Redwell Wood Farm Hertfordshire
Proposed IVC Facility
Archaeological Site Investigations

Museum Accession Number: SMR6

OASIS record: slrconsu1-56695

AGRIVERT

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1.0 BACKGROUND

SLR Consulting was commissioned by Agrivert Limited to carry out archaeological site investigations of a proposed construction of an in-vessel composting facility and access road at Redwell Wood Farm Hertfordshire. The site is centred on NGR 520000,203100 (the 'application site').

The application site lies adjacent to the north edge of the M25, 30km north-west of central London, 2km south-east of London Colney and 7km south-east of St Albans.

The proposed development would comprise a reception building, composting tunnels and maturation area. The scheme would be mostly low-level but the reception building would be in the order of 11.5m high. The visual impact would be mitigated by screening from existing planting, the M25 motorway embankment, a proposed soil bund and proposed planting. Access would be provided through the upgrading of an existing farm track and the addition of a stretch of new road in order to bypass the farm buildings.

An archaeological risk appraisal of September 2008, prepared by SLR Consulting, concluded in relation to potential archaeological remains within the application site, that:

- The area contains a large number of prehistoric and later archaeological sites of various types
- Five cropmarks [HER 7982-7986] suggesting land divisions, enclosures and a possible round barrow lie within 300m of the application site
- 7986 lies on the eastern corner of the application site but it is described as a 'macula' (i.e. a spot) and is of uncertain archaeological significance; 7982 extends into the extreme western corner of the application site
- Undated archaeological features have been found in the close vicinity of the application site but small-scale prehistoric and Roman activity, probably agricultural, has been located 400m or more away
- There is potential for the existence of currently-unknown archaeological features within the application site, which have the possibility of being damaged, or destroyed during development.
- Any such features are likely to have already been damaged by long-term ploughing
- There is a low risk of archaeological remains of national importance existing within the application site.

On the basis of proximity and orientation, the possible prehistoric multiple ditch system does not appear to have extended into the application site, and the type of feature most likely to be encountered is probably ditches and enclosures. Results from the adjacent field-evaluations suggest that these are most likely to be prehistoric or Roman, and agricultural in function. This outcome would relate chiefly to two areas identified for special focus in the Research Agenda (*Research and Archaeology: a Framework for the Eastern Counties, 2. Research Agenda and Strategies* (East Anglian Archaeology Occasional Papers 8, 2000).):

- Iron Age and Roman agriculture (particularly palaeoecological and faunal remains)
- Dating of co-axial field boundaries (Prehistoric and Roman).

In view of the archaeological potential of the site, the County Planning Archaeologist recommended to the Local Planning Authority that archaeological site investigations should be carried out and reported on prior to determination of the application. The general scope of the work has been set out in the Design Brief for Archaeological Geophysical Survey and Evaluation (HCC 2008), and a detailed Written Scheme of Investigation produced by SLR Consulting and approved by the County Planning Archaeologist.

2.0 GENERAL ARRANGEMENTS FOR ARCHAEOLOGICAL FIELDWORK

2.1 Aims and objectives

Aims

To clarify the extent and significance of any surviving archaeological remains within the proposed application site, so that a design solution or other appropriate archaeological response can be planned in advance of development

To provide the client with information for budgetary and programming purposes.

Objectives

To establish the exact location, and the extent, nature and condition of the cropmark macula 7986 and ditch 7982.

To identify any currently unknown archaeological features within the application site, and establish their nature and extent.

To identify the extent of any areas devoid of archaeological features.

2.2 Monitoring

The curatorial archaeologist was informed of the project timetable, and was invited to visit site at any time during the fieldwork and discuss the results with SLR, so that the implications for detailed design and mitigation could be resolved at an early date. Monitoring was carried out on Wednesday 10th December 2008.

The curatorial archaeologist was

Andy Instone
County Planning Archaeologist (CPA) for Hertfordshire
County Hall
Hertford SG13 8DN
Tel: 01992 555 241

The archaeological consultant is

Gavin Kinsley
Associate Archaeologist
SLR Consulting
Aspect House, Aspect Business Park
Bennerley Road
Nottingham NG6 8WR
Tel: 0115 964 7280

All archaeologists employed by the archaeological contractor to work on the project were suitably qualified to complete the tasks required. Fieldwork was be carried out directed by Damian Hind and Assisted by Laurence Hayes of SLR Consulting. All archaeological work adhered to the Institute for Archaeologists' *Standard and Guidance For Archaeological Field Evaluation*.

Agreement to deposit the archive was obtained from the destination museum prior to commencement of fieldwork.

The destination museum is:

Potter's Bar Museum (honorary curator Arnold Davey)
Wyllyotts Centre
Wyllyotts Place
Darkes Lane
Potters Bar
EN6 2HN
Tel: 01707 645005 Ext 22

2.3 Health and Safety

SLR operates in accordance with the health and safety procedures as set out in:-

- the *Health and Safety at Work Act* 1974 and related legislation.
- the *Health and Safety Manual* of the Standing Conference of Archaeology Unit Managers (2002)
- the Council for British Archaeology Handbook no. 6, *Safety in Archaeological Fieldwork* (1989)
- the *Construction Design and Management Regulation* (1994)
- and the SLR *Health and Safety Handbook*.

A project-specific health and safety plan and risk assessment were produced prior to the commencement of the project. Personal protective clothing and equipment were used as necessary.

The client supplied information on below-ground services, and a CAT scanning device was be used before and during trenching. Due to the lack of public access and the shallowness of the trenches, it was not considered necessary to fence the work.

3.0 STRATEGY AND CONSTRAINTS

It was proposed that these archaeological site investigations should follow an iterative approach, as recommended within MAP2. Accordingly a Phase 1 comprising magnetometry was followed immediately by a phase of trenching; the trench locations were determined in the light of the results from Phase 1, and taking into account the cropmark plots.

3.1 Strategy:

3.1.1 Phase 1 geophysical survey (magnetometry)

- The areas of geophysical survey are indicated in Figure 3-1, marked as 'Site Investigation Areas'. They cover the IVC site and the access road where it lies away from the farm track (the application site totalling approximately 2.5ha).

3.1.2 Phase 2 excavation

- In the event, no significant anomalies were found in the geophysical survey and the scheme of trenching implemented consisted of a trench positioned across the cropmark 7982 as plotted, and four further trenches distributed to investigate apparent blank areas (Figure 4-1). The five trenches, each measuring 50x2m in plan provided coverage of 500sqm, forming 2% of the 2.5ha of the application site area. The location and extent of trenches were agreed prior to commencement with the curatorial archaeologist.

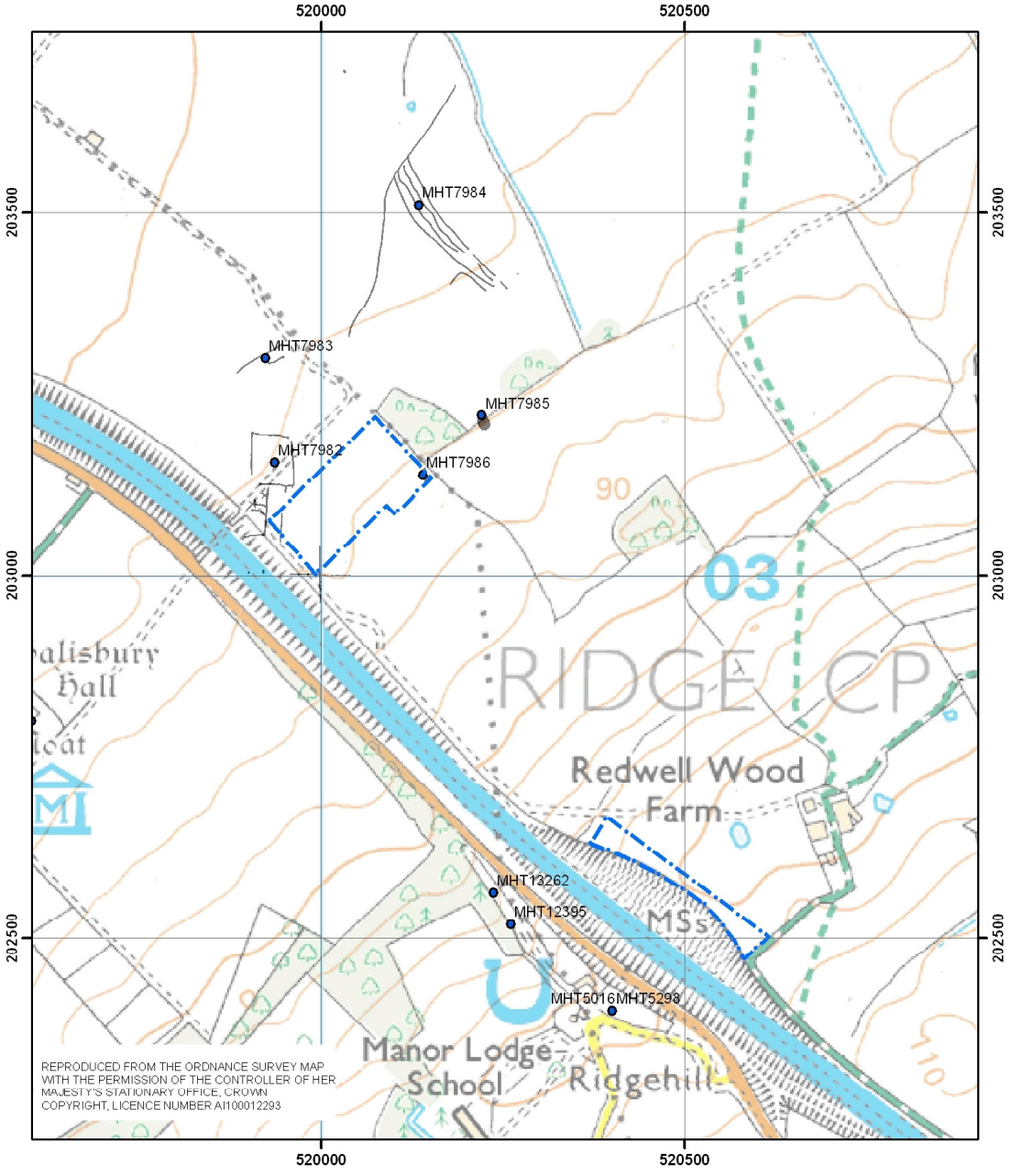
3.2 Constraints

A bridleway crosses the extreme east end of the access road, running to Redwell Wood Farm and a permissive right of way runs along the north-east end of the IVC site. These will not significantly impede any archaeological work.

Two telecommunications masts lie in the vicinity of the access road area. The effects of installations of this type are unpredictable, but they can prevent magnetometry surveys from being carried out.

No trenching was carried out within a maize crop, left to provide cover for nesting birds, which occupied a 25m- band wide across the north-east end of the application site. An overhead power line also prevented mechanical excavation within this area.

Figure 3-1
NMP cropmark plot and layout of site investigation areas



Legend

Site Investigation Areas

4.0 FIELDWORK METHODS

4.1 Geophysical survey

A detailed method statement is included in the report from GSB Prospecting (Appendix 1).

4.2 Excavation

Trenches were excavated using an 8 ton tracked mechanical excavator under continuous archaeological supervision, to carefully remove the topsoil to the top of archaeological remains or undisturbed natural deposits, whichever proved the higher. Great care was exercised to identify any buried soils or other archaeological deposits which might lie over the subsoil. A toothless ditching bucket was used.

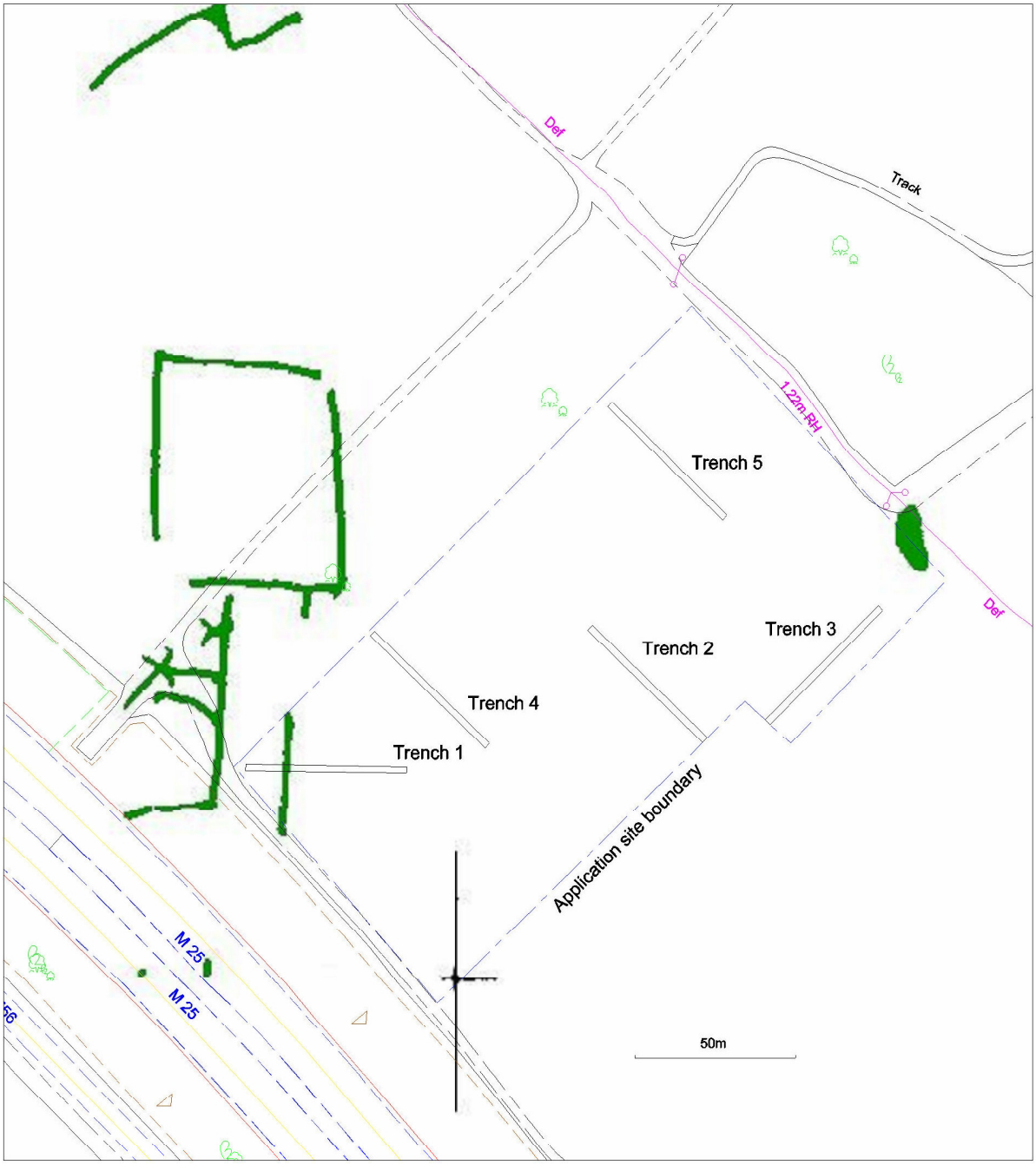
The trenches were recorded by text and drawings through use of proformas, plus suitably-scaled plans and sections (at 1:20 and 1:10 as appropriate). Photographs were taken in colour digital and 35 mm monochrome film format. Photographic scales were included.

No artefacts or palaeoenvironmental samples were collected, due to the absence of archaeological features.

4.3 Reinstatement

Reinstatement of the trial trenches was by backfilling with the arisings, as agreed with the client. Given the lack of features, this was completed without archaeological supervision.

Figure 4-1
Cropmarks and layout of trenches in the IVC site (scale 1:2000)



5.0 RESULTS

5.1 Trench 1

The topsoil was 0.4m thick at the western end of the trench, thinning slightly to 0.3m at the eastern end. It comprised a well ploughed humic loam containing many frequent small to medium sized rounded pebbles derived from the underlying natural subsoil. The subsoil consisted of a relatively uniform deposit of rounded gravels c.10-50mm in diameter in a red/ brown silty clay matrix.

It was noted that there was a slight influx of water at the western end of the trench, on the slightly lower ground. This was identified close to a pair of plough marks, which cut slightly into the substrate. These were investigated, but were shallow and apparently not related to the cropmark which was the target of the trench.

No archaeological features or finds were identified.

Figure 5-1
South-west end of Trench 1 in vicinity of cropmark as plotted

5.2 Trench 2

The topsoil was 0.35m thick throughout. It appeared to be slightly more clayey than in trench 1, although of very similar character. Similarly, the subsoil appeared to be slightly more clayey than in trench 1, although of similar red/ brown colour and makeup. The ground was slightly higher on this side of the site, as the ground gently rises to east, to a ridge about 750m distant.

No archaeological features or finds were identified.

Figure 5-2
Trench 2 facing north-west

5.3 Trench 3

Topsoil was 0.35m thick throughout. The natural subsoil proved to be a red/ brown, poorly sorted gravel with occasional nodules of flint in a slightly clayey matrix. Plough marks were visible throughout the trench, running NE-SW, in line with the existing direction of ploughing.

No archaeological features or finds were identified.

Figure 5-3
Trench 3 facing north-east

5.4 Trench 4

Topsoil was 0.3m thick throughout. The natural subsoil was well sorted medium to small rounded pebbles and gravel in a mid-red/ brown silty sand matrix. It appeared to be slightly drier and cleaner than trench 3, with occasional modern plough marks also being observed.

No archaeological features or finds were identified.

Figure 5-4
Trench 4 facing north-west

5.5 Trench 5

Topsoil was 0.3m thick throughout. The subsoil was consistently red/ brown with well sorted rounded pebbles in a coarse silty sand matrix, somewhat finer and less pebbly in a 10m-wide band in the centre of the trench.

No archaeological features or finds were identified.

Figure 5-5
Trench 5 facing south-east

6.0 CONCLUSIONS

No archaeological features were observed, despite the careful positioning of trench 1 across the cropmark 7982 which was the main focus of the investigations. This mark was, as plotted (Figures 3-1, 4-1), a ditch orientated north-south, crossing the western corner of the application site, interrupted but apparently originally connected to an enclosure lying north-west of the application site boundary (HER ref MHT7982). This lack of evidence could be attributed to two main factors, outlined below.

A degree of error in plotting aerial photographs cannot be avoided and its magnitude will vary according to the flatness of the terrain and the proximity and definition of adjacent visual references such as field-boundaries, tracks etc. Although the terrain is flat, the cropmarks as plotted extend beneath the embankment of the M25, placing the source photograph(s) in the early 1980s or earlier. There is therefore currently insufficient information to form a view on the likely accuracy of the plot, but it is possible that the cropmark feature lies entirely outside the application site boundary.

As an alternative, it should be recognised that the area has been ploughed for a considerable length of time, and it is possible that shallow features have been removed by recent ploughing. Plough marks were noted in trench 1 in roughly the area where the ditch was expected. The cropmark plot itself shows the ditch as interrupted, presumably due to erosion even at the time of the taking of the source photographs.

At the opposite, eastern, corner of the application site, the cropmark macula MHT7986 could not be investigated, due to the presence there of an overhead power line and a standing crop (left as cover for nesting birds). Although included in the national mapping programme, there is no certainty that the cropmark is of archaeological significance and geological patterning or recent agricultural pits are other possibilities.

Although no features of archaeological significance were found within the trenches of the archaeological site investigations, the area trenched represents a 2% sample of the application site, and it is possible that archaeological features exist outside those areas but within the application site boundary.

The site investigation work reported here has confirmed and reinforced the conclusion of the risk appraisal that there is a low risk of archaeological remains of national importance existing within the application site.

7.0 ARCHIVE INCLUDING FINDS

The archive was compiled in accordance with any requirements of the destination museum. They will also follow the *Guidelines for the Preparation of Excavation Archives for Long-term Storage* (UKIC, 1990), and *Standards in the Museum Care of Archaeological Collections* (Museum and Galleries Commission 1992), where there is no conflict.

The archive contains:

- all field records
  - trench recording sheets
  - photographs and photograph record sheets
- this report.

There were no artefactual finds.

The archive has been deposited with the following museum.

Potter's Bar Museum (honorary curator Arnold Davey)
Wyllyotts Centre
Wyllyotts Place
Darkes Lane
Potters Bar
EN6 2HN
Tel: 01707 645005 Ext 22

Museum Accession Number: SMR6

OASIS record: slrconsu1-56695.

8.0 COPYRIGHT

9.0 CLOSURE

This report has been prepared by SLR Consulting Limited with all reasonable skill, care and diligence, and taking account of the manpower and resources devoted to it by agreement with the client. Information reported herein is based on the interpretation of data collected and has been accepted in good faith as being accurate and valid.

This report is for the exclusive use of Agrivert Limited; no warranties or guarantees are expressed or should be inferred by any third parties. This report may not be relied upon by other parties without written consent from SLR.

SLR disclaims any responsibility to the client and others in respect of any matters outside the agreed scope of the work.

10.0 REFERENCES

HCC 2008. *Design Brief for Archaeological Geophysical Survey and Evaluation: Land at Redwell Wood Farm, Shenley, Planning Ref.: 10/****/08*.

SLR Consulting September 2008. *Redwell Wood Farm Hertfordshire Archaeological Risk Appraisal*.

SLR Consulting November 2008. *Redwell Wood Farm Hertfordshire Proposed IVC Facility: Written Scheme of Investigation for Archaeological Site Investigations.*

APPENDIX 1 – GEOPHYSICAL SURVEY REPORT

GSB

PROSPECTION Ltd

GEOPHYSICAL SURVEY REPORT
2008/72

Redwell Wood Farm, Hertfordshire
Proposed IVC Facility: Archaeological Site Investigations

Client:

SLR CONSULTING

on behalf of

AGRIVERT

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Specialising in Shallow and Archaeological Prospection

GSB Survey No. 2008/72

Redwell Wood Farm, Hertfordshire
Proposed IVC Facility: Archaeological Site Investigations

NGR	TL 200 031
Location	North of the M25, approximately 2km south-east of London Colney and 7km south-east of St Albans.
County	Hertfordshire.
District	Hertsmere.
Parish	Ridge.
Topography	Generally level (Area 1), undulating (Area 2).
Current land-use	Pasture and agricultural.
Soils	Windsor association: Slowly permeable seasonally waterlogged clayey soils mostly with brown subsoils (SSEW 1983).
Geology	Mixture of Upper Chalk, London Clay, Reading Beds and Glacial Gravel.
Archaeology	Five cropmarks (HER 7982-7986) lie within 300m of the application site. 7986 lies on the eastern corner of the survey area, although it is only described as a macula. Small-scale Prehistoric and Roman activity has been located 400m away (SLR 2008).
Study Area	c.3ha.
Survey Methods	Detailed Fluxgate Gradiometer.

Aims

To locate and characterise any anomalies of possible archaeological interest within the application area. The work forms part of a wider archaeological assessment being carried out by **SLR Consulting Ltd.** on behalf of **Agrivert Limited.**

Summary of Results*

The data show that no definite archaeological anomalies have been detected within the study area. Anomalies of an *Uncertain* origin have been located within Area 1, but on balance they are perhaps most likely to be pockets of natural responses - as have also been located within Area 2. Both survey areas are dominated by ferrous responses which are presumed to be modern origin.

Project Information

Project Co-ordinator: E Wood MIfA
Project Assistants: E Collier, C Stephens & G Taylor
Date of Fieldwork: 2nd & 3rd December 2008
Date of Report: 9th December 2008

***It is essential that this summary is read in conjunction with the detailed results of the survey.**

Survey Specifications

Method

The survey grid (20m points) was set out and tied in to the Ordnance Survey (OS) grid using a Trimble R8 Real Time Kinematic (RTK) GPS system. A copy of the georeferenced results in .dxf and .txt format is included on the Archive CD. Stakes were left *in situ* for reconstruction of the grid, see Figure T1.

Technique	Traverse Separation	Reading Interval	Instrument	Survey Size
Magnetometer - Scanning (Appendix 1)	-	-	-	-
Magnetometer – Detailed (Appendix 1)	1m	0.25	Bartington Grad 601-2	2.4ha
Resistance – Twin Probe (Appendix 1)	-	-	-	-
Ground Penetrating Radar (GPR) – 250MHz (Appendix 1)	-	-	-	-

Data Processing

	Magnetic	Resistance	GPR
Tilt Correct	Y	-	-
De-stagger	Y	-	-
Interpolate	Y	-	-
Filter	N	-	-

Presentation of Results

Report Figures (Printed & Archive CD):	Location, data plots and interpretation diagram on base map (Figures 1-3). Tie-in information (Figure T1).
Reference Figures (Archive CD):	Data plots at 1:500 for reference and analysis. (See List of Figures).
Plot Formats:	See Appendix 1: Technical Information, at end of report.

General Considerations

Conditions for survey were good as the fields consisted of either pasture or young crop. Strips of land to the northeast and northwest of Area 1 were not surveyed due to an area of maize and young trees respectively (see Figure 1).

Smaller scale ferrous anomalies ("iron spikes") are present in both the survey areas, their form best illustrated in the XY trace plots. These responses are characteristic of small pieces of ferrous debris in the topsoil and are commonly assigned a modern origin. While the most prominent of these are highlighted on the interpretation diagram, they are not discussed in the text below unless considered relevant.

Results of Survey

1. Magnetic Survey

Area 1

1.1 A handful of anomalies within the dataset have been given the category of *Uncertain*; this has been attributed due to their spurious form. Whilst they may have an archaeological origin, the lack of definition or associated features suggests a natural source is perhaps more likely – they are slightly magnetically stronger than the natural responses in Area 2 (see below). Trends can also be seen within the data and are probably related to ploughing.

1.2 The data are dominated by ferrous anomalies; either seen as individual responses or as clusters. These may be from shotgun shells as the site was within the vicinity of a bird shooting area. The ferrous response on the southern limits is due to the road.

Area 2

1.3 A number of natural type anomalies are apparent within the dataset, likely to reflect changes in the sub-soils or topography. Trends within the data are likely to have an agricultural, rather than archaeological, origin.

1.4 Ferrous responses on the edges of the data are caused by a telecommunication mast, a wire fence and a piece of farming machinery.

2. Conclusions

2.1 Based on the geophysical survey, the potential for archaeological features surviving within the surveyed areas would seem to be low. There is the possibility that the *Uncertain* anomalies within Area 1 have an archaeological origin, but this is perhaps unlikely. The majority of responses within Area 2 are of a natural origin. Ferrous anomalies are modern in date and may have masked any archaeology, if present, within the study area.

References

SLR 2008 Redwell Wood Farm Hertfordshire Proposed IVC Facility. *Archaeological Risk Appraisal.* Unpublished Report.

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

List of Figures

Report Figures

Reference Figures on CD

0 metres 200

Gradiometer Survey

Area not Surveyed

Direction of Traverses

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Location of Survey Areas

Figure 1

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Summary Greyscales
Reproduced from the Ordnance Survey Map with the permission of the Controller of HMSO © Crown Copyright (AL100018665)
Figure 2

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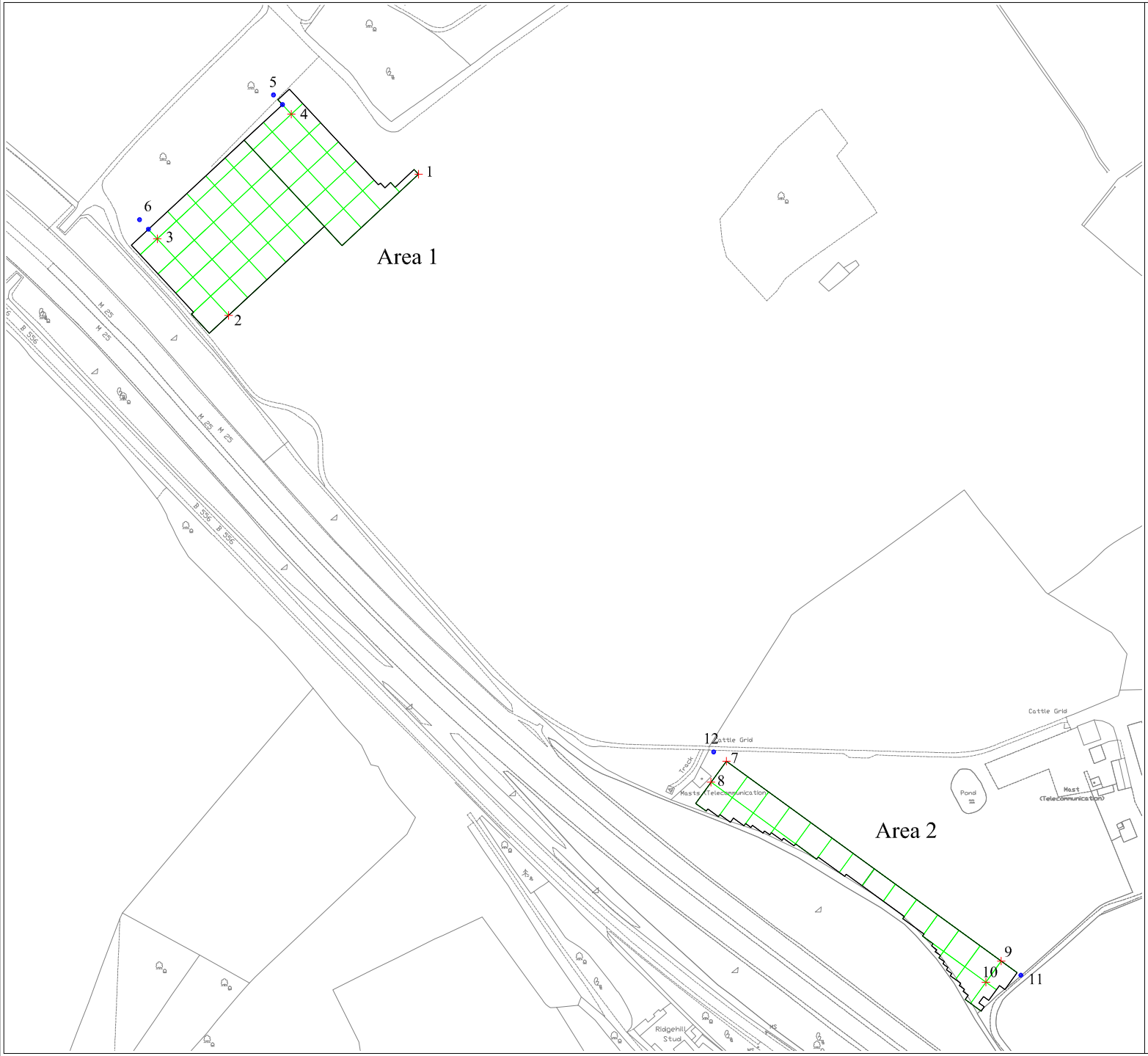
Summary Interpretations

Figure 3



0 metres 200

	Eastings	Northings	Name
1	520157.256	20312.818	Grid Point
2	520113.286	203071.946	Grid Point
3	520161.185	203063.49	Grid Point
4	520059.869	203 58.811	Grid Point
5	520046.244	203 73.448	Stake
6	519943.722	203078.12	Stake
7	520392.685	202664.036	Grid Point
8	520380.924	202647.859	Grid Point
9	520602.978	202511.165	Grid Point
10	520591.218	202494.98	Grid Point
11	520617.938	202500.287	Stake
12	520382.946	202671.082	Stake

Selected GPS Points

Stake/Peg in situ.

Stakes in Situ = Points 5,6,11 & 12

3-6 = 10m
4-5 = 10m
7-12 = 12m
9-11 = 18.5m

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Tie-in Information

Figure T1

Appendix 1: Technical Information

Instrumentation

Fluxgate Gradiometer: Geoscan FM36/256 and Bartington *Grad*601-2

Both the Geoscan and Bartington instruments comprise two fluxgate sensors mounted vertically apart; the distance between the sensors on the former is 500mm, on the latter 1000mm. The gradiometers are carried by hand, with the bottom sensor approximately 100-300mm from the ground surface. At each survey station, the difference in the magnetic field between the two fluxgates is measured in nanoTesla (nT). The sensitivity of the instrument can be adjusted; for most archaeological surveys the most sensitive range (0.1nT) is used. The fluxgate gradiometer suppresses any diurnal or regional effects. Generally, features up to 1m deep may be detected by this method. Having two gradiometer units mounted laterally with a separation of 1000mm, the Bartington instrument can collect two lines of data per traverse.

Resistance Meter: Geoscan RM15

This instrument measures the electrical resistance of the earth, using a system of four electrodes (two current and two potential.) Depending on the arrangement of these electrodes an exact measurement of a specific volume of earth may be acquired. This resistance value may then be used to calculate the earth resistivity. The most common arrangement is the Twin Probe configuration which involves two pairs of electrodes (one current and one potential): one pair remain in a fixed position, whilst the other measures the resistance variations across a grid. The resistance is measured in ohms and, when calculated, resistivity is in ohm-metres. The resistance method as used for standard area survey employs a probe separation of 0.5m, which samples to a depth of approximately 0.75m. The nature of the overburden and underlying geology will cause variations in this depth.

GPR: Sensors & Software Noggin Smartcart

The Noggin system includes an onboard digital video logger (DVL III), 250 MHz or 500MHz antenna, an odometer wheel and battery. It is, therefore, a fully integrated system. The built-in software uses the integrated odometer to provide an accurate distance measurement to the response. The data are recorded in digital format and can be processed to produce depth slice maps, 2D sections or 3D cubes.

Display Options

XY Trace

This involves a line representation of the data. Each successive row of data is equally incremented in the Y axis, to produce a stacked profile effect. This display may incorporate a hidden-line removal algorithm, which blocks out lines behind the major peaks and can aid interpretation. The advantages of this type of display are that it allows the full range of the data to be viewed and shows the shape of the individual anomalies. The display may also be changed by altering the horizontal viewing angle and the angle above the plane. The output may be either colour or black and white.

Greyscale

This format divides a given range of readings into a set number of classes. Each class is represented by a specific shade of grey, the intensity increasing with value. All values above the given range are allocated the same shade (maximum intensity); similarly all values below the given range are represented by the minimum intensity shade. Similar plots can be produced in colour, either using a wide range of colours or by selecting two or three colours to represent positive and negative values. The assigned range (plotting levels) can be adjusted to emphasise different anomalies in the data-set.

Relief Plot

This is a method of display that creates a three dimensional effect by directing an imaginary light source on a given data set. Particular elements of the results are highlighted depending on the angle of strike of the light source. This display method is particularly useful when applied to resistance data to highlight subtle changes in resistance that might otherwise be obscured.

3D Surface Plot

This is similar to the XY trace, but in 3 dimensions. Each data point of a survey is represented in its relative position on the *x* and *y* axes and the data value is represented in the *z* axis. This gives a digital terrain, or topographic effect.

Radargram

Radar data comprise a record of reflection intensity against the time taken for the emitted energy to travel from the transmitter down to the reflector and back to the receiver. The resultant plot is effectively a vertical section through the ground along the line of the traverse, with time (depth) on the vertical axis, displacement on the horizontal axis and reflection intensity as a grey or colour scale.

Time Slice

If a number of radargrams are collected over a grid, or in conjunction with GPS data, it is possible to reconstruct the entire dataset into a 3D volume. This can then be resampled to compile 'plan' maps of response strength at increasing time (or depth) offsets, thus simplifying the visualisation of how anomalies vary beneath the surface across a survey area.

Data Processing

Zero Mean Traverse	This process which sets the background mean of each traverse within each grid to zero. The operation removes striping effects and edge discontinuities over the whole of the data set. It is usually only applied to gradiometer data.
Step Correction	When gradiometer data are collected in 'zig-zag' fashion, stepping errors can sometimes arise. These occur because of a slight difference in the speed of walking on the forward and reverse traverses. The result is a staggered effect in the data, which is particularly noticeable on linear anomalies. This process corrects these errors
Interpolation	When geophysical data are presented as a greyscale, each data point is represented as a small square. The resulting plot can sometimes have a 'blocky' appearance. The interpolation process calculates and inserts additional values between existing data points. The process can be carried out with points *along* a traverse (the *x* axis) and/or *between* traverses (the *y* axis) and results in a smoother greyscale image.
Despike	In resistance survey, spurious readings can occasionally occur, usually due to a poor contact of the probes with the surface. This process removes the spurious readings, replacing them with values calculated by taking the mean and standard deviation of surrounding data points. It is not usually applied to gradiometer data.
High Pass Filter	Carried out over the whole a resistance data-set, the filter removes low frequency, large scale spatial detail, such as that produced by broad geological changes. The result is to enhance the visibility of the smaller scale archaeological anomalies that are otherwise hidden within the broad 'background' change in resistance. It is not usually applied to gradiometer data.
GPR Filters	There are a wide range of GPR filters available and their application will vary from project to project. The most commonly used are: Dewow (removes low frequency, down-trace instrument noise); DC-Shift (re-establishes oscillation of the radar pulse around the zero point); Bandpass Filtering (suppresses frequencies outside of the antenna's peak bandwidth thus reducing noise); Background Removal (can remove ringing, instrument noise and minimize the near-surface 'coupling' effect); Migration (collapses hyperbolic tails back towards the reflection source).

Tie-in Techniques and Information

Tapes

A number of points on each survey grid are recorded by triangulating to at least two fixed points on the base map. If there is a lack of 'hard detail' in the mapping, some form of survey marker will be left *in-situ* for reference.

NOTE: When re-establishing the grid (for excavation or other post-survey work) only data from the supplied tie-in diagram should be used and NOT the report figures.

Electronic Distance Measurers (EDM) / Total Stations (TST)

This type of instrument measures the distance and angle to features with reference to a fixed point. Where possible the EDM will be set up over a point that can be re-established with relative ease, e.g. over map detail, a survey marker or at a point measureable by tapes. Distances and angles to permanent points of reference and/or map detail are recorded as well as at least two points per survey grid.

NOTE: When re-establishing the grid (for excavation or other post-survey work) only data from the supplied tie-in diagram should be used and NOT the report figures.

Global Positioning Systems (GPS)

Using a roving receiver unit, these systems record the longitude, latitude and altitude of a given point by triangulating between a network of satellites. For survey-grade measurements, the accuracy is refined by integrating data from a fixed base station or local reference network. In addition to grid points, elements of map detail are collected to assess the existing base-map accuracy and, in worst-case scenarios, use the data on a non-georeferenced map. If the supplied mapping is found to be inaccurate, it is sometimes necessary to shift the position of GPS points (keeping their relative positions fixed) within the site plan to correlate cartographic features with the 'real-world' co-ordinates; this should be considered when using GPS to re-establish an existing survey grid (see note below). It should be noted that the accuracy of any GPS-positioned point is dependent upon both the system and the satellite geometry at the time of survey. On projects where multiple contractors have used GPS, the possibility of compound errors between original survey grid creation, tie-in information and grid re-establishment should be borne in mind when positioning trenches over recorded anomalies.

NOTE: If re-establishing the grid with a GPS (for excavation or other post-survey work), use only the co-ordinates recorded on the tie-in diagram or, if supplied, the GPS data file included on the Archive CD; relative positions in the report diagrams may be correct but absolute co-ordinates can vary if discrepancies in the base mapping have been encountered.

Terms Commonly used in the Interpretation of Results

Magnetic

Archaeology	This term is used when the form, nature and pattern of the response are clearly or very probably archaeological These anomalies, whilst considered anthropogenic, could be of any age.
? Archaeology	The interpretation of such anomalies is often tentative, with the anomalies exhibiting either weak signal strength or forming incomplete archaeological patterns. They may be the result of variable soil depth, plough damage or even aliasing as a result of data collection orientation.
Areas of Increased Magnetic Response	These responses show no visual indications on the ground surface and are considered to have some archaeological potential.
Industrial	Strong magnetic anomalies that, due to their shape and form or the context in which they are found, suggest the presence of kilns, ovens, corn dryers, metal-working areas or hearths. It should be noted that in many instances modern ferrous material can produce similar magnetic anomalies.
Natural	These responses form clear patterns in geographical zones where natural variations are known to produce significant magnetic distortions e.g. palaeochannels or magnetic gravels.
? Natural	These are anomalies that are likely to be natural in origin i.e. geological or pedological.
Ridge and Furrow	These are regular and broad linear anomalies that are presumed to be the result of ancient cultivation. In some cases the response may be the result of modern activity.
Ploughing Trend	These are isolated or grouped linear responses. They are normally narrow and are presumed modern when aligned to current field boundaries or following present ploughing.
Uncertain Origin	Often, anomalies (both positive and negative) will be recorded which stand out from the background magnetic variation yet show little to suggest an exact origin. This may be because the characteristics and distribution of the responses straddle the categories of "*?Archaeology*" and "*?Natural*" or that they are simply of an unusual form.
Trend	This is usually an ill-defined, weak, isolated or obscured linear anomaly of unknown cause or date.
Areas of Magnetic Disturbance	These responses are commonly found in places where modern ferrous or fired materials are present e.g. brick rubble. They are presumed to be modern.
Ferrous Response	This type of response is associated with ferrous material and may result from small items in the topsoil, larger buried objects such as pipes, or above ground features such as fence lines or pylons. Ferrous responses are usually regarded as modern. Individual burnt stones, fired bricks or igneous rocks can produce responses similar to ferrous material.

Resistance

Archaeology	High or low res responses are clearly or very probably archaeological These anomalies, whilst considered anthropogenic, could be of any age.
? Archaeology	The interpretation of such anomalies is often tentative, with the anomalies exhibiting either weak signal strength or forming incomplete archaeological patterns. They may be the result of variable soil depth, plough damage or even aliasing as a result of data collection orientation.
Natural	These responses form clear patterns in geographical zones where natural variations are known to produce significant magnetic distortions e.g. palaeochannels or magnetic gravels.
? Natural	These are anomalies that are likely to be natural in origin i.e. geological or pedological.
? Landscaping / topography	These are regular and broad linear anomalies that are presumed to be the result of ancient cultivation. In some cases the response may be the result of modern activity.
Vegetation	These are isolated or grouped linear responses. They are normally narrow and are presumed modern when aligned to current field boundaries or following present ploughing.
Trend	This is usually an ill-defined, weak, isolated or obscured linear anomaly of unknown cause or date.

GPR

Wall /Foundation/ /Vault /Culvert etc.	High amplitude anomaly definitions used when other evidence is available that supports a clear archaeological interpretation.
Archaeology	Anomalies whose form, nature and pattern indicate archaeology but where little or no supporting evidence exists. If a more precise archaeological interpretation is possible, for example the responses appear to respect known local archaeology, then this will be indicated in the accompanying text. As low amplitude responses are less obvious features it is unlikely that they would have a definitive categorisation.
? Archaeology	When the anomaly could be archaeologically significant, given its discrete nature, but where the distribution of the responses is not clearly archaeological. Interpretation of such anomalies is often tentative, exhibiting either little contrast or forming incomplete archaeological patterns.
Historic	Responses showing clear correlation with earlier map evidence.
?Historic	Responses relating to features not directly recorded on earlier maps but which appear to respect features that are. May form patterns suggestive of formal gardens, landscaping or footpaths.
Area of Anomalous Response	An area in which the response levels are very slightly elevated or diminshed with respect to the 'background'. Where no obvious surface features or documentary evidence can explain this spread of altered reflectivity it is assumed to denote some kind of disturbance, though the origins could be of any age and either anthropogenic or natural. Possible explanations are changes in subsurface composition and groundwater 'ponding'.
Natural	Anomalies relating to natural sub-surface features as indicated by documentary sources, local knowledge or evidence on the surface.
?Natural	Responses forming patterns akin to subsoil/geological variations either attenuating or reflecting greater amounts of energy. An archaeological origin such as rubble spreads or robbed out remains cannot be dismissed.
Trend	An ill defined, weak or isolated linear anomaly of unknown cause or date.
Modern	Reflections that indicate features such as services, rebar or modern cellars correlating with available evidence (maps, communications with the client, alignment of drain covers etc.).
?Modern	Reflections appearing to indicate buried services but where there is no supporting evidence. Also applies to responses which form patterns, or are at a depth which suggests a modern origin. An archaeological source cannot be completely dismissed.
Surface	Responses clearly due to surface discontinuities, the effects of which may be seen to 'ring' down through radargrams and so incorrectly appearing in the deeper time-slices.