Early Modern warfare: 1600-1745

The Civil Wars were an intense period of warfare in which England, Ireland, Wales and Scotland were all involved. While for historically incidental reasons this report is confined to England, the study and management of battle archaeology of the Early Modern age should be British Isles-wide.

There are over 400 English records on the database for the 17th century. Of these just one, the Anglo-Scottish battle of Newburn Ford (1640), precedes the Civil Wars, though in reality it should be treated as part of the same phase of warfare.

From 1660 come another nine actions. Three were part of the Anglo-Dutch wars, involving naval landings around the Thames Estuary, on the Medway and at Landguard and Sheerness forts in 1667. The main actions stem from the Monmouth rebellion, the abortive attempt to overthrow James II in 1685. This campaign saw a series of skirmishes at Bridport, Keynsham and Norton St Philip and then the final destruction of the rebel army at Sedgemoor.

In military terms the events of 1688 represent little more than a footnote to the Monmouth rebellion. They saw the successful overthrow of James II by a Dutch army under William of Orange which had strong support in England and so involved only token resistance in skirmishes at Reading and Wincanton.

Apart from the phasing out of the matchlock in favour of the flintlock amongst most of the government troops, and the apparent introduction of the hand grenade to the battlefield,[1] military practice and equipment changed little between the 1640s and 1680s. The pike was still in use and the bayonet would not be used in action until 1689 at Killiecrankie. Thus the warfare of the 1680s is treated here alongside those of the Civil Wars.

[1] The grenade may have been used in some circumstances in the 1640s

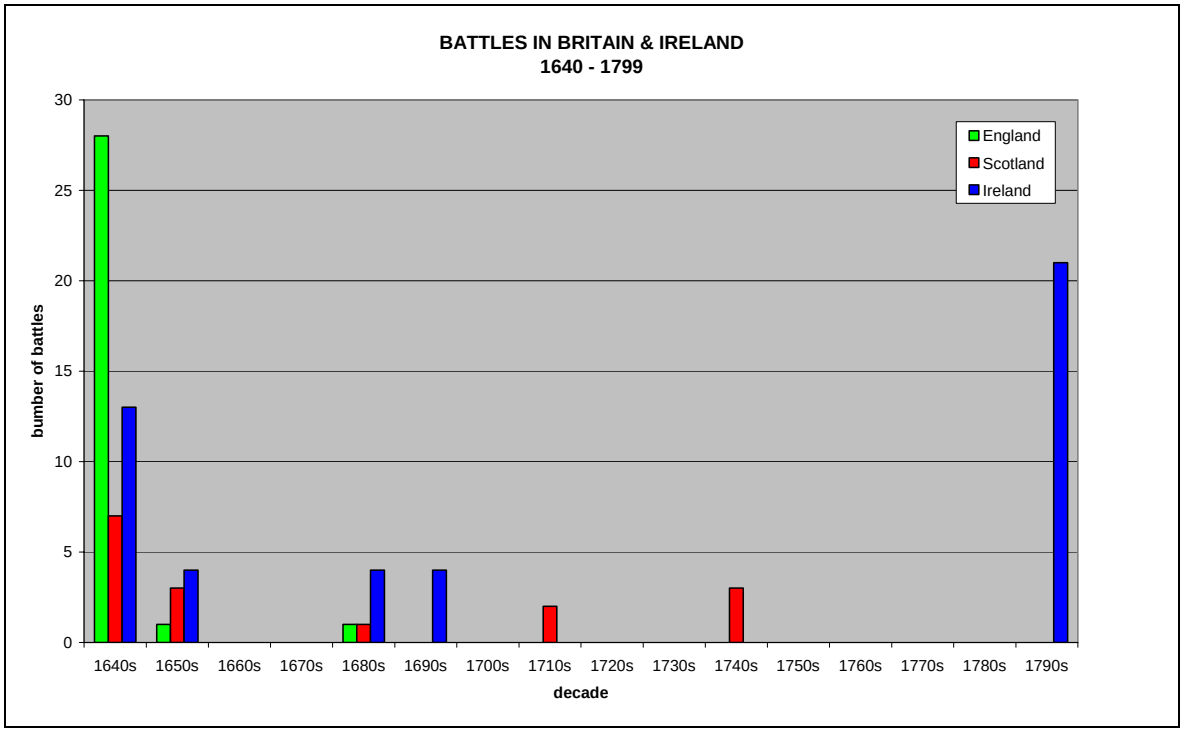

Figure 51: Battles in Britain and Ireland, 1640-1799

The database also contains 20 actions in England from the 18th and 19th centuries. Of these four are 19th century events of civil unrest, such as the Gordon Riots. One is an American naval landing at Whitehaven in 1778, during the American War of Independence. None were substantial, and all lie beyond the scope of the present study. The significant actions from this later period are all from the Stuart uprisings based in Scotland. In 1715 during the first Jacobite rebellion a substantial army entered England via the west coast route. At Penrith they were faced by local levies who fled rather than engage, with the result that this was not a significant engagement. Subsequently the rebel army was defeated in an urban action at Preston but although some 6000 troops were involved, Preston II was an urban street fight and is normally classified as a skirmish whence no significant terrain or battle archaeology is to be expected.

During the second Jacobite uprising in 1745, following their victory at Prestonpans, another rebel army some 5000 strong entered England, again via the western route. They first took the garrison of Carlisle on 15 November and then continued south as far as Derby where the massive scale of the government response forced them to retrace their steps. With a detachment of cavalry, dragoons and mounted infantry the Duke of Cumberland pursued the rebels and on 18 December engaged them in a running skirmish around the village of Clifton and on Clifton Moor on the upland pass north of Shap in Cumbria. Only about 50 troops

were killed but it was an effective rearguard action for it allowed the rebel army to escape into Scotland. Although it cannot be classed as a battle it was the last substantial action to take place on English soil. Clifton is also reasonably well documented, including the Jacobite battle plan, and may be expected to have left significant archaeological traces. As the only 18th century action of note where the field of conflict is likely to remain intact, this site should be fully assessed.

Clifton aside, for warfare of the 18th century which can yield a substantial battle archaeology it is to Scotland that one must look for the first half of the century and to the British campaigns in Ireland for the 1790s.

The focus of interest here is the period of the Civil Wars, together with the addendum of the Monmouth Rebellion.

The most important conclusion of this study is that battlefields of the early modern period can no longer be studied in isolation from other fields of conflict, including sieges and skirmishes, and other military sites, including garrisons and shipwrecks. Archaeologically, these different aspects are interdependent, with the potential to answer questions better when explored together than alone.

Seventeenth-century warfare

England saw no military action in the first forty years of the century. In the 1640s it was plunged into what was arguably the most intense period of warfare in its history. This age of civil conflict can be divided into five phases. The first opened with a clash between Charles I and his Scottish subjects that led to the First and Second Bishops Wars, which saw Scottish armies enter England and in 1640 culminated in the first battle on English soil since Solway Moss nearly a century before.

The main events belonged to the First Civil War (1642-1646), followed in 1648 by the Second Civil War. The Third Civil War developed out of a pre-emptive strike by English government forces into Scotland in 1650 to counter a campaign for the English crown that was being planned by the son of Charles I from his Scottish kingdom. Despite Cromwell's success at Dunbar, there was an invasion of England in 1651 that ended in the destruction of the largely Scottish army at Worcester, one of the largest and most complex actions of the war. The final years of the Republic saw no further battles but were troubled by several small scale royalist rebellions, the Penruddock Rising (1655) and the Booth Rising (1659), which led only to minor skirmishes.

The Civil Wars differ from earlier periods of warfare not simply in scale and intensity, but also in the wealth of primary written sources that refer to them, and the range of physical evidence that has survived. The scale and depth of action, together

with the quality and detail of scholarly analysis already undertaken, puts the Wars on a European scale of importance, as an example of warfare in the period when the full development of pike and shot tactics had been achieved. The short period within which the Wars took place also makes it likely that evidence on garrison sites will not be confused by later or earlier action and military occupation. Methodology for research into the archaeology of this period is increasingly well developed.[2]

It has not been practicable to attempt a list of all the minor actions, but a pilot study was undertaken to establish the scale of information that could be rapidly retrieved. Thus in addition to the more intensive work on battles of all periods in Cumbria and West Yorkshire, discussed above (p.00), several of the county histories on the Civil War were also examined to identify the number of sieges, skirmishes, beating up of quarters and other minor military events.

Five works were examined, from the later 19th or early 20th century, which was a period of intense interest in the history of the Civil Wars Thomas-Stanford's 'Sussex' yielded four sieges and four skirmishes not already present on the database. Bayley's 'Dorset' gave eight new sieges and three other minor actions. Broxap's 'Lancashire' added no significant sites. Such variation is explained in part by the fact that some HERs have better listings of Civil War sites than others, and some counties are better served than others by the national overviews that were used for the general database enhancement phase.

One more county, Shropshire, was enhanced from a modern study of the war followed by field visits, though here the emphasis was on siege sites (below, p.00).[3] Given that most counties or regions have one or more secondary works on the Civil War, a national review would be useful to collect the majority of lesser garrison and siege sites and many of the skirmishes. It might also help to decide the scale of some of those actions which sit on the boundary between battle and skirmish. But this is not a high priority.

Sieges and related sites

Sieges lay largely outside the present study, other than for scoping purposes. However, for the Civil War the evidence they offer is so closely associated with the characterisation of battle archaeology that it was essential to address them in more detail. The scale of the data retrieved incidentally from the SMR and bibliographic searches enabled this.

[2] Harrington, 2004; Foard, 2008a
[3] Bracher and Emmett, 2000. Rapid searching of other county volumes was precluded by the absence or inadequacy of indexes

There are five types of evidence for military action that may be recovered from siege sites: bullet scatters, bullet impact scars scatters, siege works, destruction levels and burials. Key aspects of this resource have never previously been characterised or investigated. The present discussion is therefore offered as a scoping exercise, to illustrate what would be achievable through a full resource assessment of what emerges on the one hand as an important class of monument, and on the other as a category that has largely escaped strategies for management of the historic environment.

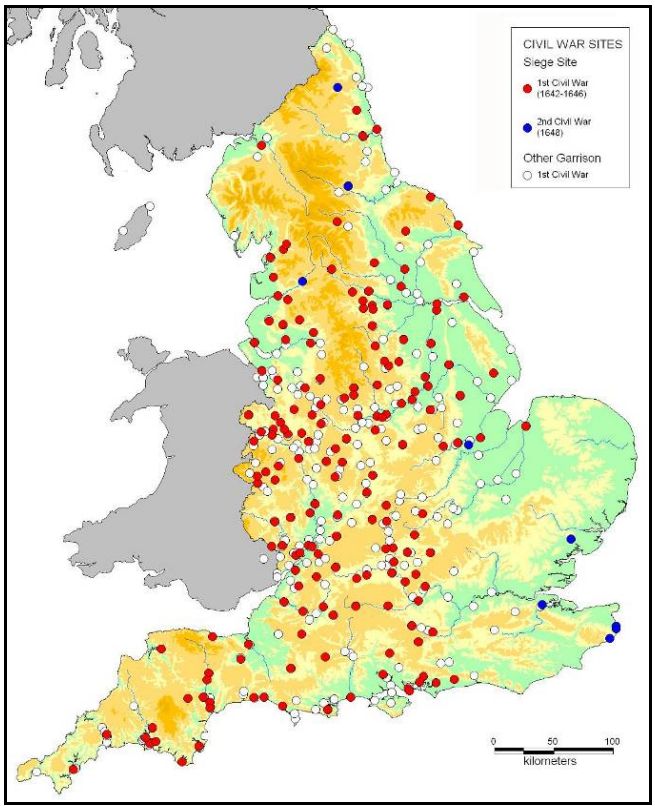

Figure 52: Siege sites and garrisons of the Civil Wars in mid 17th-century England

The database (not a definitive list) includes 242 sieges in England from the Civil Wars, of which 223 are from the first Civil War (1642-6) and 19 from the second (1648).[4] These comprise just 189 siege sites as a number of garrisons were besieged more than once (e.g. Basing House, attacked in 1643, 1644 and 1645).

Evidence from a siege will vary in nature according to the scale, duration and character of the action, the size of the garrison and the attacking forces and the scale of the defences. A siege that involved attempts at storming is more likely to have left complex and informative archaeological evidence. It was not practicable to

[4] Hutton and Reeves, 1998

distinguish where storming took place, but the 41 stormings identified here are almost certainly a large underestimate.

In addition to offensive works such as trenches to approach the defences or saps to undermine them, siege works are likely to have been accompanied by camps, sometimes with their own defences. Such constructions can be substantial, as seen with the siege of Newark, which appear to be the only major complex of English Civil War offensive works to have been the subject of extensive archaeological study.[5] No attempt has been made here to collect information on the detail of the siege works themselves.[6]

In addition, there are garrisons for which no record of a siege has been identified (and hence do not appear as such on the Fields of Conflict database) but yet may have seen some action. To catch these, a supplementary database of Civil War garrisons, developed independently, has been used to map their distributions as ancillary data.[7] This is probably the most complete listing so far produced, but is still not exhaustive: for instance, it is very possible that a small number of sites were defended at some point during the war, and saw action, but were not garrisons as such. For example, the church of St Mary at Canons Ashby, Northamptonshire, was used as a place of refuge by a tax-collecting force from Northampton when attacked by troops from the royalist garrison of Banbury. The latter proceeded to launch an attack on the church, blowing the door with a petard and firing the tower, which remains a floorless shell today as a result.[8] Additional garrisons and such lesser sites of action would only be identified by a systematic search of secondary works that have been produced at a county and regional level. The present data for sieges must therefore be taken as interim.

Magazines and related evidence

Garrisons are identified here not only because some of them may have seen action but also because they have a research potential with wider relevance to battlefield studies. Many were occupied only briefly, and since they often have clear destruction phases they can provide exceptional sealed assemblages of Civil War date. They will normally include unfired bullets, which may provide a calibre signature for the types of firearm in use by a particular force, as seen below with the Beeston castle and

[5] RHME, 1964. Some other sites have seen more limited investigation, as at Plymouth
[6] Some information is provided in Harrington, 2003, 35-39 and Harrington, 2004 but this does not appear to be an exhaustive catalogue.
[7] Sources included: Gaunt, 1987; Foard, 1995; Atkin, 1995; Bracher and Emmett, 2000; Harrington, 1992; Harrington, 2003; Kenyon and Ohlmeyer, 1998; Baker, 1986; Newman, 1985; Marix Evans, 1998
[8] Page, 1893

Sandal castle data sets. If so, such information will assist the analysis of battlefield assemblages as well as being of interest in its own right.

In a few cases remains of the magazine may survive, as with the 1691 garrison of Ballymore in Ireland, where more than more than 2000 unfired bullets illuminate the nature of the munitions in use at the time by a particular army.[9] Garrison assemblages may also contribute to the resolution of problems of identification of non weapon-related artefacts in use by the military, and assist in their separation from other metal artefacts deposited by agricultural and other non-military activity over the centuries.

A maritime contribution

Of yet greater importance for the characterisation of munitions and other equipment are shipwrecks. There are many European wrecks scattered around the world; warships or supply vessels carrying munitions are well-dated sealed assemblages which can contain near-unique data, valuable for the interpretation of battlefield archaeology. Just two from the 17th century were assessed in association with the present project: the *Duart*, lost off Scotland c.1650, and the *Vasa*, wrecked in 1628 in Stockholm harbour. With the exception of the Akko I shipwreck from the harbour at Haifa, Israel, which seems to represent naval combat c.1800, nearly all the bullets so far seen from wrecks are unfired and mainly magazine assemblages. These collections are essential for the first stages of characterisation of early modern munitions in use on the battlefield. The resulting bullet calibre graphs are presented here. Individual bullets have also provided a reference collection of unfired munitions for comparison with the mainly fired munitions recovered from battlefields and siege sites.[10] Having demonstrated the value of the data and the effectiveness of the methodology for analysis, what is now required is for the data from excavated European wrecks around the world to be brought together in a single study to more effectively define the calibres and character of munitions in use by different European armies from the 15th to the early 19th century as an essential reference point for the archaeological study of early modern warfare.

[9] Foard, 2008a
[10] Foard, 2008a

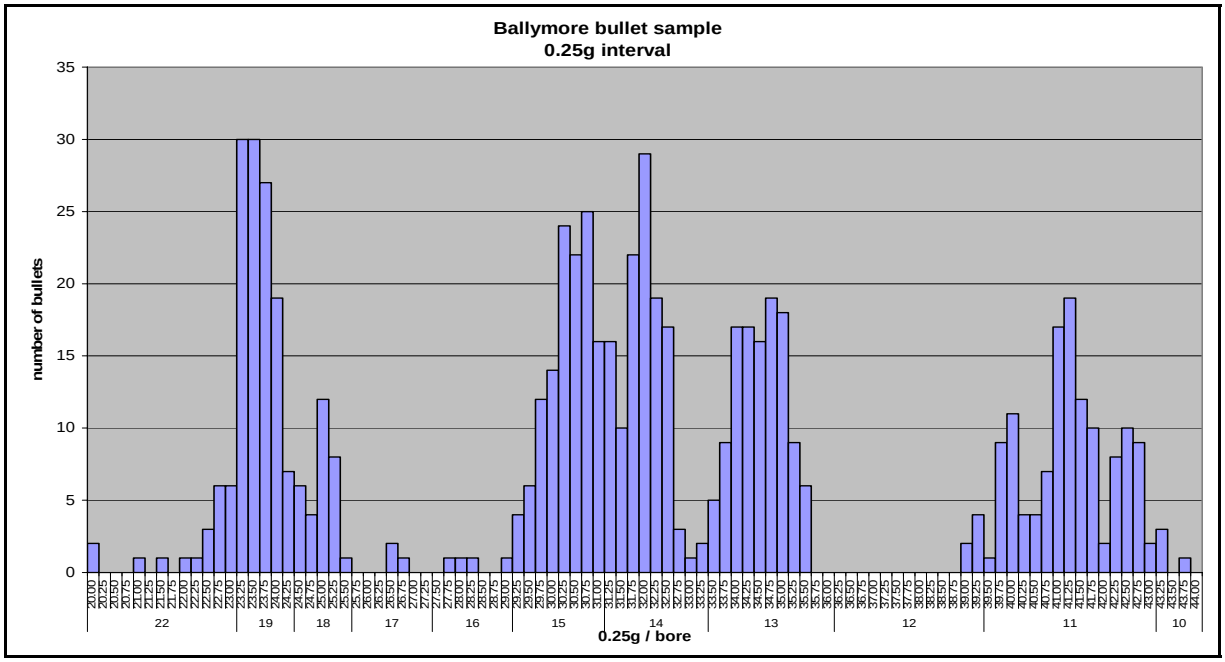

Figure 53: Calibre graph for lead ball from the 1691 siege of the Ballymore garrison, Ireland[11]

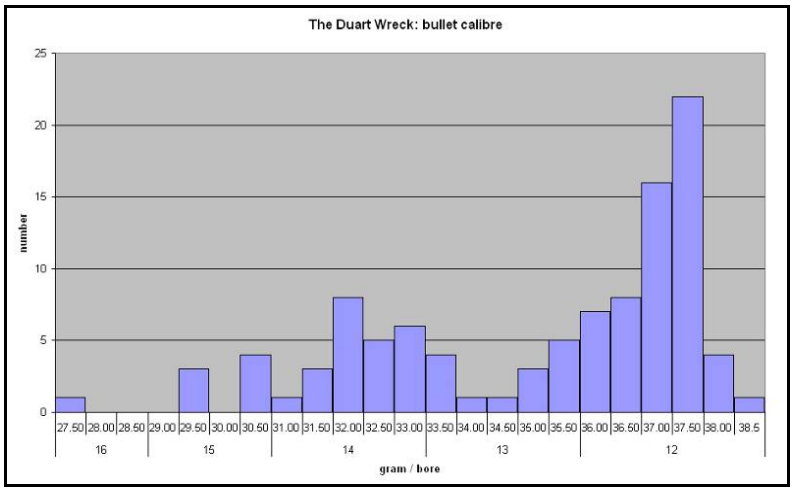

Figure 54: Calibre graph for lead ball from the *Duart*, lost off Scotland c.1650[12]

[11] Foard, 2008a
[12] Foard, forthcoming a

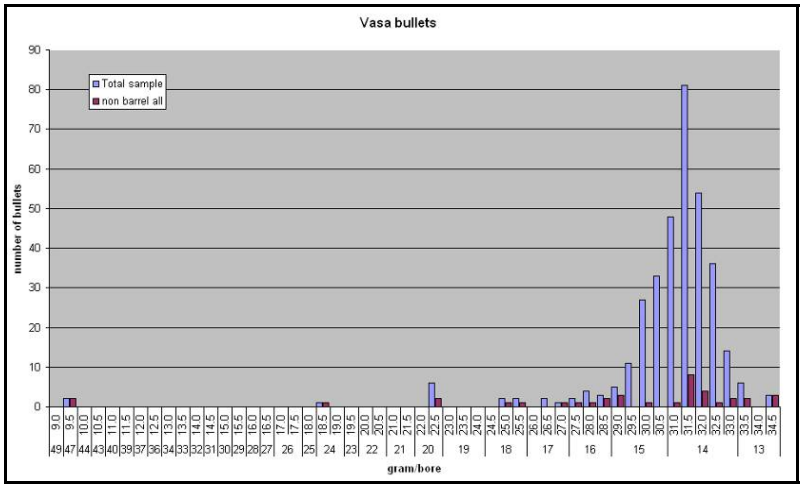

Figure 55: Calibre graph for lead ball, mainly of one calibre intended for case, from the *Vasa*, wrecked in Stockholm harbour in 1628[13]

Impact scars and impacted bullets

Buildings on fields of conflict may bear scars resulting from fire-fights or artillery bombardment. To date there has been no systematic study of such evidence. Limited recording has thus been carried out on several sites, to sample the nature of this resource and to assess where and how it is likely to present itself.

[13] Foard, 2008a

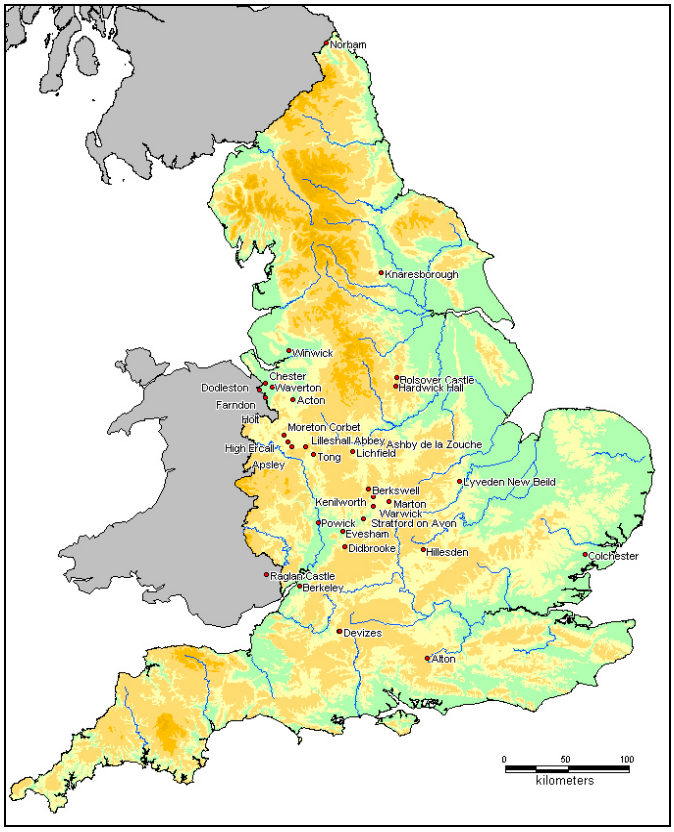

Figure 56: Sites with signs of bullet impact scars

Impact scars have long been known, but have been treated as a curiosity rather than a potential source of information.[14] Field inspection of 16th and 17th century battlefields in England for the present project produced impact scar evidence only at Nantwich (Acton church). There are reports of impact scars on Winwick church, which was a refuge for some routed troops from the 1648 battle of Winwick Pass, but the church was also part of a garrison in 1643 and the evidence may not relate to the battle.[15] The rarity of such cases is in part because few battles involved the use of buildings or walls for defensive purposes, and because not all structures that might have been so used have survived. For example, at Adwalton Moor royalist musketeers took cover behind isolated buildings and enclosures to slow down the parliamentarian approach to the moor. They were driven off in a fire fight by parliamentarian musketeers, but none of those buildings remain.[16]

This type of evidence is far more common on siege sites, particularly castles and churches. The accompanying map gives results of a rapid assessment of a small

[14] Barrett, 1896, 285
[15] Information from Michael Rayner
[16] Foard, 2003a; Johnson, 2003b

sample of siege sites of the 17th century, together with examples that have come to light incidentally. Many more such sites will exist.[17]

Scars result from bullet impacts on all but the hardest stones, such as granite. They are most clearly defined on dressed stone, particularly sandstone or limestone, but may be lost or obscured by erosion on friable stone and are very difficult to recognise on rubble. Scars can be several centimetres deep and typically have a cup-shaped central depression often with surrounding shallower surface spalling. There may also be one or more radial fractures, especially where the impact is close to the edge of a block of stone when larger pieces of stone may also have been broken off. Such attributes are quite distinctive compared to pitting of stone due to the natural erosion of faults in stonework and other damage caused by human activities. Normally problems of recognition only occur where stonework is heavily eroded.

Figure 57: Bullet impact scars on sandstone at Ashby de la Zouche castle (an English Heritage property), showing the typical cup shaped core though there has been some erosion of the spalled surrounding surface. There is also one example of radial fractures and another of fragmentation due to impacting close to the edge of a stone.

While most of this evidence appears to be from musket fire, occasionally there are larger scars which have resulted from roundshot fired by artillery, as at Tong church, Shropshire and on the defences of Chester. The latter appear to be the only published example of impact scars that have been subject to recording.[18] Structural damage from artillery fire is reported on several other sites, including Lichfield Cathedral which suffered two Civil War sieges.[19] Other types of munition

[17] While the large majority should prove to be the result of Civil War action, a few may be the result of later target practice, as with the impact scars identified on Lyveden New Build, Northamptonshire which is known never to have been defended in the Civil War but which did lie within a hunting landscape. Lyveden is said to have been used for a day or more as a military camp in the 18th century.
[18] Ward, 1987
[19] Information from Bob Meeson; Morris 1979

that may have left such scars, of varying form and scale, are case fired by artillery, and carbine, pistol and hailshot fired from small arms.

Figure 58: Roundshot impact scar from artillery fire against the exterior of Tong church, Shropshire

Only one example of a roundshot impact scar has been noted on brickwork: the wall of the Grange within the outermost defences of Basing House.[20] The character of bullet impact scars on brick seems to be quite different from those on stone, with a far more jagged and fractured form, as demonstrated by an example of Minie ball impacts from the American Civil War on the Carter House in Franklin, Tennessee. However it should be noted that the Minie ball had a higher velocity than a 17th century musket bullet and the brick may have been harder, so it is possible that 17th-century examples will differ. Another variant is the bullet hole, which is seen on various siege sites including the timber framed 'Siege House' at Colchester, on the main door at Hillesden church, Buckinghamshire and on the tower doors at Berkeley church, Gloucestershire.

[20] Information from Alan Turton

Figure 59: Detail of impact scars on brick on an outbuilding of the Carter House, Franklin, Tennessee from Minie ball fired in an assault during the American Civil War

Figure 10: Hillesden church, Buckinghamshire, showing bullet hole in wooden door in north porch from the storming of the garrison in hall and church, 1643

Given the lack of previous analysis, in the present project a simple method has been developed for the recording of impact scars. Firstly they have been mapped in plan, to record the surviving distribution and thus give an indication of the intensity and direction of incoming fire around the site. Two example sites have been mapped in this way: Acton church, Cheshire (battle of Nantwich, 1644) and Morton Corbet castle, Shropshire (siege, 1644). Secondly a sample section of the elevation of Morton Corbet castle has been recorded, to present the vertical distribution of impact scars. This complements the plan, as distinctive patterning in the vertical plane has been noted on many of the sites. A simple method of recording individual scars has been trialled on Kenilworth castle, with vertical and horizontal sections produced with a template to accompany a photograph and annotated scale drawing of the scar.

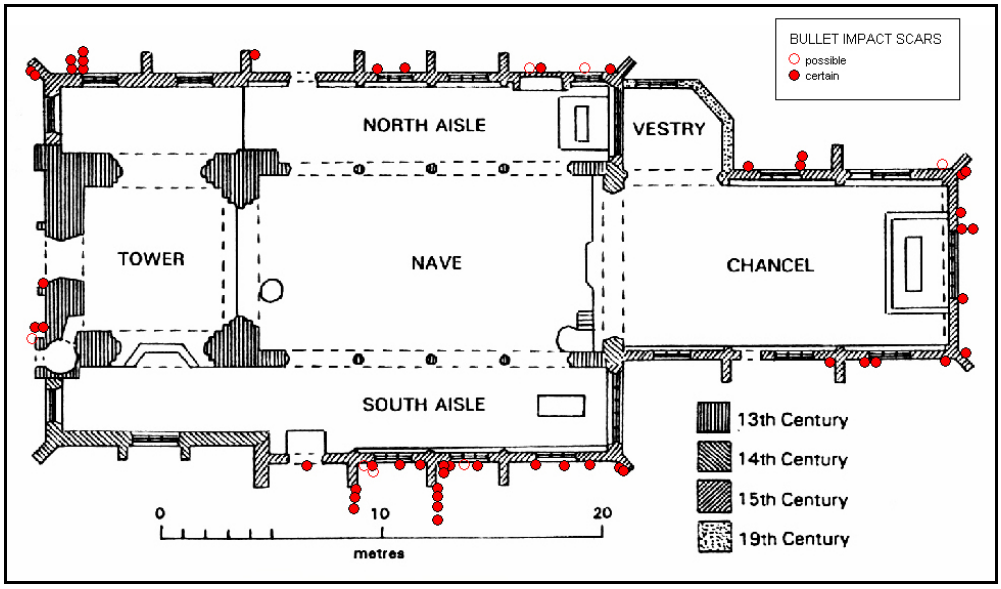

Figure 11: Bullet impact scars on Acton church, attacked during the battle of Nantwich, 1644. Scar locations were surveyed by G Foard in 2007 and are superimposed on a plan of church taken from Salter, 1995

Acton church was the site of the royalist baggage train during the battle of Nantwich in 1644; some 50 bullet impact scars witness the assault on the building.[21] A photo-based sketch plot of the distribution of impact scars gives a basic insight into the scale and distribution of incoming fire. For full recording a measured survey would be required using the data from the photo rectification used to record the elevation. However, additional information is required for interpretation. For example, the pattern may represent only part of that which existed, some having been lost though demolition or repair. It is clear from the plan of Acton that the 19th century vestry will have obscured or destroyed scars on that part of the building, whilst other evidence may have been lost when the upper stages of the church were rebuilt in the later 18th century. Even more problematic is the loss of impact scars through piecemeal re-facing and stone replacement. While occasionally a small piece of patching is seen that almost certainly represents the repair of a scar, a comprehensive identification of the potential losses would require a detailed recording of the structure that was far beyond the scope of the present work. Another uncertainty concerns the number of bullets which passed through windows. In the case of Acton no impact scars were found within the church, but at Tong church the incoming rounds had passed through one window and impacted on internal vaulting.

[21] English Heritage 1994

This was probably during the 1644 royalist assault on the adjacent parliamentarian garrison in the castle, of which the church may prove to have been an outwork.[22]

Figure 12: Impact scars, one partly repaired, on the arch of the north aisle arcade at Tong church from rounds which passed through the windows

Further piloting of the recording methodology was undertaken on the English Heritage property of Morton Corbet castle, Shropshire. Between 1643 and 1645 this was a minor royalist garrison. It fell when it was stormed on the night of 8 September 1644, but was soon back in royalist hands and was not finally abandoned until late 1645. The assault presumably involved the attackers in taking the adjacent church, for it too carries scars from bullets fired from the direction of the castle. In contrast, the impact scars suggest that the assault on the castle was aimed primarily at the south eastern corner of the site, though this could in part simply represent suppressing fire against an artillery piece firing from the gun port there. Moreover, as the plan indicates, survival of the whole circuit of the defences is incomplete, while in some areas survival is only of unfaced or very low walling. Hence, the picture provided by the impact scars may not be wholly representative.

[22] Auden and Frost, 2007

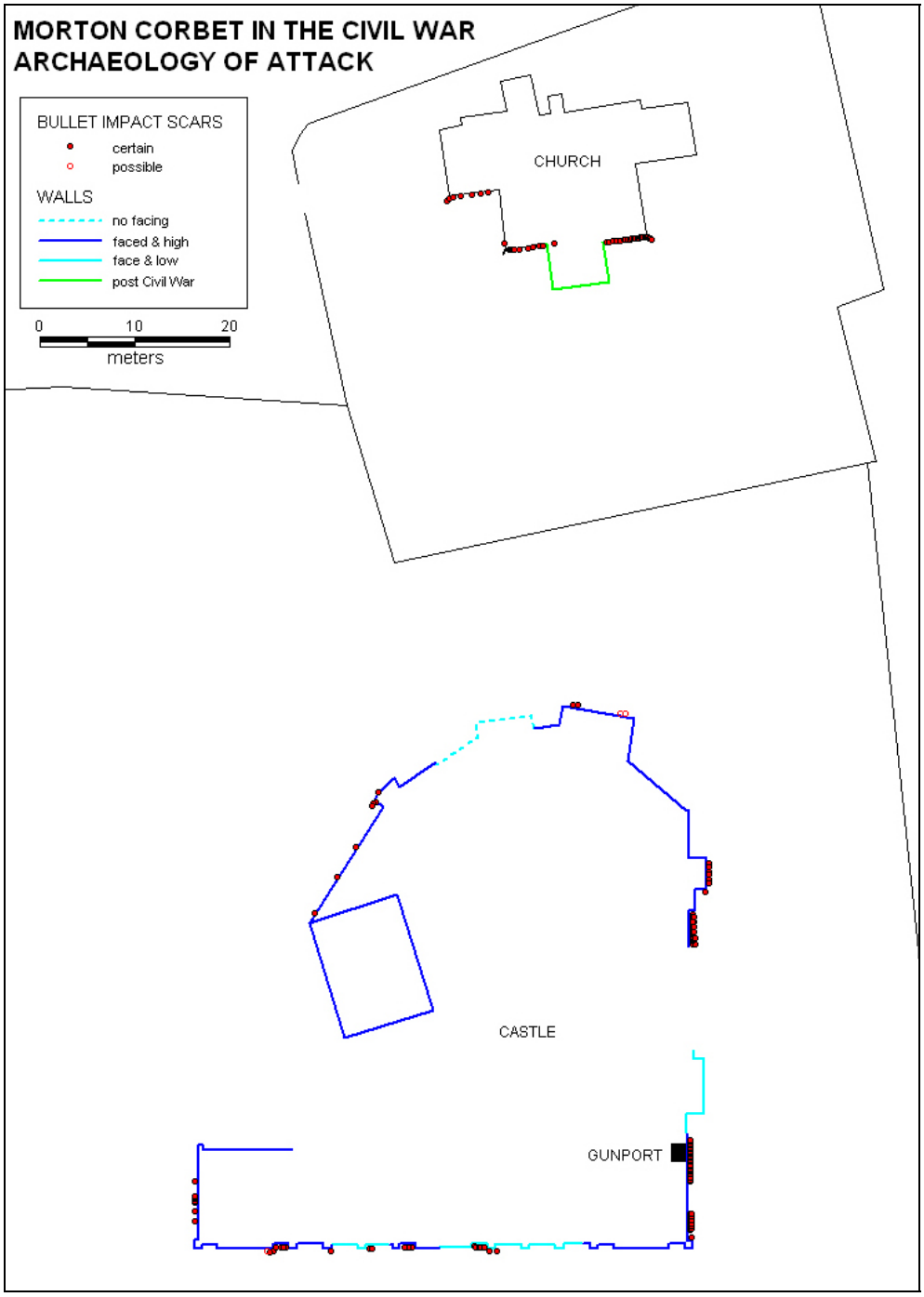

Figure 13: Plan showing distribution of bullet impact scars on Morton Corbet castle and church (Crown Copyright 2008. An Ordnance Survey / EDINA supplied service)

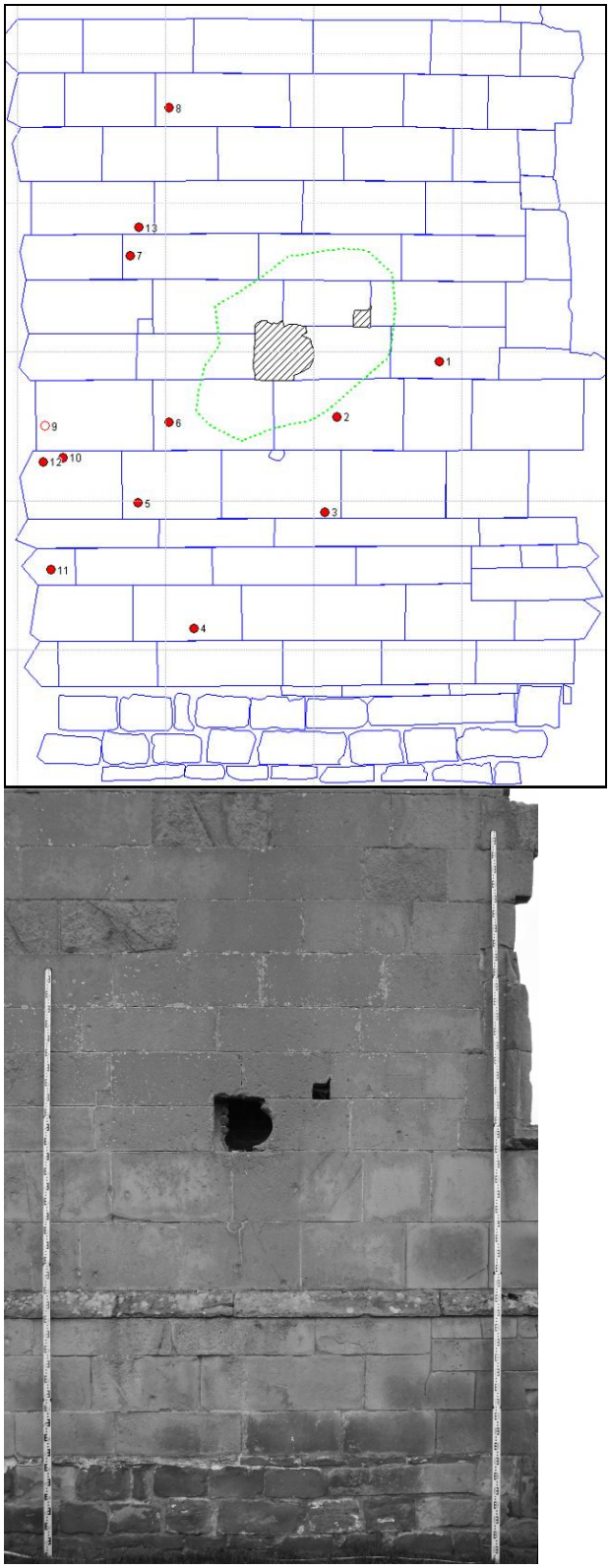

Figure 14: Digital drawing and related rectified photograph of a sample area of the elevation of Morton Corbet castle showing the distribution of bullet impact scars (red) and area of possible hailshot impact (green) around a probable gunport and associated viewing point (shaded) cut into the wall

A small number of impact scars from musket fire survive on the gatehouse and barn of Kenilworth castle. These are part of a wider spread that extends to

remains of the Abbey and the church in the town. They may derive from a brief royalist assault in 1642. Examples were recorded in plan and section to trial a simple recording method for recording individual scars. However, until there are data from experimental firing it is unclear whether this method produces a record that will be adequate for future analysis – for instance to recover information on the angle of impact and kinetic energy dissipated during impact. Comprehensive analysis will also require assessment of the properties of the stone, both its geological composition and its hardness, measured with a Schmitt hammer.[23]

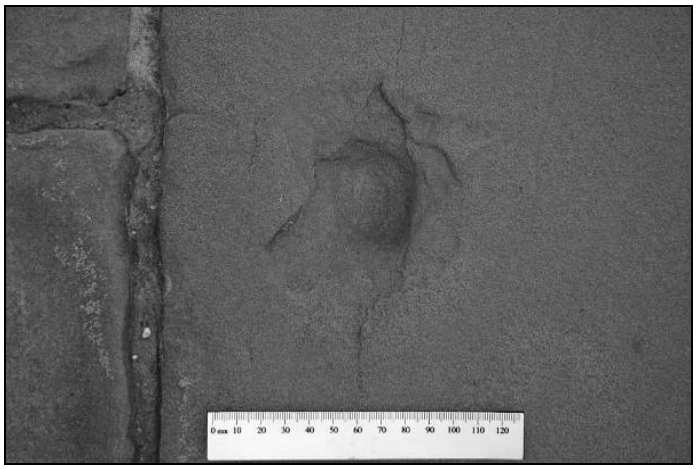

Figure 15: Bullet impact scar on the gatehouse of Kenilworth Castle showing the distinctive central cup shaped depression, shallower spalling of the surrounding surface but no radial fractures

Kenilworth provides other evidence which demonstrates the complementarity of siege sites and battlefields. On the gatehouse there is an apparent association of bullet and hailshot impact scars. Although it is possible that the two types of impact scar are coincidentally superimposed they may come from a single weapon discharge. This would be evidence of use of an unusual bullet type recent discovered in fieldwork on the Sedgemoor battlefield and subsequently matched by other bullets from Wareham. The Sedgemoor bullet is a musket calibre ball which has been fired as a multiple load with very small calibre hailshot resting immediately above.[24] This seems to be a precursor of the buck and ball multiple loads that are seen in the 18th and 19th century in the USA.[25]

[23] Advice on this issue has come from Professor Peter Doyle
[24] Foard, 2008a; Foard and Ladle, in preparation; information from John Pettet
[25] Information from Larry Babits

Figure 16: Impact scars on Kenilworth castle gatehouse where one of the larger scars, presumably from musket fire, is apparently accompanied by hailshot. These scars may all derive from the single firing of a multiple load though they may prove to be two separate and superimposed sets of impact scars

Figure 17: Banded ball of 12 bore musket calibre fired as part of a multiple load in the form of small hailshot set immediately above the ball. The polygonal compression marks from the hailshot and the surrounding melt grooves are identical to the larger scale evidence seen on musket calibre ball fired in groups as case from artillery, as discussed below (Sedgemoor 2007 find 180)

Impacted bullets

Even when a structure has been demolished, rebuilt or refaced, evidence of impacting rounds may still be recoverable from the bullets themselves. Some bullets will lie in the ground where they fell after ricochet from the wall, their stratigraphic significance depending on subsequent activity. Ricochet bullets should also be present around structures of the hardest stone which do not display scars.

Bullets in the ground around buildings are likely to be far more common than impact scars, yet they have scarcely been noticed in archaeological literature, and there is no known published site plan showing their distribution.

Anecdotal reports concern bullets recovered from building fabric (as at Ripley, where impacted lead can be seen in some scars), in thatch (at Old Basing, just outside the Civil War dfences), or timber structures or even walls (as on Lansdown Hill, where a wall is suggested as having been defended by Waller's troops in the 1643 battle[26]) and even trees (as on the York estate at Long Marston, where bullets found in the trunks of several trees were suggested as being from the 1644 battle). However, no examples have been identified from published archaeological investigations. Other likely collecting places for embedded bullets include 'Cornish hedges' and other forms of embanked boundary. The Stratton battlefield, where intense fire fights took place within an enclosed landscape of Cornish hedges, appears from field inspection to survive in good condition and offers potential as an ideal case study placing such evidence within a wider context.[27] However, there will undoubtedly have been change in the boundary system since 1643, such an enquiry would need first to be placed within the context of a wider interdisciplinary study of the historic terrain. This could apply or extend the existing methodology for the study of such landscapes that has been developed in the South West but which has not yet been applied to Stratton.[28]

Impacted bullets appear to witness the temperatures and pressures during impact, the direction of impact, and in some cases, apparently, embedded particles from the impacted surface. This is an aspect of bullet analysis that has not been much researched and currently there are few data either on the nature of impact evidence or on what useful information such evidence might convey.[29] Bullet assemblages from excavations on two Civil War siege sites, Beeston Castle and Sandal Castle, have accordingly been re-examined to characterise such material.[30] This shows a very high number of impacted bullets compared to battlefield assemblages and certain bullet attributes not yet encountered from battlefields. The best examples relate to information on angles of impact, and major variations in the degree and character of impact damage that may relate to issues of range and the type of impacted surface. However, as at present there are no experimental firing data to calibrate or contextualise such evidence, this becomes part of the wider data shortfall that is discussed below (p.00).

[26] Information from Alan Turton, Colonel York, David Evans
[27] National Army Museum, 1995g
[28] Information from Steve Hartgroves
[29] Foard, 2008a
[30] Mayes and Butler, 1983; Ellis, 1993

Figure 18: Heavily impacted bullet showing impact face with the typical irregular surface to the central core, though unusually with grains of embedded stone, and radial lead flow towards the periphery, where some lead has been lost by spalling. The symmetrical splash suggests an impact at or near 90 degrees to the wall surface

Figure 19: Massively impacted bullet with asymmetrical patterning of the core (below) and radial flow suggesting an oblique impact

A small experiment was undertaken as a first step in scoping how impact effects might be reproduced. In this work, 19 bore lead balls fired from a musket at 25m range against limestone disintegrated on impact and failed to produce the cup shaped marks. They did, however, produce the fractures and fragmentation of stone at the edge of the block. They also deposited large quantities of lead on the impacted surface and this might suggest that microscopic quantities of lead residues may still survive in association with some Civil War impact scars. Whether analysis with modern forensic techniques would yield more evidence in this context has yet to be demonstrated.[31] Although the bullets themselves all fragmented, probably because of the small calibre of the bullet, those fragments did exhibit the key attributes of irregular central core and radial lead flow to the periphery seen on the Civil War bullets from siege sites. A more extensive programme of research needs to be developed if the character and potential of this kind of evidence is to be ascertained.

[31] Use of lead residue tests for modern forensic work in the USA: information from Douglas Scott

Figure 20: Result of experimental firing against limestone with a 19 bore musket ball: two areas of lead have melted onto the stone, with fragmentation of stone to the left where it was close to the edge of the block. The presence of melted lead and failure to create an impact depression may be linked to the close range and resultant extreme pressures generated. (Ashdown experimental firing, 2007)

Figure 21: Fragment of ball recovered after firing against limestone, showing the central irregular area and traces of the surrounding radial melt and flow. (Ashdown firing experiment 2007)

Bullet scatters

While there has been extensive study of defences,[32] there has been little archaeological investigation of (and almost no management thought given to) the archaeology of attack on siege sites. Given that it is just this evidence that is likely to tell most about the purpose of the sites and how in practice they were actually defended and attacked, this is surprising.

[32] E.g. Saunders, 2004; Harrington, 2003

The archaeology of attack lies primarily in the bullets and other artefacts that are scattered across the site. This evidence often extends well beyond the small arms range from the defences. Close and within the defences it will comprise mainly incoming fire, unless there was a storming which breached the defences. The wider scatters outside the defences may include fire fights from ancillary action, where troops engaged in skirmishing in open or, more often, in enclosed ground beyond the defences. This is in addition to the outgoing fire from the fortifications.

At Grafton Regis, dense bullet scatters extend well beyond 500m (547 yds) from the probable defences; some bullets have been recovered at a similar distance from the defences of Boarstall Tower (below, p.00). In some cases there may have been structures in the environs which provided cover for the attacking forces and these may yield distinctive impact scar and impacted bullet evidence, as discussed above for Morton Corbet church, and demonstrated by excavations at Hayes Barton in the suburbs of seventeenth century Exeter.[33] Significant pattering may also relate to siege camps and artillery positions set around a besieged site where a complementary archaeology might be expected. It follows that the archaeology of attack on siege sites will be a variation from, rather than contrast to, the archaeology of battlefields.

A handful of surveys, almost all of them small, have been identified in the present review. A survey was undertaken by Colchester Museum in High Woods, Colchester recovering a bullet scatter related to the 1648 siege.[34] Limited field survey has been undertaken on Prince Rupert's Mound at Lichfield, part of the defensive works around the cathedral, which recovered a small number of munitions including bullets and a cast iron grenade fragment (a munition that may be unique to siege sites in the mid 17th century).[35] A small but systematic metal detecting survey was undertaken in 2001-02 in Farnham Park, north of the English Heritage castle, on the site of the siege of 1643, recovering lead bullets of musket, carbine and pistol calibres and several fired as case.[36] However, the great part of the large area of undeveloped land on the north-west and north-east sides of Farnham castle has never been examined. It may contain a substantial body of archaeological evidence relating to action.

[33] Henderson, 1987
[34] Information from Philip Wise
[35] Information from Bob Meeson; Welch, 1998
[36] Information from David Graham

Grafton Regis

Grafton Regis, Northamptonshire, was besieged in 1643. It is the only siege site to have been subject to an extensive, recorded archaeological metal detecting survey to recover the wider distribution of bullets. Over 800 bullets were collected in the survey, which was carried out by the Midland Archaeological Research Society (MARS) in the late 1990s under the supervision of Bob Kings.[37] The calibre graph presented here has been prepared from an unpublished initial assessment of the assemblage by Mark Curteis.

The survey was never finished because the intensity of survey was too great, thus demanding too great a commitment of time, especially in the areas of low or negative bullet distribution. Among other things this demonstrates the need for full site surveys to be undertaken at a sustainable level of intensity and then subject to follow-up resurvey of specific areas.[38] The small calibre of most of the bullets differs sharply from the bullets detected at Basing, raising questions as to the nature of the evidence and its meaning, and demonstrating the value of calibre graphs in identifying archaeological signatures of conflict.[39]

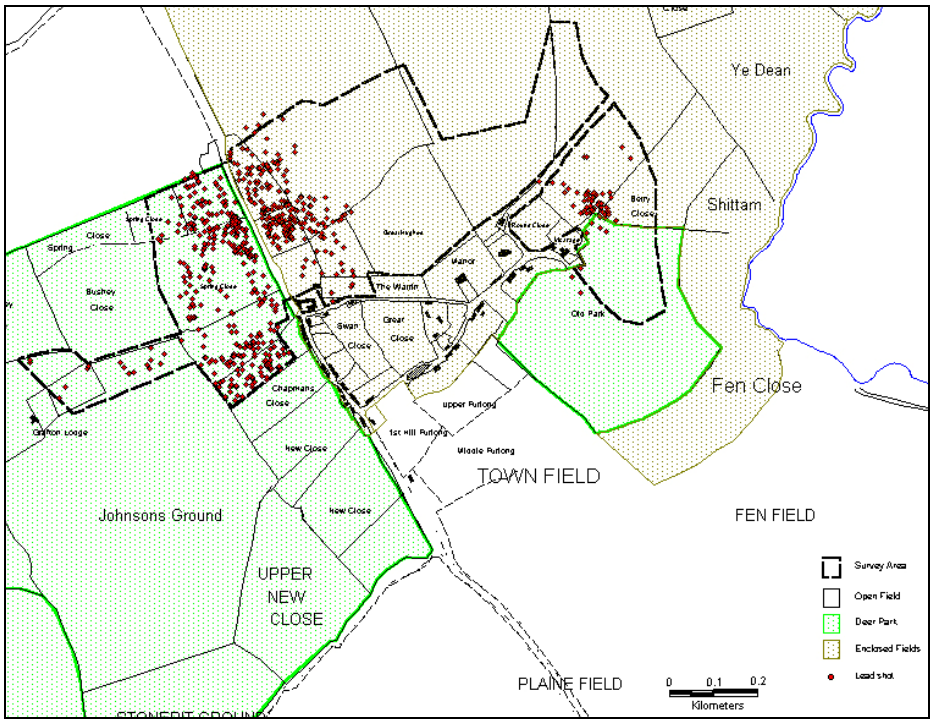

Figure 22: Bullet scatter from systematic metal detecting of part of the siege site at Grafton Regis, Northamptonshire, where a royalist garrison in the fortified manor house and church was besieged in December 1643. Data are superimposed on terrain reconstruction

[37] Foard, 2000; Foard, 2001
[38] As now demonstrated at Edgehill: Foard, 2008a
[39] The excavated collection from Basing was not examined. Allen *et a*l, 1999

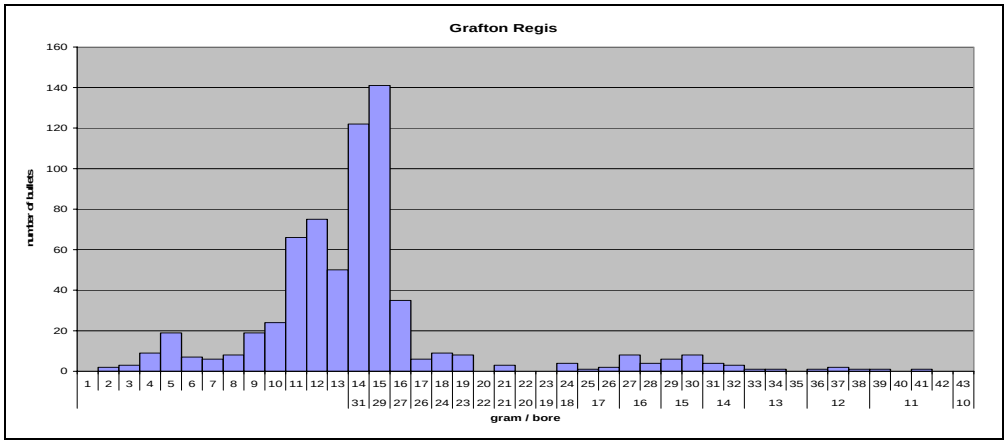

Figure 23: Calibre graph for the siege of 1643 at Grafton Regis, Northamptonshire

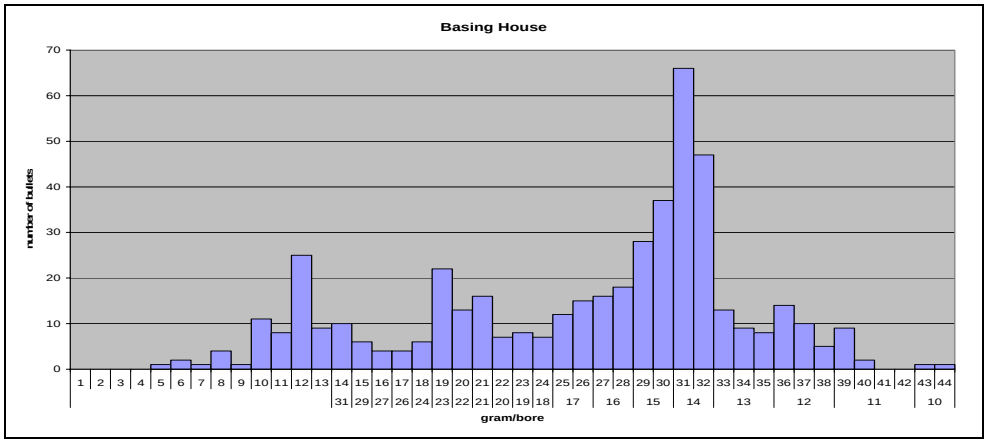

Figure 24: Calibre graph for bullets collected by D Coppin from metal detecting immediately adjacent to the site of Basing House, besieged in 1644 and besieged and stormed in 1645

Boarstall (Buckinghamshire, 1643-1646)

Another site where a partial distribution plan has been produced – in this case by non-systematic collection with sketch recording by a metal detectorist – is around Boarstall Tower. Now a National Trust property, the fortified manor house was established as a royalist garrison in 1643 as an outpost to the royalist capital at Oxford. It was abandoned soon after but was reoccupied by the parliamentarians in spring 1644, being surrendered in the face of a royalist assault a short time later. A royalist garrison was again installed, and briefly besieged by Waller later in 1644. In late May 1645 a large detachment of the New Model Army besieged the site once more and attempted a night assault. This failed and soon after the siege was raised. The royalists then demolished the church and all the surrounding buildings of the

village to establish a clear field of fire as part of a refortification. The garrison finally surrendered to a siege in 1646.[40]

Metal detecting was undertaken by Les Rees over several years in the 1990s, recovering some 400 bullets plus various other artefacts. A sketch plan of the distribution of finds, including just 115 bullets, was produced in 1996=97, after the event. No subsequent finds were mapped, but are said to have come from the same general areas, particularly the field on the south east of the site. In addition, a small number of bullets were found on the north east edge of the site. Seven bullets were recovered following dredging on the inner bank on the west side of the moat in August 1997, and a further nine bullets on 26/9/1997.[41] The bullets held by Rees were briefly examined and although no recording was undertaken it was confirmed that they embraced a range of calibres and types, as well as several powder box caps. The majority of the artefacts undoubtedly relate to the siege but the assemblage also included several belted bullets – 19th century rifle balls – and it thus looks as though some contamination by later activity has occurred. The bullets were all stored loosely in a single box, with no artefact identified to a particular location on the site. An additional small group of impacted bullets was held by the resident of the Tower in 1994, who also reported at that time the earlier discovery of one iron roundshot which had subsequently been lost. The surviving gatehouse, which is the only part of the house that survives from the time of the siege, shows no obvious evidence of bullet or roundshot impact scars.

[40] Page, 1925, 10-11; Porter, 86-90
[41] Plan in Buckinghamshire HER. Information from Les Rees

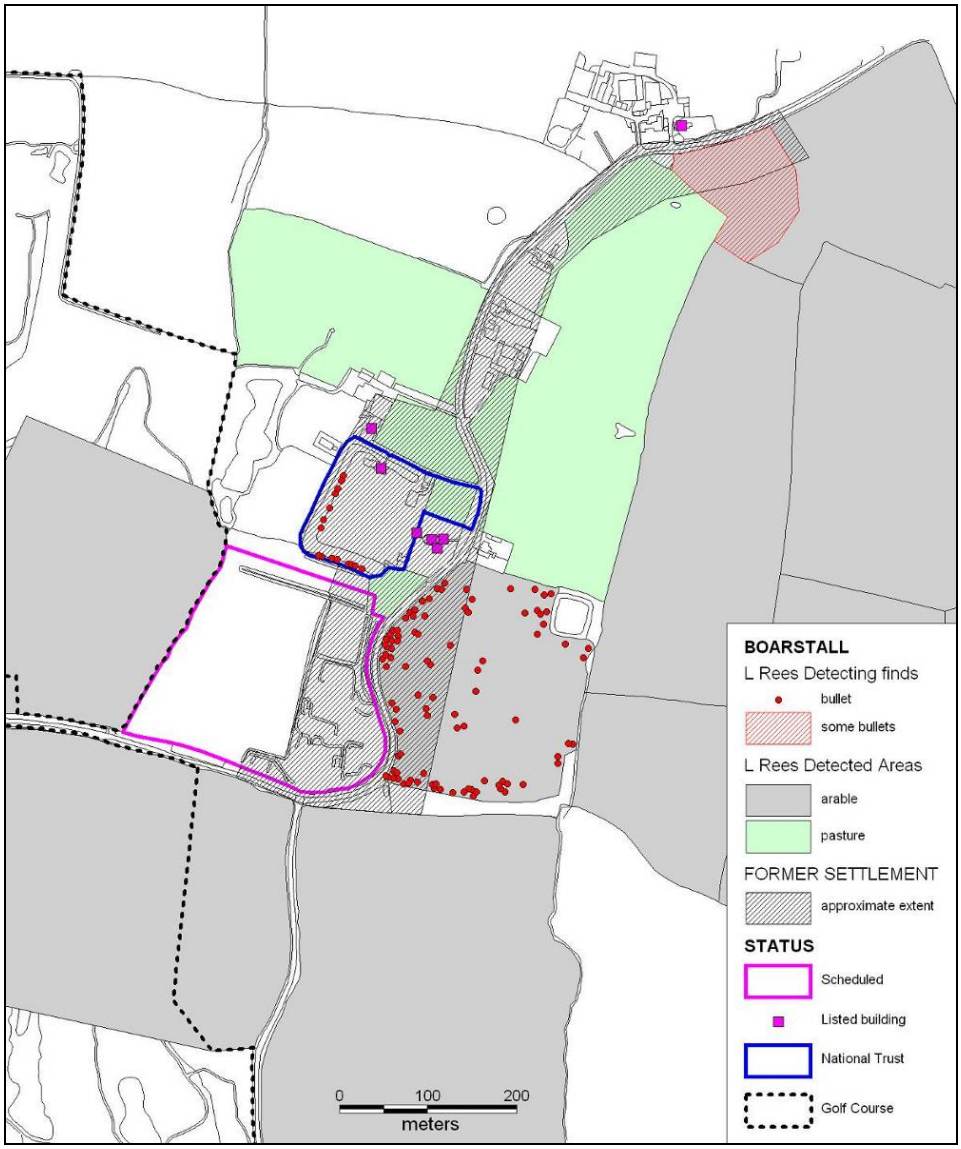

Figure 25: Siege site at Boarstall, Buckinghamshire: plan showing distribution of bullets from the sieges of 1643-1646 from detecting by L Rees (Crown Copyright 2008. An Ordnance Survey / EDINA supplied service)

The medieval and early modern settlement, as mapped from aerial survey, fieldwalking, and a map of 1697, extended well beyond the moated manor.[42] The settlement was at least in part deserted as a result of the clearance for the refortification. The apparent close association between the bullet scatter and the settlement area may indicate that approach to the house was mainly via the built up area during the 1645 siege and before. The absence of finds from the pasture areas is, however, very suspect, as the scatter extends from beneath it to both north and south and may simply be a result of differential recovery where bullets have been deeply buried in the absence of recent ploughing.

[42] Buckinghamshire HER; Beresford and St Joseph, 1979, 111-112

Although over 400 bullets have already been removed from the site, most of them without record, there would still appear to be a high potential here for the archaeology of the sieges. The potential confusion of more than one siege would pose problems of interpretation, but it may be that the 1645 siege alone involved a substantial assault depositing large numbers of bullets. The fact that various buildings stood until late 1645 means that there may be a good stratigraphic association between bullets and other siege-related artefacts and the structures. Such potential may not exist on many siege sites. In other respects, however, this may be less than ideal as an exemplar for investigation of siege archaeology, since there are no buildings to show impact scars, and most of the impacted bullets are likely to have ended up in the moat and so are inaccessible. In addition, the surviving earthworks will mean that investigation of this part of the site would be severely restricted and only really possible through excavation.

Subsequent to the detecting by Rees, an extensive area immediately west of the site has been converted to a golf course. Earthmoving for tees, greens and bunkers may have caused substantial archaeological loss. Although Rees recovered no bullets in this area the comprehensiveness of his recovery is unknown, and would need a control survey to test. There has also been a small amount of infilling within the settlement area, in another area where Rees' detecting produced no bullets, though his notes suggest that in these small fields either side of the church the main problem was later contamination. Such problems could probably be overcome in recording action involving trenching prior to development. The presence of a scheduled area, created purely to protect the remaining village earthworks, has had the incidentally positive effect of protecting part of the siege site from the golf course, and the artefacts within it from detecting. This is in contrast to the unprotected half of the former village. The ownership of part of the site by the National Trust appears to have conferred only a limited restriction on detecting, apparently because the National Trust lacks a conservation strategy for the management of battle archaeology on their properties.[43]

Beeston Castle (Cheshire, 1642-1646)

The published report for two excavations on this Civil War garrison claims 70 bullets were recovered.[44] Rapid re-analysis of the collection as part of the present study has revealed a total of 233 certain and 5 possible bullets. Of these 220 are lead ball, including one certain and two possible burred bullet, plus two possible lead balls. A

[43] Information from Mark Newman
[44] Ellis, 1993, 159

calibre graph based on bullet weight has been produced. There are also 10 hammered slugs, three possible slugs, plus two 'rods' of uncertain significance. Neither the burr nor the slugs were identified in the finds report, though one slug was identified there as a 'rod'. Twelve headers from bullet casting were also examined, two more than reported, and including one with a bullet attached. All had far smaller spacing of sprues than the finds report states. At least 38 of the bullets had been fired, of which 32 were impacted, most of them massively so.

Besston's bullet assemblage should be re-analysed in detail as it tends to be treated as one of the standard reference assemblages for Civil War bullets and contains important information not previously reported. Moreover, it is said that accurate 3D recording was made of each bullet location and if this record survives then a distribution plan indicating each calibre and distinguishing the fired and the impacted bullets should be produced. Most of the latter appear from Courtney's report to have come mainly from the outer gateway and so presumably relate to the various attacks on the castle. If this is achievable then it would be the first plan of its kind to be produced for any site and might allow further development of a methodology for the investigation of siege sites.[45]

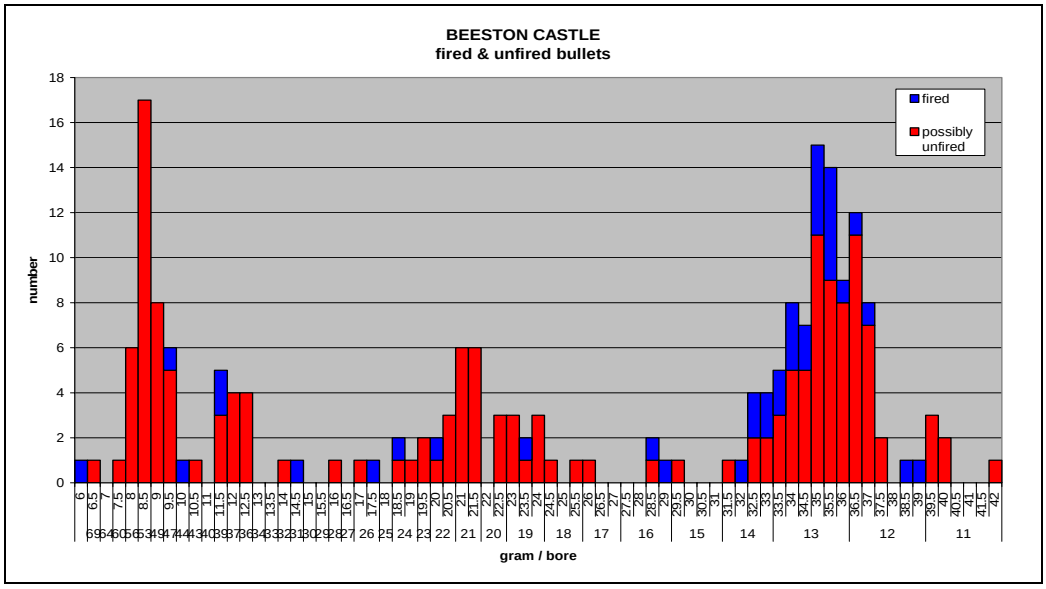

Figure 26: Calibre graph for bullets from Beeston Castle. The graph distinguishes definitely fired lead ball (impacted & banded) from all other

[45] Information from Paul Courtney. The limitations of his report on the finds arise largely from the full assemblage not having been passed to him for study, and also from the degree to which the study of bullets has advanced in recent years

Table 1: Bullets from Beeston castle excavations

	certain	*possible*	*banded*	*impacted*
Total of Bullets	233	5		
Ball	223	2	10 (+ 1?)	32 (+9?)
including burred ball	1 (+2?)			
Hammered Slug	10	3		
Casting headers	12			
Rods (not bullets?)	3			

Re-analysis of the 220 lead ball from the Beeston assemblage shows that at least six discrete calibres were in use during the Civil War at the site. Pistol bullets centre on c. 50 bore but with a minor cluster on c.37 bore. Carbine bullets centre on c.20 bore. Musket bullets focus on both 13 bore and, with a subsidiary peak, at the lower end of 12 bore, together with a minor grouping on 11 bore.

If the fired bullets are taken into account separately (most are heavily impacted and have lost significant mass), then the distortion of the graph may be explained, with the impacted bullets probably being largely12 bore shifted down to13 bore or less. The significance of this pattern in the musket calibres is unclear, as Beeston is the only site so far examined which shows a concentration on 13 bore. More detailed analysis is called for, but cannot be undertaken until the collection has been washed; the dirty condition of the bullets may mean that a significant number with firing evidence await identification. If our interpretation of the calibres is correct then it may distinguish bullets fired by attacking forces from those dropped by defending forces, with the former having mainly 12 bore and the defending forces mainly 13 bore muskets. This could be tested by mapping the bullets in GIS on the plan of the castle.

Sandal Castle (West Yorkshire, 1645-1646)

The Civil War garrison was subject to a long and intensive siege in 1645. There are just 98 bullets in the assemblage from excavations made between 1964 and1973.[46] Fragments of wall survive, but careful examination failed to reveal more than one or two doubtful examples of bullet impact scars. All the bullets from the excavations were subject to rapid re-analysis in the present project, enabling the preparation of a calibre graph of the un-impacted bullets. No information exists as to the location of each bullet on the site, the association at best being no closer than to the trenches that were open in a particular year. Moreover, the greater part of the ground outside the walls appears to have been cleared by machining to ‘restore’ the earthworks

[46] Mayes *et al*, 1983

without collection of the bullets, roundshot and grenados. The greater part of the archaeology of the siege thus appears to have been destroyed without record.

What the small assemblage does demonstrate is the distinctive character of bullets that have impacted on stone structures, although in the absence of locations for the bullets it is impossible to take this further. Though Sandal is often cited as a type site for the archaeology of the Civil War, the study is wanting. The report on the bullets, though a significant statement at the time, can now be seen to have failed to address the range of evidence available.[47]

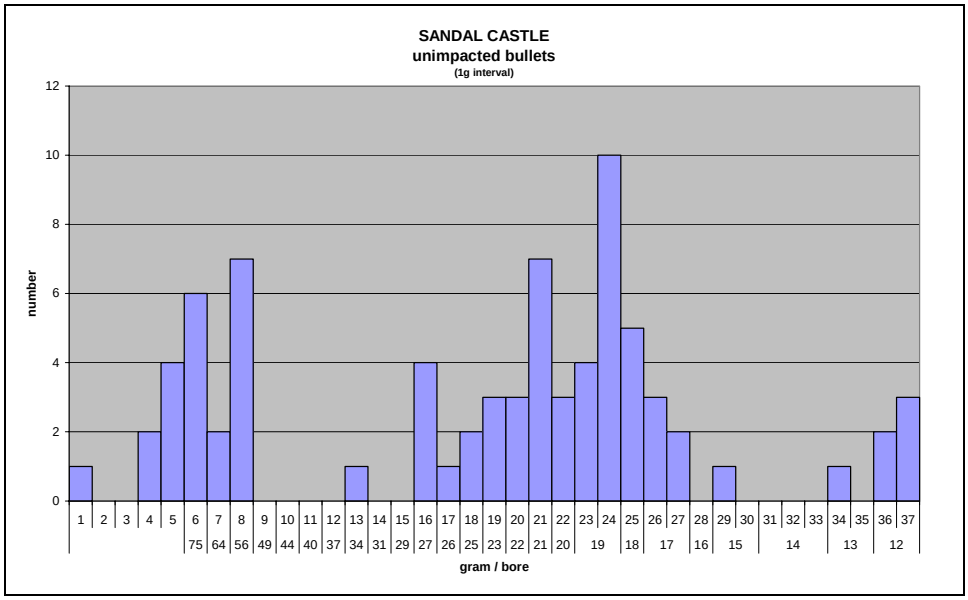

Figure 27: Calibre graph for unimpacted bullets from Sandal Castle excavations

Wareham (Dorset, 1640s)

As part of the Bestwall quarry excavation, an assemblage of 558 bullets from one or more of sieges was recovered by metal detecting survey both prior to and during excavation, with limited recording of spatial location of finds.[48] The collection was rapidly assessed and a calibre graph produced. This is a good example of a collection of bullets from a highly acidic sandy soil. The bullets show a high level of erosion and surface decay which has destroyed most of the detail of manufacture and use that is normally seen on bullet assemblages. Even the calibre graph appears to have been compromised by the differential loss of bullet weight due to varying degrees of erosion on different bullets. The assemblage thus clearly demonstrates the importance of soil chemistry to the selection of sites for detailed investigation of battle archaeology.

[47] Mayes and Butler, 1983
[48] Foard and Ladle, in preparation

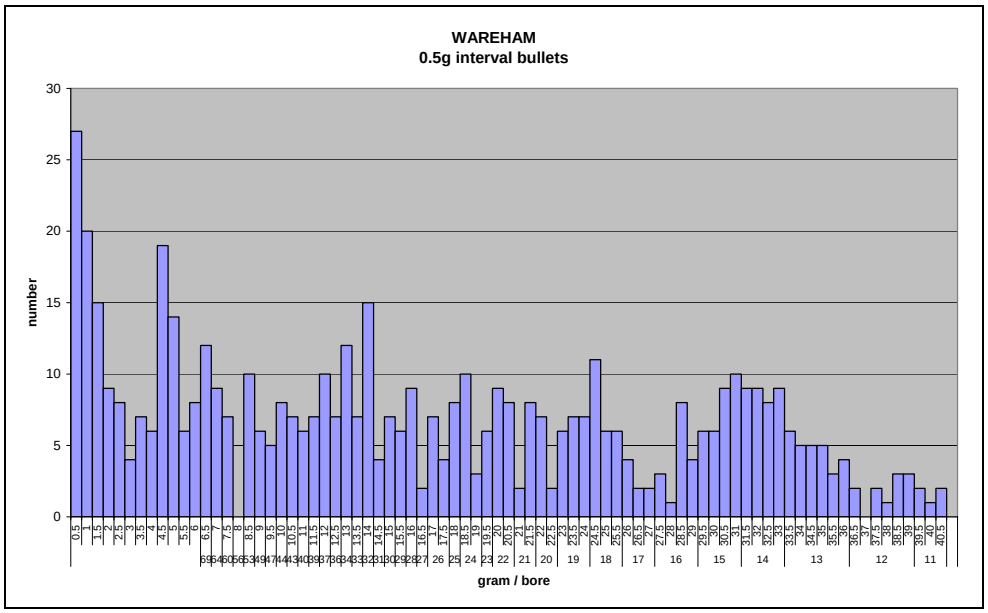

Figure 28: Calibre graph for bullets recovered on the Bestwall Quarry excavation from one or more of the Civil War sieges of Wareham

Wareham is a highly atypical assemblage. The near absence of 12 bore bullets is interesting, though the same occurs with the Basing House siege; on most sites 12 bore would expected to be the dominant musket calibre. The very flat graph below 16 bore is also unusual. One might expect a 20 bore carbine calibre to stand out, and the continuance of the spread into the pistol calibres is very odd. Nor does any distinct pistol calibre – such as 28 or 36 bore – stand out. The presence of so many very small bullets, which are very small even for hailshot (which tends to be at between 5g and 9g) may indicate a substantial amount of later birding shot. A separate distribution plan would be needed to address this. It should be noted that, as at Sedgemoor, a single bullet shows clear evidence of having been fired as a multiple load with very small hailshot; this might indicate the at least some of the fine hailshot is from the Civil War action.

Gleaning more from impact scars and their ricochets: a prelude to management

Research on the combined evidence of impact scars and their related impacted bullets, which have ricocheted back or to one side, possibly in fragments, may enable reconstruction of information such as the direction, range, accuracy and intensity of fire. Such work needs to include the testing of the stone itself to seek a calibration between its hardness, measured with a Schmit Hammer, and the depth of the scar and degree of fragmentation of the stone, in relation to the energy of the impact and the calibre of the bullet.

An initial small scale pilot survey is required to test and refine the methodology. This would attempt to recover bullets from a sample area of bullet scatter close to the walls and to record the related impact scars, to explore the extent and significance of the two data sets and the degree to which they can be correlated, and to test the recording and survey methodologies presented here. This should be complemented by firing experiments on blocks of stone and/or stone walls of identical type to determine whether the angle of impact, and hence direction of incoming fire, and the range of the gun, can be determined from fine detail, or whether such information could be recoverable from more sophisticated recording. A proposal for such a trial at Morton Corbet castle is given in Appendix 00.

Unlike battlefields, where the background noise of non-projectile artefacts will normally be relatively low, on most siege sites a garrison will have been present for months or years, while on many there will have been longer lived occupation. In such circumstances a higher proportion of non-projectile artefacts is likely to derive from occupation rather than combat. This needs further investigation.

Once the methodology has been refined then a site needs to be sought for a more extensive survey, where the methodology can be applied, combining comprehensive impact scar recording, recovery of impacted bullets from sample areas, and systematic sampling at an appropriate intensity to recover the full distribution pattern of the bullet scatter in the immediate context. Research on the vertical plane in the study of impact scars and associated impacted bullets should provide an important complement to the general study of the horizontal distributions, for it should give clear evidence on spread, angle of impact etc that is not available from horizontal distributions.

In this way, outgoing as well as incoming fire would be integrated into what a single coherent picture – something that hitherto has never been achieved.

This broad scale approach should then, for the first time, enable effective exploration of the analytical potential of such evidence. Such a full study would act as an exemplar to guide work on other sites, providing a methodology for

- bullet impact scar recording where this is demanded by repair
- the recovery of a representative sample of bullets, impacted or not, where these are threatened by ground disturbance

Such work could also

- assist in refining research questions to be addressed by further experimental firing
- provide information to allow, for the first time, the drafting of management strategies appropriate for conservation of siege assemblages across entire sites

For individual sites Conservation Statements should include such evidence, the evaluation of which should form part of the evaluation of a structure before any potentially destructive work is undertaken. The identification of sites where such work is called for requires an assessment of all garrison and siege sites, to enhance the UKFOC database.

Management needs

Next to nothing has yet been done to investigate and conserve the archaeology of attack on siege sites. Action will be thus needed to ensure the survival of a representative sample of this evidence.

It is suggested in the Battlefields Register that 'sieges are better considered separately from battles because they are usually associated with physical remains which can be conserved through existing statutory mechanisms such as scheduling and listing'.[49] The evidence presented here suggests that this is wrong: the resource is being neither protected nor managed, and it is almost certainly being rapidly eroded without record.

Morton Corbet site provides a conspectus of the issues. The scheduled area encompasses only the area enclosed by the defences of the castle together with two small isolated areas. The listing does cover the standing structures of church and castle, but without understanding of the importance of the evidence of impact scars this may not count for much. The same applies to deliberations of the Diocesan Advisory Committee about groundworks.

[49] English Heritage, 1995

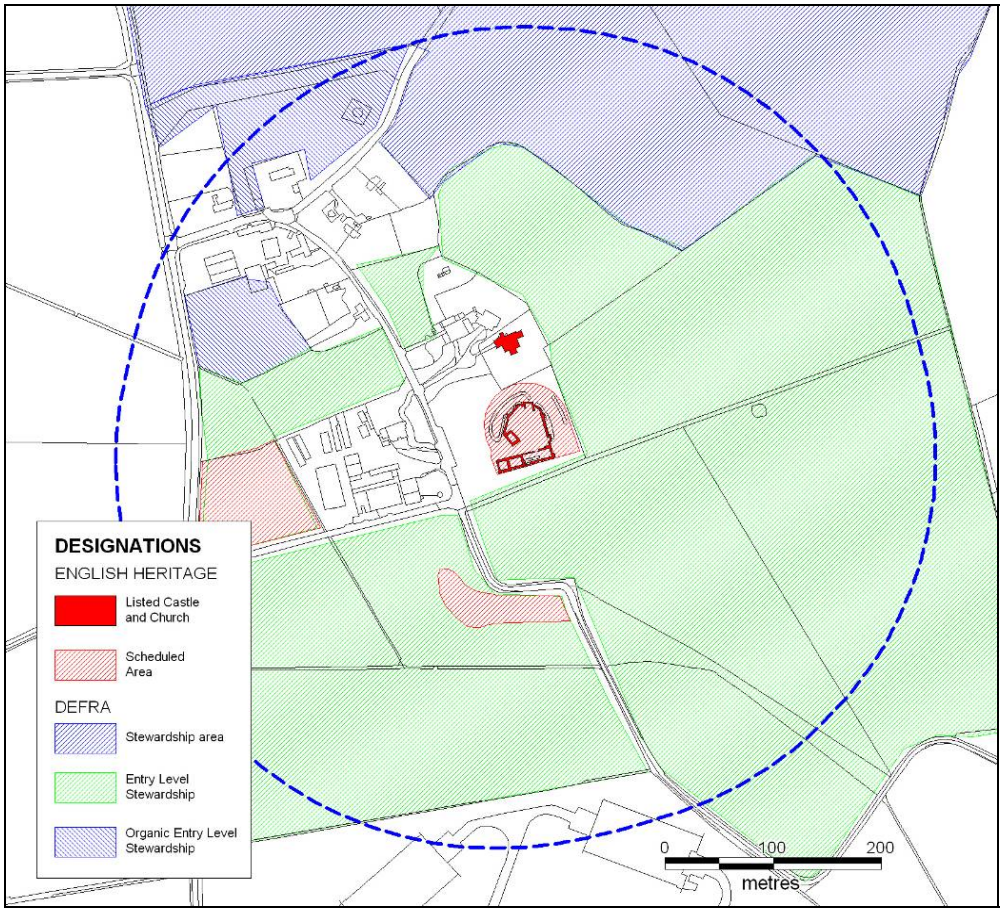

Figure 29: Scheduled and Stewardship areas at Morton Corbet relative to the probable maximum final range of a musket fired from the castle. The 350m diameter is based on the Ashdown 2007 firing experiment

Around the site, in the absence of any detecting survey but on the basis of musket range, one can suggest a minimum area of likely combat evidence. This is provided on the plan in the form of a near circular zone drawn 350m from the walls, which represent the final range, after bounce and roll, of a musket fired point blank, as recorded by the initial Ashdown firing experiment.

Unfortunately there may be a large number of apparently well preserved siege sites in guardianship where the bullet evidence was destroyed during the first half of the 20th century Office of Works clearances to display the stone structures. At Helmsley Castle, for example, there was massive destruction of stratified and unstratified bullet scatters.[50] As we have seen, continuing official indifference to the archaeology of attack from siege sites is shown at Sandal Castle. Even where impacted and un-impacted bullets have been recovered in trench and area

[50] Paper by Peter Harrington to the Fields of Conflict IV conference, Leeds, 2006

excavations, as at Beeston, the data do not appear to have survived and were certainly not published.[51]

Professional unawareness of the character and potential of siege assemblages, and methodology for recording them, mean that such losses continue in the present. Hence, when the former garden immediately north of the slighted wall of the keep of Kenilworth Castle was excavated in 2005-06 on behalf of English Heritage, the research design (which went to EHAC for advice) did not provide for the metal detecting survey that would have been appropriate to record unstratified and secondary stratified bullet distributions. This is despite the fact that the castle held a Civil War garrison, and the presence of numerous bullet impact scars. The presence of bullets is rumoured to have been demonstrated by metal detecting of the spoil heaps; this cannot be confirmed because Northamptonshire Archaeology has not replied to requests for information.

Within the present study it has not been possible to review the full range of excavations and reports that relate to recent fieldwork on siege sites, but these include Corfe Castle, Taunton, Montgomery, Pontefract Castle and Dudley Castle.

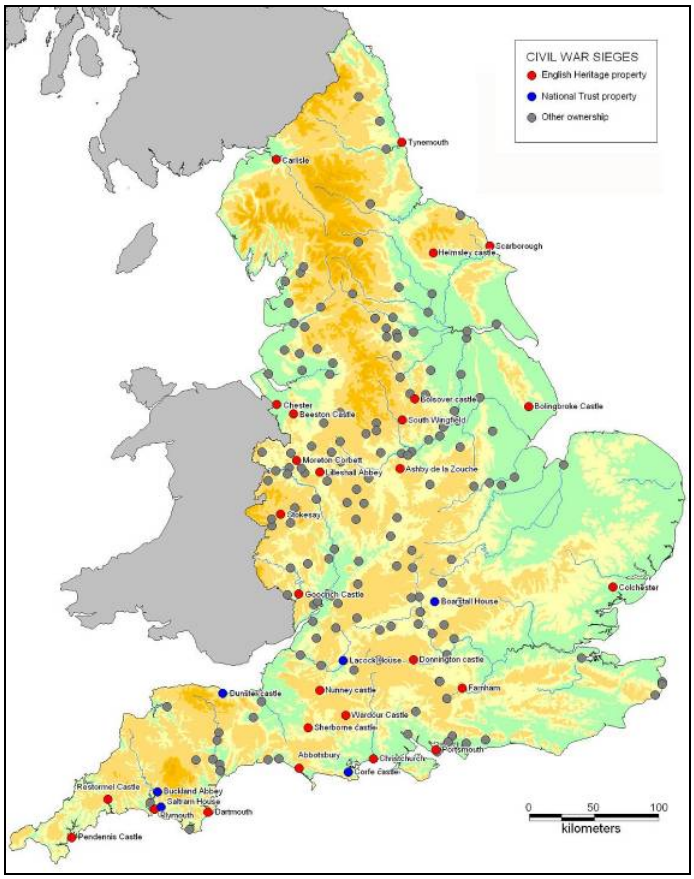

Figure 30: Civil War siege sites indicating English Heritage and National Trust ownership of all or part of site

[51] Information from Paul Courtney

Siege sites of the Civil War have been assessed to identify ownership. English Heritage own or manage all or part of 27 sites, the National Trust at least 6. These 33 sites represent an important sub-set of the resource from which one or more case studies could be drawn for further investigation, more fully to define the character of siege assemblages and to develop best practice for their management.

A significant number of the remainder are standing structures in private, local government or ecclesiastical ownership. Many of them are either scheduled or listed, and the provision of appropriate guidance to those who operate these controls is a clear priority. The Chester Diocesan Advisory Committee (DAC) was consulted regarding bullet impact scars because, in addition to Acton, they have a number of churches that bear such evidence. Chester DAC acknowledged awareness of the issue and in at least one case, at Dodleston, the church's inspecting architect had made a rudimentary record of the impact scar locations on the north elevation of the tower when identifying works required.[52] However, the DAC does not have a list of churches in the diocese which display such evidence, and neither English Heritage nor the CCC have issued guidance on what effective management might involve. Since identical problems and opportunities will exist for other siege sites in country houses and castles, there is a case for the production of guidance on the management of Civil War archaeology generally, for use by individual owners, local authority archaeological advisors, conservation officers, DACs and the HHA.

Skirmishes

One hundred and thirty two skirmishes are listed on the database. A handful appears to be based purely on local traditions and may be spurious. Even so, for reasons already discussed (p.00), this figure is far below the real total.

The 132 are unlikely to be distributionally representative. Though the rarity of skirmishes in East Anglia is real, the concentration in Cheshire and Lancashire is as much a result of exceptional HER enhancement and greater representation in national works as it is a reflection of the true intensity of action.

No attempt has been made to examine any of the skirmish sites in detail. While a major enhancement of the database to include them would be practicable, it is not clear that the scale of the task would be proportional to the value gained, other than to explain many of the small bullet scatters identified by metal detectorists.

Nevertheless, that lesser actions can have a substantial battle archaeology is shown by recent work on the site of the 1642 'battle' of Aylesbury. Both the

[52] Information from Richard Mortimer, Chester DAC Secretary

identification of this action and its location on the basis of a vaguely reported 19th-century discovery of a mass grave, beside Holman's Bridge on the edge of Aylesbury, had been questioned; however, recent development-led fieldwork produced at least 24 lead bullets and four powder box caps, in addition to other possibly battle-related artefacts.[53]

Such lesser actions are not well documented. What is needed is systematic investigation of several large and small skirmish sites, using the methodology which has been demonstrated on battlefields, to ascertain if or how they can contribute to wider understanding of warfare in the period.

While it may be important in the longer term to ensure the conservation of a representative sample of skirmishes, the main issue that would justify immediate attention is the problem encountered in defining the boundary between skirmish and battle. Some substantial skirmishes, like Southam in 1642, might on detailed inspection reclassify as a battle. The coalescence of several neighbouring skirmishes likewise illustrates an inconsistency in the way in which battles at the lower end of the scale are currently being defined.

For actions involving more than 5000 troops there is no uncertainty. The exceptions can be explained. Modbury is classified as a skirmish because no substantial action occurred, despite the numbers present. Alton, with 6000 engaged, had the character of a skirmish similar to Preston II, with disbanded groups fighting through the town. In contrast, uncertainty does arise over actions involving 5000 or less. Hopton Heath, for example, with just 2500 engaged is a Registered battle whereas Norton St Philip with 4500 is not. Two other engagements of or below 5000 were Registered, though recognised as skirmishes, and a further four were assessed for the Register but dismissed. Even at 2000 and below, some actions might need to be reconsidered as battles, as with Middlewich where the surviving plan suggests a formal deployment in battalions.[54]

[53] Foard, 2008c
[54] Liddiard & McGuicken, 2007

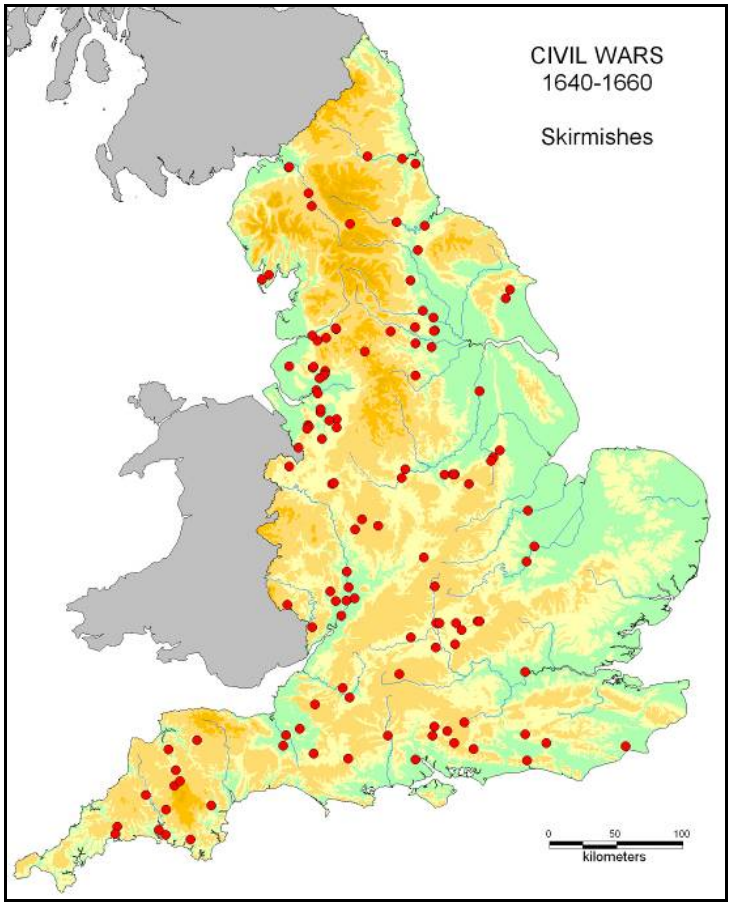

Figure 31: The 132 Civil War skirmishes recorded on the database under-represents this type of site type

Action name	Year	Type of action	Numbers engaged	State of development	Designation
South Molton	1655	skirmish	400	0	
Marshall's Elm	1642	skirmish	500	0	
South Harting	1642	skirmish	500	0	
Babylon Hill	1642	skirmish	500	0	
Longford	1644	skirmish	1000	0	
St Neots	1646	skirmish	1000	0	
Huntingdon	1645	skirmish	1000	0	
Wetherby	1642	skirmish	1140	0	
Carlisle Sands	1645	skirmish	1250	0	
Powick Bridge	1642	skirmish	2000	0	Registered
Grantham	1643	skirmish	2000	0	
Seacroft Moor	1643	skirmish	2000	0	
Middlewich	1643	skirmish	2000	0	
Willoughby on the Wolds	1648	skirmish	2000	0	
Chalgrove	1643	skirmish	2000	0	Registered
Wigan	1651	skirmish	2100	0	
Saltash	1644	skirmish	2500	0	
Hopton Heath	1643	battle	2500	3	Registered
Gainsborough	1643	skirmish	3000	0	
Highnam	1643	skirmish	3000	0	
Ripple Field	1643	battle	3000	4	assessed
Ankle Hill	1645	skirmish	3500	0	
Oldcastle Heath	1644	skirmish	3500	0	
Sherburn in Elmet	1645	skirmish	3500	0	site a
Sourton Down	1643	skirmish	4000	0	assessed
Norton St. Philip	1685	skirmish	4500	0	
Launceston	1643	skirmish	5000	0	
Brentford	1642	skirmish	5000	0	
Whalley / Sabden Brook	1643	skirmish	5000	0	
Tadcaster	1642	skirmish	5000	0	
Torrington II	1646	battle	5000	2	site b
Sedgemoor	1685	battle	6000	4	Registered
Roundway Down	1643	battle	6000	4	Registered
Alton	1643	skirmish?	6300	0	
Stow on the Wold	1646	battle	6300	4	Registered
Selby	1644	battle	7000	1	
Stratton	1643	battle	8000	3	Registered
Rowton Heath	1645	battle	8000	3	Registered
Winceby	1643	battle	8000	4	Registered
Braddock Down	1643	battle	9000	4	Registered
Modbury	1643	skirmish	10000	0	
Maidstone	1648	battle	10000	1	
Lansdown	1643	battle	10000	4	Registered
Nantwich	1644	battle	10000	4	Registered
Winwick Pass	1648	battle	12500	3	
Adwalton Moor	1643	battle	14000	3	Registered
Newark	1644	battle	15000	1	site b
Cheriton	1644	battle	15000	4	Registered
Langport	1645	battle	17000	3	Registered
Cropredy Bridge	1644	battle	18000	3	Registered
Preston I	1648	battle	20000	1	site b

Newburn Ford	1640	battle	20000	2	Registered
Lostwithiel	1644	battle	25000	3	assessed
Naseby	1645	battle	25000	4	Registered
Newbury II	1644	battle	30000	2	site b
Newbury I	1643	battle	30000	3	Registered
Edgehill	1642	battle	30000	3	Registered
Worcester	1651	battle	40000	2	Registered
Marston Moor	1644	battle	45000	4	Registered

Battles

For practical purposes the following assessment is limited to the 29 actions listed as battles because it was not practicable in the current project to begin an assessment to identify the skirmishes which might justify reclassification. Of these battles, 20 are Registered and three were assessed but dismissed as being too heavily developed. While re-examination has confirmed that little if any of Preston I or Newark remains undeveloped, there is the potential for some surviving areas of both Newbury II and possibly for Torrington II, while Ripple appears to be wholly undeveloped. Given the scale and importance of Newbury II a re-examination of that site is justified. Of those never assessed for the Register both Selby and Maidstone are wholly developed but Winwick which was not assessed would appear to justify consideration, not least because it is the one battle from 1648 which appears to survive in a good state of preservation. It may for example provide valuable information as to the character of the munitions in use in the Second Civil War. Without doubt, however, the most remarkable omission is the battle of Lostwithiel, one of the largest and most substantial battles of the war.

The Lostwithiel battle was a large complex action extending over more than 6km, involving various skirmishes over several days. This was one of the most important actions of the Civil War which saw the destruction of parliament's most important field army, which together with the abortive action at Newbury II led to major political upheaval ultimately resulting in the establishment of the New Model Army, with the most dramatic military and then political results. It was almost the only major battle of the war that was fought in an almost wholly enclosed landscape and thus the character of the action is very different from that of the other battles, comprising a number of subsidiary action over several days and across a wide landscape. As such it would be a valuable comparator for the many battles fought in wholly or partly open landscape. The action included the capture of Restormel Castle, an English Heritage property, and the destruction of church in Lostwithiel when the powder magazine exploded but the most substantial event was the engagement around Castle Dore, a publicly accessible prehistoric earthwork. It is

such a complex action that it was not practicable to undertake a detailed study as part of the present project but there is clearly a high priority for its assessment for the Register (cf. p.000).

The level of detail which exists in the primary written sources for seventeenth century battles means that almost all are located in general terms, with Braddock Down the only one of the 29 currently with two alternative sites where the uncertainty over location has not been resolved. At Cheriton it appears that battle archaeology has already demonstrated that the alternative site proposed by Adair is incorrect, although the extent of the action has yet to be clearly defined and the Registered area certainly appears inadequate.[55]

The potential of the battlefield varies enormously as a result of the state of preservation of the sites. This has been crudely assessed in table x, with 4 representing the site is nearly complete whereas 1 represents one that is wholly developed. Of those with some survival Worcester and Newburn Ford are the most damaged. The physical evidence for both is however still of great value because a whole sector of Worcester battlefield where probably the most critical actions of the battle took place, for the crossing of the Severn. At Newburn Ford it may be that the two river crossings and the at least one of the two sconces around which the critical action was focussed, are undeveloped. The sites classified as having less extensive destruction vary greatly in the significance of the loss, with some development being in critical areas, as at Edgehill or Adwalton, which has severely devalued the site while on others the destruction appears to have occurred in less important areas, although until detailed investigation has taken place it is difficult to be certain. This aspect of survival may however be more than outweighed by the destruction suffered by the battle archaeology, discussed below, as a result of the lack of control of metal detecting or from the impact of soil chemistry and land use history, which may mean that the overall potential of a site like Marston Moor or Braddock Down respectively may be no greater than that of Edgehill. However this may only be determined through fieldwork.

Historic terrain

Our understanding of the nature of the historic landscape of the regions of 17th century England is generally far better and the documentary record for individual landscape is often far more detailed than for earlier periods. Together with the topographical detail present in many primary accounts, this means that terrain

[55] Bonsall, 2008

reconstruction can be very effective. The principles are demonstrated through the case studies of Braddock Down and Sedgemoor (below, pp.00-00), with the former showing what can be achieved with relatively limited documentary research, whilst simultaneously demonstrating that existing historic landscape characterisation mapping is not adequate for the purpose. The Sedgemoor study provides an example of the integration of documentary and archaeological evidence for terrain.

The character of the terrain within which a battle was fought will often have had a key influence on the tactics employed and how the events evolved. There are examples of commanders manoeuvring to force a battle in a specific type of landscape that best suited the composition and strengths of their forces, as with Essex's approach to Newbury in 1643 to take advantage of the enclosed landscape to the south west of the town rather than face the royalist army, which was far stronger in cavalry, in the more open landscape to the north.

Of the 29 battles on the database the terrain of eight has not been classified, though four of these are now wholly built over and so not relevant. Of the remaining 21, 13 were fought in a landscape with significant areas of enclosed land which had consequences for the battle, with various examples of enclosures used by one army and open landscape by the other (e.g. at Adwalton Moor) In almost every case the enclosures were hedged, with just Stratton being wholly Cornish hedges (effectively stone-revetted banks), though several others had some stone walls, as at Lansdown. Only in four – Nantwich, Stratton, Newbury I and Lostwithiel – does the enclosed landscape appear to have been the dominant context. In contrast, 22 were fought in a landscape with substantial open land, and in 12 of these open field, heath, moor or pasture was the predominant context for the action. Only one battle (Newburn Ford, where two sconces controlled the river crossing) was fought primarily around fortified positions.

Most of the detailed studies we have of battlefield terrain and battle archaeology come from the open landscape battles, thus potentially introducing a striking bias in our understanding of warfare of the period. There is as yet no recovered evidence as to the nature of battle archaeology where hedged or walled enclosures were defended, but the nature of the battle archaeology should be very distinctive in such a context. Investigation of a battlefield which was predominantly enclosed is a high priority.

Action name	Historic terrain	State of development
Adwalton Moor	open moor, enclosures	3
Braddock Down	open pasture, (enclosures)	4
Cheriton	open pasture, enclosures (wood)	4
Cropredy Bridge	open field	3
Edgehill	open field	3
Hopton Heath	open heath, (enclosures)	3
Langport	open field, enclosures	3
Lansdown	open pasture, enclosures, open field	4
Lostwithiel	enclosures?	3
Maidstone	unclassified	1
Marston Moor	open field, open moor, (enclosures)	4
Nantwich	enclosures, (settlement)	4
Naseby	open field, (enclosures)	4
Newark	unclassified	1
Newburn Ford	open meadow, enclosures, fortifications	2
Newbury I	enclosures, open heath, open field	3
Newbury II	unclassified	2
Preston I	enclosures, open moor?	1
Ripple Field	open field?	4
Roundway Down	open pasture	4
Rowton Heath	open heath, enclosures	3
Sedgemoor	open moor	4
Selby	unclassified	1
Stow on the Wold	open field?	4
Stratton	enclosures	3
Torrington II	unclassified	2
Winceby	open field	4
Winwick Pass	unclassified	3
Worcester	open meadow?, enclosures, settlement	2

Battle archaeology

In this period the lead bullet became the main projectile, and the rate of fire at a distance became the determinant of success.[56] Firepower provides the critical element of battle archaeology and is directly representative of the actual fighting. From the great arrow-storms launched by English warbows in the 14th and15th centuries through to the relentless fire of machine guns in the 20th, understanding of firepower is central to the historian's task. From the 18th century this can largely be achieved through written records; before this, archaeology plays a key role.

At least from the 16th century, lead bullets are the most durable and ubiquitous of battle artefacts. However, the reverse transition from the 18th century back to the introduction of firearms in the 15th is marked by a diminishing quantity of

[56] Foard, 2008a

bullets. The earlier the date, the fewer the number of troops carried firearms as primary offensive weapons. In the 18th century all troops would be expected to carry and use firearms, whereas passing back through the 17th century just two thirds decreasing to one half of the infantry carried small-arms. In the early 17th and 16th centuries the proportions decrease again, while in the earlier 16th and later 15th centuries only a very small number of troops, if any, carried such weapons, even in major actions.

Although the rate of fire possible for small-arms was not substantially increased by technological change during this period (except right at its start), the nature of tactics evolved from one of great depth of deployment and associated slow rate of fire through to shallow deployments and more intense fire. These changes affect the archaeological record. The earlier the period, the fewer are the absolute numbers of bullets likely to have been fired, while the distributions are likely to be sparser. Up to the mid 16th century arrows were still in use alongside bullets, but rapidly declined during the second half of the century.

Typically, bullets were deposited on the battlefield in thousands or tens of thousands. And because they are small it was not normally practicable to recover them.[57] Lead is stable over long periods. There is therefore a high potential for the survival of battle scatters from this period. Compared to ferrous objects, lead bullets give distinctive signatures during metal detecting and so are relatively easy to recover by systematic survey. This also makes them vulnerable to treasure hunting or maverick survey.

Research on several 17th- and 18th-century battlefields in the UK, and more in the United States, has shown that projectile distribution provides the most valuable evidence as to the extent, intensity and character of fighting. Other military equipment and non-military artefacts lost during action or in the stripping of bodies can assist interpretation,[58] but projectiles provide the bulk of the evidence. To interpret this, and to determine wider potential, it has been necessary to undertaken firing experiments in which ballistics and forensics have been applied alongside archaeology.[59] Results have been pivotal in the characterisation of early modern battle archaeology; uncertainties remain.[60]

---

[57] With this said, during the American Civil War great quantities of lead were collected as soon as lead oxidation occurred (the whiteness permitting easy identification of lead on the surface). Lead collecting was an organised affair in the Confederate armies, and noted as such during the sieges of Petersburg and Atlanta. Also, large quantities of lead shot were collected for sale as souvenirs, even before the Civil War had ended. Information from Charles Haecker

[58] Foard, 2008a

[59] E.g.: Allsop and Foard, 2008

[60] Foard, 2008a

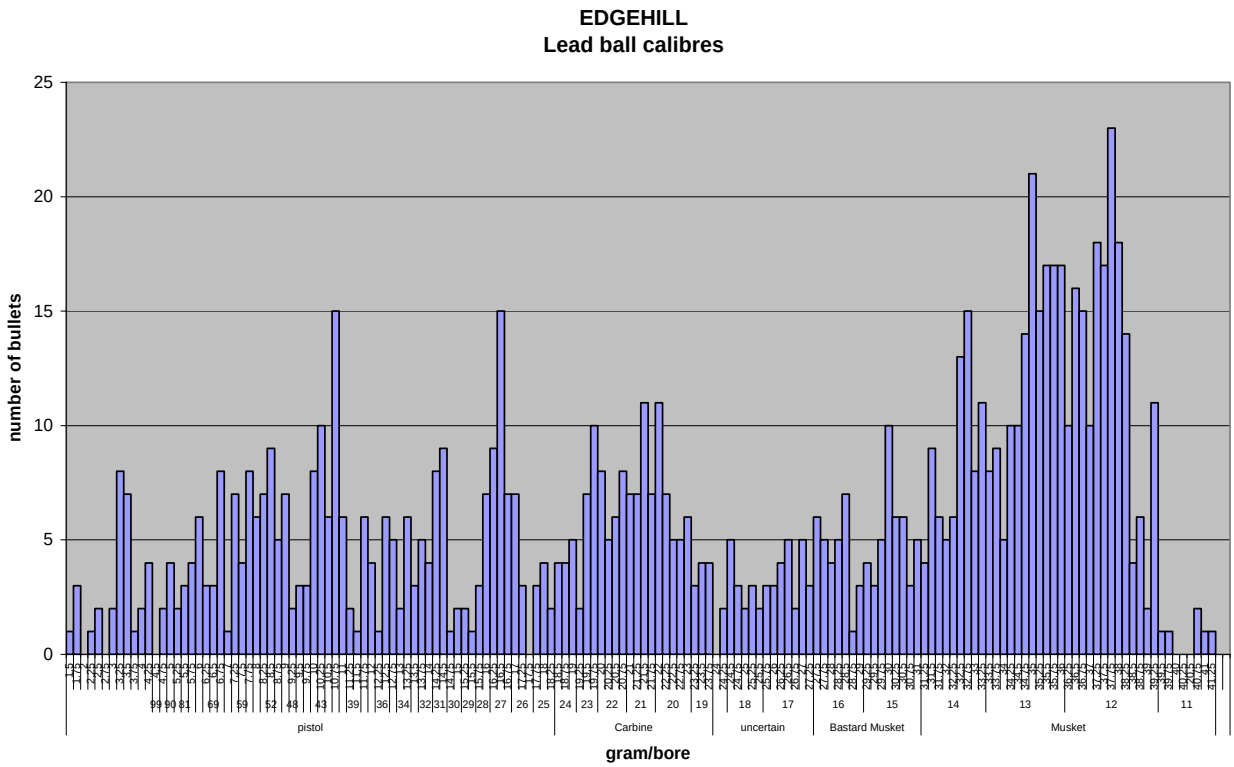

Figure 32: Calibre graph from Edgehill, showing relative numbers of bullets by weight, also indicating bore and probable weapon type[61]

Unlike flint arrowheads, stone, clay or lead slingshot, and ferrous arrowheads, a substantial proportion of fired lead bullets bear distinctive marks which show that they have been fired. Because of this, an archaeology of attack is recoverable from lead bullets that is more significant than that which can be derived from any other class of artefact.

The weight/diameter of a lead ball can be broadly correlated with the weapon – and hence the kind of troops – that fired it. The first and most significant information about a bullet is thus its calibre or 'bore'. This is most consistently defined and effectively presented from its weight, whence evidence for a site can be graphed.

Bullets show a range of form and surface detail that relate to their manufacture and use. This has been subject to detailed study; some aspects are well understood, enabling sophisticated analysis; other aspects, such as impact damage, are subject to ongoing research which it is hoped will enable better interpretation of bullet assemblages in future.[62]

[61] Foard, 2008a
[62] Sivilich, 2007; Allsop and Foard, 2008; Foard, 2008a

Figure 33: Unfired lead ball, the dominant type of bullet in use via early modern small arms. The image shows detail of manufacture, with sprue extending up from the centre that shows a distinctive snip with a central bar. Also to be seen is the faint trace of a ridge running around the ball from top to bottom, representing the join between the two halves of the mould

Figure 34: Bullet showing extreme evidence of firing through a smooth bore musket, where under pressure the bullet has expanded to fit the barrel. The lower hemisphere (right) shows melting from the combustion, while the upper (left) hemisphere shows the original bullet surface intact

Figure 35: Lead slug, a distinctive type of ammunition fired in small quantities on early modern battlefields, normally by cavalry from pistols or carbines

Figure 36: Lead bullet which shows the most distinctive evidence of having been fired as part of a multiple load of 'case shot' from an artillery piece, where the lead ball has been compressed on firing against other bullets to create a polygonally facetted surface

Figure 37: Lead bullet of musket calibre which has impacted on a hard, smooth surface distorting the lead ball and creating a distinctive impact surface

Taphonomy of bullets

Understanding of the taphonomy of most battlefield finds is incomplete. However, as a result of investigation undertaken over the last five years there is now limited evidence to suggest that a basic correlation can be made between the geology of early modern battlefields (as supplemented by information on 20th century land use), and the condition of lead bullets found upon them.

At one extreme sits the Edgehill material, in excellent condition. At the other is the Wareham siege assemblage, which shows extreme decay.[63] Subjective analysis of these bullets suggests that it is soil chemistry, primarily the soil pH, which determines the degree of lead decay. On high pH sites, such as those with parent geologies such as clays and limestones, there is stabilisation of the decay process. The build-up of a thin layer of corrosion deposit retains much of the fine surface detail

[63] Information from Michael Pratt and Charles Haecker

of evidence for bullet manufacture and use. Beneath this the lead is largely unaltered.

By contrast, in low pH conditions decay appears to proceed to a far greater depth with no stabilisation. In some cases aspects of the detail of manufacture and use are retained at the surface of the deep corrosion deposit, but often it is very poorly preserved. The condition seems to be further affected by land use history, with arable cultivation causing mechanical damage. Where bullets have minimal corrosion then mechanical damage progressively removes the corrosion layer, although much of the detailed evidence survives. Where corrosion has been more aggressive, the bullet is made much more vulnerable to mechanical damage, rapidly losing its surface detail as the deep corrosion deposits are removed; in the worst situations, bullets begin to fracture and fragment, so that even calibre information for weight or diameter are no longer certain. Where early land use history was non-arable then damage may be less, but attenuation of evidence is likely wherever arable cultivation occurs.

Almost all bullet assemblages on land show corrosion of the surface lead, usually with conversion to lead carbonate. Unlike the oxidisation of ferrous artefacts, in most environmental conditions the build-up of lead carbonate leads to a relatively stable condition and thus significant loss of bullet mass does not normally occur. Where a corrosion deposit is thin then the fine surface details left by manufacture and use of the bullet will normally show; where there is a thick deposit the finer detail may be masked or lost. Where corrosion has been more extreme then a thick deposit results and the surface evidence then appears to be preserved only in the lead carbonate; in such cases, removal of the corrosion deposit will often remove the evidence.

Figure 38: Slight corrosion on this bullet from Sedgemoor means that remarkable detail survives, showing it to be a lead ball of carbine bore that was fired as the lower part of a multiple load together with a large number of hailshot of a few millimetres diameter

Figure 39: A slightly thicker lead carbonate corrosion deposit on this musket calibre bullet from Edgehill masks some detail. Even so, the snip which removed the casting sprue (a shallow scoop in the form of two hemispheres with a central bar) remains visible

So little investigation has yet taken place that it is as yet unclear how many sites are seeing erosion, and to what degree. It is possible that a substantial long term loss of evidence is underway which will rob most sites of the level of detail that has been seen at Edgehill, where conditions have been highly conducive to bullet preservation. Yet even at Edgehill there is evidence of decay, in some cases amounting to near complete removal of corrosion deposits.

Figure 40: The crazed surface of a lead bullet from Edgehill, apparently resulting from early stages of decay of the lead carbonate corrosion deposit

In aggressive soil conditions, corrosion penetrates deeper. Where there is no mechanical damage then deeply-corroded bullets may still retain some detail on their surface, but where cultivation occurs then the mechanical damage appears to lead to rapid erosion of the surface.

If corrosion has been even more extreme the result can be a fracturing and fragmentation of the bullet, rendering all measurements of calibre nugatory.

Figure 41: Intense corrosion has penetrated deep into the lead of this bullet from Wareham where, on a parent geology of sand, the soil pH is very low. The bullet has begun to fracture and fragment under the impact of mechanical damage in arable conditions

The other major cause of loss of surface detail is post recovery. For bullets this is a combination of lack of control of moisture levels and, most importantly, the failure to protect bullets from mechanical damage. Standards of current best practice are detailed in Appendix 3.

In the present project just two large data sets, from Wareham and Edgehill, have been subjectively assessed and soil chemistry tested. They represent the two extremes. The majority of the Edgehill assemblage survives in excellent condition and most bullets have yielded evidence of manufacture and use. This excellent condition seems to result from high soil pH (see Chapter 4) combined until recently with relatively low mechanical damage over several centuries, demonstrated by a well documented land use history. The site was wholly under pasture in 1931-5 while the presence of ridge and furrow over almost the whole battlefield in the late 1940s shows it to have been uncultivated since the 18th century when the open fields were enclosed. By 2004-7 the landscape was largely arable, although a small number of fields still contained ridge and furrow that had never been ploughed. Thus mechanical damage at Edgehill will have been very recent.

At the other extreme lies the Wareham siege assemblage, where the condition of most though not all bullets is very poor. Not only have the surface indicators of manufacture and use been lost on a large part the assemblage, the erosion appears to have rendered the calibre graph meaningless for this is the only assemblage so far studied where distinctive calibre groupings are not distinguishable. The primary factor is likely to be soil chemistry, for the soil has a parent geology of sand and so the soil has a low pH (see Chapter 4). Mechanical damage may also have played a part for the site was under arable in 1931-5 and immediately prior to mineral extraction in the 1990s. One problem complicating the analysis is that the Wareham assemblage, because collected in the 1990s as an

unstratified collection, has not been stored to curtail decay by controlling humidity and minimise abrasion.

The present analysis needs validation. Further research is required to establish the relative importance and complementary nature of the various factors that influence decay of bullets, including the impacts of different land use history and different modern agricultural regimes. The Edgehill data provide the starting point as they reflect variable mechanical influences on a well preserved site. However, these need to be compared to new samples collected to the same standard from other battlefields where conditions vary. Until this is done it will not be possible to predict the trajectory of decay and so determine where conservation need may lie. It is recommended that such validation be undertaken in Phase II through small scale sampling of bullets and soil chemistry from a number of battlefields on contrasting geologies, with a standard method of assessment of bullet condition to ensure parity of data. The principles behind such an approach may also prove valid for ferrous and copper alloy artefacts. If the preliminary analysis offered here can be so formalised, and if some chronology can be determined for the decay processes in different conditions, then it should be possible to predict the potential of the bullet assemblages on early modern battlefields. If so, it will then be possible to see where the greatest threats exist and hence where the priorities lie for arable reversion or, failing that, recording.

For the present purposes, 31 battles have been assessed for

- their surface geology
- the percentage of land under arable on the 1930s land use survey
- percentage of land under arable on vertical aerial photography of c.2000

All early modern battles have been assessed except for those which are so heavily developed as to be irrelevant or where information as to the exact location of the battlefield was unavailable. Lesser areas of potentially significant geologies are indicated in brackets, for example where there are peat and alluvial deposits which might provide exceptional preservation, through protection from mechanical damage or waterlogging, respectively. Grading is in each case from 1 (bad) to 4 (good). Zero indicates not assessed. Braddock Down appears twice because alternative sites have been separately assessed, incidentally showing how greatly the potential of a battlefield may vary depending on exactly where the core of the action is focused. If the correlation is broadly correct then it is likely that the potential of different battlefields may vary substantially, not simply according to the state of development

or the quality of the documentary record but also because of the differing quality of the archaeological record.

action name	year	state of dev.	arable modern	arable 1930s	bullet potential suggest by geology	geology
Selby	1644	1	0	0	0	n/a
Maidstone	1648	1	0	0	0	n/a
Newark	1644	1	0	0	0	n/a
Hilton	1644	1	0	0	0	n/a
Preston I	1648	1	0	0	0	n/a
Torrington II	1646	2	0	0	0	n/a
Newbury II	1644	2	0	0	0	n/a
Braddock Down	1643	4	2	3	1	sandstone
Hopton Heath	1643	3	2	4	1	sandstone
Adwalton Moor	1643	3	3	3	1	sandstone
Stratton	1643	3	4	4	1	sandstone
Ripple Field	1643	4	1	1	2	sand & gravel; sandstone
Newbury I	1643	3	2	3	2	sand & gravel; clay/sand/silt; (alluvium)
Lostwithiel	1644	3	3	4	2	sandstone
Winwick Pass	1648	3	1	1	3	clay (sandstone)
Rowton Heath	1645	3	1	4	3	clay (sand & gravel / sandstone)
Winceby	1643	4	1	1	4	clay
Marston Moor	1644	4	1	2	4	clay; (peat?)
Newburn Ford	1640	2	2	2	4	alluvium
Stow on the Wold	1646	4	2	2	4	limestone
Cheriton	1644	4	2	2	4	chalk; clay with flints
Roundway Down	1643	4	1	3	4	chalk
Cropredy Bridge	1644	3	2	3	4	mudstone; alluvium
Langport	1645	3	2	3	4	mudstone; limestone (alluvium)
Worcester	1651	2	2	4	4	alluvium; siltstone (sand & gravel)
Edgehill	1642	3	2	4	4	mudstone; (alluvium)
Langport	1645	3	3	3	4	(alluvium)
Nantwich	1644	4	2	4	4	clay (sand & gravel)
Naseby	1645	4	2	4	4	clay; (alluvium)
Lansdown	1643	4	3	3	4	limestone
Sedgemoor	1685	4	2	4	4	peat (sand & gravel)
Braddock Down	1643	4	3	3	4	shale (alluvium)

Further priorities

There is need for

- a reference collection of bullets, comprising digital images and descriptive text
- database analysis of bullets, roundshot and bandolier items to facilitate wider and more consistent analysis of battlefield assemblages. This needs to be linked to a
- physical reference collection of experimentally fired bullets with related scientific data and a detailed methodology of bullet analysis
- a case study on a well-preserved battlefield fully to explore the potential of bullet scatters, including particular aspects such as case shot scatters and firing lines; the Edgehill study suggests that such aspects may enable the recognition of individual battalions

Braddock Down: a case study in historic terrain

Summary of action

On the 9 January 1643 at Braddock in Cornwall (SX177631), about seven kilometres north east of Lostwithiel, a royalist army of c.5000 men under Sir Ralph Hopton defeated a parliamentarian army of c.4000 under General Ruthin. There were few royalist losses but the parliamentarians suffered about 200 killed and 1500 captured as well as losing their baggage train and several pieces of artillery. The battle secured Cornwall for the royalists and established Hopton's reputation as an effective commander.

The royalists camped the night before the battle at nearby Boconnoc and were surprised when, in the morning on breaking camp, their vanguard of dragoons encountered enemy cavalry to the east. They discovered the parliamentarian army already deployed in battle array on Braddock Down, though a parliamentarian report claims it was they who were caught on the march by the royalists. Hopton quickly deployed his own troops with the infantry flanked by cavalry on both wings, and in the centre placed two artillery pieces commandeered from Boconnoc House. A forlorn of musketeers, a detachment of commanded musketeers sent forward of the main body as a skirmishing unit, was placed in small enclosures closer towards the enemy.

The two armies faced each other on opposing ridges across a small valley. To begin with there was a prolonged fire fight but neither seemed willing to give up the advantage of their relative positions. Eventually Hopton, after firing the two artillery pieces, led his entire army down into the valley and charged up the other side. The Parliamentarians were overwhelmed almost immediately. Standing to fire only a single volley they fled. Ruthin left parliamentarian musketeers lining the hedges on the road towards Liskeard, to protect the retreat, but these were soon flushed out and the rout was complete, as the royalists continued the pursuit into Liskeard.

Finding the battlefield

Braddock battlefield is included on the Register, but is one of the few Civil War battles where there is a significant dispute over the exact location. Only one of the alternative sites has been included within the Register boundary but there is no definitive evidence to prove that this is correct. Detailed discussion of the battle is omitted by most battlefield guides and histories but where it is addressed most

authors, including Burne and Kinross, follow the traditional location although Brooks presents both options.[64]

The traditional site, recorded in 1881 on the 1st edition six inch Ordnance Survey, lies between Boconnoc Park and Braddock Church.[65] The suggestion of an alternative site 2km to the north east was made by a local historian after re-examination of the primary sources for the battle and historic terrain evidence.[66] This reinterpretation has been followed by the English Heritage Battlefield Register report and thus the Registered Battlefield lies adjacent to the main Liskeard to Lostwithiel road near Middle Taphouse.[67]

One thing that emerges both from the review of English battles in this report and for the inventory of Scottish battlefields is that where sites have been shifted from traditional locations the transfer is seldom satisfactory.[68] Re-examination of the primary documentary sources in the context of our terrain reconstruction does not yield sufficient topographical evidence to resolve the issue. However, the present analysis has worked from the reprinting of extracts of the primary accounts of the battle in the Register report. A prerequisite for analysis is the compilation of full transcripts of all the accounts in a concordance. However, though this may add to understanding, it is unlikely that the dispute over location will be resolved by this alone. Braddock Down thus presents a classic example of where integration of the evidence for terrain and military history provide hypotheses that need to be tested archaeologically.

Historic terrain

In a region which was largely enclosed at a very early date, extensive areas of open ground are significant. The battle name Braddock Down mirrors many from the enclosed zones of Britain, which relate to the intentional choice of open ground in which the standard 17th-century tactical formations could be applied.

The historic landscape and the main historic map sources for the Registered Battlefield area were discussed by Buck, in the CEI landscape report and in the National Army Museum battlefield report which underpins the Register.[69] This is one of the Register's more substantial discussions. However, a mapped reconstruction was not prepared for the latter and it is this which enables the sometimes disparate

[64] Burne and Young, 1959; Brooks, 2005
[65] Kinross, 1988
[66] Wilton, 1985; Wilton, 1992
[67] National Army Museum, 1995c
[68] Foard and Partida, 2005
[69] CEI, 1994; Buck, 1996; National Army Museum, 1995c

details from different sources to be brought together in a single representation. The same is true of the 1996 desk top assessment prior to pipeline construction across the Registered battlefield.[70] The preparation of such reconstructions is a key issue that needs to be clearly defined in a guide to best practice for battlefield investigation. As demonstrated above, the landscape characterisation data set is not adequate for the purpose.[71]

The historic landscape of the Boconnoc/Braddock/St Pinnock area is unusually well documented. There is a very good sequence of historic maps from the 16th to 19th centuries which have been used here, as well as an extensive written record for the Bocconoc estate from the 16th century onwards, which could not be exploited here but which offers a high research potential. Gascoyne's county map of 1699 yields little, but that of 1748 by Martyn provides a valuable picture of enclosed versus open land at that date, a level of detail only occasionally found in such county maps. There is also more detailed local mapping. Few parliamentary enclosures took place in Cornwall, the majority of the open land being enclosed by agreement in the 15th-18th centuries; in some areas enclosure is even more ancient. It is therefore exceptional to have extensive parliamentary enclosure of the Downs at Braddock defined in a map and award of 1822.[72] More important still the enclosure was so late that prior to enclosure the downland had been mapped on the Ordnance Surveyors' Drawings at two inch scale in 1803.

Enclosure maps, because of their very specific purpose, typically do not show the pre-enclosure roads and pre-enclosure field closes (enclosures in which common rights were still maintained). However, both are shown on the Ordnance Surveyors' Drawings, which were intended to provide a representation of the militarily significant aspects of the landscape.[73] In addition there is a detailed map of the southern part of the area in the late 16th century, long before the battle, while in 1675 Ogilby shows the main post road across the Down. There are also various other estate and tithe maps from the 18th and 19th centuries and a vast documentary archive in the Cornwall Record Office for the Boconnoc estate, which will probably contain a great deal of information on the landscape of the 17th century. Of all the main data sources consulted for this assessment only the RAF 1940s vertical air photographs failed to produce any useful evidence.

[70] Buck, 1996
[71] Cornwall County Council, 1996
[72] Tate and Turner, 1978, 82
[73] Delano-Smith and Kain, 1999

The mapping presented here shows the extent of open common which was still unenclosed in 1803. Within that it distinguishes the field closes, at least one of which (to the east of Boconnoc church) is depicted on the 16th-century map. The remaining areas were anciently enclosed as defined on the enclosure map and this is broadly confirmed for the southern part of the battlefield by the 16th-century map. A small area of ancient enclosures surrounds Middle Taphouse, to north and south of the main Liskeard to Lostwithiel road. Ogilby's 1675 Itinerary does not show the enclosures at Middle Tap House but it does refer to the House itself and so there may already have been a very small area of enclosures there are that time. It would, however, be surprising if they had existed on both sides of the road and yet remained unmapped by him, given his usual attention to such detail.[74] Within the southern area of the Taphouse enclosures a large mound, interpreted as a Bronze Age burial mound, still survived in 1946; others are recorded from historic maps and archaeologically elsewhere on the former heathland of Braddock Down.[75] But, contrary to the Register report's suggestion, this proves little in relation to the battle account reference to artillery being placed on a barrow, for at least ten barrows were recorded in the 20th century as still scattered across the downs, and many more appear on the 16th century map.[76]

The road network will have been critical in determining the approach and flight of the parliamentarian army. The army's initial deployment, though not necessarily the principal deployment before the action, is said in one original account to have been where the Liskeard road opened out into Braddock Down. The Register report describes the Liskeard Road running through St Pinnock, but Ogilby in 1675 clearly identifies it on a more northerly course, joining the Launceston to Fowey road at East Tapp House. The remaining road network is provided on the 1803 map with those on the southern half of the area largely confirmed by the 16th century map. While the geological mapping provides little clear evidence of peat or even alluvial deposits across most of the area, the 1881 Ordnance Survey depicts a substantial boggy area immediately north of the Fowey to Liskeard road south of Middle Tap House.

[74] Ogilby, 1675, plate 69
[75] Buck, 1996
[76] 'draught of the East Commons', c.1590: CRO map AD644

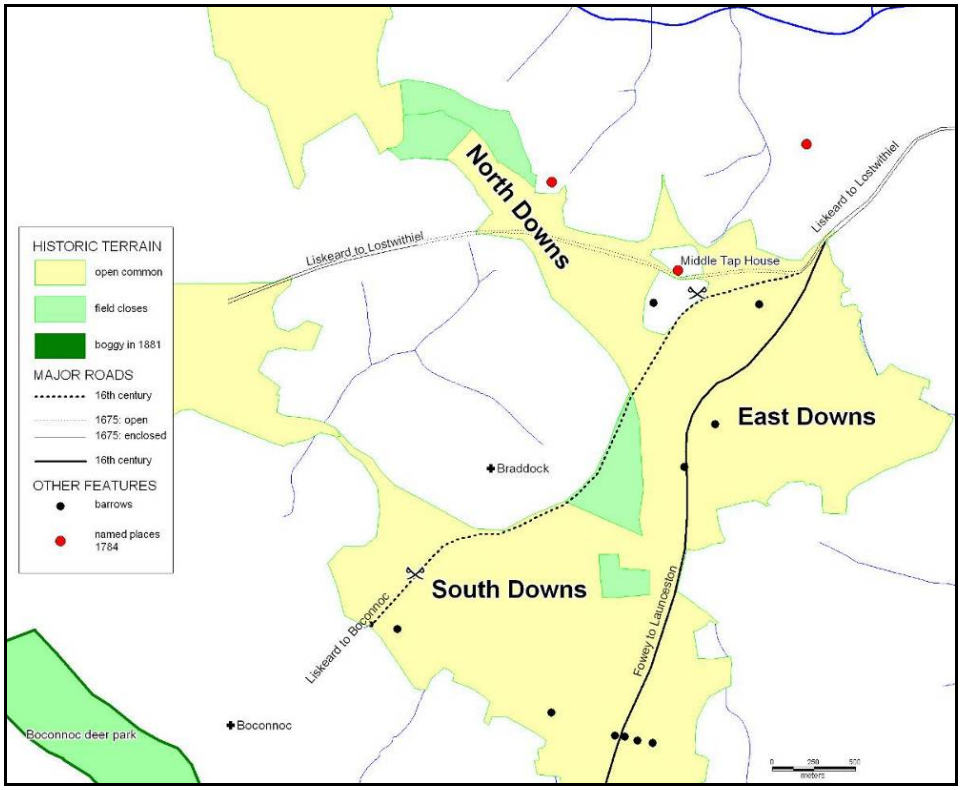

Figure 42: Braddock Down: historic terrain with traditional battlefield to the south west and the Registered battlefield to the north east

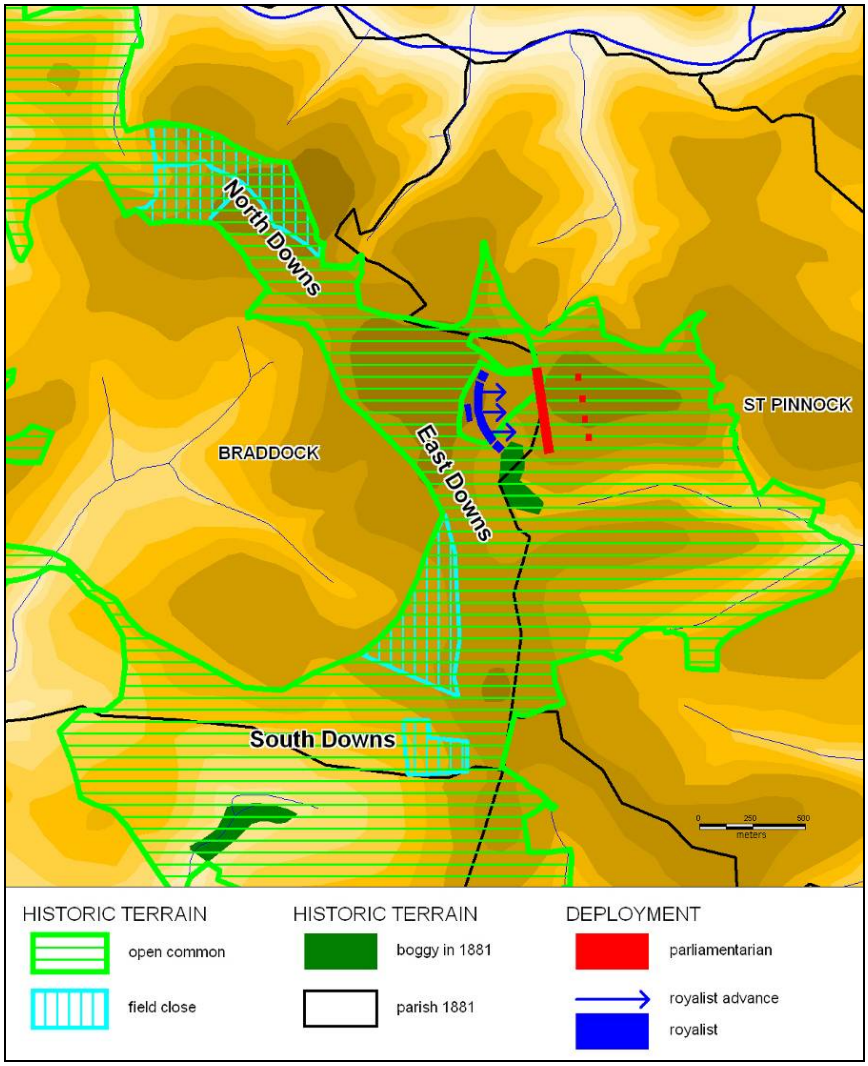

Figure 43: Braddock Down: relief with superimposed historic terrain detail

Action placed in terrain

Having recovered the broad structure of the historic terrain it is possible to reconsider the detail presented in the primary accounts of the battle, briefly reviewing each of the arguments presented in the Register report.

The parliamentarian account by Wrothe specified that they were attacked as they marched 'beside a dangerous bog and a very high hill'. This would seem to accord best with the road from Liskeard to Fowey where, to the south east of Middle Tap House, it crosses the boggy area depicted in 1881. Thus the first encounter seems most likely to be where the East Downs begins to narrow south westward towards the South Downs. A royalist approach to the Downs from Boconnoc park, where they were camped, will almost certainly have brought the royalists across the traditional site of the battle, on the South Downs.

According to Hopton the parliamentarians deployed on Braddock Down at the end of the lane coming out from Liskeard and the royalists deployed on the west side

of Braddock Down. This seems initially to fit well with the Registered site, if the East Down is meant, but there are three separate downs and when the field closes are taken into account, and particularly that recorded in the 16th century on the East Common (South Downs), then it can be seen that the Liskeard to Boconnoc road would also enter the East Common through enclosed ground. Thus the descriptions could equally be compatible with the traditional site. To reinforce the latter there is the most specific of all topographical references, written by Grenville, one of the senior royalist officers who was from the region. Grenville states that the action took place on the heathland between Boconnoc and Braddock church, which fits perfectly with the traditional site for the battle. The Register analysis, following Wilton, presents a convoluted argument to accommodate this description with the modern re-interpretation of the battle site, arguing that Grenville mixed up Braddock church, which is close and clearly visible, with St Pinnock church which is over 2.5km to the east and out of sight from both alternative sites. It is suggested that this error may have occurred because of the lack of clarity over the churches seen on Speed's map, or in various published derivatives, to which Grenville probably had access.

Grenville then says that the parliamentarians deployed on a 'pritty rising ground' which was in the way towards Liskeard and the royalists on another hill within musket shot of them, so perhaps some 250-350 meters apart.

Symond's Diary states that during the1644 Lostwithiel campaign, on 7th August 1644, Charles I's army camped on the site of the Braddock Down battle, on Pinnock or Broadoak [Braddock] Down and then the next day advanced towards Boconnoc.[77] Though at first sight this might seem to be helpful in fact there is again insufficient detail to be certain of the location meant.

Thus it can be seen that even with more detailed terrain reconstruction, it is impossible to be sure about the location of the battlefield. Unless important new documentary evidence is found it will only be through a study of the battle archaeology that this problem will be resolved.

Battle archaeology

Part of the Registered Battlefield has been subject to an archaeological desk based assessment, evaluation and watching brief.[78] A metal detecting survey was conducted in advance of pipeline construction, but this was restricted to the Registered Battlefield, incidentally showing how influential the Registered boundary can be in governing the archaeological response to threats. The full 20m width of the

[77] National Army Museum, 1995c
[78] Cole, 1999; Buck, 1996

planned pipeline was detected prior to topsoil stripping, but not all fields within the corridor were accessible. The survey, undertaken by a number of metal detectorists under archaeological supervision, produced no Civil War related artefacts at all. The follow up watching brief during construction was conducted under difficult circumstances and again produced no significant results.

The survey traced a transect through the two opposing deployments, as defined by English Heritage. While the absence of finds on the parliamentarian side is explained by the inaccessibility of the land for survey, the lack of finds from the area of the supposed royalist deployment challenges the Register's interpretation of the battlefield location and the position and extent of deployments shown there. While an absence of bullets from an area of cavalry action might be explicable, the failure to find bullets deriving from the substantial fire-fight that occurred between infantry battalions is very difficult to explain. Even if the area had been under pasture for a century or more and the bullets had all migrated to the bottom of the topsoil, the results from Edgehill demonstrate that at least some musket calibre bullets would be recovered by competent metal detecting.[79] Though the report does not specify the level of expertise of the detectorists or the intensity of the survey, to find no bullets is highly unusual.

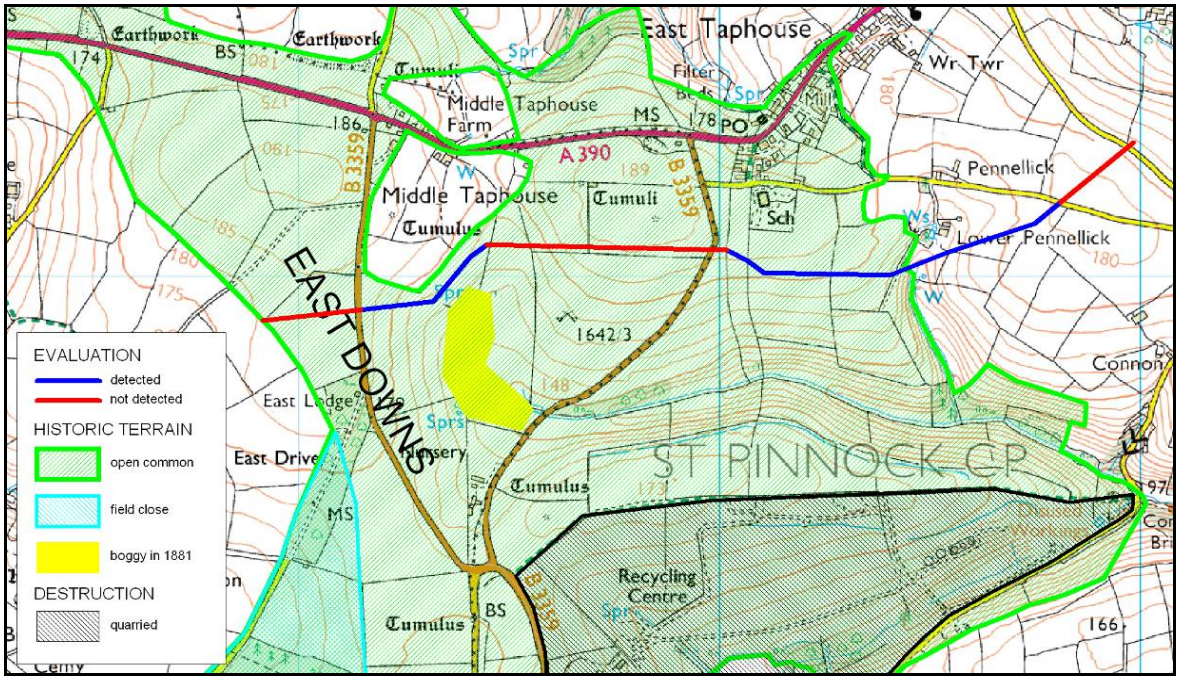

Figure 44: Braddock Down: evaluation prior to pipeline construction across the Registered battlefield

[79] Foard, 2008a, chapter 5

Condition

The landscape of the traditional site was wholly transformed by 19th-century and earlier imparking. It is now half under woodland and half under pasture. In the 1930s it was 30% heathland, 10% pasture and 60% woodland and it is on a sandstone and siltstone geology which may have produced an acidic soil. This combination of land use and geology may have resulted in soil chemistry which is causing some damage to the bullets, but the lack of arable cultivation would probably largely mitigate this. The Registered site appears to retain most of its early enclosure hedgerows. It is now largely arable (90%) with a further 10% under pasture, but in the 1930s it was 70% pasture and 30% arable. The geology is slate and siltstone and so may prove to have less aggressive soil chemistry but this may be compensated for by mechanical damage due to the largely arable land use.

Research potential

Work at Wareham siege site has shown that even in very aggressive of soil conditions and with intensive arable for much of the twentieth century lead bullets from a Civil War action still survive, even if their surface information is largely lost. Thus it cannot be suggested that the absence of battle archaeology in the Registered site is due to its destruction. If there has been no depletion by treasure hunting (of which as yet there are no reports), then evidence should be well preserved. Further, it is highly improbable, in the light of the topography, that the action could have occurred solely in the large area on the south eastern quarter of the East Down which has been recently quarried.

Both in the ancient and in the parliamentary enclosed areas there are the typical Cornish hedges, stone faced banks surmounted by hedges, as well as normal hedgerows. There may thus also be potential in several locations for evidence of the fire fights preserved in these revetted banks. Though bullet impact scars are unlikely to survive on the stone revetting, embedded bullets may well exist within the banks, though this would pose some unusual problems for battlefield survey.

If well preserved the battle archaeology can be expected conclusively to locate the battlefield, both from the musket calibre bullets from small arms fire, and probably also from case fired by artillery. Indeed as at Edgehill, it is likely that such evidence, if surveyed and analysed following the methodology demonstrated for Edgehill, will enable the deployments and action to be closely mapped. Moreover, given the high quality of the historic landscape data combined with the relatively good level of detail available in the various primary accounts of the action, Braddock offers

a high research potential to explore the relationship between the action and the historic terrain, by integrating the three data sets.

There were at least three main elements to the action: a fire fight; a rapid assault; and a destructive rout, including a separate fire fight for enclosures bounding the main road leaving the battlefield towards Liskeard. The archaeological signatures of the three elements are likely to be spatially separate and may exemplify the archaeological signature of a fighting retreat in an enclosed landscape.[80]

---

[80] **Primary sources: terrain** In the 19th century Braddock (or Bradoc) was a parish united with Bocconnoc. It includes the manors of Braddock and Warleggan. Boconnoc includes manors of Botelet, Langunnet, Bodulgate. St Pinnock includes manors of: Botelet, Penvvrane, Fursdon, Trevillis. Lanreath, the northern extremity, extends into the East Down at Boconnoc, and includes the manors of Botolet, Langunnet, Lanreath, Treire. St Winnow: the West Down of Braddock was contiguous with that of St Winnow at enclosure, and also includes the north western part of Boconnoc Park.

Historic maps and awards*:*

Boconnoc	Tithe Map CRO TM12, Award CRO TA12
Braddock	Tithe Map FS3/924, Award TA17
Lanreath	Tithe Map TM113, Award TA113
St Pinnock	Tithe Map TM189, Award TA189
St Winnow	Tithe Map TM253, Award TA253/1

Inclosure of Downs in Braddock, Boconnoc & St Winnow (2300 acres):
1809 Enclosure Act, CRO AD593
1822 Enclosure Award, CRO QS/PDA1

Inclosure of Pollard's Down in St Pinnock (106 acres) (not on or near the battlefield):
1867 Enclosure Act
1873 Enclosure Award, CRO QS/PDA20

- Tracing of Bodargie in Bradoc with fields numbered (ref. P 17/3/2, no date)
- Plan of Boconnoc, 'draught of the East Commons', c.1590, CRO AD644 (catalogue states: Bought by CRO from Grampound Antiques, Truro, but was from the sale of the contents of Ethy House, June 1977)
- Plan of Boconnock Barton – woods, fields named, undated, F/3/map/21
- Enclosure of roads in Boconnoc, Bradoc & St Winnow, 1811: F/325 – unfit for production
- Commissioners' draft plan Boconnoc Enclosure c.1821, F/326 – unfit for production
- Plan of part of Boconnoc estate, c.1811-20, F/327/1
- Plan of Penventon platation and adjoining land, 1817, F/321/8
- Map of deer park in parishes of Boconnoc & St Winnow, F/327/27
- Warleggan manor in Braddock – 18th century, no land in Braddock identified, CRO DDG1872

Other sources: Various deeds, leases etc from 17th-19th centuries: DDR741-5; Fortescue Collection: summary catalogue only. Important large collection, mostly uncatalogued, extending t least from 16th century onwards. The estate encompasses most of the battlefield. County maps: Gascoyne 1699, Martyn 1784 (appears to show church towns (church), other hamlets (circle) and isolated single farms or great houses etc (house)); Morden 1695, Greenwood 1826-7; Smith 1804

The potential of Characterisation data

The first project completed was for Cornwall by the Cornwall Archaeological Unit. [81] The generalised mapping that this provided of anciently (pre 17th century) and recently (17th-19th century) enclosed lands provides a useful background against which to view the military situation in the region in the 17th century. However, because it was prepared for a very different purpose, at a battlefield scale the mapping does not provide sufficient detail for understanding of the historic landscape at the time of the Civil Wars.

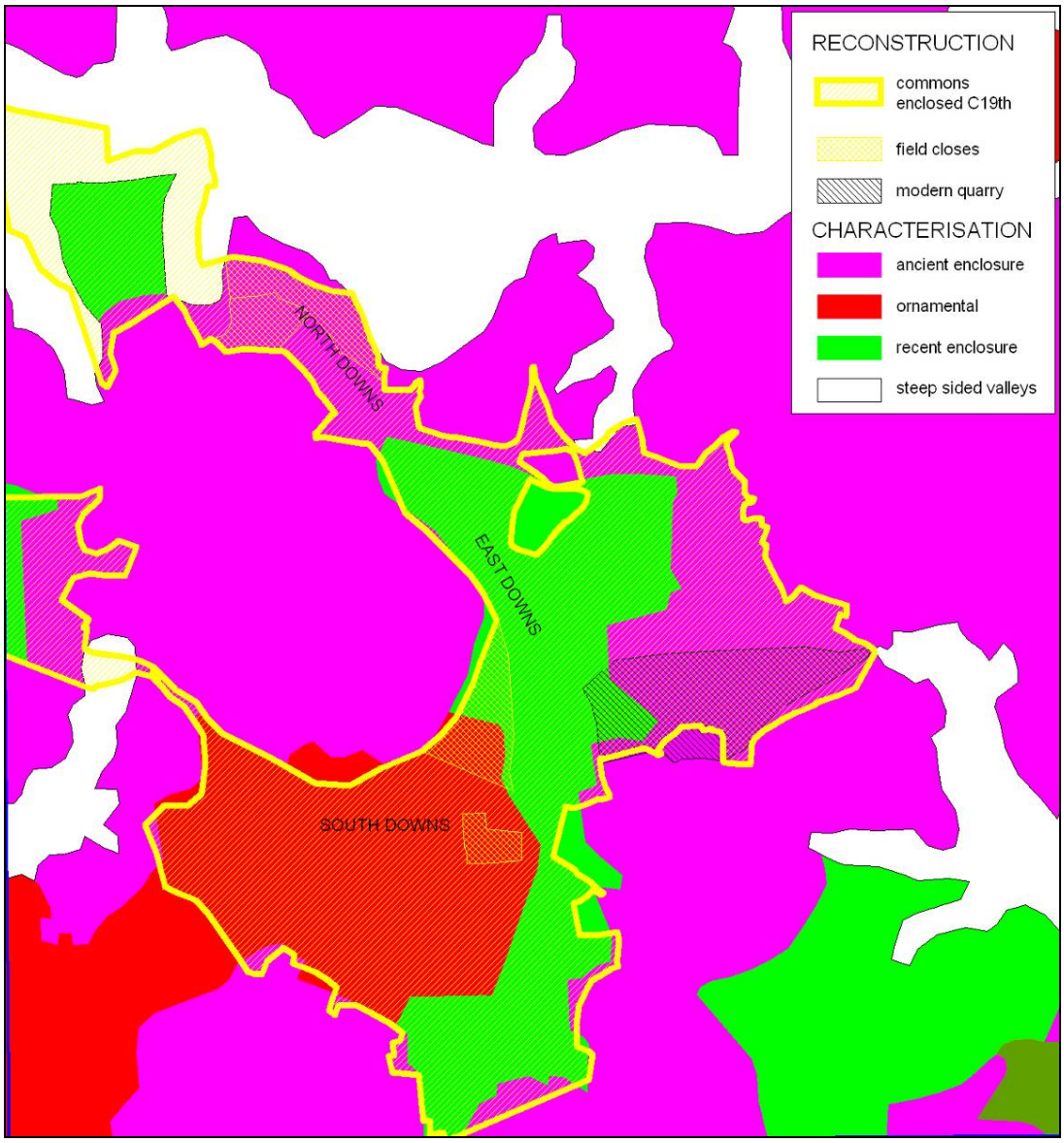

Figure 45: Landscape characterisation and historic terrain reconstruction compared

The Cornish battlefield of 1643 on Braddock Down was taken as a case study to test this. A basic reconstruction of the historic terrain of the battlefield has been prepared

[81] Cole, 1999, 1996

from a range of maps from the 16th to 19th centuries. The key elements mapped are: ancient enclosures; common enclosed in the nineteenth century by parliamentary Act; and field closes enclosed at an early date but still retained as commonable land until parliamentary enclosure.

This accurately-mapped terrain detail has then been superimposed in onto an extract of the countywide characterisation dataset. It can be seen that the characterisation classification represents a merging of different chronological elements, the ornamental obscuring the earlier pattern of ancient and recent enclosure. In addition, at this scale the level of accuracy in the countywide characterisation data set is low, with key areas of common being misclassified as anciently enclosed and a small but potentially very important area of ancient enclosure at Middle Taphouse misclassified as recent. Further, the field closes within the common are wholly missed, whereas the reconstruction provides an unusually accurate definition of them, with good documentary evidence that the largest lying between South and East Downs was already in existence in the 16th century. This demonstrates that landscape characterisation, at least as first applied in Cornwall, is too inaccurate and inconsistent for the reconstruction of historic terrain at the level required by battlefields.

Sedgemoor: a case study in historic terrain and battle archaeology

Summary of action

In June 1685 the Duke of Monmouth mounted a rebellion in south-west England in an attempt to topple the new Catholic king James II. It proved an abortive campaign and by 5 July the rebel army of about 3,500 lay cornered in Bridgewater. That night across the boggy wastes of Kings Sedgemoor, Monmouth launched a last desperate attack on the royal army's camp. They were discovered before they arrived and then, in the darkness, their cavalry failed to locate the ford giving access to the camp. Most of the rebel horse soon fled and, in open country without cavalry support, Monmouth's infantry proved an easy target for the royal cavalry. Finally the royal

commander launched a join cavalry and infantry attack and Monmouth's army was destroyed.[82]

Historic terrain

Sedgemoor is arguably the best documented of all English battles, with a series of contemporary plans by Dummer and by Paschal. It is, however a landscape that was dramatically transformed, largely under an Act of Parliament of 1791 for drainage and enclosure.[83] Thus the military information in the primary sources can only be fully unlocked through reconstruction of the historic terrain. For this there is excellent documentary and archaeological data, which enable a clear demonstration of the methodology of historic landscape reconstruction for the purposes of battlefield study.

The analysis was made using a sequence of maps that start with the Ordnance Survey 1st edition six inch survey of 1880s, which were registered in MapInfo to the modern OS map base. Then there was a sequence of three earlier maps of King's Sedgemoor: a late-18th-century pre-enclosure map; a drainage and enclosure map of 1795; and a tithe map of Westonzoyland, 1843. Relevant data from each earlier map was successively added, as discussed above, the later map providing the base for mapping from its predecessor and thus correcting for the geodetic inaccuracy of the earlier maps.[84] Where features were depicted on earlier maps but not later ones then archaeological earthwork evidence from the RAF 1947 vertical air photographs, rectified and registered in GIS, was used, where possible, accurately to position them. This was most successful in locating the 'rhynes' or drainage dykes.[85] The reconstruction plan shows a small section of King's Sedgemoor, a lowland moor of poorly drained alluvium, with adjacent anciently enclosed arable fields on the main islands of Chedzoy and Zoy, on the north west corner of which lay Westonzoyland. Small areas on the periphery of Chedzoy and of the mainland to the north east had been drained and enclosed as meadow, something that had already happened by 1685 judging by Dummer's plan. From Westonzoyland the main road led across the moor to Bridgewater but there was also a moorland route that crossed the Bussex Rhyne via the lower plungeon and passed by Penzoy Pound westward. A second track led from that plungeon to Chedzoy,

[82] Chandler, 1995
[83] Foard, 2003b; transcripts published by Chandler, 1999; Young and Adair, 1979, plate 13
[84] Late eighteenth-century pre-enclosure map of Kings Sedgemoor, Somerset Record Office: DD/AH Box 47, 11. Map of Kings Sedgemoor re Drainage and Enclosure, 1795, National Archives CP43/851, after rot.276; Tithe Map of Westonzoyland, 1843, National Archives IR30/30/453
[85] RAF CPE/UK/1924/3035-8

entering the enclosures via Brinsell Gate. Another track crossed by the Upper Plungeon and went via Langmoor Stone, where it crossed the Langmoor Rhyne, then following a thin tongue of moorland skirting Chedzoy to the east and north, ultimately joining lanes leading from the Bridgewater to Bristol / London road.

Taking the battle accounts and battle plans produced at the time, and using the troop numbers and principles of deployment in the military manuals, a detailed reconstruction of the approach of the rebel army to the battlefield and the deployment of both armies has been developed.

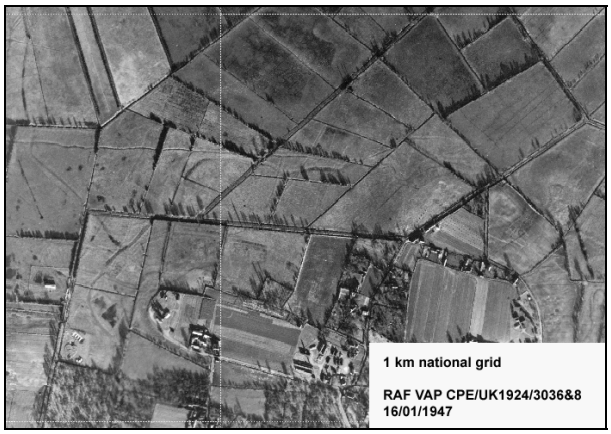

Figure 46: Sedgemoor: earthworks on RAF vertical air photograph (© English Heritage)

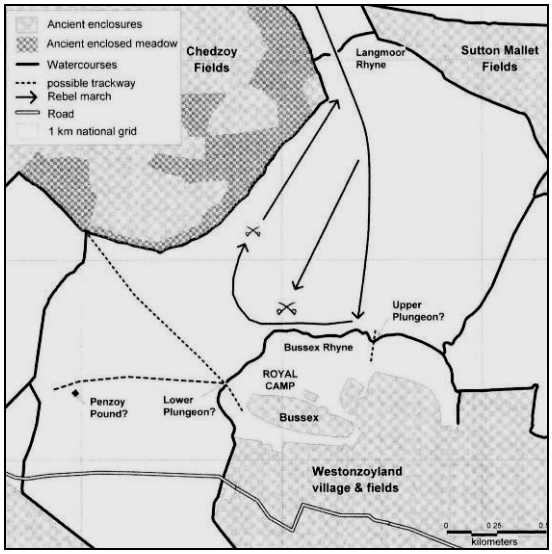

Figure 47: Sedgemoor: reconstruction of historic terrain (from Foard, 2003b)

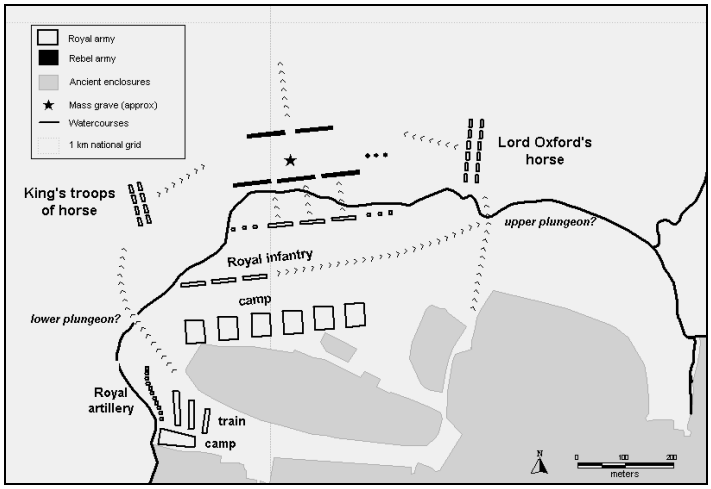

Figure 48: Sedgemoor: deployment and action within reconstructed terrain (from Foard, 2003b)

Battle archaeology

This hypothesis has since been tested by battle archaeology, as recorded by a metal detectorist, and by limited new investigation carried out in 2007 in response to a threat from pipeline construction.[86] The management issues are discussed further in chapter 6. A more extensive data set from detecting by Pettet is currently under analysis by Fergusson as part of post graduate research at the University of Glasgow. Conclusions presented here are accordingly provisional.

[86] Undertaken in collaboration with Context One, Wessex Water and Somerset County Council. Foard, 2008b. The work was requested by Somerset County Council in fulfilment of requirements in Local Plan Policy HE10 and County Structure Plan policy10:
http://www.sedgemoor.gov.uk/localplan/text/text10.htm
http://www.somerset.gov.uk/enprop/strucplan/review4.htm

The 2007 investigation was conducted on 2.5m spaced transects along the proposed route of the pipeline and then on a single sample field to link the pipeline data to the wider context of the battlefield. The survey was undertaken with a team of six metal detectorists and followed the Edgehill survey methodology, but with survey grade GPS recording, complemented in the second stage by navigation grade GPS recording as used at Edgehill. Dramatic variation in bullet recovery rates between detectorists demonstrates the large biases in recovery rates that can occur when an inexperienced detecting team is employed. This bias will have caused some distortion in the recovered pattern but this was minimised by interspersing the transects undertaken by each detectorist. This also shows the importance of recording reconnaissance speed, coverage and finds recovered by each detectorist (see further in Chapter 6).

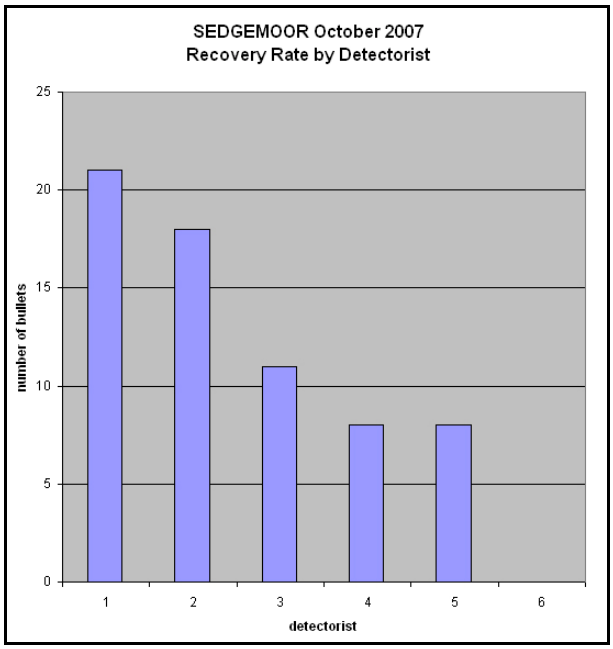

Figure 49: Sedgemoor: comparison of recovery rates between detectorists (October 2007)

There are no data on the recovery times for finds reported by Sagar, so it is not possible to control for relative intensity of survey in his data or to correlate this with results of the new survey. What is clear, however, is that the pre-2007 distribution pattern is highly unrepresentative of the pattern that was recovered in 2007 by systematic survey; the latter shows a far more extensive scatter with discrete concentrations missed in the earlier work although some elements of patterning do match. This seems to be a typical problem with unsystematic metal detecting and shows the extreme care that needs to be taken in placing reliance upon or drawing conclusions from such data sets. It can be however be seen that

there is good correlation between the results of the 2007 pipeline and full field surveys. However, the battle archaeology may pose some questions. The orientation of the case scatters, particularly that at A in Fig 100, suggests that at least in one stage of the action the orientation of the deployments may have been rotated somewhat further in a clockwise direction than shown here as the case scatter might be expected to lie at right angles to the deployment. However, if enfiladed fire was involved then A could represent fire from the artillery on the left flank of the royal army's forward deployment. To say which is correct calls for more extensive and consistent data, to enable firing lines to be distinguished which can be compared to the case scatters.

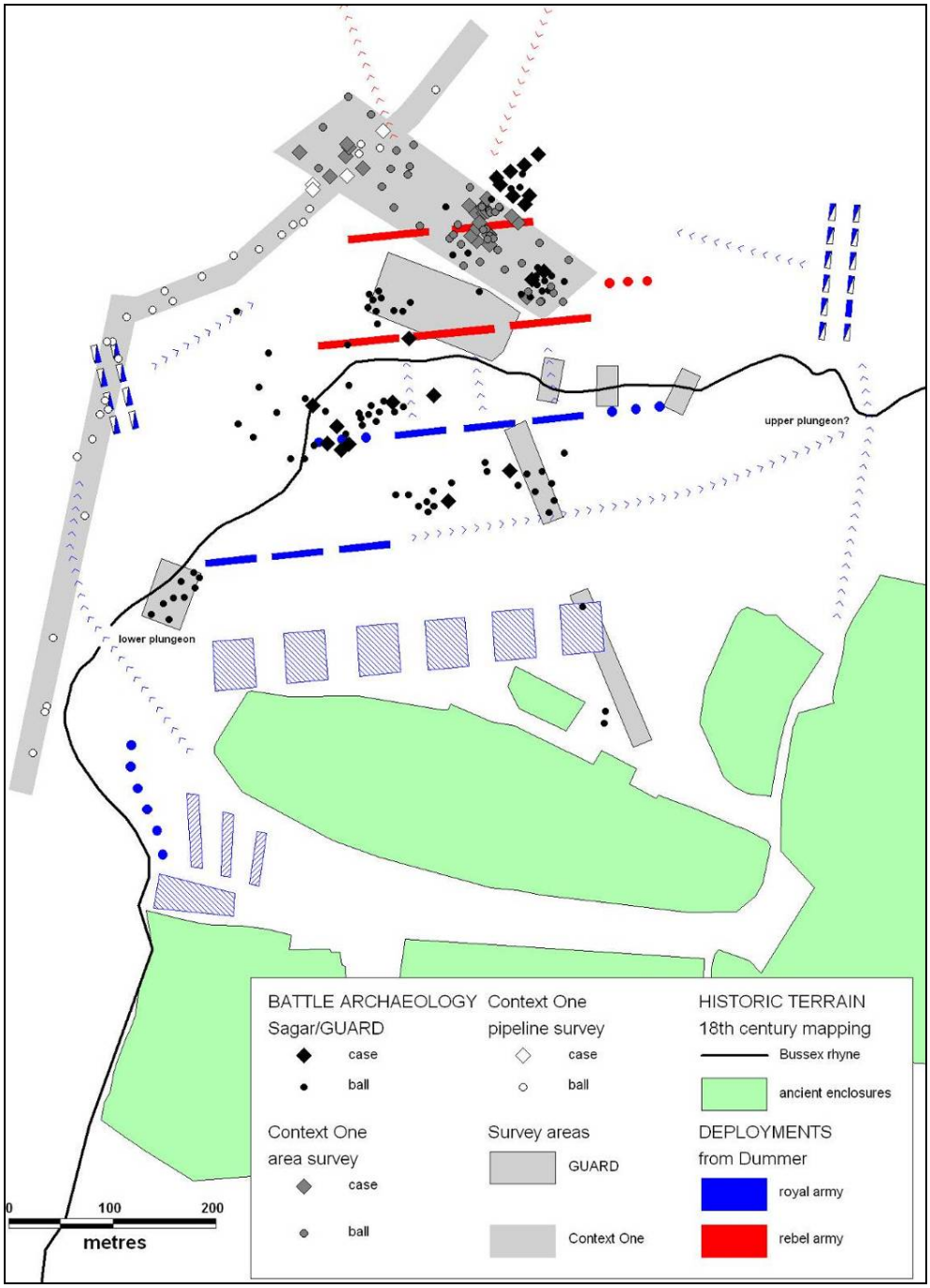

Figure 50: Sedgemoor: the battle archaeology, historic terrain and deployments combined

Though the Sagar/GUARD data did distinguish case from other bullets, and pistol from musket calibres, there is no information on the criteria used in this classification, while no other types, calibres or evidence on use is presented. As the material was not available for re-analysis the following discussion is therefore restricted to the 2007 bullets. Using a calibre graph that data was inspected to identify any groupings by weight in order to distinguish and then map the bullet calibres. This reveals three peaks for musket which, when calibre shift due to weight

loss in firing is taken into account,[87] may broadly correspond with 16, 14 and 12 bore. Also visible are five bullets of carbine calibre and three groupings of pistol calibres. However, the sample size is so small that uncertainty remains over the validity of these groupings.

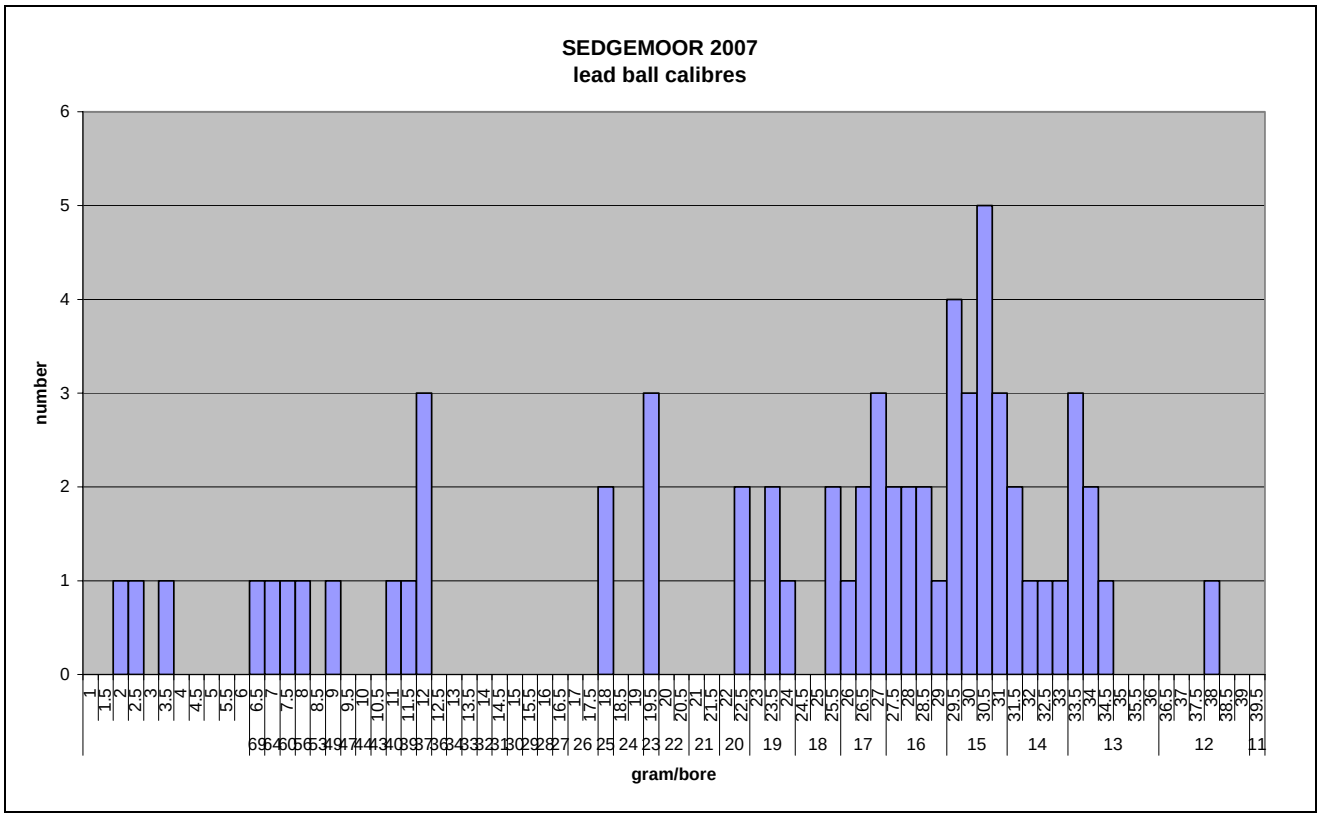

Figure 51: Sedgemoor 2007: calibre graph distinguishing three musket calibres

These calibres have then been presented in plan form, first in relation to the Sagar/GUARD data. This demonstrates the greater part of the scatter to the north west side is in the form of pistol and carbine fire, representing cavalry action. This even includes very small calibre hailshot, which may have been fired as a multiple load with a single carbine bullet (based on the evidence of Fig 102). These accord reasonably well with the reconstruction of the royal cavalry enveloping counter attack.

In the centre there is a far higher density of musket calibres associated with the reconstructed rebel infantry deployment. The presence of a low proportion of pistol calibres within the infantry core suggests cavalry sweeping through the rebel infantry position, though the potential for some of the cavalry action to relate to the early stage of action between detachments of rebel and royal cavalry must be born in

[87] Foard, 2008a, 118

mind as this might represent separate but superimposed action from a different stage of the battle.

From the point blank musket range scale it can be seen that the musket scatters could be compatible with fire from the approximate positions shown for the infantry, but the extent and consistency of the overall data are inadequate to enable bullet overshot lines to be distinguished which might be related to deployments. The other problem encountered with the Sedgemoor data in this context is the relatively low numbers of bullets showing impact damage, presumably because of the pasture in 1685 on soft peat soils, and hence the need to use firing evidence to suggest whether and where bullets have been fired or dropped. Though that evidence has been isolated in the 2007 analysis, a more extensive data set would be needed to reveal patterns that would be susceptible to detailed analysis.

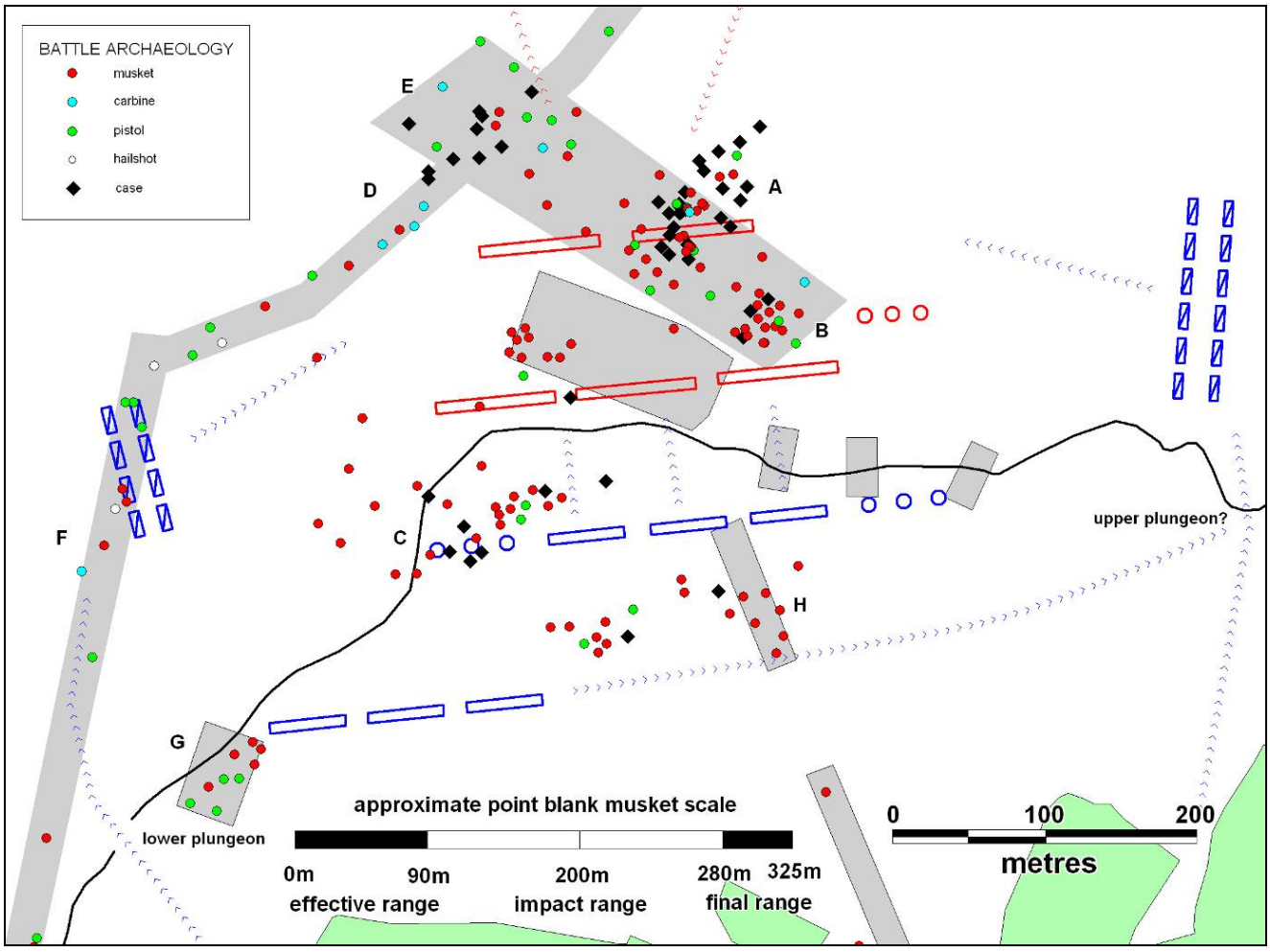

Figure 52: Sedgemoor: integrated data showing main bullet calibres and types present in relation to the reconstruction of deployments

In contrast, it has been possible to undertake an initial analysis of the distribution of the individual musket calibres distinguished in the calibre graph. The

2007 data suggest a potentially significant new pattern, with the 16 bore bullets all concentrated in the rebel position, whereas the 12 and 14 bore bullets are more widely distributed. This might indicate that the 16 bore bullets represent only royal musket fire while the 12 and 14 bore were used by both sides. The sample is, however, very small and the pattern may prove to be illusory when more data are recovered.

This analysis points to ways in archaeological data may be employed, and the ways in which such evidence may complement and validate the interpretations derived from written records and terrain.

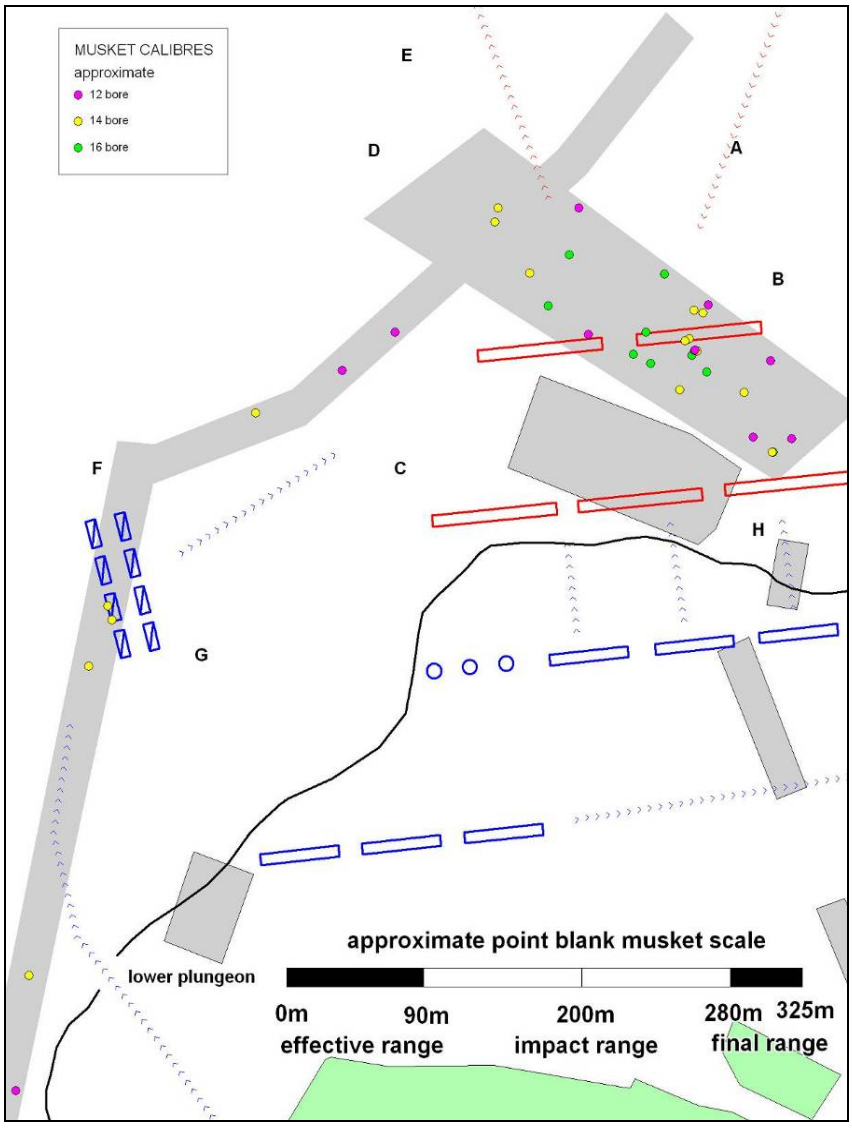

Figure 53: Sedgemoor 2007: distribution of musket calibre bullets