South West Bicester

Technical appendix 2:
Cultural heritage

MAY 2006

Terence O'Rourke

Countryside Properties
(Bicester) Ltd

South West Bicester Environmental Statement
Countryside Properties (Bicester) Ltd

Technical Appendix 2 Cultural Heritage

Contents

Air Photo Services Ltd, Land South-West of Bicester, Oxfordshire, Interpretation of Aerial Photographs for Archaeology, September 2005.

Geophysical survey report: Land southwest of Bicester, Oxon for Terence O'Rourke Ltd. February 2006 J2104 by Richard J. Smalley

LAND SOUTHWEST OF BICESTER, OXFORDSHIRE

INTERPRETATION OF AERIAL PHOTOGRAPHS FOR ARCHAEOLOGY

AIR PHOTO SERVICES LTD

WWW.AIRPHOTOSERVICES.CO.UK

PROJECT NO. 0418

CHRIS COX BA MA MIFA

SEPTEMBER 2005

COMMISSIONED BY TERENCE O'ROURKE LTD.

ON BEHALF OF COUNTRYSIDE PROPERTIES

1 INTRODUCTION

1.1 This interpretation of aerial photographs has been prepared by Air Photo Services Ltd under instruction by Terence O'Rourke Ltd. on behalf of Countryside Properties.

1.2 The object of the interpretation was to provide information on the location and nature of archaeological features visible on existing aerial photographs within and directly adjacent to the study area.

1.3 API data is designed to act as a framework for ground-based intrusive investigations, which may reveal the date and nature of the deposits which are initially identified from the air. In areas where the soil is well drained, crop marked evidence does not show all the stratified deposits, but shows the main elements of concentrations of archaeological features.

1.4 Accurate mapping from aerial photographs has been undertaken during this project, to assist the location of ground-based archaeological works.

2 THE STUDY AREA

2.1 Location

2.2 The interpretation considers a study area to the southwest of Bicester, Oxfordshire. The site is c.192 hectares in extent and is bounded to the north by Middleton Stoney Road, the east by Oxford Road, the south by a drain associated with Gagle Brook and the west by Bignell Belt and Bignell Lodge woodlands. Two ancillary areas lie to the immediate east of Oxford Road.

2.3 The study area is centred at National Grid Reference SP 570 220.

2.4 Geology and Topography

2.4.1 The western part of the study area is underlain by Jurassic clay and limestone which give rise to fine calcareous soils which are well drained (SSEW classification 511b, Moreton soil association). The eastern part of the area comprises drift over Cretaceous clay or mudstone which give rise to clayey soils of the Wickham 2 soil association (SSEW classification 711f). The area thus lies over the boundary of two differing soil types.

2.4.2 The outlying areas to the east of Oxford Road are less well drained and are characterised by rough pasture, drains and marshy areas which are now interspersed by modern development in the vicinity of the Roman town and the Roman road.

2.4.3 The deposits in the central part of the area are well drained and in most places conducive to the formation of crop marks in the presence of sub-surface differences in the depth of soil. Other deposits, particularly to the east and north of the main area, are not well drained, and will not show clear marks in crops unless under severe soil moisture deficit.

3 ARCHAEOLOGY FROM AERIAL PHOTOGRAPHS

3.1 The role of aerial photographic interpretation

3.1.1 Air photo interpretation provides an overview of landscape history and changes in land-use. It provides informed guidance for subsequent desk and ground-based investigations and complements cartographic and documentary research.

3.1.2 Information gained from aerial photographs cannot easily be detected by other means. The interpretation of contemporary and archival aerial photographs is thus an important component of multi-disciplinary archaeological investigation.

3.1.3 Interpretation of aerial photographs allows the accurate mapping of archaeological sites recorded as crop, grass or vegetation marks (caused by the differential growth of plants over buried features); soil marks (caused by differences in soil colour over ploughed buried features) and shadows cast by upstanding earthworks and features seen in relief. In this instance, features were seen as positive marks in crops and vestigial earthworks.

3.2 Limitations of the data

3.2.1 Aerial photographic evidence is limited by seasonal, agricultural, meteorological and environmental factors which affect the extent to which either buried or upstanding archaeological features can be detected. It is thus advantageous to examine a range of photos taken under a variety of environmental conditions in order to build up a comprehensive interpretation of the archaeological landscape. The visibility of archaeological features may differ from year to year, and be obscured by differential depths of soil or differing types of vegetation. Individual photographs often record only a small percentage of the actual extent of buried or upstanding features.

3.2.2 In this case, the photos showed the study area and its environs under a good variety of environmental conditions, but it is evident that the ancillary areas to the east are of a very different natural character to the central part of the area. Ridge and furrow (both medieval broad ridges and Post Medieval ‘narrow rig’), was seen as vestigial earthworks, soil marks and crop marks.

4 AERIAL PHOTOGRAPHS: TYPES AND SOURCES

4.1 Types

4.1.1 Two types of aerial photograph are used for archaeological interpretation. Vertical aerial photographs are taken for general-purpose survey using a camera mounted inside a modified aircraft. The aircraft is flown on a pre-planned set of overlapping flight-lines which cover the survey area completely. The camera points straight towards the ground. The vertical viewpoint provides aerial photographic coverage from a fixed scale and constant 180° angles at the centre of each frame. The overlap between the areas covered by each consecutive frame is usually 60%. This overlap between frames enables the photo interpreter to study each pair of vertical photos under a stereoscope.

4.1.2 The stereoscope combines the two images to allow the interpreter to see one three-dimensional image of the ground surface. Vertical aerial photographs carry inherent distortions introduced by variations in perspective and ground height, but are essentially 'map-like' in appearance. They are generally taken for non-archaeological, civil and military purposes and form the basic data from which most modern maps are compiled. Vertical aerial photographs are a very useful source of archaeological data, particularly in areas where features survive as earthworks. They also constitute historical 'documents' and provide evidence for changes in boundaries and land use over the past half century.

4.1.3 Oblique aerial photographs are taken using a hand held camera by an aerial archaeologist to portray features which have been identified during specialist survey. These photos are extremely useful, but contain inherent perspective distortions, which must be accounted for in rectification and mapping procedures.

4.1.4 Over one hundred vertical and oblique aerial photographs, taken between 1941 and 2003, provided data for this interpretation.

4.2 Sources of data

4.2.1 Photographs were consulted at English Heritage National Monuments Record (NMR, coversearch number 80538), Oxfordshire SMR and Cambridge University Collection at the Unit for Landscape Modelling (formerly CUCAP)

4.2.2 Theses photos are listed at Appendix 1.

5 INTERPRETATION AND MAPPING METHODOLOGY

5.1 All photographs were closely examined, under 1.5x and 4x magnification and interpreted with the aid of a mirror stereoscope where appropriate.

5.2 Relevant photographs were digitally rectified to a 1:10000 scale OS map base and interpreted on screen and as hard copies. The OS state an accuracy tolerance of ±8m for 1:10000 scale survey. The 'error values' stated during rectification all lay under 1m, and the mapping is accurate within the tolerance of 1:10000 mapping and gives a detailed overview of the visible evidence.

5.3 Interpretations were drawn to the OS base and are presented as a geo-referenced digital file with this report.

6 RESULTS

AP Site 01, Figure 2

Site Type Possible ring ditches

Central NGR SP 564 222

TOR Site No. 16

Principal Air Photo OS mosaic, 1947, Oxfordshire SMR

Description

AP 01 is identified on the SMR as possible Bronze Age ring ditches (vestigial remains of burial mounds). Air photos taken by Fairey surveys in 1961 show marks in crops at this location. Some of these are indeed sub circular features, but these are natural anomalies in the underlying limestone.

A mosaic of vertical photos taken in 1947 shows three distinct dark toned areas, which have been mapped for this assessment. These features are unlikely to have been round barrows, and do not show on photographs which show other features as very clear crop marks, notable those taken by Fairey Surveys in 1961.

I conclude that these features are not round barrows and are likely to be of natural or agricultural origin.

They lie within an area which contains traces of ditched enclosures as fragmentary crop marks (AP 02).

AP Site	02, Figure 2
Site type	Boundary, ditched enclosures and pits
Central NGR	SP 564 221
TOR Site No.	17
Principal Air Photos	FSL 6125 12 109

Description

Vertical aerial photographs taken in 1961 show a complex series of crop marks at this location which are caused by natural, archaeological and modern features. The archaeological features have been mapped as crop marked ditches, and the natural background comprises mottled patterns in the crop caused by anomalies in the underlying limestone.

AP 02 comprises a complex of ditched enclosures, of completely unknown date, with fragments of possible boundaries and tracks. One of the linear features aligns with the general layout of the remaining modern boundaries. Features are likely to be more extensive than shown on the photographs, but not to comprise a site of high national or regional importance. The area is likely to have been overlain by medieval ridge and furrow, which is now almost wholly eroded, as the area, in common with the rest of the study area, has been heavily ploughed.

AP Site	03, Figure 3
Site type	Boundaries, tracks, ditched enclosures and pits
Central NGR	SP 575 221
TOR Site No.	1 & 3
Principal Air Photos	SP5721/6; SP5721/11; SP5721/13; SP5721/14.

Description

Oblique aerial photographs show a double ditched track, various fragmentary sub-rectangular ditched enclosures, pits and boundaries or tracks as crop marks at this location. This site is likely to be more complex than the air photos show, and may be partially masked at its southern extent by an area of deeper soil. The site is not dateable from the crop marked evidence alone, but may be Roman, as a scatter of Roman pottery discovered in this vicinity and the site lies near to known Roman remains. There is likely to be further' background' scatter of archaeological features outside the core of the site, which may be identified during targeted ground works when any planned foundations are laid.

Two sweeping curvilinear ditched features show at the west of the site. One of these shows as a crop mark, and is definitely pre-modern. This is shown in red on figure 3. The westernmost feature is non archaeological, and was caused by a farm vehicle driving across a field of ripe cereal crop which is freshly and clearly disturbed.

This field shows crop marked evidence readily at the appropriate times of year, and has been photographed on a number of occasions. Two ring ditches, the vestigial remains of Bronze Age burial mounds, are visible as crop marks to the south (AP 04). The field has been heavily ploughed, and all remaining features are likely to be very truncated within a shallow subsoil horizon.

AP Site 04, Figure 4

Site type Two ring ditches and other cut features

Central NGR SP 574 217

TOR Site No. 4

Principal Air Photos SP5721/4; SP5721/5; ABW 50; CU 068; SP5721/15; SP5721/16; SP5721/11; SP5721/6; SP5721/14; SP5721/13; SP5721/8.

Description

Two uninterrupted ring ditches show as crop marks at this location, and indicate the position of former Bronze Age burial mounds. These monuments are wholly eroded and flattened by ploughing. They do not show as soil marks or as vestigial mounds and are only persistent in the sub soil.

Some fragmentary ditched features lie adjacent to the ring ditches, but are likely to be associated with the focus of past activity to the north, or the Roman Town.

Crop marked traces of eroded broad ridge and furrow indicate that the area has been ploughed since medieval times. The area to the southeast of the ring ditches carries traces of both broad ridge and furrow and overlying narrow ridge and furrow which was produced by steam ploughing in the post-medieval period. It is unusual that the post medieval ploughing has been conducted in a differing direction to the medieval. Both are shown on the map, and both are heavily eroded.

An area of well defined small scale quarrying is seen as a crop mark to the northeast of the ring ditches. These features are common in areas adjacent to Roman roads and settlement, where construction materials will have been dug locally in the past. This feature is now eroded and in filled and shows as a crop mark.

Photograph number SP5721/13 shows a linear feature which is definitely caused by a modern agricultural vehicle, and is show as such on the map.

AP Site	05, Figure 4
Site type	Possible track way
Central NGR	SP 576 215
TOR Site No.	Probably associated with TOR 11
Principal Air Photos	SP5721/6

Description

A double ditched sinuous feature shows as a mark in a ripe crop, to the immediate north of the scheduled Roman town. This may be a track way or roadway associated with the town, and excavations have been undertaken in this vicinity during 1996.

AP Site 06, Figure 1

Site type Medieval and post medieval agricultural landscape

Central NGR Throughout the site

TOR Site No. 19

Principal Air Photos CU 68; OS/CSL/84243 v 1008; OS/66042 v 072;OS/91258 V22CPE/UK1897 3315; OS/CSL/84243 V 1020.

Description

The study area was ploughed in the medieval period and contains traces of classic broad ridge and furrow. These features are upstanding in the area adjacent to Whitelands Farm, where the ridges abut and create a sinuous headland which runs from northeast to southwest and is visible as a vestigial embanked feature. Part of the headland has been re-used as a modern field boundary. In other areas the medieval ridges are wholly eroded by subsequent agriculture. The focus of medieval settlement was obviously at the now deserted medieval village at Bignell.

In places, there are traces of post medieval ridges caused by steam ploughing. This type of ploughing produced straight, narrow furrows and ridges and was simply a by product of mechanical ploughing rather than a reflection of the current system of land division.

AP Site 07, Figure 3

Site type Former quarry

Central NGR SP 574 223

TOR Site No.

Principal Air Photos OS/CSL/84243 v 1020

Description

An ovoid depression which is likely to be a former quarry, of unknown date.

AP Site 08, Figure 3

Site type Former quarry

Central NGR SP 578216

TOR Site No.

Principal Air Photos OS/CSL/84243 v 1020

An ovoid depression which is likely to be a former quarry. In this area, the ridge and furrow overlies the surface of the depression, which was thus quarried before the medieval period. It is likely to be associated with the nearby Roman town and road.

7 CONCLUSION

7.1 The aerial photographic evidence shows a landscape which comprises funerary monuments in known locations, ancient tracks and boundaries, associated with a focus of settlement near to a Roman road and town, and Medieval and later agricultural land use.

7.2 The archaeological landscape is very heavily eroded by ploughing since the medieval period.

7.3 All the pre-medieval archaeological evidence which is visible on aerial photographs shows as crop marks, with the exception of one quarry. These crop marks are very clear, and show on numerous photographs which were taken over a series of years. It is possible, but unlikely, that further archaeological evidence for major sites will lie within the study area.

7.4 These crop marks are visible in discrete and focussed locations, interspersed by track ways and some outlying pits. They indicate a focus of probable settlement activity at AP 01 and 03, and Bronze Age burials at AP 04. A further ring ditch, indicative of an eroded round barrow, as seen on photo number B1 22, which was taken by JK St Joseph in the 1940s. This feature lay outside the study area to the north, and is now built over.

7.5 Evidence for further burial mound in the western part of the area is not strong, and the aerial photographic evidence is inconclusive. It is not usual for later settlements or enclosures to have been built over vestigial or upstanding burial mounds, and these features do lie within an area of crop marked enclosures. I therefore conclude that they are non-archaeological.

APPENDIX 1

Aerial Photographs consulted:

UFLM, Cambridge

Oblique Photos

Rec	PHOTO_ID	PHOTO_TYPE	VIEW_DIRN	PHOTO_SUBJ	Z00KM_SQUA	NGRE	NGRN	PHOTO_DATE
1	BI22	o		Cropmark, ring-ditch, 1 mile NE of Chesterton	SP=42	456800	222700	Wed, 14 Jul 1948
2	CU68	s	NE	Roman road near Bicester, looking NE	SP=42	457400	221400	Sun, 26 Jun 1949
3	ZH15	o		Chesterton	SP=42	456300	221300	Thu, 2 Jul 1959
4	ZH16	o		Chesterton	SP=42	456300	221300	Thu, 2 Jul 1959
5	ABW59	o		Cropmarks, 0.75 mile SW of Bicester	SP=42	457500	221800	Sat, 9 Jul 1960
6	ABW60	o		Cropmarks, 0.75 mile SW of Bicester	SP=42	457500	221800	Sat, 9 Jul 1960

EH NMR

Overleaf

ENGLISH HERITAGE

NATIONAL MONUMENTS RECORD

Ms. Chris Cox
Air Photo Services Ltd
76 The Green
Lyneham
Wiltshire
SN15 4PD

Our Ref: **AP 80538**
Your Ref: **Bicester**
Direct Line: 01793 414737
Fax: 01793 414606
E-mail: nmrinfo@english-heritage.org.uk

16 August 2005

Dear Chris,

Air photograph priority search: Bicester

Thank you for your request. I have searched our collections of aerial photography for material covering your site, and the results are listed on the accompanying computer printouts. I have enclosed Explanatory Notes for the printouts and information sheets.

Specialist oblique records:	9
Military oblique records:	0
Vertical records:	84

If you would like to view these images please phone to make an appointment to visit the NMR (we need five working days notice to prepare Archive material). Our search room is open from 9.30 to 5pm Tuesday to Friday. If you cannot make a visit then we can send photocopies by post, subject to any copyright restrictions and the appropriate charges. We can make copies of almost all the Archive material.

If you need any further information, please do not hesitate to contact me.

An invoice for this priority search of £45.00 + VAT will follow shortly.

Yours sincerely,

Laura Butler
NMR Enquiry and Research Services
Please note that NMR information is supplied subject to the conditions specified overleaf.

ENGLISH HERITAGE - NATIONAL MONUMENTS RECORD
National Monuments Record - Air Photos Library

Summary report for vertical coversearch
Date : 16-Aug-2005 Time : 11:49:58
Customer Enquiry Reference No. 80538

Sortie Number	Library Number	Cam Pos	Start Frame	End Frame	Held	National Start	Reference End	Date	Date Flag	Qual ity	Scale 1:	Focal Length	Format	Repos itory	Copy Rght
RAF/CPE/UK/1897	562	RP	3313	3317	P	SP579224	SP556223	12-DEC-1946	1	AB	9800	20.00	BW87	MOD	RAF
RAF/CPE/UK/2013	603	RS	4097	4098	P	SP563213	SP557213	16-APR-1947	1	A	9800	20.00	BW87	MOD	RAF
FSL/6125	1118A	V	12011	12011	P	SP573212	SP573212	01-JUN-1961	3	A	8000	6.00	BW99	CSL	CSL
FSL/6125	1118A	V	12016	12016	P	SP564212	SP564212	01-JUN-1961	3	A	8000	6.00	BW99	CSL	CSL
FSL/6125	1118A	V	12109	12111	P	SP562224	SP577224	01-JUN-1961	3	A	8000	6.00	BW99	CSL	CSL
RAF/58/716	1189	RP	3121	3123	P	SP569225	SP577225	04-JUN-1951	1	A	5000	20.00	BW87	MOD	RAF
RAF/82/1006	1520	F61	293	295	P	SP555230	SP561208	31-AUG-1954	1	AB	15000	36.00	BW87	MOD	RAF
RAF/540/1400	1563	F21	138	141	P	SP561214	SP576215	01-SEP-1954	1	AB	10300	20.00	BW87	MOD	RAF
RAF/540/1400	1563	F21	161	164	P	SP579221	SP558222	01-SEP-1954	1	AB	10300	20.00	BW87	MOD	RAF
RAF/543/673	2114	F41	12	13	P	SP562229	SP571233	24-AUG-1959	1	AB	11000	36.00	BW87	MOD	CRW
RAF/543/673	2114	F42	12	13	P	SP571211	SP580215	24-AUG-1959	1	AB	11000	36.00	BW87	MOD	CRW
RAF/542/1	2577	F22	4	5	P	SP569212	SP568224	04-AUG-1954	1	A	10000	36.00	BW87	MOD	RAF
RAF/541/340	2661	RS	4120	4123	P	SP577217	SP559217	26-JUL-1949	1	AB	10000	36.00	BW87	MOD	RAF
RAF/16/AC638	6510	V	5021	5024	P	SP565204	SP555225	07-NOV-1943	1	A	10800	20.00	BW87	FDM	RAF
US/7PH/GP/LOC267	6914	V	5028	5029	P	SP583215	SP578205	10-APR-1944	1	AC	13300	24.00	BW1809	FDM	USA
RAF/HLA/110	8380	V	25	25	P	SP573229	SP573229	05-FEB-1941	1	A	12200	8.00	BW55	FDM	RAF
OS/70023	10537	V	30	32	P	SP574228	SP575219	23-MAR-1970	1	A	5000	12.00	BW99	NMR	CRW
OS/66042	11626	V	55	58	P	SP579227	SP560227	29-APR-1966	1	A	7500	12.00	BW99	NMR	CRW
OS/66042	11626	V	69	72	P	SP558218	SP577217	29-APR-1966	1	A	7500	12.00	BW99	NMR	CRW
OS/75312	12174	V	71	72	P	SP580226	SP572226	05-JUL-1975	1	A	10600	6.00	BW99	NMR	CRW
OS/75312	12174	V	85	87	P	SP558210	SP576210	05-JUL-1975	1	A	10600	6.00	BW99	NMR	CRW
OS/75392	12197	V	188	190	P	SP560209	SP578210	21-SEP-1975	1	A	11000	6.00	BW99	NMR	CRW
OS/CSL/84243	12669	V	1008	1009	P	SP558222	SP558213	26-NOV-1984	1	A	10000	6.00	BW99	OS	CRW
OS/CSL/84243	12669	V	1020	1021	P	SP574215	SP575224	26-NOV-1984	1	A	10000	6.00	BW99	OS	CRW
OS/89439	13627	V	18	18	P	SP560210	SP560210	23-SEP-1989	1	A	10400	6.00	BW99	OS	CRW
OS/91258	13884	V	20	23	P	SP558216	SP577216	19-SEP-1991	1	A	8600	6.00	BW99	OS	CRW
OS/93002	14193	V	21	24	P	SP568210	SP580222	19-FEB-1993	1	A	7800	12.00	BW99	OS	CRW
OS/94213	14691	V	27	29	P	SP573215	SP561215	28-JUN-1994	1	A	8000	12.00	BW99	OS	CRW
OS/94214	14692	V	11	14	P	SP569224	SP569209	28-JUN-1994	1	A	6500	12.00	BW99	OS	CRW
OS/94214	14692	V	22	23	P	SP578215	SP579220	28-JUN-1994	1	A	6500	12.00	BW99	OS	CRW

Total 22 Sorties 84 Prints

APS 0418 September 2005

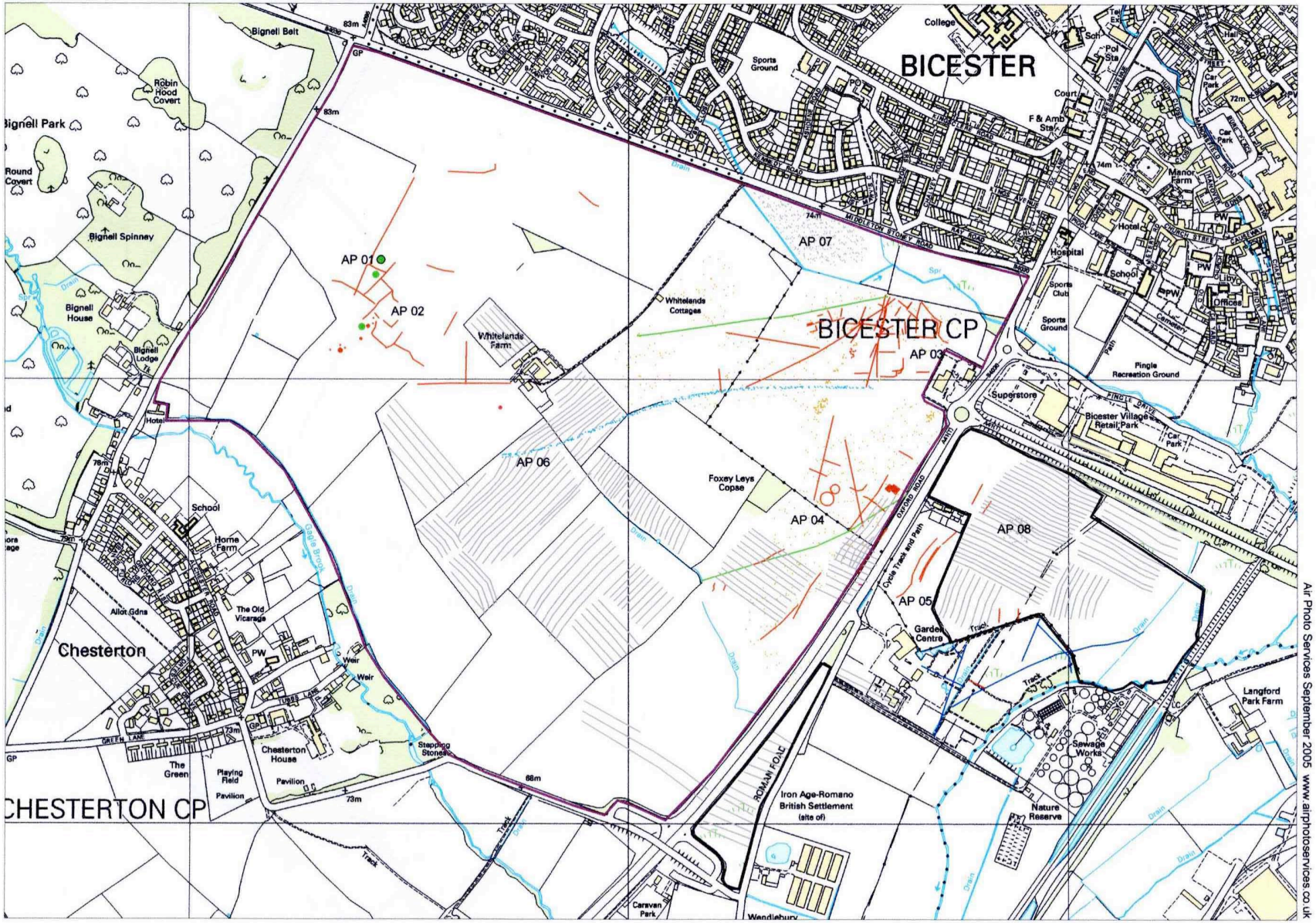
Land Southwest of Bicester, Oxfordshire

ENGLISH HERITAGE - NATIONAL MONUMENTS RECORD
National Monuments Record - Air Photos Library

Summary report for specialist collection
Date : 16-Aug-2005 Time : 11:47:55
Customer Enquiry Reference No. 80538

NGR Index Number	Accession Number	Frame	Original Number	Copy right	Repos itory	Film Details		Date Flown	DF	6 Fig NGR
SP5721/4	NMR 4634	03		CRW	NMR	B 70mm,120,220	Black& white	02-JUN-1990	1	SP572215
SP5721/5	NMR 4634	04		CRW	NMR	B 70mm,120,220	Black& white	02-JUN-1990	1	SP572215
SP5721/6	NMR 15332	15		CRW	NMR	B 70mm,120,220	Black& white	07-JUL-1995	1	SP575218
SP5721/8	NMR 15332	17		CRW	NMR	B 70mm,120,220	Black& white	07-JUL-1995	1	SP575217
SP5721/11	NMR 23137	23		EHC	NMR	B 70mm,120,220	Black& white	24-JUN-2003	1	SP574218
SP5721/13	NMR 23115	34		EHC	NMR	B 35 mm	Colour neg	24-JUN-2003	1	SP574218
SP5721/14	NMR 23115	35		EHC	NMR	B 35 mm	Colour neg	24-JUN-2003	1	SP574218
SP5721/15	NMR 23115	36		EHC	NMR	B 35 mm	Colour neg	24-JUN-2003	1	SP574217
SP5721/16	NMR 23115	37		EHC	NMR	B 35 mm	Colour neg	24-JUN-2003	1	SP574217

FIGURE 1: Site overview & AP 06



Cut feature

Embanked feature

Non-archaeological feature

Ridge and furrow

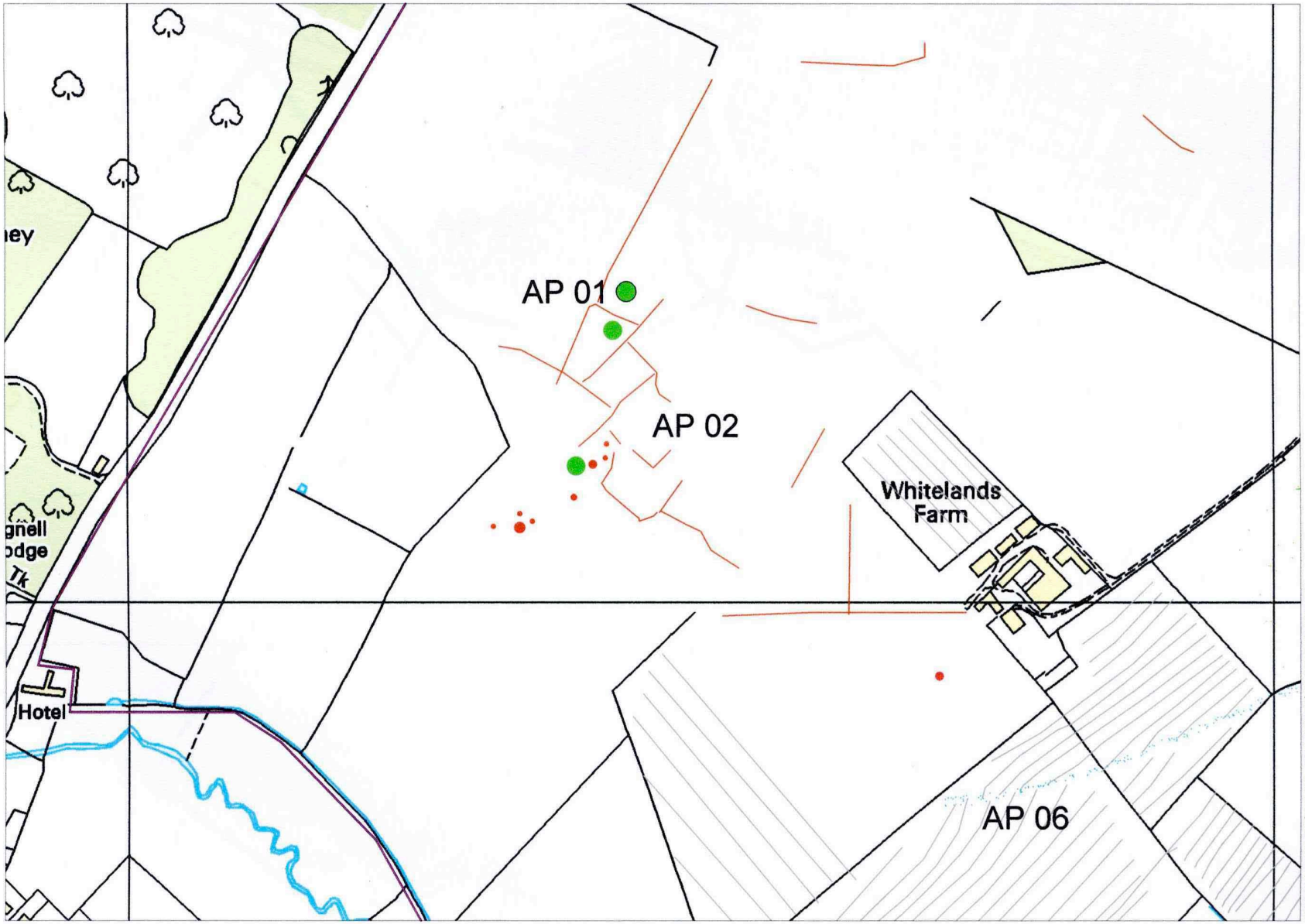
Former quarry or extraction area

Deeper soil

Drainage

FIGURE 1

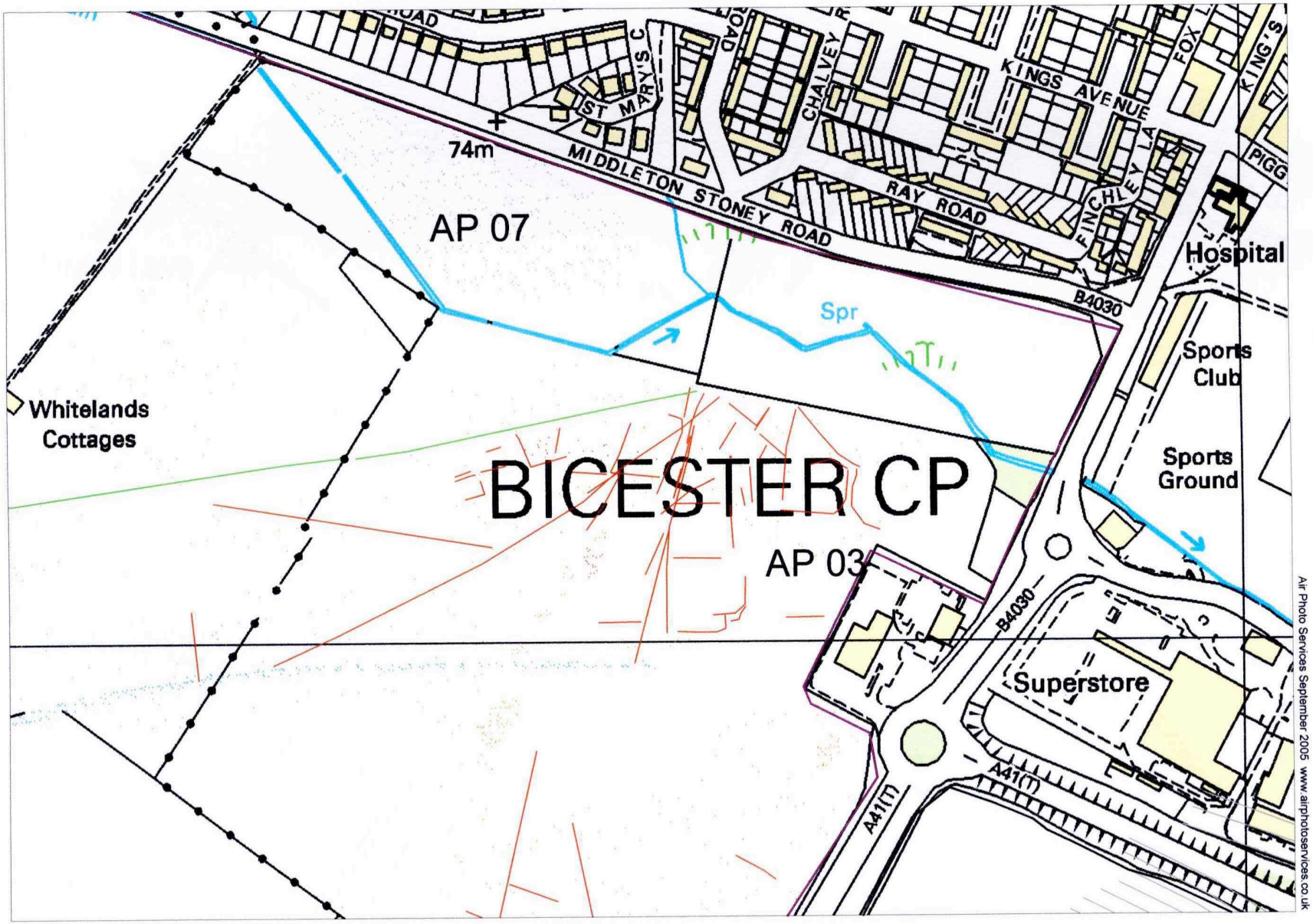
FIGURE 2: Land Southwest of Bicester, Assessment of Aerial Photographs. AP 01 & AP 02.



Cut feature
Embanked feature
Non-archaeological feature
Ridge and furrow
Former quarry or extraction area
Deeper soil
Drainage

FIGURE 2

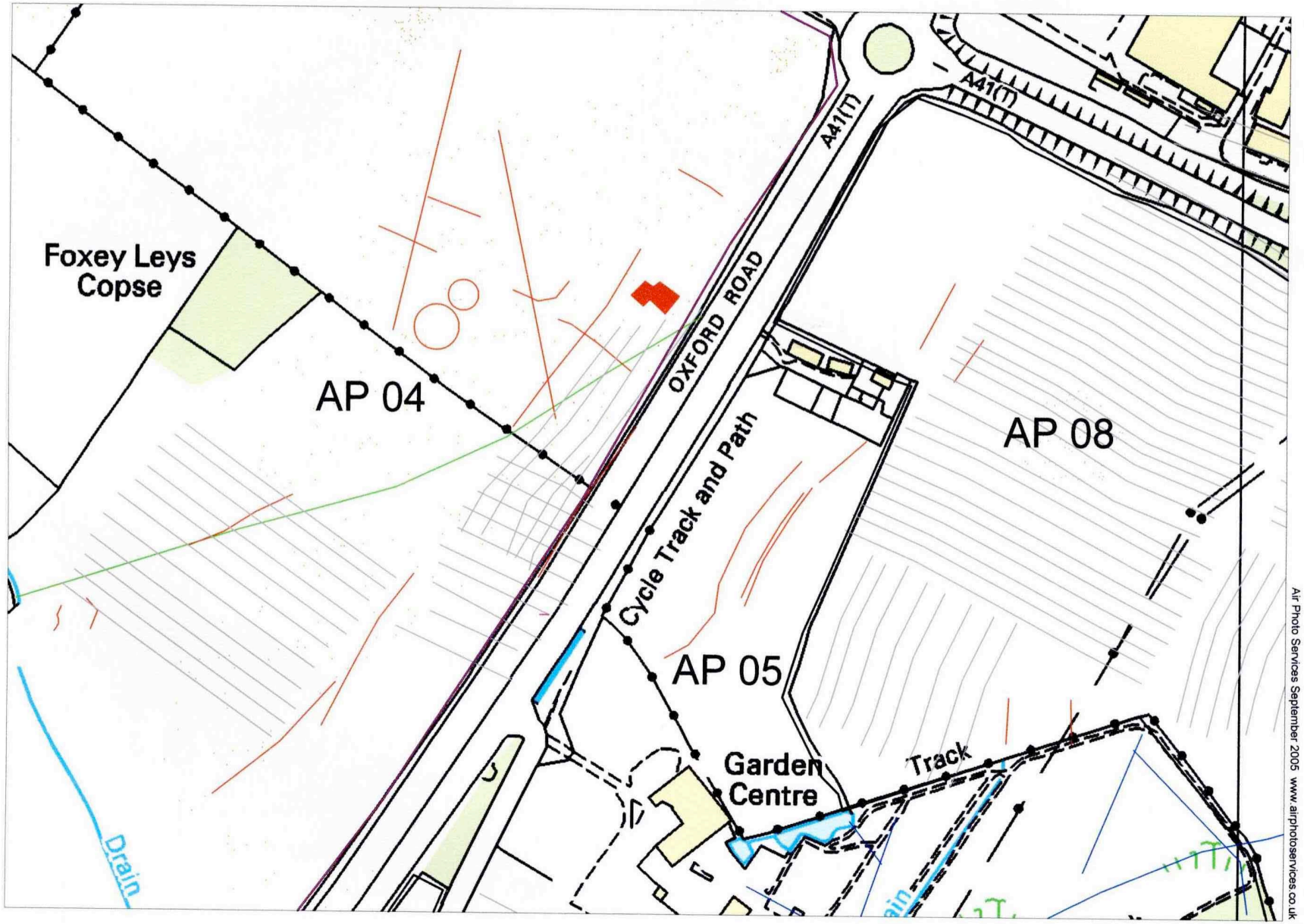
FIGURE 3: Land Southwest of Bicester, Assessment of Aerial Photographs. AP 03 & AP 07



Cut feature
Embanked feature
Non-archaeological feature
Ridge and furrow
Former quarry or extraction area
Deeper soil
Drainage

FIGURE 3

FIGURE 4: Land Southwest of Bicester, Assessment of Aerial Photographs. AP 04, AP 05 & AP 08.



Cut feature
Embanked feature
Non-archaeological feature
Ridge and furrow
Former quarry or extraction area
Deeper soil
Drainage

FIGURE 4

STRATASCAN

Geophysical Survey Report

Land Southwest of Bicester, Oxon

for

Terence O' Rourke Ltd

February

J2104

Richard A J Smalley BA (Hons)

Document Title: **Geophysical Survey Report**
Land Southwest of Bicester, Oxon

Client: **Terence O' Rourke**

Stratascan Job No: **J2104**

Techniques: **Detailed magnetic survey (gradiometry)**

National Grid Ref: **SP 571 220**

Field Team: **Lee Moorhead, Steven Russell, Laurence Chadd, and Sam Russell**

Project Manager: **Simon Stowe BSc. (Hons)**

Report written by: **Richard Smalley BA (Hons)**

CAD illustration by: **Richard Smalley BA (Hons)**

Checked by: **Peter Barker C.Eng MICE MCIWEM MIFA**

Stratascan Ltd.

Vineyard House
Upper Hook Road
Upton upon Severn
WR8 0SA

Tel: 01684 592266
Fax: 01684 594142
Email: ppb@stratascan.co.uk

www.stratascan.co.uk

LIST OF FIGURES

1 SUMMARY OF RESULTS

The gradiometer survey undertaken on the land southwest of Bicester has been successful in locating a number of anomalies of possible archaeological potential. Two ring ditches associated with round barrows have been located in the centre of the site. A number of substantial ditches run across the survey area and evidence for possible pits can be seen in all areas of the site.

2 INTRODUCTION

2.1 Background synopsis

Stratascan were commissioned by Terence O' Rourke to undertake a geophysical survey of an area outlined for mixed-use development by Cherwell District Council.

2.2 Site location

The site is located on the land southwest of Bicester at OS ref. SP 571 220.

2.3 Description of site

The survey area consists of approximately 55.8ha of gently undulating agricultural land currently used for pasture. Obstructions include roads, copses and springs.

2.4 Geology and soils

The underlying geology is Oxford Clay and Kellaway Beds (British Geological Survey South Sheet, Fourth Edition Solid, 2001). The overlying soils are known as Whickham 2 soils which are a type of drift over Jurassic and Cretaceous clay or mudstone. These consist of slowly permeable seasonally waterlogged fine loamy over clayey, fine silty over clayey and clayey soils. Small areas of slowly permeable calcareous soils may occur on steeper slopes (Soil Survey of England and Wales, Sheet 6 South East England).

2.5 Site history and archaeological potential

A geophysical survey undertaken by Stratascan immediately to the east of the current survey area in 1997 (J1258) identified a complex of linear ditches and a number of discrete features believed to be Romano- British in origin.

2.6 Survey objectives

The objective of the survey was to locate any features of possible archaeological significance in order that they may be assessed prior to development.

2.7 Survey methods

Detailed magnetic survey (gradiometry) was used as an efficient and effective method of locating archaeological anomalies. More information regarding this technique is included in the Methodology section below.

3 METHODOLOGY

3.1 Date of fieldwork

The fieldwork was carried out over 19 days from 9th January 2006. Weather conditions during the survey were cold and dry.

3.2 Grid locations

The survey grid was based upon the Ordnance Survey National Grid, see Figure 1. The referencing and alignment of grids was achieved using a Leica TS 705auto Total Station in conjunction with a Leica GS50 Global Positioning System using OS co-ordinate reference points derived from digital base mapping.

3.3 Survey equipment

The magnetic survey was carried out using a dual sensor Grad601-2 Magnetic Gradiometer manufactured by Bartington Instruments Ltd. 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 increasing the sensitivity to small changes in the Earths magnetic field.

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

3.4.1 Sampling interval

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

3.4.2 Depth of scan and resolution

The Grad601-2 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 0.25m centres provides an appropriate methodology balancing cost and time with resolution.

3.4.3 Data capture

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

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 gradiometer data used in this report:

1. *Despike* (useful for display and allows further processing functions to be carried out more effectively by removing extreme data values)

   Geoplot parameters:
   X radius = 1, y radius = 1, threshold = 3 std. dev.
   Spike replacement = mean

2. *Zero mean grid* (sets the background mean of each grid to zero and is useful for removing grid edge discontinuities)

   Geoplot parameters:
   Threshold = 0.25 std. dev.

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

Geoplot parameters:
Least mean square fit = off

3.5.2 Presentation of results and interpretation

The presentation of the data for each site involves a print-out of the raw data both as greyscale (Figures 2, 7, 12 and 17) and trace plots (Figures 3, 4, 8, 9, 13, 14, 18 and 19), together with a greyscale plot of the processed data (Figures 5, 10, 15 and 20). Magnetic anomalies have been identified and plotted onto the 'Abstraction and Interpretation of Anomalies' drawings for the site (Figures 6, 11, 16 and 21).

4 RESULTS

The survey has been subdivided into four areas for ease of interpretation and presentation. All four survey areas are dominated by the presence of positive linear anomalies representing agricultural marks.

4.1 Northwest Area (*Figures 2-6*)

A number of positive linear anomalies indicating cut features of possible archaeological origin are evident within this survey area. A positive, rectilinear anomaly (Anomaly **1**) can be noted to the east of this survey area. This may be of archaeological origin however further investigation is required in order to ascertain the nature of the feature. The positive area anomalies in close proximity to Anomaly **1** may represent large pits.

A number of discrete positive anomalies (**2**) are clustered in the east of this area, with a further cluster observed at the western limits of the survey. These features have been interpreted as possible pits and may be of archaeological origin.

Positive linear anomalies representing agricultural marks dominate this area of the survey. The majority of these marks run from the northeast to southwest, however a number run northwest to southeast in the western limits of the survey area. The reverse 'S' shape and the distance between the furrows may suggest that these anomalies represent the presence of ridge and furrow. Other evidence of agricultural activity can be noted in the northwest of the survey area in the form of possible land drains. A former field boundary (**3**) is evident in the form of a positive linear anomaly running approximately east to west through the centre of this survey area.

Four bipolar anomalies representing buried ferrous objects are evident in this area.

4.2 Northeast Area (*Figures 7-11*)

The northern edge of this area shows evidence of ground disturbance (**4**) taking place on a large scale. Positive and negative linear anomalies (**5** and **18**) in these northern fields suggest the presence of banks and ditches. The areas of magnetic disturbance provide further evidence of activity on site. Further investigation is required in order to fully understand the origin of this feature.

A large positive linear anomaly (**6**) runs diagonally through the centre of this area. This feature cuts the former field boundary but may be cut by a modern service. Further investigation of this anomaly may shed light of the dating sequence of the ditch, the former field boundary and the modern service. Other positive linear anomalies (**7**) representing cut features of possible archaeological origin can also be noted in this survey area. An isolated negative linear anomaly with a north to south alignment (**8**) in the centre of this area may indicate the presence of a former earthen bank.

A large number of discrete positive anomalies are evident across this survey area (**9**). These features may be of archaeological origin and have been interpreted as possible pits.

The former field boundary evident in the North-Western Area of the site (**3**) continues with the same alignment in this section of the survey area.

A large number of bipolar anomalies (**10**) representing buried ferrous objects can be noted in this area with a concentration in the northern limits of the survey. Agricultural marks can also be noted in this survey area.

4.3 Central Area (Figures 12-16)

Two clear positive circular features are evident in this area (**11**). These anomalies represent the ditches of round barrows typical of the Bronze Age. Another, more subtle circular feature (**12**) is discernable to the south and west of these barrows. This feature may indicate the presence of another barrow that has been ploughed out through time. To the east of the two barrows (**11**) positive curvilinear anomalies can be noted (**13**). The localised disturbance in this area prevents us from interpreting this feature as a barrow. Further investigation is required in order to ascertain the nature of this feature.

A number of other positive linear anomalies of possible archaeological origin can be noted in this area. One runs approximately north to south in close proximity to the round barrows (**14**). Further investigation into this cut feature may determine as to whether or not it is contemporary with the Bronze Age barrows. Two orientations of agricultural markings can also be observed. The fact that these agricultural marks run parallel to the present field boundaries suggests that they are contemporary with or later than the division of the land.

4.4 Southern Area (*Figures 17-21*)

A set of parallel positive linear anomalies (**15**) is evident to the north of this area. These linear anomalies are cut by the more recent agricultural marks, however the origin of these cut features remains unknown.

A small number of discrete positive anomalies (**16**) can be noted in this area. These have been interpreted as possible pits and may be of archaeological origin.

A large number of bipolar anomalies (**17**) are evident throughout this survey area. These magnetic spikes indicate the presence of buried ferrous objects. The long, narrow area of magnetic debris is caused by the debris being spread across the field through plough action. A possible land drain runs around the southern perimeter of this survey area.

5 CONCLUSION

The geophysical survey undertaken on the land southwest of Bicester has been successful in locating a number of anomalies, some of which have greater archaeological potential than others. The data from across the site is dominated by evidence of ridge and furrow. The positive linear anomalies caused by these agricultural activities vary in strength across the survey and therefore it is possible to identify the more subtle features in some areas. However, faint, subtle features of archaeological origin may be masked in areas where the agricultural marks are stronger.

Two positive circular anomalies are evident in the central area of the survey. These have been interpreted as being caused by the ring ditches commonly associated with the round barrows of the Bronze Age. To the south and west of these barrows is another circular feature. This feature is by no means as well defined as the round barrows. It is possible that this anomaly represents a ploughed out barrow, but further investigation would be required to verify this. To the east of the two round barrows (**11**) is another feature (**13**). The localised debris around these anomalies disguises the feature's shape. It is not uncommon for round barrows to be clustered in an area. Therefore it is possible that Anomaly **13** is another barrow or some other form of burial monument.

A substantial ditch runs across the survey area (**6**). It may be possible that the ditch forms a western boundary to the Bronze Age burial area. However, further investigation is required in order to ascertain as to whether or not the barrows are contemporary with Anomaly **6** or Anomaly **14**.

A great deal of ground disturbance has taken place to the northern limits of the site (**4**). Positive and negative linear anomalies in this area indicate the presence of former bank and ditch arrangements (**18**). The disturbance may be as a result of industrial activity or some other form of intrusive groundwork.

A set of parallel positive linear anomalies (**15**) evident in the southern part of the survey area may indicate some form of boundary ditches. Further investigation is required to decide how these tie in with the sequence of the site and to ascertain as to whether or not it is contemporary with the other large ditches (**6** and **14**).

Discrete positive anomalies are evident across the survey area with a concentration in northern and central areas (**2** and **9**). These anomalies have been interpreted as possible pits. The presence of other prehistoric activity on site increases the likelihood that some of these features are of archaeological origin.

APPENDIX A – Basic principles of magnetic survey

Detailed magnetic survey can be used to effectively define areas of past human activity by mapping spatial variation and contrast in the magnetic properties of soil, subsoil and bedrock.

Weakly magnetic iron minerals are always present within the soil and areas of enhancement relate to increases in *magnetic susceptibility* and permanently magnetised *thermoremnant* material.

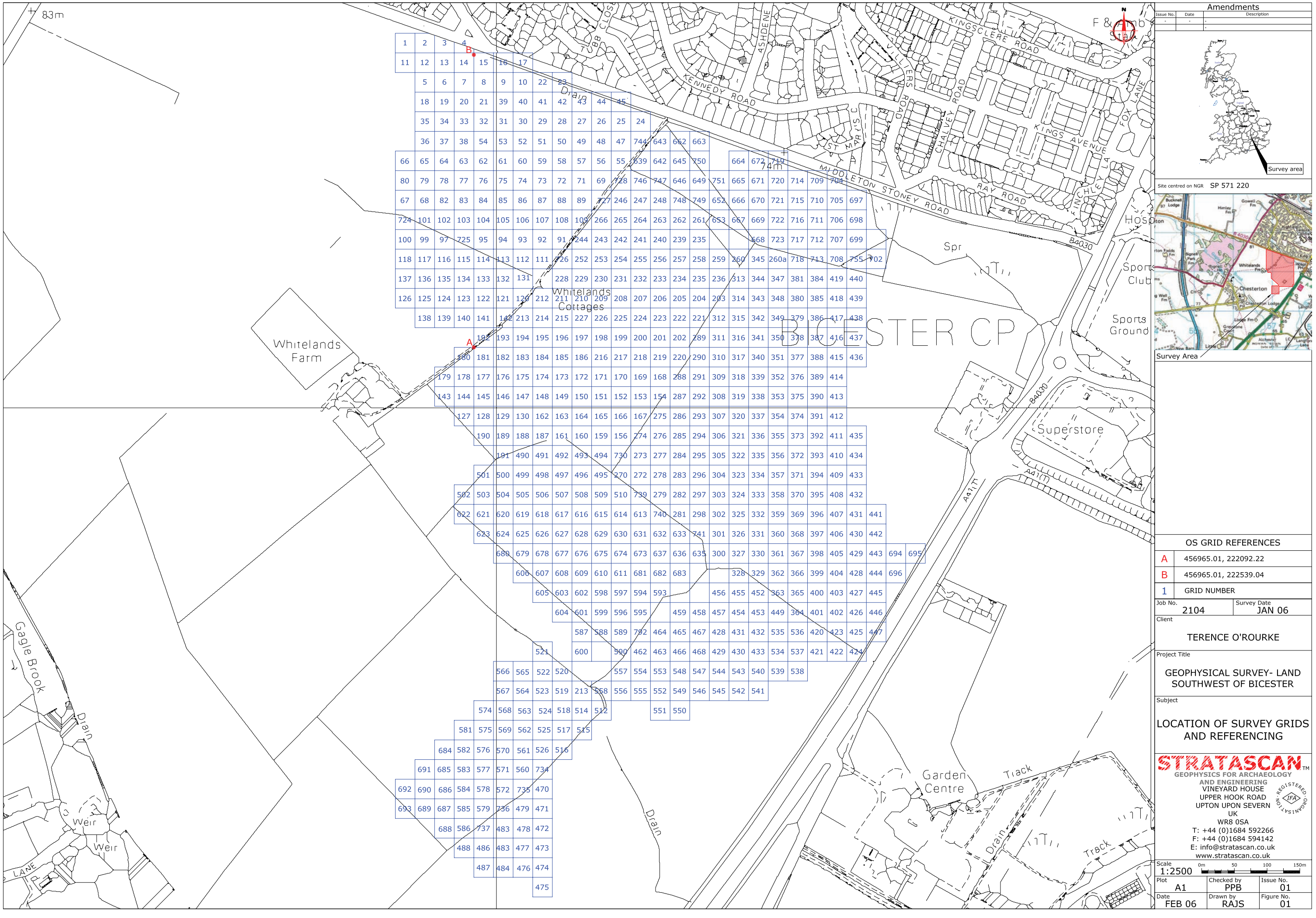
Magnetic susceptibility relates to the induced magnetism of a material when in the presence of a magnetic field. This magnetism can be considered as effectively permanent as it exists within the Earth's magnetic field. Magnetic susceptibility can become enhanced due to burning and complex biological or fermentation processes.

Thermoremnance is a permanent magnetism acquired by iron minerals that, after heating to a specific temperature known as the Curie Point, are effectively demagnetised followed by re-magnetisation by the Earth's magnetic field on cooling. Thermoremnant archaeological features can include hearths and kilns and material such as brick and tile may be magnetised through the same process.

Silting and deliberate infilling of ditches and pits with magnetically enhanced soil creates a relative contrast against the much lower levels of magnetism within the subsoil into which the feature is cut. Systematic mapping of magnetic anomalies will produce linear and discrete areas of enhancement allowing assessment and characterisation of subsurface features. Material such as subsoil and non-magnetic bedrock used to create former earthworks and walls may be mapped as areas of lower enhancement compared to surrounding soils.

Magnetic survey is carried out using a fluxgate gradiometer which is a passive instrument consisting of two sensors mounted vertically either 0.5 or 1m apart. The instrument is carried about 30cm above the ground surface and the top sensor measures the Earth's magnetic field whilst the lower sensor measures the same field but is also more affected by any localised buried field. The difference between the two sensors will relate to the strength of a magnetic field created by a buried feature, if no field is present the difference will be close to zero as the magnetic field measured by both sensors will be the same.

Factors affecting the magnetic survey may include soil type, local geology, previous human activity, disturbance from modern services etc.



Amendments

Issue No.	Date	Description
-	-	-
		-

Site centred on NGR SP 571 220

OS GRID REFERENCES	
A	456965.01, 222092.22
B	456965.01, 222539.04
1	GRID NUMBER

Job No.	Survey Date
2104	JAN 06

Client

TERENCE O'ROURKE

Project Title

GEOPHYSICAL SURVEY- LAND SOUTHWEST OF BICESTER

Subject

LOCATION OF SURVEY GRIDS AND REFERENCING

STRATASCAN™
GEOPHYSICS FOR ARCHAEOLOGY AND ENGINEERING
VINEYARD HOUSE
UPPER HOOK ROAD
UPTON UPON SEVERN
UK
WR8 0SA
T: +44 (0)1684 592266
F: +44 (0)1684 594142
E: info@stratascan.co.uk
www.stratascan.co.uk

Scale 1:2500 (0m 50 100 150m)

Plot	Checked by	Issue No.
A1	PPB	01
Date	Drawn by	Figure No.
FEB 06	RAJS	01

Amendments

Issue No.	Date	Description
-	-	-
		-

Plotting parameters;

Maximum +5nT (black)
Minimum -5nT (white)

-3SD +3SD

+5nT

-5nT

Job No.	Survey Date
2104	JAN 06

Client

TERENCE O'ROURKE

Project Title

LAND SOUTH WEST OF BICESTER

Subject

RAW GRADIOMETER DATA-
NORTH WEST AREA

STRATASCAN™
GEOPHYSICS FOR ARCHAEOLOGY
AND ENGINEERING
VINEYARD HOUSE
UPPER HOOK ROAD
UPTON UPON SEVERN
UK
WR8 0SA
T: +44 (0)1684 592266
F: +44 (0)1684 594142
E: info@stratascan.co.uk
www.stratascan.co.uk

REGISTERED ORGANISATION IFA

Scale 1:1250 0m 10 20 30 40 50 60 70 80m

Plot	Checked by	Issue No.
A1	PPB	01
Date	Drawn by	Figure No.
FEB 06	RAJS	02

Amendments

Issue No.	Date	Description
-	-	-
		-

Plotting parameters

+40nT

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

Data clipped at 250nT

200nT
160nT
120nT
80nT
40nT
0nT

Job No.	Survey Date
2104	JAN 06

Client

TERENCE O'ROURKE

Project Title

GEOPHYSICAL SURVEY- LAND SOUTHWEST OF BICESTER

Subject

TRACE PLOT OF GRADIOMETER DATA SHOWING POSITIVE VALUES- NW AREA

STRATASCAN™
GEOPHYSICS FOR ARCHAEOLOGY AND ENGINEERING
VINEYARD HOUSE
UPPER HOOK ROAD
UPTON UPON SEVERN
UK
WR8 0SA
T: +44 (0)1684 592266
F: +44 (0)1684 594142
E: info@stratascan.co.uk
www.stratascan.co.uk

Scale 1:1250 (0m 10 20 30 40 50 60 70 80m)

Plot	Checked by	Issue No.
A1	PPB	01
Date	Drawn by	Figure No.
FEB 06	RAJS	03

Amendments

Issue No.	Date	Description
-	-	-
		-

Plotting parameters

-40nT

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

Data clipped at -250nT

-200nT
-160nT
-120nT
-80nT
-40nT
0nT

Job No.	Survey Date
2104	JAN 06

Client

TERENCE O'ROURKE

Project Title

GEOPHYSICAL SURVEY- LAND SOUTHWEST OF BICESTER

Subject

TRACE PLOT OF GRADIOMETER DATA SHOWING NEGATIVE VALUES- NW AREA

STRATASCAN™
GEOPHYSICS FOR ARCHAEOLOGY AND ENGINEERING
VINEYARD HOUSE
UPPER HOOK ROAD
UPTON UPON SEVERN
UK
WR8 0SA
T: +44 (0)1684 592266
F: +44 (0)1684 594142
E: info@stratascan.co.uk
www.stratascan.co.uk

Scale 1:1250 (0m 10 20 30 40 50 60 70 80m)

Plot	Checked by	Issue No.
A1	PPB	01
Date	**Drawn by**	**Figure No.**
FEB 06	RAJS	04

Amendments

Issue No.	Date	Description
-	-	-
		-

Plotting parameters;

Maximum +2nT (black)
Minimum -2nT (white)

-3SD +3SD

+2nT

-2nT

Job No.	Survey Date
2104	JAN 06

Client

TERENCE O'ROURKE

Project Title

GEOPHYSICAL SURVEY- LAND SOUTHWEST OF BICESTER

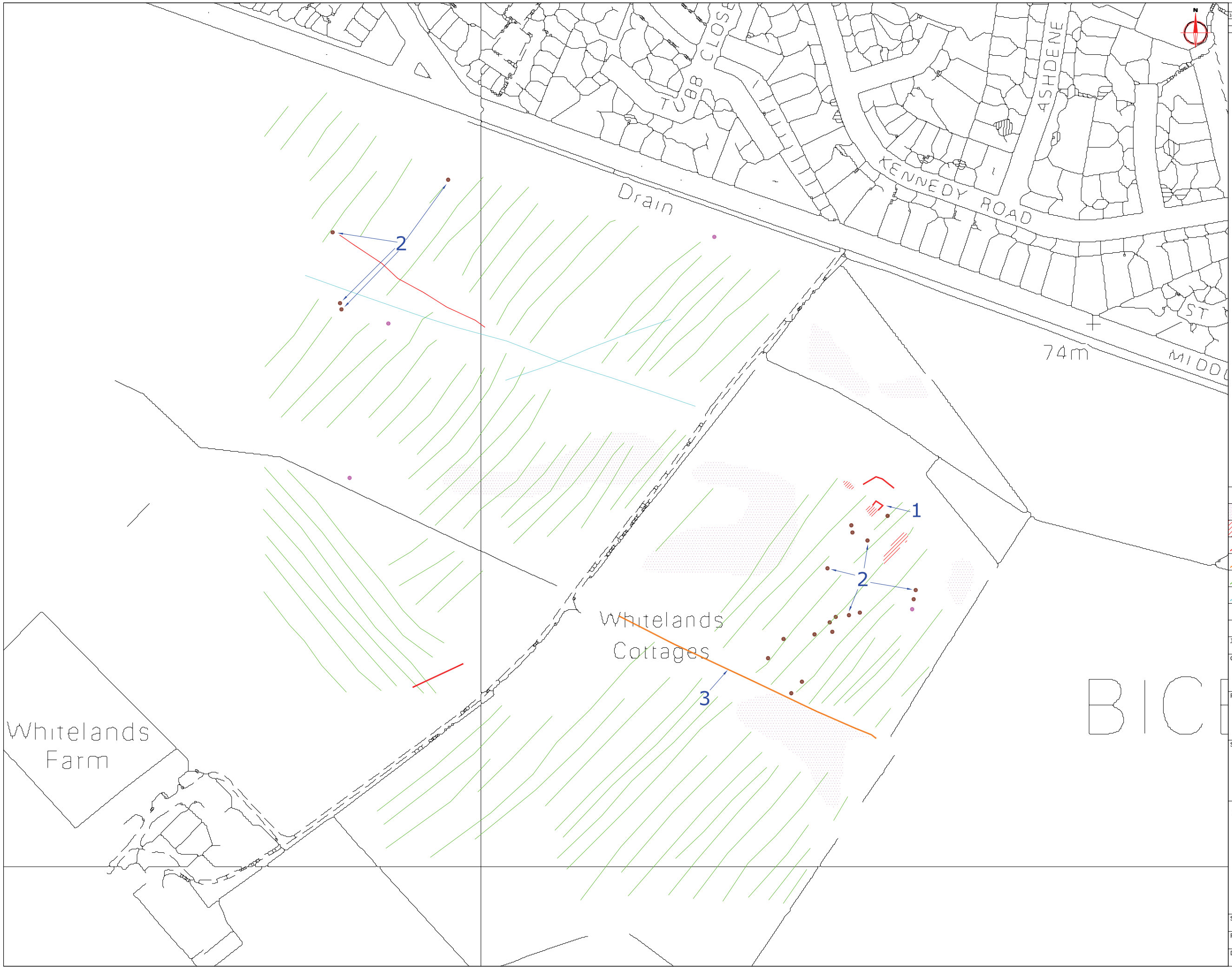
Subject

PROCESSED GRADIOMETER DATA- NORTH WEST AREA

STRATASCAN™
GEOPHYSICS FOR ARCHAEOLOGY AND ENGINEERING
VINEYARD HOUSE
UPPER HOOK ROAD
UPTON UPON SEVERN
UK
WR8 0SA
T: +44 (0)1684 592266
F: +44 (0)1684 594142
E: info@stratascan.co.uk
www.stratascan.co.uk

Scale 1:1250 (0m 10 20 30 40 50 60 70 80m)

Plot	Checked by	Issue No.
A1	PPB	01
Date	Drawn by	Figure No.
FEB 06	RAJS	05



Amendments

Issue No.	Date	Description
-	-	-
		-

KEY

- Area of magnetic debris
- Positive area anomaly- possible archaeological origin
- Positive linear anomaly - possible archaeological origin
- Former field boundary
- Positive linear anomaly - agricultural mark
- Possible land drains
- Discrete positive anomaly with negative response - ferrous object
- Discrete positive anomaly - possible pit

Job No. 2104 | Survey Date JAN 06

Client

TERENCE O'ROURKE

Project Title

GEOPHYSICAL SURVEY- LAND SOUTHWEST OF BICESTER

Subject

ABSTRACTION AND INTERPRETATION OF GRADIOMETER ANOMALIES- NORTH WEST AREA

STRATASCAN™
GEOPHYSICS FOR ARCHAEOLOGY AND ENGINEERING
VINEYARD HOUSE
UPPER HOOK ROAD
UPTON UPON SEVERN
UK
WR8 0SA
T: +44 (0)1684 592266
F: +44 (0)1684 594142
E: info@stratascan.co.uk
www.stratascan.co.uk

Scale 1:1250 (0m 10 20 30 40 50 60 70 80m)

Plot	Checked by	Issue No.
A1	PPB	01
Date	Drawn by	Figure No.
FEB 06	RAJS	06

Amendments		
Issue No.	Date	Description
-	-	-
		-

Plotting parameters;

Maximum +5nT (black)
Minimum -5nT (white)

+5nT

-5nT

-3SD +3SD

Job No.	Survey Date
2104	JAN 06

Client

TERENCE O'ROURKE

Project Title

GEOPHYSICAL SURVEY- LAND SOUTH WEST OF BICESTER

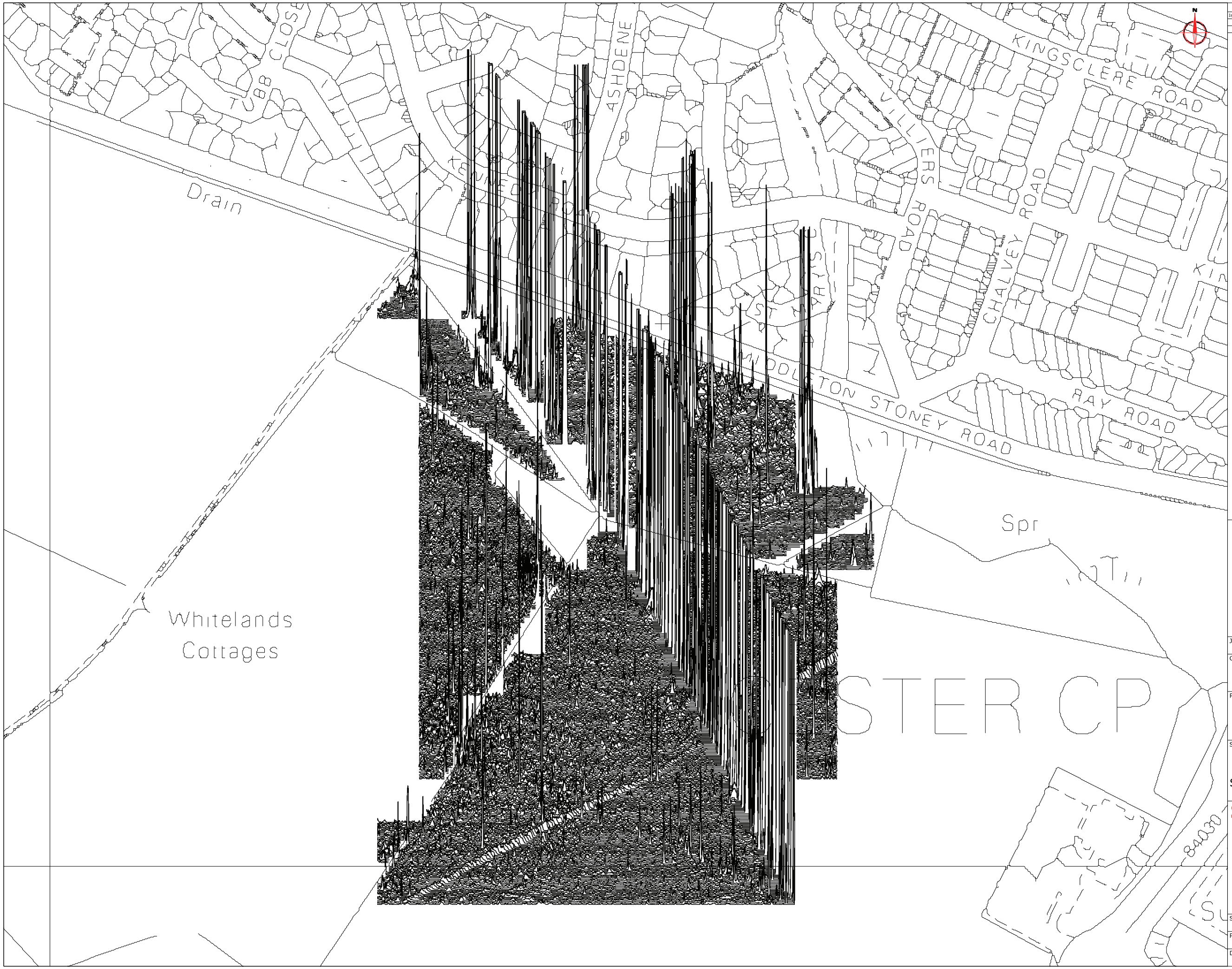
Subject

RAW GRADIOMETER DATA- NORTH EAST AREA

STRATASCAN™
GEOPHYSICS FOR ARCHAEOLOGY AND ENGINEERING
VINEYARD HOUSE
UPPER HOOK ROAD
UPTON UPON SEVERN
UK
WR8 0SA
T: +44 (0)1684 592266
F: +44 (0)1684 594142
E: info@stratascan.co.uk
www.stratascan.co.uk

Scale 1:1000 (0m 10 20 30 40 50 60m)

Plot	Checked by	Issue No.
A1	PPB	01
Date	Drawn by	Figure No.
FEB 06	RAJS	07



Amendments

Issue No.	Date	Description
-	-	-
		-

Plotting parameters

+40nT

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

Data clipped at 250nT

200nT
160nT
120nT
80nT
40nT
0nT

Job No.	Survey Date
2104	JAN 06

Client

TERENCE O'ROURKE

Project Title

GEOPHYSICAL SURVEY- LAND SOUTHWEST OF BICESTER

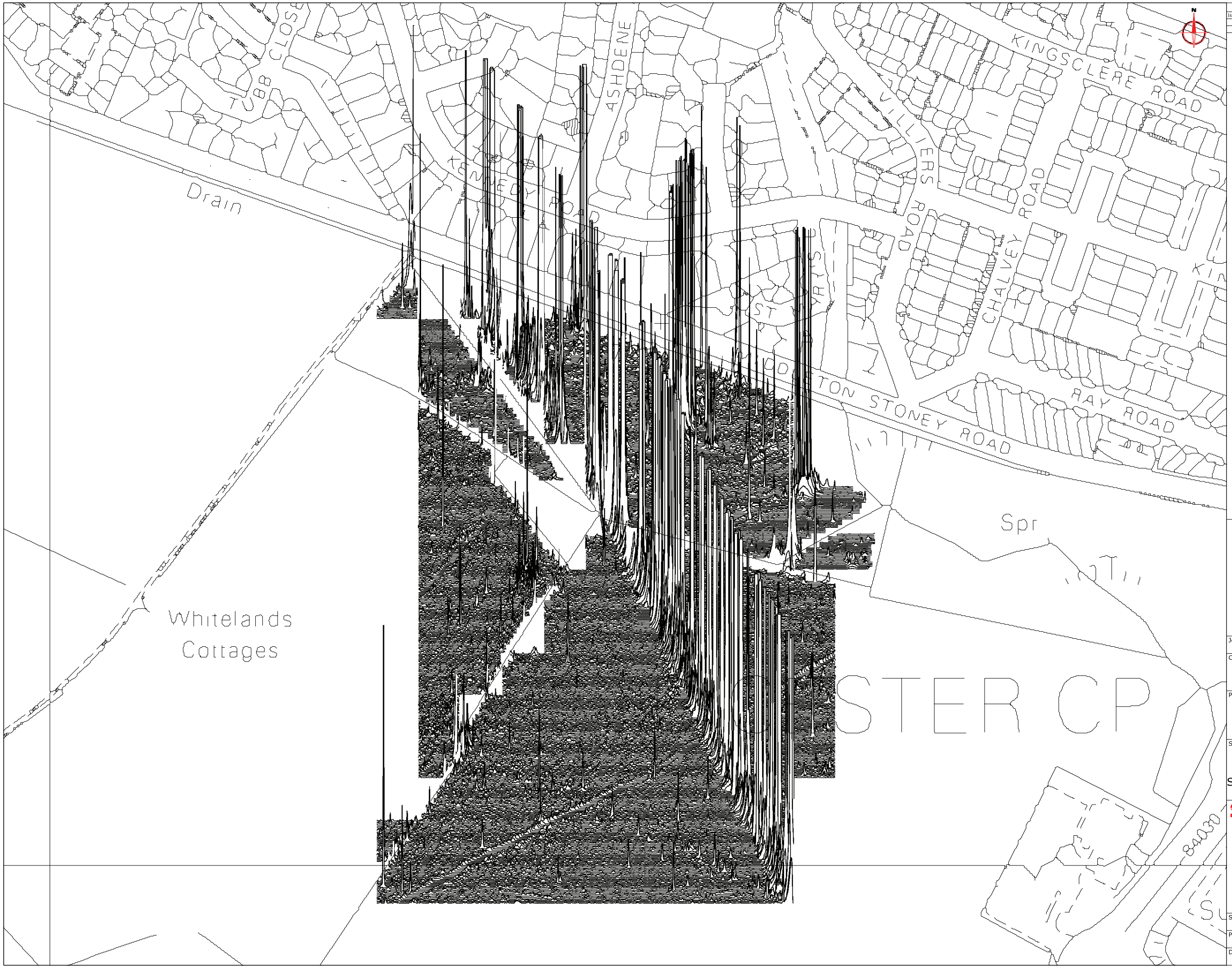
Subject

TRACE PLOT OF GRADIOMETER DATA SHOWING POSITIVE VALUES- NE AREA

STRATASCAN™
GEOPHYSICS FOR ARCHAEOLOGY AND ENGINEERING
VINEYARD HOUSE
UPPER HOOK ROAD
UPTON UPON SEVERN
UK
WR8 0SA
T: +44 (0)1684 592266
F: +44 (0)1684 594142
E: info@stratascan.co.uk
www.stratascan.co.uk

Scale 1:1250 (0m 10 20 30 40 50 60 70 80m)

Plot	Checked by	Issue No.
A1	PPB	01
Date	**Drawn by**	**Figure No.**
FEB 06	RAJS	08



Amendments

Issue No.	Date	Description
-	-	-
		-

Plotting parameters

-40nT

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

Data clipped at -250nT

-200nT
-160nT
-120nT
-80nT
-40nT
0nT

Job No.	Survey Date
2104	JAN 06

Client

TERENCE O'ROURKE

Project Title

GEOPHYSICAL SURVEY- LAND SOUTHWEST OF BICESTER

Subject

TRACE PLOT OF GRADIOMETER DATA SHOWING NEGATIVE VALUES- NE AREA

STRATASCAN™
GEOPHYSICS FOR ARCHAEOLOGY AND ENGINEERING
VINEYARD HOUSE
UPPER HOOK ROAD
UPTON UPON SEVERN
UK
WR8 0SA
T: +44 (0)1684 592266
F: +44 (0)1684 594142
E: info@stratascan.co.uk
www.stratascan.co.uk

Scale 1:1250 (0m 10 20 30 40 50 60 70 80m)

Plot	Checked by	Issue No.
A1	PPB	01
Date	**Drawn by**	**Figure No.**
FEB 06	RAJS	09

Amendments

Issue No.	Date	Description
-	-	-
		-

Plotting parameters;

Maximum +2nT (black)
Minimum -2nT (white)

+2nT

-3SD +3SD

-2nT

Job No.	Survey Date
2104	JAN 06

Client

TERENCE O'ROURKE

Project Title

GEOPHYSICAL SURVEY- LAND SOUTH WEST OF BICESTER

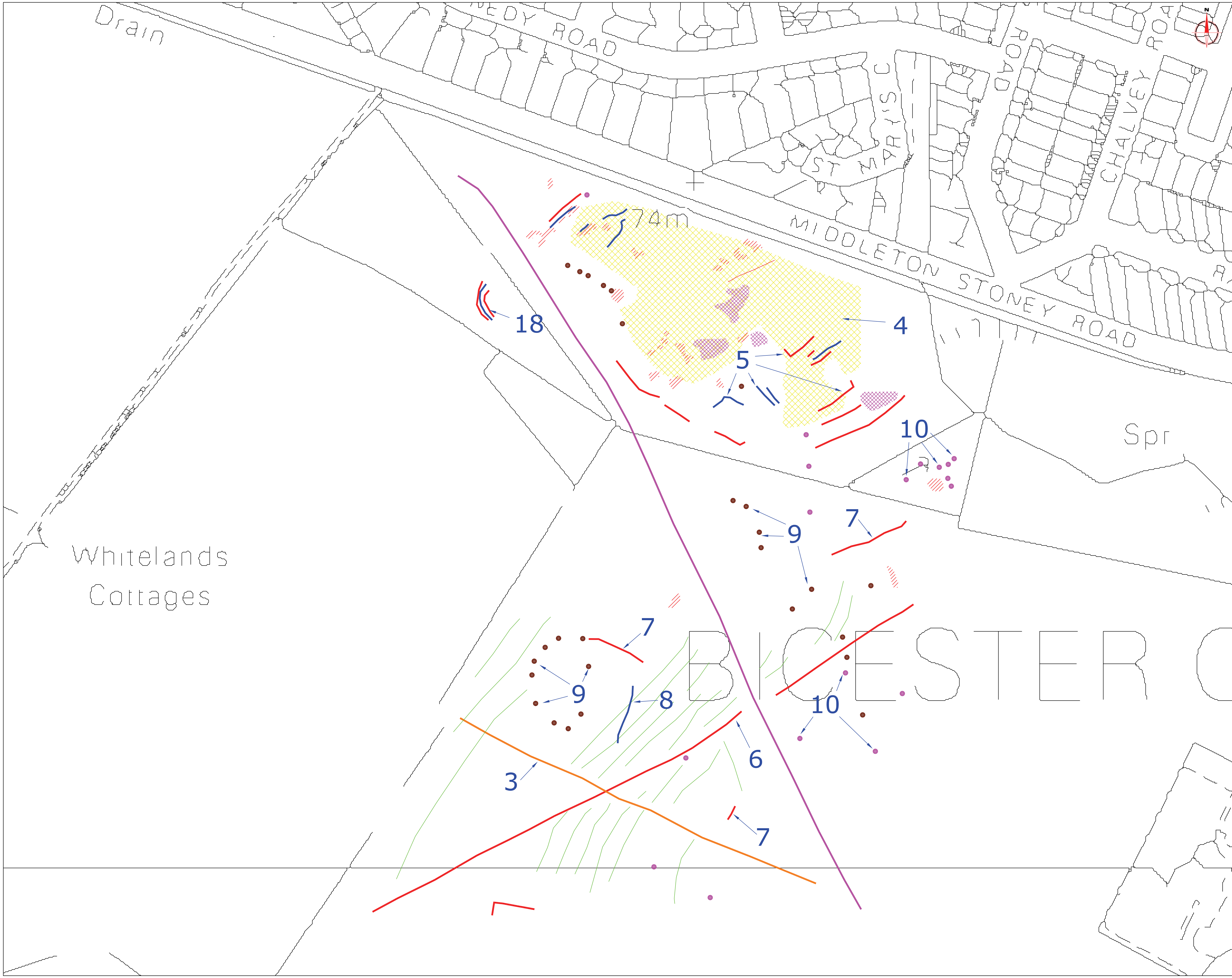
Subject

PROCESSED GRADIOMETER DATA- NORTH EAST AREA

STRATASCAN™
GEOPHYSICS FOR ARCHAEOLOGY AND ENGINEERING
VINEYARD HOUSE
UPPER HOOK ROAD
UPTON UPON SEVERN
UK
WR8 0SA
T: +44 (0)1684 592266
F: +44 (0)1684 594142
E: info@stratascan.co.uk
www.stratascan.co.uk

Scale 1:1000 (0m 10 20 30 40 50 60m)

Plot	Checked by	Issue No.
A1	PPB	01
Date	Drawn by	Figure No.
FEB 06	RAJS	10



KEY

Symbol	Description
	Pipeline
	Area of magnetic disturbance
	Positive area anomaly- possible pit/ditch of archaeological origin
	Area of ground disturbance- possibly related to quarrying
	Positive linear anomaly - possible archaeological origin
	Negative linear anomaly - possible bank of archaeological origin
	Bank and ditch alignment
	Positive linear anomaly - agricultural mark
	Former field boundary
	Discrete positive anomaly with negative response - ferrous object
	Discrete positive anomaly - possible pit

Amendments

Issue No.	Date	Description
-	-	-
		-

Job No. 2104
Survey Date JAN 06

Client
TERENCE O'ROURKE

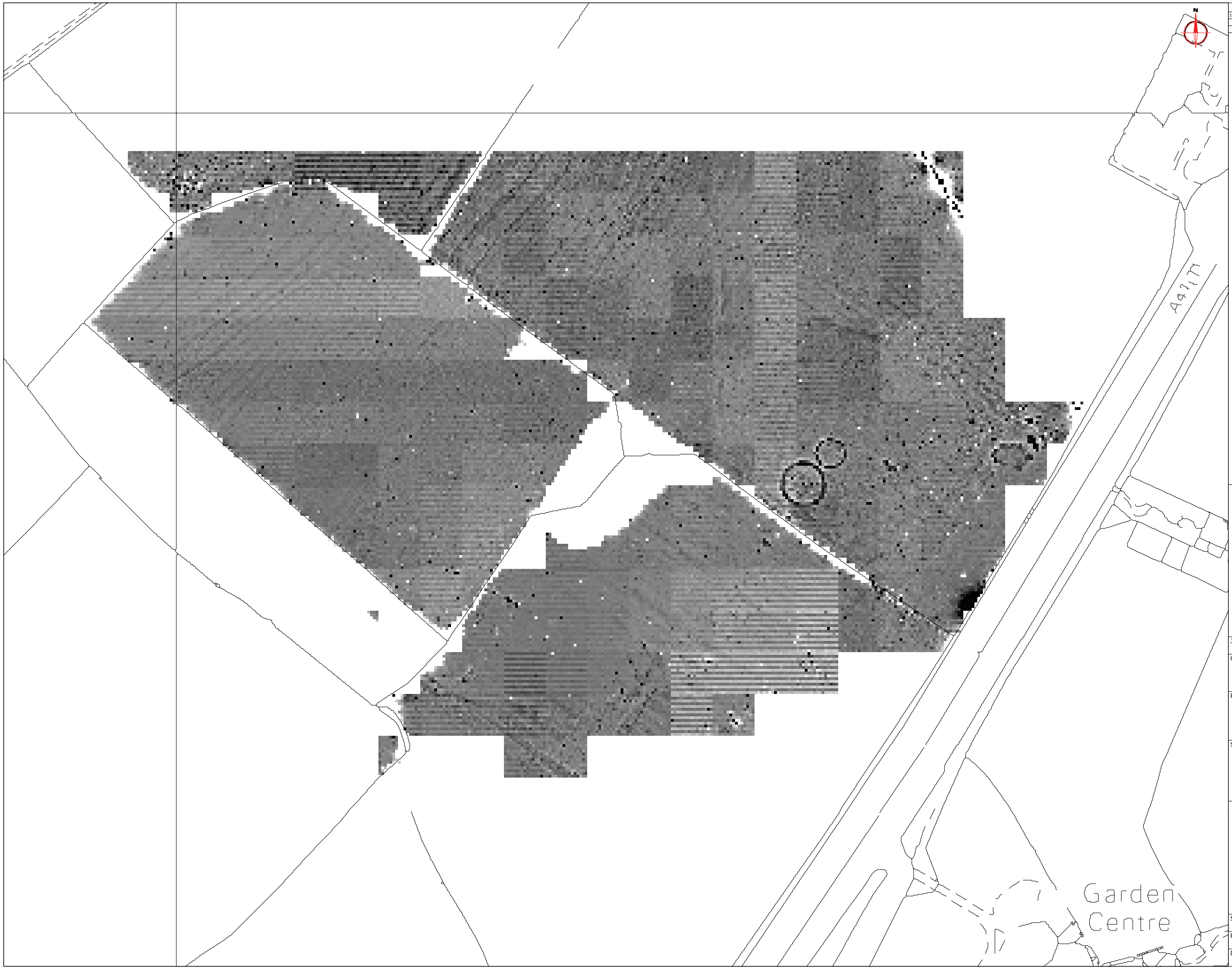
Project Title
GEOPHYSICAL SURVEY- LAND SOUTHWEST OF BICESTER

Subject
ABSTRACTION AND INTERPRETATION OF GRADIOMETER ANOMALIES- NORTH EAST AREA

STRATASCAN™
GEOPHYSICS FOR ARCHAEOLOGY AND ENGINEERING
VINEYARD HOUSE
UPPER HOOK ROAD
UPTON UPON SEVERN
UK
WR8 0SA
T: +44 (0)1684 592266
F: +44 (0)1684 594142
E: info@stratascan.co.uk
www.stratascan.co.uk
REGISTERED ORGANISATION IFA

Scale 1:1000 — 0m 10 20 30 40 50 60m

Plot	Checked by	Issue No.
A1	PPB	01
Date	**Drawn by**	**Figure No.**
FEB 06	RAJS	11



Amendments

Issue No.	Date	Description
-	-	-
		-

Plotting parameters;

Maximum +5nT (black)
Minimum -5nT (white)

-3SD +3SD

+5nT

-5nT

Job No.	Survey Date
2104	JAN 06

Client

TERENCE O'ROURKE

Project Title

GEOPHYSICAL SURVEY- LAND SOUTHWEST OF BICESTER

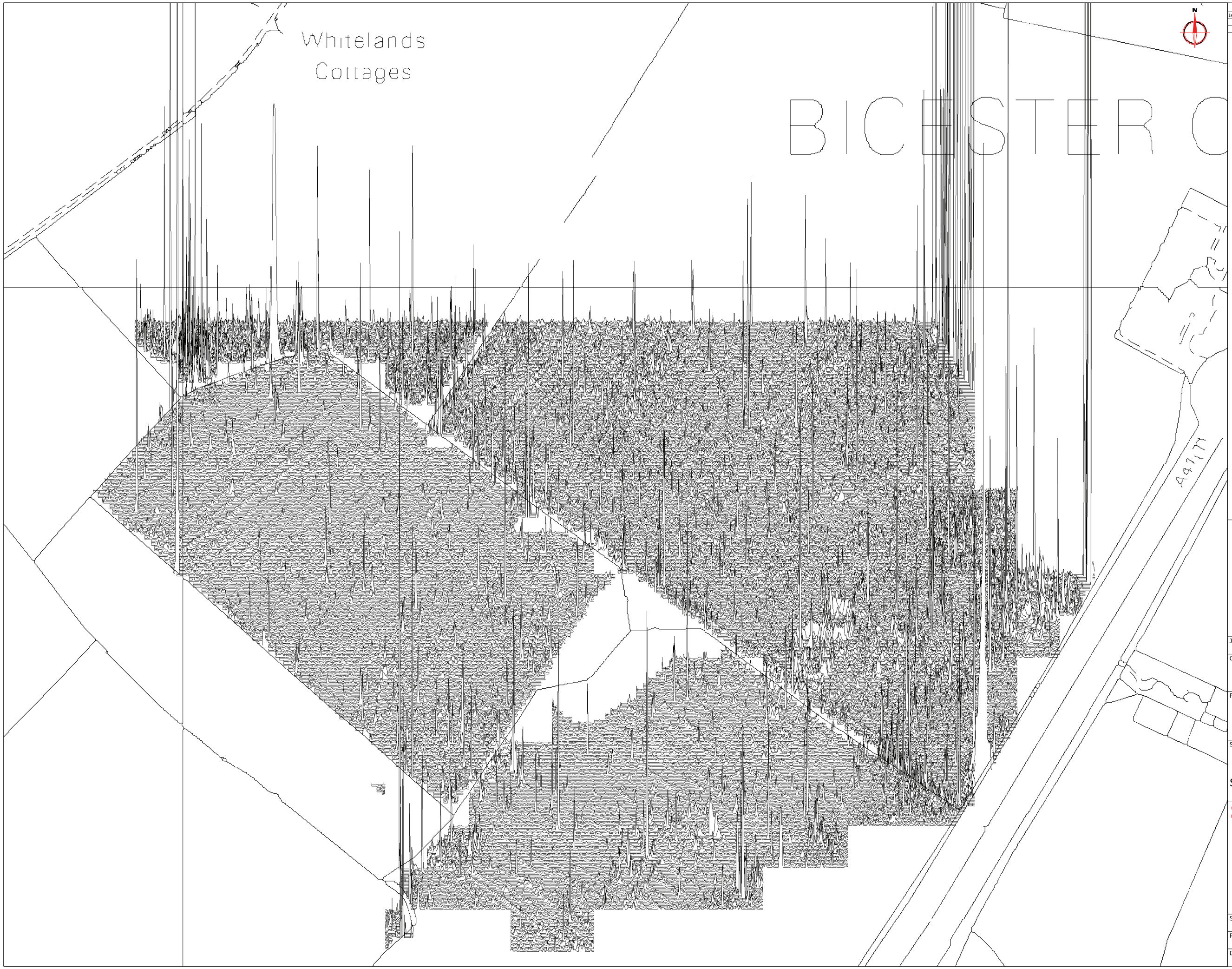
Subject

RAW GRADIOMETER DATA- CENTRAL AREA

STRATASCAN™
GEOPHYSICS FOR ARCHAEOLOGY AND ENGINEERING
VINEYARD HOUSE
UPPER HOOK ROAD
UPTON UPON SEVERN
UK
WR8 0SA
T: +44 (0)1684 592266
F: +44 (0)1684 594142
E: info@stratascan.co.uk
www.stratascan.co.uk

Scale 1:1250 0m 10 20 30 40 50 60 70 80m

Plot	Checked by	Issue No.
A1	PPB	01
Date	Drawn by	Figure No.
FEB 06	RAJS	12



Amendments

Issue No.	Date	Description
-	-	-
		-

Plotting parameters

+40nT

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

Data clipped at 250nT

200nT
160nT
120nT
80nT
40nT
0nT

Job No.	Survey Date
2104	JAN 06

Client

TERENCE O'ROURKE

Project Title

GEOPHYSICAL SURVEY- LAND SOUTHWEST OF BICESTER

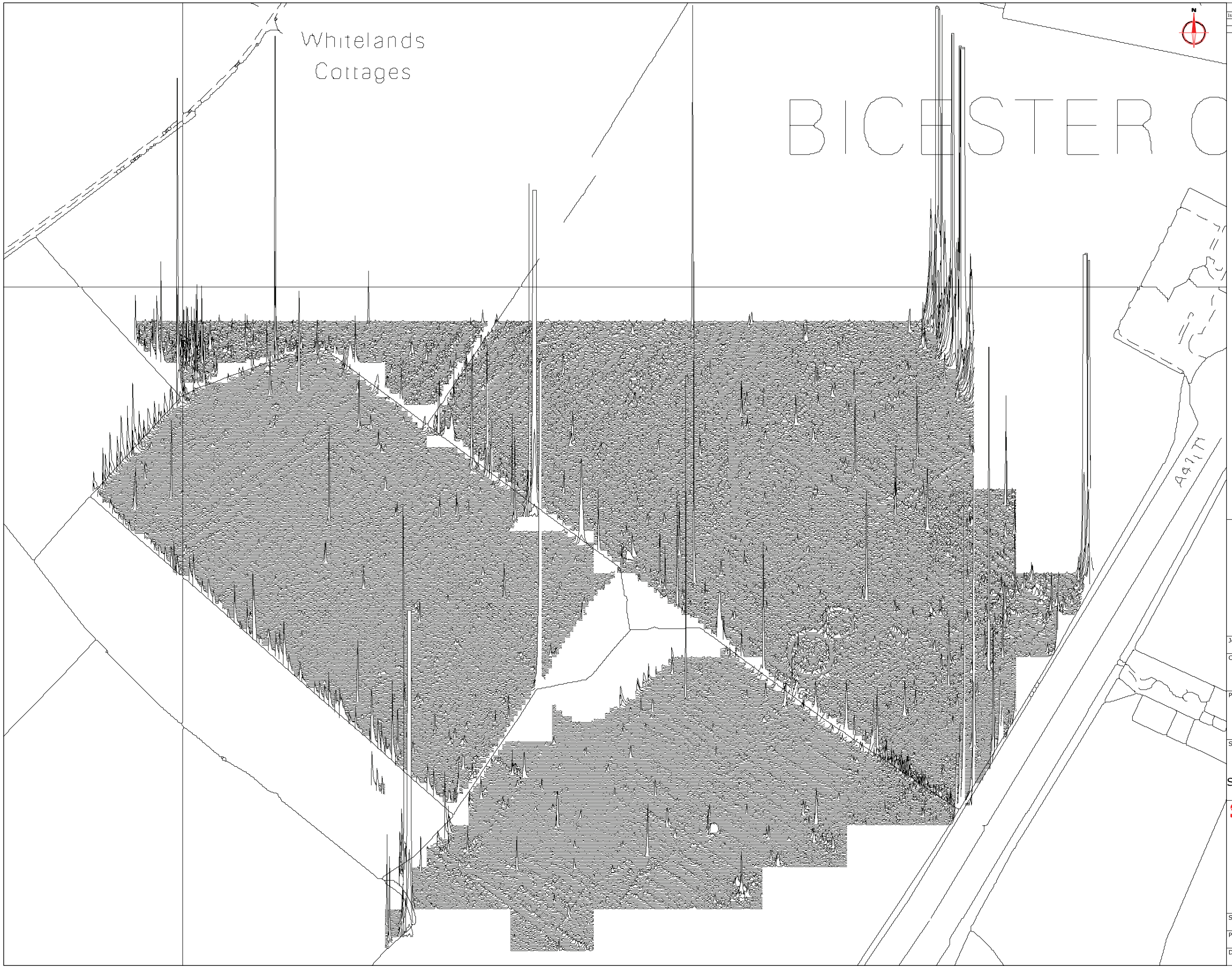
Subject

TRACEPLOT OF GRADIOMETER DATA SHOWING POSITIVE VALUES- CENTRAL AREA

STRATASCAN™
GEOPHYSICS FOR ARCHAEOLOGY AND ENGINEERING
VINEYARD HOUSE
UPPER HOOK ROAD
UPTON UPON SEVERN
UK
WR8 0SA
T: +44 (0)1684 592266
F: +44 (0)1684 594142
E: info@stratascan.co.uk
www.stratascan.co.uk

Scale 1:1250 (0m 10 20 30 40 50 60 70 80m)

Plot	Checked by	Issue No.
A1	PPB	01
Date	Drawn by	Figure No.
FEB 06	RAJS	13



Amendments

Issue No.	Date	Description
-	-	-
		-

Plotting parameters

-40nT

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

Data clipped at -250nT

-200nT
-160nT
-120nT
-80nT
-40nT
0nT

Job No.	Survey Date
2104	JAN 06

Client

TERENCE O'ROURKE

Project Title

GEOPHYSICAL SURVEY- LAND SOUTHWEST OF BICESTER

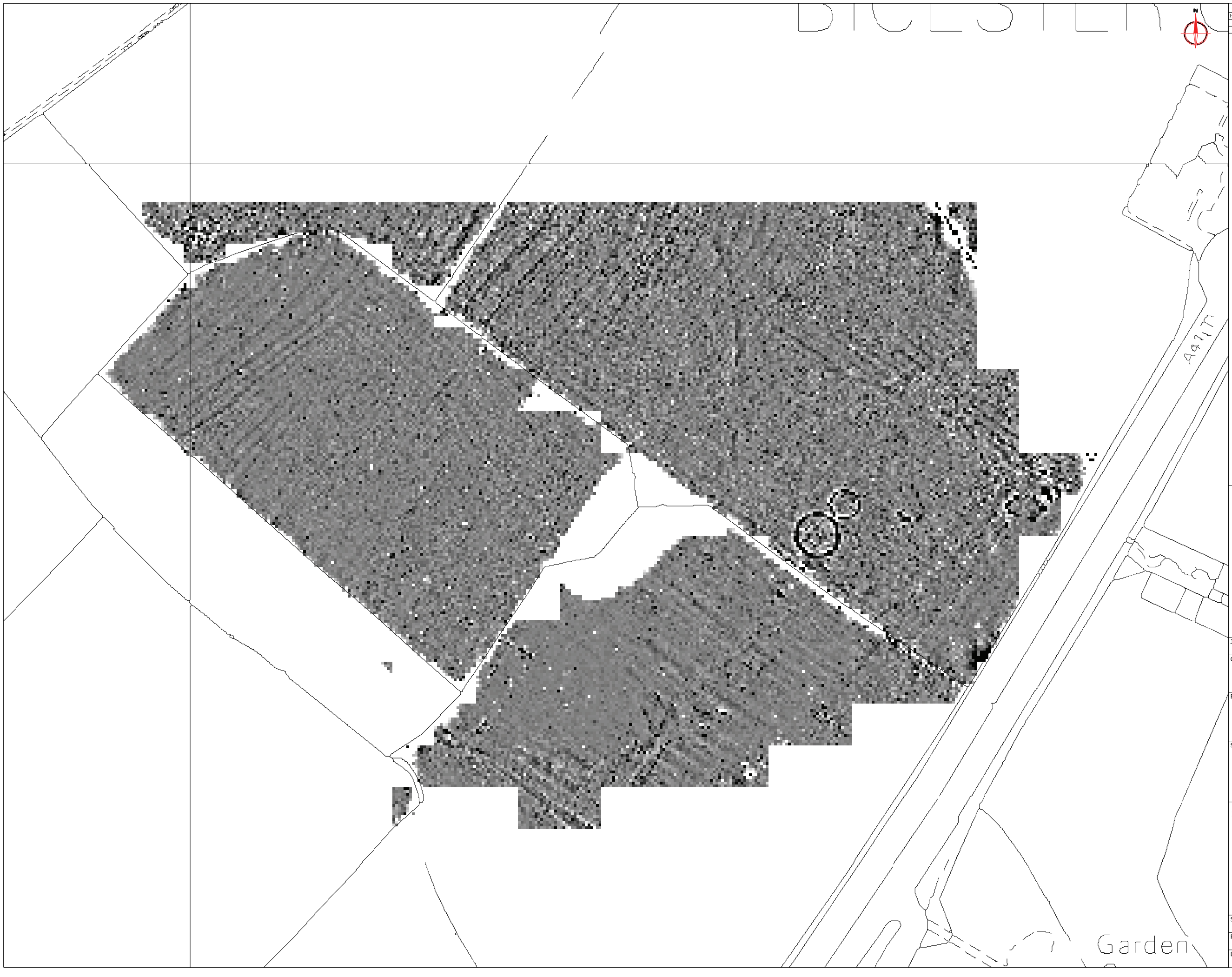
Subject

TRACE PLOT OF GRADIOMETER DATA SHOWING NEGATIVE VALUES- CENTRAL AREA

STRATASCAN™
GEOPHYSICS FOR ARCHAEOLOGY AND ENGINEERING
VINEYARD HOUSE
UPPER HOOK ROAD
UPTON UPON SEVERN
UK
WR8 0SA
T: +44 (0)1684 592266
F: +44 (0)1684 594142
E: info@stratascan.co.uk
www.stratascan.co.uk

Scale 1:1250 (0m 10 20 30 40 50 60 70 80m)

Plot	Checked by	Issue No.
A1	PPB	01
Date	Drawn by	Figure No.
FEB 06	RAJS	14



Amendments

Issue No.	Date	Description
-	-	-
		-

Plotting parameters;

Maximum +2nT (black)
Minimum -2nT (white)

-3SD +3SD

+2nT

-2nT

Job No.	Survey Date
2104	JAN 06

Client

TERENCE O'ROURKE

Project Title

GEOPHYSICAL SURVEY- LAND SOUTH WEST OF BICETSER

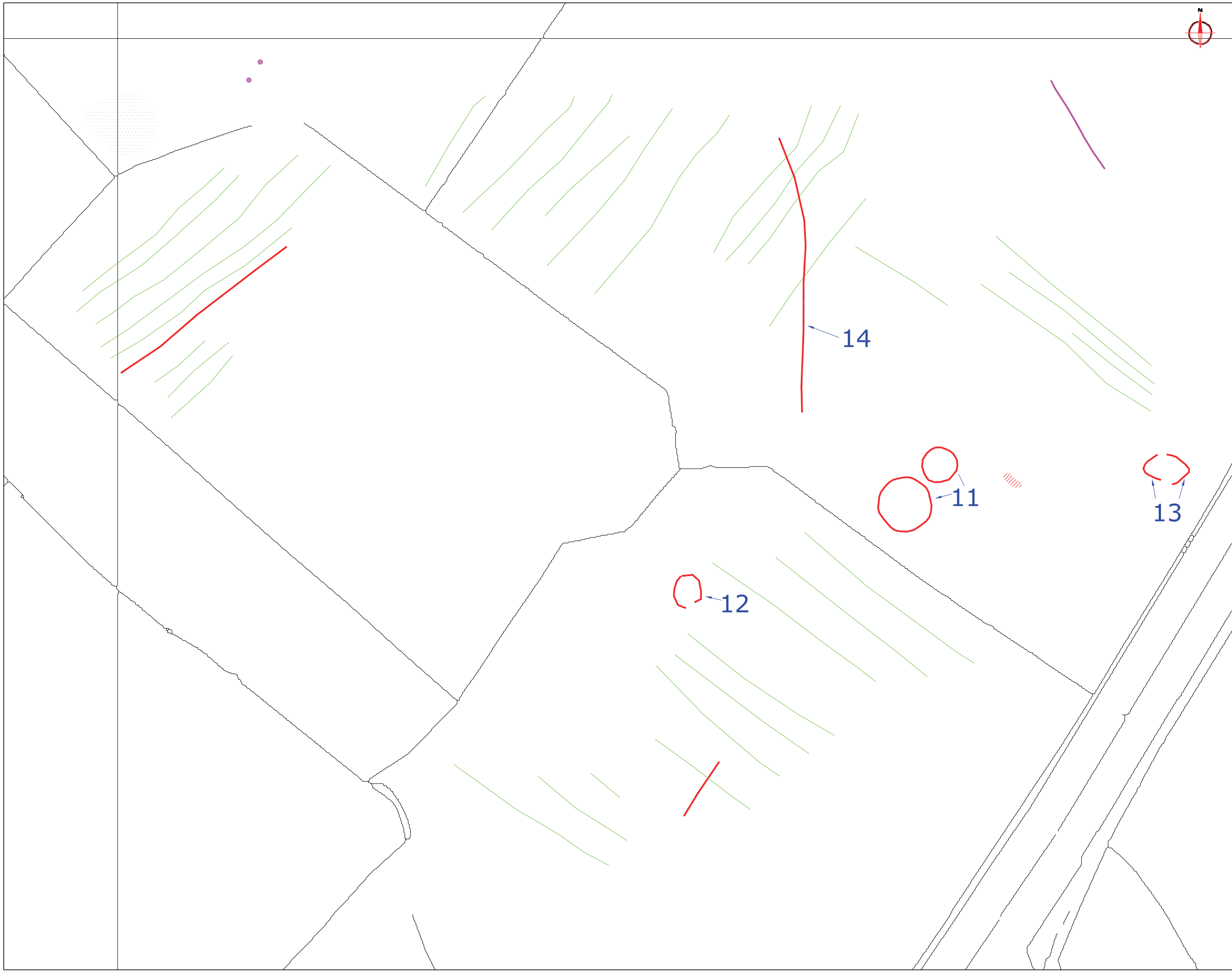
Subject

PROCESSED GRADIOMETER DATA- CENTRAL AREA

STRATASCAN™
GEOPHYSICS FOR ARCHAEOLOGY AND ENGINEERING
VINEYARD HOUSE
UPPER HOOK ROAD
UPTON UPON SEVERN
UK
WR8 0SA
T: +44 (0)1684 592266
F: +44 (0)1684 594142
E: info@stratascan.co.uk
www.stratascan.co.uk

Scale 1:1250 0m 10 20 30 40 50 60 70 80m

Plot	Checked by	Issue No.
A1	PPB	01
Date	Drawn by	Figure No.
FEB 06	RAJS	15



Amendments

Issue No.	Date	Description
-	-	-
		-

KEY

	Pipeline
	Area of magnetic debris
	Positive area anomaly- possible archaeological origin
	Positive circular anomaly - ring ditch of round barrow
	Positive linear anomaly - possible archaeological origin
	Positive linear anomaly - agricultural mark
	Discrete positive anomaly with negative response - ferrous object
	Discrete positive anomaly - possible pit

Job No.	Survey Date
2104	JAN 06

Client

TERENCE O'ROURKE

Project Title

GEOPHYSICAL SURVEY- LAND SOUTHWEST OF BICESTER

Subject

ABSTRACTION AND INTERPRETATION OF GRADIOMETER ANOMALIES- CENTRAL AREA

STRATASCAN™
GEOPHYSICS FOR ARCHAEOLOGY AND ENGINEERING
VINEYARD HOUSE
UPPER HOOK ROAD
UPTON UPON SEVERN
UK
WR8 0SA
T: +44 (0)1684 592266
F: +44 (0)1684 594142
E: info@stratascan.co.uk
www.stratascan.co.uk

Scale 1:1250 (0m 10 20 30 40 50 60 70 80m)

Plot	Checked by	Issue No.
A1	PPB	01
Date	Drawn by	Figure No.
FEB 06	RAJS	16

Amendments

Issue No.	Date	Description
-	-	-
		-

Plotting parameters;

Maximum +5nT (black)
Minimum -5nT (white)

-3SD +3SD

+5nT

-5nT

Job No.	Survey Date
2104	JAN 06

Client

TERENCE O'ROURKE

Project Title

GEOPHYSICAL SURVEY- LAND SOUTHWEST OF BICESTER

Subject

RAW GRADIOMETER DATA- SOUTHERN AREA

STRATASCAN™
GEOPHYSICS FOR ARCHAEOLOGY AND ENGINEERING
VINEYARD HOUSE
UPPER HOOK ROAD
UPTON UPON SEVERN
UK
WR8 0SA
T: +44 (0)1684 592266
F: +44 (0)1684 594142
E: info@stratascan.co.uk
www.stratascan.co.uk

Scale 1:1000 (0m 10 20 30 40 50 60m)

Plot	Checked by	Issue No.
A1	PPB	01
Date	Drawn by	Figure No.
FEB 06	RAJS	17

Amendments

Issue No.	Date	Description
-	-	-
		-

Plotting parameters

+40nT

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

Data clipped at 250nT

200nT
160nT
120nT
80nT
40nT
0nT

Job No. 2104

Survey Date JAN 06

Client

TERENCE O'ROURKE

Project Title

GEOPHYSICAL SURVEY- LAND SOUTHWEST OF BICESTER

Subject

TRACE PLOT OF GRADIOMETER DATA SHOWING POSITIVE VALUES- SOUTHERN AREA

STRATASCAN™
GEOPHYSICS FOR ARCHAEOLOGY AND ENGINEERING
VINEYARD HOUSE
UPPER HOOK ROAD
UPTON UPON SEVERN
UK
WR8 0SA
T: +44 (0)1684 592266
F: +44 (0)1684 594142
E: info@stratascan.co.uk
www.stratascan.co.uk

Scale 1:1000 (0m 10 20 30 40 50 60m)

Plot	Checked by	Issue No.
A1	PPB	01
Date	Drawn by	Figure No.
FEB 06	RAJS	18

Amendments

Issue No.	Date	Description
-	-	-
		-

Plotting parameters

-40nT

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

Data clipped at -250nT

-200nT
-160nT
-120nT
-80nT
-40nT
0nT

Job No.	Survey Date
2104	JAN 06

Client

TERENCE O'ROURKE

Project Title

GEOPHYSICAL SURVEY- LAND SOUTHWEST OF BICESTER

Subject

TRACE PLOT OF GRADIOMETER DATA SHOWING NEGATIVE VALUES- SOUTHERN AREA

STRATASCAN™
GEOPHYSICS FOR ARCHAEOLOGY AND ENGINEERING
VINEYARD HOUSE
UPPER HOOK ROAD
UPTON UPON SEVERN
UK
WR8 0SA
T: +44 (0)1684 592266
F: +44 (0)1684 594142
E: info@stratascan.co.uk
www.stratascan.co.uk

Scale 1:1000 (0m 10 20 30 40 50 60m)

Plot	Checked by	Issue No.
A1	PPB	01
Date	Drawn by	Figure No.
FEB 06	RAJS	19

Amendments

Issue No.	Date	Description
-	-	-
		-

Plotting parameters;

Maximum +2nT (black)
Minimum -2nT (white)

-3SD +3SD

+2nT

-2nT

Job No.	Survey Date
2104	JAN 06

Client

TERENCE O'ROURKE

Project Title

GEOPHYSICAL SURVEY- LAND SOUTH WEST OF BICESTER

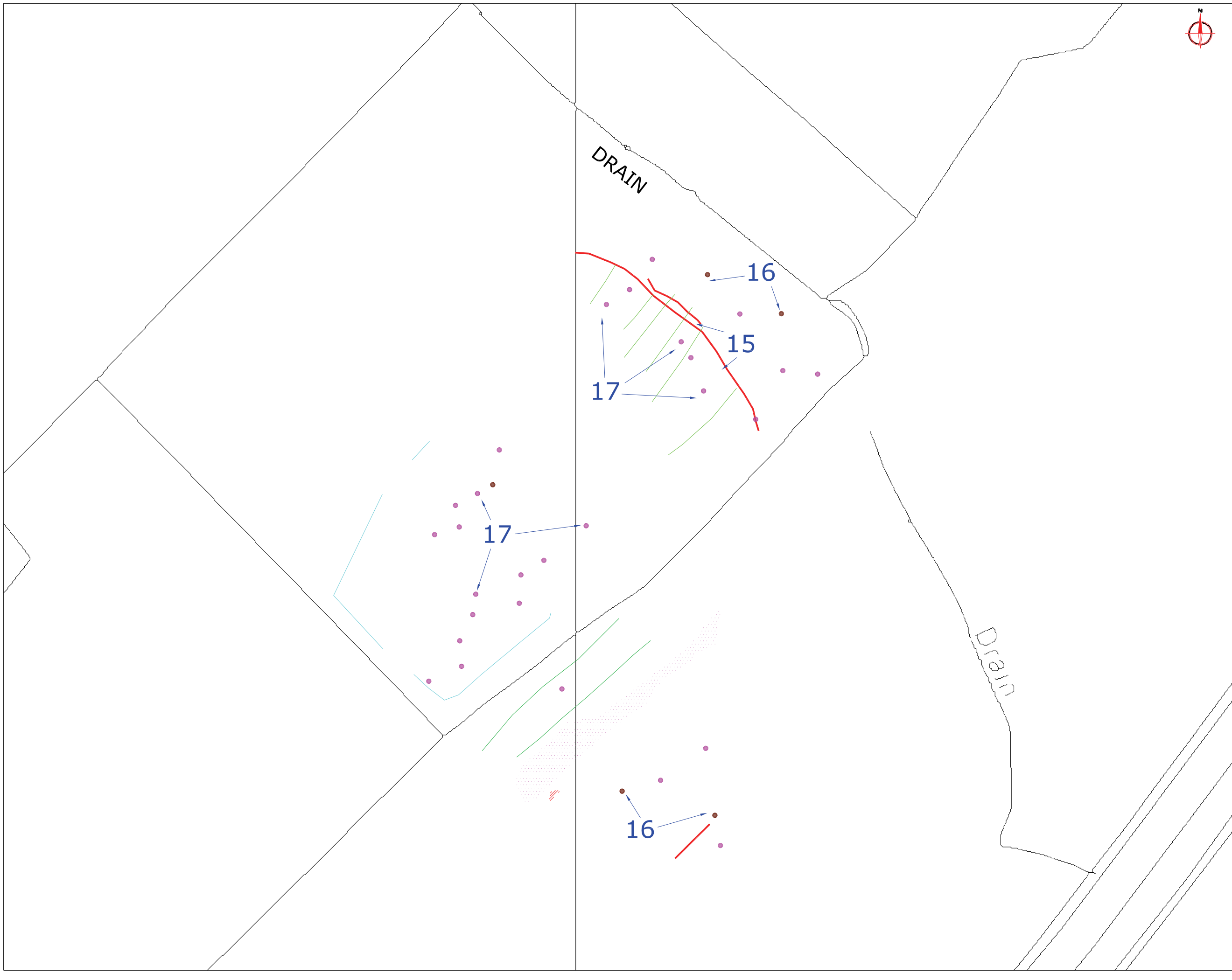
Subject

PROCESSED GRADIOMETER DATA- SOUTHERN AREA

STRATASCAN™
GEOPHYSICS FOR ARCHAEOLOGY AND ENGINEERING
VINEYARD HOUSE
UPPER HOOK ROAD
UPTON UPON SEVERN
UK
WR8 0SA
T: +44 (0)1684 592266
F: +44 (0)1684 594142
E: info@stratascan.co.uk
www.stratascan.co.uk

Scale 1:1000 (0m 10 20 30 40 50 60m)

Plot	Checked by	Issue No.
A1	PPB	01
Date	Drawn by	Figure No.
FEB 06	RAJS	20



Amendments

Issue No.	Date	Description
-	-	-
		-

KEY

- Area of magnetic debris
- Positive area anomaly- possible archaeological origin
- Positive linear anomaly - possible archaeological origin
- Positive linear anomaly - agricultural mark
- Agricultural mark with associated magnetic debris
- Possible land drains
- Discrete positive anomaly with negative response - ferrous object
- Discrete positive anomaly - possible pit

Job No.	Survey Date
2104	JAN 06

Client

TERENCE O'ROURKE

Project Title

GEOPHYSICAL SURVEY- LAND SOUTHWEST OF BICESTER

Subject

ABSTRACTION AND INTERPRETATION OF GRADIOMETER ANOMALIES- SOUTHERN AREA

STRATASCAN™
GEOPHYSICS FOR ARCHAEOLOGY AND ENGINEERING
VINEYARD HOUSE
UPPER HOOK ROAD
UPTON UPON SEVERN
UK
WR8 0SA
T: +44 (0)1684 592266
F: +44 (0)1684 594142
E: info@stratascan.co.uk
www.stratascan.co.uk

Scale 1:1000 (0m 10 20 30 40 50 60m)

Plot	Checked by	Issue No.
A1	PPB	01
Date	Drawn by	Figure No.
FEB 06	RAJS	21

Amendments

Issue No.	Date	Description
-	-	-
		-

Plotting parameters;

Maximum +2nT (black)
Minimum -2nT (white)

-3SD +3SD

+2nT

-2nT

Job No.	Survey Date
2104	JAN 06

Client

TERENCE O'ROURKE

Project Title

GEOPHYSICAL SURVEY- LAND SOUTH WEST OF BICESTER

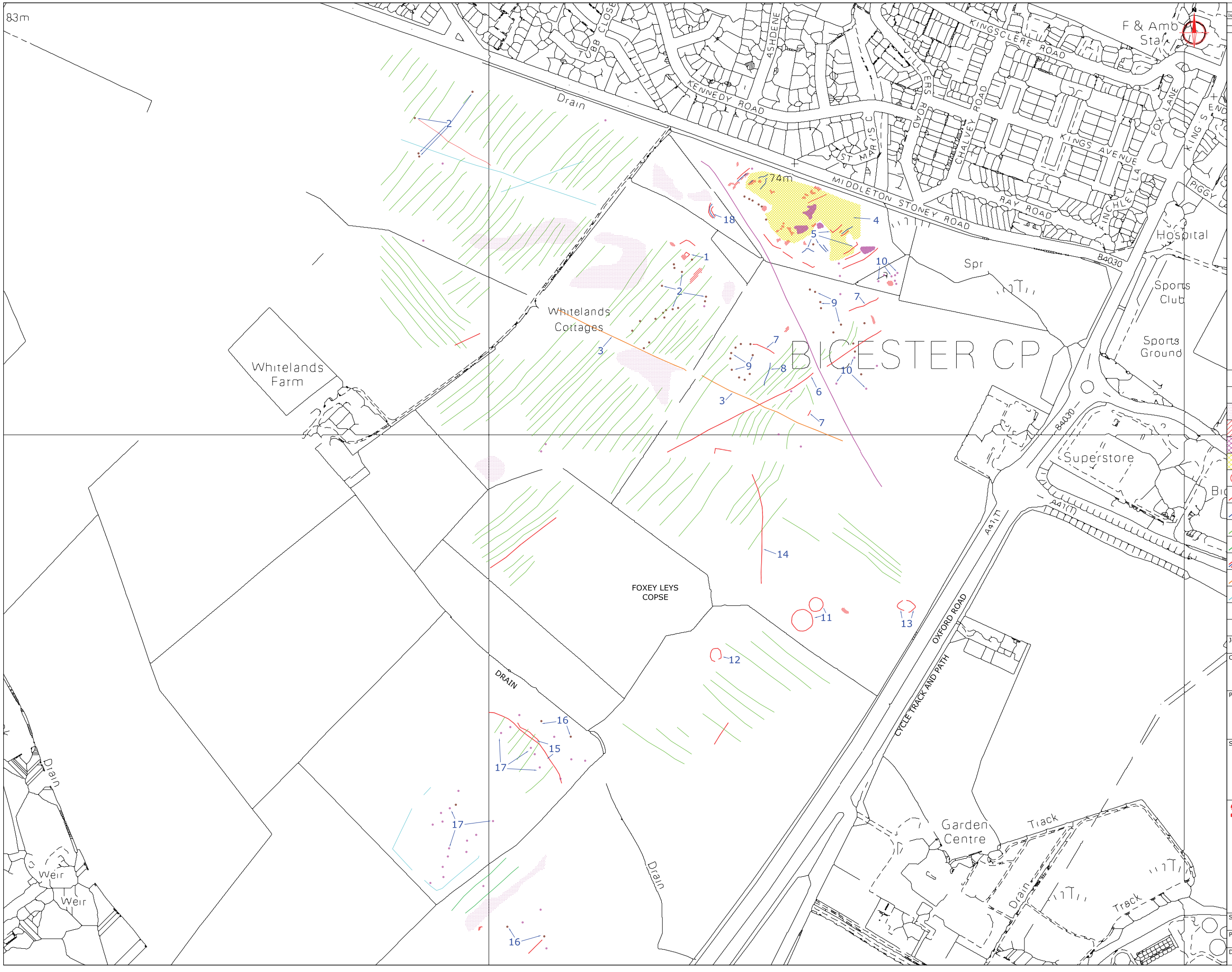
Subject

PROCESSED GRADIOMETER DATA

STRATASCAN™
GEOPHYSICS FOR ARCHAEOLOGY AND ENGINEERING
VINEYARD HOUSE
UPPER HOOK ROAD
UPTON UPON SEVERN
UK
WR8 0SA
T: +44 (0)1684 592266
F: +44 (0)1684 594142
E: info@stratascan.co.uk
www.stratascan.co.uk

Scale 1:2500 (0m 50 100 150m)

Plot	Checked by	Issue No.
A1	PPB	01
Date	Drawn by	Figure No.
FEB 06	RAJS	22



Amendments

Issue No.	Date	Description
-	-	-
		-

KEY

- Pipeline
- Area of magnetic debris
- Positive area anomaly- possible archaeological origin
- Area of magnetic disturbance
- Area of ground disturbance- possibly related to quarrying
- Positive circular anomaly - ring ditch of round barrow
- Positive linear anomaly - possible archaeological origin
- Negative linear anomaly - possible bank of archaeological origin
- Positive linear anomaly - agricultural mark
- Agricultural mark with associated magnetic debris
- Bank and ditch alignment
- Former field boundary
- Possible land drains
- Discrete positive anomaly with negative response - ferrous object
- Discrete positive anomaly - possible pit

Job No.	Survey Date
2104	JAN 06

Client

TERENCE O'ROURKE

Project Title

GEOPHYSICAL SURVEY- LAND SOUTHWEST OF BICESTER

Subject

ABSTRACTION AND INTERPRETATION OF GRADIOMETER ANOMALIES

STRATASCAN™
GEOPHYSICS FOR ARCHAEOLOGY AND ENGINEERING
VINEYARD HOUSE
UPPER HOOK ROAD
UPTON UPON SEVERN
UK
WR8 0SA
T: +44 (0)1684 592266
F: +44 (0)1684 594142
E: info@stratascan.co.uk
www.stratascan.co.uk

Scale 1:2500 (0m 50 100 150m)

Plot	Checked by	Issue No.
A1	PPB	01
Date	Drawn by	Figure No.
FEB 06	RAJS	23