



Geophysical Survey Report No. 32

NIEA License Number AE/14/137

Dunluce Village & Garden Fields Supplementary,

Co. Antrim

Dr Siobhán McDermott

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Summary of results

An evaluation resolution electrical resistance survey was carried out over a total area of 0.27 hectares along the westernmost limits of the gardens and village at Dunluce Castle (ANT 002:008). It was commissioned to supplement two earlier episodes of geophysical survey in the area and feed into the interpretation of data gathered during the 2014 season of excavation. The castle and its environs are currently the focus of a Lottery Heritage Funded project to develop its potential as a unique heritage destination within Northern Ireland.

There are a series of linear anomalies which may have archaeological significance. Two of these, r2014_3 & r2014_4, are extension of earlier features identified in the previous seasons of geophysical survey and targeted by the 2014 excavations. The other two narrow linear features, r2014_1 & r2014_2, extend from the western edge of r2014_4 which is probably the western limit of the cobbled surface (c. 1604) identified in Trench 16 of the 2014 excavations. It is proposed that r2014_2 is an extension of the wall (c. 1607) also revealed in Trench 16. The anomaly r2014_1 may predate features associated with 17th-century settlement to the south. It is possible that r2014_1 is an earlier routeway which utilised a natural bedrock outcrop and which may have been used to help demarcate later routes through the immediate landscape.

Site Specific Information

Site Name: Dunluce Village & Garden Fields Supplementary, Co. Antrim

Townland: Dunluce

SMR No: ANT 002:013 (Souterrain – unlocated), ANT 002:008 (Earthworks associate with town and gardens), ANT 002:003 (Dunluce Castle).

Grid Ref: C 90319 41193

County: Antrim

Date of Survey: 16th September 2014

Surveyors Present: Siobhán McDermott Centre for Archaeological Fieldwork, School of Geography, Archaeology and Paleoecology, Queens University, Belfast, with the assistance of Francis Woods & Claire Privilege

Size of area surveyed: 0.27 hectares

Weather conditions: Mild and warm.

Solid Geology: Upper Basalt Formation: Antrim Lava Group

Drift Geology: Diamicton till

Current Land Use: Pasture

Intended Land Use: Heritage tourism amenity

Survey methodology overview

Survey type:

Electrical resistance

Instrumentation:

Geoscan RM85 resistance meter

Probe spacing:

0.5m parallel twin probe array

Grid size:

30m x 30m

Traverse interval:

1m twin parallel three probes (2 x 0.5m)

Sample Interval:

1m

Traverse Pattern:

Zig-zag

Lecia TS06-plus total station

Station setup:

Tied into Irish National Grid using differential GPS

Spatial Accuracy:

Survey grade accuracy (<3cm)

Georeferencing:

The dataset was downloaded from the TS06 and imported into ArcGIS 10.2. The grid points were extracted as a separate feature class and used to georeference the geophysical survey datasets exported from Geolplot v.3.

Data processing:

The geophysical data was processed in Geolplot v. 3 software. The primary processes applied were high pass filtering (HPF) to remove geological 'background' noise and low pass filtering (LPF) which helps to eradicate minor spikes in the data. The datasets were also interpolated which creates a smoothing effect.

Visualisations:

The datasets were visualised within Geolplot v.3 using shade, trace, dot density and relief plots. Processed datasets and bitmap graph plots was exported from Geolplot v.3 and imported into ArcGIS 10.2. Once georeferenced statistical analysis were carried out on the rasters within ArcGIS 10.2 and they were interpreted in relation to the First, Third and Fifth Edition Ordnance Survey maps of the area, the 2006 orthorectified aerial photographs and relevant georeference bitmap imports.

Digital archive:

The geophysical datasets were collected, processed and archived in accordance with Archaeological Data Services best practice.¹

¹ Schmidt, A. & E. Ernenwein, 2011, Guide to good practice: Geophysical data in Archaeology [Online]
http://guides.archaeologydataservice.ac.uk/g2gp/Geophysics_Toc

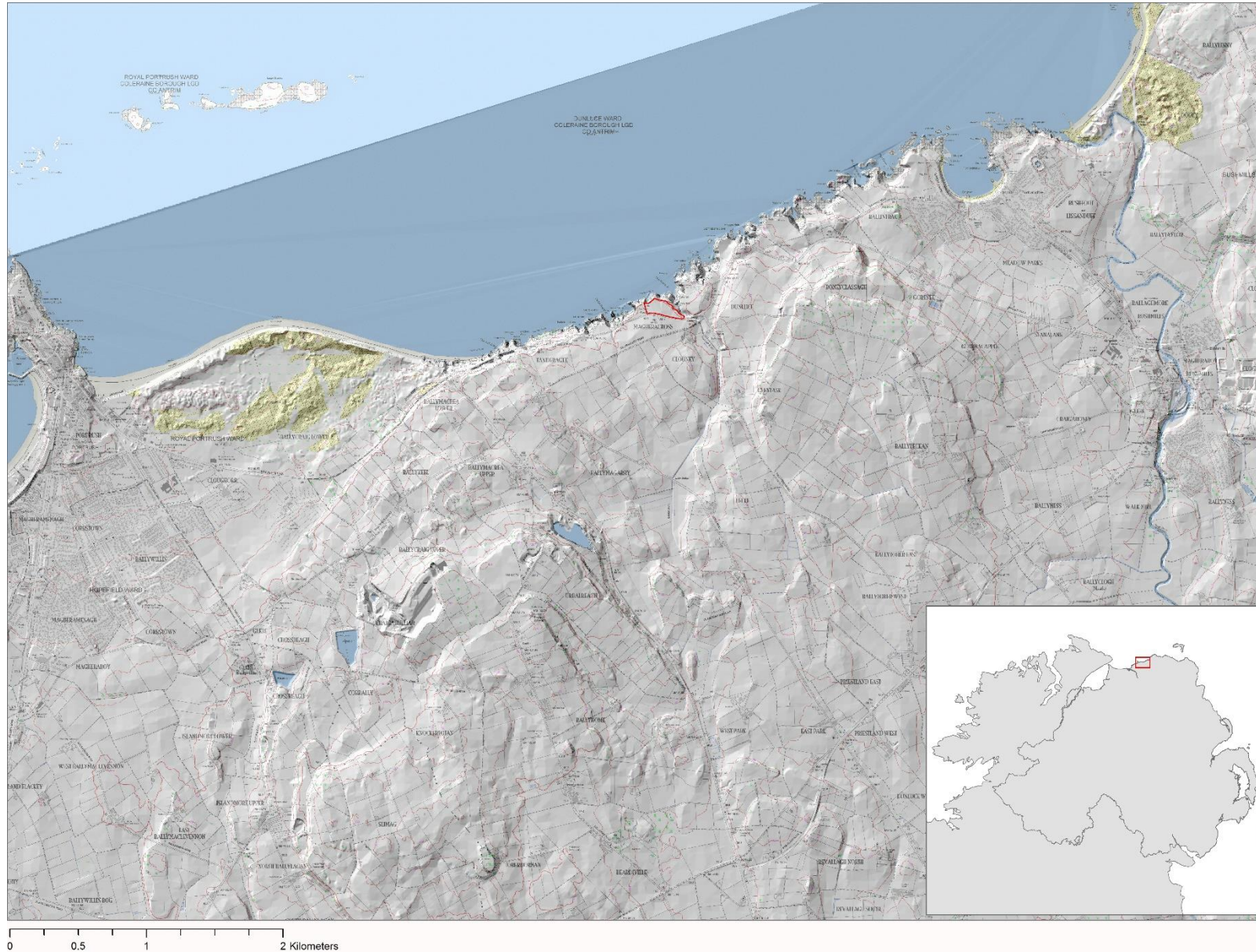


Figure 1 Location and landscape setting of the geophysical survey grid marked in red (OSNI 10km vector data layered over 5km DEM Hillshade).*

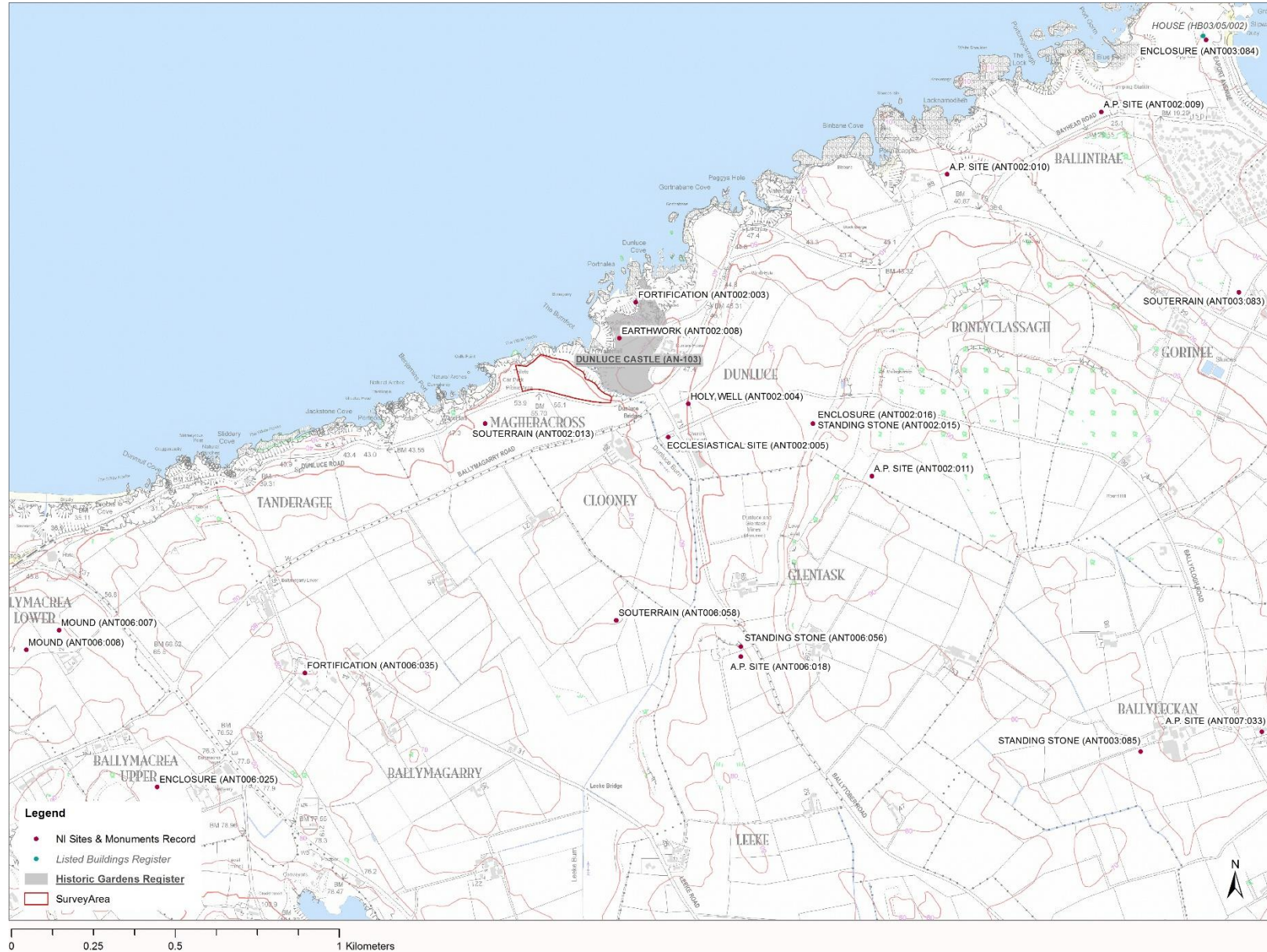


Figure 2 Wider recorded archaeological landscape setting. Geophysical survey area in red with Key NISMR locations noted.**



0 15 30 60 Meters



Figure 3 Location of supplementary geophysical, marked in red, in relation to the 2009 (bottom) and 2012 (top) seasons of geophysical survey.*

Introduction

An evaluation resolution electrical resistance survey was carried out over a total area of 0.27 hectares in the western vicinity of the castle gardens and to the north of the 17th-century village (ANT 002:008). Dunluce Castle (ANT 002:003) and its environs are currently the focus of a Lottery Heritage Funded project to develop their potential as a unique heritage destination within Northern Ireland. The survey area abuts two previous episodes of geophysical survey (McHugh 2012; Mussen 2012; Figure 3) carried out by the Centre for Archaeological Fieldwork, Queen's University Belfast. It was commissioned to supplement these earlier surveys and partly inform the interpretation of an extensive programme of excavation which took place within the vicinity of the castle over the summer of 2014.

Dunluce Castle is located midway along the A2 between the towns of Portrush and Bushmills, both Co. Antrim. The survey area is situated c. 80m to the west of mainland elements of Dunluce castle. It is located c. 45m OD with the area to the north and west dropping away steeply to the Atlantic Ocean below. It is included in the Scheduled Monument Zone² associated with ANT 002:008 and part of the area defined by the Register of Historic Parks, Gardens and Demesnes.³

Historical & archaeological background

The following is a modified extract from McDermott (2014, 5 – 6).

The survey area is situated along the westernmost limit of Dunluce Castle gardens and village (ANT 002:008). The Castle is in State care and the associated gardens and village are within a scheduled monument zone. The contemporary narrative of Dunluce and its wider archaeological landscape setting is dominated by later medieval and post-medieval phases of settlement activity. However there is evidence for prehistoric activity. Roughly 2km west a limited excavation at White Rocks sand dunes, in advance of the construction of Portrush golf course, unearthed multi-period activity. Finds included Neolithic flint lithics, hearths, a cist burial, saddle quern, bronze fibular and silver Henry III coin from an area measuring roughly 18m x 20m (Collins 1977). There is also a notable distribution of standing stones within a 5km radius of the survey area with a significant number of references to megalithic monuments, which can no longer be located, in the Ordnance Survey Memoirs (Day & McWilliams 1992). During the course of a geophysical survey to west of the current survey area, in Maghercross townland a number of struck and worked flints were identified eroding from the earth. Although lacking diagnostic features they were loosely grouped to the Neolithic and Bronze Age (McDermott 2014, 5). A small number of worked flint was recovered during monitoring of the archaeological mitigation of that area (Redmond 2012, 9). A small amount of struck flint was recovered during the 2014 excavations (McAlister *per comms*)

The early medieval period is evident through a strong distribution of souterrains and to a lesser extent raths. Many of these, including an example (ANT 002:013) 300m south-west of the survey area, are referred to in the Ordnance Survey Memoirs by cannot now be located. Another example, which underlays the northeast tower of the castle was revealed during clearance work in 1928 (Breen 2012, 21). Breen (*ibid* 19) has

² Downloadable polygon dataset available online [http://www.doeni.gov.uk/niea/scheduled_zones.zip].

³ Downloadable polygon dataset available online [<http://www.doeni.gov.uk/niea/gardens.zip>].

proposed that 'a fortified headland existed' at the location of Dunluce Castle during the 11th- to 12th-centuries. Evidence for which would have been heavily eroded by the later phases of castle building.

The later and post-medieval history and archaeology of Dunluce Castle and its environs has been extensively and ably covered by Breen (2012). The following is a brief synopsis of his work with notes which may have significance for the interpretation of the geophysical data from the survey area. Historical evidence indicates that an Anglo-Norman manor was established at Dunluce at the end of the 13th-century. Excavations to the south of the castle beside Dunluce House, to test the areas archaeological potential, unearthed high medieval ceramics. However it appears that the main foci for settlement activity in the area, from the 13th to 15th centuries, was at Ballylough Castle, 2.5km south of Bushmills (Breen 2012, 27 – 31). The first significant phase of construction activity in the immediate vicinity of the castle dates to the close of the 15th-century and the lordship of the Route which was then controlled by the MacQuillans. The MacQuillans established themselves in Ulster society relatively quickly after their arrival as Scottish mercenaries. In the mid-15th-century they took Ballylough Castle, probably seizing upon opportunities created by the fall of Anglo-Norman Ulster. They refurbished Ballylough before moving their attention onto Dunluce (ibid 38 – 41). By the mid-16th century the MacQuillans had also established and were patrons to the Franciscan friary at Bonamargy in the style of a typical Gaelic Irish lordship. However by the end of the century the ambitions of their Scottish kinsmen, the MacDonnells, would see their territory and position lost.

By the 1580s the MacDonnells were identifying themselves as the lords of the Route, had taken Dunluce from the MacQuillans and begun a major phase of refurbishment at the castle in a typically Scottish architectural style (Breen 2012, 68 – 72, 86 – 7). A late 16th-century phase of gentrification retained its medieval antecedents in the form of the 'buttery' – which appears to be a reception hall separated from the lord's private quarters.

Much of what we understand about the castle, gardens and surrounding settlement dates to the period of MacDonnell occupation. By the early 17th-century the MacDonnells were successfully negotiating the complex political landscape of early modern Ireland. Under the leadership of Randal MacDonnell the family maintained the lands initially granted them in the 1580s and consolidated their relationship with the Stuart court. These Gaelic lords began a programme of plantation bringing in new Scottish and local Irish settlers, establishing settlements, trade centres and small-scale industries. The changes to Dunluce Castle reflect these emerging cultural norms as an emphasis was placed on consumption and privacy. On the rocky outcrop, the Jacobean manor house was built which incorporated the earlier 'buttery' and a new kitchen was constructed. An ambitious programme of building on the mainland adjacent to the castellated outcrop was started which included stables, brew-house and lodgings. It was during this period that the pleasure gardens and town to the west of the castle date. This was the zenith of the town and castle. By the 1680s after half a century of war and the death of the 2nd earl the town was abandoned. A fair continued to be held in the castle's environs up until the 1740s. Archaeological evidence for temporary structures associated with this phase of activity were revealed during Breen's excavations (Breen 2012, 177).

Understandably, most research on Dunluce and the MacDonnell lordship to date has focussed on either the castle, its immediate environs or other elite settlements within the territory (Breen 2012). Less focus has been given to how the MacDonnell's would have organised and worked their estate internally. The mid-17th-century Down Survey depicts a series of larger landholding parcels which appear to have been sub-divided at a later date. An episode of townland renaming and subdivision has been noted during the 18th- and 19th-centuries in mid-Ulster (McDermott 2013, 7) and something similar may have occurred at Dunluce.

By the 1830s the land surrounding Dunluce was improved enough to suit the tastes, and agenda, of Samuel Lewis (1837, 585). The ideology of Improvement linked a well-ordered and well-managed landscape with civility and civilising influences (Forsythe 2013, 73). Sixty years previous Arthur Young (Wollaston-Hutton 1892, 161) had noted that the area surrounding the Giant's Causeway was, 'in the rundale and likewise in the change-dale system'. Presumably this meant by the 1770s the collectively farmed system of in-fields, out-fields and common-lands in north Antrim was in the process of being enclosed and privatised.

Since 2008 the castle and associated settlement features has been at the centre of archaeological research. In 2008 the Centre for Maritime Archaeology (CMA), University of Ulster, opened a limited trench near the south-west bay window of the manor house. The deposits were heavily disturbed although loose finds included 17th-century ceramics and plasterwork (Breen & Raven 2008). Further excavations were undertaken in 2009 & 2010, by members of CMA and the Centre for Archaeological Fieldwork (CAF), Queen's University. They further revealed the extent of 17th-century material surviving in the castle's environs and indicated extensive earlier phases of activity. The 2009 season uncovered a Scottish merchant's house (Breen & Raven 2009). In 2010 a Blacksmith's workshop associated with the 17th-century village was excavated and evidence was found for the earlier 15th-century MacQuillan settlement phases (Breen 2010). This research has been discussed in detail in Breen (2012).

From 2009 – 2012 CAF carried out an extensive programme of electrical resistance geophysical survey in the environs of the castle and its hinterland (McHugh 2012; Mussen 2012). The 2009 study focussed on the Village Field (McHugh 2012). It revealed an arterial street running west-south-west to east-north-east onto which a number of house faced. This was the location of the 17th-century town already hypothesised from earthworks. A geophysical survey of the gardens identified many of their structural elements as well (Mussen 2012). A LiDAR survey commissioned by the NIEA confirmed the presence of many of these elements.

Description and interpretation of anomalies (Figure 4)

Table 1 Description and interpretation of archaeological anomalies.

Code	Description	Interpretation
r2014_1 (r2014_1a, r2014_1b)	High resistance linear anomaly running north-east to south-west for a maximum length of c. 44m. The feature is comprised of two sections; r2014_1a abuts the western end of r2014_4 and is mapped for a length of c. 4.7m. The western section is recorded for a distance of c. 34m. Its westernmost limits appears to be truncated by an episode of quarrying along the western limits of the survey area. The two sections are elements of the one curvilinear high resistance feature. They are separated by a gap, c. 5m wide, which is visible in the 2010 orthorectified aerial photography (Figure 12) and the LiDAR survey (Figure 11).	<p>The feature r2014_1 follows the path of a ridge captured in the LiDAR data of the area. It appears to extend from the western end of a high resistance linear feature (r2) recorded during the 2012 electrical resistance survey of the Castle Gardens (Mussen 2012, 19). The 2012 anomaly was interpreted as a landscaping feature probably related to the 17th-century gardens to the north. Recent excavations have confirmed that the 2012 feature r2 is composed of a revetment wall, c. 0.6m wide, to the north and a cobbled routeway, c. 4.7m, to the south. A hollow-way following the route of this cobbled surface is clearly captured by the LiDAR survey.</p> <p>In plan r2014_1 appears to extend from the southern edge of r1 suggests it may be the remnants of this cobbled routeway perhaps following a natural ridgeway through the survey area. The presence of a series of very high resistance returns in the vicinity of the quarrying activity which truncates r2014_1 confirms near surface solid geology. However neither trench 20 or 30e found evidence for a cobbled surface which would appear to have petered out further to the east.</p> <p>Notably there is a substantial break in r2014_1, c. 5m, noted in the LiDAR data. An excavation trench (Trench 20) was positioned over this gap during the 2014 excavations. The trench was aligned east – west. In the middle of this trench, running north – south, was a stone-lined drain. The drain is believed to date to the late 16th-century as it is similar to an example excavated in the interior of the stables in 2009 (Grace Macalister <i>per coms</i>). The geophysical anomaly r2014_2 does not display any evidence for a similar break but profiles through the bank, as captured by the LiDAR survey, along the path of r2014_1 and r2014_2 suggests that there is a depression (Figure 13). This would further the proposition that the drain cut (c. 2014) identified in Trench 20 cut through the cobbled surface and possible the wall noted in trench 16.</p>

r2014_2	High resistance linear feature running west-south-west to east-north-east for a distance of c. 38m. It extends beyond the western limits of the current survey area.	A clearly defined drop was noted in the immediate vicinity of r2014_2 as the surveyors were moving over the survey area. With the ground level to the north c. 0.5m lower than that to the south.
r2014_3	High resistance linear running c. 4.5m north-west to south-east and c. 1.8m in width. The feature extends beyond the southern limit of the 2014 survey and appears to have been captured in the 2009 survey of the Village Field.	<p>The anomaly r2014_3 is an extension of a linear recorded during the 2009 electrical resistance survey of the Village Field (Figure 3). Between the two seasons of survey the anomaly is mapped for a length of c. 18m running south-east to north-west. It is roughly parallel with southern wall of an early 17th-century building excavated by Breen (2012, 139-148) extending from the western end of the roadway which delineated the 17th-century town. The building has been interpreted as a merchant's house on the bases of imported ceramics and coinage recovered during excavation. It sub-divided later during the century to accommodate animals.</p> <p>During the 2014 excavations a trench (Trench 21) was positioned to capture the eastern limit of this high resistance linear. The 2014 trench cut into the area of the previous excavation which focussed on the merchant's house. The 2014 excavation located the northernmost limit of the 17th-century roadway defined by a line of large cobbles aligned east-west. Extending north from this was a cobbled pathway, c. 2.15m wide. It was composed of three lines of large cobbles two on either side and one running down the middle. The cobbled pathway was bedded into layers of loam which produced a large number of 17th-century artefacts, including flints, slate, clay pip fragments, pottery, glass and nails (Macalister 2014).</p> <p>It is likely that r2014_3 maps the northernmost extension of this cobbled pathway.</p>
r2014_4	High resistance linear anomaly running west-south-west to east-north-east captured for a length of c. 11m with a width of c. 5m. The feature extends beyond the easternmost limits of the survey area and appears to have been captured in both the 2009 and 2012 electrical resistance surveys of the area.	<p>The feature r2014_4 is the westernmost limits of a high resistance linear feature recorded by the 2009 geophysical survey and identified as r2 in the 2012 study. It runs for a total distance of c. 53m and is associated with a distinct ridge evident in the LiDAR data (Figure 11).</p> <p>During the 2014 excavations a trench (Trench 16) was positioned perpendicular to the ridge. Excavation revealed a wall, cobbled surface and drain which may compose and therefore run the length of the high resistance anomaly. The cobbled surface, c. 5m wide, is defined to the north the wall, c. 0.7m wide, to the north. The wall appears to delineate</p>

		the boundary between the 17 th -century gardens to the north and the Village Field to the south. The cobbled surface ran down to drain comprised of sub-angular cobbles set on edge to create a narrow v-shaped channel (Macalister 2014).
r2104_5	Two irregular areas of high resistance to the south of the survey area in the immediate vicinity of quarrying activity.	Near surface bedrock. The evidence for quarrying further indicates the presence an easily accessible source of stone.

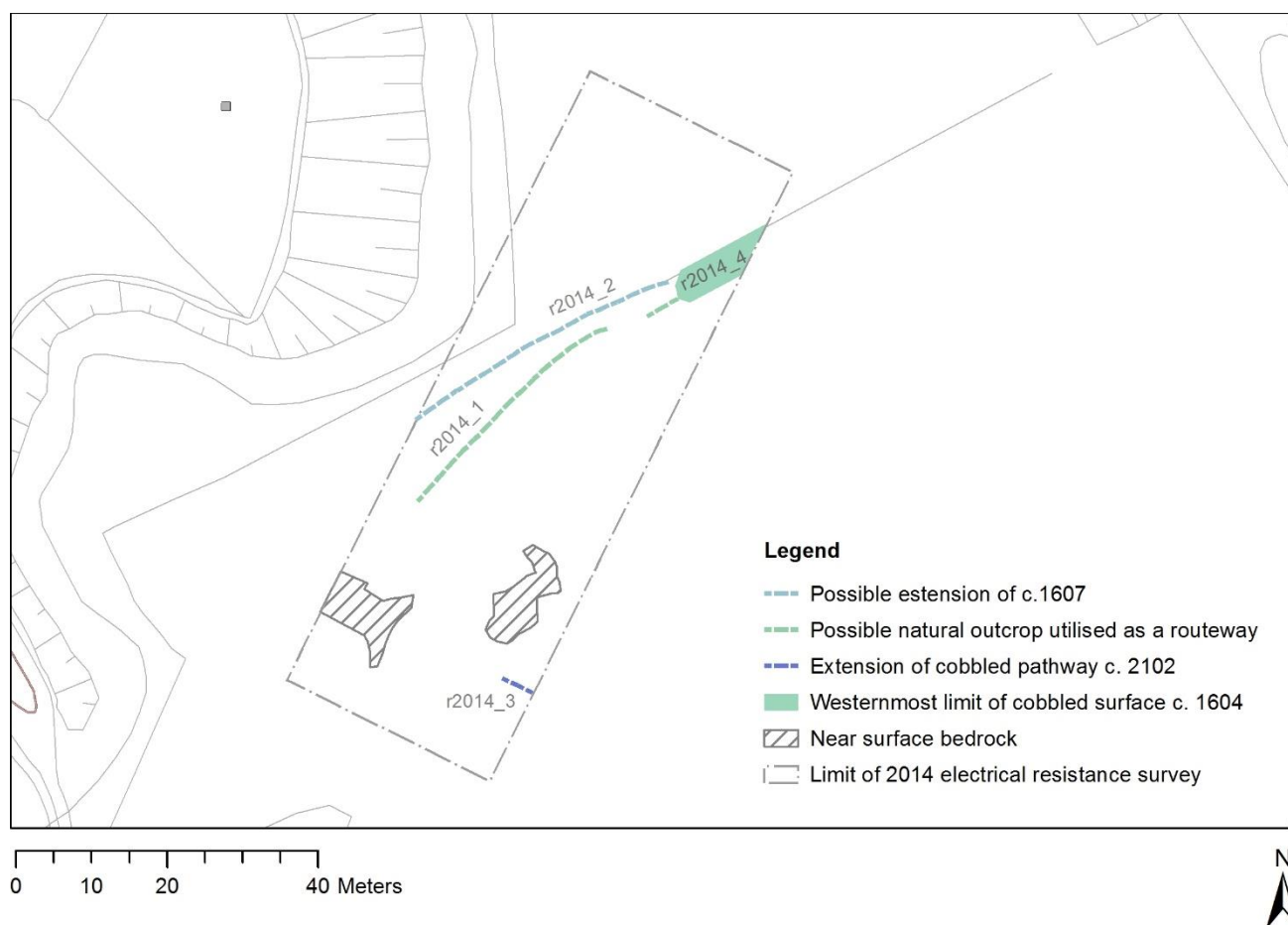


Figure 4 Interpretation diagram with geophysical anomalies identified

Discussion

This survey focussed on a small area to the west of the 17th-century castle gardens and to the north of 17th-century town. Both these areas had been extensively and ably surveyed prior to this (McHugh 2012; Mussen 2012). The current survey sort to supplement this earlier work and to aid the interpretation of the 2014 archaeological excavations.

The electrical resistance survey identified a series of linear anomalies which have possible archaeological significance. Two of these, r2014_3 & r2014_4, are extensions of earlier features identified in the previous seasons of geophysical survey which were also targeted by the 2014 excavations. The anomaly r2014_4 maps the westernmost limit of the cobbled surface (c. 1604) identified in Trench 16 of the 2014 excavations (Grace Macalister *per comms*). The cobbled surface was not captured in trenches 20 or 30d as would be expected as neither of these overlaid r2014_4. The cobbled surface was evident in trenches 30a – 30c which do coincide with the eastern portion of r2014_4 as mapped by the previous electrical resistance surveys.

The feature r2014_3 is the northernmost extension of a narrow linear feature identified during the 2009 electrical resistance survey. During the 2014 excavations a trench (Trench 21) was positioned to capture its south-eastern limit. The trench included the area of the previous 2009 excavation which focussed on the merchant's house. The 2014 excavation located the northernmost limit of the 17th-century roadway defined by a line of large cobbles aligned east-west. Extending north from this was a cobbled pathway, c. 2.15m wide. It was composed of three lines of large cobbles two on either side and one running down the middle.

The cobbled pathway was bedded into layers of loam which produced a large number of 17th-century artefacts, including flints, slate, clay pip fragments, pottery, glass and nails (Macalister 2014). It is this feature which appears to coincide with r2014_3 in the current geophysical survey.

The other two narrow linear features, r2014_1 & r2014_2, extend from the western edge of r2014_4 which is probably the western limit of the cobbled surface (c. 1604) identified in Trench 16 of the 2014 excavations. It is proposed that r2014_2 is an extension of the wall (c. 1607) also revealed in Trench 16. The anomaly r2014_1 appears to be cut, possibly by the drain (c. 2014) excavated in Trench 20 which is currently believed to be associated with the 17th-century settlement to the south. This would suggest that r2014_1 predates these later settlement features. It is a narrow, curvilinear band of high resistance curving from r2014_4 towards an area of quarrying. The quarrying truncates r2014_1 and therefore post-dates it. It is possible that r2014_1 is an earlier routeway which utilised a natural bedrock outcrop and which may have been used to help demarcate later routeways through the area.

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Appendix one: Georeferenced geophysical survey grid

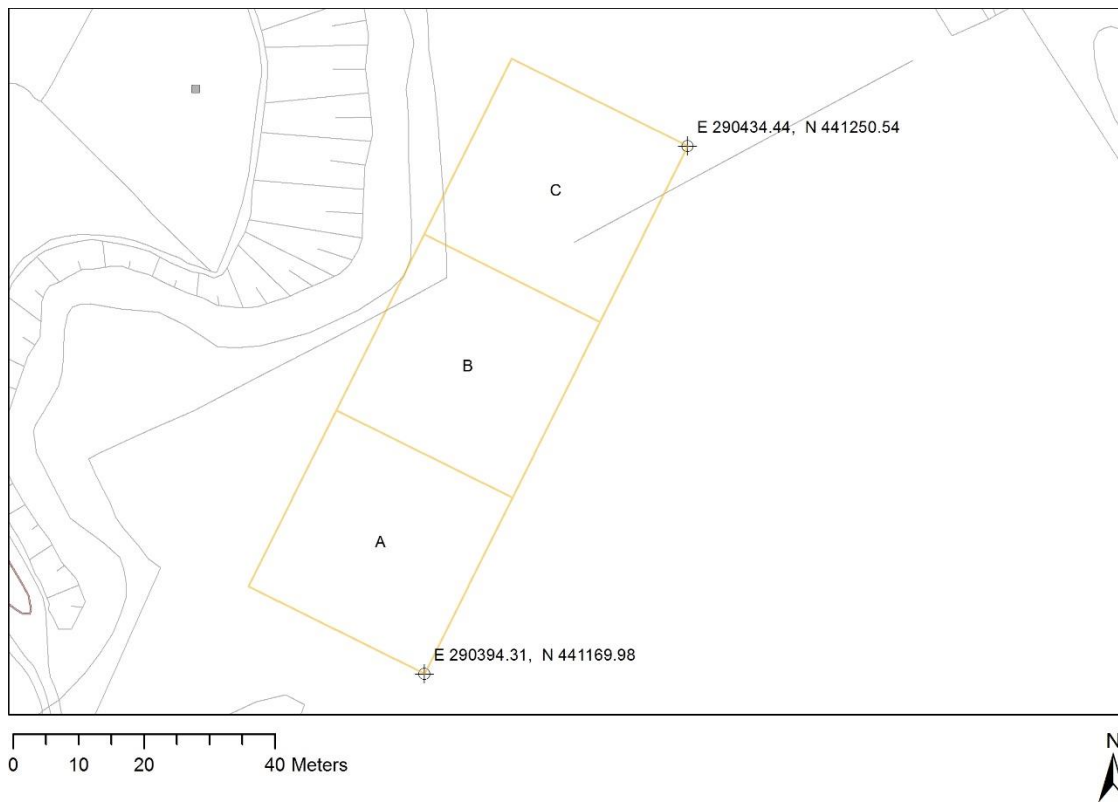


Figure 5 Irish National Grid coordinates for geophysical survey grid baseline.*

Appendix two: Processed and raw geophysical survey plots

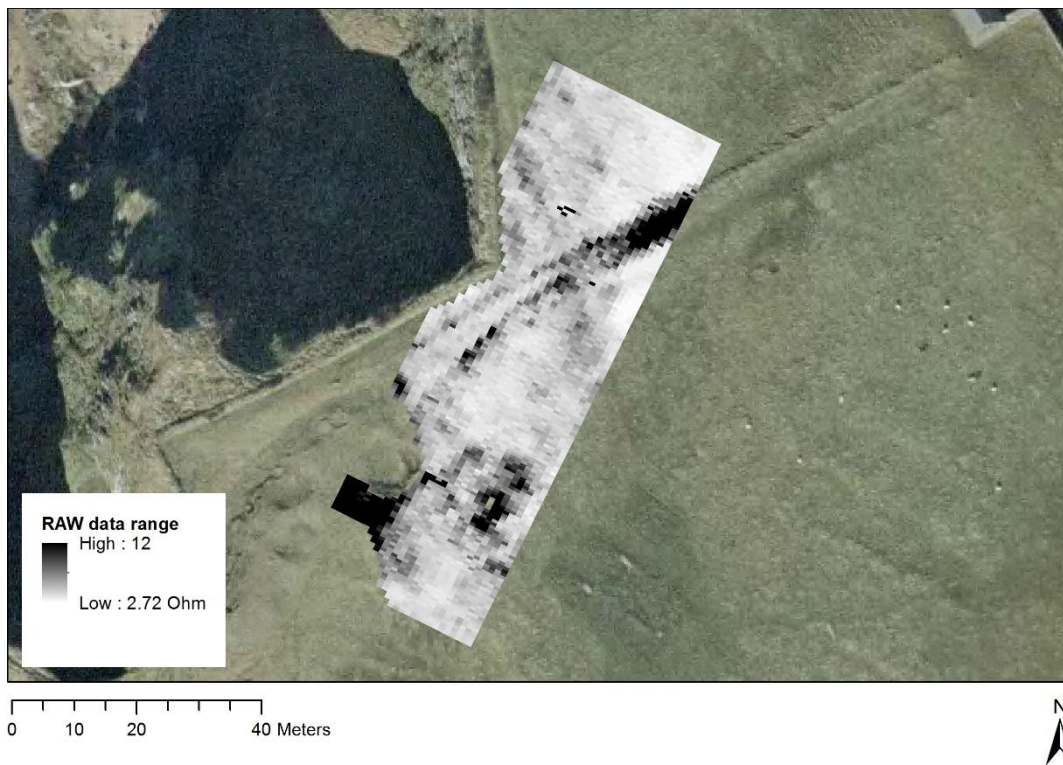


Figure 6 Greyscale plot of RAW data clipped -24/120 Ohm and despiked. Statistics: Mean: 4.62 Ohm, Std Dev.: 1.87.*

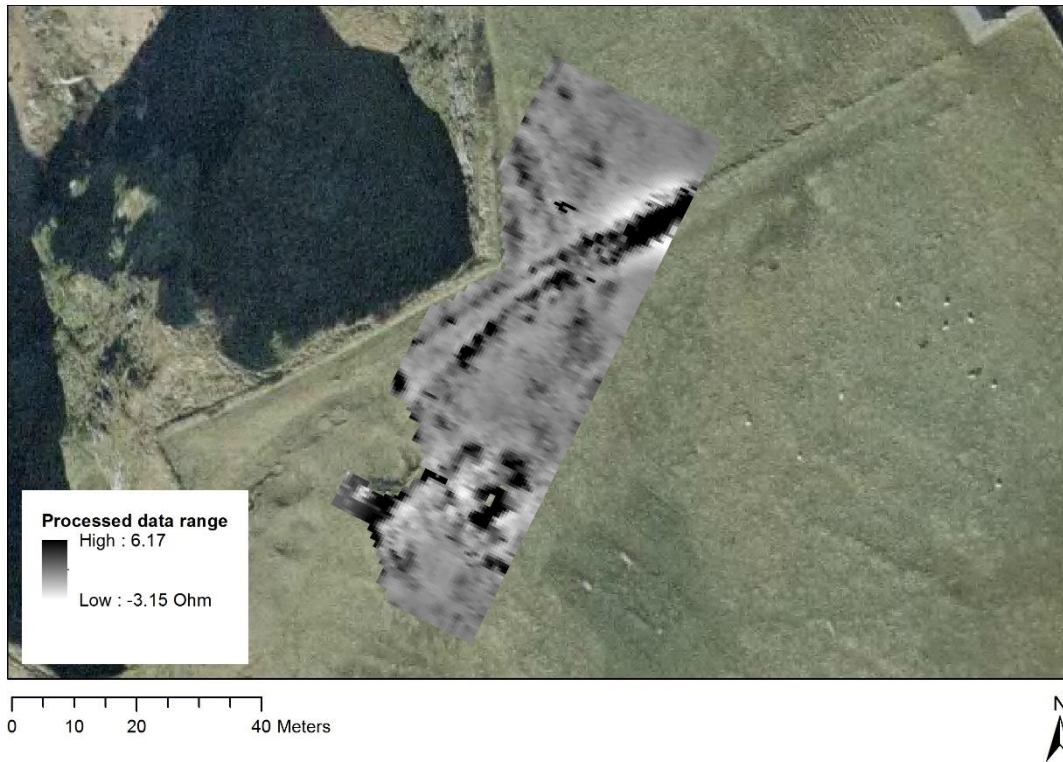


Figure 7 Greyscale plot of processed data clipped, despiked, LPF (Gaussian weighting applied x1 on x-axis, x2 on y-axis), and $\sin(x)/x$ interpolation on x- and y-axis. Statistics: Mean: 0.01 Ohm, Std Dev: 1.04.*

Appendix three: Historical mapping

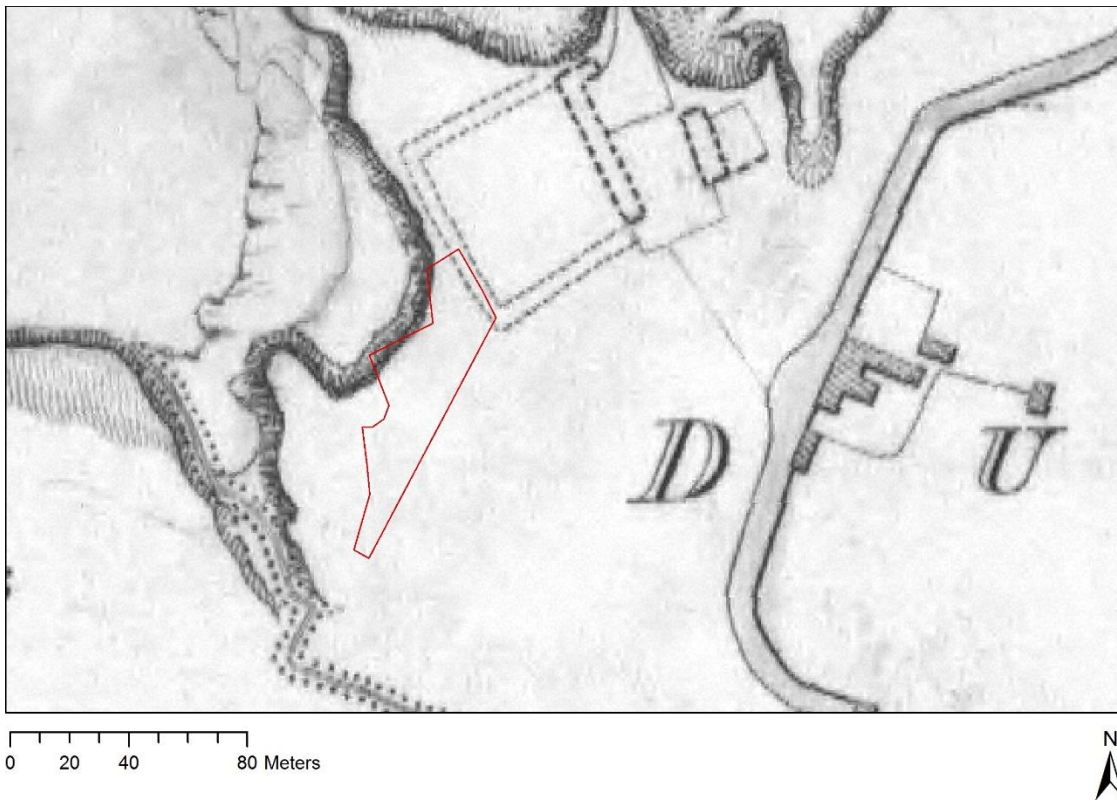


Figure 8 Geophysical survey area in relation to the First Edition Ordnance Survey map series, c. 1831-3.*

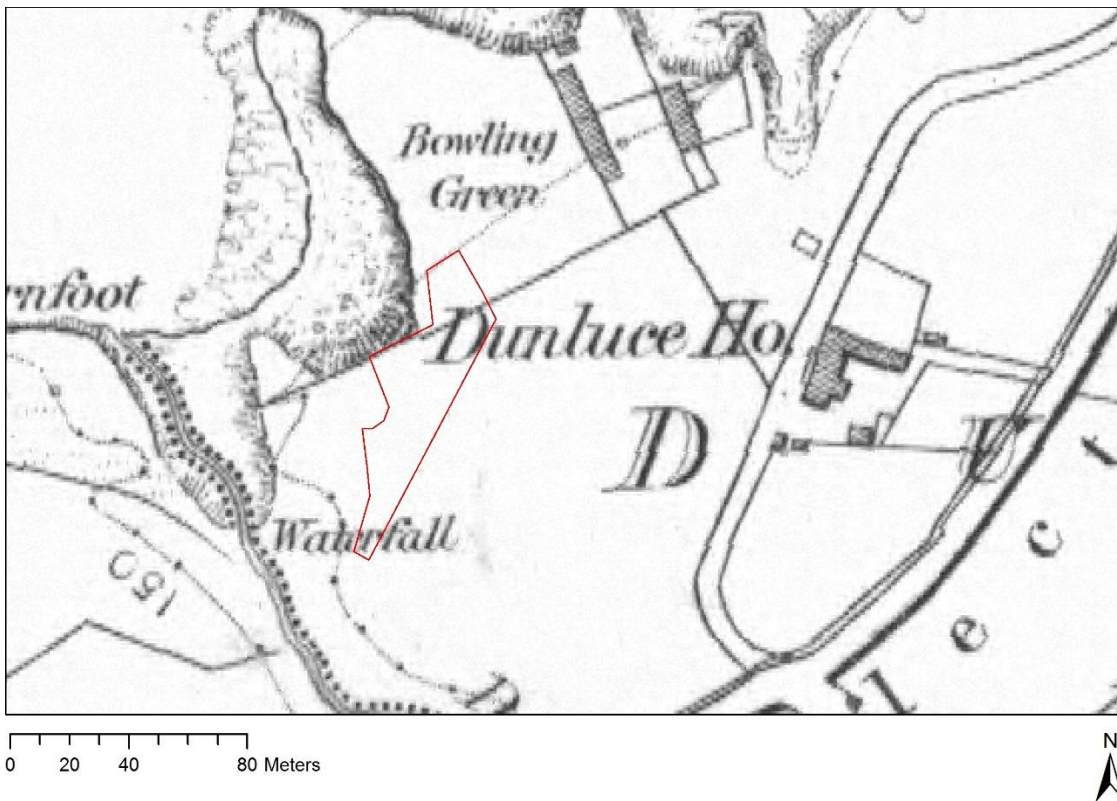


Figure 9 Geophysical survey area in relation to the Third Edition Ordnance Survey map series, c. 1853-58.*

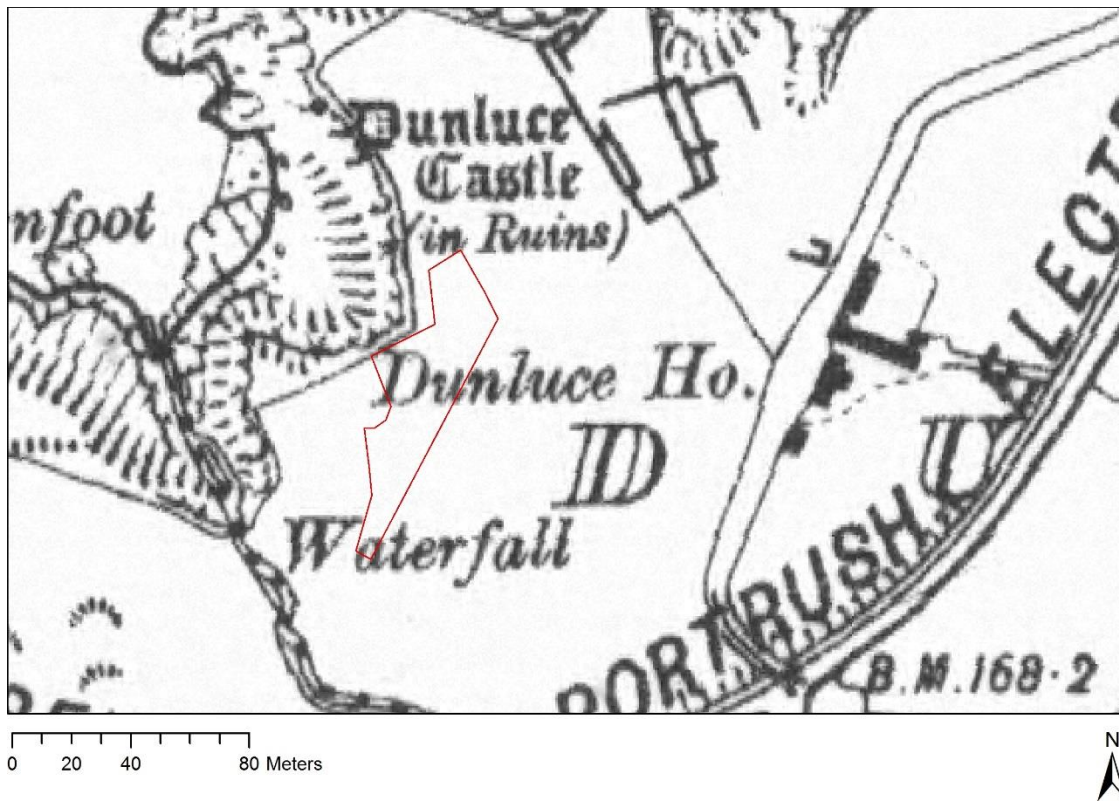


Figure 10 Geophysical survey area in relation to the Third Edition Ordnance Survey map series, c. 1900-6.*

Appendix four: Supporting images

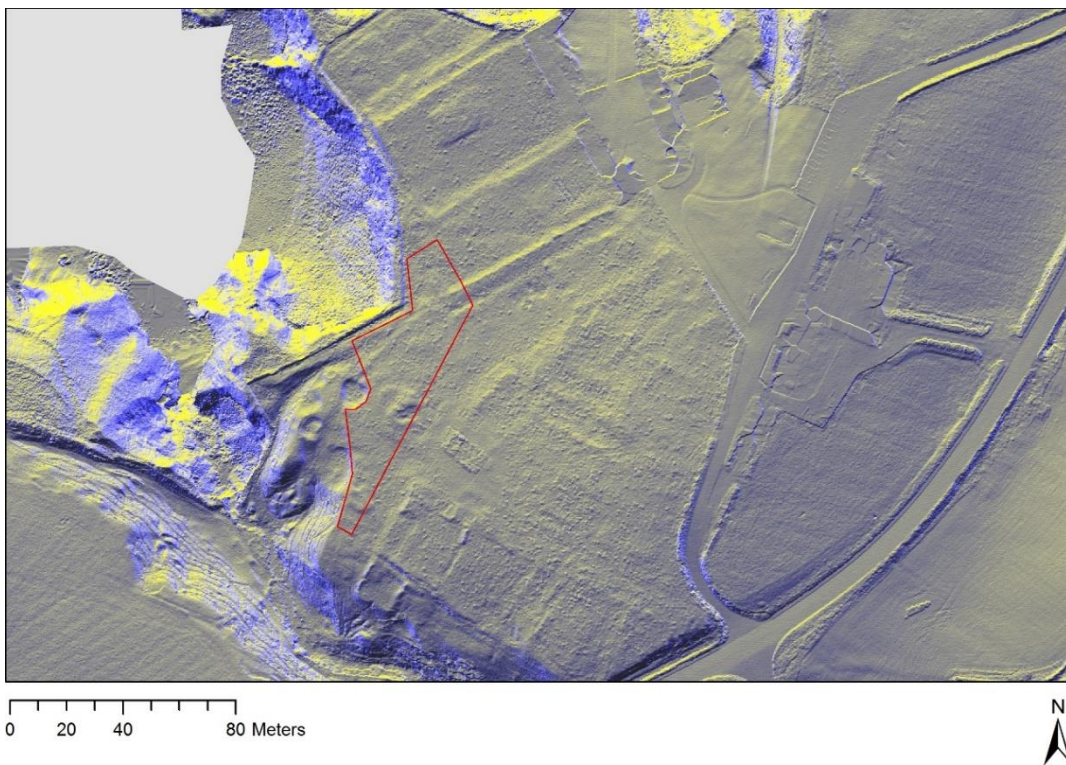


Figure 11 Area of the geophysical survey (marked in red) overlaid LiDAR visualisation produced from Principle Component Analysis of sixteen hillshades at zenith 4°, RGB of the first three bands (after Devereux 2008). *

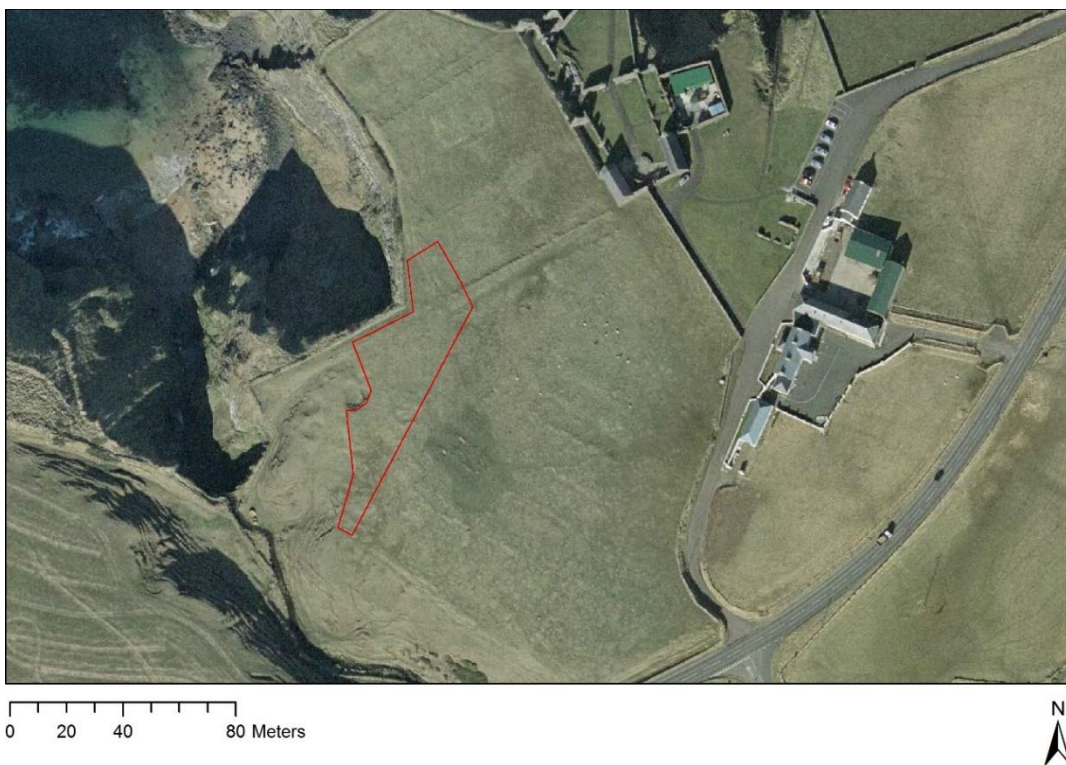


Figure 12 Geophysical survey area in relation to 2010 ortho-rectified aerial photographs. *

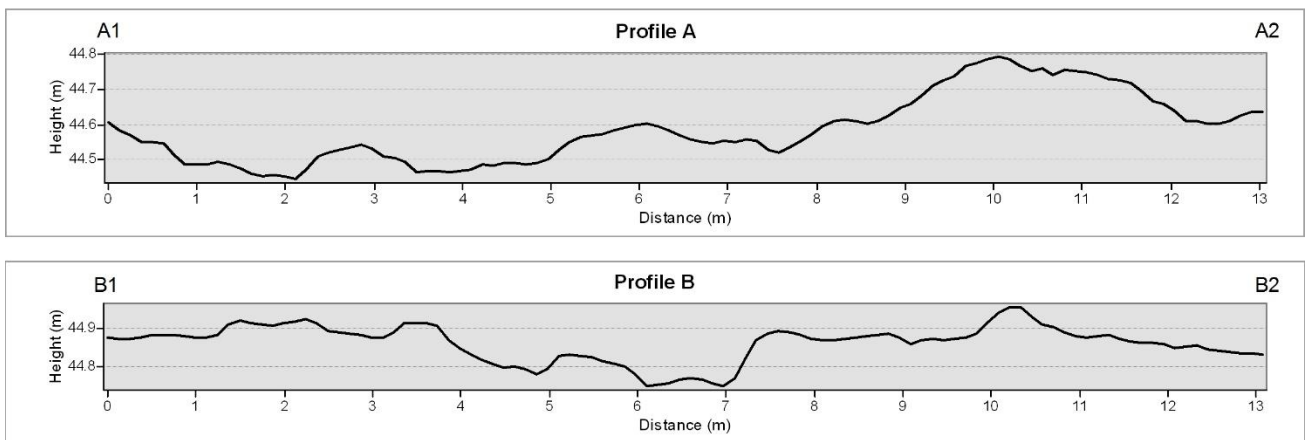
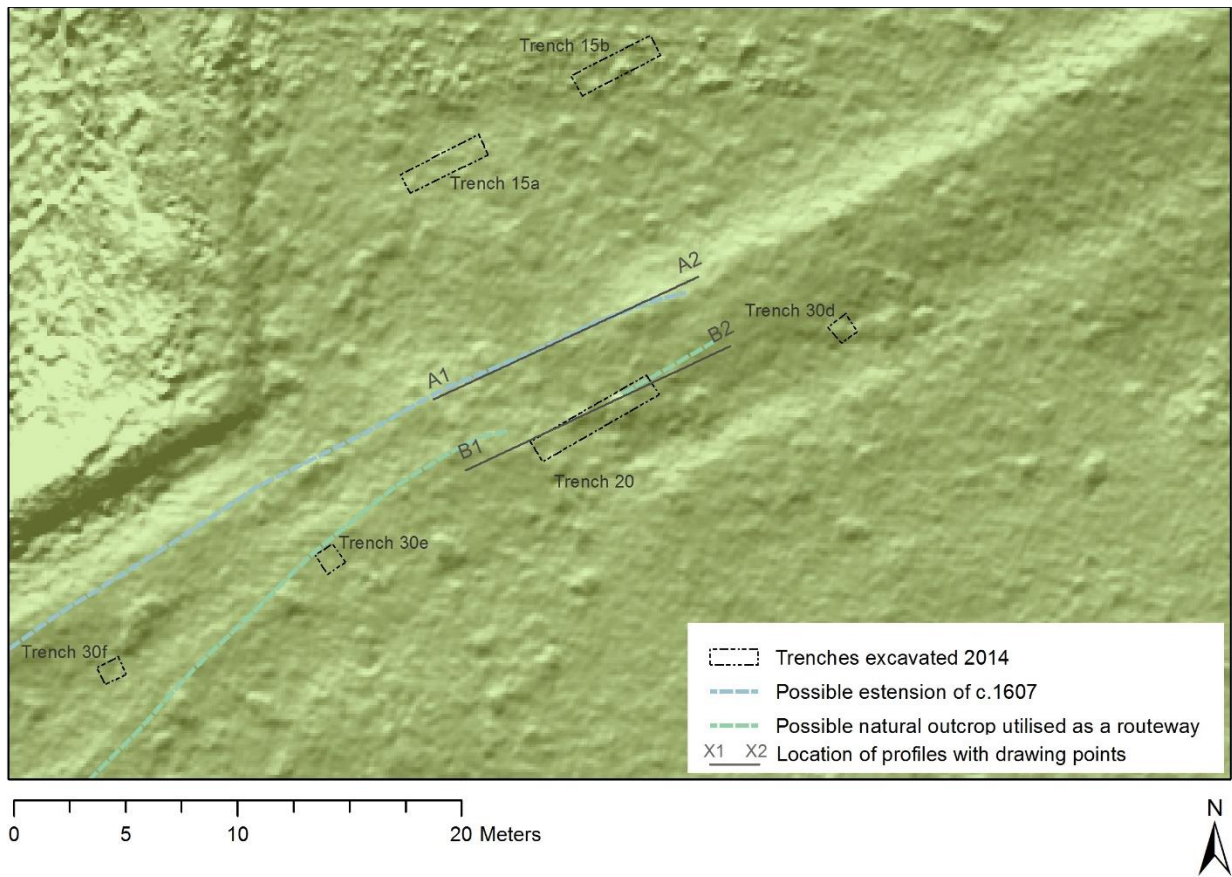


Figure 13 Profiles through possible breaks in r2014_1 and r2014_2 as captured in the LiDAR survey data.