

APPENDIX 16.4 GEOPHYSICAL SURVEY REPORT

GEOPHYSICAL SURVEY

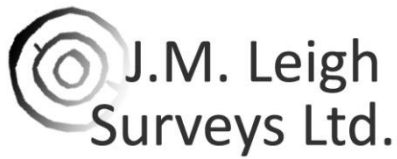
REPORT

Drumnigh,
Portmarnock,
County Dublin

Date:
04/05/2021

Licence: 21R0089

J. M. Leigh Surveys Ltd.
124 Oaklawn West
Leixlip
County Kildare
www.jmlsurveys.com
01 615 4647



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J. M. Leigh Surveys Ltd.
124 Oaklawn West,
Leixlip, Co. Kildare
Tel: 01 615 4647
Mobile: 0879062729
www.jmlsurveys.com

**GEOPHYSICAL SURVEY SUMMARY SHEET
DRUMNIGH, PORTMARNOCK, COUNTY DUBLIN**

Site Name	Portmarnock	Ref No.	21023
Townland	Drumnigh	Licence No.	21-R-0089
County	Dublin	Licence Holder	Joanna Leigh
ITM (centre)	E723130, N741880	Purpose	Pre-planning
Client	Courtney Deery Heritage Consultancy Ltd.	Reference No.	N/A
Ground Conditions	Survey was conducted within the northern half of a large field which comprised short grass. Ground conditions were fair.		
Survey Type	Detailed gradiometer survey totalling c. 4 hectares.		
Summary of Results			
<p>Short linear responses in the north-east of the data set may be of interest. They may represent plough damaged archaeology associated with the adjacent excavated enclosure. However, there is no clear pattern or form, and they may equally be agricultural in origin.</p> <p>Parallel faint linear trends run north to south through the data. It is possible that these represent a trackway, perhaps associated with the enclosures to the north and south. However, the trends are at the limits of instrument detection and may represent a more recent farm trackway.</p> <p>A small area of increased response in the north-west of the data is of possible interest. This may represent a spread of burnt material. However, archaeological interpretation is tentative. This may equally represent more recent activity.</p> <p>Linear trends in the data correspond with former field divisions as depicted in historic mapping. The linear trends reflect former field divisions and agricultural activity.</p>			
Field Staff	Joanna Leigh & Susan Curran		
Report Date	04/05/2021	Report Authors	Joanna Leigh & Susan Curran

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Geophysical Survey Report

Drumnigh, Portmarnock, County Dublin

1 Introduction

- 1.1 A geophysical survey has been conducted by J. M. Leigh Surveys Ltd. at a site in the townland of Drumnigh, Portmarnock, County Dublin. The survey was requested by Courtney Deery Heritage Consultancy Ltd. on behalf of Quintain Developments Ireland Ltd. The survey forms part of a wider archaeological study for a proposed housing development.
- 1.2 The application area is contained within the northern half of a large open agricultural field to the south of Station Road. It is bounded by a railway line to the west and by ongoing construction to the north and east. Figure 1 presents the site and survey location at a scale of 1:3,000.
- 1.3 There are no recorded monuments within the survey area, However, a recent excavation (G. McLoughlin, 19E0303) immediately adjacent to the application area identified a sub-circular enclosure (36m x30m) with an outer enclosure ditch (110m x 80m). It was unknown if any associated features extended into the current application area.
- 1.4 In addition to the adjacent excavation, the application area lies within an archeologically rich environment. There are two recorded enclosures (DU015-115 & DU015-0135) and a 'Ring-ditch' (DU015-119) which lie c. 60m to the south and c. 40m to the east, respectively. Further recorded enclosures are found near the east (DU015-055 & DU015-130), west (DU015-117 & DU015-134), and north (DU015-014001). A 'Mound' (DU015-014) is situated c. 200m to the north. The location of the recent excavation and the recorded monuments is presented in Figure 1 at a scale of 1:3,000.
- 1.5 The main aim of the survey was to identify any responses which may represent previously unknown archaeological remains within the application area. It is the objective of the survey to identify ant responses that may represent associated features to the adjacent enclosure sites. The detailed gradiometer survey was conducted under licence 21R0089 issued by the Department of Housing, Local Government and Heritage.

2 Survey ground conditions and further information

- 2.1 The survey area was contained within the northern half of a large field which had been cut and cleared prior to survey. The ground was quite rough underfoot and overall ground conditions were fair.
- 2.2 The railway line to the west has caused considerable magnetic disturbance to the data along the western boundary of the site. This may obscure more subtle archaeological responses within this area.

3 Survey Methodology

- 3.1 A detailed gradiometer survey detects subtle variations in the local magnetic field and measurements are recorded in nano-Tesla (nT). Some archaeological features such as ditches, large pits and fired features have an enhanced magnetic signal and can be detected through recorded survey.
- 3.2 Data was collected with a Bartington Grad 601-2 instrument. This is a specifically designed gradiometer for use in archaeological prospection. The gradiometer operates with a dual sensor capacity making survey fast and effective.
- 3.3 The instrument is calibrated in the field to ensure a constant high quality of data. Extremely sensitive, these instruments can detect variations in soil magnetism to 0.01nT, affording diverse application throughout a variety of archaeological, soil morphological and geological conditions.
- 3.4 All data was collected in 'zigzag' traverses. Grid orientation remained constant throughout to facilitate the data display and interpretation.
- 3.5 Data was collected with a sample interval of 0.25m and a traverse interval of 1m, providing 6400 readings per 40m x 40m grid. The survey grid was set-out using a GPS VRS unit. Survey tie-in information is available upon request.
- 3.6 The survey methodology, data presentation and report content adhere to the European Archaeological Council (EAC) (2016) 'Guidelines for the use of Geophysics in Archaeology'.

4 Data display

- 4.1 A summary greyscale image and accompanying interpretation diagram are presented in Figures 2 and 3, at a scale of 1:1,250.
- 4.2 Numbers in parenthesis in the text refer to specific responses highlighted in the interpretation diagram (Figure 3).
- 4.3 Isolated ferrous responses highlighted in the interpretation diagram most likely represent modern ferrous litter and debris and are not of archaeological interest. These are not discussed in the text unless considered relevant.
- 4.4 The raw gradiometer data is presented in archive format in Appendix A1.01 and A1.02. The raw data is displayed as a greyscale image and xy-trace plot, both at a scale of 1:500. The archive plots are used to aid interpretation of the results and are used for reference only. The archive plots are available as PDF images upon request.
- 4.5 The display formats referred to above and the interpretation categories are discussed in the summary technical information section at the end of this report.

5 Survey Results

- 5.1 The railway line which lies adjacent to the western boundary of the site has resulted in significant magnetic disturbance (1) which extends up to 30m into the application area. It is possible that this has obscured more subtle archaeological responses within this zone. No archaeological interpretation within this disturbance can be provided.
- 5.2 A series of ferrous and positive magnetic responses and trends (2) form a fragmented linear pattern which runs approximately east/west across the eastern half of the dataset. This effectively separates the southern half of the now open field from the narrow arm that extends to the north. This response corresponds with the location of a former field boundary which is evident on OS 6inch and 25inch mapping in addition to Digital Globe aerial imagery.
- 5.3 To the north of (2), a series of positive magnetic responses and trends (3) form a fragmented linear pattern which runs approximately north/south, almost bisecting this narrow arm of land. Perpendicular to (3) at its northern extent, a further series of linear responses (4) with a similar magnetic signature run approximately east/west. The responses are indicative of ditched features and most likely represent a series of former field divisions. The linear response (4) is parallel to (2) which could suggest that they belong to the same phase of agricultural activity, although this is speculative as they are not depicted on the historic mapping. A poorly defined linear trend (5) further north of (3) may represent a continuation of this probable field boundary.
- 5.4 A series of fragmented positive and ferrous responses and trends (6) form a rectilinear pattern in the north-eastern corner of (3) and (4). This encloses an area measuring c. 25m x 22m, although it is somewhat incomplete as a possible eastern extent has not been identified on the geophysical survey. This may represent a smaller field division, possibly associated with the surrounding field boundaries, although this is speculative.
- 5.5 A negative magnetic trend (7) has been identified c. 45m north of (4). This runs parallel to (4) and (2) and is most likely agricultural in origin.
- 5.6 A poorly defined linear trend (8) runs approximately east/west c. 18m north of (2). It has a similar orientation to (2), (4) and (7) and may represent a further field division.
- 5.7 A curvilinear trend (9) has been identified in the eastern half of the dataset, running between (2) and (8), although its relationship, if any, to these trends is unclear. The

response is suggestive of a ditched feature; however, it does not form a coherent pattern and an archaeological interpretation is therefore cautious.

- 5.8 In the western half of the narrow arm of land to the north, a series of fragmented responses (10) form linear and curvilinear patterns. The responses are suggestive of short ditched features, although no clear pattern is evident. Although it is possible that plough damaged archaeology is represented here, it is equally likely that they reflect former agricultural activity. An archaeological interpretation is tentative.
- 5.9 A negative linear trend (11) to the south of (6) is the result of modern ground disturbance.
- 5.10 Multiple parallel linear trends are evident in the southern half of the dataset. These responses share a similar north/south orientation and are indicative ploughing.
- 5.11 Faint parallel linear trends (12) orientated north to south run through the data. These trends may represent a former farm trackway running through the field. However, an archaeological interpretation must be considered. It is possible that they represent the remains of a trackway associated with the enclosures to the south and the excavated enclosure to the north. This interpretation is speculative but must be considered.
- 5.12 Further faint trends (13) to the west of (12) may also result from agricultural activity. However, it is possible that plough damaged archaeology is represented here. Interpretation is tentative as these trends are at the limits of instrument detection and no clear pattern is evident.
- 5.13 In the north west of the survey there is a small area of increased magnetic response (14). It is possible that this represents burnt material or the remains of a burnt spread. However, interpretation is cautious. This may equally result from more recent ground disturbance and reflect modern activity. An archaeological interpretation is unclear.

6 Conclusion

- 6.1 A series of short linear responses in the northern half of the data set were recorded. These are adjacent to the excavated enclosure, located to the west. Although it is possible that they represent associated plough damaged archaeology, interpretation is cautious. There is no clear archaeological pattern, and these may equally represent former agricultural activity.
- 6.2 Faint parallel linear trends in the south of the data may be of interest. The trends are orientated north to south and appear to run through the data set. It is possible that they represent a trackway, perhaps linking the recorded enclosures to the south with the excavated enclosure to the north. However, this is speculative. The trends are at the limits of instrument detection and may equally represent a former farm trackway.
- 6.3 In the west of the data there is a small area of increased magnetic response. This may represent the remains of a burnt spread. Archaeological interpretation is cautious as there are no further responses of interest in the vicinity. The increased magnetic response may equally result from modern activity.
- 6.4 Linear trends within the data correlate with former field boundaries depicted in the historic mapping and most likely represent former field boundaries and agricultural activity.
- 6.5 Consultation with a licensed archaeologist and with the Department of Housing, Local Government and Heritage is recommended to establish if any additional archaeological works are required.

7 Technical Information Section

Instrumentation & Methodology

Detailed Gradiometer Survey

Detailed gradiometer survey can either be targeted across a specific area of interest or conducted as a blanket survey across an entire application area, often as a standalone methodology.

Sampling methodologies can vary but a typical survey is conducted with a sample interval of 0.25m and a traverse interval of 1m. This allows detection of potential archaeological responses. Data is often collected in grids measuring 40m x 40m, with the data displayed accordingly. A more detailed survey methodology may be applied where archaeological remains are thought likely. This can sometimes produce results with a more detailed resolution. A survey with a grid size of 20m x 20m and a traverse interval of 0.5m will provide a data set with high resolution.



Bartington GRAD 601-2

The Bartington Grad 601-2 instrument is a specifically designed gradiometer for use in archaeological prospection. The gradiometer operates with a dual sensor capacity making survey very fast and effective. The sensors have a separation of 1m allowing greater sensitivity.

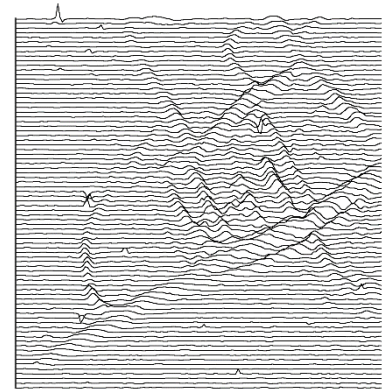


Frequent realignment of the instruments and zero drift correction ensure a constant high quality of data. Extremely sensitive, these instruments can detect variations in soil magnetism to 0.1nT, affording diverse application throughout a variety of archaeological, soil morphological and geological conditions.

Gradiometer Data Display & Presentation

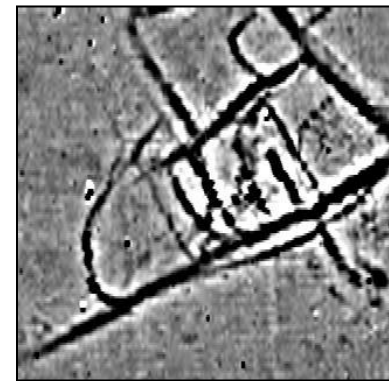
XY Trace

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.



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. In the summary diagrams processed, interpolated data is presented. Raw un-interpolated data is presented in the archive drawings along with the xy-trace plots.



Interpretation

An interpretation of the data is made using many of the plots presented in the final report, in addition to examination of the raw and processed data. The project managers' knowledge and experience allows a detailed interpretation of the survey results with respect to archaeological potential.



**XY Trace and raw greyscale plots are presented in archive form for display of the raw survey data. Summary greyscale images of the interpolated data are included for presentation purposes and to assist interpretation. The archive plots are provided as PDF images upon request.*

Glossary of Interpretation Terms

Categories of responses may vary for different data sets. The list below are the most commonly used categories for describing geophysical responses, as presented in the summary interpretation diagrams.

Archaeology

This category refers to responses which are interpreted as of clear archaeological potential and are supported by further archaeological evidence such as aerial photography or excavation. The term is generally associated with significant concentrations of former settlement, such as ditched enclosures, 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.

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 or archaeological cultivation activity.

?Natural

A broad response resulting from localised natural variations in the magnetic background of the subsoil; presenting as broad amorphous responses most likely resulting from geological features.

Ferrous Response

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 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.

Bibliography

European Archaeological Council (EAC) (2016) '*Guidelines for the use of Geophysics in Archaeology*' by Armin Schmidt, Paul Linford, Neil Linford, Andrew David, Chris Gaffney, Apostolos Sarris and Jörg Fassbinder.

English Heritage (2008) '*Geophysical guidelines: Geophysical Survey in Archaeological Field Evaluation.*' Second Edition.

Gaffney, C. Gater, J. & Ovenden, S. (2006) '*The use of Geophysical Techniques in Archaeological Evaluations.*' IFA Paper No. 6.

Gaffney, C & Gater, J (2003). '*Revealing the buried past: Geophysics for Archaeologists.*' Tempus Publishing Limited.

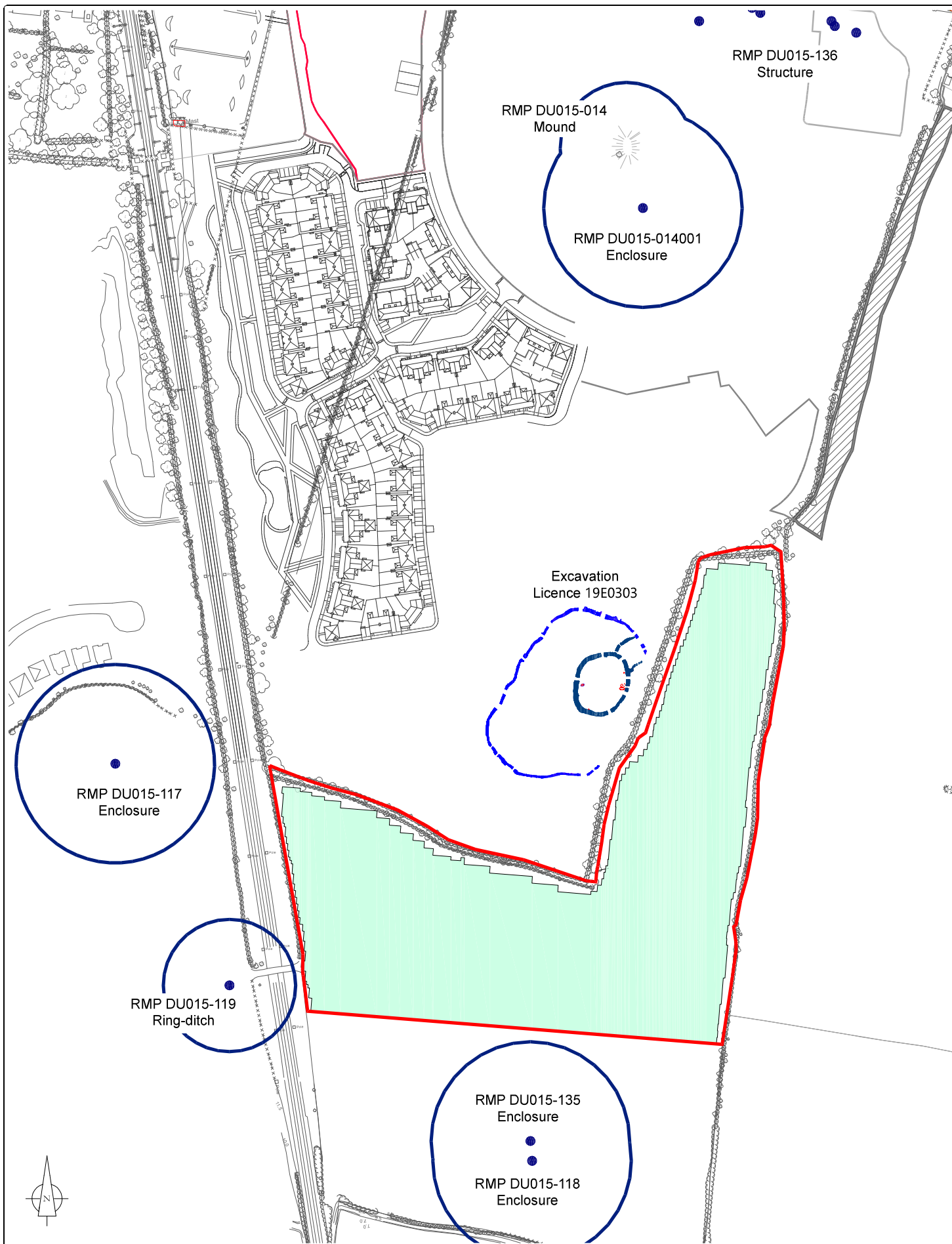
National Soil Survey of Ireland (1980) *General soil map second edition (1:575,000)*. An Foras Taluntais.

List of Figures

Figure	Description	Paper Size	Scale
Figure 1	Site & survey location diagram	A4	1:3,000
Figure 2	Summary greyscale image	A3	1:1,250
Figure 3	Summary interpretation diagram	A3	1:1,250

Archive Data Supplied as a PDF Upon Request

A1.01	Raw data greyscale image	A0	1:500
A1.02	Raw data XY-Trace plot	A0	1:500



Application Area



Detailed Gradiometer Survey

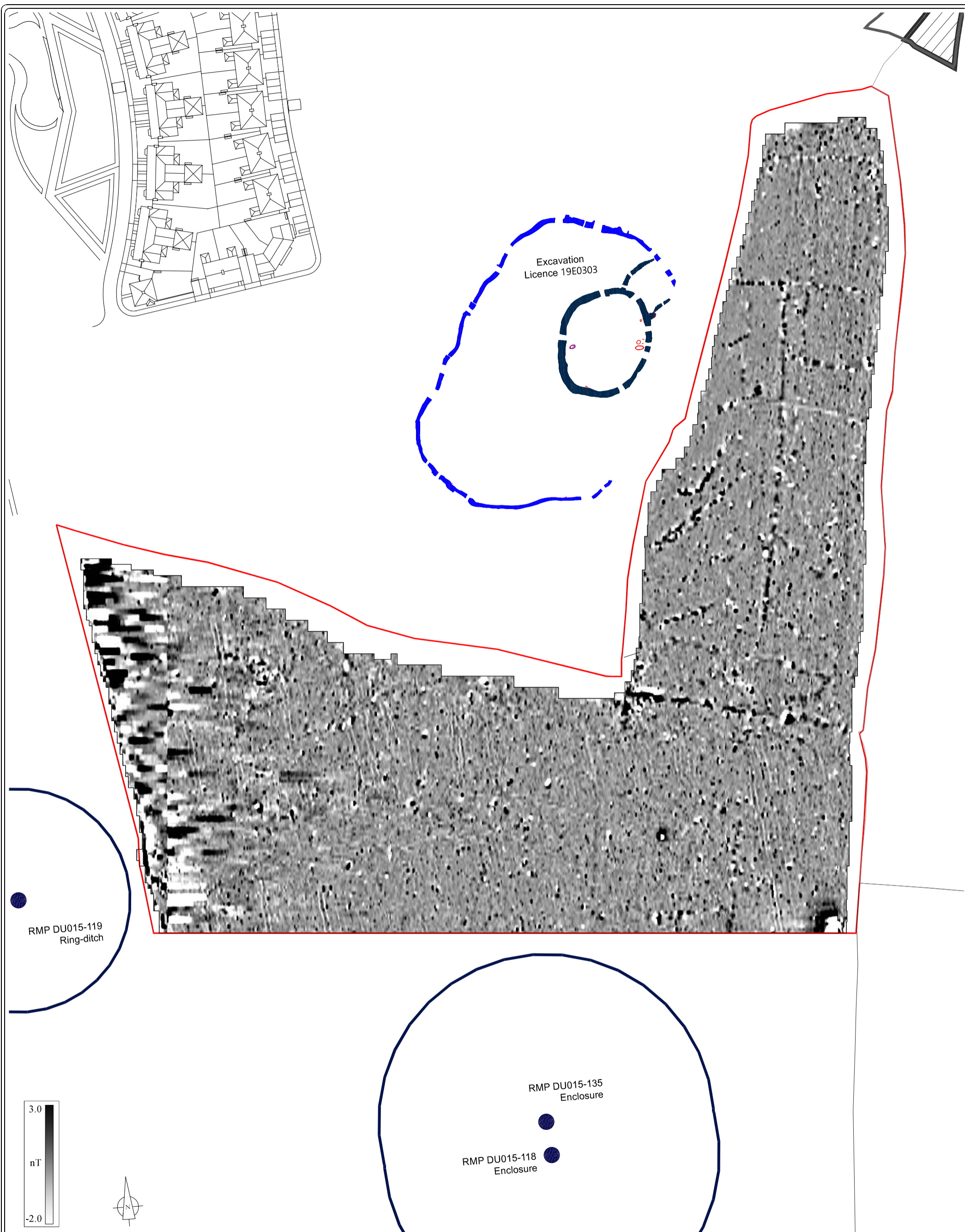
Client:
Courtney Deery Heritage
Consultancy Ltd.

Project:
Geophysical Survey
Drumnigh, Portmarnock,
County Dublin

Title:
Site & Survey Location

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Scale @ A4: 1:3,000
Figure: 1
Licence No.: 21R0089
Issue Date: 04.05.2021



0 metres 50 Application Area

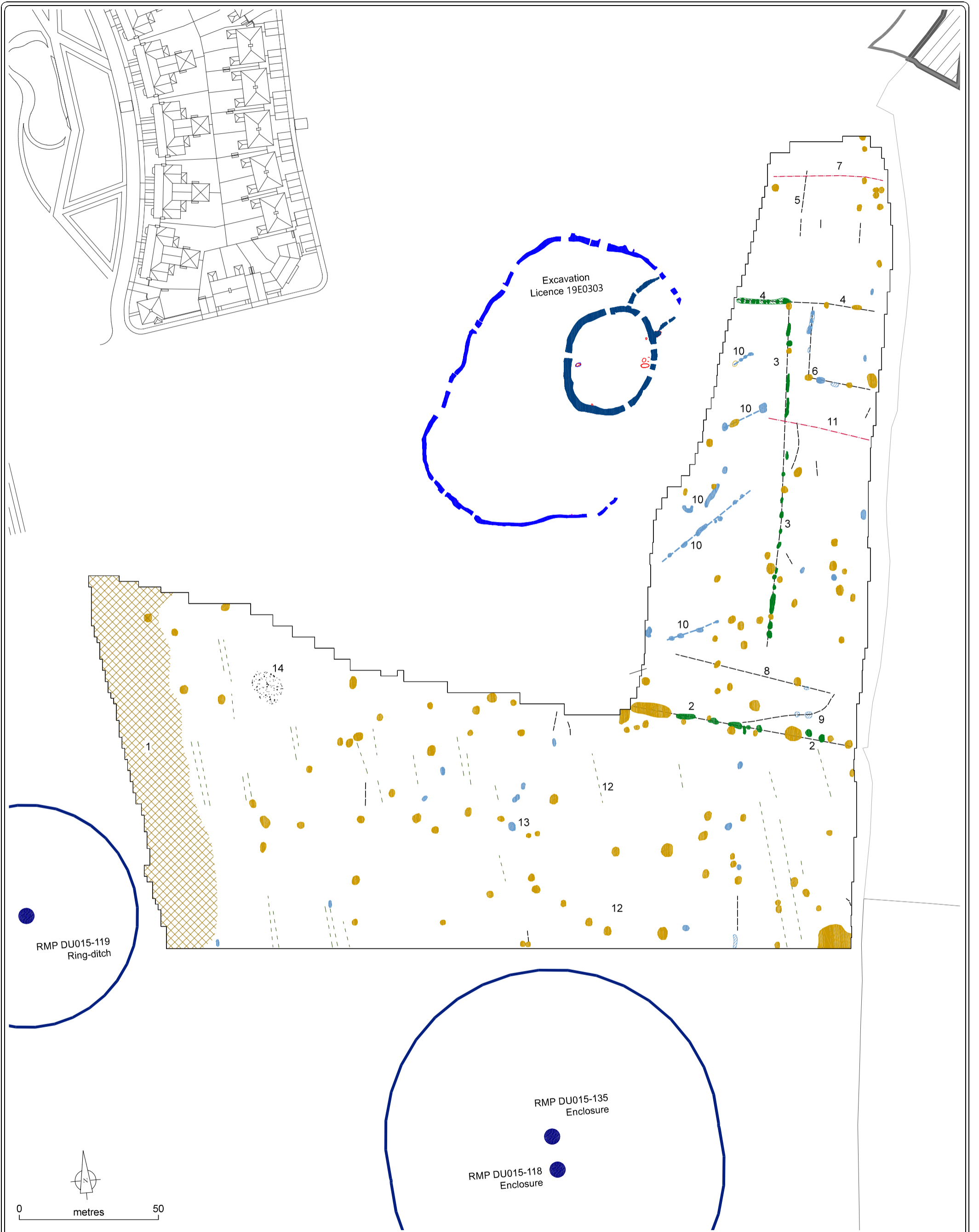
Client:
Courtney Deery Heritage
Constultancy Ltd.

Project:
Geophysical Survey
Drumnigh, Portmarnock,
County Dublin

Title:
PRELIM:
Summary Greyscale Image



Scale @ A3: 1:1,250
Figure: 2
Licence No.: 21R0089
Issue Date: 04.05.2021



Client:
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Project:
 Geophysical Survey
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Title:
 Summary Interpretation Diagram

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Scale @ A3: 1:1,250
 Figure: 3
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