken already) and remedial works may be necessary in the short term and likely over the long term.
Moderate	It is possible that harm could arise to a designated receptor from an identified hazard. However, it is either relatively unlikely that any such harm would be severe, or if any harm were to occur it is more likely that the harm would be relatively mild.
Low	It is possible that harm could arise to a designated receptor from an identified hazard, but it is likely that this harm, if realised, would at worst normally be mild.
Very Low	There is a low possibility that harm could arise to a receptor. In the event of such harm being realised it is not likely to be severe.
N/A	Not Applicable because the proposed development will remove the source.

COMMENTS ON GROUND CONTAMINATION IN RELATION TO PROPOSED DEVELOPMENT

Anticipated exposure scenarios relating to the existing site, the site history and proposed residential end use of the site, in the context of the conceptual model, are discussed as follows.

The proposed development is understood to comprise construction of a new dwelling, stables, storage building and manège.

This investigation may not have revealed the full extent of contamination on the site and appropriate professional advice should be sought if subsequent site work reveals materials that may appear to be contaminated.

Contaminated Soil

On the basis of the ground investigation, the site is underlain by between 0.30m and 0.60m of made ground. The presence of made ground and the levels of contaminants indicate that there is a low risk of contaminants affecting groundworkers during any construction works, and there is a low risk of affecting future end users of the site.

The made ground soils encountered beneath the site would be considered suitable for re-use within the gardens or landscaped areas of this residential development.

Existing Drainage

Redundant drain runs, where encountered, should be removed from beneath the site and precautions should ensure that any remaining effluent is directly disposed off-site. The integrity of existing drainage should be checked, and if they are to be retained any damaged sections should be replaced prior to development. The latter measures should minimise any future risk to human health and the water environment.

Soil Gas

According to the environmental database there are no landfills on, or within 250m of the site. The site is generally underlain by a thin layer of made ground, covering superficial Tidal Flat Deposits.

There is a moderate risk that hazardous gases would affect groundworkers during the construction phase and a low risk of hazardous gases affecting future users of the site.

The site lies within an area where less than 1% of homes are above the BRE action level for radon and that no radon protection measures are required.

Human Health - Construction Workers

Based on the chemical test results, no special precautions would be required during the development of the site by workers who may come into contact with the soil during groundworks, providing standard precautions are adopted which should generally include the procedures given by the Health and Safety Executive (The Blue Book) HS(G)66.

For the protection of workers during groundworks the following is recommended:

- a) Limit repeated or prolonged skin contact with soils by wearing gloves with sleeves rolled down.
- b) Washing facilities should be made available to groundworkers, so as to minimise the potential for inadvertent ingestion of soil.
- c) If any soils are revealed which are different to those encountered by this ground investigation, the advice of a specialist should be sought in view of classifying the material and ascertaining its risk to groundworkers.
- d) Consideration should be given to gas monitoring within deep or confined spaces, to ensure safety of personnel entering them, since carbon dioxide could accumulate within any excavations, service chambers or sub-structures.

Human Health - Users of Completed Development

The results of the chemical analysis would indicate that the made ground should be considered to be suitable for retention/re-use at the surface within any new garden, landscaped or patio areas.

For areas to be covered by buildings or hard surfaced areas, which would effectively provide a barrier from end users to the made ground, the made ground could be re-used, however these soils could affect buried services.

Any soil imported to site must be certified as "suitable for use".

Water Environment

The site is underlain by superficial clay Tidal Flat Deposits, covering glacial deposits and the solid geology Oxford Clay Formation at depth. The Tidal Flat Deposits and Oxford Clay are indicated by the EA to be "Unproductive strata". The nearest surface water feature is a drain bordering the southern end of the site. The site does lie within a Zone 2 (outer catchment) source protection zone.

Groundwater was approximately 1.95m below ground level during the investigation.

The risk to the water environment is considered very low as it is unlikely that the proposed development and contaminants within the made ground soils would impact the quality of the water environment.

Effects on Building Materials and Buried Services

The sulphate requirements for buried concrete have been discussed in the previous section of this report.

The local water supply company should be consulted if new buried plastic water pipes within the made ground soils on this site are proposed.

Off-Site Disposal of Soil Arisings

The results of chemical analysis are provided following the exploratory hole records and can be used within the information necessary for basic characterisation of the soil destined for landfill. The Environment Agency publication Hazardous Waste, Technical Guidance WM2 outlines the methodology for classifying wastes and should be referenced for guidance. The test results (total metals, hydrocarbons and cyanide) should be compared to the relevant thresholds to determine whether they fall into the primary categories of non-hazardous or hazardous waste and will help indicate the likely European Waste Catalogue (EWC) code which is determined by the waste type.

Excavated material and excess spoil should always be classified prior to removal from site as required by 'Duty of Care' (Environmental Protection Act, 1990) legislation. This means that material has to be given a proper description and waste classification prior to removal. Basic characterisation is the responsibility of the waste producer, whilst compliance checking and on-site verification are generally the responsibility of the landfill operator. The landfill operator will need to liaise with the waste producer, as the approach relies on the information from basic characterisation. Hydrocarbon impacted soils are likely to be classified as special waste.

It is expected that arisings of natural soils from the excavations across this site would fall into the inert category under the European Waste Catalogue description 'Soil and Stones' EWC code 17 05 04 with restrictions excluding topsoil and peat.

CONCLUSIONS

The proposed development is understood to comprise construction of a new dwelling, stables, storage building and manège.

Remediation Strategy

No remediation is considered necessary where garden, landscaped or patios areas are proposed.

For areas to be covered by buildings or hard surfaced areas, which would effectively provide a barrier to end users, from the made ground. The made ground, the made ground could be re-used if geotechnically suitable, however these soils could affect buried services.

No gas protection measures are considered necessary for the proposed dwelling.

Topsoil

Any imported topsoil should have appropriate certificates confirming its suitability prior to placement.

REMEDIAL METHOD STATEMENT

The following points will constitute a plan for remedial works considered necessary in order to ensure that soils retained within the development are fit for use.

- The groundworks contractor should undertake a watching brief during works to check for polluted soil.
- No remediation is considered necessary in garden, landscaped and patios areas.
- The made ground could be considered for re-use beneath proposed buildings and permanent hardstanding, if suitable for engineering purposes, where the risk to future site users would be very low.
- If soils are revealed which are different to those encountered by this ground investigation, the advice of a specialist should be sought. Any such soils will either be immediately removed off site to a licensed disposal or treatment facility or placed within a designated quarantine zone on a membrane or holding tank for future classification, treatment and/or removal.
- A photographic record of such remediation should be undertaken by the contractor.
- Any imported 'clean' inert topsoil and granular fill should be supported by verification certificates to provide proof of its suitability. Documentation relating to the source of clean inert topsoil should be presented to the Local Planning Authority for approval prior to infilling. Samples of the imported clean topsoil placed in the raised landscaped areas should be tested to verify that the soil is suitable for use.
- The Local Authority should also be informed regarding each stage of the works and photographic evidence together with copied waste transfer receipts for any arisings should be gathered, as they are essential to demonstrate the works.
- The local water supply company should be consulted if new buried plastic water pipes within the made ground soils on this site are proposed.

VALIDATION

As the scheme includes gardens and landscaping within a residential development, remediation will be required within the site if unsuitable soils are met. Implementation of the remediation strategy should be checked during construction and on completion, and appropriate records kept so that a Validation Report can be compiled and subsequently submitted to the local authority.

GROUND ENGINEERING LIMITED



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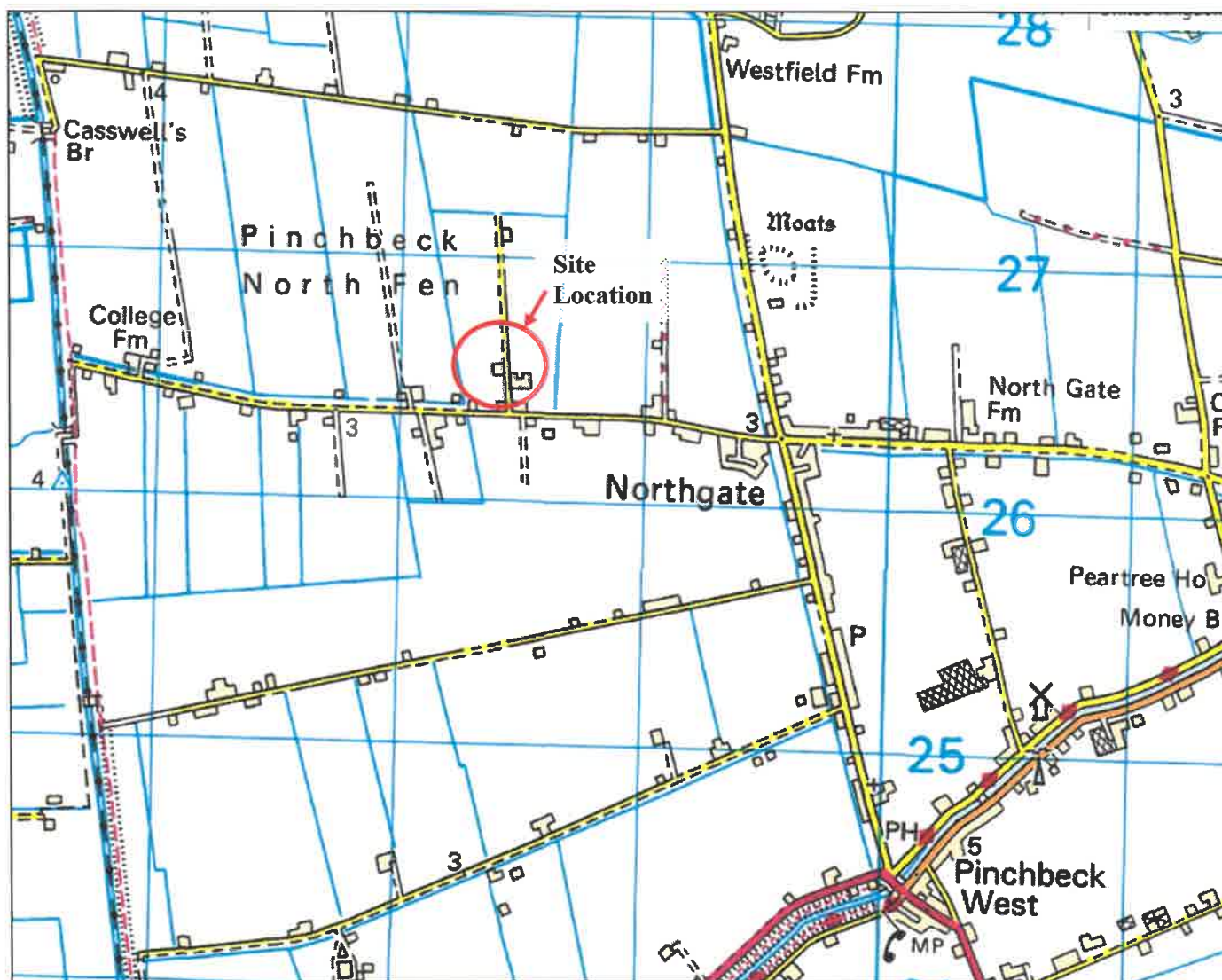
M.Sc., M.A.E.G.

C.Geol., F.G.S.,

Director

Site Location Plan

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Not To Scale



Project : The Cottage, Cowbit Drive, West Pinchbeck,
Spalding, Lincolnshire

Client : Andrew & Zoe Chamberlain

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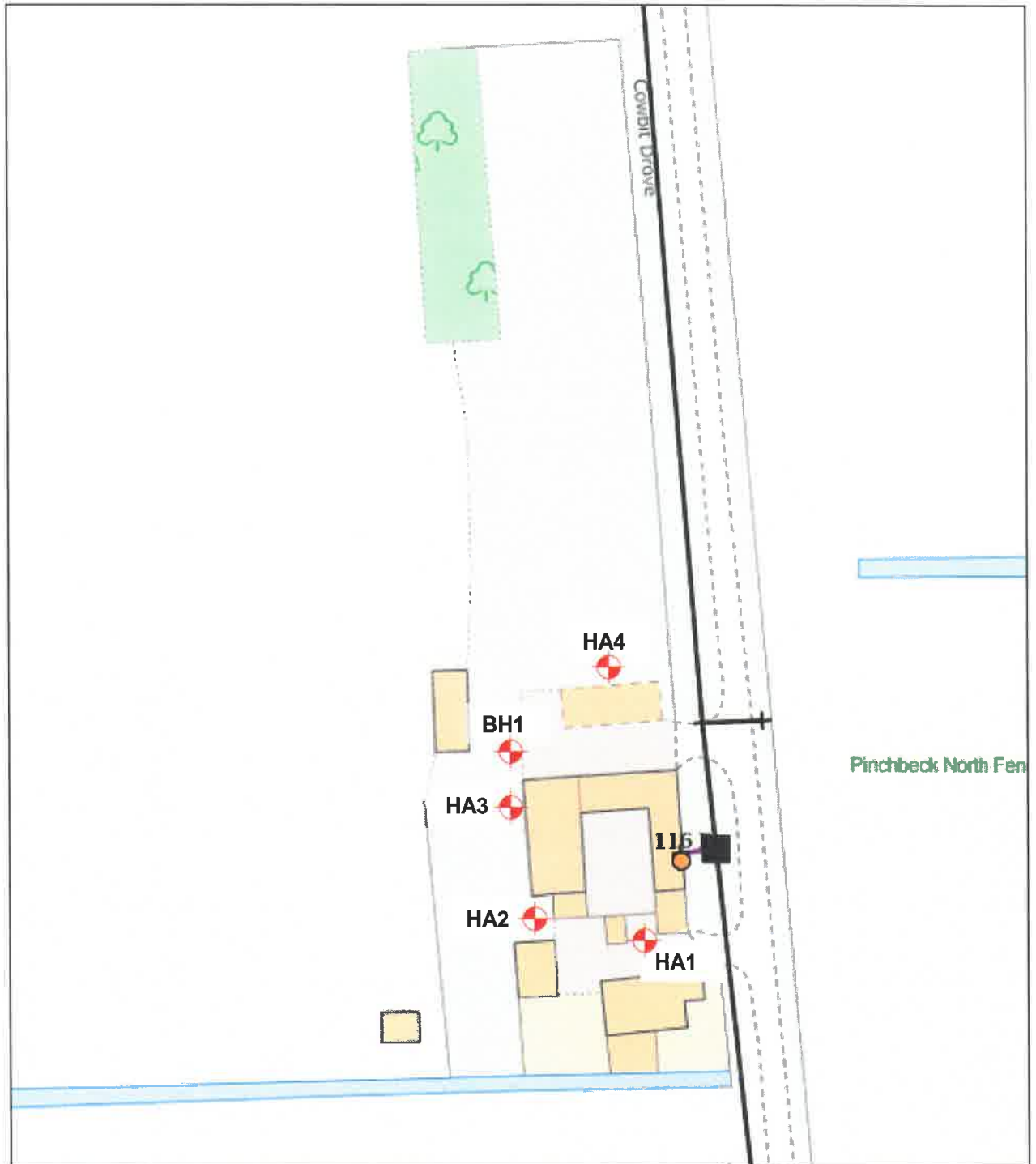
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Project No.

C14565

Exploratory Hole Location Plan

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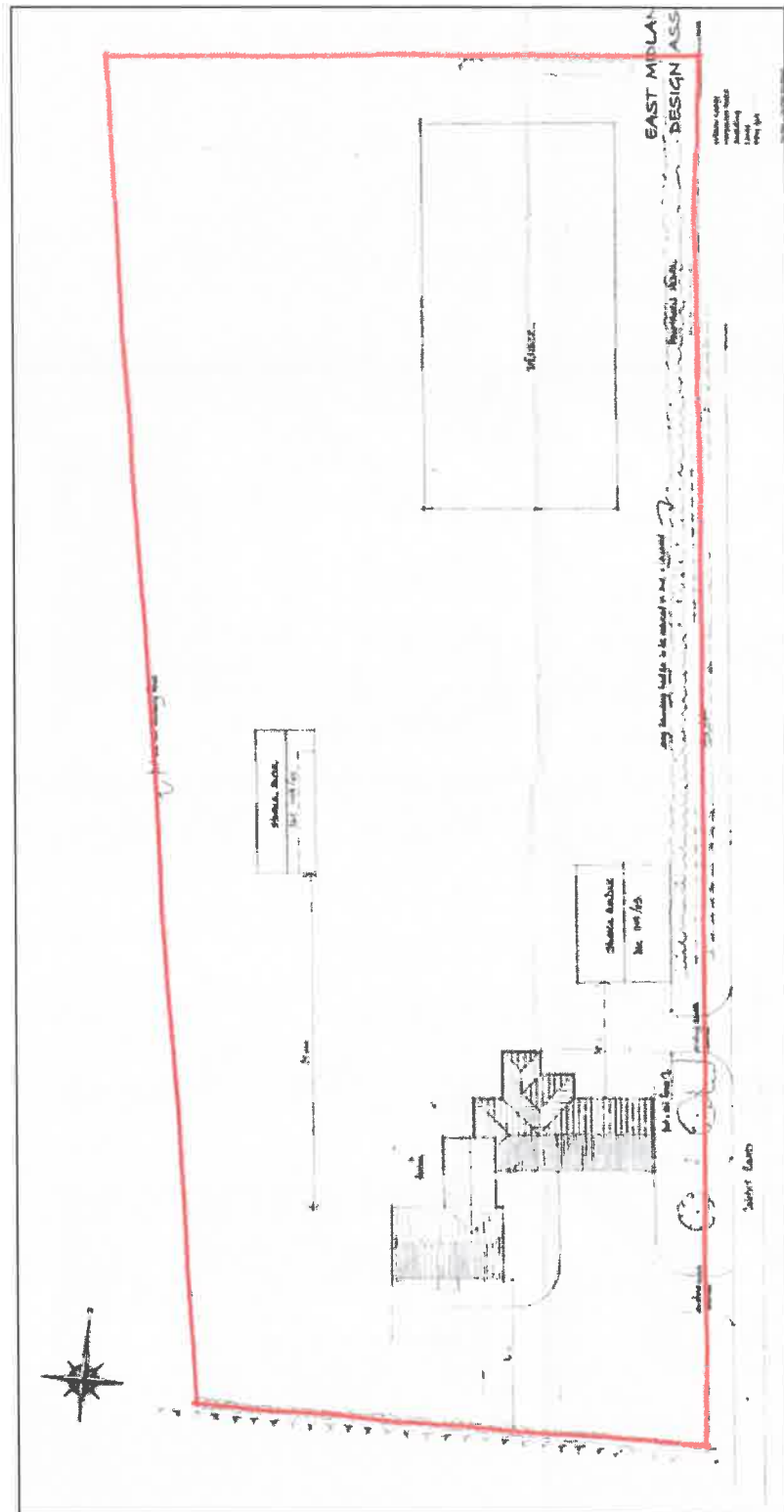
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Proposed Development Plan

Based on plan provided by the client



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Spalding, Lincolnshire

Client: Andrew & Zoe Chamberlain

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Site Walkover Photographs



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**Project No.
C14565**

GROUND ENGINEERING LIMITED Tel: 01733-566566 www.groundengineering.co.uk			Site: THE COTTAGE, COWBIT DROVE, WEST PINCHBECK			BOREHOLE BH1						
Date: 14/09/18			Hole Size: 150mm dia to 15.00m			Ground Level:						
Samples and in-situ Tests			(Date)	Description of Strata		Legend	Depth m	O.D. Level m				
Depth m	Type	Blows	Casing									
0.10 0.20-0.70	D1 B1			MADE GROUND - Firm, dark brown and brown, slightly gravelly, silty CLAY. Gravel is angular to sub-rounded flint and brick fragments.			0.60					
0.70 0.80-1.20	D2 B2			Very loose, orange brown, gravelly, very silty SAND. Sand is fine grained. Gravel is angular to sub-rounded flint.								
1.20-1.70 1.35-1.65	B3 S	N2	1.20	(TIDAL FLAT DEPOSIT)			1.70					
1.65 1.70 1.80-2.20	D3 D4 U1	20	1.60	Soft becoming very soft below 2.50m depth, grey, organic CLAY.								
2.30	D5											
2.80-3.20	U2	10	2.80									
3.30	D6											
3.80-4.20	U3	10	3.10	(TIDAL FLAT DEPOSIT)								
4.30	D7											
4.80-5.20	U4	10	4.80									
5.30 5.40 5.50-5.90	D8 D9 U5	12	5.50	Firm, black, fibrous PEAT. (TIDAL FLAT DEPOSIT)			5.30					
6.00	D10						5.90					
6.20 6.30-6.70	D11 U6	8	6.10	Soft becoming very soft, green-grey, silty, organic CLAY. (TIDAL FLAT DEPOSIT)								
6.80 7.00 7.10-7.50	D12 D13 U7	15	7.10	Firm, black, fibrous PEAT. (LOWER PEAT)			7.00					
7.60	D14						7.40					
7.80 8.00-8.30	D15 U8	45	8.00	Soft, grey, slightly gravelly, sandy, silty CLAY. Gravel is angular to rounded flint and sandstone. (CROWLAND BED)			7.80					
8.40 8.60	D16 D17		1 1/2	Stiff, grey and brown, silty CLAY, occasional gravel size calcareous concretions. (CROWLAND BED)			8.60					
8.80 9.00-9.40	D18 U9	80	9.00	Brown, gravelly SAND. Gravel is angular to rounded flint. (ABBEY GRAVEL)			8.80					
9.50	D19			Very stiff, brown and grey, slightly gravelly, silty CLAY. Gravel is sub-angular to rounded chalk and flint. (GLACIAL TILL)								
10.00	D20						10.00					
REMARKS 1. Excavating a pit from 0.00m to 1.20m for 1 hour 2. Borehole cased to 10.50m depth							Project No 14565					
							Scale 1:50	Page 1/2				
KEY			Groundwater Strikes				Groundwater Observations					
N/* - SPT Blows for 0.3m or given penetration			Depth m				Depth m					
D - Disturbed Sample			No	Struck	Rose to	Rate	Cased	Sealed	Date	Hole	Casing	Water
B - Bulk Sample			1	8.60		seepage	8.00	not	14/09/18	15.00	10.50	dry
U - Undisturbed Sample									14/09/18	15.00	0.00	dry
W - Water Sample												
S/C - SPT Spoon/Cone												
V - Vane Shear Test												
Cohesion () kPa												
Level on completion												
c/w Level casing withdrawn												
Standpipe Level												

GROUND ENGINEERING LIMITED Tel: 01733-566566 www.groundengineering.co.uk			Site: THE COTTAGE, COWBIT DROVE, WEST PINCHBECK				BOREHOLE BH1				
			Date: 14/09/18		Hole Size: 150mm dia to 15.00m			Ground Level:			
Samples and in-situ Tests			(Date) Casing	Description of Strata	Legend	Depth m	O.D. Level m				
Depth m	Type	Blows									
10.50-10.90	U10	85	10.50	Very stiff, grey, slightly gravelly, silty CLAY with bivalve shell fragments. Gravel is angular and sub-angular chalk.		10.00					
11.00	D21										
11.50	D22										
12.00-12.40	U11	85	10.50	(GLACIAL TILL)		13.00					
12.50	D23										
13.00	D24										
13.50-13.90	U12	90	10.50	Very stiff, fissured to stiff, grey, silty CLAY. (OXFORD CLAY)		15.00					
14.00	D25										
14.50-14.90	U13	95									
15.00	D26			Borehole completed at 15.00m depth							
REMARKS								Project No 14565			
								Scale 1:50	Page 2/2		
KEY D - Disturbed Sample B - Bulk Sample U - Undisturbed Sample W - Water Sample S/C - SPT Spoon/Cone ☒ Water Strike ☒ Water Rise			N/* - SPT Blows for 0.3m or given penetration ES - Environmental Sample V - Vane Shear Test Cohesion () kPa ☒ Level on completion c☒w Level casing withdrawn ☒s Standpipe Level			Groundwater Strikes Depth m No Struck Rose to Rate Cased Sealed			Groundwater Observations Date Depth m Hole Casing Water		

GROUND ENGINEERING

L I M I T E D
Tel: 01733-566566
www.groundengineering.co.uk

Site: THE COTTAGE, COWBIT DROVE, WEST PINCHBECK

HAND AUGER
HA1

Date: 07/09/18

Hole Size: 70mm dia to 3.00m

Ground Level:

Samples and in-situ Tests			(Date)	Inst.	Description of Strata	Legend	Depth m	O.D. Level m
Depth m	Type	Result	Water					
0.20 0.30-0.40	ES1 B1	100			MADE GROUND - CONCRETE.		0.05	
0.55-0.65 0.55-0.65	B2 ES2				MADE GROUND - Grey and brown, slightly gravelly, sandy SILT. Gravel is angular to sub-rounded flint and brick fragments.		0.50 0.60	
0.90-1.10 1.00-1.25	B3 MP1				MADE GROUND - Brown and yellow brown, slightly gravelly, sandy, clayey SILT. Sand is fine grained. Gravel is ash and coal.			
					Medium dense, orange brown and grey, silty fine SAND.			
1.40-1.80	B4				(TIDAL FLAT DEPOSIT)			
							1.80	
2.10-2.30	B5				Soft, grey, silty, slightly organic CLAY with part decayed root fragments and pockets of organic matter below 2.60m depth.			
2.60-3.00	B6				(TIDAL FLAT DEPOSIT)			
							3.00	
					Hole completed at 3.00m depth			

REMARKS 1. Live roots observed to 0.65m depth
2. Hole sides stable
3. Gas monitoring standpipe installed to 3.00m depth

Project No
14565

Scale 1:25
Page 1/1

KEY

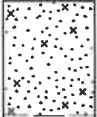
D - Disturbed Sample
B - Bulk Sample
U - Undisturbed Sample
W - Water Sample
R - Root Sample
▽ Water Strike
▽c Level on completion
MP - Mackintosh Probe
V - Vane Shear Test
Cohesion () kPa
ES - Environmental Sample
▽ Water Rise
▽s Standpipe Level

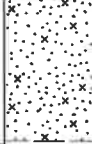
Groundwater Strikes

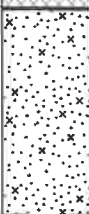
Depth m					
No	Struck	Rose to	Rate	Cased	Sealed
1	2.70		seepage		

Groundwater Observations

Depth m			
Date	Hole	Casing	Water
07/09/18	3.00		
19/09/18	3.00	1.00	2.02
26/09/18	3.00	1.00	2.05
03/10/18	3.00	1.00	1.93

GROUND ENGINEERING LIMITED Tel: 01733-566566 www.groundengineering.co.uk			Site: THE COTTAGE, COWBIT DROVE, WEST PINCHBECK				HAND AUGER HA2					
			Date: 07/09/18		Hole Size: 70mm dia to 1.00m					Ground Level:		
Samples and in-situ Tests			(Date) Water	Description of Strata	Legend	Depth m	O.D. Level m					
Depth m	Type	Result										
0.10-0.20	B1	100		MADE GROUND - Brown and dark brown, slightly gravelly, sandy SILT. Gravel is angular to sub-rounded flint, mortar and brick fragments.								
0.10-0.20	ES1											
0.30-0.60	B2			Medium dense, orange brown, silty fine SAND. (TIDAL FLAT DEPOSIT)			0.60					
0.50	ES2											
0.70-1.00	B3											
1.00-1.18	MP1				1.00							
				Hole completed at 1.00m depth								
REMARKS 1. Live roots observed to 0.60m depth 2. Hole sides stable								Project No 14565				
								Scale 1:25	Page 1/1			
KEY D - Disturbed Sample MP - Mackintosh Probe B - Bulk Sample V - Vane Shear Test U - Undisturbed Sample Cohesion () kPa W - Water Sample ES - Environmental Sample R - Root Sample  Water Strike  Water Rise  Level on completion  Standpipe Level			Groundwater Strikes				Groundwater Observations					
			Depth m						Depth m			
			No	Struck	Rose to	Rate	Cased	Sealed	Date	Hole	Casing	Water
						07/09/18	1.00		dry			

GROUND ENGINEERING L I M I T E D Tel: 01733-566566 www.groundengineering.co.uk			Site: THE COTTAGE, COWBIT DROVE, WEST PINCHBECK				HAND AUGER HA3					
			Date: 07/09/18		Hole Size: 70mm dia to 1.00m		Ground Level:					
Samples and in-situ Tests			(Date) Water	Description of Strata	Legend	Depth m	O.D. Level m					
Depth m	Type	Result										
0.10-0.20	B1	100		MADE GROUND - Grey and brown, sandy, gravelly SILT with rare cobbles of brick. Gravel is angular to sub-rounded flint, igneous rock and brick fragments.		0.30						
0.20	ES1											
0.40-0.50	B2			Brown, slightly gravelly, sandy SILT. Sand is fine grained. Gravel is angular to sub-rounded quartz and flint. (TIDAL FLAT DEPOSIT)		0.50						
0.80-1.00	B3			Medium dense, orange brown and grey, silty fine SAND. (TIDAL FLAT DEPOSIT)								
1.00-1.26	MP1					1.00						
				Hole completed at 1.00m depth								
REMARKS 1. Live roots observed to 0.30m depth 2. Hole sides stable								Project No 14565				
								Scale 1:25	Page 1/1			
KEY D - Disturbed Sample MP - Mackintosh Probe B - Bulk Sample V - Vane Shear Test U - Undisturbed Sample Cohesion () kPa W - Water Sample ES - Environmental R - Root Sample Sample ▽ Water Strike ▽ Water Rise ▽c Level on completion ▽s Standpipe Level			Groundwater Strikes				Groundwater Observations					
			Depth m						Depth m			
			No	Struck	Rose to	Rate	Cased	Sealed	Date	Hole	Casing	Water
						07/09/18	1.00		dry			

GROUND ENGINEERING L I M I T E D Tel: 01733-566566 www.groundengineering.co.uk			Site: THE COTTAGE, COWBIT DROVE, WEST PINCHBECK				HAND AUGER HA4			
			Date: 07/09/18		Hole Size: 70mm dia to 1.00m		Ground Level:			
Samples and in-situ Tests			(Date) Water	Description of Strata	Legend	Depth m	O.D. Level m			
Depth m	Type	Result								
0.05-0.25	B1	55		MADE GROUND - Brown, slightly gravelly, sandy SILT. Sand is fine grained. Gravel is angular to sub-rounded flint and brick fragments.		0.30				
0.20	ES1			Medium dense, orange brown and grey, silty fine SAND.						
0.50-1.00	B2			(TIDAL FLAT DEPOSIT)						
1.00-1.30	MP1			Hole completed at 1.00m depth						
REMARKS 1. Live roots observed to 0.30m depth 2. Hole sides stable								Project No 14565		
								Scale 1:25	Page 1/1	
KEY D - Disturbed Sample MP - Mackintosh Probe B - Bulk Sample V - Vane Shear Test U - Undisturbed Sample Cohesion () kPa W - Water Sample ES - Environmental Sample R - Root Sample  Water Rise  Level on completion  Standpipe Level			Groundwater Strikes				Groundwater Observations			
			Depth m				Depth m			
			No	Struck	Rose to	Rate	Cased	Sealed	Date	Hole
							07/09/18	1.00		dry

Groundwater & Gas Monitoring Record

Site: **The Cottage, Cowbit Drive, West Pinchbeck**

Report Ref: **C14565**

Date	Borehole No.	Methane (% v/v)		Methane LEL %	Carbon Dioxide (% v/v)		Oxygen (% v/v)		Flow Rate (l/hr)	Atmosph. Pressure (mb)	Depth of Well (mbgl)	Depth to Groundwater (mbgl)	Comments
		Peak	Steady		Peak	Steady	Min.	Max.					
19/09/2018	HA1	<0.1	<0.1	<0.1	4.4	4.4	15.6	15.6	<0.1	1009	3.00	2.02	Water sampled
26/09/2018	HA1	<0.1	<0.1	<0.1	4.3	4.3	18.2	18.2	<0.1	1029	3.00	2.05	
03/10/2018	HA1	<0.1	<0.1	<0.1	4.2	4.2	18.5	18.5	<0.1	1027	3.00	1.93	

LEL – Lower Explosive Limit

GROUND ENGINEERING LIMITED, NEWARK ROAD, PETERBOROUGH, PE1 5UA

LABORATORY TEST RESULTS

CONTRACT THE COTTAGE, COWBIT DROVE, WEST PINCHBECK

Bore-hole	Sample	Depth m	Classification				Density		Triaxial Compression					Sulphates (SO ₄)				Remarks
			Liquid Limit %	Plastic Limit %	Plasticity Index %	Moisture Content %	Bulk Mg/m ³	Dry Mg/m ³	Type	Principal Stress Difference kPa	Cell Pressure kPa	Shear Strength kPa	Angle of Shear Resistance degrees	Total % Dry Wt.	Aqueous Extract mg/l	Water mg/l	pH	
BH1	B2	0.80 - 1.20	32	24	8	20												SOIL CLASSIFICATION = ML 21% retained on 425µm sieve
	B3	1.20 - 1.70												412			8.2	
	U1	1.80 - 2.20	69	26	43	49	1.71	1.16	QM	46 54 62	50 100 200	27	0					SOIL CLASSIFICATION = CH 0% retained on 425µm sieve
	U2	2.80 - 3.20				76	1.63	0.93	Q	11	50	5	0	899			7.8	
	U3	3.80 - 4.20																Hand Vane Test = 13kPa
	U4	4.80 - 5.20																Hand Vane Test = 15kPa
	D9	5.40												6341			5.1	
	U6	5.50 - 5.90																Hand Vane Test = 12kPa
	U7	7.10 - 7.50																Hand Vane Test = 23kPa
	U8	8.00 - 8.30				22	2.10	1.73	Q	213	140	106	0					

14565

Aqueous Extract 2:1 Water:Soil

U - UNDISTURBED SAMPLE
D - DISTURBED SAMPLE
B - BULK SAMPLE
W - WATER SAMPLE
C.U. - CONSOLIDATED UNDRAINED
C.D. - CONSOLIDATED DRAINED
Q. - IMMEDIATE UNDRAINED
Q.M. - IMMEDIATE UNDRAINED MULTISTAGE

LABORATORY TEST RESULTS

CONTRACT THE COTTAGE, COMBIT DROVE, WEST PINCHBECK

Bore-hole	Sample	Depth m	Classification				Density		Triaxial Compression					Sulphates (SO ₄)				Remarks	
			Liquid Limit %	Plastic Limit %	Plasticity Index %	Moisture Content %	Bulk Mg/m ³	Dry Mg/m ³	Type	Principal Stress Difference kPa	Cell Pressure kPa	Shear Strength kPa	Angle of Shear Resistance degrees	Soil		Water			pH
														Total Dry Wt. %	Aqueous Extract mg/l	mg/l	mg/l		
BH1	U9	9.00 - 9.40				16	2.19	1.88	Q	521	160	261	0						
	U10	10.50 - 10.90				21	2.13	1.77	Q	254	190	127	0						
	U11	12.00 - 12.40				15	2.18	1.89	Q	529	210	264	0						
	U12	13.50 - 13.90				20	2.01	1.67	Q	187	240	94	0						
	U13	14.50 - 14.90				21	2.04	1.69	Q	295	260	148	0						

U - UNDISTURBED SAMPLE
D - DISTURBED SAMPLE
B - BULK SAMPLE
W - WATER SAMPLE

C.U. - CONSOLIDATED UNDRAINED
C.D. - CONSOLIDATED DRAINED
Q. - IMMEDIATE UNDRAINED
Q.M. - IMMEDIATE UNDRAINED MULTISTAGE

Aqueous Extract 2:1 Water:Soil

14565

LABORATORY TEST RESULTS

CONTRACT THE COTTAGE, COMBIT DROVE, WEST PINCHBECK

Bore-hole	Sample	Depth m	Classification				Density		Triaxial Compression					Sulphates (SO ₄)				Remarks	
			Liquid Limit %	Plastic Limit %	Plasticity Index %	Moisture Content %	Bulk Mg/m ³	Dry Mg/m ³	Type	Principal Stress Difference kPa	Cell Pressure kPa	Shear Strength kPa	Angle of Shear Resistance degrees	Soil		Water			
														Total % Dry Wt.	Aqueous Extract mg/l	mg/l	pH		
HA1	B4	1.40 - 1.80														272		8.1	SOIL CLASSIFICATION = CV 0% retained on 425µm sieve
	B5	2.10 - 2.30	89	35	54	58										957		7.4	

U - UNDISTURBED SAMPLE
D - DISTURBED SAMPLE
B - BULK SAMPLE
W - WATER SAMPLE

C.U. - CONSOLIDATED UNDRAINED
C.D. - CONSOLIDATED DRAINED
Q. - IMMEDIATE UNDRAINED
Q.M. - IMMEDIATE UNDRAINED MULTISTAGE

14565



8180

TEST CERTIFICATE**GROUND ENGINEERING**

Newark Road Peterborough
t: 01733 566566
e: admin@groundengineering.co.uk

Determination of Particle Size Distribution

Tested in Accordance with BS 1377-2: 1990: Clause 9.2
Sieved Grading

Client: Ground Engineering Ltd
Client Address: Newark Road
Peterborough
PE1 5UA

Certificate Number: PL6407-1/1/710-2
Client Reference: C14565
Lab Job Number: PL6407-1
Date Sampled: Unknown
Date Received: 20.09.2018
Date Tested: 17.10.2018
Certificate of Sampling: N/A
Sampling Certificate No.: N/A
Sampled By: Client

Contact: Simon Weatherley

Site Name: The Cottage
Site Address: Cowbit Drive, West Pinchbeck

TEST RESULTS

Laboratory Reference: PL6407-1/1

Pre-treatment for organic material: N/A

Client Reference: B2

Sample Description: Brown slightly gravelly SILT/SAND. Gravel consists of angular to sub-rounded flint.

Material Specification: Not Required

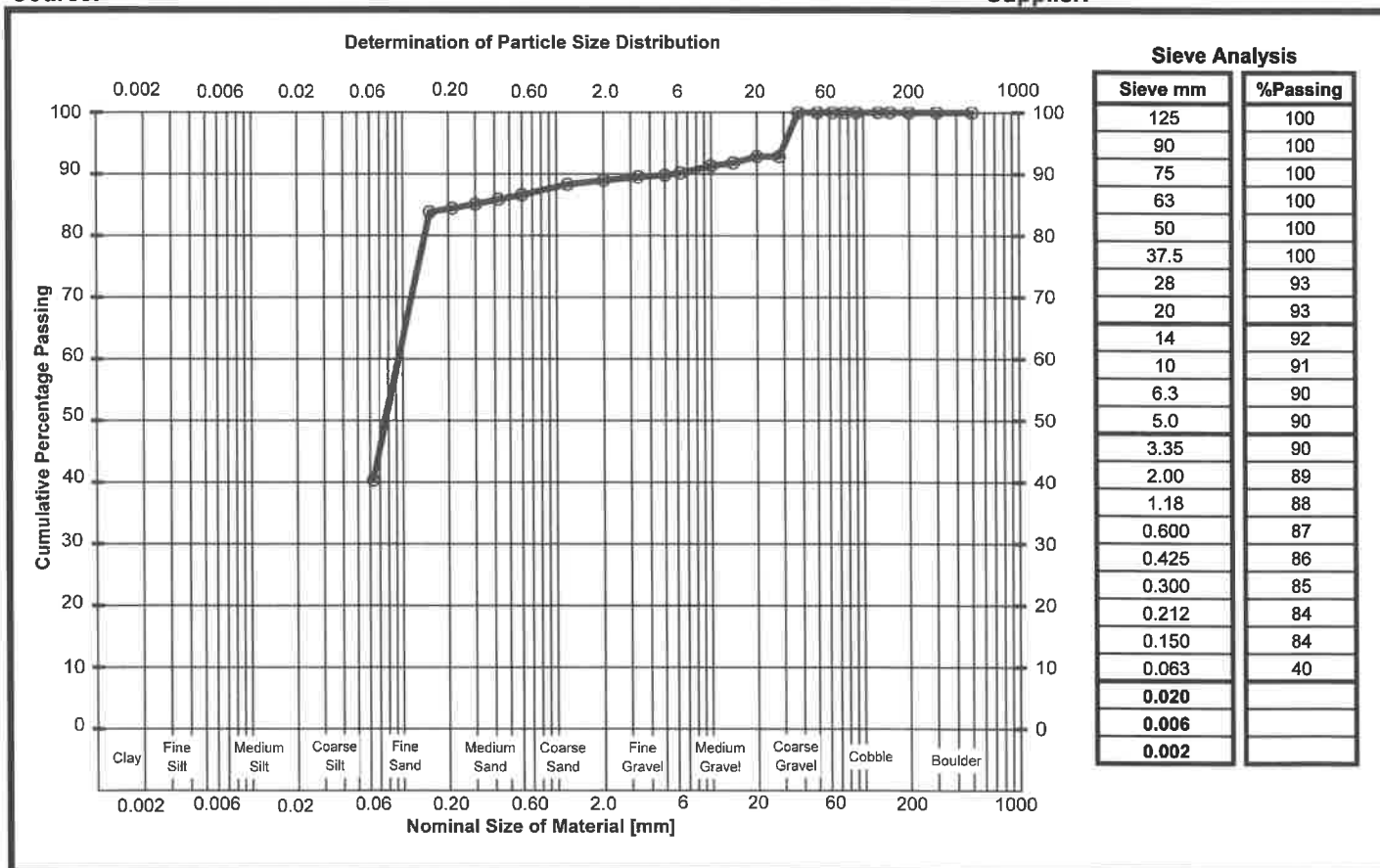
Depth Top: 0.80m

Location: BH1

Depth Base: 1.20m

Source:

Supplier:



Comments:

Approved Signatory: M. Hartnup - Laboratory Manager

Signed:

for and on behalf of Ground Engineering Ltd

Date Reported: 23.10.2018 Page 1 of 1
Form Number: GELab/C/709-2 Version 51

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Registered in England & Wales
Registration Number: 6929574
Reg Office: Ground Engineering Ltd
Newark Rd, Peterborough PE1 5UA

TEST CERTIFICATE**One-Dimensional Consolidation
Properties**

(Tested in accordance with BS1377 : Part 5 1990)

Client: Ground Engineering Ltd
Client Address: Newark Road
Peterborough
Cambridgeshire
Postcode: PE1 5UA
Contact: Simon Weatherley
Site Name: The Cottage, Cowbit Drove,
Site Address: West Pinchbeck

Newark Road Peterborough

t:01733 566566

e: admin@groundengineering.co.uk

Certificate Number: PL6407-1-3/731

Client Reference Number: C14565

Date Sampled: Unknown

Date Received: 20.09.2018

Date Tested: 10.10.2018

Sampling Certificate No: N/A

Certificate of Sampling: N/A

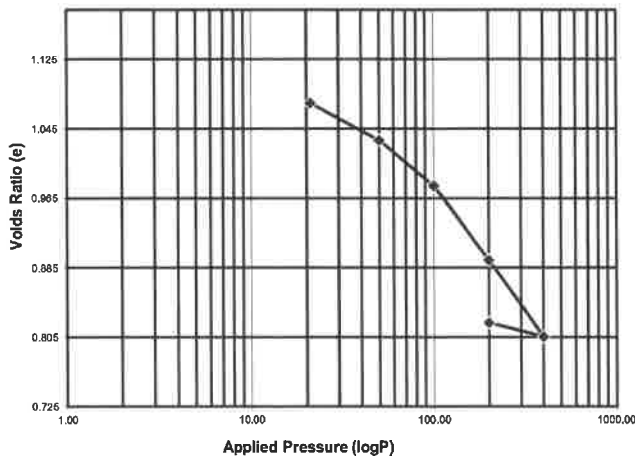
Sampled By: Client

Test Details

Location: BH1
Sample Ref: U1
Sample Description: Firm brown orange-brown grey slightly silty CLAY
Particle Density (Mg/m^3): 2.5 Assumed
Mean Lab Temp. ($^{\circ}\text{C}$): 22
Variations from Standard: None
Lab Reference: PL6407-1-3
Depth: 1.80 m

Specimen Details

	INITIAL	FINAL
Height (mm):	18.52	16.26
Bulk Density (Mg/m^3):	1.76	1.91
Moisture Content (%):	46	39
Dry Density (Mg/m^3):	1.21	1.37
Voids Ratio:	1.074	0.821
Degree of Saturation (%):	100.0	100.0
Diameter (mm):	75.12	N/A
Swelling Pressure (kPa):	21	N/A
Method of time fitting used:	Log Time	N/A

Voids Ratio against logarithm of Applied Pressure

Applied Pressure (kPa)	Coefficient of Compressibility m_v (m^2/MN)	Coefficient of Consolidation c_v (m^2/year)
21	0.73	1.12
50	0.51	0.89
100	0.43	0.68
200	0.23	0.75
400	0.05	---
200		

Comments:

Approved [x] M.Hartnup - Laboratory Manager
Signatory: [] L.Petch - Team Leader

Signed:

for and on behalf of Ground Engineering Ltd

Date Reported: 23/10/2018

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Registered in England Wales
Reg Number 6929574
Reg Office: Ground Engineering Ltd
Newark Rd
Peterborough PE1 5UA



Final Report

Report No.: 18-27730-1
Initial Date of Issue: 19-Sep-2018
Client Ground Engineering Limited
Client Address: Newark Road
Peterborough
Cambridgeshire
PE1 5UA
Contact(s): Simon Weatherley
Project SW/C14565 - The Cottage, West
Pinchbeck

Quotation No.:

Date Received:

Order No.: SW/C14565

Date Instructed: 13-Sep-2018

No. of Samples: 8

Turnaround (Wkdays): 5

Results Due: 19-Sep-2018

Date Approved: 19-Sep-2018

Approved By:

Details: Robert Monk, Technical Manager

Results - Soil

Client: Ground Engineering Limited		Chemtest Job No.:		18-27730	18-27730	18-27730	18-27730	18-27730	18-27730	18-27730	18-27730	18-27730	18-27730
Quotation No.:		Chemtest Sample ID.:		687529	687530	687531	687532	687533	687534	687535	687536	687537	687538
		Client Sample ID.:		ES1	B1	B2	ES2	ES1	B1	B1	ES1	B1	ES1
		Sample Location:		HA1	HA1	HA2	HA2	HA3	HA3	HA4	HA4	HA4	HA4
		Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
		Top Depth (m):		0.20	0.30	0.30	0.50	0.20	0.10	0.05	0.20	0.20	0.20
		Bottom Depth (m):			0.40	0.60			0.20	0.25			
Determination		Date Sampled:		07-Sep-2018	07-Sep-2018	07-Sep-2018	07-Sep-2018	07-Sep-2018	07-Sep-2018	07-Sep-2018	07-Sep-2018	07-Sep-2018	07-Sep-2018
		Accred.	SOP	Units	LOD								
pH		U	2010		N/A								
Moisture		N	2030	%	0.020	14	8.2	14	16	7.6	13	16	14
Stones and Removed Materials		N	2030	%	0.020		< 0.020		< 0.020	< 0.020	< 0.020	< 0.020	< 0.020
Boron (Hot Water Soluble)		U	2120	mg/kg	0.40		0.99		5.5	2.2	3.0	3.0	3.0
Sulphate (2:1 Water Soluble) as SO4		U	2120	g/l	0.010		0.032		0.30	0.10	0.017	0.017	0.017
Cyanide (Free)		U	2300	mg/kg	0.50		< 0.50		< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Cyanide (Total)		U	2300	mg/kg	0.50		< 0.50		< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Sulphide (Easily Liberatable)		N	2325	mg/kg	0.50		5.8		2.9	3.1	1.2	1.2	1.2
Arsenic		U	2450	mg/kg	1.0		19		25	13	9.7	9.7	9.7
Cadmium		U	2450	mg/kg	0.10		0.42		0.28	0.21	0.47	0.47	0.47
Chromium		U	2450	mg/kg	1.0		17		17	15	15	15	15
Copper		U	2450	mg/kg	0.50		17		55	14	27	27	27
Mercury		U	2450	mg/kg	0.10		0.13		0.16	0.22	< 0.10	< 0.10	< 0.10
Nickel		U	2450	mg/kg	0.50		19		28	15	14	14	14
Lead		U	2450	mg/kg	0.50		140		100	37	36	36	36
Selenium		U	2450	mg/kg	0.20		0.23		0.62	0.36	0.33	0.33	0.33
Zinc		U	2450	mg/kg	0.50		130		160	82	93	93	93
Chromium (Hexavalent)		N	2490	mg/kg	0.50		< 0.50		< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Organic Matter		U	2625	%	0.40		13		5.5	2.8	3.1	3.1	3.1
Acenaphthene		U	2700	mg/kg	0.10		0.27		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Acenaphthylene		U	2700	mg/kg	0.10		0.22		0.30	< 0.10	< 0.10	< 0.10	< 0.10
Anthracene		U	2700	mg/kg	0.10		0.97		0.11	0.15	< 0.10	< 0.10	< 0.10
Benzofluoranthene		U	2700	mg/kg	0.10		4.1		0.78	0.91	0.37	0.37	0.37
Benzofluoranthene		U	2700	mg/kg	0.10		4.2		0.70	0.97	0.40	0.40	0.40
Benzofluoranthene		U	2700	mg/kg	0.10		5.7		0.95	1.4	0.65	0.65	0.65
Benzofluoranthene		U	2700	mg/kg	0.10		2.5		0.44	1.2	0.58	0.58	0.58
Benzofluoranthene		U	2700	mg/kg	0.10		2.8		0.60	0.93	0.61	0.61	0.61
Chrysene		U	2700	mg/kg	0.10		5.2		1.2	1.3	0.63	0.63	0.63
Dibenz(a,h)Anthracene		U	2700	mg/kg	0.10		1.3		0.65	0.92	0.45	0.45	0.45
Fluoranthene		U	2700	mg/kg	0.10		8.3		1.3	2.4	0.74	0.74	0.74
Fluorene		U	2700	mg/kg	0.10		0.27		< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Indeno(1,2,3-c,d)Pyrene		U	2700	mg/kg	0.10		3.1		0.32	0.97	0.39	0.39	0.39
Naphthalene		U	2700	mg/kg	0.10		0.25		0.31	< 0.10	< 0.10	< 0.10	< 0.10
Phenanthrene		U	2700	mg/kg	0.10		3.8		0.96	1.5	< 0.10	< 0.10	< 0.10
Pyrene		U	2700	mg/kg	0.10		8.1		1.3	2.1	0.70	0.70	0.70
Total Of 16 PAH's		U	2700	mg/kg	2.0		51		9.9	15	5.5	5.5	5.5
Total Phenols		U	2920	mg/kg	0.30		< 0.30		< 0.30	< 0.30	< 0.30	< 0.30	< 0.30
Total TPH >C6-C40		U	2670	mg/kg	10		< 10		< 10	< 10	< 10	< 10	< 10

Test Methods

SOP	Title	Parameters included	Method summary
2010	pH Value of Soils	pH	pH Meter
2030	Moisture and Stone Content of Soils (Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2300	Cyanides & Thiocyanate in Soils	Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate	Alkaline extraction followed by colorimetric determination using Automated Flow Injection Analyser.
2325	Sulphide in Soils	Sulphide	Steam distillation with sulphuric acid / analysis by 'Aquakem 600' Discrete Analyser. using N.N-dimethyl-p-phenylenediamine.
2450	Acid Soluble Metals in Soils	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.
2490	Hexavalent Chromium in Soils	Chromium [VI]	Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazine.
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2670	Total Petroleum Hydrocarbons (TPH) in Soils by GC-FID	TPH (C6–C40); optional carbon banding. e.g. 3-band – GRO. DRO & LRO*TPH C8–C40	Dichloromethane extraction / GC-FID
2700	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-FID	Acenaphthene; Acenaphthylene; Anthracene; Benzo[a]Anthracene; Benzo[a]Pyrene; Benzo[b]Fluoranthene; Benzo[ghi]Perylene; Benzo[k]Fluoranthene; Chrysene; Dibenzo[a,h]Anthracene; Fluoranthene; Fluorene; Indeno[123cd]Pyrene; Naphthalene; Phenanthrene; Pyrene	Dichloromethane extraction / GC-FID
2920	Phenols in Soils by HPLC	Phenolic compounds including Resorcinol, Phenol, Methylphenols, Dimethylphenols, 1-Naphthol and Trimethylphenols. Note: chlorophenols are excluded.	60:40 methanol/water mixture extraction, followed by HPLC determination using electrochemical detection.

Report Information

Key

- U UKAS accredited
- M MCERTS and UKAS accredited
- N Unaccredited
- S This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
- SN This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
- T This analysis has been subcontracted to an unaccredited laboratory
- I/S Insufficient Sample
- U/S Unsuitable Sample
- N/E not evaluated
- < "less than"
- > "greater than"

Comments or interpretations are beyond the scope of UKAS accreditation

The results relate only to the items tested

Uncertainty of measurement for the determinands tested are available upon request

None of the results in this report have been recovery corrected

All results are expressed on a dry weight basis

The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols

For all other tests the samples were dried at < 37°C prior to analysis

All Asbestos testing is performed at the indicated laboratory

Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

- A - Date of sampling not supplied
- B - Sample age exceeds stability time (sampling to extraction)
- C - Sample not received in appropriate containers
- D - Broken Container
- E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

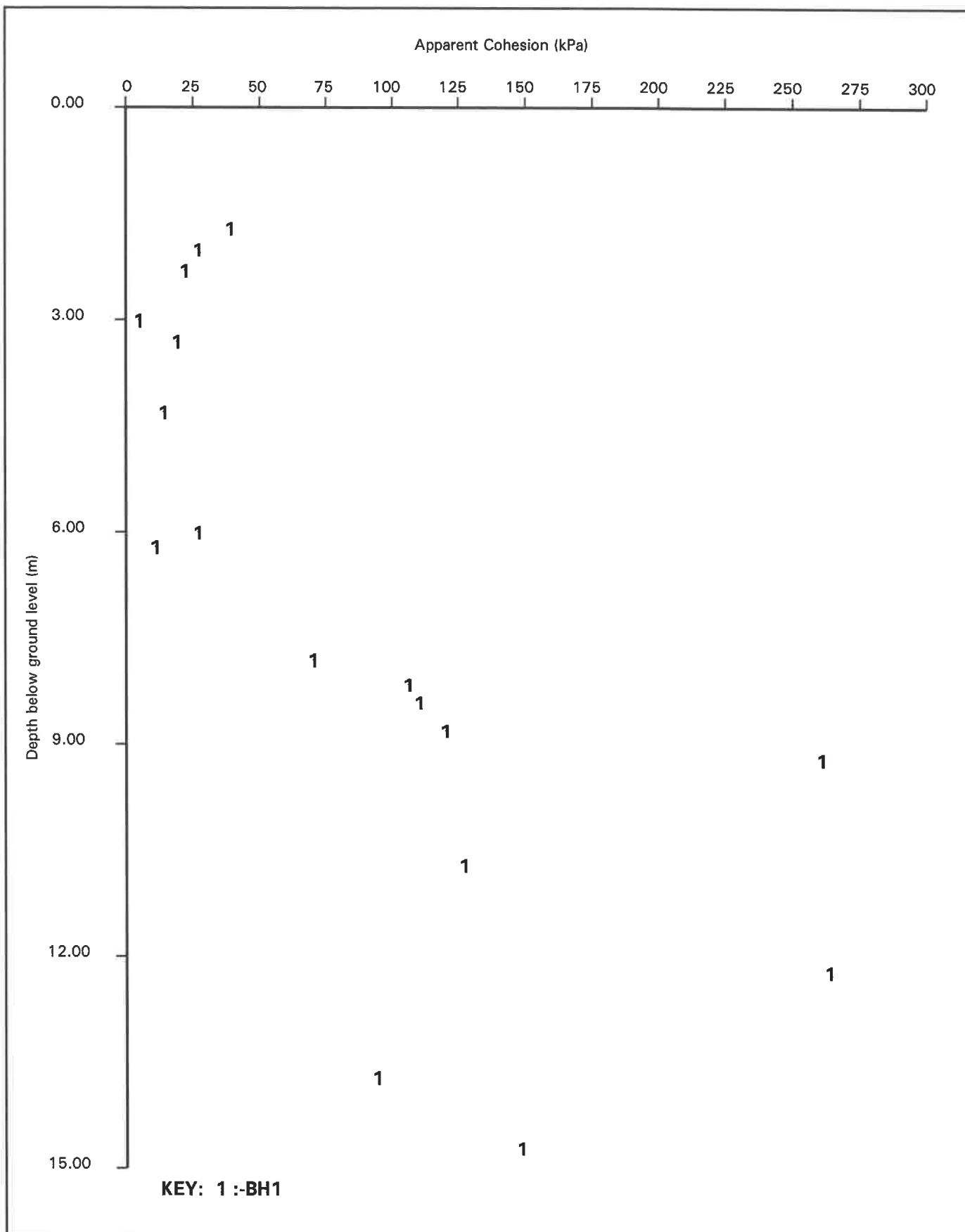
Sample Retention and Disposal

All soil samples will be retained for a period of 45 days from the date of receipt

All water samples will be retained for 14 days from the date of receipt

Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.com



Apparent Cohesion (kPa) vs Depth below ground level (m).

SITE

THE COTTAGE, COWBIT DROVE, WEST PINCHBECK

CLIENT

ANDREW & ZOE CHAMBERLAIN

Contract
Number

14565

GROUND ENGINEERING

Tel: 01733-666566

Date

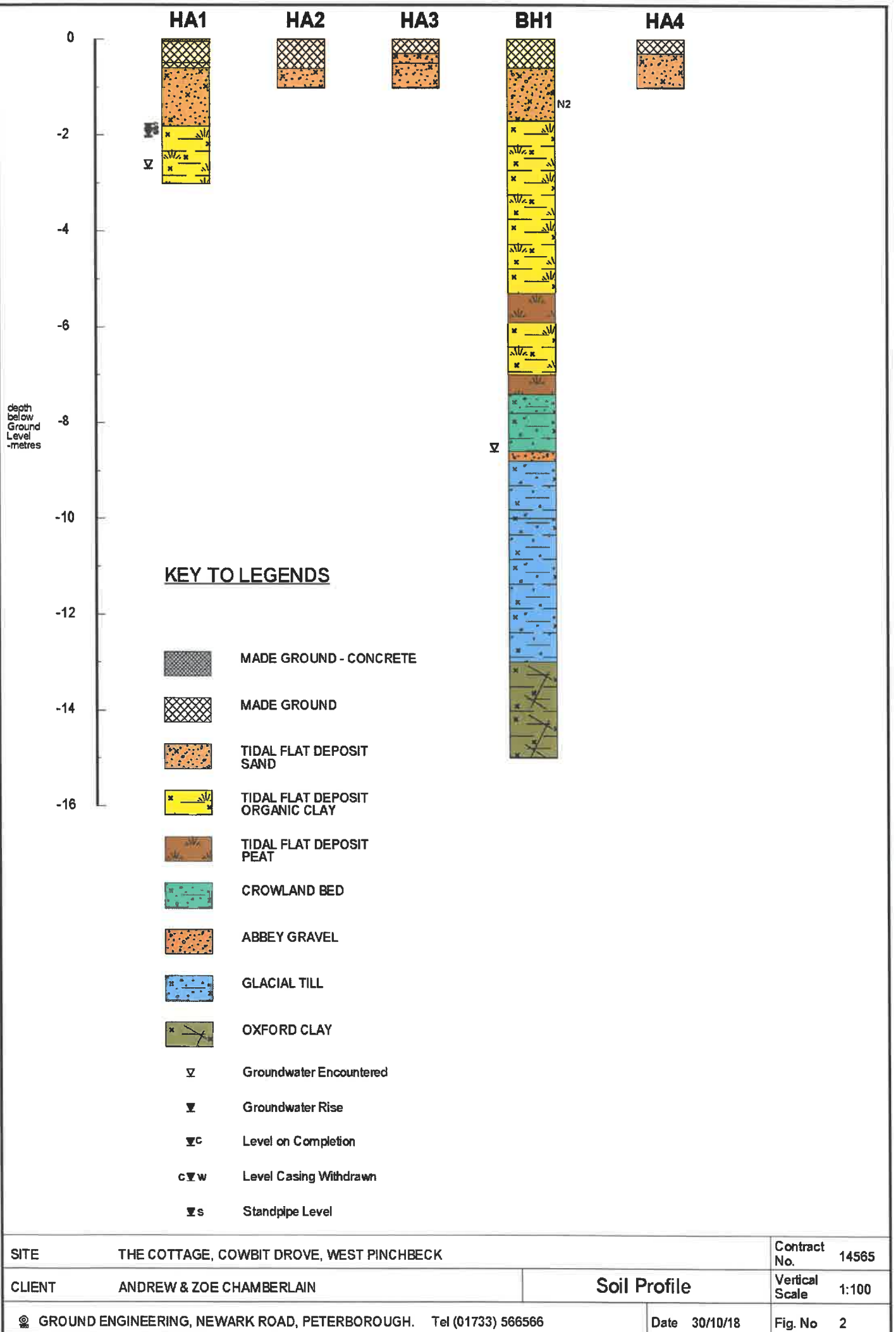
30/10/18

Figure

1

L I M I T E D

www.groundengineering.co.uk



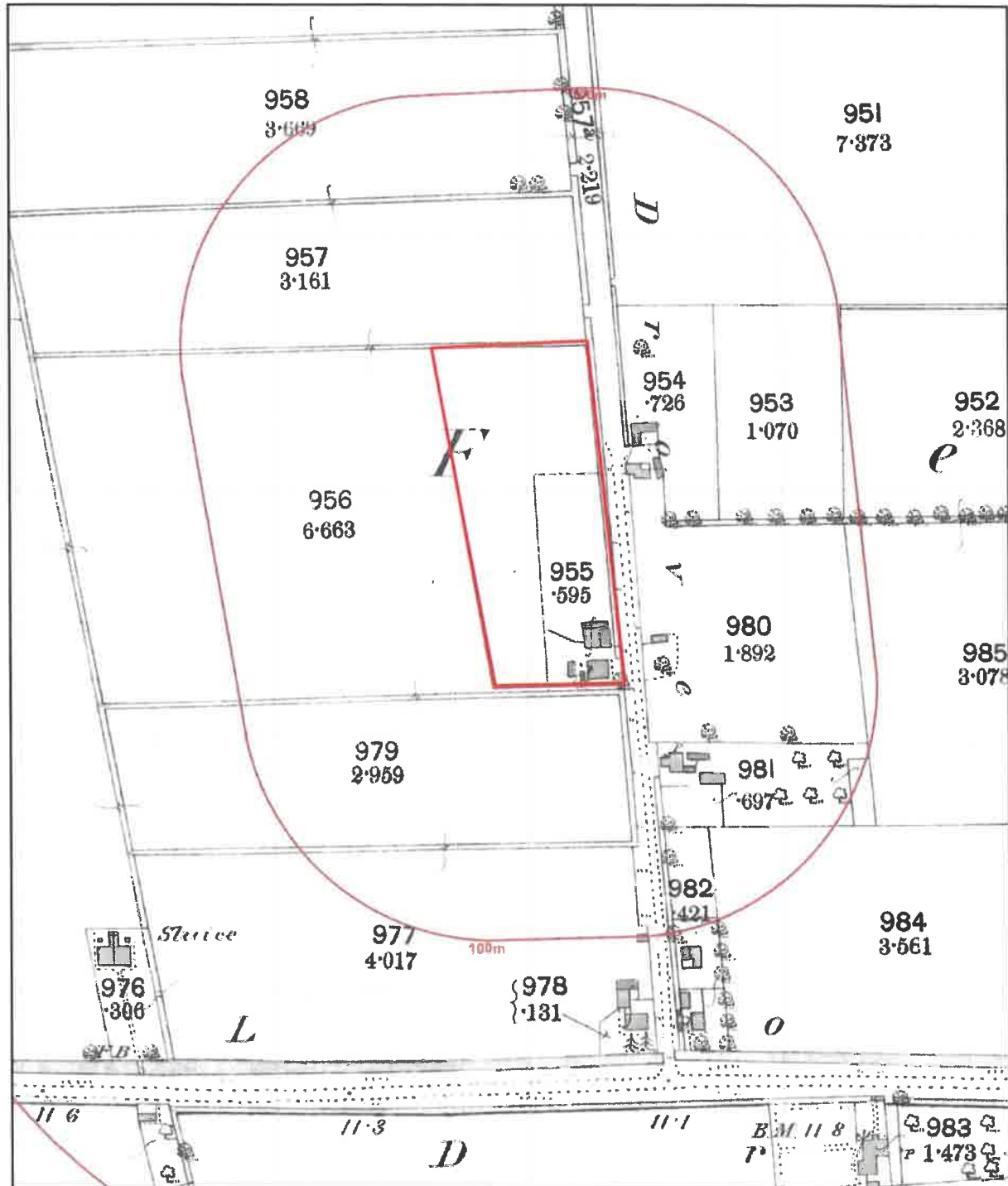
APPENDIX 1

HISTORICAL MAP EXTRACTS

Site History

Figure B

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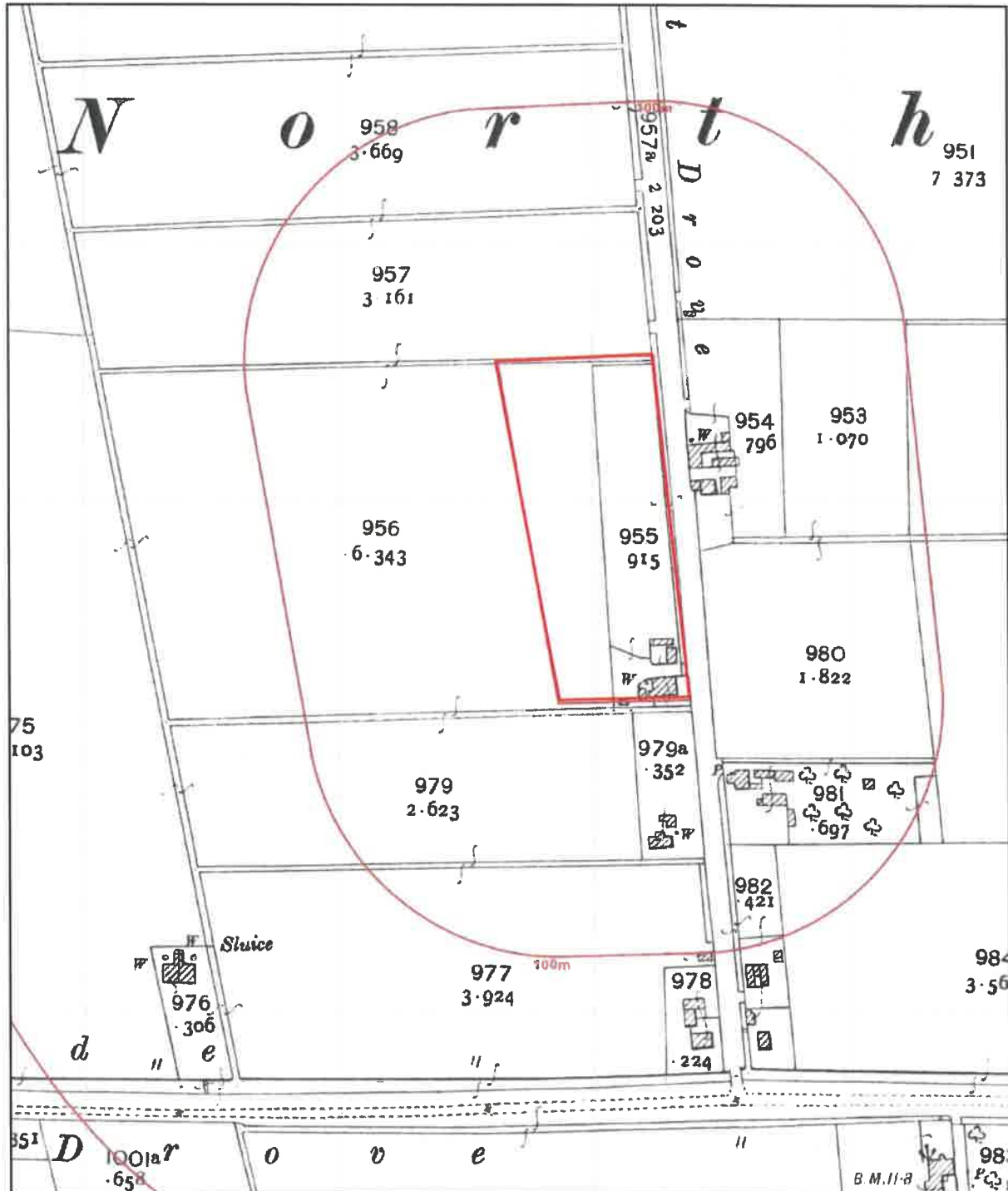
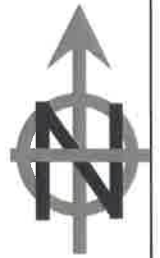
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Site History

Figure C

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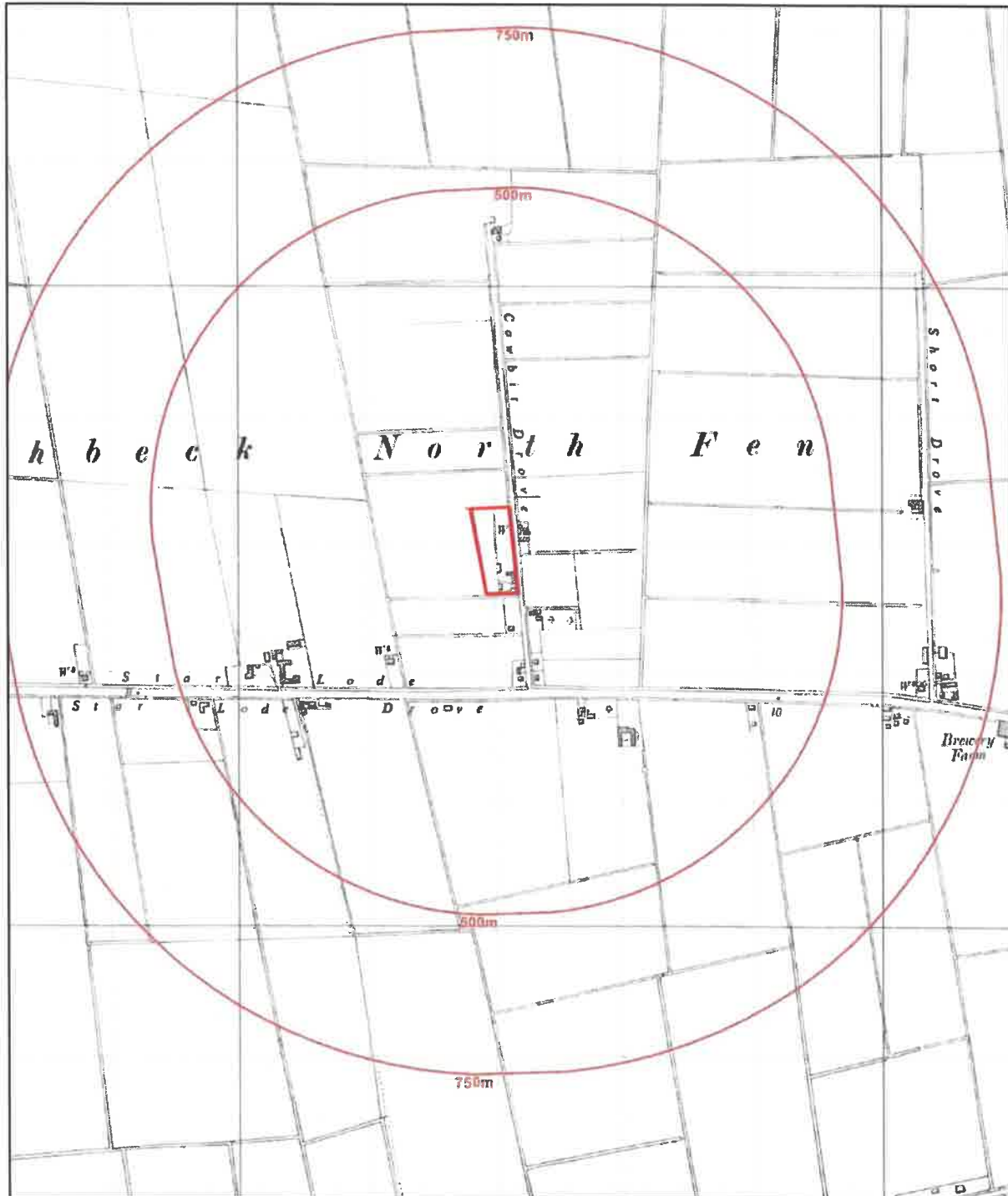
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Site History

Figure D

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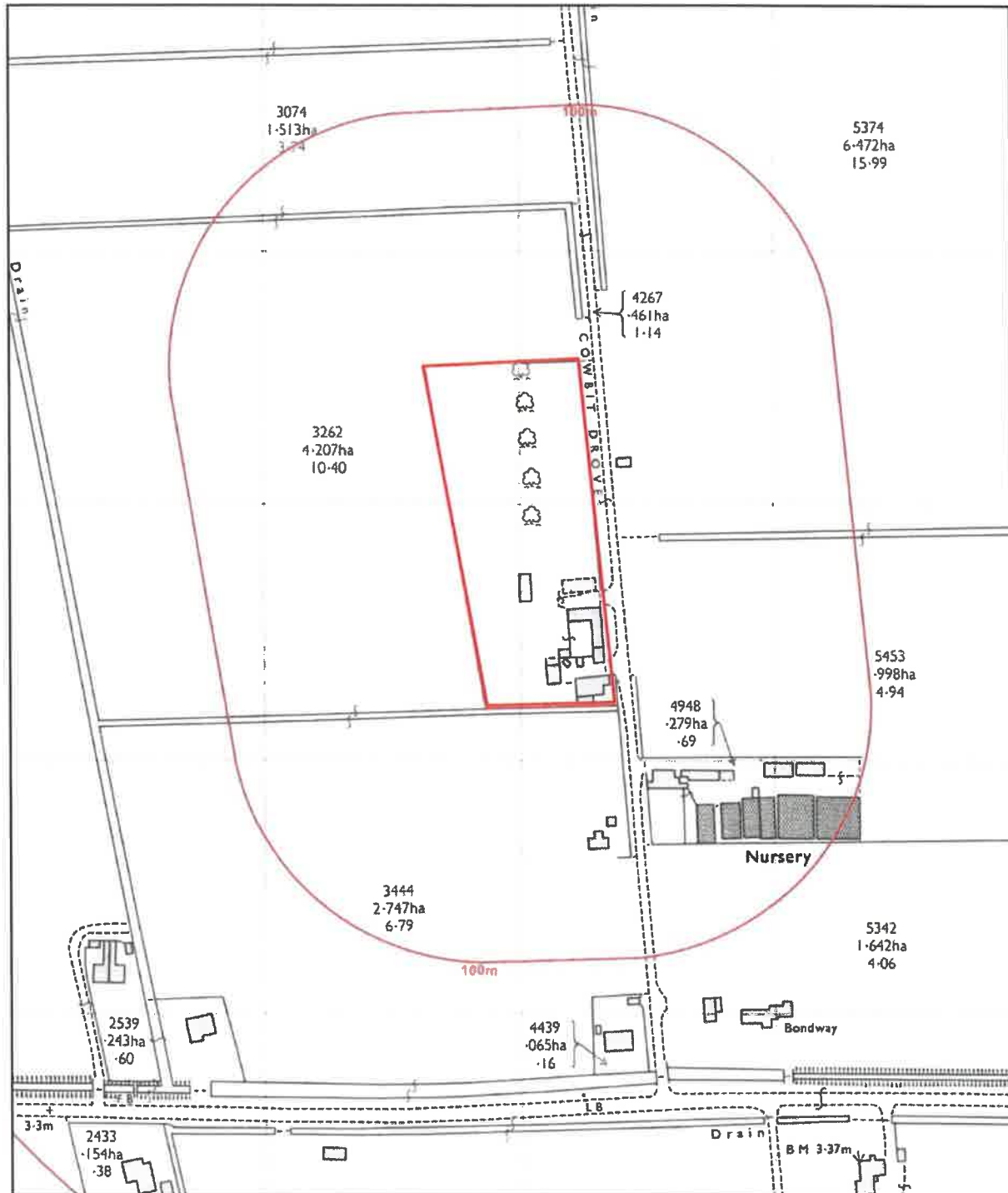
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Site History

Figure E

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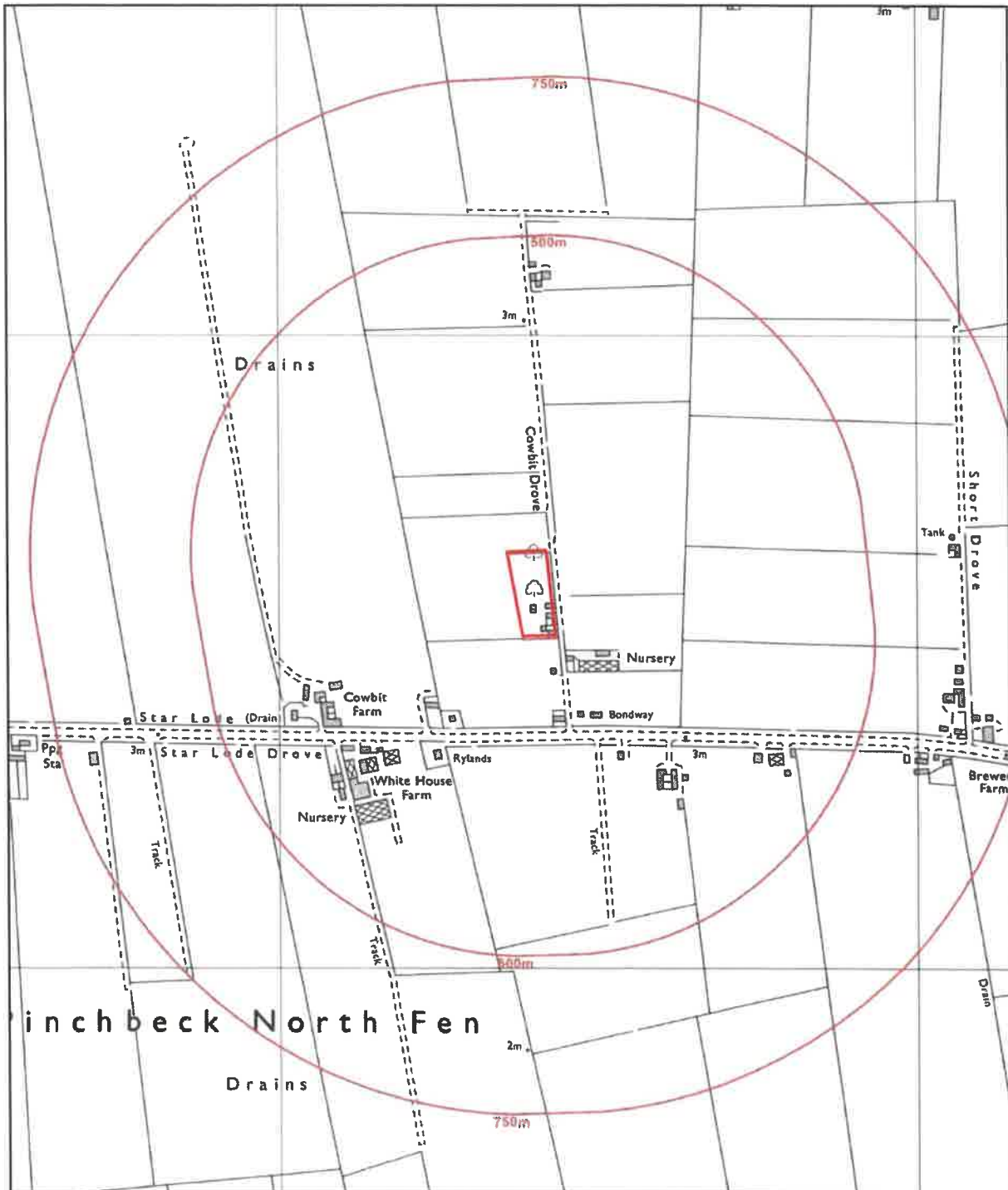
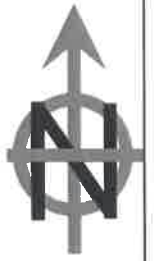
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Figure F

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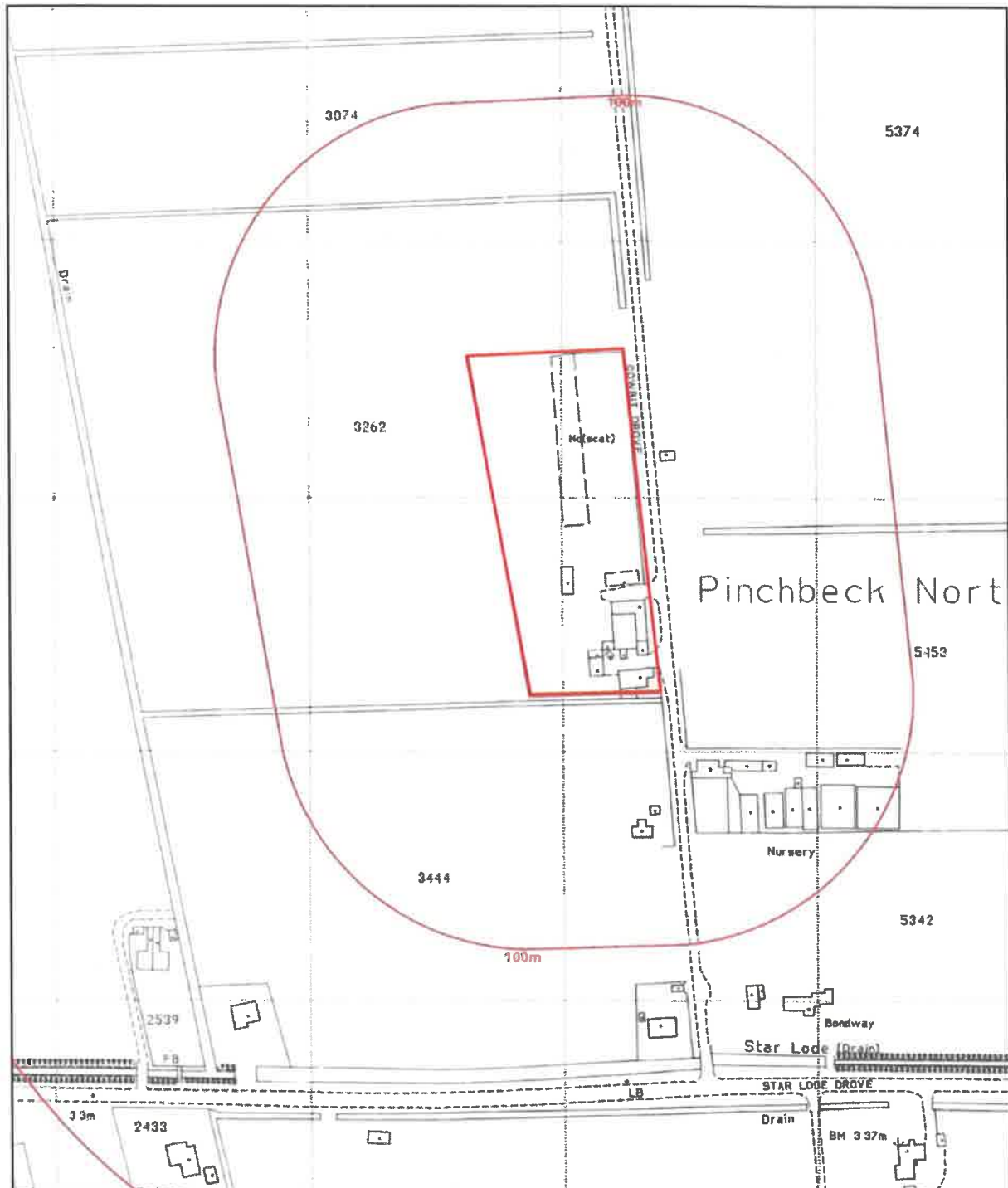
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Figure G

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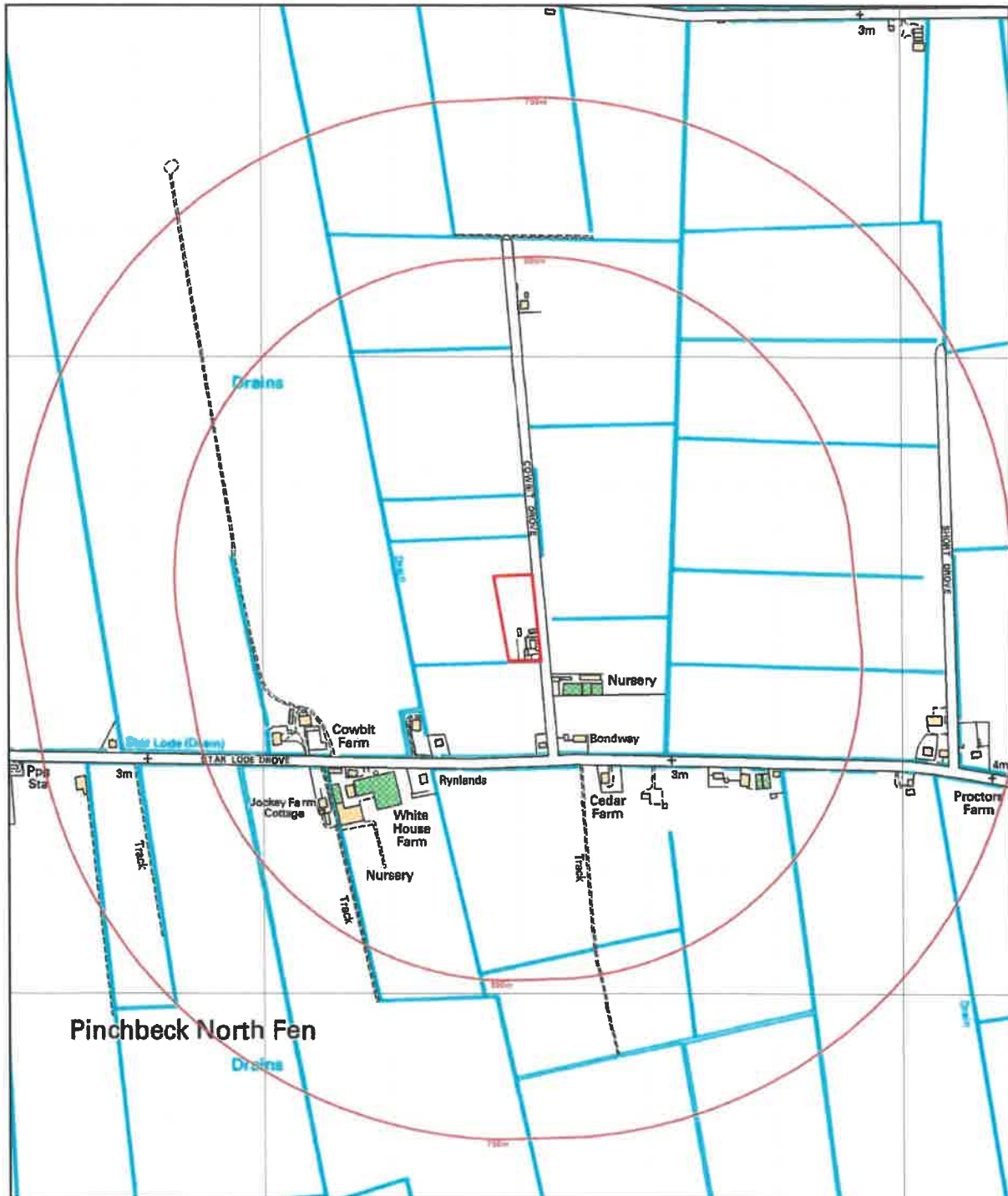
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Site History

Figure H

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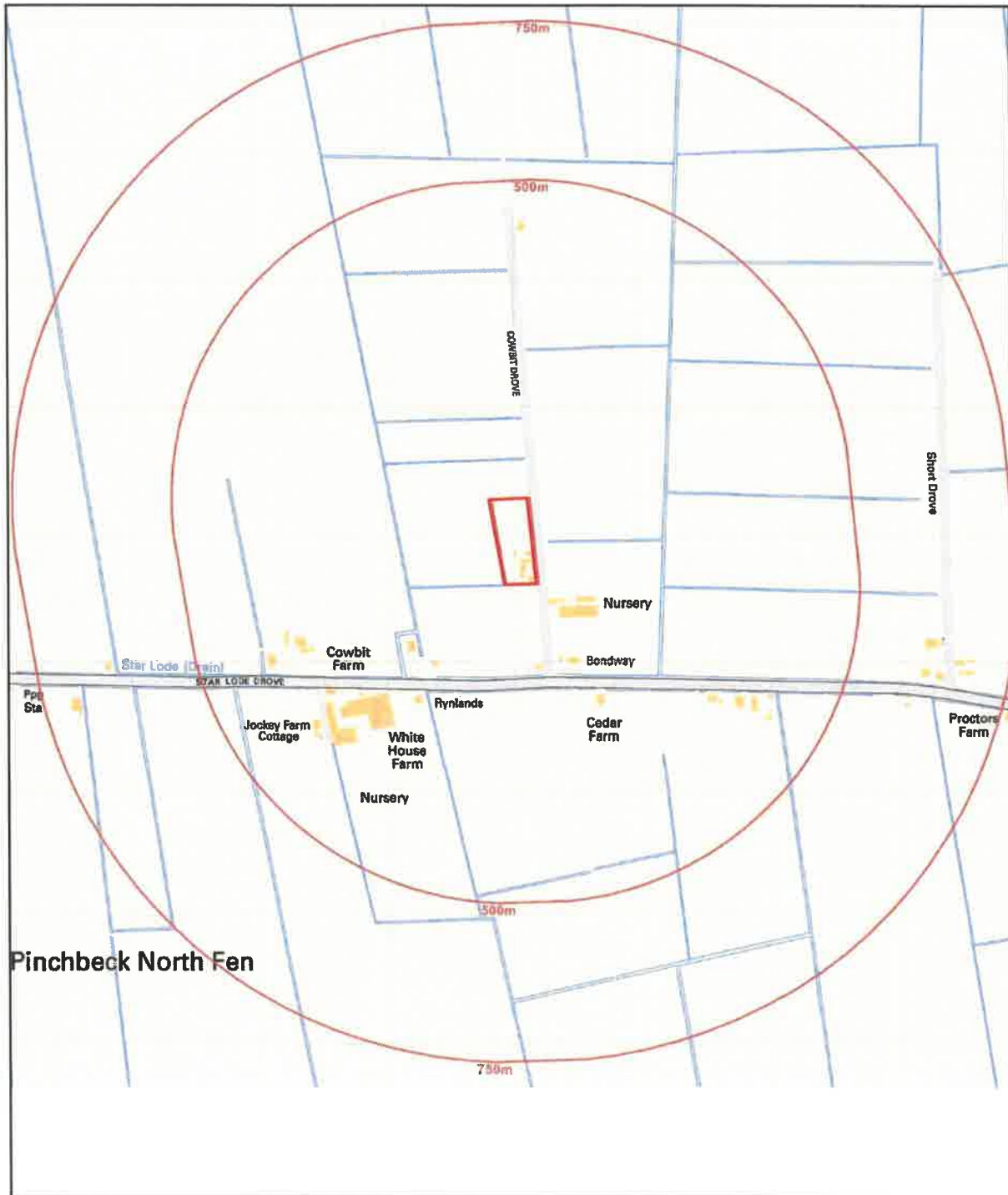
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Site History

Figure I

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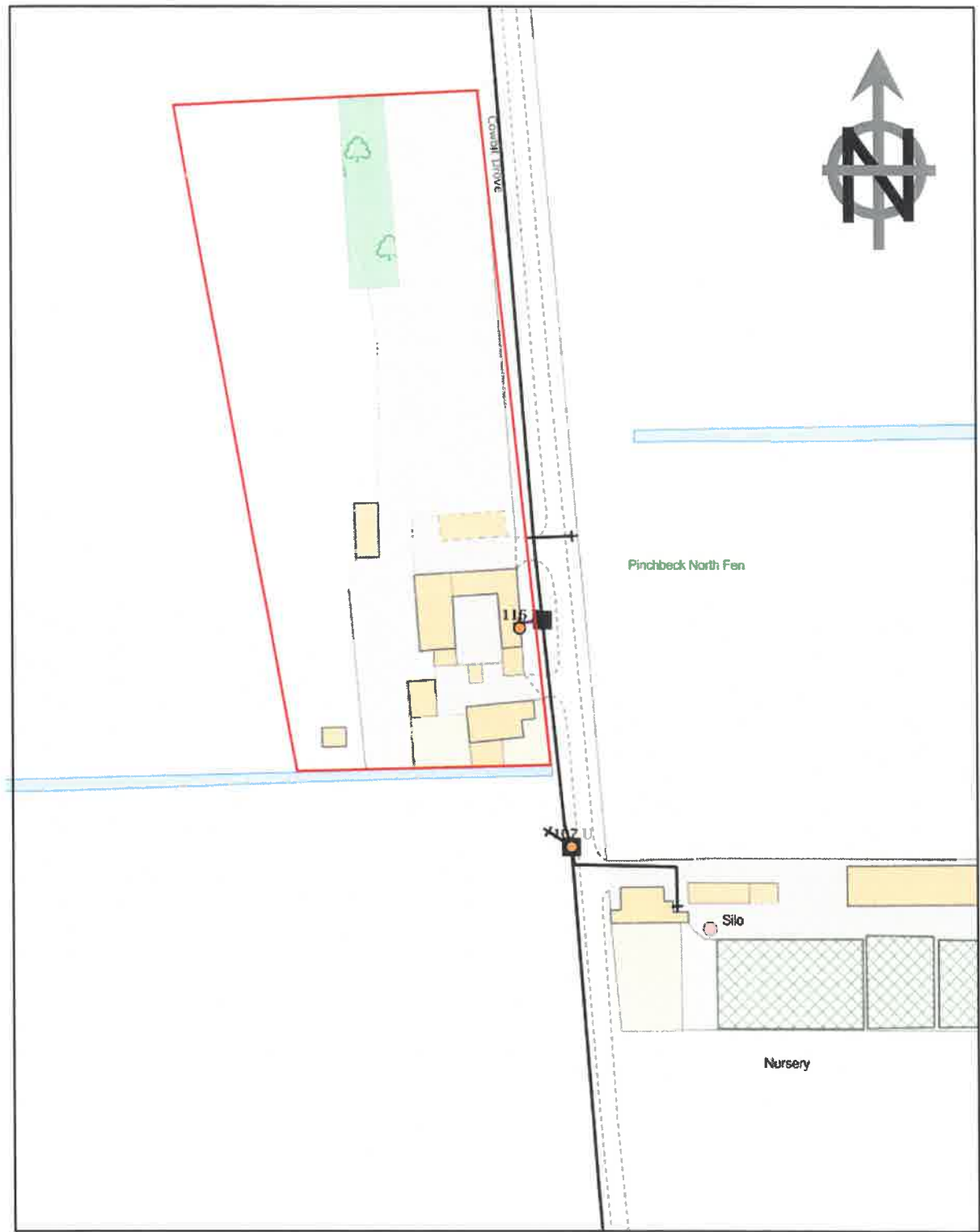
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Site History

Figure J

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Project No.

C14565

APPENDIX 2

ENVIRONMENTAL DATABASE SEARCH

Address: THE COTTAGE, COWBIT DROVE, PINCHBECK, SPALDING, PE11 3TG
Date: 28 Aug 2018
Reference: GS-5357152
Client: Ground Engineering Limited



Aerial Photograph Capture date: 30-Apr-2016
Grid Reference: 518407,326593
Site Size: 0.76ha

Report Reference: GS-5357152
Client Reference: SWC14565

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Overview of Findings

For further details on each dataset, please refer to each individual section in the main report as listed. Where the database has been searched a numerical result will be recorded. Where the database has not been searched '-' will be recorded.

Section 1: Historical Industrial Sites	On-site	0-50	51-250	251-500
1.1 Potentially Contaminative Uses identified from 1:10,000 scale mapping	0	1	0	1
1.2 Additional Information – Historical Tank Database	0	0	0	0
1.3 Additional Information – Historical Energy Features Database	0	0	0	0
1.4 Additional Information – Historical Petrol and Fuel Site Database	0	0	0	0
1.5 Additional Information – Historical Garage and Motor Vehicle Repair Database	0	0	0	0
1.6 Historical military sites	0	0	0	0
1.7 Potentially Infilled Land	0	0	0	0

Section 2: Environmental Permits, Incidents and Registers	On-site	0-50m	51-250	251-500
2.1 Industrial Sites Holding Environmental Permits and/or Authorisations				
2.1.1 Records of historic IPC Authorisations	0	0	0	0
2.1.2 Records of Part A(1) and IPPC Authorised Activities	0	0	0	0
2.1.3 Records of Red List Discharge Consents	0	0	0	0
2.1.4 Records of List 1 Dangerous Substances Inventory sites	0	0	0	0
2.1.5 Records of List 2 Dangerous Substances Inventory sites	0	0	0	0
2.1.6 Records of Part A(2) and Part B Activities and Enforcements	0	0	0	0
2.1.7 Records of Category 3 or 4 Radioactive Substances Authorisations	0	0	0	0
2.1.8 Records of Licensed Discharge Consents	0	0	1	4
2.1.9 Records of Water Industry Referrals	0	0	0	0
2.1.10 Records of Planning Hazardous Substance Consents and Enforcements within 500m of the study site	0	0	0	0
2.2 Records of COMAH and NIHHS sites	0	0	0	0
2.3 Environment Agency/Natural Resources Wales Recorded Pollution Incidents				
2.3.1 National Incidents Recording System, List 2	0	0	0	0
2.3.2 National Incidents Recording System, List 1	0	0	0	0
2.4 Sites Determined as Contaminated Land under Part 2A EPA 1990	0	0	0	0

Section 3: Landfill and Other Waste Sites

	On-site	0-50m	51-250	251-500	501-1000	1000-1500
3.1 Landfill Sites						
3.1.1 Environment Agency/Natural Resources Wales Registered Landfill Sites	0	0	0	0	0	Not searched
3.1.2 Environment Agency/Natural Resources Wales Historic Landfill Sites	0	0	0	0	0	0
3.1.3 BGS/DoE Landfill Site Survey	0	0	0	0	0	0
3.1.4 Records of Landfills in Local Authority and Historical Mapping Records	0	0	0	0	0	0
3.2 Landfill and Other Waste Sites Findings						
3.2.1 Operational and Non-Operational Waste Treatment, Transfer and Disposal Sites	0	0	0	0	Not searched	Not searched
3.2.2 Environment Agency/Natural Resources Wales Licensed Waste Sites	0	0	0	0	0	0

Section 4: Current Land Use

	On-site	0-50m	51-250	251-500
4.1 Current Industrial Sites Data	0	1	1	Not searched
4.2 Records of Petrol and Fuel Sites	0	0	0	0
4.3 National Grid Underground Electricity Cables	0	0	0	0
4.4 National Grid Gas Transmission Pipelines	0	0	0	0

Section 5: Geology

5.1 Records of Artificial Ground and Made Ground present beneath the study site	None identified
5.2 Records of Superficial Ground and Drift Geology present beneath the study site	Identified
5.3 For records of Bedrock and Solid Geology beneath the study site see the detailed findings section.	

Section 6: Hydrogeology and Hydrology

	On-site	0-50m	51-250	251-500	501-1000	1000-2000
6.1 Records of Strata Classification in the Superficial Geology within 500m of the study site				Identified		
6.2 Records of Strata Classification in the Bedrock Geology within 500m of the study site				Identified		
6.3 Groundwater Abstraction Licences (within 2000m of the study site)	0	0	0	6	2	2
6.4 Surface Water Abstraction Licences (within 2000m of the study site)	0	0	0	0	1	11
6.5 Potable Water Abstraction Licences (within 2000m of the study site)	0	0	0	0	2	0
6.6 Source Protection Zones (within 500m of the study site)	1	0	1	1	Not searched	Not searched
6.7 Source Protection Zones within Confined Aquifer	0	0	0	0	Not searched	Not searched
6.8 Groundwater Vulnerability and Soil Leaching Potential (within 500m of the study site)	0	0	#250GWV #	#500GWV #	Not searched	Not searched

Section 6: Hydrogeology and Hydrology

0-500m

	On-site	0-50m	51-250	251-500	501-1000	1000-1500
6.9 Environment Agency/Natural Resources Wales information on river quality within 1500m of the study site	No	No	No	No	No	No
6.10 Ordnance Survey MasterMap Water Network entries within 500m of the site	0	6	66	78	Not searched	Not searched
6.11 Surface water features within 250m of the study site	Yes	Yes	Yes	Not searched	Not searched	Not searched

Section 7: Flooding

7.1 Environment Agency Zone 2 floodplains within 250m of the study site	Identified
7.2 Environment Agency/Natural Resources Wales Zone 3 floodplains within 250m of the study site	Identified
7.3 Risk of flooding from Rivers and the Sea (RoFRaS) rating for the study site	High
7.4 Flood Defences within 250m of the study site	None identified
7.5 Areas benefiting from Flood Defences within 250m of the study site	None identified
7.6 Areas used for Flood Storage within 250m of the study site	None identified
7.7 Maximum BGS Groundwater Flooding susceptibility within 50m of the study site	Not Prone
7.8 BGS confidence rating for the Groundwater Flooding susceptibility areas	Not Applicable

Section 8: Designated Environmentally Sensitive Sites

	On-site	0-50m	51-250	251-500	501-1000	1000-2000
8.1 Records of Sites of Special Scientific Interest (SSSI)	0	0	0	0	0	0
8.2 Records of National Nature Reserves (NNR)	0	0	0	0	0	0
8.3 Records of Special Areas of Conservation (SAC)	0	0	0	0	0	0
8.4 Records of Special Protection Areas (SPA)	0	0	0	0	0	0
8.5 Records of Ramsar sites	0	0	0	0	0	0
8.6 Records of Ancient Woodlands	0	0	0	0	0	0
8.7 Records of Local Nature Reserves (LNR)	0	0	0	0	0	0
8.8 Records of World Heritage Sites	0	0	0	0	0	0
8.9 Records of Environmentally Sensitive Areas	0	0	0	0	0	0

Section 8: Designated Environmentally Sensitive Sites

	On-site	0-50m	51-250	251-500	501-1000	1000-2000
8.10 Records of Areas of Outstanding Natural Beauty (AONB)	0	0	0	0	0	0
8.11 Records of National Parks	0	0	0	0	0	0
8.12 Records of Nitrate Sensitive Areas	0	0	0	0	0	0
8.13 Records of Nitrate Vulnerable Zones	1	0	0	0	0	1
8.14 Records of Green Belt land	0	0	0	0	0	0

Section 9: Natural Hazards

9.1 Maximum risk of natural ground subsidence	Moderate
9.1.1 Maximum Shrink-Swell hazard rating identified on the study site	Low
9.1.2 Maximum Landslides hazard rating identified on the study site	Very Low
9.1.3 Maximum Soluble Rocks hazard rating identified on the study site	Negligible
9.1.4 Maximum Compressible Ground hazard rating identified on the study site	Moderate
9.1.5 Maximum Collapsible Rocks hazard rating identified on the study site	Negligible
9.1.6 Maximum Running Sand hazard rating identified on the study site	Moderate
9.2 Radon	
9.2.1 Is the property in a Radon Affected Area as defined by the Health Protection Agency (HPA) and if so what percentage of homes are above the Action Level?	The site is not in a Radon Affected Area, as less than 1% of properties are above the Action Level.
9.2.2 Is the property in an area where Radon Protection are required for new properties or extensions to existing ones as described in publication BR211 by the Building Research Establishment?	No radon protective measures are necessary.

Section 10: Mining

10.1 Coal mining areas within 75m of the study site	None identified
10.2 Non-Coal Mining areas within 50m of the study site boundary	None identified
10.3 Brine affected areas within 75m of the study site	None identified

Using this report

The following report is designed by Environmental Consultants for Environmental Professionals bringing together the most up-to-date market leading environmental data. This report is provided under and subject to the Terms & Conditions agreed between Groundsure and the Client. The document contains the following sections:

1. Historical Industrial Sites

Provides information on past land uses that may pose a risk to the study site in terms of potential contamination from activities or processes. Potentially Infilled Land features are also included. This search is conducted using radii of up to 500m.

2. Environmental Permits, Incidents and Registers

Provides information on Regulated Industrial Activities and Pollution Incidents as recorded by Regulatory Authorities, and sites determined as Contaminated Land. This search is conducted using radii up to 500m.

3. Landfills and Other Waste Sites

Provides information on landfills and other waste sites that may pose a risk to the study site. This search is conducted using radii up to 1500m.

4. Current Land Uses

Provides information on current land uses that may pose a risk to the study site in terms of potential contamination from activities or processes. These searches are conducted using radii of up to 500m. This includes information on potentially contaminative industrial sites, petrol stations and fuel sites as well as high pressure gas pipelines and underground electricity transmission lines.

5. Geology

Provides information on artificial and superficial deposits and bedrock beneath the study site.

6. Hydrogeology and Hydrology

Provides information on productive strata within the bedrock and superficial geological layers, abstraction licences, Source Protection Zones (SPZs) and river quality. These searches are conducted using radii of up to 2000m.

7. Flooding

Provides information on river and coastal flooding, flood defences, flood storage areas and groundwater flood areas. This search is conducted using radii of up to 250m.

8. Designated Environmentally Sensitive Sites

Provides information on the Sites of Special Scientific Interest (SSSI), National Nature Reserves (NNR), Special Areas of Conservation (SAC), Special Protection Areas (SPA), Ramsar sites, Local Nature Reserves (LNR), Areas of Outstanding Natural Beauty (AONB), National Parks (NP), Environmentally Sensitive Areas, Nitrate Sensitive Areas, Nitrate Vulnerable Zones and World Heritage Sites and Scheduled Ancient Woodland. These searches are conducted using radii of up to 2000m.

9. Natural Hazards

Provides information on a range of natural hazards that may pose a risk to the study site. These factors include natural ground subsidence and radon..

10. Mining

Provides information on areas of coal and non-coal mining and brine affected areas.

11. Contacts

This section of the report provides contact points for statutory bodies and data providers that may be able to provide further information on issues raised within this report. Alternatively, Groundsure provide a free Technical Helpline (08444 159000) for further information and guidance.

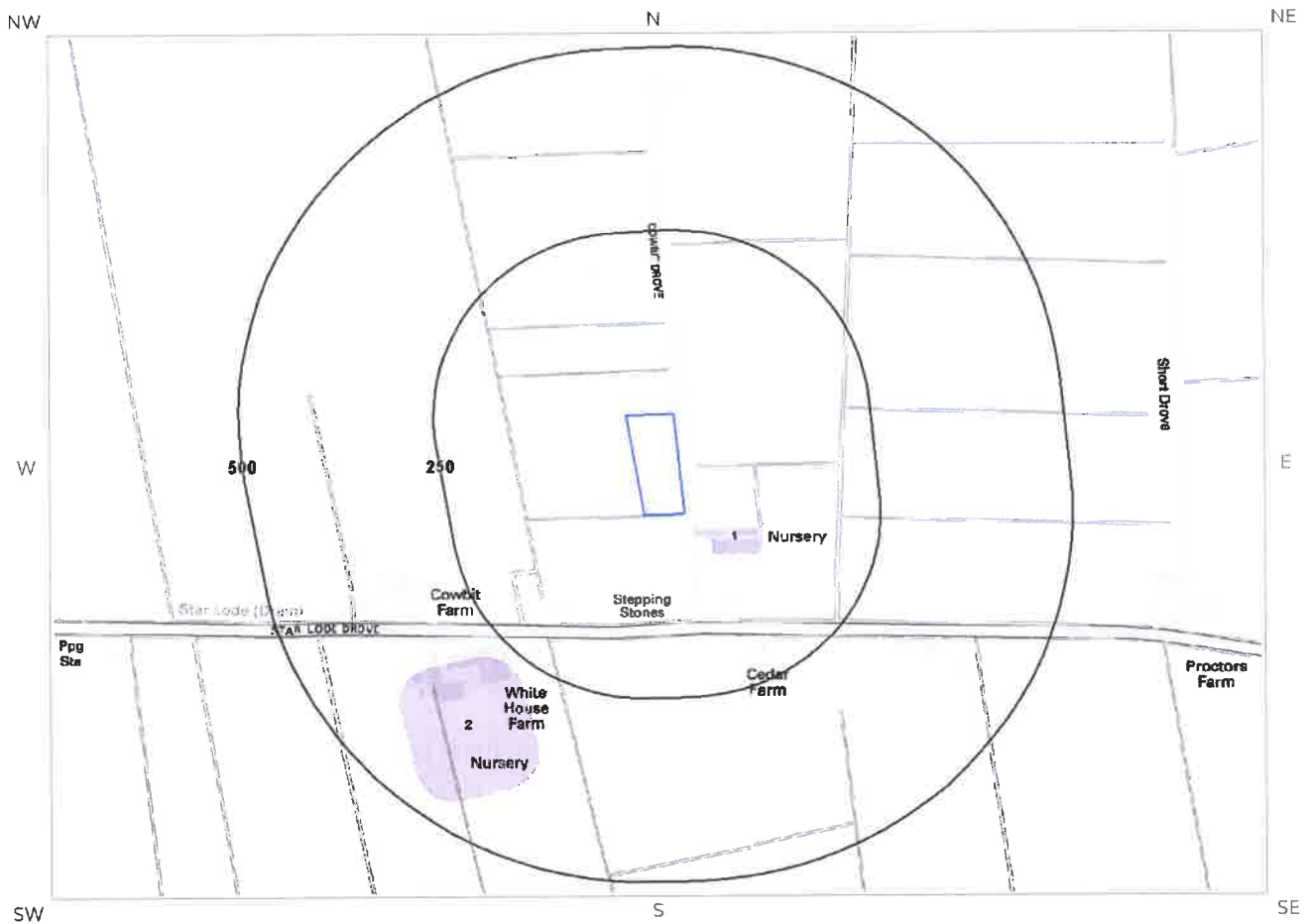
Note: Maps

Only certain features are placed on the maps within the report. All features represented on maps found within this search are given an identification number. This number identifies the feature on the mapping and correlates it to the additional information provided below. This identification number precedes all other information and takes the following format -Id: 1, Id: 2, etc. Where numerous features on the same map are in such close proximity that the numbers would obscure each other a letter identifier is used instead to represent the features. (e.g. Three features which overlap may be given the identifier "A" on the map and would be identified separately as features 1A, 3A, 10A on the data tables provided).

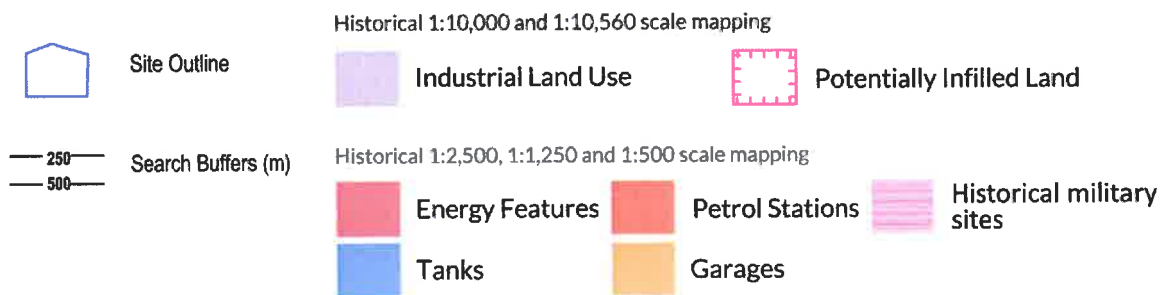
Where a feature is reported in the data tables to a distance greater than the map area, it is noted in the data table as "Not Shown".

All distances given in this report are in Metres (m). Directions are given as compass headings such as N: North, E: East, NE: North East from the nearest point of the study site boundary.

1. Historical Land Use



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1. Historical Industrial Sites

1.1 Potentially Contaminative Uses identified from 1:10,000 scale Mapping

The systematic analysis of data extracted from standard 1:10,560 and 1:10,000 scale historical maps provides the following information:

Records of sites with a potentially contaminative past land use within 500m of the search boundary: 2

ID	Distance [m]	Direction	Use	Date
1	24	SE	Nursery	1983
2	270	SW	Nursery	1983

1.2 Additional Information – Historical Tank Database

The systematic analysis of data extracted from High Detailed 1:1,250 and 1:2,500 scale historical maps provides the following information.

Records of historical tanks within 500m of the search boundary: 0

Database searched and no data found.

1.3 Additional Information – Historical Energy Features Database

The systematic analysis of data extracted from High Detailed 1:1,250 and 1:2,500 scale historical maps provides the following information.

Records of historical energy features within 500m of the search boundary: 0

Database searched and no data found.

1.4 Additional Information – Historical Petrol and Fuel Site Database

The systematic analysis of data extracted from High Detailed 1:1,250 and 1:2,500 scale historical maps provides the following information.

Records of historical petrol stations and fuel sites within 500m of the search boundary: 0

Database searched and no data found.

1.5 Additional Information – Historical Garage and Motor Vehicle Repair Database

The systematic analysis of data extracted from High Detailed 1:1,250 and 1:2,500 scale historical maps provides the following information.

Records of historical garage and motor vehicle repair sites within 500m of the search boundary: 0

Database searched and no data found.

1.6 Historical military sites

Certain military installations were not noted on historic mapping for security reasons. Whilst not all military land is necessarily of concern, Groundsure has researched and digitised a number of Ordnance Factories and other military industrial features (e.g. Ordnance Depots, Munitions Testing Grounds) which may be of contaminative concern. This research was drawn from a number of different sources, and should not be regarded as a definitive or exhaustive database of potentially contaminative military installations. The boundaries of sites within this database have been estimated from the best evidence available to Groundsure at the time of compilation.

Records of historical military sites within 500m of the search boundary: 0

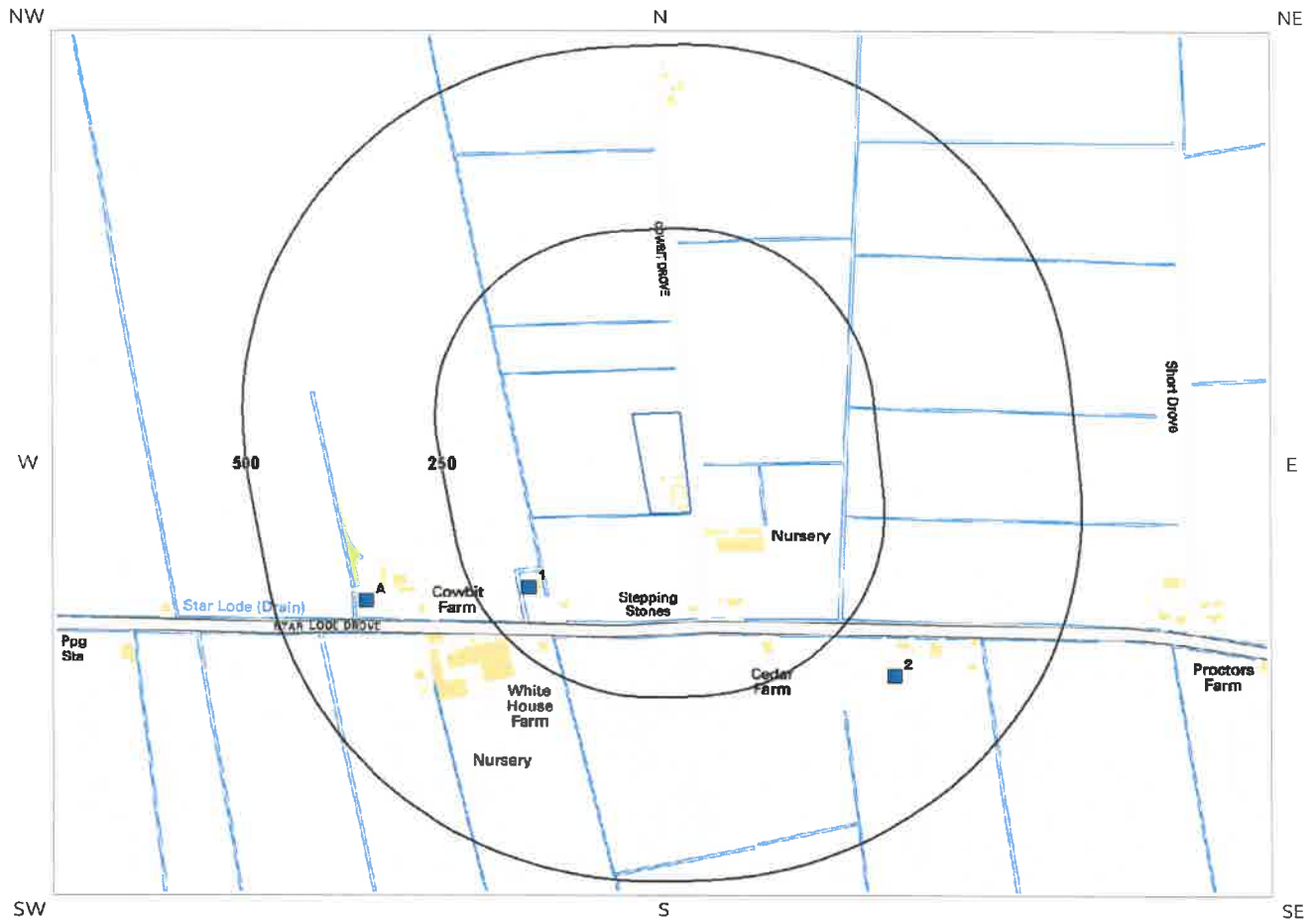
Database searched and no data found.

1.7 Potentially Infilled Land

Records of Potentially Infilled Features from 1:10,000 scale mapping within 500m of the study site: 0

Database searched and no data found.

2. Environmental Permits, Incidents and Registers Map



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- | | | |
|--------------------|-------------------------------|--|
| Site Outline | Recorded Pollution Incident | RAS 3 & 4 Authorisations |
| Search Buffers (m) | Dangerous Substances (List 1) | Part A(1) Authorised Processes and Historic IPC Authorisations |
| | Dangerous Substances (List 2) | Part A(2) and Part B Authorised Processes |
| | Water Industry Referrals | COMAH / NIHHS Sites |
| | Licenced Discharge Consents | Sites Determined as Contaminated Land |
| | Red List Discharge Consents | Hazardous Substance Consents and Enforcements |

2. Environmental Permits, Incidents and Registers

2.1 Industrial Sites Holding Licences and/or Authorisations

Searches of information provided by the Environment Agency/Natural Resources Wales and Local Authorities reveal the following information:

2.1.1 Records of historic IPC Authorisations within 500m of the study site:

0

Database searched and no data found.

2.1.2 Records of Part A(1) and IPPC Authorised Activities within 500m of the study site:

0

Database searched and no data found.

2.1.3 Records of Red List Discharge Consents (potentially harmful discharges to controlled waters) within 500m of the study site:

0

Database searched and no data found.

2.1.4 Records of List 1 Dangerous Substances Inventory Sites within 500m of the study site:

0

Database searched and no data found.

2.1.5 Records of List 2 Dangerous Substance Inventory Sites within 500m of the study site:

0

Database searched and no data found.

2.1.6 Records of Part A(2) and Part B Activities and Enforcements within 500m of the study site:

0

Database searched and no data found.

2.1.7 Records of Category 3 or 4 Radioactive Substances Authorisations:

0

Database searched and no data found.

2.1.8 Records of Licensed Discharge Consents within 500m of the study site:

5

The following Licensed Discharge Consents records are represented as points on the Environmental Permits, Incidents and Registers Map:

ID	Distance (m)	Direction	NGR	Details
1	186	SW	518230 326420	Address: NO2 COWBIT FARM COTTAGES, STAR LODE DROVE, WEST PINCHBECK, SPALDING, LINCOLNSHIRE, PE11 3TD Effluent Type: SEWAGE DISCHARGES - FINAL/TREATED EFFLUENT - NOT WATER COMPANY Permit Number: PRNNF12317 Permit Version: 1 Receiving Water: THE STAR LODE DRAIN Status: NEW CONSENT (WRA 91, S88 & SCHED 10 AS AMENDED BY Issue date: 01/09/1999 Effective Date: 13-Aug-1999 Revocation Date: -
2	344	SE	518700 326300	Address: PROCTORS FARM, STARLODE DROVE, WEST PINCHBECK, SPALDING, PE11 3TD Effluent Type: UNSPECIFIED Permit Number: PR3LF69 Permit Version: 1 Receiving Water: land Status: PRE NRA LEGISLATION WHERE ISSUE DATE < 01-SEP-89 (HISTORIC ONLY) Issue date: 31/05/1985 Effective Date: 31-May-1985 Revocation Date: 01/10/1996
3A	383	W	518022 326402	Address: COWBIT FARMHOUSE, STARLODE DROVE, WEST PINCHBECK, SPALDING, Lincs, PE11 3TD Effluent Type: SEWAGE DISCHARGES - FINAL/TREATED EFFLUENT - NOT WATER COMPANY Permit Number: PR3NFA1296 Permit Version: 1 Receiving Water: - Status: PRE NRA LEGISLATION WHERE ISSUE DATE < 01-SEP-89 (HISTORIC ONLY) Issue date: 15/07/1963 Effective Date: 15-Jul-1963 Revocation Date: 16/05/1991
4A	383	W	518022 326402	Address: COWBIT FARMHOUSE, STARLODE DROVE, WEST PINCHBECK, SPALDING, Lincs, PE11 3TD Effluent Type: SEWAGE DISCHARGES - FINAL/TREATED EFFLUENT - NOT WATER COMPANY Permit Number: PR3NFA1298 Permit Version: 1 Receiving Water: - Status: PRE NRA LEGISLATION WHERE ISSUE DATE < 01-SEP-89 (HISTORIC ONLY) Issue date: 15/07/1963 Effective Date: 15-Jul-1963 Revocation Date: 02/05/1991
5A	383	W	518022 326402	Address: COWBIT FARMHOUSE, STARLODE DROVE, WEST PINCHBECK, SPALDING, Lincs, PE11 3TD Effluent Type: SEWAGE DISCHARGES - FINAL/TREATED EFFLUENT - NOT WATER COMPANY Permit Number: PR3NFA1297 Receiving Water: - Status: PRE NRA LEGISLATION WHERE ISSUE DATE < 01-SEP-89 (HISTORIC ONLY) Issue date: 15/07/1963 Effective Date: 15-Jul-1963 Revocation Date: 02/05/1991

ID	Distance (m)	Direction	NGR	Details
Permit Version: 1				

2.1.9 Records of Water Industry Referrals (potentially harmful discharges to the public sewer) within 500m of the study site:

0

Database searched and no data found.

2.1.10 Records of Planning Hazardous Substance Consents and Enforcements within 500m of the study site:

0

Database searched and no data found.

2.2 Dangerous or Hazardous Sites

Records of COMAH & NIHHS sites within 500m of the study site:

0

Database searched and no data found.

2.3 Environment Agency/Natural Resources Wales Recorded Pollution Incidents

2.3.1 Records of National Incidents Recording System, List 2 within 500m of the study site:

0

Database searched and no data found.

2.3.2 Records of National Incidents Recording System, List 1 within 500m of the study site:

0

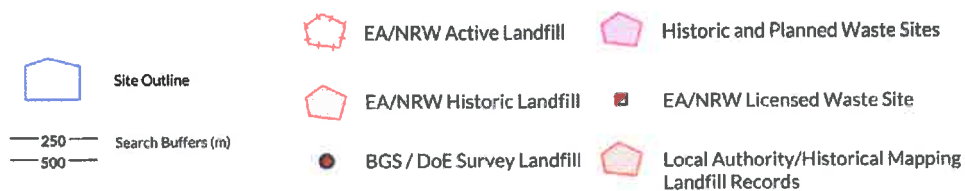
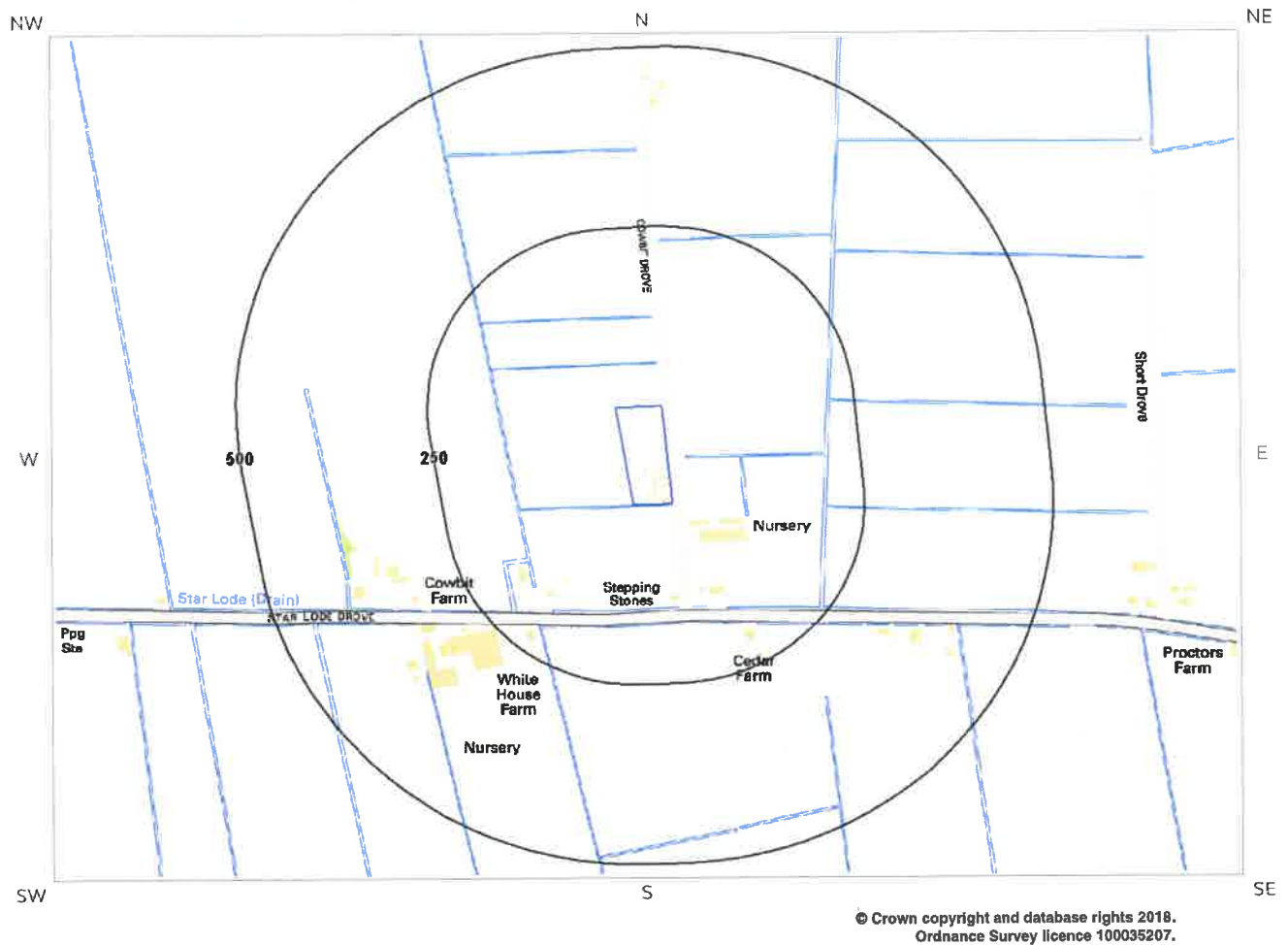
Database searched and no data found.

2.4 Sites Determined as Contaminated Land under Part 2A EPA 1990

Records of sites determined as contaminated land under Section 78R of the Environmental Protection Act 1990 are there within 500m of the study site 0

Database searched and no data found.

3. Landfill and Other Waste Sites Map



3. Landfill and Other Waste Sites

3.1 Landfill Sites

3.1.1 Records from Environment Agency/Natural Resources Wales landfill data within 1000m of the study site:

0

Database searched and no data found.

3.1.2 Records of Environment Agency/Natural Resources Wales historic landfill sites within 1500m of the study site:

0

Database searched and no data found.

3.1.3 Records of BGS/DoE non-operational landfill sites within 1500m of the study site:

0

Database searched and no data found.

3.1.4 Records of Landfills from Local Authority and Historical Mapping Records within 1500m of the study site:

0

Database searched and no data found.

3.2 Other Waste Sites

3.2.1 Records of waste treatment, transfer or disposal sites within 500m of the study site:

0

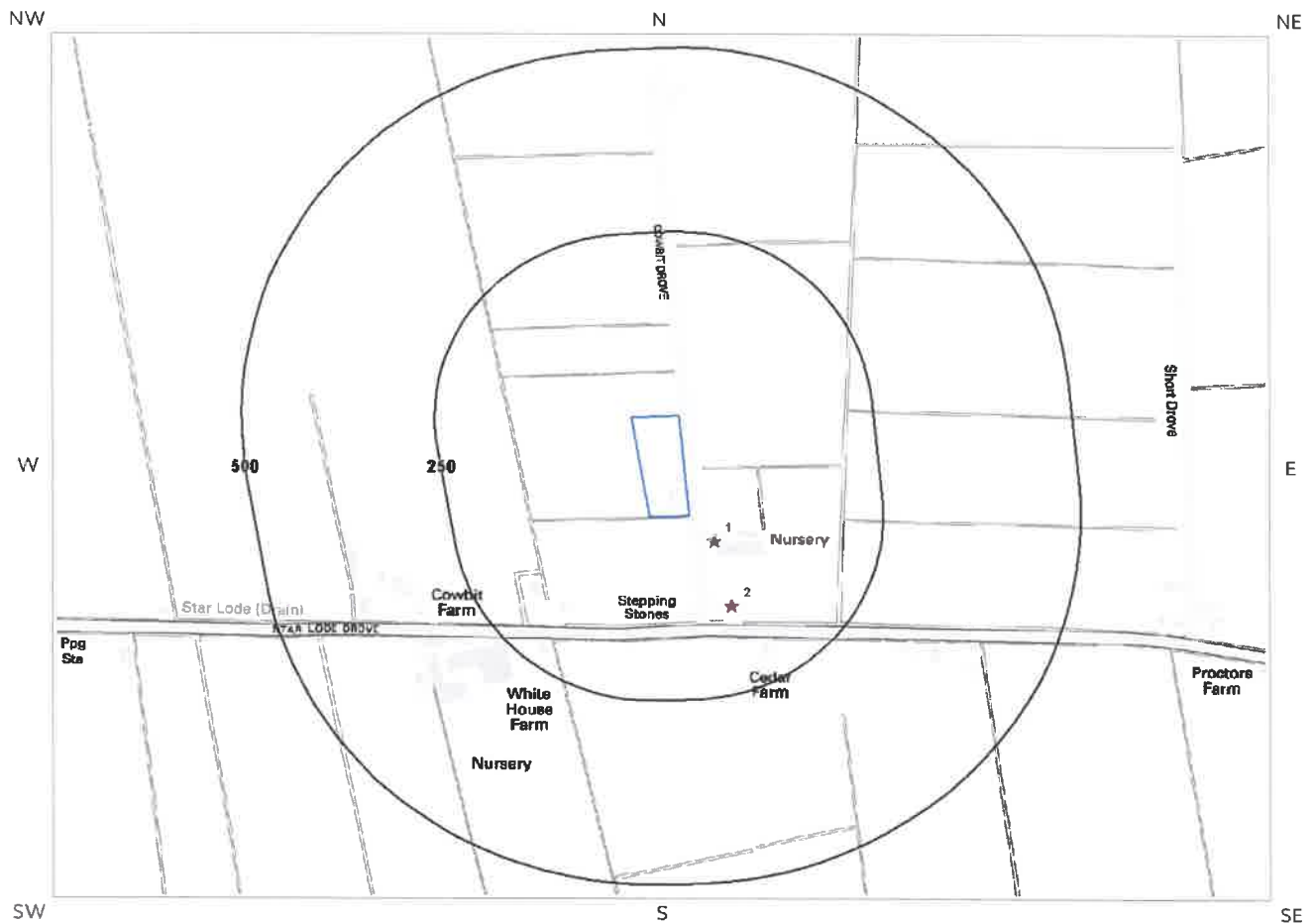
Database searched and no data found.

3.2.2 Records of Environment Agency/Natural Resources Wales licensed waste sites within 1500m of the study site:

0

Database searched and no data found.

4. Current Land Use Map



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4. Current Land Uses

4.1 Current Industrial Data

Records of potentially contaminative industrial sites within 250m of the study site:

2

The following records are represented as points on the Current Land Uses map.

ID	Distance (m)	Direction	Company	NGR	Address	Activity	Category
1	46	SE	Silo	518470 326489	PE11	Hoppers and Silos	Farming
2	133	SE	Bond Way Nurseries	518492 326400	100, Starlode Drove, West Pinchbeck, Spalding, PE11 3TD	Fruit, Flower and Vegetable Growers	Farming

4.2 Petrol and Fuel Sites

Records of petrol or fuel sites within 500m of the study site:

0

Database searched and no data found.

4.3 National Grid High Voltage Underground Electricity Transmission Cables

This dataset identifies the high voltage electricity transmission lines running between generating power plants and electricity substations. The dataset does not include the electricity distribution network (smaller, lower voltage cables distributing power from substations to the local user network). This information has been extracted from databases held by National Grid and is provided for information only with no guarantee as to its completeness or accuracy. National Grid do not offer any warranty as to the accuracy of the available data and are excluded from any liability for any such inaccuracies or errors.

Records of National Grid high voltage underground electricity transmission cables within 500m of the study site:

0

Database searched and no data found.

4.4 National Grid High Pressure Gas Transmission Pipelines

This dataset identifies high-pressure, large diameter pipelines which carry gas between gas terminals, power stations, compressors and storage facilities. The dataset does not include the Local Transmission System (LTS) which supplies gas directly into homes and businesses. This information has been extracted from databases held by National Grid and is provided for information only with no guarantee as to its completeness or accuracy. National Grid do not offer any warranty as to the accuracy of the available data and are excluded from any liability for any such inaccuracies or errors.

Records of National Grid high pressure gas transmission pipelines within 500m of the study site: 0

Database searched and no data found.

5. Geology

5.1 Artificial Ground and Made Ground

Database searched and no data found.

The database has been searched on site, including a 50m buffer.

5.2 Superficial Ground and Drift Geology

The database has been searched on site, including a 50m buffer.

Lex Code	Description	Rock Type
TFD-XCZ	TIDAL FLAT DEPOSITS	CLAY AND SILT

5.3 Bedrock and Solid Geology

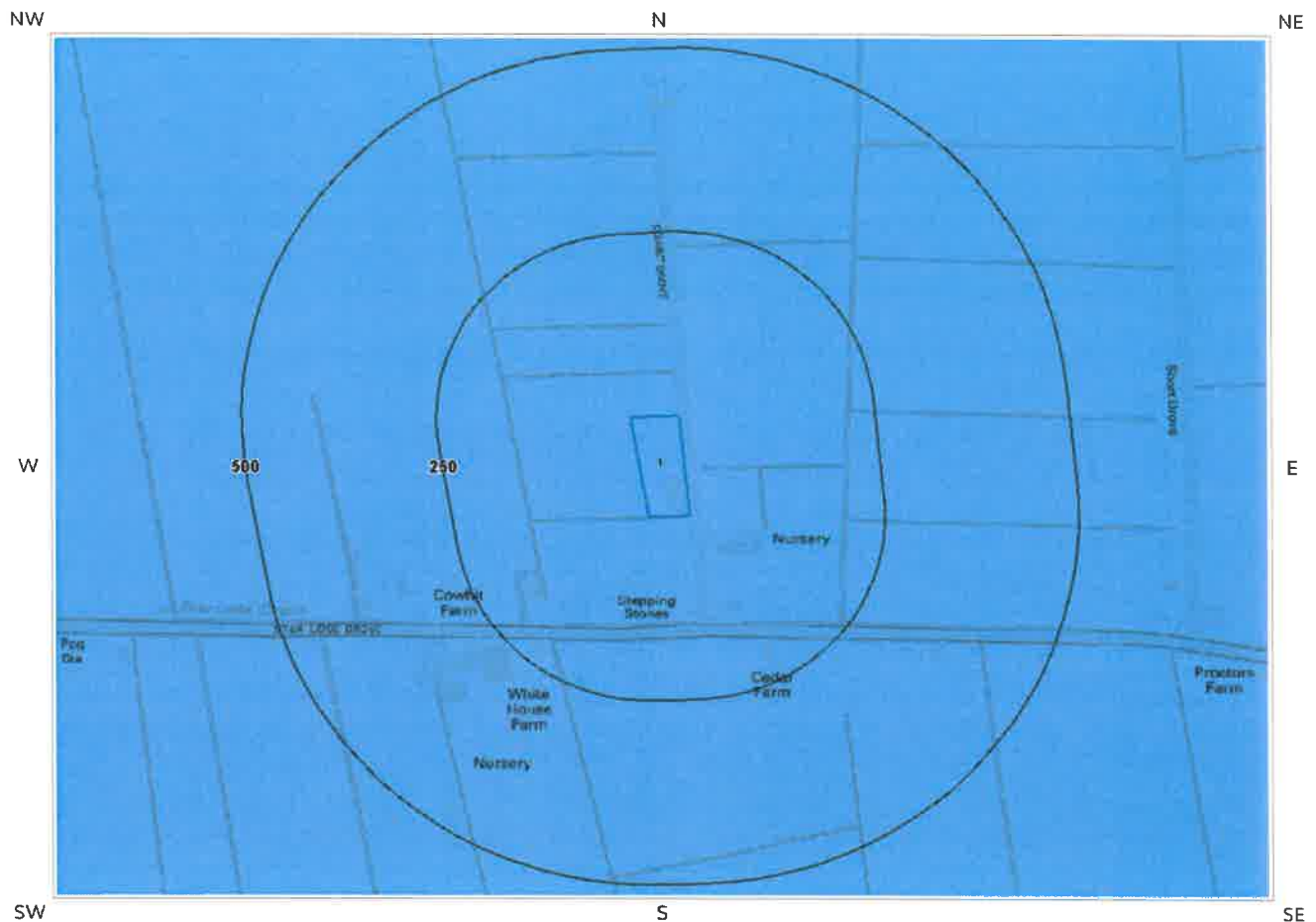
The database has been searched on site, including a 50m buffer.

Lex Code	Description	Rock Type
OXF-MDST	OXFORD CLAY FORMATION	MUDSTONE

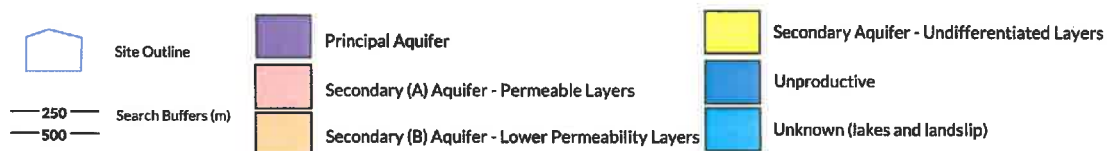
(Derived from the BGS 1:50,000 Digital Geological Map of Great Britain)

6 Hydrogeology and Hydrology

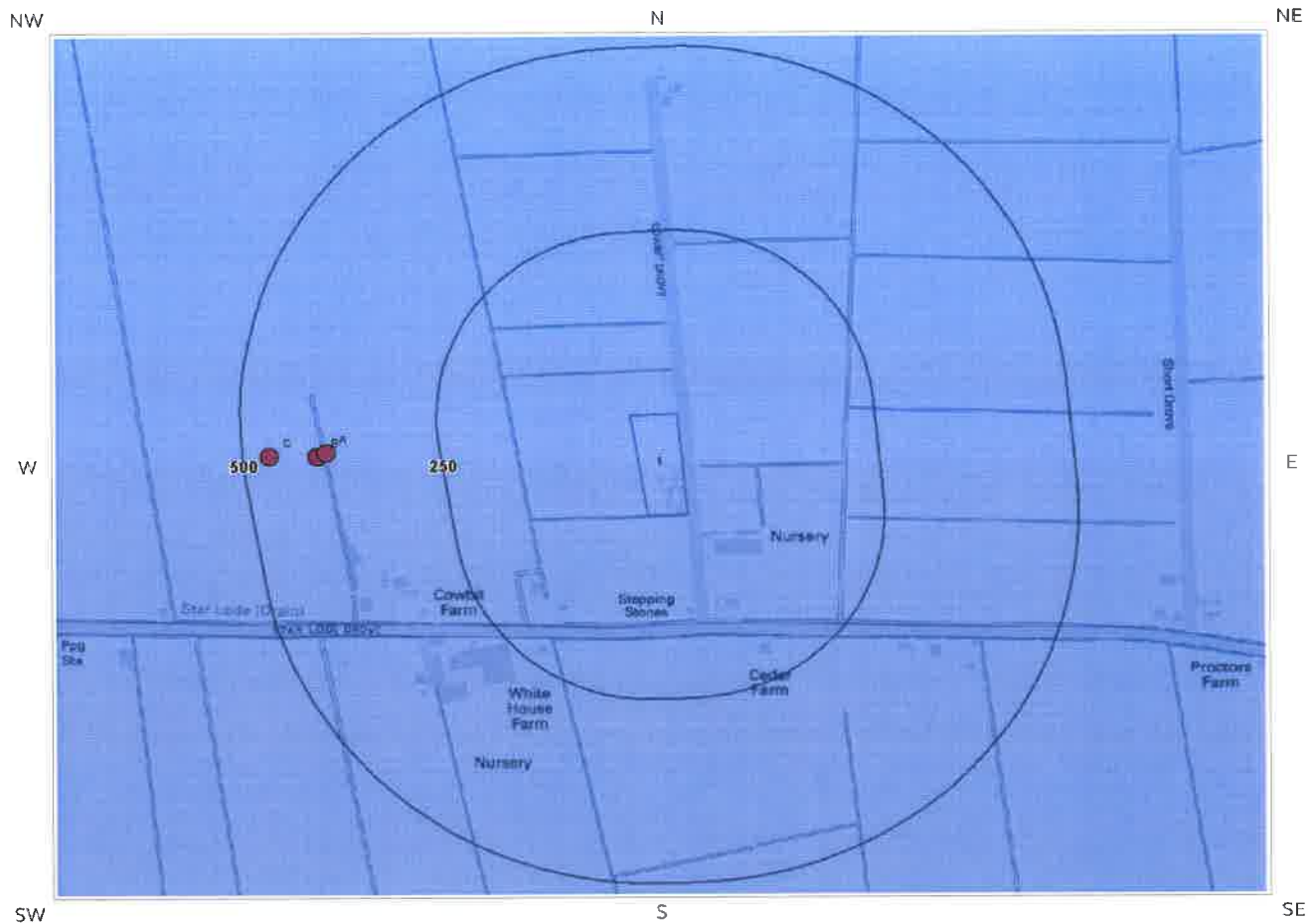
6a. Aquifer Within Superficial Geology



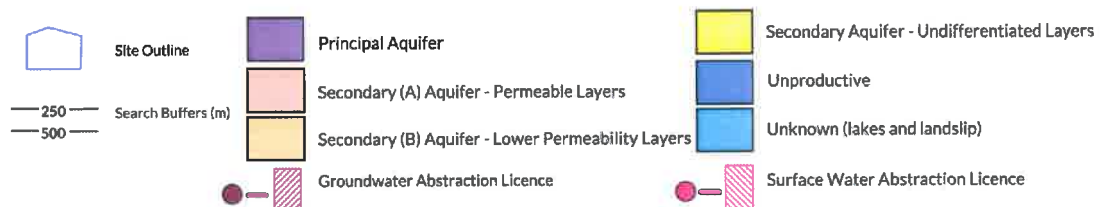
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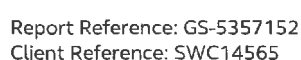


6b. Aquifer Within Bedrock Geology and Abstraction Licences

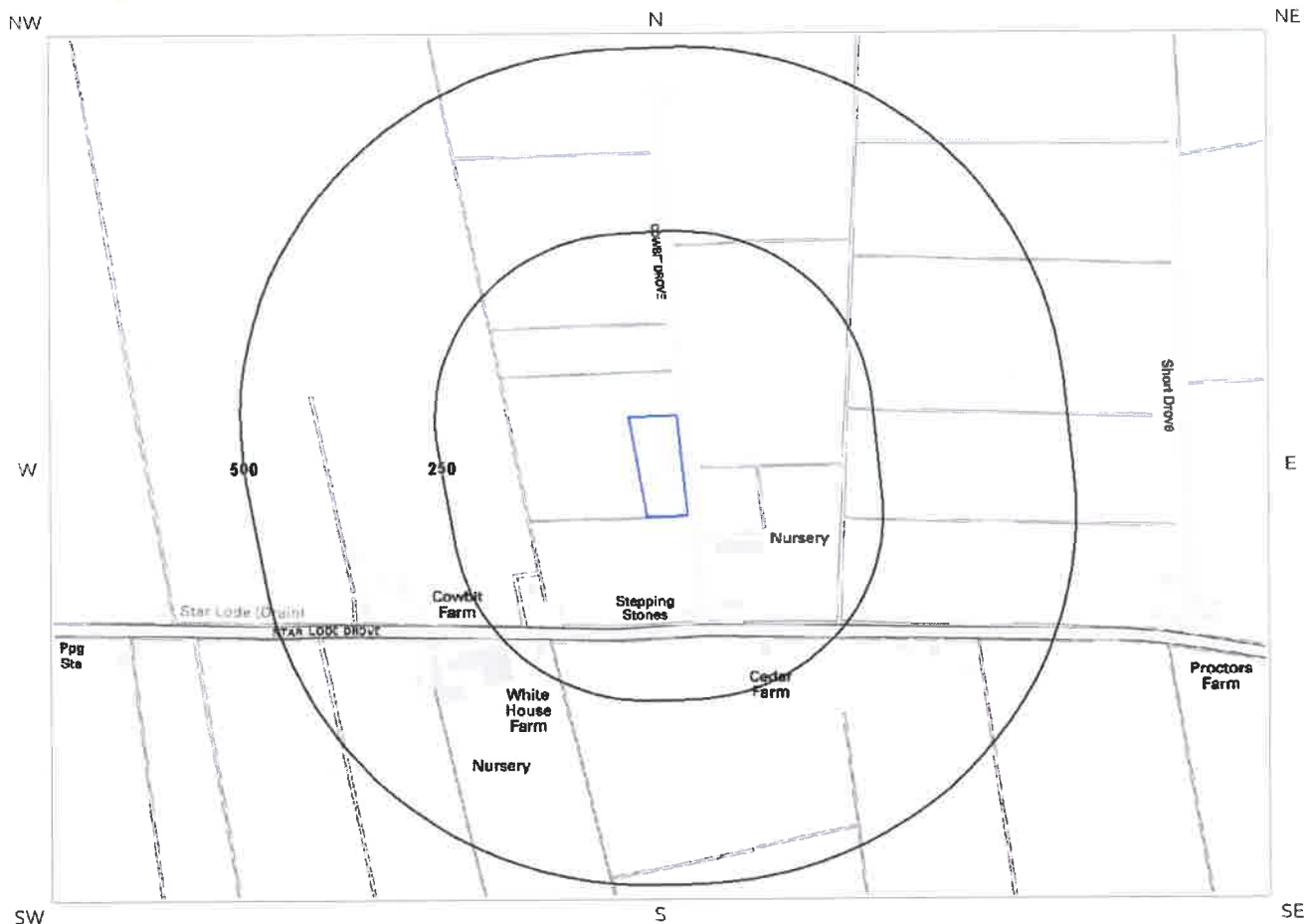


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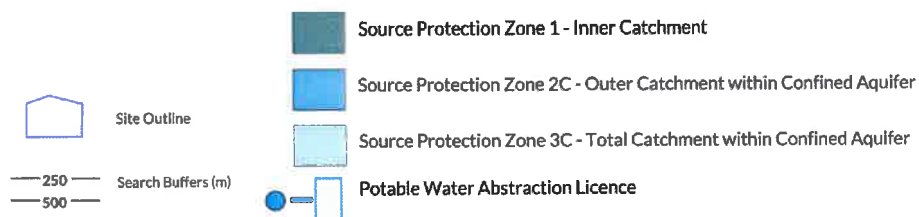




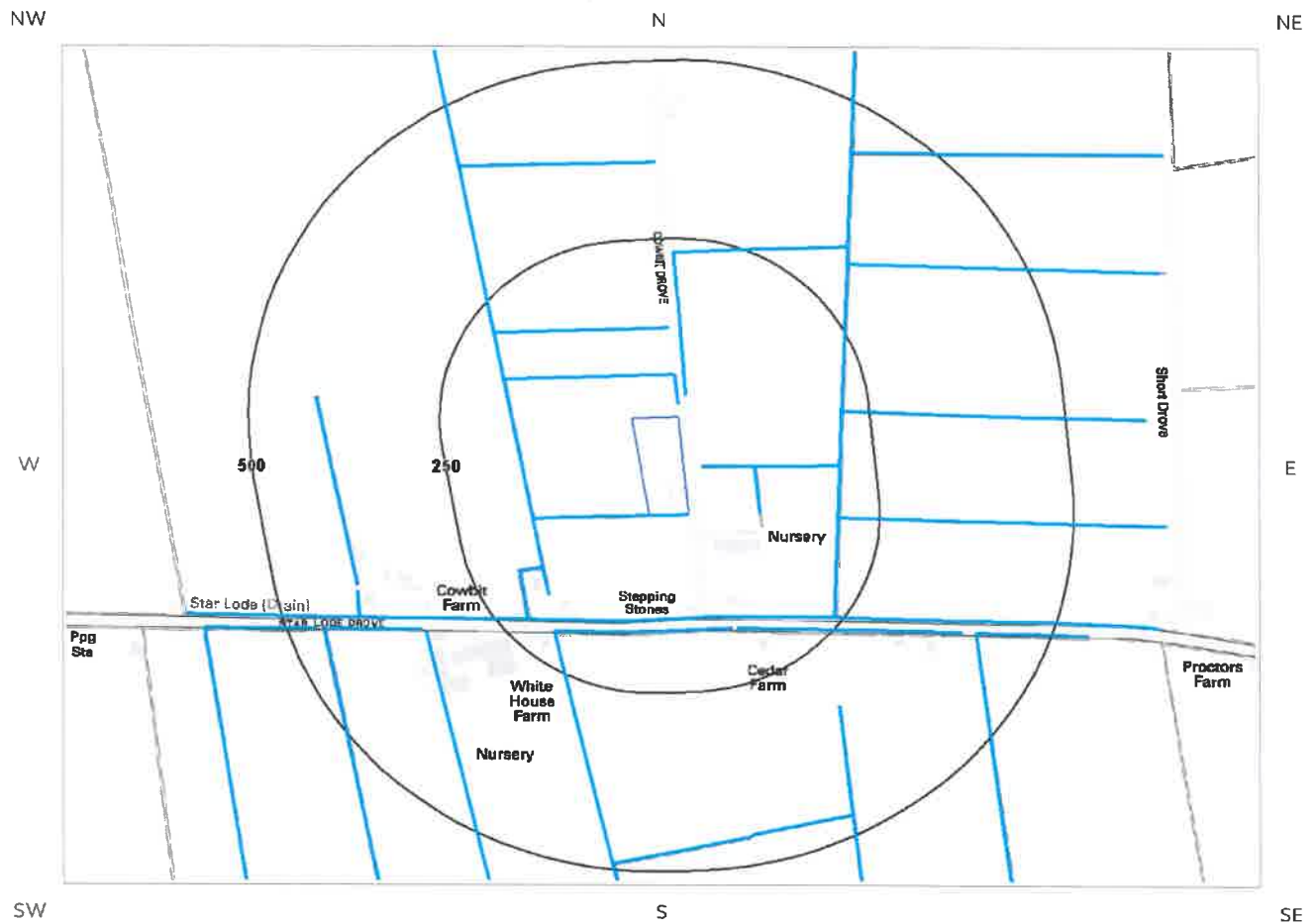
6d. Hydrogeology – Source Protection Zones within confined aquifer



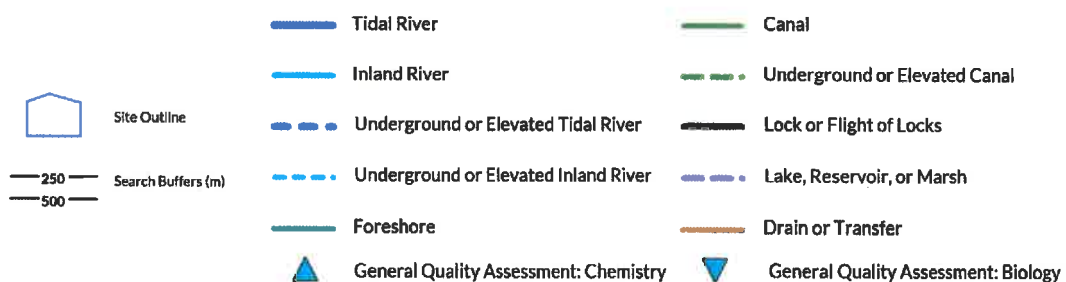
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6e. Hydrology – Watercourse Network and River Quality



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6. Hydrogeology and Hydrology

6.1 Aquifer within Superficial Deposits

Records of strata classification within the superficial geology at or in proximity to the property Yes

From 1 April 2010, the Environment Agency/Natural Resources Wales's Groundwater Protection Policy has been using aquifer designations consistent with the Water Framework Directive. For further details on the designation and interpretation of this information, please refer to the Groundsure Enviro Insight User Guide.

The following aquifer records are shown on the Aquifer within Superficial Geology Map (6a):

ID	Distance (m)	Direction	Designation	Description
1	0	On Site	Unproductive	These are rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow

6.2 Aquifer within Bedrock Deposits

Records of strata classification within the bedrock geology at or in proximity to the property Yes

From 1 April 2010, the Environment Agency/Natural Resources Wales's Groundwater Protection Policy has been using aquifer designations consistent with the Water Framework Directive. For further details on the designation and interpretation of this information, please refer to the Groundsure Enviro Insight User Guide.

The following aquifer records are shown on the Aquifer within Bedrock Geology Map (6b):

ID	Distance (m)	Direction	Designation	Description
1	0	On Site	Unproductive	These are rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow

6.3 Groundwater Abstraction Licences

Groundwater Abstraction Licences within 2000m of the study site Identified

The following Abstraction Licences records are represented as points, lines and regions on the Aquifer within Bedrock Geology Map (6b):

ID	Distance (m)	Direction	NGR	Details
2A	394	W	517972 326605	Status: Active Licence No: 4/30/12/*G/0040B Details: Transfer Between Sources (Pre Water Act 2003) Direct Source: Ground Water Source Of Supply Point: Atkinsons Bore G Data Type: Point Name: J E ATKINSON & SON Annual Volume (m³): 154567 Max Daily Volume (m³): 3232 Original Application No: NPS/WR/013215 Original Start Date: 1/3/1978 Expiry Date: - Issue No: 103 Version Start Date: 22/8/2013 Version End Date:

ID	Distance (m)	Direction	NGR	Details
3A	394	W	517972 326605	Status: Active Licence No: 4/30/12/*G/0040B Details: Spray Irrigation - Direct Direct Source: Ground Water Source Of Supply Point: Atkinsons Bore G Data Type: Point Name: J E ATKINSON & SON Annual Volume (m³): 154567 Max Daily Volume (m³): 3232 Original Application No: NPS/WR/013215 Original Start Date: 1/3/1978 Expiry Date: - Issue No: 103 Version Start Date: 22/8/2013 Version End Date:
4B	407	W	517960 326600	Status: Historical Licence No: 4/30/12/*G/0040B Details: Spray Irrigation - Direct Direct Source: Ground Water Source Of Supply Point: Atkinsons Bore G Data Type: Point Name: J E ATKINSON & SON Annual Volume (m³): 154567 Max Daily Volume (m³): 1932 Original Application No: N1507 Original Start Date: 1/3/1978 Expiry Date: - Issue No: 102 Version Start Date: 17/6/2008 Version End Date:
5B	407	W	517960 326600	Status: Historical Licence No: 4/30/12/*G/0040B Details: Transfer Between Sources (Pre Water Act 2003) Direct Source: Ground Water Source Of Supply Point: Atkinsons Bore G Data Type: Point Name: J E ATKINSON & SON Annual Volume (m³): 154567 Max Daily Volume (m³): 1932 Original Application No: N1507 Original Start Date: 1/3/1978 Expiry Date: - Issue No: 102 Version Start Date: 17/6/2008 Version End Date:
6C	466	W	517900 326600	Status: Historical Licence No: 4/30/12/*G/0040B Details: Transfer Between Sources (Pre Water Act 2003) Direct Source: Ground Water Source Of Supply Point: Atkinsons Bore G Data Type: Point Name: J E ATKINSON & SON Annual Volume (m³): 154567 Max Daily Volume (m³): 1932 Original Application No: - Original Start Date: 1/3/1978 Expiry Date: - Issue No: 100 Version Start Date: 1/7/1993 Version End Date:
7C	466	W	517900 326600	Status: Historical Licence No: 4/30/12/*G/0040B Details: Spray Irrigation - Direct Direct Source: Ground Water Source Of Supply Point: Atkinsons Bore G Data Type: Point Name: J E ATKINSON & SON Annual Volume (m³): 154567 Max Daily Volume (m³): 1932 Original Application No: - Original Start Date: 1/3/1978 Expiry Date: - Issue No: 100 Version Start Date: 1/7/1993 Version End Date:
Not shown	809	W	517600 326330	Status: Active Licence No: 4/30/12/*G/0034 Details: Potable Water Supply - Direct Direct Source: Ground Water Source Of Supply Point: Pinchbeck P.s. Borehole 1 Data Type: Point Name: ANGLIAN WATER SERVICES LIMITED Annual Volume (m³): 3318653 Max Daily Volume (m³): 9092 Original Application No: NPSWR019354 Original Start Date: 1/4/1966 Expiry Date: - Issue No: 104 Version Start Date: 3/11/2015 Version End Date:
Not shown	809	W	517600 326330	Status: Active Licence No: 4/30/12/*G/0034 Details: Potable Water Supply - Direct Direct Source: Ground Water Source Of Supply Point: Pinchbeck P.s. Borehole 2 Data Type: Point Name: ANGLIAN WATER SERVICES LIMITED Annual Volume (m³): 3318653 Max Daily Volume (m³): 9092 Original Application No: NPSWR019354 Original Start Date: 1/4/1966 Expiry Date: - Issue No: 104 Version Start Date: 3/11/2015 Version End Date:
Not shown	1880	NW	516800 327700	Status: Historical Licence No: 4/30/12/*G/0076A Details: General Farming & Domestic Direct Source: Ground Water Source Of Supply Point: Laurel Farm Bore Pinchbeck Data Type: Point Name: W DENNIS AND SONS Annual Volume (m³): - Max Daily Volume (m³): - Original Application No: - Original Start Date: 1/10/1975 Expiry Date: - Issue No: 100 Version Start Date: 1/10/1975 Version End Date:

ID	Distance (m)	Direction	NGR	Details
Not shown	1964	NE	519500 328300	Status: Historical Licence No: 4/30/12/*G/0196 Details: General Farming & Domestic Direct Source: Ground Water Source Of Supply Point: Rigbolt House Bore Gosberton Data Type: Point Name: RIGBOLT FARMS LTD Annual Volume (m³): - Max Daily Volume (m³): - Original Application No: - Original Start Date: 1/3/1966 Expiry Date: - Issue No: 100 Version Start Date: 1/3/1966 Version End Date:

6.4 Surface Water Abstraction Licences

Surface Water Abstraction Licences within 2000m of the study site Identified

The following Surface Water Abstraction Licences records are represented as points, lines and regions on the Aquifer within Bedrock Geology Map (6b):

ID	Distance (m)	Direction	NGR	Details
Not shown	958	E	519300 327100	Status: Active Licence No: 4/30/12/*S/0016 Details: Spray Irrigation - Direct Direct Source: Surface Water Source Of Supply Point: Hammond Beck Data Type: Line Name: HACCONBY FARMING COMPANY Annual Volume (m³): 4091 Max Daily Volume (m³): 1136 Application No: - Original Start Date: 1/5/1966 Expiry Date: - Issue No: 100 Version Start Date: 1/1/1994 Version End Date:
Not shown	1617	E	524550 325970	Status: Historical Licence No: 5/31/14/*S/0247 Details: Spray Irrigation - Direct Direct Source: Surface Water Source Of Supply Point: Captains Drain "e - F" Data Type: Line Name: LINCOLNSHIRE FIELD PRODUCTS LTD Annual Volume (m³): 135000 Max Daily Volume (m³): 8000 Application No: NS761 Original Start Date: 27/11/1998 Expiry Date: - Issue No: 1 Version Start Date: 27/11/1998 Version End Date:
Not shown	1653	NE	519900 327400	Status: Active Licence No: 4/30/12/*S/0016 Details: Spray Irrigation - Direct Direct Source: Surface Water Source Of Supply Point: New Drain(idb System)pinchbeck Data Type: Line Name: HACCONBY FARMING COMPANY Annual Volume (m³): 4091 Max Daily Volume (m³): 1136 Application No: - Original Start Date: 1/5/1966 Expiry Date: - Issue No: 100 Version Start Date: 1/1/1994 Version End Date:
Not shown	1696	E	524550 325970	Status: Active Licence No: 5/31/14/*S/0247 Details: Spray Irrigation - Direct Direct Source: Surface Water Source Of Supply Point: Captains Drain "e - F" Data Type: Line Name: LINCOLNSHIRE FIELD PRODUCTS LTD Annual Volume (m³): 135000 Max Daily Volume (m³): 8000 Application No: NS761 Original Start Date: 27/11/1998 Expiry Date: - Issue No: 1 Version Start Date: 27/11/1998 Version End Date:
Not shown	1777	E	520200 326300	Status: Active Licence No: 4/30/12/*S/0016 Details: Spray Irrigation - Direct Direct Source: Surface Water Source Of Supply Point: Graft Drain(idb Syst)pinchbeck Data Type: Line Name: HACCONBY FARMING COMPANY Annual Volume (m³): 4091 Max Daily Volume (m³): 1136 Application No: - Original Start Date: 1/5/1966 Expiry Date: - Issue No: 100 Version Start Date: 1/1/1994 Version End Date:
Not shown	1798	W	515400 326000	Status: Active Licence No: 4/30/12/*S/0086 Details: Spray Irrigation - Direct Annual Volume (m³): 11365 Max Daily Volume (m³): 113.65 Application No: -

ID	Distance (m)	Direction	NGR	Details
				Direct Source: Surface Water Source Of Supply Point: Hacconby Lode Dunsby Fen Data Type: Line Name: J E ATKINSON & SON Original Start Date: 1/5/1966 Expiry Date: - Issue No: 100 Version Start Date: 1/10/1994 Version End Date:
Not shown	1808	W	513800 326120	Status: Active Licence No: 4/30/12/*S/0014 Details: Spray Irrigation - Direct Direct Source: Surface Water Source Of Supply Point: Hacconby Lode(&dykes)hacconby Data Type: Line Name: HACCONBY FARMING COMPANY Annual Volume (m³): 7517 Max Daily Volume (m³): 900 Application No: - Original Start Date: 1/3/1974 Expiry Date: - Issue No: 100 Version Start Date: 1/9/1997 Version End Date:
Not shown	1895	W	515300 327300	Status: Active Licence No: 4/30/12/*S/0086 Details: Spray Irrigation - Direct Direct Source: Surface Water Source Of Supply Point: Dunsby Fen Drain Dunsby Fen Data Type: Line Name: J E ATKINSON & SON Annual Volume (m³): 11365 Max Daily Volume (m³): 113.65 Application No: - Original Start Date: 1/5/1966 Expiry Date: - Issue No: 100 Version Start Date: 1/10/1994 Version End Date:
Not shown	1920	SW	514700 325670	Status: Active Licence No: 4/30/12/*S/0014 Details: Spray Irrigation - Direct Direct Source: Surface Water Source Of Supply Point: Drove Pump Drn(&dykes)hacconby Data Type: Line Name: HACCONBY FARMING COMPANY Annual Volume (m³): 7517 Max Daily Volume (m³): 900 Application No: - Original Start Date: 1/3/1974 Expiry Date: - Issue No: 100 Version Start Date: 1/9/1997 Version End Date:
Not shown	1925	NE	520200 327400	Status: Active Licence No: 4/30/12/*S/0016 Details: Spray Irrigation - Direct Direct Source: Surface Water Source Of Supply Point: New Drain(idb System)pinchbeck Data Type: Line Name: HACCONBY FARMING COMPANY Annual Volume (m³): 4091 Max Daily Volume (m³): 1136 Application No: - Original Start Date: 1/5/1966 Expiry Date: - Issue No: 100 Version Start Date: 1/1/1994 Version End Date:
Not shown	1976	SE	520390 325590	Status: Active Licence No: 4/30/12/*S/0207 Details: Spray Irrigation - Direct Direct Source: Surface Water Source Of Supply Point: Riparian Dykes Pinchbeck Data Type: Line Name: F TIPLER & SONS PINCHBECK LTD Annual Volume (m³): 4546 Max Daily Volume (m³): 363.69 Application No: - Original Start Date: 1/12/1967 Expiry Date: - Issue No: 100 Version Start Date: 1/4/2004 Version End Date:
Not shown	1976	SE	520110 325470	Status: Active Licence No: 4/30/12/*S/0207 Details: Spray Irrigation - Direct Direct Source: Surface Water Source Of Supply Point: Riparian Dykes Pinchbeck Data Type: Line Name: F TIPLER & SONS PINCHBECK LTD Annual Volume (m³): 4546 Max Daily Volume (m³): 363.69 Application No: - Original Start Date: 1/12/1967 Expiry Date: - Issue No: 100 Version Start Date: 1/4/2004 Version End Date:

6.5 Potable Water Abstraction Licences

Potable Water Abstraction Licences within 2000m of the study site

Identified

The following Potable Water Abstraction Licences records are represented as points, lines and regions on the SPZ and Potable Water Abstraction Licences Map (6c):

ID	Distance (m)	Direction	NGR	Details
Not shown	809	W	517600 326330	Status: Active Licence No: 4/30/12/*G/0034 Details: Potable Water Supply - Direct Direct Source: Ground Water Source Of Supply Point: Pinchbeck P.s. Borehole 1 Data Type: Point Name: ANGLIAN WATER SERVICES LIMITED Annual Volume (m³): 3318653 Max Daily Volume (m³): 9092 Original Application No: NPSWR019354 Original Start Date: 1/4/1966 Expiry Date: - Issue No: 104 Version Start Date: Version End Date:
Not shown	809	W	517600 326330	Status: Active Licence No: 4/30/12/*G/0034 Details: Potable Water Supply - Direct Direct Source: Ground Water Source Of Supply Point: Pinchbeck P.s. Borehole 2 Data Type: Point Name: ANGLIAN WATER SERVICES LIMITED Annual Volume (m³): 3318653 Max Daily Volume (m³): 9092 Original Application No: NPSWR019354 Original Start Date: 1/4/1966 Expiry Date: - Issue No: 104 Version Start Date: Version End Date:

6.6 Source Protection Zones

Source Protection Zones within 500m of the study site

Identified

The following Source Protection Zones records are represented on the SPZ and Potable Water Abstraction Map (6c):

ID	Distance (m)	Direction	Zone	Description
2	0	On Site	2	Outer catchment
3	73	E	3	Total catchment
1	291	SW	1	Inner catchment

6.7 Source Protection Zones within Confined Aquifer

Source Protection Zones within the Confined Aquifer within 500m of the study site None identified

Historically, Source Protection Zone maps have been focused on regulation of activities which occur at or near the ground surface, such as prevention of point source pollution and bacterial contamination of water supplies. Sources in confined aquifers were often considered to be protected from these surface pressures due to the presence of a low permeability confining layer (e.g. glacial till, clay). The increased interest in subsurface activities such as onshore oil and gas exploration, ground source heating and cooling requires protection zones for confined sources to be marked on SPZ maps where this has not already been done.

Database searched and no data found.

6.8 Groundwater Vulnerability and Soil Leaching Potential

Environment Agency/Natural Resources Wales information on groundwater vulnerability and soil leaching potential within 500m of the study site None identified

Database searched and no data found.

6.9 River Quality

Environment Agency/Natural Resources Wales information on river quality within 1500m of the study site None identified

6.9.1 Biological Quality:

Database searched and no data found.

6.9.2 Chemical Quality:

Database searched and no data found.

6.10 Ordnance Survey MasterMap Water Network

Ordnance Survey MasterMap Water Network entries within 500m of the study site

This watercourse information is provided by Ordnance Survey MasterMap Water Network. The data provides a detailed centre line following the curve of the waterway precisely, so all distances provided in the report should be understood as measurements to the centreline rather than a measurement to the nearest point of the watercourse. Underground watercourses are inferred from entry and exit points so caution is advised in using these to indicate precise locations of underground watercourses when planning site investigation and development.

The following Ordnance Survey MasterMap Water Network records are represented on the Hydrology Map (6e):

ID	Distance/ Direction	Name	Type of Watercourse	Additional Details
1	1 S	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.4
17	1 S	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.4
2	17 N	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.3
18	17 N	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.3
3	23 E	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 3.5
19	23 E	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 3.5
4	30 N	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.1
20	30 N	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.1
5	94 E	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 3.5
6	94 E	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 3.5
21	94 E	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 3.5
22	94 E	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 3.5
7	125 N	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.4
23	125 N	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.4
8	145	Star Lode	Inland river not influenced	Catchment Area: Witham

ID	Distance/ Direction	Name	Type of Watercourse	Additional Details
	S	Alternative Name: -	by normal tidal action.	Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 4.9
24	145 S	Star Lode Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 4.9
9	152 W	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 3.6
10	152 W	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 3.4
25	152 W	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 3.6
26	152 W	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 3.4
11	159 SE	Star Lode Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 3.5
27	159 SE	Star Lode Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 3.5
12	160 SW	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.8
13	160 SW	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 3.8
28	160 SW	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.8
29	160 SW	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 3.8
14	163 S	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.3
30	163 S	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.3
15	166 N	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: Underground Permanence: Unclassified. Average Width in Watercourse Section (m): Not Provided
31	166	-	Inland river not influenced	Catchment Area: Witham

ID	Distance/ Direction	Name	Type of Watercourse	Additional Details
	N	Alternative Name: -	by normal tidal action.	Relationship to Ground Level: Underground Permanence: Unclassified. Average Width in Watercourse Section (m): Not Provided
16	172 S	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.1
32	172 S	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.1
17	173 N	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.8
33	173 N	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.8
18	176 W	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 3.0
34	176 W	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 3.0
19	181 SW	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: Underground Permanence: Unclassified. Average Width in Watercourse Section (m): Not Provided
35	181 SW	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: Underground Permanence: Unclassified. Average Width in Watercourse Section (m): Not Provided
20	183 SE	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: Underground Permanence: Unclassified. Average Width in Watercourse Section (m): Not Provided
21	183 SW	Star Lode Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: Underground Permanence: Unclassified. Average Width in Watercourse Section (m): Not Provided
36	183 SE	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: Underground Permanence: Unclassified. Average Width in Watercourse Section (m): Not Provided
37	183 SW	Star Lode Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: Underground Permanence: Unclassified. Average Width in Watercourse Section (m): Not Provided
22	185 SW	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 3.0
38	185 SW	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 3.0
23	189	Star Lode	Inland river not influenced	Catchment Area: Witham

ID	Distance/ Direction	Name	Type of Watercourse	Additional Details
	SW	Alternative Name: -	by normal tidal action.	Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.0
39	189 SW	Star Lode Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.0
24	194 SW	Star Lode Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: Underground Permanence: Unclassified. Average Width in Watercourse Section (m): Not Provided
25	194 SE	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.7
40	194 SW	Star Lode Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: Underground Permanence: Unclassified. Average Width in Watercourse Section (m): Not Provided
41	194 SE	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.7
26	197 E	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 4.8
27	197 E	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 4.1
28	197 E	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.8
42	197 E	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 4.8
43	197 E	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 4.1
44	197 E	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.8
29	200 SW	Star Lode Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.8
45	200 SW	Star Lode Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.8
30	205 E	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 4.4
46	205	-	Inland river not influenced	Catchment Area: Witham

ID	Distance/ Direction	Name	Type of Watercourse	Additional Details
	E	Alternative Name: -	by normal tidal action.	Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 4.4
31	215 E	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 4.4
32	215 E	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 3.1
33	215 NW	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.7
47	215 E	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 4.4
48	215 E	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 3.1
49	215 NW	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.7
34	217 SW	Star Lode Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.8
50	217 SW	Star Lode Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.8
35	236 SE	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: Underground Permanence: Unclassified. Average Width in Watercourse Section (m): Not Provided
51	236 SE	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: Underground Permanence: Unclassified. Average Width in Watercourse Section (m): Not Provided
36	240 SE	Star Lode Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 3.3
37	240 SE	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.6
52	240 SE	Star Lode Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 3.3
53	240 SE	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.6
38	294	-	Inland river not influenced	Catchment Area: Witham

ID	Distance/ Direction	Name	Type of Watercourse	Additional Details
	SE	Alternative Name: -	by normal tidal action.	Relationship to Ground Level: Underground Permanence: Unclassified. Average Width in Watercourse Section (m): Not Provided
54	294 SE	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: Underground Permanence: Unclassified. Average Width in Watercourse Section (m): Not Provided
39	300 SE	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.6
55	300 SE	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.6
40	306 SW	Star Lode Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: Underground Permanence: Unclassified. Average Width in Watercourse Section (m): Not Provided
56	306 SW	Star Lode Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: Underground Permanence: Unclassified. Average Width in Watercourse Section (m): Not Provided
41	311 NE	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 3.9
42	311 NE	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.3
57	311 NE	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 3.9
58	311 NE	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.3
43	318 SW	Star Lode Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.7
59	318 SW	Star Lode Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.7
44	323 SE	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: Underground Permanence: Unclassified. Average Width in Watercourse Section (m): Not Provided
60	323 SE	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: Underground Permanence: Unclassified. Average Width in Watercourse Section (m): Not Provided
45	329 NE	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 3.8
61	329	-	Inland river not influenced	Catchment Area: Witham

ID	Distance/ Direction	Name	Type of Watercourse	Additional Details
	NE	Alternative Name: -	by normal tidal action.	Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 3.8
46	331 SE	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.5
62	331 SE	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.5
47	333 SE	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.8
Not shown	333 SE	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.8
48	334 SW	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.5
64	334 SW	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.5
49	338 SW	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.0
65	338 SW	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.0
50	353 SW	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: Underground Permanence: Unclassified. Average Width in Watercourse Section (m): Not Provided
66	353 SW	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: Underground Permanence: Unclassified. Average Width in Watercourse Section (m): Not Provided
51	357 SE	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: Underground Permanence: Unclassified. Average Width in Watercourse Section (m): Not Provided
67	357 SE	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: Underground Permanence: Unclassified. Average Width in Watercourse Section (m): Not Provided
52	358 N	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.9
Not shown	358 N	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.9
53	360	-	Inland river not influenced	Catchment Area: Witham

ID	Distance/ Direction	Name	Type of Watercourse	Additional Details
	SW	Alternative Name: -	by normal tidal action.	Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 1.6
69	360 SW	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 1.6
54	367 SE	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.6
70	367 SE	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.6
55	393 W	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 3.5
71	393 W	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 3.5
56	395 W	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.9
72	395 W	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.9
57	399 E	Star Lode Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.3
58	399 E	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 3.2
73	399 E	Star Lode Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.3
74	399 E	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 3.2
59	404 W	Star Lode Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.9
75	404 W	Star Lode Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.9
60	409 SE	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 3.5
76	409	-	Inland river not influenced	Catchment Area: Witham

ID	Distance/ Direction	Name	Type of Watercourse	Additional Details
	SE	Alternative Name: -	by normal tidal action.	Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 3.5
61	411 W	Star Lode Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: Underground Permanence: Unclassified. Average Width in Watercourse Section (m): Not Provided
77	411 W	Star Lode Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: Underground Permanence: Unclassified. Average Width in Watercourse Section (m): Not Provided
62	418 W	Star Lode Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 3.3
78	418 W	Star Lode Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 3.3
63	419 NW	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.6
Not shown	419 NW	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.6
64	435 NE	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 4.4
65	435 NE	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 3.7
Not shown	435 NE	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 4.4
Not shown	435 NE	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 3.7
66	453 W	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 4.2
82	453 W	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 4.2
67	457 S	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.8
68	457 S	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: Underground Permanence: Unclassified. Average Width in Watercourse Section (m): Not Provided
Not	457	-	Inland river not influenced	Catchment Area: Witham

ID	Distance/ Direction	Name	Type of Watercourse	Additional Details
shown	S	Alternative Name: -	by normal tidal action.	Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.8
Not shown	457 S	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: Underground Permanence: Unclassified. Average Width in Watercourse Section (m): Not Provided
69	460 S	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 3.0
Not shown	460 S	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 3.0
70	461 W	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 3.1
Not shown	461 W	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 3.1
71	472 E	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: Underground Permanence: Unclassified. Average Width in Watercourse Section (m): Not Provided
72	472 SE	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.6
Not shown	472 E	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: Underground Permanence: Unclassified. Average Width in Watercourse Section (m): Not Provided
Not shown	472 SE	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.6
73	474 W	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: Underground Permanence: Unclassified. Average Width in Watercourse Section (m): Not Provided
Not shown	474 W	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: Underground Permanence: Unclassified. Average Width in Watercourse Section (m): Not Provided
74	478 W	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 3.3
Not shown	478 W	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 3.3
75	479 E	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.3
Not	479	-	Inland river not influenced	Catchment Area: Witham

ID	Distance/ Direction	Name	Type of Watercourse	Additional Details
shown	E	Alternative Name: -	by normal tidal action.	Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.3
76	492 S	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.9
Not shown	492 S	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Witham Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.9

6.11 Surface Water Features

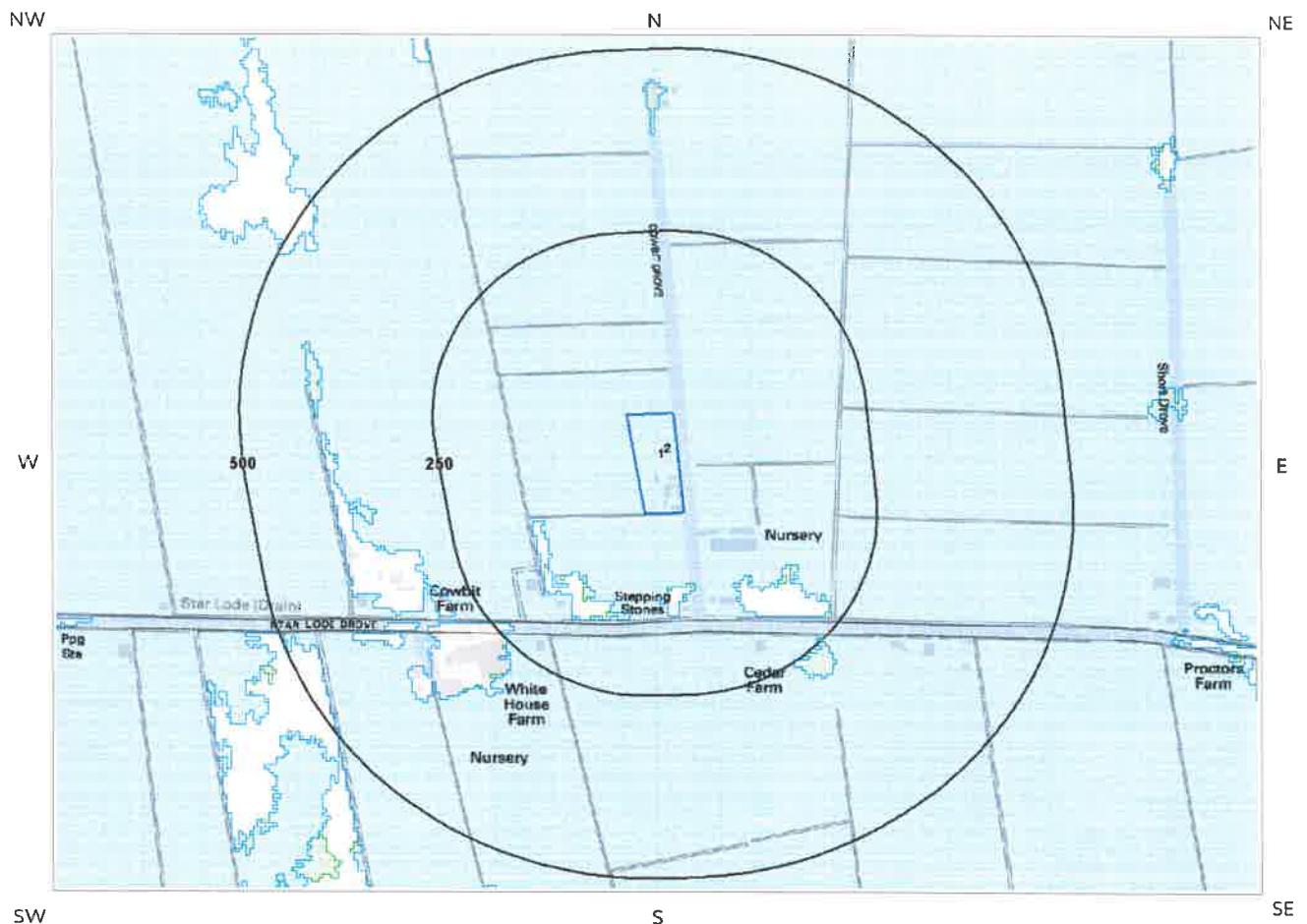
Surface water features within 250m of the study site

Identified

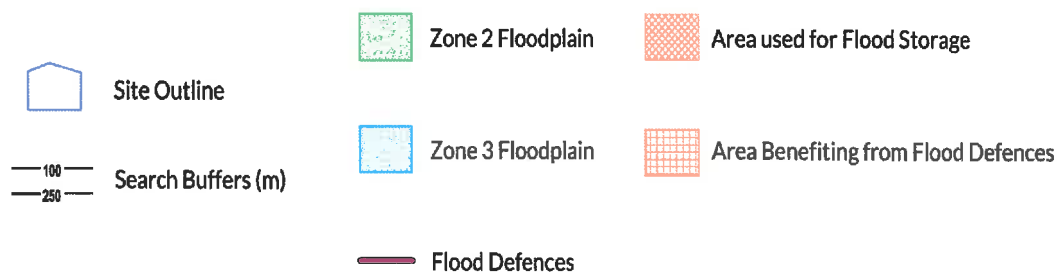
The following surface water records are not represented on mapping:

Distance (m)	Direction
0	On Site
23	E
29	N
143	S
144	S
162	S
183	SW
193	SE
240	SE

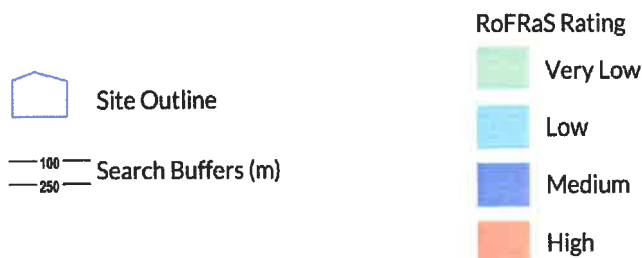
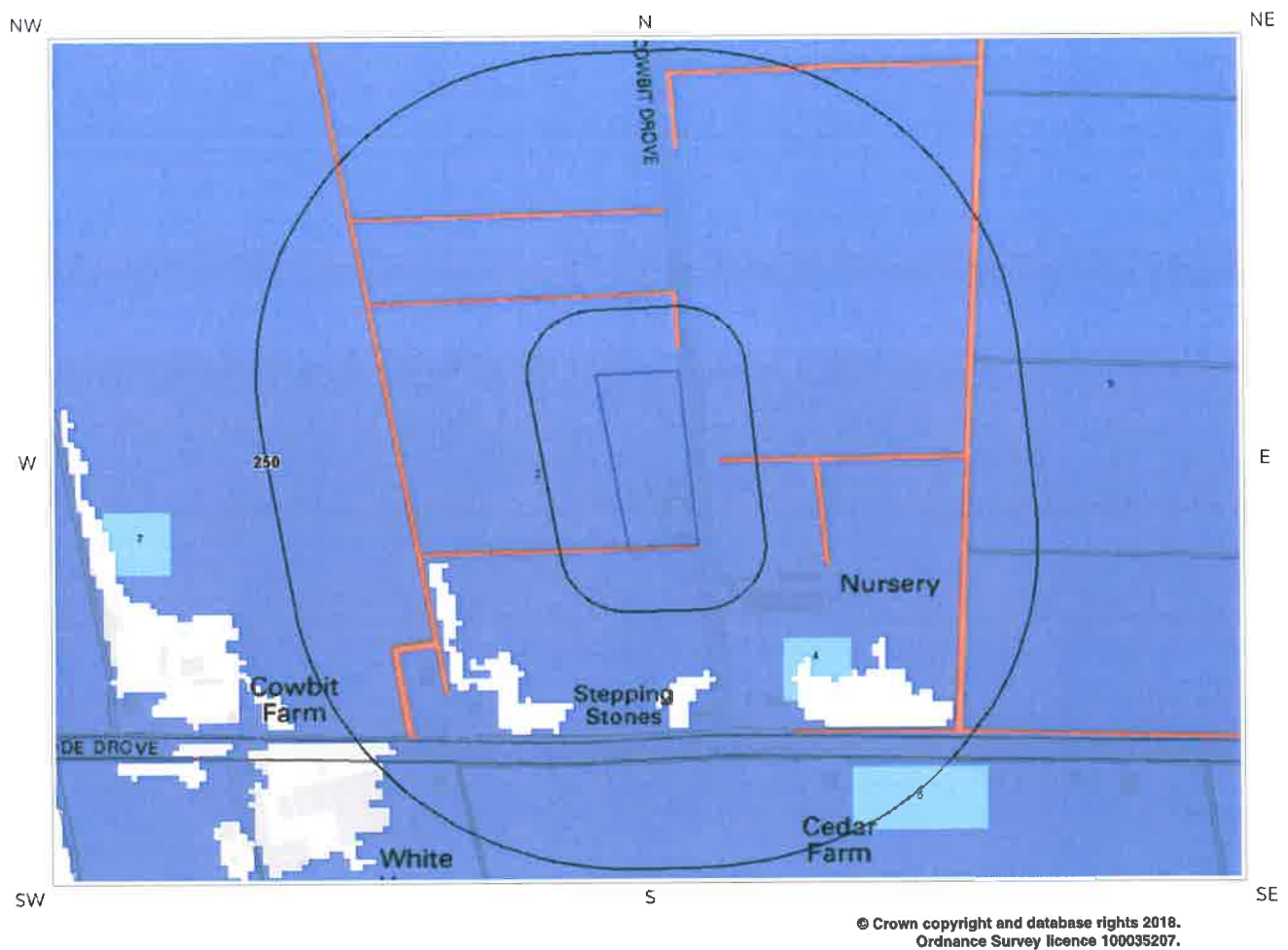
7a. Environment Agency/Natural Resources Wales Flood Map for Planning (from rivers and the sea)



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7b. Environment Agency/Natural Resources Wales Risk of Flooding from Rivers and the Sea (RoFRaS) Map



7 Flooding

7.1 River and Coastal Zone 2 Flooding

Environment Agency/Natural Resources Wales Zone 2 floodplain within 250m

Identified

Environment Agency/Natural Resources Wales Zone 2 floodplains estimate the annual probability of flooding as between 1 in 1000 (0.1%) and 1 in 100 (1%) from rivers and between 1 in 1000 (0.1%) and 1 in 200 (0.5%) from the sea. Any relevant data is represented on Map 7a – Flood Map for Planning:

ID	Distance (m)	Direction	Update	Type
1	0	On Site	29-May-2018	Zone 2 - (Fluvial /Tidal Models)

7.2 River and Coastal Zone 3 Flooding

Environment Agency/Natural Resources Wales Zone 3 floodplain within 250m

Identified

Zone 3 shows the extent of a river flood with a 1 in 100 (1%) or greater chance of occurring in any year or a sea flood with a 1 in 200 (0.5%) or greater chance of occurring in any year. Any relevant data is represented on Map 7a – Flood Map for Planning.

ID	Distance (m)	Direction	Update	Type
1	0	On Site	30-May-2018	Zone 3 - (Fluvial Models)

7.3 Risk of Flooding from Rivers and the Sea (RoFRaS) Flood Rating

Highest risk of flooding onsite

High

The Environment Agency/Natural Resources Wales RoFRaS database provides an indication of river and coastal flood risk at a national level on a 50m grid with the flood rating at the centre of the grid calculated and given above. The data considers the probability that the flood defences will overtop or breach by considering their location, type, condition and standard of protection.

RoFRaS data for the study site indicates the property is in an area with a High (1 in 30 or greater) chance of flooding in any given year.

Any relevant data within 250m is represented on the RoFRaS Flood map. Data to 50m is reported in the table below.

ID	Distance (m)	Direction	RoFRaS flood Risk
1	0.0	On Site	High
2	0.0	On Site	Medium

7.4 Flood Defences

Flood Defences within 250m of the study site None identified
Database searched and no data found.

7.5 Areas benefiting from Flood Defences

Areas benefiting from Flood Defences within 250m of the study site None identified

7.6 Areas benefiting from Flood Storage

Areas used for Flood Storage within 250m of the study site None identified

7.7 Groundwater Flooding Susceptibility Areas

7.7.1 British Geological Survey groundwater flooding susceptibility areas within 50m of the boundary of the study site None identified

Notes: Groundwater flooding may either be associated with shallow unconsolidated sedimentary aquifers which overlie unproductive aquifers (Superficial Deposits Flooding), or with unconfined aquifers (Clearwater Flooding).

7.7.2 Highest susceptibility to groundwater flooding in the search area based on the underlying geological conditions

The area is not considered to be prone to groundwater flooding based on rock type. Not Prone

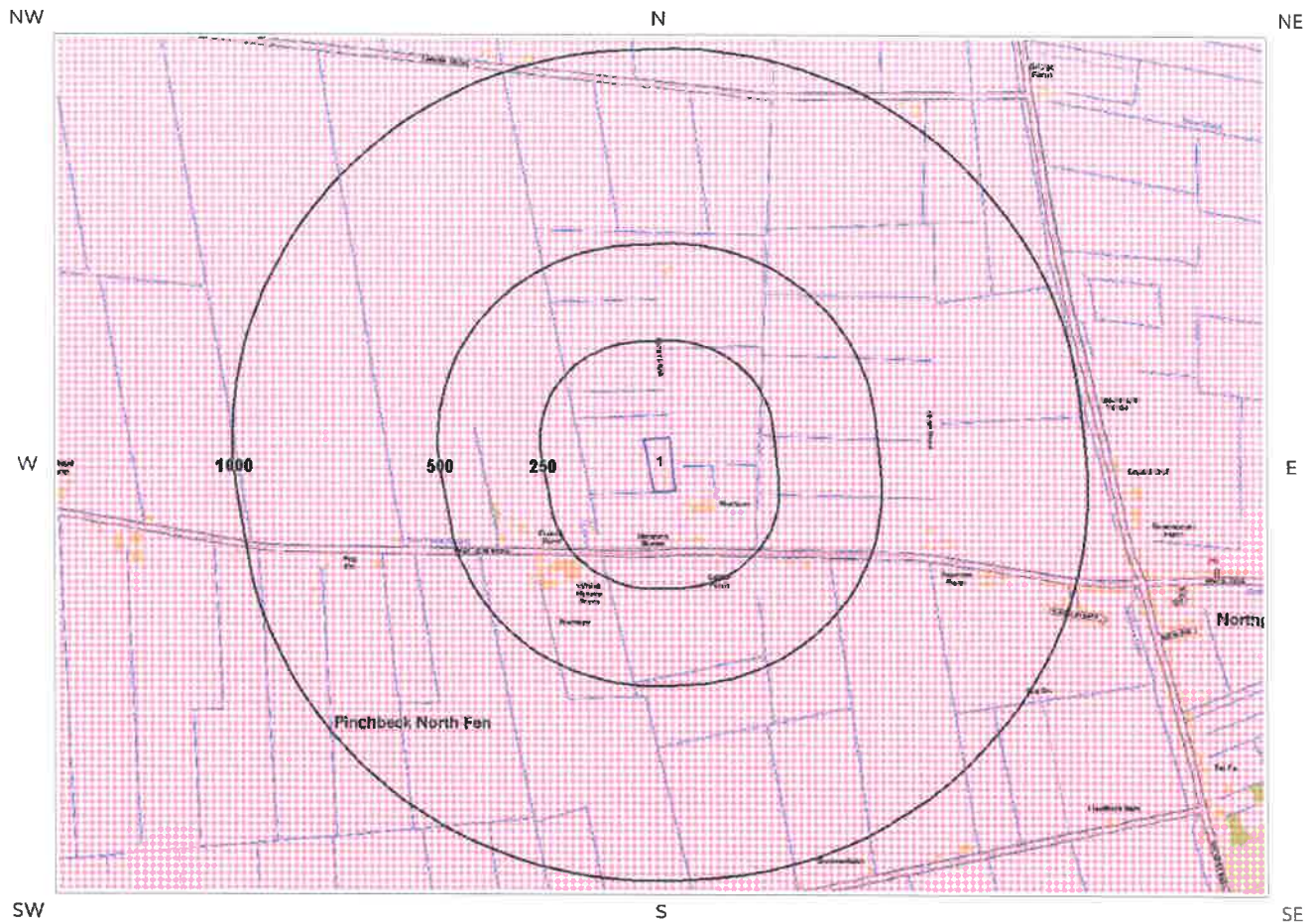
7.8 Groundwater Flooding Confidence Areas

British Geological Survey confidence rating in this result Not Applicable

Notes: Groundwater flooding is defined as the emergence of groundwater at the ground surface or the rising of groundwater into man-made ground under conditions where the normal range of groundwater levels is exceeded.

The confidence rating is on a threefold scale - Low, Moderate and High. This provides a relative indication of the BGS confidence in the accuracy of the susceptibility result for groundwater flooding. This is based on the amount and precision of the information used in the assessment. In areas with a relatively lower level of confidence the susceptibility result should be treated with more caution. In other areas with higher levels of confidence the susceptibility result can be used with more confidence.

8. Designated Environmentally Sensitive Sites Map



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8. Designated Environmentally Sensitive Sites

Designated Environmentally Sensitive Sites within 2000m of the study site

Identified

8.1 Records of Sites of Special Scientific Interest (SSSI) within 2000m of the study site:

0

Database searched and no data found.

8.2 Records of National Nature Reserves (NNR) within 2000m of the study site:

0

Database searched and no data found.

8.3 Records of Special Areas of Conservation (SAC) within 2000m of the study site:

0

Database searched and no data found.

8.4 Records of Special Protection Areas (SPA) within 2000m of the study site:

0

Database searched and no data found.

8.5 Records of Ramsar sites within 2000m of the study site:

0

Database searched and no data found.

8.6 Records of Ancient Woodland within 2000m of the study site:

Database searched and no data found.

0

8.7 Records of Local Nature Reserves (LNR) within 2000m of the study site:

Database searched and no data found.

0

8.8 Records of World Heritage Sites within 2000m of the study site:

Database searched and no data found.

0

8.9 Records of Environmentally Sensitive Areas within 2000m of the study site:

Database searched and no data found.

0

8.10 Records of Areas of Outstanding Natural Beauty (AONB) within 2000m of the study site:

Database searched and no data found.

0

8.11 Records of National Parks (NP) within 2000m of the study site:

Database searched and no data found.

0

8.12 Records of Nitrate Sensitive Areas within 2000m of the study site:

Database searched and no data found.

0

8.13 Records of Nitrate Vulnerable Zones within 2000m of the study site:

2

The following Nitrate Vulnerable Zone records produced by DEFRA are represented as polygons on the Designated Environmentally Sensitive Sites Map:

ID	Distance (m)	Direction	NVZ Name	Data Source
1	0	On Site	Existing	DEFRA
Not shown	1563	E	Existing	DEFRA

8.14 Records of Green Belt land within 2000m of the study site:

0

Database searched and no data found.

9. Natural Hazards Findings

9.1 Detailed BGS GeoSure Data

BGS GeoSure Data has been searched to 50m. The data is included in tabular format. If you require further information on geology and ground stability, please obtain a Groundsure Geo Insight, available from our [website](#). The following information has been found:

9.1.1 Shrink Swell

Maximum Shrink-Swell** hazard rating identified on the study site Low

The following natural subsidence information provided by the British Geological Survey is not represented on mapping:

Hazard
Ground conditions predominantly medium plasticity. Do not plant trees with high soil moisture demands near to buildings. For new build, consideration should be given to advice published by the National House Building Council (NHBC) and the Building Research Establishment (BRE). There is a possible increase in construction cost to reduce potential shrink-swell problems. For existing property, there is a possible increase in insurance risk, especially during droughts or where vegetation with high moisture demands is present.

9.1.2 Landslides

Maximum Landslide* hazard rating identified on the study site Very Low

The following natural subsidence information provided by the British Geological Survey is not represented on mapping:

Hazard
Slope instability problems are unlikely to be present. No special actions required to avoid problems due to landslides. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with landslides.

9.1.3 Soluble Rocks

Maximum Soluble Rocks* hazard rating identified on the study site Negligible

The following natural subsidence information provided by the British Geological Survey is not represented on mapping:

Hazard
Soluble rocks are present, but unlikely to cause problems except under exceptional conditions. No special actions required to avoid problems due to soluble rocks. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with soluble rocks.

* This indicates an automatically generated 50m buffer and site.

9.1.4 Compressible Ground

Maximum Compressible Ground* hazard rating identified on the study site

Moderate

The following natural subsidence information provided by the British Geological Survey is not represented on mapping:

Hazard
Significant potential for compressibility problems. Avoid large differential loadings of ground. Do not drain or de-water ground near the property without technical advice. For new build consider possibility of compressible ground in ground investigation, construction and building design. Consider effects of groundwater changes. Extra construction costs are likely. For existing property possible increase in insurance risk from compressibility, especially if water conditions or loading of the ground change significantly.

9.1.5 Collapsible Rocks

Maximum Collapsible Rocks* hazard rating identified on the study site

Negligible

The following natural subsidence information provided by the British Geological Survey is not represented on mapping:

Hazard
No indicators for collapsible deposits identified. No actions required to avoid problems due to collapsible deposits. No special ground investigation required, or increased construction costs or increased financial risk due to potential problems with collapsible deposits.

9.1.6 Running Sand

Maximum Running Sand** hazard rating identified on the study site

Moderate

The following natural subsidence information provided by the British Geological Survey is not represented on mapping:

Hazard
Significant potential for running sand problems with relatively small changes in ground conditions. Avoid large amounts of water entering the ground (for example through pipe leakage or soak-aways). Do not dig (deep) holes into saturated ground near the property without technical advice. For new build consider the consequences of soil and groundwater conditions during and after construction. For existing property possible increase in insurance risk from running sand, for example, due to water leakage, high rainfall events or flooding.

* This indicates an automatically generated 50m buffer and site.

9.2 Radon

9.2.1 Radon Affected Areas

Is the property in a Radon Affected Area as defined by the Health Protection Agency (HPA) and if so what percentage of homes are above the Action Level? The site is not in a Radon Affected Area, as less than 1% of properties are above the Action Level.

The radon data in this report is supplied by the BGS/Public Health England and is the definitive map of Radon Affected Areas in Great Britain and Northern Ireland. The dataset was created using long-term radon measurements in over 479,000 homes across Great Britain and 23,000 homes across Northern Ireland, combined with geological data. The dataset is considered accurate to 50m to allow for the margin of error in geological lines, and the findings of this report supercede any answer given in the less accurate Indicative Atlas of Radon in Great Britain, which simplifies the data to give the highest risk within any given 1km grid square. As such, the radon atlas is considered indicative, whereas the data given in this report is considered definitive.

9.2.2 Radon Protection

Is the property in an area where Radon Protection are required for new properties or extensions to existing ones as described in publication BR211 by the Building Research Establishment? No radon protective measures are necessary.

10. Mining

10.1 Coal Mining

Coal mining areas within 75m of the study site

None identified

Database searched and no data found.

10.2 Non-Coal Mining

Non-Coal Mining areas within 50m of the study site boundary

None identified

Database searched and no data found.

10.3 Brine Affected Areas

Brine affected areas within 75m of the study site

None identified

Guidance: No Guidance Required.

Contact Details

Groundsure Helpline
Telephone: 08444 159 000
info@groundsure.com

British Geological Survey Enquiries

Kingsley Dunham Centre
Keyworth, Nottingham NG12 5GG
Tel: 0115 936 3143.
Fax: 0115 936 3276.
Email:
Web: www.bgs.ac.uk

BGS Geological Hazards Reports and general geological enquiries:
enquiries@bgs.ac.uk

Environment Agency

National Customer Contact Centre, PO Box 544
Rotherham, S60 1BY
Tel: 03708 506 506

Web: www.environment-agency.gov.uk
Email: enquiries@environment-agency.gov.uk

Public Health England

Public information access office
Public Health England, Wellington House
133-155 Waterloo Road, London, SE1 8UG
www.gov.uk/phe
Email: enquiries@phe.gov.uk
Main switchboard: 020 7654 8000

The Coal Authority

200 Lichfield Lane
Mansfield
Notts NG18 4RG
Tel: 0345 7626 848
DX 716176 Mansfield 5
www.coal.gov.uk

Ordnance Survey

Adanac Drive, Southampton
SO16 0AS
Tel: 08456 050505

Local Authority

Authority: South Holland District Council
Phone: 01775 761 161
Web: <http://www.sholland.gov.uk/>
Address: Council Offices, Priory Road, Spalding, Lincolnshire, PE11

Gemapping PLC

Virginia Villas, High Street, Hartley Witney,
Hampshire RG27 8NW
Tel: 01252 845444



APPENDIX 3

CLASSIFICATION OF AGGRESSIVE CHEMICAL ENVIRONMENT FOR BURIED CONCRETE

TABLE C1 – AGGRESSIVE CHEMICAL ENVIRONMENT FOR CONCRETE

(ACEC) CLASSIFICATION FOR NATURAL GROUND LOCATIONS^a

Table C1 Aggressive Chemical Environment for Concrete (ACEC) classification for natural ground locations^a						
Sulfate				Groundwater		ACEC
Design Sulfate	2:1 water/soil	Groundwater	Total potential	Static	Mobile	Class for
Class for location	extract^b		sulfate^c	water	water	location
1	2	3	4	5	6	7
	(SO ₄ mg/l)	(SO ₄ mg/l)	(SO ₄ %)	(pH)	(pH)	
DS-1	< 500	< 400	< 0.24	≥ 2.5	> 5.5 ^d	AC-1s
					2.5–5.5	AC-1 ^d
						AC-2z
DS-2	500–1500	400–1400	0.24–0.6	> 3.5	> 5.5	AC-1s
				2.5–3.5		AC-2
					2.5–5.5	AC-2s
						AC-3z
DS-3	1600–3000	1500–3000	0.7–1.2	> 3.5	> 5.5	AC-2s
				2.5–3.5		AC-3
					2.5–5.5	AC-3s
						AC-4
DS-4	3100–6000	3100–6000	1.3–2.4	> 3.5	> 5.5	AC-3s
				2.5–3.5		AC-4
					2.5–5.5	AC-4s
						AC-5
DS-5	> 6000	> 6000	> 2.4	> 3.5		AC-4s
				2.5–3.5	≥ 2.5	AC-5

Notes

- a** Applies to locations on sites that comprise either undisturbed ground that is in its natural state (ie is not brownfield – Table C2) or clean fill derived from such ground.
- b** The limits of Design Sulfate Classes based on 2:1 water/soil extracts have been lowered relative to previous Digests (Box C7).
- c** Applies only to locations where concrete will be exposed to sulfate ions (SO₄) which may result from the oxidation of sulfides (eg pyrite) following ground disturbance (Appendix A1 and Box C8).
- d** For flowing water that is potentially aggressive to concrete owing to high purity or an aggressive carbon dioxide level greater than 15 mg/l (Section C2.2.3), increase the ACEC Class to AC-2z.

Explanation of suffix symbols to ACEC Class

- Suffix 's' indicates that the water has been classified as static.
- Concrete placed in ACEC Classes that include the suffix 'z' primarily have to resist acid conditions and may be made with any of the cements or combinations listed in Table D2 on page 42.

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