M6/18

Witham Archaeology

A Report to Wold Grain Storage Ltd
December 2006

PROPOSED GRAIN STORE EXTENSION, WOLD GRAIN STORAGE LTD, HEMSWELL CLIFF, LINCS

Desk-Based Assessment & Geophysical Survey

R Trimble

WA Report No.: 8 ♦ Site Code: WGHC06 ♦ Museum Accession No.: 2006.262

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PROPOSED GRAIN STORE EXTENSION, WOLD GRAIN STORAGE LTD, HEMSWELL CLIFF, LINCS.

Site Code: WGHC06
LCCM Accession No.: 2006.262
Planning Application No.: M06/P/0616
NGR: SK 9503 9056

Desk-based Assessment & Geophysical Survey

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PROPOSED GRAIN STORE EXTENSION, WOLD GRAIN STORAGE LTD, HEMSWELL CLIFF, LINCS.

DESK-BASED ASSESSMENT & GEOPHYSICAL SURVEY

SUMMARY

This report describes the results of a Desk-based Assessment and Geophysical Survey carried by Witham Archaeology on the site of a proposed storage facility extension at Wold Grain Storage Ltd, Hemswell Airfield, Hemswell Cliff, Lincolnshire. The work was commissioned Wold Grain Storage Ltd in response to a condition of planning permission issued by West Lindsey District Council.

The site lies on the northern side of the complex of former airfield buildings (now a trading estate). Existing storage silos are located on the northern side of the site, while the majority of the proposed new silos are scheduled for construction on a flat, grassed area to the south.

The County Historic Environment Record contains aerial photographs showing a linear ditch - probably a prehistoric or Roman boundary - to the east of the site. Traces of cropmarks adjoining the feature could indicate related boundary ditches. There is also mention of a triple ditched boundary in approximately the same area, but the feature is not visible on the available aerial photographs.

The geophysical survey carried out by Stratascan Ltd located anomalies indicative of a cut feature in the western part of the survey area, with an area of possible stone or masonry further to the east.

The new storage silos are likely to impact upon deposits up to one metre below existing ground level. It is therefore likely that any archaeology in the survey area would be substantially affected by the development.

1.0 INTRODUCTION

This report describes the results of an Archaeological Desk-based Assessment and Geophysical Survey carried out by Witham Archaeology on the site of the proposed grain store extension at Wold Grain Storage Ltd, Hemswell Cliff, Lincolnshire. The work was commissioned by Wold Grain Storage Ltd in response to a condition of planning permission issued by West Lindsey District Council. The fieldwork component of the project was carried out on 4th December, 2006.

Planning permission (Application No. M06/P/0616) has been granted by West Lindsey District Council, for the erection of 27 new grain storage silos, along with 2 dryers, 2 loading hoppers, a fuel tank, a plant building, and interlinking gantries. The plans also provide for a new internal access road. The desk-based assessment and geophysical survey was initiated in response to a condition of planning permission issued by West Lindsey District Council.

The information in this document is presented with the proviso that further data may yet emerge. Witham Archaeology cannot, therefore, be held responsible for any loss, delay or damage, material or otherwise, arising out of this report. The document has been prepared in accordance with the Code of Conduct of the Institute of Field Archaeologists.

2.0 SITE LOCATION, TOPOGRAPHY & GEOLOGY

The village and civil parish of Hemswell Cliff, in the administrative district of West Lindsey, lies approximately 18km north of Lincoln and 14km east of Gainsborough (see Figs 1 & 2). Founded on the site of the now defunct RAF Station Hemswell (closed in 1967) the village incorporates a residential component - mostly former RAF housing - and a trading estate utilising the surviving airfield buildings. Wold Grain Storage Ltd is situated on the northern periphery of the trading estate, with existing storage facilities occupying the northern half of the *c.* 2.3 ha site and an area of open ground to the south. The latter is bounded by areas of hardstanding associated with the former airfield to the north and west, with small trees lining the southern boundary. A tarmac track runs along the full length of the eastern boundary.

The parish of Hemswell spans the west facing scarp of the N-S Jurassic limestone ridge (the 'Lincoln Edge') running between Lincoln and the Humber. To the east the parish extends from the scarp to the line of the modern A15 (Ermine Street), attaining a maximum elevation of *c.* 69m OD. To the west it extends across claylands at an elevation of *c.* 20m OD (Everson 1991, Archive Notes). The ancient village of Hemswell is located at the foot of the scarp slope, with Hemswell Cliff on higher, generally level ground to the east of the scarp. The superficial geology consists of Lincolnshire Limestone (British Geological Survey, Market Rasen, Sheet 102, Solid and Drift).

3.0 AIMS & OBJECTIVES

The principal aims and objectives of the project, as set out in a Witham Archaeology specification of 10th November 2006, were to:

- *Provide information from documentary sources, which places the site in its historical context, and to record prevailing site circumstances.*
- *Identify any magnetic anomalies indicative of underlying archaeological remains and to assess the archaeological significance of such remains.*
- *Provide site specific archaeological information and an assessment of the potential impact of development, which, if necessary, would allow for the design of any further archaeological investigation which might be required.*
- *Produce a project archive for deposition with the appropriate museum.*

4.0 METHODOLOGY

4.1 Desk-based Assessment and Walkover Survey

A search was made in the Lincolnshire County Historic Environment Record (HER) for sites of archaeological significance falling within a *c.* 1km radius of the site. Further to this, a search was made at the Lincolnshire Archives Office for relevant topographical information: early Ordnance Survey Maps, enclosure award plans, private surveys and tithe maps.

There are several extremely useful secondary sources containing information relevant to the area - most notably a history of the village of Hemswell from 1086 - 1901 (Binall 1985) and archive notes arising from an RCHM(E) survey of earthworks in West Lindsey (Everson, Taylor & Dunn 1991).

A comprehensive walkover survey of the development area was carried out on 15th November, 2006 to ascertain the nature of current land-use and general site circumstances, and to identify any salient features of potential archaeological significance. A photographic record (both film and digital) made at the time of the visit includes general views of site as well as specific views of the areas scheduled for development under the current proposals. The following sources of information were consulted for the purposes of the current study:

i) Lincolnshire County HER	Parish Files
	Sites Database
	Aerial Photographs
	RCHM(E) transcriptions of aerial photographs
ii) Lincolnshire Archives Office	Early OS maps
	Enclosure award documents and maps

iii) Secondary sources of information (see bibliography).

iv) Information on the development proposal made available by Wold Grain Storage Ltd.

4.2 Geophysical Survey

The only area suitable for geophysical survey was the grassed area (*c.* 7625m²) south of the existing storage silos. In anticipation of high levels of ferrous contamination resulting from previous use of the site, it was decided that both magnetometry and resistance surveys would be carried out. For full details of the survey methodology see Appendix B.

5.0 RESULTS

5.1 Walkover Survey

A site visit was made on 15th November 2006. This revealed grass *c.* 300mm high across most of the area south of the existing silos, with evidence of recent dumping (broken concrete, turf, redeposited soil, plastic and iron) to the northeast. A southwest-northeast aligned area of ground disturbance (probably recent) was visible in the western part of the area, in the form of upturned soil interspersed with nettles.

Ground level immediately east of the existing silos (intended location for two new silos) appeared to have been raised – to a maximum of about 1m above existing ground level at the northeastern corner of the site. This probably reflects dumping of material disturbed by construction of the existing silos.

5.2 Documentary Research

This section contains a period by period discussion of the results of documentary research. Although the primary purpose of this research was to collate evidence of known archaeological activity in the immediate vicinity of the site (nominal 1km radius - see Appendix A) the discussion contains references to more remote sites where this is deemed relevant to an understanding of the wider setting.

Prehistoric (AD43 and earlier)
Two aerial photographs contained in the County Historic Environment Record show a set of cropmarks (HER 50352) interpreted as being of probable prehistoric date, on farmland to the east of Hemswell Airfield (see Fig. 2). The most prominent feature, as plotted by the Royal Commission of the Historical Monuments (England), is a single ditch, which starts at a point *c.* 500m east of the development site boundary and runs southeast for a distance of around 500m before turning east to continue for a further 180m. Occasional short linear traces branching to north and south off the main boundary, may be interpreted as associated ditches. The same photographs show a linear cropmark (*c.* 180m long) aligned northeast-southwest, immediately northeast of the airfield. This feature, if projected to the southwest, aligns with a point close to the eastern corner of the development area.

Another cropmark lying at right angles to the above and situated some 200m north of the site, takes the form of an interrupted linear.

The wider landscape around the study area – including Hemswell Willoughton, Blyborough and Grayingham parishes - has been identified as one of three landscape blocks in north-western Lincolnshire containing cropmarks of potential significance for resolving issues of spatial relationships and extents of land units as defined by multiple-ditched and other prehistoric boundary forms (Bountwood 1998, 33). One notable example - a triple ditch and possible terminus with radiating boundaries - occurs on the border between Hemswell parish and Willoughton parish, approximately 1.5km northwest of the site (see also *Romano-British* below). It is a rare example - one of only two observed in West Lindsey - of a prehistoric multiple-ditched boundary aligning with a parish boundary (Bountwood 1998, 39). A set of undated cropmarks (HER 51090), comprising a circular enclosure or ring ditch and two linear features, lies about 1.5km southeast of the site in Glentworth Parish.

A possible long barrow of Neolithic date has been noted on aerial photographs, approximately 1.8km northeast of the site in close proximity to Ermine Street. Cropmarks indicate possible Bronze Age barrows in the area southeast of Caenby Corner (HER 53959 & 53962) and two early Iron Age Sites have been found in close proximity to Hemswell village. The only record of the first site, located *c.*700m north of the village, consists of an annotated plan by Mr FT Baker. The second site, located 900m south-east of Hemswell village (HER 50980) and about 1.5km southwest of the site produced sherds of early Iron Age pottery and a skeleton.

Romano-British (AD 43 – c. AD 450)
The eastern boundary of Hemswell parish is formed by Ermine Street (the modern A15), which follows the line of the major Roman road between London and York. It lies *c.* 1.5 km east of the proposed development site.

There is no direct evidence for Romano-British activity in the immediate locality of the site, but a rural settlement (HER 54814) of the period was identified during archaeological investigations along the route of a new gas pipeline approximately 2km to the northwest at Patchett's Cliff in the adjacent parish of Willoughton. Excavations revealed two possible phases of occupation occurring within the limits of an L-shaped enclosure defined as an anomaly by prior geophysical survey. Pottery from the site indicates a date range of mid/late second to third and possibly fourth century. The site lies within a wider complex of generally indistinct cropmarks, including ditches interpreted as forming part of settlement or stock enclosures. A single ditch, continuing the line of one element of the nearby triple ditch system, extended into the investigated area (see above). The feature was excavated where encountered in the pipeline trench immediately south of the L-shaped enclosure, but its primary fills did not yield any datable artefactual material (Cooke & Smith 1998).

Several finds of Romano-British date – including coins (HER 51017 & 51018), wall plaster (HER 51060) and pottery (HER 51054) – have been made in the area south and east of Caenby corner, in close proximity to Ermine Street.

Anglo-Saxon/Scandinavian (c. AD 450 – AD 1066)
There is no record of finds to indicate Anglo-Saxon activity in the immediate vicinity of the site. However, limited evidence of early Anglo-Saxon occupation in the parish is provided by two sherds of pottery found at the foot of the scarp slope *c.* 1.3km to the southwest.

The site of an early Anglo-Saxon barrow (HER 50430) lies slightly further afield – to the southeast of Caenby Corner and approximately 2.5km southeast of the site. Excavated in 1849 by Edwin Jarvis the rector of nearby Hackthorn, the barrow was found to contain a high status burial of possible 'princely' status, accompanied by a sword and shield, the latter with silver mounts dated to the early seventh century. Paul Everson has speculated that the position of the barrow – close to the intersection of Ermine Street (A Roman road) and a probable ancient routeway (HER 53954; the modern A613) defining the boundary between Hemswell and Harpswell parishes – could indicate the site of an ancient meeting place and traditional place of authority. This interpretation is to some extent

corroborated by the later documented role of the nearby settlement of Spital in the Street (see below) as a meeting place of the West Riding of Lindsey (Everson 1993, 94-8).

Entries in the Domesday Book of 1086 confirm that a settlement was in existence at Hemswell by the late Saxon/Scandinavian period. The place-name *Helmeswelle* as it appears in Domesday is believed to derive from 'Helm's spring' after the Old English personal name *Helm* and the Old English *wella* (Cameron 1998, 63).

The Domesday Book indicates that there were three principal units of land ownership in the parish during the immediate pre-conquest period. These comprised the king's land forming part of the soke of Kirton (most recently owned by Edwin Earl of Mercia) and two small manors belonging to the lords Elnod and Speri.

Medieval (c. 1066 – c. AD 1539)
A comprehensive survey of the medieval history of Hemswell (Binall 1985) forms the basis of much the following account.

After the conquest of England by William the Conqueror the king's land in Hemswell was retained by the crown. According to the Domesday Book the king's estate comprised four carucates (notionally the area of land that could be cultivated by an eight-ox plough-team) and two bovates (an eighth of a carucate) of arable land, and one hundred and seventy three acres of meadow. The number of occupants is listed as seventeen sokemen, one villain and seven bordars, with three teams of oxen. The land was passed on to subsequent kings until, in the time of Edward III, it became permanently attached to the Earldom of Cornwall.

Land held by Alnoth from the Saxon lord Elnod was granted by William I to Odo Bishop of Bayeux. This comprised four bovates of land assessed for tax and twenty seven and a half acres of meadow. By the time of the Lindsey Survey of 1115-18 the land had passed to Count Stephen of Brittany. It eventually descended by marriage to the Whichcote family in the late fifteenth century.

Speri's manor, consisting at the time of the Domesday survey of ten bovates of arable land cultivated by two ox-teams, had passed to the Norman lord Martin after the conquest and then to Earl Stephen of Amuele by the time of the Lindsey Survey in 1115-18. As a result of later sub-infuedation, there were then a number of tenants, including Oliver Wendover, who in an account of 1346 held a quarter part of a fee of the Earl of Amuele.

Before the arrival of the Black Death in the mid fourteenth century Hemswell was divided into two separate parishes, centred on St Helen's church to the north and the church of All Saints to the south. It seems that St Helen's parish might have suffered more greatly from the depopulation associated with the Black Death, resulting in the demise of the church for which there are no surviving remains (Everson 1991, Archive Notes). The surviving church of All Saints contains Early English and Decorated elements (Pevsnor, Harris & Antram 1989, 380). It appears to have been heavily rebuilt in the fourteenth century, possibly in response to the decline of St Helen's (Binall 1985).

The shrunken medieval settlement at Spital in the Street (HER 50846) lies *c.* 1.5km east of the site, extending either side of Ermine Street (now the A15). These remains extend into the parishes of Hemswell, Glentham and Bishop Norton but are usually documented with Hemswell. Early RAF vertical photographs indicate the original limits of the settlement, in the form of slight earthworks in both Bishop Norton and Hemswell parishes. These conform to areas of 'Old Enclosure' defined in the Bishop's Norton and Hemswell enclosure award surveys of 1772 and 1792-4 respectively. The settlement included a chapel dedicated to St. Edmund the Martyr and a connected hospital founded in 1396 (HER 50981), though there are twelth century references to an earlier institution.

Post Medieval (c. AD 1540 to present)
The population of Hemswell halved during the later seventeenth century but recovered rapidly therafter. This could account for a discernable southward shift in the focus of the settlement (Everson 1991, Archive Notes). The abandonment or shrinkage of settlements was widespread in West Lindsey during the sixteenth and seventeenth cenuries, perhaps owing to a combination of factors including

migration to towns, the effects of plague, conversion from arable to pasture and the rationalisation of farming (Everson, Taylor & Dunn 1991).

The medieval hospital and chapel at Spital in the Street were demolished in *c.* 1594, with the materials being used to build a sessions house in 1619. Two cottages believed to have been constructed in 1620 and a chapel dating from 1661 still survive.

Parliamentary enclosure of the open fields of the parish was carried out during the period 1792-4. The associated award plan indicates that, with the exception of a small block of land adjacent to the village (divided between three individuals) the majority of parish land east of Kirton Road/Middle Street was divided between three landholders: Sir Thomas Whichcote, the Corporation of Lincoln and Sir Cecil Wray (Russell & Russell 1983, 52-4). The proposed development area together with the majority of the former Hemswell Airfield lies within the area allocated to Sir Thomas Whichcote. This extended north from the parish boundary with Harpswell/Glentworth and east from Kirton Road/Middle Street to form the largest block of land. By the time of the First Edition 6 inch to one mile Ordnance Survey Map of 1885 further subdivision had taken place. However, none of the pre-airfield field boundaries appear to extend into the area of the proposed development.

The first airfield at Hemswell was opened in 1916, during World War 1. Named Harpswell, it lay immediately east of Middle Street and north of the line of the A631, extending over an area of approximately 60 hectares. The airfield was closed in the immediate post-war period and its four hangers were demolished. The brick operations room survived – eventually becoming a farm store (Blake, Hodgson & Taylor 1984, 97-102). A much larger airfield (HER 53944) - Royal Air Force Station Hemswell - was opened at the end of 1936, becoming operational in 1937. Built on the site of the original airfield, and additional land to the north and east, it was used by Bomber Command for bombing operations during World War II and continued in use as an airfield until the late 1950's when it was equipped as a Douglas Thor missile site. The missiles were withdrawn in 1963 and the site was briefly used for the final development stage of the TSR-2 (intended replacement for the Canberra and v-bombers) project until its cancellation in 1965. The station was eventually closed by the RAF in 1967.

The main area for the proposed extension lies between hard-standings surviving from the airfield. A hanger or warehouse lies a short distance to the northwest.

Most of the pre-war RAF station buildings remain intact following conversion of the site to a trading estate. The estate is noted its concentration of antiques traders.

5.3 Geophysical Survey

The geophysical survey detected possible evidence of stone and masonry in the western part of the site, as well as a possible cut feature and bank. Three linear anomalies in the eastern part of the area were interpreted as probable ploughmarks or (less likely) as possible degraded stone walls. For a full description of the results, and analysis, please refer to Appendix B)

6.0 ASSESSMENT OF ARCHAEOLOGICAL POTENTIAL

Later Prehistoric and Romano-British
The combined results of the desk-based assessment and geophysical survey indicate that there is a moderate potential for remains of the later prehistoric and Roman periods, in the form of features associated with the set of cropmarks located to the east of the airfield's perimeter. The cropmarks have been interpreted as boundary features, but the potential for related settlement activity, such as that revealed at Patchett's Cliff (see above), should not be overlooked, and it might be considered significant that the cropmarks lie in close proximity to an ancient spring (Aisthorpe Springs). The cut linear feature identified by geophysical survey could represent an element within this landscape. The Historic Environment Record reference to a possible triple ditched boundary in the area, while uncorroborated by photographic evidence, should not be disregarded. Later prehistoric land allotment is an important area of archaeological research, and there are key questions to be answered with

regard to the dating and development of boundary ditches. If present on the site such remains would be of at least local and regional importance.

Anglo-Saxon
There is a low but not insignificant potential for Anglo-Saxon remains. While there is no evidence of Anglo-Saxon activity in the immediate vicinity of the site, there is a strong case (based in part upon the presence of the 'princely' burial at Caenby Corner) for attributing an early importance to the settlement at Spital in the Street. The early Anglo-Saxon settlement pattern was probably dispersed in character, compared to the later pattern of nucleated settlement. Such nucleation would appear to have taken place by the late Anglo-Saxon/Scandinanvian period as evidenced by the emergence of Hemswell in the documentary record. Any evidence for earlier Anglo-Saxon activity on the site, especially in view of its proximity to the high status burial at Caenby Corner would be of at least regional, possibly national importance.

Medieval
The late eighteenth century enclosure award map indicates that the area now occupied by Hemswell Cliff lay, during the medieval and early post-medieval period, within the open fields (South Cliff and North Cliff) of the parish of Hemswell. There is, therefore, a low potential for remains associated with settlement activity. There is however a high potential for evidence of agricultural (almost certainly arable) activity in the form of the broad furrows associated with the typical 'ridge and furrow' cultivation. These type of remains are ubiquitous in the region but do have the potential to inform about the particular cultivation pattern in operation. Its presence on the site would be of primarily local significance.

Post-medieval
There is a low potential for significant remains of this period. The 1885 Ordnance survey map demonstrates that the area now occupied by Hemswell Cliff was eventually divided into a number of relatively small fields; the site is entirely contained within one of these fields. The later use of the land as part of RAF Station Hemswell is already well-documented. The geophysical survey located a sizeable area of high resistance to the east of the cut anomaly mentioned above. This might indicate a stone or masonry feature associated with the airfield but a much earlier date cannot be discounted.

7.0 IMPACT ASSESSMENT

There is minimal information available from which to assess the likely state of preservation of remains should they be present on the site. The grassed area south of the existing facility, where the majority of new silos will be built (see Fig. 3), appears to be relatively undisturbed but might have been affected by groundworks associated with the construction of the airfield and/or by subsequent activities relating to subsequent use of the adjacent hardstandings. The current use as a storage facility does not appear to have had a significant impact upon this area. A row of four new silos immediately south of the existing silos are to be partially located on the area of the hardstanding, where there is an unknown degree of previous truncation. Two new silos are to be located to the east of the existing silos. This area might have been affected by enabling works relating to the earlier phase of construction.

It is anticipated that construction of the new silos will result in substantial disturbance to a depth of approximately one metre below existing ground level. In view of the expected shallow depth of topsoil and other overburden (for example, relict ploughsoil) it is likely that any archaeological deposits present on the site would suffer a relatively high degree of truncation.

8.0 CONCLUSIONS

The results of the desk-based assessment indicate the presence of a cropmark ditch to the east of the proposed development, with traces of contiguous ditches to north and south suggestive of later Prehistoric or possibly Romano-British land divisions or enclosures. The geophysical survey located a

number of anomalies, most notably a probable cut feature, which might be associated with the cropmarks to the east, and an area containing possible stone or masonry. An assessment of the likely impact of the development indicates that any remains contained on the site would be adversely affected by the intended programme of construction.

Should the local planning authority require further information on the site, a programme of trial trench evaluation might represent a suitable method for establishing the date, extent and character of anomalies revealed by the geophysical survey. In this case, the linear cut anomaly (possible ditch) to the west of the site, the area of possible masonry, and the linear anomalies at the eastern end of the site should be targeted as priorities for further assessment. Trial trench evaluation on other parts of the site – in particular, the area of hardstanding immediately south of the existing silos – might be more problematic.

9.0 ACKNOWLEDGEMENTS

The author of this report would like to thank Mr Richard Milligan-Manby of Wold Grain Storage Ltd and Ken Spreadbury of T H White for assistance in providing information relating to the development. Thanks are also due to Stratascan Ltd for prompt delivery of the geophysical survey results and Ed Lewis for assistance in locating information at the County Historic Environment Record Office.

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11.0 PROJECT/ ARCHIVE DETAILS

11.1 LHA NOTE DETAILS

SITE CODE: WGHC06

PLANNING APPLICATION No.: M06/P/0616

FIELD OFFICER: R Trimble (Geophysical Survey by Stratascan Ltd)

NGR: TF 9503 9056

CIVIL PARISH: Hemswell Cliff

SMR No.:

DATE OF INTERVENTION: Walkover Survey - 15th November 2006
Geophysical Survey - 4th December 2006

TYPE OF INTERVENTION: Desk-Based Assessment & Geophysical Survey

UNDERTAKEN FOR: Wold Grain Storage Ltd

11.2 ARCHIVE DETAILS

PRESENT LOCATION: Witham Archaeology, 65 Grantham Road, Sleaford, Lincolnshire, NG34 7NG

FINAL LOCATION:The City and County Museum, Friars Lane, Lincoln

MUSEUM ACCESSION No.: 2006.262

ACCESSION DATE: -

The Site Archive Comprises:

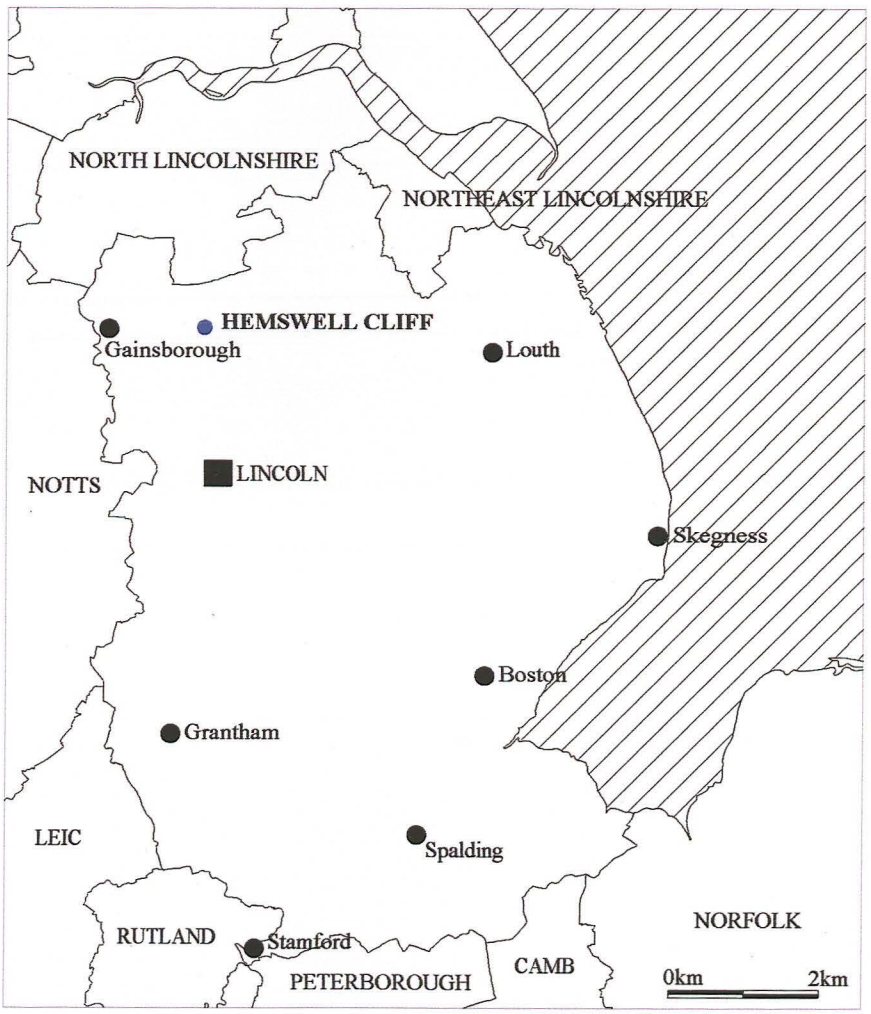
Client Report
Original Stratascan Ltd Report

It is intended that transfer of the archive in accordance with current published requirements will be undertaken following completion of this project.

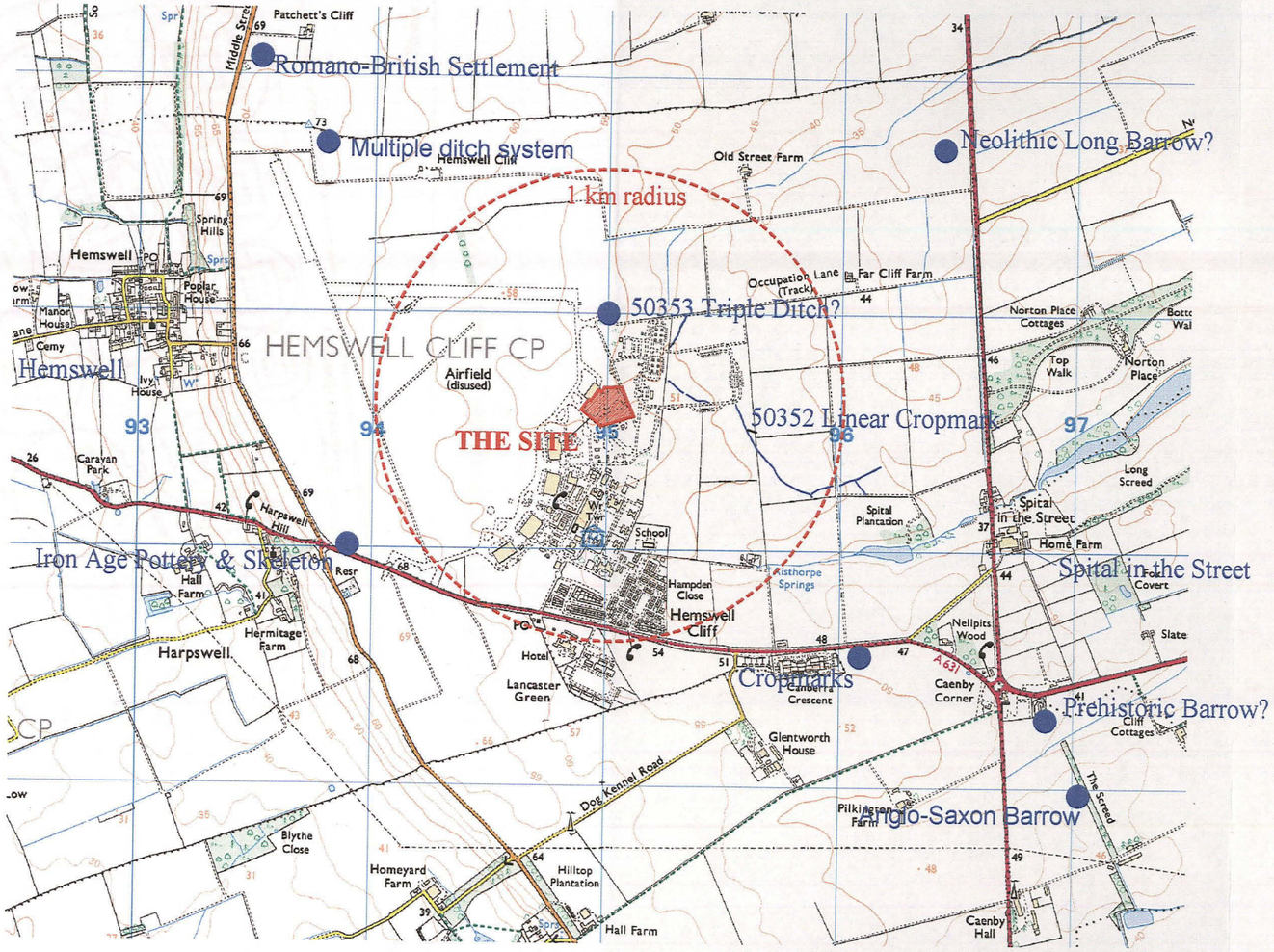
COLOUR PLATES

Plate I - View of surveyed area, looking NE from SW corner of the site

Plate II – General view including surveyed area, looking NW from SE corner of the site



December 2006 Site Location Map Fig. 1

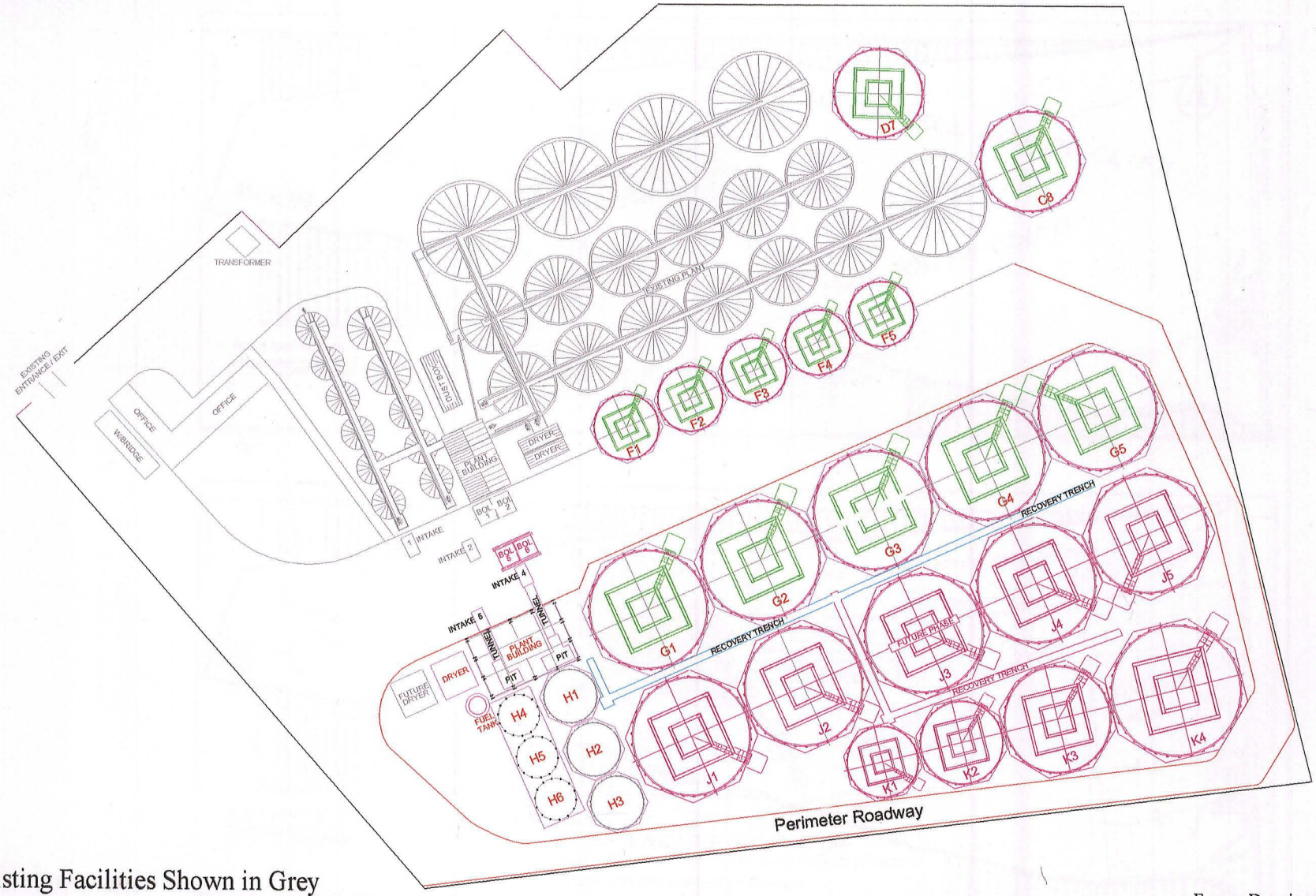


December 2006

Map Showing Site Location, Sites within a 1 km radius and Significant Sites in the Wider Area

Scale 1:25 000

Fig. 2



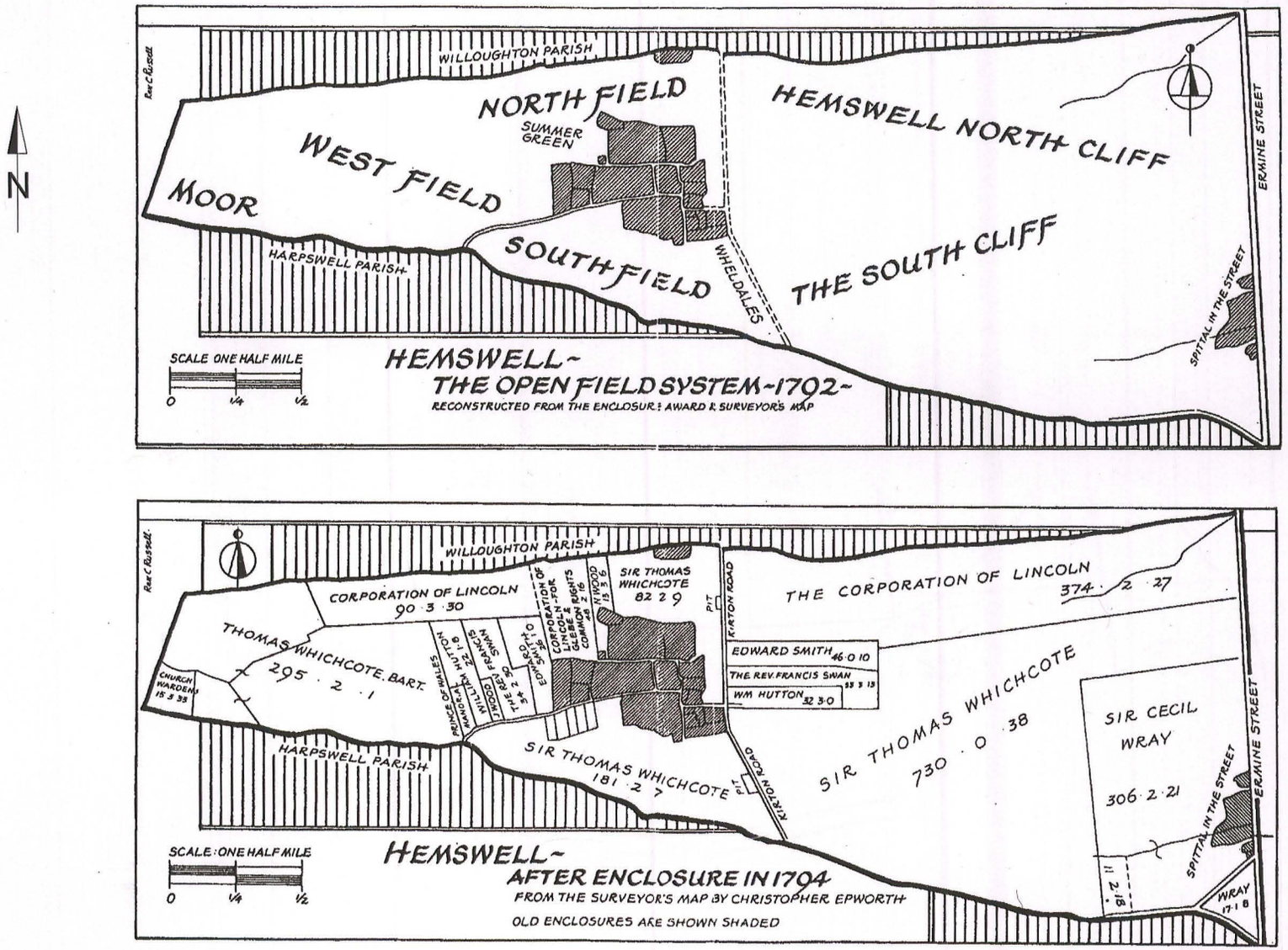
Existing Facilities Shown in Grey

From a Drawing Supplied by TH White

December 2006

Plan Showing Development Proposals Scale 1:1000

Fig. 3



Reproduced from Russell, E & Russell, RC 1983

December 2006 Hemswell Before and After Parliamentary Enclosure Not to Scale Fig. 4

December 2006 | 1907 Ordnance Survey 2nd Edition Map (Surveyed 1885 & Revised 1905) | Scale: 6 inch to 1 mile | Fig. 5

APPENDIX A – SITES LISTED IN THE COUNTY HER

Sites Within 1km Radius of Study Area:

Plan No.	HER No.	NGR	Description/ Period
	50352	SK 9550 9050	Cropmark east of Hemswell airfield – Later Prehistoric?
	50353	SK 95 91	Cropmark of N-S triple ditch - Undated
	53944	SK 9380 9030	RAF Station Hemswell

APPENDIX B – GEOPHYSICAL SURVEY

STRATASCAN

Geophysical Survey Report

Former Airfield, Hemswell Cliff
Lincolnshire

December 2006

J 2268

For

Witham Archaeology

David Elks MSc. AIFA

REGISTERED IFA ORGANISATION

Document Title:	**Geophysical Survey Report** **Former Airfield, Hemswell Cliff, Lincolnshire**
Client:	**Witham Archaeology**
Stratascan Job No:	**2268**
Techniques:	**Detailed magnetic survey (gradiometry)** **Detailed resistance survey**
National Grid Ref:	**SK 950 905**

Field Team:	**Richard Elliott BA., Sam Russell BSc.**
Project Officer:	**David Elks MSc. AIFA**
Project Manager:	**Simon Stowe BSc.**
Report written by:	**David Elks MSc. AIFA**
CAD illustration by:	**David Elks MSc. AIFA**
Checked by:	**Simon Stowe BSc.**

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1 SUMMARY OF RESULTS

Detailed magnetic and resistance surveys were carried out over approximately 7625m^2 of land at a former airfield near Hemswell Cliff, Lincolnshire.

The results show there to be large amounts of ferrous debris across the site which may be masking weaker archaeological targets. Responses which are likely to be anthropogenic cannot be classified as to whether they relate to the former airfield or older archaeology.

2 INTRODUCTION

2.1 Background synopsis

Stratascan were commissioned by Witham Archaeology to undertake a geophysical survey of an area outlined for proposed development for storage silos.

2.2 Site location

The site is located to the north of Hemswell Cliff, Lincolnshire at OS ref. SK 950 905.

2.3 Description of site

The survey area is approximately 7625m^2 and is located adjacent to existing storage silos. The survey area is flat and mostly grass covered with some areas of vegetation, rubble and concrete around the perimeter. The underlying geology is limestone of Inferior Oolite (British Geological Survey South Sheet, Fourth Edition Solid, 2001). The overlying soils are of the Elmton 1 soil association which are brown redzinas (Soil Survey of England and Wales, Sheet 4 Eastern England).

2.4 Site history and archaeological potential

Crop marks have been identified from aerial photographs in adjacent fields to the east of the site of probable prehistoric date. However none are recorded within the survey area itself. The site has been previously used as an RAF airfield from 1916-1967.

There is potential to locate features of prehistoric date in line with adjacent crop marks, however it is likely that ferrous debris form the former airfield may interfere with the results.

2.5 Survey objectives

The objective of the survey was to locate any anomalies that may be of archaeological origin in order they can be assessed prior to development.

2.6 Survey methods

Detailed magnetometry and resistivity surveys were carried out across the site in order to assess the area with complementary techniques. More information regarding these techniques is included in the Methodology section below.

3 METHODOLOGY

3.1 Date of fieldwork

The fieldwork was carried out on a single day, 4th December 2006 when the weather was fine.

3.2 Grid locations

The location of the survey grids has been plotted in Figure 2 together with the referencing information.

3.3 Description of techniques and equipment configurations

3.3.1 Magnetometer

Although the changes in the magnetic field resulting from differing features in the soil are usually weak, changes as small as 0.2 nanoTesla (nT) in an overall field strength of 48,000nT, can be accurately detected using an appropriate instrument.

The mapping of the anomaly in a systematic manner will allow an estimate of the type of material present beneath the surface. Strong magnetic anomalies will be generated by buried iron-based objects or by kilns or hearths. More subtle anomalies such as pits and ditches can be seen if they contain more humic material which is normally rich in magnetic iron oxides when compared with the subsoil.

To illustrate this point, the cutting and subsequent silting or backfilling of a ditch may result in a larger volume of weakly magnetic material being accumulated in the trench compared to the undisturbed subsoil. A weak magnetic anomaly should therefore appear in plan along the line of the ditch.

The magnetic survey was carried out using a dual sensor Grad601-2 Magnetic Gradiometer manufactured by Bartington Instruments Ltd. The instrument consists of two fluxgates very accurately aligned to nullify the effects of the Earth's magnetic field. Readings relate to the difference in localised magnetic anomalies compared with the general magnetic background. The Grad601-2 consists of two high stability fluxgate gradiometers suspended on a single frame. Each sensor has a 1m separation between the sensing elements giving a strong response to deep anomalies.

3.3.2 Resistance Meter

This method relies on the relative inability of soils (and objects within the soil) to conduct an electrical current, which is passed through them. As resistivity is linked to moisture content, and therefore porosity, hard dense features such as rock will give a relatively high resistivity response, while features such as a ditch which retains moisture give a relatively low response.

The resistance meter used was an RM15 in conjunction with an MPX15 multiplexer manufactured by Geoscan Research incorporating a mobile Twin Probe Array. The Twin Probes are separated by 0.5m and the associated remote probes were positioned approximately 15m outside the grid. The instrument uses an automatic data logger, which permits the data to be recorded as the survey progresses for later downloading to a computer for processing and presentation.

Though the values being logged are actually resistances in ohms they are directly proportional to resistivity (ohm-metres) as the same probe configuration was used through-out.

3.4 Sampling interval, depth of scan, resolution and data capture

3.4.1 Sampling interval

Gradiometer
Readings were taken at 0.25m centres along traverses 1m apart. This equates to 3600 sampling points in a full 30m x 30m grid.

Resistance
Readings were taken at 1.0m centres along traverses 1.0m apart. This equates to 900 sampling points in a full 30m x 30m grid. All traverses were surveyed in a "zigzag" mode.

3.4.2 Depth of scan and resolution

Gradiometer
The Grad 601-2 has a typical depth of penetration of 0.5m to 1.0m. This would be increased if strongly magnetic objects have been buried in the site. The collection of data at 0.5m centres provides an appropriate methodology balancing cost and time with resolution.

Resistance
The 0.5m probe spacing of a twin probe array has a typical depth of penetration of 0.5m to 1.0m. The collection of data at 1m centres with a 0.5m probe spacing provides an appropriate methodology balancing cost and time with resolution.

3.4.3 Data capture

Gradiometer
The readings are logged consecutively into the data logger which in turn is daily down-loaded into a portable computer whilst on site. At the end of each job, data is transferred to the office for processing and presentation.

Resistance
The readings are logged consecutively into the data logger which in turn is daily down-loaded into a portable computer whilst on site. At the end of each job, data is transferred to the office for processing and presentation.

3.5 Processing, presentation of results and interpretation

3.5.1 Processing

Gradiometer
Processing is performed using specialist software known as *Geoplot 3.* This can emphasise various aspects contained within the data but which are often not easily seen in the raw data. Basic processing of the magnetic data involves 'flattening' the background levels with respect to adjacent traverses and adjacent grids. 'Despiking' is also performed to remove the anomalies resulting from small iron objects often found on agricultural land. Once the basic processing has flattened the background it is then possible to carry out further processing which may include low pass filtering to reduce 'noise' in the data and hence emphasise the archaeological or man-made anomalies.

The following schedule shows the basic processing carried out on all processed magnetometer data used in this report:

Zero mean traverse	*Last mean square fit = off*
Despike	*X radius = 1 Y radius = 1*
	Threshold = 3 std. dev.
	Spike replacement = mean

Resistance
The processing was carried out using specialist software known as *Geoplot 3* and involved the 'despiking' of high contact resistance readings and the passing of the data though a high pass filter. This has the effect of removing the larger variations in the data often associated with geological features. The nett effect is aimed at enhancing the archaeological or man-made anomalies contained in the data.

The following schedule shows the processing carried out on the processed resistance plots.

Despike	*X radius = 1*
	Y radius = 1
	Spike replacement
High pass filter	*X radius = 10*
	Y radius = 10
	Weighting = Gaussian

3.5.2 Presentation of results and interpretation

Gradiometer
The presentation of the data for the survey involves a print-out of the raw data both as grey scale (Figure 3) and trace plots (Figure 4 and 5), together with a grey scale plot of the processed data (Figure 6). Magnetic anomalies have been identified and plotted onto the 'Abstraction and Interpretation of Anomalies' drawing for the site (Figure 7).

Resistance
The presentation of the data for the site involves a print-out of the raw data as a grey scale plot (Figure 8), together with a grey scale plot of the processed data (Figure 9). Anomalies have been identified and plotted onto the 'Abstraction and Interpretation of Anomalies' drawing (Figure 10).

4 RESULTS

4.1 Magnetic survey

The data from the magnetic survey show large amounts of strong dipolar responses spread across the site. It is likely that this is the result of scattered ferrous debris probably resulting from the former airfield located on the site.

A moderately strong bipolar linear response is observed running across the site west to east with values ranging up to +/-50nT. It is likely that this is caused by a modern ferrous service, which may be deeply buried as a shallow pipe would return values significantly greater of +/-1000nT or more.

4.2 Resistance survey

The resistance survey shows a large area of high and moderately high resistance in the west of the site. It is possible that this relates to stone and masonry remains of anthropogenic origin. It is not clear whether this might be modern features associated with the airfield or older archaeological structures. A low resistance linear response is identified which may be caused by a cut feature, similarly it is not apparent whether this is modern or older. Running parallel to the west of this response a moderately high resistance anomaly can be seen. This is likely to be associated with the possible cut feature and may represent some form of bank to the cut feature.

Three weakly high resistance linear anomalies are also identified towards the east of the survey area. These have only a very low contrast and as such are probably caused by ephemeral features such as ploughing marks, however it remains possible (but unlikely) that they are remnants of more significant high resistance features which have suffered from degradation such as stone walls.

5 CONCLUSION

The site appears to contain a large amount of ferrous debris which may be masking weaker archaeological targets from the magnetic survey data. Anomalies identified in the resistance data seem to be anthropogenic in origin but it is not possible to say if these relate to the former airfield or originate from older archaeological periods.

6 REFERENCES

British Geological Survey, 2001. *Geological Survey Ten Mile Map, South Sheet, Fourth Edition (Solid)*. British Geological Society.

Soil Survey of England and Wales, 1983. *Soils of England and Wales, Sheet 4 Eastern England.*

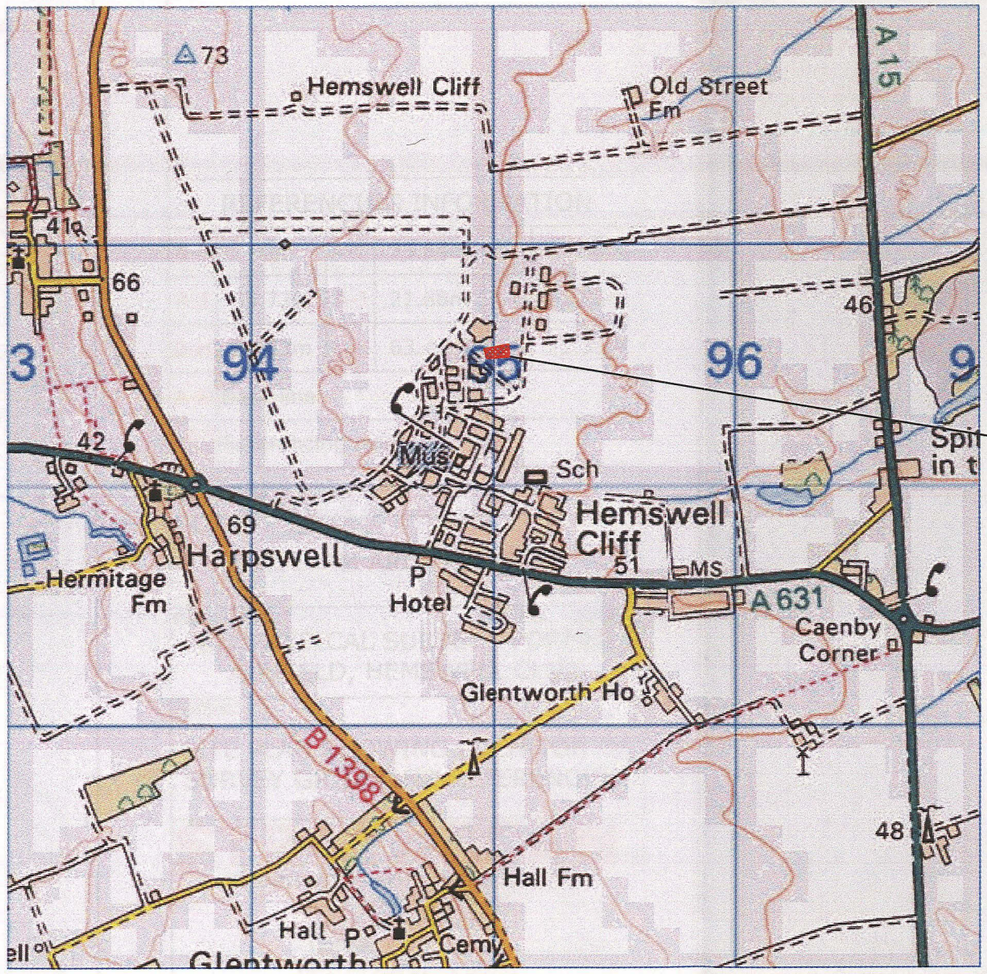
92

91

90

89

88



SURVEY AREA

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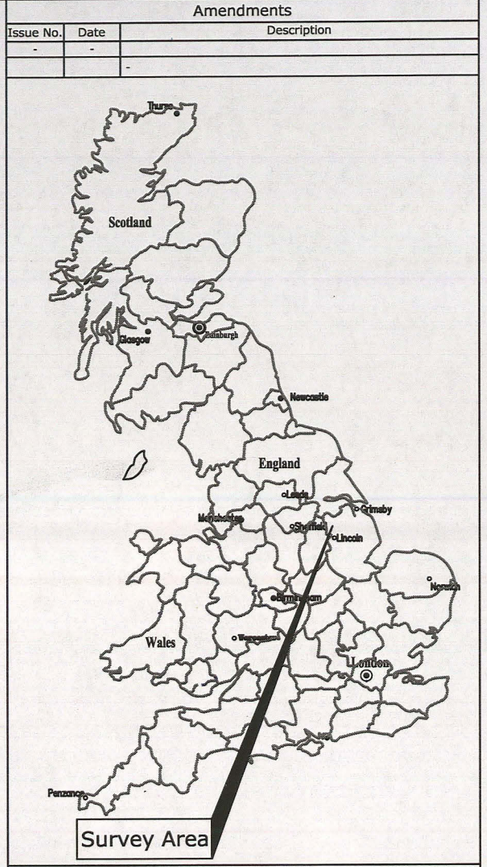

Amendments

Issue No.	Date	Description
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		-

Site centred on NGR SK 950 905

Client
WITHAM ARCHAEOLOGY

Project Title Job No. 2268
GEOPHYSICAL SURVEY - FORMER AIRFIELD, HEMSWELL CLIFF

Subject
LOCATION PLAN OF SURVEY AREA

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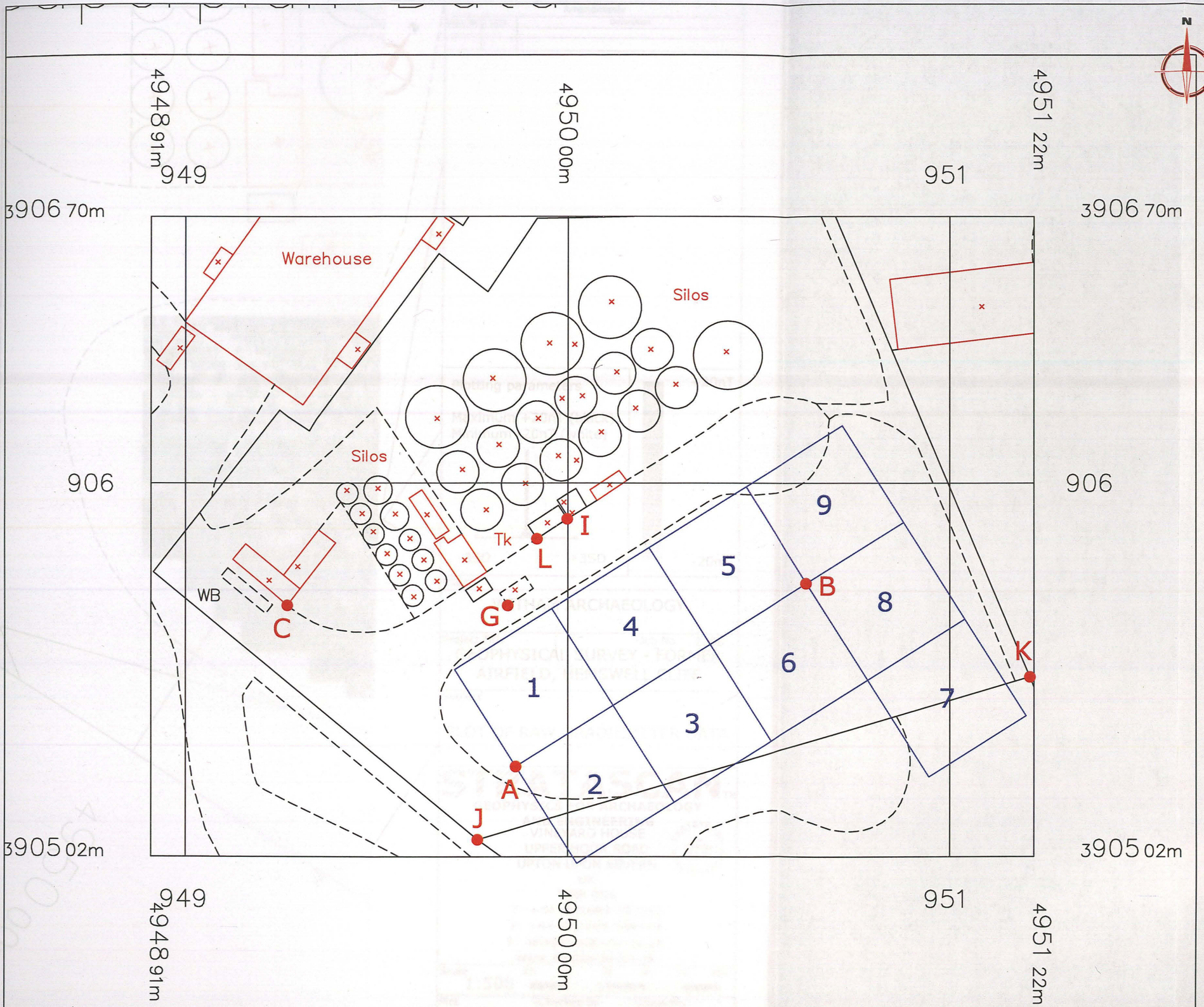

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REFERENCING INFORMATION

A-B	90m	A-C	73.64m	A-G	43.50m
A-I	65.72m	A-J	21.86m	B-G	75.25m
B-H	71.83m	B-K	63.43m	B-L	71.35m

A-B	Base line
C,G,H, I,J,K,L	Referencing points
2	Grid number

Client

WITHAM ARCHAEOLOGY

Project Title — Job No. 2268

GEOPHYSICAL SURVEY - FORMER AIRFIELD, HEMSWELL CLIFF

Subject

SITE PLAN SHOWING LOCATION OF SURVEY GRIDS AND REFERENCING

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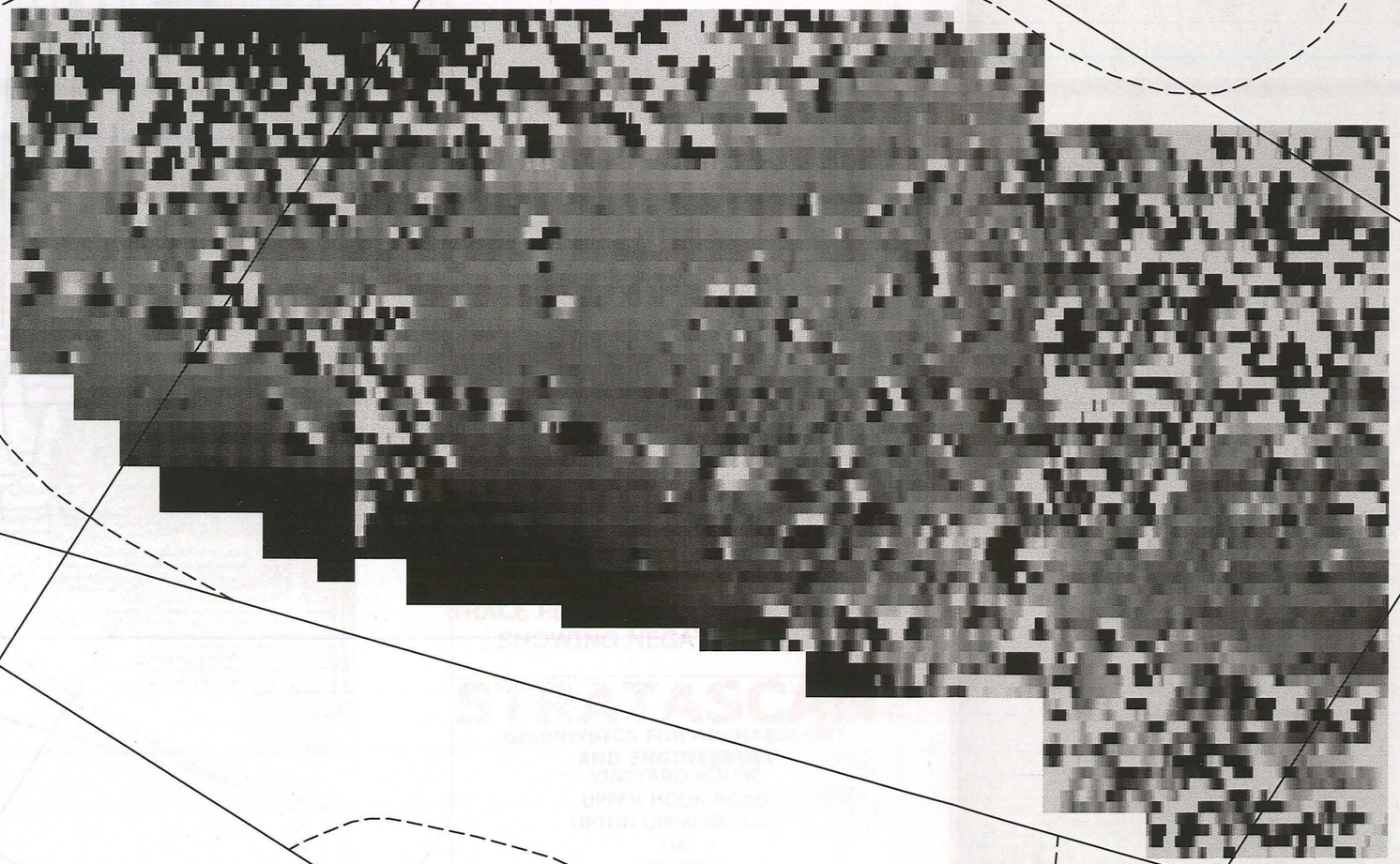

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Plotting parameters

Maximum +20nT (black)
Minimum -20nT (white)

-3SD +3SD

+20nT

-20nT

Client

WITHAM ARCHAEOLOGY

Project Title Job No. 2268

GEOPHYSICAL SURVEY - FORMER AIRFIELD, HEMSWELL CLIFF

Subject

PLOT OF RAW GRADIOMETER DATA

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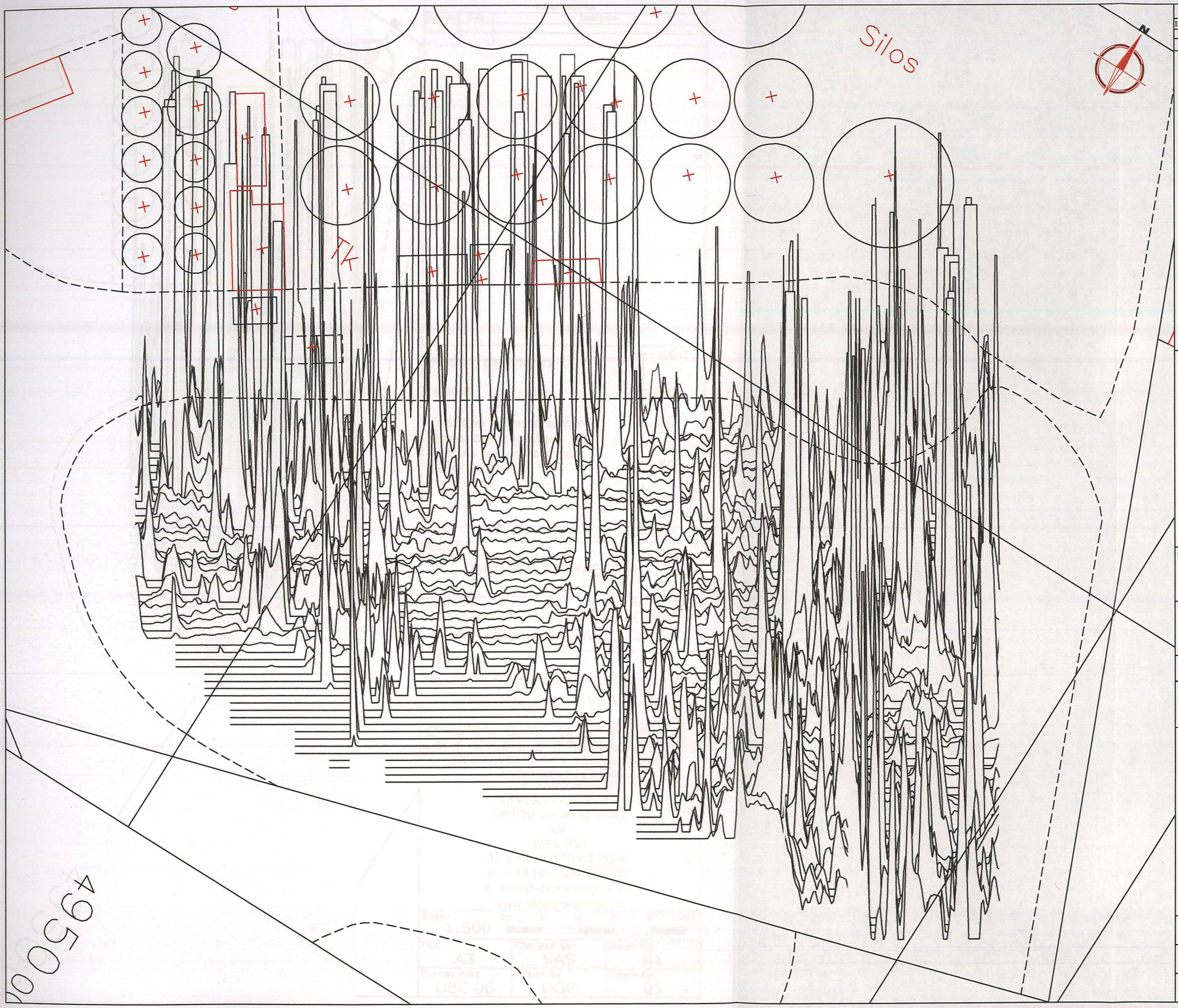

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Plotting parameters

-40nT

(*Negative values displace above the trace line. Hidden values have not been plotted*)

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-80nT
-60nT
-80nT
-40nT
0nT

Client

WITHAM ARCHAEOLOGY

Project Title — Job No. 2268

GEOPHYSICAL SURVEY - FORMER AIRFIELD, HEMSWELL CLIFF

Subject

TRACE PLOT OF GRADIOMETER DATA SHOWING NEGATIVE VALUES

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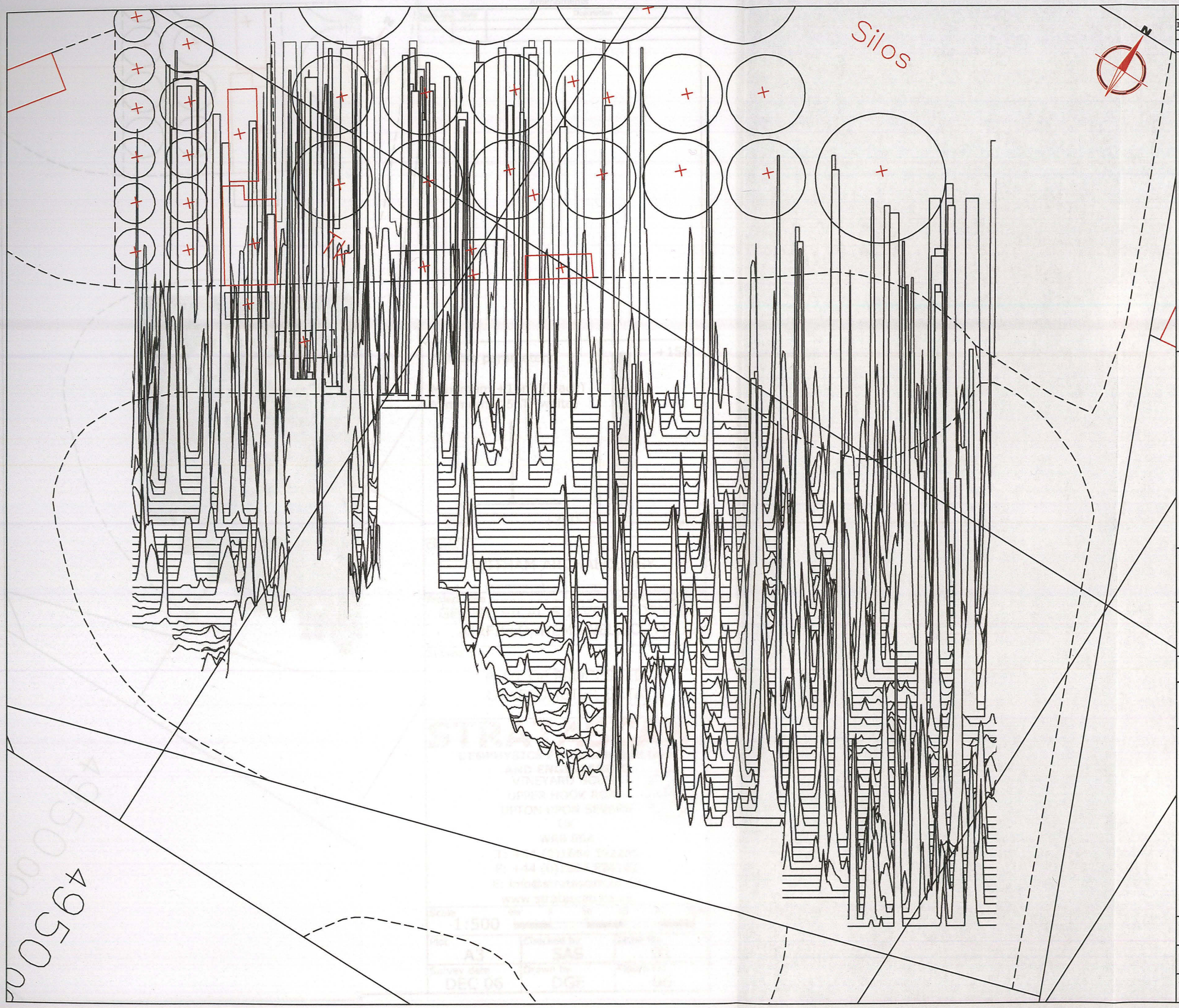

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60nT
40nT
20nT
0nT

Client

WITHAM ARCHAEOLOGY

Project Title — Job No. 2268

GEOPHYSICAL SURVEY - FORMER AIRFIELD, HEMSWELL CLIFF

Subject

TRACE PLOT OF GRADIOMETER DATA SHOWING POSITIVE VALUES

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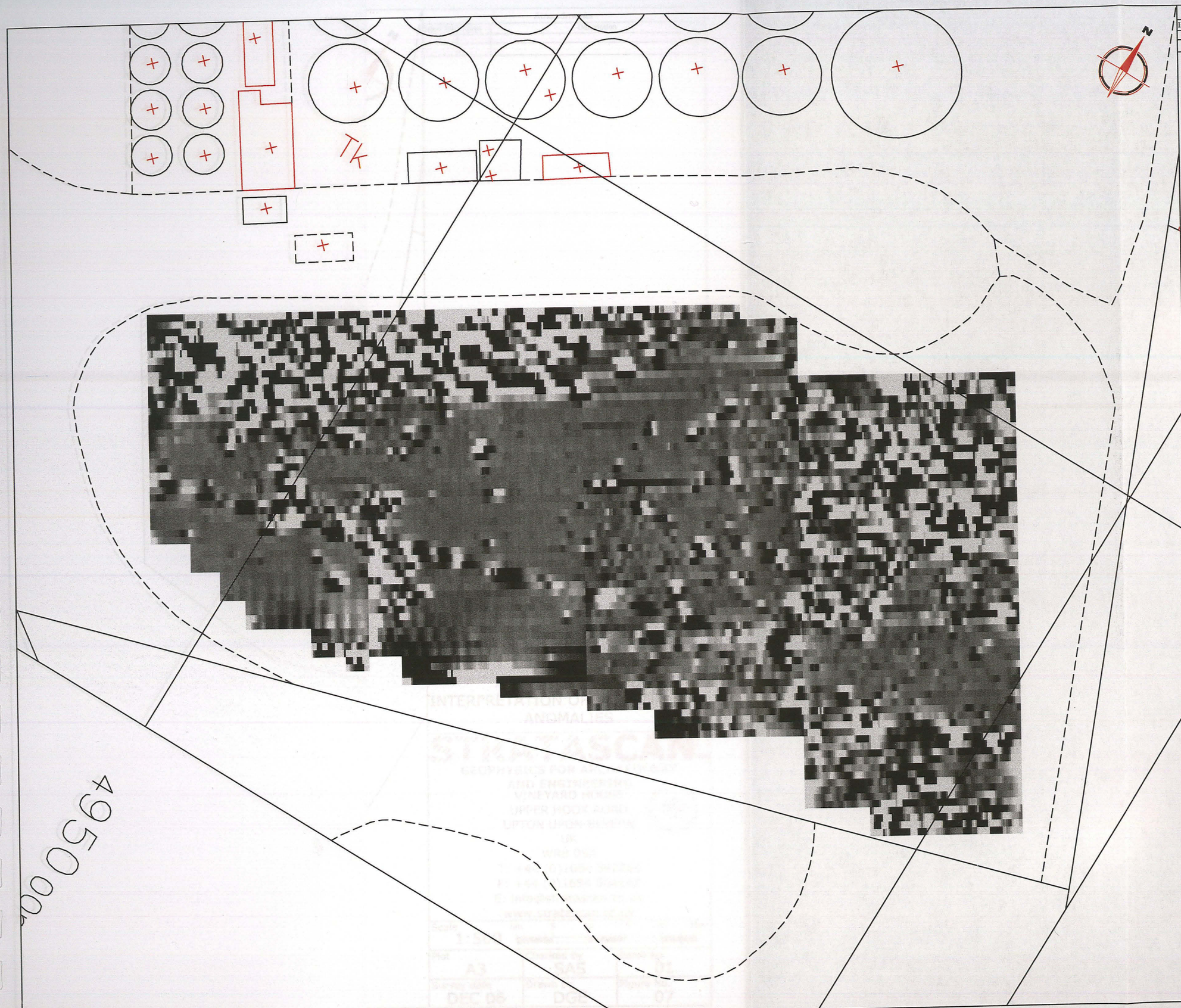

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Minimum -15nT (white)

-3SD +3SD

+15nT

-15nT

Client

WITHAM ARCHAEOLOGY

Project Title — Job No. 2268

GEOPHYSICAL SURVEY - FORMER AIRFIELD, HEMSWELL CLIFF

Subject

PLOT OF PROCESSED GRADIOMETER DATA

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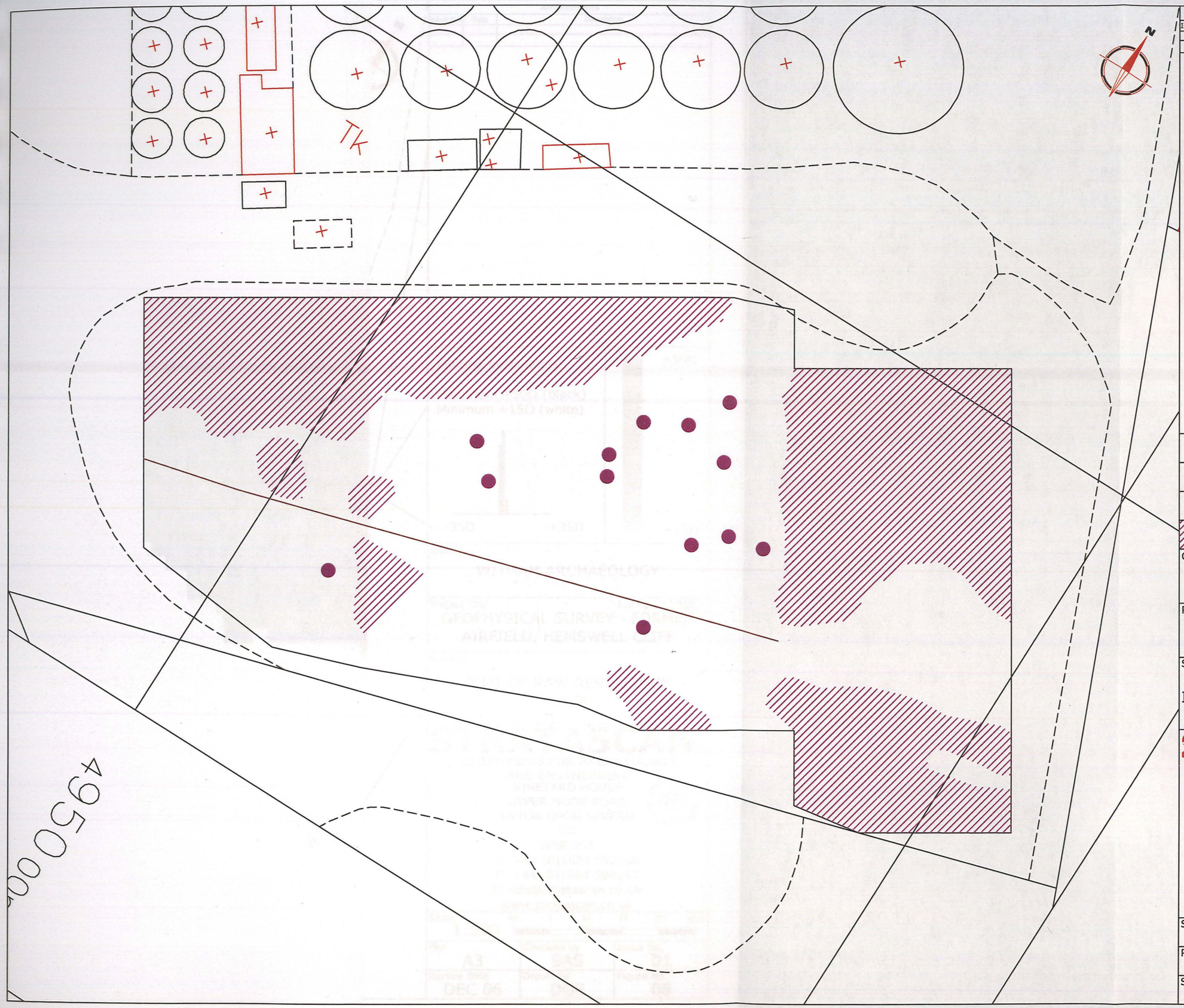

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Issue No.	Date	Description
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KEY

	Moderately strong linear anomaly - possible service or field drain
	Strong discrete positive response with associated negative response - likely ferrous object
	Magnetic debris - probably caused by scatter of ferrous objects

Client

WITHAM ARCHAEOLOGY

Project Title — Job No. 2268

GEOPHYSICAL SURVEY - FORMER AIRFIELD, HEMSWELL CLIFF

Subject

ABSTRACTION AND INTERPRETATION OF GRADIOMETER ANOMALIES

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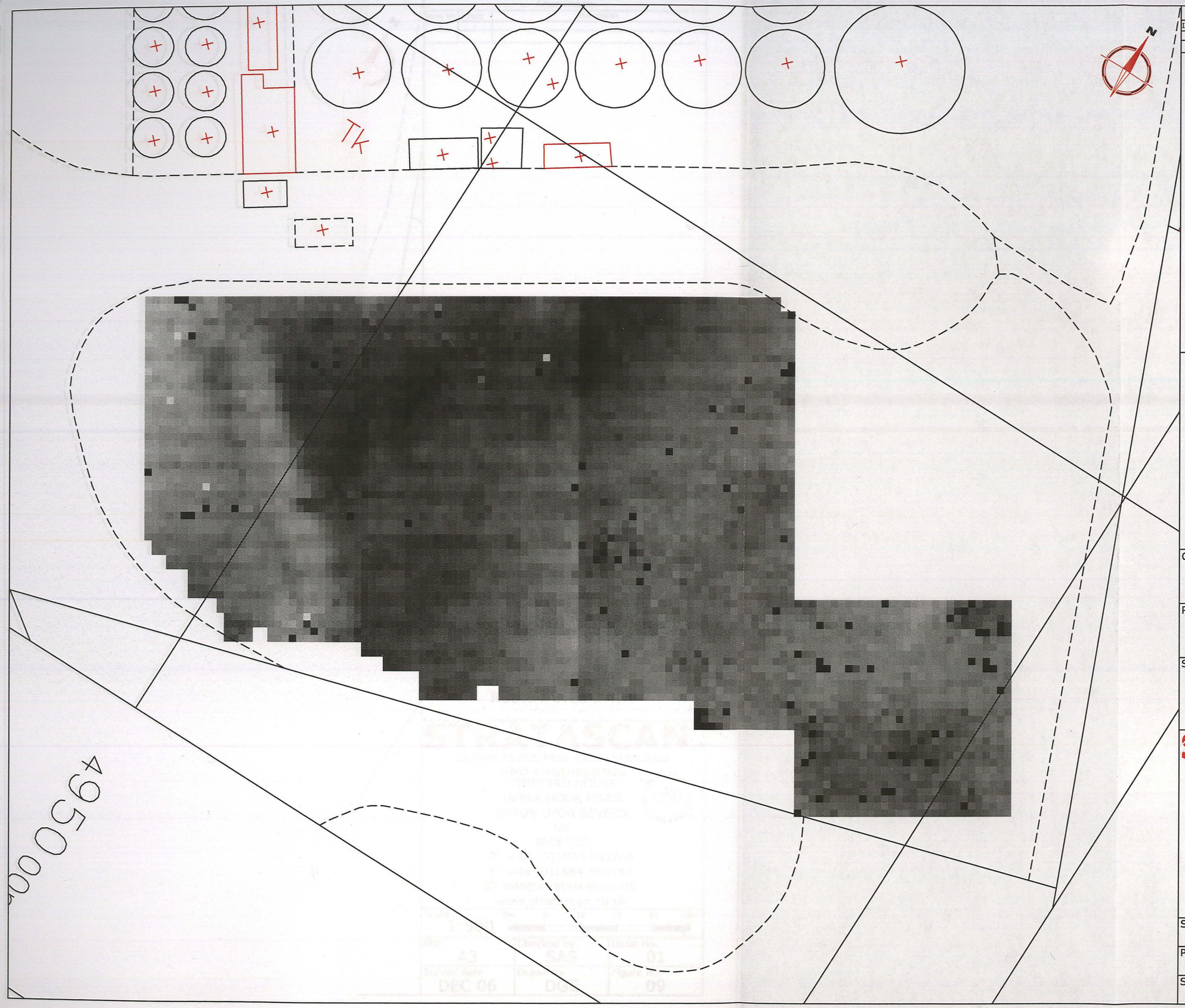

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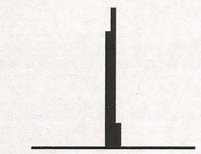

Client

WITHAM ARCHAEOLOGY

Project Title — Job No. 2268

GEOPHYSICAL SURVEY - FORMER AIRFIELD, HEMSWELL CLIFF

Subject

PLOT OF RAW RESISTANCE DATA

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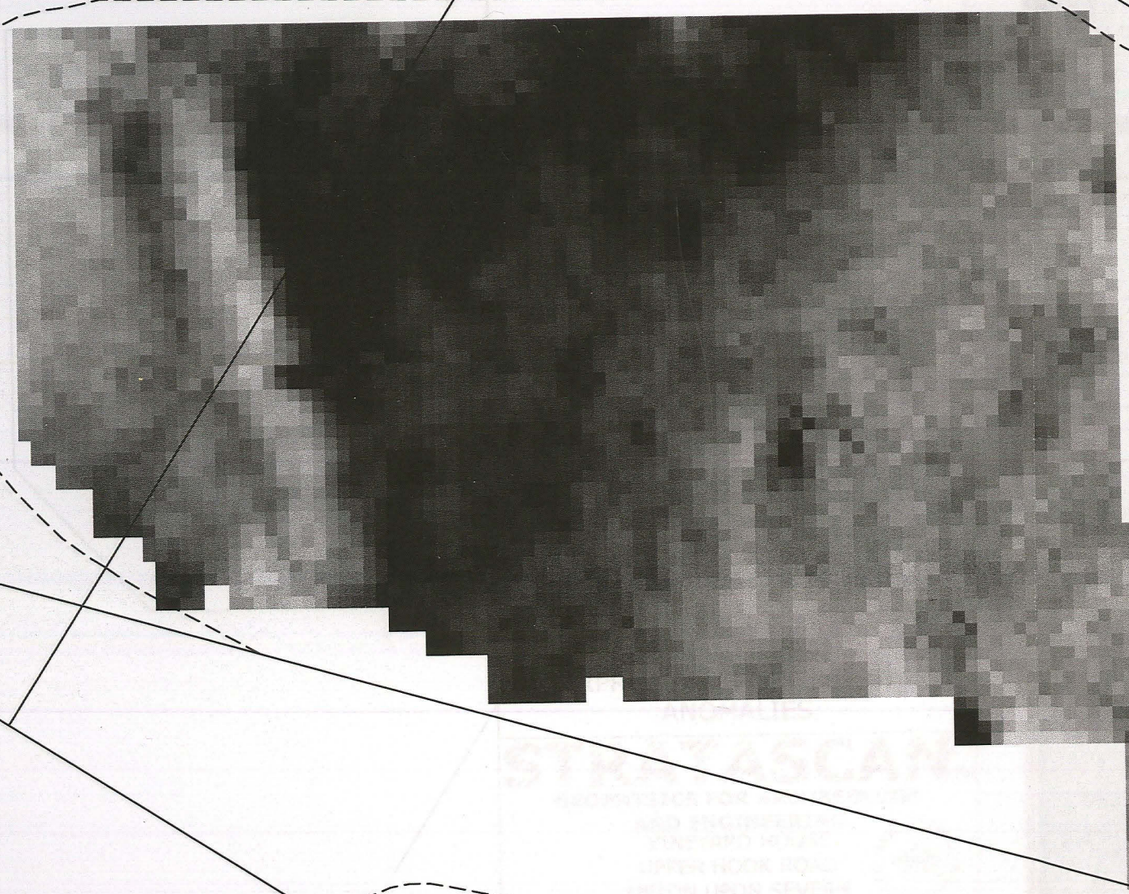

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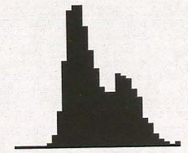

-3SD +3SD

+42Ω

+18Ω

Client
WITHAM ARCHAEOLOGY

Project Title Job No. 2268
GEOPHYSICAL SURVEY - FORMER AIRFIELD, HEMSWELL CLIFF

Subject
PLOT OF PROCESSED RESISTANCE DATA

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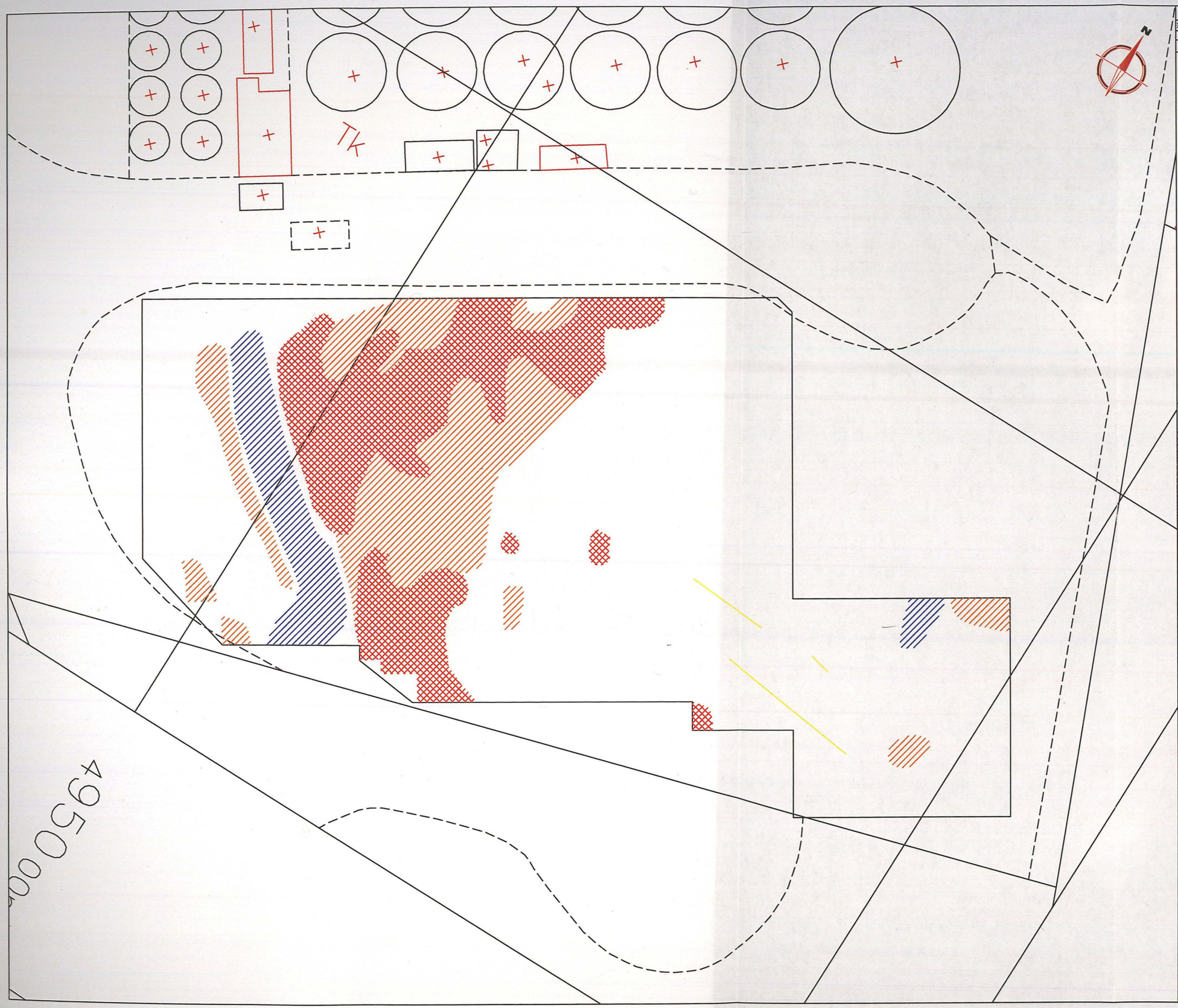

Amendments

Issue No.	Date	Description
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		-

KEY

- High resistance area anomaly - possible stone/masonry remains of archaeological origin
- Moderately high resistance response - possible stone remains or compacted ground associated with adjacent high resistance responses
- Low resistance area anomaly - cut or wet feature of possible archaeological origin
- Weak high resistance anomaly - uncertain origin

Client

WITHAM ARCHAEOLOGY

Project Title — Job No. 2268

GEOPHYSICAL SURVEY - FORMER AIRFIELD, HEMSWELL CLIFF

Subject

ABSTRACTION AND INTERPRETATION OF RESISTANCE ANOMALIES

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REGISTERED ORGANISATION IFA

Scale 1:500 — 0m 5 10 15 20 25m

Plot	Checked by	Issue No.
A3	SAS	01
Survey date	Drawn by	Figure No.
DEC 06	DGE	10