



Phase I & II Geo-Environmental Assessment

Coronation Avenue
Throckenholt
Spalding
Lincolnshire
PE12 0QT

Prepared for:

Fowler Refinishers Ltd
Coronation Avenue
Throckenholt
Spalding
Lincolnshire
PE12 0QT

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CORONATION AVENUE, THROCKENHOLT

NON TECHNICAL SUMMARY

This report presents the findings of a Phase I Geo-Environmental Assessment which was carried out to identify potential contamination from previous or current uses of the site and surrounding area and to provide an initial assessment of geological and geotechnical aspects of the site and how the proposed development or surrounding environment might be affected.

- The desk study has revealed a school and a works have occupied the site and immediate area for most of the historical period studied. A number of potential contaminant linkages have been identified associated with the former use of the area.
- The intrusive investigation comprised the forming of three window sampler boreholes to a maximum depth of 6m which found the ground conditions to comprise a layer of made ground, of up to 0.60m in depth, overlying Tidal Flat Deposits consisting of soft to firm clay.
- Chemical analysis has identified polycyclic aromatic hydrocarbons (PAH) concentrations exceeding the minimal risk screening criteria which are considered to pose a risk to future site users and therefore remedial measures are considered necessary.
- Remediation may include the removal of the made ground materials from landscaping and gardens or the adoption of an engineered soil cover system with a cover thickness of 600mm. Verification that the remediation has been undertaken will also be required.

ENGINEERING SUMMARY

- Whilst the ground conditions are considered suitable for the use of conventional spread foundations, bearing upon the underlying Tidal Deposits an allowable bearing pressure of only 60kN/m² is recommended at roughly 1m. Deepening of the foundations to achieve a higher bearing capacity is not recommended due to the soft nature of the soils. If structural loads exceed the allowable bearing capacity, then alternative foundation solutions, such as piles may need to be considered.
- Suspended ground floor construction is recommended.
- A design sulphate class of DS1 is considered suitable, with an aggressive chemical environment for concrete (ACEC) of AC-1.

By their very nature, the above bullet points represent a simplified summary of our work and should not be relied upon to form the basis for key decisions for the proposed development. A full picture is provided in the following report, or alternatively give us a call and we'll talk you through it.

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Where ground investigations have been conducted, these have been limited to the level of detail required for the site in order to achieve the objectives of the investigation.

The report has been written, reviewed and authorised by the persons listed above. It has also undergone EPS' in house quality management inspection. Should you require any further assistance regarding the information provided within the report, please do not hesitate to contact us.

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1 INTRODUCTION

In September 2015, Environmental Protection Strategies Ltd (EPS) was commissioned by Fowler Refinishers to complete a Phase I & II Geo-Environmental Assessment land at Coronation Avenue, ('the site'); see Figure 1.

The work was commissioned in order to fulfil pre-planning requirements for a residential property with a garden with the planning reference of H19-0083-15-South Holland District Council.

This report presents the findings, conclusions, and recommendations of the Phase I & II Intrusive investigation undertaken for the site as instructed.

1.1 Objectives

The objectives of this investigation were as follows:

- a) To compile a Phase I desk study and Conceptual Site Model (CSM) to evaluate the potential risks the site may pose to human and environmental receptors, both currently and in future.
- b) To investigate potential contaminant linkages identified through the CSM by means of investigating shallow soils.
- c) To determine the potential risks posed by the site and make recommendations for further work that may be required, to ensure safe development in accordance with the *Model Procedures for the Management of Land Contamination - Contaminated Land Report 11*.
- d) To collect information on ground conditions and strength in order to make appropriate recommendations for geotechnical design.

1.2 Scope of Work

To perform an exploratory assessment of the site in accordance with the principles and requirements of DEFRA Circular 01/2006, BS10175 – '*Investigation of Potentially Contaminated Sites*', BS 5930:2015 '*Code of Practice for Ground Investigation*' and BS EN 1997 '*Geotechnical Design*', the following tasks were undertaken:

Desk Study:

- Collection of site records.
- Study of existing geological, hydrogeological and historic maps of the area.
- Consultation of environmental databases, including records held by the local authority.
- Review of proposed development plans.
- Development of conceptual model and contaminant linkage assessment.

Intrusive Investigation:

- Site walkover, inspection of any visual evidence of contamination at the site, obtaining photographic records.
- Health and safety briefing / site supervision.
- Drilling of three window sample boreholes (WS1 to WS3) to a maximum depth of 6m below ground level (bgl).
- Recording of ground conditions including inspection of samples for visual and olfactory contamination.
- In-situ testing to assist in geotechnical design.

Reporting:

- Data collection and interpretation.
- Reporting.

The findings of these investigations and their conclusions are presented in the following sections.

1.3 Project Limitations and Constraints

The purpose of this report is to present the findings of a Phase I & II Geo-Environmental Assessment conducted at the location(s) specified. When examining the data collected from the investigations made during the assessment, EPS makes the following statements:

No investigation method is capable of completely identifying all the ground conditions that might be present in the soil or groundwater under a site. Where outlined in our report, we have examined the ground beneath a site by forming a number of boreholes and / or trial pits to recover soil and / or groundwater samples. The locations of these excavations and sampling points are considered to be representative of the condition of the whole site subsurface however, ground conditions are naturally variable and it may be possible that localised ground controls could influence the spread of contaminants within the site subsurface. For this reason it is possible that samples collected and ground conditions observed during the investigation may not represent the conditions across the entire site.

The investigation was carried out to assess the significance of contamination resulting from the use of the site as identified in this report. Unless EPS has otherwise indicated, no assessment of potential impact of any other previous uses has been made.

No visible evidence of Japanese Knotweed was identified during the site walkover, however this plant can be difficult to identify in the early stages of growth and therefore it is not always possible to identify its presence at certain times of the year. For this reason EPS cannot confirm that Japanese Knotweed rhizomes do not exist and it is recommended that if it is suspected that this species or other similarly invasive plants are present at the site, a specialist contractor should be commissioned to make a detailed assessment.

2 GEO-ENVIRONMENTAL SETTING

The following section provides a summary of the information collected in relation to the site location and history.

2.1 Site Location and Description

Detail	Description
Location	The site is located in the small village of Throckenholt, which lies roughly 11km to the west of Wisbech, Cambridgeshire.
National Grid Reference	535181, 309367
Topographic Elevation	Approximately 3m above ordnance datum (AOD).
Topographic Gradient	Generally flat.
Description of Site	The site currently forms part of the yard to Fowlers Refinishers, commercial van painters. The surface is made ground containing materials such as bricks and gravel with two caravans adjacent to it.. A large metal building used for van painting is present to the east adjacent to the proposed development land. During the on the site walk over no presence of any fuel storage or contaminations above or below ground was noted. The site was fenced off from the surrounding land. To the north a roughly 2m high wooden fence was present and to the west a small metal fence existed. The only vegetation present on site are mature and trees that are located 10m south of the land and act as a natural barrier to the surrounding residential houses. The proposed development site had already been dug to a depths of around 0.3m by the owner in order to get a better understanding of the current land surface. Within this already dug area, large bricks and asphalt patches can easily be observed. A small electrical substation h was also noted immediately to the north west.
Surrounding Land Use	Residential housing is located around the site. Beyond this residential land, are fields associated with one of the farms around the area. A minor road (B1166) is located immediately to the north and runs parallel to the site. Within the surrounding fields are a number of drainage ditches are present and to the south a larger water course known as 'New South Eau' exists.

A plan showing the site location is provided as Figure 1, the current site layout is detailed on Figure 2 and an aerial photograph is included as Figure 3. Selected site photographs are included as Appendix A, an indicative proposed development plan as Appendix B and relevant extracts of a Landmark Envirocheck report are included as Appendix C.

2.2 Environmental Setting

Detail	Description																
Geology	Geological maps of the area show the site to lie on Tidal Flat Deposits overlying the West Walton Formation and Amptill Clay Formation. Information on the sites geological context is included as Appendix D.																
Geological Hazards	<table> <tr> <th>Hazard</th><th>On Site Risk</th></tr> <tr> <td>Mining</td><td>No Hazard</td></tr> <tr> <td>Collapsible Ground</td><td>No Hazard</td></tr> <tr> <td>Compressible Ground</td><td>Moderate</td></tr> <tr> <td>Ground Dissolution</td><td>No Hazard</td></tr> <tr> <td>Running Sand</td><td>Moderate</td></tr> <tr> <td>Landslide</td><td>Very Low</td></tr> <tr> <td>Shrinking/Swelling Clay</td><td>Low</td></tr> </table>	Hazard	On Site Risk	Mining	No Hazard	Collapsible Ground	No Hazard	Compressible Ground	Moderate	Ground Dissolution	No Hazard	Running Sand	Moderate	Landslide	Very Low	Shrinking/Swelling Clay	Low
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Radon	The BGS and Health Protection Agency (HPA) report entitled ' <i>Indicative Atlas of Radon in England and Wales</i> ' (November 2007) shows the site to lie within a 1km grid section where the percentage of homes above the radon action level is between 0% and 1%. The joint Building Research Establishment Ltd (BRE) report entitled: ' <i>Radon: Guidance on Protective Measures for New Buildings - 2007</i> ' reports that the site does not lie within an area where basic radon protection methods will need to be employed.																
Hydrogeology	Groundwater vulnerability maps for the area show that the underlying geology is classified as an Unproductive Strata but is in close proximity to a Secondary Undifferentiated. The site does not lie within a Source Protection Zone for local groundwater abstraction. There is no groundwater abstraction sites within the surrounding area. Groundwater vulnerability maps are included as Appendix E.																
Hydrology	A number of drains are located within the surrounding area. One drain is small and approximately 100m north. The other drain is classed as secondary river and named New South Eau, located approximately 200m south.																
Flood Risk	The site lies within flood zone 1, which is the area defined by the Environment Agency (EA) as having a low risk of flooding from rivers or the sea. An indicative floodzone map is included within Appendix E																
Landfill & Waste	The EA public database has not listed any current or historic landfills in the area.																
Industrial Land Use	The Envirocheck report lists two different industrial land uses in the area. The first is an inactive cleaning services located 665m to the south west. The second is an active trade directory that specialises in spraying- paint and coatings that is located 14m south east to the site.																
Pollution Incidents	Only one pollution incident to controlled waters is reported within 150m. This was a minor incident with an unknown pollutant and an unknown cause.																
Sensitive Land Use	According to the Envirocheck report there are no sensitive land uses around the area.																

2.3 Site History

A summary of historical map data from 1887 to 2015 is provided below and copies of relevant historic maps and any others examined during the investigation are included in this report as Appendix F.

- During the late 1800s the area around the site was undeveloped. Surrounding land use comprised fields with the closest residential housing being located approximately 100m north west and Inkley Farm 500m to the north. At this time a drainage ditch appear to run along the western boundary and New South Eau is also present to the south.
- During the early 1900s a school was developed on the site and Cole's Bridge Farm established approximately 200m south west.
- Between the years of 1904-1977 development of the area occurred. This included the expansion of Cole Bridge Farm and residential housing being built within 100m. According to historic maps, during this period of time the school located at the site was replaced with "works".
- In the late 1900s sewage works were established approximately 100m to the north with no other residential or farm land development.
- In the early 2000's more residential housing was developed along Coronation Avenue. During this time the work present on the site were removed and a vehicle paint works was established in its current position to the west.

3 ENVIRONMENTAL CONCEPTUAL MODEL

The following section provides a review of the contaminant linkages that may be active at the site through examination of the potential sources that may be present as a result of historic and / or current site activities and where potential interaction between these sources and the identified human / environmental receptors may occur.

3.1 Source Characterisation

The following potential contaminant sources have been identified at the site and in the surrounding area:

Potential Source	Source Description	Principal Contaminants of Concern
Historic Site Use	In-fill material of unknown origin (Made Ground) used to level areas beneath existing / historic buildings and hardstanding.	PAH, Metals, ACM
	Previous use of the site as a works.	TPH, PAH, VOC, Metals, ACM
Current and Historic Surrounding Land Use	Current use of adjacent site for vehicle paint sparying	SVOC, VOC, TPH, PAH, Metals
	Electrical Substation to the north	PCBs

Notes: TPH Total Petroleum Hydrocarbons PAH Polycyclic Aromatic Hydrocarbons
VOC Volatile Organic Compounds SVOC Semi-Volatile Organic Compounds
ACM Asbestos Containing Material PCBs Polychlorinated Biphenyls

3.2 Potential Receptors

A framework for the assessment of risks arising from the presence of contamination in soils has been produced by the Environment Agency and the Department for the Environment, Food and Rural Affairs (DEFRA) and is presented with the report: 'Using Science to Create A Better Place: Updated Technical Background to the CLEA Model – Science Report SC050021/SR3'. This guidance document defines a series of standard land-uses, which form a basis for the development of an Environmental Conceptual Model.

The proposed development plan for the site includes the erection of a residential property with a garden. This proposed future land use, as defined within Science Report SC050021/SR3, has been considered as:

- Residential

In view of the environmental setting, current and potential future land use of the site and surrounding sites, the potential receptors for any contaminant impact are discussed below:

Receptor	Site Specific Description
Human	Future site users, site workers involved in the site redevelopment, and those working and living in the surrounding area have the potential to be at risk from exposure to potential contaminants of concern (CoCs).
Groundwater	The site is reported to be underlain by West Walton Formation and Amphill Clay Formation which is defined by the EA as an unproductive aquifer, the site does not lie within a SPZ for nearby groundwater abstraction and the historic borehole log does not indicate that shallow groundwater is likely to be present at the site. Therefore underlying groundwater has not been considered as a potential receptor to site derived contaminants.
Surface Water	The nearest surface watercourse is an unnamed drain which is located around 100m north. If significant impacts to groundwater or soil were to be encountered then further consideration should be given to the associated risk posed to nearby surface waters via lateral migration of contaminants in the subsurface.
Flora and Fauna	The proposed development includes the provision of domestic garden areas. Some of the identified contaminants of concern are known to be phytotoxic and as such the potential for this impact should be considered.
Buildings & Infrastructure	Subsurface structures are likely to be present at the site that may be adversely affected by the potential presence of the identified contaminants of concern. These include concrete used in building foundations, buried potable water supply pipes and other service lines and pipes.
Adjacent Land	Adjacent properties including private residential dwellings could also be at risk from potential contaminants found at the site.

3.3 Potential Pathways

Where contaminants may be present in soil, there are a number of potential pathways that enable human receptors to come into contact with or be exposed to them. The most direct pathways, considered under current UK legislation, can be summarised as follows:

- Direct ingestion of contaminated soil
- Ingestion of household dust
- Ingestion of contaminated vegetables
- Ingestion of soil attached to vegetables
- Dermal contact with contaminated soil
- Dermal contact with household dust
- Inhalation of fugitive soil dust
- Inhalation of fugitive household dust
- Inhalation of vapours outdoors
- Inhalation of vapours indoors

Clearly, not all of these potential pathways apply for every standard land-use; the simplest example for exclusions being a commercial / industrial site which is covered by concrete hardstanding. The concrete precludes the direct exposure of humans working at the site to any contaminated soils.

However in addition to direct exposure pathways, a number of physical transport mechanisms / pathways may also exist at a site that allow remote or less accessible contaminants in soil or groundwater to reach human or environmental receptors both at a site and beyond the site boundary. These include the following:

- Downward and lateral movement of contaminants in soil either by gravity or through being 'leached' by percolating rainwater.
- Lateral migration of contaminants dissolved in groundwater.
- Direct seepage or leaching of contaminants from soil into subsurface drains or supply pipework.
- Volatilisation of contaminants from groundwater or unsaturated soils into buildings or outdoor air.

Through examination of the standard land use and environmental setting at each site, the presence of pathways and transport mechanisms described above must be considered when assessing whether a contaminant linkage may plausibly be active, and therefore be included in the conceptual site model.

3.4 Summary of Contaminant Linkages

Considering the site use and environmental setting, and the proposed land use; the plausible contaminant linkages that require further investigation are summarised in the following table:

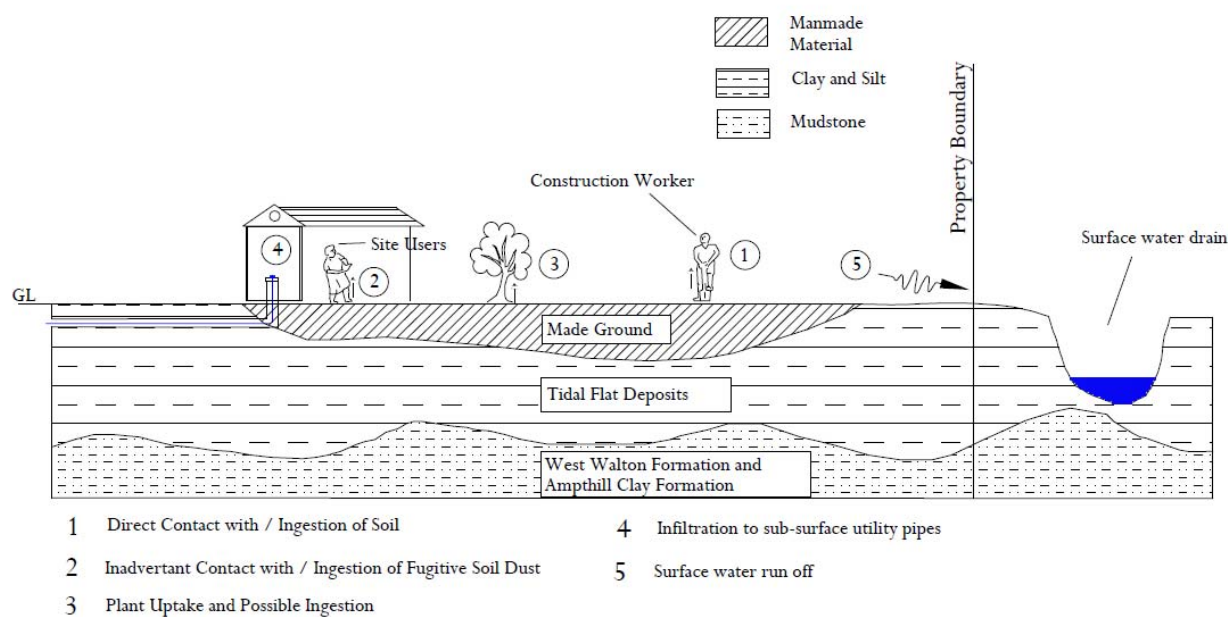
Source	Pathway	Receptor
Contaminated soil	Direct contact and inadvertent ingestion by eating or smoking with dirty hands	Construction workers during redevelopment & site users
	Inhalation of fugitive dusts	Site users
	Ingress / diffusion through permeable potable water supply pipes	Site users
	Direct uptake via root systems	Plants
	Surface water run-off	Surface water features

The following comments are made with respect to contaminant linkages which have been considered through development of the conceptual model, but have not been concluded as 'plausible' – i.e. through which a significant possibility of significant harm could occur to an identified receptor:

- PAHs and metals have been identified as contaminants of concern associated with the historic onsite Made Ground, however these contaminants are considered to be relatively immobile in the environment by virtue of their very low solubility and volatility. On this basis, plausible pathways by which these potential contaminants could pose a significant risk to the underlying groundwater or nearby surface watercourses are not considered to be active.
- The majority of relatively modern electrical transformers do not contain insulation oils containing PCBs and given the limited mobility of PCBs in the environment, this source is not considered to pose a significant risk to the proposed development.

The following diagram provides an illustration of the plausible contaminant linkages that may be active at the site and which may need further investigation or control to ensure safe development:

Coronation Avenue – Illustrative Conceptual Site Model



4 SUMMARY OF INTRUSIVE INVESTIGATIONS

The intrusive investigation was undertaken on 17th September 2015 in accordance with EPS standard operating procedures, copies of which will be made available on request. A summary of the investigation is presented in the following sections:

4.1 Borehole Locations

Borehole locations were selected through consideration of the potential contaminant linkages identified through the Phase I Desk Study, the proposed development layout and operational health & safety considerations.

A total of three window sample boreholes (WS1-WS3) were drilled during the intrusive investigation in order to assess the nature and quality of underlying soils to depths of up to 6m below ground level (m bgl).

The overall objective in terms of borehole locations was to provide an appropriate lateral and vertical coverage of the site to determine the underlying ground conditions and identify potential contamination which may be present.

A detailed layout plan showing the locations of the boreholes formed during the investigation is presented as Figure 4.

4.2 Soil Sampling

Each borehole was logged for ground conditions encountered and inspected for any physical evidence of contamination such as soil staining, odour and the presence of separate phase liquids.

Shallow soil samples were obtained from each location and submitted for laboratory analysis to assess the nature and quality of underlying soils.

4.3 Environmental Laboratory Analysis

All samples obtained for analysis of identified contaminants of concern were submitted to Jones Environmental of Flintshire, who hold appropriate UKAS / MCERT accreditation for the required testing. Samples were transported in laboratory supplied containers and delivered to the laboratory by approved courier.

5 FINDINGS OF THE INVESTIGATION

This section of the report provides a summary of the findings of the various aspects of the investigation.

5.1 Ground Conditions

A total of three boreholes were formed at the site and the ground conditions encountered, from ground level, were found to comprise:

- Made Ground
- Tidal Flat Deposits

Site specific borehole logs are included as Appendix G and give descriptions and depths of strata encountered. A summary of the general strata encountered across the site is provided in the table below, with more detailed description given in the following sub sections.

Geological Strata	Maximum Depth to Base of Strata(m bgl)	Strata Thickness (m)
Made Ground	0.6	0.5-0.6
Tidal Flat Deposits	Not Proven	Not Proven

5.1.1 *Made Ground*

A band of dark grey coloured material containing fragments of brick, gravel and some tarmac within reworked clay soil. Made ground was located in all three boreholes having the greatest thickness of 0.6m in both WS1 and WS2.

5.1.2 *Tidal Flat Deposits*

Material interpreted as Tidal Flat Deposits was recorded in all three boreholes. These generally consisted of an upper layer of thick, firm dark grey clay overlying soft silty clay at approximately 3m. Within WS2 the soft clay was overlain by a thin layer (0.1m) of organic material.

5.1.3 *Groundwater*

Groundwater was encountered during the drilling of this area at depths of 4m, 3.4m and 2m in WS1, WS2 and WS3 respectively.

5.2 Physical Evidence of Contamination

Potential asbestos fragments were encountered within made ground materials from 0.2m – 0.4m in WS1. Other than made ground materials, no other visible or olfactory evidence of contamination, such as hydrocarbon odours / staining or putrefiable materials were encountered at any borehole location.

5.3 Laboratory Analysis

5.3.1 Chemical Analysis-Soils

A laboratory analysis testing schedule is presented as Table 1 and all environmental sample results obtained from the laboratory are included as Appendix H.

The key results of laboratory testing on environmental soil samples are summarised as follows:

Contaminant	No. of Samples	No of Detections	Range of Detections (mg/kg)		Highest Location & Depth (m bgl)
			Min	Max	
Arsenic	4	4	7.3	27	WS2 0.4-0.6
Cadmium	4	2	0.2	0.3	WS3 0.1-0.3
Chromium	4	4	39.0	52.3	WS3 0.1-0.3
Chromium (6 ⁺)	4	-	-	-	-
Copper	4	3	7.0	27.0	WS1 0.2-0.4
Mercury	4	-	-	-	-
Nickel	4	4	7.0	27.0	WS1 0.2-0.4
Lead	4	4	7	110	WS1 0.2-0.4
Selenium	4	2	-	3	WS3 0.1-0.3
Zinc	4	4	29.0	180	WS1 0.2-0.4
Benzo[a]pyrene	4	4	0.81	188.96	WS3 0.1-0.3
PAH (Total of 16)	4	4	9.8	2045.5	WS3 0.1-0.3
ACM (% mass)	4	1	-	0.005	WS1 0.2-0.4
Cyanide (Total)	4	1	-	1.2	WS3 0.1-0.3
Phenols (Total)	4	1	-	1.26	WS3 0.1-0.3

Notes:

- = Contaminant not found above laboratory detection limits
- PAH = Polycyclic Aromatic Hydrocarbons
- ACM = Asbestos Containing Material
- TPHCWG = Total Petroleum Hydrocarbons Criteria Working Group
- MTBE = Methyl-tert-butyl-ether

- Relatively low concentrations of metals were identified within the analysed samples, although within a shallow soil obtained from WS2 (0.4-0.6m) the concentration of arsenic was encountered at 27mg/kg which is nearing the minimal concentration for generic screening risk (37 mg/kg).
- Elevated levels of PAH and Benzo[a]pyrene were identified in WS3 (0.1-0.3m) reaching a value of 2045.5 mg/kg and 188.96 mg/kg respectively.
- Chrysotile asbestos fibre bundles were identified within WS1 (0.2-0.4m) at 0.005% mass.

5.3.2 *Geotechnical Testing*

The results of geotechnical laboratory testing are summarised in the table below.

Strata	Range of Parameters			
	Moisture Content (%)		Plasticity Index (%)	
	Min	Max	Min	Max
Tidal Flat Deposits	30	65	25	46

The natural moisture content was established for three samples of cohesive soil in accordance with BS1377 Part 1:7.3 and BS1377: Part 2:3.2.

Sulphate contents and pH values determinations were also carried out by the analytical laboratory, the results of which are summarised in section 9.4 below.

A laboratory analysis testing schedule is presented as Table 1 and all geotechnical sample results obtained from the laboratory are included as Appendix I.

6 GENERIC QUANTITATIVE RISK ASSESSMENT

The following section summarises the method used to assess the risks posed to human health and identifies any sample results found by this investigation which warrant further consideration.

6.1 Generic Screening - Soils

In order to screen laboratory data for concentrations of contaminants in soil with potential to cause harm to human health in a residential (with gardens) setting, relevant generic screening values for contaminants in soil have been used. The technical framework used to derive the assessment criteria and the documents in which they are published are summarised as follows:

- *EA Science Reports* (SC050021/SR2, SC050021/SR3, and SC050021/SR7)
- *EA Soil Guideline Value Science Reports*
- *Suitable For Use Levels ('S4ULs') for Human Health Risk Assessment* – LQM and CIEH (2015)
- *Soil Generic Assessment Criteria for Human Health Risk Assessment* - EIC/AGS/CL:AIRE (2010)

Category 4 Screening Levels (C4SLs) released in December 2013 by The Department for the Environment, Food and Rural Affairs (DEFRA), (*Development of Category 4 Screening Levels for assessment of land affected by contamination - SP1010*) provide generic suitable for use screening values for concentrations of Benzo(a)Pyrene (BaP), for a variety of land uses.

For concentrations BaP in soil, EPS has used DEFRA's C4SL as an appropriate guide for professional judgement with respect to reasonable 'low risk' levels in the context of this site and its suitability for use.

In addition to screening the concentrations of contaminants in soil for risks to human health, EPS has also screened the concentrations for potential to cause harm to water resources. The criteria used for this process were derived by EPS using the following technical guidance:

- *Environment Agency Remedial Targets Methodology: Hydrogeological Risk Assessment for Land Contamination*

6.2 Generic Screening – Groundwater

EPS has also screened the reported groundwater concentrations at an initial Tier 1 level for potential to cause harm to controlled waters within the local area. The criteria used for this process has been taken as follows:

Resource Sensitivity of Area	Basis of Tier 1 Criteria
High Groundwater Resource Potential (HGwRP) - Principal aquifers	UK Drinking Water Standards (UKDWS)
Low Groundwater Resource Potential (LGwRP) - Secondary aquifers not being abstracted and Un-productive groundwater strata	UK Environmental Quality Standards (EQS)

The superficial geology at this site was classed as a secondary undifferentiated aquifer not being abstracted and the underlying bedrock geology classified as an unproductive strata. Therefore a Low Groundwater Resource Potential (LGWRP) classification has been attributed to the site.

A summary of the screening criteria and the methodology used to derive them is included in Appendix J.

6.3 Assessment of Soil Results

The results of the screening process for on-site human receptors show that screening values representative of minimal risk for residential land use have been exceeded by the PAH compounds Napthalene, Phenanthrene, Fluoranthene, Benzo(a)anthracene, Chrysene, Benzo(bk)fluoranthene, Benzo(a)pyrene (BaP), Indeno(123cd)pyrene and Dibenzo(ah)anthracene at a number of locations. These exceedances are summarised in the table below.

Contaminant	Screening Criteria (mg/kg) (S4ULs)	No. of Exceedances	Highest Exceedance (mg/kg) & Sampling Location (m bgl)
Napthalene	2.3	1	3.87 (WS3 – 0.1-0.3)
Phenanthrene	95	2	155.95 (WS3- 0.1-0.3)
Fluoranthene	280	1	384.84 (WS3- 0.1-0.3)
Benzo(a)anthracene	7.2	3	165.99 (WS3 – 0.1-0.3)
Chrysene	15	3	175.99 (WS3 – 0.1-0.3)
Benzo(bk)fluoranthene	2.6	3	296.72 (WS3- 0.1-0.3)
Benzo(a)pyrene	2.2	3	188.96 (WS3 – 0.1-0.3)
Indeno(123cd)pyrene	27	2	124.93 (WS3 – 0.1-0.3)
Dibenzo(ah)anthracene	0.24	3	16.72 (WS3- 0.1-0.3)

Exceedances of the S4UL Screening Values, representative of minimal risk, for the above PAH compounds have been reported. It is considered reasonable to utilise recorded concentrations of BaP as a risk driver representative of genotoxic PAHs (i.e. including Benzo(a)anthracene and Dibenzo(ah)anthracene) to further assess the data. The C4SL value representative of low risk for BaP in a residential setting of 5.0mg/kg is still exceeded by the concentration identified at location WS3. Given the small number of samples (four) within the dataset, statistical analysis of identified concentrations has not been considered appropriate in this case.

The results of the screening process for controlled waters show that the screening values for Low Groundwater Resource Potential (LGWRP) have been exceeded by the PAH compounds Napthalene and Benz0(a)pyrene. These are summarised in the table below.

Contaminant	Screening Criteria (mg/kg)	No. of Exceedances	Highest Exceedance (mg/kg) & Sampling Location (m bgl)
Napthalene	0.93	2	3.87 (WS3 – 0.1-0.3)
Benzo(a)pyrene	10	3	188.96 (WS3 – 0.1-0.3)

7 ENVIRONMENTAL CONCLUSIONS

The Phase I (Desk Study) identified a number of plausible contaminant linkages associated with historical developments at the site and in the surrounding area and the potential risks posed to human receptors and underlying groundwater.

The Phase II intrusive investigation identified ground conditions to comprise made ground to depths of between 0.5 - 0.6m in thickness overlying Tidal Flat Deposits (Clay) Groundwater was encountered in all three borehole at depths between 2m and 4m.

Shallow soil samples collected during the intrusive investigation were submitted for laboratory analysis of selected contaminants of concern and subsequent results have shown that Tier 1 screening criteria representative of minimal risk to human receptors at a residential setting have been exceeded for concentrations of a number of PAH compounds.

Trace levels of asbestos fibres (0.005%) have been identified within one of the shallow soil samples (WS1). As these levels are just above the minimum laboratory detection limit they are considered to represent a potential risk to future site users or workers.

The concentrations of contaminants reported within shallow soils must be considered to have potential to pose a risk to future site users, primarily through linkages associated with physical interaction, (e.g. direct contact, inadvertent ingestion, inhalation of dusts etc.) and controlled waters. Therefore appropriate control measures will be required to ensure future safe development, details of which are discussed in Section 8.

In the context of the Model Procedures for Management of Land Contamination (CLR 11), it has been concluded through this Risk Assessment phase that residential development of the site could result in potentially unacceptable risks to human receptors and on that basis control measures will be required.

A summary of the approach outlined in CLR11, marking the work already completed under the risk assessment phase, is presented as a flow diagram in Figure 5 of this report

8 ENVIRONMENTAL RECOMMENDATIONS

8.1 Human Health

Given that ground impacts are considered to potentially pose an unacceptable or ongoing risk to future site users, recommendations are made below with respect to necessary control measures during forthcoming site development works to ensure that any potential risks are evaluated and appropriately controlled:

Significantly elevated concentrations of PAH were detected in the near-surface soils above minimum / low risk levels which have the potential to pose a risk to future site users. It is understood that residential gardens / areas of soft landscaping are to be part of the proposed redevelopment. Given the nature of the site and the type and concentrations of contaminants identified a number of options to remediate the site may be considered.

Firstly, the ground investigation has identified between 500mm and 600mm of Made Ground to be present beneath the site, which is considered to be the source of the contamination recorded. On this basis, the Made Ground could be removed from beneath the areas of landscaping and garden to remove the contamination source in these areas. Testing of the reduced level should be undertaken to confirm removal of contaminated soils and levels should be raised in clean imported soils that are certified both chemically and physically suitable for use.

Secondly, the implementation of an engineered cover system could also be to control potential risks to future site users. The engineered cover system should comprise the installation of a 200mm layer of free draining single sized granular soils situated between two layers of high visibility geotextile at the base of excavations across the landscaped / garden areas of the site, then brought up to final elevations using soils certified as chemically and physically clean and suitable for use. The engineered cover system should be, in total, a minimum of 600mm thick to adequately mitigate risks to future site users.

Remedial recommendations are made only for grassed and landscaped areas, and as such are not required for areas beneath hard standing or building footprints. All imported material should be accompanied by appropriate chemical analysis including analysis of metals, TPH and PAH compounds.

In order to comply with the likely requirements of the local authority, it is also recommended that once the required thickness of clean cover has been implemented within landscaped / garden areas, a validation/verification exercise is undertaken to confirm correct application and thicknesses.

Waste soils will need to be disposed of off-site to an appropriately licensed facility in accordance with all current guidance and waste transfer notes will need to be kept to support the verification report.

8.2 Controlled Waters

Elevated concentrations of PAH were detected in the near-surface soils above screening levels which have the potential to pose a risk to controlled waters. However, there are a number of factors that mitigate against impact to controlled waters, namely;

- The underlying geology is classified as an unproductive aquifer.
- Ground conditions have been proven to be predominantly cohesive, which will restrict the migration of contaminants.
- The site does not lie within a Source Protection Zone for local groundwater abstraction and there are no groundwater abstractions within the surrounding area.
- PAHs have low environmental mobility and the main risk driver for impact to controlled waters should be considered to be Naphthalene, which has only been recorded to a maximum of 3.87mg/kg

On the basis of the above, the level of contamination recorded is not considered to pose a plausible risk to controlled waters.

8.3 Precautionary Measures

Additional precautionary measures to reduce the risk of exposure to contamination are detailed below:-

- a) All construction workers operating at the site should be advised of the potential for exposure to and contact with, made ground in the subsurface of the site. Appropriate health and safety precautions should also be adopted during any excavation works to avoid exposure to soils. Reference should be made to the following HSE document: *Protection of Workers and the General Public during Development of Contaminated Land*.
- b) In order to reduce potential risks associated with ingress of contaminants to underground water supply pipework, aluminium barrier pipework meeting Water Industry Standard 4-32-19 and associated fittings can be used subject to agreement with the local water company. If other pipework is preferable, more detailed testing may be required in accordance with UK Water Industry Research Report 10/WM/03/21 – ‘Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites’ (2010).
- c) Should any palpable evidence of unexpected contamination be encountered during the redevelopment work, it should be reported to EPS so that an inspection can be made and appropriate sampling and assessment work carried out. A method statement for encountering any unexpected contamination is included as Appendix K of this report.

A copy of this report should be provided to the Environmental Health Department of South Holland District Council in order to facilitate discharge of associated planning conditions and for inclusion in their land quality records.

9 GEOTECHNICAL APPRAISAL

The ground conditions have been found to comprise of Made Ground, of up to 0.60m in thickness, overlying Tidal Flat Deposits. The Tidal Flat Deposits have been found to generally decrease in strength with an increase in depth, which is quite typical of these types of soil.

9.1 Structural Foundations

The ground conditions are considered suitable for the use of conventional spread foundations bearing upon the Tidal Flat Deposits. The Made Ground is not considered as appropriate bearing strata due to its low strength and variability.

A minimum foundation depth of 1.0m is considered suitable for the site, below existing or proposed ground level, whichever gives the deeper foundation based upon the following provisos.

- a) Foundations should fully penetrate all Made Ground and all disturbed ground arising from the removal of existing foundations, and extend a minimum of 150mm into undisturbed natural strata.
- b) The Tidal Flat clay is a shrinkable soil, and where affected by trees, foundations should be designed in accordance within Chapter 4.2 of NHBC Standard “Building Near Trees”. Foundations affected by trees should be designed for a high volume change potential soil.

An allowable bearing capacity of only 60kN/m² is considered appropriate for the Tidal Flat Deposits. The allowable bearing capacity is the permissible increase in vertical stress at the level of the underside of the foundation, above existing overburden pressure, which may be calculated on the basis of a soil density of 18kN/m³. Due to the generally low strength of the ground conditions, if foundations do need to be deepened due to the presence of trees, the allowable bearing pressure will need to be reduced and given that this is already low, the use of piles or raft foundation solutions may need to be considered.

At the above NABP, total settlements are considered likely to be in the region of 20mm to 25mm. Settlements in cohesive soils will likely comprise a small amount of immediate settlement and a larger proportion of consolidation settlement which will occur over a long period of time.

Where foundations exceed 1.5m in depth due to the influence of trees/vegetation anti-heave precautions will need to be adopted.

It is strongly recommended that a detailed tree survey is undertaken in order that the impact of all trees influencing the development can be taken in to account.

9.2 Ground Floor Construction

Given the depth of Made Ground and the soft nature of the shallow soils recorded, it is recommended that suspended ground floor construction is adopted.

9.3 Groundworks

The stability of Made Ground and granular Tidal Flat Deposits encountered must not be relied upon in unsupported excavations.

Safe working conditions must be provided at all times where persons are required to work in excavations.

Heavy plant and stockpiles of materials should not be permitted close to the edges of open excavations.

Groundwater has been recorded at depths of around 2m.

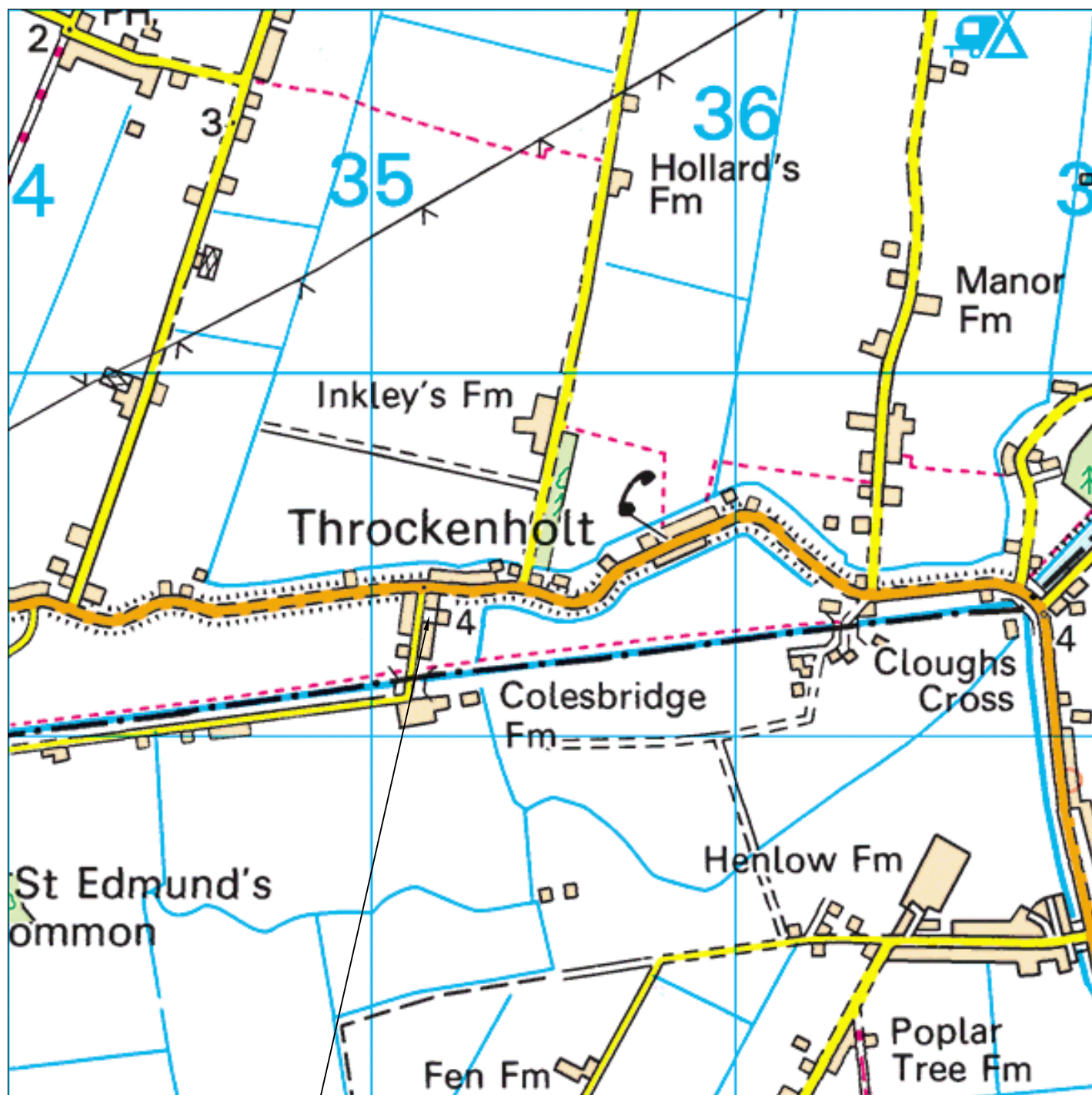
Further reference should be made to CIRIA Report No.97 'Trenching Practice' 1992.

9.4 Concrete Grade

Sulphate contents and pH values determinations were carried out by the analytical laboratory. Sulphate contents ranged from 0.003g/l SO₄ to 0.0897g/l SO₄. The pH values ranged from 7.66 to 9.20.

In accordance with Part 1 of the BRE Special Digest 1 'Concrete in Aggressive Ground' 2005, a design sulphate class of DS1 is considered suitable for the site, with an aggressive chemical environment for concrete (ACEC) of AC-1.

FIGURES



Approximate Site Location

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Licence Number: 100054115



Title: Site Location Plan

Project: Coronation Avenue,
Throckenbolt, PE12 0QT
Client: Fowler Refinishers

Fig No: 1

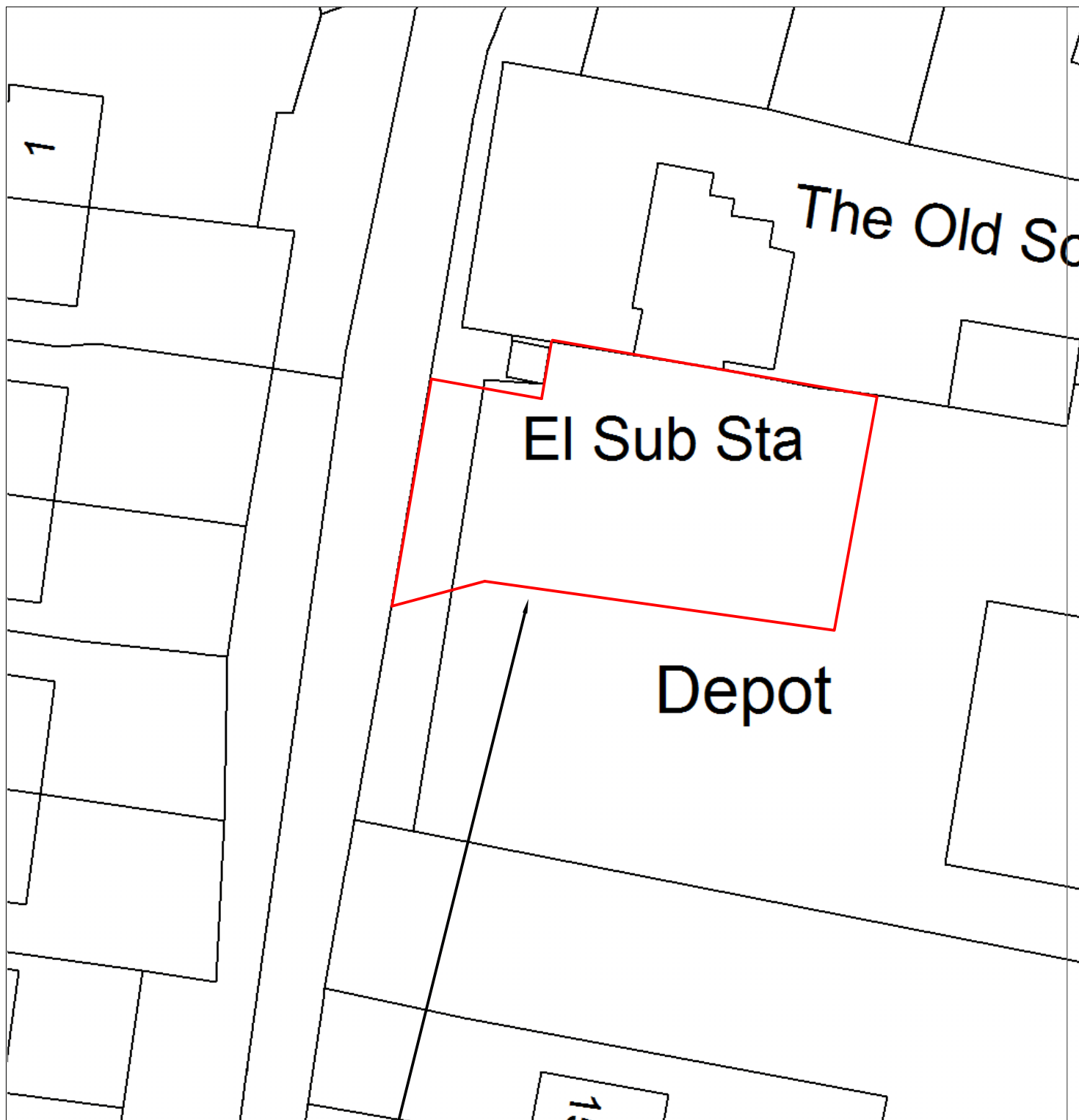
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Drawn By: FC Approved By: SB

Job No: UK15.1996

Dwg No: Fowler Refinishers/Throckenholt/0915/01

Date: October 2015



Approximate Site Location

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Title: Current Site Layout Plan

Project: Coronation Avenue,
Throckenbolt, PE12 0QT

Client: Fowler Refinishers

Fig No: 2

Scale: NTS

Drawn By: FC Approved By: SB

Job No: UK15.1996

Dwg No: Fowler Refinishers/Throckenbolt/0915/02

Date: 22nd October 2015



Approximate Site Location

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Title: Aerial Photograph

Project: Coronation Avenue,
Throckenbolt, PE12 0QT

Client: Fowler Refinishers

Fig No: 3

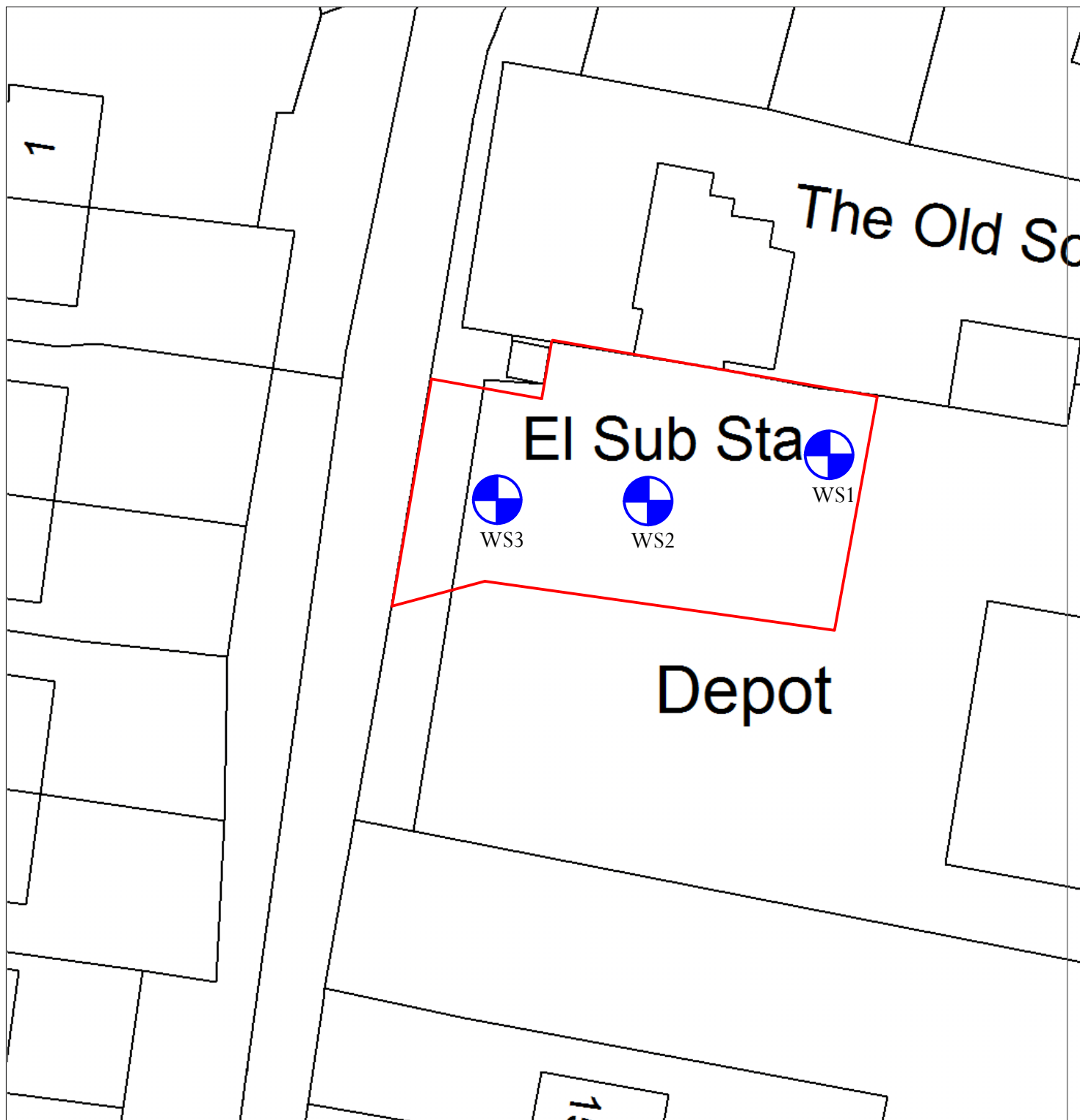
Scale: NTS

Drawn By: FC Approved By: SB

Job No: UK15.1996

Dwg No: Fowler Refinishers/Throckenbolt/0915/03

Date: 22nd October 2015



Approximate Site Location



Approximate Borehole location

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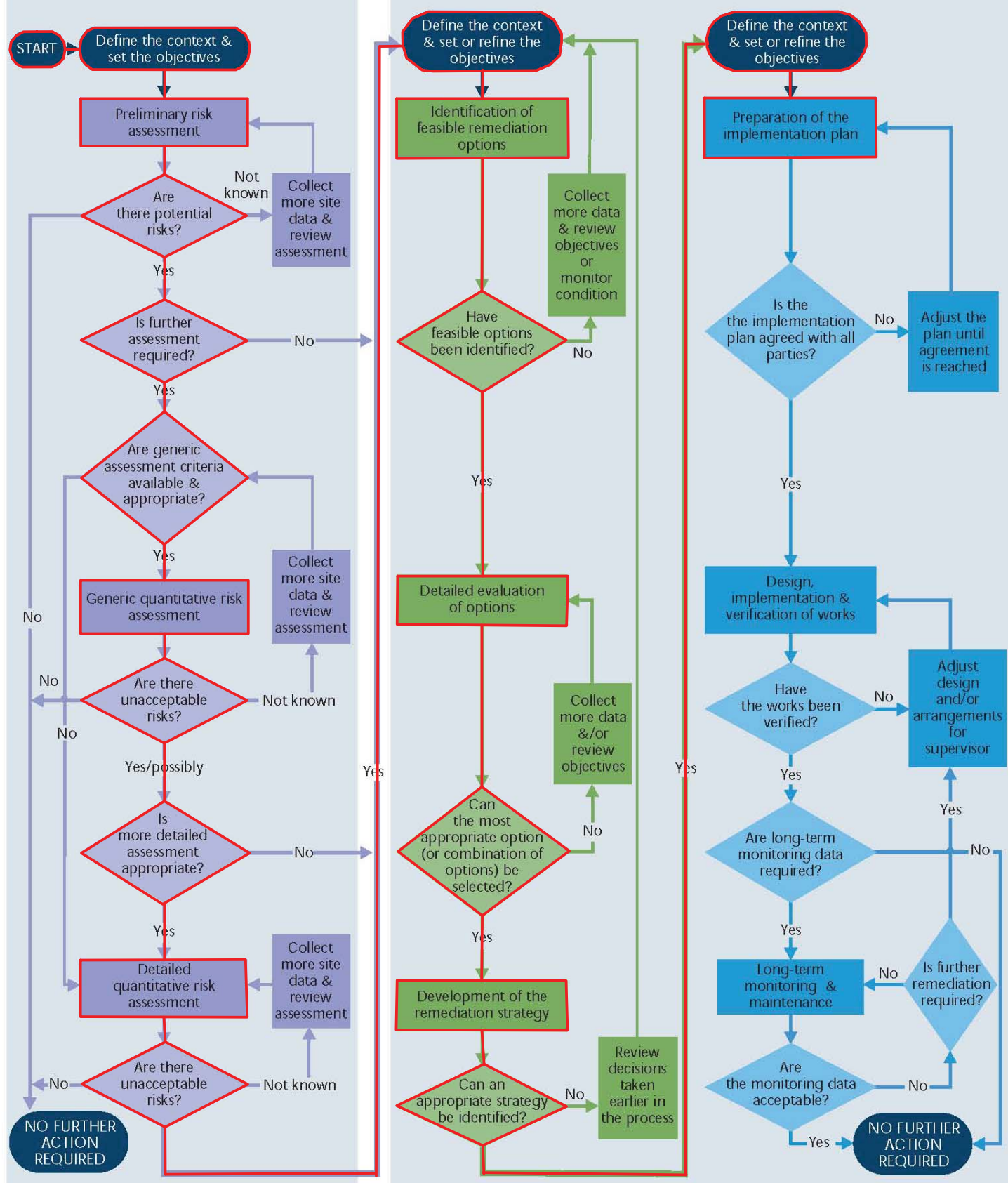
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Project: Coronation Avenue,
Throckenbolt, PE12 0QT
Client: Fowler Refinishers
Fig No: 4

Scale: NTS	
Drawn By: FC	Approved By: SB
Job No: UK15.1996	
Dwg No: Fowler Refinishers/Throckenbolt/0915/04	
Date: 22nd October 2015	

Risk Assessment

Options Appraisal

Implementation of the Remediation Strategy



Assessment Pathway For Site



Title: Site Context - CLR11

Project: Coronation Avenue,
Throckenbolt
Lincolnshire
PE12 0QT

Client: Fowler Refinishers
Fig No: 5

Scale: n/a

Drawn By: FC Approved By:

Job No: UK15.1996

Dwg No: Fowler Refinishers/Throckenbolt/0915/05

Revision Date: October 2015

TABLES

Table 1 – Laboratory Testing Schedule

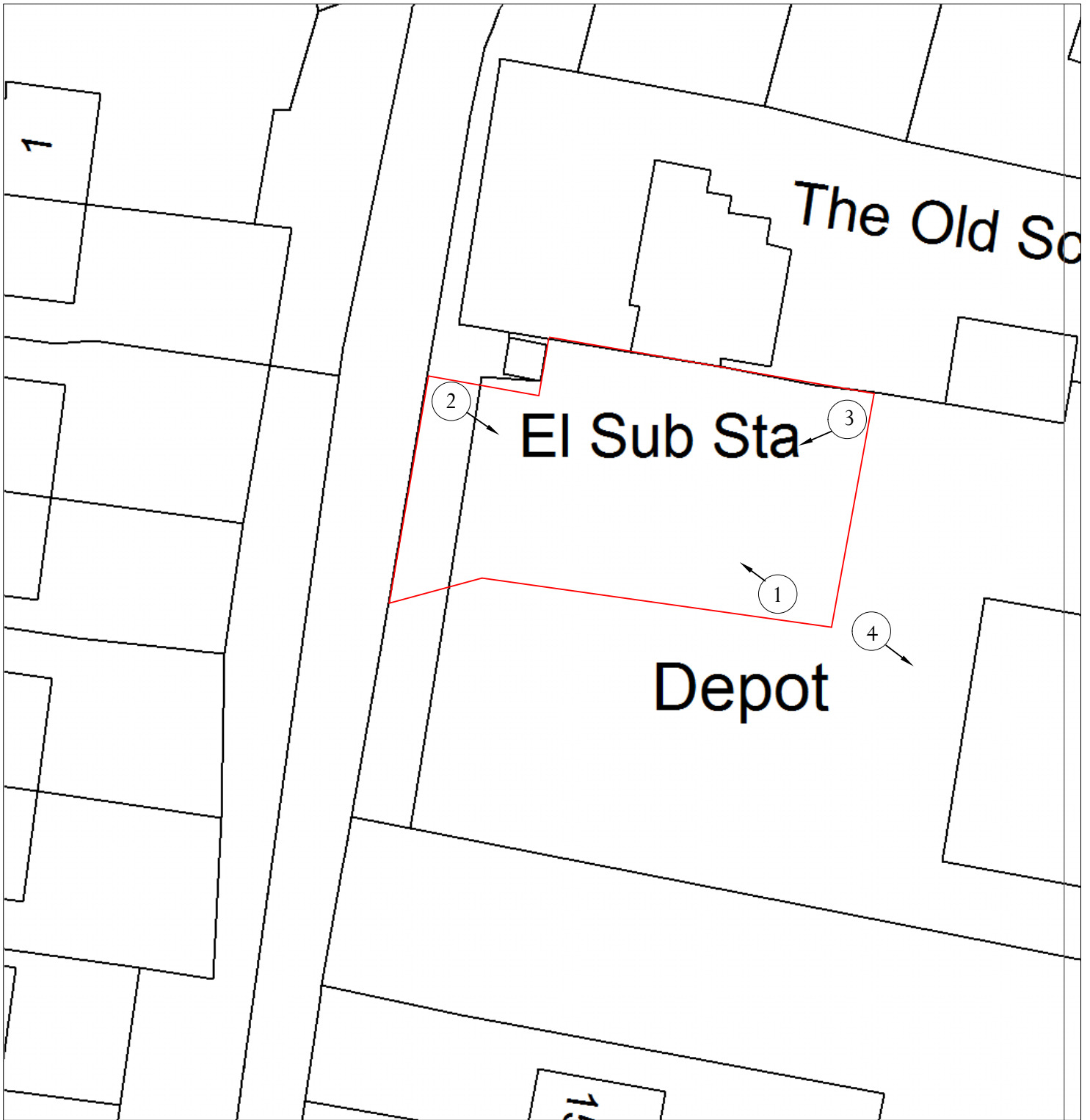
Sample ID	Sample Depth (m bgl)	EPS Mini Suite	Sulphate (2:1 water soluble)& pH	Moisture Content & Atterberg Limits
WS1	0.2-0.4	1		
WS1	1		1	
WS1	1.2			1
WS2	0.4-0.6	1		
WS2	0.8		1	
WS2	2.3			1
WS3	0.1-0.3	1		
WS3	0.6-0.8	1		
WS3	1		1	
WS3	0.8			1



APPENDICES

APPENDIX A

Selected Site Photographs



Approximate Site Location

1

→

Approximate Photo location

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Title: Photo Location Plan		
Project: Coronation Avenue, Throckenholt, PE12 0QT	Scale: NTS	
	Drawn By: FC	Approved By:
Client: Fowler Refinishers	Job No: UK15.1996	
	Dwg No: Fowler Refinishers/Throckenholt/0915/A	
Appendix: A	Date: September 2015	

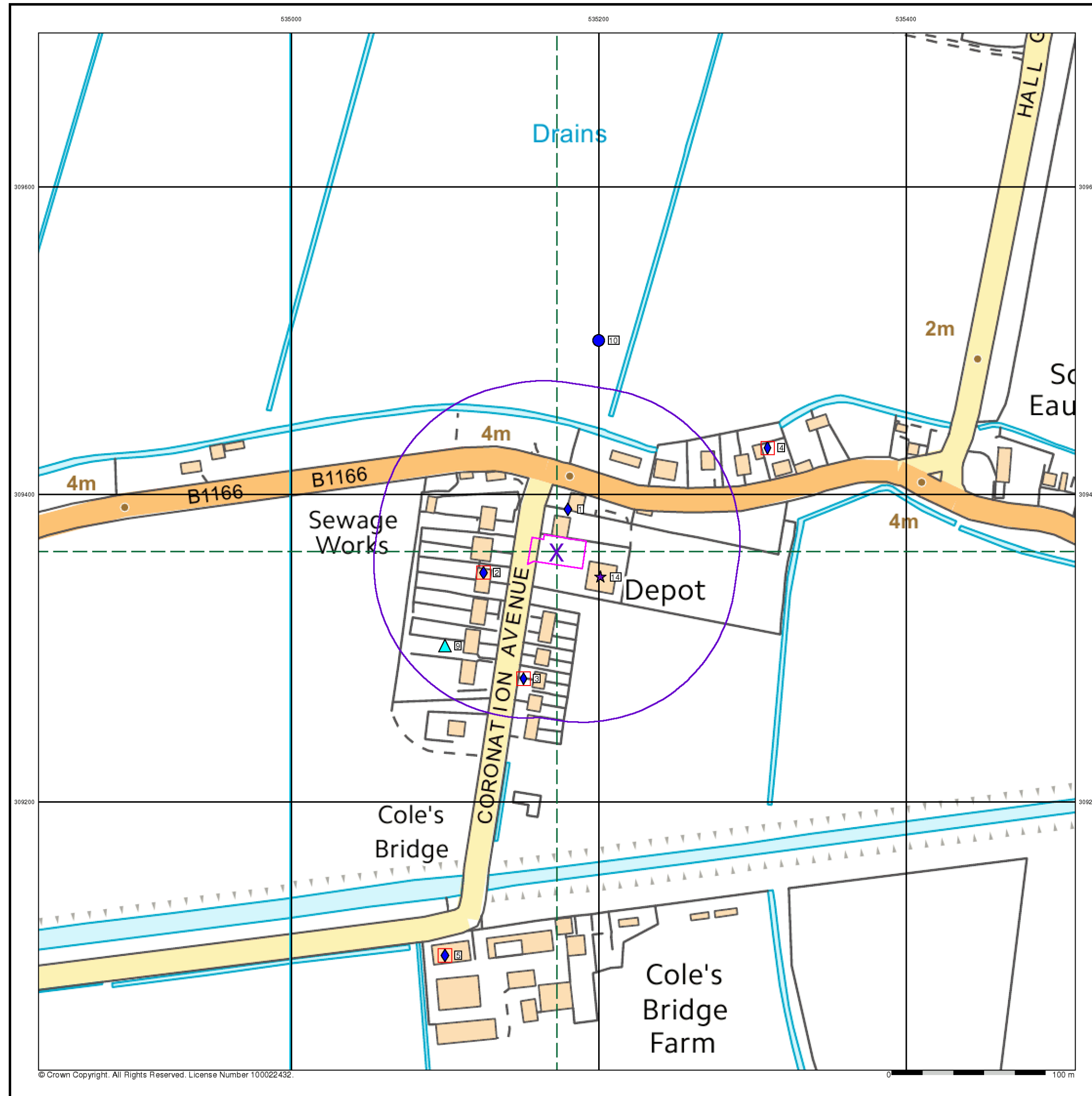
Photo 1: View of the proposed site from the east. The owner of the land already dug where the development would be located.	Photo 2: View of the proposed site from the road.
	
Photo 3: Image of the proposed site from the north facing south.	Photo 4: Van paint works located immediately east of the proposed site
	

APPENDIX B

Indicative Proposed Development Plan

APPENDIX C

Surrounding Land Use



General

- Specified Site
- Specified Buffer(s)
- Bearing Reference Point
- Map ID
- Several of Type at Location

Agency and Hydrological

- Contaminated Land Register Entry or Notice (Location)
- Contaminated Land Register Entry or Notice
- Discharge Consent
- Enforcement or Prohibition Notice
- Integrated Pollution Control
- Integrated Pollution Prevention Control
- Local Authority Integrated Pollution Prevention and Control
- Local Authority Pollution Prevention and Control
- Local Authority Pollution Prevention and Control Enforcement
- Pollution Incident to Controlled Waters
- Prosecution Relating to Authorised Processes
- Prosecution Relating to Controlled Waters
- Registered Radioactive Substance
- River Network or Water Feature
- River Quality Sampling Point
- Substantiated Pollution Incident Register
- Water Abstraction
- Water Industry Act Referral

Waste

- BGS Recorded Landfill Site (Location)
- BGS Recorded Landfill Site
- EA Historic Landfill (Buffered Point)
- EA Historic Landfill (Polygon)
- Integrated Pollution Control Registered Waste Site
- Licensed Waste Management Facility (Landfill Boundary)
- Licensed Waste Management Facility (Location)
- Local Authority Recorded Landfill Site (Location)
- Local Authority Recorded Landfill Site
- Registered Landfill Site
- Registered Landfill Site (Location)
- Registered Landfill Site (Point Buffered to 100m)
- Registered Landfill Site (Point Buffered to 250m)
- Registered Waste Transfer Site (Location)
- Registered Waste Transfer Site
- Registered Waste Treatment or Disposal Site (Location)
- Registered Waste Treatment or Disposal Site

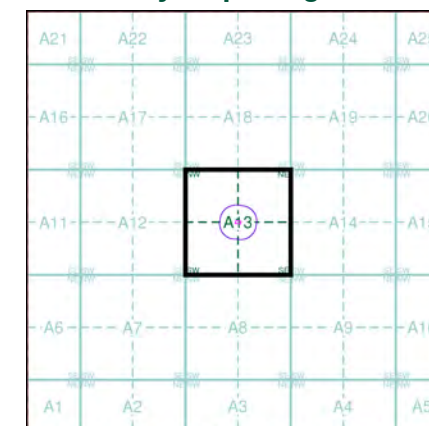
Geological

- BGS Recorded Mineral Site

Industrial Land Use

- Contemporary Trade Directory Entry
- Fuel Station Entry
- COMAH Site
- Explosive Site
- NIHHS Site
- Planning Hazardous Substance Consent
- Planning Hazardous Substance Enforcement

Site Sensitivity Map - Segment A13



Order Details

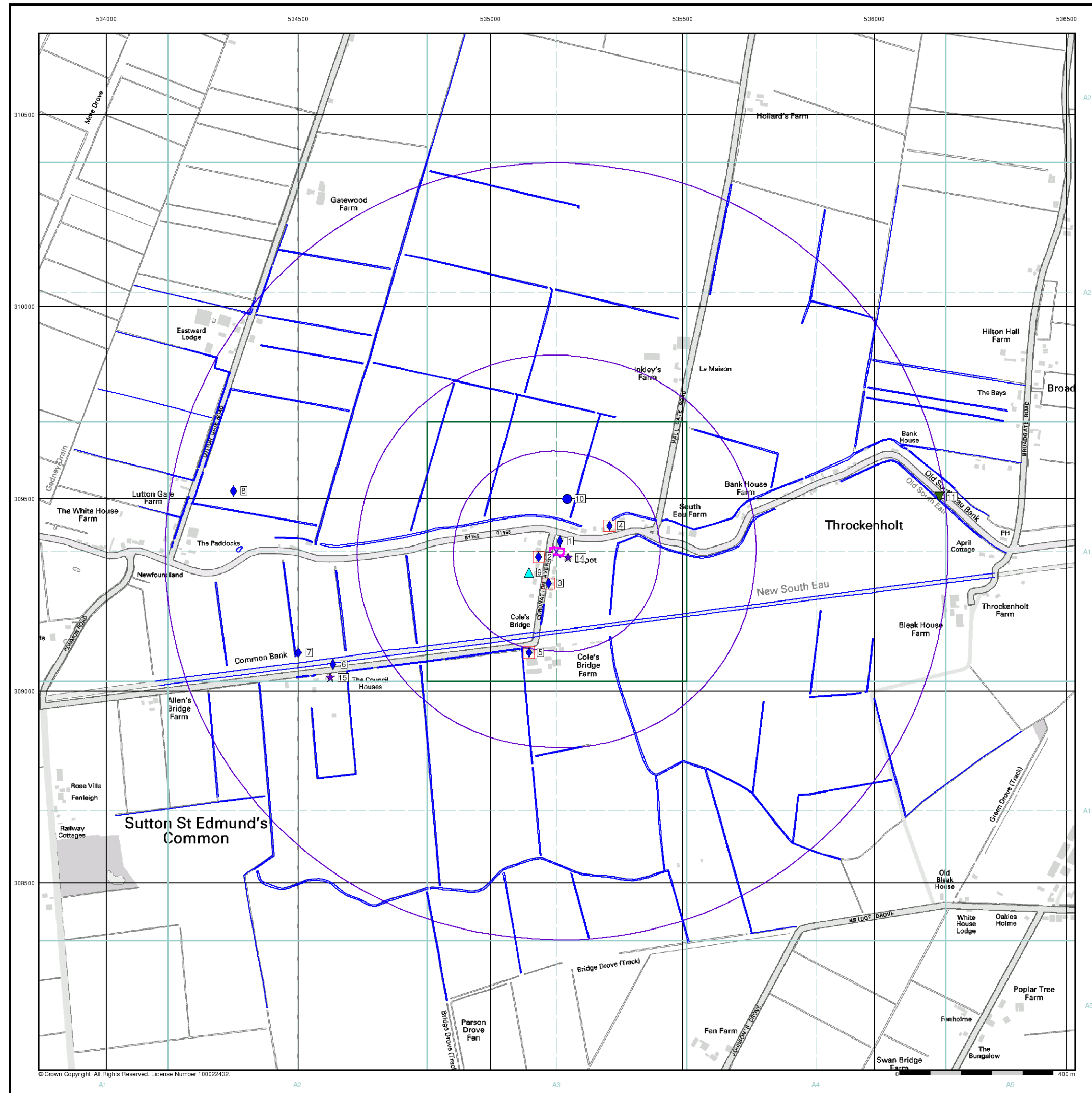
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Customer Ref: UK15.1996
National Grid Reference: 535170, 309360
Slice: A
Site Area (Ha): 0.07

Site Details

Fowler Refinishers Ltd, Coronation Avenue, Throckenholt, SPALDING, Lincolnshire, PE12 0QT



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Fax: 0844 844 9951
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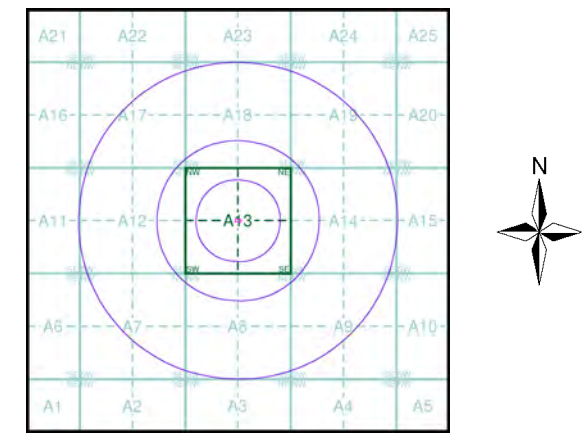


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- General**
- Specified Site
 - Specified Buffer(s)
 - Bearing Reference Point
 - Map ID
 - Several of Type at Location
- Agency and Hydrological**
- Contaminated Land Register Entry or Notice (Location)
 - Contaminated Land Register Entry or Notice
 - Discharge Consent
 - Enforcement or Prohibition Notice
 - Integrated Pollution Control
 - Integrated Pollution Prevention Control
 - Local Authority Integrated Pollution Prevention and Control
 - Local Authority Pollution Prevention and Control
 - Local Authority Pollution Prevention and Control Enforcement
 - Pollution Incident to Controlled Waters
 - Prosecution Relating to Authorised Processes
 - Prosecution Relating to Controlled Waters
 - Registered Radioactive Substance
 - River Network or Water Feature
 - River Quality Sampling Point
 - Substantiated Pollution Incident Register
 - Water Abstraction
 - Water Industry Act Referral
- Waste**
- BGS Recorded Landfill Site (Location)
 - BGS Recorded Landfill Site
 - EA Historic Landfill (Buffered Point)
 - EA Historic Landfill (Polygon)
 - Integrated Pollution Control Registered Waste Site
 - Licensed Waste Management Facility (Landfill Boundary)
 - Licensed Waste Management Facility (Location)
 - Local Authority Recorded Landfill Site (Location)
 - Local Authority Recorded Landfill Site
 - Registered Landfill Site
 - Registered Landfill Site (Location)
 - Registered Landfill Site (Point Buffered to 100m)
 - Registered Landfill Site (Point Buffered to 250m)
 - Registered Waste Transfer Site (Location)
 - Registered Waste Transfer Site
 - Registered Waste Treatment or Disposal Site (Location)
 - Registered Waste Treatment or Disposal Site
- Hazardous Substances**
- COMAH Site
 - Explosive Site
 - NIHHS Site
 - Planning Hazardous Substance Consent
 - Planning Hazardous Substance Enforcement
- Geological**
- BGS Recorded Mineral Site
- Industrial Land Use**
- Contemporary Trade Directory Entry
 - Fuel Station Entry

Site Sensitivity Map - Slice A



Order Details

Order Number: 72049274_1_1
Customer Ref: UK15.1996
National Grid Reference: 535170, 309360
Slice: A
Site Area (Ha): 0.07
Search Buffer (m): 1000

Site Details

Fowler Refinishers Ltd, Coronation Avenue, Throckenholt, SPALDING, Lincolnshire, PE12 0QT

APPENDIX D

Geological Context

Geology 1:50,000 Maps Legends

Superficial Geology

Map Colour	Lex Code	Rock Name	Rock Type	Min and Max Age
	TFD1	Tidal Flat Deposits, 1	Clay and Silt	Quaternary - Quaternary
	TFD1	Tidal Flat Deposits, 1	Sand and Silt	Quaternary - Quaternary

Bedrock and Faults

Map Colour	Lex Code	Rock Name	Rock Type	Min and Max Age
	WWAC	West Walton Formation and Amphill Clay Formation (Undifferentiated)	Mudstone	Oxfordian - Oxfordian
	OXC	Oxford Clay Formation	Mudstone	Oxfordian - Callovian



Geology 1:50,000 Maps

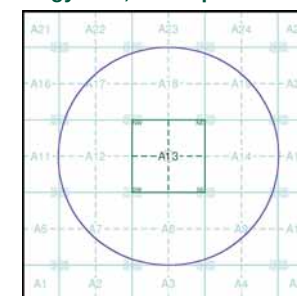
This report contains geological map extracts taken from the BGS Digital Geological map of Great Britain at 1:50,000 scale and is designed for users carrying out preliminary site assessments who require geological maps for the area around the site. This mapping may be more up to date than previously published paper maps.

The various geological layers - artificial and landslip deposits, superficial geology and solid (bedrock) geology are displayed in separate maps, but superimposed on the final 'Combined Surface Geology' map. All map legends feature on this page. Not all layers have complete nationwide coverage, so availability of data for relevant map sheets is indicated below.

Geology 1:50,000 Maps Coverage

Map ID:	1
Map Sheet No:	158
Map Name:	Peterborough
Map Date:	1984
Bedrock Geology:	Available
Superficial Geology:	Available
Artificial Geology:	Available
Faults:	Not Supplied
Landslip:	Not Available
Rock Segments:	Not Supplied

Geology 1:50,000 Maps - Slice A



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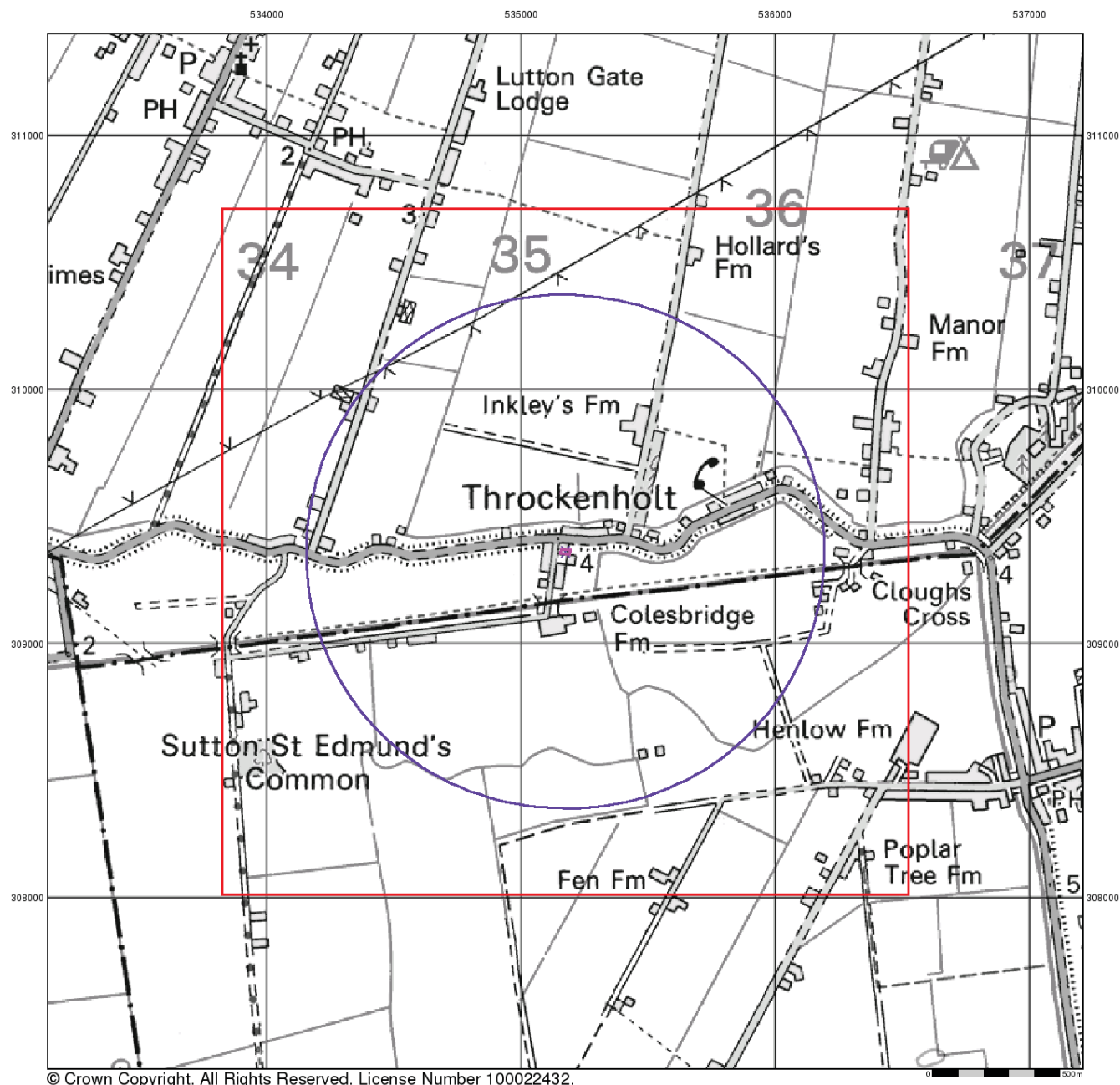
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Customer Reference:	UK15.1996
National Grid Reference:	535170, 309360
Slice:	A
Site Area (Ha):	0.07
Search Buffer (m):	1000

Site Details:

Fowler Refinishers Ltd, Coronation Avenue, Throckenholt, SPALDING, Lincolnshire, PE12 0QT



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Artificial Ground and Landslip

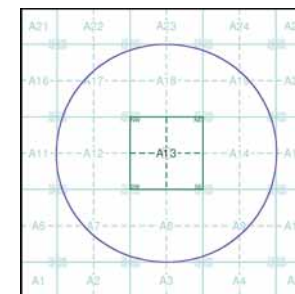
Artificial ground is a term used by BGS for those areas where the ground surface has been significantly modified by human activity. Information about previously developed ground is especially important, as it is often associated with potentially contaminated material, unpredictable engineering conditions and unstable ground.

Artificial ground includes:

- Made ground - man-made deposits such as embankments and spoil heaps on the natural ground surface.
- Worked ground - areas where the ground has been cut away such as quarries and road cuttings.
- Infilled ground - areas where the ground has been cut away then wholly or partially backfilled.
- Landscaped ground - areas where the surface has been reshaped.
- Disturbed ground - areas of ill-defined shallow or near surface mineral workings where it is impracticable to map made and worked ground separately.

Mass movement (landslip) deposits on BGS geological maps are primarily superficial deposits that have moved down slope under gravity to form landslips. These affect bedrock, other superficial deposits and artificial ground. The dataset also includes foundered strata, where the ground has collapsed due to subsidence.

Artificial Ground and Landslip Map - Slice A



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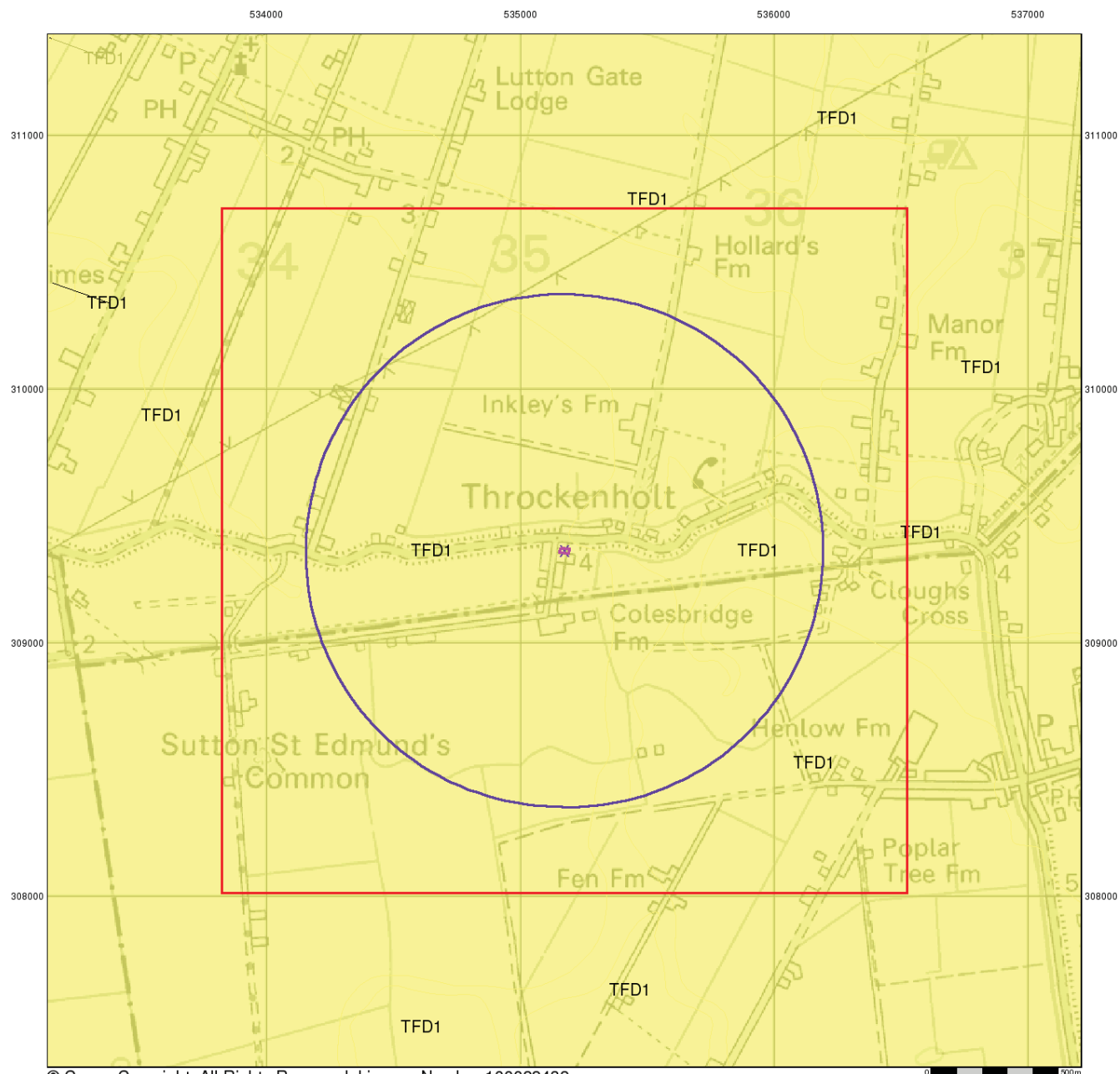
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 National Grid Reference: 535170, 309360
 Slice: A
 Site Area (Ha): 0.07
 Search Buffer (m): 1000

Site Details:

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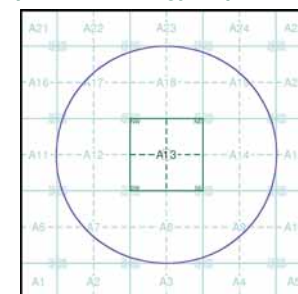
Superficial Geology

Superficial Deposits are the youngest geological deposits formed during the most recent period of geological time, the Quaternary, which extends back about 1.8 million years from the present.

They rest on older deposits or rocks referred to as Bedrock. This dataset contains Superficial deposits that are of natural origin and 'in place'. Other superficial strata may be held in the Mass Movement dataset where they have been moved, or in the Artificial Ground dataset where they are of man-made origin.

Most of these Superficial deposits are unconsolidated sediments such as gravel, sand, silt and clay, and onshore they form relatively thin, often discontinuous patches or larger spreads.

Superficial Geology Map - Slice A



Order Details:

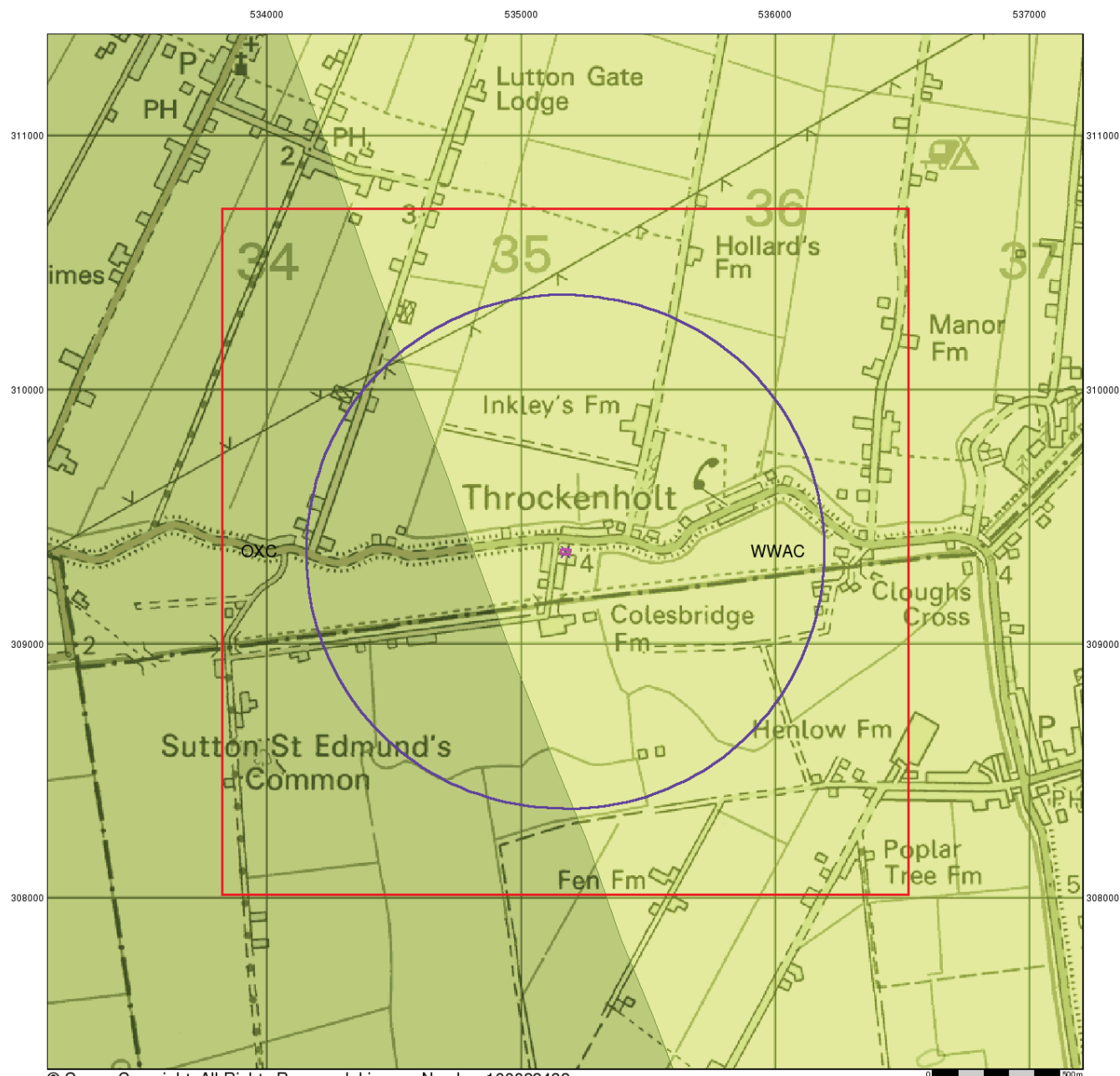
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 Slice: A
 Site Area (Ha): 0.07
 Search Buffer (m): 1000

Site Details:

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Bedrock and Faults

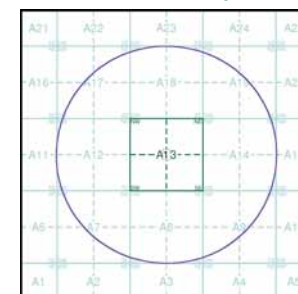
Bedrock geology is a term used for the main mass of rocks forming the Earth and are present everywhere, whether exposed at the surface in outcrops or concealed beneath superficial deposits or water.

The bedrock has formed over vast lengths of geological time ranging from ancient and highly altered rocks of the Proterozoic, some 2500 million years ago, or older, up to the relatively young Pliocene, 1.8 million years ago.

The bedrock geology includes many lithologies, often classified into three types based on origin: igneous, metamorphic and sedimentary.

The BGS Faults and Rock Segments dataset includes geological faults (e.g. normal, thrust), and thin beds mapped as lines (e.g. coal seam, gypsum bed). Some of these are linked to other particular 1:50,000 Geology datasets, for example, coal seams are part of the bedrock sequence, most faults and mineral veins primarily affect the bedrock but cut across the strata and post date its deposition.

Bedrock and Faults Map - Slice A



Order Details:

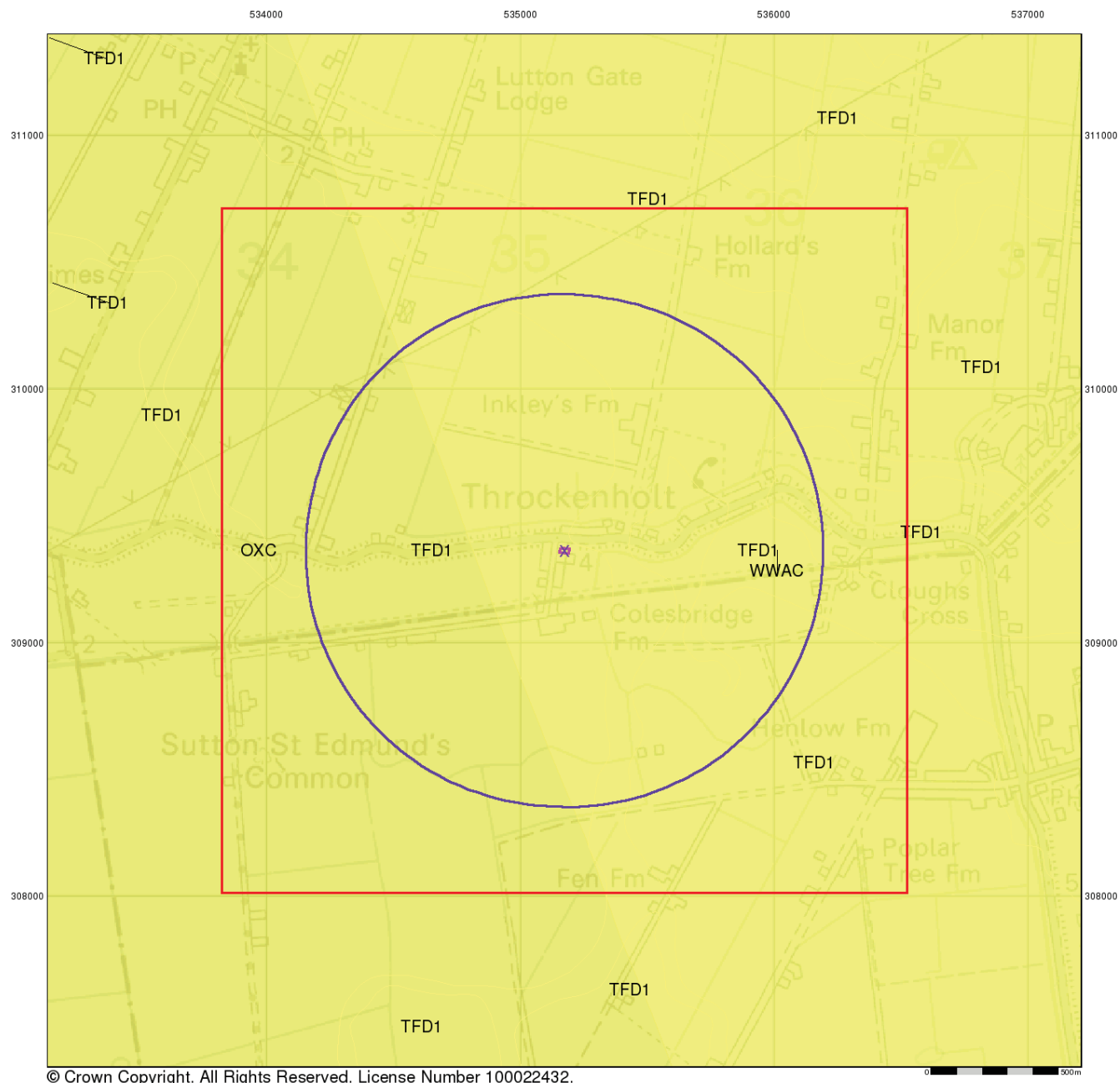
Order Number: 72049274_1_1
 Customer Reference: UK15.1996
 National Grid Reference: 535170, 309360
 Slice: A
 Site Area (Ha): 0.07
 Search Buffer (m): 1000

Site Details:

Fowler Refinishers Ltd, Coronation Avenue, Throckenholt, SPALDING, Lincolnshire, PE12 0QT



Tel: 0844 844 9952
 Fax: 0844 844 9951
 Web: www.envirocheck.co.uk



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Combined Surface Geology

The Combined Surface Geology map combines all the previous maps into one combined geological overview of your site.

Please consult the legends to the previous maps to interpret the Combined "Surface Geology" map.

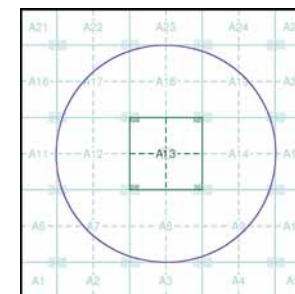
Additional Information

More information on 1:50,000 Geological mapping and explanations of rock classifications can be found on the BGS website. Using the LEX Codes in this report, further descriptions of rock types can be obtained by interrogating the 'BGS Lexicon of Named Rock Units'. This database can be accessed by following the 'Information and Data' link on the BGS website.

Contact

British Geological Survey
Kingsley Dunham Centre
Keyworth
Nottingham
NG12 5GG
Telephone: 0115 936 3143
Fax: 0115 936 3276
email: enquiries@bgs.ac.uk
website: www.bgs.ac.uk

Combined Geology Map - Slice A



Order Details:

Order Number: 72049274_1_1
Customer Reference: UK15.1996
National Grid Reference: 535170, 309360
Slice: A
Site Area (Ha): 0.07
Search Buffer (m): 1000

Site Details:

Fowler Refinishers Ltd, Coronation Avenue, Throckenholt, SPALDING, Lincolnshire, PE12 0QT



Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk

6-in or 1:10 000 Map Registration No.

National Grid Reference

1-in or 1:50 000
New Series Map No.

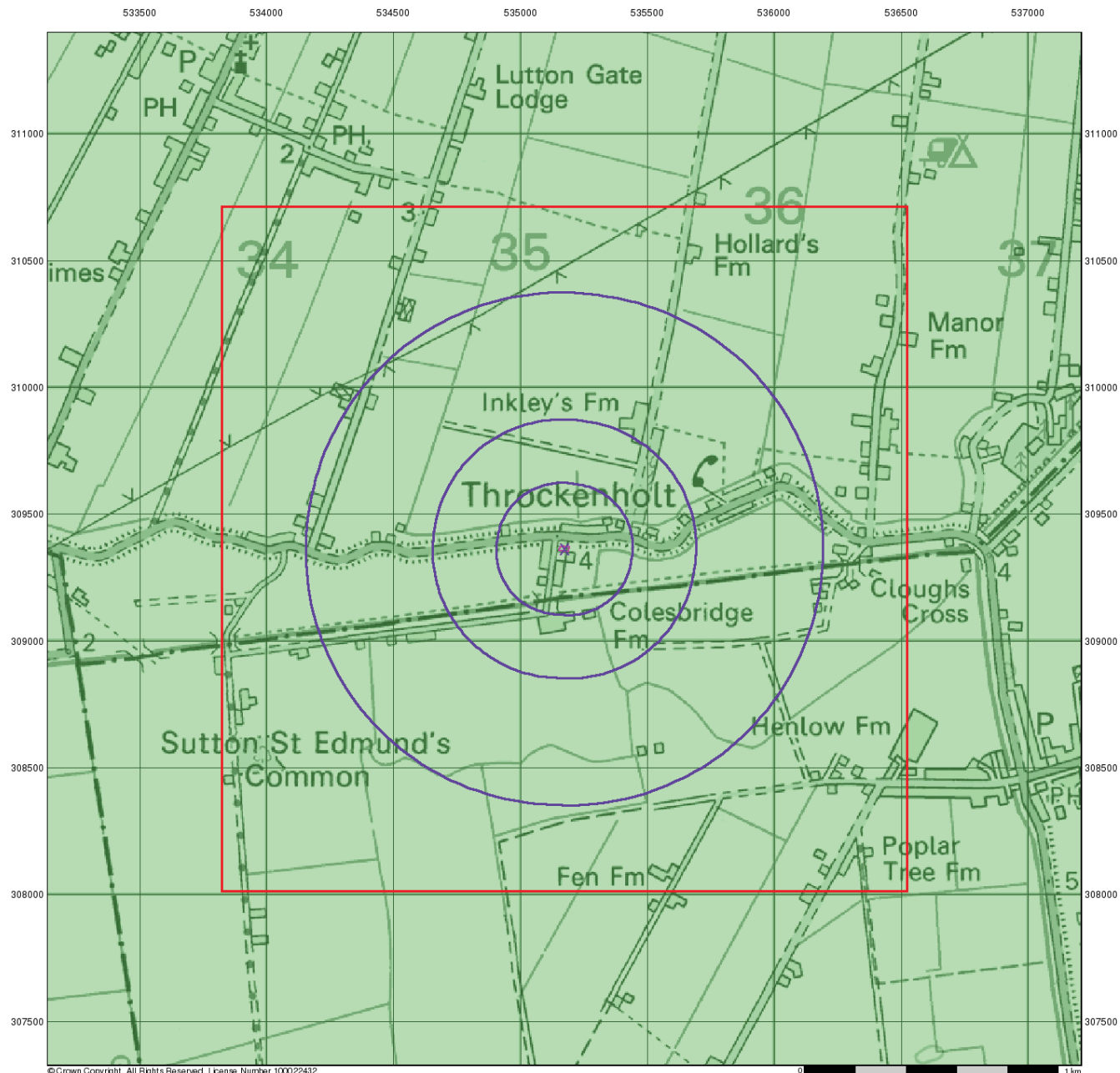
Enter 'C' if
Confidential

Examined by

[illegible]

APPENDIX E

Groundwater Vulnerability Maps



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0 1 km



Groundwater Vulnerability

General

- Specified Site Specified Buffer(s) Bearing Reference Point
- Slice Map ID

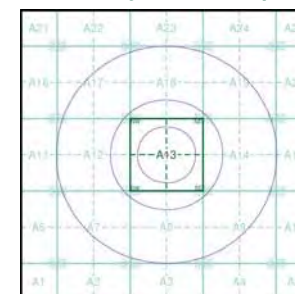
Agency and Hydrological

Geological Classes

Major Aquifer (Highly Permeable)		High (H) 1, 2, 3, U
		Intermediate (I) 1, 2
		Low
Minor Aquifer (Variably Permeable)		High (H) 1, 2, 3, U
		Intermediate (I) 1, 2
		Low
Non Aquifer (Negligibly Permeable)		
Water or Sea		
Drift Deposit		

Soil Classes

Site Sensitivity Context Map - Slice A



Order Details

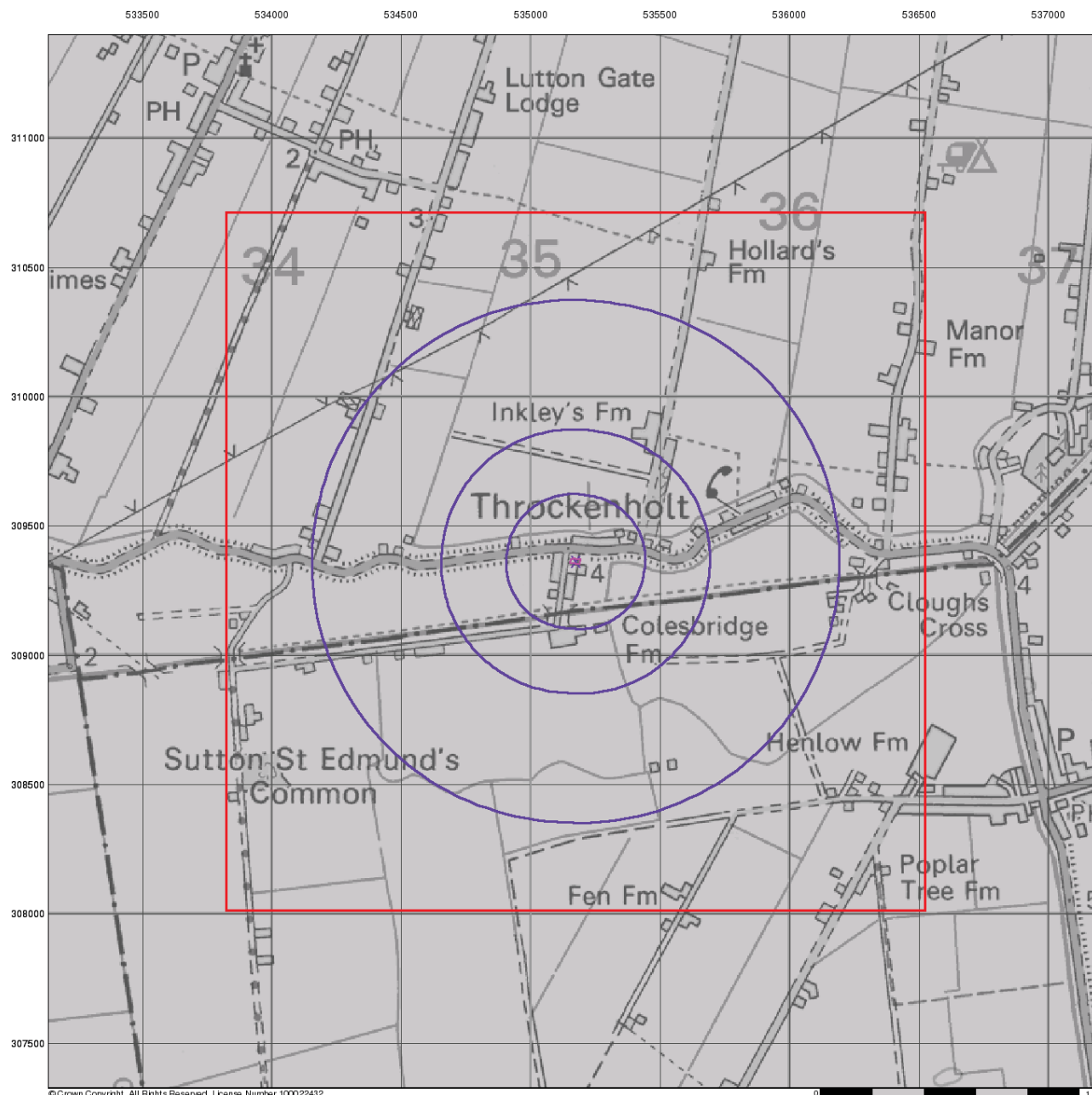
Order Number: 72049274_1_1
 Customer Ref: UK15.1996
 National Grid Reference: 535170, 309360
 Slice: A
 Site Area (Ha): 0.07
 Search Buffer (m): 1000

Site Details

Fowler Refinishers Ltd, Coronation Avenue, Throckenholt, SPALDING, Lincolnshire, PE12 0QT



Tel: 0844 844 9952
 Fax: 0844 844 9951
 Web: www.envirocheck.co.uk



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0 1 km



Bedrock Aquifer Designation

General

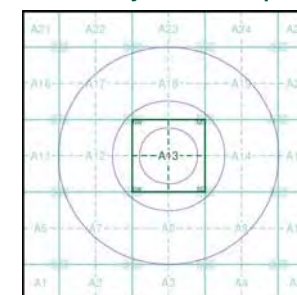
- Specified Site
- Specified Buffer(s)
- Slice
- Map ID
- Bearing Reference Point

Agency and Hydrological

Geological Classes

- Principal Aquifer
- Secondary A Aquifer
- Secondary B Aquifer
- Secondary Undifferentiated
- Unproductive Strata
- Unknown

Site Sensitivity Context Map - Slice A



Order Details

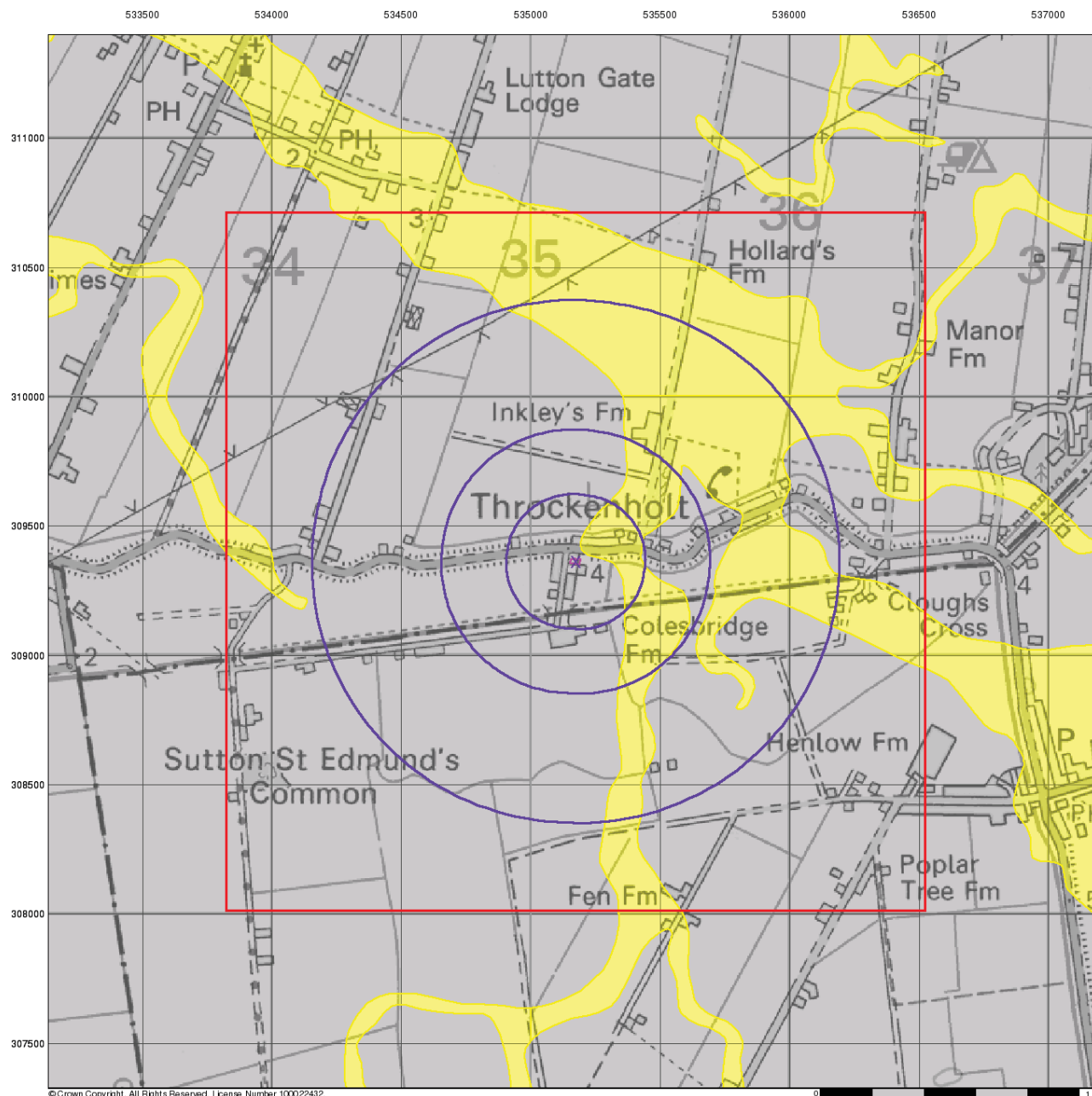
Order Number: 72049274_1_1
 Customer Ref: UK15.1996
 National Grid Reference: 535170, 309360
 Slice: A
 Site Area (Ha): 0.07
 Search Buffer (m): 1000

Site Details

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0 1 km



Superficial Aquifer Designation

General

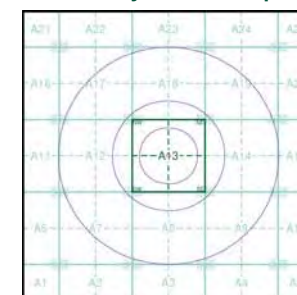
- Specified Site
- Specified Buffer(s)
- Bearing Reference Point
- Slice
- Map ID

Agency and Hydrological

Geological Classes

- Principal Aquifer
- Secondary A Aquifer
- Secondary B Aquifer
- Secondary Undifferentiated
- Unproductive Strata
- Unknown

Site Sensitivity Context Map - Slice A



Order Details

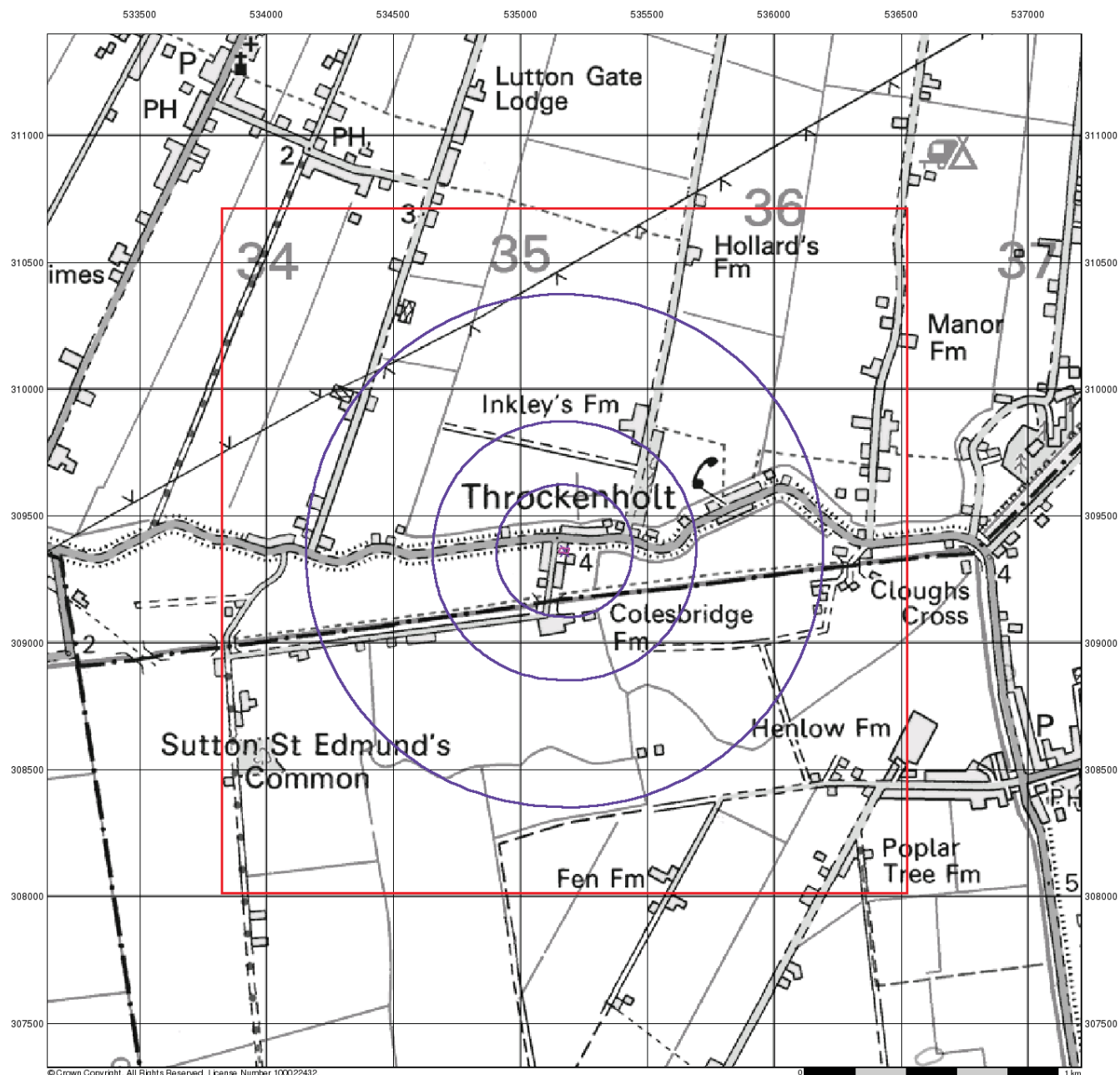
Order Number: 72049274_1_1
 Customer Ref: UK15.1996
 National Grid Reference: 535170, 309360
 Slice: A
 Site Area (Ha): 0.07
 Search Buffer (m): 1000

Site Details

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Source Protection Zones

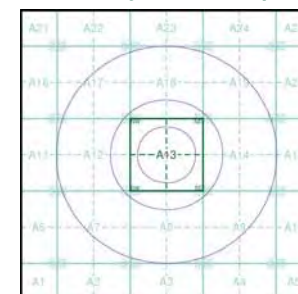
General

- Specified Site
- Specified Buffer(s)
- Bearing Reference Point
- Slice
- Map ID

Agency and Hydrological

- Inner zone (Zone 1)
- Inner zone - subsurface activity only (Zone 1c)
- Outer zone (Zone 2)
- Outer zone - subsurface activity only (Zone 2c)
- Total catchment (Zone 3)
- Total catchment - subsurface activity only (Zone 3c)
- Special interest (Zone 4)
- Source Protection Zone Borehole

Site Sensitivity Context Map - Slice A



Order Details

Order Number: 72049274_1_1
 Customer Ref: UK15.1996
 National Grid Reference: 535170, 309360
 Slice: A
 Site Area (Ha): 0.07
 Search Buffer (m): 1000

Site Details

Fowler Refinishers Ltd, Coronation Avenue, Throckenholt,
 SPALDING, Lincolnshire, PE12 0QT



Tel: 0844 844 9952
 Fax: 0844 844 9951
 Web: www.envirocheck.co.uk



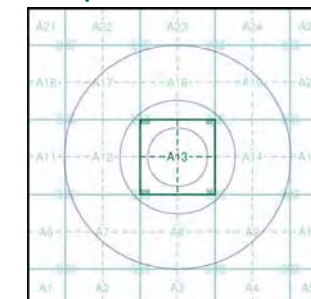
General

- Specified Site
- Specified Buffer(s)
- Bearing Reference Point

Agency and Hydrological (Flood)

- Extreme Flooding from Rivers or Sea without Defences (Zone 2)
- Flooding from Rivers or Sea without Defences (Zone 3)
- Area Benefiting from Flood Defence
- Flood Water Storage Areas
- Flood Defence

Flood Map - Slice A



Order Details

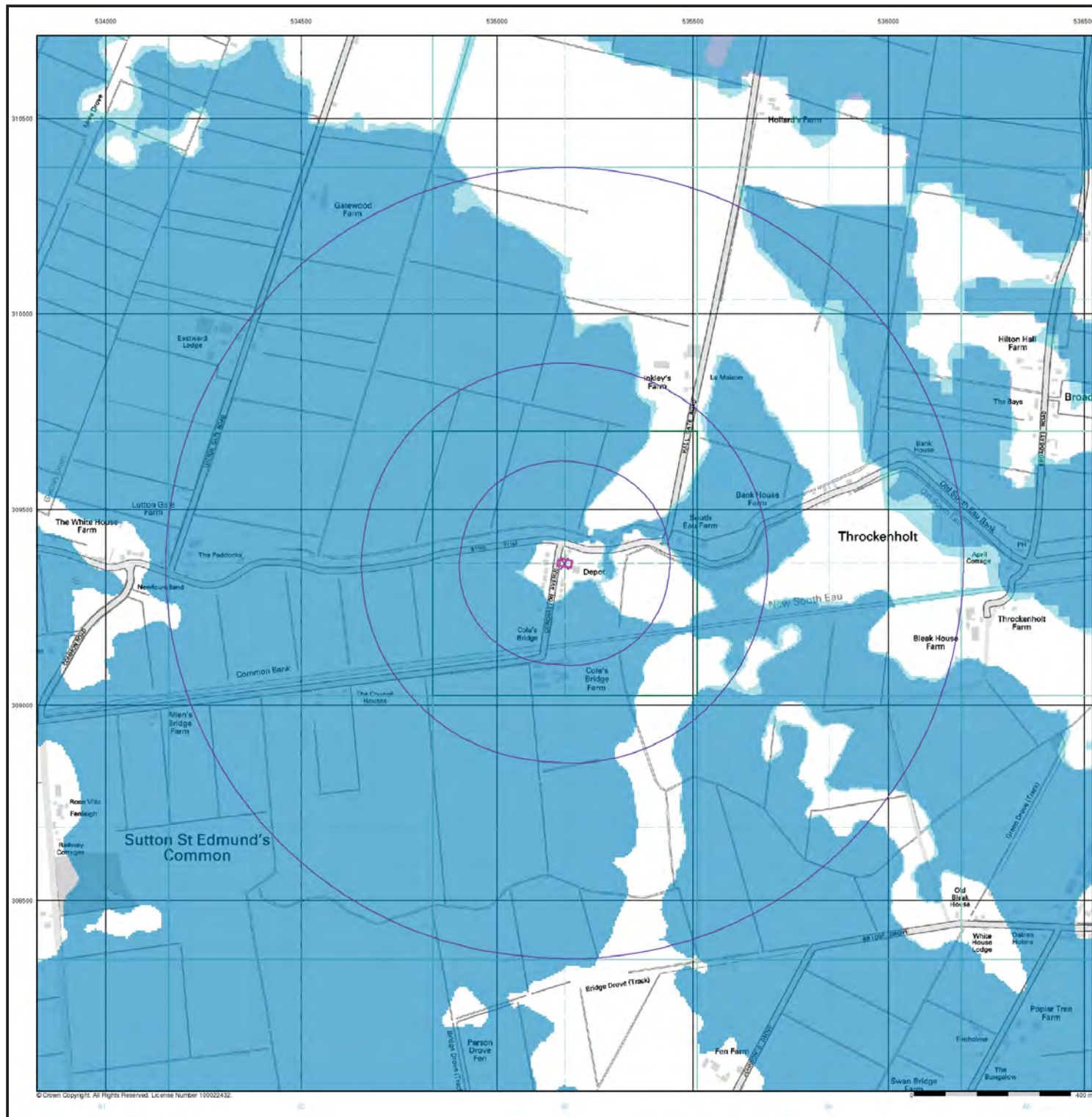
Order Number: 72049274_1_1
Customer Ref: UK15.1996
National Grid Reference: 535170, 309360
Slice: A
Site Area (Ha): 0.07
Search Buffer (m): 1000

Site Details

Fowler Refinishers Ltd, Coronation Avenue, Throckenholt,
SPALDING, Lincolnshire, PE12 0QT



Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk



APPENDIX F

A Selection of Historic Maps



Lincolnshire

Published 1889

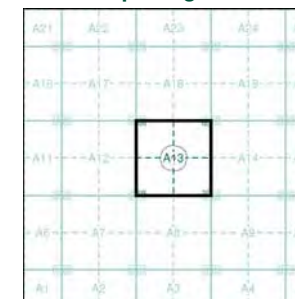
Source map scale - 1:2,500

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)



Historical Map - Segment A13



Order Details

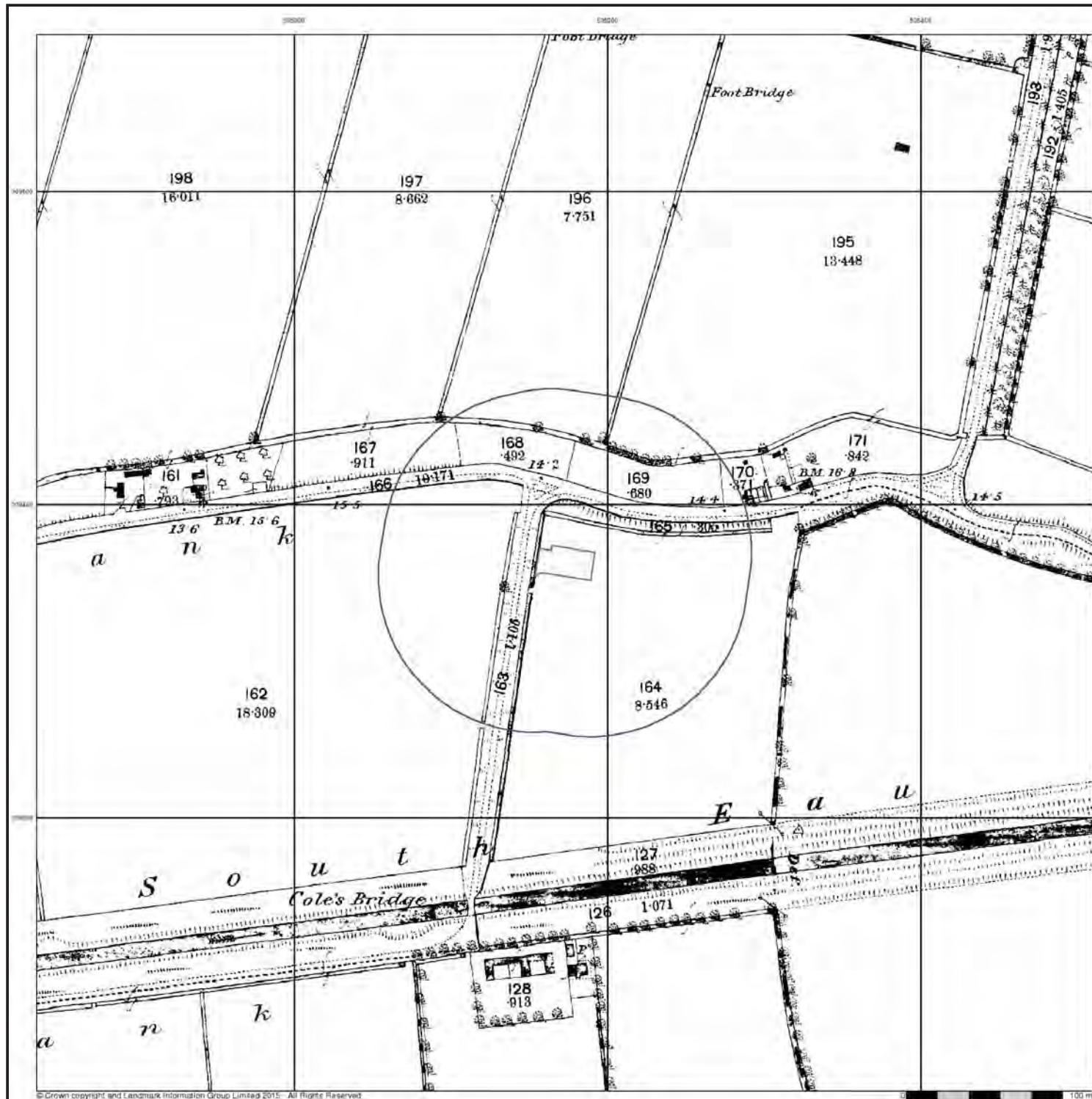
Order Number: 72049274_1_1
Customer Ref: UK15.1996
National Grid Reference: 535170, 309360
Slice: A
Site Area (Ha): 0.07
Search Buffer (m): 100

Site Details

Fowler Refinishers Ltd, Coronation Avenue, Throckenolt, SPALDING, Lincolnshire, PE12 0QT



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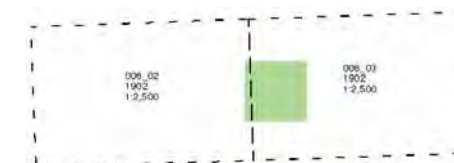
Cambridgeshire & Isle Of Ely

Published 1902

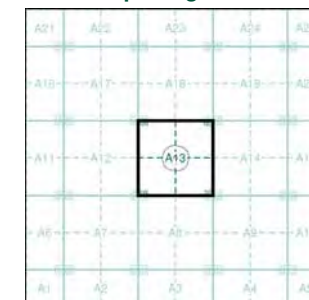
Source map scale - 1:2,500

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)



Historical Map - Segment A13



Order Details

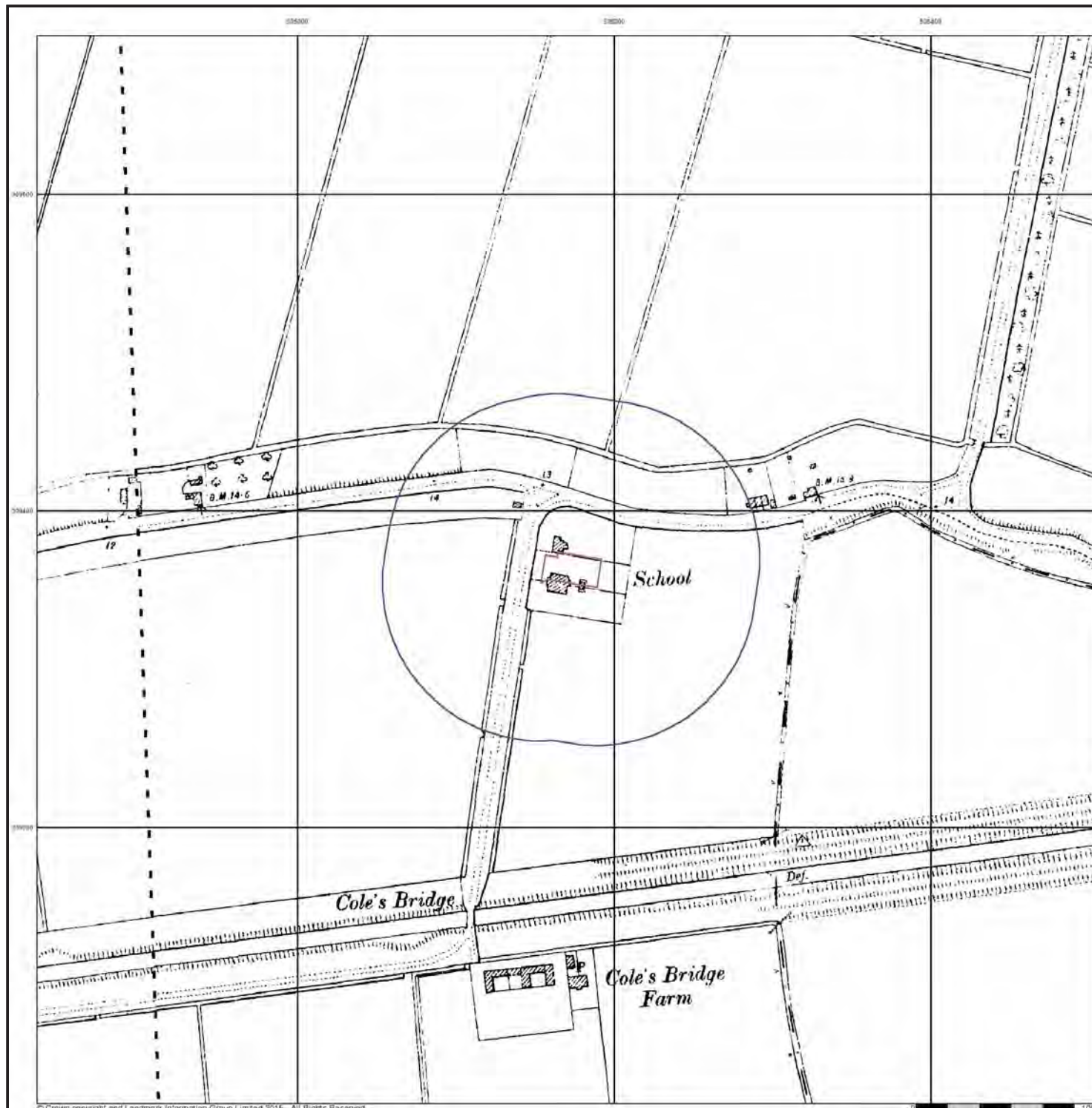
Order Number: 72049274_1_1
Customer Ref: UK15.1996
National Grid Reference: 535170, 309360
Slice: A
Site Area (Ha): 0.07
Search Buffer (m): 100

Site Details

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Lincolnshire

Published 1904

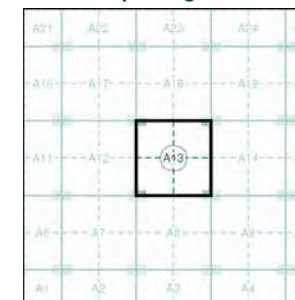
Source map scale - 1:2,500

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)



Historical Map - Segment A13



Order Details

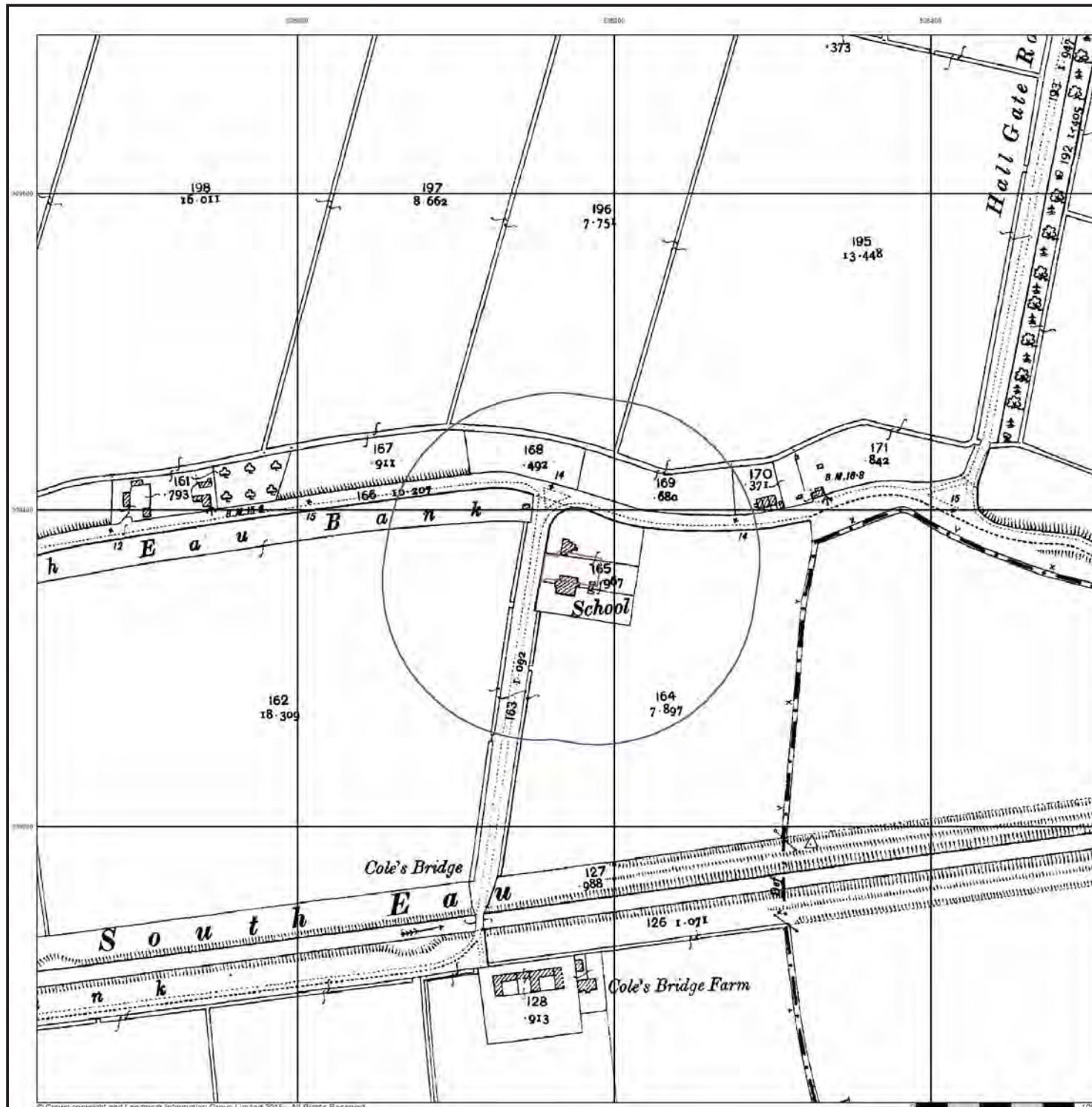
Order Number: 72049274_1_1
Customer Ref: UK15.1996
National Grid Reference: 535170, 309360
Slice: A
Site Area (Ha): 0.07
Search Buffer (m): 100

Site Details

Fowler Refinishers Ltd, Coronation Avenue, Throckenolt,
SPALDING, Lincolnshire, PE12 0QT



Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk



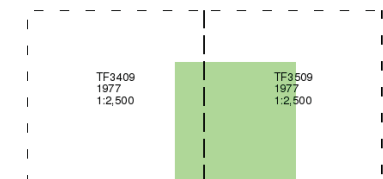


1964

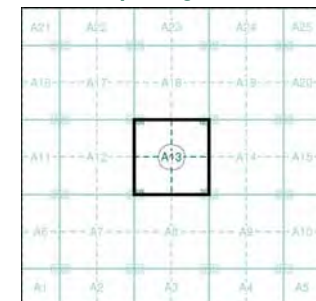


The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)



Historical Map - Segment A13

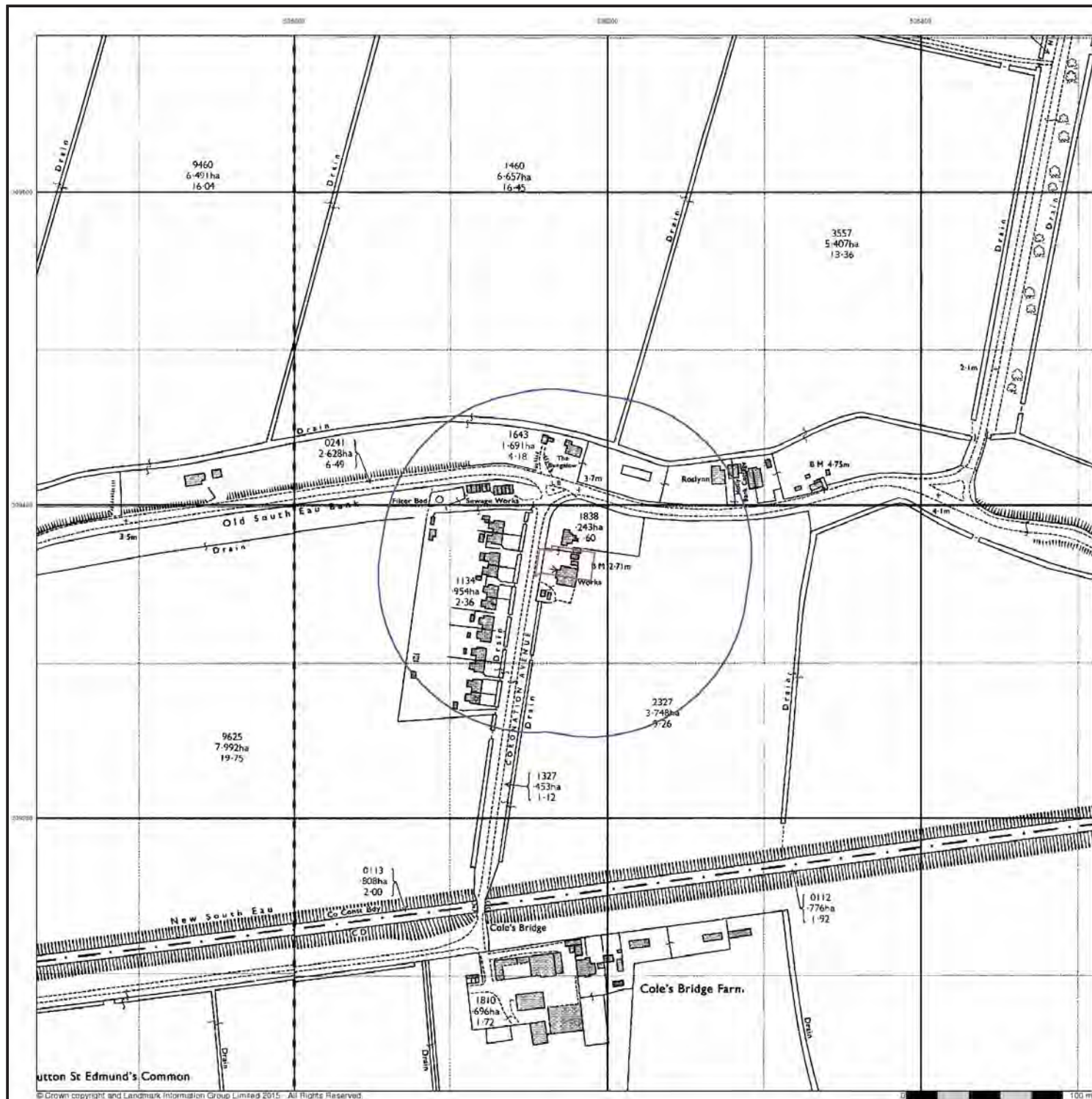


Order Details

Order Number: 72049274_1_1
Customer Ref: UK15.1996
National Grid Reference: 535170, 309360
Slice: A
Site Area (Ha): 0.07
Search Buffer (m): 100

Site Details

Fowler Refinishers Ltd, Coronation Avenue, Throckenholt,
SPALDING, Lincolnshire, PE12 0QT





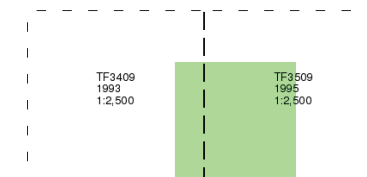
Large-Scale National Grid Data

Published 1993 - 1995

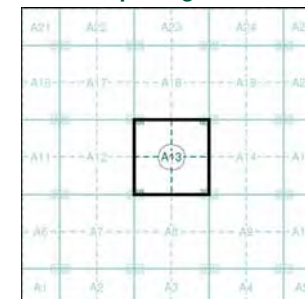
Source map scale - 1:2,500

'Large Scale National Grid Data' superseded SIM cards (Ordnance Survey's 'Survey of Information on Microfilm') in 1992, and continued to be produced until 1999. These maps were the fore-runners of digital mapping and so provide detailed information on houses and roads, but tend to show less topographic features such as vegetation. These maps were produced at both 1:2,500 and 1:1,250 scales.

Map Name(s) and Date(s)



Historical Map - Segment A13



Order Details

Order Number: 72049274_1_1
Customer Ref: UK15.1996
National Grid Reference: 535170, 309360
Slice: A
Site Area (Ha): 0.07
Search Buffer (m): 100

Site Details

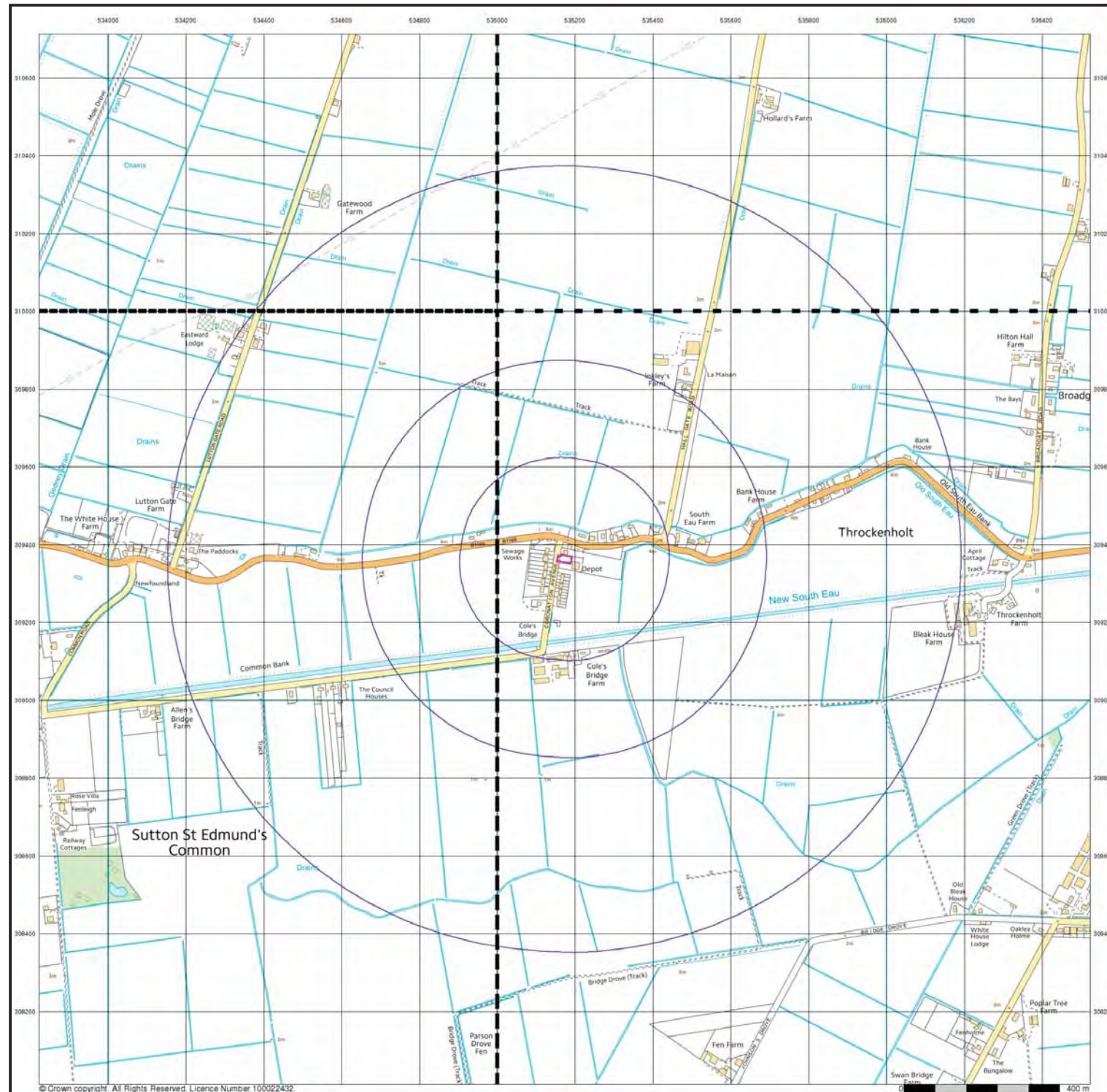
Fowler Refinishers Ltd, Coronation Avenue, Throckenholt,
SPALDING, Lincolnshire, PE12 0QT



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Fax: 0844 844 9951
Web: www.envirocheck.co.uk



utton, St Edmund's Common



VectorMap Local

Published 2015

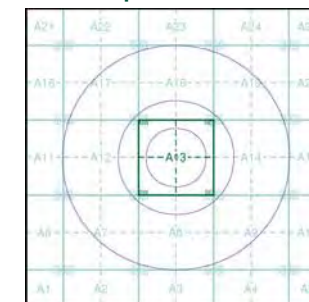
Source map scale - 1:10,000

VectorMap Local (Raster) is Ordnance Survey's highest detailed 'backdrop' mapping product. These maps are produced from OS's VectorMap Local, a simple vector dataset at a nominal scale of 1:10,000, covering the whole of Great Britain, that has been designed for creating graphical mapping. OS VectorMap Local is derived from large-scale information surveyed at 1:250 scale (covering major towns and cities), 1:2500 scale (smaller towns, villages and developed rural areas), and 1:10 000 scale (mountain, moorland and river estuary areas).

Map Name(s) and Date(s)

TF31SW 2015 Variable	TF31SE 2015 Variable
TF30NW 2015 Variable	TF30NE 2015 Variable

Historical Map - Slice A



Order Details

Order Number: 72049274_1_1
Customer Ref: UK15.1996
National Grid Reference: 535170, 309360
Slice: A
Site Area (Ha): 0.07
Search Buffer (m): 1000

Site Details

Fowler Refinishers Ltd, Coronation Avenue, Throckenholt,
SPALDING, Lincolnshire, PE12 0QT



Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk

APPENDIX G

Site Specific Borehole Logs



Environmental Protection Strategies
Tel: 01954 710666
email: info@epstrategies.co.uk
www.epstrategies.co.uk

Borehole No

WS1

Sheet 1 of 1

Project Name
Throckenholt

Project No.
UK15.1996

Co-ords: -

Hole Type
WLS

Location: Coronation Avenue, Throckenholt, PE12 0QT

Level: -

Scale
1:50

Client: Fowler Refinishers Ltd

Dates: 17/09/2015

Logged By

Well	Water Strikes	Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.20-0.40	ES		0.60			MADE GROUND: Firm, dark grey sandy gravelly clay. This strata contains brick fragments and tarmac. (MG)	
		1.00-1.10	ES					Firm, dark CLAY	1
		1.20-1.40	D		1.80			Soft, grey CLAY that becomes softer with depth.	2
									3
									4
					5.00			Clay becoming siltier with depth.	5
								End of Borehole at 5.00 m	6
									7
									8
									9

Remarks:





Environmental Protection Strategies
Tel: 01954 710666
email: info@epstrategies.co.uk
www.epstrategies.co.uk

Borehole No

WS2

Sheet 1 of 1

Project Name
Throckenholt

Project No.
UK15.1996

Co-ords: -

Hole Type
WLS

Location: Coronation Avenue, Throckenholt, PE12 0QT

Level: -

Scale
1:50

Client: Fowler Refinishers Ltd

Dates: 17/09/2015

Logged By

Well	Water Strikes	Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description		
		Depth (m)	Type	Results						
		0.40-0.60	ES		0.60			MADE GROUND: Firm, dark brown sandy gravelly CLAY . This strata contains brick, tarmac and coarse, angular gravel clasts. (MG)		
		0.80-1.00	ES					Firm, grey (with brown tints) CLAY. Silty top to Clay strata	1	
		2.30-2.50	D				Firm to soft, light grey CLAY. The clay becomes softer with depth.. Organic Peat top.	2		
								Increasing Silt content	3	
									4	
					5.00			End of Borehole at 5.00 m	5	
										6
										7
										8
										9
		Type	Results							

Remarks:



Project Name Throckenholt				Project No. UK15.1996		Co-ords: -		Hole Type WLS	
Location: Coronation Avenue, Throckenholt, PE12 0QT						Level: -		Scale 1:50	
Client: Fowler Refinishers Ltd						Dates: 17/09/2015		Logged By	

Well	Water Strikes	Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.10-0.30	ES		0.50		MADE GROUND: Firm, dark brown gravelly sandy clay. This strata contains brick, tarmac and coarse angular gravel fragments. (MG)		
		0.60-0.80	ES				Soft, dark brown, Silty CLAY.		
		0.80-1.00	D		0.80		Firm, brown CLAY.	1	
		0.90-1.00	ES						
		1.80			Firm to soft, brown CLAY that becomes softer with an increasing silt content with depth.	2			
		6.00			End of Borehole at 6.00 m	6			
								7	
								8	
					9				

Remarks:	

APPENDIX H

Laboratory Results-Environmental



Jones Environmental Laboratory

Registered Address : Unit 3 Deeside Point, Zone 3, Deeside Industrial Park, Deeside, CH5 2UA, UK

Unit 3 Deeside Point
Zone 3
Deeside Industrial Park
Deeside
CH5 2UA

EPS Ltd
7B Caxton House
Broad Street
Cambourne
Cambridgeshire
CB23 6JN

Tel: +44 (0) 1244 833780
Fax: +44 (0) 1244 833781



Attention : Sharleen Smith
Date : 2nd October, 2015
Your reference : UK15.1996
Our reference : Test Report 15/13008 Batch 1
Location : Throckenholt
Date samples received : 19th September, 2015
Status : Final report
Issue : 1

Seven samples were received for analysis on 19th September, 2015 of which seven were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied. All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Compiled By:

Phil Sommerton BSc
Project Manager

Client Name: EPS Ltd
Reference: UK15.1996
Location: Throckenholt
Contact: Sharleen Smith
JE Job No.: 15/13008

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

J E Sample No.	1	2	3	4	5	6	7				Please see attached notes for all abbreviations and acronyms		
Sample ID	WS1	WS1	WS2	WS2	WS3	WS3	WS3						
Depth	0.20-0.40	1.00	0.40-0.60	0.80	0.10-0.30	0.60-0.80	1.00						
COC No / misc													
Containers	J	T	J	T	J	J	T						
Sample Date	17/09/2015	17/09/2015	17/09/2015	17/09/2015	17/09/2015	17/09/2015	17/09/2015						
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil						
Batch Number	1	1	1	1	1	1	1						
Date of Receipt	19/09/2015	19/09/2015	19/09/2015	19/09/2015	19/09/2015	19/09/2015	19/09/2015				LOD/LOR	Units	Method No.
Arsenic ^{#M}	-	-	27.0	-	7.3	7.3	-				<0.5	mg/kg	TM30/PM15
Arsenic	14.3	-	-	-	-	-	-				<0.5	mg/kg	TM30/PM62
Cadmium ^{#M}	-	-	<0.1	-	0.3	<0.1	-				<0.1	mg/kg	TM30/PM15
Cadmium	0.2	-	-	-	-	-	-				<0.1	mg/kg	TM30/PM62
Chromium ^{#M}	-	-	50.6	-	52.3	39.0	-				<0.5	mg/kg	TM30/PM15
Chromium	29.7	-	-	-	-	-	-				<0.5	mg/kg	TM30/PM62
Copper ^{#M}	-	-	10	-	7	<1	-				<1	mg/kg	TM30/PM15
Copper	27	-	-	-	-	-	-				<1	mg/kg	TM30/PM62
Lead ^{#M}	-	-	39	-	23	7	-				<5	mg/kg	TM30/PM15
Lead	110	-	-	-	-	-	-				<5	mg/kg	TM30/PM62
Mercury ^{#M}	-	-	<0.1	-	<0.1	<0.1	-				<0.1	mg/kg	TM30/PM15
Mercury	<0.1	-	-	-	-	-	-				<0.1	mg/kg	TM30/PM62
Nickel ^{#M}	-	-	24.2	-	7.0	14.3	-				<0.7	mg/kg	TM30/PM15
Nickel	27.0	-	-	-	-	-	-				<0.7	mg/kg	TM30/PM62
Selenium ^{#M}	-	-	1	-	3	<1	-				<1	mg/kg	TM30/PM15
Selenium	<1	-	-	-	-	-	-				<1	mg/kg	TM30/PM62
Sulphur	-	0.10	-	0.06	-	-	0.01				<0.01	%	TM30/PM15
Total Sulphate ^{#M}	-	667	874	400	4401	538	124				<50	mg/kg	TM50/PM29
Total Sulphate	606	-	-	-	-	-	-				<50	mg/kg	TM50/PM29
Zinc ^{#M}	-	-	114	-	29	38	-				<5	mg/kg	TM30/PM15
Zinc	180	-	-	-	-	-	-				<5	mg/kg	TM30/PM62
PAH MS													
Naphthalene ^{#M}	1.97 ^{AA}	-	<0.40 ^{AA}	-	3.87 ^{AB}	<0.04	-				<0.04	mg/kg	TM4/PM8
Acenaphthylene	2.96 ^{AA}	-	0.47 ^{AA}	-	15.49 ^{AB}	<0.03	-				<0.03	mg/kg	TM4/PM8
Acenaphthene ^{#M}	14.77 ^{AA}	-	<0.50 ^{AA}	-	11.85 ^{AB}	<0.05	-				<0.05	mg/kg	TM4/PM8
Fluorene ^{#M}	20.72 ^{AA}	-	0.84 ^{AA}	-	9.87 ^{AB}	0.12	-				<0.04	mg/kg	TM4/PM8
Phenanthrene ^{#M}	124.28 ^{AA}	-	22.13 ^{AA}	-	155.95 ^{AB}	1.07	-				<0.03	mg/kg	TM4/PM8
Anthracene [#]	39.78 ^{AA}	-	6.13 ^{AA}	-	60.69 ^{AB}	0.44	-				<0.04	mg/kg	TM4/PM8
Fluoranthene ^{#M}	134.96 ^{AA}	-	36.15 ^{AA}	-	384.84 ^{AB}	1.59	-				<0.03	mg/kg	TM4/PM8
Pyrene [#]	101.67 ^{AA}	-	27.63 ^{AA}	-	317.33 ^{AB}	1.17	-				<0.03	mg/kg	TM4/PM8
Benzo(a)anthracene [#]	54.18 ^{AA}	-	15.66 ^{AA}	-	165.99 ^{AB}	1.21	-				<0.06	mg/kg	TM4/PM8
Chrysene ^{#M}	55.75 ^{AA}	-	16.48 ^{AA}	-	175.99 ^{AB}	1.02	-				<0.02	mg/kg	TM4/PM8
Benzo(bk)fluoranthene ^{#M}	80.07 ^{AA}	-	21.77 ^{AA}	-	296.72 ^{AB}	1.11	-				<0.07	mg/kg	TM4/PM8
Benzo(a)pyrene [#]	53.53 ^{AA}	-	12.65 ^{AA}	-	188.96 ^{AB}	0.81	-				<0.04	mg/kg	TM4/PM8
Indeno(123cd)pyrene ^{#M}	27.62 ^{AA}	-	6.59 ^{AA}	-	124.93 ^{AB}	0.46	-				<0.04	mg/kg	TM4/PM8
Dibenzo(ah)anthracene [#]	6.38 ^{AA}	-	1.27 ^{AA}	-	16.72 ^{AB}	0.29	-				<0.04	mg/kg	TM4/PM8
Benzo(ghi)perylene [#]	23.96 ^{AA}	-	5.35 ^{AA}	-	95.30 ^{AB}	0.46	-				<0.04	mg/kg	TM4/PM8
PAH 16 Total	742.6 ^{AA}	-	173.1 ^{AA}	-	2024.5 ^{AB}	9.8	-				<0.6	mg/kg	TM4/PM8
Benzo(b)fluoranthene	57.65 ^{AA}	-	15.67 ^{AA}	-	213.64 ^{AB}	0.80	-				<0.05	mg/kg	TM4/PM8
Benzo(k)fluoranthene	22.42 ^{AA}	-	6.10 ^{AA}	-	83.08 ^{AB}	0.31	-				<0.02	mg/kg	TM4/PM8
PAH Surrogate % Recovery	102 ^{AA}	-	104 ^{AA}	-	104 ^{AB}	1176	-				<0	%	TM4/PM8
Total Phenols HPLC	<0.15	-	<0.15	-	1.26	<0.15	-				<0.15	mg/kg	TM26/PM21

Please see attached notes for all abbreviations and acronyms

Client Name: EPS Ltd
Reference: UK15.1996
Location: Throckenholt
Contact: Sharleen Smith

Note:

Analysis was carried out in accordance with our documented in-house methods PM042 and TM065 and HSG 248 by Stereo and Polarised Light Microscopy using Dispersion Staining Techniques and is covered by our UKAS accreditation. Samples are retained for not less than 6 months from the date of analysis unless specifically requested.

Opinions lie outside the scope of our UKAS accreditation.

Where the sample is not taken by a Jones Environmental Laboratory consultant, Jones Environmental Laboratory cannot be responsible for inaccurate or unrepresentative sampling.

If asbestos fibres are reported at trace levels there will not be enough fibres to quantify and will be less than 0.001%.

Signed on behalf of Jones Environmental Laboratory:


 Ryan Butterworth
 Asbestos Team Leader

J E Job No.	Batch	Sample ID	Depth	J E Sample No.	Date Of Analysis	Analysis	Result
15/13008	1	WS1	0.20-0.40	1	21/09/2015	Mass of Dry Sample	53.2 (g)
					21/09/2015	General Description (Bulk Analysis)	soil-slate-stones
					21/09/2015	Asbestos Containing Material	Asbestos Cement
					21/09/2015	Asbestos Screen	Chrysotile
					21/09/2015	Asbestos Level	Quantifiable
					24/09/2015	Asbestos Gravimetric Quantification (ACMs)	0.005 (mass %)
					24/09/2015	Asbestos PCOM Quantification (Fibres)	<0.001 (mass %)
					24/09/2015	Asbestos Gravimetric & PCOM Total	0.005 (mass %)
15/13008	1	WS2	0.40-0.60	3	21/09/2015	Mass of Dry Sample	53.1 (g)
					21/09/2015	General Description (Bulk Analysis)	soil-stones
					21/09/2015	Asbestos Containing Material	None
					21/09/2015	Asbestos Containing Material (2)	None
					21/09/2015	Asbestos Screen	NAD
					21/09/2015	Asbestos Screen (2)	NAD
					21/09/2015	Asbestos Level	NAD
15/13008	1	WS3	0.10-0.30	5	21/09/2015	Mass of Dry Sample	56.1 (g)
					21/09/2015	General Description (Bulk Analysis)	Soil-Silt/Clay/Brick/Stone
					21/09/2015	Asbestos Containing Material	None
					21/09/2015	Asbestos Containing Material (2)	None
					21/09/2015	Asbestos Screen	NAD
					21/09/2015	Asbestos Screen (2)	NAD
					21/09/2015	Asbestos Level	NAD
15/13008	1	WS3	0.60-0.80	6	21/09/2015	Mass of Dry Sample	46.5 (g)
					21/09/2015	General Description (Bulk Analysis)	Soil-Sand/Clay
					21/09/2015	Asbestos Containing Material	None
					21/09/2015	Asbestos Containing Material (2)	None
					21/09/2015	Asbestos Screen	NAD
					21/09/2015	Asbestos Screen (2)	NAD
					21/09/2015	Asbestos Level	NAD

Matrix : Solid

5 of 11

Client Name: EPS Ltd
Reference: UK15.1996
Location: Throckenholt
Contact: Sharleen Smith

[illegible]

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating. Only analyses which are accredited are recorded as deviating if set criteria are not met.

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

JE Job No.: 15/13008

SOILS

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 (UKAS) accreditation applies to surface water and groundwater and one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

DEVIATING SAMPLES

Samples must be received in a condition appropriate to the requested analyses. All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. If this is not the case you will be informed and any test results that may be compromised highlighted on your deviating samples report.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.

Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS) accredited - UK.
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
++	Result outside calibration range, results should be considered as indicative only and are not accredited.
*	Analysis subcontracted to a Jones Environmental approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range
AA	x10 Dilution
AB	x20 Dilution

JE Job No: 15/13008

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465 and BS1377.	PM0	No preparation is required.				
PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465 and BS1377.	PM0	No preparation is required.			AR	Yes
PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465 and BS1377.	PM0	No preparation is required.			AR	
TM4	Modified USEPA 8270 method for the solvent extraction and determination of 16 PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.			AR	Yes
TM4	Modified USEPA 8270 method for the solvent extraction and determination of 16 PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes
TM4	Modified USEPA 8270 method for the solvent extraction and determination of 16 PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes	Yes	AR	Yes
PM13	A visual examination of the solid sample is carried out to ascertain sample make up, colour and any other inclusions. This is not a geotechnical description.	PM0	No preparation is required.			AR	
TM21	Modified USEPA 415.1. Determination of Total Organic Carbon or Total Carbon by combustion in an Eltra TOC furnace/analyser in the presence of oxygen. The CO ₂ generated is quantified using infra-red detection.	PM24	Dried and ground solid samples are washed with hydrochloric acid, then rinsed with deionised water to remove the mineral carbon before TOC analysis.			AD	Yes
TM21	Modified USEPA 415.1. Determination of Total Organic Carbon or Total Carbon by combustion in an Eltra TOC furnace/analyser in the presence of oxygen. The CO ₂ generated is quantified using infra-red detection.	PM89	Preparation of positive asbestos samples for Eltra analysis			AD	Yes
TM26	Determination of phenols by Reversed Phased High Performance Liquid Chromatography and Electro-Chemical Detection.	PM21	As received solid or water samples are extracted in Methanol: Sodium Hydroxide (0.1M NaOH) (60:40) by orbital shaker.			AR	Yes

JE Job No: 15/13008

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground.			AD	Yes
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground.	Yes	Yes	AD	Yes
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7	PM62	Acid digestion of as received solid samples using Aqua Regia refluxed at 112.5 °C.			AR	Yes
TM38	Soluble Ion analysis using the Thermo Aquakem Photometric Automatic Analyser. Modified US EPA methods 325.2, 375.4, 365.2, 353.1, 354.1	PM20	Extraction of dried and ground samples with deionised water in a 2:1 water to solid ratio for anions. Extraction of as received samples with deionised water in a 2:1 water to solid ratio for ammoniacal nitrogen. Samples are extracted using an orbital shaker.	Yes	Yes	AD	Yes
TM38	Soluble Ion analysis using the Thermo Aquakem Photometric Automatic Analyser. Modified US EPA methods 325.2, 375.4, 365.2, 353.1, 354.1	PM20	Extraction of dried and ground samples with deionised water in a 2:1 water to solid ratio for anions. Extraction of as received samples with deionised water in a 2:1 water to solid ratio for ammoniacal nitrogen. Samples are extracted using an orbital shaker.	Yes		AR	Yes
TM38	Soluble Ion analysis using the Thermo Aquakem Photometric Automatic Analyser. Modified US EPA methods 325.2, 375.4, 365.2, 353.1, 354.1	PM60	As received solid samples are extracted with deionised water in a 2:1 ratio of water to solid.			AR	Yes
TM50	Acid soluble sulphate analysed by ICP-OES	PM29	Dried and ground solid sample is boiled with dilute hydrochloric acid, the resulting liquor is then analysed.	Yes	Yes	AD	Yes
TM50	Acid soluble sulphate analysed by ICP-OES	PM29	Dried and ground solid sample is boiled with dilute hydrochloric acid, the resulting liquor is then analysed.			AR	Yes
TM65	Asbestos Bulk Identification method based on HSG 248.	PM42	Solid samples undergo a thorough visual inspection for asbestos fibres prior to asbestos identification using TM065.			AR	Yes
TM65	Asbestos Bulk Identification method based on HSG 248.	PM42	Solid samples undergo a thorough visual inspection for asbestos fibres prior to asbestos identification using TM065.			AR	

JE Job No: 15/13008

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM65	Asbestos Bulk Identification method based on HSG 248.	PM42	Solid samples undergo a thorough visual inspection for asbestos fibres prior to asbestos identification using TM065.	Yes		AR	
TM73	Modified US EPA methods 150.1 and 9045D. Determination of pH by Metrohm automated probe analyser.	PM11	Extraction of as received solid samples using one part solid to 2.5 parts deionised water.	Yes	Yes	AR	No
TM89	Modified USEPA method OIA-1667. Determination of cyanide by Flow Injection Analyser.	PM45	As received solid samples are extracted with 1M NaOH by orbital shaker for Cyanide and Thiocyanate analysis.	Yes	Yes	AR	Yes
NONE	No Method Code	NONE	No Method Code			AR	Yes

APPENDIX I

Laboratory Results-Geotechnical



TEST REPORT.

ISSUED BY : SOIL PROPERTY TESTING LTD.

DATE OF ISSUE : 06/10/15 PAGE 1 of 7 Pages

Contract

Serial No.

UK15.1996 - Throckenholt

S29261



CLIENT:

Environmental Protection
Strategies Ltd
7B Caxton House
Broad Street
CAMBOURNE
CAMBRIDGE
CB23 6JN

Soil Property Testing Ltd.

15,16 & 18 Halcyon Court, St Margarets Way,
Stukeley Meadows, Huntingdon,
Cambs. PE29 6DG.

Telephone (01480) 455579 Fax (01480) 453619
Email enquiries@soilpropertytesting.com

SAMPLES SUBMITTED BY:

Environmental Protection

APPROVED SIGNATORIES:

- ☒ J.C.GARNER B.Eng (Hons.) FGS
Technical Director
- ☐ S.P.TOWNEND FGS
Quality Manager
- ☐ W.JOHNSTONE
Materials Lab Manager

SAMPLES LABELLED:

UK15.1996 - Throckenholt

DATE RECEIVED: 17/09/15

SAMPLES TESTED BETWEEN 17/09/15 and 06/10/15

REMARKS: For the attention of Mr F Campbell
Your Ref: PO-15/5681

- NOTES:**
- 1 All remaining samples or remnants from this contract will be disposed of after 21 days from today, unless we are notified to the contrary.
 - 2 (a) UKAS - United Kingdom Accreditation Service.
(b) Opinions and interpretations expressed herein are outside the scope of UKAS accreditation.
 - 3 Tests marked "NOT UKAS ACCREDITED" in this test report are not included in the UKAS Accreditation Schedule for this testing laboratory.
 - 4 This test report may not be reproduced other than in full except with the prior written approval of the issuing laboratory.

TEST REPORT.

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DATE OF ISSUE : As page 1 PAGE 2 of 7

Contract

Serial No.

UK15.1996 - Throckenholt

S29261

SCHEDULE OF LABORATORY TESTS

[illegible]

Scheduled by: Environmental Protection

Target Date: 01/10/15



TEST REPORT.

ISSUED BY : SOIL PROPERTY TESTING LTD.

DATE OF ISSUE : As page 1 PAGE 3 of 7

Contract
UK15.1996 - Throckenholt

Serial No.
S29261



SUMMARY OF MOISTURE CONTENT, LIQUID LIMIT, PLASTIC LIMIT, PLASTICITY INDEX AND LIQUIDITY INDEX

Borehole/ Pit No.	Depth m.	Sample	Moisture Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasti- city Index (%)	Liqui- dity Index (%)	SAMPLE PREPARATION				Description	CLASS
								Method S/N	Ret'd 0.425mm (%)	Corr'd W/C <0.425mm	Curing Time (hrs.)		
WS1	1.20	D1.2	44	72	32	40	0.30	N	0(A)		26	Firm dark brownish grey organic CLAY	CVO
WS2	2.30	D2.3	65	71	25	46	0.87	N	0(A)		119	Very soft dark grey organic CLAY oxidised to brown on sides of sample	CVO
WS3	0.80	D0.8	30	52	27	25	0.12	N	0(A)		27	Stiff dark grey organic CLAY oxidised to brown on sides of sample with rare orange fine sand partings	CHO

METHOD OF PREPARATION : BS 1377:PART 1:1990:7.4 & PART 2:1990:4.2 S = Wet Sieved Specimen
N = prepared from Natural

METHOD OF TEST : BS 1377:PART 2:1990:3.2, 4.4, 5.3, 5.4

TYPE OF SAMPLE KEY : U = Undisturbed, B = Bulk, D = Disturbed, J = Jar, W = Water, SPT = Split Spoon Sample,
C = Core Cutter. A = Assumed, M = Measured

COMMENTS :

REMARKS TO INCLUDE : Sample disturbance, loss of moisture, variation from test procedure, location and origin
of test specimen within original sample. Oven drying temperature if not 105-110 deg C.



TEST REPORT.

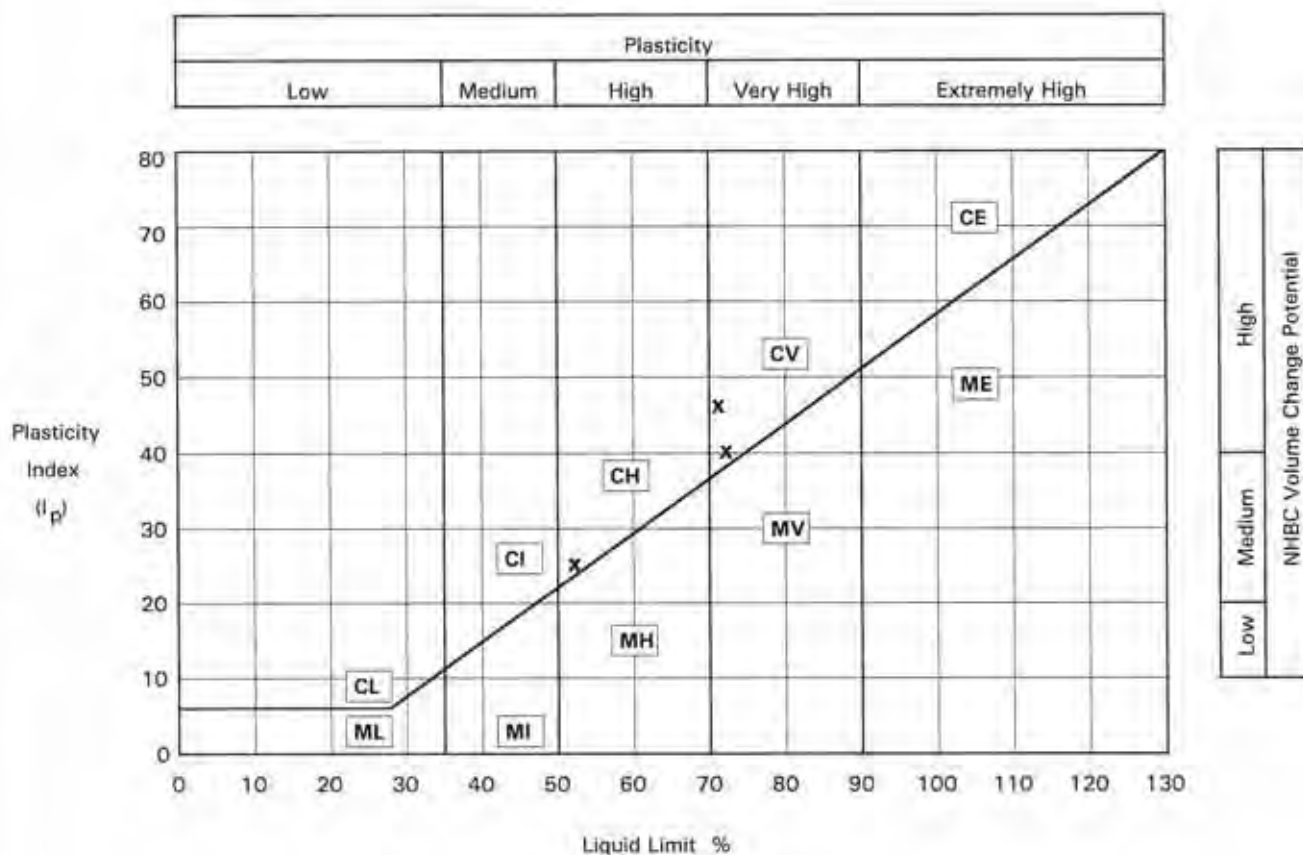
ISSUED BY : SOIL PROPERTY TESTING LTD.

DATE OF ISSUE : As page 1 PAGE 4 of 7

Contract
UK15.1996 - Throckenholt

Serial No.
S29261

PLOT OF PLASTICITY INDEX AGAINST LIQUID LIMIT USING CASAGRANDE CLASSIFICATION CHART



METHOD OF PREPARATION: BS 1377:PART 1:1990:7.4 & PART 2:1990:4.2

METHOD OF TEST : BS 1377:PART 2:1990:3.2, 4.4, 5.3, 5.4

TYPE OF SAMPLE KEY : U = Undisturbed, B = Bulk, D = Disturbed, J = Jar, W = Water, SPT = Split Spoon Sample, C = Core Cutter

COMMENTS : VOLUME CHANGE POTENTIAL: NHBC Standards Chapter 4.2 Unmodified Plasticity Index PLASTICITY CHART BS5930:1999:Figure 18



TEST REPORT.

ISSUED BY : SOIL PROPERTY TESTING LTD.

DATE OF ISSUE : As page 1 PAGE 5 of 7

Contract
UK15.1996 - Throckenholt

Serial No.
S29261



DETERMINATION OF MOISTURE CONTENT, LIQUID LIMIT AND PLASTIC LIMIT AND DERIVATION OF PLASTICITY INDEX AND LIQUIDITY INDEX

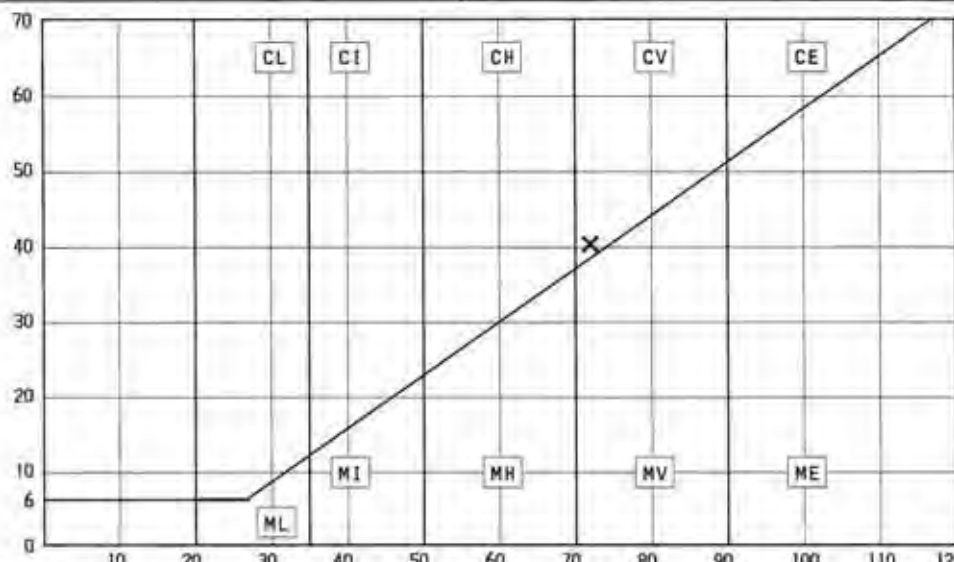
Borehole/ Pit No.	Depth m.	Sample	Moisture Content %	Description	Remarks
WS1	1.20	D1.2	44	Firm dark brownish grey organic CLAY	

PREPARATION				Liquid Limit	72 %
Method of Preparation Specimen from Natural Soil				Plastic Limit	32 %
Sample retained 0.425 sieve (Assumed) 0 %				Plasticity Index	40 %
Corrected moisture content for material passing 0.425mm %				Liquidity Index	0.30
Curing Time 26 Hours				Clay Content	Not analysed. %
				Derived Activity (PI/CC)	Not analysed.

C = CLAY

Plasticity
Index %
(I_p)

M = SILT



High
Medium
Low

NHBC Volume Change Potential

Liquid Limit %

METHOD OF PREPARATION: BS 1377:PART 1:1990:7.4 & PART 2:1990:4.2

METHOD OF TEST : BS 1377:PART 2:1990:3.2, 4.4, 5.3, 5.4

TYPE OF SAMPLE KEY : U = Undisturbed, B = Bulk, D = Disturbed, J = Jar, W = Water, SPT = Split Spoon Sample, C = Core Cutter

COMMENTS : PLASTICITY CHART BS5930:1999:Figure 18
VOLUME CHANGE POTENTIAL: NHBC Standards Chapter 4.2 Unmodified Plasticity Index
NOTE: Modified Plasticity Index I'_p = I_p × (% less than 425 microns/100)



TEST REPORT.

ISSUED BY : SOIL PROPERTY TESTING LTD.

DATE OF ISSUE : As page 1 PAGE 6 of 7

Contract
UK15.1996 - Throckenholt

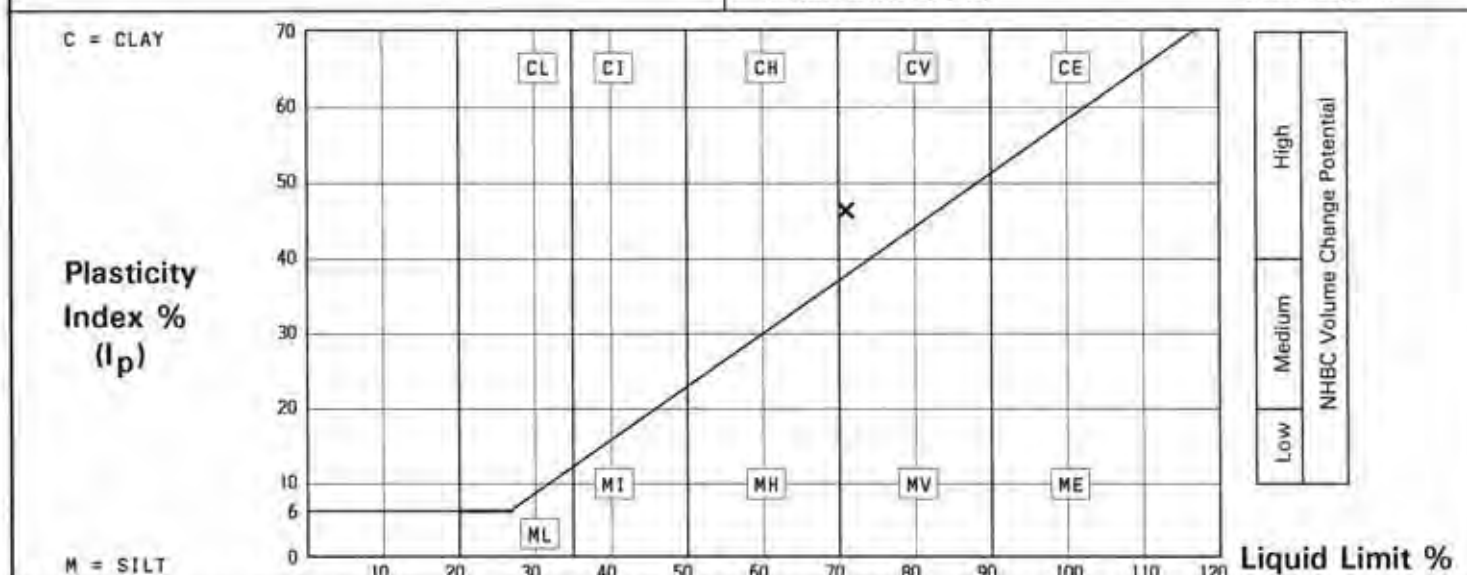
Serial No.
S29261



DETERMINATION OF MOISTURE CONTENT, LIQUID LIMIT AND PLASTIC LIMIT AND DERIVATION OF PLASTICITY INDEX AND LIQUIDITY INDEX

Borehole/ Pit No.	Depth m.	Sample	Moisture Content %	Description	Remarks
WS2	2.30	D2.3	65	Very soft dark grey organic CLAY oxidised to brown on sides of sample	

PREPARATION				Liquid Limit	71 %
Method of Preparation Specimen from Natural Soil				Plastic Limit	25 %
Sample retained 0.425 sieve (Assumed) 0 %				Plasticity Index	46 %
Corrected moisture content for material passing 0.425mm %				Liquidity Index	0.87
Curing Time 119 Hours				Clay Content	Not analysed. %
				Derived Activity (PI/CC)	Not analysed.



METHOD OF PREPARATION: BS 1377:PART 1:1990:7.4 & PART 2:1990:4.2

METHOD OF TEST : BS 1377:PART 2:1990:3.2, 4.4, 5.3, 5.4

TYPE OF SAMPLE KEY : U = Undisturbed, B = Bulk, D = Disturbed, J = Jar, W = Water, SPT = Split Spoon Sample, C = Core Cutter

COMMENTS : PLASTICITY CHART BS5930:1999:Figure 18
VOLUME CHANGE POTENTIAL: NHBC Standards Chapter 4.2 Unmodified Plasticity Index
NOTE: Modified Plasticity Index I'_p = I_p x (% less than 425 microns/100)



TEST REPORT.

ISSUED BY : SOIL PROPERTY TESTING LTD.

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Contract
UK15.1996 - Throckenholt

Serial No.
S29261



DETERMINATION OF MOISTURE CONTENT, LIQUID LIMIT AND PLASTIC LIMIT AND DERIVATION OF PLASTICITY INDEX AND LIQUIDITY INDEX

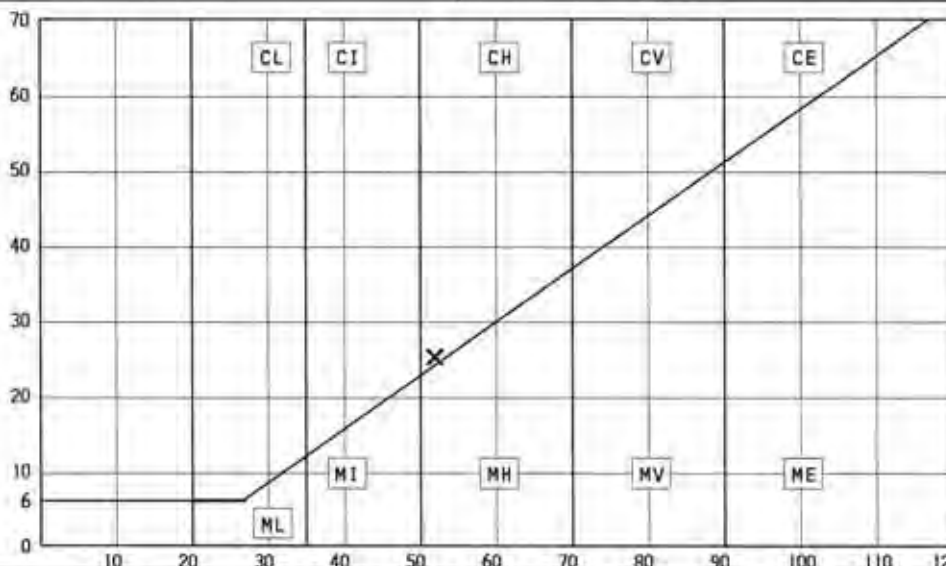
Borehole/ Pit No.	Depth m.	Sample	Moisture Content %	Description	Remarks
WS3	0.80	DO.8	30	Stiff dark grey organic CLAY oxidised to brown on sides of sample with rare orange fine sand partings	

PREPARATION				Liquid Limit	52 %
Method of Preparation Specimen from Natural Soil				Plastic Limit	27 %
Sample retained 0.425 sieve (Assumed) 0 %				Plasticity Index	25 %
Corrected moisture content for material passing 0.425mm %				Liquidity Index	0.12
Curing Time 27 Hours				Clay Content	Not analysed. %
				Derived Activity (PI/CC)	Not analysed.

C = CLAY

Plasticity
Index %
(I_p)

M = SILT



High
Medium
Low
NHBC Volume Change Potential

Liquid Limit %

METHOD OF PREPARATION: BS 1377:PART 1:1990:7.4 & PART 2:1990:4.2

METHOD OF TEST : BS 1377:PART 2:1990:3.2, 4.4, 5.3, 5.4

TYPE OF SAMPLE KEY : U = Undisturbed, B = Bulk, D = Disturbed, J = Jar, W = Water, SPT = Split Spoon Sample, C = Core Cutter

COMMENTS : PLASTICITY CHART BS5930:1999:Figure 18
VOLUME CHANGE POTENTIAL: NHBC Standards Chapter 4.3 Unmodified Plasticity Index
NOTE: Modified Plasticity Index I_p' = I_p x (% less than 425 microns/100)

APPENDIX J

Minimal And Low Risk Generic Screening Criteria



EPS Generic Quantitative Risk Assessment

Low Risk Generic Screening Criteria - All Land Uses

	Soil Targets					
Contaminant	Residential		Allotments	Commercial	Public Open Spaces	
	With Home Grown Produce	Without Home Grown Produce			Residential	Parks
Unit	mg/kg					
Arsenic	37	40	49	640	79	168
Benzene	0.87	3.3	0.18	98	140	230
Benzo(a)pyrene	5	5.3	5.7	76	10	21
Cadmium	26	149	4.9	410	220	880
Chromium (VI)	21	21	170	49	23	250
Lead	200	310	80	2330	630	1300

Notes:

Targets for Human Health have been taken from available Category 4 Screening Levels (C4SLs) for assessment of land affected by contamination issued by DEFRA in December 2013.

EPS Generic Quantitative Risk Assessment

Minimal Risk Generic Screening Criteria - Residential Land Use

Contaminant	Human Health	Soil Targets	
		Controlled Waters	
		LGWRP	HGWRP
Unit		mg/kg	
Arsenic	37	n/c	n/c
Cadmium	11	n/c	n/c
Chromium III	910	n/c	n/c
Chromium VI	6	n/c	n/c
Copper	2400	n/c	n/c
Mercury (elemental)	1.2	n/c	n/c
Nickel	180	n/c	n/c
Lead	NA	n/c	n/c
Selenium	250	n/c	n/c
Zinc	3700	n/c	n/c
Benzene	0.087	0.252	0.008
Toluene	130	1.17	1.17
Ethylbenzene	47	15.0	10.0
Xylene (para)	56	0.885	0.885
MTBE#	49	0.138	0.0276
Benzo(a)Pyrene	2.2	10	1.44
Naphthalene	2.3	0.934	0.02
Dibenz(ah)anthracene	0.24	n/c	n/c
Aliphatic C5-C6	42	5.27	1.05
Aliphatic C6-C8	100	23.2	4.64
Aliphatic C8-C10	27	175	35.1
Aliphatic C10-C12	130(48)*	1380	276
Aliphatic C12-C16	1100(8.48)**	27500	5490
Aliphatic C16-C35	65000 (8.48)**	3.46E+06	6.91E+05
Aromatic C8-C10	34	8.74	1.75
Aromatic C10-C12	74	13.8	2.76
Aromatic C12-C16	140	27.5	5.5
Aromatic C16-C21	260	86.9	17.4
Aromatic C21-C35	1100	690	138

Groundwater Targets	
Controlled Waters	
LGWRP	HGWRP
ug/l	
50	10
5	5
250	50
n/c	n/c
28	28
1	1
200	50
250	10
10	10
500	500
30	1
50	50
300	200
30	30
75	15
0.7	0.1
10	0.1
n/c	n/c
50	10
50	10
50	10
50	10
50	10
50	10
50	10
50	10
50	10

Notes:

LGWRP - Low Groundwater Resource Potential

HGWRP - High Groundwater Resource Potential

f = Oral, dermal and inhalation exposure compared with oral HCV N/C = Not Calculated

* = S4UL exceeds vapour saturation limit (in brackets)

** = S4UL exceeds solubility saturation limit (in brackets)

Soil Targets

Targets for Human Health have been taken from *S4ULs 'Suitable For Use Levels for Human Health Risk Assessment' – LQM and CIEH (2014)* derived using standard sandy loam soil with 1% SOM, except (#) = *EIC/AGS/CL:AIRE GAC 'Soil Generic Assessment Criteria' (2010)*. For sites where ground conditions differ significantly from sandy loam or site-specific SOM and pH are available, the generic human health targets may be revised.

Targets for Controlled waters have been derived using EA Remedial Targets Worksheet (v3.1) - using standard Sandy Loam ground conditions as described in Science Report SC050021/SR3, assuming no degradation for a 10m compliance distance with criteria of EQS or UKDWS for LGWRP and HGWRP respectively (see notes for GW targets).

Groundwater Targets

For LGWRP, targets have been taken as Freshwater EQS where available. For Ethylbenzene and BaP the WHO Health limit has been used and for MTBE and individual TPH fractions a 5 times multiplier of taste threshold and UKDWS has been taken respectively.

For HGWRP, targets have been taken as UKDWS where available, with the exception of Copper and Zinc where the EQS is lower than the DWS and therefore the EQS has been used as the groundwater target. For Ethylbenzene the upper WHO ATO limit has been used. For Toluene and Xylene, the WHO ATO limit is higher than the EQS and so the lower value has been taken. For MTBE the taste threshold has been taken.

Work carried out to calculate generic screening criteria for concentrations of contaminant in groundwater with respect of risks to Human Health has generally found that criteria far exceed (by at least 2 orders of magnitude) those listed for the protection of either LGWRP and HGWRP receptors. On this basis, the above Groundwater criteria are also considered protective of human health and further evaluation of these risks should be considered alongside any detailed quantitative risk assessments carried out for groundwater on a site specific basis.

APPENDIX K

Method Statement of Unexpected Contamination



METHOD STATEMENT

ACTIONS TO BE TAKEN IN THE EVENT OF DISCOVERING UNEXPECTED CONTAMINATION DURING INTRUSIVE GROUNDWORKS

If at any point during intrusive groundworks at a site, evidence of unforeseen contamination is encountered in the form of significant noxious odours, discolouration, or instability within soils or sheen / discolouration in groundwater, the following actions will be taken:

- Intrusive works in the immediate area of the impacted ground will be suspended and the continuation of work in other areas of the site will be considered within the context of the site specific health & safety plan.
- Environmental Protection Strategies Ltd (EPS) will be contacted and appraised of the situation so that arrangements can be made to characterise the impact and determine what action may be necessary in addition to the scheduled site works. Where possible / health & safety plan permits, digital photographs of the impacted ground will be taken and emailed to EPS at the address below to assist in the initial assessment.
- It may well be necessary for EPS to attend site to undertake visual inspection and obtain samples for field and/or laboratory analysis, although the actions taken will be dependent on the nature of what is encountered.
- In cases where EPS consider the unforeseen contamination likely to pose a significant risk of significant harm to adjacent site users or local environmental receptors, the local authority and the Environment Agency will be informed of the situation and the actions being taken.
- Once appropriate action has been agreed and undertaken, a written summary will be produced by EPS for submission to the Local Authority, (and where relevant, the Environment Agency) in accordance with planning requirements. The submission will include details of work undertaken, analytical results of investigative and validation samples obtained and conclusions and recommendations for any further actions considered necessary.
- Where regulatory bodies have been involved, site works should only recommence following their agreement and in all cases should only recommence when the site manager considers it safe to do so within the context of the site specific health & safety plan.

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Email: info@epstrategies.co.uk (Automatically forwarded to both of the above and office based personnel.)