



Rampion Offshore Wind Farm



ES Section 26 – Archaeology & Cultural Heritage - Appendix 25.6 (Part one)

RSK Environment Ltd

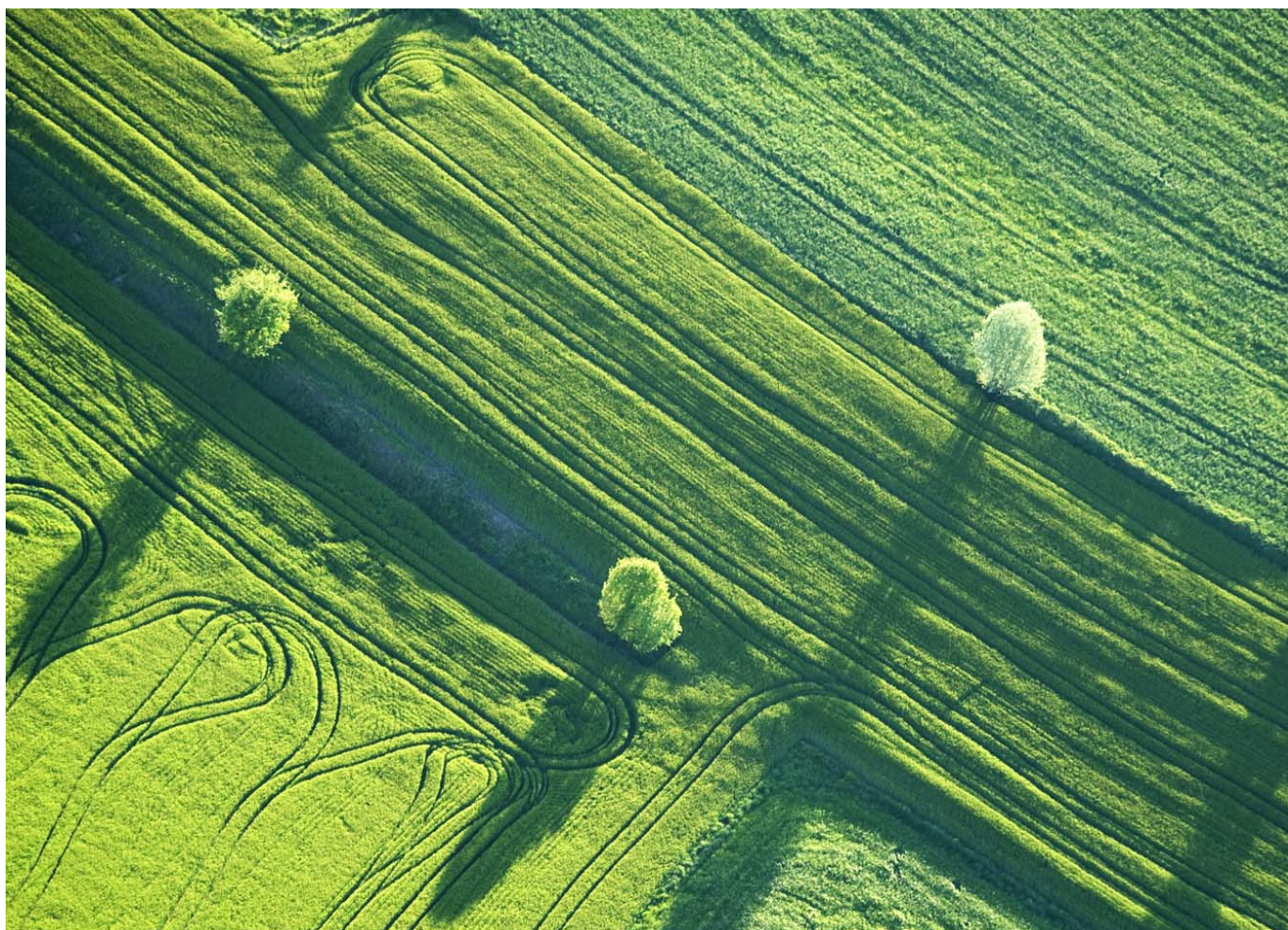
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Where field investigations have been carried out, these have been restricted to a level of detail required to achieve the stated objectives of the work.

This work has been undertaken in accordance with the quality management system of RSK Environment.

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EXECUTIVE SUMMARY

On the instructions of E.ON Climate and Renewables, RSK Environment Limited carried out a geophysical site investigation to seek to determine the possible presence of features of archaeological interest along the proposed cable route and working width for the Rampion Offshore Wind Farm.

Project Findings

Site Setting and Current Usage	The survey area comprises the proposed onshore cable route corridor for the proposed offshore Rampion Offshore Wind Farm development. The proposed Wind Farm is to be located off the South Coast of Sussex. The survey route is approximately 28km in length, starting from the northern outskirts of Worthing in the south, progressing north to the proposed new substation, located east of Wineham, West Sussex.
Survey Objectives	As part of the ongoing feasibility study and ESIA being undertaken by RSK, on behalf of E.ON, a geophysical survey was required in order to further evaluate potential archaeological activity along the proposed route corridor. Initial archaeological field walking and desk study had been undertaken prior to the geophysical survey.
Geophysical Techniques Employed	The geophysical technique employed to locate and identify these features was magnetometry. The field survey was carried out between the 23 rd January and 28 th March 2012.
Geophysical Investigation Findings	Data have been presented on A3 drawings at a scale of 1:2500 in Sheets 1 to 28, with a separate interpretation drawing alongside, so that the data can be easily matched against the interpretations, and to avoid the interpretation lines masking the data. A geophysicist and an archaeologist have interpreted the data, and features have been classed based on the signal character and the geometry of the anomaly.

1 INTRODUCTION

1.1 Introductions

On the instructions of E.ON Climate and Renewables, RSK Environment Limited, carried out a geophysical site investigation to seek to determine the possible presence of features of archaeological interest along the proposed cable route and working width for the Rampion Offshore Wind Farm.

1.2 Details of the Project

The project was carried out to an agreed brief as set out in RSK proposals letter of 19 December 2011, and included the following:

- A magnetometry survey.
- An Interpretative report.

1.3 Limitations

Non-intrusive geophysical techniques seek to locate boundaries across which there is a marked contrast in physical properties. Such a contrast may be detected remotely because it gives rise to a geophysical anomaly, which is indicative of variation in a physical property relative to some background value. Insufficient contrast (including high levels of cultural noise) can result in masking of the sought anomaly. Therefore, there may be other conditions prevailing at the site which have not been revealed by this investigation and which have therefore not been taken into account in this report.

The response of the ground to different physical forces can be highly variable. Interpretation of the responses contained in this report is based on experience in similar environments and site conditions.

The materials encountered and samples obtained during on-site intrusive investigations represent only a small proportion of the materials present on-site. It should be accepted, therefore, that the interpretation from remotely sensed geophysical data might be inconsistent with that arising from direct methods of investigation.

2 THE SITE

2.1 Location and Regional Setting

The survey area comprises the proposed onshore cable route corridor for the proposed offshore Rampion Offshore Wind Farm development. The proposed Wind Farm is to be located off the South Coast of Sussex.

The survey route is approximately 28km in length, starting from the northern outskirts of Worthing in the south, progressing north to the new Bolney substation, located east of Wineham, West Sussex, as shown in **Figure 1**.

The proposed route generally crosses through gently undulating arable farmland and grazing pasture. The route gently rises over the South Downs at Sompting north of Worthing, before heading east and decreasing in elevation towards the Adur valley. The route crosses the Adur north of Shoreham, and steeply rises onto the South Downs behind the former Cement Works off the A283. The route crosses the Downs at Beeding Hill and Tottington Mount, before dropping in elevation on the northside of the escarpment to the arable farmland east of Small Dole. The route continues north towards Woodmancote and then Twineham over gently undulating arable and pasture.

The survey corridor is 65m in width, which encompasses the cable route and potential working width for the installation of the cable.

The route crosses a number of minor and major roads, the River Adur and a number of minor streams/ditches/drains.

2.2 Geology

The published 1:50,000 scale geological map of the area (Sheet 318) indicates that the site is underlain largely by a variety of chalk formations. These are predominantly the Upper and Middle Cretaceous chalk formations, with additional outcrops of Lower Cretaceous chalk and Weald Clay. Generally while chalks are considered to be reasonably good lithologies over which to conduct magnetometry surveys.

3 THE SURVEY

3.1 Objective and Geophysical Approach

It is proposed an offshore wind farm be developed off the South Coast of Sussex. E.ON are currently proposing to construct an offshore and onshore cable route to connect the Wind Farm to the National Grid.

The proposed landfall for the offshore route will be on the beach at Worthing, East Sussex. The onshore route is proposed to run from Worthing to a new substation located near Bolney, west of Twineham. The route will be constructed predominantly by means of open cut, and at critical crossing points by non-open cut techniques.

As part of the ongoing feasibility study and ESIA being undertaken by RSK, on behalf of E.ON, a geophysical survey was required in order to further evaluate potential archaeological activity along the proposed route corridor. Initial archaeological field walking and desk study had been undertaken prior to the geophysical survey. It was agreed that a geophysical survey would be undertaken with West Sussex County Council in a meeting of the 11th November 2011.

The survey area identified for geophysical survey commenced from the northern outskirts of Worthing (Sompting Bypass) to the existing substation at Bolney, east of Twineham.

The survey of the proposed substation has not been included within this report. At the time of survey the location and access to land had not been confirmed.

The geophysical technique employed to locate and identify these features was magnetometry. The field survey was carried out between the 23rd January and 28th March 2012.

3.2 Magnetic Surveying

Magnetic surveying is a passive method based on the measurement of localised perturbations to the Earth's magnetic field caused by the presence of buried ferrous targets (e.g., pipes, cables, drums, military ordnance etc.).

As well as being able to find ferrous objects, the high sensitivity of the instruments allows for their application to archaeological surveying. For example they may measure the contrast between e.g. a stone wall surrounded by earthworks, or a ditch backfilled with a contrasting material to the natural surroundings.

3.2.1 Theory

In the UK, the strength of the Earth's magnetic field is on the order of 48,000 nanoTesla (nT). Geological or man-made features can cause local variations in the Earth's magnetic field, which can also be measured by a magnetometer.

Magnetic surveys can be conducted with a wide range of magnetometers, which can measure the amplitude of the field to within 0.1nT. Gradiometry surveys, which determine the vertical gradient of the magnetic field, are increasingly common in surface environmental/engineering site investigations as they are particularly sensitive (i.e. 0.01nT) to the near surface.

Magnetic surveys may be conducted on the surface or downhole. On the surface, data is collected in a systematic manner across a site and then presented as a contoured map (nT or nT/m) from which inferences may be drawn regarding the nature of the sub surface. The amplitude and shape of an individual anomaly will reflect the dimensions, orientation and magnetic susceptibility of the buried target (**Appendix A**).

3.2.2 Application to Site

The magnetometry technique was selected for this project, firstly as it is one of the few techniques capable of detecting the subtle contrasts that arise as a result of archaeological features. The second reason for its application to this site is that the rate of data collection is moderately high, and the terrain across which the equipment can be used may be particularly rugged or varied.

3.2.3 Equipment

Geometrics G858 Caesium Vapour Magnetometer

The equipment used was the Geometrics Caesium Vapour Magnetometer (see **Appendix A** for equipment specifications). This type of magnetometer determines the magnetic field strength using the energy in transferring atomic electrons from one energy level to another. This type of magnetometer is commonly used for high-resolution surveys as it exhibits a high degree of accuracy (0.01nT) and tolerance of large vertical gradients.

A G880 was used as the base station magnetometer for the duration of the survey.

3.3 Survey Design

The survey corridor was divided into field plots, corresponding with the previous archaeological field walking exercise. Data were collected as discrete sections within field plots, as access allowed. Data were collected in this manner as traversing field boundaries was generally not practicable, and would have resulted in poor data over field boundaries.

The survey was designed so that generally data were collected parallel to the centre line of the cable route. Sensors were mounted on hand held frames, so that each G858 console had two sensors attached, separated at 1m horizontally. Field operatives used extended frames to allow the sensors to be located closer to the ground surface than conventional G858 survey frames.

With pairs of sensors mounted at 1m intervals, the operators were able to traverse the survey corridor at 2m intervals, parallel with the centre line. As such the effective coverage of the corridor was at 1m intervals. The width of the survey corridor was

generally 65m, but this was constrained in some areas by access restrictions from, for example, topography or vegetation. Areas that have not been surveyed have been identified in the survey drawings.

Further to the findings of the desk study and walkover surveys, two areas of particular interest were extended to a larger survey width of 130m. These two areas are located in Beeding Hill and Tottington Mount. In order to undertake works at Tottington Mount details of survey methodology were submitted to, and approved by, English Heritage in order for a Section 42 licence to be granted.

Data were located using differential GPS. Magnetic data were sampled at 1Hz, which at normal walking speed gives a sampling density of approximately 0.2m along line.

3.4 Areas of No Access

Access along the route was generally good. Some individual plots could not be accessed at the time of survey due to livestock in the fields. Others could not be surveyed safely due to the terrain, or were not suitable for survey due to dense vegetation or other access restrictions.

The table below gives a summary of the plots that were not surveyed.

Field	Notes
4/4	Horses in field
4/5	Bull in field / Too steep to survey
4/7	Cattle in field
5/5	Cattle in field (calving cows)
6/4	Too proximal to River Adur to survey
6/5	Too proximal to River Adur to survey
7/1	Edges of survey area too steep to survey safely
9/5	Too steep to survey safely
9/7	Western edge too steep to survey
9/8	Southern edge too steep to survey
9/10	Western edge heavily vegetated
10/7	Horses in northern half of field
11/1-6	No permission from landowners
12/1	Horses in field
12/3	Too overgrown to survey
12/15	Large earthwork in northeast corner of field
12/19	Horses in field
13/1	Horses in field
13/2	Too densely wooded to survey
13/3	Horses in field
13/6	Horses in field
13/7	Horses in field

The number of fields surveyed during the works was approved by Mark Taylor, of WSCC, by email on the 15th March 2012.

3.5 Data Processing and Presentation

The magnetometry data and their interpretation are presented in **Sheets 1 to 28**

The data are displayed in a greyscale contoured format, with the units of measurement for each dataset being displayed on the appropriate figure. The scale for all figures is 1:2500.

The scale of the data is indicated on each respective map, and is generally between -2 and +2 nT.

The processing flow for this project has been specifically designed to remove noise and erroneous signal from the data.

Table 1: Summary of Magnetometry processing methods

<i>Method</i>	<i>Justification</i>
Base correction	Collected data is adjusted relative to a series of base readings. This removes the effects of diurnal variations; i.e. those caused by the sun as well as by natural temporal variations in the earth's magnetic field.
Window clipping	Values significantly above and below the expected normal value were removed to focus the data to a range relevant to archaeological features. (Typically around ± 50 of the mean value). Such extreme values are typically associated with equipment anomalies or near surface metallic features.
High Pass Filtering	This removes any low frequency signals such as those caused by large-scale geology, or changes in terrain. High frequency signals such as those produced by archaeological features remain, and are more clearly visible within the processed data.
Despike and Edge Effect Removal	High amplitude, short wavelength data spikes, most likely caused by recent activity or erroneous data readings were removed from the data set. In addition, edge effects resulting from above ground features such near metallic field boundary fences, gates etc. were removed

<i>Method</i>	<i>Justification</i>
Mean Levelling	To remove subtle heading errors resulting from collecting data in a bi-directional nature, data have been reduced and levelled to the mean to reduce striping effects within the data.

4 DATA INTERPRETATION

4.1 Data Quality

The quality of the data is generally high. There are a small number of fields in the north of the route where data have been effected by magnetic storms and overhead power lines. The effect from both of these outside influences cannot be further removed from processing.

Good quality base station data have allowed the diurnal effects to be successfully removed.

Data striping from heading error during data collection is low, and has generally been removed during the processing stages.

In a number discrete locations subtle data striping is observed close to features that produce high amplitude magnetic anomalies, such as fences, and buried and overhead services. This is an artefact of the high-pass filtering stage of the data processing. Whilst the routine will serve to remove most discrete anomalies the smearing effect has not been completely removed in all cases. However this affect alone does not obscure responses from potential archaeological features.

4.2 Results

Data have been presented on A3 drawings at a scale of 1:2500 in **Sheets 1 to 28**, with a separate interpretation drawing alongside, so that the data can be easily matched against the interpretations whilst avoiding the interpretation lines masking the data.

Qualified and experienced geophysicists have collaborated with RSK's archaeological experts to produce the data interpretation. Features have been classed based on the signal character and the geometry of the anomaly.

These features are subsequently graded on their likelihood of being archaeological features.

- Class A – Probable archaeological feature (Red)
- Class B – Possible archaeological feature (Green)
- Class C – Potential metallic/geological/modern feature on the surface or in the subsurface (Dark Blue)
- Class D – Buried Service (Light Blue)
- Class E – Plough Scars (Brown)

The classification above has been used in the report Figures. The numbers and types of features, (except buried services), are summarised in the tables below. Data are referenced against field numbers, which relate to the field numbers shown in the report Figures.

Field 3/1 is located nearest to Worthing and the shore, Field 14/3 at the site of the substation at Wineham Lane, at the Northern end of the cable route. Plots negative (i.e. south) of RDX 3 were not required for survey.

4.2.1 RDX 3 to RDX 4

Field	Probable archaeological site or feature (Class A)	Possible site or linear (Class B)	Possible discrete features (Class B)	Geological features (Class C)	Surface or subsurface Metal (Class C)	Plough scars (Class E)
3/1	0	2	N	N	Y	N
3/2	1	0	N	N	N	N

Field 3/1

There are two intersecting linear features towards the southern half of the field. They intersect approximately perpendicular to one another, and show some angularity at their centres. They are each in excess of 100m in length. They have been determined to be of possible archaeological origin, though the exact nature of the feature is unknown.

Field 3/2

A broad linear feature runs parallel to the southern field boundary. The feature is probably associated with the interpreted Roman road, (RSK ID3), thought to be present in the proximity of the current field boundary.

4.2.2 RDX 4 to RDX 5

Field	Probable archaeological site or feature (Class A)	Possible site or linear (Class B)	Possible discrete features (Class B)	Geological features (Class C)	Surface or subsurface Metal (Class C)	Plough scars (Class E)
4/1	1	0	N	N	N	N
4/2	1	0	N	N	Y	N
4/3	0	1	N	N	N	N
4/4	N/A	N/A	N/A	N/A	N/A	N/A
4/5	N/A	N/A	N/A	N/A	N/A	N
4/6	3	0	N	N	N	N
4/7	N/A	N/A	N/A	N/A	N/A	N/A
4/8	0	1	N	N	Y	N
4/9	0	0	N	N	N	N

Field 4/1

A linear feature of probable archaeological significance runs in a north-south orientation approximately 55m from the western field boundary. The feature has been associated with a probable Iron Age or Roman field system, (RSK ID36).

Field 4/2

A linear feature with an inflection of approximately 90 degrees is observed 50m from the western field boundary. The linearity and angle, as well as the proximity to the probable Iron Age or Roman field system, (RSK ID36), give cause for it to be considered of probable archaeological interest.

Field 4/3

A single elliptical feature of possible archaeological interest is located near the centre of the survey corridor, approximately 20m south of the northern field boundary. The subtle nature of the anomaly, and lack of known archaeological features within the immediate area, do not allow for identification to the origin of this feature.

Field 4/6

A high amplitude dipolar linear feature most likely caused by a buried metallic service runs across the cable route towards the southern extent of the field. No buried utility is marked on the existing records. To the north of the buried service, in the centre of the field, two parallel anomalous features, of probable archaeological origin, are observed crossing the survey corridor. Another more subtle feature, probably of archaeological origin, runs northwest to southeast in the northern section of the field.

Field 4/8

A high amplitude, linear, dipolar anomaly runs east-west, along the same orientation as the existing adjacent field boundary located to the east of the survey corridor. The response is a strong dipolar anomaly and it is likely that the origin is a buried metallic service.

In the northern part of this field, another elliptical feature of positive response is present, the response from a feature of possible archaeological interest.

4.2.3 RDX 5 to RDX 6

Field	Probable archaeological site or feature (Class A)	Possible site or linear (Class B)	Possible discrete features (Class B)	Geological features (Class C)	Surface or subsurface Metal (Class C)	Plough scars (Class E)
5/1	2	0	N	N	Y	N
5/2	2	3	N	N	Y	N
5/3	0	0	N	N	N	N
5/4	0	0	N	N	Y	N
5/5	N/A	N/A	N/A	N/A	N/A	N/A
5/6	1	0	N	Y	Y	N

Field	Probable archaeological site or feature (Class A)	Possible site or linear (Class B)	Possible discrete features (Class B)	Geological features (Class C)	Surface or subsurface Metal (Class C)	Plough scars (Class E)
5/7	4	0	Y	Y	Y	N
5/8	0	0	Y	N	Y	N
5/9	0	1	N	N	Y	N
5/10	0	4	N	N	Y	N
5/11	0	1	N	N	Y	N

Field 5/1

This plot contains a large circular feature at its southern end. The feature is in the same location as cropmark remains, indicating a possible Romano-British settlement, (RSK ID35). It is 95m in diameter and its southerly extent is at 15m from the southern field boundary. To the northeast, approximately 215m from the southern field boundary, a linear feature probably of archaeological origin, and oriented northwest-southeast, crosses the survey corridor.

Field 5/2

In the southern section of this field there are three anomalies with possible archaeological origin. The first, 50m from the southern field boundary is a short negative anomaly approximately 20m in length. The second anomaly is a negative feature with a slight curvature 225m from the southern field boundary. The most northern feature of possible archaeological interest in this field is 300m from the southern field boundary, and manifests as a curvilinear positive magnetic anomaly that is intersected at an acute angle by another linear feature. The origin of these features is unknown.

A feature of probable archaeological interest, comprising two linear features intersecting one another to form a cross shape, is observed adjacent to the eastern field boundary. The linear features are not continuous but a series of closely spaced dipoles. The feature is identified as being associated with a possible prehistoric trackway or later boundary ditches, (RSK ID32).

Field 5/6

A single feature of probable archaeology is present approximately 280m from the western boundary of this field. It is a narrow linear feature, interpreted as being the remains of a field system, (RSK ID17).

Field 5/7,8

These fields contain a large number of features of archaeological interest, with a number of the anomalies being of probable archaeological origin. The anomalies form two sets of intersecting perpendicular linear features. These features have been identified as being part of the previously mentioned field system, (RSK ID17).

In the centre of field 5/7 and offset to the northeast in plot 5/8, there are a group of 3 discrete features. All three are roughly circular or elliptical and are strong positive

poles. Their close proximity to the linear features described above, and their polar nature suggests they are of possible archaeological origin.

Field 5/9

A large section of the magnetic data collected from this field has been influenced by archaeology activity. There is a distinct boundary, (beginning at approximately 120m from the western edge of the field), between the 'quiet' data to the west of the field and the remainder. The remaining area is comprised of a number of large scale, high amplitude anomalies.

Field 5/10

The area of possible archaeological activity identified in 5/9 continues for 220m into this field. The magnetic signature is relatively quiet towards the eastern end of the field, however one broad, high amplitude anomaly is located approximately 125m west of the eastern field boundary. This anomaly is also enclosed on two sides by a possible rectilinear feature.

Field 5/11

A single linear feature of possible archaeological origin is present towards the western end of this field. It is approximately 65m in length and of unknown origin.

4.2.4 RDX 6 to RDX 7

Field	Probable archaeological site or feature (Class A)	Possible site or linear (Class B)	Possible discrete features (Class B)	Geological features (Class C)	Surface or subsurface Metal (Class C)	Plough scars (Class E)
6/1	0	1	N	N	N	N
6/2	1	0	N	N	N	N
6/3	0	2	N	N	Y	N
6/4	N/A	N/A	N/A	N/A	N/A	N/A
6/5	N/A	N/A	N/A	N/A	N/A	N/A

Field 6/2

The magnetic signature from this field is varied and disturbed in nature suggesting that the area has been a site of previous activity as indicated in the desk study and field walking survey, (Medieval Salt Mounds, RSK ID16).

Field 6/3

This field contains a large area of possible archaeological activity, within which are two main focal points. These are two large dipolar anomalies, one situated adjacent to the western edge of the field, and the other on the northern edge of the survey corridor, east of the centre of the field. These anomalies possibly result from activity associated with former salt workings in this area.

4.2.5 RDX 7 to RDX 8

Field	Probable archaeological site or feature (Class A)	Possible site or linear (Class B)	Possible discrete features (Class B)	Geological features (Class C)	Surface or subsurface Metal (Class C)	Plough scars (Class E)
7/1	0	1	N	N	N	N
7/2	0	0	N	N	Y	N
7/3	2	2	N	N	Y	N

Field 7/1

There is a small rectilinear feature, measuring approximately 12m by 20m, located in the centre of the valley, close to the northern end of the field. From surface disturbance it is obvious that there has been recent activity within this area. As such the response has been inferred to relate to possible foundations.

Field 7/3

This field contains a large number of features of possible and probable archaeological interest. Two features of possible archaeological origin are located at the southern end of the field. Both are narrow linear features, representing possible field boundaries or ditches. The first runs parallel to the current southern field boundary offset at a distance of approximately 45m. The second is perpendicular to the direction of the proposed cable route and intersects the first on the eastern edge of the survey area.

Two features of probable archaeological nature are a clear linear feature that runs northwest southeast across the proposed route, and a positive rectilinear feature enclosed by a negative halo. The linear feature, which intersects the rectilinear feature on the centre of the route, is interpreted as being a possible ditch, (RSK ID84). The other discrete feature is a possible Bronze Age round barrow, (RSK ID85).

4.2.6 RDX 8 to RDX 9

Field	Probable archaeological site or feature (Class A)	Possible site or linear (Class B)	Possible discrete features (Class B)	Geological features (Class C)	Surface or subsurface Metal (Class C)	Plough scars (Class E)
8/1	1	0	N	N	Y	N
8/2	2	2	N	N	Y	N

Field 8/1

A circular feature of approximately 20m diameter is present close to the northern boundary of the field. It has a positive signal, and is of possible archaeological origin.

Field 8/2

A subtle circular anomaly is identified at the southern end of the increased width survey area, 28m from the location of the reservoir. It is interpreted as a possible ring ditch. A clear dipolar anomaly is observed on the western edge of the survey area. This corresponds well with the 'Tumulus' marked on the Ordnance Survey map, (RSK ID69). A second response, of possible archaeological origin is observed to the northeast, on the opposite side of the survey area.

An area of disturbed magnetic response along the northern field boundary may relate to subsurface archaeology, although this disturbance may also relate to more recent ground disturbance associated with the road construction.

A high amplitude linear anomaly, indicative of a buried utility, has been identified crossing the survey area in a east-west orientation. No record of this is provided in the utility drawings and it is inferred that the pipe is associated with the buried reservoir at Beeding Hill.

4.2.7 RDX 9 to RDX 10

Field	Probable archaeological site or feature (Class A)	Possible site or linear (Class B)	Possible discrete features (Class B)	Geological features (Class C)	Surface or subsurface Metal (Class C)	Plough scars (Class E)
9/1	1	2	N	N	Y	N
9/2	1	1	N	N	Y	N
9/3	1	2	N	N	Y	N
9/4	0	4	N	N	Y	N
9/5	N/A	N/A	N/A	N/A	N/A	N/A
9/6	2	0	N	N	N	N
9/7	0	0	N	N	N	N
9/8	0	0	N	N	Y	N
9/9	0	0	N	N	N	N
9/10	0	0	N	N	N	N

Field 9/1

A relatively large amplitude dipolar anomaly is observed south of the slight inflection point in the field. This feature is surrounded by a series of small dipolar anomalies, with regular spacing of approximately 20m, which serve to enclose the southern side of the larger anomaly. This area is of possible archaeological interest.

A relatively large area of disturbed magnetic signal, and of probable archaeological origin, begins 80m south of the northern field boundary, and extends north into field 9/2. The signal is possibly produced by many scattered near surface metallic, or modern, debris from earthworks originating from the Second World War, (RSK ID193).

Field 9/2

The southern half of the field is dominated by the continuation of the probable archaeological feature described above in Field 9/1, (RSK ID193).

A high amplitude linear anomaly, indicative of a buried utility, has been identified crossing the survey area in a southeast-northwest orientation. No record of this is provided in the utility drawings.

Field 9/3

This field contains a linear feature that has been identified as being in the location of a Bronze Age cross dyke, (RSK ID99). The feature is particularly subtle, and has only been identified from correlation of results of the field walking and desk study exercise. Once identified in the data it has been observed traversing the entire width of the survey area.

In addition to this feature, two more linear features of possible archaeological interest are observed in a similar orientation to the known cross dyke. The first, located 180m from the western fence boundary is approximately 35m long and runs from the northern boundary fence to the centre of the survey area. The second, which appears to be closer to parallel with the known cross dyke than the first, is located approximately 155m from the western field boundary and is observed to traverse the width of the survey area. The orientation, location and dimensions of these features support interpretation as possible additional dykes.

Field 9/4

Four linear features in similar orientations are observed within this field. Three are aligned parallel to one another at intervals of between 30m and 40m. The first of these features is 70m west of the eastern field boundary. The length of the individual features suggest that they may be connected or form part of a geometrical pattern, although no additional feature connecting them is identified in the magnetic data. The origin of these features is unknown. The fourth feature is positioned approximately 65m from the eastern field boundary, and is almost perpendicular to the proposed cable route, orientated towards the inflection point of the northern field boundary.

Field 9/6

Two intersecting rectilinear features are present within this field. They are situated towards the southern side of the field. Their distinct linearity gives them cause to be considered as probable archaeological origin.

4.2.8 RDX 10 to RDX 11

Field	Probable archaeological site or feature (Class A)	Possible site or linear (Class B)	Possible discrete features (Class B)	Geological features (Class C)	Surface or subsurface Metal (Class C)	Plough scars (Class E)
10/1	0	0	N	N	Y	N
10/2	0	1	N	N	Y	N
10/3	N/A	N/A	N/A	N/A	N/A	N/A
10/4	0	0	N	Y	N	N
10/5	0	0	N	N	Y	N
10/6	0	0	Y	N	Y	N
10/7	0	2	N	N	N	N
10/8	0	0	N	N	N	N
10/9	0	0	N	Y	Y	N
10/10	0	0	N	Y	N	N
10/11	1	1	N	N	Y	N
10/12	0	0	N	N	N	N
10/13	0	1	N	N	Y	N
10/14	0	0	N	Y	N	N

Field 10/2

An angular linear feature is present in the north-eastern corner of this field. The feature is comprised of a number of dipoles aligned linearly, with an inflection of 90 degrees at its centre. The origin of this feature is unknown.

Field 10/6

Within this plot a number of distinct discrete features are identified. The features comprise three 3.5m and one 10m in diameter, and are arranged with the smaller features aligned to the north of the larger one. The high amplitude response from the modern surface material located in the southwest corner of the field masks the signal, so it is not possible to determine in any more detail the nature of this feature.

Field 10/7

Two linear features, of possible archaeological interest, have been identified within this field. The first crosses the field from a point 30m north of the southern field boundary for a distance of approximately 50m to intersect the northwest boundary. The origin of this feature is unknown.

A second linear feature, showing a positive magnetic response crossed the field from the western boundary across to the eastern boundary approximately 65m south of the northern field boundary. This feature is of possible archaeological interest and may relate to a former earthwork.

Field 10/11

A moderately sized area of possible archaeological activity is noted in the south of this field. The area contains a number of discrete features, including a area of increased density of high frequency, high amplitude responses on the eastern edge of the survey area. These features and the general area of possible activity maybe linked with a structure noted on tithe mapping, (RSK ID180).

Within the general area of interest, a probable archaeological feature traverses the width of the route. This feature is indentified as being a former ditch.

Field 10/13

A number of subtle features of possible archaeological interest are present within the southern part of the field. The area of interest extends from the southern field boundary, approximately 90m north. Although there are no distinct or discrete features, the presence of a number of small possible linears and angular features make this whole area of interest.

4.2.9 RDX 11 to RDX 12

Field	Probable archaeological site or feature (Class A)	Possible site or linear (Class B)	Possible discrete features (Class B)	Geological features (Class C)	Surface or subsurface Metal (Class C)	Plough scars (Class E)
11/1	N/a	N/A	N/A	N/A	N/A	N/A
11/2	N/A	N/A	N/A	N/A	N/A	N/A
11/3	N/A	N/A	N/A	N/A	N/A	N/A
11/4	N/A	N/A	N/A	N/A	N/A	N/A
11/5	N/A	N/A	N/A	N/A	N/A	N/A
11/6	N/A	N/A	N/A	N/A	N/A	N/A

No access to any fields in the section during the time of survey.

4.2.10 RDX 12 to RDX 13

Field	Probable archaeological site or feature (Class A)	Possible site or linear (Class B)	Possible discrete features (Class B)	Geological features (Class C)	Surface or subsurface Metal (Class C)	Plough scars (Class E)
12/1	N/A	N/A	N/A	N/A	N/A	N/A
12/2	0	0	N	N	Y	N
12/3	N/A	N/A	N/A	N/A	N/A	N/A
12/4	0	0	N	N	Y	N
12/5	0	0	N	Y	N	N
12/6	0	0	N	N	N	N
12/7	0	0	N	N	N	N

Field	Probable archaeological site or feature (Class A)	Possible site or linear (Class B)	Possible discrete features (Class B)	Geological features (Class C)	Surface or subsurface Metal (Class C)	Plough scars (Class E)
12/8	0	0	N	N	N	N
12/9	0	0	N	N	N	N
12/10	0	0	N	N	N	N
12/11	0	0	N	N	Y	N
12/12	0	1	N	N	Y	N
12/13	0	0	N	Y	N	N
12/14	0	0	N	N	N	N
12/15	0	0	N	N	N	N
12/16	0	0	N	N	N	N
12/17	0	0	N	N	N	N
12/18	0	0	N	N	N	N
12/19	N/A	N/A	N/A	N/A	N/A	N/A
12/20	0	0	N	Y	N	N
12/21	0	5	N	N	N	N

Field 12/12

This field contains a moderately sized area of possible archaeology. It is an almost square area with edges approximately 55m by 55m, and has been identified as a possible enclosure.

Field 12/21

A number of linear and curvilinear features are observed within this plot. The east-west orientated linear features are possible former field boundaries. They are parallel to the existing field boundary.

The second linear feature within this field is running diagonally through the field. It is a faint feature and in conjunction with the field walking survey has been interpreted as a possible trackway.

A more significant curved feature, interpreted as a possible enclosure, is observed along the southern field boundary.

4.2.11 RDX 13 to RDX 14

Field	Probable archaeological site or feature (Class A)	Possible site or linear (Class B)	Possible discrete features (Class B)	Geological features (Class C)	Surface or subsurface Metal (Class C)	Plough scars (Class E)
13/1	N/A	N/A	N/A	N/A	N/A	N/A
13/2	N/A	N/A	N/A	N/A	N/A	N/A
13/3	N/A	N/A	N/A	N/A	N/A	N/A

Field	Probable archaeological site or feature (Class A)	Possible site or linear (Class B)	Possible discrete features (Class B)	Geological features (Class C)	Surface or subsurface Metal (Class C)	Plough scars (Class E)
13/4	0	1	N	N	N	N
13/5	0	5	N	N	Y	Y
13/6	N/A	N/A	N/A	N/A	N/A	N/A
13/7	N/A	N/A	N/A	N/A	N/A	N/A
13/8	0	0	N	N	N	N
13/9	0	0	N	N	N	N
13/10	0	1	N	N	Y	N
13/11	1	0	N	Y	Y	N
13/12	0	0	N	N	N	N
13/13	0	1	N	N	Y	N
13/14	1	1	N	N	Y	N
13/15	1	0	N	N	Y	N
13/16	0	1	N	N	Y	N

Field 13/4

A thin negative response linear feature of possible archaeological origin is observed crossing the middle of the field. The origin of this anomaly is unknown.

Field 13/5

A large number of features are present within this field. A series of potential plough scars can be observed in the southern end of the field. These anomalies are orientated approximately southwest northeast, and traverse the working width. The features are not aligned to current day field boundaries, and may reflect historic changes in land use.

In the middle of the plot an area of possible archaeological interest is indicated by multiple linear and features that are elliptical in nature. Some larger dipolar features are also present in this area, the origin of which is unknown, but may also be of some interest.

Towards the northern end of the field, a small circular feature approximately 25m in diameter is observed close to the major inflection of the field boundary. The feature is of possible archaeological origin and may relate to an enclosure.

To the north east of the possible enclosure lie a series of intersecting linear features. They form a number of geometrical shapes and possibly relate to former field boundaries.

Field 13/10

A faint curvilinear feature is observed towards the southern extent of this field. It is located close to the western boundary of the survey area in a north-south orientation and extends eastwards after around 25m. The likely origin of the feature is unknown.

Field 13/11

A known metallic service dominates the signal recorded in the southern half of this field, however a subtle linear feature of probable archaeology is still clearly visible. The feature is very thin and runs approximately southwest to northeast across the width of the survey area. It is interpreted, through correlation with the field walking study, to be a possible trackway.

Field 13/14,15

The most striking response within these fields is a circular feature, approximately 95m in diameter. The feature is of probable archaeological origin, located adjacent to the northern field boundary, and has been interpreted as being a ditched enclosure.

Within the centre of the field, an angular linear feature can be identified in the data. This response is due to archaeology and is interpreted as relating to a possible former field boundary.

Field 13/16

The influence of the overhead power cables dominates the data recorded for the majority of this field. The noisy signal generally masks potential archaeology, leaving only the feature at the southern field boundary visible. While the data show a distinctive shape, its irregularity makes it unclear as to what subsurface feature may be causing it.

4.2.12 RDX 14 to End

Field	Probable archaeological site or feature (Class A)	Possible site or linear (Class B)	Possible discrete features (Class B)	Geological features (Class C)	Surface or subsurface Metal (Class C)	Plough scars (Class E)
14/1	0	0	N	Y	Y	N
14/2	0	0	N	Y	N	N
14/3	0	0	N	N	N	N

4.3 Services/Utilities

Utility records have been overlain onto the geophysical data. Most known utilities correlate with location of magnetic anomalies indicative of buried utilities. However the geophysical data do suggest that some utilities are located incorrectly on the record drawings. A number of additional anomalies typical of the response of buried utilities have been identified in the data. Such features have been annotated in the interpretation drawings.

5 CONCLUSIONS

On the instructions of E.ON Climate and Renewables, RSK Environment Limited, carried out a geophysical site investigation to seek to determine the possible presence of features of archaeological interest along the proposed cable route and working width for the Rampion Offshore Wind Farm.

The survey route is approximately 28km in length, starting from the northern outskirts of Worthing in the south, progressing north to the Bolney substation, located east of Wineham, West Sussex.

The survey corridor is 65m in width, which encompasses the cable route and potential working width for the installation of the cable.

The geophysical technique employed to locate and identify these features was magnetometry. The field survey was carried out between the 23rd January and 28th March 2012.

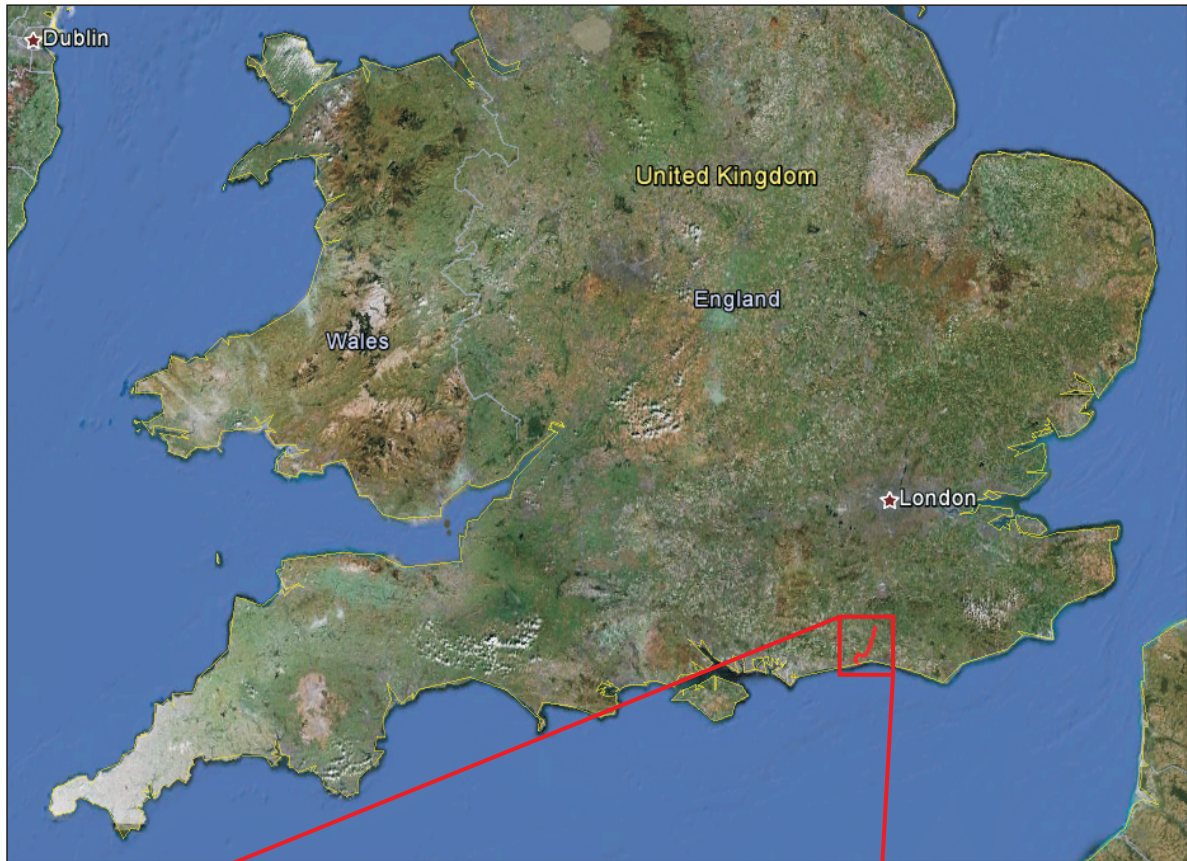
Data have been presented on A3 drawings at a scale of 1:2500 with a separate interpretation drawing alongside, so that the data can be easily matched against the interpretations, and to avoid the interpretation lines masking the data. Descriptions of the features of interest have been presented in the text.

A geophysicist and an archaeologist have interpreted the data, and features have been classed based on the signal character and the geometry of the anomaly.

The numbers and types of features are summarised in the tables below.

RDX	Probable archaeological site or feature (Class A)	Possible site or linear (Class B)	Possible discrete features (Class B)	Geological features (Class C)	Surface or subsurface Metal (Class C)	Plough scars (Class E)
3 to 4	1	2	N	N	Y	N
4 to 5	5	2	N	N	Y	N
5 to 6	9	9	Y	Y	Y	N
6 to 7	1	3	N	N	Y	N
7 to 8	2	3	N	N	Y	N
8 to 9	3	2	N	N	Y	N
9 to 10	5	9	N	N	Y	N
10 to 11	1	5	Y	Y	Y	N
11 to 12	N/A	N/A	N/A	N/A	N/A	N/A
12 to 13	0	6	N	N	Y	N
13 to 14	3	10	N	Y	Y	Y
14 to End	0	0	N	Y	Y	N

FIGURES



Client:

E.On UK Ltd

Site/Project:

RAMPION WIND FARM

SITE LOCATION

Figure: 1

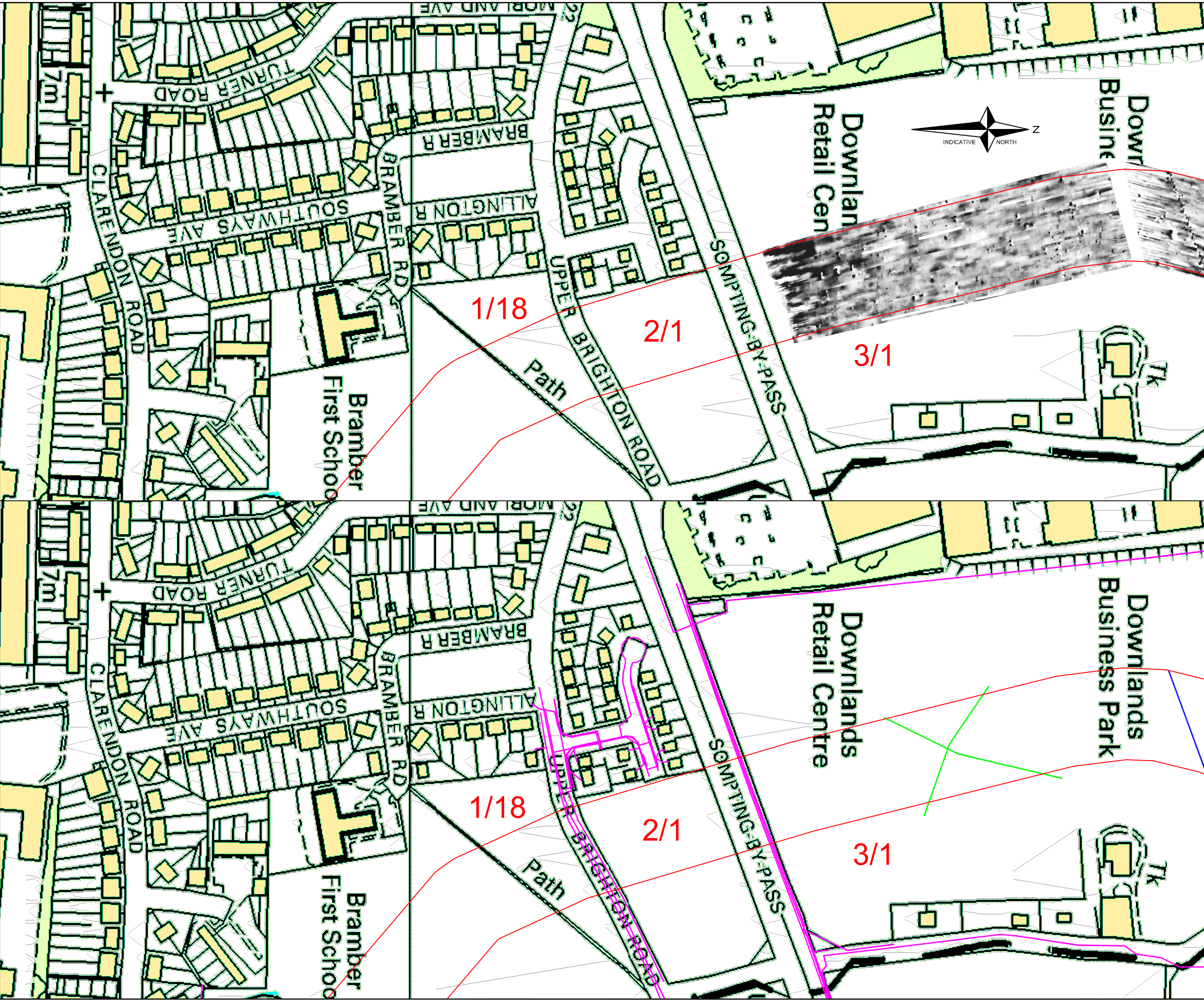
Job: 293069

Scale:

N/A

Date:

JULY 2012



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Scale

0 20 40 60 80 100m

Residual Magnetic Field (nT)

-2 0 2

KEY

Survey Area

Areas of No Access

Utilities from records (non-specific)

Probable Archaeology

Possible Archaeology

Above/Below Surface Metal, Modern or Geological Features

Plough Scars

Metallic Service

14/1 FIELD REFERENCE NO.

SHEET LAYOUT

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Client

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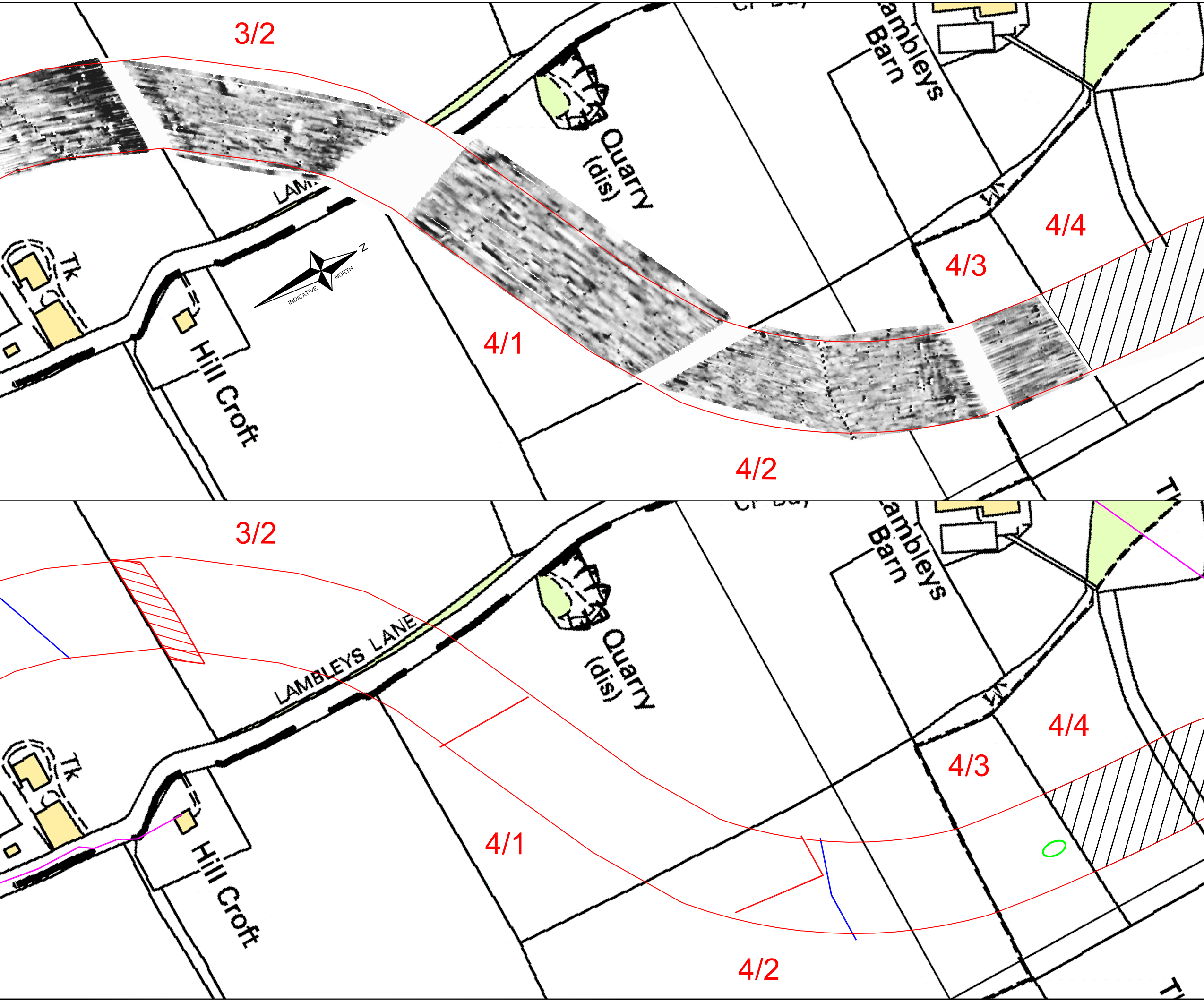
Project Title

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Drawing Title

MAGNETOMETRY RESULTS & INTERPRETATION

Drawn	Date	Checked	Date	Approved	Date
TWC	05/07/12	TG	05/07/12	GT	06/07/12
Scale	1:2500	Orig Sbs	A3	Project No.	293069
Drawing No.	293069 Sheet 1 of 28				Rev.



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Probable Archaeology

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Above/Below Surface Metal, Modern or Geological Features

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Metallic Service

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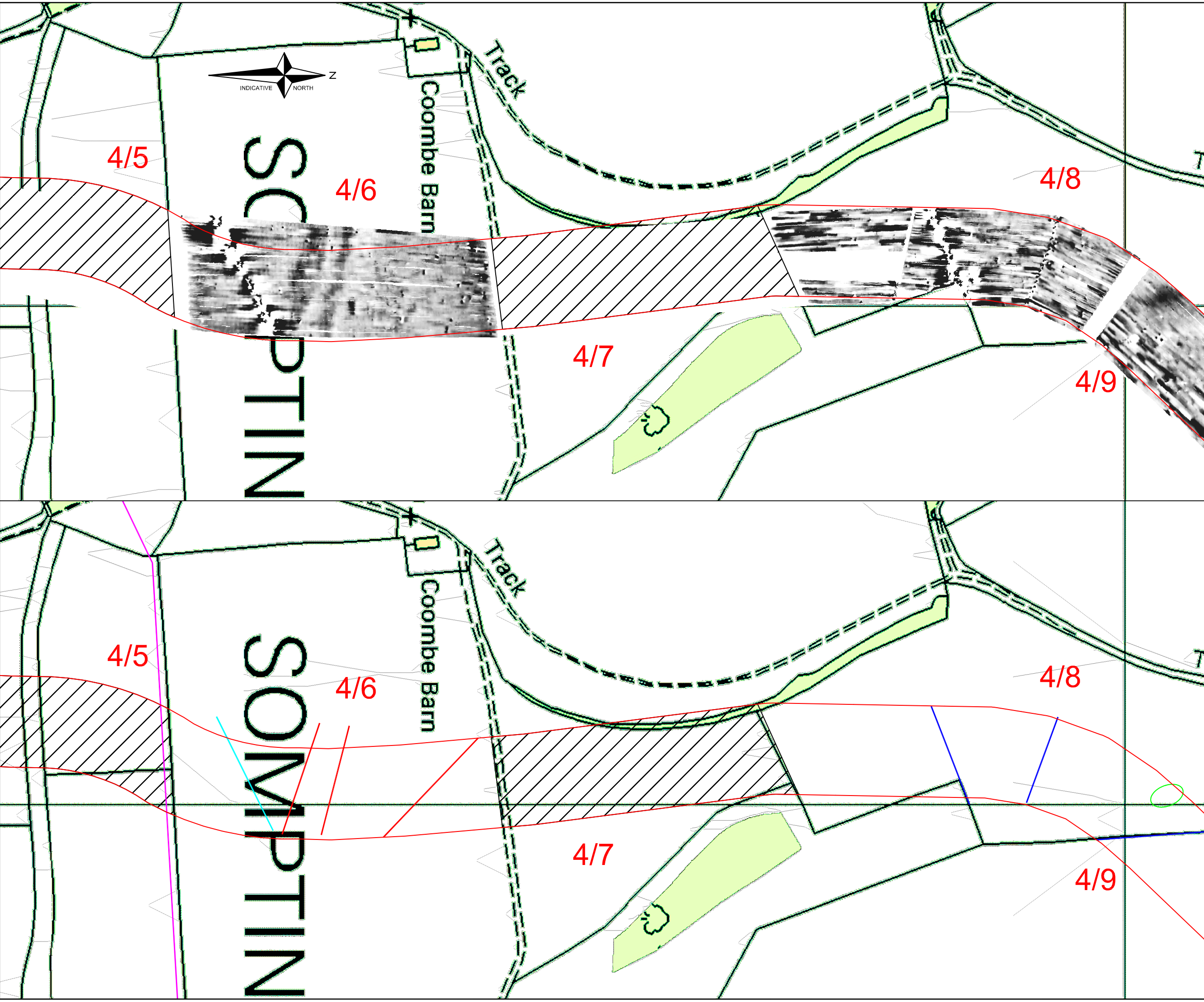
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MAGNETOMETRY RESULTS & INTERPRETATION

Drawn	Date	Checked	Date	Approved	Date
TWC	05/07/12	TG	05/07/12	GT	06/07/12

Scale	Orig Sbr	Project No.
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Residual Magnetic Field (nT)

-2 0 2

KEY

Survey Area

Areas of No Access

Utilities from records (non-specific)

Probable Archaeology

Possible Archaeology

Above/Below Surface Metal, Modern or Geological Features

Plough Scars

Metallic Service

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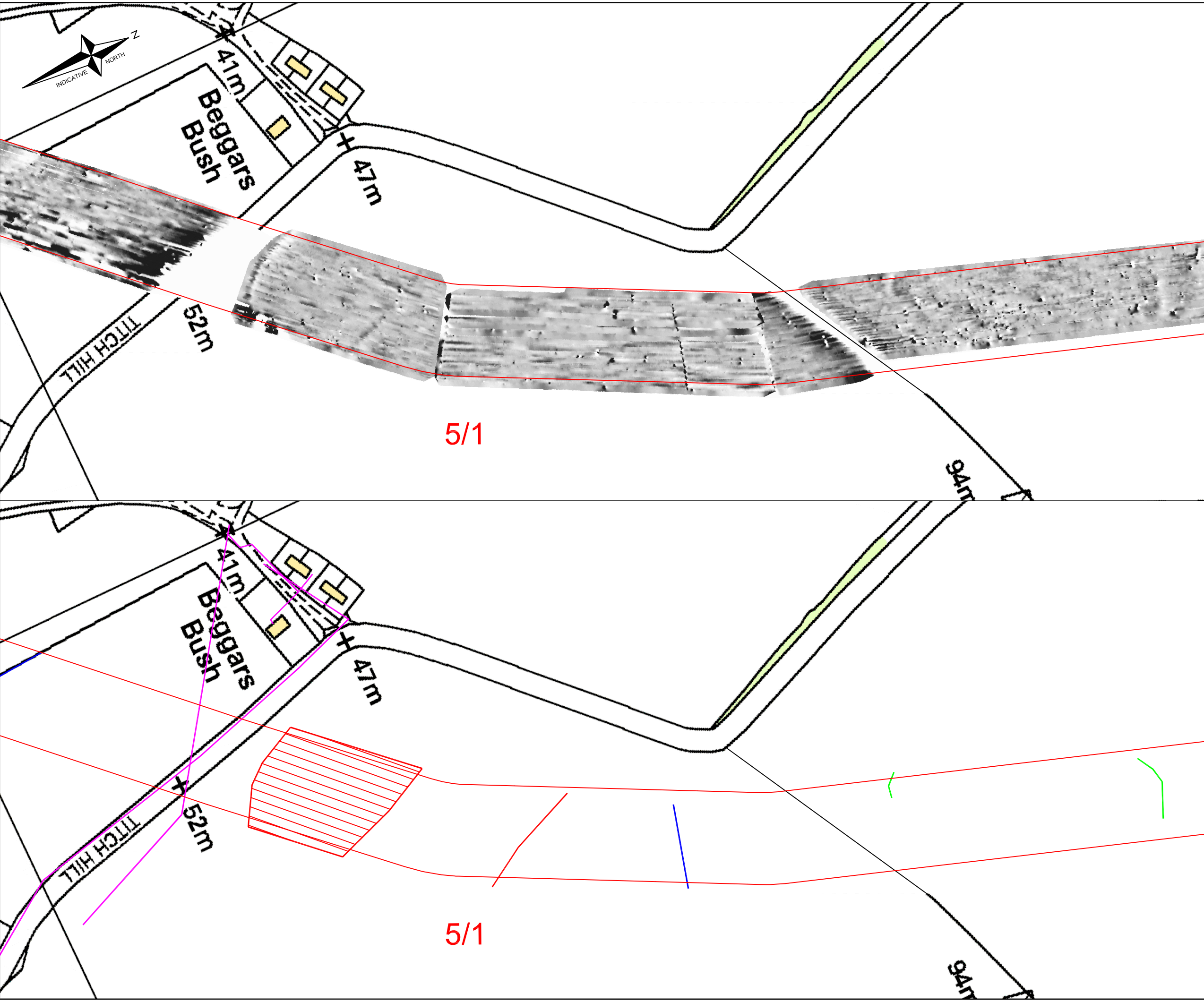
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Scale	Orig. Sbr	Project No.
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Residual Magnetic Field (nT)

-2 0 2

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Survey Area

Areas of No Access

Utilities from records (non-specific)

Probable Archaeology

Possible Archaeology

Above/Below Surface Metal, Modern or Geological Features

Plough Scars

Metallic Service

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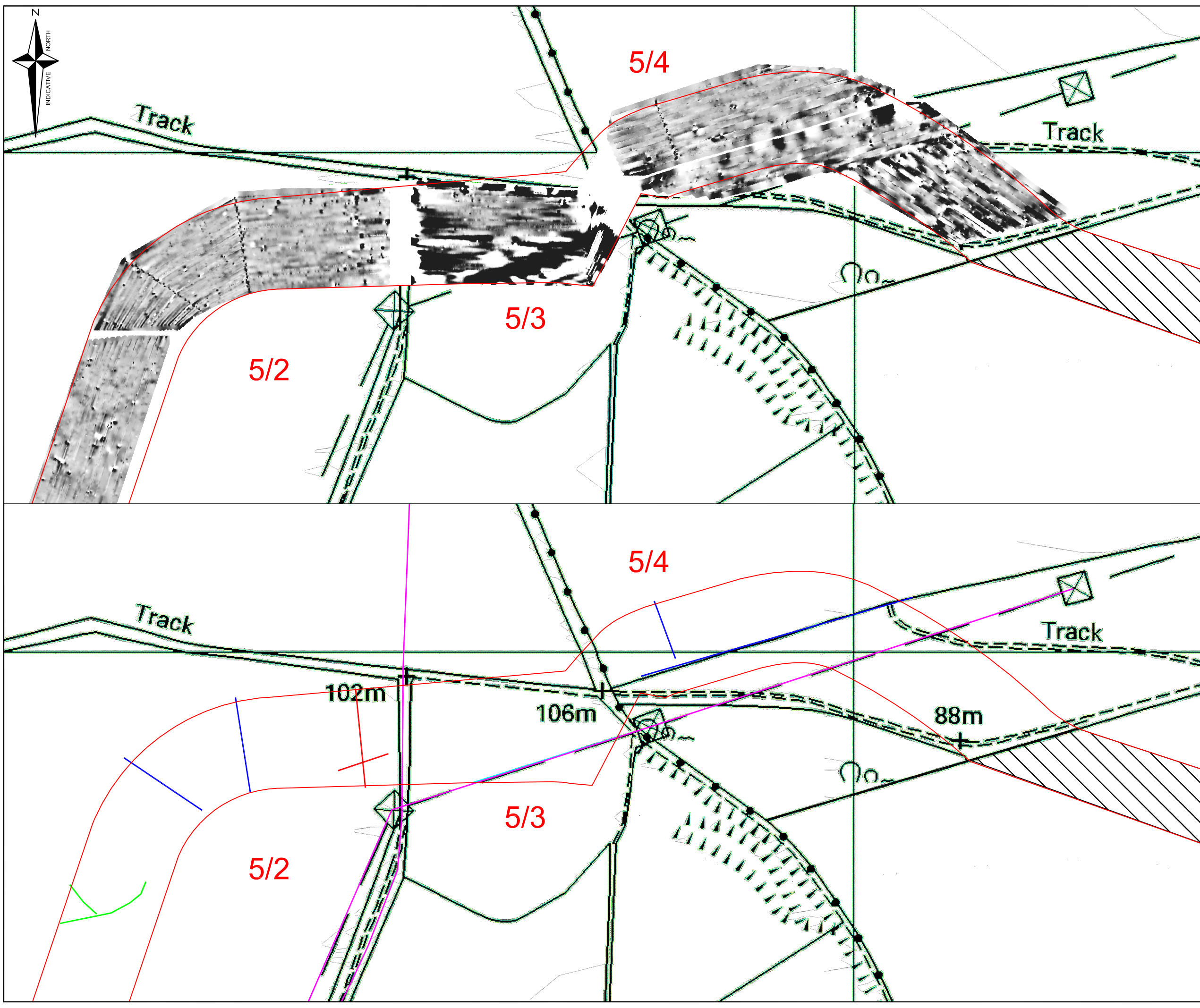
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& INTERPRETATION**

Drawn	Date	Checked	Date	Approved	Date
TWC	05/07/12	TG	05/07/12	GT	06/07/12

Scale	Orig Sbr	Project No.
1:2500	A3	293069

Drawing No.	Rev.
293069 Sheet 4 of 28	



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Residual Magnetic Field (nT)

-2 0 2

KEY

Survey Area

Areas of No Access

Utilities from records (non-specific)

Probable Archaeology

Possible Archaeology

Above/Below Surface Metal, Modern or Geological Features

Plough Scars

Metallic Service

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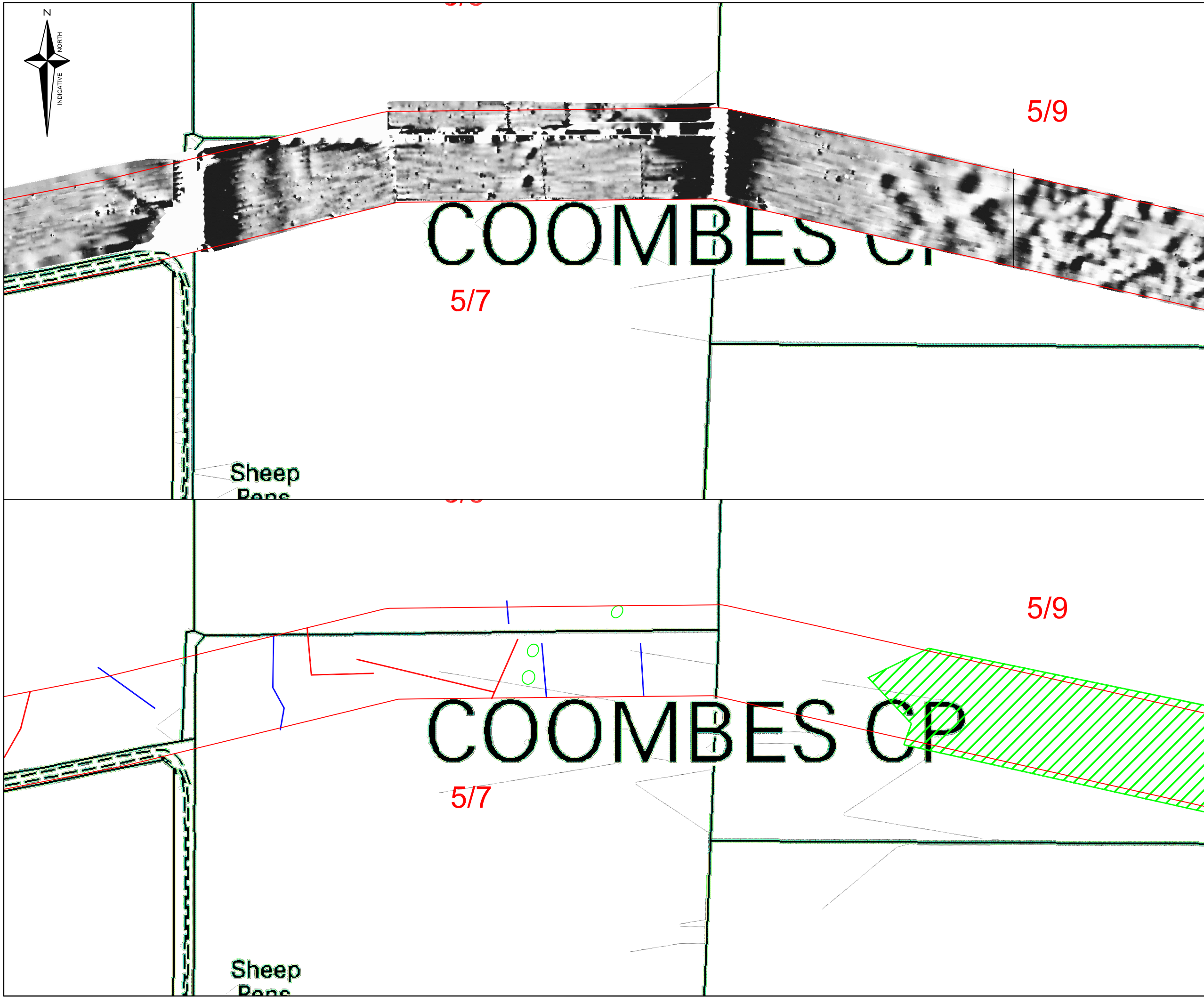
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MAGNETOMETRY RESULTS & INTERPRETATION

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Residual Magnetic Field (nT)

-2 0 2

KEY

Survey Area

Areas of No Access

Utilities from records (non-specific)

Probable Archaeology

Possible Archaeology

Above/Below Surface Metal, Modern or Geological Features

Plough Scars

Metallic Service

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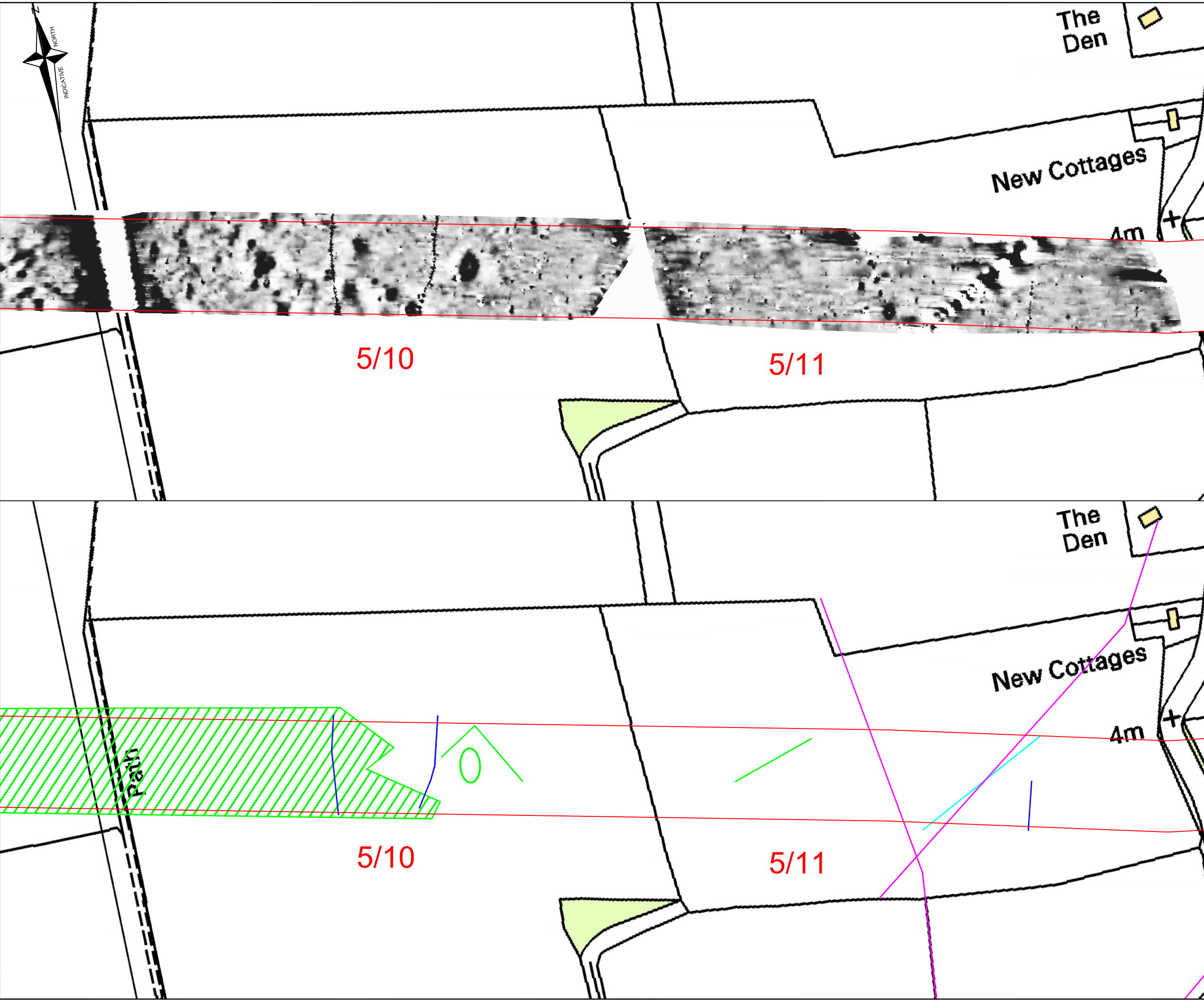
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Scale

0 20 40 60 80 100m

Residual Magnetic Field (nT)

-2 0 2

KEY

Survey Area

Areas of No Access

Utilities from records (non-specific)

Probable Archaeology

Possible Archaeology

Above/Below Surface Metal, Modern or Geological Features

Plough Scars

Metallic Service

14/1 FIELD REFERENCE NO.

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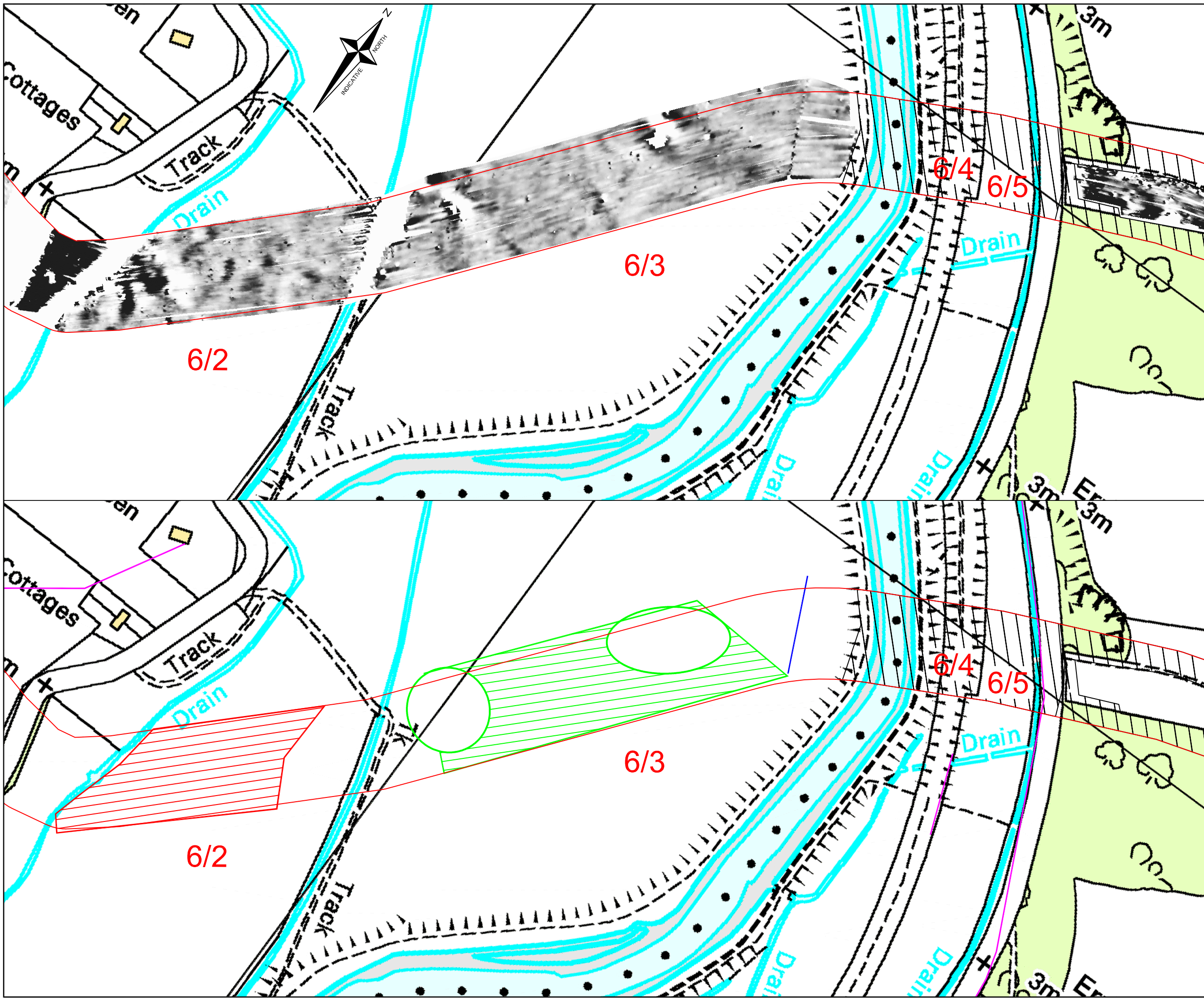
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& INTERPRETATION**

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Scale	Orig. Sbr	Project No.
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Scale

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Residual Magnetic Field (nT)

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KEY

Survey Area

Areas of No Access

Utilities from records (non-specific)

Probable Archaeology

Possible Archaeology

Above/Below Surface Metal, Modern or Geological Features

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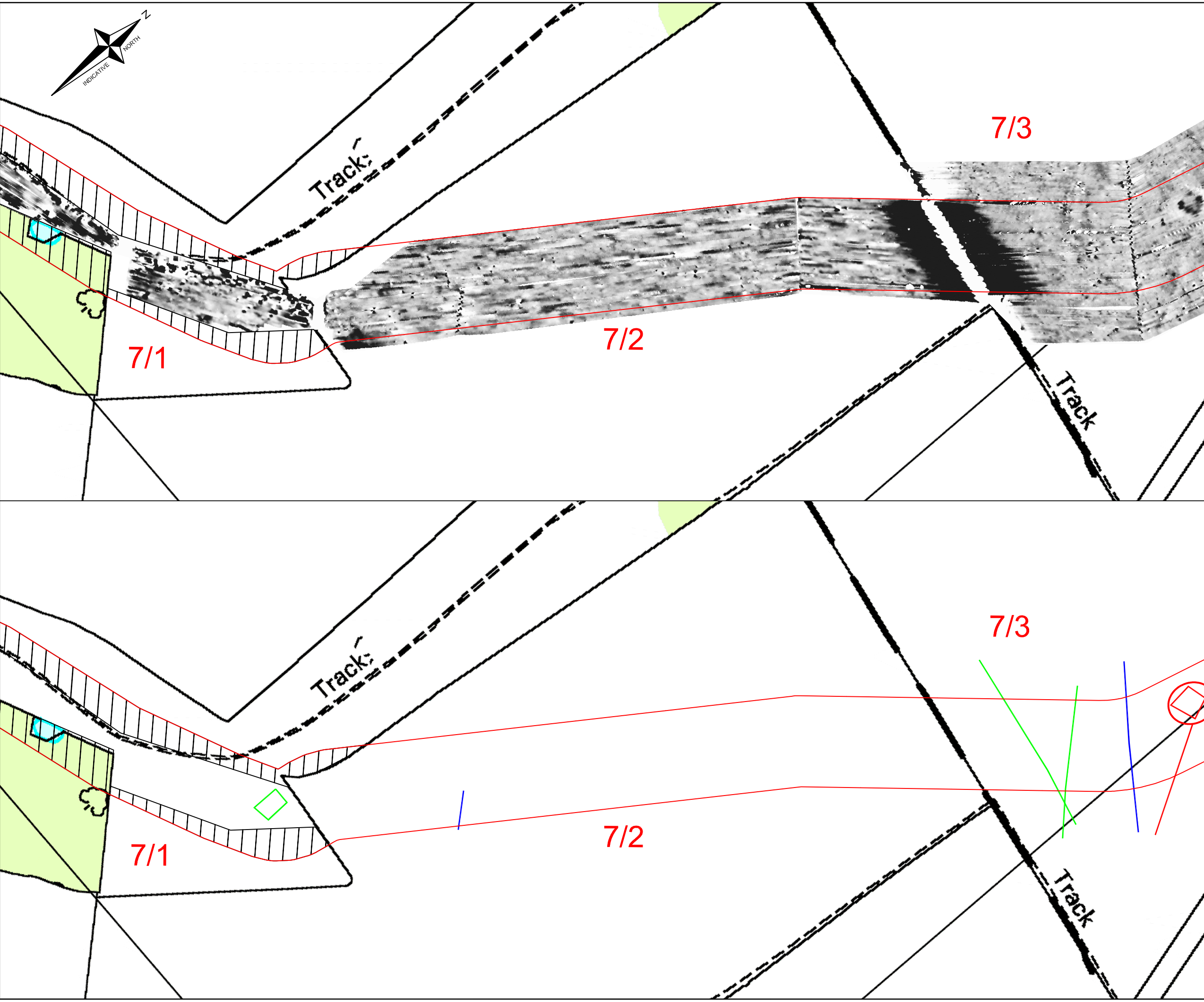
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MAGNETOMETRY RESULTS & INTERPRETATION

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Scale	Orig Sbr	Project No
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Scale

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Residual Magnetic Field (nT)

-2 0 2

KEY

Survey Area

Areas of No Access

Utilities from records (non-specific)

Probable Archaeology

Possible Archaeology

Above/Below Surface Metal, Modern or Geological Features

Plough Scars

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Fax: +44 1442 437550
Email: geophysics@rsk.co.uk
Web: www.rsk.co.uk

Client

e-on

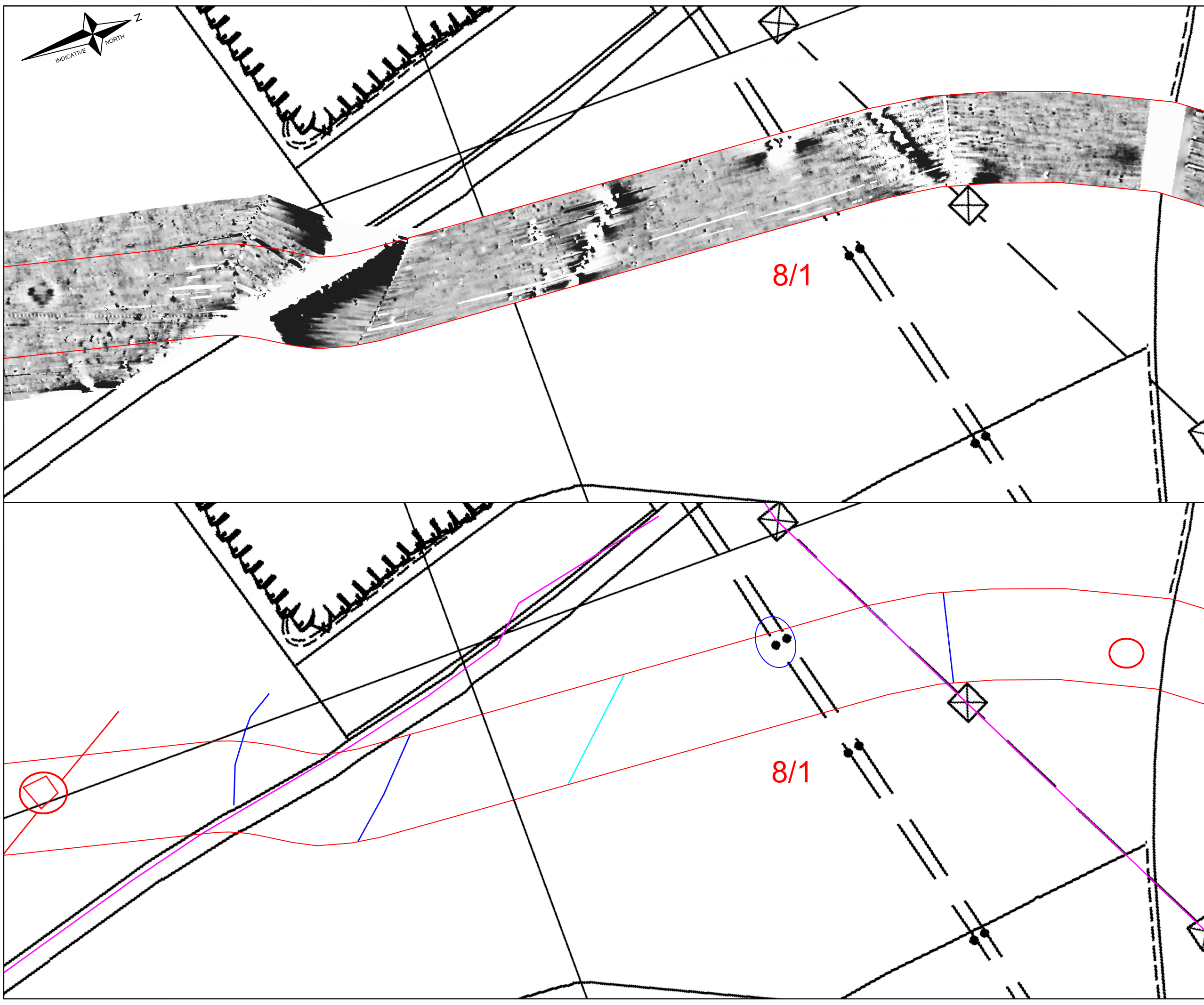
Project Title

RAMPION WIND FARM

Drawing Title

MAGNETOMETRY RESULTS & INTERPRETATION

Drawn	Date	Checked	Date	Approved	Date
TWC	05/07/12	TG	05/07/12	GT	06/07/12
Scale	1:2500	Orig. Sctr	A3	Project No.	293069
Drawing No.	293069 Sheet 10 of 28				Rev.



NOTES

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(2) Location of the cable route (Rev10) has been provided by the Client.

Scale

0 20 40 60 80 100m

Residual Magnetic Field (nT)

-2 0 2

KEY

Survey Area

Areas of No Access

Utilities from records (non-specific)

Probable Archaeology

Possible Archaeology

Above/Below Surface Metal, Modern or Geological Features

Plough Scars

Metallic Service

14/1 FIELD REFERENCE NO.

SHEET LAYOUT

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Client

e-on

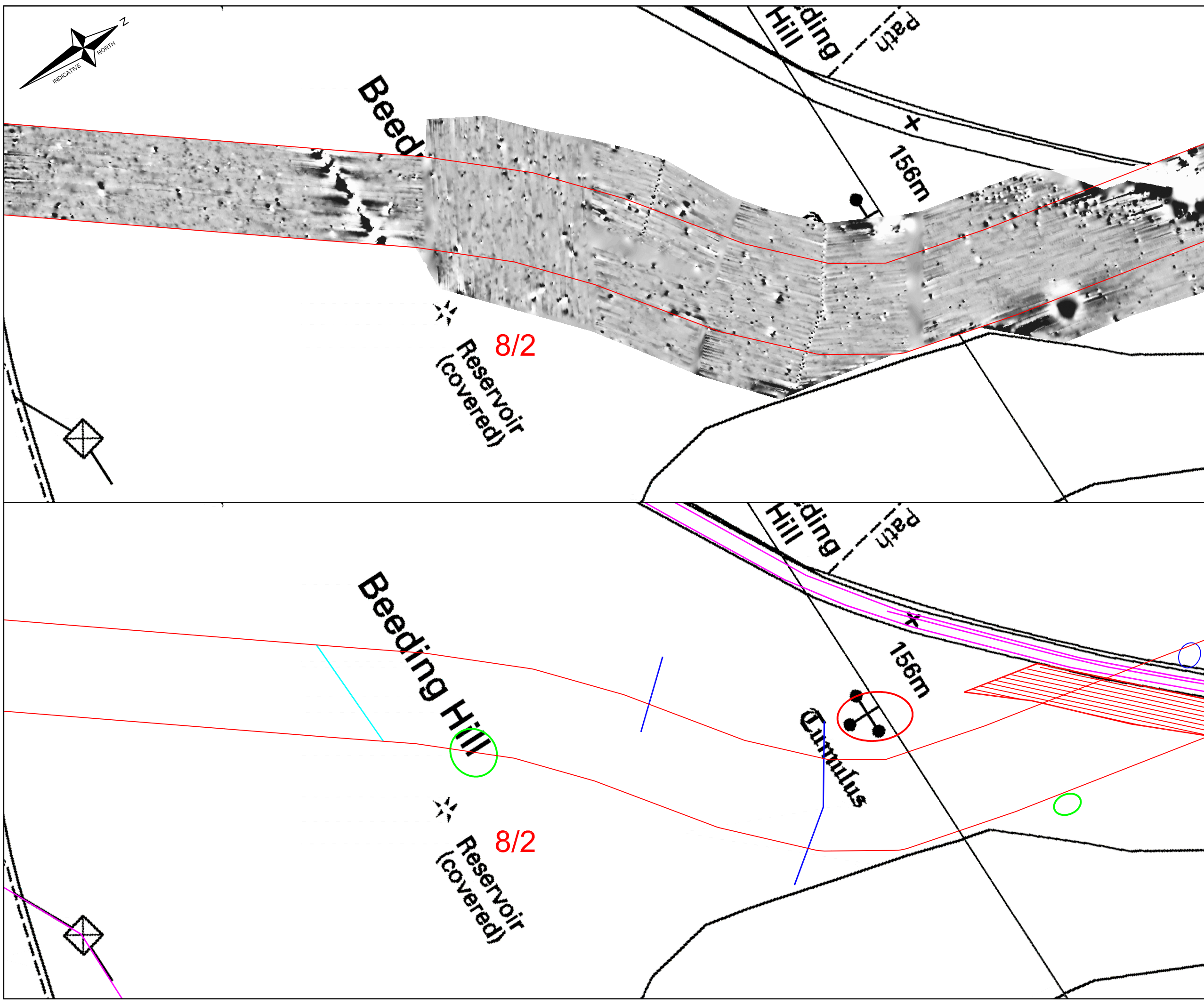
Project Title

RAMPION WIND FARM

Drawing Title

**MAGNETOMETRY RESULTS
& INTERPRETATION**

Drawn	Date	Checked	Date	Approved	Date
TWC	05/07/12	TG	05/07/12	GT	06/07/12
Scale	1:2500	Orig. Sbr	A3	Project No.	293069
Drawing No.	293069 Sheet 11 of 28				Rev.



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Residual Magnetic Field (nT)

-2 0 2

KEY

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Possible Archaeology

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Metallic Service

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Project Title

RAMPION WIND FARM

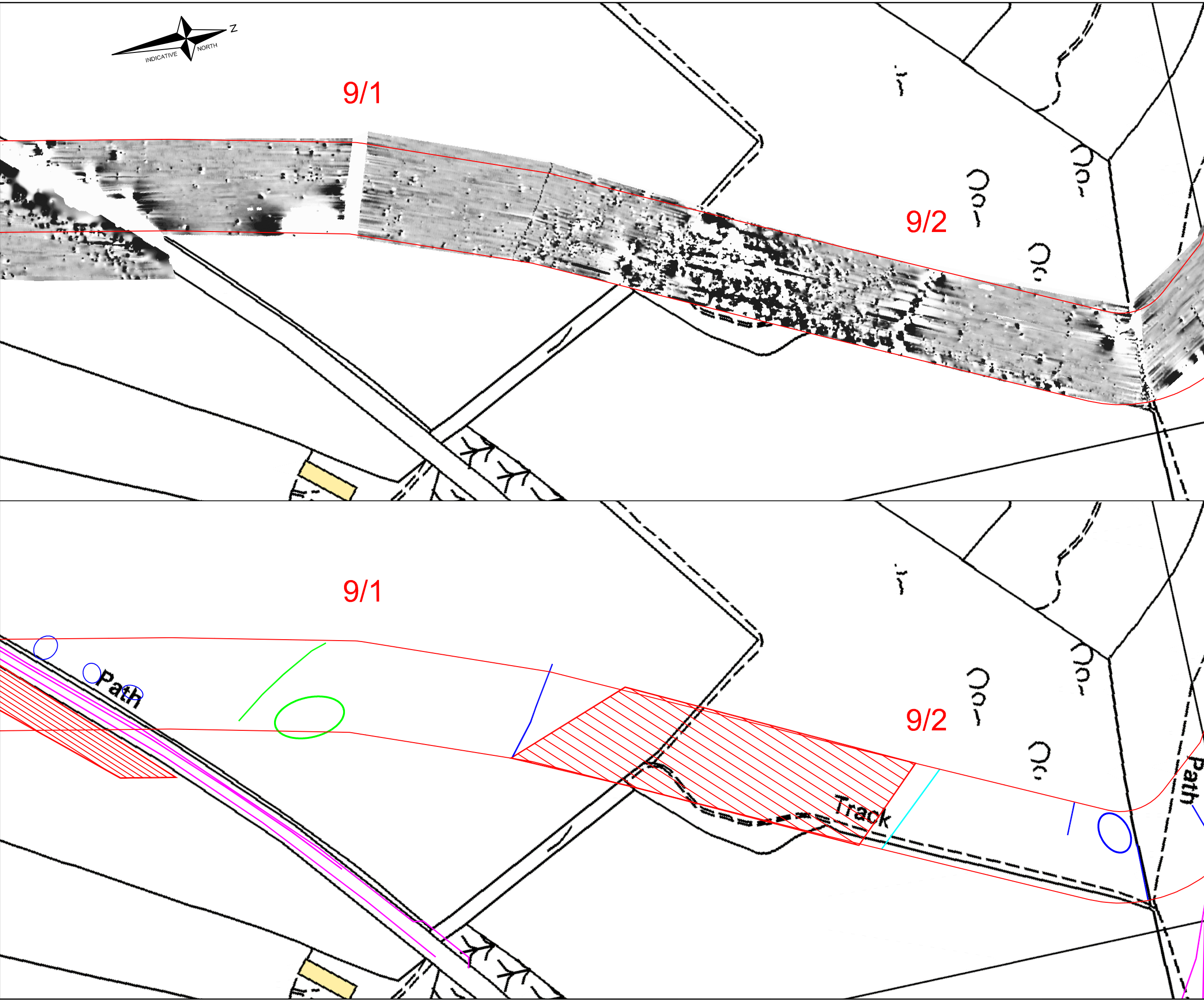
Drawing Title

MAGNETOMETRY RESULTS & INTERPRETATION

Drawn	Date	Checked	Date	Approved	Date
TWC	05/07/12	TG	05/07/12	GT	06/07/12

Scale	Orig. Sbr	Project No.
1:2500	A3	293069

Drawing No.	Rev.
293069 Sheet 12 of 28	



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Survey Area

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Project Title

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Drawing Title

MAGNETOMETRY RESULTS & INTERPRETATION

Drawn	Date	Checked	Date	Approved	Date
TWC	05/07/12	TG	05/07/12	GT	06/07/12

Scale	Orig Sbr	Project No.
1:2500	A3	293069

Drawing No.	Rev.
293069 Sheet 13 of 28	