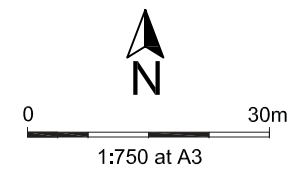
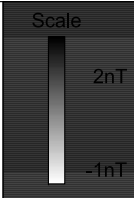




Minimally processed Gradiometer survey results - Greyscale plot

Figure
3



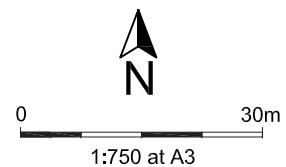
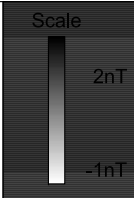
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Project No: 51808		
Drawing Title: Figure 3		
Minimally processed Gradiometer survey results		
V1/51808/GEO/F3/28.09.17		
Drawn by: KT	Checked by: JL	Approved by: JL
28/09/2017	28/09/2017	28/09/2017





Processed Gradiometer survey results - Greyscale plot

Figure 4



Project Title: Dover Road, Deal, Kent		
Project No: 51808		
Drawing Title: Figure 4		
Processed Gradiometer survey results		
V1/51808/GEO/F4/28.09.17		
Drawn by: KT	Checked by: JL	Approved by: JL
28/09/2017	28/09/2017	28/09/2017

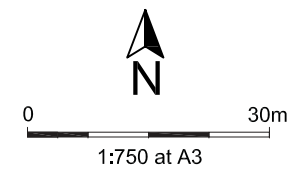




Interpretation of Gradiometer survey results

Figure
5

- | | |
|---|--|
|  Discrete Trend (Archaeology?) |  Area of Disturbance (Modern) |
|  Discrete Pit (Archaeology?) |  Ferrous / Iron Spikes |



Project Title: Dover Road, Deal, Kent		
Project No: 51808		
Drawing Title: Figure 5		
Interpretation of Gradiometer survey results		
V1/51808/GEO/F5/29.09.17		
Drawn by: KT	Checked by: JL	Approved by: JL
29/09/2017	29/09/2017	29/09/2017



Appendix 1: Characterisation of Identified Anomalies

Gradiometer survey

Site Specific Anomaly Code: **D**

Anomaly	Type of Archaeology
D1	Discrete linear trend
D2	Discrete curvilinear trend
D3	Discrete linear trend
D4	Discrete pit like anomalies
D5	Disturbed area (modern)

Appendix 2: Survey Metadata

Field	Description
Surveying Company	AOC Archaeology
Data collection staff	Alistair Galt, Dan Shiel
Client	WYG
Site name	Dover Road, Deal
County	Kent
NGR	TR 36701 49603
Land use/ field condition	Paddocks
Duration	21/09/2017
Weather	Overcast/Sunny
Survey type	Gradiometer Survey
Instrumentation	Trimble GXOR system Bartington Grad 601-2
Area covered	Approx 0.7ha (20 full or partial)
Download software	Grad601 PC Software v313
Processing software	Geoplot v3.0 / v4.0
Visualisation software	AutoCAD LT 2009
Geology	The bedrock recorded geology within the survey area consists of the sedimentary Seaford Chalk Formation (BGS 2017).
Soils	Clay and silt head (Soilscapes 2017).
Scheduled Ancient Monument	No
Known archaeology on site	None
Historical documentation/ mapping on site	None
Report title	Dover Road, Deal, Kent
Project number	51808
Report Author	James Lawton and Kimberley Teale
Report approved by	Graeme Cavers

Appendix 3: Archaeological Prospection Techniques, Instrumentation and Software Utilised

Gradiometer survey

Gradiometer surveys measure small changes in the earth's magnetic field. Archaeological materials and activity can be detected by identifying changes to the magnetic values caused by the presence of weakly magnetised iron oxides in the soil (Aspinall *et al.*, 2008, 23; Sharma, 1997, 105). Human habitation often causes alterations to the magnetic properties of the ground (Aspinall *et al.*, 2008, 21). There are two physical transformations that produce a significant contrast between the magnetic properties of archaeological features and the surrounding soil: the enhancement of magnetic susceptibility and thermoremanent magnetization (Aspinall *et al.*, 2008, 21; Heron and Gaffney 1987, 72).

Ditches and pits can be easily detected through gradiometer survey as the top soil is generally suggested to have a greater magnetisation than the subsoil caused by human habitation. Also areas of burning or materials which have been subjected to heat commonly have high magnetic signatures, examples include: hearths, kilns, fired clay and mudbricks (Clark 1996, 65; Lowe and Fogel 2010, 24). It should be noted that negative anomalies can also be useful for characterising archaeological features. If the buried remains are composed of a material with a lower magnetisation compared with the surrounding soil, the surrounding soil will consequently have a greater magnetisation resulting in the feature displaying a negative signature. For example stone materials of a structural nature that are composed of sedimentary rocks are considered non-magnetic and so will appear a negative features within the data set.

Ferrous objects- i.e. iron and its alloys- are strongly magnetic and are typically detected as high-value peaks in gradiometer survey data, though it is not usually possible to determine whether these relate to archaeological or modern objects.

Although gradiometer surveys have been successfully carried out in all areas of the United Kingdom, the effectiveness of the technique is lessened in areas with complex geology, particularly where igneous and metamorphic bedrock is present. All magnetic geophysical surveys must therefore take the effects of background geological and geomorphological conditions into account.

Gradiometer survey instrumentation

AOC Archaeology's gradiometer surveys are carried out using Bartington Grad601-2 magnetic gradiometers. The Grad601-2 is a high-stability fluxgate magnetic gradient sensor, which uses a 1m sensor separation. The detection resolution is from 0.03 nT/m to 0.1nT/m, depending on the sensor parameters selected, making the Grad601-2 an ideal instrument for prospective survey of large areas as well as detailed surveys of known archaeology. The instrument stores the data collected on an on-board data-logger, which is then downloaded as a series of survey grids for processing.

Gradiometer survey software

Following the survey, gradiometer data is downloaded from the instrument using Grad601 PC Software v313. Survey grids are then assembled into composites and enhanced using a range of processing techniques using Geoscan Geoplot v3.0 / v4.0 (see Appendix 4 for a summary of the processes used in Geoplot and Appendix 5 for a list of processes used to create final data plots).

Appendix 4: Summary of Processes used in Geoplot

Process	Effect
Clip	Limits data values to within a specified range
De-spike	Removes exceptionally high readings in the data that can obscure the visibility of archaeological features. In resistivity survey, these can be caused by poor contact of the mobile probes with the ground. In gradiometer survey, these can be caused by highly magnetic items such as buried ferrous objects.
De-stagger	Corrects a misalignment of data when the survey is conducted in a zig-zag traverse pattern.
Edge Match	Counteracts edge effects in grid composites by subtracting the difference between mean values in the two lines either side of the grid edge.
High pass filter	Removes low-frequency, large scale detail in order to remove background trends in the data, such as variations in geology.
Interpolate	Increases the resolution of a survey by interpolating new values between surveyed data points, creating a smoother overall effect.
Low Pass filter	Uses a Gaussian filter to remove high-frequency, small scale detail, typically for smoothing the data.
Periodic Filter	Used to either remove or reduce the appearance of constant and reoccurring features that distort other anomalies, such as plough lines.
Wallis filter	Applies a locally adaptive contrast enhancement filter.
Zero Mean Grid	Resets the mean value of each grid to zero, in order to counteract grid edge discontinuities in composite assemblies.
Zero Mean Traverse	Resets the mean value of each traverse to zero, in order to address the effect of striping in the data and counteract edge effects.

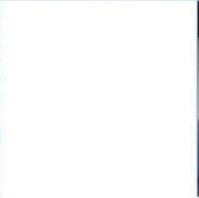
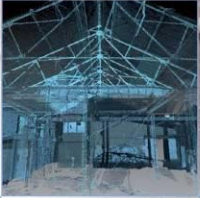
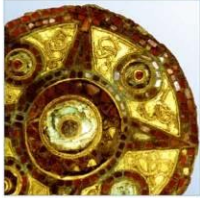
Appendix 5: Survey Processing Steps

Gradiometer survey	
Process	Extent
Zero Mean Traverse	All LMS =on, threshold -5 to 5
Despike	X=1 Y=1 Thr = 3 Repl = Mean
Clip	Min =-5 Max = 5
Destagger	All grids dir Shift = 2 Line Pattern 34-78 Dual-DS
Low Pass filter	X=1 Y=1 Wt=G
Interpolate	Y, Expand – Expand –SinX/X x2
Raw Palette Scale	Grey08 Min= -1nT Max= 2nT
Palette Scale	Grey08 Min= -1nT Max= 2nT

Appendix 6: Technical Terminology

Type of Anomaly	Description
Archaeology	
Archaeology - Trend	<p>These are made up of linear / curvilinear / rectilinear anomalies and are either characterised by an increase or decrease in values compared to the magnetic background.</p> <p>This evidence is normally supported by the presence of archaeological remains and is confirmed by other forms of evidence such as HER records and aerial photography.</p>
Archaeology - Area of Disturbance	<p>This is characterised by a general increase and decrease of magnetic responses over a localised area and does not appear as having a linear form. These anomalies do not have the high dipolar response which are manifested in an 'iron spike' anomaly. This anomaly may be supported by the known location of a former building, or other forms of evidence such as HER records and aerial photography.</p>
Archaeology - Pit	<p>An anomaly composed of an increase in magnetic values with a patterning on the XY trace plot that is suggestive of buried remains, such as the infill of a pit.</p> <p>This evidence is normally supported by the presence of archaeological remains and is confirmed by other forms of evidence such as HER records and aerial photography.</p>
Discrete Archaeology	
Archaeology? – Trend	<p>Anomalies of a linear / curvilinear / rectilinear form either composed of an increased or decreased signal compared to magnetic background values.</p> <p>It is possible these anomalies belong to archaeological remains, but poor patterning or weaker response values makes interpretation difficult.</p> <p>Where historical records are present, the anomalies would appear to be weak or inconclusive.</p>
Archaeology? - Area of Disturbance	<p>Anomalies with an increase or decrease in magnetic values compared with the magnetic background over a localised area. Poor patterning or weak signal changes creates difficulty in defining the origin of the anomaly and so interpretation is only tentative. The anomaly lacks definitive records to confirm its origin as being archaeological.</p> <p>Disturbed areas could indicate the presence of buried rubble relating to fallen structures, or instead denote modern material from either quarrying or agricultural activity. On certain geologies these anomalies could be caused by in-filled natural features.</p>
Archaeology? – Pit	<p>An anomaly composed of an increase in magnetic values with a patterning on the XY trace plot that is suggestive of buried remains, such as the infill of a pit, but is isolated in its location and association with other features.</p>
Unclear Origin	
Linear Trend	<p>Anomalies of a linear / curvilinear form which are composed of a weak or different change in magnetic values. Coupled with poor patterning, the anomaly is difficult to interpret and it is unclear whether it has an archaeological origin.</p>
Area of Disturbance	<p>An area of magnetic disturbance which consists of a variety of increased and decreased magnetic values compared with background readings, but lacks sufficient patterning or context for a conclusive interpretation. It is likely that these readings are caused by modern disturbances, but interpretation is tentative.</p>

<i>Agricultural</i>	
Linear Trend (Old Field Boundary)	These isolated long linear anomalies, most often represented as a negative magnetic trend, are likely to relate to former field boundaries. The magnetic signal may appear inconsistent but when the positioning is cross referenced with historic mapping, it is confirmed as a former field boundary.
Linear Trend (Old Field Boundary?)	These isolated long linear anomalies, most often represented as a negative magnetic trend, are likely to relate to former field boundaries. The positioning is not supported by historic mapping, but is often confirmed with adjacent ploughing patterns.
Linear Trend (Ridge and Furrow / Rig and Furrow)	A series of regular linear anomalies either composed of an increased or decreased magnetic response compared to background values. The width between the anomalies is consistent with that of a Ridge and Furrow ploughing regime, which is normally wider than conventional ploughing methods.
Linear Trend (Conventional ploughing)	A series of regular linear anomalies either composed of an increased or decreased magnetic response compared to background values. The regular patterning is likely to denote the presence of ploughing, however isolated trends can occasionally be observed that follow the orientation of ploughing trends seen elsewhere in the area. Anomalies seen adjacent to field edges are representative of headlands caused by ploughing.
Linear Trend (field drainage)	A series of linear anomalies of an indeterminate date, usually with a regular or herringbone patterning and regular spacing. These are likely to represent agricultural activity such as land drainage.
<i>Non- Archaeology</i>	
Geology / Natural	An area of disturbance that is composed of irregular significant increases or decreases in magnetic values compared with background readings and is likely to indicate natural variations in soil composition or geology.
Linear Trend (possible modern service)	Anomalies of a linear form often composed of contrasting high positive and negative values. Such anomalies usually signify a feature with a high level of magnetisation and are likely to belong to modern activity such as pipe lines or modern services.
Disturbed Area (modern disturbance?)	An area of disturbance that is likely to be caused by modern activity and is characterised by significant increases or decreases in magnetic values compared with background readings.
Isolated Dipolar Anomalies / Ferrous (iron spikes)	A response normally caused by ferrous materials on the ground surface or within the top soil, which causes a 'spike' representing a rapid variation in the magnetic response. These are generally not assessed to be archaeological when surveying on rural sites, and generally represent modern material often re-deposited during manuring.



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