APPENDIX 9

GEOPHYSICAL SURVEY REPORT

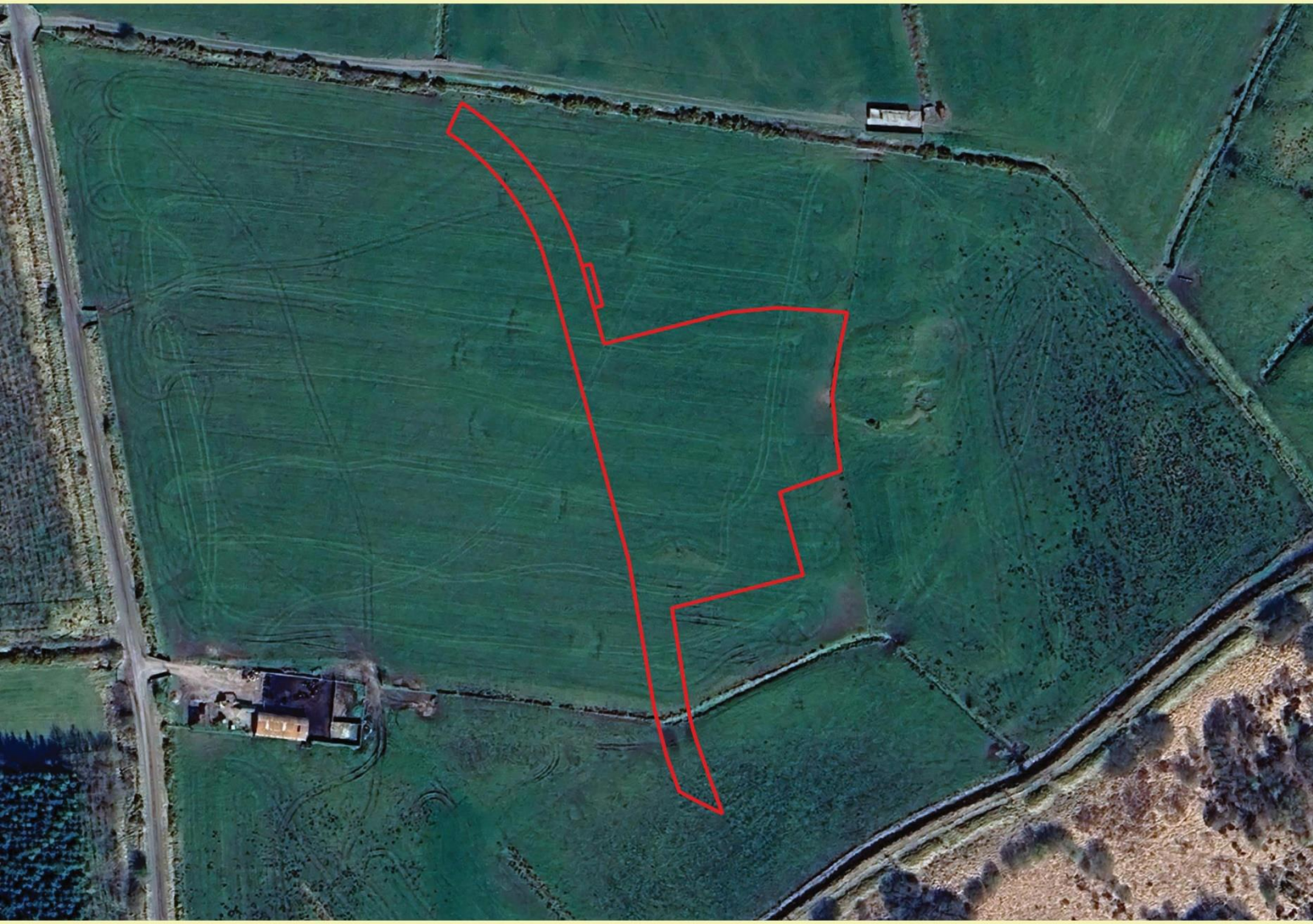
Geophysical Survey Report

Killavoher, Co. Galway

Part 1: Survey Information

License No.: 25R0306
RMP: GA030-073, Enclosure

ITM: 555670, 757350



Ger Dowling, PhD MIAI
July 2025

Summary

This report details the results of an archaeo-geophysical survey (Licence No.: 25R0306) of lands at Killavoher townland, Co. Galway. The investigation, comprising high-resolution magnetometer (fluxgate gradiometer) survey, was implemented over an area of approximately 0.65 hectares, located immediately west of an enclosure (GA030-073). The work was conducted as part of a Request for Further Information relating to a proposed development.

The site had not previously been subject to geophysical survey and the present investigation sought to identify and map any subsurface archaeology that may be present.

The survey did not identify any anomalies of obvious archaeological significance and no evidence was encountered to indicate a larger, subsurface footprint to enclosure GA030-073. Several isolated 'pit-type' responses were recorded, as well as traces of past cultivation.

Survey details

Site Name: Killavoher
Townland: Killavoher
County: Galway

Parish: Dunmore
Barony: Ballymoe

RMP/SMR No.: GA030-073, Enclosure
ITM (centroid): 555670, 757350

Land use: Pasture
Geology: pale grey clean skeletal limestone (Burren Formation)
Soils: coarse loamy drift with limestones (Mullabane Series) and (reclaimed) peat

Detection License No.: 25R0306
Planning Reference No.: N/A

Survey Type & Instrumentation: Magnetometer – Five-channel fluxgate gradiometer system
Sample/Transverse Interval: 0.10m/0.50m

Area Surveyed: *c*.0.65 ha
Survey Date: 28 July 2025

Licence Holder: Ger Dowling
Report Authors: Ger Dowling
Report Date: 29 July 2025

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Abbreviations

GA	Galway
GPS	Global Positioning System
ITM	Irish Transverse Mercator
nT	nanoTesla (unit of magnetic measurement)
OS	Ordnance Survey
QGIS	Quantum Geographical Information Systems
SMR	Sites and Monuments Record
RMP	Record of Monuments and Places

Coordinate System

All GPS coordinates given in this report are in Irish Transverse Mercator (ITM)

1 Introduction

This report details the results of an archaeo-geophysical survey (Licence No.: 25R0306) of lands at Killavoher townland, Co. Galway. The investigation, comprising high-resolution magnetometer (fluxgate gradiometer) survey, was implemented over an area of approximately 0.65 hectares, located immediately west of an enclosure (GA030-073). The work was conducted as part of a Request for Further Information relating to a proposed development.

The site had not previously been subject to geophysical survey and the present investigation sought to identify and map any subsurface archaeology that may be present.

2 Site Location

The area targeted for geophysical investigation is in the townland of Killavoher, Co. Galway (Figure 1). The site lies approximately 7.5km southeast of Dunmore, in the Civil Parish of Dunmore and the Barony of Ballymoe.[1]

[1] Coill an Bhóthair/Killavoher | logainm.ie: accessed on 05 July 2025.

3 Survey Background

The survey at Killavoher was conducted as part of a Request for Further Information relating to a proposed development.

Details on the proposed development and the Request for Further Information as it relates specifically to archaeology are found in Part 2 of this report.

4 Archaeological Background

4.1 Recorded/Known Archaeology

The survey area encompasses part of the buffer zone of an enclosure (GA030-073**)** (Plate 1; Figure 2).[2] The enclosure is described in the Files of the Archaeological Survey as:

> *On a SE-facing slope in reclaimed grassland overlooking bogland to E and S. Poorly preserved subcircular platform (E-W 30m) defined by a degraded scarp. It has been quarried out at NE and SE, and does not survive from SE to SW where a field boundary cuts the monument.*[3]

The survey area is shown as farmland on historic mapping (Figures 3 & 4).

4.2 Previous Investigations

No recorded archaeological excavations have previously been undertaken at the survey area or within the wider locality.[4]

[2] Historic Environment Viewer (arcgis.com): accessed on 05 July 2025.
[3] Ibid.
[4] Excavations: accessed on 05 July 2025.

5 Survey Location, Topography and Aims

The geophysical investigation, comprising high-resolution magnetometer (fluxgate gradiometer) survey, located immediately west of an enclosure (GA030-073) (Figure 5).

The subject site comprises the eastern sector of a large, subrectangular field of pasture and a small tract of wet, boggy terrain on the south (Plates 2 & 3). The land is flat and is bounded by post-and-wire fences. The southern sector of the survey contains a modern bore hole that is capped by metal and surrounded by a post-and-wire fence. The wider landscape is mixed, with pasture to the north, bog to the east and south, and confer plantation to the west.

The underlying bedrock of the locality comprises pale grey clean skeletal limestone (Burren Formation).[5] The local soils are dominated by coarse loamy drift with limestones (Mullabane Series) and (reclaimed) peat.[6]

The geophysical investigation aimed to:

- identify any geophysical anomalies of potential 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
- incorporate the above in a report to the Client

[5] Geological Survey of Ireland Spatial Resources, Public Data Viewer Series: https://dcenr.maps.arcgis.com/apps/MapSeries/index.html?appid=a30af518e87a4c0ab2fbde2aaac3c228 [accessed on 05 July 2025].

[6] Irish National Soils Map, 1:250,000k, V1b (2014): http://gis.teagasc.ie/soils/map.php [accessed 05 July 2025].

6 Survey Methodology and Instrumentation

The geophysical investigation at Killavoher comprised high-resolution magnetometer (fluxgate gradiometer) survey (Table 1). This technique measures variations in the magnetic properties of the soils and is widely used in archaeological prospection due to its ability to detect and map a broad range of sub-surface archaeological remains, including ditches and pits as well as burnt/fired features and deposits associated with domestic and industrial activities.

The survey was conducted using a five-channel fluxgate gradiometer system, combining a Sensys MAGNETO MXPDA and Sensys FGM650 probes, with cm-precision GPS (Trimble R12 antenna and TSC5 controller) georeferenced to Irish Transverse Mercator and Ordnance Datum. The system, which is mounted on a cart that can be hand pushed or pulled by a quad bike, records geophysical and GPS data simultaneously into a single data file. The data capture strategy involved logging readings at 0.10m intervals along transects spaced 0.5m apart, with a maximum traverse width of 2.5m. The sampling strategy produces a high-resolution dataset, giving clarity to any archaeological features detected.

The highly accurate positioning of the survey data provides strong confidence when integrating the geophysical results with other datasets such as aerial imagery in GIS and ensures repeatability should further investigation of anomalies (e.g., test excavation) be required.

Table 1. Geophysical survey details

Technique	Instrumentation	Sensor spacing	Sample rate	Survey Area	Number of recorded data
Magnetometry	Five-channel fluxgate gradiometer array	0.5m	100 Hz	*c*.0.65 ha	64,987

7 Data Management, Processing and Interpretation

Geophysical data was logged to a laptop computer and archived daily to an external hard drive. The collated data was processed using the following methodology:

- Real-time positioning of magnetometer data based on GPS measurements;
- Track correction (compensation) of collated magnetometer data; and
- Export of georeferenced greyscale images at optimum visual range

The processed data was imported into QGIS for final image production (Figures 6 & 7). Final geophysical datasets have been formatted as raster data models/GeoTiffs (projected to ITM, EPSG:2157) to enable subsequent geospatial analysis. Fieldwork, data processing and reporting adhered to the most up-to-date guidelines for conducting archaeo-geophysical surveys.[7] All geophysical raster datasets will be digitally archived to best practice.[8]

[7] 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*: *Questions to Ask and Points to Consider*. EAC Guidelines 2. [Online] Available from: https://f64366e3-8f7d-4b63-9edf5000e2bef85b.filesusr.com/ugd/881a59_fdb1636e95f64813a65178895aea87cf.pdf

[8] Niven, K. 2012. *Raster Images: A Guide to Good Practice*. Archaeology Data Service/Digital Antiquity, Guides to Good Practice. [Online] Available from: http://guides.archaeologydataservice.ac.uk/g2gp/RasterImg_Toc; & Schmidt, A. and Ernenwein, E. 2012. *Guide to Good Practice: Geophysical Data in Archaeology*. Oxford: Oxbow.

8 General Considerations and Complicating Factors

8.1 Access and Ground Conditions

There were no obstacles to the investigation.

8.2 Modern Interference

Magnetic disturbance ('noise') was recorded along the part of the eastern edge of the survey area, in proximity to a post-and-wire fence.

Multiple small-scale, 'ferrous-type', dipolar (positive–negative) responses are evident in the results from the gradiometer survey. These are a common occurrence in magnetic surveys and in most cases represent modern metal debris and other magnetised material (e.g., fired brick) within the topsoil.

A large dipolar response (labelled '2' on Figure 7) in the southern half of the survey area reflects the metal capped borehole and surrounding wire fence.

8.3 Former Land Use

Evidence of former cultivation (e.g. plough trends) was recorded throughout the site.

9 Survey Results

Table 2. Survey results

Area	Killavoher		
ITM (centroid)	555670, 757350		
Area surveyed	*c.*0.65 ha		
Figure Numbers	6 & 7		
Anomaly Number	***Form/nature of anomaly***	***Potential source(s) of anomaly***	***Interpretation***
1	Three 'pit-type' responses	Possible archaeology/ modern/natural	Possible pits and/or deposits. Archaeological interpretation is highly tentative, as similar anomalies can have a modern/agricultural origin or reflect natural soil variations.
	Multiple, closely spaced, parallel, positive linear trends	Agricultural	Former cultivation.
	Multiple 'ferrous-type' responses	Modern	Ferrous debris and other weakly magnetised material.
2	Large ferrous-type' response	Modern	Metal capped borehole and surrounding wire fence
	Small, amorphous area of weakly enhanced magnetism	Natural	Localised natural variation in underlying waterlogged (organic-rich) soils.
	Area of magnetic disturbance	Modern	Disturbance from post-and-wire fence.

10 Conclusion

Gradiometer survey at Killavoher did not identify any anomalies of obvious archaeological significance. Indeed, there is no evidence in the dataset to indicate a larger, subsurface footprint to enclosure GA030-073. Several isolated 'pit-type' responses were recorded across the site and while some may have an anthropogenic (possibly archaeological) origin, they could equally reflect natural variations in the underlying subsoils. Traces of past cultivation were also recorded.

10.1 Statement of Indemnity

The geophysical properties of sub-surface features must contrast sufficiently with the surrounding soils/background variation to enable them to be detected and mapped using geophysical methods. As such, the clarity and definition of buried features can vary considerably, with some having well-defined signatures while others are only barely visible, or not discernible, in geophysical imagery. A lack of geophysical anomalies cannot be taken to imply the absence of archaeological features.

The interpretations presented here are invariably provisional and further work (e.g., test trenching) is required to fully assess the nature and archaeological potential of the anomalies identified by the present investigation.

11 Figures

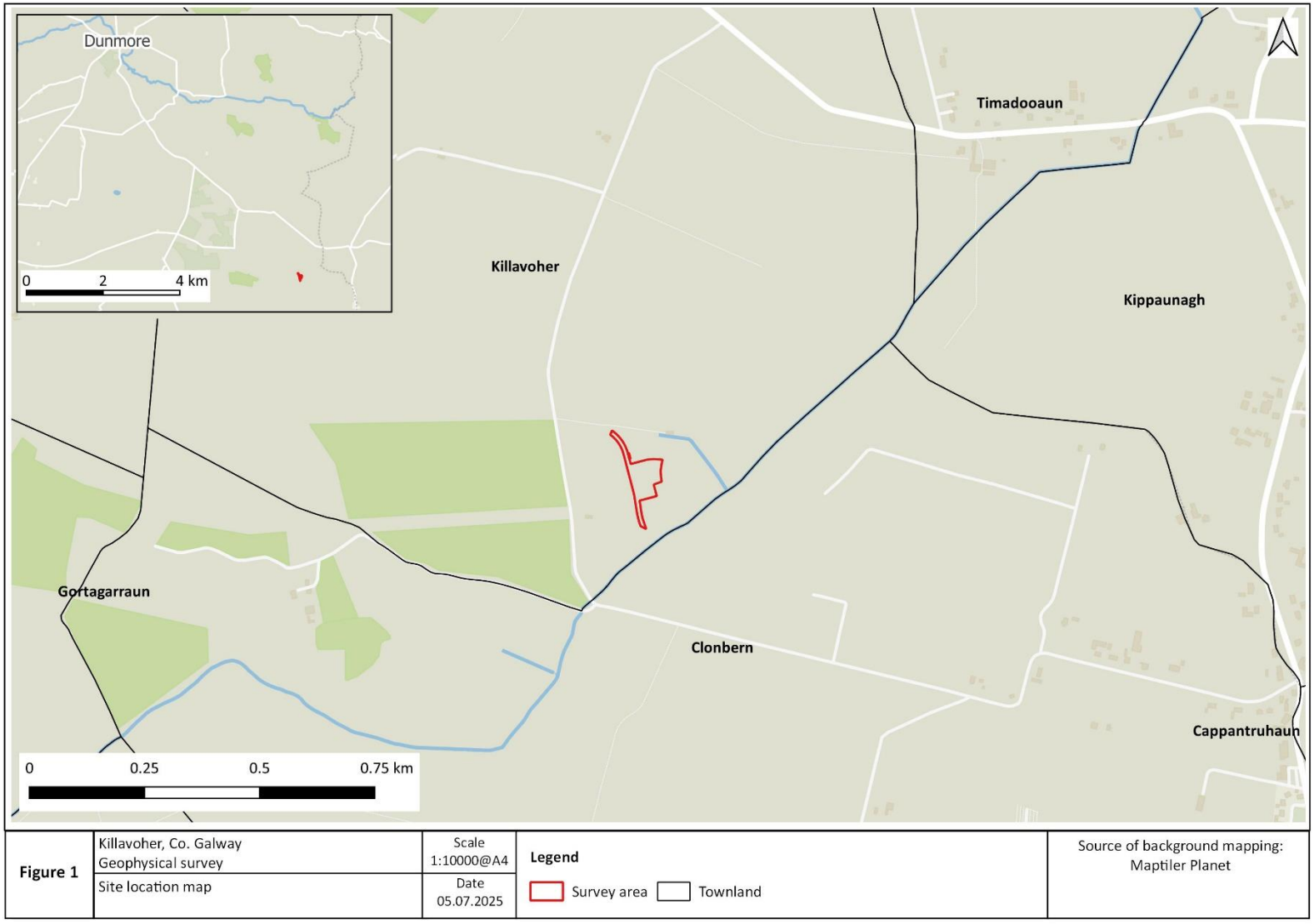

Figure 1. Site location map, showing survey area highlighted in red.

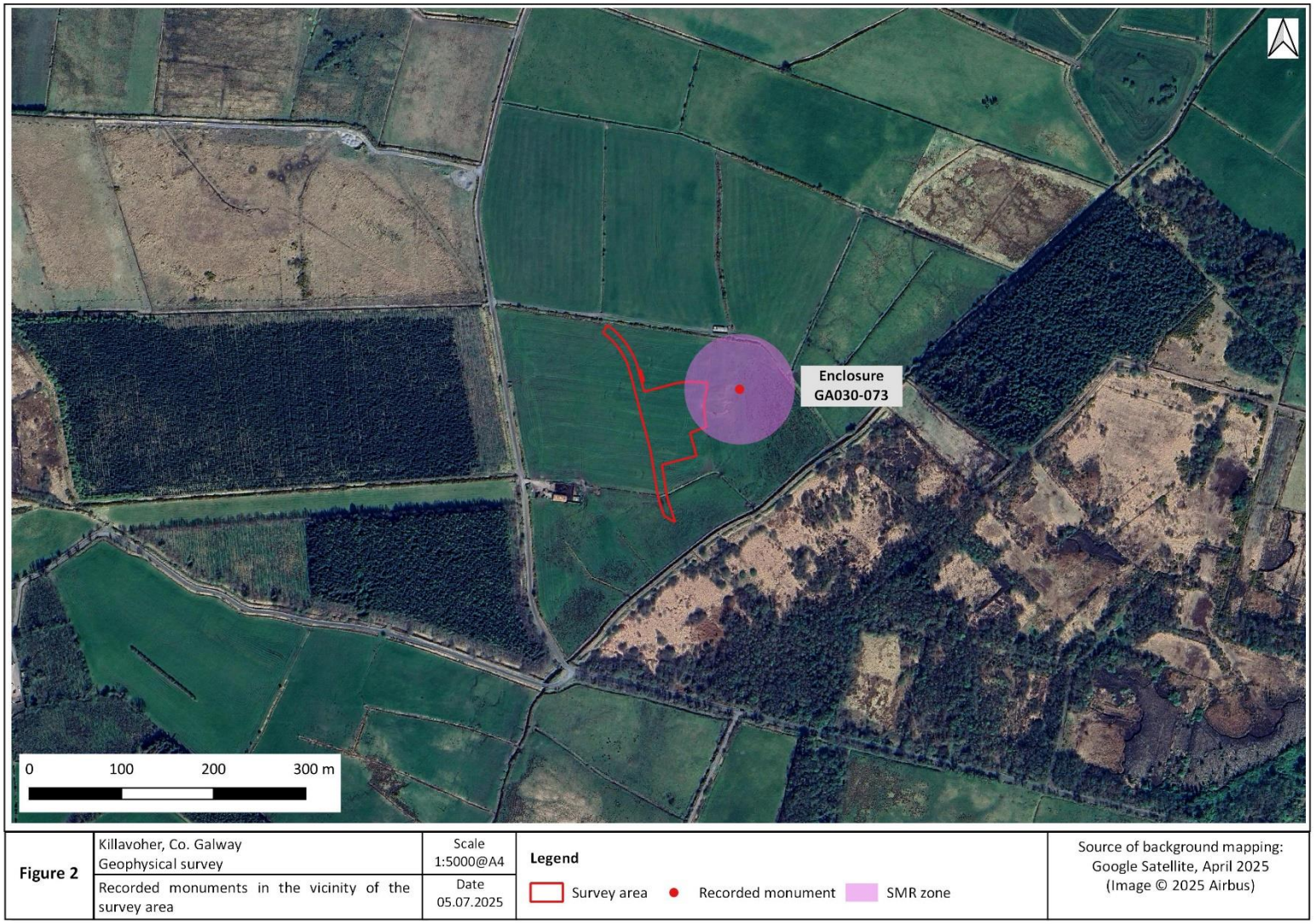

Figure 2. Location of recorded archaeological sites in the vicinity of the survey area.

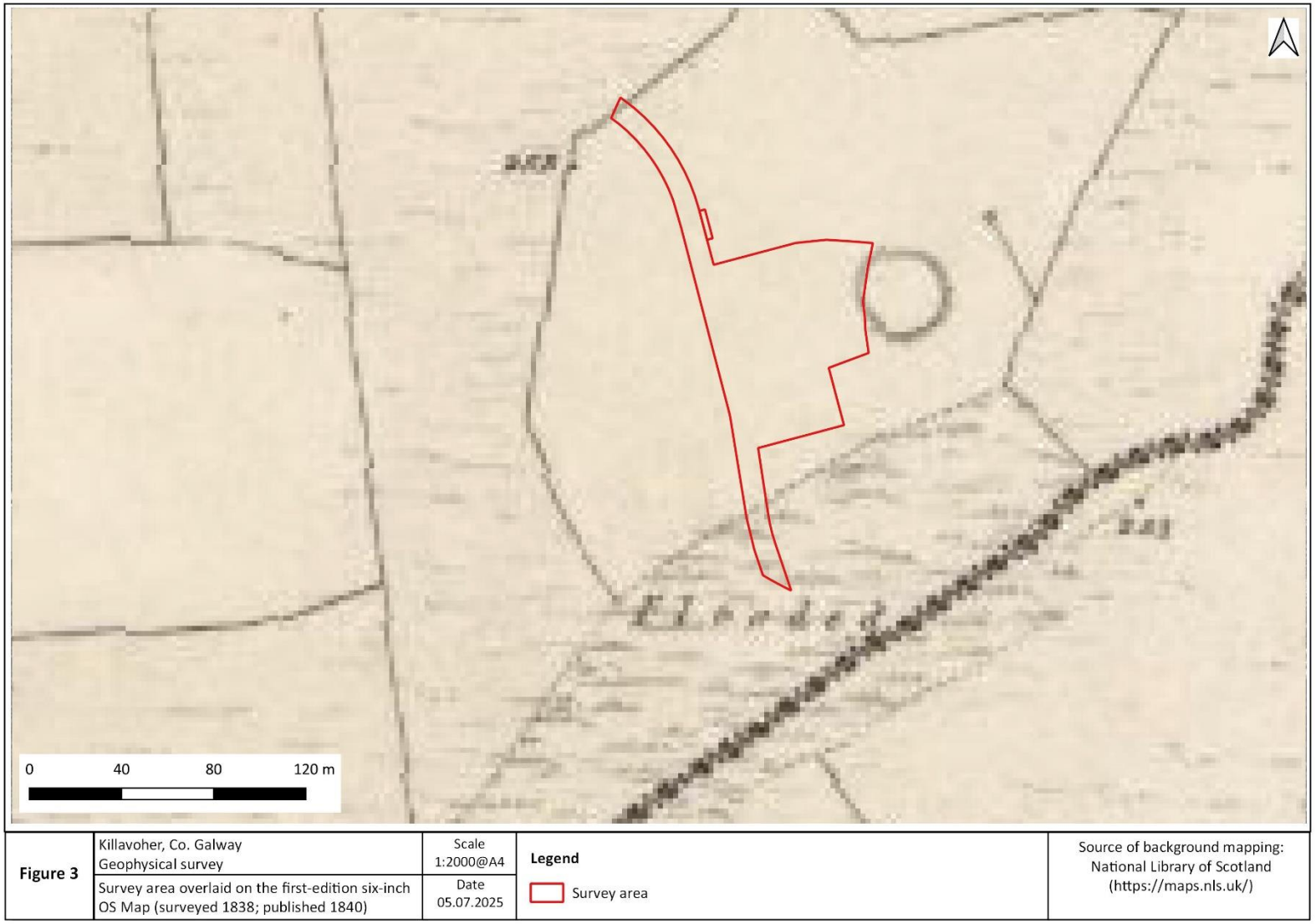

Figure 3	Killavoher, Co. Galway Geophysical survey	Scale 1:2000@A4	**Legend** Survey area	Source of background mapping: National Library of Scotland (https://maps.nls.uk/)
	Survey area overlaid on the first-edition six-inch OS Map (surveyed 1838; published 1840)	Date 05.07.2025		

Figure 3. The survey area overlaid on the first-edition six-inch Ordnance Survey Map (surveyed 1838; published 1840).

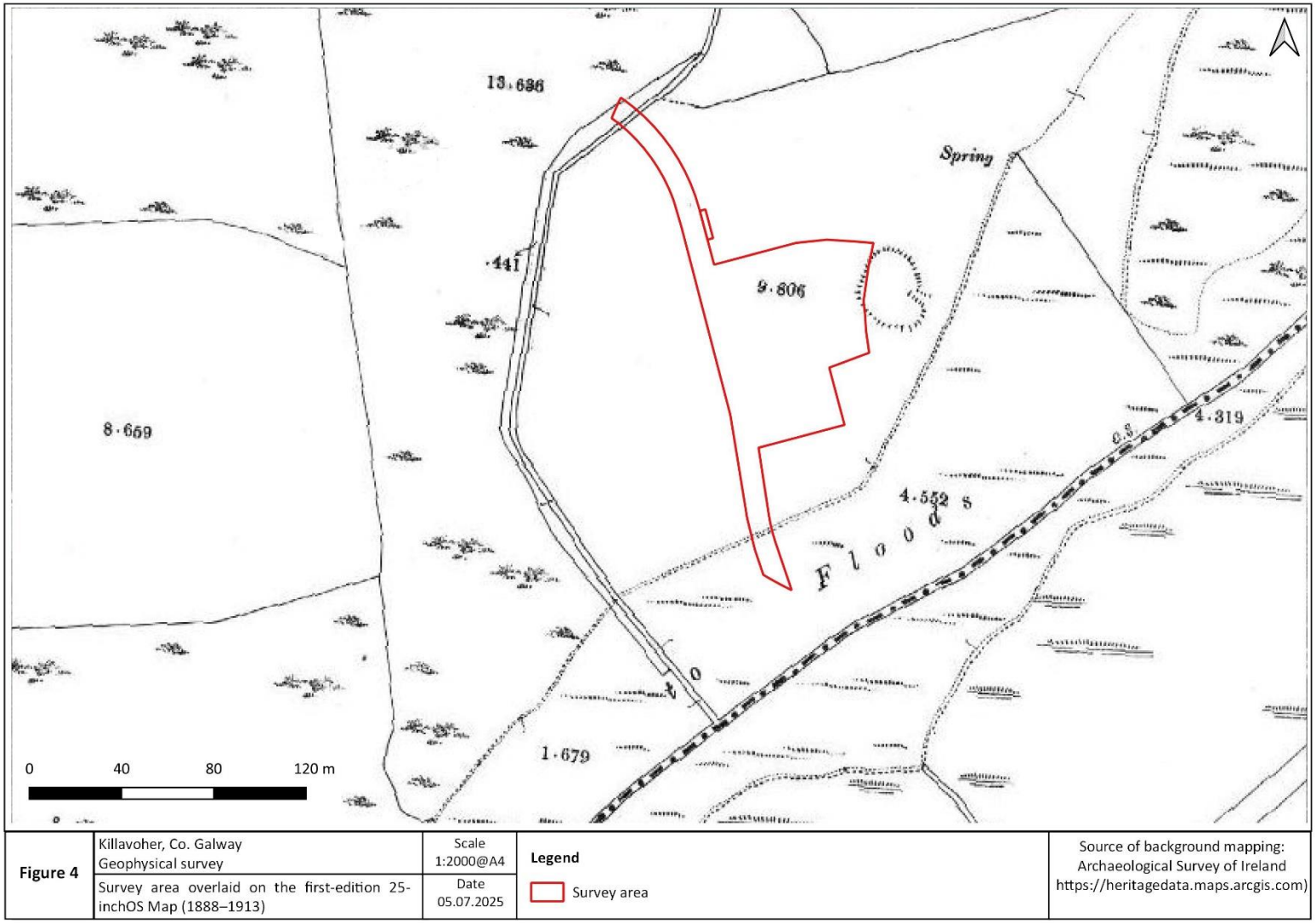

Figure 4. The survey area overlaid on the first-edition 25-inch Ordnance Survey Map (1888–1913).

Figure 5. The survey area, outlined in red.

Figure 6. Greyscale image of gradiometry results.

Figure 7. Interpretive plan showing principal geophysical anomalies.

12 Plates

Plate 1. Enclosure GA030-073, viewed from the west.

Plate 2. Looking north across the survey area.

Plate 3. Waterlogged, boggy terrain at southern end of the survey area, looking south.

An Roinn Cultúir, Oidhreachta agus Gaeltachta
Department of Culture, Heritage and the Gaeltacht

		E					X

2 5 R 0 3 0 6 X

Site Owner:	Clonberne Windfarm Limited		
Address:	Mill House, 10 Mill Street, Galway, Co. Galway		
Planning Authority:	An Bord Pleanála		
Planning Reg. No.:	ABP-320089-24	**Excavation Type:**	Geophysical Survey [as per licence application]

Contractor/Developer:	Clonberne Windfarm Limited,
Address:	Mill House, 10 Mill Street, Galway, Co. Galway

Background to excavation:
A geophysical survey, involving high resolution magnetometry (fluxgate gradiometry), was conducted at lands at Killavoher townland, Co. Galway. The work was undertaken in response to a Request for Further Information related to the proposed construction of a hardstand for a wind turbine (An Bord Pleanála Order: ABP-320089-24). The turbine (No. 2) forms part of a larger wind farm at the site. As part of a Request for Further Information, An Bord Pleanála stated the following regarding Cultural Heritage:

Cultural Heritage

Recorded Monument GA030-073 ---- (Enclosure) is located c. 22m to the east of the hardstand for T2. While this monument is partially upstanding and visible in the landscape, it may have a larger sub-surface extent. You are requested to undertake an archaeological geophysical survey at the location for T2, its associated infrastructure and general environs and provide a report on the findings.

Signed:	Ger Dowling	**Date:**	**29/07/2025**

Figure 6	Killavoher, Co. Galway Geophysical survey	Scale 1:1400@A4	Source of background mapping: Google Satellite, April 2025 (Image © 2025 Airbus)
	Greyscale image of gradiometry results	Date 28.07.2025	