6. ARCHAEOLOGICAL RESOURCE: RESULTS

6.1 INTRODUCTION

6.1.1 The analysis of the archaeological resource involved the quantitative and qualitative evaluation of recorded sites and monuments, followed by the analysis of their location and distribution, highlighting significant patterns or groups. It should be noted that there is an inherent bias within the known archaeological resource relating to factors including geology, agricultural practice, vegetational cover, development, drainage, and previous archaeological work. The Ribble and its floodplain have been subject to canalisation, dredging and gravel extraction, which may have led to archaeological discoveries. In contrast, deposition of riverine material and intensive agricultural exploitation may mask the extent of past activity. The knowledge of archaeology within the Ribble Valley is therefore subject to the visibility of early remains and the amount and location of past interventions.

6.1.2 Differences in the distribution of the monuments (Fig 113) have been investigated, and this has entailed examining whether their absence was genuine or a matter of archaeological recording. To identify the two very different types of lacunae, the relationship between monuments and events was studied, along with the relationship between monuments and specific landscape types and environmental parameters.

6.1.3 Finally, after studying the distribution of monuments and highlighting the lacunae, maps of potential were created. These should not be considered as marking the location of hitherto undiscovered monuments, but instead highlight areas where more management of the cultural resource might be required, or where further investigation will be required in advance of any development.

6.2 THE DISTRIBUTION OF ARCHAEOLOGICAL SITES WITHIN THE LOWER RIBBLE VALLEY

6.2.1 Perhaps not surprisingly, the number of known sites increases through time, with a greater level of evidence for later prehistory, the Roman and post-Roman periods, and correspondingly the spatial distribution of activity and settlement becomes more evident. In comparison to surrounding areas, the coastal, estuarine, and river valley landscapes appear to have been favoured, presumably as they provided access to a wide range of land types and subsistence resources, and later established communication routes, such as surfaced roads.

6.2.2 ***Prehistoric Period:*** the earliest evidence of prehistoric activity within the Ribble Valley comes from flint and stone tools dating from the later Mesolithic period. While there are certainly biases within the distribution of Mesolithic material on a regional scale, river valleys and terraces do appear to have been one area favoured for habitation (Hodgson and Brennand 2006, 26), possibly due both to the variety of available resources and ease of movement and communication.

6.2.3 There is a significant assemblage of faunal and organic material from the River Ribble that remains undated, although associated artefacts provide some broad chronological indicators. prehistoric activity appears to have followed the course

of the river, and subsequently there is a distinct curving line of sites running south of Preston, which reflects the more southerly, historic line of the watercourse, as shown on the first edition OS Mapping (Fig 114). Most significantly, a large assemblage of unstratified flint tools and debitage was recovered from the Marles Wood area during the 1980s, and held in the collection of John Hallam. They were subsequently examined as part of the North West Wetlands Survey and typologically dated to the later Mesolithic period (Middleton 1993, 87; HER PRN28205).

6.2.4 The assemblages from Preston Docks and from Marles Wood both contained waterlogged organic remains, and are therefore indicative of good areas for preservation of archaeological material. The Preston Dock finds included human and animal remains, stone tools, metal artefacts, and two dug-out canoes or boats, only parts of which were recovered. The flint recovered from the dock site has been classed only as 'prehistoric' by the HER (PRN2), and the assemblages of animal and human remains were found in conjunction with a Bronze Age spearhead. At Marles Wood a bronze spearhead and two canoe fragments (HER PRN1872 and PRN1015) were recovered, while two recorded finds of flint blades from the vicinity are listed by the HER as being 'prehistoric' (HER PRN2984; PRN1868). Both assemblages were also reported as being over 3.5m below the ground surface, and it is evident that there has been a significant deposition of fluvial sand and gravel, burying the archaeological remains.

6.2.5 Elsewhere, isolated finds hint at similar practices of deposition as found on other rivers in England. Boats of dug-out construction have been recovered from New Division Quay (HER PRN12882) and the railway embankment of Church Wood, Penwortham (HER PRN12883), during the mechanical removal of gravels on the river floodplain (Hallam 1989). Additional finds of metalwork include a socketed bronze axe from Penwortham New Bridge (HER PRN4952), and a Bronze socketed spearhead and axe found at Brockholes (HER PRN7 and PRN8).

6.2.6 The circumstances behind the deposition of the assemblage from Preston Docks is not known. There may have been a settlement or butchery area close by (Hallam 1986), or the material may have deposited or eroded from sites further up the river, and subsequently washed downstream until it accumulated at natural 'catch points' (Turner *et al* 2002). The area of the Ribble before the construction of the dock, as depicted on the OS first edition mapping (1850), shows a curving watercourse with a large marsh area prone to flooding on the south bank. On the same map Marles Wood is shown as a very sharp bend in the river with a large sand and gravel bank, and both of these might represent such naturally occurring 'catch points'. This may also account for the multi-period nature of the finds. It should be noted, however, that particular points within rivers and wetland locations may have been the focus for the repeated deliberate deposition of a wide range of artefactual material and human bones during prehistory (Bradley 1998, 23-4; Field and Parker Pearson 2003), and the assemblages from Preston Dock and Marles Wood do not necessarily provide evidence for settlement on the river edge or floodplain.

6.2.7 Records for prehistoric funerary activity within the Ribble Valley are confined to five sites, all dating from the Bronze Age (Fig 115). The group includes an urned cremation from Pleasington Cemetery (HER PRN7118), a ring ditch

containing several urned cremations from Parsonage House, Ribchester (HER PRN4219), and two tumuli from Winckley Lowes. These were subject to antiquarian excavation, and while Winckley Lowes Barrow A (HER PRN180) contained urned cremations, Winckley Lowes Barrow B (HER PRN179) was found to contain no evidence of burial. In addition, a possible barrow site was located to the west of Winckley Lowes at Brockhall Wood (HER PRN149), the HER record describes a late nineteenth-century removal of a 'mound', in which iron spearhead was found, although the HER records this as being a Bronze Age barrow. If the earlier date is confirmed then the reuse of this monument has occurred. Workmen digging out gravel in 1887, removed another barrow at Pindar Hill, Waddington (HER PRN305), here urned cremation remains were again found.

6.2.8 Evidence of Iron Age activity is scarce in Lancashire (Hodgson and Brennand 2006, 52), and there is only one record of Iron Age pottery from the study area, recovered at Ribchester Church of England School (HER PRN4215). The only other find of this date close by is an Iron Age pin (HER PRN1629) found on Longton Marsh. A series of so-called promontory forts within the valley may also represent Iron Age occupation, and perhaps even territorial organisation, although there is little dating evidence to confirm whether these are all contemporary, or even if they date from the Iron Age at all.

6.2.9 ***Prehistoric Distribution:*** prehistoric activity, albeit sparsely distributed, appears to be concentrated along the floodplain of the former line of the Ribble. Mesolithic flintwork from the Marles Wood area would certainly indicate more than a transitory stop-over, although no structures from this date are known. The substantial assemblage from Preston Docks obviously skews this distribution to an extent, and the exact nature and depositional circumstances of this material remain far from certain (Fig 116). It should be noted that, within this context, there is a significant potential for earlier remains to have been buried by later riverborne material, and the absence of surface scatters would not be indicative of no activity, particularly given that the land in the study area is predominantly given over to pasture and there is little plough action to bring up underlying artefacts. The position of the Bronze Age funerary evidence is unlikely to be random or fortuitous, and probably reflects the importance of the area, perhaps even operating as a statement of tenure or habitation. It is possible that by the Iron Age a more organised system of territorial land division was in operation, but the dating evidence upon which to base any firm conclusions is not yet available.

6.2.10 The assemblage from Preston Docks in particular, must raise the question of deliberate deposition in the river of artefacts, human and animal remains during prehistory, as well as in later periods. The assemblage is not typical of those found on any settlement site in the North West to date, and the assemblage of human skulls, both prehistoric and later (Turner *et al* 2002), is the largest single assemblage of such material in the region. Similarly, antlers would have been a prized raw material, not normally to be discarded as carcass waste. In this context it should be noted that other points along the river, or former course of the river, may yield evidence of similar practices during below-ground disturbance.

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6.2.11 ***Roman Period:*** the dominant archaeological perception of the Ribble Valley is that of a former Roman military communication route across the Pennines, policed by the forts at Ribchester (Buxton and Howard-Davis 2000) and Kirkham (Howard-Davis and Buxton 2000) in conjunction with a manufacturing and distribution centre at Walton-le-Dale. The Roman period saw the establishment of a long-distance road network of formal construction, linking military bases and crossing points of natural barriers (eg rivers). Where the roads are within an urban context, which has undergone substantial expansion in the post-medieval period, they have either been lost, deeply buried or truncated (Fig 117). Their presence would, however, certainly have encouraged activity, and concentrated settlement, not just from the Roman period, but also in subsequent periods as they continued to be used, in some cases through to the present day. Inevitably the density of archaeological finds along these arteries is a result of this activity.

6.2.12 From the available evidence, it seems likely that when the Roman army entered the North West it encountered a mixed landscape, with stock rearing and arable agriculture, widespread woodland clearance, and some areas enclosed into plots and fields (Philpott 2006, 61). The location and emphasis on the different farming practices are likely to be due both to physical and cultural factors, although the quality of soil is likely to have been a major determining element. Evidence of such settlement is scarce within the Ribble Valley, although the low level of archaeological work, a lower level of cropmark formation (Shotter 2004, 141), and post-Roman disturbance may mask the true extent of Romano-British activity in the area. River valleys, in particular, may have been favoured areas for settlement, and the distribution of known sites and findspots within the HER suggests a ribbon of activity along the valley bottom, in conjunction with the line of the Roman road.

6.2.13 The land along the Ribble Valley, forming part of the hinterland of the forts at Ribchester and Kirkham, is likely to have formed part of the supply system to the army. Similarly, the 'depot' at Walton-le-Dale (Gibbons *et al* forthcoming) may have required food supplies, raw materials and labour from the surrounding area. If these goods were not available at the time of the conquest, then it is likely that production and supply were to some extent instigated by the military authorities after their arrival. The distribution of find spots of coins from the Fylde area, both close to, and away from the lines of the roads (Graystone 1996), suggests a rural population that was, at least in part, involved in the official monetary economy, suggesting trade and interaction with the military authorities.

6.2.14 Whether the presence of the Roman army led directly to intensification of settlement and agricultural exploitation is not known, although the presence of the army and the occupants of the extramural settlements around the forts might suggest that this was the case. Pollen evidence from the surrounding area, beyond the valley, indicates increased tree clearance during this period. Similarly, the location of settlement may have intensified along the line of the Roman road. The valley bottom, within the environs of the Roman road, would therefore be a prime site for Romano-British activity and settlement, even if little of it is visible today.

6.2.15 ***Early medieval Period:*** the system of settlement and land division in existence during the Romano-British period is unlikely to have broken down immediately or ceased entirely following the end of Roman military administration (Fig 118). The visibility and dating of archaeological remains from this period does, however, become more problematic, with the end of Roman material culture (RM Newman 2006). Economic circumstances changed, systems of lordship, tenure and taxation are also likely to have changed, but rural settlement and agricultural production almost certainly continued. There is also some evidence that the sites of Roman administration continued to be occupied, as at Ribchester, whereas Walton-le-Dale did not (Gibbons *et al* forthcoming).

6.2.16 The presence of stone sculpture at Ribchester and Whalley suggests some form of ecclesiastical presence in the valley, and possibly organisation of estates. Two urn fragments (HER PRN155), two metal shield bosses (HER PRN154; PRN2895), and a 'Saxon' coin provide scant evidence for continued occupation at Ribchester. Political and ethnic influence may be seen in both artistic styles of stone sculpture and place-name evidence, which suggest both Northumbrian and Scandinavian influence (RM Newman 2006). The presence of the Cuerdale hoard (*Section 2.5.57*) suggests Viking activity on the river, but not necessarily settlement purely from this evidence.

6.2.17 ***Later medieval Period:*** it is during the later medieval period that the expansion of settlements into the wider landscape is demonstrable from the archaeological distribution in the study area (Fig 119). This would include the expansion into upland areas and the establishment of cattle ranches known as vaccaries (Winchester 1987, 6). The results of expansion and development of nucleated field systems dominate the landscape of the valley even today. The period also saw the development of monastic estates. Sawley (Hunt 2005) and Whalley Abbeys (Wood 1996), founded in the twelfth and thirteenth centuries respectively, represent powerful landowners within the valley up until their dissolution in 1537.

6.2.18 The study area contains 84 monuments that have been allocated a medieval date, including 12 Deserted Medieval Village sites that were all close to the Ribble or one of its tributaries. Presuming that these were small hamlets or villages predominantly carrying out subsistence farming, it can be postulated that the post-Roman and medieval period exhibited a slow movement towards nucleated settlement, although a large number of dispersed settlements also remained (R Newman 2006, 117). It is unlikely that there was any single cause for the 'failure' or desertion of some medieval settlements, or that these desertions were all in the medieval period itself (*op cit*, 120). Associated with the nucleated settlement, which was often focussed on the principal water courses, was a development of water-related rural industries, such as the flax-retting areas at Grindleton and Newton (Higham 1991b). Although these activities were probably commonplace, archaeological evidence is scarce, and low-lying areas and river terraces retain considerable potential for elucidating details of medieval water management and industrial practices.

6.2.19 The valley continued to develop economically as market towns emerged in the North West, in many instances in places determined by communications and the potential for natural defence, such as Clitheroe. Inevitably, the corridor between the centres of Preston and Clitheroe became an increasingly busy trade route. As

the de Lacy family held both Clitheroe and Pontefract castles (King 1983), this may also have instigated a trans-Pennine trade route between the two.

6.2.20 The upland waste was defined by the designation of large tracts as chase, forest or parkland, the notable example being the expansive chase of the Forest of Bowland, owned by the de Lacys (Farrer and Brownbill 1908). The other notable park was that associated with Samlesbury Hall, which originated in the fourteenth century, and continued to utilise the same prime valley bottom site (LUAU 1997c). Towards the later medieval period there was, however, considerable encroachment of the chase and parkland for agriculture, and the emergence of dispersed settlement in these areas.

6.2.21 ***Post-medieval period:*** despite the rural agricultural appearance of the Ribble Valley today, the archaeological record is numerically dominated by industrial monuments. Records of sites pre-dating the post-medieval period show a broadly equal balance between 'Agricultural' and 'Industrial' activity. Records for post-medieval sites, however, suggest an increase in industrial activity, with 145 monuments being classified as relating to agriculture and subsistence, and 167 classified as Industrial.

6.2.22 This apparent change results from the nucleated centres of settlement containing large numbers of post-medieval industrial and domestic monuments, within what is otherwise a predominantly rural area. Many of the industries had their origins in the later medieval period, with fulling mills operating between the fifteenth and eighteenth centuries, and sites such as the retting ponds at Grindleton having possible eighth-century origins (Higham 1991b). Extraction industries have also scarred the landscape of the valley, the most obvious of which are the limestone quarries north of Clitheroe at Chatmoss.

6.2.23 Redevelopment has occurred since many of the mills and factories were built, which has to some extent reduced the present-day visibility of former industries in the valley landscape. The demolition or conversion of many industrial sites has effectively lowered the visual impact that industrial growth, particularly of the textile industries, had on the Ribble Valley. The localised medieval rural industries were small enough to co-exist with the farming settlements and indeed these activities often took place in the same households (Rothwell 1990). Where these structures remain, their overall condition is good, with the survival of both historic fabric and character in the individual buildings, towns and overall landscape.

6.2.24 The distribution of the post-medieval industrial monuments can clearly be seen to follow watercourses, based on the large number of mill remains (Fig 120) that were located to exploit water power. The only known medieval mill is at Samlesbury (Mill and Maltkiln, HER PRN1735), on the River Darwen. There are also two distinct groupings of extraction sites, one in the north-west outskirts of Blackburn, around Billinge Hill, and a second group, to the north of Clitheroe, which exclusively comprises limestone quarries, and reflects a geological source.

6.2.25 Unlike monuments from earlier periods, those relating to post-medieval industry are typically very visible elements within the landscape, and are often depicted on historic maps. Consequently, the distribution of post-medieval monuments defined by the present study for the most part correlates with the actual

distribution and the risk of development impacting on an unknown post-medieval resource is correspondingly lower.

6.3 EXAMINATION OF THE DENSITY OF SITES

6.3.1 The density of monuments for each period was calculated using the methods described in *Section 3.13.11* in order to highlight clusters of monuments. It was hoped that this would provide further information on the distribution of monuments, by highlighting 'favoured areas' or zones of heightened activity. It might also be supposed that these areas would be of higher potential for the discovery of new monuments.

6.3.2 ***Prehistoric period***: the density of prehistoric monuments within the study area (Fig 121) is very similar to the simple distribution, as described above in *Section 6.2.* The cluster of sites around the south of Preston (*Section 6.2.2*) shows up as an area of high density, but there are also areas of high density around Ribchester, Marles Wood (*Section 6.2.3*) and Brockhall Farm/Winckley Lowes (*Section 6.2.7*).

6.3.3 In general, these highlight the clusters of monuments that are evident from the general distribution, although the area around Ribchester can perhaps be disregarded, as it is more representative of the large number of events within that area than any particular grouping of monuments. Since there are so few prehistoric monuments within the study area, each individual monument stands out as an area of higher density.

6.3.4 Disregarding the isolated individual monuments, the general picture from the density is that, throughout the study area, the zone around the Ribble and its immediate environs is an area of heightened prehistoric activity. This ties in with the postulation (*Section 6.2.1*) that river valleys were a preferred area of occupation and activity in the prehistoric period.

6.3.5 ***Roman period***: it is immediately clear from the density of Roman monuments throughout the study area that Ribchester is by far the largest cluster (Fig 112). This is not a surprise, and to some extent it obscures other pertinent detail about the pattern of Roman occupation in the area, which is the extremely close relationship between the pattern of activity and the main trans-Pennine road (*Section 6.2.11*).

6.3.6 If the monuments relating specifically to sections of the Roman road network are disregarded, then the distribution of the other monuments, and hence the density, is very even. To compare the Roman density with the prehistoric (and medieval) it is necessary to disregard the area around Ribchester, but even when this is removed there are no obvious clusters.

6.3.7 This supports the idea (*Section 6.2.14*) that there is very little known Roman activity outside the roads and forts, and that these features represent major foci within the landscape of the valley.

6.3.8 ***Medieval period***: the larger number of monuments can be partly attributed to their greater visibility, but also, to the increase in population and land use in this period (*Section 6.2.17*). This has several effects on the density map in comparison with earlier periods, as it now shows considerably more areas of

high density, but also more areas of clustering, around villages and towns (Fig 123).

6.3.9 Settlements such as Ribchester remain areas of high density. This may represent continuity of occupation from the Roman period, but may also be the result of more archaeological investigation within the area (see S*ection 3.13.1*). However, in the medieval period, the area of high density around Ribchester is concentrated less on the settlement itself, but continues to the north-east, taking in the villages of Stydd and Lower Dutton. In general, though, the density map does not provide any new information on the distribution of monuments.

6.4 MONUMENTS, EVENTS, AND THE HLC

6.4.1 ***Introduction***: HLC-type classification groups together those areas where the same historic processes have shaped the landscape. As a result, every polygon of a particular HLC type should display broadly similar historic characteristics. By studying the quantities and densities of monuments within particular landscape types it was hoped to identify correlations or trends between the two. Furthermore, by examining the relationship between landscape types, monuments, and archaeological events, an understanding of the shortcomings or lacunae in the dataset could be sought.

6.4.2 Rather than the kernel density calculations (*Section 3.13.11*), the density of monuments per unit area was used in this case (see *Section 3.12.10*). This allowed the distinction between polygons of differing areas having commensurately few or many monuments, and follows on from the Lynher Valley model (Cornwall Archaeological Unit 2002). The count and density of monuments of each period, and overall, were then included in the enhanced HLC (see *Section 3.12.10*).

6.4.3 ***Monument Density:*** density maps were created for all monuments, and for monuments of each period: prehistoric; Roman; and medieval. The polygon representing the ancient and post-medieval settlement of Ribchester was found, not unsurprisingly, to contain the highest number, and the highest density of monuments overall within the study area (Fig 124); unsurprisingly, this polygon also contains the largest number of events. Before jumping to the conclusion that *lacunae* in monument distribution occur where no events have taken place, it was necessary to examine further the distribution of monuments within other settlement polygons (*Section 6.3.1*).

6.4.4 The density per HLC polygon calculations threw up what initially appeared to be interesting results, but which in the event turned out to be more a function of the number of polygons of particular types than a trend in the distribution of monuments. For example, there are 31 polygons containing prehistoric monuments, and the HLC class containing the highest density of prehistoric monuments is 'Ancient and Post-medieval Settlement'; however, this is again skewed as there is only one record, the historic core of Ribchester. This has a very small extent, and consequently a high density, whereas the finds at Preston Dock are considerably larger in scale and number but are represented by only two monument records, and as such have a relatively low density. The lowest density of prehistoric material is within the HLC class 'Water', which essentially

is the single HLC polygon for the River Ribble, and as such is a large area (Fig 52).

6.4.5 This line of analysis also tends to support the conclusions already drawn elsewhere, for example, that the historic core of Ribchester is also the area of highest density of known prehistoric, Roman and medieval monuments as well as overall. The area of lowest density of monuments of all periods is in HLC class 'Water', which is represented by the entirety of the Ribble.

6.4.6 ***Link Between Monuments and Landscape Type***: more monuments have been found in areas of 'Ancient Enclosure' than any other landscape type (Table 29). However, the average number of monuments per polygon is lower than landscape types such as 'Modern Ornamental'. When considering the factors that led to the identification of monuments, their existence is only one factor; others are visibility, and development activity. The large number of monuments within 'Ancient Enclosure' landscapes may be due to the high visibility of extant features, and similarly the relatively small numbers of monuments in landscape types such as 'Ancient Woodland' and 'Modern Woodland' may reflect relatively low site visibility within such contexts.

HLC broad type	Number of Polygons	Total Number of Monuments	Average Number of Monuments
Water	1	29	29
Ancient and Post-medieval Settlement	11	125	11.36
Modern Ornamental	2	19	9.5
Ancient Enclosure	91	478	5.25
Modern Settlement	32	163	5.09
Post-medieval Enclosure	71	240	3.38
Modern Recreation	11	34	3.09
Modern Industry	16	44	2.75
Ancient and Post-medieval Ornamental	3	6	2
Modern Enclosure	20	32	1.6
Ancient and Post-medieval Wood	49	65	1.33
Modern Communications	3	2	0.67
Modern Woodland	7	3	0.43
Reverted Moorland	1	0	0
Saltmarsh	2	0	0
Sand and Mudflats	2	0	0

Table 29: HLC landscape types, showing the total and average number of monuments per polygon

6.4.7 In order to examine the relationship between monuments and landscape types statistically, the KS test (*Section 3.12.5*) was used. This demonstrated some correlation between landscape type and the location of prehistoric and Roman monuments, but not of medieval, which essentially means that it would appear to be possible to predict the types of landscape that prehistoric and Roman monuments are more likely to be found in. The results of this test were used in the construction of the maps of potential (see *Section 3.13.4-13*).

6.4.8 For prehistoric monuments, the correlation showed that statistically less monuments than would be expected have been found in areas of 'Ancient Enclosure' and Post-medieval Enclosure', given that 'Ancient Enclosure' is the type of landscape where most prehistoric monuments have been found, and

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covers over half the study area. Nevertheless, more monuments of this period might be expected in areas of this landscape type.

6.4.9 For Roman monuments, there were statistically less monuments found in both 'Ancient and Post-medieval Woodland', and 'Modern Woodland', which may reflect the fact that monuments are less visible in these landscape types, or that they are likely to be disturbed (*Section 6.5.2*). There was also correlation, albeit less, between monuments of all periods and HLC broad type, with statistically less monuments occurring in areas of 'Ancient and Post-medieval Woodland'.

6.4.10 Table 30 shows the comparison between HLC polygons of each landscape type containing no monuments, and the total number of polygons of each type. No particular landscape type can be highlighted as having a greater proportion of polygons containing no monuments, and as such this cannot be used to highlight lacunae in the monument distribution.

HLC Polygons containing no Monuments	Count of Polygons with no monuments	Total Count of Polygons
Ancient and Post-medieval Ornamental	2	3
Ancient and Post-medieval Settlement	2	11
Ancient and Post-medieval Wood	25	49
Ancient Enclosure	25	91
Modern Communications	2	3
Modern Enclosure	8	20
Modern Industry	6	16
Modern Ornamental	1	2
Modern Recreation	2	11
Modern Settlement	10	32
Modern Woodland	5	7
Post-medieval Enclosure	21	71
Reverted Moorland	1	1
Saltmarsh	2	2
Sand and Mudflats	2	2
Water	0	1
Totals:	**114**	**322**

Table 30: Breakdown of HLC polygons by landscape type, showing number of polygons containing no monuments

6.4.11 ***Density of Events***: the purpose of analysing the distribution of events was to highlight areas where development had taken place, and as such where there would be a better understanding of the nature of any archaeological monuments, buried or otherwise. Conversely, in areas where no events had taken place there would be a reasonable understanding of the visible monuments, generally of later periods, but no real evidence for buried, which are more likely to be earlier monuments.

6.4.12 This is problematic, for several reasons. Firstly, there are events such as the *River Ribble Catchment Survey* (event LA0005, LUAU 1997b) that had a specific aim: to conduct a rapid survey of the region, concentrating on the eighteenth- and nineteenth-century industrial monuments. Monuments of other periods were not recorded, therefore this survey cannot be considered objective in terms needed for the current study. As such, it has been discounted from the general event distribution for this analysis.

6.4.13 Secondly, a centroid (point) location for an event is not a good indicator of its extent or of the amount of development that precipitated it. Consequently, it was decided that the quantity and density of events within HLC polygons should be considered. As each polygon represents a parcel of land of the same landscape type, an event, or its accompanying development, can be thought of as acting over the entire land parcel.

6.4.14 After excluding events relating to the *River Ribble Catchment Survey*, 294 out of a total of 322 HLC polygons contained no events, which encompass approximately 75% of the actual land area. All HLC landscape types are represented in this number, but over half (113) comprise 'Post-medieval Enclosure' and 'Ancient and Post-medieval Wood'. When the total numbers of parcels of these landscape types are considered (Table 31), it can be seen that only a very small number of events have taken place in these landscapes (Fig 126). These are, however, landscapes that will have conversely seen little recent development. Table 31 shows that these landscape types also contain large numbers of parcels with no monuments. This could be a reflection of the lack of development / archaeological activity, but for the landscape type 'Ancient and Post-medieval Wood' it is probably also a reflection of the reduced visibility of any monuments in those areas.

6.4.15 The largest number of events in an individual polygon was found in the area of 'Ancient and Post-medieval Settlement' representing the historic core of Ribchester, as expected. This landscape type also has a high average number of monuments per polygon (Table 31), reflecting the large levels of development-led archaeological events that have taken place in these areas. The extremely high average for the 'Water' landscape type can be disregarded because there is only one polygon, representing the entirety of the Ribble.

HLC broad type	Number of Polygons	Total Number of events	Average Number of Events
Water	1	7	7
Ancient and Post-medieval Settlement	11	30	2.7
Modern Industry	16	8	0.5
Modern Settlement	32	8	0.25
Ancient Enclosure	91	20	0.22
Modern Recreation	11	1	0.09
Ancient and Post-medieval Ornamental	3	0	0
Modern Enclosure	20	2	0.1
Post-medieval Enclosure	71	8	0.11
Ancient and Post-medieval Wood	49	2	0.04
Modern Communications	3	0	0
Modern Ornamental	2	0	0
Modern Woodland	7	0	0
Reverted Moorland	1	0	0
Saltmarsh	2	0	0
Sand and Mudflats	2	0	0

Table 31: HLC broad types, showing the total and average number of events (excluding LA0005) per polygon

6.4.16 ***Link between Landscape Type and Events***: the historic core of Ribchester contains the highest density of monuments overall, and of all periods, and is an

area classified as 'Ancient and Post-medieval Settlement'. The other areas of this HLC type are Grindleton, West Bradford, Sawley, Waddington, Riley Green, Samlesbury, Chatburn, Barrow and some of the outer areas of Preston (Fig 127). Unlike Ribchester, which contains monuments of all periods, these other settlements contain either only archaeology of medieval and post-medieval date, or later, or, in the case of the settlements of Chatburn and Barrow, contain no monuments at all within the study area.

6.4.17 If the event data for these polygons are examined, it is clear that Ribchester has been subject to considerably more events (28, as opposed to its nearest rival - Sawley, with four). However, the relationship between monuments and events is not straightforward. As Table 32 shows, several of these areas contain monuments but no events. This would suggest that any relationship, if it exists, is between the location of earlier, buried monuments and events. On the whole, medieval and particularly post-medieval monuments are more likely to be extant surface features, and as such can be identified without the need for intrusive events such as excavations.

Area	Total Monument Count	Prehistoric Monument Count	Roman Monument Count	Medieval Monument Count	Event Count
Barrow	0	0	0	0	0
Chatburn	0	0	0	0	0
Grindleton	1	0	0	0	0
Preston	2	0	0	0	0
Preston	4	0	0	0	0
Ribchester	85	2	42	3	28
Riley Green	3	0	0	0	0
Samlesbury	7	0	0	2	1
Sawley	10	0	0	2	4
Waddington	8	0	0	1	0
West Bradford	5	0	0	0	1

Table 32: Areas of 'Ancient and Post-medieval Settlement', and the breakdown of events and monuments within them

6.4.18 If the distribution of monuments was truly related to the distribution of events, then the monuments should be should be in the proximity of the events. The results of running the 'Select by Location' tool on the monuments are shown in Table 33.

Distance from Event (m)	Number of Monuments	Percentage of total	Cumulative Total
25	111	8.99	8.99
50	62	5.02	14.01
75	44	3.56	17.57
100	35	2.83	20.4
150	77	6.23	26.64
200	62	5.02	31.66
250	51	4.13	35.79
500	245	19.84	55.63
750	167	13.52	69.15
1000	160	12.96	82.11

1500	145	11.74	93.85
2000	40	3.24	97.09
>2000	36	2.91	100
Total	**1235**	**100**	

Table 33: Number of monuments at given distances from events

6.4.19 Table 33 shows that less than 50% of monuments are located within 250m of an event, and as such there is no clear geographic relationship between the locations of monuments and events. This is borne out by a study of the sources of the monuments; 423 monuments were identified in three single events: the 1890 documentary survey (Lancashire County Council), the *River Ribble Catchment Survey*, and this project; a further 225 are extant listed buildings. Of the remainder, a large majority (approximately 200) were located from historic mapping and, consequently, intrusive archaeological interventions account for only a very small number of monuments within the study area. They could thus not be used as an indicator for the potential discovery of new sites.

6.4.20 In conclusion, analysing the distribution of events and monuments within HLC polygons has highlighted landscape types that may be under-represented in the monument distribution, but has also highlighted a relationship between the location of events and monuments, albeit not a strong one. This may be due to relatively low levels of development-led archaeological investigation, or simply to low visibility of surviving remains. The issue of the amount of development, or below-ground disturbance, is considered as a key factor in the survival of buried, archaeological monuments (*Section 6.5.2*).

6.5 ANALYSIS OF THE *LACUNAE*

6.5.1 Having established that the distribution of monuments earlier than the post-medieval period throughout the study area does have some limited relationship to the amount of development-led archaeological investigation, the next step was to look further at factors that would affect the survivability or visibility of earlier buried monuments. Many factors, such as chemical or biological effects, were beyond the scope of this project, but the influence of below-ground disturbance was considered.

6.5.2 ***Survivability***: it was postulated that, in areas of below-ground disturbance, either archaeological intervention would have taken place and uncovered buried monuments, or no archaeological intervention had taken place but the level of disturbance would have destroyed any monuments.

6.5.3 The HLC landscape types were used to classify polygons in terms of the amount of below-ground disturbance this would cause (Fig 128). Modern land uses that require considerable landscaping or excavation were classified as bad. Ancient land use types were considered more stable, and were classified as either medium or good (Table34).

HLC Broad Class	Disturbance Level	Number of polygons
Ancient and Post-medieval Ornamental	Medium	3
Ancient and Post-medieval Settlement	Good	11
Ancient and Post-medieval Wood	Good	49

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HLC Broad Class	Disturbance Level	Number of polygons
Ancient Enclosure	Good	91
Modern Communications	Bad	3
Modern Enclosure	Medium	20
Modern Industry	Bad	16
Modern Ornamental	Bad	2
Modern Recreation	Medium	11
Modern Settlement	Bad	32
Modern Woodland	Bad	7
Post-medieval Enclosure	Good	71
Reverted Moorland	Good	1
Saltmarsh	Medium	2
Sand and Mudflats	Medium	2
Water	Medium	1

Table 34: HLC broad types showing disturbance classification

6.5.4 The KS test, comparing the location of monuments and the disturbance of HLC land use types, showed that there was a correlation. The calculations show that statistically more monuments are known in areas of higher disturbance. The implication is that land uses causing below-ground disturbance are subject to higher levels of archaeological investigation or exposure, so more monuments are found. However, given the levels of development and disturbance, it is unlikely that these areas will yield any new monuments.

6.5.5 ***Visibility***: factors such as fluvial deposition in the vicinity of rivers would have an effect on the visibility of monuments within those areas. Terrace T4 and the floodplain have formed and continued to develop since the prehistoric period (S*ections 5.2.23 and 5.2.34*). These are areas that are likely to have seen considerably more activity in the prehistoric period (*Section 2.3*), and as such there is a likelihood of archaeology buried under the fluvial deposits. However, the depths of these deposits, up to 7m in the Lower Ribble Valley (*Section 5.2.23*) and 3.5m in the Lower Calder Valley (*Section 5.2.34*), mean that it is unlikely that anything other than deep excavation will expose any buried archaeological remains (*see also Section 9*).

6.5.6 Unlike *lacunae* resulting from disturbance, *lacunae* because of bad visibility cannot be used as a factor in a discussion of potential. Bad visibility does not affect the potential of an area to contain archaeology; it merely affects our ability to discover it. Although any archaeology in these areas will potentially be buried at a considerable depth, they would be exposed by aggregate extraction and would require careful management and monitoring, given their nature.

6.5.7 ***Conclusion:*** there are two elements to consider when excavating *lacunae*: firstly survivability, or *lacunae* resulting from disturbance; and secondly, visibility. Knowledge of below-ground disturbance can be used to classify areas as having lower potential for surviving archaeology. Low visibility does not affect the potential for archaeological remains, but these areas would require more careful management and monitoring.

6.6 STATISTICAL ANALYSIS

6.6.1 ***NMR broad class:*** the KS test was originally run on the monuments separated by NMR broad class, rather than period (*Section 3.12.5*).

NMR broad class	Total Number of Monuments	Distance from Water	Slope	Aspect	Elevation	Number of correlations
Agriculture and subsistence	145	No	No	No	No	0
Civil	2	N/A	N/A	N/A	N/A	N/A
Commemorative	1	N/A	N/A	N/A	N/A	N/A
Commercial	35	No	No	No	No	0
Defence	37	Yes	No	Yes	Yes	3
Domestic	133	Yes	No	No	Yes	2
Education	21	N/A	N/A	N/A	N/A	N/A
Findspot	79	No	No	No	Yes	1
Gardens, parks and urban spaces	39	No	No	No	No	0
Health and welfare	7	N/A	N/A	N/A	N/A	N/A
Industrial	167	Yes	Yes	No	Yes	3
Maritime	24	Yes	No	No	Yes	2
Monument <by form>	158	N/A	N/A	N/A	N/A	N/A
Recreational	10	N/A	N/A	N/A	N/A	N/A
Religious, ritual and funerary	76	No	No	No	No	0
Transport	99	Yes	No	No	Yes	2
Unassigned	84	N/A	N/A	N/A	N/A	N/A
Water supply and drainage	120	Yes	Yes	No	Yes	3
Number of correlations		**6**	**2**	**1**	**7**	**16**

Table 35: Results of KS test using NMR broad class

6.6.2 It is clear from Table 35 that the distance from water and elevation are the parameters that have the highest number of correlations with Broad Class, and would imply that they had the biggest effect on monument location, whereas slope and aspect appear to have less of an effect. This can perhaps be explained by the topography of the study area, where the narrow valley reduces aspect to one of two choices (in other words which side of the valley is chosen), and slope is reduced to a choice of valley bottom/floodplain or valley sides. Further analysis to test this assumption might involve the reclassification of the aspect into two very broad groups, roughly south-east-facing and roughly north-west-facing. The slope could be grouped as roughly flat or roughly sloping. However, given the eventual decision to concentrate on analysing the monuments by period, it was felt that this was beyond the scope of the project.

6.6.3 When exploring the results by Broad Class (Table 35), no single Class correlated against every environmental parameter. However, the classes 'defence', 'industrial' and 'water supply and drainage' correlated against three factors. This implies that environmental conditions do have an effect on the location of these classes of monument.

6.6.4 ***Defence***: this class correlated most highly with elevation, but an analysis of the monuments themselves shows that 26 of the sites relate to the Roman fort at Ribchester. Putting this cluster aside, it is still clear that environmental factors make a contribution to the location of this type of monument (Fig 129). All but three of the defence-class monuments lie within 50m above sea level, typically reflecting an association with the river. From the putative promontory forts along the north of the Ribble, to the motte and bailey castle at Penwortham,

there would have been a need to either control a river crossing, or use the river as part of the defences; in both instances it would have been important to have a good view over the line of the river.

6.6.5 When a map of the potential for the 'defence' class was constructed, it highlighted the area of the Ribble floodplain as being of greatest potential, with zones of medium potential extending up the valleys of the tributary rivers and streams. The zones of lowest potential were the north- and north-west-facing slopes on the southern side of the Ribble Valley. A rough visibility analysis using viewsheds showed that the northern valley side does allow good visibility of the approaches up the river from the estuary at Preston, but more detailed viewshed analysis would be necessary to develop this inference.

6.6.6 ***Industry***: this class correlated most highly with distance to water, with most monuments clustered at 100-200m from water, which reflects the importance of water power on the siting of industrial sites. The second highest correlation was with slope, most being located on slopes of 5-10° above the horizontal. Thirdly, most sites were between 0m and 100m above sea level. The most numerous of the 167 known monuments of this type are pits (typically for coal); (21 sites) and quarries (31 sites), mainly medieval, post-medieval or modern period, spread relatively evenly across the study area with no obvious clustering.

6.6.7 When a map of the potential for monuments of this class was constructed, most of the study area was shown to be of medium to high potential, as expected, given the even spread of known sites (Fig 130). There are some areas of medium to high potential that do not contain any known monuments, the most obvious of which is the area to the west of Ribchester.

6.6.8 ***Water Supply and Drainage Sites***: unsurprisingly, this class correlated most highly with distance from water, with most sites being within 100m of a water source. The majority are on slopes of between 10° and 20° from the horizontal, and less than 50m above sea level. The majority of monuments of this class are wells (70 sites) and weirs (13 sites). The wells were mainly medieval in date and were spread fairly evenly across the study area, whereas the weirs are clustered on the tributaries of the Ribble, such as the Darwen (ten sites). A map of potential for this class of monument clearly highlighted the majority of the area as being of low potential, with only the zones close to the river and its tributaries being of medium or high potential (Fig 131).

6.6.9 ***Analysis for the Terraces***: it was decided that repeating analysis for the much smaller area covered by the river terraces might provide more useful and detailed information, and allow questions to be asked about the differing uses of the terraces from the prehistoric period to the present day. However, when producing slope, aspect and elevation models for the terraces, it became clear that more detailed base data would be required to differentiate between the small variations in the topography between one terrace and the next. Unfortunately, the LiDAR dataset, which would have provided the additional detail, did not provide full coverage of the area of the multiple terraces. Attempts to merge this with other contour data failed, as the resolution of the final dataset could only be as good as the poorest of the datasets used, which was no better than the initial data.

6.6.10 ***Conclusion***: it seems that this kind of analysis was interesting but not particularly useful. To highlight an area as having high potential for industrial monuments would not provide any indication of the activity in other periods, and yet it is arguable that the method of dealing with likely prehistoric monuments would be different from that for the post-medieval period and later.

6.6.11 If the monuments of a broad class were also split into period, this would lead to 70 different combinations of period and class, and many of these would then have too small a number of monuments to be significant statistically, and it would be a very time-consuming exercise. As a consequence, it was decided to repeat the analysis solely by period, as this would be produce more manageable and meaningful results, and perhaps be more useful as a planning tool.

6.6.12 ***Predictive Modelling: Analysis by Period:*** the second phase of statistical analysis was to look at the distribution of monuments by period. Whilst originally this seemed counter-intuitive, as different types of monument require different environmental parameters, a society of any period would, by necessity, create a landscape of monuments in the area of their choosing. Running the KS tests on these datasets (Table 36) produced results, where 'Yes' indicates correlation.

Period	Number of Monuments	Elevation	Slope	Distance to Water	Distance from Roman Road
Prehistoric	38	Yes	No	No	N/A
Roman	97	Yes	No	Yes	Yes
Medieval	100	No	No	Yes	No

Table 36: Results of running KS test on monuments by period compared to environmental parameters

6.6.13 ***Prehistoric Activity*:** the prehistoric monuments correlated with only one parameter, elevation. The effect of this is that most of the study area appears suitable for prehistoric monuments, because the other environmental factors do not rule zones out (Fig 132).

6.6.14 All but four of the monuments were situated between 1m and 75m above sea-level, with an even spread throughout the 25m, 50m and 75m increments. Of the four above this elevation, only the urn from Pleasington Cemetery is significantly above, being at 100m above sea level. It is possible that this site was significant, and viewshed analysis may prove or disprove this, but it was beyond the scope of this project. The position of the main body of monuments, slightly above the level of the river, might be to avoid flooding, but it would be necessary to reconstruct the prehistoric river course to investigate this more thoroughly.

6.6.15 To create the map of potential for prehistoric monument location, the elevation raster was ranked according to the number of monuments within each band (one for less than three monuments, two for between three and ten, and three for more than ten monuments). This was added to the density map (Fig 121), the HLC Landscape Type map (Fig 52) and the HLC Disturbance Map (Fig 128). This produced a raster with potential values ranging from four to 12 (since each raster was ranked between one and three within the study area). In fact, the maximum score was 11, indicating that there were no areas within the study area that

scored three in each category. To simplify the map, these scores were grouped into three bands to create zones of low, medium and high potential (Fig 132).

6.6.16 This map shows that the zone of high potential is dictated mainly by the elevation, as expected, covering the valley floor and lower reaches of the tributary rivers, although the rivers themselves are of medium potential. The zones of lowest potential are the built-up areas, where the highest level of disturbance might be expected, such as Blackburn and Clitheroe. Only one of the known sites falls within a zone of low potential, the urn from Pleasington Cemetery (*Section 6.2.7*). This site is officially classified as a findspot, although the description (pottery sherds and burnt bone fragments) implies an *in situ* cremation. Other monuments classified as religious, ritual or funerary within the study area fall safely within the zones of high potential, and comprise barrows and similar remains. The Pleasington Cemetery site should be seen as anomalous within the study area and perhaps subject to further investigation, if only to ensure that it has not been mis-classified.

6.6.17 ***Roman Activity***: the Roman monuments correlated with three of the parameters: elevation; distance to water; and distance from the Roman road (Table 37). The greater number of parameters with a correlation has the effect of ruling out larger areas as being of lower potential (Fig 133). This in turn makes the study area appear to have less potential for Roman monuments than for the prehistoric period, but the comparison is misleading and should be avoided.

6.6.18 The largest correlation was with distance from the Roman roads, followed by elevation, and then distance from water. The KS test indicated that 45 out of the 60 monuments other than the roads, were located within 250m of a Roman road. This was then broken down into smaller increments using the Spatial Location Query Tool.

Distance from Road (m)	Number of Monuments	Percentage of Total (%)
0-50	20	44.5
50-100	14	31.1
100-150	9	20
150-200	1	2.2
200-250	1	2.2
Total	**45**	**100**

Table 37: Distribution of monuments with distance from a Roman road

6.6.19 Almost half of the Roman monuments are located within 50m of the Roman road system (Table 37), but while this looks very significant, further analysis shows that all the Roman monuments within 250m of the road system are clustered around Ribchester. As such, this distribution does not indicate that the road system is a particularly high potential zone, despite the strong correlation found using the KS test. Of the remaining 15 monuments, 12 are findspots, including three coin hoards and five single coins, indicating that there was some limited Roman activity within the study area but away from the established lines of the roads and the main focus at Ribchester. Nevertheless the overall results do appear to support the hypothesis (S*ection 6.2.13*) that the main foci of Roman activity was indeed the fort and road system, with relatively little activity known outside of those areas. To an extent this may be biased by the fact that the Roman fort and road system has been known for a considerable period, and that

archaeological and antiquarian investigations have commonly targeted sites of known Roman character (see, for instance, Edwards 2000).

6.6.20 The KS test for elevation shows that the majority of sites (83 of the total, including roads) are situated between 1m and 75m above sea-level, with the majority in the 50-75m band. Again, the cluster of monuments around Ribchester accounts for this, with most of the remainder representing the route of the road. Further analysis of the exact line of the road would probably show that it holds to a specific elevation through most of its route through the valley. Only those monuments away from the road (*Section 6.6.18*) are outside this elevation band.

6.6.21 The KS test for distance from water shows that all of the Roman monuments are within 750m of water, and that 73 of the total are within 250m of it. As for the KS tests for Elevation and Distance from the Roman roads, these results are somewhat skewed by the cluster of sites around Ribchester. Since the Roman roads run in almost straight lines through the study area, whereas the rivers meander, it is the monuments representing parts of the road that are outside the 250m band.

6.6.22 The Roman KS test results taken together show that the distribution is heavily skewed towards the fort and settlement at Ribchester, as expected (Fig 133). Further analysis might include removing those sites, allowing analysis to concentrate on the outliers, but it is fair to say that the zone around Ribchester has by far the highest potential for future sites.

6.6.23 To create the map of potential for Roman monument location, the three correlating rasters were ranked from one to three according to the number of monuments per band. They were then added together, along with the Roman density map (Fig 122), the HLC Landscape type map (Fig 52) and the HLC disturbance map (Fig 128). This produced a raster with potential values from 6 to 18, and the actual values fell between 7 and 18. This means that there are no zones of minimum potential (a score of one in each category), but there are zones of maximum potential (a score of three in each category) within the study area. The area of highest potential overall is, not surprisingly, a radius of approximately 1km around the fort at Ribchester.

6.6.24 When the map of potential was grouped into bands of low, medium and high, the majority of the study area was shown to be of medium potential, with zones of high potential along the line of the roads around Ribchester, and along the river tributaries such as the Darwen (Fig 133). The lower reaches of the Ribble itself, west of Preston, have a low potential, and the remainder is medium. Other zones of lower potential occur in those HLC polygons classified as having high disturbance.

6.6.25 When the known Roman monuments were superimposed onto this map of potential, it was clear that, disregarding those clustered around Ribchester, most were in the zones of high potential along the roads, as expected. However, the zone around the River Darwen was a large area of high potential that contained no known monuments. There are almost certainly other factors at stake in the location of Roman monuments, but this area would appear to be worth further investigation. There are other zones of high potential containing no known monuments around the villages of Waddington, West Bradford, and Sawley, and

a long strip from Myerscough, through Samlesbury to Walton and Lower Penwortham. These areas are smaller in size, but would also be worth investigating.

6.6.26 ***Medieval Activity***: the KS tests for medieval monuments showed correlation with only one factor: distance to water. The factor of the distance from a Roman road had been included to examine the possibility that there was continuity of settlement and activity in the areas of Roman settlement through to later periods, but the KS test did not demonstrate this (Fig 134). Again, the results of the KS test for distance to water showed that the majority of sites (76 of 99) were within 250m of water (Table 38).

Distance from water (m)	Number of Monuments	Percentage of Total (%)
0-50	28	36.8
50-100	20	26.3
100-150	12	15.8
150-200	7	9.3
200-250	9	11.8
Total	**76**	**100**

Table 38: Monuments within 250m of water

6.6.27 The distribution of monuments is more even than that of the Roman monuments (see Tables 37 and 38), showing only a slight tailing off with increasing distance. When the NMR broad classes were examined, all of the monuments in the following classes were within this area: Defence; Findspot; Health and Welfare; Industrial, Transport; Unassigned; and Water Supply and Drainage. Discounting the Findspots, which can be taken as evidence for unspecified activity within the area, it is likely that the other classes of monument required a supply of water nearby.

6.6.28 To create the map of potential for medieval monument location (Fig 134), the 'distance from water' raster was ranked from one to three, according to the number of monuments per band. This was then added to the reclassified medieval density map (Fig 123) and the reclassified HLC disturbance map (Fig 128) to create a combination raster with a potential score of between three and nine. The actual score was from three to nine, indicating that there were zones of minimum and maximum potential within the study area.

6.6.29 There are two zones with a score of nine. The first is the area around Ribchester, and the second around Great Mitton. These represent areas with a high density of known medieval finds; Ribchester contains a number of monuments relating to St Wilfrid's Church and several early medieval metal finds. Great Mitton also has a medieval church and hall.

6.6.30 When the map of potential was grouped into three bands (Fig 134), it showed that more of the area than might be expected was of low potential. This includes the river itself, but also the parts of the area furthest from water, and those areas with high levels of disturbance. The areas of medium potential are those of medium density of known monuments, and close to water. The few small areas of higher potential are those with the highest density of known monuments, the overall result being more predictable than those for prehistoric or Roman potential activity, where the disturbance and density effects were counterbalanced by the greater number of environmental parameters. Having

said that, 36 of the possible 100 known monuments were within the relatively small zones classed as higher potential, compared to only 16 within the zones of lower potential.

6.6.31 The zones of high potential are relatively small and discrete. There are zones smaller than 1km in diameter around Sawley, Great Mitton, Hurst Green, Samlesbury, Samlesbury Bottoms, Cuerdale, and a larger zone around Ribchester. That the largest zone is focussed on Ribchester is not surprising, as it has remained a focal point of settlement and activity from the Roman period to the present day.

6.6.32 ***Conclusions:*** when the three reclassified rasters of potential were added together, this created a new combination raster representing the potential of the study area for monuments of any period (Fig 135). The range of values in the combination raster was from three to nine, indicating that there are parts of the area that have both the minimum and maximum overall potential.

6.6.33 The areas with the lowest potential overall (a score of three) are mainly located on the edges of the major urban areas within the study area, in particular on the margins of Blackburn and Clitheroe. The lowest reaches of the Ribble within the study area are also zones of lowest potential.

6.6.34 The areas of highest potential overall can be found around Ribchester, Sawley, Samlesbury, Samlesbury Bottoms and Cuerdale Hall. None of these locations are particularly surprising, given the high density of existing monuments in those areas.

6.6.35 When the layer was reclassified into zones of low, medium and high overall potential, most of the study area was classified as of high potential, with zones of medium and low potential restricted to the peripheries and small, discrete areas.

6.7 HLC ENHANCEMENT

6.7.1 ***Geomorphic Enhancement - Aggregate Weighting:*** the aggregate terrace data supplied by the University of Liverpool (*Section 3.11.29*), classified in terms of suitability for aggregate extraction, were superimposed on the HLC polygons. This made it possible to add information to each HLC polygon on the suitability of aggregate extraction.

6.7.2 A study of the types of landscapes potentially affected by aggregate extraction shows that, of the 322 HLC polygons within the study area, 222 do not contain river terraces and are therefore not liable to threat from extraction. Of the 100 remaining, Table 39 shows the breakdown of HLC Types by extraction suitability.

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Aggregate Suitability	HLC broad type	Polygon Count	Percentage of Total Area of HLC broad type
High	Ancient and Post-medieval Settlement	1	5.3
High	Ancient and Post-medieval Wood	2	9.8
High	Ancient Enclosure	7	3.8
High	Modern Enclosure	4	38.5
High	Modern Industry	6	45.2
High	Modern Recreation	3	17.1
High	Modern Settlement	3	36.1
High	Modern Woodland	1	1.5
High	Post-medieval Enclosure	8	13.2
High	Saltmarsh	1	72.2
High	Sand and Mudflats	1	49.7
High	Water	1	100
Medium	Ancient and Post-medieval Ornamental	1	80.0
Medium	Ancient and Post-medieval Wood	12	19.4
Medium	Ancient Enclosure	23	53.5
Medium	Modern Communications	1	58.1
Medium	Modern Enclosure	2	6.2
Medium	Modern Settlement	1	3.1
Medium	Post-medieval Enclosure	9	28.4
Low	Ancient and Post-medieval Settlement	1	24.2
Low	Ancient Enclosure	9	9.2
Low	Modern Settlement	2	2.4
Low	Post-medieval Enclosure	1	1.1
	Total	100	

Table 39: Breakdown of HLC broad types by suitability for aggregate extraction

6.7.3 Given the fact that the suitability for aggregate extraction decreases with distance from main roads and the M6 junction in particular (*Section 7.2.6*), because of the cost of transport and the need to improve any roads that will carry large amounts of aggregate, the HLC polygons likely to be highly suitable for extraction are within the western part of the study area, grouped around Preston. They are split into two discrete groups, linked only by the polygon representing the Ribble itself (Fig 136). As a whole, this grouping includes almost half of the total area of 'Modern Industry', and over a third of 'Modern Settlement' and 'Modern Enclosure' landscape types. The western area is predominantly classified as 'Modern Industry', along with the estuarine 'Saltmarsh' and 'Sand and Mudflats'. The eastern sub-group is centred on Higher Brockholes and is considerably less industrial in nature.

6.7.4 The HLC polygons rated medium cover a much larger area but are less diverse, with less Broad Types represented. This area, moving eastwards from Preston and largely covering the area to the north of the Ribble, is mainly designated 'Ancient Enclosure', with areas of 'Ancient and Post-medieval Wood' and 'Post-medieval Enclosure'.

6.7.5 Only a few HLC polygons were considered to have a low level of suitability for aggregate extraction. These are small, discrete areas, with the two largest centred

on Ribchester and Osbaldeston Green, and two further areas around Waddington and Great Mitton.

6.7.6 Over two-thirds of the study area are not considered at risk from aggregate extraction at all, which include most of the study area south of the Ribble, but the most northern extent, and parts of Preston, to the north of the Ribble, are also not at risk.

6.7.7 ***Geomorphic Enhancement - Present Threat***: as with the aggregate weightings (*Section 6.7.1*), the present fluvial threat dataset collated by the University of Liverpool (S*ection 3.11.43*) was superimposed onto the HLC polygons.

6.7.8 Only 85 of a total of 322 polygons are considered to be at threat from fluvial change (Fig 137). There is an even breakdown by threat type, with 31 polygons at risk from deposition, 25 from erosion and 29 from a risk of both deposition and erosion (Table 39).

Present Threat Type	HLC broad type	Number of Polygons	Percentage of Total Area of Type
Deposition	Ancient and Post-medieval Settlement	2	26.1
Deposition	Ancient and Post-medieval Wood	2	4.3
Deposition	Ancient Enclosure	14	17.5
Deposition	Modern Communications	1	58.1
Deposition	Modern Enclosure	1	5.0
Deposition	Modern Settlement	1	19.4
Deposition	Post-medieval Enclosure	10	19.1
Deposition/Erosion	Ancient and Post-medieval Ornamental	1	71.0
Deposition/Erosion	Ancient and Post-medieval Wood	8	23.0
Deposition/Erosion	Ancient Enclosure	11	26.7
Deposition/Erosion	Modern Industry	1	28.1
Deposition/Erosion	Post-medieval Enclosure	7	24.6
Deposition/Erosion	Water	1	100
Erosion	Ancient and Post-medieval Settlement	1	16.7
Erosion	Ancient and Post-medieval Wood	4	4.4
Erosion	Ancient Enclosure	10	8.1
Erosion	Modern Enclosure	3	8.2
Erosion	Modern Settlement	4	5.6
Erosion	Post-medieval Enclosure	3	4.5
	Total	**85**	

Table 40: Breakdown of present threat by HLC broad type

6.7.9 Most of the western and southern parts of the study area are under no current threat from geomorphological change, with the exception of small discrete areas around Walton and Penwortham that are subject to deposition (*Section 8.1*; Fig 138). Moving east, the river meanders through some wide curves, and the land immediately outside these curves are also subject to deposition. The majority of this area is enclosed land and classified as 'Ancient', 'Post-medieval', or 'Modern Enclosure'. North of the river, and in the far north-east of the study area, there is a threat from both deposition and erosion, albeit in different places, and at the meeting of the Hodder, the Calder and the Ribble the threat is also from erosion.

6.7.10 ***Geomorphic Enhancement - Future Threat***: more polygons are likely to be subject to geomorphological change in the future (*Section 8.2*), 115 polygons out of a total of 322 being subject to future change, as opposed to 85 for present-day fluvial change (Fig 139). Of these, 17 are likely to be subject to deposition, 21 at risk from erosion and 77 from both deposition and erosion, albeit in different parts of the polygon. In comparison with the present, slightly fewer polygons will be at risk from either deposition or erosion, but more will have a combined risk (Table 41).

Future Threat	HLC broad type	Number of Polygons	Percentage of Total Area of Type
Deposition	Ancient and Post-medieval Settlement	3	43.6
Deposition	Ancient and Post-medieval Wood	1	1.1
Deposition	Ancient Enclosure	8	6.7
Deposition	Modern Enclosure	1	6.4
Deposition	Modern Settlement	1	2.1
Deposition	Post-medieval Enclosure	3	3.1
Deposition/Erosion	Ancient and Post-medieval Ornamental	1	70.1
Deposition/Erosion	Ancient and Post-medieval Settlement	2	30.7
Deposition/Erosion	Ancient and Post-medieval Wood	13	40.5
Deposition/Erosion	Ancient Enclosure	33	67.3
Deposition/Erosion	Modern Enclosure	4	23.9
Deposition/Erosion	Modern Industry	1	28.1
Deposition/Erosion	Modern Settlement	4	33.9
Deposition/Erosion	Post-medieval Enclosure	18	44.2
Deposition/Erosion	Water	1	100
Erosion	Ancient and Post-medieval Wood	7	10.2
Erosion	Ancient Enclosure	6	2.7
Erosion	Modern Enclosure	2	4.2
Erosion	Modern Settlement	2	1.8
Erosion	Post-medieval Enclosure	4	3.4

Table 41: Breakdown of future threat by HLC broad type

6.7.11 The most striking differences can be seen when the future and present threats are compared (Table 42). It can be seen that the threat of combined deposition and erosion on 'Ancient Enclosure' and 'Post-medieval Enclosure' will increase in the future. This is balanced in part, but not entirely, by a diminished risk of deposition in these Broad Types. The areas likely to be affected in this way are mainly in the central part of the study area, with a second zone around the confluence of the Ribble, Hodder and Calder and other smaller zones to the north.

Future Threat	Present Threat	HLC broad type	Difference
Deposition	Deposition	Ancient and Post-medieval Settlement	1
Deposition	Deposition	Ancient and Post-medieval Wood	-1
Deposition	Deposition	Ancient Enclosure	-6
Deposition	Deposition	Modern Enclosure	0
Deposition	Deposition	Modern Settlement	0
Deposition	Deposition	Post-medieval Enclosure	-7
Deposition/Erosion	Deposition/Erosion	Ancient and Post-medieval Ornamental	0

Future Threat	Present Threat	HLC broad type	Difference
Deposition/Erosion	Deposition/Erosion	Ancient and Post-medieval Wood	5
Deposition/Erosion	Deposition/Erosion	Ancient Enclosure	22
Deposition/Erosion	Deposition/Erosion	Modern Industry	0
Deposition/Erosion	Deposition/Erosion	Post-medieval Enclosure	11
Deposition/Erosion	Deposition/Erosion	Water	0
Erosion	Erosion	Ancient and Post-medieval Wood	3
Erosion	Erosion	Ancient Enclosure	-4
Erosion	Erosion	Modern Enclosure	-1
Erosion	Erosion	Modern Settlement	-2
Erosion	Erosion	Post-medieval Enclosure	1

Table 42: Comparison between future threat and present threat, by HLC broad type

6.7.12 ***Potential Enhancement:*** the maps of potential (*Section 3.13*) were also superimposed onto the HLC dataset to establish the potential of each polygon for archaeological monuments of each period, and overall. As the maps of potential are quite different for each period, the potentials for each period within a particular HLC polygon are also quite different.

6.7.13 ***Prehistoric Potential***: when the prehistoric potential mapping (*Section 6.6.13*) was used to enhance the HLC dataset, the overwhelming majority of the polygons (256 out of 322) contained at least some areas of high potential (Fig 140). Sixty-five polygons contained areas of medium potential at best, and only one contained areas of only low potential. This adds further support to the idea that, according to this type of analysis, most of the study area can be considered to have a high potential for prehistoric monuments.

6.7.14 The area of low potential is a very small polygon that is a remnant of a much larger area representing Samlesbury Aerodrome. It was created when the HLC dataset was clipped to the study area (*Section 3.12.9*), but is really too small to be of use. The areas of medium potential are mainly situated around the peripheries of the study area, with zones to the west of Preston and in the far north and north-east. The biggest zone is in the south of the study area, comprising the 'Modern' development and 'Ancient Enclosure' on the outskirts of Blackburn. A further aggregated group of polygons having medium potential for prehistoric activity can be found around Hurst Green, and in particular Stoneyhurst College (Table 43).

HLC broad type	High Potential for prehistoric Monuments	Medium Potential for prehistoric Monuments	Low Potential for prehistoric Monuments
Ancient Enclosure	81	10	0
Post-medieval Enclosure	54	17	0
Ancient and Post-medieval Wood	43	6	0
Modern Settlement	23	9	0
Modern Enclosure	15	5	0
Modern Industry	11	4	1
Ancient and Post-medieval Settlement	8	3	0
Modern Recreation	8	3	0
Modern Woodland	4	3	0

HLC broad type	High Potential for prehistoric Monuments	Medium Potential for prehistoric Monuments	Low Potential for prehistoric Monuments
Modern Communications	3	0	0
Ancient and Post-medieval Ornamental	2	1	0
Modern Ornamental	1	1	0
Reverted Moorland	1	0	0
Saltmarsh	1	1	0
Water	1	0	0
Sand and Mudflats	0	2	0
Totals	**256**	**65**	**1**

Table 43: Breakdown of HLC broad types by potential for prehistoric monuments

6.7.15 ***Potential Enhancement: Roman Activity***: the Roman HLC enhancement is more evenly divided than for the prehistoric period; of the 322 polygons, 149 contain areas of high potential, 173 contain areas of medium at best, and none contain only a low potential (Fig 141). While more polygons were rated medium, the physical area of high potential is greater. The medium potential polygons are less peripheral than those rated medium potential for the prehistoric period, although they are still confined mainly to the outer limits of the study area. The exceptions to this are zones around a series of meanders in the in the centre of the study area.

6.7.16 There is no real distinction between the Broad Types of HLC and their potential for Roman sites, although there are marginally more polygons of Broad Types 'Ancient and Post-medieval Settlement', 'Wood' and 'Enclosure', and 'Modern Communications' assigned high potential rather than medium (Table 44).

HLC broad type	High Potential for Roman Monuments	Medium Potential for Roman Monuments
Ancient Enclosure	51	40
Ancient and Post-medieval Wood	28	21
Post-medieval Enclosure	27	44
Modern Settlement	12	20
Ancient and Post-medieval Settlement	7	4
Modern Enclosure	6	14
Modern Industry	5	11
Modern Recreation	5	6
Modern Communications	2	1
Modern Woodland	2	5
Ancient and Post-medieval Ornamental	1	2
Modern Ornamental	1	1
Water	1	0
Reverted Moorland	0	1
Saltmarsh	1	1
Sand and Mudflats	0	2
Totals	**149**	**173**

Table 44: Breakdown of HLC broad types by potential for Roman monuments

6.7.17 ***Potential Enhancement: Medieval Activity***: the medieval potential HLC enhancement breaks down as follows: 62 High; 254 Medium; and 7 Low. This has the highest number of low potential polygons, and the lowest number of high potential of any of the periods (Fig 142; Table 45).

6.7.18 The low potential polygons form discrete groups. The first is a stretch of the Ribble in the far west of the study area. Moving east, the area of Preston Docks is of low potential, mainly because it has already been highly disturbed. The brewery at Samlesbury and the quarry at Billinge Hall in Blackburn are the other larger areas of low potential.

HLC broad type	High potential for medieval monuments	Medium potential for medieval monuments	Low potential for medieval monuments
Ancient Enclosure	21	68	2
Post-medieval Enclosure	15	56	0
Ancient and Post-medieval Wood	10	38	1
Modern Settlement	5	26	1
Ancient and Post-medieval Settlement	3	7	1
Modern Enclosure	2	18	0
Modern Industry	1	13	2
Modern Recreation	1	10	0
Modern Woodland	1	6	0
Water	1	0	0
Ancient and Post-medieval Ornamental	0	3	0
Modern Communications	0	3	0
Modern Ornamental	0	2	0
Reverted Moorland	0	1	0
Saltmarsh	1	1	0
Sand and Mudflats	1	2	0
Total	**62**	**254**	**7**

Table 45: Breakdown of HLC broad types by potential for medieval monuments

6.7.19 ***Potential Enhancement: Overall***: when the overall potential was examined for each HLC polygon, the breakdown was as follows: 258 High; 63 Medium; and 1 Low, which closely mirrors the distribution of the potential prehistoric activity. The one polygon of low overall potential is the same as for the prehistoric potential, namely the aerodrome at Samlesbury. The only difference is that two further polygons are of medium potential, in areas of 'Modern Settlement' and 'Modern Industry' at Grimsargh and the brewery at Samlesbury respectively (Fig 143).

6.7.20 ***Conclusions***: the various types of analysis have tended to support the initial hypotheses about the development of human occupation within the Ribble Valley. Examination of the relationship between the different historic landscape types of the HLC, and the distribution of monuments and events, has shown that lacunae in our knowledge may be related to the level of below-ground disturbance. Furthermore, the small number of intrusive events within the study area appear to have skewed the distribution of known monuments to those that are later and more visible, compared to those that are earlier and are less visible,

perhaps buried by fluvial deposition. The dating of the terraces indicates that Terrace T2 at Lower House Farm, for example (*Section 5.2.15*) formed in the Iron Age: the basal flood horizon for Terrace T2 produced a date of 387-205 cal BC (2232±28 BP; OxA-15687 and also cal AD 467-650 (1480±35 BP; SUERC-10648). At the same location, Terrace T4 produced dates of cal AD 239-383 (1739±27 BP; OxA-15689) and cal AD 135-378 (1770±35 BP; SUERC-10666), securely in the Roman period. This accords with the fact that the only major prehistoric sites from the valley floor, at Marles Wood and Preston Dock, were identified at depths of between 3.5m and 5m below the surface. This would suggest that any prehistoric sites at the western end of the Lower Ribble Valley are likely to be buried by relatively recent fluvial deposits. As such, the lacunae of pre-Iron age sites in some parts of Terrace T2 and pre-Roman sites on Terrace T4, reflects that only very deep interventions / explorations would have been able to identify them.

6.7.21 Nevertheless, examination of the potential of the study area for monuments of different periods has highlighted that some areas are worthy of further investigation or monitoring, particularly in the light of the data on aggregate resource and geomorphological change created by the University of Liverpool (*Section 3.11*).