



Geophysical Survey Report No. 6

**Bighouse
Co. Antrim**

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1. Introduction

- 1.1 This document discusses the results of an evaluative geophysical survey of land in the townland of Bighouse, Co. Antrim following an application for planning permission from the landowner. Within the application site may lie a souterrain (ANT 9:106), and the SMR records two standing stones in an adjacent field (ANT 9:128). In February 2006 the EHS requested a geophysical survey of the application area to locate the souterrain, identify archaeology associated with the standing stones, and any other extant subsurface remains. Figure 1 shows the location of the survey area.

2. Historical background

- 2.1 The evaluation area is located in a culturally rich landscape. It lies in a designated Area of Outstanding Natural Beauty, amongst the glens of Antrim, with the cliffs of Murlough Bay a kilometre to the north, and The Ulster Way passing immediately to the south. There are a wealth of historical and archaeological monuments in the vicinity, including two standing stones in the adjacent field (see plate 1), and a scatter of burial mounds and prehistoric settlement sites along the cliffs to the north. The area around Fair Head is notable for a concentration of so-called rock-cut souterrains, the densest concentration of such monuments in Ireland (Clinton 2001, fig. 11).

- 2.2 The souterrain at Bighouse is known from a reference in the OS Memoirs of the parish of Culfeightrin, from the early 19th century. Lieutenant T. C. Robe recorded in July 1831:

In Bighouse, and holding of Michael Scally, stood a cave of considerable length constructed of dry stone work and roofed with long flat stones. It was divided into several rooms and averaged about 5 and a half feet high and 5 feet wide, but all at present dug out except one room and a part of the narrow passage leading to it, which stand beneath a dwelling house.

In digging out this cave about 14 years back, there was discovered in one of the rooms, a small wooden box containing above of 4 dozen of Danes' smoking pipes, also small bones and fish shells, likewise some ancient silver and copper coins of small size and also coining implements, 4 of which resembled oval scales of small size, frequently used by doctors. These were for dissolving the metals. Other articles were for casting or forming the old spade guineas. (Day, McWilliams & Dobson 1994, 73).

- 2.3 The precise location of the souterrain is unconfirmed. The EHS SM7 file on the monument identifies Michael Scally's house as the building over the road immediately

south of the evaluation area, based on discussions between an EHS inspector and a local landowner (see EHS 'SM7' file on ANT 9:106, dated September 1992). This building is now in a derelict condition (plate 2). However, whether this is the dwelling associated with the souterrain is uncertain. The memoir simply mentions 'a dwelling', and the 'holding of Michael Scally' was potentially a large area since it also incorporated the ruins of 'an extensive mansion' (Day, McWilliams & Dobson 1994, 74). The EHS inspector visiting the 'Michael Scally house' in the early 1990s could find no trace of a souterrain (see SM7 file). Precisely identifying the holdings of Michael Scally through research at the Public Record Office would provide a more concise catchment in which to work. This is beyond the scope of the present report but would constitute an interesting topic for future research.

- 2.4 The present condition of the souterrain is also unknown. The memoirs describe the majority of it as being 'dug out'. This may describe its discovery and clearing out, or a more destructive process of stone removal and infill. The memoirs record that a section of passageway and one room existed under a dwelling house in 1831. Whether these have since been destroyed is unknown.

3 Geology

- 3.1 The bedrock geology to the northeast of Antrim is primarily Dalradian rocks which are unconformably overlain by Carboniferous, Cretaceous and Palaeogenestrata along its margins. The area at which the site is located is within this area and marks a boundary between one of the six formations, namely the Murlough Bay Formation (*MF*) making up the older Dalradian succession (which make up the lower inverted limb of the Altmore Anticline), and the Ulster White Limestone Formation (UWLF) of the Cretaceous. The Murlough Bay Formation (*MF*) are metamorphic rocks which have been deformed, and consist mainly of coarse grained schistose psammite and semipelite. However, the Ulster White Limestone Formation (UWLF) are sedimentary rocks which are relatively young in age geologically, and consists of limestone, white chalk, with flints and glauconite-rich beds (GSNI 2002; McAllister pers comm.).
- 3.2 The soils in the area are varied. The UWLF parent material has resulted in clay-with-flints, with the clay matrix containing whole and fragmented flints. Elsewhere blanket peat covers the level plateau surface tops, and mineral and mixed organo-mineral gleys are on the valley slopes (Cruickshank 1997).

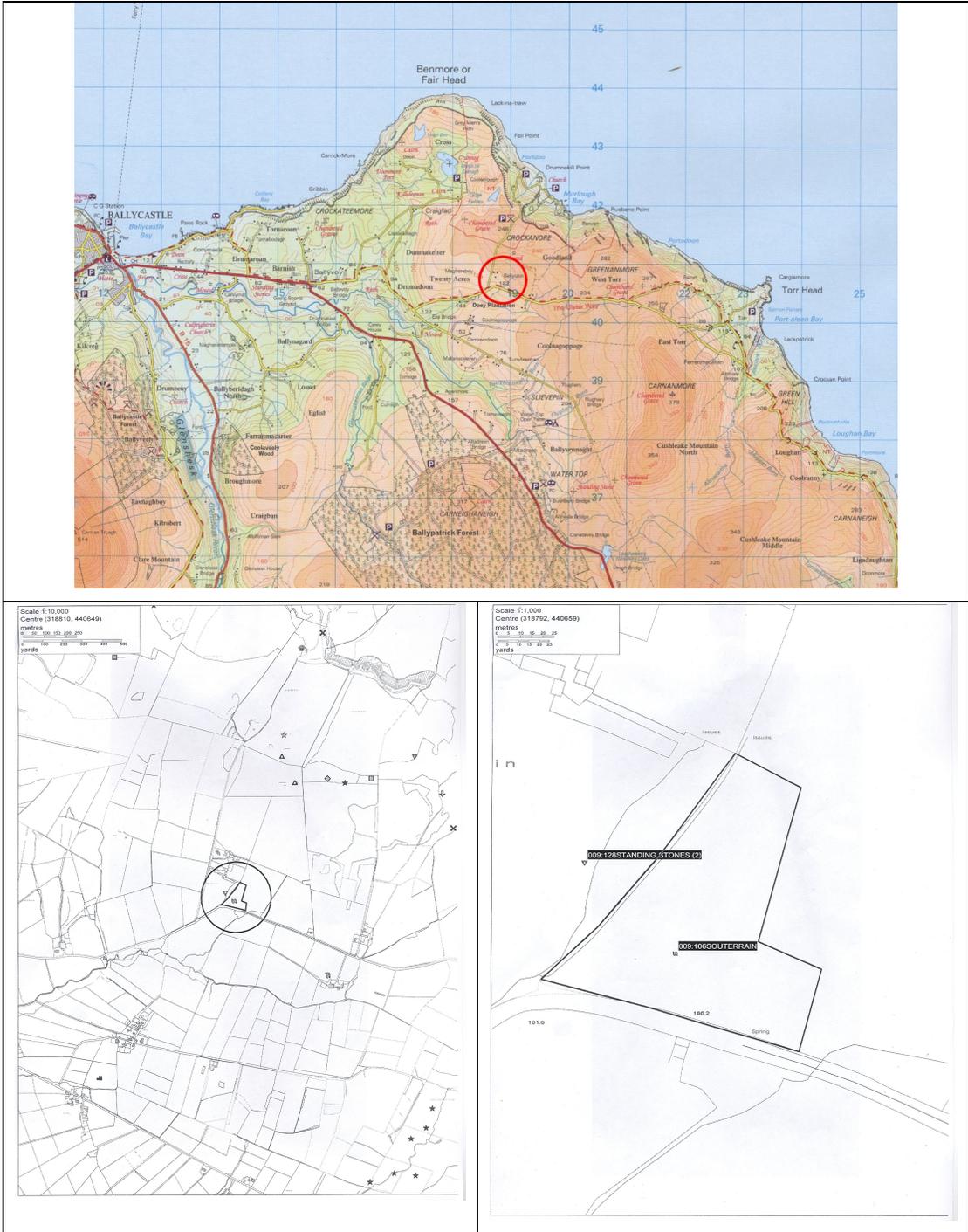


Figure 1. Map showing location of survey area.



Plate 1. One of the pair of standing stones recorded as ANT 009:126. The OS Memoirs noted two standing stones in this field in the 1830s, however the SMR and our own searches only confirmed the presence of one possible candidate. The sunken position in a field fence, and pointed top of the stone in the photograph above, fit the description in the SMR.



Plate 2. The 'Michael Scally house'.

4 Summary of the evaluation area

- 4.1 The evaluation zone is an irregularly-shaped area in the southwest corner of a large field (see figure 1). The land rises to the north, with the skyline in this direction formed by the cliffs above Murlough Bay. There are panoramic views to the south and west; Knocklayd dominates the skyline in the latter direction. Field boundaries form the western and southern limit.
- 4.2 The field is generally dry and firm underfoot, in contrast to the field to the west which is boggy. The landowner stated that the field had been re-claimed in recent years. A *sheugh* runs inside the western field boundary, and a number of subsurface stone-lined field drains empty into this, no doubt part of land improvement measures. One part of the field remains soft and boggy, that in the southwest corner by the entrance gate.
- 4.3 The field is presently used for the grazing of sheep and the landowner states that this characterises its use historically.

5 Geophysical survey strategy

- 5.1 The geophysical survey focused on the use of one technique, that of earth resistivity. This technique was chosen on the basis of the expected archaeology in the evaluation area, and the local geological context.
- 5.2 The prime aim of the survey was to locate a souterrain recorded in the SMR. Early medieval souterrains in Ireland usually comprise stone-lined passageways with stone slabs as roofing (Clinton 2001). Resistivity is particularly suited to sensing buried walls and hollow chambers (Clarke 1990; Gaffney and Gater 2003).
- 5.3 A magnetometry survey would have been potentially useful, however the use of this method in County Antrim is usually ruled out due to the predominance of basalt in the region. Basalt is strongly magnetic, interfering with the equipment to such a degree as to mask any archaeological traces present. The current site, however, occurs in a pocket of Metamorphic and Cretaceous solid geology amongst the basalt, theoretically making magnetometry more viable. A quick trial with the gradiometer found the area to be magnetically noisy and produced incoherent data. This is most likely due to the geological history of this area. Basalt lava flows deposited over these rocks in the Tertiary have now been eroded. This is likely to have left basalt boulders, cobbles and gravel in the soils, which leave a strong magnetic trace.

6 Method

- 6.1 The evaluation area was surveyed on a grid-by-grid basis using a Geoscan RM15 Resistance Meter. The grids (20m x 20m) were set out using a total station (see figure 2).
- 6.2 The RM15 was used with a probe separation of 0.5m, which penetrates to a depth of between 0.5m and 1.0m (Geoscan 1996, 6-4; Gaffney and Gater 2003, 32). The traverse interval was 1m and the sample interval was 0.5m, in order to provide good resolution of subsurface anomalies. This configuration was used on the assumption that any souterrain present would be archaeologically recognisable as a feature. The grids were surveyed in a zig-zag pattern.
- 6.3 Since the souterrain is associated with the 'Michael Scally house' over the road, the survey aimed to pass as close to the southern field boundary as possible (figure 2). A number of the grids were necessarily partially surveyed due to field boundaries or limits of the evaluation zone. Grid numbers suffixed with a 'p' in figure 2 were partial grids.
- 6.4 A total station survey related the geophysical grid to local features such as field boundaries, gates, buildings etc, to enable the geophysical plot to be placed on OS base maps.
- 6.5 In the northern part of the evaluation area the soil was relatively firm and contained many large stones. Analysis of the profile of the *sheugh* revealed this to be clay-with-flints. This often caused high-contact-resistance (HCR) problems during the survey where the instrument struggled to close the electrical circuit.
- 6.7 The survey data was downloaded and processed using Geoplot 3.0s by Geoscan Research (Geoscan 2005). The data were interpolated along the traverse axis. Figure 3 shows a standard plot of the survey with the greyscale spread across the entire dataset. Figure 4 shows a 'negative' of the plot.
- 6.8 The collected resistance data were quite 'noisy' as result of the changing geology across the evaluation area. As stated in section 3.1, this field marks the border between the Murlough Bay formation, and the Ulster White Limestone Formation. This change in the parent geology is the most obvious explanation for the change in physicality of the soils across the survey area.



Figure 2. The layout of the survey grids. 'p' = partial grid.

6.9 In the south of the field the soils were soft and generally damp, whereas to the north, where the survey encountered high-contact-resistance problems, the ground was a lot firmer, with the clay soil matrix supporting large blocks of flint and smaller stones. This has resulted in a background resistance level in the southern half of the plot of between 40 and 60 ohms. In the northern half, the background level is 70 – 90 ohms, the higher resistance caused primarily by the stony make-up of the soil. This change in the soils can be seen in the histogram of resistance values in figure 3, where the distribution is bimodal.

6.10 This diverse range of data values has ramifications for presentation and interpretation. Presenting such diversity with the standard greyscale plot results in poor contrast of any archaeological anomalies present. This has been addressed with three further plots which use adjustment of display parameters and filtering. In figure 5 the display parameters have been adjusted to bring contrast to anomalies in the northern half of the survey area. In figure 6 the same process has been applied to bring contrast to anomalies in the southern half.

Bighouse, County Antrim

Earth resistance survey

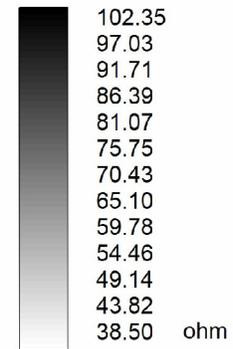
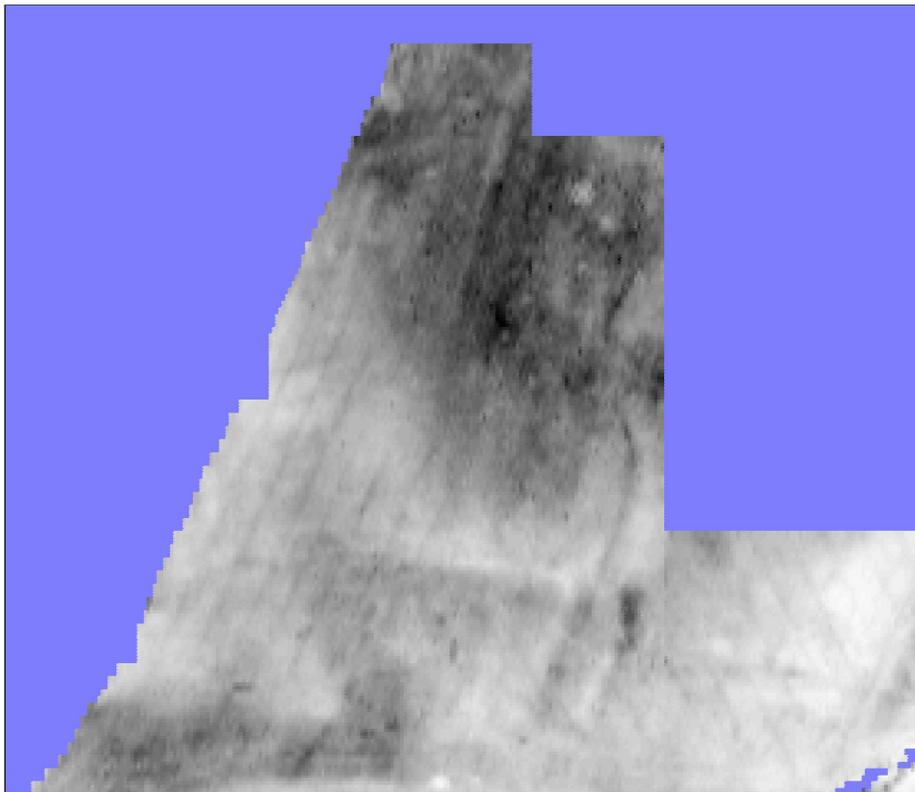
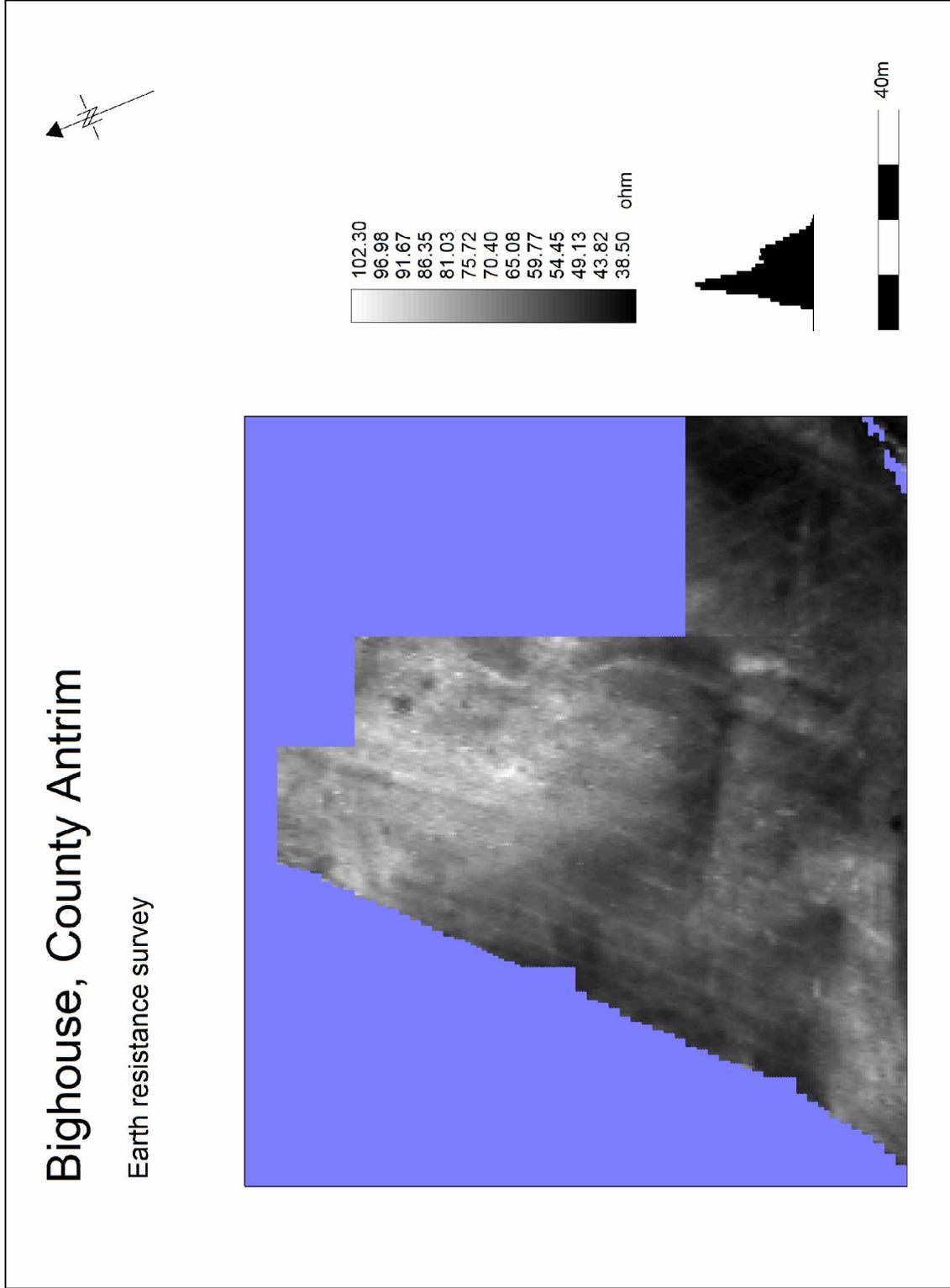


Figure 3. The plot of resistance data, showing colour-scale, histogram of resistance values, and scale bar.

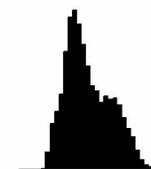
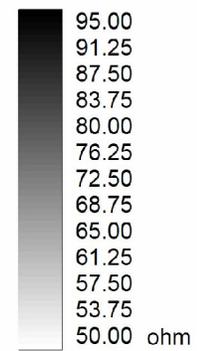
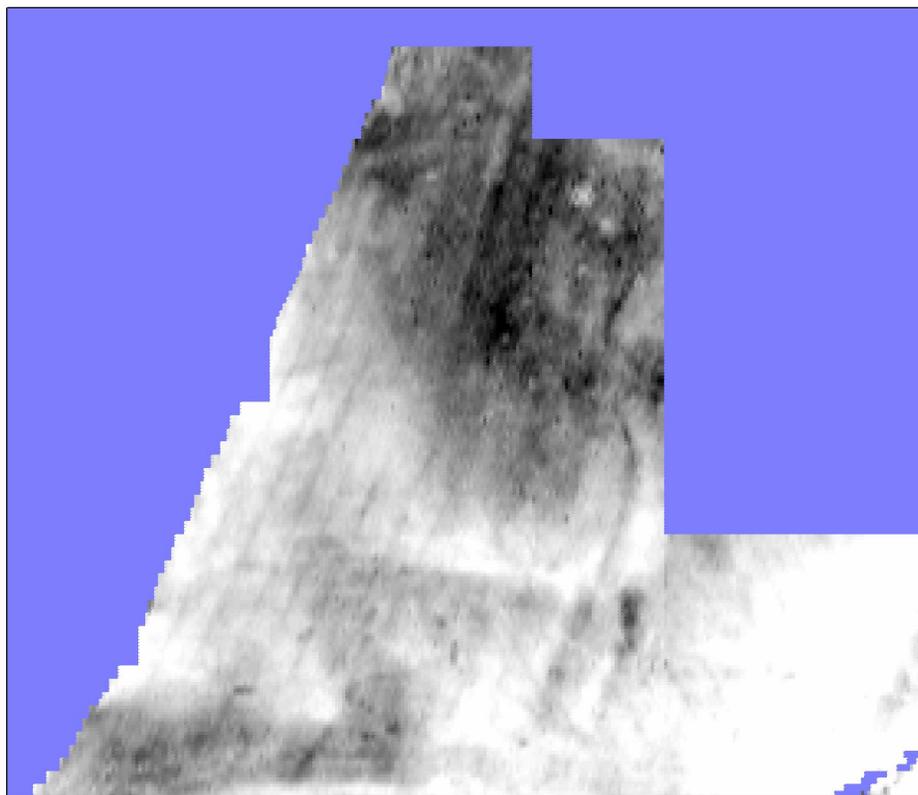


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Figure 4. Negative of Geophysical Plot.

Bighouse, County Antrim

Earth resistance survey (clipped to higher range)



40m

Figure 5. Geophysical plot with greyscale spread across higher band of readings.

Bighouse, County Antrim

Earth resistance survey (clipped to lower range)

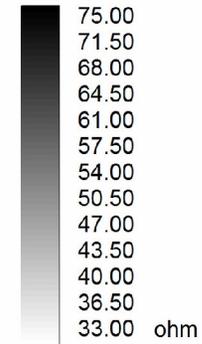
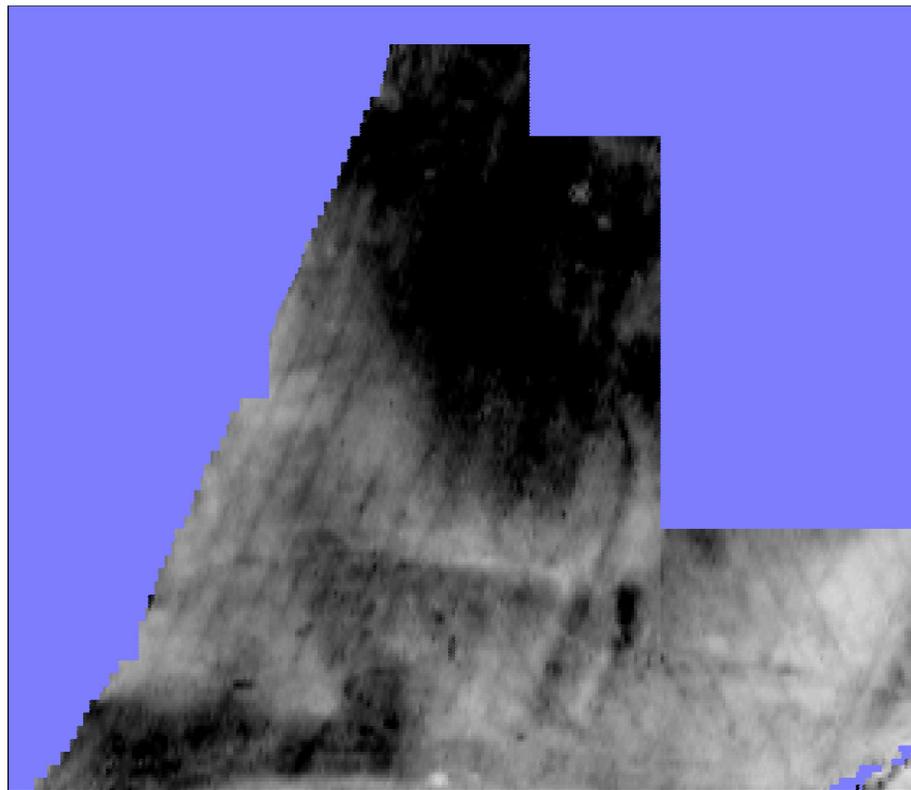
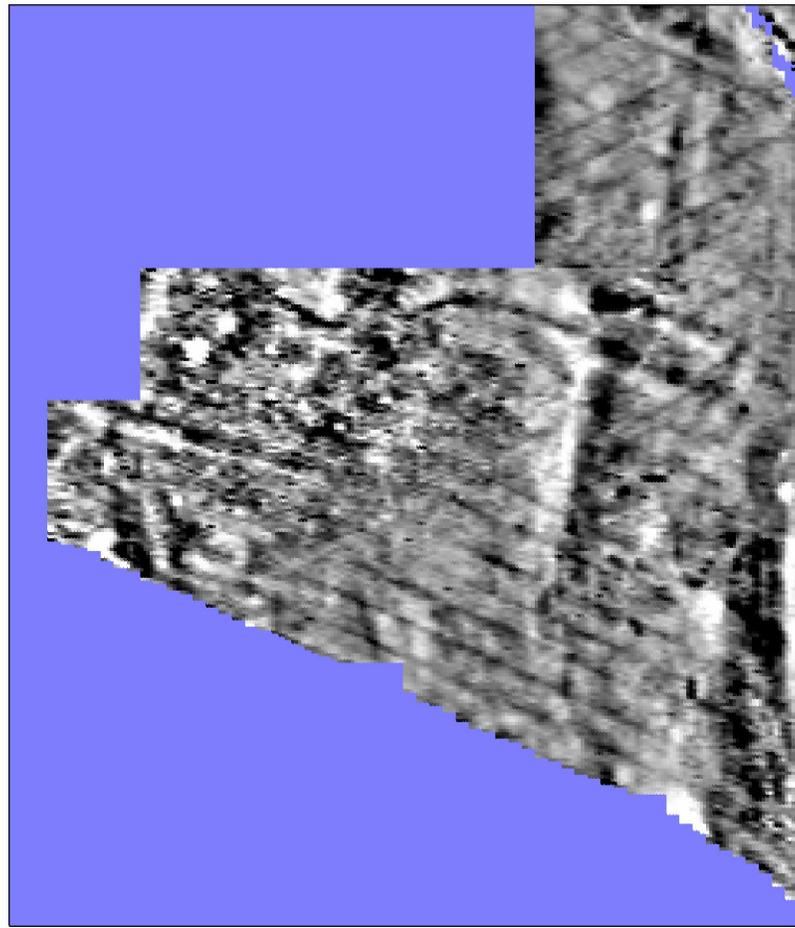


Figure 6. Geophysical plot with greyscale spread across lower band of readings.

Bighouse, County Antrim

Earth resistance survey (high-pass filter)



40m





Figure 8. Geophysical plot overlaid on location plan.

6.11 Figure 7 shows the plot with a high-pass filter applied in an attempt to remove the effect of the background geology. Normally such a filter would be used where the geological response fluctuates across the plot. Since the geological change in the current project is a sharp divide between northern and southern halves, the results of this processing are only partly successful.

6.12 Figure 8 shows the basic plot overlaid on the base map. This figure was generated using ESRI ArcView 9.1. The total station survey provided the georeferencing for the plot.

7 Results

7.1 Interpretation of the geophysical plot has been made more challenging by the geological circumstances. To the south of the survey area, anomalies appear as higher-resistance anomalies against a lower background. To the north they can occur as low resistance anomalies against a higher-resistance background. Historic OS mapping does not provide clues to the interpretation of the anomalies since neither the 1832 or 1857 revision depict any features within the survey area. Figure 9 provides a graphical summary of the anomalies present.

- 7.2 Perhaps the most striking patterning in the plot are a series of parallel lines, occurring in two sets, labelled 1 and 2 in figure 8. These lines are consistently around 5m apart. Series 1 are oriented in a northeast to southwest fashion, series 2 at a north-northwest to south-southeast direction. The regularity of the anomalies suggests they may represent some form of historic cultivation pattern. They possibly relate to an episode of deep ploughing in the past, it is perhaps less likely that they are the result of spade cultivation such as lazy-beds (for the latter see Evans 1957; Bell & Watson 1988).
- 7.3 The patterning at 3 is discernable in the plot as a pair of concentric arcs with a sub-circular shape at their centre. Their shape is suggestive of a prehistoric ring-ditch or other penannular cut feature. However, the fact that they present as high-resistance anomalies is potentially at odds with this interpretation. It is not impossible for ditches cut into chalk bedrock to present as high-resistance features, especially during drier periods (Clark 1990, 49).
- 7.4 From the southwestern corner of the survey area, running parallel with the fenceline in a linear fashion, is a broad, high resistance area, which then proceeds to zig-zag up into the centre of the survey zone. Since it is a weak anomaly with poorly defined edges, it is interpreted as a geological response, perhaps a patterning of clay-with-flints subsoil. However, within this area there appear to be more sharply defined linear anomalies, see no. 4 in figure 8. These are difficult to interpret because of the local variance of background resistance. Some anomalies are low- resistance against a high background, others high-resistance against a lower background. One set of parallel anomalies are high-resistance, in the range 70 – 80 ohms, spaced approximately 1.5m apart. The morphology suggests a series of parallel stone walls, perhaps the lining of a passageway that has caved-in. This could be interpreted as a collapsed souterrain. The anomalies are 17m from the 'Michael Scally house', associated with the souterrain. Alternatively it may be a chance geological formation of high resistance material such large flints in a clay matrix.
- 7.5.1 Anomaly 5 is a wedge-like patch of high-resistance values. Its location at the edge of a spread of cultivation marks suggest that it might be a clearance cairn. It is also spatially associated with anomaly 6 (discussed below), and may mark an entrance into a field, that has perhaps been consolidated with ballast material, such as stone fragments.

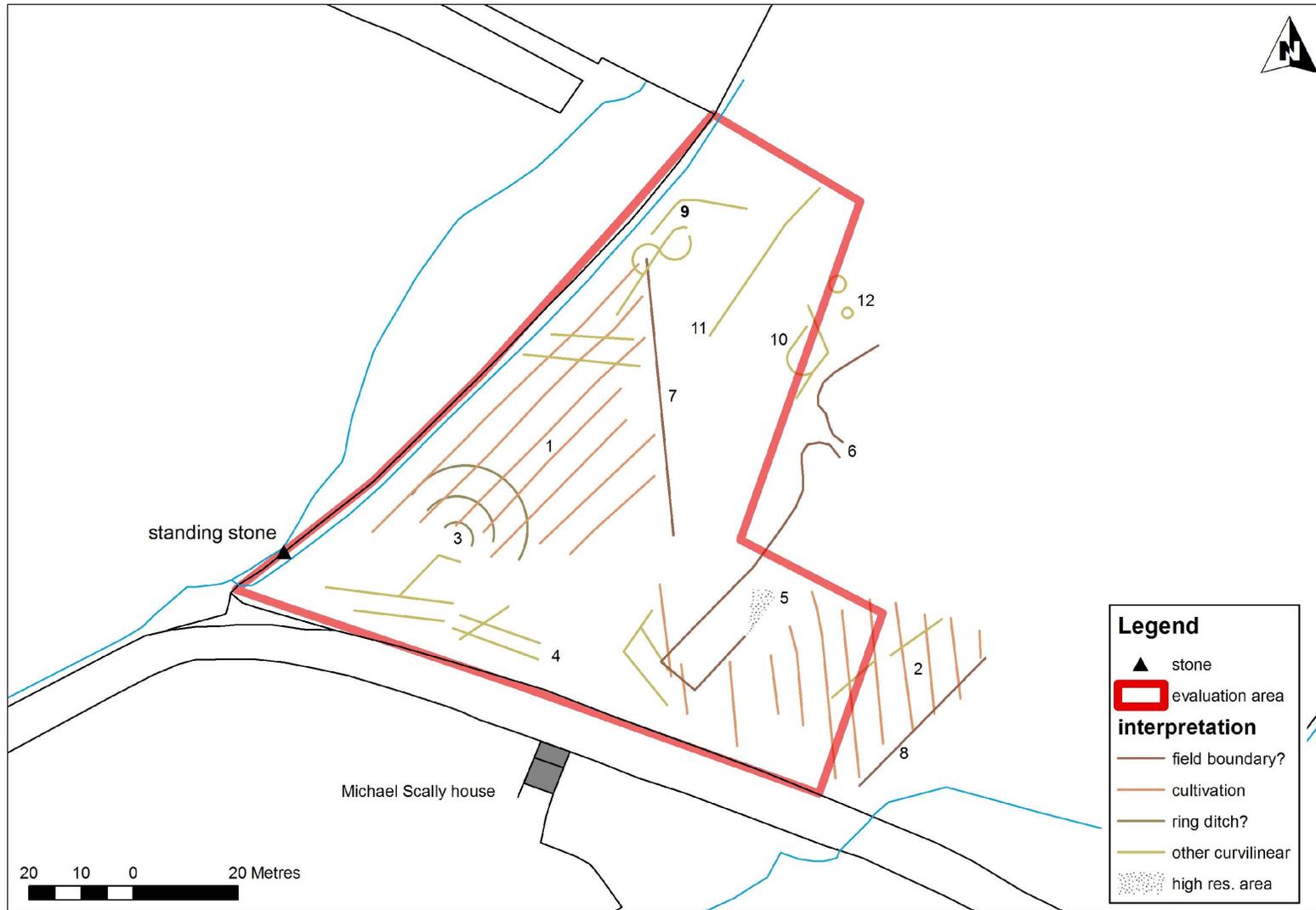


Figure 9. Summary of geophysical anomalies.

- 7.6 At 6 are a pair of curving / angular linear anomalies that appear to meet in the form of a funnelled –entrance. Since the southern-most anomaly separates spatially the two areas of cultivation (anomalies 1 & 2), it may be suggested that these are former field boundaries with an internal driveway. They are of higher resistance than the surrounding material, possibly due to the presence of banks, or the build-up of field debris at the periphery.
- 7.7 Of apparent similar function is the faint linear at 7. Since this coincides with the eastern limit of the cultivation patterns at 1 it is interpreted as a field boundary. It exhibits similar resistance values to 6, but because it is located on a different geological background it appears as a low-resistance anomaly. It also appears to be a division between higher background levels of resistance to the north and lower-resistance to the south. This may be a result of field maintenance processes where larger stones have been removed and deposited elsewhere.
- 7.8 The linear anomaly at 8 runs contra to the cultivation patterns at 2, and also appears to bound them, and so is interpreted as another former field boundary.
- 7.9 Anomalies 9 and 10 present themselves as low-resistance patterns against a high-resistance background, the latter caused by the hard, clay-with-flints subsoil in this part of the field. The anomalies bear some similarities morphologically, featuring a curved and figure-of-eight pattern which is associated with a linear element. The sub-circular elements are some 4-5m in diameter. They do not have any obvious archaeological interpretation. They are possibly related to more recent agricultural use, such as the turning circle for a vehicle, or a stand for animal feed. The linear mark at 12 also presents as a low-resistance anomaly amongst the strong local geological response. It is approximately 35m long, and 2m wide at its widest point. Again, its form does not point to any obvious archaeological interpretation.
- 7.10 Also within this zone of high background resistance are the circular anomalies at 12. The northernmost of these corresponds exactly with the position of a ‘mineral lick’ tablet in the field, for the nourishment of the livestock. It is suggested that the repeated crowding of sheep around this tablet, and their defecation and urination has lowered the resistance of the soil in the immediate vicinity. The southern anomaly is interpreted as a former location for a mineral lick.

8 Conclusions and recommendations for further work

- 8.1 The earth resistance survey at Bighouse identified a number of geophysical anomalies. The interpretation of these was made challenging by the changing geological response across the area. While the majority of anomalies are apparently related to historic farming practices and are of limited archaeological significance, the results obtained at anomaly 3 and anomaly 4 merit further investigation.
- 8.2 The morphology of anomaly 3 suggests a prehistoric origin, and the proximity to a standing stone some 20m away lends support to this interpretation. It is suggested that this anomaly be investigated further by excavation to define its physical nature and chronology.
- 8.3 Anomaly 4 is a potential early medieval souterrain. A small scale excavation is therefore recommended to confirm the results obtained by the geophysical survey.

Acknowledgements

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