Witham Archaeology

A Report to W. R. Davidge Planning Consultancy on behalf of Mr & Mrs W. Strain
December 2011

LAND TO THE SOUTH OF KETTERING ROAD, STAMFORD, LINCOLNSHIRE

Archaeological Evaluation

R Trimble

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LAND TO THE SOUTH OF KETTERING ROAD, STAMFORD, LINCOLNSHIRE

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Archaeological Trial Trench Evaluation

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LAND TO THE SOUTH OF KETTERING ROAD, STAMFORD, LINCOLNSHIRE

ARCHAEOLOGICAL EVALUATION

SUMMARY

This report outlines the findings of a programme of geophysical survey and trial trench evaluation undertaken by Witham Archaeology on a parcel of land c. 0.72 hectares in area situated south of Kettering Road, Stamford at NGR TF 02979 06477. The project was commissioned by the W. R. Davidge Planning Consultancy on behalf of Mr and Mrs W., Strain to obtain information in support of an application to South Kesteven District Council to include the land as part of residential allocation.

The site lies c. 200m east of the line of the Roman road linking London to Lincoln and then York. In 2005 a watching brief carried out during the construction of new tennis courts in the grounds of Stamford Junior School on the opposite side of Kettering Road revealed furnace remains and slag indicative of a late Saxon or Saxo-Norman iron smelting site. The remains lay at a distance of approximately 40m north of the northern boundary of the current assessment area. Previous investigations in Stamford, north of the River Welland, had demonstrated the presence of late 9th to 11th century iron-working remains at the eastern periphery of the Danish settlement. Structural remains and graves associated with the Benedictine nunnery of St Michael have been recorded on the site of the school buildings, c. 250m west of the assessment area.

The geophysical survey identified a number of anomalies including a possible linear feature following the south-eastern boundary of the assessment area and a series of strong positive area anomalies indicative of possible iron extraction or production activity. The latter were concentrated in the northwest part of the field.

Subsequent trial trenching produced no evidence of features or finds relating to late Saxon/Saxo-Norman iron production or to the Benedictine nunnery of St Michael. Accordingly, the report concludes that during the medieval period the assessment area probably lay within open fields adjacent to the town and the nunnery. A ditch and possible pit (both undated) were found in an evaluation trench at the northeast corner of field (Trench 3) and undated colluvial or alluvial deposits were located on the lower part of the site, to the southeast.

While the results of the geophysical survey and trial trench evaluation suggest a low potential for archaeologically significant remains in the assessment area, the potential for more ephemeral remains (for example, of the prehistoric period) cannot be entirely dismissed. In this regard, the features in Trench 3 attest to the possibility of at least some level of activity

1.0 INTRODUCTION

This report outlines the findings of a programme of geophysical survey and archaeological trial trench evaluation undertaken by Witham Archaeology on a parcel of land *c*. 0.72 hectares in area situated south of Kettering Road, Stamford. The geophysical survey was carried out on the 8th November 2011 (the full report by Archaeological Project Services is presented in Appendix B) and trial trenching was completed during the period 16th to 18th November 2011. The project was commissioned by the W. R. Davidge Planning Consultancy on behalf of Mr and Mrs W. Strain to obtain information in support of an application to South Kesteven District Council for inclusion of the land as part of residential allocation. The requirements of South Kesteven District Council were set out in a brief (dated 13th October 2011) prepared by their archaeological advisor, Jenny Young.

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 Archaeologists.

2.0 SITE LOCATION, TOPOGRAPHY & GEOLOGY (see Fig. 1)

The site, comprising a parcel of land c. 0.72 hectares in area, lies on the southern periphery of Stamford, on the south side of Kettering Road at NGR TF 02979 06477. It is bounded to the south and east by agricultural land, and to the west by sports fields belonging to Stamford Endowed Schools.

The site is generally level (there is a slight rise in elevation at the northeast corner) on a solid geology of mudstone (Whitby Mudstone Formation), bordered by ooidal ironstone (Northamptonshire Sand Formation) to the south and Lower Lincolnshire Limestone to the east (British Geological Survey 1:50 000 solid and drift; bgs.ac.uk). The field is generally under grass, with patches of nettles and light shrubbery.

3.0 ARCHAEOLOGICAL & HISTORICAL BACKGROUND

Prehistoric
A small quantity of Neolithic and early Bronze Age worked flint (HER Nos. 35259 and 35260) was retrieved during archaeological investigations (see below) at Stamford Junior School, on the north side of Kettering Road (see below).

Romano-British
The site lies *c*. 200m east of the line of the Roman road linking London to Lincoln and then York

Anglo-Saxon to Saxo-Norman
One sherd of pottery dated 5th to 7th century and small quantities of pottery dated 10th to 12th century have been recovered during watching briefs at Stamford Junior School (Hambly 2000a and 2000b, and Snee 2001).

Another watching brief located evidence of iron production at the southern end of the School's tennis courts (Trimble 2006). Several hollows were found in association with furnace remains and large quantities of smelting slag. Analysis of the slag indicated parallels with late Saxon and Saxo-Norman material found on sites in the town north of the River Welland.

Medieval
Remains of the Benedictine nunnery of St Michael have been located 250m west of the assessment area, during successive investigations on the site of the Stamford Junior School buildings and further to the north during construction of the Stamford to Leicester railway in 1846.

The nunnery was founded by William de Waterville in *c*. 1155 as a cell of Peterborough Abbey. Originally housing both nuns and monks, it was dissolved in 1536 and Richard Cecil acquired the site in 1540. Peck reported in 1727, that all buildings associated with the nunnery had been completely demolished. In 1734, a new house was built on the site (Hartley & Rogers 1974).

Remains relating to the nunnery, including wall foundations, window mullions, stone coffins, human bone, and coloured glass were discovered during railway construction in 1846 (RCHME 1977). In 1973, walls and related occupation material were recorded on the site of a new school building. The remains included a subterranean arcade interpreted as possibly representing the south wall of the reredorter (Scheduled Ancient Monument No. 22607); a clay-lined reservoir at ground level may have served water to the proposed reredorter (RCHME 1977).

More recent investigations (Cope-Faulkner 1999) undertaken in advance of building work have revealed painted plaster walls and a mortar floor, possibly relating to a cloister, and a stone drain (possibly a wall), which may have been related to the reredorter (Hambly 2000a) found in 1973. Further remains, located on the site of the school's car park (Hambly 2000b), included two inhumations and three possible graves which were not excavated. Pottery dated 10th – 12th century was found in one of the graves and in a pit. Further investigations (Snee 2001) revealed a hearth-like feature, postholes relating to a timber structure, a possible robber trench and ditches. Demolition material was recorded during a watching brief (Hambly 2000c) on the site of an extension to the school's porch.

North of the railway, three inhumations and two possible graves were recorded during work to extend the school's boarding house (Hambly 2001). Further remains including the corner of a building, a limestone drain, and a cobbled surface appear to have succeeded the cemetery.

Post Medieval
On the Ordnance Survey 1:2500 map of 1886-7 the assessment area is depicted as more or less in its present state, with identical boundaries and no evidence of structures.

4.0 AIMS & OBJECTIVES

The principal objectives of the project, as set out in a Witham Archaeology specification of 3rd November 2011, were to:

- *provide information on the presence/absence, nature, date and quality of survival of archaeological deposits and remains which might be contained within the site, at the depth of proposed construction disturbance, and to assess the importance of such remains in terms of their local, regional and national context.*
- *assess the possible scale of development impact on any remains and provide information which might influence development design so that impact on any remains can be avoided or minimised.*
- *provide information that will allow the local planning authority to reconcile development proposals with their policy for preserving archaeological remains and make an informed and reasoned decision on a planning application.*
- *provide site specific archaeological information which (if necessary) would allow for the design and integration of timing and funding of any further archaeological work (or other mitigating strategy) which might be required in advance of or during any subsequent development programme.*
- *produce a project archive for deposition with the appropriate museum and from which the potential for further study and academic research could be assessed.*
- *provide information for accession to the county Historic Environment Record (HER).*

5.0 METHODOLOGY

In line with recommendations made by Jenny Young, archaeological advisor to South Kesteven District Council, the first phase of evaluation was by geophysical survey (see Fig.2), designed to locate magnetic anomalies indicative of archaeological features and deposits (see Appendix B for a complete description of the survey and methodology employed). Subsequent investigations were through trial trenching within 2% sample of the total area, focussing upon any anomalies located by the geophysical survey.

Following the agreement of trench positions with Jenny Young, sample excavation was undertaken in one 20m trench and five 15m long trenches, each measuring *c*. 1.6m wide. Some variation in the agreed layout of trenches was required to maintain safe access along public footpaths which traverse the field.

Topsoil and other recent deposits were removed by mechanical excavator fitted with a 1.6m wide toothless ditching bucket. All features and deposits of potential archaeological origin were hand cleaned and then sampled by excavation to ascertain their date, character and extent. Plans were drawn at scale 1:20 and sections at scale 1:10 or 1:20 as appropriate. The drawn record is supplemented by a series of photographs in both monochrome (35mm) and colour (digital) including general views of each trench and specific views of archaeologically significant features and deposits, while written context descriptions were made on *pro forma* single context recording sheets. Trench outlines, referenced to fixed points within the surrounding field boundaries, were surveyed by Geodolite total station.

6.0 RESULTS (Fig. 3, 4 and 5)

The results of excavation are presented below on a trench by trench basis.

Trench 1
Trench 1 was positioned to intersect with a positive area anomaly (B), located by geophysical survey. Natural clay (007) was located at around 0.5m below existing ground, overlain by subsoil (006) and topsoil (005), each 0.25m thick. A land drain ran the length of the trench. Partial removal of the drain in the area of anomaly B, produced no evidence of archaeologically significant features or deposits.

Trench 2
Trench 2 was placed at right angles to Trench 1, to intersect with a second positive area anomaly (C). Natural (007) was revealed at around 0.44m below existing ground level, overlain by subsoil (006) and topsoil (005), 0.19m and 0.25m thick respectively. There was no sign of archaeologically significant remains.

Trench 3
Trench 3 was positioned to assess an area of relatively elevated ground at the northern corner of the field.

Plate 1: Trench 3, general view looking north

Plate 2: Trench 3, ditch [001] looking SE

Natural in Trench 3 was a limestone brash, (008), comprising light reddish brown clayey sand mixed with irregular limestone fragments. It was sealed by subsoil (006), 0.25m thick.

A linear cut, [001], probably a ditch, was revealed at the northern end of the trench, cutting the limestone brash. The feature, aligned NW-SE, was 0.70m wide and 0.16m deep with steep sides breaking gradually to a generally flat, slightly undulating base. There were no finds in its fill of sandy silt (002).

A discrete cut, [003], was identified near the southern end of the trench. It was ovoid in plan shape with gradually sloping sides and a slightly concave base, measuring 0.88m by 0.72m by 0.14m deep. No finds were recovered from the reddish brown, sandy silt fill (004). The fill closely resembled the adjacent natural suggesting that the feature might have arisen from a natural variation in deposits.

Trench 4
Trench 4 was sited centrally within the evaluation area, following the line of an adjacent N-S footpath. Natural (007) was revealed at depths of between 0.65m and 0.95m below existing ground level, overlain by a layer of clayey sandy silt (009), 0.3m thick at the southern end of the trench and tapering out to the north in the vicinity of a ceramic land drain (see below). Subsoil (006), *c*. 0.42m thick,

extended over (009) and was in turn sealed by a shallow depth (varying around 50mm thick) of small limestone fragments (010), possibly the remnants of an area of hard standing. Topsoil (005) in Trench 4 varied in thickness between 0.17m to 0.22m.

Plate 3: Trench 4, Section 4 looking NW

Trench 5
Trench 5 lay to the east of Trench 4 and south of the footpath. Natural (007) was revealed at 0.55m below existing ground, sealed by subsoil (006) and topsoil (005), 0.3m and 0.25m thick respectively.

Trench 6
Trench 6 was placed at right angles to a negative linear anomaly (A) extending NE-SW along the southeast edge of the assessment area. Five land drains were revealed during machine excavation, resulting in the trench being excavated to variable depths, to a maximum of around 1.1m. Natural (007) was overlain by a layer of greenish grey silty sand 0.3m thick (017), which was in turn sealed by subsoil 0.3m thick (006).

A stone drain (014) intersected with the trench at right angles, coinciding with the line of geophysical anomaly (A). It had a base of flat stone, walls of four courses to each side and flat capping stones giving internal dimensions of around 0.15m to 0.2m across by 0.2m high. The feature was completely silted up with loose, grey sandy silt (016). The feature lay within a construction trench, [015], 1.4m wide and filled by a cream coloured silt (013). The construction trench appeared to have been excavated from immediately below the topsoil.

A second stone drain, [011] also running at right angles to Trench 6, lay further to the north. It was around 0.3m wide and 0.25m high, comprising flat limestone slabs placed on edge. The feature appeared to have been constructed close against the sides of its trench [012].

There more drains, two of them ceramic pipe land drains and one of plastic, were uncovered in Trench 6.

7.0 DISCUSSION & CONCLUSION

The geophysical survey identified a number of anomalies including a possible linear feature at the southeast edge of the area and a series of strong positive area anomalies indicative of possible iron extraction or production. The latter were concentrated in the northwest part of the field.

Plate 4: Trench 6, general view looking south

Subsequent investigation by trial trench excavation revealed a superficial geology of clay interspersed with patches of reddish brown clayey sand (007) in all of the trenches except Trench 3 in the highest part of the field, where limestone brash (008) was encountered. The only features of potential archaeological significance were the ditch, [001], and possible pit, [003], located in Trench 3. Both features remain undated.

Depths of colluvium or alluvium were evident on slightly lower lying ground to the southeast, in Trench 4 (009) and Trench 6 (017); the deposits were not dated. A layer of subsoil (006) extending throughout the assessment area probably represents a relict ploughsoil originating from medieval and/or post medieval cultivation in the typical open field strip system.

Elements of post medieval drainage were revealed in Trenches 1, 4 and 6. The need for drainage was particularly evident in Trench 6, where a succession of drains in stone, ceramic and plastic probably reflect the comparatively low-lying nature of the original ground and consequent potential for flooding. It is highly likely that one of the stone drains, [014], produced the linear anomaly (A) located by geophysical survey.

Trial trenching produced no evidence of archaeologically significant features in the northwest part of the field, where the geophysical survey had indicated a potential for iron extraction or production related activity. It would appear, therefore, that the anomalies reflected more recent activity, possibly connected with use of the area as an overflow car park for Stamford Football Club (Mr W. Strain, pers. comm.).

In conclusion, the combined results of geophysical survey and trial trench excavation indicate a low potential for archaeologically significant remains within the assessment area. Trial trenching produced no evidence of features or finds relating to iron production comparable to those located in the grounds of Stamford Junior School on the opposite side of Kettering Road. Furthermore, there was no evidence to suggest that the site contains any structural remains relating to the Benedictine nunnery of St Michael, which appears to have been concentrated in the area now occupied by buildings of Stamford Junior School and land to the north. Instead, it would appear that during the medieval period the assessment area lay within open fields surrounding the nunnery and areas of settlement in Stamford.

The ditch and possibly a pit in Trench 3 (both undated) indicate the potential for a certain level of archaeological activity within the assessment area and the potential for more ephemeral remains (perhaps prehistoric) not disclosed by the trial trenching cannot be entirely discounted. Furthermore, the presence of colluvial and/or alluvial deposits in the southeastern part of the area would tend to suggest that any remains found in those parts of the assessment site would be comparatively well preserved.

8.0 ACKNOWLEDGEMENTS

The author of this report would like to thank Mr R. Kilsby of the W. R. Davidge Planning Practice and the landowner Mr W. Strain for their interest and support in ensuring the successful completion of this project. Thanks are also due to Jenny Young, archaeological advisor to South Kesteven District Council, for information provided and advice given during the course of the project.

9.0 BIBLIOGRAPHY

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10.0 PROJECT/ ARCHIVE DETAILS

10.1 Project Information

SITE CODE: STKR11

PLANNING APPLICATION No.: -

FIELD OFFICER: R Trimble

NGR: TF 02979 06477

CIVIL PARISH: Stamford

SMR No.: -

DATE OF INTERVENTION: 8/11/2011 (Geophysical Survey), 16 – 18/11/2011 (Trial Trenching)

TYPE OF INTERVENTION: Geophysical Survey & Trial Trench Excavation

UNDERTAKEN FOR: W. R. Davidge Planning Practice on behalf of Mr and Mrs W. Strain, Stamford

OASIS ID: withamar1-115640

10.2 Archive Details

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

FINAL LOCATION: The Collection: Art and Archaeology in Lincolnshire, Danes Terrace, Lincoln

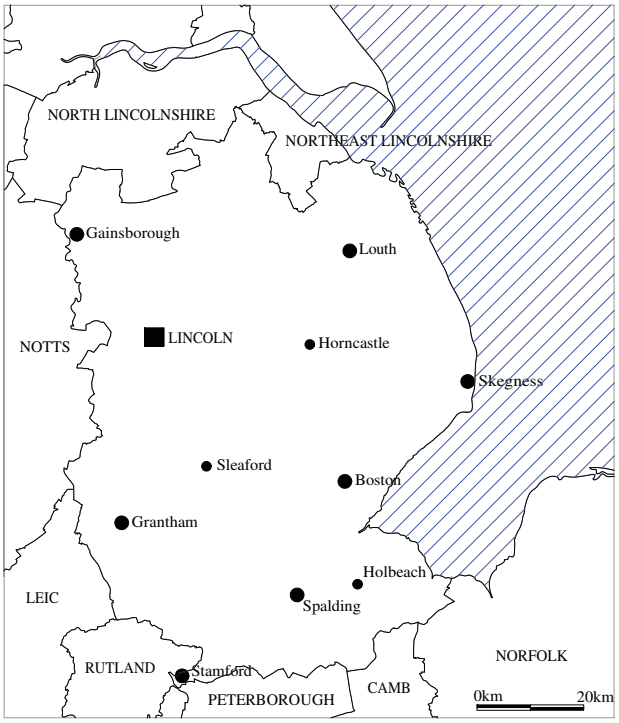
MUSEUM ACCESSION No.: LCNCC 2011.421

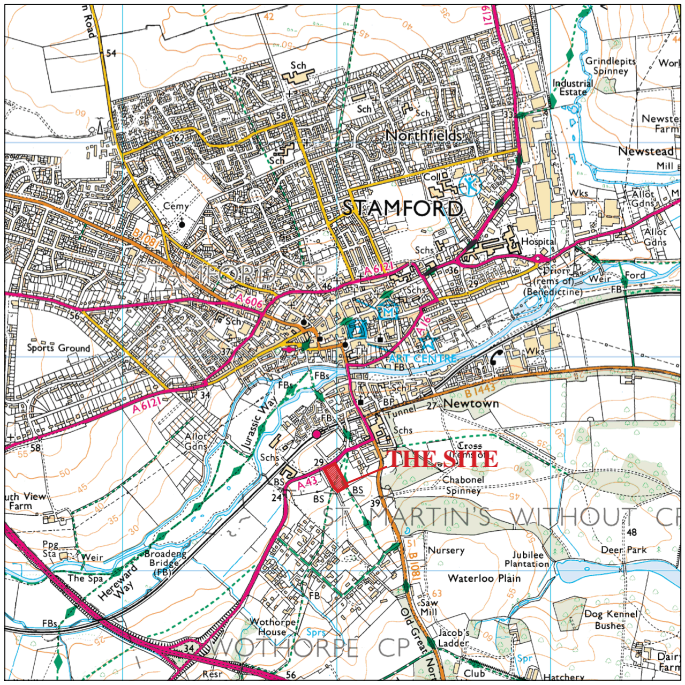
ACCESSION DATE: - February 2012

The Site Archive Comprises:

Context Records	16
Plans at Scale 1:20	2 (on Four sheets of A3 permatrace)
Section Drawings at Scale 1:20	1
Section Drawings at Scale 1:10	6
35mm monochrome print photographs	33
Colour Print Photographs	27
Set of Site Notes	1

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





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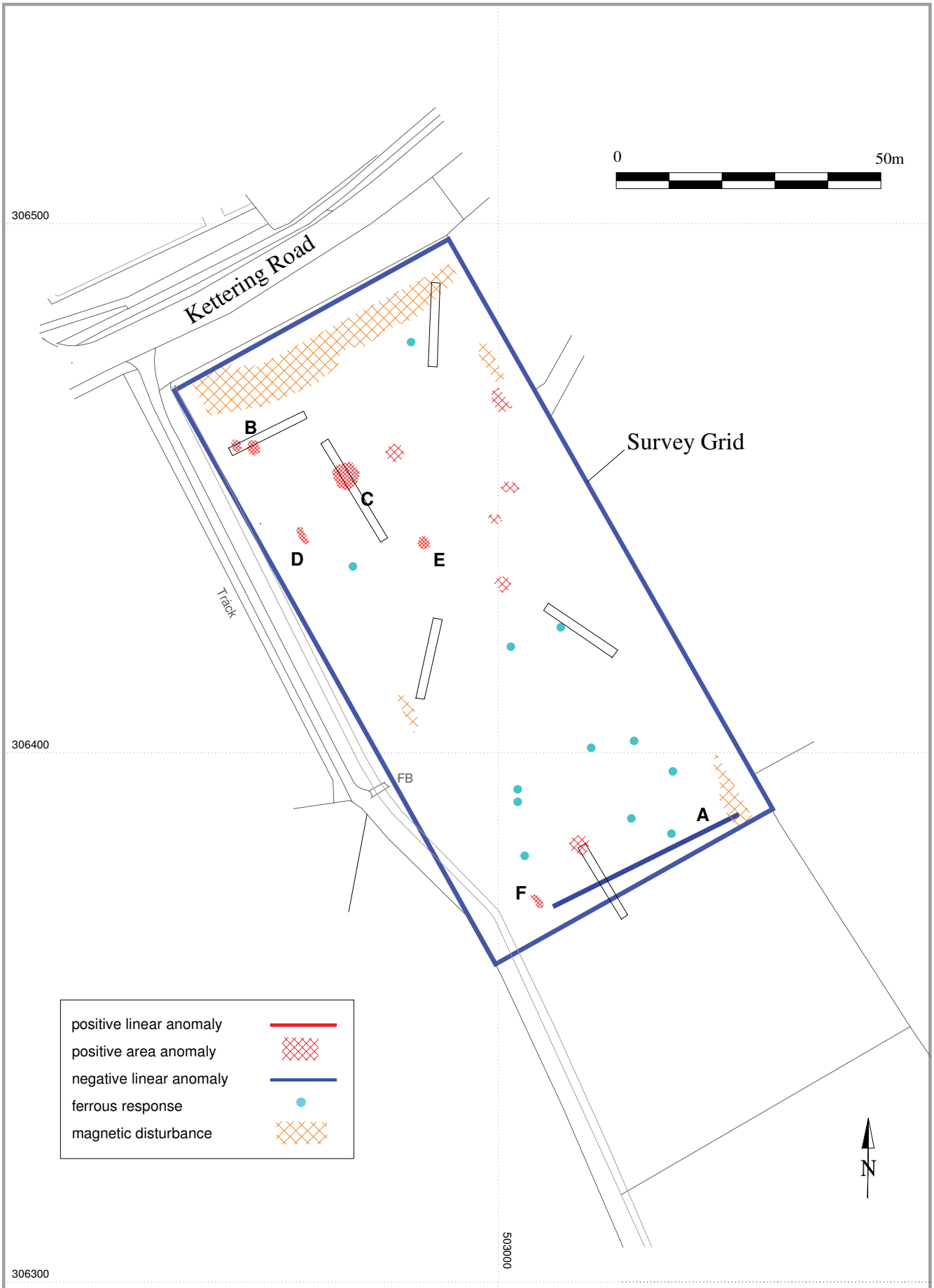
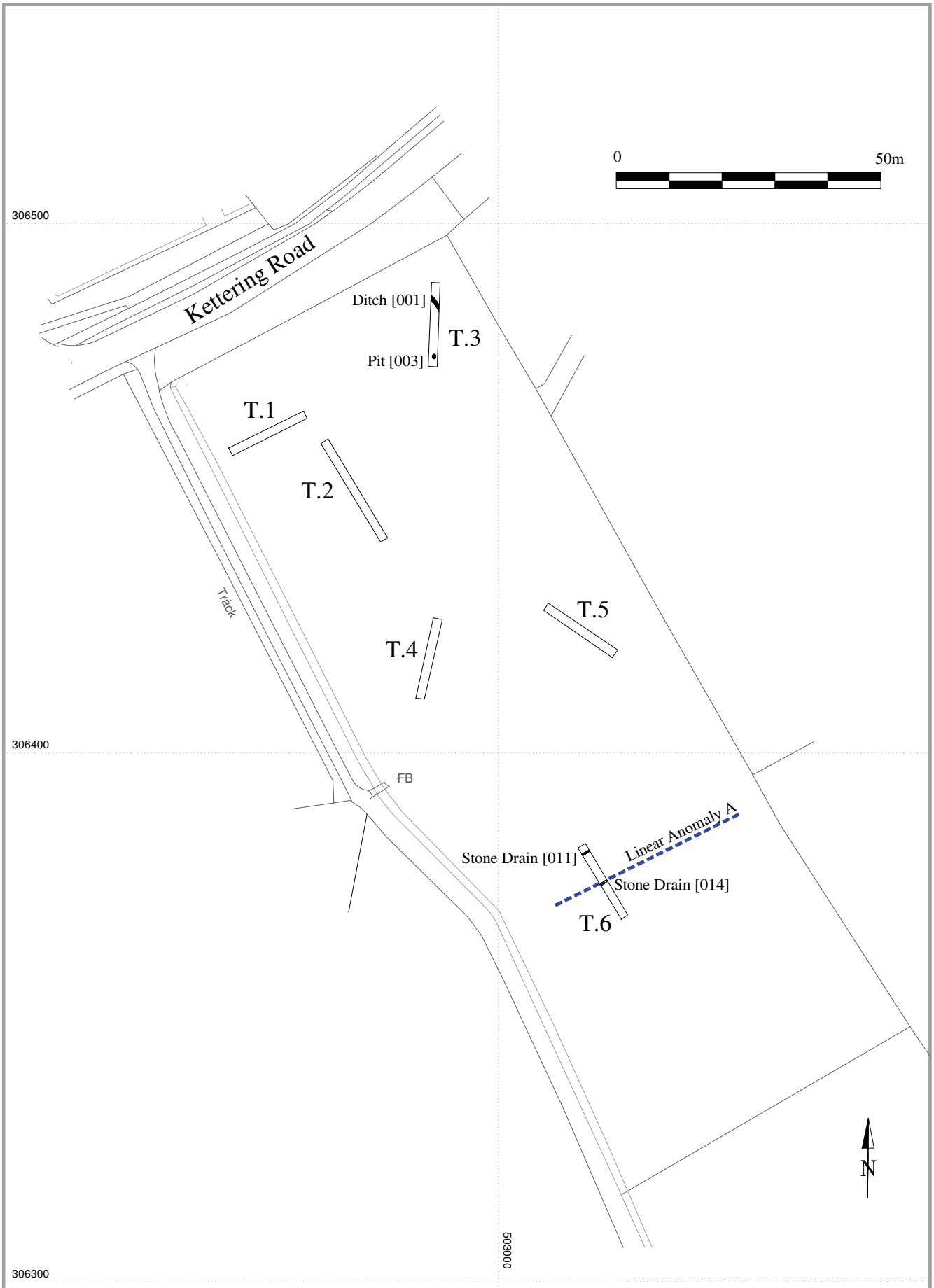


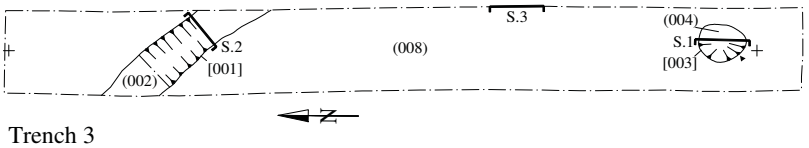
Based upon survey by Archaeological Project Services

Witham Archaeology Site Location with Survey Anomalies Scale 1:1000 Fig. 2

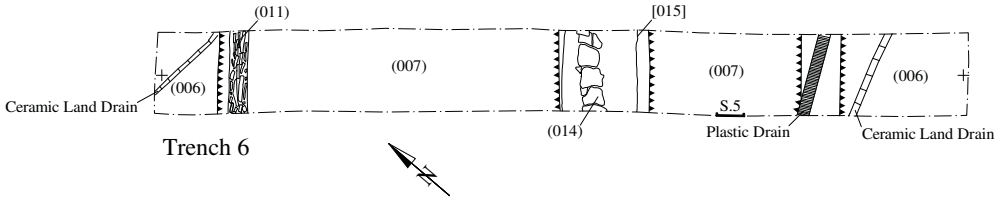


Based upon survey by Archaeological Project Services

Witham Archaeology Plan Showing Trenches 1 -6 Scale 1:1000 Fig. 3



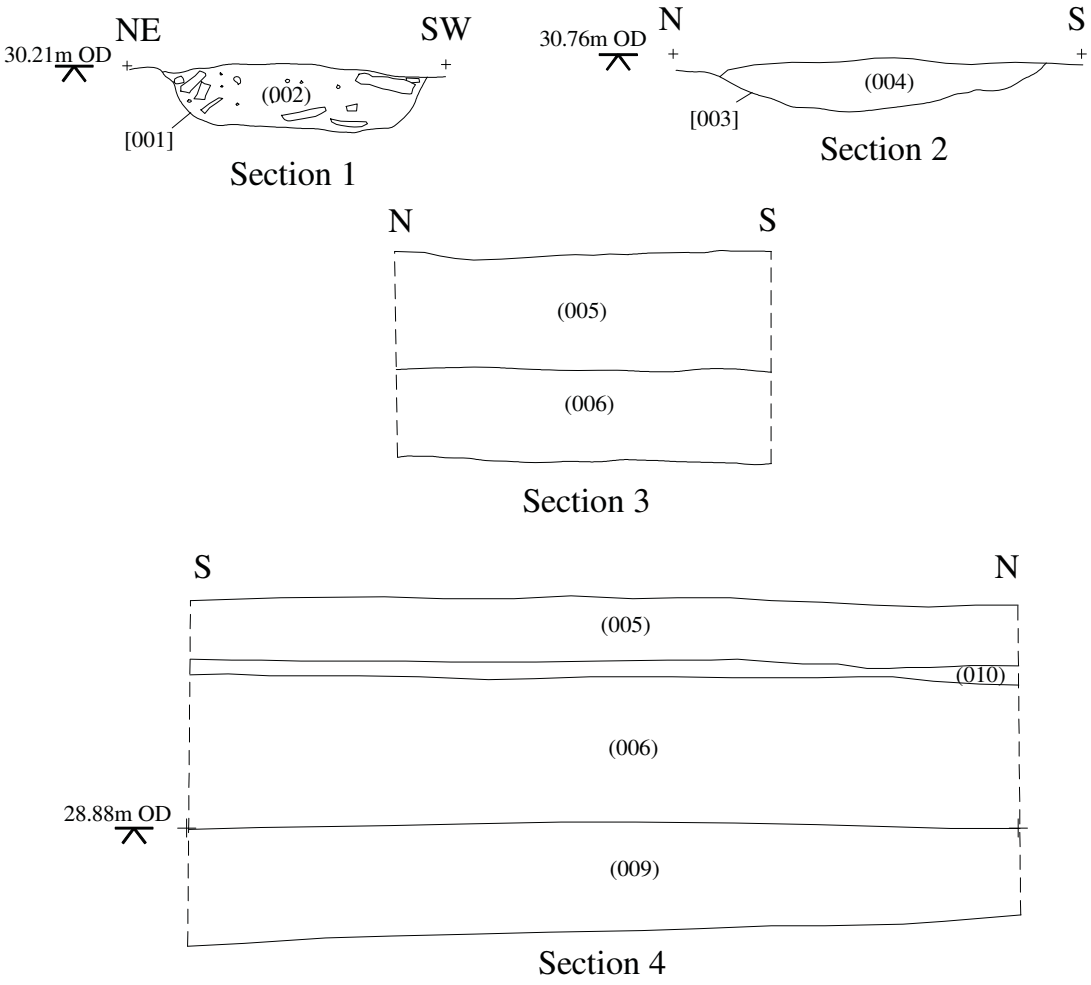
Trench 3



Trench 6

0 5m

Witham Archaeology Plans of Trenches 1 and 2 Scale 1:100 Fig. 4



Witham Archaeology

Sections 1 - 6 Scale 1:20

Fig. 5

APPENDIX A - CONTEXT DESCRIPTIONS

No.	*Interpretation*	*Area*	*Description*
001	Ditch	Tr. 3	Linear cut aligned NW-SE, 0.7m wide x 0.16m deep with steep sides and a flat, slightly undulating base; extends beyond the limits of excavation in both directions.
002	Fill of [001]	Tr. 3	Hard, light to mid brown sandy silt containing large fragments of tabular limestone together with smaller lumps and fragments.
003	Pit (possibly natural)	Tr. 3	Ovoid in plan, 0.88m x 0.72m x 0.14 deep with gently sloping sides and a slightly concave base.
004	Fill of [003]	Tr. 3	Very hard, reddish brown sandy silt containing very occasional pebbly gravel.
005	Topsoil	All areas	Moderately compact/friable, mid to dark greyish brown silty sand, average 0.25m thick.
006	Subsoil/ploughsoil	All areas	Moderately compact to compact, mid yellowish brown sandy clay containing moderate limestone fragments to 20mm.
007	Natural	Except Tr. 3	Compact mid greyish brown and yellowish brown clay interspersed with large patches of compact, mid reddish brown clayey sand containing frequent iron pan flecks.
008	Natural	Tr. 3	Compact light reddish brown clayey sand mixed with irregular limestone fragments to 0.2m (components in proportion of around 50/50).
009	Layer – colluvium or alluvium?	Tr. 4	Moderately compact, mid greyish brown slightly clayey sandy silt containing occasional charcoal flecks and limestone to 20mm; 0.3m thick (max.).
010	Hard-standing	Tr. 4	
011	Stone drain	Tr. 6	Flat limestone slabs place on edge; c. 0.3m wide x 0.25m high.
012	Cut for [010]	Tr. 6	0.3m wide; aligned NE-SW .
013	Fill of [013]	Tr. 6	Soft cream coloured silt .
014	Stone drain	Tr. 6	Flat stone base with four courses of on limestone on each side forming the walls; capped by flat limestone. Internal dimensions of around 0.15 to 0.2m wide by 0.2m high.
015	Cut for [013]		1.4m wide, aligned NE-SW, extending beyond limits of trench in each direction. Not excavated.
016	Fill of [013]	Tr. 6	Loose, grey sandy silt.
017	Layer – colluvium or alluvium?	Tr. 6	Greenish grey silty sand; 0.3m thick.

APPENDIX B

GEOPHYSICAL SURVEY REPORT

LAND AT
KETTERING ROAD
STAMFORD
LINCOLNSHIRE

GEOPHYSICAL SURVEY

Work undertaken for
Witham Archaeology

November 2011

Report produced by
S J Malone BSC PhD MIFA

OASIS Ref: archaeol1-113593
National Grid Reference: 502995 306425

APS Report No: **125/11**

ARCHAEOLOGICAL
PROJECT
SERVICES

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Figure 7 Interpretative plot against basemap

1. SUMMARY

Detailed magnetic gradiometer survey was undertaken for Witham Archaeology in connection with proposed residential development on 0.8ha of land south of Kettering Road, Stamford, Lincolnshire. The survey revealed a single linear anomaly and series of very strong bipolar anomalies perhaps relating to iron extraction or production.

The linear anomaly shows only a weak positive response and perhaps reflects the position of a former boundary or bank rather than a cut feature. There is a break in slope in the field at about this point, perhaps also indicating some earlier subdivision.

The very strong bipolar area (and point) anomalies occur largely in the northwest corner close to the road frontage. These may relate to iron extraction or production but are not distinctive in form.

2. INTRODUCTION

2.1 Definition of an Evaluation

Geophysical survey is a non-intrusive method of archaeological evaluation which is defined as *'a limited programme of non-intrusive and/or intrusive fieldwork which determines the presence or absence of archaeological features, structures, deposits, artefacts or ecofacts within a specified area or site. If such archaeological remains are present Field Evaluation defines their character and extent, quality and preservation, and it enables an assessment of their worth in a local, regional, national or international context as appropriate'* (IFA 2008).

2.2 Background

Archaeological Project Services was commissioned by Witham Archaeology to undertake detailed magnetometer survey on 0.8ha of land at Kettering Road, Stamford, Lincolnshire. The survey was carried out on the 8th November 2011.

2.3 Topography and Geology

Stamford is situated 63km south of Lincoln, 23km southwest of Spalding and 30km southeast of Grantham in the administrative district of South Kesteven, Lincolnshire (Fig. 1). The town lies on the bank of the River Welland, close to its confluence with the Gwash which provides the eastern boundary of the town.

The site is located in the southwestern corner of the town, south of the River Welland, on the south side of the Kettering Road at NGR 502995 306425 (Fig. 1) and comprises a single pasture field.

Local soils are the Denchworth Association, fine loamy over clayey soils developed over a solid geology of Whitby Mudstone (Hodge et al. 1984, 155).

2.4 Archaeological Setting

Stamford is situated in an area of rich archaeological remains dating generally from the prehistoric to the medieval periods. The site lies on the southern and western outskirts of the historic town core. The projected line of the Roman road, Ermine Street, approaches the River Welland just to the southwest of the development area. The site of the Benedictine Nunnery of St. Michael is located approximately 250m to the west beneath the Stamford Endowed Schools site.

3. AIMS

The aim of the survey was to locate any features of possible archaeological significance within the proposed development area in order to inform potential further site investigations.

4. GEOPHYSICAL SURVEY

4.1 Methods

Location and layout of the survey area is shown in Figure 2. Weather and ground conditions during the survey were damp and overcast. The area was under rough pasture, recently mown and in generally good condition for survey, although hedges and boundaries were very overgrown, especially to the southwest, limiting the area available for survey.

Survey was undertaken in accordance with English Heritage (2008) and IfA (2010) guidelines and codes of conduct.

The magnetic survey was carried out using a dual sensor Grad601-2 Magnetic Gradiometer manufactured by Bartington Instruments Ltd. 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 c. 49,000nT can be accurately detected using this instrumentation, although in practice instrument interference and soil noise can limit sensitivity.

The mapping of anomalies in a systematic manner allows 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 representing pits and ditches can be seen where their fills contain more topsoil which is normally richer in magnetic iron oxides and provides a contrast with the natural subsoil (but this can vary depending on the nature of the underlying deposits). Wall foundations can show as negative anomalies where the stone is less magnetic than the surrounding soil, or as stronger positive and negative anomalies if of brick, but are not always responsive to the technique.

Magnetometers measure changes in the Earth's magnetic field. With two sensors configured as a gradiometer the recorded values indicate the difference between two magnetic measurements separated by a fixed distance. The Grad601-2 consists of two high stability fluxgate gradiometers suspended on a single frame with a 1m separation between the sensing elements giving a strong response to deep anomalies.

Sampling interval and data capture
Readings were taken at 0.25m centres along traverses 1m apart. This equates to 3600 sampling points in a full 30m x 30m grid. The Grad 601 has a typical depth of penetration of 0.5m to 1.0m although a greater range is possible where strongly magnetic objects have been buried in the site.

Readings are logged consecutively into the data logger which is downloaded daily either into a portable computer whilst on site or directly to the office computer. At the end of each job, data is transferred to the office for processing and presentation.

Processing and presentation of results
Processing is performed using specialist ArcheoSurveyor software. 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 shows the processing techniques carried out on the processed gradiometer data used in this report:

1. DeStripe (sets the background mean of each traverse within a grid to zero and is useful for removing striping effects)

2. Despike (useful for display and allows further processing functions to be carried out more effectively by removing extreme data values)
Parameters: X radius = 1; Y radius = 1; Threshold = 3SD; Spike replacement = mean

3. Clip (excludes extreme values allowing better representation of detail in the mid range): -5 to 5nT.

4.2 Results

The presentation of the data for the site involves a print-out of the raw data as minimally processed greyscale and trace plots (Figs 3, 4), together with greyscale plots of the processed data (Figs 5, 6). Magnetic anomalies have been identified and plotted onto interpretative drawings (Fig. 7) and are described below.

Linear negative anomalies
A SW-NE anomaly **A** runs close to the southern limit of the survey area. This is faintly shadowed by a positive response along its northern edge.

Positive area anomalies
Positive area anomalies of varying degrees of response are present across much of the area and may largely relate to changes in the background. However, several of these **B**, **C**, **D**, **E** and **F** are very strong bipolar responses approaching, or even exceeding the 1000nT limits of the magnetic sensors. The anomaly at C is the only one which might really be classed as an area anomaly, the rest are localised (almost single point) responses, but much stronger than would be expected from a single iron item.

Modern/magnetic disturbance
Strong bipolar responses occur at points around the margins of the field adjacent to fenced boundaries especially along the northern boundary which is fenced with metal railings.

Iron spikes (discrete bipolar anomalies)
Iron items within the topsoil give a distinctive localised bipolar response. Normally such items derive from relatively recent management or agricultural use of the land – broken or discarded pieces of agricultural machinery or other modern debris. Here, there may be a possibility that ironstone or slag contributes to such responses. These are fairly widely scattered but more apparent in the southern half of the area.

5. DISCUSSION

Magnetic survey of the proposed development site has revealed a single linear anomaly and series of very strong bipolar anomalies perhaps relating to iron extraction or production.

The linear anomaly shows only a weak positive response and perhaps reflects the position of a former boundary or bank rather than a cut feature (negative responses are more often associated with

banks of material). There is a break in slope in the field at about this point, perhaps also indicating some earlier subdivision.

The very strong positive area (and point) anomalies occur largely in the northwest corner of the field closest to the road frontage. These may relate to iron extraction or production but are not distinctive in form.

6. ACKNOWLEDGEMENTS

Archaeological Project Services wishes to acknowledge the assistance of Russell Trimble of Witham Archaeology who commissioned the project and arranged access to the site. Tom Lane edited the report.

7. PERSONNEL

Project coordinator: Steve Malone
Geophysical Survey: Steve Malone, Andy Failes
Survey processing and reporting: Steve Malone

8. BIBLIOGRAPHY

Clark, A., 1996 *Seeing Beneath the Soil*, London, 2nd edn

English Heritage, 2008 *Geophysical Survey in Archaeological Field Evaluation*

IfA, 2011 *Standard and Guidance for Geophysical Survey*

9. ABBREVIATIONS

APS Archaeological Project Services

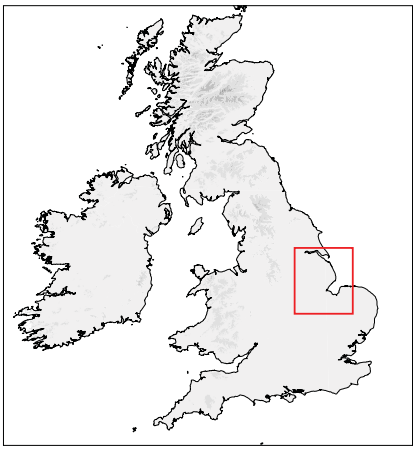
BGS British Geological Survey

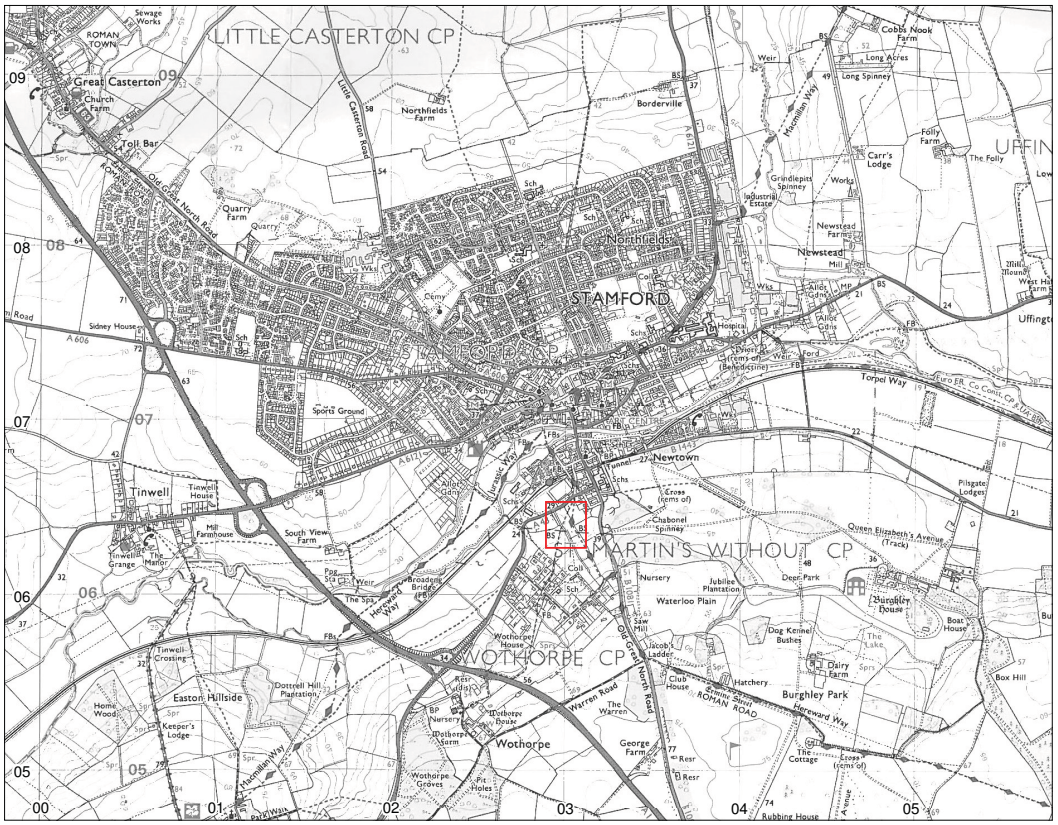
EH English Heritage

IfA Institute for Archaeologists

HER Historic Environment Record

SM Scheduled Monument





Archaeological Project Services		
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Scale: varies	Drawn by: SJM	Report No: 125/11

Figure 1 Site location map

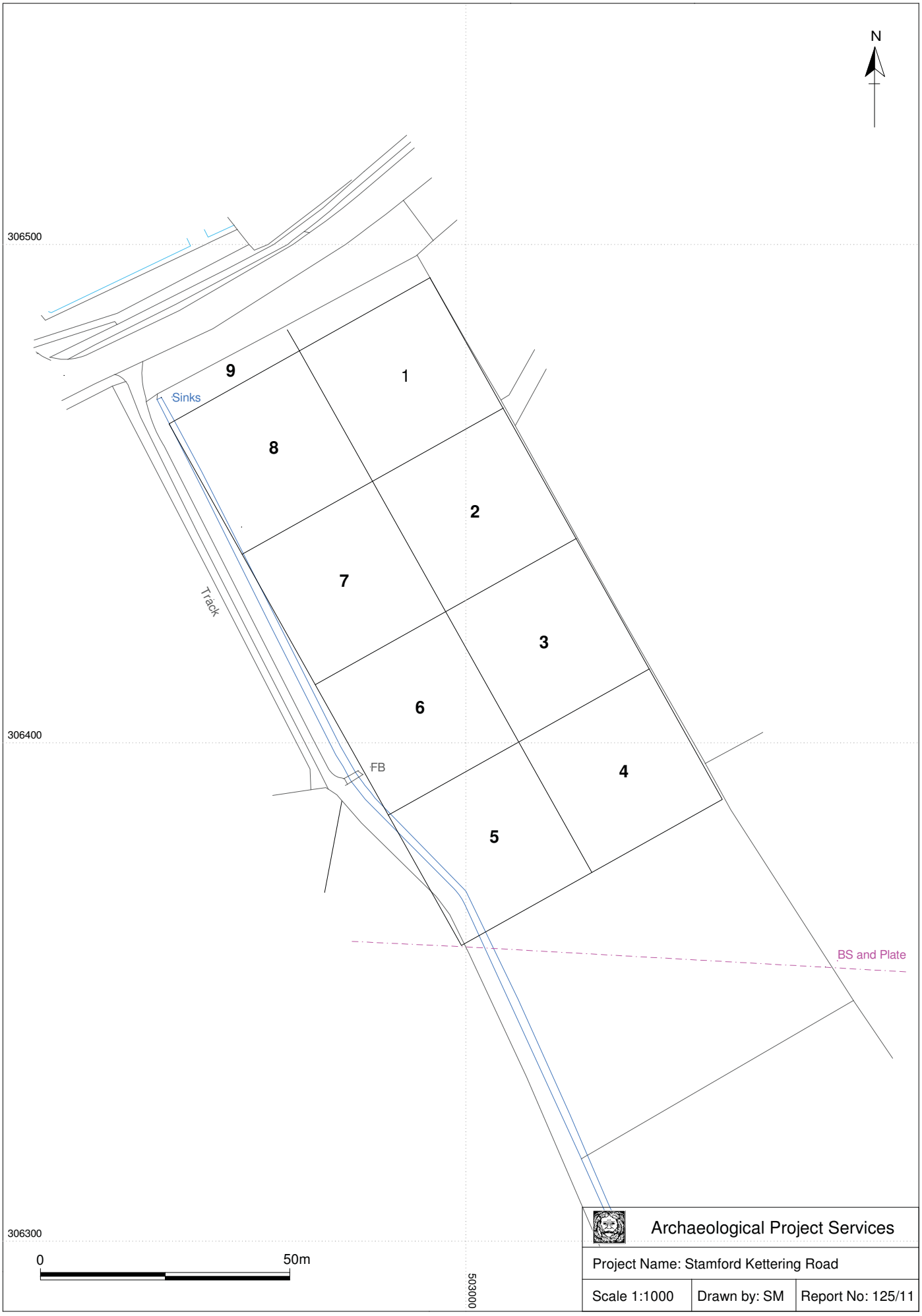

Figure 2 Location and layout of survey area

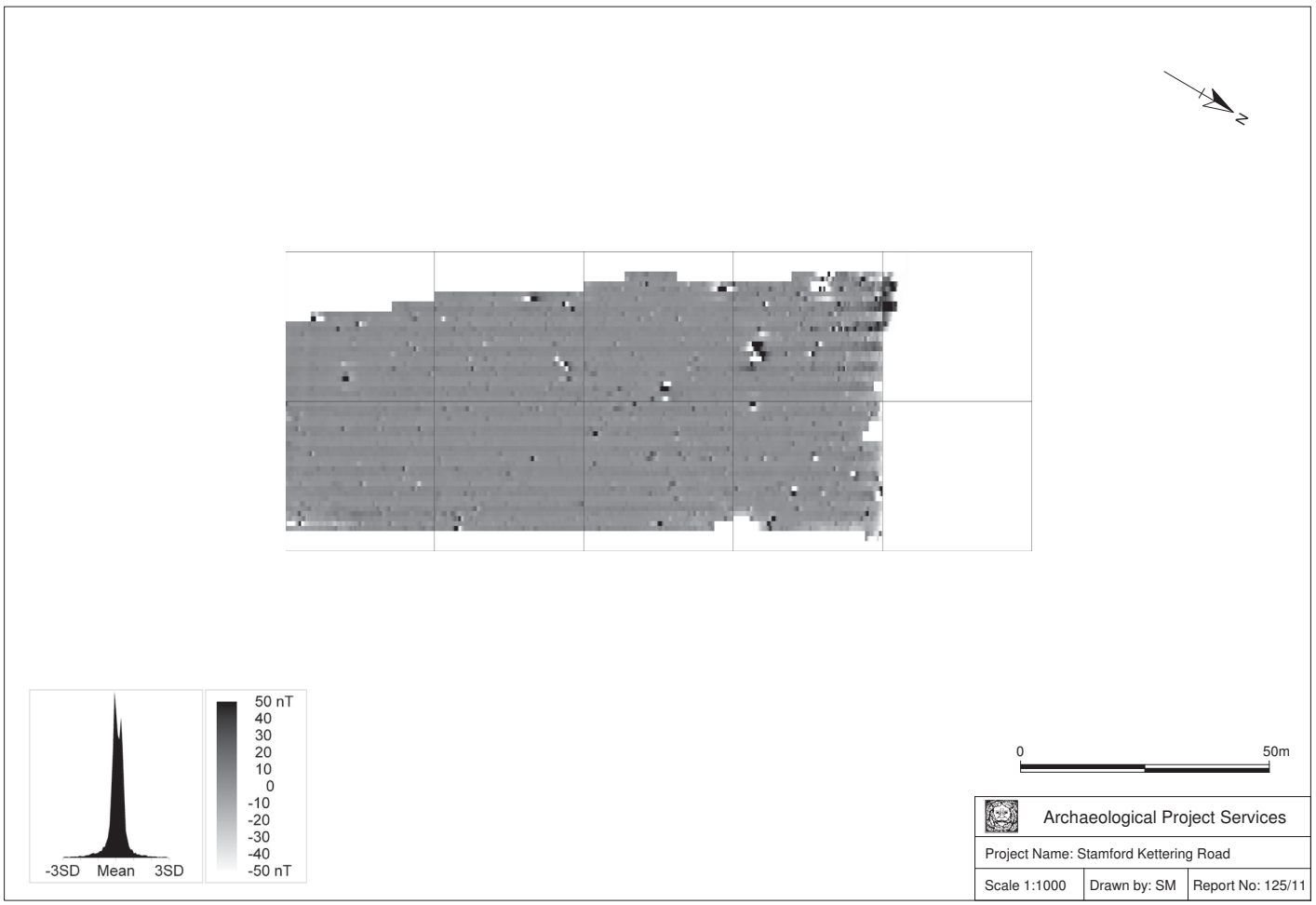

Figure 3 Minimally processed data greyscale plot

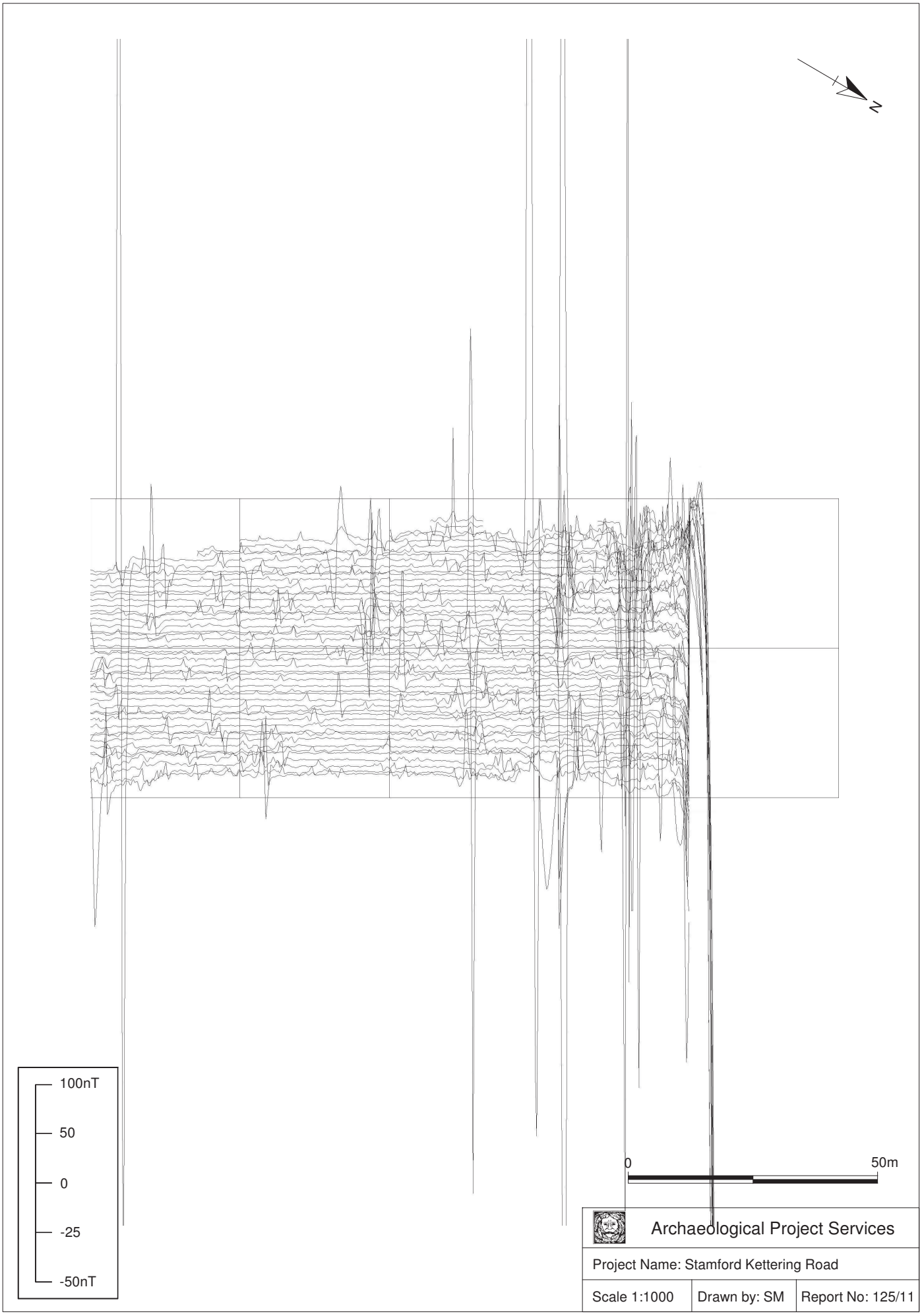

Figure 4 Unprocessed data trace plot

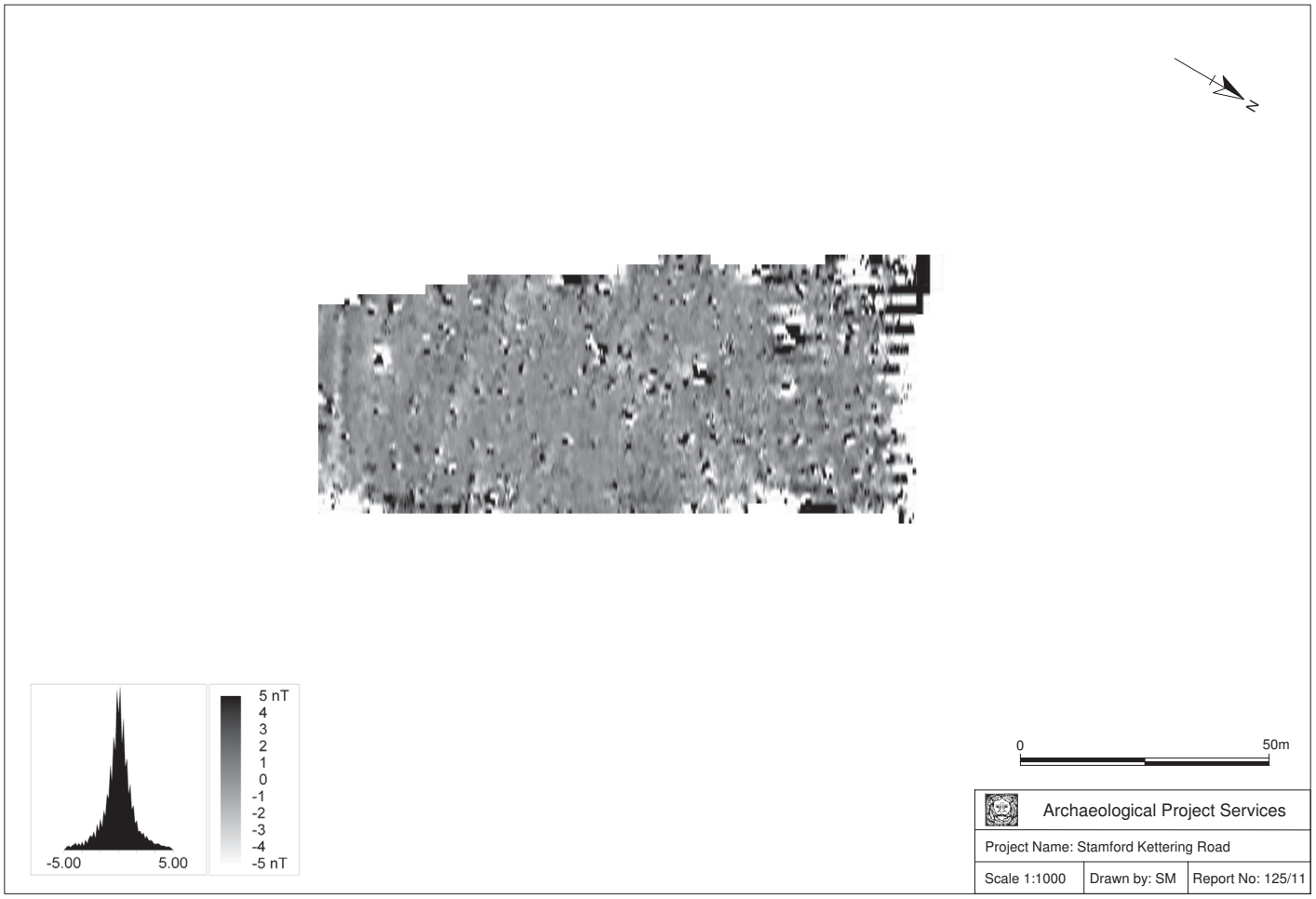

Figure 5 Processed data greyscale plot

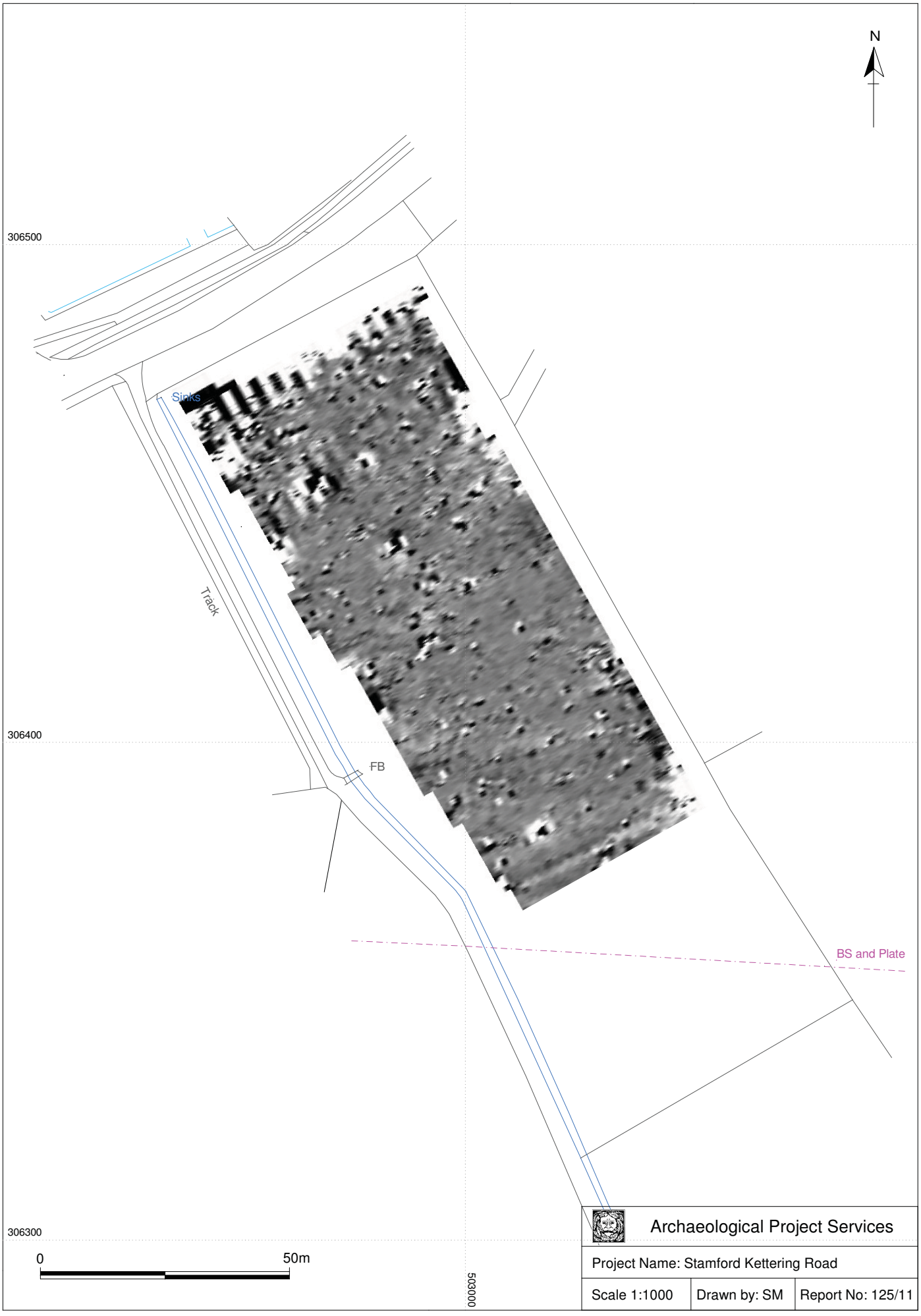

Figure 6 Processed data greyscale on basemap

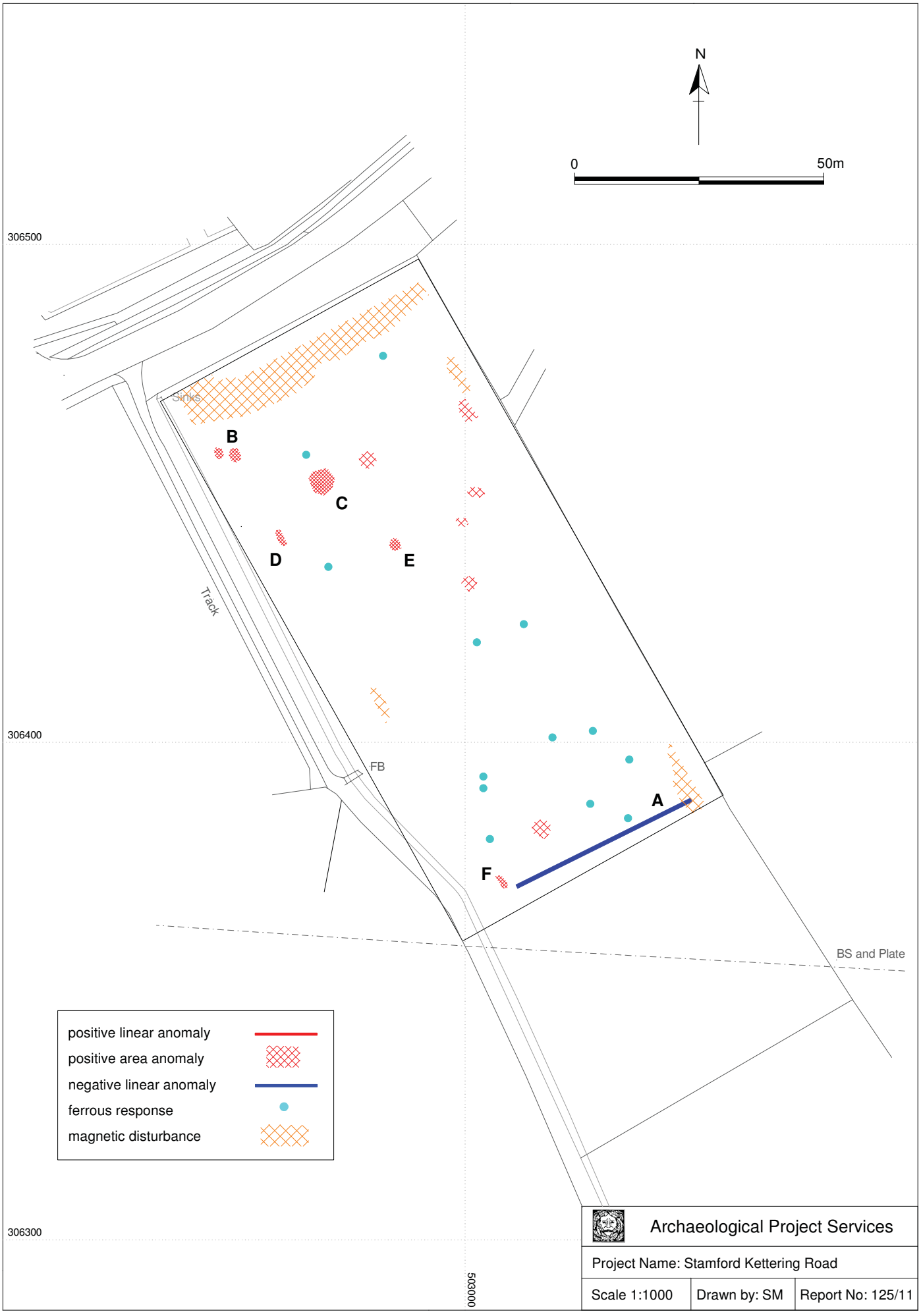

Figure 7 Interpretative plot

Appendix 1
THE ARCHIVE

The archive consists of:

1 Daily record sheet
1 Report text and illustrations
Digital data

File names	stkr11-01.xgd stkr11-02.xgd stkr11-02-a.xgd stkr11-03.xgd stkr11-03-a.xgd stkr11-04.xgd stkr11-04-a.xgd stkr11-05.xgd stkr11-05-a.xgd	stkr11-06.xgd stkr11-06-a.xgd stkr11-07.xgd stkr11-07-a.xgd stkr11-08.xgd stkr11-08-a.xgd stkr11-09.xgd stkr11-c1.xcp	
Explanation of codes used in file names	xgd files are magnetometer grids, named with site code and number in the order surveyed. Grids rotated to first traverse north are suffixed with "-a" xcp files are composites containing record of all the data and processes used to produce the end product		
Description of file formats	All files are in plain text xml format with header data defining survey and processing parameters		
List of codes used in files	D indicates a "dummy" value within the composite data		
Hardware, software and operating systems	ArcheoSurveyor 2.5.13 running under Windows XP Service Pack 3		
Date of last modification	08/11/11		
Indications of known areas of weakness in data	Grids 1, 8, 9 show directional effects caused by highly magnetic material at margins of survey		

All primary records are currently kept at:

Archaeological Project Services, The Old School, Cameron Street, Heckington, Sleaford, Lincolnshire NG34 9RW

The ultimate destination of the project archive is:

Lincolnshire City and County Museum
The Collection
Danes Terrace
Lincoln
LN2 1LP

Site Code: STKR11
Accession no: LCNCC 2011.421

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