



Archaeology Research Grant Report

Recipient name:	Dr James O'Driscoll
Discipline and subject area:	Archaeology Research Grant
Year awarded:	2022
Title of project:	Geophysical survey at the Creeveroe linear earthworks: a previously unidentified hillfort?

Summary of findings:

The Creeveroe earthworks form part of an incredibly dense late prehistoric landscape which include some of Ireland's foremost prehistoric monuments, such as the Bronze Age hillfort of Haughey's Fort and the man-made ritual pool of The King's Stables, as well as the Iron Age ceremonial complex at Navan Fort. Analysis of recent LiDAR and satellite imagery, however, suggested that Creeveroe formed part of a massive 109.2-hectare hillfort surrounding Haughey's Fort. Indeed, taking all of the aerial, satellite, topographical and remote sensing data together, it looks increasingly likely that the Creeveroe earthworks are not part of a linear earthworks system similar to those of the Dorsey or Dane's Cast. Rather, it seems to form a massive hillfort comparable to other Irish example such as Spinans Hill 2 or Tinoran hillforts, both Co. Wicklow. Funding from the RIA allowed for geophysical survey to be undertaken over the perimeter of this monuments, with the aim of confirming, or refuting, this interpretation.





Archaeology Research Grant Report

Please outline the objectives of the project.

The project, directed by Dr James O'Driscoll (University of Aberdeen), aimed to clarify and confirm the continuation of the Creeveroe earthworks identified in the LiDAR and satellite photographic record, by mapping sections of the eastern, southern and northern extent of the monument (the western side has recently been planted with forestry). This was done using state-of-the-art remote sensing techniques, including extensive magnetic gradiometry and targeted earth resistance surveys. An archive collection of aerial photographs collected by Hartwell in the 1980's and 1990's were the first to identify and record the Creeveroe earthworks. These were also scanned, digitized and enhanced as part of the project, in order to reveal further potential details of the extensive monument. The project had a number of research questions which can now be answered due to the large amount of geophysical survey data collected. These include:

- Do the Creeveroe earthworks form a massive enclosure surrounding Haughey's Fort?
- Do the earthworks actually represent the outermost enclosing elements of the hillfort of Haughey's Fort?
- Are there other unrecorded features associated with the earthworks, such as palisades or banks?
- Are there any obvious entrances or breaks in the earthworks?
- Is there a 'main' entrance, and if so, is this associated with an elaboration of the enclosing elements/additional entrance features such as gates, palisades, etc.?
- Can we identify 'internal' settlement associated with the earthworks as Conway did during his excavations?
- Are there structures, metalwork areas or activity zones within or associated with the earthworks?
- Is there any evidence for domestic habitation, hut structures, etc.?
- Can we continue to identify a close association between the Creeveroe earthworks and ancient burial monuments?

Please describe the methodology used in conducting the research.

A number of geophysical survey techniques were employed in order to accurately map the archaeological features associated with the Creeveroe earthworks, providing us a better understanding of this important later prehistoric landscape. The techniques and methods employed consist of:

1) Sensys MXPDA multi-sensor gradiometer cart:

Over 1.5 kilometres of the Creeveroe earthworks have now been mapped using gradiometry survey. A Sensys MXPDA 5 sensor gradiometry unit was used to collect data at a resolution of 0.5m traverse and 0.125m sample intervals. This system incorporates five magnetometers stacked 1m apart. The top sensor measures the Earth's magnetic field, which is measured in nanoTesla (nT), while the bottom measures the same field, but is affected by any buried feature closer to it (Aspinall et al. 2009). The Earth's magnetic field never stabilises at a fixed reading due to diurnal variations caused by solar winds and this can cause dramatic variations in the measurements (Aspinall et al. 2009). This is largely overcome by gradiometers, where the two magnetometers form an inherent spatial high-pass filter, largely cancelling out diurnal variations (Aspinall et al. 2009, 33). Data was collected using the Sensys unit tethered with a DGPS, allowing for data to be collected without the need for grids. This significantly increased the speed and accuracy of survey. Collected data was then processed in DLMGPS, Magneto and Geoplot 4 software to produce final images for interpretation and report writing.

2) Geoscan RM85 attached to a cart-based system employing a square array:

Targeted survey using earth resistance survey was undertaken. Readings were taken with a Geoscan RM85 electrical resistance meter attached to a cart system employing a square array. Archaeological features can be identified by a number of geophysical techniques, all of which detect specific physical discontinuities found within the subsoil. These anomalies can be caused by the distribution of moisture, due to the presence of archaeological features, and their physical properties. In the case of earth resistance, 'the electrical resistance of the ground is almost entirely dependent upon the amount and distribution of moisture within it. Buried remains affect this distribution, and can be detected with instruments' (Clark 1990, 27). This technique is traditionally much slower than gradiometry survey,



Archaeology Research Grant Report

however, the incorporation of a cart system allows for much larger areas to be surveyed at a higher resolution. A series of 50m-by-50m grids were established for electrical resistance survey, which were then tied into the National Grid using D-GPS. Collected data was processed in Geoplot 4.

Please outline the findings of your research and/or milestones achieved.

While it is clear Haughey's Fort is an incredibly important part of the Bronze Age landscape of the region, and this hillfort, along with the unique artificially created ritual pool of The King's Stables, often dominates the narrative, another significant but often neglected monument – the Creeveroe earthworks – may be just as crucial to the evolution of this Bronze Age landscape. Excavations undertaken at Creeveroe by Conway (2006) confirmed Hartwell's interpretation of the aerial photographic evidence that the monument consists of two parallel ditches. These were of strikingly similar size, shape and character to those that form the enclosing elements of Haughey's Fort. While Late Bronze Age pottery within key contexts of the ditch fill suggest the earthworks are likely contemporary with the hillfort and the nearby King's Stables, no radiocarbon dates have been obtained. Only fragments of the Creeveroe earthworks have been mapped, mostly on the eastern sides near the King's Stables and the recorded barrow cemetery. More recent analysis of LiDAR and aerial photography by the applicant have highlighted the possibility that the Creeveroe earthworks form the outermost enclosure of the hillfort of Haughey's Fort, creating a massive 109.2-hectare monument. This would be the second largest of its type in Ireland and one of the largest hillforts known in north-western Europe. Geophysical survey was undertaken in areas to the south, south-east, south-west and north-east in order to more comprehensively map this incredible monument and confirm (or refute) our interpretation of it as a massive hillfort. Over 1.5 kilometres of the monument was mapped as part of this project and over 38 hectares of geophysical survey data was collected. It has confirmed the monument is indeed a large enclosure, mapping the two parallel ditches in areas where the LiDAR data had indicated its presence, but also revealing the existence of the ditches in areas where neither LiDAR, satellite nor aerial photographs had previously identified the monument.

A large number of levelled mounds, enclosures and barrows have also been identified in close proximity to the earthworks, with many positioned immediately outside the perimeter, possibly physically and ritually demarcating and reinforcing the extensive boundary. No obvious evidence for habitation in the form of buildings or possible activity areas were identified, suggesting that this was centralised at Haughey's Fort which is positioned at the centre of the hillfort formed by the Creeveroe earthworks. Curiously, there are no indications of any small breaks or gaps in the surveyed extent of the earthworks, apart from one distinctive break at its very southern extent. Here, the layout of the earthworks form a distinctive 'V' shape in plan, a layout which does not occur anywhere else in its circuit. At the point of this 'V', a c. 15m gap is apparent, and it is likely that this formed the main entrance into the enclosure. The 'V' is flanked on either side two natural glacial hillocks, each of which was capped with what appears to be levelled circular mound.

Please provide details of the dissemination of the outcomes from this project.

The results of the surveys will be made available to the nearby Navan Centre once the report on the findings have been completed, which will allow the general public and local stakeholders to access to this research. Throughout the course of fieldwork, the project was promoted on social media platforms such as Facebook and Twitter. As the fieldwork has only just been completed, it is envisaged that a presentation on its results will be given in the near future, specifically at the 2023 Bronze Age Forum and the EAA conference in Belfast.

No. of Academic Papers/articles published: 1

No. of Lectures given/outreach events involved in: 2

Media Coverage (article in local newspaper, feature on university website etc.): 3



Archaeology Research Grant Report

How will you continue to communicate the results of your project and what are your publication plans?

The survey results will form part of a major monograph presenting the extensive remote sensing investigations in and around the Navan landscape over the last number of years.

How did the award enhance your professional development?

The award has allowed me to gain further experience in running my own project, and in that regard, will help to enhance my professional development, CV and future job prospects. It has also allowed me to strengthen my collaborations with colleagues in Belfast and the Historic Environment Division in Northern Ireland. The results will also be important in allow me to complete a monograph of the remote sensing studies of this well-known landscape, which again, can have a significant positive impact on my future career.

What plans (if any) do you have to further your proposal/project?

This was the last major question we had for this landscape that large-scale geophysical survey can answer. However, the results of the survey work in the area, along with previous excavations, have led to a considerable number of site-specific questions that now need answering. Most of these need intrusive investigations to answer, though some can be addressed using archive material. For example, now that we know the Creeveroe earthworks form a massive hillfort, can we obtain scientific dating evidence (instead of relying on pottery typology) to more precisely date the enclosure and assess how it corresponds with the rise and fall of Haughey's Fort or the King's Stables. Or, can we use archival material to obtain more precise dates and isotopic data from animal bones found at the base of the King's Stables?