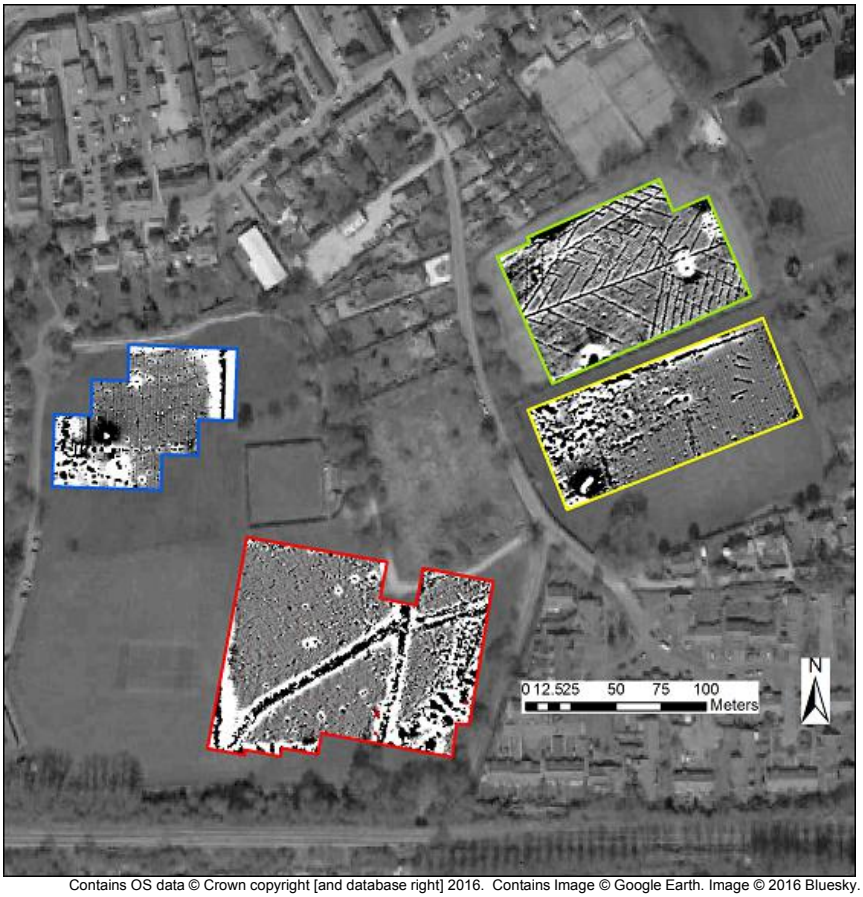

Geophysical Magnetometer and Resistance Survey, and Topographic Survey at the Bath Grounds, and surroundings, Ashby-de-la-Zouch, Leicestershire, 2016.

(SK 35880 16362).

Geophysical and Topographic Survey Report

Andy Gaunt
Mercian Archaeological Services CIC

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Report MAS027

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Geophysical and Topographic Survey Report

Bath Grounds (SK 35880 16362).

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MAS027

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Geophysical Survey Report

1. Summary

A Geophysical Magnetometer and Resistance Survey, along with a topographic survey was undertaken by Mercian Archaeological Services CIC in Ashby-de-la-Zouch over a number of locations in the proximity of the Ashby Bath Grounds, during the summer of 2016. The survey focused on earthworks in the southeast corner of the Bath Ground site at the location of former ponds (Monument Number MLE4277). The Historic Environment Record for Leicestershire lists this monument as "Moat and Fishpond, The Moats". Anomalies in the geophysical surveys and results from the topographic survey suggest that there are potentially preserved (in-filled) remains of a medieval pond, and possible remains of the boundary of a formal medieval/ post-medieval garden. A second area of focus was the northern part of the Bath Grounds site, where drainage culverts and underground pipes (including for the Gilwiskaw Brook) were detected, possibly associated with the former Ivanhoe Baths. To the east of the Bath Grounds a further two fields were surveyed, these are the Memorial Field and the field to the south belonging to Leicestershire County Council. Both fields lie within the remains of medieval/ post-medieval formal gardens associated with the Castle. The Memorial Field has been subject to landscaping and changes in elevation (which may mask archaeological remains); the field was underlain by a complex system of land drains which were detected as anomalies in the magnetometer survey. The 'Council Field' to the south of the Memorial Field contained possible preserved remains of the former boundaries of the formal gardens of the castle mentioned above. The survey detected information about water management in the site including drainage systems, underground culverts relating to altered water courses and pipework possibly related to the Ivanhoe Baths. Ephemeral anomalies detected in the Bath Grounds may represent early occupation. The pond system possibly preserved in the southeast of the Bath Grounds site, and the possible remains of medieval garden features at that location detected by this survey and in the field to the east is of particular interest. The ponds are believed to have formed part of a designed landscape for the castle, and as such may represent part of the setting for the Scheduled Monument of the Castle, within the boundaries of the Bath Grounds.

2. Project location, topography and geology

2.1. **Site Location:**

The site covers a number of locations in and around the Ashby bath Grounds, Ashby-de-la-Zouch.

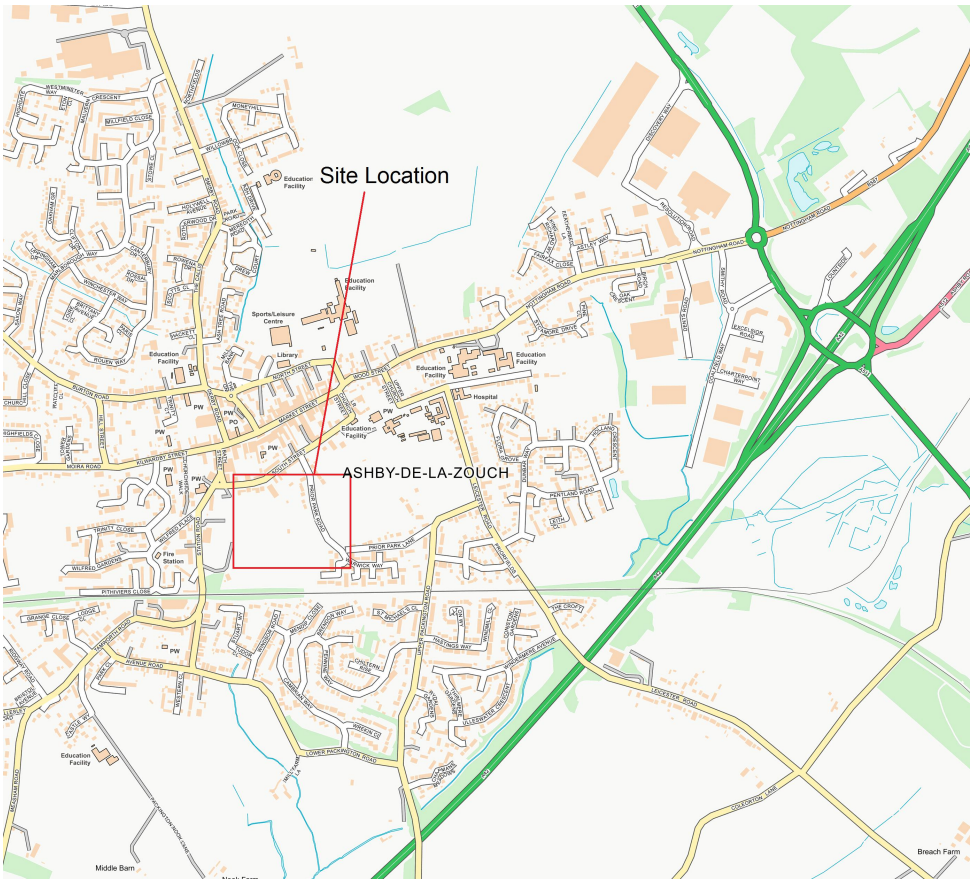

Figure 1: Site Location. Contains OS data © Crown copyright [and database right] 2016.

2.1.1. **Ashby Bath Grounds**

The western part of the survey covers sections of the Bath Grounds (SK 35880 16362), The Bath Grounds now constitutes a Public Park including Cricket Pitch on the south side of the historic core of Ashby-de-la-Zouch. As well as

formerly falling within the boundary of a medieval park (see below) the Bath Grounds were also the former grounds of the Ivanhoe Baths.

Two discreet areas within the Bath Grounds were surveyed. The southeastern part focused on an area of earthworks in the corner of the Bath Grounds that are believed to be the in-filled remains of medieval ponds (Monument Number MLE4277). The northern part of the Bath Grounds was surveyed to search for the route of the Gilwiskaw Brook and to look for evidence of former use of the site.

2.1.2. **Memorial Field**

To the East of the Bath Grounds (separated from the Bath Grounds site by Prior Park Road) lies the Memorial Field at SK 35991 16546. This area is directly adjacent to the site of Ashby Castle on its southwestern side, with the castle overlooking the site from an elevated position. The Memorial Field was within the area believed to have been occupied by formal medieval gardens of the castle. The site is in the private ownership of trustees who manage the field. It was given as a memorial; to pupils and former pupils of Ashby Grammar School who died in the First and Second World Wars. Permission to survey was granted by Ashby Rugby Club.

2.1.3. **Council Field**

For the sake of this survey the field to the south of the Memorial Field is referred to as the “Council Field”. The Council Field lies adjacent to the Memorial Field, on its southern side at (SK 36016 16481). This field lies within the area believed to have been occupied by a formal medieval garden of the castle, and was therefore chosen as an area for the survey so as to

determine the level of preservation of archaeological remains.

2.2 Topography:

2.2.1. **Elevation**

The Ashby Bath Ground site occupies an area of open ground to the south of the historic core and market place of Ashby-de-la-Zouch. The southwestern part of the Bath Grounds has been levelled to form a cricket pitch. The ground level of the Cricket Pitch is approximately 119m Ordnance Datum Newlyn (ODN). The area to the north rises slightly to 120m and the area to the southeast where the former ponds are situated is slightly higher still at 121m ODN. The Memorial Field and Council Field occupy slightly higher ground to the north east of the Bath Grounds adjacent to the castle. The Memorial Field was landscaped to make a roughly level playing surface for Rugby and other sports, with the western end being raised (see below) and now ranges in height from 123m ODN at the western end to 124.5m ODN at the eastern end. The Council Field has not been landscaped in the same way as the memorial field, and ranges in height from 121.9m ODN at the western end to 125m ODN at the eastern end.

2.2.2. **Drainage**

The Gilwiskaw Brook originally formed the eastern boundary of the Bath Grounds, and was the source of medieval ponds which form part of this survey. The Gilwiskaw Brook is now in a culvert and crosses the Bath Grounds from north to south (see results and interpretations below) via an underground route.

2.3 Geology

2.3.1. **Bedrock Geology**

The British Geological Survey (BGS) 1:50,000 scale bedrock geology description, identifies the area of the Bath Grounds and the Memorial Field sites as being underlain by Pennine Lower Coal Measures Formation. This is a Sedimentary Bedrock composed of Mudstone, Siltstone And Sandstone. The rocks formed approximately 312 to 313 million years ago in the Carboniferous Period. At the time the local environment was dominated by swamps, estuaries and deltas. These rocks were formed in marginal coastal plains with lakes and swamps periodically inundated by the sea; or estuaries and deltas, and shallow seas. (www.BGS.ac.co.uk- accessed 09/11/2016).

2.3.2. **Superficial Geology**

In the area of the Bath Grounds these Carboniferous rocks are overlain by superficial alluvium deposits. The BGS 1:50,000 scale Superficial Deposits description for these deposits describes them as being composed of Clay, Silt, Sand and Gravel. These deposits formed during the last two million years in the Quaternary Period. (www.BGS.ac.co.uk- accessed 09/11/2016). The Alluvium forms a linear area running north-south across the Bath Grounds. It was presumably formed by the original course of the Gilwiskaw Brook, which now crosses the site in a culvert.

3. Archaeological and Historical Background

3.1. **Archaeological and Historical background**

3.1.1. **Prehistoric to Early Medieval**

The Historic Environment Record shows little evidence in the area of the site for prehistoric occupation or activity. A quernstone is recorded a being found near Prior Park Road (MLE8291), and is suggested to be of Iron Age date. There is nothing of Roman date listed, or of Early Medieval date.

3.1.2. **Medieval**

Ashby Castle dates to the 12th century and has been extensively re-built especially in the 15th century (Cotswold 2012). The Castle is ruinous with the remains of gardens and other earthworks preserved in its immediate vicinity.

3.1.2.1. **Park and Designed landscape**

Designed landscapes surrounding high-status houses and palaces are now a recognised feature around high-status medieval residences, castles and palaces; such as at Clipstone in Sherwood Forest (Gaunt 2011, Gaunt & Wright 2013).

The surviving historic mapping (see below) shows evidence of a designed landscape as having been present at Ashby surrounding the castle (Way 2003). Recent work (Way 2003, Newsome et al 2008) has demonstrated how the area of the Bath Grounds most likely fell within the 'Western Park' of the castle. The area covered by the survey centres on earthworks believed to be the in-filled remains of fishponds, probably dating from the Medieval period (Newsome et al 2008, 21-22). The areas surveyed to the east in the 'Memorial Field' and the

'Council Field' lay within the boundary of 'Little Park' (Newsome et al 2008, 21-22) and were later re-configured into formal gardens in the 15th - 17th centuries (Newsome et al , 2008, 21-22).

"The Castle Garden was set into an existing landscape that comprised deer parks, a warren, fishponds and mills (Way 2006, 17). Numerous examples of 14th-century designed landscapes associated with high status houses, such as Framlingham and Bodiam (Way 2006, 21), and even in the period that the Zouches owned the castle, a designed landscape demonstrating the power of the owners to the local community and beyond may have been present at Ashby. In the 14th century it is recorded that the manor had three mills, a park of 60 acres and a dovecote, despite the assertion that the manor was worth very little at this time (Way 2006, 18). The Zouches were probably aware of early designed landscapes, such as Kenilworth, and another branch of the family was involved in landscaping in this period, at Harrington in Northamptonshire (Way 2006, 18). Whorlton Castle in North Yorkshire has been noted as being particularly comparable to the probable layout at Ashby (way 2006, 21)."

"Cantor (1983), 10) states that on the death of Alan la Zouch in 1347 it was recorded that there was 'a rabbit warren, surrounded by a ditch, and two fishponds'. The geometric pond complex recorded on Gardiner's estate map of 1735... may have been the location of the warren and ponds mentioned by Cantor, views of would have been afforded from the site of the manor, but with later elaboration as they are clearly an integrated element of the later formal landscape depicted on the map."

"The infilled remains of these ponds are visible as earthworks and swampy vegetation on the Bath Recreation Grounds. Their

nature and extent might be untangled by detailed survey... and they have potential to preserve archaeological deposits. The ponds and the other elements of the medieval manorial landscape potentially influenced the laying out of the later gardens."

"The boundary of the pre-Hasting's park mentioned by Cantor (1983, 10) is not clear from the documentary sources but interestingly the areas marked as 'Little park', 'Wilderness' and 'Moats' on the Gardiner estate survey of 1735 add up to just over 60 acres... and encompass the area to the south of the castle between Gilwiskhaw Brook and Mount Walk / Packington Lane. Therefore the 60 acres mentioned in the 14th century may equate to the later 'Little Park', with and area taken out to create the formal garden (Way 2006, 63)."
(Newsome et al. 2008 ,21-22).

3.1. 3. **Post Medieval**

The earliest map to survive of the castle and gardens and bath Ground site is the 1735 estate map by Gardiner (see below). This map shows the castle and the gardens situated in its immediate vicinity, "*It also shows elements of the designed landscape extending beyond the area of the existing garden, including avenues of trees dividing up the land closest to the castle into roughly equal sized compartments, most of which survived long enough to become fossilised in late 19th century field boundaries... The series of geometrically-shaped ponds to the west of the castle are also depicted, marked 'moats'. Though they may have earlier origins... their orientation and the tree avenue leading to the ponds from the sunken garden demonstrate that they were an integral part of the castle's 16th - or 17th century designed landscape."* (Newsome et al 2008, 25).

The area described includes the former ponds in the Bath Grounds, and contains the Memorial Field and Council Field surveyed in this project. The 19th century field boundaries described here are discussed in the Interpretation section below.

3.1.4. **Modern**

3.1.7.1. **Ivanhoe Baths**

In 1822 the Marquis of Hastings built the Ivanhoe Baths, naming them after Sir Walter Scott's novel which had been published in 1820 (Hillier 2016, 25). The Baths remained popular until the 1870s. They were restored in 1887 for the Golden Jubilee of Queen Victoria, but did not regain their former popularity. They were used as workshops by 1923 and demolished in 1962 (Cotswold 2012).

3.1.7.2. **Ashby Bath Grounds**

The Bath Grounds subsequently went into a period of decline, but following various planning applications, the *Friends of Ashby Bath Grounds* were formed in January 2014 with the aim *"to work and campaign to protect and improve the Bath Grounds as a free, public access park and recreational facility for the benefit of the whole community"* Hillier 2016, 61).

3.2 **Previous Archaeological Work**

3.2.1.

A number of previous archaeological projects have been undertaken in the vicinity of the site. A request for information from the Historic Environment Record for Leicestershire in December 2016 returned a number of recent records of nearby work including:

- 2012 trial trenching, land at Moira Road, Ashby
- 2012/13 geophysical survey, land at Money Hill.
- 2013 building survey of outbuildings at 8-10, Market Street.
- 2013 desk based assessment, former Soap Factory, The Callis
- 2013 historic building survey, former Soap Factory, The Callis
- 2012 geophysical survey, Royal Hotel
- 2012 trial trenching at Leicester Road
- 2013 watching brief during groundworks at Court 19, rear of 81, Market Street.
- 2013 trial trenching, land at the former Castle Soapworks, Callis
- 2014 trial trenching to the rear of 8-10, Market Street
- 2013 desk-based assessment, land off Kilwardby Street and Derby Road
- 2014 strip map and sample at the former Castle Soap Works, Callis
- 2015 watching brief on land off North Street
- 2015 trial trenching on land at Leicester Road
- 2013 desk-based assessment, land at Money Hill
- 2016 trial trenching and LiDAR study, land off Woodcock Way.

The site of the bath Grounds was recently subject to a Desk-Based Assessment for the Royal Hotel, Ashby-de-la-Zouch, undertaken by Cotswold Archaeology. The project examined the archaeological potential of the Hotel site and Bath Grounds for a planning application. The report gave a low potential for medieval/ post-medieval remains to be preserved on the site. The Cotswold report lists the following work having taken place in the near vicinity of the site prior to 2012:

"These include:-

- *phases of work at Ashby-de-la-Zouch Castle, including watching briefs (1992, 2002, and 2008) and a multi-disciplinary research project (2006) which comprised earthwork, bore hole and geophysical surveys, an evaluation and documentary research…*
- *phases of work at Ashby School, including evaluations (1992, 1999 and 2002) which identified post-medieval demolition debris and the remains of a post-medieval building which would formerly have occupied the castle courtyard, desk-based assessments (2005 and 2007) and a watching brief (2006) which identified no archaeological remains;*
- *a watching brief at Manor School in 1992…*
- *a watching brief at 28 North Street in 1996 which identified no archaeological remains,*
- *a desk-based assessment (1996), evaluation (1996) and watching brief (1997) at the Bull's Head which identified a late yard surface and stone-lined well, along with early features of the building itself;*
- *A desk-based assessment (1996) and watching briefs (1996 and 1997) at the Lamb Inn which identified post-medieval building remains and garden soils;*
- *a desk-based assessment (2004) and evaluation (2006) of land to the rear of 37-39 Wood Street which identified*

a post-medieval pit and ditch:

- *a desk-based assessment and architectural survey at 47-49 Market Street in 2005;*
- *a watching brief at Derby road in 2008;*
- *a desk-based assessment and geophysical survey of land off Lower Packington Road in 2009, the latter of which identified possible enclosures and mill leets; and*
- *an evaluation at Church Hall which identified medieval and post-medieval domestic remains."*

(Cotswold 2012, 13).

4. Research Aims and Objectives

4.1.

The project was designed to detect potential buried archaeological remains particularity relating to the possible survival of in-filled medieval/ post-medieval pond systems, medieval/ post-medieval garden features. The project also investigated as much of the area of the Bath Grounds site to search for archaeological features that may have been preserved under a site that has seen no buildings or development since at least medieval times. The location of the Bath Grounds site so close to the medieval core of a prominent local medieval market town, and the Memorial Field and Council Field to the Castle site; made all locations prime targets for archaeological prospection.

The project aimed in particular to address the following updated research agenda questions highlighted in the recent publication: (Knight, Vyner and Allen 2012). *East Midlands Heritage- An Updated Research Agenda and Strategy for the*

Historic Environment of the East Midlands:

4.1.1.

Research Objective 7G: *Estates, architecture and power: Investigate the relationship between castles and great houses and their estates.*

4.1.2.

It is hoped that the fieldwork will reveal preserved remains of medieval gardens, and ponds which are seen as evidence of a designed landscape surrounding Ashby castle.

5. Methodology

5.1. **Geophysical Survey**

5.1.1. **Standards**

The surveys and reporting were conducted in accordance with English Heritage guidelines, *Geophysical survey in Archaeological Field Evaluation* (David, Linford & Linford 2008); the Institute for Archaeologists (IfA) Draft Standard and Guidance for archaeological geophysical survey (2010); the IfA Technical Paper No.6, *The use of geophysical techniques in archaeological evaluations* (Gaffney, Gater & Ovenden 2002); and the Archaeology Data Service Guide to Good Practice: *Geophysical Data in Archaeology* (draft 2nd edition, Schmidt & Ernenwein 2010).

5.1.2. **Magnetometry Survey**

5.1.2.1 **Equipment**

The survey was undertaken using a Bartington Grad601 fluxgate Gradiometer. This technique involves the use of hand-held magnetometers to detect and record anomalies in the vertical component of the Earth's magnetic field caused by variations in soil magnetic susceptibility or permanent magnetisation; such anomalies can be caused by archaeological features. The gradiometer works by measuring the earth's magnetic field at two separate sensors; one positioned 1 metre above the other. The lower of the two sensors is placed nearer to the ground surface and so is affected by magnetic variations in the soil. The signal is either higher or lower than the top sensors. This 'gradient' is recorded.

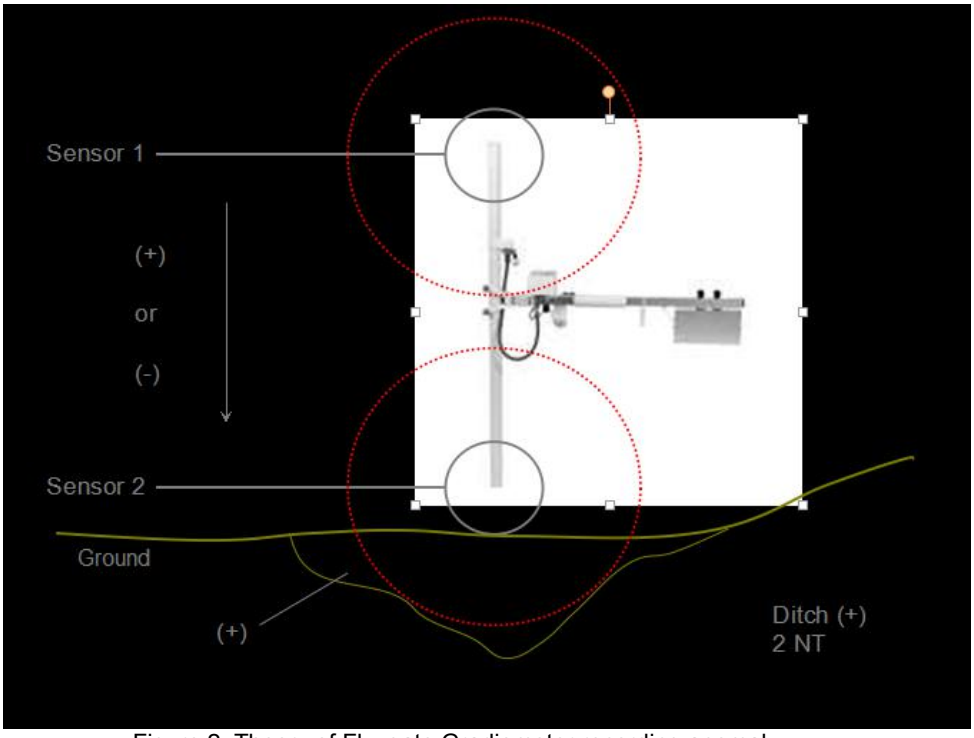

Figure 2: Theory of Fluxgate Gradiometer recording anomaly.
A. Gaunt © Mercian Archaeological Services CIC, 2015.

5.1.2.2. **Magnetometry Fieldwork Methods**

5.1.2.2.1. **Survey Areas**

The site was divided into four survey areas. These can be seen in figure 3. A 20m grid was established across each of these survey areas using tapes and off-set measurements. The corners of grids were recorded to Ordnance Survey coordinates using a Leica Differential Geographic Positioning System (DGPS) survey instrument. DGPS is accurate to +/- 100mm (Crutchley 2010) which complies with English Heritage requirements for control of archaeological survey (Lutton 2003). The grid was reestablished as necessary by staking out points using the DGPS.

Figure 3: Locations of areas of Magnetmometer survey. Contains OS data © Crown copyright [and database right] 2016. Contains Image © Google Earth. Image © 2016 Bluesky.

5.1.2.2.2. **Measurements**

Measurements of vertical geomagnetic field gradient were determined using Bartington Grad601 dual fluxgate gradiometer. A parallel traverse scheme was employed and data were logged in 20m grid units. The instrument sensitivity was nominally 0.03nT, the sample interval was 0.25m and the traverse interval was 1m.

5.1.2.2.3. **Data**

Data was downloaded on site onto a laptop for initial processing and storage. The data was then backed up onto Mercian's data network, with copies made of the data for processing.

5.1.2.3. **Interpretation and archiving.**

5.1.2.3.1 **Data processing**

A combination of Snuffler version 1.14, and Geoplot v.3 software was used to process the geophysical data and to produce a continuous tone greyscale image of the raw (minimally processed) data. A plot of filtered data is also provided. The greyscale images and interpretations are presented below. A palette bar relates the greyscale intensities to anomaly values in nanoTesla.

5.1.2.3.2.

The following basic processing functions have been applied to the geomagnetic data:

5.1.2.3.2.1. **Clip.**

This clips data to specified maximum or minimum values; to eliminate large noise spikes; also generally makes statistical calculations more realistic.

5.1.2.3.2.2. **ZMT**

ZMT or Zero Mean traverse. This sets the background mean of each traverse within a grid to zero; used for removing striping effects in the traverse direction and removing grid edge discontinuities.

5.1.2.3.2.3. **Interpolate**

This increases the number of data points in a survey to match sample and traverse intervals; in this instance the data have been interpolated to 0.25m x 0.25m intervals

5.1.2.3.2.4. **Destripe.**

This is used to remove error caused during data collection., due to problems maintaining a regular pace walking traverses.

5.1.2.3.3. **Anomaly types**

A colour-coded geophysical interpretation plan is provided. Three types of geomagnetic anomaly have been distinguished in the data:

5.1.2.3.3.1. **Positive**

Positive magnetic regions of anomalously high or positive magnetic field gradient, which may be associated with high magnetic susceptibility soil-filled structures such as pits and ditches.

5.1.2.3.3.2. **Negative**

Negative magnetic regions of anomalously low or negative magnetic field gradient, which may correspond to features of low magnetic susceptibility such as wall footings and other concentrations of sedimentary rock or voids.

5.1.2.3.3.3. **Dipolar**

Dipolar magnetic paired positive-negative magnetic anomalies, which typically reflect ferrous or fired materials (including fences and service pipes) and/or fired structures such as kilns or hearths.

5.1.2.3.4. **Interpretation: features**

A colour-coded archaeological interpretation plan is provided. Except where stated otherwise in the text below, positive magnetic anomalies are taken to reflect relatively high magnetic susceptibility materials, typically sediments in cut archaeological features (such as ditches or pits) whose magnetic susceptibility has been enhanced by decomposed organic matter or by burning.

5.1.3 **Resistance Survey**

5.1.3.1**. Control of survey**

According to English Heritage control of survey is the accurate framework of carefully measured points within which the rest of the survey is fitted (Ainsworth et al 2007), Control must be accurate and repeatable, and within the tolerances stated (Lutton. 2003). The level of accuracy required for geophysical survey control is 0.1m (Jones 2008). This level of control was achieved by using a Leica Viva DGPS system (see below) A regular grid was then marked out using survey pegs and tape-measured off-sets. The use of DGPS also meets the criteria of repeatability.

5.1.3.2. **Resistance survey methodology**

Resistance survey is an active geophysical technique based on the passing of an electrical current through the ground and the measurement of the resistance to its current (Gaffney & Gater 2006). The main influence on the level of resistance of subsoil material to an electrical current is the moisture content and porosity. The archaeological theory is based on the fact that

'dry' features such as walls and compacted features such as metalled surfaces or floors will demonstrate relatively high resistance. Opposite to this 'wet' ditches and pits which have a more silt-rich filling should hold higher relative levels of groundwater. This should provide lower resistance readings. Resistance survey is therefore measuring high and low resistance anomalies. Resistance is measured in Ohms. Resistance survey works by sending a current between two probes inserted into the ground. These probes are known as 'current electrodes'. A second pair of probes known as the 'potential electrodes' measure the voltage between the two points. In effect the potential probes measure the contact resistance encountered by the current probes. These probes can be arranged in a number of different formations known as arrays. The survey used 'twin-probe' array. Twin-probe array consists of two current electrodes and two potential electrodes. One of each of the current and potential electrodes are known as as 'mobile' probes, and are fixed to a frame. The other pair (one potential and one current) known as 'remote' probes are placed in the ground. The mobile probes are attached to a frame at a set distance apart. The depth to which a device can record is dependent on the mobile probe separation. The depth of recording is generally 1 to 1.5 times the width of the mobile probes separation. The survey used an RM15 Resistance Meter with a probe separation of 0.5m, giving a depth reading of up to 0.75m. To avoid unwanted interference and to provide a stable background response the remote probes were set 15m away from the survey (30 times the width of the mobile probe separation). The cable to the remote probes is only 50m in length to prevent interference. The remote probes therefore had to be moved throughout the survey. A technique known as *normalising* was employed to provide consistency across the survey site when the remote probes were moved to new

locations.

5.1.3.3. **Equipment**

A Geoscan Research RM15 Resistance Meter was used to undertake the survey. The meter was set to twin-probe array at 0.5m sensor separation as stated above. The RM15 was fitted with an MPX15 Multiplexer and PA20 modular frame to allow parallel twin array, allowing two 1m transects to be recorded at the same time.

5.1.3.4. **Field method**

The survey was undertaken in two separate areas. Area 5 in the area of the ponds on the eastern edge of the Bath Grounds site, and Area 6 on the northern side of the memorial Grounds. These can be seen in figure 4. The resistance survey was the first method employed in the field on the project, in area 5 and so a baseline was established using tape measures and pegs. From the baseline a 20x20m grid was established. The corners of the grid were recorded with Differential GPS (see below). Tapes were aligned across the top and bottom of these grid squares, and tapes were set as guidelines at 2m intervals at 90° to the baseline, beginning at the 1 metre mark. 1 metre transects were walked using the RM15. Data was collected in parallel mode, at 0.5m data collection intervals along the transects. Trees and other obstacles were avoided using ‘no data value’ *dummy reading* function, ‘’end line’ and ‘image line’ functions available in the RM15 data logger module.

Figure 4: Locations of areas of Resistance Survey. Contains OS data © Crown copyright [and database right] 2016. Contains Image © Google Earth. Image © 2016 Bluesky.

5.1.3.5. **Data post-processing**

Geoplot software was used to download data from the resistance meter. The data was transferred to *Snuffler* software and a master grid was created. A composite image of all the grids in the survey was created. Post-processing was then undertaken on the composite image. Post-processing of the resistance survey data included 'edge matching' to improve matches between grids and the data was then despiked.The

geophysical results were then georeferenced and displayed in GIS to enable analysis and interpretation.

5.2 **Topographic Survey**

5.2.1. **Topographic survey methodology**

5.2.1.1 **Equipment**

The survey was undertaken using differential survey grade Global Positioning System (GPS). The GPS system used was a Leica GPS Viva enabled to use Smartnet technology. This GPS system operates using Differential GPS (DGPS), where corrections are made to errors in the location data received f rom the satellites. The GPS rover was set to record either continuously or to take static points, depending on requirements as recommended in Ainsworth, S. & Thomason, B. (2003).

5.2.2.2. **Control of survey**

'Control is the accurate framework of carefully measured points within which the rest of the survey is fitted' (Ainsworth, et al. 2007). Section 2.1 Control of Survey in Metric Survey Specifications for English Heritage (Lutton. 2003) states that metric survey 'must provide reliable and repeatable control capable of generating the required coordinates within the tolerances stated' (Lutton. 2003). As well as falling within the accepted tolerance levels, this technique also fulfills the requirement that the control must be repeatable.

5.2.2.3. **Topographic survey method**

The survey was undertaken using a combination of objective

and subjective survey techniques.

5.2.2.3.1. **Objective survey**

The objective, systematic part of the survey was carried out using the Real-time Kinematic DGPS systems described above. 1m transects were surveyed across the site at right angles to the edges of the survey areas, using volunteers as markers for the surveyor to walk towards. Surveyors walked these transects, and recordings were automatically taken every 0.25 metres. The objective survey was undertaken at various areas around the site. The area focused on in the report is Area 7, in the vicinity of the ponds (see figure 5 below).

Figure 5: Location of area of Objective Topographic Survey. Contains OS data © Crown copyright [and database right] 2016. Contains Image © Google Earth. Image © 2016 Bluesky.

5.2.2.3.2. **Subjective survey**

Subjective survey was used as a means to record features in

more detail. It relies on the expertise of the surveyor to analyse the earthworks and to record them. For this procedure, the GPS recorded individual stationary points to record the tops and bottoms of slopes. These recordings were highlighted in the survey data using alpha-numeric codes. This subjective survey method was employed in order to allow a hachure plan of the site to be created as recommended by English Heritage (Bowden 2006). This was then used for interpretation.

Figure 6: Location of area of Subjective Topographic Survey. Contains OS data © Crown copyright [and database right] 2016. Contains Image © Google Earth. Image © 2016 Bluesky.

5.2.2. **Data preparation and analysis.**

All data was processed in Geographic Information Systems (GIS).3D elevation models and greyscale image files were created in Golden Software “Surfer” 3D.

5.3. **Archiving and reporting:**

5.3.1. **OASIS**

An OASIS entry pertaining to the work has been created. The OASIS identifier for the project is OASIS ID - merciana2-272577.

5.3.2 **Historic Environment Record**

A copy of the report has been logged with the Leicestershire Historic Environment Record (HER).

5.3.3. **Public Dissemination online**

Mercian will also publish free downloadable versions of the report via our website.

5.4. **Community Archaeology**

As a community archaeology company Mercian Archaeological Services CIC are experts in involving members of the public in archaeological projects. Alongside seeking to answer various archaeological research questions; the project was designed to engage local people in the heritage and history of the Bath Grounds Site through participation in archaeological fieldwork.

All aspects of the fieldwork were undertaken by volunteers and local community members, including many passers-by who used all the equipment and undertook all the surveys under supervision from Mercian staff.

6. Results

6.1 **Magnetometer Survey**

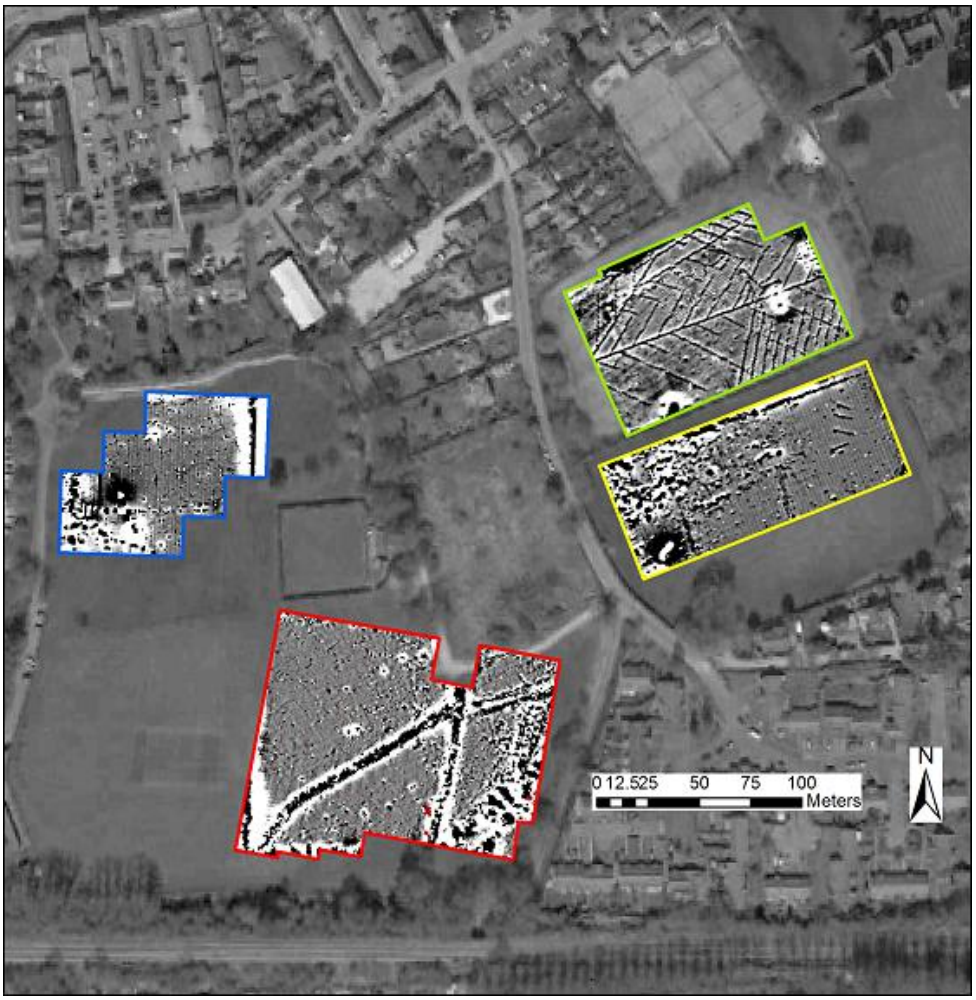

Figure 7: Geophysical Magnetometer Survey Results, 2016.
Contains OS data © Crown copyright [and database right] 2016.
Contains Image © Google Earth. Image © 2016 Bluesky.

6.1.1. Area 1

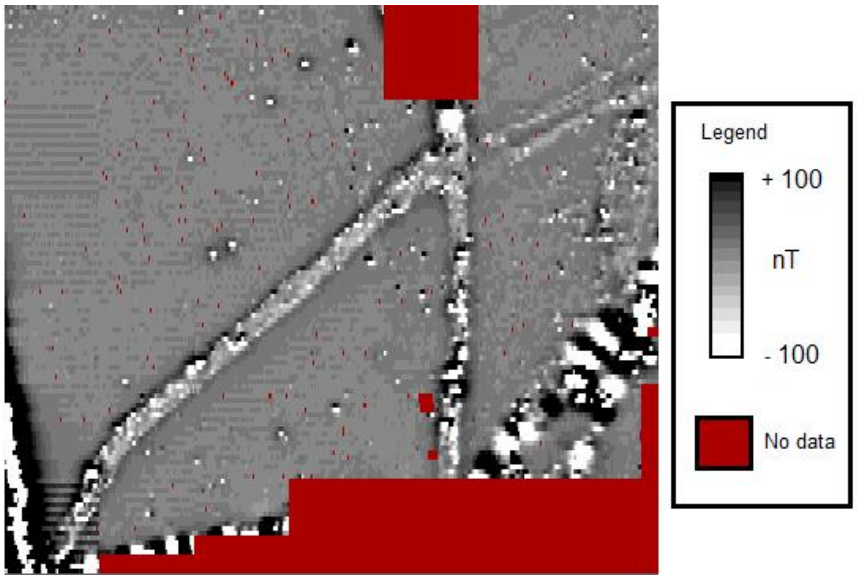

Figure 8: Unprocessed Magnetometer data greyscale image Area 1.

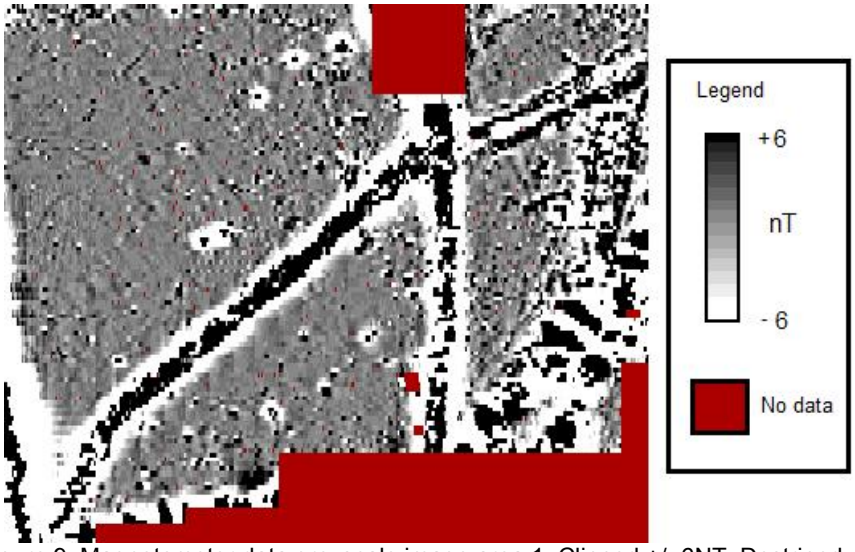

Figure 9: Magnetometer data greyscale image area 1, Clipped +/- 6NT, Destriped, De-Spiked (Threshold 1.0), Interpolated Vertical.

Figure 10: Geophysical Magnetometer Survey Results Area 1, 2016. Magnetometer data greyscale image, Clipped +/- 6NT, Destriped, De-Spiked (Threshold 1.0), Interpolated Vertical. Contains OS data © Crown copyright [and database right] 2016. Contains Image © Google Earth. Image © 2016 Bluesky.

6.1.2. Area 2

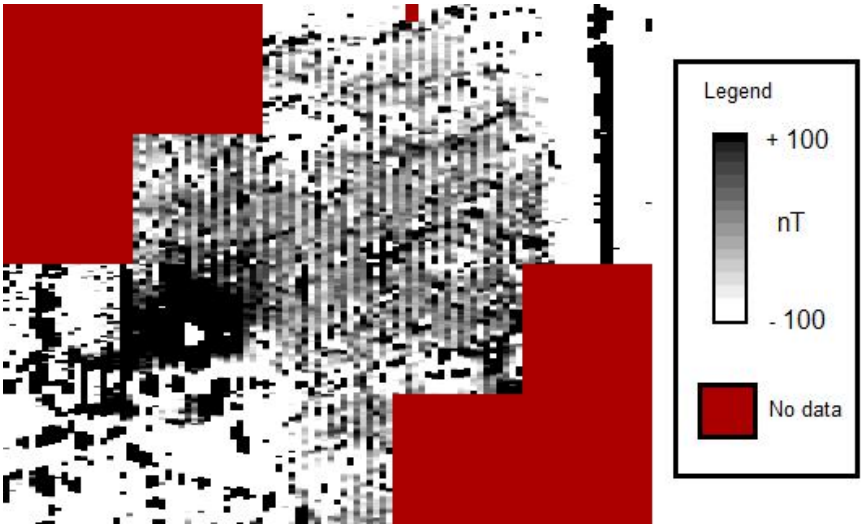

Figure 11: Unprocessed Magnetometer data greyscale image Area 2.

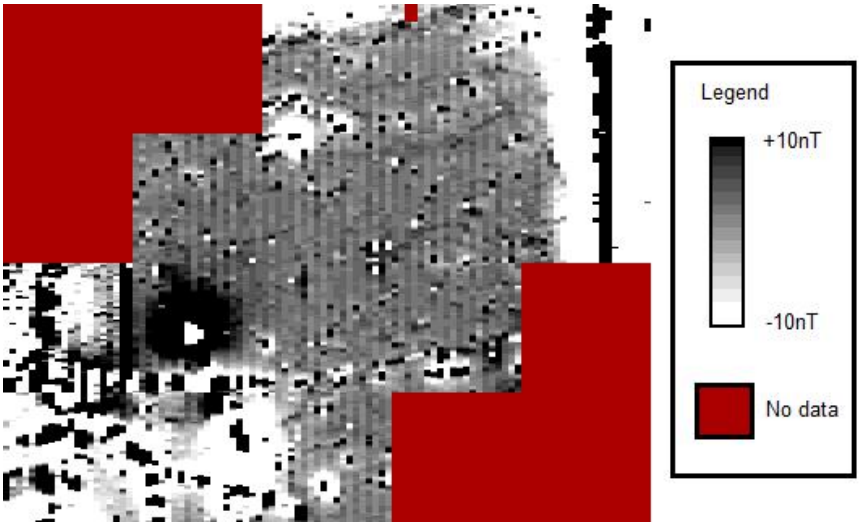

Figure 12: Magnetometer data greyscale image area 1, Clipped +/- 10NT, Destriped, De-Spiked (Threshold 1.0), Interpolated Vertical.

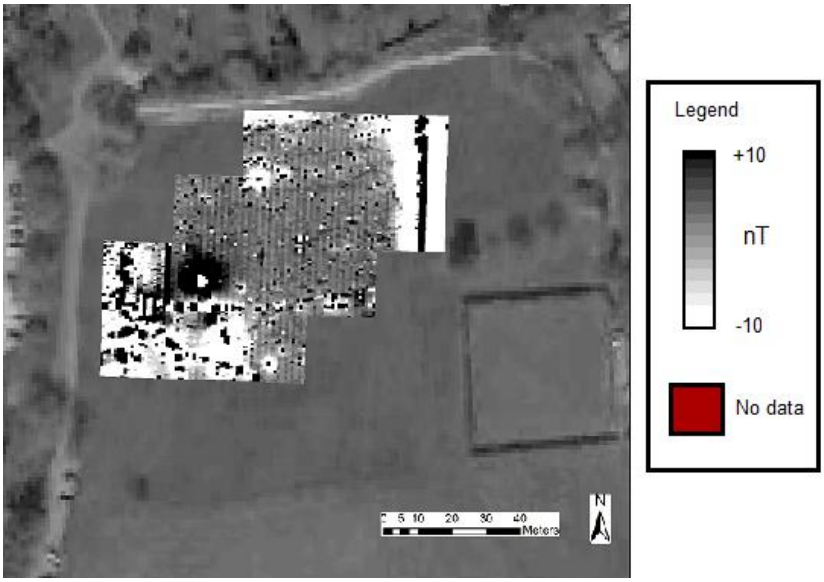

Figure 13: Geophysical Magnetometer Survey Results Area 2, 2016. Magnetometer data greyscale image, Clipped +/- 10NT, Destriped, De-Spiked (Threshold 1.0), Interpolated Vertical. Contains OS data © Crown copyright [and database right] 2016. Contains Image © Google Earth. Image © 2016 Bluesky.

6.1.3. Area 3

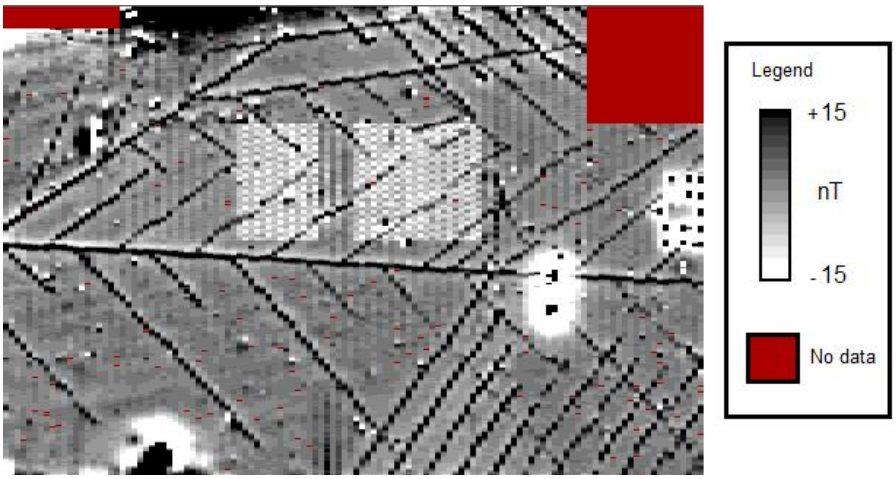

Figure 14: Unprocessed Magnetometer data greyscale image Area 3.

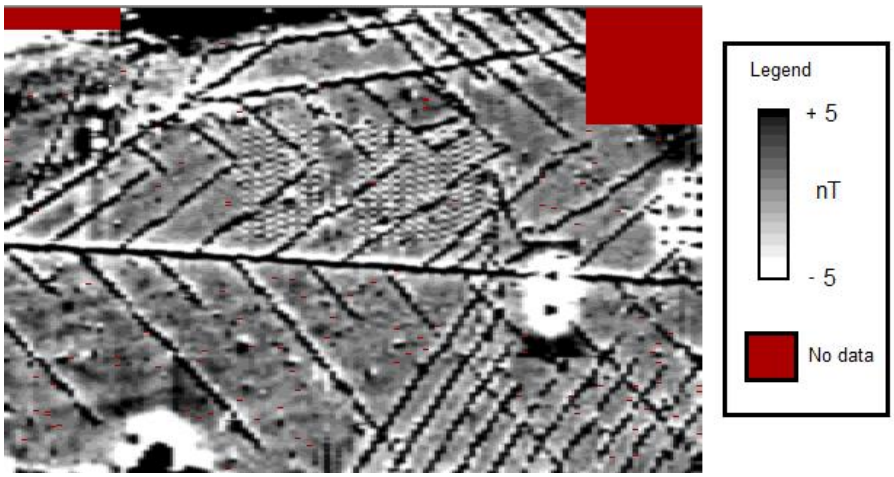

Figure 15: Magnetometer data greyscale image area 3, Clipped +/- 5NT, Destriped, De-Spiked (Threshold 1.0), Interpolated Vertical.

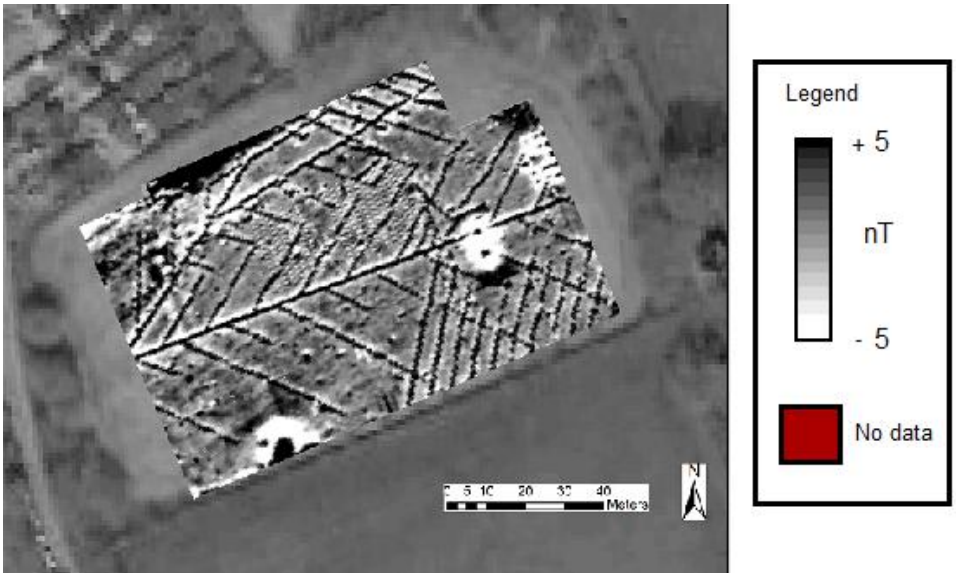

Figure 16: Geophysical Magnetometer Survey Results Area 3, 2016. Magnetometer data greyscale image, Clipped +/- 5NT, Destriped, De-Spiked (Threshold 1.0), Interpolated Vertical. Contains OS data © Crown copyright [and database right] 2016. Contains Image © Google Earth. Image © 2016 Bluesky.

6.1.4. Area 4

Figure 17: Unprocessed Magnetometer data greyscale image Area 4.

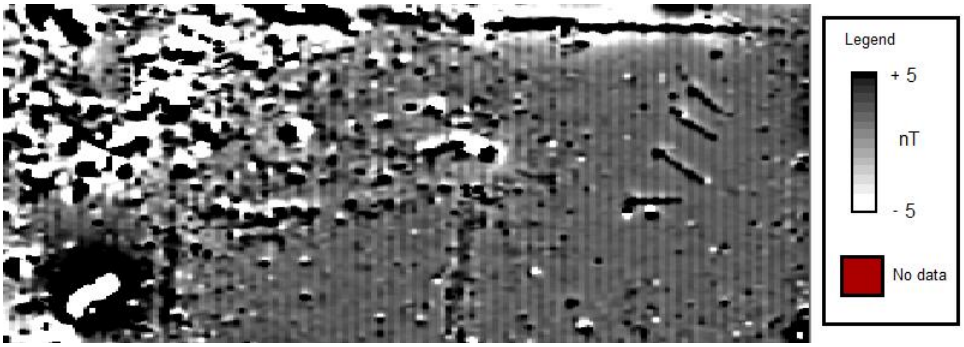

Figure 18: Magnetometer data greyscale image area 4, Clipped +/- 5NT, Destriped, De-Spiked (Threshold 1.0), Interpolated Vertical.

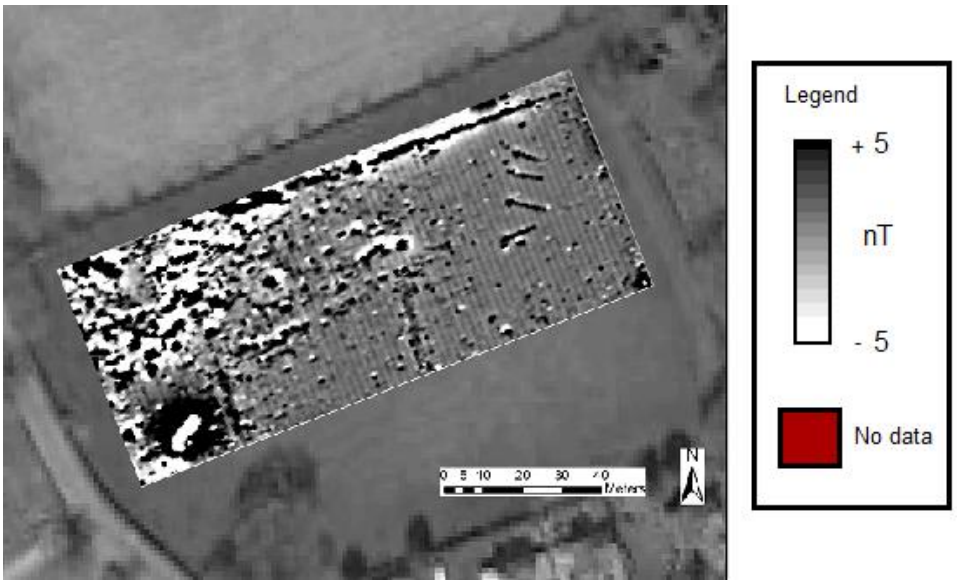

Figure 19: Geophysical Magnetometer Survey Results Area 4, 2016. Magnetometer data greyscale image, Clipped +/- 5NT, Destriped, De-Spiked (Threshold 1.0), Interpolated Vertical. Contains OS data © Crown copyright [and database right] 2016. Contains Image © Google Earth. Image © 2016 Bluesky.

6.1.5. **Magnetometer Survey Interpretation.**

Figure 20: Magnetometer Survey Interpretation Plot. Contains OS data © Crown copyright [and database right] 2016. Contains Image © Google Earth. Image © 2016 Bluesky.

6.1.6. **Results**

As stated above all work in the field was undertaken by volunteers and members of the community under supervision from Mercian staff. A wide variety of people were involved in the project ranging from young children to retired people, with members of the public surveying with the Bartington Grad 601 Fluxgate Gradiometer. With such a wide variety of different "surveyors" and with problems relating to metal interference, and timing of transects, it was necessary to record a large number of the grids more than once. The final output shows some evidence of the presence of metal (especially two grids in area 3), however despite this the data has produced some excellent results, helping to show that community archaeology engaging people from all ages and backgrounds can also produce excellent results when undertaken under supervision from professional community archaeologists. The results of the Magnetometer survey can be seen above in figures 7-20.

6.1.6.1.

The features described below can be seen in Figure 20 above, and can be checked against the corresponding raw data images and processed data images for the relevant survey area (see above; figures 7-19). All numbers referred to in the text come from figure 20. The locations of areas 1-4 can be seen in figures 3 and 7.

6.1.6.2. **Area 1**

Area 1 contains a number of high and low magnetic anomalies, as well as areas of dipolar responses. Features 1 and 2 are linear dipolar anomalies that run close to parallel northeast to southwest across the southeastern scorner of the surveyed area.

6.1.6.3.

Anomaly 3 is a linear dipolar anomaly that is orientated north to south on the western edge of the surveyed area. Area 1 is crossed by two large high magnetic linear anomalies 4 and 5. Anomaly 4 runs northeast-southwest across the survey area. The feature appears to merge with anomaly 5; a second linear high magnetic anomaly that runs north-south across the centre of the survey area. Anomaly 4 merges with anomaly 5 towards the northern part of the grid. It runs towards the southwestern corner of the grid where it is lost in the dipolar signal from anomaly 3. Anomalies 4 and 5 are high magnetic, with low magnetic signals detected on either side running parallel to the high resistance response (see figure 20). Anomaly 6 is a collection of alternating linear low and high resistance anomalies orientated east-northeast to west-southwest. The anomaly merges with anomaly 5 close to the point anomaly 5 merges with anomaly 4. Anomaly 7 represents and area of mixed high magnetic and low magnetic responses in a discrete area on the eastern side of the survey area. At its northern end anomaly 7 a-butts anomaly 6, and at its southern end is truncated by the dipolar responses from anomalies 1 and 2.

6.1.6.4. **Area 2**

Area 2 is situated on the northern part of the Bath Grounds. It is characterised by the presence of a large number of Dipolar linear anomalies 8, 9, 10 and 11. Anomaly 8 probably represents a number of linear dipolar anomalies clustered at the southeastern corner of the grid, possibly radiating from a point close to where the number ‘8’ is labelled on the plot in figure 20. Feature 9 is a linear dipolar anomaly that is orientated east-west across the southern half of area 2. The signal was very strong on the western half of the survey, but tapers to a weaker signal

to the east. Feature 10 is a large linear dipolar anomaly oriented north-south at the eastern end of the surveyed area 2. Anomaly 11 is another linear dipolar response running south-southeast to north-northwest. Feature 12 is a sub-circular low magnetic anomaly with a high magnetic anomaly at its centre.

6.1.6.5. **Area 3**

Area3 has a very different character to the other areas surveyed. The area has a large number of linear high magnetic anomalies appearing to form a straight-limbed dendritic pattern across the area (see the interpretation section below for discussion of anomalies 17-19). Feature 13 represents an area of less regular high magnetic anomalies. Feature 14 and 15 are dipolar anomalies at the eastern end of the surveyed area. Feature 16 is an irregular area of low magnetic response, with an area of high magnetism within it. Anomaly 20 is an area of high magnetism that runs along the northern edge of the surveyed area 3.

6.1.6.6. **Area 4**

Area 4 is located directly to the south of area 3 but has a very different nature. The area is characterised by a number of large areas of dipolar responses (21,22,and 23),there are also a number of linear high magnetic anomalies. Feature 26 runs almost parallel to the northern edge of the surveyed area, it forms a linear anomaly running approximately 80 metres in length. To the southwest of this is anomaly 27 a high magnetic linear response detected near to the southwest corner of the area. Feature 27 runs perpendicular to feature 26. Feature 24 I a series of four near parallel linear high magnetic anomalies each approximately 10 metres in length detected in the eastern end of survey area 4. Feature 25 is the location of an artificial cricket wicket.

6.2 **Resistance Survey**

6.2.1. **Area 5**

Figure 21: Resistance Survey Results Area 5. Contains OS data © Crown copyright [and database right] 2016. Contains Image © Google Earth. Image © 2016 Bluesky.

6.2.2. **Area 6**

Figure 22: Resistance Survey Results Area 6. Contains OS data © Crown copyright [and database right] 2016. Contains Image © Google Earth. Image © 2016 Bluesky.

6.2.3. **Resistance Survey Interpretation**

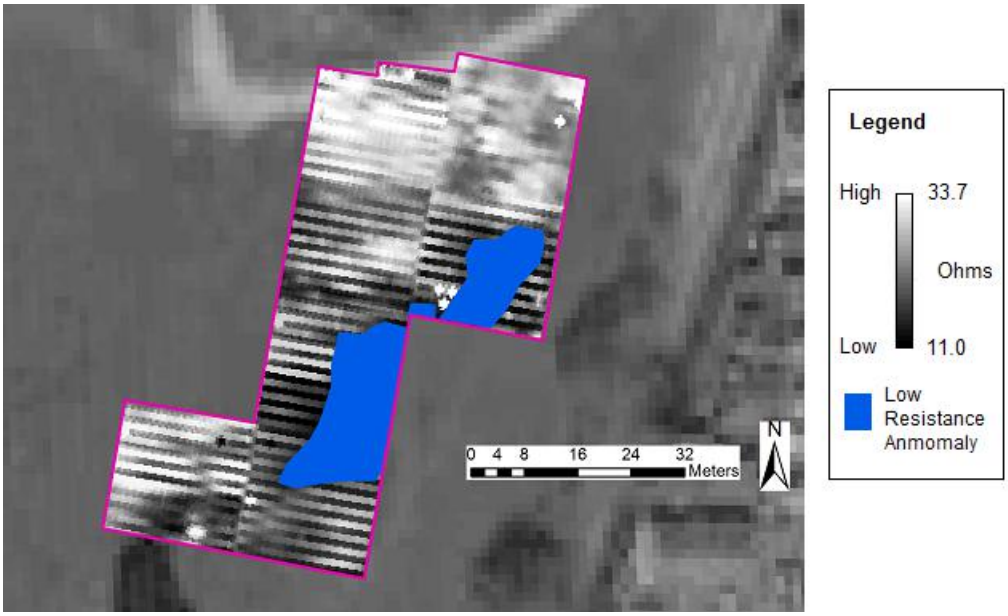

Figure 23: Low resistance Anomaly in Area 5. Contains OS data © Crown copyright [and database right] 2016. Contains Image © Google Earth. Image © 2016 Bluesky.

Figure 24: Low resistance Anomaly in Area 6. Contains OS data © Crown copyright [and database right] 2016. Contains Image © Google Earth. Image © 2016 Bluesky.

6.2.4. **Results**

6.2.4.1.

The resistance survey was undertaken in two areas which can be seen above in figures 21-22. The survey was undertaken with volunteers and members of the public under supervision from Mercian Archaeological Services CIC. The site was water-logged and boggy underfoot in both areas, and this has affected the results. Despite their poor quality the results have been displayed in figure 21 and 22. The results from area 5 have been displayed in figure 23 with an area of low resistance marked for interpretation purposes. Area 6 is displayed with an area of low resistance displayed in figure 24. These low resistance anomalies are discussed in the interpretations section below.

6.3 **Topographic Survey**

6.3.1. **Objective Survey Digital Terrain Model**

The results of the topographic survey are displayed below in figures 25-27. Two areas were surveyed for the report, Area 7 (see figure 5 above) was subject to an objective survey, and Area 8 (see figure 6 above) was measured through subjective survey. The results of the objective survey have been used to create a Digital Terrain Model (DTM) of the surveyed area. This is displayed as a shaded-relief model in Figure 26. A number of linear trends orientated east-southeast to west-northwest can be seen running parallel to the northern and southern edges of the survey area, and perpendicular to the eastern and western edges. These represent the individual transects walked by surveyors. The data was collected by a large number of different volunteers, each holding the equipment differently. The DGPS was set to allow a 0.1m vertical off-set measurement for the machine to be carried with

the base of the staff 0.1m above the ground surface. The DGSP is then carried with the staff held vertically. Any errors or deviations from this methodology will result in slight errors in the data. These narrow ridges aligned east-southeast - west-northwest can therefore be explained as errors in the data collection.

6.3.1.2.

A number of linear features running diagonal to the direction of data collection can be seen and these are discussed below.

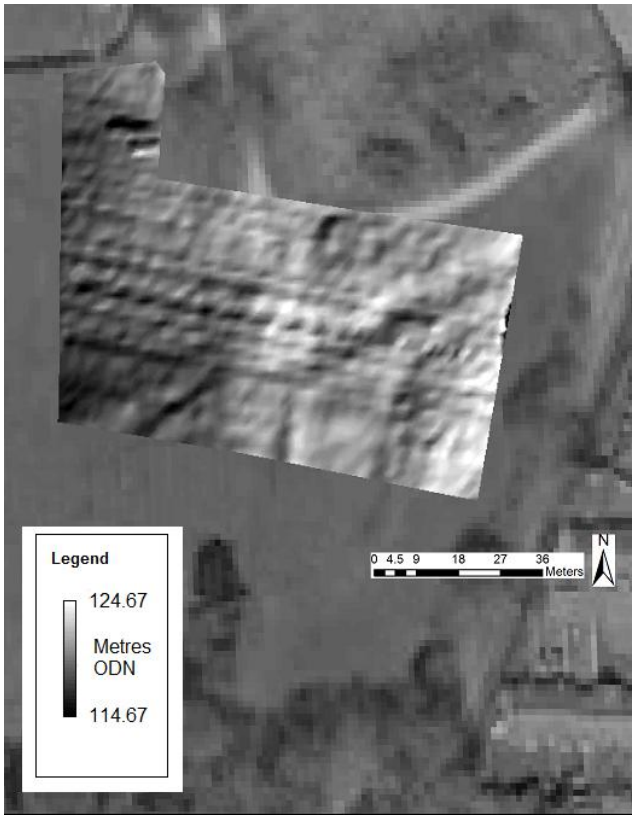

Figure 25: Objective Survey Digital Terrain Model image.Contains OS data © Crown copyright [and database right] 2016. Contains Image © Google Earth. Image © 2016 Bluesky.

6.3.2. **Subjective Survey Hachure Plan**

The results of the subjective are presented in figure 6 as a two-dimensional hachure plan of the site. The map uses hachures to define slopes. As explained above the archaeological surveyor decides which features to record, thus

allowing for in the field interpretations of the earthworks. This makes the survey subjective rather than the objective approach used for the DTM above. The surveyors recorded points along the tops and bottoms of slopes and then used hachures to display these features on a map. A hachure is a convention which uses in this instance a triangle to mark the top of the slope. The flat-headed side of the triangle is aligned with the top of the slope. The triangle then points down the line of the slope to the base of the slope. A line is used extending from the triangle to reach to the bottom of the slope. The length of the slope is therefore depicted by the length of the line of the individual hachure at that point. Hachures are closer together where the slope is steeper, and wider apart where it is shallower. This convention allows complex information about the ground surface to be portrayed on a two- dimensional map. The map contains features numbered 1-4 which are discussed below.

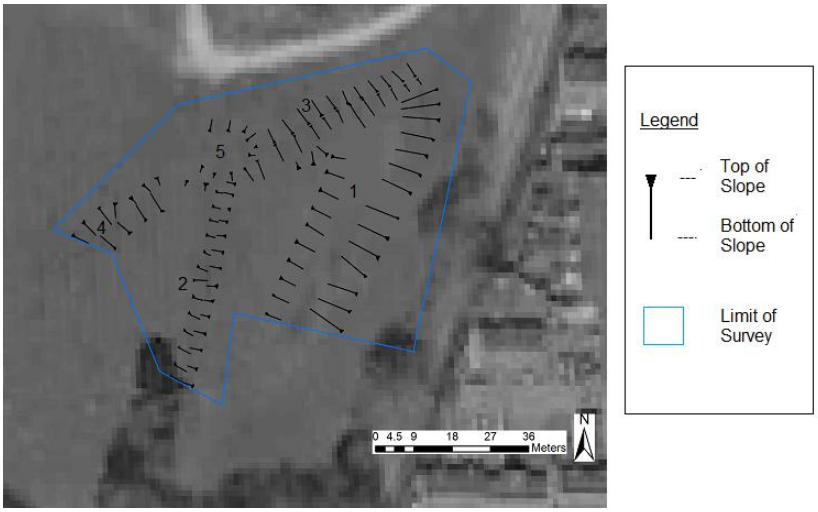

Figure 26: Hachure Plan of Subjective Survey.Contains OS data © Crown copyright [and database right] 2016. Contains Image © Google Earth. Image © 2016 Bluesky.

6.3.3. **Combined 2D and 3D Survey Results**

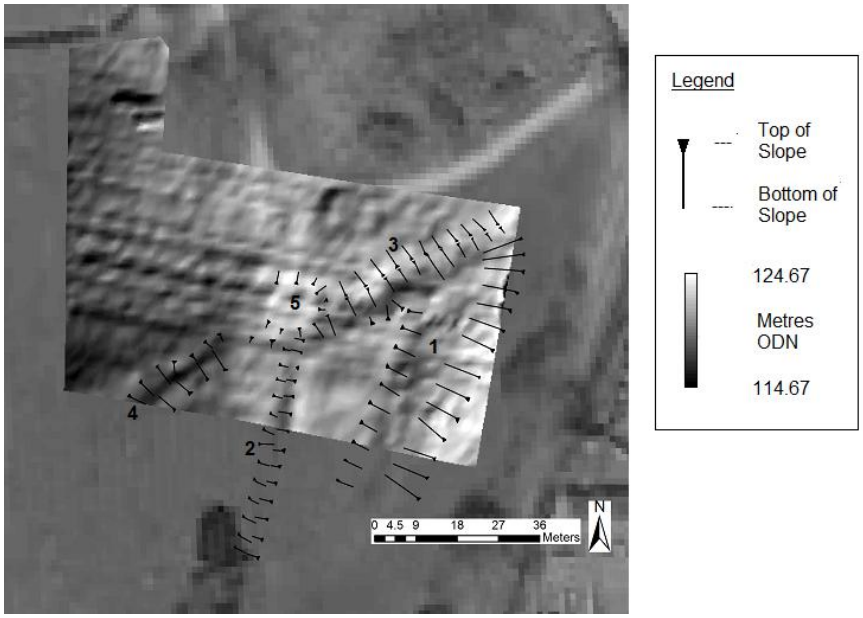

Figure 27: Combined 2D and 3D Survey Results. Hachure. Contains OS data © Crown copyright [and database right] 2016.
Contains Image © Google Earth. Image © 2016 Bluesky.

The results from the topographic survey in Areas 7 and 8 have been combined in figure 27 to help in interpretation. Figure 26 lists 5 features which have been detected by both the objective and subjective surveys. Feature number 1 is a linear depression approximately 20 metres wide at the top and up to 8 metres wide at the base. The depression is up to 0.4 metres deep but is shallower in places. It is orientated north-northeast to south-southwest at the eastern side of the surveyed area, it extends southward beyond the surveyed area, but is truncated or terminates to the north where it meets feature 3. Feature 3 is displayed in the hachure plan as a narrow ridge of hachures, which is also seen in the DTM. This feature is orientated northeast to southwest. This ridge creates a narrow ditch or gully on its southern flank seen in the DTM. The feature including the associated depression on its southern side is 10 metres wide, by 40 metres in length. The ridge stands 0.4 metres above the lower area to the south and 0.3 metres above the area to the north. The ditch is 0.2 metres deep. Features 2

and 4 are long linear ditches. Feature 4 is orientated northeast to southwest and extends out of the surveyed area in the southeastern side continuing on a similar orientation to feature 3. This feature is 9 metres wide and 21 metres in length as recorded, it is up to 0.3m deep. It extends beyond the area surveyed to the southeast. Feature 2 is a north- south orientated linear ditch approximately 45 metres in length (but extending beyond the surveyed area to the south) and 5 metres in width. The feature is ephemeral and only 0.2 metres deep in places. Features 2, 3 and 4 all appear to meet close to feature 5; a slightly raised sub-circular area.

7. Interpretations and conclusions

7.1.

The geophysical and topographic surveys have covered a number of areas each with their own characteristics. The anomalies and earthworks discovered are related to the landscape uses and changes in the layout of landscape features in the Bath Grounds and surrounding areas, including the castle grounds over time. Some of the features are important as they not only help to demonstrate that there are potentially important archaeological remains within the surveyed area but they also help to tell the story of the development of the site.

7.2.

The oldest surviving map of the area is the 1735 estate map by Gardiner (see Figure 28). The map depicts the castle in red and shows what appear to be the remains of formal gardens laid out in a large square area to the east and southeast of the castle (see figure 29). This large square area is sub-divided into

smaller square compartments. In the southwest these compartments are defined by a series of tree-lined avenues in an area marked “wilderness”. One of these tree-lined avenues runs southeastwards towards a geometric complex of ponds marked “Moats”, and to the south of the “Moats” a further pond is seen extending southwards. The area of ponds called the “Moats” still survives as silted up but waterlogged earthworks just outside the current Bath Grounds. The second pond is shown to the south of this; extending into what is now the southeastern corner of the Bath Grounds. These ponds are fed from the north by a stream on the western side. This is the Gilwiskaw Brook, and this was its course, as depicted on the map at this time.

7.3.

Previous work at the castle (Newsome et al 2008) has suggested that the ponds are possibly 13th century, and forming part of a medieval designed landscape. These ponds were subsequently included in gardens started in the 15th century and possibly remodeled in to a formal compartmentalised 16th century garden preserved on the 17th century map (Newsome et al 2008).

Figure 28: 1735 estate map by William Gardner of Ashby-de-la-Zouch. Reproduced with kind permission of Leicestershire, Leicester and Rutland Record Office DG 30/Ma/249/1. North to the right.

Figure 29: 1735 estate map by William Gardner of Ashby-de-la-Zouch (rotated 90° to the left). Reproduced with kind permission of Leicestershire, Leicester and Rutland Record Office DG 30/Ma/249/1. North to top.

7.4.

Examination of the results of the geophysical surveys and topographic survey suggest that multiple elements of the medieval/ post-medieval landscape survive either as earthworks or under the surface within the Bath Grounds and the Council Field.

7.5.

Figure 30 shows the results of the Magnetmometer survey for Area 1, figure 31 shows the interpenetration plot for area 1 Magnetometer survey, and figure 32 shows the topographic survey results; these are all overlain with the 1735 map set to 65% transparency, the results are discussed below.

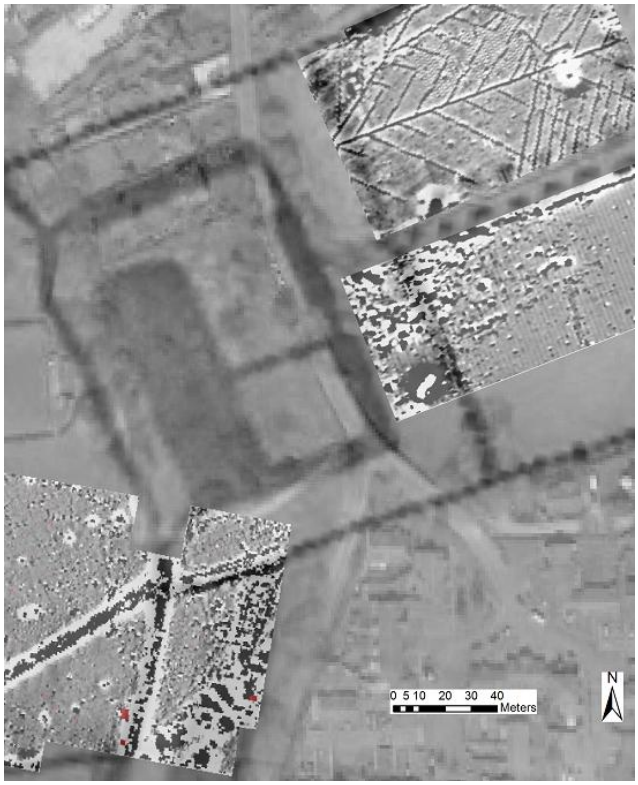

Figure 30: 1735 estate map by William Gardner of Ashby-de-la-Zouch, overlain on Magnetometer results Contains OS data © Crown copyright [and database right] 2016. Contains Image © Google Earth. Image © 2016 Bluesky.

Figure 31: 1735 estate map by William Gardner of Ashby-de-la-Zouch, overlain on Magnetometer results interpretation plot Area 1. Contains OS data © Crown copyright [and database right] 2016. Contains Image © Google Earth. Image © 2016 Bluesky.

Figure 32: 1735 estate map by William Gardner of Ashby-de-la-Zouch, overlain on Topographic Survey Results. Contains OS data © Crown copyright [and database right] 2016. Contains Image © Google Earth. Image © 2016 Bluesky.

7.6.

When overlain with the 1735 map certain features detected in the surveys align with elements on the map. Magnetometer survey feature 7 and topographic feature 1 appear to line up with the location of the southern-most of the two medieval ponds. Anomaly 7 is an area of mixed high and low magnetic deposits suggesting that the pond contains a mix of fills. The pond still survives at this location as topographic survey feature 1 a linear depression. These features also align with the low resistance anomaly recorded in the resistance survey of area 5 seen in figure 23. These earthworks therefore most likely represent the remains of an in-filled medieval pond. This pond is believed to form part of the designed landscape of the castle and its park, and therefore form part of the setting of the Scheduled Monument of Ashby Castle. The boundary between the northern ponds or “Moats” and the southern pond

depicted on the 1735 map align with the topographic survey feature 3, a linear bank with a ditch on the southern side. It also aligns with the alternating linear high and low magnetic anomaly 6 (see figure 31). It is proposed here that these earthworks represent the former boundary depicted on the map. This boundary appears to form an extension of the southern boundary of the formal park depicted on the 1735 map. This therefore possibly represents a late medieval/ post-medieval garden feature preserved as an earthwork and possibly under the surface in the southeastern corner of the Bath Grounds along with the medieval pond. Anomaly 5 and earthwork 2 both align with the course of the Gilwiskaw Brook as depicted on the 1735 map. This was the source of the ponds, and appears to be a straightened watercourse by at least the 17th century. It is possible that the stream was altered into this course when the ponds were constructed in the medieval period. The water channel is open and is depicted as such in 1884 (see figure 34) through to 1902 (see figure 35) on the 6 inch to 1 mile Ordnance Survey maps. The water channel at this location is absent from the 1925 Ordnance Survey map (see figure 36) and is shown in a culvert on the 1967 plan of the Bath Grounds (see figure 38). The linear depression is presumed to be an area of slumping over the channel cut for a brick culvert sometime between the 1902 and 1925 maps, and is represented by a high magnetic response.

Figure 33: 1735 estate map by William Gardner of Ashby-de-la-Zouch, overlain on Magnetometer results interpretation plot Area 1. Contains OS data © Crown copyright [and database right] 2016. Contains Image © Google Earth. Image © 2016 Bluesky.

7.7.

Figure 33 depicts the interpretation plot for Area 6 overlain by the 1735 map at 65% transparency. The high magnetic linear anomaly number 26 seem to align with the southern row of trees forming part of the boundary of the avenue leading to the ponds in the “Moats”. The linear high magnetic linear anomaly 27 aligns with the western boundary of the formal gardens and the eastern boundary of the “Moats”. It is suggested here that these anomalies represent preserved (possibly infilled ditches) associated with the boundaries of, and compartments within a formalised late medieval/ post-medieval garden. These features were fossilised in the landscape and are depicted on the Ordnance survey maps from 1884 to 1925 in figures 34 to 35. Mapping suggests that the boundary formed by anomaly 26 and 27 were present in the landscape, disappearing by the time of the 1961 Ordnance Survey map (figure 37). The

1961 map first shows the Memorial Field to the north as having been landscaped to form a sports pitch. It is possible that feature 27 extends northwards under the raised part of the Memorial Field. It is truncated in the survey to the north of the area by dipolar response 21. Anomalies 21 and 22 may represent dumped material possibly from the raising of Memorial Field to the north. Dipolar anomaly 25 may be from metal fencing in the current boundary.

Figure 34: Ordnance Survey 6 inch to 1 mile survey 1881-2 published 1884.

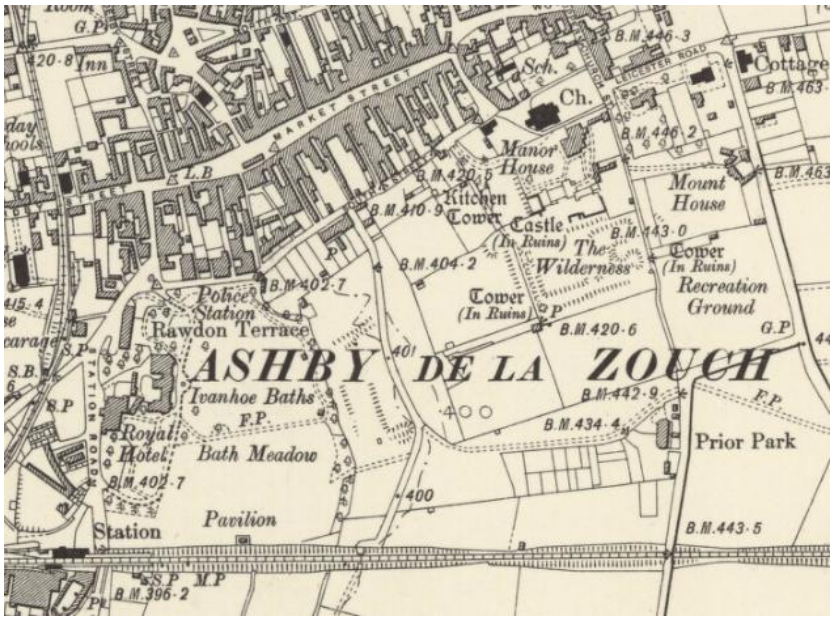

Figure 35: Ordnance Survey 6 inch to 1 mile survey 1901 published 1902.

Figure 36: Ordnance Survey 6 inch to 1 mile survey 1920 published 1925.

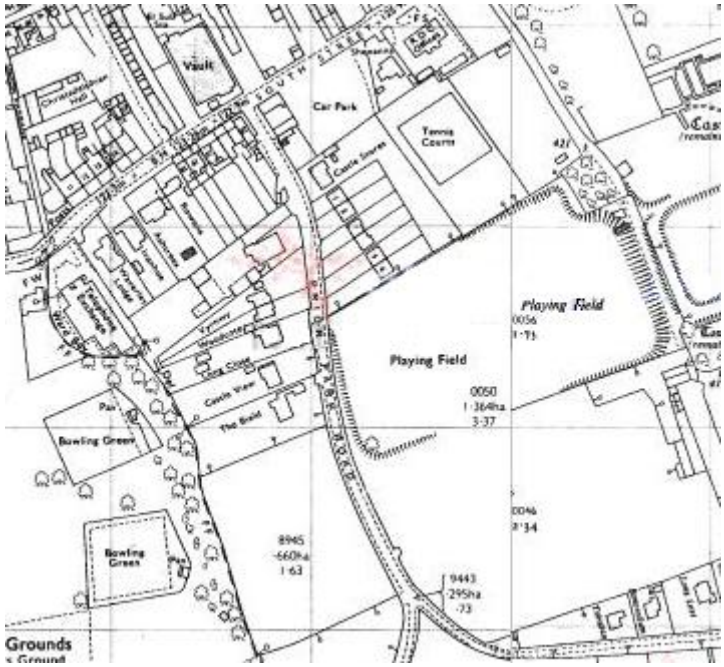

Figure 37: Ordnance Survey 1,2500 Map 1961.

7.8.

The high magnetic anomaly 4 (figures 20 and 31) is not

depicted on the 1735 map but is shown as an open water channel by 1884 (figure 34). This seems to represent one of two courses for the Gilwiskaw at this time, the one from 1735 and a new channel following the line of feature 4. This channel (feature 4) is not depicted on the 1902 map which was surveyed in 1901, suggesting that the channel had been set within an underground culvert by this time. It is presumed from the high magnetic response that this represents a brick lined culvert. The 1967 plan in figure 38 calls the feature a 12" storm sewer. The 1967 plan also shows the location of the Gilwiskaw Brook in a linear pipe crossing the Bath Grounds from north to south. This pipe appears to be metal and has been detected by the Magnetometer survey as feature 3 in Area 1 and feature 10 in Area 2. It is assumed that feature 4 was a diversion of the course of the brook by 1884, but by 1902 this was set in a covered culvert that perhaps acted as a storm drain with the main course diverted into the culvert preserved as anomalies 3 and 10. The original course depicted on the 1735 map is no longer in use by 1902. The 1967 plan also depicts a 9" sewer which runs along the alignment of anomalies 1 and 2 from the magnetic survey of Area 1. These services give a diploar reading suggesting they are metallic. In the northern part of the site a feature is recorded possibly as the "Holywell Spring tap" this feature may be detected as dipolar anomaly 9, and follows a curving course northwards from the west of Area 2 across the survey area. Anomalies 8 and 11 are not depicted on the 1967 plan but may represent metal pipes associated with water movement around the complex to the fountain that stood nearby, or with the Ivanhoe Baths site. The low magnetic anomaly feature 12 in Area 2 might be worth further investigation and may represent the location of a former building.

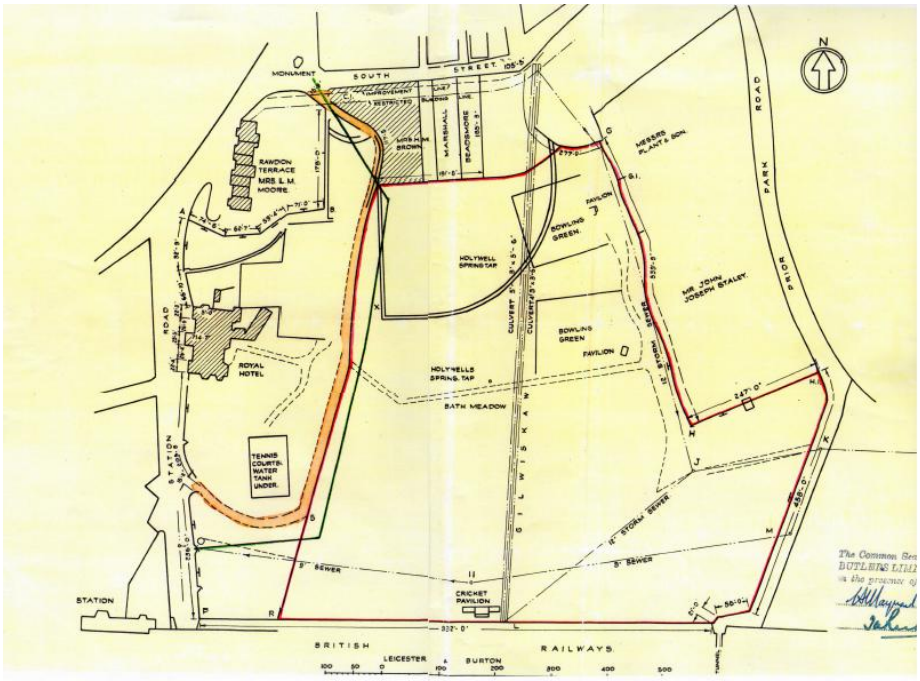

Figure 38: Plan from the Lease of the Ashby Bath Ground 1967. Reproduced Courtesy of Ashby-de-la-Zouch Town Council.

7.9.

The dendritic system of high magnetic anomalies seen in Area 3 represents a drainage network of presumably clay pipes. Anomaly 17 forms the main part of the system with anomalies 18 and 19 possibly representing later phases, as they cross the main system, possibly overlying it. They may represent subsequent attempts to drain boggier areas that the initial system did not cure. Figure 24 shows an area of low resistance associated with a water-logged part of the field seen during fieldwork. This corresponds with the area of pipe seen in anomaly 19, and could show that this area has had historic problems of drainage. The Trustees for the field initially invited Mercian on to the site to examine the area of a more recent attempt to solve the drainage, by searching for a plastic pipe laid in the last decade. The pipe was not detected, but the problems of drainage are not a recent phenomenon. The cut for

the pipe may be represented by disturbed ground seen in anomaly 13 in the corner of the field. The drainage network discovered is not seen in the Council Field to the south and so is assumed to date from the remodeling the Memorial Field for a playing field some time prior to the 1961 map. Dipolar anomaly 14 relates to metal service covers in the field. Anomaly 15 may represent a metal deposit.

7.10.

As well as the features above; a number of very discrete linear and curvilinear features are visible in the Magnetometer data for the Bath Grounds. These are presented below in figure 39. It is not possible to interpret these possible features, but they are presented to recommend further work of the site. It is possible that they represent earlier land use for the site and could represent very old field boundaries. However their ephemeral nature makes then very difficult to interpret. The features marked are selected because they do not follow the direction of data collection and cross grids. It is recommended that the area of the central Bath Grounds, especially within the boundaries of the current cricket pitch be subject to further geophysical survey as this area may provide evidence of past occupation, especially as the ground is lower here and may have less topsoil. The floodplain of the Gilwiskaw would have made a likely place for occupation from prehistoric times onwards. The area of the Bath Grounds is in very close proximity to the historic core of Ashby-de-la-Zouch, and has not been developed or built on in any major capacity since before the medieval period. In Medieval times the Bath Grounds was within the area of the Western Park of Ashby Castle. Its function before that time is unknown. It is possible that these features may date from medieval times or earlier, but further survey may be required to record these features properly. The cricket pitch

was avoided during this survey which took place during the cricket season.

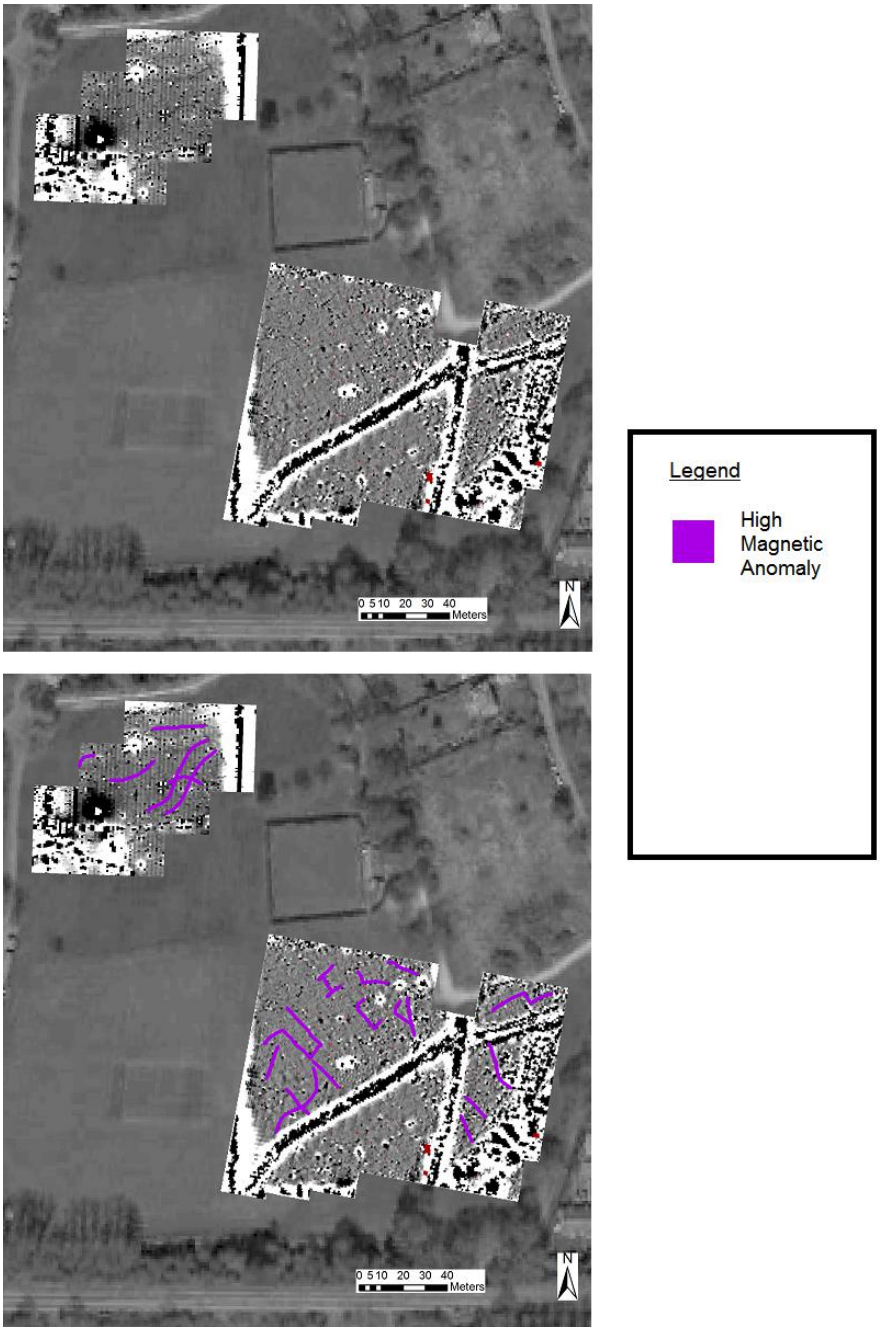

Figure 39: Geophysical Magnetometer Survey Results Area 4, 2016. Magnetometer data greyscale image, Clipped +/- 5NT, Destriped, De-Spiked (Threshold 1.0), Interpolated Vertical. Contains OS data © Crown copyright [and database right] 2016. Contains Image © Google Earth. Image © 2016 Bluesky.

. 7.11.

In summary the geophysical and topographic surveys of

the Bath Grounds, Memorial Field and Council Field produced some very interesting results. The survey has uncovered an interesting array of anomalies and earthworks relating to water management; from the previously unknown complex dendritic drainage system in the Memorial Field, to the identification of features relating to the history of drainage and water management on the Bath Grounds site, and the various historic courses of the Gilwiskaw Brook. The survey has also detected ephemeral features across the Bath Grounds site that could represent prehistoric to medieval features, which would benefit from further research and fieldwork. Perhaps most significantly the surveys found features preserved below ground that might represent former boundaries and compartments within a large square shaped formal gardens dating from the medieval to early post-medieval periods within the Council Field. The survey also detected earthworks in the southeastern corner of the Bath Grounds park that relate to the boundaries of these gardens and wider designed landscape, and also recorded the earthworks of the southern-most of the two ponds depicted on the 1735 estate map and found good evidence for the sub-surface preservation of the in-filled medieval pond system. This pond was part of a medieval system that is believed to have formed part of a medieval designed landscape from the 14th century. The ponds were presumably designed to be viewed from the castle and vice versa in this period. In the 15th - 16th century these ponds were incorporated into, and even influenced the shaping of a formal gardens laid out below the castle. Therefore these ponds form part of the setting of the castle. The possibility that these ponds survive underground and as earthworks, alongside possible surviving earthworks from the gardens suggests that this corner of the Bath Grounds should be considered as part of the setting of the Scheduled Monument of Ashby Castle.

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10. Disclaimer:

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Geophysical techniques are not a map of the ground and are instead a direct measurement of subsurface properties. Detecting and mapping features requires that said features have properties that can be measured by the chosen technique(s) and that these properties have sufficient contrast with the background to be identifiable. The interpretation of any identified anomalies is always subjective. While the scrutiny of the results is undertaken by qualified, experienced individuals and rigorously checked for quality and consistency it is often not possible to classify all anomaly sources; while there will be degrees of certainty for others. Where possible an anomaly source will be identified along with the certainty of the interpretation. The only way to improve the interpretation of results is through a process of comparing excavated results with the geophysical reports.

Appendix I

Community Archaeology Photographs

Picture 1: Instructing volunteers for laying out Geophysics grids and introducing the DPGS.

Picture 2: Volunteers undertaking Geophysical Resistance Survey in Area 5.

Picture 3: Volunteers braving the elements to undertake Resistance Survey and Objective Topographic Survey on the Bath Grounds

Picture 4: Volunteer undertaking Objective Topographic Survey at the Bath Grounds

Picture 5: Volunteers undertaking Resistance Survey

Picture 6: Volunteers pegging out the Geophysical Survey gird in the Memorial Field

Picture 7: Volunteers pegging out the Geophysical Survey gird in the Memorial Field

Picture 8: Volunteer undertaking Geophysical Magnetometer Survey in Area 2 of the Bath Grounds

Appendix II

Historic Environment Record

Archaeological Monuments on the Historic Environment Register:

MLE16077	Midland Railway, Leicester & Burton Branch line
MLE16085	Midland Railway, Ashby to Derby line
MLE16627	Burton and Ashby Light Railway
MLE20653	Turnpike Road, Leicester to Ashby-de-la-Zouch
MLE20654	Turnpike Road, Ashby-de-la-Zouch to Burton on Trent
MLE16992	Willesley Basin to Ticknall tramway
MLE16992	Willesley Basin to Ticknall tramway
MLE20911	Turnpike Road, Loughborough to Ashby-de-la-Zouch
MLE20914	Turnpike Road, Tamworth to Sawley Ferry
MLE20914	Turnpike Road, Tamworth to Sawley Ferry
MLE21280	Turnpike Road, near Moira to near Ashby-de-la-Zouch

Building Monuments on the Historic Environment Register:

MLE15047	STREET BOUNDARY WALL TO THE EASTERN BUILDINGS OF ASHBY DE LA ZOUCH BOYS' GRAMMAR SCHOOL, LEICESTER ROAD (SOUTH SIDE)
MLE15040	SOUTHERN GARDEN WALL AT THE VICARAGE, UPPER CHURCH STREET (WEST SIDE), ASHBY DE LA ZOUCH
MLE14439	GARDEN BOUNDARY WALL TO THE NORTH OF MANOR HOUSE SCHOOL, SOUTH STREET (SOUTH SIDE), ASHBY DE LA ZOUCH
MLE14437	ENTRANCE GATES & PIERS TO CHURCHYARD OF ST HELEN'S PARISH CHURCH (FORMERLY LISTED AS GATEWAY TO CHURCHYARD AT CHURCH OF ST HELEN)
MLE15038	GATE PIERS AND STREET BOUNDARY WALL AT ASHBY DE LA ZOUCH BOYS' GRAMMAR SCHOOL, SOUTH STREET (SOUTH SIDE)
MLE15037	GATE PIERS AND WALL AT ENTRANCE TO MANOR HOUSE SCHOOL, SOUTH STREET (SOUTH SIDE), ASHBY DE LA ZOUCH
MLE15106	WESTERN WALL & GARDEN BOUNDARY WALL (INCLUDING WESTERN END PIERS) AT NO.26A (GLENRIDDING), KILWARDBY STREET (NORTH SIDE), ASHBY DE LA ZOUCH
MLE15107	GATE PIERS AT MANSION HOUSE, KILWARDBY STREET (NORTH SIDE), ASHBY DE LA ZOUCH
MLE14980	BOUNDARY WALL TO SOUTH SIDE OF KILWARDBY STREET AT NO. 1, 1, TRINITY CLOSE, ASHBY DE LA ZOUCH
MLE14978	BOUNDARY WALL TO SOUTH SIDE OF KILWARDBY STREET AT NO. 2, 2, TRINITY CLOSE, ASHBY DE LA ZOUCH
MLE15113	STREET BOUNDARY WALL TO GARDEN OF NO. 44 (THE SHRUBBERIES), KILWARDBY STREET (NORTH SIDE), ASHBY DE LA ZOUCH
MLE15116	CEMETERY GATE PIERS, RAILED WALL AND GATES, MOIRA ROAD (SOUTH SIDE)
MLE15115	BOUNDARY WALL TO SOUTH SIDE OF KILWARDBY STREET AT NO. 3, 3, TRINITY CLOSE, ASHBY DE LA ZOUCH
MLE15114	BOUNDARY WALL TO SOUTH SIDE OF KILWARDBY STREET AT NO. 4, 4, TRINITY CLOSE, ASHBY DE LA ZOUCH
MLE15066	RAILINGS, PIERS, GATE AND LAMPS ATTACHED TO WAR MEMORIAL, MARKET STREET (NORTH SIDE), ASHBY DE LA ZOUCH