

**Archaeological Impact Assessment
Courtstown, Little Island, Co. Cork**

Avril Purcell MA, MIAI
June 2024

Lane Purcell Archaeology,
64 Fr Mathew Road,
Turner's Cross,
Cork
Job Ref. LPA1236
on behalf of

Ruden Homes Ltd,
Carrig House,
Old Waterpark,
Carrigaline,
Co Cork

1 Introduction

1.1 It is proposed to construct a Largescale Residential Development (LRD) on a green field site at Courtstown, Little Island, Co Cork (ITM 576768 571967) (Figs. 1 & 2). The proposed development site lies at the eastern end of Little Island and comprises the western portion of a large rectangular field which will form the first phase of a larger development. A narrow NS strip of ground along the eastern field boundary and an EW strip extending to the east also lie within the proposed first phase of the development and will provide, respectively, a landscape buffer of mixed planting and connections to existing infrastructure.

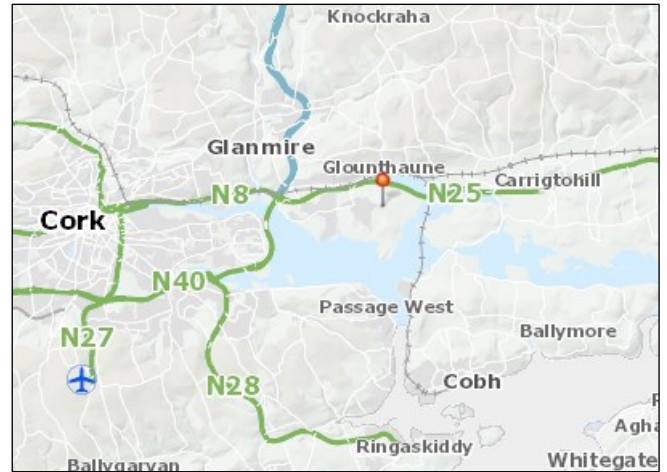


Figure 1: Development site on Ordnance Survey of Ireland map

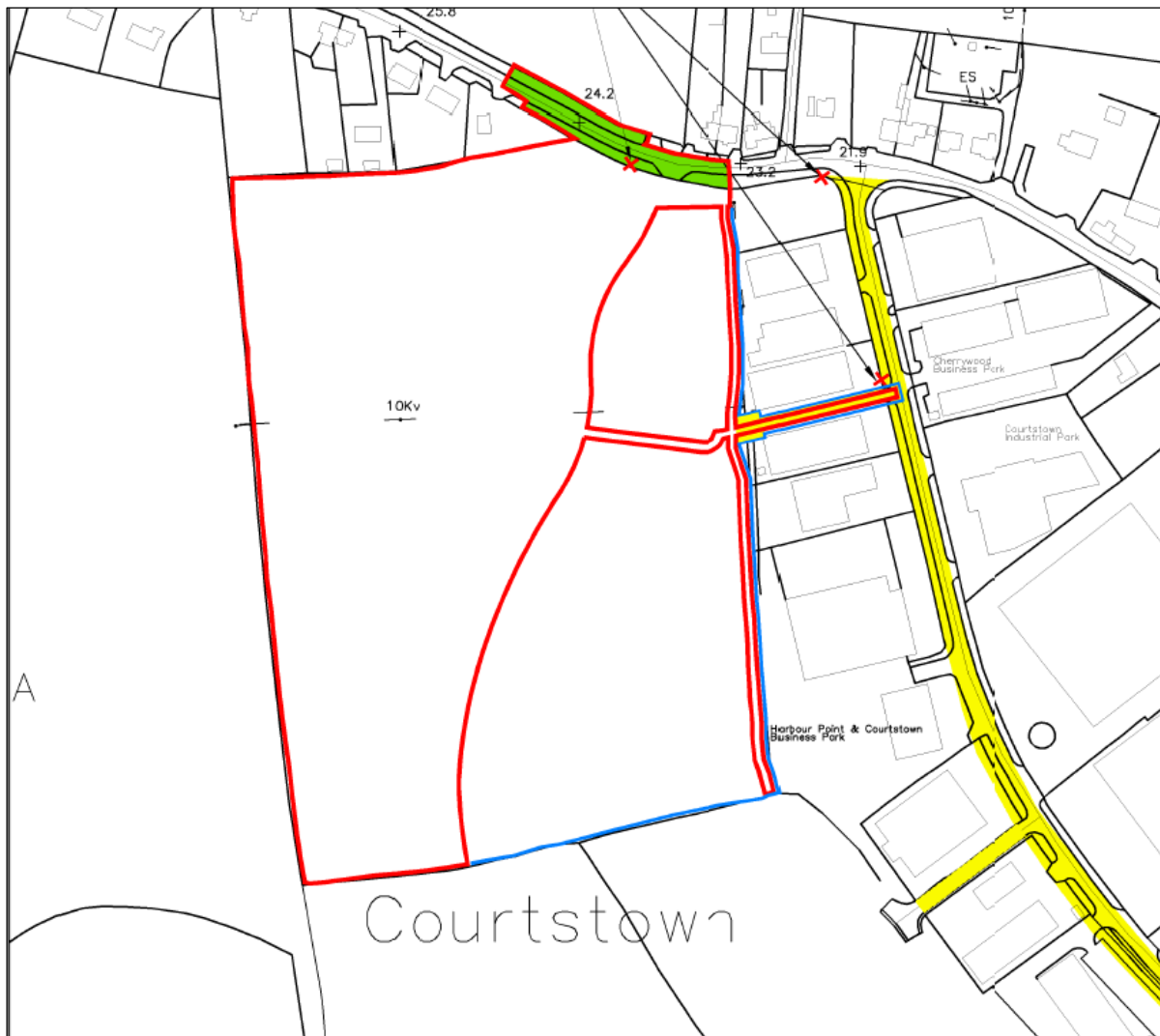


Figure 2: Ordnance Survey of Ireland map (scale 1:2,500 reduced) (after Engenuiti Consulting Engineers)

1.2 There are no recorded archaeological sites within the proposed development site. The site of Courtstown Castle (CO075-025) is located approximately 440m to the east of the eastern field boundary (Fig. 3). A geophysical survey was undertaken on the entire field in April 2024 (Nicholls 2024). No responses of definite archaeological character were noted in the survey, however, responses of potential significance were

identified, most notably a curvilinear anomaly (A) at the southern end of the field. This anomaly lies at the southeastern edge of the proposed development site.

- 1.3 Following completion of the geophysical survey a test trenching layout was agreed with Cork County Archaeologist, Annette Quinn, and a licence application, including the agreed trenching layout was submitted to the National Monuments Service (NMS), Department of Housing, Local Government and Heritage.
- 1.4 This report was compiled by Avril Purcell, Lane Purcell Archaeology, 64 Fr Mathew Road, Turner's Cross, Cork on behalf of Ruden Homes Limited, Carrig House, Old Waterpark, Carrigaline, Co Cork.

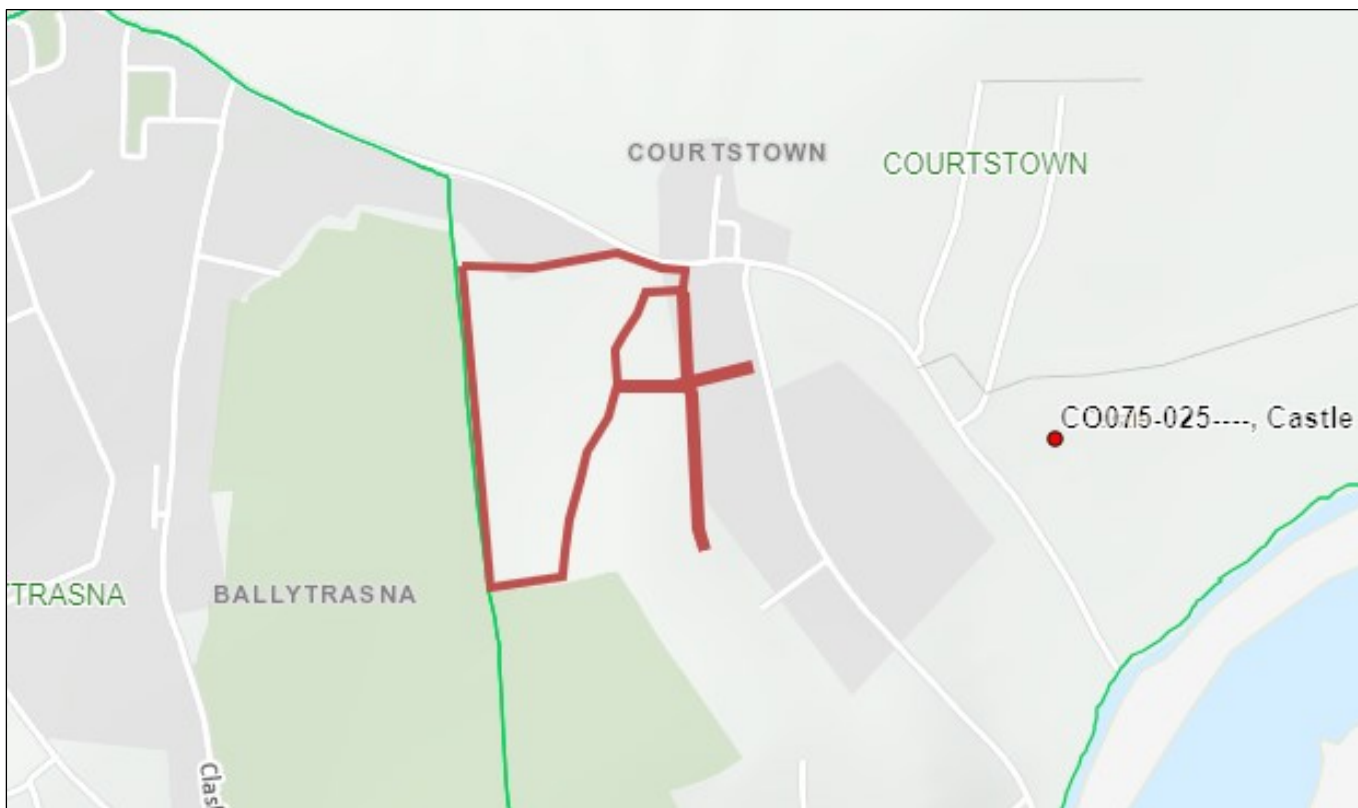


Figure 3: OSI map showing nearest recorded archaeological site (www.archaeology.ie)

2 The Proposed Development

2.1 It is proposed to construct an LRD on the site (Fig. 4) to include:

- The construction of 172 no. residential units to include 146 no. dwelling houses (with 83 no. dwelling houses to include the option for constructing a ground floor extension to the rear); 6 no. duplex units; and 20 no. apartments.
- Provision of 1 no. creche and 4 no. commercial units.
- Upgrading of the existing vehicular access to the site and the creation of a signalised junction on Ballytrasna Park Road (L-2985-0), including footpaths, cycle lanes and pedestrian crossing points, to facilitate access into the site.
- The provision of a new distributor road, including footpaths and cycle lanes, connecting the proposed residential development with Ballytrasna Park Road.
- All associated infrastructure and ancillary development works to include the provision of roads, footpaths and cycle lanes as well as the provision of vehicular connections to adjoining lands with pedestrian/cycle facilities; proposed diversion and undergrounding of the existing 10KV overhead electricity line and associated poles traversing the site; landscaping & amenity areas, lighting, drainage and services connections; bicycle and car parking; bin storage; and boundary treatments including fencing and landscape buffer of mixed native hedge planting along the eastern boundary of the site.



Figure 4: Proposed site layout plan (after Engenuti)

3 Archaeological and Historic Background

3.1 The proposed development site is located in the townland of Courtstown, in the parish of Little Island and the barony of Barrymore, Co. Cork. There are no recorded archaeological monuments within the proposed development site. The closest recorded monument is the site of Courtstown Castle (CO075-025) approximately 440m to the east. The castle site is listed in the Record of Monuments and Places (RMP) for County Cork and the Sites and Monuments Record (SMR) database of the Archaeological Survey of Ireland (ASI). The RMP lists all archaeological monuments and places known to be of archaeological importance in the county and affords them statutory protection under the National Monuments Act 1930 to 2004 (1994 amendment). The SMR database is a working database of all known archaeological monuments in the state and is continually updated.

3.2 There are 15 recorded archaeological sites within an approximate 2km radius of the proposed development site (Table 1 and Fig. 5). These provide evidence for human settlement and activity in the area dating from the Bronze Age (2400BC – 500BC).



Figure 5: Development site outlined on OS map with RMP detail. All numbers are prefaced with CO075 (www.archaeology.ie)

SMR/RMP No.	Site Type	Townland	Distance from site
CO075-025	Castle	Courtstown	440m to N
CO075-046	Designed landscape-folly	Foaty	900m to E
CO075-026	Martello tower	Belvelly	1.5km to SE
CO075-090	Pit	Foaty	1.6km to E
CO075-091	Fulacht fia	Foaty	1.73km to E
CO075-092	Fulacht fia	Foaty	1.73km to E
CO075-093	Excavation-miscellaneous	Foaty	1.75km to E
CO075-089	Fulacht fia	Foaty	1.88km to E
CO075-024002-	Designed landscape-belvedere	Carrigrennan	895m to S
CO075-024001-	Midden	Carrigrennan	940m to S
CO075-095	Midden	Carrigrennan	1.3km to S

CO075-084	Corn-drying kiln	Castleview	1.57km to W
CO075-085	Corn-drying kiln	Castleview	1.65km to W
CO075-086	Corn-drying kiln	Castleview	1.7km to W
CO075-082	Fulacht fia	Castleview	1.75km to W

Table 1: Recorded archaeological sites within approximately 2km of development site and on Little Island

- 3.3 The castle in Courtstown is described in the Archaeological Inventory of Co Cork (Power *et al.*, 1994) as follows: *On top of a natural knoll, in commanding position at E end of Little Island. Marked 'site of' on 1842 OS 6-inch map; no visible surface trace. Barry castle, the name 'court' may indicate a 17th century date of construction (Healy 1988, 102).*
- This is one of two known castles on Little Island, the other a tower house at the western end in Wallingstown (CO075-021), is 2.1km away and is upstanding to four storeys. There is a church and graveyard (CO075-02002- and CO075-020001-) of late medieval date a short distance to its west (*ibid.*). The castle at Courtstown cannot be further classified due to the absence of upstanding remains but it is likely to have been either a tower house (generally built during the 15th and 16th centuries) or a fortified house (generally of 17th century date). There is also a tower house on the Great Island at Belvelly (CO075-030) almost 2.5km to the southeast. Further afield at Barryscourt there is a substantial tower house and associated bawn (CO075-018001- and CO075-018002-) just over 5km to the east. At a similar distance to the west in Mahon on the Mahon Peninsula, there are two tower houses Blackrock Castle (CO074-052) and Ringmahon Castle (CO074-053). The former is prominently sited defending the River Lee on the approach to the medieval city. The presence of a large number of late medieval defensive buildings in the upper harbour demonstrates a significant level of contemporary activity and the strategic importance of the harbour.
- 3.4 The earliest recorded monuments in the vicinity of the proposed development site are the fulachtaí fia in Foaty (CO075-089, CO075-091 and CO075-092) and Castleview (CO075-082). Fulachtaí fia are generally interpreted as ancient cooking sites, but could have been used for any purpose that required large quantities of hot or boiling water. They usually survive as a spread, or mound, of heat-shattered and burnt stone. The burnt stone generally fills and covers one or more troughs or pits cut into the ground. The trough, which was sometimes lined with timber, wattle or stone, would have been excavated below the water table, near a spring or stream and allowed to fill with water. A fire was set adjacent to the trough, to heat stones, and the water was then heated or boiled by immersing the fire-heated stones in it. Experiments have shown that large quantities of water can be boiled in this way in about twenty minutes and joints of meat wrapped in straw can be cooked over several hours. After each use the burnt and heat-shattered stones would have to be cleaned out of the trough. Over time this material accumulated to form a crescent shaped mound of burnt material around the trough. Many of these mounds have been levelled by agricultural and land improvement activities during recent decades, in particular, and may survive as burnt spreads scattered across low lying or reclaimed land. Fulachtaí fia are usually dated to the Bronze Age (2400-500BC), but a small number of excavated examples have been dated to the Neolithic and early historic periods. While these sites are generally interpreted as cooking sites, they could also have been used for bathing, processing textiles, tanning, brewing, extraction of fats from meat, and soap making, or even a combination of these functions (Ó Drisceoil, 1988; Monk 2007; Quinn & Moore 2007).

The fulachtaí fia in Foaty were found along with a number of other Bronze Age and later deposits when archaeological investigations were carried out as part of construction works at Fota Wildlife Park and Fota House and Gardens between 2009 and 2014 (Lane 2009, Lane 2010 and Lane and Purcell 2013, Quinn 2012 and Carroll 2014). In 2009 investigations were undertaken to facilitate construction of a car park during which a number of small scale pits were identified and excavated. Cremated human remains were found in two of the excavated pits and were dated to the Late Bronze Age (Lane 2009, Lane 2010 and Lane and Purcell 2013). During later works in Fota Wildlife Park (Quinn 2012), approximately 150m to the west, an oval enclosure (CO075-093), two fulachtaí fia (CO075-091 and CO075-092), and a pit (CO075-090) were excavated. In subsequent construction works additional features including a fulacht fia, pits and linear features were found and it was speculated that these also may have been associated with the enclosure (Carroll 2014). The fulacht fia in Castleview was discovered in 1999 when a D-shaped spread was identified

covering a trough in advance of the construction of an industrial complex. It was found to date to the Late Bronze Age (McCarthy 1999 and Ronan *et al.* 2009).

- 3.5 There are a number of early medieval sites at the western end of Little Island which indicate activity during the 5th to 12th centuries AD. Along with the Bronze Age fulacht fia found in Castleview (see above), three corn drying kilns were also found (CO075-084, CO075-085 and CO075-086) (McCarthy *ibid.*). A quantity of charred cereal grain recovered from one of the kilns provided radiocarbon dates in the 5th /6th century AD (Ronan *et al.* 2009). Further to the west (approximately 2.4km from the proposed development site) a horizontal water mill (CO075-052) was identified in Wallingstown in advance of the construction of a factory in 1978 (Rynne 1998). The mill was found to comprise two tidal mills; one vertical-wheeled and the other horizontal-wheeled and both were dated by dendrochronology to c. 630 AD (Power *et al.* 1994).
- 3.6 Little Island is a small island in the inner reaches of Cork Harbour. Extensive reclamation and the construction of the N25 road along its northern shore have significantly altered the surrounding landscape and it is now joined to the mainland close to Glounthaune village, although an expanse of mud flats remains along its northeastern shore. The 1842 OS 6-inch map shows it as an isolated rural island accessed by a single bridge at its northern side. Numerous unnamed buildings and cottages are shown lining the network of roads and lanes criss-crossing the island along with a small number of country houses and demesnes. The closest country house to the proposed development site is Courtstown Cottage, 350m to the east, and it, like most of the other country houses on the island, is no longer extant.

The island is described in very favourable terms by Lewis in 1837 (Cadogan 1998). He notes it was connected by “a handsome causeway of hewn stone and a metal spring bridge constructed in 1833...”. He mentions a number of “handsome seats...” and notes the “... pure atmosphere, fertile soil, and sylvan scenery having induced several wealthy individuals to settle on this small but beautiful island.” He considers the land to be productive with no waste land or bog, noting the reclamation of approximately 20 acres from the river. The area of the proposed development site is shown as the larger part of a large sub-rectangular field (Fig. 6) extending along the southern side of a local road. No buildings or features are shown within the field. The ‘site of’ Courtstown Castle lies 440m to the east.

- 3.7 Both the 25-inch OS map of 1897-1913 (Fig 7) and the OS 6-inch map of 1935 (Fig. 8) show the area of the proposed development site as unchanged. By 1935 development has begun across the road to the north where several houses with long rear gardens have been built. OSI aerial images from 1995 onwards show the proposed development site unchanged and in recent years under cultivation (Fig. 9).
- 3.8 Two phases of archaeological testing (Sutton 2006 and O’Rourke 2008) and subsequent monitoring (Purcell 2023) were carried out on a site a short distance to the east close to the site of Courtstown Castle in advance of a commercial development. No archaeological features associated with Courtstown Castle were found and no previously unknown archaeological sites were identified.

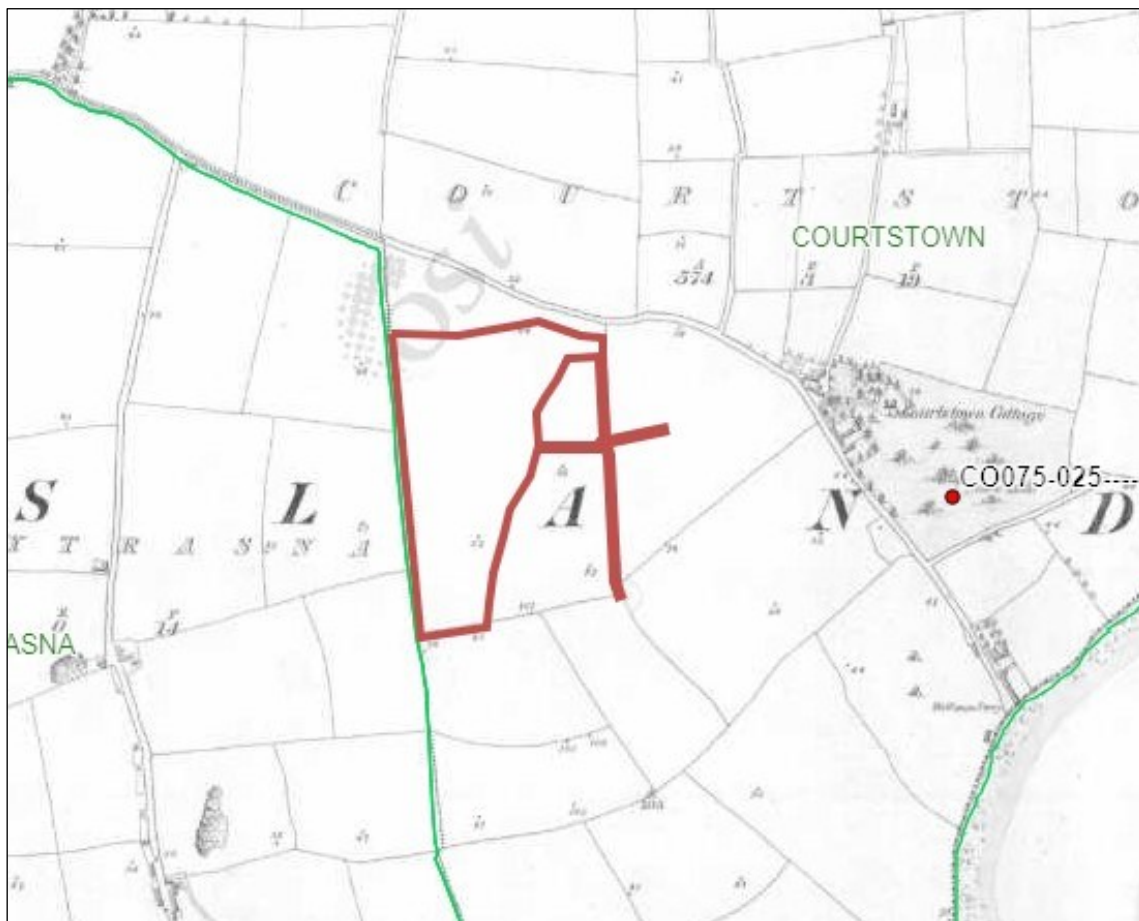


Figure 6: Extract from OS 6-inch map (1842), with proposed development site outlined in red (www.archaeology.ie)

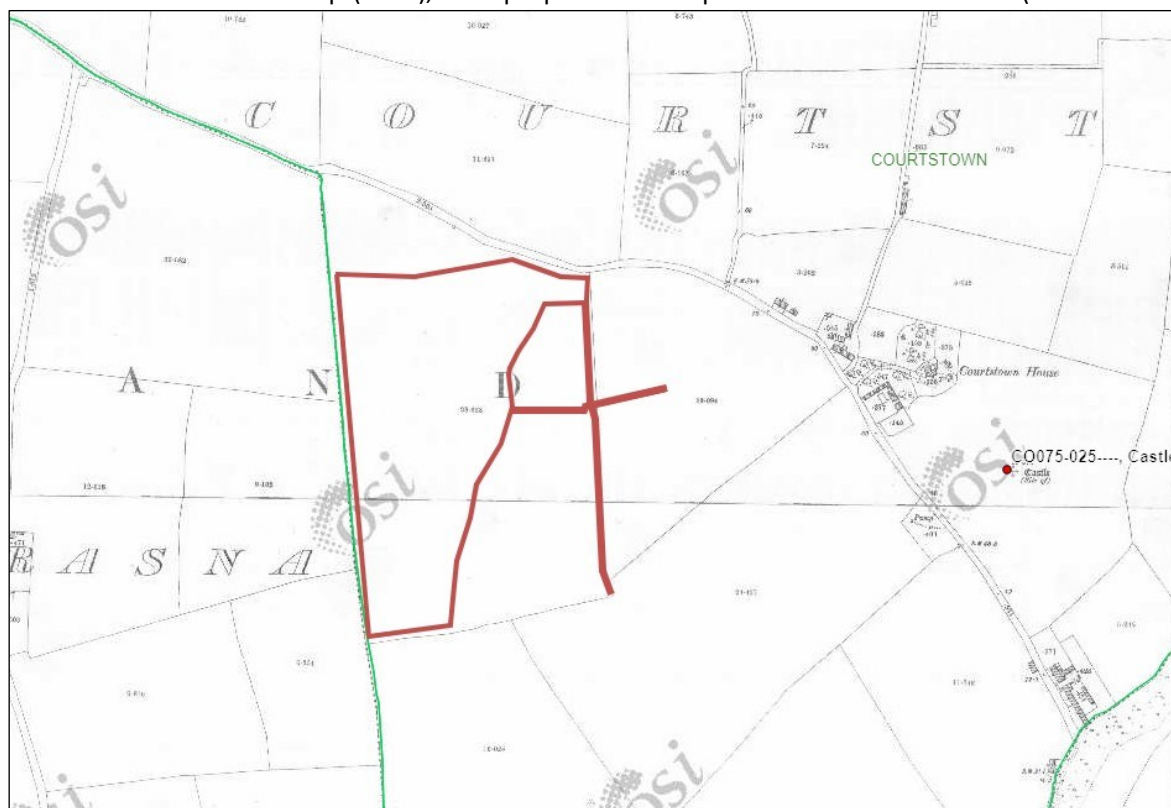


Figure 7: Extract from OS 25-inch map (1897-1913), with proposed development site outlined in red (www.archaeology.ie)

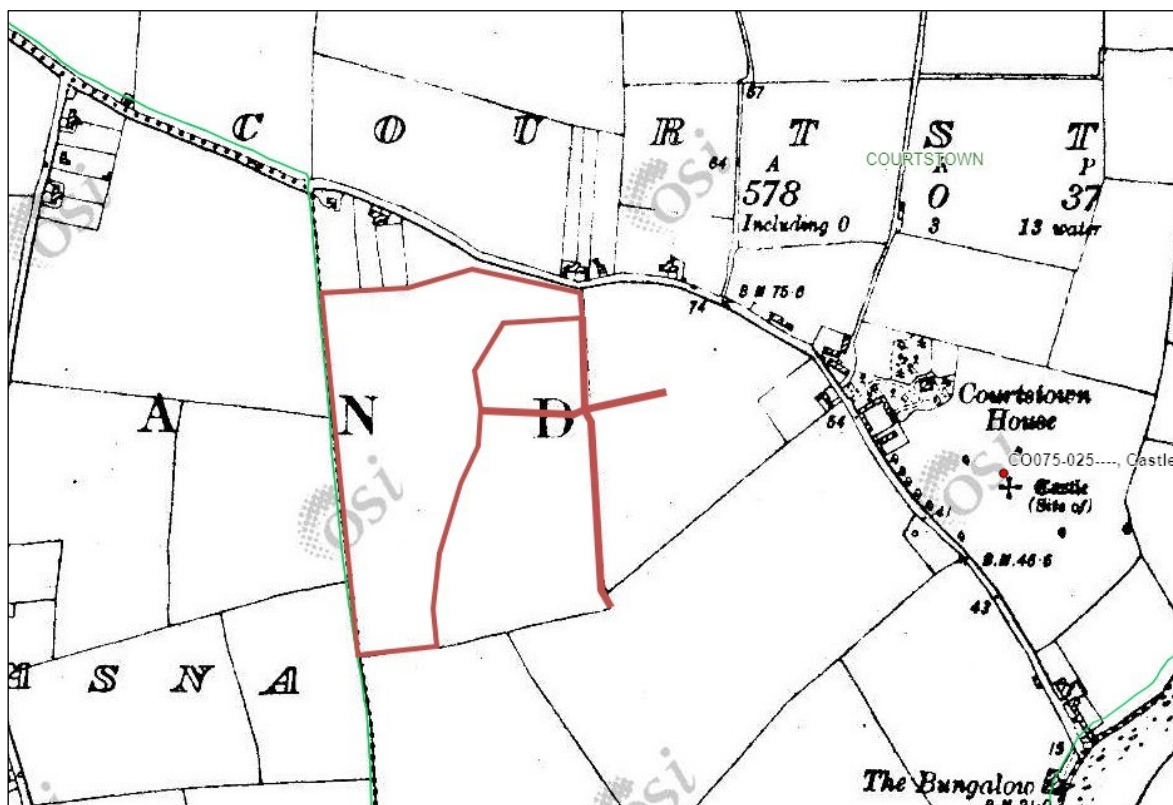


Figure 8: Extract from OS 6-inch map (1935), with proposed development site outlined in red (www.archaeology.ie)



Figure 9: Extract from OSI aerial image (MapGenie 2013 to 2018) (www.archaeology.ie)

4 Geophysical Survey

- 4.1 Geophysical survey was undertaken on the site under licence 24R219 in April 2024. The survey employed an advanced multichannel fluxgate gradiometer system combined with cm precision GPS recording magnetometer and GPS data simultaneously at rates of 50Hz and 1Hz respectively (Nicholls 2024).
- 4.2 The full geophysical survey is included as Appendix 1 and the results of the survey are as follows (Fig. 10):
“No responses of definite archaeological character are evident... Responses of potential significance are, however, indicated by the data. The most notable of these responses represents a weakly negative curvilinear anomaly (A) with adjacent trends, located at the southern edge of survey. This curvilinear anomaly and the adjacent trends may represent the remains of a levelled enclosure, potentially 45m in diameter. An archaeological interpretation for A remains somewhat tentative, however, given its overall weak magnetic signature and the abundance of natural soil/geological variation throughout the results. A natural soil/geological and/or recent landuse origin for anomaly A, should, therefore, not be discounted. A smaller curvilinear response (B), c 20m in length, which is similar in magnetic contrast to anomaly A, has been identified along the eastern survey edge to the SE of survey centre. A potential archaeological origin for anomaly B should also be considered. Interpretation remains uncertain, however, given encroaching ferrous disturbance from modern buildings to the E beyond the site perimeter, and also the abundance of natural soil/geological apparent throughout the results. The results from geophysical survey also highlight a number of interconnecting linear trends (C-D), which extend from survey centre to S. The possibility that C-D represent remnants of a former field system should not be dismissed, although there is no evidence for such visible on historic mapping. A recent landuse and/or natural soil/geological origin for responses C-D should also be considered. No further responses of note are indicated by the results from geophysical survey within the boundary of the proposed development.”
- 4.3 The survey extended over the entire field (8.9ha) of which the western part comprises the first phase of the proposed development site and is the subject of this application (Fig. 11). Anomaly A straddles the eastern boundary; its western portion inside the proposed development site and the remainder outside it to the east. Anomaly B lies outside the proposed development site further to the east at the eastern edge of the field. Anomalies C-D also lie close to the eastern site boundary, with C just inside and D outside the proposed development area.



Figure 10: Interpretation of geophysical survey results (Nicholls 2024)

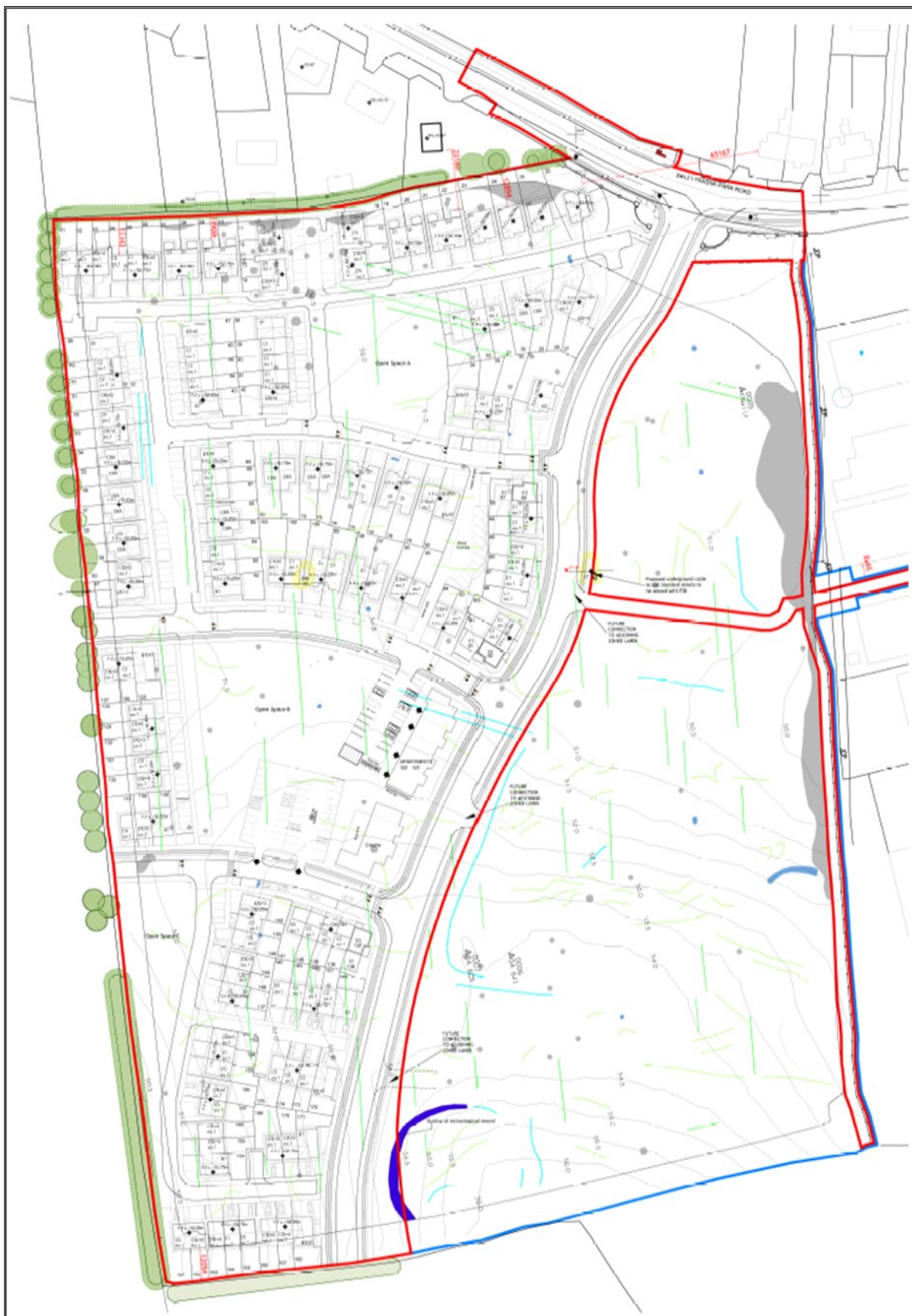


Figure 11: Interpretation of geophysical imposed on proposed development layout (after Engenuiti)

5 Site inspection

5.1 The proposed development site was inspected on the 6th of June 2024 in dry, overcast weather conditions. It comprises the western part of a large field under cultivation that opens onto the southern side of a local road through a single gateway in its southeastern corner. There is a small area of rough vegetation immediately south of the entrance. The field undulates gently and rises gradually to the south (Plates 1 and 2). The larger part of the proposed development site occupies the western part of the field (Plate 3). There were no features or buildings apparent in the field.



Plate 1: View of entire field, looking south



Plate 2: View of entire field, looking north



Plate 3: The western part of the field which comprises the larger part of the proposed development site, looking south

- 5.2 Field boundaries generally comprise hedgerows with mature trees and scrub, the scrub particularly dominating the eastern boundary to an industrial/commercial park in adjoining land. Along the western boundary there is a low earthen bank within the hedgerow on which traces of stone facing survive (Plates 4 and 5).
- 5.3 The location of Anomaly A (the possible enclosure identified in the geophysical survey) on a slightly elevated, north-facing slope, is a typical location for a ringfort (Plate 6). There is no surface indication of the anomaly in this area. Visibility is quite extensive, to the north, while a dense hedgerow to the south curtails visibility in that direction.



Plate 4: View of western field boundary, looking south



Plate 5: Traces of stone facing on earthen bank along western boundary



Plate 6: View south towards elevated ground where Anomaly A was identified, from western edge of field

5.4 No features or finds of archaeological significance were noted within the proposed development site or in the larger field during the site inspection.

6 Impact Assessment

- 6.1 It is proposed to construct an LRD on a green field site at Courtstown, Little Island, Co Cork. The proposed development site comprises the western portion of a large rectangular field which will form the first phase of a larger development. A narrow NS strip of ground along the eastern field boundary and an EW strip extending to the east also form part of the proposed development site.
- 6.2 There are no recorded archaeological sites within the proposed development site. The closest recorded archaeological site is the site of Courtstown Castle (CO075-025) approximately 440m to the east. There are 15 recorded archaeological sites within an approximate 2km radius of the proposed development site. These lie on Little Island and on Foaty Island to the east and provide evidence for human settlement and activity in the area dating from the Bronze Age.
- 6.3 A geophysical survey was undertaken on the entire field in April 2024 (Nicholls 2024). No responses of definite archaeological character were noted in the survey, however, responses of potential significance were identified, most notably a curvilinear anomaly (A) located at the southern end of the field. The anomaly lies along the red line boundary to the proposed development site, its western portion inside and the remainder outside the proposed development site to the east. Three other anomalies were noted - B, C and D. Anomaly B was a small curvilinear response lying outside the proposed development site to the east. Anomalies C and D were interpreted as remnants of a field system and this system lies on each side (i.e. inside and outside) of the proposed development site boundary.
- 6.4 Field walking was carried out in favourable weather conditions in June 2024. The field was under cultivation, planted with a low crop of barley. No features or finds of archaeological significance were identified during fieldwalking and there was no visible surface trace of Anomaly A, the possible enclosure identified in the geophysical survey. Anomaly A is located in an area of elevated ground at the southern end of the proposed development site. The geophysical survey estimates its diameter as approximately 45m and it is possible that it may represent the subsurface remains of a levelled ringfort. There are no known ringforts on Little Island, however, the corn drying kilns in Castleview (CO075-084, CO075-085 and CO075-086), 1.5 to 1.7km to the west, and the tidal mill at Wallingstown (CO075-052) indicate contemporary activity on the island. The enclosure is not shown on OSI mapping from the mid 19th century onwards indicating, if present, it was levelled in antiquity. Subsequent agricultural activity, in particular ploughing, would have removed above ground traces of the monument, however subsurface remains may exist.
- 6.5 Construction of the proposed development will require extensive removal of topsoil and ground reduction across the site. This will directly negatively impact any previously unrecorded subsurface archaeological deposits that may exist on the site. Although located outside of the residential development area, the geophysical Anomaly A lies approximately 5m east of a proposed access road. If development proceeds the setting of the feature will be removed and any associated features or deposits to its east will be directly negatively impacted.

7 Mitigation

- 7.1 To mitigate impact on any subsurface archaeological deposits that may exist on the proposed development site, an extensive program of archaeological testing has been agreed with Cork County Archaeologist, Annette Quinn (Fig. 12). A licence application for archaeological testing has been submitted to the NMS, Department of Housing, Local Government and Heritage and archaeological testing will be carried out when the licence is granted and in advance of development.
- 7.2 If archaeological deposits, features or finds are identified during archaeological testing consultation will be undertaken with the NMS and Cork County Archaeologist to agree appropriate mitigation. The preferred policy of the NMS and Cork County Council is that archaeological sites be preserved *in situ* within appropriate buffer zones (Framework and Principles for the Protection of the Archaeological Heritage 1999 and Cork County Development Plan 2022-2028). Archaeological deposits will be preserved *in situ* where possible on the proposed development site. If deposits cannot be preserved *in situ* they will be preserved by record through archaeological excavation. Such deposits and features will be fully excavated under licence to the NMS in advance of construction. Excavation will be carried out to professional standards of archaeological practice as outlined in Policy & Guidelines on Archaeological Excavation (1999). Sufficient time and resources will be available to carry out such works and will be funded by the developer.
- 7.3 Archaeological testing will be carried out on Anomaly A, to determine its nature and extent. The layout of the proposed road, accessing the adjoining land to the south, was moved to the west to accommodate the preservation *in situ* of the anomaly. The anomaly, as identified in the geophysical survey, will be preserved *in situ* within a buffer zone (minimum radius 5m from the nearest element of the development). The buffer zone will be securely fenced during construction and will be excluded from the development area. The fencing will be retained during the construction process to ensure no encroachment onto the feature and a landscape plan will be agreed with the planning authority for the area. Potential associated deposits to the east of the anomaly and within the proposed development site will be preserved by record through archaeological excavation, to facilitate construction of the access road. The remaining portion of Anomaly A lies outside the current application area and within the larger landholding. Its preservation *in situ* will be facilitated should further development be undertaken.
- 7.4 All recommendations are subject to the approval of Cork County Council and the NMS.



Figure 12: Layout of test trenches, shown in green, to be excavated across the site in advance of development.

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Appendix 1
Geophysical survey

Geophysical Survey Report
**Proposed Large Scale Residential Development (LRD),
in Courtstown townland, Little Island, Co. Cork**

Client
Ruden Homes Ltd.

Detection License
24R0219

TAG Project
2024IE09

Date
May 2024

Author
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Bluebell Avenue, Dublin 12, D12 KH67

TARGET GEOPHYSICAL SURVEY REPORT 2024IE09, PROPOSED LARGE SCALE RESIDENTIAL DEVELOPMENT (LRD) IN COURTSOWN TOWNLAND, LITTLE ISLAND, COUNTY CORK

PROJECT BACKGROUND

Target Archaeological Geophysics Ltd. was appointed by Ruden Homes Ltd. to undertake a geophysical survey at the site of a proposed Large Scale Residential Development (LRD) located in Courtstown townland, Little Island, Co. Cork. Situated c.1.8km SE of Junction 2 on the N25, to the E of Clash Rd and N of Well Road, the site of proposed development extends over 1 arable field c.9.8ha in size, and is located between Courtstown Industrial Estate (E-SE) and Harbour Point Golf Course (W-S). A total 8.9ha of high-resolution recorded magnetometry was completed within the boundary of the proposed development, examining all lands available at the time of fieldwork.

This geophysical survey was undertaken as part of a preliminary archaeological assessment prior to proposed development at the site. The survey was carried out under license from the National Monuments Service, Department of Housing, Local Government & Heritage with the following aims (detection license 24R0219):

- to identify geophysical anomalies of possible archaeological origin within the investigation area
- accurately locate these anomalies and present the findings in graphical format
- describe the anomalies and discuss their likely provenance in a written report

ITM central coordinates: 576848 571905

Townland: Courtstown

County: Cork

Landuse: Tillage

Landscape, soils, geology

The investigation area lies 23-28m above mean sea level within an undulating agricultural landscape used for both grazing and tillage. Soils of the locality comprise of coarse loamy drift (Clashmore 1100n), typically brown earths, with fine gravels present to a depth of 1.4m (Irish National Soils Map, 1:250,000k, V1b, 2014). Bedrock is characterised by Waulsortian limestone to the N, Cork Red Marble Formation limestone across site centre, and Little Island Formation limestone to the S (Geological Survey of Ireland Spatial Resources, Public Data Viewer Series).

Archaeology

No recorded monuments and places (RMPs) are located within the boundary of the proposed development, nor within the immediate vicinity of the site. CO075-025, Castle (unclassified), lies in closest proximity to the site boundary c.0.38km to the E. The following extract from the National Monuments Service SMR database provides summary details relating to all RMPs present within a 1km radius of the proposed development:

SMR No.	Class	Townland	ITM East	ITM North
CO075-024001	Midden	Carrigrenan	576547	570806
CO075-024002	Designed landscape	Carrigrenan	576533	570832
CO075-025	Castle -unclassified	Courtsown	577397	571930

Fieldwork

24th April 2024

Geophysical technique

High-resolution recorded magnetometry (fluxgate gradiometry)

Report issue

10th May 2024

Author

John Nicholls MSc.

Detection license no.

24R0219

Client

Ruden Homes Ltd..

Archaeologists

Lane Purcell Archaeology

1 SURVEY METHODOLOGY

1.1 Methodology

1.1.1 Geophysical survey was conducted throughout all available lands within the site boundary, completing a total 8.9ha of high-resolution recorded magnetometry in 1 area.

1.1.2 The survey employed an advanced multichannel fluxgate gradiometer system combined with cm precision GPS, recording magnetometer (fluxgate gradiometer) and GPS data simultaneously at rates of 50Hz and 1Hz respectively. The geophysical data were acquired along parallel instrument traverses 3.64m in width, with the instrumentation installed in 'tow configuration' for use with an ATV.

1.2 Instrumentation

1.2.1 The following table provides a summary of the survey methodology and geophysical instrumentation employed during the course of this work:

Technique	Sensor spacing	Sample rate	Instrumentation	Sensitivity/precision	No. of data recorded
Magnetometry (fluxgate gradiometry)	0.28m	50Hz	Multi-channel fluxgate gradiometer	<75pT/√Hz @ 1Hz (650mm baseline)	387,345
GPS	3.92m	1Hz	Trimble R10 (VRS)	<0.1m	9,726

1.2.2 The instrumentation and software employed for this geophysical survey were configured to apply a spatial resolution of c.60-80 magnetometer measurements per m². This spatial resolution meets with ease the 'Level 3 – Characterisation' EAC Guidelines for geophysical survey in archaeology (Schmidt et al, 2016).

1.3 Data processing

1.3.1 Post-fieldwork the geophysical data were processed as follows:

Process	Description
i	Positioning of geophysical data based on real-time GPS measurements (WGS84 geodetic CRS)
ii	Zero median transect processing for multi-sensor magnetometer data collected along parallel transects
iii	Transformation from WGS84 geodetic coordinate system to ITM (IRENET95) projected CRS
iv	Gridding (ordinary kriging)
v	Export of greyscale images georeferenced in ITM (IRENET95) projected CRS

1.3.2 To maintain the integrity of the processed geophysical data, and its close correlation with the original raw on-site measurements, no further processing, filtering or 'smoothing' of the data was undertaken following steps i-v.

1.4 Data display

1.4.1 Figure 1 presents the site location between Courtstown Industrial Estate to the E-SE and Harbour Point Golf Course to the W and S, highlighting also the zones of notification for all RMPs situated within a 1km radius (scale 1:12,500).

1.4.2 Figure 2 presents the results from geophysical survey in greyscale format at a scale of 1:1500, and includes also the elevation contours acquired during data acquisition on site.

1.4.3 Figure 3 provides an interpretation of the results from geophysical survey at a scale of 1:1500. Letters included on figure 3 refer to notable anomalies recorded from this geophysical survey, and these anomalies are discussed in the results section of this report.

2 GENERAL CONSIDERATIONS

2.1 Ground conditions & access

2.1.1 The site of proposed development occupies 1 level arable field which rises gently to the S. Ground conditions for the geophysical survey at the site were very good excluding an area of rough terrain and high vegetation to the NE, and heavy farm machinery tracks to the W, both of these avoided during fieldwork.

2.2 Modern interference & disturbance

2.2.1 The results from geophysical survey highlight numerous small-scale ferrous anomalies throughout. These are a common occurrence in magnetometer data and relate mostly to modern metallic debris contained in the topsoil.

2.2.2 Broad ferrous responses also occur in the data and these relate to accumulation of modern ferrous material adjacent to existing boundaries, as well as disturbance from modern surfaces a short distance beyond the site perimeter .

2.3 Recent landuse

2.3.1 Responses associated with recent cultivation are also evident in the results aligned mostly N-S.

2.4 Natural soil/geological variation

2.4.1 Weakly positive/negative linear/curvilinear responses indicative of natural soil/geological variation have also been recorded by this geophysical survey.

3 GEOPHYSICAL SURVEY RESULTS

3.1 Survey results

- 3.1.1 The results from geophysical survey at the site of proposed development demonstrate a quiet magnetic background across the investigation area, and this is in the region of +/-1.5nT. Fluctuations in the data set above magnetic background relate mostly to 'noise' from past cultivation, natural soil/geological variation and modern ferrous disturbance.
- 3.1.2 No responses of definite archaeological character are evident in the results from this geophysical survey. Responses of potential significance are, however, indicated by the data. The most notable of these responses represents a weakly negative curvilinear anomaly (A) with adjacent trends, located at the southern edge of survey. This curvilinear anomaly and the adjacent trends may represent the remains of a levelled enclosure, potentially 45m in diameter. An archaeological interpretation for A remains somewhat tentative, however, given its overall weak magnetic signature and the abundance of natural soil/geological variation throughout the results. A natural soil/geological and/or recent landuse origin for anomaly A should, therefore, not be discounted.
- 3.1.3 A smaller curvilinear response (B), c.20m in length, which is similar in magnetic contrast to anomaly A, has been identified along the eastern survey edge to the SE of survey centre. A potential archaeological origin for anomaly B should also be considered. Interpretation remains uncertain, however, given encroaching ferrous disturbance from modern buildings to the E beyond the site perimeter, and also the abundance of natural soil/geological apparent throughout the results..
- 3.1.4 The results from geophysical survey also highlight a number of interconnecting linear trends (C-D), which extend from survey centre to the S. The possibility that C-D represent remnants of a former field system should not be dismissed, although there is no evidence for such visible on historic mapping. A recent landuse and/or natural soil/geological origin for responses C-D should also be considered.
- 3.1.5 No further responses of note are indicated by the results from geophysical survey within the boundary of the proposed development.

4 CONCLUSION

- 4.1 The results from geophysical survey at the site of proposed development highlight the location of a possible levelled enclosure located at the southern site edge. Further responses of potential note are apparent in the data, and these include a curvilinear anomaly and interconnecting trends, which are indicated to the SE and from survey centre to the S. The precise origin of these latter anomalies remains uncertain, and a recent landuse and or/natural soil/geological explanation is also plausible.
- 4.2 Elsewhere, the results from geophysical survey at the site of proposed development display modern ferrous responses small and large in scale, remnants of past cultivation and weakly magnetic trends indicative of natural soil/geological variation and/or recent landuse.

BIBLIOGRAPHY

QGIS Development Team, 2021, QGIS Geographic Information System, Open-Source Geospatial Foundation Project <http://qgis.osgeo.org>

Schmidt A, (2002), Archaeology Data Service. Geophysical Data in Archaeology. A guide to good practice.

Schmidt A, Linford P, Linford N, David A, Gaffney C, Sarris A, and Fassbinder J, (2016), EAC Guidelines for the Use of Geophysics in Archaeology.

ONLINE RESOURCES

Archaeological Survey of Ireland SMR Database: <http://webgis.archaeology.ie/historicenvironment/>

Bing Maps: <https://www.bing.com/maps>

Geological Survey of Ireland Spatial Resources, Public Data Viewer Series:

<https://dcenr.maps.arcgis.com/apps/MapSeries/index.html?appid=a30af518e87a4c0ab2fbde2aac3c228>

Google Maps: <https://www.google.com/maps>

Irish National Soils Map, 1:250,000k, V1b (2014), Teagasc, Cranfield University (jointly funded by the EPA STRIVE Research Programme 2007-2013 & Teagasc): <http://gis.teagasc.ie/soils/map.php>

LIST OF FIGURES

Fig. 1	Site location	1:12,500
Fig. 2	Greyscale	1:1500
Fig. 3	Interpretation	1:1500

APPENDIX

Technical Information: magnetometry

MAGNETOMETRY

Introduction

Magnetometry represents one of a suite of geophysical techniques employed in archaeological prospection to inform invasive work such as trial trenching and excavation.

Frequently used to determine the often non-visible boundaries of archaeological remains, magnetometer surveys enable archaeologists to identify the location, form and extent of a diverse array of archaeological features no longer visible at the surface.

Buried archaeological remains successfully identified using magnetometry include sites such as enclosure systems and deserted villages, hillforts and military encampments, henges and tumuli, villa/castle foundations, ecclesiastical settlements and formal gardens.

Background to application

The basis for use of magnetometry in archaeological prospection derives from the abundance of natural iron oxides in most soils, and our ability to measure subtle variations in the magnetic properties of these iron oxides caused by human activity. Discrete variations in soil magnetism associated with buried archaeological remains derive typically from in situ burning and organic enrichment of the soil, through activities such as cooking and heating; pottery manufacture and metal working; as well as use of fired building materials such as ceramic tiles and brick. These burnt, fired and organic rich deposits create subtle magnetic contrasts visible as discrete magnetic anomalies superimposed on the earth's geomagnetic field.



1. Magnetometer survey data in greyscale format highlighting pit remains SE of an enclosure and Roman villa.



2. Burnt-fired debris uncovered during excavation of the highlighted area SE of the same enclosure and Roman villa.

Magnetometer surveys conducted in both commercial and research archaeological investigations enable determination of the location, form and extent of buried archaeological remains. Data acquired from these surveys can be quickly generated into georeferenced images and interpretation layers to inform subsequent trial trenching and excavation.

Technology

TARGET provides precise mapping and characterization of buried archaeological remains by employing an array of highly stable and sensitive fluxgate gradiometers, combined with an advanced data logging system and cm precision GPS. This state-of-the-art geophysical instrumentation, which is capable of collecting extremely dense data sets, permits detailed high-resolution survey of archaeological sites from as small as 1ha in size, to larger scale investigation of sites up to 150ha or more.

High resolution magnetometer surveys are undertaken as standard, recording data at c.5cm intervals with probe separations of 0.3m for precise measurement and characterization of buried archaeological remains. This spatial resolution meets with ease the 'Level 3 – Characterisation' EAC Guidelines recommendation for geophysical survey in archaeology (Schmidt et al, 2016).

Instrumentation is used in combination with cm precision GPS and data collected along parallel traverses with the system installed in 'tow configuration' for use with an ATV or in push mode.

Data Display

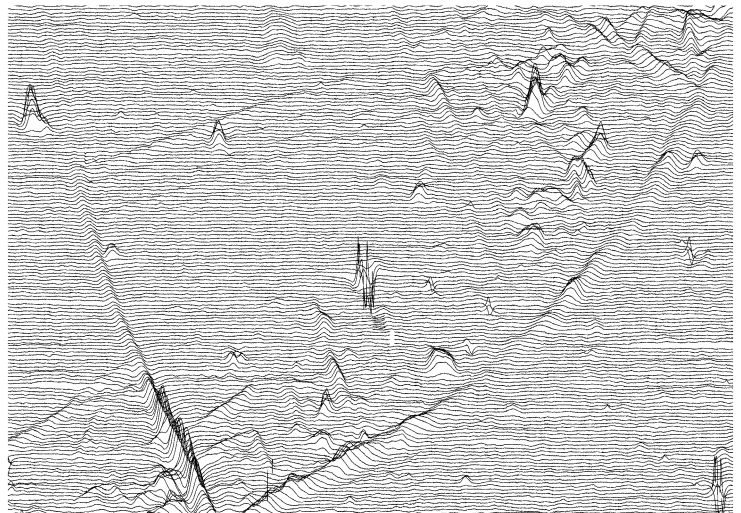
Greyscale plots are the most common format for displaying magnetometer data. This display format assigns a cell to each datum according to its location on the grid. The display of each data point is conducted at very fine increments, allowing the full range of values to be displayed within a given data set. This display method also enables the identification of discrete responses barely visible above natural 'background' magnetic variation on site.

6. Greyscale from survey at the site of a deserted medieval village.

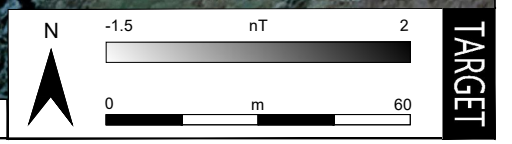
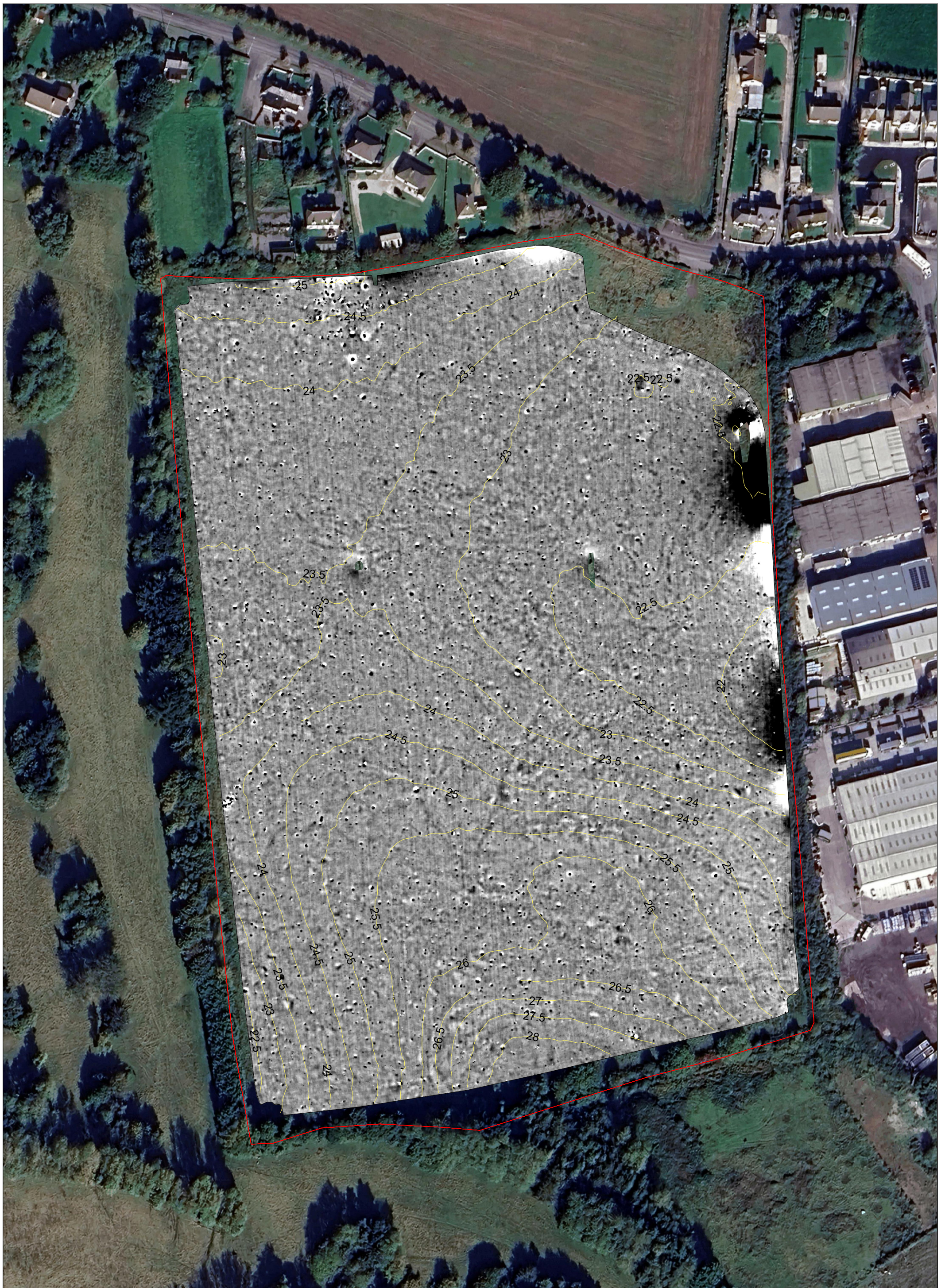


XY trace plots provide a near-perspective representation of measurements along individual lines of data recorded from each magnetometer sensor. The XY trace format is used as a conventional method for identifying responses of modern ferrous debris, and also as an aid in identifying locations of potential industrial features, such as kilns and metal working.

7. XY trace from survey at the site of a deserted medieval village.

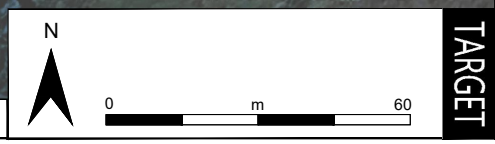








- ? Archaeology
- Anomaly of uncertain origin
- ▨ Trend
- ▨ Cultivation
- ▨ Natural soil/geological variation
- Response from pylon
- Ferrous



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