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# GIS USAGE IN UK ARCHAEOLOGY MID-1997: THE CAERE SURVEY

## 1. Introduction

Several years ago I co-authored a paper which assessed the potential adoption and diffusion of GIS within UK archaeology (Harris, Lock 1990). We recognised that both archaeology and GIS technology operate within wider worlds and that external influences would be important to the character and speed of the adoption process. Of considerable relevance was the then recently published UK government Chorley Report on all aspects of geographic information (DoE 1987), a document which highlighted the central future role of GIS while at the same time identifying a series of possible barriers to its adoption. These were not to do with the technology, which by that time was well established (Burrough 1986, for example), but mainly concerned issues of institutional structuring and human acceptance of a new technology that not only required new working practices to perform existing tasks but offered the prospect of performing quite revolutionary new tasks.

Our paper discussed these issues in terms of the rather complicated structure of archaeology within the UK, identifying in particular the importance of the national and local bodies with inventorying responsibilities for archaeology and the role of universities as both training agencies and as centres of research and awareness raising. This current survey and its results offer a chance to revisit many of these issues and to comment on their development over the last seven years.

There is little doubt that GIS has rapidly become of interest to many archaeological organisations and individual archaeologists, seemingly overcoming one of the problems raised by Chorley, that of awareness. The GIS bandwagon is now unstoppable, being driven by a multi-million dollar software industry which pays little regard to the interests and needs of minority users such as archaeologists. This explosion has produced a myriad of software and much confusion over the definition of GIS (Maguire 1991), a situation which will become even more confused with the impending desk top mapping systems which in a few years time will come installed on any new PC along with already standard office software. If the label 'GIS' sells software, and it does, then it will be applied in a commercial world regardless of definition, which it is.

For the purpose of this survey, however, it is useful to define what is being surveyed. Much of the existing confusion stems from the hybrid roots of GIS development where the related technologies of CAD/CAM (Compu-

ter-Aided Design and Computer-Assisted Mapping, also known as CAC, Computer-Assisted Cartography) and Remote Sensing/Image Processing not only contributed to the origins of GIS but have continued to develop as independent technologies (MARTIN 1996, chapter 2). Generically GIS are accepted as including modules for: data collection, input and correction; data storage and retrieval; data manipulation and analysis; and output and reporting. Fundamental to a GIS, and common to both raster and vector data-structures, are certain classes of analytical operations which can be divided into: reclassification operations; overlay operations; distance and connectivity measurement; and neighbourhood characterisation (*ibid*., chapter 4). This analytical functionality enables cartographic modelling, or map algebra (TOMLIN 1990), and differentiates the underlying philosophy of GIS from that of CAD software (GOODCHILD 1995).

Within archaeological applications the GIS identity crisis seems to have developed from two directions. Firstly, there has been some confusion from the very beginning between GIS and CAD which has been exacerbated by the increasing ability to link CAD and database software. This is illustrated by DALLAS *et al.* (1995, 259) who define 'GIS principles' as the 'allying of spatial information with database information', and in a popular surveying package (GILMOUR *et al.* 1996) which has a 'GIS module' that simply connects spatial objects with database records. For any discussion of GIS I would prefer not to include applications such as these although it is difficult to be rigorous and some are included below. Secondly, the confusion is furthered by many applications of GIS software that involve little or no analysis but emphasise the mapping capabilities usually of vector-based systems, typically distribution maps resulting from a database query. These are included here on the basis that reproducing what is familiar before moving on to do new types of things is an acceptable stage within the process of adopting a new technology.

In many ways this is a sterile debate which can never be resolved as the boundaries between software types become more fuzzy. It may be more productive to think in wider terms of spatial modelling as with the term 'Spatial Technologies' (WHEATLEY, WISE 1996) which includes GIS, CAD, modelling and Virtual Reality software, or 'Geographic Information Science' (GOODCHILD 1992), both of which stress the importance of space and spatial concepts rather than the mechanics of the software.

## 2. GIS USAGE IN UK ARCHAEOLOGY

When considering the uptake and current usage of GIS in UK archaeology there are two important background factors. The first is the availability of digital map data, of which there is now a good range at acceptable

scales available from the Ordnance Survey [1] (OS), the government mapping agency. The high cost of these products is prohibitive, however, and has caused problems for university and agency based archaeologists which has inhibited GIS use for many years. On the positive side, local government organisations have the option of a service level agreement with the OS which provides discounted data (but not contours) for their own area, thus offering an opportunity for regional Sites and Monuments Records.

A recently initiated pilot scheme between the OS and universities (DigiMap) could result in the provision of a limited amount of data (with contours) at reduced price. The problem for the national heritage agencies, specifically English Heritage and the Royal Commissions, has been the quantity of data required to cover their national responsibilities although there have been discussions with the OS and there are joint initiatives in progress. The second influence on GIS usage is the provision of software to universities through the CHEST (Combined Higher Education Software Team [2]) deal which for many years has been restricted to ArcInfo (PC and full version, plus ArcView).

The structure and recent history of archaeology in the UK are somewhat complicated but well documented (Hunter, Ralston 1993a), and that structure has been influential in the patterning of GIS use across the country. For this discussion a distinction will be drawn between Cultural Resource Management (CRM) applications, both national and local, and research-driven applications. The split is not a neat one as there is obviously research involved in CRM, especially in data modelling and allied considerations, and this does introduce another important consideration. Despite having already emphasised the analytical capabilities of GIS it must be recognised that a major strength of the software is its ability to integrate and manage large and diverse data-sets. The integration and georeferencing of different types of spatial data over large geographical areas typically a county or a country, often from sources at varying scales, together with textual databases is a central concern of CRM usually based on statutory obligations. It is not surprising, although not always true, therefore, that analysis plays a secondary role.

### 2.1 *GIS and CRM in the UK*

The fragmentary nature of the UK archaeological inventory and responsibilities for it are explained in detail elsewhere (Fraser 1993), together with progress towards the computerisation of that resource (Harris, Lock 1990). The main developments over the last few years have been the increasing co-operation between agencies and it is significant that this has

[1] http://www.ordsvy.gov.uk/index.html [accessed 5th October 1997].
[2] http://www.chest.ac.uk/ [accessed 5th October 1997].

largely been triggered by the potential of IT, especially electronic networking and the obvious advantages in sharing and remotely accessing and integrating electronic data. To summarise the agencies concerned (HUNTER, RALSTON 1993b): state involvement with archaeology is through English Heritage, Historic Scotland and Cadw in England, Scotland and Wales respectively which oversee conservation, preservation and access to the heritage; each of these three countries also has a Royal Commission on (Ancient and) Historical Monuments generally known as RCHME, RCAHMS and RCAHMW which are the prime sources of heritage information and field recording.

There are areas of overlapping interests, particularly, in this context, the maintenance of archives and information provision; in England and Scotland Sites and Monuments Records (SMRs) act as curators of the local, detailed archaeological resource through the local government system whereas in Wales they are within independent commercial archaeological units (the Trusts) who are county-based and both curators and contractors within the contemporary system of planning-based archaeology; the situation in Northern Ireland is completely different with a single SMR equivalent, curatorial and contractual responsibilities being centralised within the Department of the Environment; other agencies with a responsibility for archaeology over considerable areas of landscape include the National Trust and the National Parks.

All three Commissions are committed to IT strategies that have spatial technologies at their core although RCAHMS [3] has the longest involvement with GIS and now operates a sophisticated system which has been evolving since 1992 (MURRAY 1995; MURRAY, DIXON 1995; DIXON 1996). The RCAHMS experience is important in demonstrating fundamental points in the process of adopting a new technology: firstly that GIS is about information and especially spatial information, and requires a thorough understanding of how information is structured and accessed within the organisation (usually based on an external analysis of working practices); and, secondly, the process should include a suitable pilot study which integrates the involvement and training of staff with the close collaboration of IT specialists; and thirdly that the required budget goes way beyond the cost of the hardware and software. Another aspect of this argument is the need for user-friendly interfaces especially if the system is meant for public use as those in the UK are. Despite using industry standard software, the RCAHMS have had to invest considerable time and money in the production of customised user interfaces simply because commercial versions are not suitable however good they may seem to professionals.

It is now possible to search the National Monuments Record of Scot-

[3] http://www.open.gov.uk/scotoff/heritage.htm [accessed 5th October 1997].

land either spatially or as an index and see the results against OS map data and over eighty other layers of information including field surveys and aerial photographic transcriptions, together with various external data sources. Networking with Historic Scotland has been established to provide access to their data including databases of scheduled sites and listed buildings. A very recent initiative in collaboration with SCRAN (Scottish Cultural Resources Access Network [4]) has introduced access over the Internet, a pilot study with an emphasis on images although the aim is to develop access to the entire NMR of Scotland.

The situation in Wales is not so well advanced where, drawing upon the Scottish experience, RCAHMW has established core data standards for the digital Extended National Database of Wales (Driver 1996) and is in a period of extensive digital data gathering. The mapping of archaeological sites from aerial photographs has been the core component for testing the system so far (James 1996), with work underway on a series of archaeological and other layers including accessing the Scheduled Ancient Monuments database held by Cadw. There is an important emphasis on compatibility with the Welsh archaeological Trusts because of their role as Curators of the SMRs, a situation which is different to both England and Scotland.

The organisation of archaeology in Northern Ireland is very different with a single-level archaeological service that integrates archaeology with other environmental concerns and activities within the Department of the Environment (Hunter, Ralston 1993b). The National Monuments Record has been computerised for some time and is in the process of being linked to mapping software so that the emphasis is on mapping archaeological data against a background of OS data resulting from database querying (L. Haner, personal communication).

Work towards the adoption of GIS in RCHME [5] has been restricted to policy statements, position papers and the clarification of RCHME's changing relationships mainly with English Heritage and the SMRs (Clubb, Lang 1996). The situation in England illustrates the complexity of the modern 'heritage community' comprising large and small organisations at local and national level in the public, private and voluntary sectors. Creating partnerships and links based on applied data standards and networked databases is the way forward (Quine 1997; Lang 1997) and the RCHME are centrally involved in establishing these with the National Monuments Record (the NMR, which is RCHME's public archive) seen as the natural entry point to networked resources which will eventually include the county-based SMRs. Field survey is an important area of work for RCHME, as for the other

[4] http://www.scran.ac.uk/info.htm [accessed 5th October 1997].
[5] http://www.rchme.gov.uk/ [accessed 5th October 1997].

commissions, and involves the evaluation and use of a variety of new technologies including GPS surveys which can be downloaded into CAD and GIS for presentation (see survey entry).

Establishing data standards, particularly spatial data standards, is fundamental to the future of GIS generally and also in archaeology, consequently a great deal of work on this issue is in progress both internationally and in the UK. This typifies wider movements towards co-operation, for example at an international commercial level GIS vendors are beginning to exchange file formats through the OpenGIS Consortium [6], an initiative which could provide great benefits to all GIS users. An important national initiative is the NGDF (National Geospatial Data Framework) [7] which involves the OS and a range of government and other organisations in the establishment of a UK framework for the sharing of digital spatial data. This includes consultations with a committee of heritage bodies ensuring that heritage data is included in building data networks for the next century.

The ADS (Archaeology Data Service) [8] is a recent addition to the UK heritage scene but one that has tremendous potential and has already had an impact by focusing existing debates on data standards (Richards, Wise 1997). The ADS aims to collect, describe, catalogue and provide access to digital resources that are both a product of and available for archaeological research. It also has a responsibility for promoting standards and establishing best practice in the creation, description and preservation of digital data, and especially spatial data. To this end a series of guides to good practice are in preparation (to be both printed and Web-based) and the one on GIS should become a key document for future GIS work. Essentially the ADS is creating a distributed digital archive by providing a web-based searchable catalogue and interface that will link to remote databases such as those held by the Commissions, SMRs and many other organisations.

Fundamental to this is the concept of 'resource discovery' [9] and the use of metadata (Wise, Miller 1997), enabling the searching of many different databases which use different data structures and standards. While the ADS is not enforcing any particular standard it is advocating the sufficient documenting of standards using a metadata structure based on the international initiative known as the Dublin Core [10]. The ADS archive will differ to traditional archaeological archives by placing the emphasis firmly on access and

[6] http://www.opengis.org/homepage.html [accessed 5th October 1997].

[7] http://www.ngdf.org.uk/ [accessed 5th October 1997].

[8] http://ads.ahds.ac.uk/ahds/ [accessed 5th october 1997].

[9] Final report of the ADS Resource Discovery Workshop, http://ads.ahds.ac.uk/ahds/project/metadata/workshop1_final_report.html [accessed 5th October1997].

[10] http://ads.ahds.ac.uk/ahds/project/metadata/dublin.html [accessed 5th October 1997].

the re-use of data so that, for example, GIS coverages can be located and downloaded.

English Heritage [11] (EH) has a long tradition of using computers including an early and innovative use of a mapping system which overlays vector representations of protected areas onto raster background maps for the generation of reports (CLUBB 1988). Its Central Archaeology Service are using GIS and Virtual Reality modelling for interpretation and management of the World Heritage site of Stonehenge (BATCHELOR *et al.* 1997), and that at Avebury is following suit. EH also funds projects carried out by commercial units, for example the North West Wetlands Survey with a significant GIS component (MIDDLETON, WINSTANLEY 1993).

This recognition by EH of the importance of GIS for large spatial datasets is continued in their support of the Urban Archaeological Databases (UADs) [12]. These are detailed records of historic town and city centres which are too archaeologically complex for most Sites and Monuments Records to handle. There are currently 35 major UADs, plus many smaller centres being funded by EH. An important aspect is that UADs use the same software and systems of their host local authority (see St. Albans and Cambridge in the survey below) so that it becomes an archaeological component within an integrated planning and conservation record. The emphasis is on vector mapping with a linked database that records 'events' (anything from excavations to watching briefs) and interpreted 'monument' layers to produce constraint maps. Because historic town centres often have deep stratigraphy the vertical axis is important in these applications and work is in progress to use height data from excavations, boreholes and many other holes in the ground to model the original natural ground surface, the modern topography and ancient surfaces in between. Recent work at York shows the potential of this (MILLER 1996). Scanned 19th century OS maps (1:500 scale) are often included as a layer to facilitate studies of the changing urban landscape.

Another important heritage body is the National Trust [13] which holds a database of nearly 17,000 archaeological and architectural sites in its care (CLARIS 1995) and is currently reviewing the options for using digital mapping. Ten National Parks cover 9% of England and Wales and are by definition areas of outstanding landscape containing much important archaeology. Because they are working environments and not preserved as museum pieces as National Parks are in some other countries, their management is critical and the use of GIS or CAD systems is becoming *de facto*. The Peak

[11] http://www.eng-h.gov.uk/ [accessed 5th October 1997].

[12] http://www.eng-h.gov.uk/ArchRev/rev95_6/urbs.htm#Urban archaeological strategies programme [accessed 5th October 1997].

[13] http://www.ukindex.co.uk/nationaltrust/ [accessed 6th October 1997].

National Park [14], for example, covers 1,404 km$^2$ and runs an integrated system for archaeology, other environmental data such as ecology and land use together with administrative information such as grant allocations. This enables efficient development control as well as themed investigations, for example the historical development of enclosure within the Park (K. Smith, personal communication).

At the local level in England and Wales, and for much of Scotland, the Sites and Monument Records (SMRs) are the primary inventory of archaeological information. A great deal has been written on the computerisation of the SMRs since their beginnings in the late 1960s (Lang 1992, for example) and it has been recognised for some time that the application of GIS is the way forward (Lock, Harris 1991) for both data management and analytical functionality (Harris, Lock 1992). The complicating factor for the SMRs has always been their lack of standardisation and *ad hoc* development, often because of their ties with a host local authority, and the situation has become more complicated with recent local government re-structuring resulting in nearly 50 SMRs in England.

Several SMRs have been innovative in developing GIS applications and a recent initiative between RCHME, EH and ALGAO (the Association of Local Government Archaeological Officers) is establishing and promoting a standard [15] (see the Cambridgeshire SMR entry in the survey below). This standard could be greatly strengthened if SMRs gain statutory status within the next few years as is hoped by many people. A champion of these developments and an example of the way ahead for the SMRs which adopt the standard, is the Northamptonshire SMR (Foard 1996). This uses a model similar to that of the UADs in joining individual 'site events' comprising different types of data to create interpreted 'monument maps'. Planning applications and development control, the major work of an SMR, can be processed on-line by working entirely in a networked digital environment thus increasing speed and efficiency.

Progress on the practical applications of GIS to SMRs does not happen in a theoretical vacuum and there have been many discussions that are pertinent. Lang and Stead (1992), for example, discuss a relational approach to integrating the spatial and attribute components of an SMR while Robinson (1993) demonstrates that GIS functionality can not be 'bolted on' to an existing database but requires a complete restructuring of the underlying data model. The suggested spatio-temporal data model is fundamental to

[14] http://www.highpeaknet.com/pdp/home.htm [accessed 6th October 1997].

[15] See *The Future of SMR Software* by G. Foard in the Newsletter of the SMR Software Users Group, online at http://www.rchme.gov.uk/smrnews2.html [accessed 5th October 1997].

the Manx National Heritage Information System which integrates archaeology with social and natural history, not just for CRM purposes but with research and analytical capabilities built in.

In the wider world of commercial archaeology and governmental agencies there are also GIS-based projects that involve archaeology. The Channel Tunnel rail link project is a massive development which includes several archaeological contractors who supply their data in digital format to be incorporated into an integrated GIS database. The government Environment Agency runs a GIS for rivers and waterways management, among other things, which includes archaeological constraint maps based on Scheduled Ancient Monuments and Listed Buildings data. Overall, it can be seen that digital spatial technologies are now considered fundamental to all aspects of cultural resource management at the national and local levels.

*2.2 GIS and non-CRM in the UK*

Outside the world of CRM which is complicated by a plethora of national and international suggested data standards, and endlessly changing liaisons between numerous agencies, there is a quite different world of GIS usage. This involves applications to specific archaeological research interests, often concerning a fairly small geographical area, landscape modelling and analysis, often driven by theoretical concerns, often using a raster rather than vector data structure and often, although not always, carried out by individuals or small teams within universities.

Perhaps more important than individual examples of GIS applications in UK archaeology is the underlying debate on the epistemology of GIS and the symbiotic relationship between GIS and archaeological theory. This is a debate that raged in geography several years ago (Taylor, Johnston 1995, for an overview) and surfaced in archaeology as an argument against a return to positivism and environmental determinism (Wheatley 1993), both parts of an outdated theoretical stance long since rejected by many (although the arguments are obviously not that simple, see Gaffney, van Leusen 1995). Reactions to this debate have focused on attempts to integrate current theoretical approaches to landscape within GIS functionality involving various ways of humanising the landscape. Initially these approaches attempted to comment on the perception and cognition of an individual situated in the landscape based on visibility and intervisibility studies involving line-of-sight and viewshed routines (for example, Gaffney *et al*. 1995). One problem with this work is that to a certain extent it is technologically determined simply because GIS offers these routines, although the development of a new technique specifically of interest to archaeology, cumulative viewshed analysis (Wheatley 1995), is important.

A more significant consideration is that meaning is culturally embed-

ded within a landscape (Tilley 1994) and simply identifying intervisibility between monuments and places does not constitute explanation. Meaning is a multi-faceted qualitative measure that can not be reached with crude quantitative tools such as GIS. This argues for the application of the technology to be theory-driven rather than data-driven, as is often the case, and as part of this ongoing debate there have been two recent and quite different approaches. Llobera (1996) has attempted to formalise various indices of landscape topography and perception by writing new routines within a raster environment and applying them to the locations of a particular type of prehistoric monument in southern England. This introduces formal methods which are embedded within a social theory of being in the landscape and of the humanisation of space. The other work, while rooted in much of the same theory (Gillings, Goodrick 1996), proposes a more phenomenological approach integrating Virtual Reality modelling with GIS thus enabling a body-centred engagement with a locale through experiential analysis (Gillings 1997). A lively session at the 1996 Theoretical Archaeology Group conference (Wheatley, Wise 1996) containing ten papers demonstrates the current interest and future importance of post-positivist GIS within the UK.

It is impossible to itemise the varied on-going GIS-based research projects that are in progress throughout the UK although it is of interest to identify some of the main themes. For example, the flexibility of raster-based modelling for the analysis of changing patterns across a surface, particularly where applied to surface survey data. Wheatley (1996) uses predictive modelling, incorporating cultural landscape features, on the data for the area around Stonehenge while Lock *et al.* (forthcoming) have developed a methodology for the visualisation and analysis of fieldwalking data. There are a series of regional studies including the impressive Wroxeter Hinterland Project[16] (also see the survey results below, and Gaffney *et al*. 1996) which has assembled a massive varied data-set relating to the area around the Roman town of Wroxeter in order to investigate the process of romanisation from late prehistoric times. The York Environs Project (also in the survey results below) is one of several GIS projects based at the University of York (Richards 1996) which work towards integrating the urban and rural archaeological records for the area. Lock and Harris (1996) report on the Danebury area study which takes a chronological approach to the analysis of 500 square kilometres of chalk downland from the Neolithic to Romano-British periods. Wilkinson (1996) has demonstrated the research potential within commercial archaeological units given the right conditions, with a study of the development of landscape based on environmental and cultural factors in the Cotswolds of England.

[16] http://bufau.bham.ac.uk/Projects/WH/base.html [accessed 6th October 1997].

Another theme which needs mentioning is research into the technology of GIS, its application and functionality rather than application specific case studies. Temporality and 3-dimensional GIS is an area that has seen relatively little work in archaeology although the early paper on archaeology, time and GIS by CASTLEFORD (1992) is still important. HARRIS and LOCK (1996) demonstrate the potential of fully functional 3D GIS using a voxel data structure for spatio-temporal modelling of excavation data, and use the same structure to outline a theoretical model for representing change through time using the continuous vertical axis (LOCK, HARRIS forthcoming). Other topics of importance on this theme are alternative data structures (RUGGLES 1992), the importance of perception surfaces, effort surfaces and time surfaces (STEAD 1995) and the current work on modelling diffusion processes across a heterogeneous surface such as the colonisation of the Americas (STEELE *et al*. 1996; GLASS *et al*. 1997).

One of the particular interests of the CAERE survey is the use of GIS in excavation. Based on the distinction outlined in the introduction, while there is considerable use of CAD for excavation recording and processing there is very little application of GIS. POWLESLAND (1997) has been a champion of integrated on-site digital recording and analysis for many years and has developed his own software, G-Sys (LYALL, POWLESLAND 1996), with some GIS functionality which has been adopted by a number of other excavators. Conversely, though, BISWELL *et al.* (1995) discuss the severe limitations of modern commercial archaeology in terms of integrating GIS into existing working practices while at the same time demonstrating its potential with a series of intra-site spatial analyses that highlight the difference between CAD and GIS.

## 3. CONCLUSIONS AND THE SURVEY

Within England, Wales, Scotland and Northern Ireland there is a great deal of GIS-based archaeology in progress, and a high level of awareness of spatial technologies generally even if confusion still exists between CAD and GIS. For various reasons this survey does not itemise this work, a task that would surely be impossible given that potential GIS users across the whole range of archaeological organisations must total over a hundred [17]. In the discussion, however, I have attempted to identify important themes that are emerging from the current situation and, in my opinion are going to be influential to the use of the technology in the future.

It is evident that CRM applications are in a crucial stage of formalisa-

[17] For example see the Archaeologists using GIS list, available online at http://ads.ahds.ac.uk/ahds/project/gisarchies.html [accessed 6th October 1997].

tion involving the development and adoption of international standards for spatial digital data. The outcome from this will be fundamental to the long term aims of data compatibility and exchange that lie at the heart of CRM work. Digitally-based local and national monuments records will soon be available over the Internet and when the ADS is fully operational a single access to a whole range of digital archives could revolutionise the way archaeology is done in the UK. At the analytical and theoretical level the situation is also healthy having moved beyond the 'return to ED' debate, new and stimulating GIS-based approaches to landscape study have emerged. The Chorley Report was an important comment on the adoption process of GIS within the UK, and ten years after its publication at least one of its concerns, a lack of awareness, has now been addressed.

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RESULTS OF THE QUESTIONNAIRE GIS AND ARCHAEOLOGY

*Title of the project*: Survey of Dartmoor.

*Promoting institution*: Royal Commission on the Historical Monuments of England.

*Year of beginning*: 1993.

*Foreseen term*: 4 years.

*Geographic area*: 200 km$^2$.

*Excavation area*: Not applicable.

*Short description of the project*: To survey and evaluate the entirety of the archaeological resource (above ground) within the designated area of the Dartmoor National Park.

*Hardware*: Survey by Leica GPS and EDM processing by DEL/Compaq 486 and Pentium.

*Software*: Trimmap, AutoCAD, GenaSys.

*Application of descriptive standards*: Ongoing – developmental infancy.

*Application of Spatial Analysis*: Ongoing – developmental.

*Other important information*:

*Address*: RCHME, National Monuments Record Centre, Kemble Drive, Swindon, SN2 2GZ.

*E-mail*:

*www address*:

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*Title of the project*: Northamptonshire Sites and Monuments Record.

*Promoting institution*: Northamptonshire County Council with support on specific work by English Heritage.

*Year of beginning*: 1992.

*Foreseen term*:

*Geographic area*: Northamptonshire, England.

*Excavation area:* All excavations in Northamptonshire.

*Short description of the project*: As part of the development of our Sites and Monu-

ments Record we have begun the mapping of the extent of all excavations in the county- ie definition as polygons of excavation trench boundaries. These polygons are then cross referenced to the database entries for those excavations. So far we have mapped in this way all the excavations in the Medieval and later town of Northampton. Work is now extending to all other towns in the county. We are currently considering the way in which we will set standards for the recording of all future excavation feature plan data on GIS and how we will apply this to the work of all archaeological contractors working in Northamptonshire (Northamptonshire Archaeology, the archaeological contracting arm of Northamptonshire County Council, is currently conducting digital planning on several excavations and we intend to develop our standards in collaboration with them). For all previous excavations we intend to explore the practicality of scanning published excavation plans and registering them in our GIS.

*Hardware*: Various 486 and Pentium PCs. Access to A0 size drum plotter.

*Software*: MapInfo GIS, Oracle database.

*Application of descriptive standards*:

*Application of Spatial Analysis*:

*Other important information*:

*Address*: Glenn Foard, County Archaeologist, Northamptonshire Heritage, PO Box 287, 27, Guildhall Rd., Northampton, NN1 1BD, England. Tel: 01604 237243.

*E-mail*: glenn.foard@ukonline.co.uk

*www address*:

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*Title of the project*: St. Albans Archaeological Urban Database.

*Promoting institution*: English Heritage.

*Year of beginnin*g: 1995.

*Foreseen term*: 1995-1998.

*Geographic area*: St. Albans District.

*Excavation area*: Verulamium pre-Roman oppidum, Roman town, Medieval abbey and town.

*Short description of the project*: Mapping all known archaeological structures and deposits together with the area of excavation, geographical survey, aerial photography and watching briefs. Linked to comprehensive computerised databases.

*Hardware*: IBM with Calcomp digitiser.

*Software*: Sun Solaris Unix operating system. Sysdeco records database and utilities. Sysdeco OS vector map processing and editing. System is compatible with Hertfordshire County SMR.

*Application of descriptive standards*: Royal Commission on Historical Monuments standard list.

*Application of Spatial Analysis*: See short description above.

*Other important information*:

*Address*: Rosalind Niblett, 57 Brampton Road, St. Albans, Hertfordshire, AL1 4PU, UK.
*E-mail*: 101451,345@compuserve.com.uk
*www address:*

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*Title of the project*: Cambridgeshire County Sites and Monuments Record.
*Promoting institution*: Cambridgeshire County Council Archaeology Service.
*Year of beginning*: 1996.
*Foreseen term*: Indefinite.
*Geographic area:* Administrative county of Cambridgeshire.
*Excavation area*: Not applicable.
*Short description of the project*: To record all known archaeology – from research and rescue excavation, chance find or other information source – as a basis for understanding the nature of the archaeology of the county, both for planning decisions and as a tool for academic research and general public information.
*Hardware*: PCs.
*Software*: MapInfo, together with Microsoft Access database.
*Application of descriptive standards*: Royal Commission on Historic Monuments England thesaurus; EU working party on archaeological terminology.
*Application of Spatial Analysis*: To be developed – we welcome information which may become available as part of your project.
*Other important information*: Links with Royal Commission on Historic Monuments England's National Monument Record and with Association of Local Government Archaeology Officers' working party on Sites and Monuments Records.
*Address*: Tim Reynolds, Archaeology Office, Shire Hall, Cambridge, CB3 0AP.
*E-mail*: tim.reynolds@libraries.camcnty.gov.uk
*www address*:

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*Title of the project*: City of Cambridge Urban Area Database.
*Promoting institution*: Cambridgeshire City Council, in partnership with English Heritage and Cambridgeshire County Council. Project work to be carried out by Cambridge University Archaeology Unit.
*Year of beginning*: 1997.
*Foreseen term*: 2 years initial project, thereafter to be maintained indefinitely as the Sites and Monuments Record for Cambridge City.
*Geographic area*: Urban core of City of Cambridge.
*Excavation area*: Not applicable.
*Short description of the project*: To record all known archaeology – from research and rescue excavation, chance find or other information source – as a basis for the preparation of an Urban Area Assessment and Urban Area Strategy for preservation

of the City's archaeology.

*Hardware*: PCs.

*Software*: MapInfo, together with Microsoft Access database.

*Application of descriptive standards*: Royal Commission on Historic Monuments England thesaurus.

*Application of Spatial Analysis*: To be developed.

*Other important information*: Links with Sites and Monuments Record for Cambridgeshire; part of a programme of Urban Area projects promoted and funded by English Heritage.

*Address*: Tim Reynolds, Archaeology Office, Shire Hall, Cambridge, CB3 0AP.

*E-mail*: tim.reynolds@libraries.camcnty.gov.uk

*www address*:

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*Title of the project*: Wroxeter Hinterland Project.

*Promoting institution*: University of Birmingham.

*Year of beginning*: 1994.

*Foreseen term*: 3 years.

*Geographic area*: A 31 by 38 km block centered on Wroxeter, Shropshire, UK.

*Excavation area*: One major excavation (50 x 50 meters) at Whitley Roman villa; 5 or 6 minor excavations at other sites.

*Short description of the project*: A regional study of the dynamics of 'Romanisation' and urban-rural development centering on the Roman city of Viroconium Cornoviorum (present day Wroxeter in Shropshire), the WHP employs extensive field work, remote sensing and GIS modelling in order to assess the known archaeological record in the area and to model the social-economic development of the area through the establishment and eventual disappearance of Roman power in the lands of a remote British tribe.

*Hardware*: PC LAN (486 and 586) with remote access to a Sun Solaris workstation and a Digital Alpha workstation.

*Software*: Grass 4.1, ArcInfo 7.1, PCI EasiPace 5.3

*Application of descriptive standards*:

*Application of Spatial Analysis*: Mainly through GIS implementation of various sorts.

*Other important information*: Extensive use of local volunteers for both fieldwork and project administration; maintenance of Web pages.

*Address:* P. Martin van Leusen, BUFAU, University of Birmingham, Edgbaston, Birmingham, B15 2TT, UK.

*E-mail*: P.M.van-Leusen@bham.ac.uk

*www address*: http://www.bham.ac.uk/BUFAU/Projects/WH/base.html

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*Title of the project*: York Environs Project.

*Promoting institution*: University of York.

*Year of beginning*: 1991.

*Foreseen term*: Ongoing.

*Geographic area*: 4100 sq. km with York at its centre.

*Excavation area*: Sample excavation carried out for a sub-project on the Anglian and Anglo-Scandinavian period in the Yorkshire Wolds.

*Short description of the project*: To integrate the archaeology of urban projects within the City of York with the archaeological evidence from the region, to identify gaps in knowledge and to compare the past use of resources in the various landscapes of the region. Work has so far focused on a sub-project aimed at the examination of the Anglian and Anglo-Scandinavian periods, with the aim of defining the development of rural settlement patterns during the period 700-1000 AD, and examining the relationship of town and country.

*Hardware*: Silicon Graphics Indy workstations and Unix file servers, with PCs for data capture.

*Software*: ArcInfo 7.0.

*Application of descriptive standards*: The database design was published in «Archeologia e Calcolatori» 5, 203-17, in a paper by J. Chartrand and P. Miller.

*Application of Spatial Analysis*: Terrain modelling, artefact fall-off distributions, regression analysis, chi square statistics etc.

*Other important information*:

*Address*: J.D. Richards, Department of Archaeology, University of York, King's Manor, York, YO1 2EP.

*E-mail*:

*www address*: http://www.york.ac.uk/depts/arch/

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*Title of the project*: A study of Neolithic settlement in southern Britain using landscape studies and GIS.

*Promoting institution*: University of Southampton.

*Year of beginning*: 1995.

*Foreseen term*: 3 years.

*Geographic area*: Test Valley, Hampshire, England. The Mendips, Somerset, England.

*Excavation area*: Not applicable.

*Short description of the project*: An exploration of the application of 3D animation of paths through Neolithic Landscapes, combined with detailed analysis of lithic tool, and lithic working locations. These will be incorporated with landscape details such as geology and soils, drainage and monument location.

*Hardware*: Silicon Graphics.

*Software*: Grass 4.1 GIS package with SG3d and Movie Maker.
*Application of descriptive standards*:
*Application of Spatial Analysis*:
*Other important information*: Main focus of study to break down traditional site categorisations, and explore potential patterns of mobility in the Neolithic, rather than seeing the landscape as being dominated by sedentary agricultural landscapes.
*Address*: Lucy Wood, Department of Archaeology, University of Southampton.
*E-mail*: lw6@soton.ac.uk
*www address*:

ABSTRACT

There is a great deal of interests in the application of GIS within UK archaeology and, consequently, many varied examples. Rather then attempting the difficult task of itemising these, this paper discusses important themes which are emerging from the maturing understanding and usage of GIS technology within archaeology and more widely. These include issues such as establishing standards and the archiving and accessibility of digital data. It also makes a distinction between Cultural Resource Management and research led application. For each application area of the current position is offered together with discussion of relevant theoretical and practical issues.