Appendix 13.6

Geophysical Survey Report

N2 Slane Bypass,

Phase 3,

Co. Meath

Archaeological Geophysical Survey

Detection Licence No. 20R0238

Survey undertaken on behalf of

Meath County Council

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EARTHSOUND geophysics

EAG 416

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Summary of Results

Between the 23rd November and 4th December 2020, a series of geophysical surveys were undertaken along the N2 Slane Bypass. These surveys represent the third phase of work undertaken on the proposed scheme on behalf of Meath County Council. The work was undertaken on 24 preselected sites along the emerging preferred route of the N2 around Slane Village, County Meath. Magnetometer surveys were undertaken on all sites at a sample resolution of 0.5m x 0.25m.

The survey was conducted upon a changeable bedrock geology consisting of Limestone, mudstone, Greywacke and Shale, beneath tills, alluvium and gleys. Some near surface bedrock is known within the area. The majority of the survey area was agricultural land covered in short grass.

Evidence of agricultural activity can be seen through the detection of relict field boundaries, field divisions and ditches, cultivation furrows and green manure. Evidence for possible geological activity and potential River Boyne dredging or embanking can also be seen.

Four sites of archaeological interest have been identified: two enclosure ditches and a ring ditch. In addition a sub-circular enclosure and associated pits were found on the side of a monument identified during a geophysical survey undertaken in 2005 for the previous N2 Slane Bypass Scheme. The site identified during the previous geophysical survey was added to the SMR ME019-085 (to be included in the next revision of the RMP). Further potential archaeological activity includes a possible ring ditch, possible pits, ditches and cut features.

A number of debris zones were detected which contain metallic components; these could be associated with structural demolition or imported soils and could be archaeologically significant. A series of zones of magnetic enhancement were also detected which could indicate archaeological, agricultural or geological formations.

Statement of Indemnity

A geophysical survey is a scientific procedure that produces observations of results which are influenced by specific variables. The results and subsequent interpretation of the geophysical survey presented here should not be treated as an absolute representation of the underlying archaeological features, but as a hypothesis that must be proved or disproved. ***Direct investigations are recommended to confirm the findings of this report.*** *Verification can only be provided via intrusive means, such as Test Trench excavations.*

1 Introduction

1.1 Brief Description of the Proposed Development

Earthsound Geophysics Ltd. were commissioned by Meath County Council to carry out a geophysical survey along preselected areas of the preferred route of the N2 around Slane Village, County Meath.

The preferred route corridor, c. 3.5km in length runs from the N2 north of Slane, it crosses the N51 and the river Boyne and reconnects to the N2 to the south of Slane. The geophysical surveys were undertaken over 24 pre-determined sites encompassing a total area of 25.75 hectares with the intention of detecting any previously unknown archaeological remains as part of an evaluation of the archaeological and cultural heritage along the preferred route.

1.2 Aims of the Survey

Meath County Council required an archaeological geophysical survey of the route of the N2 Slane Bypass as part of the archaeological and cultural heritage assessment in advance of the scheme. The surveys have been carried out in accordance with the brief prepared by Meath County Council. The aims of the Geophysical Surveys were to:

- identify any geophysical anomalies of possible archaeological origin within the specified survey areas.
- accurately locate these anomalies and present the findings in map form.
- describe the anomalies and discuss their likely provenance in a written report.
- recommend any further work (including other forms of geophysical survey if appropriate) likely to contribute to the mitigation of the impacts of the road scheme on these features.
- incorporate all of the above in a report to Meath County Council.

1.3 Archaeological Background and Statutory Protections

Geophysical survey have been carried out in 2005, 2008 and 2010 as part of a previous N2 Slane Bypass Scheme. In 2018 during the routing study for the present scheme development, a further phase of geophysical survey was carried out at numerous locations along the route options which were identified as being of archaeological potential. The previous geophysical surveys were carried out by GSB, Target Geophysics and JML. The current geophysical surveys are intended to bridge the gap and survey fields that have not been previously surveyed.

The National Monuments Acts (1930-2014) prohibit the unauthorised use of detecting devices on archaeological sites as well as unauthorised searches for archaeological objects using such devices. All elements of the survey were carried out in accordance with a written method statement and an application for a detection licence from the Department of Culture, Heritage, and the Gaeltacht to carry out the work. The Detection Licence number 20R0238 was issued to Heather Gimson.

1.4 Health and Safety requirements

A health and safety statement was submitted to Meath County Council/TII prior to the commencement of work.

2 Methodology

The fieldwork was carried out between the 23rd November and 4th December 2020 by C. Hogan and U. Garner of Earthsound Geophysics Ltd.

A Magnetometer survey was carried out using a LEA MAX Förster gradiometer system. The survey areas covered a total of 25.75 hectares. The surveys were undertaken gridlessly with each data point logged using a Trimble RTK GPS VRS Now system.

This technique has been used in commercial and research archaeological projects for many years and are considered the most appropriate techniques for a detailed investigation of the underlying archaeology (Aspinall *et al*. 2008, Clark 1996, Scollar *et al*. 1990, Gaffney & Gater 2003).

Throughout the survey areas background signatures can be seen which compose of dipolar and strong magnetic anomalies. These are not associated with buried archaeological features as they have no formation but instead are spread randomly across the fields. The presence of green manure within the landscape causes these signatures. It raises the background values and has the capacity of obscuring small weak archaeological signatures.

2.1 Magnetometer Survey

Instrument	Eastern Atlas LEA MAX1505 System
Components	LEA D2, 10-channel digitiser
Data Acquisition Resolution	0.5m x 0.1m
Sensors	8 x Förster FEREX® 4.032 CON650 fluxgate gradiometers
Platform	LEA MAX1505 System cart
Data Acquisition Method	Gridless, using a Trimble RTK GPS VRS Now system to an accuracy of 5cm
Sensitivity	<0.2 nT
Data Logger	Panasonic Toughbook CF-H2 Field computer
Calibration	According to manufacturers guidelines (Pilz & Goossens 2015)
Data Processing	Ealdec: Profile decoding Ealmat.m: Normalisation, drift correction Process-it: Surfer 8: Data Gridding (0.5m x 0.25m), using the Kriging Gridding Method
Graphical Display	Greyscale -2nT (white) to 2nT (black)

2.2 Reporting, Mapping & Archiving

The geophysical survey and report follow the recommendations outlined by relevant best practice guidance documents as a minimum standard (Bonsall *et al*. 2014; David *et al*. 2008; Gaffney *et al*. 2002, Schmidt *et al*. 2015).

Ordnance Survey of Ireland mapping was supplied by Meath County Council.

Geophysical data, the figures presented here and the text have been archived following the recommendations of the Archaeology Data Service (Schmidt & Ernenwein 2011).

3 Results & Discussion

The interpretation figures should not be looked at in isolation but in conjunction with the relevant discussion section and with the information contained in the Appendices. Features are highlighted in the interpretation diagrams and are described and interpreted within the text.

3.1 Area 1

Survey Methodology:	**Magnetometer**	**Townland:**	**Slane**
ITM Coordinate:	697108,775296	**OD height of Survey Area**	80 m OD
Survey Weather Conditions:	Overcast	**Survey Date and Area (Ha):**	25/11/20 1.16 Ha
Site Description:	Undulating pasture field.		
Figure No.:	4 & 5		

No.	Form of Anomaly	ITM NGR (E,N)	Possible Source(s) of Anomaly						Comment	Recommendation	
			Ditch	**Archaeology**	**Poss. Archaeology**	Ferrous	Geology / Soils	Interference / Modern		Test Excavation	Geophysical Survey
Site 1-1	Zone of dipolar responses	697126.338,775310.739			✓	✓			Possible demolition rubble associated with a number of buildings and boundary features seen on the historic 6in OS map (1837-1842).	✓	
Site 1-2	Linear magnetic anomaly	697105.726,775329.767	✓		✓				Possible ditch or cut feature, c.12m in length. May be associated with historic farm buildings visible on historic 6in OS map (1837-1842).	✓	
Site 1-3	Zone of dipolar responses	697087.314,775312.232			✓	✓			Possible demolition rubble associated with a number of buildings and boundary features seen on the first ed. historic 6in OS map (1837-1842).	✓	
Site 1-4	Linear magnetic anomalies	697090.189,775307.657	✓		✓				Possible ditch or cut feature, c.38m in length. May be associated with historic farm buildings visible on historic 6in OS map (1837-1842).	✓	
Site 1-5	Multiple linear and curvilinear anomalies	697087.052,775280.766	✓		✓				A cluster of possible ditches or cut features which may be associated with historic farm buildings visible on historic 6in OS map (1837-1842).	✓	
Site 1-6	Linear magnetic anomaly	697124.400,775278.525	✓		✓				Possible ditch or cut feature, c.17.4m in length. May be associated with historic farm buildings visible on historic 6in OS map (1837-1842).	✓	
Site 1-7	Linear magnetic anomaly	697088.397,775253.128	✓		✓				Possible ditch or cut feature, c.46.7m in length. May be associated with historic farm buildings visible on historic 6in OS map (1837-1842).	✓	
	Weakly magnetic trends	Multiple locations			✓		✓		Series of weakly magnetic trends which could be archaeological, agricultural or geological in origin.	✓	
	Parallel anomalies	Multiple locations						✓	Cultivation furrows running in SW-NE direction.		
	Highly magnetic responses	Multiple locations						✓	Modern disturbance, most likely caused by fencing materials or dumping against the field boundaries.		

3.2 Area 2

Survey Methodology:	**Magnetometer**	**Townland:**	**Slane**
ITM Coordinate:	697324,775134	**OD height of Survey Area**	78m OD
Survey Weather Conditions:	Overcast	**Survey Date and Area (Ha):**	25/11/20 0.29 Ha
Site Description:	N-facing agricultural land.		
Figure No.:	4 & 5		

No.	Form of Anomaly	ITM NGR (E,N)	Possible Source(s) of Anomaly						Comment	Recommendation	
			Ditch	**Archaeology**	**Poss. Archaeology**	Ferrous	Geology / Soils	Interference / Modern		Test Excavation	Geophysical Survey
	Weakly magnetic trends	Multiple locations			✓		✓		Series of weakly magnetic trends which could be archaeological, agricultural or geological in origin.	✓	

3.3 Area 3

Survey Methodology:	**Magnetometer**	**Townland:**	**Slane**
ITM Coordinate:	697384,774653	**OD height of Survey Area**	67 m OD
Survey Weather Conditions:	Overcast	**Survey Date and Area (Ha):**	25/11/20 1.17 Ha
Site Description:	Pasture field with areas of waterlogging present.		
Figure No.:	6 & 7		

No.	Form of Anomaly	ITM NGR (E,N)	Possible Source(s) of Anomaly						Comment	Recommendation	
			Ditch	**Archaeology**	**Poss. Archaeology**	Ferrous	Geology / Soils	Interference / Modern		Test Excavation	Geophysical Survey
Site 3-1	Multiple zones of magnetic enhancement	697377.921,774673.319 Multiple locations			✓		✓		A number of areas of raised magnetism ranging from c. 3m to 21m in diameter were detected across the survey area. These may be areas of ploughed out archaeological materials or burning, but could also be caused by natural changes in the soil composition or geology.	✓	
Site 3-2	Linear magnetic anomaly	697355.521,774643.740	✓		✓				Possible ditch or cut feature, 80m in length which could be agricultural or archaeological in origin.	✓	
Site 3-3	Linear magnetic anomaly	697403.914,774670.526	✓		✓				Possible ditch or cut feature, 98m in length which could be agricultural or archaeological in origin.	✓	
Site 3-4	Linear magnetic anomaly	697381.235,774661.597	✓		✓				Possible cut feature, c. 26m in length which could be agricultural or archaeological in origin and crosses anomaly 3-3.	✓	
Site 3-5	Linear magnetic anomaly	697348.556,774638.026	✓		✓				Possible ditch, c. 71.7m in length which could be agricultural or archaeological in origin. This anomaly may contain burnt remains.	✓	
Site 3-6	Linear magnetic anomaly	697334.092,774626.240	✓		✓				Possible ditch, c. 18m in length and forking at the W end, which could be agricultural or archaeological in origin. May be a continuation of anomaly 3-7.	✓	
Site 3-7	Linear magnetic anomaly	697391.414,774647.669	✓		✓				Possible ditch or field drain, 79.5m in length which could be agricultural or archaeological in origin. May be a continuation of anomaly 3-6.	✓	
Site 3-8	Linear magnetic anomaly	697393.378,774632.847	✓		✓				Possible ditch or field drain, 90m in length which could be agricultural or archaeological in origin.	✓	
	Weakly magnetic trends	Multiple locations			✓		✓		Series of weakly magnetic trends which could be archaeological, agricultural or geological in origin.	✓	
	Highly magnetic responses	Multiple locations						✓	Areas of modern dumping along the field boundary and in the NE section of the survey area.		

3.4 Area 4

Survey Methodology:	**Magnetometer**	**Townland:**	**Slane**
ITM Coordinate:	697307,774005	**OD height of Survey Area**	64 m OD
Survey Weather Conditions:	Overcast	**Survey Date and Area (Ha):**	24/11/20 1.94 Ha
Site Description:	Flat pasture field.		
Figure No.:	8 & 9		

No.	Form of Anomaly	ITM NGR (E,N)	Possible Source(s) of Anomaly						Comment	Recommendation	
			Ditch	**Archaeology**	**Poss. Archaeology**	Ferrous	Geology / Soils	Interference / Modern		Test Excavation	Geophysical Survey
Site 4-1	Magnetic curvilinear anomaly	697350.491,774035.603	✓		✓				Possible ditch or cut feature, 58m in length which could be agricultural or archaeological in origin. This anomaly may contain burnt remains.	✓	
Site 4-2	Linear magnetic anomaly	697337.122,774025.821	✓		✓				Possible ditch or cut feature, 49.6m in length which could be agricultural or archaeological in origin. May be a continuation of historic field boundary 4-3.	✓	
Site 4-3	Linear magnetic anomaly	697399.649,774031.894	✓		✓				Possible ditch, 54m in length which corresponds to a historic field boundary on the 1838-1842 6in OS map. May continue as ditch 4-2 towards W.	✓	
Site 4-4	Isolated magnetic responses	697290.465,774012.424 Multiple locations			✓		✓		A number of isolated possible pits were detected throughout the survey area. These anomalies may be associated with archaeological activity; alternatively they could be caused by natural changes in the soil or geological activities.	✓	
Site 4-5	Magnetic linear anomaly	697275.193,773969.394	✓		✓				A possible ditch, c. 100m in length and running parallel to the W field boundary. Possibly containing burnt remains this anomaly could be agricultural or archaeological in origin.	✓	
Site 4-6	Magnetic linear anomaly	697373.752,773991.650	✓		✓				Possible ditch, 39.4m in length which corresponds to a historic field boundary on the 1838-1842 6in OS map.	✓	
	Weakly magnetic trends	Multiple locations			✓		✓		Series of weakly magnetic trends which could be archaeological, agricultural or geological in origin.	✓	
	Highly magnetic response	Multiple locations						✓	Modern disturbance associated with fencing materials and dumping of ferrous materials.		

3.5 Area 5

Survey Methodology:	**Magnetometer**	**Townland:**	**Slane**
ITM Coordinate:	697289,773907	**OD height of Survey Area**	62 m OD
Survey Weather Conditions:	Overcast	**Survey Date and Area (Ha):**	24/11/20 0.19 Ha
Site Description:	Pasture field.		
Figure No.:	8 & 9		

No.	Form of Anomaly	ITM NGR (E,N)	Possible Source(s) of Anomaly						Comment	Recommendation	
			Ditch	**Archaeology**	**Poss. Archaeology**	Ferrous	Geology / Soils	Interference / Modern		Test Excavation	Geophysical Survey
Site 5-1	Linear magnetic anomaly	697282.453,773895.307	✓		✓				Possible ditch, 39.4m in length which could be agricultural or archaeological in origin.	✓	
	Weakly magnetic trend	697318.160,773916.095			✓		✓		A weakly magnetic trend which could be archaeological, agricultural or geological in origin.	✓	
	Highly magnetic responses	Multiple locations						✓	Modern disturbance associated with fencing materials and dumping of ferrous materials.		

3.6 Area 6

Survey Methodology:	**Magnetometer**	**Townland:**	**Slane**
ITM Coordinate:	697207,773860	**OD height of Survey Area**	61 m OD
Survey Weather Conditions:	Overcast	**Survey Date and Area (Ha):**	24/11/20 1.27 Ha
Site Description:	Flat pasture field.		
Figure No.:	8 & 9		

No.	Form of Anomaly	ITM NGR (E,N)	Possible Source(s) of Anomaly						Comment	Recommendation	
			Ditch	**Archaeology**	**Poss. Archaeology**	Ferrous	Geology / Soils	Interference / Modern		Test Excavation	Geophysical Survey
Site 6-1	Interconnecting magnetic anomalies	697213.781,773921.352	✓		✓				Two possible ditches or cut features which form a 'T-shaped' anomaly which could be agricultural or archaeological in origin.	✓	
Site 6-2	Magnetic curvilinear anomaly	697199.852,773856.642	✓		✓				Curvilinear possible ditch or cut feature, 66m in length. This possible agricultural boundary could contain burnt remains on its northern edge and may be associated with anomaly 6-3.	✓	
Site 6-3	Linear magnetic anomaly	697218.959,773850.352	✓		✓				Possible ditch or cut feature, 12m in length. This anomaly may be associated with 6-2 or possibly the arcing series of magnetic trends detected to the north. The anomaly could be archaeological, agricultural or geological in origin.	✓	
Site 6-4	Magnetic curvilinear anomaly	697191.102,773837.674							Possible ditch or cut feature, 12m in length which could relate to archaeological or agricultural processes.	✓	
Site 6-5	Linear magnetic anomaly	697193.424,773833.388							Possible ditch or cut feature, 9m in length which may be related to 6-4 and could be archaeological or agricultural in origin.	✓	
Site 6-6	Linear magnetic anomaly	697190.924,773819.459							Possible ditch which may contain burnt remains. Measuring 61m in length this anomaly runs parallel to the modern field boundary and is likely to be agricultural in origin.	✓	
Site 6-7	Right-angled magnetic anomaly	697174.138,773809.816							Possible ditch or cut feature, 12m in length which contains a right-angled bend at its northern extent. This anomaly may be associated with 6-4 or 6-5 and could be archaeological or agricultural.	✓	
	Weakly magnetic trends	Multiple locations			✓		✓		Series of weakly magnetic trends which could be archaeological, agricultural or geological in origin.	✓	
	Highly magnetic response	Multiple locations						✓	Modern disturbance associated with fencing materials and dumping of ferrous materials.		

3.7 Area 7

Survey Methodology:	**Magnetometer**	**Townland:**	**Slane**
ITM Coordinate:	697084,773791	**OD height of Survey Area**	59 m OD
Survey Weather Conditions:	Overcast	**Survey Date and Area (Ha):**	25/11/20 0.8 Ha
Site Description:	Agricultural land on a S-facing slope.		
Figure No.:	8 & 9		

No.	Form of Anomaly	ITM NGR (E,N)	Possible Source(s) of Anomaly						Comment	Recommendation	
			Ditch	**Archaeology**	**Poss. Archaeology**	Ferrous	Geology / Soils	Interference / Modern		Test Excavation	Geophysical Survey
Site 7-1	Two interconnecting magnetic anomalies	697068.312,773765.628	✓		✓				Possible ditch or cut feature which comprises of two interconnecting features. Measuring 60m E-W and 17m N-S this anomaly could be agricultural or archaeological in origin.	✓	
	Weakly magnetic trends	Multiple locations			✓		✓		Series of weakly magnetic trends which could be archaeological, agricultural or geological in origin.	✓	
	Parallel anomalies	Multiple locations						✓	Cultivation furrows.		

3.8 Area 8

Survey Methodology:	**Magnetometer**	**Townland:**	**Slane**
ITM Coordinate:	697001,773659	**OD height of Survey Area**	50 m OD
Survey Weather Conditions:	Overcast	**Survey Date and Area (Ha):**	23/11/20 1.79 Ha
Site Description:	Agricultural land on a S-facing slope.		
Figure No.:	8 & 9		

No.	Form of Anomaly	ITM NGR (E,N)	Possible Source(s) of Anomaly						Comment	Recommendation	
			Ditch	**Archaeology**	**Poss. Archaeology**	Ferrous	Geology / Soils	Interference / Modern		Test Excavation	Geophysical Survey
Site 8-1	Three highly magnetic curvilinear anomalies	697016.893,773685.52, 697009.96,773675.99, 697030.182,773678.012			✓		✓		Three highly magnetic anomalies which are suggestive of geological dykes, however the local area is not prone to geological dykes and their formation is unusual. It is possible that the anomalies are associated with a cut feature containing large amounts of burnt or fired material. These anomalies need to be tested to determine their origin.	✓	
Site 8-2	Three sections of a linear anomaly	697035.717,773698.904, 697018.37,773651.293, 696998.071,773598.152	✓		✓				Three sections of a ditch were detected crossing the length of the survey area. The anomaly was detected in three sections due to the disturbance from 8-1 and an electric fence, however they relate to one ditch which is likely to be agricultural in origin.	✓	
Site 8-3	Magnetic anomaly	697018.627,773608.419	✓		✓				Possible ditch, 17m in length which could be archaeological or agricultural.	✓	
Site 8-4	Magnetic curvilinear anomaly	697066.162,773704.862	✓		✓				Possible ditch or cut feature, 38m in length which may be archaeological or agricultural in origin.	✓	
Site 8-5	Series of isolated magnetic responses	Multiple locations			✓		✓		Series of isolated features which were detected in the northern half of the survey area. These could be archaeological in origin or associated with geological outcrops from 8-1.	✓	
Site 8-6	Two interconnecting magnetic anomalies	697001.007,773677.067	✓		✓				Two interconnecting ditch or cut features, 42m & 13m in length which could be archaeological or agricultural in nature.	✓	
Site 8-7	Magnetic curvilinear anomaly	696984.156,773651.619	✓		✓				Possible ditch or cut feature, 33m in length which possibly continues into 8-9. This anomaly could be archaeological or agricultural.	✓	
Site 8-8	Two interconnecting magnetic anomalies	696977.787,773672.97	✓		✓				Two interconnecting ditch or cut features, 42m & 21m in length which are likely to be agricultural in origin.	✓	
Site 8-9	Magnetic curvilinear anomaly	696984.425,773687.503	✓		✓				Possible ditch or cut feature, 62m in length which could relate to archaeological or agricultural processes and appears to have been truncated by 8-8 and crossed by 8-10.	✓	
Site 8-10	Magnetic anomaly	696996.724,773718.135	✓		✓				Possible ditch, 25m in length which could be archaeological or agricultural.	✓	
	Weakly magnetic trends	Multiple locations			✓		✓		Series of weakly magnetic trends which could be archaeological, agricultural or geological in origin.	✓	
	Highly magnetic zone							✓	Magnetic interference from an electric fence present in the field		

3.9 Area 9

Survey Methodology:	**Magnetometer**	**Townland:**	**Slane**
ITM Coordinate:	696952,773466 & 696894,773409	**OD height of Survey Area**	34 m OD
Survey Weather Conditions:	Sunny	**Survey Date and Area (Ha):**	24/11/20 0.71 & 0.79 Ha
Site Description:	Pasture field. Some steep S-facing slopes were present which could not be surveyed as well as areas overgrown with gorse bushes and trees.		
Figure No.:	10 & 11		

No.	Form of Anomaly	ITM NGR (E,N)	Possible Source(s) of Anomaly						Comment	Recommendation	
			Ditch	**Archaeology**	**Poss. Archaeology**	Ferrous	Geology / Soils	Interference / Modern		Test Excavation	Geophysical Survey
Site 9-1	Zones of dipolar anomalies	Multiple locations			✓	✓	✓		Multiple zones of dipolar anomalies were detected across the survey area. Associated with deposits which have metallic components within them, it is possible that these are archaeological, agricultural or associated with river flooding or river dredging.	✓	
Site 9-2	Linear anomaly	696908.737,773461.484	✓		✓				Possible cut feature, 14m in length which could be archaeological or agricultural.	✓	
Site 9-3	Linear magnetic anomaly	696912.377,773484.526	✓		✓				Possible cut feature, 12m in length which could be archaeological or agricultural in origin.	✓	
Site 9-4	Linear magnetic anomaly	696931.385,773474.42	✓		✓				Possible ditch or cut feature, 34m in length which may be associated with 9-5 and may represent a relict field boundary.	✓	
Site 9-5	Sub-rectangular magnetic anomaly	696945.944,773483.313	✓		✓				Three sections of ditch or cut feature which form a sub-rectangular feature, 17m in length and 8m in width. This ditch could be associated with structural remains.	✓	
Site 9-6	Sub-circular magnetic anomaly	696973.849,773471.994	✓		✓				Sub-circular ditch or cut feature which is located within the centre of a zone of dipolar anomalies (9-1). Measuring 21m E-W and 14m N-S this could be archaeological in origin or associated with a deposit which forms anomaly 9-1.	✓	
Site 9-7	Series of curvilinear magnetic anomalies	Multiple locations	✓		✓				Three small possible cut features which appear to form a curvilinear possible boundary feature, possibly associated with 9-1 or 9-6. This anomaly could be archaeological.	✓	
Site 9-8	Curvilinear magnetic anomaly	697007.821,773461.484	✓		✓				Curvilinear ditch or cut feature, 32m in length which could be archaeological, agricultural or associated with adjacent deposits 9-1.	✓	
Site 9-9	Linear magnetic anomaly	696901.053,773395.187	✓		✓				Possible ditch or cut feature, 32m in length which may represent a relict field boundary, possibly extending into anomaly 9-4.	✓	
Site 9-10	Linear magnetic anomaly	696942.708,773368.506	✓		✓				Possible ditch or cut feature, 204m in length. This anomaly may represent an old bank of the River Boyne or a relict field boundary.	✓	
	Weakly magnetic trends	Multiple locations			✓		✓		Series of weakly magnetic trends which could be archaeological, agricultural or geological in origin.	✓	
	Highly magnetic zone							✓	Magnetic interference from the adjacent fence line		

3.10 Area 10

Survey Methodology:	**Magnetometer**	**Townland:**	**Fennor**
ITM Coordinate:	696857,773278	**OD height of Survey Area**	- m OD
Survey Weather Conditions:	-	**Survey Date and Area (Ha):**	- 0.68 Ha
Site Description:	The survey could not be undertaken within this site due to the presence of a waterlogged and flooded landscape.		
Figure No.:	10 & 11		

3.11 Area 11

Survey Methodology:	**Magnetometer**	**Townland:**	**Fennor**
ITM Coordinate:	696825,773180	**OD height of Survey Area**	20 m OD
Survey Weather Conditions:	Sunny	**Survey Date and Area (Ha):**	02/12/20 0.53 Ha
Site Description:	Pasture field on a moderate to steep N-facing slope. The northern survey edge extends into a wide ditch.		
Figure No.:	10 & 11		

No.	Form of Anomaly	ITM NGR (E,N)	Possible Source(s) of Anomaly						Comment	Recommendation	
			Ditch	**Archaeology**	**Poss. Archaeology**	Ferrous	Geology / Soils	Interference / Modern		Test Excavation	Geophysical Survey
Site 11-1	Series of raised magnetic responses	Multiple locations	✓		✓		✓		Series of isolated and undulating magnetic responses, measuring between 2m and 6m in length, which could be associated with archaeological, agricultural or geological processes.	✓	
Site 11-2	Linear magnetic anomaly	696783.036,773184.245	✓		✓				Linear ditch or cut feature, 27m in length which is likely to be agricultural in origin.	✓	
Site 11-3	Linear magnetic anomaly	696810.352,773178.418	✓		✓				Linear ditch or cut feature, 38m in length which runs parallel to 11-2 and may bound part of 11-1. It is likely that this anomaly is agricultural in origin.	✓	
Site 11-4	Highly magnetic response	696839.745,773177.456			✓			✓	Possible area of burning which may be associated with industrial archaeological activity, alternatively the burning may be relatively modern in origin.	✓	
	Weakly magnetic trends	Multiple locations			✓		✓		Series of weakly magnetic trends which could be archaeological, agricultural or geological in origin.	✓	
	Parallel anomalies	Multiple locations						✓	Cultivation furrows.		
	Highly magnetic zone							✓	Magnetic interference associated with an unknown source which is likely to be modern in origin.		

3.12 Area 11a

Survey Methodology:	**Magnetometer**	**Townland:**	**Fennor**
ITM Coordinate:	696678,773221	**OD height of Survey Area**	- m OD
Survey Weather Conditions:	-	**Survey Date and Area (Ha):**	- 1.34 Ha
Site Description:	The survey could not be undertaken within this site due to the presence of a steep slope.		
Figure No.:	10 & 11		

3.13 Area 12

Survey Methodology:	**Magnetometer**	**Townland:**	**Fennor**
ITM Coordinate:	696791,773034	**OD height of Survey Area**	- m OD
Survey Weather Conditions:	-	**Survey Date and Area (Ha):**	- 0.75 Ha
Site Description:	The survey could not be undertaken within this site due to the presence of crop.		
Figure No.:	10 & 11		

3.14 Area 13

Survey Methodology:	**Magnetometer**	**Townland:**	**Fennor**
ITM Coordinate:	696738,772904	**OD height of Survey Area**	45 m OD
Survey Weather Conditions:	Sunny	**Survey Date and Area (Ha):**	26/11/20 0.96 Ha
Site Description:	Agricultural land on a N-facing slope.		
Figure No.:	10 & 11		

No.	Form of Anomaly	ITM NGR (E,N)	Possible Source(s) of Anomaly						Comment	Recommendation	
			Ditch	**Archaeology**	**Poss. Archaeology**	Ferrous	Geology / Soils	Interference / Modern		Test Excavation	Geophysical Survey
Site 13-1	Sub-circular magnetic anomaly	696751.308,772932.007	✓		✓				Sub-circular ditch or cut feature, 9m E-W and 12m N-S. This anomaly could be an archaeological ring ditch and there is a small possible entranceway visible on the western edge.	✓	
Site 13-2	Linear magnetic anomaly	696701.81,772896.485	✓		✓				Possible ditch or cut feature, 83m in length which is likely to be agricultural in origin.	✓	
Site 13-3	Curvilinear magnetic anomaly	696719.572,772879.619	✓		✓				Possible ditch or cut feature which was detected in two portions due to the presence of a central dipolar anomaly which is modern in origin and not associated with anomaly 13-3. Measuring 70m in length this anomaly could be archaeological or agricultural.	✓	
Site 13-4	Curvilinear magnetic anomaly	696713.616,772888.57	✓		✓				Possible ditch or cut feature, 11m in length which could be archaeological, agricultural or geological in origin.	✓	
Site 13-5	Curvilinear magnetic anomaly	696696.916,772878.51	✓		✓				Possible ditch or cut feature, 18m in length which could be archaeological, agricultural or geological in origin.	✓	
Site 13-6	Linear magnetic anomaly	696761.577,772846.643	✓		✓				Possible ditch or cut feature, 21m in length which could be archaeological or agricultural in origin and appears to run parallel to 13-2.	✓	
Site 13-7	Linear band of raised magnetism	696742.753,772845.098			✓		✓		Linear band of magnetic enhancement which could be geological in origin. Alternatively it could be associated with a ploughed out archaeological or agricultural feature.	✓	
Site 13-8	Sub-circular magnetic anomaly	696710.627,772835.124	✓		✓				Sub-circular ditch, 7m E-W and 8m N-S which is likely to contain burnt deposits. The ditch is archaeological in origin and contains a southern opening c.3.6m in width, at which point the ditches appear to splay out.	✓	
	Weakly magnetic trends	Multiple locations			✓		✓		Series of weakly magnetic trends which could be archaeological, agricultural or geological in origin.	✓	
	Highly magnetic zone							✓	Magnetic interference from the adjacent fence line and other unknown sources		

3.15 Area 14

Survey Methodology:	**Magnetometer**	**Townland:**	**Fennor**
ITM Coordinate:	696689,772701	**OD height of Survey Area**	51 m OD
Survey Weather Conditions:	Period of rain	**Survey Date and Area (Ha):**	26/11/20 2.26 Ha
Site Description:	Undulating pasture field on a N-facing slope and divided by an electric fence. An overgrown mound is located in the northern section of the field and a geological borehole machine was present along the eastern edge of the survey area.		
Figure No.:	12 & 13		

No.	Form of Anomaly	ITM NGR (E,N)	Possible Source(s) of Anomaly						Comment	Recommendation	
			Ditch	**Archaeology**	**Poss. Archaeology**	Ferrous	Geology / Soils	Interference / Modern		Test Excavation	Geophysical Survey
Site 14-1	Linear magnetic anomaly	696685.659,772750.878	✓		✓				Linear ditch, 90m in length which is likely to be agricultural in origin.	✓	
Site 14-2	Linear magnetic anomaly	696670.572,772722.43	✓		✓				Linear ditch, 97m in length which crosses 14-1 and is likely to be related to it. This anomaly represents a relict agricultural boundary.	✓	
Site 14-3	Linear magnetic anomaly	696705.323,772745.549	✓		✓				Ditch or cut feature, 42m in length which is possibly associated with 14-2. This ditch or cut feature is likely to be agricultural in origin.	✓	
Site 14-4	Zone of raised magnetism	696723.918,772747.656			✓		✓		Zone of magnetic enhancement which runs in a rough NE-SW direction. Measuring 75m in length this anomaly is likely to be geological in origin; however an archaeological explanation cannot be completely ruled out without test trenching it.	✓	
Site 14-5	Zone of dipolar responses	696715.176,772712.351			✓	✓	✓		Zone of dipolar anomalies, c.21m in diameter which is associated with deposits which have metallic components within them. These may be archaeological or agricultural.	✓	
Site 14-6	Zone of raised magnetism	696669.015,772682.639			✓		✓		Zone of magnetic enhancement which runs in a rough NE-SW direction. Measuring 80m in length this anomaly is likely to be geological in origin however an archaeological explanation cannot be completely ruled out without test trenching it.	✓	
Site 14-7	Linear magnetic anomaly	696718.28,772691.917	✓		✓				Possible ditch or cut feature, 23m in length which may represent a continuation of 14-1.	✓	
Site 14-8	Curvilinear magnetic anomaly	696721.482,772696.728	✓		✓				Possible ditch or cut feature, 6m in length which may be archaeological, agricultural or geological in origin.	✓	
Site 14-9	Linear magnetic anomaly	696721.482,772696.728	✓		✓				Possible ditch or cut feature, 34m in length which is likely to be agricultural in origin.	✓	
Site 14-10	Linear magnetic anomaly	696628.326,772654.776	✓		✓				Possible ditch or cut feature, 11m in length which could be archaeological or agricultural in nature.	✓	

Survey Methodology:	**Magnetometer**	**Townland:**	**Fennor**
ITM Coordinate:	696689,772701	**OD height of Survey Area**	51 m OD
Survey Weather Conditions:	Period of rain	**Survey Date and Area (Ha):**	26/11/20 2.26 Ha
Site Description:	Undulating pasture field on a N-facing slope and divided by an electric fence. An overgrown mound is located in the northern section of the field and a geological borehole machine was present along the eastern edge of the survey area.		
Figure No.:	12 & 13		

No.	Form of Anomaly	ITM NGR (E,N)	Possible Source(s) of Anomaly						Comment	Recommendation	
			Ditch	**Archaeology**	**Poss. Archaeology**	Ferrous	Geology / Soils	Interference / Modern		Test Excavation	Geophysical Survey
Site 14-11	Linear magnetic anomaly	696677.482,772642.65	✓		✓				Possible ditch or cut feature, 76m in length which runs roughly parallel to 14-1 and is likely to be agricultural in origin.	✓	
Site 14-12	Linear magnetic anomaly	696709.602,772603.599	✓		✓				Possible ditch or cut feature, 15m in length which runs parallel to 14-11 and is likely to be agricultural.	✓	
Site 14-13	Curvilinear magnetic anomaly	696699.81,772596.048	✓		✓				Possible ditch or cut feature, 57m in length which could be associated with archaeological or agricultural processes.	✓	
Site 14-14	Linear magnetic anomaly	696658.187,772609.051	✓		✓				Linear ditch which corresponds to a relict field boundary shown on the historic 25in OS map (1888-1913).	✓	
	Weakly magnetic trends	Multiple locations			✓		✓		Series of weakly magnetic trends which could be archaeological, agricultural or geological in origin.	✓	
	Highly magnetic zone							✓	Magnetic interference from the adjacent fence line, earthen mound, electric fence, pylon and geological borehole machine.		

3.16 Area 15

Survey Methodology:	**Magnetometer**	**Townland:**	**Cullen**
ITM Coordinate:	696517,772306	**OD height of Survey Area**	56 m OD
Survey Weather Conditions:	Periods of rain	**Survey Date and Area (Ha):**	27/12/20 1.92 Ha
Site Description:	Flat agricultural field.		
Figure No.:	12 & 13		

No.	Form of Anomaly	ITM NGR (E,N)	Possible Source(s) of Anomaly						Comment	Recommendation	
			Ditch	**Archaeology**	**Poss. Archaeology**	Ferrous	Geology / Soils	Interference / Modern		Test Excavation	Geophysical Survey
Site 15-1	Linear magnetic anomaly	696498.378,772326.888	✓		✓				Three section of ditch were detected running down the western edge of the survey area. Measuring 164 in total length this anomaly is likely to represent a relict field boundary. This anomaly interlinks with 15-7.	✓	
Site 15-2	Linear magnetic anomaly	696527.712,772380.198	✓		✓				Possible ditch or cut feature, 15m in length which appears to lead from 15-1. It is likely that this anomaly is also agricultural in origin.	✓	
Site 15-3	Right-angled magnetic anomaly	696522.846,772370.641	✓		✓				Right-angled possible ditch or cut feature, 24m in length which could be archaeological or agricultural in origin.	✓	
Site 15-4	Linear magnetic anomaly	696558.387,772309.026	✓		✓				Two sections of a ditch or cut feature, 68m in total length, were detected which are likely to represent a relict field boundary associated with 15-1.	✓	
Site 15-5	Right-angled magnetic anomaly	696536.046,772261.557	✓		✓				Right-angled possible ditch or cut feature, 45m in length which could be archaeological or agricultural in origin and is crossed by 15-6.	✓	
Site 15-6	Linear magnetic anomaly	696533.251,772255.461	✓		✓				Ditch, 90m in length which interlinks with 15-7 and is likely to be agricultural in origin.	✓	
Site 15-7	Sub-rectangular magnetic anomaly	696482.611,772238.727	✓		✓				Sub-rectangular ditched enclosure which could be archaeological or agricultural in origin. This anomaly appears to contain burnt deposits and measures 42m by 32m. A number of possible breaks or entranceways can be seen within anomaly 15-7. The presence of this enclosure appears to have influenced the surrounding landscape as it's ditches define the orientation of the surrounding probable field boundaries (15-1 & 15-6).	✓	
	Weakly magnetic trends	Multiple locations			✓		✓		Series of weakly magnetic trends which could be archaeological, agricultural or geological in origin.	✓	
	Highly magnetic zone							✓	Magnetic interference from unknown sources		

3.17 Area 16

Survey Methodology:	**Magnetometer**	**Townland:**	**Johnstown**
ITM Coordinate:	696283,772189	**OD height of Survey Area**	60 m OD
Survey Weather Conditions:	Light rain	**Survey Date and Area (Ha):**	01/12/20 0.98 Ha
Site Description:	Flat pasture field.		
Figure No.:	12 & 13		

No.	Form of Anomaly	ITM NGR (E,N)	Possible Source(s) of Anomaly						Comment	Recommendation	
			Ditch	**Archaeology**	**Poss. Archaeology**	Ferrous	Geology / Soils	Interference / Modern		Test Excavation	Geophysical Survey
Site 16-1	Zones of dipolar responses	Multiple locations			✓	✓	✓		Three large zones of dipolar anomalies which are likely to be associated with demolition, imported soils or the spread on relatively modern debris. The presence of this material is likely to mask any underlying potential archaeological responses.	✓	
Site 16-2	Isolated magnetic response	696282.921,772232.149	✓		✓				Possible pit or cut feature, 5m in width which could be archaeological in origin or associated with the adjacent anomaly 16-1.	✓	
Site 16-3	Sub-circular magnetic anomaly	696309.165,772137.831	✓		✓				Small sub-circular possible ditch or cut feature which was detected in the southern corner of the survey area. Measuring 16m in length this anomaly could represent archaeological material or have been caused by changes within the surrounding deposit (anomaly 16-1).	✓	
	Highly magnetic zone							✓	Magnetic interference from the adjacent gateway		

3.18 Area 17

Survey Methodology:	**Magnetometer**	**Townland:**	**Johnstown**
ITM Coordinate:	696274,772083	**OD height of Survey Area**	62 m OD
Survey Weather Conditions:	Light rain	**Survey Date and Area (Ha):**	01/12/20 0.62 Ha
Site Description:	Pasture field on a slight W-facing slope.		
Figure No.:	12 & 13		

No.	Form of Anomaly	ITM NGR (E,N)	Possible Source(s) of Anomaly						Comment	Recommendation	
			Ditch	**Archaeology**	**Poss. Archaeology**	Ferrous	Geology / Soils	Interference / Modern		Test Excavation	Geophysical Survey
Site 17-1	Arcing magnetic anomaly	96280.745,772110.897	✓	✓					Arcing ditch which represents an archaeological enclosure ditch. Measuring 29m in diameter this feature is likely to extend into area 16 but has been masked by the dipolar zone (16-1). This enclosure ditch is relatively magnetic suggesting that it might contain burnt remains.	✓	
Site 17-2	Series of isolated magnetic responses	Multiple locations			✓				Series of possible pits which are located within enclosure 17-1. A number of these pits appear to run along the internal edge of the enclosure ditch suggesting the presence of a possible palisade or further enclosing element. Three larger possible pits can be seen within the centre of the enclosure.	✓	
Site 17-3	Series of isolated magnetic responses	Multiple locations			✓		✓		Four further possible pits were detected on the northern edge of the survey area. These may represent archaeological pits or could be associated with agricultural processes.	✓	
Site 17-4	Linear magnetic anomaly	696246.432,772090.19	✓		✓				Possible ditch or cut feature, 62m in length this runs parallel to the field boundary and is likely to represent a relict field division.	✓	
Site 17-5	Linear magnetic anomaly	696305.429,772107.77	✓		✓				Possible ditch or cut feature, 27m in length which could be archaeological or agricultural in origin.	✓	
Site 17-6	Linear magnetic anomaly	696294.125,772072.227	✓		✓				Possible ditch or cut feature, 10m in length which could be archaeological or agricultural in origin or associated with the adjacent magnetic trends.	✓	
Site 17-7	Linear magnetic anomaly	696298.461,772066.299	✓		✓				Possible ditch or cut feature, 57m in length which could be archaeological or agricultural in nature.	✓	
Site 17-8	Linear magnetic anomaly	696302.885,772050.106	✓		✓				Possible ditch or cut feature, 70m in length this runs roughly parallel to the field boundary and is likely to represent a relict field division.	✓	
	Weakly magnetic trends	Multiple locations			✓		✓		Series of weakly magnetic trends which could be archaeological, agricultural or geological in origin.	✓	
	Parallel anomalies	Multiple locations						✓	Cultivation furrows.		

3.19 Area 18

Survey Methodology:	**Magnetometer**	**Townland:**	**Johnstown**
ITM Coordinate:	696396,772068	**OD height of Survey Area**	63 m OD
Survey Weather Conditions:	Overcast	**Survey Date and Area (Ha):**	27/12/20 0.51 Ha
Site Description:	Agricultural field on a W-facing slope.		
Figure No.:	12 & 13		

No.	Form of Anomaly	ITM NGR (E,N)	Possible Source(s) of Anomaly						Comment	Recommendation	
			Ditch	**Archaeology**	**Poss. Archaeology**	Ferrous	Geology / Soils	Interference / Modern		Test Excavation	Geophysical Survey
Site 18-1	Series of isolated magnetic responses	Multiple locations			✓		✓		Four possible pits or dug features which may be archaeological, agricultural or geological in origin.	✓	
	Weakly magnetic trends	Multiple locations			✓		✓		Series of weakly magnetic trends which could be archaeological, agricultural or geological in origin.	✓	
	Parallel anomalies	Multiple locations						✓	Cultivation furrows.		

3.20 Area 19

Survey Methodology:	**Magnetometer**	**Townland:**	**Cashel**
ITM Coordinate:	697567,774111	**OD height of Survey Area**	74 m OD
Survey Weather Conditions:	Heavy rain	**Survey Date and Area (Ha):**	02/12/20 1.26 Ha
Site Description:	Heavily poached pasture field rising towards S. A semi-circular low stone wall lined with mature trees is located in the centre of the field. This has the appearance of an old quarry in the SW part of the survey area.		
Figure No.:	6 & 7		

No.	Form of Anomaly	ITM NGR (E,N)	Possible Source(s) of Anomaly						Comment	Recommendation	
			Ditch	**Archaeology**	**Poss. Archaeology**	Ferrous	Geology / Soils	Interference / Modern		Test Excavation	Geophysical Survey
Site 19-1	Linear magnetic anomaly	697556.954,774116.39	✓		✓				Possible ditch or cut feature, 15m in length which could be agricultural or archaeological in origin.	✓	
Site 19-2	Linear magnetic anomaly	697563.74,774110.379	✓		✓				Possible ditch or cut feature, 9m in length which could be agricultural or archaeological.	✓	
Site 19-3	Zone of dipolar responses	697593.662,774095.365			✓	✓	✓		Zone of dipolar anomalies, c.57m in length which is associated with deposits which have metallic components within them. It may be archaeological or agricultural in origin.	✓	
Site 19-4	Curvilinear magnetic anomaly	697513.86,774088.67	✓		✓				Possible ditch or cut feature, 15m in length which could be agricultural or archaeological in nature.	✓	
Site 19-5	Linear magnetic anomaly	697512.788,774060.671	✓		✓				Possible ditch or cut feature, 17m in length which could be agricultural or archaeological.	✓	
Site 19-6	Linear magnetic anomaly	697505.911,774056.954	✓		✓				Possible ditch or cut feature, 28m in length which could be agricultural or archaeological in origin.	✓	
	Weakly magnetic trends	Multiple locations			✓		✓		Series of weakly magnetic trends which could be archaeological, agricultural or geological in origin.	✓	
	Highly magnetic zone							✓	Magnetic interference from the adjacent field boundary		

3.21 Area 20

Survey Methodology:	**Magnetometer**	**Townland:**	**Cashel**
ITM Coordinate:	697683,774140	**OD height of Survey Area**	80 m OD
Survey Weather Conditions:	Rain	**Survey Date and Area (Ha):**	02/12/20 0.73 Ha
Site Description:	Heavily poached pasture field on a N-facing slope.		
Figure No.:	6 & 7		

No.	Form of Anomaly	ITM NGR (E,N)	Possible Source(s) of Anomaly						Comment	Recommendation	
			Ditch	**Archaeology**	**Poss. Archaeology**	Ferrous	Geology / Soils	Interference / Modern		Test Excavation	Geophysical Survey
Site 20-1	Linear magnetic anomaly	697713,774140.781	✓		✓				Possible ditch or cut feature, 37m in length which could be agricultural or archaeological in origin.	✓	
Site 20-2	Zone of dipolar responses	697716.613,774099.245			✓	✓	✓		Zone of dipolar anomalies, c.58m in length which is associated with deposits which have metallic components within them. It may be archaeological or agricultural in origin.	✓	
Site 20-3	Arcing magnetic anomaly	697745.721,774098.242	✓	✓					Enclosure ditch which possibly contains burnt deposits. Measuring at least 27m in diameter this ditch is located on the southern edge of the survey area and is archaeological in origin.	✓	
Site 20-4	Isolated magnetic response	697745.721,774098.242 ,			✓				Possible pit located within enclosure 20-3. It is likely that other pits exist beyond the survey area.	✓	
	Weakly magnetic trends	Multiple locations			✓		✓		Series of weakly magnetic trends which could be archaeological, agricultural or geological in origin.	✓	
	Parallel anomalies	Multiple locations						✓	Cultivation furrows.		
	Highly magnetic zone							✓	Magnetic interference from the adjacent field boundaries		

3.22 Area 21

Survey Methodology:	**Magnetometer**	**Townland:**	**Cashel**
ITM Coordinate:	697768,774152	**OD height of Survey Area**	- m OD
Survey Weather Conditions:	-	**Survey Date and Area (Ha):**	- 0.6 Ha
Site Description:	The survey could not be undertaken within this site due to the presence of horses which could not be moved.		
Figure No.:	6 & 7		

3.23 Area 22

Survey Methodology:	**Magnetometer**	**Townland:**	**Cashel**
ITM Coordinate:	697482.436 ,774438.481	**OD height of Survey Area**	75 m OD
Survey Weather Conditions:	Dry	**Survey Date and Area (Ha):**	01/12/20 0.5 Ha
Site Description:	Undulating agricultural field rising towards the centre of the survey area and sloping down towards N and S.		
Figure No.:	6 & 7		

No.	Form of Anomaly	ITM NGR (E,N)	Possible Source(s) of Anomaly						Comment	Recommendation	
			Ditch	**Archaeology**	**Poss. Archaeology**	Ferrous	Geology / Soils	Interference / Modern		Test Excavation	Geophysical Survey
Site 22-1	Linear magnetic anomaly	697483.142,774489.356	✓		✓				Possible ditch, 48m in length which appears to contain possible burnt deposits and could be agricultural or archaeological in origin.	✓	
Site 22-2	Linear magnetic anomaly	697494.477,774467.292	✓		✓				Possible ditch or cut feature, 10m in length which appears to contain possible burnt deposits and could be agricultural or archaeological in origin.	✓	
Site 22-3	Linear magnetic anomaly	697495.471,774462.72	✓		✓				Possible ditch or cut feature, 4.5m in length which appears to contain possible burnt deposits and could be agricultural or archaeological in origin. Alternatively this feature could represent two closely spaced possible pits.	✓	
Site 22-4	Linear magnetic anomaly	697493.88,774458.149	✓		✓				Highly magnetic ditch, 46m in length which terminates close to the extant field boundary. This ditch could have been burnt and may be archaeological or agricultural.	✓	
Site 22-5	Linear magnetic anomaly	697477.574,774456.161	✓		✓				Possible ditch or cut feature, 20m in length which appears to contain possible burnt deposits and could be agricultural or archaeological in origin. Alternatively this feature could comprise of multiple closely spaced possible pits.	✓	
Site 22-6	Arcing magnetic anomaly	697467.631,774433.899	✓	✓					Enclosure ditch, 38m in length. This enclosure ME019-085 has been truncated by the modern field boundary and extends into the western field (as detected by GSB in a previous geophysical survey in 2005 for the previous N2 Slane Bypass Scheme). The highly magnetic nature of anomaly 22-6 suggests that it contains burnt remains and may have suffered burning itself. There is a small possible break or entranceway detected in the centre of the anomaly.	✓	
Site 22-7	Sub-circular magnetic anomaly	697498.454,774439.464	✓	✓					Sub-circular enclosure ditch which is located on the southeastern edge of enclosure 22-6 (ME019-085). Measuring 31m E-W and 29m N-S this enclosure contains very strong magnetism suggesting that it contains burnt remains or may have suffered burning itself. A possible break of entranceway can be seen in the southwest corner while two possible ditches form the northeast portion of the enclosure. A ditch spur leading from the northeast portion of the enclosure may indicate that it was interlinked with further archaeological features.	✓	

Survey Methodology:	**Magnetometer**	**Townland:**	**Cashel**
ITM Coordinate:	697482.436 ,774438.481	**OD height of Survey Area**	75 m OD
Survey Weather Conditions:	Dry	**Survey Date and Area (Ha):**	01/12/20 0.5 Ha
Site Description:	Undulating agricultural field rising towards the centre of the survey area and sloping down towards N and S.		
Figure No.:	6 & 7		

No.	Form of Anomaly	ITM NGR (E,N)	Possible Source(s) of Anomaly						Comment	Recommendation	
			Ditch	**Archaeology**	**Poss. Archaeology**	Ferrous	Geology / Soils	Interference / Modern		Test Excavation	Geophysical Survey
Site 22-8	Series of isolated responses	697479.96,774439.663 Multiple locations			✓				A large number of possible pits were detected within the centre of enclosure 22-7. No discernible pattern can be seen within these pits but they may be associated with the magnetic trend also detected in the centre of the enclosure.	✓	
Site 22-9	Series of isolated responses	697470.216,774413.426 Multiple locations			✓				Four possible pits which are located on the southern edge of enclosure 22-7. These anomalies may be archaeological or agricultural in origin.	✓	
Site 22-10	Two of isolated responses	697501.635,774451.788, 697501.635,774444.235			✓		✓		Two possible pits which are located close to the northeast side of enclosure 22-7. These anomalies may be archaeological or agricultural in origin.	✓	
Site 22-11	Linear magnetic anomaly	697512.374,774439.663			✓		✓		Possible ditch, cut feature or pit which is located on the edge of the survey area. Measuring 4m in width this anomaly extends beyond the survey area and therefore is difficult to fully classify. It may be archaeological or agricultural in origin.	✓	
Site 22-12	Linear magnetic anomaly	697512.374,774431.315	✓		✓				Possible ditch or cut feature, 7m in width which is likely to have similar origins to 22-11 and could be archaeological or agricultural in nature. It is possible that 22-13 surrounds this anomaly.	✓	
Site 22-13	Arcing magnetic anomaly	697507.402,774423.96	✓		✓				Arcing possible ditch or cut feature, 25m in length which possibly surrounds 22-12. This possible enclosure ditch may interlink with the eastern ditch spur of enclosure 22-7. No evidence of burnt remains can be seen within ditch 22-13.	✓	
Site 22-14	Linear magnetic anomaly	697505.943,774418.568	✓		✓				Linear ditch which corresponds to a relict field boundary shown on historic 6in OS map (1837-1842).	✓	
	Weakly magnetic trends	Multiple locations			✓		✓		Series of weakly magnetic trends which could be archaeological, agricultural or geological in origin.	✓	
	Parallel anomalies	Multiple locations						✓	Cultivation furrows.		

3.24 Site 23

Survey Methodology:	**Magnetometer**	**Townland:**	**Slane**
ITM Coordinate:	697291.7675,775336.231	**OD height of Survey Area**	77 m OD
Survey Weather Conditions:	Overcast	**Survey Date and Area (Ha):**	30/11/20 0.5 Ha
Site Description:	Pasture field on a slight E-facing slope.		
Figure No.:	4 & 5		

No.	Form of Anomaly	ITM NGR (E,N)	Possible Source(s) of Anomaly						Comment	Recommendation	
			Ditch	**Archaeology**	**Poss. Archaeology**	Ferrous	Geology / Soils	Interference / Modern		Test Excavation	Geophysical Survey
Site 23-1	Linear magnetic anomaly	697289.251,775336.454	✓		✓				Linear ditch which corresponds to a relict field boundary shown on historic 6in OS map (1837-1842).	✓	
Site 23-2	Linear magnetic anomaly	697321.45,775327.278	✓		✓				Linear ditch which corresponds to a relict field boundary shown on historic 6in OS map (1837-1842).	✓	
Site 23-3	Highly magnetic response	697330.676,775319.285			✓			✓	Possible area of burning which may be associated with industrial archaeological activity, alternatively the burning may be relatively modern in origin.	✓	
Site 23-4	Curvilinear magnetic anomaly	697299.471,775294.254	✓		✓				Possible ditch or cut feature, 99m in length which could be agricultural or archaeological in origin. There is a possible break within the centre of the anomaly.	✓	
	Weakly magnetic trends	Multiple locations			✓		✓		Series of weakly magnetic trends which could be archaeological, agricultural or geological in origin.	✓	
	Highly magnetic zone							✓	Magnetic interference from the adjacent field boundaries and structures.		

4 Conclusion

4.1 Summary of Results

The geophysical surveys undertaken for this report have revealed a landscape which has been heavily impacted by human activity. Evidence of agricultural activity can be seen through the detection of relict field boundaries, field divisions and ditches, cultivation furrows and green manure. Evidence for possible geological activity and potential River Boyne dredging or embanking can also be seen.

Four sites of archaeological interest have been identified: two enclosure ditches and a ring ditch. In addition a sub-circular enclosure and associated pits were found on the side of a monument identified during a geophysical survey undertaken in 2005 for the previous N2 Slane Bypass Scheme. The site identified during the previous geophysical survey was added to the SMR ME019-085 (to be included in the next revision of the RMP). Further potential archaeological activity includes a possible ring ditch, possible pits, ditches and cut features.

A number of debris zones were detected which contain metallic components; these could be associated with structural demolition or imported soils and could be archaeologically significant. A series of zones of magnetic enhancement were also detected which could indicate archaeological, agricultural or geological formations.

4.2 Dissemination

The results of this survey were submitted to Meath County Council. Additional copies will be distributed in accordance with the Consent to use a Detection Device (see Appendix 2).

5 Acknowledgements

Report: Heather Gimson BA (Hons) MSc MIAI
Ursula Garner BSc (Hons) MSc

Fieldwork: Cian Hogan BSc (Hons) MIAI
Ursula Garner BSc (Hons) MSc

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7 Figures

Technical Appendix

Appendix 1: Anomaly Classifications

Magnetometer

Magnetometer surveys are undertaken using magnetic gradiometers which measure the magnetic content of the underlying soils. Measurements are gained using sensors which calculate the difference between the geological / pedological background and anthropogenic remains associated with archaeological activity.

Positive Magnetic Anomalies
Burnt features, particularly kilns, but also hearths, furnaces and burnt (specifically 'burnt', not 'heated') mounds of stone will create a strongly magnetic anomaly due to thermoremanence. Cut features, such as pits, ditches or wooden postholes will create anomalies that will vary in shape and magnetic intensity depending on which material they were backfilled by (Fassbinder 2015). For cut features backfilled (or 'refilled') by

- magnetically enhanced topsoil – the refill will generate a positive magnetic anomaly
- homogeneous topsoil – the refill will generate an anomaly proportional to the size and volume of the archaeological feature.

The magnetic anomaly shape and intensity will also be determined by concentrations of pottery, ash or burned material, solid rocks or other material.

Negative Magnetic Anomalies
Negative magnetic anomalies have a number of causes (Fassbinder 2015):

- The material remains of the archaeological feature may have a lower magnetic susceptibility (MS) than the adjacent topsoil. In some cases the MS of a ditch may appear as both a positive and negative anomaly, reflecting the variable MS of the refill material. Some stone foundations can also appear as weakly magnetic or negative magnetic anomalies.
- If a cut feature is immediately refilled by the same material e.g. a grave cut excavated before a funeral is (almost) immediately refilled by the human body and the same (unaltered) sediment that was excavated before.
- Geochemical processes (see Fassbinder 2015) can alter the magnetic response, e.g. an archaeological feature identified by a positive anomaly can convert to a negative anomaly due to the combination of stagnant moisture and a changing groundwater table.

Dipolar Anomalies
A dipolar anomaly is a response to buried ferrous objects, often in the topsoil. Iron spikes generally are not removed in geophysical data; although often modern in origin (iron agricultural implements, rubbish), they can be indicative of archaeological material.

Absence of Anomalies
It is also possible that archaeological features exist that exhibit no magnetic contrast and hence cannot be identified by magnetometer survey.

Anomaly classification used to interpret Magnetometer data

After Gaffney & Gater (2003) and Gaffney *et al*. (2000).

A known archaeological feature type e.g. Ditch / Wall / Structure etc: An anomaly with a magnetic gradient that contrasts strongly with the surrounding sub-soil, where the presence of a type of archaeological feature is known from supporting evidence.

Archaeology: A linear, curvilinear or isolated anomaly with a magnetic gradient that contrasts strongly with the surrounding sub-soil, without any supporting evidence from another source.

- **Ditch / Wall:** A linear, curvilinear, annular or penannular anomaly with a magnetic gradient that contrasts strongly with the surrounding sub-soil. A positive polarity suggests a ditch; a negative polarity suggests a stone-filled ditch or wall.
- **Burnt Mound / Spread:** A horseshoe or ovoid shaped anomaly with a positive magnetic gradient that contrasts strongly with the surrounding sub-soil. An associated trough may be observed as a positive/negative anomaly, a hearth may also be expected nearby. Isolated responses in the vicinity could represent spreads of (or ploughed out) heat shattered stones.
- **Hearth:** A small isolated area (<2m diameter) of higher magnetic gradient than the surrounding sub-soil (typically >6nT).
- **Pit:** A small isolated area (>1-2m diameter) of moderate to high magnetic gradient, judged to be caused by a pit-type feature with a fill more magnetic than the surrounding soil.

Industrial: An isolated anomaly with a strong positive gradient (>30nT), judged not to be surface iron. This type of anomaly is typically caused by the remains of kilns or furnaces.

Magnetic Enhancement: A broad area of moderate positive magnetic gradient that contrasts with the surrounding sub-soil. May represent cultural noise associated with occupation or soil disturbance, judged to be of archaeological origin.

Ferrous: Dipolar anomalies indicating ferrous responses, judged to be in the near-surface.

Cultivation: Parallel linear responses of positive or negative polarity. Strong responses may indicate added magnetic material (e.g. burnt deposits) as fertiliser. Lower magnetic gradient anomalies 'beneath' the furrow overprint may be obscured. Higher magnetic gradient anomalies may be visualised *in situ* or ploughed out 'beneath' the furrow overprint.

Possible Archaeology: A linear, curvilinear or isolated anomaly with a magnetic gradient that contrasts weakly with the surrounding sub-soil, without any supporting evidence from another source. Such categories may represent possible archaeological or geological sources.

Modern Disturbance: Area where the ground has been disturbed in the recent past. Characterised by very large magnetic gradients and a high level of noise often accompanied by concentrations of dipolar, near-surface ferrous responses. This category also represents anomalies whose source may lie beyond the survey area, such as fencelines, vehicles or modern buildings.

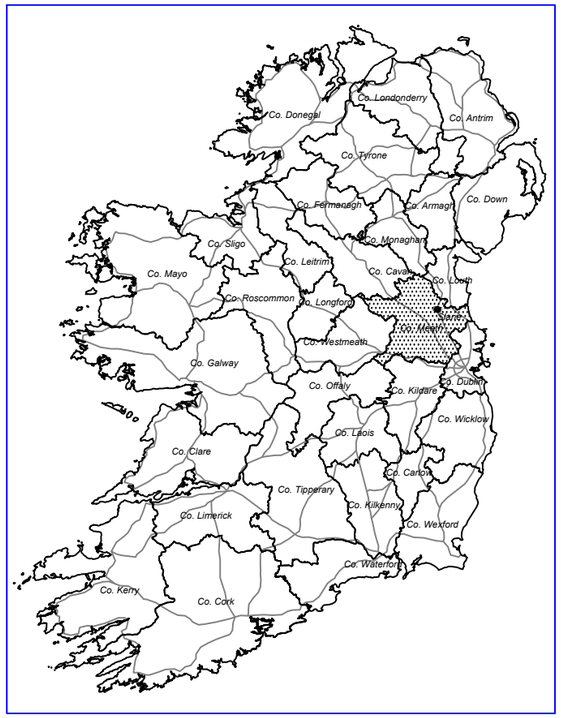
Modern Pipe: Straight, linear anomaly with very large magnetic gradients alternating regularly between positive and negative polarity.

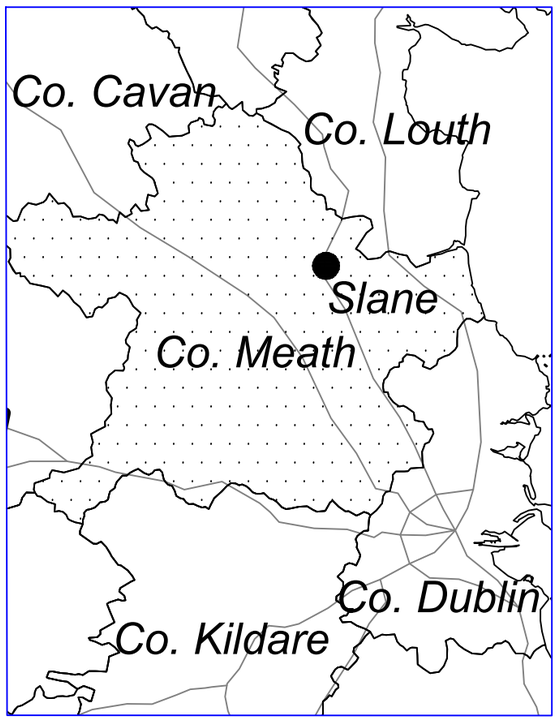
Previous Excavation?: Area of uniform magnetic signal contained within a well-defined boundary in regions otherwise densely covered with archaeological anomalies.

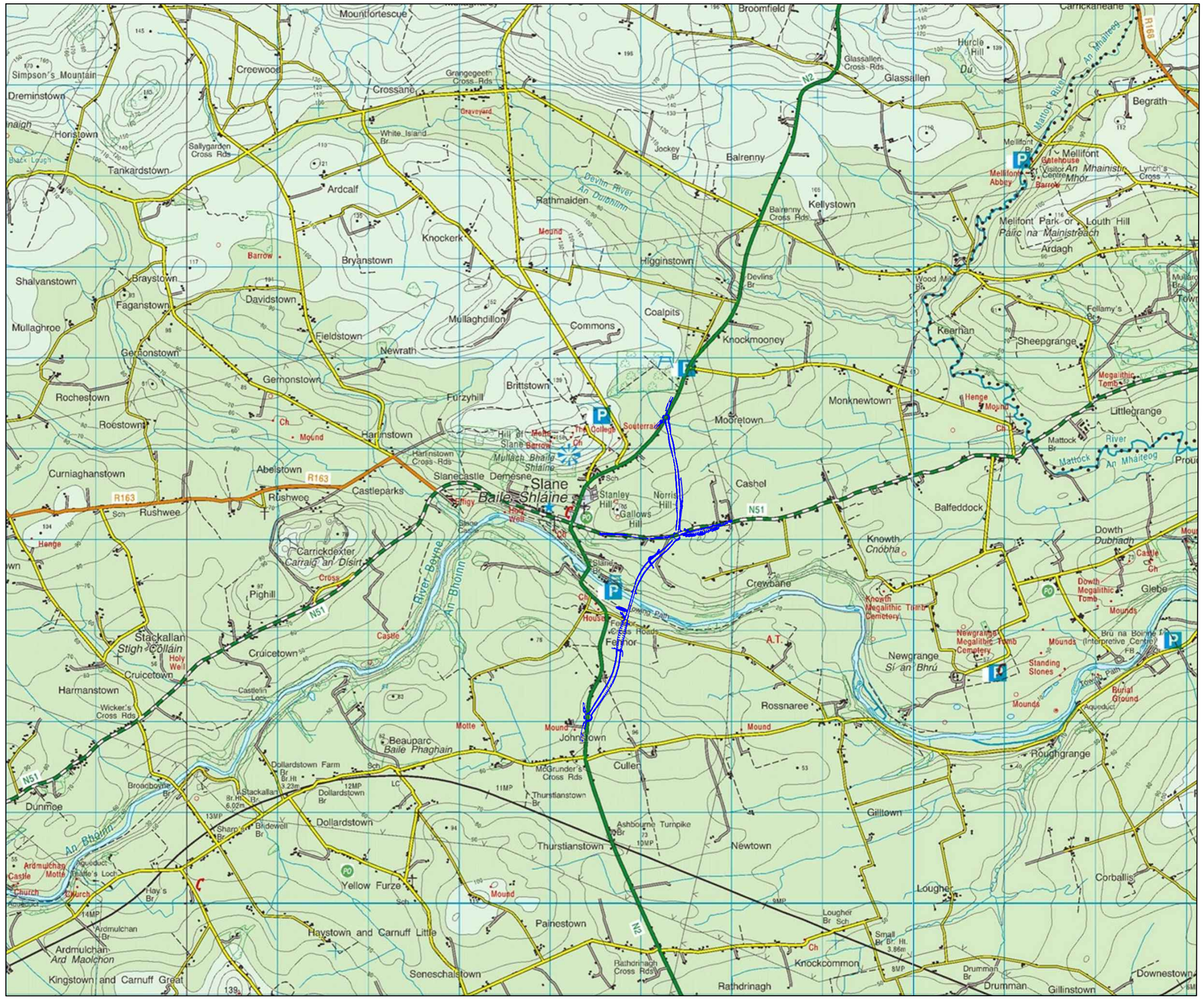
Geology: Anomalies of possible geomorphological origin.

Appendix 2: Geophysical Archive

- Copies of the archive are held by Earthsound Geophysics Ltd., at separate locations to ensure preservation against accidental damage or theft.
- The Client, Meath County Council, holds further copies of the report.
- A hard copy and a soft copy will be deposited with the Archaeological Licensing Section, National Monuments Service, Department of Culture, Heritage and the Gaeltacht, Room G50, Custom House, Dublin 1.
- A hard copy will be deposited with the National Museum of Ireland, Kildare Street, Dublin 2.







Legend

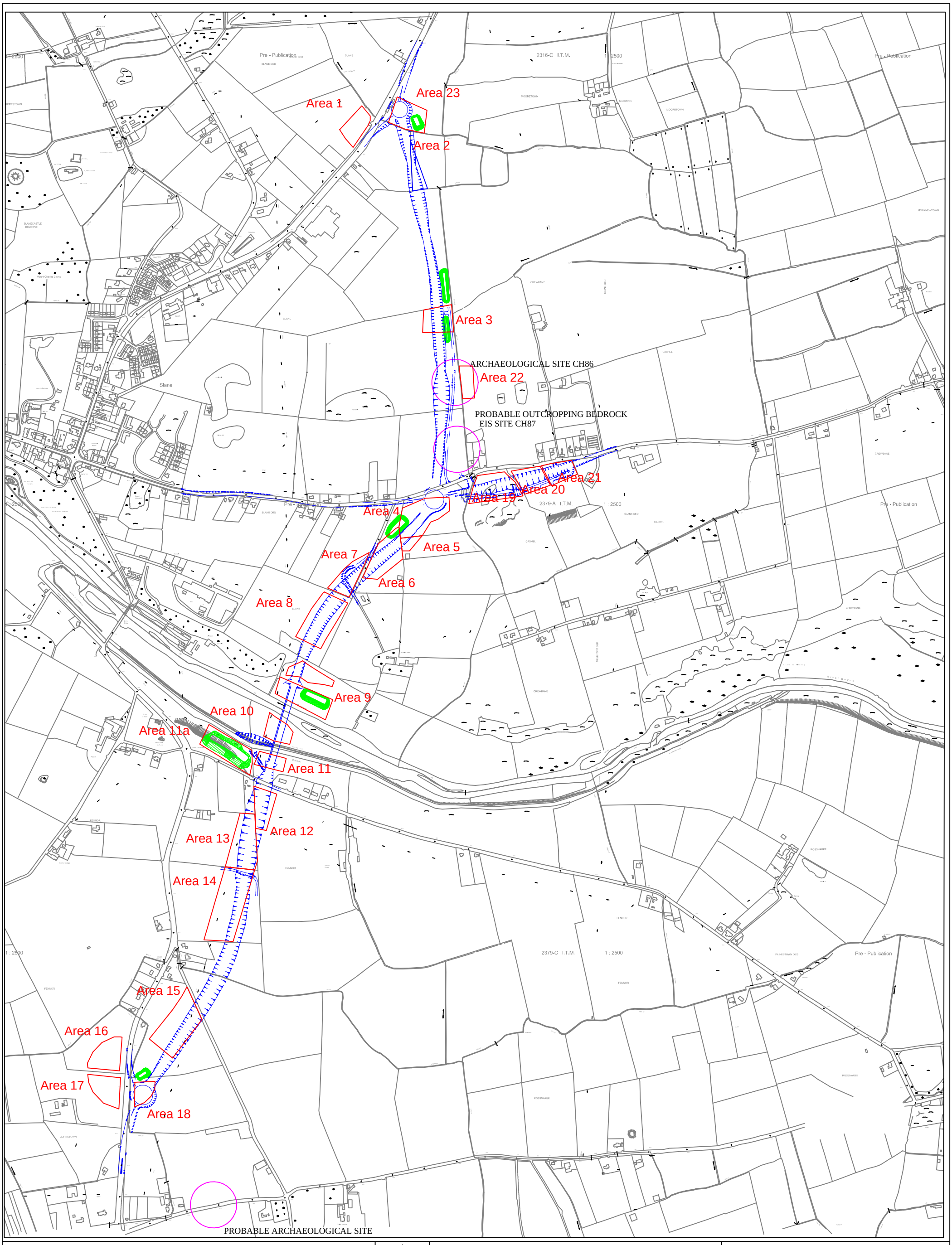
Current Proposed Road Alignment

Project: Slane Bypass, Phase 3, County Meath		
Client: Meath County Council		
Drawing Courtesy of: OSI	Date: 17/11/20	Drawing No.: 20-057/01

0m 2000m 4000m

Figure No. 1: Location Map

EARTHSOUND geophysics



Legend

- Basemap
- Current Proposed Road Alignment
- Current Proposed Attenuation Ponds
- Previously Identified Possible Archaeological Site
- Geophysical Survey Areas

Project: Slane Bypass, Phase 3, County Meath

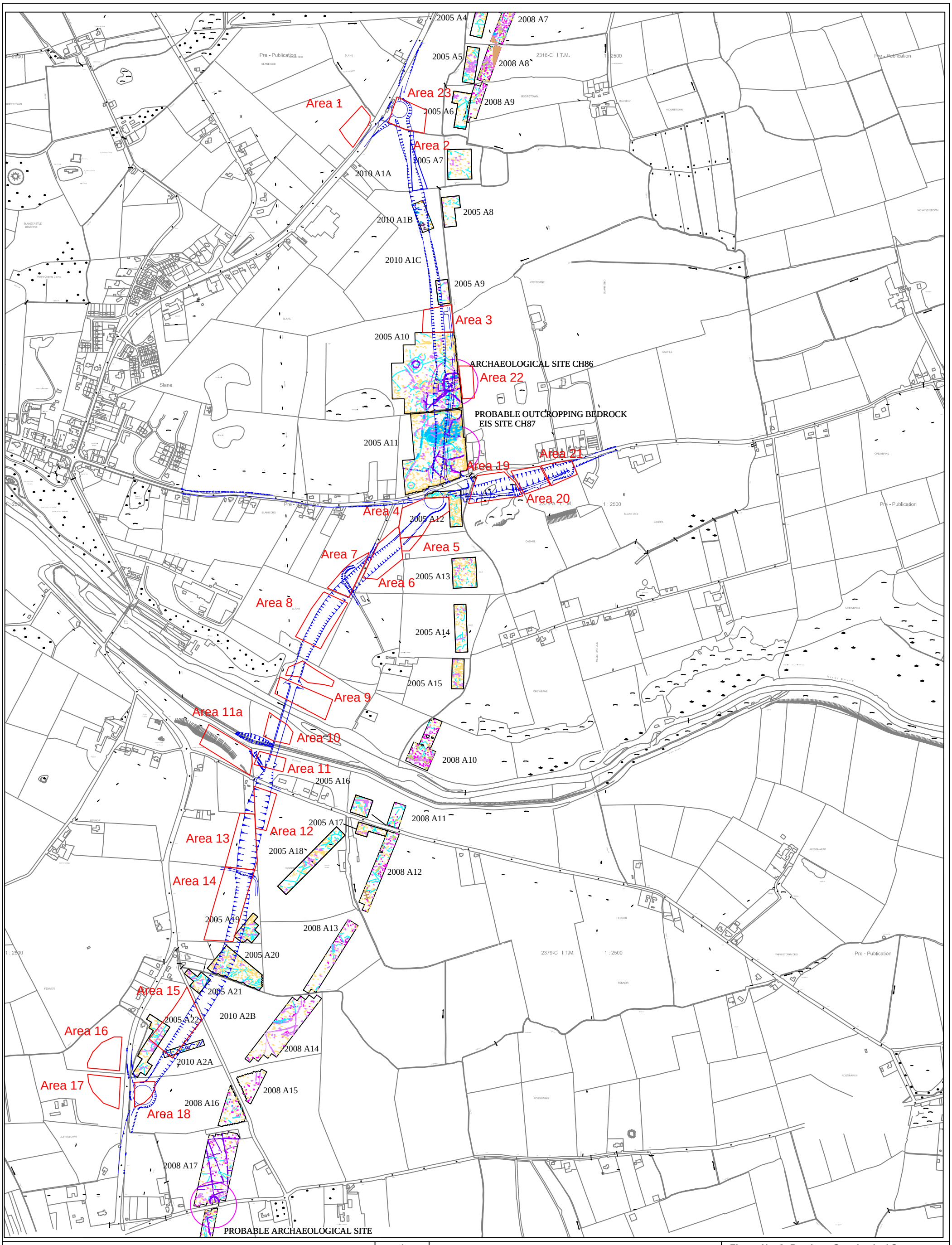
Client: Meath County Council

Drawing Courtesy of: OSI	Date: 17/11/20	Drawing No.: 20-057/02

0m 350m 700m

Figure No. 2: Detailed Location Map

EARTHSOUND geophysics



Legend

- Basemap
- Current Proposed Road Alignment
- Current Geophysical surveys Areas
- Previous Geophysical surveys conducted on the N2 Slane bypass - Interpretations included. Surveys undertaken by GSB, Target Geophysics and JML surveys.

Project: Slane Bypass, Phase 3, County Meath

Client: Meath County Council

Drawing Courtesy of: Meath CoCo / OSI	Date: 17/11/20	Drawing No.: 20-057/03

0m 350m 700m

Figure No. 3: Previous Geophysical Survey Areas

EARTHSOUND geophysics

Legend

- Basemap
- Geophysical Survey Areas
- Unsurveyable Areas

nT: -2 0 2

Project: Slane Bypass, Phase 3, County Meath

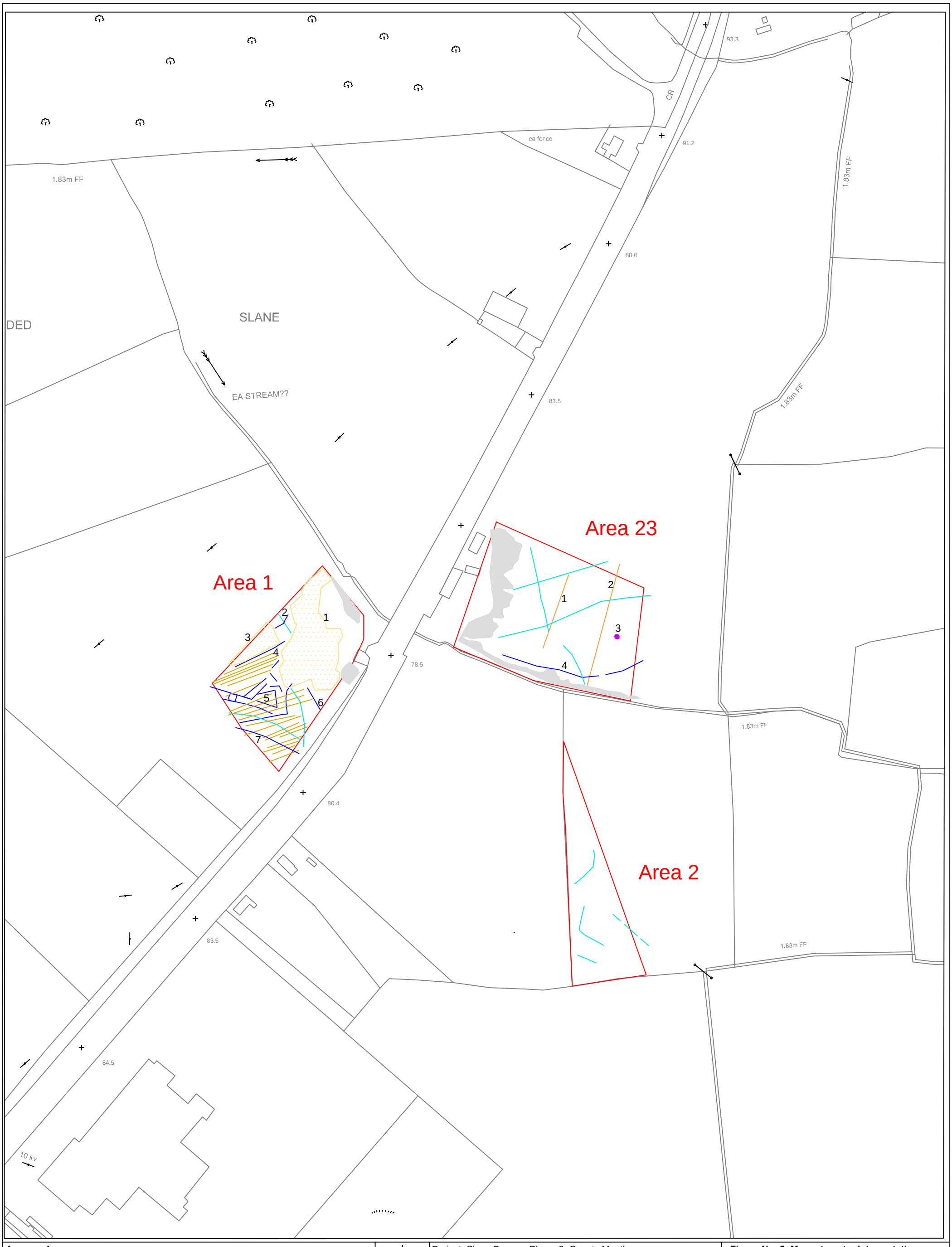
Client: Meath County Council

Drawing Courtesy of: Meath CoCo / OSI	Date: 01/12/20	Drawing No.: 20-057/04

0m 75m 150m

Figure No. 4: Magnetometer Data: Areas 1-2 & 23

EARTHSOUND geophysics



Legend

- Basemap
- Geophysical Survey Areas
- Archaeology
- Possible Archaeology
- Possible Industrial
- Magnetic Enhancement
- Trend
- Zone of Dipolar Anomalies
- Feature on Historic OS
- Cultivation
- Modern Disturbance
- Possible Geology

Project: Slane Bypass, Phase 3, County Meath

Client: Meath County Council

Drawing Courtesy of: Meath CoCo / OSI	Date: 1/12/20	Drawing No.: 20-057/05

0m 75m 150m

Figure No. 5: Magnetometer Interpretation: Areas 1-2 & 23

EARTHSOUND geophysics

CREWBANE

ea detail

1.83m FF

Area 3

Area 22

CR

67.0

64.2

63.3

68.4

71.9

Area 21

Area 20

Area 19

Area 4

Legend

Basemap

Geophysical Survey Areas

Unsurveyable Areas

nT

-2 0 2

Project: Slane Bypass, Phase 3, County Meath

Client: Meath County Council

Drawing Courtesy of: Meath CoCo / OSI | Date: 1/12/20 | Drawing No.: 20-057/06

0m 75m 150m

Figure No. 6: Magnetometer Data: Areas 3 & 19-22

EARTHSOUND geophysics

CREWBANE

ea detail

1.83m FF

Area 3

Area 22

Area 4

Area 19

Area 20

Area 21

CR

UND

72.9

71.9

68.4

67.0

64.2

63.3

Legend

- Basemap
- Geophysical Survey Areas
- Archaeology
- Possible Archaeology
- Possible Industrial
- Magnetic Enhancement
- Trend
- Zone of Dipolar Anomalies
- Feature on Historic OS
- Cultivation
- Modern Disturbance
- Possible Geology

Project: Slane Bypass, Phase 3, County Meath

Client: Meath County Council

Drawing Courtesy of: Meath CoCo / OSI | Date: 1/12/20 | Drawing No.: 20-057/07

0m 75m 150m

Figure No. 7: Magnetometer Interpretation: Areas 3 & 19-22

EARTHSOUND geophysics

Area 4

Area 5

Area 6

Area 7

Area 8

SLANE

Area 9

Janeville Cottage

68.4

65.2

63.8

64.2

63.3

61.7

53.8

10 kv

Legend

- Basemap
- Geophysical Survey Areas
- Unsurveyable Areas

nT

-2 0 2

Project: Slane Bypass, Phase 3, County Meath

Client: Meath County Council

Drawing Courtesy of: Meath CoCo / OSI | Date: 1/12/20 | Drawing No.: 20-057/08

0m 75m 150m

Figure No. 8: Magnetometer Data: Areas 4-8

EARTHSOUND geophysics

Area 4

Area 5

Area 6

Area 7

Area 8

SLANE

Area 9

Janeville Cottage

10 kv

68.4
65.2
63.8
63.3
64.2
61.7
53.8

Legend

- Basemap
- Geophysical Survey Areas
- Archaeology
- Possible Archaeology
- Possible Industrial
- Magnetic Enhancement
- Trend
- Zone of Dipolar Anomalies
- Feature on Historic OS
- Cultivation
- Modern Disturbance
- Possible Geology

Project: Slane Bypass, Phase 3, County Meath

Client: Meath County Council

Drawing Courtesy of: Meath CoCo / OSI	Date: 1/12/20	Drawing No.: 20-057/09

0m 75m 150m

Figure No. 9: Magnetometer Interpretation: Areas 4-8

EARTHSOUND geophysics

Area 9

Area 9

Area 10

Area 11a

Area 11

Area 12

Area 13

Area 14

Boyneville

Mills

10 kV

CR

River Boyne

EA CANAL DRY

Towing Path

Canal

Fennor Cross Roads

33.9

31.0

38.4

31.0

29.5

28.8

42.1

32.6

FENNOR

Fennor House

Legend

Basemap

Geophysical Survey Areas

Unsurveyable Areas

nT

-2 0 2

Project: Slane Bypass, Phase 3, County Meath

Client: Meath County Council

Drawing Courtesy of: Meath CoCo / OSI | Date: 1/12/20 | Drawing No.: 20-057/10

0m 75m 150m

Figure No. 10: Magnetometer Data: Areas 9-13

EARTHSOUND geophysics

Area 9

Area 10

Area 11a

Area 11

Area 12

Area 13

Area 14

Boyneville

Mills

10 kV

CR

River Boyne

EA CANAL DRY

Towing Path

Canal

Fennor Cross Roads

33.9

31.0

38.4

42.1

29.5

28.8

32.6

FENNOR

Fennor House

Legend

- Basemap
- Geophysical Survey Areas
- Archaeology
- Possible Archaeology
- Possible Industrial
- Magnetic Enhancement
- Trend
- Zone of Dipolar Anomalies
- Feature on Historic OS
- Cultivation
- Modern Disturbance
- Possible Geology

Project: Slane Bypass, Phase 3, County Meath

Client: Meath County Council

Drawing Courtesy of: Meath CoCo / OSI | Date: 1/12/20 | Drawing No.: 20-057/11

0m 75m 150m

Figure No. 11: Magnetometer Interpretation: Areas 9-13

EARTHSOUND geophysics

Area 14

Area 16

Area 15

Area 17

Area 18

49.3
54.9
59.9
61.9
62.0
1.83m FF
CULLEN
UND
CR
10 kv

Legend

- Basemap
- Geophysical Survey Areas
- Unsurveyable Areas

nT
-2 0 2

N

Project: Slane Bypass, Phase 3, County Meath

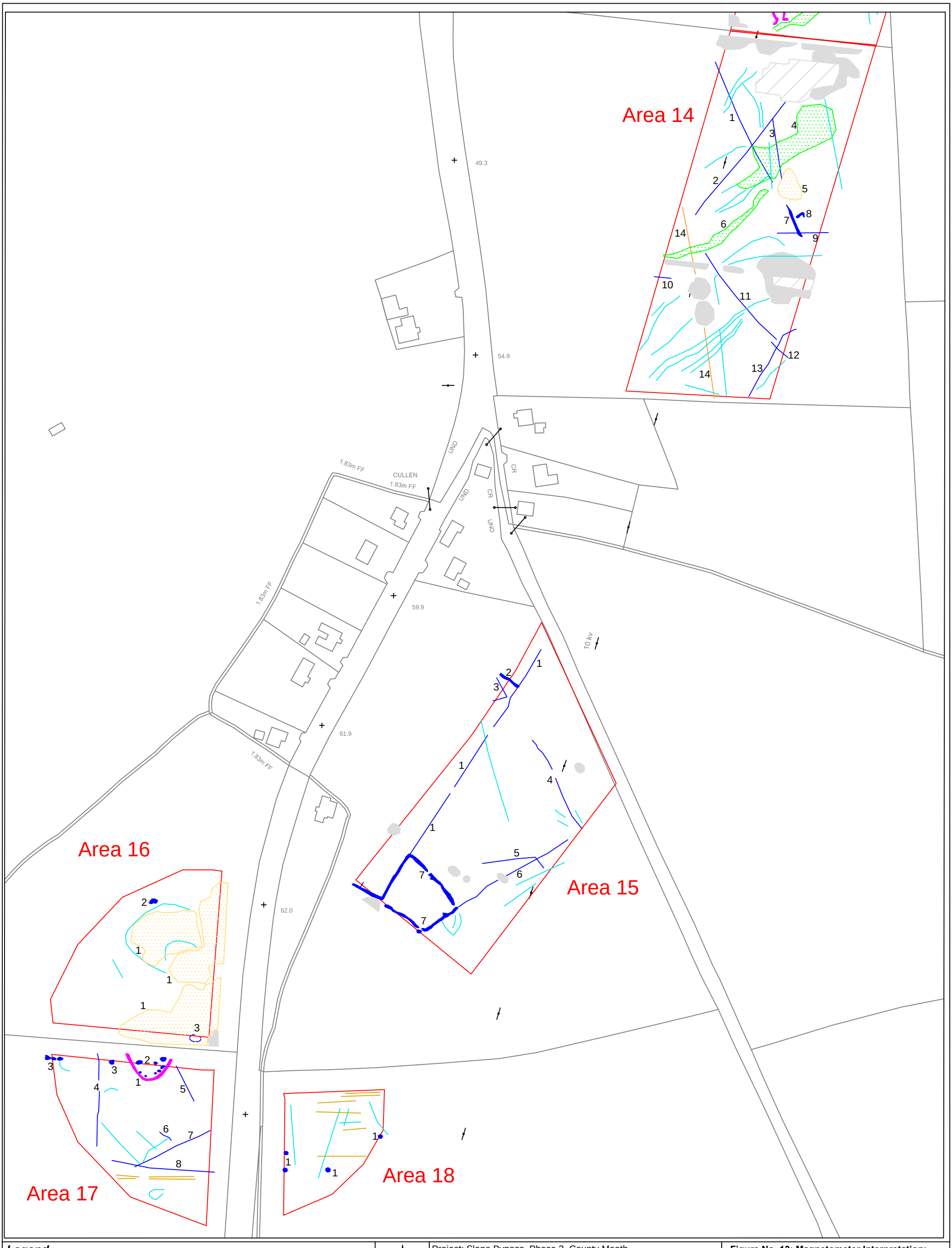
Client: Meath County Council

Drawing Courtesy of: Meath CoCo / OSI	Date: 1/12/20	Drawing No.: 20-057/12

0m 75m 150m

Figure No. 12: Magnetometer Data: Areas 14-18

EARTHSOUND geophysics



Legend

- Basemap
- Geophysical Survey Areas
- Archaeology
- Possible Archaeology
- Possible Industrial
- Magnetic Enhancement
- Trend
- Zone of Dipolar Anomalies
- Feature on Historic OS
- Cultivation
- Modern Disturbance
- Possible Geology

Project: Slane Bypass, Phase 3, County Meath

Client: Meath County Council

Drawing Courtesy of: Meath CoCo / OSI | Date: 1/12/20 | Drawing No.: 20-057/13

0m 75m 150m

Figure No. 13: Magnetometer Interpretation: Areas 14-18

EARTHSOUND geophysics