GeoDyne

Geotechnical &
Environmental
Consultants

Joyce – Crease Drove
Crowland

Combined Phase I Desk Study & Phase II Exploratory Investigation For Ashwood Homes

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Project No: D38056c		**Date: 6th July 2018**	
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EXECUTIVE SUMMARY

Ground Conditions	TOPSOIL was encountered at the surface of all exploratory holes to depths of between 0.30m and 0.40m begl with an average thickness of approximately 0.30m. Beneath the Topsoil, typically soft to firm and firm sandy CLAY (locally becoming gravelly at depths in the region of 1.20m begl) was encountered to depths of up to 3.00m begl. Sand/Gravel pockets were locally encountered within the Clay strata. Near surface fissures were locally encountered within the Clay strata. Discrete layers of spongy fibrous PEAT with an average thickness of approximately 0.15m were typically encountered within the Clay strata including directly underlying the Topsoil to depths of up to 2.20m begl. Within the cable percussive boreholes, peaty CLAY and PEAT were typically encountered as pockets / layers within Clay strata to depths of up to 2.90m begl. Medium dense clayey sandy GRAVEL and medium dense gravelly SAND were locally encountered underlying firm Clay strata. Stiff sandy gravelly CLAY was encountered in the majority of the trial pits and in each of the cable percussive boreholes from depths of between 1.60m and 3.80m begl to the bases of the exploratory holes.
Foundation Design	A piled foundation solution is recommended for the proposed dwellings. Advice from a specialist piling contractor should be sought to confirm the depths of the piles and the most feasible and cost efficient type of pile to be used at the site.
Floor Slab Design	Given the presence of potentially compressible peat including at relatively shallow depths, it is considered that ground bearing floor slabs are unlikely to be suitable. In view of this and based on the proposed pile foundation solution, a suspended slab may be adopted which may be either cast in-situ or a pre-cast suspended floor with a clear ventilated void (i.e. beam and block / beam and thermal insulation infill floor).
Ground Gas Precautions	Based on the programme of gas monitoring carried out, the results indicate that no ground gas precautions (in relation to methane and carbon dioxide) would be necessary for the site.
Building Near Trees	Foundation designs will need to be adjusted in full accordance with NHBC Standards Chapter 4.2 *'Building near trees'*. It is recommended that cohesive soils of a high volume change potential should be assumed for design purposes. Assuming that a piled foundation solution is adopted for the proposed development, heave precautions should be incorporated into the design of ground beams.
Radon	No radon precautions are required at the site.
Water	It is anticipated that excavations from depths typically in the region of 0.70m begl will likely require dewatering. This may involve sump pumping techniques, in the first instance, particularly where excavations are left open for a significant period of time.
Excavations / Stability	Excavations are likely to require trench support for stability and health and safety reasons, particularly when excavating deeper than approximately 2.20m begl. The assessment of excavations and provision of support will be the responsibility of the contractor on site.
Sulphate Classification	Design Class DS-2/ACEC Class AC-3z. (BRE Spec. Digest 1:2005).
Coal Mining	No specific investigation or mitigation measures in relation to coal mining issues are considered to be necessary.
CBRs	The remoulded soaked CBR testing has revealed CBR values for the Natural Strata ranging between 0.2% and 1.8%.
Surface Water Drainage	The results from the programme of in-situ infiltration rate testing have indicated that traditional soakaways and permeable paving are unlikely to be viable for the site and it may be prudent to investigate alternative methods for draining the site, at this stage.
Contamination Assessment	The soils may be considered to be uncontaminated for the proposed end use.
Remediation Proposals	No remediation works will be required. It may be necessary to increase the thickness of topsoil around the root balls of trees to suit the proposed planting regime.
Off Site Disposal	If off-site disposal is required a separate contamination assessment may be required to include bespoke leachate analysis (i.e. WAC testing) to classify the soils for off-site disposal with testing criteria to assess whether the soil is hazardous, non-hazardous or inert waste.
Flood Risk	The site is revealed to lie within an area identified as being at risk of flooding. It is recommended that advice be sought from a Drainage Consultant with respect to this matter.
Construction Workers	No contamination has been identified that requires specific PPE.
Utilities	Prior to development of the site, we would recommend that a copy of this report is supplied to utility companies, and that their recommendations relating to appropriate supply pipes are adhered to.
Unforeseen Circumstances	Should any areas of potentially contaminated soil be encountered during site construction works we would recommend consultation with GeoDyne Limited to ensure that our recommendations continue to apply.
Licenses, Permits etc.	The Contractor/Developer is responsible for, and must ensure that, all necessary licenses, permits, plans, registrations and approvals are in place prior to commencing with the earthworks at the site.

1.0 INTRODUCTION

1.1 Introduction

GeoDyne Limited has been appointed by the Client, Ashwood Homes, to undertake a Combined Phase I Desk Study and Phase II Exploratory Investigation on a parcel of land located to the east of Crease Drove, Crowland, Lincolnshire.

1.2 Scope of Works

The scope of the Phase I Desk Study included the following:

- Detailed site walkover.
- Review of historical and contemporary Ordnance Survey publications.
- Review of the sites geology, hydrology and hydrogeology.
- Review of commissioned Landmark geological maps.
- Review of the sites coal mining status.
- Review of the sites radon status.
- Review of a commissioned Landmark Envirocheck Report.

Phase II Exploratory Investigation works comprised:

- A sub-contracted utility avoidance scan of proposed exploratory hole locations.
- A series of trial pits and cable percussive boreholes across the site.
- A programme of in-situ soakaway testing.
- Geotechnical and environmental soils testing.
- A programme of ground gas and water monitoring.

1.3 Project Understanding

We understand that it is proposed to develop the site for a low-rise residential end-use incorporating private gardens. It is also understood that current development proposals incorporate areas of Public Open Space (POS). This understanding has formed the basis of our report.

For the purposes of the assessments detailed herein, we have adopted a residential with plant uptake end-use (where applicable) for the proposed development. If our understanding is incorrect (for example if a commercial/industrial end-use was proposed), it would be necessary to review our report to ensure it continues to apply.

1.4 Limitations

The conclusions and recommendations made in this report are limited to those that can be made based on the findings of the investigation. Where comments are made based on information obtained from third parties, GeoDyne Limited assumes that all third party information is true and correct. No independent action has been undertaken to validate the findings of third parties, unless specifically stated.

This report has been prepared in accordance with our understanding of current good practice. However changes to good practice, guidance or legislation may necessitate revision of this report after the date of issue.

We would note that the scope of laboratory testing and our assessment of the chemical soil test results have been primarily focussed on potential risks to human health. Our scope of chemical testing and assessment has not been specifically designed to fulfil any landfill or waste disposal company's requirements to suitably characterise any waste soil arising during future redevelopment of the site, or accurately determine disposal costs for any waste soil, although it will assist in such an assessment.

GeoDyne Limited has prepared this report for the sole use and reliance of the Client, Ashwood Homes, in accordance with our Standard Conditions and Limitations (included in Appendix XII). This report may not be used or relied upon by any unauthorised third party without the explicit written agreement of GeoDyne Limited.

1.5 Confidentiality

The risk assessment herein remains the intellectual property and trade secret of GeoDyne Limited. The information contained within this report must not be disclosed or divulged to any commercial Consultant or other third party without the prior written agreement of GeoDyne Limited.

2.0 SITE DESCRIPTION & HISTORY

2.1 Site Description

The site comprises a rectangular shaped parcel of land located to the east of Crease Drove, Crowland, Lincolnshire. The site may be located centred around approximate Ordnance Survey National Grid Reference 523720E 309490N. A site location plan (Figure No. D38056c/01) is included in Appendix I. The site covers an area of approximately 1.69 hectares.

At the time of our works (May 2018), the site effectively comprised an approximately flat field with short vegetation and plant/crop remains.

A drainage ditch and a field with bare topsoil and plant/crop remains was present to the south of the site; a drainage ditch and a cropped field was present to the north of the site; a road with a grass verge (Crease Drove) and a crane yard (Crowland Cranes Ltd) was present to the west of the site beyond the road; and residential properties were present to the east of the site.

The Annotated Site Plan in Appendix II of this report (Figure No. D38056c/02) shows the main features of the site and immediate surrounding area. General views of the site are included on the plan in Appendix III of this report (Figure No. D38056c/03).

2.2 Site History

The historical and contemporary Ordnance Survey publications included within the Landmark Envirocheck report have been reviewed by GeoDyne to establish the history of the site and its environmental setting. The historical Ordnance Survey maps are included as Appendix IX of this report.

It should be noted that the site boundaries marked on the historical sheets within the Envirocheck report appears to 'shift' on several of the maps. This is due to Envirocheck transposition and scaling algorithm inaccuracies.

The key findings of the historical search are summarised in Table 1.

TABLE 1 – HISTORICAL PUBLICATION DATA

Date	Features on Site	Features off Site
1880s	• The site comprises a field. Drainage ditches are shown to form the boundary of the site (i.e. around the perimeter of the field). • A small enclosure appears to be present in the northwestern corner of the site. Two small structures are present within the enclosure.	• A road named as *'Crease Drove'* is present to the immediate west of the site. • The surrounding area comprises undeveloped open fields. The field boundaries are defined by a network of drainage ditches. • A *'Corn Mill'* is present approx. 200m to the northeast of the site.
1890s	• No maps available for viewing.	• No maps available for viewing.
1900s	• The boundary to the enclosure in the northwest corner is no longer shown. One of the structures within the enclosure is no longer shown although an additional small structure is now indicated.	• A plant *'Nursery'* is present approx. 140m to the south west of the site. • The surrounding area remains essentially unchanged.
1910s to 1940s	• No maps available for viewing.	• No maps available for viewing.

TABLE 1 – HISTORICAL PUBLICATION DATA		
Date	Features on Site	Features off Site
1950s	• The small structures in the northwest of the site are no longer shown.	• The immediate surrounding area remains essentially unchanged. • Buildings including assumed residential properties are situated approx. 150m to the northeast and southeast of the site. • A series of small presumed commercial structures are present approx. 100m to the north of the site.
1960s	• No maps available for viewing.	• No maps available for viewing.
1970s	• The drainage ditch previously forming the western site boundary and part of the drainage ditch previously forming the northern site boundary are no longer indicated (potentially infilled or culverted).	• A *'Poultry House'* is present approx. 90m to southwest of the site beyond Crease Drove. • Several drainage ditches around the site are no longer indicated (potentially infilled or culverted). • Further '*Poultry Houses'* including a '*Hopper'* are situated approx. 120m northeast of the site. • Predominantly residential development has taken place from approx. 150m to the east of the site. • A *'Warehouse & Packing Station'* is present approx. 100m to the north of the site. • Residential development has taken place from approx. 180m to the north of the site.
1980s	• The site remains essentially unchanged.	• A *'Depot'* is present to the immediate southwest of the site beyond Crease Drove. • Additional structures have been constructed adjacent to the Poultry House, to the southwest of the site. • A drainage ditch to the west of the site is no longer indicated (potentially infilled or culverted). • Further residential development has taken place to the northeast of the site.
1990s	• The drainage ditch previously forming the eastern site boundary is no longer indicated on the aerial photograph (potentially infilled or culverted). • Otherwise the site remains essentially unchanged.	• Further residential development has taken place to the east of the site, up to the eastern site boundary. • A drainage ditch to the southeast of the site is no longer indicated (potentially infilled or culverted). • Additional structures have been constructed adjacent to the Depot, to the southwest of the site. • All but one of the small presumed commercial structures to the north of the site are no longer present. • An additional warehouse structure has been constructed adjacent to the Warehouse and Packing Station, approx. 130m to the north of the site.
2000	• The site remains essentially unchanged.	• The final small presumed commercial structure to the north of the site is no longer present.
2006 to 2018	• The site remains essentially unchanged.	• The surrounding area remains essentially unchanged.

3.0 GEOLOGY & ENVIRONMENTAL SETTING

3.1 Geological References

The following geological publications were referred to:

- BGS 1:50000 Series Sheet 158 '*Peterborough*' (1984).
- BGS 1:10000 Series Sheet TF20NW (1992).
- BGS Publication '*Geology of the Peterborough district*' (1989).
- BGS Publication '*Geology of the country around Kings Lynn and The Wash*' (1994).
- The Coal Authority and The Law Society Publication '*Coal Mining and Brine Subsidence Claim Searches - Directory and Guidance*', Sixth Edition (2006).
- Environment Agency website: www.environment-agency.gov.uk.
- British Geological Survey website: www.bgs.ac.uk.

3.2 Geology

Superficial Drift Deposits

The site is indicated to be underlain by Nordelph Peat which dates from the Recent and Pleistocene. The on-line BGS information notes Nordelph Peat to comprise '… *trunks and roots of oaks and small trees, some in-situ, and woody debris from alder, birch, sallow, buckthorn and pine are common. In the more seaward areas the peat is largely composed of stems and rhizomes of sedges and reeds. In southern Fenland the peat contains thin but extensive, lenticular deposits of shell marl which formed in shallow meres within the peat fens*'. The Nordelph Peat is indicated to be typically less than 1m in thickness, although locally over 3m in thickness where preserved in channels.

In addition, the 1:50000 scale map reveals that Nordelph Peat has the potential to incorporate a series of silt filled channels (tidal creek deposits).

Drift deposits comprising Abbey Gravel described as Marine/Estuarine Sand and Gravel are shown to be present to the north and west of the site and Barroway Drove Beds comprising '*Salt marsh Clays and silty clays*…[and] *thin mats of rotted, drifted stems of reeds and sedges'* are shown to be present to the east of the site.

Drift deposits have the potential to alter rapidly in character and geotechnical properties both laterally and vertically over relatively short distances and may also be water bearing.

The peat deposits beneath, and in the general vicinity of, the site are considered to represent a potential source of hazardous ground gas (i.e. methane and carbon dioxide) at the site.

Bedrock Geology

The drift deposits at the site and in the immediate surrounding area are indicated to be underlain by Oxford Clay, dating from the Jurassic.

Oxford Clay typically comprises *'silicate-mudstone, grey, generally smooth to slightly silty, with sporadic beds of argillaceous limestone nodules'*.

3.3 Faults

No faults are indicated beneath the site or within the general vicinity of the site.

3.4 Man-Made Deposits

No man-made deposits (i.e. Made Ground, Worked Ground or Infilled Ground) are indicated on the reviewed geological map publications relating to the site.

We would note that the historical publications revealed the presence of drainage ditches around the site boundary and immediate surrounding area which became absent circa 1970s-1990s and it is possible that the drainage ditches were infilled or culverted. Any infill materials to the former drainage ditches would represent areas of Made Ground at the site which may represent a low-risk source of hazardous ground gas (i.e. methane and carbon dioxide) at the site.

3.5 Coal Mining

The site does not lie within an area requiring the commission of a coal mining report in accordance with The Coal Authority and The Law Society publication '*Coal Mining and Brine Subsidence Claim Searches - Directory and Guidance*', Sixth Edition (2006).

No specific investigation or mitigation in relation to historical coal mining issues is therefore considered to be necessary at the site.

3.6 Landmark Envirocheck Report

A Landmark Envirocheck report was commissioned to assist in ascertaining the environmental setting of the site. The full Envirocheck report is presented in Appendix X and has revealed the following relevant information (details are only listed where they are within potential influencing distance, i.e. 250m, of the site).

3.6.1 Agency & Hydrological

Aquifer Status

The superficial deposits comprising Nordelph Peat and the underlying bedrock geology comprising Oxford Clay are designated as Unproductive Strata.

The Environment Agency describes Unproductive Strata as '*…rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow*'.

Source Protection Zones

The Envirocheck report indicates that the site does not lie within a Source Protection Zone (SPZ), as designated by the Environment Agency. SPZs relate to the protection of groundwater used for public drinking water supply.

Surface Water

The closest surface water features are indicated to be the drainage ditches which define the northern and southern site boundaries. Additional ditches are present within 250m around the site. The Envirocheck report classifies these features as inland rivers.

Water Abstractions

There is one recorded water abstraction within 250m of the site. This abstraction is situated approximately 137m to the west of the site and is operated by S G Beeken where groundwater was abstracted for a groundwater fed reservoir for agricultural purposes. The abstraction licence is indicated to have been revoked.

Flood Risk

The site and immediate surrounding area are identified to be at risk from extreme flooding from rivers or sea without defences. Areas of the site are identified to be at risk of surface water flooding.

Pollution Incidents to Controlled Waters

There is one recorded pollution incident within 250m of the site, i.e. 117m to the west of the site. The incident occurred in 1993 and appears to relate to unknown pollutants entering a local dyke. The incident was classified as a '*Category 3 – Minor Incident*'

Discharge Consents

There are two entries listed within 250m of the site. The closest relates to the discharge of '*Other Matter – Surface Water*' to Fen Drain by C & B Construction Ltd at an apparent residential development situated approximately 58m to the north of the site. The consent was revoked in 1992. The other entry relates to the discharge of *'Trade Effluent'* to an unknown receiving body by Whitworth Produce (Crowland) Limited situated 187m to the northeast of the site.

Local Authority Pollution Prevention and Controls

There is one Local Authority Air Pollution Controls entry listed within 250m of the site. The entry is situated approximately 40m to the west of the site, which relates to Crowland Cranes. This entry is described as for '*Respraying of road vehicles*' and the status is recorded as '*Authorised'*.

3.6.2 Waste

There are no sites associated with waste (e.g. historic landfills, transfer stations etc.) identified within 250m of the site.

However, the historical publications show the presence of a series of drains around the site boundary and immediate surrounding area that are considered likely to have been infilled/culverted.

The Envirocheck report lists an entry for Potentially Infilled Land (Water) approximately 7m to the east of the site which appears to relate to a former drainage ditch.

3.6.3 Hazardous Substances

There are no sites associated with hazardous substances (e.g. explosives) identified within 250m of the site.

3.6.4 Geological & Radon

Geological Hazards

The site has been given a Hazard Potential ranking of *'High'* with regards to Potential for Compressible Ground Stability Hazards and a Hazard Potential ranking of *'Moderate'* with regards to Potential for Shrinking or Swelling Clay Ground Stability Hazards.

No other potentially significant onerous geological issues have been identified within the Envirocheck report which relate to the site.

BGS Estimated Soil Chemistry Data Maps

The BGS has prepared estimated soil concentration maps for several metals (including arsenic, lead, nickel, chromium and cadmium), which are extrapolated from records available for use within their assessments.

Whilst potentially useful for the inference of Natural Metal Enrichment (NME) of the natural soils in a general locale, the data should not be used to inform any detailed decisions with regards to the chemistry of a particular site as it does not allow for anthropogenic effects.

BGS estimates of the soil chemistry at the site indicate anticipated concentrations of arsenic of 15-25mg/kg, cadmium of <1.8mg/kg, chromium of 90-120mg/kg, lead of <100mg/kg and nickel of 45-60mg/kg.

Based on the information supplied within the Envirocheck report, the site is not shown to be located within an area where Natural Metal Enrichment of the underlying natural soils is likely to be present. However, this is only applicable to the specific determinands listed above.

Radon

The Envirocheck report states that '*The property is in a lower probability radon area, as less than 1% of homes are above the action level…No radon protective measures are necessary in the construction of new dwellings or extensions*.' No specific mitigation in relation to radon issues are therefore required at the site.

3.6.5 Industrial Land Use

Contemporary Trade Directory Entries

There are thirteen contemporary trade directory entries recorded within 250m of the site comprising five active entries and six inactive entries.

Active entries comprise the following:

- A lifting equipment supplier (T M C Lifting Supplies) 40m to the west of the site.
- A crane hire (Crowland Cranes Ltd) 40m to the west of the site.
- A trailer and towing equipment business 134m to the west of the site.
- An electric motor sales 232m to the southwest of the site.
- An electronic equipment manufacturer 242m to the southwest of the site.

The closest inactive entries relate to car body repair businesses recorded as being 2m and 3m to the west of the site (although it is suspected that these former activities were carried out on the premises situated beyond Crease Drove, i.e. in excess of 10m to the west of the site).

Points of Interest – Commercial Services

There are three Points of Interest – Commercial Services entries recorded within 250m of the site.

Entries comprise the following:

- A vehicle repair and servicing business 26m to the west of the site.
- A distribution and haulage business 128m to the north of the site.
- A repair and servicing business 216m to the west of the site.

3.6.6 Sensitive Land Use

The site is shown to lie within a Nitrate Vulnerable Zone. In our experience large parts of this area of the country are defined as a Nitrate Vulnerable Zone and this classification is considered not to present a potential risk to the development of the site.

3.6.7 BGS Borehole Records

The Envirocheck report reveals that the BGS do not hold any available records for any boreholes relating to the site or to the immediate surrounding area.

3.7 Land Use Assessment

As part of the land use assessment, reference has been made to the '*Desk Reference Guide to potentially Contaminative Land Uses*' produced by Mr P Syms and published jointly by the ISVA (The Professional Society for Valuers and Auctioneers) in association with The Royal Institution of Chartered Surveyors and the Chartered Institute of Environmental Health.

We have also made reference to the Department for Environment, Food and Rural Affairs and the Environment Agency Contaminated Land Report CLR8 '*Potential Contaminants for the Assessment of Land*' (March 2002). This document identifies key contaminants which may potentially be present at a site as a result of a given historical land use, and whilst formally withdrawn is still considered to be a useful desk based reference guide.

3.7.1 On Site Assessment

Based on the reviewed historical information, the site has essentially remained an undeveloped field.

The site is not identified in any of the land-use categories detailed within the publications referenced in Section 3.7. Based on the information obtained from the desk study and our walkover of the site, potential contamination that may be present could include:

- Metals or metalloids associated with any Made Ground.
- Polycyclic Aromatic Hydrocarbons (PAHs) from any ashy inclusions and/or carbonaceous inclusions in the near surface soils.
- Asbestos possibly associated with the former structures in the northwest corner of the site (if present).
- Pesticides associated with the growing of crops.
- Hazardous ground gases (i.e. methane and carbon dioxide) associated with any Peat/organic deposits beneath the site and any Made Ground associated with infill materials associated with former drainage ditches.
-

3.7.2 Off Site Assessment

The site lies within an area with only a limited number of commercial and industrial activities. The closest known land uses to the site appear to be crane company immediately beyond Crease Drove to the west of the site. The desk study also indicates former car body repair workshops situated 2m and 3m to the northwest of the site, although these are likely to be in excess of 10m from the site, i.e. beyond Crease Drove. However, the geological mapping indicates soils of generally low permeability beneath and in the vicinity of the site (with the exception of possible sand and gravel deposits to the northwest of the site). It is therefore considered that the migration of potentially mobile contaminants (such as hydrocarbons and solvents) to significantly impact the study site is unlikely.

Based on the information obtained from the desk study, the following sources of potentially hazardous ground gas (i.e. carbon dioxide and methane) have been identified within potential influencing distance (i.e. <250m) of the site:

- Peat/organic deposits within the sites general environs.
- Made Ground associated with infill materials to the potential former drainage ditches within the surrounding area of the site.

4.0 GROUND INVESTIGATION

4.1 Introduction

Sub-Surface Utility Avoidance Scan

Prior to the commencement of our intrusive works at the site, a sub-contracted sub-surface utility scan of proposed exploratory hole locations was undertaken to attempt to avoid buried services. Based on the results of the service scan, the exploratory holes were positioned in order to maximise the amount of information obtained during our site works, whilst avoiding known utilities.

Trial Pits

A total of fourteen trial pits (TP1 to TP14) and three soakaway pits (SA1 to SA3) were excavated at the site on 10th and 14th May 2018. The pits were excavated to depths of up to 3.30m below existing ground level (begl).

Cable Percussive Boreholes

Three cable percussive boreholes (BH1 to BH3) were advanced at the site between 13th and 16th May 2018 to depths of 15.34m begl. Upon completion, all three boreholes were installed with ground gas monitoring points to depths of 5.00m begl to facilitate a programme of ground gas monitoring.

Exploratory Hole Locations/Logs

The approximate locations of the exploratory holes are shown on the plan presented in Appendix IV (Figure No. D38056c/04). The exploratory hole logs are presented in Appendix VI of this report.

4.2 Ground Conditions

Topsoil

TOPSOIL was encountered at the surface of all exploratory holes to depths of between 0.30m and 0.40m begl with an average thickness of approximately 0.30m.

Natural Strata

Beneath the Topsoil, typically soft to firm or firm sandy CLAY (locally becoming gravelly at depths in the region of 1.20m begl) was encountered to depths of up to 3.00m begl. Sand/Gravel pockets were locally encountered within the Clay strata. Visually extensive fissures were encountered within the Clay strata in TP5 and TP6 from respective depths of 1.00m and 0.80m begl.

Discrete layers of spongy fibrous PEAT with an average thickness of approx. 0.15m were typically encountered within the Clay strata including directly underlying the Topsoil to depths of up to 2.20m begl. Within the cable percussive boreholes, peaty CLAY and PEAT were typically encountered as pockets/layers within Clay strata to depths of up to 2.90m begl.

Medium dense clayey sandy GRAVEL and medium dense gravelly SAND were locally encountered underlying firm Clay strata.

Stiff sandy gravelly CLAY was encountered in the majority of the trial pits and in each of the cable percussive boreholes from depths of between 1.60m and 3.80m begl to the bases of the exploratory holes.

We would note that no obvious visual or olfactory evidence of significant soil contamination (such as by hydrocarbons or asbestos) was identified during the course of the site works. No Made Ground materials (such as containing demolition materials) were encountered within the soils at the site, including in the trial pit (TP1) excavated in the area of the former enclosure which historically contained small structures (of unknown construction).

4.3 Water

The majority of exploratory holes encountered multiple slight and/or moderate water seepages from depths typically between 0.70m and 3.20m begl. Faster water flows were observed in TP5 and TP6 from fissures within the Clay strata.

4.4 Stability

The sides of the majority of trial pits remained stable during excavation and for the short period of time they remained open following completion. Four trial pits became unstable when excavating below depths of between 2.20m and 2.70m begl.

During advancement, the borehole sides were cased to depths of up to 4.50m begl to prevent collapse during their advancement through the drift deposits.

4.5 Plates

A photographic record of the exploratory investigation was obtained during the intrusive works. Selected photographs are presented in the Plates included in Appendix XI of this report (Plate Nos. 1 to 20).

4.6 Shear Vane Values

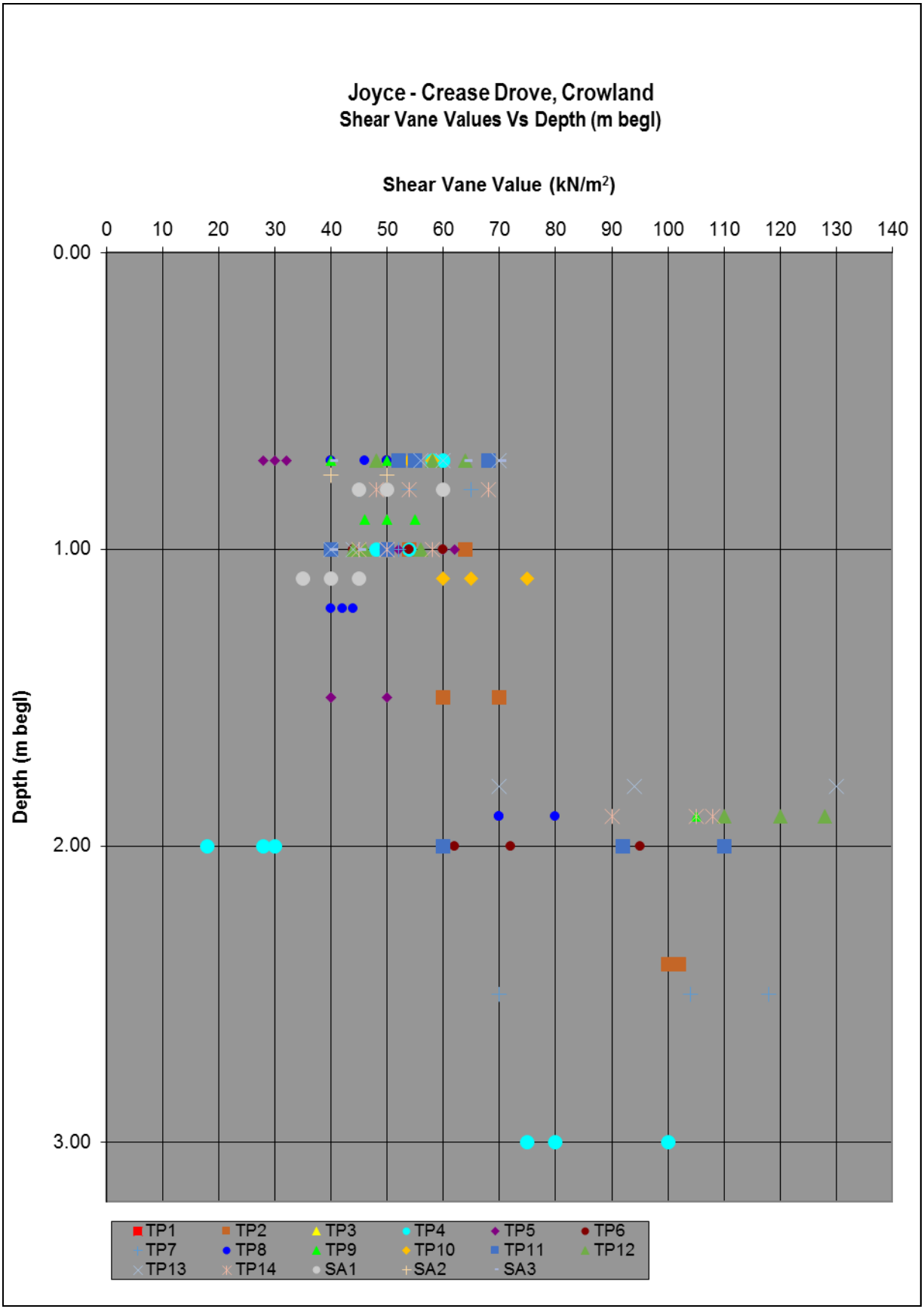
Shear vane testing was undertaken within the predominantly clay soils within the trial pits and soakaway pits. The results typically revealed soil shear strength values of between 28N/m^2 and 70kN/m^2 at depths of between 0.70m and 0.80m begl.

At depths of between 1.00m and 1.50m begl, the results typically revealed soil shear strength values of between 35N/m^2 and 75kN/m^2.

At depths of 1.80m begl and greater, the results typically revealed soil shear strength values of between 60N/m^2 and 130kN/m^2, with the exception of TP4 where values of between 18N/m^2 to 30N/m^2 were recorded at a depth of 2.00m begl.

Shear vane values taken at depths in excess of 1.20m begl were taken ex-situ due to health and safety reasons.

The following chart presents the shear vane values in relation to depth recorded in the trial pits and soakaway pits excavated at the site. Individual shear vane results are provided on the exploratory hole logs included in Appendix VI of this report.


Joyce - Crease Drove, Crowland
Shear Vane Values Vs Depth (m begl)
Shear Vane Value (kN/m²)
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
0.00
1.00
2.00
3.00
Depth (m begl)
TP1
TP2
TP3
TP4
TP5
TP6
TP7
TP8
TP9
TP10
TP11
TP12
TP13
TP14
SA1
SA2
SA3

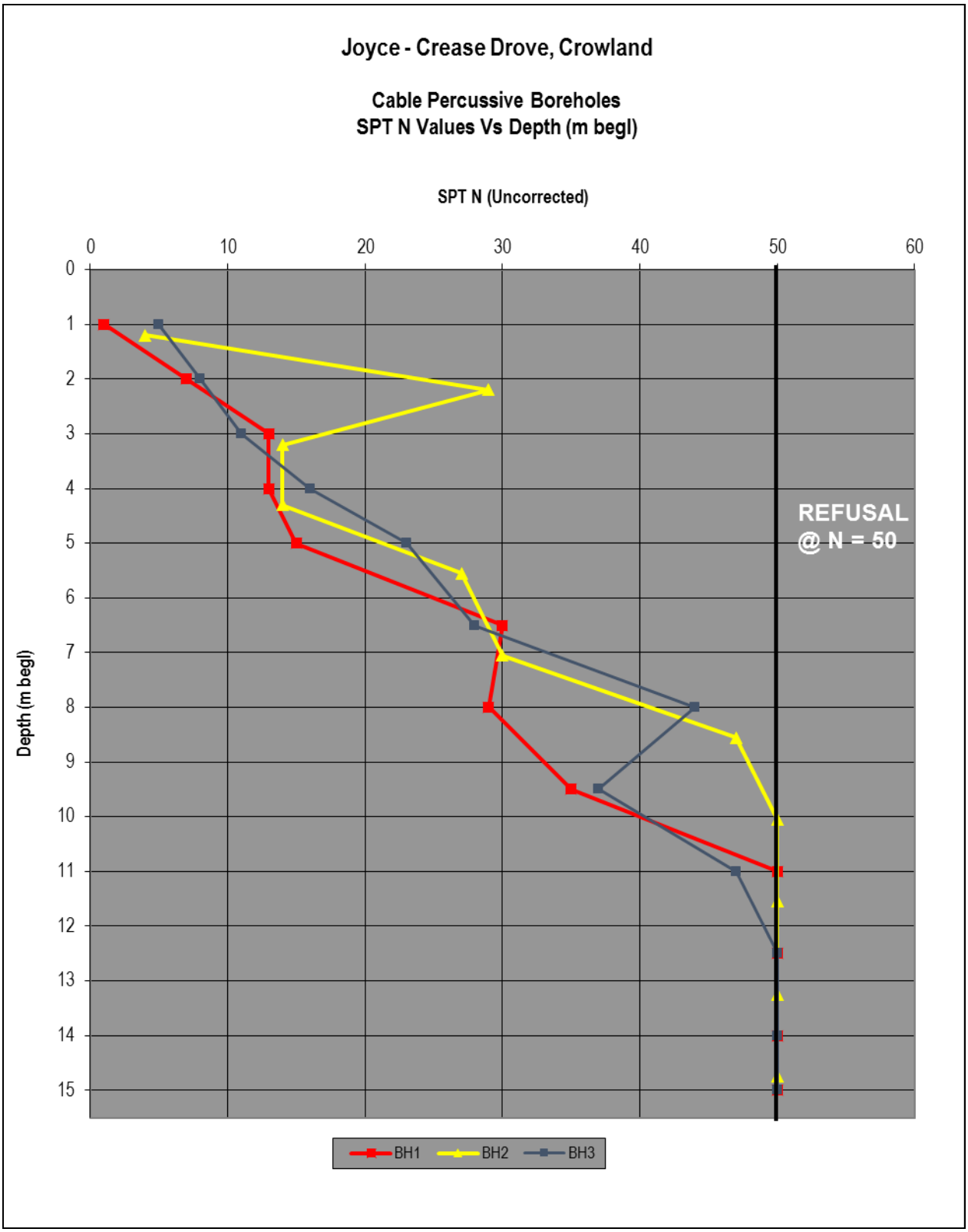
4.7 Standard Penetration Test (SPT) Data

In order to establish a strength/depth profile of the soils beneath the site, in-situ Standard Penetration Testing (SPT) was undertaken at intervals of typically 1m to 1.5m within the cable percussive boreholes.

Within the near surface Drift Deposits at depths of 1.00m and 1.20m, uncorrected SPT 'N' values of between 1 and 5 were achieved. Within the underlying Drift Deposits at depths of 2.00m and 2.20m, uncorrected SPT 'N' values ranged between 7 and 29. In borehole BH1, the Drift Deposits extended to a depth of 3.80m and the uncorrected SPT 'N' value at a depth of 3.00m was 13.

Within the underlying Oxford Clay Formation at depths of between 3.00m and 15.00m, uncorrected SPT 'N' values typically ranged between 11 and SPT refusal (i.e. a value in excess of 50). The SPT 'N' values typically increased with depth.

A Chart showing the SPT results in relation to depth is provided on the following page for information, with SPT results for each of the boreholes provided on the logs included in Appendix VI.


Joyce - Crease Drove, Crowland
Cable Percussive Boreholes
SPT N Values Vs Depth (m begl)
SPT N (Uncorrected)
0
10
20
30
40
50
60
Depth (m begl)
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
REFUSAL
@ N = 50
BH1
BH2
BH3

4.8 Soakaway Testing

Two soakaway tests (SA1 and SA3) were conducted in deeper pits (i.e. 1.80m and 2.00m begl respectively) to determine the suitability of traditional soakaways for the site. An additional soakaway test (SA2) was conducted in a shallower soakaway pit advanced to 0.75m as specified by the Client to determine the suitability of permeable paving as a possible drainage solution for the site.

The approximate locations of the soakaway pits are included on the plan presented in Appendix IV (Figure No. D38056c/04).

The water level failed to significantly drop within all three of the soakaway test pits for the duration of the testing period, therefore infiltration rates have not been calculated.

In view of this and based on the limited preliminary testing undertaken, the use of traditional soakaways and permeable paving are not considered likely to be a feasible means of surface water drainage at the site. It would therefore be prudent to investigate alternative methods for draining the site, at this stage.

5.0 GROUND GAS & WATER MONITORING RESULTS

5.1 Introduction

Based on the findings of the Desk Study works, it was considered necessary to install a series of monitoring points to facilitate a programme of ground gas monitoring at the site.

5.2 Monitoring Installations

Upon completion, all three of the cable percussive boreholes were installed with combined ground gas and water monitoring standpipes to depths of between 5.00m begl to facilitate a programme of monitoring.

The ground gas and water monitoring data obtained is presented in Appendix VII of this report.

5.3 Results of the Ground Gas Monitoring

A total of six monitoring visits over a six week period have been undertaken at the site as part of our works. The ground gas monitoring results are summarised in Table 2 below.

TABLE 2 – SUMMARY OF GROUND GAS MONITORING DATA

Parameter	Minimum % by volume (v/v)	Maximum % by volume (v/v)
Methane	0.0	0.0
Carbon Dioxide	0.0	0.8
Oxygen	19.2	20.5
Peak Flow (l/h)	0.0	0.2 (and -23.5)
Steady Flow (l/h)	0.0	0.1

The flow rates recorded during the monitoring carried out at the site are noted to be variable, as summarised in Table 3 below:

TABLE 3 – SUMMARY OF GAS FLOW RATE DATA

Gas Monitoring Standpipe Reference	Flow Rates (Litres per Hour)						
	Peak / Steady Reading	24.05.2018	01.06.2018	08.06.2018	14.06.2018	19.06.2018	26.06.2018
BH1	Peak	0.2	0.0	0.0	0.0	-0.1	0.0
	Steady	0.0	0.0	0.0	0.0	-0.1	0.0
BH2	Peak	-23.5	0.0	0.1	0.0	0.0	0.1
	Steady	0.0	0.0	0.0	0.0	0.0	0.1
BH3	Peak	0.0	0.0	0.0	0.0	0.0	0.0
	Steady	0.0	0.0	0.0	0.0	0.0	0.0

Note: all flow values were recorded where groundwater levels were recorded above the slotted section of the gas monitoring standpipe.

As indicated above, no flow rates (or negligible flow rates of +/- 0.1 litres / hour) were typically recorded at the site, with the exception of one visit where flow rates were recorded in two of the monitoring points. A peak positive flow rate of 0.2 litres / hour was recorded within BH1 on 24th May 2018 which fell to 0.0 litres / hour within seconds. A negative flow rate of -23.5 litres / hour was recorded within BH2 also on 24th May 2018 which also fell to 0.0 litres / hour within seconds.

In view of the above, a review of the groundwater levels recorded within each of the monitoring standpipes has been carried out. Groundwater was recorded at depths ranging between 0.71m and 0.99m begl within the borehole installations during the course of the monitoring programme.

The groundwater was noted to be above the interface between the solid and slotted sections of the standpipes on each of the monitoring visits i.e. less than 1.00m begl.

It is therefore considered that the flow rates recorded at the site, particularly the notable negative flow rate, has been caused by ground gas / air that has become trapped under pressure within the solid section of the monitoring pipe due to shallow / fluctuating groundwater levels. With regard to the to the notable negative flow rate recorded in BH2 on 24th May 2018, it is considered that the groundwater level may have fallen prior to monitoring, creating a negative pressure within the solid section of the standpipe and when the gas tap was opened to undertake the monitoring, air was drawn into the standpipe resulting in an initially high negative flow rate. The flow rate recorded under these circumstances (-23.5 litres / hour within BH2) is therefore considered to be artificially high and unreliable and has therefore been disregarded.

A further factor which appears to support the hypothesis that the fluctuating groundwater levels are causing the most notable flow rates at this site is the relatively low ground gas concentrations recorded within each of the standpipes during the six gas monitoring visits. It is therefore considered that the flow rates are not attributable to ground gas emissions and therefore caused by the air being trapped under pressure in the headspace of the monitoring standpipe by potential groundwater fluctuations.

Periods of rapidly falling atmospheric pressure are considered to be the optimum barometric conditions for gas emissions from the ground. The gas monitoring carried out on two of the monitoring visits followed periods of falling atmospheric pressure during the 24 hour period prior to monitoring. The atmospheric pressure trends are summarised below:

- 24th May 2018 – Fall of 5mb from 1027mb to 1022mb.
- 1st June 2018 – Rise of 2mb from 1015mb to 1017mb.
- 8th June 2018 – Steady around 1017mb.
- 14th June 2018 – Fall of 13mb from 1018mb to 1005mb.
- 19th June 2018 – Rise of 3mb from 1018mb to 1021mb.
- 26th June 2018 – Rise of 2mb from 1025mb to 1027mb.

The highest recorded carbon dioxide concentration of 0.8% by volume and the highest peak and negative flow rates were all detected when the atmospheric pressure fell by only 5mb in the 24 hour period prior to monitoring on 24th May 2018. During the highest fall in atmospheric pressure of 13mb in the 24 hour period prior to monitoring on 14th June 2018, all flow readings were 0.0 litres / hour and the maximum carbon dioxide concentration recorded on this occasion was only 0.3% by volume.

During the highest rise in atmospheric pressures of 3mb in the 24 hour period prior to monitoring on 19th June 2018, the flow readings in two of the standpipes were 0.0 litres / hour, with the remaining standpipe (BH1) recording only -0.1 litres / hour. No carbon dioxide was recorded in any of the monitoring standpipes on this occasion. During the remaining gas monitoring visits when rises in atmospheric pressure were recorded (each of 2mb in the 24 hours prior to monitoring), carbon dioxide concentrations up to 0.4% by volume were recorded. In view of the above, it would appear that there was no consistent correlation / relationship between the noted falls / rise in atmospheric pressure and the ground gas emissions.

5.4 Appropriate Guidance

5.4.1 British Standard & CIRIA

The results of the gas monitoring have been reviewed with reference to the following documentation:

- British Standard BS 8485 *'Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings*' (2015).
- CIRIA Report C665 '*Assessing risks posed by hazardous ground gases to buildings*' (2007).

BS 8485:2015 and CIRIA Report C665 recommend a risk-based methodology to ground gas assessment, which includes the calculation of a site-specific Gas Screening Value (GSV). The GSV of a particular ground gas regime equates to:

- GSV (L/h) = (maximum borehole flow rate (L/h) x maximum gas concentration)/100.

The GSV should be calculated for both methane and carbon dioxide to determine a site-specific Characteristic Situation for each gas. The higher the calculated GSV, the greater the risk posed by the presence of ground gas. The CIRIA guidance document notes that '*…the GSV is a guideline value and not an absolute threshold*'.

Table 2 of BS 8485:2015 (reproduced below) presents a total of six Characteristic Situations (CS) to assist in classification of the site, based on the calculated GSVs for methane and carbon dioxide.

Table 2 **CS by site characteristic GSV**

CS	Hazard potential	Site characteristic GSV [A] L/h	Additional factors
CS1	Very low	<0.07	Typically <1% methane concentration and <5% carbon dioxide concentration (otherwise consider an increase to CS2)
CS2	Low	0.07 to <0.7	Typical measured flow rate <70 L/h (otherwise consider an increase to CS3)
CS3	Moderate	0.7 to <3.5	–
CS4	Moderate to high	3.5 to <15	–
CS5	High	15 to <70	–
CS6	Very high	>70	–

[A] The figures used in this column are empirical.

NOTE The CS is equivalent to the characteristic GSV in CIRIA C665 [6].

In accordance with BS 8485:2015, the CS classification for the site should be considered in conjunction with the proposed Building Type to determine the appropriate level of ground gas protection measures that should be installed to mitigate the risk posed by ground gases, based on the gas protection score for the site.

BS 8485:2015 notes '*The Building Type is determined based the proposed construction and use of the building, together with the control of future structural changes to the building and its maintenance (the building's management) should be assessed, since potential risks posed by ground gases are strongly influenced by these factors*'. Subject to the development proposals, each building may be categorised as a whole, or for each different part of the building.

The Building Types are presented in Table 3 of BS 8485:2015, reproduced below.

Table 3 **Building types**

	Type A	Type B	Type C	Type D
Ownership	Private	Private or commercial/ public, possible multiple	Commercial/ public	Commercial/ industrial
Control (change of use, structural alterations, ventilation)	None	Some but not all	Full	Full
Room sizes	Small	Small/ medium	Small to large	Large industrial/ retail park style

Summary of Building Types (taken from BS 8485:2015)

Type A Buildings — Examples include private housing and some retail premises.

Type B Buildings — Examples include managed apartments, multiple occupancy offices, some retail premises and parts of some public buildings (such as schools, hospitals, leisure centres) and parts of hotels.

Type C Buildings — Examples include offices, some retail premises and parts of some public buildings (such as schools, hospitals, leisure centres and parts of hotels).

Type D Buildings — Examples are retail park sales buildings, factory shop floor areas, warehouses. (Small rooms within these style buildings should be separately categorized as Type B or Type C).

Table 4 of BS 8485:2015, reproduced below, should be used to derive the minimum level of gas protection applicable to the Building Type, based on the CS determined from the calculated GSV.

Table 4 **Gas protection score by CS and type of building**

CS	Minimum gas protection score (points)			
	High risk		Medium risk	Low risk
	Type A building	Type B building	Type C building	Type D building
1	0	0	0	0
2	3.5	3.5	2.5	1.5
3	4.5	4	3	2.5
4	6.5[A)]	5.5[A)]	4.5	3.5
5	—[B)]	6.5[A)]	5.5	4.5
6	—[B)]	—[B)]	7.5	6.5

[A)] Residential buildings should not be built on CS4 or higher sites unless the type of construction or site circumstances allow additional levels of protection to be incorporated, e.g. high-performance ventilation or pathway intervention measures, and an associated sustainable system of management of maintenance of the gas control system, e.g. in institutional and/or fully serviced contractual situations.

[B)] The gas hazard is too high for this empirical method to be used to define the gas protection measures.

The appropriate level of precautions, to be designed in accordance with the point scoring system of BS 8485:2015 should therefore be applied for the proposed development. These should include a combination of the following three types of protection measures, which should be used to achieve the required score:

- The structural barrier of the floor slab, or of the basement slab and walls if a basement is present;
- Ventilation measures; and
- Gas resistant membrane.

The points achieved for each element of the ground gas precautions are summarised in Tables 5, 6 and 7 of the British Standard. These tables are reproduced below.

Table 5 **Gas protection scores for the structural barrier**

Floor and substructure design (see Annex A)	Score [A]
Precast suspended segmental subfloor (i.e. beam and block)	0
Cast in situ ground-bearing floor slab (with only nominal mesh reinforcement)	0.5
Cast in situ monolithic reinforced ground bearing raft or reinforced cast in situ suspended floor slab with minimal penetrations	1 or 1.5 [B]
Basement floor and walls conforming to BS 8102:2009, Grade 2 waterproofing [C]	2
Basement floor and walls conforming to BS 8102:2009, Grade 3 waterproofing [C]	2.5

[A] The scores are conditional on breaches of floor slabs, etc., being effectively sealed.
[B] To achieve a score of 1.5 the raft or suspended slab should be well reinforced to control cracking and have minimal penetrations cast in (see A.2.2.2).
[C] The score is conditional on the waterproofing not being based on the use of a geosynthetic clay liner waterproofing product (see C.3, Note 4).

Table 6 **Gas protection scores for ventilation protection measures**

Protection element/system	Score	Comments
(a) Pressure relief pathway (usually formed of low fines gravel or with a thin geocomposite blanket or strips terminating in a gravel trench external to the building)	0.5	Whenever possible a pressure relief pathway (as a minimum) should be installed in all gas protection measures systems. If the layer has a low permeability and/or is not terminated in a venting trench (or similar), then the score is zero.
(b) Passive sub floor dispersal layer: Very good performance: Good performance: Media used to provide the dispersal layer are: • Clear void • Polystyrene void former blanket • Geocomposite void former blanket • No-fines gravel layer with gas drains • No-fines gravel layer	 2.5 1.5	Performance criteria for methane and carbon dioxide are shown in Figure B.6 and Figure B.7, respectively. The ventilation effectiveness of different media depends on a number of different factors including the transmissivity of the medium, the width of the building, the side ventilation spacing and type and the thickness of the layer. The selected score should be assigned taking into account the recommendations in Annex B. Passive ventilation should be designed to meet at least "good performance", see Annex B.
(c) Active dispersal layer, usually comprising fans with active abstraction (suction) from a subfloor dilution layer, with roof level vents. The dilution layer may comprise a clear void or be formed of geocomposite or polystyrene void formers	1.5 to 2.5	This system relies on continued serviceability of the pumps, therefore alarm and response systems should be in place. There should be robust management systems in place to ensure the continued maintenance of the system, including pumps and vents. Active ventilation should always be designed to meet at least "good performance", as described in Annex B.
(d) Active positive pressurization by the creation of a blanket of external fresh air beneath the building floor slab by pumps supplying air to points across the central footprint of the building into a permeable layer, usually formed of a thin geocomposite blanket	1.5 to 2.5	This system relies on continued operation of the pumps, therefore alarm and response systems should be in place. The score assigned should be based on the efficient "coverage" of the building footprint and the redundancy of the system. Active ventilation should always be designed to meet at least "good performance".
(e) Ventilated car park (floor slab of occupied part of the building under consideration is underlain by a basement or undercroft car park)	4	Assumes that the car park is vented to deal with car exhaust fumes, designed to *Buildings Regulations 2000, Approved Document F* [9].

Table 7 **Gas protection score for the gas resistant membrane**

Protection element/system	Score	Comments
Gas resistant membrane meeting all of the following criteria: • sufficiently impervious to the gases with a methane gas transmission rate <40.0 ml/day/m²/atm (average) for sheet and joints (tested in accordance with BS ISO 15105-1 manometric method); • sufficiently durable to remain serviceable for the anticipated life of the building and duration of gas emissions; • sufficiently strong to withstand in-service stresses (e.g. settlement if placed below a floor slab); • sufficiently strong to withstand the installation process and following trades until covered (e.g. penetration from steel fibres in fibre reinforced concrete, penetration of reinforcement ties, tearing due to working above it, dropping tools, etc); • capable, after installation, of providing a complete barrier to the entry of the relevant gas; and • verified in accordance with CIRIA C735 [N1]	2	The performance of membranes is heavily dependent on the quality and design of the installation, resistance to damage after installation and integrity of joints. For example, a minimum 0.4 mm thickness (equivalent to 370 g/m² for polyethelene) reinforced membrane (virgin polymer) meets the performance criteria in Table 7 (see C.3). If a membrane is installed that does not meet all the criteria in column 1 then the score is zero.

5.5 Ground Gas Analysis

5.5.1 Gas Screening Value & Site Classification

The ground gas monitoring undertaken to date has identified no methane and a maximum carbon dioxide concentration of 0.8% v/v. With regard to flow rates, for the purposes of the ground gas risk assessment BS8576:2013 states that “steady state flow rates, rather than brief peak values on opening, should be used in screening risk assessments, if these are considered to be representative of the conceptual site model”. A maximum steady flow rate of 0.1 l/h has been utilised.

With regard to recorded methane and carbon dioxide concentrations and gas flow rates, the worst case gas regime identified is summarised as follows:

The GSV for carbon dioxide at the site may be calculated as follows:

- 0.1(0.8/100) = 0.0008 l/h

Therefore, with a GSV of 0.0008 l/h and a carbon dioxide concentration of 0.8% v/v, the site may be classified as **‘CS1’** with respect to carbon dioxide in accordance with Table 2 of BS 8485 and based on the visits undertaken.

5.5.2 Building Type

We understand that it is proposed to develop the site with low-rise residential dwellings. In accordance with Table 3 of BS 8485, **Building Type A** is considered to be the most appropriate classification.

5.5.3 Gas Protection Score

On the basis of Characteristic Situation (CS1) and the development proposals with structures that may be designated as Building Type A and in accordance with Table 4 of BS 8485:2015, the minimum gas protection score for the site is **0 points**.

5.5.4 Comments

The results of the gas monitoring carried out to date indicate that no ground gas precautions would be required for the site based on the gas protection score of zero in accordance with BS 8485:2015 and based on the gas data obtained for the site.

6.0 LABORATORY TESTING & CONTAMINATION ASSESSMENT

6.1 Introduction

The following environmental soil testing was carried out on visually representative samples recovered from the exploratory holes:

- 7 No. Standard contamination suites (including metals, speciated PAH and TOC).
- 3 No. Combined pesticide screens – Organochlorine & Organophosphate (OCP & OPP).

The desk study has identified that former small structures within an enclosure were historically situated in the northwest corner of the site (presumably for agricultural use), as indicated on the 1880s and 1900s historical maps, although the construction materials used in these structures are not known. The trial pit excavated closest to the former structures (trial pit TP1) did not encounter any Made Ground materials, such as containing demolition materials, only natural soils. In view of this, no asbestos testing was carried out on the samples of natural soils collected from this area.

Geotechnical soil testing comprised the following:

- 6 No. Water soluble sulphate tests.
- 11 No. pH tests.
- 6 No. Plasticity Index (PI) tests.
- 4 No. Remoulded Soaked CBR tests.
- 2 No. Loss on Ignition tests.

All laboratory soil test results are included in Appendix VIII of this report.

6.2 Geotechnical Soil Test Results

Water Soluble Sulphate / pH

Water soluble sulphate testing was undertaken on 6 No. samples of the Natural Strata (excluding Topsoil) during the site works. The results revealed water soluble sulphate concentrations of between 0.08g/l SO_4 and 1.21g/l SO_4. The pH values of the Natural Strata (excluding topsoil) analysed ranged between 4.57 and 8.79.

In accordance with the Building Research Establishment publication Special Digest 1 *'Concrete in Aggressive Ground'* (2005) the mean of the highest two sulphate concentrations should be used to indicate the Design Sulphate Class (i.e. 0.97g/l SO_4), together with the mean of the lowest 20% of the results for pH (4.74).

Therefore, in accordance with Special Digest 1:2005 the site falls into Design Sulfate Class DS-2 and an Aggressive Chemical Environment for Concrete (ACEC) classification of AC-3z.

This classification has been made based on the assumption of natural ground conditions and the presence of potentially mobile groundwater conditions beneath the site.

Plasticity Index (PI) Testing

A total of 6 No. Plasticity Index tests have been undertaken on selected samples of the near surface Natural Strata obtained during the site works from across the site. In accordance with NHBC standards Chapter 4.2 '*Building Near Trees*' and BRE Digest 240 '*Low-rise buildings on shrinkable clay soils: Part 1*' (1993) the reported PI values may be modified based on the portion of the sample passing the 425μm sieve.

The result of the PI analysis is summarised in Table 4.

TABLE 4 – SUMMARY OF PLASTICITY INDEX (PI) DATA

Sample Reference & Location	Reported PI Value (%)	Portion Passing 425μm Sieve (%)	Modified PI Value (%)	Volume Change Potential
TP2, 1.00-1.30m (CLAY)	30	100	30	Medium
TP4, 1.10-1.60m (CLAY)	33	100	33	Medium
TP5, 0.80-1.20m (CLAY)	57	100	57	High
TP6, 1.75-2.00m (CLAY)	32	92	29	Medium
TP9, 1.70-2.20m (CLAY)	32	98	31	Medium
TP6, 0.55-0.95m (CLAY)	45	100	45	High

In accordance with NHBC Guidance, Table 5 reveals that the cohesive Clay soils analysed at the site may be regarded as being of medium to high volume change potential.

Loss on Ignition

Loss on ignition testing was undertaken on two samples of the peaty Clay encountered across the site. The analysis revealed loss on ignition values of between 3.4% and 9.5% for the peaty Clay. The results indicate that peaty Clay has the potential to be compressible and subject to peat wastage (i.e. biodegradation).

Remoulded Soaked California Bearing Ratio (CBR) Testing

Remoulded soaked California Bearing Ratio testing was undertaken on 4 No. samples of shallow Natural Strata across the site. The results of the recompacted CBR testing are summarised in Table 5 below. CBR values for the top and bottom of the remoulded soaked sample are recorded. The approximate locations of the CBR samples are shown on the plan presented in Appendix V (Figure No. D38056c/05).

TABLE 5 – SUMMARY OF LABORATORY CBR TEST RESULTS

Sample Ref.	Depth (m begl)	Initial Moisture Content (%)	CBR Value Sample Top (%)	CBR Value Sample Bottom (%)
LB1; TP2, 0.55-0.80m (CLAY)	0.55-0.80	43	0.9	1.8
LB2; TP4, 0.55-0.95m (CLAY)	0.55-0.95	31	0.7	1.4
LB3; TP5, 0.75-1.00m (CLAY)	0.75-1.00	64	0.2	0.3
LB4; TP6, 0.55-0.95m (CLAY)	0.55-0.95	28	0.5	0.9

6.3 Contamination Assessment Rationale

We understand that it is proposed to develop the site for a low-rise residential end-use incorporating private gardens.

Based on the development proposals, we have adopted a residential with plant uptake end-use scenario for the purposes of the contamination assessment.

6.4 Appropriate Guidance

Reference has been made to documents reflecting current good practice, including (but not limited to) the following:

- Environment Agency Contaminated Land Report 11 '*Model Procedures for the Management of Land Contamination*', September 2004, ISBN: 1844322955.
- British Standard BS10175:2011+A1:2013, '*Investigation of potentially contaminated sites. Code of practice*', March 2011.
- Nathanail, C.P., McCaffrey, C. Gillett, A.G. Ogden, R.C. and Nathanail, J.F 2015. '*The LQM/CIEH S4ULs for Human Health Risk Assessment. Land Quality Press, Nottingham. "Copyright Land Quality Management Limited reproduced with permission; Publication Number S4UL3026. All rights reserved.*"'
- DEFRA publication '*SP1010 – Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination*', Final Project Report (Revision 2), dated 24th September 2014 and Erratum dated December 2014.
- DEFRA publication '*SP1010 – Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination*' – Policy Companion Document, dated December 2014.
- EIC/AGS/CL:AIRE publication '*Soil Generic Assessment Criteria for Human Health Risk Assessment*', January 2010, ISBN 978-1-905046-20-1.
- Department of Environment, Food and Rural Affairs (DEFRA) and the Environment Agency publication – '*Contaminated Land Exposure Assessment (CLEA) model*' (March 2002).
- Environment Agency Science Report, '*Using Soil Guideline Values*', SC050021/SGV, March 2009.
- R & D Draft Technical Report P5-079/TR1 '*Review of the Fate and Transport of Selected Contaminants in the Soil Environment*' dated 2003.
- CL:AIRE/CIEH '*Guidance on Comparing Soil Contamination Data with a Critical Concentration*' (May 2008).
- Environment Agency Science Report SC050021/SR7 '*Compilation of Data for Priority Organic Pollutants for Derivation of Soil Guideline Values*', dated November 2008, ISBN 978-84432-964-9.
- Environment Agency Science Report Final SC050021/SR2 '*Human health toxicological assessment of contaminants in soil*', dated January 2009, ISBN 978-84432-858-1.
- Environment Agency Science Report SC050021/SR3 '*Updated technical background to the CLEA model*', dated January 2009, ISBN 978-84432-856-7.
- Environment Agency Science Report SC050021/SR4 '*CLEA Software (Version 1.05) Handbook*', dated September 2009, ISBN 978-1-84911-105-8.

6.4.1 Selection of Appropriate Tier 1 Screening Values

Generic Assessment Criteria (GAC)

The assessment of contaminated land in the UK was historically undertaken with reference to ICRCL Guidance Note 59/83 together with successive versions of the CLEA model (inc. CLEA2002 (2002), CLEA UK (2005), CLEA V1.03 beta (2008), CLEA V1.04 (January 2009), CLEA V1.05 (September 2009) and CLEA V1.06 (October 2009)).

The CLEA V1.06 model is a deterministic quantitative risk assessment (QRA) model, which has historically been utilised by the Environment Agency to produce Soil Guideline Values (SGVs) for several contaminants, and has been used and modified by the authors of the

LQM/CIEH S4UL publication and the authors of the DEFRA SP1010 series of documents in the derivation of their respective human health screening values.
Of key importance is the basis on which these two differing sets of commercially available screening criteria have been created, with the SP1010 values reflective of a '*Low Level of Toxicological Concern*' (LLTC) and the Suitable 4 Use Level (S4UL) values based on a '*Minimal Risk Level*' (MRL).

Based on our understanding of current good practice within the contaminated land field, we have adopted the S4UL values (representing a compatible approach to risk assessments undertaken since the initial derivation of the CLEA model, and based on an established and fully justifiable methodology) as our initial Generic Assessment Criteria (GAC) values for human health. In the absence of a suitable S4UL value (such as lead), reference has been made to the relevant C4SL, and these have been adopted where considered justifiable and as appropriate (further consideration of their use is provided below).

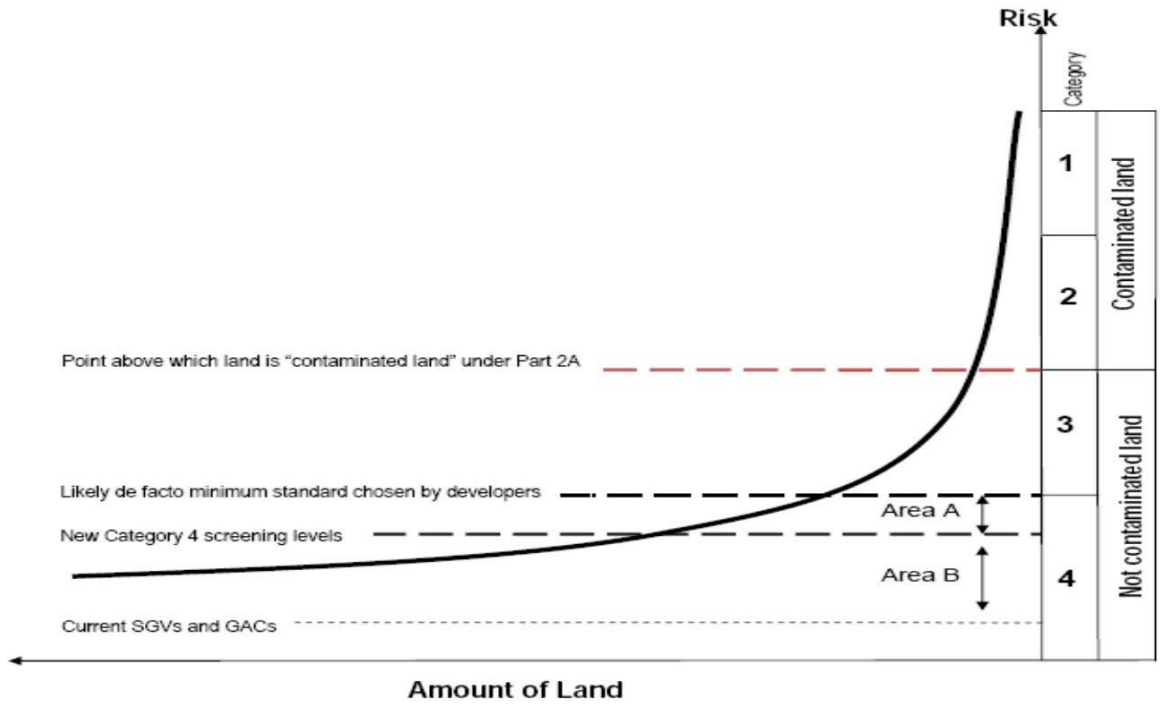
We would additionally note that other GAC values are commercially available, such as the Atkins ATRISKSOIL values (to which GeoDyne subscribe) and the EIC/AGS/CL:AIRE values for organic substances; and these have been referred to where relevant to the site.

Category 4 Screening Levels

Revised Statutory guidance for the assessment of land under Part 2A of the Environmental Protection Act 1990 was published by the Department for Environment, Food and Rural Affairs (Defra) in April 2012. The guidance introduced a new four-part category system for classifying land under Part 2A; Section 4.17 of the Guidance states:

'*In deciding whether or not land is contaminated land on grounds of significant possibility of significant harm to human health, the local authority should use the categorisations described in paragraphs 4.19 – 4.30...Categories 1 and 2 would encompass land which is capable of being determined as contaminated land on the grounds of significant possibility of harm to human health. Categories 3 and 4 would encompass land which is not capable of being determined on such grounds*'.

The foregoing categories are depicted in diagrammatical form in the following graph (taken from Defra publication SP1010):



Defra has subsequently commissioned the production of Category 4 Screening Levels (C4SLs) for a total of six substances (cadmium, benzo(a)pyrene, benzene, arsenic, lead and chromium VI), which are detailed within the SP1010 document titled '*Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination – Policy Companion Document*', dated March 2014. The C4SL values represent a level below which a contaminant concentration is considered to have a 'Low' risk to human health. The C4SL values are stated within the SP1010 document (page 7) as still remaining '*strongly precautionary*' and represent a more pragmatic approach to contaminated land risk assessment than the minimal risk values represented by the SGV/GAC levels.

In addition to the use of C4SLs in contaminated land risk assessment, the SP1010 document states the following with respect to background levels of contaminants:

'*The outputs of Defra-funded research to determine 'normal' background concentrations of various contaminants in England and Wales and the outputs of this research project to develop new screening levels for contaminants in soil, are both designed as tools to be used by contaminated land risk assessors to inform decisions about whether or not it is necessary to proceed to a Detailed Quantitative Risk Assessment (DQRA) on a particular site taking into account the broad aims of the regime as set out in Section 1 of the Statutory Guidance. Questions have been raised about how these tools relate and interact.*

41. Ultimately, it is up to individual risk assessors to make the most appropriate decisions on a site-by-site basis and to use the most appropriate tools in each case. However, with reference to the Part 2A Statutory Guidance, which states that 'normal' background concentrations should not be considered to cause a site to be determined as contaminated under Part 2A unless there is a reason to consider otherwise, it is envisaged that, where available, Category 4 Screening Levels should be the initial value against which site concentrations can be compared. Where a value on a particular site exceeds the Category 4 Screening Level for that substance, reference can then be made to the normal background concentration for that contaminant in that area.

If concentrations are higher than the relevant Category 4 Screening Level but within 'normal' background concentrations for that area, it is not envisaged that a site would be determined as contaminated under Part 2A (unless there was a reason to consider otherwise).

42. The British Geological Survey has derived 'normal' background concentrations for lead for England and Wales. In England, the 'normal' background concentrations of lead are 180 mg/kg for the 'principal' domain, 2,400 mg/kg for the 'mineralisation' domain and 820 mg/kg for the 'urban' domain (Defra, 2012) (see table below). In Wales the 'normal' background concentrations are 230 mg/kg for the 'principal' domain, 280 mg/kg for the 'mineralisation' domain and 890 - 1300 mg/kg for the 'urban' domain (Defra, 2013). Current advances in our understanding of the toxicology of lead have resulted in Category 4 Screening Levels for Residential, Allotments and Public Open Space 1 that are lower than the 'normal' background concentration of lead in ***urban*** *areas. This was also the case for the (now withdrawn) Soil Guideline Value for lead of 450 mg/kg.*

43. The report identifies other relevant considerations that may have a bearing on the final choice of Category 4 Screening Levels and the background level in soil is one of these. A pragmatic approach for lead would be to recommend the use of the 'normal' background concentration when the land use and domain permit (for example, providing other site and contaminant specific characteristics such as chemical form, bioavailability, soil depth, site use, etc. are comparable between the background and the site under investigation) so as not to disproportionately target land where there is widespread diffuse pollution of lead.

Normal background concentrations of contaminants in England

Substance	Principal domain	Urban domain	Mineralisation domain 1	Mineralisation domain 2	Ironstone	Chalk South
Arsenic	32 mg/kg		290 mg/kg		220 mg/kg	
Benzo-a-pyrene	0.5 mg/kg	3.6 mg/kg				
Cadmium	1.0 mg/kg	2.1 mg/kg	17 mg/kg	2.9 mg/kg		2.5 mg/kg
Lead	180 mg/kg	820 mg/kg	2400 mg/kg			

Where a valid Soil Guideline Value exists for a contaminant where a Category 4 Screening Level has also been derived, it is anticipated that risk assessors will use the Category 4 Screening Level in line with the Part 2A Statutory Guidance. In the absence of a suitable C4SL, risk assessors should identify and select appropriate generic assessment criteria in accordance with established good practice....'

The general approach indicated in the SP1010 document has been adopted in this report (as appropriate), although the C4SL values have been used as a second tier of risk assessment, due to the difference in the level of 'acceptable' risk between the various GACs (which we will adopt as the first tier of risk assessment) and the C4SLs.

National Planning Policy Framework (NPPF)

In relation to the requirements of a contaminated land risk assessment, the Department for Communities and Local Government publication titled '*National Planning Policy Framework*' (NPPF), dated March 2012, provides the following commentary:

'*121. Planning policies and decisions should also ensure that:*

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

The Defra SP1010 document states: '***The Part 2A Statutory Guidance and accompanying Impact Assessment were developed on the basis that Category 4 Screening Levels could be used under the planning regime, as they would be in Part 2A investigations directly***' [GeoDyne emphasis added].

Summary

Taking account of the foregoing, we consider that industry good practice is currently best represented by GAC (variously LQM/CIEH, Atkins ATRISKSOIL or EIC/AGS/CL:AIRE) that adopt a MRL as the foundation for its derivation. In the case of Lead (which is modelled on blood lead concentrations rather than typical exposure scenarios applicable to other contaminants), the relevant C4SL value has been adopted, as this incorporates the most up-to-date toxicological information in the derivation of the various end-use specific screening criteria.

In relation to the remaining C4SL values, these have been adopted as a second tier of generic assessment criteria, and will be utilised where the GAC has been exceeded at a Tier 1 generic level and where justified in a site-specific context. Whilst representing a LLTC, the C4SL values are considered to represent a suitably conservative assessment tool, given that they fall comfortably within Category 4.

In the following sections, screening criteria have collectively been referred to as Generic Assessment Criteria (GAC). The C4SL values have been referenced as such. The GAC/C4SL adopted herein, i.e. residential with plant uptake, are included in the table in Section 6.8.

6.4.2 Selection of Soil Organic Matter (SOM) Content

The SOM content and soil type are used to provide an assessment of the applicability of the Tier 1 GAC adopted (the GAC are typically based upon SOM of 1%, 2.5% and 6%, as applicable, with Defra C4SL based on the default assumption of a UK Sandy Loam soil with 6% SOM).

Determinands have in the first instance, been compared to GAC adopting a conservative SOM of 1%, or, in the absence of one of the former, a relevant C4SL value. Where the determinand exceeds the relevant GAC at 1% SOM, a site specific SOM may be adopted as appropriate to derive new GAC and the dataset reassessed.

6.4.3 Assessment Methodology

Taking account of the foregoing, an initial qualitative Tier 1 Soil Assessment has been undertaken to assess the soils at the site. We have adopted a policy whereby determinands within the dataset are individually compared to the relevant screening values.

Where determinands within the dataset are less than the appropriate Tier 1 GAC value the determinand is considered to be present at an acceptable concentration and no further assessment is required. However, where a determinand exceeds the relevant Tier 1 GAC value on at least one occasion further assessment is required and will be undertaken in accordance with CL:AIRE/CIEH '*Guidance on Comparing Soil Contamination Data with a Critical Concentration*'.

Further assessment will comprise a quantitative Tier 1 assessment to examine the contamination data set in more detail. The methodology for undertaking the statistical assessment is provided in Section 6.5 below.

6.5 Statistical Considerations

Statistical tests relating to contaminated land, typically referred to as a Mean and Maximum Value Tests, were detailed in Department for Environment, Food and Rural Affairs and The Environment Agency publication CLR 7 '*Assessment of Risks to Human Health From Land Contamination: An Overview of the Development of Soil Guideline Values and Related Research*', dated 2002, ISBN 1-857-05732-5.

This guidance was superseded by publication of CL:AIRE/CIEH '*Guidance on Comparing Soil Contamination Data with a Critical Concentration*' dated May 2008.

6.5.1 Null and Alternative Hypothesis

In consideration of statistical guidance jointly published by CL:AIRE/CIEH *'Guidance on Comparing Soil Contamination Data with a Critical Concentration'*, statistical convention requires consideration of the Null Hypothesis (expressed as H_o) or an Alternative Hypothesis (expressed as H_1). Appropriate statistical tests are then applied to the data to assess whether the strength of evidence favours the Null or the Alternative Hypothesis.

For the purpose of the following contamination assessments and in accordance with the CL:AIRE/CIEH guidance the key question for the site is as follows.

Question - '*Is there sufficient evidence that the true mean concentration of a contaminant in soil (μ) is less than some critical concentration (Cc)?*'

The Null and Alternative hypotheses are therefore defined as follows.

The Null Hypothesis (H_o)

$\mu \geq Cc$ (i.e. Tier 1 or 2 Assessment Criteria).

The Alternative Hypothesis (H_1) (the question the selected statistical test is designed to answer)

$\mu < Cc$ (i.e. Tier 1 or 2 Assessment Criteria).

6.5.2 95th Percentile Upper Confidence Level Mean Values

The selected relevant statistical assessment undertaken to evaluate the Null and Alternative Hypotheses requires consideration of the 95th Percentile Upper Confidence Level Mean value (this is abbreviated as the UCL).

The UCL value takes account the number of samples tested, the data set mean and the standard deviation of the data set and applies a correction factor to take account of the uncertainty of the data set.

CL:AIRE/CIEH guidance states that '*…since the 95% UCL is at most times greater than the true population mean, it follows that if the 95% UCL is less than Cc, the assessor will know (with a defined high level of confidence) that the true population mean (μ, the value which is not known) is also likely to be less than Cc*'.

6.5.3 Considerations for Appropriate Dataset(s)

The CL:AIRE/CIEH statistical guidance requires consideration of the appropriateness of the dataset being subjected to the statistical testing and notes the following three key elements to be considered.

- Consideration of any non-detects within the dataset.
- Consideration of potential outliers within the dataset.
- Consideration of the statistical distribution of the data (i.e. normality/non normality).

6.5.4 Consideration of Normality of Dataset

CL:AIRE/CIEH statistical guidance notes that the choice of statistical test to be applied to the dataset will depend on the assumptions about the distribution of the data being tested. The assumptions of the statistical test adopted therefore must be appropriate to the distribution assumptions of the data being considered.

The CL:AIRE/CIEH statistical guidance details the following two key statistical tests.

- **The one-sample t test** - assumes the data being assessed is approximately normally distributed.
- **The one-sided Chebychev Theorem** - assumes the data being assessed does not demonstrate normality (method makes no assumption about the shape of the distribution).

CL:AIRE/CIEH statistical guidance, however notes '*…with large datasets, minor deviations from normality may be flagged as statistically significant even though small deviations from a normal distribution will not affect the reliability of the one sample t-test*'. The guidance goes on to note '*Conversely, datasets with a small sample size more easily pass normality tests.* ***Failing, however to detect non-normality in a small dataset is unlikely to compromise the validity of the one sample t-test*****'** [GeoDyne emphasis added].

CL:AIRE/CIEH statistical guidance further notes '*When considering which of the two tests to use, however, assessors should bear in mind that, in general, the one-sample t-test is more powerful that the method based on the Chebychev Theorem…****Given that the one sample t-test is also not sensitive to moderate departures from normality, it is recommended that assessors use the t-test unless there is good evidence that the dataset departs significantly from normality*****'** [GeoDyne emphasis added]**.**

On the basis of the above, an assumption of data normality has been made and the one-sample t-test adopted accordingly.

6.5.5 Consideration of Non-Detects within the Dataset

The dataset may reveal the presence of non-detects for a number of the determinands tested. Where this occurs, we have adopted the LOD (i.e. 1.0LOD) as the chemical concentration, which provides a suitably conservative approach. However, please note that GACs have only been used for determinands where they are present at concentrations in excess of the LOD on at least one occasion.

6.5.6 Consideration of Outliers

The CL:AIRE/CIEH statistical guidance advises that '…*if outliers are identified, assessors have to decide whether they represent genuine soil concentrations or are the result of an error'*.

The guidance further notes that outliers should only be excluded from a dataset where they '…*are obviously and demonstrably the result of an error that can be identified and explained'* or *'…clearly indicate that more than one soil population exists within the dataset and this can be justified by (or informs the further development of) the conceptual model- in which case the different population expressed by the outlier(s) should be explored in more detail*'.

Taking account of the foregoing, we have adopted a policy of interrogating the relevant dataset to calculate the UCL and to ascertain the possible presence of statistical outliers (where relevant). At this point the possible relevance of statistical outliers to the interpretation of the data is considered, in accordance with the following matrix.

TABLE 6 – OUTLIER DECISION MATRIX

	UCL < GAC	UCL > GAC
Outlier Test reveals No Hotspot(s)	Determinand present at acceptable concentrations.	Pervasive contamination present in soil at unacceptable concentrations.
Outlier Test reveals Hotspot(s)	Determinand present at acceptable concentrations. Possible second population identified. Only of potential concern where outlier is at an individual concentration in excess of the Tier 1 GAC.	Pervasive contamination present in soil at unacceptable concentrations with possible hotspots of contamination identified.

6.5.7 CLEA Averaging Area

The CLEA Model requires consideration of an averaging area, i.e. an area within which the UCL is calculated and compared to the Tier 1 GAC. Within our assessments (where appropriate) the entire site has been adopted as the averaging area, in the first instance.

6.6 Sampling Strategy

Our sampling strategy is based on a review of the historical, geological and environmental information obtained as part of our Phase I Desk Study, together with the current site setting and the ground conditions encountered during our Phase II exploratory works, taking account of the proposed end-use.

No specific areas of concern were identified at the site with respect to ground contamination, other than the potential for contamination of the near surface soils from the use of pesticides associated with the growing of crops and the former small structures in an enclosure in the northwestern corner of the site.

Therefore, it was considered appropriate to position the exploratory holes to provide general site coverage.

Table 7 summarises the reasoning behind the exploratory hole positions.

TABLE 7 – REASONING FOR EXPLORATORY HOLE LOCATION	
Exploratory Hole Reference	Reasoning Behind Location
TP1 – TP14, SA1 – SA3	General site coverage
TP1	Positioned in the area of the former enclosure adjacent to the small structures in the northwestern corner of the site.
BH1 – BH3	General site coverage and to install a series of ground gas and water monitoring points
Key TP – Trial Pit SA – Soakaway Pit BH – Cable Percussive Boreholes	

The ground conditions encountered during our Phase II works revealed the presence of two distinct types of material i) Topsoil and ii) the underlying Natural Strata.

Representative samples were obtained during our Phase II works and subjected to chemical analysis for a suite of contaminants deemed appropriate based on the land use assessment.

6.7 Contamination Analysis

A total of 7 No. standard chemical contamination tests (including speciated PAH and TOC) were carried out on selected soil samples obtained during the site works, which comprised 4 No. tests of the topsoil and 3 No. tests of the underlying Natural Strata.

Pesticide screening was undertaken on 3 No. samples of the Topsoil recovered from the site.

For initial assessment purposes, we have combined the results into two datasets, for individual comparison of the reported determinand concentrations against appropriate Tier 1 GAC, namely Topsoil and underlying undisturbed Natural Strata.

6.8 Contamination Soil Test Results

6.8.1 Topsoil

The contamination assessment for the samples of Topsoil analysed at the site is summarised in Table 8.

TABLE 8 – SUMMARY OF TIER 1 GENERIC ACCEPTANCE CRITERIA DATA ASSESSMENT (RESIDENTIAL WITH PLANT UPTAKE END-USE)						
Contaminants – Potentially Harmful to Human Health	No. of Samples Tested	Concentration Range (mg/kg)	Tier 1 GAC (mg/kg)	C4SL (mg/kg)	UCL (mg/kg)	Tier 1 GAC Exceeded (Yes/No)
Metals						
Arsenic	4	10 – 14	37 $_{S4UL}$	37	NA	No
Cadmium	4	0.8 – 0.9	11 $_{S4UL}$	22	NA	No

Copper	4	16 – 23	2400 S4UL	-	NA	No
Chromium III	4	41 - 44	910 S4UL	-	NA	No
Lead	4	28 - 48	200 C4SL	200	NA	No
Nickel	4	33 - 36	130 S4UL	-	NA	No
Mercury	4	<0.17 – 0.85	40 S4UL	-	NA	No
Selenium	4	2 – 2	250 S4UL	-	NA	No
Zinc	4	71 - 89	3700 S4UL	-	NA	No

Key
S4UL – CIEH/LQM Suitable 4 Use Levels (2015). Copyright Land Quality Management Limited reproduced with permission; Publication Number S4UL3026. All rights reserved.
C4SL – values for Arsenic, Cadmium and Lead taken from DEFRA publication SP1010 and based on a residential (with home-grown produce) end-use.
NA – UCL not applicable as all individual concentrations are present at concentrations individually below the GAC.

All of the determinands assessed were present either at individual concentrations below the Limit of Detection of the method of analysis adopted by the laboratory or below the appropriate Tier 1 GAC based on a residential with plant uptake end-use.

6.8.2 Natural Strata

The contamination assessment for the samples of Natural Strata analysed at the site is summarised in Table 9.

TABLE 9 – SUMMARY OF TIER 1 GENERIC ACCEPTANCE CRITERIA DATA ASSESSMENT (RESIDENTIAL WITH PLANT UPTAKE END-USE)

Contaminants – Potentially Harmful to Human Health	No. of Samples Tested	Concentration Range (mg/kg)	Tier 1 GAC (mg/kg)	C4SL (mg/kg)	UCL (mg/kg)	Tier 1 GAC Exceeded (Yes/No)
Metals						
Arsenic	3	8 – 21	37 S4UL	37	NA	No
Cadmium	3	<0.5 – 0.8	11 S4UL	22	NA	No
Copper	3	5 – 11	2400 S4UL	-	NA	No
Chromium III	3	23 – 36	910 S4UL	-	NA	No
Lead	3	9 – 21	200 C4SL	200	NA	No
Nickel	3	20 – 34	130 S4UL	-	NA	No
Selenium	3	<1 – 2	250 S4UL	-	NA	No
Zinc	3	53 – 76	3700 S4UL	-	NA	No

Key
S4UL – CIEH/LQM Suitable 4 Use Levels (2015). Copyright Land Quality Management Limited reproduced with permission; Publication Number S4UL3026. All rights reserved.
C4SL – values for Arsenic, Cadmium and Lead taken from DEFRA publication SP1010 and based on a residential (with home-grown produce) end-use.
NA – UCL not applicable as all individual concentrations are present at concentrations individually below the GAC.

All of the determinands assessed were present either at individual concentrations below the Limit of Detection of the method of analysis adopted by the laboratory or below the appropriate Tier 1 GAC based on a residential with plant uptake end-use.

6.9 Pesticide Screening

Three samples of the topsoil from across the site were screened for a suite of pesticides by the laboratory as part of the contamination assessment. The results revealed individual concentrations below the Limit of Detection of the method of analysis adopted by the laboratory (0.2 mg/kg).

6.10 Contamination Assessment Summary

Contamination testing was carried out on selected samples of the Topsoil and the underlying Natural Strata. It was considered appropriate to base our sampling and investigation strategy on the potential contamination issues identified within our land use assessment taking into account the proposed end-use and the historical and existing use of the site.

On the basis of the chemical contamination assessment undertaken, the soils may be considered to be uncontaminated for the proposed residential with plant uptake end-use (i.e. in relation to human health).

We would additionally note that no visual or olfactory evidence of significant contamination (such as by hydrocarbons or asbestos) was identified during the course of the exploratory investigation works. No Made Ground materials (such as containing demolition materials) were encountered within the soils encountered at the site, including in the trial pit (TP1) excavated in the area of the former enclosure which historically contained small structures (of unknown construction).

Given the low contaminant concentrations revealed by the testing, together with the generally low groundwater sensitivity of the area, there are considered to be no specific risks posed to Controlled Waters by the findings of the laboratory analysis undertaken.

7.0 CONCEPTUAL SITE MODEL

7.1 General

The DEFRA publication '*Environmental Protection Act 1990: Part 2A Contaminated Land Statutory Guidance*' (dated April 2012) states the following with regards to the production of a Conceptual Site Model (CSM) for a site:

'*The process of risk assessment involves understanding the risks presented by land, and the associated uncertainties. In practice, this understanding is usually developed and communicated in the form of a "conceptual model"*'. The development of a CSM is typically undertaken in an iterative process, reflecting the changes in understanding as more detailed site information becomes available.

In developing a CSM, and specifically in the context of land contamination, consideration needs to be given to three essential elements; which form the basis of any risk present. The statutory guidance sections 3.8 and 3.9 (April 2012) states the following with respect to Part 2A.

'Under Part 2A, for a relevant risk to exist there needs to be one or more contaminant-pathway-receptor [CPR] *linkages – "contaminant linkage" – by which a relevant receptor might be affected by the contaminants in question. In other words, for a risk to exist there must be contaminants present in, on or under the land in a form and quantity that poses a hazard, and one or more pathways by which they might significantly harm people, the environment, or property; or significantly pollute controlled waters. For the purposes of this guidance:*

(a) A "contaminant" is a substance which is in, on or under the land and which has the potential to cause significant harm to a relevant receptor, or to cause significant pollution of controlled waters.
(b) A "receptor" is something that could be adversely affected by a contaminant, for example a person, an organism, an ecosystem, property, or controlled waters. The various types of receptors that are relevant under the Part 2A regime are explained in later sections.
(c) A "pathway" is a route by which a receptor is or might be affected by a contaminant.

The term "contaminant linkage" means the relationship between a contaminant, a pathway and a receptor. All three elements of a contaminant linkage must exist in relation to a particular land before the land can be considered potentially to be contaminated land under Part 2A, including evidence of the actual presence of contaminants. The term "significant contaminant linkage", as used in this Guidance, means a contaminant linkage which gives rise to a level of risk sufficient to justify a piece of land being determined as contaminated land. The term "significant contaminant" means the contaminant which forms part of a significant contaminant linkage.'

With respect to the presence of background levels of contaminants, section 3.21 to 3.23 states '*The Part 2A regime was introduced to help identify and deal with land which poses unacceptable levels of risk. It was not intended to apply to land with levels of contaminants in soil that are commonplace and widespread throughout England or parts of it, and for which in the very large majority of cases there is no reason to consider that there is an unacceptable risk.*

Normal levels of contaminants in soil should not be considered to cause land to qualify as contaminated land, unless there is a particular reason to consider otherwise. Therefore, if it is established that land is at or close to normal levels of particular contaminants, it should usually not be considered further in relation to the Part 2A regime...

For the purpose of this Guidance, "normal" levels of contaminants in soil may result from:

(a) The natural presence of contaminants (e.g. caused by soil formation processes and underlying geology) at levels that might reasonably be considered typical in a given area and have not been shown to pose an unacceptable risk to health or the environment.
(b) The presence of contaminants caused by low level diffuse pollution, and common human activity other than specific industrial processes. For example, this would include diffuse pollution caused by historic use of leaded petrol and the presence of benzo(a)pyrene from vehicle exhausts, and the spreading of domestic ash in gardens at levels that might reasonably be considered typical.'

In selecting appropriate generic assessment criteria Section 3.27 of the Guidance states:

'It is common practice in contaminated land risk assessment to use "generic assessment criteria" (GACs) as screening tools in generic quantitative human health risk assessment to help assessors decide when land can be excluded from the need for further inspection and assessment, or when further work would be warranted'.

With respect to assessing contaminated land, section 4.17 of the Guidance states:

'In deciding whether or not land is contaminated land on grounds of significant possibility of significant harm to human health, the local authority should use the categorisations described in paragraphs 4.19 – 4.30 below. Categories 1 and 2 would encompass land which is capable of being determined as contaminated land on the grounds of significant possibility of harm to human health. Categories 3 and 4 would encompass land which is not capable of being determined on such grounds.'

In relation to the use of GAC values in the assessment of contaminated land, section 3.29 of the Guidance states:

'GACs relating to human health risk assessment represent cautious estimates of levels of contaminants in soil at which there is considered to be no risk to health or, at most, a minimal risk to health. With regards to such GACs:

(a) They may be used to indicate when land is very unlikely to pose a significant possibility of significant harm to human health. This is on the basis that they are designed to estimate levels of contamination at which risks are likely to be negligible or minimal and far from posing a significant possibility of significant harm to human health.
(b) They should not be used as direct indicators of whether a significant possibility of significant harm to human health may exist. Also, the local authority should not view the degree by which the GACs are exceeded (in itself) as being particularly relevant to this consideration, given that the degree of risk posed by land would normally depend on many factors other than simply the amount of contaminants in soil.
(c) They should not be seen as screening levels which describe the boundary between Categories 3 and 4 in terms of Section 4 (i.e. the two Categories in which land would not be contaminated land on grounds of risk to human health). In the very large majority of cases, these SGVs/GACs describe levels of contamination from which risks should be considered to be comfortably within Category 4.

(d) They should not be viewed as indicators of levels of contamination above which detailed risk assessment would automatically be required under Part 2A.
(e) They should not be used as generic remediation targets under the Part 2A regime. Nor should they be used in this way under the planning system, for example in relation to ensuring that land affected by contamination does not meet the Part 2A definition of contaminated land after it has been developed.'

In undertaking a risk assessment and deriving a CSM for the purposes of the redevelopment of a site (i.e. planning and development control) reference has been made to both the Model Procedures for the Management of Land Contamination, as well as the National Planning Policy Framework (NPPF, dated March 2012). Reference has also been made to the Contaminated Land Statutory Guidance (referenced above), although this is primarily concerned with Local Government determinations of Statutory '*Contaminated Land*', which is separate to planning framework requirements.

7.2 Contaminant-Pathway-Receptor [CPR] Considerations

The following CPR assessment has been undertaken based on the assumption of a residential with plant uptake end-use for the proposed development.

7.3 Consideration of Potential Sources of Contamination [C]

Based on the findings of our works, the potential key sources of contamination at the site are considered to be the following:

- Metals or metalloids associated with any Made Ground.
- Polycyclic Aromatic Hydrocarbons (PAHs) from any ashy inclusions and/or carbonaceous inclusions in the near surface soils.
- Asbestos possibly associated with the former structures in the northwest corner of the site (if present).
- Pesticides associated with the growing of crops.
- Hazardous ground gases (i.e. methane and carbon dioxide) associated with on and off-site sources.

With regard to the former small structures within the enclosure in the northwest corner of the site (as indicated on the 1880s and 1900s historical maps), the construction materials used are not known. The trial pit excavated closest to these former structures (TP1) did not encounter any Made Ground materials, such as containing demolition materials, only natural soils. In view of this, no asbestos testing was carried out on the samples of natural soils collected from this area.

In addition, consideration has also been given to the following:

- Radon.
- Sulphate/Acid conditions (mainly for constructional reasons).

7.4 Consideration of Potential Pathways [P]

The potential pathways at the site are primarily:

- Direct ingestion of soil.
- Inhalation of dust and vapours.
- Direct skin contact with the ground.
- Direct ground contact with building materials.

- Direct ingestion of home-grown produce.
- Vertical and lateral migration of contamination.
- Vertical and lateral migration of potentially hazardous ground gases/vapours.

7.5 Consideration of Potential Receptors [R]

The potential receptors at the site are:

- The construction personnel (i.e. site workers) involved with the development of the site (typically short term (acute) exposure).
- The final end users (i.e. residents - typically long term (chronic) exposure or site visitors (typically acute exposure).
- Controlled Waters (i.e. underlying groundwater, open drainage ditches).
- Neighbouring properties (off-site receptors).
- Buildings/construction materials (including buried utilities).

7.6 Summary

GeoDyne Limited's conceptual site model of possible CPR pollutant linkages, applicable to the proposed site usage and based on the information currently available, is summarised in Table 10.

TABLE 10 – SUMMARY OF CPR ASSESSMENT

Contaminant	Pathway	Receptor	Comments	Plausible Pollutant Linkage	Possible Mitigation	Possible Statutory 'Contaminated Land' following mitigation
Contaminated Soils	*Direct Ingestion / Direct Contact*	*Site Workers*	The soils may be regarded as uncontaminated, based on a residential with plant uptake end-use and the testing undertaken.	No	No contamination has been identified that requires specific PPE.	No
Contaminated Soils	*Inhalation of Dust and Vapours*	*Site Workers*	The soils may be regarded as uncontaminated, based on a residential with plant uptake end-use and the testing undertaken.	No	No contamination has been identified that requires specific PPE.	No
Contaminated Soils	*Direct Ingestion / Direct Contact*	*End Users (Residents & Site Visitors)*	The soils may be regarded as uncontaminated, based on a residential with plant uptake end-use and the testing undertaken.	No	None required.	No
Contaminated Soils	*Inhalation of Dust and Vapours*	*End Users (Residents & Site Visitors)*	The soils may be regarded as uncontaminated, based on a residential with plant uptake end-use and the testing undertaken. Following development, generation of significant levels of dust on a chronic basis unlikely.	No	None required.	No
Contaminated Soils	*Vertical and Lateral Migration*	*Neighbouring properties (off site receptors)*	No sources of potentially mobile contamination have been identified.	No	None required.	No
Contaminated Soils	*Vertical and Lateral*	*Controlled Waters*	The site is underlain by unproductive strata and	No	No specific mitigation required, based on the	No

TABLE 10 – SUMMARY OF CPR ASSESSMENT						
Contaminant	Pathway	Receptor	Comments	Plausible Pollutant Linkage	Possible Mitigation	Possible Statutory 'Contaminated Land' following mitigation
	Migration		does not lie within a designated SPZ. The closest surface water features are indicated to be the drainage ditches which define the northern and southern site boundaries. The concentrations of determinands detected are considered unlikely to represent a significant risk to controlled waters.		findings of the works undertaken.	
Water Soluble Sulphate/Acid Contaminated Soils	*Direct Contact*	*Building Materials*	Design Class DS-2/ACEC Class AC-3z. (BRE Spec. Digest 1:2005).	*Yes*	Adopt appropriate concrete mix for all concrete in contact with the ground.	No
Radon	*Vertical and Lateral Migration*	*Site Users & Building Envelope*	Based on the Desk Study works, the site does not lie within an area affected by radon.	No	No specific precautions required in proposed dwellings.	No
Ground Gases	*Vertical and Lateral Migration*	*Site Users & Building Envelope*	Characteristic Situation 'CS1' based on the gas monitoring programme carried out.	No	Based on the monitoring undertaken, no specific precautions required in the proposed buildings.	No

KEY

Where text is in ***Bold Italic*** item is potentially present. Where normal text is used item is not present/plausible.

No - Pollutant linkage not plausible.
Yes - Pollutant linkage plausible, mitigation required.
? - Insufficient information, further work necessary.
The requirement for mitigation is subject to review and confirmation by the appropriate regulatory authority.

In the foregoing CPR assessment, determinands identified by chemical analysis are only considered to be contaminated with respect to generic guidance where the determinand is present at concentrations above the respective screening criteria.

8.0 CONCLUSIONS & RECOMMENDATIONS

8.1 Site Summary

At the time of our works, the site effectively comprised an approximately flat field with short vegetation and plant / crop remains.

8.2 Site History

Based on the reviewed historical information, the site has essentially remained an undeveloped field. The only historical features present on site were small structures and an enclosure in the northwestern corner of the site. These structures were shown on the 1880s and early 1900s historical maps and are assumed to be for agricultural use.

8.3 Site Geology

The site is indicated to be initially underlain by drift deposits comprising Nordelph Peat of Quaternary age and underlain at depth by Oxford Clay of Jurassic age.

8.4 Ground Conditions

TOPSOIL was encountered at the surface of all exploratory holes to depths of between 0.30m and 0.40m begl with an average thickness of approximately 0.30m.

Beneath the Topsoil, typically soft to firm and firm sandy CLAY (locally becoming gravelly at depths in the region of 1.20m begl) was encountered to depths of up to 3.00m begl. Sand/Gravel pockets were locally encountered within the Clay strata. Near surface fissures were locally encountered within the Clay strata.

Discrete layers of spongy fibrous PEAT with an average thickness of approximately 0.15m were typically encountered within the Clay strata including directly underlying the Topsoil to depths of up to 2.20m begl. Within the cable percussive boreholes, peaty CLAY and PEAT were typically encountered as pockets / layers within Clay strata to depths of up to 2.90m begl.

Medium dense clayey sandy GRAVEL and medium dense gravelly SAND were locally encountered underlying firm Clay strata.

Stiff sandy gravelly CLAY was encountered in the majority of the trial pits and in each of the cable percussive boreholes from depths of between 1.60m and 3.80m begl to the bases of the exploratory holes.

8.5 Foundation Design

Shallow footings such as strip / trench fill are considered not to be suitable for the proposed development due to the low geotechnical strength of the variable, organic, water bearing drift deposits across the site. Furthermore, the presence of Peat and peaty Clay within the drift deposits which was revealed by geotechnical testing to be potentially compressible and subject to peat wastage, is likely to preclude the use of a traditional raft design at the site.

On the basis of the foregoing, it is recommended that a piled foundation solution is adopted for the proposed dwellings at the site. Advice from a specialist piling contractor should be sought to confirm the depths of the piles and the most feasible and cost efficient type of pile to be used at the site.

8.6 Floor Slab Design

Given the presence of potentially compressible peat at relatively shallow depths, it is considered that ground bearing floor slabs are unlikely to be suitable at the site. In view of this and based on the proposed pile foundation solution, a suspended slab may be adopted which may be either cast in-situ or a pre-cast suspended floor with a clear ventilated void (i.e. beam and block / beam and thermal insulation infill floor).

8.7 Ground Gas Precautions

Based on the programme of ground gas monitoring undertaken, the site may be classified as Characteristic Situation 'CS1' in accordance with BS8485:2015. Therefore, these results indicate that no ground gas precautions (in relation to methane and carbon dioxide) would be necessary for the site.

8.8 Building Near Trees

The geotechnical laboratory test results have revealed the presence of predominantly cohesive soils across the site. Foundation designs will therefore need to be adjusted in full accordance with NHBC Standards Chapter 4.2 *'Building near trees'* where building near existing, proposed or recently removed trees. It is recommended that cohesive soils of a high volume change potential should be assumed for design purposes.

Assuming that a piled foundation solution is adopted for the proposed development, heave precautions should be incorporated into the design of ground beams.

8.9 Radon

No radon precautions are required at the site.

8.10 Water

The majority of exploratory holes encountered multiple slight and / or moderate water seepages from depths typically between 0.70m and 3.20m begl. Faster water flows were locally observed from fissures within the Clay strata.

Therefore, it is anticipated that excavations from depths typically in the region of 0.70m begl will likely require dewatering. This may involve sump pumping techniques, in the first instance, particularly where excavations are left open for a significant period of time.

Excavations may be susceptible to standing water following periods of wet weather. It should be noted that groundwater levels may vary due to seasonal or other effects.

8.11 Excavations / Stability

The sides of the majority of trial pits remained stable during excavation and for the short period of time they remained open following completion. Four trial pits became unstable when excavating below depths of between 2.20m and 2.70m begl. During advancement, the borehole sides were cased to depths of up to 4.50m begl to prevent collapse during their advancement through the drift deposits.

On the basis of the exploratory works, excavations are likely to require trench support for stability and health and safety reasons, particularly when excavating deeper than approximately 2.20m begl. The assessment of excavations and provision of support will be the responsibility of the contractor on site.

The natural cohesive soils may be subject to deterioration and softening if excavations are left open and exposed to wet weather. Any softened soils should be removed from excavations prior to the pouring of concrete.

8.12 Sulphate Classification

In accordance with BRE Special Digest 1:2005 the site falls into Design Sulfate Class DS-2 and an Aggressive Chemical Environment for Concrete (ACEC) classification of AC-3z, based on the assumption of natural ground conditions, and the presence of potentially mobile groundwater conditions beneath the site.

Therefore, an appropriate concrete mix should be adopted in accordance with BRE Special Digest 1 for all buried concrete in contact with the ground.

8.13 Coal Mining

No specific investigation or mitigation measures in relation to coal mining issues are considered to be necessary at the site.

8.14 California Bearing Ratios (CBRs)

The remoulded soaked CBR testing has revealed CBR values for the Natural Strata ranging between 0.2% and 1.8%.

8.15 Surface Water Drainage

The results from the programme of in-situ infiltration rate testing have indicated that traditional soakaways and permeable paving are unlikely to be viable for the site and it may be prudent to investigate alternative methods for draining the site, at this stage.

8.16 Contamination Assessment

Contamination testing was carried out on selected samples of the Topsoil and the underlying Natural Strata. It was considered appropriate to base our sampling and investigation strategy on the potential contamination issues identified within our land use assessment taking into account the proposed end-use and the historical and existing use of the site.

On the basis of the chemical contamination assessment undertaken, the soils may be considered to be uncontaminated for the proposed residential with plant uptake end-use (i.e. in relation to human health).

We would additionally note that no visual or olfactory evidence of significant contamination was identified during the course of the exploratory investigation works.

Given the low contaminant concentrations revealed by the testing, together with the generally low groundwater sensitivity of the area, there are considered to be no specific risks posed to Controlled Waters by the findings of the laboratory analysis undertaken.

8.17 Remediation Proposals

8.17.1 Proposed Garden Areas

It is considered that taking account of the current setting of the site and development proposals, human health is the principle driver for any remediation works based on the proposed residential end-use of the site.

The chemical analysis undertaken has revealed the site to be uncontaminated with respect to the determinands tested, based on a residential with plant uptake end-use. Therefore, no remediation works will be required.

It may be necessary to increase the thickness of topsoil around the root balls of trees to suit the proposed planting regime.

8.17.2 Proposed Areas of Hard Standing

Specific remedial measures are considered not necessary within areas of proposed hard standing at the site (i.e. external hard standing areas and beneath the floor slabs to the proposed dwellings).

8.17.3 Re-use of Existing Topsoil and Natural Strata

The existing topsoil is considered suitable for re-use within the proposed development. We would recommend that the existing topsoil is stripped and appropriately stockpiled prior to commencement of the development.

Furthermore, where there is an excess volume of topsoil, consideration should be given to re-use on other developments (subject to regulatory approval) rather than off-site disposal. Similarly, the Natural Strata may be regarded as suitable for re-use within proposed gardens as subsoil (to raise levels, as appropriate) or for landscaping / capping on alternative developments (subject to regulatory approval) where surplus arisings are generated from the site. Please note that further sampling and analysis may be required in due course where these options are to be investigated and a Materials Management Plan (MMP) prepared accordingly.

8.17.4 Off Site Disposal & Waste Acceptance Criteria Testing

If off-site disposal is required the chemical testing regime can be different to the chemical testing required to assess the suitability of the soils for retention on site and the risks to human health. Therefore, a separate contamination assessment may be required to include bespoke leachate analysis (i.e. Waste Acceptance Criteria [WAC] testing) to classify the soils for off-site disposal with testing criteria to assess whether the soil is hazardous, non-hazardous or inert waste. However, the existing chemical test data will assist this process.

If disposal is necessary then the environmental laboratory test results (included within Appendix VIII) should be provided to several landfill operators for consideration and cost provision in the first instance, prior to the material being removed from the site.

8.18 Flood Risk

The Landmark Envirocheck report has revealed the site to lie within an area identified as being at risk of flooding. It is recommended that advice be sought from a Drainage Consultant with respect to this matter.

8.19 Construction Workers

No contamination has been identified that requires specific PPE. However, it is recommended that construction personnel involved with direct contact with the soils at the site use appropriate PPE equipment (i.e. boots, gloves and overalls) together with hygiene facilities in accordance with general health and safety guidelines.

A copy of this report should be included in the site health and safety file, and site workers should be made fully aware of the sites setting.

8.20 Utilities

Prior to development of the site, we would recommend that a copy of this report is supplied to utility companies, and that their recommendations relating to appropriate supply pipes are adhered to.

8.21 Unforeseen Circumstances

Should any areas of potentially contaminated soil be encountered during site construction works we would recommend consultation with GeoDyne Limited to ensure that our recommendations continue to apply. Any potentially contaminated soils should be left in-situ and subjected to further assessment, to potentially include further chemical testing and risk assessment.

The following procedure should be adhered to if any areas of previously unidentified suspected contamination are encountered during the development of the site:

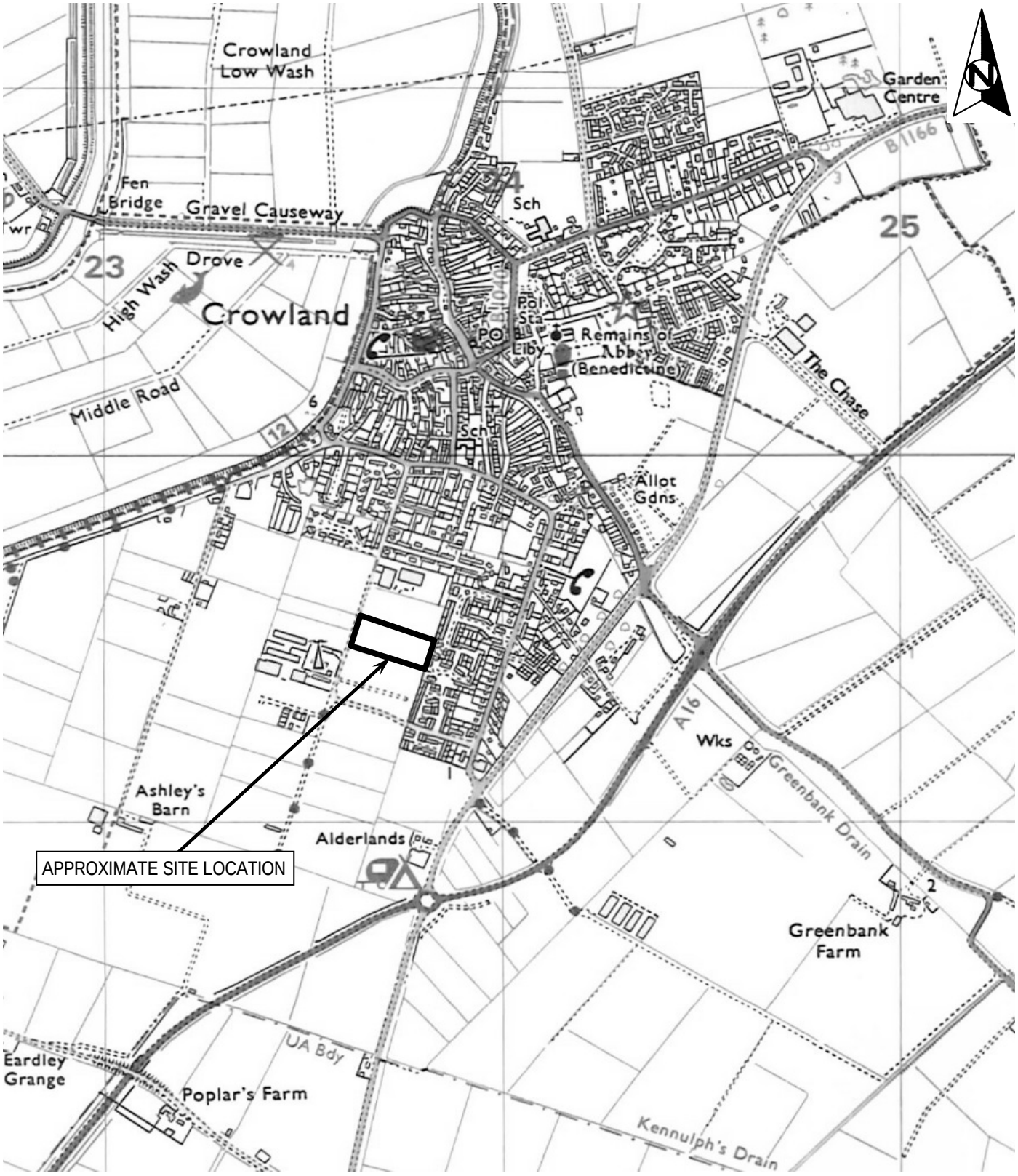
i. Suspected contaminated material will remain in-situ.
ii. GeoDyne Limited to be notified. We will then undertake a visual assessment of the possible contamination, followed by appropriate sampling/testing (as necessary).
iii. If necessary, an appropriate strategy to remove/remediate the contamination will be submitted to the Local Authority.

8.22 Licences, Permits, Registrations, Plans & Approvals

The Contractor/Developer is responsible for, and must ensure that, all necessary licenses, permits, plans, registrations and approvals are in place prior to commencing with the earthworks at the site. These will include any Materials Management Plans (MMPs), Site Waste Management Plans (SWMPs) and/or Environmental Permits/Exemptions as necessary to enable the completion of the proposed works.

APPENDIX I

Site Location Plan
(Figure No. D38056c/01)



Do Not Scale

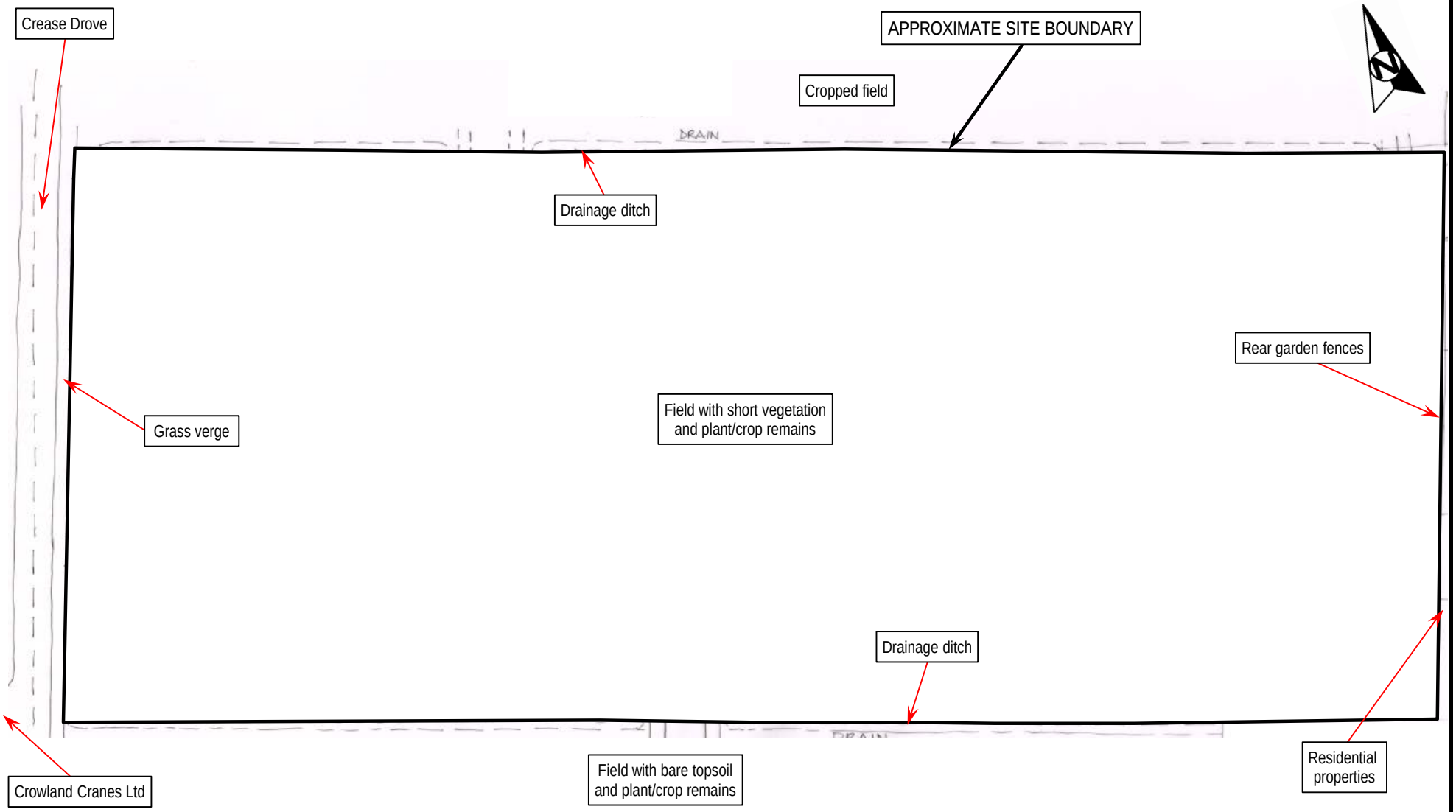
REPRODUCED FROM THE ORDNANCE SURVEY MAP WITH THE PERMISSION OF THE CONTROLLER OF HER MAJESTY'S STATIONERY OFFICE. CROWN COPYRIGHT RESERVED. LICENCE NO. LAN 1001274

Project No.	D38056c	Drawn	CB
Client	Ashwood Homes	Checked	DB
Project	Joyce - Crease Drove Crowland	Approved	PK
		Scale	NTS
		Date Drawn	02/07/2018
Title	Site Location Plan	Rev.	
		Figure No.	D38056c/01

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APPENDIX II

Annotated Site Plan
(Figure No. D38056c/02)



REPRODUCED FROM THE DRAWING ENTITLED 'FEASIBILITY LAYOUT'. PRODUCED BY NKW DESIGN, DRAWING REF 1233-001, DATED MAR 2018. REPRODUCED AND EDITED WITH THE PERMISSION OF THE CLIENT.

Project No.	D38056c	Title	Annotated Site Plan	Drawn	CB
Client	Ashwood Homes			Checked	DB
Project	Joyce - Crease Drove Crowland	Date Drawn	02/07/2018	Approved	PK
		Scale	NTS	Figure No.	D38056c/02
		Revision			

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APPENDIX III

Site Plan Showing General Site Views
(Figure No. D38056c/03)







APPROXIMATE SITE BOUNDARY





REPRODUCED FROM THE DRAWING ENTITLED 'FEASIBILITY LAYOUT'. PRODUCED BY NKW DESIGN, DRAWING REF 1233-001, DATED MAR 2018. REPRODUCED AND EDITED WITH THE PERMISSION OF THE CLIENT.

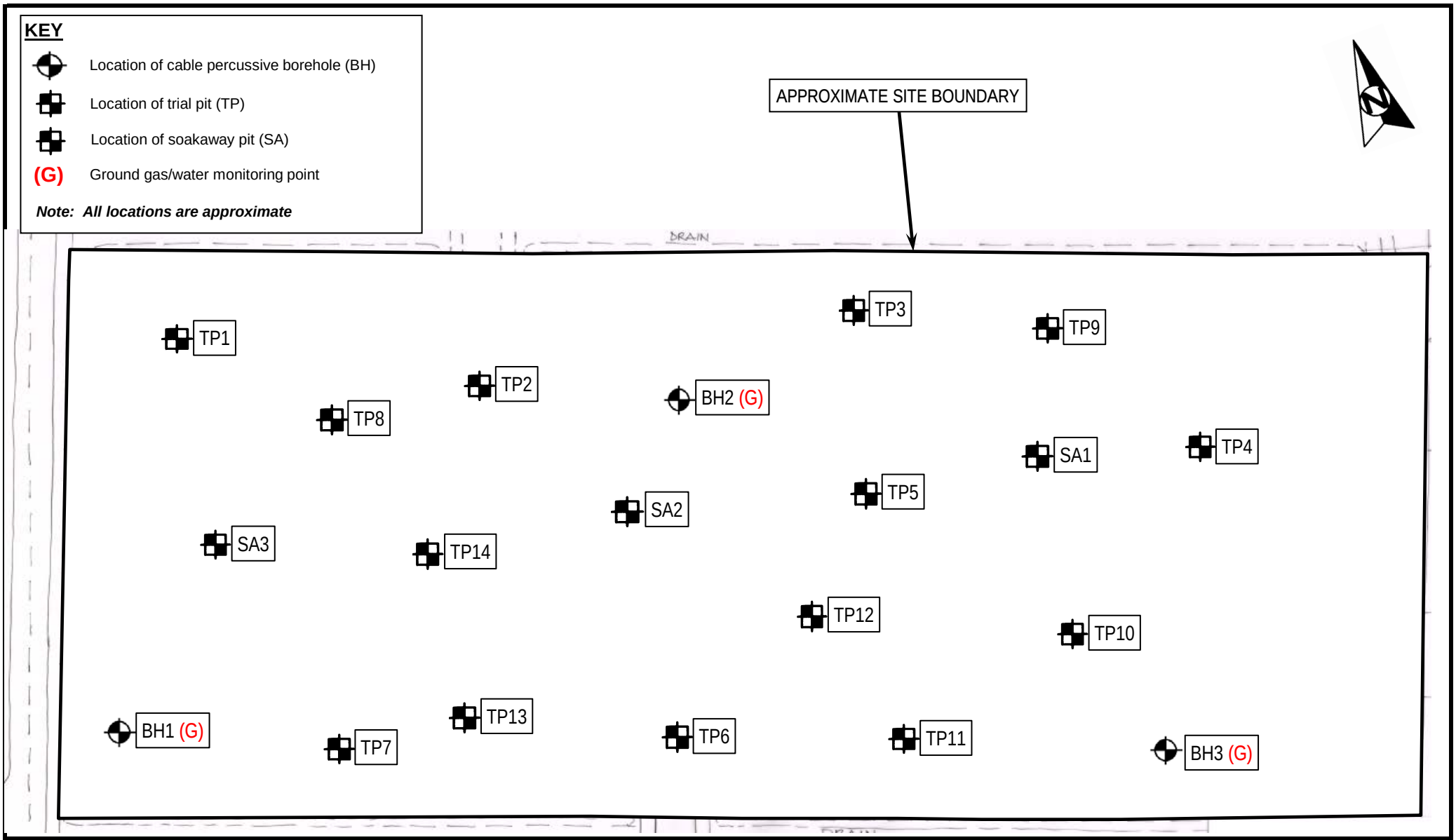
Project No.	D38056c	Title	Site Plan Showing General Site Views	Drawn	CB
Client	Ashwood Homes			Checked	DB
Project	Joyce - Crease Drove Crowland	Date Drawn	02/07/2018	Approved	PK
		Scale	NTS	Figure No.	D38056c/03
		Revision			

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APPENDIX IV

Exploratory Hole Location Plan
(Figure No. D38056c/04)



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Project No.	D38056c	Title	Annotated Site Plan	Drawn	CB
Client	Ashwood Homes			Checked	DB
Project	Joyce - Crease Drove Crowland	Date Drawn	02/07/2018	Approved	PK
		Scale	NTS	Figure No.	D38056c/04
		Revision			

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APPENDIX V

Laboratory CBR Test Location Plan
(Figure No. D38056c/05)

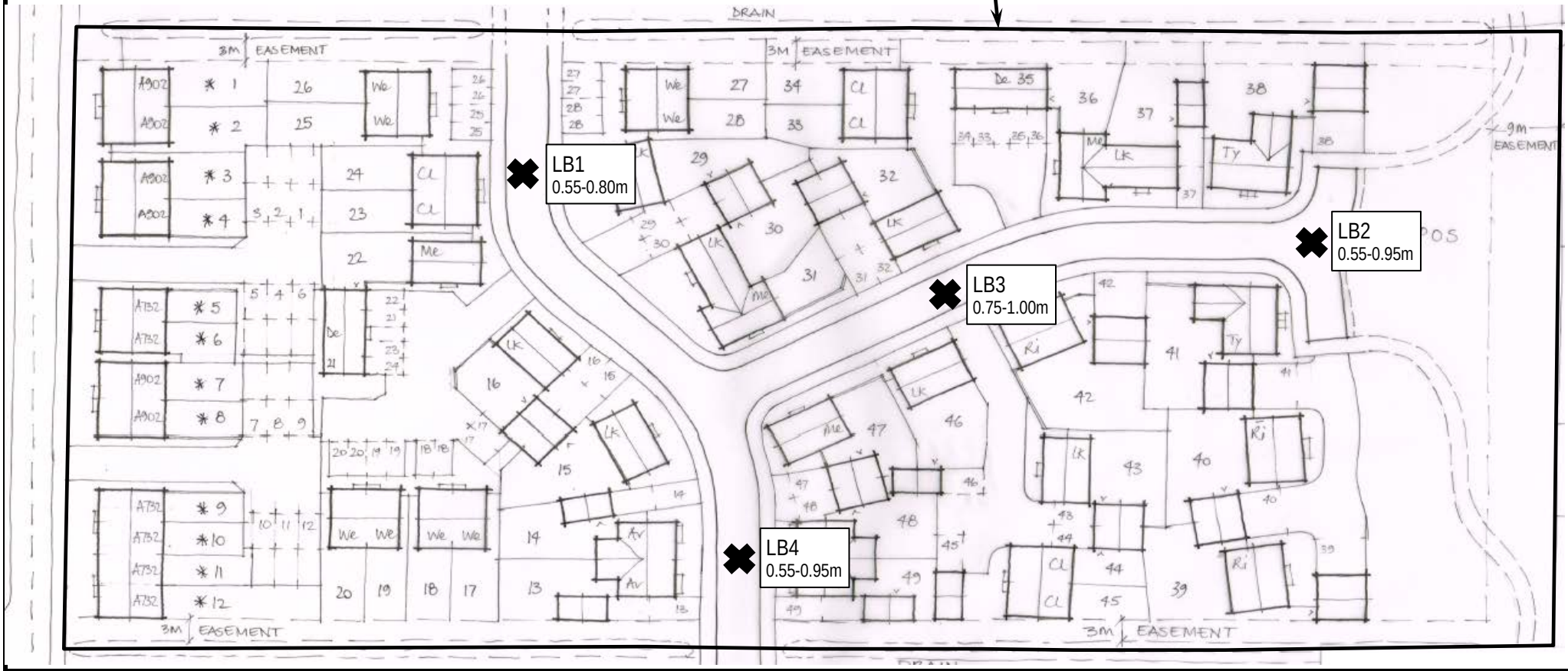
KEY

✖ Location of lab CBR test sample (LB)

0.55-0.80m Depth of lab CBR test sample

Note: All locations are approximate

APPROXIMATE SITE BOUNDARY



REPRODUCED FROM THE DRAWING ENTITLED 'FEASIBILITY LAYOUT'. PRODUCED BY NKW DESIGN, DRAWING REF 1233-001, DATED MAR 2018. REPRODUCED AND EDITED WITH THE PERMISSION OF THE CLIENT.

Project No.	D38056c	Title	Laboratory CBR Test Location Plan (based on proposed layout)	Drawn	CB
Client	Ashwood Homes			Checked	DB
Project	Joyce - Crease Drove Crowland	Date Drawn	02/07/2018	Approved	PK
		Scale	NTS	Figure No.	D38056c/05
		Revision			

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APPENDIX VI

Exploratory Hole Logs
(TP1 – TP14, SA1 – SA3, BH1 – BH3)

GeoDyne
9 Brunel Parkway, Pride Park, Derby DE24 8HR
Tel: 01332 290798
email: info@geodyne.co.uk

TP1

Project No: D38056c

Sheet 1 of 1

Description of Strata	Legend	Depth (m)	Sample Ref	Sample Type	Field Test Type	Field Test Result	Ground-water
Dark brown slightly sandy clayey very silty TOPSOIL (TOPSOIL)		0.10	T1	D			
Firm bluish grey mottled brown slightly sandy CLAY (UNDIFFERENTIATED DRIFT DEPOSITS)		0.30					
Spongey dark brown fibrous PEAT (UNDIFFERENTIATED DRIFT DEPOSITS)		0.40 0.45					
Firm bluish grey mottled brown slightly sandy CLAY (UNDIFFERENTIATED DRIFT DEPOSITS)		0.70			In-Situ SV	60 60 65	
...slightly gravelly very sandy clay pockets below 1.00m		1.00			In-Situ SV	60 70 70	
...frequent slightly gravelly fine to coarse sand layers/lenses below 1.50m ...becoming less mottled with depth ...orange-brown sandy medium to course gravel pocket between 1.80m and 2.40m							▼
Stiff bluish grey mottled brown slightly sandy CLAY (OXFORD CLAY)		2.00 2.10	T2	D	Ex-Situ SV	100 104 110	
...subrounded flint boulder ~0.40m at approximately 2.30m							▼
End of Trial Pit at 3.00m		3.00					

Remarks:

1.Sides generally stable.
2.Slight water seepages encountered at 2.00m and 2.90m.

Key: B = Bulk Sample D = Disturbed Sample W = Water Sample SV = Shear Vane (kN/m2) P = Penetrometer (kN/m2)
J = Jar Sample V = Vial Sample ▽ = Water Strike (m) ▼ = Steady Water Level (m)

Project: Joyce - Crease Drove, Crowland			**Client:** Ashwood Homes	
Logged: CB	**Checked:** DB	**Field Book Ref:** CB18/01	**Plant:** JCB 3CX	**Drawing No.** TP1
Date: 10/05/2018	**Approved:** PK		**Scale:** 1:25	

GeoDyne
9 Brunel Parkway, Pride Park, Derby DE24 8HR
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TP2

Project No: D38056c

Sheet 1 of 1

Description of Strata	Legend	Depth (m)	Sample Ref	Sample Type	Field Test Type	Field Test Result	Ground-water
Dark brown slightly sandy silty very clayey TOPSOIL (TOPSOIL)		0.20	TJ3	D/J			
Spongey dark brown fibrous PEAT (UNDIFFERENTIATED DRIFT DEPOSITS)		0.40 0.45					
Firm greenish grey mottled brown slightly sandy CLAY (UNDIFFERENTIATED DRIFT DEPOSITS)		0.55 - 0.80	LB1	LB			
Spongey dark brown fibrous PEAT (UNDIFFERENTIATED DRIFT DEPOSITS)		0.80					
Firm greenish grey mottled brown slightly sandy CLAY with occasional sand layers/lenses (~0.01m) (UNDIFFERENTIATED DRIFT DEPOSITS)		1.00 - 1.30 1.00	B1	B	In-Situ SV	50 54 64	▼
		1.50			Ex-Situ SV	60 70 70	▼
Medium dense yellowish brown clayey very sandy fine to coarse subrounded to subangular flint GRAVEL (UNDIFFERENTIATED DRIFT DEPOSITS)		1.70 1.80	T4	D			
Stiff bluish grey mottled brown slightly sandy CLAY (OXFORD CLAY)		2.30 2.40			Ex-Situ SV	100 100 102	
End of Trial Pit at 3.20m		3.20					

Remarks:

1.Sides generally stable.
2.Slight water seepages encountered at 1.00m and 1.40m.

Key: B = Bulk Sample D = Disturbed Sample W = Water Sample SV = Shear Vane (kN/m2) P = Penetrometer (kN/m2)
J = Jar Sample V = Vial Sample ▽ = Water Strike (m) ▼ = Steady Water Level (m)

Project: Joyce - Crease Drove, Crowland			**Client:** Ashwood Homes	
Logged: CB	**Checked:** DB	**Field Book Ref:** CB18/01	**Plant:** JCB 3CX	**Drawing No.** TP2
Date: 10/05/2018	**Approved:** PK		**Scale:** 1:25	

GeoDyne
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TP3

Project No: D38056c

Sheet 1 of 1

Description of Strata	Legend	Depth (m)	Sample Ref	Sample Type	Field Test Type	Field Test Result	Ground-water
Dark brown slightly sandy silty very clayey TOPSOIL (TOPSOIL)		0.20	T5	D			
Spongey dark brown fibrous PEAT (UNDIFFERENTIATED DRIFT DEPOSITS)		0.30					
Soft to firm greenish grey mottled brown slightly sandy CLAY (UNDIFFERENTIATED DRIFT DEPOSITS)		0.35					
		0.60	TJ6	D/J			
		0.70			In-Situ SV	40	▼
						40	
						50	▼
Spongey dark brown fibrous PEAT (UNDIFFERENTIATED DRIFT DEPOSITS)		0.90					
Firm to stiff bluish grey mottled brown slightly gravelly slightly sandy CLAY. Gravel is fine to course subrounded to subangular flint (UNDIFFERENTIATED DRIFT DEPOSITS)		1.20					
...clayey very sandy fine to course subrounded to subangular gravel lenses/pockets between 2.30m and 2.50m							
End of Trial Pit at 2.70m		2.70					

Remarks:

1.Trial pit collapsing when excavating below 2.40m.
2.Slight water seepage at 0.70m and moderate water seepage at 0.90m.

Key: B = Bulk Sample D = Disturbed Sample W = Water Sample SV = Shear Vane (kN/m2) P = Penetrometer (kN/m2)
J = Jar Sample V = Vial Sample ▽ = Water Strike (m) ▼ = Steady Water Level (m)

Project: Joyce - Crease Drove, Crowland			**Client:** Ashwood Homes	
Logged: CB	**Checked:** DB	**Field Book Ref:** CB18/01	**Plant:** JCB 3CX	**Drawing No.** TP3
Date: 10/05/2018	**Approved:** PK		**Scale:** 1:25	

GeoDyne
9 Brunel Parkway, Pride Park, Derby DE24 8HR
Tel: 01332 290798
email: info@geodyne.co.uk

TP4

Project No: D38056c

Sheet 1 of 1

Description of Strata	Legend	Depth (m)	Sample Ref	Sample Type	Field Test Type	Field Test Result	Ground-water
Dark brown slightly gravelly slightly sandy silty very clayey TOPSOIL (TOPSOIL)		0.20	TJ7	D/J			
Firm greenish grey slightly sandy silty CLAY (UNDIFFERENTIATED DRIFT DEPOSITS)		0.40 0.55 - 0.95 0.70	LB2	LB	In-Situ SV	58 60 60	
		1.00			In-Situ SV	48	
		1.10 - 1.60	B2	B		50 54	
Soft bluish grey slightly sandy silty CLAY (UNDIFFERENTIATED DRIFT DEPOSITS) ...very peaty between 1.90m and 2.10m		1.70 2.00			Ex-Situ SV	18 28 30	
Stiff bluish grey mottled brown slightly gravelly locally very sandy CLAY with occasional fine to coarse sand pockets/ lenses. Gravel is predominantly fine to medium flint (OXFORD CLAY) ...large sand pocket in eastern pit side between 2.70m to 3.00m, did not extend to western side		2.50 3.00			Ex-Situ SV	100 75 80	
End of Trial Pit at 3.20m		3.20					

Remarks:

1.Trial pit totally collapsing when excavating below 2.70m.
2.No water encountered.

Key: B = Bulk Sample D = Disturbed Sample W = Water Sample SV = Shear Vane (kN/m2) P = Penetrometer (kN/m2)
J = Jar Sample V = Vial Sample ▽ = Water Strike (m) ▼ = Steady Water Level (m)

Project: Joyce - Crease Drove, Crowland			**Client:** Ashwood Homes	
Logged: CB	**Checked:** DB	**Field Book Ref:** CB18/01	**Plant:** JCB 3CX	**Drawing No.** TP4
Date: 10/05/2018	**Approved:** PK		**Scale:** 1:25	

GeoDyne
9 Brunel Parkway, Pride Park, Derby DE24 8HR
Tel: 01332 290798
email: info@geodyne.co.uk

TP5

Project No: D38056c

Sheet 1 of 1

Description of Strata	Legend	Depth (m)	Sample Ref	Sample Type	Field Test Type	Field Test Result	Ground-water
Dark brown slightly sandy silty very clayey TOPSOIL (TOPSOIL)		0.10	TJ8	D/J			
		0.30					
Spongey dark brown fibrous PEAT (UNDIFFERENTIATED DRIFT DEPOSITS)		0.40					
Soft to firm greenish grey mottled brown slightly sandy CLAY (UNDIFFERENTIATED DRIFT DEPOSITS)		0.60					
Spongey dark brown fibrous PEAT (UNDIFFERENTIATED DRIFT DEPOSITS)		0.70					
Soft to firm greenish grey mottled brown slightly sandy very peaty CLAY (UNDIFFERENTIATED DRIFT DEPOSITS)		0.75 - 1.00	LB3	LB	In-Situ SV	28	
		0.75	B3	B		30	
		0.80 - 1.20				32	
...fissures from approximately 1.00m		1.00			In-Situ SV	52	▼
		1.20				60	
Spongey dark brown fibrous PEAT (UNDIFFERENTIATED DRIFT DEPOSITS)						62	
		1.35					▼
Firm bluish grey mottled brown slightly sandy slightly gravelly CLAY. Gravel is fine to coarse subrounded to subangular flint (UNDIFFERENTIATED DRIFT DEPOSITS)		1.50	T9	D	Ex-Situ SV	40	
						40	
						50	
End of Trial Pit at 1.80m		1.80					

Remarks:

1.Sides generally stable.
2.Moderate to fast water flows at 1.00m and 1.40m from fissures within clay strata.
3.Trial pit terminated due to water flow.

Key: B = Bulk Sample D = Disturbed Sample W = Water Sample SV = Shear Vane (kN/m2) P = Penetrometer (kN/m2)
J = Jar Sample V = Vial Sample ▽ = Water Strike (m) ▼ = Steady Water Level (m)

Project: Joyce - Crease Drove, Crowland			**Client:** Ashwood Homes	
Logged: CB	**Checked:** DB	**Field Book Ref:** CB18/01	**Plant:** JCB 3CX	**Drawing No.** TP5
Date: 10/05/2018	**Approved:** PK		**Scale:** 1:25	

GeoDyne
9 Brunel Parkway, Pride Park, Derby DE24 8HR
Tel: 01332 290798
email: info@geodyne.co.uk

TP6

Project No: D38056c

Sheet 1 of 1

Description of Strata	Legend	Depth (m)	Sample Ref	Sample Type	Field Test Type	Field Test Result	Ground-water
Dark brown slightly sandy silty very clayey TOPSOIL (TOPSOIL)		0.20	TJ10	D/J			
		0.40					
Sot to firm becoming firm greenish grey mottled brown slightly sandy silty CLAY (UNDIFFERENTIATED DRIFT DEPOSITS)		0.55 - 0.95	LB4	LB			
		0.70			In-Situ SV	40 50 50	
...fissures from approximately 0.80m		1.00			In-Situ SV	44 54 60	
		1.30					▼
Spongey dark brown fibrous PEAT (UNDIFFERENTIATED DRIFT DEPOSITS)		1.45					▼
Firm greenish grey occasional mottled brown slightly sandy slightly gravelly peaty CLAY. Gravel is fine to course subrounded to subangular flint (UNDIFFERENTIATED DRIFT DEPOSITS)		1.60	T11	D			
		1.75 - 2.00	B4	B			
Firm to stiff bluish grey mottled brown slightly sandy slightly gravelly CLAY. Gravel is fine to course subrounded to subangular flint (OXFORD CLAY)		1.75					
		2.00			Ex-Situ SV	62 72 95	
End of Trial Pit at 2.90m		2.90					

Remarks:

1.Sides generally stable.
2.Moderate and fast water flows at 1.30m and 1.45m from fissures within clay strata/peat.

Key: B = Bulk Sample D = Disturbed Sample W = Water Sample SV = Shear Vane (kN/m2) P = Penetrometer (kN/m2)
J = Jar Sample V = Vial Sample ▽ = Water Strike (m) ▼ = Steady Water Level (m)

Project: Joyce - Crease Drove, Crowland			**Client:** Ashwood Homes	
Logged: CB	**Checked:** DB	**Field Book Ref:** CB18/01	**Plant:** JCB 3CX	**Drawing No.** TP6
Date: 10/05/2018	**Approved:** PK		**Scale:** 1:25	

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TP7

Project No: D38056c

Sheet 1 of 1

Description of Strata	Legend	Depth (m)	Sample Ref	Sample Type	Field Test Type	Field Test Result	Ground-water
Dark brown slightly sandy silty very clayey TOPSOIL (TOPSOIL)		0.10	T12	D			
		0.30					
Firm greenish grey mottled brown slightly sandy CLAY (UNDIFFERENTIATED DRIFT DEPOSITS)		0.50	TJ13	D/J			
		0.80			In-Situ SV	45 54	
		1.00			In-Situ SV	65 50 50 52	
Spongey dark brown fibrous PEAT (UNDIFFERENTIATED DRIFT DEPOSITS)		1.50					▼
Firm to stiff greenish grey mottled brown slightly sandy slightly gravelly slightly peaty CLAY with occasional sand pockets/ lenses. Gravel is fine to coarse subrounded to subangular flint (UNDIFFERENTIATED DRIFT DEPOSITS) ...not peaty below approximately 1.90m		1.60					
		2.50			Ex-Situ SV	104 118 70	
End of Trial Pit at 3.00m		3.00					

Remarks:
1.Sides generally stable.
2.Slight to moderate water seepages at 1.60m.

Key: B = Bulk Sample D = Disturbed Sample W = Water Sample SV = Shear Vane (kN/m2) P = Penetrometer (kN/m2)
J = Jar Sample V = Vial Sample ▽ = Water Strike (m) ▼ = Steady Water Level (m)

Project: Joyce - Crease Drove, Crowland			**Client:** Ashwood Homes	
Logged: CB	**Checked:** DB	**Field Book Ref:** CB18/01	**Plant:** JCB 3CX	**Drawing No.** TP7
Date: 10/05/2018	**Approved:** PK		**Scale:** 1:25	

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TP8

Project No: D38056c

Sheet 1 of 1

Description of Strata	Legend	Depth (m)	Sample Ref	Sample Type	Field Test Type	Field Test Result	Ground-water
Dark brown slightly sandy slightly silty very clayey TOPSOIL (TOPSOIL)		0.30					
Soft to firm greenish grey mottled brown slightly sandy very silty CLAY (UNDIFFERENTIATED DRIFT DEPOSITS)		0.70			In-Situ SV	40 46 50	
Spongey dark brown fibrous PEAT (UNDIFFERENTIATED DRIFT DEPOSITS)		1.10					
Soft to firm becoming firm to stiff bluish grey mottled brown slightly silty sandy CLAY with occasional shell fragments and sand pockets (UNDIFFERENTIATED DRIFT DEPOSITS)		1.20			In-Situ SV	40 42 44	▼
		1.40	T14	D			
		1.90			Ex-Situ SV	70 70 80	
Stiff bluish grey mottled brown CLAY (OXFORD CLAY)		2.60					▼
End of Trial Pit at 3.00m		3.00					

Remarks:

1.Sides generally stable.
2.Slight water seepages at 1.20m and 2.60m.

Key: B = Bulk Sample D = Disturbed Sample W = Water Sample SV = Shear Vane (kN/m2) P = Penetrometer (kN/m2)
J = Jar Sample V = Vial Sample ▽ = Water Strike (m) ▼ = Steady Water Level (m)

Project: Joyce - Crease Drove, Crowland			**Client:** Ashwood Homes	
Logged: CB	**Checked:** DB	**Field Book Ref:** CB18/02	**Plant:** JCB 3CX	**Drawing No.** TP8
Date: 14/05/2018	**Approved:** PK		**Scale:** 1:25	

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TP9

Project No: D38056c

Sheet 1 of 1

Description of Strata	Legend	Depth (m)	Sample Ref	Sample Type	Field Test Type	Field Test Result	Ground-water
Dark brown slightly sandy slightly silty very clayey TOPSOIL (TOPSOIL)							
		0.35					
Spongey dark brown fibrous PEAT (UNDIFFERENTIATED DRIFT DEPOSITS)		0.45					
Soft to firm greenish grey mottled brown slightly sandy CLAY (UNDIFFERENTIATED DRIFT DEPOSITS)		0.70			In-Situ SV	40 48	
		0.90			In-Situ SV	50 46 50 55	▼
		1.50					
Spongey dark brown fibrous PEAT (UNDIFFERENTIATED DRIFT DEPOSITS)							▼
		1.65					
Stiff bluish grey mottled brown slightly sandy CLAY with occasional sand pockets and rare plant remains (OXFORD CLAY)		1.70 - 2.20	B5	B			
		1.90			Ex-Situ SV	105 110 110	
End of Trial Pit at 3.00m		3.00					

Remarks:

1.Trial pit collapsing when excavating below 2.20m.
2.Slight water seepage at 0.90m and moderate water seepage at 1.60m.

Key: B = Bulk Sample D = Disturbed Sample W = Water Sample SV = Shear Vane (kN/m2) P = Penetrometer (kN/m2)
J = Jar Sample V = Vial Sample ▽ = Water Strike (m) ▼ = Steady Water Level (m)

Project: Joyce - Crease Drove, Crowland			**Client:** Ashwood Homes	
Logged: CB	**Checked:** DB	**Field Book Ref:** CB18/02	**Plant:** JCB 3CX	**Drawing No.** TP9
Date: 14/05/2018	**Approved:** PK		**Scale:** 1:25	

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TP10

Project No: D38056c

Sheet 1 of 1

Description of Strata	Legend	Depth (m)	Sample Ref	Sample Type	Field Test Type	Field Test Result	Ground-water
Dark brown slightly gravelly slightly sandy slightly silty very clayey TOPSOIL (TOPSOIL)		0.10	TJ19	D/J			
Firm greenish grey mottled yellow brown slightly sandy peaty CLAY (UNDIFFERENTIATED DRIFT DEPOSITS)		0.30					
Spongey dark brown fibrous PEAT (UNDIFFERENTIATED DRIFT DEPOSITS)		0.50					
Firm greenish grey mottled orange slightly sandy silty CLAY (UNDIFFERENTIATED DRIFT DEPOSITS)		0.60 0.70			In-Situ SV	54 55 58	
		1.10			Ex-Situ SV	60 65 75	
Spongey dark brown fibrous PEAT (UNDIFFERENTIATED DRIFT DEPOSITS)		2.00					
Soft to firm bluish grey peaty CLAY (UNDIFFERENTIATED DRIFT DEPOSITS)		2.20					
Stiff bluish grey mottled brown slightly sandy gravelly CLAY with frequent sand pockets and rare plant remains. Gravel is fine to coarse subrounded to subangular quartzite, flint and chalk (OXFORD CLAY)		2.60 - 3.00 2.60	B7	B			▼
End of Trial Pit at 3.30m		3.30					

Remarks:
1.Sides generally stable.
2.Slight water seepages at 3.20m.

Key: B = Bulk Sample D = Disturbed Sample W = Water Sample SV = Shear Vane (kN/m2) P = Penetrometer (kN/m2)
J = Jar Sample V = Vial Sample ▽ = Water Strike (m) ▼ = Steady Water Level (m)

Project: Joyce - Crease Drove, Crowland			**Client:** Ashwood Homes	
Logged: CB	**Checked:** DB	**Field Book Ref:** CB18/02	**Plant:** JCB 3CX	**Drawing No.** TP10
Date: 14/05/2018	**Approved:** PK		**Scale:** 1:25	

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TP11

Project No: D38056c

Sheet 1 of 1

Description of Strata	Legend	Depth (m)	Sample Ref	Sample Type	Field Test Type	Field Test Result	Ground-water
Dark brown slightly sandy slightly silty very clayey TOPSOIL (TOPSOIL)		0.20	T18	D			
Firm greenish grey mottled brown slightly sandy silty CLAY (UNDIFFERENTIATED DRIFT DEPOSITS)		0.30					
		0.70			In-Situ SV	52 55 68	▼
		1.00			In-Situ SV	40 50 50	▼
...occasional fissures from approximately 1.20m ...becoming peaty below 1.40m							
Spongey dark brown fibrous PEAT (UNDIFFERENTIATED DRIFT DEPOSITS)		1.70					
Firm to stiff bluish grey mottled brown sandy gravelly CLAY. Gravel is fine to coarse subrounded to subangular flint and quartzite (OXFORD CLAY)		1.85 2.00			Ex-Situ SV	110 60 92	
End of Trial Pit at 3.00m		3.00					

Remarks:

1.Sides generally stable.
2.Slight to moderate water seepage at 0.90m and moderate water seepage at 1.20m.

Key: B = Bulk Sample D = Disturbed Sample W = Water Sample SV = Shear Vane (kN/m2) P = Penetrometer (kN/m2)
J = Jar Sample V = Vial Sample ▽ = Water Strike (m) ▼ = Steady Water Level (m)

Project:			**Client:**	
Joyce - Crease Drove, Crowland			**Ashwood Homes**	
Logged: CB	**Checked:** DB	**Field Book Ref:** CB18/02	**Plant:** JCB 3CX	**Drawing No.** TP11
Date: 14/05/2018	**Approved:** PK		**Scale:** 1:25	

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TP12

Project No: D38056c

Sheet 1 of 1

Description of Strata	Legend	Depth (m)	Sample Ref	Sample Type	Field Test Type	Field Test Result	Ground-water
Dark brown slightly sandy slightly silty very clayey TOPSOIL (TOPSOIL)							
		0.30					
Firm greenish grey mottled brown slightly sandy CLAY (UNDIFFERENTIATED DRIFT DEPOSITS)							
		0.70			In-Situ SV	48	
		0.80 - 1.20	B6	B		58 64	
		1.00			In-Situ SV	44 46	▼
						56	
		1.40					
Firm dark brown slightly sandy very peaty CLAY (UNDIFFERENTIATED DRIFT DEPOSITS)		1.50	T17	D			▼
		1.60					
Stiff bluish grey occasionally mottled brown slightly sandy CLAY with occasional sand pockets and rare plant remains (OXFORD CLAY)							
		1.90			Ex-Situ SV	110 120 128	
End of Trial Pit at 2.90m		2.90					

Remarks:

1.Trial pit collapsing when excavating below 2.60m.
2.Slight water seepages at 1.10m and 1.50m.

Key: B = Bulk Sample D = Disturbed Sample W = Water Sample SV = Shear Vane (kN/m2) P = Penetrometer (kN/m2)
J = Jar Sample V = Vial Sample ▽ = Water Strike (m) ▼ = Steady Water Level (m)

Project: Joyce - Crease Drove, Crowland			**Client:** Ashwood Homes	
Logged: CB	**Checked:** DB	**Field Book Ref:** CB18/02	**Plant:** JCB 3CX	**Drawing No.** TP12
Date: 14/05/2018	**Approved:** PK		**Scale:** 1:25	

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TP13

Project No: D38056c

Sheet 1 of 1

Description of Strata	Legend	Depth (m)	Sample Ref	Sample Type	Field Test Type	Field Test Result	Ground-water
Dark brown slightly sandy slightly silty very clayey TOPSOIL (TOPSOIL)							
		0.30					
Firm greenish grey mottled brown slightly sandy silty CLAY (UNDIFFERENTIATED DRIFT DEPOSITS)							
		0.50	TJ16	D/J			
		0.70			In-Situ SV	56 60 70	
...becoming soft to firm and slightly peaty below 1.00m		1.00			In-Situ SV	40 44 50	▼
							▼
Spongey dark brown fibrous PEAT (UNDIFFERENTIATED DRIFT DEPOSITS)		1.60					
		1.70					
Firm to stiff bluish grey mottled brown slightly sandy CLAY with occasional sand pockets (OXFORD CLAY)		1.80			Ex-Situ SV	130 70 94	
End of Trial Pit at 3.00m		3.00					

Remarks:

1.Sides generally stable.
2.Slight water seepage at 1.00m and moderate water seepage at 1.50m.

Key: B = Bulk Sample D = Disturbed Sample W = Water Sample SV = Shear Vane (kN/m2) P = Penetrometer (kN/m2)
J = Jar Sample V = Vial Sample ▽ = Water Strike (m) ▼ = Steady Water Level (m)

Project: Joyce - Crease Drove, Crowland			**Client:** Ashwood Homes	
Logged: CB	**Checked:** DB	**Field Book Ref:** CB18/02	**Plant:** JCB 3CX	**Drawing No.** TP13
Date: 14/05/2018	**Approved:** PK		**Scale:** 1:25	

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TP14

Project No: D38056c

Sheet 1 of 1

Description of Strata	Legend	Depth (m)	Sample Ref	Sample Type	Field Test Type	Field Test Result	Ground-water
Dark brown slightly sandy slightly silty very clayey TOPSOIL (TOPSOIL)		0.10	T15	D			
Firm greenish grey mottled brown slightly sandy very silty CLAY (UNDIFFERENTIATED DRIFT DEPOSITS)		0.30					
		0.80			In-Situ SV	48 54	
...becoming less silty with depth		1.00			In-Situ SV	68 45 50 58	
Stiff bluish grey mottled brown slightly sandy slightly gravelly CLAY with occasional small (>1cm) organic fragments near the top of the horizon, plant remains and sand pockets (OXFORD CLAY)		1.50					
		1.90			Ex-Situ SV	105 108 90	
End of Trial Pit at 3.10m		3.10					

Remarks:
1.Sides generally stable.
2.No water encountered.

Key: B = Bulk Sample D = Disturbed Sample W = Water Sample SV = Shear Vane (kN/m2) P = Penetrometer (kN/m2)
J = Jar Sample V = Vial Sample ▽ = Water Strike (m) ▼ = Steady Water Level (m)

Project: Joyce - Crease Drove, Crowland			**Client:** Ashwood Homes	
Logged: CB	**Checked:** DB	**Field Book Ref:** CB18/02	**Plant:** JCB 3CX	**Drawing No.** TP14
Date: 14/05/2018	**Approved:** PK		**Scale:** 1:25	

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SA1

Project No: D38056c

Sheet 1 of 1

Description of Strata	Legend	Depth (m)	Sample Ref	Sample Type	Field Test Type	Field Test Result	Ground-water
Dark brown slightly sandy slightly silty very clayey TOPSOIL (TOPSOIL)							
		0.30					
Firm greenish grey mottled brown slightly sandy CLAY (UNDIFFERENTIATED DRIFT DEPOSITS)							
		0.50					
Spongey dark brown fibrous PEAT (UNDIFFERENTIATED DRIFT DEPOSITS)		0.60					
Firm bluish grey mottled brown slightly sandy CLAY with rare plant remains (UNDIFFERENTIATED DRIFT DEPOSITS)		0.80			In-Situ SV	45 50 60	
...becoming soft to firm from 1.10m		1.10			In-Situ SV	35 40 45	
End of Trial Pit at 1.80m		1.80					

Remarks:

1.Sides generally stable to 1.80m.
2.No water encountered.

Key: B = Bulk Sample D = Disturbed Sample W = Water Sample SV = Shear Vane (kN/m2) P = Penetrometer (kN/m2)
J = Jar Sample V = Vial Sample ▽ = Water Strike (m) ▼ = Steady Water Level (m)

Project: Joyce - Crease Drove, Crowland			**Client:** Ashwood Homes	
Logged: CB	**Checked:** DB	**Field Book Ref:** CB18/02	**Plant:** JCB 3CX	**Drawing No.** SA1
Date: 14/05/2018	**Approved:** PK		**Scale:** 1:25	

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SA2

Project No: D38056c

Sheet 1 of 1

Description of Strata	Legend	Depth (m)	Sample Ref	Sample Type	Field Test Type	Field Test Result	Ground-water
Dark brown slightly sandy slightly silty very clayey TOPSOIL (TOPSOIL)							
		0.40					
Soft to firm bluish grey mottled brown slightly sandy CLAY with occasional plant remains (UNDIFFERENTIATED DRIFT DEPOSITS)							
		0.75			In-Situ SV	40 40 50	
End of Trial Pit at 0.75m							

Remarks:
1.Sides generally stable.
2.No water encountered.

Key: B = Bulk Sample D = Disturbed Sample W = Water Sample SV = Shear Vane (kN/m2) P = Penetrometer (kN/m2)
J = Jar Sample V = Vial Sample ▽ = Water Strike (m) ▼ = Steady Water Level (m)

Project: Joyce - Crease Drove, Crowland			**Client:** Ashwood Homes	
Logged: CB	**Checked:** DB	**Field Book Ref:** CB18/02	**Plant:** JCB 3CX	**Drawing No.** SA2
Date: 14/05/2018	**Approved:** PK		**Scale:** 1:25	

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SA3

Project No: D38056c

Sheet 1 of 1

Description of Strata	Legend	Depth (m)	Sample Ref	Sample Type	Field Test Type	Field Test Result	Ground-water
Dark brown slightly sandy slightly silty very clayey TOPSOIL (TOPSOIL)							
		0.30					
Firm greenish grey mottled brown slightly sandy CLAY (UNDIFFERENTIATED DRIFT DEPOSITS)							
		0.55					
Spongey dark brown fibrous PEAT (UNDIFFERENTIATED DRIFT DEPOSITS)		0.65					
Firm becoming soft to firm greenish grey mottled brown slightly sandy peaty CLAY (UNDIFFERENTIATED DRIFT DEPOSITS)		0.70			In-Situ SV	40 64 70	
		1.00			In-Situ SV	40 40 45	▼
		1.20					
Spongey dark brown fibrous PEAT (UNDIFFERENTIATED DRIFT DEPOSITS)		1.30					
Stiff bluish grey mottled brown slightly gravelly sandy CLAY with occasional fossil fragments and sand pockets. Gravel is fine to coarse subrounded to subangular quartzite and flint (UNDIFFERENTIATED DRIFT DEPOSITS)							
		2.00					
End of Trial Pit at 2.00m							

Remarks:

1.Sides generally stable.
2.Slight water seepage at 1.20m.

Key: B = Bulk Sample D = Disturbed Sample W = Water Sample SV = Shear Vane (kN/m2) P = Penetrometer (kN/m2)
J = Jar Sample V = Vial Sample ▽ = Water Strike (m) ▼ = Steady Water Level (m)

Project: Joyce - Crease Drove, Crowland			**Client:** Ashwood Homes	
Logged: CB	**Checked:** DB	**Field Book Ref:** CB18/02	**Plant:** JCB 3CX	**Drawing No.** SA3
Date: 14/05/2018	**Approved:** PK		**Scale:** 1:25	

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BH1

Project No. D38056c

Sheet 1 of 2

Samples and Tests				Description of Strata	Legend	Depth & (Thickness) (m)	Casing (m)	Ground-water	Installation
Depth (m)	Type	Sample Ref	SPT "N" Value						
				Dark brown slightly sandy silty very clayey TOPSOIL (TOPSOIL)		(0.30) 0.30			
1.00 - 1.45	C		1	Soft greenish grey mottled brown slightly sandy CLAY with occasional peaty clay and peat pockets/layers (UNDIFFERENTIATED DRIFT DEPOSITS)		(1.30) 1.60			
2.00 - 2.45	C		7	Firm greenish grey mottled brown slightly sandy slightly gravelly slightly peaty CLAY with occasional sand pockets/ lenses. Gravel is fine to coarse subrounded to subangular flint (UNDIFFERENTIATED DRIFT DEPOSITS)		(2.20) 3.80			
3.00 - 3.45	C		13	...becoming stiff from 3.00m			3.00		
4.00 - 4.45	C		13	Stiff bluish grey mottled brown slightly sandy slightly gravelly CLAY. Gravel is fine to coarse subrounded to subangular flint and chalk (OXFORD CLAY)					
5.00 - 5.45	C		15						
6.50 - 6.95	C		30			(11.51)			
8.00 - 8.45	C		29						
9.50 - 9.95	C		35						
				...becoming less mottled with depth					

Remarks

1.Borehole cased to 3.00m as a precautionary measure.
2.No water encountered.
3.Plain pipe installed from ground level to 1.00m in a bentonite surround. Slotted pipe installed from 1.00m to 5.00m in a gravel surround.
4.Bung, value and lockable cover installed.

Key

D = Disturbed Sample
U = Undisturbed Sample
B = Bulk Sample
J = Jar Sample
V = Vial Sample
W = Water Sample
S = Standard Penetration Test (Split Spoon)
C = Standard Penetration Test (Cone)
= Water Strike (m)
= Steady Water Level (m)

Project:	Joyce - Crease Drove, Crowland			**Client:**	Ashwood Homes		
Logged:	CB	**Checked:**	DB	**Field Book Ref:**	**Plant:**	Dando 150	**Drawing Ref:**
Date:	13/05/2018	**Approved:**	PK	CB18/02	**Scale:**	1:50	BH1

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BH1

Project No. D38056c

Samples and Tests				Description of Strata	Legend	Depth & (Thickness) (m)	Casing (m)	Ground-water	Installation
Depth (m)	Type	Sample Ref	SPT "N" Value						
				Stiff bluish grey mottled brown slightly sandy slightly gravelly CLAY. Gravel is fine to coarse subrounded to subangular flint and chalk (OXFORD CLAY)					
11.00 - 11.45	C		50/255mm						
12.50 - 12.95	C		50/225mm						
14.00 - 14.45	C		50/210mm						
15.00 - 15.45	C		50/160mm						
				End of Borehole at 15.31m		15.31			

Remarks

1.Borehole cased to 3.00m as a precautionary measure.
2.No water encountered.
3.Plain pipe installed from ground level to 1.00m in a bentonite surround. Slotted pipe installed from 1.00m to 5.00m in a gravel surround.
4.Bung, value and lockable cover installed.

Key

D = Disturbed Sample
U = Undisturbed Sample
B = Bulk Sample
J = Jar Sample
V = Vial Sample
W = Water Sample

S = Standard Penetration Test (Split Spoon)
C = Standard Penetration Test (Cone)
= Water Strike (m)
= Steady Water Level (m)

Project:	Joyce - Crease Drove, Crowland			**Client:**	Ashwood Homes		
Logged:	CB	**Checked:**	DB	**Field Book Ref:**	**Plant:**	Dando 150	**Drawing Ref:**
Date:	13/05/2018	**Approved:**	PK	CB18/02	**Scale:**	1:50	BH1

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BH2

Project No. D38056c

Sheet 1 of 2

Samples and Tests				Description of Strata	Legend	Depth & (Thickness) (m)	Casing (m)	Ground-water	Installation
Depth (m)	Type	Sample Ref	SPT "N" Value						
				Dark brown slightly sandy silty very clayey TOPSOIL (TOPSOIL)		(0.30) 0.30			
				Firm greenish grey mottled brown slightly sandy CLAY with frequent peaty clay and peat pockets/layers (UNDIFFERENTIATED DRIFT DEPOSITS)					
1.20 - 1.65	C		4			(2.10)			
2.20 - 2.65	C		29						
				Medium dense brown gravelly fine to coarse grained SAND. Gravel is fine to coarse subrounded to subangular flint and quartzite (UNDIFFERENTIATED DRIFT DEPOSITS)		2.40 (0.50) 2.90			
3.20 - 3.65	C		14	Stiff bluish grey mottled brown slightly sandy slightly gravelly CLAY. Gravel is fine to coarse subrounded to subangular flint and chalk (OXFORD CLAY)			3.50		
4.30 - 4.75	C		14						
5.55 - 6.00	C		27						
						(12.19)			
7.05 - 7.50	C		30						
8.55 - 9.00	C		47						
10.05 - 10.50	C		50/266mm	...becoming less mottled with depth					

Remarks

1.Borehole cased to 3.50m as a precautionary measure.
2.Water encountered at 2.40m.
3.Plain pipe installed from ground level to 1.00m in a bentonite surround. Slotted pipe installed from 1.00m to 5.00m in a gravel surround.
4.Bung, value and lockable cover installed.

Key

D = Disturbed Sample
U = Undisturbed Sample
B = Bulk Sample
J = Jar Sample
V = Vial Sample
W = Water Sample

S = Standard Penetration Test (Split Spoon)
C = Standard Penetration Test (Cone)
= Water Strike (m)
= Steady Water Level (m)

Project:	Joyce - Crease Drove, Crowland			**Client:**	Ashwood Homes		
Logged:	CB	**Checked:**	DB	**Field Book Ref:**	**Plant:**	Dando 150	**Drawing Ref:**
Date:	15/05/2018	**Approved:**	PK	CB18/02	**Scale:**	1:50	BH2

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BH2

Project No. D38056c

Samples and Tests				Description of Strata	Legend	Depth & (Thickness) (m)	Casing (m)	Ground-water	Installation
Depth (m)	Type	Sample Ref	SPT "N" Value						
				Stiff bluish grey mottled brown slightly sandy slightly gravelly CLAY. Gravel is fine to coarse subrounded to subangular flint and chalk (OXFORD CLAY)					
11.55 - 12.00	C		50/282mm						
13.25 - 13.70	C		50/225mm						
14.75 - 15.20	C		50/209mm						
				End of Borehole at 15.09m		15.09			

Remarks

1.Borehole cased to 3.50m as a precautionary measure.
2.Water encountered at 2.40m.
3.Plain pipe installed from ground level to 1.00m in a bentonite surround. Slotted pipe installed from 1.00m to 5.00m in a gravel surround.
4.Bung, value and lockable cover installed.

Key

D = Disturbed Sample
U = Undisturbed Sample
B = Bulk Sample
J = Jar Sample
V = Vial Sample
W = Water Sample

S = Standard Penetration Test (Split Spoon)
C = Standard Penetration Test (Cone)
= Water Strike (m)
= Steady Water Level (m)

Project:	Joyce - Crease Drove, Crowland			**Client:**	Ashwood Homes		
Logged:	CB	**Checked:**	DB	**Field Book Ref:**	**Plant:**	Dando 150	**Drawing Ref:**
Date:	15/05/2018	**Approved:**	PK	CB18/02	**Scale:**	1:50	BH2

GeoDyne
9 Brunel Parkway, Pride Park, Derby DE24 8HR
Tel: 01332 290798
email: info@geodyne.co.uk

BH3

Project No. D38056c

Sheet 1 of 2

Samples and Tests				Description of Strata	Legend	Depth & (Thickness) (m)	Casing (m)	Ground-water	Installation
Depth (m)	Type	Sample Ref	SPT "N" Value						
				Dark brown slightly gravelly slightly sandy slightly silty very clayey TOPSOIL (TOPSOIL)		(0.30) 0.30			
				Firm greenish grey mottled yellow brown slightly sandy peaty CLAY with frequent peaty clay and peat pockets/layers (UNDIFFERENTIATED DRIFT DEPOSITS)					
1.00 - 1.45	C		5						
						(2.60)			
2.00 - 2.45	C		8						
3.00 - 3.45	C		11	Stiff bluish grey mottled brown slightly sandy gravelly CLAY with frequent sand pockets and rare plant remains. Gravel is fine to coarse subrounded to subangular quartzite, flint and chalk (OXFORD CLAY)		2.90 (1.10)			
4.00 - 4.45	C		16	Stiff bluish grey mottled brown slightly sandy slightly gravelly CLAY. Gravel is fine to coarse subrounded to subangular flint and chalk (OXFORD CLAY)		4.00	4.50		
5.00 - 5.45	C		23						
6.50 - 6.95	C		28			(11.34)			
8.00 - 8.45	C		44						
9.00	D	D1							
9.50 - 9.95	C		37						
				...becoming less mottled with depth					

Remarks

1.Borehole cased to 4.50m as a precautionary measure.
2.No water encountered.
3.Plain pipe installed from ground level to 1.00m in a bentonite surround. Slotted pipe installed from 1.00m to 5.00m in a gravel surround.
4.Bung, value and lockable cover installed.

Key

D = Disturbed Sample
U = Undisturbed Sample
B = Bulk Sample
J = Jar Sample
V = Vial Sample
W = Water Sample
S = Standard Penetration Test (Split Spoon)
C = Standard Penetration Test (Cone)
= Water Strike (m)
= Steady Water Level (m)

Project:	Joyce - Crease Drove, Crowland			**Client:**	Ashwood Homes		
Logged:	CB	**Checked:**	DB	**Field Book Ref:**	**Plant:**	Dando 150	**Drawing Ref:**
Date:	16/05/2018	**Approved:**	PK	CB18/02	**Scale:**	1:50	BH3

GeoDyne
9 Brunel Parkway, Pride Park, Derby DE24 8HR
Tel: 01332 290798
email: info@geodyne.co.uk

BH3

Project No. D38056c

Samples and Tests				Description of Strata	Legend	Depth & (Thickness) (m)	Casing (m)	Ground-water	Installation
Depth (m)	Type	Sample Ref	SPT "N" Value						
				Stiff bluish grey mottled brown slightly sandy slightly gravelly CLAY. Gravel is fine to coarse subrounded to subangular flint and chalk (OXFORD CLAY)					
11.00 - 11.45	C		47						
12.00	D	D2							
12.50 - 12.95	C		50/270mm						
14.00 - 14.45	C		50/205mm						
15.00 - 15.45	C		50/190mm						
				End of Borehole at 15.34m		15.34			

Remarks

1.Borehole cased to 4.50m as a precautionary measure.
2.No water encountered.
3.Plain pipe installed from ground level to 1.00m in a bentonite surround. Slotted pipe installed from 1.00m to 5.00m in a gravel surround.
4.Bung, value and lockable cover installed.

Key

D = Disturbed Sample
U = Undisturbed Sample
B = Bulk Sample
J = Jar Sample
V = Vial Sample
W = Water Sample

S = Standard Penetration Test (Split Spoon)
C = Standard Penetration Test (Cone)
= Water Strike (m)
= Steady Water Level (m)

Project:	Joyce - Crease Drove, Crowland			**Client:**	Ashwood Homes		
Logged:	CB	**Checked:**	DB	**Field Book Ref:**	**Plant:**	Dando 150	**Drawing Ref:**
Date:	16/05/2018	**Approved:**	PK	CB18/02	**Scale:**	1:50	BH3

GeoDyne

APPENDIX VII

Ground Gas & Water Monitoring Results

GeoDyne
9 Brunel Park Way
Derby
DE24 8HR
Tel: 01332 290798

Project No.	D38056c
Client	Ashwood Homes
Site Location	Joyce - Crease Drove, Crowland
Date	24/05/2018
Weather	Clear, Sunny
Atmospheric Pressure Range (mb)	Fall of 5mb in 24 hour period prior to monitoring from 1027 to 1022
Equipment	GEO09 + Dip Meter
Operator	HG

MONITORING OF SOIL GASES AND GROUNDWATER - IN ACCORDANCE WITH CIRIA C665								
Borehole No.	Peak Steady	Methane (% v/v)	Carbon Dioxide (% v/v)	Oxygen (% v/v)	Gas Flow (l/h)	Depth to Groundwater (mbgl)	Time to steady reading (secs)	Other Issues i.e. odour, condition of installation, etc
BH1	Peak	0.0	0.8	19.8	0.2	0.94	73	Monitored for 120 seconds
	Steady	0.0	0.8	19.8	0.0			
BH2	Peak	0.0	0.0	20.4	-23.5	0.71	42	Monitored for 120 seconds
	Steady	0.0	0.0	20.4	0.0			
BH3	Peak	0.0	0.1	20.5	0.0	0.79	54	Monitored for 120 seconds
	Steady	0.0	0.1	20.5	0.0			
Ambient		0.0	0.0	20.7	N/A	N/A	N/A	

Notes

Cell is highlighted in the following conditions

1. Where Methane exceeds 1% v/v (after BR212)
2. Where Carbon Dioxide exceeds 5% v/v (after BR212)

N/A - Not Applicable/ Not Available
BOH - Bottom of Hole
ND - Not Determined
NGW - No groundwater encountered

GeoDyne
9 Brunel Park Way
Derby
DE24 8HR
Tel: 01332 290798

Project No.	D38056c
Client	Ashwood Homes
Site Location	Joyce - Crease Drove, Crowland
Date	01/06/2018
Weather	Clear, Sunny
Atmospheric Pressure Range (mb)	Rise of 2mb in 24 hour period prior to monitoring from 1015 to 1017
Equipment	GEO09 + Dip Meter
Operator	HG

MONITORING OF SOIL GASES AND GROUNDWATER - IN ACCORDANCE WITH CIRIA C665								
Borehole No.	Peak Steady	Methane (% v/v)	Carbon Dioxide (% v/v)	Oxygen (% v/v)	Gas Flow (l/h)	Depth to Groundwater (mbgl)	Time to steady reading (secs)	Other Issues i.e. odour, condition of installation, etc
BH1	Peak	0.0	0.0	19.9	0.0	0.88	20	Monitored for 120 seconds
	Steady	0.0	0.0	19.9	0.0			
BH2	Peak	0.0	0.4	19.4	0.0	0.81	53	Monitored for 120 seconds
	Steady	0.0	0.4	19.4	0.0			
BH3	Peak	0.0	0.0	19.9	0.0	0.80	30	Monitored for 120 seconds
	Steady	0.0	0.0	19.9	0.0			
Ambient		0.0	0.0	20.7	N/A	N/A	N/A	

Notes

Cell is highlighted in the following conditions
1. Where Methane exceeds 1% v/v (after BR212)
2. Where Carbon Dioxide exceeds 5% v/v (after BR212)

N/A - Not Applicable/ Not Available
BOH - Bottom of Hole
ND - Not Determined
NGW - No groundwater encountered

GeoDyne
9 Brunel Park Way
Derby
DE24 8HR
Tel: 01332 290798

Project No.	D38056c
Client	Ashwood Homes
Site Location	Joyce - Crease Drove, Crowland
Date	08/06/2018
Weather	Humid, Cloudy
Atmospheric Pressure Range (mb)	Steady around 1017 in 24 hour period prior to monitoring
Equipment	GEO09 + Dip Meter
Operator	HG

MONITORING OF SOIL GASES AND GROUNDWATER - IN ACCORDANCE WITH CIRIA C665								
Borehole No.	Peak Steady	Methane (% v/v)	Carbon Dioxide (% v/v)	Oxygen (% v/v)	Gas Flow (l/h)	Depth to Groundwater (mbgl)	Time to steady reading (secs)	Other Issues i.e. odour, condition of installation, etc
BH1	Peak	0.0	0.0	19.8	0.0	0.98	20	Monitored for 120 seconds
	Steady	0.0	0.0	19.8	0.0			
BH2	Peak	0.0	0.3	19.2	0.1	0.94	30	Monitored for 120 seconds
	Steady	0.0	0.3	19.2	0.0			
BH3	Peak	0.0	0.1	19.3	0.0	0.96	20	Monitored for 120 seconds
	Steady	0.0	0.1	19.3	0.0			
Ambient		0.0	0.0	20.7	N/A	N/A	N/A	

Notes

Cell is highlighted in the following conditions
1. Where Methane exceeds 1% v/v (after BR212)
2. Where Carbon Dioxide exceeds 5% v/v (after BR212)

N/A - Not Applicable/ Not Available
BOH - Bottom of Hole
ND - Not Determined
NGW - No groundwater encountered

GeoDyne
9 Brunel Park Way
Derby
DE24 8HR
Tel: 01332 290798

Project No.	D38056c
Client	Ashwood Homes
Site Location	Joyce - Crease Drove, Crowland
Date	14/06/2018
Weather	Sunny
Atmospheric Pressure Range (mb)	Fall of 13mb in 24 hour period prior to monitoring from 1018 to 1005
Equipment	GEO09 + Dip Meter
Operator	HG

MONITORING OF SOIL GASES AND GROUNDWATER - IN ACCORDANCE WITH CIRIA C665								
Borehole No.	Peak Steady	Methane (% v/v)	Carbon Dioxide (% v/v)	Oxygen (% v/v)	Gas Flow (l/h)	Depth to Groundwater (mbgl)	Time to steady reading (secs)	Other Issues i.e. odour, condition of installation, etc
BH1	Peak	0.0	0.0	20.4	0.0	0.92	32	Monitored for 120 seconds
	Steady	0.0	0.0	20.4	0.0			
BH2	Peak	0.0	0.3	19.5	0.0	0.82	60	Monitored for 120 seconds
	Steady	0.0	0.3	19.5	0.0			
BH3	Peak	0.0	0.0	20.1	0.0	0.80	38	Monitored for 120 seconds
	Steady	0.0	0.0	20.1	0.0			
Ambient		0.0	0.0	20.6	N/A	N/A	N/A	

Notes

Cell is highlighted in the following conditions
1. Where Methane exceeds 1% v/v (after BR212)
2. Where Carbon Dioxide exceeds 5% v/v (after BR212)

N/A - Not Applicable/ Not Available
BOH - Bottom of Hole
ND - Not Determined
NGW - No groundwater encountered

GeoDyne
9 Brunel Park Way
Derby
DE24 8HR
Tel: 01332 290798

Project No.	D38056c
Client	Ashwood Homes
Site Location	Joyce - Crease Drove, Crowland
Date	19/06/2018
Weather	Humid
Atmospheric Pressure Range (mb)	Rise of 3mb in 24 hour period prior to monitoring from 1018 to 1021
Equipment	GEO09 + Dip Meter
Operator	HG

MONITORING OF SOIL GASES AND GROUNDWATER - IN ACCORDANCE WITH CIRIA C665								
Borehole No.	Peak Steady	Methane (% v/v)	Carbon Dioxide (% v/v)	Oxygen (% v/v)	Gas Flow (l/h)	Depth to Groundwater (mbgl)	Time to steady reading (secs)	Other Issues i.e. odour, condition of installation, etc
BH1	Peak	0.0	0.0	19.8	-0.1	0.99	35	Monitored for 120 seconds
	Steady	0.0	0.0	19.8	-0.1			
BH2	Peak	0.0	0.0	19.9	0.0	0.90	35	Monitored for 120 seconds
	Steady	0.0	0.0	19.9	0.0			
BH3	Peak	0.0	0.0	19.9	0.0	0.84	40	Monitored for 120 seconds
	Steady	0.0	0.0	19.9	0.0			
Ambient		0.0	0.0	20.6	N/A	N/A	N/A	

Notes

Cell is highlighted in the following conditions
1. Where Methane exceeds 1% v/v (after BR212)
2. Where Carbon Dioxide exceeds 5% v/v (after BR212)

N/A - Not Applicable/ Not Available
BOH - Bottom of Hole
ND - Not Determined
NGW - No groundwater encountered

GeoDyne
9 Brunel Park Way
Derby
DE24 8HR
Tel: 01332 290798

Project No.	D38056c
Client	Ashwood Homes
Site Location	Joyce - Crease Drove, Crowland
Date	26/06/2018
Weather	Sunny
Atmospheric Pressure Range (mb)	Rise of 2mb in 24 hour period prior to monitoring from 1025 to 1027
Equipment	GEO09 + Dip Meter
Operator	HG

MONITORING OF SOIL GASES AND GROUNDWATER - IN ACCORDANCE WITH CIRIA C665								
Borehole No.	Peak Steady	Methane (% v/v)	Carbon Dioxide (% v/v)	Oxygen (% v/v)	Gas Flow (l/h)	Depth to Groundwater (mbgl)	Time to steady reading (secs)	Other Issues i.e. odour, condition of installation, etc
BH1	Peak	0.0	0.1	19.7	0.0	0.88	40	Monitored for 120 seconds
	Steady	0.0	0.1	19.7	0.0			
BH2	Peak	0.0	0.0	20.0	0.1	0.91	30	Monitored for 120 seconds
	Steady	0.0	0.0	20.0	0.1			
BH3	Peak	0.0	0.0	19.7	0.0	0.86	43	Monitored for 120 seconds
	Steady	0.0	0.0	19.7	0.0			
Ambient		0.0	0.0	20.4	N/A	N/A	N/A	

Notes

Cell is highlighted in the following conditions
1. Where Methane exceeds 1% v/v (after BR212)
2. Where Carbon Dioxide exceeds 5% v/v (after BR212)

N/A - Not Applicable/ Not Available
BOH - Bottom of Hole
ND - Not Determined
NGW - No groundwater encountered

GeoDyne

APPENDIX VIII

Laboratory Soil Test Results

LABORATORY REPORT

4043

Contract Number: PSL18/2476

Report Date: 01 June 2018

Client's Reference: D38056d

Client Name: Geodyne Derby
9 Brunel Parkway
Pride Park
Derby
DE24 8HR

For the attention of: Chris Bowley

Contract Title: Crowland - Joyce

Date Received: 23/5/2018
Date Commenced: 23/5/2018
Date Completed: 1/6/2018

Notes: Opinions and Interpretations are outside the UKAS Accreditation

A copy of the Laboratory Schedule of accredited tests as issued by UKAS is attached to this report. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced other than in full, without the prior written approval of the laboratory.

Checked and Approved Signatories:

R Gunson (Director)	A Watkins (Director)	R Berriman (Quality Manager)
L Knight (Senior Technician)	S Eyre (Senior Technician)	A Fry (Senior Technician)

5 – 7 Hexthorpe Road, Hexthorpe,
Doncaster DN4 0AR
tel: +44 (0)844 815 6641
fax: +44 (0)844 815 6642
e-mail: rgunson@prosoils.co.uk
awatkins@prosoils.co.uk

SUMMARY OF LABORATORY SOIL DESCRIPTIONS

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Description of Sample
TP2	B1		1.00	1.30	Brown slightly sandy CLAY.
TP4	B2		1.10	1.60	Brown slightly sandy CLAY.
TP5	B3		0.80	1.20	Brown slightly sandy peaty CLAY.
TP6	B4		1.75	2.00	Brown slightly gravelly slightly sandy CLAY.
TP9	B5		1.70	2.20	Brown slightly gravelly slightly sandy CLAY.
TP2	LB1		0.55	0.80	Brown mottled grey slightly sandy CLAY.
TP4	LB2		0.55	0.95	Brown CLAY.
TP5	LB3		0.75	1.00	Brown mottled grey slightly sandy peaty CLAY.
TP6	LB4		0.55	0.95	Dark brown CLAY.

UKAS TESTING
4043

PSL
Professional Soils Laboratory

Crowland - Joyce

Contract No:
PSL18/2476
Client Ref:
D38056d

SUMMARY OF SOIL CLASSIFICATION TESTS

(BS1377 : PART 2 : 1990)

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Moisture Content % Clause 3.2	Linear Shrinkage % Clause 6.5	Particle Density Mg/m^3 Clause 8.2	Liquid Limit % Clause 4.3/4	Plastic Limit % Clause 5.3	Plasticity Index % Clause 5.4	Passing .425mm %	Remarks
TP2	B1		1.00	1.30	27			53	23	30	100	High plasticity CH.
TP4	B2		1.10	1.60	33			56	23	33	100	High plasticity CH.
TP5	B3		0.80	1.20	64			93	36	57	100	Extremely high plasticity CE.
TP6	B4		1.75	2.00	23			54	22	32	92	High plasticity CH.
TP9	B5		1.70	2.20	24			54	22	32	98	High plasticity CH.
TP6	LB4		0.55	0.95	28			79	34	45	100	Very high plasticity CV.

SYMBOLS : **NP : Non Plastic** *** : Liquid Limit and Plastic Limit Wet Sieved.**

UKAS TESTING 4043

PSL Professional Soils Laboratory

Crowland - Joyce

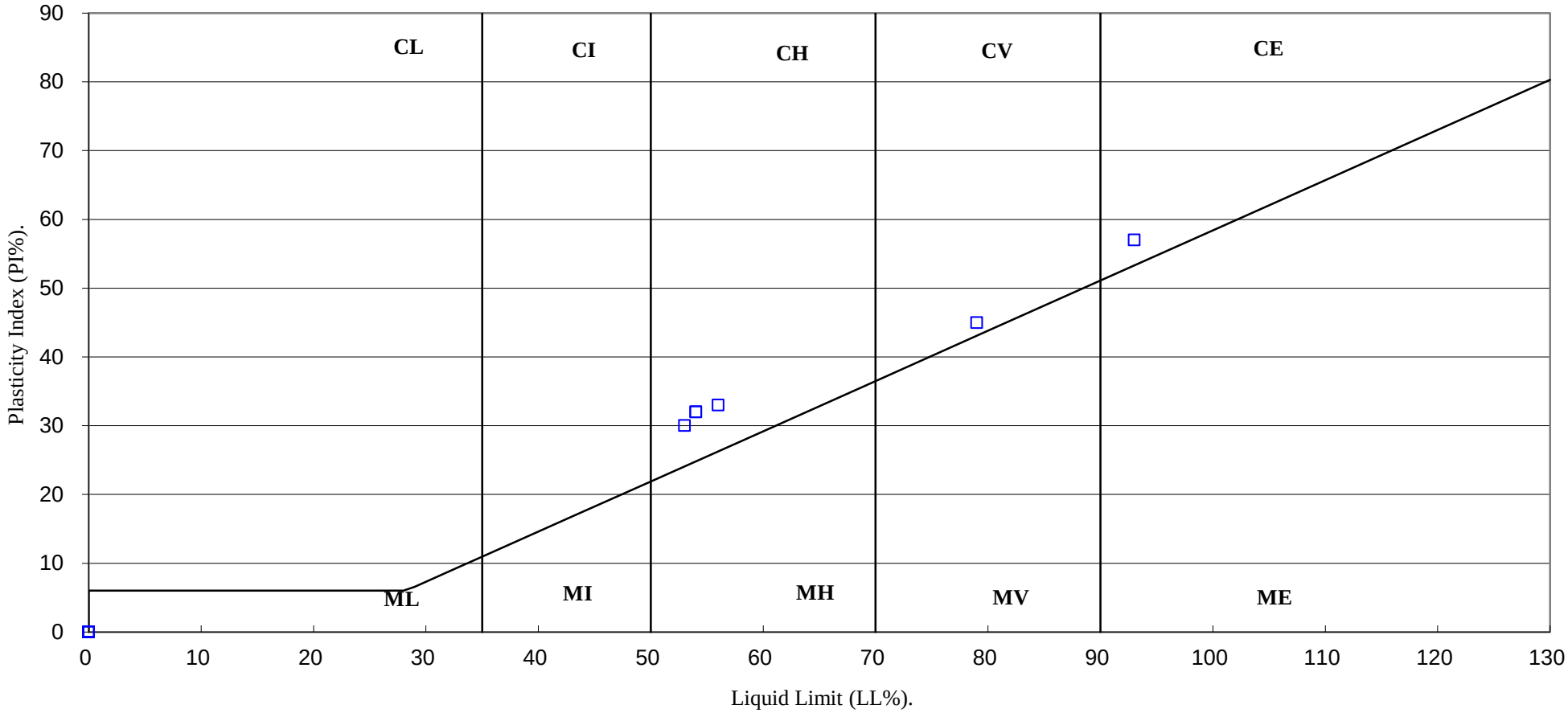
Contract No:

PSL18/2476

Client Ref:

D38056d

PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.

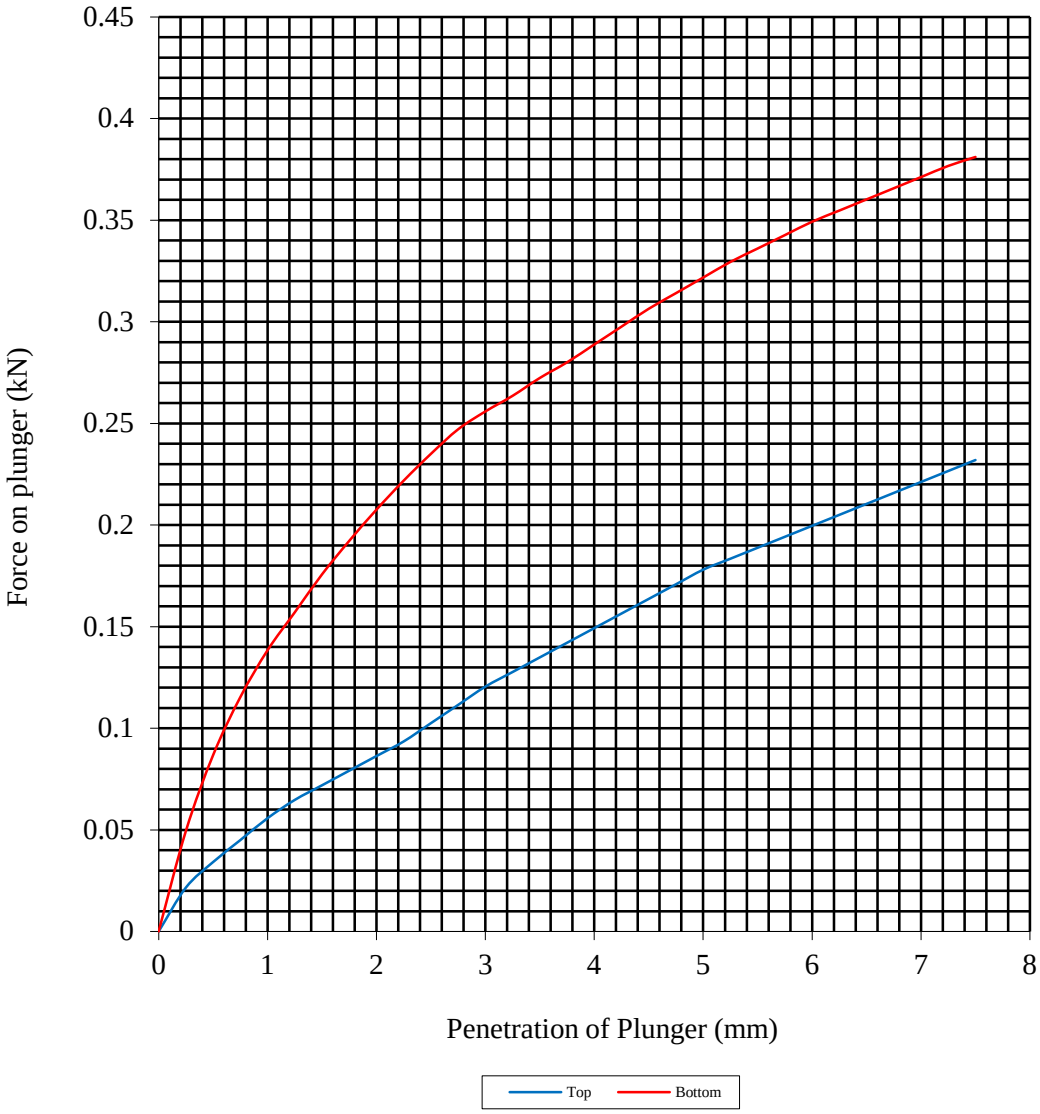


UKAS TESTING 4043	PSL Professional Soils Laboratory	**Crowland - Joyce**	**Contract No:** PSL18/2476 **Client Ref:** D38056d

CALIFORNIA BEARING RATIO TEST

BS 1377 : Part 4 : 1990

Hole Number:	**TP2**	**Top Depth (m):**	**0.55**
Sample Number:	**LB1**	**Base Depth (m):**	**0.80**
Sample Type:			



Initial Sample Conditions		Sample Preparation		Final Moisture Content %		C.B.R. Value %	
Moisture Content:	43	Surcharge Kg:	4.20	Sample Top	45	Sample Top	0.9
Bulk Density Mg/m3:	1.70	Soaking Time hrs	**96**	Sample Bottom	44	Sample Bottom	1.8
Dry Density Mg/m3:	1.19	Swelling mm:	**3.54**	Remarks : See Summary of Soil Descriptions.			
Percentage retained on 20mm BS test sieve:			0				
Compaction Conditions		2.5kg					

UKAS TESTING 4043	PSL Professional Soils Laboratory	**Crowland - Joyce**	**Contract No: PSL18/2476** **Client Ref: D38056d**

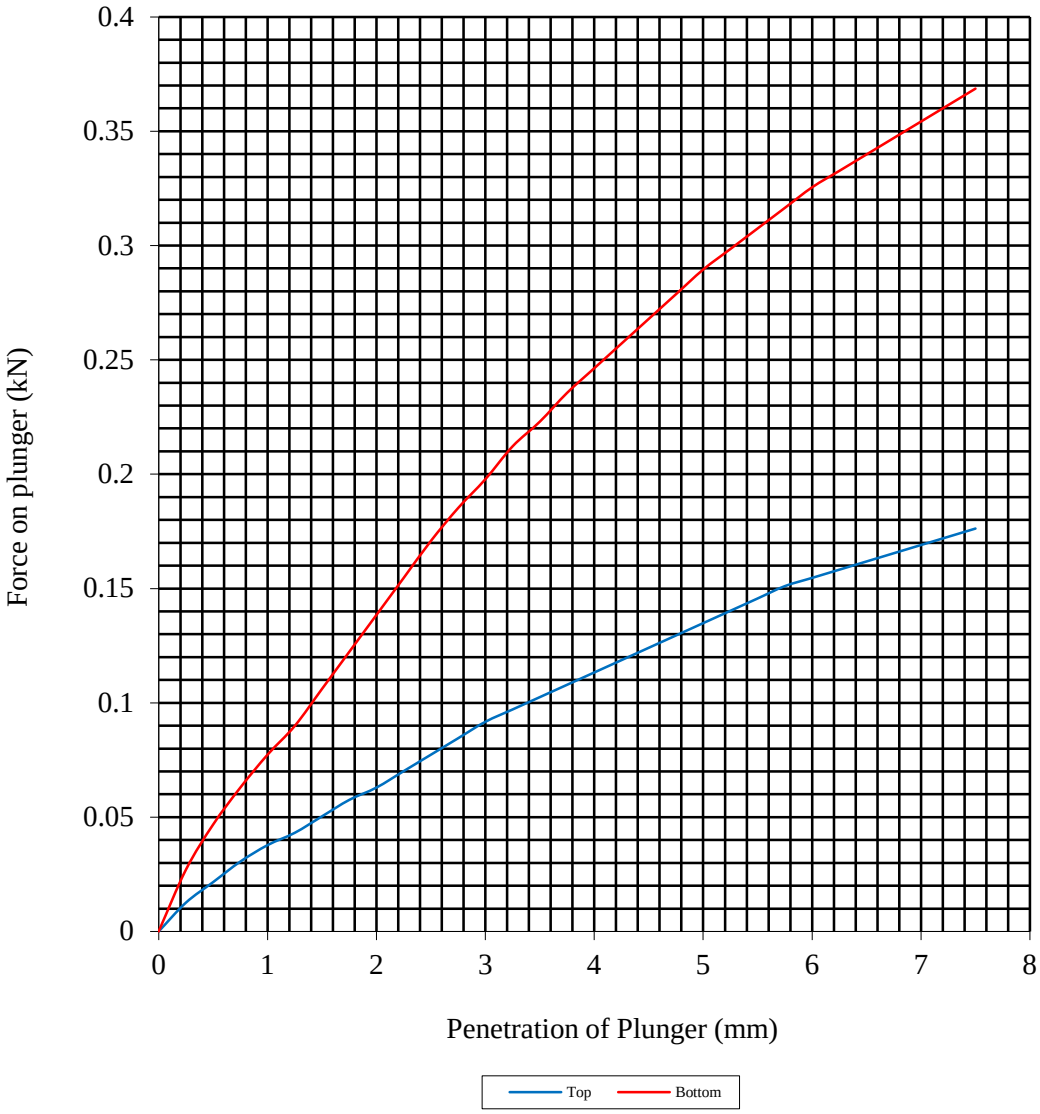
CALIFORNIA BEARING RATIO TEST

BS 1377 : Part 4 : 1990

Hole Number: TP4 **Top Depth (m):** 0.55

Sample Number: LB2 **Base Depth (m):** 0.95

Sample Type:



Initial Sample Conditions		Sample Preparation		Final Moisture Content %		C.B.R. Value %	
Moisture Content:	31	Surcharge Kg:	4.20	Sample Top	33	Sample Top	0.7
Bulk Density Mg/m3:	1.87	Soaking Time hrs	**96**	Sample Bottom	32	Sample Bottom	1.4
Dry Density Mg/m3:	1.42	Swelling mm:	**0.12**	Remarks : See Summary of Soil Descriptions.			
Percentage retained on 20mm BS test sieve:			0				
Compaction Conditions		2.5kg					

UKAS TESTING 4043

PSL Professional Soils Laboratory

Crowland - Joyce

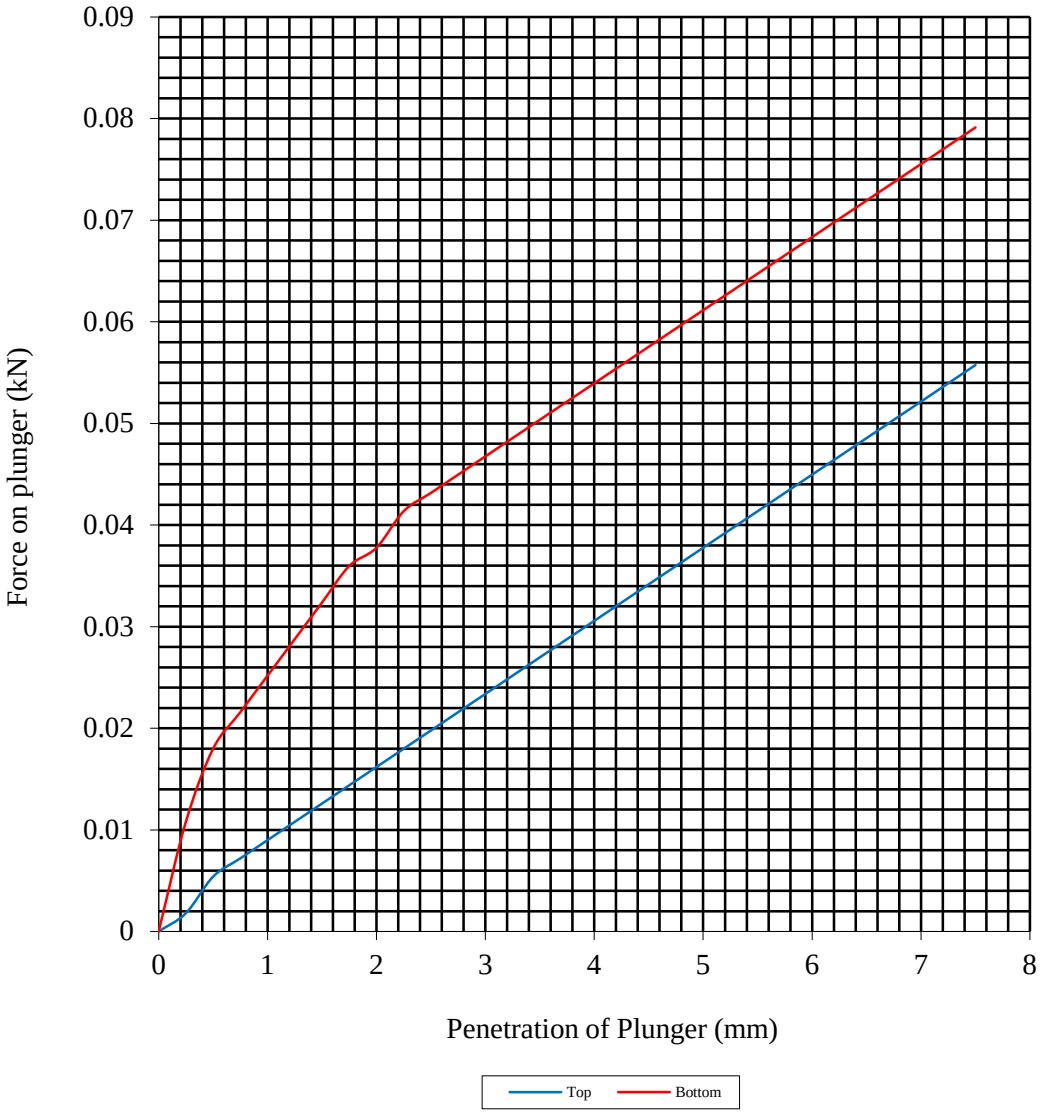
Contract No: PSL18/2476

Client Ref: D38056d

CALIFORNIA BEARING RATIO TEST

BS 1377 : Part 4 : 1990

Hole Number:	**TP5**	**Top Depth (m):**	**0.75**
Sample Number:	**LB3**	**Base Depth (m):**	**1.00**
Sample Type:			



Initial Sample Conditions		Sample Preparation		Final Moisture Content %		C.B.R. Value %	
Moisture Content:	64	Surcharge Kg:	4.20	Sample Top	67	Sample Top	0.2
Bulk Density Mg/m3:	1.57	Soaking Time hrs	**96**	Sample Bottom	67	Sample Bottom	0.3
Dry Density Mg/m3:	0.96	Swelling mm:	**0.45**	Remarks : See Summary of Soil Descriptions.			
Percentage retained on 20mm BS test sieve:			0				
Compaction Conditions		2.5kg					

UKAS TESTING 4043

PSL Professional Soils Laboratory

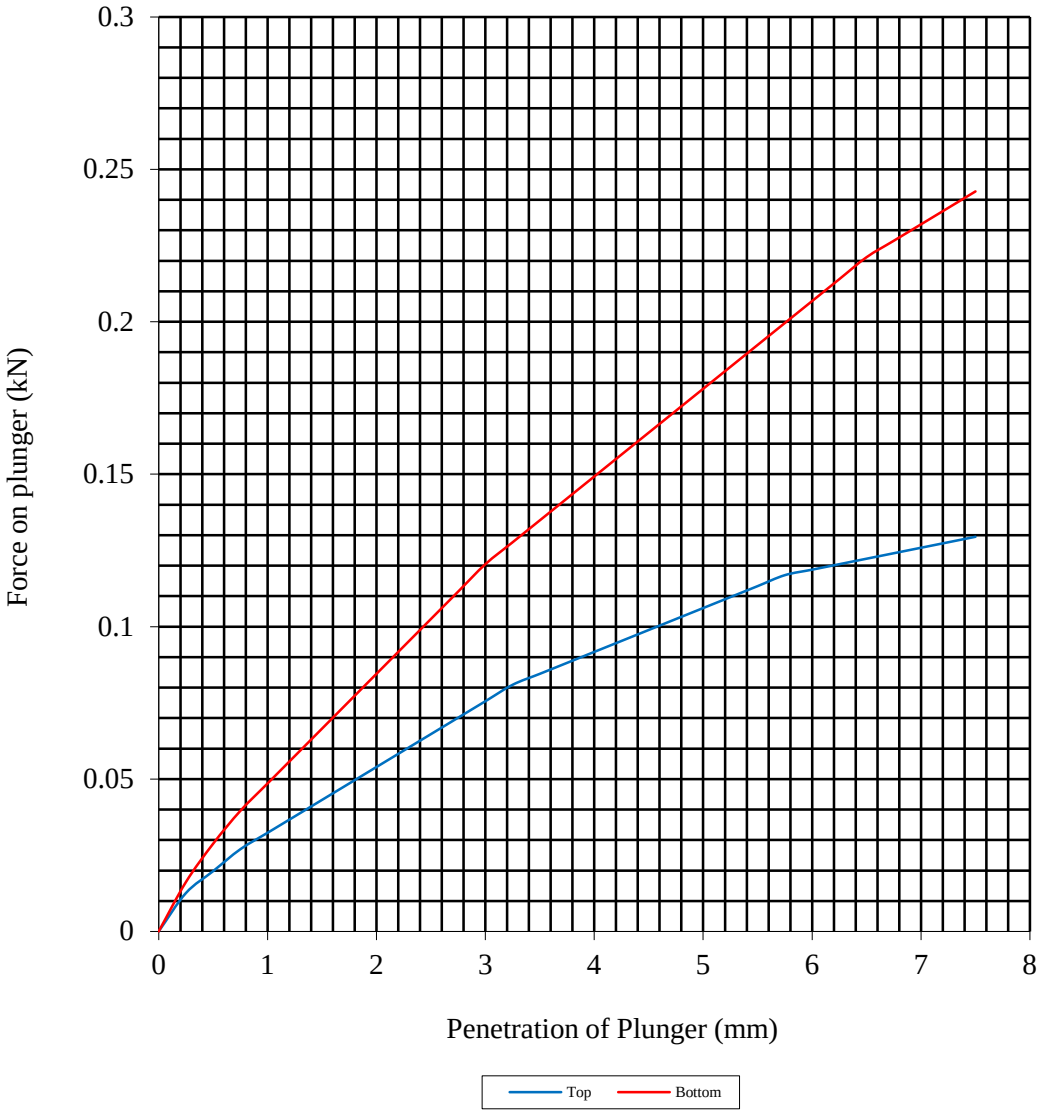
Crowland - Joyce

Contract No:
PSL18/2476
Client Ref:
D38056d

CALIFORNIA BEARING RATIO TEST

BS 1377 : Part 4 : 1990

Hole Number:	**TP6**	**Top Depth (m):**	**0.55**
Sample Number:	**LB4**	**Base Depth (m):**	**0.95**
Sample Type:			



Initial Sample Conditions		Sample Preparation		Final Moisture Content %		C.B.R. Value %	
Moisture Content:	28	Surcharge Kg:	4.20	Sample Top	30	Sample Top	0.5
Bulk Density Mg/m3:	1.78	Soaking Time hrs	**96**	Sample Bottom	30	Sample Bottom	0.9
Dry Density Mg/m3:	1.40	Swelling mm:	**1.49**	Remarks : See Summary of Soil Descriptions.			
Percentage retained on 20mm BS test sieve:			0				
Compaction Conditions		2.5kg					

UKAS TESTING 4043

PSL Professional Soils Laboratory

Crowland - Joyce

Contract No:
PSL18/2476
Client Ref:
D38056d

envirolab
Units 7 & 8 Sandpits Business Park
Mottram Road, Hyde, Cheshire, SK14 3AR

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 18/04147
Issue Number: 1 **Date:** 05 June, 2018

Client:
GeoDyne (Derby)
9 Brunel Parkway
Pride Park
Derby
Derbyshire
UK
DE24 8HR

Project Manager: Chris Bowley
Project Name: Joyce - Crowland
Project Ref: D38056C
Order No: D38056c
Date Samples Received: 21/05/18
Date Instructions Received: 29/05/18
Date Analysis Completed: 05/06/18

Prepared by:
Melanie Marshall
Laboratory Coordinator

Approved by:
John Gustafson
Managing Director

Envirolab Job Number: 18/04147

Client Project Name: Joyce - Crowland

Client Project Ref: D38056C

Lab Sample ID	18/04147/1	18/04147/3	18/04147/4	18/04147/6	18/04147/9	18/04147/10	18/04147/11	18/04147/13	Units	Method ref
Client Sample No	T1	TJ3	T4	TJ6	T9	TJ10	T11	TJ13		
Client Sample ID	TP1	TP2	TP2	TP3	TP5	TP6	TP6	TP7		
Depth to Top	0.10	0.20	1.80	0.60	1.50	0.20	1.60	0.50		
Depth To Bottom										
Date Sampled	10-May-18	10-May-18	10-May-18	10-May-18	10-May-18	10-May-18	10-May-18	10-May-18		
Sample Type	Soil - D	Soil - D	Soil - D	Soil - D	Soil - D	Soil - D	Soil - D	Soil - D		
Sample Matrix Code	6A	6A	5A	6A	3	2E	6E	6		
% Stones >10mm$_A$	<0.1	<0.1	30.5	<0.1	<0.1	<0.1	<0.1	<0.1	% w/w	A-T-044
pH$_D$ M#	7.42	7.13	8.35	4.57	7.59	6.20	4.91	7.07	pH	A-T-031s
Sulphate (water sol 2:1)$_D$ M#	-	-	0.16	0.08	0.72	-	1.21	-	g/l	A-T-026s
Loss on ignition (550degC)$_D$	-	-	-	-	-	-	3.4	-	% w/w	A-T-030s
Total Organic Carbon$_D$ M#	10.1	7.57	-	2.00	-	11.3	0.63	1.24	% w/w	A-T-032s
Arsenic$_D$ M#	14	11	-	21	-	14	8	12	mg/kg	A-T-024s
Cadmium$_D$ M#	0.9	0.8	-	0.7	-	0.8	<0.5	0.8	mg/kg	A-T-024s
Copper$_D$ M#	23	20	-	11	-	21	5	9	mg/kg	A-T-024s
Chromium$_D$ M#	44	44	-	36	-	41	23	29	mg/kg	A-T-024s
Chromium (hexavalent)$_D$	<1	<1	-	<1	-	<1	<1	<1	mg/kg	A-T-040s
Chromium (trivalent)	44	44	-	36	-	41	23	29	mg/kg	Calc
Lead$_D$ M#	47	37	-	21	-	48	9	15	mg/kg	A-T-024s
Mercury$_D$	<0.17	<0.17	-	<0.17	-	0.85	<0.17	<0.17	mg/kg	A-T-024s
Nickel$_D$ M#	34	34	-	20	-	33	21	34	mg/kg	A-T-024s
Selenium$_D$ M#	2	2	-	2	-	2	<1	1	mg/kg	A-T-024s
Zinc$_D$ M#	89	84	-	53	-	71	53	76	mg/kg	A-T-024s

Envirolab Job Number: 18/04147

Client Project Name: Joyce - Crowland

Client Project Ref: D38056C

Lab Sample ID	18/04147/1	18/04147/3	18/04147/4	18/04147/6	18/04147/9	18/04147/10	18/04147/11	18/04147/13	Units	Method ref
Client Sample No	T1	TJ3	T4	TJ6	T9	TJ10	T11	TJ13		
Client Sample ID	TP1	TP2	TP2	TP3	TP5	TP6	TP6	TP7		
Depth to Top	0.10	0.20	1.80	0.60	1.50	0.20	1.60	0.50		
Depth To Bottom										
Date Sampled	10-May-18	10-May-18	10-May-18	10-May-18	10-May-18	10-May-18	10-May-18	10-May-18		
Sample Type	Soil - D	Soil - D	Soil - D	Soil - D	Soil - D	Soil - D	Soil - D	Soil - D		
Sample Matrix Code	6A	6A	5A	6A	3	2E	6E	6		
OCP+OPP Combined Pesticides										
alpha-Hexachlorocyclohexane (HCH)$_A$	-	<0.2	-	-	-	<0.2	-	-	mg/kg	Subcon Chemtest
gamma-Hexachlorocyclohexane (HCH / Lindane)$_A$	-	<0.2	-	-	-	<0.2	-	-	mg/kg	Subcon Chemtest
beta-Hexachlorocyclohexane (HCH)$_A$	-	<0.2	-	-	-	<0.2	-	-	mg/kg	Subcon Chemtest
delta-Hexachlorocyclohexane (HCH)$_A$	-	<0.2	-	-	-	<0.2	-	-	mg/kg	Subcon Chemtest
Heptachlor$_A$	-	<0.2	-	-	-	<0.2	-	-	mg/kg	Subcon Chemtest
Aldrin$_A$	-	<0.2	-	-	-	<0.2	-	-	mg/kg	Subcon Chemtest
Heptachlor Epoxide$_A$	-	<0.2	-	-	-	<0.2	-	-	mg/kg	Subcon Chemtest
trans-Chlordane (Gamma)$_A$	-	<0.2	-	-	-	<0.2	-	-	mg/kg	Subcon Chemtest
cis-Chlordane (Alpha)$_A$	-	<0.2	-	-	-	<0.2	-	-	mg/kg	Subcon Chemtest
Endosulphan I (Alpha)$_A$	-	<0.2	-	-	-	<0.2	-	-	mg/kg	Subcon Chemtest
Endosulphan II (Beta)$_A$	-	<0.2	-	-	-	<0.2	-	-	mg/kg	Subcon Chemtest
Endosulphan Sulphate$_A$	-	<0.2	-	-	-	<0.2	-	-	mg/kg	Subcon Chemtest
p,p-DDD (TDE) (4,4)$_A$	-	<0.2	-	-	-	<0.2	-	-	mg/kg	Subcon Chemtest
p,p-DDE (4,4)$_A$	-	<0.2	-	-	-	<0.2	-	-	mg/kg	Subcon Chemtest
p,p-DDT (4,4)$_A$	-	<0.2	-	-	-	<0.2	-	-	mg/kg	Subcon Chemtest
Dieldrin$_A$	-	<0.2	-	-	-	<0.2	-	-	mg/kg	Subcon Chemtest
Endrin$_A$	-	<0.2	-	-	-	<0.2	-	-	mg/kg	Subcon Chemtest
Endrin Aldehyde$_A$	-	<0.2	-	-	-	<0.2	-	-	mg/kg	Subcon Chemtest
Endrin Ketone$_A$	-	<0.2	-	-	-	<0.2	-	-	mg/kg	Subcon Chemtest
Methoxychlor$_A$	-	<0.2	-	-	-	<0.2	-	-	mg/kg	Subcon Chemtest
Demeton-O$_A$	-	<0.2	-	-	-	<0.2	-	-	mg/kg	Subcon Chemtest
Demeton-S$_A$	-	<0.2	-	-	-	<0.2	-	-	mg/kg	Subcon Chemtest
Phorate$_A$	-	<0.2	-	-	-	<0.2	-	-	mg/kg	Subcon Chemtest
Disulfoton$_A$	-	<0.2	-	-	-	<0.2	-	-	mg/kg	Subcon Chemtest
Fenthion$_A$	-	<0.2	-	-	-	<0.2	-	-	mg/kg	Subcon Chemtest
Trichloronate$_A$	-	<0.2	-	-	-	<0.2	-	-	mg/kg	Subcon Chemtest
Prothiofos (Tokuthion)$_A$	-	<0.2	-	-	-	<0.2	-	-	mg/kg	Subcon Chemtest
Fensulphothion$_A$	-	<0.2	-	-	-	<0.2	-	-	mg/kg	Subcon Chemtest

Envirolab Job Number: 18/04147

Client Project Name: Joyce - Crowland

Client Project Ref: D38056C

Lab Sample ID	18/04147/1	18/04147/3	18/04147/4	18/04147/6	18/04147/9	18/04147/10	18/04147/11	18/04147/13	Units	Method ref
Client Sample No	T1	TJ3	T4	TJ6	T9	TJ10	T11	TJ13		
Client Sample ID	TP1	TP2	TP2	TP3	TP5	TP6	TP6	TP7		
Depth to Top	0.10	0.20	1.80	0.60	1.50	0.20	1.60	0.50		
Depth To Bottom										
Date Sampled	10-May-18	10-May-18	10-May-18	10-May-18	10-May-18	10-May-18	10-May-18	10-May-18		
Sample Type	Soil - D	Soil - D	Soil - D	Soil - D	Soil - D	Soil - D	Soil - D	Soil - D		
Sample Matrix Code	6A	6A	5A	6A	3	2E	6E	6		
Sulprofos$_A$	-	<0.2	-	-	-	<0.2	-	-	mg/kg	Subcon Chemtest
Azinphos-methyl$_A$	-	<0.2	-	-	-	<0.2	-	-	mg/kg	Subcon Chemtest
Coumaphos$_A$	-	<0.2	-	-	-	<0.2	-	-	mg/kg	Subcon Chemtest

Envirolab Job Number: 18/04147

Client Project Name: Joyce - Crowland

Client Project Ref: D38056C

Lab Sample ID	18/04147/1	18/04147/3	18/04147/4	18/04147/6	18/04147/9	18/04147/10	18/04147/11	18/04147/13	Units	Method ref
Client Sample No	T1	TJ3	T4	TJ6	T9	TJ10	T11	TJ13		
Client Sample ID	TP1	TP2	TP2	TP3	TP5	TP6	TP6	TP7		
Depth to Top	0.10	0.20	1.80	0.60	1.50	0.20	1.60	0.50		
Depth To Bottom										
Date Sampled	10-May-18	10-May-18	10-May-18	10-May-18	10-May-18	10-May-18	10-May-18	10-May-18		
Sample Type	Soil - D	Soil - D	Soil - D	Soil - D	Soil - D	Soil - D	Soil - D	Soil - D		
Sample Matrix Code	6A	6A	5A	6A	3	2E	6E	6		
PAH-16MS (Geodyne)										
Acenaphthene$_A^{M\#}$	<0.1	<0.1	-	<0.1	-	<0.1	<0.1	<0.1	mg/kg	A-T-019s
Acenaphthylene$_A^{M\#}$	<0.1	<0.1	-	<0.1	-	<0.1	<0.1	<0.1	mg/kg	A-T-019s
Anthracene$_A^{M\#}$	<0.1	<0.1	-	<0.1	-	<0.1	<0.1	<0.1	mg/kg	A-T-019s
Benzo(a)anthracene$_A^{M\#}$	<0.1	<0.1	-	<0.1	-	<0.1	<0.1	<0.1	mg/kg	A-T-019s
Benzo(a)pyrene$_A^{M\#}$	<0.1	<0.1	-	<0.1	-	<0.1	<0.1	<0.1	mg/kg	A-T-019s
Benzo(b)fluoranthene$_A^{M\#}$	<0.1	<0.1	-	<0.1	-	<0.1	<0.1	<0.1	mg/kg	A-T-019s
Benzo(ghi)perylene$_A^{M\#}$	<0.1	<0.1	-	<0.1	-	<0.1	<0.1	<0.1	mg/kg	A-T-019s
Benzo(k)fluoranthene$_A^{M\#}$	<0.1	<0.1	-	<0.1	-	<0.1	<0.1	<0.1	mg/kg	A-T-019s
Chrysene$_A^{M\#}$	<0.1	<0.1	-	<0.1	-	<0.1	<0.1	<0.1	mg/kg	A-T-019s
Dibenzo(ah)anthracene$_A^{M\#}$	<0.1	<0.1	-	<0.1	-	<0.1	<0.1	<0.1	mg/kg	A-T-019s
Fluoranthene$_A^{M\#}$	<0.1	<0.1	-	<0.1	-	<0.1	<0.1	<0.1	mg/kg	A-T-019s
Fluorene$_A^{M\#}$	<0.1	<0.1	-	<0.1	-	<0.1	<0.1	<0.1	mg/kg	A-T-019s
Indeno(123-cd)pyrene$_A^{M\#}$	<0.1	<0.1	-	<0.1	-	<0.1	<0.1	<0.1	mg/kg	A-T-019s
Naphthalene$_A^{M\#}$	<0.1	<0.1	-	<0.1	-	<0.1	<0.1	<0.1	mg/kg	A-T-019s
Phenanthrene$_A^{M\#}$	<0.1	<0.1	-	<0.1	-	<0.1	<0.1	<0.1	mg/kg	A-T-019s
Pyrene$_A^{M\#}$	<0.1	<0.1	-	<0.1	-	<0.1	<0.1	<0.1	mg/kg	A-T-019s
Total PAH-16MS (Geodyne)$_A^{M\#}$	<0.1	<0.1	-	<0.1	-	<0.1	<0.1	<0.1	mg/kg	A-T-019s

Envirolab Job Number: 18/04147

Client Project Name: Joyce - Crowland

Client Project Ref: D38056C

Lab Sample ID	18/04147/17	18/04147/19	18/04147/20	18/04147/25					Units	Method ref
Client Sample No	T17	TJ19	SD1	D2						
Client Sample ID	TP12	TP10	BH1	BH3						
Depth to Top	1.50	0.10	4.00	9.00						
Depth To Bottom										
Date Sampled	14-May-18	14-May-18	13-May-18	16-May-18						
Sample Type	Soil - D	Soil - D	Soil - D	Soil - D						
Sample Matrix Code	6A	6A	3	3						
% Stones >10mm$_A$	1.6	1.9	<0.1	<0.1					% w/w	A-T-044
pH$_D$ M#	-	7.37	8.79	8.53					pH	A-T-031s
Sulphate (water sol 2:1)$_D$ M#	-	-	0.63	0.55					g/l	A-T-026s
Loss on ignition (550degC)$_D$	9.5	-	-	-					% w/w	A-T-030s
Total Organic Carbon$_D$ M#	-	4.82	-	-					% w/w	A-T-032s
Arsenic$_D$ M#	-	10	-	-					mg/kg	A-T-024s
Cadmium$_D$ M#	-	0.8	-	-					mg/kg	A-T-024s
Copper$_D$ M#	-	16	-	-					mg/kg	A-T-024s
Chromium$_D$ M#	-	41	-	-					mg/kg	A-T-024s
Chromium (hexavalent)$_D$	-	<1	-	-					mg/kg	A-T-040s
Chromium (trivalent)	-	41	-	-					mg/kg	Calc
Lead$_D$ M#	-	28	-	-					mg/kg	A-T-024s
Mercury$_D$	-	<0.17	-	-					mg/kg	A-T-024s
Nickel$_D$ M#	-	36	-	-					mg/kg	A-T-024s
Selenium$_D$ M#	-	2	-	-					mg/kg	A-T-024s
Zinc$_D$ M#	-	84	-	-					mg/kg	A-T-024s

Envirolab Job Number: 18/04147

Client Project Name: Joyce - Crowland

Client Project Ref: D38056C

Lab Sample ID	18/04147/17	18/04147/19	18/04147/20	18/04147/25					Units	Method ref
Client Sample No	T17	TJ19	SD1	D2						
Client Sample ID	TP12	TP10	BH1	BH3						
Depth to Top	1.50	0.10	4.00	9.00						
Depth To Bottom										
Date Sampled	14-May-18	14-May-18	13-May-18	16-May-18						
Sample Type	Soil - D	Soil - D	Soil - D	Soil - D						
Sample Matrix Code	6A	6A	3	3						
OCP+OPP Combined Pesticides										
alpha-Hexachlorocyclohexane (HCH)$_A$	-	<0.2	-	-					mg/kg	Subcon Chemtest
gamma-Hexachlorocyclohexane (HCH / Lindane)$_A$	-	<0.2	-	-					mg/kg	Subcon Chemtest
beta-Hexachlorocyclohexane (HCH)$_A$	-	<0.2	-	-					mg/kg	Subcon Chemtest
delta-Hexachlorocyclohexane (HCH)$_A$	-	<0.2	-	-					mg/kg	Subcon Chemtest
Heptachlor$_A$	-	<0.2	-	-					mg/kg	Subcon Chemtest
Aldrin$_A$	-	<0.2	-	-					mg/kg	Subcon Chemtest
Heptachlor Epoxide$_A$	-	<0.2	-	-					mg/kg	Subcon Chemtest
trans-Chlordane (Gamma)$_A$	-	<0.2	-	-					mg/kg	Subcon Chemtest
cis-Chlordane (Alpha)$_A$	-	<0.2	-	-					mg/kg	Subcon Chemtest
Endosulphan I (Alpha)$_A$	-	<0.2	-	-					mg/kg	Subcon Chemtest
Endosulphan II (Beta)$_A$	-	<0.2	-	-					mg/kg	Subcon Chemtest
Endosulphan Sulphate$_A$	-	<0.2	-	-					mg/kg	Subcon Chemtest
p,p-DDD (TDE) (4,4)$_A$	-	<0.2	-	-					mg/kg	Subcon Chemtest
p,p-DDE (4,4)$_A$	-	<0.2	-	-					mg/kg	Subcon Chemtest
p,p-DDT (4,4)$_A$	-	<0.2	-	-					mg/kg	Subcon Chemtest
Dieldrin$_A$	-	<0.2	-	-					mg/kg	Subcon Chemtest
Endrin$_A$	-	<0.2	-	-					mg/kg	Subcon Chemtest
Endrin Aldehyde$_A$	-	<0.2	-	-					mg/kg	Subcon Chemtest
Endrin Ketone$_A$	-	<0.2	-	-					mg/kg	Subcon Chemtest
Methoxychlor$_A$	-	<0.2	-	-					mg/kg	Subcon Chemtest
Demeton-O$_A$	-	<0.2	-	-					mg/kg	Subcon Chemtest
Demeton-S$_A$	-	<0.2	-	-					mg/kg	Subcon Chemtest
Phorate$_A$	-	<0.2	-	-					mg/kg	Subcon Chemtest
Disulfoton$_A$	-	<0.2	-	-					mg/kg	Subcon Chemtest
Fenthion$_A$	-	<0.2	-	-					mg/kg	Subcon Chemtest
Trichloronate$_A$	-	<0.2	-	-					mg/kg	Subcon Chemtest
Prothiofos (Tokuthion)$_A$	-	<0.2	-	-					mg/kg	Subcon Chemtest
Fensulphothion$_A$	-	<0.2	-	-					mg/kg	Subcon Chemtest

Envirolab Job Number: 18/04147

Client Project Name: Joyce - Crowland

Client Project Ref: D38056C

Lab Sample ID	18/04147/17	18/04147/19	18/04147/20	18/04147/25					Units	Method ref
Client Sample No	T17	TJ19	SD1	D2						
Client Sample ID	TP12	TP10	BH1	BH3						
Depth to Top	1.50	0.10	4.00	9.00						
Depth To Bottom										
Date Sampled	14-May-18	14-May-18	13-May-18	16-May-18						
Sample Type	Soil - D	Soil - D	Soil - D	Soil - D						
Sample Matrix Code	6A	6A	3	3						
Sulprofos$_A$	-	<0.2	-	-					mg/kg	Subcon Chemtest
Azinphos-methyl$_A$	-	<0.2	-	-					mg/kg	Subcon Chemtest
Coumaphos$_A$	-	<0.2	-	-					mg/kg	Subcon Chemtest

Envirolab Job Number: 18/04147

Client Project Name: Joyce - Crowland

Client Project Ref: D38056C

Lab Sample ID	18/04147/17	18/04147/19	18/04147/20	18/04147/25					Units	Method ref
Client Sample No	T17	TJ19	SD1	D2						
Client Sample ID	TP12	TP10	BH1	BH3						
Depth to Top	1.50	0.10	4.00	9.00						
Depth To Bottom										
Date Sampled	14-May-18	14-May-18	13-May-18	16-May-18						
Sample Type	Soil - D	Soil - D	Soil - D	Soil - D						
Sample Matrix Code	6A	6A	3	3						
PAH-16MS (Geodyne)										
Acenaphthene$_A^{M\#}$	-	<0.1	-	-					mg/kg	A-T-019s
Acenaphthylene$_A^{M\#}$	-	<0.1	-	-					mg/kg	A-T-019s
Anthracene$_A^{M\#}$	-	<0.1	-	-					mg/kg	A-T-019s
Benzo(a)anthracene$_A^{M\#}$	-	<0.1	-	-					mg/kg	A-T-019s
Benzo(a)pyrene$_A^{M\#}$	-	<0.1	-	-					mg/kg	A-T-019s
Benzo(b)fluoranthene$_A^{M\#}$	-	<0.1	-	-					mg/kg	A-T-019s
Benzo(ghi)perylene$_A^{M\#}$	-	<0.1	-	-					mg/kg	A-T-019s
Benzo(k)fluoranthene$_A^{M\#}$	-	<0.1	-	-					mg/kg	A-T-019s
Chrysene$_A^{M\#}$	-	<0.1	-	-					mg/kg	A-T-019s
Dibenzo(ah)anthracene$_A^{M\#}$	-	<0.1	-	-					mg/kg	A-T-019s
Fluoranthene$_A^{M\#}$	-	<0.1	-	-					mg/kg	A-T-019s
Fluorene$_A^{M\#}$	-	<0.1	-	-					mg/kg	A-T-019s
Indeno(123-cd)pyrene$_A^{M\#}$	-	<0.1	-	-					mg/kg	A-T-019s
Naphthalene$_A^{M\#}$	-	<0.1	-	-					mg/kg	A-T-019s
Phenanthrene$_A^{M\#}$	-	<0.1	-	-					mg/kg	A-T-019s
Pyrene$_A^{M\#}$	-	<0.1	-	-					mg/kg	A-T-019s
Total PAH-16MS (Geodyne)$_A^{M\#}$	-	<0.1	-	-					mg/kg	A-T-019s

REPORT NOTES

General:
This report shall not be reproduced, except in full, without written approval from Envirolab.
All samples contained within this report, and any received with the same delivery, will be disposed of one month after the date of this report.
Analytical results reflect the quality of the sample at the time of analysis only.
Opinions and interpretations expressed are outside the scope of our accreditation.
If results are in italic font they are associated with an AQC failure and there is insufficient sample to repeat the analysis. These are not accredited and are unreliable.
A deviating samples report is appended and will indicate if samples or tests have been found to be deviating. Any test results affected may not be an accurate record of the concentration at the time of sampling and, as a result, may be invalid.

Soil chemical analysis:
All results are reported as dry weight (<40°C).
For samples with Matrix Codes 1 - 6 natural stones, brick and concrete fragments >10mm and any extraneous material (visible glass, metal or twigs) are removed and excluded from the sample prior to analysis and reported results corrected to a whole sample basis. This is reported as '% stones >10mm'.
For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis and this supersedes any “A” subscripts
All analysis is performed on the sample as received for soil samples which are positive for asbestos or the client has informed asbestos may be present and/or if they are from outside the European Union and this supersedes any "D" subscripts.

TPH analysis of water by method A-T-007:
Free and visible oils are excluded from the sample used for analysis so that the reported result represents the dissolved phase only.

Electrical Conductivity of water by Method A-T-037:
Results greater than 12900µS/cm @ 25°C / 11550µS/cm @ 20°C fall outside the calibration range and as such are unaccredited.

Asbestos:
Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if only present in small numbers as discrete fibres/fragments in the original sample.
Stones etc. are not removed from the sample prior to analysis.
Quantification of asbestos is a 3 stage process including visual identification, hand picking and weighing and fibre counting by sedimentation/phase contrast optical microscopy if required. If asbestos is identified as being present but is not in a form that is suitable for analysis by hand picking and weighing (normally if the asbestos is present as free fibres) quantification by sedimentation is performed. Where ACMs are found a percentage asbestos is assigned to each with reference to 'HSG264, Asbestos: The survey guide' and the calculated asbestos content is expressed as a percentage of the dried soil sample aliquot used.

Predominant Matrix Codes:
1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER, 8 = Asbestos bulk ID sample.
Samples with Matrix Code 7 & 8 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations, with the exception of bulk asbestos which are BSEN 17025 accredited.
Secondary Matrix Codes:
A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal, E = contains roots/twigs.

Key:
IS indicates Insufficient Sample for analysis.
US indicates Unsuitable Sample for analysis.
NDP indicates No Determination Possible.
NAD indicates No Asbestos Detected.
N/A indicates Not Applicable.
Superscript # indicates method accredited to ISO 17025.
Superscript "M" indicates method accredited to MCERTS.
Subscript "A" indicates analysis performed on the sample as received.
Subscript "D" indicates analysis performed on the dried sample, crushed to pass a 2mm sieve

Please contact us if you need any further information.

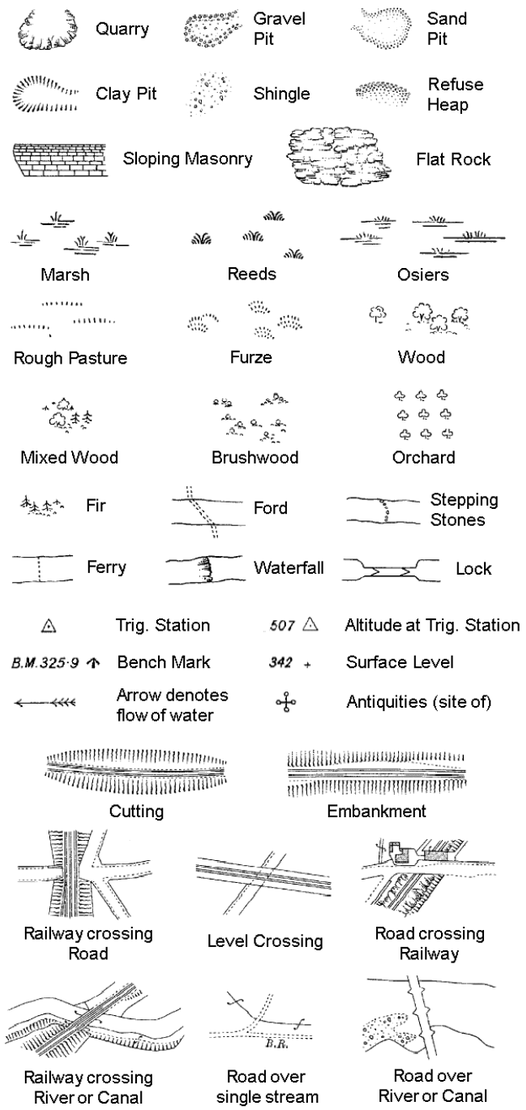
GeoDyne

APPENDIX IX

Historical Plans

Historical Mapping Legends

Ordnance Survey County Series and Ordnance Survey Plan 1:2,500



County Boundary (Geographical)

County & Civil Parish Boundary

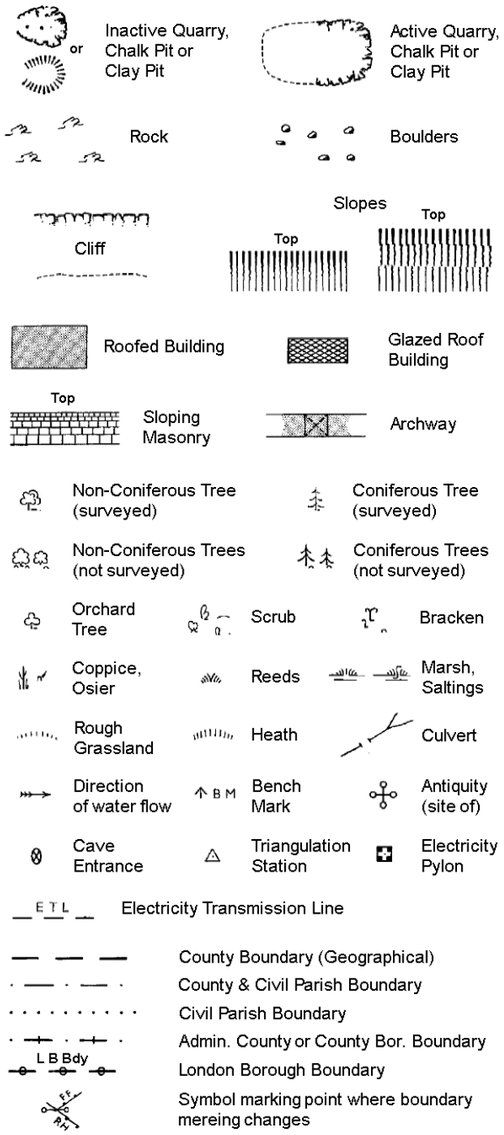
Administrative County & Civil Parish Boundary

Co. Boro. Bdy. County Borough Boundary (England)

Co. Burgh Bdy. County Burgh Boundary (Scotland)

B P B S	Boundary Post or Stone	P.C.B	Police Call Box
B.R.	Bridle Road	P	Pump
E.P	Electricity Pylon	S.P	Signal Post
F.B.	Foot Bridge	St.	Sluice
F.P.	Foot Path	Sp.	Spring
G.P	Guide Post or Board	T.C.B	Telephone Call Box
M.S	Mile Stone	Tr.	Trough
M.P M.R	Mooring Post or Ring	W	Well

Ordnance Survey Plan, Additional SIMs and Supply of Unpublished Survey Information 1:2,500 and 1:1,250



County Boundary (Geographical)

County & Civil Parish Boundary

Civil Parish Boundary

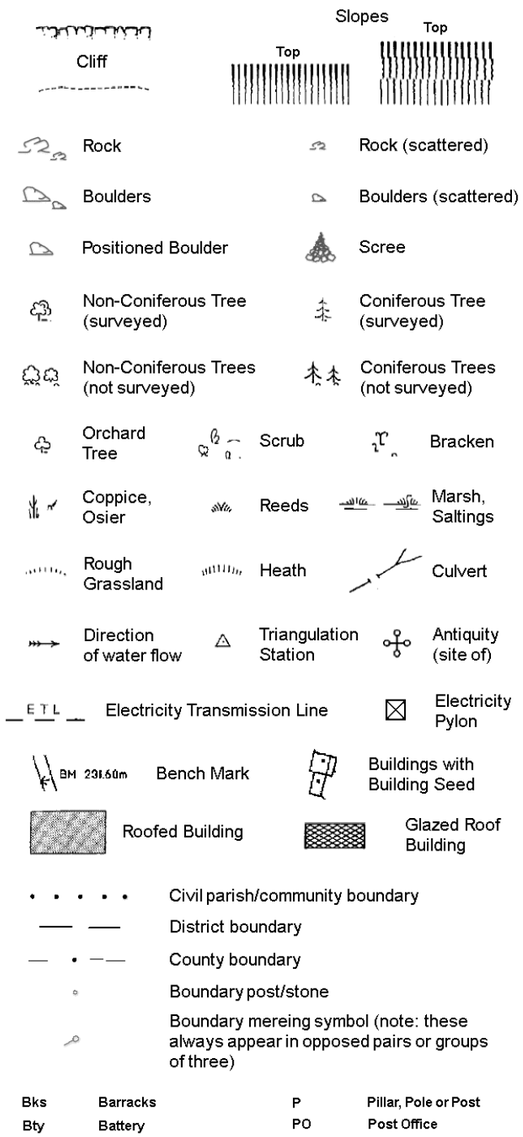
Admin. County or County Bor. Boundary

L B Bdy London Borough Boundary

Symbol marking point where boundary mereing changes

BH	Beer House	P	Pillar, Pole or Post
BP, BS	Boundary Post or Stone	PO	Post Office
Cn, C	Capstan, Crane	PC	Public Convenience
Chy	Chimney	PH	Public House
D Fn	Drinking Fountain	Pp	Pump
El P	Electricity Pillar or Post	SB, S Br	Signal Box or Bridge
FAP	Fire Alarm Pillar	SP, SL	Signal Post or Light
FB	Foot Bridge	Spr	Spring
GP	Guide Post	Tk	Tank or Track
H	Hydrant or Hydraulic	TCB	Telephone Call Box
LC	Level Crossing	TCP	Telephone Call Post
MH	Manhole	Tr	Trough
MP	Mile Post or Mooring Post	Wr Pt, Wr T	Water Point, Water Tap
MS	Mile Stone	W	Well
NTL	Normal Tidal Limit	Wd Pp	Wind Pump

Large-Scale National Grid Data 1:2,500 and 1:1,250



Civil parish/community boundary

District boundary

County boundary

Boundary post/stone

Boundary mereing symbol (note: these always appear in opposed pairs or groups of three)

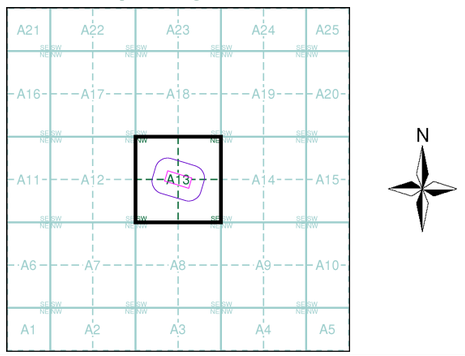
Bks	Barracks	P	Pillar, Pole or Post
Bty	Battery	PO	Post Office
Cemy	Cemetery	PC	Public Convenience
Chy	Chimney	Pp	Pump
Cis	Cistern	Ppg Sta	Pumping Station
Dismtd Rly	Dismantled Railway	PW	Place of Worship
El Gen Sta	Electricity Generating Station	Sewage Ppg Sta	Sewage Pumping Station
El P	Electricity Pole, Pillar	SB, S Br	Signal Box or Bridge
El Sub Sta	Electricity Sub Station	SP, SL	Signal Post or Light
FB	Filter Bed	Spr	Spring
Fn / D Fn	Fountain / Drinking Ftn.	Tk	Tank or Track
Gas Gov	Gas Valve Compound	Tr	Trough
GVC	Gas Governer	Wd Pp	Wind Pump
GP	Guide Post	Wr Pt, Wr T	Water Point, Water Tap
MH	Manhole	Wks	Works (building or area)
MP, MS	Mile Post or Mile Stone	W	Well

GeoDyne

Historical Mapping & Photography included:

Mapping Type	Scale	Date	Pg
Lincolnshire	1:2,500	1887 - 1888	2
Northamptonshire	1:2,500	1901	3
Lincolnshire	1:2,500	1904	4
Ordnance Survey Plan	1:2,500	1975	5
Additional SIMs	1:2,500	1982 - 1989	6
Large-Scale National Grid Data	1:2,500	1995	7
Large-Scale National Grid Data	1:2,500	1996	8
Historical Aerial Photography	1:2,500	1999	9

Historical Map - Segment A13



Order Details

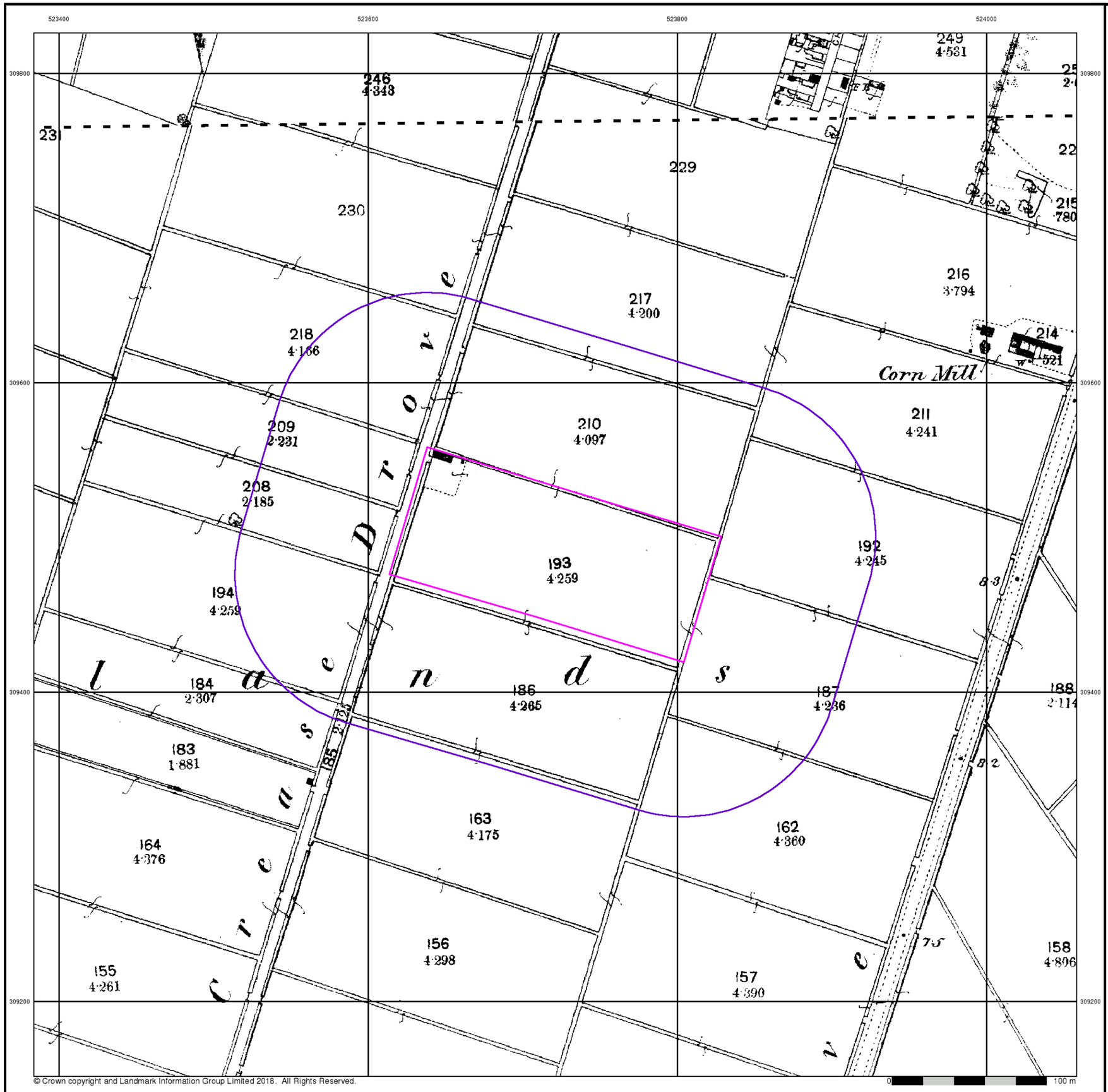
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Customer Ref: D38056c
National Grid Reference: 523720, 309490
Slice: A
Site Area (Ha): 1.69
Search Buffer (m): 100

Site Details

Crease Drove, Crowland, PETERBOROUGH, PE6 0BN

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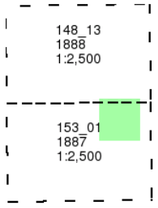
Lincolnshire

Published 1887 - 1888

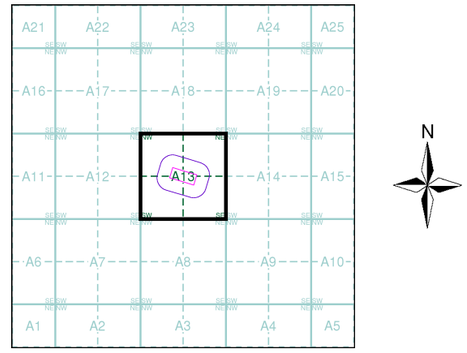
Source map scale - 1:2,500

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



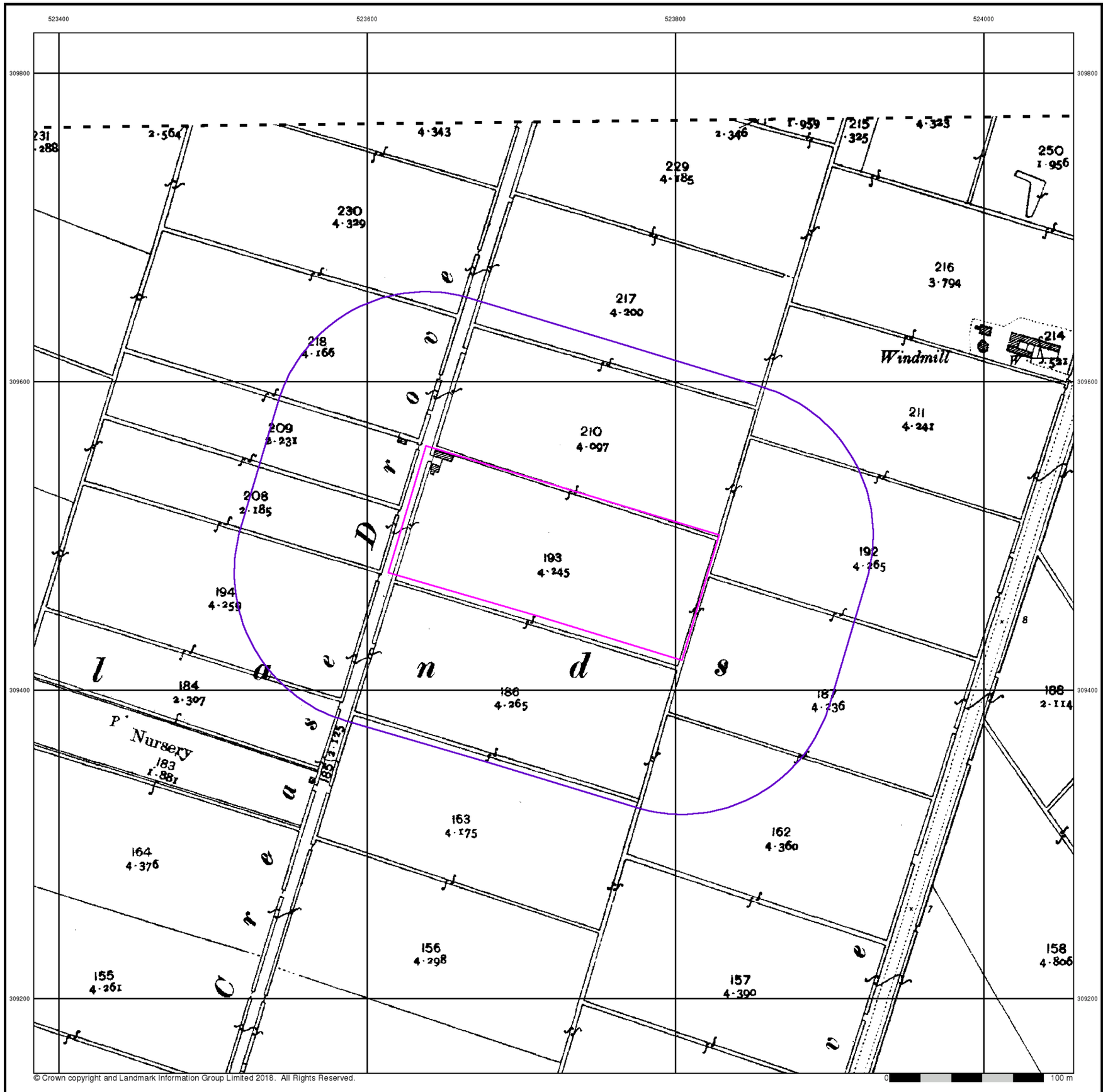
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Customer Ref:	D38056c
National Grid Reference:	523720, 309490
Slice:	A
Site Area (Ha):	1.69
Search Buffer (m):	100

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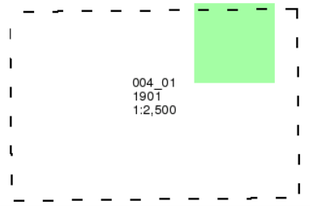
Northamptonshire

Published 1901

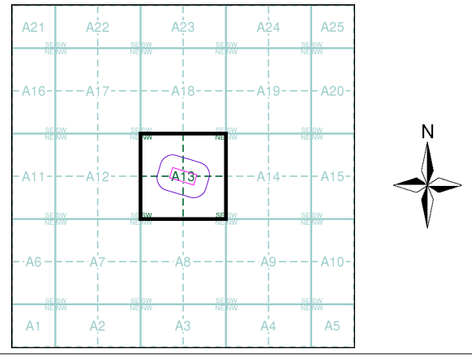
Source map scale - 1:2,500

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



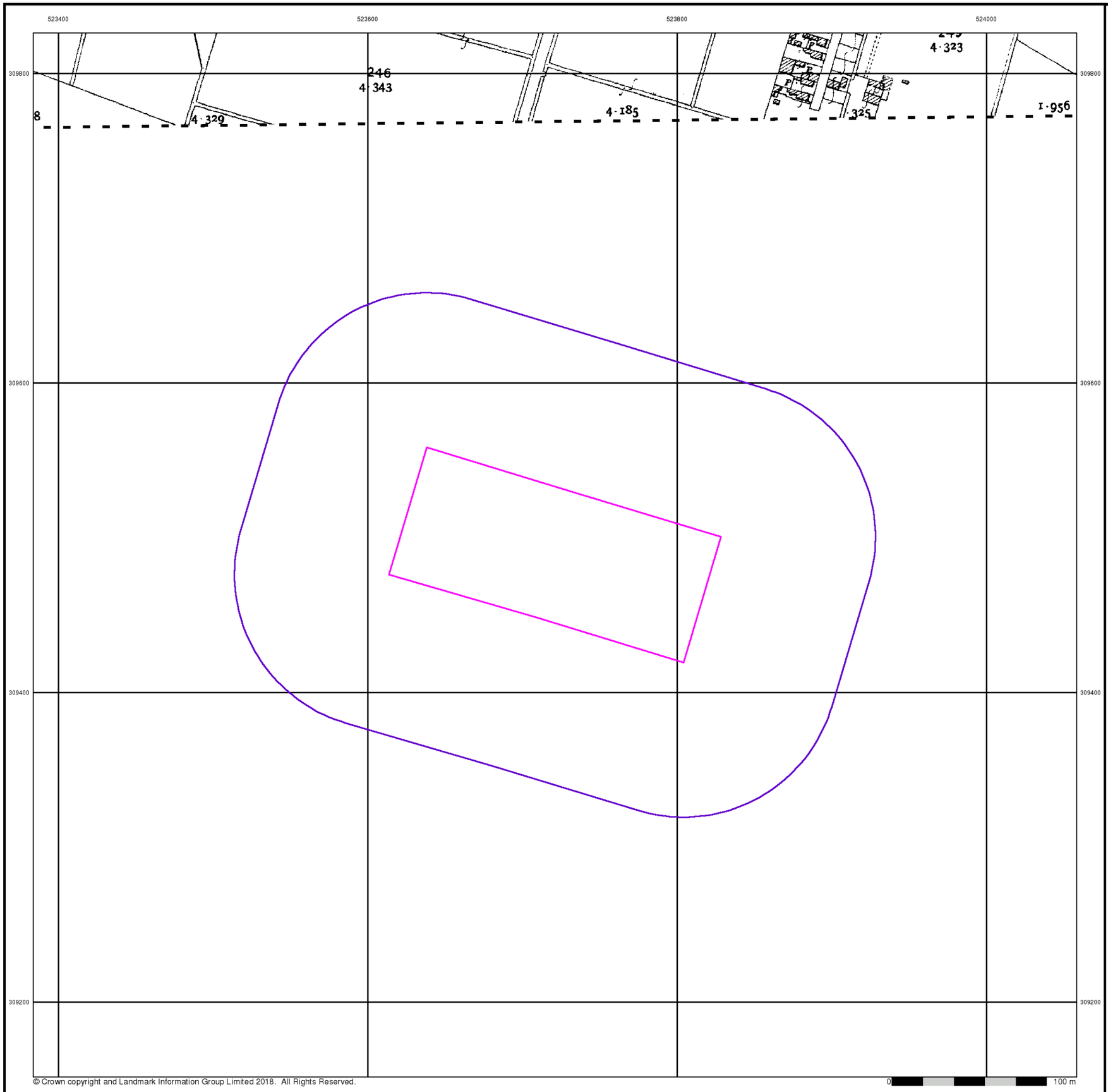
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National Grid Reference:	523720, 309490
Slice:	A
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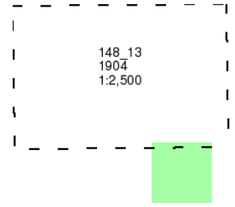
Lincolnshire

Published 1904

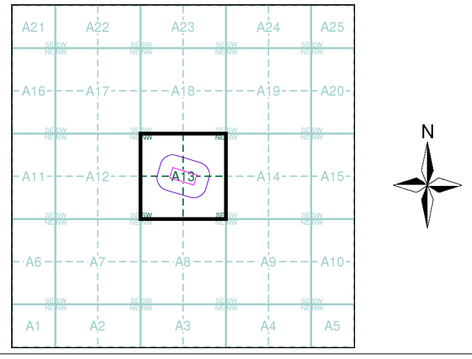
Source map scale - 1:2,500

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

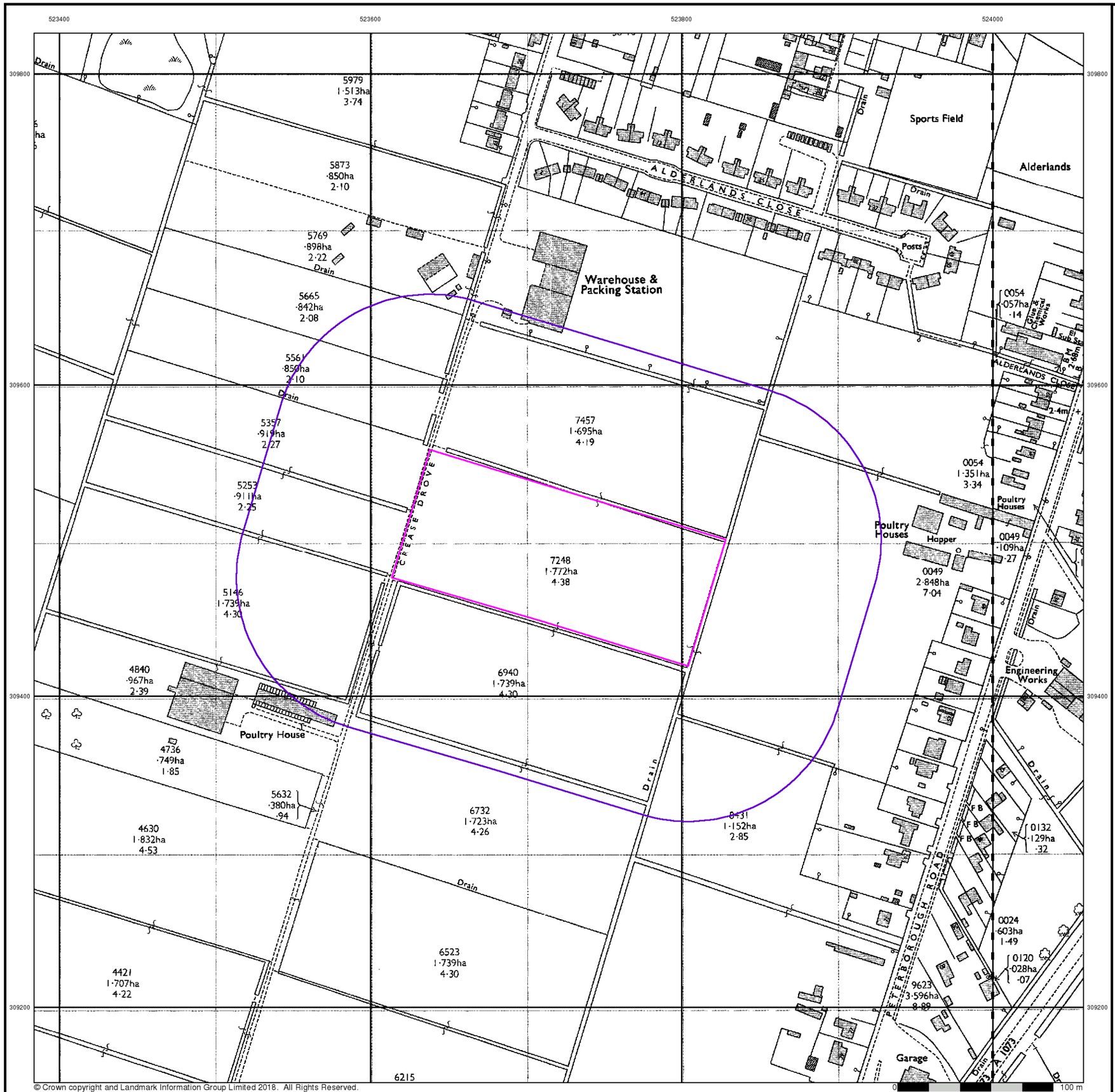
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Customer Ref:	D38056c
National Grid Reference:	523720, 309490
Slice:	A
Site Area (Ha):	1.69
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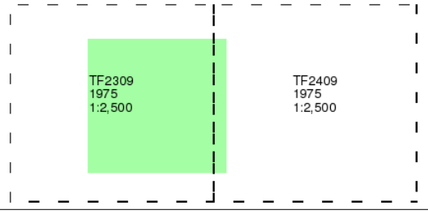
Ordnance Survey Plan

Published 1975

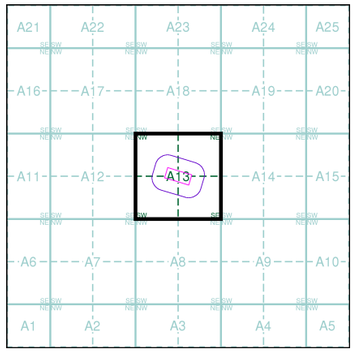
Source map scale - 1:2,500

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



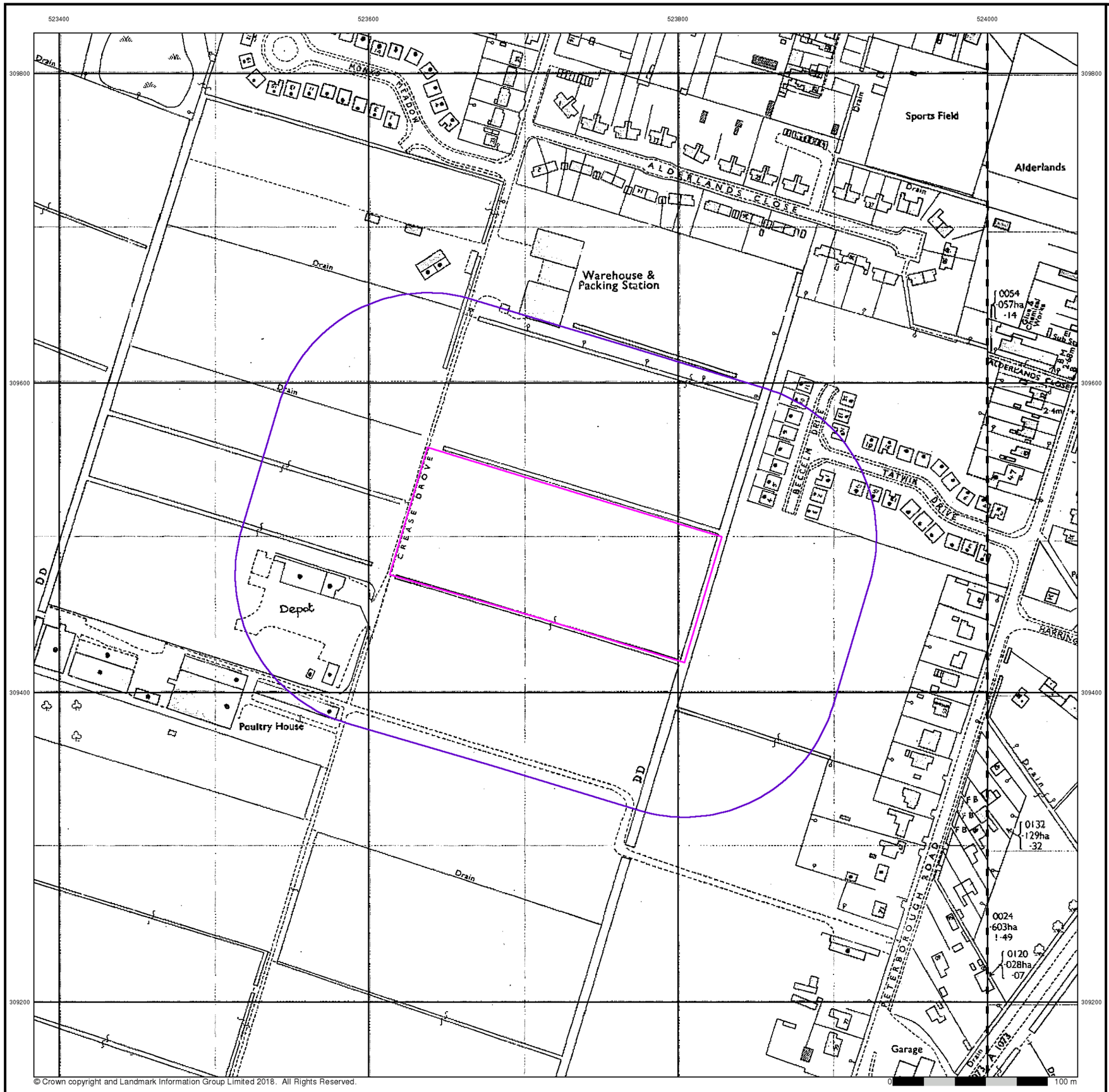
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Customer Ref:	D38056c
National Grid Reference:	523720, 309490
Slice:	A
Site Area (Ha):	1.69
Search Buffer (m):	100

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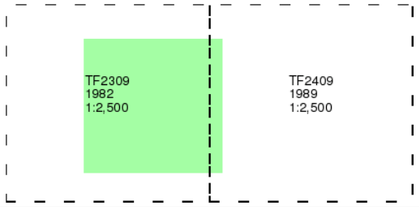
Additional SIMs

Published 1982 - 1989

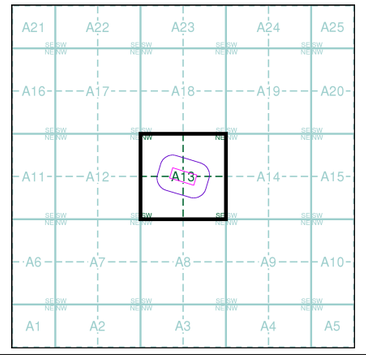
Source map scale - 1:2,500

The SIM cards (Ordnance Survey's `Survey of Information on Microfilm') are further, minor editions of mapping which were produced and published in between the main editions as an area was updated. They date from 1947 to 1994, and contain detailed information on buildings, roads and land-use. 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

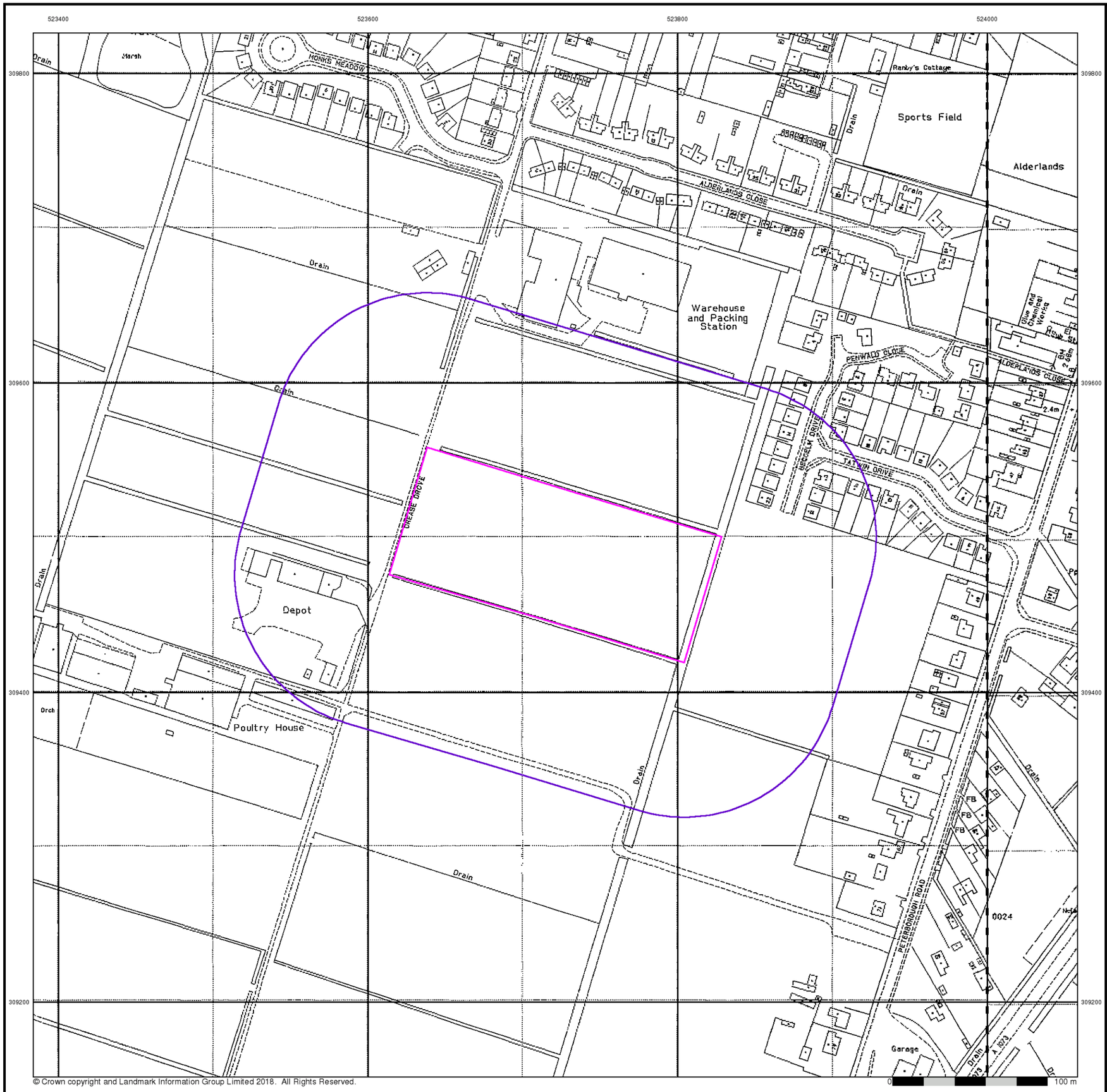
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Customer Ref:	D38056c
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Site Area (Ha):	1.69
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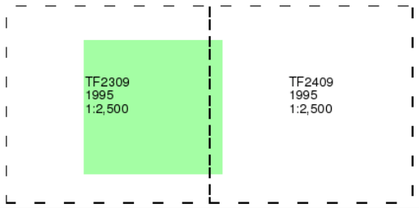
Large-Scale National Grid Data

Published 1995

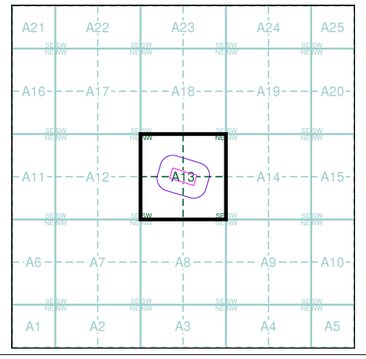
Source map scale - 1:2,500

'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

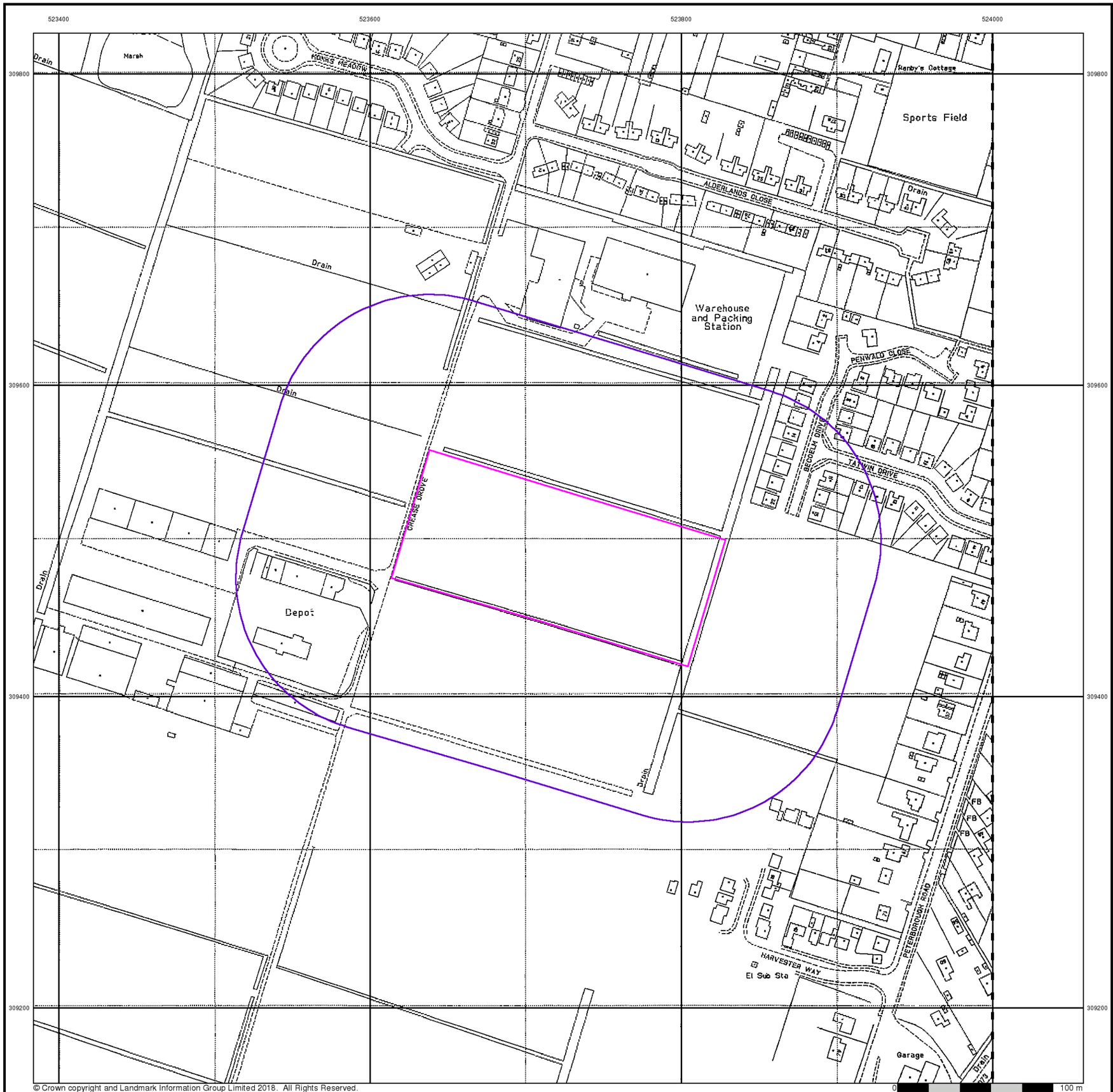
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Customer Ref:	D38056c
National Grid Reference:	523720, 309490
Slice:	A
Site Area (Ha):	1.69
Search Buffer (m):	100

Site Details

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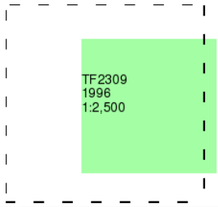
Large-Scale National Grid Data

Published 1996

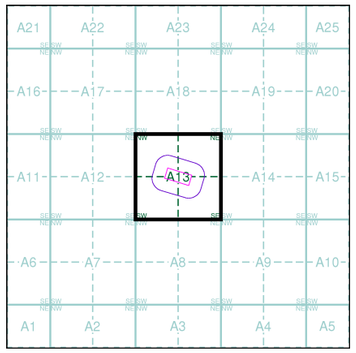
Source map scale - 1:2,500

'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:	163602664_1_1
Customer Ref:	D38056c
National Grid Reference:	523720, 309490
Slice:	A
Site Area (Ha):	1.69
Search Buffer (m):	100

Site Details

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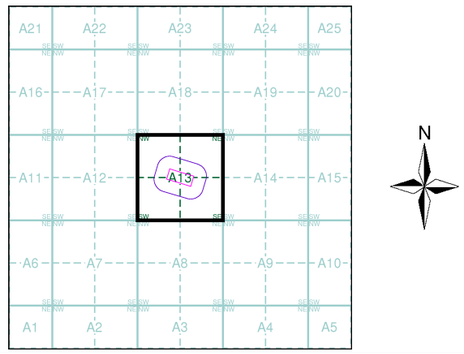
GeoDyne

Historical Aerial Photography

Published 1999

This aerial photography was produced by Getmapping, these vertical aerial photographs provide a seamless, full colour survey of the whole of Great Britain

Historical Aerial Photography - Segment A13



Order Details

Order Number:	163602664_1_1
Customer Ref:	D38056c
National Grid Reference:	523720, 309490
Slice:	A
Site Area (Ha):	1.69
Search Buffer (m):	100

Site Details

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Historical Mapping Legends

Ordnance Survey County Series 1:10,560

Gravel Pit
Sand Pit
Other Pits
Quarry
Shingle
Orchard
Osiers
Reeds
Marsh
Mixed Wood
Deciduous
Brushwood
Fir
Furze
Rough Pasture
Arrow denotes flow of water
Trigonometrical Station
Site of Antiquities
Bench Mark
Pump, Guide Post, Signal Post
Well, Spring, Boundary Post
·285 Surface Level
Sketched Contour
Instrumental Contour
Main Roads
Fenced
Un-Fenced
Minor Roads
Fenced
Un-Fenced
Sunken Road
Raised Road
Road over Railway
Railway over River
Railway over Road
Level Crossing
Road over River or Canal
Road over Stream
Road over Stream
County Boundary (Geographical)
County & Civil Parish Boundary
Administrative County & Civil Parish Boundary
Co. Boro. Bdy. County Borough Boundary (England)
Co. Burgh Bdy. County Burgh Boundary (Scotland)
R.D. Bdy. Rural District Boundary
Civil Parish Boundary

Ordnance Survey Plan 1:10,000

Chalk Pit, Clay Pit or Quarry
Gravel Pit
Sand Pit
Disused Pit or Quarry
Refuse or Slag Heap
Lake, Loch or Pond
Dunes
Boulders
Coniferous Trees
Non-Coniferous Trees
Orchard
Scrub
Coppice
Bracken
Heath
Rough Grassland
Marsh
Reeds
Saltings
Building
Direction of Flow of Water
Shingle
Sand
Glasshouse
Pylon
Pylon
Electricity Transmission Line
Sloping Masonry
Cutting
Embankment
Standard Gauge Multiple Track
Road Under
Road Over
Level Crossing
Foot Bridge
Standard Gauge Single Track
Siding, Tramway or Mineral Line
Narrow Gauge
Geographical County
Administrative County, County Borough or County of City
Municipal Borough, Urban or Rural District, Burgh or District Council
Borough, Burgh or County Constituency
Shown only when not coincident with other boundaries
Civil Parish
Shown alternately when coincidence of boundaries occurs

BP, BS	Boundary Post or Stone	Pol Sta	Police Station
Ch	Church	PO	Post Office
CH	Club House	PC	Public Convenience
F E Sta	Fire Engine Station	PH	Public House
FB	Foot Bridge	SB	Signal Box
Fn	Fountain	Spr	Spring
GP	Guide Post	TCB	Telephone Call Box
MP	Mile Post	TCP	Telephone Call Post
MS	Mile Stone	W	Well

1:10,000 Raster Mapping

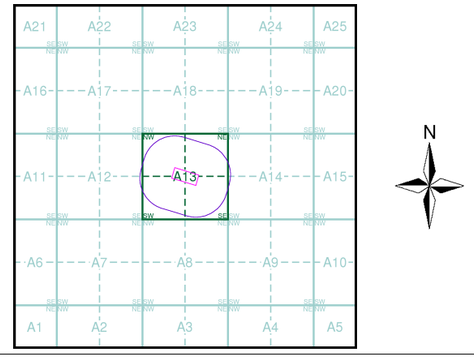
Gravel Pit
Refuse tip or slag heap
Rock
Rock (scattered)
Boulders
Boulders (scattered)
Shingle
Mud
Sand
Sand Pit
Slopes
Top of cliff
General detail
Underground detail
Overhead detail
Narrow gauge railway
Multi-track railway
Single track railway
County boundary (England only)
Civil, parish or community boundary
District, Unitary, Metropolitan, London Borough boundary
Constituency boundary
Area of wooded vegetation
Non-coniferous trees
Non-coniferous trees (scattered)
Coniferous trees
Coniferous trees (scattered)
Positioned tree
Orchard
Coppice or Osiers
Rough Grassland
Heath
Scrub
Marsh, Salt Marsh or Reeds
Water feature
Flow arrows
MHW(S) Mean high water (springs)
MLW(S) Mean low water (springs)
Telephone line (where shown)
Electricity transmission line (with poles)
BM 123.45 m Bench mark (where shown)
Triangulation station
Point feature (e.g. Guide Post or Mile Stone)
Pylon, flare stack or lighting tower
Site of (antiquity)
Glasshouse
General Building
Important Building

GeoDyne

Historical Mapping & Photography included:

Mapping Type	Scale	Date	Pg
Lincolnshire	1:10,560	1886 - 1887	2
Northamptonshire	1:10,560	1901	3
Lincolnshire	1:10,560	1905 - 1906	4
Lincolnshire	1:10,560	1905 - 1906	5
Lincolnshire	1:10,560	1905	6
Lincolnshire	1:10,560	1952	7
Ordnance Survey Plan	1:10,000	1958	8
Ordnance Survey Plan	1:10,000	1975 - 1979	9
Ordnance Survey Plan	1:10,000	1979	10
10K Raster Mapping	1:10,000	2000	11
10K Raster Mapping	1:10,000	2006	12
VectorMap Local	1:10,000	2018	13

Historical Map - Slice A



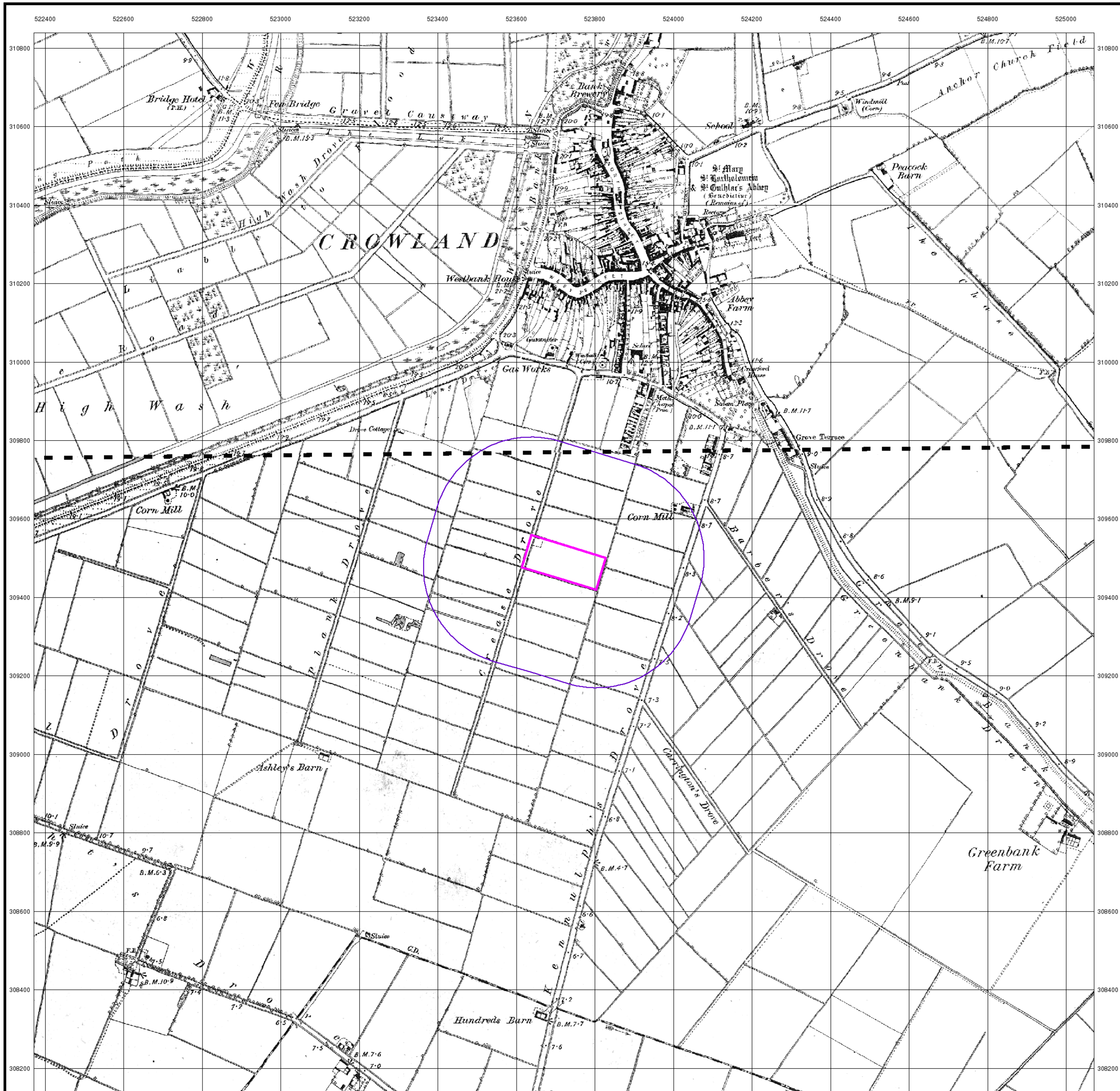
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Order Number: 163602664_1_1
Customer Ref: D38056c
National Grid Reference: 523720, 309490
Slice: A
Site Area (Ha): 1.69
Search Buffer (m): 250

Site Details

Crease Drove, Crowland, PETERBOROUGH, PE6 0BN

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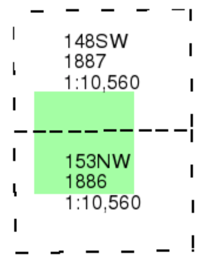
Lincolnshire

Published 1886 - 1887

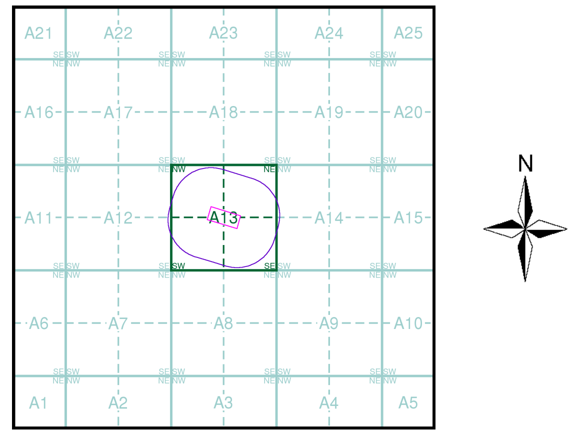
Source map scale - 1:10,560

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; these maps were used to update the 1:10,560 maps. The published date given therefore 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. In the late 1940`s, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)



Historical Map - Slice A



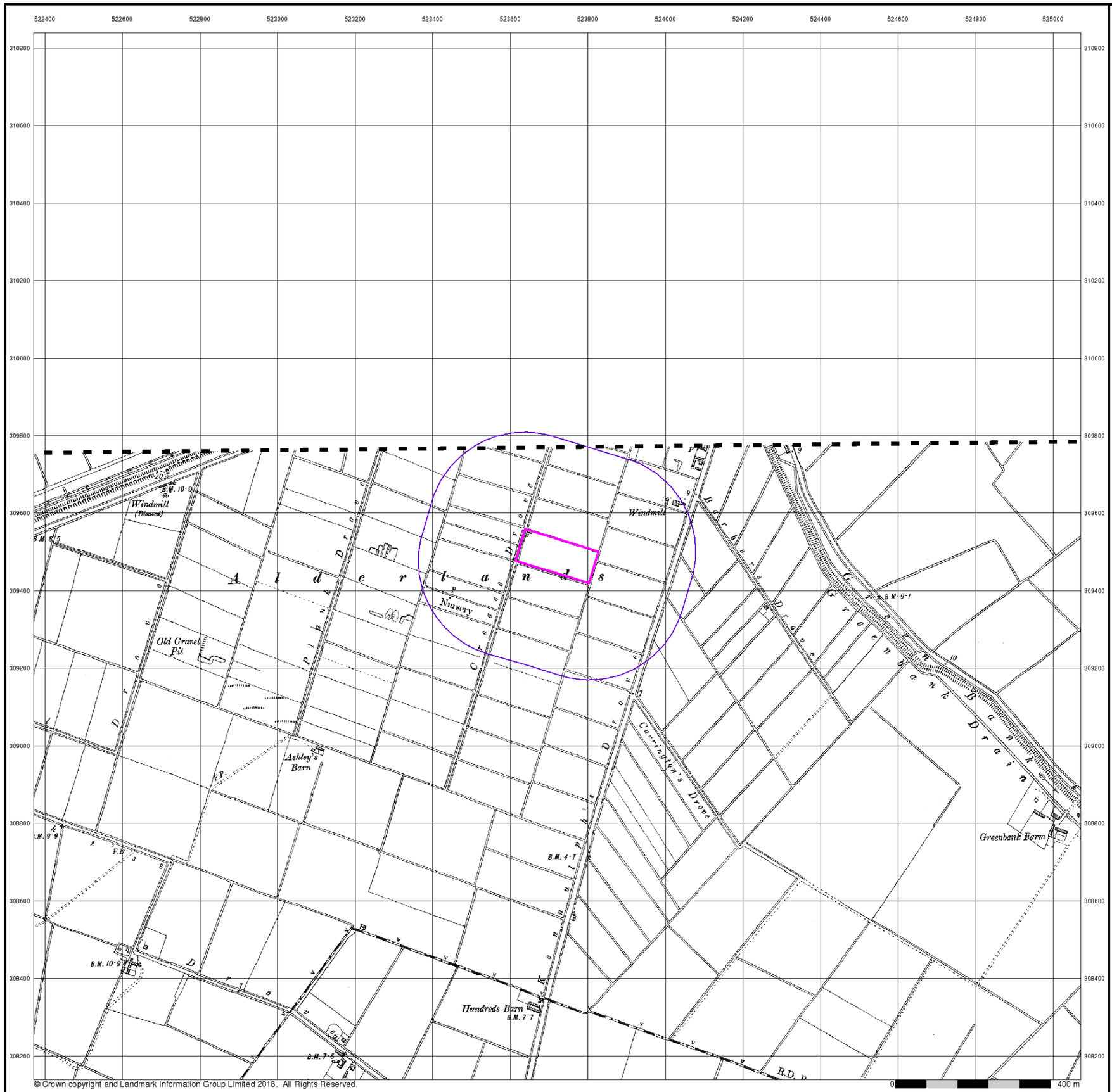
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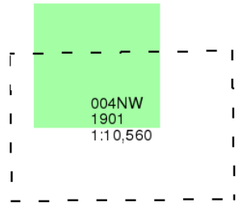
Northamptonshire

Published 1901

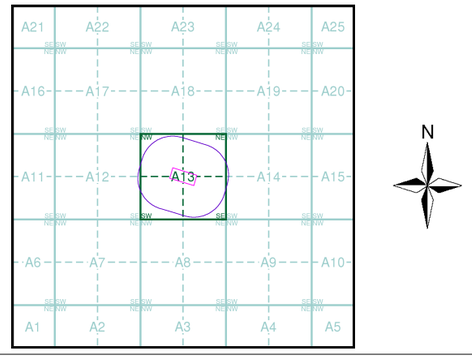
Source map scale - 1:10,560

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; these maps were used to update the 1:10,560 maps. The published date given therefore 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. In the late 1940`s, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)



Historical Map - Slice A



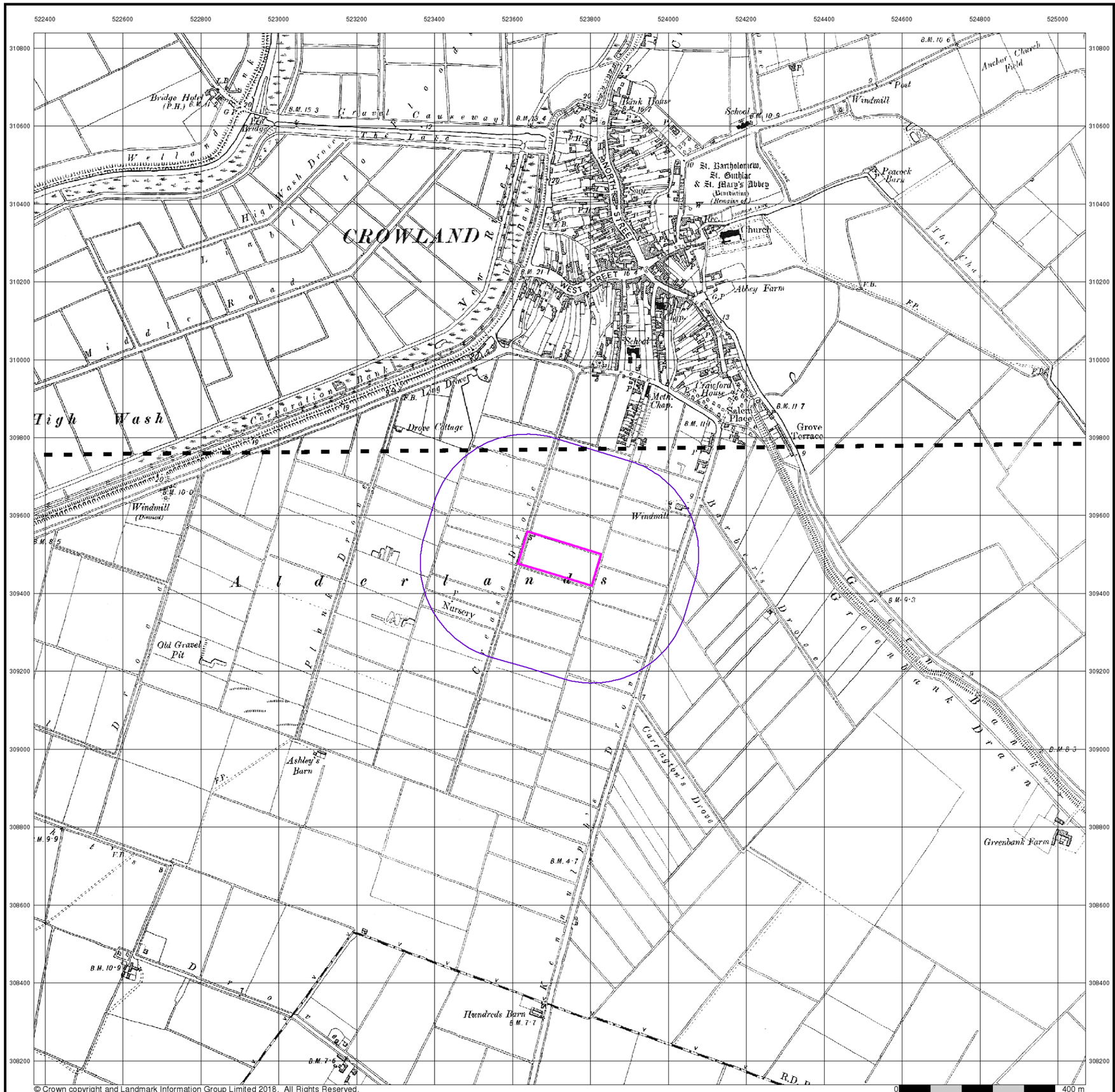
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Site Area (Ha):	1.69
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GeoDyne

Lincolnshire

Published 1905 - 1906

Source map scale - 1:10,560

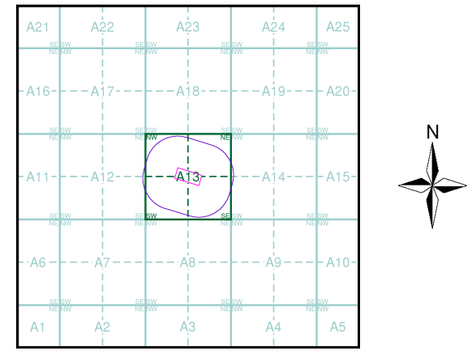
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Map Name(s) and Date(s)

148SW
1906
1:10,560

153NW
1905
1:10,560

Historical Map - Slice A



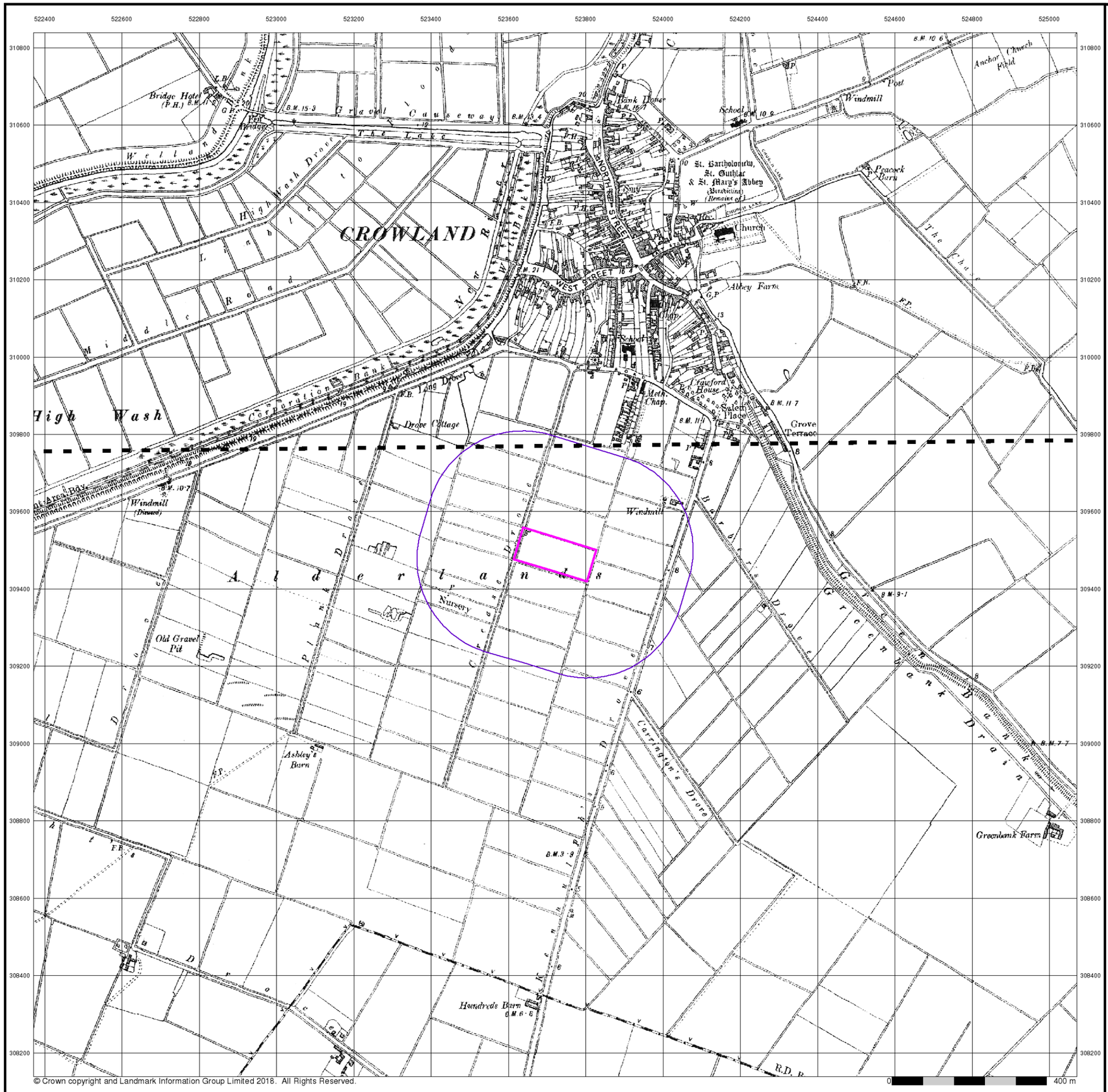
Order Details

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Slice:	A
Site Area (Ha):	1.69
Search Buffer (m):	250

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GeoDyne

Lincolnshire

Published 1905 - 1906

Source map scale - 1:10,560

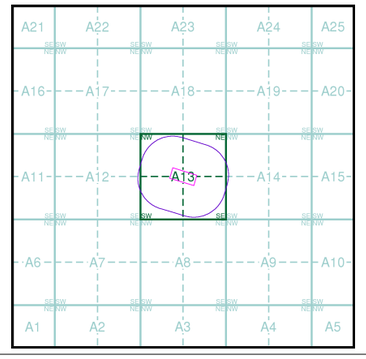
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Map Name(s) and Date(s)

148SW
1906
1:10,560

153NW
1905
1:10,560

Historical Map - Slice A



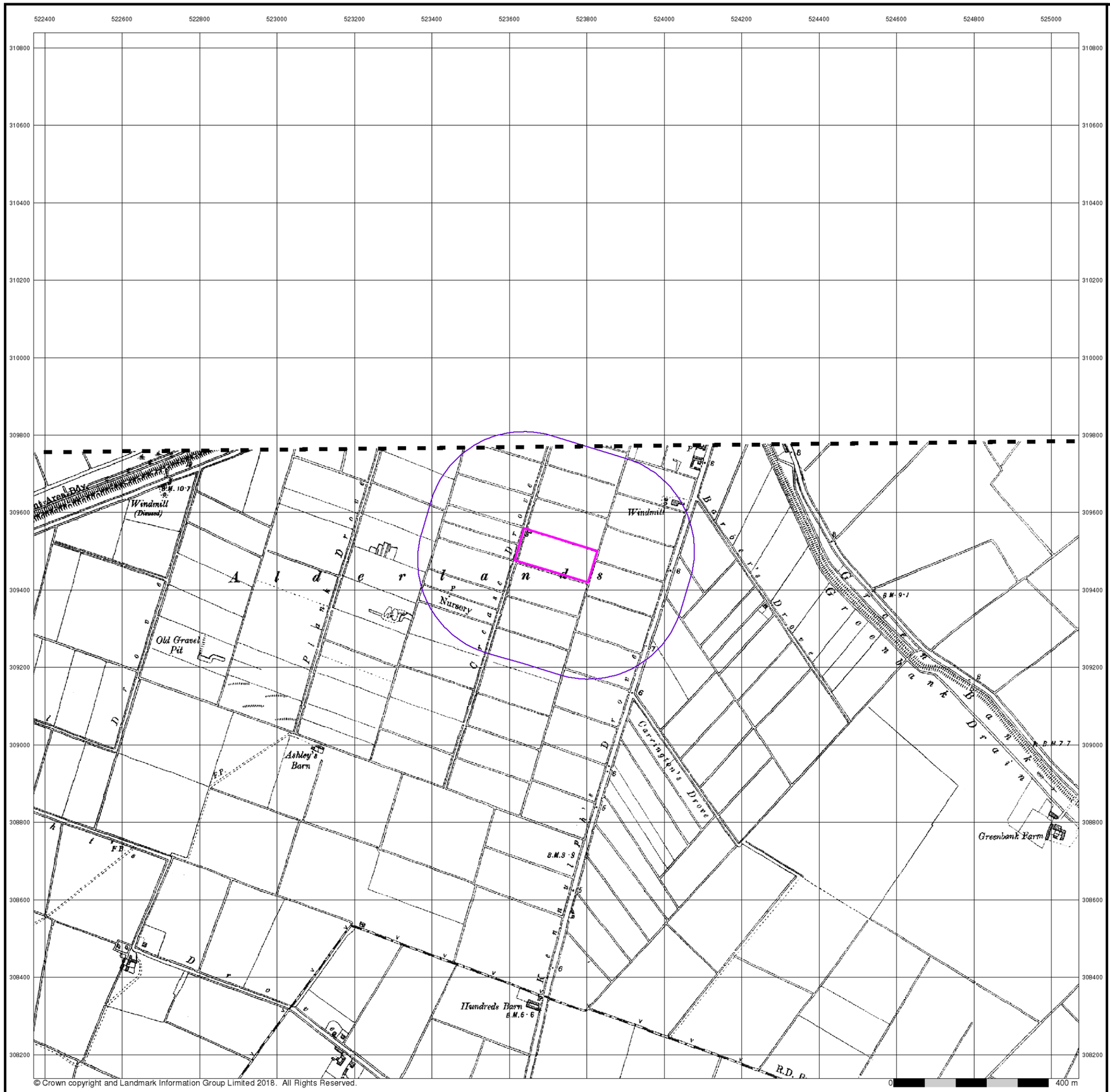
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Search Buffer (m):	250

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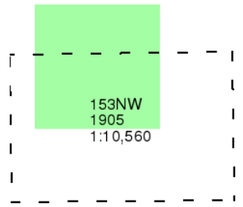
Lincolnshire

Published 1905

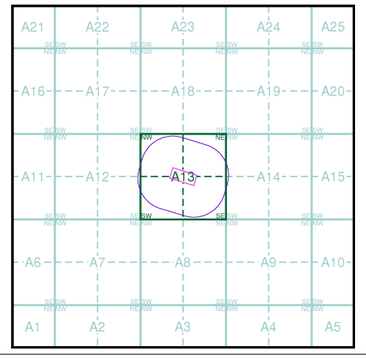
Source map scale - 1:10,560

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Map Name(s) and Date(s)



Historical Map - Slice A



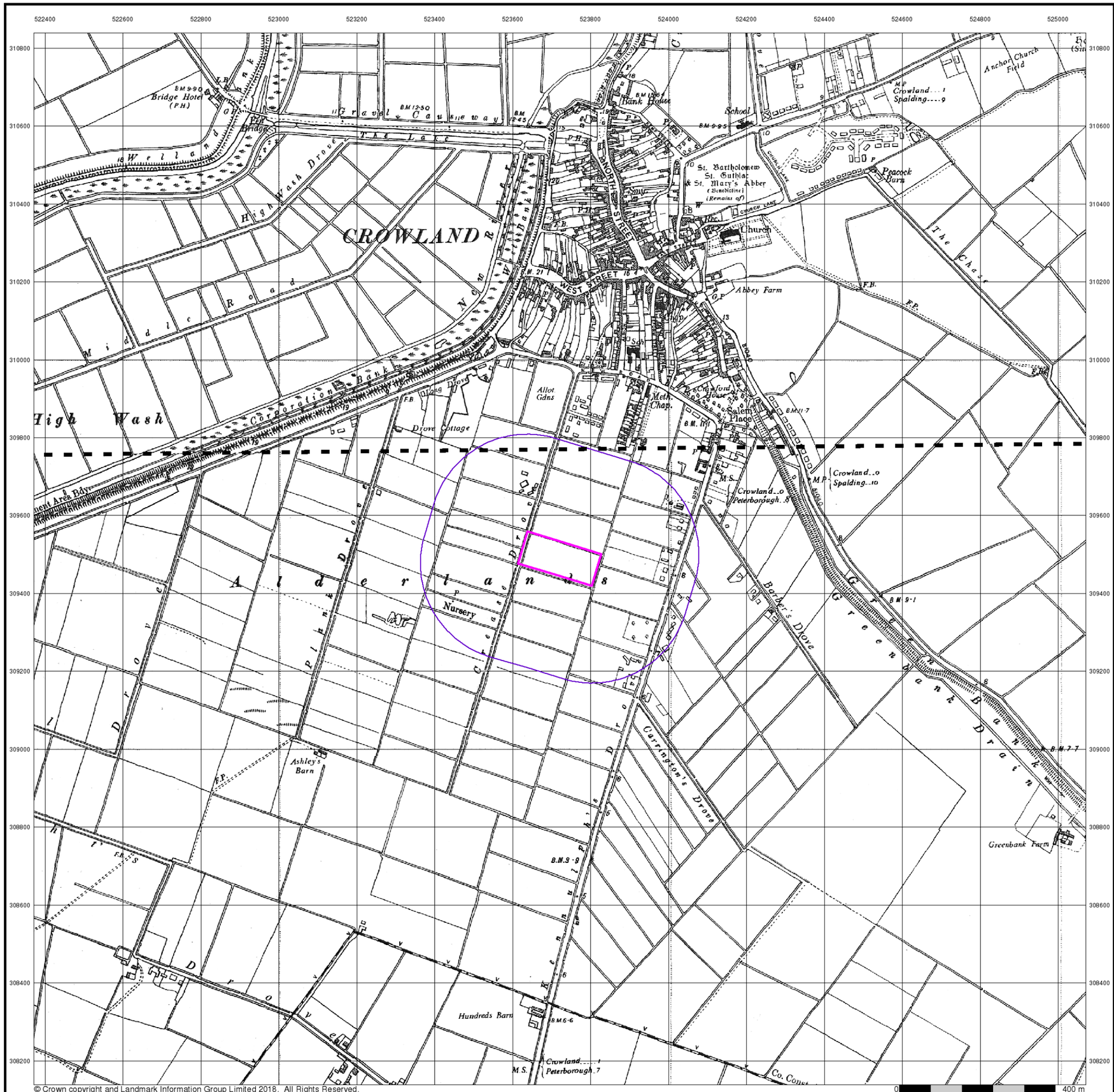
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Search Buffer (m):	250

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Lincolnshire

Published 1952

Source map scale - 1:10,560

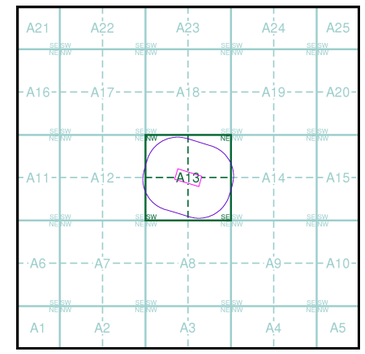
The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840`s. In 1854 the 1:2,500 scale was adopted for mapping urban areas; these maps were used to update the 1:10,560 maps. The published date given therefore is often some 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. In the late 1940`s, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)

148SW
1952
1:10,560

153NW
1952
1:10,560

Historical Map - Slice A



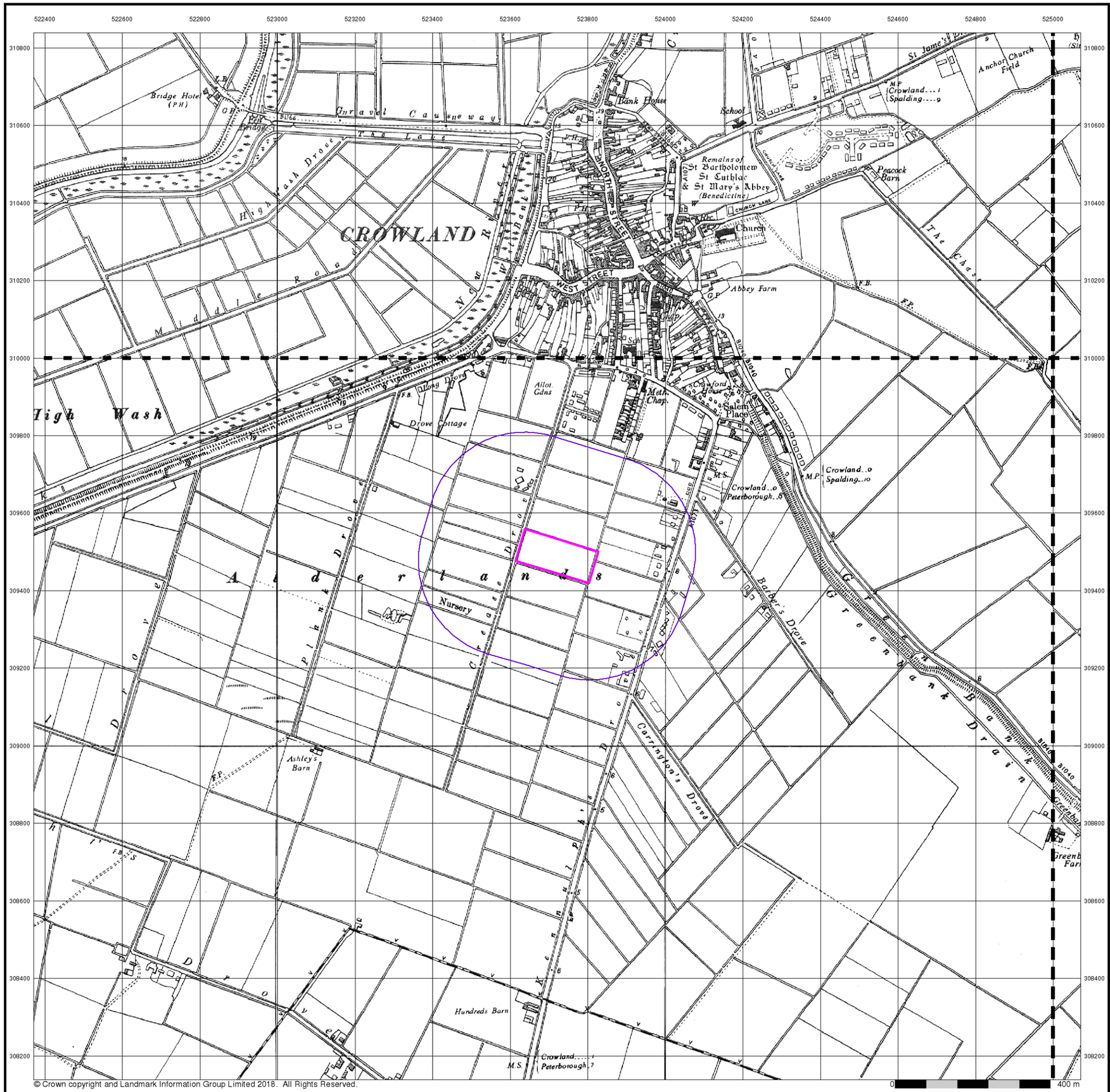
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Site Area (Ha):	1.69
Search Buffer (m):	250

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0 400 m

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Ordnance Survey Plan

Published 1958

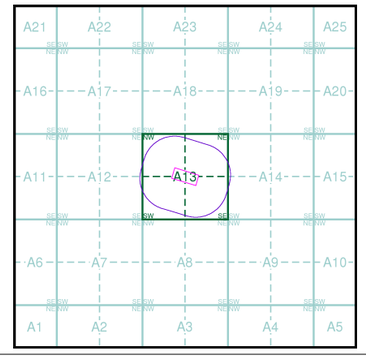
Source map scale - 1:10,000

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Map Name(s) and Date(s)

TF21SW 1958 1:10,560	TF21SE 1958 1:10,560
TF20NW 1958 1:10,560	TF20NE 1958 1:10,560

Historical Map - Slice A



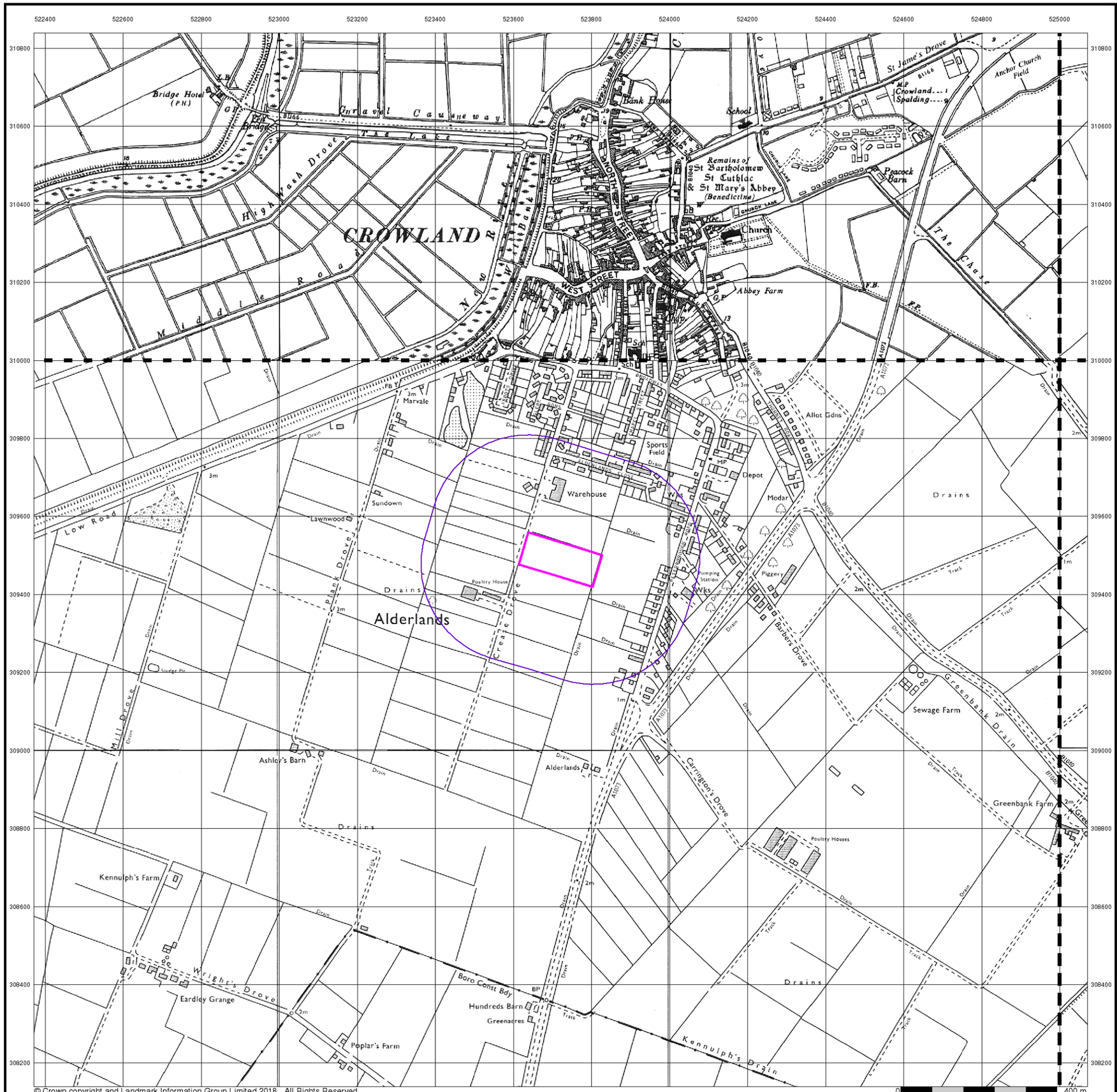
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Ordnance Survey Plan

Published 1975 - 1979

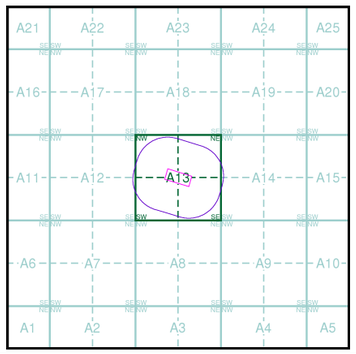
Source map scale - 1:10,000

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Map Name(s) and Date(s)

TF21SW 1975 1:10,560	TF21SE 1979 1:10,000
TF20NW 1978 1:10,000	TF20NE 1978 1:10,000

Historical Map - Slice A



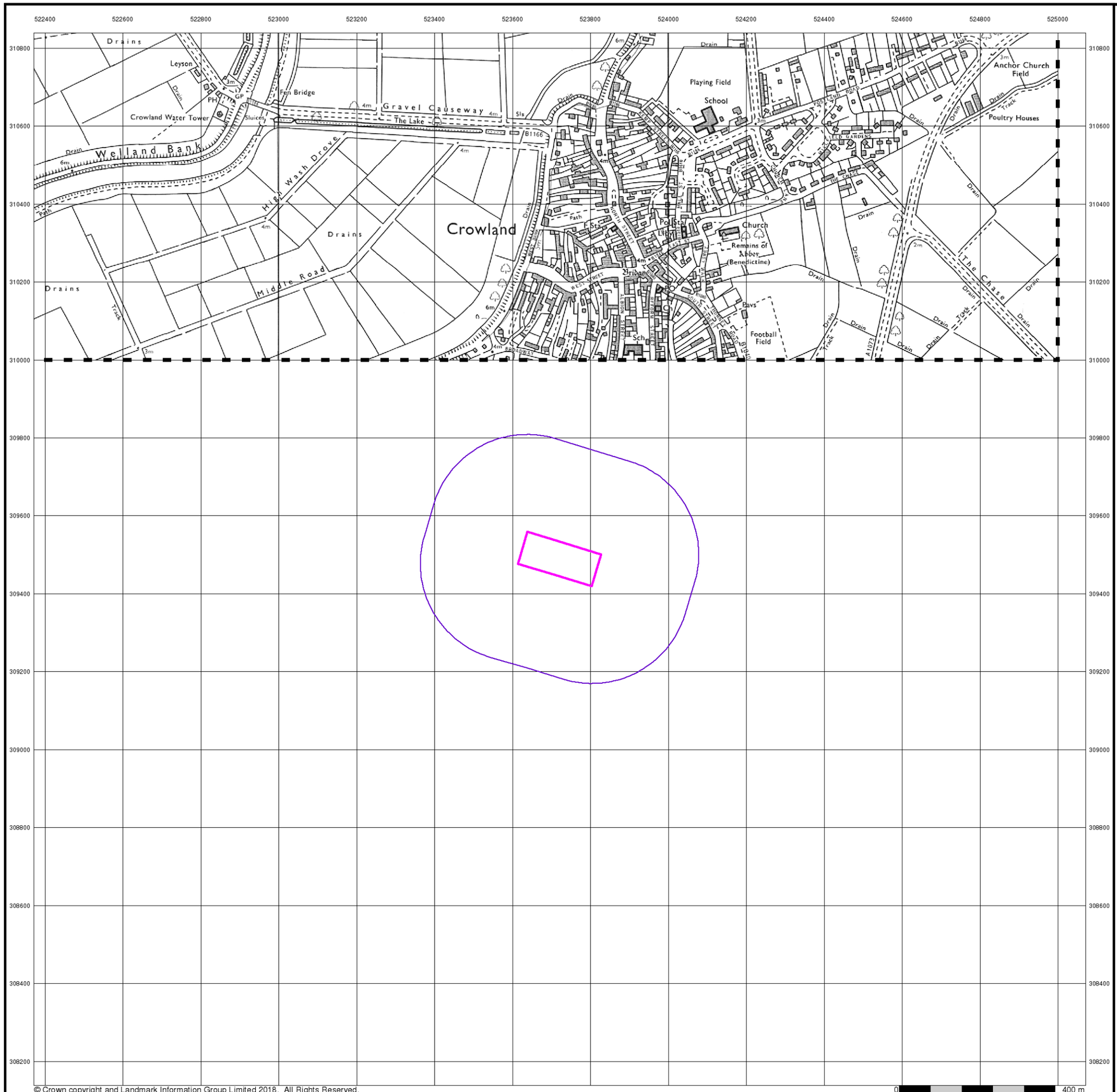
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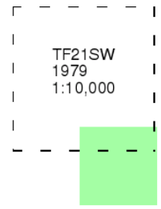
Ordnance Survey Plan

Published 1979

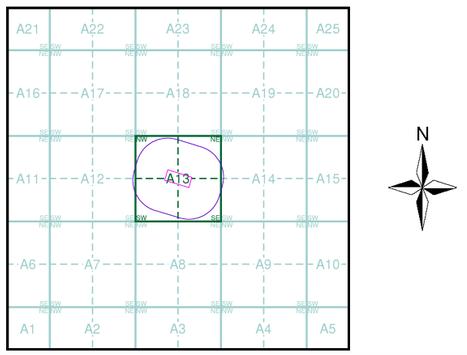
Source map scale - 1:10,000

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Map Name(s) and Date(s)



Historical Map - Slice A



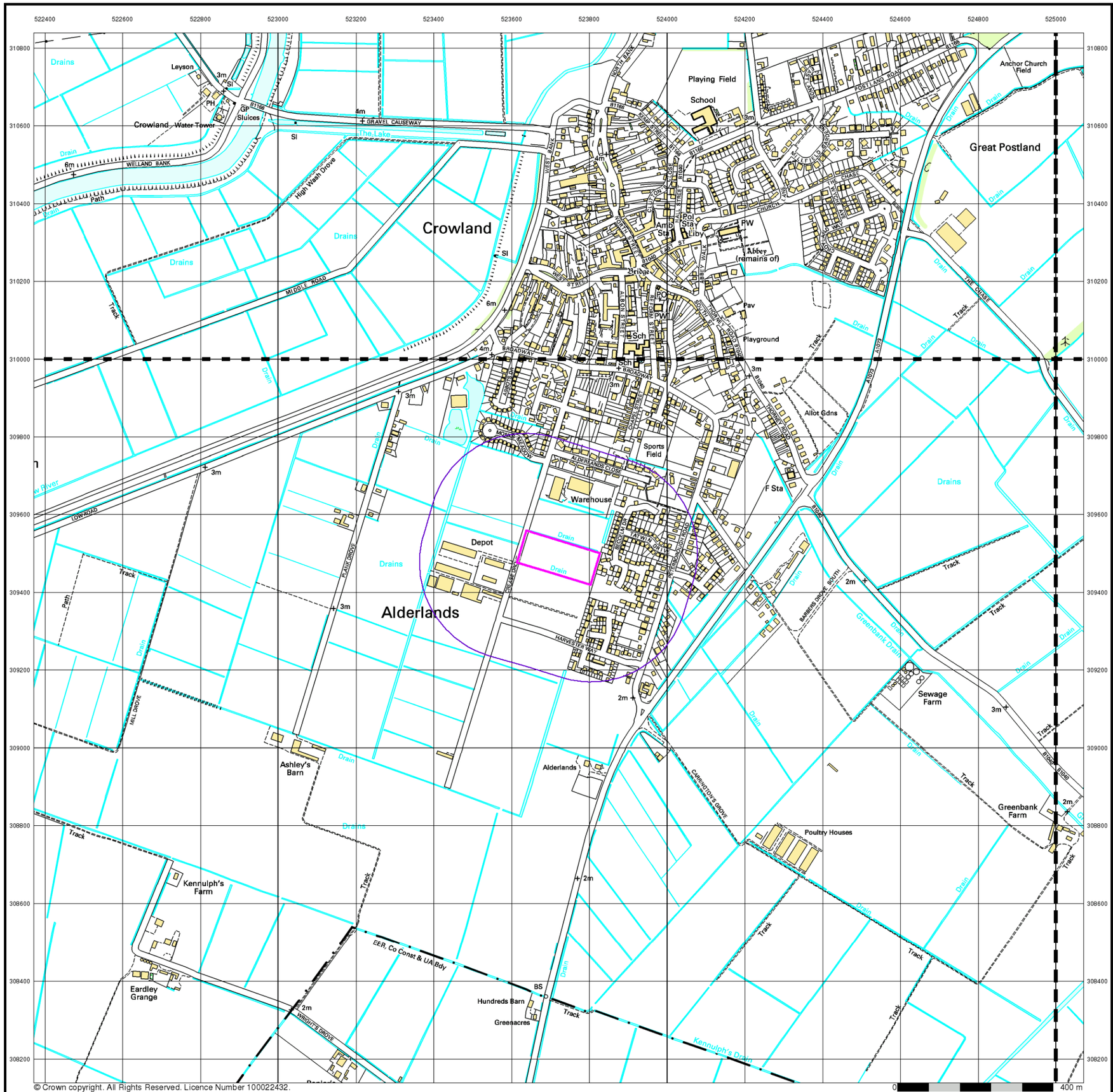
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10k Raster Mapping

Published 2000

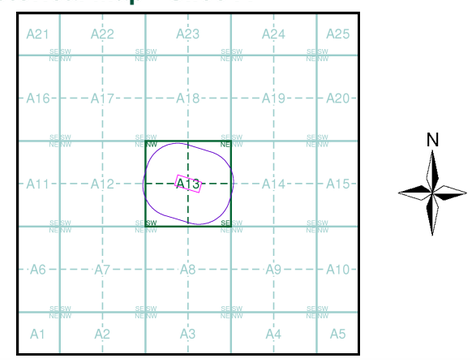
Source map scale - 1:10,000

The historical maps shown were produced from the Ordnance Survey`s 1:10,000 colour raster mapping. These maps are derived from Landplan which replaced the old 1:10,000 maps originally published in 1970. The data is highly detailed showing buildings, fences and field boundaries as well as all roads, tracks and paths. Road names are also included together with the relevant road number and classification. Boundary information depiction includes county, unitary authority, district, civil parish and constituency.

Map Name(s) and Date(s)

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TF20NW 2000 1:10,000	TF20NE 2000 1:10,000

Historical Map - Slice A



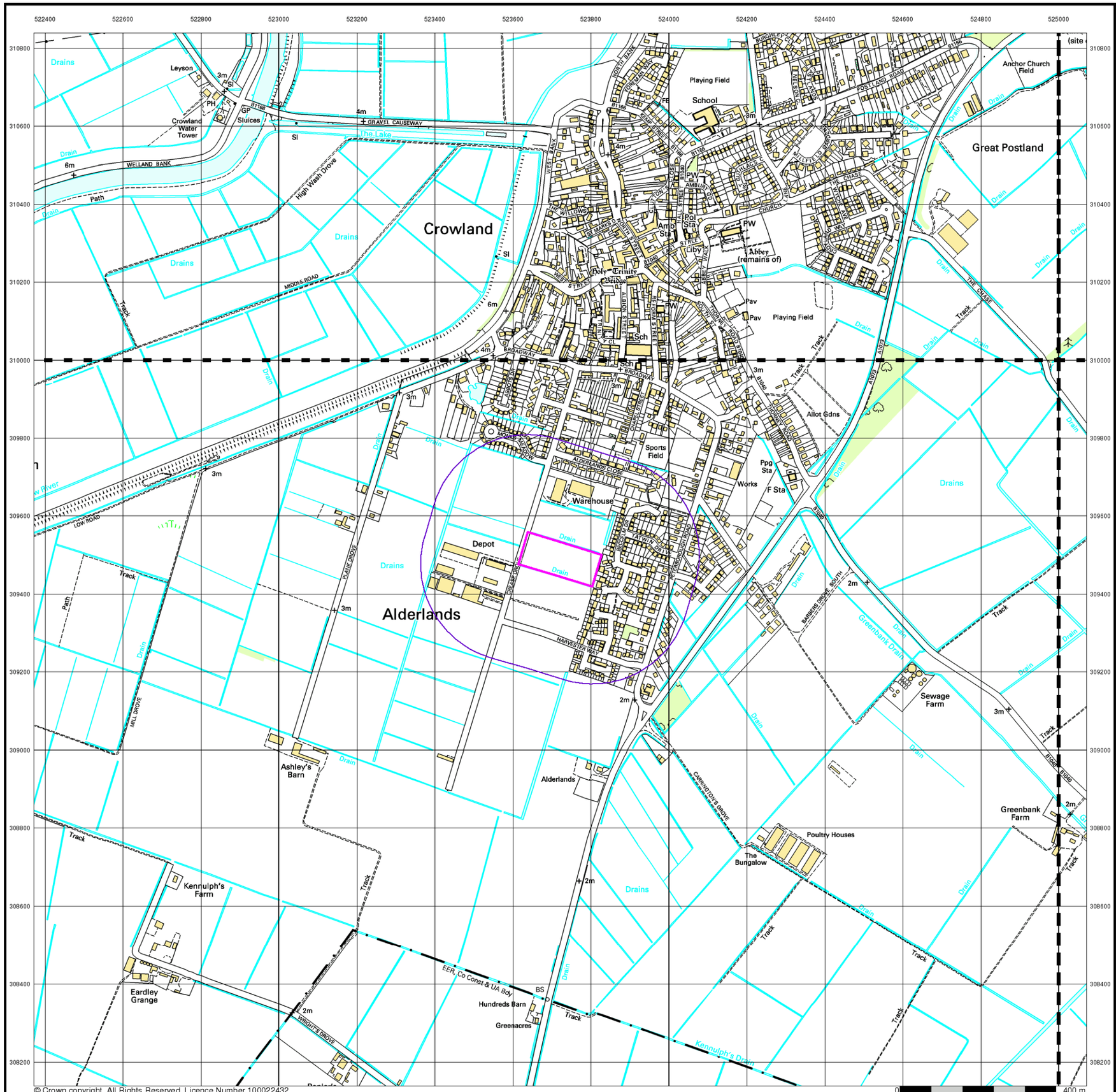
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10k Raster Mapping

Published 2006

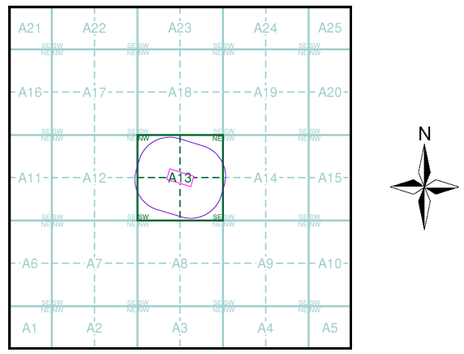
Source map scale - 1:10,000

The historical maps shown were produced from the Ordnance Survey`s 1:10,000 colour raster mapping. These maps are derived from Landplan which replaced the old 1:10,000 maps originally published in 1970. The data is highly detailed showing buildings, fences and field boundaries as well as all roads, tracks and paths. Road names are also included together with the relevant road number and classification. Boundary information depiction includes county, unitary authority, district, civil parish and constituency.

Map Name(s) and Date(s)

TF21SW 2006 1:10,000	TF21SE 2006 1:10,000
TF20NW 2006 1:10,000	TF20NE 2006 1:10,000

Historical Map - Slice A



Order Details

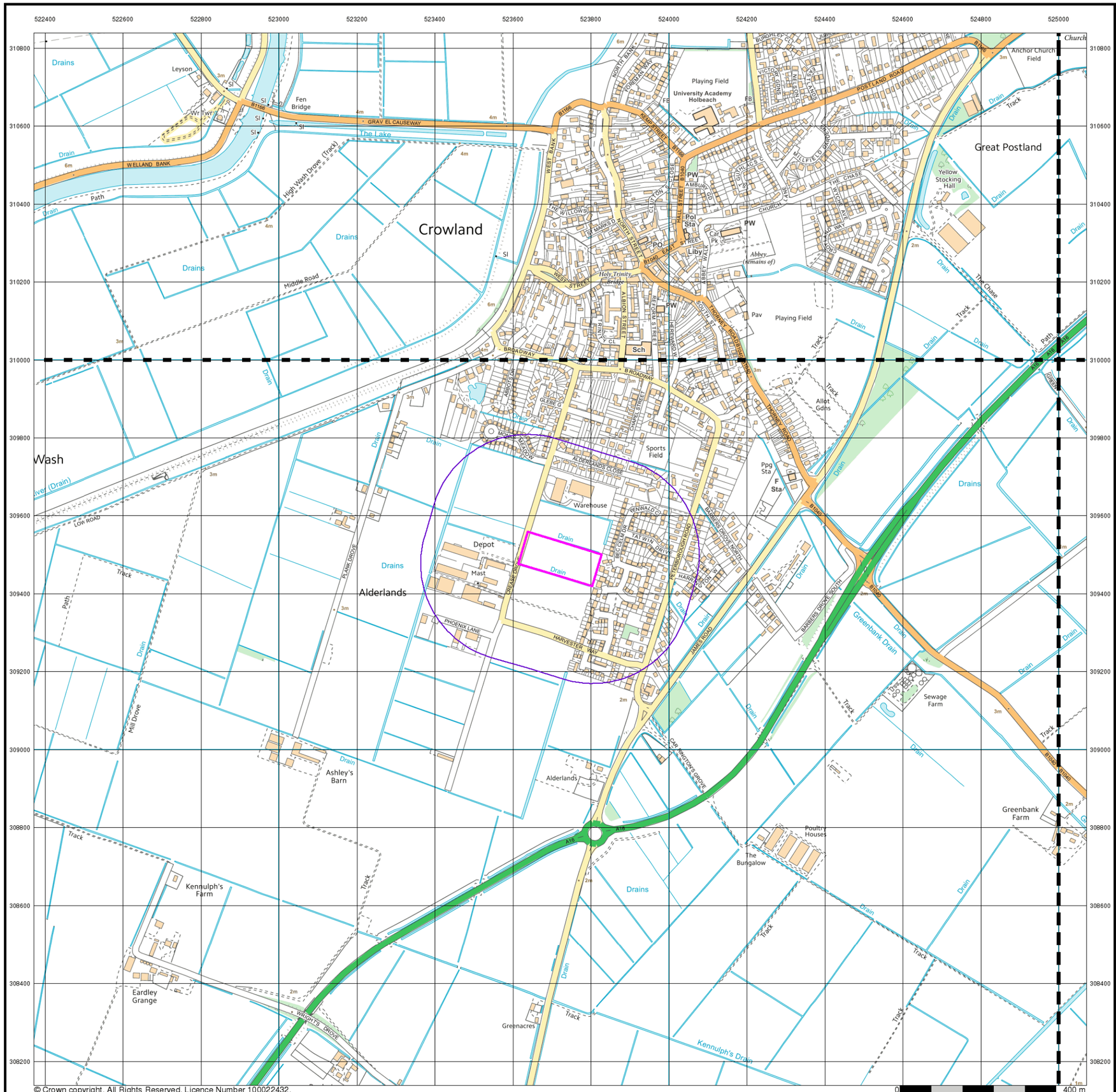
Order Number:	163602664_1_1
Customer Ref:	D38056c
National Grid Reference:	523720, 309490
Slice:	A
Site Area (Ha):	1.69
Search Buffer (m):	250

Site Details

Crease Drove, Crowland, PETERBOROUGH, PE6 0BN

Landmark INFORMATION GROUP

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Web: www.envirocheck.co.uk



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VectorMap Local

Published 2018

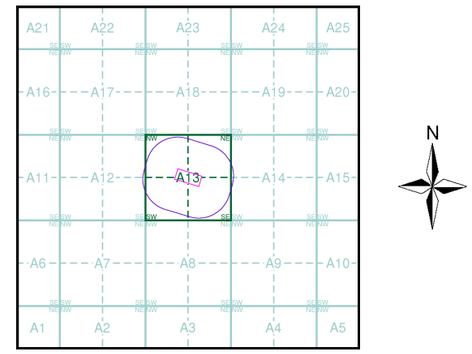
Source map scale - 1:10,000

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 1:1250 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)

TF21SW 2018 Variable	TF21SE 2018 Variable
TF20NW 2018 Variable	TF20NE 2018 Variable

Historical Map - Slice A



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APPENDIX X

Landmark Envirocheck Report

GeoDyne

Envirocheck® Report:

Datasheet

Order Details:

Order Number:
163602664_1_1

Customer Reference:
D38056c

National Grid Reference:
523720, 309490

Slice:
A

Site Area (Ha):
1.69

Search Buffer (m):
250

Site Details:

Crease Drove
Crowland
PETERBOROUGH
PE6 0BN

Client Details:

Mr J Hollands
GeoDyne Ltd
Unit 2.2 Clarendon House
Clarendon Business Park
Clumber Avenue
Nottingham
NG5 1AH

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Contents

Report Section	Page Number
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Agency & Hydrological	1
Waste	5
Hazardous Substances	-
Geological	6
Industrial Land Use	8
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Data Currency	11
Data Suppliers	16
Useful Contacts	17

Introduction

The Environment Act 1995 has made site sensitivity a key issue, as the legislation pays as much attention to the pathways by which contamination could spread, and to the vulnerable targets of contamination, as it does the potential sources of contamination.
For this reason, Landmark's Site Sensitivity maps and Datasheet(s) place great emphasis on statutory data provided by the Environment Agency/Natural Resources Wales and the Scottish Environment Protection Agency; it also incorporates data from Natural England (and the Scottish and Welsh equivalents) and Local Authorities; and highlights hydrogeological features required by environmental and geotechnical consultants. It does not include any information concerning past uses of land. The datasheet is produced by querying the Landmark database to a distance defined by the client from a site boundary provided by the client.
In the attached datasheet the National Grid References (NGRs) are rounded to the nearest 10m in accordance with Landmark's agreements with a number of Data Suppliers.

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GeoDyne

Report Version v53.0

Contents

GeoDyne

Summary

Data Type	Page Number	On Site	0 to 250m (*up to 500m)
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Discharge Consents	pg 1		2
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Enforcement and Prohibition Notices			
Integrated Pollution Controls			
Integrated Pollution Prevention And Control			
Local Authority Integrated Pollution Prevention And Control			
Local Authority Pollution Prevention and Controls	pg 1		1
Local Authority Pollution Prevention and Control Enforcements			
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Prosecutions Relating to Authorised Processes			
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River Quality			
River Quality Biology Sampling Points			
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Extreme Flooding from Rivers or Sea without Defences	pg 2	Yes	Yes
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GeoDyne

Summary

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Potentially Infilled Land (Non-Water)			
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Planning Hazardous Substance Consents			
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GeoDyne

Summary

Data Type	Page Number	On Site	0 to 250m (*up to 500m)
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BGS Recorded Mineral Sites			
BGS Urban Soil Chemistry			
BGS Urban Soil Chemistry Averages			
CBSCB Compensation District			n/a
Coal Mining Affected Areas			n/a
Mining Instability			n/a
Man-Made Mining Cavities			
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Potential for Collapsible Ground Stability Hazards	pg 6		Yes
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Potential for Ground Dissolution Stability Hazards			
Potential for Landslide Ground Stability Hazards	pg 6	Yes	
Potential for Running Sand Ground Stability Hazards	pg 6	Yes	
Potential for Shrinking or Swelling Clay Ground Stability Hazards	pg 6	Yes	
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Data Type	Page Number	On Site	0 to 250m (*up to 500m)
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Special Areas of Conservation			
Special Protection Areas			
World Heritage Sites			

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	BGS Groundwater Flooding Susceptibility Flooding Type: Potential for Groundwater Flooding to Occur at Surface	A13NW (N)	42	1	523700 309600
1	**Discharge Consents** Operator: C & B Construction Ltd (Civil Engin) Property Type: Not Supplied Location: Res. Dev. Tatwin Drive, Crowland Authority: Environment Agency, Anglian Region Catchment Area: Not Supplied Reference: Pr5nf5156 Permit Version: 1 Effective Date: 21st May 1986 Issued Date: 21st May 1986 Revocation Date: 11th February 1992 Discharge Type: Discharge Of Other Matter-Surface Water Discharge Environment: Drain Receiving Water: Fen Drain **Status:** **Pre National Rivers Authority Legislation where issue date < 01/09/1989** Positional Accuracy: Located by supplier to within 100m	A13NW (N)	58	2	523700 309600
2	**Discharge Consents** Operator: Whitworth Produce (Crowland) Limited Property Type: MAKING OF FOOD PRODUCTS/DAIRY Location: Crease Drove, Crowland, Peterborough, Pe6 0bn Authority: Environment Agency, Anglian Region Catchment Area: Not Supplied Reference: Pr5nf447 Permit Version: 1 Effective Date: 12th December 1968 Issued Date: 12th December 1968 Revocation Date: 26th February 1992 Discharge Type: Trade Effluent Discharge Environment: Freshwater Stream/River Receiving Water: Unknown Trib **Status:** **Pre National Rivers Authority Legislation where issue date < 01/09/1989** Positional Accuracy: Located by supplier to within 10m	A13NE (NE)	187	2	523880 309680
3	**Local Authority Pollution Prevention and Controls** Name: Crowland Cranes Location: Crease Drove, Crowland, PETERBOROUGH, Cambridgeshire, PE6 0BN Authority: South Holland District Council, Environmental Services Permit Reference: Not Given Dated: Not Supplied Process Type: Local Authority Air Pollution Control Description: PG6/34 Respraying of road vehicles **Status:** **Authorised** Positional Accuracy: Automatically positioned to the address	A13SW (W)	40	3	523575 309469
	Nearest Surface Water Feature	A13NE (N)	0	-	523733 309529
4	**Pollution Incidents to Controlled Waters** Property Type: Not Given Location: Spalding District Authority: Environment Agency, Anglian Region Pollutant: Unknown Note: Local Dyke Incident Date: 16th August 1993 Incident Reference: 1636 Catchment Area: Not Given Receiving Water: Freshwater Stream/River Cause of Incident: Unknown Incident Severity: Category 3 - Minor Incident Positional Accuracy: Located by supplier to within 100m	A13NW (W)	117	2	523500 309500

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
5	**Water Abstractions** Operator: S G Beeken Licence Number: 5/32/11/*g/008 Permit Version: Not Supplied Location: Well At, CROWLAND Authority: Environment Agency, Anglian Region Abstraction: Agriculture (General) Abstraction Type: Not Supplied Source: Groundwater Fed Reservoir Daily Rate (m3): 0 Yearly Rate (m3): 450 Details: Fluvial Sand and Gravel; Status: Revoked Authorised Start: Not Supplied Authorised End: Not Supplied Permit Start Date: Not Supplied Permit End Date: Not Supplied Positional Accuracy: Located by supplier to within 100m	A13SW (W)	137	2	523500 309400
	Groundwater Vulnerability Soil Classification: Not classified Map Sheet: Sheet 24 North Northamptonshire Scale: 1:100,000	A13SW (E)	0	2	523721 309489
	Drift Deposits None				
	Bedrock Aquifer Designations Aquifer Designation: Unproductive Strata	A13SW (E)	0	1	523721 309489
	Superficial Aquifer Designations Aquifer Designation: Unproductive Strata	A13SW (E)	0	1	523721 309489
	Extreme Flooding from Rivers or Sea without Defences Type: Extent of Extreme Flooding from Rivers or Sea without Defences Flood Plain Type: Fluvial Models and Fluvial Events Boundary Accuracy: As Supplied	A13SW (E)	0	2	523721 309489
	Extreme Flooding from Rivers or Sea without Defences Type: Extent of Extreme Flooding from Rivers or Sea without Defences Flood Plain Type: Fluvial Models Boundary Accuracy: As Supplied	A13NE (NE)	186	2	523810 309700
	Flooding from Rivers or Sea without Defences Type: Extent of Flooding from Rivers or Sea without Defences Flood Plain Type: Fluvial Models Boundary Accuracy: As Supplied	A13SW (E)	0	2	523721 309489
	Areas Benefiting from Flood Defences None				
	Flood Water Storage Areas None				
	Flood Defences None				
6	**OS Water Network Lines** Watercourse Form: Inland river Watercourse Length: 187.8 Watercourse Level: On ground surface Permanent: True Watercourse Name: Not Supplied Catchment Name: Welland Primacy: 2	A13SW (S)	2	4	523708 309447
7	**OS Water Network Lines** Watercourse Form: Inland river Watercourse Length: 181.1 Watercourse Level: On ground surface Permanent: True Watercourse Name: Not Supplied Catchment Name: Welland Primacy: 2	A13NE (N)	2	4	523734 309531
8	**OS Water Network Lines** Watercourse Form: Inland river Watercourse Length: 25.3 Watercourse Level: Underground Permanent: True Watercourse Name: Not Supplied Catchment Name: Welland Primacy: 2	A13NE (E)	3	4	523821 309505

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
9	**OS Water Network Lines** Watercourse Form: Inland river Watercourse Length: 191.6 Watercourse Level: On ground surface Permanent: True Watercourse Name: Not Supplied Catchment Name: Welland Primacy: 2	A13NW (NW)	9	4	523633 309565
10	**OS Water Network Lines** Watercourse Form: Inland river Watercourse Length: 180.7 Watercourse Level: On ground surface Permanent: True Watercourse Name: Not Supplied Catchment Name: Welland Primacy: 2	A13NW (W)	25	4	523604 309527
11	**OS Water Network Lines** Watercourse Form: Inland river Watercourse Length: 177.5 Watercourse Level: On ground surface Permanent: True Watercourse Name: Not Supplied Catchment Name: Welland Primacy: 2	A13NE (E)	27	4	523836 309526
12	**OS Water Network Lines** Watercourse Form: Inland river Watercourse Length: 222.8 Watercourse Level: On ground surface Permanent: True Watercourse Name: Not Supplied Catchment Name: Welland Primacy: 2	A13NW (N)	176	4	523686 309727
13	**OS Water Network Lines** Watercourse Form: Inland river Watercourse Length: 100.8 Watercourse Level: On ground surface Permanent: True Watercourse Name: Not Supplied Catchment Name: Welland Primacy: 2	A13SE (E)	199	4	524007 309405
14	**OS Water Network Lines** Watercourse Form: Inland river Watercourse Length: 2.9 Watercourse Level: On ground surface Permanent: True Watercourse Name: Not Supplied Catchment Name: Welland Primacy: 2	A13NW (W)	205	4	523431 309580
15	**OS Water Network Lines** Watercourse Form: Inland river Watercourse Length: 135.2 Watercourse Level: On ground surface Permanent: True Watercourse Name: Not Supplied Catchment Name: Welland Primacy: 2	A13NW (W)	208	4	523428 309581
16	**OS Water Network Lines** Watercourse Form: Inland river Watercourse Length: 185.2 Watercourse Level: On ground surface Permanent: True Watercourse Name: Not Supplied Catchment Name: Welland Primacy: 2	A13NW (W)	208	4	523428 309581
17	**OS Water Network Lines** Watercourse Form: Inland river Watercourse Length: 198.3 Watercourse Level: On ground surface Permanent: True Watercourse Name: Not Supplied Catchment Name: Welland Primacy: 2	A13NW (W)	214	4	523430 309608

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
18	**OS Water Network Lines** Watercourse Form: Inland river Watercourse Length: 4.1 Watercourse Level: Underground Permanent: True Watercourse Name: Not Supplied Catchment Name: Welland Primacy: 2	A13SW (W)	228	4	523388 309452
19	**OS Water Network Lines** Watercourse Form: Inland river Watercourse Length: 498.2 Watercourse Level: On ground surface Permanent: True Watercourse Name: Not Supplied Catchment Name: Welland Primacy: 2	A13SW (W)	229	4	523387 309448
20	**OS Water Network Lines** Watercourse Form: Inland river Watercourse Length: 591.3 Watercourse Level: On ground surface Permanent: True Watercourse Name: Not Supplied Catchment Name: Welland Primacy: 2	A13SE (S)	231	4	523737 309198

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	Local Authority Landfill Coverage Name: South Holland District Council - Has no landfill data to supply		0	3	523721 309489
	Local Authority Landfill Coverage Name: Lincolnshire County Council - Had landfill data but passed it to the relevant environment agency		0	5	523721 309489
21	**Potentially Infilled Land (Water)** Use: Unknown Filled Ground (Pond, marsh, river, stream, dock etc) Date of Mapping: 1958	A13SE (E)	7	-	523828 309479

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	BGS 1:625,000 Solid Geology Description: Kellaways Formation And Oxford Clay Formation (Undifferentiated)	A13SW (E)	0	1	523721 309489
	BGS Estimated Soil Chemistry Source: British Geological Survey, National Geoscience Information Service Soil Sample Type: Rural Soil Arsenic Concentration: 15 - 25 mg/kg Cadmium Concentration: <1.8 mg/kg Chromium Concentration: 90 - 120 mg/kg Lead Concentration: <100 mg/kg Nickel Concentration: 45 - 60 mg/kg	A13SW (E)	0	1	523721 309489
	BGS Estimated Soil Chemistry Source: British Geological Survey, National Geoscience Information Service Soil Sample Type: Rural Soil Arsenic Concentration: 15 - 25 mg/kg Cadmium Concentration: <1.8 mg/kg Chromium Concentration: 60 - 90 mg/kg Lead Concentration: <100 mg/kg Nickel Concentration: 30 - 45 mg/kg	A13NW (N)	46	1	523686 309618
	BGS Measured Urban Soil Chemistry No data available				
	BGS Urban Soil Chemistry Averages No data available				
	Coal Mining Affected Areas In an area that might not be affected by coal mining				
	Non Coal Mining Areas of Great Britain No Hazard				
	Potential for Collapsible Ground Stability Hazards Hazard Potential: No Hazard Source: British Geological Survey, National Geoscience Information Service	A13SW (E)	0	1	523721 309489
	Potential for Collapsible Ground Stability Hazards Hazard Potential: Very Low Source: British Geological Survey, National Geoscience Information Service	A13NW (N)	46	1	523686 309618
	Potential for Compressible Ground Stability Hazards Hazard Potential: High Source: British Geological Survey, National Geoscience Information Service	A13SW (E)	0	1	523721 309489
	Potential for Compressible Ground Stability Hazards Hazard Potential: No Hazard Source: British Geological Survey, National Geoscience Information Service	A13NW (N)	46	1	523686 309618
	Potential for Ground Dissolution Stability Hazards Hazard Potential: No Hazard Source: British Geological Survey, National Geoscience Information Service	A13SW (E)	0	1	523721 309489
	Potential for Landslide Ground Stability Hazards Hazard Potential: Very Low Source: British Geological Survey, National Geoscience Information Service	A13SW (E)	0	1	523721 309489
	Potential for Running Sand Ground Stability Hazards Hazard Potential: Very Low Source: British Geological Survey, National Geoscience Information Service	A13SW (E)	0	1	523721 309489
	Potential for Shrinking or Swelling Clay Ground Stability Hazards Hazard Potential: Moderate Source: British Geological Survey, National Geoscience Information Service	A13SW (E)	0	1	523721 309489
	Potential for Shrinking or Swelling Clay Ground Stability Hazards Hazard Potential: No Hazard Source: British Geological Survey, National Geoscience Information Service	A13NE (N)	185	1	523733 309727
	Radon Potential - Radon Affected Areas Affected Area: The property is in a Lower probability radon area (less than 1% of homes are estimated to be at or above the Action Level). Source: British Geological Survey, National Geoscience Information Service	A13SW (E)	0	1	523721 309489

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
	Radon Potential - Radon Protection Measures Protection Measure: No radon protective measures are necessary in the construction of new dwellings or extensions Source: British Geological Survey, National Geoscience Information Service	A13SW (E)	0	1	523721 309489

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
22	**Contemporary Trade Directory Entries** Name: Amac Refinishing Location: Crease Drove, Crowland, Peterborough, Cambridgeshire, PE6 0BN Classification: Car Body Repairs **Status: Inactive** Positional Accuracy: Manually positioned to the road within the address or location	A13SW (W)	2	-	523615 309487
22	**Contemporary Trade Directory Entries** Name: Fenland Repairs Location: Crease Drove, Crowland, Peterborough, Cambridgeshire, PE6 0BN Classification: Car Body Repairs **Status: Inactive** Positional Accuracy: Manually positioned to the road within the address or location	A13SW (W)	3	-	523612 309480
22	**Contemporary Trade Directory Entries** Name: T M C Lifting Supplies Location: Crease Drove, Crowland, Peterborough, PE6 0BN Classification: Lifting Equipment **Status: Active** Positional Accuracy: Automatically positioned to the address	A13SW (W)	40	-	523575 309469
22	**Contemporary Trade Directory Entries** Name: Crowland Cranes Ltd Location: Crease Drove, Crowland, Peterborough, PE6 0BN Classification: Crane Hire, Sales & Service **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A13SW (W)	40	-	523575 309469
22	**Contemporary Trade Directory Entries** Name: Crowland Cranes Location: Crease Drove, Crowland, Peterborough, PE6 0BN Classification: Crane Hire, Sales & Service **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A13SW (W)	40	-	523575 309469
22	**Contemporary Trade Directory Entries** Name: Crowland Cranes Location: Crease Drove, Crowland, Peterborough, PE6 0BN Classification: Crane Hire, Sales & Service **Status: Active** Positional Accuracy: Automatically positioned to the address	A13SW (W)	40	-	523575 309469
23	**Contemporary Trade Directory Entries** Name: Asset Machine Tools Ltd Location: Crease Drove, Crowland, Peterborough, PE6 0BN Classification: Engineers - General **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A13NW (W)	114	-	523503 309498
23	**Contemporary Trade Directory Entries** Name: F P & S Truck & Trailer Parts Location: Unit 1, Crowland Business Centre, Crease Drove, Crowland, Peterborough, PE6 0FB Classification: Trailers & Towing Equipment **Status: Active** Positional Accuracy: Automatically positioned to the address	A13NW (W)	134	-	523483 309504
24	**Contemporary Trade Directory Entries** Name: Iron X Press Location: 59, Beccelm Drive, Crowland, Peterborough, PE6 0AG Classification: Ironing & Home Laundry Services **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A13SE (SE)	127	-	523916 309362
25	**Contemporary Trade Directory Entries** Name: Blecs Global Ltd Location: Unit 4, Crowland Business Centre, Crease Drove, Crowland, Peterborough, Cambridgeshire, PE6 0FB Classification: Manufacturers **Status: Inactive** Positional Accuracy: Automatically positioned to the address	A13SW (W)	180	-	523435 309460
26	**Contemporary Trade Directory Entries** Name: Spinney Rewinds Ltd Location: Unit 3, Pinnacle Close, Crowland, Peterborough, PE6 0GB Classification: Electric Motor Sales & Service **Status: Active** Positional Accuracy: Automatically positioned to the address	A13SW (SW)	232	-	523462 309302

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
26	**Contemporary Trade Directory Entries** Name: Spiratronics Location: Unit 2, Pinnacle Close, Crowland, Peterborough, PE6 0GB Classification: Electronic Equipment - Manufacturers & Assemblers **Status: Active** Positional Accuracy: Automatically positioned to the address	A13SW (SW)	242	-	523456 309293
27	**Contemporary Trade Directory Entries** Name: Marcus Trevean Location: 66, Peterborough Road, Crowland, Peterborough, PE6 0BA Classification: Stained Glass Designers & Producers **Status: Inactive** Positional Accuracy: Automatically positioned in the proximity of the address	A14NW (E)	239	-	524066 309522
28	**Points of Interest - Commercial Services** Name: Fenland Repairs Location: Unit 1, Crease Drove, Crowland, Peterborough, PE6 0BN Category: Repair and Servicing Class Code: Vehicle Repair, Testing and Servicing Positional Accuracy: Positioned to address or location	A13SW (W)	26	6	523595 309458
29	**Points of Interest - Commercial Services** Name: Adcocks Soda Syphons Location: Crease Drove, Crowland, Peterborough, PE6 0BN Category: Transport, Storage and Delivery Class Code: Distribution and Haulage Positional Accuracy: Positioned to address or location	A13NE (N)	128	6	523721 309666
30	**Points of Interest - Commercial Services** Name: A P B Mobile Installations Ltd Location: Unit 4, Pinnacle Close, Crowland, Peterborough, PE6 0GB Category: Repair and Servicing Class Code: Vehicle Repair, Testing and Servicing Positional Accuracy: Positioned to address or location	A13NW (W)	216	6	523400 309500

Map ID	Details	Quadrant Reference (Compass Direction)	Estimated Distance From Site	Contact	NGR
31	**Nitrate Vulnerable Zones** Name: River Welland Nvz Description: Surface Water Source: Environment Agency, Head Office	A13SW (E)	0	7	523721 309489

Agency & Hydrological	Version	Update Cycle
Contaminated Land Register Entries and Notices		
Peterborough City Council - Environmental Health Department	March 2015	Annual Rolling Update
South Holland District Council - Environmental Services	October 2013	Annual Rolling Update
Discharge Consents		
Environment Agency - Anglian Region	January 2018	Quarterly
Enforcement and Prohibition Notices		
Environment Agency - Anglian Region	March 2013	As notified
Integrated Pollution Controls		
Environment Agency - Anglian Region	October 2008	Variable
Integrated Pollution Prevention And Control		
Environment Agency - Anglian Region	January 2018	Quarterly
Local Authority Integrated Pollution Prevention And Control		
Peterborough City Council - Environmental Health Department	March 2015	Variable
South Holland District Council - Environmental Services	October 2014	Variable
Local Authority Pollution Prevention and Controls		
Peterborough City Council - Environmental Health Department	March 2015	Annual Rolling Update
South Holland District Council - Environmental Services	October 2014	Annual Rolling Update
Local Authority Pollution Prevention and Control Enforcements		
Peterborough City Council - Environmental Health Department	March 2015	Variable
South Holland District Council - Environmental Services	October 2014	Variable
Nearest Surface Water Feature		
Ordnance Survey	September 2017	
Pollution Incidents to Controlled Waters		
Environment Agency - Anglian Region	September 1999	Not Applicable
Prosecutions Relating to Authorised Processes		
Environment Agency - Anglian Region	March 2013	As notified
Prosecutions Relating to Controlled Waters		
Environment Agency - Anglian Region	March 2013	As notified
Registered Radioactive Substances		
Environment Agency - Anglian Region	January 2015	
River Quality		
Environment Agency - Head Office	November 2001	Not Applicable
River Quality Biology Sampling Points		
Environment Agency - Head Office	July 2012	Annually
River Quality Chemistry Sampling Points		
Environment Agency - Head Office	July 2012	Annually
Substantiated Pollution Incident Register		
Environment Agency - Anglian Region - Northern Area	January 2018	Quarterly
Water Abstractions		
Environment Agency - Anglian Region	January 2018	Quarterly
Water Industry Act Referrals		
Environment Agency - Anglian Region	October 2017	Quarterly
Groundwater Vulnerability		
Environment Agency - Head Office	April 2015	Not Applicable
Drift Deposits		
Environment Agency - Head Office	January 1999	Not Applicable
Bedrock Aquifer Designations		
British Geological Survey - National Geoscience Information Service	August 2015	As notified
Superficial Aquifer Designations		
British Geological Survey - National Geoscience Information Service	August 2015	As notified

Agency & Hydrological	Version	Update Cycle
Source Protection Zones Environment Agency - Head Office	January 2018	Quarterly
Extreme Flooding from Rivers or Sea without Defences Environment Agency - Head Office	February 2018	Quarterly
Flooding from Rivers or Sea without Defences Environment Agency - Head Office	February 2018	Quarterly
Areas Benefiting from Flood Defences Environment Agency - Head Office	February 2018	Quarterly
Flood Water Storage Areas Environment Agency - Head Office	February 2018	Quarterly
Flood Defences Environment Agency - Head Office	February 2018	Quarterly
OS Water Network Lines Ordnance Survey	January 2018	Quarterly
Surface Water 1 in 30 year Flood Extent Environment Agency - Head Office	October 2013	As notified
Surface Water 1 in 100 year Flood Extent Environment Agency - Head Office	October 2013	As notified
Surface Water 1 in 1000 year Flood Extent Environment Agency - Head Office	October 2013	As notified
Surface Water Suitability Environment Agency - Head Office	October 2013	As notified
BGS Groundwater Flooding Susceptibility British Geological Survey - National Geoscience Information Service	May 2013	As notified

Waste	Version	Update Cycle
BGS Recorded Landfill Sites		
British Geological Survey - National Geoscience Information Service	June 1996	Not Applicable
Historical Landfill Sites		
Environment Agency - Head Office	April 2018	Quarterly
Integrated Pollution Control Registered Waste Sites		
Environment Agency - Anglian Region	October 2008	Not Applicable
Licensed Waste Management Facilities (Landfill Boundaries)		
Environment Agency - Anglian Region - Northern Area	April 2018	Quarterly
Licensed Waste Management Facilities (Locations)		
Environment Agency - Anglian Region - Northern Area	January 2018	Quarterly
Local Authority Landfill Coverage		
Lincolnshire County Council	May 2000	Not Applicable
Peterborough City Council	May 2000	Not Applicable
South Holland District Council - Environmental Services	May 2000	Not Applicable
Local Authority Recorded Landfill Sites		
Lincolnshire County Council	May 2000	Not Applicable
South Holland District Council - Environmental Services	May 2000	Not Applicable
Peterborough City Council	September 2003	Not Applicable
Potentially Infilled Land (Non-Water)		
Landmark Information Group Limited	December 1999	Not Applicable
Potentially Infilled Land (Water)		
Landmark Information Group Limited	December 1999	Not Applicable
Registered Landfill Sites		
Environment Agency - Anglian Region - Northern Area	March 2003	Not Applicable
Registered Waste Transfer Sites		
Environment Agency - Anglian Region - Northern Area	March 2003	Not Applicable
Registered Waste Treatment or Disposal Sites		
Environment Agency - Anglian Region - Northern Area	March 2003	Not Applicable
Hazardous Substances	**Version**	**Update Cycle**
Control of Major Accident Hazards Sites (COMAH)		
Health and Safety Executive	September 2017	Bi-Annually
Explosive Sites		
Health and Safety Executive	March 2017	Variable
Notification of Installations Handling Hazardous Substances (NIHHS)		
Health and Safety Executive	November 2000	Not Applicable
Planning Hazardous Substance Enforcements		
Peterborough City Council	February 2016	Variable
South Holland District Council	January 2016	Variable
Lincolnshire County Council - Highways and Planning Department	June 2010	Variable
Planning Hazardous Substance Consents		
Lincolnshire County Council - Highways and Planning Department	August 2007	Variable
Peterborough City Council	February 2016	Variable
South Holland District Council	January 2016	Variable

Geological	Version	Update Cycle
BGS 1:625,000 Solid Geology British Geological Survey - National Geoscience Information Service	January 2009	Not Applicable
BGS Estimated Soil Chemistry British Geological Survey - National Geoscience Information Service	October 2015	As notified
BGS Recorded Mineral Sites British Geological Survey - National Geoscience Information Service	November 2017	Bi-Annually
CBSCB Compensation District Cheshire Brine Subsidence Compensation Board (CBSCB)	August 2011	Not Applicable
Coal Mining Affected Areas The Coal Authority - Property Searches	March 2014	As notified
Mining Instability Ove Arup & Partners	October 2000	Not Applicable
Non Coal Mining Areas of Great Britain British Geological Survey - National Geoscience Information Service	May 2015	Not Applicable
Potential for Collapsible Ground Stability Hazards British Geological Survey - National Geoscience Information Service	June 2015	As notified
Potential for Compressible Ground Stability Hazards British Geological Survey - National Geoscience Information Service	June 2015	As notified
Potential for Ground Dissolution Stability Hazards British Geological Survey - National Geoscience Information Service	June 2015	As notified
Potential for Landslide Ground Stability Hazards British Geological Survey - National Geoscience Information Service	June 2015	As notified
Potential for Running Sand Ground Stability Hazards British Geological Survey - National Geoscience Information Service	June 2015	As notified
Potential for Shrinking or Swelling Clay Ground Stability Hazards British Geological Survey - National Geoscience Information Service	June 2015	As notified
Radon Potential - Radon Affected Areas British Geological Survey - National Geoscience Information Service	July 2011	As notified
Radon Potential - Radon Protection Measures British Geological Survey - National Geoscience Information Service	July 2011	As notified
Industrial Land Use	**Version**	**Update Cycle**
Contemporary Trade Directory Entries Thomson Directories	February 2018	Quarterly
Fuel Station Entries Catalist Ltd - Experian	February 2018	Quarterly
Gas Pipelines National Grid	July 2014	Quarterly
Points of Interest - Commercial Services PointX	March 2018	Quarterly
Points of Interest - Education and Health PointX	March 2018	Quarterly
Points of Interest - Manufacturing and Production PointX	March 2018	Quarterly
Points of Interest - Public Infrastructure PointX	March 2018	Quarterly
Points of Interest - Recreational and Environmental PointX	March 2018	Quarterly
Underground Electrical Cables National Grid	December 2015	Bi-Annually

Sensitive Land Use	Version	Update Cycle
Ancient Woodland Natural England	October 2017	Bi-Annually
Areas of Outstanding Natural Beauty Natural England	February 2018	Bi-Annually
Environmentally Sensitive Areas Natural England	January 2017	
Forest Parks Forestry Commission	April 1997	Not Applicable
Local Nature Reserves Natural England	February 2018	Bi-Annually
Marine Nature Reserves Natural England	January 2018	Bi-Annually
National Nature Reserves Natural England	February 2018	Bi-Annually
National Parks Natural England	April 2017	Bi-Annually
Nitrate Vulnerable Zones Environment Agency - Head Office Department for Environment, Food and Rural Affairs (DEFRA - formerly FRCA)	December 2017 October 2015	Bi-Annually
Ramsar Sites Natural England	February 2018	Bi-Annually
Sites of Special Scientific Interest Natural England	February 2018	Bi-Annually
Special Areas of Conservation Natural England	January 2018	Bi-Annually
Special Protection Areas Natural England	February 2018	Bi-Annually

Data Suppliers

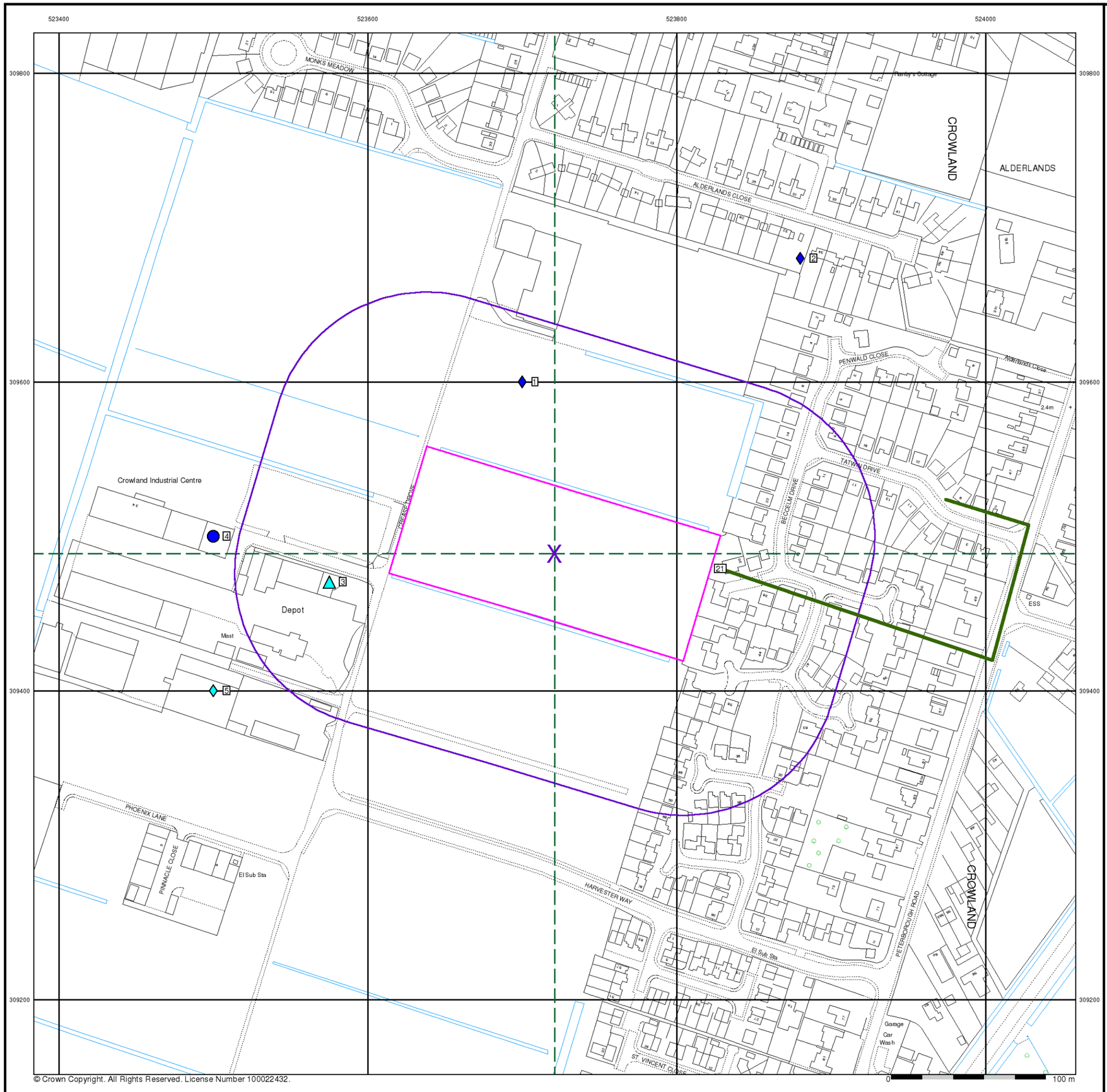
A selection of organisations who provide data within this report

Data Supplier	Data Supplier Logo
Ordnance Survey	Map data
Environment Agency	Environment Agency
Scottish Environment Protection Agency	SEPA Scottish Environment Protection Agency
The Coal Authority	The Coal Authority
British Geological Survey	British Geological Survey NATURAL ENVIRONMENT RESEARCH COUNCIL
Centre for Ecology and Hydrology	Centre for Ecology & Hydrology NATURAL ENVIRONMENT RESEARCH COUNCIL
Natural Resources Wales	Cyfoeth Naturiol Cymru Natural Resources Wales
Scottish Natural Heritage	SCOTTISH NATURAL HERITAGE
Natural England	NATURAL ENGLAND
Public Health England	Public Health England
Ove Arup	ARUP
Peter Brett Associates	pba peterbrett

Useful Contacts

Contact	Name and Address	Contact Details
1	**British Geological Survey - Enquiry Service** British Geological Survey, Environmental Science Centre, Keyworth, Nottingham, Nottinghamshire, NG12 5GG	Telephone: 0115 936 3143 Fax: 0115 936 3276 Email: enquiries@bgs.ac.uk Website: www.bgs.ac.uk
2	**Environment Agency - National Customer Contact Centre (NCCC)** PO Box 544, Templeborough, Rotherham, S60 1BY	Telephone: 03708 506 506 Email: enquiries@environment-agency.gov.uk
3	**South Holland District Council - Environmental Services** Council Offices, Priory Road, Spalding, Lincolnshire, PE11 2XE	Website: www.sholland.gov.uk
4	**Ordnance Survey** Adanac Drive, Southampton, Hampshire, SO16 0AS	Telephone: 03456 05 05 05 Email: customerservices@ordnancesurvey.co.uk Website: www.ordnancesurvey.gov.uk
5	**Lincolnshire County Council** 4th Floor, City Hall, Lincoln, Lincolnshire, LN1 1DN	Telephone: 01522 552222 Fax: 01522 552288 Email: PublicRelations@lincolnshire.gov.uk Website: www.lincolnshire.gov.uk
6	**PointX** 7 Abbey Court, Eagle Way, Sowton, Exeter, Devon, EX2 7HY	Website: www.pointx.co.uk
7	**Environment Agency - Head Office** Rio House, Waterside Drive, Aztec West, Almondsbury, Bristol, Avon, BS32 4UD	Telephone: 01454 624400 Fax: 01454 624409
-	**Public Health England - Radon Survey, Centre for Radiation, Chemical and Environmental Hazards** Chilton, Didcot, Oxfordshire, OX11 0RQ	Telephone: 01235 822622 Fax: 01235 833891 Email: radon@phe.gov.uk Website: www.ukradon.org
-	**Landmark Information Group Limited** Imperium, Imperial Way, Reading, Berkshire, RG2 0TD	Telephone: 0844 844 9952 Fax: 0844 844 9951 Email: customerservices@landmarkinfo.co.uk Website: www.landmarkinfo.co.uk

Please note that the Environment Agency / Natural Resources Wales / SEPA have a charging policy in place for enquiries.



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GeoDyne

General

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

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

Hazardous Substances

- COMAH Site
- Explosive Site
- NIHHS Site
- Planning Hazardous Substance Consent
- Planning Hazardous Substance Enforcement

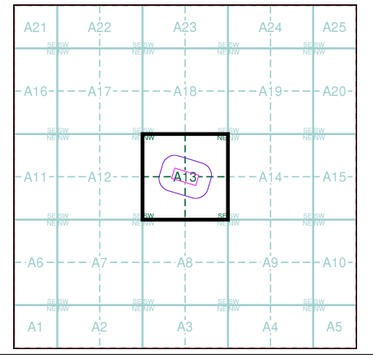
Geological

- BGS Recorded Mineral Site

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
- Potentially Infilled Land (Non-water)
- Potentially Infilled Land (Non-water)
- Potentially Infilled Land (Non-water)
- Potentially Infilled Land (Water)
- Potentially Infilled Land (Water)
- Potentially Infilled Land (Water)
- 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

Site Sensitivity Map - Segment A13



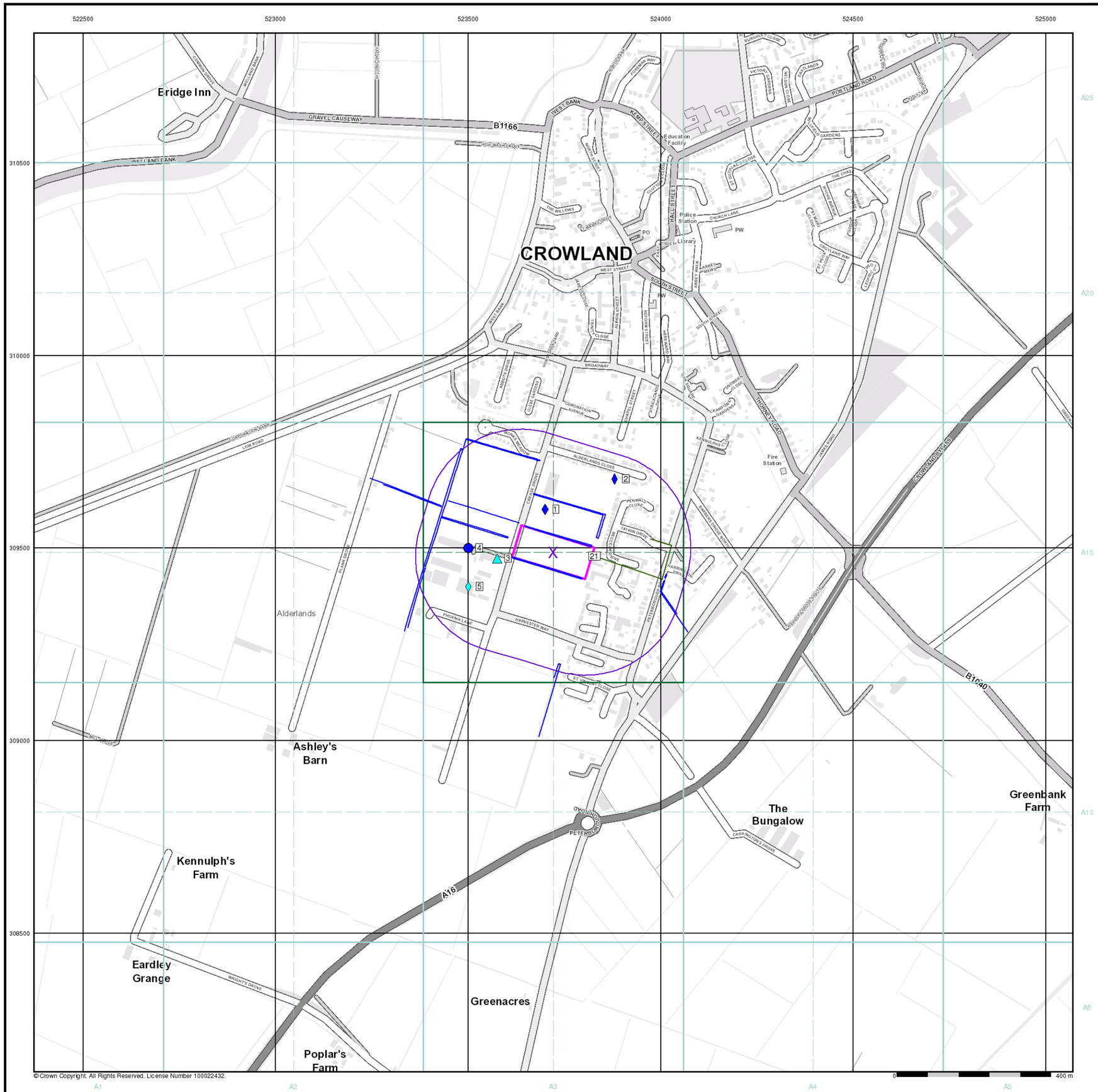
Order Details

Order Number:	163602664_1_1
Customer Ref:	D38056c
National Grid Reference:	523720, 309490
Slice:	A
Site Area (Ha):	1.69
Plot Buffer (m):	100

Site Details

Crease Drove, Crowland, PETERBOROUGH, PE6 0BN

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



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GeoDyne

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

Hazardous Substances

- COMAH Site
- Explosive Site
- NIHHS Site
- Planning Hazardous Substance Consent
- Planning Hazardous Substance Enforcement

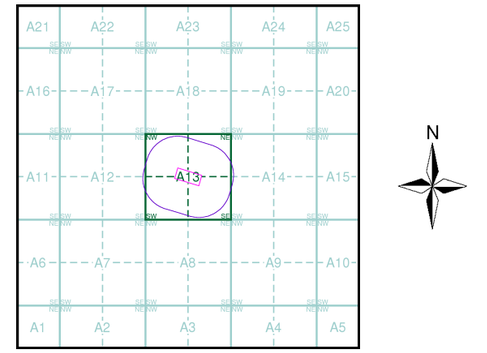
Geological

- BGS Recorded Mineral Site

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
- Potentially Infilled Land (Non-water)
- Potentially Infilled Land (Non-water)
- Potentially Infilled Land (Non-water)
- Potentially Infilled Land (Water)
- Potentially Infilled Land (Water)
- Potentially Infilled Land (Water)
- 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

Site Sensitivity Map - Slice A



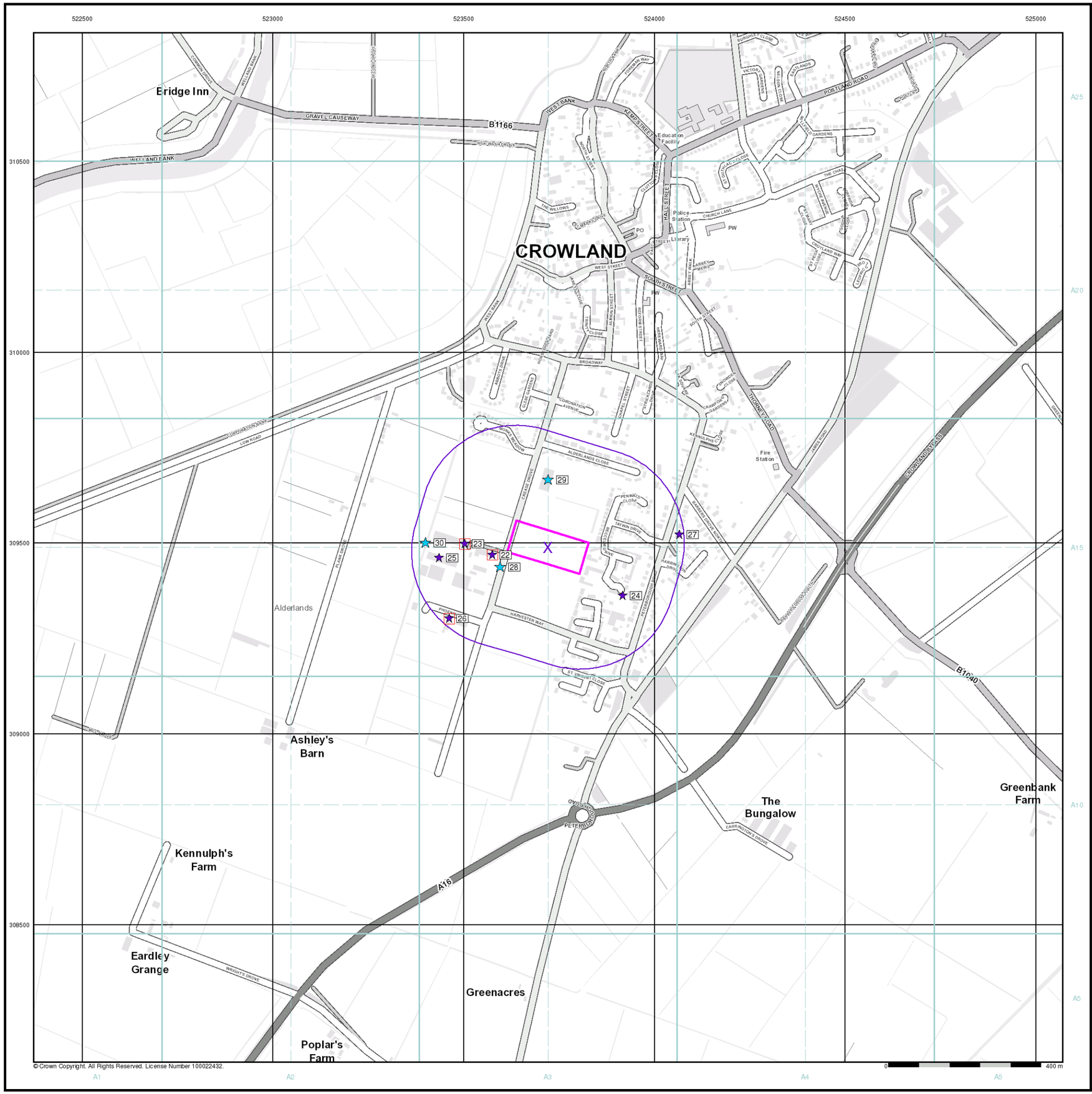
Order Details

Order Number:	163602664_1_1
Customer Ref:	D38056c
National Grid Reference:	523720, 309490
Slice:	A
Site Area (Ha):	1.69
Search Buffer (m):	250

Site Details

Crease Drove, Crowland, PETERBOROUGH, PE6 0BN

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GeoDyne

Industrial Land Use Map

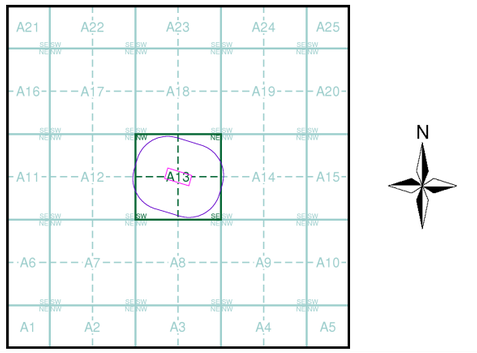
General

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

Industrial Land Use

- Contemporary Trade Directory Entry
- Fuel Station Entry
- Gas Pipeline
- Points of Interest - Commercial Services
- Points of Interest - Education and Health
- Points of Interest - Manufacturing and Production
- Points of Interest - Public Infrastructure
- Points of Interest - Recreational and Environmental
- Underground Electrical Cables

Industrial Land Use Map - Slice A



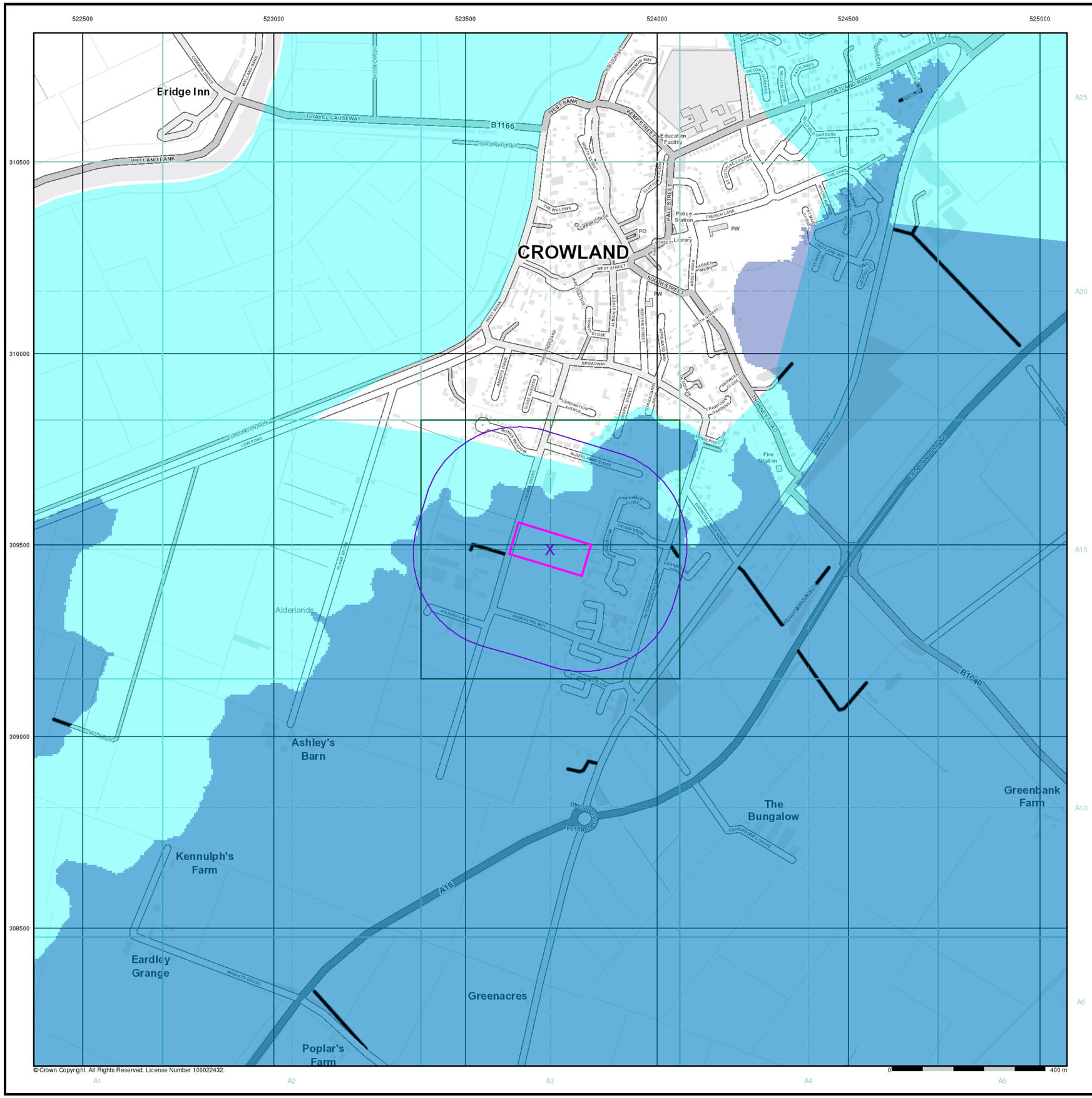
Order Details

Order Number:	163602664_1_1
Customer Ref:	D38056c
National Grid Reference:	523720, 309490
Slice:	A
Site Area (Ha):	1.69
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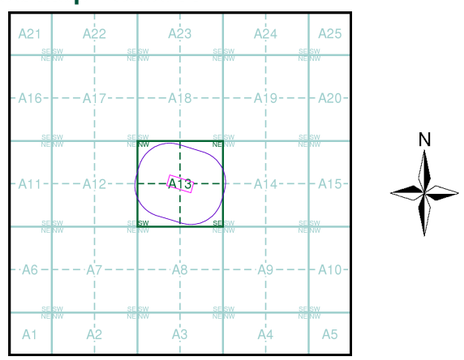
General

- Specified Site
- Specified Buffer(s)
- X 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



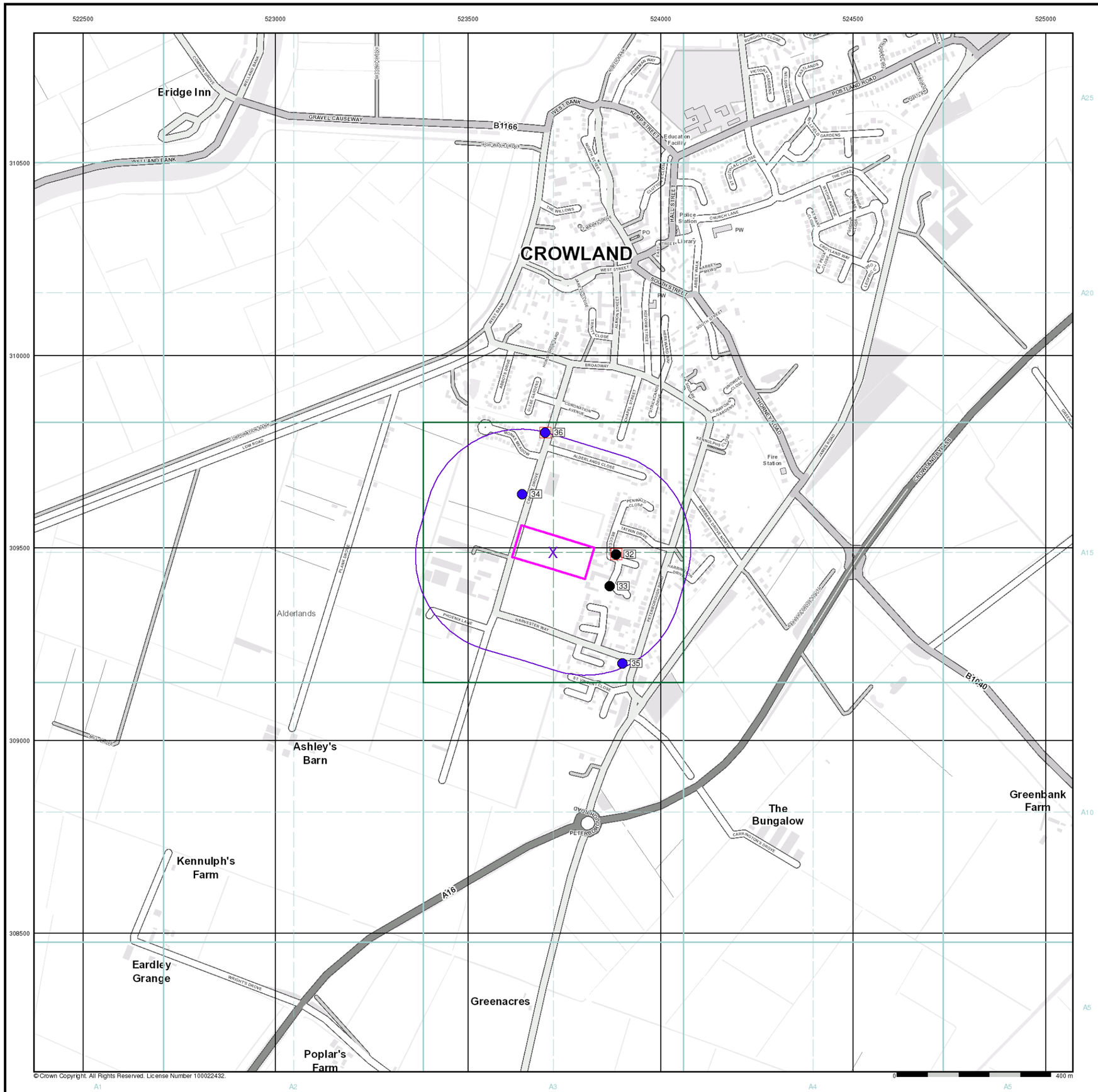
Order Details

Order Number:	163602664_1_1
Customer Ref:	D38056c
National Grid Reference:	523720, 309490
Slice:	A
Site Area (Ha):	1.69
Search Buffer (m):	250

Site Details

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GeoDyne

General

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

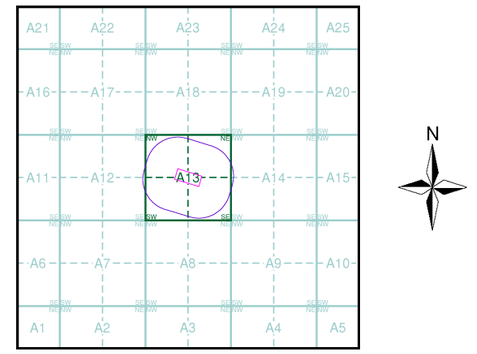
Agency and Hydrological (Boreholes)

- BGS Borehole Depth 0 - 10m
- BGS Borehole Depth 10 - 30m
- BGS Borehole Depth 30m +
- Confidential
- Other

For Borehole information please refer to the Borehole .csv file which accompanied this slice.

A copy of the BGS Borehole Ordering Form is available to download from the Support section of www.envirocheck.co.uk.

Borehole Map - Slice A



Order Details

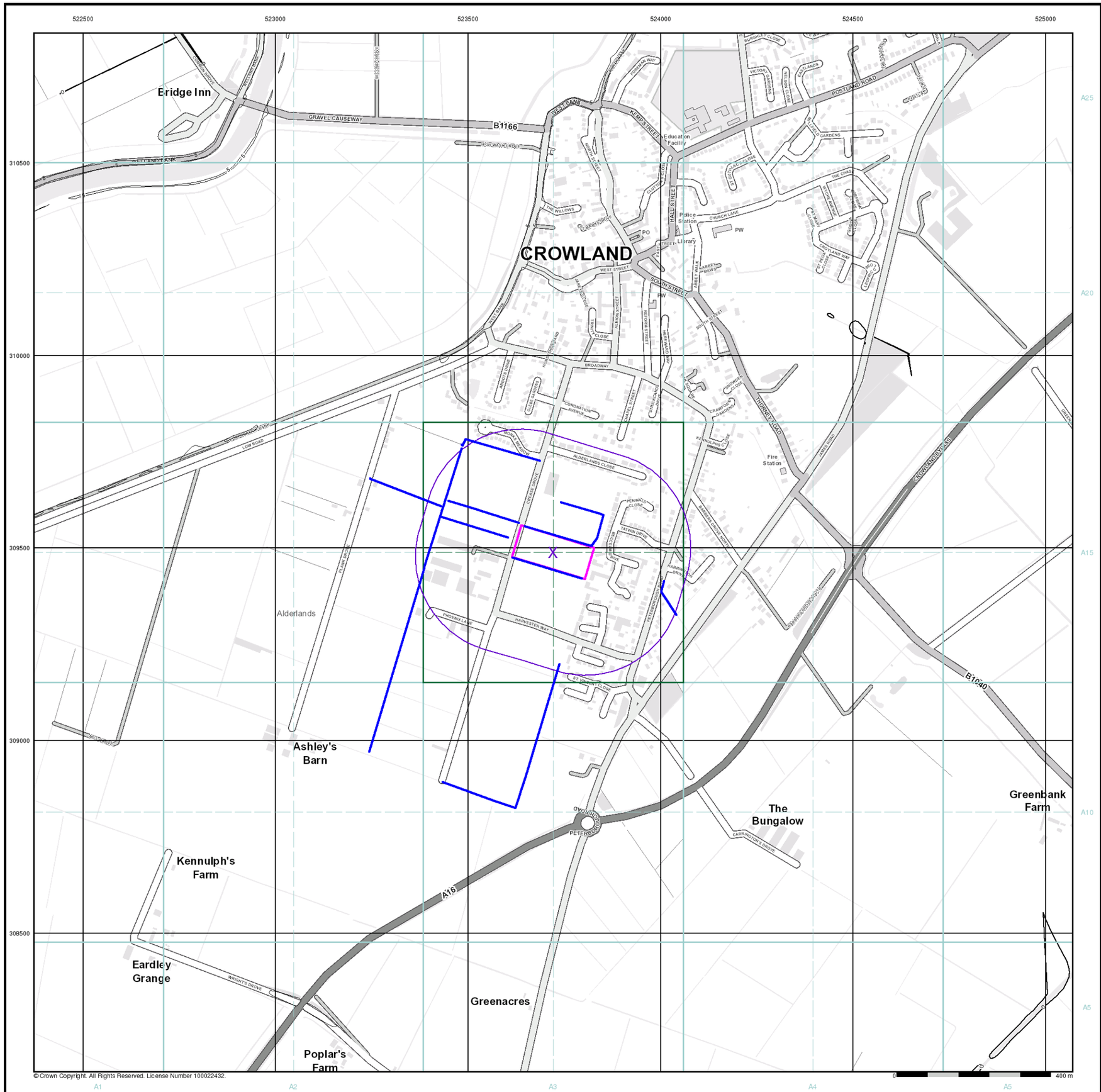
Order Number:	163602664_1_1
Customer Ref:	D38056c
National Grid Reference:	523720, 309490
Slice:	A
Site Area (Ha):	1.69
Search Buffer (m):	250

Site Details

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GeoDyne

General

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

OS Water Network Data

- Canal
- Reservoir
- Foreshore
- Marsh
- Tidal River
- Inland River
- Drain
- Other
- Lake
- Transfer
- Lock Or Flight Of Locks
- Sea

Contours (height in meters)

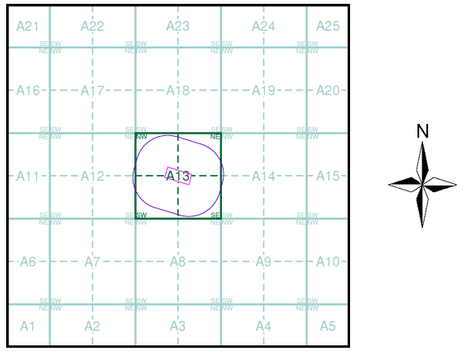
Standard Contour 105 100 95

Master Contour

Spot Height 167.3

- MLW Mean Low Water
- MHW Mean High Water

OS Water Network Map - Slice A



Order Details

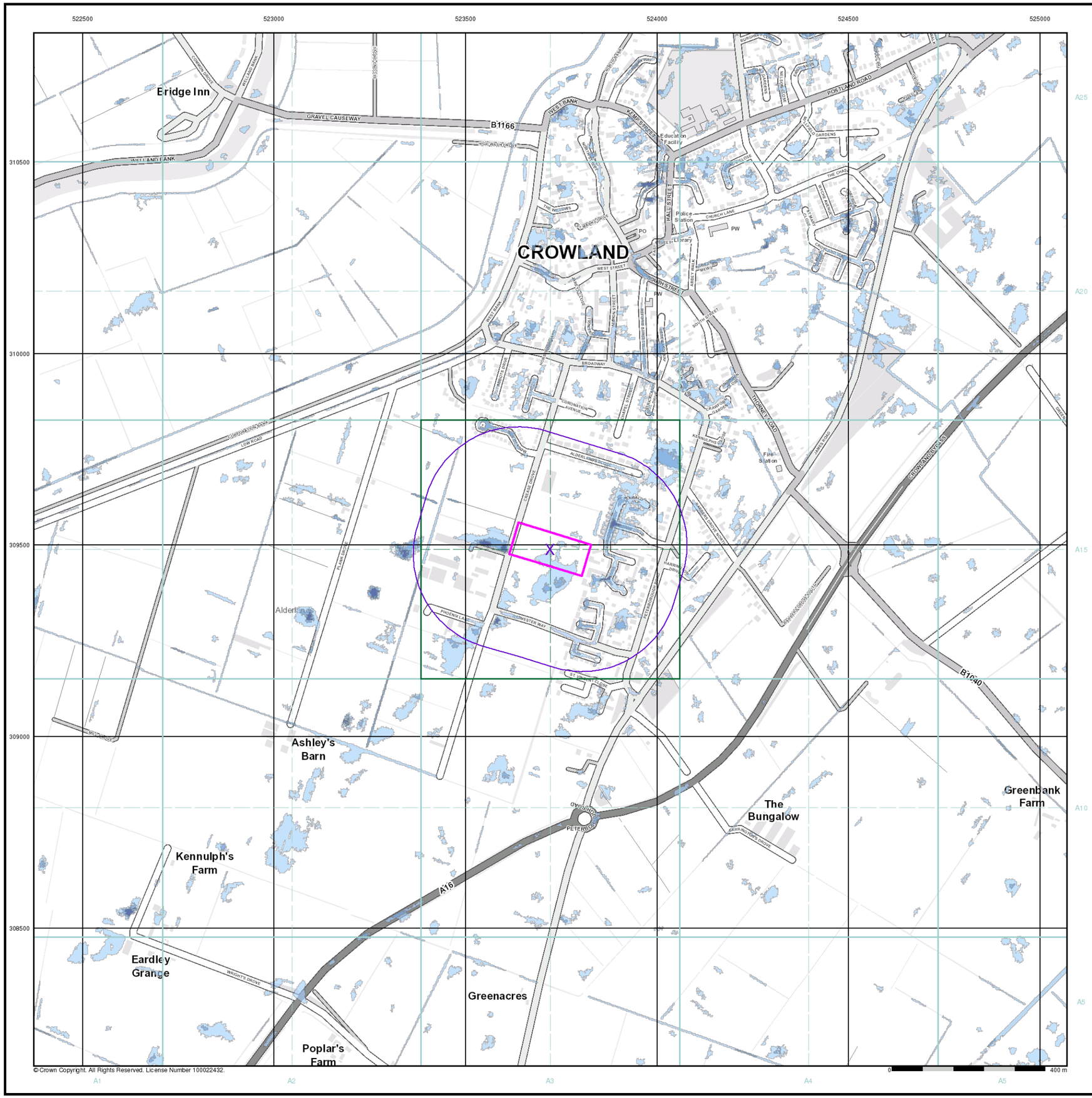
Order Number:	163602664_1_1
Customer Ref:	D38056c
National Grid Reference:	523720, 309490
Slice:	A
Site Area (Ha):	1.69
Search Buffer (m):	250

Site Details

Crease Drove, Crowland, PETERBOROUGH, PE6 0BN

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



GeoDyne

General

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

Risk of Flooding from Surface Water

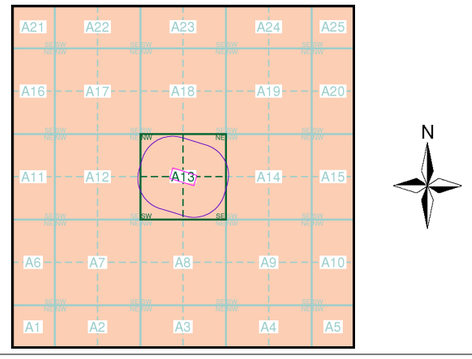
- High - 30 Year Return
- Medium - 100 Year Return
- Low - 1000 Year Return

Suitability

See the suitability map below

- National to county
- County to town
- Town to street
- Street to parcels of land
- Property

EA/NRW Suitability Map - Slice A



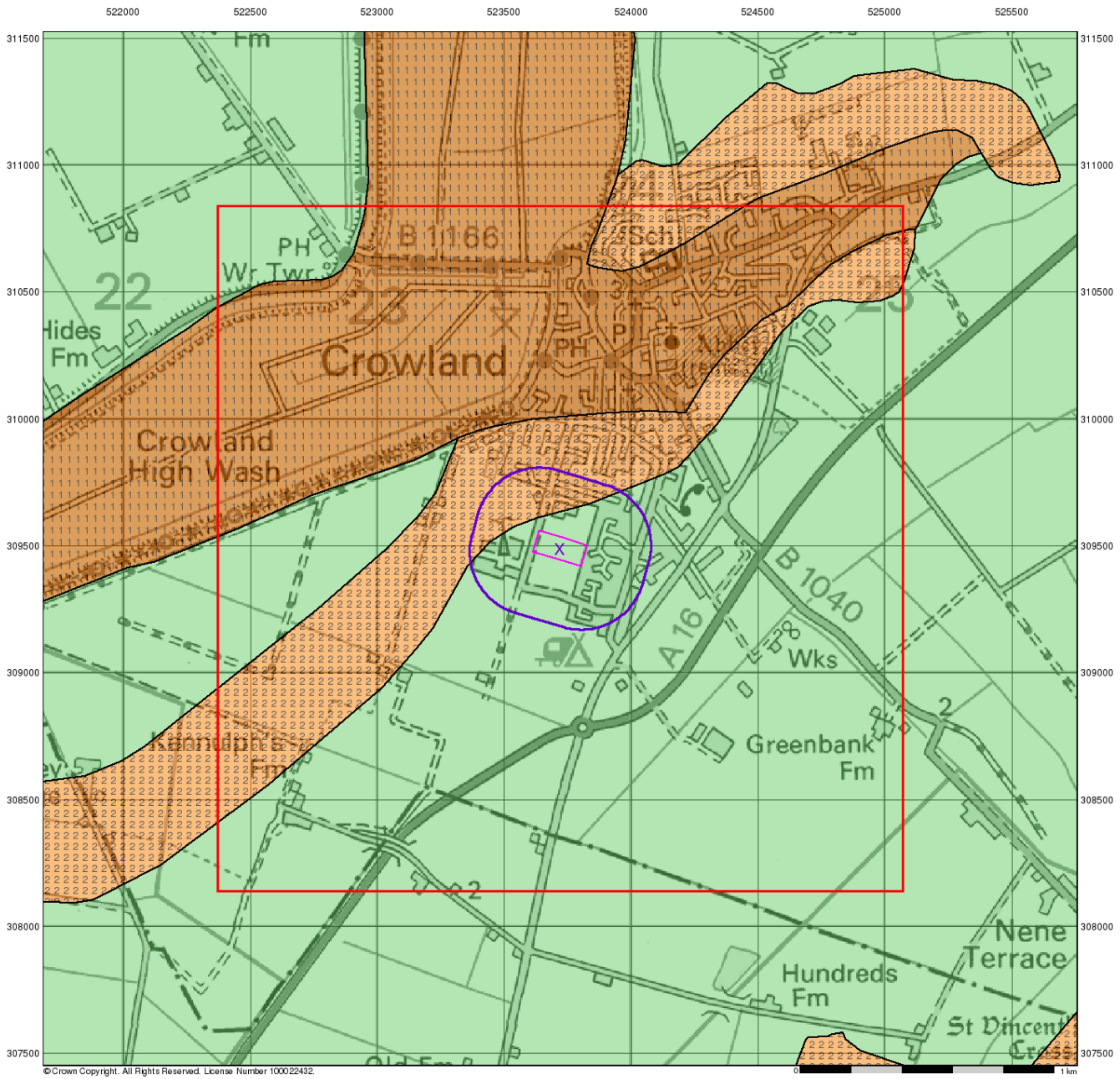
Order Details

Order Number:	163602664_1_1
Customer Ref:	D38056c
National Grid Reference:	523720, 309490
Slice:	A
Site Area (Ha):	1.69
Search Buffer (m):	250

Site Details

Crease Drove, Crowland, PETERBOROUGH, PE6 0BN

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GeoDyne

Groundwater Vulnerability

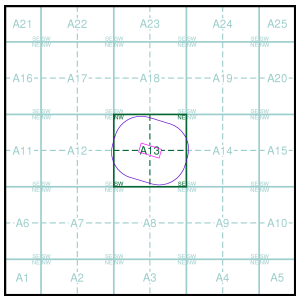
General

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

Agency and Hydrological

Geological Classes	Soil 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	

Site Sensitivity Context Map - Slice A



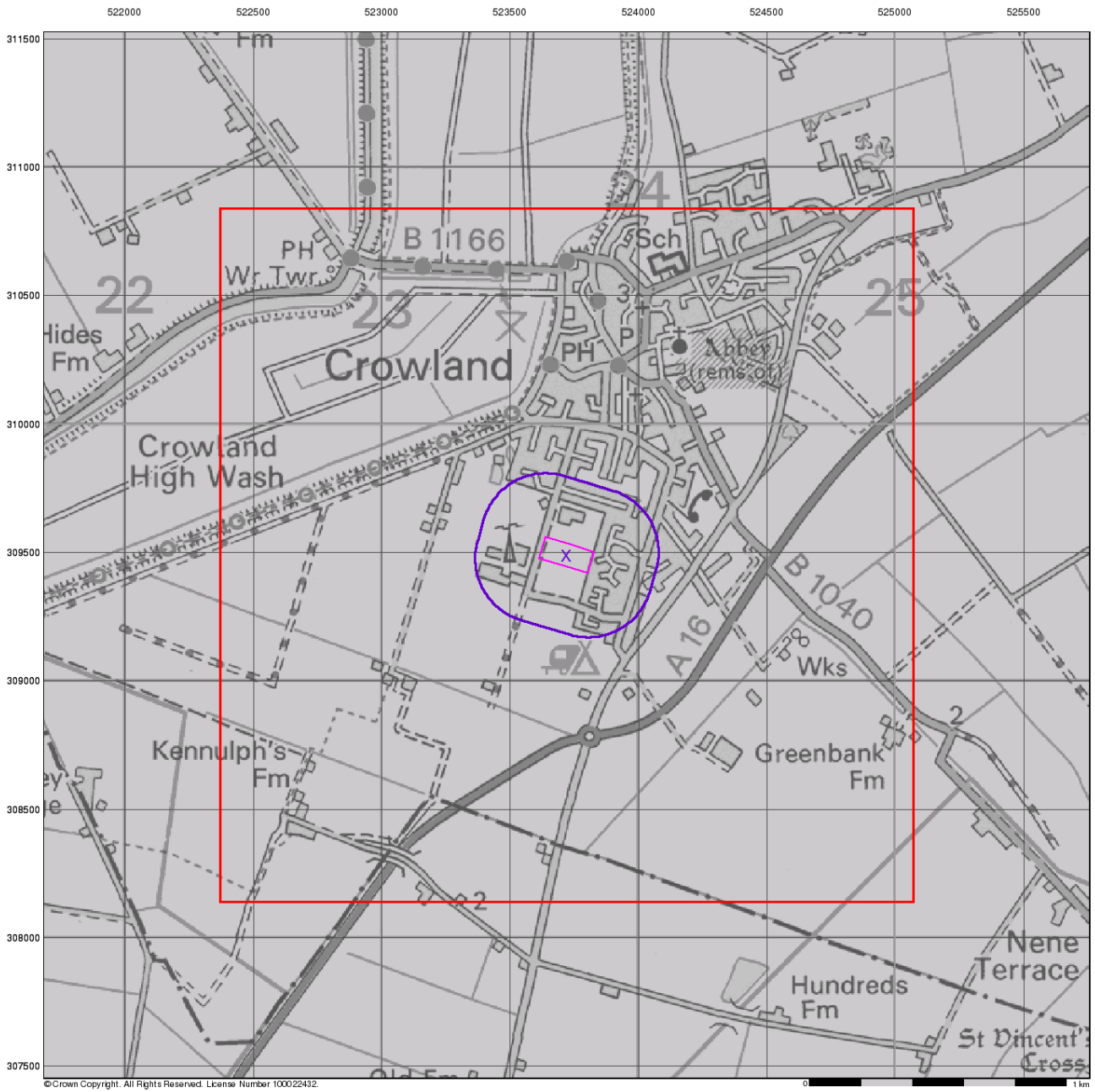
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Order Number:	163602664_1_1
Customer Ref:	D38056c
National Grid Reference:	523720, 309490
Slice:	A
Site Area (Ha):	1.69
Search Buffer (m):	250

Site Details

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GeoDyne

Bedrock Aquifer Designation

General

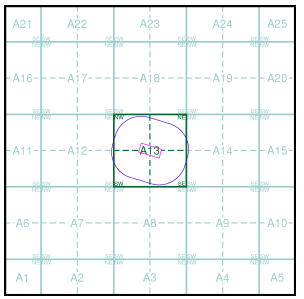
Specified Site | Specified Buffer(s) | Bearing Reference Point | Slice | Map ID

Agency and Hydrological

Geological Classes

- Principal Aquifer
- Secondary A Aquifer
- Secondary B Aquifer
- Secondary Undifferentiated
- Unproductive Strata
- Unknown
- Unknown (Lakes and Landslip)

Site Sensitivity Context Map - Slice A



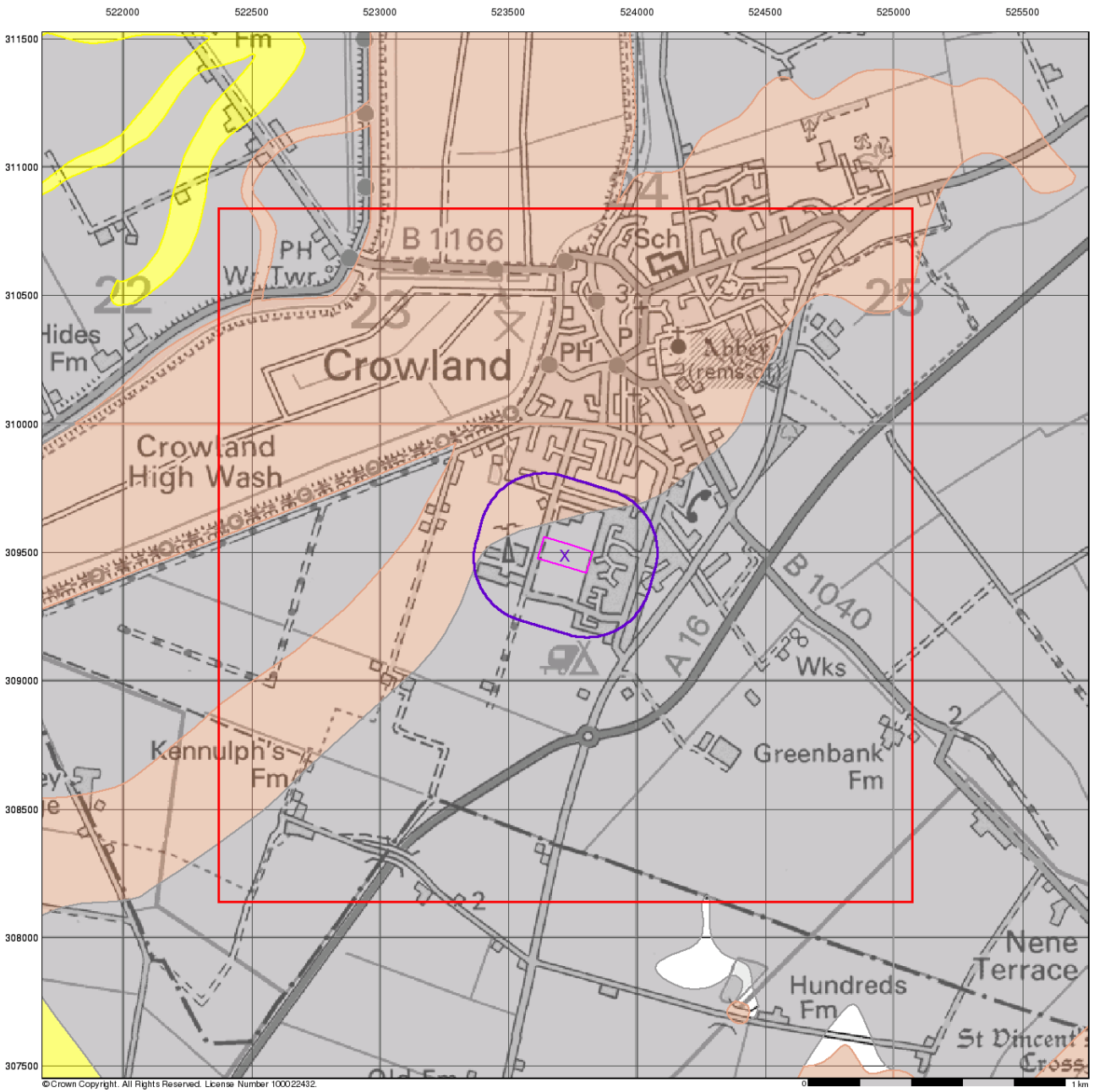
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Superficial Aquifer Designation

General

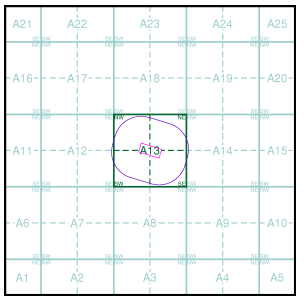
Specified Site | Specified Buffer(s) | Bearing Reference Point | Slice | Map ID

Agency and Hydrological

Geological Classes

- Principal Aquifer
- Secondary A Aquifer
- Secondary B Aquifer
- Secondary Undifferentiated
- Unproductive Strata
- Unknown
- Unknown (Lakes and Landslip)

Site Sensitivity Context Map - Slice A

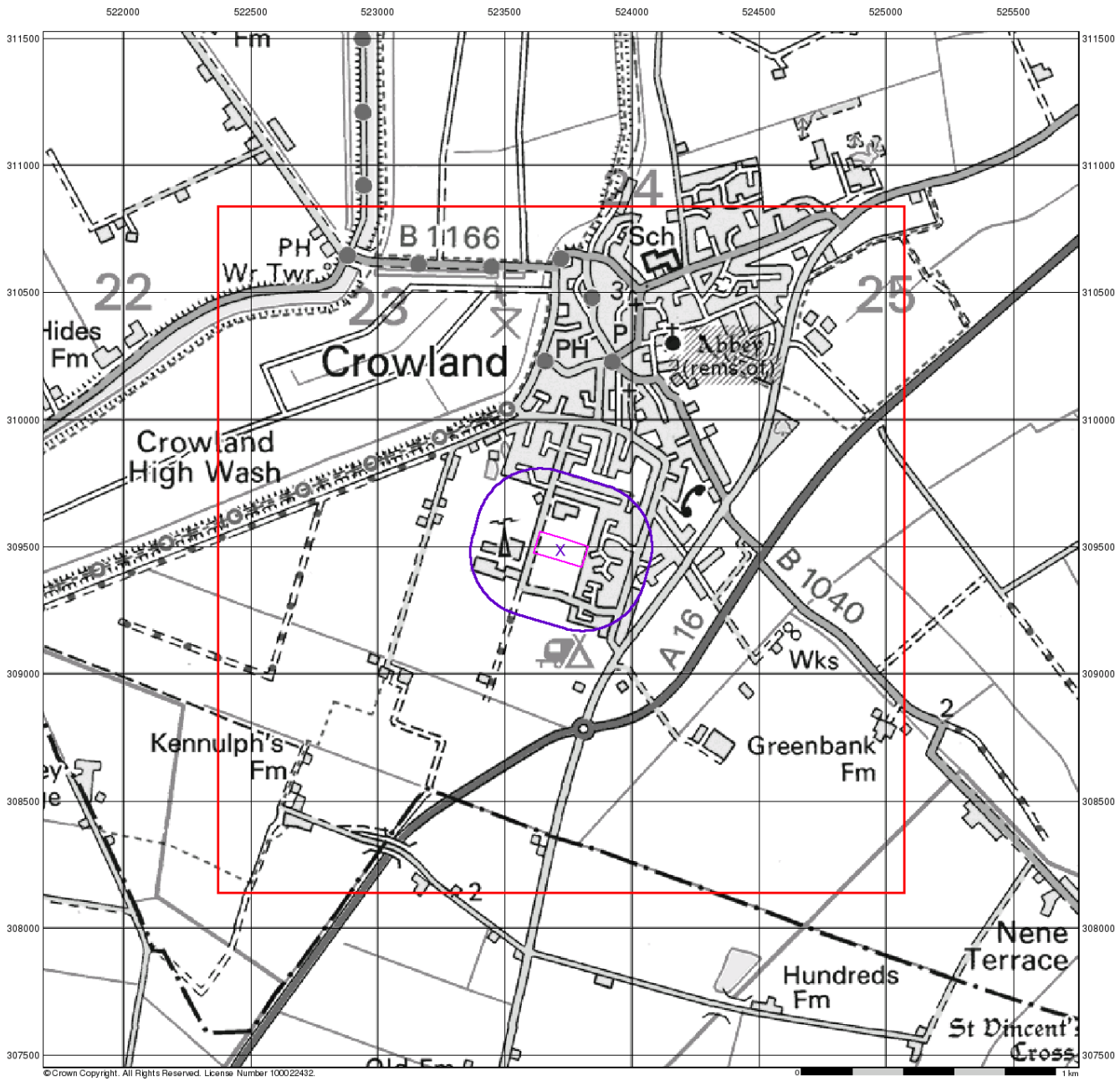


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Site Details

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Source Protection Zones

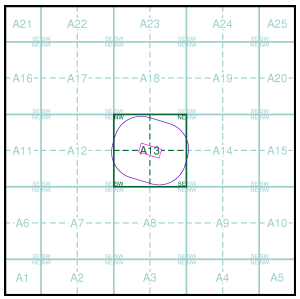
General

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)

Site Sensitivity Context Map - Slice A



Order Details

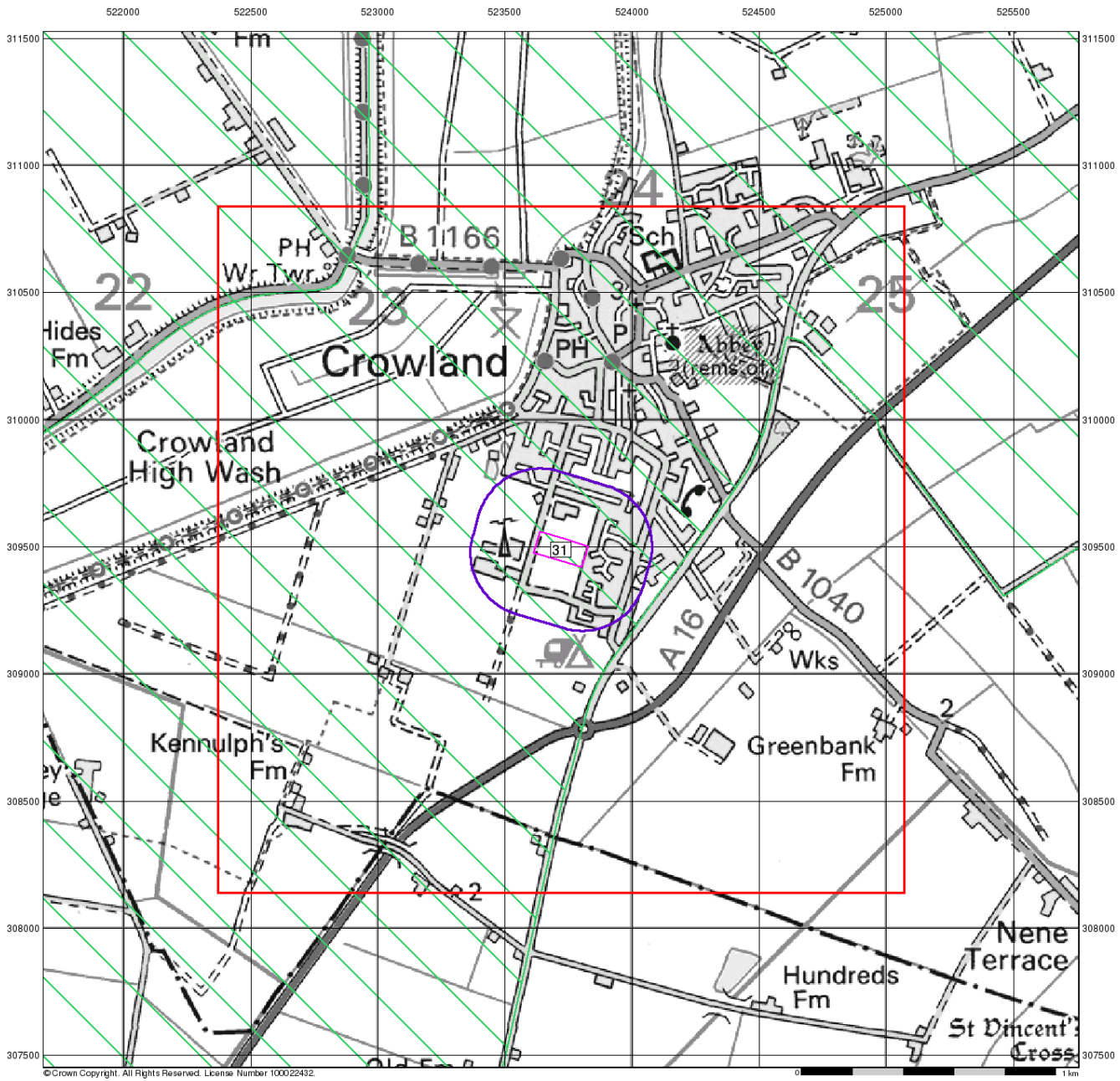
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Customer Ref:	D38056c
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Sensitive Land Uses

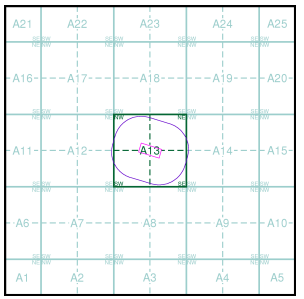
General

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

Sensitive Land Uses

- Ancient Woodland
- Area of Adopted Green Belt
- Area of Unadopted Green Belt
- Area of Outstanding Natural Beauty
- Environmentally Sensitive Area
- Forest Park
- Local Nature Reserve
- Marine Nature Reserve
- National Nature Reserve
- National Park
- Nitrate Sensitive Area
- Nitrate Vulnerable Zone
- Ramsar Site
- Site of Special Scientific Interest
- Special Area of Conservation
- Special Protection Area
- World Heritage Sites

Site Sensitivity Context Map - Slice A



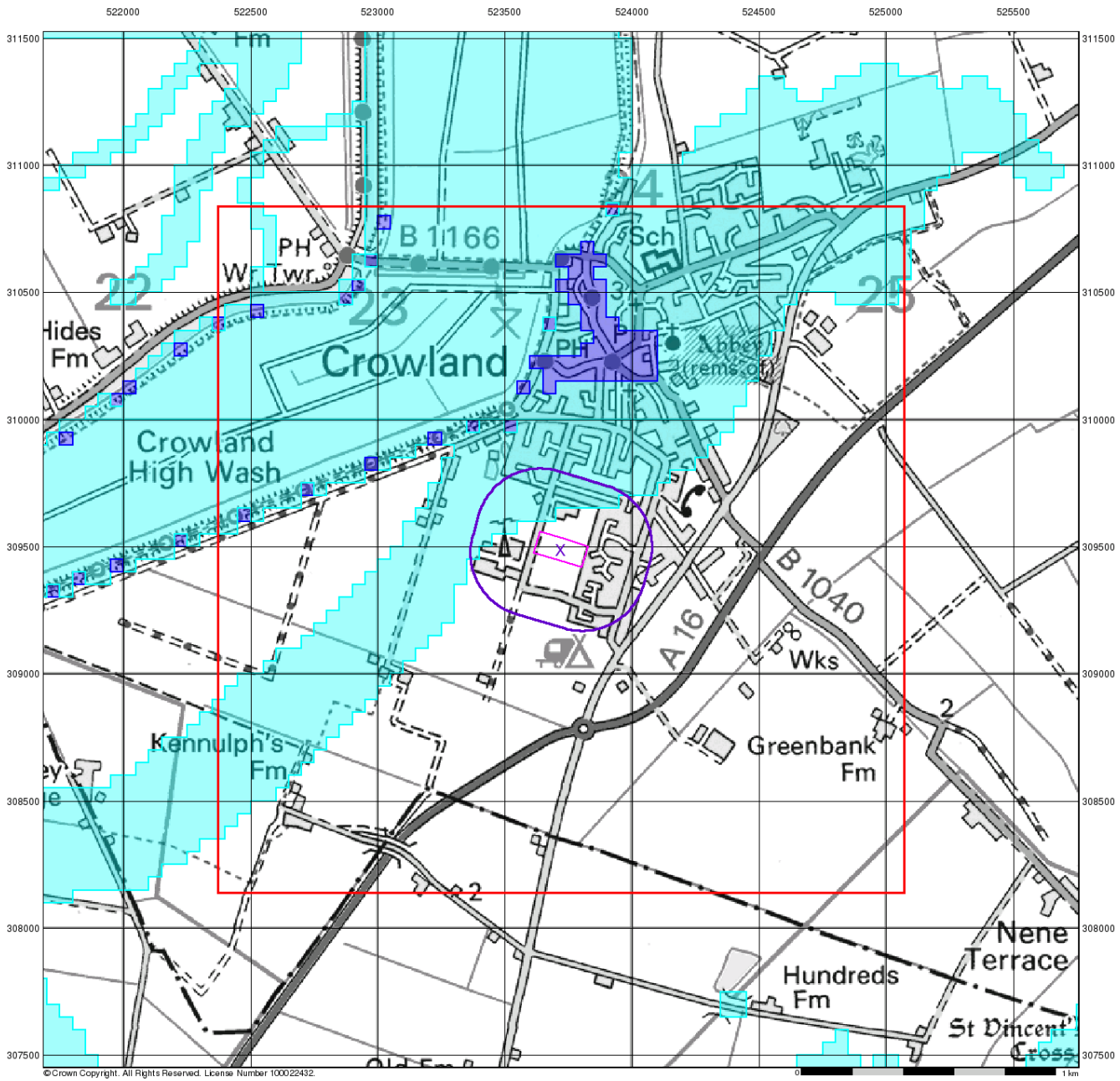
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BGS Flood GFS Data

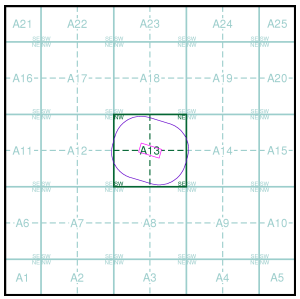
General

Specified Site | Specified Buffer(s) | Bearing Reference Point | Slice

Agency and Hydrological (Flood)

- Limited Potential for Groundwater Flooding to Occur
- Potential for Groundwater Flooding of Property Situated Below Ground Level
- Potential for Groundwater Flooding to Occur at Surface

Site Sensitivity Context Map - Slice A



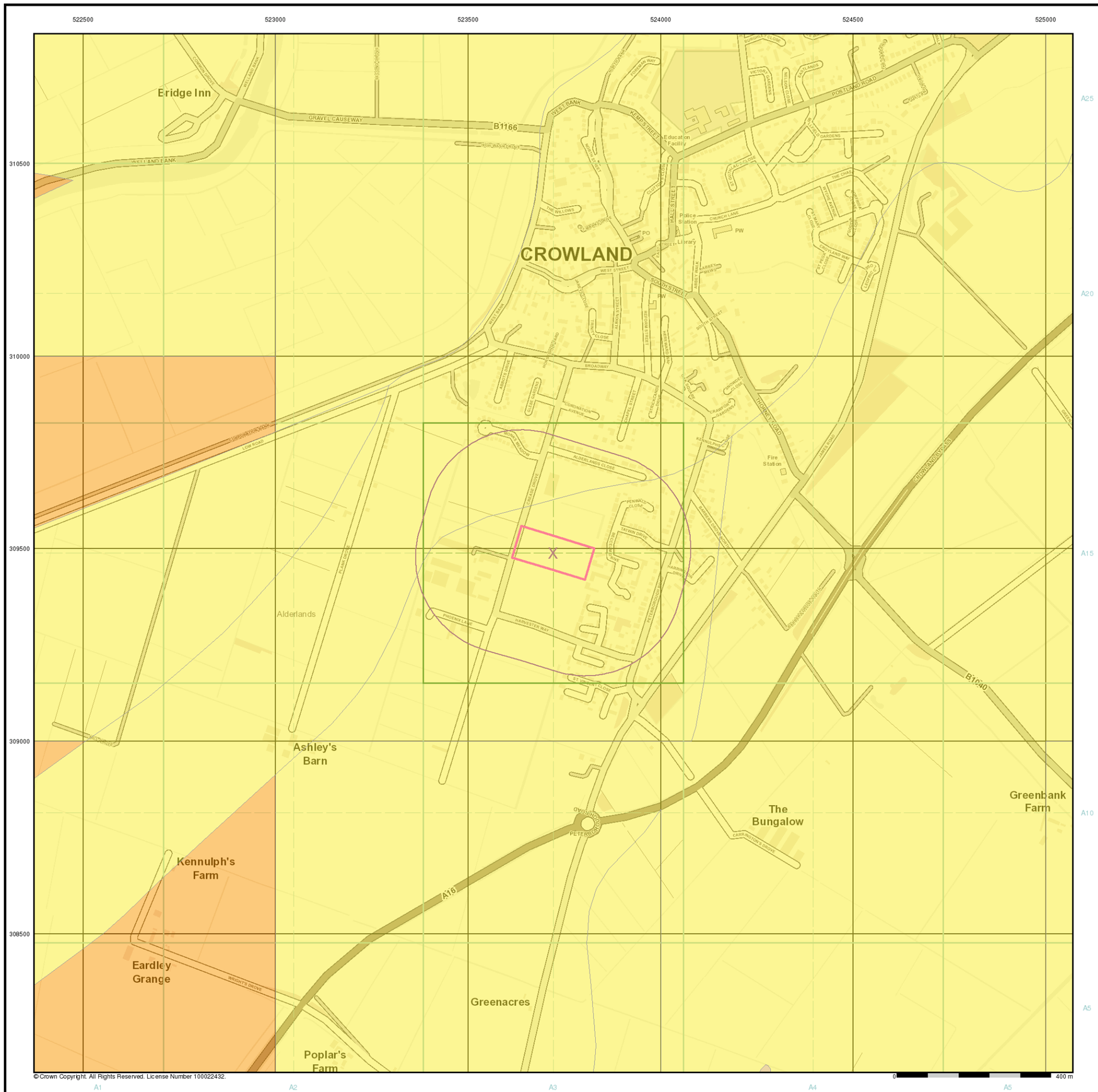
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General

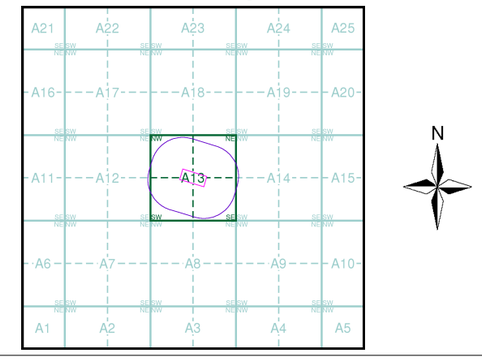
Specified Site | Specified Buffer(s) | X Bearing Reference Point

Estimated Soil Chemistry Arsenic

Arsenic Concentrations mg/kg

- < 15
- 15 - 25
- 25 - 35
- 35 - 45
- 45 - 60
- 60 - 120
- > 120

Estimated Soil Chemistry Arsenic - Slice A



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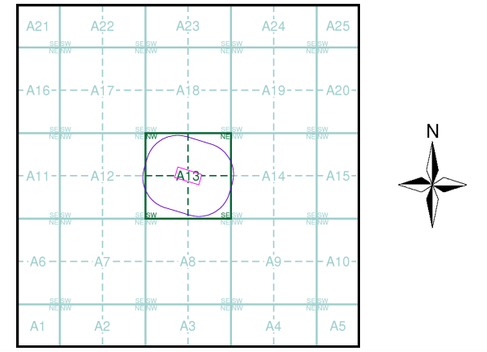
Specified Site | Specified Buffer(s) | X Bearing Reference Point

Estimated Soil Chemistry Cadmium

Cadmium Concentrations mg/kg

	< 1.8
	1.8 - 2.2
	2.2 - 3.0
	> 3.0

Estimated Soil Chemistry Cadmium - Slice A



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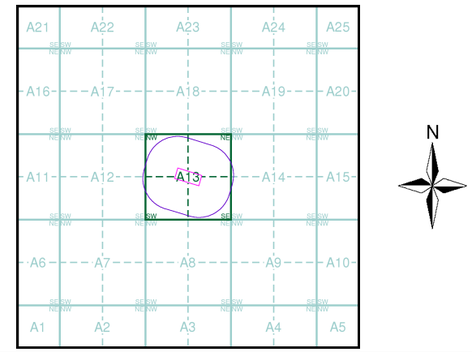
Specified Site | Specified Buffer(s) | X Bearing Reference Point

Estimated Soil Chemistry Chromium

Chromium Concentrations mg/kg

- < 20
- 20 - 40
- 40 - 60
- 60 - 90
- 90 - 120
- 120 - 180
- > 180

Estimated Soil Chemistry Chromium - Slice A



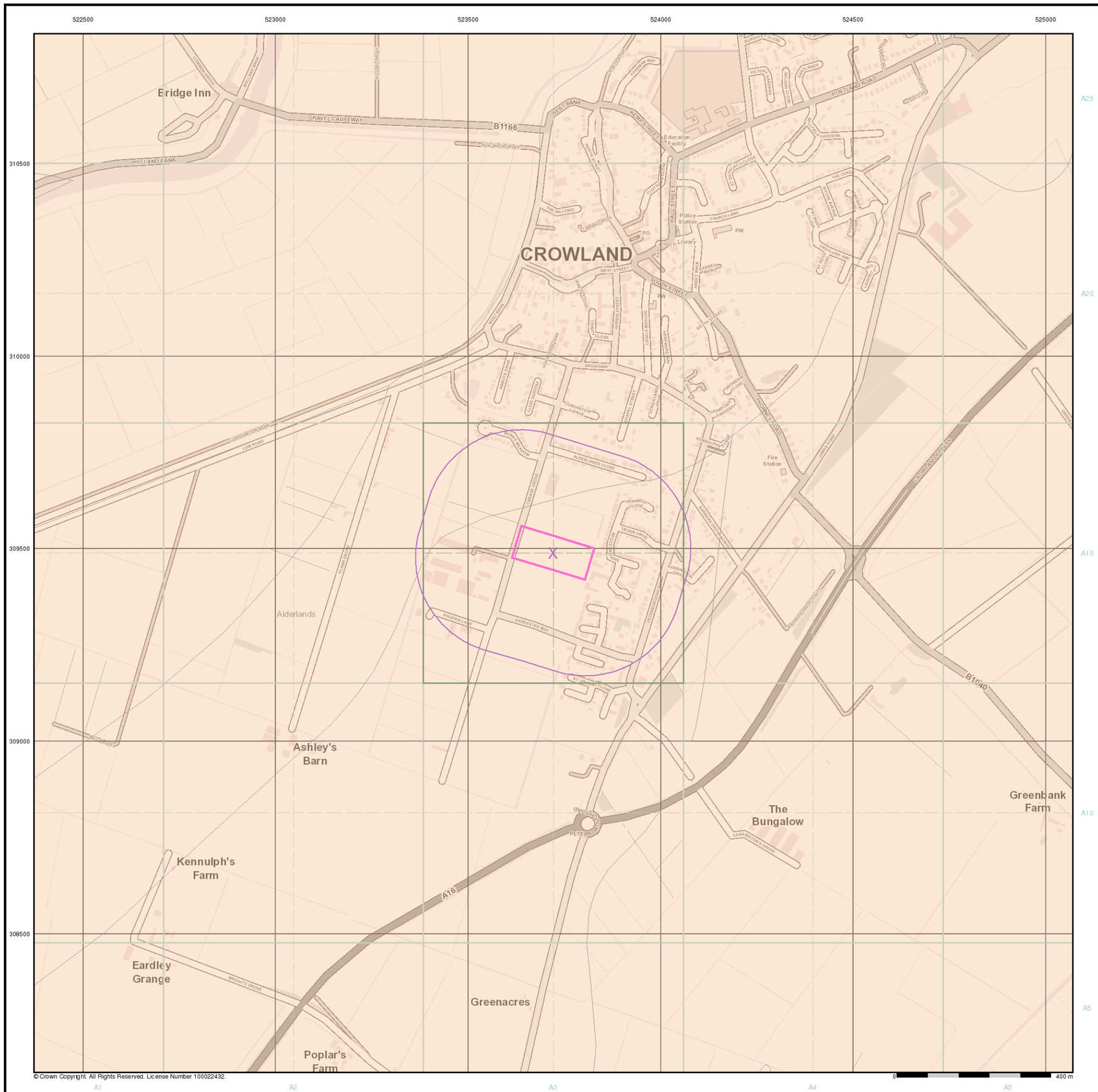
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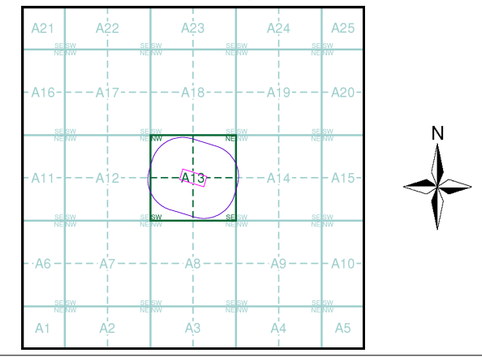
Specified Site | Specified Buffer(s) | X Bearing Reference Point

Estimated Soil Chemistry Lead

Lead Concentrations mg/kg

- <100 mg/kg
- 100 - 200
- 200 - 300
- 300 - 600
- 600 - 1200
- >1200

Estimated Soil Chemistry Lead - Slice A



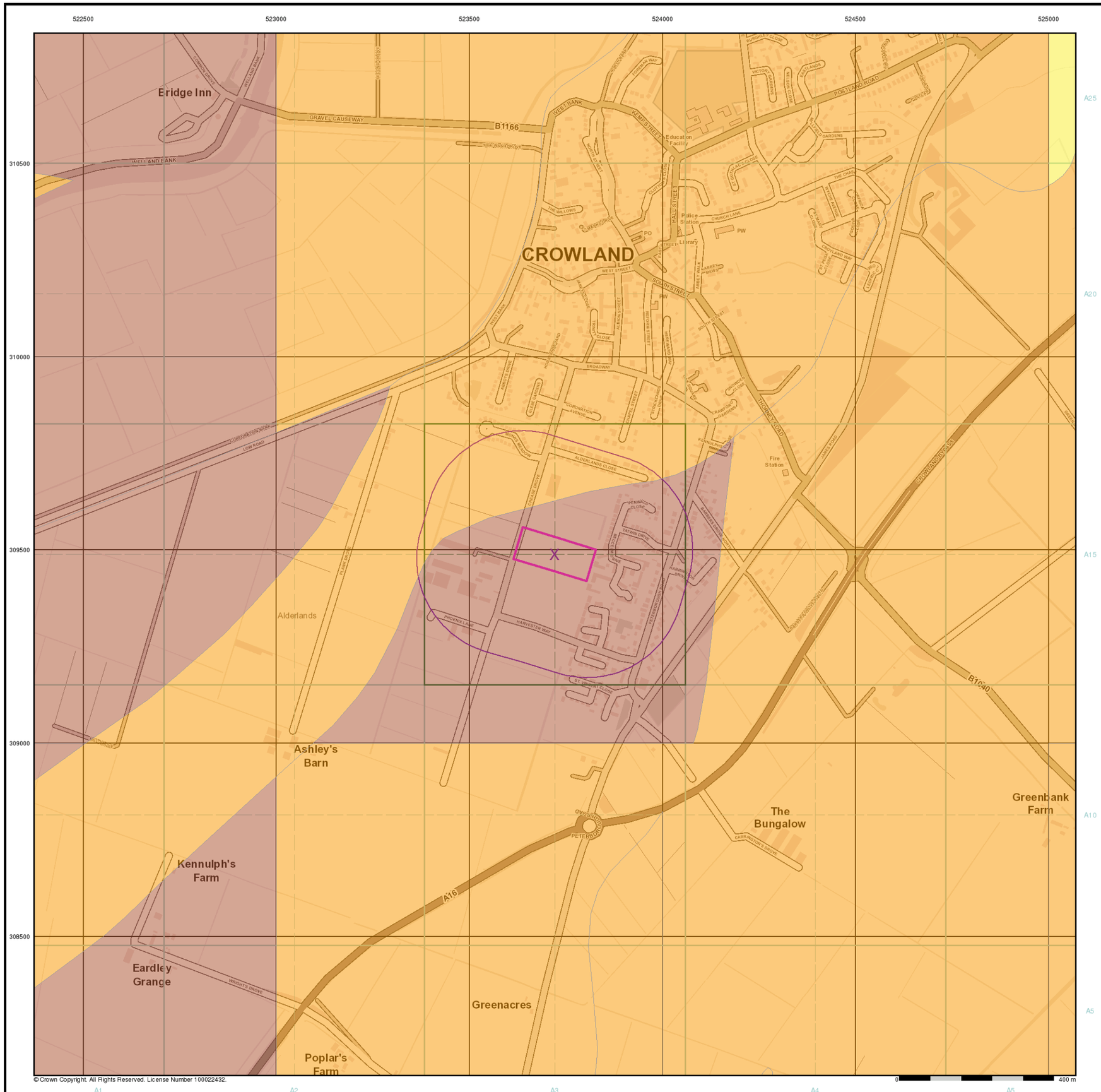
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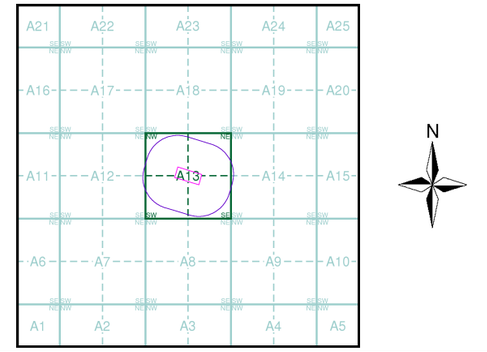
Specified Site | Specified Buffer(s) | X Bearing Reference Point

Estimated Soil Chemistry Nickel

Nickel Concentrations mg/kg

- < 15
- 15 - 30
- 30 - 45
- 45 - 60
- 60 - 80
- 80 - 100
- > 100

Estimated Soil Chemistry Nickel - Slice A



Order Details

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Geology 1:50,000 Maps Legends

Superficial Geology

Map Colour	Lex Code	Rock Name	Rock Type	Min and Max Age
	ALV	Alluvium	Clay, Silt, Sand and Gravel	Not Supplied - Holocene
	TFD	Tidal Flat Deposits	Sand and Silt	Not Supplied - Holocene
	ABSG	Abbey Sand and Gravel	Sand and Gravel	Not Supplied - Devensian
	MRCG	March Gravels Member	Sand and Gravel	Not Supplied - Ipswichian
	PEAT	Peat	Peat	Not Supplied - Quaternary
	TFD1	Tidal Flat Deposits, 1	Clay and Silt	Not Supplied - Quaternary
	RTD1	River Terrace Deposits, 1	Sand and Gravel	Not Supplied - Quaternary
	TFD1	Tidal Flat Deposits, 1	Sand and Silt	Not Supplied - Quaternary

Bedrock and Faults

Map Colour	Lex Code	Rock Name	Rock Type	Min and Max Age
	OXC	Oxford Clay Formation	Mudstone	Not Supplied - Callovian

GeoDyne

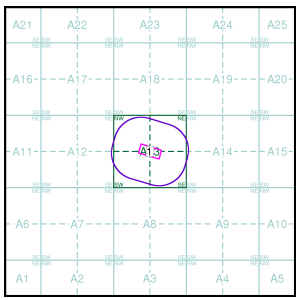
Geology 1:50,000 Maps

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



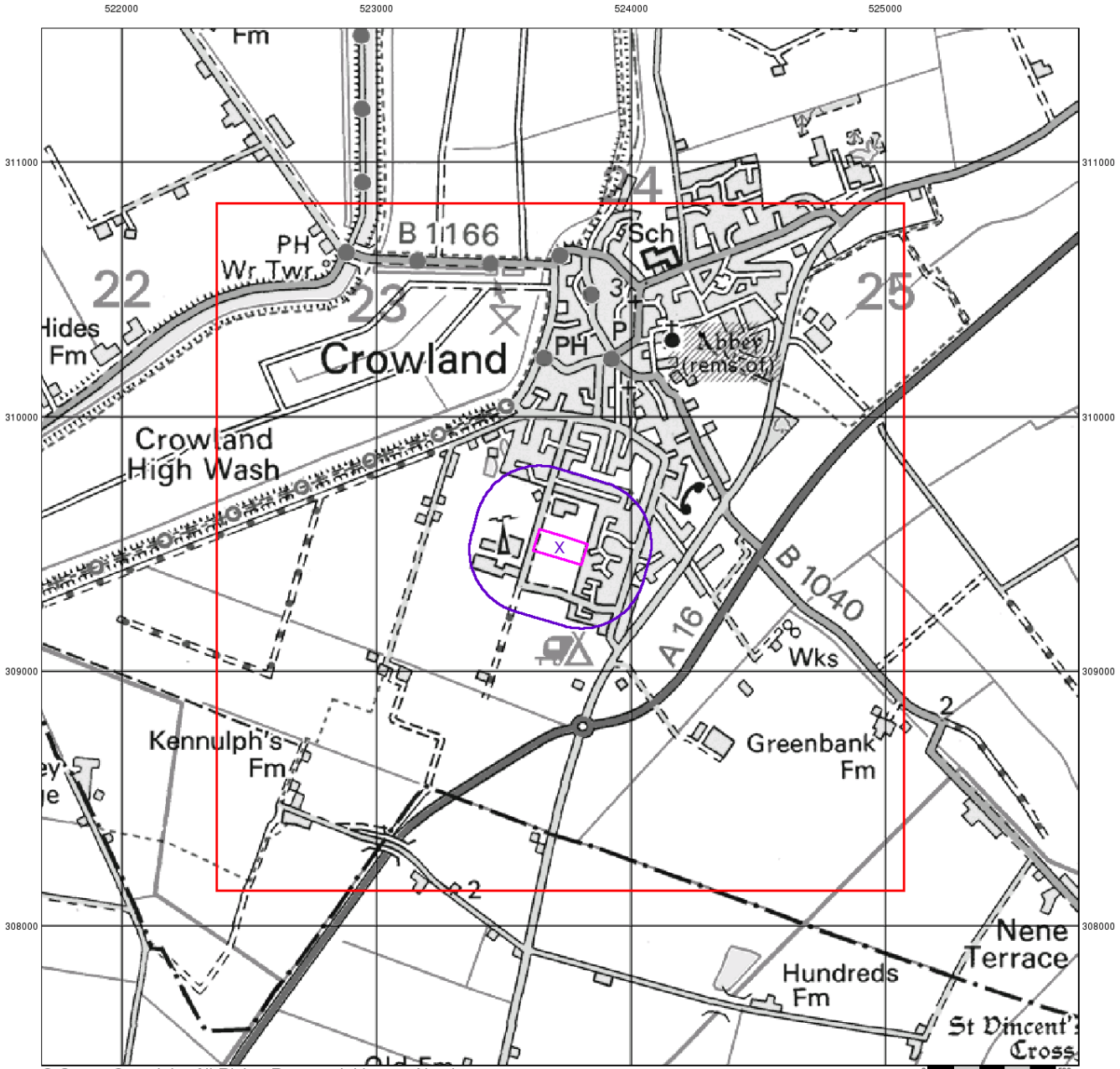
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Order Number: 163602664_1_1
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Artificial Ground and Landslip

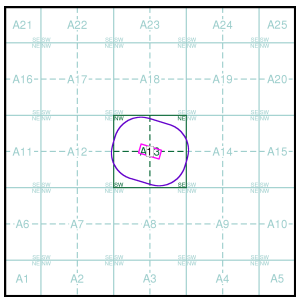
Artificial ground is a term used by BGS for those areas where the ground surface has been significantly modified by human activity. Information about previously developed ground is especially important, as it is often associated with potentially contaminated material, unpredictable engineering conditions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



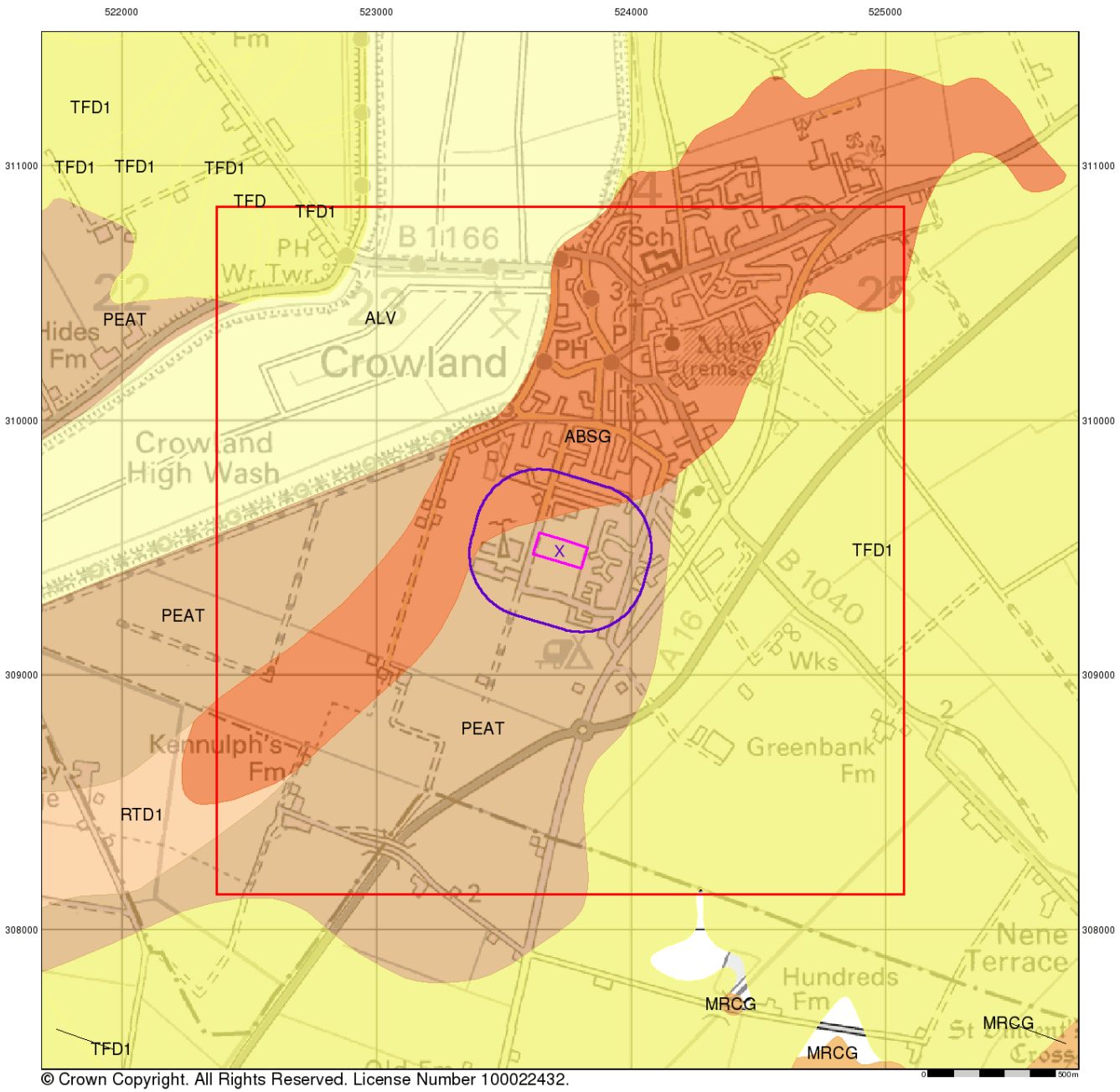
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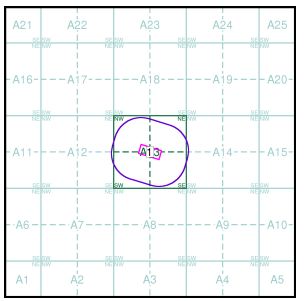
Superficial Geology

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



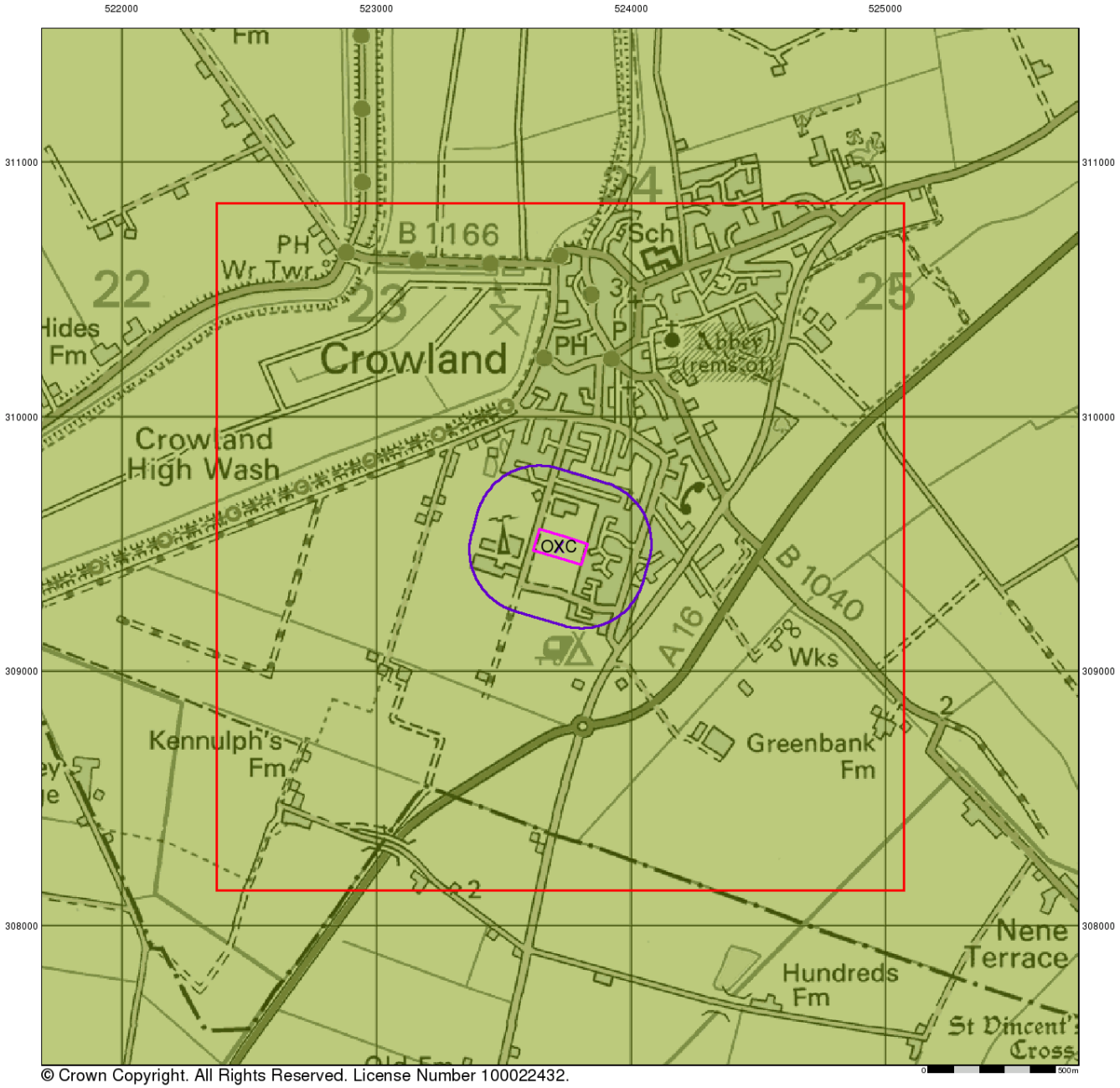
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Bedrock and Faults

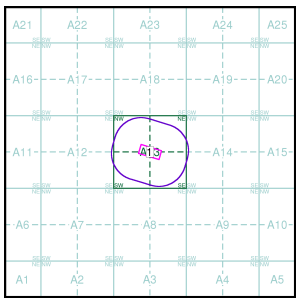
Bedrock geology is a term used for the main mass of rocks forming the Earth and are present everywhere, whether exposed at the surface in outcrops or concealed beneath superficial deposits or water.

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



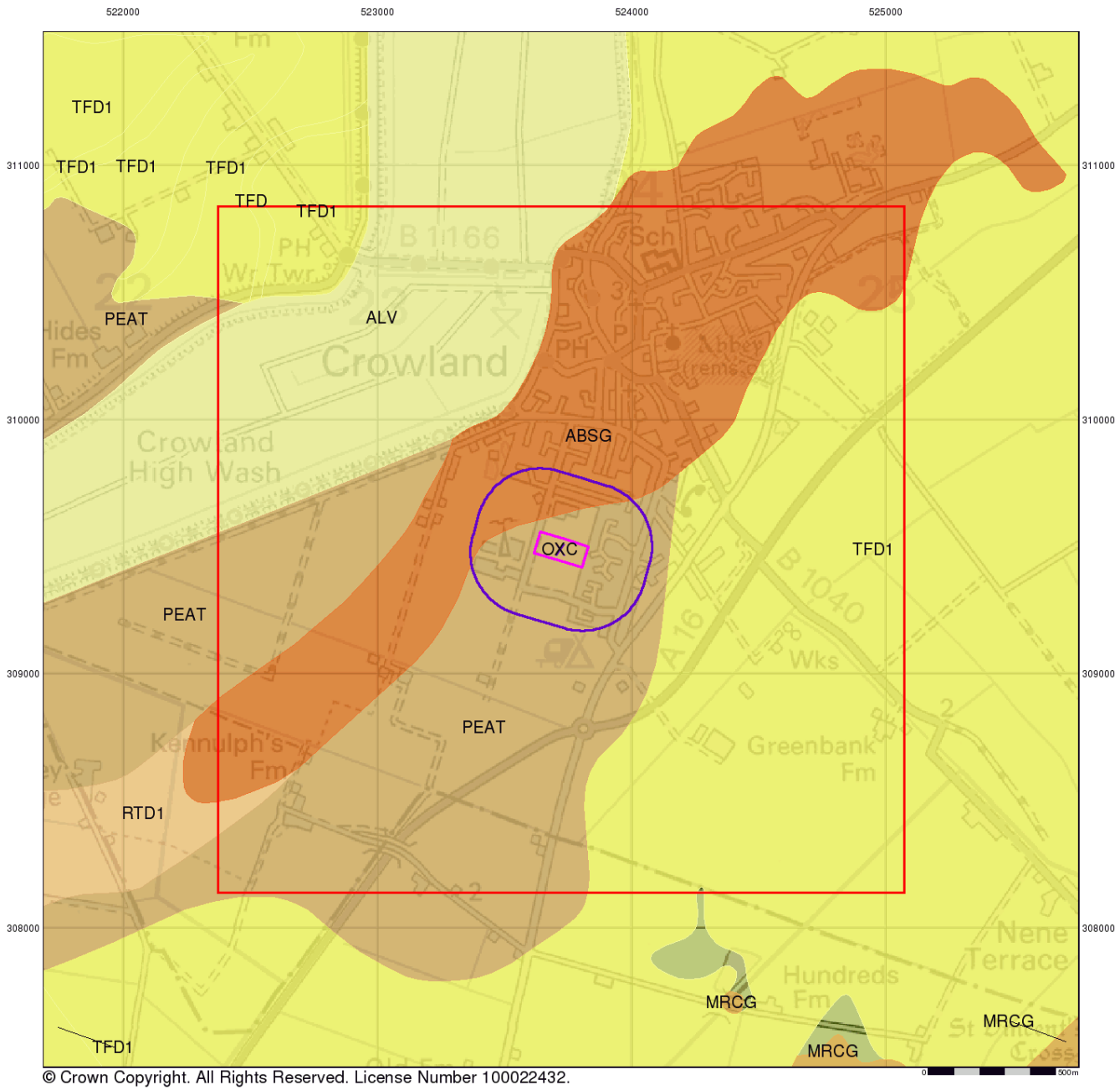
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Combined Surface Geology

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.

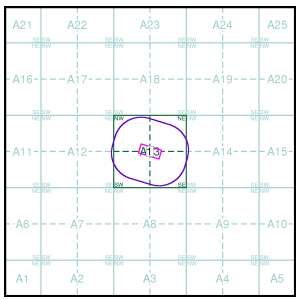
Additional Information

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

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email: enquiries@bgs.ac.uk
website: www.bgs.ac.uk

Combined Geology Map - Slice A



Order Details:

Order Number:	163602664_1_1
Customer Reference:	D38056c
National Grid Reference:	523720, 309490
Slice:	A
Site Area (Ha):	1.69
Search Buffer (m):	250

Site Details:

Crease Drove, Crowland, PETERBOROUGH, PE6 0BN

GeoDyne

APPENDIX XI

Plates



Project No.	D38056c	Drawn	CB
Client	Ashwood Homes	Checked	DB
		Approved	PK
Project	Joyce - Crease Drove Crowland	Scale	NTS
		Date Drawn	02/07/2018
		Rev.	
Title	TP1 - completed excavation	Plate No.	1

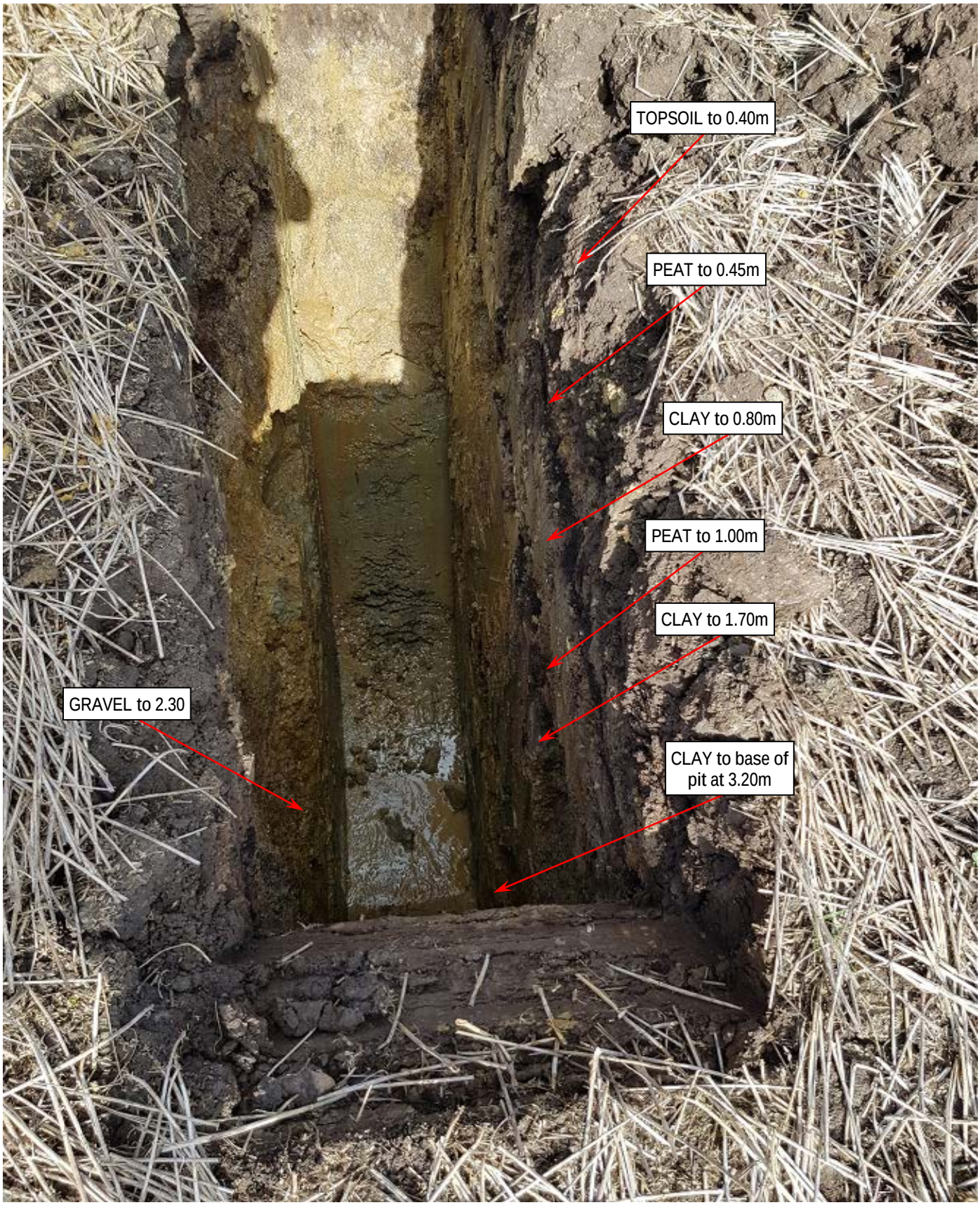
GeoDyne





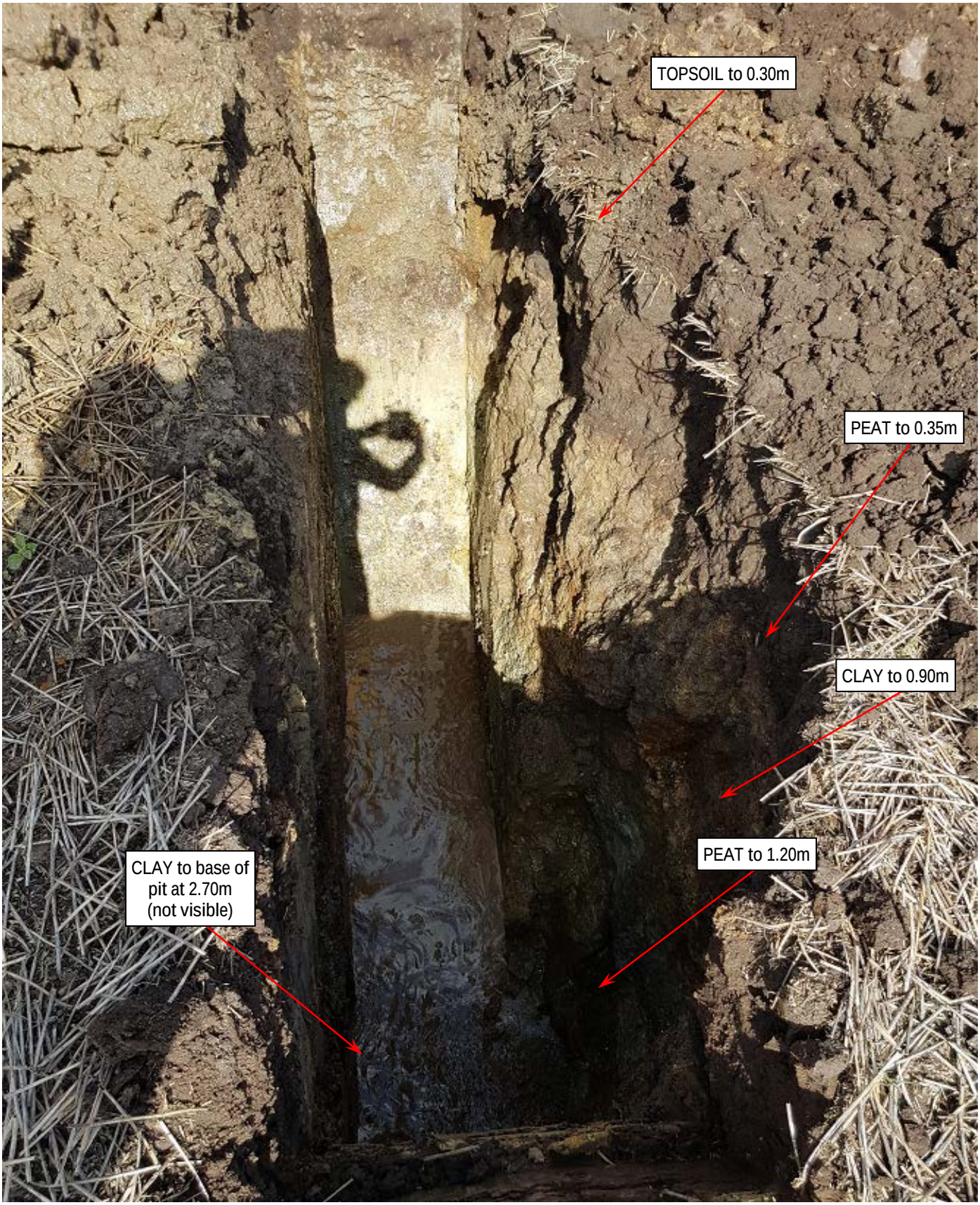
Project No.	D38056c	Drawn	CB
Client	Ashwood Homes	Checked	DB
		Approved	PK
Project	Joyce - Crease Drove Crowland	Scale	NTS
		Date Drawn	02/07/2018
		Rev.	
Title	TP1 - views of arisings	Plate No.	2

GeoDyne



Project No.	D38056c	Drawn	CB
Client	Ashwood Homes	Checked	DB
		Approved	PK
Project	Joyce - Crease Drove Crowland	Scale	NTS
		Date Drawn	02/07/2018
		Rev.	
Title	TP2 - completed excavation	Plate No.	3

GeoDyne



Project No.	D38056c	Drawn	CB
Client	Ashwood Homes	Checked	DB
		Approved	PK
Project	Joyce - Crease Drove Crowland	Scale	NTS
		Date Drawn	02/07/2018
		Rev.	
Title	TP3 - completed excavation	Plate No.	4

GeoDyne



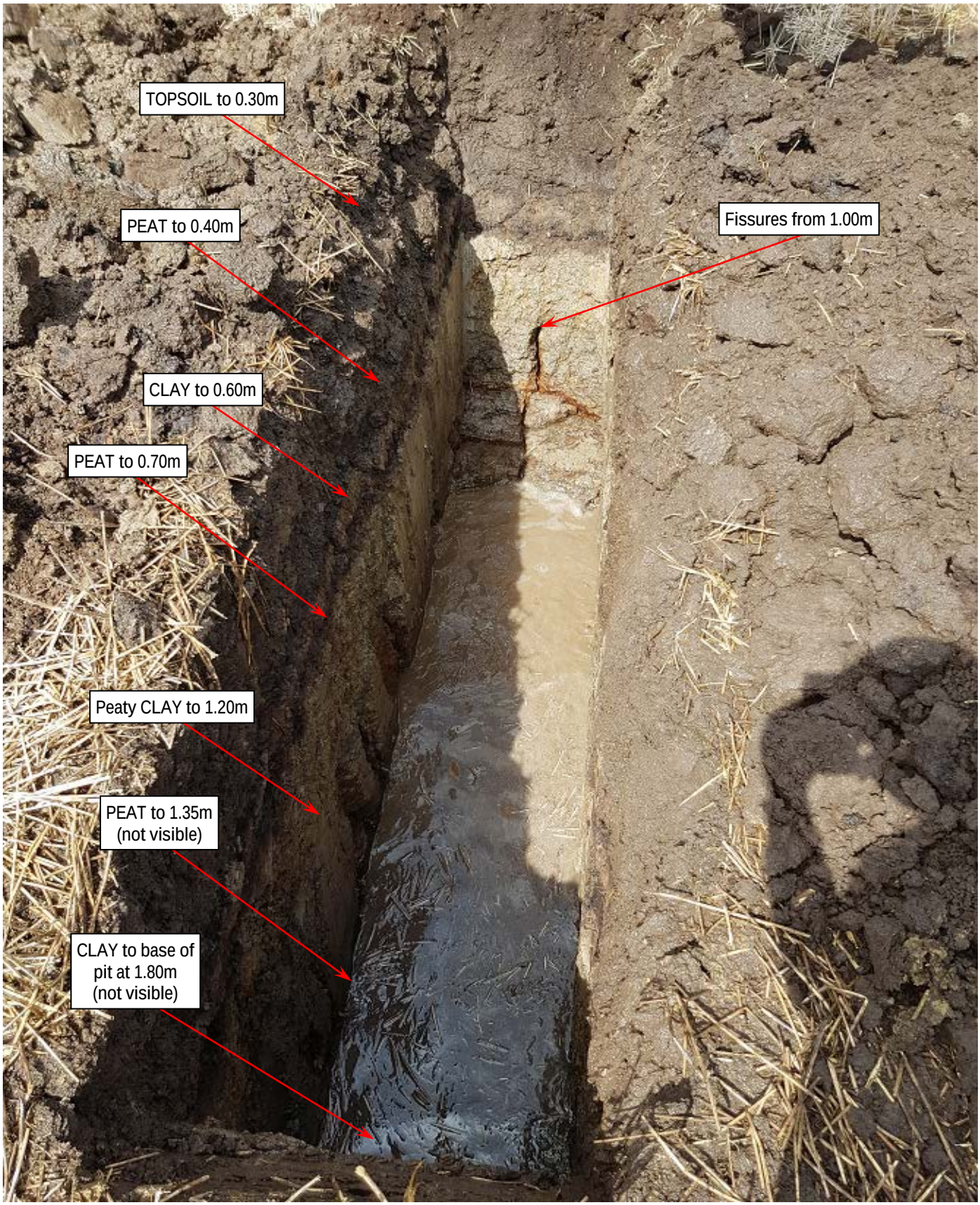
Project No.	D38056c	Drawn	CB
Client	Ashwood Homes	Checked	DB
		Approved	PK
Project	Joyce - Crease Drove Crowland	Scale	NTS
		Date Drawn	02/07/2018
		Rev.	
Title	TP4 - completed excavation	Plate No.	5

GeoDyne



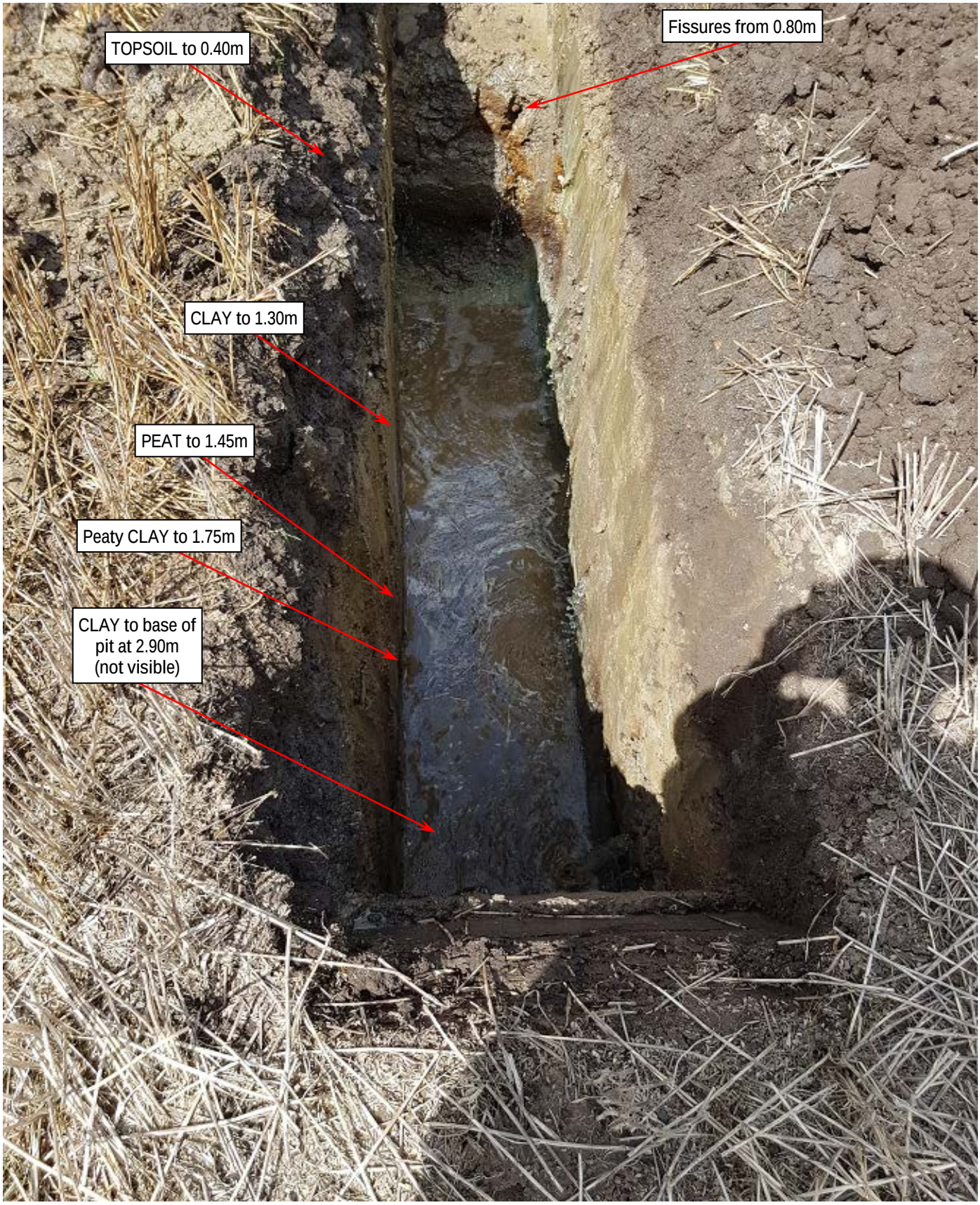
Project No.	D38056c	Drawn	CB
Client	Ashwood Homes	Checked	DB
		Approved	PK
Project	Joyce - Crease Drove Crowland	Scale	NTS
		Date Drawn	02/07/2018
		Rev.	
Title	TP4 - view of arisings	Plate No.	6

GeoDyne



Project No.	D38056c	Drawn	CB
Client	Ashwood Homes	Checked	DB
		Approved	PK
Project	Joyce - Crease Drove Crowland	Scale	NTS
		Date Drawn	02/07/2018
		Rev.	
Title	TP5 - completed excavation	Plate No.	7

GeoDyne



Project No.	D38056c	Drawn	CB
Client	Ashwood Homes	Checked	DB
		Approved	PK
Project	Joyce - Crease Drove Crowland	Scale	NTS
		Date Drawn	02/07/2018
		Rev.	
Title	TP6 - completed excavation	Plate No.	8

GeoDyne





Project No.	D38056c	Drawn	CB
Client	Ashwood Homes	Checked	DB
		Approved	PK
Project	Joyce - Crease Drove Crowland	Scale	NTS
		Date Drawn	02/07/2018
		Rev.	
Title	TP6 - views of arisings	Plate No.	9

GeoDyne



Project No.	D38056c	Drawn	CB
Client	Ashwood Homes	Checked	DB
		Approved	PK
Project	Joyce - Crease Drove Crowland	Scale	NTS
		Date Drawn	02/07/2018
		Rev.	
Title	TP7 - completed excavation	Plate No.	10

GeoDyne



Project No.	D38056c	Drawn	CB
Client	Ashwood Homes	Checked	DB
		Approved	PK
Project	Joyce - Crease Drove Crowland	Scale	NTS
		Date Drawn	02/07/2018
		Rev.	
Title	TP8 - completed excavation	Plate No.	11

GeoDyne



Project No.	D38056c	Drawn	CB
Client	Ashwood Homes	Checked	DB
		Approved	PK
Project	Joyce - Crease Drove Crowland	Scale	NTS
		Date Drawn	02/07/2018
		Rev.	
Title	TP9 - completed excavation	Plate No.	12

GeoDyne



Project No.	D38056c	Drawn	CB
Client	Ashwood Homes	Checked	DB
		Approved	PK
Project	Joyce - Crease Drove Crowland	Scale	NTS
		Date Drawn	02/07/2018
		Rev.	
Title	TP10 - completed excavation	Plate No.	13

GeoDyne



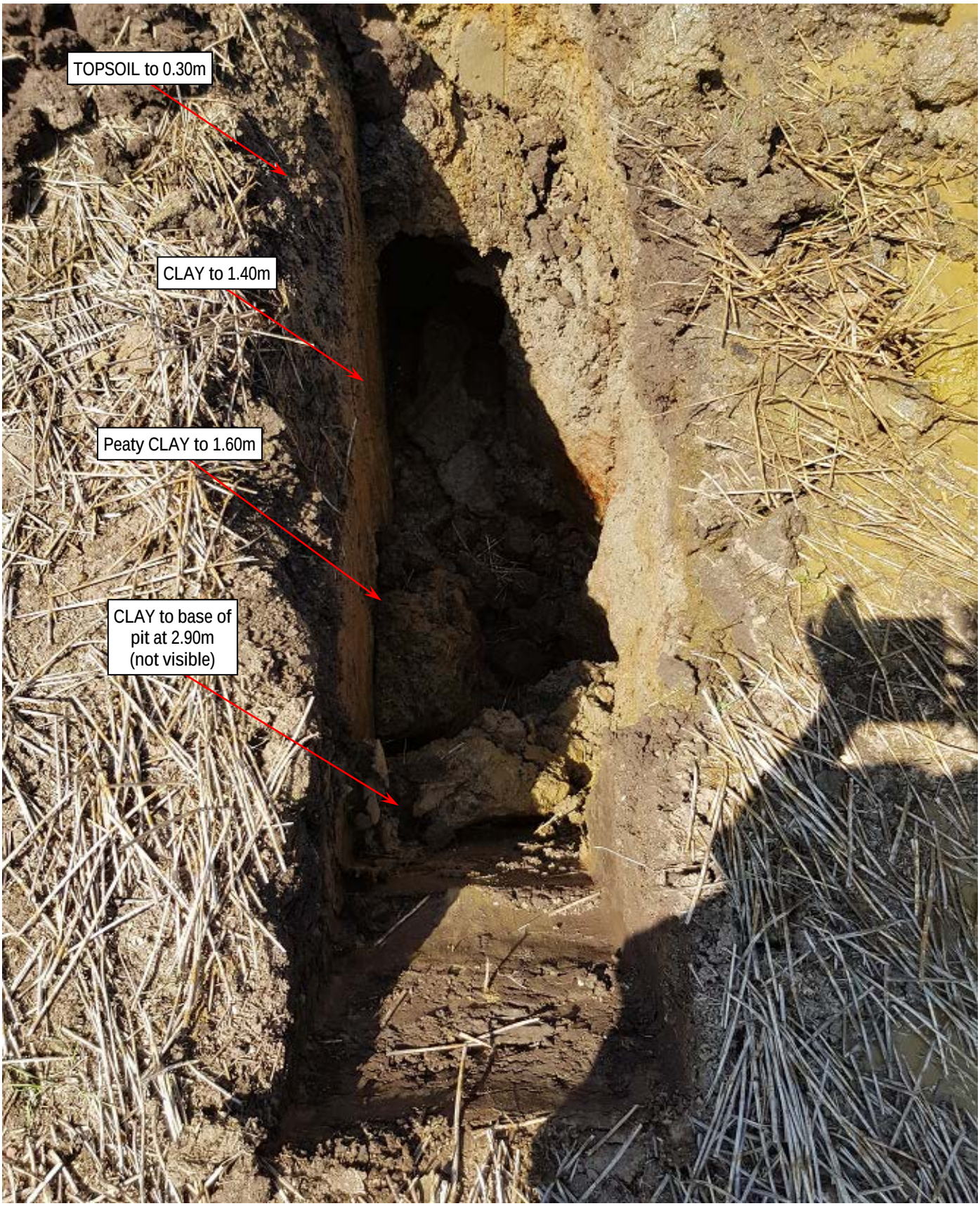
Project No.	D38056c	Drawn	CB
Client	Ashwood Homes	Checked	DB
		Approved	PK
Project	Joyce - Crease Drove Crowland	Scale	NTS
		Date Drawn	02/07/2018
		Rev.	
Title	TP11 - completed excavation	Plate No.	15

GeoDyne



Project No.	D38056c	Drawn	CB
Client	Ashwood Homes	Checked	DB
		Approved	PK
Project	Joyce - Crease Drove Crowland	Scale	NTS
		Date Drawn	02/07/2018
		Rev.	
Title	TP11 - view of arisings	Plate No.	16

GeoDyne



Project No.	D38056c	Drawn	CB
Client	Ashwood Homes	Checked	DB
		Approved	PK
Project	Joyce - Crease Drove Crowland	Scale	NTS
		Date Drawn	02/07/2018
		Rev.	
Title	TP12 - completed excavation	Plate No.	14

GeoDyne



Project No.	D38056c	Drawn	CB
Client	Ashwood Homes	Checked	DB
		Approved	PK
Project	Joyce - Crease Drove Crowland	Scale	NTS
		Date Drawn	02/07/2018
		Rev.	
Title	TP12 - view of peaty clay arisings	Plate No.	14

GeoDyne



Project No.	D38056c	Drawn	CB
Client	Ashwood Homes	Checked	DB
		Approved	PK
Project	Joyce - Crease Drove Crowland	Scale	NTS
		Date Drawn	02/07/2018
		Rev.	
Title	TP13 - completed excavation	Plate No.	17

GeoDyne



Project No.	D38056c	Drawn	CB
Client	Ashwood Homes	Checked	DB
		Approved	PK
Project	Joyce - Crease Drove Crowland	Scale	NTS
		Date Drawn	02/07/2018
		Rev.	
Title	TP14 - completed excavation	Plate No.	18

GeoDyne



Project No.	D38056c	Drawn	CB
Client	Ashwood Homes	Checked	DB
		Approved	PK
Project	Joyce - Crease Drove Crowland	Scale	NTS
		Date Drawn	02/07/2018
		Rev.	
Title	SA2 - completed excavation prior to infiltration rate testing	Plate No.	19

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APPENDIX XII

Conditions & Limitations

Conditions & Limitations

Phase I Desk Studies

1. Works undertaken to provide the basis of the Phase I Desk Study report comprise a review of information available from a number of sources/parties (potentially also including the Client) together with a walk over of the site (where applicable and included within the quotation). The opinions given in the Phase I Desk Study are based on the information available from third parties/sources that has been obtained within the available timeframe. GeoDyne Limited assumes all third party information to be true and correct and therefore cannot accept liability for the accuracy of such information supplied.

2. Should additional information become available that may affect the comments and opinions made within the Phase I Desk Study, GeoDyne Limited reserves the right to review such information and make modifications to comments/opinions as appropriate.

3. It should be borne in mind that a Phase I Desk Study collates available information to generate a conceptual model of the site. The actual geotechnical and environmental considerations can only be fully quantified by intrusive investigation works to confirm the accuracy of the conceptual site model.

Phase II Intrusive Investigations

1. Our quotation assumes that access to the site will be arranged by others at no cost to ourselves.

2. We have assumed that free access is available throughout to the entire site and that works can be undertaken during a single mobilisation. Where restricted access is encountered, or where additional unscheduled mobilisations are required, additional costs may be incurred to the client.

3. We have assumed that all available information relating to buried services will be supplied by the Client at no cost to ourselves. No responsibility will be accepted for damage to underground services that have not been brought to our prior attention by the Client.

4. All excavations/boreholes will be backfilled with compacted arisings upon completion, with any excess arisings left proud of ground levels. Excess arisings will not be removed from the site unless specifically requested by the Client. Where we are requested to remove excess arisings, all associated costs will be passed to the Client.

5. We will attempt to leave the site in a clean and tidy state, however, it must be understood that some disturbance of the site is unavoidable during intrusive works.

6. Exploratory holes are positioned approximately on site by GeoDyne Limited. Should the client require precise locations of all exploratory points, additional fees will be incurred. It must be borne in mind that backfilled trial pits can create ‘soft spots’, therefore, should the Client wish to designate ‘no dig’ zones, for example under the footprint of proposed structures, these must be brought to our attention prior to commencement of works.

7. Groundwater observations relate to conditions encountered at the time of investigation. It must be understood that groundwater levels may vary as a result of recent climatic conditions or seasonal variation.

8. Trial pits and boreholes examine only a small proportion of the total site area. No liability can be accepted for conditions not revealed in exploratory holes, particularly between positions. All extrapolations of available data are given in good faith.

Payment

1 Payment terms are strictly 28 days from the invoice date.

2 Prior to commencement of works, we require receipt of formal written instruction from the party accepting full financial responsibility for the work. In the absence of such an instruction, we would expect the instructing Consulting Engineers/Architects to accept full financial responsibility for the works.

3 Receipt of instruction to commence work shall be taken as acceptance and compliance of the foregoing conditions.

Liability

1. GeoDyne Limited offer £5,000,000.00 Professional Indemnity Insurance (in aggregate over the year). This shall be the limit of our liability for works undertaken. No individual liability shall be implied to, or accepted by, any employee for works undertaken for and on the behalf of GeoDyne Limited.