National Roads Authority
Archaeological Geophysical Survey Database 2001-2010: Archive Report

This report has been archived by J. Bonsall, NRA Fellow at the University of Bradford. The archive was funded by and carried out under the auspices of, the National Roads Authority Research Fellowship Programme.

Survey Event No. **25**

Survey Name **Archaeological Geophysical Survey At Enclosure Site WM12:087, Portnashangan Townland, N4 Mullingar – Longford (Roosky) Scheme, Co. Westmeath**

This Geophysical Report should be Referenced or Acknowledged as:

Nicholls, J., 2009. Archaeological Geophysical Survey at Enclosure Site WM12:087, Portnashangan Townland, N4 Mullingar-Longford (Rooskey) Scheme, Co. Westmeath. Target Archaeological Geophysics. Project No. 09/025. August 2009.

Detection Licence No. 09R154

Ministerial Directions No. Not Applicable

NRA Route No. N4

NRA Scheme Name Mullingar to Longford (Roosky)

NRA Scheme ID WH/06/430

Survey carried out for Westmeath County Council

Survey funded by the National Roads Authority

Known problems with this report

There are no known archive issues with this report

Depositor James Bonsall, NRA Fellowship Programme

Primary Archive held by Westmeath NRDO

Secondary Archive held by Target Archaeological Geophysics

This archive was last updated on 06/04/2012

Archaeological Geophysical Survey At
Enclosure Site WM12:087, Portnashangan Townland
N4 Mullingar – Longford (Roosky) Scheme, Co. Westmeath

License No. 09R154

TAG Project No. 09025

Client:

Westmeath County Council

TARGET Geophysics

Specialists In Geophysical Prospection For Archaeological Assessment

PROJECT DETAILS

Project	Geophysical Survey At RMP WM12:087, Portnashangan Townland, N4 Mullingar – Longford (Roosky) Scheme, Co. Westmeath
Client	Westmeath County Council
Townland	Portnashangan
Nat Grid Ref	240950 259850 (Central Coordinate)
License Number	09R154
Project Start Date	3rd August 2009
Report Date	23rd August 2009

Summary Of Results

Detailed gradiometer and resistance surveys at enclosure site WM12:087 recorded concentrations of remains that define the core of archaeological activity associated with enclosure site WM12:087. The data from both techniques display the location of the enclosure ditches associated with WM12:087, the outline of pit type features and linear remains at the perimeter and interior of the monument, and evidence for industrial activity in the form of a number of suspected kilns to the north-east. Further linear features that may represent remains associated with abbey site WM12-086 and grave yard site WM12:086/08601 have also been detected, although none of these appear to be of a structural / walled nature.

*** The summary of survey results should be read in conjunction with the main report.**

Contents

List of Figures

List of Tables

1. Introduction

As part of route selection process for the N4 Mullingar - Longford (Roosky) Scheme, archaeological geophysical survey was undertaken at recorded monument earthwork site WM12:087, in Portnashangan townland, Co. Westmeath. WM12:087 lies within the area of a potential route for the scheme, to the north-west of Mullingar and west of the existing N4, and a further abbey (WM12-086) and graveyard site (WM12:08601), lies c.100m due west.

The N4 Mullingar to Longford (Roosky) scheme will extend 52km north-west to south-east, from the Mullingar Bypass in Culleenbeg townland, Co. Westmeath, to the N4 Dromod Roosky Bypass in Tomisky townland, Co. Longford. The scheme will link two existing dual carriageways of the N4 between the N52 Mullingar Bypass and the N4 Dromod Roosky Bypass.

This work was commissioned by Westmeath County Council and funded through the NRA by the Irish Government under the National Development Plan 2007-2013.

2. Survey Aims

This survey was commissioned by Westmeath County Council to determine the location, form and extent of buried archaeological remains associated with earthwork site WM12:087, and to record any features which might indicate a possible easterly extension of abbey site WM12:086 and graveyard site WM12-08601. The interpretation of the anomalies identified will assist in the evaluation and / or mitigation to be designed with respect to the scheme.

3. Site Description

Figure 1

The investigation area extends across the north-western corner of a single arable field located 3km due west of the N4 and 7.5km north-west of Mullingar town. The survey area is bound to the north, east and south by agricultural land, and to the west by the Dublin – Sligo railway line.

3.1 Soils & Geology

The survey area lies within flat to undulating lowland, occupied by grey brown podzolics, with brown earths and gleys occurring locally (Association 37, National

Soil Survey Of Ireland, 1980). The underlying geology for this part of County Westmeath includes limestone, shale and glacial till.

3.2 Archaeological Background

Earthwork site WM12:087 is described as a completely levelled earthwork, which remains visible on aerial photographs as a large circular enclosure. Abbey site WM12:086 lies at 240750 259780, 100m due west, at the western edge of the Dublin – Sligo railway line. This monument survives as foundation remains of a small sub-rectangular church measuring c.16m x 6m in diameter, located within a sub-circular grave yard (WM12:08601) enclosed by a modern stone wall. WM12:086/08601 may represent an early monastic settlement dating from the 6th century AD.

Further recorded monuments lie within a 1km radius of this investigation, including nine ringforts and two earthworks. Summary details for these monuments, and of abbey, grave yard and earthwork sites WM12-086/08601 & WM12-087 are provided below in Table 1:

RMP	NGR	Townland	Description
WM12-084	240567 260030	Ballynafid	Ringfort
WM12-085	240662 26-169	Ballynafid	Ringfort
WM12-086	240858 259836	Ballynafid	Ringfort
WM12-087	240956 259861	Portnashangan	Ringfort
WM12-088	241475 260313	Portnashangan	Ringfort
WM12-089	241534 260219	Portnashangan	Ringfort
WM12-090	241559 259972	Portnashangan	Ringfort
WM12-091	241764 259948	Portnashangan	Ringfort
WM12-098	240758 259795	Portnashangan	Ringfort
WM12-099	240926 259536	Portnashangan	Ringfort
WM12-100	241196 259675	Portnashangan	Ringfort
WM12-101	241276 259379	Portnashangan	Earthwork
WM12-102	241483 259158	Portnashangan	Earthwork

Table 1. Recorded Monuments Within 1km Of Survey

4. Methodology

Detailed gradiometry and electrical resistivity surveys totalling 0.8ha extended throughout the area highlighted for inspection at earthwork site WM12-087.

Grids utilised for both surveys were set out and tied-in to the OS using differential GPS, tapes, ranging rods and an optical square.

Instrument specifications and survey methodology are discussed in the *Summary Technical Information* document attached to this report.

4.1 Data Display Figures 1 - 5

Figure 1 presents the locations of gradiometer and resistance surveys centred on earthwork site WM12-087 at scales of 1:10,000 & 1:4000. The results from both surveys are presented as greyscale images in Figures 2 & 3 at a scale of 1/1000, with interpretations provided in Figures 4 & 5 at the same scale.

5. Data Processing

Standard routines for gradiometer and resistance data processing were applied and followed the guidelines outlined in the Geoscan Research Geoplot 3.00p software manual. These routines area summarised below in Table 2:

Data Processing
Zero Mean Traverse: This function was used on the gradiometer data to overcome edge matching, and sloping effects generated by instrument drift, as well as tilting errors which occur during traversing of individual grids. The function allows for the adjustment of the mean value along each individual instrument traverse to '0' and was generally applied using a threshold of +2 / -2.
Destaggering: *The 'Destagger' routine* was employed on the gradiometer data, only where appropriate, to correct for stepping errors generated during survey of individual grids. This function allows for the positive / negative shifting of individual traverses and whole grids.
Interpolation: This routine was completed on both the gradiometer and resistance data to improve the visibility of archaeological features and trends in the data set. This routine has been used to generate the greyscales included in Figures 2 & 3 of the report.

Table 2. Summary Of Data Processing

6. Digital Archive

The digital archive attached to this report includes the .grd, grs & .dat files for individual grids, .plm files for mesh templates, and .cmd, .cms, cmp and .csv files for processed composites. This archive also includes .tiff and .bmp image files in XY trace and greyscale format, with interpretations provided as AutoCAD .dwg files.

7. *Ground Conditions & General Considerations*

Ground conditions at the site were suitable for survey, the investigation area having been previously cleared of crop in advance of fieldwork. No physical obstructions which might impact on the progress of survey were noted.

Isolated ferrous responses occur throughout the results from gradiometer survey. These are usually caused by the presence of modern debris within the topsoil, and are not referred to in the text unless considered relevant. Broad concentrations of ferrous response also occur to the west and south-west. These derive from interference caused by modern debris adjacent to existing boundaries and the railway line to the west of the site.

8. Survey Results

Figures 2 – 5

8.1 Gradiometer Survey

Detailed gradiometry over enclosure site WM12:087 has recorded a concentration of magnetically strong anomalies, numerous small-scale positives, and weak curvilinear ditch type responses. These extend 70 – 75m east to west across the centre of survey. Together they indicate the location of a bivallate enclosure, which is well-defined at its western limit (A), and almost beyond detection to the east (B) and south (C). The northern limit of the enclosure is partially traversed by a modern trackway used to gain access to the site.

At the enclosure's north-eastern limit a scatter of strong magnetic anomalies (D), and a zone of elevated response have been recorded. The range and pattern of these anomalies are indicative of substantial burnt / fired remains, possibly representing the locations of several kilns with associated debris. A further zone of increased response (E) in the north-western portion of the enclosure may represent plough damaged remains of pit type features and small ditches.

One linear ditch type feature (F), with a break at its approximate centre, appears to form a north-west / south-east partition of the enclosure interior, and is adjoined by a series of rectilinear trends to the south-east (G). The latter may represent remains of a possible dwelling. A similar group of responses with associated pit type anomalies has been recorded to the south-west at the enclosure perimeter. Interpretation of these anomalies remains unclear as such low-level responses are often associated with natural interference. Variations from natural are present to the south-east.

A large number of discrete positive anomalies and linear responses are present throughout the remainder of the data set to the north, south and west. The most notable of these include several linear ditch type features (H) extending to the north and south-west from the western enclosure edge. These may in part represent linear remains associated with abbey site WM12:086/08601.

Many of the remaining small-scale positive responses and linear features present within the gradiometer data are deemed to be of potential archaeological interest, possibly representing remains of pits, post-holes, and linear features. A natural or modern ferrous source for some of these anomalies should however not be dismissed.

The gradiometer data suggests that the core of archaeological activity associated with enclosure site WM12:087 lies within the survey grid.

8.2 Resistance Survey

A broad sub-circular pattern of low resistance has been recorded from resistance survey across WM12:087. Measured east to west the extent of this low resistance corresponds to the area encompassed by the magnetic anomalies recorded from gradiometry. The breadth of low resistance to the south-east suggests that natural interference overlaps with this section of the enclosure. However, a series of curving trends (1), which form a sub-circular arrangement across the centre of survey roughly correspond to the edges of the ditches recorded by the gradiometry.

A band of low resistance (2) extending westwards from the enclosure perimeter also coincides with gradiometer anomalies H, which are thought to represent ditch remains possibly associated with abbey and graveyard site WM12:086/08601. A weak low resistance trend (3) aligned north-west to south-east extending through the centre of WM12:087 coincides with gradiometer anomaly (F), a suspected partition feature at the enclosure interior.

The remaining anomalies recorded from resistance survey are indicative of interference from neighbouring boundaries, a recent farm access, and patterns of cultivation. The latter are visible as a series of closely spaced parallel linear anomalies aligned north-east by south-west which extend throughout the survey grid.

No clear evidence for remains of walls or foundations associated with abbey and grave yard site WM12:086/08601 have been recorded from resistance survey.

9. Conclusions

Gradiometer and resistance survey at enclosure site WM12:087 have been successful in defining the core of archaeological activity associated with the monument. The responses recorded by both techniques show the limits of the enclosure associated with the monument, numerous pit type features, linear remains and a dense spread of burnt / fired activity. The latter are thought to represent the locations off a number of probable kilns and associated features. While some of the anomalies recorded from survey may represent features associated with abbey and grave yard site WM12:086/08601, there are no indications of walled remains present within either data set.

Remains of former cultivation, and variation from natural sources have also been recorded.

10. Bibliography

National Soil Survey of Ireland (1980), *General Soil Map 2nd Edition (1:575,000.* An Foras Taluntais).

Report Author John Nicholls MSc MIAI

Personnel John Nicholls MSc & Karla Poot MA

Appendix: Digital Archive Information

A complete digital archive for this project is provided on CD with this report. The archive includes the report text with digital versions of all drawings and displays relating to this work.

All report figures are included in AutoCad format (.DWG, Version 2004), and can be re-referenced to the raw and processed data included as part of this archive. Greyscale and XY Trace displays forming part of this archive are provided at –1/1.5nT and 15nT/cm respectively unless otherwise stated. A complete PDF version of this report is also included.

The following table details the various file types provided.

Description	File Type
Survey Location	.DWG
Greyscale (Interpolated Data)	.DWG
Interpretation	.DWG
Greyscale (Raw Data)	.BMP
XY Trace (Raw Data)	.TIF
Area Interpretation	.DWG
Report Text	.DOC
Entire report as PDF	.PDF

Summary Technical Information

Fluxgate Gradiometer Survey

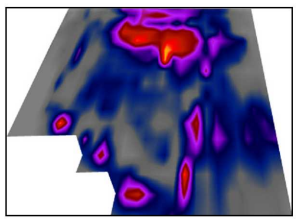
Surveys are undertaken using a Bartington *Grad* 601-single axis dual sensor gradiometer. The instrument has a vertical 1m sensor separation permitting finite resolution of buried archaeological features. Surveys are undertaken in scan or detailed (zig-zag traverse) modes for reconnaissance or high-density mapping. The fluxgate sensors are highly stable, minimizing requirements for excess data processing, and their dual or single configuration enables reliable flexibility during fieldwork. The instrument can be employed in both commercial and research based investigations allowing for completion of projects within short timescales. Regular grid sample densities from standard 1600 readings to 12800 readings per $20m^2$ grid are permitted.

A constant high quality of data is assured by experienced field staff operating in accordance to English Heritage Research & Professional Guidelines *Geophysical Survey In Archaeological Evaluation (David, A, 1995)*.

Electrical Resistance

The technique is used to record variations in electrical resistance by passing an electrical current through the ground. The standard instrument for archaeological investigations is a twin-probe array of mobile and remote electrodes maintained at a distance of about 20m. The mobile electrodes (one current and one potential, usually 1m apart) are mounted on a survey frame and connected to a Geoscan RM15 resistance meter, which records the specific resistance of the soil (measured in ohms). The resistance meter is connected to the pair of remote probes (one current and one potential), which remain in a fixed location. Data are collected as the survey frame and mobile probes reach each designated sample interval. Surveys are usually undertaken at 1 m sample intervals along 1 m traverses (i.e., 400 readings per 20m x 20m grid. The adaptability of the instrument enables increased sampling intervals, as well as a range of probe configuration to operate at varying depths.

Magnetic Susceptibility



Field and laboratory magnetic susceptibility measurements are taken by applying a low magnetic field and measuring the resultant magnetisation of the soil sample. The magnetic susceptibility of the soil is measured as a proportional constant of the resultant magnetisation of the soil and the applied field. The most common methods used to measure magnetic susceptibility are as follows:

Volume-specific magnetic susceptibility
The volume, or field, specific susceptibility method employs a hand-held Bartington MS2D field coil connected to an MS2 susceptibility bridge and measures the volume-specific susceptibility of the soil in SI units. The field-sampling interval is commonly 10 m.

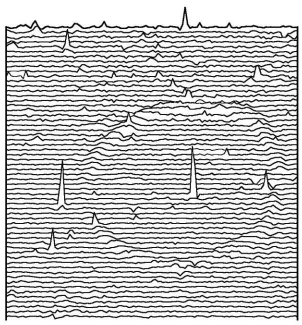
Mass-specific magnetic susceptibility
Mass, or laboratory, specific susceptibility measurements are taken using a Bartington MS2 susceptibility bridge connected to an MS2B laboratory sensor into which previously dried and sieved samples are inserted. Units of measurement are given in m^3kg^{-1},at 5m sample intervals.

**The relevant technical information for ground penetrating radar, phosphate analysis and further geophysical survey techniques are included as appropriate.*

Data Display Formats

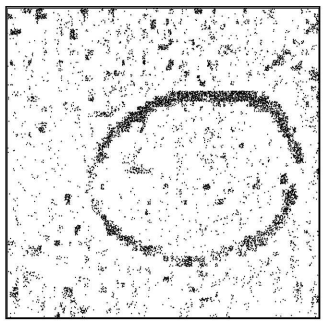
XY Trace

The data are presented as a series of linear traces, enabling a semi-profile display of the respective anomalies along the X and Y-axes. This display option is essential for distinguishing between modern ferrous materials (buried metal debris) and potential archaeological responses. The XY trace plot provides a linear display of the magnitude of the response within a given data set.



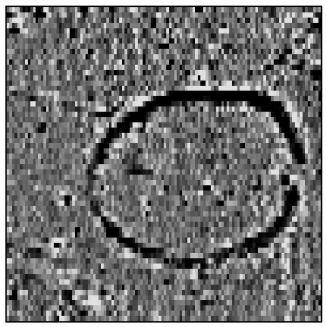
Dot Density Plot

Each datum is assigned a cell in which the intensity or number of dots displayed is proportional to the magnitude of the individual response. The visibility or presentation of responses within a given survey area is governed by numeric parameters specific to both soil morphological and archaeological conditions observed on site. Typically, the range of weak to strong responses is manifested by a low to high level of dot density. The format is useful for displaying gradiometer and resistance data particularly for identifying low-level responses.



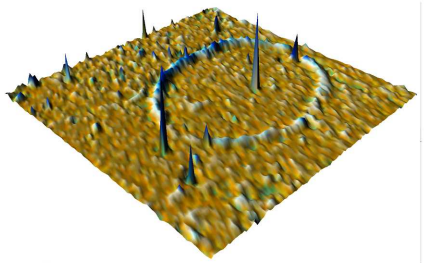
Greyscale

As with dot density plots, the greyscale format assigns a cell to each datum according to its location on the grid. The display of each data point is conducted at very fine increments, allowing the full range of values to be displayed within the given data set. This display method also enables the identification of discrete responses that may be at the limits of instrument detection.



3D Surface Plot

3D Surface plots employ selected colour scale, offset display, and relief plotting to replicate 3D view of datum across a given survey area. Perspective and orthographic projection, variable field view angle, rotation and tilt, are used to demonstrate the magnitude and breadth of responses.



**XY Trace and dot density plots are presented in archive form for display of the raw survey data. Summary greyscale images of the interpolated data are included for presentation purposes and to assist interpretation. 3D Surface Plots are included where deemed beneficial to the viewing and interpretation of the results from survey.*

Glossary of Interpretation Terms

Archaeology

This category refers to responses usually supported by comparative archaeological evidence (i.e., photographic transcriptions, excavation, etc). The term is generally associated with significant concentrations of former settlement, such as ditched enclosures, storage pits and associated features.

?Archaeology

This term corresponds to anomalies that display typical archaeological patterns where no record of comparative archaeological evidence is available. In some cases, it may prove difficult to distinguish between these and evidence of more recent activity also visible in the data.

?Industrial

Such anomalies generally possess a strong magnetic response and may equate with archaeological features such as kilns, furnaces, concentrations of fired debris and associated industrial debris.

Area of Increased Magnetic Response

These responses often lack any distinctive archaeological form, and it is therefore difficult to assign any specific interpretation. The resulting responses are site specific, possibly associated with concentrations of archaeological debris or more recent disturbance to underlying archaeological features.

Trend

This category refers to low-level magnetic responses barely visible above the magnetic background of the soil. Interpretation is tentative, as these anomalies are often at the limits of instrument detection.

Ploughing/Ridge & Furrow

Visible as a series of linear responses, these anomalies equate with recent cultivation trends.

?Natural

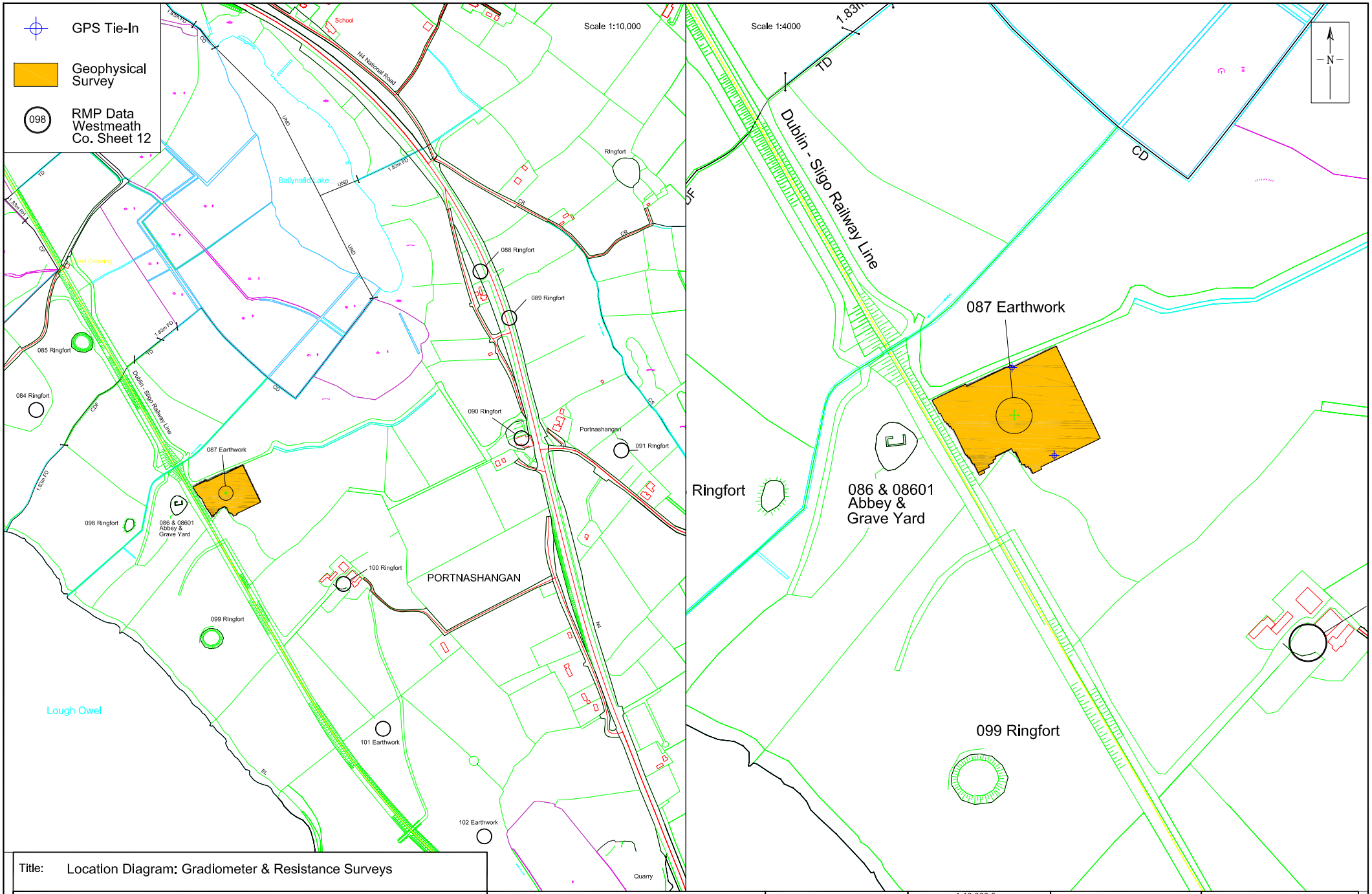
Resulting from localised natural variations in the magnetic background of the subsoil, these responses are often recorded in areas of low-lying land prone to flooding.

Ferrous

These anomalies exhibit a typically strong magnetic response, often referred to as ‘iron spikes,’ and are the result of modern metal debris located within the topsoil.

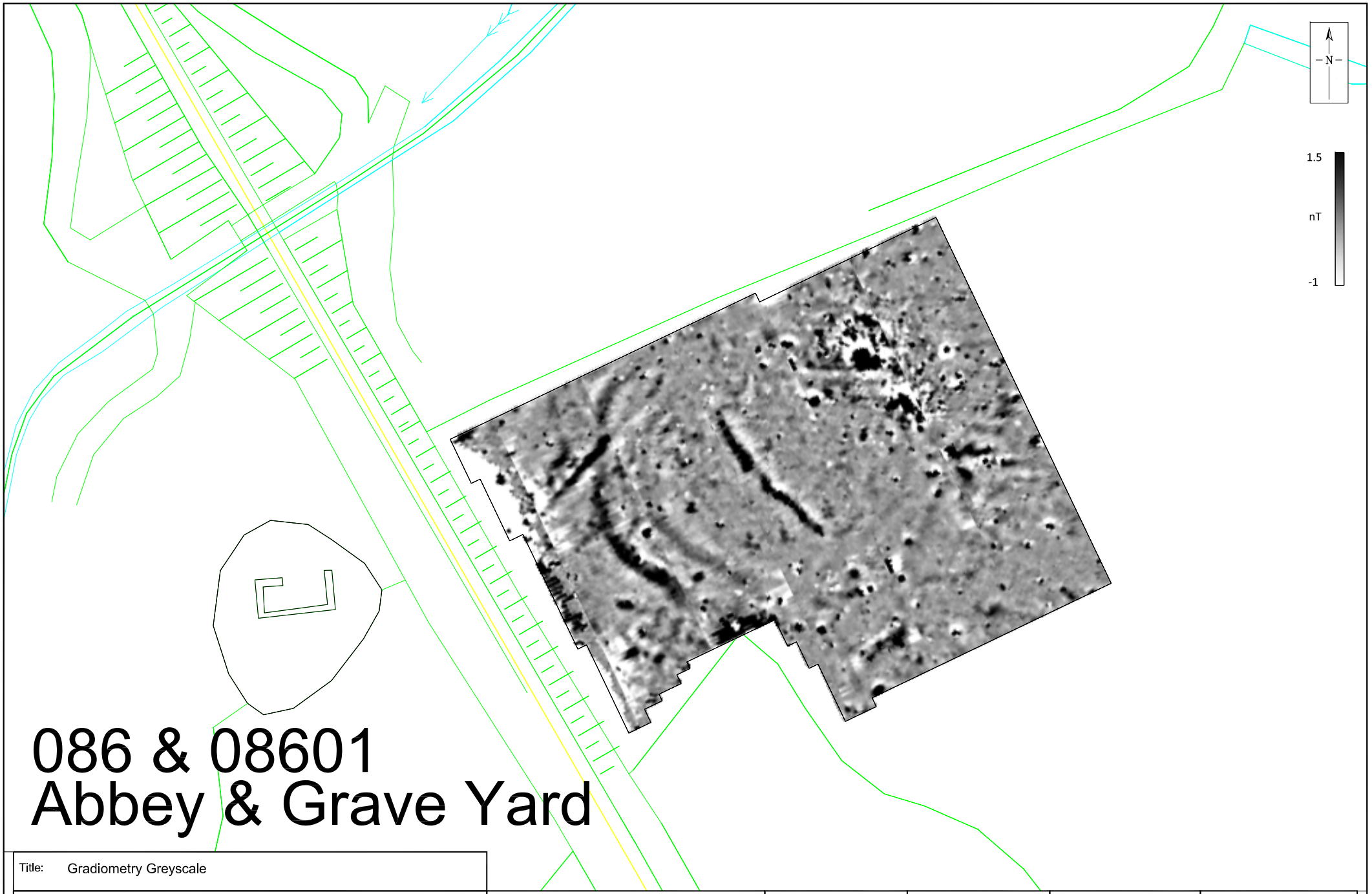
Area of Strong Magnetic Disturbance

This term refers to large-scale magnetic interference from existing services or structures. The extent of this interference may in some cases obscure anomalies of potential archaeological interest.



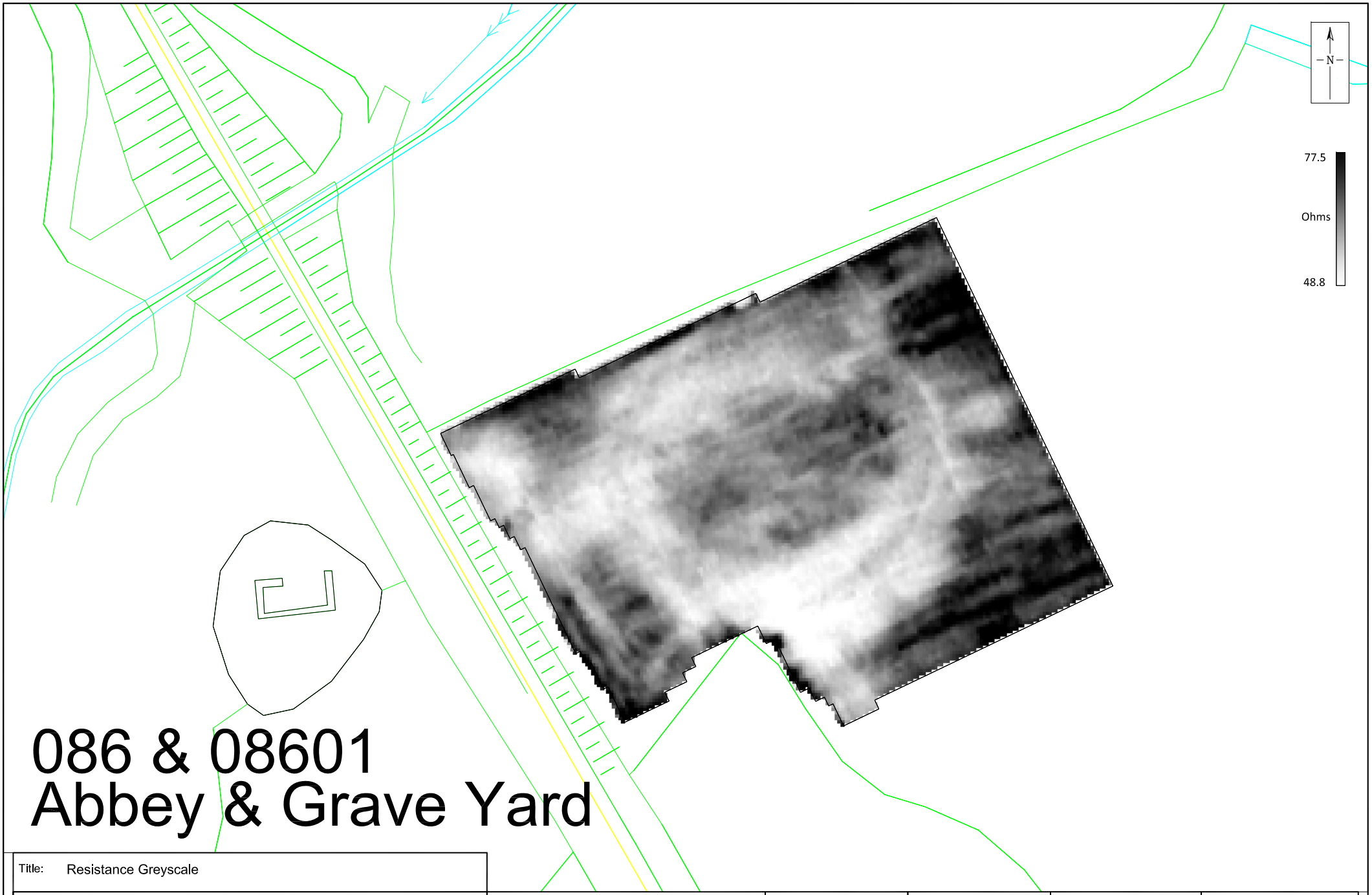
Title:	Location Diagram: Gradiometer & Resistance Surveys				
Project:	Archaeological Geophysical Survey At RMP WM12:087, Portnashangan Townland, N4 Mullingar - Longford (Roosky) Scheme, Co. Westmeath	Client: Westmeath County Council	Figure: 1	Scale: 1:10,000 & 1:4000 @ A4	Date: 23/08/09
			License: 09R154	Planning Ref: Route Selection	Job No: TAG_09025

TARGET GEOPHYSICS



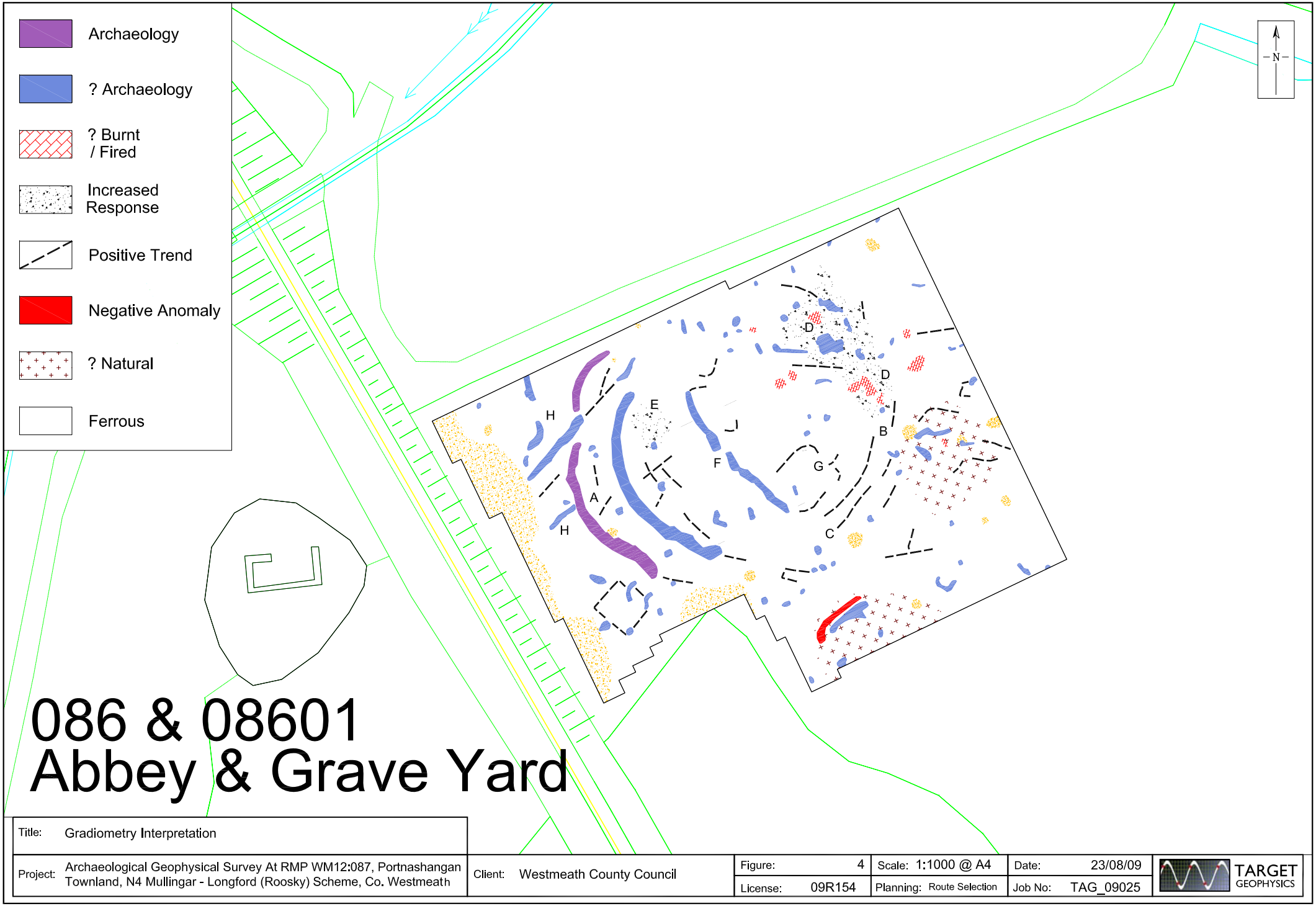
086 & 08601
Abbey & Grave Yard

Title: Gradiometry Greyscale					
Project: Archaeological Geophysical Survey At RMP WM12:087, Portnashangan Townland, N4 Mullingar - Longford (Roosky) Scheme, Co. Westmeath	Client: Westmeath County Council	Figure: 2	Scale: 1:1000 @ A4	Date: 23/08/09	TARGET GEOPHYSICS
		License: 09R154	Planning: Route Selection	Job No: TAG_09025	



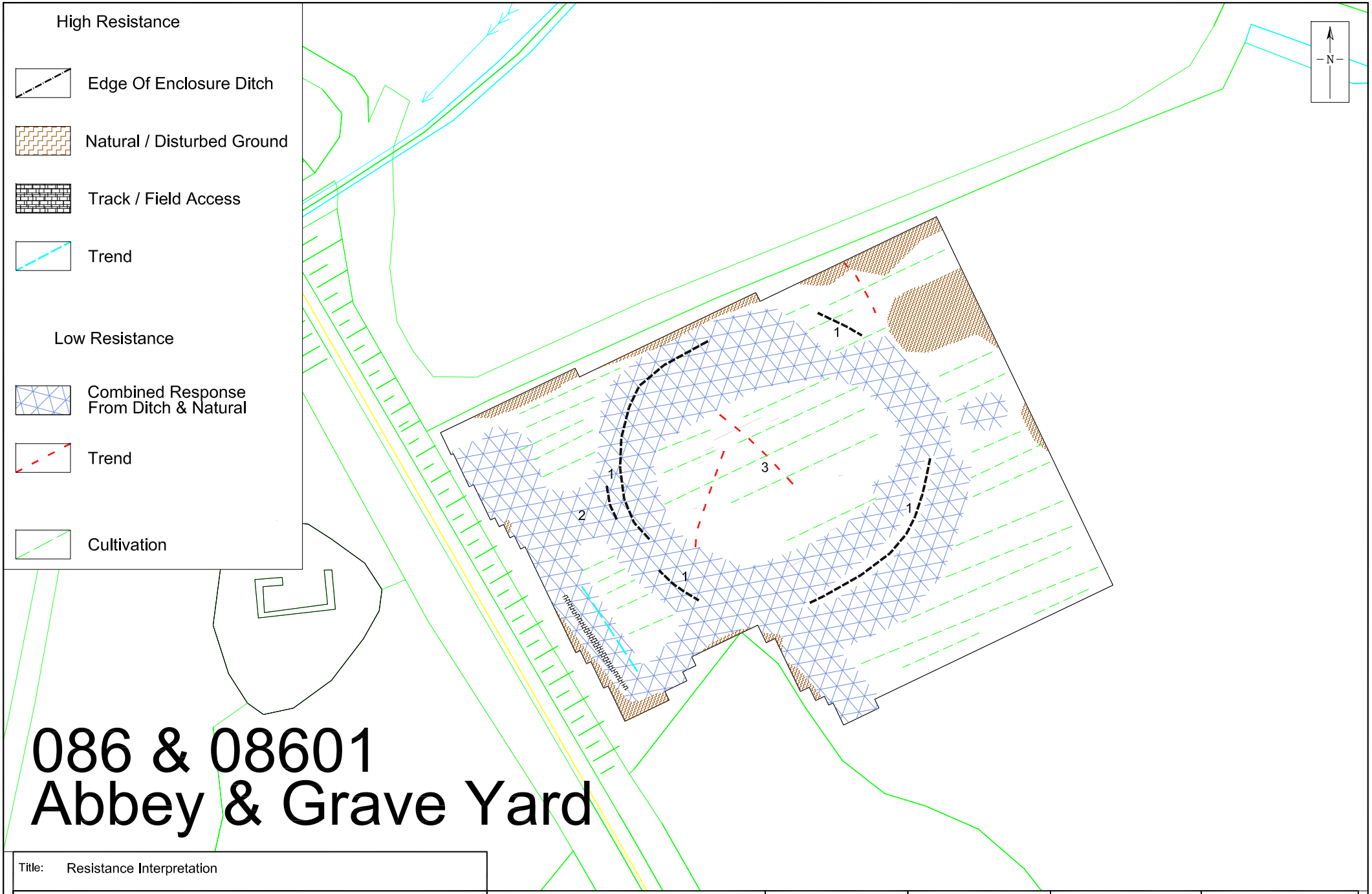
086 & 08601
Abbey & Grave Yard

Title: Resistance Greyscale					
Project: Archaeological Geophysical Survey At RMP WM12:087, Portnashangan Townland, N4 Mullingar - Longford (Roosky) Scheme, Co. Westmeath	Client: Westmeath County Council	Figure: 3	Scale: 1:1000 @ A4	Date: 23/08/09	TARGET GEOPHYSICS
		License: 09R154	Planning: Route Selection	Job No: TAG_09025	



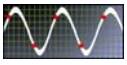
086 & 08601
Abbey & Grave Yard

Title: Gradiometry Interpretation					
Project: Archaeological Geophysical Survey At RMP WM12:087, Portnashangan Townland, N4 Mullingar - Longford (Roosky) Scheme, Co. Westmeath	Client: Westmeath County Council	Figure: 4	Scale: 1:1000 @ A4	Date: 23/08/09	TARGET GEOPHYSICS
		License: 09R154	Planning: Route Selection	Job No: TAG_09025	



086 & 08601
Abbey & Grave Yard

Title: Resistance Interpretation					
Project: Archaeological Geophysical Survey At RMP WM12:087, Portnashangan Townland, N4 Mullingar - Longford (Roosky) Scheme, Co. Westmeath	Client: Westmeath County Council	Figure: 5	Scale: 1:1000 @ A4	Date: 23/08/09	TARGET GEOPHYSICS
		License: 09R154	Planning: Route Selection	Job No: TAG_09025	



TARGET Geophysics

Apt. 25, Block 11, Gallery Quay, Dublin 2
Telephone +353 (0)1 441 8818 / +353 (0)87 858 0112

www.targetgeophysics.ie
survey@targetgeophysics.ie