GSB Survey No. 2008/73

N2 Slane Bypass, Co. Meath

NGR	Northern Section: 298200, 277000 to 297550, 275250 Southern Section: 297450, 273300 to 296600, 271150
Location	The proposed route leaves the existing N2 road approximately 3.5km north-northeast of Slane, extends southwards, over the river Boyne, rejoining the N2 roughly 3km south of the town.
Study Area	Two sections of corridor (northern and southern) which diverge from the previous proposed route (GSB 2005/2006). Total length c4km; maximum corridor width 100m.
County / Townlands	Meath / Balrenny, Knockmooney, Mooretown, Crewbane, Fennor, Cullen.
Topography	Gently undulating with some steep slopes.
Current land-use	Arable: under stubble, plough or young crop; some boggy rough pasture.
Soils / Geology	Varying depths of clay, sands and gravels overlying limestone (information provided by Roughan & O'Donovan, see previous report GSB 05/87).
Archaeology	No known sites identified in 2005 desk based study. Previous geophysical survey (GSB 05/87 and 06/03) identified a concentration of clear archaeological type anomalies at 297500, 274400 approx. (outside the current study area), but elsewhere only very tentative responses were recorded.
Survey Methods	Magnetic scan; detailed magnetic (fluxgate gradiometer) survey.
Licence No.	08R322

Aims

To locate and characterise any archaeological type responses that may be present within the study area. The work forms part of a wider archaeological assessment being carried out by **Roughan & O'Donovan** on behalf of the **National Roads Design Office (NRDO), Meath County Council**.

Summary of Results*

Definitive archaeological anomalies, comprising a circular feature c. 25m in diameter and a pattern of overlapping field system ditches have been identified towards the southern end of the route (Areas 17 & 18). Although linear ditch type anomalies have been detected in a few other sample blocks (for example Area 12), they are either isolated, ill defined, or form less convincing archaeological patterns, making an archaeological interpretation cautious. "Pit type" anomalies are noted in most of the survey areas, including some strong responses which could indicate burnt/fired material. They are, however, not associated with any clear linear anomalies and, in the absence of corroborative evidence, an archaeological interpretation remains tentative.

Project Information

Project Co-ordinator: C Stephens
Project Assistants: E Collier, R Green, J Tanner & G Taylor
J Leigh (JML Surveys) & D Shiel (Dan Logistics)
Date of Fieldwork: 9th - 18th December 2008
Date of Report: 16th January 2009

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

Survey Specifications

Method

The survey grids were set out using tapes and tied in to the Irish National Grid using a Trimble differential GPS system. A copy of the georeferenced results in AutoCAD format is included on the Archive CD.

Technique	Traverse Separation	Reading Interval	Instrument
Magnetometer - Scanning (Appendix 1)	10m	n/a	Bartington Grad 601-2
Magnetometer – Detailed (Appendix 1)	1m	0.25m	Bartington Grad 601-2
Resistance – Twin Probe (Appendix 1)	-	-	-
Ground Penetrating Radar (GPR) – 250MHz (Appendix 1)	-	-	-

Data Processing

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

Presentation of Results

Report Figures (Printed & Archive CD): Location, data plots and interpretation diagrams on base map (Figures 1-15).

Reference Figures (Archive CD): Data plots at 1:500 for reference and analysis. Some areas have been subdivided for display at this scale. (See List of Figures).

Plot Formats: See Appendix 1: Technical Information, at end of report.

General Considerations

Ground conditions along the route varied considerably. A few fields were completely unsuitable for survey due to densely packed overgrown rushes and weeds, or excessively boggy ground. The fields that were under deep plough presented particular hindrances to survey. In the case of the scan it was difficult to walk safely and observe the display panel simultaneously, reducing the effectiveness of this method. For the detailed survey it was impossible to walk at an even pace and maintain the instrument in an absolutely vertical position; this has resulted in stepping errors (correctable by data processing) and an increase in the potential for spurious instrument noise responses.

The geology along the route should not have had any significant effect on the results and major archaeological features such as field system ditches and settlement sites should be readily detectable. However, localised natural soil variations, such as pockets of magnetic gravels, can produce responses which are comparable in form to archaeological "pit type" anomalies. Interpretation of these "pit type" responses is always cautious, especially when they cannot be associated with other definitive (linear) archaeological features; the potential for natural variations further complicates the identification and analysis of such small scale responses.

Results of Survey

1. Magnetic Survey - Scan

1.1 With gradiometers in scanning mode, the evaluation area was examined along traverses spaced at intervals of approximately 10m. During this operation, fluctuations in magnetic signal were observed on the instruments' display panel. Any significant variations were investigated more closely to determine their likely origin and those anomalies considered to have archaeological potential were marked with canes for detailed recorded survey.

1.2 Isolated scanned targets were identified in many of the fields along the proposed route but confidence in their archaeological potential was generally low. Increased levels of background fluctuation together with a number of noisy responses were encountered midway along the northern section of the route (Areas 7 to 9) and adjacent to the river Boyne (Area 10). Concentrations of potential targets were observed towards southern end of the route (Area 17).

1.3 Detailed survey was carried out to investigate all the scanned anomalies and cover the core area of the evaluation corridor.

2. Magnetic Survey - Detailed Gradiometry

2.1 All of the survey areas contain anomalies of the following categories: *Ferrous/Magnetic Disturbance*, *?Natural* and *Trend*. To avoid repetition, a brief description of each of these is given in the following three paragraphs. Thereafter they are not mentioned unless they have a particular impact on the archaeological assessment of the data.

2.2 The category *Ferrous* is used for discrete, small scale ferrous anomalies, or "iron spikes". These are characteristic of small pieces of ferrous debris scattered in the topsoil and are commonly assigned a modern origin. Only the most prominent of these have been highlighted on the interpretations. *Magnetic Disturbance* refers to bands of ferrous responses and magnetic "shadows" present along the edges of the grid. These have been produced by adjacent wire boundary fences, iron gates or other ferrous material in the adjacent boundaries. The magnitude of the disturbance will have masked any weaker responses, regardless of origin; however, as these bands are narrow, they have had little impact on the wider analysis of the results.

2.3 *?Natural* anomalies can vary in type from small scale "pit type" responses reflecting localised variations in the soil to more substantial, stronger anomalies thought to have been produced by pockets of naturally enhanced material such as magnetic gravels. Also present are broader amorphous or sinuous responses, often weakly negative, caused by soil slippage or water rivulets. The problems differentiating between some natural and archaeological “pit type” anomalies are discussed in the *General Considerations* above.

2.4 Most of the *Trends* in the data are linear or sinuous and weak; some are barely visible above background levels. Most do not form any obvious patterns that would suggest archaeological significance and a combination of agricultural and natural origins seems probable.

Area 1 (Figures 2 & 3)

2.5 "Pit type" anomalies of possible interest are located primarily on higher ground at the northern end of the grid and on the low lying ground to the south. Many of the responses are not particularly well defined and lie within areas of sinuous, weakly negative anomalies. This overall pattern of responses would normally suggest a natural origin (e.g. magnetic gravels) or a modern one (e.g. deeply buried ferrous debris). However, spreads of burnt stones from *fulacht fiadh* could have produced such anomalies and it is largely on this basis that the interpretation

?Archaeology is cautiously offered. The magnitude of discrete anomalies (1) could suggest intact burnt/fired features, but again, natural or modern origins cannot be excluded.

Area 2 (Figures 2 & 3)

2.6 This field slopes steeply down from south to north. The archaeological "pit type" responses are largely confined to the northern half of the grid where the ground becomes increasingly boggy and overgrown. These waterlogged conditions, close to a stream, favour the location of *fulacht fiadh*; however none of the responses are strong enough to indicate burnt material. Moreover, the ground conditions will have hindered walking and contributed to instrument noise; it is equally possible, therefore that any or all of these *?Archaeology* responses are in fact a product of natural and pedological variations.

2.7 Negative anomaly and trend (2) share an alignment parallel with the eastern field boundary ditch. The linear nature of (2) would suggest an anthropogenic origin and it is suggested that they might represent drainage ditches.

Area 3 (Figures 2 & 3)

2.8 Anomaly (3) is a truncated linear, roughly 30m long, containing some strongly magnetic elements. Based on anomaly form, an archaeological interpretation is posited but there is nothing to suggest its precise function. The interpretation of all the other ?*Archaeology* responses is highly tentative.

2.9 A weak negative trend (4) aligns directly with the existing field boundary ditch described in paragraph 2.7 above and could represent a continuation of this feature. Ditches usually produce positive responses; the negative could indicate a lack of magnetic ditch fill. Alternatively (2) could represent a non-magnetic (e.g. plastic) field drain.

Area 4 (Figures 4 & 5)

2.10 Anomalies (5) have a magnitude that indicates strongly magnetic material, possibly burnt/fired deposits; however they could equally reflect deeply buried ferrous objects. Natural or modern (deeply buried ferrous) origins should also be considered for the few other *?Archaeology* responses in this block.

Area 5 (Figures 4 & 5)

2.11 Comparatively low levels of background fluctuation were recorded and very few archaeological type responses have been identified. Anomalies (6) have a magnitude that could suggest burnt material and could represent *fulacht fiadh*; however although the ground was boggy, the absence of any nearby obvious water source makes this interpretation cautious. Four well defined "pit type" anomalies are present; although their form suggests an archaeological origin, the lack of a wider context precludes any firm interpretation. Anomaly (7) is a very weak linear anomaly, petering out to a barely visible trend. It may be of interest, possibly reflecting a former boundary, but could equally represent a more recent drainage feature or have some other agricultural origin.

2.12 A roughly oval area of increased magnetic response (8), some 16m in diameter, is difficult to interpret. The maximum values of the response are around 10nT; these levels are consistent with either archaeological or natural deposits. If the former, it could indicate a very large pit of uncertain function. However, it is also possible that (8) is a magnetic "shadow" produced by a mid-sized ferrous object buried at considerable depth below ground.

Area 6 (Figures 6 & 7)

2.13 Only a very few "pit type" responses of possible interest have been identified in this area; an archaeological interpretation for these is highly cautious.

2.14 Anomaly (9) is comparable in form and size to response (8) discussed in paragraph 2.12 above. It seems likely that (8) and (9) have the same origin, though this remains unclear.

Area 7 (Figures 6 & 7)

2.15 This dataset illustrates well the problems in interpreting archaeological versus natural "pit type" anomalies. A large number of such responses are present throughout much of the area and none form any obvious archaeological patterns. In general, a possible archaeological origin has been assigned to those which are stronger or more coherent in form, but this interpretation is far from conclusive. It is also possible that some of the weaker positive *?Natural* anomalies may represent archaeological pits. At the northern end of the grid, the concentration of "pit type" responses appears to terminate roughly at trend (10); to the south the responses continue into Area 8 (paragraph 2.18 below).

2.16 Linear anomaly (11), roughly 27m long, is magnetically strong, suggesting burnt/fired material. If it is archaeological, its precise function remains unclear. Alternatively, it could represent a short section of brick or clay pipe/drain of more recent origin.

2.17 A magnetically quiet band at the southern edge of the grid is an effect of overhead electricity cables.

Area 8 (Figures 6 & 7)

2.18 The effect of the overhead cables is also present in the northern half of this survey area; it has effectively masked most other magnetic signals emanating from below surface. Beyond the cable effect, the recorded anomalies are comparable to those in Area 7 above, with similar uncertainties surrounding the interpretation.

Area 9 (Figures 6 & 7)

2.19 There is a reduction in background magnetic fluctuation in this block with fewer "pit type" anomalies identified. Those that have been interpreted as *?Archaeology* have a well defined archaeological form, but in the absence of a wider context, the interpretation is tentative.

Area 10 (Figures 8 & 9)

2.20 The northern half of this sample is on steeply sloping ground (conditions unlikely to be suitable for most human activity) and is largely devoid of anomalies of possible interest. The low lying ground to the south contains a band of "pit type" and sinuous responses (12) which vary in strength and definition. The location, close to a major water source, might favour anthropogenic activity; as such, some of the more coherent responses have been interpreted as *?Archaeology*, although their function cannot be determined. However, the location equally supports a natural interpretation for all the responses, which may reflect material deposited during river flooding.

2.21 The distinct linear nature of anomaly (13) suggests an anthropogenic origin, but whether archaeological or modern is unclear.

Area 11 (Figures 8 & 9)

2.22 This area is magnetically very quiet, with no anomalies of possible archaeological interest identified.

Area 12 (Figures 8 & 9)

2.23 In terms of anomaly form and distribution, this area can be roughly divided into two by trend (14). All bar one of the tentative "pit type" *?Archaeology* responses lie north of this line together with a general increase in background variation, *?Natural* responses and short trends. South of (14) the data are generally magnetically quiet, with only a few broad trends suggesting natural variations or agricultural practices and a linear band of responses (15), with a ferrous component, suggestive of a field drain or ploughed out boundary.

Area 13 (Figures 10 & 11)

2.24 Anomaly (16) comprises a linear negative response and trends partially bound by positive linears. Together these could indicate the remains of a former boundary wall and ditch and as such may be of archaeological interest. The possibility that (16) reflects more recent agricultural practices (e.g. drainage) must also be considered.

2.25 There are hints of a circular response, roughly 8m in diameter at (17). Although the pattern suggests an archaeological origin, it must be stressed that the anomaly is barely visible above background levels (thus represented as a dashed line) which makes the interpretation highly cautious.

2.26 Very weak closely spaced parallel linear responses in the data are typical of ploughing trends.

Area 14 (Figures 10 & 11)

2.27 Several broad parallel positive and negative linears (18) are present in this block. This parallel arrangement suggests some form of cultivation activity, but the responses are several orders of magnitude stronger than the weak modern ploughing trends and may therefore be archaeologically significant. Two more sinuous parallel responses (19) and (20) run perpendicular to (18) and appear to at least partially delimit them. Together the anomalies could represent part of a former strip field system, though the poor definition of (19) and (20) in particular, makes this interpretation cautious.

2.28 Another weak linear anomaly (21) may be of interest, possibly indicating a former boundary. It is on a different orientation to the above group and is therefore likely to represent an unrelated feature.

Area 15 (Figures 10 & 11)

2.29 Two indistinct parallel linear anomalies are on a slightly different alignment to the modern ploughing trend. As such they may be of archaeological interest, possibly indicating a trackway, though a modern agricultural origin cannot be dismissed. Of the few "pit type" anomalies tentatively categorised as *?Archaeology*, well defined response (22) has a magnitude that could indicate burnt/fired material; but it could equally be the product of more deeply buried ferrous debris.

Area 16 (Figures 12 & 13)

2.30 Three "pit type" anomalies have been categorised as *?Archaeology*; the interpretation is inconclusive and they could equally have natural or modern origins. Cultivation responses, represented by weak positive and negative trends, are present on two alignments, parallel to the existing boundaries. A more pronounced linear negative response has been identified on the same orientation as one of the ploughing trends. Its precise significance is unclear but an agricultural origin seems most likely.

Area 17 (Figures 12, 13, 14 & 15)

2.31 A number of generally well defined ditch type anomalies of probable archaeological origin have been detected in this area. The majority form overlapping rectilinear patterns suggesting at least two phases of former field systems. A single well defined "pit type" anomaly (23), roughly 5m in diameter, seems to be appended to one of the ditches and as such it has been given a more definitive archaeological interpretation. Weaker "pit type" responses, short linears and faint trends may also be of archaeological interest, given the wider context. However, since these responses are somewhat indistinct and form incomplete patterns, they have been downgraded to the *?Archaeology* category.

2.32 A relatively strong well defined circular ditch type anomaly (24), with a diameter of roughly 25m, is present at the southern grid edge, extending into the boundary. The anomaly becomes markedly weaker on the northern side (indicated by the dashed lines) for a distance of about 2.5m; this could indicate a deliberate break in the ditch, later damage, or simply a reduction in the magnetic fill at this point. One of the field system ditches described above appears to cross the circular response. This could support the middle interpretation (later damage) and certainly indicates another phase of activity in the area. Unfortunately ferrous anomalies and magnetic disturbance associated with the adjacent boundary have hindered a full analysis of the interior of the circle. In areas unaffected by this noise, three "pit type" *?Archaeology* anomalies have been identified, but interpretation is cautious due to their weak nature.

Area 18 (Figures 12, 13 14 & 15)

2.33 No evidence for the circular feature is present at the northern edge of this strip, thus its continuation must lie wholly under the modern road. Well defined linear anomaly (25) is likely to represent an extension of the field systems described above (paragraph 2.31); it continues southwards for roughly 100m to the limit of the survey corridor. No clearly defined ditches extend westwards from (25), while to the east the potential archaeological responses are somewhat weak and/or ill defined.

2.34 The remainder of this survey block contains no definitive archaeological anomalies; a few isolated "pit type" responses have been highlighted, but these could equally be natural or modern in origin.

3. Conclusions

3.1 Although scanned target anomalies were found in many of the fields within the study area, most of these were isolated and in some fields, due to poor ground conditions, the levels of confidence in the scan was low. Increased concentrations of scanned responses were observed in Areas 7 to 10 and 17.

3.2 Of all the areas investigated by detailed gradiometry, only two (Areas 17 and 18 at the southern end of the route) contain definitive archaeological responses. These comprise a circular feature and a pattern of overlapping field systems. Although a possible strip field system may be present in Area 14, this interpretation is far more cautious due to the poor definition of many of the responses.

3.3 Some of the other areas contain isolated linear responses which may be of interest but the lack of a wider context for them makes an archaeological interpretation inconclusive. Even more tentative is the archaeological interpretation of the "pit type" responses detected by the survey. Concentrations of these anomalies are present in Areas 7, 8 and 10, but most of the other areas contain several isolated responses of this type. While an archaeological origin cannot be dismissed, in the absence of a wider definitive archaeological context (e.g. enclosure ditches), natural or modern origins are equally tenable.

3.4 Several anomalies are noted which are magnetically strong, suggesting the presence of burnt/fired remains. *Fulacht fiadh* can produce anomalies of such a magnitude; however, although some of the responses are in suitable locations (waterlogged ground close to a water source) none have the ‘kidney’ or ‘horseshoe’ shape commonly associated with these burnt stone features. While they might still represent damaged/denuded remains, they could equally be natural or modern in origin.

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