

Geophysical Survey Report: Harbottle Castle, August 2015

Aidan Robert Pratt

19 Boulmer Gardens

Wideopen

Newcastle-Upon-Tyne

NE13 6AT

20/7/2015

Harbottle Castle

Northumberland National Park

Morpeth

Northumberland

NE65 7DG

NT 9322 0482

Contents

1. Summary:.....	1
2. Site Location:.....	1
3. Methodology:.....	3
4. Results:.....	5
5. Discussion:	9
6. Conclusions:	14
7. Plates.....	16
8. Bibliography:	19

Figures

Figure 1: Harbottle Castle location map (Google Maps). Survey areas in red.....	2
Figure 2: Proposed Geophysical Survey (survey grids are marked in red).	4
Figure 3: Trace and dot density plots for interpolated data from survey area A.	6
Figure 4: Processed Magnetometry data.....	7
Figure 5: Unprocessed shade plot data	8
Figure 6: Integrated processed magnetometry data and interpretation diagram.....	11

Figure 7: Interpretation diagram.	12
Figure 8: RCHM(E) Topographical map of motte and bailey of Harbottle Castle with GPR strips shown in green (Northumbrian Surveys 1997: 3)	13
Figure 9: Scheduled area of Harbottle Castle (Historic England website).	15

Appendices

- I. OASIS Form
- II. Historic England Geophysical Survey Database Questionnaire
- III. Raw geophysical survey data (on CD)
- IV. Supplementary material: Pratt, A. R. P., 2015. *Harbottle Castle: A Historic, Geophysical and Regional Evaluation*, Masters Thesis, York: University of York, Unpublished.

1. Summary:

- 1.1 This document presents a report of the geophysical research survey of Harbottle Castle, designed for the research of the site for the Masters dissertation of the project leader (Appendix IV: Pratt 2015). Harbottle castle is a 12th century motte and bailey fortification comprising an extensive curtain wall and shell keep. It was extensively rebuilt in the 13th century and again in the 16th century. Previous work at the site has included an antiquarian excavation conducted by Hunter-Blair and Honeyman (Dodds 1940; Hunter-Blair 1935), various projects of recording and consolidation (Ryder 1990; Northern Archaeological Associates 1991) and small a research excavation conducted by Newcastle University (Crow 2004). These have however largely focused on the motte and the inner and outer baileys. This project of geophysical survey is more interested in the area to the east of the castle (Fig. 1). The history and previous archaeological work are discussed in much greater detail in the supplementary material (Pratt 2015: Chapter 2).
- 1.2 The site is located just within the Northumberland National Park (National Grid reference (NGR) NT 9322 0482) at the northern extent of Harbottle village, c. 50km north west of Newcastle.
- 1.3 The project comprised a magnetometry survey of the site designed by Aidan Pratt and conducted by Aidan Pratt and Lauren Proctor. The survey was carried out using a Bartington Grad601 Single Axis Magnetic Field Gradiometer System, with the resulting data plotted and interpreted using ArcMap 10.3.1.

2. Site Location:

- 2.1 Harbottle Castle is located just inside the Northumberland National Park at NGR NT 9322 0482. Harbottle is located at the mouth of the flood plain of the River Coquet with the Cheviot Hills rising to the north and west, c. 50km north west of Newcastle and c. 26km south west of Alnwick, with the castle itself to the immediate north of the village on the southern bank of the River Coquet (Fig. 1).
- 2.2 The area of survey that this report details comprises the inner and outer baileys of the castle and an area of flat ground to the east that has been suspected to be related to the development of the castle and its surrounding settlement.



Figure 1: Harbottle Castle location map (Google Maps). Survey areas in red.

3. Methodology:

3.1 Instrumentation/Software:

- Bartington Grad601 Single Axis Magnetic Field Gradiometer System
- Geoscan RM15-D Resistance Meter
- Trimble Geo7x GPS
- ArcMap 10.3.1 (part of the ESRI ArcGIS suite)
- Geoplot 3.0 (Geoscan Research, 2014)

3.2 The survey grids were 20m x 20m. These were set out using Pythagorean theory with measuring tapes (Plate 1) and marked with bamboo canes. These were then recorded with the Trimble Geo7x GPS for later georectification in ArcMap 10.3.1.

3.3 Figure 2 shows the originally intended survey area as set out in the WSI. When setting out the grids it quickly became clear that this area was neither viable nor would much of it produce useful data. As a result an amended survey grid was set up comprising 1.2 hectares split into two areas covering the inner and outer baileys of the castle as well as the area to the east (Figure 4).

3.4 The magnetometry survey was carried out as detailed in the WSI with traverses of 1m separation in a “zig-zag” pattern. The resolution of the survey was increased from 4 readings per 1m² to 8 read per 1m² (at 0.125m separation) taken.

3.5 Due to deficiencies in the equipment provided by the University of York, it was not possible to carry out the electrical resistivity survey of the site that was detailed in the Written Scheme of Investigation (WSI) for this project of geophysical survey. This was caused by faulty wiring in the Geoscan RM15-D at the time of survey. In addition the GPS data produced by the Trimble Geo7x GPS device was not recognised by the GIS program being utilised for this project (ArcMap 10.3.1). This has meant that the geophysical data are not satisfactorily plotted onto the result maps, as detailed in the WSI for this project of geophysical survey. The data produced from the magnetometry has been plotted using landmarks on the base map.

Harbottle Castle Geophysical Survey: Proposed Survey Area

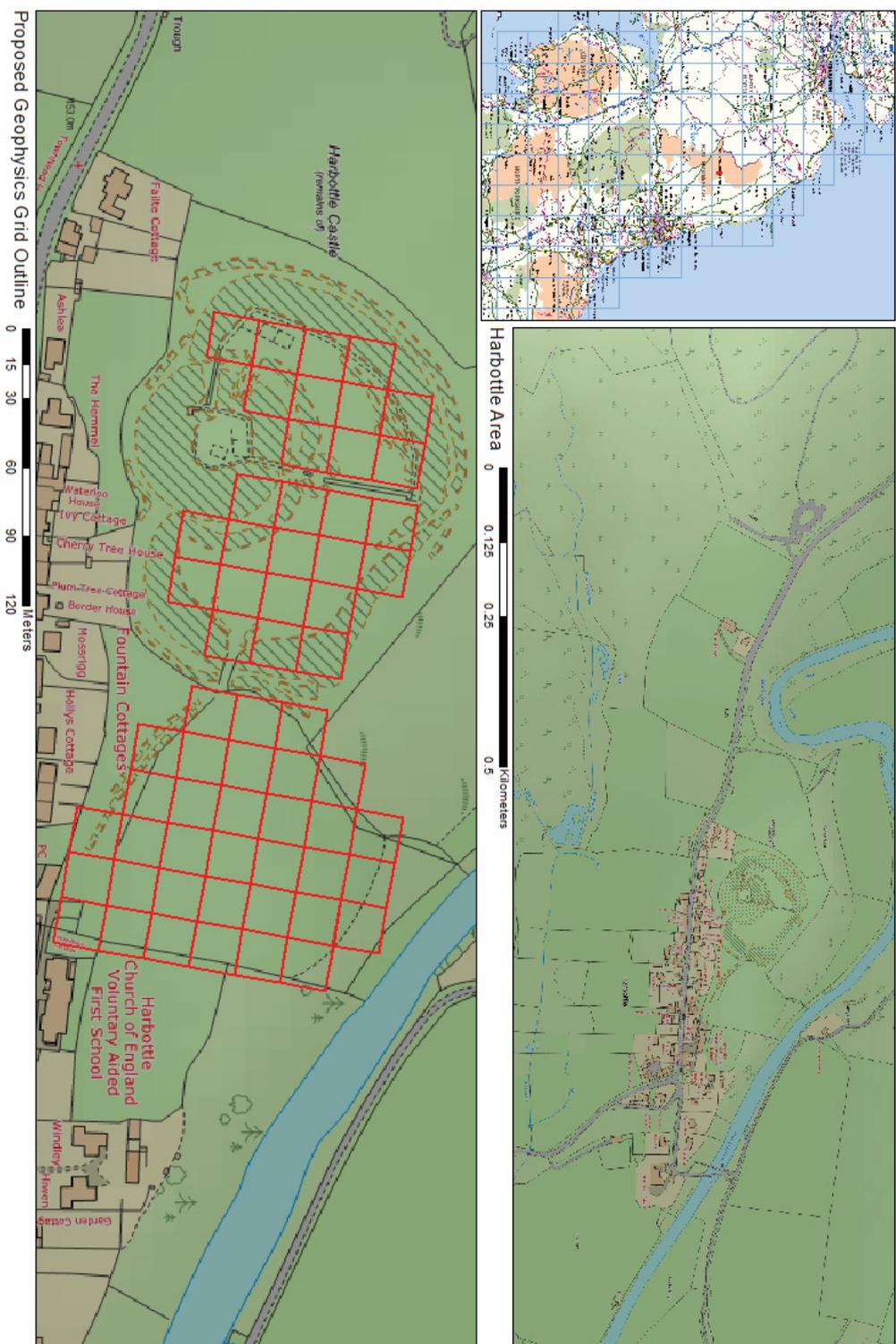
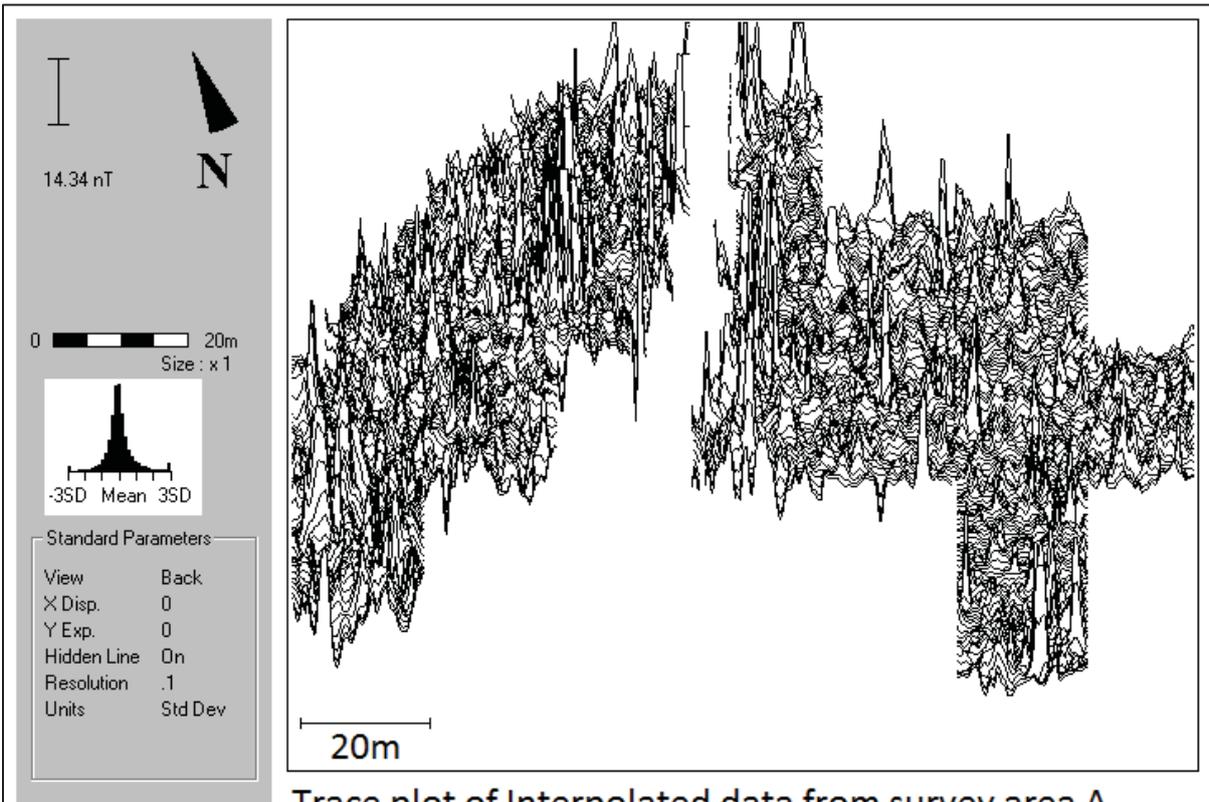


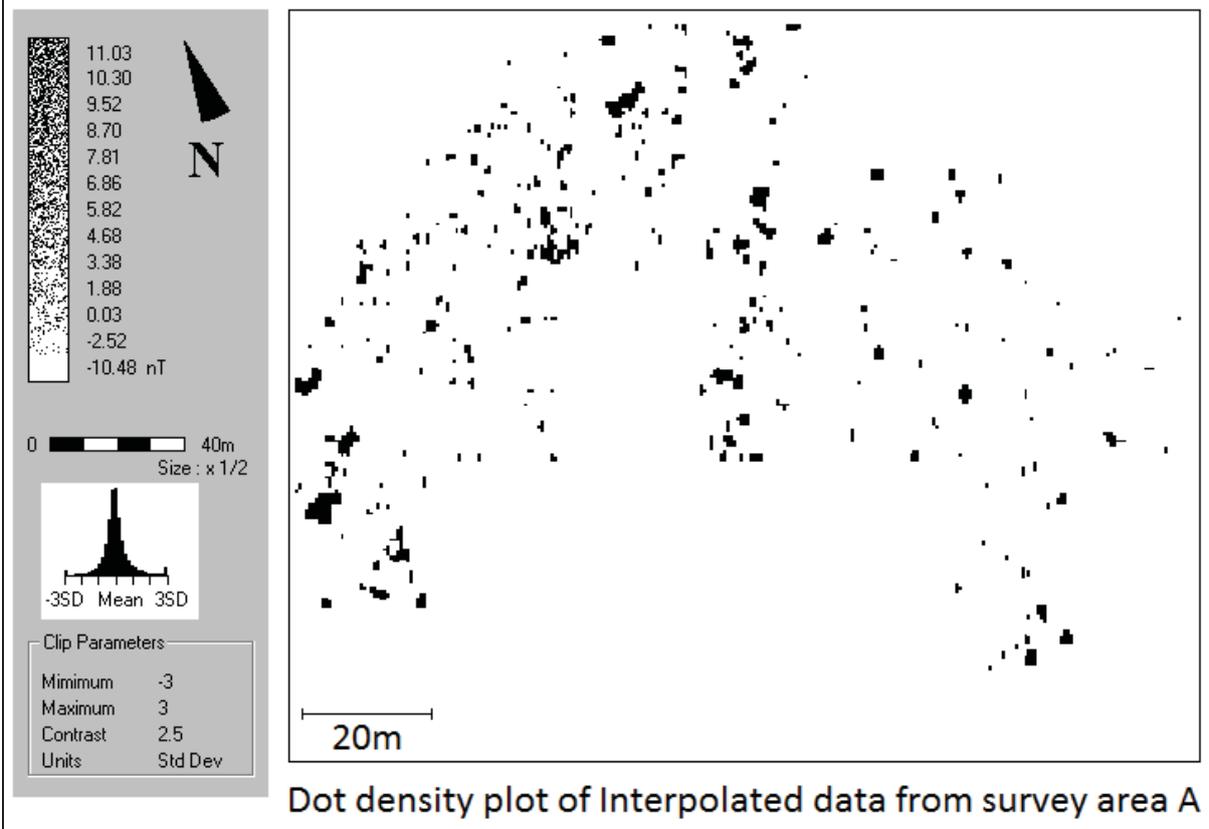
Figure 2: Proposed Geophysical Survey (survey grids are marked in red).

4. Results:

- 4.1 As can be seen from Figure 3, the trace plot of the data within the castle is difficult to read. This may be because of the high resolution of the survey, or it could possibly be due to the intensity and multitude of responses from that area. In addition the dot density plot is not as informative as the shade plots, although it is possible to use these two in tandem in order to produce a clearer picture of the data. For these reasons, the magnetometry data produced during the survey are presented here as shade plots (Fig. 4).
- 4.2 An examination of each computational stage of data cleaning has been set out in the supplementary material (Pratt 2015: 53 – 6). A number of responses have been identified through this process which will be discussed further below (Section 5). As can be seen from Figures 4 and 5 some defects were present in the raw data such as the striping effect caused by one of the sensors “drifting” during the survey process. This was likely due to the high level of vegetation on site as well as having to allow the equipment to rest whilst arranging walking due to the small size of the survey team. These defects may have masked some archaeological deposits however as mentioned above, the examination of the computational processes has gone some way to eliminate this problem by identifying potential archaeological responses between each process.
- 4.3 In addition some features in the processed data have been identified by their visual presence on the surface. These comprise the curtain wall encompassing the inner bailey at the westernmost extent of the survey; well in the inner bailey; ridge and furrow in the north eastern part of the outer bailey and the modern farm track running across it; the retaining stone wall for the eastern area and the Over Head Pylon (OHP) to the eastern of the eastern survey area.



Trace plot of Interpolated data from survey area A



Dot density plot of Interpolated data from survey area A

Figure 3: Trace and dot density plots for interpolated data from survey area A.

Harbottle Magnetometry Survey Results

Shade
Plot Key

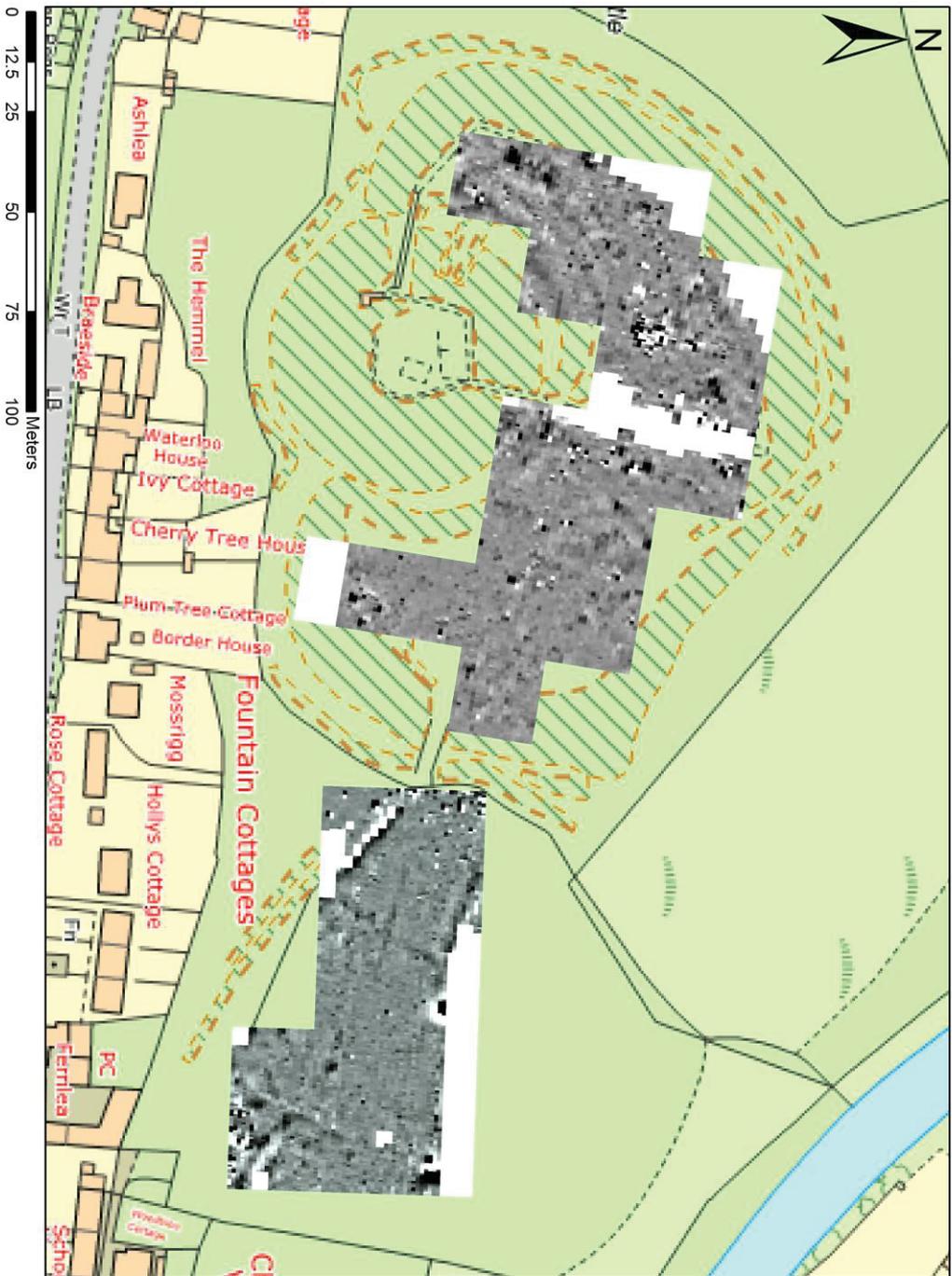
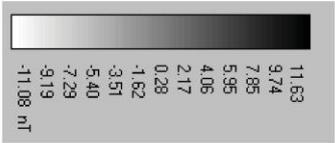


Figure 4: Processed Magnetometry data.

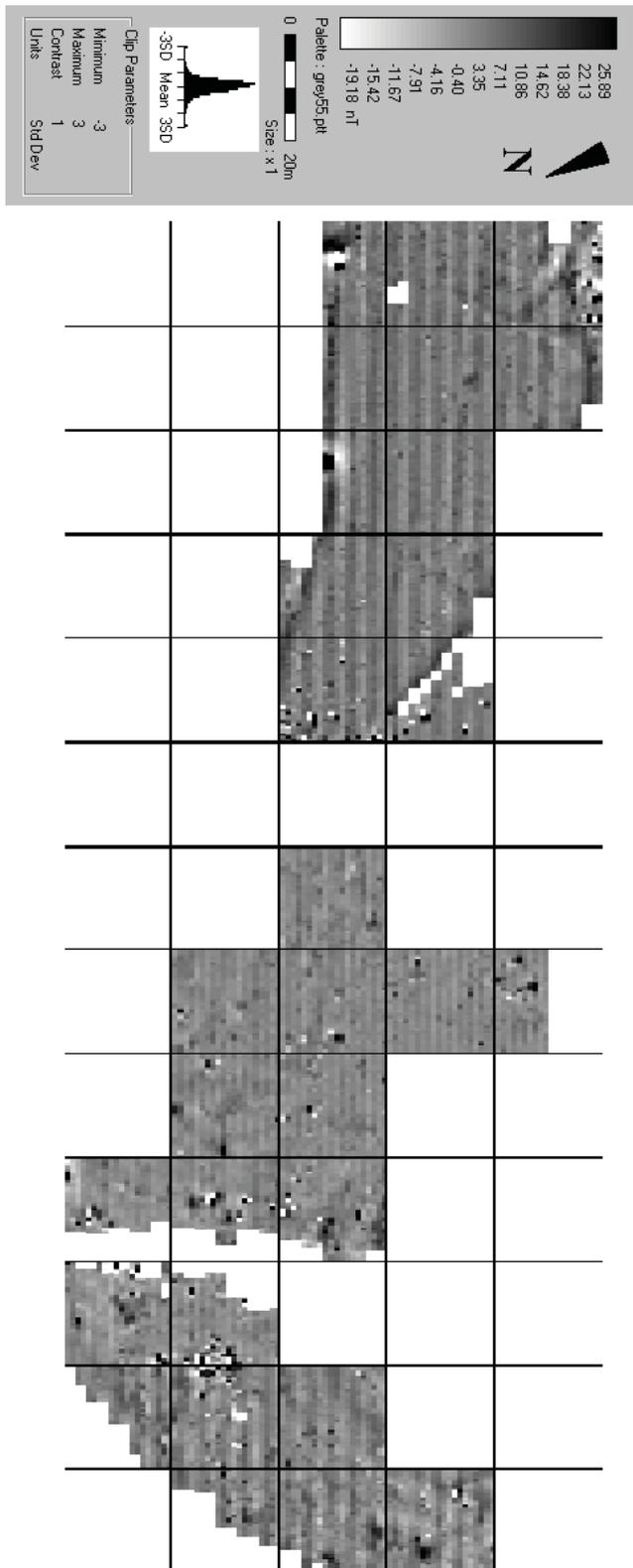


Figure 5: Unprocessed shade plot data

5. Discussion:

- 5.1 Schmidt advises the use of simplified interpretation diagrams (i.e. free of the geophysical data itself) in the form of vector drawings (2002: 23). This is corroborated by Gaffney and Gater, especially as digitised interpretation allows for ease of access at a later stage or date (2003: 115). In conjunction with this, the interpretation diagram was constructed from the survey data and then produced in two different maps (Figs. 6 and 7).
- 5.2 The determination of anomaly recognition in this project has been taken from Gaffney and Gater's levels of confidence in anomaly recognition (2003: 110). The anomalies identified in the data presented here have been more thoroughly discussed in the supplementary material (Appendix IV: Pratt 2015: 57 – 66).
- 5.3 The above mentioned retaining wall (Plates 2 and 3) in the eastern survey area has been given a passing examination prior to this project. Ryder offers two interpretations of this area (1990: 4). The first is simply an approach to the castle via the causeway between this eastern area and the bailey. The other is that the eastern area (survey area B) is actually a barmkin, being 'a yard or open space girt by a high wall which could be used to protect livestock and owners alike in time of strife' (Long 1967: 11). This has also been considered by Hunter-Blair in his examination of the site (Hunter Blair 1935: 220), although it appears that his joint excavation with Honeyman (discussed in supplementary material, Pratt 2015: 11 – 3) did not revisit this proposal.
- 5.4 Crow points out that the use of the outer bailey for ridge and furrow farming practice suggests that the outer bailey 'no longer formed part of the castle's defences' after the mid fourteenth century (2004: 258). The magnetometry data presents no suggestive anomalies of the walls found in this area by the GPR survey (Northumbrian Surveys 1997: 3 – 6). This may suggest that these walls went out of use much earlier than those around the inner bailey. It is clear from the magnetometry data however that the ridge and furrow either overlays or has destroyed at least some earlier features, evidenced by the northern end of a potential footprint of a building.
- 5.5 The two rectilinear features in the south eastern corner of the survey have been attributed to the structure that is visible in this area on the 1866 1st edition OS map. This area has experienced a certain amount of post medieval activity and any earlier

medieval archaeology that may have existed here is likely to either be contaminated with later deposits or simply destroyed.

- 5.6 The two strong negative anomalies on the northern limit of the potential barmkin could denote an area of intense heat or burning (Aspinall *et. al.* 2008: 155 – 156). By themselves they may only represent two areas of considerable magnetic activity such as burning however when considered with the sub-square anomaly in the north western corner of the barmkin they may represent a series of structures or archaeological deposits.
- 5.7 Similar to this set of responses is the sub-square feature seen at the southern limit of the outer bailey. The data represented in Location 5 of the GPR survey shows either masonry or a wall in this area (Northumbrian Surveys 1997: 5). Due to the strong response of these anomalies, it would not be untoward at this stage to suggest that they represent the footprint of a building. What the magnetometry survey did not find in this area however, is the possible tunnel or culvert represented approximately 25m from the southern end of Location 5 in the GPR survey (Northumbrian Surveys 1997: 11). This would be better tested by a resistivity survey.
- 5.8 There is an extremely strong set of positive and negative anomalies, surrounded to the north by a rectilinear feature in the centre of the inner bailey. This sort of response can often represent a kiln or furnace (the Landscape Research Centre website), however in this instance there is no obvious sign of the large surrounding heat signature which normally accompanies these structures. This set of anomalies could therefore simply represent the presence of a large amount of ferrous material such as iron/mill scale, although again there is no obvious ferrous material in the vicinity.
- 5.9 The strong positive anomalies to the south western corner of the inner bailey could relate to the series of three rectilinear earthwork features seen on the RCHM(E) topographical map of the castle (Figure 8). Although the responses do not directly correspond with these earthworks, this can be accounted for by the lack of usable GPS data for this survey. It is possible to say that this anomaly may represent the 'range containing kitchen, bakehouse and brewhouse' mentioned in the 1537 survey of the site (Ryder 1990: 3).

Harbottle Magnetometry Survey Results

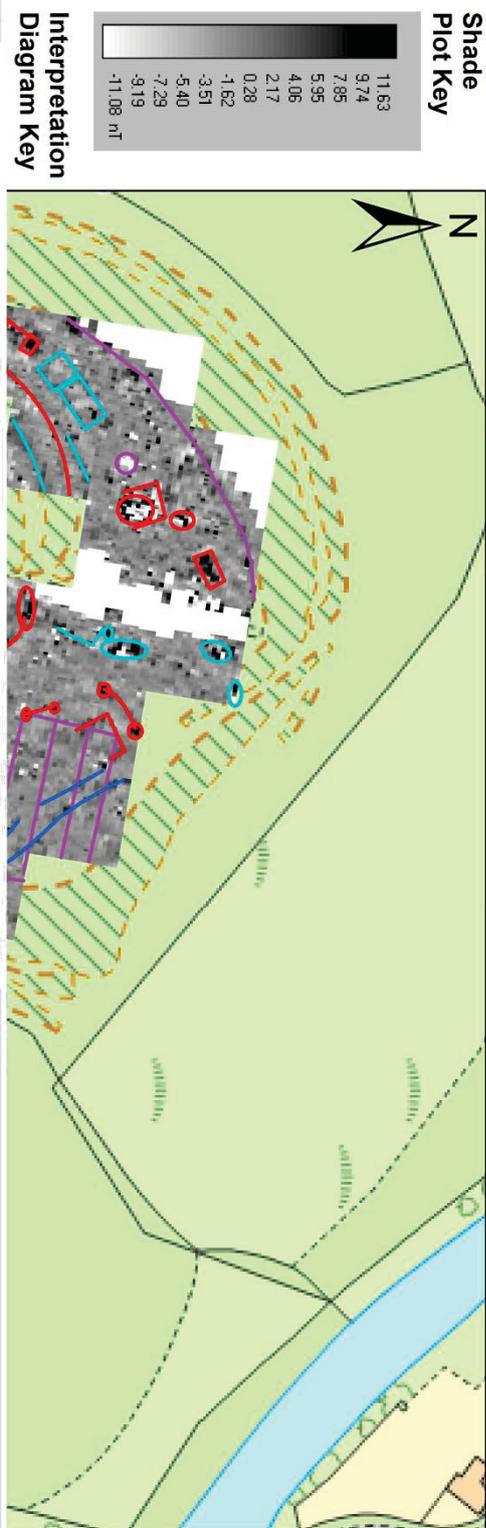


Figure 6: Integrated processed magnetometry data and interpretation diagram.

Harbottle Magnetometry Survey Results

Interpretation Diagram Key

- Modern Feature
- Identified Archaeological Anomaly
- Archaeology
- Archaeology (?)

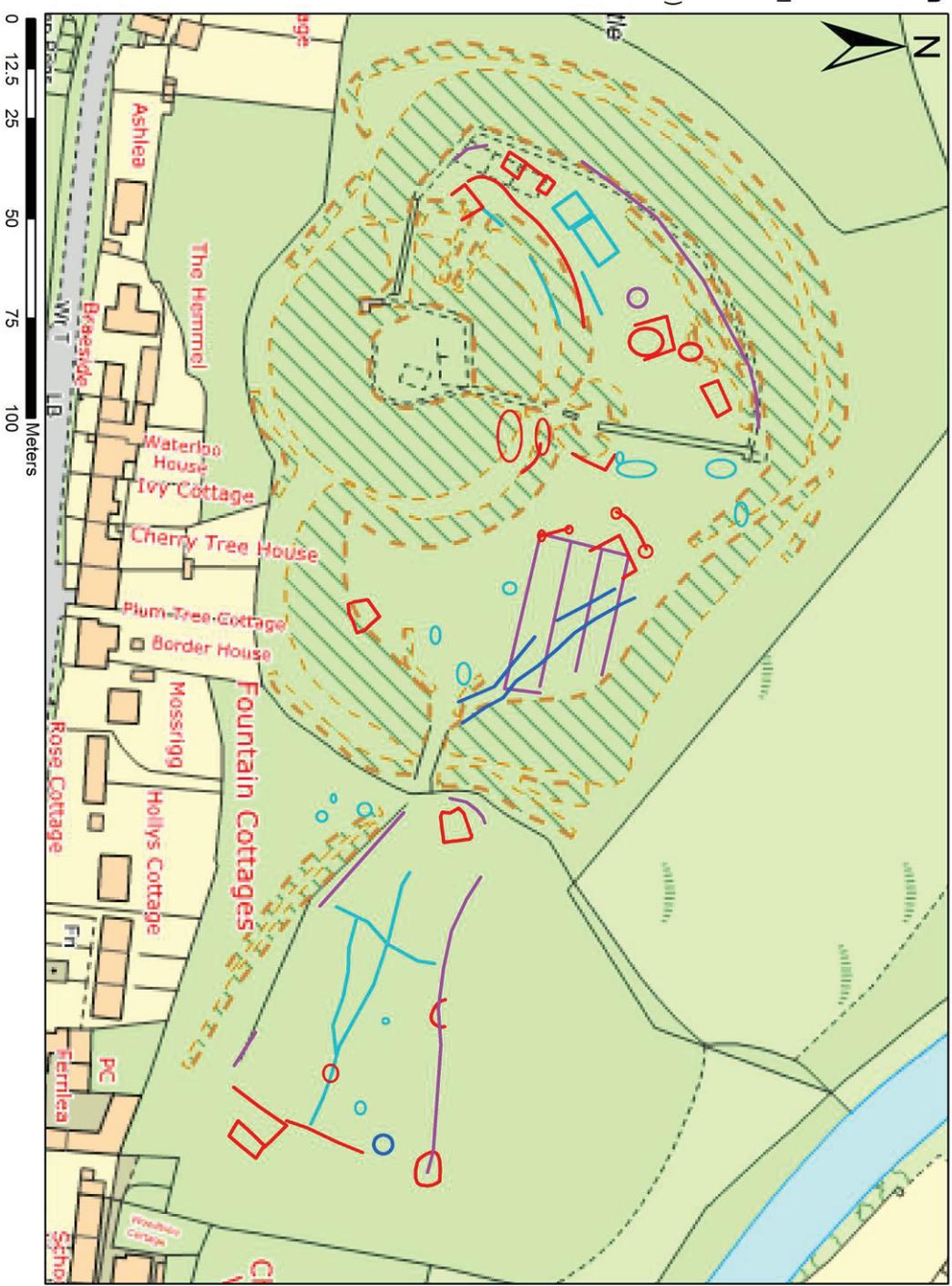


Figure 7: Interpretation diagram.

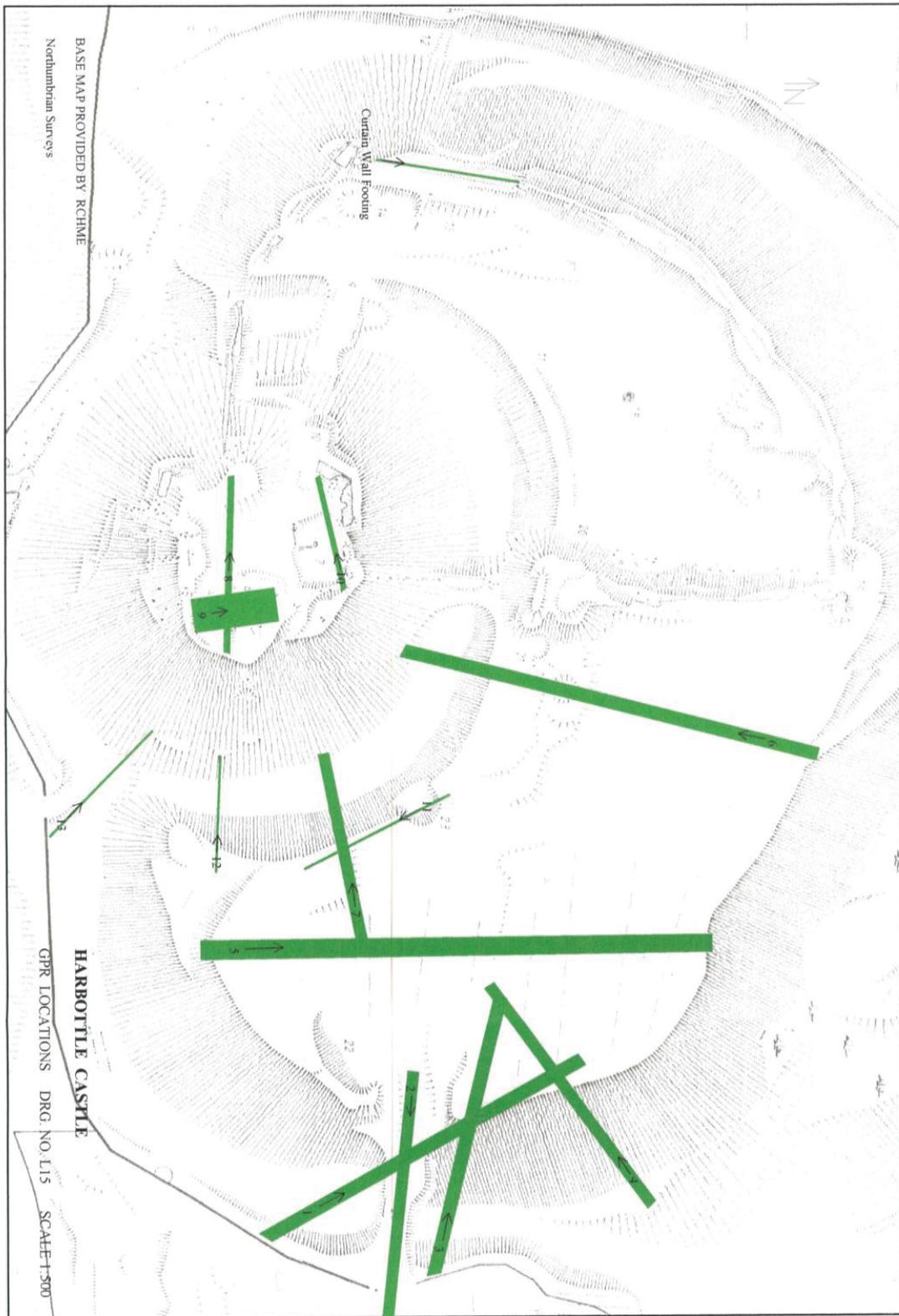


Figure 8: RCHM(E) Topographical map of motte and bailey of Harbottle Castle with GPR strips shown in green (Northumbrian Surveys 1997: 3)

6. Conclusions:

- 6.1 It is clear from this survey project that the next logical step in the investigation of this site would be the electrical resistivity survey that had originally been planned to take part in conjunction with the magnetometry survey. In addition, the Ordnance Survey map data for Harbottle castle is not precise enough for this level of research (particularly in the potential barmkin). It may therefore be prudent to conduct a topographical survey of the site and some of the surrounding area. Further examination of the topography of the area may present useful data, however this would most effectively be achieved through LIDAR which presents a considerable cost.
- 6.2 As detailed in the supplementary material (Appendix IV: Pratt 2015: 103), due to the findings of this research, continued investigation of the site may lead to the need for the scheduled area (Figure 9) to be extended in order to contain the potential barmkin to the east of the castle. Further investigation of this area may become pertinent due to the presence of a large number of rabbit burrows (Plates 4 and 5) which have already damaged suspected retaining wall for the suspected barmkin and may be damaging further archaeological deposits.
- 6.3 Further investigation of the site, especially the area to the east comprising the possible barmkin, will result in a more detailed understanding of the use and development of this specific castle. It may also enable a better understanding of the relationship between the northern border castles in terms of the movement/development of trends in medieval prestige architecture as well as their influence on the surrounding populous and township formation. As part of this further investigation, it would be desirable to conduct an electrical resistivity survey of the site with a GPS plotted grid as originally intended in order to complement the magnetometry data detailed here.
- 6.4 An investigation of the area surrounding Harbottle Castle may result in a greater understanding of its effect on the landscape. This could potentially strengthen our understanding of the development of ancillary/outer areas of the castle itself such as the outer bailey or barmkin.
- 6.5 Furthermore a consideration of the anecdotal knowledge/memory of the site would build a picture of its use and impact on the modern community it serves locally and nationally and may enable a more cohesive scheme of management for the site, incorporating the wider community.

7. Plates



Plate 1: Setting out survey grid with 50m tapes.



Plate 2: Remains of wall to the north and west of survey area B. Taken from the causeway, facing north east.



Plate 3: Remains of wall to the north and west of survey area B. Taken from the north west corner of survey area B, facing southwest.



Plate 4: Rabbit burrows at northern extent of eastern survey area.



Plate 5: Rabbit burrows at northern extent of eastern survey area.

8. Bibliography:

Aspinall, A., Gaffney, C. and Schmidt, A., 2008. *Magnetometry for Archaeologists*, Plymouth: AltaMira Press.

Bartington Instruments, 2015. *Operationa Manual for Grad601 Single Axis Magnetic Field Gradiometer System*, Oxford: Bartington Instruments Limited:
<http://www.bartington.com/Literaturepdf/Operation%20Manuals/OM1800%20Grad601.pdf>

Crow, J., 2004. 'Harbottle Castle Excavation and Survey 1997 – 99' in Frodsham, P. (ed.) *Archaeology in the Northumberland National Park*, York: Council for British Archaeology, Research Reports No. 136, pp 246 – 261.

Gaffney, C. and Gater, J., 2003. *Revealing the Buried Past Geophysics for Archaeologists*, Stroud: Tempus.

Geoscan Research, 2014. *Geoplot Version 3.0 for Windows*, Data Sheet Issue 13, Bradford: Geoscan Research: http://www.geoscan-research.co.uk/Geoplot3_v13_Data_Sheet.pdf

Hunter Blair, C. H., 1935. 'Harbottle Castle' in *Proceedings of the Berwickshire Naturalists' Club*, Vol. 28, Part III, pp 215 – 231.

Long, B., 1967. *Castles of Northumberland: The Mediaeval Fortifications of the County*, Newcastle – Upon – Tyne: Harold Hill.

Northern Archaeological Associates, 1991. *Harbottle Castle Archaeological Recording and Rectified Photography for Northumberland National Park*, Unpublished.

Northumbrian Surveys, 1997. *Report on Ground Penetrating Radar Survey at Harbottle Castle, Upper Coquetdale for Northumberland National Park*, Unpublished.

Ryder, P. F., 1990. *Harbottle Castle A Short Historical and Descriptive Account*, Unpublished.

Schmidt, A., 2002. *Geophysical Data in Archaeology: A Guide to Good Practice*, Archaeology Data Service, Oxford: Oxbow Books.

Website sources:

Historic England map search: <http://list.historicengland.org.uk/mapsearch.aspx>

The Landscape Research Centre:

<http://www.landscaperesearchcentre.org/Project%203841/Magnetometry/How%20does%20it%20work.htm>

Appendix I

OASIS Form

Appendix II

Historic England Geophysical Survey Database Questionnaire

Appendix III

Raw geophysical survey data

Appendix IV

**Supplementary material: Pratt, A. R. P., 2015. Harbottle Castle: A
Historic, Geophysical and Regional Evaluation, Masters Thesis, York:
University of York, Unpublished.**