2957 NMP acceleration: West Yorkshire

LOWER WHARFEDALE

NATIONAL MAPPING PROGRAMME PROJECT

SUMMARY REPORT

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SUMMARY

The Lower Wharfedale NMP project was funded by English Heritage's Archaeology Commissions Programme and operated by Advisory Services, West Yorkshire Archaeology Service (WYAS).

Two-fifths of the county of West Yorkshire and smaller parts of North and South Yorkshire were surveyed to National Mapping Programme standards from existing air photographs. Digital maps, at a nominal scale of 1:10,000, and supporting records were created by a team of three aerial investigators. This team was contracted by Advisory Services WYAS and based with English Heritage's Aerial Survey (North) at Tanner Row, York.

The project identified and mapped sites varying in date and type ranging from a Neolithic henge to military remains from the twentieth century. New AMIE records were created for 1345 monuments or monument groups and a further 363 amendments or enhancements were made to existing records.

1 INTRODUCTION

The Lower Wharfedale NMP Project is part of English Heritage's National Mapping Programme. The National Mapping Programme (NMP) is ongoing and is generating a comprehensive record of the archaeology that is visible on air photographs for the whole of England. To date, approximately 32% of the country has been covered by the programme.

This project has produced maps and records of the visible archaeological features in the area of Wharfedale between Skipton and Wetherby and from Wetherby southward to the northern edge of Barnsley. Overall the project comprises 44 OS 1:10,000 scale quarter sheets and covers an area of 1100km2..

Work was undertaken by a small team of aerial investigators who were contracted by Advisory Services WYAS and based with English Heritage's Aerial Survey (North) at Tanner Row, York.

This project ran between 4th March 2002 and 9th November 2004 but was suspended for six months during 2003 to allow the team to undertake work on a small NMP-type project in Northumberland.

This report is a brief overview of the results of the project with particular reference the original aims and objects. An overview of the management and operation of the project is provided in the end of project Management Report (Deegan 2004).

2 AIMS AND OBJECTIVES

The aim of the National Mapping Programme is to produce a comprehensive record of the archaeology of England, from prehistory to modern times through the interpretation and mapping of remains that are visible as earthworks, crop marks, parchmarks and soilmarks on air photographs.

In addition to this overarching aim, this project was instigated by a number of broad issues as identified in the original project design (Deegan 2001).

- It was well understood that the existing specialist archaeological air photograph coverage was heavily biased towards the articulated crop marked landscape on the Magnesian Limestone belt to the detriment of other areas in West Yorkshire. It was anticipated that the results of this project would inform productive strategies for future aerial reconnaissance in areas of perceived low monument density, particularly in the immediate vicinity of living settlement on the coal measures and Millstone Grit in the rest of the county, as well as allowing targeted research reconnaissance within the area mapped.
- Substantial areas of this project are under acute pressure from residential development because of their proximity to the urban areas of Bradford and Leeds. The greatest threats are in those areas where archaeological recording has been poor, in the Aire/Wharfe interfluve and around small living settlements in the west of the county. Thus this project was required in order to assist

Advisory Services WYAS to make better informed recommendations on individual planning applications.

- Ploughing and soil erosion is already a chronic threat to buried archaeological landscapes on the Magnesian Limestone belt. This trend is likely to be repeated on the Millstone Grit and particularly along the River Wharfe as increasing areas of former permanent pasture are given over to arable cultivation. This will undoubtedly accelerate the destruction of the medieval and post-medieval rural and industrial landscapes as well as expose any earlier remains to the same threats. It was hoped that the NMP project could contribute to the management of this threat.

There were also specific objectives for this NMP project in particular areas.

- At the time of the project's inception the Monument Protection Plan (MPP) was considering the scheduling proposals for the extensive industrial remains on Baildon Moor. Although ground survey had previously revealed the nature of the surviving earthwork monuments on the Moor, at that time information on the levelled features and the wider multi-period landscape context was absent.
- Rombalds Moor is the setting of a nationally important group of carved rocks. Although the character and distribution of the rock art was well-studied (RAPP 2000) the landscape context had received less attention. It was hoped that detailed examination of a broad range of air photographs would reveal hitherto unknown monuments on the Moor.
- At the inception of this NMP project the Ilkley Moor Management Plan was in consultation and in the opinion of the WYAS Advisory Service, was inadequate in its treatment of the historic environment. It was, however, proving difficult to redress this with the current level of knowledge about the archaeological remains on the Moor. It was anticipated that this project would considerably enhance the existing record and in doing so help WYAS Advisory Service to promote a more enlightened approach to the management of this Moor.

There were also ambitious objectives for this NMP project to contribute to regional discussions on patterns of rural settlement and the nature of the extensive crop marked landscapes known to exist on the Magnesian Limestone.

This and earlier NMP projects in the Yorkshire Dales National Park and the Vale of York together form a contiguous block of mapping through the putative Central Province and Northern and Western province identified by Professor B. K. Roberts and Dr S. Wrathmell in their national study of the rural settlement patterns (2000). This provides an opportunity to study a significant archaeological section through the areas of nucleated and dispersed settlement and provide a means of relating pre-medieval to medieval patterns.

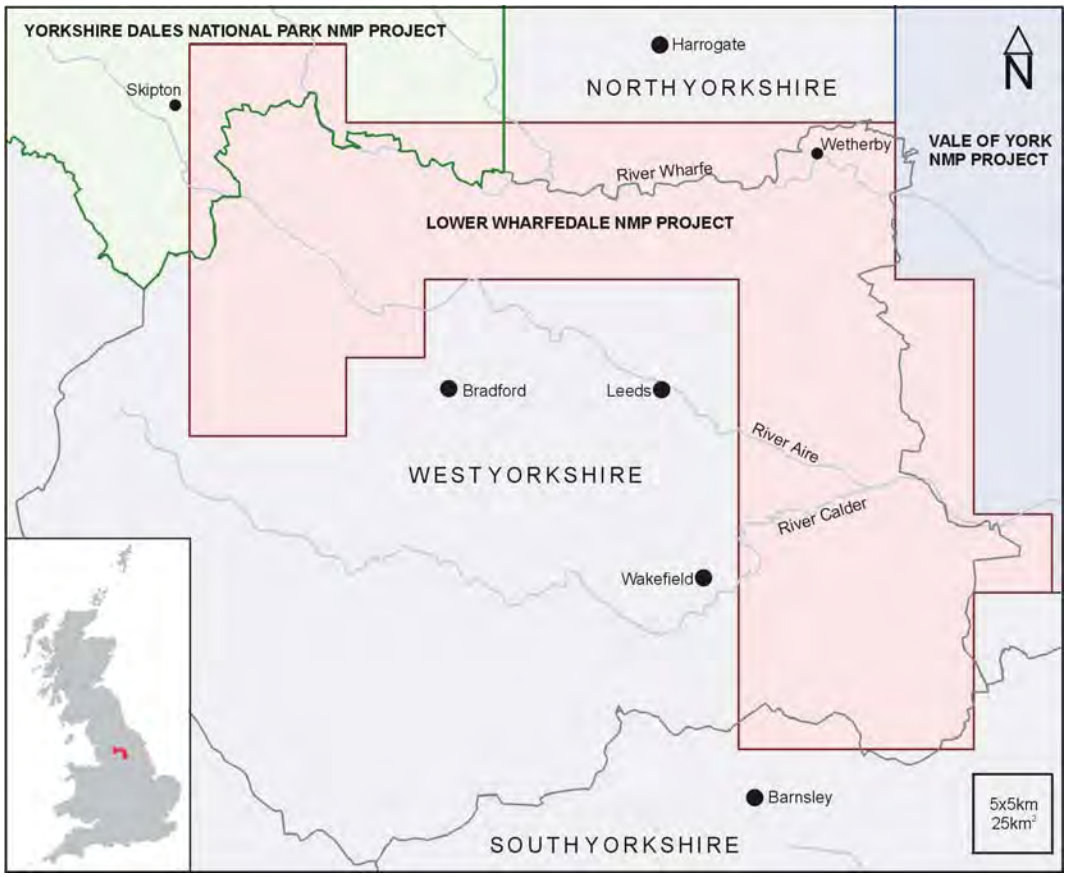
There is a wealth of data from excavation and geophysical survey for the eastern part of the project area which provides an opportunity to test and enhance the principles of air photo interpretation.

3 SCOPE OF THE SURVEY

3.1 Geographical scope of the survey

The project area is irregular in plan and consists of 1100 km2. It covers approximately 40% of the county of West Yorkshire, just 3% of North Yorkshire and a smaller proportion of South Yorkshire.

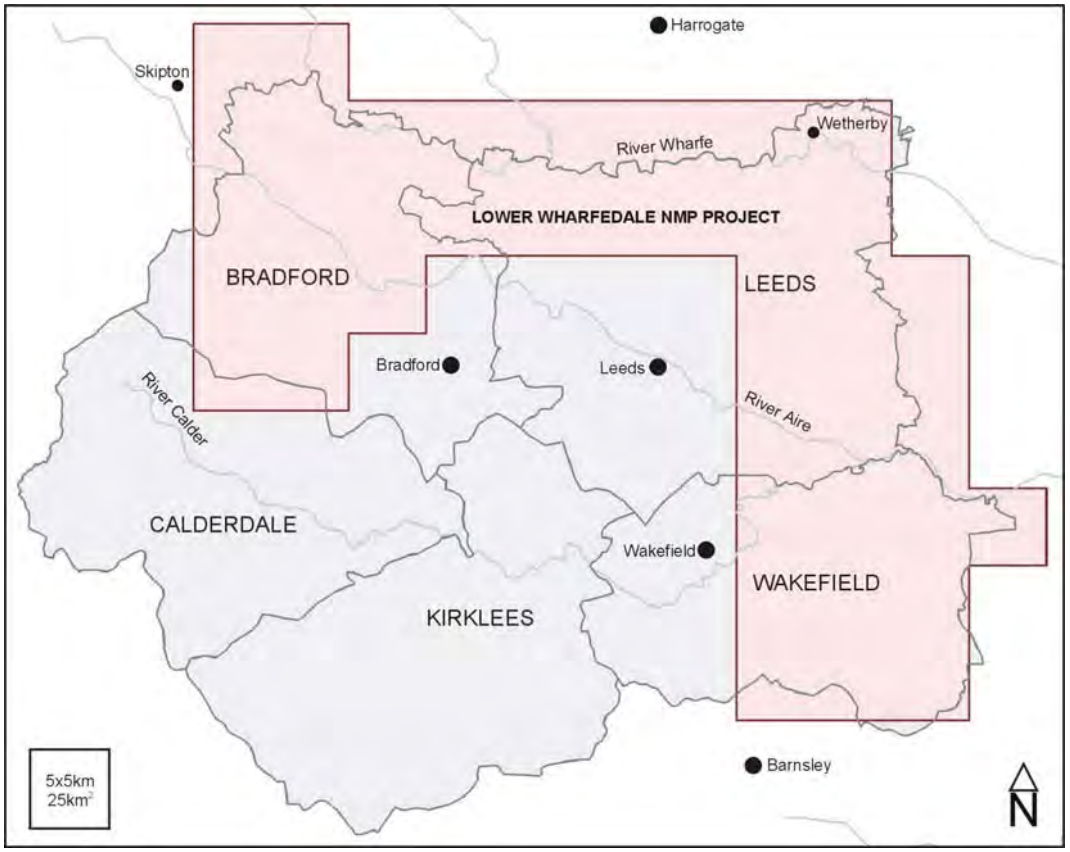
Figure 1 - Location plan for the Lower Wharfedale NMP Project



In North Yorkshire the Lower Wharfedale NMP Project covers parts of Selby and Harrogate Districts. Small parts of this project lie within the Yorkshire Dales National Park and have been covered by an early NMP Pilot Project, but these were re-mapped to the current NMP standards and specification and the earlier data was used in reference (NMR Event UID 974999).

Within West Yorkshire, the project covers parts of four of the five districts. Leeds, Bradford and Wakefield each have approximately two-thirds of their areas covered by NMP, Calderdale has just 5% coverage and, at this time, there is no NMP coverage of any part of Kirklees District.

Figure 2 - Lower Wharfedale NMP Project coverage of the West Yorkshire Districts

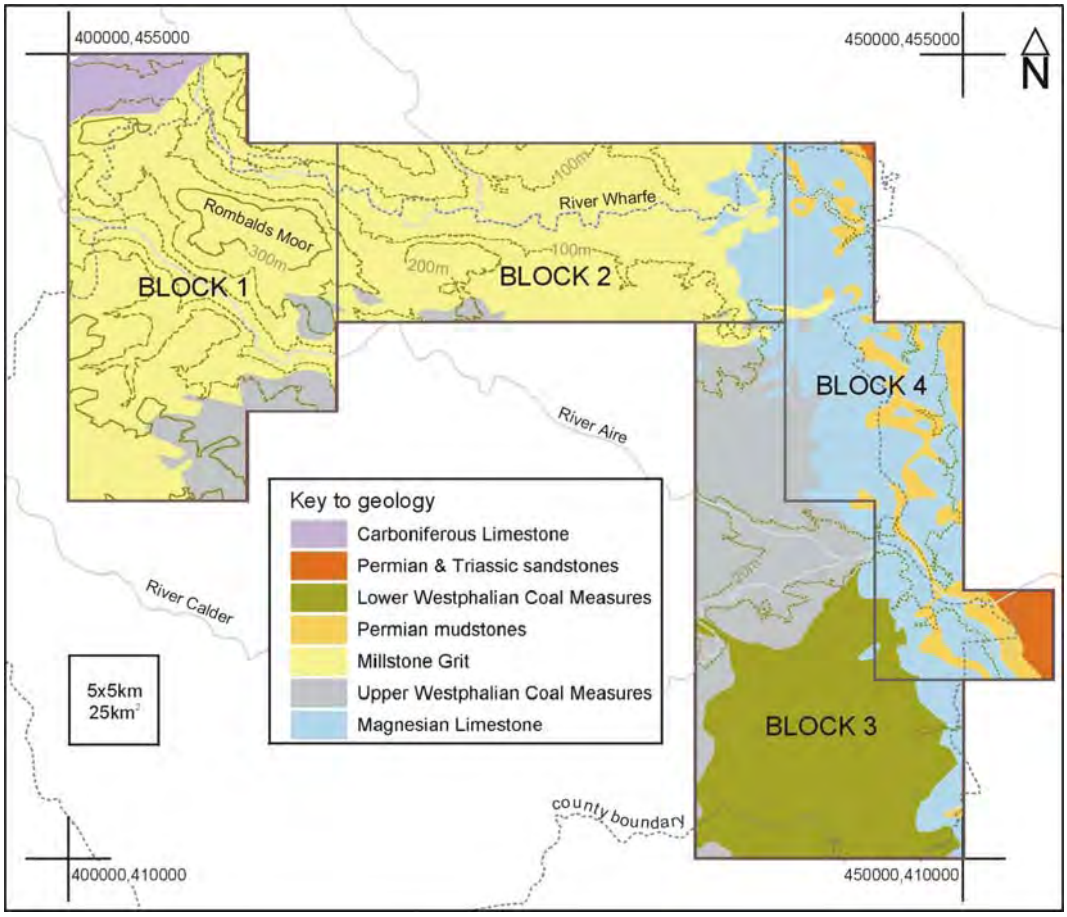


The topography, soils and land use vary considerably with the underlying geology of the project area. For administrative purposes the project area was divided into 4 blocks based on a simplified plan of the landscape (See Figure 3).

Block 1. The Moors (13 OS 1:10,000 quarter sheets)

In the west the land rises to the great Millstone Grit moors of Rombalds, Ilkley, Baildon and Oxenhope and is cut by the valleys of the Wharfe and Aire and their tributaries. The River Aire divides the Rombalds Moor area from the Central Pennine Plateau further south. Thick blanket peat has developed on Oxenhope Moor where precipitation is highest. The more northerly moors are capped with glacial clays and have poorly drained soils with peat horizons. Where the Millstone Grit outcrops the soils are thin and acidic. Lower in the valleys the soils tend to be heavy and poorly drained, developed from glacial deposits and river alluvium with only localised areas of coarser, better drained soils. There is considerable urban settlement to the south-east of this area and along the river courses, extending from the Leeds-Bradford conurbation. The river valleys form the main routes for modern communications. There is permanent pasture along the valley floors and sides and above this grazing on open moorland. The mean annual rainfall is more than 127cm (Faull & Moorhouse 1981: Map 2).

Figure 3 - Simplified solid geology within the Lower Wharfedale NMP Project area



Block 2. Wharfedale (10 OS 1:10,000 quarter sheets)

The central section of the project area forms a broad corridor along the River Wharfe, again on Millstone Grit, bordered to the south by the Leeds-Bradford Conurbation. The southern edge of the valley at Otley is accentuated by the steep scarp slopes of the Pennines but the valley profile becomes shallower as the Wharfe flows eastward. The soils are generally heavy and poorly drained, developed from glacial deposits and river alluvium with only localised areas of coarser, better-drained soils. Within the corridor and south of the Wharfe the modern population is generally concentrated in small towns with some small dispersed hamlets and farmsteads. North of the river, in North Yorkshire, modern settlement is sparser and concentrated in small villages and hamlets. The land is under pasture and, increasingly, arable cultivation, with some areas of parkland, such as at Harewood and woodland, particularly along the steeper slopes. The mean annual rainfall ranges from c 89cm in the west to c 70cm in the east (Faull & Moorhouse 1981: Map 2).

Block 3 The Coal Measures (12 OS 1:10,000 quarter sheets)

The eastern part of the project area lies on Coal Measures and Magnesian Limestone. The soils formed on Coal Measures are generally poorly drained. The

topography is one of rolling hills, cut by the broad valleys of the Rivers Aire and Calder. The recent past and modern landuse reflect the importance and the demise of the coal industry in this area. Modern settlement is nucleated within the former colliery villages, large areas have been re-landscaped from slag heaps or open cast mines and disused railways criss-cross the landscape. Despite the industrial character of the Coal Measures there are substantial areas of arable farming and they have attracted considerable aerial reconnaissance. The mean annual rainfall is between 61cm and 70cm (Faull & Moorhouse 1981: Map 2).

Block 4 The Limestone block (9 OS 1:10,000 quarter sheets)

The soils on the gently rolling limestone terrain are particularly well-drained and conducive to crop mark formation. This area has attracted considerable attention from aerial archaeologists as reflected in the relatively high number of specialist photographs in this block. The archaeological landscape is characterised by extensive prehistoric field systems and trackways, the friability of the soils and a history of intensive arable farming on the limestone has greatly denuded the remains from later periods. However there are also areas of park and woodland within which preservation is better. The mean annual rainfall is again between 61cm and 70cm (Faull & Moorhouse 1981: Map 2).

3.2 Archaeological Scope

The aim of the National Mapping Programme is to increase our understanding of the historic environment. It achieves this by identifying, interpreting and recording all probable and possible archaeological features that are visible on air photographs as crop marks, soilmarks, parchmarks and earthworks. The NMP Sphere of Interest draft report (RCHME 1997) documents in full the scope of the NMP. The main aspects relevant to the landscapes of the Lower Wharfedale NMP Project are summarised below:

3.2.1 Earthwork archaeology

All extant earthworks identified as archaeological in origin were recorded.

3.2.2 Levelled archaeology

All crop mark, parchmark and soilmark features identified as archaeological in origin were mapped.

3.2.3 Post medieval and modern field boundaries

Field boundaries (upstanding or levelled) that are visible on air photographs, but that are also depicted on first edition Ordnance Survey or later edition maps, were not mapped.

3.2.4 Medieval and post medieval ridge and furrow

All extant, vestigial, soilmark and crop mark evidence of ridge and furrow visible on air photos was mapped. Using a simple graphical depiction the extent of the original furlongs (as far as these could be deduced) and the direction of ploughing were delineated. Remains were characterised as either medieval ridge and furrow,

post-medieval ridge and furrow and post-medieval narrow ridge and furrow such as steam rig.

The state of preservation was evaluated from the latest photography and the visible remains were distinguished in the system of AutoDESK Map 2004® layers and conventions between those that were extant and those that had probably been levelled. This is by no means a definitive statement on the condition of ridge and furrow, earthworks that appear to be completely levelled from the air may actually survive as upstanding features and vice versa.

3.2.5 Industrial features and extraction

Large-scale disused and active quarry complexes (> 2 hectares) were recorded by a simple outline of their greatest visible extent, though some details such as trackways and spoil heaps were recorded as seen. Smaller quarries (1-2 hectares) were recorded if they were not mapped on the relevant Ordnance Survey First Edition six inch to one mile sheet or if they impacted on other archaeological features. Very small quarries (< 1 hectare) were not recorded unless they were thought to be of pre-medieval date. The remains of pre-modern coal extraction and associated features were recorded.

3.2.6 20th century military features

As it is within the brief of English Heritage to record former military features constructed up to and within the Cold War period these features were mapped where visible. In general the presence of complex and extensive sites such as army camps was denoted by a simple outline though selective features within these sites were occasionally mapped “as seen”.

3.2.7 Buildings

The foundations of buildings visible as earthworks or ruined stonework were recorded. Standing roofed or unroofed buildings or structures were generally not recorded unless they had a particular association in the context of industrial or military sites.

4 SOURCES

4.1 Air Photographs

The Lower Wharfedale NMP Project Design identified the following collections as containing photographic coverage of areas within the project’s area:

- Cambridge University Committee for Aerial Photography (now the Unit for Landscape Modelling, ULM)
- English Heritage’s National Monuments Record (NMR)
- Sites and Monuments Record (SMR), Heritage Group, North Yorkshire County Council
- SMR, South Yorkshire Archaeology Service

- SMR, West Yorkshire Archaeology Service
- Regeneration Department, Wakefield Metropolitan District Council (WMDC)
- Environment Agency

The NMR provided a medium to high density of vertical air photo coverage for the whole of the survey area: between c. 244 and 921 prints per quarter sheet. The vertical photographs held by WMDC Regeneration Department are, in the main, duplicates of sorties held by the NMR. There are no formal facilities for consulting photographs at Newton Bar and on balance it was considered inappropriate to consult this collection for this project. Similarly, for reasons of impracticality and likely poor returns, photographs held by the Environment Agency, which were not taken for archaeological purposes, were not consulted.

The specialist oblique and vertical photographs held by the NMR were loaned to the project team in batches covering between 3 and 14 quarter sheets, depending on the density of coverage. Mapping was started from this resource and amended or appended with the information from the other collections as it became available.

The project was also carried out in collaboration with Cambridge University's Unit for Landscape Modelling (ULM): their contribution being the loan of material from their Air Photo Library. Photographs were also kindly loaned by North Yorkshire SMR and West Yorkshire SMR. Photographs of the project area held by South Yorkshire SMR, for which there were very few, were consulted at the offices of South Yorkshire Archaeology Service in a single visit.

The table below quantifies the holdings of each collection, there is considerable duplication between collections. Reference numbers for the NMR loans are given by quarter sheet in Appendix 4 and full contact details for each collection are given in Appendix 5.

Collection Name	No. of oblique photographs	No. of vertical photographs
National Monuments Record	8700	c. 19 200
Unit for Landscape Modelling	c. 660	c. 151
West Yorkshire SMR	c. 2520**	None consulted
North Yorkshire SMR	Minimum 740*	None consulted
South Yorkshire SMR	All duplicated in NMR	None consulted

* On NYCC AP database 1 entry may contain references to more than 1 photograph

** in addition at least 2743 other photographs taken by Bob Yarwood for WYSMR were duplicated in the NMR loan and were not borrowed for consultation from the SMR.

4.2 Existing records

The National Monuments Record database AMIE (formerly NewHIS and previously MONARCH) was routinely consulted. This process was assisted by the output from English Heritage's GIS, HSIS, which facilitates graphic representation of the records with attached summary data.

Data for the project areas from the Sites and Monuments Record for West Yorkshire, North Yorkshire and South Yorkshire was made available by Ian Sanderson, Principal Archaeologist, Nick Boldrini, SMR Officer and Louisa Matthew, SMR Officer, respectively. Where possible the records that were created or enhanced by this project were concorded with the SMR records supplied by the three counties.

5 METHODOLOGY AND RECORDING

5.1 Mapping Methods

All the available air photographs from the specified sources were examined under magnification and stereoscopically where possible. Photographs selected for transcription (rectification and mapping) were scanned at a suitable resolution, this was usually 300dpi, and output as uncompressed TIFF format images (.TIF). Where permission to scan was not forthcoming from the copyright holder the necessary information was traced onto acetate sheets and these were scanned and rectified.

Scanned images were rectified using the specialist software AERIAL5.18 until April 2004 and subsequently AERIAL5.24. Control information was mostly derived from the Ordnance Survey Land-LineTM 1:2500 scale vector maps, which were also used as a base for mapping. Height information from the OS Land-form ProfileTM (5m vertical interval, 1:10,000 scale) was used to create Digital Terrain Models in AERIAL where the topography rendered this necessary.

Accuracy for the Ordnance Survey raster 1:2500 maps is in the range of ±2m and rectification of photographs is normally within ±2.5m. However areas of open moorland with little control present particular problems which can only be overcome by the availability of good vertical coverage for secondary control.

Rectified images were output from AERIAL in uncompressed TIFF format at a resolution of 200-300 dpi and a scale of 1:2500. A World file (.TFW) was created alongside each TIFF file and the control information was retained in the AERIAL RDA file (.RDA).

Individual digital drawings were created for each map quarter sheet in AutoCAD2000® until March 2004 and subsequently Autodesk Map 2004®. The rectified image was placed into the relevant map drawing, the information in the World file determined the image's correct position and scale. The archaeological features were then traced from the photograph into the standard NMP layers using the established NMP conventions (see Appendix 1).

All drawings original ly created in AutoCAD2000® were updated to AutoDESK Map 2004®. EH's Aerial Survey changed the standards and conventions for NMP mapping midway through this project. These changes were applied retrospectively to the whole of the project when all mapping and recording was completed.

5.2 Recording Strategy

There are three strands to the NMP recording strategy. The main strand is the creation of new or the enhancement of existing monument records in the NMR's AMIE database. The NMP-generated entries or enhancements for each monument or monument group in this database record the key locational information, the monument types present and their dating, the nature of the evidence, a free text description of the monument or monument group, the source of record information (i.e. photograph and any bibliographic or cartographic references) and administrative details such as concordance with SMR records, record authorship, and links to events and archives.

To assist in the management and querying of the actual map data in the Autodesk Map 2004® environment and in English Heritage's planned GIS a summary of some of the database information is attached to each individual mapped feature. Two tables of data are attached to each feature, the content of these tables is listed Appendix 2.

For selective sites morphological information was entered on the Aerial Survey Morphological Recording Module.

6 PROJECT MANAGEMENT

The mapping and recording for the project was carried out by Matthew Oakey, Daniel van den Toorn and Alison Deegan (project team leader). Yvonne Boutwood was the Aerial Survey Project Officer and the first point of contact for matters of interpretation, recording and NMP standards. Yvonne Boutwood also undertook some mapping of part of one quarter sheet and organised the loan of material from the Unit for Landscape Modelling.

The project started on 4th March 2002 and was completed on the 9th November 2004. The project was suspended between April and September 2003 whilst the team produced NMP mapping for the Till-Tweed Geoarchaeology Project, an Aggregates Levy Sustainability Fund project. In January 2004 a request to vary the duration of the Lower Wharfedale NMP project and for extra funds to cover shortfalls in the timetable was formally submitted and approved by Archaeology Commissions.

7 SUMMARY OF PROJECT RESULTS

The following is intended to provide a brief overview of the project's results.

7.1 Quantification of results

This project created 1345 new AMIE (NMR) records and made amendments or enhancements to at least another 270 records. Some records were amended or enhanced more than once, for example those extending across one or more quarter sheet maps, so that the actual number of amendments or enhancements made is 363. A breakdown of the number of new and amended records by quarter sheet is provided in Appendix 4.

Of the new and amended records 1168, or 72%, were not previously recorded in the databases of the relevant Sites and Monument Record (as supplied during the course of the project). Breaking this down into the three counties, of the 406 AMIE records created or amended in North Yorkshire 306 were not recorded in that county's SMR, of the 1177 records in West Yorkshire, 837 were not recorded in that county's SMR and 24 of the 32 AMIE records created within South Yorkshire were not previously recorded in its SMR.

Of the records that were new to the Sites and Monuments Record at the time of mapping approximately two-thirds related to features that were medieval or later in date, the other third being features of Roman, earlier or uncertain date.

The predominant forms of evidence were earthworks and crop marks. A small proportion of remains survived as ruined buildings or structures. Soilmarks and parchmarks were not explicitly differentiated from crop marked sites in neither the AMIE index nor the attached data tables. The form of evidence is simply a record of the nature of the monument on the photograph from which it is recorded and is not intended to be an indication of current condition of the monument. A full list of the types of monuments represented in this project is given in Appendix 4.

7.2 Overview of results by period

The distribution of monuments attributed to the Neolithic and Bronze Age is restricted to moorland in the west and the south-east of the project area. Evidence for monuments of these dates is notably absent in the areas north of the Aire-Calder confluence and east of Rombalds Moor. There are particular concentrations around Rombalds and Baildon Moors in the west and around Ferrybridge in the south-west.

The number of individual monuments is fairly small but the range of types observed is surprisingly wide and includes two embanked stone circles on Rombalds Moor (UIDs 50140 & 49717), a possible long cairn on Black Hill (UID 48081), at Normanton there is a cursus of the short variety like the Barnack example in Cambridgeshire (UID 1390677) and there is the henge at Ferrybridge. A more diverse range of monument types could be identified around the Ferrybridge Henge partly as a result of recent ground investigations by Archaeological Services

WYAS, some of which had been photographed from the air. Round barrows and barrow ring ditches were the most commonly identified monuments of these periods, but although often attributed to the Bronze Age the excavations at Ferrybridge has demonstrated that some examples may date from the Neolithic. Photographs of Rombalds Moor also yielded evidence of several possible enclosures of Bronze Age date (UIDs 49991, 49896, 1030842), one confirmed by excavation prior to this project, and there are possible clearance cairns in the form of small round cairns (UIDs 1362360 & 1030759).

The majority of the Iron Age and Roman period features identified by this project are concentrated in the east of the project area on the Magnesian Limestone and to a lesser extent the coal measures. Crop marked sites of any period are far fewer across the moors and intervening valleys and along Wharfedale. Nevertheless the NMP is an important record of the Iron Age and Roman remains in the west of the county of West Yorkshire. This includes new details about well-known but poorly understood earthworks such as Castle Stead Ring (UID 47897), Woofa Bank and Round Dikes Camp and the associated boundaries (UID 48311) as well as the previously unrecorded potential Iron Age enclosure north-east of Baildon Moor (UID 1369494). For the Roman period in these areas the more notable observations concern the numerous sections of roads leading to and from the fort at Ilkley, from the south (eg UID 1360419), from the north (eg UID 1364062), from the north-west (eg UID 1366097) and from the east (eg UID 1374240). The latter is particularly well represented on the air photographs, is visible over a distance of approximately 4.5 kilometres and its raised agger survives well in parts. Of additional interest are the possible Roman enclosure that cuts across the road near the Leeds-Bradford Airport (UID 921276) and the small sections of possible Roman road that run obliquely to the route of the main road in the same area (UIDs 1374206 & 1374210).

In the east of the county the monuments of the Iron Age and Roman period that are visible from the air can be neatly summarised as enclosures, trackways, fields and pits. Occasionally, excavation of crop marked sites has exposed or confirmed less prosaic interpretations: the Iron Age chariot burial in Fryston Park (UID 922179) and the possible Roman shrine just over a kilometre to the south (Roberts et al forthcoming). However in the absence of excavation evidence it is near impossible to reconstruct the function of an enclosure from the crop mark evidence alone, and in many cases, to differentiate the Iron Age from the Roman period remains. Nevertheless the NMP is a valuable record of these Iron Age and Roman period landscapes, however fragmentary and undifferentiated. Previous multi-disciplinary studies have demonstrated the potential of integrating air photo interpretations with the results of geophysical survey and excavation (Roberts et al 2001). This project provides an opportunity to extend this exercise to a much larger and thus more statistically significant data set. Even a cursory examination of the NMP data brings to light some intriguing issues: the differences in character between the highly visible ancient landscapes of the Magnesian Limestone and the

more fragmentary picture recorded on the coal measures, the significance of the variation of field shape, size and layout and the apparent concentration of curvilinear enclosures in certain area when rectilinear forms tend to dominate elsewhere.

As is common to many previous NMP projects evidence of early medieval remains in extremely rare. In this case the only tentative sites are a small group of sunken featured buildings (indexed as Grubenhaus) near Thorner (UID 1386226) and a single example near Barwick in Elmet (UID 1386353).

The main component of the record for the medieval period generated by this NMP project was the remains of ploughing and cultivation: ridge and furrow, lynchets, headlands and terraces. A main objective of this project was to record ridge and furrow in units that reflected the original furlongs and it remains to be seen if the results are a success. Certainly distinguishing medieval remains from the results of similar processes in the post-medieval period presented considerable difficulty. A common characteristic of ridge and furrow in many parts was the combination of narrow ridges with the gentle s-bends, perhaps an indication of post-medieval re-modelling of earlier plough ridges.

Evidence of medieval rural settlement is exceptionally scarce, undoubtedly a reflection of its dispersed nature over much of the project area. Possible remains of nucleated settlements have been recorded at Felkirk (UID 52594) and North Elmsell (UID 1396679). Evidence of specialist sites such as granges, moats, mottes with and without baileys and ringworks has also been recorded.

For the post-medieval period the remains of ridge and furrow again dominate but this project has also generated a significant record of industrial activities, in particular of coal extraction. Coal workings, bell pits and associated features cover an area of nearly 3km2 on Baildon Moor, where coal measures cap the Millstone Grit (eg UID 1361187). Activity of a similar concentration and scale is also apparent across Rivock Edge on Rombalds Moor (eg UID 1360940). In the east of county, evidence of pre-twentieth century coal extraction is concentrated along the surface boundary between coal measures and the Magnesian Limestone where the former dips shallowly under the latter (eg UID 1400583, 1143718, 1403961).

For twentieth century activities this project restricted its recording to military remains and large-scale extraction. The latter was mapped and recorded mainly to document the impact of the coal and aggregates industry on the survival and visibility of earlier archaeology. These activities have their greatest impact in the east of the project area, south of Barwick upon Elmet. Here at least 6% of the ground surface has been heavily disturbed by gravel extraction, opencast coal mining or limestone quarrying, in most cases destroying archaeological features in the process. In several instances archaeological features have been recorded from photographs taken before these interventions took place.

A range of military sites have been recorded by this project although the restrictions of EH's Monument Thesaurus belies the full diversity of types present.

More specific technical nomenclature has been used in the free text fields of the relevant NMR record, when it is known. Almost without exception information of this kind has been supplied by the unfailingly enthusiastic Roger Thomas (EH Investigator).

It is important to note that in its current form the data produced by most NMP projects, including this one, cannot be used to generate detailed distribution plots or quantifications on a “by monument” basis. Each NMR AMIE record contains an index of the different monument types that are present but not the numbers of each type, though this information should be included in the free text field. Furthermore because monuments are not individually grid referenced in any searchable field only basic distribution plots can be obtained. In the Autodesk Map 2004® drawings a single monument may contain many discrete elements (polylines and hatches), each of which will be represented by an entry in the attached data tables thus grossly inflating the results of any count conducted on the subjects of any of the fields. In neither context can a definitive count be achieved nor is it possible to extrapolate a detailed distribution of point data. Between 1994 and 2001 Northamptonshire County Council produced for English Heritage an NMP project whose data could be used to these ends. For that project all the mapped elements of individual monuments were combined to produce stable monument units that were directly correlate with the entries in the project’s record database (MORPH2.2).

7.3 Results with respect of the project’s original aims and objectives

The completion of the mapping and recording of the Lower Wharfedale project is a crucial stage in realising the aims and objectives that instigated the original proposal for this project.

The project has, as expected, demonstrated a considerable bias in the coverage of photographs taken for archaeological purposes to the east of the project area and in particular the Magnesian Limestone. Approximately 3650 photographs were used directly in the transcription process, that is photographs (or overlays) that were scanned and rectified and then used as the basis for mapping. Sixty percent of these were vertical photographs taken by the Royal Air Force, Meridian Airmaps Ltd or the Ordnance Survey for non-archaeological purposes and only 40% were specialist oblique photographs. Although vertical photographs are often favoured over obliques for the transcription of extensive areas of ridge and furrow it is clear that they were also essential to the recording of other types of features including levelled prehistoric remains. This high reliance on the vertical resources might suggest that in some areas the specialist oblique coverage was somewhat deficient: either absent, of insufficient detail and clarity, or perhaps without adequate control for the rectification process. However, taking the Magnesian Limestone area in isolation, over 60% of the images used for transcription were specialist oblique photographs.

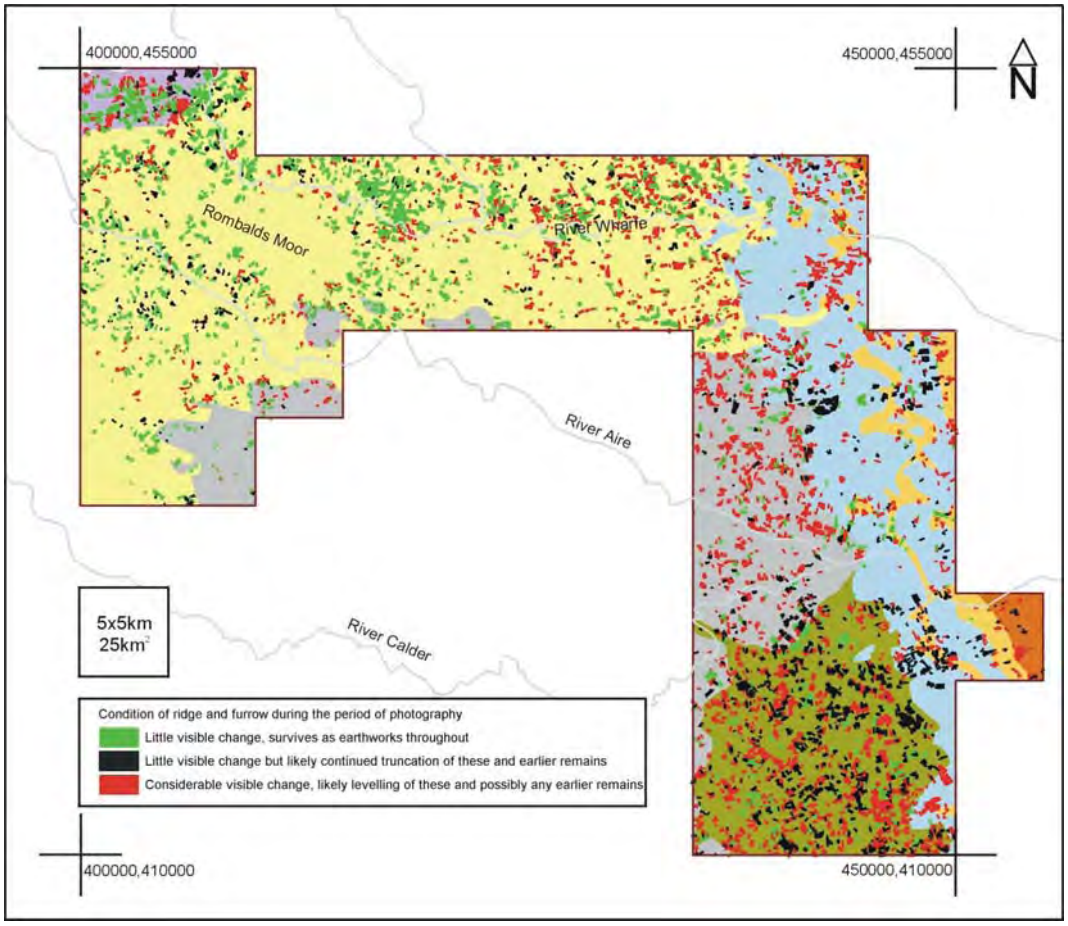
As with other NMP projects the results from this project can be transferred to 1:50 000 scale Ordnance Survey maps, used during flying to allow EH's reconnaissance team to target their activities within the project area more effectively. This will be particularly welcome within West Yorkshire, which has received little attention since the cessation of the county's own flying programme in 1996.

To ensure that the results of this project are immediately available to those charged with the management of our archaeological environment, the maps created by this project have been supplied to the three SMRs as seamless MAPINFO tables with comprehensive instructions for their use and interrogation. It is hoped that this will obviate any technical problems of data exchange that might otherwise be experienced by the receiving organisations.

It is beyond the remit of the NMP to record comprehensively, the level of plough and soil erosion and it lacks the mechanism to do so. In practise any wide-scale monitoring of monument condition from existing air photographs is difficult in the absence of any other detailed land-use data sets, especially given the variables of site visibility. However some aspects of this project's data can illustrate the broad changes that have occurred within the project area since the beginning of the period of photography. Such observations may be of consequence to future aerial reconnaissance and management of the archaeological resource. The current NMP recording strategy for ridge and furrow notes both the form of the evidence from the source photograph (in the EVIDENCE field) and the latest seen condition from the most recent photographs (in the layer structure i.e. either cmrf or ewkrf). The relationship between the two provides a basic statement on change of condition over the period of photography where ridge and furrow is present, as illustrated on Figure 4.

This analysis suggests that the conversion from pastoral to arable cultivation during the period of photography has been greatest on the coal measures and Millstone Grit to the east and north of Leeds. The comparative sparsity of any evidence for surviving ridge of furrow on the neighbouring Magnesian Limestone, presuming this land was ploughed in the medieval and post-medieval periods, indicates that truncation was well advanced before the mid-twentieth century. Without the protection of the medieval and later plough zone the prehistoric archaeology on these light friable soils are likely to be exposed and extremely vulnerable from continued cultivation.

Figure 4 - Changes to the condition of medieval and post-medieval ridge and furrow

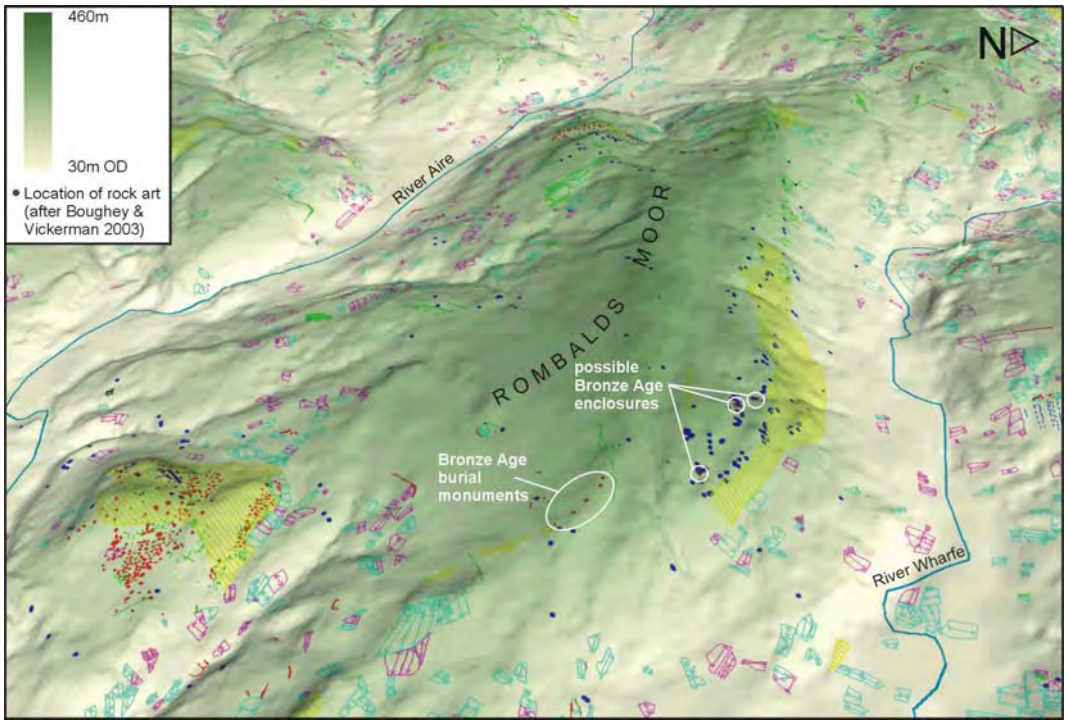


EH's Designation Archaeologist, Eric Branse-Instone took the opportunity to consult this project's mapping of the prehistoric, industrial and modern military remains on Baildon Moor at an early stage and will continue to use the data for information on current scheduling priorities and possible new targets. Neil Redfern, (Ancient Monuments Inspector) also made good use of the data whilst the project was in progress. Undoubtedly it would be beneficial if Aerial Survey could now increase the profile and availability of the Lower Wharfedale NMP data to the relevant Heritage Protection Department and the Regional Inspectors.

Due to the unconducive ground cover few new features of significant antiquity were identified on Rombalds and Ilkley Moors: most newly recorded features pertain to more recent activities. However the NMP data has highlighted an interesting relationship between the prehistoric landscape and the distribution of known rock art sites, which were recently published by Boughey & Vickerman (2003). Rock art is more prevalent in the areas that have yielded evidence of possible Bronze Age enclosures and less so where there are known burial monuments, though the availability of exposed rocks was undoubtedly the main consideration for the carvers (see Figure 5). The coverage of the Lower Wharfedale NMP Project covers

a significant proportion of the rock art sites in West and North Yorkshire and further, more detailed analysis of the two data sets may bear significant results.

Figure 5 - The relationship between archaeological features recorded on Rombalds Moor and sites of rock art identified by Boughey & Vickerman 2003



With the completion of mapping and interpretation in Lower Wharfedale an extensive transect of mapping across the putative Central Province and Northern and Western province, identified by Professor B. K. Roberts and Dr S. Wrathmell in their national study of the rural settlement patterns, became available (2000). The availability of this combined dataset, comprising data from at least three NMP projects, should be broadcast widely to research and academic archaeological communities so that the potential of this data may be realised.

At the time of this project's inception it was recognised that there was a wealth of information arising from excavation and geophysical survey, particularly from the freely-draining soils of the Magnesian Limestone belt in the east of the project area. Three years on, the quantity of ground-based investigations has increased exponentially, particularly, but not exclusively, under the auspices of the A1 upgrading along several sections in West Yorkshire. The Lower Wharfedale NMP Project has assimilated the information from thousands of vertical and oblique photographs to reveal the remarkable density and contiguity of the ancient landscape on this geology. The objectives for this data have developed beyond the simple validation of the air photo interpretation to an altogether more ambitious multi-disciplinary programme of research and synthesis. Funding for the Magnesian Limestone Project is currently being sought from the Aggregate Levy Sustainability Fund Project by Archaeological Services WYAS. The results from the

Lower Wharfedale NMP Project will be pivotal to this planned programme, as will those from a similar NMP-type project planned for parts of South Yorkshire.

Overall the project has made and will continue to make a considerable contribution to the objectives of the original project design as well as those of the wider National Mapping Programme. One important outcome of this project that might easily be overlooked is the development of two previously inexperienced aerial investigators who are now conversant with the archaeology of a diverse range of landscapes and who are proficient in the methodology of the NMP process. These two individuals represent a considerable investment and their skills will not be easy to replace at a later date if their continued employment cannot now be assured with funding for new projects.

8 DATA ARCHIVING AND DISSEMINATION

8.1 Copyright

The copyright of the air photo mapping and associated records produced by this project lies with English Heritage. Licence to use this data has been extended to the North Yorkshire SMR, West Yorkshire SMR and South Yorkshire SMR.

With permission from the copyright holders, this project scanned a large quantity of photographs. Copyright of this digital data is retained by the original copyright holders.

8.2 Project Archive

This project produced 44 Autodesk Map® 2004 drawing files, one for each whole quarter sheet. These will be deposited with the NMR archive and Aerial Survey North and South shall also retain digital copies. In addition hard-copies of each map, printed at 1:10,000 scale, in colour and on film will also be archived in the NMR.

There is no precedent for the formal archive deposition of other digital data associated with the project: the scanned image files (.TIF), rectified image files (.TIF), World files (.TFW), AERIAL rectification files (.RDA) and lists of consulted material (.XLS). For the time being this information will be retained by Aerial Survey North. Data entered into the Aerial Survey Module will be retained by Aerial Survey South.

8.3 Project dissemination

During the course of the project ongoing results where shared with heritage partners and stakeholders through the format of the Liaison Group Meeting. Three such meetings were convened, on the 13th June 2002, 10th December 2002 and 6th April 2004. An Interim Report on this project's progress and early results was prepared for Advisory Services WYAS in April 2003 (Deegan 2003).

On completion of the project North Yorkshire SMR, West Yorkshire SMR and South Yorkshire SMR have been supplied with extracts of the map data as is

appropriate to their areas. The map data has been supplied to all three SMRs in MAPINFO format. The transfer from Autodesk Map to MAPINFO has retained the attached data table structure and content with the addition of fields recording the original layer name, author, date of completion, and, where a concordance has been made, SMR record numbers. The NMR records created and amended by this project have been supplied to each SMR in a digital rich text format (RTF) as an accompaniment to the mapping. West Yorkshire SMR has also received printed copies of each map for their immediate use whilst their paper archives are transferred to GIS.

The wider dissemination of a considerable proportion of the Lower Wharfedale NMP project data is an integral part of the Magnesian Limestone Project proposal, which is currently seeking funding from the Aggregate Levy Sustainability Fund, as disbursed by English Heritage.

The design of a small project that signposts the availability of the Lower Wharfedale NMP Projects and disseminates select results via local publications, suitably-placed web pages and slide show presentations is currently in progress. Funding for this project will be sought from English Heritage's Archaeology Commissions Programme.

9 BIBLIOGRAPHY

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Faull, M. L. & Moorhouse, S. A. (eds) 1981. *West Yorkshire: an Archaeological Survey to A.D. 1500*. Vol. 4, Map 2

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10 APPENDIX 1 - AUTODESK MAP MAP® LAYER CONTENT AND DRAWING CONVENTIONS

Layer Name	Layer content	Attached data tables	Layer colour	Linetype
0	none (AutoDesk map requirement)	none	7 (white)	CONTINUOUS
AIRFIELD	outline of airfield complex	MONUMENT & MONARCH		DASHEDX2
BANK	closed polygons for supra-surface earthen features such as banks, platforms, mounds and spoil heaps	MONUMENT & MONARCH	1 (red)	CONTINUOUS
BANKFILL	solid fill for bank layer polygons	MONUMENT & MONARCH	1 (red)	NA
DITCH	closed polygons for cut or wear features such as ditches, ponds, pits or hollow-ways	MONUMENT & MONARCH	3 (green)	CONTINUOUS
DITCHFILL	solid fill for ditch layer polygons	MONUMENT & MONARCH	3 (green)	NA
EXTENT OF AREA	closed polygons outlining complex or extensive remains such as mining or army camps	MONUMENT & MONARCH	2 (yellow)	DASHEDX2
GRID	grid lines at 1km intervals	NONE	7 (white)	CONTINUOUS
KEYLAYOUT	title boxes, key & copyright statement for printing maps all in paper space. Only appears in drawing layouts.	NONE	7 (white)	CONTINUOUS
MONUMENT_ POLYGON	closed polygons encircling all the features comprised within a single NMR record.	MONARCH ONLY	7 (white)	CONTINUOUS
RIGARREWK	polyline showing the direction of ploughing in outlines of extant ridge and furrow	MONUMENT & MONARCH	4 (cyan)	CONTINUOUS
RIGARRLEVEL	polyline showing the direction of ploughing in outlines of levelled or crop mark ridge and furrow	MONUMENT & MONARCH	6 (magenta)	ACAD_ISO03W 100
RIGDOTSEWK	closed polygon defining the furlongs or extent of area of extant	MONUMENT & MONARCH	4 (cyan)	DOTX2

Layer Name	Layer content	Attached data tables	Layer colour	Linetype
	ridge and furrow			
RIGDOTSLEVEL	closed polygon defining the furlongs or extent of area of levelled or crop mark ridge and furrow	MONUMENT & MONARCH	6 (magenta)	DOTX2
STRUCTURE	for all stone, concrete, metal and timber features, structures and erections	MONUMENT & MONARCH	7 (white)	CONTINUOUS
THACHURE	polyline t-hachure convention to schematise sloped features indicating the top of slope and direction of slope.	MONUMENT & MONARCH	5 (blue)	CONTINUOUS
VIEWPORT	an administrative layer to allow printing	NONE	7 (white)	CONTINUOUS

11 APPENDIX 2 - AUTODESK MAP 2004® ATTACHED DATA TABLES

MONUMENT DATA TABLE

The Monument Data Table consists of five fields that are input directly through AutoDesk Map®. The content of the MONARCH, PERIOD, TYPE and EVIDENCE fields reflect the content of the related fields in AMIE. Where features were "dual-indexed" in AMIE i.e. when alternative periods or interpretations are stated, then all the indexed terms appeared in the attached data, separated by "\" e.g. IRON AGE\ROMAN. In the attached data tables the PHOTO field identifies the photograph from which the feature was actually traced. This may not reflect the reference given in AMIE as the latter is intended for the "best illustrative" photograph of the archaeology.

FIELD NAME	FIELD CONTENT	Sample data for Ferrybridge Henge
MONARCH	AMIE Unique Identifier (UID)	54454
PERIOD	Date of features (EH Thesaurus)	NEOLITHIC
TYPE	Monument type (EH Thesaurus)	HENGE
EVIDENCE	Form of remains (EH Thesaurus)	EARTHWORK
PHOTO	NMR or other reference for the photograph from which the feature was plotted and its date of photography	RAF/541/31 4156 18-May-1948

MONARCH DATA TABLE

The Monarch Data Table comprises just one field which records the AMIE Monument UID.

FIELD NAME	FIELD CONTENT	Sample data for Ferrybridge Henge
MONARCH	AMIE Unique Identifier (UID)	54454

12 APPENDIX 3 - EH THESAURUS TERMS INDEXED BY THE LOWER WHARFEDALE NMP PROJECT

A ADIT
AIR RAID SHELTER
AIRCRAFT HANGAR
AIRFIELD
ANNEXE ENCLOSURE
ANTI AIRCRAFT BATTERY
APPROACH ROAD

B BAILEY
BANJO ENCLOSURE
BANK (EARTHWORK)
BARRACKS
BARROW
BELL PIT
BOMB CRATER
BOUNDARY
BOUNDARY BANK
BOUNDARY DITCH
BOWL BARROW
BUILDING
BUILDING PLATFORM
BURIAL

C CAIRN CIRCLE
CARRIAGEWAY
CASTLE
CHAPEL
CIRCULAR ENCLOSURE
CLAY EXTRACTION SITE
CLAY PIT
CLAY PUDDLING PIT
COAL WORKINGS
COLLIERY
COMMAND POST
COVERED WAY
CROFT
CROP MARK
CULTIVATION TERRACE
CURSUS
CURVILINEAR ENCLOSURE

D D SHAPED ENCLOSURE
DAM
DESERTED SETTLEMENT
DITCH
DITCHED ENCLOSURE
DOUBLE DITCHED ENCLOSURE
DOVECOTE
DRAIN
DROVE ROAD
DYKE (DEFENCE)

E EMBANKED ENCLOSURE
EMBANKED STONE CIRCLE
ENCLOSED SETTLEMENT
ENCLOSURE
EXTRACTIVE PIT

F FARMSTEAD
FIELD BOUNDARY
FIELD SYSTEM
FILLING FACTORY
FIRING RANGE
FISHPOND
FOOTBRIDGE
FORD
FORMAL GARDEN

G GARDEN FEATURE
GARDEN PATH
GEOLOGICAL MARKS
GRAVEL PIT

L LEAT
LIME KILN
LIMESTONE QUARRY
LINEAR EARTHWORK
LINEAR FEATURE
LONG CAIRN
LYNCHET

M MACULA
MAGAZINE
MILITARY BUILDING
MILITARY CAMP
MILL POND
MILL RACE
MOAT
MOTTE
GRUBENHAUS

H HALL HOUSE
HENGE
HILLFORT
HOLLOW
HOLLOW WAY
HOUSE
HUT
HUT CIRCLE

I INHUMATION
IRONSTONE WORKINGS

MOUND
MUNITIONS FACTORY

N NARROW RIDGE AND FURROW
NATURAL FEATURE

O OPEN CAST MINE
OVAL ENCLOSURE

P PACKHORSE ROAD
PADDOCK
PALISADE
PARK PALE
PATH
PILLBOX
PILLOW MOUND
PIT

PIT ALIGNMENT

PIT CIRCLE

PIT CLUSTER

PLATFORM

PLOUGH HEADLAND

POLYGONAL ENCLOSURE

POND

PRACTICE TRENCH

PRISONER OF WAR CAMP

PROMONTORY FORT

PROSPECT MOUND

Q QUARRY

R RABBIT WARREN

RAILWAY EMBANKMENT

RAILWAY SIDING

RECTANGULAR ENCLOSURE

RECTILINEAR ENCLOSURE

RIDGE AND FURROW

RING BANK

RING BARROW

RING CAIRN

RING DITCH

RINGWORK

ROAD

ROBBER TRENCH

ROUND BARROW

ROUND CAIRN

ROUND HOUSE (DOMESTIC)

S SAND AND GRAVEL EXTRACTION SITE

SAND PIT

SAND WORKINGS

SANDSTONE QUARRY

SCARP

SEARCHLIGHT BATTERY

SETTLEMENT

SHEEP FOLD

SPOIL HEAP

SPRING

SQUARE ENCLOSURE

STACK STAND

STONE CIRCLE

STONE QUARRY

STRUCTURE

SUB CIRCULAR ENCLOSURE

T TANNERY

TANNING PIT

TERRACED GROUND

TOLL ROAD

TRACKWAY

TRAMWAY

TRENCH

V VILLA

W WALL

WATER CHANNEL

WHEEL PIT

WINDMILL MOUND

13 APPENDIX 4 - MAP QUARTER SHEET INFORMATION

BLOCK	MAP	AUTHOR	NO. OF NEW RECORDS	NO. OF AMENDED RECORDS	END DATE	LOAN NMR REF
1	SE03NE	YB/MO/DVDT	19	5	13/06/02	38034
1	SE03NW	MO	12	0	10/05/02	38034
1	SE03SE	AD	31	2	06/06/02	38034
1	SE03SW	DVDT	19	1	10/05/02	38034
1	SE04NE	AD	34	8	19/11/02	38034
1	SE04NW	DVDT	27	14	03/09/02	38034
1	SE04SE	DVDT	32	3	02/07/02	38034
1	SE04SW	DVDT	99	3	08/07/02	38034
1	SE05SE	DVDT	38	14	24/10/02	38034
1	SE05SW	MO	29	12	24/10/02	38034
1	SE13NW	MO	22	5	28/06/02	38034
2	SE14NE	DVDT	16	7	29/11/02	45499
1	SE14NW	MO	20	10	03/09/02	38034
2	SE14SE	MO	21	9	06/12/02	45499
1	SE14SW	MO	14	16	05/08/02	38034
2	SE24NE	DVDT	18	7	12/02/03	45499
2	SE24NW	MO	19	4	17/01/03	45499
2	SE24SE	DVDT	27	4	21/01/03	45499
2	SE24SW	AD	18	12	03/03/03	45499
3b	SE31NE	MO	52	7	17/02/04	58888B
3b	SE31SE	MO	47	8	18/03/04	58888B
3a	SE32NE	MO	42	6	12/12/03	58888A
3a	SE32SE	MO	49	3	23/01/04	58888A
3a	SE33NE	DVDT	34	6	24/10/03	58888A
3a	SE33SE	MO	48	11	05/11/03	58888A

BLOCK	MAP	AUTHOR	NO. OF NEW RECORDS	NO. OF AMENDED RECORDS	END DATE	LOAN NMR REF
2	SE34NE	MO	34	11	17/04/03	45499
2	SE34NW	MO	21	10	11/03/03	45499
2	SE34SE	DVDT	30	13	24/03/03	45499
2	SE34SW	MO	19	8	20/02/03	45499
3b	SE41NE	AD	16	12	02/07/04	58888B
3b	SE41NW	DVDT	39	4	13/02/04	58888B
3b	SE41SE	DVDT	28	3	15/06/04	58888B
3b	SE41SW	DVDT	32	8	15/03/04	58888B
4b	SE42NE	MO	26	9	30/09/04	68478
3a	SE42NW	DVDT	22	8	28/11/03	58888A
4b	SE42SE	DVDT	26	10	28/10/04	68478
3a	SE42SW	DVDT	43	10	12/01/04	58888A
4a	SE43NE	DVDT	31	14	10/09/04	66116
4a	SE43NW	DVDT	32	10	06/08/04	66116
4a	SE43SE	MO	36	17	06/09/04	66116
4a	SE43SW	MO	39	18	19/07/04	66116
4a	SE44NW	MO	22	10	25/05/04	66116
4a	SE44SW	DVDT	22	8	17/06/04	66116
4b	SE52SW	MO	40	3	27/10/04	68478

14 APPENDIX 5 - THE AIR PHOTO COLLECTIONS CONSULTED FOR THIS PROJECT:

National Monument Record
English Heritage
National Monuments Record Centre
Great Western Village
Kemble Drive
Swindon
SN2 2GZ

Heritage Unit
North Yorkshire County Council
County Hall
Northallerton
North Yorkshire
DL7 8AH

South Yorkshire SMR
Howden House
1 Union Road
Sheffield
S1 2SH

Unit for Landscape Modelling
University of Cambridge
Air Photograph Library
Sir William Hardy Building
Tennis Court Road,
Cambridge
CB2 1QB
http://www.uflm.cam.ac.uk

West Yorkshire SMR
Registry of Deeds
Newstead Road
Wakefield
West Yorkshire
WF1 2DE

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