West Burton Solar Project

Environmental Statement

Appendix 13.2: Archaeological Geophysical Survey Report (Part 3 of 6)

Prepared by: NAA
March 2023

PINS reference: EN010132
Document reference: APP/WB6.3.13.2
APFP Regulation 5(2)(a)

West Burton
SOLAR PROJECT

Appendix 2

West Burton 2 Solar Site Geophysics Report (NAA 2022a)

NAA

GEOPHYSICAL SURVEY REPORT

WEST BURTON TWO

WEST BURTON SOLAR SCHEME

LINCOLNSHIRE

prepared for
West Burton Solar Project Ltd

NAA 21/53
April 2022

Northern
Archaeological
Associates

01833 690800

info@naaheritage.com

[redacted]

Marwood House
Harmire Enterprise Park
Barnard Castle
Co. Durham
DL12 8BN

QUALITY ASSURANCE		
Project Number	2107	
Report Number	21-53	
Manager	Damien Ronan	
Edit	Damien Ronan	
Authorised	A Crowson	
Draft 1		22/04/22

Author Kate Chapman, Matthew Fay and Alice James
Illustrations Kate Chapman, Matthew Fay, Alice James and Dawn Knowles

Client West Burton Solar Project Ltd
Location Ingleby, Lincolnshire
Grid Ref SK 89452 77300
Planning authority East Riding of Yorkshire Council

WEST BURTON TWO, WEST BURTON SOLAR SCHEME, LINCOLNSHIRE GEOPHYSICAL SURVEY REPORT

TABLE OF CONTENTS

FIGURE LIST

WEST BURTON TWO, WEST BURTON SOLAR SCHEME, LINCOLNSHIRE GEOPHYSICAL SURVEY REPORT

Summary

Northern Archaeological Associates Ltd (NAA) was commissioned by West Burton Solar Project Ltd. to undertake a gradiometer survey across 32 Areas (N1 – N32) totalling c.306ha of agricultural land belonging to the West Burton 2 Solar Scheme.

The survey was required to assess the archaeological potential of the site and help inform subsequent archaeological mitigation, in support of the West Burton Solar Scheme. This report is concerned with the area known as Ingleby (NGR: SK 89452 77300; Fig. 1).

The survey was carried out between Monday, 24 May 2021 and 28th February 2022 and covered a mixture of pasture, set-aside and arable fields.

Several concentrations of anomalies were identified as having archaeological potential. A series of rectilinear anomalies were identified in Areas N1 and N2 that possibly denote enclosures, magnetic disturbances were present in Areas N5 and N7 that correspond with the location of farmsteads recorded on the 1885 Ordnance Survey map, a curvilinear anomaly was identified in area N7, and anomalies possibly associated with medieval occupational activity belonging to Ingleby deserted medieval village were identified in areas N15, N16, N17 and N18.

Anomalies associated with agricultural activity were common across the site. There are numerous linear anomalies that are likely to be caused by former field boundaries, many of which are recorded on 18th- and 19th-century maps. Ridge and furrow occurred frequently in the survey results—especially in the direct hinterland of the deserted medieval village at Ingleby—as well as evidence of modern ploughing and land drains.

Several anomalies were caused by modern activity, including linear bipolar anomalies that are likely to be indicative of buried utilities, and dipolar and bipolar anomalies that are caused by material/objects with a high magnetic susceptibility in the topsoil and periphery of the site. Broad areas of magnetic disturbance are caused by natural pedological and geological changes in the substrata.

1.0 INTRODUCTION

1.1 Northern Archaeological Associates Ltd. (NAA) was commissioned by West Burton Solar Project Ltd. to undertake a gradiometer survey across 32 Areas (N1 – N32) totalling c.306ha of agricultural land belonging to the West Burton 2 Solar Scheme.

1.2 The survey was required to assess the archaeological potential of the site and help inform subsequent archaeological mitigation, in support of the West Burton Solar Scheme.

1.3 This report details the setting (location, topography, geology) and archaeological background of the scheme and sets out the methodology used for the geophysical survey. The interpretation of the geophysical survey is achieved through the analysis of identified anomalies and is aided by a rapid examination of supporting information. The results of the geophysical survey are discussed below, and the interpretations are supported by appropriate illustrations. Where feasible, a detailed synopsis of anomalies is provided and, if possible, the features that the anomalies are likely to relate to are suggested.

2.0 LOCATION, TOPOGRAPHY AND GEOLOGY

Location

2.1 The PDA encompassed fields surrounding the small hamlet of Ingleby, which lies c.2km north of the centre of Saxilby Village (Fig. 1).

2.2 The PDA comprised 32 fields—totalling c.306ha—that were used for pasture, set-aside and arable, the latter containing crops of wheat, maize, miscanthus and root vegetable.

2.3 The PDA lies within rural land characterised by a patch work of mixed-use farmland, small pockets of woodland and dispersed farmsteads. Sturton Road (B1241) runs through the centre of the PDA on a north south orientation, Sykes Lane runs to the south-west of the PDA, bordering Area N7, and Broxholme Lane runs east West through the south-east of the site between Areas N23 and N29, and N30. The River Till meanders to the east of the PDA and the North Eastern railway line runs to the west.

Geology and soils

2.4 The geology below the site is composed of interbedded mudstone and limestone of the Scunthorpe Mudstone Formation to the west, and mudstones from the Charmouth Mudstone Formation closer to the River Till. The majority of the survey area does not have any recorded superficial deposits. However, in the northern central part of the scheduled area there is an 'island' of Quaternary River terrace deposits of sand and gravel. Alluvial deposits of clay, silt, sand, and gravel were also recorded alongside the River Till (BGS 2022).

2.5 The soils are mapped as being of the Wickam 2 Association, fine loamy over clayey stagnogly soils best suited to winter wheat and pasture (Soil Survey of England and Wales 1983; Jarvis et al. 1984, 305).

Table 1: bedrock geology and superficial deposits recorded in the PDA

Area	Bedrock geology	Superficial deposits
N1	Scunthorpe Mudstone Formation (mudstone and limestone)	None recorded
N2	Scunthorpe Mudstone Formation (mudstone and limestone)	None recorded
N3	Scunthorpe Mudstone Formation (mudstone and limestone)	None recorded
N4	Scunthorpe Mudstone Formation (mudstone and limestone)	None recorded
N5	Scunthorpe Mudstone Formation (mudstone and limestone)	None recorded
N6	Scunthorpe Mudstone Formation (mudstone and limestone)	South-west: Holme Pierrepont Sand and Gravel Member
N7	Scunthorpe Mudstone Formation (mudstone and limestone)	West: Holme Pierrepont Sand and Gravel Member
N8	Scunthorpe Mudstone Formation (mudstone and limestone)	None recorded
N9	Scunthorpe Mudstone Formation (mudstone and limestone)	None recorded
N10	Scunthorpe Mudstone Formation (mudstone and limestone)	None recorded

N11	Scunthorpe Mudstone Formation (mudstone and limestone)	None recorded
N12	Scunthorpe Mudstone Formation (mudstone and limestone)	None recorded
N13	Scunthorpe Mudstone Formation (mudstone and limestone)	None recorded
N14	Scunthorpe Mudstone Formation (mudstone and limestone)	South: sand and gravel river terrace deposits
N15	Scunthorpe Mudstone Formation (mudstone and limestone)	West: sand and gravel river terrace deposits
N16	Scunthorpe Mudstone Formation (mudstone and limestone)	None recorded
N17	Scunthorpe Mudstone Formation (mudstone and limestone)	None recorded
N18	Scunthorpe Mudstone Formation (mudstone and limestone)	None recorded
N19	Scunthorpe Mudstone Formation (mudstone and limestone)	None recorded
N20	Scunthorpe Mudstone Formation (mudstone and limestone)	None recorded
N21	Scunthorpe Mudstone Formation (mudstone and limestone)	None recorded
N22	Scunthorpe Mudstone Formation (mudstone and limestone)	None recorded
N23	West: Scunthorpe Mudstone Formation (mudstone and limestone) East: Charmouth Mudstone Formation	None recorded
N24	Charmouth Mudstone Formation	East: Clay, Silt, Sand and Gravel Alluvium
N25	Charmouth Mudstone Formation	Clay, Silt, Sand and Gravel Alluvium
N26	Charmouth Mudstone Formation	Clay, Silt, Sand and Gravel Alluvium
N27	Charmouth Mudstone Formation	Clay, Silt, Sand and Gravel Alluvium
N28	Charmouth Mudstone Formation	Clay, Silt, Sand and Gravel Alluvium
N29	Charmouth Mudstone Formation	East: Clay, Silt, Sand and Gravel Alluvium

N30	West: Scunthorpe Mudstone Formation (mudstone and limestone) Centre: Charmouth Mudstone Formation	None recorded East: Clay, Silt, Sand and Gravel Alluvium
N31	Charmouth Mudstone Formation	Clay, Silt, Sand and Gravel Alluvium
N32	Charmouth Mudstone Formation	Clay, Silt, Sand and Gravel Alluvium

Topography

2.6 The land across the PDA is relatively flat with a very gradual downward slope to the west towards the River Till. The highest recorded values are in the centre and the west of the site, where it is recorded at 14m above Ordnance Datum (aOD). The lowest recorded values are along the western banks of the River Till, which are recorded at 5m aOD.

3.0 ARCHAEOLOGICAL AND HISTORICAL BACKGROUND

3.1 The following archaeological background summarises a forthcoming desk-based assessment (Lanpro 2022)

Prehistoric and Roman

3.2 The HER contains three records relating to prehistoric activity within the PDA. A polished stone axe was recovered from Area N2, a piece of worked flint was discovered in Area N10 and a Neolithic axe was found adjacent to the River Till on the south-east edge of the PDA. Other prehistoric flints have been found within a 1km search area of the site at Ingleby grange, Ingleby Farm, Wood Farm and to the south of Broxholme.

3.3 A possible prehistoric or Roman enclosure was identified c.350m to the south of the study site near Saxilby.

3.4 Evidence of Roman activity within the PDA is limited to a scatter of pottery found at Ingleby Hall Farm. Within the PDA's immediate surroundings, Roman activity largely comprises scant finds. The most noteworthy include a group of 2nd-4th century coins and pottery sherds discovered 420m away at Mill Lane, as well as a collection of pottery and tile fragments, found 550m to the west of the site, that could be suggestive of Roman buildings.

Early Medieval

3.5 There is no evidence of early medieval activity within the site. The only evidence of early medieval activity within the HER is pottery dated to the 10th that was found during an extension to Gables Manor, Ingleby in 1996.

3.6 Documentary and archaeological evidence suggests that the present pattern of hamlets and villages surrounding the PDA broadly represents the pattern of the Late Anglo-Saxon period settlement.

3.7 Ingleby is first documented in the Domesday Book of 1086, when it was recorded as Englarbi. Etymology of 'Englarbi' place name suggests it is Old Scandinavian meaning 'the farmstead or village of the Englishmen'.

3.8 Etymology of Broxholme—which is located c.03km to the east of the PDA— suggests the place name has Old Norse origin with *'holme'* meaning 'marsh island' or 'brook island'.

Medieval

3.9 The deserted medieval village of North Ingleby is located in the centre of the PDA. The remains comprise earthworks representing building platforms, property boundaries, streets and two moated sites. The northernmost area of surviving earthworks forms part of the 'Deserted village of North Ingleby' Scheduled Monument (NHLE 1003570), although well preserved earthwork remains additionally survive in fields under pasture to the south of the Scheduled Monument area. The site's absence from 14th century poll tax records suggests it may have been abandoned by this time (Lincolnshire County Council 2012).

3.10 Further medieval settlement remains are present at Broxholme 340m to the east of the site, while four medieval coins are recorded as being found in a field south of Wood Farm.

3.11 Aside from these recorded settlement features the majority of the PDA is believed to have comprised of agricultural land, a belief bolstered by the high incidence of ridge and furrow cropmarks in the area surrounding the site.

Post-medieval

3.12 A number of post-medieval features are present within the PDA, including a post-medieval windmill to south of Ingleby Grange, two 19th century farmsteads and a 19th century park associated with Ingleby House.

3.13 Following the decline of the settlement at Ingleby, during the post-medieval period the PDA is believed to have comprised almost wholly of agricultural land. This was certainly the case in 1885 upon the completion of the first Ordnance Survey (OS) map of the area, which depicts an agricultural landscape neatly divided by predominately linear field boundaries.

3.14 Later maps demonstrate that agriculture continued to dominate land use in the area into the 20th century. Modern changes to the fabric of the PDA include the removal of numerous field boundaries visible on the 1885 OS map, the infilling of various historic ponds and the demolition of farmsteads in the west of the PDA.

4.0 AIMS AND OBJECTIVES

4.1 The aim of the geophysical survey was to map and record potential buried features located within the PDA. Through analysis of the results of the geophysical survey, NAA aimed to provide a detailed interpretation of the archaeological potential of the site that would inform subsequent archaeological mitigation strategies.

4.2 The objectives of the project were to:

- carry out a geophysical survey across areas deemed suitable for data collection within the PDA;
- attempt to identify, record and where possible characterise any subsurface remains within the survey boundary;
- assess the archaeological potential of identified anomalies and
- identify possible concentrations of past activity in order to inform the requirement for any further archaeological investigation at the site.

5.0 METHODOLOGY

5.1 All survey work was completed to appropriate standards set out in current guidelines (CIfA 2014; Schmidt *et al*. 2015). The gradiometer survey used Bartington Grad601-2 dual magnetic gradiometer systems with data loggers. Readings were recorded at a resolution of 0.01nT and data was collected with a traverse interval of 1m and a sample

interval of 0.25m. A cart system was used to collect data in Area N24, the survey data in all other Areas were collected with reference to a site survey grid comprised of individual 30m x 30m squares. All data was located using Real Time Kinematic (RTK) differential GPS equipment with a positional accuracy of at least 0.1m.

5.2 The processing was undertaken using Geoplot 3.0 and TerraSurveyor version 3.0.37 software and consisted of standard processing procedures. Details of processing steps applied to collected data are given in Appendix B.

5.3 On the greyscale plots positive readings are shown as increasingly darker areas and negative readings are shown as increasingly lighter areas (Fig 3 and all subsequent even numbered Figs).

5.4 Interpretation of identified anomalies is generally achieved through analysis of anomaly patterning and increases in magnetic response and is often aided by examining supporting information. The interpreted data uses colour coding to highlight specific readings in the survey area (Fig 5 and all subsequent odd numbered Figs). Appendix C details the terminology and characterisation of anomalies used for interpreting data.

Surface conditions and other mitigating factors

5.5 The Ingleby survey area was divided into 32 distinct parcels by utilising the existing field boundaries (Figure 2). These were labelled N1 to N32.

5.6 Fieldwork was undertaken between March 2021 and February 2022.

5.7 Ground conditions were variable, depending on season and the period in the farming calendar that survey was undertaken. Attempts were made to ensure fields were surveyed at suitable times, in particular fields were not surveyed when rough ploughed or waterlogged.

5.8 Field boundaries comprised a mixture of native hedgerows and trees, along with drainage ditches, and metal fences. Field gates, tracks, and footpaths were used for access into the various areas, and several areas contained pylons.

5.9 Attempts were made to avoid areas affected by above-ground features that were likely to have a high magnetic susceptibility, such as metal fencing and pylons, to minimise the potential for their magnetic responses to impinge on the survey results and mask potential buried features.

6.0 RESULTS

6.1 The following section discusses anomalies identified generally across the site and provides a detailed interpretation of each area surveyed.

General anomalies across the whole site (Figs. 4 and 5)

6.2 There are numerous anomalies with an amorphous form across the survey area. Those with a coherent patterning or broader form have been identified within the interpretation. Generally, the interpretation of these anomalies is tentative. Those located near anomalies considered to have a possible archaeological origin have a greater potential of relating to archaeological features.

6.3 There are several weak and diffuse linear trends. Generally, these fail to produce the necessary patterning or increases in magnetic response to be interpreted fully, and as a consequence their origin is unknown.

6.4 Linear anomalies with clear increases in magnetic value that correspond with the location of field boundaries on historic maps are considered likely to denote infilled material associated with the removal of field boundaries. A tentative interpretation applies to linear anomalies that either do not correspond with the location of field boundaries on historic maps or are composed of weak increases in magnetic value.

6.5 There are numerous alignments of regularly spaced linear anomalies, which are considered likely to relate to agricultural activity. Those with a broad spacing and a reverse 'S' curve are considered to be indicative of earlier agricultural features, such as ridge and furrow, while those with a narrow spacing and straight form are likely to denote steam ploughing or modern ploughing. Linear anomalies with a very broad spacing and straight form are likely to be caused by land drains. Isolated linear anomalies and regularly spaced linear anomalies with very weak increases in magnetic strength are considered to be agricultural in origin, but their exact cause is unknown.

6.6 Numerous bipolar responses have been identified. Linear bipolar anomalies are likely to denote buried utilities. Isolated bipolar anomalies are generally of a modern nature and caused by material with a high magnetic susceptibility, such as ferrous objects. It should be noted that the strength and size of the anomaly associated with the buried utility reflect the highly magnetic responses of ferrous material rather than the actual dimensions of any buried pipe.

6.7 Dipolar anomalies often relate to ferrous or modern objects buried in the topsoil. Consequently, these anomalies are generally considered to be of a modern nature and have not been depicted on interpretation plots.

6.8 Concentrations of dipolar anomalies have been identified that are likely to be caused by modern magnetic debris in the topsoil or near the surface; concentrations of bipolar anomalies—predominately located along the edges of the survey area—relate to above-ground features external to the survey area, such as metal fencing, gates and electricity poles.

6.9 There are several broad responses that are considered likely to be caused by geological or pedological changes in the substrata. Many of these correspond with topographic changes and cropmarks identified on Google Earth.

Description and interpretation

Area N1 (Figs. 6, 7, 8 and 9)

6.10 A series of anomalies (**N1a**) forming three sides of a rectangle are visible in the north-east corner of Area N1 that correspond with a cropmark on aerial imagery. **N1a** is likely to be archaeological in nature and plausibly denotes an enclosure that is c.60m wide by 130m long. Several curvilinear and amorphous anomalies and trends have also been identified in the direct vicinity of **N1a**. Although tentative, those with clear increases and a good patterning have a higher potential to denote infilled features and so have been shown on the interpretation. It should be noted that bipolar anomalies caused by a buried modern utility (**N1c**) have obscured and possibly truncated the eastern ends of **N1a**.

6.11 Two field boundaries were identified that are on the 1885 OS map (**N1b**).

6.12 Numerous regimes of regularly spaced linear anomalies were identified across Area N1. Those with a broad spacing are likely to denote ridge and furrow. In the east and south-west of Area N1 ridge and furrow generally runs on an east-west alignment; in the west of the field, it runs on a north-south alignment. Linear anomalies with a narrow spacing are caused by modern ploughing and largely occur on an east-west alignment. Two regimes of broadly spaced linear anomalies with a straight form plausibly indicative of land drains were identified that run on a north-northeast to south-southwest alignment and north-west to south-east alignment.

6.13 The linear bipolar anomaly (**N1c**) in the east of Area N1 is caused by a buried utility. Five bipolar anomalies (**N1d**) running north-northwest to south-southeast were identified that correspond with the locations of metal pylons that support electricity cables. Two further large bipolar anomalies (**N1e**) were identified that are also considered to be modern and likely to be caused by ferrous objects in the topsoil.

6.14 Two parallel trends (**N1f**) with weak increases in magnetic value were identified running on a rough north-west to south-east orientation. Although the origin of **N1f** is tentative, they correspond with cropmarks present on Google Earth that appear to be of geological origin. Several other trends were identified across the survey area but lacked the necessary patterning and increases in magnetic value to be conclusively interpreted and so their origin is unknown.

Area N2 (Figs. 10, 11, 12 and 13)

6.15 Two roughly perpendicular linear anomalies (**N2a**) forming a possible corner were identified in the west of Area N2. They are likely be of an archaeological origin and denote infilled ditches. It is not certain if identified linear trends continuing to the north and west of the anomalies belong to the same activity. If so, it is likely that the linear anomalies and trends relate to a large enclosure that continues beyond the limits of the surveyed area.

6.16 Several trends occur in the direct vicinity of **N2a** that also plausibly relate to infilled features but lack the required increases in magnetic value or patterning to be conclusively interpreted as such. This makes it is equally possible that they are agricultural or geological in nature.

6.17 Two field boundaries were identified that are on the 1885 OS map (**N2b**). Several isolated linear anomalies were identified that are not present on historic maps but are also considered likely to denote field boundaries (**N2c**).

6.18 Regularly spaced linear anomalies were identified on an east-west alignment that are likely to be caused by both ridge and furrow and modern ploughing.

6.19 The area of magnetic disturbance (**N2d**) in the south of Area N2 corresponds with a former footpath or trackway first recorded on the 1885 OS map.

Area N3 (Figs. 14 and 15)

6.20 Several trends of an unknown origin were identified. Although they lack the necessary patterning and increases in magnetic value to be conclusively interpreted, it is likely they are either of a modern or agricultural origin.

6.21 Broadly spaced linear anomalies indicative of ridge and furrow were identified in Area N3 running on a south-west to north-east orientation.

6.22 The series of regular linear anomalies oriented west-southwest to east-northeast in the west of Area N3 are likely to be agricultural and plausibly denote land drains.

6.23 The linear bipolar anomaly (**N3a**) that bisects Area N3 denotes a buried utility. It is worth noting that **N3b** corresponds with the location of a field boundary recorded on the 1885 OS map.

6.24 Numerous isolated bipolar anomalies and areas of magnetic disturbance were identified that are likely caused by modern ferrous objects in the topsoil of Area N3.

Area N4 (Figs. 16, 17, 18 and 19)

6.25 A field boundary was identified that is on the 1885 OS map (**N4a**).

6.26 A bipolar anomaly and concentration of dipolar anomalies (**N4b**) correspond with the location of a pond recorded on the 1885 OS map.

6.27 Ridge and furrow occur on an east-west orientation. Modern ploughing and land drains appear on a north-south orientation. A second regime of land drains occurs in the north of Area N4 on a south-west to north-east orientation.

6.28 There is a high level of magnetic disturbance—comprising bipolar and dipolar anomalies—in the west of Area N4 that is caused by modern material with a high magnetic susceptibility in the topsoil and periphery of the site. Those with strong increases in magnetic value have been identified within the interpretation.

Area N5 (Figs. 20, 21, 22, 23, 24 and 25)

6.29 A linear anomaly (**N5a**) was identified in the north-west of Area N5 that is of an unknown origin. Given the high level of magnetic disturbance in the west of Area N5, it is plausible that this **N5a** is of a modern or agricultural origin.

6.30 Several trends of an unknown origin were identified in Area N5. Although they lack the necessary patterning and increases in magnetic value to be conclusively interpreted, it is likely they are either of a modern or agricultural origin.

6.31 Four field boundaries were identified that are on the 1885 OS map (**N5b**).

6.32 An area of magnetic disturbance (**N5c**) is located in the centre of Area N5 that is caused by buildings and trackways associated with the former Ingleby Wood Farm, which was first recorded on the 1885 OS map. **N5d** appears to represent a possible service leading towards the former farm.

6.33 Modern ploughing is visible on east-northeast to west-southwest and north-northeast to south-southwest orientations. Although tentative, it is possible that remnants of ridge and furrow survives on the same orientation as modern ploughing. Several orientations of field drains occur in the east of Area N5, and anomalies with weak increases in magnetic value were identified that are likely to denote agricultural activity, but it is not possible to ascertain their exact origin.

6.34 Several isolated bipolar anomalies were identified that indicate the presence of modern ferrous material. There is a high level of magnetic disturbance in the west of the field which is likely to be caused by material in the topsoil with a high magnetic susceptibility. The area of magnetic disturbance conforms with the former layout of field boundaries, and at the time of survey, the west of Area N5 contained a different crop (miscanthus) to the remainder of the field (wheat). This suggests the magnetic disturbance is plausibly caused by different agricultural land uses.

Area N6 (Figs. 26 and 27)

6.35 Several linear anomalies and trends (**N6a**) were identified in the east of Area N6 that are of an unknown origin. Although tentative, it is plausible that they relate to agricultural activity.

6.36 A field boundary was identified that is on the 1885 OS map (**N6b**). A second possible field boundary (**N6c**) was identified running perpendicular to **N6b,** but a tentative interpretation applies as it does not correspond with feature recorded on historic maps.

6.37 Ridge and furrow run east west and several regimes of land drains were identified.

6.38 Several bipolar anomalies were identified that are likely to be caused by modern ferrous objects.

Area N7 (Figs. 28 and 29)

6.39 A circular anomaly (**N7a**) was identified in the north of N7 that possibly denotes an infilled feature. Interpretation is tentative due to the weak increases in magnetic value that **N7a** is composed of.

6.40 Six field boundaries were identified that are on the 1885 OS map (**N7b**).

6.41 Several trends were identified that lacked the necessary patterning or increases in magnetic value to be conclusively interpreted. Although tentative, it is plausible that they are of an agricultural origin.

6.42 The magnetic disturbance (**N7c**) in the north of the field is caused by a post-medieval farmstead that is recorded on the 1885 OS map.

6.43 Ridge and furrow run east west and several regimes of land drains were identified.

6.44 Several bipolar anomalies were identified that are likely to be caused by modern ferrous objects.

Area N8 (Figs. 30, 31, 32, 33, 34 and 35)

6.45 A trend (**N8a**) was identified in the north of Area N8 that doesn't relate to features present on historic maps or aerial imagery and so a tentative interpretation applies. Given the patterning of the anomaly, it is plausible that it either denotes agricultural activity or pedological changes in the substrata, such as a field boundary or the infilling of a former watercourse.

6.46 Four field boundaries were identified that are on the 1885 OS map (**N8b**).

6.47 Ridge and furrow occur in the south of Area N8 on an east-west orientation. land drains appear in the west of Area N8 on a north-east to south-west orientation, and in the east of Area N8 they run north-west to south-east.

6.48 A linear area of broad anomalies (**N8c**) was identified in the south-west corner of Area N8 that is likely to denote geological or pedological changes in the substrata.

6.49 Several trends were identified that were composed of weak increases in magnetic value and so their origin is unknown.

6.50 A bipolar anomaly and concentration of dipolar anomalies (**N8d**) correspond with the location of ponds recorded on the 1885 OS map.

6.51 Several bipolar anomalies and areas of magnetic disturbance were identified that are caused by modern material in the topsoil and periphery of the site.

Area N9 (Figs. 30, 31, 32 and 33)

6.52 A single north-northwest to south-southeast oriented trend of uncertain origin was identified.

6.53 Land drains were identified running north-west to south-east.

6.54 Several bipolar anomalies were identified that are probably caused by modern material in the topsoil.

Area N10 (Figs. 36 and 37)

6.55 Several weak and diffuse trends were identified that are of an unknown origin. Although tentative it is plausible that they denote agricultural activity or geological or pedological changes in the substrata.

6.56 Land drains were identified running north-west to south-east.

6.57 A linear area of magnetic disturbance (**N10a**) was identified running diagonally north-west to south-east across the centre of the Area N10. Although tentative, it is plausible that **N10a** either denotes a land drain, buried utility or former trackway.

6.58 Several bipolar anomalies and areas of magnetic disturbance were identified that are caused by modern material in the topsoil and periphery of the site.

Area N11 (Figs. 24 and 25)

6.59 Several trends were identified that lack the necessary patterning and increases in magnetic value to be conclusively interpreted. Although very tentative, it is plausible that they are either of a modern or agricultural origin.

6.60 Two regimes of broadly spaced linear anomalies composed of weak increases in magnetic value were identified that are likely to be agricultural in nature and plausibly denote land drains. Weak linear anomalies were also identified on a north-south orientation that are of an unknown agricultural origin.

6.61 Isolated bipolar anomalies and areas of magnetic disturbance are of a modern nature and either related to objects with a high magnetic susceptibility in the topsoil or ferrous objects located on the periphery of the area.

Area N12 (Figs. 38 and 39)

6.62 Regularly spaced linear anomalies running both south-north and north-west to south-east were identified. Although they are likely to be agricultural, their weak increases in magnetic value and incomplete patterning has meant it is not possible to ascertain the type of agricultural practice(s) they relate to.

6.63 A number of isolated bipolar anomalies indicative of buried ferrous objects are found within Area N12.

6.64 A large area of magnetic disturbance (**N12a**) is present in the north of the field with a rough north-west to south-east orientation. Its curved profile, the broad form of anomalies and their continuation into the neighbouring field of N13 is suggestive that they are of a geological origin and denote a palaeochannel.

6.65 Areas of magnetic disturbance located at the field's edges are likely to be caused by modern objects in the topsoil and periphery of the site.

Area N13 (Figs. 40 and 41)

6.66 A linear anomaly (**N13a**) in the south of N13 corresponds with a former field boundary recorded on the 1885 OS map.

6.67 Several linear anomalies were identified on the same orientation as N13a that may represent land drains or possibly services. Two regimes of regularly spaced linear anomalies were identified as being of an unknown agricultural origin due to their weak increases in magnetic value.

6.68 The bipolar anomaly (**N13b**) in the north-west of Area N13 corresponds with the location of a former pond present on the 1885 OS map. Other isolated bipolar anomalies are likely linked to the presence of buried ferrous material.

6.69 The pattern of geological magnetic interference (**N12a**) identified in Area N12 continues into Area N13 (**N13c**) and is considered to be caused by a palaeochannel.

Area N14 (Figs. 42 and 43)

6.70 Two regimes of regularly spaced linear anomalies occur in Area N14. Those with a broad spacing running east-west are indicative of ridge and furrow, while those with weak increases in magnetic value running north-northwest to south-southeast are of an unknown agricultural origin.

6.71 The three interconnected linear bipolar anomalies (**N14a**) denote a buried utility. Isolated bipolar anomalies are likely to denote modern ferrous material in the topsoil.

6.72 An area of magnetic disturbance (**N14b**) is located along the eastern edge of Area N14 that corresponds to the location of a former pond.

6.73 Areas of magnetic disturbance identified along the field's edges are likely to relate to ferrous objects in the topsoil and periphery of the survey area.

Area N15 (Figs. 44 and 45)

6.74 Numerous rectilinear, linear and amorphous anomalies correspond with earthworks (**N15a**) present in the west of Area N15 that are associated with the deserted medieval village at Ingleby.

6.75 Several weak and diffuse trends (**N15b**) were identified that correspond with visible earthworks. Their interpretation is tentative, as it is uncertain if they denote infilled features associated with occupational deposits or relate to furlongs between different regimes of ridge and furrow.

6.76 In the south of Area N15, ridge and furrow are clearly visible running on an east-northeast to west-southwest orientation. Regularly spaced anomalies on the same alignment also occur in the north of Area N15 but are composed of weak increases in magnetic value. It is likely they also denote ridge and furrow but a tentative interpretative applies.

6.77 The bipolar anomaly in the north of Area N15 (N15c) is caused by an animal feeder. Areas of disturbance along the field boundaries of N15 are caused by ferrous debris in the topsoil and immediate hinterland of the area.

Area N16 (Figs. 46 and 47)

6.78 A rectangular concentration anomalies and trends (**N16a**) was identified in the south of Area N16 that corresponds with an earthwork visible on Google Earth aerial imagery. **N16a** is plausibly caused by a building platform that is potentially related to the medieval settlement located to the north of Area N16.

6.79 A second sub-rectangular concentration of anomalies (**N16b**) was identified in the west of Area N16, which also corresponds with cropmarks visible on Google Earth aerial imagery. The lack of uniformity and incomplete patterning renders the origin of N16 uncertain, and so a tentative interpretation applies. Given the proximity of **N16b** to the medieval village in the field to the north, an archaeological origin cannot be dismissed, and it is plausible that anomalies relate to a building platform. Conversely the poor patterning of **N16b** may instead be suggestive that anomalies are at least in part agricultural, modern, or geological in nature.

6.80 Several linear trends are extant at the northern edge of the field (**N16c**) that correspond with cropmarks visible on Google Earth. It is likely that **N16c** is either of a geological or archaeological origin, but weak increases in magnetic value makes interpretation very tentative. If **N16c** are geological, they are likely to be caused by natural erosion and deposition processes caused by the stream forming the northern boundary of Area N16. Alternatively, if archaeological, the trends are likely to either be caused by occupational activity associated with the medieval village located directly to the north of Area N16 or relate to medieval agricultural activity such as a headland.

6.81 A subcircular linear anomaly (**N16d**) was identified but composed of incomplete patterning and so its origin is unknown. Likewise, numerous trends were identified but lacked the necessary patterning or increases in magnetic value to be conclusively interpreted and so their origin is unknown.

6.82 Multiple phases of ridge and furrow agriculture occur in Area N16 and largely follow either a north-south or east-west orientation. Linear anomalies following a north-east to south-west orientation denote land drains.

6.83 Isolated bipolar anomalies and areas of magnetic disturbance were also identified that are likely indicative of modern ferrous material.

Area N17 (Figs. 46 and 47)

6.84 An area of magnetic disturbance (**N17a**) in the north of Area N17 has a similar form to the area of magnetic disturbance identified in Area N16 (**N16a**). Although tentative it is plausible that **N17a** is also archaeological in nature and belongs to the same phase of activity as **N16a**.

6.85 A cluster of linear and amorphous anomalies (**N17b**) is located in the south of Area N17. Their rectilinear form may be suggestive of archaeological features. However, a tentative interpretation applies as their fragmented patterning and weak increases in magnetic value does not preclude an alternative modern or agricultural origin.

6.86 Several phases of ridge and furrow were identified, largely following north-northeast to south-southwest and north-east to south-west orientations. Regularly spaced linear anomalies of an unknown agricultural origin were identified in the north of the area running on north-northeast to south-southwest and north-northwest to south-southeast orientations.

6.87 The bipolar linear anomaly (**N17c**) located in the east of Area N17 is of a modern origin and plausibly denotes a buried utility or land drain. Although tentative, it is plausible that the magnetic disturbance surrounding **N17c** is also of a modern nature and caused by objects with a high magnetic susceptibility in the topsoil.

Area N18 (Figs. 44 and 45)

6.88 Several linear anomalies and trends (**N18a**) were identified in the north of Area N18 that correspond with cropmarks visible on Google Earth satellite imagery and are on the same orientation as features considered to be of medieval origin. Although tentative due to incomplete patterning, it is plausible that **N18a** either relates to medieval settlement to the west or agricultural activity such as headlands or furlongs which divided the regimes of ridge and furrow.

6.89 Clear evidence of ridge and furrow activity occurs in Area N18 on north-west to south-east orientation.

6.90 Isolated bipolar anomalies and areas of magnetic disturbance relate to ferrous objects in the topsoil and periphery of the site.

Area N19 (Figs. 48 and 49)

6.91 Several trends of an unknown origin were identified. Although they lack the necessary patterning and increases in magnetic value to be conclusively interpreted, it is likely they are either of a modern or agricultural origin.

6.92 Evidence of ridge and furrow is present on a south-west to north-east orientation; modern ploughing occurs on a north-northwest to a south-southeast orientation. Several linear bipolar anomalies with a broad spacing and regular pattern were identified on a north-west to south-east orientation and are likely to indicate the presence of land drains.

Area N20 (Figs. 48 and 49)

6.93 Two field boundaries were identified that are on the 1885 OS map (**N20a**).

6.94 Several trends of an unknown origin were identified. Although they lack the necessary patterning and increases in magnetic value to be conclusively interpreted, it is likely they are either of a modern or agricultural origin.

6.95 Two possible regimes of ridge were identified within Area N20. The first appears on the same alignment as modern ploughing which runs on a north-northeast to south-southwest orientation, and the second runs east-northeast to west-southwest. Regularly spaced linear anomalies of an unknown agricultural origin were identified in the east of Area N20 running north-northeast to south-southwest.

6.96 An area of magnetic disturbance occurs in the east of Area 20 (**N20b**) that corresponds with the location of a pond recorded on the 1885 OS map.

6.97 The large bipolar anomaly (**N20c**) and nearby areas of magnetic disturbance are considered to mark the presence of modern ferrous objects.

Area N21 and N22 (Figs. 50 and 51)

6.98 Possible ridge and furrow occur on an east-northeast to west-southwest orientation in Area N22. Land drains appear on a north-northwest to south-southeast and east-northeast to west-southwest orientation.

6.99 Areas N21 and N22 both contain a high level of bipolar and dipolar anomalies that are caused by modern material with a high magnetic susceptibility in the topsoil and periphery of the site. Those with strong increases in magnetic value have been identified within the interpretation. The area of magnetic noise in the north of Area N21 is likely to be caused by farm buildings located to the north of the area.

Area N23 (Figs. 52 and 53)

6.100 A linear anomaly (N23a) is located in the south of area N23. It is plausible that N23a relates to an infilled feature, but it is not possible to ascertain its exact origin.

6.101 Several trends of an unknown origin were identified. Although they lack the necessary patterning and increases in magnetic value to be conclusively interpreted, it is likely they are either of a modern or agricultural origin.

6.102 Possible ridge and furrow occur on a north-northwest to south-southeast and east-northeast to west-southwest orientation. Modern ploughing runs on a north-northwest to south-southeast orientation and land drains are present running north-northeast to south-southwest and north-west to south-east.

6.103 Bipolar anomalies are likely to be caused by modern ferrous objects in the topsoil of the site.

Area N24 (Figs. 54 and 55)

6.104 Several weak and diffuse trends of an unknown origin were identified in Area N24.

6.105 A series of anomalies traverse Area N24 on an east-northeast to west-southwest orientation that bear the wide spacing and regularity of land drains. Traces of an unknown form of agriculture following a north-northwest to south-southeast orientation are also present.

6.106 Isolated bipolar anomalies and small areas of magnetic disturbance relate to modern material with a high magnetic susceptibility in the topsoil and periphery of the site.

Area N25 (Figs. 56 and 57)

6.107 Several trends of an unknown origin were identified in Area N25. Although they lack the necessary patterning and increases in magnetic value to be conclusively interpreted, it is likely they are either of a modern or agricultural origin.

6.108 Ridge and furrow are present in the north-east of Area N25 on an east-west orientation. The regularly spaced linear anomalies on a north-west to south-east orientation are likely relate to land drains.

6.109 The magnetic disturbance (**N25a**) running along the eastern edge of Area N25 is likely to be geological and is plausibly caused by a natural accumulation of sediments associated with the River Till to the east of the survey area.

6.110 Google Earth satellite imagery demonstrates that Area N25 comprised arable land until the beginning of the 21st century, when the area was transformed into wild grass land with several ponds. Several areas of magnetic disturbance (**N25b**) were identified in Area N25 that are likely to be of a modern origin. It should be noted that their regular spacing is suggestive that they relate to the same activity, and although very tentative, it could be postulated that they are caused by activity associated with the creation of the ponds in Area N25.

6.111 The bipolar linear anomaly (**N25c**) in the south-east of Area N25 is likely to be of a modern origin, but it is unclear if it relates to a buried utility or alternative modern ferrous object(s).

Area N26 (Figs. 58 and 59)

6.112 A long linear trend (**N26a**) of unknown origin crosses the west of Area N26 on a north-west to south-east orientation and appears to continue into the east of Area N27. Numerous other trends were also identified in Area N26 but lacked the necessary increases in magnetic value and patterning to be conclusively interpreted and so are of an unknown origin. Although very tentative, it is plausible that they denote agricultural activity.

6.113 Regularly spaced linear anomalies on an east-west alignment with a narrow spacing denote modern ploughing. Broadly spaced anomalies running on a north-south alignment are indicative of land drains.

6.114 A broad area of magnetic disturbance (**N26b**) is present along the eastern edge of the Area N26, some faint trending and dipoles are visible within this area which may relate to drainage and possible ponding. The River Till runs immediately to the east of Area N26, and the small parcel of woodland to the north-east of Area N26 is labelled on the 1885 OS map as being a marshy area until the 1907 OS map when it was planted with trees. It is likely that **N26b** is caused by geological or pedological changes in the substrata associated with either river deposits, marsh land or the erection of a woodland to the north-east of Area N26.

Area N27 (Figs. 60 and 61)

6.115 A linear trend (**N27a**)—orientated north-west to south-east—appears to be a continuation of **N26a** present in Area N26 to the north. The origin of **N26a** and **N27a** is unknown.

6.116 Regularly spaced linear anomalies on an east-west alignment with a narrow spacing denote modern ploughing; likewise, linear anomalies curving around the south-east edge of the Area N27 are also considered to be caused by modern ploughing. Broadly spaced anomalies running on a north-south alignment are indicative of land drains.

6.117 The area of broad magnetic anomalies (**N27b**) along the eastern edge of Area N27 is caused by geological or pedological changes in the substrata associated with the River Till.

Area N28 (Figs. 62 and 63)

6.118 Several trends of an unknown origin were identified in Area N28. Although they lack the necessary patterning and increases in magnetic value to be conclusively interpreted, it is likely they are either of a modern or agricultural origin.

6.119 Regularly spaced linear anomalies on a west-southwest to east-northeast alignment with a narrow spacing denote modern ploughing; those with a broad spacing are likely to denote ridge and furrow. Broadly spaced anomalies running on a north-northwest south-southeast alignment are indicative of land drains.

6.120 Several isolated bipolar anomalies (**N28a**) and areas of magnetic disturbance (**N28b**) were identified that relate to modern ferrous material.

Area N29 (Figs. 64, 65, 66 and 67)

6.121 Two field boundaries were identified that are on the 1885 OS map (**N29a**).

6.122 Several trends of an unknown origin were identified in Area N29. Although they lack the necessary patterning and increases in magnetic value to be conclusively interpreted, it is likely they are either of a modern or agricultural origin.

6.123 Possible ridge and furrow occur on an east-west orientation, while modern ploughing runs north-south. Two regimes of land drains have been identified, as well as several potential linear anomalies that are of an unknown agricultural origin.

6.124 The area of broad magnetic anomalies (**N29b**) in the south-east of Area N27 is caused by geological or pedological changes in the substrata associated with the River Till.

Area N30 (Figs. 68, 69, 70 and 71)

6.125 Three field boundaries were identified that are on the 1885 OS map (**N30a**).

6.126 One isolated linear anomaly (**N30b**) was identified that is not present on historic maps but is also potentially caused by a former field boundary.

6.127 A bipolar anomaly surrounded by magnetic disturbance (**N30c**) corresponds with the location of a former pond present on the 1885 OS map.

6.128 Several trends were identified that lacked the necessary patterning and increases in magnetic value to be conclusively interpreted, and so are of an unknown origin.

6.129 Two possible regimes of ridge and furrow were identified running north-northwest to south-southeast and west-southwest to east-northeast. Anomalies caused by land drains are prevalent in the west of Area N30 and run on four different orientations.

6.130 The centre of Area N30 contains a high level of magnetic disturbance caused by modern ferrous material.

Area N31 (Figs. 72, 73, 74 and 75)

6.131 A field boundary was identified that is on the 1885 OS map (N31a). Three isolated linear anomalies (N31b) were identified that are not present on historic maps but are also potentially caused by former field boundaries.

6.132 Several trends were identified that lacked the necessary patterning and increases in magnetic value to be conclusively interpreted, and so are of an unknown origin.

6.133 Modern ploughing runs on a north-northwest to south-southeast orientation. Regularly spaced linear anomalies with strong increases in magnetic value in the south of Area N31 are caused by land drains. Other regularly spaced anomalies were identified that are likely to be of an agricultural origin but lacked the necessary increases in magnetic value to be conclusively interpreted.

6.134 Area N31 contains a high level of bipolar anomalies and magnetic disturbance caused by modern material with a high magnetic susceptibility—such as ferrous objects—in the topsoil and periphery of the site.

Area N32 (Figs. 74 and 75)

6.135 Regularly spaced linear anomalies on an north-east to south-west alignment with a narrow spacing are indicative of land drains. Some magnetic disturbance is visible, mainly in the west and south of the Area.

7.0 CONCLUSIONS

7.1 NAA was commissioned to undertake a geophysical (gradiometer) survey on land proposed for the West Burton Solar Scheme, Lincolnshire.

7.2 The results of the geophysical survey have identified several concentrations of magnetic anomalies that are plausibly indicative of buried archaeological deposits. These include potential enclosures in Areas N1 and N2, possible medieval settlement activity in Areas N16, N17 and N18, and the remains of former post-medieval farmsteads in Areas N5 and N7.

7.3 Other anomalies, as well as trends, were identified across the PDA but were composed of weak increases in magnetic response or poor patterning. Consequently, their origin is unknown, and it is uncertain if they are of an archaeological origin or are related to agricultural or modern activity.

7.4 The results have also identified anomalies associated with agricultural activity (including former field boundaries, possible former trackways, ridge and furrow, modern ploughing and land drains), as well as several isolated bipolar anomalies, linear bipolar anomalies (indicative of buried utilities), and areas of modern disturbance.

7.5 Several areas of magnetic disturbance were identified as being of a geological origin including linear areas of broad anomalies, which were considered likely to denote palaeochannels.

8.0 STORAGE AND CURATION

8.1 The records of the geophysical survey are currently held by NAA. All material will be appropriately packaged for long-term storage in accordance with national guidelines (CIfA 2014; Schmidt *et al*. 2015). An online OASIS form will be completed on the results of the works within three months of the completion of the project. This will include submission of a pdf version of the final report to the Archaeology Data Service via the OASIS form.

REFERENCES

Aspinal, A., Gaffney., C. and Schmidt, A. (2008) *Magnetometry for Archaeologists*. Plymouth: Altamira Press.

Bartington Instruments (n.d.) *Grad601 Single Axis Magnetic Field Gradiometer system.* Oxford: Bartington Instruments.

British Geological Survey (2022) *Geology of Britain viewer*. [Online] Available at: [redacted](accessed on 06/03/2022).

Chartered Institute for Archaeologists (CIfA) (2014) *Standard and guidance for archaeological geophysical survey*. Reading: Chartered Institute for Archaeologists.

Gaffney, C. and Gater, J. (2003) *Revealing the Buried Past*. Stroud: Tempus Publishing.

Jarvis, R. A., Bendelow, V. C., Bradley, R. I., Carroll, D. M., Furness, R. R., Kilgour, I. N. L. and King, S. J. (1984) *Soils and their use in Northern England*. Soil Survey Bulletin No. 10. Harpenden: Rothamsted Experimental Station.

Lanpro (2022) *West Burton 2, West Burton Solar Farm, Lincolnshire*. Lanpro Unpublish report 2893H/02

Schmidt, A., Linford, P., Linford, N., David, A., Gaffney, C., Sarris, A. and Fassbinder, J. (2015) *EAC Guidelines for the Use of Geophysics in Archaeology.* EAC Guidelines 2. Belgium: Europae Archaeologiae Consilium.

Soil Survey of England and Wales (1983) *Soils of England and Wales 1:250 000 Map Sheet 4: Northern England*. Southampton: Ordnance Survey.

Online sources

National Library of Scotland [redacted]

Historic England National Heritage List for England

[redacted]

Old Maps [redacted]

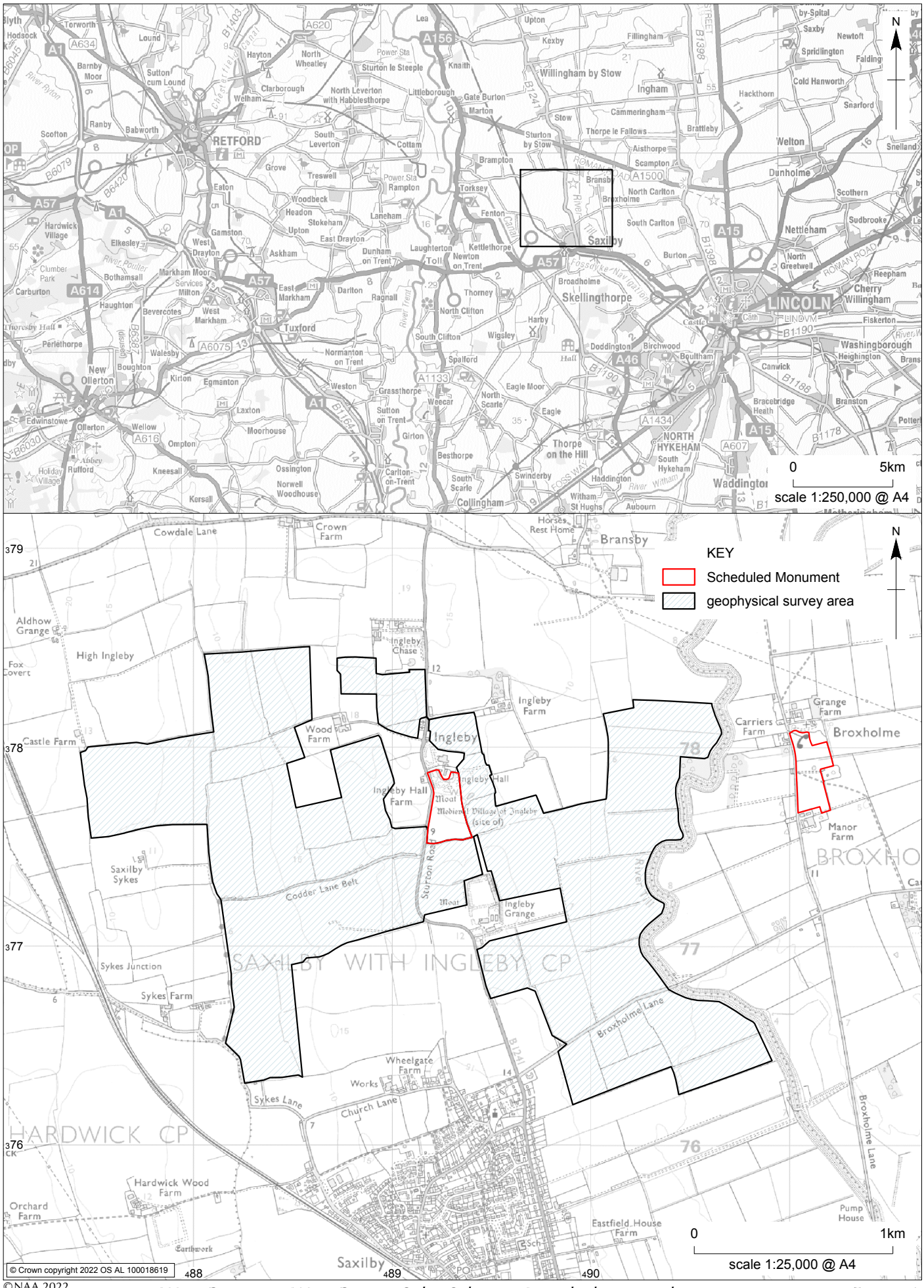
Google Earth [redacted]

Magic (DEFRA) http://magic.defra.gov.uk/MagicMap.aspx

NPPF Planning Practice Guidance https://www.gov.uk/government/collections/planning-practice-guidance

British Geological Survey GeoIndex [redacted]

Domesday Book [redacted]



West Burton 2, West Burton Solar Scheme, Lincolnshire: site location *Figure 1*

NAA
HERITAGE & ARCHAEOLOGY

Area N1
Area N2
Area N3
Area N4
Area N5
Area N6
Area N7
Area N8
Area N9
Area N10
Area N11
Area N12
Area N13
Area N14
Area N15
Area N16
Area N17
Area N18
Area N19
Area N20
Area N21
Area N22
Area N23
Area N24
Area N25
Area N26
Area N27
Area N28
Area N29
Area N30
Area N31
Area N32
gpA
gpB
gpC
gpD

KEY
Scheduled Monument
geophysical survey baseline
geophysical survey area
proposed development area
N
0
500 m
scale 1:10,000 @ A3

West Burton 2, West Burton Solar Scheme, Lincolnshire: location of geophysics survey areas

Figure 2

NAA
HERITAGE & ARCHAEOLOGY

N1
N2
N3
N4
N5
N6
N7
N8
N9
N10
N11
N12
N13
N14
N15
N16
N17
N18
N19
N20
N21
N22
N23
N24
N25
N26
N27
N28
N29
N30
N31
N32

5nT
-4nT

KEY
proposed development area

0 500 m
scale 1:10,000 @ A3

N

West Burton 2, West Burton Solar Scheme, Lincolnshire: unprocessed greyscale plots of gradiometer survey results

Figure 3

NAA
HERITAGE & ARCHAEOLOGY

N1 N2 N3 N4 N5 N6 N7 N8 N9 N10 N11 N12 N13 N14 N15 N16 N17 N18 N19 N20 N21 N22 N23 N24 N25 N26 N27 N28 N29 N30 N31 N32 N33

2nT
-1nT

KEY
proposed development area

N
0 500 m
scale 1:10,000 @ A3

West Burton 2, West Burton Solar Scheme, Lincolnshire: processed greyscale plots of gradiometer survey results

Figure 4

NAA
HERITAGE & ARCHAEOLOGY

KEY

- linear anomaly (archaeology) (greater / lesser)
- amorphous anomaly (unknown)
- field boundary
- field boundary?
- trends
- ridge and furrow
- agriculture (ploughing)
- land drains
- agriculture (unknown)
- bipolar anomaly (modern)
- magnetic disturbance (modern)
- magnetic disturbance (geological)
- edge of geophysical survey
- proposed development area

N

0 50 m

scale 1:1,500 @ A3

West Burton 2, West Burton Solar Scheme, Lincolnshire: interpretation of gradiometer survey results

Figure 5

NAA
HERITAGE & ARCHAEOLOGY

Pond

KEY
proposed development area
0 50 m
scale 1:1,500 @ A3
N

2nT
-1nT

West Burton 2, West Burton Solar Scheme, Lincolnshire: processed greyscale plots of gradiometer survey results - Area N1 west *Figure 6*

NAA
HERITAGE & ARCHAEOLOGY

Pond

N1d

N1f

N1d

N1d

N1b

N1d

N1e

N1d

N1

KEY

field boundary
trends
ridge and furrow
agriculture (ploughing)
land drains
agriculture (unknown)
bipolar anomaly (modern)
magnetic disturbance (modern)
edge of geophysical survey
proposed development area

N

0 500 m

scale 1:10,000 @ A3

West Burton 2, West Burton Solar Scheme, Lincolnshire: interpretation of gradiometer survey results - Area N1 west

Figure 7

NAA
HERITAGE & ARCHAEOLOGY

KEY
proposed development area
0 50 m
scale 1:1,500 @ A3
N
2nT
-1nT

West Burton 2, West Burton Solar Scheme, Lincolnshire: processed greyscale plots of gradiometer survey results - Area N1 east *Figure 8*

NAA
HERITAGE & ARCHAEOLOGY

N1f
N1a
N1c
N1b
N1e
N1

KEY

linear anomaly (archaeology) (greater / lesser)
amorphous anomaly (unknown)
field boundary
trends
ridge and furrow
agriculture (ploughing)
land drains
agriculture (unknown)
bipolar anomaly (modern)
magnetic disturbance (modern)
edge of geophysical survey
proposed development area

N

0 50 m
scale 1:1,500 @ A3

West Burton 2, West Burton Solar Scheme, Lincolnshire: interpretation of gradiometer survey results - Area N1 east *Figure 9*

NAA
HERITAGE & ARCHAEOLOGY

KEY

proposed development area

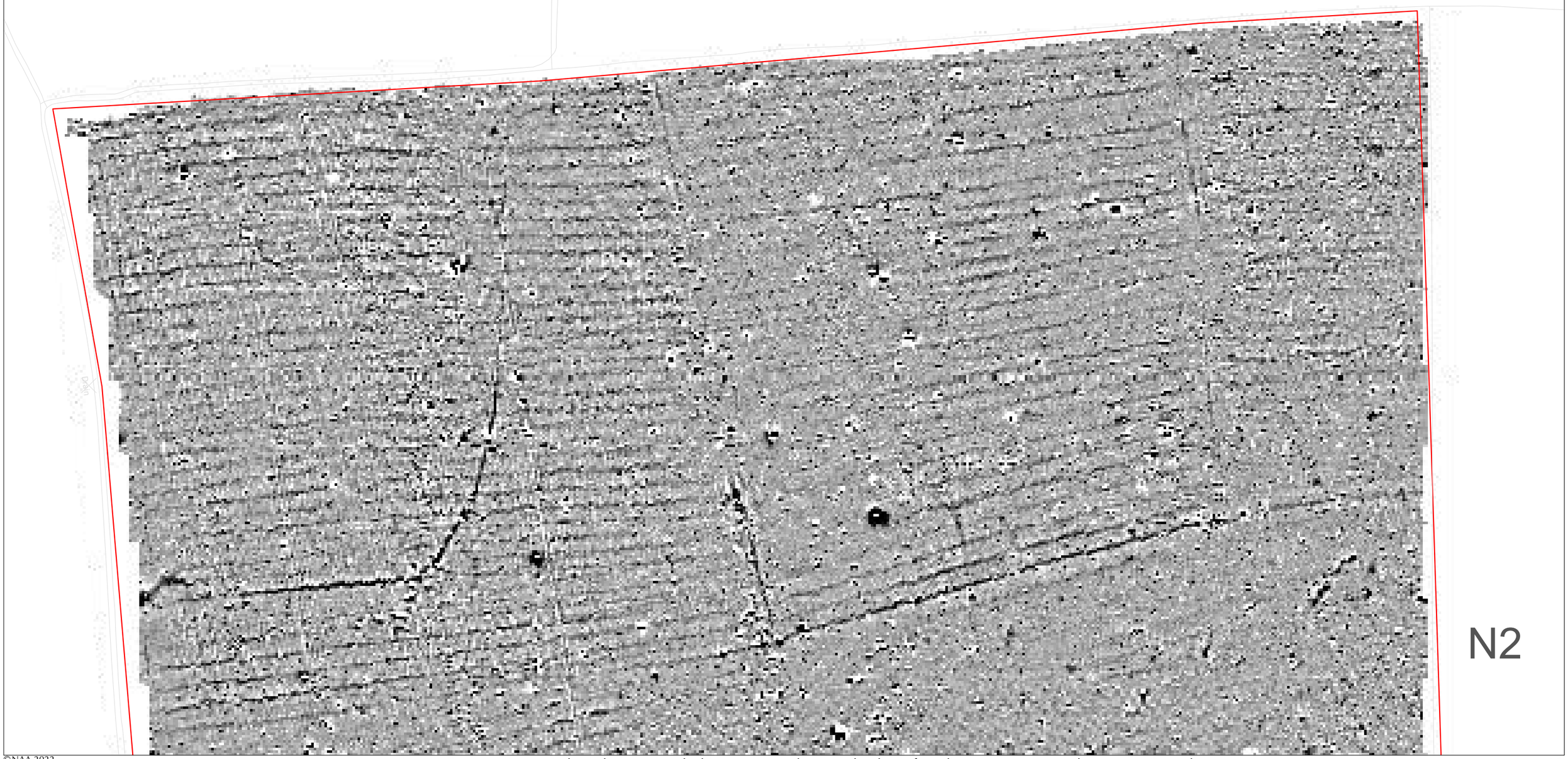
0 50 m

scale 1:1,500 @ A3

N

2nT

-1nT



N2

West Burton 2, West Burton Solar Scheme, Lincolnshire: processed greyscale plots of gradiometer survey results - Area N2 north

Figure 10

NAA
HERITAGE & ARCHAEOLOGY

KEY

- linear anomaly (archaeology) (greater / lesser)
- amorphous anomaly (unknown)
- field boundary
- field boundary?
- trends
- ridge and furrow
- agriculture (ploughing)
- bipolar anomaly (modern)
- magnetic disturbance (modern)
- edge of geophysical survey
- proposed development area

N

0 50 m

scale 1:1,500 @ A3

N2a
N2b
N2c
N2c
N2c
N2
Ditch

West Burton 2, West Burton Solar Scheme, Lincolnshire: interpretation of gradiometer survey results - Area N2 north

Figure 11

NAA
HERITAGE & ARCHAEOLOGY

N2

N3

KEY
proposed development area

0 50 m
scale 1:1,500 @ A3

N

2nT
-1nT

West Burton 2, West Burton Solar Scheme, Lincolnshire: processed greyscale plots of gradiometer survey results - Area N2 south

Figure 12

NAA
HERITAGE & ARCHAEOLOGY

N2a
N2c
N2b
N2c
N2
N2d
N3a

KEY

linear anomaly (archaeology) (greater / lesser)
field boundary
field boundary?
trends
ridge and furrow
agriculture (ploughing)
bipolar anomaly (modern)
magnetic disturbance (modern)
edge of geophysical survey
proposed development area

N

0 50 m
scale 1:1,500 @ A3

West Burton 2, West Burton Solar Scheme, Lincolnshire: interpretation of gradiometer survey results - Area N2 south

Figure 13

NAA
HERITAGE & ARCHAEOLOGY

N3

KEY
proposed development area
0 50 m
scale 1:1,500 @ A3
N

2nT
-1nT

West Burton 2, West Burton Solar Scheme, Lincolnshire: processed greyscale plots of gradiometer survey results - Area N3

Figure 14

NAA
HERITAGE & ARCHAEOLOGY

N2d

N3

N3a

N8a

KEY

trends

ridge and furrow

agriculture (unknown)

bipolar anomaly (modern)

magnetic disturbance (modern)

edge of geophysical survey

proposed development area

N

0 50 m

scale 1:1,500 @ A3

West Burton 2, West Burton Solar Scheme, Lincolnshire: interpretation of gradiometer survey results - Area N3

Figure 15

NAA
HERITAGE & ARCHAEOLOGY

KEY

proposed development area

0 50 m

scale 1:1,500 @ A3

N

2nT

-1nT

N4

West Burton 2, West Burton Solar Scheme, Lincolnshire: processed greyscale plots of gradiometer survey results - Area N4 north *Figure 16*

NAA
HERITAGE & ARCHAEOLOGY

KEY

- field boundary
- trends
- ridge and furrow
- agriculture (ploughing)
- land drains
- bipolar anomaly (modern)
- magnetic disturbance (modern)
- edge of geophysical survey
- proposed development area

N

0 50 m

scale 1:1,500 @ A3

N1e

N4b

N4a

N4

West Burton 2, West Burton Solar Scheme, Lincolnshire: interpretation of gradiometer survey results - Area N4 north

Figure 17

NAA
HERITAGE & ARCHAEOLOGY

KEY

proposed development area

0 50 m

scale 1:1,500 @ A3

N

2nT

-1nT

West Burton 2, West Burton Solar Scheme, Lincolnshire: processed greyscale plots of gradiometer survey results - Area N4 south *Figure 18*

NAA
HERITAGE & ARCHAEOLOGY

KEY

field boundary
trends
ridge and furrow
agriculture (ploughing)
land drains
bipolar anomaly (modern)
magnetic disturbance (modern)
edge of geophysical survey
proposed development area

N

0 50 m

scale 1:1,500 @ A3

N1e

N4b

N4a

N4

West Burton 2, West Burton Solar Scheme, Lincolnshire: interpretation of gradiometer survey results - Area N4 south

Figure 19

NAA
HERITAGE & ARCHAEOLOGY

KEY
proposed development area
0
50 m
scale 1:1,500 @ A3
N
2nT
-1nT

West Burton 2, West Burton Solar Scheme, Lincolnshire: processed greyscale plots of gradiometer survey results - Area N5 west

Figure 20

NAA
HERITAGE & ARCHAEOLOGY

N5a
N5b
N5b
N5c
Track
Drain
Drain

KEY
linear anomaly (archaeology) (greater / lesser)
field boundary
trends
ridge and furrow
agriculture (ploughing)
agriculture (unknown)
bipolar anomaly (modern)
magnetic disturbance (modern)
edge of geophysical survey
proposed development area
N
0
50 m
scale 1:1,500 @ A3

West Burton 2, West Burton Solar Scheme, Lincolnshire: interpretation of gradiometer survey results - Area N5 west

Figure 21

NAA
HERITAGE & ARCHAEOLOGY

Codder Lane Belt

Drain

N5

KEY
proposed development area

0 50 m
scale 1:1,500 @ A3

N

2nT
-1nT

West Burton 2, West Burton Solar Scheme, Lincolnshire: processed greyscale plots of gradiometer survey results - Area N5 central

Figure 22

NAA
HERITAGE & ARCHAEOLOGY

Codder Lane Belt

N5b

N5b

N5b

N5c

N5d

N5

Drain

KEY

field boundary
trends
ridge and furrow
agriculture (ploughing)
land drains
agriculture (unknown)
bipolar anomaly (modern)
magnetic disturbance (modern)
edge of geophysical survey
proposed development area

N

0 50 m

scale 1:1,500 @ A3

West Burton 2, West Burton Solar Scheme, Lincolnshire: interpretation of gradiometer survey results - Area N5 central

Figure 23

NAA
HERITAGE & ARCHAEOLOGY

N8

Drain

STURTON ROAD

N11

KEY
proposed development area
0 50 m
scale 1:1,500 @ A3
N

2nT
-1nT

West Burton 2, West Burton Solar Scheme, Lincolnshire: processed greyscale plots of gradiometer survey results - Area N5 east and Area N11

Figure 24

NAA
HERITAGE & ARCHAEOLOGY

KEY
- field boundary
- trends
- ridge and furrow
- agriculture (ploughing)
- land drains
- agriculture (unknown)
- bipolar anomaly (modern)
- magnetic disturbance (modern)
- edge of geophysical survey
- proposed development area

N

0 50 m

scale 1:1,500 @ A3

N8

N5b

N5b

N5d

N17c

N11

West Burton 2, West Burton Solar Scheme, Lincolnshire: interpretation of gradiometer survey results - Area N5 east and Area N11

Figure 25

NAA
HERITAGE & ARCHAEOLOGY

KEY

proposed development area

0 50 m

scale 1:1,500 @ A3

N

2nT

-1nT

Drain

N6

West Burton 2, West Burton Solar Scheme, Lincolnshire: processed greyscale plots of gradiometer survey results - Area N6 *Figure 26*

NAA
HERITAGE & ARCHAEOLOGY

KEY

- linear anomaly (archaeology) (greater / lesser)
- field boundary
- field boundary?
- trends
- ridge and furrow
- agriculture (ploughing)
- land drains
- bipolar anomaly (modern)
- magnetic disturbance (modern)
- edge of geophysical survey
- proposed development area

N

0 50 m

scale 1:1,500 @ A3

N6

N6a

N6b

N6c

N7a

N7b

N7b

N7b

N7b

N7c

Drain

Drain

Drain

West Burton 2, West Burton Solar Scheme, Lincolnshire: interpretation of gradiometer survey results - Area N6

Figure 27

NAA
HERITAGE & ARCHAEOLOGY

KEY
proposed development area
0 50 m
scale 1:1,500 @ A3
N

2nT
-1nT

N6

N7

Drain
Drain
SYKES LANE
Pond

West Burton 2, West Burton Solar Scheme, Lincolnshire: processed greyscale plots of gradiometer survey results - Area N7 *Figure 28*

NAA
HERITAGE & ARCHAEOLOGY

KEY

linear anomaly (archaeology) (greater / lesser)
field boundary
field boundary?
trends
land drains
bipolar anomaly (modern)
magnetic disturbance (modern)
edge of geophysical survey
proposed development area

N

0 50 m

scale 1:1,500 @ A3

N6

N6c

N6a

Drain

N7c

N7a

N7b

N7b

N7b

N7b

N7b

N7

Drain

SYKES LANE

Pond

West Burton 2, West Burton Solar Scheme, Lincolnshire: interpretation of gradiometer survey results - Area N7

Figure 29

NAA
HERITAGE & ARCHAEOLOGY

KEY

proposed development area

0 50 m

scale 1:1,500 @ A3

N

2nT

-1nT

N8

N9

West Burton 2, West Burton Solar Scheme, Lincolnshire: processed greyscale plots of gradiometer survey results - Area N8 north

Figure 30

NAA
HERITAGE & ARCHAEOLOGY

KEY

- field boundary
- trends
- land drains
- agriculture (unknown)
- bipolar anomaly (modern)
- magnetic disturbance (modern)
- edge of geophysical survey
- proposed development area

N

0 50 m

scale 1:1,500 @ A3

N8a

N8

N9

N4b

N8b

I4a

West Burton 2, West Burton Solar Scheme, Lincolnshire: interpretation of gradiometer survey results - Area N8 north and N9 north

Figure 31

NAA
HERITAGE & ARCHAEOLOGY

N8

Codder Lane Belt

KEY
proposed development area
0 50 m
scale 1:1,500 @ A3
N

2nT
-1nT

West Burton 2, West Burton Solar Scheme, Lincolnshire: processed greyscale plots of gradiometer survey results - Area N8 south and Area N9 south

Figure 32

NAA
HERITAGE & ARCHAEOLOGY

N8b
N8c
N8b
N8
Codder Lane Belt

KEY
field boundary
trends
ridge and furrow
land drains
bipolar anomaly (modern)
magnetic disturbance (modern)
magnetic disturbance (geological)
edge of geophysical survey
proposed development area
N
0 50 m
scale 1:1,500 @ A3

West Burton 2, West Burton Solar Scheme, Lincolnshire: interpretation of gradiometer survey results - Area N8 south and Area N9 south

Figure 33

NAA
HERITAGE & ARCHAEOLOGY

N8

Drain

Drain

Drain

STURTON ROAD

KEY

proposed development area

N

0 50 m

scale 1:1,500 @ A3

2nT

-1nT

West Burton 2, West Burton Solar Scheme, Lincolnshire: processed greyscale of gradiometer survey results - Area N8

Figure 34

NAA
HERITAGE & ARCHAEOLOGY

N8b

N8d

N8d

N8b

N8

Drain

Drain

Drain

Drain

STURTON ROAD

KEY

field boundary
trends
ridge and furrow
land drains
bipolar anomaly (modern)
magnetic disturbance (modern)
edge of geophysical survey
proposed development area

N

0 50 m

scale 1:1,500 @ A3

West Burton 2, West Burton Solar Scheme, Lincolnshire: interpretation of gradiometer survey results - Area N8

Figure 35

NAA
HERITAGE & ARCHAEOLOGY

KEY

proposed development area

0 50 m

scale 1:1,500 @ A3

N

2nT

-1nT

N10

Path (um)

Drain

Drain

Ingleby

West Burton 2, West Burton Solar Scheme, Lincolnshire: processed greyscale plots of gradiometer survey results - Area N10 *Figure 36*

NAA
HERITAGE & ARCHAEOLOGY

KEY
trends
land drains
bipolar anomaly (modern)
magnetic disturbance (modern)
edge of geophysical survey
proposed development area

N

0 50 m
scale 1:1,500 @ A3

N10

N10a

N8b

Path (un)

Drain

West Burton 2, West Burton Solar Scheme, Lincolnshire: interpretation of gradiometer survey results - Area N10

Figure 37

NAA
HERITAGE & ARCHAEOLOGY

N12

N2

N13

Pond

12.1m

Ingleby

Cattle Grid

2nT

-1nT

KEY

proposed development area

0 50 m

scale 1:1,500 @ A3

N

West Burton 2, West Burton Solar Scheme, Lincolnshire: processed greyscale plots of gradiometer survey results - Area N12

Figure 38

NAA
HERITAGE & ARCHAEOLOGY

N12

N12a

N2

N13

N13a

N13b

N13c

Ingleby

Pond

12.1m

Cattle Grid

New Cottages

Rose Cottage

Tanks

KEY

agriculture (unknown)

bipolar anomaly (modern)

magnetic disturbance (modern)

magnetic disturbance (geological)

edge of geophysical survey

proposed development area

N

0 50 m

scale 1:1,500 @ A3

West Burton 2, West Burton Solar Scheme, Lincolnshire: interpretation of gradiometer survey results - Area N12

Figure 39

NAA
HERITAGE & ARCHAEOLOGY

N13

Ingleby

Willow Cottage

Crown Cottage

Cattle Grid

Ingleby Hall Farm

2nT

-1nT

KEY

proposed development area

0 50 m

scale 1:1,500 @ A3

N

West Burton 2, West Burton Solar Scheme, Lincolnshire: processed greyscale plots of gradiometer survey results - Area N13

Figure 40

NAA
HERITAGE & ARCHAEOLOGY

N12a

N13

N13a

N13b

N13c

Ingleby

Cattle Grid

New Cottages

Rose Cottage

White Cottages

Crown Cottage

Willow Cottage

12.1m

LB

N14a

KEY

- field boundary
- trends
- ridge and furrow
- land drains
- agriculture (unknown)
- bipolar anomaly (modern)
- magnetic disturbance (modern)
- magnetic disturbance (geological)
- edge of geophysical survey
- proposed development area

N

0 50 m

scale 1:1,500 @ A3

West Burton 2, West Burton Solar Scheme, Lincolnshire: interpretation of gradiometer survey results - Area N13

Figure 41

NAA
HERITAGE & ARCHAEOLOGY

N14

N15

Ingleby Farm
The Courtyard
Willow Cottage
Crown Cottage
Moat
13.6m
Ingleby Hall Stables
Ingleby Hall Barns
Pond
Drain

2nT
-1nT

KEY
proposed development area

0 50 m
scale 1:1,500 @ A3

N

West Burton 2, West Burton Solar Scheme, Lincolnshire: processed greyscale plots of gradiometer survey results - Area N14

Figure 42

NAA
HERITAGE & ARCHAEOLOGY

N14

N14b

N14a

N15c

N15b

N15a

N15

Ingleby Farm

The Courtyard

Crown Cottage

Willow Cottage

New Cottages

Rose Cottage

White Cottages

Moat

Ingleby Hall Stables

Ingleby Hall Barns

Pond

13.6m

Drain

KEY

- linear anomaly (archaeology) (greater / lesser)
- amorphous anomaly (unknown)
- field boundary
- trends
- ridge and furrow
- land drains
- agriculture (unknown)
- bipolar anomaly (modern)
- magnetic disturbance (modern)
- magnetic disturbance (geological)
- edge of geophysical survey
- proposed development area

N

0 50 m

scale 1:1,500 @ A3

West Burton 2, West Burton Solar Scheme, Lincolnshire: interpretation of gradiometer survey results - Area N14

Figure 43

NAA
HERITAGE & ARCHAEOLOGY

KEY
proposed development area
0 50 m
scale 1:1,500 @ A3
N

2nT
-1nT

N14
N15
N18
N

Ingleby Hall Barns
Pond
Gables Manor
Well
Moat
Medieval Village of Ingleby
Pond
Drain
Ingleby

West Burton 2, West Burton Solar Scheme, Lincolnshire: processed greyscale plots of gradiometer survey results - Area N15 and N18 *Figure 44*

NAA
HERITAGE & ARCHAEOLOGY

N14

N15c

N15b

N15a

N15

N15b

N15a

N15b

N18

N

N18a

N16c

Ingleby

Ingleby Hall Barns

Pond

Gables Manor

Well

Moat

Medieval Village of Ingleby

Pond

Drain

Drain

KEY

- linear anomaly (archaeology) (greater / lesser)
- amorphous anomaly (unknown)
- field boundary
- trends
- ridge and furrow
- agriculture (ploughing)
- land drains
- agriculture (unknown)
- bipolar anomaly (modern)
- magnetic disturbance (modern)
- edge of geophysical survey
- proposed development area

N

0 50 m

scale 1:1,500 @ A3

West Burton 2, West Burton Solar Scheme, Lincolnshire: interpretation of gradiometer survey results - Area N15 and N18

Figure 45

NAA
HERITAGE & ARCHAEOLOGY

KEY

proposed development area

0 50 m

scale 1:1,500 @ A3

N

2nT

-1nT

N16

N17

N11

STURTON ROAD

Drain

Pond

Moat

Ingleby Grange

Track

West Burton 2, West Burton Solar Scheme, Lincolnshire: processed greyscale plots of gradiometer survey results - Area N16 and N17 *Figure 46*

NAA
HERITAGE & ARCHAEOLOGY

KEY

- linear anomaly (archaeology) (greater / lesser)
- amorphous anomaly (unknown)
- field boundary
- field boundary?
- trends
- ridge and furrow
- land drains
- agriculture (unknown)
- bipolar anomaly (modern)
- magnetic disturbance (modern)
- edge of geophysical survey
- proposed development area

N

0 50 m

scale 1:1,500 @ A3

N8d
N16c
N16b
N16
N16d
N16a
N17a
N17c
N17b
N17
N11

West Burton 2, West Burton Solar Scheme, Lincolnshire: interpretation of gradiometer survey results - Area N16 and N17

Figure 47

NAA
HERITAGE & ARCHAEOLOGY

KEY

proposed development area

0 50 m

scale 1:1,500 @ A3

N

2nT

-1nT

N18

N19

N20

Drain

Drain

Drain

West Burton 2, West Burton Solar Scheme, Lincolnshire: processed greyscale plots of gradiometer survey results - Area N19 and N20 *Figure 48*

NAA
HERITAGE & ARCHAEOLOGY

N19

N20b

N20a

N20a

N20c

N20

Drain

Drain

Track

KEY

- field boundary
- trends
- ridge and furrow
- agriculture (ploughing)
- land drains
- agriculture (unknown)
- bipolar anomaly (modern)
- magnetic disturbance (modern)
- edge of geophysical survey
- proposed development area

N

0 50 m

scale 1:1,500 @ A3

West Burton 2, West Burton Solar Scheme, Lincolnshire: interpretation of gradiometer survey results - Area N19 and N20

Figure 49

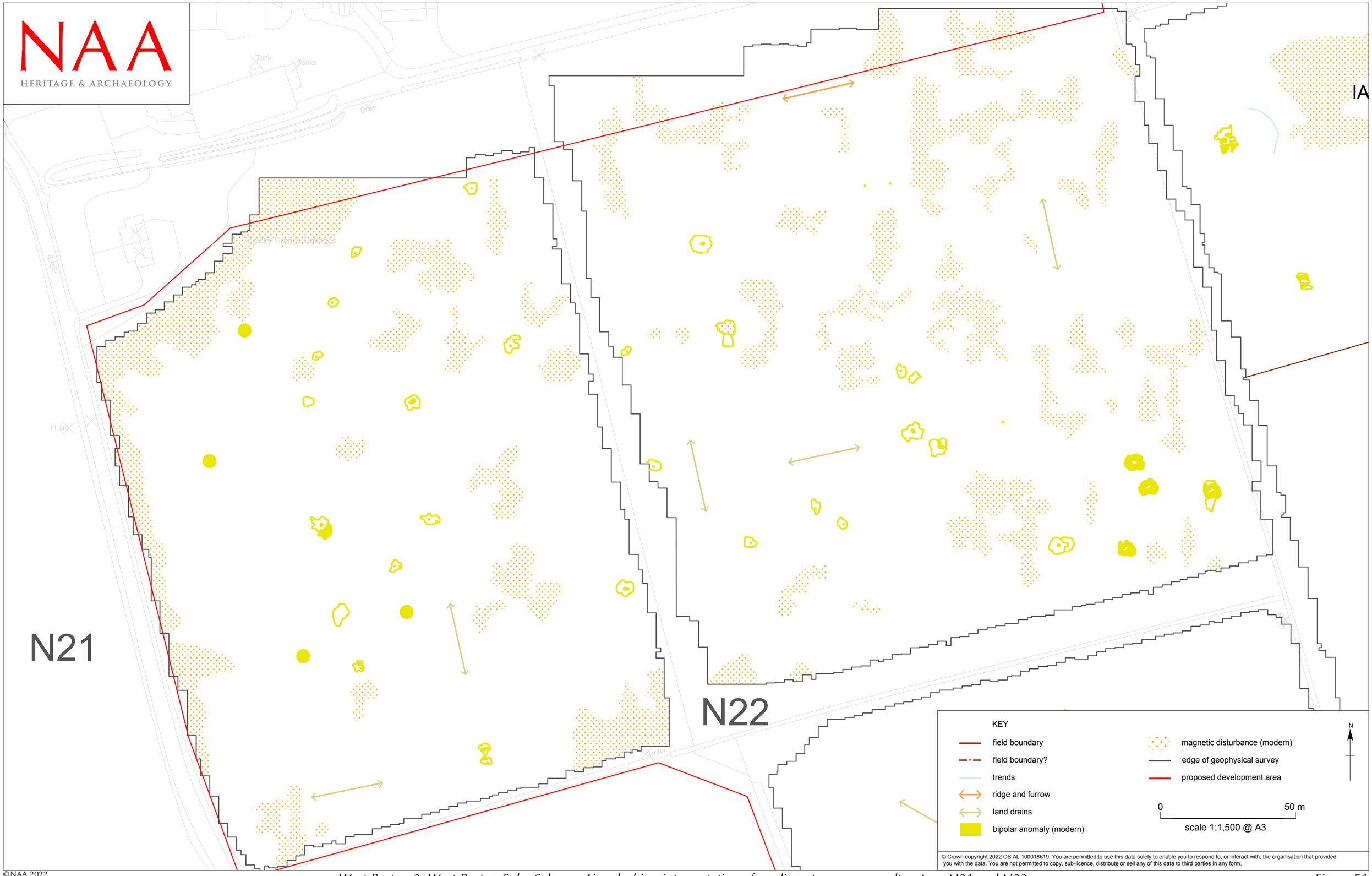
NAA
HERITAGE & ARCHAEOLOGY

Tank
Tanks
drain
Ridge Cottages
B1191
11.9m
N21
N22
drain
KEY
proposed development area
0
50 m
scale 1:1,500 @ A3
N
2nT
-1nT

West Burton 2, West Burton Solar Scheme, Lincolnshire: processed greyscale plots of gradiometer survey results - Area N21 and N22

Figure 50

NAA
HERITAGE & ARCHAEOLOGY



West Burton 2, West Burton Solar Scheme, Lincolnshire: interpretation of gradiometer survey results - Area N21 and N22

Figure 51

NAA
HERITAGE & ARCHAEOLOGY

N22

N23

2nT
-1nT

KEY
proposed development area

0 50 m
scale 1:1,500 @ A3

N

West Burton 2, West Burton Solar Scheme, Lincolnshire: processed greyscale plots of gradiometer survey results - Area N23

Figure 52

NAA
HERITAGE & ARCHAEOLOGY

N22

N23

N23a

Drain

BROXHOLME LANE

Drain

April Cottage

KEY

linear anomaly (archaeology) (greater / lesser)
field boundary
field boundary?
trends
ridge and furrow
agriculture (ploughing)
land drains
agriculture (unknown)
bipolar anomaly (modern)
magnetic disturbance (modern)
edge of geophysical survey
proposed development area

N

0 50 m

scale 1:1,500 @ A3

West Burton 2, West Burton Solar Scheme, Lincolnshire: interpretation of gradiometer survey results - Area N23

Figure 53

NAA
HERITAGE & ARCHAEOLOGY

N24

Drain

2nT
-1nT

KEY
proposed development area

0 50 m
scale 1:1,500 @ A3

N

West Burton 2, West Burton Solar Scheme, Lincolnshire: processed greyscale plots of gradiometer survey results - Area N24

Figure 54

NAA
HERITAGE & ARCHAEOLOGY

N24

N20b

Drain

KEY

- trends
- ridge and furrow
- agriculture (ploughing)
- land drains
- agriculture (unknown)
- bipolar anomaly (modern)
- magnetic disturbance (modern)
- edge of geophysical survey
- proposed development area

N

0 50 m

scale 1:1,500 @ A3

West Burton 2, West Burton Solar Scheme, Lincolnshire: interpretation of gradiometer survey results - Area N24

Figure 55

NAA
HERITAGE & ARCHAEOLOGY

KEY

proposed development area

0 50 m

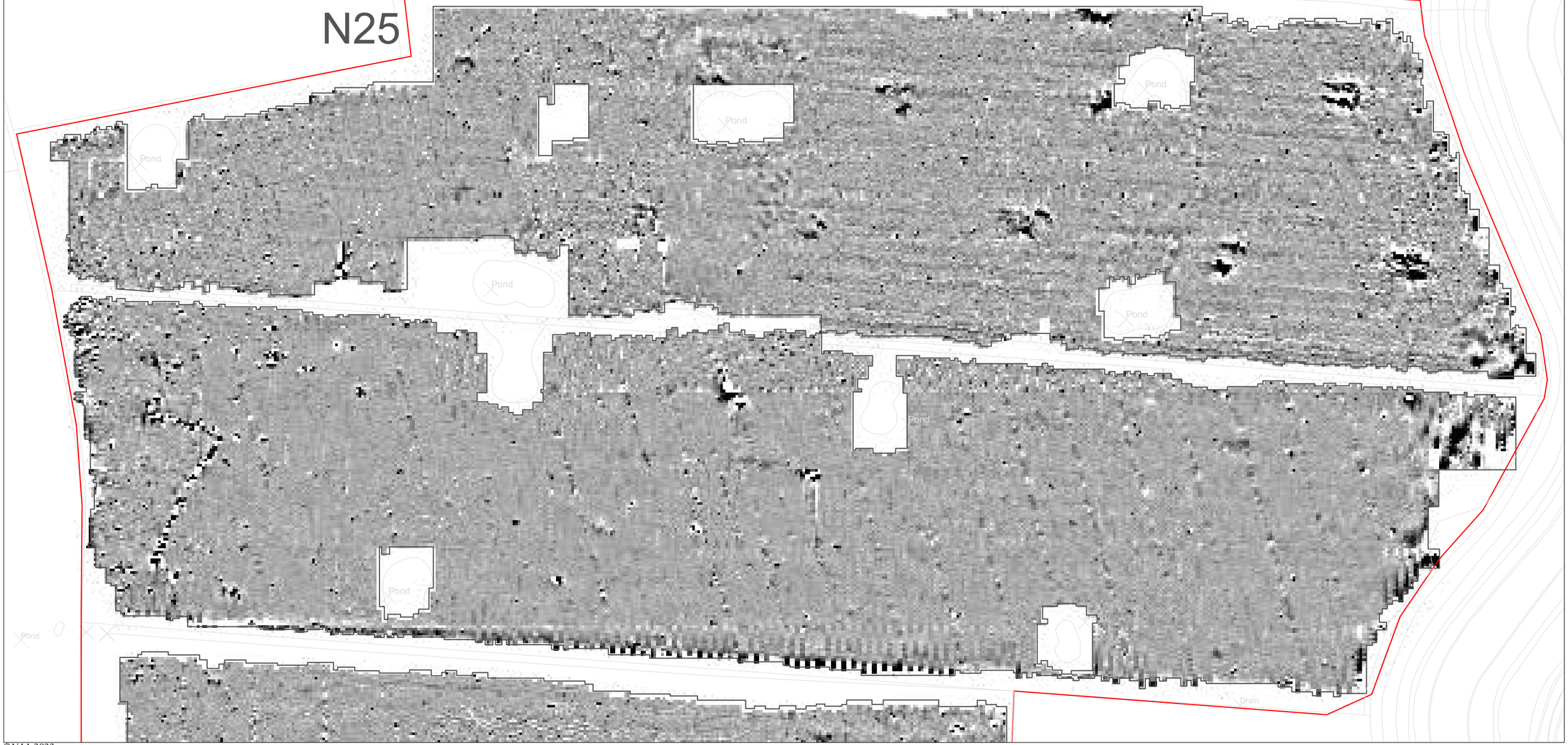
scale 1:1,500 @ A3

N

2nT

-1nT

N25



West Burton 2, West Burton Solar Scheme, Lincolnshire: processed greyscale plots of gradiometer survey results - Area N25

Figure 56

NAA
HERITAGE & ARCHAEOLOGY

KEY

trends
ridge and furrow
land drains
magnetic disturbance (modern)
magnetic disturbance (geological)
edge of geophysical survey
proposed development area

N

0 50 m

scale 1:1,500 @ A3

N25

N25a

N25b

N25c

Pond

Drain

West Burton 2, West Burton Solar Scheme, Lincolnshire: interpretation of gradiometer survey results - Area N25

Figure 57

NAA
HERITAGE & ARCHAEOLOGY

N26

Pond
Pond
Drain
Drain
Drain

KEY
proposed development area
0
50 m
scale 1:1,500 @ A3
N

2nT
-1nT

West Burton 2, West Burton Solar Scheme, Lincolnshire: processed greyscale plots of gradiometer survey results - Area N26

Figure 58

NAA
HERITAGE & ARCHAEOLOGY

N25c

N26

N26a

N26b

Pond

Pond

Pond

Drain

Drain

KEY

trends

agriculture (ploughing)

land drains

agriculture (unknown)

bipolar anomaly (modern)

magnetic disturbance (modern)

magnetic disturbance (geological)

edge of geophysical survey

proposed development area

N

0 50 m

scale 1:1,500 @ A3

West Burton 2, West Burton Solar Scheme, Lincolnshire: interpretation of gradiometer survey results - Area N26

Figure 59

NAA
HERITAGE & ARCHAEOLOGY

N27

Drain

KEY
proposed development area
0 50 m
scale 1:1,500 @ A3

N

2nT
-1nT

West Burton 2, West Burton Solar Scheme, Lincolnshire: processed greyscale plots of gradiometer survey results - Area N27

Figure 60

N26a

N27a

N27

N27b

N27a

Drain

KEY

trends

agriculture (ploughing)

land drains

agriculture (unknown)

bipolar anomaly (modern)

magnetic disturbance (modern)

magnetic disturbance (geological)

edge of geophysical survey

proposed development area

N

0 50 m

scale 1:1,500 @ A3

West Burton 2, West Burton Solar Scheme, Lincolnshire: interpretation of gradiometer survey results - Area N27

Figure 61

NAA
HERITAGE & ARCHAEOLOGY

20

N28

2nT
-1nT

KEY
proposed development area

0 50 m
scale 1:1,500 @ A3

N

West Burton 2, West Burton Solar Scheme, Lincolnshire: processed greyscale plots of gradiometer survey results - Area N28

Figure 62

NAA
HERITAGE & ARCHAEOLOGY

)a

N28a

N28a

N28b

N28

KEY
trends
ridge and furrow
agriculture (ploughing)
land drains
agriculture (unknown)
bipolar anomaly (modern)
magnetic disturbance (modern)
edge of geophysical survey
proposed development area

N

0 50 m

scale 1:1,500 @ A3

West Burton 2, West Burton Solar Scheme, Lincolnshire: interpretation of gradiometer survey results - Area N28

Figure 63

NAA
HERITAGE & ARCHAEOLOGY

N29

KEY
proposed development area
0 50 m
scale 1:1,500 @ A3
N

2nT
-1nT

West Burton 2, West Burton Solar Scheme, Lincolnshire: processed greyscale plots of gradiometer survey results - Area N29 north

Figure 64

NAA
HERITAGE & ARCHAEOLOGY

Drain

N29a

N29

N29a

Drain

KEY
field boundary
field boundary?
trends
ridge and furrow
land drains
agriculture (unknown)
bipolar anomaly (modern)
magnetic disturbance (modern)
edge of geophysical survey
proposed development area

0 50 m
scale 1:1,500 @ A3

N

West Burton 2, West Burton Solar Scheme, Lincolnshire: interpretation of gradiometer survey results - Area N29 north

Figure 65

NAA
HERITAGE & ARCHAEOLOGY

N29

KEY
proposed development area
0
50 m
scale 1:1,500 @ A3
N
2nT
-1nT

West Burton 2, West Burton Solar Scheme, Lincolnshire: processed greyscale plots of gradiometer survey results - Area N29 south

Figure 66

NAA
HERITAGE & ARCHAEOLOGY

N29a

N29a

N29

N29b

BROXHOLME LANE

Drain

Track

KEY

field boundary

field boundary?

trends

ridge and furrow

agriculture (ploughing)

land drains

bipolar anomaly (modern)

magnetic disturbance (modern)

edge of geophysical survey

proposed development area

N

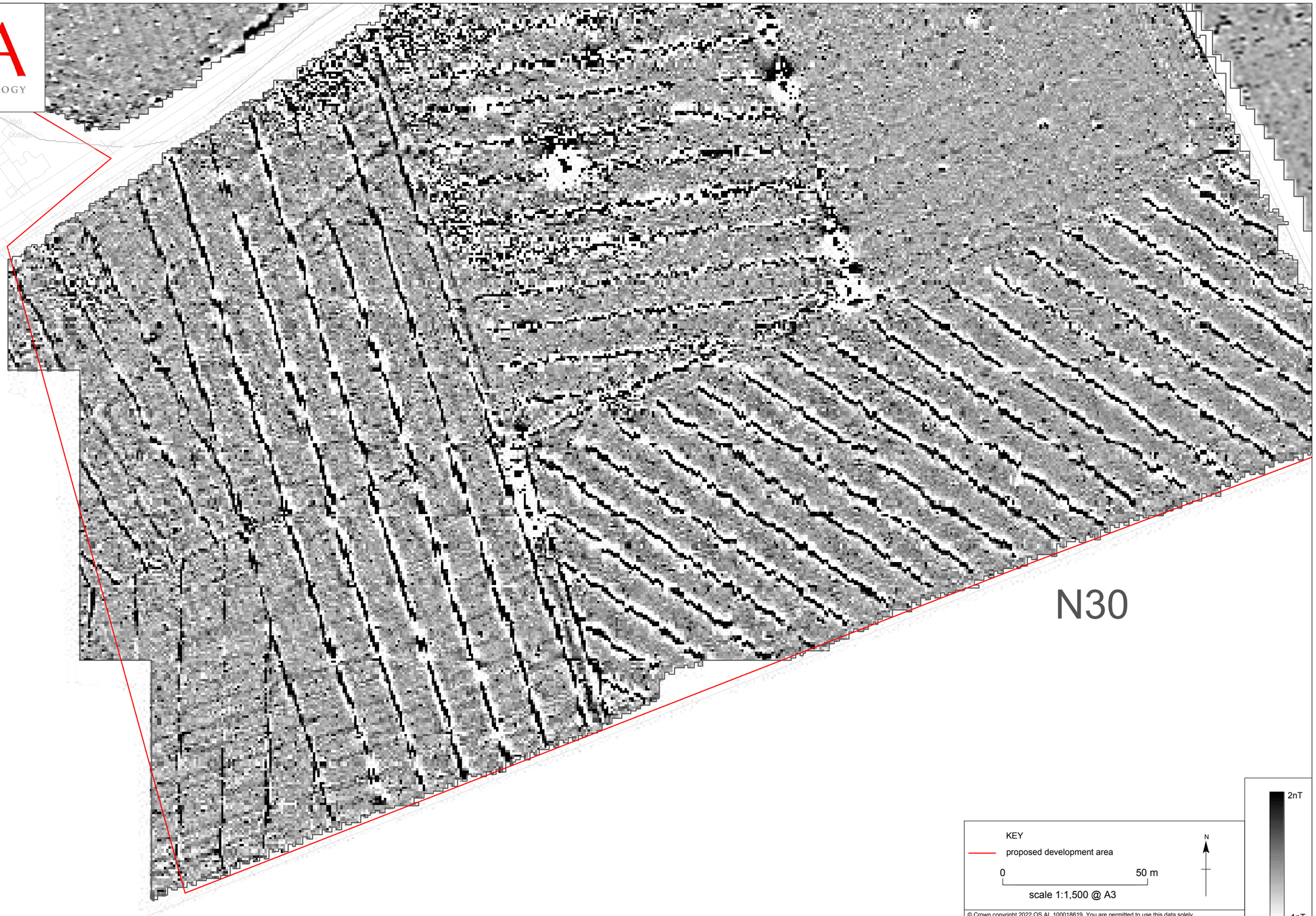
0 50 m

scale 1:1,500 @ A3

West Burton 2, West Burton Solar Scheme, Lincolnshire: interpretation of gradiometer survey results - Area N29 south

Figure 67

NAA
HERITAGE & ARCHAEOLOGY



West Burton 2, West Burton Solar Scheme, Lincolnshire: processed greyscale plots of gradiometer survey results - Area N30 west

Figure 68

NAA
HERITAGE & ARCHAEOLOGY

N30c
N30a
N30a
N30a
N30b
N30

KEY
field boundary
field boundary?
trends
ridge and furrow
land drains
bipolar anomaly (modern)
magnetic disturbance (modern)
magnetic disturbance (geological)
edge of geophysical survey
proposed development area

N
0 50 m
scale 1:1,500 @ A3

West Burton 2, West Burton Solar Scheme, Lincolnshire: interpretation of gradiometer survey results - Area N30 west

Figure 69

NAA
HERITAGE & ARCHAEOLOGY

KEY
proposed development area
0 50 m
scale 1:1,500 @ A3
N

2nT
-1nT

West Burton 2, West Burton Solar Scheme, Lincolnshire: processed greyscale plots of gradiometer survey results - Area N30 east

Figure 70

NAA
HERITAGE & ARCHAEOLOGY

KEY

- field boundary
- field boundary?
- trends
- ridge and furrow
- agriculture (ploughing)
- land drains
- agriculture (unknown)
- bipolar anomaly (modern)
- magnetic disturbance (modern)
- magnetic disturbance (geological)
- edge of geophysical survey
- proposed development area

N

0 50 m

scale 1:1,500 @ A3

BROXHOLME LANE

Drain

N30a

N30c

N30a

N30a

N30a

West Burton 2, West Burton Solar Scheme, Lincolnshire: interpretation of gradiometer survey results - Area N30 east

Figure 71

NAA
HERITAGE & ARCHAEOLOGY

KEY
proposed development area
0 50 m
scale 1:1,500 @ A3

N

2nT
-1nT

N31

River Till

West Burton 2, West Burton Solar Scheme, Lincolnshire: processed greyscale plots of gradiometer survey results - Area N31 north

Figure 72

NAA
HERITAGE & ARCHAEOLOGY

KEY

- field boundary
- field boundary?
- trends
- ridge and furrow
- agriculture (ploughing)
- land drains
- agriculture (unknown)
- bipolar anomaly (modern)
- magnetic disturbance (modern)
- edge of geophysical survey
- proposed development area

N

0 50 m

scale 1:1,500 @ A3

N31

N31b

N31b

N31b

N31a

West Burton 2, West Burton Solar Scheme, Lincolnshire: interpretation of gradiometer survey results - Area N31 north

Figure 73

NAA
HERITAGE & ARCHAEOLOGY

N31

N32

KEY
proposed development area
0 50 m
scale 1:1,500 @ A3
N

2nT
-1nT

West Burton 2, West Burton Solar Scheme, Lincolnshire: processed greyscale plots of gradiometer survey results - Area N31 south and N32

Figure 74

NAA
HERITAGE & ARCHAEOLOGY

N31b

N31a

N31

N32

KEY

field boundary
field boundary?
trends
agriculture (ploughing)
land drains
agriculture (unknown)
bipolar anomaly (modern)
magnetic disturbance (modern)
edge of geophysical survey
proposed development area

N

0 50 m

scale 1:1,500 @ A3

West Burton 2, West Burton Solar Scheme, Lincolnshire: interpretation of gradiometer survey results - Area N31 south and N32

Figure 75

APPENDIX A
TECHNICAL INFORMATION

GRADIOMETER SURVEY

Magnetic surveys measure distortions in the earth's magnetic field caused by small magnetic fields associated with buried features (Gaffney and Gater, 2003: 36) that have either remanent or induced magnetic properties (Aspinal et al. 2008: 21-26). Human activity and inhabitation often alter the magnetic properties of materials (Aspinal et al. 2008: 21) resulting in the ability for a wide range of archaeological features to be detected through magnetic surveys. Intensive burning or heating can result in materials attaining a thermoremanent magnetisation; examples of which include kilns, ovens, heaths and brick structures (Aspinal et al. 2008: 27; Gaffney and Gater, 2003: 37). When topsoil rich with iron oxides, fills a man-made depression in the subsoil, it creates an infilled feature, such as a pit or ditch, with a higher magnetic susceptibility compared to the surrounding soil (Aspinal et al. 2008: 37-41; Gaffney and Gater, 2003: 22-26). Magnetic surveys can also detect features with a lower magnetically susceptibility than the surrounding soil, an example of which is a stone wall.

LIMITATIONS

Poor results can be due to several factors including short lived archaeological occupation/use or sites with minimal cut or built features. Results can also be limited in areas with soils naturally deficient in iron compounds or in areas with soils overlying naturally magnetic geology, which will produce strong responses masking archaeological features.

Overlying layers, such as demolition rubble or layers of made ground, can hide any earlier archaeological features. The presence of above ground structures and underground services containing ferrous material can distort or mask nearby features.

Particularly uneven or steep ground can increase the processing required or distort results beyond the capabilities of processing. It is also possible in areas containing dramatic topographical changes that natural weathering, such as hillwash, often in combination with intensive modern ploughing, will reduced the topsoil on slopes and towards the peaks of hills and possibly destroy or truncate potential archaeological features. Conversely features at the bottom of slopes may be covered by a greater layer of topsoil and so if buried features are present, they appear faint within the results, if at all.

Over processing of data can also obscure or remove features, especially if there are on the same orientation as the direction of data collection. Consequently, where possible, attempts are made to ensure data is not collected on the same orientation as known potential features and that data quality is sufficient to minimise the required data processing.

INSTRUMENTATION

The data was collected using Bartington Grad 601-2 fluxgate gradiometers. The Bartington 601-2 is a single axis, vertical component fluxgate gradiometer comprising a data logger battery cassette. The sensors are Grad-01-1000L cylindrical gradiometer sensors mounted on either a or cart system carrying an array of four sensors or a rigid frame carrying two sensors; each sensor contains two fluxgate magnetometers with 1m vertical separation.

The difference in the magnetic field between the two fluxgates in each sensor is measured in nanoTesla (nT). NAA gradiometer data is recorded with a range of ±100nT, which equates to a resolution of 0.01nT. It should be noted that the actual resolution is limited to 0.03nT as a consequence of internal instrumental noise (Bartington Instruments Ltd: 23).

The handheld gradiometer records two lines of data on each traverse, the grids are walked in a zig-zag pattern amounting to 15 traverses per grid. Or cart mounted gradiometers recording four lines of data, located by real time GPS. The gradiometers are calibrated at the start of every day and recalibrated whenever necessary.

SURVEY DETAILS

Table A1: Survey summary

	Survey
Grid size Traverse interval Reading interval Area covered	30mx30m 1m 0.25m 306ha

Table A2: Baseline co-ordinates (baseline is shown on Fig. 2)

Grid point (gp) A	Grid point (gp) B
NGR: 487707.7306 377951.421	NGR: 487857.7306 377951.421

Grid point (gp) C	Grid point (gp) D
NGR: 488087.6967 377775.1402	NGR: 488205.7737 377796.5364

Table A3: Site information and conditions

Item	Detail
Geology	West: Scunthorpe Mudstone Formation East: Charmouth Mudstone Formation
Superficial deposits	None recorded Holme Pierrepont Sand and Gravel Member Clay, Silt, Sand and Gravel Alluvium
Topography	14m aOD to 5m aOD

Land use	Mixed use: pasture, set-aside and arable (crops of wheat, maize, miscanthus and root vegetable)
Weather / conditions prior to and during survey	Mixed

APPENDIX B

DATA PROCESSING INFORMATION

Gradiometer survey data is downloaded using the Bartington Grad 601 software and the processing was undertaken using Geoplot 3.0 or TerraSurveyor software.

Table B1: Commonly applied techniques

Process	Effect
Zero mean traverse (Destripe)	Removes stripping which can occur as a consequence of using multi sensor arrays or a 'zigzag' data collection method by setting the mean reading for each traverse to zero.
Destagger	Removes stagger in the data introduced through inconsistence data collection pace and often exacerbated through the 'zig-zag' methodology.
Clip	Clips data above or below a set value to potentially enhance potential weaker anomalies.
Despike	Removes random spikes or high readings to reduce the appearance of dominant readings, often created by modern ferrous objects that can distort the results.
Low pass filter	Removes low frequency waves or broad anomalies such as those caused by strong or large gradual variations in the soil's magnetic susceptibility often caused by geological or natural changes in the substrata.
Interpolation	Used to smooth or reduce the blocky appearance of data by improving the spatial density and balance the quantity of data points in the X and Y directions.

Table B2: Processing steps

Minimal Processing	Increased Processing
• Zero mean traverse +5/-5 (Destripe) • Destagger:	• Low Pass Filter • Interpolate Y, Expand - Linear, x2

APPENDIX C

DATA VISUALISATION INFORMATION

FIGURES

The data from the surveys was used to produce a series of images to represent the results. The terminology used is detailed below:

- Greyscale/Colourscale Plot: this visualised the results as a shaded drawing with highest readings showing as black, running through different shades to lowest showing as white.

- XY-trace Plot: this creates a line drawing showing the peaks and troughs of the readings as vertical offset from a centreline.

- Interpreted Plot: through detailed analysis anomalies have been interpreted and possible features identified. Interpretation drawings are used to show potential features and in particular to reinforce and clarify the written interpretation of the data. Anomalies have been characterised using the terminology detailed in the following section and have been assigned colour coding outlined in keys found on the relevant figures associated with this report.

MAGNETIC ANOMALIES AND TERMINOLOGY

Table C1: Lexicon of terminology

Terminology	Detail
Anomaly	Any outstanding high or low readings forming a particular shape or covering a specific area with the survey results.
Feature	A man-made or naturally created object or material that has been detected through investigation works and has sufficient characteristics or supporting evidence for positive identification.
Magnetic susceptibility	The ability of a buried feature to be magnetically induced when a magnetic field is applied
Magnetic response	The strength of the changes in magnetic values caused by a buried feature with either a greater or lesser ability to be magnetised compared with the soil around it. Anomalies are considered to either have strong / weak or positive / negative responses. The strength of magnetic response (along with patterning) can be essential in determining the nature of an anomaly, but it should be noted that the size or strength of the magnetic response does not correlate with the size of the buried feature.
Patterning of an anomaly	The shape or form of an individual anomaly
Thermoremanence	The affect caused when a material has been magnetically altered through a process of heating. Thermoremanent magnetisation occurs when an object or material is heated passed the Curie Point and acquires a permanent magnetisation that is associated with the magnetic field that they cooled within (Gaffney and Gater 2003:37)

Different anomalies can represent different features created by human, agricultural or modern activity, or natural pedological or geological changes in the substrata.

Anomalies interpreted with a 'greater' categorisation are considered more likely to be of the interpreted characterisation; whereas a more tentative interpretation is applied to those with a 'lesser' categorisation as a consequence of weaker increases in magnetic response or the anomalies incomplete patterning or irregular form.

The strength and size of anomalies can vary depending on the magnetic properties of the feature, the magnetic susceptibility of the soil, the depth to which the feature is buried, and the state of preservation.

Table C2: Characterisation of anomalies

Characterisation	Detail
Archaeology	
Linear anomaly (archaeology)	Linear anomalies with a positive or negative magnetic response and composed of a patterning or shape that is suggestive of a buried archaeological feature. These are often indicative of structural remains or infilled features such as ditches. The strength of anomaly signal can be suggestive of the properties of the feature. Negative linear anomalies represent upstanding or infilled features that are less magnetically susceptible than background readings, for example structures or ditches composed of a non-igneous stone material. Bipolar linear anomalies considered to be of an archaeological nature are indicative of material with a high magnetic susceptibility, such as a brick wall.
Isolated anomaly (archaeology)	Isolated anomalies or anomalies with a more amorphous form possibly represent infilled features or thermomagnetic features such as areas of heating/burning of an archaeological origin. Unless associated with conclusively identified archaeological remains, such as linear anomalies, absolute identification of positive responses can be problematic as it is often not possible to decipher if they are of an archaeological, modern or agricultural origin. Consequently, isolated positive responses are not shown within the interpretation unless composed of a broad form or belonging to a series of isolated positive responses. Bipolar responses considered likely to be of an archaeological are also interpreted as isolated anomaly (archaeology). These are considered to relate to material with a very strong magnetic susceptibility or thermoremanent magnetisation.
Trends	Weak and diffuse anomalies with an uncertain origin are denoted by trends. It is possible that these belong to archaeological features but given their weak signatures or incomplete patterning it is equally plausible that they relate to agricultural features or natural soil formations.
Agriculture	
Field boundary	Isolated linear anomalies that are likely to be indicative of former land divisions. A more conclusive interpretation is given to linear anomalies that

Characterisation	Detail
	correspond with the location of field boundaries recorded on historic maps, Aerial photos or LiDAR coverage of the site.
Ridge and furrow	Broadly spaced linear anomalies that are likely to be indicative of earlier forms of agriculture, such as ridge and furrow. These often correspond with the location of earthworks visible on the ground or identified on aerial photos or LiDAR survey coverage.
Agriculture (plough)	Regularly spaced linear anomalies, often with a narrower spacing, that conform with ploughing regime at the time of survey, or a recent regime recorded on aerial photos of the site.
Agriculture (land drain)	The response and distribution of land drains varies depending on the composition of the land drain and associated ditch or channel. Consequently, land drains can be composed of weak / strong positive / negative magnetic responses and are identified as a product of either their variance in magnetic values or positioning compared with regularly spaced linear anomalies considered to relate to modern ploughing. Land drains can be located within former agricultural regimes, such as ridge and furrow.
Agriculture?	Weak, irregularly spaced or isolated linear anomalies that possibly relate to agricultural activity. Given the tentative interpretation, the agricultural process they are caused by is also likely to unknown.
Modern	
Bipolar response (modern)	Positive anomalies with associated negative 'halo' (bipolar) denote features with a strong magnetic response are likely to be of a modern origin. Isolated bipolar responses of a modern nature are likely to relate to buried ferrous material or objects, such as metallic agricultural debris. If a trend is noted in the alignment or spacing of isolated bipolar responses, it is possible that they are indicative of ferrous fittings or connectors used on buried non-magnetic buried utilities. Linear bipolar anomalies are likely to be indicative of modern services.
Dipolar response	Dipolar anomalies relate to individual spike within the data and tend to be caused by ferrous objects. These responses have only been shown when located near to archaeological features. When the site is located in a mining landscape it is possible that identified dipolar anomalies relate to mining activity and are indicative of further pits or mine shafts.
Magnetic disturbance (modern)	Areas of increased magnetic response denote areas of disturbance containing a high concentration of dipolar and / or bipolar responses. These are generally considered to be caused by modern debris in the topsoil, although it is possible that the disturbance is in part also caused by isolated archaeological material or geological or pedological changes in the substrata.
Natural	
Magnetic disturbance (geology)	Areas of variable broad magnetic responses often with irregular patterning that are caused by natural features or changes in geology or soil type these often correspond with topographical variations. It should be notes that ground water can naturally dissolve or erode porous or permeable bedrock, such as limestone, and create fissures and cracks. Depending on the magnetic susceptibility of the soil it is possible for these

Characterisation	Detail
	fissures to appear as a series of contiguous rectilinear anomalies, often having a similar appearance to archaeological enclosures.