



LAND OFF MOULTON CHAPEL ROAD, COWBIT, SPALDING

PHASE I & II GEO-ENVIRONMENTAL INVESTIGATION FOR COWBIT HOMES LTD

Project No:
GML18201/1/1

Date:
September 2018

Prepared for:
Cowbit Homes Ltd
22 The Point
Rockingham Road
Market Harborough
LE16 7QU

Prepared by:
Geo-Matters Ltd
104 Bondgate
Castle Donington
Derby
DE74 2NR

info@geo-matters.com
<http://www.geo-matters.com>

Revision - 1

PHASE I & II GEO-ENVIRONMENTAL INVESTIGATION: LAND OFF MOULTON CHAPEL ROAD, COWBIT, SPALDING

CONTENTS

EXECUTIVE SUMMARY

- 1.0 INTRODUCTION**
- 2.0 SITE LOCATION AND DESCRIPTION**
- 3.0 GEO-ENVIRONMENTAL SETTING**
- 4.0 HISTORY OF LAND USE**
- 5.0 PHASE I GEOTECHNICAL ASSESSMENT**
- 6.0 PHASE I ENVIRONMENTAL ASSESSMENT**
- 7.0 RATIONALE FOR PHASE II INVESTIGATION**
- 8.0 SITE WORKS**
- 9.0 PHASE II GEOTECHNICAL ASSESSMENT**
- 10.0 ANALYSIS, RESULTS AND INTERPRETATION**
- 11.0 PHASE II ENVIRONMENTAL ASSESSMENT**
- 12.0 RECOMMENDATIONS**

INFORMATION SOURCES

APPENDICES

- I** Proposed Layout Plan
- II** Site Location Plan
- III** Site Features Plan
- IV** General Photographic Record
- V** Environmental Data Report and Pre-Desk Study Unexploded Ordnance Assessment
- VI** Historic Mapping
- VII** Site Investigation Layout Plan
- VIII** Exploratory Hole Logs
- IX** Laboratory Testing Data

Executive Summary

This presents the salient points of the report and should not be referred to in isolation. The conclusions and recommendations presented below are considered reasonable based on the findings of the site investigation. However, these cannot be guaranteed to gain regulatory approval and therefore copies of this report should be sent to the appropriate Regulatory Authorities and / or other organisations (as appropriate) by the Client for their comments and approval prior to undertaking any irrecoverable works associated with the subject site.

Floor Slabs	At this stage ground bearing floor slabs should be appropriate for the majority of the site. However, where made ground / unsuitable soils are encountered in thicknesses of greater than 0.60m, a suspended floor slab would be required (encountered in TR01 and TR02). A suspended floor slab with a clear void and heave precautions will also be required where deepening due to trees is in excess of 1.50m depth. This is subject to confirmation following final foundation designs / approaches.
Enabling / Earthworks	Significant enabling works are not envisaged at this stage, although consideration must be given to the presence of the sewer pipes running beneath the northern part of the site. Specialist advice must be sought in relation to such issues. Specific testing (e.g. waste acceptance criteria testing) may be required at the discretion of the Client's designated waste handler if the off-site movement / disposal of soils is undertaken. Where applicable, such requirements must be verified directly with them by the Client. Additionally, where soils are imported there will be the necessity to ensure compliance with all regulatory licensing procedures (i.e. U1, MMP etc) and also to validate the soils prior to importation, subject to the approval of the Local Authority / NHBC.
Foundations	Foundations must not be founded in made ground, buried topsoil or soft natural strata, all of which should be fully penetrated by all new foundations. The ground conditions recorded within our recent investigations included low strength soils and shallow groundwater. Where groundwater is encountered within granular soils and / or pockets of granular soils are encountered within influencing distance of foundations etc., bearing capacities of granular soils will be significantly reduced. In addition, due to the medium volume change potential of the cohesive soils (see Section 9.3) and the presence of trees / hedgerows, foundations will also require deepening within the influencing distance of trees. It is therefore considered likely that traditional shallow foundations (strip or trench fill) will be unsuitable, and an alternative foundation solution (such as piled or vibro-replacement stone column foundations) should be considered with respect to the proposed low rise residential end use. A specialist piling contractor should be consulted to advise on the most appropriate and cost effective pile type and required length. Due to the presence of very low strength soils including medium volume change potential soils, piles should be designed to resist potential heave, down-drag and negative skin friction. It should also be noted that deep cable percussion boreholes or similar may be required to aid the design of piles or vibro-replacement stone columns and pile layouts / ground beams will need to be engineer designed and the piling contractor will require a suitable working platform. Should vibro-replacement stone columns be considered then groundwater monitoring is recommended to ensure that the columns are not impacted by groundwater flow. A specialist vibro contractor should confirm the suitability of the ground conditions for vibro replacement columns and advise on column lengths. However, a minimum bearing capacity of 125kN/m² is likely to be achieved.

	A testing regime and objectives of the works will need agreeing with regulatory and warranting bodies prior to works. It should also be noted that a working platform will be required by the vibro contractor.
Building Near Trees	Cohesive soils were recorded at depth across most areas of the site. Although it is not considered likely at this stage, should foundations terminate within cohesive soils (or within an influencing depth), foundation designs may need to be adjusted locally with regard to building near trees and hedgerows in accordance with NHBC Standards (Chapter 4.2). Heave precautions may also need to be considered for ground beams and pile caps if piling is utilised.
Groundwater	Groundwater was encountered from an average depth of 1.59m begl within all window sampler boreholes undertaken across the site during the recent investigation. Wet soils were recorded at depths of between 1.00m begl (in WS01 in the north-eastern part of the site) and 2.10m begl in WS06 (in the south-western part of the site). At this stage, the recorded groundwater is considered likely to be representative of the groundwater rather than perched water. It is considered that the groundwater levels at the subject site may be subject to tidal influence but will also be subject to seasonal variations associated with rainfall and ambient water levels within surface channels / drains etc. Based on the above, dewatering is likely to be required for excavations to greater than 1.00m begl, subject to prevailing weather conditions.
Road Construction	As a standard / generic approach, CBR values of less than 2% can be anticipated in the made ground, CBR values of between 2% and 5% can be anticipated in the natural cohesive soils, and CBR values of between 5% and 10% can be found in granular soils based on general road construction guidance literature subject to <i>in situ</i> testing. To derive site specific CBR values laboratory soaked CBR testing was scheduled to provide a more comprehensive overview of site conditions, which is still outstanding at the time of writing. Results of the additional analysis shall be published under separate cover as an addendum. All road construction proposals should be agreed with the Local Authority prior to finalising designs.
Drainage	At this stage, the granular soils across the site are not considered to be suitable for the use of <i>in situ</i> drainage soakaways due to their variability of depth, cohesive / fines content. Additionally, any shallow groundwater or perched groundwater within the granular soils will limit attenuation. All drainage proposals should be agreed with the Local Authority prior to finalising designs.
Mining	No precautions neccersarry.
Excavations	Variable stability was noted in the exploratory holes completed across the site during the recent ground investigation with casing utilised in all boreholes to prevent collapse. Due to the presence of shallow groundwater and fine granular soils there is also the potential for running sands at depth. In consideration and recognition of the shallow groundwater and the soft / loose soils encountered, all excavations should be assumed to be unstable as a precautionary measure. No man entry into unsupported excavations should therefore be allowed without an appropriate risk assessment by the Client and / or their appointed site contractors. Reference to CIRIA report 97 (1983) should be made to establish a suitable means of support or battering of excavation sides.
Sulphate Classification	The pH values recorded from the soil samples averaged 8.33, indicating that generally near neutral soil conditions prevail within soils at the site. Water soluble sulphate analysis of the soils recovered from the site by Geo-Matters Ltd recorded soils to have concentrations ranging between 0.0091g/l and 0.3700g/l. Indicating that overall DS1 – AC1 conditions are present at the site in accordance with BRE Special Digest 1 'Concrete in Aggressive Ground 2005'. Minimum concrete specification should be in accordance with NHBC Standards, Section 2.1.

Contamination	Chemical analysis results have been compared with current relevant guidance and site-specific screening values which indicates that there are no elevated levels of contaminants present across the site. Following these site works no issues have been identified in relation to the proposed residential with gardens end-use subject to the approval of the Local Authority.
Remediation	Remediation works to protect human health are not considered necessary subject to the approval of the Local Authority / NHBC.
Ground Gas and Radon	Given the absence of plausible ground gas sources it is considered that the installation of ground gas monitoring wells is not required at the site. As our assessment indicates that the ground gas regime at the site is likely to be negligible, and therefore it is considered that the site is likely to correspond with Modified Wilson & Card CS1 (equivalent to a C665 / NHBC Traffic Light classification of GREEN (if the floor slabs are to utilise a clear ventilated sub-floor void of at least 150mm). As a result, special ground gas protection measures will not be required within buildings constructed at the site, subject to regulatory / NHBC approval. In accordance with the Site Specific Environmental Data Report (included in Appendix V) the site is recorded to be within an area where radon protective measures are not necessary for new properties.
Topsoil	Topsoil was encountered during the recent site works which has been chemically proven to be suitable for re-use in all areas. There should not be a requirement to import additional topsoil onto the site for use in private gardens etc., However, it is reiterated that any importation and / or exportation of soils must be undertaken in full compliance with all regulatory licensing procedures (i.e. U1, MMP etc), and validation of the soils prior to importation will be required, subject to the approval of the Local Authority. Where topsoil is discussed it has been described and classified in general accordance with prevailing logging practice (e.g. BS5930 / ISO14688). Additional inspection(s) and analyses will be required should classification of such material be required against standards such as BS3882: 2007 'Specification for Topsoil and Requirements for Use'.
Further Works	At this stage the following further works will be necessary, subject to comments from the Regulatory Authorities: • If piled foundations are considered then deeper drilling (i.e. shell and auger drilling) is likely to be required, subject to confirmation from your structural engineer and / or piling contractor; and • The Client will need to liaise with appropriately licensed waste management contractors to determine requirements for additional analysis etc. should materials be considered for off-site removal / disposal.

The executive summary given above is an overview of the key findings and conclusions of the report. There may be other information contained in the body of the report which puts into context the findings of the executive summary. No reliance should be placed on the executive summary until the whole report has been read in full.

1.0 INTRODUCTION

1.1 Preamble

Geo-Matters Ltd were appointed by Cowbit Homes Ltd (hereafter referred to as 'the Client') to undertake a Phase I & II Geo-Environmental Investigation of the Land off Moulton Chapel Road, Cowbit, Spalding (hereafter referred to as 'the site').

1.2 Report Status

This report provides factual geotechnical and environmental information, alongside associated construction issues and recommendations, in relation to a proposed redevelopment of the site for a residential end use (see Section 1.4 below, and our notes concerning our terms and conditions at the end of this report).

1.3 Previous Reports

The Client has not made Geo-Matters Ltd aware of any previous geotechnical or environmental reports relating to the subject site.

1.4 Proposed Development

This report has been prepared on the understanding that the development proposals for the site comprise a residential end use with private rear gardens.

The proposed end use includes 32 no. residential properties along with a private driveways and associated gardens, public open space and hardstanding. Extracts of the indicative proposed development plan (Surface Planning Ltd, Site Feasibility Plan, December 2017) are presented in the Proposed Site Layout Plan (Drawing 001) in Appendix I.

Should the development proposals alter (e.g. layout, site levels, type or foundation option), then the recommendations in this report may be subject to change. Whilst it may be utilised by others for reference purposes at the Client's discretion, it has not been prepared for any other purposes (e.g. waste classification etc.) and therefore additional works may be required by third parties dependent upon their own requirements / works.

Drawings showing the Proposed Site Layout Plan (Drawing 001), Site Location Plan (Drawing 002), General Site Features Plan (Drawing 003), General Site Photographs (Drawing 004a and 004b) and the Site Investigation Layout Plan (005) are presented within Appendices I, II, III, IV and VII respectively.

2.0 SITE LOCATION AND DESCRIPTION

2.1 Location

The site consists of a 0.98-hectare parcel of land situated on the outskirts of the village of Cowbit, which lies 5.13km south of the centre of Spalding as presented in the Site Location Plan (Drawing 002) in Appendix II. The site is roughly centred at National Grid Reference 526736, 318004.

2.2 Description

The following general observations have been made concerning the site:

2.2.1 Site:

- The site is an irregular but roughly rectangular shaped parcel of land and is approximately 0.98ha in area;
- The site comprises a former agricultural field which had recently undergone a vegetation strip and been ploughed at the time of our investigation;
- No significant topographic gradient was observed across the subject site;
- The site surface was observed to be free of anthropogenic / fly tipped materials during our site investigation;
- The site is accessed via Moulton Chapel Road which runs parallel with the northern boundary of the site;
- The northern boundary of the site is unfenced and is defined by a pavement running parallel with the northern boundary of the site;
- The eastern and southern boundaries of the site are defined by hedgerows which include semi-mature trees and hawthorn; and
- The western boundary of the site is defined by fencing, hedgerows, mature and semi-mature trees associated with adjacent residential properties.

Both a Site Features Plan and a General Photographic Record showing the general aspects of the site are included in Appendix III (Drawing 003) and Appendix IV (Drawings 004a and 004b) respectively.

2.2.2 Surrounding Area:

- The site is set in a mixed agricultural, residential and commercial area on the outskirts of the village of Cowbit;
- Land to the north of the site supports Moulton Chapel Road with residential housing, a plant nursery and farmland beyond this;
- Land to the east of the site supports the A16 (Cowbit Road) and traffic island, with a car wash, plant nursery and farmland beyond this;
- Land to the south of the site supports residential housing, beyond which is open farmland; and
- Land to the west of the site supports residential housing with open farmland beyond this.

3.0 GEO-ENVIRONMENTAL SETTING

3.1 Geology, Hydrogeology and Mining

A review of the following information has been undertaken:

- British Geological Survey 1:50,000 Scale Mapping Sheet 144 Solid & Drift;
- Coal Mining Searches, The Law Society Guidance Notes and Directory 1998 Edition; and
- Site Specific Environmental Data Report (Ref. GEO-M-5233408 dated July 2018).

Table 3.1: Geological Information

Artificial Ground	None recorded beneath the site or within a 250m radius of the site on available mapping.
Drift Deposits	The BGS 1:50,000 mapping reviewed shows the site to be underlain by superficial tidal flat deposits these are generally recorded to comprise soft silty clays with occasional layers of sand, gravel and peat.
Solid Geology	The BGS mapping 1:50,000 mapping reviewed shows the site to be underlain at depth by the Oxford Clay Formation. This is generally recorded to comprise grey silty mudstone with rare limestone nodules.
Discontinuities	No faults or other discontinuities are recorded beneath the site or within close proximity to the site on available geological mapping.
Radon	The site is not in a radon affected area in accordance with the Site Specific Environmental Data Report (Appendix V). Radon protective measures are therefore not required for the subject site.
Ground Workings	There are 3 No. records of historic surface ground workings within a 250m radius of the site, which relate to 2 No. separate pond features. The ponds are recorded 41m south-west and between 70m and 78m north-west of the site. No records of historic underground workings are recorded within a 250m radius of the site. No records of current ground workings are recorded within a 250m radius of the site.
Mining	The site is not recorded to be set within a Coal Authority mining area. The site is not recorded to be set within a brine, gypsum, tin or clay extraction area. No natural cavities are recorded within a 250m radius of the site.

Table 3.1: Geological Information (Continued)

Natural Ground Stability Hazards	The site has been classified as having the following hazard ratings: - Shrinking / Swelling Clay - Low Hazard Rating - Landslide - Very Low Hazard Rating - Ground Dissolution - Negligible Hazard Rating - Compressible Ground - Moderate Hazard Rating - Collapsible Ground - Negligible Hazard Rating - Running Sand - Moderate Hazard Rating
Soil Chemistry	Soil chemistry for the site does not highlight any elevated natural contaminants.
Hydrogeology & Hydrology	Both the superficial and bedrock geology across the site have the designation of 'Unproductive' aquifer. These are recorded as rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow. No records of groundwater or surface water abstractions are recorded within a 250m radius of the site. No potable water abstraction licences are recorded within a 2km radius of the site. The site is not recorded to be set within an Environment Agency Groundwater Source Protection Zone. 31 No. surface water features are identified within a 250m radius of the site. These relate to inland rivers not influenced by normal tidal action recorded between 8m and 218m south of the site and many of these appear to be field drains. The River Welland flows north to south approximately 1.6km west of the site.
Flooding	The central and eastern parts of the site are recorded to be set within an Environment Agency 'Zone 2' floodplain. Accordingly, the highest risk of flooding for these parts of the site is recorded as 'Medium'. The remainder of the site is not recorded to be within an Environment Agency flood risk area. Accordingly, the risk of flooding across the remainder of the site is recorded as 'Very Low'. However, Zone 3 floodplains are recorded within a 250m radius of the site. With the nearest Zone 3 floodplain identified 6m north of the site, therefore these must be taken into account within any future flood risk assessment. No records of flood defenses or flood storage are identified within a 250m radius of the site. The site is recorded to be set within an area identified as being 'Not Prone' to groundwater flooding.

* This table does not present a full summary of the content of the third party environmental database report. Please refer to this for more information (Appendix V).

3.2 Environmental Data Search

The principal considerations of immediate relevance within a 250m radius of the site are given in Table 3.2 (below). For a comprehensive list of environmental data, please refer to the site specific environmental data report presented in Appendix V.

Table 3.2: Environmental Data

Category	Entries and Notes*
Historic Industrial Sites	41 No. entries are recorded within a 250m radius of the site. The closest include 6 No. records of a railway station recorded between 6m west and 8m south-west of the site. Further records relate to nurseries recorded between 28m north and 189m east of the site, railway buildings and sidings recorded between 33m north-west and 157m north-west of the site, a windmill recorded 49m south-west of the site and a tank recorded 73m south-west of the site. 1 No. record of a historical 'Unspecified Tank' is recorded within a 250m radius of the site and is identified 72m south-west of the site. No records of historical energy features are recorded within a 250m radius of the site. No records of historical petrol, fuel sites and / or garages are recorded within a 250m radius of the site. 3 No. records of potentially infilled land are recorded within a 250m radius of the site. These relate to small ponds recorded 41m south-west, and between 70m and 78m north-west of the site.
Railways and Tunnels	Historic railway sidings are recorded between 58m south and 114m north-west of the site. These records relate to an 'abandoned' railway to the west of the site which ran from south-east to north-west.
Environmental Permits, Incidents and Registers	No records of environmental permits, discharge consents, incidents or registers are identified within a 250m radius of the site.
Landfills and other Waste Sites	No records of historic or operational landfills are recorded within a 1km radius of the site. No records of other waste sites are recorded within a 1km radius of the site.
Current Land Use	2 No. potentially contaminative current land uses are recorded within a 250m radius of the site. The closest record relates to a packaging business identified 148m north-west of the site, with a further record relating to an electricity substation 205m west of the site. No records of petrol or fuel sites are recorded within a 250m radius of the site.
Unexploded Ordnance	A pre-desk study assessment of the risk from unexploded ordnance was completed (and is included in Appendix V) which concluded that 'No readily available records have been found indicating that the site was bombed' and that further works were not essential at this stage.
Sensitive Land Use	None recorded within a 1000m radius of the site.

* This table does not present a full summary of the content of the third party environmental database report. Please refer to this for more information (Appendix V).

4.0 HISTORY OF LAND USE

A study of historical Ordnance Survey maps has been undertaken to identify any potentially contaminative former land-uses. The main historical features of the site and surrounding area (within a 250m radius) are summarised in Table 4.1 (below) and Table 4.2 (below) and are shown on the historical maps presented in Appendix VI. It should be noted, however, that considerable periods of time may have elapsed between successive Ordnance Survey map editions and it is possible that further land uses have occurred in the intervening years which were not recorded. In these circumstances, whilst we have tried to ascertain the complete record of the site history, the possibility that other significant land uses may have taken place cannot be discounted.

Table 4.1 Principal Historical On-Site Features

OS Map Date Range(s)~	Principal On-Site Features
1887 - 1995	The site comprises part of a field. A field drain is recorded to run from east to west parallel with the northern boundary of the site. From 1968 the land is referenced as Cowbit Fen.
1995 - 2014	The drain recorded running from east to west parallel with the northern boundary of the site is no longer identified.

Historical map incomplete

Table 4.2 Principal Historical Off-Site Features

OS Map Date Range(s)~	Principal Off-Site Features	Direction
1887 - 1950	Drains. Fields. Farm. Houses. Ponds Wells. Windmill. Railway Hotel. Railway Station. Railway Line.	All Directions All Directions N E & W E & W SW & NW SW W W W
1950 - 1968	Houses. Commercial buildings.	All Directions N
1968 - 1988	Change in layout and increase in the number of commercial buildings which are identified as belonging to 'Croft House Nurseries'. Nursery. The Railway Station is identified as being 'disused'. The Hotel is now identified as 'Railway House'. Wells no longer identified.	N E W W E & W
1988* - 2014	The railway line is no longer identified. Ponds no longer identified and appear to have been constructed over.	W SW & NW

Historical map incomplete

5.0 PHASE I GEOTECHNICAL ASSESSMENT

5.1 Anticipated Ground Conditions

Soils – Made Ground / Topsoil

On the basis of the available information, cultivated topsoil is anticipated across the majority of the site associated with its historic use as arable farmland.

However, small areas of made ground are considered likely to exist in the northern part of the site, associated with the drain that historically ran from east to west parallel with the northern boundary of the site.

Variable ground conditions (with potentially greater depths of made ground) may be therefore present (e.g. around and beneath the historic drain).

Natural Strata

The superficial geology across the site are recorded as Tidal Flat Deposits, which may be recovered as soils comprising soft silty clay with occasional bands of sand, gravel and peat at shallow depths.

The superficial geology across the site is recorded to be underlain at depth by the Oxford Clay Formation, which is generally recorded to comprise grey silty mudstones with occasional limestone nodules. These strata may have weathered at depth to form weathered mudstone / siltstone (i.e. clay and / or silt) with rare bands of granular soils.

Groundwater

Both the superficial and bedrock geology across the site have the designation of 'Unproductive' aquifer in accordance with the Environmental Data Report.

However, due to the presence of Tidal Flat Deposits beneath the site groundwater / perched groundwater may be encountered at shallow depth during intrusive works, subject to confirmation of ground and prevailing weather conditions.

Stability Issues (e.g. Mining / Slopes)

The site has been classified as having:

Table 5.1: Ground Hazard Classifications

Hazard	Maximum Designated Rating
Shrinking / Swelling Clay	Low Hazard Rating
Landslide	Very Low Hazard Rating
Ground Dissolution	Negligible Hazard Rating
Compressible Ground	Moderate Hazard Rating
Collapsible Ground	Negligible Hazard Rating
Running Sand	Moderate Hazard Rating

No coal or other mining issues have been identified at this stage in accordance with the enclosed Environmental Data Report.

Deposits of moderate hazard compressibility and moderate hazard running sands are recorded beneath the site. Therefore, the potential presence of compressible ground / running sands will need to be investigated during an intrusive investigation. Additionally, there may be a requirement for structural / foundation design which takes into account the presence of compressible deposits / and running sands at shallow depth.

Ground Gas and Radon

The Environmental Data Report (Appendix V) has identified small ponds (recorded 41m south-west and between 70m and 78m north-west of the site), and a former onsite drain (no longer present) running from east to west parallel with the northern boundary of the site. However, it is considered by Geo-Matters Ltd that these features are unlikely to present significant ground gas risks to the site as the ponds have since been built over with housing (from the mid 1990's) and therefore are unlikely to have been backfilled with any putrescible and / or landfill materials which would produce any significant generation of ground gas. Therefore, the risks associated with these features are considered to be low.

In addition, no fuel sites or records of artificial ground are recorded within a 500m radius of the site.

Subject to confirmation of backfill materials in the former ditch, it is considered by Geo-Matters Ltd that ground gas monitoring may not be required at the.

The property is **not** in a radon affected area, in accordance with Site Specific Environmental Data Report (Appendix V). Radon protective measures are therefore **not** necessary for new properties, subject to Local Authority approval.

Contamination and Performance of Building Materials

Following a review of available records, some potentially contaminative former land uses have been identified within an influencing distance of the site. These relate to the plant nurseries to the north and east and the former railway / railway station / sidings to the west of the site. The sites use as arable farmland and the historical on-site drain are not considered to be significant in terms of a 'potentially contaminative land use'.

Issues relating to these potentially contaminative land uses within redevelopment / construction areas are therefore subject to laboratory testing, final layout proposals and regulatory discussions.

6.0 PHASE I ENVIRONMENTAL ASSESSMENT

6.1 Phase I Conceptual Model

The following is based on the desk study information listed above and the site assessment undertaken by Geo-Matters Ltd.

6.1.1 Site Summary:

A review of all available desk study information indicates that the site has supported farmland from earliest available mapping (dated 1887). A drain is recorded running from east to west parallel with the northern site on historic mapping up until the mid 1990s.

The wider area is recorded to be similarly agricultural, although areas to the north, south and west of the site have experienced minor residential, and minor commercial development dating from the early 1950s. Additionally, from earliest available mapping a train station and associated railway line are recorded to the west of the site (the railway runs from north-west to south-east), however, this was recorded to have been dismantled in the late 1980s.

Limited areas of made ground are considered likely to exist in the northern part of the site associated with the historic drain (now potentially infilled), additionally the site is recorded to be underlain by Tidal Flat Deposits which due to their moderate hazard rating for compressibility and running sands will require assessment as part of future intrusive ground investigation works.

No significant on site or off-site sources of ground gas have been identified at this stage, although there is potential for organic rich or anthropogenic materials to be encountered in the former drainage ditch, therefore subject to intrusive investigation ground gas monitoring is not considered to be warranted at this stage.

No other significant potentially contaminative land uses have been recorded on site or within an influencing distance.

6.1.2 S-P-R Characterisation:

The statutory guidance describes contaminated land in terms of 'significant pollutants' and 'pollutant linkages', using SOURCE-PATHWAY-RECEPTOR' scenarios for the site. For a pollutant linkage to exist all three of these elements must be present. These have been clearly defined in the guidance as follows (see overleaf):

.....potential source as 'a contaminant which is in, or under the land and which has the potential to cause significant harm or to cause pollution of controlled waters'.

.....potential pathway as 'one or more routes or means by, or through, which a receptor is being exposed to, or affected by a contaminant, or could be so exposed or affected'.

.....potential receptor as 'a living organism, a group of living organisms, an ecological system or a piece of property which is being or could be, harmed by a contaminant or controlled waters which are being, or could be, polluted by a contaminant'.

Examination of the desk study information has identified the following:

Potential Sources:

The review of the available desk study information has revealed the following potential sources of contamination identified resulting from former and / or existing land uses that must be considered in a SOURCE-PATHWAY-RECEPTOR scenario.

Table 6.1 Potential Sources of Contamination

Potential Onsite Sources	Associated Potential Contaminants ^{a,b}	
	<i>Metals and Inorganics</i>	<i>Organics and Others</i>
Farmland	General Suite	Pesticides
Former Drain	General Suite	TPH & Asbestos
Potential Offsite Sources		
Train Station / Railway Line	-	TPH, PAHs

^a Professional experience alongside DoE Industry Profiles and CLR8 (withdrawn but used for reference);

^b Subject to Local Authority comments / planning conditions.

Acronyms – PAHs = Polycyclic Aromatic Hydrocarbons, TPH = Total Petroleum Hydrocarbons.

Potential Pathways:

- Direct ingestion of soil and dust;
- Dermal contact with soil and dust;
- Inhalation of vapour and dust;
- Made ground (if identified); and
- Migration on / within groundwater or saturated soils.

Potential Receptors:

- Ground workers employed in the redevelopment of the site;
- Future end users of the site (including properties);
- Vegetation (gardens and landscaping);
- Controlled waters; and
- Neighbouring land users.

6.1.3 Potential Pollutant Linkages:

A potential pollutant linkage is defined as ‘the relationship between a contaminant, a pathway and a receptor’ where the pollutant is the contaminant in the pollutant linkage. For land to be identified as contaminated under the current UK guidance all three elements of the pollutant linkage must be present. In many cases there may be more than one pollutant linkage on any given site.

A review of the desk study information, the features noted in the site visit and the potential sources, pathways and receptors listed above has led to the following potential significant pollutant linkages (SPL) being considered (Table 6.2 overleaf).

Table 6.2 Potential Pollutant Linkages

Potential Source	Pathway	Receptors					SPL*
		Controlled Waters	Ground workers	End-users	Flora	Building materials	
Metal / metalloids and inorganics in SOIL	Direct Ingestion		✓	✓			✓
	Dermal Contact		✓	✓			✓
	Inhalation		✓	✓			✓
	Leaching/direct movement				✓	✓	✓
Asbestos containing materials in SOIL	Inhalation		✓	✓			✓
Organics in SOIL (hydrocarbons, PAH etc.)	Direct Ingestion		✓	✓			✓
	Dermal Contact		✓	✓			✓
	Inhalation		✓	✓			✓
	Leaching/direct movement				✓	✓	✓
Metal / metalloids and inorganics In CONTROLLED WATERS	Direct Ingestion	✓	✓	✓	✓		✓
	Dermal Contact	✓	✓	✓	✓		✓
	Inhalation						
	Leaching/direct movement	✓	✓	✓	✓		✓
Organics in CONTROLLED WATERS (hydrocarbons, PAH etc.)	Direct Ingestion	✓	✓	✓	✓		✓
	Dermal Contact	✓	✓	✓	✓		✓
	Inhalation						
	Leaching/direct movement	✓	✓	✓	✓		✓
GROUND GAS (Carbon Dioxide and Methane)	Direct Ingestion						
	Dermal Contact						
	Inhalation			✓	✓		✓
	Leaching/direct movement			✓	✓	✓	

* Potential SPL identified pending Local Authority comments and confirmation of ground conditions.

6.1.4 Model Status and Uncertainty

The potential significant linkages listed above are based on available data reviewed to date. Therefore, the linkages identified are tentative in nature and are subject to the following uncertainties:

- Presence and nature of any made ground and the underlying strata;
- Presence and depth of any groundwater at shallow depth; and
- Actual presence of contaminants or ground gas sources in soils and / or water.

7.0 RATIONALE FOR PHASE II INVESTIGATION

7.1 Scope of Environmental Ground Investigation

The Phase II Environmental Investigation will comprise the recovery of soil samples from all exploratory holes positioned to provide optimum coverage across accessible areas of the site as outlined on the Site Investigation Plan presented in Appendix VII (Drawing 005) and identified in Table 7.1 below in general accordance with BS5930:2015. Samples will be selected for analysis on the basis of their onsite visual descriptions with particular attention given to samples displaying any olfactory evidence of contamination. All samples will be taken in snap top plastic containers and 250ml amber glass jars or vials. All samples will be placed in cooled containers and transported to Geo-Matters Ltd.'s storage facility before awaiting transfer to a UKAS / MCERTS accredited laboratory.

Table 7.1: Exploratory Hole Layout Rationale

Potential Source / Issue	Exploratory Holes
General Site Coverage	All Holes
Former Drain	TR01 & TR02
Location of Sewer ¹	TR01 & TR02

1 – Detected during initial ground investigation works (as explained later within this report).

The samples taken during the intrusive investigation will be analysed for a range of contaminants in accordance with NHBC Standards Chapter 4.1 'Land Quality – managing ground conditions' and CLR 8 'Potential Contaminants for the Assessment of Land' (withdrawn but used for reference purposes where applicable). The soil samples will be analysed for the following parameters: arsenic, cadmium, chromium, copper, nickel, zinc, lead, mercury, selenium, chromium, sulphate, and phenols, with selected samples also analysed for asbestos, pesticides and total petroleum hydrocarbons (TPH). If samples are observed to display visual or olfactory evidence of contamination (e.g. evidence of hydrocarbon staining) they shall be scheduled for appropriate additional analysis including TPH (screen or CWG).

7.2 Scope of Geotechnical Investigation

The geotechnical investigation will comprise the advancement of exploratory locations across accessible areas of the site to determine the geo-morphological characteristics of the site. The visual description of the soils will be used as the basis of determining the basic engineering properties of the soils encountered and all soils logging will be in accordance to BS5930:2015 where applicable.

The site is recorded to be underlain by Tidal Flat Deposits which due to their moderate hazard rating for compressibility and running sands will be investigated as part of the intrusive ground investigation works.

During site works, samples will be collected; where necessary; to allow for classification testing and chemical analysis to be undertaken to determine the potential effects of soil upon the performance of building materials.

Equivalent *in situ* SPT's will be taken within all window sampler boreholes to allow strength profiling of the underlying strata to be determined.

8.0 SITE WORKS

All fieldwork and soil descriptions were carried out in general accordance with BS EN 14688 'Geotechnical Investigation and Testing – Identification and Classification of Soil' and / or BS5930:2015. Each of the exploratory locations was positioned on site by Geo-Matters Ltd. The locations of these exploratory holes are shown on the Site Investigation Plan presented in Appendix VII (Drawing 005).

Prior to any excavation, the locations were checked for the presence of underground services with specialist utility detection tools, and with reference to service plans where supplied.

All exploratory locations were backfilled with the arisings once representative samples had been obtained.

8.1 Scope of Investigation

A summary of the ground investigation undertaken by Geo-Matters Ltd is outlined in the table below:

Table 8.1: Method of Investigation

Method of Investigation	No.	Max Depth (m)	Sampling Regime
Window Sampling	7	5.00	1 & 2
Hand Dug Trial Pit	1	1.00	1 & 2
CBR Trial Pits	4	0.80	2
Trenching	2	1.30	-

¹ – 500ml plastic tubs, 250ml amber jars and 40ml glass vials.

² – Bulk bags.

The investigation was carried out under the supervision of an Engineer from Geo-Matters Ltd.

Disturbed samples were collected from each discrete horizon within the exploratory holes (where possible) to provide soils for laboratory testing.

Exploratory Hole Logs are presented in Appendix VIII.

8.2 Limitations to the Investigation

The majority of the site was fully accessible during our recent intrusive investigation works. However, a sewer has been recorded to run from east to west across the northern part of the site therefore as requested by the Client trenching was undertaken to confirm the position of this feature.

Trenches were completed to locate the sewer, and it was subsequently identified at two locations which were in the eastern part of the site at 1.40m begl (below existing ground level) (TR02), and in the western part of the site at 1.20m begl (TR01). The sewer comprised 4 No. 150mm (approx.) plastic pipes running parallel with each other, set within a coarse gravel backfill which was not accompanied by any marker tape.

The trenching confirmed that the sewer runs from east to west across the northern part of the site. A temporary easement was therefore imposed upon all works within the immediate vicinity of this feature (where encountered and subsequently recorded) as a precautionary measure, and exploratory holes which were proposed in the vicinity of these were re-positioned to alternative locations nearby.

No other significant limitations were encountered across the development areas of the site.

9.0 PHASE II GEOTECHNICAL ASSESSMENT

9.1 Ground Conditions

The geotechnical element of the works was undertaken concurrently with the environmental investigation. The ground conditions encountered within the exploratory locations are summarised in the table below with the logs presented in Appendix VIII.

Table 9.1: Summary of Ground Conditions at the Site

General Description	Maximum Thickness (m)
MADE GROUND (Comprising vegetation over reworked brown sandy silty clayey topsoil). (TR01 & TR02)	0.60 (average 0.50)
MADE GROUND (Comprising reworked light brown and grey mottled slightly clayey sandy silt). (TR01 & TR02)	0.90+ (average 0.75)
Dark brown slightly silty sandy TOPSOIL. (CBR01, CBR02, CBR03, CBR04, WS01, WS03, WS04, WS05, WS06, WS07, WS08 & HTP01)	0.40 (average 0.34)
Loose light brown and occasionally grey mottled slightly silty fine SAND. (CBR01, CBR02, CBR03, CBR04, WS01, WS03, WS04, WS05, WS06, WS07, WS08 & HTP01)	2.25 (average 1.18)
Very soft to firm light brown and occasionally grey mottled slightly sandy SILT. (WS01, WS03, WS04, WS05, WS06, WS07 & HTP01)	1.90+ (average 1.06)
Very soft to firm dark grey occasionally clayey sandy SILT. (WS01, WS03, WS04, WS05, WS06, WS07 & WS08)	2.50+ (average 2.37)

* Not fully penetrated at all locations

9.1.1 Soils – Made Ground / Topsoil

A localised area of shallow made ground was encountered in TR01 and TR02 only (these positions were trenches completed to find a sewer). The made ground was encountered in the northern end of the trenches and is assumed to be associated with a former drain running from east to west parallel with the northern boundary of the site. The made ground comprised reworked topsoil underlain by reworked light brown and grey mottled slightly clayey sandy silt. The material used to infill the former drain was not observed to contain any organic or putrescible materials and no organic sediment associated with the base of the drain was noted.

Topsoil was encountered across the remainder of the site during the recent site works. This was encountered in thicknesses ranging between 0.30m and 0.40m depth with an average thickness of 0.34m.

The made ground and topsoil encountered across the site are not considered to be suitable bearing strata for the proposed development due to the variability of composition and strength associated with such materials.

9.1.2 Soils – Natural Strata

Across the site the natural strata beneath the topsoil or localised made ground were generally recorded to comprise loose light brown and occasionally grey mottled fine sands with variable proportions of silt to depths of between 1.00m below existing ground level (begl) (in HTP01 and WS03) and 2.60m begl (in WS08) and were encountered to an average depth of 1.53m begl. These were further underlain by very soft to firm light brown and occasionally grey mottled silts with variable proportions of sand.

Where fully penetrated, the light brown and grey mottled sands and silts were further underlain by very soft to firm dark grey silts (with variable proportions of clay and sand), from depths of between 2.50m begl (in WS01, WS05 and WS06) and 2.90m begl (in WS03), and from an average depth of 2.63m begl.

These strata are considered representative of the underlying superficial Tidal Flat Deposits.

9.1.3 Groundwater and Excavations

Groundwater was encountered from an average depth of 1.59m begl within all of the window sampler boreholes undertaken across the site during the recent investigation (groundwater was not encountered during the trial pitting due to these being terminated at shallow depth). The groundwater was recorded in wet soils at depths of between 1.00m begl (in WS01 in the north-eastern part of the site) and 2.10m begl in WS06 (in the south-western part of the site). The groundwater was generally encountered at shallower depths in the central and eastern parts of the site (between 1.00m begl in WS01 and 1.50m begl in WS04 and WS08), and from depths of between 1.80m begl and 2.10m begl across the remainder of the site and is considered to be groundwater rather than perched water at this stage.

It is considered likely that the groundwater levels at the subject site may be subject to seasonal variations associated with rainfall and ambient water levels within surface channels / drains etc.

Based on the above, dewatering is likely to be required for excavations to greater than 1.00m begl, subject to prevailing weather conditions.

9.1.4 Stability Issues (e.g. Mining / Slopes)

Table 9.2: Ground Hazard Classifications

Hazard	Maximum Designated Rating
Shrinking / Swelling Clay	Low Hazard Rating
Landslide	Very Low Hazard Rating
Ground Dissolution	Negligible Hazard Rating
Compressible Ground	Moderate Hazard Rating
Collapsible Ground	Negligible Hazard Rating
Running Sands	Moderate Hazard Rating

No coal or other mining issues have been identified at this stage in accordance with the enclosed Environmental Data Report.

Deposits of moderate hazard compressibility and moderate hazard running sands are recorded beneath the site. However, no evidence was noted during our recent site investigation, due to the soils at depth being predominantly cohesive.

Evidence of instability was encountered during the site investigation, with loose / soft soils and groundwater encountered and casing used in all boreholes to prevent collapse. Such issues must therefore need to be taken into account prior to any future redevelopment of the site (i.e. for construction and design considerations).

9.2 Contamination and Performance of Building Materials

9.2.1 Sulphates

The pH values recorded from the soil samples averaged 8.33, indicating that generally near neutral soil conditions prevail within soils at the site.

Water soluble sulphate analysis of the soils recovered from the site by Geo-Matters Ltd recorded soils to have concentrations ranging between 0.0091g/l and 0.3700g/l. Indicating that overall **DS1 – AC1** conditions are present at the site in accordance with BRE Special Digest 1 'Concrete in Aggressive Ground 2005'. Minimum concrete specification should be in accordance with NHBC Standards, Section 2.1.

9.3 Geotechnical Testing

The geotechnical laboratory testing was carried out in accordance with BS EN 14688 'Geotechnical Investigation and Testing – Identification and Classification of Soil'. Full details of the test results are presented in Appendix IX.

Supplementary laboratory soaked CBR (California bearing ratio) testing was then scheduled to provide a more comprehensive overview of site conditions, which is still outstanding at the time of writing. Results of the additional analysis shall be published under separate cover as an *addendum*.

1 No. representative soil sample (1 No. sample of dark grey slightly sandy silt) was tested for Particle Size Distribution with the results broadly corresponding with the engineer's logs with results shown in Table 9.3

Additional samples were analysed for Moisture Contents, and 4 No. sample were tested for Plasticity Index the results are also presented in Table 9.3:

Table 9.3: Particle Size Distribution and Plasticity Index Results

Determinand	No. of Samples	Range	Remark
Moisture Content	14	1.30% - 32.00%	-
Very Coarse (>63.00mm)	1	0.00%	-
Gravel (2.00 – 63.00mm)	1	0.50%	-
Sand (0.063 – 2.000mm)	1	31.40%	-
Fines <0.063mm	1	68.10%	-
% passing 425µm test sieve	4	99.00% - 100.00%	-
Plasticity Index (unmodified)	3	Non-Plastic – 22.00%	Medium Plasticity
Modified Plasticity Index	3	Non-Plastic - 22.00%	Medium Plasticity

From the results outlined in Table 9.3, on-site cohesive soils have been calculated to have modified plasticity indices ranging between 16.00% and 22.00% indicating cohesive soils to have an overall **MEDIUM** volume change potential as a maximum classification, which should be used when calculating foundation depths across the site in accordance with the relevant standards (e.g. NHBC Standards, Chapter 4.2).

Equivalent *in situ* standard penetration tests (SPTs) were undertaken at suitable depths within the natural strata in the window sampler exploratory holes advanced across the site, with SPT values generally not increasing with depth and generally recorded to be higher in the natural granular soils whilst generally lower in wet soils

wet cohesive and granular soils, with the lowest SPTs recorded in the dark grey silts. No SPTs were undertaken in the made ground (due to it not being encountered within the boreholes).

SPT 'N' values of 0 to 10 were recorded overall across the site and the SPT results are summarised in Table 9.4.

Table 9.4: Summary of *In Situ* SPT Results

Strata	Range Reported
Light brown and grey mottled SAND	4.0 – 10.0
Light brown and grey mottled SILT	0.0 – 9.0
Dark grey sandy SILT	0.0 – 6.0

9.4 Geotechnical Hazards for the Proposed Development

It is understood that the proposed development at the site is to comprise residential housing with private gardens, an area of public open space and associated infrastructure.

Table 9.5 summarises the main geotechnical hazards identified during intrusive works associated with the proposed development.

Table 9.5: Summary of Geotechnical Hazards

Hazard	Comment
Granular Soils & Groundwater	Granular soils have been encountered across the site. Where these soils are present and where groundwater / perched water is also present, alternative foundation strategies should be considered should they terminate within these soils (or within an influencing depth). Groundwater will reduce the bearing capacity of the granular soils, where encountered.
Soft / Loose Soils	Loose / soft soils have been encountered across the site which will need to be taken into account as part of any redevelopment of the site. Running sands were not encountered during the recent investigation however they may be encountered at depths greater than 5.00m.
Former Drainage Ditch	A former drainage ditch is recorded running from east to west parallel with the northern boundary of the site. Therefore, foundations will need to be deepened to bear on the undisturbed natural strata where the former drainage ditch is identified. This may not be a factor should alternative (e.g. piled) foundations be considered, which is considered most likely at this stage.
Variable Ground Conditions	Should foundations straddle variable soil types (i.e. cohesive / granular) then suitable mesh reinforcement should be provided within foundations to prevent the potential for differential settlement.

Table 9.5: Summary of Geotechnical Hazards (Continued)

Cohesive Soils	Test data indicates that cohesive soils at the site have a maximum medium volume change potential. Foundation depths will therefore need to be deepened (where cohesive soils are encountered within the influence of foundations), with additional deepening likely to be required where they are constructed within an influencing distance of trees. This may not be a factor should alternative (e.g. piled) foundations be considered, which is considered likely at this stage.
Services / Obstructions	Services / utilities are known to cross the site including the four PVC pipes associated with a foul sewer in the northern portion of the site. Foundations / plot layouts may need to compensate for / avoid these features appropriately, or alternatively diversions etc. may be required.
Road Construction on Low Strength Soils	Low <i>in situ</i> CBR values are considered likely (subject to specific testing) due to the low strength of the soils across the site therefore <i>in situ</i> CBR tests should be considered to confirm specific conditions in the areas of proposed road construction. All road construction proposals should be agreed with the Local Authority prior to finalising designs.

Foundations must not be founded in made ground, buried topsoil or soft natural strata, all of which should be fully penetrated by all new foundations.

The ground conditions recorded within our recent investigations included low strength soils and shallow groundwater. Where groundwater is encountered within granular soils and / or pockets of granular soils are encountered within influencing distance of foundations etc., bearing capacities of granular soils will be significantly reduced.

In addition, due to the medium volume change potential of the cohesive soils (see Section 9.3) and the presence of trees / hedgerows, foundations will also require deepening within the influencing distance of trees.

It is therefore considered likely that traditional shallow foundations (strip or trench fill) will be unsuitable, and an alternative foundation solution (such as piled or vibro-replacement stone column foundations) should be considered with respect to the proposed low rise residential end use.

A specialist piling contractor should be consulted to advise on the most appropriate and cost effective pile type and required length. Due to the presence of very low strength soils including medium volume change potential soils, piles should be designed to resist potential heave, down-drag and negative skin friction.

It should also be noted that deep cable percussion boreholes or similar may be required to aid the design of piles or vibro-replacement stone columns and pile

layouts / ground beams will need to be engineer designed and the piling contractor will require a suitable working platform.

Should vibro-replacement stone columns be considered then groundwater monitoring is recommended to ensure that the columns are not impacted by groundwater flow. A specialist vibro contractor should confirm the suitability of the ground conditions for vibro replacement columns and advise on column lengths. However, a minimum bearing capacity of 125kN/m² is likely to be achieved.

A testing regime and objectives of the works will need agreeing with regulatory and warranting bodies prior to works. It should also be noted that a working platform will be required by the vibro contractor.

10.0 ANALYSIS, RESULTS AND INTERPRETATION

10.1 Chemical Analyses of Soils

In December 2014 DEFRA released a set of 'Category 4 Screening Levels' (C4SLs) for a select number of determinands. These are screening values which were intended to indicate a level at which land may be considered as 'suitable for use' and 'definitely not contaminated'. Third parties (e.g. LQM, CIEH etc.) have used DEFRA's general risk assessment approach and methodology to calculate further screening values for additional determinands which are common to brownfield / redevelopment sites across the UK. However, these third party values have been derived based upon health criteria values (HCVs) which represent a lower (minimal) risk level and are therefore more conservative. In order to allow a thorough assessment of risks to human health based on the proposed end use, a tiered assessment has been undertaken which uses the more conservative of these authoritative values as an initial screening exercise.

A combined set of Tier 1 Screening Values (T1SVs) shall therefore be used in consideration of potential risks to future end-users at the subject site with reference to the proposed residential end-use **with** private gardens.

Due to ongoing revisions to the contaminated land assessment framework (including the derivation and release of authoritative screening values), the following assessment (and related conclusions / recommendations) may be revised by Geo-Matters Ltd should replacement screening values etc. be released in the near future.

10.1.1 Testing

Representative soil samples from the exploratory locations were analysed for the range of contaminants outlined in Section 2.1. Representative samples of the near surface and underlying natural strata were analysed. The environmental analysis was scheduled by Geo-Matters Ltd and carried out by a UKAS / MCERTS accredited laboratory.

The full details of the chemical test results are presented in Appendix IX and are summarised in Table 10.1 overleaf.

Table 10.1: Laboratory Analysis of Soil Samples

Determinand	no. of Samples Analysed	Concentration Range (mg/kg)	Tier 1 Screening Values (mg/kg)	no. Exceeding Threshold
Metals				
Arsenic	8	3.7 - 12.0	37.0 ^b	0
Cadmium	8	<0.2*	11.0 ^b	0
Chromium (Total)	8	13.0 - 21.0	910.0 ^b	0
Chromium VI	8	<4.0*	6.0 ^b	0
Lead	8	5.6 - 42.0	200.0 ^a	0
Selenium	8	<1.0*	250.0 ^b	0
Nickel	8	10.0 - 17.0	130.0 ^b	0
Copper	8	5.9 - 28.0	2400.0 ^b	0
Zinc	8	29.0 - 73.0	3700.0 ^b	0
Mercury	8	<0.3*	40.0 ^b	0
Organics and Inorganics				
Benzo(a)pyrene	8	<0.05* - 0.40	2.2 ^b	0
TPH C ₆ -C ₁₀	2	<0.1*	27.0 ^b	0
TPH C ₁₀ -C ₂₅	2	<10.0* - 18.0	74.0 ^b	0
TPH C ₂₅ -C ₄₄	2	<10.0* - 12.0	1100.0 ^b	0
Phenols	8	<1.0*	280.0 ^b	0
pH	10	8.0 - 8.7	N/A	-
Water Sol. Sulphate (g/l)	10	0.0091 - 0.3700	N/A	-
Pesticides	1	Absent*	Varies	0
Asbestos	2	ND	D ^c	0

^a DEFRA C4SL values for a residential end use with gardens / plant uptake;

^b LQM 'S4UL' values (at 1% SOM for organics) for a residential end use with gardens / plant uptake (Copyright Land Quality Management Ltd reproduced with permission; Publication Number S4UL3676 All Rights Reserved);

^c Geo-Matters Ltd general screening level;

* Contaminants all recorded below laboratory limits of detection;

N/A = Not Applicable, ND = Not Detected, D = Detected.

Of the 8 No. samples analysed for metals, PAHs and phenols, 4 No. comprised topsoil and 4 No. comprised subsoil. Of the 2 No. samples analysed for TPH both comprised topsoil.

Metals

The results were compared with the referenced Tier 1 Screening Values (T1SVs) which are an initial and conservative set of values which are considered most appropriate (overall) to the proposed residential end use with private gardens.

Zootoxic Metals

None of the samples analysed for zootoxic metals recorded concentrations in excess of their respective Tier 1 Screening Values (T1SVs). On this basis, no risks have been identified from zootoxic metals at the subject site based on the proposed residential end use with private gardens.

Phytotoxic Metals

None of the samples analysed for phytotoxic metals recorded concentrations that were deemed excessive. On this basis, no risks have been identified from these determinands at the subject site.

However, it is recommended that your preferred landscaping contractor is consulted to verify that ground conditions at the site are suitable for the proposed / likely planting requirements.

Inorganics and Organics

In lieu of published DEFRA Category 4 Screening Levels for inorganics and organics, the results have been assessed by comparison to available alternative T1SVs including the LQM / CIEH Generic Assessment Criteria (2nd Edition).

Inorganics

The pH values recorded from the soil samples averaged 8.33, indicating that generally near neutral soil conditions prevail within soils at the site.

Organics

The significance of the PAH laboratory results have been assessed using the T1SV for benzo(a)pyrene. This is considered, in terms of toxicity, to present the greatest hazard to human health. The T1SV of 2.2mg/kg was not exceeded in any of the soil samples analysed. On this basis, no risks have been identified from these determinands at the subject site.

Total Petroleum Hydrocarbons (TPH)

2 No. soil samples from the site were analysed for speciated total petroleum hydrocarbons (TPH) including one sample from the western portion of the site closest to the off-site railway source. None of the samples analysed recorded concentrations in excess of their respective Tier 1 Screening Values (T1SVs). On this basis, no risks have been identified from TPH at the subject site based on the proposed residential end use with private gardens.

Asbestos

2 no. representative soil samples of were scheduled for an asbestos screen and identification. No asbestos containing materials were recorded, and on this basis, no risks have been identified from these determinands at the subject site based on the proposed residential end use with private gardens.

Pesticides

1 No. representative soil sample was scheduled for a general suite of pesticides. No pesticides were recorded above the laboratory limits of detection. On this basis, no risks have been identified from these determinands at the subject site based on the proposed residential end use with private gardens.

General Contaminants*Visual, Olfactory and Field Measurements*

No significant visual or olfactory evidence of any potential contamination (such as by petroleum hydrocarbons or asbestos) or invasive weeds were noted within or around any exploratory locations advanced at the site.

Former Drainage Ditch

During the site investigation works, two trenches were extended through the former drainage ditch (TR01 and TR02) to obtain an initial overview of the composition of this feature. Materials comprising soils with the same composition as those found across the site were encountered, with no visual or olfactory evidence of contamination observed. The material used to infill the former drain was also not observed to contain any organic or putrescible materials.

10.2 CLEA Statistical Analysis

In August 2008, the Environment Agency (EA) withdrew the core regulatory guidance documents for the assessment of human health risks from contaminated land (CLR7 to CLR10), including the soil guideline value (SGV) documents. The newly published EA guidance documents (SC050021.TR1, SC050021.SR2 and SC050021.SR3) have been consulted; alongside the CL:AIRE / CIEH guidance note on statistical interpretation of contaminated land data; and the risk assessment for the subject site has been undertaken in broad accordance with these documents.

With reference to the documents listed above, statistical analysis on sample data is not required for determinands where exceedances above the relevant T1SV were not recorded. Based on Table 10.1, no exceedances were recorded for any of the determinands analysed. Therefore, further statistical analysis is not considered necessary at this stage.

10.3 Summary of Chemical Analysis

No significant sources of contamination were identified during the Phase 1 desk study.

The chemical analysis undertaken to date has indicated that soil concentrations in natural soils across the site are below the respective assessment criteria based on a proposed residential end use with private gardens.

10.4 Ground Gas & Radon

Prior to the completion of the intrusive site investigation works, a ground gas risk assessment was undertaken using the information available within the Site Specific Environmental Data Report. It was concluded that the risks from ground gas on the proposed development were low although this was fully examined during the intrusive investigation works. Geo-Matters Ltd have received correspondence from Council to indicating that they would like any areas of infilled or potentially infilled land within the vicinity of the site to be considered as part of the conceptual site model for the site and in view of this ground gas monitoring was not undertaken at the site for the following reasons:

- No putrescible materials such as organic materials (peat / wood / paper etc.) which could present a source of ground gas were encountered during the recent site investigation works;
- The former drain appeared to have been backfilled with reworked natural soils and no organic material was noted within its location;
- Whilst the soils beneath the site are granular, a preferential pathway is not considered likely due to their unconfined nature (therefore any gas would be more likely to disperse elsewhere i.e. through less tortuous routes);
- There are no recorded Environment Agency or Local Authority historic or existing landfill sites within a 1km radius of the site;
- The small historic ponds identified within the desk study were built over with housing in the mid 1990's and therefore it is highly unlikely that they were infilled with putrescible and / or landfill materials. They are also not recorded within the Environmental Data Report to have been used as landfills.

- No fuel sites or records of artificial ground are recorded within a 500m radius of the site.

The above assessment was submitted to the Environmental Protection Officer at South Holland District Council before the site investigation works (email dated 19th July 2018) and again following the investigation (email dated 15th August 2018) which included an update with the investigation findings.

Given the absence of plausible ground gas sources at the site, it is considered by Geo-Matters Ltd that in accordance with BS8485:2015 'Code of Practice for the Design or Protective Measures for Methane and Carbon Dioxide Ground Gases for New Buildings' the site should be classified as follows:

- Modified Wilson & Card Characteristic Situation 1 **CS1** (equivalent to a C665 / NHBC Traffic Light classification of **GREEN** (if the floor slabs are to utilise a clear ventilated sub-floor void of at least 150mm)).

Based upon the categorisation of the proposed development (private residential dwellings, as described in Table 3 of BS8485:2015), a 'Type A' building type has been established. Based upon Table 4 of BS8485:2015, this would require a 'minimum gas protection score' of **0 points**.

Based on the 'minimum gas protection score' of '0 points', no special requirements with regards to incorporation of gas protection measures are considered necessary within new buildings constructed at this site, subject to regulatory / NHBC approval.

The property is **not** in a radon affected area, in accordance with Site Specific Environmental Data Report (Appendix V). Radon protective measures are therefore **not** necessary for new properties, subject to Local Authority approval.

11.0 PHASE II ENVIRONMENTAL ASSESSMENT

11.1 Phase II Conceptual Model

11.1.1 Site Summary

The results of the scheduled chemical analysis were compared with the appropriate T1SVs based on a proposed residential end use with private gardens.

In light of the chemical analysis results the SOURCE-PATHWAY-RECEPTOR characteristics have been re-assessed as outlined in Table 11.1 overleaf.

11.1.2 Source-Pathway-Receptor Characterisation and Risk Assessment

The results of the chemical testing analyses indicate that no chemicals have been recorded at concentrations sufficient to act as a source in a SOURCE-PATHWAY-RECEPTOR scenario.

The potential pathways and receptors have therefore been revised from those listed in Section 6.1.3.

11.1.3 Identified Pollutant Linkages

In view of the above; the pollutant linkages have been reassessed as listed in Table 11.1 overleaf.

Table 11.1: Identified Pollutant Linkages

Potential Source	Pathway	Receptors					SPL*
		Controlled Waters	Ground workers	End-users	Flora	Building materials	
Metal / metalloids and inorganics in SOIL	Direct Ingestion						
	Dermal Contact						
	Inhalation						
	Leaching/direct movement						
Asbestos containing materials in SOIL	Inhalation						
Organics in SOIL (hydrocarbons, PAH etc.)	Direct Ingestion						
	Dermal Contact						
	Inhalation						
	Leaching/direct movement						
Metal / metalloids and inorganics in CONTROLLED WATER	Direct Ingestion						
	Dermal Contact						
	Inhalation						
	Leaching/direct movement						
Organics in CONTROLLED WATER (hydrocarbons, PAH etc.)	Direct Ingestion						
	Dermal Contact						
	Inhalation						
	Leaching/direct movement						
GROUND GAS* (Carbon Dioxide and Methane)	Direct Ingestion						
	Inhalation						
	Leaching/direct movement						

*Subject to Local Authority / NHBC approval.

11.1.4 Model Status, Uncertainty and Justification

The conceptual model is considered to represent the current site conditions based on the information derived from the site investigation.

11.2 Risk Assessment

11.2.1 Qualitative Risk Assessment

The regulatory framework within England which addresses risks from contaminated land is presented within and across several regimes. This includes sections 78 (A) to (YC) in Part IIA of the Environmental Protection Act 1990 (which was retrospectively inserted by Section 57 of the Environment Act 1995), Building Regulations, Environmental Permitting Regulations and the National Planning Policy Framework (NPPF). The contaminated land regime (principally under Part IIA of the EPA (1990)) sets out a risk based approach within which the identification and remediation of contaminated land presenting unacceptable risks to people and the environment is described. Related regimes (such as those listed above) provide additional guidance through frameworks which focus on specific subsequent scenarios (e.g. re-use of land for new uses).

In the context of the planning system (as identified within the NPPF), an emphasis is placed upon remediating and mitigating contaminated land (where appropriate). The NPPF states that (s. 120 pp28):

"To prevent unacceptable risks from pollution and land instability, planning policies and decisions should ensure that new development is appropriate for its location. The effects (including cumulative effects) of pollution on health, the natural environment or general amenity, and the potential sensitivity of the area or proposed development to adverse effects from pollution, should be taken into account. Where a site is affected by contamination or land stability issues, responsibility for securing a safe development rests with the developer and / or landowner."

And additionally:

"Planning policies and decisions should also ensure that:

- the site is suitable for its new use taking account of ground conditions and land instability, including from natural hazards or former activities such as mining, pollution arising from previous uses and any proposals for mitigation including land remediation or impacts on the natural environment arising from that remediation;*
- after remediation, as a minimum, land should not be capable of being determined as contaminated land under Part IIA of the Environmental Protection Act 1990."*

The core legislation (Part IIA) adopts the principle of a 'suitable for use' approach for; the assessment of contaminated land, the derivation of a site-specific risk assessment and subsequent determination of a remedial strategy. Action is only required if unacceptable risks are posed to human health or to the environment, taking into account the current land-use and geo-environmental settings.

The legislation places a responsibility on the Local Authority to determine whether the land under its jurisdiction is contaminated by consideration of whether: -

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

The statutory guidance describes a risk assessment methodology in terms of 'significant pollutants' and 'pollutant linkages', using SOURCE-PATHWAY-RECEPTOR' scenarios for the site.

On the basis of the above and also upon available data, the geo-environmental setting and proposed end-uses, a qualitative Source-Pathway-Receptor risk assessment (Table 11.2) is presented overleaf.

Table 11.2: Qualitative Risk Assessment Summary Table

Source	Pathway	Target (Receptor)	Comments	Risk Level	Action*
Metals / Metalloids in soils and dust	Direct ingestion (active) Inhalation (passive) Dermal contact.	Ground workers, End users	Significant contamination was not encountered	LOW	NO FURTHER ACTION REQUIRED
Metals / Metalloids in soils and dust	Near surface soils	Plants within the proposed landscaped areas and gardens.	Significant contamination was not encountered	LOW	NO FURTHER ACTION REQUIRED
Metal / Metalloids compounds in waters	As above (plus skin contact)	Ground workers, Site users	Significant Contamination was not encountered	LOW	NO FURTHER ACTION REQUIRED
Inorganics in soils and dust	Direct ingestion (active) Inhalation (passive)	Ground workers, End-users and the Property	Significant Contamination was not encountered	LOW	NO FURTHER ACTION REQUIRED
Organic / Pesticide compounds in soils and dust	As above (plus skin contact)	Ground workers, Site Users	Significant contamination was not encountered	LOW	NO FURTHER ACTION REQUIRED
Organic / Pesticide compounds in waters	As above (plus skin contact)	Ground workers, Site Users	Significant Contamination was not encountered	LOW	NO FURTHER ACTION REQUIRED
Ground Gas	Inhalation (Passive), Ingress	End-Users	Significant Ground Gas Sources not Recorded	LOW	NO FURTHER ACTION REQUIRED
Asbestos	Inhalation (passive), Ingress	End Users	No Asbestos was Encountered	LOW	NO FURTHER ACTION REQUIRED

Notes: LOW / MODERATE / HIGH - Risk level is assigned a low / moderate / high qualitative value, based on assessed requirement for action in context of Part II EPA 90.

* Subject to Local Authority Approval.

11.3 Site Status

The Phase II Conceptual Model and the Qualitative Risk Assessment outlined above indicate that soils at the site should be treated as **uncontaminated** in the context of the proposed re-development of the site for a residential land-use with private gardens, subject to regulatory authority approval.

12.0 RECOMMENDATIONS

The conclusions and recommendations presented below are considered reasonable based on the findings of the site investigation. However, these cannot be guaranteed to gain regulatory approval and therefore copies of this report should be sent to the appropriate Regulatory Authorities and / or other organisations (as appropriate) by the Client for their comments and approval prior to undertaking any irrecoverable works associated with the subject site.

- 12.1 Enabling / Earthworks:** Significant enabling works are not envisaged at this stage, although consideration must be given to the presence of the sewer pipes running beneath the northern part of the site. Specialist advice must be sought in relation to such issues.

Specific testing (e.g. waste acceptance criteria testing) may be required at the discretion of the Client's designated waste handler if the off-site movement / disposal of soils is undertaken. Where applicable, such requirements must be verified directly with them by the Client. Additionally, where soils are imported there will be the necessity to ensure compliance with all regulatory licensing procedures (i.e. U1, MMP etc) and also to validate the soils prior to importation, subject to the approval of the Local Authority / NHBC.

- 12.2 Foundations:** Foundations must not be founded in made ground, buried topsoil or soft natural strata, all of which should be fully penetrated by all new foundations.

The ground conditions recorded within our recent investigations included low strength soils and shallow groundwater. Where groundwater is encountered within granular soils and / or pockets of granular soils are encountered within influencing distance of foundations etc., bearing capacities of granular soils will be significantly reduced.

In addition, due to the medium volume change potential of the cohesive soils (see Section 9.3) and the presence of trees / hedgerows, foundations will also require deepening within the influencing distance of trees.

It is therefore considered likely that traditional shallow foundations (strip or trench fill) will be unsuitable, and an alternative foundation solution (such as piled or vibro-replacement stone column foundations) should be considered with respect to the proposed low rise residential end use.

A specialist piling contractor should be consulted to advise on the most appropriate and cost effective pile type and required length. Due to the presence of very low strength soils including medium volume change potential soils, piles should be designed to resist potential heave, down-drag and negative skin friction.

It should also be noted that deep cable percussion boreholes or similar may be required to aid the design of piles or vibro-replacement stone columns and pile layouts / ground beams will need to be engineer designed and the piling contractor will require a suitable working platform.

Should vibro-replacement stone columns be considered then groundwater monitoring is recommended to ensure that the columns are not impacted by groundwater flow. A specialist vibro contractor should confirm the suitability of the ground conditions for vibro replacement columns and advise on column lengths. However, a minimum bearing capacity of 125kN/m² is likely to be achieved.

A testing regime and objectives of the works will need agreeing with regulatory and warranting bodies prior to works. It should also be noted that a working platform will be required by the vibro contractor.

12.3 Floor Slabs: At this stage ground bearing floor slabs should be appropriate for the majority of the site. However, where made ground / unsuitable soils are encountered in thicknesses of greater than 0.60m, a suspended floor slab would be required (encountered in TR01 and TR02). A suspended floor slab with a clear void and heave precautions will also be required where deepening due to trees is in excess of 1.50m depth. This is subject to confirmation following final foundation designs / approaches.

12.4 Road Construction: As a standard / generic approach, CBR values of less than 2% can be anticipated in the made ground, CBR values of between 2% and 5% can be anticipated in the natural cohesive soils, and CBR values of between 5% and 10% can be found in granular soils based on general road construction guidance literature subject to *in situ* testing. To derive site specific CBR values laboratory soaked CBR testing was scheduled to provide a more comprehensive overview of site conditions, which is still outstanding at the time of writing. Results of the additional analysis shall be published under separate cover as an addendum. All road construction proposals should be agreed with the Local Authority prior to finalising designs.

12.5 Groundwater: Groundwater was encountered from an average depth of 1.59m begl within all window sampler boreholes undertaken across the site during the recent investigation. Wet soils were recorded at depths of between 1.00m begl (in WS01 in the north-eastern part of the site) and 2.10m begl in WS06 (in the south-western part of the site). At this stage, the recorded groundwater is considered likely to be representative of the groundwater rather than perched water.

It is considered that the groundwater levels at the subject site may be subject to tidal influence but will also be subject to seasonal variations associated with rainfall and ambient water levels within surface channels / drains etc.

Based on the above, dewatering is likely to be required for excavations to greater than 1.00m begl, subject to prevailing weather conditions.

12.6 Building Near Trees: Cohesive soils were recorded at depth across most areas of the site. Although it is not considered likely at this stage, should foundations terminate within cohesive soils (or within an influencing depth), foundation designs may need to be adjusted locally with regard to building near trees and hedgerows in accordance with NHBC Standards (Chapter 4.2). Heave precautions may also need to be considered for ground beams and pile caps if piling is utilised.

12.7 Drainage: At this stage, the granular soils across the site are **not** considered to be suitable for the use of *in situ* drainage soakaways due to their variability of depth, cohesive/fines content. Additionally, any shallow groundwater or perched groundwater within the granular soils will limit attenuation. All drainage proposals should be agreed with the Local Authority prior to finalising designs.

12.8 Ground Gas and Radon: Given the absence of plausible ground gas sources it is considered that the installation of ground gas monitoring wells is not required at the site. As our assessment indicates that the ground gas regime at the site is likely to be negligible, and therefore it is considered that the site is likely to correspond with Modified Wilson & Card **CS1** (equivalent to a C665 / NHBC Traffic Light classification of **GREEN** (if the floor slabs are to utilise a clear ventilated sub-floor void of at least 150mm)).

As a result, special ground gas protection measures will **not** be required within buildings constructed at the site, subject to regulatory / NHBC approval.

In accordance with the Site Specific Environmental Data Report (included in Appendix V) the site is recorded to be within an area where radon protective measures are **not** necessary for new properties.

12.9 Mining: No precautions necessary.

12.10 Excavations: Variable stability was noted in the exploratory holes completed across the site during the recent ground investigation with casing utilised in all boreholes to prevent collapse. Due to the presence of shallow groundwater and fine granular soils there is also the potential for running sands at depth. In consideration and recognition of the shallow groundwater and the soft / loose soils encountered, all excavations should be assumed to be unstable as a precautionary measure. No man entry into unsupported excavations should therefore be allowed without an appropriate risk assessment by the Client and / or their appointed site contractors. Reference to CIRIA report 97 (1983) should be made to establish a suitable means of support or battering of excavation sides.

12.11 Sulphate Classification: The pH values recorded from the soil samples averaged 8.33, indicating that generally near neutral soil conditions prevail within soils at the site.

Water soluble sulphate analysis of the soils recovered from the site by Geo-Matters Ltd recorded soils to have concentrations ranging between 0.0091g/l and 0.3700g/l. Indicating that overall **DS1 – AC1** conditions are present at the site in accordance with BRE Special Digest 1 'Concrete in Aggressive Ground 2005'. Minimum concrete specification should be in accordance with NHBC Standards, Section 2.1.

12.12 Contamination: Chemical analysis results have been compared with current relevant guidance and site-specific screening values which indicates that there are no elevated levels of contaminants present across the site.

Following these site works no issues have been identified in relation to the proposed residential with gardens end-use subject to the approval of the Local Authority.

12.13 Remediation: Remediation works to protect human health are **not** considered necessary subject to the approval of the Local Authority / NHBC.

12.14 Topsoil: Topsoil was encountered during the recent site works which has been chemically proven to be suitable for re-use in all areas. There should not be a requirement to import additional topsoil onto the site for use in private gardens etc., However, it is reiterated that any importation and / or exportation of soils must be undertaken in full compliance with all regulatory licensing procedures (i.e. U1, MMP etc), and validation of the soils prior to importation will be required, subject to the approval of the Local Authority.

Where topsoil is discussed it has been described and classified in general accordance with prevailing logging practice (e.g. BS5930 / ISO14688). Additional inspection(s) and analyses will be required should classification of such material be required against standards such as BS3882: 2007 'Specification for Topsoil and Requirements for Use'.

12.15 Further Works: At this stage the following further works will be necessary, subject to comments from the Regulatory Authorities:

- If piled foundations are considered then deeper drilling (i.e. shell and auger drilling) is likely to be required, subject to confirmation from your structural engineer and / or piling contractor; and
- The Client will need to liaise with appropriately licensed waste management contractors to determine requirements for additional analysis etc. should materials be considered for off-site removal / disposal.

INFORMATION SOURCES

Geological data	British Geological Survey (BGS) 1:50,000 scale Series, Sheet 144 Solid and Drift Edition. Coal Mining Searches, The Law Society Guidance Notes and Directory 1998 Edition. Site Specific Geological Data Report (Ref. GEO-M-5233409 July 2018).
Environmental	Site Specific Environmental Data Report (Ref. GEO-M- 5233408 July 2018). BRE Report BR211 '<i>Radon: Protective Measures for New Buildings</i>' (2015 Edition). Environment Agency (EA) & DEFRA: "<i>Model Procedures for the Management of Land Contamination – Contaminated Land Report 11</i>" (CLR11) (2004). Department for Environment, Food and Rural Affairs (DEFRA) – "<i>SP1010: Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination – Policy Companion Document</i>" (December 2014). DEFRA and Contaminated Land: Applications in Real Environments (CL:AIRE) "<i>SP1010 – Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination: Final Project Report</i>" (Revision 2 dated 24th September 2014). Chartered Institute of Environmental Health (CIEH): "<i>Professional Practice Note: Reviewing human health risk assessment reports invoking contaminant oral bioavailability measurements or estimates</i>" (2009). CL:AIRE in Association with EIC and AGS: "<i>Soil Generic Assessment Criteria for Human Health Risk Assessment</i>" (updated January 2010 version) (<i>Reference purposes</i>).
Historical	As presented Appendix VI.

Terms and Conditions

This report has been prepared for the sole use and reliance of the Client and their appointed agents (e.g. Geo-Matters Ltd). No other third party may rely upon or reproduce the content of this report without the written approval of Geo-Matters Ltd. If any unauthorised third party comes into possession of this report, they rely upon it entirely at their own risk and the authors do not owe them any warranty, duty of care or skill.

The findings and recommendations made in this report are based on published information (as referenced in Section 3 and at the end of this report). Geo-Matters Ltd cannot accept responsibility for the reliability and authenticity of published information or reports prepared by third parties. There may be conditions prevailing on site which have not been revealed by this assessment and which have not been taken into account by this report. Responsibility cannot be accepted for any conditions not revealed by this assessment.

Should the development proposals alter (e.g. layout, type or foundation option), then the recommendations in this report may be subject to change. Whilst it may be utilised by others for reference purposes at the Client's discretion, it has not been prepared for any other purposes (e.g. waste classification etc.) and therefore additional works may be required by third parties dependent upon their own requirements / works.

The conclusions and recommendations presented herein are considered reasonable based on the assessments of the site undertaken by Geo-Matters Ltd. However, these cannot be guaranteed to gain regulatory approval and therefore copies of this report should be sent to the appropriate regulatory authorities and / or other organisations (as appropriate) by the Client for their comments and approval prior to undertaking any irrecoverable works associated with the site.

Standard Risk Assessment – Considerations and Methodology

Geo-Matters Ltd have based our standard risk assessment methodology upon current legislation and prevailing best practice and available guidance. This includes the DEFRA / EA document 'Contaminated Land Report 11 (CLR11) Model Procedures for the Management of Land Contamination' (2004) and the NHBC / EA / CIEH document 'Guidance for the Safe Development of Housing on Land Affected by Contamination' (2008).

Our risk assessment methodology is based upon a phased approach, which takes the following steps:

1. Hazard Identification and Assessment:

- a. Preliminary risk assessment;
- b. Derivation of initial conceptual site model (CSM); and
- c. Identification of feasible pollutant linkages (which leads onto step '2' if identified).

2. Risk Estimation and Evaluation:

- a. Investigation of the identified potential risks (as highlighted in CSM);
- b. Completion of Generic Quantitative Risk Assessment (GQRA); and
- c. Evaluation of risks / confirmation of pollutant linkages (leading onto step '3' if identified).

3. Remediation Design / Implementation / Verification:

- a. Completion of Detailed Quantitative Risk Assessment (DQRA) if necessary;
- b. Collation of remedial strategy;
- c. Implementation of remedial strategy / validation; and
- d. Final reporting.

Risk terminology and classification is defined through standard wording and descriptions, as contained in the documents referenced above. This includes the balance, comparison and assessment of risk as a dynamic categorisation / classification of probability vs. possible consequence(s), as shown in the table A1 below:

Table A1: Risk Categorisation

Probability (Likelihood)		Consequence			
		Severe	Medium	Mild	Minor
	High Likelihood	Very High Risk	High Risk	Moderate Risk	Moderate / Low Risk
	Likely	High Risk	Moderate Risk	Moderate / Low Risk	Low Risk
	Low Likelihood	Moderate Risk	Moderate / Low Risk	Low Risk	Very Low Risk
	Not likely	Moderate / Low Risk	Low Risk	Very Low Risk	Very Low Risk

Risk levels are described as follows:

Table A1: Risk Level Descriptions

Term	Description
Very High Risk	A high probability exists that severe / significant harm could arise to someone or something from the hazard which has been identified. Remedial action is required.
High Risk	Harm is likely to arise to someone or something from the hazard which has been identified. Remedial action is usually required.
Moderate Risk	Harm could potentially arise to someone or something from the hazard which has been identified without remedial action, although it is considered to be relatively <u>unlikely</u> that such harm would be severe.
Low Risk	Harm could theoretically arise to someone or something from the hazard which has been identified without remedial action, although it is considered that any effects would be mild.
Very Low Risk	Harm is not likely to arise to someone or something from the hazard which has been identified.

The NHBC / EA / CIEH document 'Guidance for the Safe Development of Housing on Land Affected by Contamination' (2008) defines the following (reproduced verbatim):

"Severity (consequence) can be defined as the adverse effects (or harm) arising from a defined hazard, which impairs the quality of human health or the environment in the short or longer term. For example a consequence defined as "Severe" could be defined as "Highly elevated concentrations likely to result in 'significant harm' to human health as defined by the EPA 1990, Part 2A, if exposure occurs". The type and form of the contaminant needs to be known in order to understand the effect on humans and therefore severity of potential harm. For instance different forms of cyanide behave differently. Complex cyanide ("blue billy") is relatively "non toxic" whereas free cyanide is "highly toxic" (Environment Agency 2002b).

Probability can be defined as the chance of a particular event occurring in a given period of time. For example, a "High Likelihood" could be defined as "where an event would appear very likely in the short-term and almost inevitable over the long-term, or there is evidence at the receptor of harm or pollution"

APPENDIX I

Proposed Layout Plan



DO NOT SCALE
NOTES:

 Approx. Site Boundary



www.geo-matters.com
info@geo-matters.com

CLIENT:

Cowbit Homes Ltd

PROJECT:

Land off Moulton Chapel Road,
Cowbit, Spalding

TITLE:

Proposed Site Layout Plan

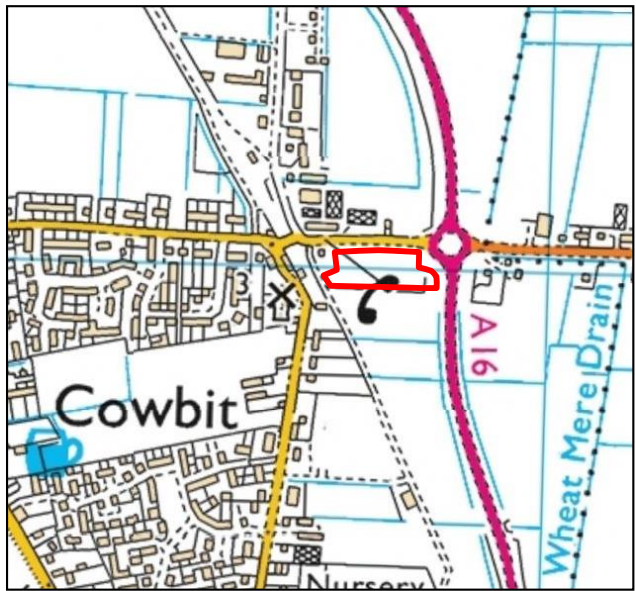
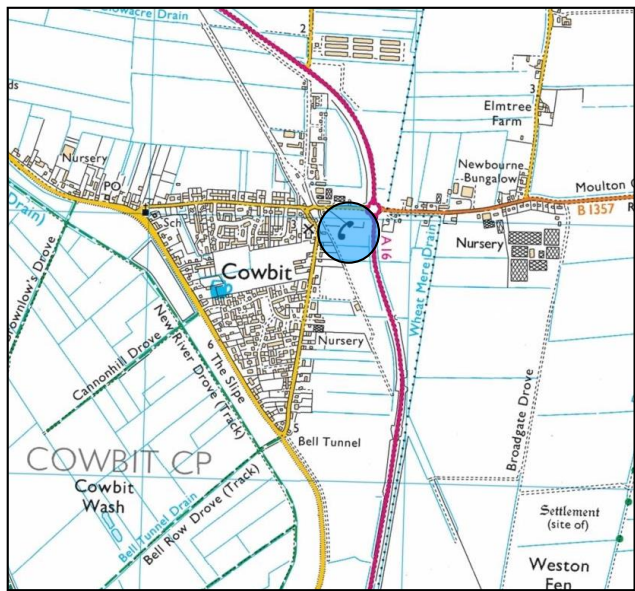
SCALE@SIZE :	ISSUE:
NTS	Final
DESIGN/DRAWN:	DATE:
AT	September 2018
PROJECT No:	DRAWING No:
GML18201	001

The proposed layout plan shown is an extract taken from Drawing CWB-2017-001 Rev. A 'Site Feasibility Plan' dated December 2017 by Surface Planning Ltd.

© Geo-Matters Ltd

APPENDIX II

Site Location Plan



DO NOT SCALE

NOTES:

 Approx. Site Location

 Approx. Site Boundary

GEOMATTERS
consulting engineers



www.geo-matters.com
info@geo-matters.com

CLIENT:

Cowbit Homes Ltd

PROJECT:

Land off Moulton Chapel Road,
Cowbit, Spalding

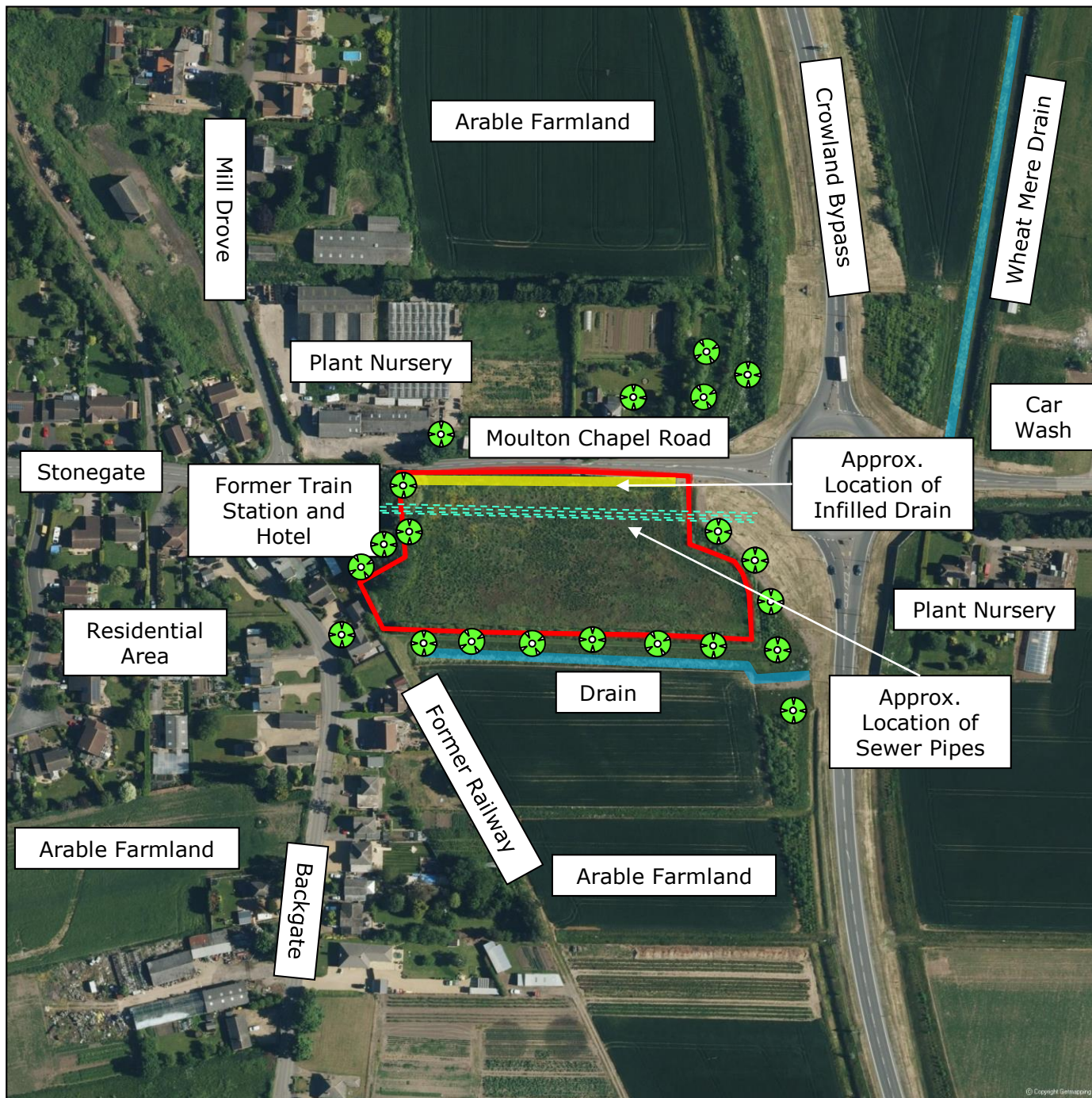
TITLE:

Site Location Plan

SCALE@SIZE :	ISSUE:
NTS	Final
DESIGN/DRAWN:	DATE:
AT	September 2018
PROJECT No:	DRAWING No:
GML18201	002

APPENDIX III

Site Features Plan



DO NOT SCALE
NOTES:



Approx. Site Boundary



Approx. Location of
Trees / Bushes

GEOMATTERS
consulting engineers



www.geo-matters.com
info@geo-matters.com

CLIENT:

Cowbit Homes Ltd

PROJECT:

Land off Moulton Chapel Road,
Cowbit, Spalding

TITLE:

Site Features Plan

SCALE@SIZE :

NTS

ISSUE:

Final

DESIGN/DRAWN:

AT

DATE:

September 2018

PROJECT No:

GML18201

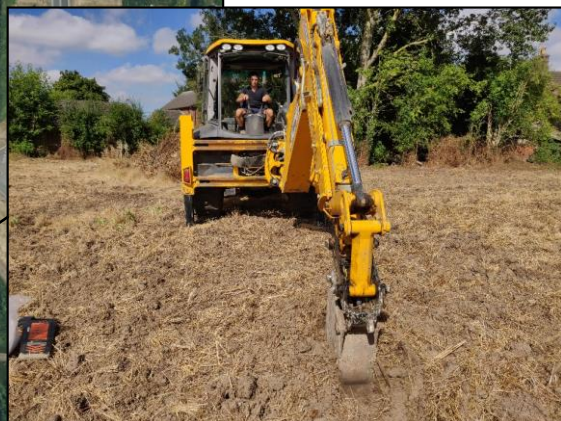
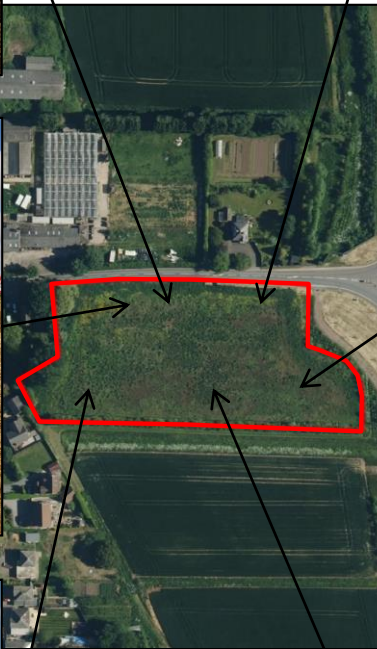
DRAWING No:

003

© Geo-Matters Ltd

APPENDIX IV

General Photographic Record



DO NOT SCALE
NOTES:



Approx. Site Boundary

GEOMATTERS
consulting engineers



www.geo-matters.com
info@geo-matters.com

CLIENT:

Cowbit Homes Ltd

PROJECT:

Land off Moulton Chapel Road,
Cowbit, Spalding

TITLE:

General Photographic Record

SCALE@SIZE :

NTS

ISSUE:

Final

DESIGN/DRAWN:

AT

DATE:

September 2018

PROJECT No:

GML18201

DRAWING No:

004a

© Geo-Matters Ltd



DO NOT SCALE
NOTES:



Approx. Site Boundary

GEOMATTERS
consulting engineers



www.geo-matters.com
info@geo-matters.com

CLIENT:

Cowbit Homes Ltd

PROJECT:

Land off Moulton Chapel Road,
Cowbit, Spalding

TITLE:

General Photographic Record

SCALE@SIZE :

NTS

ISSUE:

Final

DESIGN/DRAWN:

AT

DATE:

September 2018

PROJECT No:

GML18201

DRAWING No:

004b

© Geo-Matters Ltd

APPENDIX V

Environmental Data Report and Pre-Desk Study Unexploded Ordnance Assessment

Geo-Matters Limited

Geo-Matters Ltd, 104 Bondgate,
Castle Donington, DE74 2NR

Groundsure
Reference: GEO-M-5233408

Your Reference: GML18201-AT-001

Report Date 13 Jul 2018

Report Delivery Method: Email - pdf

Enviro Insight

Address: SITE OFF CHAPEL ROAD, COWBIT, SPALDING, PE12 6XA

Dear Sir/ Madam,

Thank you for placing your order with Groundsure. Please find enclosed the **Groundsure Enviro Insight** as requested.

If you need any further assistance, please do not hesitate to contact our helpline on 08444 159000 quoting the above Groundsure reference number.

Yours faithfully,

Geo-Matters Limited

Enc.
Groundsure Enviroinsight

Address: SITE OFF CHAPEL ROAD, COWBIT, SPALDING, PE12 6XA

Date: 13 Jul 2018

Reference: GEO-M-5233408

Client: Geo-Matters Limited

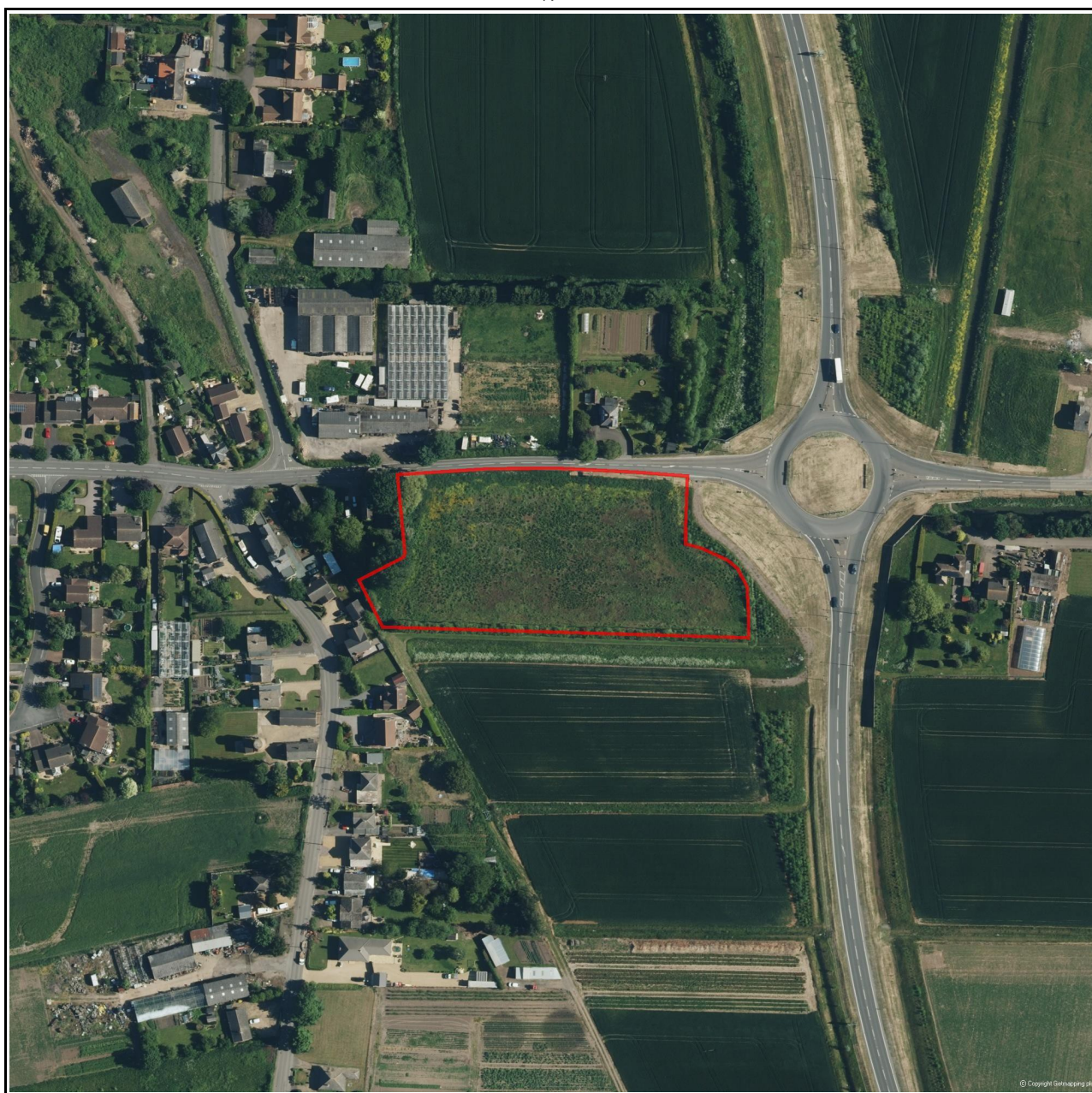
NW

N

NE

W

E



SW

S

SE

Aerial Photograph Capture date: 06-Apr-2015

Grid Reference: 526736,318004

Site Size: 0.98ha

Report Reference: GEO-M-5233408

Client Reference: GML18201-AT-001

Contents Page

Contents Page	3
Overview of Findings	6
Using this report	10
1. Historical Land Use	11
1. Historical Industrial Sites	12
1.1 Potentially Contaminative Uses identified from 1:10,000 scale Mapping	12
1.2 Additional Information – Historical Tank Database	13
1.3 Additional Information – Historical Energy Features Database	13
1.4 Additional Information – Historical Petrol and Fuel Site Database	13
1.5 Additional Information – Historical Garage and Motor Vehicle Repair Database	14
1.6 Potentially Infilled Land	14
2. Environmental Permits, Incidents and Registers Map	15
2. Environmental Permits, Incidents and Registers	16
2.1 Industrial Sites Holding Licences and/or Authorisations	16
2.1.1 Records of historic IPC Authorisations within 500m of the study site	16
2.1.2 Records of Part A(1) and IPPC Authorised Activities within 500m of the study site	16
2.1.3 Records of Red List Discharge Consents (potentially harmful discharges to controlled waters) within 500m of the study site	16
2.1.4 Records of List 1 Dangerous Substances Inventory Sites within 500m of the study site	16
2.1.5 Records of List 2 Dangerous Substance Inventory Sites within 500m of the study site	16
2.1.6 Records of Part A(2) and Part B Activities and Enforcements within 500m of the study site	17
2.1.7 Records of Category 3 or 4 Radioactive Substances Authorisations	17
2.1.8 Records of Licensed Discharge Consents within 500m of the study site	17
2.1.9 Records of Water Industry Referrals (potentially harmful discharges to the public sewer) within 500m of the study site	18
2.1.10 Records of Planning Hazardous Substance Consents and Enforcements within 500m of the study site	19
2.2 Dangerous or Hazardous Sites	19
2.3 Environment Agency/Natural Resources Wales Recorded Pollution Incidents	19
2.3.1 Records of National Incidents Recording System, List 2 within 500m of the study site	19
2.3.2 Records of National Incidents Recording System, List 1 within 500m of the study site	19
2.4 Sites Determined as Contaminated Land under Part 2A EPA 1990	19
3. Landfill and Other Waste Sites Map	20
3. Landfill and Other Waste Sites	21
3.1 Landfill Sites	21
3.1.1 Records from Environment Agency/Natural Resources Wales landfill data within 1000m of the study site	21
3.1.2 Records of Environment Agency/Natural Resources Wales historic landfill sites within 1500m of the study site	21
3.1.3 Records of BGS/DoE non-operational landfill sites within 1500m of the study site	21
3.1.4 Records of Landfills from Local Authority and Historical Mapping Records within 1500m of the study site	21
3.2 Other Waste Sites	21
3.2.1 Records of waste treatment, transfer or disposal sites within 500m of the study site	21
3.2.2 Records of Environment Agency/Natural Resources Wales licensed waste sites within 1500m of the study site	22
4. Current Land Use Map	23
4. Current Land Uses	24
4.1 Current Industrial Data	24
4.2 Petrol and Fuel Sites	24
4.3 National Grid High Voltage Underground Electricity Transmission Cables	24
4.4 National Grid High Pressure Gas Transmission Pipelines	25

5. Geology	26
5.1 Artificial Ground and Made Ground.....	26
5.2 Superficial Ground and Drift Geology	26
5.3 Bedrock and Solid Geology	26
6 Hydrogeology and Hydrology	27
6a. Aquifer Within Superficial Geology	27
6b. Aquifer Within Bedrock Geology and Abstraction Licenses	28
6c. Hydrogeology – Source Protection Zones and Potable Water Abstraction Licenses	29
6d. Hydrogeology – Source Protection Zones within confined aquifer	30
6e. Hydrology – Watercourse Network and River Quality	31
6.Hydrogeology and Hydrology	32
6.1 Aquifer within Superficial Deposits.....	32
6.2 Aquifer within Bedrock Deposits.....	32
6.3 Groundwater Abstraction Licences.....	32
6.4 Surface Water Abstraction Licences.....	33
6.5 Potable Water Abstraction Licences.....	34
6.6 Source Protection Zones.....	34
6.7 Source Protection Zones within Confined Aquifer.....	34
6.8 Groundwater Vulnerability and Soil Leaching Potential.....	35
6.9 River Quality.....	35
6.9.1 Biological Quality:.....	35
6.9.2 Chemical Quality:.....	35
6.10 Ordnance Survey MasterMap Water Network.....	35
6.11 Surface Water Features.....	46
7a. Environment Agency/Natural Resources Wales Flood Map for Planning (from rivers and the sea)	47
7b. Environment Agency/Natural Resources Wales Risk of Flooding from Rivers and the Sea (RoFRaS)	48
Map	48
7 Flooding	49
7.1 River and Coastal Zone 2 Flooding.....	49
7.2 River and Coastal Zone 3 Flooding.....	52
7.3 Risk of Flooding from Rivers and the Sea (RoFRaS) Flood Rating.....	53
7.4 Flood Defences.....	53
7.5 Areas benefiting from Flood Defences.....	53
7.6 Areas benefiting from Flood Storage.....	53
7.7 Groundwater Flooding Susceptibility Areas.....	53
7.8 Groundwater Flooding Confidence Areas.....	54
8. Designated Environmentally Sensitive Sites Map	55
8. Designated Environmentally Sensitive Sites	56
8.1 Records of Sites of Special Scientific Interest (SSSI) within 2000m of the study site:.....	56
8.2 Records of National Nature Reserves (NNR) within 2000m of the study site:.....	56
8.3 Records of Special Areas of Conservation (SAC) within 2000m of the study site:.....	56
8.4 Records of Special Protection Areas (SPA) within 2000m of the study site:.....	56
8.5 Records of Ramsar sites within 2000m of the study site:.....	56
8.6 Records of Ancient Woodland within 2000m of the study site:	57
8.7 Records of Local Nature Reserves (LNR) within 2000m of the study site:.....	57
8.8 Records of World Heritage Sites within 2000m of the study site:.....	57
8.9 Records of Environmentally Sensitive Areas within 2000m of the study site:	57
8.10 Records of Areas of Outstanding Natural Beauty (AONB) within 2000m of the study site:	57
8.11 Records of National Parks (NP) within 2000m of the study site:	57
8.12 Records of Nitrate Sensitive Areas within 2000m of the study site:.....	57
8.13 Records of Nitrate Vulnerable Zones within 2000m of the study site:.....	58

8.14 Records of Green Belt land within 2000m of the study site:.....	58
9. Natural Hazards Findings.....	59
9.1 Detailed BGS GeoSure Data.....	59
9.1.1 Shrink Swell.....	59
9.1.2 Landslides.....	59
9.1.3 Soluble Rocks.....	59
9.1.4 Compressible Ground.....	60
9.1.5 Collapsible Rocks.....	60
9.1.6 Running Sand.....	60
9.2 Radon.....	61
9.2.1 Radon Affected Areas.....	61
9.2.2 Radon Protection.....	61
10. Mining.....	62
10.1 Coal Mining.....	62
10.2 Non-Coal Mining.....	62
10.3 Brine Affected Areas	62
Contact Details.....	63
Standard Terms and Conditions.....	65

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	13	28	6
1.2 Additional Information – Historical Tank Database	0	0	1	0
1.3 Additional Information – Historical Energy Features Database	0	0	0	1
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 Potentially Infilled Land	0	1	2	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	0	12
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	0	2	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	0-500m					
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					
	On-site	0-50m	51-250	251-500	501-1000	1000-2000
6.3 Groundwater Abstraction Licences (within 2000m of the study site)	0	0	0	0	0	0
6.4 Surface Water Abstraction Licences (within 2000m of the study site)	0	0	0	0	2	7
6.5 Potable Water Abstraction Licences (within 2000m of the study site)	0	0	0	0	0	0
6.6 Source Protection Zones (within 500m of the study site)	0	0	0	0	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	0	0	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	4	60	90	Not searched	Not searched
6.11 Surface water features within 250m of the study site	No	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	Medium					
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	0	0	0	0	1	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 licenses, 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.

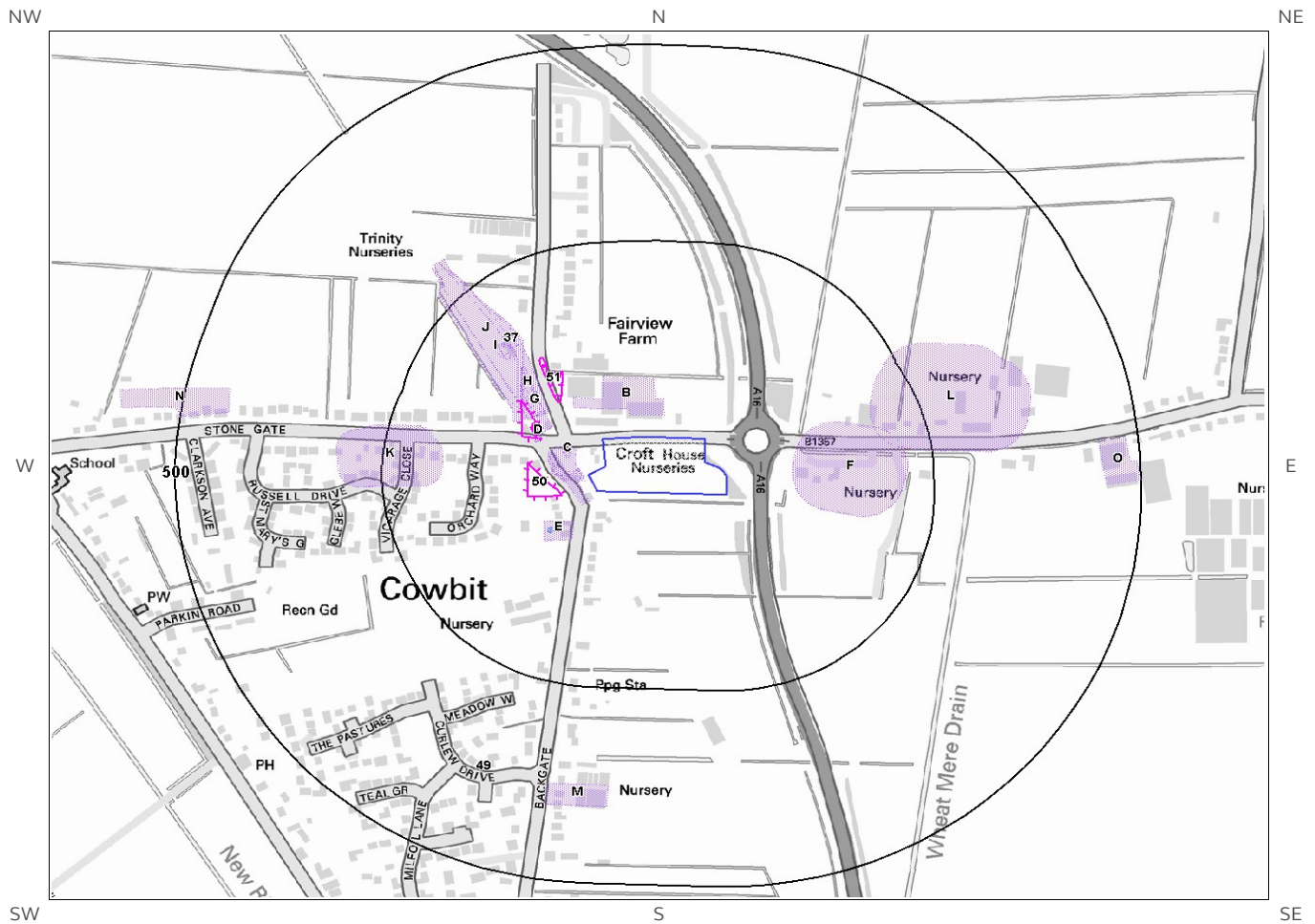
Note: Maps

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).

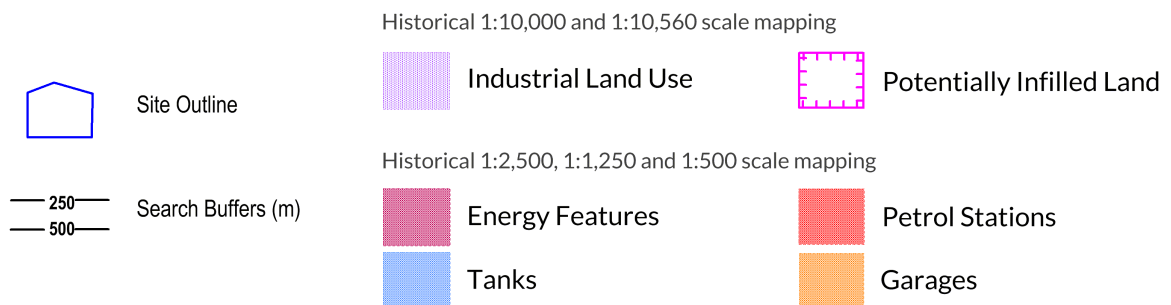
Where a feature is reported in the data tables to a distance greater than the map area, it is noted in the data table as "Not Shown".

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



© Crown copyright and database rights 2018.
Ordnance Survey license 100035207.



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: 47

ID	Distance [m]	Direction	Use	Date
1A	6	W	Railway Station	1887
2A	6	W	Railway Station	1938
3A	7	W	Railway Station	1950
4A	8	SW	Railway Station	1951
5A	8	SW	Railway Station	1903
6A	8	SW	Railway Station	1903
7B	28	N	Nurseries	1977
8B	28	N	Nurseries	1989
9A	33	NW	Railway Building	1951
10C	35	NW	Railway Building	1950
11C	38	NW	Railway Building	1938
12C	38	NW	Railway Building	1887
13E	49	SW	Corn Windmill	1887
14G	63	W	Railway Sidings	1887
15D	72	W	Railway Building	1938
16D	72	NW	Railway Building	1951
17D	72	W	Railway Building	1887
18D	73	W	Railway Building	1950
19I	73	NW	Railway Sidings	1951
20E	73	SW	Unspecified Tank	1938
21F	79	E	Nursery	1977
22F	79	E	Nursery	1989
23G	82	NW	Railway Sidings	1950
24G	93	W	Railway Sidings	1903
25G	93	W	Railway Sidings	1903
26G	93	NW	Railway Sidings	1938
27H	97	NW	Railway Sidings	1903
28H	97	NW	Railway Sidings	1903
29G	99	NW	Railway Building	1938
30I	103	W	Railway Sidings	1951
31J	105	W	Railway Sidings	1906
32J	114	NW	Railway Sidings	1887
33I	147	NW	Railway Building	1951
34I	149	NW	Railway Building	1951

35I	151	NW	Railway Building	1906
36I	152	NW	Railway Building	1887
37	157	NW	Railway Building	1977
38K	177	W	Nursery	1989
39K	177	W	Nursery	1977
40L	189	E	Nursery	1977
41L	189	E	Nursery	1989
42M	375	S	Nursery	1989
43M	375	S	Nursery	1977
44N	442	W	Nursery	1989
45N	442	W	Nursery	1977
46O	452	E	Nursery	1977
47O	452	E	Nursery	1989

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:

1

ID	Distance (m)	Direction	Use	Date
48E	72	SW	Unspecified Tank	1992

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:

1

ID	Distance (m)	Direction	Use	Date
49	378	S	Gas Governor	1992

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.

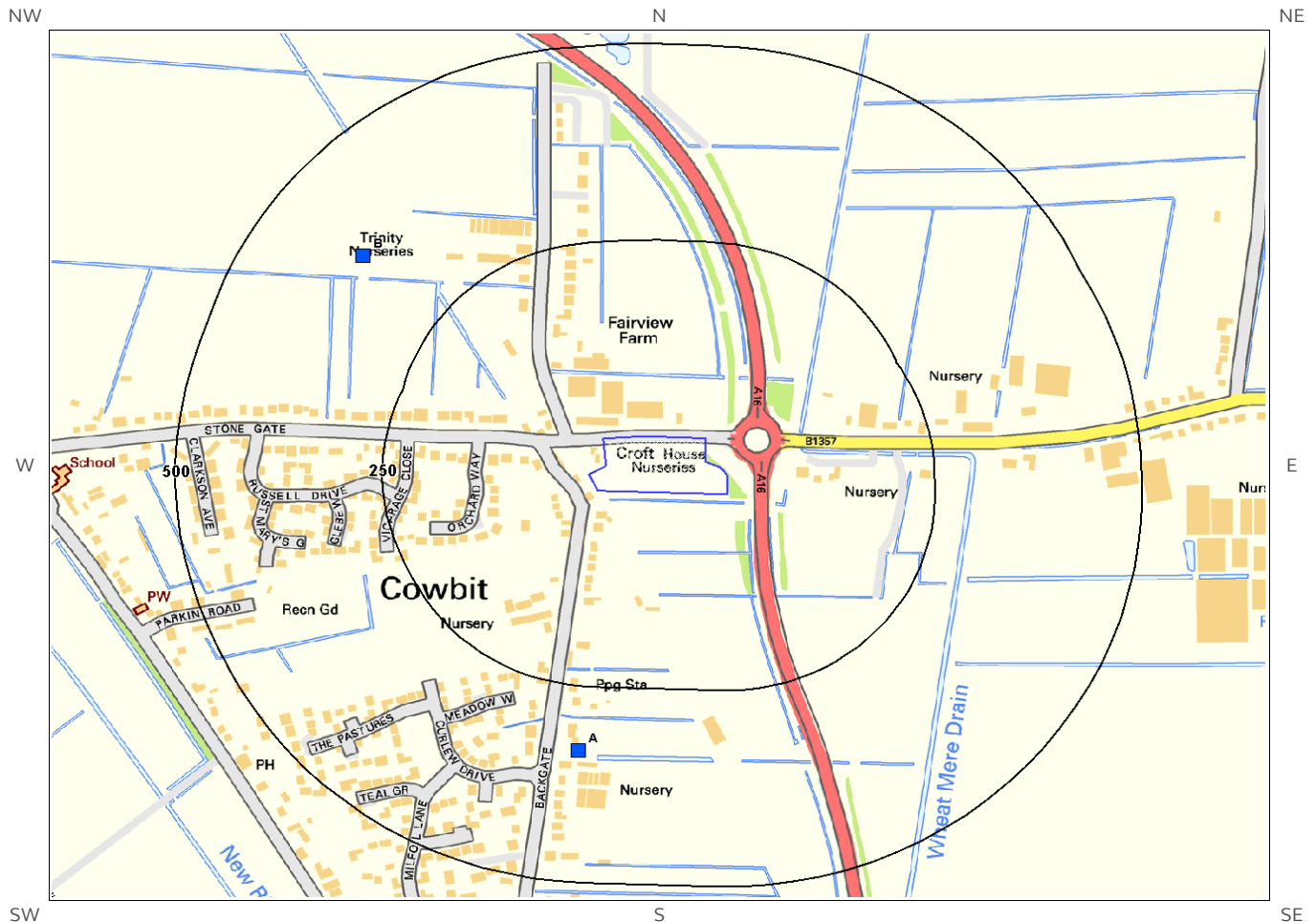
1.6 Potentially Infilled Land

Records of Potentially Infilled Features from 1:10,000 scale mapping within 500m of the study site: 3

The following Historical Potentially Infilled Features derived from the Historical Mapping information is provided by Groundsure:

ID	Distance(m)	Direction	Use	Date
50	41	SW	Pond	1887
51	70	NW	Pond	1887
52D	78	NW	Pond	1887

2. Environmental Permits, Incidents and Registers Map



© Crown copyright and database rights 2018.
Ordnance Survey license 100035207.

- | | | |
|--------------------|-------------------------------|--|
| 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 |
| 250 | Dangerous Substances (List 2) | Part A(2) and Part B Authorised Processes |
| 500 | 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:

12

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

ID	Distance (m)	Direction	NGR	Details
1A	332	S	526640 317640	Address: COWBIT STW, COWBIT, SPALDING, BROADGATE, BGATE WESTON, PE12 0XW Effluent Type: SEWAGE DISCHARGES - PUMPING STATION - WATER COMPANY Permit Number: AW5NF807 Permit Version: 6 Receiving Water: Moulton Mere Drn River Nene N Status: VARIED UNDER EPR 2010 Issue date: 21/09/2015 Effective Date: 21-Sep-2015 Revocation Date: -
2A	332	S	526640 317640	Address: COWBIT STW, COWBIT, SPALDING, BROADGATE, BGATE WESTON, PE12 0XW Effluent Type: SEWAGE DISCHARGES - PUMPING STATION - WATER COMPANY Permit Number: AW5NF807 Permit Version: 2 Receiving Water: Moulton Mere Drn River Nene N Status: REVISED BY NOTICE, AT DIRECTION OF SEC. OF STATE - 37(2) Issue date: 18/09/1989 Effective Date: 18-Sep-1989 Revocation Date: 31/12/2009
3A	332	S	526640 317640	Address: COWBIT STW, COWBIT, SPALDING, BROADGATE, BGATE WESTON, PE12 0XW Effluent Type: SEWAGE DISCHARGES - PUMPING STATION - WATER COMPANY Permit Number: AW5NF807 Permit Version: 4 Receiving Water: Moulton Mere Drn River Nene N Status: REVISED BY NOTICE, AT DIRECTION OF SEC. OF STATE - 37(2) Issue date: 31/03/2010 Effective Date: 31-Mar-2010 Revocation Date: 31/12/2010
4A	332	S	526640 317640	Address: COWBIT STW, COWBIT, SPALDING, BROADGATE, BGATE WESTON, PE12 0XW Effluent Type: SEWAGE DISCHARGES - PUMPING STATION - WATER COMPANY Permit Number: AW5NF807 Permit Version: 5 Receiving Water: Moulton Mere Drn River Nene N Status: REVISED BY NOTICE, AT DIRECTION OF SEC. OF STATE - 37(2) Issue date: 31/03/2010 Effective Date: 01-Jan-2011 Revocation Date: 20/09/2015
5A	332	S	526640 317640	Address: COWBIT STW, COWBIT, SPALDING, BROADGATE, BGATE WESTON, PE12 0XW Effluent Type: SEWAGE DISCHARGES - PUMPING STATION - WATER COMPANY Permit Number: AW5NF807 Permit Version: 1 Receiving Water: Moulton Mere Drn River Nene N Status: PRE NRA LEGISLATION WHERE ISSUE DATE < 01-SEP-89 (HISTORIC ONLY) Issue date: 22/03/1988 Effective Date: 22-Mar-1988 Revocation Date: 17/09/1989

ID	Distance (m)	Direction	NGR	Details
6A	332	S	526640 317640	Address: COWBIT STW, COWBIT, SPALDING, BROADGATE, BGATE WESTON, PE12 0XW Effluent Type: SEWAGE DISCHARGES - PUMPING STATION - WATER COMPANY Permit Number: AW5NF807 Permit Version: 3 Receiving Water: Moulton Mere Drn River Nene N Status: REVISED BY NOTICE, AT DIRECTION OF SEC. OF STATE - 37(2) Issue date: 24/09/2009 Effective Date: 01-Jan-2010 Revocation Date: 30/03/2010
7B	372	NW	526380 318270	Address: COWBIT STW, COWBIT, SPALDING, BROADGATE, BGATE WESTON, PE12 0XW Effluent Type: SEWAGE DISCHARGES - PUMPING STATION - WATER COMPANY Permit Number: AW5NF807 Permit Version: 6 Receiving Water: Moulton Mere Drn River Nene N Status: VARIED UNDER EPR 2010 Issue date: 21/09/2015 Effective Date: 21-Sep-2015 Revocation Date: -
8B	372	NW	526380 318270	Address: COWBIT STW, COWBIT, SPALDING, BROADGATE, BGATE WESTON, PE12 0XW Effluent Type: SEWAGE DISCHARGES - PUMPING STATION - WATER COMPANY Permit Number: AW5NF807 Permit Version: 2 Receiving Water: Moulton Mere Drn River Nene N Status: REVISED BY NOTICE, AT DIRECTION OF SEC. OF STATE - 37(2) Issue date: 18/09/1989 Effective Date: 18-Sep-1989 Revocation Date: 31/12/2009
9B	372	NW	526380 318270	Address: COWBIT STW, COWBIT, SPALDING, BROADGATE, BGATE WESTON, PE12 0XW Effluent Type: SEWAGE DISCHARGES - PUMPING STATION - WATER COMPANY Permit Number: AW5NF807 Permit Version: 1 Receiving Water: Moulton Mere Drn River Nene N Status: PRE NRA LEGISLATION WHERE ISSUE DATE < 01-SEP-89 (HISTORIC ONLY) Issue date: 22/03/1988 Effective Date: 22-Mar-1988 Revocation Date: 17/09/1989
10B	372	NW	526380 318270	Address: COWBIT STW, COWBIT, SPALDING, BROADGATE, BGATE WESTON, PE12 0XW Effluent Type: SEWAGE DISCHARGES - PUMPING STATION - WATER COMPANY Permit Number: AW5NF807 Permit Version: 3 Receiving Water: Moulton Mere Drn River Nene N Status: REVISED BY NOTICE, AT DIRECTION OF SEC. OF STATE - 37(2) Issue date: 24/09/2009 Effective Date: 01-Jan-2010 Revocation Date: 30/03/2010
11B	372	NW	526380 318270	Address: COWBIT STW, COWBIT, SPALDING, BROADGATE, BGATE WESTON, PE12 0XW Effluent Type: SEWAGE DISCHARGES - PUMPING STATION - WATER COMPANY Permit Number: AW5NF807 Permit Version: 4 Receiving Water: Moulton Mere Drn River Nene N Status: REVISED BY NOTICE, AT DIRECTION OF SEC. OF STATE - 37(2) Issue date: 31/03/2010 Effective Date: 31-Mar-2010 Revocation Date: 31/12/2010
12B	372	NW	526380 318270	Address: COWBIT STW, COWBIT, SPALDING, BROADGATE, BGATE WESTON, PE12 0XW Effluent Type: SEWAGE DISCHARGES - PUMPING STATION - WATER COMPANY Permit Number: AW5NF807 Permit Version: 5 Receiving Water: Moulton Mere Drn River Nene N Status: REVISED BY NOTICE, AT DIRECTION OF SEC. OF STATE - 37(2) Issue date: 31/03/2010 Effective Date: 01-Jan-2011 Revocation Date: 20/09/2015

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.

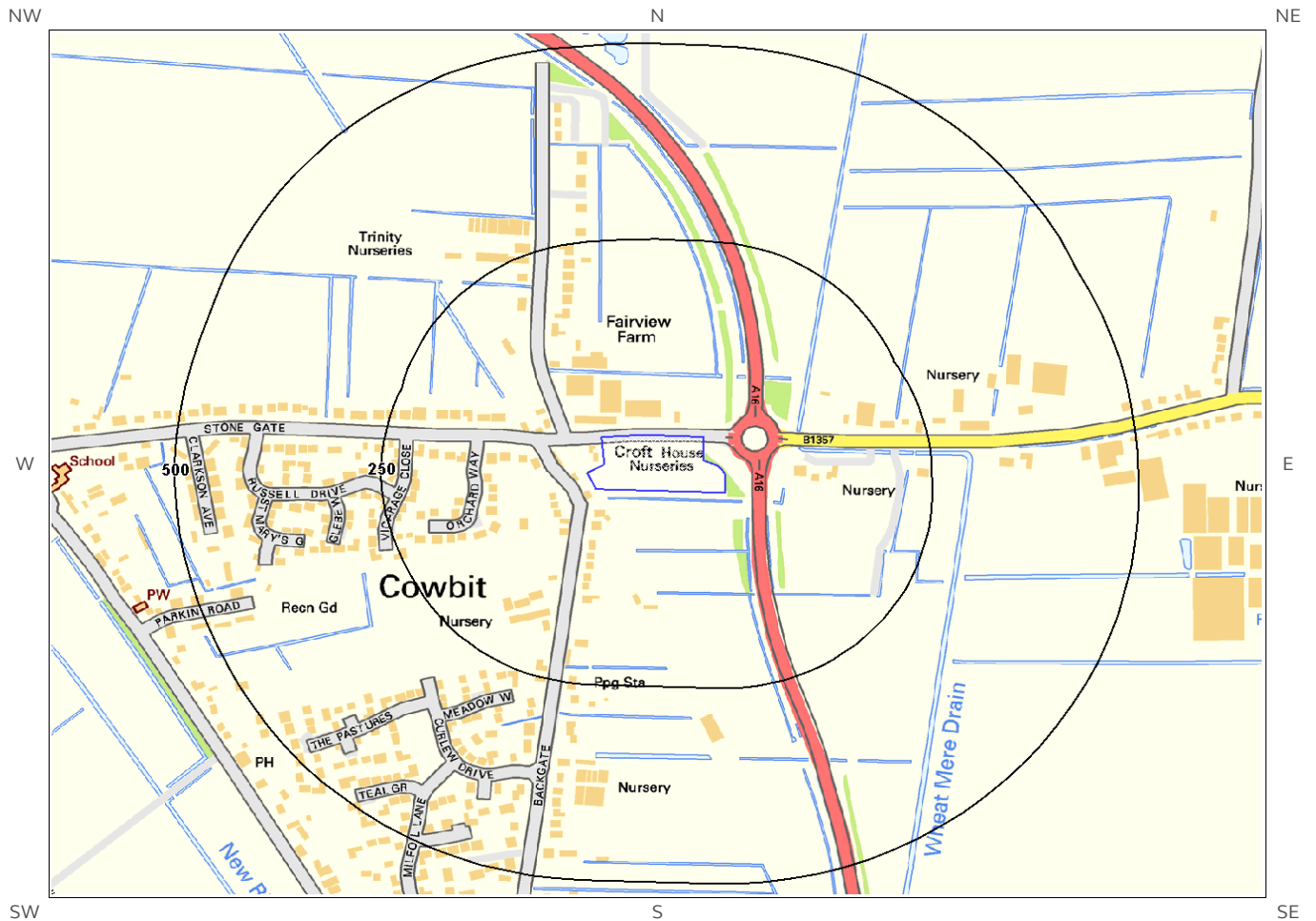
2.4 Sites Determined as Contaminated Land under Part 2A EPA 1990

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

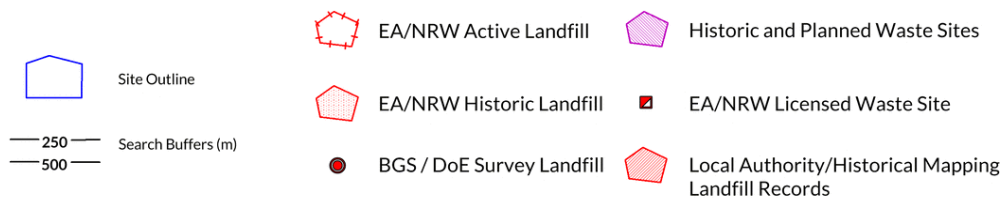
0

Database searched and no data found.

3. Landfill and Other Waste Sites Map



© Crown copyright and database rights 2018.
Ordnance Survey license 100035207.



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

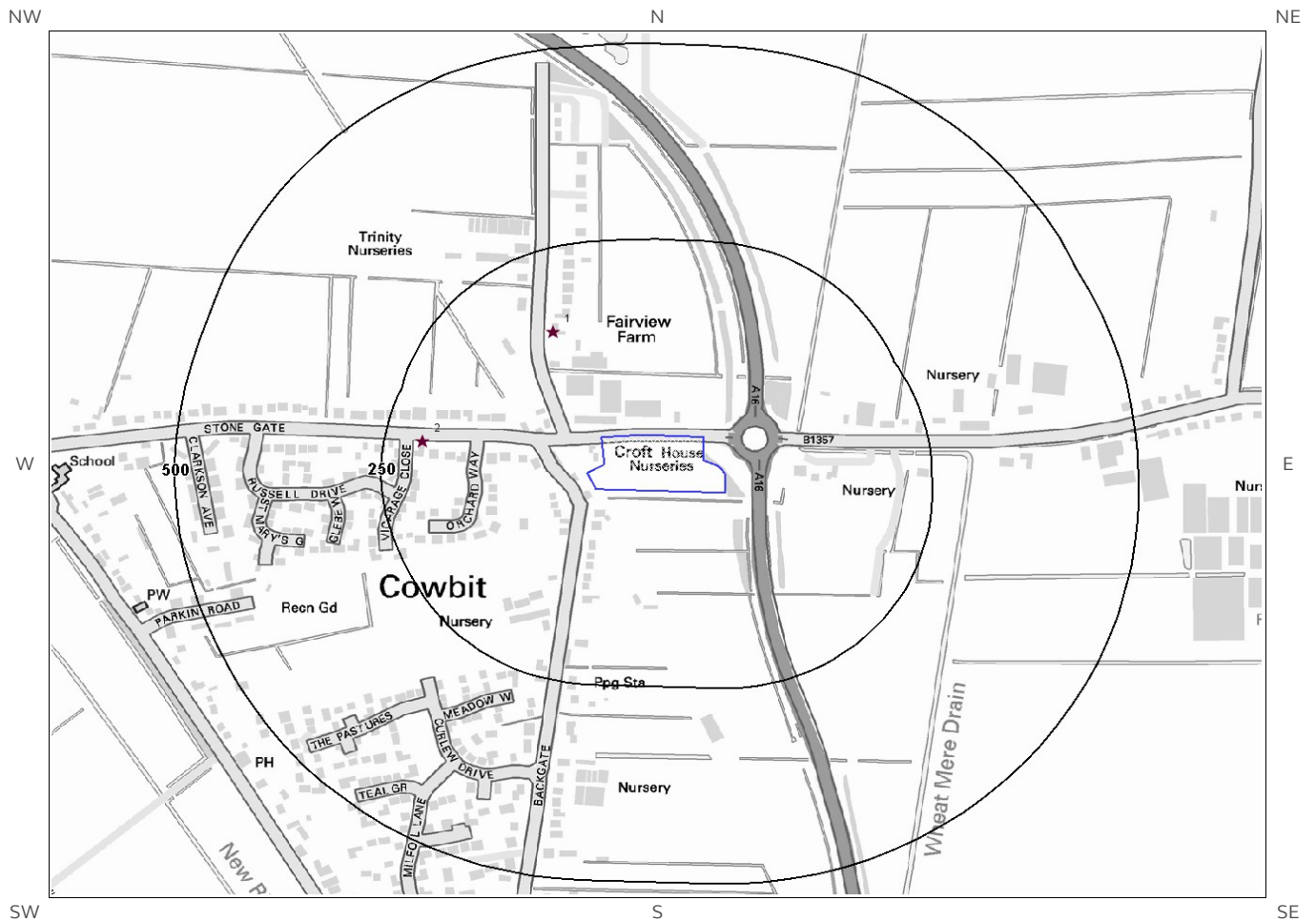
Database searched and no data found.

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



© Crown copyright and database rights 2018.
Ordnance Survey license 100035207.



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	148	NW	Crowland Pallets 2009 Ltd	526612 318173	19, Mill Drove South, Cowbit, Spalding, PE12 6FS	Packaging	Industrial Products
2	205	W	Electricity Sub Station	526453 318033	PE12	Electrical Features	Infrastructure and Facilities

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
OXC-MDST	OXFORD CLAY FORMATION	MUDSTONE

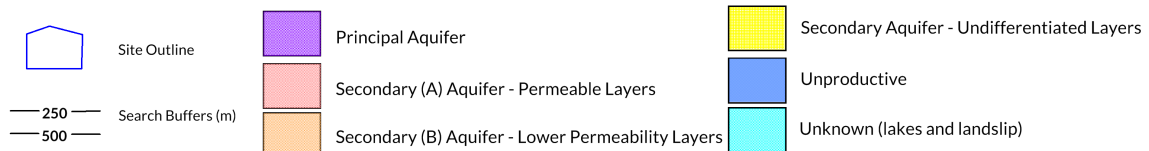
(Derived from the BGS 1:50,000 Digital Geological Map of Great Britain)

6 Hydrogeology and Hydrology

6a. Aquifer Within Superficial Geology



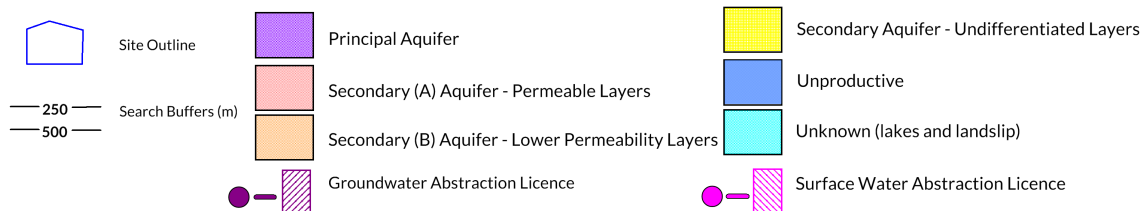
© Crown copyright and database rights 2018
Ordnance Survey license 100035207.



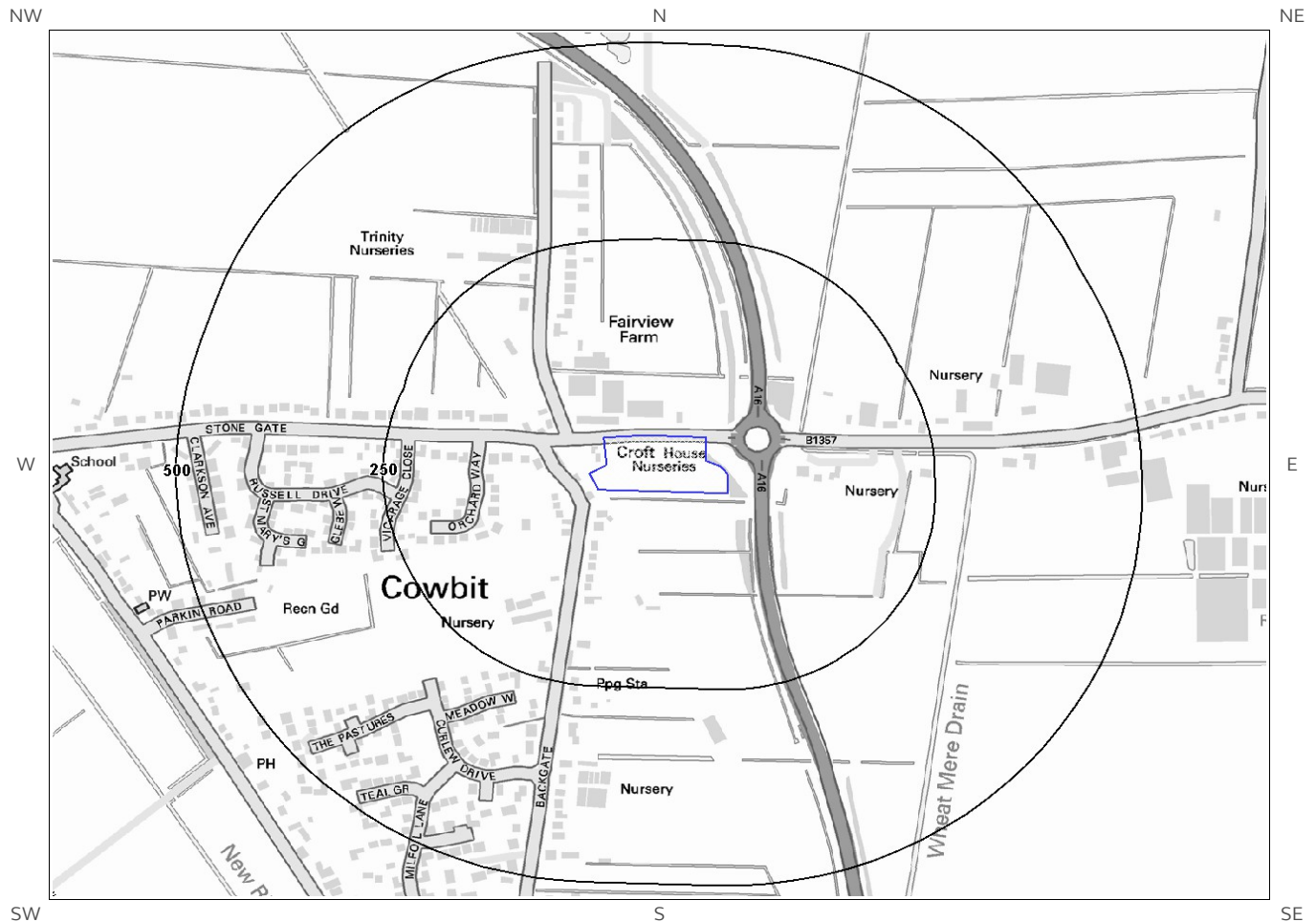
6b. Aquifer Within Bedrock Geology and Abstraction Licenses



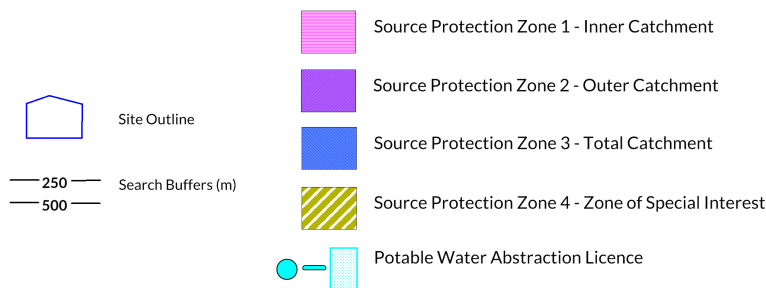
© Crown copyright and database rights 2018
Ordnance Survey license 100035207.



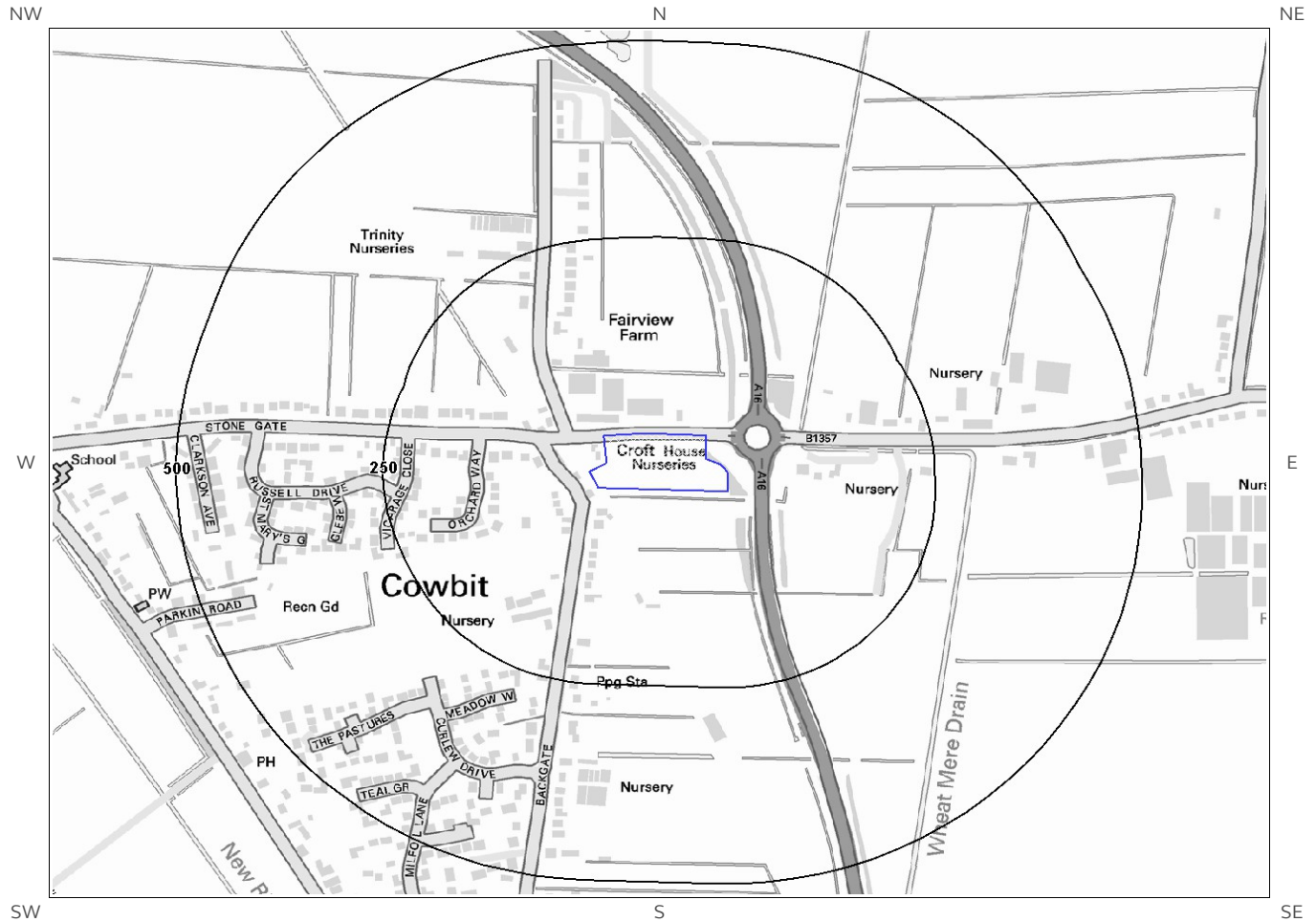
6c. Hydrogeology – Source Protection Zones and Potable Water Abstraction Licenses



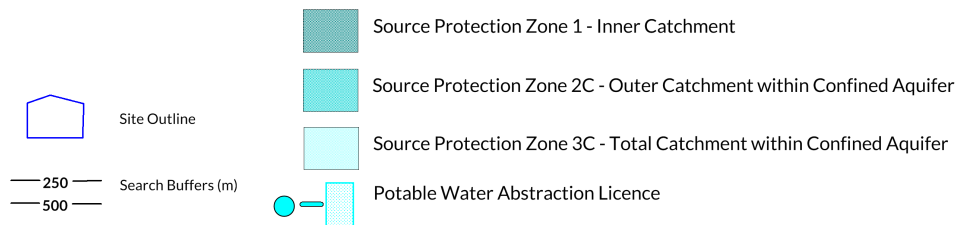
© Crown copyright and database rights 2018
Ordnance Survey license 100035207.



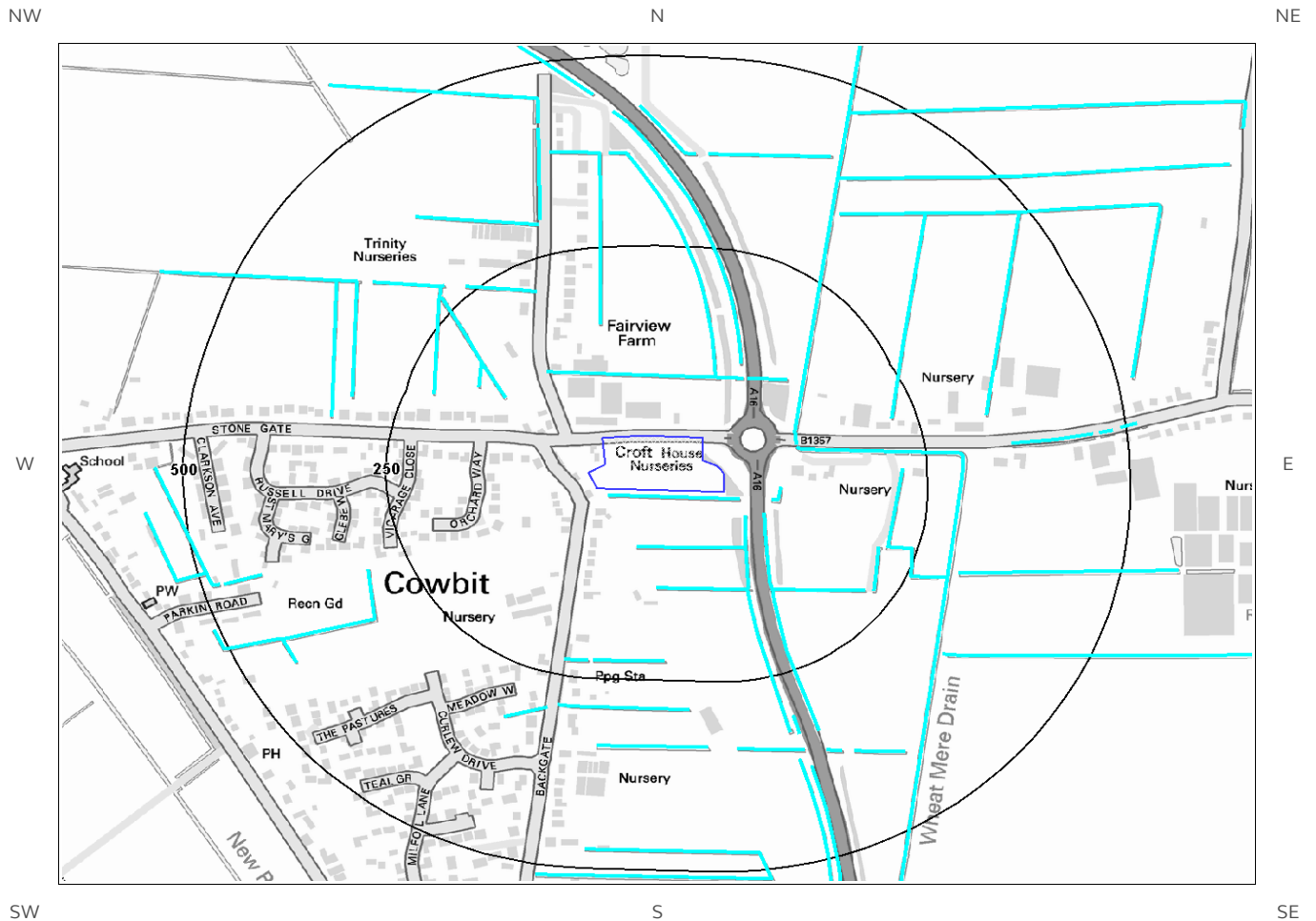
6d. Hydrogeology – Source Protection Zones within confined aquifer



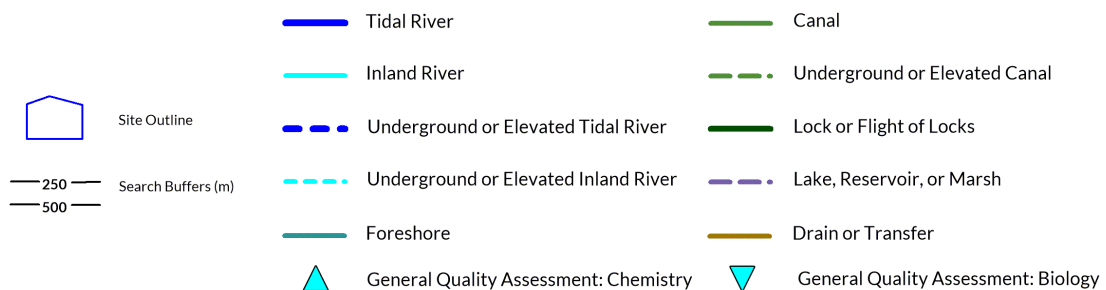
© Crown copyright and database rights 2018
Ordnance Survey license 100035207.



6e. Hydrology – Watercourse Network and River Quality



© Crown copyright and database rights 2018.
Ordnance Survey license 100035207.



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 None identified

Database searched and no data found.

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	778	S	527000 317210	Status: Historical Licence No: 5/31/14/*S/0263 Details: Spray Irrigation - Direct Direct Source: Surface Water Source Of Supply Point: Wheatmere Drain Data Type: Line Name: J W E BANKS LTD Annual Volume (m³): 4546 Max Daily Volume (m³): 545.5 Application No: N1354 Original Start Date: 28/2/2005 Expiry Date: 31/8/2013 Issue No: 1 Version Start Date: 28/2/2005 Version End Date:
Not shown	993	E	527700 316000	Status: Historical Licence No: 5/32/11/*S/0052C Details: Spray Irrigation - Direct Direct Source: Surface Water Source Of Supply Point: Moulton Mere Drain Data Type: Line Name: A H CLARK FARMS LTD Annual Volume (m³): 4000 Max Daily Volume (m³): 818.3 Application No: - Original Start Date: 1/4/1966 Expiry Date: - Issue No: 100 Version Start Date: 2/4/1966 Version End Date:
Not shown	1468	SW	524170 319130	Status: Historical Licence No: 5/31/14/*S/0185 Details: Spray Irrigation - Direct Direct Source: Surface Water Source Of Supply Point: The New River At Cowbit Data Type: Line Name: BOOR Annual Volume (m³): 10000 Max Daily Volume (m³): 2000 Application No: N1353 Original Start Date: 1/6/1986 Expiry Date: - Issue No: 101 Version Start Date: 23/2/2005 Version End Date:
Not shown	1469	SW	524184 319104	Status: Active Licence No: 5/31/14/*S/0185 Details: Spray Irrigation - Direct Direct Source: Surface Water Source Of Supply Point: The New River At Cowbit Data Type: Line Name: BOOR Annual Volume (m³): 10000 Max Daily Volume (m³): 2000 Application No: NPS/WR/012359 Original Start Date: 1/6/1986 Expiry Date: - Issue No: 102 Version Start Date: 18/9/2013 Version End Date:
Not shown	1667	SW	525346 316951	Status: Active Licence No: 5/31/14/*S/0185 Details: Spray Irrigation - Direct Direct Source: Surface Water Source Of Supply Point: The Soke Dyke At Cowbit Data Type: Line Name: BOOR Annual Volume (m³): 10000 Max Daily Volume (m³): 2000 Application No: NPS/WR/012359 Original Start Date: 1/6/1986 Expiry Date: - Issue No: 102 Version Start Date: 18/9/2013 Version End Date:
Not shown	1672	SW	525340 316950	Status: Historical Licence No: 5/31/14/*S/0185 Details: Spray Irrigation - Direct Direct Source: Surface Water Source Of Supply Point: The Soke Dyke At Cowbit Data Type: Line Name: BOOR Annual Volume (m³): 10000 Max Daily Volume (m³): 2000 Application No: N1353 Original Start Date: 1/6/1986 Expiry Date: - Issue No: 101 Version Start Date: 23/2/2005 Version End Date:
Not shown	1694	SW	525320 316940	Status: Historical Licence No: 5/31/14/*S/0185 Details: Spray Irrigation - Direct Direct Source: Surface Water Source Of Supply Point: River Welland At Cowbit Data Type: Line Name: BOOR Annual Volume (m³): 10000 Max Daily Volume (m³): 2000 Application No: N1353 Original Start Date: 1/6/1986 Expiry Date: - Issue No: 101 Version Start Date: 23/2/2005 Version End Date:

ID	Distance (m)	Direction	NGR	Details		
Not shown	1710	SW	525305 316934	Direct	Status: Active Licence No: 5/31/14/*S/0185 Details: Spray Irrigation - Direct Source: Surface Water Source Of Supply Point: River Welland At Cowbit Data Type: Line Name: BOOR	Annual Volume (m³): 10000 Max Daily Volume (m³): 2000 Application No: NPS/WR/012359 Original Start Date: 1/6/1986 Expiry Date: - Issue No: 102 Version Start Date: 18/9/2013 Version End Date:
Not shown	1790	E	528542 302094	Direct	Status: Active Licence No: 5/32/11/*S/0154/R01 Details: Spray Irrigation - Direct Source: Surface Water Source Of Supply Point: Butchers Drain Data Type: Line Name: P J Lee and Sons	Annual Volume (m³): 195500 Max Daily Volume (m³): 5184 Application No: NPS/WR/025422 Original Start Date: 14/12/2001 Expiry Date: 31/3/2029 Issue No: 2 Version Start Date: 31/5/2017 Version End Date:

6.5 Potable Water Abstraction Licences

Potable Water Abstraction Licences within 2000m of the study site

None identified

Database searched and no data found.

6.6 Source Protection Zones

Source Protection Zones within 500m of the study site

None identified

Database searched and no data found.

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	9 S	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.0
92	9 S	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.0
2	40 SE	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.0

ID	Distance/ Direction	Name	Type of Watercourse	Additional Details
93	40 SE	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.0
3	56 SE	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.0
94	56 SE	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.0
4	59 E	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.8
95	59 E	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.8
5	73 S	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.5
96	73 S	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.5
6	78 S	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.0
97	78 S	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.0
7	80 N	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 3.3
98	80 N	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 3.3
8	83 N	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.0
9	83 N	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.5
10	83 N	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: Underground Permanence: Unclassified. Average Width in Watercourse Section (m): Not Provided
99	83 N	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.0

ID	Distance/ Direction	Name	Type of Watercourse	Additional Details
100	83 N	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.5
101	83 N	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: Underground Permanence: Unclassified. Average Width in Watercourse Section (m): Not Provided
11	88 NE	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.7
102	88 NE	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.7
12	93 NE	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: Underground Permanence: Unclassified. Average Width in Watercourse Section (m): Not Provided
103	93 NE	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: Underground Permanence: Unclassified. Average Width in Watercourse Section (m): Not Provided
13	97 E	Wheat Mere Drain Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Welland Relationship to Ground Level: Underground Permanence: Unclassified. Average Width in Watercourse Section (m): Not Provided
14	97 E	Wheat Mere Drain Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Welland Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 5.3
104	97 E	Wheat Mere Drain Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Welland Relationship to Ground Level: Underground Permanence: Unclassified. Average Width in Watercourse Section (m): Not Provided
105	97 E	Wheat Mere Drain Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Welland Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 5.3
15	104 NE	Wheat Mere Drain Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Welland Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 3.6
106	104 NE	Wheat Mere Drain Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Welland Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 3.6
16	107 NE	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 3.7
107	107 NE	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 3.7
17	108 NE	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.0

ID	Distance/ Direction	Name	Type of Watercourse	Additional Details
108	108 NE	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.0
18	128 S	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.0
109	128 S	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.0
19	130 NW	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 3.2
110	130 NW	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 3.2
20	131 S	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.0
111	131 S	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.0
21	142 SE	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.0
22	142 SE	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.1
112	142 SE	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.0
113	142 SE	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.1
23	149 N	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.6
114	149 N	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.6
24	166 NW	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.4
115	166 NW	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.4

ID	Distance/ Direction	Name	Type of Watercourse	Additional Details
25	180 NW	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 4.4
116	180 NW	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 4.4
26	203 E	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.3
117	203 E	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.3
27	209 NW	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.7
118	209 NW	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.7
28	211 E	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.5
119	211 E	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.5
29	215 W	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.3
120	215 W	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.3
30	219 E	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.3
121	219 E	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.3
31	225 S	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.1
122	225 S	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.1
32	226 S	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.0

ID	Distance/ Direction	Name	Type of Watercourse	Additional Details
123	226 S	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.0
33	273 NW	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 4.5
124	273 NW	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 4.5
34	280 NW	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 3.0
125	280 NW	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 3.0
35	282 NW	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.8
126	282 NW	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.8
36	287 S	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.3
Not shown	287 S	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.3
37	291 N	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.5
Not shown	291 N	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.5
38	294 S	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 1.3
Not shown	294 S	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 1.3
39	296 N	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.9
Not shown	296 N	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.9

ID	Distance/ Direction	Name	Type of Watercourse	Additional Details
40	297 E	Wheat Mere Drain Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Welland Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 5.6
131	297 E	Wheat Mere Drain Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Welland Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 5.6
41	300 SW	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.9
132	300 SW	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.9
42	306 S	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 1.9
Not shown	306 S	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 1.9
43	308 W	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.7
44	308 E	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 4.9
134	308 W	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.7
135	308 E	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 4.9
45	326 W	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.8
Not shown	326 W	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.8
46	333 E	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 3.2
Not shown	333 E	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 3.2
47	337 S	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 5.9

ID	Distance/ Direction	Name	Type of Watercourse	Additional Details
Not shown	337 S	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 5.9
48	338 S	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.3
Not shown	338 S	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.3
49	340 NE	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.7
Not shown	340 NE	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.7
50	343 SE	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 3.9
141	343 SE	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 3.9
51	357 E	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.5
Not shown	357 E	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.5
52	362 S	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.3
Not shown	362 S	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.3
53	363 S	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.0
Not shown	363 S	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.0
54	366 NW	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.5
145	366 NW	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.5

ID	Distance/ Direction	Name	Type of Watercourse	Additional Details
55	367 NW	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.5
146	367 NW	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.5
56	373 N	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.0
Not shown	373 N	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.0
57	374 N	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.2
Not shown	374 N	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.2
58	376 S	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.0
59	376 SE	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.4
Not shown	376 S	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.0
Not shown	376 SE	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.4
60	380 NE	Wheat Mere Drain Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Welland Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 3.6
61	380 NE	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.6
Not shown	380 NE	Wheat Mere Drain Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Welland Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 3.6
Not shown	380 NE	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.6
62	388 NW	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.9

ID	Distance/ Direction	Name	Type of Watercourse	Additional Details
Not shown	388 NW	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.9
63	404 NE	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.4
Not shown	404 NE	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.4
64	421 N	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.3
Not shown	421 N	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.3
65	424 W	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.1
Not shown	424 W	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.1
66	436 SW	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.7
67	436 SW	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.3
Not shown	436 SW	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.7
Not shown	436 SW	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.3
68	451 N	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.0
Not shown	451 N	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.0
69	465 NE	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 3.1
70	465 NE	Wheat Mere Drain Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 3.6

ID	Distance/ Direction	Name	Type of Watercourse	Additional Details
Not shown	465 NE	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 3.1
Not shown	465 NE	Wheat Mere Drain Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 3.6
71	466 E	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.1
Not shown	466 E	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.1
72	474 S	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.5
Not shown	474 S	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.5
73	478 W	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.0
Not shown	478 W	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.0
74	490 W	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.3
75	490 W	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.4
76	490 NE	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.6
Not shown	490 W	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.3
Not shown	490 W	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.4
Not shown	490 NE	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 2.6
77	492 E	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 1.6

ID	Distance/ Direction	Name	Type of Watercourse	Additional Details
Not shown	492 E	- Alternative Name: -	Inland river not influenced by normal tidal action.	Catchment Area: Nene Relationship to Ground Level: On ground surface Permanence: Unclassified. Average Width in Watercourse Section (m): 1.6

6.11 Surface Water Features

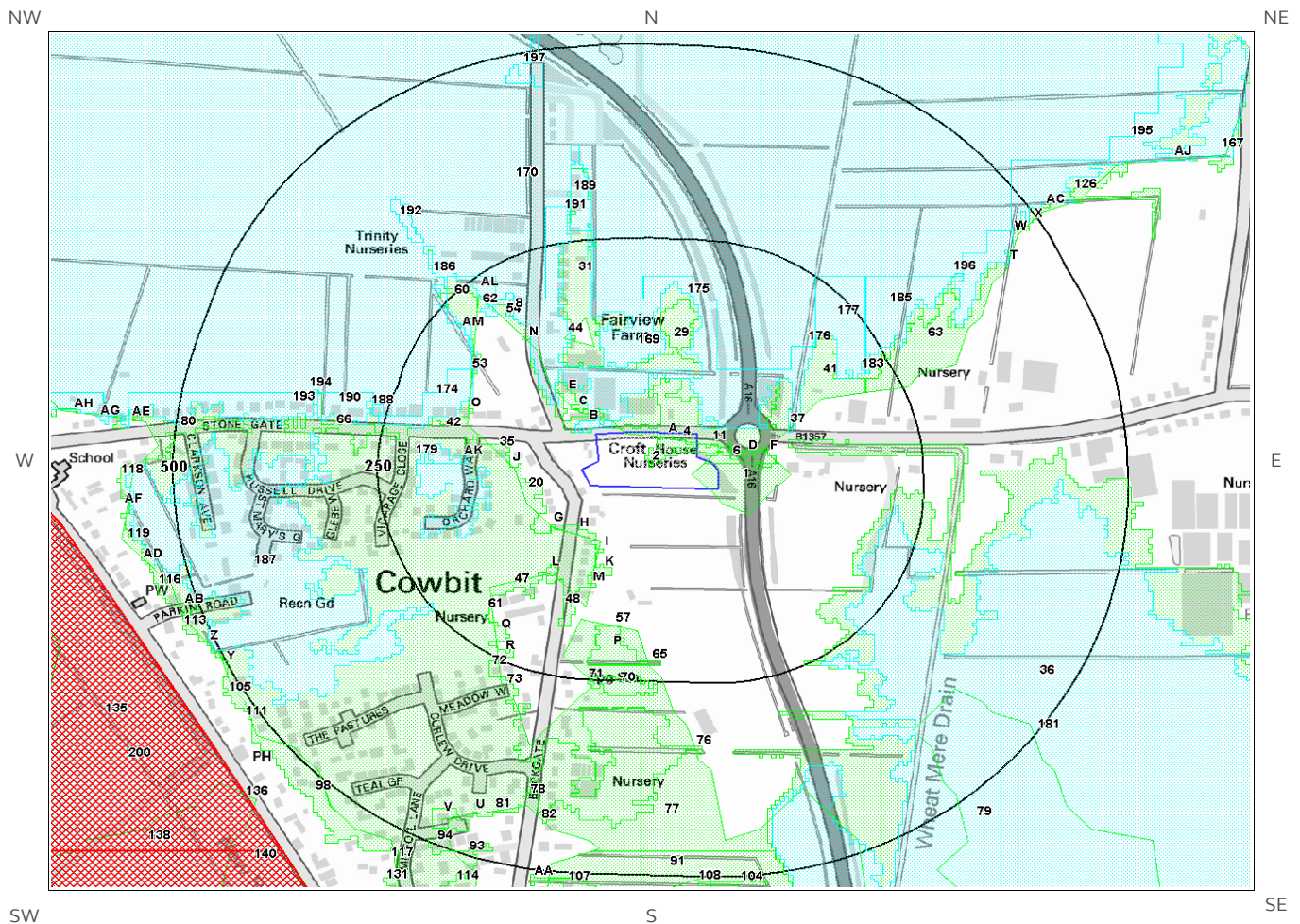
Surface water features within 250m of the study site

Identified

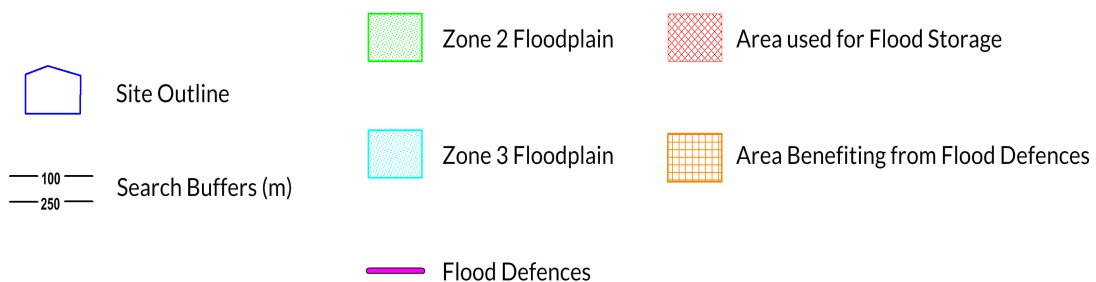
The following surface water records are not represented on mapping:

Distance (m)	Direction
8	S
40	SE
55	SE
78	N
95	E
103	NE
106	NE
107	NE
127	S
129	NW
140	SE
149	N
202	E
208	NW
209	E
210	E
218	E

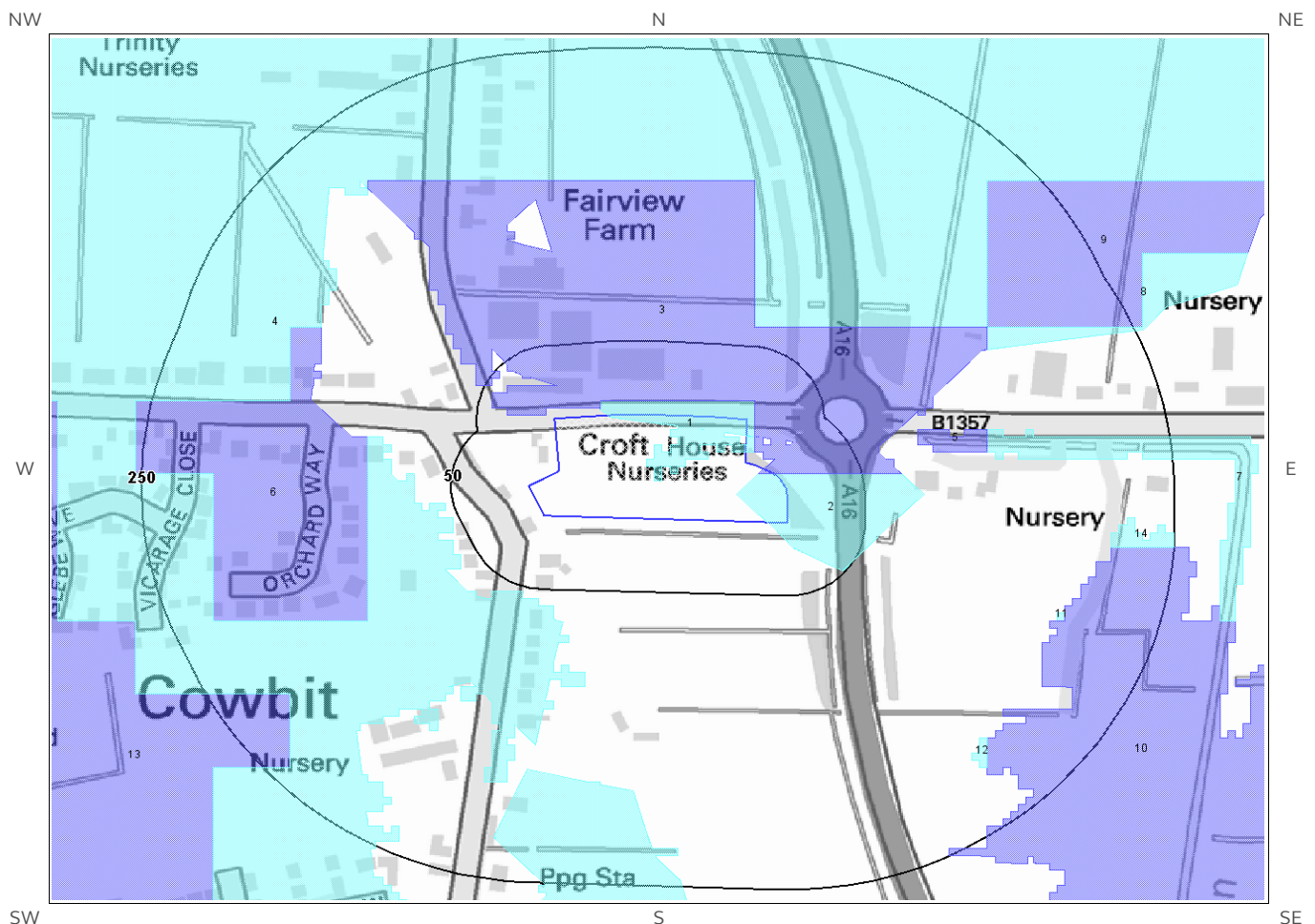
7a. Environment Agency/Natural Resources Wales Flood Map for Planning (from rivers and the sea)



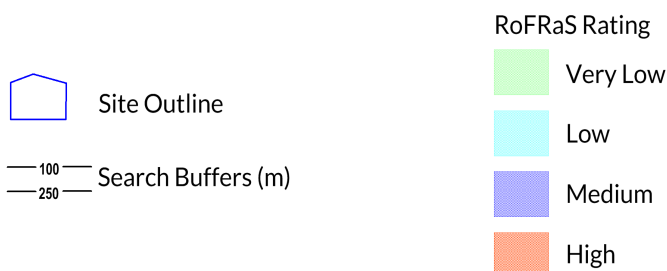
© Crown copyright and database rights 2018.
Ordnance Survey license 100035207.



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



© Crown copyright and database rights 2018.
Ordnance Survey license 100035207.



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)
2	0	On Site	29-May-2018	Zone 2 - (Fluvial /Tidal Models)
3A	0	On Site	29-May-2018	Zone 2 - (Fluvial /Tidal Models)
4	0	On Site	29-May-2018	Zone 2 - (Fluvial /Tidal Models)
5A	0	On Site	29-May-2018	Zone 2 - (Fluvial /Tidal Models)
6	0	On Site	29-May-2018	Zone 2 - (Fluvial /Tidal Models)
7	0	On Site	29-May-2018	Zone 2 - (Fluvial /Tidal Models)
8	5	N	29-May-2018	Zone 2 - (Fluvial /Tidal Models)
9B	6	N	29-May-2018	Zone 2 - (Fluvial /Tidal Models)
10D	9	NE	29-May-2018	Zone 2 - (Fluvial /Tidal Models)
11	15	E	29-May-2018	Zone 2 - (Fluvial /Tidal Models)
12B	22	N	29-May-2018	Zone 2 - (Fluvial /Tidal Models)
13B	32	NW	29-May-2018	Zone 2 - (Fluvial /Tidal Models)
14C	36	NW	29-May-2018	Zone 2 - (Fluvial /Tidal Models)
15C	42	NW	29-May-2018	Zone 2 - (Fluvial /Tidal Models)
16E	43	NW	29-May-2018	Zone 2 - (Fluvial /Tidal Models)
17D	44	E	29-May-2018	Zone 2 - (Fluvial /Tidal Models)
18E	45	NW	29-May-2018	Zone 2 - (Fluvial /Tidal Models)
19H	53	S	29-May-2018	Zone 2 - (Fluvial /Tidal Models)

20	53	SW	29-May-2018	Zone 2 - (Fluvial /Tidal Models)
21F	63	E	29-May-2018	Zone 2 - (Fluvial /Tidal Models)
22F	63	NE	29-May-2018	Zone 2 - (Fluvial /Tidal Models)
23F	67	E	29-May-2018	Zone 2 - (Fluvial /Tidal Models)
24G	68	SW	29-May-2018	Zone 2 - (Fluvial /Tidal Models)
25G	68	SW	29-May-2018	Zone 2 - (Fluvial /Tidal Models)
26H	70	S	29-May-2018	Zone 2 - (Fluvial /Tidal Models)
27F	70	E	29-May-2018	Zone 2 - (Fluvial /Tidal Models)
28G	71	SW	29-May-2018	Zone 2 - (Fluvial /Tidal Models)
29	73	N	29-May-2018	Zone 2 - (Fluvial /Tidal Models)
30I	81	S	29-May-2018	Zone 2 - (Fluvial /Tidal Models)
31	83	N	29-May-2018	Zone 2 - (Fluvial /Tidal Models)
32J	84	W	29-May-2018	Zone 2 - (Fluvial /Tidal Models)
33I	86	S	29-May-2018	Zone 2 - (Fluvial /Tidal Models)
34J	89	W	29-May-2018	Zone 2 - (Fluvial /Tidal Models)
35	89	W	29-May-2018	Zone 2 - (Fluvial /Tidal Models)
36	90	E	29-May-2018	Zone 2 - (Fluvial /Tidal Models)
37	98	NE	29-May-2018	Zone 2 - (Fluvial /Tidal Models)
38K	100	S	29-May-2018	Zone 2 - (Fluvial /Tidal Models)
39L	111	SW	29-May-2018	Zone 2 - (Fluvial /Tidal Models)
40K	111	S	29-May-2018	Zone 2 - (Fluvial /Tidal Models)
41	113	NE	29-May-2018	Zone 2 - (Fluvial /Tidal Models)
42	119	W	29-May-2018	Zone 2 - (Fluvial /Tidal Models)
43L	124	S	29-May-2018	Zone 2 - (Fluvial /Tidal Models)
44	125	N	29-May-2018	Zone 2 - (Fluvial /Tidal Models)
45L	126	S	29-May-2018	Zone 2 - (Fluvial /Tidal Models)
46M	126	S	29-May-2018	Zone 2 - (Fluvial /Tidal Models)
47	130	SW	29-May-2018	Zone 2 - (Fluvial /Tidal Models)

48	131	S	29-May-2018	Zone 2 - (Fluvial /Tidal Models)
49M	131	S	29-May-2018	Zone 2 - (Fluvial /Tidal Models)
50N	142	NW	29-May-2018	Zone 2 - (Fluvial /Tidal Models)
51N	150	NW	29-May-2018	Zone 2 - (Fluvial /Tidal Models)
52O	153	NW	29-May-2018	Zone 2 - (Fluvial /Tidal Models)
53	155	W	29-May-2018	Zone 2 - (Fluvial /Tidal Models)
54	156	NW	29-May-2018	Zone 2 - (Fluvial /Tidal Models)
55O	159	W	29-May-2018	Zone 2 - (Fluvial /Tidal Models)
56	173	S	29-May-2018	Zone 2 - (Fluvial /Tidal Models)
57	180	S	29-May-2018	Zone 2 - (Fluvial /Tidal Models)
58P	180	S	29-May-2018	Zone 2 - (Fluvial /Tidal Models)
59P	182	S	29-May-2018	Zone 2 - (Fluvial /Tidal Models)
60	184	NW	29-May-2018	Zone 2 - (Fluvial /Tidal Models)
61	190	SW	29-May-2018	Zone 2 - (Fluvial /Tidal Models)
62	194	NW	29-May-2018	Zone 2 - (Fluvial /Tidal Models)
63	206	NE	29-May-2018	Zone 2 - (Fluvial /Tidal Models)
64Q	209	SW	29-May-2018	Zone 2 - (Fluvial /Tidal Models)
65	224	S	29-May-2018	Zone 2 - (Fluvial /Tidal Models)
66	227	W	29-May-2018	Zone 2 - (Fluvial /Tidal Models)
67R	231	SW	29-May-2018	Zone 2 - (Fluvial /Tidal Models)
68Q	232	SW	29-May-2018	Zone 2 - (Fluvial /Tidal Models)
69R	236	SW	29-May-2018	Zone 2 - (Fluvial /Tidal Models)
70	244	S	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	6	N	30-May-2018	Zone 3 - (Fluvial Models)
2	87	N	30-May-2018	Zone 3 - (Fluvial Models)
3A	113	W	30-May-2018	Zone 3 - (Fluvial Models)
4	138	W	30-May-2018	Zone 3 - (Fluvial Models)
5A	148	W	30-May-2018	Zone 3 - (Fluvial Models)
6	158	W	30-May-2018	Zone 3 - (Fluvial Models)
7	173	N	30-May-2018	Zone 3 - (Fluvial Models)
8	181	NE	30-May-2018	Zone 3 - (Fluvial Models)
9B	185	NE	30-May-2018	Zone 3 - (Fluvial Models)
10D	189	NW	30-May-2018	Zone 3 - (Fluvial Models)
11	193	W	30-May-2018	Zone 3 - (Fluvial Models)
12B	194	NW	30-May-2018	Zone 3 - (Fluvial Models)
13B	195	SE	30-May-2018	Zone 3 - (Fluvial Models)
14C	201	NW	30-May-2018	Zone 3 - (Fluvial Models)
15C	218	NE	30-May-2018	Zone 3 - (Fluvial Models)
16E	223	NW	30-May-2018	Zone 3 - (Fluvial Models)
17D	227	NE	30-May-2018	Zone 3 - (Fluvial Models)
18E	244	NW	30-May-2018	Zone 3 - (Fluvial Models)
19H	246	SW	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

Medium

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 Medium (greater than 1 in 100 but less than 1 in 30) 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	Low
2	0.0	On Site	Low
3	0.0	On Site	Medium

7.4 Flood Defences

Flood Defences within 250m of the study site

Database searched and no data found.

None identified

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

Not Prone

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

7.8 Groundwater Flooding Confidence Areas

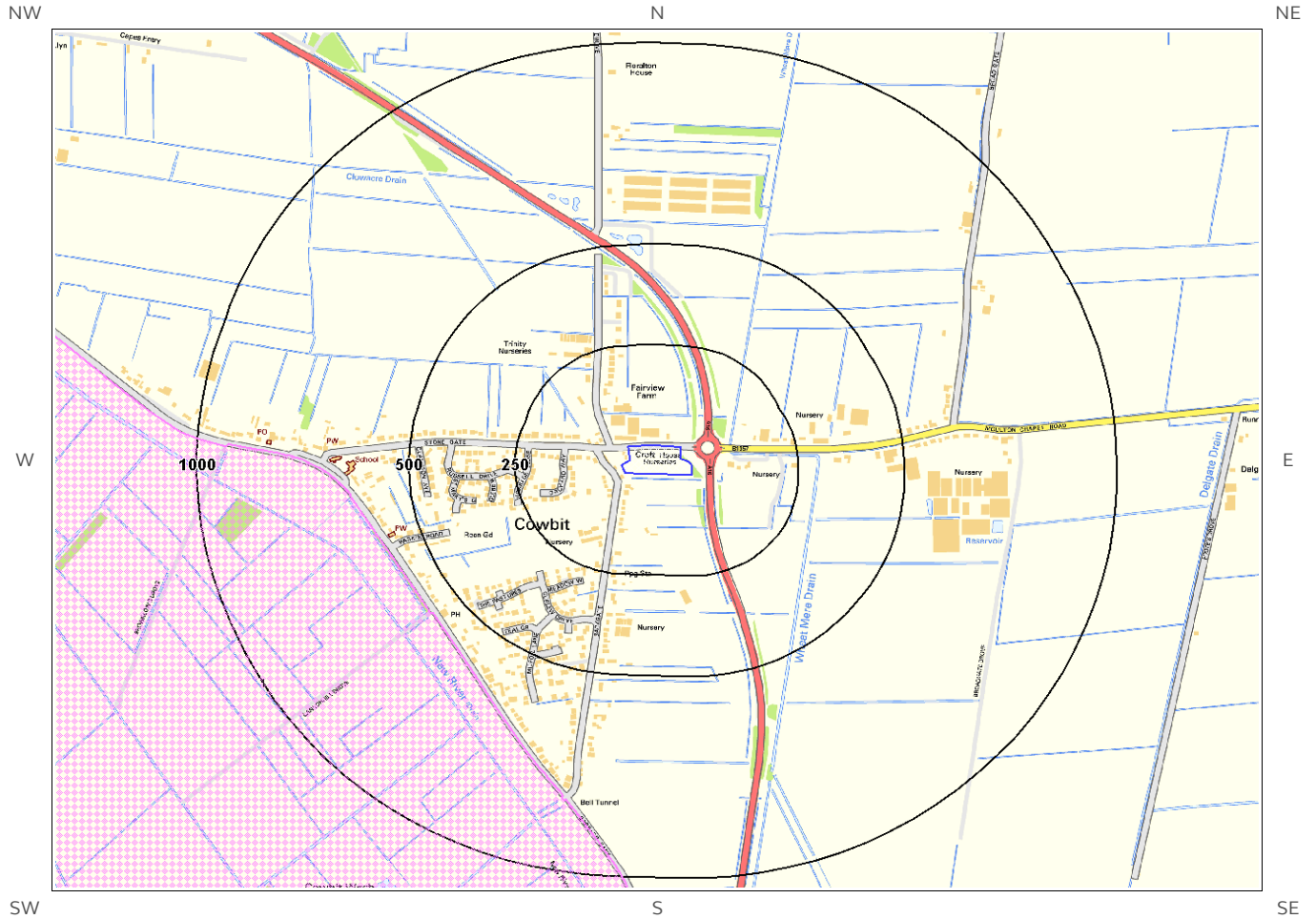
British Geological Survey confidence rating in this result

Not Applicable

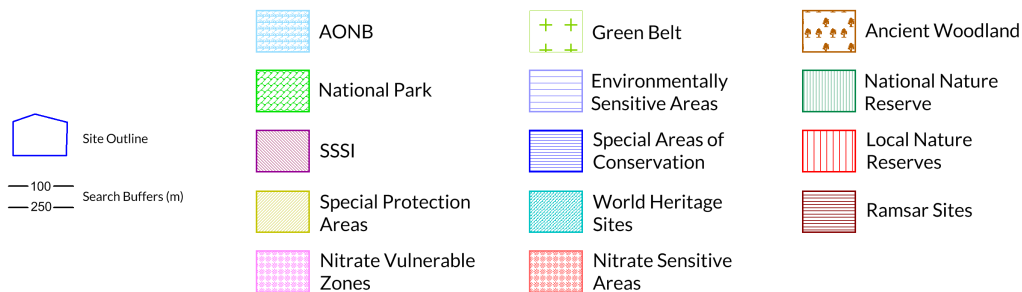
Notes: Groundwater flooding is defined as the emergence of groundwater at the ground surface or the rising of groundwater into man-made ground under conditions where the normal range of groundwater levels is exceeded.

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



© Crown copyright and database rights 2018.
Ordnance Survey license 100035207.



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	570	SW	Existing	DEFRA
Not shown	1683	SW	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.

9.2.1 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

Geo-Matters Limited

Telephone: 0800 0149249

info@geo-matters.com

104 Bondgate, Castle Donington, Derbyshire, DE74 2NR



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



**British
Geological Survey**

NATURAL ENVIRONMENT RESEARCH COUNCIL

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



**Public Health
England**

The Coal Authority

200 Lichfield Lane

Mansfield

Notts NG18 4RG

Tel: 0345 7626 848

DX 716176 Mansfield 5

www.coal.gov.uk



**The Coal
Authority**

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



Acknowledgements: Site of Special Scientific Interest, National Nature Reserve, Ramsar Site, Special Protection Area, Special Area of Conservation data is provided by, and used with the permission of, Natural England/Natural Resources Wales who retain the Copyright and Intellectual Property Rights for the data.

PointX © Database Right/Copyright, Thomson Directories Limited © Copyright Link Interchange Network Limited © Database Right/Copyright and Ordnance Survey © Crown Copyright and/or Database Right. All Rights Reserved. Licence Number [03421028].

This report has been prepared in accordance with the Groundsure Ltd standard Terms and Conditions of business for work of this nature.

Standard Terms and Conditions

Groundsure's Terms and Conditions can be viewed online at this link:

<https://www.groundsure.com/terms-and-conditions-may25-2018>

Geo-Matters Limited

Geo-Matters Ltd, 104 Bondgate,
Castle Donington, DE74 2NR

Report Reference: GEO-M-5233409

Your Reference: GML18201-AT-001

Report Date 13 Jul 2018

Report Delivery Email - pdf
Method:

Geo Insight

Address: SITE OFF CHAPEL ROAD, COWBIT, SPALDING, PE12 6XA

Dear Sir/ Madam,

Thank you for placing your order with Groundsure. Please find enclosed the **Groundsure Geo Insight** as requested.

If you need any further assistance, please do not hesitate to contact our helpline on 08444 159000 quoting the above Groundsure reference number.

Yours faithfully,

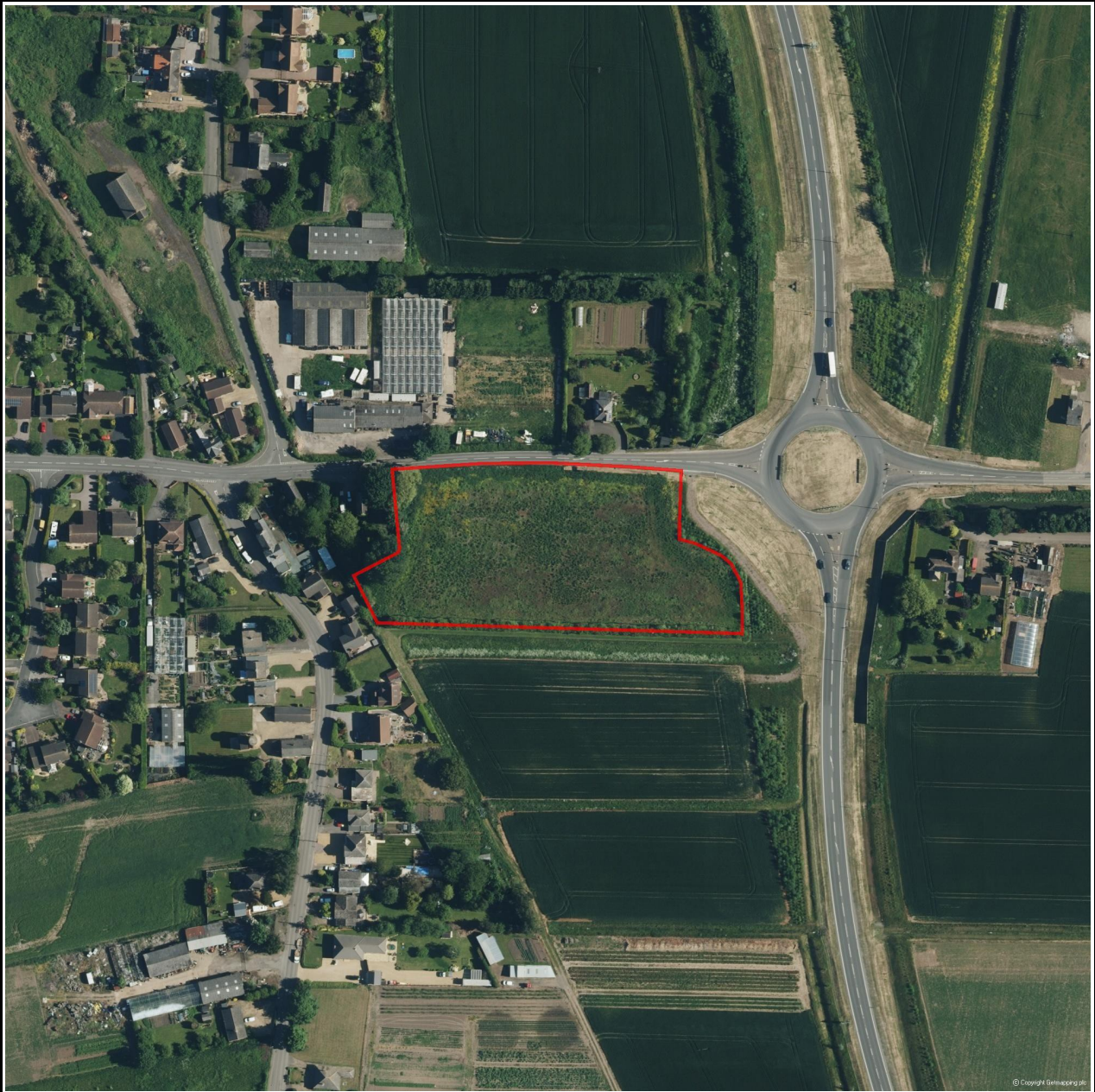
Geo-Matters Limited

Enc.
Groundsure Geo Insight

Address: SITE OFF CHAPEL ROAD, COWBIT, SPALDING, PE12 6XA
Date: 13 Jul 2018
Reference: GEO-M-5233409
Client: Geo-Matters Limited

NW N NE

W E



SW S SE

Aerial Photograph Capture date: 06-Apr-2015
Grid Reference: 526736,318004
Site Size: 0.98ha

Contents Page

Contents Page.....	3
Overview of Findings.....	5
1:10,000 Scale Availability.....	8
Availability of 1:10,000 Scale Geology Mapping.....	9
1 Geology (1:10,000 scale).....	10
1.1 Artificial Ground map (1:10,000 scale).....	10
1. Geology 1:10,000 scale.....	11
1.1 Artificial Ground.....	11
1.2 Superficial Deposits and Landslips map (1:10,000 scale).....	12
1.2 Superficial Deposits and Landslips.....	13
1.2.1 Superficial Deposits/ Drift Geology.....	13
1.2.2 Landslip.....	13
1.3 Bedrock and linear features map (1:10,000 scale).....	14
1.3 Bedrock and linear features.....	15
1.3.1 Bedrock/ Solid Geology.....	15
1.3.2 Linear features.....	15
2 Geology 1:50,000 Scale.....	16
2.1 Artificial Ground map.....	16
2. Geology 1:50,000 scale.....	17
2.1 Artificial Ground.....	17
2.1.1 Artificial/ Made Ground	17
2.1.2 Permeability of Artificial Ground.....	17
2.2 Superficial Deposits and Landslips map (1:50,000 scale).....	18
2.2 Superficial Deposits and Landslips.....	19
2.2.1 Superficial Deposits/ Drift Geology.....	19
2.2.2 Permeability of Superficial Ground	19
2.2.3 Landslip.....	19
2.2.4 Landslip Permeability.....	19
2.3 Bedrock and linear features map (1:50,000 scale).....	20
2.3 Bedrock, Solid Geology & linear features.....	21
2.3.1 Bedrock/Solid Geology.....	21
2.3.2 Permeability of Bedrock Ground.....	21
2.3.3 Linear features.....	21
3 Radon Data.....	22
3.1 Radon Affected Areas.....	22
3.2 Radon Protection.....	22
4 Ground Workings map.....	23
4 Ground Workings.....	24
4.1 Historical Surface Ground Working Features derived from Historical Mapping.....	24
4.2 Historical Underground Working Features derived from Historical Mapping.....	24
4.3 Current Ground Workings.....	25
5 Mining, Extraction & Natural Cavities.....	27
5.1 Historical Mining.....	27
5.2 Coal Mining.....	27
5.3 Johnson Poole and Bloomer.....	27
5.4 Non-Coal Mining.....	27
5.5 Non-Coal Mining Cavities.....	28
5.6 Natural Cavities.....	28
5.7 Brine Extraction.....	28
5.8 Gypsum Extraction.....	28
5.9 Tin Mining.....	28
5.10 Clay Mining.....	29
6 Natural Ground Subsidence.....	30
6.1 Shrink-Swell Clay map.....	30
6.2 Landslides map.....	31
6.3 Ground Dissolution of Soluble Rocks map.....	32
6.4 Compressible Deposits map.....	33
6.5 Collapsible Deposits map.....	34
6.6 Running Sand map.....	35

6 Natural Ground Subsidence.....	36
6.1 Shrink-Swell Clays.....	36
6.2 Landslides.....	36
6.3 Ground Dissolution of Soluble Rocks.....	37
6.4 Compressible Deposits.....	37
6.5 Collapsible Deposits.....	37
6.6 Running Sands.....	37
7 Borehole Records.....	39
8 Estimated Background Soil Chemistry.....	40
9 Railways and Tunnels map.....	41
9 Railways and Tunnels.....	42
9.1 Tunnels	42
9.2 Historical Railway and Tunnel Features	42
9.3 Historical Railways.....	43
9.4 Active Railways.....	43
9.5 Railway Projects.....	44

Overview of Findings

The Groundsure Geo Insight provides high quality geo-environmental information that allows geo-environmental professionals and their clients to make informed decisions and be forewarned of potential ground instability problems that may affect the ground investigation, foundation design and possibly remediation options that could lead to possible additional costs.

The report is based on the BGS 1:50,000 and 1:10,000 Digital Geological Map of Great Britain, BGS Geosure data; BRITPITS database; Non-coal mining data and Borehole Records, Coal Authority data including brine extraction areas, PBA non-coal mining and natural cavities database, Johnson Poole and Bloomer mining data and Groundsure's unique database including historical surface ground and underground workings.

For further details on each dataset, please refer to each individual section in the 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: Geology 1:10,000 Scale

1.1 Artificial Ground	1.1 Is there any Artificial Ground/ Made Ground present beneath the study site at 1:10,000 scale?	No
1.2 Superficial Geology and Landslips	1.2.1 Is there any Superficial Ground/Drift Geology present beneath the study site at 1:10,000 scale?*	Yes
	1.2.2 Are there any records of landslide within 500m of the study site boundary at 1:10,000 scale?	No
1.3 Bedrock, Solid Geology and linear features	1.3.1 For records of Bedrock and Solid Geology beneath the study site* see the detailed findings section.	
	1.3.2 Are there any records of linear features within 500m of the study site boundary at 1:10,000 scale?	No

Section 2: Geology 1:50,000 Scale

2.1 Artificial Ground	2.1.1 Is there any Artificial Ground/ Made Ground present beneath the study site?	No
	2.1.2 Are there any records relating to permeability of artificial ground within the study site*boundary?	No
2.2 Superficial Geology and Landslips	2.2.1 Is there any Superficial Ground/Drift Geology present beneath the study site?*	Yes
	2.2.2 Are there any records of permeability of superficial ground within 500m of the study site?	Yes
	2.2.3 Are there any records of landslide within 500m of the study site boundary?	No
	2.2.4 Are there any records relating to permeability of landslips within the study site* boundary?	No

Section 2: Geology 1:50,000 Scale

2.3 Bedrock, Solid Geology and linear features

2.3.1 For records of Bedrock and Solid Geology beneath the study site* see the detailed findings section.

2.3.2 Are there any records relating to permeability of bedrock ground within the study site boundary?

Yes

2.3.3 Are there any records of linear features within 500m of the study site boundary?

No

Section 3: Radon

3. Radon

3.1 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 property is not in a Radon Affected Area, as less than 1% of properties are above the Action Level.

3.2 Radon Protection

No radon protective measures are necessary.

Section 4: Ground Workings

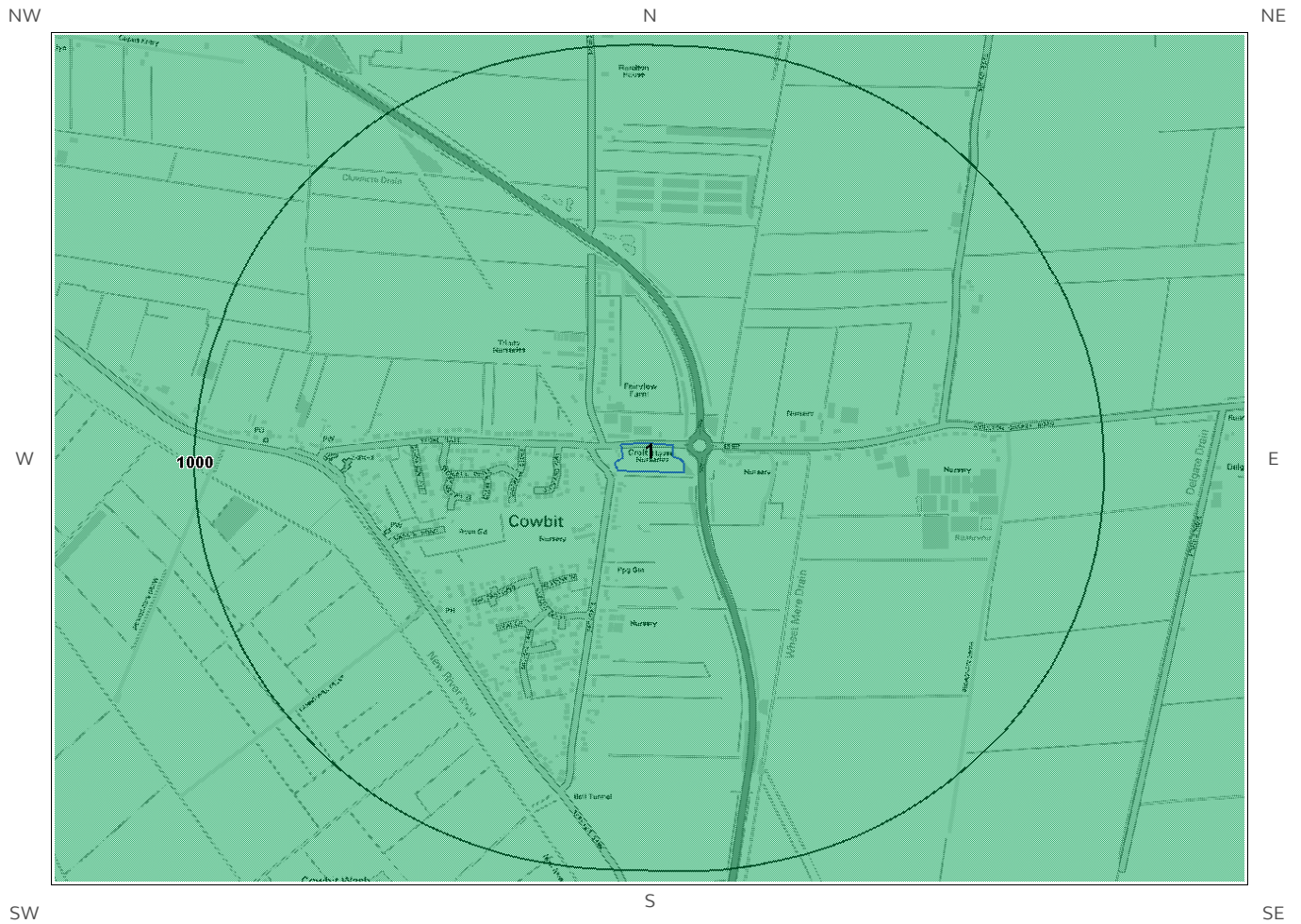
	On-site	0-50m	51-250	251-500	501-1000
4.1 Historical Surface Ground Working Features from Small Scale Mapping	0	1	2	Not Searched	Not Searched
4.2 Historical Underground Workings from Small Scale Mapping	0	0	0	0	4
4.3 Current Ground Workings	0	0	0	0	0

Section 5: Mining, Extraction & Natural Cavities

	On-site	0-50m	51-250	251-500	501-1000
5.1 Historical Mining	0	0	0	0	0
5.2 Coal Mining	0	0	0	0	0
5.3 Johnson Poole and Bloomer Mining Area	0	0	0	0	0
5.4 Non-Coal Mining*	0	0	0	0	0
5.5 Non-Coal Mining Cavities	0	0	0	0	0
5.5 Natural Cavities	0	0	0	0	0

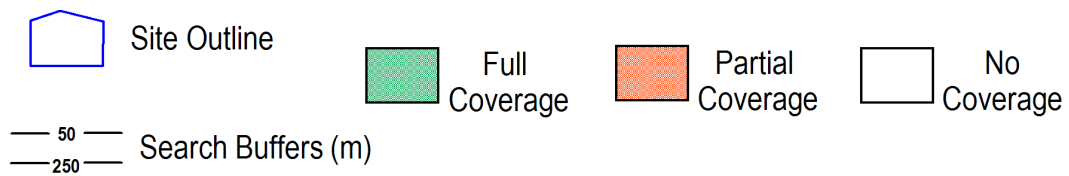
Section 5: Mining, Extraction & Natural Cavities	On-site	0-50m	51-250	251-500	501-1000
5.6 Brine Extraction	0	0	0	0	0
5.7 Gypsum Extraction	0	0	0	0	0
5.8 Tin Mining	0	0	0	0	0
5.9 Clay Mining	0	0	0	0	0
Section 6: Natural Ground Subsidence	On-site				
6.1 Shrink-Swell Clay	Low				
6.2 Landslides	Very Low				
6.3 Ground Dissolution of Soluble Rocks	Negligible				
6.4 Compressible Deposits	Moderate				
6.5 Collapsible Deposits	Negligible				
6.5 Running Sand	Moderate				
Section 7: Borehole Records	On-site	0-50m	51-250		
7 BGS Recorded Boreholes	0	1	4		
Section 8: Estimated Background Soil Chemistry	On-site	0-50m	51-250		
8 Records of Background Soil Chemistry	2	0	0		
Section 9: Railways and Tunnels	On-site	0-50m	51-250	250-500	
9.1 Tunnels	0	0	0	Not Searched	
9.2 Historical Railway and Tunnel Features	0	0	12	Not Searched	
9.3 Historical Railways	0	1	0	Not Searched	
9.4 Active Railways	0	0	0	Not Searched	
9.5 Railway Projects	0	0	0	0	

1:10,000 Scale Availability



1_10,000 Availability Legend

© Crown copyright and database rights 2018.
Ordnance Survey license 100035207.



Availability of 1:10,000 Scale Geology Mapping

The following information represents the availability of the key components of the 1:10,000 scale geological data.

ID	Distance	Artificial Coverage	Superficial Coverage	Bedrock Coverage	Mass Movement Coverage
1	0.0	No deposits are mapped	Full	Full	No coverage
N2	1654.0	No deposits are mapped	Full	Full	No coverage
N3	1960.0	No deposits are mapped	No coverage	No coverage	No coverage

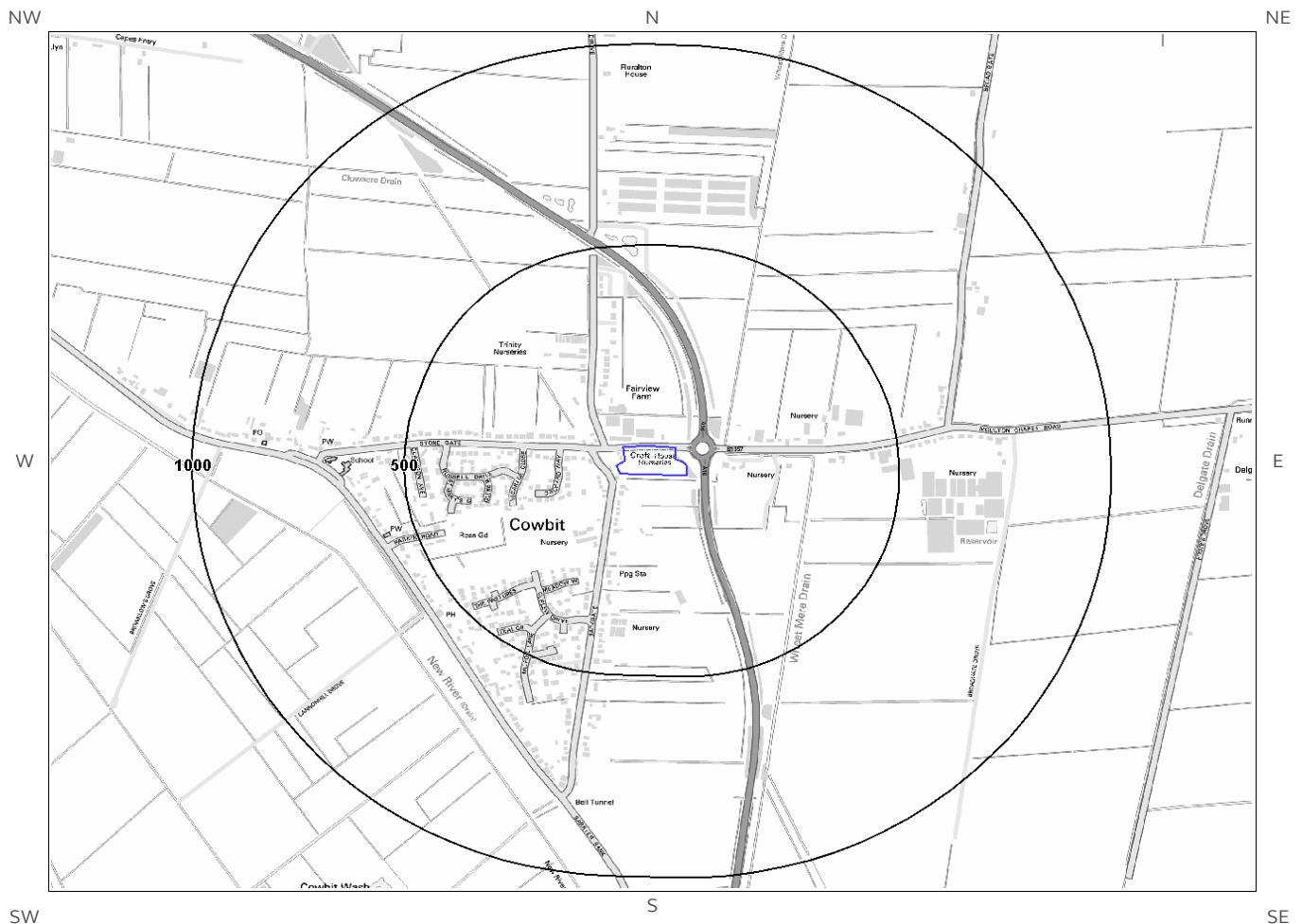
Guidance: The 1:10,000 scale geological interpretation is the most detailed generally available from BGS and is the scale at which most geological surveying is carried out in the field. The database is presented as four types of geology (artificial, mass movement, superficial and bedrock), although not all themes are mapped or available on every map sheet. Therefore a coverage layer showing the availability of the four themes is presented above.

The definitions of coverage are as follows:

Geology	Full Coverage	Partial Coverage	No Coverage
Bedrock	The whole tile has been mapped	Some but not all the tile has been mapped	No coverage
Superficial	The whole tile has been mapped	Some but not all of the tile has been mapped	No coverage
Artificial	Some deposits are mapped on this tile	-	No deposits are mapped
Mass Movement	Some deposits are mapped on this tile	-	No coverage

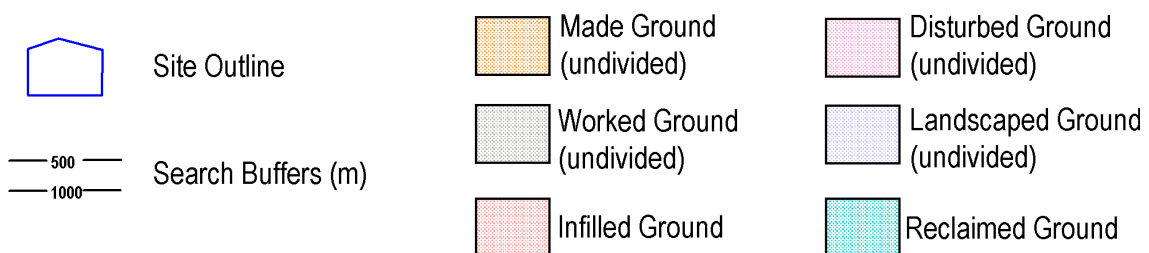
1 Geology (1:10,000 scale).

1.1 Artificial Ground map (1:10,000 scale)



Artificial Ground Legend

© Crown copyright and database rights 2018.
Ordnance Survey license 100035207.



1. Geology 1:10,000 scale

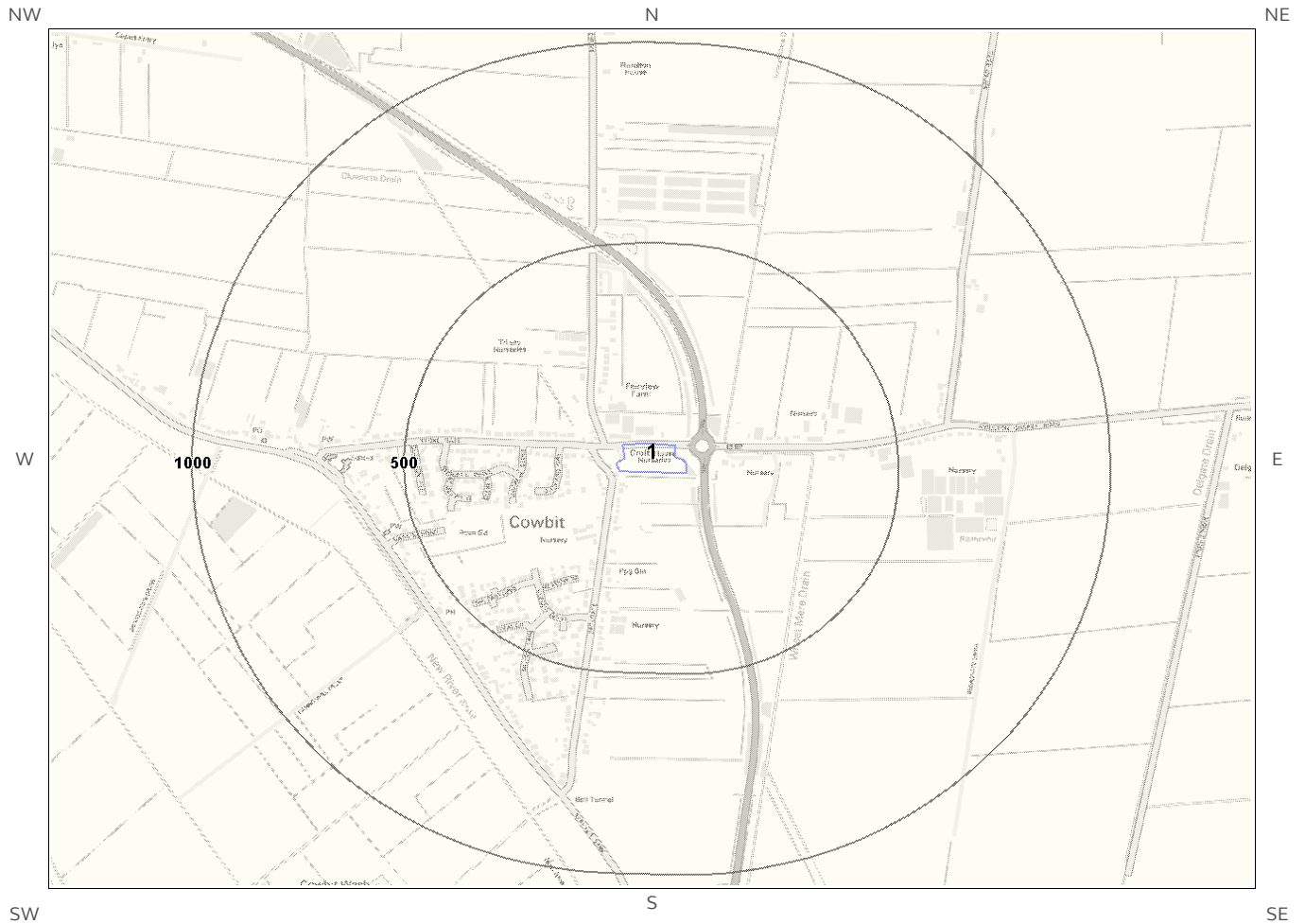
1.1 Artificial Ground

The following geological information represented on the mapping is derived from 1:10,000 scale BGS Geological mapping.

Are there any records of Artificial/ Made Ground within 500m of the study site boundary at 1:10,000 scale? No

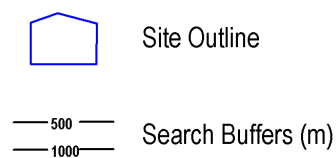
Database searched and no data found.

1.2 Superficial Deposits and Landslips map (1:10,000 scale)



Artificial Ground Legend

© Crown copyright and database rights 2018.
Ordnance Survey license 100035207.



1.2 Superficial Deposits and Landslips

The following geological information represented on the mapping is derived from 1:10,000 scale BGS Geological mapping

1.2.1 Superficial Deposits/ Drift Geology

Are there any records of Superficial Deposits/ Drift Geology within 500m of the study site boundary at 1:10,000 scale? Yes

ID	Distance (m)	Direction	LEX Code	Description	Rock Description
1	0.0	On Site	SUPNM-UNKNOWN	Superficial Theme Not Mapped [for Digital Map Use Only] - Unknown/unclassified Entry	Unknown/unclassified Entry

1.2.2 Landslip

Are there any records of Landslip within 500m of the study site boundary at 1:10,000 scale? No

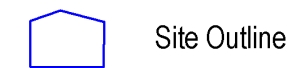
Database searched and no data found.

The geology map for the site and surrounding area are extracted from the BGS Digital Geological Map of Great Britain at 1:10,000 scale

This Geology shows the main components as discrete layers, these are: Artificial / Made Ground, Superficial / Drift Geology and Landslips. These are all displayed with the BGS Lexicon code for the rock unit and BGS sheet number. Not all of the main geological components have nationwide coverage.

A map of the Cowbit Nurseries area, showing a 1000m and 500m buffer around the site. The map includes labels for various locations such as Cowbit Nurseries, Cowbit Farm, and Cowbit Nurseries. The 1000m buffer is indicated by a large circle, and the 500m buffer is indicated by a smaller circle. The map also shows the River Great Ouse and the A10 road.

© Crown copyright and database rights 2018.
Ordnance Survey license 100035207.



1.3 Bedrock and linear features

The following geological information represented on the mapping is derived from 1:10,000 scale BGS Geological mapping.

1.3.1 Bedrock/ Solid Geology

Records of Bedrock/Solid Geology within 500m of the study site boundary at 1:10,000 scale.

ID	Distance (m)	Direction	LEX Code	Description	Rock Age
1	0.0	On Site	BEDNM-UNKNOWN	Bedrock Theme Not Mapped [for Digital Map Use Only] - Unknown/unclassified Entry	No Details

1.3.2 Linear features

Are there any records of linear features within 500m of the study site boundary at 1:10,000 scale? No

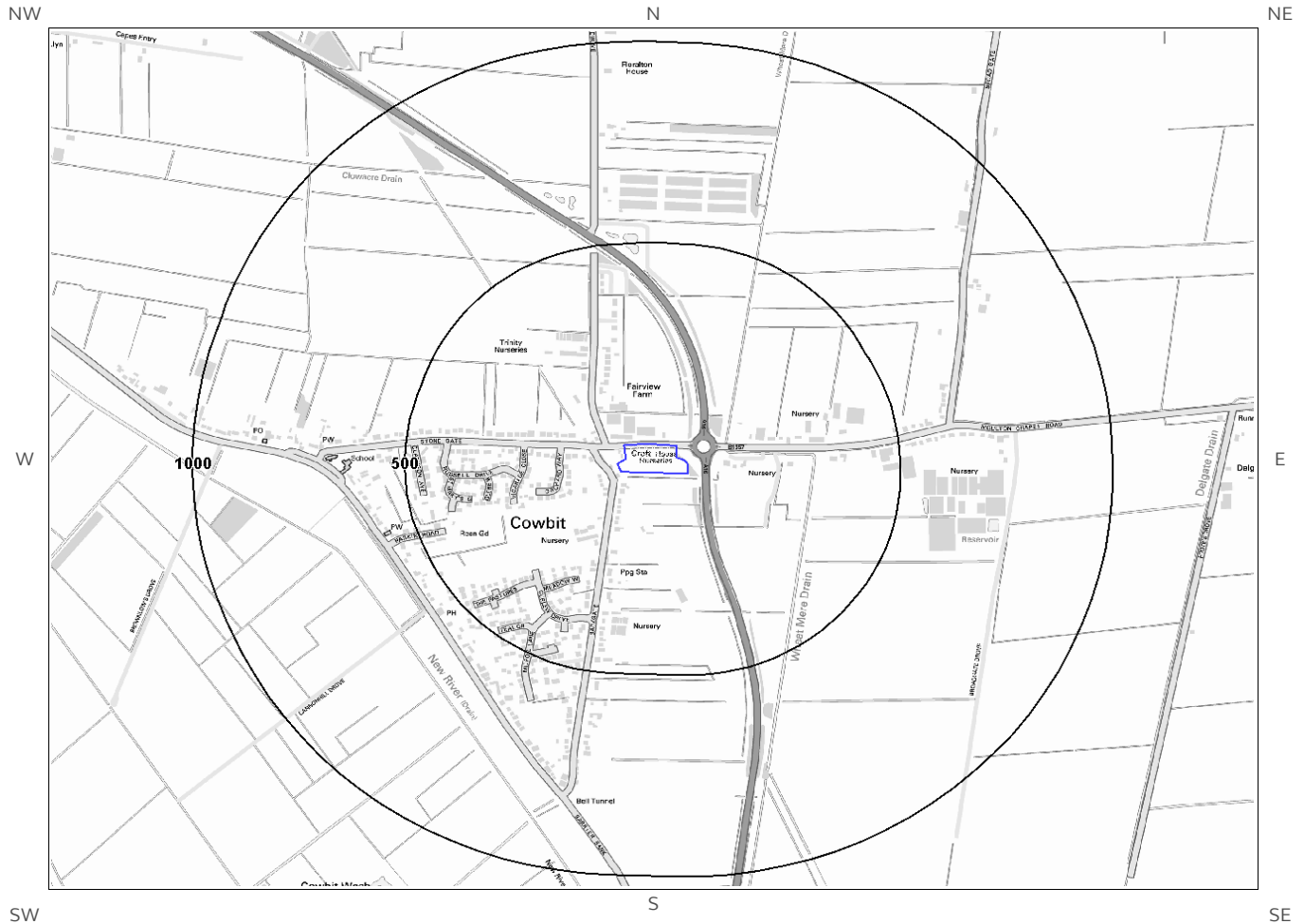
Database searched and no data found at this scale.

The geology map for the site and surrounding area are extracted from the BGS Digital Geological Map of great Britain at 1:10,000 scale.

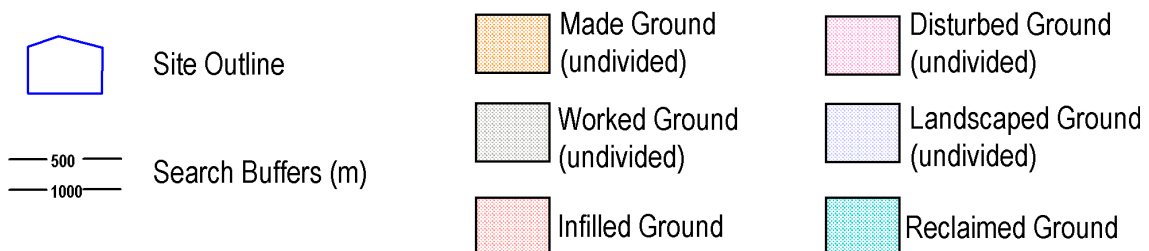
This Geology shows the main components as discrete layers, these are: Bedrock/ Solid Geology and linear features such as faults. These are all displayed with the BGS Lexicon code for the rock unit and BGS sheet number. Not all of the main geological components have nationwide coverage.

2 Geology 1:50,000 Scale

2.1 Artificial Ground map



© Crown copyright and database rights 2018.
Ordnance Survey license 100035207.



2. Geology 1:50,000 scale

2.1 Artificial Ground

The following geological information represented on the mapping is derived from 1:50,000 scale BGS Geological mapping, Sheet No: 144

2.1.1 Artificial/ Made Ground

Are there any records of Artificial/ Made Ground within 500m of the study site boundary? No

Database searched and no data found.

2.1.2 Permeability of Artificial Ground

Are there any records relating to permeability of artificial ground within the study site boundary? No

Database searched and no data found.

Site Outline

— 500 —
— 1000 — Search Buffers (m)

2.2 Superficial Deposits and Landslips

2.2.1 Superficial Deposits/ Drift Geology

Are there any records of Superficial Deposits/ Drift Geology within 500m of the study site boundary? Yes

ID	Distance	Direction	LEX Code	Description	Rock Description
1	0.0	On Site	TFD-XCZ	TIDAL FLAT DEPOSITS	CLAY AND SILT

2.2.2 Permeability of Superficial Ground

Are there any records relating to permeability of superficial ground within the study site boundary? Yes

Distance (m)	Direction	Flow Type	Maximum Permeability	Minimum Permeability
0.0	On Site	Intergranular	Low	Very Low

2.2.3 Landslip

Are there any records of Landslip within 500m of the study site boundary? No

Database searched and no data found.

The geology map for the site and surrounding area are extracted from the BGS Digital Geological Map of Great Britain at 1:50,000 scale.

This Geology shows the main components as discrete layers, there are: Artificial/ Made Ground, Superficial/ Drift Geology and Landslips. These are all displayed with the BGS Lexicon code for the rock unit and BGS sheet number. Not all of the main geological components have nationwide coverage.

2.2.4 Landslip Permeability

Are there any records relating to permeability of landslips within the study site boundary? No

Database searched and no data found.

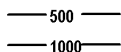
2.3 Bedrock and linear features map (1:50,000 scale)



© Crown copyright and database rights 2018.
Ordnance Survey license 100035207.



Site Outline



Search Buffers (m)

2.3 Bedrock, Solid Geology & linear features

The following geological information represented on the mapping is derived from 1:50,000 scale BGS Geological mapping, Sheet No: 144

2.3.1 Bedrock/Solid Geology

Records of Bedrock/Solid Geology within 500m of the study site boundary:

ID	Distance	Direction	LEX Code	Rock Description	Rock Age
1	0.0	On Site	OXF-MDST	OXFORD CLAY FORMATION - MUDSTONE	CALLOVIAN

2.3.2 Permeability of Bedrock Ground

Are there any records relating to permeability of bedrock ground within the study site boundary? Yes

Distance	Direction	Flow Type	Maximum Permeability	Minimum Permeability
0.0	On Site	Fracture	Low	Very Low

2.3.3 Linear features

Are there any records of linear features within 500m of the study site boundary? No

Database searched and no data found.

The geology map for the site and surrounding area are extracted from the BGS Digital Geological Map of Great Britain at 1:50,000 scale.

This Geology shows the main components as discrete layers, these are: Bedrock/Solid Geology and linear features such as faults. These are all displayed with the BGS Lexicon code for the rock unit and BGS sheet number. Not all of the main geological components have nation wide coverage.

3 Radon Data

3.1 Radon Affected Areas

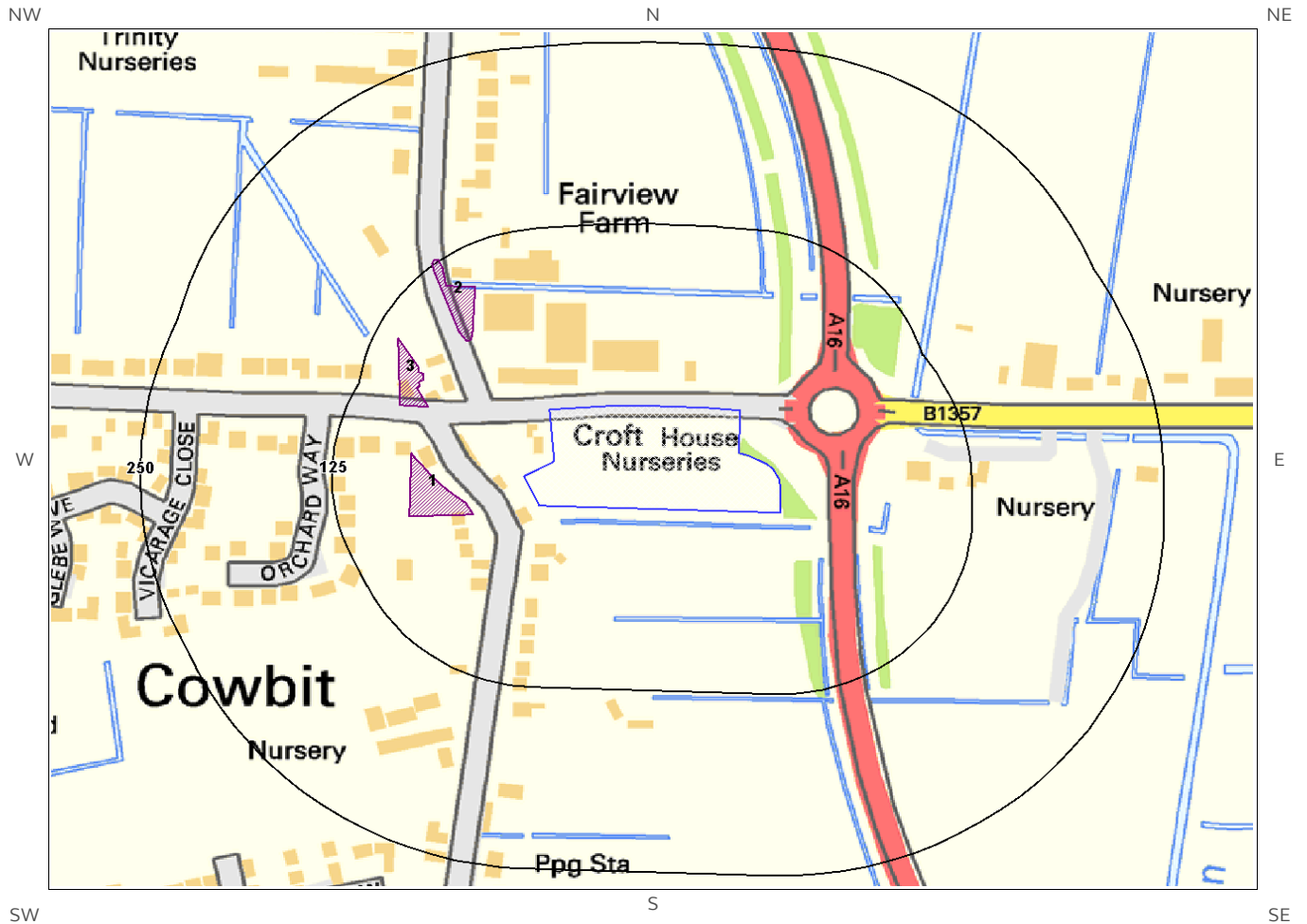
Is the property in a Radon Affected Area as defined by the Health Protection Agency (HPA) and if so what percentage of homes are above the Action Level? The property is not in a Radon Affected Area, as less than 1% of properties are above the Action Level.

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.

3.2 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.

4 Ground Workings map



Ground Workings Legend

© Crown copyright and database rights 2018.
Ordnance Survey license 100035207.

- | | | | |
|--|--------------------|--|----------------------------------|
| | Site Outline | | Historic Surface Ground Workings |
| | Search Buffers (m) | | Historic Underground Workings |
| | | | Current Ground Workings |

4 Ground Workings

4.1 Historical Surface Ground Working Features derived from Historical Mapping

This dataset is based on Groundsure's unique Historical Land Use Database derived from 1:10,560 and 1:10,000 scale historical mapping

Are there any Historical Surface Ground Working Features within 250m of the study site boundary? Yes

ID	Distance (m)	Direction	NGR	Use	Date
1	41.0	SW	526600 317985	Pond	1887
2	70.0	NW	526608 318113	Pond	1887
3	78.0	NW	526582 318063	Pond	1887

4.2 Historical Underground Working Features derived from Historical Mapping

This data is derived from the Groundsure unique Historical Land Use Database. It contains data derived from 1:10,000 and 1:10,560 historical Ordnance Survey Mapping and includes some natural topographical features (Shake Holes for example) as well as manmade features that may have implications for ground stability. Underground and mining features have been identified from surface features such as shafts. The distance that these extend underground is not shown.

Are there any Historical Underground Working Features within 1000m of the study site boundary? Yes

The following Historical Underground Working Features are provided by Groundsure:

ID	Distance (m)	Direction	NGR	Use	Date
Not shown	792.0	S	526530 317171	Tunnel	1989
Not shown	792.0	S	526530 317171	Tunnel	1977
Not shown	809.0	S	526528 317159	Tunnel	1951
Not shown	811.0	S	526527 317157	Tunnel	1951

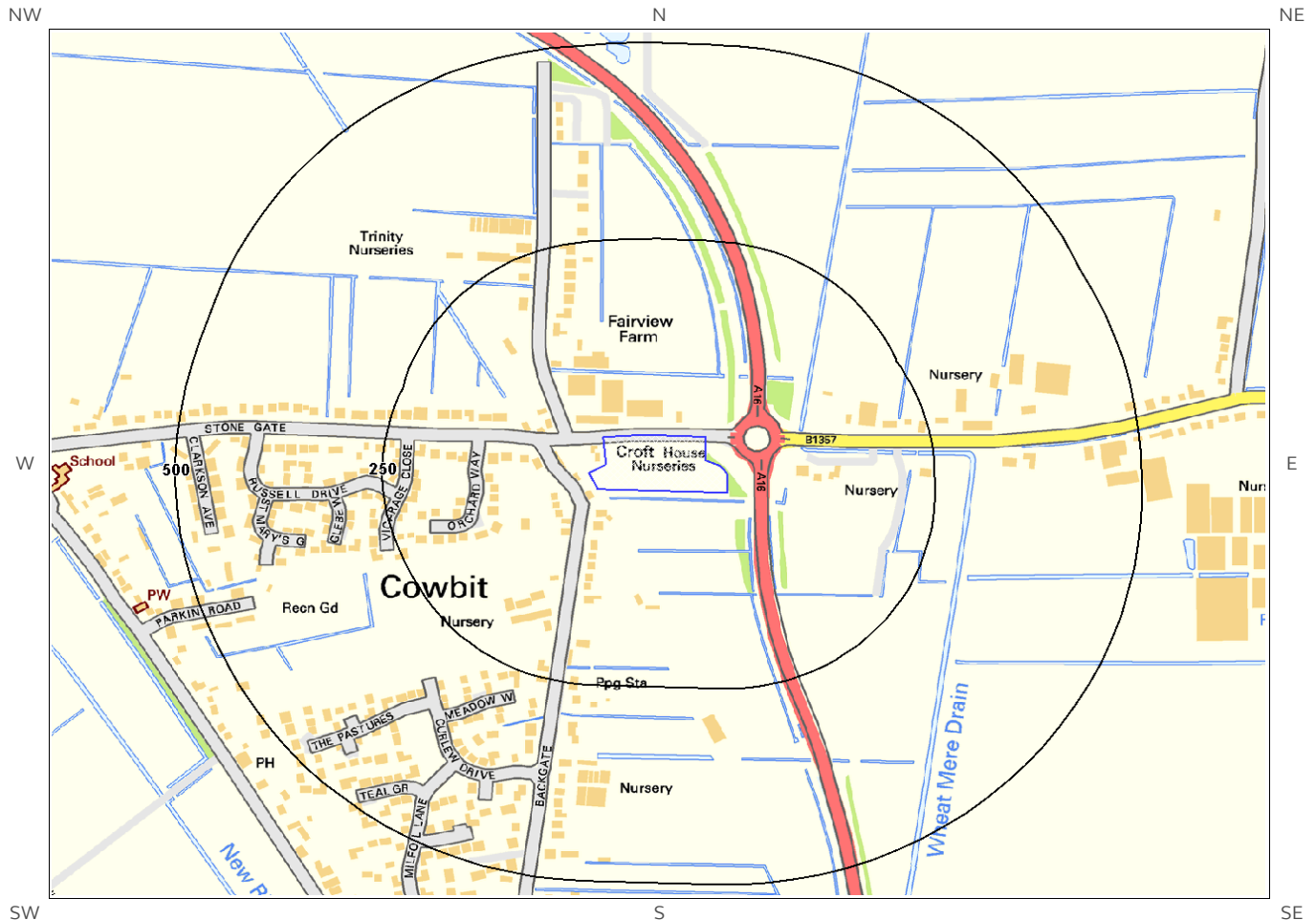
4.3 Current Ground Workings

This dataset is derived from the BGS BRITPITS database covering active; inactive mines; quarries; oil wells; gas wells and mineral wharves; and rail deposits throughout the British Isles.

Are there any BGS Current Ground Workings within 1000m of the study site boundary? No

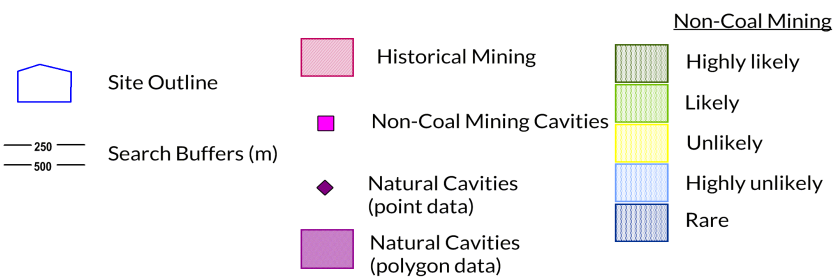
Database searched and no data found.

5 Mining, Extraction & Natural Cavities map



Mining, Extraction and Natural Cavities Legend

© Crown copyright and database rights 2018.
Ordnance Survey license 100035207.



5 Mining, Extraction & Natural Cavities

5.1 Historical Mining

This dataset is derived from Groundsure unique Historical Land-use Database that are indicative of mining or extraction activities.

Are there any Historical Mining areas within 1000m of the study site boundary? No

Database searched and no data found.

5.2 Coal Mining

This dataset provides information as to whether the study site lies within a known coal mining affected area as defined by the coal authority.

Are there any Coal Mining areas within 1000m of the study site boundary? No

Database searched and no data found.

5.3 Johnson Poole and Bloomer

This dataset provides information as to whether the study site lies within an area where JPB hold information relating to mining.

Are there any JPB Mining areas within 1000m of the study site boundary? No

The following information provided by JPB is not represented on mapping: Database searched and no data found.

5.4 Non-Coal Mining

This dataset provides information as to whether the study site lies within an area which may have been subject to non-coal historic mining.

Are there any Non-Coal Mining areas within 1000m of the study site boundary? No

Database searched and no data found.

5.5 Non-Coal Mining Cavities

This dataset provides information from the Peter Brett Associates (PBA) mining cavities database (compiled for the national study entitled "Review of mining instability in Great Britain, 1990" PBA has also continued adding to this database) on mineral extraction by mining.

Are there any Non-Coal Mining cavities within 1000m of the study site boundary? No

Database searched and no data found.

5.6 Natural Cavities

This dataset provides information based on the Peter Brett Associates natural cavities database. The dataset is made up of points and polygons. Where polygons are used these represent an area in which it is expected the cavities could be found. It does not indicate that cavities are present everywhere within the polygon, and caution should be used in the interpretation of this data.

Are there any Natural Cavities within 1000m of the study site boundary? No

Database searched and no data found.

5.7 Brine Extraction

This data provides information from the Coal Authority issued on behalf of the Cheshire Brine Subsidence Compensation Board.

Are there any Brine Extraction areas within 1000m of the study site boundary? No

Database searched and no data found.

5.8 Gypsum Extraction

This dataset provides information on Gypsum extraction from British Gypsum records.

Are there any Gypsum Extraction areas within 1000m of the study site boundary? No

Database searched and no data found.

5.9 Tin Mining

This dataset provides information on tin mining areas and is derived from tin mining records. This search is based upon postcode information to a sector level..

Are there any Tin Mining areas within 1000m of the study site boundary? No

Database searched and no data found.

This dataset provides information on Kaolin and Ball Clay mining from relevant mining records.

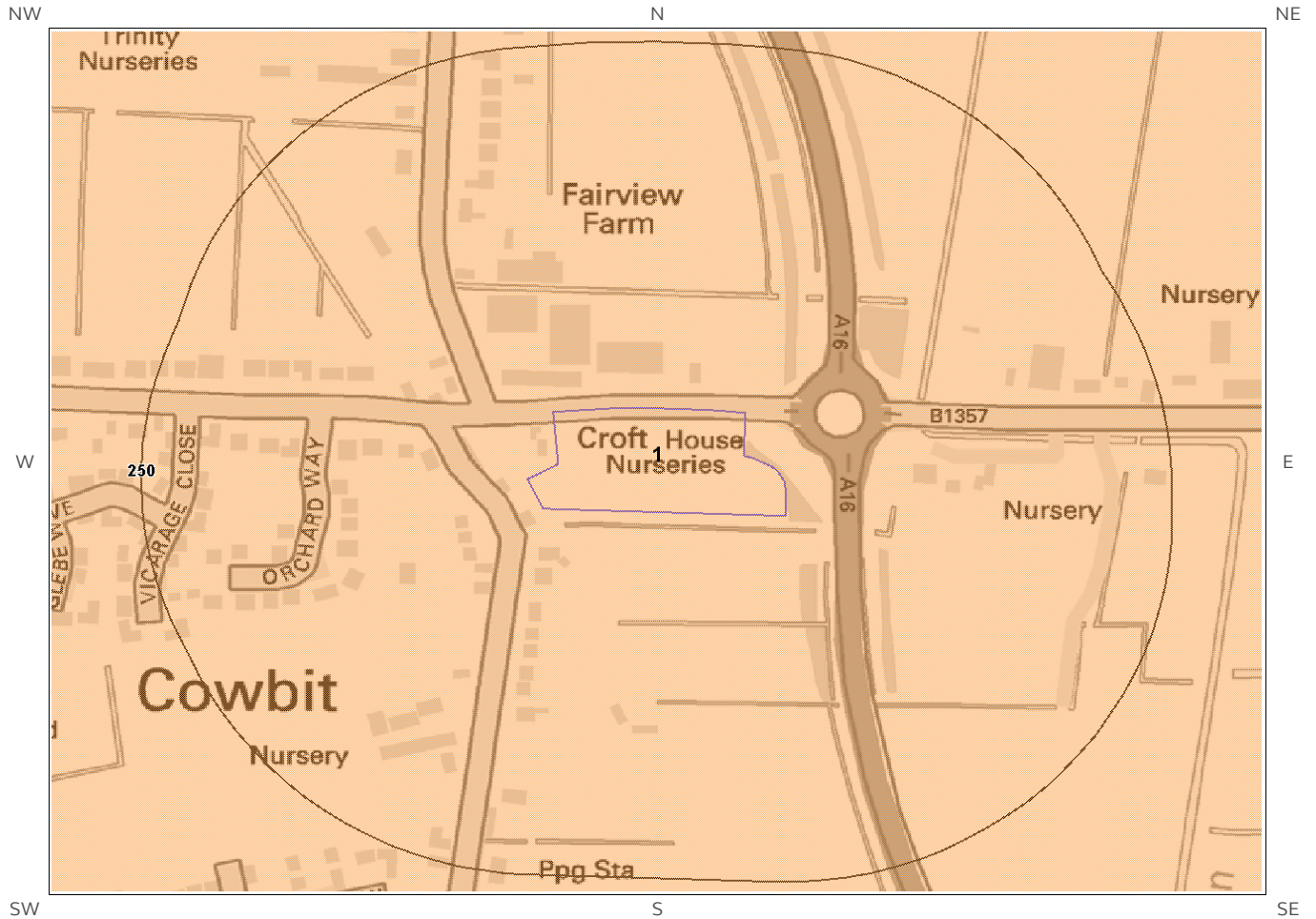
Are there any Clay Mining areas within 1000m of the study site boundary?

No

Database searched and no data found.

6 Natural Ground Subsidence

6.1 Shrink-Swell Clay map

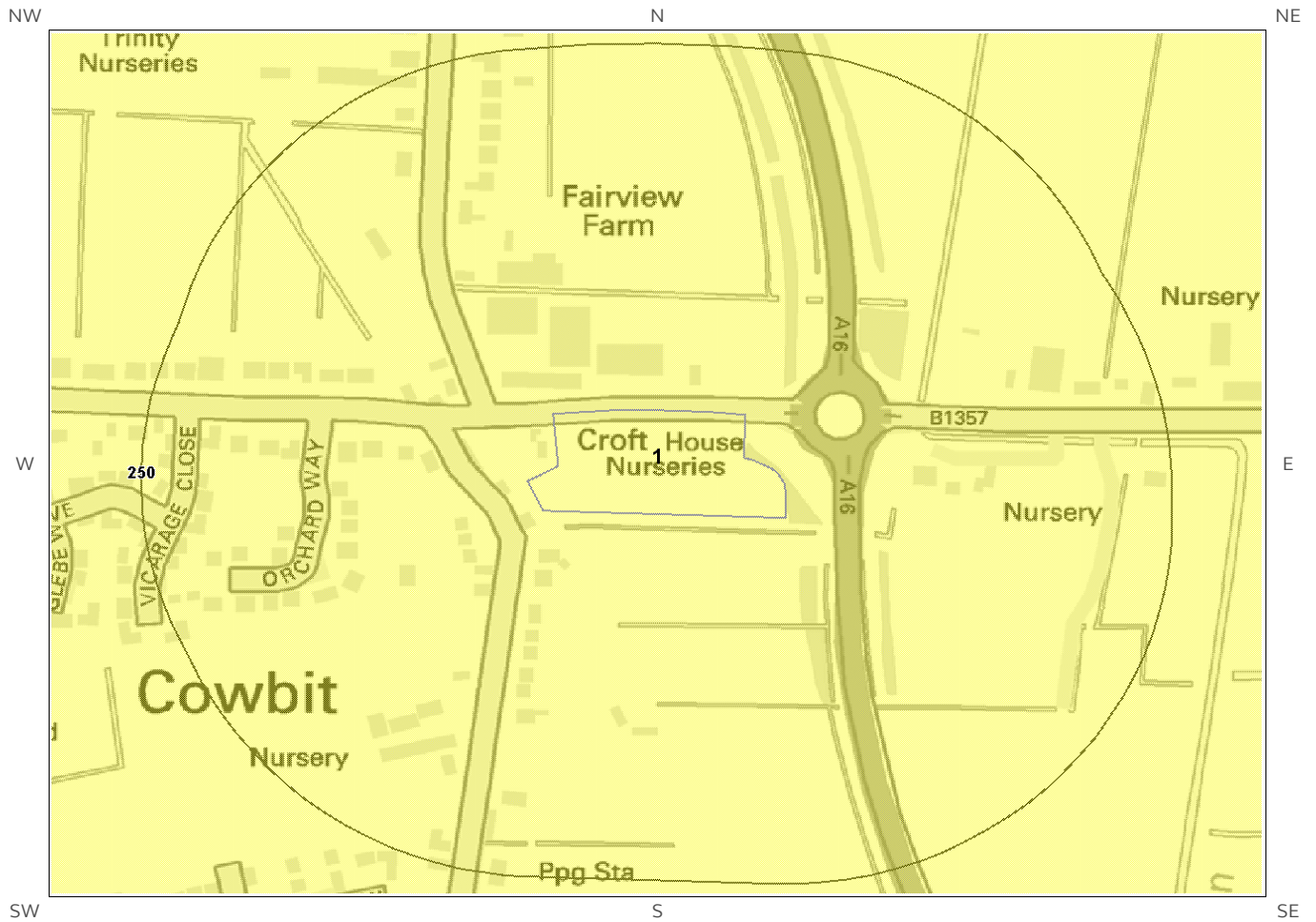


Shrink Swell Clay Legend

© Crown copyright and database rights 2018.
Ordnance Survey license 100035207.



6.2 Landslides map

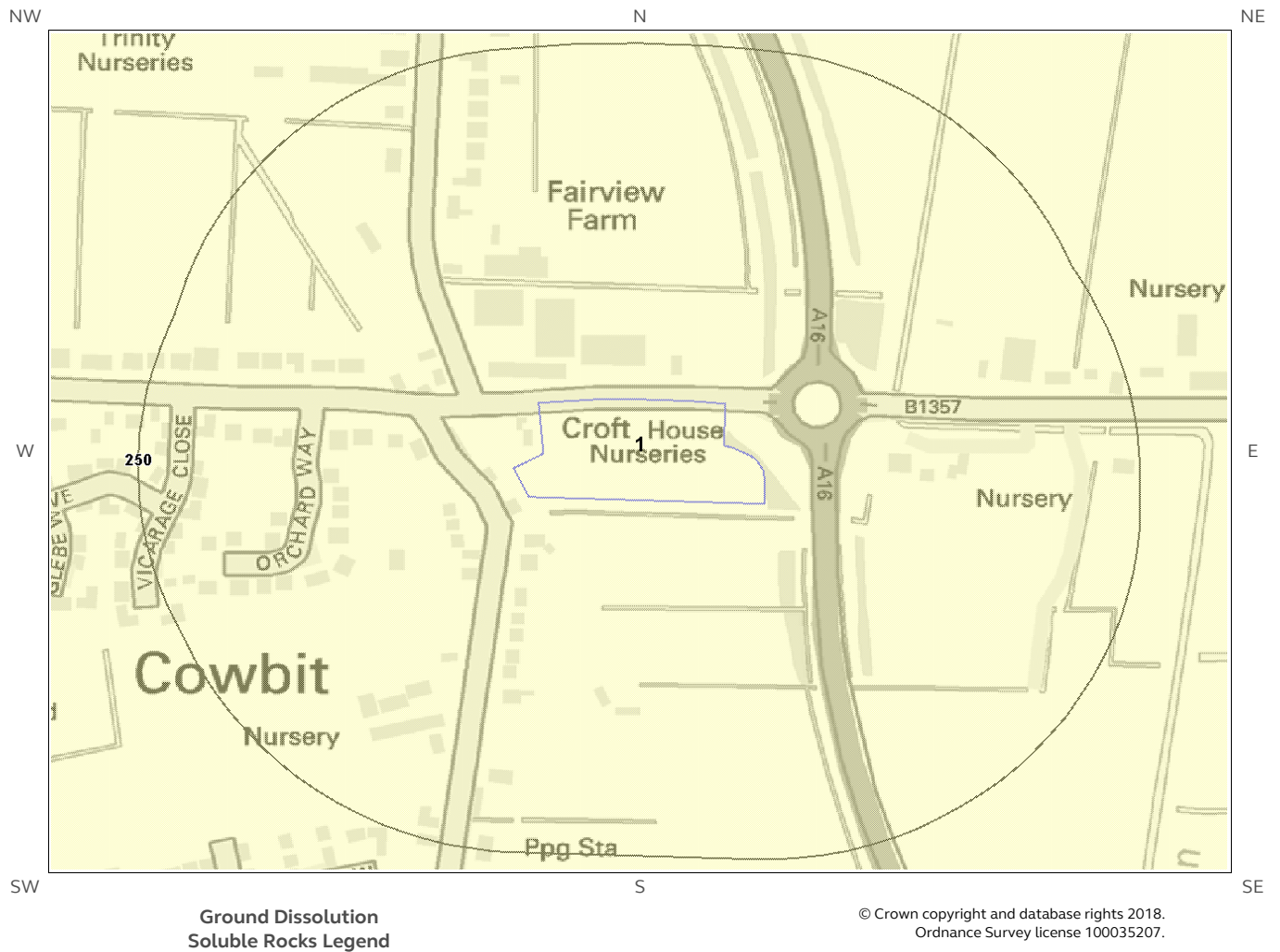


Landslides Legend

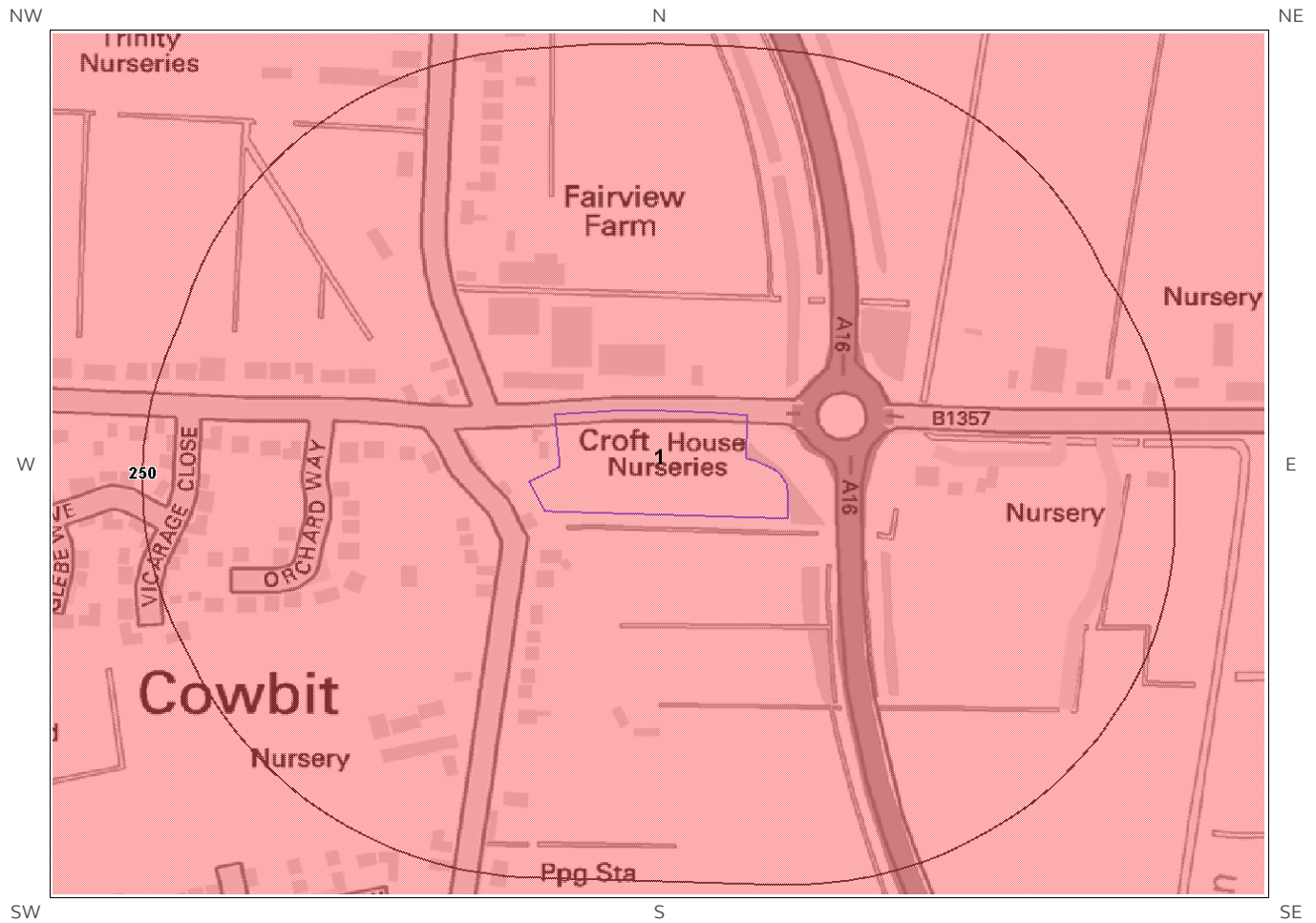
© Crown copyright and database rights 2018.
Ordnance Survey license 100035207.



6.3 Ground Dissolution of Soluble Rocks map



6.4 Compressible Deposits map

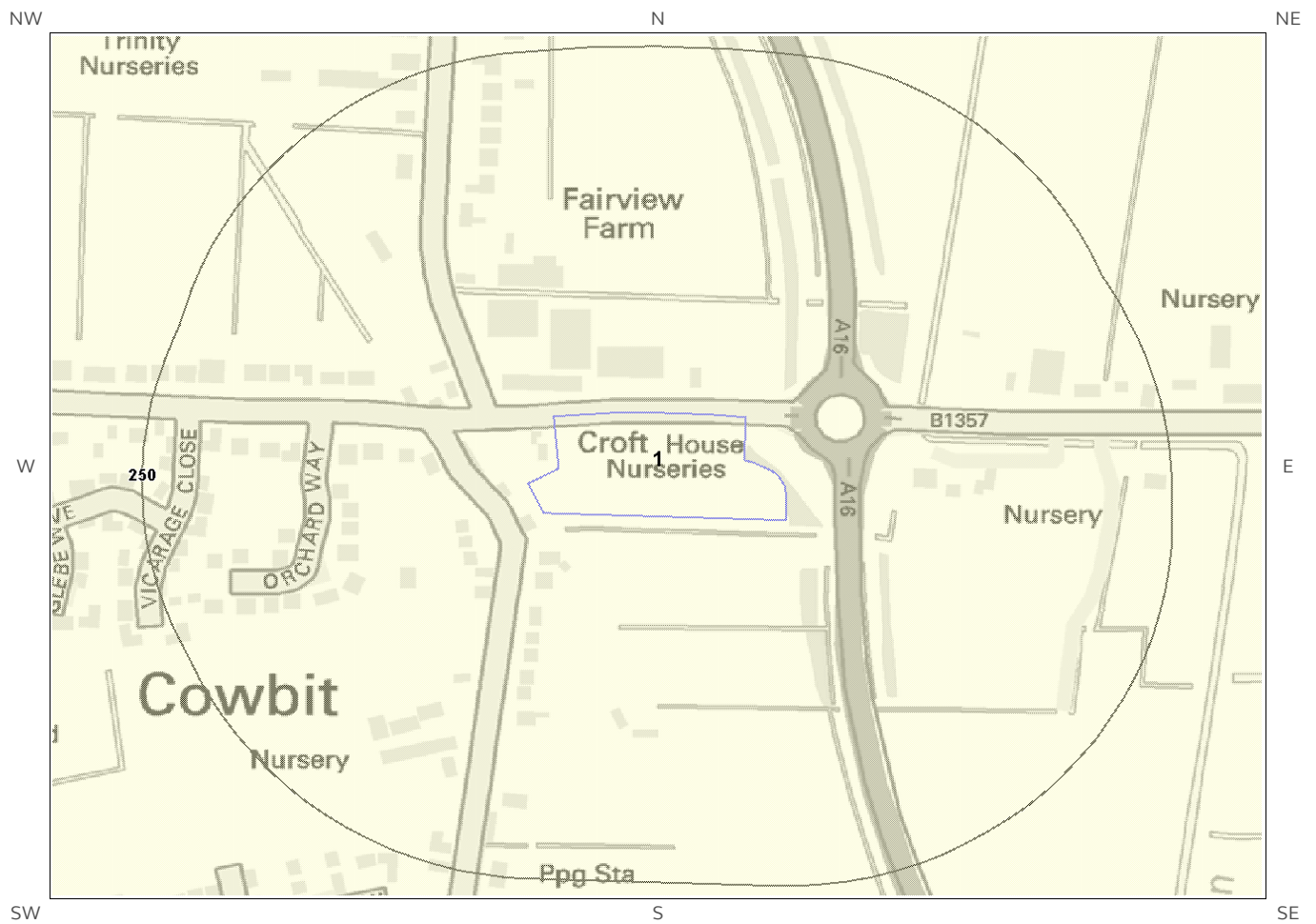


Compressible Deposits Legend

© Crown copyright and database rights 2018.
Ordnance Survey license 100035207.



6.5 Collapsible Deposits map

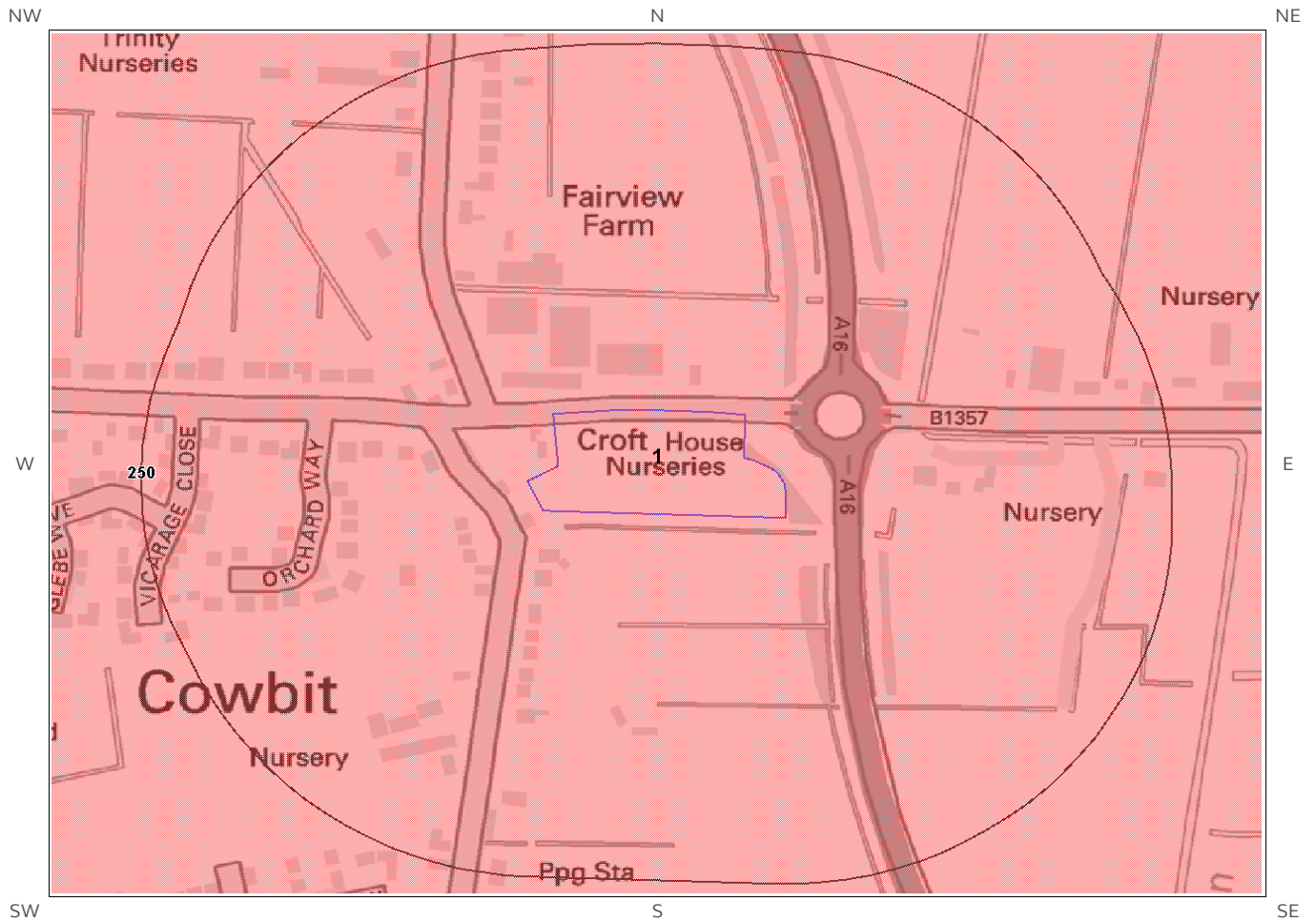


Collapsible Deposits Legend

© Crown copyright and database rights 2018.
Ordnance Survey license 100035207.



6.6 Running Sand map



Running Sand Legend

© Crown copyright and database rights 2018.
Ordnance Survey license 100035207.



6 Natural Ground Subsidence

The National Ground Subsidence rating is obtained through the 6 natural ground stability hazard datasets, which are supplied by the British Geological Survey (BGS).

The following GeoSure data represented on the mapping is derived from the BGS Digital Geological map of Great Britain at 1:50,000 scale.

What is the maximum hazard rating of natural subsidence within the study site* boundary? **Moderate**

6.1 Shrink-Swell Clays

The following Shrink Swell information provided by the British Geological Survey:

ID	Distance (m)	Direction	Hazard Rating	Details
1	0.0	On Site	Low	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.

6.2 Landslides

The following Landslides information provided by the British Geological Survey:

ID	Distance (m)	Direction	Hazard Rating	Details
1	0.0	On Site	Very Low	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.

* This includes an automatically generated 50m buffer zone around the site

6.3 Ground Dissolution of Soluble Rocks

The following Ground Dissolution information provided by the British Geological Survey:

ID	Distance (m)	Direction	Hazard Rating	Details
1	0.0	On Site	Negligible	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.

6.4 Compressible Deposits

The following Compressible Deposits information provided by the British Geological Survey:

ID	Distance (m)	Direction	Hazard Rating	Details
1	0.0	On Site	Moderate	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.

6.5 Collapsible Deposits

The following Collapsible Rocks information provided by the British Geological Survey:

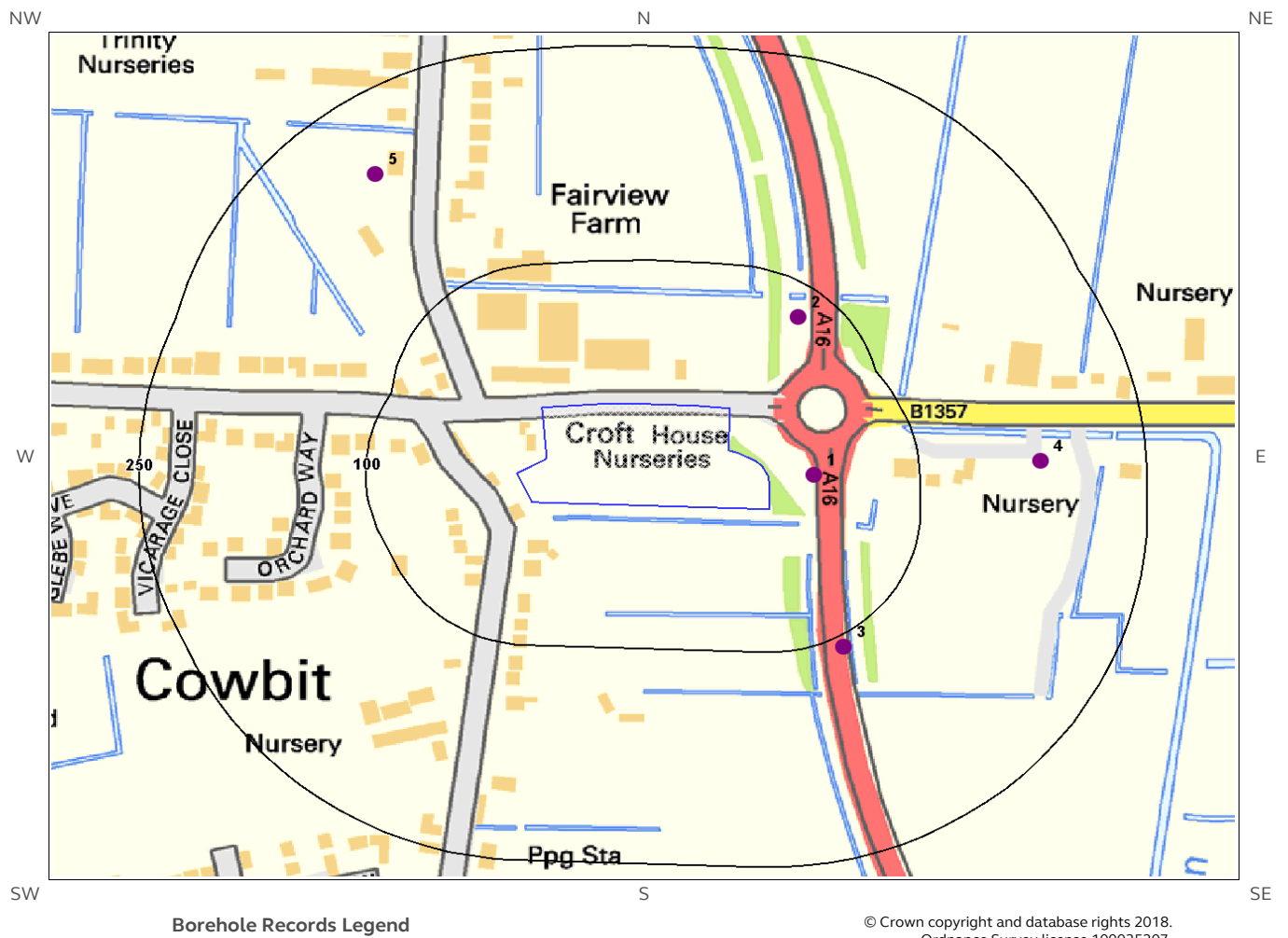
ID	Distance (m)	Direction	Hazard Rating	Details
1	0.0	On Site	Negligible	No indicators for collapsible deposits identified. No actions required to avoid problems due to collapsible deposits. No special ground investigation required, or increased construction costs or increased financial risk due to potential problems with collapsible deposits.

6.6 Running Sands

The following Running Sands information provided by the British Geological Survey:

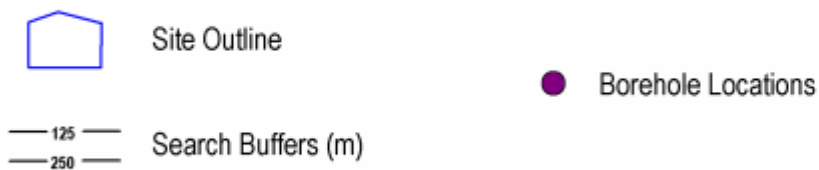
ID	Distance (m)	Direction	Hazard Rating	Details
1	0.0	On Site	Moderate	Significant potential for running sand problems with relatively small changes in ground conditions. Avoid large amounts of water entering the ground (for example through pipe leakage or soak-aways). Do not dig (deep) holes into saturated 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.

7 Borehole Records map



Borehole Records Legend

© Crown copyright and database rights 2018.
Ordnance Survey license 100035207.



7 Borehole Records

The systematic analysis of data extracted from the BGS Borehole Records database provides the following information.

Records of boreholes within 250m of the study site boundary:

5

ID	Distance (m)	Direction	NGR	BGS Reference	Drilled Length	Borehole Name
1	30.0	E	526850 317990	TF21NE38	-1.0	A1073 LINE 5 RE-ALIGNMENT 48
2	78.0	NE	526840 318100	TF21NE37	-1.0	A1073 LINE 5 RE-ALIGNMENT 46
3	108.0	SE	526870 317870	TF21NE39	-1.0	A1073 LINE 5 RE-ALIGNMENT 49
4	180.0	E	527000 318000	TF21NE61	3.0	WESTON
5	197.0	NW	526560 318200	TF21NE5	7.0	C5 COWBIT

The borehole records are available using the hyperlinks below: Please note that if the donor of the borehole record has requested the information be held as commercial-in-confidence, the additional data will be held separately by the BGS and a formal request must be made for its release.

#4: scans.bgs.ac.uk/sobi_scans/boreholes/473424

#5: scans.bgs.ac.uk/sobi_scans/boreholes/473366

8 Estimated Background Soil Chemistry

Records of background estimated soil chemistry within 250m of the study site boundary:

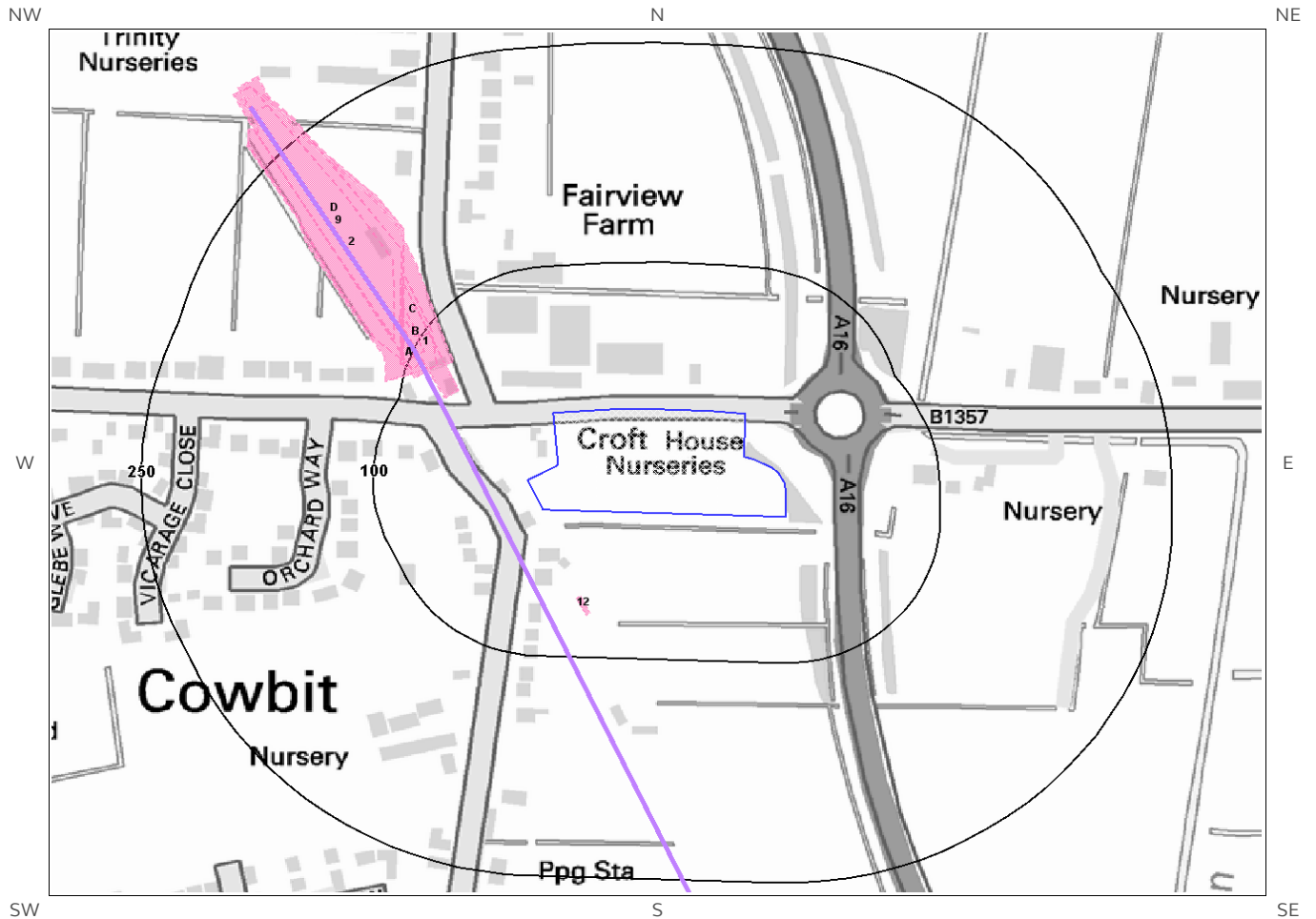
2

For further information on how this data is calculated and limitations upon its use, please see the Groundsure Geo Insight User Guide, available on request.

Distance (m)	Direction	Sample Type	Arsenic (As)	Cadmium (Cd)	Chromium (Cr)	Nickel (Ni)	Lead (Pb)
0.0	On Site	RuralSoil	15 - 25 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg	<100 mg/kg
0.0	On Site	RuralSoil	<15 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg	<100 mg/kg

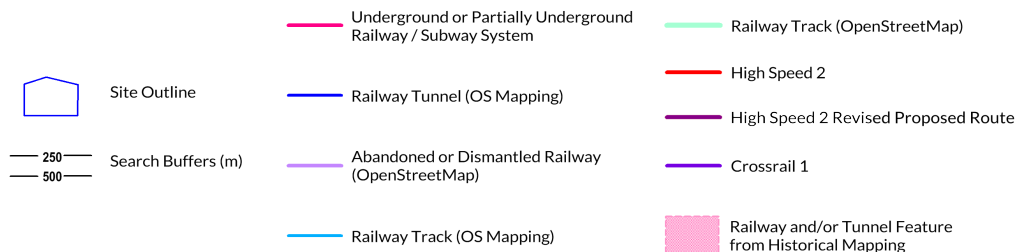
*As this data is based upon underlying 1:50,000 scale geological information, a 50m buffer has been added to the search radius.

9 Railways and Tunnels map



Railways and Tunnels Legend

© Crown copyright and database rights 2018.
Ordnance Survey license 100035207.
© OpenStreetMapContributors



9 Railways and Tunnels

9.1 Tunnels

This data is derived from OpenStreetMap and provides information on the possible locations of underground railway systems in the UK - the London Underground, the Tyne & Wear Metro and the Glasgow Subway.

Have any underground railway lines been identified within the study site boundary? No

Have any underground railway lines been identified within 250m of the study site boundary? No

Database searched and no data found.

Any records that have been identified are represented on the Railways and Tunnels map.

This data is derived from Ordnance Survey mapping and provides information on the possible locations of railway tunnels forming part of the UK overground railway network.

Have any other railway tunnels been identified within the site boundary? No

Have any other railway tunnels been identified within 250m of the site boundary? No

Database searched and no data found.

Any records that have been identified are represented on the Railways and Tunnels map.

9.2 Historical Railway and Tunnel Features

This data is derived from Groundsure's unique Historical Land-use Database and contains features relating to tunnels, railway tracks or associated works that have been identified from historical Ordnance Survey mapping.

Have any historical railway or tunnel features been identified within the study site boundary? No

Have any historical railway or tunnel features been identified within 250m of the study site boundary? Yes

ID	Distance (m)	Direction	NGR	Details	Date
12	58	S	526690 317906	Railway Sidings	1974
1	63	W	526591 318089	Railway Sidings	1887
2	73	NW	526538 318157	Railway Sidings	1951
3B	82	NW	526584 318096	Railway Sidings	1950
4A	93	W	526578 318078	Railway Sidings	1903
5A	93	W	526578 318078	Railway Sidings	1903

ID	Distance (m)	Direction	NGR	Details	Date
6B	93	NW	526579 318089	Railway Sidings	1938
7C	97	NW	526581 318109	Railway Sidings	1903
8C	97	NW	526581 318109	Railway Sidings	1903
9	103	W	526528 318176	Railway Sidings	1951
10D	105	W	526520 318172	Railway Sidings	1906
11D	114	NW	526515 318174	Railway Sidings	1887

Any records that have been identified are represented on the Railways and Tunnels map.

9.3 Historical Railways

This data is derived from OpenStreetMap and provides information on the possible alignments of abandoned or dismantled railway lines in proximity to the study site.

Have any historical railway lines been identified within the study site boundary? No

Have any historical railway lines been identified within 250m of the study site boundary? Yes

Distance (m)	Direction	Status
28	SW	Abandoned

Multiple sections of the same track may be listed in the detail above

Any records that have been identified are represented on the Railways and Tunnels map.

9.4 Active Railways

These datasets are derived from Ordnance Survey mapping and OpenStreetMap and provide information on the possible locations of active railway lines in proximity to the study site.

Have any active railway lines been identified within the study site boundary? No

Have any active railway lines been identified within 250m of the study site boundary? No

Database searched and no data found.

Multiple sections of the same track may be listed in the detail above

Any records that have been identified are represented on the Railways and Tunnels map.

These datasets provide information on the location of large scale railway projects High Speed 2 and Crossrail 1 .

Is the study site within 5km of the route of the High Speed 2 rail project? No

Is the study site within 500m of the route of the Crossrail 1 rail project? No

Further information on proximity to these routes, the project construction status and associated works can be obtained through the purchase of a Groundsure HS2 and Crossrail 1 Report.

The route data has been digitised from publicly available maps by Groundsure. The route as provided relates to the Crossrail 1 project only, and does not include any details of the Crossrail 2 project, as final details of the route for Crossrail 2 are still under consultation.

Please note that this assessment takes account of both the original Phase 2b proposed route and the amended route proposed in 2016. As the Phase 2b route is still under consultation, Groundsure are providing information on both options until the final route is formally confirmed. Practitioners should take account of this uncertainty when advising clients.

Contact Details

Geo-Matters Limited
Telephone: 0800 0149249
info@geo-matters.com
104 Bondgate, Castle Donington, Derbyshire, DE74 2NR



British Geological Survey Enquiries

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

BGS Geological Hazards Reports and general geological enquiries



British Gypsum

British Gypsum Ltd
East Leake
Loughborough
Leicestershire
LE12 6HX



The Coal Authority

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



Public Health England

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



Johnson Poole & Bloomer Limited

Harris and Pearson Building, Brettell Lane
Brierley Hill, West Midlands
DY5 3LH
Tel: +44 (0) 1384 262 000
Email: enquiries.gs@jpb.co.uk
Website: www.jpb.co.uk



Ordnance Survey

Adanac Drive, Southampton
SO16 0AS
Tel: 08456 050505
Website: <http://www.ordnancesurvey.co.uk/>



Getmapping PLC

Virginia Villas, High Street, Hartley Witney,
Hampshire RG27 8NW
Tel: 01252 845444
Website: <http://www.1.getmapping.com/>



Peter Brett Associates

Caversham Bridge House
Waterman Place
Reading
Berkshire RG1 8DN

Tel: +44 (0)118 950 0761 E-mail: reading@pba.co.uk
Website: <http://www.peterbrett.com/home>



Acknowledgements: Ordnance Survey © Crown Copyright and/or Database Right. All Rights Reserved. Licence Number [03421028].
This report has been prepared in accordance with the Groundsure Ltd standard Terms and Conditions of business for work of this nature.

Standard Terms and Conditions

Groundsure's Terms and Conditions can be viewed online at this link:
<https://www.groundsure.com/terms-and-conditions-may25-2018>

Pre-Desk Study Assessment

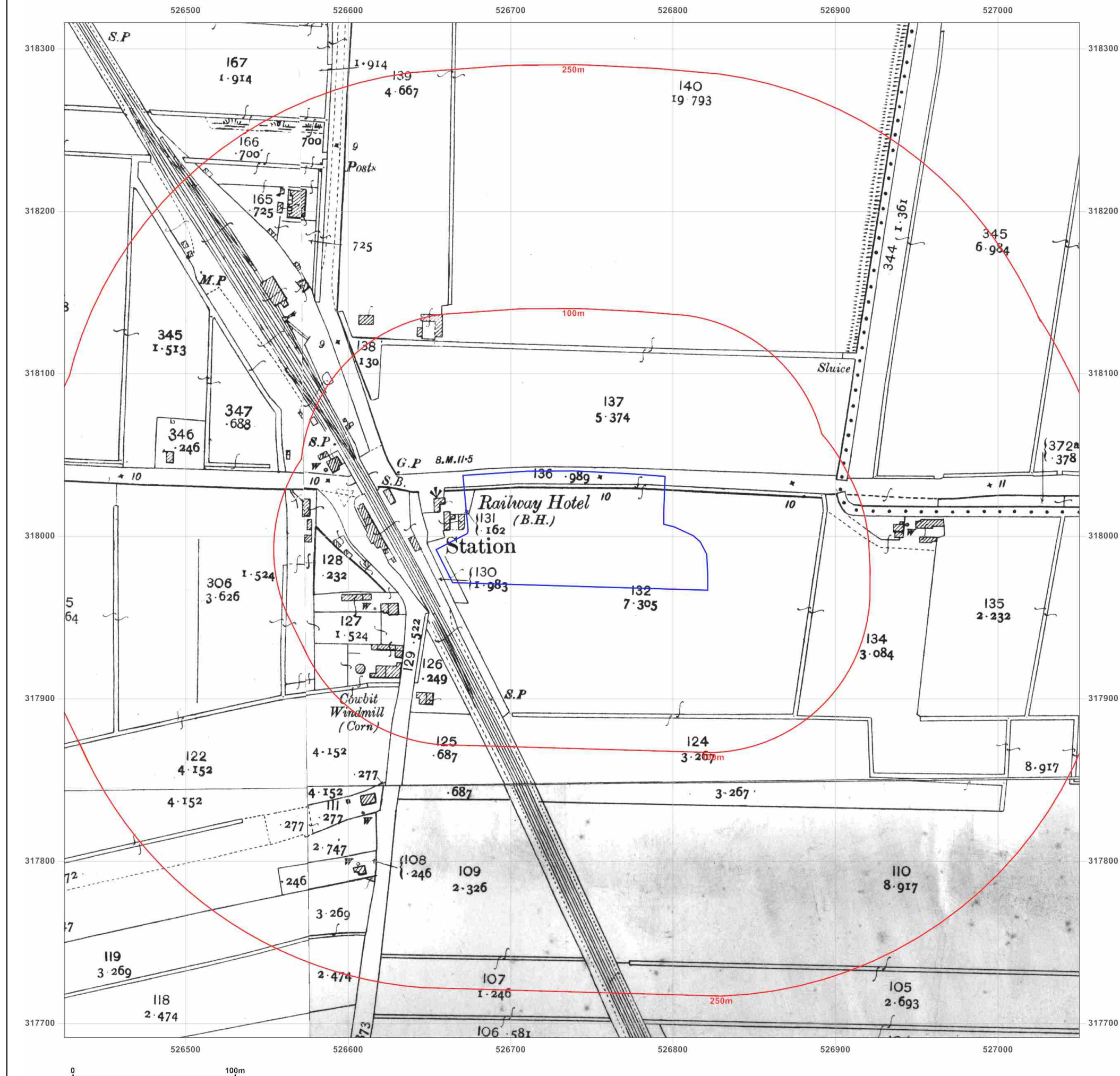
Site:	Stonegate, Cowbit, Spalding
Client:	Geo Matters
Contact:	Alexandra Thornber
Date:	14 th August 2018
Pre-WWI Military Activity on or Affecting the Site	None identified.
WWI Military Activity on or Affecting the Site	None identified.
WWI Strategic Targets (within 5km of Site)	The following strategic targets were located in the vicinity of the Site: ■ Transport infrastructure. ■ Light industries, including brick works.
WWI Bombing	None identified on the Site.
Interwar Military Activity on or Affecting the Site	None identified.
WWII Military Activity on or Affecting the Site	None identified on the Site. Readily available records have been found indicating that on the 2 nd October 1942 1No. B17 Flying Fortress bomber aircraft, serial number 41-24492, crashed in the vicinity of Cowbit during a training flight. No readily available records have been found to indicate that B-17 41-24492 crashed on the Site.
WWII Strategic Targets (within 5km of Site)	The following strategic targets were located in the vicinity of the Site: ■ Transport infrastructure. ■ Industries important to the war effort, including engineering works. ■ Military camps.
WWII Bombing Decoys (within 5km of Site)	None.
WWII Bombing	During WWII the Site was located in the Rural District (RD) of Spalding, which officially recorded 68No. HE bombs with a bombing density of 0.7 bombs per 405 hectares (ha). No readily available records have been found to indicate that the Site was bombed.
Post-WWII Military Activity on or Affecting the Site	None identified.
Recommendation	A detailed desk study, whilst always prudent, is not considered essential in this instance.

This summary is based on a cursory review of readily available records. Caution is advised if you plan to action work based on this summary.

It should be noted that where a potentially significant source of UXO hazard has been identified on the Site, the requirement for a detailed desk study and risk assessment has been confirmed and no further research will be undertaken at this stage. It is possible that further in-depth research as part of a detailed UXO desk study and risk assessment may identify other potential sources of UXO hazard on the Site.

APPENDIX VI

Historic Mapping



Site Details:

SITE OFF CHAPEL ROAD,
COWBIT, SPALDING, PE12 6XA

Client Ref: GML18201-AT-001
Report Ref: GEO-M-5233410
Grid Ref: 526738, 318003

Map Name: County Series

Map date: 1904

Scale: 1:2,500

Printed at: 1:2,500



Surveyed 1904
Revised 1904
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1904
Revised 1904
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1904
Revised 1904
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1904
Revised 1904
Edition N/A
Copyright N/A
Levelled N/A



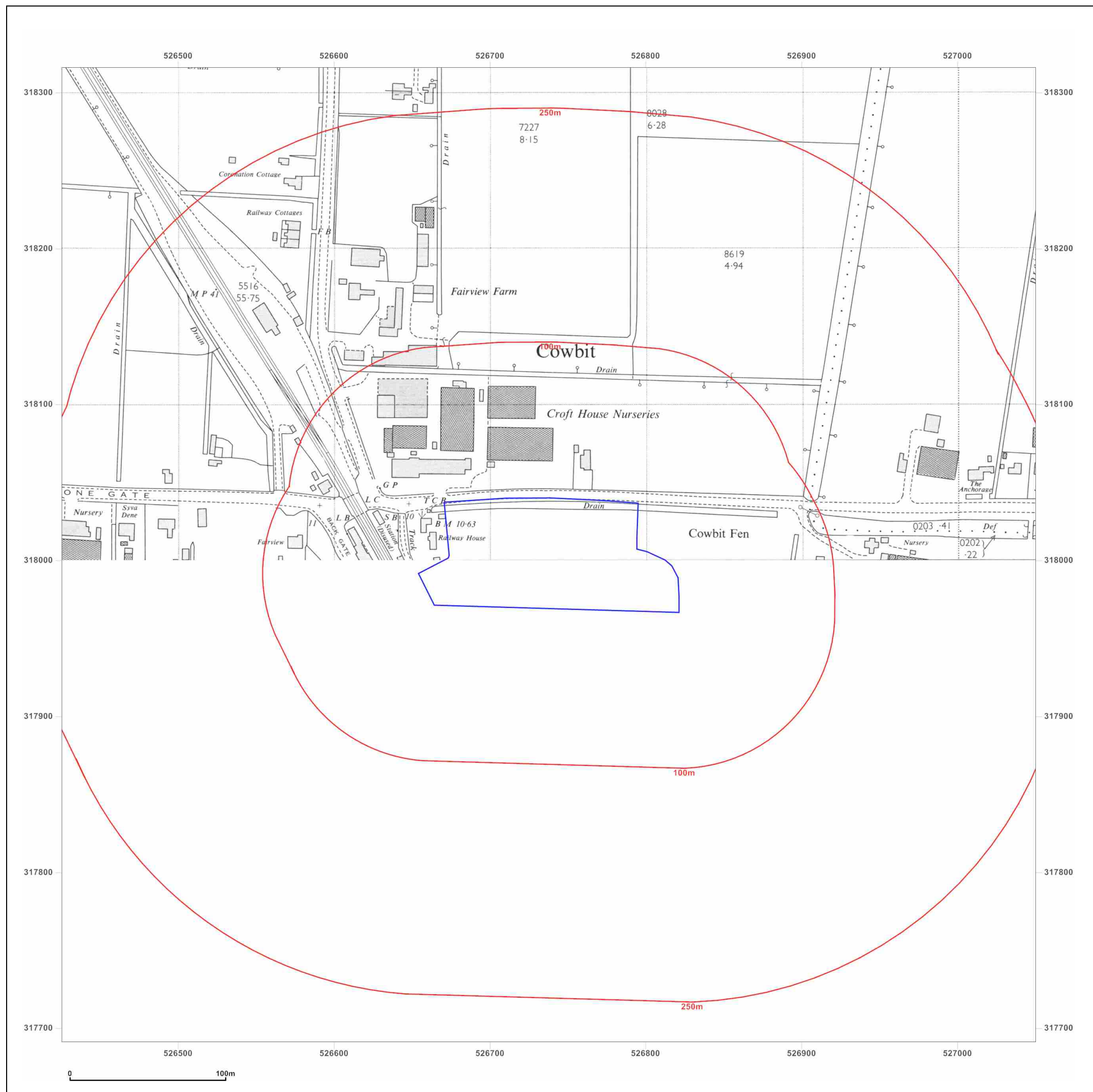
Produced by
Groundsure Insights
T: 08444 159000
E: info@groundsure.com
W: www.groundsure.com



© Crown copyright and database rights 2018 Ordnance Survey 100035207

Production date: 13 July 2018

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



Site Details:

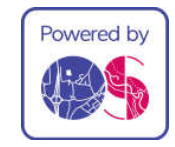
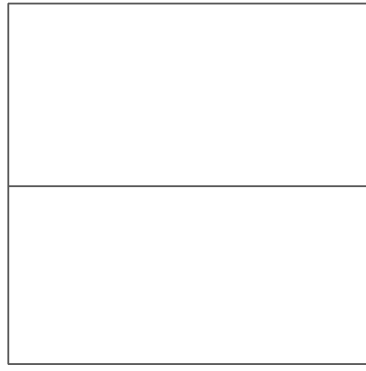
SITE OFF CHAPEL ROAD,
COWBIT, SPALDING, PE12 6XA

Client Ref: GML18201-AT-001
Report Ref: GEO-M-5233410
Grid Ref: 526738, 318003

Map Name: National Grid
Map date: 1968
Scale: 1:2,500
Printed at: 1:2,500



Surveyed 1968
Revised 1968
Edition N/A
Copyright 1969
Levelled 1965

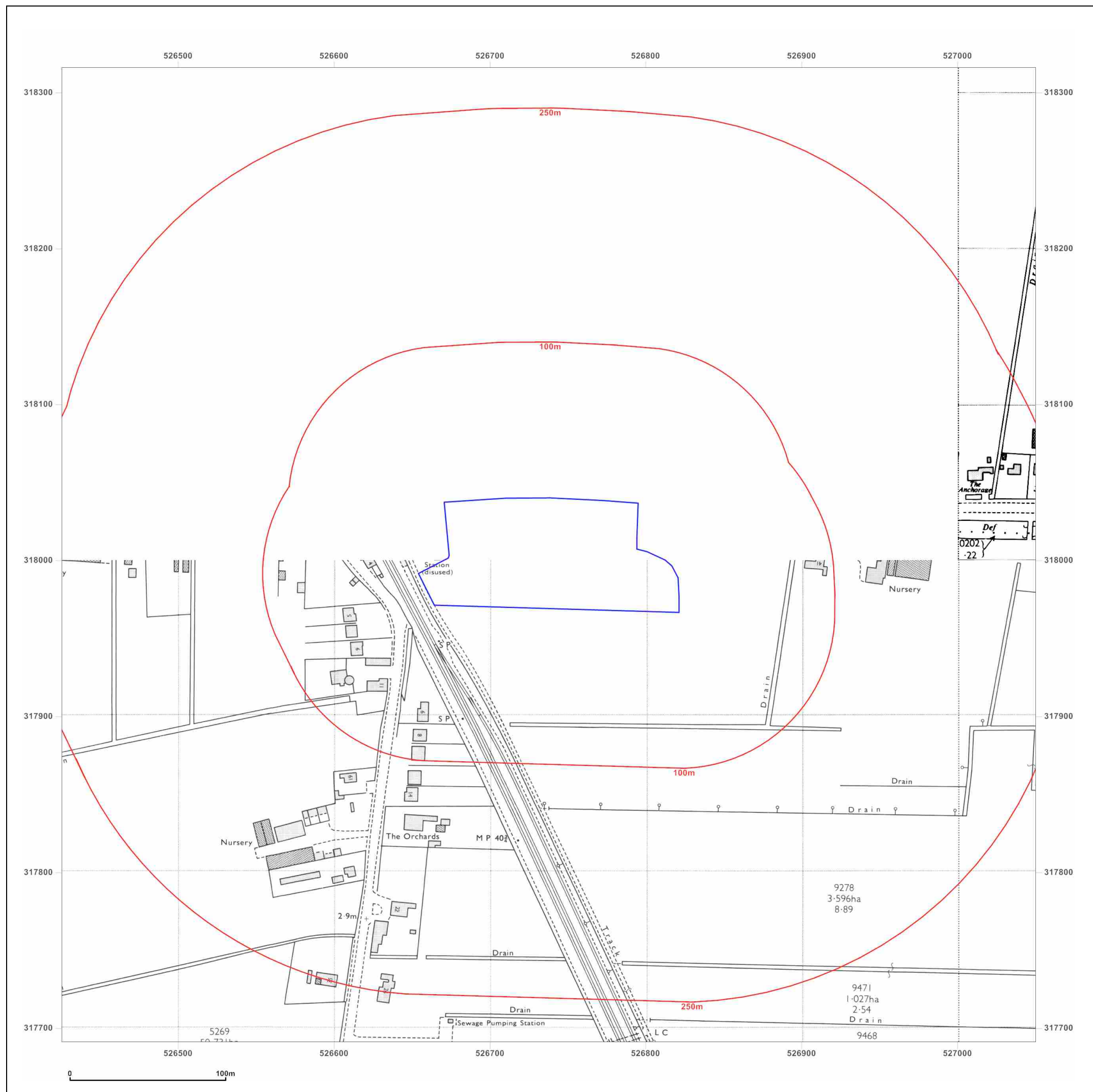


Produced by
Groundsure Insights
T: 08444 159000
E: info@groundsure.com
W: www.groundsure.com

© Crown copyright and database rights 2018 Ordnance Survey 100035207

Production date: 13 July 2018

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



Site Details:

SITE OFF CHAPEL ROAD,
COWBIT, SPALDING, PE12 6XA

Client Ref: GML18201-AT-001
Report Ref: GEO-M-5233410
Grid Ref: 526738, 318003

Map Name: National Grid

Map date: 1969-1974

Scale: 1:2,500

Printed at: 1:2,500



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

Surveyed 1974
Revised 1974
Edition N/A
Copyright 1976
Levelled 1965

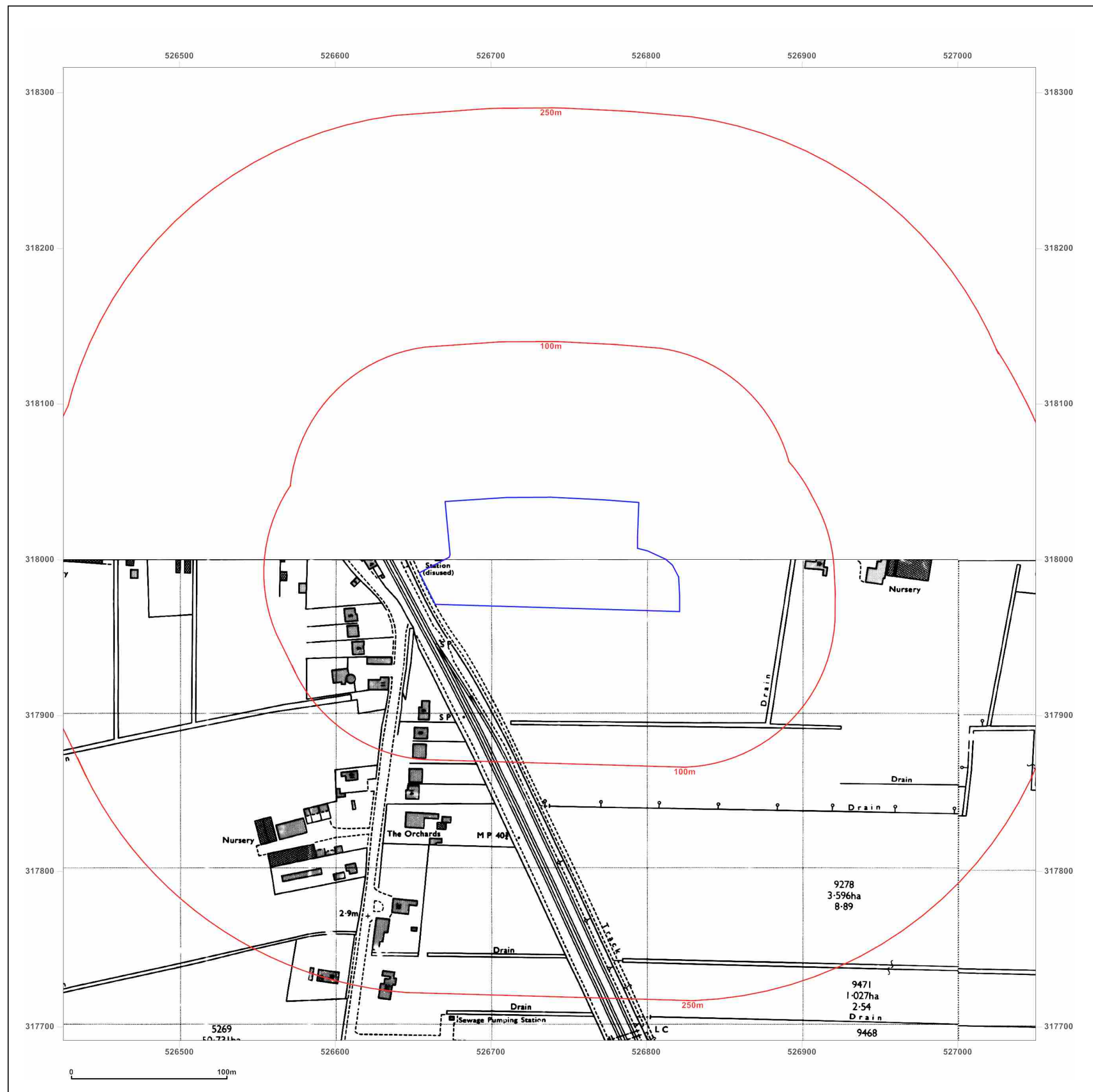


Produced by
Groundsure Insights
T: 08444 159000
E: info@groundsure.com
W: www.groundsure.com

© Crown copyright and database rights 2018 Ordnance Survey 100035207

Production date: 13 July 2018

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



Site Details:

SITE OFF CHAPEL ROAD,
COWBIT, SPALDING, PE12 6XA

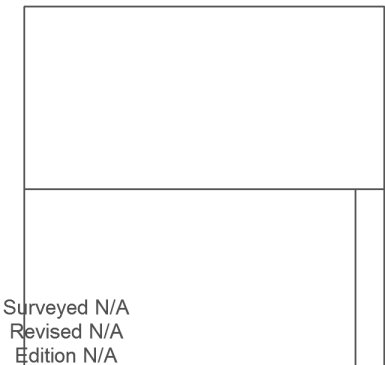
Client Ref: GML18201-AT-001
Report Ref: GEO-M-5233410
Grid Ref: 526738, 318003

Map Name: National Grid

Map date: 1976

Scale: 1:2,500

Printed at: 1:2,500



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

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



Produced by
Groundsure Insights
T: 08444 159000
E: info@groundsure.com
W: www.groundsure.com

© Crown copyright and database rights 2018 Ordnance Survey 100035207

Production date: 13 July 2018

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



Site Details:

SITE OFF CHAPEL ROAD,
COWBIT, SPALDING, PE12 6XA

Client Ref: GML18201-AT-001
Report Ref: GEO-M-5233410
Grid Ref: 526738, 318003

Map Name: National Grid

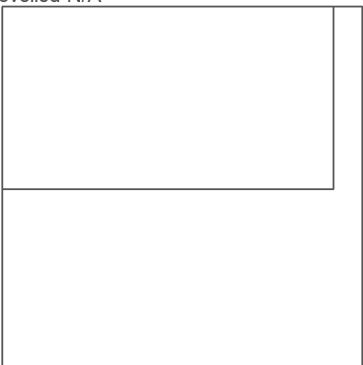
Map date: 1988

Scale: 1:2,500

Printed at: 1:2,500



Surveyed 1988
Revised 1988
Edition N/A
Copyright 1988
Levelled N/A

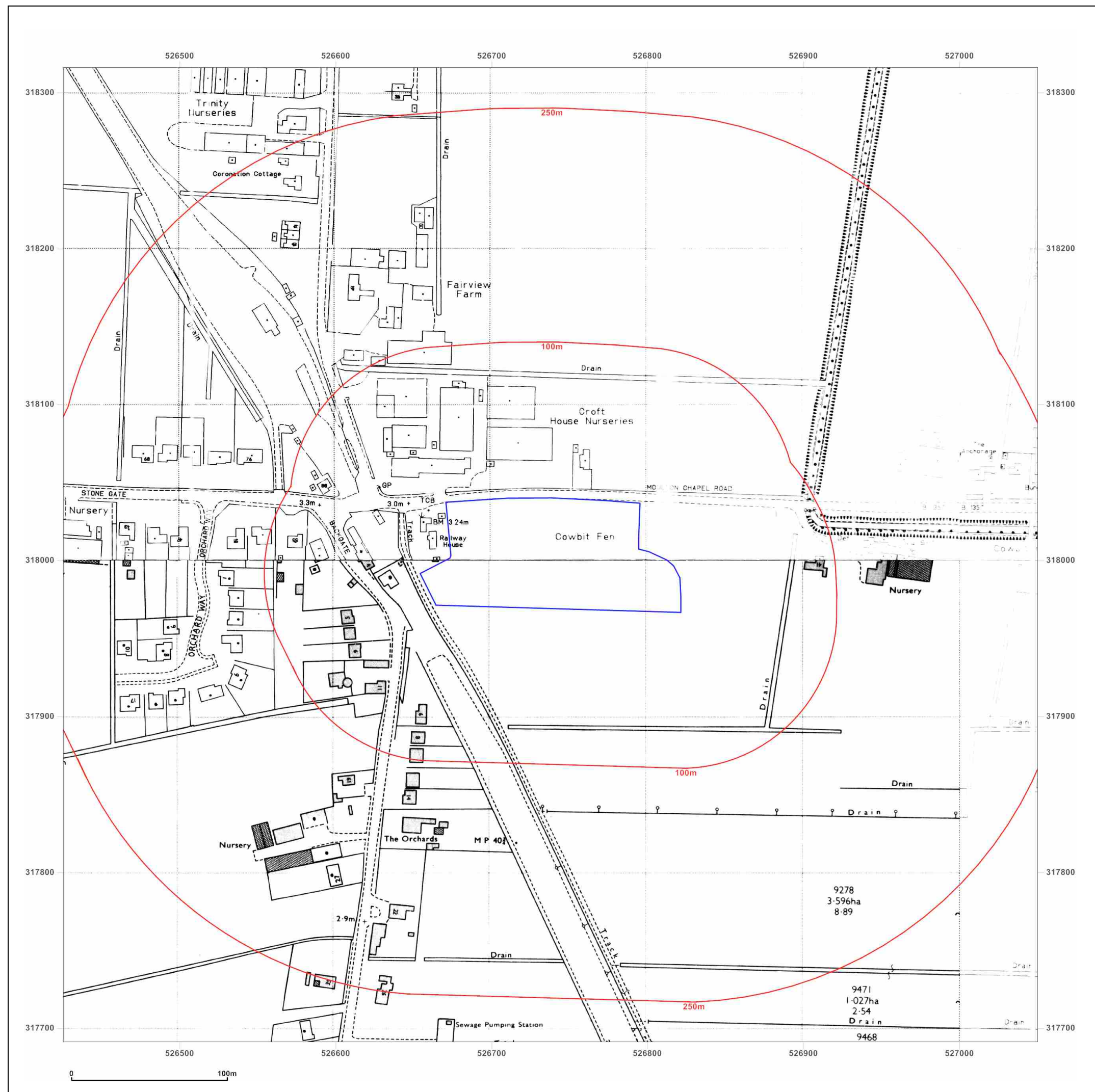


Produced by
Groundsure Insights
T: 08444 159000
E: info@groundsure.com
W: www.groundsure.com

© Crown copyright and database rights 2018 Ordnance Survey 100035207

Production date: 13 July 2018

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



Site Details:

SITE OFF CHAPEL ROAD,
COWBIT, SPALDING, PE12 6XA

Client Ref: GML18201-AT-001
Report Ref: GEO-M-5233410
Grid Ref: 526738, 318003

Map Name: National Grid

Map date: 1992-1995

Scale: 1:2,500

Printed at: 1:2,500



Surveyed N/A
Revised N/A
Edition N/A
Copyright 1995
Levelled N/A

Surveyed N/A
Revised N/A
Edition N/A
Copyright 1995
Levelled N/A

Surveyed 1992
Revised 1992
Edition N/A
Copyright 1992
Levelled N/A

Surveyed N/A
Revised N/A
Edition N/A
Copyright 1995
Levelled N/A

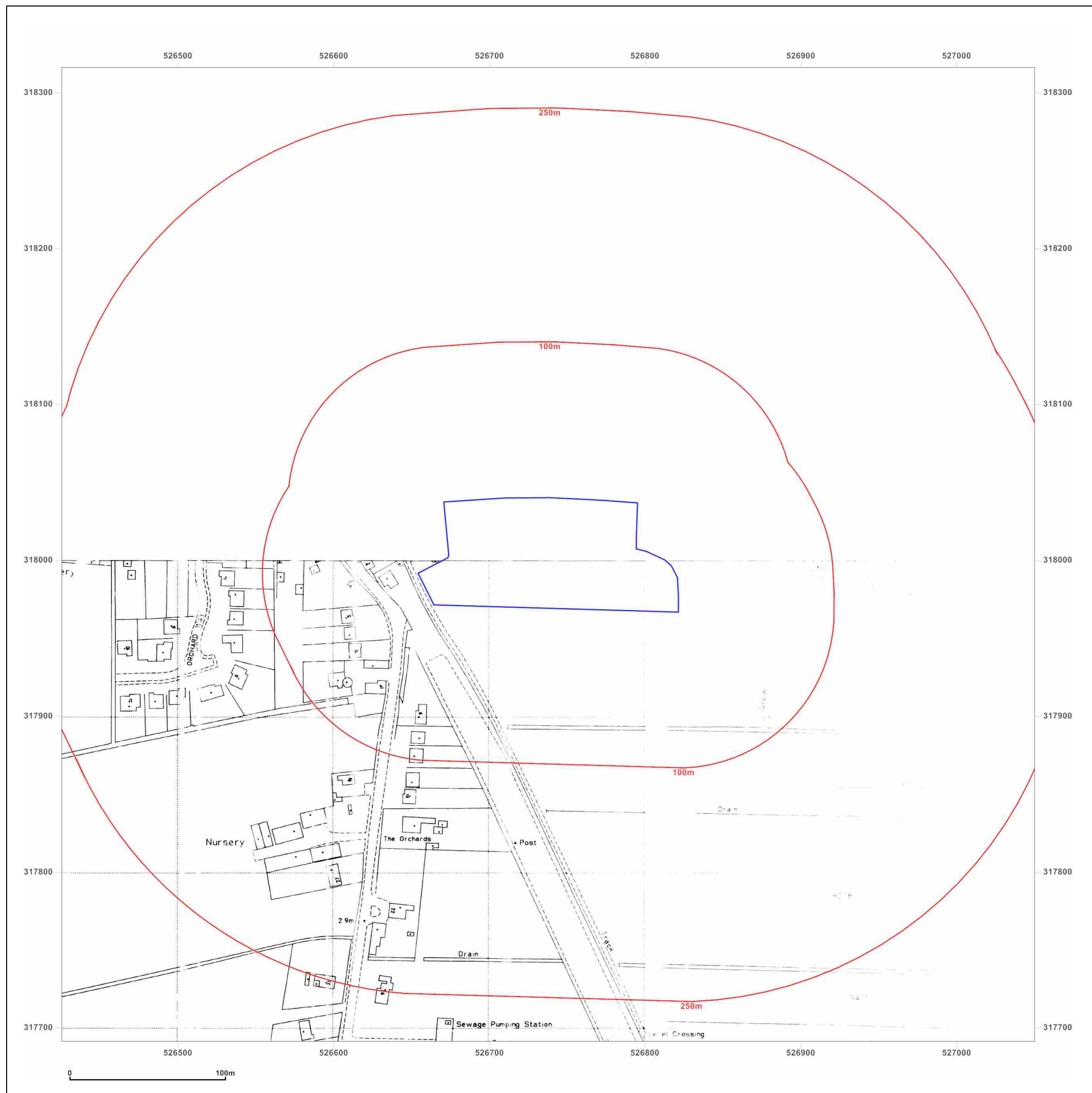


Produced by
Groundsure Insights
T: 08444 159000
E: info@groundsure.com
W: www.groundsure.com

© Crown copyright and database rights 2018 Ordnance Survey 100035207

Production date: 13 July 2018

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



Site Details:

SITE OFF CHAPEL ROAD,
COWBIT, SPALDING, PE12 6XA

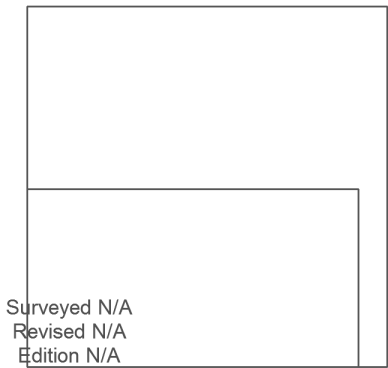
Client Ref: GML18201-AT-001
Report Ref: GEO-M-5233410
Grid Ref: 526738, 318003

Map Name: National Grid

Map date: 1995

Scale: 1:2,500

Printed at: 1:2,500



Produced by
Groundsure Insights
T: 08444 159000
E: info@groundsure.com
W: www.groundsure.com

© Crown copyright and database rights 2018 Ordnance Survey 100035207

Production date: 13 July 2018

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf

Site Details:

SITE OFF CHAPEL ROAD,
COWBIT, SPALDING, PE12 6XA

Client Ref: GML18201-AT-001
Report Ref: GEO-M-5233410
Grid Ref: 526738, 318003

Map Name: County Series

Map date: 1887

Scale: 1:10,560

Printed at: 1:10,560



Surveyed 1887
Revised 1887
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1887
Revised 1887
Edition N/A
Copyright N/A
Levelled N/A

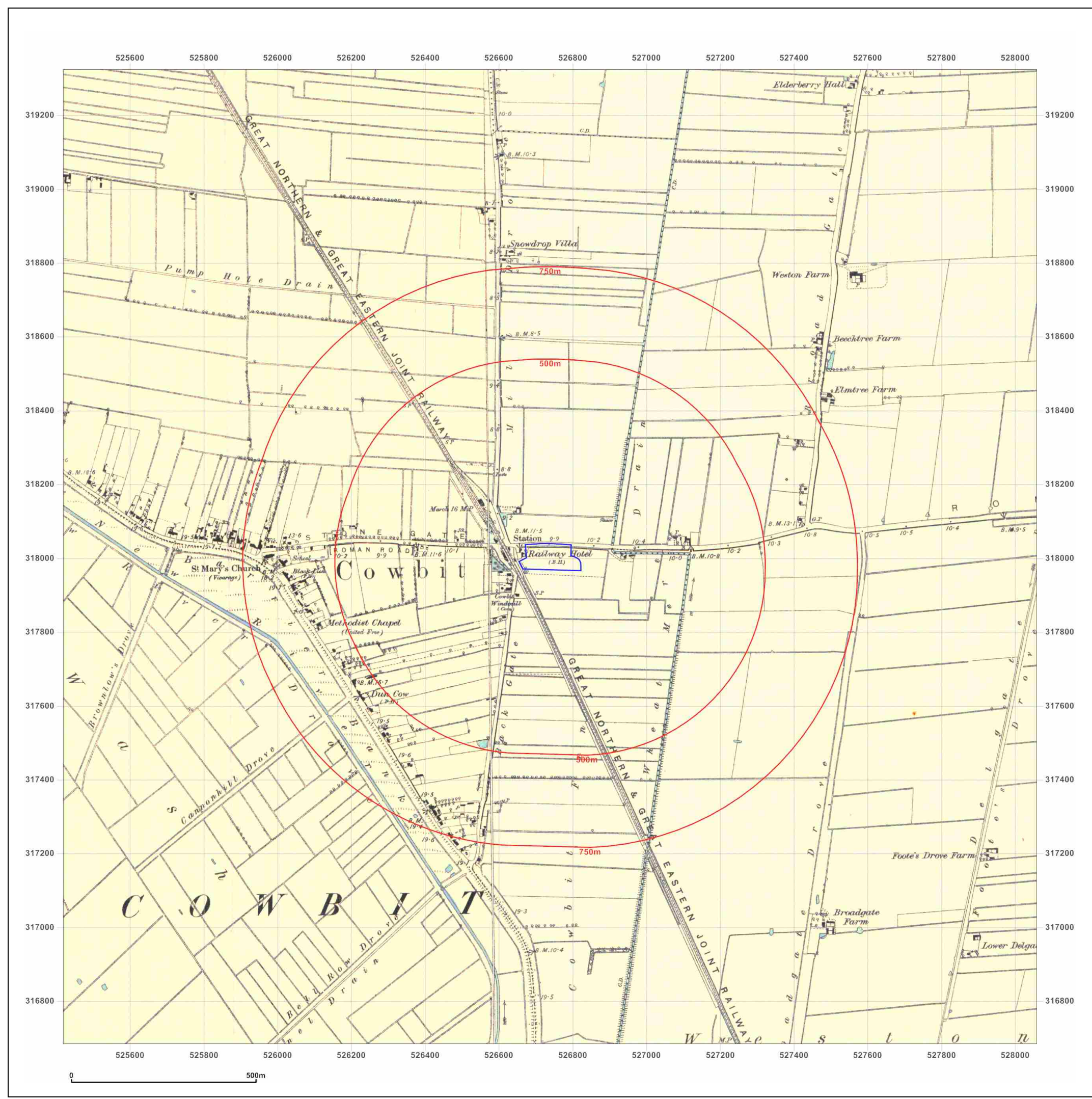


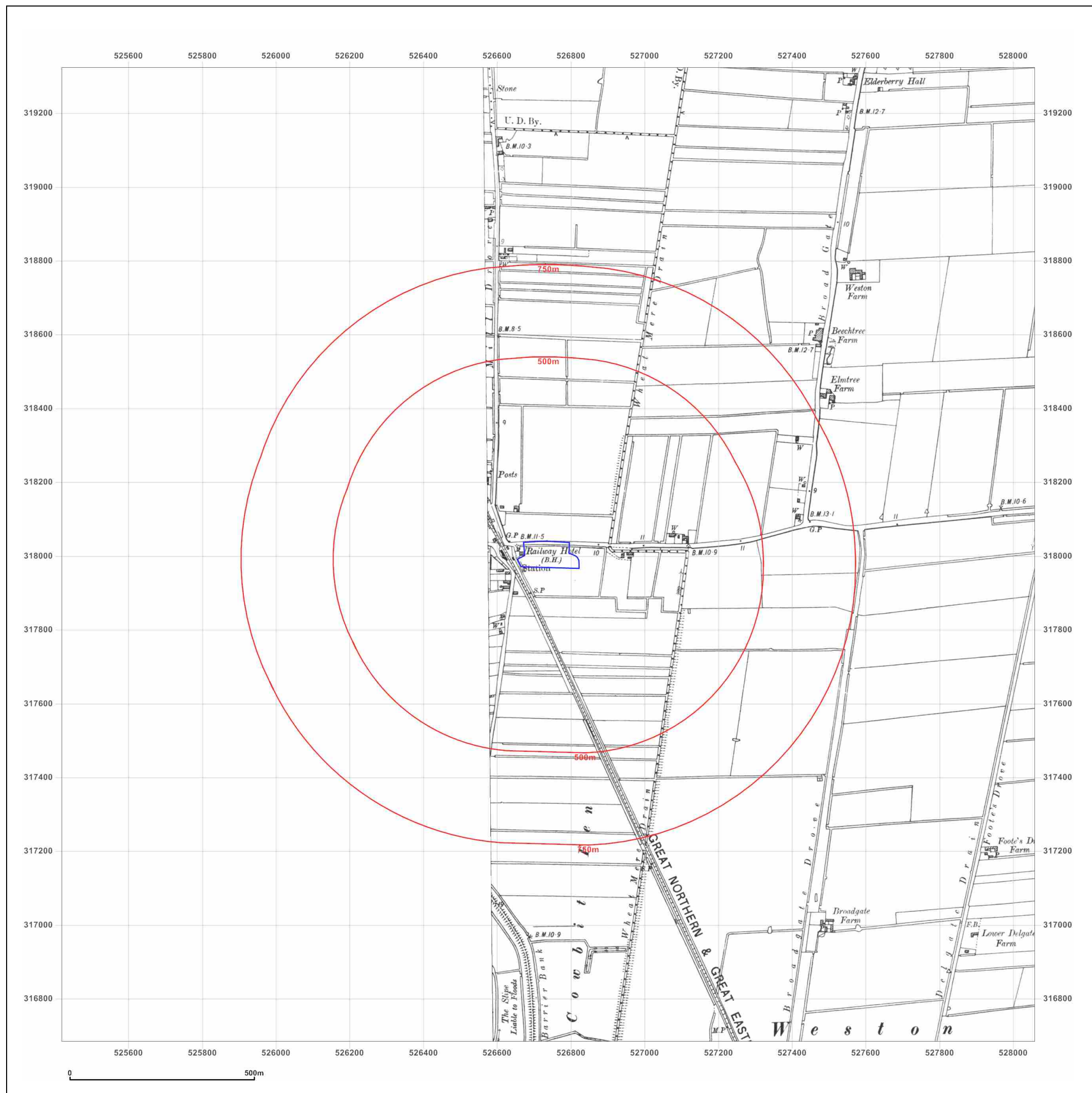
Produced by
Groundsure Insights
T: 08444 159000
E: info@groundsure.com
W: www.groundsure.com

© Crown copyright and database rights 2018 Ordnance Survey 100035207

Production date: 13 July 2018

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf





Site Details:

SITE OFF CHAPEL ROAD,
COWBIT, SPALDING, PE12 6XA

Client Ref: GML18201-AT-001
Report Ref: GEO-M-5233410
Grid Ref: 526738, 318003

Map Name: County Series

Map date: 1903

Scale: 1:10,560

Printed at: 1:10,560



Surveyed 1886
Revised 1903
Edition N/A
Copyright N/A
Levelled N/A

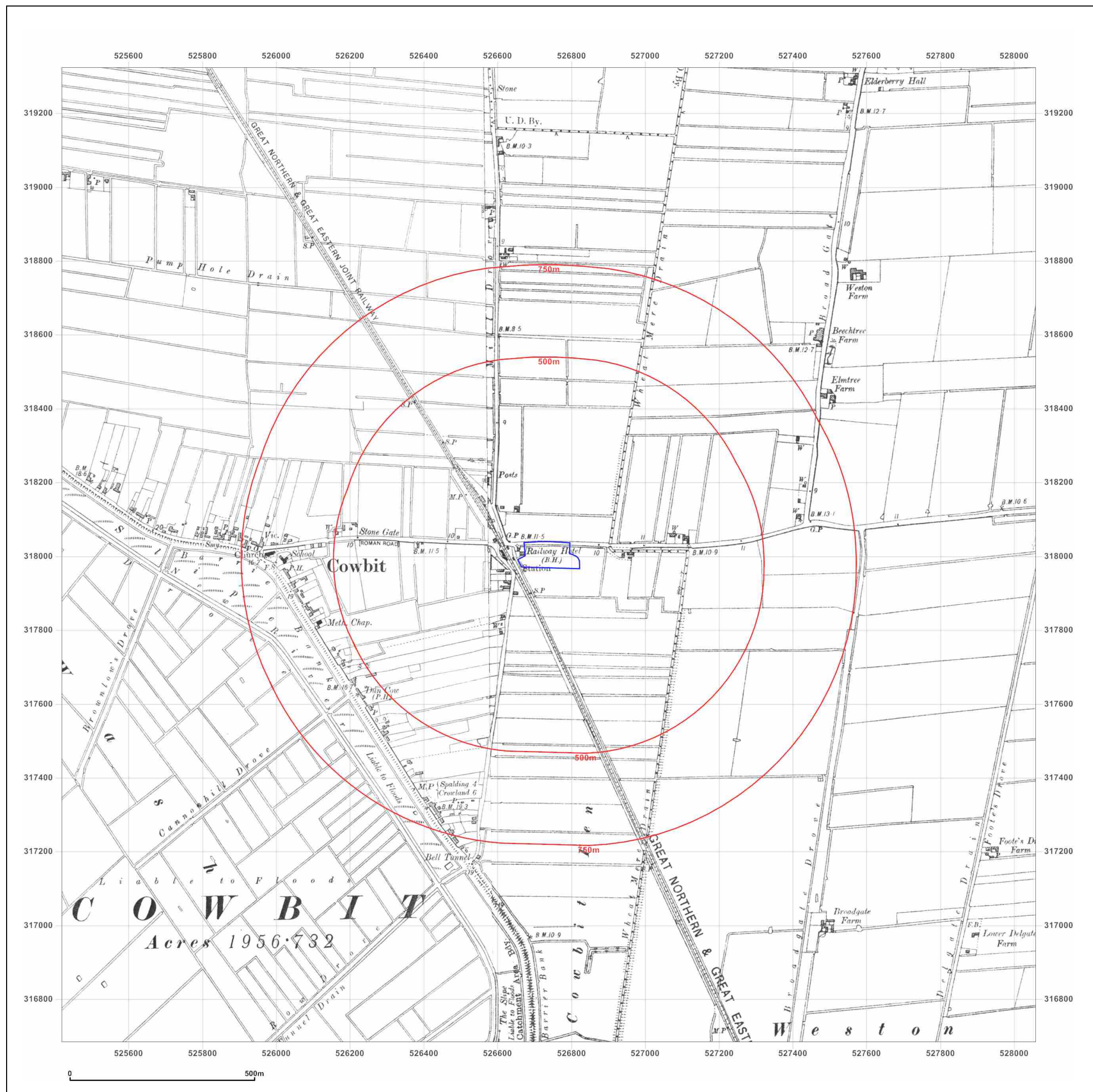


Produced by
Groundsure Insights
T: 08444 159000
E: info@groundsure.com
W: www.groundsure.com

© Crown copyright and database rights 2018 Ordnance Survey 100035207

Production date: 13 July 2018

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



Site Details:

SITE OFF CHAPEL ROAD,
COWBIT, SPALDING, PE12 6XA

Client Ref: GML18201-AT-001
Report Ref: GEO-M-5233410
Grid Ref: 526738, 318003

Map Name: County Series

Map date: 1903-1906

Scale: 1:10,560

Printed at: 1:10,560



Surveyed 1886
Revised 1906
Edition 1906
Copyright N/A
Levelled N/A

Surveyed 1886
Revised 1903
Edition N/A
Copyright N/A
Levelled N/A

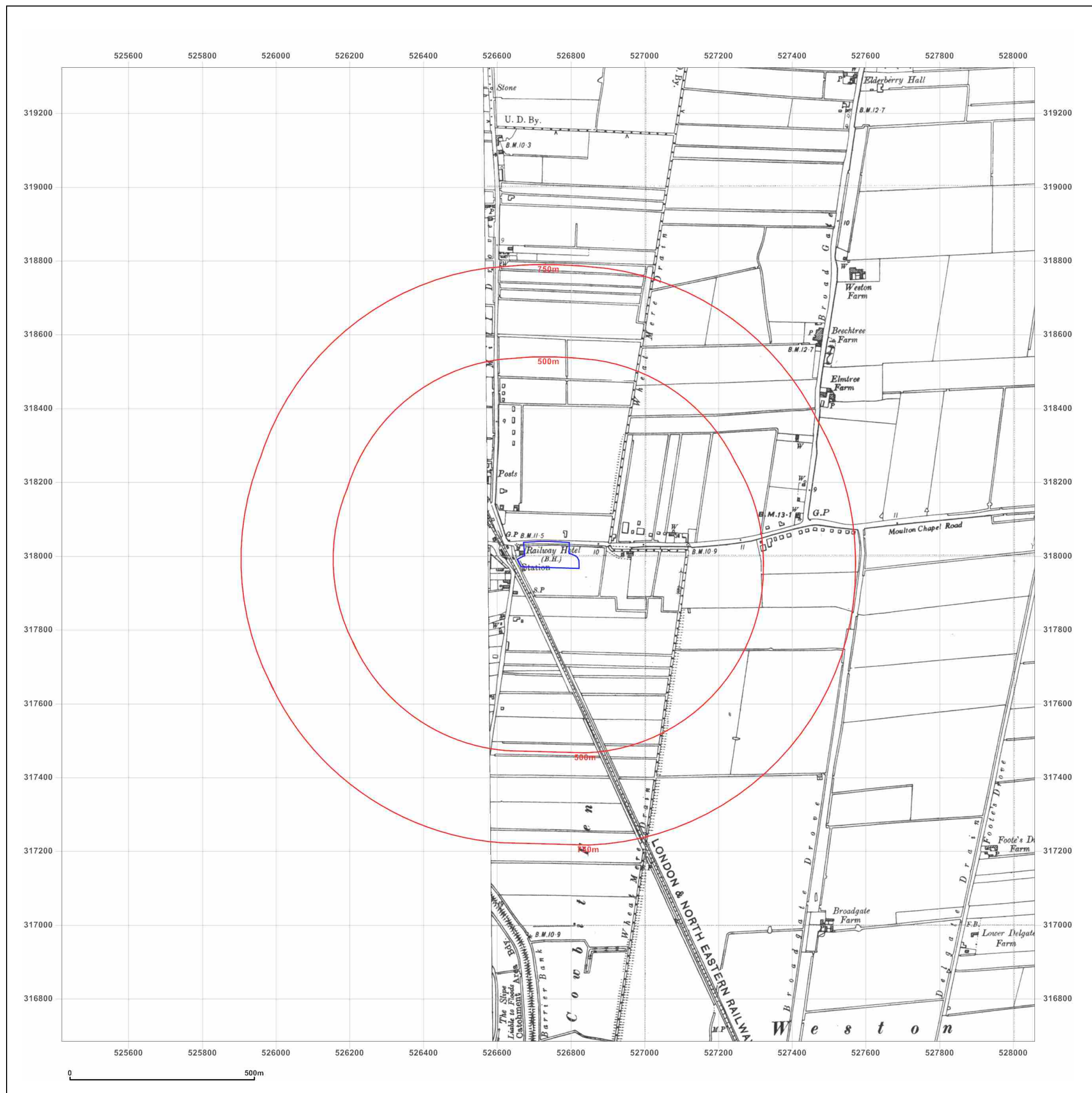


Produced by
Groundsure Insights
T: 08444 159000
E: info@groundsure.com
W: www.groundsure.com

© Crown copyright and database rights 2018 Ordnance Survey 100035207

Production date: 13 July 2018

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



Site Details:

SITE OFF CHAPEL ROAD,
COWBIT, SPALDING, PE12 6XA

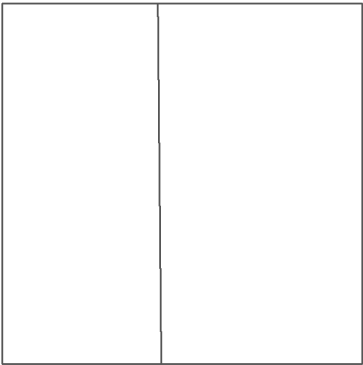
Client Ref: GML18201-AT-001
Report Ref: GEO-M-5233410
Grid Ref: 526738, 318003

Map Name: County Series

Map date: 1938

Scale: 1:10,560

Printed at: 1:10,560



Surveyed 1886
Revised 1938
Edition N/A
Copyright N/A
Levelled N/A



Produced by
Groundsure Insights
T: 08444 159000
E: info@groundsure.com
W: www.groundsure.com

© Crown copyright and database rights 2018 Ordnance Survey 100035207

Production date: 13 July 2018

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



Site Details:

SITE OFF CHAPEL ROAD,
COWBIT, SPALDING, PE12 6XA

Client Ref: GML18201-AT-001
Report Ref: GEO-M-5233410
Grid Ref: 526738, 318003

Map Name: County Series

Map date: 1950-1951

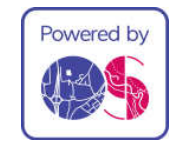
Scale: 1:10,560

Printed at: 1:10,560

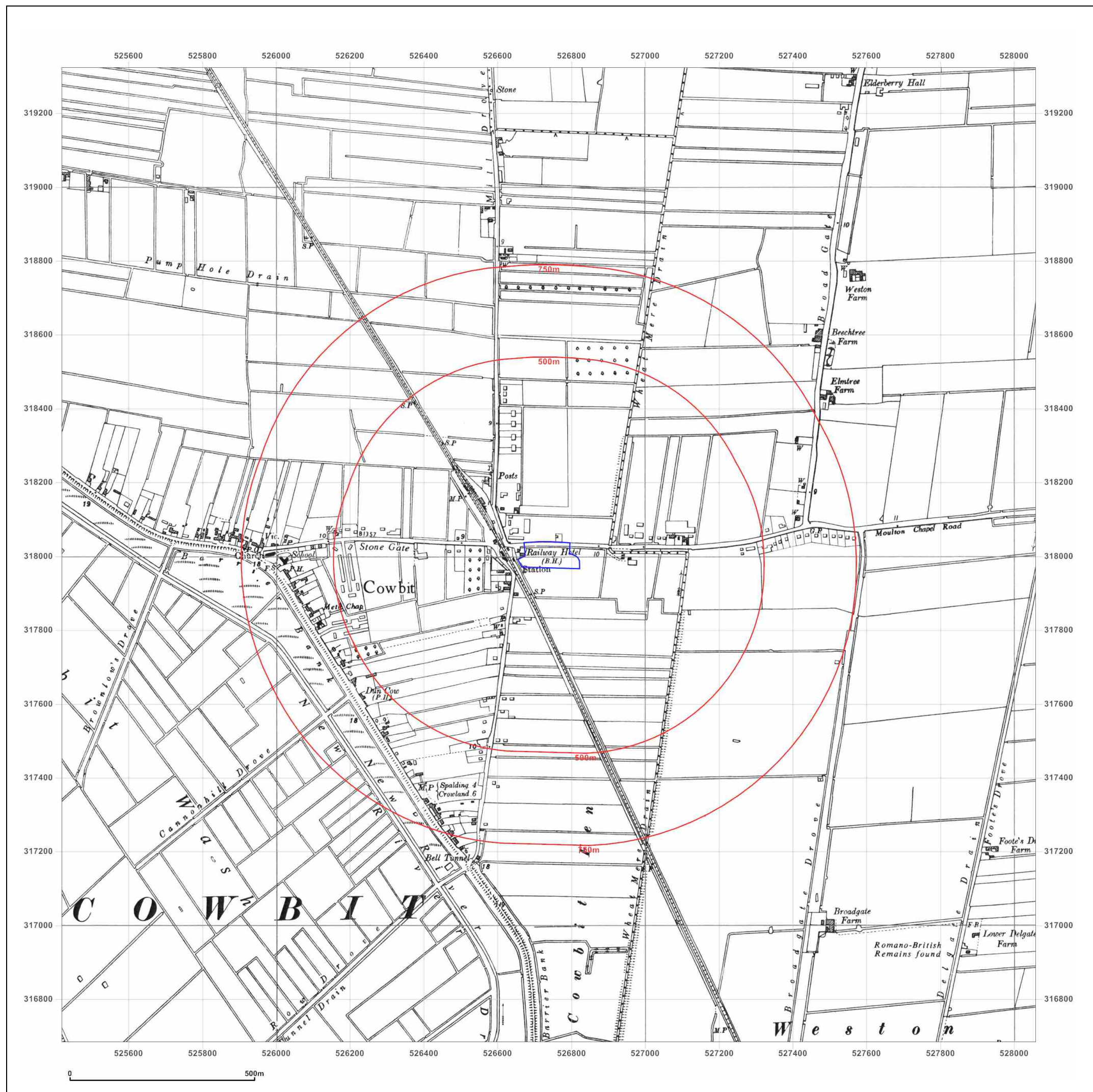


Surveyed 1886
Revised 1951
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1886
Revised 1950
Edition 1950
Copyright N/A
Levelled N/A



Produced by
Groundsure Insights
T: 08444 159000
E: info@groundsure.com
W: www.groundsure.com



Site Details:

SITE OFF CHAPEL ROAD,
COWBIT, SPALDING, PE12 6XA

Client Ref: GML18201-AT-001
Report Ref: GEO-M-5233410
Grid Ref: 526738, 318003

Map Name: Provisional

Map date: 1959

Scale: 1:10,560

Printed at: 1:10,560



Surveyed N/A
Revised 1958
Edition N/A
Copyright 1959
Levelled N/A

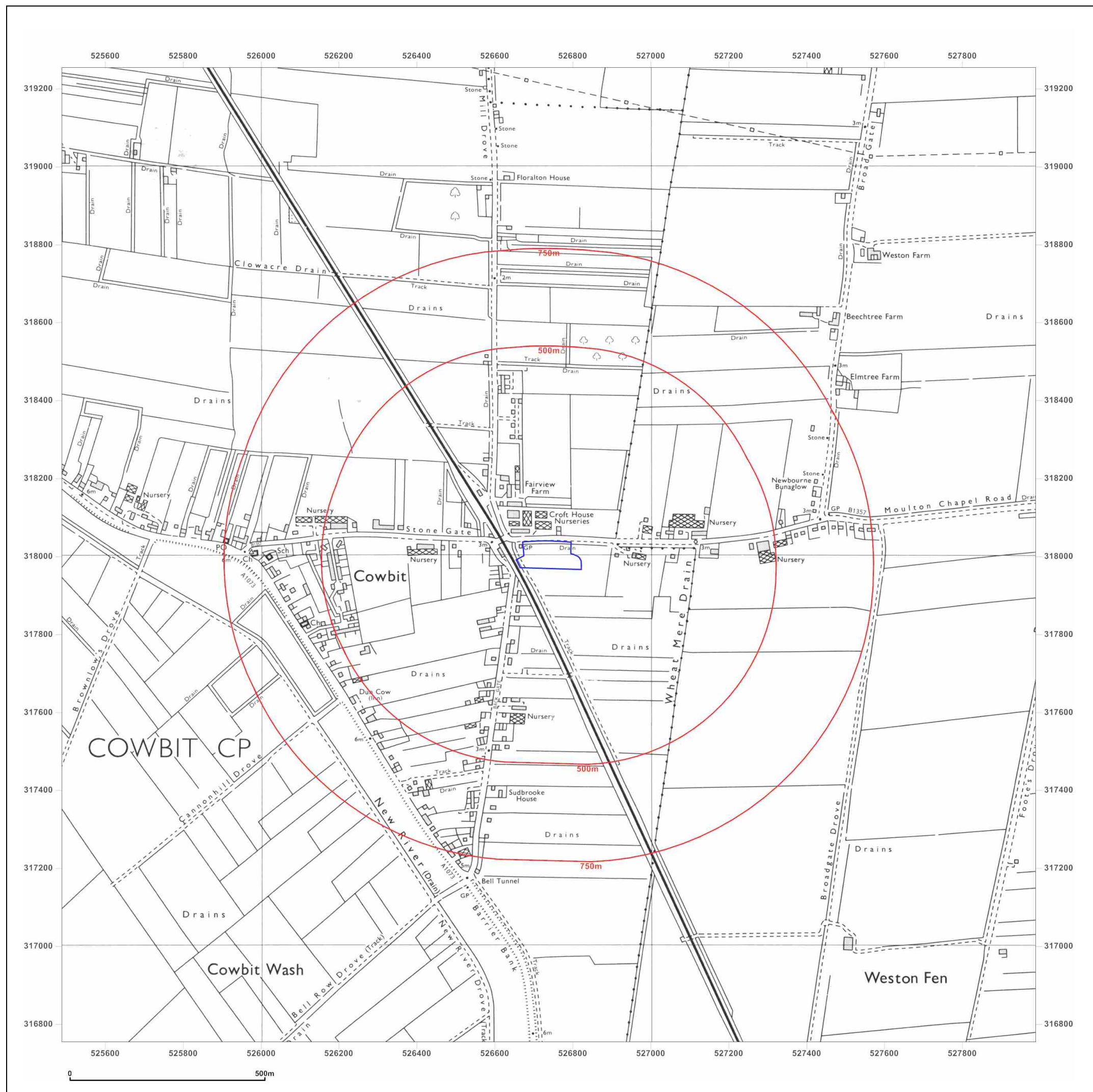


Produced by
Groundsure Insights
T: 08444 159000
E: info@groundsure.com
W: www.groundsure.com

© Crown copyright and database rights 2018 Ordnance Survey 100035207

Production date: 13 July 2018

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



Site Details:

SITE OFF CHAPEL ROAD,
COWBIT, SPALDING, PE12 6XA

Client Ref: GML18201-AT-001
Report Ref: GEO-M-5233410
Grid Ref: 526738, 318003

Map Name: National Grid

Map date: 1979

Scale: 1:10,000

Printed at: 1:10,000



Surveyed 1975
Revised 1979
Edition N/A
Copyright 1979
Levelled N/A

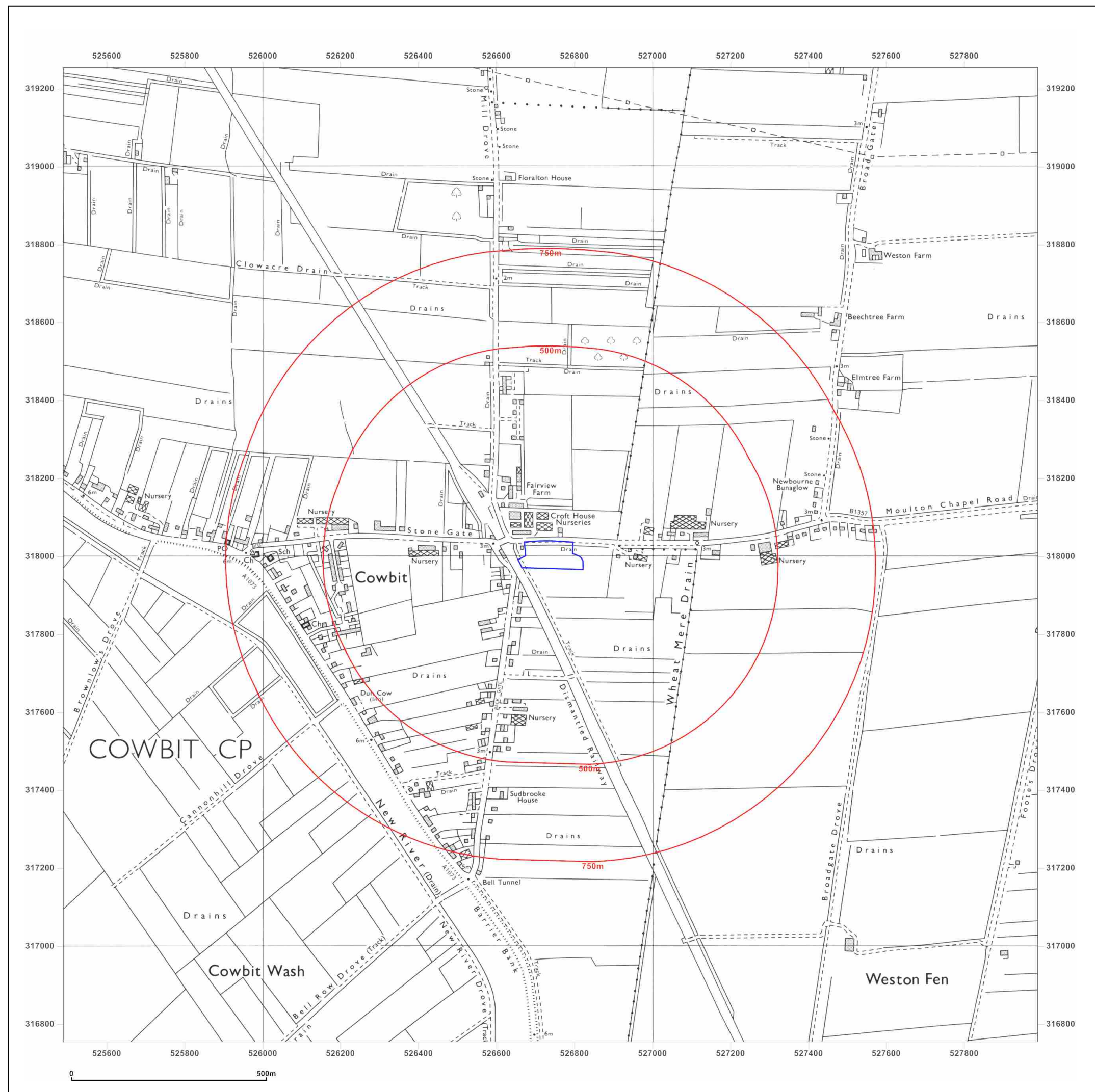


Produced by
Groundsure Insights
T: 08444 159000
E: info@groundsure.com
W: www.groundsure.com

© Crown copyright and database rights 2018 Ordnance Survey 100035207

Production date: 13 July 2018

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



Site Details:

SITE OFF CHAPEL ROAD,
COWBIT, SPALDING, PE12 6XA

Client Ref: GML18201-AT-001
Report Ref: GEO-M-5233410
Grid Ref: 526738, 318003

Map Name: National Grid

Map date: 1989

Scale: 1:10,000

Printed at: 1:10,000



Surveyed 1975
Revised 1989
Edition N/A
Copyright N/A
Levelled N/A

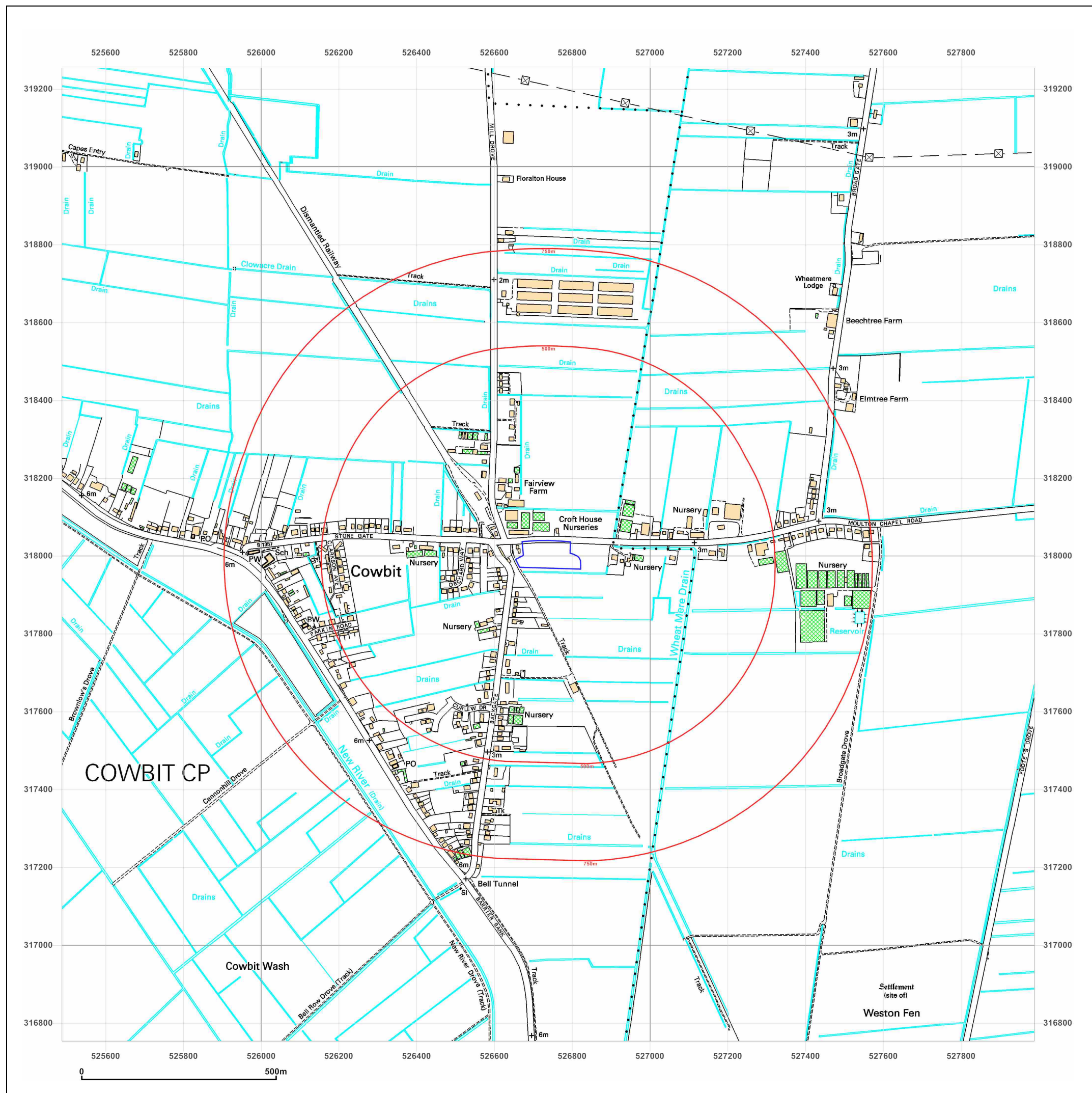


Produced by
Groundsure Insights
T: 08444 159000
E: info@groundsure.com
W: www.groundsure.com

© Crown copyright and database rights 2018 Ordnance Survey 100035207

Production date: 13 July 2018

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



Site Details:

SITE OFF CHAPEL ROAD,
COWBIT, SPALDING, PE12 6XA

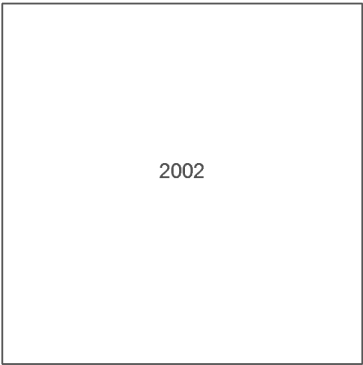
Client Ref: GML18201-AT-001
Report Ref: GEO-M-5233410
Grid Ref: 526738, 318003

Map Name: 1:10,000 Raster

Map date: 2002

Scale: 1:10,000

Printed at: 1:10,000

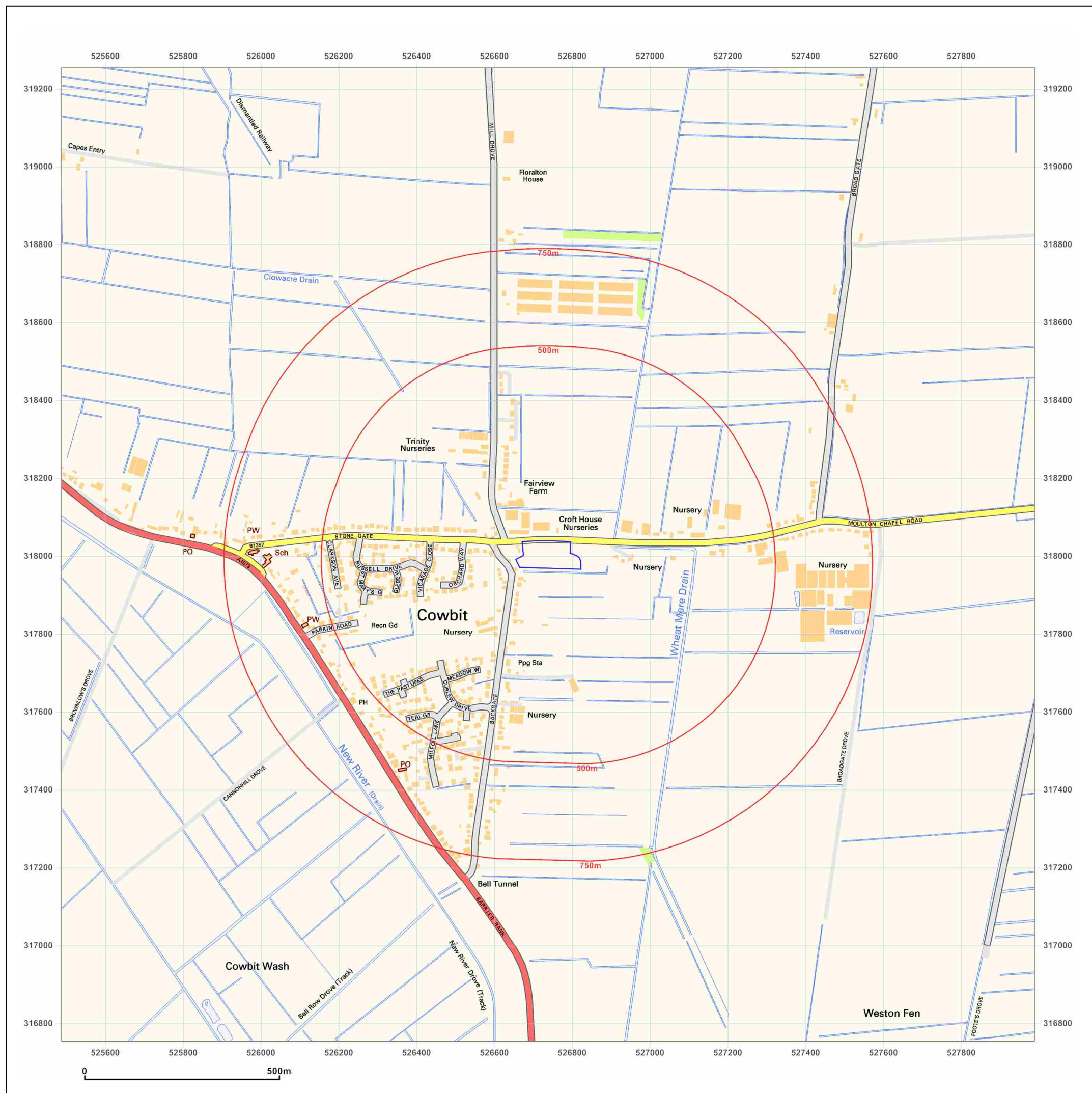


Produced by
Groundsure Insights
T: 08444 159000
E: info@groundsure.com
W: www.groundsure.com

© Crown copyright and database rights 2018 Ordnance Survey 100035207

Production date: 13 July 2018

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf



Site Details:

SITE OFF CHAPEL ROAD,
COWBIT, SPALDING, PE12 6XA

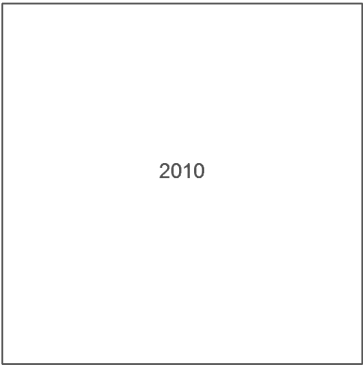
Client Ref: GML18201-AT-001
Report Ref: GEO-M-5233410
Grid Ref: 526738, 318003

Map Name: National Grid

Map date: 2010

Scale: 1:10,000

Printed at: 1:10,000



Produced by
Groundsure Insights
T: 08444 159000
E: info@groundsure.com
W: www.groundsure.com

© Crown copyright and database rights 2018 Ordnance Survey 100035207

Production date: 13 July 2018

Map legend available at:
www.groundsure.com/sites/default/files/groundsure_legend.pdf

APPENDIX VII

Site Investigation Layout Plan



- DO NOT SCALE
- NOTES:
-  Approx. Site Boundary
-  Approx. Location of Boreholes
-  Approx. Location of Trenches and Trial Pits



www.geo-matters.com
info@geo-matters.com

CLIENT:

Cowbit Homes Ltd

PROJECT:

Land off Moulton Chapel Road,
Cowbit, Spalding

TITLE:

Exploratory Hole Layout Plan

SCALE@SIZE :

NTS

ISSUE:

FINAL

DESIGN/DRAWN:

AT

DATE:

September 2018

PROJECT No:

GML18201

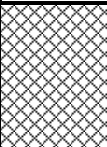
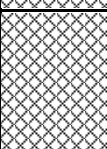
DRAWING No:

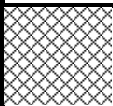
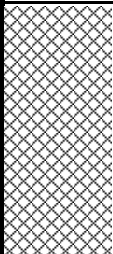
005

© Geo-Matters Ltd

APPENDIX VIII

Exploratory Hole Logs

Contractor: M Bacon Plant Hire Ltd			Project No: GML18201		Sheet: 1 of 1	
Equipment: JCB 3CX Excavator			Logged by: KAB		Date: 24th July 2018	
Field Monitoring and Sampling			Strata			Legend
Depth (m)	Type	Result (HSV/PP)	depth (m)	Description		
			0.60	MADE GROUND (Comprising reworked dark brown sandy silty clayey topsoil).		
			1.20	MADE GROUND (Comprising reworked light brown and grey mottled slightly clayey sandy silt).		
				Exploratory hole completed at 1.20m - on natural soil (SILT).		
Sheet 1 of 1			Groundwater:		Date : 24/07/18	
Logged by: KAB			No groundwater encountered during excavation.		Logged by: KAB	
EXPLORATORY RECORD			Remarks: 1) 3.00m long trench positioned 7.50m into the site from the kerb of Moulton Chapel Road. Four 150mm black plastic pipes encountered running east to west at 1.10m depth. Pipes were sat on (not surrounded by) pea gravel within the natural site soils at 1.00m. Strength descriptions of granular soils are based on Engineer's field description(s) HSV = Hand Shear Vane (kPa). PP = Pocket Penetrometer (daN/cm ²)			
						

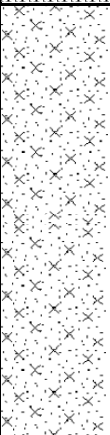
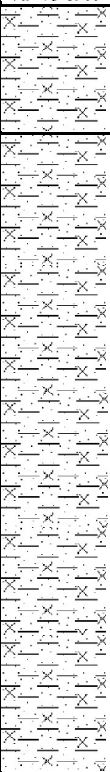
		Site: Land off Moulton Chapel Road, Cowbit, Spalding		TR02/ TR02A	
		Client: Cowbit Homes Ltd			
Contractor: M Bacon Plant Hire Ltd		Project No: GML18201		Sheet: 1 of 1	
Equipment: JCB 3CX Excavator		Logged by: KAB		Date: 24th July 2018	
Field Monitoring and Sampling		Strata			Legend
Depth (m)	Type	Result (HSV/PP)	depth (m)	Description	
			0.40	MADE GROUND (Comprising reworked brown sandy silty clayey topsoil).	
			1m	MADE GROUND (Comprising reworked light brown and grey mottled slightly clayey sandy silt).	
			1.40		
			2m	Exploratory hole completed at 1.40m - on natural soil (SILT).	
			3m		
			4m		
			5m		
Sheet 1 of 1		Groundwater:		Date : 24/07/18	
Logged by: KAB		No groundwater encountered during excavation.		Logged by: KAB	
EXPLORATORY RECORD		Remarks: 1) TR02 excavated on 24/07/18. Re-excavated and extended on 09/08/2018 and measured: 2.50m trench positioned 6.00m into the site from the kerb of Moulton Chapel Road. Plastic pipes encountered within the 1.30m depth pit. Pipes were surrounded by pea gravel within the natural site soils at 1.3m. Strength descriptions of granular soils are based on Engineer's field description(s) HSV = Hand Shear Vane (kPa). PP = Pocket Penetrometer (daN/cm ²)			
					

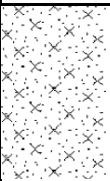
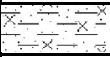
		Site: Land off Moulton Chapel Road, Cowbit, Spalding		CBR01
		Client: Cowbit Homes Ltd		
Contractor: M Bacon Plant Hire Ltd		Project No: GML18201		Sheet: 1 of 1
Equipment: JCB 3CX Excavator		Logged by: HB		Date: 24th July 2018
Field Monitoring and Sampling		Strata		Legend
Depth (m)	Type	Result (HSV/PP)	depth (m)	Description
0.50	B		0.30	Dark brown slightly gravelly silty sandy TOPSOIL. Gravel is fine to coarse and angular to subangular of sandstone.
			0.70	Loose light brown and occasionally grey mottled silty fine SAND.
			Exploratory location completed at 0.60m depth.	
			1m	
			2m	
			3m	
			4m	
			5m	
Sheet 1 of 1		Groundwater:		Date : 24/07/18
Logged by: HB		No groundwater encountered during excavation.		Logged by: HB
EXPLORARY RECORD		Remarks: 1) Trial pit completed at shallow depth to take bulk sample for laboratory soaked CBR testing.		
		Strength descriptions of granular soils are based on Engineer's field description(s) HSV = Hand Shear Vane (kPa), PP = Pocket Penetrometer (daN/cm ²)		

		Site: Land off Moulton Chapel Road, Cowbit, Spalding		CBR02
		Client: Cowbit Homes Ltd		
Contractor: M Bacon Plant Hire Ltd		Project No: GML18201		Sheet: 1 of 1
Equipment: JCB 3CX Excavator		Logged by: HB		Date: 24th July 2018
Field Monitoring and Sampling		Strata		Legend
Depth (m)	Type	Result (HSV/PP)	depth (m)	Description
0.80	B		0.30	Dark brown slightly gravelly silty sandy TOPSOIL. Gravel is fine to coarse and angular to subangular of sandstone.
			0.80	Loose light brown and occasionally grey mottled silty fine SAND.
			Exploratory location completed at 0.80m depth.	
			1m	
			2m	
			3m	
			4m	
			5m	
Sheet 1 of 1		Groundwater:		Date : 24/07/18
Logged by: HB		No groundwater encountered during excavation.		Logged by: HB
EXPLORATORY RECORD		Remarks: 1) Trial pit completed at shallow depth to take bulk sample for laboratory soaked CBR testing.		
		Strength descriptions of granular soils are based on Engineer's field description(s) HSV = Hand Shear Vane (kPa), PP = Pocket Penetrometer (daN/cm ²)		

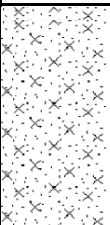
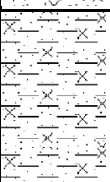
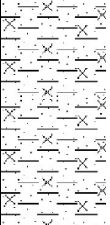
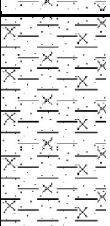
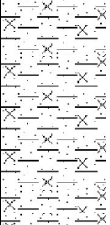
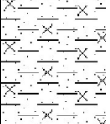
		Site: Land off Moulton Chapel Road, Cowbit, Spalding		CBR03
		Client: Cowbit Homes Ltd		
Contractor: M Bacon Plant Hire Ltd		Project No: GML18201		Sheet: 1 of 1
Equipment: JCB 3CX Excavator		Logged by: HB		Date: 24th July 2018
Field Monitoring and Sampling		Strata		Legend
Depth (m)	Type	Result (HSV/PP)	depth (m)	Description
0.60	B		0.30	Dark brown slightly gravelly silty sandy TOPSOIL. Gravel is fine to coarse and angular to subangular of sandstone.
			0.70	Loose light brown and occasionally grey mottled silty fine SAND.
			Exploratory location completed at 0.70m depth.	
			1m	
			2m	
			3m	
			4m	
			5m	
Sheet 1 of 1		Groundwater: No groundwater encountered during excavation.		Date : 24/07/18 Logged by: HB
Logged by: HB				
EXPLORATORY RECORD		Remarks: 1) Trial pit completed at shallow depth to take bulk sample for laboratory soaked CBR testing.		
		Strength descriptions of granular soils are based on Engineer's field description(s) HSV = Hand Shear Vane (kPa), PP = Pocket Penetrometer (daN/cm ²)		

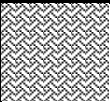
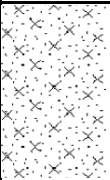
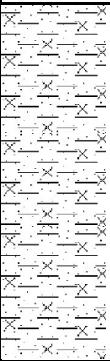
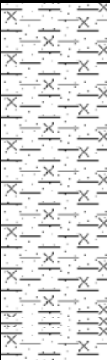
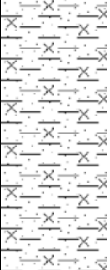
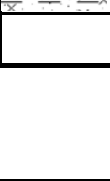
		Site: Land off Moulton Chapel Road, Cowbit, Spalding		CBR04
		Client: Cowbit Homes Ltd		
Contractor: M Bacon Plant Hire Ltd		Project No: GML18201		Sheet: 1 of 1
Equipment: JCB 3CX Excavator		Logged by: HB		Date: 24th July 2018
Field Monitoring and Sampling		Strata		Legend
Depth (m)	Type	Result (HSV/PP)	depth (m)	Description
0.70	B		0.30	Dark brown slightly gravelly silty sandy TOPSOIL. Gravel is fine to coarse and angular to subangular of sandstone.
			0.80	Loose light brown and occasionally grey mottled silty fine SAND.
			Exploratory location completed at 0.80m depth.	
			1m 2m 3m 4m 5m	
Sheet 1 of 1		Groundwater: No groundwater encountered during excavation.		Date : 24/07/18 Logged by: HB
Logged by: HB				
EXPLORATORY RECORD		Remarks: 1) Trial pit completed at shallow depth to take bulk sample for laboratory soaked CBR testing.		
		Strength descriptions of granular soils are based on Engineer's field description(s) HSV = Hand Shear Vane (kPa), PP = Pocket Penetrometer (daN/cm ²)		

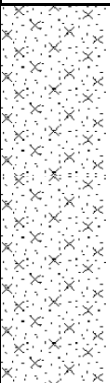
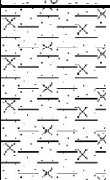
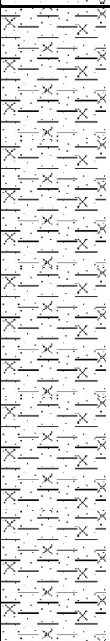
		Site: Land off Moulton Chapel Road, Cowbit, Spalding Client: Cowbit Homes Ltd		WS01	
Contractor: RP Drilling			Project No: GML18201		Sheet: 1 of 1
Equipment: Window Sampler Rig			Logged by: AT		Date: 25th July 2018
Field Monitoring and Sampling			Strata		Legend Well
Depth (m)	Type	Result (SPT or HSV)	depth (m)	Description	
0.05	JT			Dark brown silty sandy TOPSOIL.	
0.40	JT		0.30	Loose light brown and occasionally grey mottled silty fine SAND.	
1.00	B	N = 9	1m		
1.20	JT				
		N = 5	2.00		
			2.50	Soft to firm light brown and occasionally grey mottled sandy SILT.	
2.60	B	HSV @ 2.60m = 7, 7, 7		Very soft dark grey slightly sandy SILT.	
		N = 0	3m		
		HSV @ 3.50m = 7, 9, 13			
		N = 0	4m		
		HSV @ 4.50m = 5, 7, 7		... becoming firm from 4.90m depth.	
		N = 6	5.00	Exploratory location completed at 5.00m depth.	
Sheet 1 of 1 Logged by: AT			Groundwater: Groundwater encountered at 1.00m depth.		Date : 25/07/18 Drilled by: RP Logged by: AT
EXPLORATORY RECORD			Remarks: 1) Borehole cased to 1.00m depth.		
			HSV = Hand Shear Vane (kPa), PP = Pocket Penetrometer (daN/cm ²)		

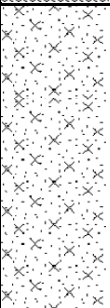
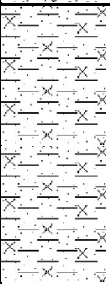
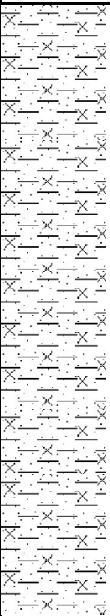
		Site: Land off Moulton Chapel Road, Cowbit, Spalding Client: Cowbit Homes Ltd		HTP01 / WS02	
Contractor: N/A		Project No: GML18201		Sheet: 1 of 1	
Equipment: Hand Tools		Logged by: AT		Date: 25th July 2018	
Field Monitoring and Sampling			Strata		Legend
Depth (m)	Type	Result (HSV/PP)	depth (m)	Description	
0.10	JT	HSV @ 1.10m = 13, 16, 18		Dark brown slightly silty sandy TOPSOIL.	
	0.35		Loose light brown slightly silty fine SAND.		
	1.00		Soft light brown slightly sandy SILT.		
	1.20		Exploratory location completed at 1.20m depth.		
			2m		
			3m		
			4m		
			5m		
Sheet 1 of 1		Groundwater:		Date : 25/07/18	
Logged by: AT		No groundwater encountered during excavation.		Logged by: AT	
EXPLORATORY RECORD		Remarks: 1) HTP01 completed as a hand dug trial pit rather than a window sampler borehole (WS02) due to proximity to sewer.			
		Strength descriptions of granular soils are based on Engineer's field description(s) HSV = Hand Shear Vane (kPa), PP = Pocket Penetrometer (daN/cm ²)			

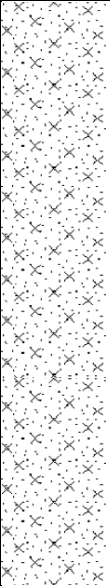
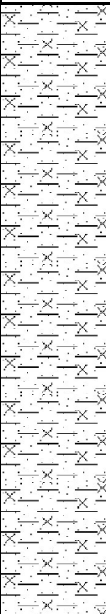
		Site: Land off Moulton Chapel Road, Cowbit, Spalding		WS03
		Client: Cowbit Homes Ltd		
Contractor: RP Drilling		Project No: GML18201		Sheet: 1 of 1
Equipment: Window Sampler Rig		Logged by: AT		Date: 25th July 2018
Field Monitoring and Sampling		Strata		Legend Well
Depth (m)	Type	Result (SPT or HSV)	depth (m)	Description
0.40	JT	N = 7	0.35	Dark brown silty sandy TOPSOIL.
1.20	JTB	HSV @ 1.50m = 13, 13, 11	1.00	Loose light brown and occasionally grey mottled silty fine SAND.
3.00	JTB	N = 3	2m	Firm light and dark brown mottled slightly sandy SILT.
3.00	JTB	N = 0	2.90	... becoming soft and very sandy from 2.00m depth.
3.00	JTB	HSV @ 3.50m = 5, 3, 5	3m	Very soft dark grey slightly sandy SILT.
3.00	JTB	N = 3	4m	... becoming soft from 4.00m depth.
3.00	JTB	N = 5	5.00	... becoming firm from 4.90m depth.
				Exploratory location completed at 5.00m depth.
Sheet 1 of 1		Groundwater:		Date : 25/07/18
Logged by: AT		Groundwater encountered at 2.00m depth.		Drilled by: RP
				Logged by: AT
EXPLORATORY RECORD		Remarks:		
		1) Borehole cased to 1.00m depth.		
		HSV = Hand Shear Vane (kPa), PP = Pocket Penetrometer (daN/cm ²)		

		Site: Land off Moulton Chapel Road, Cowbit, Spalding Client: Cowbit Homes Ltd		WS04	
Contractor: RP Drilling		Project No: GML18201		Sheet: 1 of 1	
Equipment: Window Sampler Rig		Logged by: AT		Date: 25th July 2018	
Field Monitoring and Sampling		Strata		Legend	Well
Depth (m)	Type	Result (SPT or HSV)	depth (m)	Description	
0.05	JT	N = 4		Dark brown slightly sandy silty TOPSOIL.	
			0.30		
0.80	JT			Loose light brown and occasionally grey mottled silty fine SAND.	
			1m		
			1.20		
1.50	JT	▼ HSV @ 1.50m = 70, 80, 70		Soft light brown slightly sandy SILT.	
1.90	B	N = 0	2m	... becoming very soft from 2.00m depth.	
			2.80		
3.00	B	N = 0	3m	Very soft dark grey sandy SILT.	
		HSV @ 3.50m = 9, 9, 7		... becoming slightly sandy from 3.40m depth.	
		N = 0	4m		
		N = 3	5.00	... becoming soft from 4.90m depth.	
				Exploratory location completed at 5.00m depth.	
Sheet 1 of 1		Groundwater:		Date : 25/07/18	
Logged by: AT		Groundwater encountered at 1.50m depth.		Drilled by: RP	
				Logged by: AT	
EXPLORATORY RECORD		Remarks: 1) Borehole cased to 1.00m depth.			
		HSV = Hand Shear Vane (kPa), PP = Pocket Penetrometer (daN/cm ²)			

		Site: Land off Moulton Chapel Road, Cowbit, Spalding Client: Cowbit Homes Ltd		WS05	
Contractor: RP Drilling		Project No: GML18201		Sheet: 1 of 1	
Equipment: Window Sampler Rig		Logged by: AT		Date: 25th July 2018	
Field Monitoring and Sampling		Strata		Legend	Well
Depth (m)	Type	Result (SPT or HSV)	depth (m)	Description	
0.50	JT	N = 8 HSV @ 1.50m = 16, 18, 16  N = 0	0.40	Dark brown slightly sandy TOPSOIL.	
1.20	JTB		1.10	Loose light brown and occasionally grey mottled slightly silty fine SAND.	
			2m	Soft to firm light brown and occasionally grey mottled slightly sandy SILT.	
			2.50	... becoming very soft from 2.00m depth.	
4.00	B	N = 0	3m	Very soft dark grey slightly sandy clayey SILT.	
5.00	JT	HSV @ 3.50m = 7, 7, 6 N = 0 HSV @ 4.50m = 20, 15, 20 N = 4	4m	... becoming soft from 4.90m depth.	
			5.00	Exploratory location completed at 5.00m depth.	
Sheet 1 of 1		Groundwater:		Date : 25/07/18	
Logged by: AT		Groundwater encountered at 1.80m depth.		Drilled by: RP	
				Logged by: AT	
EXPLORATORY RECORD		Remarks: 1) Borehole cased to 1.00m depth.			
		HSV = Hand Shear Vane (kPa), PP = Pocket Penetrometer (daN/cm ²)			

		Site: Land off Moulton Chapel Road, Cowbit, Spalding Client: Cowbit Homes Ltd		WS06	
Contractor: RP Drilling		Project No: GML18201		Sheet: 1 of 1	
Equipment: Window Sampler Rig		Logged by: AT		Date: 25th July 2018	
Field Monitoring and Sampling		Strata		Legend	Well
Depth (m)	Type	Result (SPT or HSV)	depth (m)	Description	
0.10	JT			Dark brown silty sandy TOPSOIL.	
			0.35		
0.70	JT	N = 10	1m	Loose light brown and occasionally grey mottled silty fine SAND.	
1.50	B				
1.70	JT		1.80		
2.00	B	N = 9	2m	Firm light brown and occasionally grey mottled sandy SILT.	
			2.50		
		HSV @ 2.80m = 7, 9, 9 N = 4	3m	Soft dark grey sandy SILT. ... becoming slightly sandy from 2.90m depth.	
		N = 0	4m	... becoming very soft from 4.00m depth.	
		HSV @ 4.50m = 1, 3, 4			
		HSV @ 4.90m = 18, 16, 13 N = 0	5.00		
				Exploratory location completed at 5.00m depth.	
Sheet 1 of 1		Groundwater:		Date : 25/07/18	
Logged by: AT		Groundwater encountered at 2.10m depth.		Drilled by: RP	
				Logged by: AT	
EXPLORATORY RECORD		Remarks: 1) Borehole cased to 1.00m depth.			
		HSV = Hand Shear Vane (kPa), PP = Pocket Penetrometer (daN/cm ²)			

		Site: Land off Moulton Chapel Road, Cowbit, Spalding Client: Cowbit Homes Ltd		WS07	
Contractor: RP Drilling		Project No: GML18201		Sheet: 1 of 1	
Equipment: Window Sampler Rig		Logged by: AT		Date: 25th July 2018	
Field Monitoring and Sampling		Strata		Legend	Well
Depth (m)	Type	Result (SPT or HSV)	depth (m)	Description	
0.50	JT	N = 5	0.35	Dark brown slightly sandy silty TOPSOIL.	
1.00 1.10	B JT		1m	Loose light brown and occasionally grey mottled silty fine SAND.	
2.00	B	HSV @ 1.60m = 6, 11, 9 N = 4	1.50 2m	Soft light brown and occasionally grey mottled sandy SILT.	
2.70	JT	HSV @ 2.70m = 5, 7, 7 N = 0	2.60 3m	Very soft dark grey slightly sandy SILT.	
		N = 0 HSV @ 4.00m = 2, 7, 7	4m		
		N = 4	5.00	... becoming soft from 4.90m depth.	
				Exploratory location completed at 5.00m depth.	
Sheet 1 of 1		Groundwater:		Date : 25/07/18	
Logged by: AT		Groundwater encountered at 1.20m depth.		Drilled by: RP	
				Logged by: AT	
EXPLORATORY RECORD		Remarks: 1) Borehole cased to 1.00m depth.			
		HSV = Hand Shear Vane (kPa), PP = Pocket Penetrometer (daN/cm ²)			

		Site: Land off Moulton Chapel Road, Cowbit, Spalding Client: Cowbit Homes Ltd		WS08	
Contractor: RP Drilling		Project No: GML18201		Sheet: 1 of 1	
Equipment: Window Sampler Rig		Logged by: AT		Date: 25th July 2018	
Field Monitoring and Sampling		Strata		Legend	Well
Depth (m)	Type	Result (SPT or HSV)	depth (m)	Description	
0.20	JT	N = 6	0.35	Dark brown slightly sandy silty TOPSOIL.	
0.70	JT		1m	Loose light brown and occasionally grey mottled silty fine SAND. ... with rare 0.04m pockets of sandy silt encountered from 0.80m depth.	
1.50	B	N = 7	2m		
2.70 2.80	JT B	N = 0 HSV @ 3.00m = 4, 5, 3	2.60	Very soft dark grey slightly sandy SILT.	
		N = 0	3m		
		N = 0	4m		
		N = 0	5.00	Exploratory location completed at 5.00m depth.	
Sheet 1 of 1		Groundwater:		Date : 25/07/18	
Logged by: AT		Groundwater encountered at 1.50m depth.		Drilled by: RP	
				Logged by: AT	
EXPLORATORY RECORD		Remarks: 1) Borehole cased to 1.00m depth.			
		HSV = Hand Shear Vane (kPa), PP = Pocket Penetrometer (daN/cm ²)			

APPENDIX IX

Laboratory Testing Data

**Alex Thornber**

Geo-Matters Limited
104 Bondgate
Castle Donington
DE74 2NR

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

t: 01332817644

e: info@geo-matters.com

t: 01923 225404

f: 01923 237404

e: reception@i2analytical.com

Analytical Report Number : 18-94217

Project / Site name: Site Off Moulton Chapel Road, Cowbit

Samples received on: 26/07/2018

Your job number: GML18201

Your order number: GML18201-AT-007

Report Issue Number: 1

Samples Analysed: 11 soil samples

Signed:

Jordan Hill
Reporting Manager
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

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

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

Excel copies of reports are only valid when accompanied by this PDF certificate.

Analytical Report Number: 18-94217

Project / Site name: Site Off Moulton Chapel Road, Cowbit

Your Order No: GML18201-AT-007

Lab Sample Number	1010604	1010605	1010606	1010607	1010608
Sample Reference	WS01	WS01	WS03	WS04	WS04
Sample Number	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)	0.05	0.40	0.40	0.05	0.80
Date Sampled	25/07/2018	25/07/2018	25/07/2018	25/07/2018	25/07/2018
Time Taken	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status		
Stone Content	%	0.1	NONE	< 0.1	< 0.1
Moisture Content	%	N/A	NONE	8.7	14
Total mass of sample received	kg	0.001	NONE	1.0	1.1
				0.83	0.86
				0.86	0.95

Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	-	-	-	-
------------------	------	-----	-----------	--------------	---	---	---	---

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	8.3	8.6	8.0	-	8.2
Total Sulphate as SO ₄	mg/kg	50	MCERTS	470	-	300	-	220
Water Soluble SO ₄ 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.0097	0.0091	0.012	-	0.012
Total Organic Carbon (TOC)	%	0.1	MCERTS	1.1	-	1.4	-	0.5

Total Phenols

Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	-	< 1.0	-	< 1.0
----------------------------	-------	---	--------	-------	---	-------	---	-------

Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	-	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	-	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	-	< 0.05
Fluorene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	-	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	< 0.05	-	0.13	-	< 0.05
Anthracene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	-	< 0.05
Fluoranthene	mg/kg	0.05	MCERTS	< 0.05	-	0.28	-	< 0.05
Pyrene	mg/kg	0.05	MCERTS	< 0.05	-	0.23	-	< 0.05
Benzo(a)anthracene	mg/kg	0.05	MCERTS	< 0.05	-	0.16	-	< 0.05
Chrysene	mg/kg	0.05	MCERTS	< 0.05	-	0.15	-	< 0.05
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	-	< 0.05
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	-	< 0.05
Benzo(a)pyrene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	-	< 0.05
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	-	< 0.05
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	-	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	-	< 0.05

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	< 0.80	-	0.95	-	< 0.80
-----------------------------	-------	-----	--------	--------	---	------	---	--------

Heavy Metals / Metalloids

Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	8.7	-	10	-	9.4
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	-	< 0.2	-	< 0.2
Chromium (hexavalent)	mg/kg	4	MCERTS	< 4.0	-	< 4.0	-	< 4.0
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	17	-	20	-	16
Copper (aqua regia extractable)	mg/kg	1	MCERTS	15	-	22	-	5.9
Lead (aqua regia extractable)	mg/kg	1	MCERTS	15	-	42	-	8.0
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	-	< 0.3	-	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	14	-	17	-	17
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	-	< 1.0	-	< 1.0
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	43	-	73	-	34

Petroleum Hydrocarbons

Petroleum Range Organics (C6 - C10)	mg/kg	0.1	MCERTS	< 0.1	-	-	-	-
TPH (C10 - C25)	mg/kg	10	MCERTS	< 10	-	-	-	-
TPH (C25 - C40)	mg/kg	10	NONE	< 10	-	-	-	-

Pesticide and Herbicide Screen

Pesticides/Herbicides Screen in Soil	P/A	N/A	NONE	-	-	-	Absent	-
--------------------------------------	-----	-----	------	---	---	---	--------	---

Analytical Report Number: 18-94217

Project / Site name: Site Off Moulton Chapel Road, Cowbit

Your Order No: GML18201-AT-007

Lab Sample Number	1010609	1010610	1010611	1010612	1010613
Sample Reference	WS05	WS05	WS06	HTP01	WS08
Sample Number	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)	0.50	5.00	0.10	0.10	0.20
Date Sampled	25/07/2018	25/07/2018	25/07/2018	25/07/2018	25/07/2018
Time Taken	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status		
Stone Content	%	0.1	NONE	< 0.1	< 0.1
Moisture Content	%	N/A	NONE	13	32
Total mass of sample received	kg	0.001	NONE	1.1	0.97
				0.89	0.66
				0.66	0.88

Asbestos in Soil	Type	N/A	ISO 17025	-	-	Not-detected	-	-
------------------	------	-----	-----------	---	---	--------------	---	---

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	8.5	8.7	8.1	8.1	8.3
Total Sulphate as SO ₄	mg/kg	50	MCERTS	210	-	440	650	400
Water Soluble SO ₄ 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.011	0.37	0.012	0.022	0.013
Total Organic Carbon (TOC)	%	0.1	MCERTS	0.5	-	1.7	2.8	1.1

Total Phenols

Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	-	< 1.0	< 1.0	< 1.0
----------------------------	-------	---	--------	-------	---	-------	-------	-------

Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	< 0.05	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	< 0.05	< 0.05
Fluorene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	< 0.05	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	< 0.05	-	0.19	0.15	< 0.05
Anthracene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	< 0.05	< 0.05
Fluoranthene	mg/kg	0.05	MCERTS	< 0.05	-	0.52	0.47	< 0.05
Pyrene	mg/kg	0.05	MCERTS	< 0.05	-	0.45	0.41	< 0.05
Benzo(a)anthracene	mg/kg	0.05	MCERTS	< 0.05	-	0.27	0.28	< 0.05
Chrysene	mg/kg	0.05	MCERTS	< 0.05	-	0.26	0.23	< 0.05
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	-	0.38	0.31	< 0.05
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	-	0.25	0.19	< 0.05
Benzo(a)pyrene	mg/kg	0.05	MCERTS	< 0.05	-	0.40	0.29	< 0.05
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	< 0.05	-	0.20	0.16	< 0.05
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	< 0.05	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	-	0.25	0.20	< 0.05

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	< 0.80	-	3.17	2.69	< 0.80
-----------------------------	-------	-----	--------	--------	---	------	------	--------

Heavy Metals / Metalloids

Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	5.8	-	12	11	8.4
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	-	< 0.2	< 0.2	< 0.2
Chromium (hexavalent)	mg/kg	4	MCERTS	< 4.0	-	< 4.0	< 4.0	< 4.0
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	13	-	21	21	18
Copper (aqua regia extractable)	mg/kg	1	MCERTS	7.8	-	28	26	11
Lead (aqua regia extractable)	mg/kg	1	MCERTS	5.6	-	27	32	15
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	-	< 0.3	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	10	-	16	17	15
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	-	< 1.0	< 1.0	< 1.0
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	29	-	61	73	46

Petroleum Hydrocarbons

Petroleum Range Organics (C6 - C10)	mg/kg	0.1	MCERTS	-	-	< 0.1	-	-
TPH (C10 - C25)	mg/kg	10	MCERTS	-	-	18	-	-
TPH (C25 - C40)	mg/kg	10	NONE	-	-	12	-	-

Pesticide and Herbicide Screen

Pesticides/Herbicides Screen in Soil	P/A	N/A	NONE	-	-	-	-	-
--------------------------------------	-----	-----	------	---	---	---	---	---

Analytical Report Number: 18-94217

Project / Site name: Site Off Moulton Chapel Road, Cowbit

Your Order No: GML18201-AT-007

Lab Sample Number				1010614				
Sample Reference				WS07				
Sample Number				None Supplied				
Depth (m)				1.10				
Date Sampled				25/07/2018				
Time Taken				None Supplied				
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					
Stone Content	%	0.1	NONE	< 0.1				
Moisture Content	%	N/A	NONE	21				
Total mass of sample received	kg	0.001	NONE	1.2				

Asbestos in Soil	Type	N/A	ISO 17025	-				
------------------	------	-----	-----------	---	--	--	--	--

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	8.5				
Total Sulphate as SO ₄	mg/kg	50	MCERTS	410				
Water Soluble SO ₄ 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.055				
Total Organic Carbon (TOC)	%	0.1	MCERTS	0.4				

Total Phenols

Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0				
----------------------------	-------	---	--------	-------	--	--	--	--

Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	< 0.05				
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05				
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05				
Fluorene	mg/kg	0.05	MCERTS	< 0.05				
Phenanthrene	mg/kg	0.05	MCERTS	< 0.05				
Anthracene	mg/kg	0.05	MCERTS	< 0.05				
Fluoranthene	mg/kg	0.05	MCERTS	< 0.05				
Pyrene	mg/kg	0.05	MCERTS	< 0.05				
Benzo(a)anthracene	mg/kg	0.05	MCERTS	< 0.05				
Chrysene	mg/kg	0.05	MCERTS	< 0.05				
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	< 0.05				
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	< 0.05				
Benzo(a)pyrene	mg/kg	0.05	MCERTS	< 0.05				
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	< 0.05				
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05				
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05				

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	< 0.80				
-----------------------------	-------	-----	--------	--------	--	--	--	--

Heavy Metals / Metalloids

Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	3.7				
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2				
Chromium (hexavalent)	mg/kg	4	MCERTS	< 4.0				
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	18				
Copper (aqua regia extractable)	mg/kg	1	MCERTS	9.2				
Lead (aqua regia extractable)	mg/kg	1	MCERTS	7.1				
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3				
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	17				
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0				
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	33				

Petroleum Hydrocarbons

Petroleum Range Organics (C6 - C10)	mg/kg	0.1	MCERTS	-				
TPH (C10 - C25)	mg/kg	10	MCERTS	-				
TPH (C25 - C40)	mg/kg	10	NONE	-				

Pesticide and Herbicide Screen

Pesticides/Herbicides Screen in Soil	P/A	N/A	NONE	-				
--------------------------------------	-----	-----	------	---	--	--	--	--



Analytical Report Number : 18-94217

Project / Site name: Site Off Moulton Chapel Road, Cowbit

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
1010604	WS01	None Supplied	0.05	Brown loam and clay with gravel and vegetation.
1010605	WS01	None Supplied	0.40	Light brown sandy clay.
1010606	WS03	None Supplied	0.40	Brown sandy clay with gravel.
1010607	WS04	None Supplied	0.05	Brown loam and clay with gravel and vegetation.
1010608	WS04	None Supplied	0.80	Light brown sandy clay.
1010609	WS05	None Supplied	0.50	Light brown sandy clay.
1010610	WS05	None Supplied	5.00	Grey clay with vegetation.
1010611	WS06	None Supplied	0.10	Brown loam and clay with gravel and vegetation.
1010612	HTP01	None Supplied	0.10	Brown loam and clay with gravel and vegetation.
1010613	WS08	None Supplied	0.20	Brown loam and clay with gravel and vegetation.
1010614	WS07	None Supplied	1.10	Brown sandy clay.

Analytical Report Number : 18-94217

Project / Site name: Site Off Moulton Chapel Road, Cowbit

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with disperion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
Hexavalent chromium in soil	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazine followed by colorimetry.	In-house method	L080-PL	W	MCERTS
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Moisture Content	Moisture content, determined gravimetrically.	In-house method based on BS1377 Part 2, 1990, Chemical and Electrochemical Tests	L019-UK/PL	W	NONE
Monohydric phenols in soil	Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	MCERTS
Pesticides and Herbicides in soil screening	In-house method	In-house method		W	NONE
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L099-PL	D	MCERTS
PRO (Soil)	Determination of hydrocarbons C6-C10 by headspace GC-MS.	In-house method based on USEPA8260	L088-PL	W	MCERTS
Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L064-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests, 2:1 water:soil extraction, analysis by ICP-OES.	L038-PL	D	MCERTS
Total organic carbon (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L009-PL	D	MCERTS
Total sulphate (as SO4 in soil)	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L038-PL	D	MCERTS
TPH Oils (Soils)	Determination of extractable hydrocarbons in soil by GC-MS/FID.	In-house method	L076-PL	D	NONE

For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.

For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.

Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.

Sample Deviation Report



Sample ID	Other ID	Sample Type	Job	Sample Number	Sample Deviation Code	test_name	test_ref	Test Deviation code
WS01		S	18-94217	1010604	b	PRO (Soil)	L088-PL	b
WS06		S	18-94217	1010611	b	PRO (Soil)	L088-PL	b



4041

TEST CERTIFICATE

Determination of Liquid and Plastic Limits

Tested in Accordance with BS1377-2: 1990: Clause 4.4 & 5: One Point Method

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



Client: Geo-Matters Limited
Client Address: 104 Bondgate
Castle Donington
DE74 2NR
Contact: Alex Thornber
Site Name: Site off Maulton Chapel, Cowbit
Site Address: Not Given

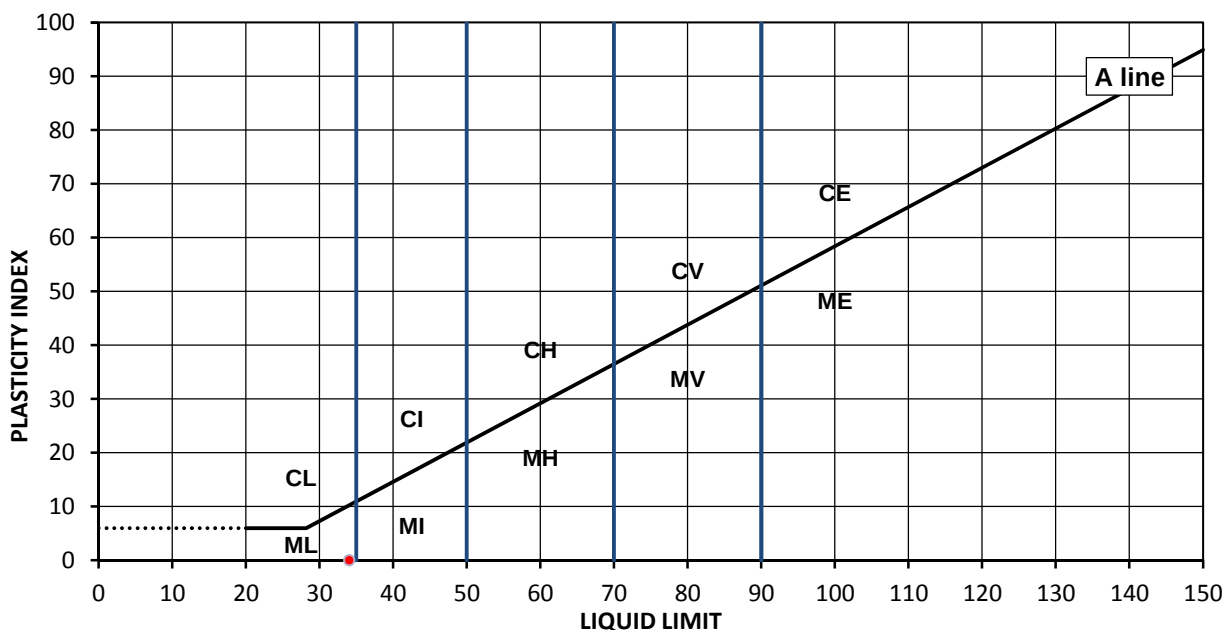
Client Reference: GML18201
Job Number: 18-94459
Date Sampled: 25/07/2018
Date Received: 26/07/2018
Date Tested: 03/08/2018
Sampled By: AT

Test Results

Laboratory Reference: 1011931
Hole No.: WS01
Sample Reference: Not Given
Soil Description: Brown very sandy CLAY
Sample Preparation: Tested in natural condition

Depth Top [m]: 1.00
Depth Base [m]: Not Given
Sample Type: B

As Received Moisture Content [%]	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index [%]	% Passing 425µm BS Test Sieve
23	34	NP	NP	100



Legend, based on BS 5930:2015 Code of practice for site investigations

C	Clay	Plasticity	Liquid Limit
M	Silt	L Low	below 35
		I Medium	35 to 50
		H High	50 to 70
		V Very high	70 to 90
		E Extremely high	exceeding 90
	Organic	O	append to classification for organic material (eg CHO)

Remarks: NP – non plastic

Approved:

Maria Chandler
Site Manager
Northampton
Date Reported:

30/08/2018

Signed:

Darren Berrill
Geotechnical General
Manager

for and on behalf of i2 Analytical Ltd

"Opinions and interpretations expressed here in are outside of the scope of the UKAS Accreditation.
This report may not be reproduced other than in full without the prior written approval of the issuing laboratory.
The results included within the report are representative of the samples submitted for analysis.
The analysis was carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland."



4041

TEST CERTIFICATE

Determination of Liquid and Plastic Limits

Tested in Accordance with BS1377-2: 1990: Clause 4.4 & 5: One Point Method

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



Client: Geo-Matters Limited
Client Address: 104 Bondgate
Castle Donington
DE74 2NR
Contact: Alex Thornber
Site Name: Site off Maulton Chapel, Cowbit
Site Address: Not Given

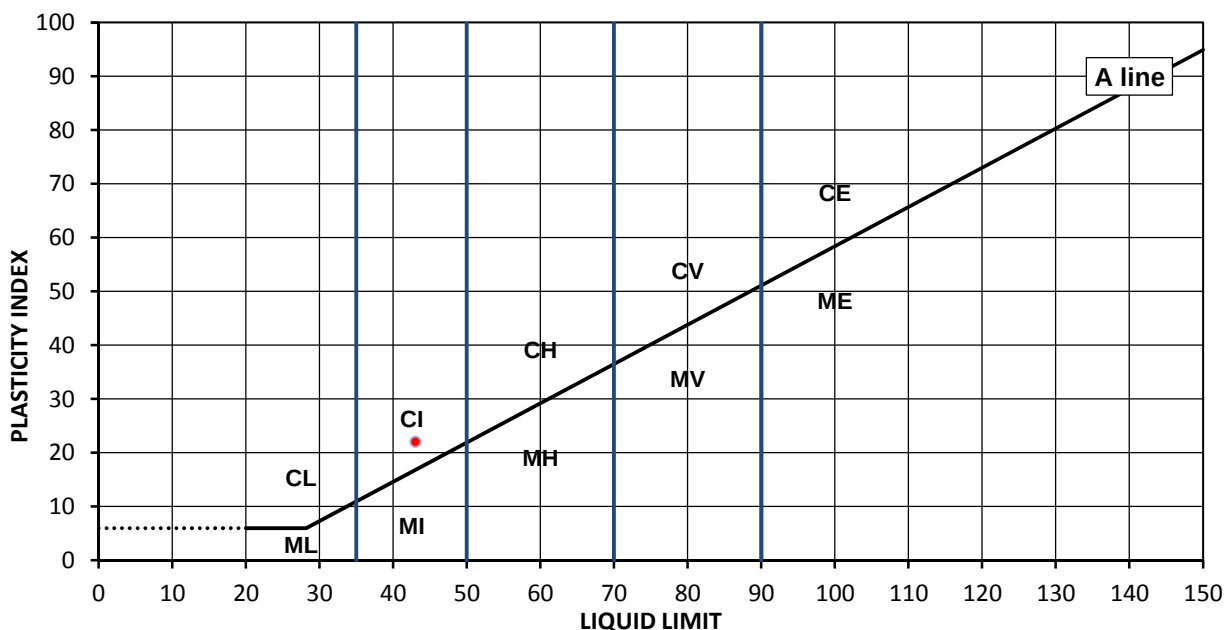
Client Reference: GML18201
Job Number: 18-94459
Date Sampled: 25/07/2018
Date Received: 26/07/2018
Date Tested: 03/08/2018
Sampled By: AT

Test Results

Laboratory Reference: 1011932
Hole No.: WS03
Sample Reference: Not Given
Soil Description: Brown sandy CLAY
Sample Preparation: Tested in natural condition

Depth Top [m]: 1.20
Depth Base [m]: Not Given
Sample Type: B

As Received Moisture Content [%]	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index [%]	% Passing 425µm BS Test Sieve
23	43	21	22	100



Legend, based on BS 5930:2015 Code of practice for site investigations

C	Clay	Plasticity	Liquid Limit
M	Silt	L Low	below 35
		I Medium	35 to 50
		H High	50 to 70
		V Very high	70 to 90
		E Extremely high	exceeding 90
	Organic	O	append to classification for organic material (eg CHO)

Remarks:

Approved:

Maria Chandler
Site Manager
Northampton
Date Reported:

30/08/2018

Signed:

Darren Berrill
Geotechnical General
Manager

for and on behalf of i2 Analytical Ltd

"Opinions and interpretations expressed here in are outside of the scope of the UKAS Accreditation.
This report may not be reproduced other than in full without the prior written approval of the issuing laboratory.
The results included within the report are representative of the samples submitted for analysis.
The analysis was carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland."



4041

TEST CERTIFICATE

Determination of Liquid and Plastic Limits

Tested in Accordance with BS1377-2: 1990: Clause 4.4 & 5: One Point Method

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



Client: Geo-Matters Limited
Client Address: 104 Bondgate
Castle Donington
DE74 2NR
Contact: Alex Thornber
Site Name: Site off Maulton Chapel, Cowbit
Site Address: Not Given

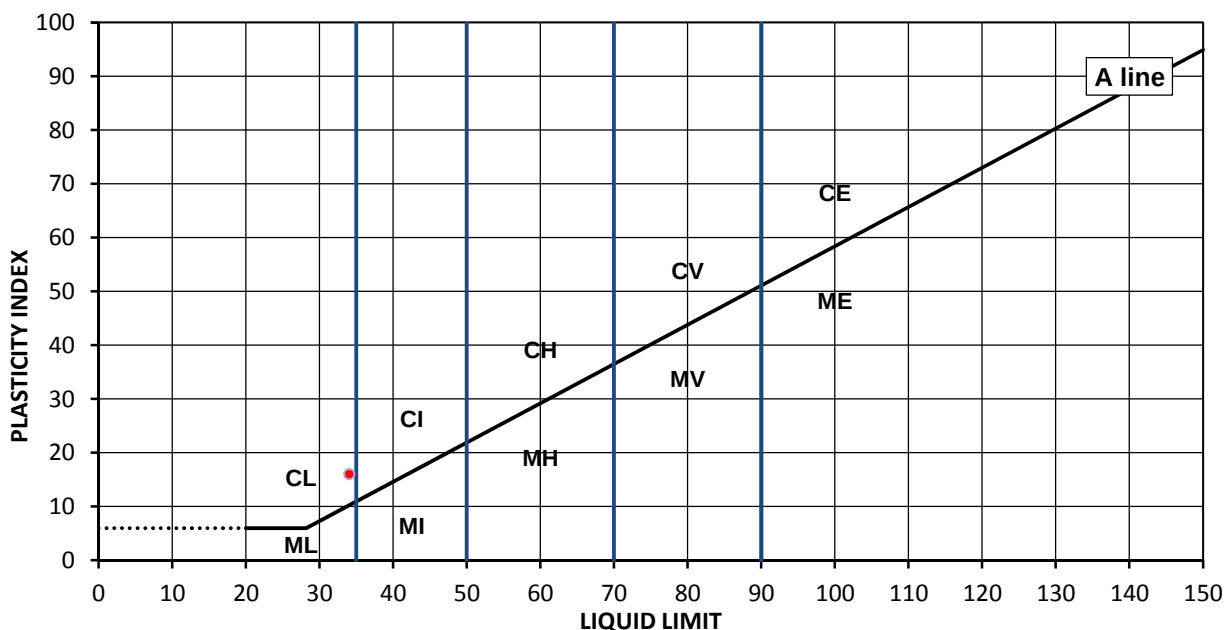
Client Reference: GML18201
Job Number: 18-94459
Date Sampled: 25/07/2018
Date Received: 26/07/2018
Date Tested: 03/08/2018
Sampled By: AT

Test Results

Laboratory Reference: 1011933
Hole No.: WS05
Sample Reference: Not Given
Soil Description: Brown very sandy CLAY
Sample Preparation: Tested in natural condition

Depth Top [m]: 1.20
Depth Base [m]: Not Given
Sample Type: B

As Received Moisture Content [%]	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index [%]	% Passing 425µm BS Test Sieve
23	34	18	16	100



Legend, based on BS 5930:2015 Code of practice for site investigations

C	Clay	Plasticity	Liquid Limit
M	Silt	L	below 35
		I	35 to 50
		H	50 to 70
		V	70 to 90
		E	exceeding 90
	Organic	O	append to classification for organic material (eg CHO)

Remarks:

Approved:

Maria Chandler
Site Manager
Northampton
Date Reported:

30/08/2018

Signed:

Darren Berrill
Geotechnical General
Manager

for and on behalf of i2 Analytical Ltd

"Opinions and interpretations expressed here in are outside of the scope of the UKAS Accreditation.
This report may not be reproduced other than in full without the prior written approval of the issuing laboratory.
The results included within the report are representative of the samples submitted for analysis.
The analysis was carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland."

TEST CERTIFICATE

Summary of Classification Test Results

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



Client: Geo-Matters Limited
Client Address: 104 Bondgate
Castle Donington
DE74 2NR
Contact: Alex Thornber
Site Name: Site off Maulton Chapel, Cowbit
Site Address: Not Given

Client Reference: GML18201
Job Number: 18-94459
Date Sampled: 25/07/2018
Date Received: 26/07/2018
Date Tested: 03/08/2018
Sampled By: AT

Test results

Laboratory Reference	Hole No.	Sample				Soil Description	M/C	Atterberg				Density		Total Porosity
		Reference	Top depth [m]	Base depth [m]	Type			% Passing 425um	LL	PL	PI	bulk	PD	
1011931	WS01	Not Given	1.00	Not Given	B	Brown very sandy CLAY	23	100	34	NP	NP			
1011932	WS03	Not Given	1.20	Not Given	B	Brown sandy CLAY	23	100	43	21	22			
1011933	WS05	Not Given	1.20	Not Given	B	Brown very sandy CLAY	23	100	34	18	16			

Comments: NP - non plastic

Approved:

Maria Chandler
Site Manager Northampton

Signed:

Darren Berrill
Geotechnical General Manager

Date Reported: 30/08/2018

for and on behalf of i2 Analytical Ltd

*Opinions and interpretations expressed herein are outside of the scope of the UKAS Accreditation.
This report may not be reproduced other than in full without the prior written approval of the issuing laboratory.
The results included within the report are representative of the samples submitted for analysis.
The analysis was carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland.*



TEST CERTIFICATE

Determination of Particle Size Distribution

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



Tested in Accordance with BS1377:Part 2:1990, clause 9.2

Client: Geo-Matters Limited
Client Address: 104 Bondgate
Castle Donington
DE74 2NR

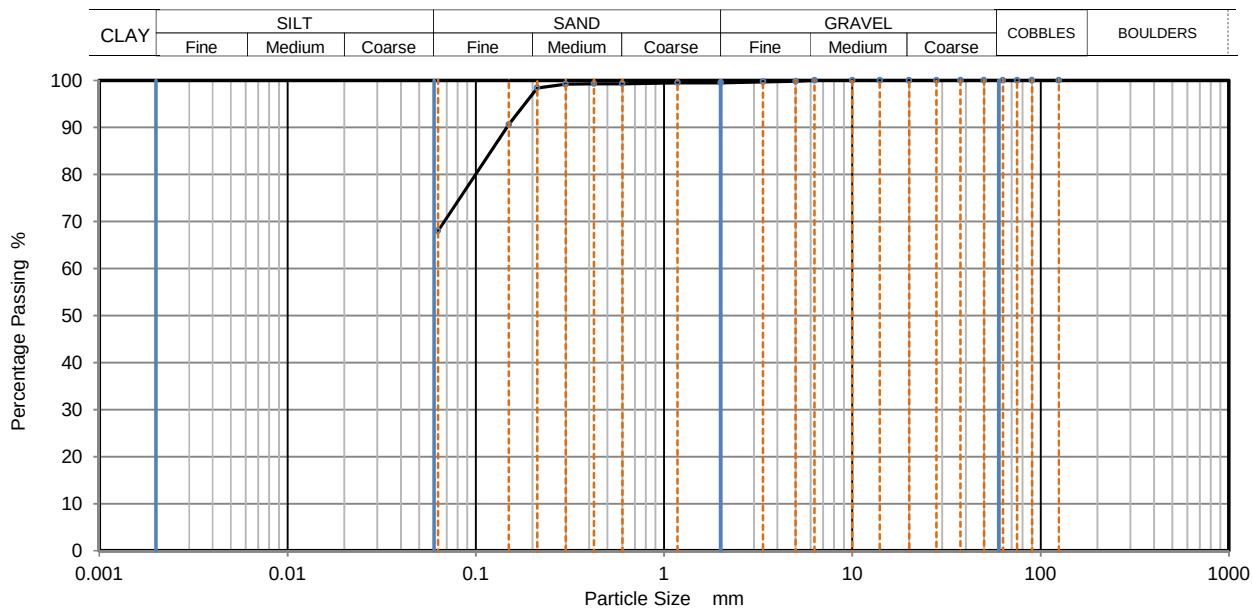
Contact: Alex Thornber
Site Name: Site off Maulton Chapel, Cowbit
Site Address: Not Given

Client Reference: GML18201
Job Number: 18-94459
Date Sampled: 24/07/2018
Date Received: 26/07/2018
Date Tested: 03/08/2018
Sampled By: AT

TEST RESULTS

Laboratory Reference: 1011934
Sample description: Mottled brown very sandy CLAY
Location: WS08
Supplier: Not Given

Sample Reference: Not Given
Sample Type: B
Depth Top [m]: 2.80
Depth Base [m]: Not Given





TEST CERTIFICATE

Determination of California Bearing Ratio

Tested in Accordance with BS 1377-4: 1990: Clause 7

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



Client: Geo-Matters Limited
Client Address: 104 Bondgate
Castle Donington
DE74 2NR
Contact: Alex Thornber
Site Name: Site off Maulton Chapel, Cowbit
Site Address: Not Given

Client Reference: GML18201
Job Number: 18-94459
Date Sampled: 24/07/2018
Date Received: 26/07/2018
Date Tested: 29/08/2018
Sampled By: AT

Test Results:

Laboratory Reference: 1011928
Hole No.: CBR01
Sample Reference: Not Given

Depth Top [m]: 0.50
Depth Base [m]: Not Given
Sample Type: B

Specimen Preparation:

Condition: Remoulded
Details: Recompacted with specified standard effort using 2.5kg rammer

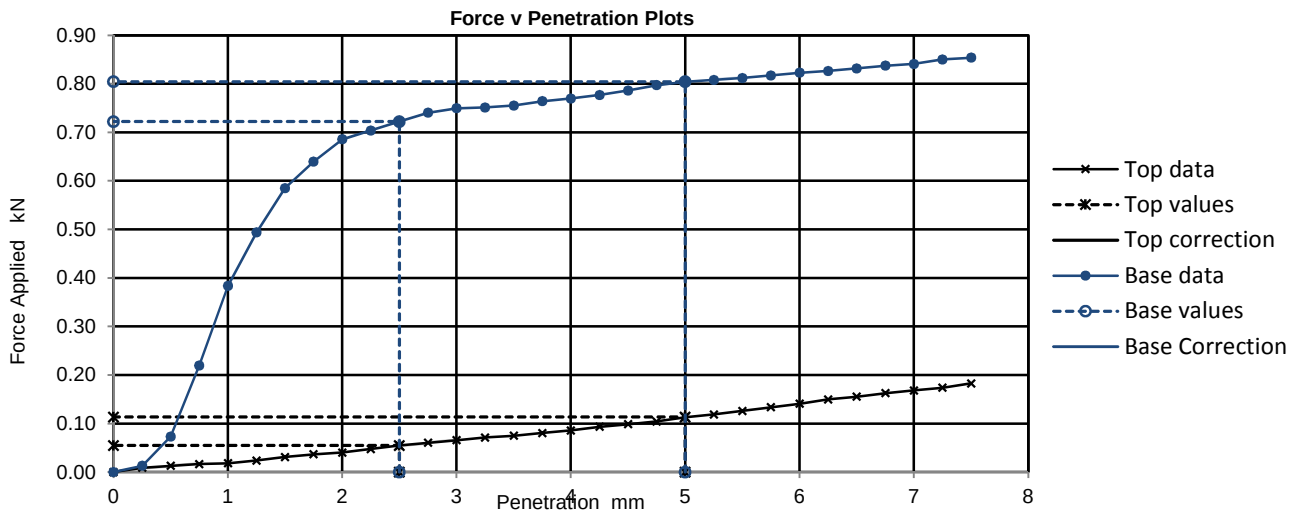
Sample Description: Brown clayey SILT

Material retained on 20mm sieve removed 0 %

Initial Specimen details
Bulk density 1.83 Mg/m3
Dry density 1.61 Mg/m3
Moisture content 14 %

Soaking details

Period of soaking 21 days
Time to surface 1.00 days
Amount of swell recorded 8.43 mm
Dry density after soaking 1.51 Mg/m3
Surcharge applied 8 kg
4.9 kPa



Results

TOP
BASE

Curve correction applied	CBR Values, %			
	2.5mm	5mm	Highest	Average
No	0.4	0.6	0.6	
No	5.5	4.0	5.5	

Moisture Content %
20
21

Remarks:

Test/ Specimen specific remarks:

Approved:

Signed:

Maria Chandler
Site Manager
Northampton

Darren Berrill
Geotechnical General
Manager

Date Reported: 30/08/2018

for and on behalf of i2 Analytical Ltd

"Opinions and interpretations expressed herein are outside of the scope of the UKAS Accreditation.
This report may not be reproduced other than in full without the prior written approval of the issuing laboratory.
The results included within the report are representative of the samples submitted for analysis.
The analysis was carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland."



TEST CERTIFICATE

Determination of California Bearing Ratio

Tested in Accordance with BS 1377-4: 1990: Clause 7

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



Client: Geo-Matters Limited
Client Address: 104 Bondgate
Castle Donington
DE74 2NR
Contact: Alex Thornber
Site Name: Site off Maulton Chapel, Cowbit
Site Address: Not Given

Client Reference: GML18201
Job Number: 18-94459
Date Sampled: 24/07/2018
Date Received: 26/07/2018
Date Tested: 29/08/2018
Sampled By: AT

Test Results:

Laboratory Reference: 1011929
Hole No.: CBR03
Sample Reference: Not Given

Depth Top [m]: 0.60
Depth Base [m]: Not Given
Sample Type: B

Specimen Preparation:

Condition: Remoulded
Details: Recompacted with specified standard effort using 2.5kg rammer

Sample Description: Light brown clayey SILT

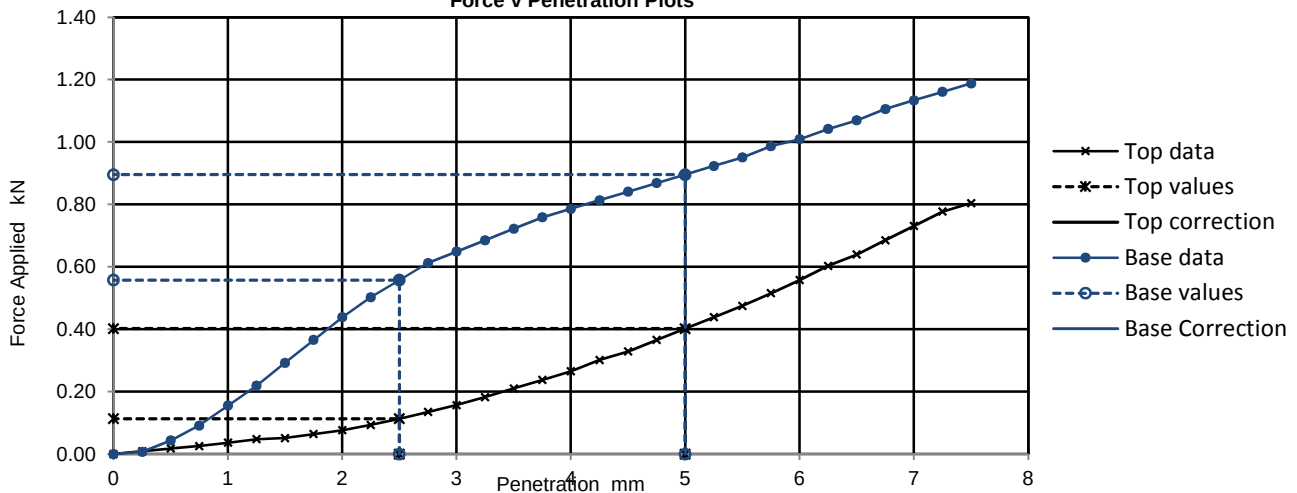
Material retained on 20mm sieve removed 0 %

Initial Specimen details
Bulk density 1.84 Mg/m3
Dry density 1.61 Mg/m3
Moisture content 14 %

Soaking details

Period of soaking 21 days
Time to surface 1.00 days
Amount of swell recorded 3.17 mm
Dry density after soaking 1.57 Mg/m3
Surcharge applied 8 kg
4.9 kPa

Force v Penetration Plots



Results

TOP
BASE

Curve correction applied	CBR Values, %			
	2.5mm	5mm	Highest	Average
No	0.9	2.0	2.0	
No	4.2	4.5	4.5	

Moisture Content %
24
24

Remarks:

Test/ Specimen specific remarks:

Approved:

Signed:

Maria Chandler
Site Manager
Northampton

Darren Berrill
Geotechnical General
Manager

Date Reported: 30/08/2018

for and on behalf of i2 Analytical Ltd

"Opinions and interpretations expressed herein are outside of the scope of the UKAS Accreditation.
This report may not be reproduced other than in full without the prior written approval of the issuing laboratory.
The results included within the report are representative of the samples submitted for analysis.
The analysis was carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland."



TEST CERTIFICATE

Determination of California Bearing Ratio

Tested in Accordance with BS 1377-4: 1990: Clause 7

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



Client: Geo-Matters Limited
Client Address: 104 Bondgate
Castle Donington
DE74 2NR
Contact: Alex Thornber
Site Name: Site off Maulton Chapel, Cowbit
Site Address: Not Given

Client Reference: GML18201
Job Number: 18-94459
Date Sampled: 24/07/2018
Date Received: 26/07/2018
Date Tested: 29/08/2018
Sampled By: AT

Test Results:

Laboratory Reference: 1011930
Hole No.: CBR04
Sample Reference: Not Given

Depth Top [m]: 0.70
Depth Base [m]: Not Given
Sample Type: B

Specimen Preparation:

Condition: Remoulded
Details: Recompacted with specified standard effort using 2.5kg rammer

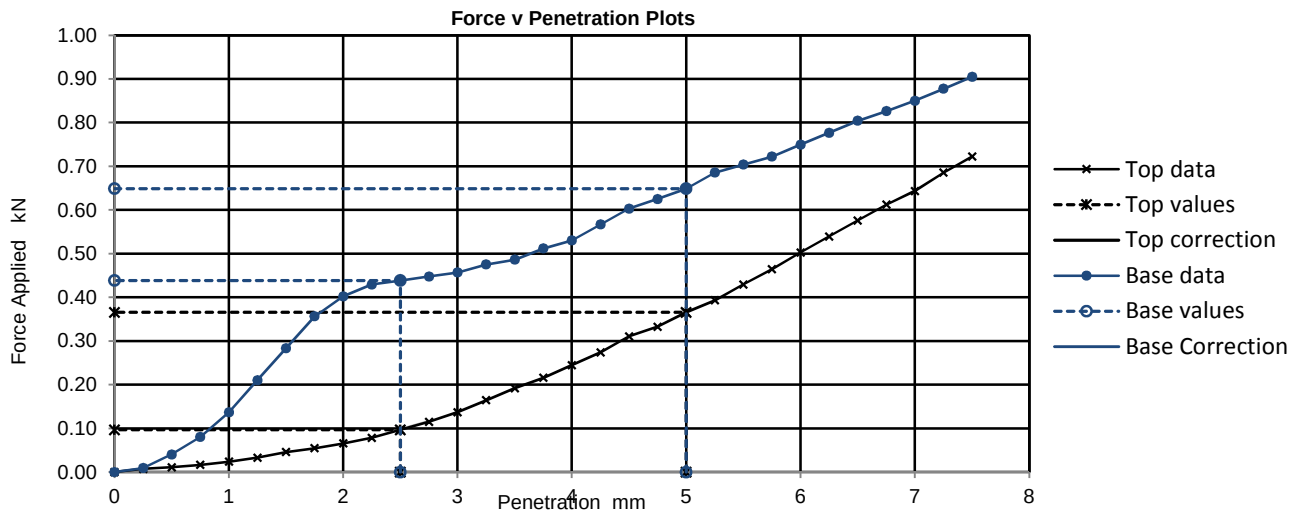
Sample Description: Light brown slightly clayey SILT

Material retained on 20mm sieve removed 0 %

Initial Specimen details
Bulk density 1.81 Mg/m3
Dry density 1.61 Mg/m3
Moisture content 13 %

Soaking details

Period of soaking 21 days
Time to surface 1.00 days
Amount of swell recorded 4.36 mm
Dry density after soaking 1.55 Mg/m3
Surcharge applied 8 kg
4.9 kPa



Results

TOP
BASE

Curve correction applied	CBR Values, %			
	2.5mm	5mm	Highest	Average
No	0.7	1.8	1.8	
No	3.3	3.2	3.3	

Moisture Content %
25
21

Remarks:

Test/ Specimen specific remarks:

Approved:

Signed:

Maria Chandler
Site Manager
Northampton

Darren Berrill
Geotechnical General
Manager

Date Reported: 30/08/2018

for and on behalf of i2 Analytical Ltd

"Opinions and interpretations expressed herein are outside of the scope of the UKAS Accreditation.
This report may not be reproduced other than in full without the prior written approval of the issuing laboratory.
The results included within the report are representative of the samples submitted for analysis.
The analysis was carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland."



4041

TEST CERTIFICATE

Determination of California Bearing Ratio

Tested in Accordance with BS 1377-4: 1990: Clause 7

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



Client: Geo-Matters Limited
Client Address: 104 Bondgate
Castle Donington
DE74 2NR
Contact: Alex Thornber
Site Name: Site off Maulton Chapel, Cowbit
Site Address: Not Given

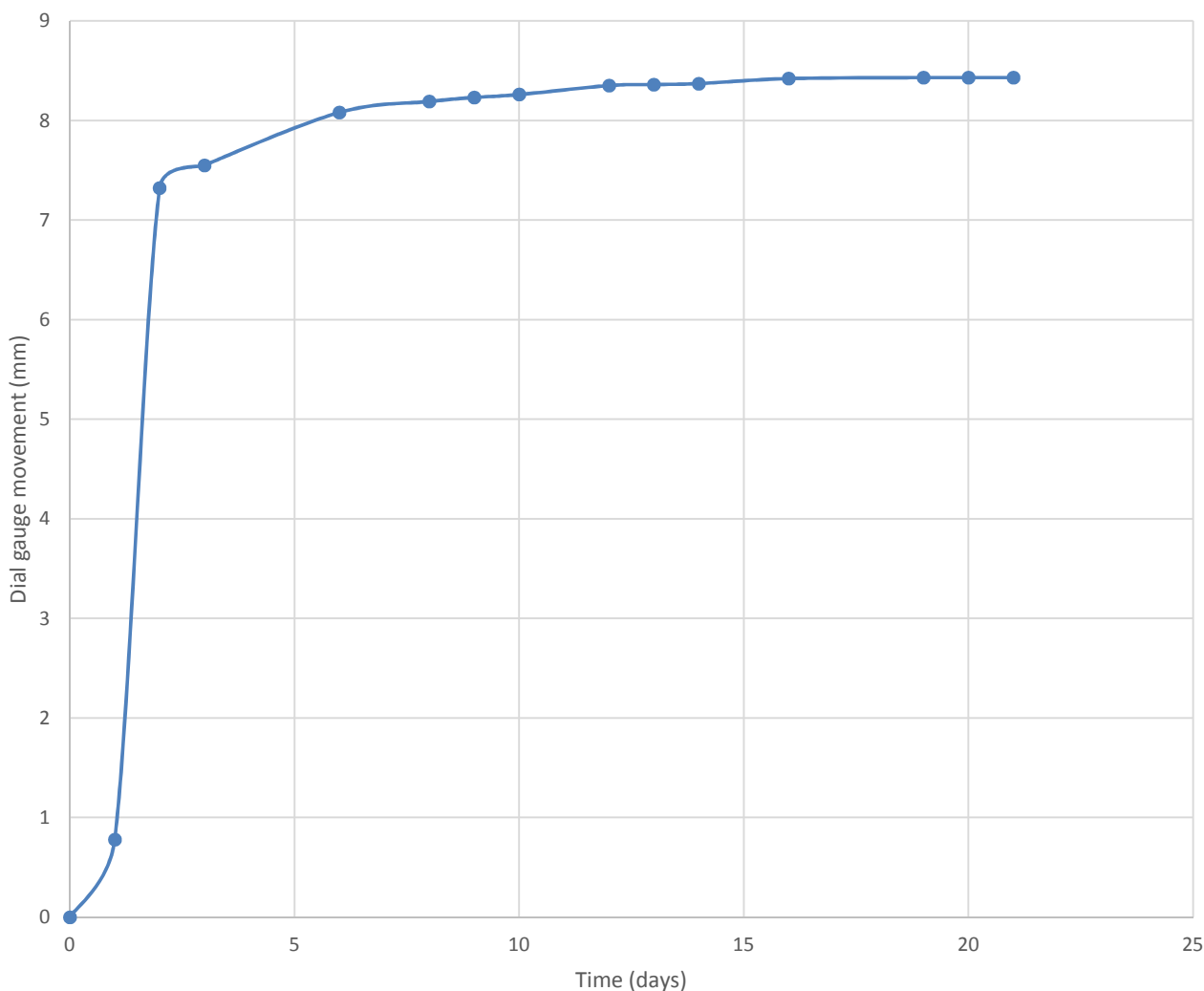
Client Reference: GML18201
Job Number: 18-94459
Date Sampled: 24/07/2018
Date Received: 26/07/2018
Date Tested: 08/08/2018
Sampled By: AT

Test Results

Laboratory Reference: 1011928
Hole No.: CBR01
Sample Reference: Not Given

Depth Top [m]: 0.50
Depth Base [m]: Not Given
Sample Type: B

CBR Soaked Graph



Remarks:

Test/ Specimen specific remarks:

Approved:

Maria Chandler
Site Manager
Northampton

Signed:

Darren Berrill
Geotechnical General
Manager

Date Reported: 30/08/2018

for and on behalf of i2 Analytical Ltd

"Opinions and interpretations expressed herein are outside of the scope of the UKAS Accreditation.
This report may not be reproduced other than in full without the prior written approval of the issuing laboratory.
The results included within the report are representative of the samples submitted for analysis.
The analysis was carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland."



4041

TEST CERTIFICATE

Determination of California Bearing Ratio

Tested in Accordance with BS 1377-4: 1990: Clause 7

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



Client: Geo-Matters Limited
Client Address: 104 Bondgate
Castle Donington
DE74 2NR
Contact: Alex Thornber
Site Name: Site off Maulton Chapel, Cowbit
Site Address: Not Given

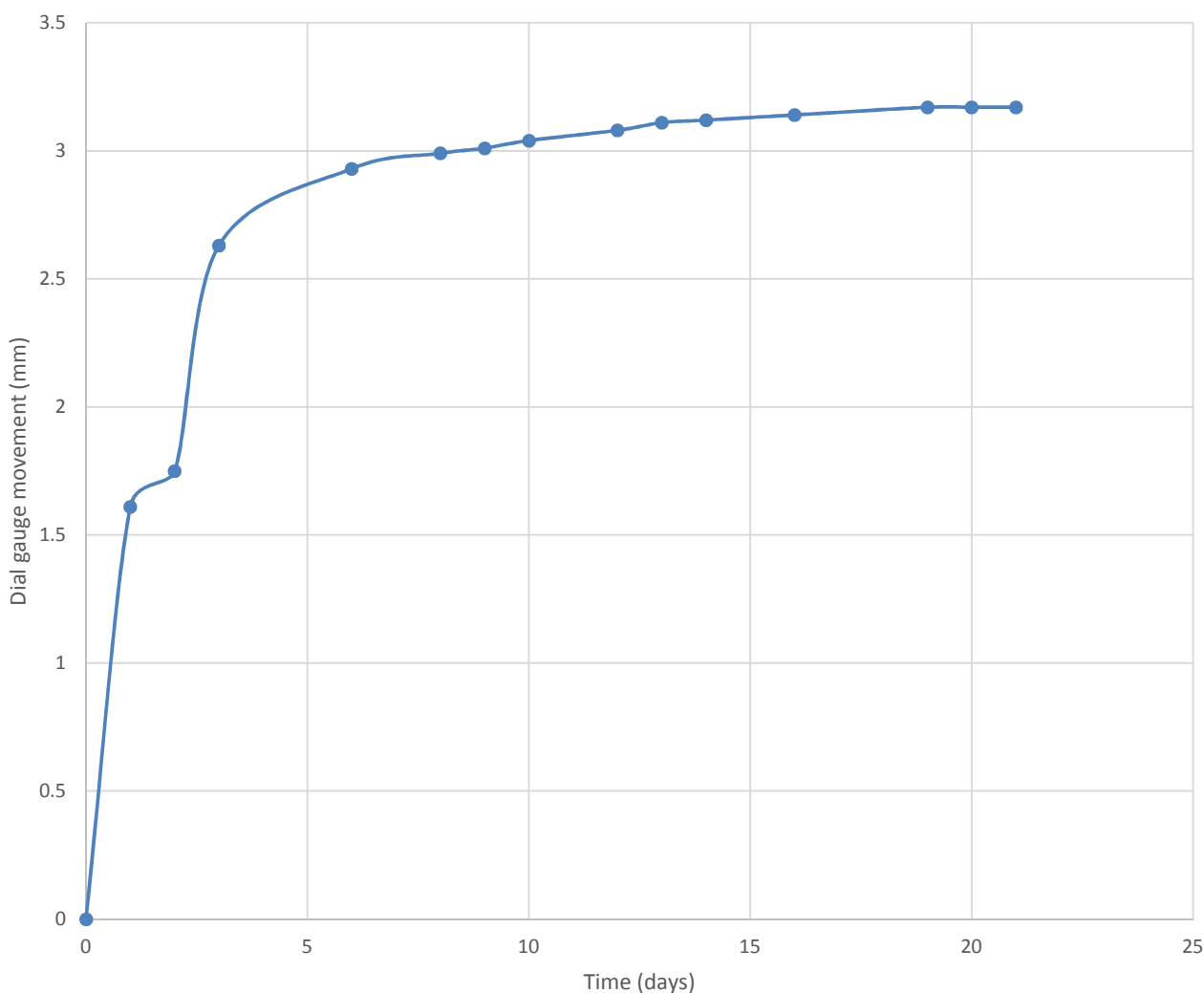
Client Reference: GML18201
Job Number: 18-94459
Date Sampled: 24/07/2018
Date Received: 26/07/2018
Date Tested: 08/08/2018
Sampled By: AT

Test Results

Laboratory Reference: 1011929
Hole No.: CBR03
Sample Reference: Not Given

Depth Top [m]: 0.60
Depth Base [m]: Not Given
Sample Type: B

CBR Soaked Graph



Remarks:

Test/ Specimen specific remarks:

Approved:

Signed:

Maria Chandler
Site Manager
Northampton

Darren Berrill
Geotechnical General
Manager

Date Reported: 30/08/2018

for and on behalf of i2 Analytical Ltd

"Opinions and interpretations expressed herein are outside of the scope of the UKAS Accreditation.
This report may not be reproduced other than in full without the prior written approval of the issuing laboratory.
The results included within the report are representative of the samples submitted for analysis.
The analysis was carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland."



4041

TEST CERTIFICATE

Determination of California Bearing Ratio

Tested in Accordance with BS 1377-4: 1990: Clause 7

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



Client: Geo-Matters Limited
Client Address: 104 Bondgate
Castle Donington
DE74 2NR
Contact: Alex Thornber
Site Name: Site off Maulton Chapel, Cowbit
Site Address: Not Given

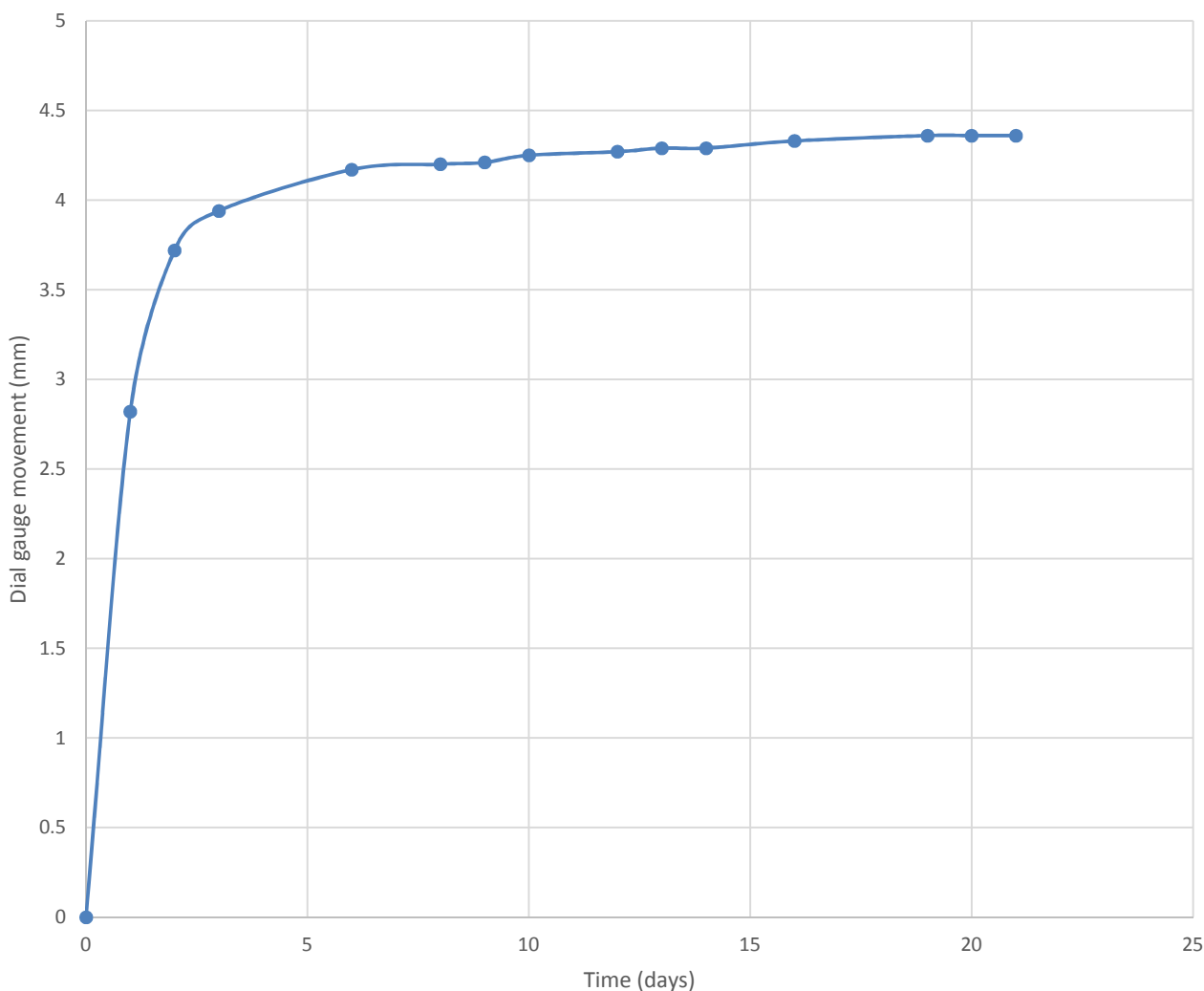
Client Reference: GML18201
Job Number: 18-94459
Date Sampled: 24/07/2018
Date Received: 26/07/2018
Date Tested: 08/08/2018
Sampled By: AT

Test Results

Laboratory Reference: 1011930
Hole No.: CBR04
Sample Reference: Not Given

Depth Top [m]: 0.70
Depth Base [m]: Not Given
Sample Type: B

CBR Soaked Graph



Remarks:

Test/ Specimen specific remarks:

Approved:

Maria Chandler
Site Manager
Northampton

Signed:

Darren Berrill
Geotechnical General
Manager

Date Reported: 30/08/2018

for and on behalf of i2 Analytical Ltd

"Opinions and interpretations expressed herein are outside of the scope of the UKAS Accreditation.
This report may not be reproduced other than in full without the prior written approval of the issuing laboratory.
The results included within the report are representative of the samples submitted for analysis.
The analysis was carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland."