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Archaeological Research Services Ltd

Durham- Assessment of Archaeological Resource in Aggregate Areas

Revised Interim Report

for English Heritage National Mapping Programme

Aggregates Levy Sustainability Fund: Project Number 4778 MAIN

AMIE Parent Collection UID: EHC01/062

AMIE Event UID: 1441165 & 1454180

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Archaeological Research Services Ltd

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The aerial survey mapping in Figures 2-8 are © English Heritage

1 SUMMARY

This aerial survey mapping project is part of the Durham-Assessment of Archaeological Resource in Aggregate Areas project, funded by English Heritage through the Aggregates Levy Sustainability Fund (ALSF 4778 MAIN) and managed by Durham County Council (DCC) with Archaeological Research Services Ltd (ARS) in partnership with English Heritage. The County Durham Archaeological Assessment Project is part of a landscape-scale assessment of the archaeology associated with aggregate areas in County Durham.

The aerial survey mapping component of the project was undertaken by ARS Investigators based with English Heritage's Aerial Survey (North) in York. Digital maps at a nominal scale of 1:10,000 and supporting records were produced to National Mapping Programme (NMP) standards for an area of 725km² (29 OS 1:10,000 quarter sheets). The mapping was done in two phases. The original project design covered 19 maps extending into the area of the Magnesian Limestone. Mapping started on 29th March 2006 and was completed by 16th January 2007 (Event UID 1441165). A variation was submitted to extend the area to include a further 12 maps. Mapping for this phase of the project started on 11th April 2007 and was completed by 31st August 2007 (Event UID 1454180). This interim report is a revised version of the January 2007 report and incorporates the results of both phases of the project. The project mapped and recorded archaeological sites varying in date and type from prehistoric enclosures to twentieth century military remains. Records for 528 new sites, with a further 92 enhancements to existing records, were input to the National Monuments Record (NMR) database (AMIE).

The project was also carried out in collaboration with Cambridge University's Unit for Landscape Modelling (ULM, formerly CUCAP), Newcastle University and Durham University; their contribution being the loan of material from their air photo collections

2 INTRODUCTION

The Durham- Assessment of Archaeological Resource in Aggregate Areas project aims to characterise, digitally map and analyse the aggregate and archaeological resource to inform both minerals development frameworks and archaeological research. The wider project will compile a Geographical Information Systems (GIS) for the County that will show the location of all known aggregate deposits, SMR entries, together with the air photo mapping data. The GIS will be able to be used by the Development Control Officer at Durham County Council, as well as by researchers, consultants and developers, to assist with long-term aggregate planning in the County. It is hoped that the results of this study will provide a basis from which a more detailed future project can proceed (Mason and Waddington, 2005; Hewitt 2006). The aerial survey mapping was undertaken according to the project design and specification outlined by Mason and Waddington 2005, 12-17. The standards adopted are those of the National Mapping Programme (NMP), which are intended to produce a comprehensive record of the archaeology of England, from prehistory to modern times, through the interpretation, mapping and recording of all archaeological features visible as earthworks, cropmarks, parchmarks and soilmarks on aerial photographs.

This interim report provides a brief overview of the results of the aerial survey mapping element of the project.

3 PROJECT MANAGEMENT

The project was undertaken as a partnership between English Heritage, Durham County Council (DCC) and Archaeological Research Services Ltd (ARS Ltd) with DCC as the lead partner. The project was managed by Dr. David Mason on behalf of Durham County Council and Dr. Clive Waddington on behalf of ARS Ltd. Richard Hewitt, in his role as Project Officer, undertook the day to day co-ordination of the project. Alison Deegan, in her role as Consultant provided quality assurance for the latter phase of the project. Gemma Pallant, Sally Radford and Cinzia Bacilieri carried out the air photo mapping and recording, working alongside English Heritage's Aerial Survey (North) team in York, supervised by Dave MacLeod. Yvonne Boutwood and Matt Oakey provided training and support, offering advice on matters of interpretation, mapping, recording and NMP standards. Pete Wilson was the English Heritage ALSF Project Officer. The project ran for 17 months and started on 29th March 2006 and mapping and recording was completed by 31st August 2007.

4 SCOPE OF THE SURVEY

4.1 Geographical Scope

County Durham is a relatively small county and is drained by two principal river systems, those of the Wear and the Tees, although much of the latter lies in the Tees' local authority areas. These rivers contain sand and gravel deposits, particularly in their middle reaches and host regionally and nationally important archaeological remains. Nevertheless, the main focus for current aggregate extraction is the distinctive escarpment of Magnesian Limestone that runs on a north-south axis on the east side of the county and for the most part lies between 100m and 200m above Ordnance Datum. The escarpment is an important source of crushed Magnesian Limestone and Yellow sands and gravel, all of which are vital building resources for the major conurbations of neighbouring Wearside, Teeside and Tyneside (Mason and Waddington 2005, 5). The aerial survey mapping project area focuses on the Magnesian Limestone escarpment and the major river valleys covering an area of 725km² (Figure 1). The project adhered to NMP practice, which maps entire 1:10,000 Ordnance Survey quarter sheets (29 maps: NZ03NE, NZ12NE, NZ13SE, NZ13SW, NZ13NW, NZ22NE, NZ22SE, NZ22NW, NZ23NE, NZ23SE, NZ23SW, NZ23NW, NZ24NE, NZ24SE, NZ25SW, NZ23NE, NZ32SW, NZ32NW, NZ33NE, NZ33SE, NZ33SW, NZ33NW, NZ34SE, NZ34SW, NZ34NW, NZ42NW, NZ43SW, NZ43NW and NZ44NW).

4.1.1 Geology and soils

The major overlying geology within the project area is boulder clay and glacial drift from the Pleistocene. These clays are occasionally interspersed with glacial sands and gravels, as well as alluviums of a similar age. As well as outcrops of the previously mentioned Pleistocene geology, there are also areas of exposed Magnesian Limestone with anhydrite and marl slate (Taylor *et al* 1971, plate XIII). These older permo-triassic rocks are generally found in higher, more exposed regions where the overlying thinner layer of clays would have been weathered away (*ibid*, 60).

A geological cross section through a part of the eastern project area shows that the overlying Pleistocene boulder clay is fairly shallow, and interspersed with pockets of sands, gravels and alluviums, whilst the Magnesian Limestone directly underneath is much deeper. The Magnesian Limestone rocks overly older coal measures, which are much nearer to the surface in the western part of the study area (Taylor *et al* 1971, 60).

4.2 Archaeological Scope

The project adhered to those adopted for the National Mapping Programme, which aims to increase our understanding of the historic environment. It achieves this by identifying, interpreting, mapping and recording all probable and possible archaeological features visible on air photographs as cropmarks, soilmarks, parchmarks and earthworks. The landscape of the Durham Magnesian Limestone escarpment encompasses all these types of evidence. The NMP Sphere of Interest

draft report (RCHME 1997) documents the scope of the NMP; the main aspects relevant to this project are summarised below.

4.2.1 Earthwork archaeology

All extant earthworks identified as archaeological in origin were mapped. All available RCHME ground survey plans were used to assist and enhance the air photograph interpretation and mapping.

4.2.2 Levelled archaeology

All cropmarks, soilmarks and parchmarks identified as archaeological in origin were mapped.

4.2.3 Post medieval and modern field boundaries

Field boundaries that have been removed (upstanding or levelled), but are depicted on first edition Ordnance Survey or later edition maps, were generally not mapped. However, where they occurred with newly identified field boundaries, which were not depicted by the Ordnance Survey, and then some were mapped to provide a wider context for the field systems.

4.2.4 Medieval and post medieval ridge and furrow

Ridge and furrow was mapped, using a simple graphical depiction, delineating the extent of area and direction of the furrows. The difference between levelled and earthwork ridge and furrow was distinguished. The state of preservation of the latter was evaluated from the latest photography, which in the case of this project was mainly from vertical photographs.

4.2.5 Industrial features and extraction

Widespread and common small-scale (less than 2 hectares) extraction of stone resources was not mapped unless it directly impinged on archaeological features. Large-scale quarries (greater than 2 hectares) were mapped and recorded, irrespective if they were depicted on any Ordnance Survey map. Coal mining and associated features, such as tramways, were mapped and recorded. Large collieries or open cast mining complexes were mapped generally as an extent of area.

4.2.6 20th Century military features

Former 20th Century military sites and installations were mapped. Extensive military complexes and sites were outlined as an extent of area.

4.2.7 Buildings

The foundations of buildings visible as cropmarks, soilmarks, parchmarks, earthworks, or ruined stonework were mapped, except when they were depicted on first edition Ordnance Survey or later edition maps. Standing roofed or unroofed buildings or structures were generally not recorded unless they had a particular association in the context of industrial or military remains.

4.2.8 Geomorphological features or natural deposits

Geomorphological features and natural deposits were not mapped. When such features occurred in the context of archaeological sites they were noted within the monument data text. This is in line with normal NMP methodology. Organic sediments and paleochannel fills were not mapped.

4.2.9 Parkland, landscaped parks, gardens and country houses

Earthwork and levelled landscape and garden features associated within this category were mapped. Modern park and garden features were not mapped.

5 SOURCES

5.1 Air Photographs

All readily available air photographs were consulted, which effectively means those held in four main collections. The National Monuments Record (NMR) was the prime source. A search for photographs identified 2010 specialist obliques and 13,299 vertical prints for the project area. For the purposes of mapping the area was divided into seven blocks to facilitate loans from the NMRC library. The date of the coversearch for each block is noted in Appendix 4. Additionally, some photographs are held in the Photograph Library of Cambridge University Unit for Landscape Modelling (ULM). Thirdly, The Museum of Antiquities, University of Newcastle hold 81 oblique photographs within the project area. Finally, a search of the Durham University collection, held by Archaeological Services was completed and a total of 19 oblique photographs were loaned. Collections held by the Durham County Council Archaeology Section were not used for this project. The vertical photographs held by the NMR comprise mainly RAF and Ordnance Survey sorties with some Meridian Airmaps photographs, which range in date from 1940 to 1995. The specialist oblique photographs range in date from 1941 to 2003, which includes specialist military photographs and those from recent reconnaissance. Other forms of remote sensing imagery (e.g. lidar) were not used during the mapping phase of the project.

5.2 Monument data

The National Monuments Record database AMIE was consulted as was the Historic Environment Record for Durham. Where possible concordance between these two datasets was made in AMIE. There are several scheduled monuments in the project area.

5.3 Previous Survey Work and Research

The Durham Magnesian Limestone Survey (Event UID: 922928), carried out by the RCHME, surveyed a total of 14 sites in this area. Amongst these eight were medieval settlements and surveyed to a 1:1000 scale. The project also surveyed Binchester Roman Fort. These surveys were consulted throughout the project to aid interpretation and aerial survey mapping.

In addition, Clack and Haselgrove (1982) include a gazetteer of air photographic sites in their publication ‘Rural Settlement in the Roman North’. This information was useful as a source of reference and additionally as introduction to the Durham University photographic collection, which was subsequently consulted for the project.

Other research includes the unpublished ‘Magnesian Limestone Escarpment Plan’ that was developed by Jones (1977), the then Antiquities Officer at Bowes Museum. It was undertaken to assess the archaeological resource associated with aggregate deposits in County Durham. This document set out the basic state of knowledge of the nature and extent of early settlement on the Magnesian Limestone escarpment. The report noted that there had been relatively little archaeological interest in the area. In fact with

the exception of the limited fieldwalking undertaken by Haselgrove (Haselgrove *et al*. 1988; Haselgrove and Healey 1992) there has been little other archaeological work that has taken place (Mason and Waddington 2005, 6).

6 METHODOLOGY AND RECORDING

6.1 Mapping Methods

Mapping methods were in accordance with practices developed for the National Mapping Programme (NMP). Oblique and vertical photographs were scanned and rectified using appropriate software (AERIAL 5.29). Ordnance Survey NTF 1:2,500 maps were used for control and as a base for mapping in AutoDesk Map 2004 and AutoDesk Map 3D 2007. Where appropriate, topographic information was derived from Ordnance Survey Land-Form PROFILE (scale 1:10,000) and the height data used to create Digital Terrain Models to improve the accuracy of the photo rectification. Accuracy for the Ordnance Survey map is in the range of ±8m and rectification of photographs is normally within ±2m. Mapping conventions and the layer structure used in the AutoDesk Map drawing files is summarised in Appendix 1.

6.2 Recording Practice

All mapped features were recorded in the English Heritage National Monuments Record database, AMIE. New records were created (528), or existing monument records were amended (92), following NMR Heritage Datasets: Monument Recording Guidelines. Within the AutoDesk Map drawing files data was also recorded in an attached data table (see Appendix 2).

6.3 Copyright

Copyright of the aerial survey mapping and associated AMIE records produced by the project resides with English Heritage. Licence to use the data has been extended to the Durham County Council Archaeology Section under the terms of the Association of Local Government Archaeological Officers (ALGAO) agreement. As project partners, Archaeological Research Services Ltd (ARS Ltd) is also licensed to use the data under the terms of the latter agreement.

6.4 Project Archive

This project produced 29 AutoDesk Map drawing files, one for each of the whole 1:10,000 quarter sheets (NZ03NE, NZ12NE, NZ13SE, NZ13SW, NZ13NW, NZ22NE, NZ22SE, NZ22NW, NZ23NE, NZ23SE, NZ23SW, NZ23NW, NZ24NE, NZ24SE, NZ25SW, NZ23NE, NZ32SW, NZ32NW, NZ33NE, NZ33SE, NZ33SW, NZ33NW, NZ34SE, NZ34SW, NZ34NW, NZ42NW, NZ43SW, NZ43NW and NZ44NW). The parent collection number is EHC01/062 and collection numbers for each map are listed in Appendix 4. Copies of the digital drawing files are deposited in the archive of the NMRC. Aerial Survey York and Swindon also retain copies of the digital files, for day to day access. This interim report will be deposited in the NMRC archive. The newly created and amended text records form part of the national monuments database (AMIE), which are downloaded into the English Heritage webGIS.

6.5 Project Dissemination

Copies of the AutoDesk Map drawing files have been supplied to the project partners (Durham County Council and Archaeological Research Services Ltd). The final product of the County Durham Archaeological Assessment Project, which includes the aerial survey mapping, will have a wider distribution. If the distribution of the aerial survey mapping is not within the terms of the ALGAO agreement, then further permission must be sought from English Heritage's Enquiry and Research Services at the NMRC in Swindon.

All AMIE records have been supplied to Durham County Council and Archaeological Research Services Ltd in rich text format (RTF). This project also used Oracle Discoverer Plus Version 9.0.4.45.04 to output the AMIE record data in EXCEL spreadsheet format.

A copy of the interim report has been supplied to the project partners (Durham County Council and Archaeological Research Services Ltd).

7 SUMMARY OF PROJECT RESULTS

For the aerial survey mapping project a total of 528 new records were created and amendments were made to 92 records in the AMIE database. In other words, 85% of the records for this project were new to the National Monuments Record. This summary provides an overview of the archaeology of the area as evidenced by the aerial survey record. A more detailed report will be produced by Richard Hewitt for the County Durham Archaeological Assessment Project. Other sources of archaeological and historical data have been consulted to complement the aerial survey evidence. The data is evaluated chronologically to provide 'period' overviews of the history of the Magnesian Limestone escarpment, spanning the millennia from early prehistory to the twentieth century. In the text sites are referred to by their NMR Unique Identifier Number (UID), which is used in the attached data tables in the AutoDesk Map drawings (Appendix 2). The monument types recorded by this project, in AMIE and the AutoDesk Map drawing attached data tables, are in accordance with English Heritage's thesaurus and are listed in Appendix 3.

7.1 Prehistoric

7.1.1 Funerary monuments

The earliest diagnostic prehistoric monument form identified in the aerial survey mapping project area is represented by a single earthwork Neolithic long barrow (Figure 2.1) situated to the east of Old Wingate (25893). As Jones (1998, 91) states most long barrows tend to be influenced by their surrounding topography and this hypothesis remains accurate for the Durham example. The Old Wingate long barrow (or cairn) is aligned north-northeast by south-southwest and is situated to follow the line of the slope. Additionally, approximately 87m to the north, positioned at the crest of the aforementioned slope, a Bronze Age round barrow (25896) is located. Although this feature is recorded in the National Monuments Record (and indeed on Ordnance Survey mapping), it was unfortunately masked by tree cover on air photographs and therefore was not included in the air photograph mapping of the area. Nevertheless, the proximity of the two funeral monuments may confirm the cultural importance of the Old Wingate area during the Prehistoric period.

Two further Bronze Age round barrows (Figure 2.2 and 2.3) are visible on air photographs (1443880 and 876887). The barrows have been repeatedly eroded during their long history and now only the tell-tale levelled mounds and surrounding ditches are visible as cropmarks. In general this site-type proved to be elusive on the air photograph coverage. However, research by Young (1980, 1) suggests that barrows within County Durham are a fairly common phenomenon, particularly upon the Magnesium Limestone of the East Durham plateau, perhaps then their concentration falls outside the aerial survey mapping project area. Alternatively, these features (like many of the archaeological features in the area) may have suffered as a result of industrial and settlement expansion.

7.1.2 Prehistoric settlement and enclosures

Three curvilinear enclosures (876850, 1443567 and 1442639 (the latter two are newly identified)) were visible on air photographs, all are levelled and evident only as cropmarks (Figure 2.4, 2.5 and 2.6). The identification of particular types of archaeological site on air photographs is largely a question of morphology i.e. it involves the recognition of certain recurring shapes or patterns (Wilson 1982, 71). On this basis the curvilinear enclosures were tentatively dated to the Prehistoric period based on their shape in plan. The site at Woodham (876850 as described above), is interesting in its close association with a square enclosure dating to the Iron Age/Roman period. As Hewitt *et al* (2006, 37) note "although the Iron Age is better represented, for the most part by rectilinear ditched enclosure sites, [*in the County Durham region*] some of these sites have earlier phases represented by gullies or curvilinear ditches, for which a Late Bronze Age date might be considered".

Although a number of Iron Age/Roman rectilinear enclosures were recorded, two (25885 and 25956) were particularly distinctive (Figure 3.1 and 3.2). They have the basic form of a rectilinear enclosure with slightly bowed sides and a single entrance. This site type is regarded as one of the principal settlement types in the North-East (Higham 1979, 23). One rectilinear enclosure (876881) survives as a partial earthwork (Figure 3.3). A further number of enclosures may also fit into this settlement type, but are visible only as partial cropmarks (Figure 3.4-3.11). This would tie in with the model as described by Haselgrove (1984, 12) of a relatively consistent picture of Iron Age settlement dynamics.

Variations on the rectilinear ditched enclosure morphology are visible; primarily consisting of 'irregular' shaped enclosures. Three sites (26160, 1448066 and 1457166) are polygonal/rectilinear enclosures with associated circular ditches, representing domestic roundhouses (Figure 4.1 and 4.2). These are significant, as features suggesting domestic occupation are rare within the cropmark elements of this survey. Winton (1998, 47), in her research into the cropmark evidence for Prehistoric and Roman settlement in West Lincolnshire suggests that there may be a twofold reason for this. Firstly, due to the poor quality of the aerial photographic cover and secondly, because of the relatively slight nature of the domestic structures, which need very good conditions to show as cropmarks.

There are also a small number of sites situated in close proximity to, or associated with, trackways. Just outside Sedgefield two sites were recorded (1443329 and 1443331), a third was discovered to the south of East Holling Carr (1446082) (Figure 4.3, 4.4 and 4.5). The trackways are defined by double ditches and it is their irregularity of form and direction that suggests a pre-Roman origin (Winton 1998, 47). These sites are all associated with rectilinear single ditched enclosures. The site at Sedgefield (1443331) is particularly interesting as the north-south aligned trackway appears to be a fairly major route (thought to be part of Cades' Road). In addition, phasing is apparent as the trackway is overlain in parts by field boundaries (or vice versa). Smaller trackways branch off towards the enclosures.

7.2 Roman

7.2.1 Roman roads

Fragments of Dere Street (1031137) have been identified in various locations within the project area as earthworks, cropmarks and parchmarks. The most extensive remains are visible in the area around Binchester Roman fort, where to the south-east they are visible as a parchmark bank around 183m in length and 3-6m in width, and to the north-west of the fort they are visible as a cropmark bank around 177m in length and 3-6m in width (Figure 5.4), both of these sections of road are on the same south-east to north-west axis. Each of these fragments of road follows the known course of Dere Street and is closely associated with the *vicus* and fort at Binchester. Another section of previously unrecorded Roman road, visible as a parchmark bank, has been found to the north of the fort (1448242) measuring 123m in length by 4m in width on a roughly north-east to south-west axis. Two further sections of Roman road are visible within the project area; both are situated along the supposed course of Dere Street. The first is a small fragment of earthwork bank (1441884, Figure 5.5) measuring approximately 60m in length and 8.5 in width. The second (1457027) appears on air photographs as a cropmark and runs for a distance of approximately 573m.

7.2.2 Roman fort and *vicus*

Binchester Roman fort (24258) survives as a partial earthwork. The northern and eastern sides of the forts platform, rampart and outer ditch are visible as earthworks on air photographs (see Figure 5.1). Unfortunately, modern buildings are situated over much of the rest of the fort and the southern and western ditch and ramparts are no longer extant. Internal structures believed to be the commandant's house and baths are visible as parchmarks, within the fort. The fort has been surveyed by the RCHME in 1983 (581570), this survey depicts part of the forts rampart along the north-west facing side which, due to heavy tree coverage, was not possible to map for this project. Associated with the fort, fragmentary structures, believed to be part of a *vicus* (24291) are visible as parchmarks lying just outside the south eastern ditch of the fort and flanking Dere Street (1031137) to the north (Figure 5.1). It is not possible to ascertain any possible function for these buildings, due to their fragmentary form. Previous excavation has identified a communal bathhouse east of the fort, which is situated north of and adjacent to the road and is marked by a depression, with faint and broken parchmarks representing some of the structures within. Within the *vicus* a road is visible as a parchmark and is clearly seen to branch off Dere Street to the south.

7.2.3 Roman camp

Situated just to the north of Binchester Roman fort, on the west bank of the River Wear, are the cropmark remains of a ditched enclosure (923013) representing a possible Roman camp (see Figure 5.2). This enclosure is believed to be a Roman camp based on its proximity to the fort and Dere Street, and on its morphology, having the 'playing card' shaped corners typical of Roman camps (Welfare and Swan 1995, 12), and a possible entrance on the western side. Only the northern and western sides of the

camp are visible as cropmarks as underlying geology obscures any potential traces of a southern outer ditch of the camp. However due to the close proximity of the camp to the River Wear it is possible that the eastern side of the enclosure was open to the river, and this site could also of acted as a transport depot as well as defending any river crossing.

Another possible temporary camp has been sited at Kimblesworth Grange (876873), again visible as a cropmark (Figure 5.3). Currently, only half the feature has been recorded due to the different growing conditions and crops between the fields in which this camp is situated so is therefore a feature worthy of further specialist photography in order to discover its full dimensions. The temporary camp has been previously recorded as an Iron Age/Roman ditched enclosure; however it has some distinctive morphological features that suggest a Roman date. It has very straight edges and the 'playing card' shaped corners first noted as characteristic of a Roman camp by Wilson (1982, 98). In addition, two evenly spaced entrances are visible on the southeast side perhaps reminiscent of the multi-gated camp at Rey Cross, Cumbria (Frere and St Joseph 1983, 24) which has a similar arrangement.

7.3 Medieval

7.3.1 Settlements and field systems

Throughout the project area both earthwork and cropmark remains of medieval ridge and furrow were visible on the available aerial photography; these medieval open field systems are, as is typical throughout north-east England, associated with lynchets, plough headlands and field boundaries (Vyner 1990, 10).

Despite the fairly high density of medieval settlements being visible on the Magnesian Limestone escarpment there was very little evidence for medieval settlement along the coal measures. These medieval sites are almost exclusively visible as earthworks with the exception of a small number of field boundaries (1443304) which are visible as cropmarks.

In the project area to the north and east where the coal measures and glacio-fluvial soil deposits are situated there are only three sites that appear to be of medieval date. These include; a moat (25906), which has been mentioned in documentary sources and the presence of the northern section been confirmed by aerial photography. The other two sites are a boundary bank (23957) and what could possibly be a small settlement (23950).

Along the Magnesian Limestone escarpment there is a relatively high density of medieval settlement sites. Amongst the best examples is the village of Preston-Le-Skerne (25846, Figure 6.2). Preston-Le-Skerne was once a large settlement which is now visible as earthworks forming tofts, crofts, platforms and enclosures on either side of a modern road which has traces of a hollow way on either side, all of these characteristics being typical of medieval settlements (Clarke 1984, 31). Medieval ridge and furrow is also associated with Preston-Le-Skerne, as it is with many of the other medieval settlements within the project area, such as Sheraton (27151, Figure 6.5),

Great Stainton (25861 Figure 6.3) and Little Stainton (25856). A different medieval settlement type is as that typified by Garmondsway (25995, Figure 6.4). Unlike the previously mentioned medieval settlements Garmondsway, has a very simple layout. It has a very regular layout of tofts and crofts running on a north south axis, and in addition has no associated ridge and furrow of a similar date. Medieval settlements of this regular, planned nature are generally rare in England (Beresford & St Joseph 1958, 138). However a number of such settlements have been recorded in the area between the River Tweed and the River Humber (Steane 1985, 147), and Garmondsway, County Durham is central to this area.

Another medieval site is the earthwork remains of ornamental gardens situated to the south of the Great Isle (25781, Figure 6.1). From aerial photographs it is possible to discern the original course of the River Skerne and how it would have fed three fishponds, and a series of trapezoidal enclosures that are possible garden water features.

It is worth noting that some of the medieval sites mapped for this project have been surveyed by the RCHME, including Coatham Mundeville (24004) in 1984, and Heworth (24016) and Great Isle in 1983 and that this aided air photo interpretation.

7.3.2 Stock enclosures and stack stands

These enclosures were generally referred to as enclosures when recorded for this project but are conjectured to be stock enclosures. Although most are recorded as medieval/post medieval in date, it is likely that the stock enclosures would have had medieval origins with their usage continuing into the post-medieval period. A number of possible stock enclosures were visible within the project area, with some (1444602, 1444244 and 1444252) concentrated around the settlements of Swainston and Embleton. Next to each of these enclosures a small platform is also visible. Although it is difficult to ascertain the function of these platforms one possible usage is that of a storage area, possibly for the fodder used to feed animals that would likely have been kept within the enclosures. Other stock enclosures are to be found within the project area, but without any associated platforms. Some are found near to other enclosures (1444730) field boundaries (1444730), or isolated (1444267). One stack stand (1443724) was found within the project area and associated with ridge and furrow.

7.4 Post medieval and Twentieth Century

7.4.1 Industry and communication

Durham is a small county with a heavy extractive burden (Mason *et al* 2005, 5). Aggregate extraction and coal mining are highly visible on air photographs, particularly in the region from the north-east to the south-west of the project area (following the Magnesian Limestone and coal measures). Aerial survey can be used as a tool to record a constantly changing industrial landscape (Gould and Ayris 1995, 8). The smaller extractive coal workings and bell pits of post medieval date (e.g. 1441851 and 1441872) are the earliest industrial activities visible. These in turn make way for the large collieries of the 19th century (e.g. Thrislington Colliery 1447997). Transport links

including railways and tramways (1444085) can be recognised, although those previously mapped on the Ordnance Survey were not recorded. As the 19th century turned to the 20th and the coal resource began to diminish the collieries closed (Turnbull and Jones 1978, 27). Ordnance Survey vertical photography shows many had been levelled in the latter part of the 20th century (e.g. East Hetton Colliery 1448280). During the same period open cast mines become visible for the first time (i.e. 1448287) but are quickly infilled and landscaped once the resource is exhausted.

Aggregate extraction, mostly of limestone, is visible on air photographs. Quarries date from the post medieval to the 20th century, and are generally extant on the latest Ordnance Survey vertical photography, but the majority are disused. Some such as Raisby Quarry (1448271) are still extending and may represent a further threat to the archaeological record. Furthermore, small-scale clay pits (1447132), gravel pits (1448211) and brickworks (1448216) are present.

7.4.2 Garden and landscape features

A small number of post medieval garden and landscape features have been recorded as part of this project. Two large parallel earthwork banks (1447166) are visible on air photographs, running along a northeast-southwest alignment in the former grounds of Cocken Hall. An 18th Century engraving shows the hall, with wings and straight avenues and vistas (Meadows and Waterson 1993, 51). The earthwork banks were probably landscaped than planted to form a tree lined avenue, which in turn formed a carriageway to the house.

In addition, a second tree avenue consisting of a series of parallel tree enclosure rings (1099603) are visible as earthworks at Croxdale Hall. The tree enclosure rings are aligned east west and consist of alternate square and circular banks.

Finally, a short section of post medieval terraced ground (85m) is visible as earthworks within Windlestone Park and is aligned on an approximately north-south axis. To the west of the terrace a larger area has been cut into the slope and levelled. It is possible that these belong to the original landscape garden designed for Sir Robert Johnson Eden in 1812 (1202119), for whom Windlestone Hall was completely rebuilt in 1835.

7.5 World War II

7.5.1 Military features

Photographs taken by the RAF in the post war era have captured a snapshot of Britain during that time. This is particularly important as many features associated with the Second World War are quickly removed in the years following the end of the war (Small 2006, 125). This situation remains accurate for this project area where the study of the RAF photography has revealed a number of new World War II sites.

A World War II Royal Ordnance filling factory was recorded at Aycliffe (1075763) using aerial photographs. The factory was responsible for the assembly of explosives and documentary evidence suggests production began in 1941. A large number of features are discernable including multiple buildings and associated blast walls. Interestingly,

the latest 1989 Ordnance Survey photography shows that although the site has been redeveloped as an industrial estate and the blast walls levelled, some buildings survive.

Two further features are associated with the filling factory and are visible on air photography; the first is a World War II proof range (1443714, Figure 7.1) situated just north of the filling factory. The proof range consists of a number of large earthwork banks and other military structures. This was the location where weapons or explosives were tested either experimentally or routinely as part of a manufacturing quality control process. This feature has been destroyed due to the development of Newton Aycliffe, reflecting the rapid spread of urban areas in the post war era.

Secondly, a series of munition houses and blast walls (1443717) are located to the southwest of the filling factory. There are a total of four blast walls, each protecting the four munition houses and all storing ammunition. All survive.

Further military features visible on 1947 RAF vertical photography are two bombing range markers (1443311 and 1443217, Figures 7.2 and 7.3). These related features comprise a directional arrow pointing to the north-east and a target. This allowed pilots to practice accurate bombing prior to live missions. Finally, air aid shelters (Figure 7.4), practice trenches, pill boxes and other military buildings are situated throughout the project area.

7.6 Uncertain date features

A small number of sites were identified that due to either their poor preservation, lack of aerial photographic coverage, or simply that the features were not characteristic of any one particular period or function, could not be accurately dated.

Two of the most interesting sites of uncertain date were what appear to be possible timber buildings near to the village of Great Stainton and the town of Chilton (1443506 and 1448057, Figure 8.1 and 8.2). These sites were both visible as cropmarks on aerial photographs and it was possible to surmise that they were both examples of the same type of site, based on their form and dimensions. The site at Great Stainton has an L-shaped section of ditch, with a number of evenly spaced parallel postholes situated internally. In contrast, the site at Chilton had a complete outer circuit of rectangular ditch, whilst only a small number of the postholes were visible on the air photography.

7.7 Discussion

The survey of the aerial evidence forms one component in a landscape survey of County Durham (The Durham Archaeological Assessment Project). The aerial photographic interpretation and mapping focused on the 29 1:10 000 OS quarter sheets associated with the Magnesian Limestone escarpment and river valleys in County Durham. It was considered that the threat of further aggregate extraction in the area combined with the scarcity of archaeological investigation made the County Durham area a priority area for detailed study.

In spite of the potential for such geology to reveal archaeological sites as cropmarks, and the presumption of an emphasis on such sites numerous earthwork sites have also

been identified. Indeed, the systematic analysis of the aerial photographic coverage for the Magnesian Limestone area has significantly increased the number of archaeological records of all types.

Through this research, evidence for human activity has been discovered from the Prehistoric period through to the present day. Sites vary from the funerary monuments of earlier prehistory, through to the settlement features of the Iron Age/Roman and medieval periods. Military features have been discovered from the Roman period through to the 20th century. For the most part quarrying and extraction, particularly in the recent past, have led to the most dramatic changes visible on the aerial photographic record.

The quality of the aerial photograph coverage can have a huge impact on an aerial survey. Fortunately in this instance, the vertical photographic coverage of the project area was particularly complete. Unusually, a number of cropmark sites were discovered using this resource (e.g. the possible timber building at Great Stainton 1443506 and the trackway/enclosure complex near Sedgefield 1443331). These sites were only discovered as a direct result of the very high quality of the 1995 Ordnance Survey vertical photography. In contrast the oblique photography coverage was limited, with some quarter sheets having very few specialist photographs. With this deficit in mind, future reconnaissance in Durham should be considered, and can now be specifically targeted to the blank areas, which will enhance our understanding of the archaeology of the region.

It was originally anticipated that mapping of geomorphological features (in particular paleochannels) would occur as part of this air photographic survey (Mason and Waddington 2005, 14). However, this mapping did not take place. There is a twofold reason for this, firstly, the air photographic coverage showing paleochannels was very limited and could therefore not give a complete picture of the features. Secondly, lidar is a proven technique in this type of analysis (Waddington and Passmore 2006, 15) and could therefore provide a fuller picture of the geomorphological features than those transcribed from air photographs.

A number of sites seem worthy of further study. The Prehistoric curvilinear enclosures (876816, 876850, 1443567 and 1442639) are a distinctive morphological group although their function is unclear. Study as to their location may provide further traces of these features and give additional clues as to their purpose. Possible interpretations may include round barrows, roundhouses or palisaded enclosures.

Finally, the technique of aerial survey has shown to be particularly successful in the Durham Magnesian Limestone region. It is therefore reasonable to suggest further aerial photographic mapping in the wider Durham area to place these archaeological features in their wider landscape context. Recommendations for future research:

- Additional aerial reconnaissance.
- Expansion of the aerial survey mapping to include the wider Durham area.

- Lidar landscape analysis for geomorphological mapping and paleoenvironmental assessment.
- Further investigation for significant features (as discussed).

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APPENDIX 1 AUTODESK MAP LAYERS AND DRAWING CONVENTIONS

Layer Name	Layer content	Attached data tables	Layer colour	Line type
0	None (AutoDesk 2006 requirement)	none	7 (white)	CONTINUOUS
BANK	Closed polygons for features such as banks, platforms, mounds and spoil heaps	MONUMENT & MONARCH	1 (red)	DASHEDX2
BANKFILL	Solid fill for BANK layer polygons	MONUMENT & MONARCH	1 (red)	
DITCH	Closed polygons for cut features such as ditches, ponds, pits or hollow-ways	MONUMENT & MONARCH	3 (green)	DASHEDX2
DITCHFILL	Solid fill for DITCH layer polygons	MONUMENT & MONARCH	3 (green)	
EXTENT_OF_AREA	Closed polygons outlining complex or extensive remains such as mining or military installations	MONUMENT & MONARCH	8 (grey)	DASHEDX2
GRID	grid lines at 1km intervals	NONE	7 (white)	CONTINUOUS
MONUMENT_ POLYGON	Closed polygons encircling all the features recorded within a single AMIE record	MONARCH ONLY	7 (white)	CONTINUOUS
RIGARREWK	Polyline showing the direction of ploughing in outlines of extant ridge and furrow	MONUMENT & MONARCH	4 (cyan)	CONTINUOUS
RIGARRLEVEL	Polyline showing the direction of ploughing in outlines of levelled or crop mark ridge and furrow	MONUMENT & MONARCH	6 (magenta)	ACAD_ISO03W100
RIGDOTSEWK	Closed polygon defining the furlongs or extent of area of extant ridge and furrow	MONUMENT & MONARCH	4 (cyan)	DOTX2

RIGDOTSLEVEL	Closed polygon defining the furlongs or extent of area of levelled or cropmark ridge and furrow	MONUMENT & MONARCH	6 (magenta)	DOTX2
STRUCTURE	Closed polygons for built features including concrete, metal and timber constructions such as military installations	MONUMENT & MONARCH	9 (grey)	CONTINUOUS
STRUCTUREFILL	Solid fill for STRUCTURE layer polygons	MONUMENT & MONARCH	9 (grey)	
THACHURE	Polyline T-hachure convention to schematize sloped features indicating the top of slope and direction of slope	MONUMENT & MONARCH	5 (blue)	CONTINUOUS

APPENDIX 2 AUTODESK MAP DATA TABLES

MONUMENT DATA TABLE

The Monument Data table consists of five fields that were input directly through AutoDesk Map 2004. The content of these fields duplicates those that are entered in the National Monuments Record Database AMIE.

FIELD NAME	FIELD CONTENT	Sample data
MONARCH	AMIE Unique Identifier (UID)	24258
PERIOD	Date of features (EH Thesaurus)	ROMAN
TYPE	Monument type (EH Thesaurus)	FORT
EVIDENCE	Form of remains (EH Thesaurus)	EARTHWORK
PHOTO	NMR or other reference for the photograph from which the feature was mapped and the date of photography	NZ2131/54 NMR 17565/12 02-May-2001

MONARCH DATA TABLE

The Monarch Data table comprises just one field that records the AMIE Monument UID.

FIELD NAME	FIELD CONTENT	Sample data
MONARCH*	AMIE Unique Identifier (UID)	24258

- MONARCH is a former name of the National Monuments Record database re-named AMIE. The table retains the former name to facilitate download into the English Heritage GIS system.

APPENDIX 3 MONUMENT TYPES USED IN THE PROJECT

AIR RAID SHELTER
ARMAMENT DEPOT
BANK (EARTHWORK)
BELL PIT
BLAST WALL
BOMBING RANGE MARKER
BOUNDARY BANK
BOUNDARY DITCH
BRICKWORKS
BUILDING
BUILDING PLATFORM
CHURCH
CIRCULAR ENCLOSURE
CLAY PIT
COAL WORKINGS
COLLIERY
CROFT
CULTIVATION TERRACE
CURVILINEAR ENCLOSURE
DITCH
DOUBLE DITCHED ENCLOSURE
DOVECOTE
DRAIN
ENCLOSURE
EXTRACTIVE PIT
FIELD BOUNDARY
FILLING FACTORY
FISHPOND
FORT
GRAVEL PIT
HOLLOW WAY
LEAT
LIMESTONE QUARRY
LONG BARROW
LYNCHET
MILITARY BUILDING
MOAT
MOUND
MUNITION HOUSE
NARROW RIDGE AND FURROW
OPEN CAST MINE
PILLBOX
PIT
PLATFORM
PLOUGH HEADLAND
POLYGONAL ENCLOSURE
POST HOLE
PROOF RANGE
QUARRY
RECTANGULAR ENCLOSURE
RECTILINEAR ENCLOSURE
RIDGE AND FURROW
ROAD
ROUND BARROW
ROUND HOUSE (DOMESTIC)
SPOIL HEAP
SQUARE ENCLOSURE
STACK STAND
STRUCTURE
TEMPORARY CAMP
TERRACED GROUND
TOFT
TRACKWAY
TREE ENCLOSURE RING
TRENCH
WALL

APPENDIX 4 MAP ARCHIVE DATA

Map sheet	Block	Coversearch Ref and date	Collection UID	Author	Date of completion
NZ 22 NE	1	85752A 07.03.06	MD000105	Sally Radford	21.06.06
NZ 22 NW	1	85752A 07.03.06	MD000104	Sally Radford	15.05.06
NZ 22 SE	1	85752A 07.03.06	MD000106	Sally Radford	26.06.06
NZ 23 SE	4	5104 06.09.06	MD000107	Sally Radford	11.10.06
NZ 23 SW	4	5104 06.09.06	MD000108	Gemma Pallant	16.01.07
NZ 24 NE	3	3044 06.07.06	MD000109	Sally Radford	19.09.06
NZ 25 SW	3	3044 06.07.06	MD000110	Gemma Pallant	14.08.06
NZ 32 NW	1	85752A 07.03.06	MD000112	Gemma Pallant	15.06.06
NZ 32 SW	1	85752A 07.03/06	MD000111	Gemma Pallant	14.06.06
NZ 33 NE	2	1391 16.05.06	MD000113	Sally Radford	24.07.06
NZ 33 NW	4	5104 06.09.06	MD000114	Sally Radford	24.10.06
NZ 33 SE	2	1391 16.05.06	MD000115	Sally Radford	18.08.06
NZ 33 SW	4	5104 06.09.06	MD000116	Gemma Pallant	09.10.06
NZ 34 NW	3	3044 06.07.06	MD000118	Sally Radford	16.08.06
NZ 34 SW	3	3044 06.07.06	MD000117	Gemma Pallant	05.09.06
NZ 42 NW	2	1391 16.05.06	MD000119	Gemma Pallant	05.07.06
NZ 43 SW	2	1391 16.05.06	MD000120	Gemma Pallant	20.07.06

APPENDIX 5 FIGURES

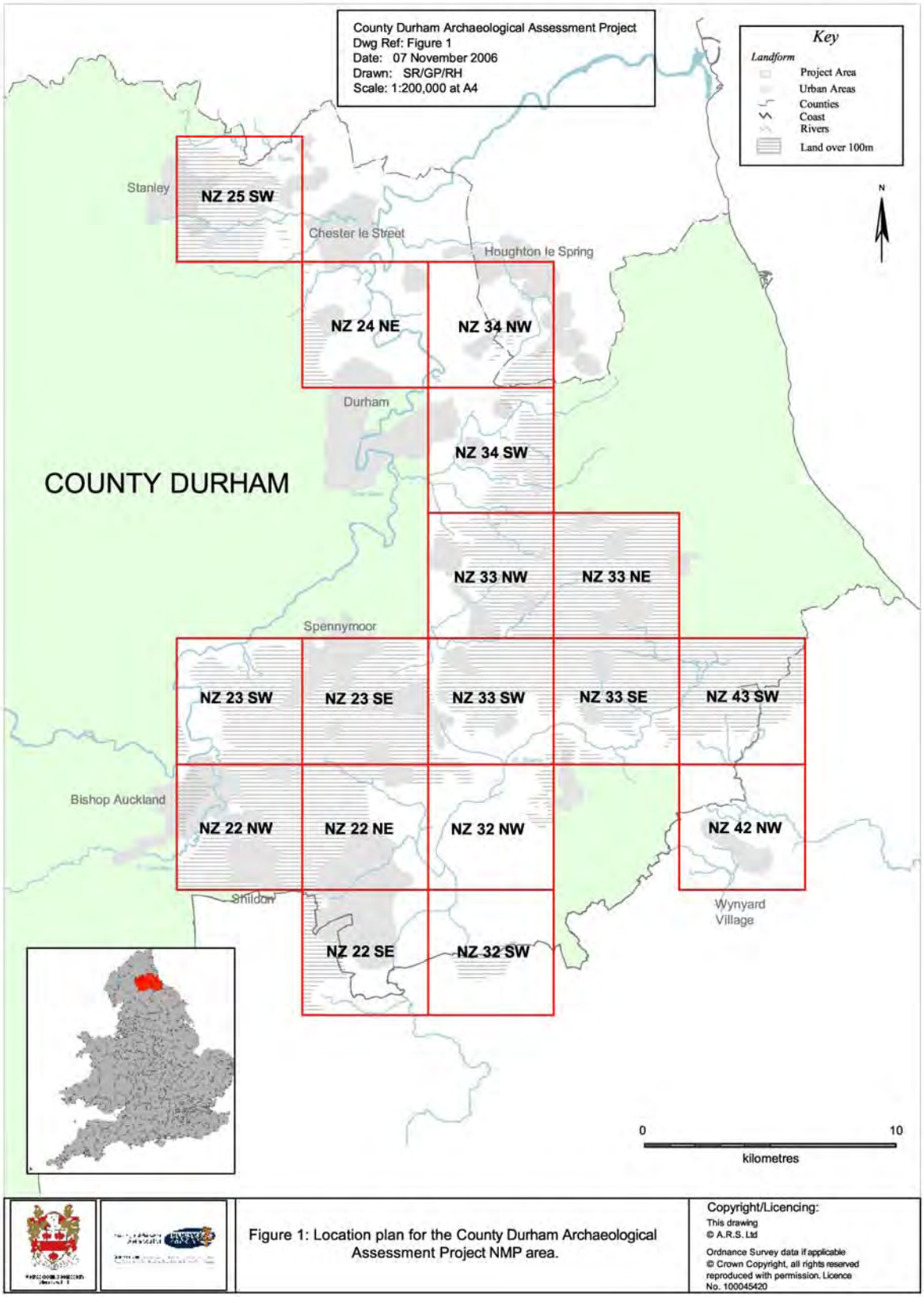

Figure 1 - Durham Aerial Survey Mapping Project area

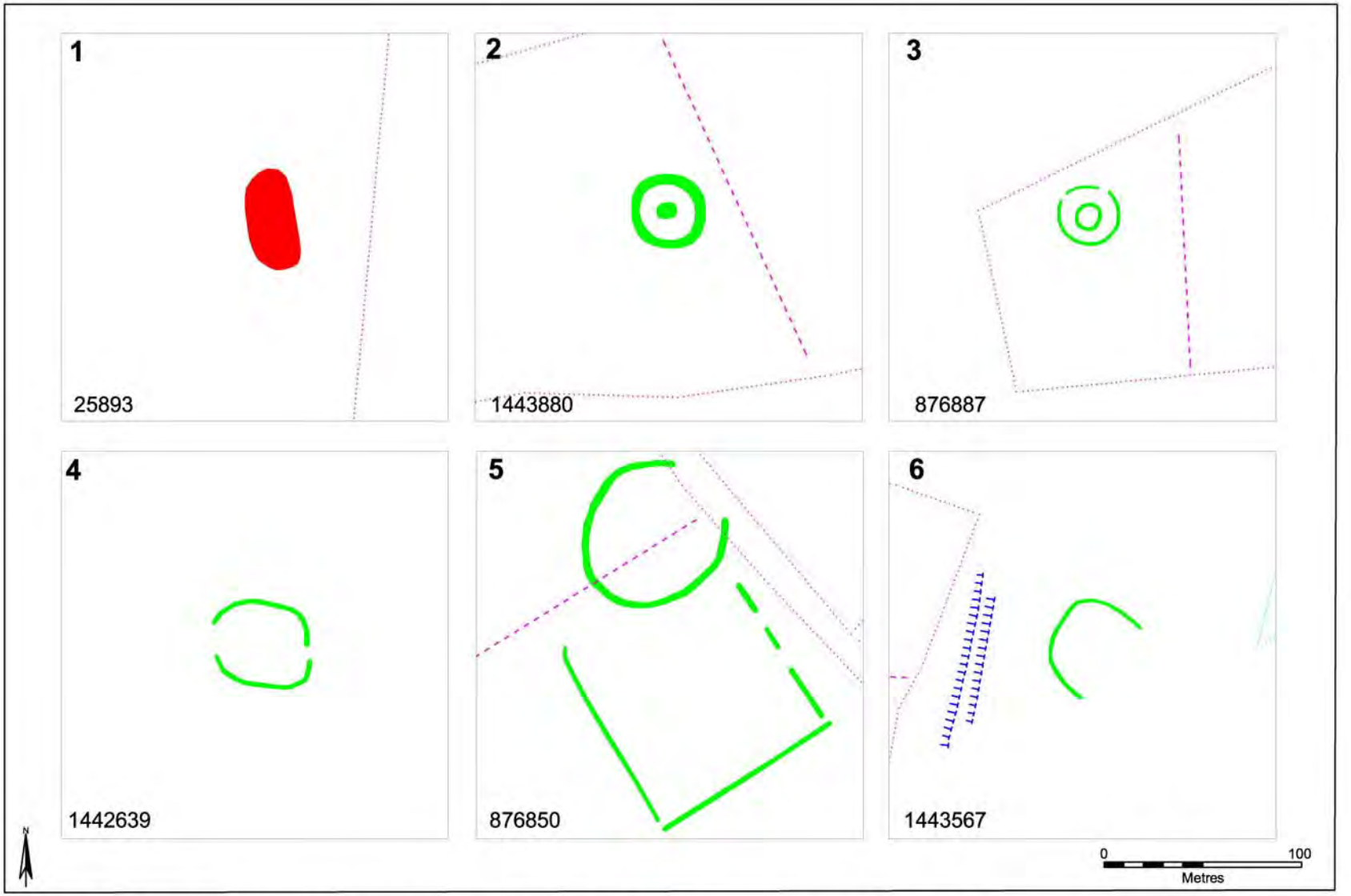

Fig 2. Prehistoric Sites, Neolithic Long Cairn (1), Bronze Age Round Barrows (2,3) and Prehistoric Curvilinear Enclosures (4,5,6)

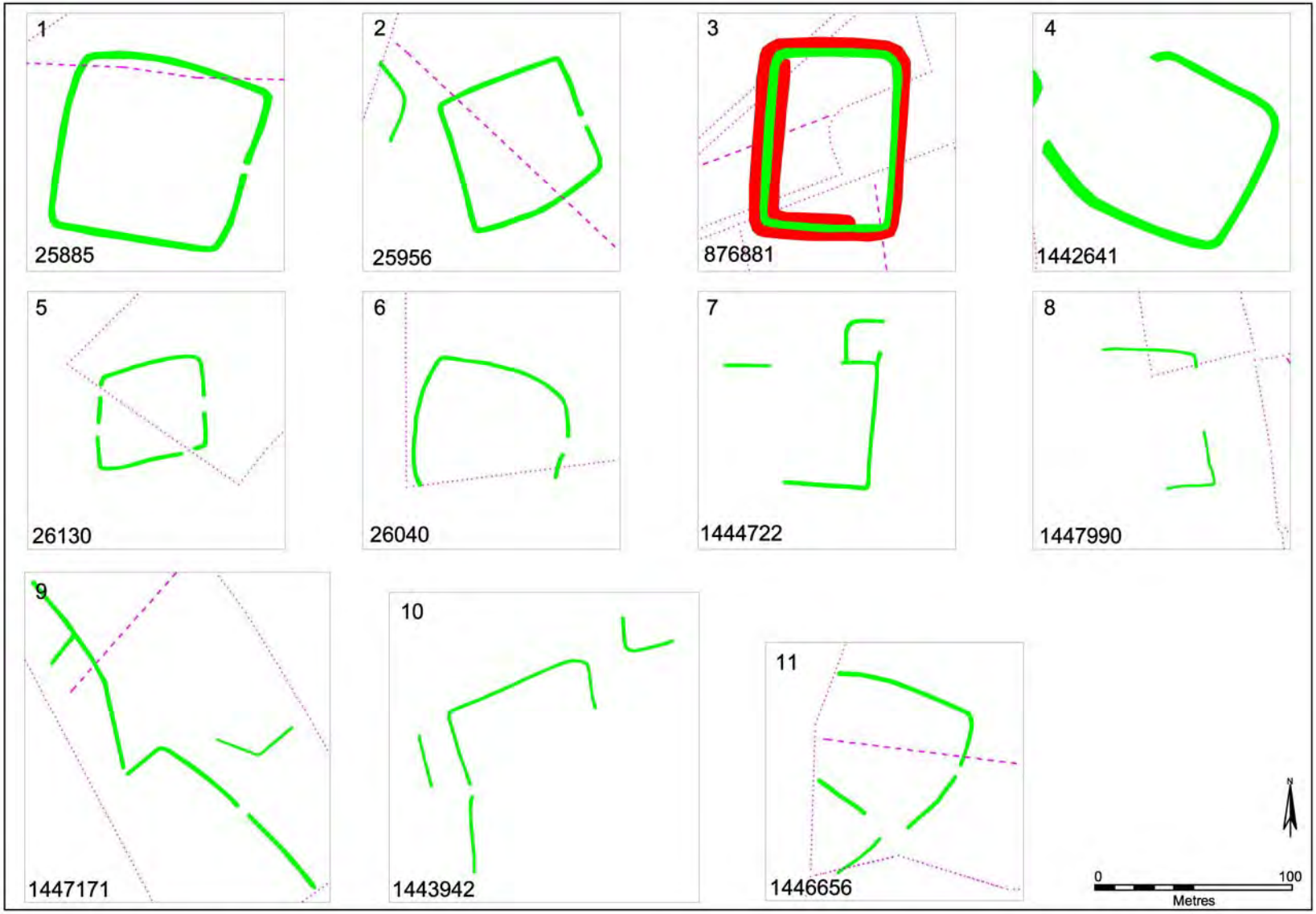

Fig 3. Iron Age/Roman Rectilinear Enclosures.

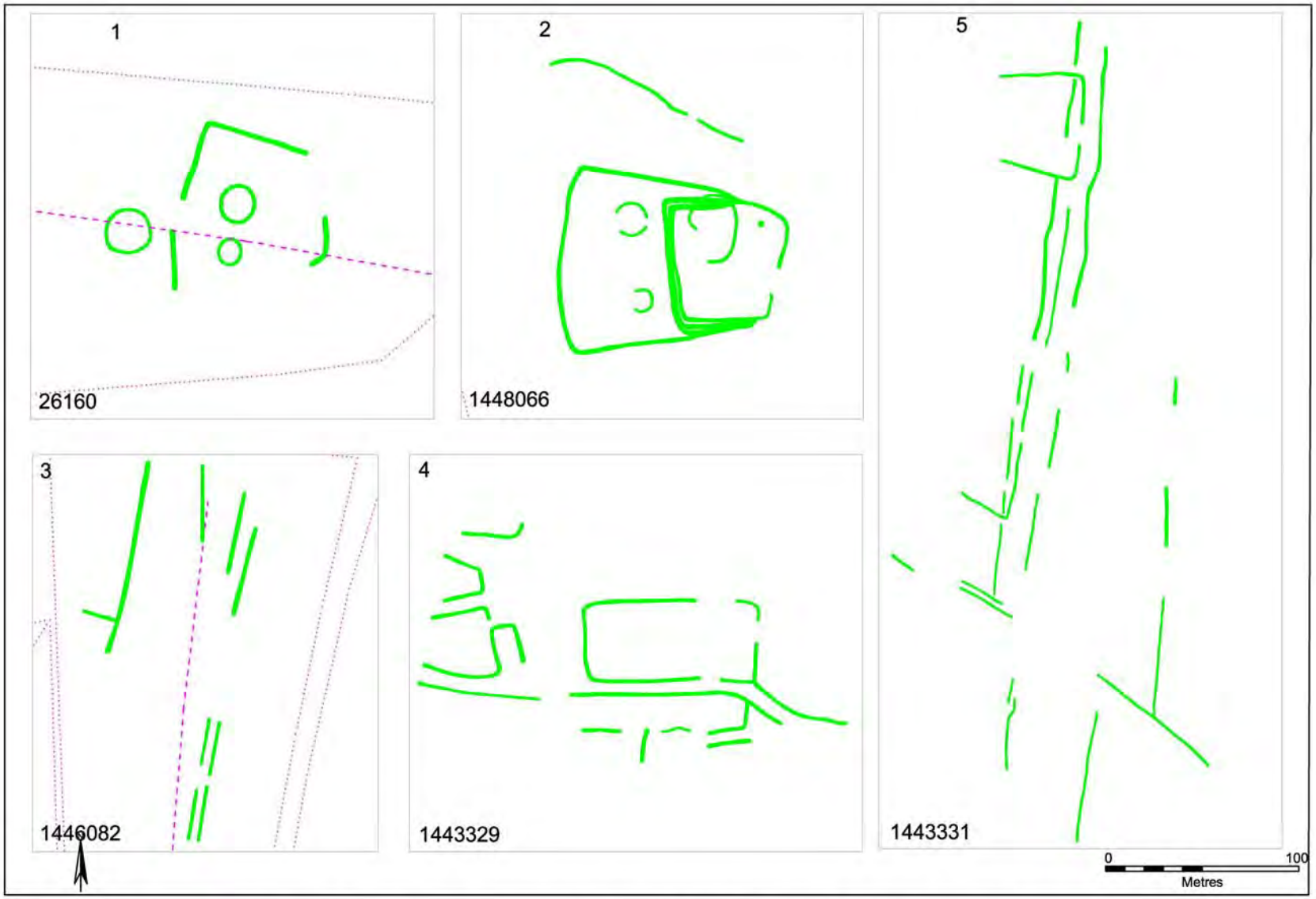

Fig 4. Iron Age/Roman Enclosures, Enclosures with associated domestic round houses (1,2), Enclosures with assiciated trackways (3,4,5)

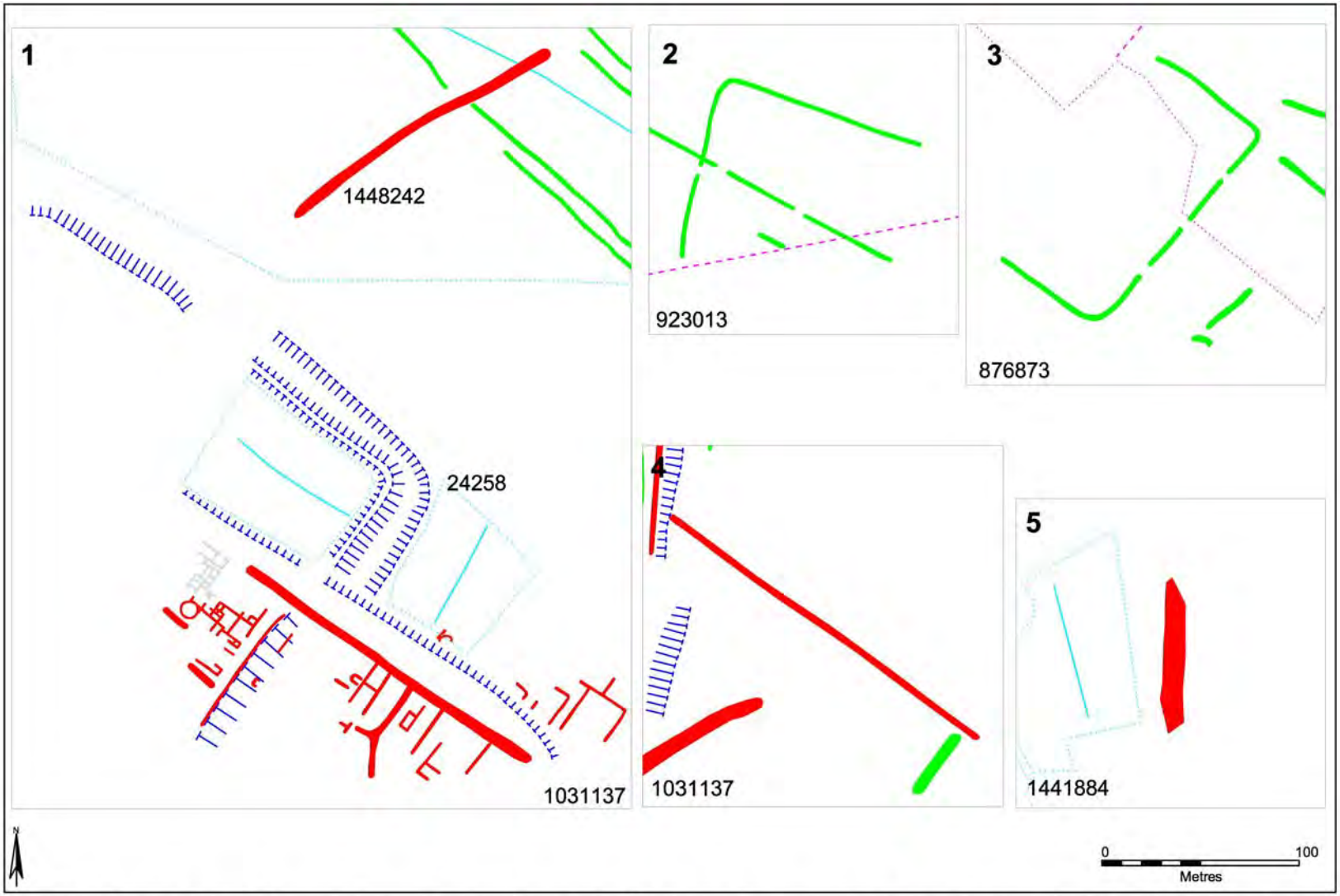

Fig 5. Roman features, Roman Vicus with associated roads (1), Roman military camps (2,3) and fragements of the Roman Road Dere Street (1,4,5)

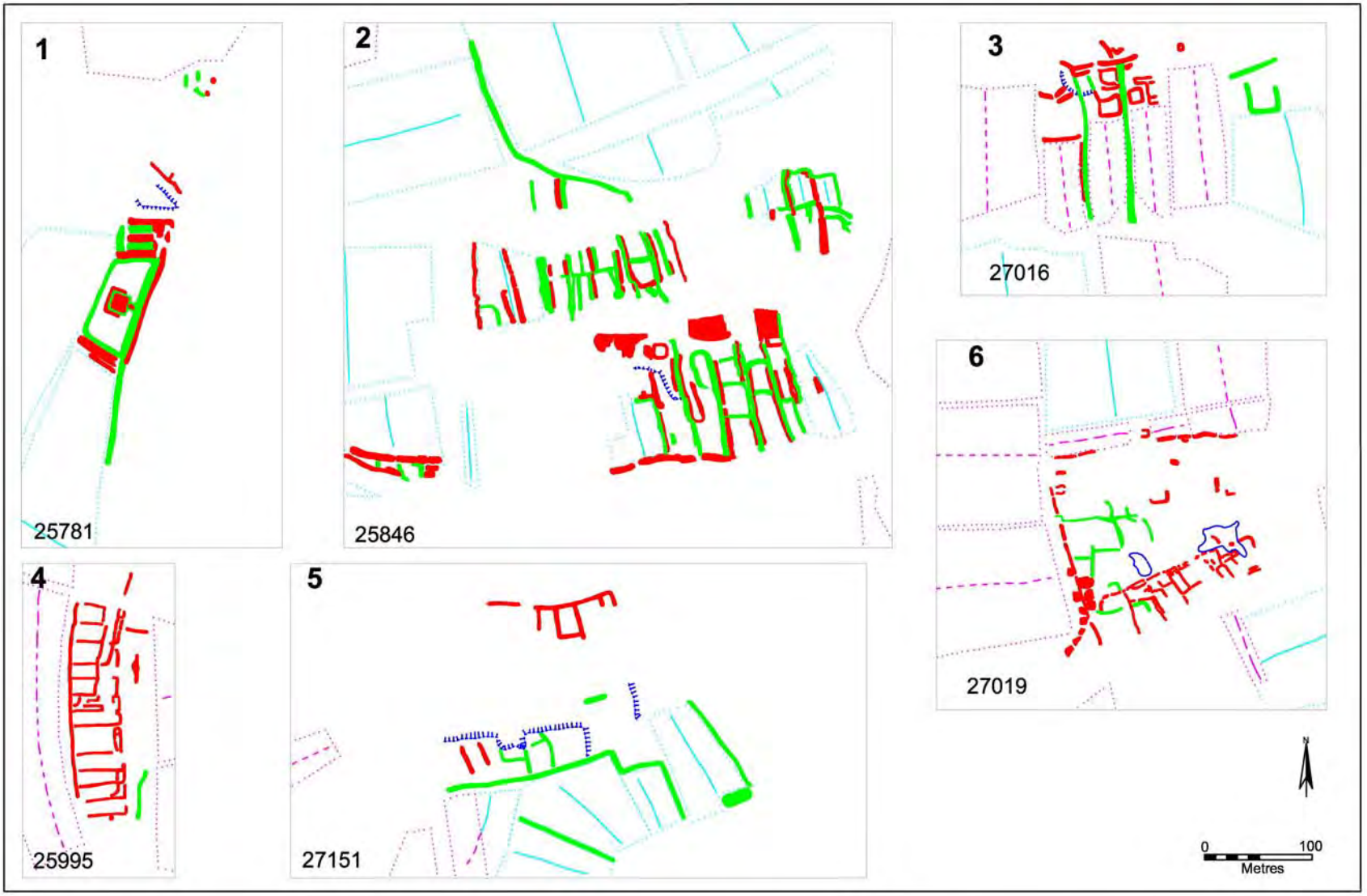

Fig 6. Medieval Settlements, Ornamental garden features (1), Medieval settlements (2,3,4,5,6).

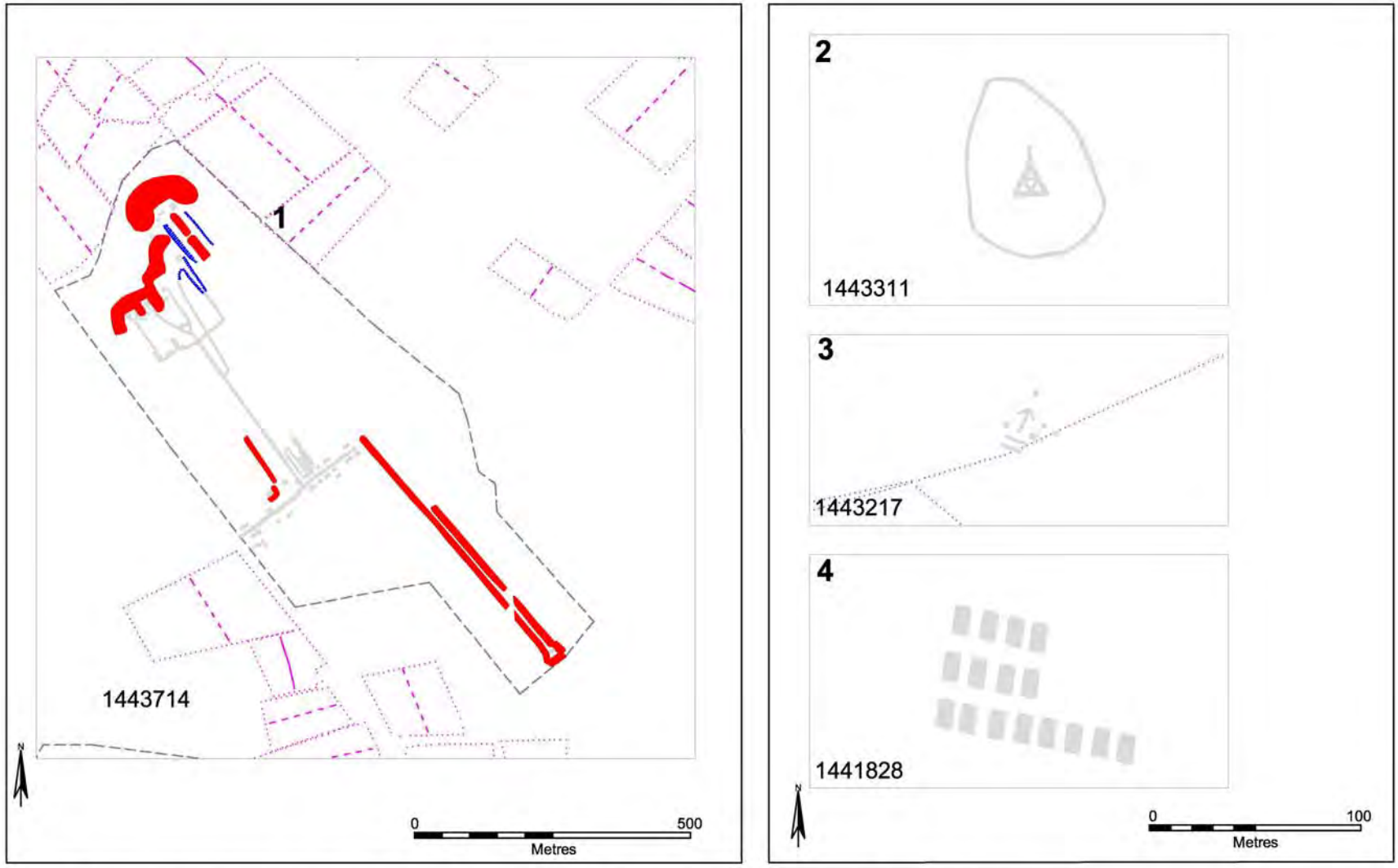

Fig 7. Military Features, Firing Range (1), Bombing Range Target (2) and Arrow (3), Air Raid Shelters (4)

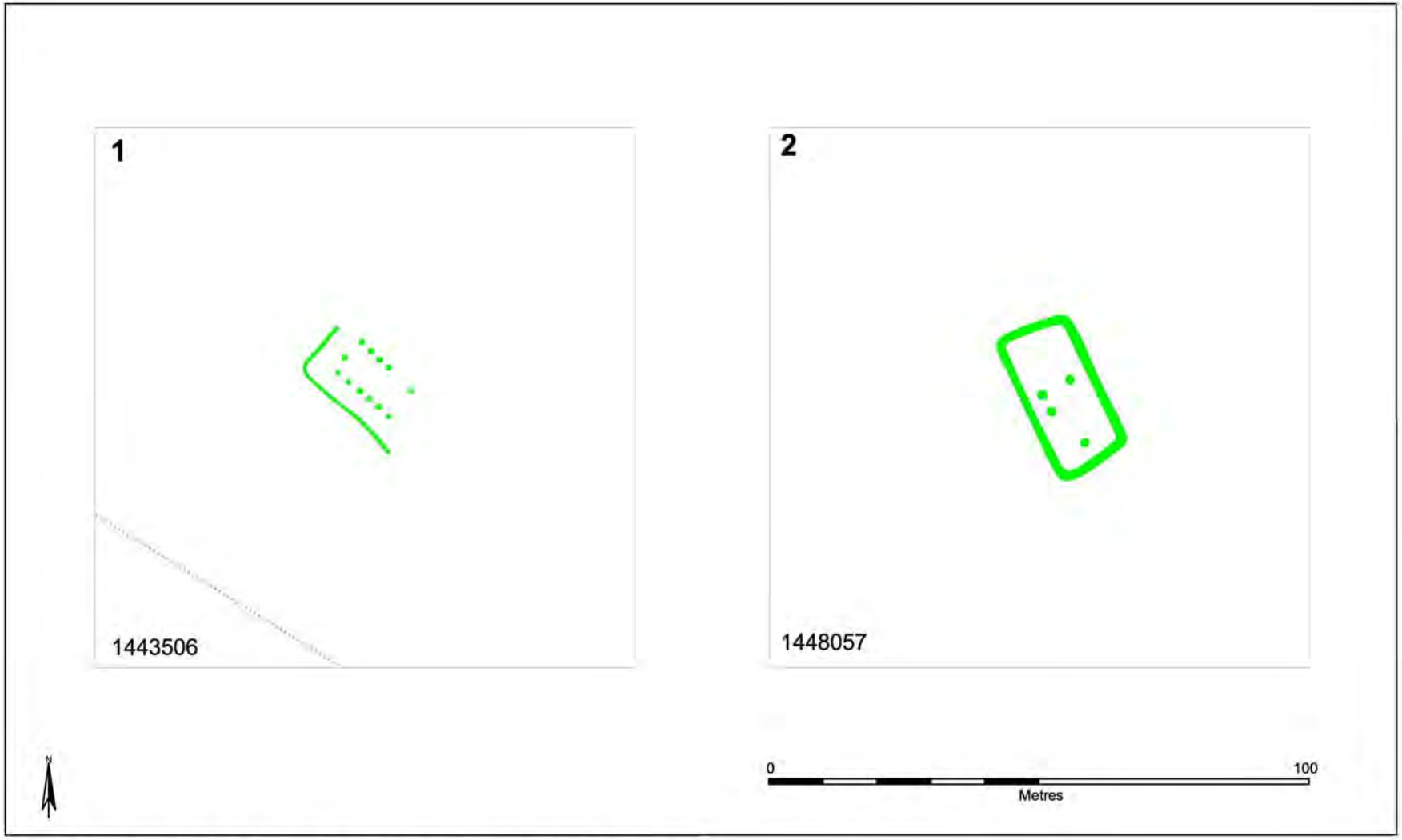

Fig 8. Uncertain date features, possible timber framed buildings (1,2)

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