ARCHAEOLOGICAL SERVICES WYAS

Land at Ormesby St Margaret
Great Yarmouth
Norfolk

Geophysical Survey

Report no. 2685

September 2014

Client: NPS Archaeology

REGISTERED ORGANISATION IA

Land at Ormesby St Margaret
Great Yarmouth
Norfolk

Geophysical Survey

Summary

A geophysical (magnetometer) survey covering approximately 9 hectares was carried out on land at Ormesby St Margaret, to provide further information on the archaeological resource of the site prior to its proposed development. Anomalies of significant archaeological potential have been identified across the majority of the site confirming, enhancing and defining the extent of archaeological remains indicated by cropmarks, documentary evidence and find-spots. These remains are likely to be predominantly medieval and post-medieval in date, including the site of St Peter's Church, which judging from the survey results confirms that the church was the early focus of the village. The cropmarks suggestive of prehistoric and Roman activity are much less represented in the magnetic data. The survey has confirmed the conclusion of an earlier desk-based assessment that the site contains important heritage assets of high archaeological potential.

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Report Information

Client:	NPS Archaeology
Address:	Scandic House, 85 Mountergate, Norwich, NR1 1PY
Report Type:	Geophysical Survey
Location:	Ormesby St Margaret
County:	Norfolk
Grid Reference:	TG 4911 1467
Period(s) of activity:	multi-period
Report Number:	2685
Project Number:	4280
Site Code:	EAN14
OASIS ID:	archaeol11- 198917
Planning Application No.:	
HER Event No:	
Museum Accession No.:	n/a
Date of fieldwork:	August 2014
Date of report:	September 2014
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Photography:	Site staff
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Authorisation for distribution: ----------

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1 Introduction

Archaeological Services WYAS (ASWYAS) were commissioned by Jayne Bown of NPS Archaeology, to undertake a geophysical (magnetometer) survey of land at Ormesby St Margaret, Norfolk (see Fig. 1) in order to more fully understand the archaeological potential of the site prior to the possible development of the site. The work was undertaken in accordance with the Heritage Statement Brief (Norfolk County Council 2014), with a Project Design (Harrison 2014) supplied to and approved by the Client, with guidance contained within the National Planning Policy Framework (NPPF 2012) and in line with current best practice (David *et al.* 2008). The survey was carried out on August 28th and August 29th 2014.

Site location, topography and land-use

Ormesby is located approximately 5km north-west of Great Yarmouth and 3km south of Hemsby, centred at TG 4911 1467. The proposed development area (PDA) is situated to the immediate south of the village and is contained within, and bordered by, Cromer Road to the north and west, the A149 to the south and Filby Lane and allotments to the east. The survey area comprises a single field (see Fig. 2) which had been recently harvested and disc harrowed prior to survey (see plates) and covered approximately 9 hectares. The site is located on relatively low-lying land between 10m and 12m above Ordnance Datum (aOD), with the higher ground situated to the south and the north-east corner with a slight depression through the centre of the site.

Soils and geology

The underlying bedrock comprises Crag Group (sand and gravel) which is overlain by superficial deposits of Happisburgh Glacigenic Formation Sand (British Geological Survey 2014).

The soils in this area are classified in the Wick 2 association, characterised as deep, well drained coarse loams that are often stoneless (Soil Survey of England and Wales 1983).

2 Archaeological Background

An Archaeological Desk-Based Assessment (Crawley 2014) concluded that the PDA '*has the potential to contain important heritage assets, in the form of buried archaeological remains of a Bronze Age round barrow and the 'lost' church of St Peter and its associated settlement. Both of these monuments are likely to have burials associated with them*'. These features and other likely Roman features are indicated by the considerable number of cropmarks and find spots both within the site and in the immediate area.

3 Aims, Methodology and Presentation

The main aim of the geophysical survey was to provide sufficient information to enable an assessment to be made of the impact of potential sub-surface archaeological remains and for further evaluation or mitigation proposals, if appropriate, to be recommended. To achieve this aim a magnetometer survey covering all of PDA was undertaken.

The general objectives of the geophysical survey were:

- to provide information about the nature and possible interpretation of any magnetic anomalies identified;
- to therefore determine the presence/absence and extent of any buried archaeological features; and
- to prepare a report summarising the results of the survey.

Specifically the survey sought to determine whether the features identified as cropmarks on aerial photographs immediately north of the PDA extended into the application area.

Magnetometer survey

The site grid was laid out using a Trimble VRS differential Global Positioning System (Trimble 5800 model). Bartington Grad601 magnetic gradiometers were used during the survey, taking readings at 0.25m intervals on zig-zag traverses 1m apart within 30m by 30m grids, so that 3600 readings were recorded in each grid. These readings were stored in the memory of the instrument and later downloaded to computer for processing and interpretation. Geoplot 3 (Geoscan Research) software was used to process and present the data. Further details are given in Appendix 1.

Reporting

A general site location plan, incorporating the 1:50000 Ordnance Survey (OS) mapping, is shown in Figure 1. Figure 2 is a large scale (1:2500) location plan displaying the processed magnetic data and cropmarks. Figure 3 is an interpretation of all the anomalies identified by the survey. Figure 4 shows the site grid and the location of the repeat grids and plates. Large scale (1:1000) plots of the data in greyscale and XY trace plot formats together with interpretation graphics at the same scale are presented in figures 5 to 10 inclusive.

Further technical information on the equipment used, data processing and survey methodologies are given in Appendix 1and Appendix 2. Trace plots of the ‘raw’ data and data repeatability plots are included in Appendix 3 and Appendix 4 respectively. Appendix 5 describes the composition and location of the site archive. Appendix 6 is a copy of the completed OASIS form.

The survey methodology, report and any recommendations comply with the Project Design (Harrison 2014) and guidelines outlined by English Heritage (David *et al.* 2008), the Institute

for Archaeologists (IfA 2013) and Norfolk County Council. All figures reproduced from Ordnance Survey (OS) mapping are with the permission of the controller of Her Majesty's Stationery Office (© Crown copyright).

The figures in this report have been produced following analysis of the data in 'raw' and processed formats and over a range of different display levels. All figures are presented to most suitably display and interpret the data from this site based on the experience and knowledge of Archaeological Services staff.

4 Results and Discussion

Summary

The most noticeable characteristic of the data is the large number of anomalies, particularly across the northern half of the site but also around the western periphery. The sheer density and number of anomalies in these areas precludes individual description, suffice to state that almost all are likely to be related to previous occupation and activity on this part of the site. Identifying the individual nature of the sub-surface feature causing each anomaly is not always possible so only the major anomalies are described in detail and labelled on the interpretation figures. Differentiating between those of possible archaeological origin and those due to variation within the superficial deposits and deep soils is similarly difficult. On this site the only those of definite archaeological provenance are interpreted as archaeological. These include the larger linear and rectilinear anomalies which define the overall layout of the site. Discrete and short linear and curvilinear anomalies located either within or immediately adjacent to the obviously archaeological anomalies are interpreted as of possible archaeological origin. Outside the obvious areas of archaeological activity the many discrete anomalies are interpreted as of likely geological origin. However, it is entirely possible that some of these geological anomalies could well be of archaeological interest given the level of activity on the rest of the site.

Non-archaeological (ferrous and modern) anomalies

Ferrous responses, visible either as individual 'spike' anomalies or more extensive areas of magnetic disturbance, are typically caused by modern ferrous (magnetic) debris, either on the ground surface or in the plough-soil, or are due to the proximity of magnetic material in field boundaries, buildings or other above ground features. Little importance is normally given to such anomalies, unless there is any supporting evidence for an archaeological interpretation. Ferrous debris or material is common on rural sites, often being present as a consequence of manuring or tipping/infilling. Throughout the PDA individual iron 'spike' anomalies are common and generally there is no obvious pattern or clustering to their distribution to suggest anything other than a random background scatter of ferrous debris in the soil. One exception to this is around the south-western edge of the site where an arc of ferrous responses is

identified. There is no obvious cause for this cluster but one possibility might be that it is due to residual material mixed into the soil from the construction of the A149 and the junction with Cromer Road immediately to the south of the site.

Linear bands of disturbance are also recorded around the edge of the site bordering Cromer Road and around the perimeter of the allotments. This disturbance is due to the presence of ferrous material either in or immediately adjoining the site boundary.

Agricultural anomalies

Throughout the site linear trend anomalies have been identified on several alignments. These are due to ploughing or possibly field drains.

Geological anomalies

Throughout the survey area discrete anomalies, characterised as localised areas of enhanced magnetic response, have been identified. Whilst any of these anomalies could have an archaeological origin in the absence of any definite information to suggest otherwise a geological origin is ascribed; these anomalies are caused by variation in the depth and composition of soils and superficial deposits of sand and gravel.

Archaeological anomalies

Analysis of historical mapping indicates that the layout of fields within the PDA has been altered over the past 175 years by the removal of several field boundaries. Linear anomaly, **A**, is aligned south-west/north-east to the west of the site and is shown on the 1841 tithe map but not the enclosure map produced the following year. However, it is shown on the first edition Ordnance Survey (OS) map. One hundred and fifty metres to the east a second former boundary, on the same alignment, manifests as linear anomaly **B**. This boundary is neither on the tithe or the enclosure maps but is on the first edition OS map. It is not known when these boundaries were removed. To the northern apex of the site anomalies **C**, **D** and **E**, also define fields which are shown on the tithe map but which do not appear on any other later mapping.

All these former boundaries seem to respect the route of the former road which led into the village of Ormesby. This road is clearly shown on both the tithe and enclosure maps but is no longer a feature in the landscape by the early 1880s and is nor depicted on the first edition. The alignment of this road is clearly indicated in the magnetic data as parallel curvilinear anomalies, **F**, confirming the cropmark data. There is clear break in the anomaly defining the southern side of the road towards the centre of the site possibly suggesting an opening into the land to the immediate south of the road.

To either side of the road, but particularly to the south, numerous anomalies indicative of settlement activity can be clearly seen. Towards the western end of the site, an L-shaped anomaly, **G**, indicative of a soil-filled boundary feature or enclosure is identified. Again this feature has been previously recorded as a cropmark. Numerous discrete anomalies within the

enclosed area clearly attest to archaeological activity. It is aligned at right angles to the former boundary, **A**.

Just to the east, and still south of the former road, another cluster of short linear and discrete anomalies is present again indicative of archaeological activity. For the most part it is impossible to define individual features although short linear anomalies, **H** and **I**, probably define another small parcel of land with linear anomaly, **J**, immediately to the east another toft aligned perpendicular to the road.

Immediately to the east of anomaly **J** negative linear trend anomalies **K** and **L** define a much larger rectangular plot of land (possibly defined to the east by boundary **B**). This area also encloses the location of the former church of St Peter, whose position and groundplan is known from cropmarks. It is suggested that anomalies **K** and **L** locate the former bank/ditch defining the churchyard. Very faint negative anomalies, **M**, in the centre of the churchyard are thought to locate the southern side of the 'lost' church – the church looks to be approximately 5m south of the cropmarked location. It would seem probable that some/all of the low magnitude discrete anomalies identified in the churchyard locate graves. However, it is notoriously difficult to identify individual graves by geophysical survey and it is therefore considered likely that there will be many more graves than indicated by the discrete anomalies.

Adjoining the churchyard to the east another cluster of discrete high magnitude anomalies constrained by the former churchyard/field boundary to the west and short linear boundary type anomaly, **N**, to the east.

To the north of the former road there are fewer clear cut anomalies. However, to the north-west three sides of a small enclosed area manifest as linear anomalies, **O**. To the south-east of **O** two weak L-shaped anomalies, **P** and **Q**, are identified.

As mentioned previously numerous discrete anomalies of lesser magnitude than those ascribed a definite archaeological origin are identified both within and immediately adjacent to the areas of medieval activity described above and these have been interpreted as of possible archaeological origin. However, it should be noted that many of these anomalies could have a geological origin, being due to variation in the superficial deposits and soils, or to the dispersal of magnetically enhanced material by ploughing over the last two centuries or more. Some of the larger discrete anomalies could also be due to small scale extraction pits, several of which are recorded on the historic mapping in the immediate vicinity of the site.

5 Conclusions

The magnetic survey has identified a plethora of anomalies mostly across the northern half of the site. Most of the well defined cropmarks do manifest as magnetic anomalies but in general the geophysical survey has added a considerable amount of detail, particularly about

the extent and layout of the former centre of the medieval village of Ormesby which is clearly centred on the medieval road and St Peter's Church. Although the church is identified as a cropmark feature the survey suggests that it is located about 5m south of its recorded position. The extent of the churchyard has also been defined as has the route of the medieval road/track which meanders across the site with linear anomalies indicative of ditches/banks enclosing areas of settlement to the north and south. Post-medieval field boundaries are also identified.

One cropmark that has notably not been identified as a magnetic anomaly is a circular feature interpreted as a Bronze Age round barrow, one of several in the near vicinity. Visibility of this feature was particularly good with internal features clearly discernible on the aerial photograph. It is unclear whether the feature may have been damaged by deep ploughing since the photograph or whether the deep, stoneless soils which prevail across the site make the identification of shallower features not associated with major settlement activity very difficult or impossible to identify. Consequently it is considered likely that there may be other sub-surface features within the site, particularly of prehistoric and/or Roman date, that have not been identified by the survey. For this reason it is considered equally important that any further intrusive work that is undertaken on this site should concentrate as much on those areas that appear devoid of anomalies as on those of obvious archaeological potential.

Overall, the geophysical survey has confirmed the conclusions of a desk-based assessment of the site and its immediate surroundings and has clearly demonstrated that the archaeological potential of the site is high and of likely regional importance. At least half the site is likely to contain the buried remains of the medieval village which was clustered around the 'lost' church of St Peter's and a former medieval road while there may be other, much older, features to the south of the site that have not been identified by the survey.

The results and subsequent interpretation of data from geophysical surveys should not be treated as an absolute representation of the underlying archaeological and non-archaeological remains. Confirmation of the presence or absence of archaeological remains can only be achieved by direct investigation of sub-surface deposits.

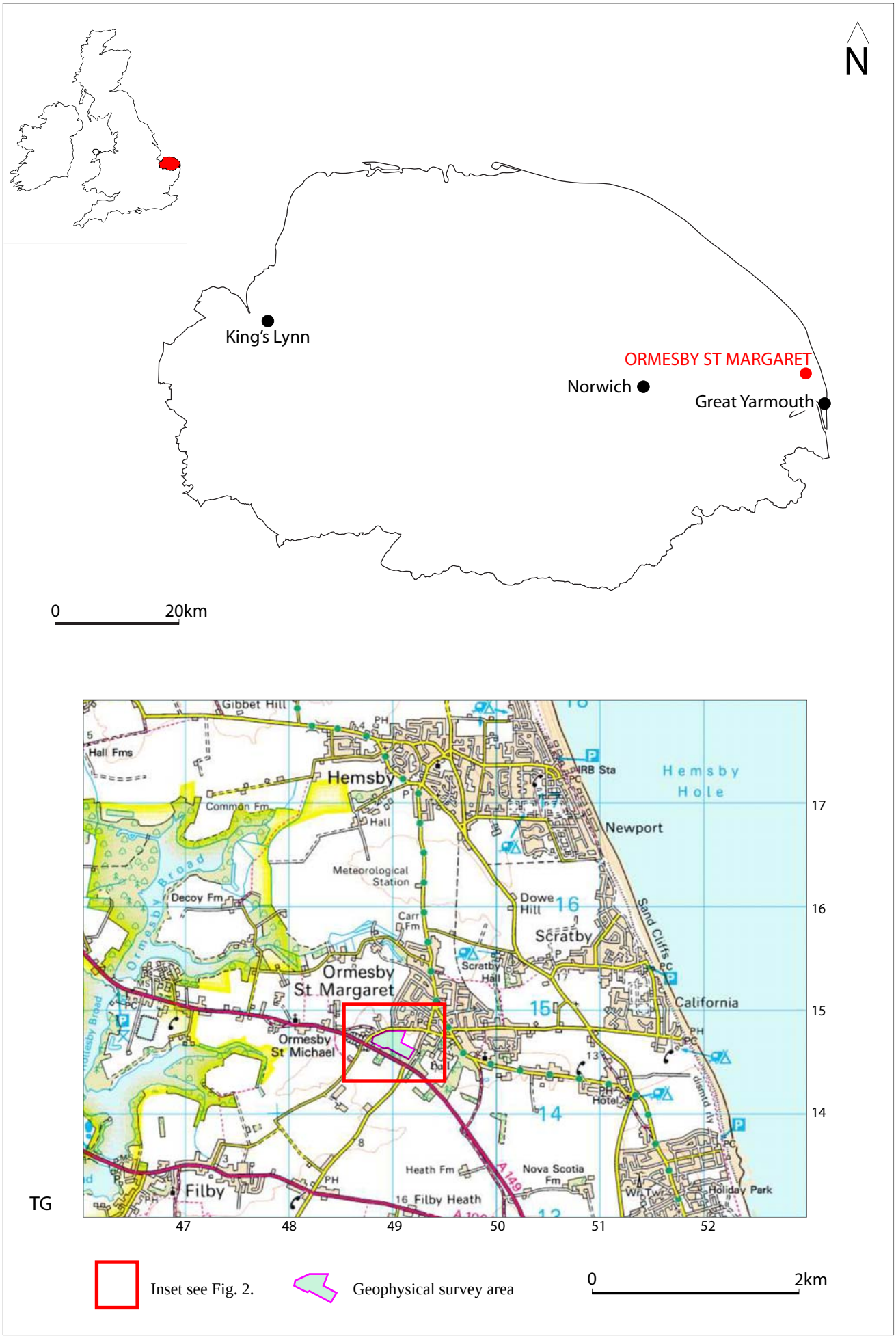

Fig. 1. Site location

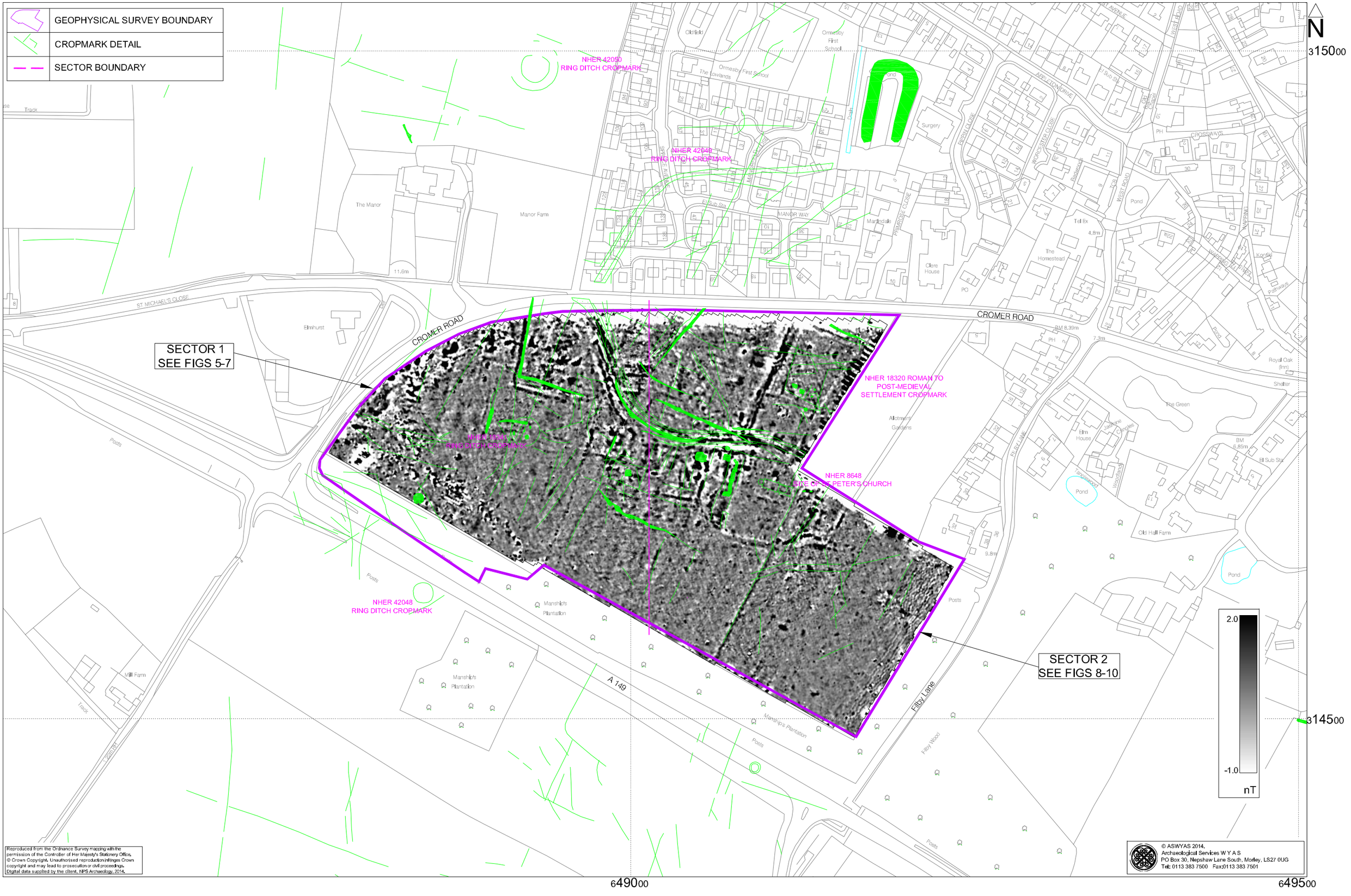

Fig. 2. Survey location showing greyscale magnetometer data and cropmark detail (1:2500 @ A3)

	GEOPHYSICAL SURVEY BOUNDARY
	SECTOR BOUNDARY

TYPE OF ANOMALY		INTERPRETATION
•	DIPOLAR ISOLATED	FERROUS MATERIAL
	MAGNETIC DISTURBANCE	FERROUS MATERIAL
	LINEAR TREND	AGRICULTURAL
	LINEAR	FORMER FIELD BOUNDARY
	MAGNETIC ENHANCEMENT	GEOLOGY
	MAGNETIC ENHANCEMENT	ARCHAEOLOGY?
	MAGNETIC ENHANCEMENT	ARCHAEOLOGY
	LINEAR TREND	ARCHAEOLOGY
	MAGNETIC ENHANCEMENT	ARCHAEOLOGY - BANK / DITCH

N

SECTOR 1
SEE FIGS 5-7

SECTOR 2
SEE FIGS 8-10

A B C D E F G H I J K L M N O P Q

CROMER ROAD

ST. MICHAEL'S CLOSE

Ormesby First School

Ormesby First School

Oldfield

The Lowlands

Pond

Surgery

Ormesby First School

SPRUCE AVENUE

MANOR WAY

MANOR RUE LANE

PRIMROSE CLOSE

BROOM CLOSE

WORCESTER CLOSE

APPLETON DRIVE

Elmhurst

The Manor

Manor Farm

Martindale

Clare House

The Homestead

PO

BM 8.39m

7.3m

Pathways

Pond

Royal Oak (Inn)

Shelter

The Green

Allotment Gardens

Elm House

Woodland

Pond

Old Hall Farm

Pond

Manships Plantation

Manships Plantation

Manships Plantation

Mill Farm

A 149

Filby Lane

Filby Wood

Track

Posts

6490 00

6495 00

3150 00

3145 00

0 50m

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Fig. 3. Overall interpretation of magnetometer data (1:2500 @ A3)

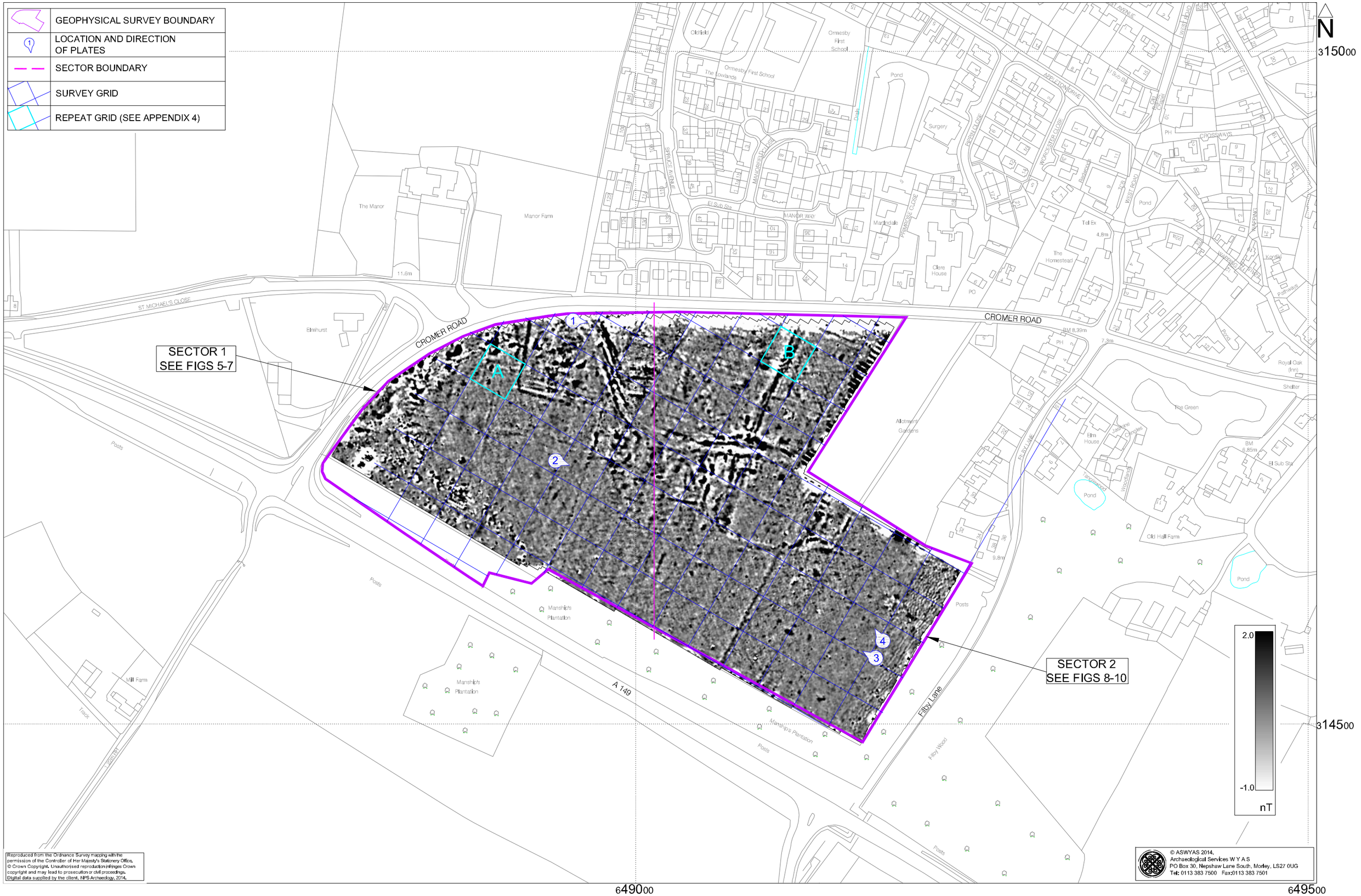

Fig. 4. Location of plates, survey grid and repeat grids (1:2500 @ A3)

SECTOR BOUNDARY

N

11.6m

Def

CROMER ROAD

Post

3148 00

3146 00

Posts

Posts

Manship's
Plantation

Manship's
Plantation

A 149

2.0

-1.0

nT

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6488 00

6490 00

0 20m

Fig. 5. Processed greyscale magnetometer data; Sector 1 (1:1000 @ A3)

SECTOR BOUNDARY

N

11.6m

Def

CROMER ROAD

hurst

3148 00

Posts

Posts

3146 00

Manship's
Plantation

Manship's
Plantation

A 149

20.0 nT/cm

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6488 00

6490 00

0 20m

Fig. 6. XY trace plot of minimally processed magnetometer data; Sector 1 (1:1000 @ A3)

SECTOR BOUNDARY

N

11.6m

Def

CROMER ROAD

Post

3148 00

F

A

G

Q

O

P

F

I

A

Posts

Posts

3146 00

Manship's Plantation

Manship's Plantation

A 149

TYPE OF ANOMALY		INTERPRETATION
•	DIPOLAR ISOLATED	FERROUS MATERIAL
	MAGNETIC DISTURBANCE	FERROUS MATERIAL
	LINEAR TREND	AGRICULTURAL
	LINEAR	FORMER FIELD BOUNDARY
	MAGNETIC ENHANCEMENT	GEOLOGY
	MAGNETIC ENHANCEMENT	ARCHAEOLOGY?
	MAGNETIC ENHANCEMENT	ARCHAEOLOGY
	MAGNETIC ENHANCEMENT	ARCHAEOLOGY - DITCH
	MAGNETIC ENHANCEMENT	ROAD / TRACKWAY

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6488 00

6490 00

0 20m

Fig. 7. Interpretation of magnetometer data; Sector 1 (1:1000 @ A3)

SECTOR BOUNDARY

N

Clere House

PO

CR

Allotment Gardens

Posts

Manship's Plantation

Posts

Filby Lane

2.0

-1.0

nT

3148 00

3146 00

6492 00

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0 20m

Fig. 8. Processed greyscale magnetometer data; Sector 2 (1:1000 @ A3)

SECTOR BOUNDARY

N

Clere House

PO

Allotment Gardens

Posts

Manship's Plantation

Filby Lane

CR 3148 00

3146 00

6492 00

20.0 nT/cm

0 20m

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Fig. 9. XY trace plot of minimally processed magnetometer data; Sector 2 (1:1000 @ A3)

SECTOR BOUNDARY

TYPE OF ANOMALY		INTERPRETATION
•	DIPOLAR ISOLATED	FERROUS MATERIAL
	MAGNETIC DISTURBANCE	FERROUS MATERIAL
	LINEAR TREND	AGRICULTURAL
	LINEAR	FORMER FIELD BOUNDARY
	MAGNETIC ENHANCEMENT	GEOLOGY
	MAGNETIC ENHANCEMENT	ARCHAEOLOGY?
	MAGNETIC ENHANCEMENT	ARCHAEOLOGY
	LINEAR TREND	ARCHAEOLOGY
	MAGNETIC ENHANCEMENT	ARCHAEOLOGY - DITCH
	MAGNETIC ENHANCEMENT	ROAD / TRACKWAY

N

3148 00

3146 00

6492 00

Allotment Gardens

Posts

Manship's Plantation

Filby Lane

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0 20m

Fig. 10. Interpretation of magnetometer data; Sector 2 (1:1000 @ A3)

Plate 1. General view of site, looking east

Plate 2. General view of site, looking south-east

Plate 3. General view of site, looking north-west

Plate 4. General view of site, looking north

Appendix 1: Magnetic survey - technical information

Magnetic Susceptibility and Soil Magnetism

Iron makes up about 6% of the Earth's crust and is mostly present in soils and rocks as minerals such as maghaemite and haemetite. These minerals have a weak, measurable magnetic property termed magnetic susceptibility. Human activities can redistribute these minerals and change (enhance) others into more magnetic forms so that by measuring the magnetic susceptibility of the topsoil, areas where human occupation or settlement has occurred can be identified by virtue of the attendant increase (enhancement) in magnetic susceptibility. If the enhanced material subsequently comes to fill features, such as ditches or pits, localised isolated and linear magnetic anomalies can result whose presence can be detected by a magnetometer (fluxgate gradiometer).

In general, it is the contrast between the magnetic susceptibility of deposits filling cut features, such as ditches or pits, and the magnetic susceptibility of topsoils, subsoils and rocks into which these features have been cut, which causes the most recognisable responses. This is primarily because there is a tendency for magnetic ferrous compounds to become concentrated in the topsoil, thereby making it more magnetic than the subsoil or the bedrock. Linear features cut into the subsoil or geology, such as ditches, that have been silted up or have been backfilled with topsoil will therefore usually produce a positive magnetic response relative to the background soil levels. Discrete feature, such as pits, can also be detected. The magnetic susceptibility of a soil can also be enhanced by the application of heat and the fermentation and bacterial effects associated with rubbish decomposition. The area of enhancement is usually quite large, mainly due to the tendency of discard areas to extend beyond the limit of the occupation site itself, and spreading by the plough. An advantage of magnetic susceptibility over magnetometry is that a certain amount of occupational activity will cause the same proportional change in susceptibility, however weakly magnetic is the soil, and so does not depend on the magnetic contrast between the topsoil and deeper layers. Susceptibility survey is therefore able to detect areas of occupation even in the absence of cut features. On the other hand susceptibility survey is more vulnerable to the masking effects of layers of colluvium and alluvium as the technique, using the Bartington system, can generally only measure variation in the first 0.15m of ploughsoil.

Types of Magnetic Anomaly

In the majority of instances anomalies are termed 'positive'. This means that they have a positive magnetic value relative to the magnetic background on any given site. However some features can manifest themselves as 'negative' anomalies that, conversely, means that the response is negative relative to the mean magnetic background.

Where it is not possible to give a probable cause of an observed anomaly a '?' is appended.

It should be noted that anomalies interpreted as modern in origin might be caused by features that are present in the topsoil or upper layers of the subsoil. Removal of soil to an archaeological or natural layer can therefore remove the feature causing the anomaly.

The types of response mentioned above can be divided into five main categories that are used in the graphical interpretation of the magnetic data:

Isolated dipolar anomalies (iron spikes)

These responses are typically caused by ferrous material either on the surface or in the topsoil. They cause a rapid variation in the magnetic response giving a characteristic 'spiky' trace. Although ferrous archaeological artefacts could produce this type of response, unless there is supporting evidence for an archaeological interpretation, little emphasis is normally given to such anomalies, as modern ferrous objects are common on rural sites, often being present as a consequence of manuring.

Areas of magnetic disturbance

These responses can have several causes often being associated with burnt material, such as slag waste or brick rubble or other strongly magnetised/fired material. Ferrous structures such as pylons, mesh or barbed wire fencing and buried pipes can also cause the same disturbed response. A modern origin is usually assumed unless there is other supporting information.

Linear trend

This is usually a weak or broad linear anomaly of unknown cause or date. These anomalies are often caused by agricultural activity, either ploughing or land drains being a common cause.

Areas of magnetic enhancement/positive isolated anomalies

Areas of enhanced response are characterised by a general increase in the magnetic background over a localised area whilst discrete anomalies are manifest by an increased response (sometimes only visible on an XY trace plot) on two or three successive traverses. In neither instance is there the intense dipolar response characteristic exhibited by an area of magnetic disturbance or of an 'iron spike' anomaly (see above). These anomalies can be caused by infilled discrete archaeological features such as pits or post-holes or by kilns. They can also be caused by pedological variations or by natural infilled features on certain geologies. Ferrous material in the subsoil can also give a similar response. It can often therefore be very difficult to establish an anthropogenic origin without intrusive investigation or other supporting information.

Linear and curvilinear anomalies

Such anomalies have a variety of origins. They may be caused by agricultural practice (recent ploughing trends, earlier ridge and furrow regimes or land drains), natural geomorphological features such as palaeochannels or by infilled archaeological ditches.

Methodology: Magnetic Susceptibility Survey

There are two methods of measuring the magnetic susceptibility of a soil sample. The first involves the measurement of a given volume of soil, which will include any air and moisture that lies within the sample, and is termed volume specific susceptibility. This method results in a bulk value that it not necessarily fully representative of the constituent components of the sample. For field surveys a Bartington MS2 meter with MS2D field loop is used due to its speed and simplicity. The second technique overcomes this potential problem by taking into account both the volume and mass of a sample and is termed mass specific susceptibility. However, mass specific readings cannot be taken in the field where the bulk properties of a soil are usually unknown and so volume specific readings must be taken. Whilst these values are not fully representative they do allow general comparisons across a site and give a broad indication of susceptibility changes. This is usually enough to assess the susceptibility of a site and evaluate whether enhancement has occurred.

Methodology: Gradiometer Survey

There are two main methods of using the fluxgate gradiometer for commercial evaluations. The first of these is referred to as ***magnetic scanning*** and requires the operator to visually identify anomalous responses on the instrument display panel whilst covering the site in widely spaced traverses, typically 10m apart. The instrument logger is not used and there is therefore no data collection. Once anomalous responses are identified they are marked in the field with bamboo canes and approximately located on a base plan. This method is usually employed as a means of selecting areas for detailed survey when only a percentage sample of the whole site is to be subject to detailed survey.

The disadvantages of magnetic scanning are that features that produce weak anomalies (less than 2nT) are unlikely to stand out from the magnetic background and so will be difficult to detect. The coarse sampling interval means that discrete features or linear features that are parallel or broadly oblique to the direction of traverse may not be detected. If linear features are suspected in a site then the traverse direction should be perpendicular (or as close as is possible within the physical constraints of the site) to the orientation of the suspected features. The possible drawbacks mentioned above mean that a ‘negative’ scanning result should be validated by sample detailed magnetic survey (see below).

The second method is referred to as ***detailed survey*** and employs the use of a sample trigger to automatically take readings at predetermined points, typically at 0.25m intervals, on zig-zag traverses 1m apart. These readings are stored in the memory of the instrument and are later dumped to computer for processing and interpretation. Detailed survey allows the visualisation of weaker anomalies that may not have been detected by magnetic scanning.

During this survey a Bartington Grad601 magnetic gradiometer was used taking readings on the 0.1nT range, at 0.25m intervals on zig-zag traverses 1m apart within 30m by 30m square

grids. The instrument was checked for electronic and mechanical drift at a common point and calibrated as necessary. The drift from zero was not logged.

Data Processing and Presentation

The detailed gradiometer data has been presented in this report in XY trace and greyscale formats. In the former format the data shown is ‘raw’ with no processing other than grid biasing having been done. The data in the greyscale images has been interpolated and selectively filtered to remove the effects of drift in instrument calibration and other artificial data constructs and to maximise the clarity and interpretability of the archaeological anomalies.

An XY plot presents the data logged on each traverse as a single line with each successive traverse incremented on the Y-axis to produce a ‘stacked’ plot. A hidden line algorithm has been employed to block out lines behind major ‘spikes’ and the data has been clipped. The main advantage of this display option is that the full range of data can be viewed, dependent on the clip, so that the ‘shape’ of individual anomalies can be discerned and potentially archaeological anomalies differentiated from ‘iron spikes’. Geoplot 3 software was used to create the XY trace plots.

Geoplot 3 software was used to interpolate the data so that 3600 readings were obtained for each 30m by 30m grid. The same program was used to produce the greyscale images. All greyscale plots are displayed using a linear incremental scale.

The results and subsequent interpretation of data from geophysical surveys should not be treated as an absolute representation of the underlying archaeological and non-archaeological remains. Confirmation of the presence or absence of archaeological remains can only be achieved by direct investigation of sub-surface deposits.

Appendix 2: Survey location information

The site grid was laid out using a Trimble VRS differential Global Positioning System (Trimble 5800 model). The accuracy of this equipment is better then 0.01m. The survey grids were then super-imposed onto a base map provided by the client to produce the displayed block locations. However, it should be noted that Ordnance Survey positional accuracy for digital map data has an error of 0.5m for urban and floodplain areas, 1.0m for rural areas and 2.5m for mountain and moorland areas. This potential error must be considered if co-ordinates are measured off hard copies of the mapping rather than using the digital co-ordinates.

Archaeological Services WYAS cannot accept responsibility for errors of fact or opinion resulting from data supplied by a third party.

Appendix 3: Raw XY trace plot data

SECTOR BOUNDARY

N

11.6m

Def

CROMER ROAD

hurst

3148 00

3146 00

Posts

Posts

Manship's
Plantation

Manship's
Plantation

A 149

20.0 nT/cm

Archaeological Services W Y A S
PO Box 30, Nepshaw Lane South, Morley, LS27 0UG
Tel: 0113 383 7500 Fax:0113 383 7501

6488 00

6490 00

Raw XY trace plot of magnetometer data; Sector 1 (1:1000 @ A3)

0 20m

SECTOR BOUNDARY

N

Clere House

PO

Allotment Gardens

Posts

Manship's Plantation

Filby Lane

CR 3148 00

3146 00

6492 00

20.0 nT/cm

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Archaeological Services W Y A S
PO Box 30, Nepshaw Lane South, Morley, LS27 0UG
Tel: 0113 383 7500 Fax:0113 383 7501

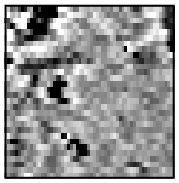
Raw XY trace plot of magnetometer data; Sector 2 (1:1000 @ A3)

0 20m

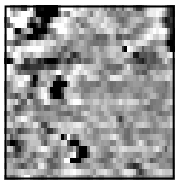
Appendix 4: Data repeatability

Data Repeatability

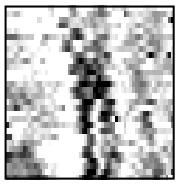
JOB NUMBER	4280	SITE CODE	EAN14	JOB NAME	Land at Ormesby St Margaret, Great Yarmouth, Norfolk



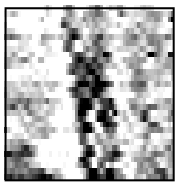
27/08/2014 Grid A surveyed at 11:45 N



27/08/2014 Grid A surveyed at 14:00 N



28/08/2014 Grid B surveyed at 10:20 N



28/08/2014 Grid B surveyed at 13:40 N

Appendix 5: Geophysical archive

The geophysical archive comprises:-

- an archive disk containing compressed (WinZip 8) files of the raw data, report text (Microsoft Word 2000), and graphics files (Adobe Illustrator CS2 and AutoCAD 2008) files; and
- a full copy of the report.

At present the archive is held by Archaeological Services WYAS although it is anticipated that it may eventually be lodged with the Archaeology Data Service (ADS). Brief details may also be forwarded for inclusion on the English Heritage Geophysical Survey Database after the contents of the report are deemed to be in the public domain (i.e. available for consultation in the Norfolk Historic Environment Record).

Appendix 6: OASIS Form

OASIS DATA COLLECTION FORM: England

Printable version

OASIS ID: archaeol11-198917

Project details

Project name	Land at Ormesby St Margaret
Short description of the project	A geophysical (magnetometer) survey covering approximately 9 hectares was carried out on land at Ormesby St Margaret, to provide further information on the archaeological resource of the site prior to its proposed development. Anomalies of significant archaeological potential have been identified across the majority of the site confirming, enhancing and defining the extent of archaeological remains indicated by cropmarks, documentary evidence and find-spots. These remains are likely to be predominantly medieval and post-medieval in date, including the site of St Peter's Church, which judging from the survey results confirms that the church was the early focus of the village. The cropmarks suggestive of prehistoric and Roman activity are much less represented in the magnetic data. The survey has confirmed the conclusion of an earlier desk-based assessment that the site contains important heritage assets of high archaeological potential.
Project dates	Start: 28-08-2014 End: 29-08-2014
Previous/future work	Not known / Not known
Any associated project reference codes	EAN14 - Sitecode
Any associated project reference codes	4280 - Contracting Unit No.
Type of project	Field evaluation
Site status	None
Current Land use	Cultivated Land 4 - Character Undetermined
Monument type	N/A None
Monument type	N/A None
Significant Finds	N/A None
Significant Finds	N/A None
Methods & techniques	"Geophysical Survey"
Development type	Not recorded
Prompt	National Planning Policy Framework - NPPF

Position in the planning process	Not known / Not recorded
Solid geology (other)	Crag Group
Drift geology (other)	Happisburgh Glacigenic Formation Sand
Techniques	Magnetometry

Project location

Country	England
Site location	NORFOLK GREAT YARMOUTH ORMESBY ST MARGARET WITH SCRATBY Land at Ormesby St Margaret
Study area	9.00 Hectares
Site coordinates	TG 4911 1467 52.6717988765 1.68511872007 52 40 18 N 001 41 06 E Point

Project creators

Name of Organisation	Archaeological Services WYAS
Project brief originator	Norfolk HER
Project design originator	Archaeological Services WYAS
Project director/manager	Harrison, S.
Project supervisor	Waterfall, D.
Type of sponsor/funding body	Consultant

Project archives

Physical Archive Exists?	No
Digital Archive recipient	N/A
Digital Contents	"other"
Digital Media available	"Geophysics"
Paper Archive recipient	N/A
Paper Contents	"other"
Paper Media available	"Report"

Project bibliography 1

Publication type	Grey literature (unpublished document/manuscript)
Title	Land at Ormesby St Margaret, Norfolk: Geophysical Survey

Author(s)/Editor(s)	Webb, A.
Other bibliographic details	Report no. 2685
Date	2014
Issuer or publisher	ASWYAS
Place of issue or publication	Morely
Description	A4 blue comb bound report

Entered by	Sam Harrison (sharrison@aswyas.com)
Entered on	5 January 2015

OASIS:

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