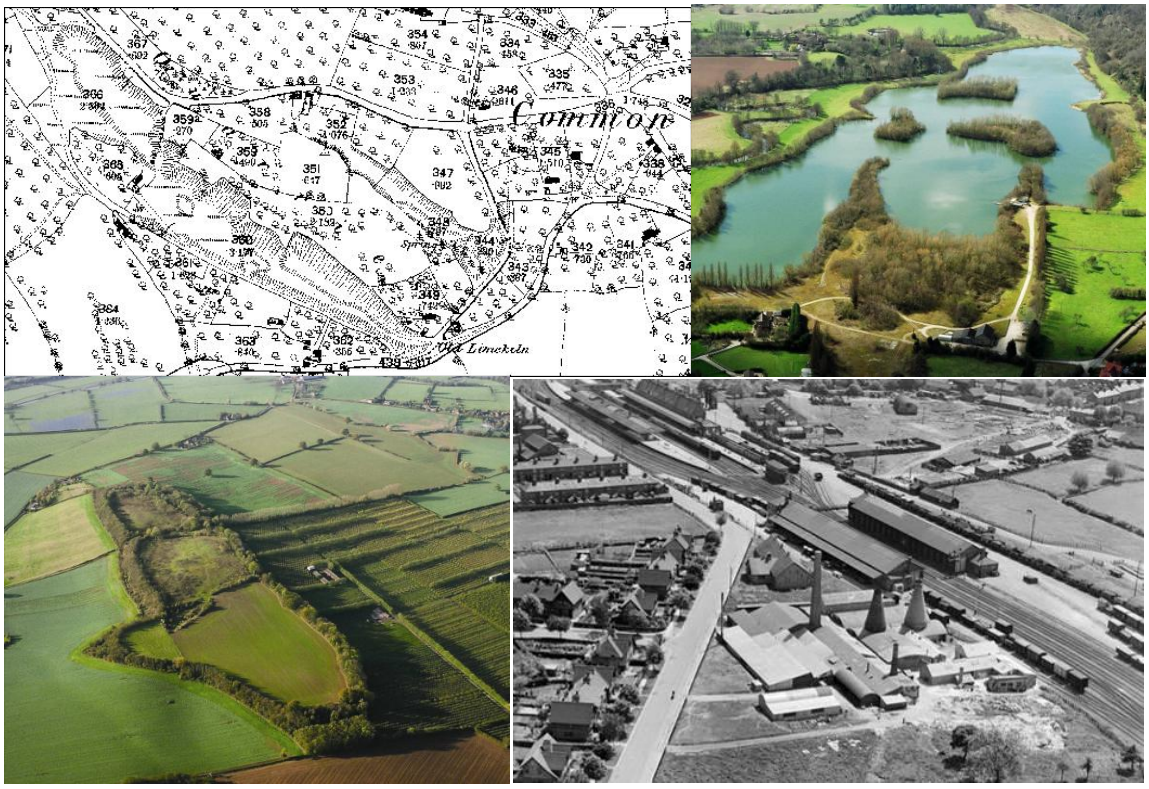
Herefordshire County Archaeology and Minerals Resource Assessment

April 2014



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Cover pictures

Top left: Old Limestone Quarries, Fownhope. 1st Ed OS 1886

Top right: Bodenham Lakes, former gravel extraction site

Bottom left: Sutton Walls hillfort, former gravel extraction site

Bottom right: Former Jeffrey Tile Works, Hereford, 1933. © English Heritage

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Section 1 Introduction and Methodology

"Mineral resources are natural concentrations of minerals, or bodies or rock, that are or may become of potential economic interest as a basis for the extraction of a commodity. They will exhibit physical and/or chemical properties and be present in sufficient quantity to be of intrinsic economic interest. Mineral resources are thus economic as well as physical entities." (Bloodworth et al, 1999)

1.1 Introduction

This document sets out an archaeological and minerals resource assessment for the county of Herefordshire. It excludes the Lower Lugg Valley which was the focus of a detailed resource assessment by Herefordshire Archaeology in 2006/7 (Bapty, 2007). This current assessment builds on the Lower Lugg study and follows the methodology established during it, though of necessity it is less detailed. Much of the background detail is set out in the 2007 report and it has not been repeated here but is referenced where appropriate.

Herefordshire is a rural county located in the central Marches with a land area of 2180 square kilometres. The geology of the county is not diverse but various components of it have in the past been the focus of extensive mineral extraction activity. Current and recent commercial activity has been focused mainly on sand and gravel aggregate (principally from the river valley terraces of the Wye, Lugg and Arrow) and hard rock aggregate derived from igneous and metamorphic rocks (Malvern Hills) and from Silurian and Carboniferous limestones (notably in the Ledbury, Aymestrey and Ross-on-Wye areas). Small scale building stone quarries mainly located on the Black Mountains ridges in the west of the county are only sporadically worked but locally important (principally sandstone for uses such as roofing tiles, flags and local building restoration, including some better quality dimension stone). In addition, Herefordshire has extensive clay deposits (Hereford basin and river valleys) and some very limited energy mineral reserves including coal (Ross coalfield). The clay in particular was important in historic brick and tile industries but neither the clay nor energy mineral deposits are currently subject to extraction or use. There may be some future potential subject to the right commercial conditions and improvements in extraction techniques. At present it is not considered to be commercially viable.

Herefordshire also has a rich and varied buried and above ground historic environment resource relating to a distinctive process of settlement, change and development from prehistory to the present day. Recent research has increasingly demonstrated the particular character of local settlement whether in the later Neolithic/Early Bronze Age or in the Medieval period. The need to better characterise, record and protect the regionally and nationally important

Herefordshire historic environment resource has been emphasised within the recently published West Midlands Archaeological Research Framework.

1.2 Methodology

The methodology used for this study broadly follows that established for the 2006/7 Lower Lugg study with the exception that there is no detailed evaluation or study of the "geo-resources" of the river valleys that was carried out within that study by a specialist contractor.

Whilst this study looks at the whole of Herefordshire, sand and gravel aggregate extraction within the county, both present and potential is almost exclusively confined to the river valleys of the Lugg and the Wye. Two areas of high potential for sand and gravel extraction have been selected for more detailed study (figure 1). These have been identified from the British Geological Survey mapping of mineral resources. They are the middle Lugg Valley between Bodenham in the south and Leominster to the north (figure 2), this is the Lugg Valley immediately north of the Lower Lugg study area, and the Wye Valley running from Hereford in the east to Winforton / Letton Lake in the west (figure 3).

Hard Rock extraction is not now widespread within Herefordshire with only one large commercial limestone quarry in the north of the county and a number of smaller less regularly worked sandstone sites in the west. It is not easy to predict future trends in this activity other than some expansion of current quarries. The approach to hard rock extraction areas is therefore much more general than for the potential aggregate extraction areas. The limestone exposures in the county have been used as the main focus for this study. These outcrop in four geographically different areas. These are the Silurian Limestone areas of Aymestrey in the north of the county; the Malvern and Ledbury Hills in the east; the Woolhope Dome south-east of Hereford City and finally the Carboniferous Limestone to the south and south-west of Ross-on-Wye.

However, most of these, although extensively quarried in the past, would be inappropriate or impossible to work today. Modern economically viable levels of production along with heavy transport would simply not be acceptable. The Woolhope Limestone, The Malvern Hills area and the Carboniferous Limestone area to the south-west of Ross-on-Wye are all within AONBs, this designation is regarded as a primary constraint within the counties planning policies. It is also explicit county policy that further extraction in the Malvern Hills be resisted. These areas are also very rural areas without developed infrastructure. The Woolhope Limestone for instance is in an area that is accessible only by roads that are single track or narrow. The Ross and Malvern areas are also major recreational and tourist destinations. For the purposes of this report therefore only the Aymestrey Limestone area is considered for assessment (figure 4).

Within the Lugg and Wye Valley study areas polygonal mapping of past and present quarries has been carried out. Past use of mineral resources has been identified from the county Historic Environment Record (HER) and additional sites recorded from historic maps. Sites such as sand, gravel, marl and clay pits, and brick and lime kilns have been recorded mainly from 1st edition and later Ordnance Survey maps and place name evidence from the Tithe apportionment maps used to identify potentially earlier areas of extraction. Existing working quarries have been mapped from Development Control GIS tables that map current quarry consents and applications. All this mapping is stored in individual MapInfo (GIS) tables within the project archive and is incorporated into the county Historic Environment Record. These tables are therefore available for editing as necessary.

The two valley study areas were also the focus of a detailed AP mapping exercise. This has been carried out by an external contractor using photographs held in the National Monuments Record and the Herefordshire HER and online resources such as Google Maps. The results of this work have also been fully incorporated into the county HER.

Areas of potential mineral extraction within the two study areas have been identified by using polygonal data from the Environment Agency Flood Zone data and British Geological Survey Data at a scale of 1:50,000 (DiGMapGB-50). The former indicates the river flood plains and potential alluvial deposits containing or masking sand and gravel deposits and the latter identifies sand and gravel deposits including “glacio-fluvial deposits”, “river terrace deposits” and inferred “sub-alluvial river terrace deposits”. These two data sets have been combined to provide polygon areas with which to interrogate the HER and to identify sites within and outside potential extraction areas within the two main study areas.

County wide hard rock limestone deposits and potential extraction areas have been identified from the Minerals Local Plan Proposals Map and the British Geological Survey DiGMapGB-625 solid geology map at 1:625,000 scale. These areas have similarly been used to identify potentially at risk sites.

Areas of palaeo-environmental potential within the river valley study areas have been identified and mapped as polygons and a GIS layer created. This mapping includes HER records for Pleistocene Deposits, Peat Deposits, Environmental Sample Sites and Palaeo-channels. The presence of glacio-fluvial and fluvial sand and gravel deposits are also an indicator of potential palaeo-environmental deposits therefore the Environment Agency flood mapping inferring alluvial deposits have been included and the British Geological Survey minerals deposits maps (DiGMapGB-50) at 1:50,000 showing superficial deposits. The latter also includes mapped peat deposits (see figures 36 and 37).

Figure 1: Herefordshire county and the main study areas

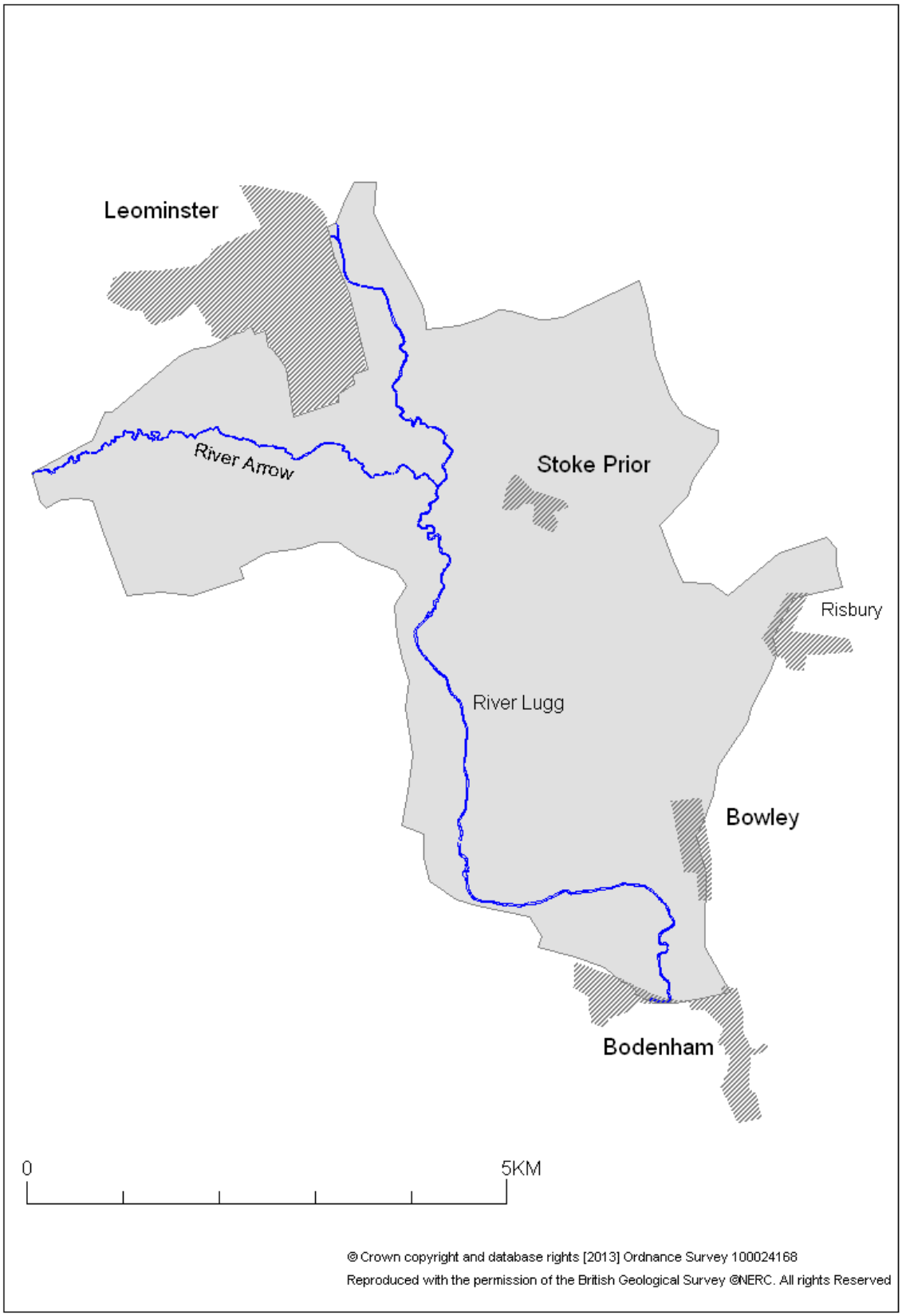


Figure 2: The Lugg Valley study area and modern settlements

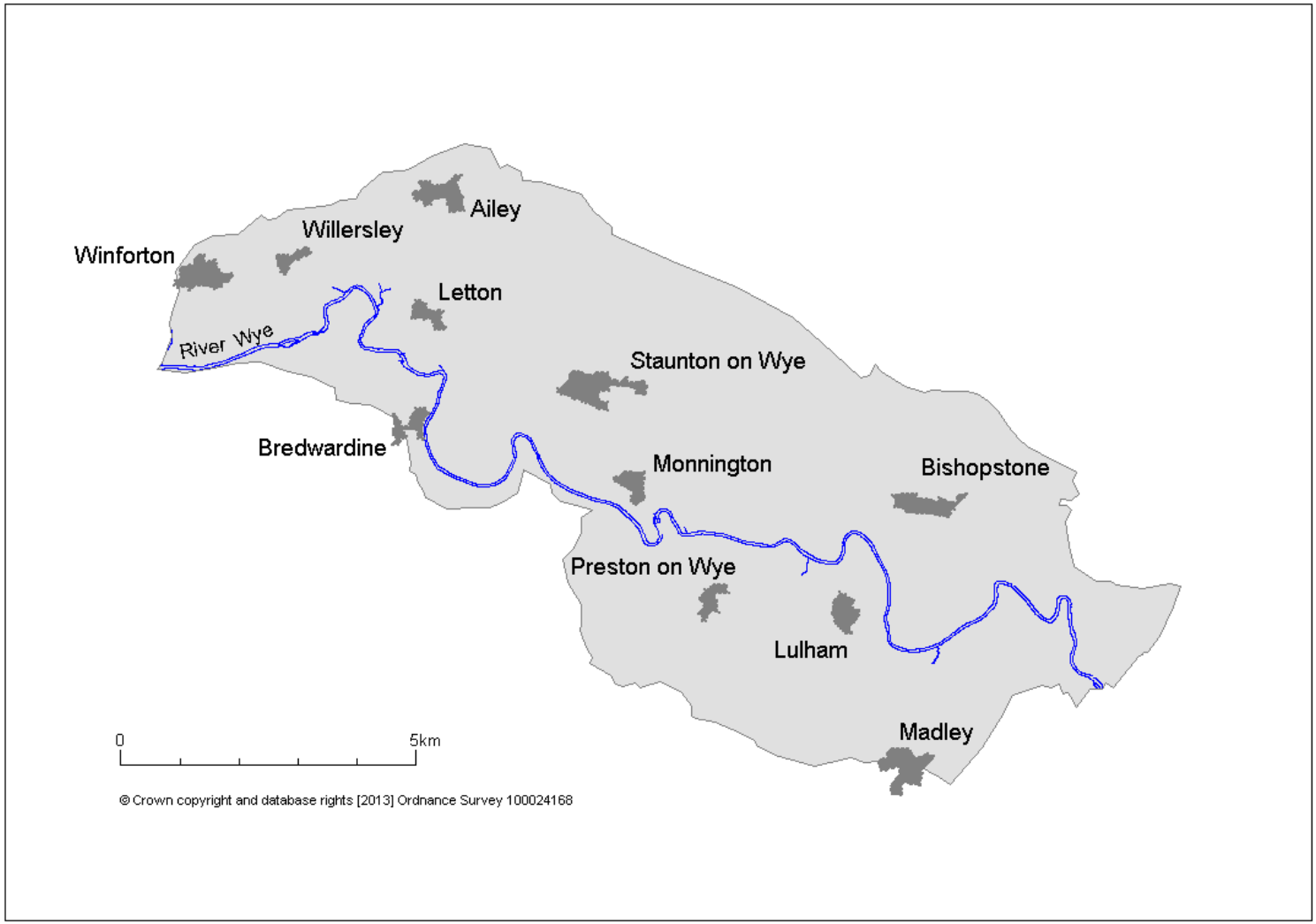


Figure 3: The Wye Valley study area and modern settlements

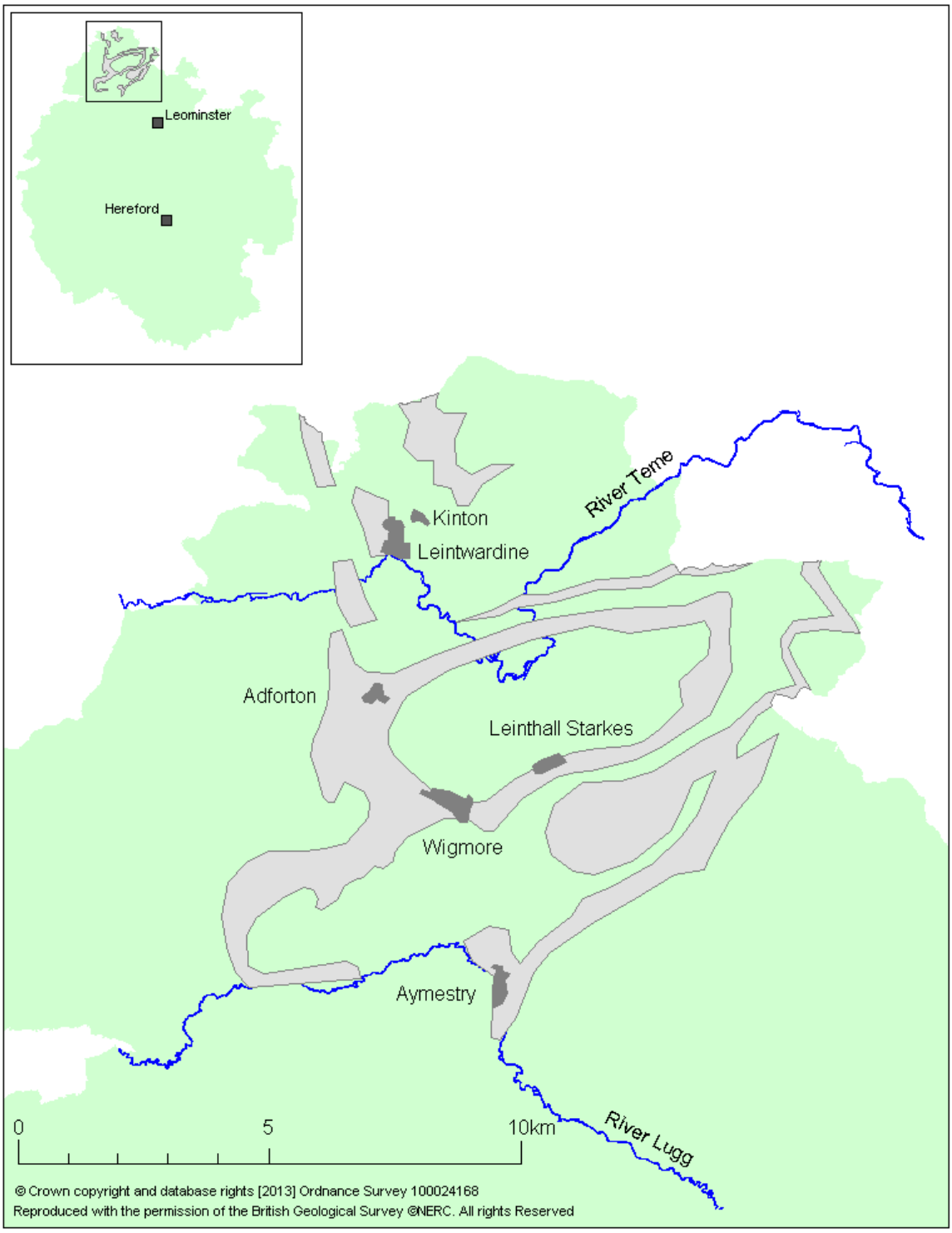


Figure 4: The Aymestrey Limestone study area and modern settlements

Section 2 Mineral Resources in Herefordshire

2.1 Distribution of mineral resources in the county (figures 5 and 6)

The information below is derived from the British Geological Survey 1:625,000 and 1:50,000 data sets. However there is no recent detailed geological survey of the entire county and there are significant areas, especially the west of the county, where no geological data is available. In the light of the increasing scarcity of accessible minerals, the British Geological Survey has been urged to roll out new work in identifying possible resources for the future.

The predominant underlying geology in Herefordshire, covering some 75% of the county, comprises Sandstones, Mudstones and Siltstones of the Silurian and Devonian periods, basically “Old Red Sandstone” (figure 5). Silurian Limestone occurs as a band between the Silurian and Devonian period rocks and outcrops in the Malvern/Ledbury range of hills, the Woolhope Dome/Shucknall Hill, and in the Aymestrey/Presteigne areas. These limestones are relatively thin and shaly and belong to two formations known as the Woolhope and Aymestrey Limestones.

The Aymestrey Limestone is a sequence of dark grey, thinly bedded, nodular limestones, inter-bedded with siltstones and mudstone. It is between 15m and 40m in thickness locally grading to calcareous mudstone. It is currently quarried at one site and is used to produce coated roadstone and constructional fill.

The Woolhope Limestone consists mostly of alternating grey nodular limestones and darker grey calcareous mudstones. Over much of its outcrop it is around 15m thick, although thickness may vary between 0m and 75m. It is generally only suitable for constructional fill, but can locally comprise relatively clean massive limestones which are suitable for good quality aggregate materials (Bloodworth, 1999). There are no quarries currently working this material.

Carboniferous limestone and some Coal Measures geology are found south-west of Ross-on-Wye, and igneous and metamorphic rock including granite in the Malvern Hills. Although none of these sources are quarried now, all have been quarried to some extent in the past for a variety of uses.

River sand and gravel deposits include spreads which occur beneath alluvium forming the floors of the major river valleys, the Wye, Lugg and Frome in particular and river terrace deposits flanking the valley sides (figure 6). These deposits have been naturally processed by running water. As a result beds of unconsolidated sand and gravel are likely to be relatively consistent in terms of particle size and usually contain a lower proportion of silt and clay than glacial deposits.

Glacial sand and gravel deposits include those laid down by glacial and glaciofluvial processes associated with ice-sheets, glaciers and, particularly, their meltwaters. They are also unconsolidated deposits, but are more variable than river sands and gravels. They are less predictable in geographical extent and have a wider range of particle sizes (op cit, 1999).

Around Hereford and Leominster glacial sand and gravel occurs in association with spreads of till and other glacial deposits. These deposits are typically very variable in extent, thickness and content but may represent valuable sand and gravel resources. The morainic deposits typical of the Wye Valley west of Hereford contain one of the largest potential sources of sand and gravel in the area, up to 20m depth of sand and gravel were exposed in the Stretton Sugwas quarry. Further north patches of gravel with lenses of sand lie within, or extend beneath, the glacial till and have been worked in the past for local use.

In Herefordshire limestone, sand and gravel are all quarried for aggregates. Although geographically extensive the Devonian Old Red Sandstone rocks are unsuitable as a source of aggregate because of their relatively poor physical properties, although they are an important local source of building stone. In the past limestone was widely utilised, where present, for building and agricultural use and in the south of the county for use in the iron industry. Granite also was once quarried from the Malvern Hills. This quarrying has ceased and current policy is to oppose further granite extraction from the Malvern Hills. Clay was extensively dug in the past for the production of bricks and tiles but none of these industries remain today.

A small outlier of the Forest of Dean Coalfield extends into the south of the county at Howle Hill. It was worked as a small scale opencast site between 1972 and 1977 but mining has long ceased and the resource is understood to be substantially worked out.

The hydrocarbon potential of the area is low. Wells drilled to test the oil and gas potential of the Lower Palaeozoic rocks in the Woolhope Inlier have failed to discover hydrocarbons.

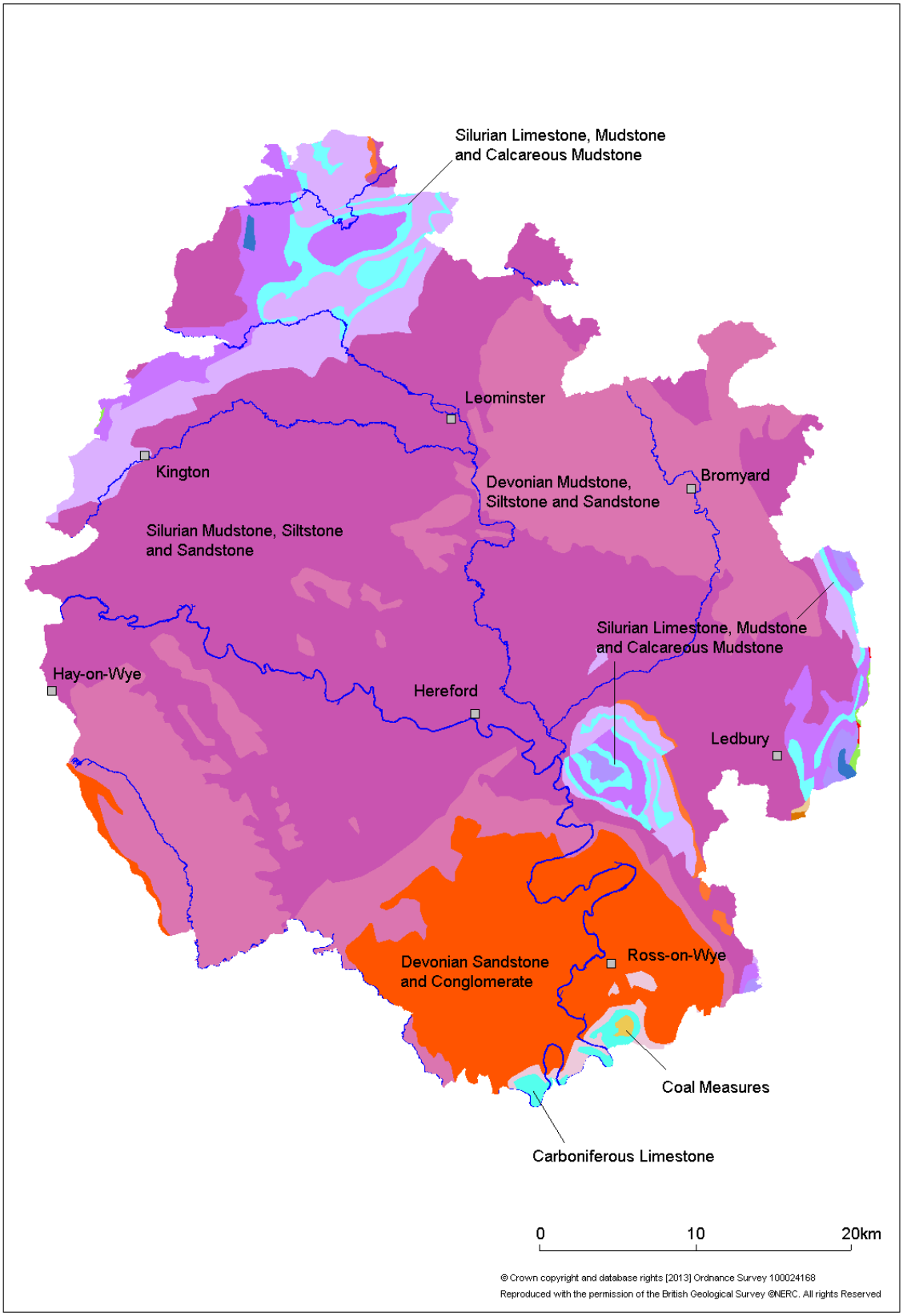


Figure 5: The solid geology of Herefordshire (only main deposits labelled)

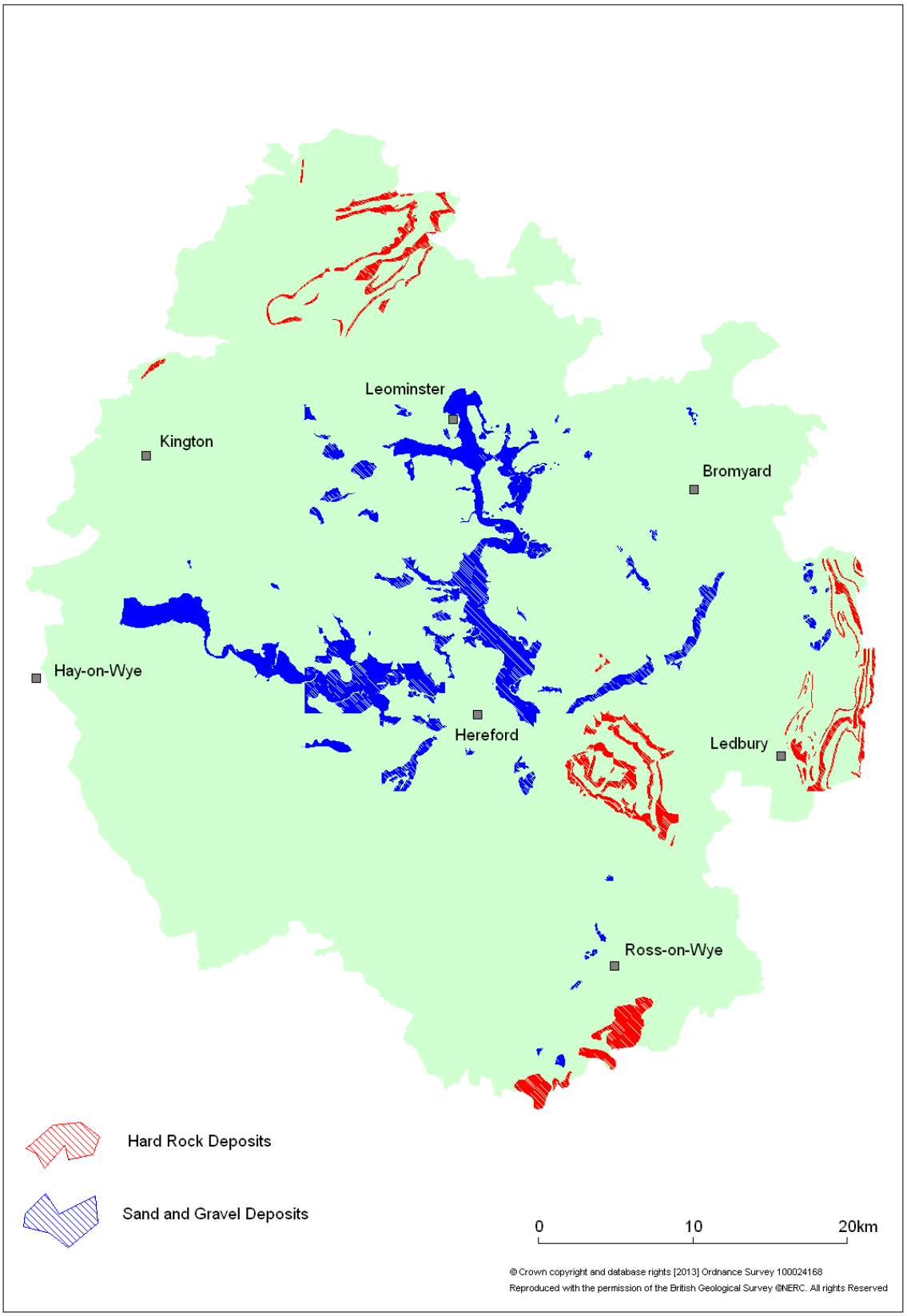


Figure 6: Hard rock (limestone) exposures and sand and gravel deposits.

2.2 A short history of past mineral uses in Herefordshire

Geological resources have been utilised by mankind for millennia. In prehistoric Herefordshire pebbles exposed in stream and river beds were readily available and could be utilised for such activities as polishing and hammering. One such stone used for both purposes was recovered from the ditch of the Neolithic enclosure at Bodenham (Dorling, 2007). The pebble is from the Ordovician Stiperstone Quartzites series which outcrop to the east and south-east of Leominster.

. So called “burnt mounds” are dated to the Bronze Age and can consist of quite large mounds of heat cracked pebbles. Often associated with troughs these appear to be the waste product from heating water for some purpose, possibly cooking although other uses are feasible. Another use for these cracked stones was recorded in the enigmatic monument known as the Rotherwas Ribbon in the Wye Valley to the south of Hereford City. An artificial metalled surface was constructed by placing individual pebbles crack side down to form a winding surface running downhill for possibly around 200m. Recent scientific dating places this activity in the middle Bronze Age.

Later, in the Iron Age there is evidence of the deliberate selection of stone for the revetment of the ramparts at Midsummer Hill hillfort on the Malvern Hills (Stanford, 1981). Two distinct stone types were used, that for the rampart was Llandovery Sandstone, whereas at the entrance way Triassic Limestone was used. Neither of these outcrops on Midsummer Hill itself. The nearest sources are thought to be the Bronsil escarpment one mile to the west for the sandstone and for the limestone Coombegreen Common one mile to the east. Revetting a rampart of nearly one mile circumference to a height (Stanford argues) of 2.4m with non-local stone was obviously a massive task. It might suggest the development of community links and the overt display of regional affiliations, in this case made visible through the use of mineral resources.

Pottery was produced from local clays throughout prehistory and into the more recent past. The so called “Malvernian” Iron Age and Romano British wares were produced in the vicinity of the Malvern Hills and the Woolhope Hills and distributed throughout Herefordshire.

The impact of the exploitation outlined above must have been fairly minimal but a phase of use during the Roman occupation of Britain was perhaps more significant. The Roman road network between forts and towns would have required large quantities of graded aggregates. Where this was extracted from exposed river banks and beds the evidence has probably vanished but where this material was available close to the roads from glacial deposits and terraces quarry scoops are likely to survive.

During the roman period there would also, perhaps for the first time, be a demand for building and dimension stone and for mortar. The towns of

Kenchester, Blackwardine and Leintwardine are all known to contain masonry buildings as were a number of forts within the county. Villas and other high status buildings would also have consumed quantities of stone.

The Medieval period undoubtedly saw a marked increase in the use of stone. The image of Herefordshire as a county of black and white half timbered buildings is however misleading. Many parts of the county have predominantly more stone and brick built buildings. This was illustrated by recent local distinctiveness building surveys (White, 2003 and Dorling, 2007). In the Lugg Valley three distinct zones were identified (figure 7). The lower Lugg close to the confluence with the Wye up to Mardon and Wellington had predominantly brick buildings, the parishes Bodenham north through Leominster to Kingsland mostly brick and timber framed and the western parishes up to the Welsh border stone and timber framed.

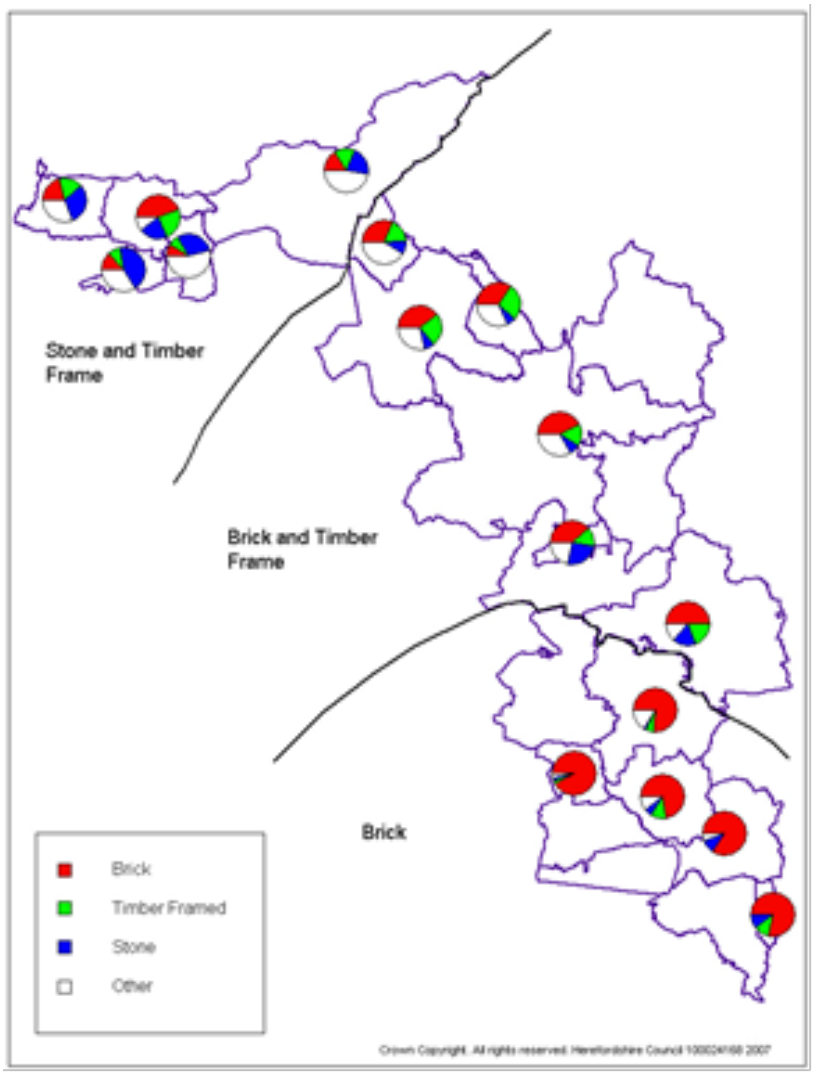


Figure 7: Zones of building materials identified in the Lugg Valley.

Stone was used in buildings for walls, roofing tiles and flagstone floors and also agriculturally for dry-stone walls. Town building and the construction of major buildings such as Hereford Cathedral and masonry castles would have been major users of stone and lime. Some of the small scale hard rock quarrying that is now carried out is specifically for historic building repairs and conservation work.

Tufa was also utilised in many high status Medieval buildings where it was used alongside freestone. Tufa is a Holocene calcareous deposit formed by the precipitation of carbonate minerals from lime rich ground water. The source of this material is largely unknown but deposits have been identified at Bodenham in the Lugg Valley, at Biblins in the Wye Gorge and at various places along the Black Mountains escarpment. Extensive deposits must have been available in the past but these may have been completely worked out. The church at Moccas in the Wye Valley for instance is built almost entirely from tufa and a reasonably local source must be supposed.

Limestone was quarried and burnt to produce quicklime, or calcium oxide. This in turn was used for a number of purposes. From the late 18th century it was used extensively as a soil improver, to reduce acidity and improve structure and large quantities were used in agricultural applications. Lime putty was the basis for a number of construction products, mixed with various grades of aggregate it was used extensively up to the 1950s for mortars, plasters and limewash.

Clay for brick and tile production became increasingly important from the Medieval period onwards (figure 10). Hereford and Leominster were both major producers. Brick kilns have also been discovered associated with some of the major country houses in the county including Croft Castle and Brampton Bryan House (T Hoverd, pers. comm.). Most use of clay deposits however would have been made by the major manufacturers such as the Jeffry Tile Works (see photograph on front cover).

Aggregates will have been increasingly in demand for both construction (hardcore and constituents of mortar) and for road making. The modern road network was constructed and is maintained using large quantities of local stone.

Small quantities of coal and Iron ore are present in the south-west corner of the county. These are part of the Forest of Dean coal fields. Mining remains visible on the ground (iron ore shafts and adits) within and close to Little Doward hillfort are probably post-medieval. Evidence of possible iron working activity was found during excavation within the hillfort, that activity was dated to the middle Iron Age and it is likely that iron deposits in that area were being exploited during that time (Dorling, 2012).

2.3 The evidence for mineral extraction sites in the county Historic Environment Record (HER)

A variety of sites that provide evidence of mineral extraction or exploitation are contained in the Herefordshire HER. The following site types have been extracted and are summarised and discussed below.

Site Type	Number of records in the HER
Brick Kilns/Yards/Works	308
Clay Pit	102
Colliery	7
Gravel Pit	234
Lime Kiln	272
Marl Pit	33
Mine	9
Quarry	2118
Sand Pit	16
Stone Quarry	7
Total	3106

Table 1: Extractive and mineral working sites in the county HER

The majority of these sites have been recorded from the 1st edition OS map. Some records are based on field name evidence from tithe maps (those for colliery mainly relate to charcoal burning). In addition further work has been carried out within the two detailed study areas and 13 new quarry sites have been identified from the 1st Ed OS map, these and the previously recorded quarries from the HER have been converted from point data to polygons with associated attribute data.

Although the recording of sites from the 1st Ed OS maps was carried out in a systematic way the recording of new sites from the same source illustrates that not all such sites were noted at the time. The HER must always be regarded as an incomplete sample as it is simply not possible to be sure that all sites are recorded. Further comment on the reliability of the HER is made in the introduction to Section 4

Another issue with historic extraction sites is that if a site was worked over a long period of time earlier activity is removed by later extraction. Where a site can be dated by whatever means this will only ever represent the lasty phase of working.

Historical extraction patterns

The following series of distribution maps have been produced from the data above and illustrate the pattern of historical mineral extraction activity across the county. It is clear that minerals can only be extracted from where they occur naturally, however the map based evidence is interesting in how it differs from the potential extraction areas of the present day. Clearly smaller scale exploitation, of for instance limestone, allowed resources that would today be commercially unviable to be exploited.

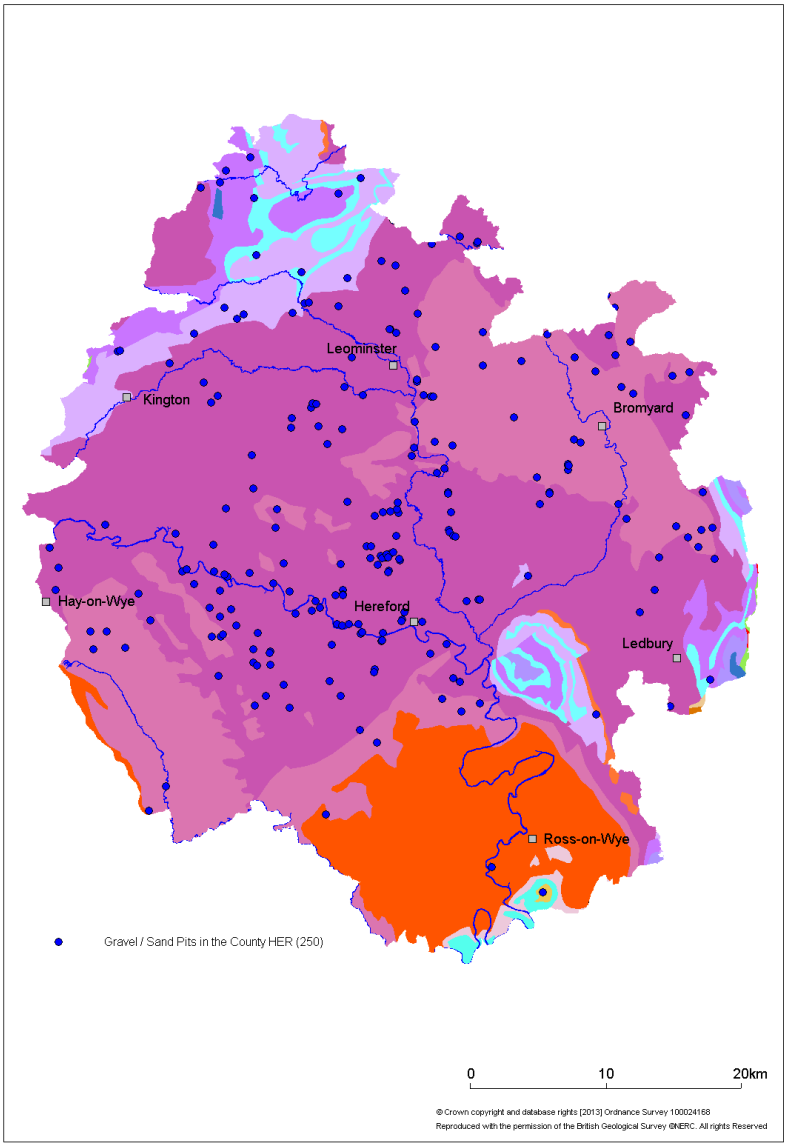


Figure 8: Gravel Pits.

As expected these occur in the main area of river gravels and glacial deposits. Most are small scale pits for very local use perhaps limited to individual holdings.

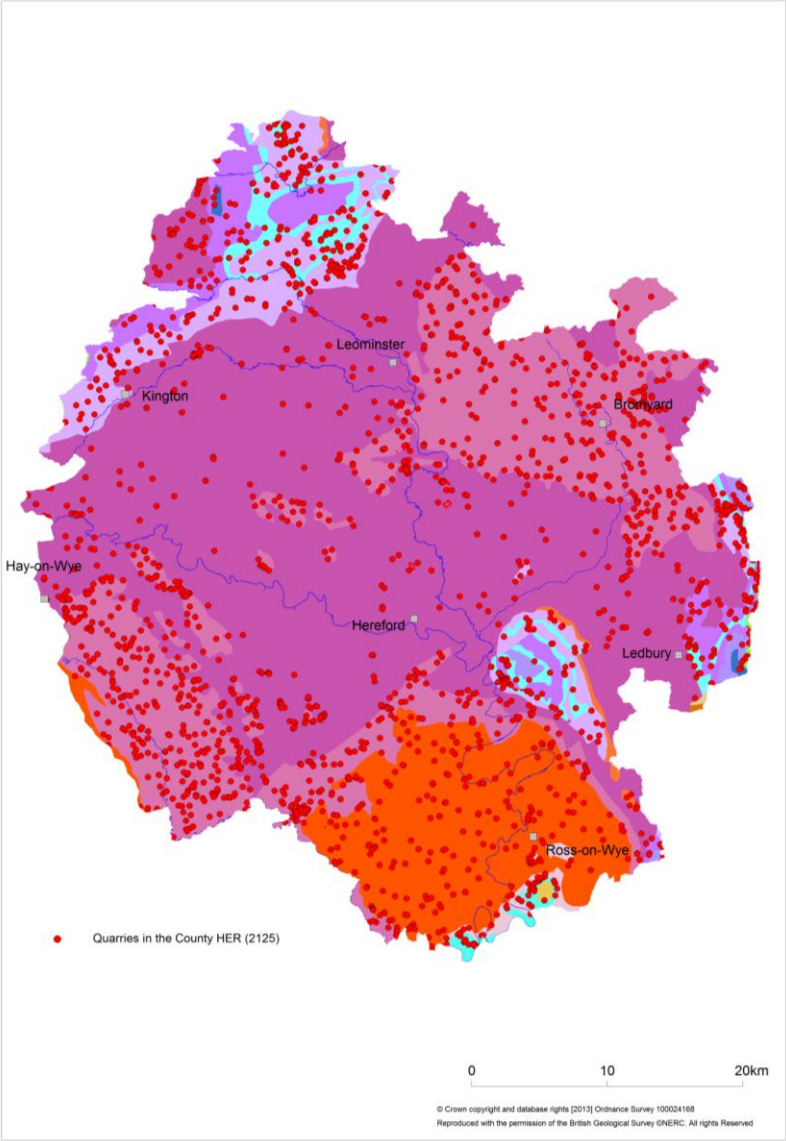


Figure 9: Quarries

As might be expected the distribution of quarries is linked very much to the higher ground where hard rock deposits are likely to be close to the surface. The main river valley and basin areas containing drift and fluvial gravel deposits have some records of quarries though it may be that some features on early maps recorded as quarries are in fact gravel pits.

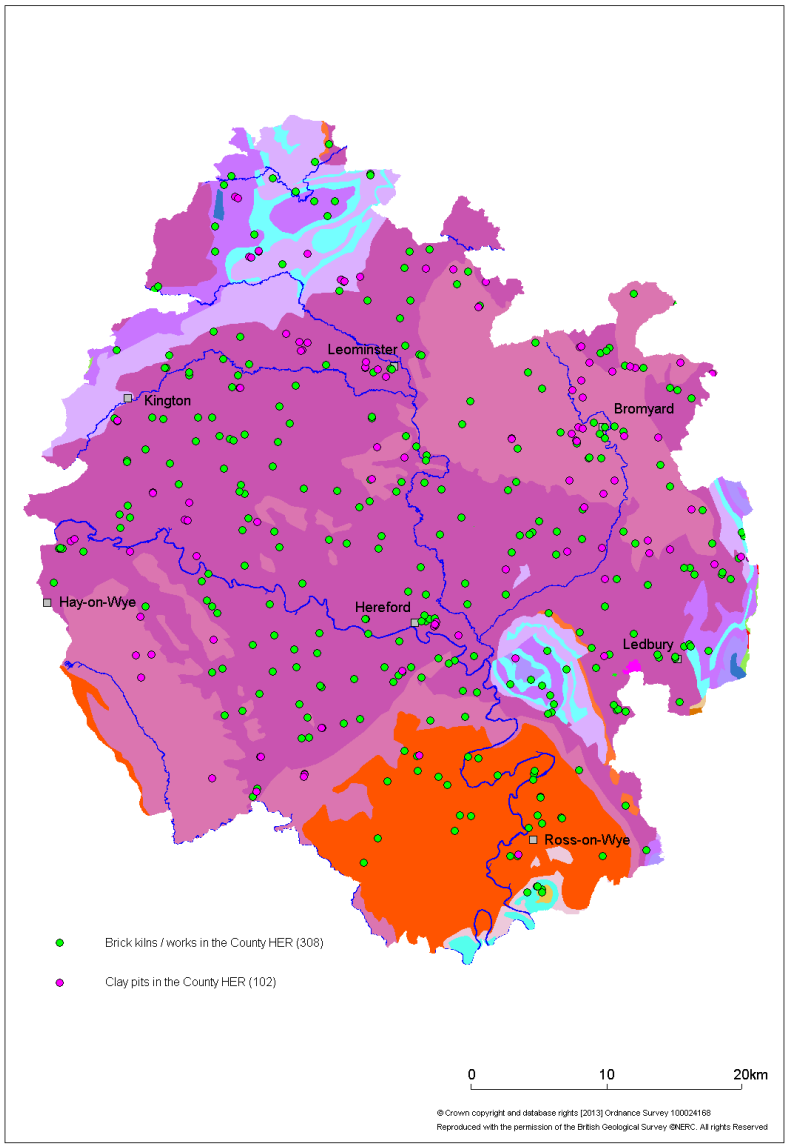


Figure 10: Brickworks

With a similar distribution to gravel pits, 308 brickworks and kilns are recorded and 102 clay pits. The clay pits are not all necessarily associated with brick or tile working, clay was dug for other purposes including the puddling of ponds and canals and some specialist pottery and clay tobacco pipe making, but the raw mineral material is the same. Many of the brick works/kiln sites are inferred from place name evidence, mainly field names recorded on the Tithe Apportionment maps, but there are 58 named brick works within the record.

Brick and tile manufacture was at one time an important industry in Herefordshire but the last brick works closed at the start of World War II. Limited manufacture of floor and glazed tiles continued at Bromyard, Hereford and Withington but had died out by the 1960s.

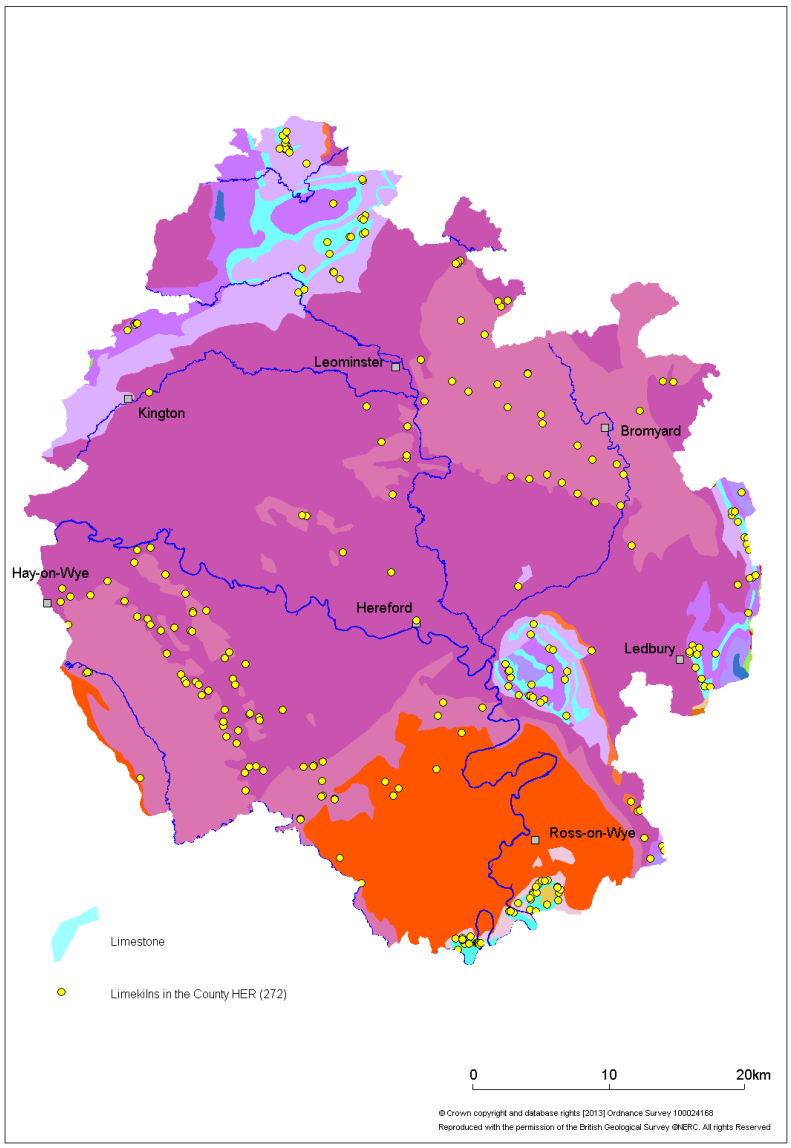


Figure 11: Limekilns

272 limekilns are recorded across the county and where there are limekilns there will usually be limestone quarries. Some of these may be derived from placename evidence but the majority will survive as extant features. Almost certainly there would have been many more limekilns but early kilns may have been destroyed by later quarry expansion and early clamp kilns leave little or ambiguous remains.

Whilst there is a clear focus on the outcrops of the Silurian Limestone in the north and east of the county and on the carboniferous limestone in the far south, there is also extensive exploitation of calcareous conglomerate (cornstone) bands in the sandstone especially on the flanks of the Black Mountains in the west of the county and on the Bromyard plateaux.

2.4 The impact of historic extraction on the archaeological resource

Much of the activity outlined above would have been small scale in comparison to the commercial extraction seen today, such as that at the Wellington/Moreton-on-Lugg gravel pits. It is quite possible, indeed likely, that early gravel extraction from valley bottom and river terrace sites has removed or damaged archaeological (and palaeo-environmental) features and deposits. There are however only a few more recent examples of chance discoveries. Although a thorough literature/HER review might reveal more it is likely that most such finds went unrecognized or unreported.

There are some examples of notable major finds revealed by other early construction works, for instance an Iron Age metalwork hoard was found in the bank of Cage Brook close to Eaton Camp promontory fort probably during canalisation of the brook in 1815 (Anon, 1815). Elements of Blackwardine Roman settlement were found during the construction of a railway cutting in 1881 (Davies Burlton, 1885).

The best recent example, or the worst in terms of impact and damage, is Sutton Walls hillfort near Marden. The entire western end was subjected to gravel extraction, and the after use of the quarry pits was as a toxic industrial waste dump. Small scale gravel extraction apparent on the 1st edition OS map and called the "Kings' Cellar" probably dates to before the 19th century. The attribution of such a name suggests a feature of some antiquity (figure 12). The main phase of extraction on the site however was from the late 1930s into the 1950s. Various finds made during extraction led eventually to salvage excavations between 1948 and 1951 (Kenyon, 1954).

A small gravel pit at Ashgrove, Marden excavated in the 1950s produced evidence of a possible Early Medieval cemetery site (Hoverd, 1999). Recent scientific dating of bones from the site produced dates of between 340AD and 540AD (Hoverd, pers. comm.).

A more recent find was made at Aymestrey in 1987. Gravel extraction close to the River Lugg revealed a stone lined cist containing the crouched inhumation burial of a seven to eight year old child accompanied by a beaker and a flint knife. Recovery of the burial was carried out archaeologically (Woodiwiss, 1989).

Few of the 2000 plus hard rock extraction sites (figures 9 and 11) have been examined on the ground and it is only through surveys and assessments for other purposes that their impact on other archaeology may be evaluated. Site visits for the recent Hillfort Assessment Study recorded historic land use including quarrying (Dorling and Wigley, 2012). It is known therefore that historic quarrying has impacted a number of hillforts. Hilltops with little overburden and often with rock outcrops are an obvious place to quarry stone.

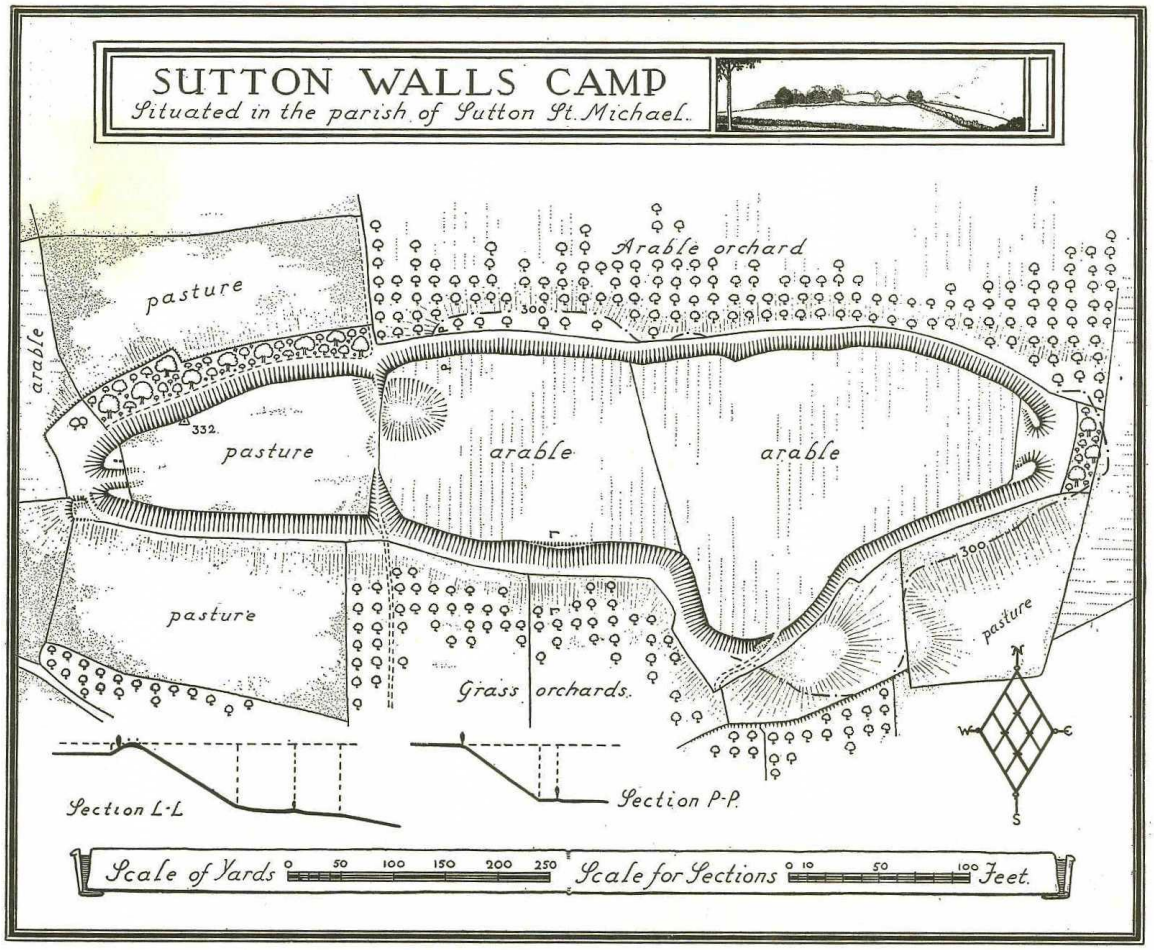


Figure 12: The 1934 Royal Commission survey plan of Sutton Walls hillfort. The small depression left of centre is called Kings' Cellar on the 1886 1st Ed OS map. All archaeology within ramparts in the two western fields has been removed by gravel extraction.

The worst affected site is that of Backbury hillfort at Dormington. Here a large portion of the southern part of the site has been quarried away in the past. Similarly extensive quarrying has removed the ramparts at the south-eastern corner of Credenhill Hillfort and affected areas of the interior. However the percentage of the site affected is relatively small. At Ivington Hillfort near Leominster limestone quarrying within the interior prior to 1882 revealed 20 graves some with crumbling bones (Anon, 1882 and 1900). It is not clear if these are associated directly with the hillfort or are of a later date.

A limekiln is recorded set into the inner rampart at Walterstone Camp (Dorling and Wigley 2012). It may be that the rampart material itself was being quarried for lime burning. The same may be the case at Cherry Hill Camp where possible vitrification of the rampart has been recorded. A series of clamp kilns might leave similar evidence.

Small scale quarrying has affected the interiors of a number of other hillforts including Capler Camp, Coxhall Knoll, Bach Camp, Eaton Camp, Wapley and Little Doward. At the latter there are also iron stone shafts within the interior of the fort.

2.5 Recent archaeological work at extraction sites

Apart from the three sites detailed below little work has been carried out at recent or current extraction sites. Many would have been in operation prior to PPG16. Only four sites have events recorded on the County HER. These are Leinthall Earls where an evaluation was carried out in the area of a proposed extension, a possible crop mark feature was found to be due to geology; at Shobdon where field walking of part of the extraction area recorded a flint scatter; at St Donat's and at Wellington.

St Donats' Quarry

At St Donat's in 1998/99 an evaluation was carried out consisting of documentary research, geophysical survey, field walking and trial trenching. The latter identified significant deposits of Roman date from the 1st to 4th century AD. They included ditches and gullies, metalled surfaces and trackways, postholes and buried soils. These are thought to relate to a D shaped cropmark enclosure lying just beyond the eastern end of the quarry. Finds within the quarry concession are interpreted as midden material spread on the surrounding fields during manuring. A thin scatter of worked flint was also recorded and two possible sherds of Neolithic pottery came from a Roman ditch raising the possibility of prehistoric activity in the vicinity. The site is located on the Lugg 2nd terrace and therefore does not have a deep accumulation of alluvia. The features were recorded immediately below the modern ploughsoil and subsoil.

Permission was granted for quarrying sand and gravel on the condition that a programme of archaeological work is carried out prior to and alongside the mineral extraction. Work has yet to start.

Lugg Bridge Quarry

At Lugg Bridge Quarry an evaluation by auger survey was carried out prior to sand and gravel extraction in 1996. Unsurprisingly given the evaluation technique no archaeology was recorded but palaeo-channels and potential interfluves were identified and the potential for archaeological deposits was recognised by comparison with deposits at Wellington. Despite the archaeological potential of the site consent for extraction was granted with only the provision for salvage recording. This was limited in scope and focused on the palaeo-environmental deposits.

Wellington/Moreton-on-Lugg Quarry

The majority of work carried out in association with extraction has been at Wellington/Moreton-on-Lugg. Archaeological work has been carried out since 1986 within an area of extraction covering some 95 hectares. The results of all the work carried out there over the years have been set out in detail in the Lower Lugg report (Bapty, 2007).

Archaeological evidence from the site is plentiful. Evidence of periodic perhaps short term occupation in the Mesolithic period is provided by flint bladelets and microliths. Early, Middle and Late Neolithic settlement is shown by ceramics and flint and stone tools, with faunal and plant remains reflecting agricultural activity. Prehistoric funerary monuments have also been recorded including a wealthy beaker burial and three ring-ditches. A possible ceremonial site has been dated to the Middle Bronze Age. Interestingly evidence for Iron Age settlement is sparse although burial and possible ritual activity is represented by two Middle to Late Iron Age burials, and the apparent deposition of two isolated skulls. Romano-British settlement evidence, possibly for a Villa, included two corn-drying kilns. Two Saxon watermills one with a preserved timber framed base were identified on palaeo-channels. These have been dated by dendrochronology to the late 7th or early 8th century. By the medieval period (13th/14th century) it is suggested that most of the area is turned over to arable agriculture, relict ridge and furrow survives buried within the alluvium. This agricultural land use though with a shift to pasture and water meadows continued into the modern period. Very recent land use is reflected by the siting of Moreton-on-Lugg Army Camp in 1942. This was recently removed for the expansion of the quarry (figure 13).

Many of the earlier periods of use have been set in their environmental and landscape context by extensive palaeo-environmental analysis carried out on peat and other organic deposits occurring in palaeo-channels and within the alluvial material.

Figure 13: An oblique view of the Moreton-on-Lugg army camp taken in April 2006. Most of the huts have been removed and part of the site stripped in advance of gravel extraction. ©HAAS 06-CN-0819

2.6 An analysis of current extraction activity (figure 14 and table 2)

Aggregate (sand, gravel and crushed rock)

Aggregate is inert minerals that have been broken into small pieces, either by nature or by people. Sand and gravel occur in the river valleys and in glacial deposits over the north and west of Herefordshire.

In Herefordshire recently extraction quantities have significantly reduced for a variety of reasons including diminishing resources, but the county contributes about 5% of the aggregate used in the West Midlands region for buildings, homes and roads.

Aggregate is expensive to transport; the price of a lorry load of crushed rock will double after a 50 kilometre journey, hence the need to find local sources for development. Local mineral products are used for producing ready-mixed concrete, pre-cast blocks, cement, and tarmac-coated or uncoated road-stone chippings. Crushed rock is also transported from quarries just in Powys near Kington, for onward transmission to London and Birmingham via the railhead at Moreton-on-Lugg.

There is currently only one active site for sand and gravel extraction in the county at Wellington/Moreton-on-Lugg, but there are other small sites with continuing permissions at Shobdon and Upper Lyde and one site undergoing restoration at Lugg Bridge. There is also a lapsed permission at St Donats/Portway and various other historic sites around the county.

Hard rock is also crushed for aggregate use. Two quarries are currently worked for crushed rock at Leinthall Earls and Perton. A large permission at Nash is currently mothballed.

In the future, further survey work may identify workable deposits for aggregate, but at present supplies are in decline. The county's quarries contribute to its economic viability in terms of employment and output of construction materials.

Building stone

Herefordshire has a strong tradition of stone-built construction, for homes, castles, barns, churches, roads, bridges and hundreds of miles of stone walls. Stone roof tiles were historically a characteristic feature of many local buildings but the majority of these have been lost. For the maintenance and repair of surviving historic buildings and their roofs there is considerable demand for local building stone, for which suitable supplies are vital if Herefordshire's character is to be maintained. Likewise, incorporating local stone into new buildings can ensure high quality design to enable integration with existing buildings. Imported stone, even from other parts of the UK, has different qualities in terms of

composition, durability, colour, texture and weathering capacity. Stone from hotter drier areas will not long withstand this county's climate.

Local quarries were mostly very small, and used by farmers either to construct their own buildings and roads or to supplement their agricultural income. In limestone areas lime burning was common, for the production of fertiliser, whitewash and lime putty cement. The county is peppered with the remains of both quarries and limekilns. Dimension stone, i.e. cut and shaped stone (or ashlar) for high quality facings to buildings such as churches and castles, has always been locally scarce; the majority of traditional quarrying has been for rubble walling and rough stone plus roof tiles. However, the working of even this stone is a fast-disappearing traditional craft now confined to a handful of quarrymen working mostly in the remote Olchon Valley in the far south-west of the county. Finding supplies of suitable stones is vital if Herefordshire's 'sense of place' is to be maintained.

Small stone quarries with planning permission are rare in England, but about 12 of these are in Herefordshire. Although policies are confined to political boundaries, geology is of course more widely distributed. Herefordshire stone is therefore important for buildings in other counties, for example the high quality deep red sandstone characteristic of the south of the county has been used for restoration at the parish church in Monmouth, sourced from Callow Quarry just within our area.

Because of their specialised nature and small-scale intermittent production, future sites for building stone quarries are not identified in the Unitary Development Plan, but policies encouraging their development, where environmentally suitable, are included. This support will be carried forward into the Local Development Framework.

Brick clay

Clay pits and brick kilns were common all over Victorian Herefordshire and many surviving buildings contain local bricks. This industry entirely died out with the closure of the last works at Linton near Bromyard. Its demise was partly due to higher specifications required by mechanised brick production in the West Midlands and the increasingly poor quality of available clay and firing shale. However, reserves may still exist which new technology could utilise, as mineral resources become scarce and, as noted above, not all of the county has undergone a geological survey. Whilst there are no plans or policies specifically to promote this possibility, the policies to encourage small-scale building stone extraction equally apply to prospective winning and working of brick clay, should a viable supply be identified. Clay is locally abundant and can also be used for flood defences, lining pools and reservoirs, and other waterproof bunding or containment.

Coal

A small area of the coalfields associated with the Forest of Dean protrudes into the south of the county at Howle Hill but mining has long ceased and the resource is understood to be substantially worked out.

Energy minerals

There is minimal potential for the extraction of shale gas in the county. Although the extraction process is unlikely to have a major impact on historic features or landscapes the ancillary/associated activities/works might be more extensive.

Figure 14: Recent Quarrying in Herefordshire (see Table 2 below for status)

*Table 2: Recent Quarrying in Herefordshire (An * indicates sites included in the BGS Directory of Mines and Quarries 2010)*

Quarry name	Type	Operator	Status	Archaeological response	Permissions
Brakes Farm *	Sandstone – decorative	Downton Castle Stone	closed		
Callow Hill *	Sandstone – building and road stone	Black Mountain Quarries	Active		
Caradoc	Sandstone – building stone		Inactive		
Coed Major * (Black Hill)	Sandstone – building stone, roof tiles and flags	Coed Major Ltd	Active		
Harewood End	Sandstone – building stone	Duchy Of Cornwall	Moth balled		
High House Quarry *	Sandstone – building stone, roof tiles	A Muhl	Closed		
Hunters Post * Quarry	Sandstone – building stone	Radbourne's	Closed		
Leinthall Earls * Quarry	Limestone – roadstone, rock and concrete aggregate	Breedon Aggregates England Ltd	Active	Evaluation of quarry extension 2002. Negative	
Llandraw Farm * Quarry	Sandstone – Flags	Black Mountain Quarries	Active		

Quarry name	Type	Operator	Status	Archaeological response	Permissions
Lugg Bridge	Aggregate – sand and gravel	N/A	Closed Restored	Evaluation by auger transects. Salvage recording	
Moreton-on-Lugg * Quarry. (Wellington)	Aggregate – sand and gravel	Tarmac Quarry Materials – West	Active	Evaluation / salvage recording / excavation	
Nash Scar	Limestone	Tarmac, Lafarge	Moth balled		
? New House Farm, Yarlton	Limestone		? Active		
Pennsylvani (and Grigland) *	Sandstone – building stone	Pennsylvani and Grigland Quarries	Active		
Perton Quarry *	Limestone – roadstone and rock aggregate	Elliot and Sons Ltd	Active		
Shobdon	Aggregate – sand abnd gravel	Tarmac, Lafarge	Moth balled	Field walking survey / evaluation. Flint scatter.	
St Donat's	Aggregate – sand and gravel	Tarmac, Lafarge	Not started, Permission lapsed	Evaluation, Geophysics and trial trenching 1998. RB and Med remains. 33 trenches in total.	
Sunnybank Delve (Birches Farm) *	Sandstone – building stone, roof tiles and flags	A Muhl	Active		

Quarry name	Type	Operator	Status	Archaeological response	Permissions
Tybubach *	Sandstone – building stone	Black Mountain Quarries	Active		
Upper Lyde	Aggregate – sand and gravel	Wye Valley Group	Not Started		
Westonhill Wood Quarry *	Sandstone – building stone	G Kirk	Active		

Section 3: The Planning Framework and Current Policies

"Mineral resources defined on the map delineate areas within which potentially workable minerals may occur. These areas are not of uniform potential, nor do they take account of planning constraints which may limit their working. The economic potential of specific sites can only be proved by a detailed evaluation programme. Such an investigation is an essential precursor to submitting a planning application for mineral working. The individual merits of the site must then be judged against other land-use planning issues." (op cit, 1999)

3.1 The planning background

It is not proposed to examine in detail the history of the mineral extraction legislative framework. This was done as part of the Lower Lugg Archaeology and Aggregates Resource Assessment carried out in 2006/7 (Bapty, 2007). However it is worth summarising the current planning framework as it stands.

Herefordshire Council is the Waste and Mineral Planning Authority for the county. Government policy requires local authorities to ensure an adequate and regular supply of minerals to meet national estimates of the tonnages needed. In Herefordshire about a quarter of a million tonnes of sand and gravel and half a million tonnes of crushed rock are estimated to be needed each year. The county is also required to maintain a 'land bank' of planning permissions to provide at least seven years supply of sand and gravel and sufficient for a 'longer period' (taken as 10 years) for crushed rock. At the end of 2008 the sand and gravel land bank was at least 18 years and that for crushed rock was at least 37.5 years. *(source - Entec Report, Herefordshire Minerals and Waste Planning Assessment, 2009)*. Future potential mineral extraction areas should also be identified and protected from development that would prevent extraction.

The council's role is to set out criteria by which future extraction proposals will be assessed and monitored to ensure that the needs of local people and business can be met without unacceptable damage to the environment and to enable the beneficial after use of sites.

At present these policies are set out in the Unitary Development Plan (UDP) which was adopted in 2007. In February 2010 those policies were all 'saved' and continue in effect until replaced by the emerging Local Development Framework (LDF), the LDF will plan for the period up to 2031. The saved policies are set out below.

The key elements of a minerals plan should be

- to balance thorough its policies the essential need for minerals against protection of the environment and local amenity

- to make an appropriate provision for the supply of minerals and provide an effective framework within which the minerals industry may make planning applications

- to set policies for the control of mineral working and associated development

- to identify areas of possible future mineral working

- to prevent unnecessary sterilisation of resources by the use of safeguarding policies, including defining mineral consultation areas

3.2 The Local Development Framework

Future replacement policies have been set out at a strategic level in the "Core Strategy" whilst detailed site allocations will be set out in a subsequent "Development Plan Document" (DPD) for Minerals under the title "Natural Resources". It is currently anticipated that the Core Strategy will be published in April 2014, after which the Minerals & Waste DPD work will begin. Until then the saved policies continue to be used.

A Local Development Framework Preferred Options Consultation Document (see Appendix 1) was produced in August 2010 proposed policies covering mineral extraction were set out within this and were subsequently carried forward to the Revised Preferred Options Paper in October 2011, These policies are set out below.

S9 Minerals
The sustainable and efficient use and management of minerals will be promoted by:
1. conserving minerals as far as possible, whilst ensuring an adequate supply to meet identified needs;
2. aiming to maintain the County's share of the regional production of aggregates and a landbank of permitted reserves, subject to environmental considerations;
3. ensuring that the impact of proposals for the winning, working, storage and transportation of minerals are kept to an acceptable minimum and can be mitigated to an acceptable extent;
4. ensuring the sensitive working, reclamation and after care of sites so as to protect or enhance the quality of the environment;
5. protecting areas of landscape or nature conservation value from minerals development, other than in exceptional circumstances;
6. preventing the unnecessary sterilisation of mineral resources; and
7. minimising the production of waste and encouraging the efficient use of minerals by promoting design solutions and construction methods which minimise mineral use, including the appropriate use of high quality materials and recycling of waste materials.

M2 Borrow pits

Proposals for the development of borrow pits will be favourably considered if:
1. granting planning permission would create significant environmental benefits which outweigh any material planning objections;
2. the borrow pit lies on or adjacent to the proposed construction scheme; and
3. the site can be restored to a state capable of beneficial afteruse without the use of imported material, other than that generated on the adjoining construction scheme.

M3 Criteria for new aggregate mineral workings

Planning applications for aggregate extraction will only be granted in exceptional circumstances, notably where the permitted aggregate reserves in the County prove insufficient to meet the County's sub-regional apportionment. In such cases planning permission for extraction will only be granted where the site is not affected by one or more primary constraints or two or more secondary constraints unless the adverse effects on the secondary constraints can be satisfactorily mitigated, or where the specialised nature of the mineral constitutes a material consideration sufficient to override the constraints, or there is no lesser constrained minerals bearing land elsewhere in the County.

Primary Constraints
1. Areas of Outstanding Natural Beauty.
2. Sites and species of international and national importance to nature conservation.
3. Scheduled Ancient Monuments and other sites of national or regional archaeological importance.

Secondary Constraints
1. Sites and species of local importance to nature conservation.
2. Groundwater Source Protection Zone 3 and Zones of Special Interest.
3. Land within or abutting a conservation area.
4. Archaeological sites of lesser regional or local importance.
5. Where the site does not have direct access to an 'A' or 'B' class road.
6. The development would have an adverse visual impact on the landscape character of the area.
7. Best and most versatile agricultural land.
8. Ancient semi-natural woodland.

Where a proposal satisfies the above constraints process, applicants will also be required to submit evidence to demonstrate the extent to which the development impacts on:

- people and local communities
- natural and cultural assets
- the highway network and other public rights of way
- land stability
- public open space

- air, soil and water resources

Unless such impacts can be satisfactorily mitigated, planning permission will be refused.

M4 Non-aggregate building stone and small scale clay production

Proposals for the extraction of non-aggregate building stone or clay will be permitted where:
1.The need for the material for the preservation of local distinctiveness, particularly features of local historic or architectural interest, listed and vernacular buildings or archaeological sites, outweighs any material harm extraction might cause to matters of acknowledged importance.
2. The proposed workings are small scale.
3. The proposal is limited to the production of non-aggregate materials.

M5 Safeguarding mineral reserves

Proposals which could sterilise potential future mineral workings will be resisted in order to safeguard identified mineral resources. Where such development is proposed, the applicant may be required:
1. To undertake a geological assessment of the site. and/or
2. To protect the minerals in question. and/or
3. To extract all or part of the mineral reserves as part of or before the other development is permitted.
In such cases mineral extraction will only be required when the need for the other development significantly outweighs the harm which extraction might cause to other matters of acknowledged importance.

M6 Secondary aggregates and recycling

The use of alternatives to naturally occurring aggregates or other minerals, including demolition and construction wastes, will be encouraged. Proposals for the production, processing, treatment and storage of such alternatives will be permitted as follows:
1. For temporary periods where the development is ancillary to principal activities at a site, including the use of demolition waste arising from the redevelopment of previously developed land and buildings, or longer periods when the development will be limited to the life of a mineral working. or
2. Permanently at a properly designed and permitted waste transfer station.
In all cases proposals must not have an unacceptably adverse effect on the environment or residential amenity.

M7 Reclamation of mineral workings

Mineral extraction proposals will only be permitted where the proposed site can be restored to an agreed and beneficial after use. Permission will only be granted where the proposed reclamation would be:
1. in scale and character with the adjoining landscape and would make a positive contribution to meeting BAP targets;
2. capable of being completed within a reasonable timescale; and
3. sufficiently detailed to achieve the proposed after use and its after care for an appropriate period. Proposals for the long term management of the site may also be necessary.

M8 Malvern Hills

No further planning permissions will be granted for the extraction for aggregate purposes of granite from the Malvern Hills.

M9 Minerals exploration

Mineral exploration which is not permitted by Part 22 of the Town and Country Planning (General Permitted Development) Order 1995 (or any order revoking and re-enacting that Order, with or without modification) will only be permitted where it does not have an unacceptably adverse effect on the environment or local amenities. Where planning permission is granted conditions will be imposed to control the development in the interests of amenity and to ensure the reinstatement of the site to a state capable of beneficial after use, including the removal of all temporary and permanent works associated with the exploration.

M10 Oil and gas exploration and development

Proposals for development associated with oil and gas exploration will only be permitted where:
1. The proposed location is shown to be the most suitable having regard to geological, technical and environmental considerations in accordance with policy M3.
2. There are satisfactory arrangements for the disposal of waste materials and the avoidance of pollution.
3. The proposals are limited to a restricted and specified time period. and
4. There is a satisfactory scheme for landscaping and reclamation. Proposals for the further evaluation and development of oil or gas fields will be expected to conform to all of the above and to demonstrate the development is part of a planned programme for the whole oil or gas field.

3.3 Further planning considerations

The following commentary is taken from the descriptive text of the Unitary Development Plan and sets out some of the other factors and issues taken into consideration when assessing mineral related planning applications

Geological heritage conservation

Although the earth is thousands of millions of years old, opportunities to study its history through rocks, minerals and landforms can be short-lived due to development pressures and changes in land use. The protection of geological features is now a matter of international concern. In 1993 an international task force for Earth Heritage Conservation was established and the concept is now widely accepted and is endorsed in government policy.

In Britain the best, nationally important geological sites are designated SSSI (Site of Special Scientific Interest) by Natural England. Other sites may not be nationally important but are still regionally significant. These are designated RIGS (Regionally Important Geological and Geomorphological Sites). Many of these are old quarries where the geology is exposed. The significant contributions of quarrying to the fossil record and scientific study in the fields of palaeontology and archaeology are universally recognised. Some of the finest fossils and archaeological evidence of early and recent human activities are discovered at quarry sites. Herefordshire is a relatively untapped resource in this regard, although significant discoveries have been made particularly at Wellington gravel quarry. Recognition of this potential is needed if important evidence is not to be lost. At Linton Tileworks, the last local clay pit noted above, Beaconites burrows were discovered - evidence of the very earliest life forms to have left the oceans; however the site has been lost and built over.

There is also potential for small local projects to promote geological importance and improve knowledge through education at suitable former quarry sites. Whitman's Hill Quarry near Cradley is a good example. The Earth Heritage Trust has facilitated a 'Champions' project whereby local landowners with important geology on their property are supported as custodians in maintaining sites, sharing information, and allowing interested professionals and groups access to nominated sites for study. Information, walking leaflets, study days, conservation surveys and other works form part of this initiative.

Landscape factors

In addition to its contribution to geological study, cultural heritage and knowledge, quarrying has shaped our predominantly man-made landscapes for thousands of years, even in the most apparently wild places. Some of our most attractive and spectacular scenery has [been shaped by] quarrying origins: in Herefordshire the Wye Valley, Symonds Yat, the Doward, Malvern Hills, Aymestrey area, and the Golden and Olchon valleys are key examples. Further afield the lower Wye, Forest

of Dean, Clifton gorge at Bristol, Dartmoor, Exmoor and the Plym and Tamar Valleys in Devon are major attractions dominated by former mineral extraction. There is a rich cultural heritage in the quarries and mines themselves, methods of stone-working and in buildings made from the extracted stone. Quarrying also creates unique wildlife habitats supporting rare and threatened species of many types. Although quarrying can be perceived negatively in its active phase, the long-term potential for landscapes and habitats should be borne in mind. Policies need to take account of this longer wider view in order to safeguard future environments.

Restoration and after-use of sites

The council must ensure that mineral working sites are restored to a 'beneficial' after-use on completion the scale of which mean that the landscape can sometimes be significantly and permanently modified. However, perceptions of what is beneficial (and for whom) may vary. The potential for quarry sites to support biodiversity where other havens for wildlife are scarce should not be overlooked. There is pressure for minerals areas to be released for human recreation and other development, but a balance needs to be struck to ensure that biodiversity can be supported and contribute to Herefordshire's ecology in the interests of our own survival. Current policies prioritise nature conservation, followed by agriculture (food production), then recreation. Other development and/or total infilling fall way behind and should be a last resort.

At present for example:

The Gravel Pit at Stretton Sugwas has been restored to a mixture of farmland, parkland with trees and a large lake. The site already hosts such a wide variety of birds, plants and insect life, including nationally rare species, that it may be of SSSI standard. The potential for some kind of future recreation or nature conservation use, as yet unspecified is therefore considerable.

Bodenham Lakes are the product of previous gravel extraction and have been restored to recreational (boating) use and nature conservation. Wellington Quarry is being progressively restored to a combination of arable farmland, a potential sailing lake of about 13 hectares (ha), a nature conservation lake approx. 4 ha in extent, and two fishing lakes approx. 2.5 and 3.5 ha in extent. Areas of naturally re-generated wet woodland will also be created and provision of a bird reserve and areas for archaeological protection have also been proposed.

The Gravel Pit at Shobdon will eventually create a large lake for possible recreation and a small lake for nature conservation.

Hard rock quarries are more difficult to reclaim but Perton is to be restored principally as a geological SSSI, with appropriate landscaping. Adjoining old quarries at Dormington, currently used for infilling with waste stone and overburden from Perton, will also be restored to forestry as part of the development.

Experimental planting is currently being undertaken along the limestone faces at Leinthall Earls quarry to decide how it can best be restored, but geological exposure will feature in the final scheme as the area is rich in fossils and supports a strong biodiversity in terms of lime-loving plants, veteran trees, many species of bat and other rare species such as Peregrine falcon and Silver-washed fritillary butterflies.

For small-scale building stone quarries, restoration should entail at least some preservation of exposed rock faces. Ideally they should be simply made safe and any excavated material remaining on site being used sympathetically to leave as natural-looking a landform as possible. Sites should then be left to natural regeneration. Small quarries should not be completely backfilled unless there is a justifiable need, for example as important to agriculture.

Future extraction

The downturn in development during the continuing financial crisis and a consequent decline in the use of aggregates has meant slower than normal use of existing extraction permissions and therefore little or no need for new applications. It has also preserved the existing substantial land bank of aggregate and hard rock resources.

However a number of new development schemes in and around Hereford including the new retail quarter development and an anticipated application for 1000 new houses will lead to some increase in demand and production of local aggregates. There is also a possibility that regional demand and a political desire of other West Midlands counties to provide less of the regional allocation may put more pressure on Herefordshire's resources.

The long awaited Hereford bypass if it ever comes about will see an increased demand for road-stone and an increase in hard rock quarry activity.

Section 4: The Archaeology and Palaeo-Environmental Resource in potential mineral extraction areas

There are a Number of things to note when considering the results of site analysis in the study areas.

It can be seen from the review of sites below that there is a strong bias towards certain types and periods of sites. Site numbers increase dramatically into the Post-Medieval period. This is due to a number of different factors. Visibility of sites is obviously an important factor in known site distribution. More recent sites are often close to the surface and may survive as topographical features. There is a relative paucity of early sites on the alluvia in the Lugg and Wye Valleys, these may be more ephemeral; have had more time to decay and are often buried in alluvium.

In the valley bottoms the early sites are more likely to be masked by these accumulations of alluvial material but there will always have been more features created in later periods. There have also been a number of projects carried out in the area that would enhance the later periods of the record. In 2006 the Lugg Valley Archaeology, Landscape Change and Conservation Project carried out a number of whole farm surveys, two of these lie within the areas considered above. There has also recently been a Herefordshire-wide Historic Farmsteads Characterisation Project – nearly all the farms in the county are now included on the record.

We do know from the work at Wellington Quarry that there is huge potential for sub-alluvial survival of abundant remains especially from the prehistoric periods up into the early Post-Roman era. Medieval and later agricultural use upstream within the catchment area has resulted in deep deposits of alluvium (up to 3m in places) and the visibility of these sites is compromised.

The results of the site analyses should anyway be treated with a degree of caution. The deficiencies inherent in the record make such studies risky if not completely erroneous. This problem is due in the main to the ad hoc accumulation of records with very little quality control in the early years. Records are often inaccurate, incomplete or confusing and very little validation has been carried out. Many other records have been established from map evidence such as the Tithe Apportionment (placenames) and the 1st and later editions of the Ordnance Survey maps. It is unclear if these features actually survive as physical entities. Unfortunately “Form” (ie Documentary, Structure or Earthwork) is not a recorded field in the record so searching or sorting on this aspect is not possible. Assessing the records one by one is outside the scope of this study and so only general conclusions can be drawn.

Some listed buildings are represented within the HER but not all. For instance in the Lugg Valley potential extraction area only 22 of the 49 listed buildings are on the HER, this is purely that the 22 have been included ad-hoc as they came to notice the remainder await resources.

The significance statements for undesignated monuments set out for the three study areas below has been guided by the criteria set out by the secretary of state for Culture Media and Sport for the selection of monuments for scheduling. This has been adapted to regional circumstances for monuments assessed to be regionally important rather than nationally important. All other sites are considered to be of local importance.

Changing circumstances, research or new information may add sites to the list or (though perhaps less likely) remove sites from the list.

The criteria are –

- Period
- Rarity
- Documentation supporting the monument's significance
- Group value with other heritage assets
- Survival / condition
- Fragility / vulnerability suggesting a need for protection
- Diversity of the attributes the monument holds
- Potential of the monument to tell us more about our past through archaeological investigation

4.1 The Lugg Valley study area

The Lugg Valley study area extends from Leominster in the north to Bodenham in the south (figure 2) it includes the settlement of Stoke Prior and parts of Bowley and Risbury. The overall size of the study area is 31.49 square kilometres of which the potential extraction area is 14.38 square kilometres or 45.7%.

The solid and drift geology of the middle Lugg to the north and east of Bodenham, comprises Devonian mudstones, sandstones and calcretes belonging to the St. Maughans Formation. To the west of Leominster, however, the Raglan Mudstones continue northwards covered in the lower-lying areas by Devensian tills and moraines. To the west of the Lugg, in an approximate line running from Leominster to Hereford, the lower lying areas of mudstone are overlain by Devensian glacial boulder clay (till) deposits. The till deposits are derived from areas to the north and west of the catchment as well as from the western portion of the catchment itself and include harder rocks which have come from further afield, through previous cycles of erosion, displacement and deposition. The valley floors are covered by Holocene alluvium, to a maximum depth of greater than 3 metres, which overlies the Devensian gravels that have been and are the target of quarrying at Wellington and Lugg Bridge. On the valley sides there are remnants surviving of Devensian and pre-Devensian fluvioglacial river terraces (Terra Nova, 2002).

Within the Lugg Valley study area a total of 370 sites are currently recorded in the Herefordshire HER (list report in appendix 2). Two of these are scheduled ancient monuments, Risbury Camp Iron Age hillfort and Blackwardine Roman settlement. The designated garden at Hampton Court also falls within the area.

Of the 370 recorded sites 150 of these are buildings such as Houses (56), Farms or farm buildings (42) Churches (9) or other structures such as Bridges (19).

Of these 370 sites 237 fall within potential extraction areas (figure 15), these are described and illustrated on the maps below. In some cases a site will appear on more than one map. This occurs where a site may be allocated say both an Iron Age and Roman date in the case of an enclosure site or perhaps a Medieval and a post Medieval date.

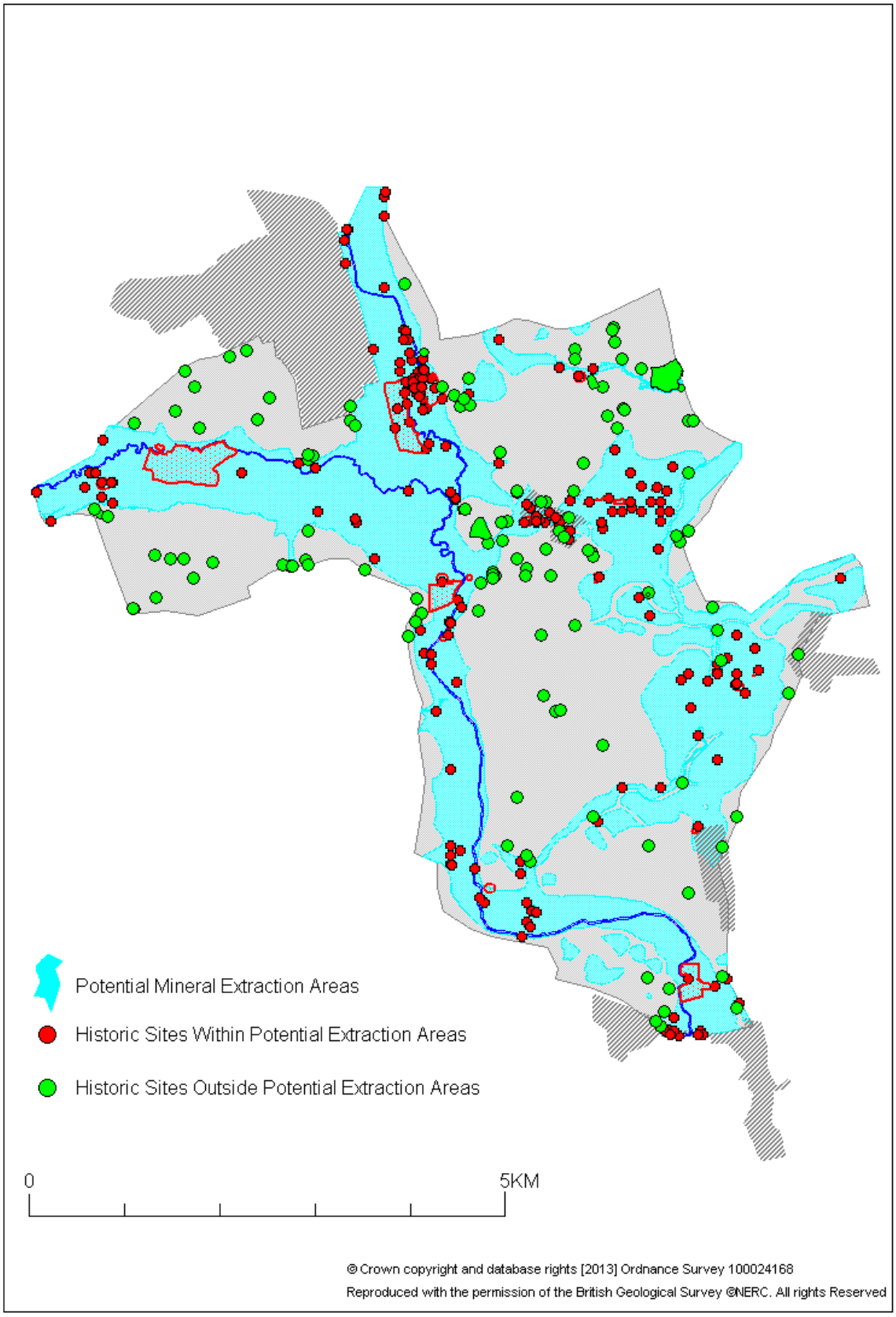


Figure 15: All recorded historic features within the Lugg Valley study area

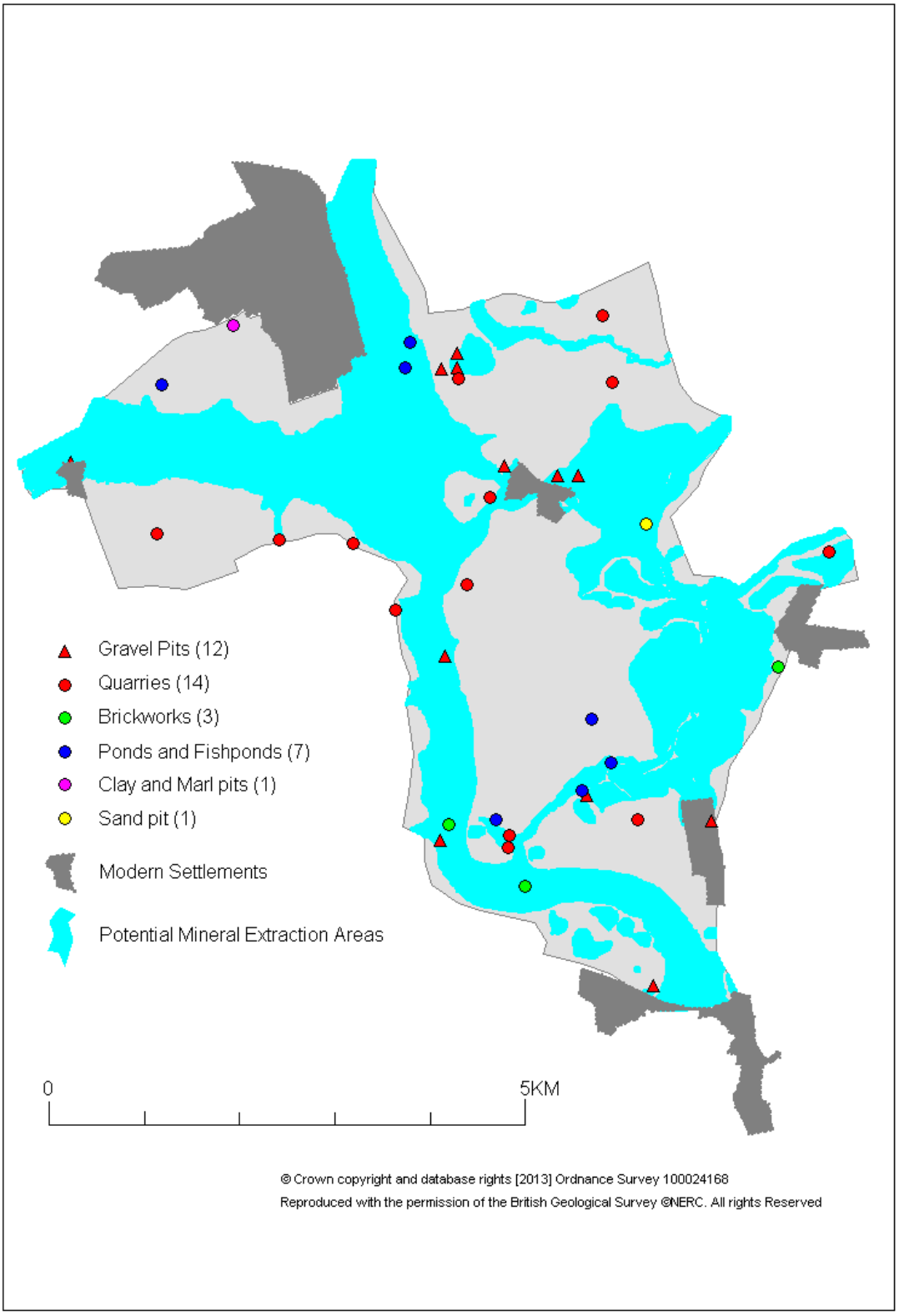


Figure 16: Historic extraction sites in the Lugg Valley study area

An overview of the sites within potential extraction areas

Prehistoric (figure 17)

Eight Prehistoric sites are recorded although the only earthwork monument recorded is the large and impressive multivallate Iron Age hillfort of Risbury, a scheduled ancient monument. The others consist of three cropmark enclosure and ring ditch complexes, three flint finds or scatter sites and the find spot of a bronze spear although the latter is thought to be a mis-location of a hoard actually found in Shropshire.

At first sight it would appear that there is very little of interest in the way of prehistoric archaeology within the potential extraction areas. However the high potential for buried prehistoric archaeology below valley bottom alluvial deposits in the Lugg Valley has been amply illustrated by the work carried out on the Wellington Quarry site. This evidence was set out in detail in the Lower Lugg Archaeology and Aggregates Resource Assessment (Bapty 2007). It is clear that important prehistoric deposits, features and riparian landscapes have the potential to survive in the very areas that may be of most potential for aggregate extraction.

Roman and Early Medieval (figure 18)

Although 20 sites are recorded 16 of these relate to various elements of the Blackwardine Roman settlement (town) site. Three others are find spots of Roman pottery. The last is a length of Roman road part of which survives as an earthwork with a visible agger. More of the original route can be surmised by modern lanes and field boundaries.

The site at Blackwardine was first recorded in 1808, further material was discovered during the excavation of a railway cutting for the Leominster to Bromyard Railway in 1881 (Davies Burlton, 1885). The extent of the site and the nature of the finds, including burials and a pottery kiln with over thirty ovens, has been suggested to indicate the presence of a fortified town of some size (Brown, 1988). However little modern excavation of the site has taken place and its exact nature and extent are still largely unknown. Part of the site is a scheduled ancient monument.

The one Early Medieval record is a reference in Domesday to a settlement at Bowley, Bodenham. There are no known physical remains.

Medieval (figure 19)

Although 39 sites have been allocated a possible Medieval date few can be reliably dated. Those that can be ascribed a Medieval foundation date are early buildings such as churches and manor houses. There are also a number of relict agricultural

features such as ridge and furrow, lynchets and water meadows that are recorded as possibly Medieval.

Nine sites are recorded as deserted or shrunken medieval villages. Although earthworks have been noted at two of the sites (Hope-under-Dinmore, HER 6563 and at Wharton HER 5163), the majority are bibliographic references to medieval manors or hamlets the exact locations of which are unknown. One at Ferney Close, Stretford (HER 30707) may have associated earthworks visible on aerial photographs.

Post-Medieval and Modern (figure 20)

This accounts for the highest proportion of sites with 162 records. Over 50% of these, some 87 are buildings or other extant structures such as bridges, houses, farms and farm buildings. Some of these have had an historic use such as toll houses, former mills or railway station. A further 24 can be described as agricultural features such as ridge and furrow, pounds, linear earthworks and banks, ponds and field boundaries. The remainder for the most part reflect previous industry and transport, brickworks, gravel pits, toll roads, milestones and a wharf.

The modern sites are a factory, a farm, a fishery, gravel pit and rifle butts.

Undated (figure 21)

Although 15 sites are designated as undated seven are crop marks sites that could in fact be prehistoric in date. Three are ring ditches and the other four enclosures or linear cropmarks. The remainder are earthworks, a ford and boundary stones.

Significance statements for undesignated assets

The caveat given at the start of this section regarding the limitations of the data held in the County record HER (formerly the SMR) is particularly pertinent when trying to determine the significance of any of the monuments recorded. There is almost no evidence on the record of the condition of the feature it is particularly difficult to assess the status of cropmark sites without knowing what the state of preservation is. The sites have been assessed assuming good levels of deposit and feature preservation.

The following are the already designated nationally important sites.

2 Scheduled Ancient Monuments – Risbury Hillfort (DHE 6014) and Blackwardine Roman settlement (DHE 5951)
1 Registered Park and Garden – Hampton Court, Grade ll
49 Listed Buildings – 1 Grade 1 (Hampton Court), 2 Grade ll* and 46 Grade ll.

Of potential national and regional importance are the following sites

National

The first three lie within the scheduled area of Blackwardine Roman settlement and the majority of the remainder are linked with the same site. As an extensive Roman settlement all features associated with Blackwardine Roman settlement are deemed to be of national importance.

Roman pottery kiln, Blackwardine, HER No. 33843
Roman occupation, Blackwardine, HER No. 737
Roman occupation, Blackwardine HER No. 53117

Roman street system, Blackwardine, HER No. 21039
Roman occupation site, Blackwardine, HER No. 21034
Roman occupation site, Blackwardine, HER No. 21035
Roman artefact scatters, Blackwardine, HER No. 21036
Roman occupation, Blackwardine, HER No. 21037
Roman occupation east of the Roman road, Blackwardine, HER No. 21041
Roman occupation west of Roman road, Blackwardine, HER No. 3898
Roman defensive ditch, Blackwardine, HER No. 3982
Roman occupation north of scheduled area, Blackwardine, HER No. 3706
Roman defensive earthworks Great House Farm, Blackwardine, HER No. 3981
Roman occupation, Blackwardine, HER No. 3854
Roman occupation, Blackwardine, HER No. 3201
Cropmark square enclosure, Stoke Prior, HER No. 30120

Regional

Some of the sites below for instance the ring-ditch cropmarks may be of national importance. However given that their condition or state of preservation is unknown it is difficult to ascribe that level of importance or significance to them at present. They are included on the regionally important list as they are worthy of further consideration in the event of threat.The other sites on the list are regionally scarce and therefore of enhanced importance.

Eaton Hall Landscape Park, HER No. 31666
DMV South of Wharton Court, HER No. 5163
Worcester, Bromyard and Leominster Railway, HER No. 19551
Ford Bridge Station, HER No. 19548
Early Mill Eaton Hall, HER No. 30759
Eaton Medieval Manor occupation site, HER No. 25292
Ring Ditch cropmark South of stoke prior, HER No. 34728
Possible ring ditch cropmark, HER No. 8524
Ring ditch Cropmark, HER No. 24129

Double ring ditch cropmark, HER No. 24130
Double ditched circular enclosure cropmark, HER No. 31637
Hampton Park Deer Park, HER No. 6560

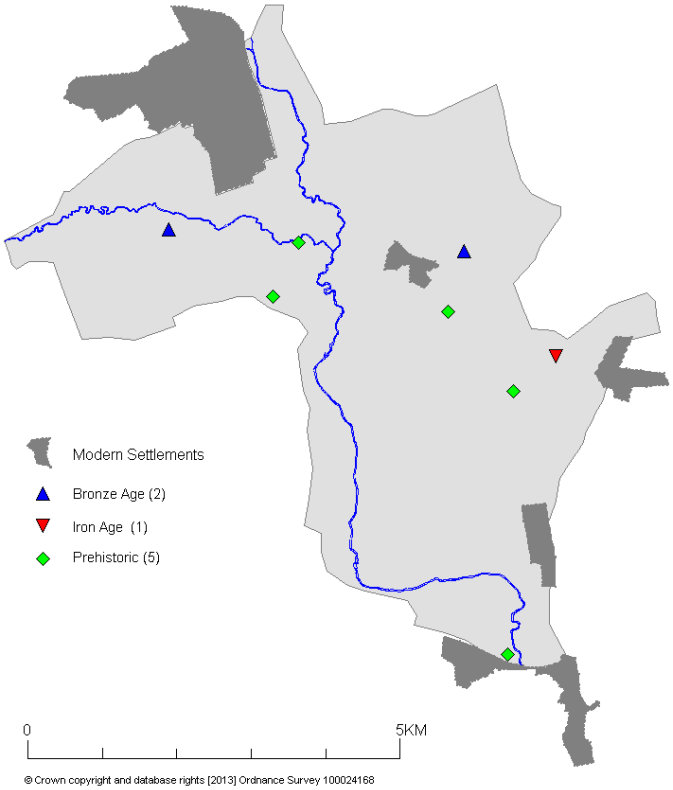


Figure 17: Prehistoric sites in the Lugg Valley study area

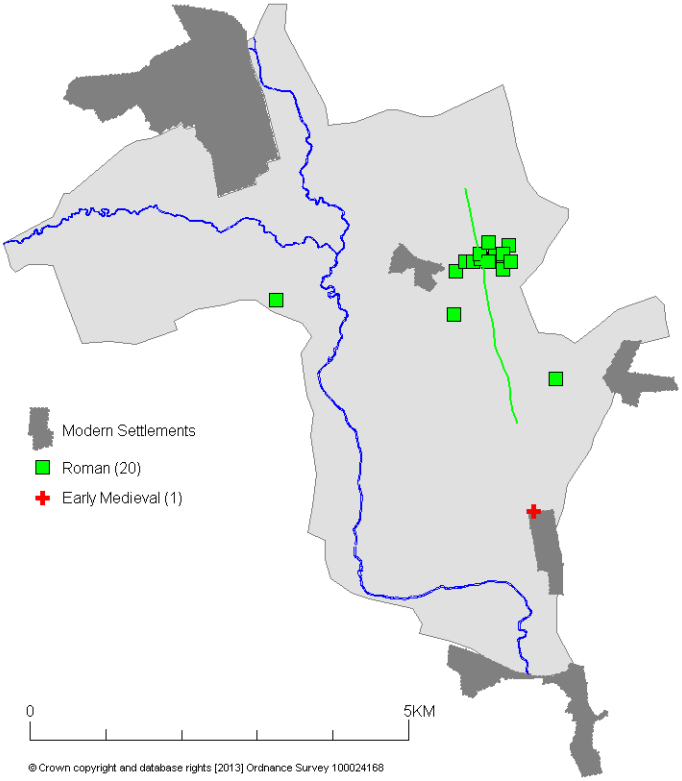


Figure 18: Roman and Early Medieval sites in the Lugg Valley study area

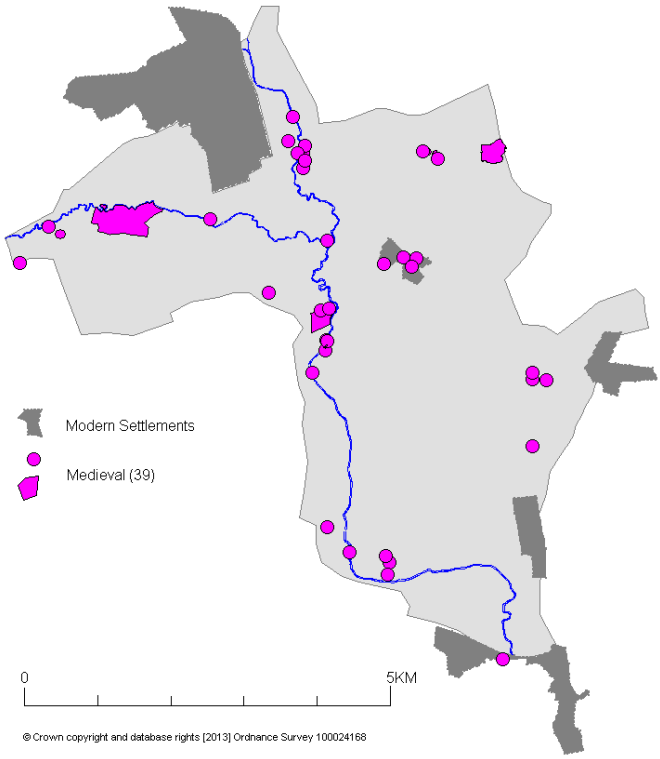


Figure 19: Medieval sites in the Lugg Valley study area

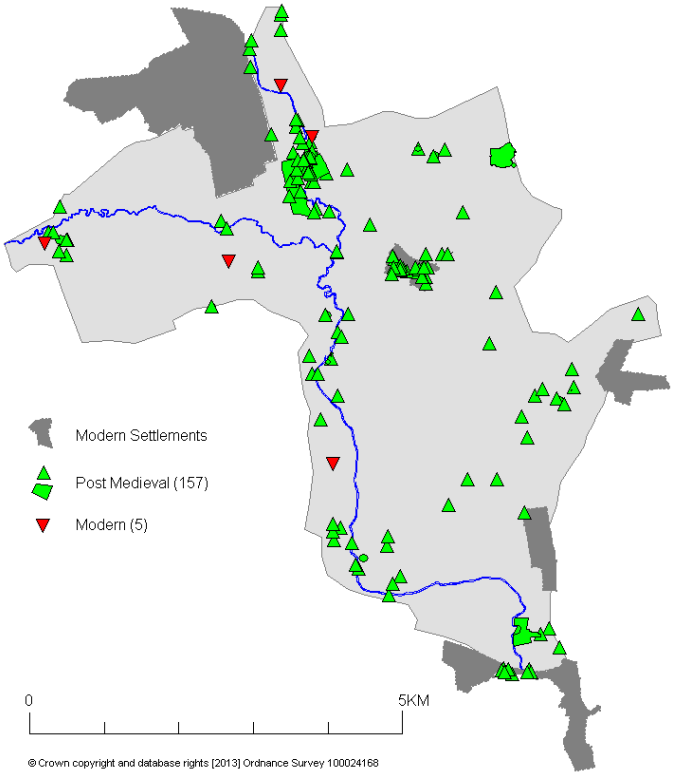


Figure 20: Post-Medieval and Modern sites in the Lugg Valley study area

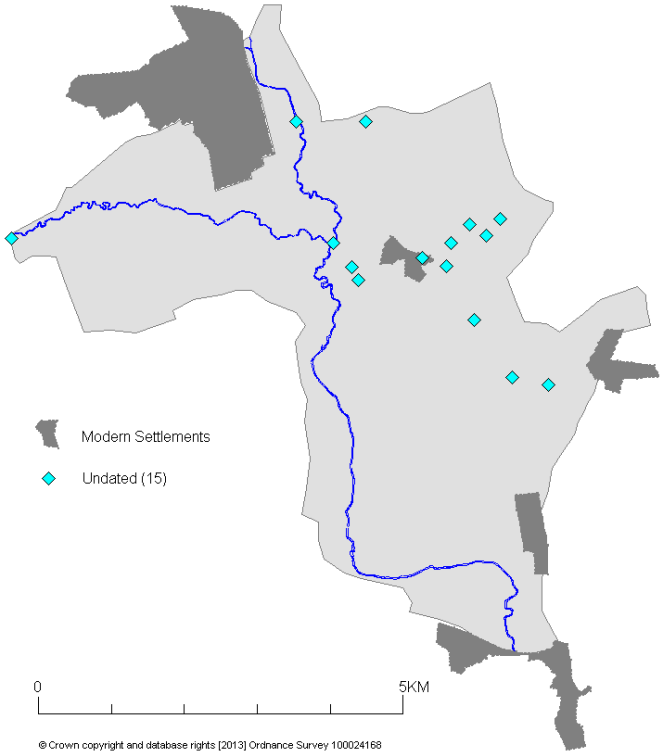


Figure 21: Undated sites in the Lugg Valley study area

4.2 The Wye Valley study area

The Wye Valley study area extends from Stretton Sugwas just west of Hereford City to just east of Eardisley. It contains a number of settlements including Staunton-on-Wye, Winforton and Willersley and parts of Madley. The large low lying area of the floodplain known as Letton Lake lies at the western end of the area. The overall size of the study area is 86.66 square kilometres of which the potential extraction areas are 33.54 square kilometres or 38.7% of the study area.

Geologically and geo-morphologically it is similar to the Lugg area containing river terrace, glacial and fluvioglacial deposits some of which contain large gravel resources. In fact the British Geological Survey report on mineral resources in Herefordshire and Worcestershire claimed that this area contained one of the largest potential sources of sand and gravel in the entire area (Bloodworth, 1999). Moraine deposits are particularly evident along the southern edge of the study area and give rise to a distinctive undulating hummocky landscape with wet hollows often containing peat deposits (see especially figure 37). The valley floor has extensive alluvial deposits overlying Devensian river gravels.

A total of 651 sites are recorded in the Herefordshire HER within the Wye valley study area (list report in appendix 2). Nine of these are scheduled ancient monuments and 2 are registered parks and gardens. The scheduled sites include Magna Roman Town, the New Weir Roman Site, three sections of Offa's dyke, Bredwardine Castle and three moated sites.

252 of these sites fall within potential aggregate extraction areas (figure 22), these are described and illustrated on the maps below. Only two of the scheduled sites fall within potential extraction areas, these are the moated site at Old Court, Bredwardine and a very small part of Offa's Dyke south of Big Oaks.

In some cases a site will appear on more than one map. This occurs where a site may be allocated say both an Iron Age and Roman date in the case of an enclosure site or perhaps a Medieval and a post-Medieval date.

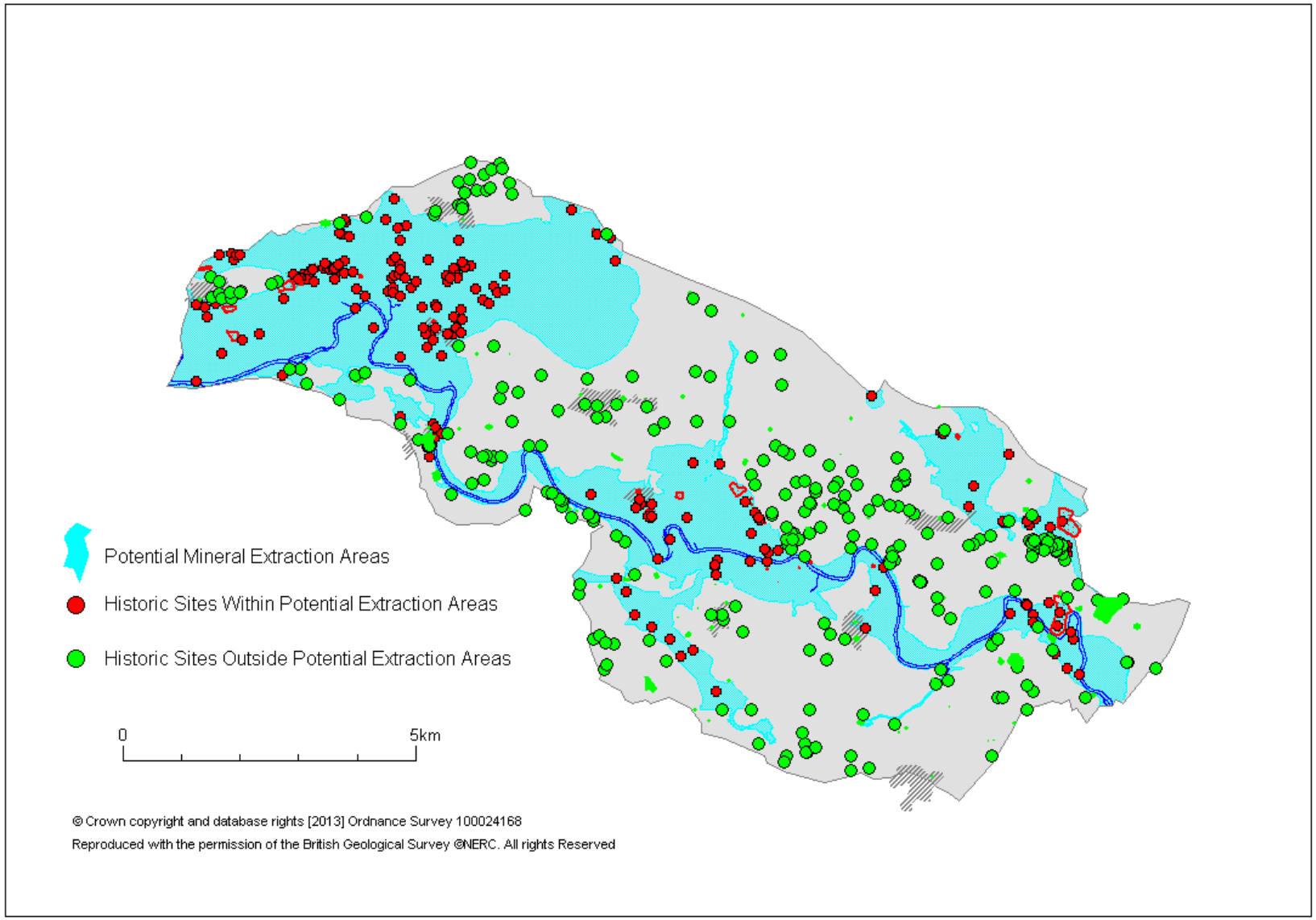


Figure 22: All recorded historic features within the Wye Valley study area

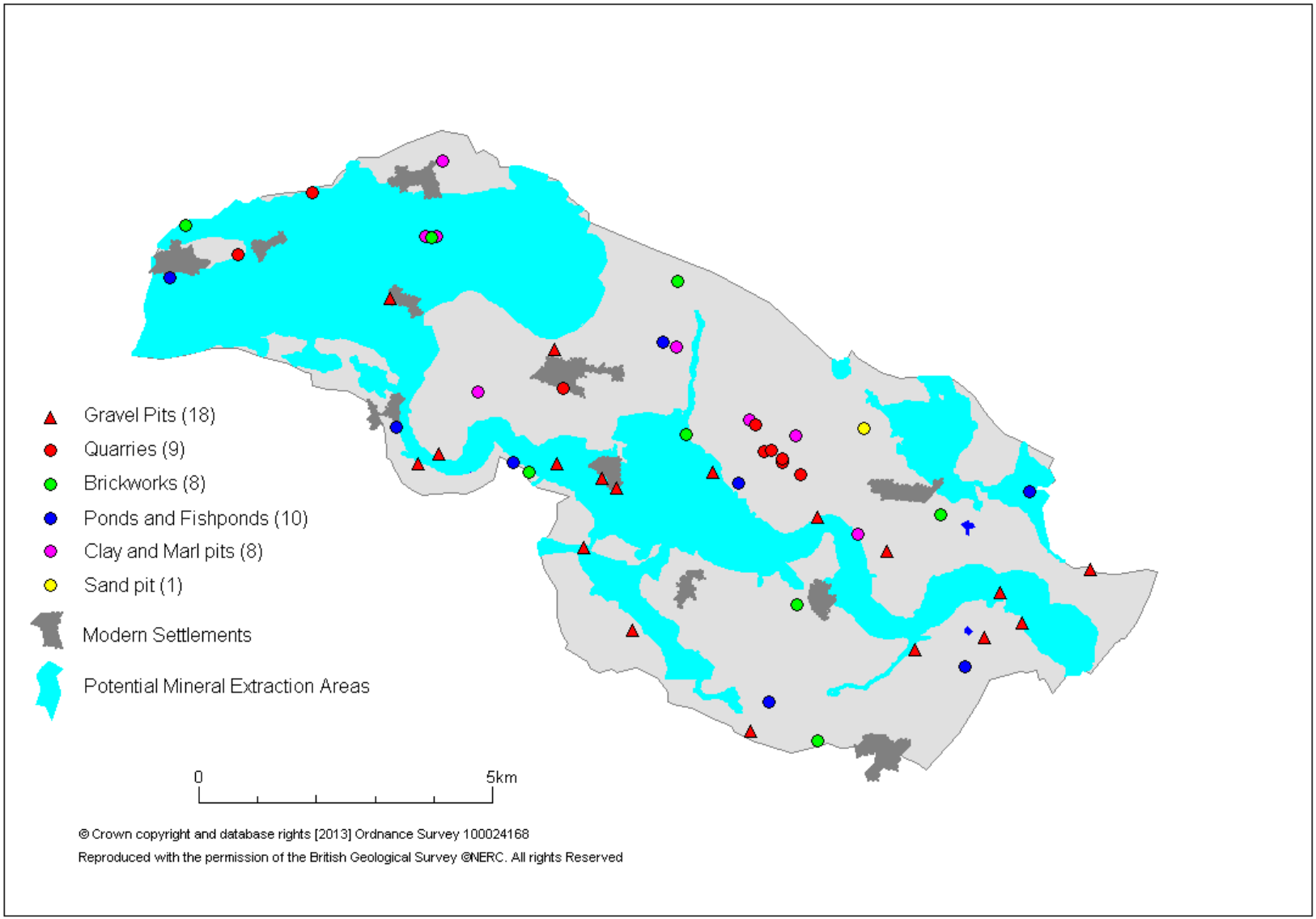


Figure 23: Historic extraction sites in the Wye Valley study area

An overview of the sites within potential extraction areas

Prehistoric (figure 24)

The ten prehistoric records include four stone tool find spots including a Neolithic stone axe, a perforated stone tool and two flint find spots one of seven flakes with secondary working and the other a single thumbnail scraper. A cropmark ring-ditch is recorded near Willersley and a cropmark multi-period complex at Winforton consisting of circular and linear features and "a potential henge". Four narrow lynchets have also been ascribed a prehistoric date although one observer suggests that these are a natural feature. The last prehistoric record is for a palaeo-environmental site where pollen analysis was carried out for an undergraduate dissertation. This is discussed in more detail in section 4.4.

Roman and Early-Medieval (figure 25)

Eight sites are recorded as Roman, the major site is the riverside building complex at The Weir, Swainshill which has the highest standing Roman masonry in Herefordshire at around 4m. Detailed survey was carried out during a programme of consolidation in 1995. The remains include a well-preserved stone buttress and a complex of rooms almost certainly representing a high status building. Although the site of the Roman town of Magnis lies outside the potential extraction area a number of associated sites are within the area. These include a Roman settlement to the east where recent work produced significant results relating to the extra mural settlement in this location. Further cropmarks in the vicinity are thought to represent Roman activity. Two lengths of Roman road are recorded and a river crossing over the Wye. There is cropmark evidence for a Roman marching camp near Byford and a further cropmark enclosure and possible building at Canon Bridge East, Madley.

The evidence for Early-Medieval remains is tantalising. There are documentary references to a chapel or Hermitage dedicated to St Cynidr and St Mary on Winforton Island the remains of which were apparently visible in 1872. The dedication to the Celtic Saint Cynidr suggests the site is pre Norman. The earthworks on the site at The Hermitage were investigated by the Woolhope Club in 1991. In one trench a possible round tower was revealed.

A reference in Domesday Book to "domus defensabilis" suggests a Saxon defensive site in the vicinity of Ailey, Old Castle Farm has been suggested as the site.

A very small part of the scheduled area of Offa's Dyke is included in the area to the south of Garnons Hill, about 20m of scheduled area is included so probably a smaller length of the earthwork dyke itself. About 5km of interrupted earthwork dyke survives running north over Garnons towards Yazor Wood. The southern extent of it (the part running into the potential extraction area) ends at the River

Wye and it may be that this natural barrier substituted for the dyke here. However if the dyke continued across the river then there is scope for any surviving ditch and alluvially buried earthwork to be located within the potential extraction area.

Medieval (figure 26)

Ninety Medieval sites are recorded in the HER. The 51 records of ridge and furrow illustrate the bias introduced by thematic surveys. These were a one-off transcription from the Royal Commission aerial photograph 1:10,000 map overlays in 2008 that at a stroke added over 500 records of ridge and furrow. It is also responsible for the heavy distribution of sites at the western end of the area (figure 26). Of the remaining 39 sites 21 are buildings or structures, farms, churches, houses or bridges.

At Bredwardine are the two scheduled defensive sites of Bredwardine Castle a Motte and Bailey with buried masonry remains and the moated site at Old Court. Two further possible moated sites are represented by a cropmark square enclosure at Willersley and some enigmatic earthworks at Court Farm Kenchester.

Of the four records for deserted Medieval villages at Willersley, Monnington-on-Wye, Preston and Winforton none is remotely convincing. The first is based on a symbol on Isaac Taylor's map of 1754, the Monnington record simply states "possible DMV" with no further information, Preston Court is represented by some vague earthworks recorded in 1976 and that at Winforton is thought by later recorders to be the remains of irrigation features or water meadows.

The remaining sites are a churchyard cross, the site of a mill and an assortment of agricultural features such as ponds, boundary banks and trackways.

Post-Medieval and Modern (figure 27)

Buildings and structures (houses, farms, barns etc) make up 85 of the 126 records for this period. Some of these have had an historic use such as Toll Houses and Vicarages. Industrial sites are more frequent (19) with records of brickworks, clay pits, gravel pits and quarries, saw pits and a chemical works at Brinsop.

Five landscape parks are recorded and a semaphore station the remaining sites are agriculture associated, vineyards, lynchets and field systems.

The modern record is a World War ll home guard defensive emplacement trench giving views up and down the river from close to Bredwardine Bridge.

Undated (figure 28)

Of the 36 undated sites the vast majority (23) are cropmark sites. Although strictly speaking they are undated most probably date to prehistory or the Romano-British period. Eight are ring ditches, 14 are enclosures and one is an occupation site possibly linked to Kenchester. There is a Chapel field name, a ferry crossing, a road, a mound and 3 peat deposit sites. The latter are deposits identified in an undergraduate dissertation but undated, this is discussed further in Section 4.4 below.

Significance statements for undesignated assets

The caveat given at the start of this section is particularly pertinent when trying to determine the significance of any of the monuments recorded. There is almost no evidence on the record of the condition of the feature and it is particularly difficult to assess the status of cropmark sites without knowing what the state of preservation is. The sites have been assessed assuming good levels of deposit and feature preservation.

The following are the already designated nationally important sites.

5 Scheduled Ancient Monuments – New Weir Roman Site (DHE 5946), Bredwardine Castle (DHE 5956), Moated Site Known as Old Court Mound at Old Court (DHE 5977) and Offa's Dyke: the section extending 950yds (870m) N and S of Big Oaks (DHE 6089).
1 Registered Park and Garden – Moccas Court and Monnington Walk Grade II*
36 Listed Buildings – 2 Grade I (St Mary's Church, Monnington-on-Wye and St John the Baptist's Church, Letton), 4 Grade II* and 30 Grade II.

Of potential national and regional importance are the following sites

National

The first three sites are associated with the scheduled Roman Town of Magna Castra and therefore merit scheduled status. The other two early-medieval sites if correctly identified are nationally rare and important as part of the archaeological record of that period.

Roman Settlement, east of Magna Castra Farm, Credenhill, HER No.785
Roman Road and river crossing, Kenchester, HER No, 258
Roman Road, north of Kenchester, HER No.39
Chapel of St Cynidr and St Mary, Winforton Island, Winforton, HER No.1076
Saxon Defended Site, Ailey, Kinnersley, HER No.1077

Regional

The cropmark sites below are likely to be of national importance. However given that their condition or state of preservation is unknown it is difficult to ascribe that level of importance or significance to them at present. They are included on the regionally important list as they are worthy of further consideration in the event of threat.The other sites on the list are regionally scarce and therefore of enhanced importance. The WWII defensive work on the river at Bredwardine is an extremely rare feature regionally.

Ring Ditch cropmark, south-west of Mansel Court Farm, Mansel Lacy, HER No.10372
Roman Marching Camp cropmark, south of Chestnut Coppice, Byford, HER No.1081
Ring ditch cropmark, Old Crow Farm, Willersley, HER No 30652
Multi period cropmark complex, north of Courtlands Farm, Winforton, HER No.52005
Earthwork of a former WWII trench, Church Orchard, Bredwardine HER No.52337
Five Ring ditch cropmarks east of Old Crow Farm, Willersley, HER Nos.8276, 8278, 8279, 8280, 8281

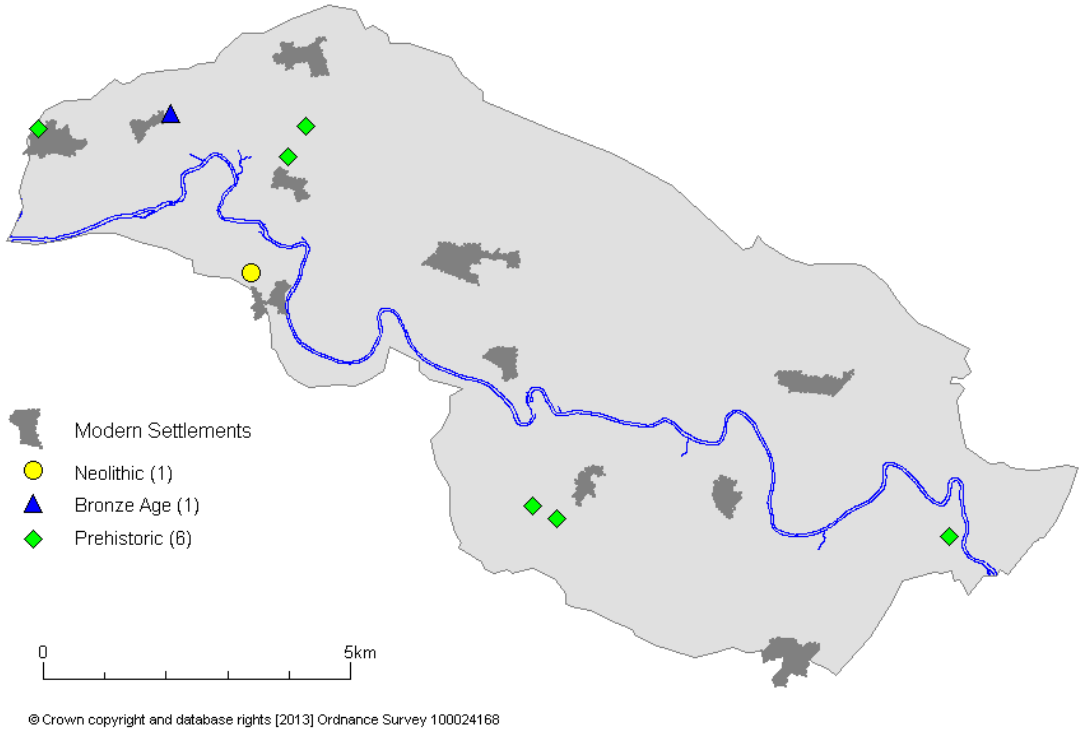


Figure 24: Prehistoric sites in the Wye Valley study area

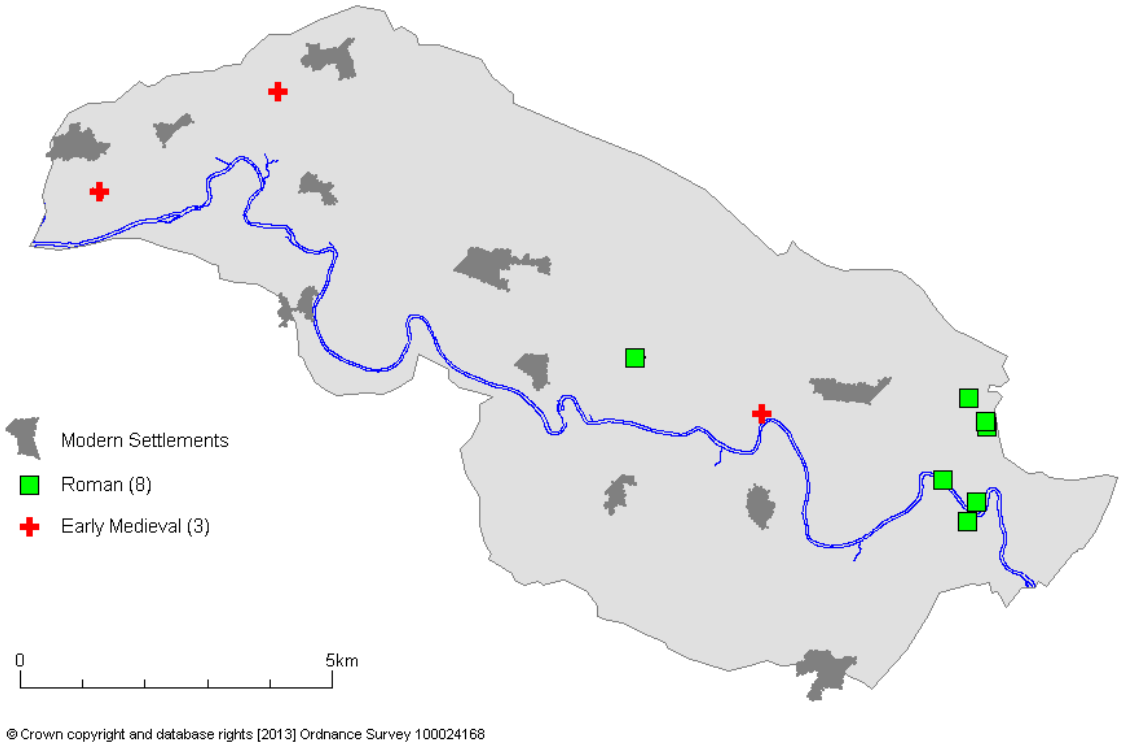


Figure 25: Roman and Early-Medieval sites in the Wye Valley study area

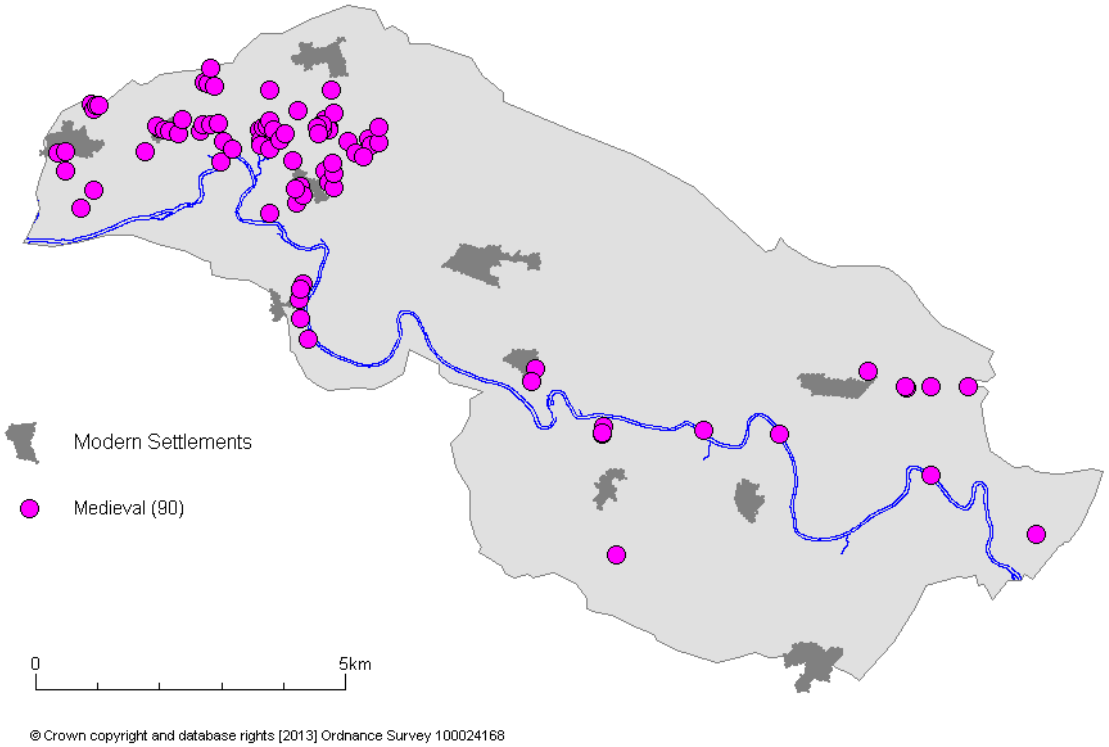


Figure 26: Medieval sites in the Wye Valley study area

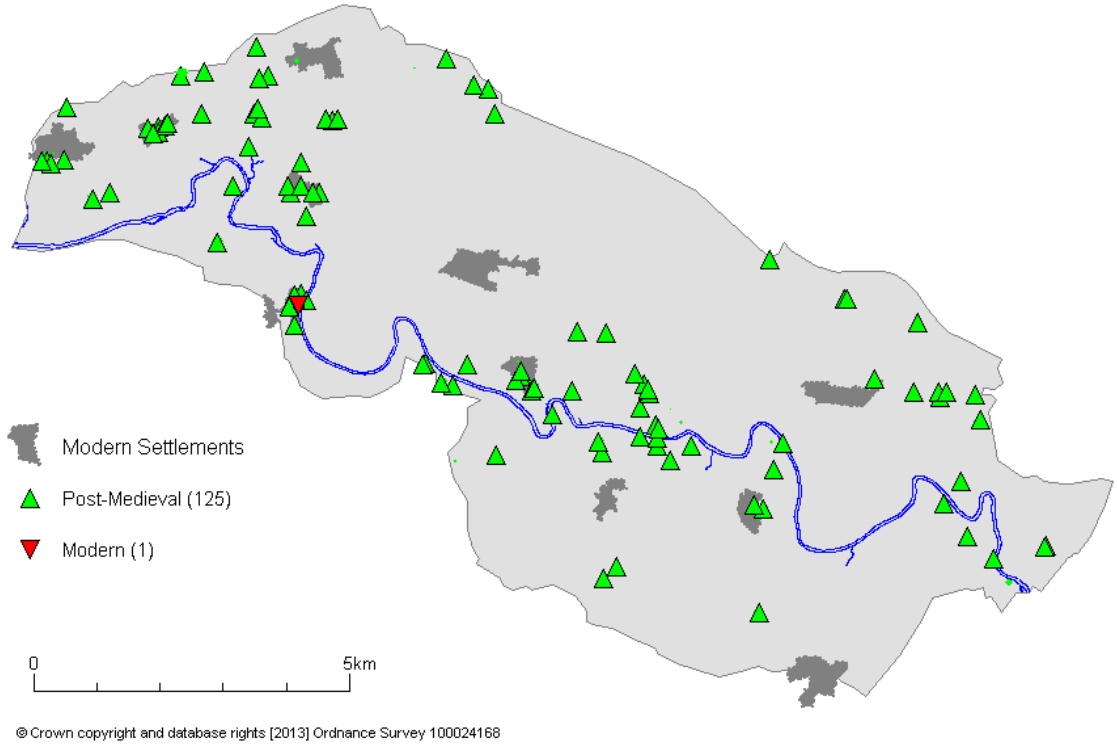


Figure 27: Post-Medieval and Modern sites in the Wye Valley study area

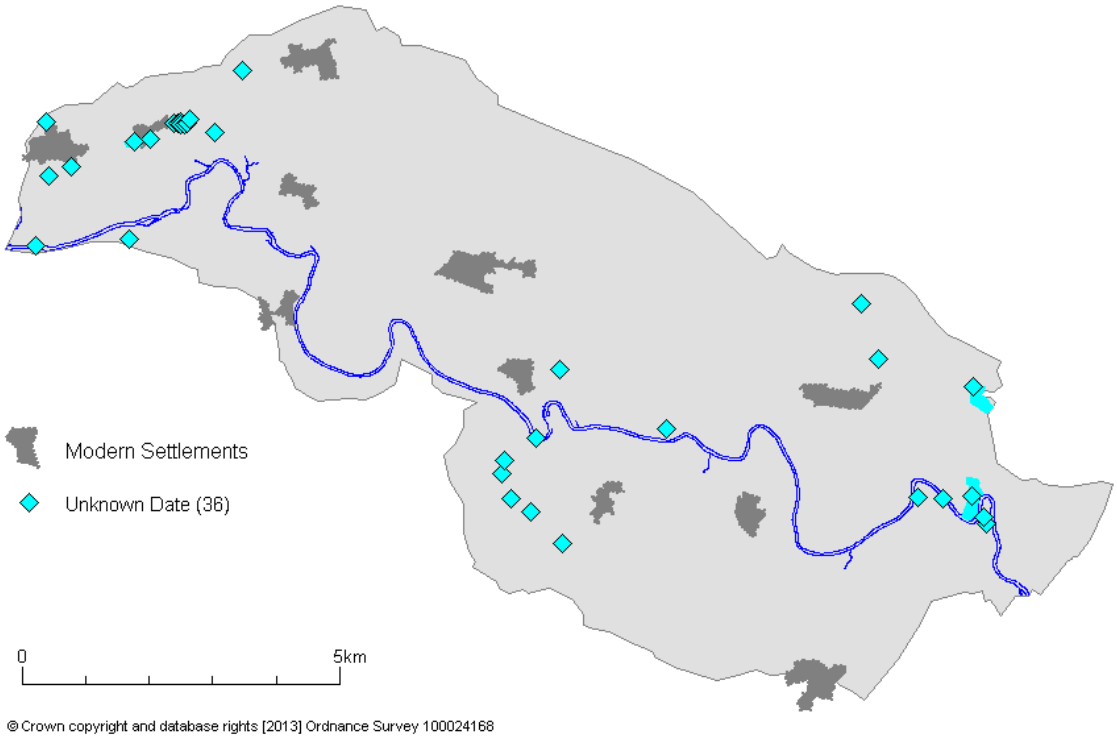


Figure 28: Undated sites in the Wye Valley study area

4.3 An assessment of the archaeological resource in potential hard rock extraction areas (Limestone)

The Aymestry Limestone area is located in the very northern part of the county between Ludlow in Shropshire to the east and Presteigne in Powys to the west. The area extends from Leintwardine in the north to just north of Mortimer's Cross in the south and includes the settlements of Aymestrey, Wigmore, Adforton, Leinthall Starkes and Leintwardine (figure 4).

At the core of the area Wigmore Vale on the Wenlock Shale marks the centre of the Ludlow anticline of Silurian rocks. The surrounding steep-sided wooded ridges formed by the Wenlock and Aymestrey Limestones are distinctive topographical features (Earp and Hains, 1971). These wooded limestone scarps are marked by valleys cut in the intervening soft shales. In these flow a number of small streams and the rivers Teme and Lugg.

The Teme now finds its way through the Downton Gorge to Ludlow and onwards to the Severn but it once flowed south through the Wigmore Vale to join the Lugg. For around 400,000 years the River Lugg was the major drainage route in central Herefordshire. This drainage network persisted until it was disrupted by the Late Devensian glaciation. In the early post glacial period the low lying area of Wigmore Vale was occupied by a glacial lake fed by the Teme, eventually the lake drained through the Downton Gorge.

It is notable that there is a very different concentration of sites on the Aymestrey Limestone potential extraction area. The area is slightly smaller than the Wye Valley area at 31.90 square kilometres compared to 33.54 but the Aymestrey area has 565 sites as opposed to 252. This must be due in part to the differing topographical location of the areas, the Lugg and Wye areas being valley floor locations that would not only have been more prone to flooding and waterlogging of soils but also the burial of early sites by alluvium.

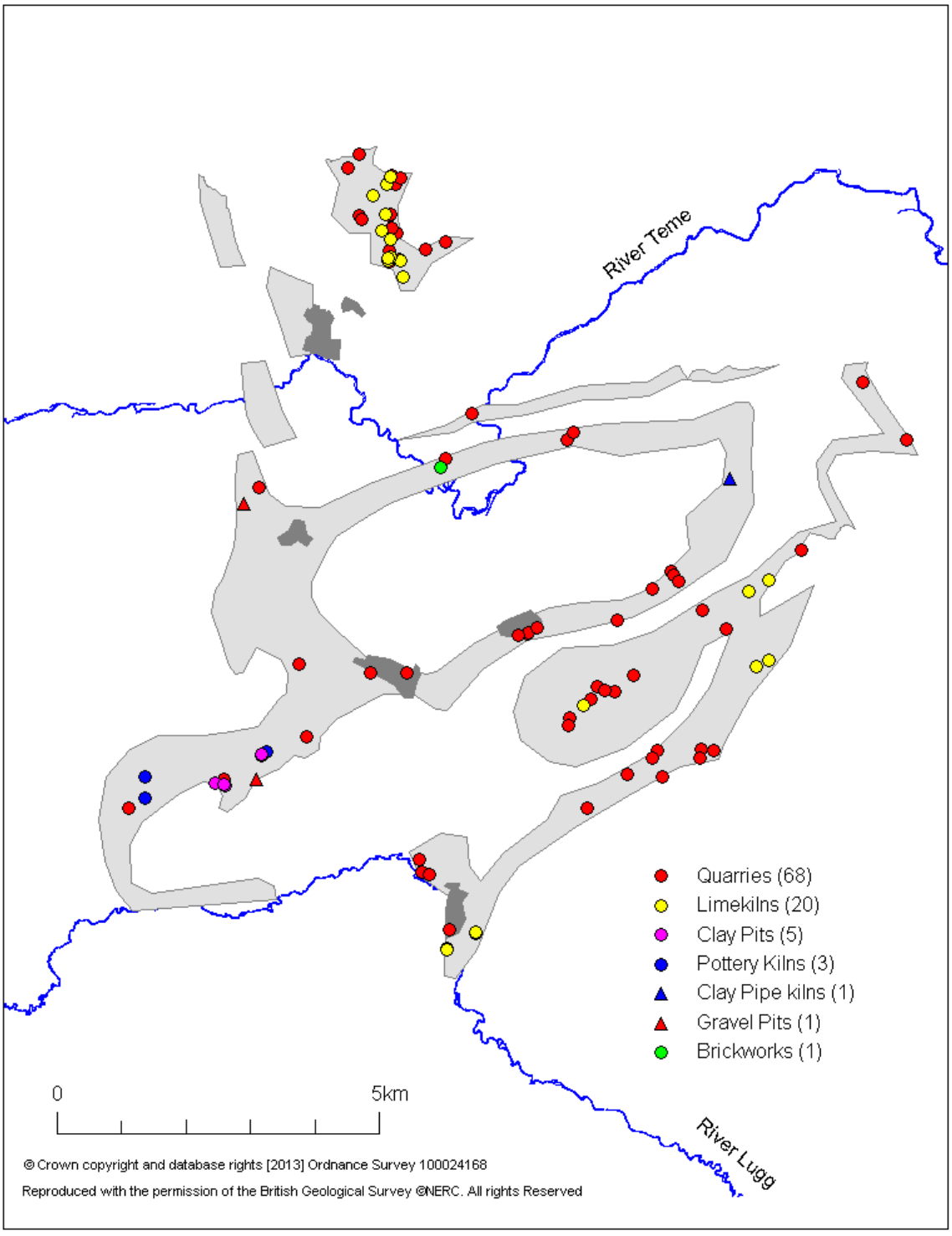


Figure 29: Historic extraction on the Aymestrey Limestone

Prehistoric (figure 31)

There are actually 64 prehistoric records within the HER. All but eight however are features associated with the site of and excavations at Croft Ambrey hillfort. For the purposes of this study therefore all but the primary record for the hillfort have been disregarded.

Four of the records relate to find spots, two Bronze Age palstaves from Aymestrey and Leintwardine and two flint find spots from Leintwardine, the latter are allocated a general prehistoric date.

Two enclosures have been assigned an Iron Age date. One is a cropmark site recorded as measuring 91m by 87m. The other was first recorded as an earthwork enclosure of 50m by 60m. It was thought to compare favourably with other Iron Age enclosures. In 2004 the site was reported to have been badly affected by forestry planting, it is called on the record “Enclosure, corner of”. Its survival is unclear.

The remaining three records are all scheduled hillforts, Pyon Wood Camp, Brandon Camp (figure 30) and Croft Ambrey. Pyon Wood Camp is a small hillfort crowning an isolated hill. The other two sites are located on the ends of ridges. Both Brandon and Croft have both been partially excavated (Frere, 1987 and Stanford, 1974 respectively).

Both have complex multi-period histories. At Brandon Camp ploughing was found to have removed all vertical stratigraphy but cut features survived. Numerous postholes or pits were attributed to the Iron Age occupation but on the highest point within the hillfort interior was a circular enclosure about 23m in diameter. A plano-convex flint knife recovered from the ditch suggests that this is a Bronze Age ring ditch. Between 55-60AD the interior was used by the Roman Military as a supply depot. Buildings included a large granary, possible barracks and administrative buildings. It is interpreted as a temporary campaign base created to support advances up the Teme valley into central Wales.

At Croft Ambrey Seven main phases of construction and occupation were identified. Within the interior four post structures were identified and interpreted as domestic buildings. Occupation was dated to 550BC through to the end of the Iron Age. Although it appears that occupation ended at the site within the Iron Age period there was distinctive use in the Romano-British period and the so called “Sanctuary” was also excavated by Stanford. This is interpreted as a religious monument.

Figure 30: Brandon Camp rampart and interior to left

Roman and Early Medieval (figure 32)

Of 27 Roman records 16 relate to the scheduled remains of the Roman town of Branogenium which lies buried under the modern village of Leintwardine.

The site is located on a south facing slope overlooking the confluence of the Rivers Clun and Teme and archaeological investigation over the last 100 years has demonstrated a good level of preservation both of (in places) upstanding defensive rampart remains and buried archaeological deposits linked to the occupation of the town. The remains of a bath house have been identified and other high status buildings within the town are demonstrated by finds of a column base and by an inscribed altar stone.

Although early in the history of investigation it was proposed as a Roman military fort most commentators now believe the settlement to have originated as a vicus settlement associated with Jay Lane fort and on the abandonment of the latter to have developed into a “way station” (Brown, 1996). It is suitably located on the Roman Road “Watling Street” that linked the legionary fortresses of Caerleon to the south and Chester to the north. It also lies between the Roman towns of Kenchester some 35km to the south and Wroxeter 50km to the north

Evidence of Roman military activity is plentiful in the general area of Leintwardine. The use of Brandon Camp as a campaign supply base has been mentioned above, Jay Lane fort lies less than a kilometre to the east of Leintwardine and two temporary marching camps lie 1.1km west-south-west of the village and 1.7km south-west close to Brandon Camp. The latter is a Scheduled Ancient Monument (HE160). All these sites (and others, such as Buckton Roman fort, not in the potential extraction area) lie within a radius of 1.2 kilometres.

The Marching camps have not been dated by excavation but work at Jay Lane suggests that it was constructed between AD 47 and 61 but abandoned around AD 70-80 and was replaced by the fort at Buckton, occupation here is thought unlikely to have continued beyond AD 120-125, (Burnham and Davies, 2010).

The line of the Roman Road (Watling Street) is traceable by tracks and hedgerow alignments running in a southerly direction from Leintwardine Bridge. It passes to the east of Brandon Camp and is recorded nearly 5km from Leintwardine as it approaches Wigmore. The remaining Roman sites are those associated with Croft Ambrey the "Sanctuary", a Shrine and a quarry.

The early Medieval is represented by three carved heads found in a field close to Wigmore Abbey. Two have been compared to Irish Early Medieval examples the third is probably later. The two earlier heads were possibly from a precursor of Wigmore Abbey where they may have been reused.

Pre Norman settlement at Wigmore Castle is based on an entry in Domesday Book and 11th century pre-castle activity on the castle site itself.

During the excavation at Brandon Camp a possible Early Medieval building was identified. Foundation trenches of a possible hall type structure cut the Roman features and lack of Roman and Medieval ceramics lead to the tentative dating.

Medieval (figure 33)

The Medieval period in this area is represented by 79 records amongst which are an interesting range of sites. There are a number of defensive sites most notable that of Wigmore Castle and an associated defensive bank and ditch feature. There are four recorded mottes or motte and baileys. Two of these are convincing, one being the scheduled site at Upper Lye. It has been suggested that this had a bailey in the field to the north but there is no sign of it now and the topography is not convincing, it is much more likely to have been an isolated motte. The other probably legitimate site is that of a low mound about 20m in diameter located on a spur overlooking the village of Adforton; the site type is given as motte or ring-work. Another site is that of a possible precursor to Wigmore Castle, a possible motte and bailey site at Green Hill, Wigmore. The least convincing is a cropmark site with an irregular circular ditch the designation motte is a very tentative suggestion.

Wigmore Castle was one of the largest castles in the Marches. The castle was slighted in 1643 to prevent it falling into Royalist hands and much of the remains are still buried under the rubble, some to first floor level (Brooks and Pevsner, 2012).

A number of important ecclesiastical sites date to the Medieval period and these include the scheduled sites of Wigmore Abbey and Limebrook Priory. The

churches at Aymestrey and Leinthall Earls are recorded and the church yard cross at Aymestrey is a Scheduled Ancient Monument. Other ecclesiastical records relate to elements of Wigmore Abbey founded in 1172 and to a possible precursor from 1160. The reputed site of the latter was investigated by the Woolhope Naturalists' Field Club with negative results (Shoesmith, 1987).

The ruined remains of Wigmore Abbey church are in part traceable but little else now remains above ground apart from "The Grange", a farmhouse created out of the abbot's lodgings. The Augustinian nunnery at Limebrook was founded in 1189. One Ruined building survives in a poor state though up to 4.6m high in places. The rest of the complex is represented by earthworks. Some of the nearby buildings might have been associated with the priory, Upper Limebrook Farm is tree ring dated to 1447-8 and may have been the home farm or a guest house. Others (Limebrook Cottage) are constructed using materials from the priory (Brooks and Pevsner, 2012).

A number of secular buildings date to or have their origins in the Medieval period. These include barns and houses including Wigmore Hall.

Four deer parks are recorded and a length of park pale and two hunting forests. Other landscape features are agricultural in origin; field systems, lynchets, hollow ways, woodbanks and ridge and furrow. Individual features include fish ponds and pillow mounds, the latter within Croft Ambrey hillfort.

An apparent "shrunken village" with 14-16 house platforms fronting a road and with a back lane was identified from aerial photography, like many of this type of record, a field visit would be necessary to confirm the interpretation.

Post Medieval and Modern (figure 34)

The majority of sites (359) are attributed a post-medieval date. 110 are buildings of various sorts, chapels and a church (3), houses (32), barns (5), farms (40). Industrial sites also register prominently sites such as a brickworks, a clay pipe kiln, three pottery kilns, charcoal burning sites (12), Quarries (66), Limekilns (19) gravel pits (2) and Clay pits (5).

The majority of the remainder are agricultural in origin. Amongst these are relict field boundaries and ridge and furrow (52), ponds, dams, fishponds, leats, hollow ways and woodbanks.

There are parts of five landscape parks three of which are registered. These parks are associated with Downton Castle, Croft Castle, (both grade ll*) Gatley Park (grade ll), Seedley House, Yatton Court and Kinsham Court (all undesignated parks). Two Follies are recorded in Gatley Park.

Undated (figure 35)

Of the undated sites a number may be prehistoric. One, a stone axe hammer, certainly is. A number of cropmark enclosures may date to the Iron Age or Romano British period.

Fourteen cropmark enclosures or parts of enclosures are recorded, one with an entrance in the south-eastern side may be late prehistoric or Romano British. The others are mostly too fragmentary to know if they are genuine archaeological features or if they are exactly what they represent. Of undoubted Roman date is the length of Watling Street recorded as undated west of Burrington.

Apart from a bowling green the remainder of the sites appear to represent agricultural features of one type or another. Earthworks, banks, ditches, a fishpond, lynchets, hollow ways ridge and furrow, trackways and a woodbank are recorded they are probably mainly post medieval in date.

Significance statements for undesignated assets

The following are the already designated nationally important sites.

Croft Ambrey hillfort, DHE6124
Pyon Wood hillfort, DHE6202
Brandon Camp, DHE6075
Jay Lane Roman fortDHE6150
Roman Station of Bravinium Leintwardine, DHE6095
Roman Temporary Camp south of Walford Bridge, DHE5985
Wigmore Castle, DHE6054
Wigmore Abbey, DHE6007
Limebrook Priory DHE6139
Castle Mound in Camp WoodDHE5994
Churchyard Cross, St John the Baptist and St Alkmund's churchyard DHE6143

18 listed buildings are on the HER. There are four Grade I, Aymestrey Church, and three buildings of Wigmore Abbey. Two II*, St Andrews Chapel, Leinthall Earls and Gatley Park. Twelve Grade II.

Of potential national and regional importance are the following sites

National

The sites below all belong to a class of site that is considered to be nationally important where identified elsewhere or associated with designated monuments.

Ringwork or motte, Adforton, HER No.32589
Ditch and bank north-west of Wigmore Castle, HER No.19424
Ringwork, Wigmore Rolls, HER No.21897
Deserted Settlement, Burrington, HER No.30664
Cropmark prehistoric enclosure, Burrington HER No.51431
Course of Roman Road, Leintwardine – Wigmore, HER No.43927

Regional

The sites identified as of regional importance are known to be regionally rare they are therefore worthy of carefull consideration for protection if under threat from extraction or other development.

Earthworks of shrunken settlement south of Aymestrey Church, HER No.38465
Pottery Kiln, Wigmore, HER No.2526
Pottery Kiln, Dickendale, Wigmore, HER No.2529
Pottery Kiln, Grove Head, Lingen, HER No.33746
Site of Clay Pipe kiln, Pipe Aston, HER No.6371

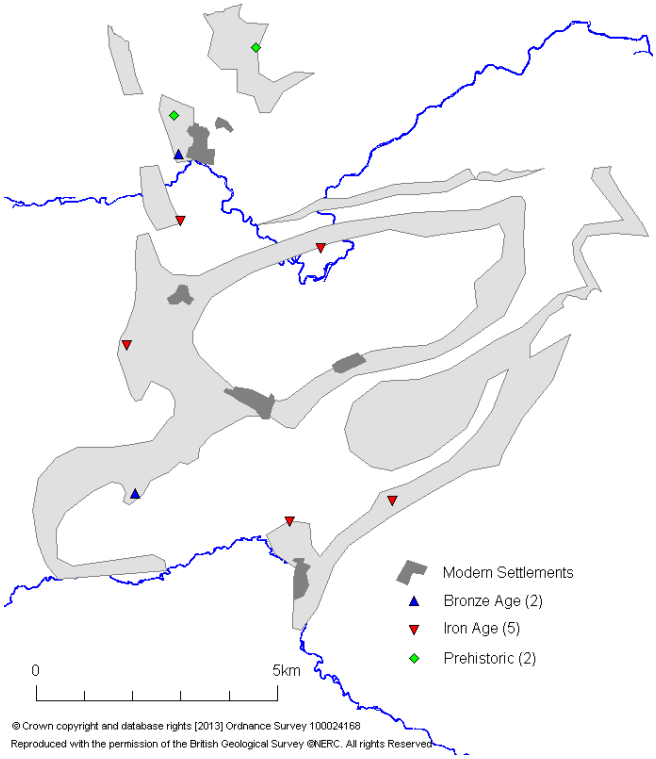


Figure 31: Prehistoric sites on the Aymestrey Limestone

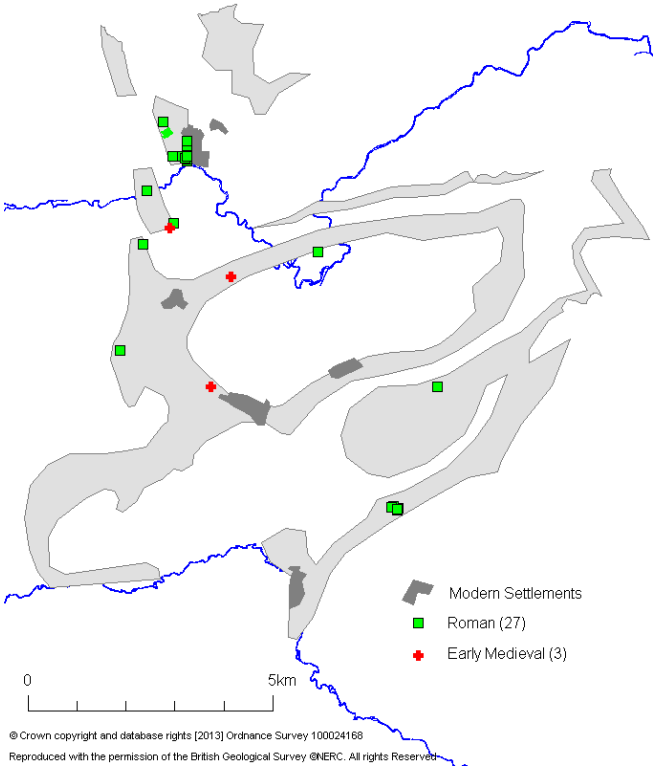


Figure 32: Roman and Early Medieval sites on the Aymestrey Limestone

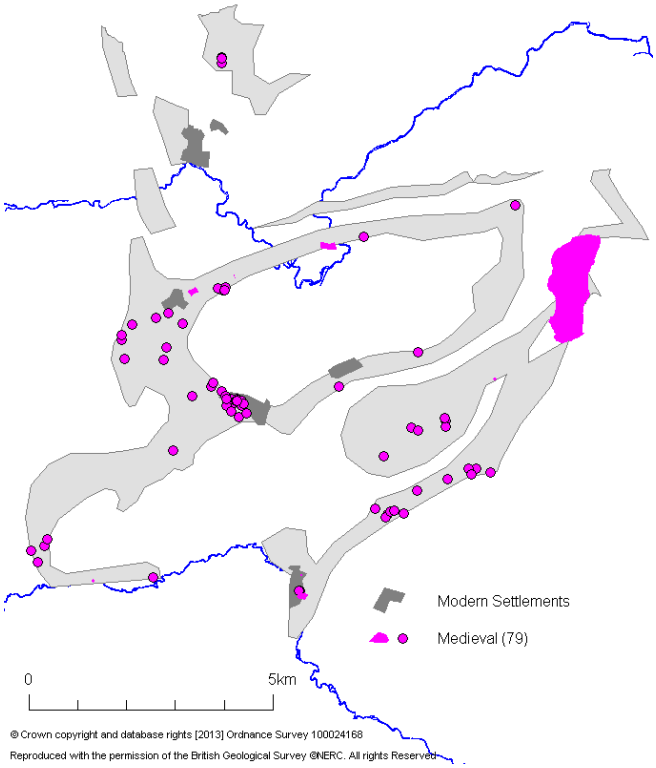


Figure 33: Medieval sites on the Aymestrey Limestone

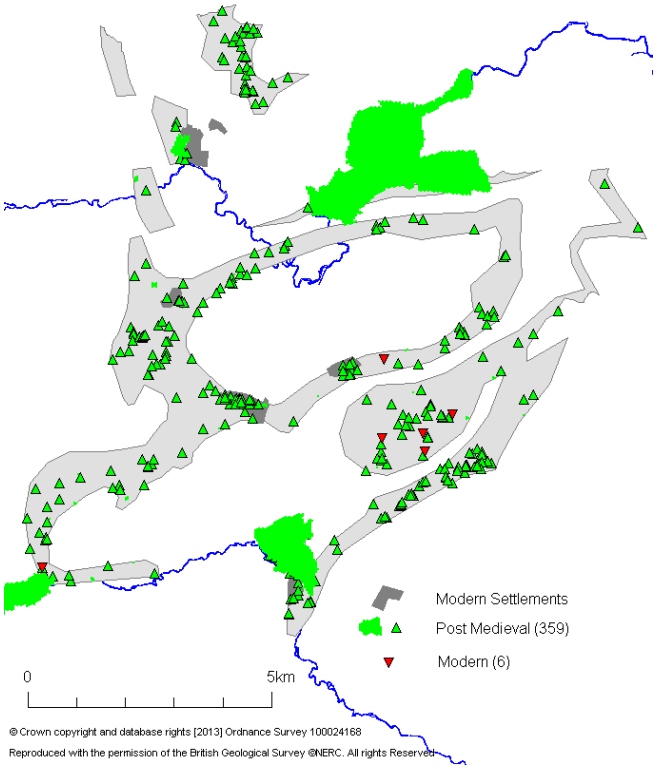


Figure 34: Post Medieval and Modern sites on the Aymestrey Limestone

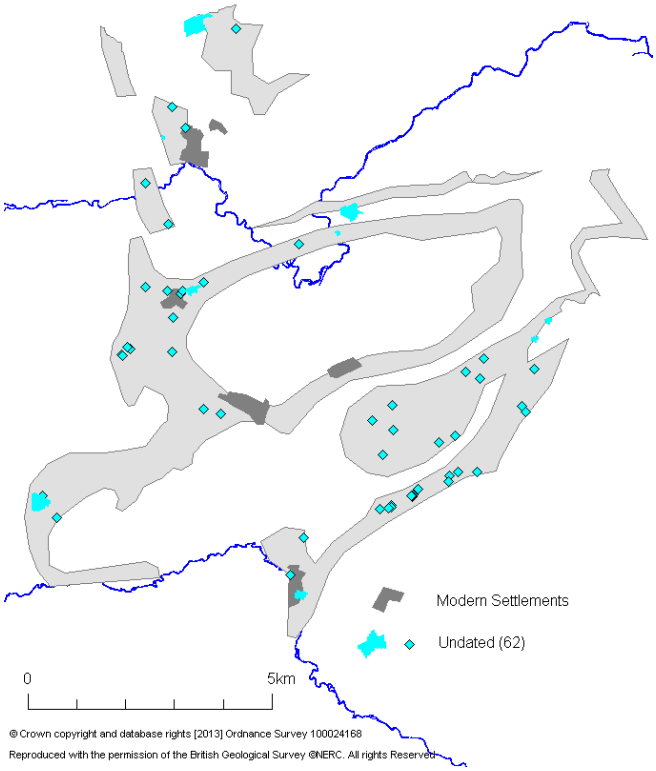


Figure 35: Undated sites on the Aymestrey Limestone

4.4 An assessment of the palaeo-environmental resource in potential extraction areas

Only a small amount of palaeo-environmental work has been carried out in the current Lugg Valley study area and some investigation of peat deposits has occurred in the Wye Valley study area.

However the high potential of valley bottom sand and gravel extraction sites in Herefordshire has been adequately demonstrated by work at sites within the Lower Lugg 2006/7 study area such as Wellington/Moreton-on-Lugg and Lugg Bridge Quarries. Resources already demonstrated include studies of pollen, plant macrofossils, molluscs, insects, animal bone, charcoal, dendrochronology, soils and sediments.

There have been relatively few palaeo-environmental studies of deposits from the wider Lugg Valley. This is a reflection of the small amount of archaeological study which has taken place in this area, rather than of any specific limitations to the range and scope of the palaeo-environmental resource. The potential of many forms of palaeo-environmental evidence has yet to be established in most of the valley because few studies have been carried out. The work which has been done, however, has shown the high potential of environmental evidence to reconstruct the past landscapes of the Lugg catchment (Terra Nova, 2002).

The nature of the information these assemblages have been used to provide about the past environment is strongly influenced by the context in which they were found and the purposes for which they were analysed. The studies of plant macrofossils and animal bone, for instance, have often been more focussed on palaeo-economic than palaeo-environmental reconstruction because the material on which they are based was recovered from excavation.

Although Environmental sampling in the Lugg Valley has been sparse, systematic sampling for archaeological material became standard procedure at Wellington Quarry in 1992 and this provides a large part of the data available. Environmental work was also undertaken on the site as part of the Birmingham University PhD project of Rebecca Roseff, including sedimentary analyses, plant macros, molluscs, and pollen from the alluvium. More recently, palaeo-channel peats have been sampled for environmental analysis at Wellington and Lugg Bridge Quarries.

The sedimentary and alluvial record of the lower Lugg floodplain

There has been detailed recording of the sediments at Wellington and Lugg Bridge Quarries. This has been supplemented by an auger survey at Lugg Meadows and salvage recording along the Eau Withington gas pipeline. However, despite these studies many questions remain about the origins and

deposition of the alluvia and their correlation with phases of archaeological activity on the floodplain and within the wider Lugg catchment.

The alluvia of the Lower Lugg consist of a 1.50m – 3.00m thick sequence of reddish and yellowish fine silty clays and clayey silts, with grey peaty clay and tufa in the base of palaeo-channels. These overlie the fluvio-glacial gravels that are the target of the quarrying operations. The sequence of the different coloured units varies quite considerably over relatively short distances. The origins of these different units are believed to relate to both parent material and source area (Roseff, 1992) and post-depositional pedogenesis (Terra Nova, 2001).

Differences in parent material may relate to phases of archaeological activity, as episodes of cultivation and clearance open up the surface of the soil to erosion. Geological differences across the catchment can sometimes be used to map the sources of the alluvium, helping to pinpoint changing areas of intensive land use through time. Post-depositional effects cannot be directly related to human land use, but they do affect the preservation of archaeological and environmental remains.

Pollen analysis

Pollen has been sampled from Wellington Quarry, Lugg Bridge, and Red Marsh on the Wellington Brook. The pollen sequences span the Late Glacial/Early Holocene through to the Medieval period, with samples taken from palaeo-channel peats, the alluvium itself, and from Medieval leats or water courses. However, complete sequences are rare and sampling resolution through the core has tended to be poor.

The assessment of pollen from Wellington Quarry (Greig, 1994) and Lugg Bridge (Pearson and Greig, 2000) indicates an early post-glacial environment dominated by herbs, sedges, birch, pine, hazel and willow. By 6800 BP at Wellington this had developed into a wildwood of oak, elm, and lime on the drier valley slopes and alder carr in the wetter valley bottom.

The Wellington sequence indicates the first signs of human activity at around 5000BP with the appearance of cereals and plantains, however, the woodlands were still widespread. The later decline in the woodlands corresponds to a rise in cereals and grasses.

Pollen from a possible Bronze Age or Roman occupation layer at Lugg Bridge suggests clearance of the wildwood, and a local vegetation of alder - oak carr whilst herb pollen suggests a more open, disturbed habitat. Greig suggested that either the level of human activity was low, or the valley bottom was not the main area of occupation. The presence of flax pollen from a palaeo-channel at Lugg Meadows has been interpreted as possible evidence of flax retting (Pearson and Roseff, 1996).

Plant macrofossils

Plant macrofossils have been sampled from palaeo-channel deposits and archaeological contexts; these broadly support the idea of wet, alder carr vegetation in the valley bottom. At Wellington Quarry there is the potential for sampling environmental remains from the Late Glacial through to the Medieval period. The macrofossils have been recovered from peats and organic clays preserved in the base of palaeo-channels the macrofossil assemblages, therefore, are all dominated by species indicative of the locally wet conditions within the cut-off meanders and along the river bank.

Animal bone

The studies of animal bones have been palaeo-economic rather than environmental but quantities of bone and antler have been found in the earliest gravels and silts at Lugg Bridge. The potential for bone survival is inherently quite good across the majority of the valley which has basic or neutral soils.

Mollusca and insects

Molluscan remains are common in the tufaceous fills of palaeo-channels in the Lower Lugg. A study of the deposits at Wellington has shown that fluvial sorting has caused very little biasing of samples and, therefore, that reliable inferences may be drawn from this evidence. Molluscan analyses, though local in scope, may prove very useful in reconstructing the development of such calcareous environments and, by inference, of the wider landscape.

Some of the organic rich palaeo-channel deposits have also been found to contain insect remains (Pearson and Greig, 2000).

The predominance of non-acid soils will allow mollusc preservation and this means that good moluscan remains may be widespread in archaeological contexts. Insect remains may be restricted to waterlogged contexts, especially those with a high proportion of organic matter.

The Lugg Valley Study Area

In 2007 as part of the Lugg Valley Archaeology, Landscape Change and Conservation project a number of coring transects were carried out across topographically identified palaeo-channels of the Lugg (Macklin et al, 2007). The aim was to investigate the Holocene river development of the valley.

The sites were selected following a programme of detailed geomorphological mapping of the Lugg's valley floor environments. Each of the sites was selected on the basis of their geomorphological characteristics and their palaeo-environmental potential, and it was hoped that they may contain extensive buried palaeo land surfaces and palaeo-channels in conjunction with rich and well-preserved archaeological and palaeo-environmental records.

Holocene deposits at Combe Moor in the Upper Lugg tended to be *c.* 1.6 to 2.4m thick; those at Holgate Farm, Kingsland were generally less than 1m thick. Records at Eaton Hall near Leominster and Ox Pastures to the south between Wellington and Bodenham generally produced *c.* 1.5m of fine-grained deposits dating to the last 2000 years. One older palaeo-channel at Ox Pastures produced deposits in excess of 3m. The southern study area at Wergins Bridge produced generally less than 1m of fine-grained deposits.

The transect carried out at Eaton Hall, Leominster falls within the current Lugg Valley study area.

To the north and west of Eaton Hall three former Lugg channels were cored with organic material suitable for radiocarbon dating being recovered from the youngest and intermediate-age palaeo-channels.

The most recent palaeo-channel was a single loop cut-off adjoining the present Lugg channel. Its fill comprised 1.5 m of clays and silts which overlay gravelly sands and gravels. The sand-gravel contact at *c*. 2.0 m is dated to AD 1530 – AD 1950 and indicates that the channel was cut-off sometime during this period. An earlier radiocarbon date of AD 1430 – AD 1630 was obtained from the gravels below and indicates, similar to results from a palaeo-channel upstream at Holgate Farm, that the River Lugg has been both laterally mobile and transporting gravel certainly up to the 16th or 17th Century AD. In addition, nearly 2 m of fine-grained alluvium have been deposited at this site in less than 400 years.

Core 2 was taken from a low-sinuosity palaeo-channel that runs from the River Lugg at Eaton Hall northwards for more than 400 m to Eaton Bridge. Its fill was similar to that of the younger channel cored to the north with silts and sands down to a depth of *c*. 1.8 m overlying gravels. Organic material radiocarbon dated at the sand-gravel contact indicates that the palaeo-channel was cut-off and started to silt up shortly after AD 780 – AD 980.

The oldest palaeo-channel system at the site was located on the western margin of the valley between 200 – 300 m from the present Lugg channel and runs

parallel to the modern river. Gravel level here is *c*. 1 m lower than at the two younger palaeo-channels but once again coring demonstrated thick (*c*. 1.5 m) layers of clayey silts overlying the sandy gravels. Unfortunately, no organic material was recovered for radiocarbon dating and the age of this channel is not known although stratigraphically it is the oldest of the three examined.

In 2009 at the southern end of the study area a series of auger holes were conducted on the Lugg Valley floodplain in the field immediately to the east of Hampton Court. These comprised a single transect of eight auger holes and 4 other holes at other locations in the field (Allen, 2009).

The overbank floodplain deposits at Hampton Court were up to 2.2m thick before compacted sands prevented further augering. The basal gravels were not encountered. Within this alluvium a band up to 30cm thick was recorded containing very fine charcoal flecks. It varied in thickness from 30cm to less than 10cm, but was recorded continuously for over 50m and was recorded again at auger point 75. Two of three augers holes in the eastern end of the field also recorded this band, over a length in excess of 750m showing the extensive nature of this deposit.

This was thought to represent a landscape phenomenon, a period or phase of burning within the wider part of the local Lugg catchment, rather than a single burning event originating from a site or a clearance event. It was argued that it relates to a period when a number of sites were active, possibly a number of craft industries within the catchment. It was further suggested that this deposit might relate to charcoal burning for the production of charcoal for smithying and although there is no dating evidence for the activity that this might date to the Iron Age (Allen, 2009).

The Wye Valley Study Area

The valley alluvium and sediments in the Wye valley study area will almost certainly have the same high potential as the Lugg but there has been no previous study or recording of these. There is some British Geological Survey borehole data from the area but on the whole the recorded data is of limited use.

The Wye valley does however have more extensive surface peat deposits than the Lugg Valley area (figure 37). Peat deposits have formed here in kettle holes and in hummocky glacial deposits as well as in palaeo-channels. Pollen analysis has been carried out in one of these deposits (see Stokes work below) and work by Pippa Wild (Wild, undated) identifies a number of deposits in kettle holes, partially enclose hollows and marginal channels in both the Wye Valley and the Dore Valley to the west. The land use in these areas is usually rough grazing and some will have been drained in the past for agricultural improvement.

Peat areas are identified by Wild to the north-west of Byford Court, to the east of Byton Church, at Lower Bellamore Farm to the east of Preston-on-Wye, two locations at Holywell, Blakemere along with a number of other former sites in now improved fields (figure 37). Unfortunately the site chosen for environmental sampling was at Gannols Farm, Dorstone outside the Wye Valley study area although it does demonstrate the potential of these peat deposits generally.

The peat profile of 150cm was studied and pollen sampled at 10cm intervals. At the base of the peat was a tufa deposit derived from calcareous marls through which ground water had run prior to emerging through springs. No dating was carried out on the profile. The earliest environmental phase (G1) was one of mixed oak woodland with lime, elm, alder, ash and birch. G2 saw a decline in lime with an increase in grasses and nettle. The final phase G3 from the top of the profile sees a dramatic decline in tree pollen and a rise in grasses and herbaceous plants.

Given the context of the report and the relative inexperience of the researcher the results should perhaps only be used as a general indicator of the potential of other peat deposits in the area.

The other study was that by Karolyn Stokes carried out at Marsh Court, Bridge Sollers (within the study area) as part of a PhD at Kingston University. The following is taken from the HER description, a copy of the thesis is not held.

Sampling here gave good dates for the late glacial Interstadial, the return to cold conditions and the beginning of the present Holocene period. An asymmetrical kettle hole with gravel at the base, mud and then peat was sampled for pollen. The lowest stratigraphy was dominated by herbs, typical of the Late Glacial. At 5.5m [below ground level] the assemblage changed to one dominated by birch, the beginning of this was radiocarbon dated to 11,861 BP. This is interpreted as the late glacial Interstadial. 0.8m above this the birch declined, at 10,813BP. This was interpreted as the beginning of the return to cold conditions. At 3.5m below ground surface birch again dominates, dated to 9433 BP, interpreted as the beginning of the Holocene. Peat builds up quite quickly at this time, at 2.5m below surface, dated to 9254 birch dies out and hazel totally dominates. At 1.3m below surface, dated to 8314 BP oak and pine appear comparatively abundantly in the record, elm had appeared at 1.8m below surface. The sequence ends 0.5m below the surface.

Palaeo-environmental potential of hard rock sites

Recent excavations at a number of sites in Herefordshire have demonstrated the potential for good preservation of certain types of environmental data on limestone areas and within calcareous gravels. Local soil conditions and taphonomy however play a large part in preservation. Excavation at Little Doward hillfort on the Carboniferous Limestone for instance showed that soil deposits within a single ditch may vary enough for snail shell to be preserved in some contexts but not in others. Preservation of bone from burials was found to be good in the gravels at Sutton Walls hillfort, at Aymestrey and at Ashgrove Quarry but at Ivington hillfort bones discovered in a limestone quarry in the 19th century were described as crumbly.

The following results from Little Doward (Dorling et al, 2012) illustrate the potential for preservation and the insights that can be gained into past environments and economies.

Snail Shell

Molluscs can be a very useful indicator of local environments, certain species being very habitat specific. Atypically for Herefordshire there was some survival of snail shell at Little Doward where the overlying Crease Limestone creates some specific conditions allowing for survival. However shell was only present in two contexts.

A reasonably sizable assemblage of snails was recovered from the primary fill of a defensive ditch. Bone provided a date for this deposit of 410-390 cal BC. The mollusc assemblage was dominated by certain shade-loving species that are some of the most common species in rock-rubble, or trogolophile, micro-habitats. It was thought therefore that this assemblage represented the micro-environments of the primary fills, existing in an established open landscape, rather than recently cleared ancient woodland. Snails from a charcoal horizon representing industrial use at a higher level within the same ditch were predominantly open country species. The assemblage compared well with those of short-turfed trampled grassland and probably represents conditions within the ditch itself. This deposit was dated to 360-170 cal BC. These two deposits were separated and overlain by a sequence of colluvial deposits that contained no shell at all. This latter data added to the evidence that the ditch was redundant (as a defensive / boundary feature) by that time.

Animal Bone

The majority of the bone assemblage from Little Doward came from a middle Iron Age midden deposit. The preservation was such that a good statistical analysis was possible. The species reflect a mixed husbandry with sheep/goat (39%), pig

(35%) and cattle (26%) all represented. Horse and dog were also identified by three and one bone respectively though interestingly there were no wild animal or bird bones in the deposit. The anatomical distribution indicated the disposal of bones was from all parts of the carcase, the deposit was not a concentration of prime meat bones, waste/low value bones, tanning or working waste.

Whilst higher proportions of pig bones have been recorded from sites in Wales and the west compared to areas such as Wessex, where sheep then cattle then pig are most numerous, these have generally been from sites of late Iron Age or early Romano-British periods and higher proportions of pig have been interpreted as indicating an increased Roman influence. This is clearly not the case at Little Doward where the deposit is securely dated to the earlier part of the middle Iron Age. It may be that we can see the influence of local topography and associated environmental factors on Iron Age animal husbandry and economy. The dissected plateau of the Forest of Dean and lower Wye Valley has an abundance of steep slopes that are unsuitable for cultivation and that continue to support extensive oak and beech woodlands, access to woodlands and plentiful pannage may have been a factor in the importance of pigs in the economy in the middle Iron Age.

Pollen

Pollen was very poorly preserved within the buried soils and the ditch deposits at Little Doward. The few recorded pollen grains and fern spores reflected differential preservation rather than a true picture of the species present on or around the site. This lack of preservation, due to oxidation within the iron rich soils, has unfortunately been recorded at other recent hillfort excavations in Herefordshire i.e. Credenhill and Dinmore Hill (Scaife in Dorling, 2009 and Dorling, et al forthcoming).

Plant and insect remains

The potential for waterlogged deposits necessary for the preservation of plant and insect remains is minimal especially on the limestone which is by its very nature well drained and porous. These remains may be represented in charred material but this has good preservation on virtually all archaeological sites.

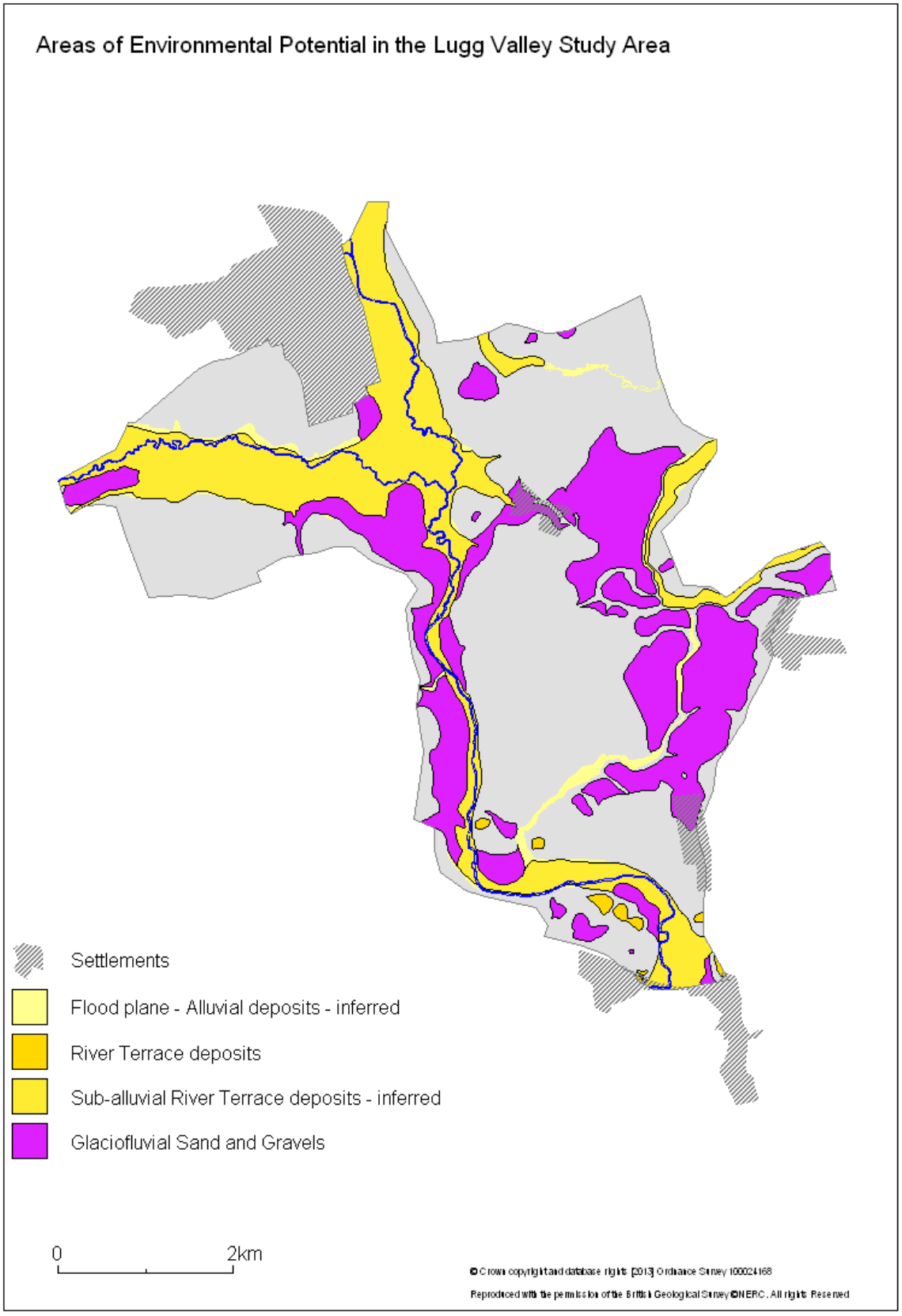


Figure 36: Areas of environmental potential in the Lugg Valley study area

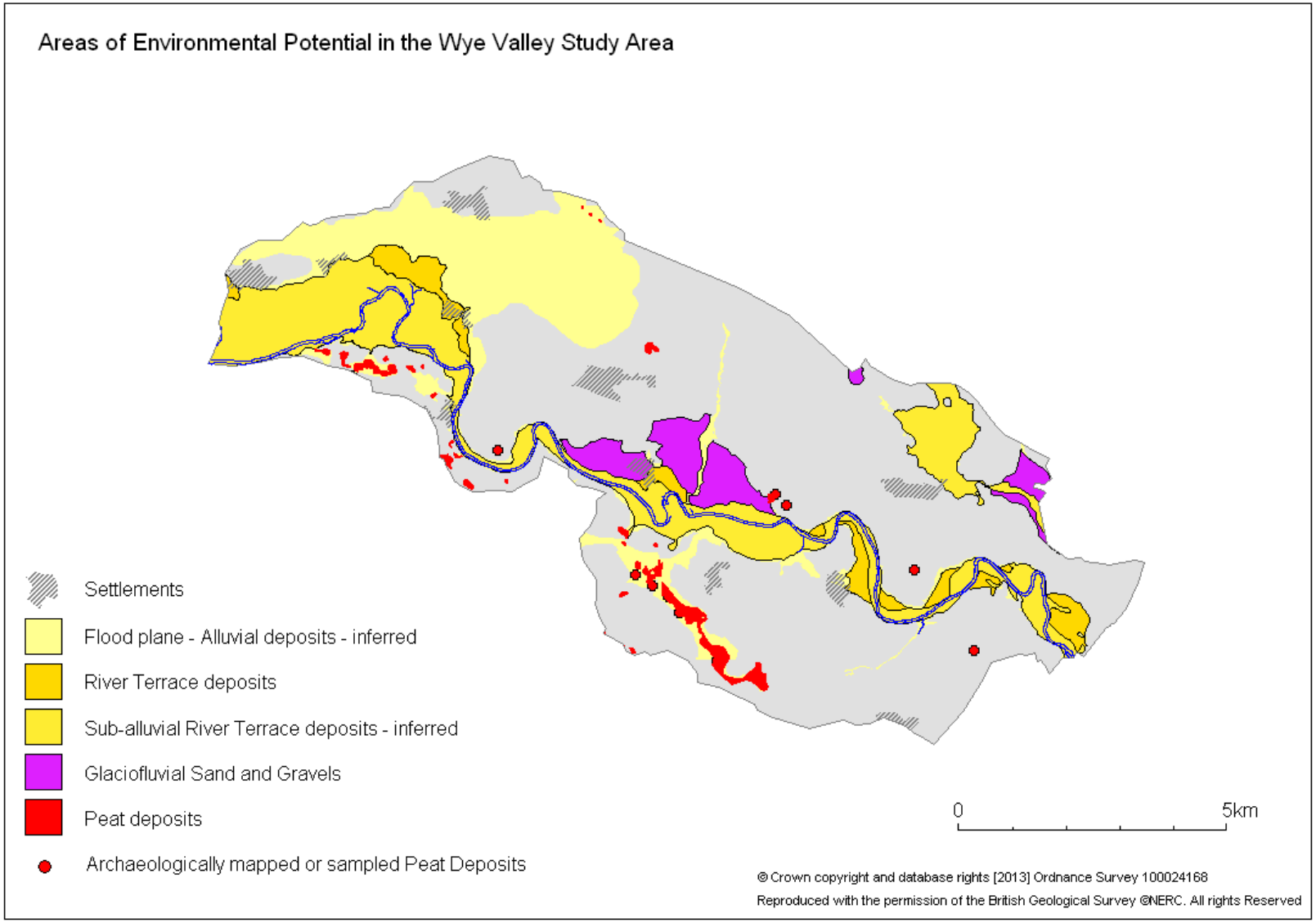


Figure 37: Areas of environmental potential in the Wye Valley study areas

4.5 Air Photo Mapping and Interpretation in Lugg and Wye study areas

Chris Cox

Introduction

This report was prepared by Chris Cox at Air Photo Services Ltd. on behalf of Herefordshire Archaeology in October 2013. Interpretation of aerial photographs was undertaken by Chris Cox BA MA MIfA and Tracy Michaels BSc AIfA.

The work was funded by English Heritage as a component of the Herefordshire County Archaeology and Minerals Resource Assessment (PN 6495).

For the purposes of this exercise three areas were defined and studied in detail as part of the aerial photograph mapping work. These are the whole of the Lugg Valley study area and two parts of the Wye Valley study area one centred on Letton and one in the Credenhill / Madley area.

The object of this aerial photographic assessment was to provide information on the location and nature of archaeological sites and areas which are visible on aerial photographs.

It is important to note that aerial photographs usually only show part of the horizontal and vertical extent of buried and upstanding features. Their capacity to reveal features as crop marks, vegetation marks, soil marks or as the shadows cast by banks, ditches and walls, depends upon a number of environmental and agricultural factors prevalent at the time of the photographic survey. (Riley 1980, Wilson 1982 and 2000).

Buried archaeological sites were recorded as crop marked former settlement and funerary landscapes, alongside former water meadows, post enclosure landscape features, former extraction pits and some traces of medieval agriculture (ridge and furrow).

These sites have been accurately located to an Ordnance Survey (OS) map base to facilitate further assessment as appropriate to the requirements of the project.

Archaeology from aerial photographs

The Role of Aerial Photographic Interpretation

Air photo interpretation provides an overview of landscape history and changes in land use. It provides informed guidance for subsequent desk and ground-based investigations and complements cartographic and documentary research. In this case it has identified a series of crop marked sites and allowed their precise location to inform appropriate mitigation strategies during construction.

Some information gained from aerial photographs cannot easily be detected by other means. Aerial photographs provide a chronologically documented and seasonal overview of a landscape and the sites and features within it. The interpretation of contemporary and archival aerial photographs is thus an important component of multi-disciplinary archaeological investigation.

Interpretation of aerial photographs allows the definition and in some cases the accurate mapping of archaeological sites or natural features recorded as crop, grass or vegetation marks (caused by the differential growth of plants over buried features); soil marks (caused by differences in soil colour over ploughed buried features) and shadows cast by upstanding earthworks and features seen in relief.

Limitations of the Data

Aerial photographic evidence is limited by seasonal, agricultural, meteorological and environmental factors which affect the extent to which either buried or upstanding archaeological features can be detected. It is thus advantageous to examine a range of photos taken under a variety of environmental conditions in order to build up a comprehensive interpretation of the archaeological landscape. The visibility of archaeological features may differ from year to year and be obscured by differential depths of soil or differing types of vegetation. Individual photographs often record only a small percentage of the actual extent of buried or upstanding features.

Newly recorded features are in evidence for recent photographs displayed at Google Earth and there will be other features in this area which have not been recorded as crop marks or earthworks on aerial photographs due to unsuitable environmental conditions at the time of photographic survey.

Types and Sources

Types

Two types of aerial photograph are used for archaeological interpretation. Vertical aerial photographs are taken for general-purpose survey using a camera mounted inside a modified aircraft. The aircraft is flown on a pre-planned set of overlapping flight-lines which cover the survey area completely. The camera points straight towards the ground. The vertical viewpoint provides aerial photographic coverage from a fixed scale and constant 180□ angles at the centre of each frame. The overlap between the areas covered by each consecutive frame is usually 60%. This overlap between frames enables the photo interpreter to study each pair of vertical photos under a stereoscope.

The stereoscope combines the two images to allow the interpreter to see one three-dimensional image of the ground surface. Vertical aerial photographs carry inherent distortions introduced by variations in perspective and ground height, but are essentially ‘map-like’ in appearance. They are generally taken for non-archaeological, civil and military purposes and form the basic data from which most modern maps are compiled.

Vertical aerial photographs are a very useful source of archaeological data, particularly in areas such as this, where features survive as earthworks.

Oblique aerial photographs are taken using a hand held camera by an aerial archaeologist to portray features which have been identified during specialist survey. These photos are extremely useful, but contain inherent perspective distortions, which must be accounted for in rectification and mapping procedures. In this case, both vertical aerial photographs, and specialist oblique's which are taken with a hand held camera by an archaeological surveyor, were available for interpretation.

Sources of Data

English Heritage Archive

English Heritage, The Engine House, Fire Fly Avenue, Swindon, Air Photo enquiry number AP 69534A This enquiry identified 221 oblique aerial photographs and 756 vertical aerial photographs which were taken between 1946 and 2004.
Cambridge University Collection of Aerial Photographs (CUCAP)

This collection was searched but relevant photographs within this collection are held as duplicates within the English Heritage Archive.

Online sources

The ortho-rectified mosaics of vertical aerial photographs at Google Earth were consulted online for this assessment and included all available timelines from 1999 to 2013.

Interpretation and mapping methodology

All photographs were interpreted in accordance with the client's brief for the Project (Herefordshire Archaeology 2012), the English Heritage National Mapping Programme (NMP) standards and current accepted best practise.

The photographs were closely examined, under 1.5x and 4x magnification and interpreted with the aid of a mirror stereoscope where appropriate, or in detail on screen when consulted as digital files. All interpretations, which were derived from multiple aerial photographs, were scanned and digitally rectified to an OS map base using AirPhoto 3.58 software and mapped using AutoCad Map GIS software.

The printed map is presently scaled to fit the appropriate paper size for illustration, and illustrate areas which were defined during the assessment. Plan 2 shows the location of Plans 3 to 5, which detail the sites mapped from APs.

Mapping is also provided digitally for import to a Geographic Information System (GIS) in Drawing Exchange Format (DXF) release 12.

Metadata were input directly to the clients' Heritage Environment Record database, HBSMR.

The Lugg Valley Study Area

Location

The study area (Plan 1) lies within the Valley of the River Lugg to the south and south-east of Leominster in Herefordshire, UK. The area contains the modern settlements of Newtown, Stoke Prior, part of Hope under Dinmore and Bodenham in the south.

Geology and Soils

The majority of the area lies over Devonian silt and sandstone which gives rise to fine silty soils of the Bromyard soil association (SSEW 1983, classification 571b). There are small areas of Cretaceous loam over sandstone to the south of Leominster (SSEW 1983 classification 571d, Fyfield 1 soil association).
The river valley contains alluvial soils of the Conway and Hollington soil associations (SSEW 1983, classifications 811 b & c).
These soils are productive of crop marked information over buried features and the environment was attractive to past settlers. It is now predominately used for modern arable agriculture.

Results

Description

This assessment of aerial photographs has defined 39 areas of archaeological interest within the study area and its immediate environs.

These areas are defined on the digital map and on Plans 3 to 5. They are numbered L 01 – L 39.

Aerial photographs record a multi period archaeological landscape in the river valley. Ditched enclosures, field systems, pits and track ways show as crop marks, alongside ring ditches which are likely to reflect a probable Bronze Age funerary land use.

There are few features which immediately surround the known hillfort at Risbury, but many of the landscape features within the valley may have been settlement and farming sites associated with the hillfort.

There are some traces of medieval farming and settlement, as well as post medieval land use and water management close to the river.

The area to the south of Hampton Court shows the detailed arrangement of the former gardens, structures and a former maze as marks in the grass.

Conclusion

The study area contains buried evidence for prehistoric and probable Romano-British land use for farming, settlement, agriculture and funerary purposes.

These sites are heavily eroded and buried and show as marks in the growing crops, grass and soils.

The features will be persistent and present, although eroded, in the sub and possibly top soils and are likely to be more extensive than is presently revealed by the crop marked evidence.

The area was attractive to settlers and was farmed and settled in the medieval period, as it is in modern times. Traces of eroded and extant ridge and furrow have been recorded, and this is likely to have been more extensive than is now preserved in the archaeological record.

These sites are typical of pre modern settlement and farming landscapes in fertile river valleys on light cultivable soils. Appropriate mitigation methods will be necessary to record these sites in advance of any changes to the modern landscape.

Summary of sites which are visible on aerial photographs within the Leominster study area

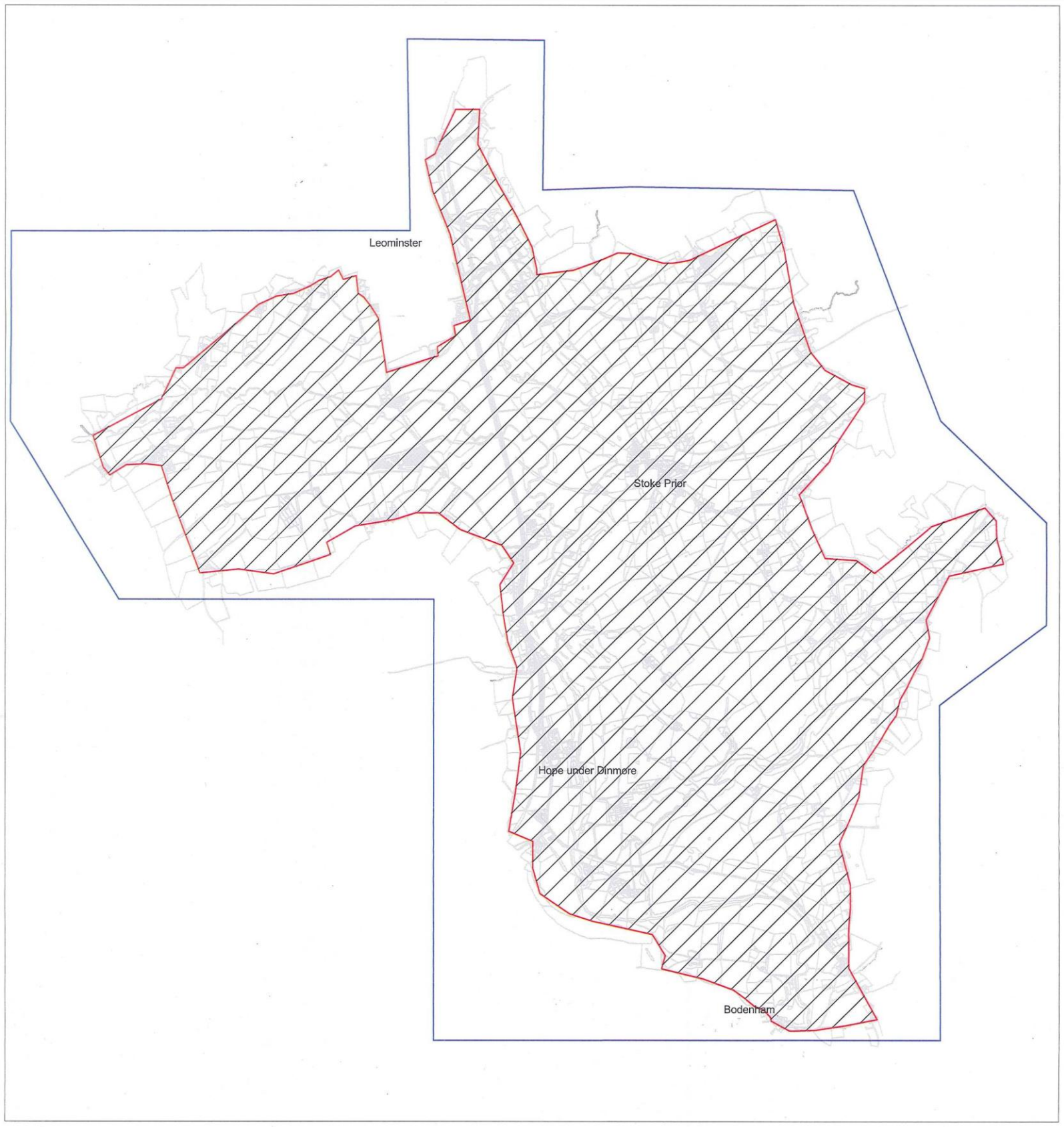
AP Site	HER	NGR	Site Type	Location	Period	Form	Present Condition	Plan
L 01	9209	SO 475 572	Water Meadows or drains	Newtown	Post medieval	Earthwork	Extant	3
L 02	10377	SO 474 561	Ditched enclosures	Lime Kiln Field, Ivington	Unknown	Crop mark	Eroded	3
L 03	31549	SO 479 569	Field system	The Workhouse, The Bury, Ivington	Medieval, post medieval	Earthwork	Extant	3
L 04	31806	SO 484 574	Buried ditched enclosures and pits, possible settlement site. Field system	Dishley	Possibly prehistoric or Romano-British, medieval	Crop mark	Eroded	3
L 05	31003	SO 534 577	Field system, buried ditches and water meadows	The Leasows	Medieval, unknown and post medieval	Crop mark and earthworks	Eroded and extant features	4
L 06	31805	SO 491 575	Funerary sites, trackway	Cock Croft	Prehistoric, possibly Bronze Age	Crop mark	Eroded	3
L 07	53109	SO 500 572	Possible drainage or water meadows	Elms Green	Post-medieval	Earthwork	Extant	3 and 4

AP Site	HER	NGR	Site Type	Location	Period	Form	Present Condition	Plan
L 08	44319	SO 508 578	Possible buildings, boundaries and field systems	Hall	Possibly medieval or post medieval	Crop mark	Eroded	4
L 09	44311, 44312	SO 506 508	Field system, drains or water meadows	Eaton	Medieval Post medieval	Earthwork	Eroded	4
L 10	53110	SO 521 538	Possible enclosure and ditches	Wig Wood	Unknown	Crop mark	Eroded	5
L 11	11948	SO 520 522	Possible former buildings and garden features, deer park and maze	Hampton Court	Late medieval post medieval	Crop mark	Eroded and buried	5
L 12	53111	SO 523 550	Pits and ditches	North of Wickton Court	Unknown	Crop mark	Eroded	4 and 5
L 13	26804	SO 482 571	Field system, water meadows and drains	Ivington Bury	Medieval and post medieval	Crop mark and slight earthwork	Eroded and slightly extant	3
L 14	30071, 53112	SO 540 548	Field system and earthworks	Upper Ho	Medieval	Earthwork	Extant	5

AP Site	HER	NGR	Site Type	Location	Period	Form	Present Condition	Plan
L 15	10378, 10380	S0 514 564	Ditched enclosures with internal features, pits and quarries, track way and field systems	Wharton Court	Iron Age or Romano-British	Crop mark	Eroded	4
L 16	44314, 44315	SO 510 577	Field system	Hall	Medieval	Earthwork	Extant	4
L 17	N/A	SO 514 525	Boundary	Dinmore Hill	Post medieval	Crop mark	Eroded	5
L 18	31613?	SO 521 518	Field systems, possible lynchets and eroded ridge and furrow	Marches Way	Medieval	Earthwork	Extant	5
L 19	2221	SO 541 552	Hillfort	Risbury	Iron Age	Earthwork	Extant	4 and 5
L 20	24101	SO 527 559	Settlement features	Norman's Farm	Unknown, possibly prehistoric or Romano-British	Crop mark	Eroded	4
L 21	34728	SO 529 566	Enclosures, pits, ditches and partially visible curvilinear enclosure	Blackwardine	Possible prehistoric or Romano-British	Crop mark	Eroded	4
L 22	30761	SO 537 516	Field system and rectilinear enclosure	Bodenham	Medieval Unknown	Earthwork	Eroded	5

AP Site	HER	NGR	Site Type	Location	Period	Form	Present Condition	Plan
L 23	53114	SO 534 514	Sub-circular ditched enclosure	Bodenham	Possible prehistoric	Crop mark	Eroded	5
L 24	24129	SO 531 556	Circular features	The Heath	Unknown	Grass mark	Eroded	4
L 25	53117, 43965, 3076	SO 533 568	Probable settlement site and quarrying	Blackwardine	Possibly Iron Age or Romano-British	Crop mark	Eroded	4
L 26	21034, 30120, 21038, 33843, 38547, 53117	SO 533 563	Enclosures, pits, ditches, ring ditch and quarrying	The Heath	Likely to be prehistoric or Romano-British	Crop mark	Eroded	4
L 27	24130, 53117	SO 531 570	Possible funerary site	Stretford	Possibly Bronze Age	Crop mark	Eroded	4
L 28	3986, 53117	SO 536 564	Field systems or possible drainage features	Blackwardine	Unknown	Earthwork	Extant	4
L 29	53117, 43965, 3986	SO 536 569	Settlement and quarrying	Steen's Bridge	Possibly prehistoric or Romano-British	Crop mark	Eroded	4
L 30	53115	SO 526 579	Boundary	The Drum	Post medieval	Earthwork	Extant	4

AP Site	HER	NGR	Site Type	Location	Period	Form	Present Condition	Plan
L 31	53116	SO 529 528	Field system, possible ditches and water meadow	East of Hampton Court	Medieval, unknown and post-medieval	Earthwork and crop mark	Eroded and extant	5
L 32	53118	SO 531 581	Buried foundations	Stretford (Henor Park)	Unknown	Exposed substrate with extant features	Extant in topsoil	4
L 33	53119	SO 530 579	Former boundary or embankment	Stretford	Post medieval	Soil mark	Eroded	4
L 34	53120	SO 525 519	Field system	Bodenham	Medieval	Crop mark	Eroded	5
L 35	53121	SO 527 574	Field system	Stoke Prior	Medieval	Earthwork	Extant but eroded	4
L 36	N/A	SO 539 535	Cut feature and ditch	Bowley Town	Unknown	Crop mark	Eroded	5
L 37	53123	SO 541 534	Linear ditches and possible cut features and enclosures	Bowley Town	Unknown	Crop mark	Eroded	5
L 38	53124	SO 511 570	Palaeochannels and drains or water meadow	Stoke Prior	Natural and post medieval	Earthwork	Extant	4
L 39	30290	SO 498 558	Possible settlement	Brierly	Unknown	Slight earth work	Extant but eroded	3 and 4



Drawing Title PLAN 1
Assessment of aerial photographs: LEOMINSTER
Location of the study area

Client Herefordshire Archaeology

Project Herefordshire County Archaeology and Minerals Resource Assessment (PN 6495)

Scale Scale from model

Drawing No APS 212 01 01 1

Drawing status Final 26 11 2013

Date 26th November 2013

Drawn CC

Key

Study area

Area which was searched for aerial photographs

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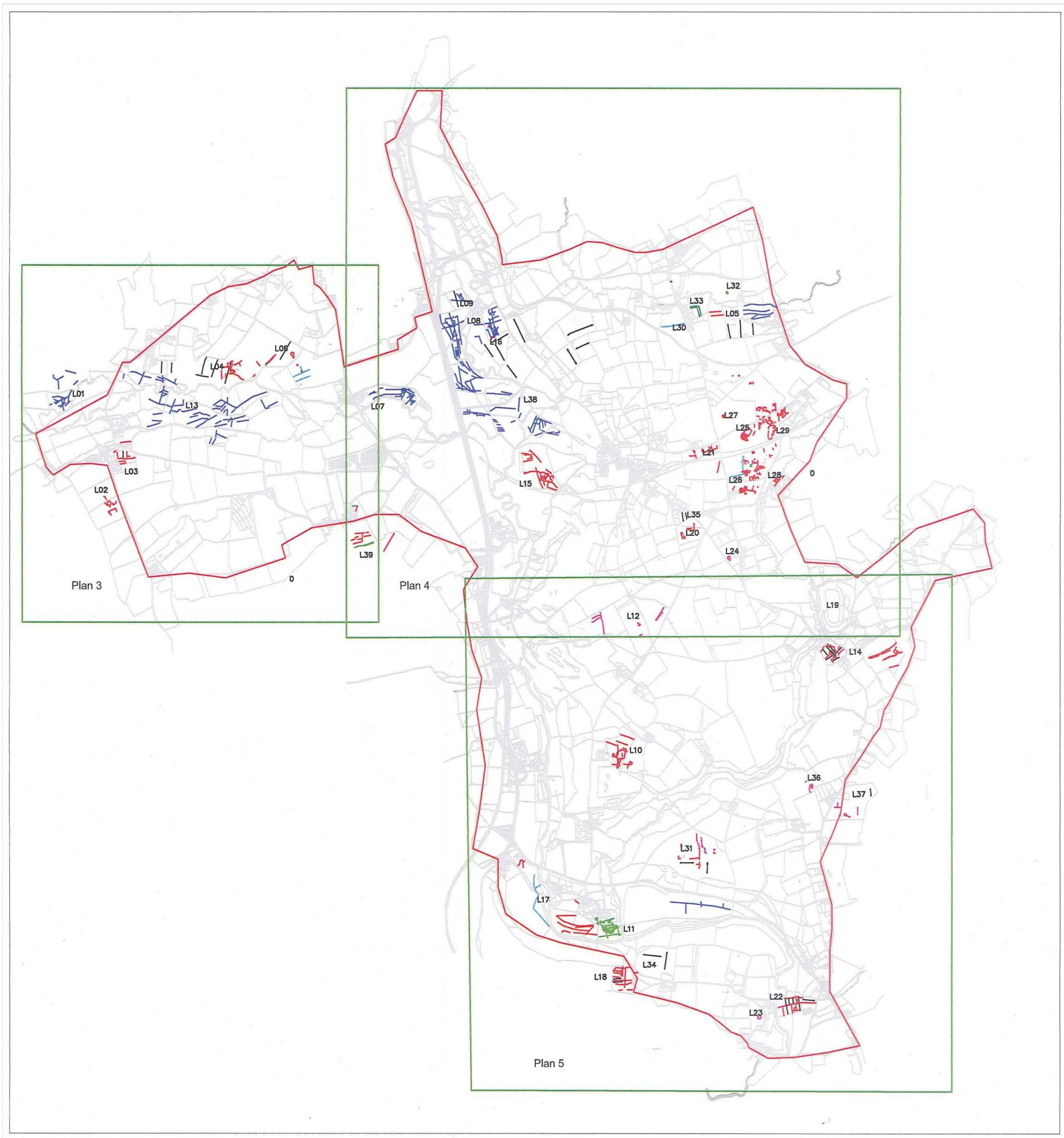
PLAN 1

Lugg Valley Study Area, Plan 1



Drawing Title PLAN 2

Assessment of aerial photographs LEOMINSTER

Location of all AP sites and plans

Client Herefordshire Archaeology

Project Herefordshire County Archaeology and Minerals Resource Assessment (PN 6495)

Scale Scale from model

Drawing No APS 212 01 01 2

Drawing status Final 26 11 2013

Date 26th November 2013

Drawn CC

Key

Study area

Plans

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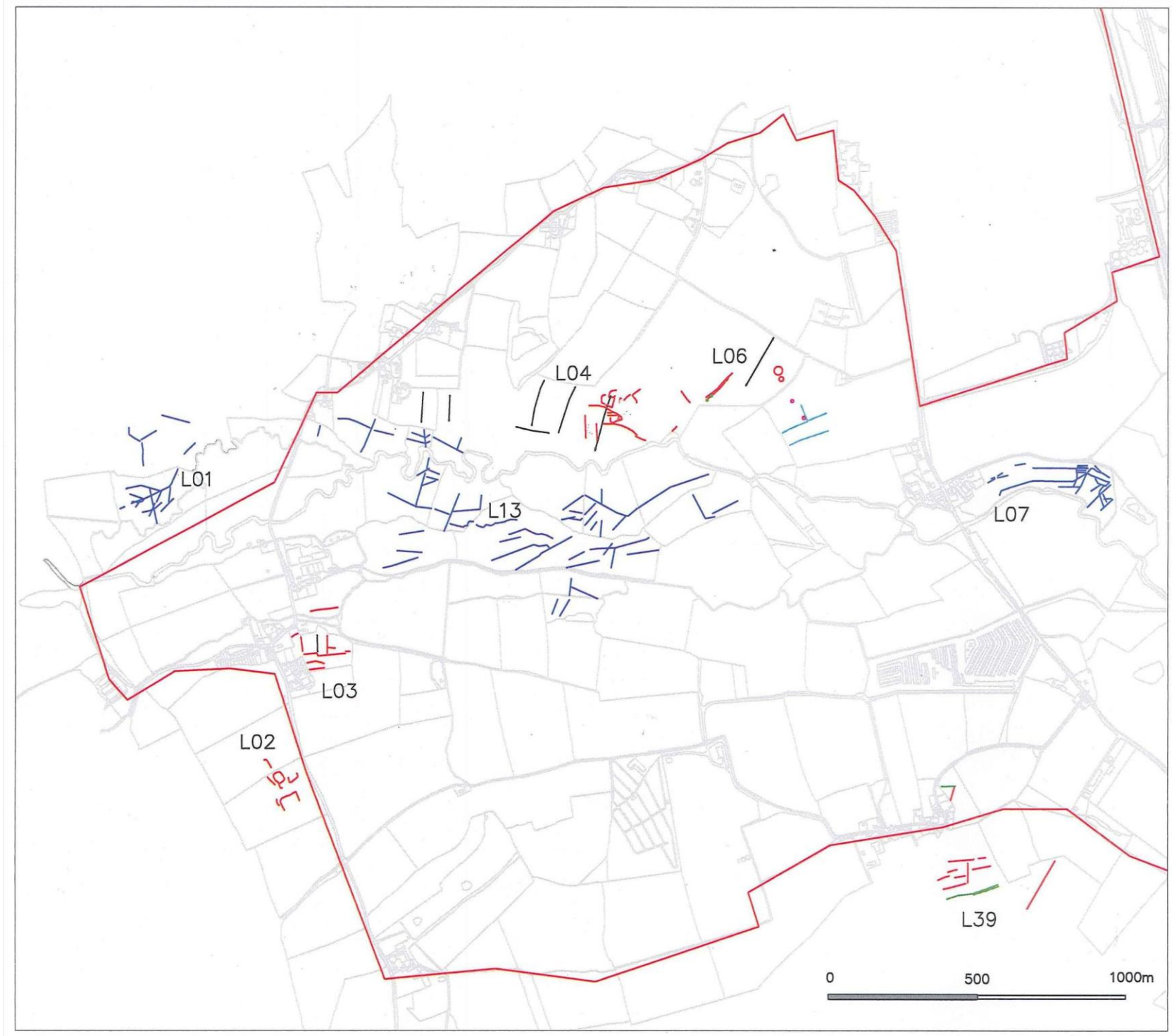
PLAN 2

Lugg Valley Study Area, Plan 2



Drawing Title PLAN 3

Assessment of aerial photographs: LEOMINSTER

North west sector of the study area

Sites L 01-04, 06, 07, 13 & 39

Client Herefordshire Archaeology

Project Herefordshire County Archaeology and Minerals Resource Assessment (PN 6495)

Scale Scale from model

Drawing No APS 212 01 01 3

Drawing status Final 26 11 2013

Date 26th November 2013

Drawn CC

Key

Study area

Cut features

Embanked features or foundations

Water management features

Ridge and furrow

Possible archaeological features

Former boundaries

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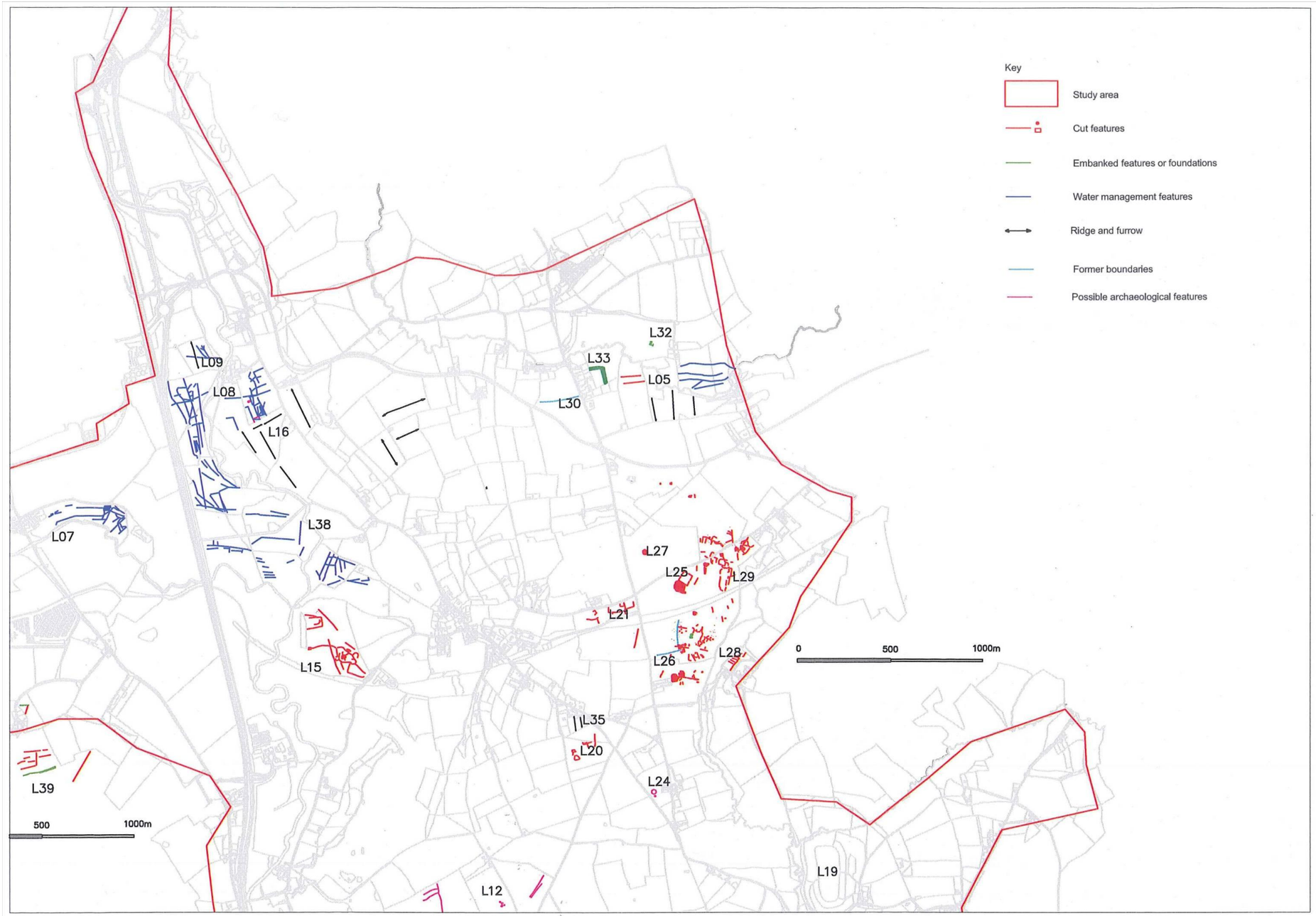
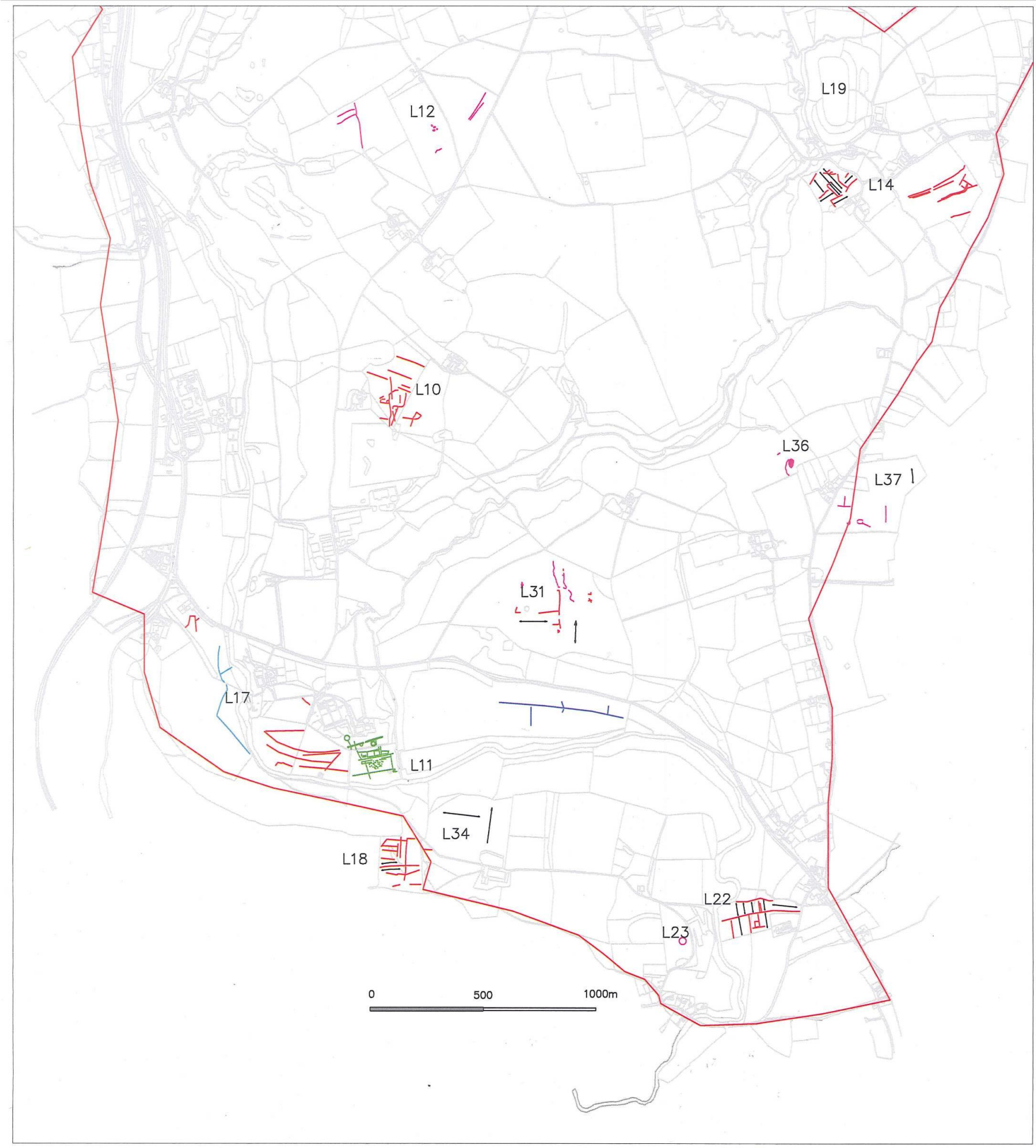
Lugg Valley Study Area, Plan 3



Lugg Valley Study Area, Plan 4



Drawing Title	PLAN 5
	Assessment of aerial photographs: LEOMINSTER
	South sector of study area
	Sites L 10 -12, 14, 17 - 19, 22, 23, 31, 34, 36 & 37
Client	Herefordshire Archaeology
Project	Herefordshire County Archaeology and Minerals Resource Assessment (PN 6495)
Scale	Scale from model
Drawing No	APS 212 01 01 5
Drawing status	Final 26th November 2013
Date	26th November 2013
Drawn	CC

Key

- Study area
- Cut features
- Embanked features or foundations
- Water management features
- Ridge and furrow
- Former boundaries
- Possible archaeological features

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PLAN 5

Lugg Valley Study Area, Plan 5

The Wye Valley – Credenhill area

Location

The study area (Plan 1) lies within the Valley of the River Wye in Herefordshire, UK. The area contains the modern settlements of Credenhill, Bishopstone, Canon Bridge, and Madley.

Geology and Soils

The majority of the area lies over till and sandstone which gives rise to loamy soils of the Escrick 1 soil association (SSEW 1983, classification 571p). There are small areas of more waterlogged silty soils (SSEW 1983 classification 711k, Vernolds soil association).

The river valley contains alluvial soils of the Teme soil association (SSEW 1983, classification 561b).

The majority of these environments are productive of crop marked information over buried features in times of moderate soil moisture deficit. The river valley environment was obviously attractive to past settlers and was the focus of Roman settlement and transport features. It is now predominately used for modern arable agriculture with some foci of modern settlement which are likely to overlie medieval and later settlement areas.

Results

Description

This assessment of aerial photographs has defined 22 areas of archaeological interest within the study area and its immediate environs.

These areas are defined on the digital map and on Plans 3 to 5. They are numbered C 01 – C 22.

Aerial photographs record a multi period archaeological landscape in the river valley. Ditched enclosures, field systems, pits and track ways show as crop marks, alongside ring ditches which are likely to reflect a probable Bronze Age funerary land use.

There is a known Roman town, *Magnis*, near modern Kentchester. This site is variably evident as marks in crops caused by the robbed out and vestigial remains of the building foundations which reflect an area of dense settlement on either side of a straight road. The remains are more extensive than those reflected on the oblique aerial photographs. Vertical photographs taken by the University of Cambridge show that the remains are likely to extend towards Credenhill, as detailed below in the gazetteer of sites. These remains show

variably and are not visible in any detail on the photographs displayed at Google Earth.

There are some traces of medieval farming and settlement, as well as post medieval land use and water management close to the river.

Conclusion

This study area contains crop marked remains which present a picture of individual small farmstead type enclosed settlements which are likely to date to the Iron Age or Romano-British periods. The area has been heavily ploughed and used in modern times and there are traces of medieval fields which were likely to have been more extensive than shown by the AP record.

The former Roman town at *Magnis* lies at the heart of the area and there is an Iron Age Hillfort outside the area. As stated in the gazetteer above, the Roman town may be more extensive to the north than initially indicated on the oblique aerial photographs.

The study area presents a high potential for archaeological discovery *via* both intrusive and non-intrusive survey methods. The modern aerial photographs displayed at Google Earth have added considerably to the known extent and number of sites which show as crop marks. This indicates a higher potential for discovery than is presently accounted for by the specialist oblique aerial photographic record and highlights the potential for on-going discovery in this area from aerial photographic surveys.

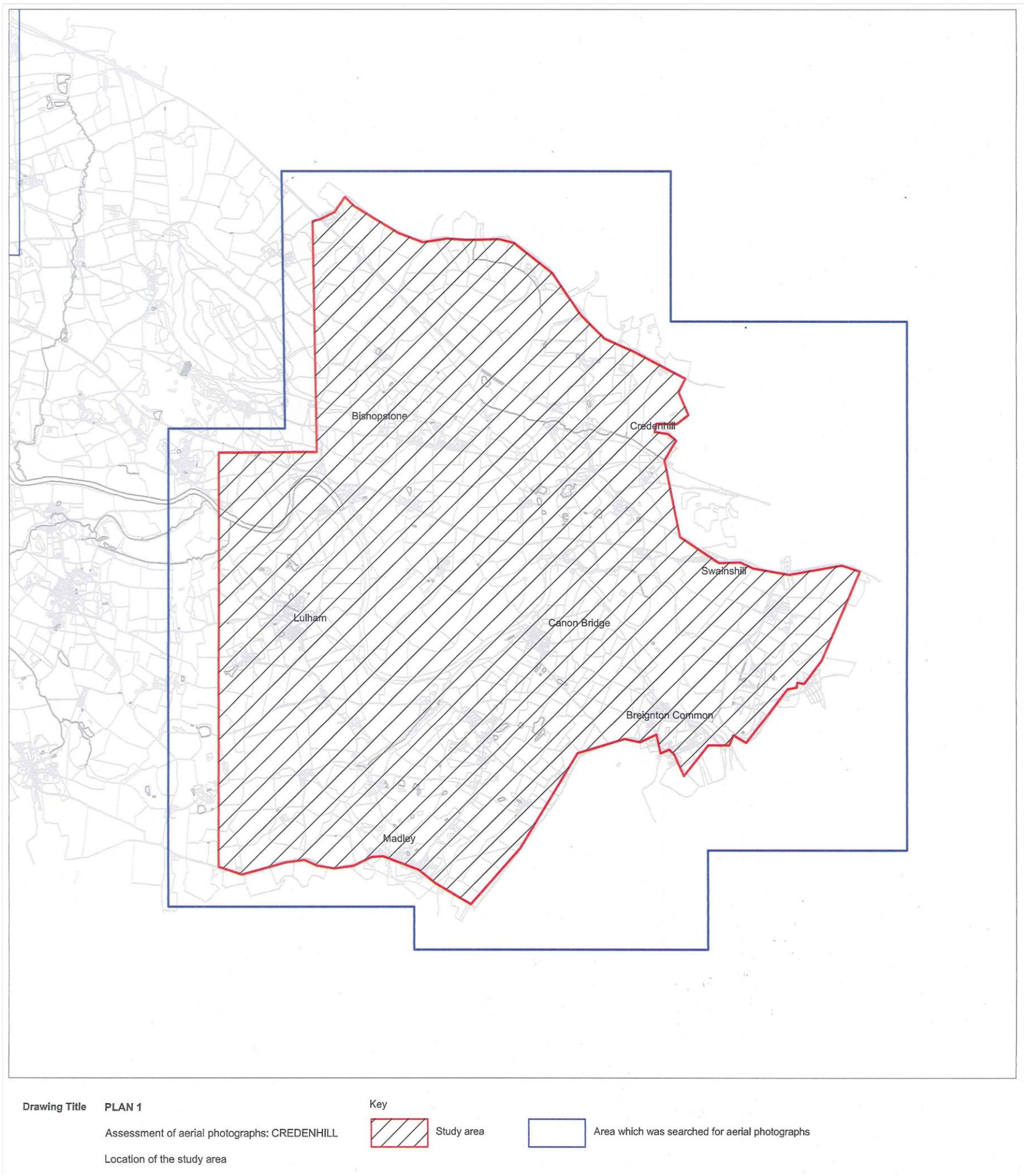
The sites recorded from the air are typical of pre modern settlement and farming landscapes in fertile river valleys on cultivable soils. Appropriate mitigation methods will be necessary to record these sites and account for the potential of their environs, in advance of any intrusive works as appropriate to the nature of any future minerals extraction plans.

Summary of sites which are visible on aerial photographs within the Wye Valley (Credenhill) study area

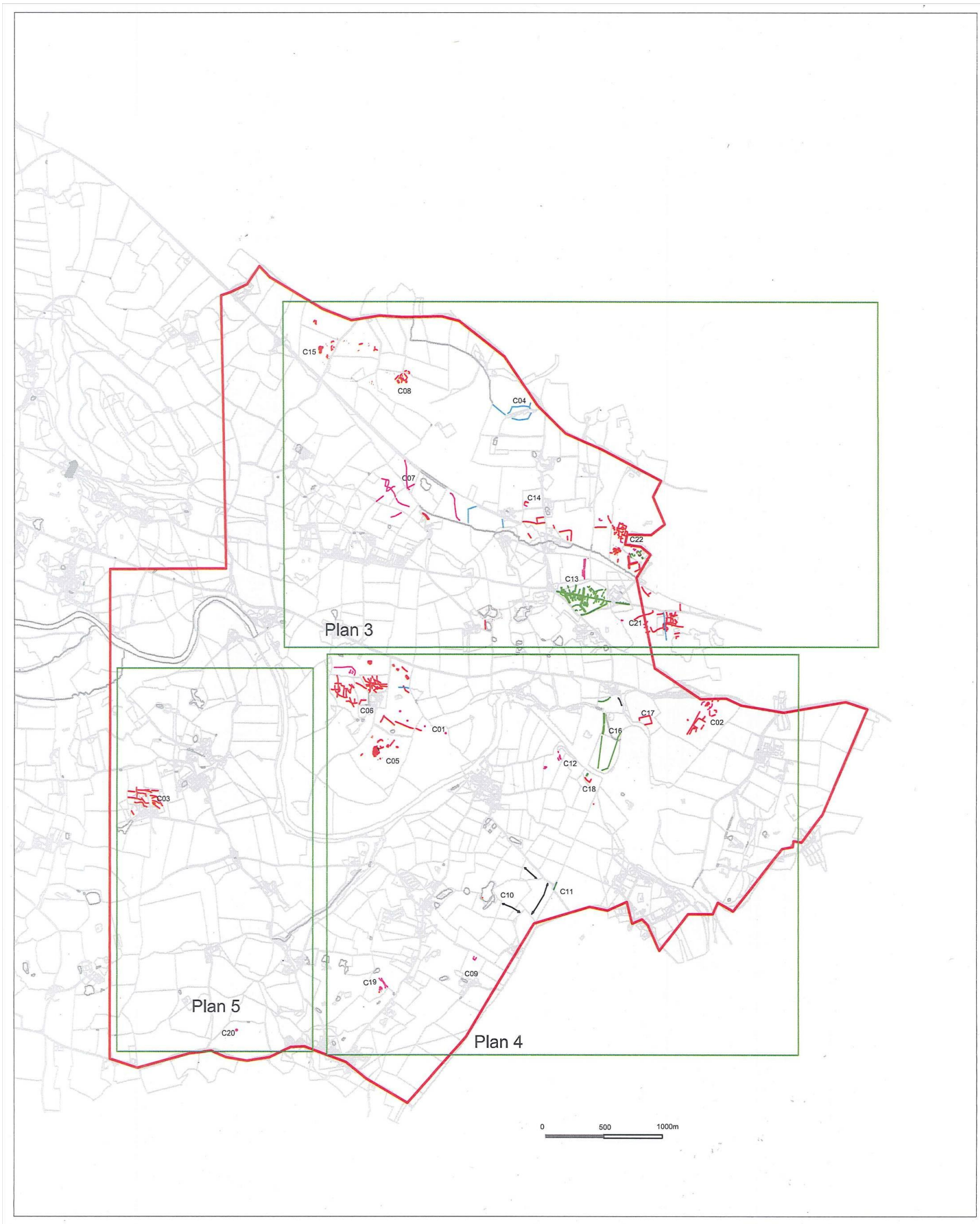
AP Site	HER	NGR	Site Type	Location	Period	Form	Present Condition	Plan
C 01	53034	SO 428 416	Sub-circular crop marks	Marsh Court	Unknown	Crop mark	Eroded and buried	4
C 02	2452, 2453	SO 451 416	Settlement	Sugwas Pool	Possible Iron Age/Romano-British	Crop mark	Eroded and buried	4
C 03	1031	SO 404 410	DMV	Carwardine Green Farm, Madley	Unknown, possible post medieval	Earthwork when first observed, now eroded	Eroded	5
C 04	53035	SO 435 444	Former settlement	Brinsop Common	Modern	Crop mark	Eroded and buried	3
C 05	38136	SO 423 414	Settlement	South of Marsh Court	Possible Iron Age/Romano-British	Crop mark	Eroded and buried	4
C 06	1053	SO 424 416	DMV	West of Marsh Court Farm	Possibly post medieval	Earthwork	Upstanding when first observed but now eroded	4

AP Site	HER	NGR	Site Type	Location	Period	Form	Present Condition	Plan
C 07	53037	SO 425 438	Former boundaries and drains	Bishopstone	Post medieval or modern	Earthwork and crop marks	Eroded and buried	3
C 08	10372, 10373	SO 425 446	Settlement	North of Bishopstone	Possible Bronze Age (10373) & Iron Age/Romano-British	Crop mark	Eroded and buried	3
C 09	53040	SO 431 396	Possible enclosure	Warlow Farm	Unknown	Crop mark	Eroded and buried	4
C 10	53039	SO 434 402	Field system	Canon Bridge	Medieval	Vestigial earthwork	Eroded	4
C 11	6883	SO 438 402	Possible part of Roman road	Canon Bridge	Possibly Roman	Crop mark	Eroded and buried	4
C 12	22855	SO 440 412	Possible cut features	Canon Bridge	Unknown	Crop mark	Eroded and buried	4
C 13	53038, 10164 & 25907	SO 440 427	Roman town, *Magnis*	Kenchester	Roman	Crop mark	Eroded and buried	3
C 14	31817	SO 436 435	Settlement	Kenchester	Possibly Iron Age/Romano-British	Crop mark	Eroded and buried	3

AP Site	HER	NGR	Site Type	Location	Period	Form	Present Condition	Plan
C 15	53036	SO 418 448	Settlement	Shetton Farm	Possible Iron Age/Romano-British	Crop mark	Eroded and buried	3
C 16	258	SO 442 416	Roman Road	Canon Bridge	Roman	Crop mark and earthwork	Eroded	4
C 17	8302	SO 445 417	Possible settlement enclosure	Sugwas Pool	Possibly Iron Age/Romano-British	Crop mark	Eroded and buried	4
C 18	22856	SO 441 411	Buried foundation and ditches	Canon Bridge	Unknown	Crop marks	Eroded and buried	4
C 19	53041	SO 423 394	Possible ditches and quarry	North of Madley	Unknown	Crop mark	Eroded and buried	4
C 20	30191	SO 409 389	Possible funerary site	Madley	Possible Bronze Age	Crop mark	Eroded and buried	5
C 21	819	SO 445 426	Settlement	Credenhill	Iron Age/Romano-British	Crop mark	Eroded	3
C 22	1732, 8930, 10165	SO 445 427	Settlement	Credenhill	Iron Age/Romano-British	Crop mark	Eroded and buried	3



Wye Valley, Credenhill Study Area, Plan 1



Drawing Title PLAN 2
Assessment of aerial photographs: CREDENHILL
Location of all AP sites and plans 3 - 5

Client Herefordshire Archaeology

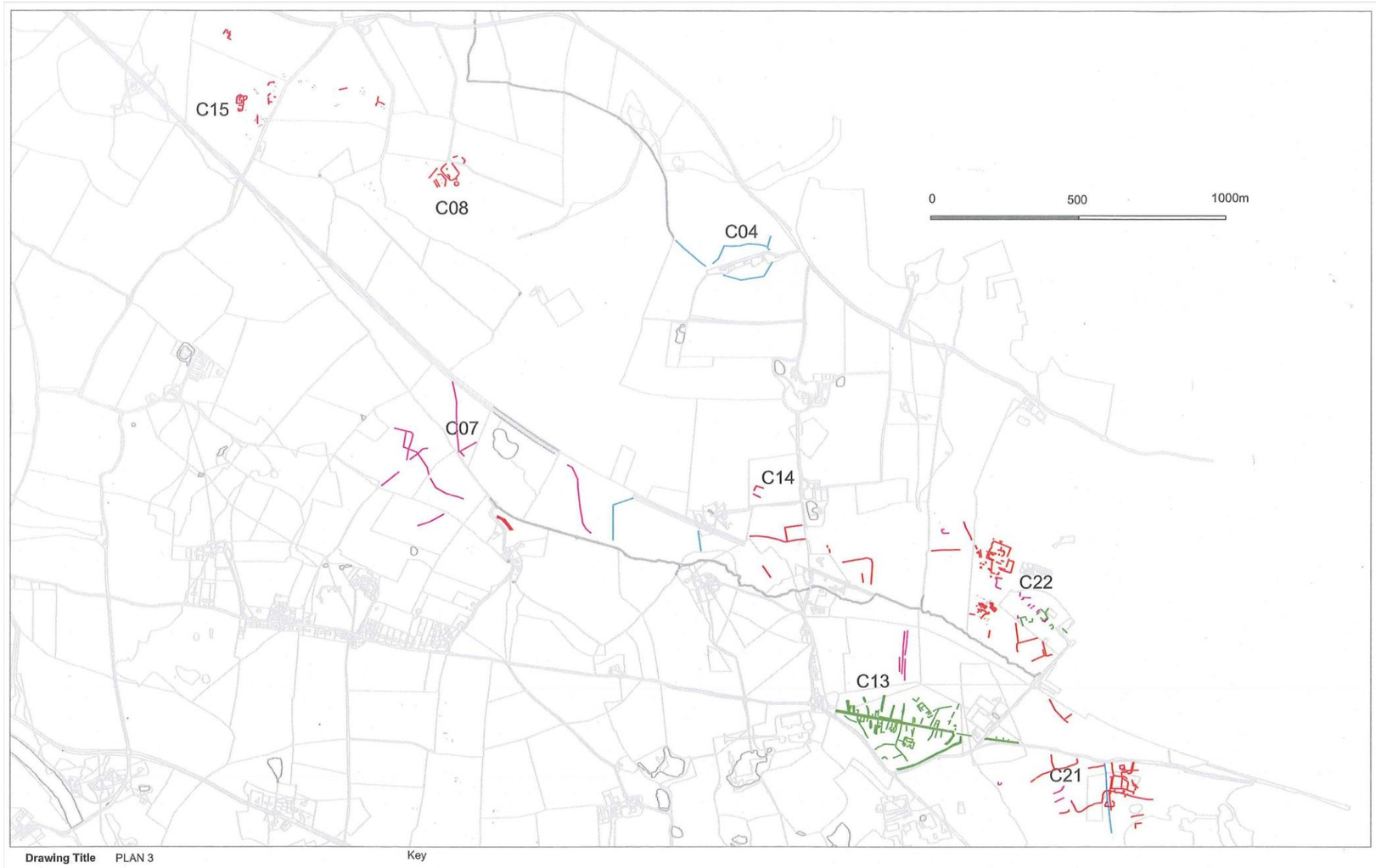
Project Herefordshire County Archaeology and Minerals Resource Assessment (PN 6495)

Key

Study area

Plans

Wye Valley, Credenhill Study Area, Plan 2



Drawing Title PLAN 3

Assessment of aerial photographs: CREDENHILL

North sector of the study area

Sites C 04, 07, 08, 13-15, 21 & 22

Client Herefordshire Archaeology

Project Herefordshire County Archaeology and Minerals Resource Assessment (PN 6495)

Scale Scale from model

Drawing No APS 212 01 01 8

Drawing status Final 26 11 2013

Date 26th November 2013

Drawn CC

Key

- Cut features
- Buried foundations
- Ridge and furrow
- Possible archaeological features
- Former boundaries

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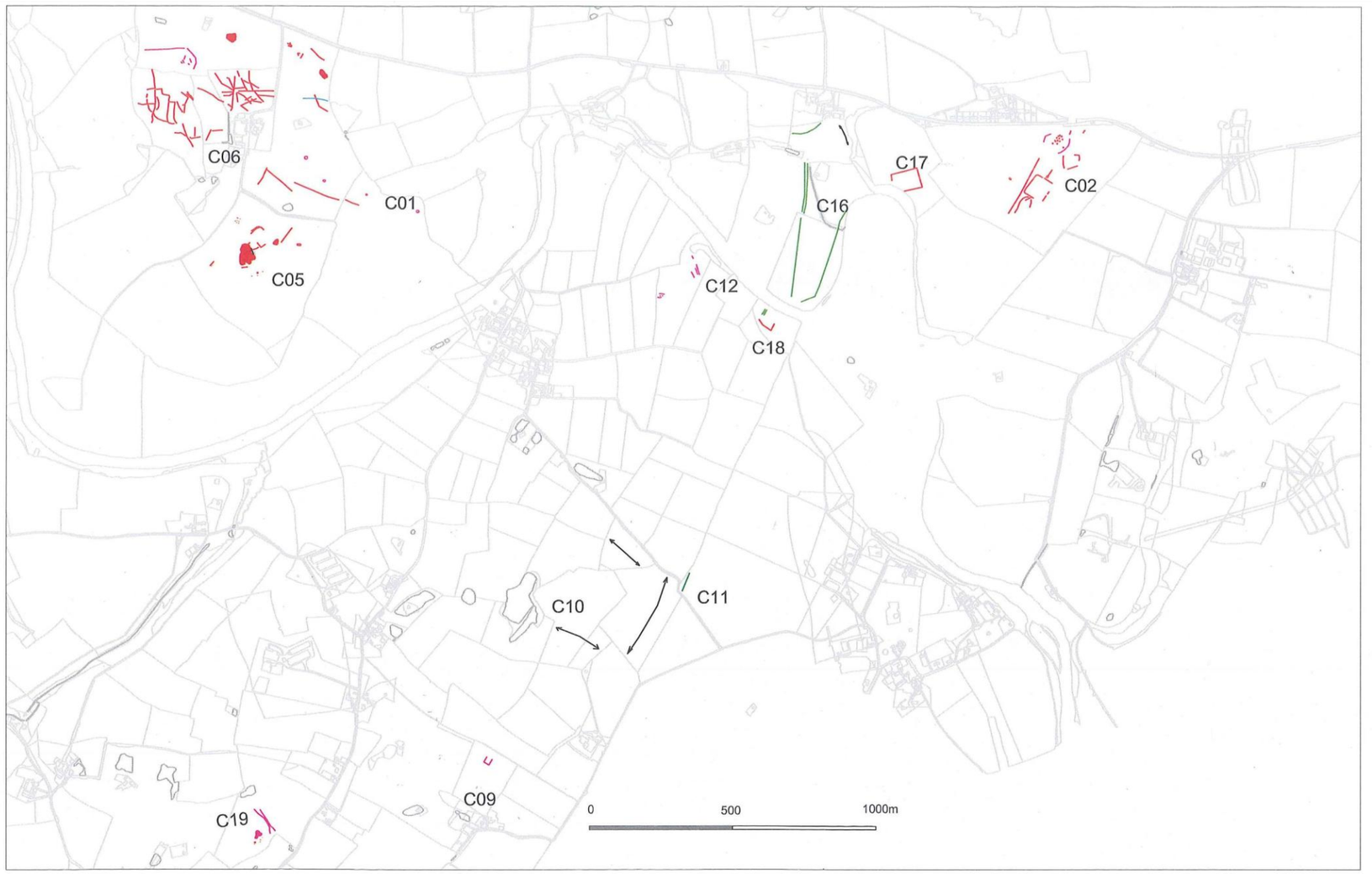
Wye Valley, Credenhill Study Area, Plan 3



Drawing Title PLAN 4
Assessment of aerial photographs: CREDENHILL
South east sector of the study area
Sites C01, 02, 05, 06, 09, 10 - 12, 16, 17 & 18

Client Herefordshire Archaeology

Project Herefordshire County Archaeology and Minerals Resource Assessment (PN 6495)

Scale Scale from model

Drawing No APS 212 01 01 9

Drawing status Final 26 11 2013 **Date** 26th November 2013 **Drawn** CC

Key

- Cut features
- Embanked features or foundations
- Ridge and furrow
- Possible archaeological features
- Former boundaries

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Wye Valley, Credenhill Study Area, Plan 4

Drawing Title PLAN 5

Assessment of aerial photographs: CREDENHILL

South west sector of the study area

Sites C03 & C20

Client Herefordshire Archaeology

Project Herefordshire County Archaeology and Minerals Resource Assessment (PN 6495)

Scale Scale from model

Drawing No APS 212 01 01 10

Drawing status 26 11 2013

Date 26th November 2013

Drawn CC

Key

Cut features

Embanked features or foundations

Ridge and furrow

Possible archaeological features

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Wye Valley, Credenhill Study Area, Plan 5

The Wye Valley Bredwardine area

Location

The study area (Plan 1) lies within the Valley of the River Wye in Herefordshire, UK. The area contains the modern settlements of Bredwardine, Kinnersley and Staunton on Wye.

Geology and Soils

The majority of the area lies over 1till and sandstone which gives rise to loamy soils of the Escrick 1 soil association (SSEW 1983, classification 571p). There are small areas of more waterlogged silty soils (SSEW 1983 classification 711k, Vernolds soil association).

The river valley contains alluvial soils of the Teme soil association (SSEW 1983, classification 561b).

The majority of these environments are productive of crop marked information over buried features in times of moderate soil moisture deficit. The river valley environment was obviously attractive to past settlers and the course of a Roman road traverses the area.

It is now predominately used for modern arable and pastoral with some smaller foci of modern settlement which are likely to overlie medieval and later settlement areas.

Results

Description

This assessment of aerial photographs has defined ten areas of archaeological interest within the study area and its immediate environs.

These areas are defined on the digital map and on Plans 3 to 5. They are numbered B 01 – B 10
Aerial photographs record a multi period archaeological landscape in the river valley. Ditched enclosures, field systems, pits and track ways show as crop marks, alongside ring ditches which are likely to reflect a probable Bronze Age funerary land use.

There are some traces of medieval farming and settlement.

Conclusion

This study area contains crop marked remains which indicate the presence of multi period buried heritage assets. These sites show as marks in crops in individual fields.

They are likely to be the remains of Bronze Age funerary monuments and later settlements and farmsteads with associated pits and track ways. The area carries higher potential for archaeological discovery than is revealed by the crop marked sites, which are less numerous than those in the adjacent study areas in the Lugg and eastern Wye valleys.

The area has been ploughed and used in modern times and there are traces of medieval fields which were likely to have been more extensive than shown by the AP record.

The historic air photos, which were taken in the 1940s, show areas of upstanding ridge and furrow which are now eroded.

In contrast to the eastern part of the Wye valley near Credenhill, the modern aerial photographs displayed at Google Earth have not added considerably to the known extent and number of sites which show as crop marks.

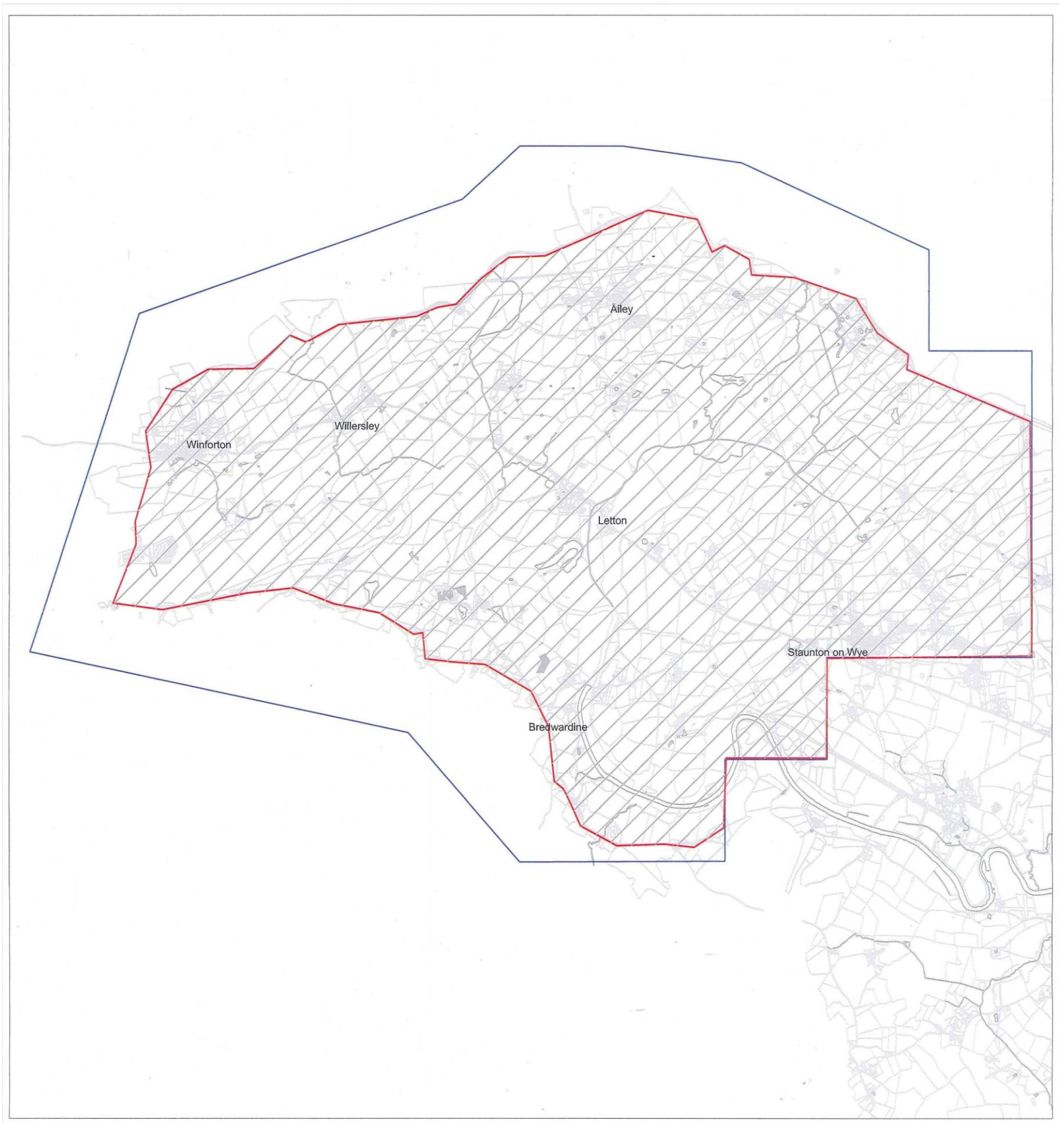
It is considered that the potential for further discovery is higher than is presently accounted for by the specialist oblique aerial photographic record and highlights the potential for on-going discovery in this area from aerial photographic surveys.

The sites recorded from the air are typical of pre modern settlement and farming landscapes in river valleys on cultivable soils.

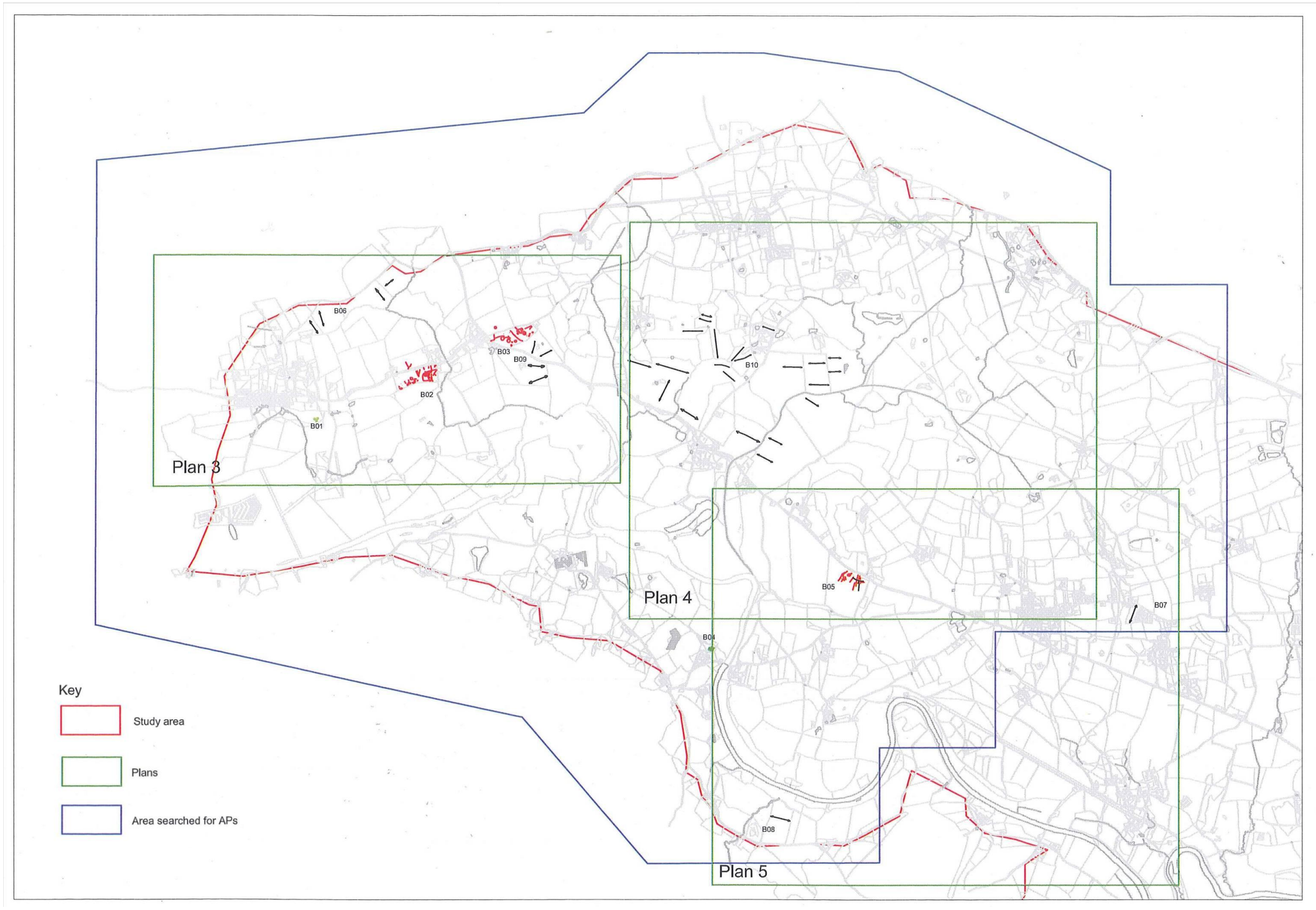
Appropriate mitigation methods will be necessary to record these sites and account for the potential of their environs, in advance of any intrusive works as appropriate to the nature of any future minerals extraction plans.

AP Site	HER	NGR	Site Type	Location	Period	Form	Present Condition	Plan
01	30118	SO 301 467	Probable garden features	Rockville House	Post medieval	Grass mark	Eroded and buried	3
02	7161 & 7162	SO 310 471	Ring ditch (funerary monument) enclosures and pits	Willersley	Multi period	Crop mark	Eroded and buried	3
03	50342	SO 318 475	Ring ditches (funerary monuments) enclosures, quarry and pits	East of Old Crow Farm, Eardisley	Multi period. unknown	Crop mark	Eroded and buried	3
04	1531	SO 334 448	Moat and motte and bailey	Old Court	Medieval	Earthwork	Upstanding	5
05	9832, 31385	SO 346 454	Possible agglomerated ditched enclosures, boundaries and field systems	Red Ley	Multi period	Crop mark	Eroded and buried	5
06	36819, 36820 36821 36822	SO 301 476	Field systems	Willersley	Medieval	Crop mark and vestigial earthwork	Eroded and buried	3
07	30354	SO 373 452	Field system, moat and fishponds	Killington Farm	Medieval	Crop mark	Eroded and buried	5

AP Site	HER	NGR	Site Type	Location	Period	Form	Present Condition	Plan
08	53044	SO 340 433	Field system	Bodcott Farm	Medieval	Crop mark	Eroded and buried	5
09	31387, 36825 – 36830, 31852 & 36855	SO 319 473	Field system	Kinley	Medieval	Former earthwork	Eroded	3
10	36826 – 36848 & 53043	SO 346 474	Field systems	Letton	Medieval	Former Earthwork	Eroded	4



Wye Valley, Bredwardine Study Area, Plan 1



Wye Valley, Bredwardine Study Area, Plan 2

Drawing Title PLAN 3

Assessment of aerial photographs: BREDWARDINE

North west sector of the study area

Sites B 01, 02, 03, 06 & 09

Key

Cut features

Ridge and furrow

Possible garden features

Wye Valley, Bredwardine Study Area, Plan 3

Drawing Title PLAN 4

Assessment of aerial photographs: BREDWARDINE

North east sector of the study area

Site B 10

Key

Ridge and furrow

Air Photo Services Ltd.

Wye Valley, Bredwardine Study Area, Plan 4

Drawing Title PLAN 5

Assessment of aerial photographs: BREDWARDINE

South sector of the study area

Sites B 04, 05, 07 & 08

Key

Cut features

Embanked features or foundations

Ridge and furrow

Wye Valley, Bredwardine Study Area, Plan 5

Section 5: Evaluation and Mitigation Strategies

In terms of pre-planning consent evaluation and conditioned mitigation hard rock and sand and gravel extraction sites have very different issues and problems. In the case of proposed hard rock extraction sites the methodologies and strategies developed and employed for conventional planning applications are entirely appropriate. Sites may be visible as surface features – earthworks or structures – or they may show as cropmarks. If buried remains are suspected these may be tested for by standard evaluation techniques such as desk-top research, field walking, geophysical survey and trial trenching.

There are obviously very different issues and challenges for sand and gravel extraction sites where we know from experience in the Lower Lugg that the archaeology may be buried under / masked by up to 3m of alluvial material. Clearly these sites cannot be evaluated by normal methods.

This deep burial however often results in well preserved archaeological features and deposits, or even landscapes, frequently under conditions that are beneficial for the preservation of organic archaeological and environmental materials. These conditions are peculiar to these alluviated river valleys and the importance of this resource cannot be overstated. The following section therefore concentrates on the issues surrounding the evaluation and mitigation of sand and gravel extraction in particular.

5.1 A review of current evaluation and mitigation strategies

The problems of evaluation and mitigation on sand and gravel extraction sites were explored in detail in the Lower Lugg Study (Bapty, 2007, Section 4.6 pp222-235). That section has been summarised here mainly in bullet point form and augmented where appropriate. For a full discussion refer to the Lower Lugg Report.

Bapty identified nine constraints that affect our ability to gauge potential from an existing knowledge base and to reach full understanding of the nature of the buried archaeological resource. They were -

- Poor levels of current archaeological knowledge
- Surface masking of deeply buried deposits
- Poor air photography results
- Ineffectiveness of geophysics
- Practical trenching limitations
- Scale of quarrying
- Nature of archaeology
- Close interrelationship of archaeological and geomorphological contexts
- Specific circumstances of visibility of the archaeological features within the alluvium

Evaluation methodologies

Field evaluation methodologies on deep alluvial sites have been developed and established over the last twenty years at Wellington Quarry these are -

- Use of borehole data
- Use of test pits
- Use of wide (minimum 5m) evaluation trenches
- Flexibility in the use of each of these (mix and match)
- Specialist on-site palaeo-environmental and geomorphological advice

A number of issues were identified associated with these methods -

- Borehole and auger data is difficult to interpret, densities are insufficient, there are difficulties recognising archaeological deposits / features.
- Test pits are of little use in deeper alluvium, there is like boreholes a lack of area coverage
- Wide trenching has cost implications, it can be applied to a very limited sample only

Mitigation methodologies

Following evaluation methods of mitigation also takes a number of forms

- Watching briefs – archaeologically controlled and recorded overburden stripping
- Salvage recording
- Full (usually area) excavation of some areas
- Specialised recording and sampling of alluvial and palaeo-environmental deposits
- Agreed contingencies to allow excavation of unexpected / isolated features of deposits

In the critical analysis of these methodologies the following points were raised by Bapty.

These methodologies have been developed and applied on one site only. There is therefore a lack of a control site – it is impossible to know what has been missed and therefore difficult to gauge any shortcomings in these methodologies. There is neither a broad enough sample on this site nor is there enough work on comparable sites on Herefordshire alluvium where conditions may differ so as to be able to address the issues associated with post depositional changes in the alluvium and differential archaeological preservation and visibility (see below).

Linked to this there are also problems of identifying features in some levels of the alluvium possibly due to post depositional changes. This is creating a bias in the recognised/recorded archaeology. It seems that later features in particular levels of alluvium may be less visible than some earlier features but this has not been adequately researched. The processes involved are poorly understood at present and why some features and contexts are visible whilst others are not is not known. This makes it all the more difficult to estimate how incomplete the recorded archaeological resource really is.

Whilst it was recognised that the system that has developed has been successful in facilitating the detailed recording of archaeological deposits and has provided an adequate degree of watching brief coverage that has allowed ongoing detection of archaeological features across extraction areas there are a number of limiting factors / conditions.

- Sustaining consistent specialist input. Availability and expense of geo-morphologists and geo-archaeologists
- Consistency of quarry company methodology especially in overburden stripping
- Problems associated with strip working and consistency
- Adequacy of contingency arrangements, dependent on good working relationship between the quarry company and the archaeological contractor
- Difficulty of preservation in situ. Nationally important sites have had to be removed in the past (Saxon water mills)

5.2 Future evaluation and mitigation strategies

Developing improved methodologies

In examining this Bapty posed two questions

- Was further evaluation really needed at Wellington or did it actually confuse matters by giving the impression that there is less archaeology predicted by evaluations than is actually the case on excavation?
- And would it be better if all parties (archaeological resource managers and quarry operators) accepted that archaeological mitigation is a significant requirement and got on with it without the expense of evaluation?

The benefits of this might be that companies would save on evaluation costs and their financial input at extraction stage would also be in relation to the actual amount of archaeology revealed. The big step here (for the current study especially but also for the Lower Lugg) is the assumption that archaeological deposits of similar density and character will be found on new application sites throughout the Lugg and Wye Valleys. Given the restricted geographical range of the Wellington evidence this is by no means certain. The difficulties would be those of persuading the planning authority and the

operators to impose and accept respectively an almost unknown financially liability.

It would also remove at a stroke the consideration of archaeological issues in the determination of planning applications and thus the potential for an application to be refused on the grounds of damage to regionally or nationally important archaeological features or deposits. Although with present evaluation methods this allocation of value is clearly not achievable anyway. It would also be unworkable under Environmental Impact Assessment legislation. An EIA would be required for major new extraction proposals and the impact on the historic environment is one of the factors that must be considered.

There is clearly therefore a need to improve evaluation of the archaeological resource on deep alluvium. Increasing evaluation areas in line with recommendations for other proposed development sites to a minimum of at least 5% would improve the level of information gained from evaluation but there are particular issues with this on sites with deep overburden. In particular the affect on systematic overburden stripping, and the impact that might have on subsequent site management. This could make extraction unviable and a planning authority could not be seen to be effectively prohibiting the availability of much of the resource in this way.

Improving and combining various geophysical and geotechnical methods was seen as the most effective way forward and included

- Use of Electromagnetic survey techniques
- Use of Ground Penetrating Radar
- Use of high sensitivity Caesium type magnetometry

Improving coring and borehole techniques

- Following extensive coring with targeted greater density coring
- Taking larger diameter cores
- Collaborative working with quarry companies who use coring for prospecting (this would entail early communication which is in any case desirable)

The key will be to combine these in the most effective way possible. Is it best to follow geophysics with geotechnical prospecting or visa versa?

Lidar data is also now being used effectively to identify the location of deeply buried palaeo-channels. These could be targeted by geotechnical investigations in order to test their potential for preservation of organic remains.

Improving the recovery of archaeological information

There need to be refinements in the recovery of geo-archaeological and archaeological information by

For geo-archaeology

- The application of Thermoluminescent Dating to give better chronological definition to alluvial sequences
- Close analysis of laminar structures in the alluvium
- Detailed sampling and dating of organic horizons to provide better chronological frameworks for associated archaeological features and deposits
- Full recording and dating of palaeo-channel sequences

For archaeology

- Maximising the use of artefact studies and distribution analysis where features are not detectable
- Develop an approach to maximise the potential for recognition of features
- Use of geo-chemical and magnetometry techniques to aid feature recognition

Conclusions

- Apparently effective archaeological mitigation of quarrying in the Lower Lugg has been achieved through post-planning identification and preservation by record of the archaeological resource.

- The difficulty of achieving effective pre-planning archaeological field evaluation is a significant issue. Larger scale intrusive evaluation carries significant logistical and resourcing issues.

- The minerals planning framework requires the demonstration of national or regional significance in order for archaeology to be considered as a constraint in the determination of minerals extraction planning applications. This can only be achieved through adequate evaluation techniques.

- The issue with the current approach is the inability to achieve preservation in-situ of nationally or regionally important sites. This would be problematic under current procedures and completely impractical unless a site was on the very edge of the extraction area and even then the change in local hydrology and soil conditions could lead to degradation of the archaeological deposits. Ideally this should be considered at the pre-determination stage.

- New field work approaches need to be developed to improve archaeological field evaluation and the recovery of data from excavation.

- This needs to be in tandem with explicit minerals planning policies and future policy documents need to highlight the archaeological issues and set out the best way for prospective extractors to meet requirements, including early consultation.

- Excavation, post excavation analysis and publication of results need to be fully funded by the quarry industry and adequately scoped. Funding of scientific analysis and dating of palaeo-environmental as well as the archaeological resource should be included as a matter of course. The results of archaeological work should be incorporated into after-use / restoration projects through reconstruction and / or interpretation.

- There is a need for a research project to develop new techniques of evaluation and excavation. Investigation of an area under ideal archaeological conditions with full scientific analysis of alluvial deposits would be instructive and would provide a better basis for future mitigation.

- This research is unlikely to happen through existing developer funded archaeology but given the recent diminution of the archaeology service in Herefordshire this would need to be carried out by an appropriate external archaeological consultancy.

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Appendix

Extract from LDF Preferred Options Consultation Document August 2010

Carried forward to the Revised Preferred Options Paper October 2011

MINERALS
Introduction

6.1 National planning policy guidance for minerals is set out in a series of specific
Guidance and policy statements, the MPGs and MPSs. The adopted Regional Spatial Strategy (RSS) for the West Midlands (2008) also contained a set of Policies with the aim of encouraging the prudent use of minerals resources Whilst maintaining an appropriate land bank of permissions and sites. New National apportionments for primary aggregates were published in 2009 but the
Process of allocating them across the West Midlands Region was not Completed on a statutory basis and the RSSs have since been revoked by Government. This remains an issue to be addressed in Herefordshire's own Minerals policies, in the absence of a sub-national policy base.

6.2 The requirement to ensure a steady and adequate supply of minerals to meet the needs of society and the economy needs to be tempered with the significant landscape and other impacts associated with large scale mineral workings. Consequently the policies need to allow for safeguarding resources and sites, whilst seeking to mitigate any adverse effects of minerals working. This includes consideration of the reclamation and after-use of sites. Policy also needs to encourage the re-use and recycling of aggregates to reduce the demand for primary aggregate extractions where feasible.

6.3 A particular feature of Herefordshire is the existence of small scale workings for building stone, defined as locally sourced and having an important role in locally distinctive building styles. Policies need to make specific allowance for this local, and important, traditional rural industry.

6.4 It is recognised that quarries of all types including gravel pits have a potential to further knowledge in terms of geology, palaeontology and archaeology. Herefordshire's mineral extraction sites have made significant contributions to the county's archaeological and fossil records. Opportunities to provide new geological exposures and improved wildlife habitats are also acknowledged.
Policies need to ensure that potential long term benefits are maximised.

Strategy for Sustainable Minerals Development

6.5 The strategy for minerals development as set out in the following policies ensures that the sustainable and efficient use and management of Herefordshire's mineral resources will be promoted by:

- defining Minerals Safeguarding Areas, and controlling development which
  would adversely affect them (policy M1);

- ensuring that any development for the winning, working, storage and transport of minerals takes place in accordance with appropriate criteria (policy M2);

- enabling small scale production of building stone and clay production (M3);

- encouraging the use of secondary aggregates and the re-use and recycling of aggregates and other minerals (policy M4);

- protecting the continued availability of the railhead at Moreton-on-Lugg for minerals transportation purposes (policy M5); and

- maintaining appropriate landbanks of permitted reserves for primary aggregates consistent with national and sub-national guidance (policy M6)

6.6 More detailed aspects of these policies will be taken forward in a Minerals and Waste Development Plan Document and subsequent Supplementary Planning Guidance.

6.7 National Planning Policy requires Minerals Planning Authorities to define Minerals Safeguarding Areas (MSAs) in their development plan documents. In Herefordshire known minerals resources and permitted reserves are already offered some protection from development which would sterilise those resources through a policy in the Unitary Development Plan. A replacement policy is therefore required both to maintain that protection and bring the form of it up to date with the advice in MPS1. This will also enable a review of boundaries of safeguarded areas. In accordance with the advice in MPS1 it is important to appreciate that the definition of an MSA does not automatically mean that minerals will be extracted during the plan period; instead the policy is used simply to prevent the unnecessary sterilisation of known minerals resources. The detailed review of boundaries, including setting out an appropriate methodology to identify them, will take place as part of the Minerals and Waste DPD (which will be prepared after the Core Strategy is adopted). In the meantime the areas currently shown on the proposals map will be regarded as interim MSAs.

Policy MN.1 – Minerals Safeguarding Areas

The areas of known minerals resources shown on the Proposals Map will be regarded as Minerals Safeguarding Areas (MSAs) to which the policy considerations below apply. Detailed boundaries will be reviewed in the preparation of a Minerals and Waste Development Plan Document which once adopted, will then define the boundaries of MSAs in Herefordshire.

The definition of MSAs does not imply that minerals extraction will take place during the plan period.

Within and adjacent to the MSAs, development which would sterilise any known minerals resource will not be permitted. Where non-minerals related development is proposed in MSAs the applicant may be required:

- to undertake a geological assessment of the site, and/or
- to protect the minerals in question and/or
- make provision for the extraction of all or part of the mineral reserves as part of or before the non-minerals related development takes place, unless it can be demonstrated that the non-minerals related development is of sufficient weight and overall benefit to planning interests to outweigh the need to protect the minerals resources.

6.8 It is not expected that there will be a need for completely new large scale extraction sites to be developed in Herefordshire in the plan period. However, 32currently dormant sites may need to be re-opened, subject to demand and national policy. There is nonetheless the possibility that, towards the end of the plan period, serious consideration has to be given to new sites for extraction of primary aggregates. Herefordshire's relative remoteness from the main growth areas of the region means that new large scale extraction remains unlikely (because of the expense of transporting aggregates over long distances) but this will need to be kept under review. That review will take place as part of the Minerals and Waste Development Plan Document. Part of the policy below also differentiates between large scale aggregate extraction and local, small scale extraction for dimension and other building stone. A nominal limit of 1 hectare of site area is used for this purpose. The policy then sets out the general criteria which will apply to planning applications for new minerals working, winning, storage and transport. Note that no further extraction of granite will be permitted from the Malvern Hills AONB area due to its landscape importance, and legislative constraints.

Policy MN.2 – Criteria for the Assessment of Minerals Related Development

Proposals for the winning and working, storage and transport of minerals will be assessed against the following criteria:

1. no further permissions will be granted for the extraction of granite from the Malvern Hills;
2. New large scale minerals extraction outside MSAs or existing and historic large scale minerals extraction sites will not be permitted (by "Large scale" is meant workings in excess of 1 hectare);
3. Where minerals extraction is permitted it shall be on the basis that:

a. the minerals resource is reasonably required to meet identified and adopted targets, or complies with policy MN.3 in respect of small scale workings
b. the environmental impact of the development can be mitigated and potential benefits maximised especially with regard to:
i. the impact on biodiversity interests (especially the River Wye SAC which includes the lower River Lugg)
ii. the impact of the development on floodplain management (which may be positive)
iii. the impact on geological, archaeological and other heritage interests (which may also be positive) and the potential for furthering scientific knowledge
iv. the impact on landscapes especially in the AONBs
v. the potential of the development to maximise the use of sustainable transport measures
vi. amenity impacts on nearby residential properties
vii. the inclusion of positive proposals for after-use and aftercare of the site, with priority being given to habitat creation, heritage and community/leisure uses (in that order of preference).
viii. the potential of the site to provide demonstrable benefits to biodiversity and wildlife habitats, both during and following minerals extraction

6.9 A particular feature of Herefordshire, especially in the west of the county, is the existence of small scale building stone quarries. It is important for heritage and local economic purposes that this local craft can continue. The nature of the workings is such that on occasions, very specific strata need to be worked on for a particular project; hence the policy needs to allow for flexibility in exactly where workings are located and the timescales for minerals extraction, including intermittent working. However the policy also needs to take account of the potential for small quarries to harm amenity, particularly where workings remain open over long periods.

Policy MN.3 – Small Scale non-Aggregate Building Stone and Clay Production.
Proposals for the small scale extraction of building stone and clay will be permitted where:
1. there is a demonstrated need for the material for the preservation of local distinctiveness; in particular features and/or building techniques of local historic or architectural interest, repair of listed and vernacular buildings, other structures or archaeological sites; or
2. suitable stone of a particular type necessary for a specific project has been identified as likely to exist in appropriate quantity; and
3. the anticipated timescales for quarry operations, including any requirements for intermittent working, have been assessed and can be justified; and
4. the majority (i.e. more than 50%) of the site's output would be for non-aggregate use; and
5. any significant adverse impacts from the minerals extraction can be identified and mitigated; and
6. the site is capable of reclamation to a beneficial use, including geological and/or scientific research, positive benefits to biodiversity, wildlife habitats and/or agriculture

The term “Small scale” means workings generally of less than 1 hectare in extent.

6.10 In order to reduce dependency on primary aggregates, and to encourage the use of waste materials as a resource, the re-use and re-cycling of demolition and other wastes from development sites will be encouraged.

Policy MN.4 – Secondary (Reused and Recycled) Aggregates.
The use of alternatives to naturally occurring aggregates or other minerals, especially construction, demolition and excavation wastes, will be positively encouraged. Proposals for the production, import, processing, treatment and storage of such alternatives will be permitted:
1. for temporary periods where development is ancillary to principal activities at a site, including use of demolition and excavation waste arising from development, or longer periods when the development will be limited to the life of a mineral working; or
2. permanently at permitted waste transfer stations. In all cases the proposals should provide adequate means of mitigating visual impact, preventing pollution and controlling traffic, noise, vibration, dust etc. as part of the development. This shall include detailed assessments and proposals to avoid adverse effects
on the amenity of the immediate or surrounding environment
(including landscape and townscape) and human health.

6.12 Aggregates, once won from the ground, are bulky and heavy materials to transport and it makes sense for sustainability and climate change reasons to encourage alternatives to road transport wherever possible. In Herefordshire’s case, in the absence of any canals, the only alternative to road transport is via rail. There is one railhead in the County dedicated to minerals loading and wharfage at Moreton-on-Lugg. Road access is available from the A49 trunk road and it is reasonably centrally located in the County. It is therefore appropriate to make specific provision to protect the railhead from alternative developments which would prejudice its continuing use for minerals transportation. There may also be future opportunities for other commodities to use the railhead.

Policy MN.5 – Moreton on Lugg Railhead.
The continued use of the railhead at Moreton-on-Lugg for the storage, loading and transport of minerals by rail will be encouraged. There will be a presumption against development which would prejudice its continued use unless it can be shown that reasonable alternative provisions have been made for the transport of minerals by rail.

6.13 Targets for the supply of minerals are known as “Apportionments”. Statutory regional apportionments were established in 2008 in the adopted Regional
Spatial Strategy (RSS) but these have been superseded by a new national apportionment in 2009, and the assumed approach to the sub-regional apportionment has been interrupted by changes in the status of regional planning in 2010. It is acknowledged that there is a need for a stated apportionment for the County to contribute to UK sand and gravel and

crushed rock requirements. The policy below continues with the most recent adopted volumes for the time being, but acknowledges that this is likely to change and amended figures will be required during the plan period, i.e. for the period beyond 2016 and up to at least 2026. Revised figures will therefore be brought forward in the Minerals and Waste Development Plan Document in due course, along with the basis for the new figures.

Policy MN.6 – Apportionments
The annual apportionment for the production of primary land-won aggregates shall be as set out below for the period to 2016. Revised apportionments for the period beyond 2016 will be established through the Minerals and Waste Development Plan Document.

- Sand and Gravel: 283,000 tonnes per annum
- Crushed Rock: 424,000 tonnes per annum

Monitoring

6.14 The effectiveness of the minerals policies will be monitored through annual reporting (in the AMR) of the matters listed below where data is available in the public domain:
1. comparison of production figures with national and sub-national apportionments
2. estimates of permitted and useable land banks for aggregates (sand, gravel and crushed rock)
3. after use of sites especially wildlife habitat creation
4. the production of secondary (reused and recycled) aggregates
5. data on the use of the railhead at Moreton-on-Lugg

6.15 The list above will be further refined through the Minerals and Waste DPD which is to be prepared.

Place Shaping Paper

6.16 The Place Shaping Paper was published for consultation in January 2010 and set out the preferred policy direction for Minerals. Views and comments were invited in order to help develop a planning strategy for the County up to 2026.
Key issues raised though the consultation were:

- support for more recycling of the types of waste suitable for use as “Secondary aggregates”;
- concern at the environmental effects of road transport of minerals;
- concern about after-use of minerals sites, including competing suggestions for habitat creation versus community or sports use;
- opposition to the re-opening of currently dormant sites, especially at Upper
  Lyde;
- concerns that adequate landbanks have been identified;
- concern at the impact of extraction on the county’s heritage resources,

especially archaeology;
- Concern at the landscape impacts of extraction sites.

Evidence

6.17 The following documentation has been compiled as part of the evidence base and utilised in the formation of this policy. The evidence base will, where appropriate, be updated and used in bringing forward the Minerals and Waste Development Plan Document in due course.

- Herefordshire Minerals and Waste Planning Assessment (2009)
- West Midland Regional Aggregates Working Party Reports
- Herefordshire Unitary Development Plan (2007) and related documents

National Policy Framework

- MPS1: "Minerals and Planning" and related practice guidance.
- MPS2: "Controlling and mitigating the environmental effects of minerals extraction in England"
- National and sub-national Guidelines for Aggregates Provision
- Guide to Mineral Safeguarding in England (October 2007), BGS.
- PPS12: Local Spatial Planning

Unitary Development Plan (UDP) Policies to be replaced

6.18 The following UDP policies will be replaced:
- Policy S9 Minerals
- Policy M2 Borrow Pits
- Policy M3 Criteria for new aggregate mineral workings
- Policy M4 Non-aggregate building stone and small scale clay production
- Policy M5 Safeguarding mineral reserves
- Policy M6 Secondary aggregates and recycling
- Policy M7 Reclamation of mineral workings
- Policy M8 Malvern Hills
- Policy M9 Minerals exploration
- Policy M10 Oil and gas exploration and development

Links to Core Strategy objectives

6.19 These policies will contribute to the achievement of the following social, economic and environmental objectives identifies in the Place Shaping Paper: Objectives 4, 8, 10, 11 and 12.

Sustainability Appraisal and Habitats Regulations Assessment

6.20 Both appraisals have resulted in adjustments to the policies to strengthen controls over adverse impacts, but the main principles have not required significant changes.

Your Views:

Do you agree with the preferred policies for Minerals Developments?
Yes/No

If not, please explain which elements you don't agree with and why?
Please complete your answers at the back of this document

Validation
Herefordshire Archaeology operates a validation system for its reports, to provide quality assurance and to comply with Best Value procedures.

This report has been checked for accuracy and clarity of statements of procedure and results.

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