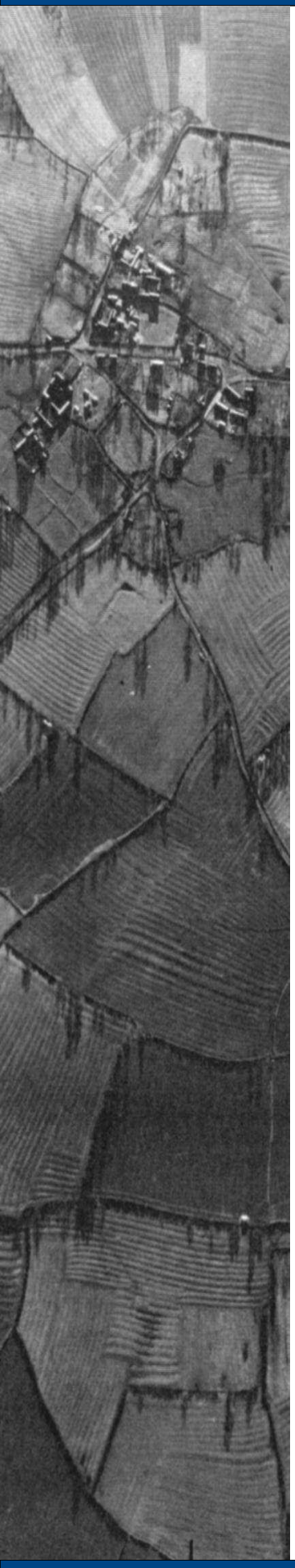

Oxford University Chemistry CLR2 Ground Source Heating Project

MAGNETOMETER SURVEY REPORT

for

Cotswold Archaeology

on behalf of

Oxford University Fixed Assets Ltd

David Sabin and Kerry Donaldson

November 2010

Ref. no. 340

ARCHAEOLOGICAL SURVEYS LTD

Oxford University Chemistry CLR2 Ground Source Heating Project

Magnetometer Survey

for

Cotswold Archaeology

on behalf of

Oxford University Fixed Assets Ltd

Fieldwork by David Sabin and Francis Sabin
Report by David Sabin BSc (Hons) MIFA and Kerry Donaldson BSc (Hons)

Survey date - **4th and 5th November 2010**
Ordnance Survey Grid Reference – **SP 517 071**

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SUMMARY

Archaeological Surveys Ltd was commissioned by Cotswold Archaeology, on behalf of Oxford University Fixed Assets Ltd, to undertake a magnetometer survey of two survey areas within the University Parks. The site has been outlined for the proposed development of a ground source heating system.

The detailed magnetometer survey located a number of positive linear and discrete anomalies within Area 1 to the north of the Observatory. Although these may appear ditch-like and pit-like, their archaeological potential cannot be determined from the data. A series of weak, broad linear anomalies may relate to agricultural or natural features. Within Area 2, to the east of the Science Area, a number of weakly positive linear anomalies have been located; however, their origin is uncertain.

1 INTRODUCTION

1.1 Survey background

1.1.1 Archaeological Surveys Ltd was commissioned by Cotswold Archaeology, on behalf of Oxford University Fixed Assets Ltd, to undertake a magnetometer survey over two survey areas within the University Parks. The site has been outlined for the proposed development of a ground source heating system. The survey forms part of an archaeological assessment of the site.

1.1.2 The geophysical survey was carried out in accordance with a Written Scheme of Investigation (WSI) produced by Cotswold Archaeology (2010a) and approved by the Oxford City Council Archaeologist prior to commencement of fieldwork.

1.1.3 The park has produced cropmark evidence for archaeological features thought to relate to a Bronze Age barrow cemetery and late prehistoric and Roman enclosures and field boundaries. A geophysical survey, carried out within the University Parks immediately to the north west, has located a number of anomalies that relate to these and other features (Archaeological Surveys 2010).

1.2 Survey objectives and techniques

1.2.1 The objective of the geophysical survey was to detect and precisely locate buried archaeological features within the University Parks in the vicinity of the proposed ground source heating system boreholes. The survey results will feed into and inform the evolving design scheme for the project and inform discussions with the Oxford City Council Archaeologist. The survey therefore comprised a much larger area than that actually required for the heating system, with the aim of providing further information on the nature of the archaeological resource in the area, and its potential extent and significance.

1.2.2 The methodology is considered an efficient and effective approach to archaeological prospection. The survey and report generally follow the recommendations set out by: English Heritage, 2008, *Geophysical survey in archaeological field evaluation;* and Institute for Archaeologists, 2002, *The use of Geophysical Techniques in Archaeological Evaluations*.

1.3 Site location, description and survey conditions

1.3.1 The two survey areas are located within the southern part of the University Parks in Oxford. They are centred on Ordnance Survey National Grid Reference SP 51647 07162 (Area 1) and SP 51814 07115 (Area 2), see Figures 01 and 02.

1.3.2 The geophysical survey covers an area of approximately 1.4ha of mown grass, split within two surveys areas. Area 1, lies to the north of the University Science Area, and contains a sports pitch. Area 2 lies to the east of the Science Area and also contains a sports pitch.

Plate 1: Survey Area 1 looking south west from the north eastern corner

Plate 2: Survey Area 2 looking towards the north

1.3.3 The ground conditions across the site were generally considered to be favourable for the collection of magnetometry data; however, the site boundaries were irregular and generally defined by clumps of specimen trees limiting access with the magnetometer. The site contained sports pitches and goal posts that produced both high magnitude magnetic disturbance and obstructions to the survey. In addition, the survey areas were constantly crossed by pedestrians often breaking the collection of data along the survey traverses. Weather conditions during the survey were variable with periods of heavy rain.

1.4 Site history and archaeological potential

1.4.1 An archaeological desk-based assessment was carried out by Cotswold Archaeology (2010b) for the proposed development of the Oxford University Chemistry CLR2 site, which lies approximately 100m to the south-west of Area 1.

1.4.2 Differences in grass growth caused by the drought during the summer of 1976 revealed evidence for widespread archaeological features within the University Parks. These included several ring ditches attributed to Bronze Age funerary monuments and prehistoric and Romano-British field boundaries and enclosures. These have been verified by the geophysical survey carried out by Archaeological Surveys (2010) to the north and north west.

1.4.3 Within the vicinity there has been a great deal of archaeological investigation

during and prior to development of the university buildings. The work has provided evidence for prehistoric ritual and funerary monuments to the south of the site, and evidence for later prehistoric activity and Romano-British settlement. Recent excavations immediately west of Area 1 identified Iron Age and Romano-British linear features.

1.5 Geology and soils

1.5.1 The underlying geology is mudstone from the Oxford Clay Formation and the Walton Formation, with overlying river terrace deposits of Northmoor sands and gravels (BGS, 2010).

1.5.2 Although the overlying soils across the site are unmapped due to their urban location, it is likely that, given the parent material, they are from the Wickham 2 association which are typical stagnogley soils. These consist of slowly permeable, seasonally water logged, fine loamy over clayey soils formed upon drift overlying Jurassic clay or mudstone (Soil Survey of England and Wales, 1983).

2 METHODOLOGY

2.1 Technical synopsis

2.1.1 Magnetometry survey records localised magnetic fields that can be associated with features formed by human activity. Magnetic susceptibility and magnetic thermoremnance are factors associated with the formation of localised fields. Additional details are set out below and within Appendix A.

2.1.2 Iron minerals within the soil may become altered by burning and the break down of biological material; effectively the magnetic susceptibility of the soil is increased, and the iron minerals become magnetic in the presence of the Earth's magnetic field. Accumulations of magnetically enhanced soils within features, such as pits and ditches, may produce magnetic anomalies that can be mapped by magnetic prospection.

2.1.3 Magnetic thermoremnance can occur when ferrous minerals have been heated to high temperatures such as in a kiln, hearth, oven etc. On cooling, a permanent magnetisation may be acquired due to the presence of the Earth's magnetic field. Certain natural processes associated with the formation of some igneous and metamorphic rock may also result in magnetic thermoremnance.

2.1.4 The localised variations in magnetism are measured as sub-units of the Tesla, which is a SI unit of magnetic flux density. These sub-units are nano Teslas (nT), which are equivalent to 10^{-9} Tesla (T).

2.2 Equipment configuration, data collection and survey detail

2.2.1 The detailed magnetic survey was carried out using Bartington Grad601-2 gradiometers. The instruments effectively measure a magnetic gradient between two fluxgate sensors mounted vertically 1m apart. Two sets of sensors are mounted on a single frame 1m apart horizontally.

2.2.2 The instruments are extremely sensitive and are able to measure magnetic variation to 0.01nanoTesla (nT), with an effective resolution of 0.03nT. The data are limited to ±100nT when surveying with the highest sensitivity. All readings are saved to an integral data logger for analysis and presentation.

2.2.3 The instruments are operated according to the manufacturer's instructions with consideration given to the local conditions. An adjustment procedure is required, prior to collection of data, in order to balance the sensors and remove the effects of the Earth's magnetic field; further adjustment is required during the survey due to instrument drift often associated with temperature change.

2.2.4 It can be very difficult to obtain optimum balance for the sensors due to localised magnetic vectors that may be associated with large ferrous objects, geological/pedological features, 'magnetic debris' within the topsoil and natural temperature fluctuations. Imperfect balance results in a heading error often visible as striping within the data; this can be effectively removed by software processing and generally has little effect on the data unless extreme.

2.2.5 The Bartington gradiometers undergo regular servicing and calibration by the manufacturer. A current assessment of the instruments is shown in Table 1 below.

Sensor type and serial numbers	Bartington Grad - 01 – 1000 Nos. 084, 085, 242 and 396
Date of calibration/service	August 2010 (084 and 085) January 2010 (242 and 396)
Bandwidth	12Hz (100nT range) both sensors
Noise	<100pT peak to peak
Adjustable errors	<2nT

Table 1: Bartington fluxgate gradiometer sensor calibration results

The instruments were considered to be in good working order prior to the survey, with no known faults or defects.

2.2.6 Data were collected at 0.25m centres along traverses 1m apart. The survey area was separated into 30m by 30m grids (900m²) giving 3600 recorded measurements per grid. This sampling interval is very effective at locating archaeological features and is the recommended methodology for archaeological prospection (English Heritage, 2008).

2.2.7 The survey grids were set out to the Ordnance Survey OSGB36 datum using

a Penmap RTK GPS. The GPS is used in conjunction with Topcon's TopNet service, where positional corrections are sent via a mobile telephone link. Positional accuracy of around 10 – 20mm is possible using the system. The instrument is regularly checked against the ETRS89 reference framework using Ordnance Survey ground marker C1ST7784 (Horton).

2.3 Data processing and presentation

2.3.1 Magnetometry data downloaded from the Grad 601-2 data logger are analysed and processed in specialist software known as ArcheoSurveyor. The software allows greyscale and trace plots to be produced for presentation and display. Survey grids are assembled to form an overall composite of data (composite file) creating a dataset of the complete survey area. Appendix C contains specific information concerning the survey and data attributes and is derived directly from ArcheoSurveyor; this should be used in conjunction with information provided by Figure 02.

2.3.2 Only minimal processing is carried out in order to enhance the results of the survey for display. Raw data are always analysed, as processing can modify anomalies. The following schedule sets out the data and image processing used in this survey:

- clipping of the raw data at ±30nT to improve greyscale resolution,
- clipping of processed data at ±5nT to enhance low magnitude anomalies,
- zero median/mean traverse is applied in order to balance readings along each traverse.

Reference should be made to Appendix B for further information on the specific processes carried out on the data. Appendix C metadata includes details on the processing sequence used for each survey area.

2.3.3 An abstraction and interpretation is offered for all geophysical anomalies located by the survey. A brief summary of each anomaly, with an appropriate reference number, is set out in list form within the results (Section 3) to allow a rapid and objective assessment of features within each survey area.

2.3.4 The main form of data display used in this report is the greyscale plot. Both 'raw' and 'processed' data have been shown followed by an abstraction and interpretation plot. Anomalies are abstracted using colour coded points, lines and polygons. All plots are scaled to landscape A3 for paper printing.

2.3.5 Graphic raster images in bitmap format (.BMP) are initially prepared in ArcheoSurveyor. Regardless of survey orientation, data captured along each traverse are displayed and processed by ArcheoSurveyor from left to right; this corresponds to a direction of south to north in the field. Prior to displaying against base mapping, raster graphics require a rotation of 294.7° anticlockwise for Area 1 and 28.2° anticlockwise fo r Area 2 to restore north to the top of the image. Greyscale images are rotated by AutoCAD.

2.3.6 The raster images are combined with base mapping using ProgeCAD Professional 2009 and AutoCAD LT 2007, creating DWG file formats. All images are externally referenced to the CAD drawing in order to maintain good graphical quality. Quality can be compromised by rotation of graphics in order to allow the data to be orientated with respect to grid north; this is considered acceptable as the survey results are effectively georeferenced allowing relocation of features using GPS, resection method etc.. A digital archive, including raster images, is produced with this report allowing separate analysis if necessary, see Appendix D below.

3 RESULTS

3.1 General overview

3.1.1 The detailed magnetic survey was carried out over 1.4ha within Areas 1 and 2. Geophysical anomalies located can be generally classified as positive anomalies of an uncertain origin, anomalies relating to land management, areas of magnetic disturbance, strong discrete dipolar anomalies relating to ferrous objects and strong multiple dipolar linear anomalies relating to buried services or pipelines. Anomalies located within the survey areas have been numbered and are described below.

3.1.2 Data are considered to provide an accurate representation of magnetic anomalies within the site. A number of issues may have influenced the quality of the data, although these were considered during the survey and have been controlled as far as possible. They are unlikely to have caused serious degradation.

3.1.3 One of the main factors influencing data quality was the high level of magnetic disturbance relating to modern services, large buildings surrounding the site and subsurface features/debris. The instrument set-up and adjustment procedure requires the location of areas clear of such magnetic 'noise' and this was found almost impossible to achieve. The resultant magnetic heading errors are considered minor, unlikely to have degraded the magnetic contrast associated with subsurface features and have been effectively removed during data processing. The high magnitude of magnetic disturbance, caused by steel objects and underground services, has produced highly disturbed zones that may obscure anomalies of archaeological potential in their immediate vicinity.

3.1.4 The list of sub-headings below attempts to define a number of separate categories that reflect the range and type of features located during the survey. A basic explanation of the characteristics of the magnetic anomalies is set out for each category in order to justify interpretation, a basic key is indicated to allow cross referencing to the abstraction and interpretation plot. CAD layer names are included to aid reference to associated digital files

(.dwg/.dxf). Sub-headings are then used to group anomalies with similar characteristics for each survey area.

Report sub-heading CAD layer names and plot colour	Description and origin of anomalies
Anomalies with an uncertain origin AS-ABST MAG POS LINEAR UNCERTAIN AS-ABST MAG POS DISCRETE UNCERTAIN AS-ABST MAG POS AREA UNCERTAIN 	The category applies to a range of anomalies where there is not enough evidence to confidently suggest an origin. Anomalies in this category may well be related to archaeologically significant features, but equally relatively modern features, geological/pedological features and agricultural features should be considered. Positive anomalies are indicative of magnetically enhanced soils that may form the fill of 'cut' features or may be produced by accumulation within layers or 'earthwork' features; soils subject to burning may also produce positive anomalies. Negative anomalies are produced by material of comparatively low magnetic susceptibility such as stone and subsoil.
Anomalies relating to land management AS-ABST MAG LAND DRAIN 	Anomalies have a characteristic linear or “herringbone” pattern. They often show as weak dipolar linear anomalies indicating ceramic land drains.
Anomalies associated with magnetic debris AS-ABST MAG STRONG DIPOLAR 	Strong discrete dipolar anomalies are responses to ferrous objects within the topsoil.
Anomalies with a modern origin AS-ABST MAG DISTURBANCE AS-ABST MAG SERVICE 	The magnetic response is often strong and dipolar indicative of ferrous material and may be associated with extant above surface features such as wire fencing, cables, pylons etc.. Often a significant area around such features has a strong magnetic flux which may create magnetic disturbance; such disturbance can effectively obscure low magnitude anomalies if they are present. Fluxgate sensors may respond erratically and with hysteresis adjacent to strong magnetic sources. Buried services may produce characteristic multiple dipolar anomalies dependant upon their construction.

Table 2: List and description of interpretation categories

3.2 List of anomalies - Area 1

Area centred on OS NGR 451647, 207162

Anomalies with an uncertain origin

(1) – Several weak positive linear anomalies appear to form a possible rectilinear feature.

(2) – Two positive linear anomalies appear to join towards the northern edge of the survey area. They also appear to be next to or joined by a weak curvilinear anomaly.

(3) – Three weak linear anomalies, close to, and roughly parallel with the eastern boundary.

(4) – A number of discrete positive anomalies may indicate pit-like features;

however, it is not possible to determine if they relate to magnetically enhanced material within cut features, natural features or to ground disturbance.

(5) – A series of weakly enhanced broadly linear anomalies located within the eastern half of the survey area are of uncertain origin.

Anomalies associated with magnetic debris

(6) – Strong discrete dipolar anomalies are a response to ferrous objects within the topsoil.

Anomalies with a modern origin

(7 & 8) – Strong, multiple dipolar linear anomalies relate to buried services.

3.3 List of anomalies - Area 2

Area centred on OS NGR 451814, 207115

Anomalies with an uncertain origin

(9) – A possible curvilinear anomaly located close to the south eastern corner of the survey area.

(10) – Weak, positive linear anomalies located close to the north eastern corner of the survey area.

(11) – Weakly positive linear anomalies oriented parallel with the long axis of the survey area are uncertain in origin.

Anomalies associated with land management

(12) – Linear anomalies that have been caused by land drains.

Anomalies associated with magnetic debris

(13) – Strong discrete dipolar anomalies are a response to ferrous objects within the topsoil.

Anomalies with a modern origin

(14) – Magnetic disturbance from ferrous material within goal posts.

(15) – A strong, multiple dipolar linear anomaly relates to a buried service.

4 CONCLUSION

4.1.1 A number of positive linear and discrete anomalies were located within Area 1 to the north of the observatory. Although many of the anomalies may appear ditch-like and pit-like, their archaeological potential cannot be determined. A series of low magnitude broadly linear anomalies may relate to former agricultural activity, although they could be of natural origin.

4.1.2 The geophysical survey in Area 2, to the east of the Science Area, located a number of weak positive linear anomalies and a possible curvilinear anomaly; however, it has not been possible to confidently determine their origin. A series of land drains probably relates to drainage of the sports pitch.

5 REFERENCES

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Appendix A – basic principles of magnetic survey

Iron minerals are always present to some degree within the topsoil and enhancement associated with human activity is related to increases in the level of magnetic susceptibility and thermoremnant material.

Magnetic susceptibility is an induced magnetism within a material when it is in the presence of a magnetic field. This can be thought of as effectively permanent due to the presence of the Earth's magnetic field.

Thermoremnant magnetism occurs when ferrous material is heated beyond a specific temperature known as the Curie Point. Demagnetisation occurs at this temperature with re-magnetisation by the Earth's magnetic field upon cooling.

Enhancement of magnetic susceptibility can occur in areas subject to burning and complex fermentation processes on biological material; these are frequently associated with human settlement. Thermoremnant features include ovens, hearths, and kilns. In addition thermoremnant material such as tile and brick may also be associated with human activity and settlement.

Silting and deliberate infilling of ditches and pits with magnetically enhanced soil can create an area of enhancement compared with surrounding soils and subsoils into which the feature is cut. Mapping enhanced areas will produce linear and discrete anomalies allowing an assessment and characterisation of hidden subsurface features.

It should be noted that areas of negative enhancement can be produced from material having lower magnetic properties compared to the topsoil. This is common for many sedimentary bedrocks and subsoils which were often used in the construction of banks and walls etc. Mapping these 'negative' anomalies may also reveal archaeological features.

Magnetic survey or magnetometry can be carried out using a fluxgate gradiometer and may be referred to as gradiometry. The gradiometer is a passive instrument consisting of two fluxgate sensors mounted vertically 1m apart. The instrument is carried about 30cm above the ground surface and the upper sensor measures the Earth's magnetic field as does the lower sensor but this is influenced to a greater degree by any localised buried field. The difference between the two sensors will relate to the strength the magnetic field created by the buried feature. If no enhanced feature is present the field measured by both sensors will be similar and the difference close to zero.

There are a number of factors that may affect the magnetic survey and these include soil type, local geology and previous human activity. Situations arise where magnetic disturbance associated with modern services, metal fencing, dumped waste material etc., obscures low magnitude fields associated with archaeological features.

Appendix B – data processing notes

Clipping

Minimum and maximum values are set and replace data outside of the range with those values. Extreme values are removed improving colour or greyscale contrast associated with data values that may be archaeologically significant. It has been found that clipping data to ranges between ±5nT and ±1nT often improves the appearance of features associated with archaeology. Different ranges are applied to data in order to determine the most suitable for anomaly abstraction and display.

Zero Median/Mean Traverse

The median (or mean) of each traverse is calculated ignoring data outside a threshold value, the median (or mean) is then subtracted from the traverse. The process is used to equalise slight differences between the set-up and stability of gradiometer sensors and can remove striping. The process can remove archaeological features that run along a traverse so data analysis is also carried out prior its application.

De-stagger

Compensates for small positional errors within data collection by shifting the position of the readings along each traverse by a specified amount. Data lost at the end of each traverse are extrapolated from adjacent value in the same row.

Deslope

Corrects for striping and distortion caused by metal objects/services etc.. The process calculates a curve based on a polynomial best fit mathematical function for each traverse. This curve is then subtracted from the actual data.

FFT (Fast Fourier Transform) spectral filtering

A mathematical process used to determine the frequency components of a traverse. Repetitive features, such as plough marks, produce characteristic spectral zones that can be suppressed allowing greyscale images to appear clearer.

Appendix C – survey and data information

Area 1 raw data

COMPOSITE
Filename: J340-mag-Area1-raw.xcp
Instrument Type: Bartington (Gradiometer)
Units: nT
Surveyed by: on 05/11/2010
Assembled by: on 05/11/2010
Direction of 1st Traverse: 0 deg
Collection Method: ZigZag
Sensors: 2 @ 1.00 m spacing.
Dummy Value: 32702

Dimensions
Composite Size (readings): 480 x 120
Survey Size (meters): 120 m x 120 m
Grid Size: 30 m x 30 m
X Interval: 0.25 m
Y Interval: 1 m

Stats
Max: 30.00
Min: -30.00
Std Dev: 9.27
Mean: 0.26
Median: 1.34
Composite Area: 1.44 ha
Surveyed Area: 0.80625 ha

Processes: 2
1 Base Layer
2 Clip from -30.00 to 30.00 nT

Source Grids: 12
1 Col:0 Row:0 grids\01.xgd
2 Col:0 Row:1 grids\02.xgd
3 Col:0 Row:2 grids\03.xgd
4 Col:0 Row:3 grids\04.xgd
5 Col:1 Row:0 grids\05.xgd
6 Col:1 Row:1 grids\07.xgd
7 Col:1 Row:2 grids\08.xgd
8 Col:1 Row:3 grids\09.xgd
9 Col:2 Row:0 grids\10.xgd
10 Col:2 Row:1 grids\11.xgd
11 Col:2 Row:2 grids\12.xgd
12 Col:3 Row:0 grids\13.xgd

Area 1 processed data

COMPOSITE
Filename: J340-mag-Area1-proc.xcp

Processes: 5
1 Base Layer
2 Clip from -30.00 to 30.00 nT
3 DeStripe Mean Traverse: Grids: 01.xgd 02.xgd 03.xgd 04.xgd 05.xgd 07.xgd 08.xgd 09.xgd Threshold: 2 SDs
4 DeStripe Median Sensors: 10.xgd 11.xgd 12.xgd 13.xgd
5 Clip from -5.00 to 5.00 nT

Area 2 raw data

COMPOSITE
Filename: J340-mag-Area2-raw.xcp
Instrument Type: Bartington (Gradiometer)
Units: nT
Surveyed by: on 04/11/2010
Assembled by: on 04/11/2010
Direction of 1st Traverse: 0 deg
Collection Method: ZigZag
Sensors: 2 @ 1.00 m spacing.
Dummy Value: 32702

Dimensions
Composite Size (readings): 240 x 120
Survey Size (meters): 60 m x 120 m
Grid Size: 30 m x 30 m
X Interval: 0.25 m
Y Interval: 1 m

Stats
Max: 30.00
Min: -30.00
Std Dev: 5.04
Mean: 1.77
Median: 0.90
Composite Area: 0.72 ha
Surveyed Area: 0.62945 ha

Processes: 2
1 Base Layer
2 Clip from -30.00 to 30.00 nT

Source Grids: 8
1 Col:0 Row:0 grids\05.xgd
2 Col:0 Row:1 grids\06.xgd
3 Col:0 Row:2 grids\07.xgd
4 Col:0 Row:3 grids\08.xgd
5 Col:1 Row:0 grids\01.xgd
6 Col:1 Row:1 grids\02.xgd
7 Col:1 Row:2 grids\03.xgd
8 Col:1 Row:3 grids\04.xgd

Area 2 processed data

COMPOSITE
Filename: J340-mag-Area2-proc.xcp

Processes: 11
1 Base Layer
2 Clip from -30.00 to 30.00 nT
3 DeStripe Mean Traverse: Grids: 01.xgd 02.xgd 03.xgd 04.xgd Threshold: 1 SDs
4 Search & Replace From: -100 To: 100 With: Dummy (Area: Top 0, Left 0, Bottom 54, Right 21)
5 Search & Replace From: -100 To: 100 With: Dummy (Area: Top 36, Left 15, Bottom 77, Right 34)
6 Search & Replace From: -100 To: 100 With: Dummy (Area: Top 76, Left 25, Bottom 112, Right 52)
7 Search & Replace From: -100 To: 100 With: Dummy (Area: Top 103, Left 45, Bottom 117, Right 66)
8 Search & Replace From: -100 To: 100 With: Dummy (Area: Top 2, Left 100, Bottom 12, Right 142)
9 DeStripe Mean Traverse: Grids: 05.xgd 06.xgd 07.xgd 08.xgd Threshold: 1 SDs
10 Edge Match (Area: Top 0, Left 16, Bottom 119, Right 120) to Right edge
11 Clip from -5.00 to 5.00 nT

Appendix D – digital archive

Archaeological Surveys Ltd hold the primary digital archive at Castle Combe, Wiltshire (see inside cover for address). Data are backed-up onto an on-site data storage drive and at the earliest opportunity data are copied to CD ROM for storage on-site and off-site. Digital data are also supplied to the client on CD ROM, see below.

Surveys are reported on in hardcopy (recycled paper) using A4 for text and A3 for plots (all plots are scaled for A3). The distribution of both hardcopy report and digital data is considered the responsibility of the Client unless explicitly stated in the survey Brief, Written Scheme of Investigation or other contractual agreement.

This report has been prepared using the following software on a Windows XP platform:

- ArcheoSurveyor version 2.5.7.11 (geophysical data analysis),
- ProgeCAD Professional 2009 (report graphics),
- AutoCAD LT 2007 (report figures),
- OpenOffice.org 3.0.1 Writer (document text),
- PDF Creator version 0.9 (PDF archive).

Digital data are supplied on CD ROM which includes the following files:

- ArcheoSurveyor grid and composite files for all geophysical data,
- CSV files for raw and processed composites,
- geophysical composite file graphics as Bitmap images,
- AutoCAD DWG files in 2000 and 2007 versions,
- report text as OpenOffice.org ODT file,
- report text as Word 2000 doc file,
- report text as rich text format (RTF),
- report text as PDF,
- PDFs of all figures,
- photographic record in JPEG format.

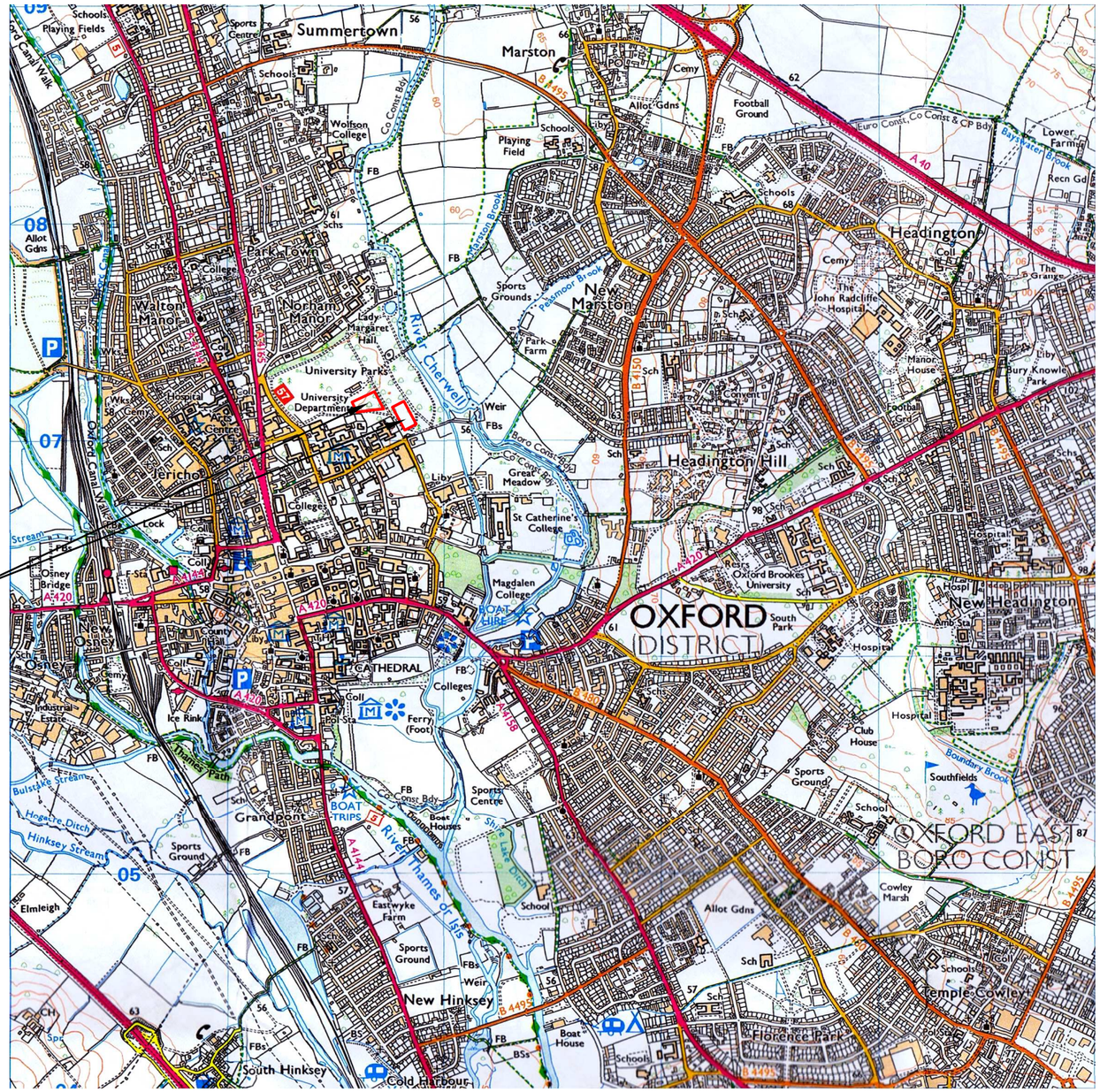
The CD ROM structure is formed from a tree of directories under the title J340 Oxford CLR2 – CD. Directory titles include Data, Documentation, CAD, PDFs and Photos. Multiple directories exist under Data and hold Grid, Composite and Graphic files with CSV composite data held in Export.

The CAD file contains externally referenced graphics that are rotated with separate A3 size layouts for each figure. Layouts are fixed using frozen layers and named views allowing straightforward plotting or analysis on screen. (Note – CAD files are prepared using AutoCAD's e Transmit function to produce a directory containing the digital drawing along with any externally referenced graphics which may need reloading).

Archaeological Surveys Ltd

Geophysical Survey
Oxford University
Chemistry CLR2
Ground Source Heating Project

Map of survey area



● Survey location

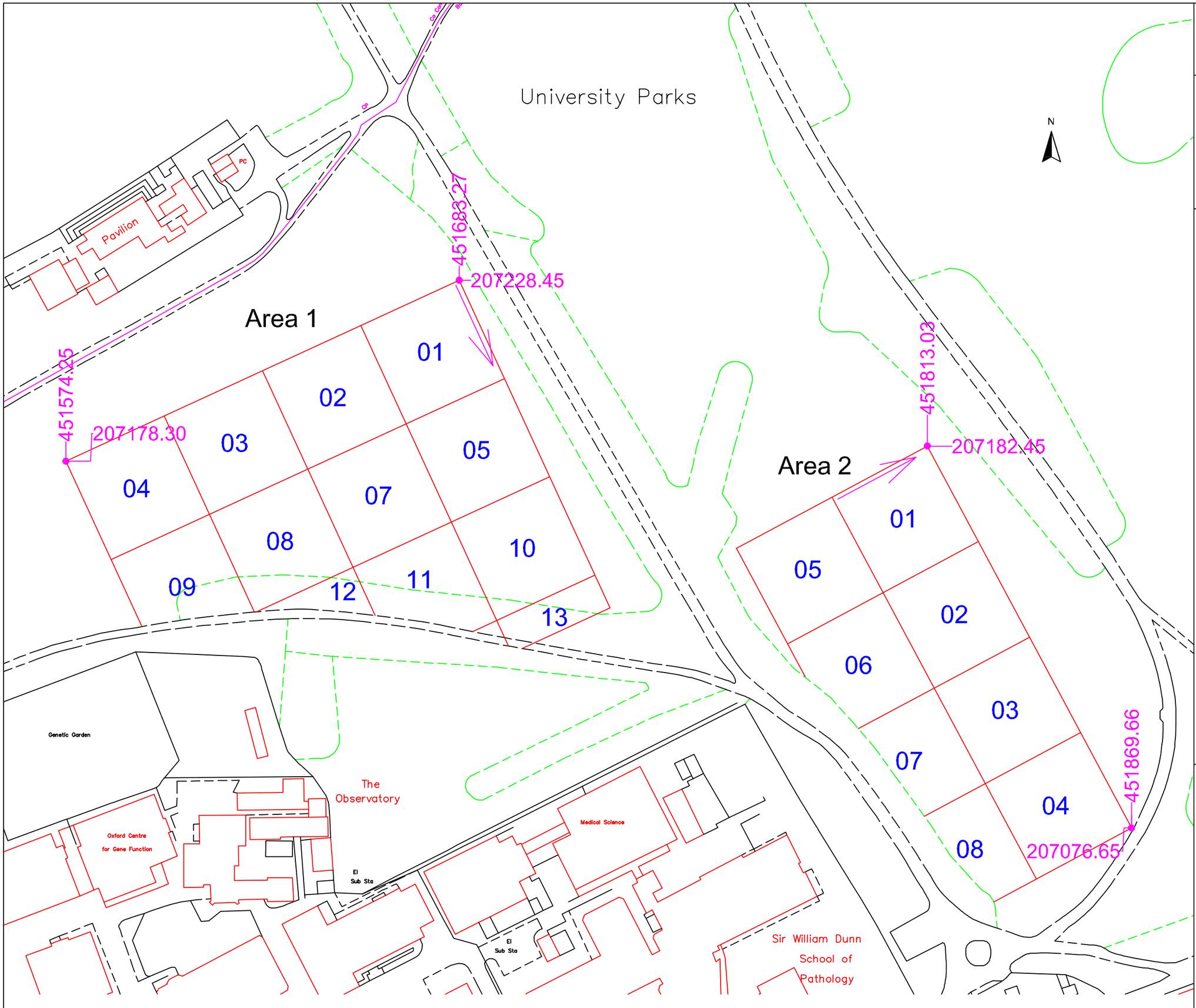
Site centred on OS NGR
SP 517 071

SCALE 1:25 000

0m 500m 1000m

SCALE TRUE AT A3

FIG 01



Archaeological Surveys Ltd

Geophysical Survey
Oxford University
Chemistry CLR2
Ground Source Heating Project

Referencing information

Grid coordinates based on Ordnance Survey OSGB36 datum

Grids set out using RTK GPS with Topcon TopNet correction data RTCMv2 format OSTN02 transformation

Survey grid size = 30m

Survey start and traverse direction

01 Grid reference number and filename

SCALE 1:1000

0m 10 20 30 40 50m

SCALE TRUE AT A3

FIG 02

University Parks

Pavilion

PC

Area 1

Area 2

N

Genetic Garden

The Observatory

Oxford Centre for Gene Function

El Sub Sta

El Sub Sta

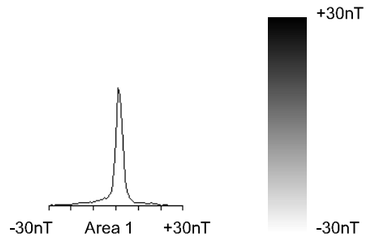
Medical Science

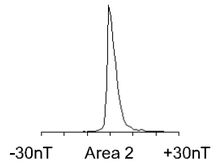
Sir William Dunn School of Pathology

Archaeological Surveys Ltd

Geophysical Survey
Oxford University
Chemistry CLR2
Ground Source Heating Project

Greyscale plot of raw magnetometer data





SCALE 1:1000

0m 10 20 30 40 50m

SCALE TRUE AT A3

FIG 03

Archaeological Surveys Ltd

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Chemistry CLR2
Ground Source Heating Project

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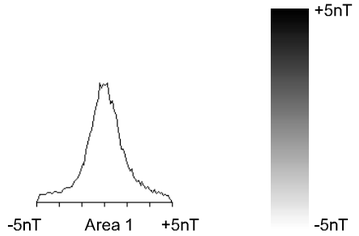
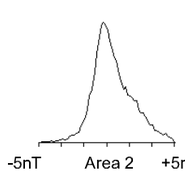
Greyscale plot of processed magnetometer data





SCALE 1:1000

0m 10 20 30 40 50m

SCALE TRUE AT A3

FIG 04

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Abstraction and interpretation of magnetometer anomalies

University Parks

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Positive linear anomaly - possible ditch-like feature

Positive anomaly anomaly - of uncertain origin

Discrete positive response - possible pit-like feature

Linear anomaly - land drain

Magnetic disturbance from ferrous material

Strong multiple dipolar linear anomaly - pipeline / cable / service

Strong dipolar anomaly - ferrous object

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SCALE 1:1000

0m 10 20 30 40 50m

SCALE TRUE AT A3

FIG 05