Appendix A20.4 Geophysical Survey Report

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Report on Geophysical Survey

Dart + West Project

Maynooth, Co. Kildare

Licence No.: 21R0091

ITM: 692515, 737340 (east) to 689350, 739099 (west)

Centre point: 690847, 738005

RMP/SMR No. KD005-003, KD005-033

RPS ID. B05-35, B05-36

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24 March 2022

Final Report

ACSU Ref.: 2128

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PROJECT DETAILS

Project	Dart + West Project, Maynooth, Co. Kildare
Report Type	Geophysical Survey Report
Licence No.	21R0091
Townland(s)	Maynooth South, Newtown, Cringstown, Laraghbryan East, Cormickstown, Treadstown, Ballycurraghan, Maws, Gragadder, Branganstown, Roestown
RMP No.	KD005-003 & KD005-033
ITM Ref.	692515, 737340 (east) to 689350, 739099 (west) Centre point: 690847, 738005
Land Use	Pasture
Survey Type	Fluxgate Gradiometer
Instrument	Bartington Grad 601-2
Sample/Traverse interval	0.25m/0.5m
Client	Lumcloon Energy Ltd
Archaeologist	Ian Russell
Report Authors	Ian Russell
Report Date	24 March 2022
Report Status	Final
ACSU Ref.	2128

SUMMARY

This report details the results of a geophysical survey conducted at the Dart + West Project, Maynooth, Co. Kildare (ITM 692515, 737340 (E) to 689350, 739099 (W)) The site is located adjacent to and south of the Royal Canal and north of the M4, on lands between Maynooth and Kilcock in Co. Kildare.

The geophysical survey was carried out in relation to the proposed Maynooth depot layout, road alignment and flood compensatory storage areas. It was undertaken at a pre-planning stage to inform the preparation of an Environmental Impact Assessment Report (EIAR) in relation to Dart+ West Project. This project is covered by the Code of Practice agreed between the Minister for Arts, Heritage and the Gaeltacht and Iarnród Éireann (2012).

There are two Recorded monuments located within the site. These include a Ring-ditch - KD005-003 and a monument scheduled for inclusion in the next revision of the Record of Monuments and Places Barrow - unclassified KD005-033. Both of these monuments are located within the north-western extent of the site and were identified as cropmark anomalies. The Ring-ditch was identified on 1970 aerial photography (CUCAP BDH 31), whilst the Barrow – unclassified was visible as a positive cropmark anomaly on June 2018 Google Earth aerial imagery. It should be mentioned that only the site of the Ring-ditch - KD005-003 was located within the area surveyed. There are two Protected Structures listed within Kildare County Development Plan 2017-2023 located within the site. These are located adjacent and north of the site and associated with the Royal Canal listed within the National Inventory of Architectural Heritage as NIAH Reg. No. 11803136. These include Chambers Bridge and Lock RPS ID B05-35 and Jackson's Bridge and Lock RPS ID B05-36, both are also listed in NIAH, respectively as Reg. No. 11900504 and Reg. No. 11900505.

The geophysical survey was conducted between May 2021 and March 2022 by Ian Russell, Robert Breen and Jeanne Rochford of Archaeological Consultancy Services Unit Ltd. (ACSU) under licence 21R0091 issued by the Department of Housing, Local Government and Heritage.

Geophysical survey of an area measuring 40.69 hectares that consisted of green fields and arable land was undertaken. The site boundary was confirmed, and all areas available were subject to geophysical survey. A large area, located mainly within the southern portion of Maws townland and a field located within the very southwest extent of the site, could not be surveyed due to access issues. In total, 20 fields were surveyed. The survey area transverses townlands of; Maynooth South (Field 13), Newtown (Field 20), Maws (Field 2), Gragadder (Fields 3, 14, 15), Branganstown (Fields 16-18). Laraghbryan East (Fields 4-10, 12), and Treadstown (Fields 8, 11, 19), it is unclear what townland Field 1 is located within. The fields are bounded by wet ditches, the Lyreen River, mature hedgerows, roads and access lanes and the Royal Canal.

This geophysical survey confirmed the presence of Ring-ditch KD005-003 visible as Anomaly M31 and identified within the northwest part of Field 16. Furthermore, curving trend M3A and oval trend M4 in Field F12, and Anomalies M30E, M30F and M30G in Field 16 might represent remains of other ring-ditches; although this interpretation is tentative. It should be noted that these anomalies are ephemeral in nature, likely due to truncation as a result of agricultural activity/ploughing, and could represent changes in geology. All fields, except for Fields 5 and 9, produced increased responses of potential archaeological significance. These were mostly small scattered anomalies indicative of postholes and pits, but some were large, indicative of spreads, while linears and curvilinear might represent ditches. It should be noted that this interpretation is tentative, and anomalies could be modern or natural in origin (stone sockets, natural geology etc.).

The remaining anomalies were interpreted as possibly representing agricultural activity or modern anomalies in the form of the furrows/plough marks or wheel roots; some might represent archaeological features or drainage, natural geology or changes in topsoil. Furthermore, five linears were interpreted as field boundaries; three anomalies M29B, M29C and M33 correspond with field boundaries

depicted on the 1836 map; others could represent earlier field systems or perhaps a more recent drainage system, as they are orientated towards a watercourse.

A number of anomalies that appear to represent paleochannels were identified. These are meandering in nature and represent former streams, while Anomaly M21 may represent the former course of the Lyreen River. Throughout the survey areas, small-scale ferrous responses were evident in the results and are likely to represent modern metal debris contained within the topsoil.

The remainder of the site will be subjected to a geophysical survey as soon as lands become available.

It is recommended that targeted test trenching of the anomalies identified in areas that will be impacted, should be undertaken in advance of construction and conditioned within any grant of planning permission for the site. In particular, Anomaly M31 representing recorded monument, ring ditch KD005-003 and anomalies of potential archaeological significance should be further assessed. This testing should be carried out under licence to assess their archaeological significance and to determine the impact that development may have on any features identified.

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1. BACKGROUND & AIMS TO SURVEY

This report details the results of a Geophysical Survey conducted on the Dart + West Project, Maynooth, Co. Kildare (ITM 692515, 737340 (E) to 689350, 739099 (W); Figures 1, 2).

The geophysical survey was carried out in relation to the proposed Maynooth depot layout, road alignment and flood compensatory storage areas. It was undertaken at a pre-planning stage to inform the preparation of an Environmental Impact Assessment Report (EIAR) in relation to the Dart+ West Project. This project is covered by the Code of Practice agreed between the Minister for Arts, Heritage and the Gaeltacht and Iarnród Éireann (2012).

There are two Recorded monuments located within the site. These include a Ring-ditch - KD005-003 and a monument scheduled for inclusion in the next revision of the Record of Monuments and Places Barrow - unclassified KD005-033. Both of these monuments are located within the north-western extent of the site and were identified as cropmark anomalies. The Ring-ditch was identified on 1970 aerial photography (CUCAP BDH 31) whilst the Barrow – unclassified was visible as a positive cropmark anomaly on June 2018 Google Earth aerial imagery. It should be mentioned that only the site of the Ring-ditch - KD005-003 was located within the area surveyed. There are two Protected Structures listed within Kildare County Development Plan 2017-2023 located within the site. These are located adjacent to and north of the site and associated with the Royal Canal listed within the National Inventory of Architectural Heritage as NIAH Reg. No. 11803136. These include Chambers Bridge and Lock RPS ID B05-35 and Jackson's Bridge and Lock RPS ID B05-36, both are also listed in NIAH, respectively, as Reg. No. 11900504 and Reg. No. 11900505.

The geophysical survey was conducted between May 2021 and March 2022 by Ian Russell, Robert Breen and Jeanne Rochford of Archaeological Consultancy Services Unit Ltd. (ACSU) under licence 21R0091 issued by the Department of Housing, Local Government and Heritage. A full detailed gradiometer survey of each area was undertaken using a Bartington GRAD 601-2 dual-sensor fluxgate gradiometer system.

The objectives of the geophysical survey were to:

- identify any geophysical anomalies of possible archaeological origin within the specified survey area;
- accurately locate these anomalies and present the findings in map form;
- describe the anomalies and discuss their likely provenance in a written report; and
- incorporate all of the above in a report to the Client.

The findings of the survey will help inform the planning process and the scope of any future works at the site.

2. DESCRIPTION OF SURVEY AREA

Geophysical survey of an area measuring 40.69 hectares that consisted of green fields and arable land was undertaken. The site boundary was confirmed, and all areas available were subject to geophysical survey. A large area, located mainly within the south portion of Maws townland and a field located within the very southwest extent of the site, could not be surveyed due to access issues. In total, 20 fields were surveyed. The survey area transverses townlands of Maynooth South (Field 13), Newtown (Field 20), Maws (Field 2), Gragadder (Fields 3, 14, 15), Branganstown (Fields 16-18), Laraghbryan East (Fields 4-10, 12), and Treadstown (field 8, 11, 19). It is unclear what townland Field 1 is located within. The fields are bounded by wet ditches, the Lyreen River, mature hedgerows, roads and access lanes and the Royal Canal.

The site has an elevation of between c. 60-67m OD. It is dominated by mineral poorly drained (mainly basic) soils, with some bands of alluvial (mineral soils) and a small pocket of Lacustrine type soils within the northwest extent of the site. The soils overlay dark limestone & shale (`calp) that is part of Lucan Formation consisting of dark-grey to black, fine-grained, occasionally cherty, micritic limestones that weather paler, usually to pale grey. There are rare dark coarser-grained calcarenitic limestones, sometimes graded, and interbedded dark-grey calcar (Geological Survey of Ireland Spatial Resources, Public Data Viewer Series).

3. METHODOLOGY

A full detailed gradiometer survey was undertaken across the survey area using a Bartington GRAD 601-2 dual-sensor fluxgate gradiometer, the work being carried out by hand or by cart, depending on ground suitability. A detailed survey was conducted with a sample interval of 0.25m and a traverse interval of 0.5m for all the survey areas with variations in the magnetic field between -100nT to +107.834nT. Where hand survey was employed, the survey grids measured 10m by 10m and were set out on the ground using a Trimble Geo7x with 1cm accuracy using the Irish Transverse Mercator projection (ITM). Survey using the cart was carried out using a Bartington cart system with mounted Trimble R10 GPS Antenna with sub centimetre accuracy. Fieldwork, data processing and reporting adhered to the most up-to-date guidelines for conducting archaeo-geophysical surveys (Schmidt et al. 2016; Chartered Institute for Archaeologists 2014; AHDS n.d; Bonsall 2014). The magnetometer was calibrated in the field in accordance with the manufacturer's instructions. The survey data was logged to a laptop computer and archived to the company's cloud servers and internal servers. The data was then processed using Geoplot 3.0 software.

Processing included:

- clipping of the range to enhance weaker anomalies,
- removal of striping where required
- edge matching of adjacent survey panels
- interpolation of the data from 0.5m to 0.25m traverse spacing to enhance the quality

4. CONDITIONS OF SURVEY

Weather conditions during the survey period varied; some parts of the fields were waterlogged. The fields were being used for pasture and crops.

5. ARCHAEOLOGICAL BACKGROUND

5.1 Archaeological & Historical Background

The site is located between Maynooth and Kilcock in County Kildare. Maynooth town is located c. 20km to the west-northwest of Dublin City Centre. Maynooth town and Kilcock lie both north of the Royal Canal. Lyreen River, which is a tributary of the River Rye, runs within the site. The site is located within Maynooth South, Newtown, Cringstown, Laraghbryan East, Cormickstown, Treadstown, Ballycurraghan, Maws, Gragadder, Branganstown, and Roestown townlands. The site is located within two parishes; Laraghbryan in the Barony of Salt North, and Kilcock in the Barony of Ikeathy and Oughterany. There are two monuments located within the site. These include Ring-ditch KD005-003 and Barrow - unclassified KD005-033. Both are located within the northwest extent of the site. These monuments were identified as cropmark anomalies; the Ring-ditch on 1970 aerial photography (CUCAP BDH 31) while the Barrow – unclassified was visible as a positive cropmark anomaly on June 2018 Google Earth aerial imagery.

RING DITCHES AND BARROWS

Towards the end of the Neolithic and the beginning of the Bronze Age, features known as 'barrows' emerged, and these can be defined as earthen or earth/stone construction mounds with a surrounding ditch or ditches, sometimes with a low external bank, typically less than 30 metres in diameter and most commonly associated with cremation burials (O'Sullivan and Downey 2012). In 2002, in advance of the gas pipeline works from North Dublin to Limerick, ring-diches/barrows were excavated at Flemingtown, Co. Meath, Dalystown 1, Co. Westmeath, Knockuregare, Co. Limerick and Rath, Co. Dublin (Grogan et al. 2007). All of these sites had substantial ditches, the largest having an external diameter of 38.75m. The excavations provide evidence for this type of funerary site occurring throughout the Bronze Age (2450–800 BC) and highlight the significance of liminal space for death and burial in the form of ceremonial enclosures. McGarry (2009) states that of all the barrows excavated in Ireland, about half of them have produced the remains of a single person, most commonly found under the mound and central to the barrow. Almost all sites, however, produce cremated human remains spread throughout the fill of the barrow ditches; as can be seen at sites such as Ballybeen, Co. Antrim (Mallory 1984) and Ballydribbeen, Co. Kerry (Dunne 2003). Another interesting feature of barrows is the presence or absence of an 'entrance' or break in the ditch, which provides a causeway into the monument. Entrances are present in a number of ring-ditches and ring-barrows and although the entrance may be orientated in any direction there is a clear preference for them facing either east or south-east. It must be noted, however, that there are also many instances where entrances are not present, such as Donacarney, Co. Meath (Stirland 2017). In 2003, two ring-ditches excavated to the north of the study area in advance of a large-scale residential development were set c. 5.5m apart, with one measuring 15m in internal diameter and the other 6m (Licence no. 03E1781; Wallace 2003a). The fragmentary remains of one cremation burial were identified in the fill of one ditch, but the other did not contain any burial evidence.

MAYNOOTH

The town of Maynooth is located just inside the western edge of The Pale. The early Christian monastic centres of Laraghbryan (KD005-009001), Taghadoe (KD010-014001), and Donaghmore (KD006-005001) are located within 2km of Maynooth town. Also, an early Christian burial ground (KD010-040) was discovered in Moneycooly townland in 2004 (04E0644), located within the southeast part of the modern town. Burials of at least 55 individuals, almost all aligned east-west, were excavated (Duffy 2005). The area of Maynooth was included in the diocese of Dublin sometime in the 10th century. This suggests that the area was somewhat organised and occupied before the arrival of the Anglo-Normans. This is also supported by the results of the excavations carried out in 1996 (96E0391) within the interior of Maynooth Castle. Hayden (1999) identified a prehistoric rectangular building (KD005-015001); and two small post-and-wattle roundhouses (KD005-015002 and KD005-015003) that pre-date the Anglo-Norman occupation. Furrows associated with the roundhouses were also excavated suggesting agricultural activity in the immediate environs of the future castle site. Also, a rectangular post-and wattle building (KD005-015004-) was excavated on top of the Anglo-Norman remains of a 1m deep sod mound.

Following the arrival of the Anglo-Normans, documentary references to Maynooth can be easily traced. In 1176 Richard de Clare, the former earl of Pembroke (Strongbow) granted the lands at Maynooth 'Magnoded' to Maurice Fitzgerald (c 1110-76). As a result, the area became integrated as the manor of Maynooth with an Anglo-Norman landholding system (Horner, 1995). Maynooth Castle (KD005-015; National Monument No. 485) was likely built by his son, Gerald FitzMaurice FitzGerald (c.1150-1204) to mark the acquisition of the lands in Uí Fáeláin (Kildare). Maynooth was at this time the centre of authority in the region and became the place where one of the earliest Anglo-Norman buildings in Ireland was erected. The construction likely started sometime just before 1180 and was completed by 1185, as suggested by O'Keeffe (2013), due to its similarities with the earliest phase of Trim's donjon; furthermore, it is also likely it was built by the same mason. The original building had two floors, a basement, and a first floor. A settlement developed or grew around the castle. A chapel was part of the castle complex, likely since 1248. Edward I, in 1286, issued a patent for a weekly market and annual

fair. In 1316 the FitzGeralds became the earls of Kildare, and Maynooth was their chief fortress. However, Maynooth did not stand out from other small manorial villages in the late medieval Dublin environs. In 1328 two mills are mentioned. In the late 15/16th centuries, the power of the FitzGeralds was at its height as members of the family served as the king's lord deputy in Ireland between 1477-1534. Lewis (1837) mentions that John the sixth Earl of Kildare from the Kildare branch of the Fitzgerald family, erected a 'magnificent castle here in 1426'; he likely refers to the enlargement of the previously simple design of the donjon. During this time, the castle became 'one of the richest earl's houses under the crown of England' (Horner 1995). In 1515 the king granted a licence for the establishment of the College of the Blessed Virgin Mary of Maynooth. However, following the rebellion of Silken Thomas in 1535, the earl's estates were forfeited to the crown. Following the restoration of the estates in 1552 and the repair of the castle, little is known about Maynooth village in the second half of the 16th century. In the 1630s, Richard Boyle, earl of Cork, one of the great entrepreneurs, enlarged the castle complex. He was a guardian to George Fitzgerald, who married his daughter. However, in 1642 the great library was destroyed, and the castle was left ruinous in 1647. The Civil Survey of 1654-55 records a manor house in Maynooth, two corn mills, two malt houses, a chapel, two bridges, and most importantly, several leases issued suggesting a new tenant population.

In 1678 a patent for a weekly market and two annual fairs, references to the mill, a tan house, a new shop, slaughterhouse, a schoolhouse, and several buildings suggest late seventeenth century Maynooth was a fast-growing village, likely due to its location on the main routes to the west of Dublin. In the late 1690s a merchant, James McManus, is mentioned concerning Maynooth, and during this time a rectory and an enclosed orchard off Parson Street are developed in the western part of the village. The 1730s saw Maynooth as a post-town with the Dublin-Kinnegad-Mullingar turnpike road constructed (Horner, 1995).

In late 1739 the 19th earl of Kildare decided to develop the house at nearby Carton as his principal country residence (KD006-009). The Talbot family had erected the first Dutch-style building in Carton, recorded in a painting by Van der Hagen. Subsequently, the estate was forfeited to the Crown and in 1703 sold to Maj. Gen. Richard Ingoldsby, Lord Justice of Ireland. A two-storey, nine-bay pedimented front with wings was added. It was later sold to the 19th Earl of Kildare who hired Richard Castle to enlarge the house. Major work took place and by the late 1740s, the works to the house and the gardens were largely completed. A Charter School is mentioned at this time as being bounded on two sides by a road to Dunboyne, on a third by a straight, tree-lined avenue, representing Carton Avenue. It is described as extending for a kilometre from the gates at the east end of the main street to the new road, skirting the newly enlarged Carton demesne. The avenue is in the same axis as the main street that dates to the 1750s (ibid). In 1757 Rocque mapped Maynooth, giving insight into the organisation and the nature of plots within Maynooth village.

Peter Bere who was associated with the earl, held several leases on the main street in 1784. He and the earl were responsible for the redevelopment of Maynooth. Evidence of a strategy to improve the village layout can be observed as a result (Prunty, Clarke, 2011). Street frontages, including the square and green areas along each side of the main street, were developed. In the 1790s a new axis at right angles to the main street and the construction of Williams Bridge allowed long-distance traffic to be finally diverted away from the castle. The Royal Canal was built to link Dublin and the Shannon and was routed south of Carton and Maynooth. In the western part of the village, a new Roman Catholic college – the Royal College of St Patrick was established in Stoyte House with additional buildings constructed. This had a positive economic impact on the village, offering a source of local employment in addition to the demesne at Carton. The Roman Catholic lay college that opened in 1802 was short-lived and closed by 1820, with its properties absorbed into St Patrick's College. The population nearly doubled since the mid-18th century; it could now be described as a small town. In the 1830s a Presentation convent was established in the eastern part of the town, on the site occupied by the charter school that had closed in 1819. This became the girls' national school, with a boys' school in the old chapel, both supported by the duke of Leinster (Horner, 1995).

In the 1820s the strategy to improve Maynooth's layout, including the street framework, was nearly complete. This allowed the third duke to focus on improving the house and demesne at Carton. In 1819 the courthouse was built on the site of the former market house and shambles. In 1815 Richard Morrison was hired to remodel and enlarge Carton House for the Dukes of Leinster. It was during this time that the demesne of c. 1000 acres was landscaped.

In 1846 the castle area in Maynooth town was bought out and cleared of houses and cabins; a garden was established here for the people of Maynooth. Only a few large houses can be noted at this time, e.g., a parochial house and a miller's house on Mill Street, and Crom-a-boo Lodge as part of the charter school site. Rows of houses were built at this time, fronting Charter School Lane, Parson Street, and later, in c. 1900, Dillion's Row of single-storey houses on the Dunboyne Road. Several lanes in the town took their names from the developer – e.g., Kelly's Lane from Clement Kelly's grocery shop, Cushin, and Coates Lane, Coffey's Lane, and Doctor's Lane. In the 1850s the most valued houses were mostly occupying both sides of Main Street.

A masterplan for the town's future development was prepared by architect A.W. Pugin in the 1850s. As a result, St Mary's Square, infirmary, chapel, the Aula Maxima (1894-5), and the great spire (1902) were constructed. The courthouse building was redeveloped to serve as a town hall with concert and meeting rooms. The town growth weakened and in 1949 the Carton estate was sold. A large out of town scheme for housing at Greenfield, on the south side of the canal and railway, was initiated in 1910. Main Street was tarred. With new water and sewerage schemes in 1950s Maynooth, and the decision to admit lay students, Maynooth was recognised as within the commuting range of an expanding Dublin and the town grew rapidly. In 1981 the railway was reopened and by 1994 the Leixlip-Kilcock motorway was built.

5.2 Recorded Monuments

There are two monuments located within the site. These include Recorded Monument Ring-ditch KD005-003 and a monument scheduled for inclusion in the next revision of the Record of Monuments and Places Barrow - unclassified KD005-033. Both are located within the northwest extent of the site (Area A). These monuments were identified as cropmark anomalies; theRing-ditch on 1970 aerial photography (CUCAP BDH 31), while the Barrow – unclassified was visible as a positive cropmark anomaly on June 2018 Google Earth aerial imagery. It should be mentioned that only the site of the Ring-ditch - KD005-003 was located within the area surveyed.
Many additional recorded monuments are located in the surrounding area, and together these sites provide a good indication of the archaeological potential of the region. The following is a list of the nearest Recorded Monuments located within the surrounding area (Figure 2). These descriptions are derived from the National Monuments Service Archaeological Survey Database (http://webgis.archaeology.ie/historicenvironment/).

Table 1: Recorded Monuments in the environs of the site

RMP/SMR No	Class/Site Type	Townland	Description
KD005-003	Ring-ditch	BRANGANSTOWN	In gently undulating tillage. Visible on a 1970 aerial photograph (CUCAP BDH 31) as the cropmark of a small circular area defined by a fosse (est. max. diam. c. 15m), probably a ring-ditch or ploughed-out ringbarrow. No visible surface trace survives, athough there is a slight rise in the field at the location (SMR file).

RMP/SMR No	Class/Site Type	Townland	Description
KD005-033	Barrow - unclassified	MAWS	Cropmark of small circular-shaped enclosure (approx. diam. 13m) visible on Google earth aerial imagery.
KD005-018	Habitation site	CRINSTOWN	In 1987, an archaeological excavation was conducted in conjunction with the construction of the Kilcock-Leixlip motorway bypass. According to Keeley (1991, 168), 'The site (was) identified from an aerial photograph … Evidence of medieval occupation was uncovered … represented by a cobbled area (dims. L c. 120m; Wth c. 120m). A habitation layer lay directly on the cobbles and consisted of a brown humic material with inclusions of fragmentary iron objects and a large amount of ceramic sherds … of both cooking and glazed wares with a dating range from the 13th-16th century.' Additional information is available on www.excavations.ie (search by townland), 'Two large ditches were also revealed. Ditch 'H' lay to the west of the cobbling and was 4m (max.) wide by 0.95m deep at subsoil level. Finds from this ditch reflect a similar date to those found associated with the cobbling. Ditch 'I' lay just east of the cobbling and was 2.65m (max.) wide by 0.85m deep at subsoil level. Five modern drains were also uncovered.'
KD005-017	Redundant record	TREADSTOWN	Cropmarks visible on an aerial photograph (GSIAP N 616-5) suggested a possible deserted settlement site. Excavated in advance of Maynooth-Leixlip-Kilcock motorway in 1989 by V.J. Keely. No archaeology found, only 'a series of old land drains'.
KD005-004	House - 17th century	GRAGADDER	Shown as a 'Farmhouse' on Noble and Keenan's 1752 map of County Kildare but marked as 'Castle Ruins' on Taylor's 1783 map of the county. A building possibly representing the monument is indicated but not named on the 1st. ed. (1838) of the OS 6-inch map. In open pasture. When inspected in 1985 the site was found to be occupied by a modern dwelling house (SMR file).
KD005-009001	Ecclesiastical site	LARAGHBRYAN EAST	The site was an early monastic foundation associated with St Senan (possibly of Scattery Island, Co Clare). The death of its abbot Glaindibur is recorded in AD 767 and its oratory was burnt and plundered by the 'men of Meath' in AD 1036 and again in AD 1040. (Gwynn and Hadcock 1970, 396). Because of it's location on a major route way, it was, according to McSweeney (1940, 125), a monastic rest house for pilgrims and clerics passing E and W. A medieval church (KD005-009002-) and graveyard (KD005-009002-) are likely to stand on, or close to, the early monastery, of which no visible surface trace survives; except for a small portion of a possibly associated enclosure (KD005-021----) c. 250m to the NE. According to the OSL (Herity 2002, 15-16) Archdall records the death of the First Earl of Kildare at Laraghbryan in AD 1316.
KD005-036	Enclosure	LARAGHBRYAN EAST	Cropmark of circular-shaped enclosure (approx. diam. 44m) visible on Google earth aerial imagery.
KD005-008	Castle - unclassified	LARAGHBRYAN EAST	On level, improved pasture, c. 130m N of a medieval church (KD005-009002-) and graveyard (KD005-009003-), with an enclosure site (KD005-021----) c. 200m to the E. Indicated as 'Ca. Rs.' (Castle Residence) on Taylor's 1783 map of County Kildare, but not recorded on the 1st (1838) or current (1939) eds. of the OS 6-inch map. In 1985, some loose

RMP/SMR No	Class/Site Type	Townland	Description
			dressed stones, a few with mortar attached, (the result of recent dumping according to the landowner), were noted together with some low linear earthworks running N-S across the field and visible on a 1986 aerial photograph (CUCAP APE 8) (SMR file). There is no longer any visible surface trace of these features. However, traces (noted in 1985) of the fosse of a possible enclosure (KD005-021----) do survive.

5.3 Protected Structures and National Inventory of Architectural Heritage (NIAH)

There are two Protected Structures listed within the Kildare County Development Plan 2017-2023 located within Area A. These are located adjacent to Area A and associated with the Royal Canal listed within the National Inventory of Architectural Heritage as NIAH Reg. No. 11803136. These include Chambers Bridge and Lock RPS ID B05-35, and Jackson's Bridge and Lock RPS ID B05-36, both are also listed in NIAH, respectively, as Reg. No. 11900504 and Reg. No. 11900505.

5.4 Previous Archaeological Investigations

An examination of previously excavated sites in the vicinity of the proposed development area indicates that several archaeological investigations have been conducted within the wider area, some of which did not reveal any archaeological remains, but those that did, are outlined in Table 2.

The details of these investigations are derived from the Summary Accounts of Archaeological Excavations in Ireland (www.excavations.ie) and listed in the table below.

Table 2: Previous excavations in the environs of the site

Excavation.ie reference	Licence No.	RMP No.	Investigation type	Site type
1987:26 - 'Crinstown', Crinstown, Kildare	-	N/A	Archaeological excavation	Medieval settlement site
2017:102 - Branganstown, Kildare	17E0158	KD005-003	Test Trenching	Medieval
2018:821 - Branganstown, Kildare	18E0567	N/A	Testing and excavation	Medieval enclosure and associated burials
1989:060 - Treadstown, Kildare	97E0390	N/A	Test trenching and excavation	Land drains

The site is located adjacent to a site that was excavated in 1987 in conjunction with the construction of the Kilcock-Leixlip motorway bypass (M4). According to Keeley (1991), 'The site (was) identified from an aerial photograph *… Evidence of medieval occupation was uncovered … represented by a cobbled area (dims. L c. 120m; Wth c. 120m). A habitation layer lay directly on the cobbles and consisted of a brown humic material with inclusions of fragmentary iron objects and a large amount of ceramic sherds …* of both cooking and glazed wares with a date ranging from the 13th-16th century.' Additional information is available on www.excavations.ie (search by townland), 'Two large ditches were also revealed. Ditch 'H' lay to the west of the cobbling and was 4m (max.) wide by 0.95m deep at subsoil level. Finds from this ditch reflect a similar date to those found associated with the cobbling. Ditch 'I' lay just east of the cobbling and was 2.65m (max.) wide by 0.85m deep at subsoil level. Five modern drains were also uncovered (from Historic Environment Viewer: KD005-018)

5.5 Cartographic Evidence

Ordnance Survey maps of the areas were examined to identify any possible archaeological features and trace the site's development during the nineteenth and early twentieth centuries. There are no buildings depicted within the area surveyed to date, and only one building is located within the northwest extent of the area not yet surveyed. It consists of a small L-shaped building near Chambers Bridge. A well is depicted within the northwest portion of the area that was not surveyed. The site as shown on mapping, consists of small and large fields bounded by wet ditches and two roads; one major, the other appears to be a local road. The Royal Canal is depicted with roads running on either side of it, and Protected Structures – 'Jackson's Br.' and '14th Lock' as well as '15th Lock' and 'Chambers Br.' are depicted and labelled. The parish and barony border transverses the west extent of the site. The (OS) 25-inch map of 1909, shows more detail. Along the south side of the Royal Canal, the Midland Great Western Railway is now depicted. Additional information is shown in relation to field boundaries, some shown as wet ditches and roads. The field systems were adjusted, and some boundaries appear to be removed, added or realigned.

5.6 Aerial Photography

Aerial photographs dating between 1995 and 2013 from the Ordnance Survey of Ireland and Google Earth imagery dating between 2009 and 2020 were also reviewed. Former field boundaries are visible as cropmarks in some of the subject lands. Some of these have been replaced by modern fencing. Within the north extent of the site, a number of linear anomalies are visible; some are curving, additional faint circular anomalies were also noted. These anomalies might be archaeological in nature but may also relate to a recent agricultural activity or be of geological origin.

It appears that some land reclamation took place, as some of the field boundaries and wet ditches appear to have been realigned and are now very straight.

5.7 Topographical Files of the National Museum of Ireland

Topographical files of the National Museum of Ireland were consulted. These list two finds for Laraghbryan (two tooth pendants found in Ballygoran Bog (3253:W194-196) and a stone slab 2012:259 in Maws. A number of finds are listed for Maynooth and include two

stone Axeheads (1945:259; 1967:101), copper alloy finds such as an ingot (1984:140), a button (1995:2001), a mount (1995:2002), four rings (1995:2004-7), a lead object (1995:2003) and a bronze brooch (SA1925:8).

6. METHOD OF DATA INTERPRETATION

Interpretation of the results was made by examination of the raw data as greyscale images, XY trace, relief, and data plots. Archived raw data is presented in Figures 3- 6 and an interpretation is presented in Figures 7-8.

7. SURVEY RESULTS

The geophysical survey was conducted between May 2021 and March 2022 by Ian Russell, Robert Breen and Jeanne Rochford of Archaeological Consultancy Services Unit Ltd. (ACSU) under licence 21R0091 issued by the Department of Housing, Local Government and Heritage.

In total, 20 fields were surveyed (Figures 1-10). The survey area transverses the townlands of Maynooth South (Field 13), Newtown (Field 20), Maws (Field 2), Gragadder (Fields 3, 14, 15), Branganstown (Fields 16-18), Laraghbryan East (Fields 4-10, 12), and Treadstown (Field 8, 11, 19). It is unclear what townland Field 1 is located within. The fields are bounded by wet ditches, the Lyreen River, mature hedgerows, roads and access lanes and the Royal Canal.

This geophysical survey confirmed the presence of Ring-ditch - KD005-003 visible as Anomaly M31 in the northwest part of Field 16 (Figure 3, 4, 7, 8). Furthermore, curving trend M3A and oval trend M4 in Field F12, and Anomalies M30E, M30F and M30G in Field 16 (Figure 4, 8) might represent remains of other ring-ditches; this interpretation is tentative. It should be mentioned that these anomalies are ephemeral, most likely due to truncation as a result of agricultural activity/ploughing, and may represent changes in geology. Except for Fields 5 and 9, all fields produced increased responses of potential archaeological significance. These were mostly small scattered anomalies, but some were large; linears and curvilinears were also noted. Some of these suggest large features and these were noted as Anomalies M7 in Field 10, M11 in Field 11; M13 in Field 7, M15 in Field 6, M18 in Field 4, M20 in Field 1, M23 in Field 15, M27 in Field 17 and M32 in Field 16. These might be of archaeological significance, and small positive anomalies may represent cut features of archaeological potential such as postholes and pits. Large spreads may also be present, and linears and curvilinears may represent ditches or other features of archaeological significance. It should be noted, however, that this interpretation is tentative and some anomalies may be of modern or natural origin (stone sockets, natural geology etc.)

The remaining anomalies were interpreted as possibly representing agricultural activity or modern anomalies in the form of the furrows/plough marks or wheel ruts. These were noted in Fields 5, 4, 12, 13, 15,17, 18 as Anomalies M1, M3, M5, M17, M19, M24, M26, M27, M28. Trends in Fields 4, 7, 9, 10, 12, 14, 16, 19 were noted as Anomalies M6, M8, M9, M10, M12, M16, M25, M30 and may represent archaeological features, drainage systems/field boundaries, natural geology or changes in topsoil. Five linears, interpreted as field boundaries, include anomalies M29A, M29B, M29C in Field 16, Anomaly M22 in Field 3 and Anomaly M33 in Field 17. Three anomalies M29B, M29C and M33 correspond with field boundaries depicted on the 1836 map, while both M22 and M29A could represent an earlier field system or perhaps a more recent drainage system as they are orientated towards a watercourse.

A number of anomalies that appear to represent paleochannels include M30I, M30H in Field 16, M21 in Field 2, M14 in Field 6 and M12D in Field 7 were identified. These are meandering in nature and represent former streams, while Anomaly M21 probably represents the former course of the Lyreen River. Throughout the survey areas, small-scale ferrous responses were evident in the results and are likely to represent modern metal debris contained within the topsoil.

The remainder of the site will be subjected to a geophysical survey as soon as lands become available.

Below is a list of anomalies detected, these are grouped by townlands:

Table 3: Geophysical Survey Results Gragadder Townland, Fields 3, 14, 15.

Gragadder		**Fields 3, 14, 15**		**Figures 3, 6, 7, 10**
Field	**Anomaly**	**Form/Nature of Anomaly**	**Possible Source(s) of Anomaly**	**Description**
3	M23A, M23B	?Archaeology	Large spread and curving linear	Two anomalies, one might represent a large spread (M23A) while the other appears to be a curving linear (M23B). These might represent features of archaeological significance, could also be natural in origin.
	M22	Negative Linear	Former Field Boundary	L shaped linear anomaly representing a probable field boundary. Visible on the aerial imagery but not depicted on any of the OS mapping.
	Increased response	?Archaeology	Multiple 'Pit' type responses	A number of negative anomalies that may be of archaeological significance and represent cut features of archaeological potential (postholes, pit etc) but may also be natural in origin (stone sockets etc.)
14	M25A, M25B	Trend	Linears, ditch former boundary or modern anomaly	Two trends, north to south aligned (M25A) and adjacent to it and west of it, northeast to southwest aligned (M25E). These represent linear trends and may represent ditches, former boundaries or modern anomalies like access routes etc.
	Increased response	?Archaeology	Multiple 'Pit' type responses	A number of negative anomalies that may be of archaeological significance and represent cut features of archaeological potential (postholes, pit etc) but may also be natural in origin (stone sockets etc.)
15	M24	Cultivation	Linear, modern	Three linears, corresponding with disturbance visible on 2003 aerial photo, might represent tree roots.
	Increased response	?Archaeology	Multiple 'Pit' type responses	A number of negative anomalies that may be of archaeological significance and represent cut features of archaeological potential (postholes, pits

Gragadder		Fields 3, 14, 15		Figures 3, 6, 7, 10
Field	**Anomaly**	**Form/Nature of Anomaly**	**Possible Source(s) of Anomaly**	**Description**
				etc) but may also be natural in origin (stone sockets etc.)

Table 4: Geophysical Survey Results Maws Townland, Field 2

Maws		Field 2		Figures 3, 5, 7, 9
Field	**Anomaly**	**Form/Nature of Anomaly**	**Possible Source(s) of Anomaly**	**Description**
2	M21	Negative meandering linear	Former Stream/townland boundary	Linear anomaly representing old watercourse that also formed townland boundary between Maws and Ballycurraghan townlands realigned since 3rd Edition OS.
	Increased response	?Archaeology	Multiple 'Pit' type responses	A number of negative anomalies that may be of archaeological significance and represent cut features of archaeological potential (postholes, pit etc) but may also be natural in origin (stone sockets etc.)

Table 5: Geophysical Survey Results Field 1

-		Field 1		Figures 3, 5, 7, 9
Field	**Anomaly**	**Form/Nature of Anomaly**	**Possible Source(s) of Anomaly**	**Description**
1	M20	? Archaeology	Linear, increased response	A linear anomaly northwest-southeast aligned. It might be of archaeological significance but likely represents a drainage ditch feeding into the watercourse.
	Increased response	?Archaeology	Multiple 'Pit' type responses	A number of negative anomalies that may be of archaeological significance and represent cut features of archaeological potential (postholes, pit etc) but may also be natural in origin (stone sockets etc.)

Table 6: Geophysical Survey Results Laraghbryan East Townland, Fields 4-7, 10, 12.

Laraghbryan East		**Fields 4-7, 10, 12**		**Figures 3, 5, 7, 9**
Field	**Anomaly**	**Form/Nature of Anomaly**	**Possible Source(s) of Anomaly**	**Description**
4	M17A, 17B	Cultivation	Linear, modern	Both, M17A and M17B are north to south aligned. M17B is a group of weak trends (M17B), representing features of agricultural origin, likely furrows within the west portion of the site. Anomaly M17A might represent drain or recent land use.
	M18	?Archaeology	Linear, poss. ditch	M18 is a roughly T-shaped linear response east-west and north-south oriented. It might be of archaeological significance, but likely represents a drainage system feeding into a watercourse.
	M16A, M16B	Trend	Linears, likely of agricultural origin	Two weak parallel trends (M16A, M16B) aligned southwest-northeast, representing linears of possible agricultural origin.
5	M19	Cultivation	Numerous parallel linears, likely furrows	A group of weak trends aligned roughly north-south, representing features of agricultural origin, likely furrows.
6	M14A, M14B	Trend	Paleochannel/former stream	Weak, meandering trends M14A and M14B aligned roughly east-west, representing a stream depicted on 1st Edition OS mapping.
	M15	?Archaeology	Multiple 'Spread' and 'Pit' type responses	A number of anomalies that may be of archaeological significance and represent features of archaeological potential such as a spread or large pits, but may also be natural in origin.
	Increased response	?Archaeology	Multiple 'Pit' type responses	A number of negative anomalies that may be of archaeological significance and represent cut features of archaeological potential (postholes, pit etc) but may also be natural in origin (stone sockets etc.)
7	M13A, M13B	?Archaeology	Multiple 'spread' and 'pit' type responses	Two concentrations of anomalies that may be of archaeological significance and represent features of archaeological potential. M13A located within the east portion of the site consists of irregular shaped anomalies, while

Laraghbryan East		Fields 4-7, 10, 12		Figures 3, 5, 7, 9
Field	**Anomaly**	**Form/Nature of Anomaly**	**Possible Source(s) of Anomaly**	**Description**
				M13B within the southwest part of the field appears more linear. These might represent spreads but may also be natural in origin.
	M12D	Trend	Former stream	A weak trend in the southwest part of the field. It likely represents the continuation of the meandering trend aligned roughly east-west and represents part of a stream depicted on 1st Edition OS mapping.
	M12A, M12C	Trends	Former field divisions?	Two weak trends, M12A and M12C, both aligned roughly east-west. Might represent the remains of former field divisions depicted on the 1st Edition OS mapping, removed by the time of 3rd Edition OS.
	M12B	Trend	Linears, likely of agricultural origin	Weak trends within the northeast part of the field, aligned roughly southwest-northeast, representing linears of possible agricultural origin.
9	-	Magnetic Disturbance	Modern disturbance	Modern disturbance within the west and east portion of the site.
10	M5	Cultivation	Numerous parallel linears	A group of weak trends aligned north-south within the northeast portion of the field representing features of agricultural origin, likely furrows.
	M16B	Trend	Former river	A weak trend, northwest-southeast aligned, likely represents former Lyreen River bed depicted only on the 1st Edition OS mapping.
	M7	Archaeology?	Multiple 'pit' type responses	A concentration of anomalies that may be of archaeological significance and represent cut features of archaeological potential (postholes, pits etc) or spreads but may also be natural in origin.
	Increased response	?Archaeology	Multiple 'Pit' type responses	A number of negative anomalies that may be of archaeological significance and represent cut features of archaeological potential (postholes, pit etc) but may also be natural in origin (stone sockets etc.)

Laraghbryan East		Fields 4-7, 10, 12		Figures 3, 5, 7, 9
Field	**Anomaly**	**Form/Nature of Anomaly**	**Possible Source(s) of Anomaly**	**Description**
12	M2A, M2B, M2C	Cultivation	Three groups of parallel linears, agricultural	Three groups (M2A, M2B, M2C) of weak trends aligned roughly north-south. Likely representing features of agricultural origin, likely furrows.
	M3A	Trend	Curvilinear trend, might be enclosure/ringditch or agricultural in origin	A penannular weak trend M3A, might represent remains of enclosure/ring-ditch, this interpretation is tentative. It may be of agricultural origin or natural soil variation.
	M3B, M3C	Trends	Agricultural	Two trends, southwest-northeast (M3B) and roughly north-south aligned (M3C), intersecting, likely represents a linear of agricultural origin.
	M3D	Trend	Agricultural?	Small curving trend M3D, likely represents a linear of agricultural origin.
	M4	Trend	Oval anomaly, might be a ringditch or agricultural in origin	Might represent remains of enclosure/ring-ditch, this interpretation is tentative. It likely represents linear of agricultural origin or natural soil variation.
	Increased response	?Archaeology	Multiple 'Pit' type responses	A number of negative anomalies that may be of archaeological significance and represent cut features of archaeological potential (postholes, pit etc) but may also be natural in origin (stone sockets etc.)

Table 7: Geophysical Survey Results Maynooth South Townland, Field 13

Maynooth South		Field 13		Figures 3, 6, 7, 10
Field	**Anomaly**	**Form/Nature of Anomaly**	**Possible Source(s) of Anomaly**	**Description**
13	M1	Cultivation	Numerous parallel linears	A group of weak trends aligned roughly north-south representing features of agricultural origin, likely furrows.
	Increased response	?Archaeology	Two 'Pit' type responses	Two anomalies that may be of archaeological significance and represent cut features of archaeological potential (postholes, pit etc) but

Maynooth South		Field 13		Figures 3, 6, 7, 10
Field	**Anomaly**	**Form/Nature of Anomaly**	**Possible Source(s) of Anomaly**	**Description**
				may also be natural in origin (stone sockets etc.)

Table 8: Geophysical Survey Results Newtown Townland, Field 20

Newtown		Field 20		Figures 3, 6, 7, 10
Field	**Anomaly**	**Form/Nature of Anomaly**	**Possible Source(s) of Anomaly**	**Description**
20	Increased response	?Archaeology	Two 'Pit' type responses	Two anomalies that may be of archaeological significance and represent cut features of archaeological potential (postholes, pit etc) but may also be natural in origin (stone sockets etc.)

Table 9: Geophysical Survey Results Treadstown Townland, Field 8, 11, 19

Treadstown		Fields 8, 11, 19		Figures 3, 5-10
Field	**Anomaly**	**Form/Nature of Anomaly**	**Possible Source(s) of Anomaly**	**Description**
8	M9A, M9B	Trend	Former road/former field division	Two weak trends, northwest-southeast aligned (M9A) and north – south aligned (M9B). M9A likely represents a field division or access road while M9B represents a road depicted on the 1st Edition OS mapping, realigned by the time of 3rd Edition OS.
	Increased response	?Archaeology	Two 'Pit' type responses	Couple of anomalies that may be of archaeological significance and represent cut features of archaeological potential (postholes, pit etc) but may also be natural in origin (stone sockets etc.)
11	M11	?Archaeology	Multiple 'spread' type responses	Three large anomalies that may be of archaeological significance and represent features of archaeological potential such as spreads, but may also be natural in origin.

Treadstown		Fields 8, 11, 19		Figures 3, 5-10
Field	**Anomaly**	**Form/Nature of Anomaly**	**Possible Source(s) of Anomaly**	**Description**
	M10A, M10B	Trends	Agricultural	Two weak, parallel trends M10A, M10B, aligned northwest southeast. Linears of possible agricultural origin.
19	M8	Trend	Former boundary	Weak trend, northeast-southwest aligned likely represents former boundary, but could be associated with fording point depicted on the 1836 map.
	Increased response	?Archaeology	'Pit' type responses	Couple of anomalies that may be of archaeological significance and represent cut features of archaeological potential (postholes, pit etc) but may also be natural in origin (stone sockets etc.)

Table 10: Geophysical Survey Results Branganstown Townland, Field 16, 17, 18

Branganstown		Fields 16, 17, 18		Figures 3, 4, 7, 8
Field	**Anomaly**	**Form/Nature of Anomaly**	**Possible Source(s) of Anomaly**	**Description**
16	M29A, 29B, 29C	Former Boundaries	Former boundaries/field divisions	Three boundaries northeast to southwest aligned. Boundaries M29B and M29C both correspond with field boundaries depicted on the 1836 map, while M29A is not depicted suggesting it represents an earlier field system or modern drain.
	M30A, M30B, M30C, M30D	Trends	Former field divisions/drains	Linear anomalies roughly parallel, northeast to southwest aligned (M30A, M30B, M30C) extending towards the canal, while M30D is northwest to southeast aligned. Their form is suggestive previous field boundaries or drains.
	M30E, M30F, M30G	Trends	Oval trends, might represent ring ditches (tentative) or be agricultural in nature	Three faint oval trends (M30E, M30F, M30G) located in proximity to ring ditch KD005-003. These might represent ring ditches, however are faint and their ephemeral nature might suggest an agricultural origin.
	M30H, M30I	Trends	Former stream/paleochannels	Two anomalies, one roughly circular M30H, the other adjacent to the west and running

Branganstown		Fields 16, 17, 18		Figures 3, 4, 7, 8
Field	**Anomaly**	**Form/Nature of Anomaly**	**Possible Source(s) of Anomaly**	**Description**
				northwest to southeast M30I. Likely represents a former stream or paleochannel, not depicted on mapping, could represent changes in natural.
	M31	Archaeology	Ring ditch	Oval anomaly measuring roughly 18m, corresponding with the location of Recorded Monument KD005-003, as visible on the 1970 aerial photograph (CUCAP BDH 31).
	M32A, M32B, M32C	?Archaeology	Multiple spread, curvilinear and linear responses of potential archaeological significance	A number of anomalies of potential archaeological significance. Anomaly M32A consists of linears, likely represents a ditch, could be modern in nature. Anomalies M32B and M32C are curvilinear, natural origin can not be excluded.
	Increased response	?Archaeology	'Pit' type responses	Couple of anomalies that may be of archaeological significance and represent cut features of archaeological potential (postholes, pit etc) but may also be natural in origin (stone sockets etc.)
17	M27	?Archaeology	Multiple 'spread' type responses	Three large anomalies that may be of archaeological significance and represent features of archaeological potential such as spreads, but may also be natural in origin.
	M26	Modern	Agricultural	Weak modern anomaly along the west boundary of the field, running northeast to southwest likely represents an access route.
	M33	Former Boundary	Former boundary/field divisions	Northwest to southeast aligned linear corresponding with field boundary depicted on the 1836 map.
	Increased response	?Archaeology	'Pit' type responses	Couple of anomalies that may be of archaeological significance and represent cut features of archaeological potential (postholes, pit etc) but may also be natural in origin (stone sockets etc.)

Branganstown		Fields 16, 17, 18		Figures 3, 4, 7, 8
Field	**Anomaly**	**Form/Nature of Anomaly**	**Possible Source(s) of Anomaly**	**Description**
19	M28	Cultivation	Numerous parallel linears	A group of weak trends M28 aligned roughly northeast-southwest representing features of agricultural origin, likely furrows.
	Increased response	?Archaeology	'Pit' type responses	A couple of anomalies that may be of archaeological significance and represent cut features of archaeological potential (postholes, pit etc) but may also be natural in origin (stone sockets etc.)

8. DISCUSSION & CONCLUSIONS

The geophysical survey (Figures 1-10) was conducted between May 2021 and March 2022 by Ian Russell, Robert Breen and Jeanne Rochford of Archaeological Consultancy Services Unit Ltd. (ACSU) under licence 21R0091 issued by the Department of Housing, Local Government and Heritage.

This geophysical survey confirmed the presence of Ring-ditch - KD005-003 visible as Anomaly M31 and identified within the northwest part of Field 16. Furthermore, curving trend M3A and oval trend M4 in Field F12, and Anomalies M30E, M30F and 30G in Field 16 might represent remains of other ring-ditches; although this interpretation is tentative. It should be noted that these anomalies are ephemeral in nature, likely due to truncation as a result of agricultural activity/ploughing, and could represent changes in geology. All fields, except for Fields 5 and 9, produced increased responses of potential archaeological significance. These were mostly small scattered anomalies, but some were large, and linears and curvilinears were also noted. Some of these are suggestive of large features, and these were noted as Anomalies M7 in Field 10, M11 in Field 11; M13 in Field 7, M15 in Field 6, M18 in Field 4, M20 in Field 1, M23 in Field 15 and M27 in Field 17 and M32 in Field 16. Small positive anomalies may represent cut features of archaeological potential (postholes, pits etc), and larger anomalies may represent a concentration of large spreads. Linears and curvilinears might represent ditches or other features of archaeological significance. It should be noted, however, that this interpretation is tentative and anomalies could be modern or natural in origin (stone sockets, natural geology etc.).

The remaining anomalies could represent modern agricultural activity including plough marks or wheel ruts. These were noted in Fields 5, 4, 12, 13, 15,17, 18 as Anomalies M1, M3, M5, M17, M19, M24, M26, M27, M28. Trends in Fields 4, 7, 9, 10, 12, 14, 16, 19 were noted as Anomalies M6, M8, M9, M10, M12, M16, M25, M30 and may represent archaeological features or drainage systems/field boundaries, natural geology or changes in topsoil. Furthermore, five linears, interpreted as field boundaries, include anomalies M29A, M29B, M29C in Field 16, Anomaly M22 in Field 3 and Anomaly M33 in Field 17. Three anomalies M29B, M29C and M33 correspond with field boundaries depicted on the 1836 map, while both M22 and M29A could represent earlier field systems or perhaps a more recent drainage system as they are orientated towards a watercourse.

A number of anomalies that appear to represent paleochannels include M30I, M30H in Field 16, M21 in Field 2, M14 in Field 6 and M12D in Field 7 were identified. These are meandering in nature and represent former streams, while Anomaly M21 could represent the former course of the Lyreen River. Throughout the survey areas, small-scale ferrous responses were evident in the results and are likely to represent modern metal debris contained within the topsoil.

9. RECOMMENDATIONS

Work on this project is ongoing, and the remaining areas will be surveyed as soon as access is provided.

It is recommended that targeted test trenching of the anomalies identified in areas that will be impacted, should be undertaken in advance of construction and conditioned within any grant of planning permission for the site. In particular, Anomaly M31 representing recorded monument, ring ditch KD005-003 and anomalies of potential archaeological significance should be further assessed. This testing should be carried out under licence to assess their archaeological significance and to determine the impact that development may have on any features identified.

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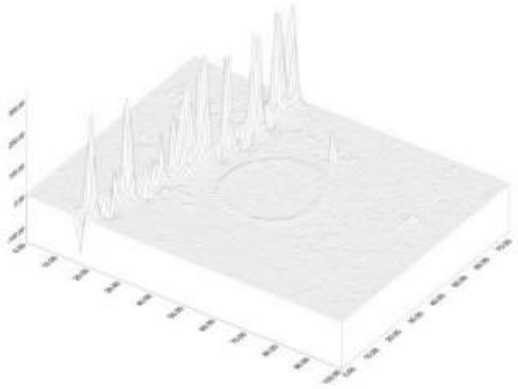
Appendix 1 - Summary Technical Information & Glossary of Terms

Fluxgate Gradiometer Survey: Surveys are undertaken using the Bartington Grad 601-2 survey instrument which was specifically designed for archaeological prospection. It includes sensors that are highly stable, minimizing requirements for excess data processing. The instrument has a vertical 1 m sensor separation permitting finite resolution of buried archaeological features. Surveys can be undertaken in scan or detailed (zig-zag traverse) modes for reconnaissance or high-density mapping. The fluxgate enables reliable flexibility during fieldwork. Frequent realignment of the instruments and zero drift correction ensure a constant high quality of data. Extremely sensitive, these instruments can detect variations in soil magnetism to 0.1nT, affording diverse application throughout a variety of archaeological, soil morphological and geological conditions. The instrument can be employed in both commercial and research-based investigations allowing for completion of projects within short timescales. Regular grid sample densities from standard 1600 readings to 12800 readings per 20m by 20m grid are permitted. A constant high quality of data is assured by experienced field staff operating in accordance with English Heritage Research & Professional Guidelines No. 1, *Geophysical Survey In Archaeological Field Evaluation* (David 1995).

Bartington Grad 601-single axis dual sensor gradiometer.

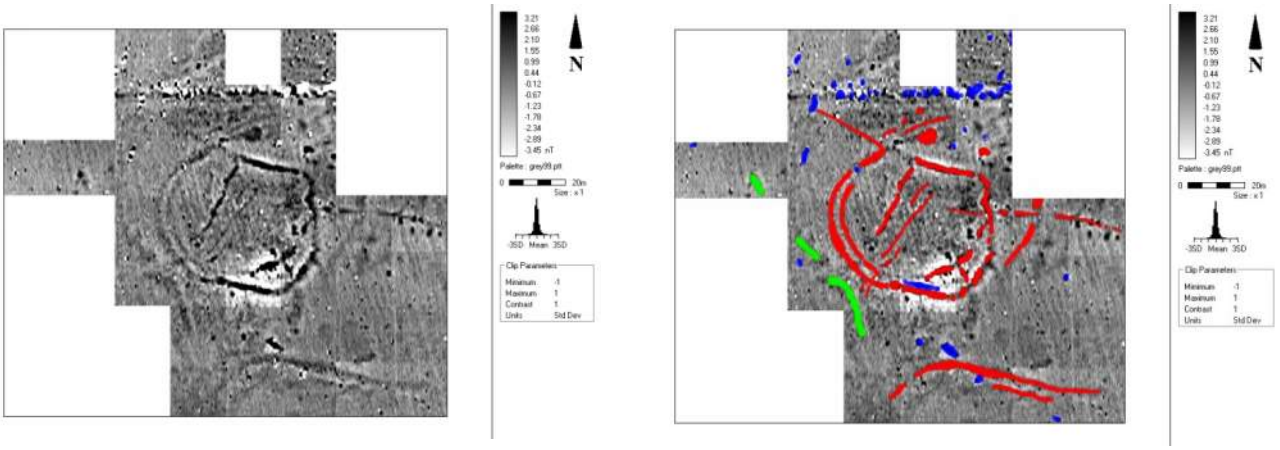
Data Display Formats

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



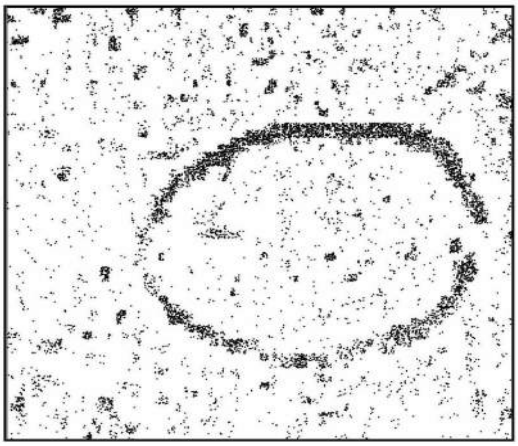
XY Trace of enclosure site

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



Early medieval enclosure greyscale

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



Dot Density plot of oval shaped enclosure

Glossary of Interpretation Terms

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

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

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

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

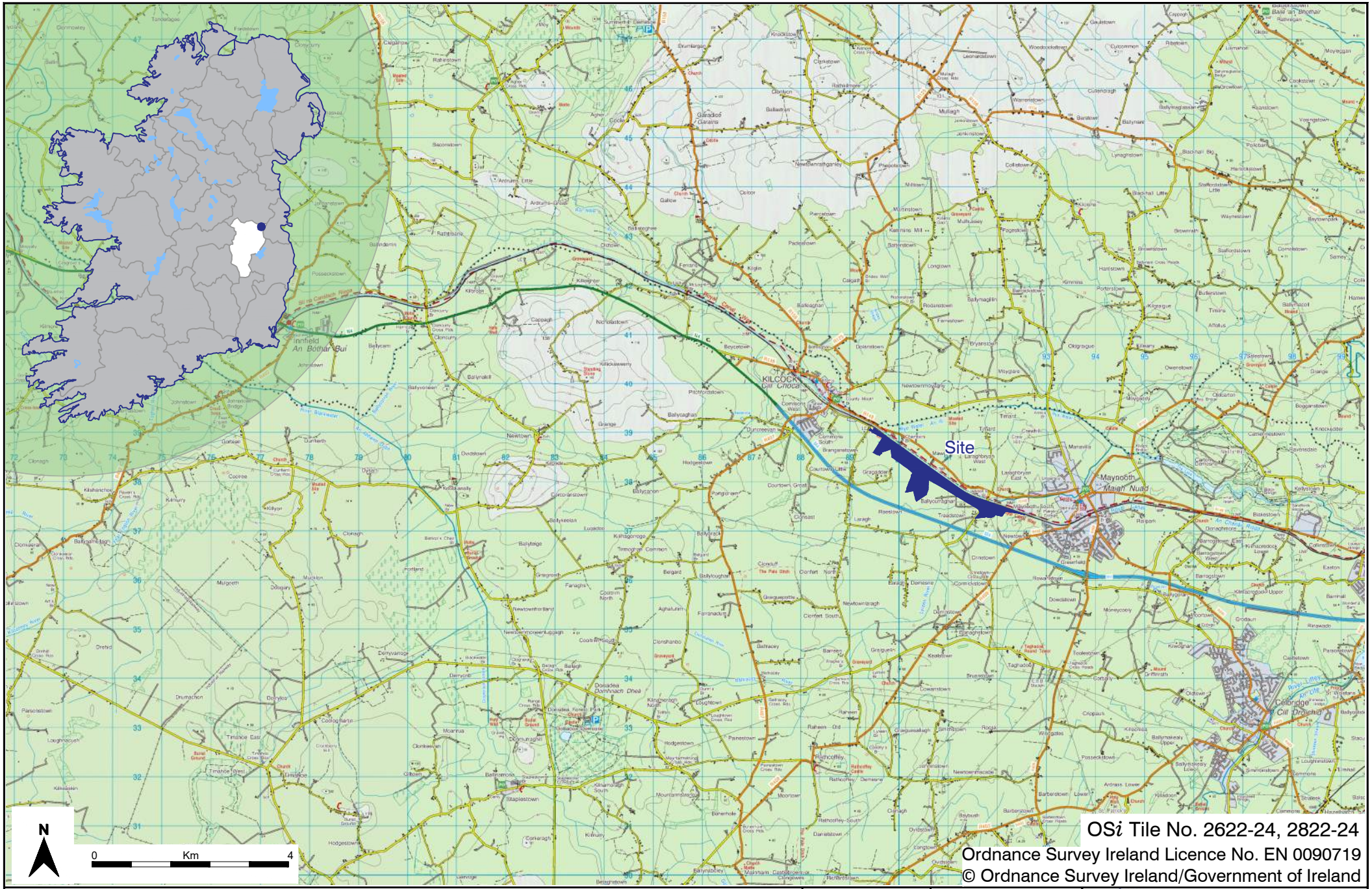
Trend :This category refers to low-level magnetic responses barely visible above the magnetic background of the soil. Interpretation is tentative, as these anomalies are often at the limits of instrument detection.

Ploughing/Ridge & Furrow : Visible as a series of linear responses, these anomalies equate with recent cultivation trends.

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

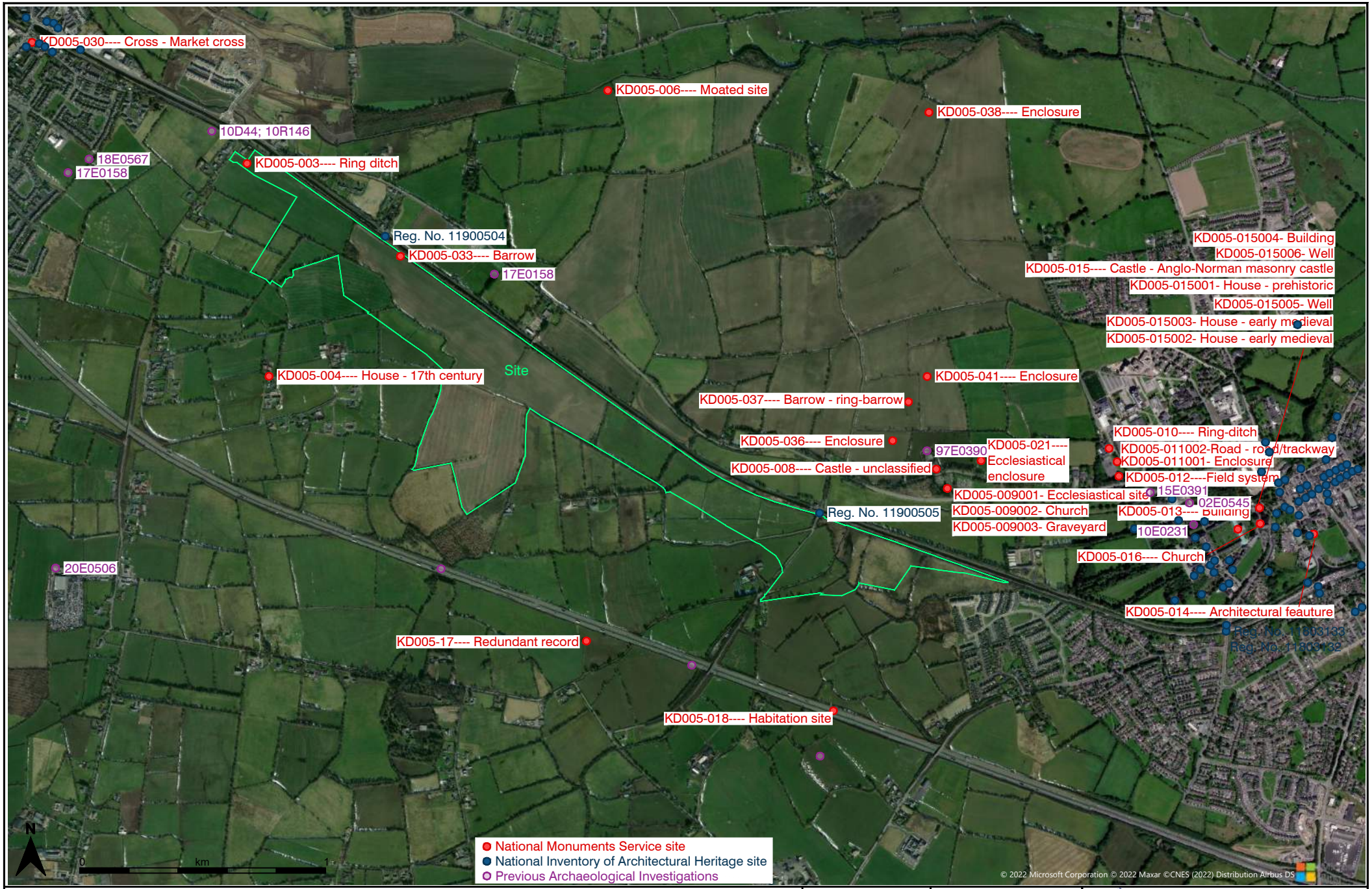
Ferrous : These anomalies exhibit a typically strong magnetic response, often referred to as 'iron spikes,' and are the result of modern metal debris located within the topsoil.

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

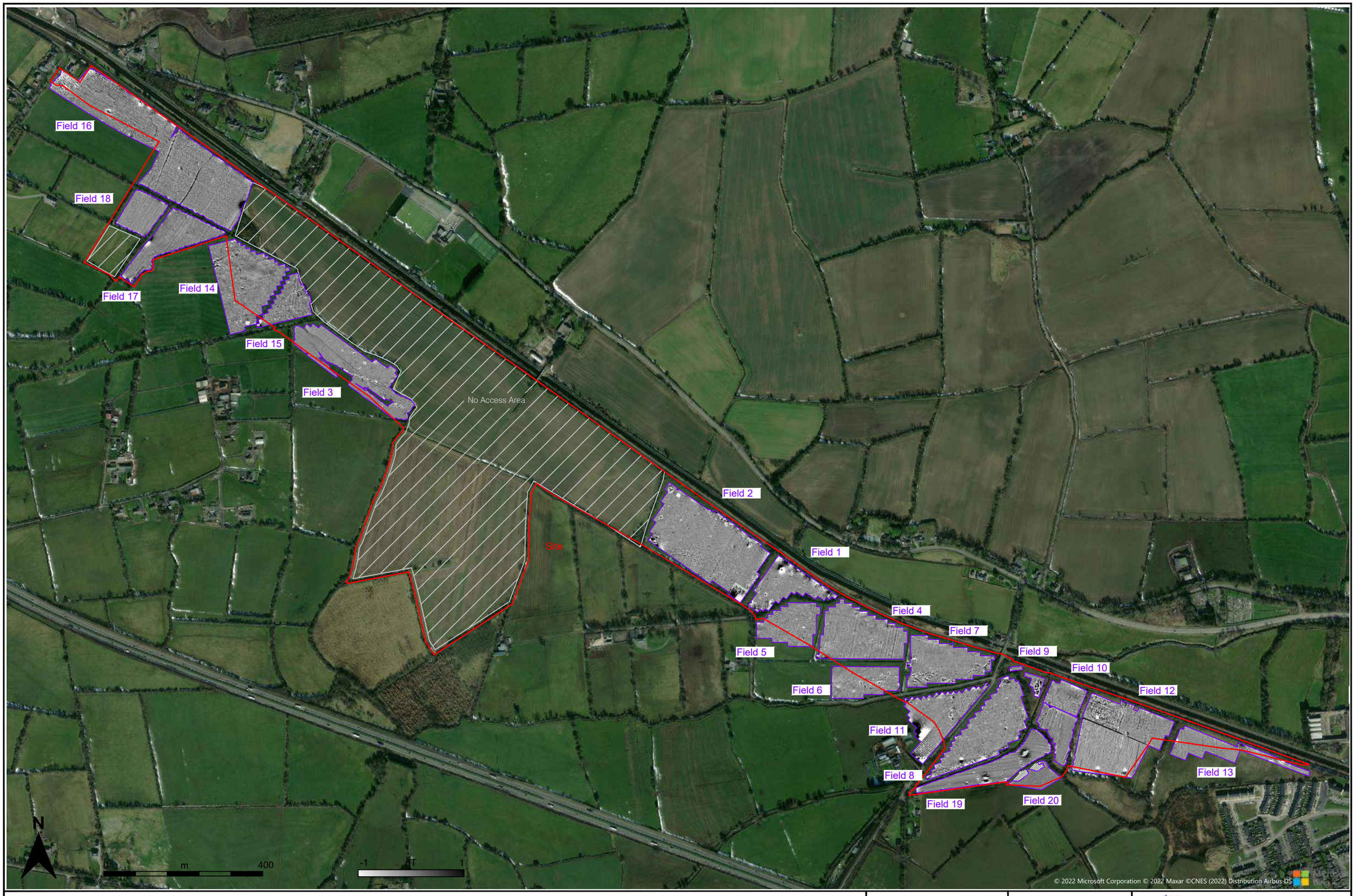


OS*i* Tile No. 2622-24, 2822-24

Project Dart + West project, Maynooth Kildare	**Date** March 2022	**Drawing No.** 2128_C1001	ARCHAEOLOGICAL CONSULTANCY SERVICES UNIT
Figure 1 Location of site		**Scale** 1:100,000 @ A4	



Project Dart + West project, Maynooth Kildare	**Date** March 2022	**Drawing No.** 2128_C1002	ARCHAEOLOGICAL CONSULTANCY SERVICES UNIT
Figure 2 Location of site, previous archaeological investigations and nearby *Sites and Monuments Record* sites		**Scale** 1:20,000 @ A4	

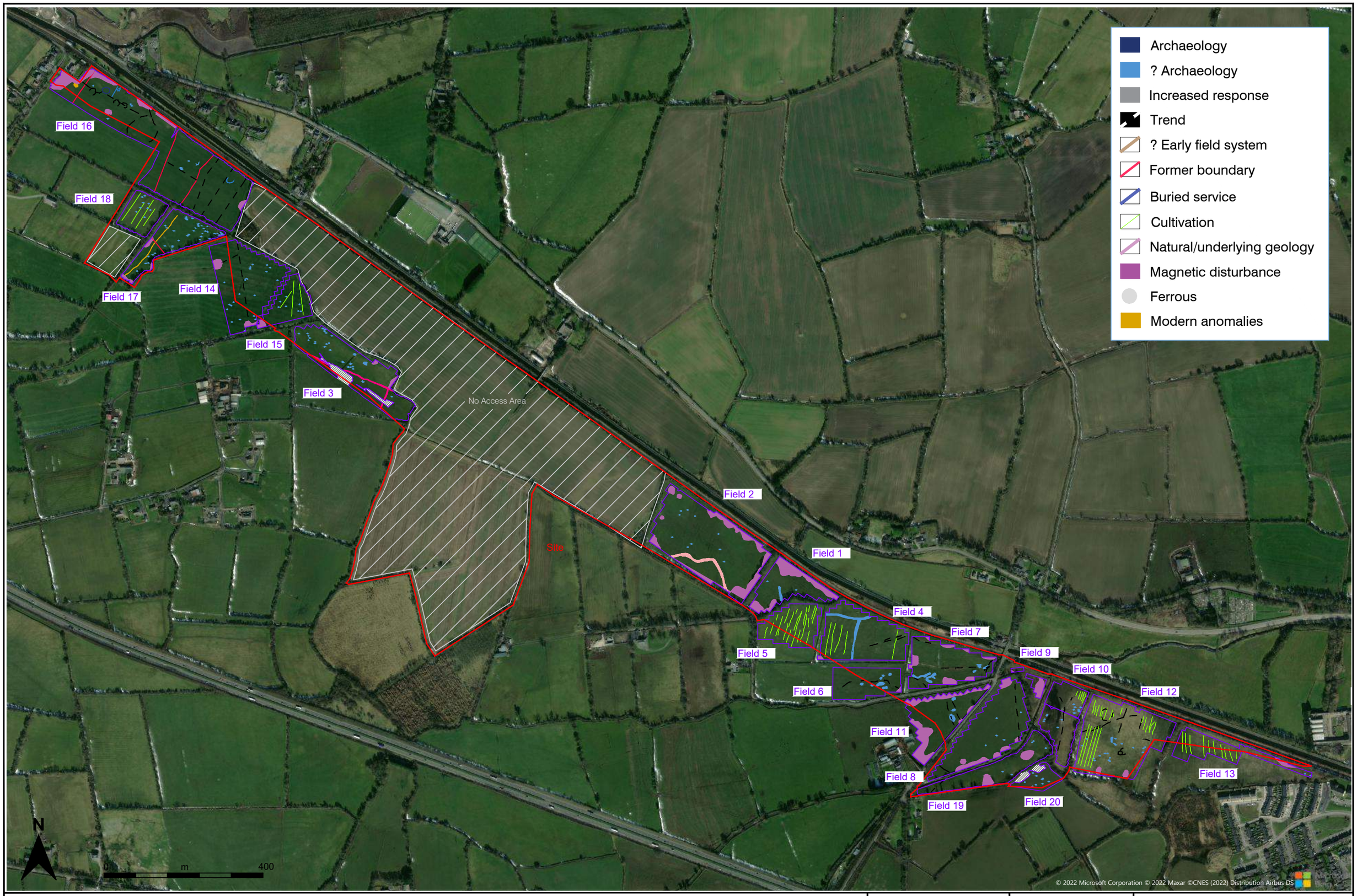


Project Dart + West project, Maynooth Kildare	**Drawing No.** 2128_C1003	**Date** March 2022	ARCHAEOLOGICAL CONSULTANCY SERVICES UNIT
Figure 3 Overall plan of geophysical survey results (grey scale image), field 1 to 20		**Scale** 1:8,500 @ A3	

Project Dart + West project, Maynooth Kildare	**Drawing No.** 2128_C1004	**Date** March 2022	ARCHAEOLOGICAL CONSULTANCY SERVICES UNIT
Figure 4 Geophysical survey results (grey scale image), field 16 to 18 and field 3		**Scale** 1:3,500 @ A3	

Project	Dart + West project, Maynooth Kildare	**Drawing No.** 2128_C1005	**Date** March 2022	ARCHAEOLOGICAL CONSULTANCY SERVICES UNIT
Figure 5	Geophysical survey results (grey scale image), field 1and 2, field 4 to 7 and field 11		**Scale** 1:3,000 @ A3	

Project Dart + West project, Maynooth Kildare	**Drawing No.** 2128_C1006	**Date** March 2022	ARCHAEOLOGICAL CONSULTANCY SERVICES UNIT
Figure 6 Geophysical survey results (grey scale image), field 8 to 10, field 11 and 13, field 19 and 20		**Scale** 1:2,500 @ A3	



Project Dart + West project, Maynooth Kildare	**Drawing No.** 2128_C1007	**Date** March 2022	ARCHAEOLOGICAL CONSULTANCY SERVICES UNIT
Figure 7 Overall plan of geophysical survey interpretation, field 1 to 20		**Scale** 1:8,500 @ A3	

Project Dart + West project, Maynooth Kildare	**Drawing No.** 2128_C1008	**Date** March 2022	ARCHAEOLOGICAL CONSULTANCY SERVICES UNIT
Figure 8 Geophysical survey interpretation of field 16 to 18 and field 3		**Scale** 1:3,500 @ A3	

Project Dart + West project, Maynooth Kildare	**Drawing No.** 2128_C1009	**Date** March 2022	ARCHAEOLOGICAL CONSULTANCY SERVICES UNIT
Figure 9 Geophysical survey interpretation of field 1and 2, field 4 to 7 and field 11		**Scale** 1:3,000 @ A3	

Project Dart + West project, Maynooth Kildare	**Drawing No.** 2128_C1010	**Date** March 2022	ARCHAEOLOGICAL CONSULTANCY SERVICES UNIT
Figure 10 Geophysical survey interpretation of field 8 to 10, field 11 and 13, field 19 and 20		**Scale** 1:2,500 @ A3	