Peter McKeague – Rebecca Jones

The National Database for Scotland:
Evolution of the Digital Resource

Abstract: RCAHMS maintains the national database and hosts the national collections of the archaeological and built heritage of Scotland, including its maritime waters. In the last twenty years, the database has evolved from a paper-based system to an Oracle database and GIS with well-established online search facilities (Canmore) and partnership applications (SWISH and PASTMAP). As RCAHMS approaches its centenary in 2008, new strategies are required not only to manage increasing volumes of information from professional organisations and amateur groups, but to engage the wider public not only through data mediation and the presentation of information already held in the database, but also by encouraging their active participation. This paper outlines current initiatives at RCAHMS to encourage data standards including the development of a Scottish thesaurus of monuments and the endorsement of the ASPIRE protocol and OASIS application. The database is also evolving to develop the Events-Monuments-Collections model.

Introduction

The Royal Commission on the Ancient and Historical Monuments of Scotland (RCAHMS) was established by Royal Warrant in 1908 in response to neglect of the built heritage of Scotland. Its sister organisations in England and Wales were founded later that year. The original role of the RCAHMS was to compile a comprehensive inventory of the archaeology and architecture of Scotland, and, in the course of the next 80 years, twenty-four inventories, comprising introductory accounts of the heritage of each area, together with a comprehensive gazetteer of the monuments recorded, have been published. Only in the last twenty years has this form of publication been replaced by a more selective approach with more in depth analysis of the wider archaeological landscapes and thematic studies coupled with more populist publications. Supporting information formerly presented in the in-depth gazetteers is now accessible through the online database and Geographic Information System (GIS). RCAHMS aims are now focused in three areas: surveying and recording the built environment of Scotland; compiling and maintaining in the archive and database a public record of the archaeological, architectural and historical environment; and promoting an understanding of this information by all appropriate means.

There have been a number of significant events in the growth of RCAHMS over the last century and the archive and database have integrated several important resources from a number of external bodies. From 1966, RCAHMS assumed responsibility for running the Scottish National Buildings Record, which had been established in 1941 to make a drawn record of Scotland's rich architectural heritage in the threat of destruction through enemy action, with extended responsibilities to record the prehistoric, Roman and medieval archaeology and to curate related archives where no suitable repository existed. This created the National Monuments Record of Scotland. The duties and archive of the Ordnance Survey archaeology branch in Scotland were transferred to RCAHMS in 1983. The OS had been responsible for the depiction of antiquities on their maps at scales ranging from Basic Scale (1:1,250 in urban areas, 1:2,500 for small towns and rural areas or 1:10,000 for moorland) to 1:250,000, and their archaeological field investigators pursued an active fieldwork programme and maintained a card index of information about antiquities across Scotland. This card index was scanned in 1986 to create the first incarnation of the database in use today. Information relating to the architectural records and collections followed in the 1990s and the database now holds over 270,000 records of 'sites' and provides an index to over 1 million items in the Collections. It is supported by an extensive collection of over 1.5 million vertical aerial photographs, transferred from the Scottish Office to RCAHMS in 1993.

RCAHMS runs an active programme of archaeological and architectural (thematic and threatened building) field surveys, an aerial survey and transcription programme and other projects such as Historic Landuse Assessment. The database and GIS are seen as the key repositories of the information gathered through both survey programmes and the collection policy for enhancing the national archive, and the database continues to evolve to reflect the needs of surveying, recording and collecting.

The Legislative Framework

RCAHMS exists as a body of record and has no statutory powers to protect or conserve. These latter functions are performed by Historic Scotland, an Executive Agency within the Scottish Executive charged with protecting and conserving Scotlands built heritage and encouraging its public appreciation and enjoyment[1]. The relationship between Historic Scotland and the RCAHMS is established through a concordat agreed in 2003.

In addition to national organisations, there are also 16 local authority archaeology services providing archaeological advice to 31 out of the 32 councils in Scotland. The work of the Local Authority archaeologists is supported through the maintenance and development of local Sites and Monuments Records (SMRs) and Historic Environment Records (HERs) for historic sites and landscapes. The SMRs/HERs are primarily a tool in aiding the planning process but increasingly their value in promoting the archaeology of an area to a wider, interested audience is being recognised through the development of searchable online databases and GIS. The SMRs/HERs and RCAHMS perform different and complementary roles, appropriate to their purpose, in the management, recording and explanation of the historic environment[2]. The information required to support these activities is derived from records held both nationally and locally, usually maintained in computerised inventories. The primary sources are the databases and related records of the RCAHMS and the SMRs together with an increasingly wide range of other records, including the national collection of the built heritage held by RCAHMS and the Scheduled Ancient Monuments (SAM) and Listed Buildings (LB) statutory information maintained by Historic Scotland.

Since 1994, with the issuing of National Planning Policy Guidelines (NPPG) and Planning Advice Notes[3] setting out the Scottish Ministers policy on the Historic Environment, Local Authority archaeologists play an increasingly important role in ensuring the consideration of archaeology within local development plans and in the development control process of the planning departments. Since the implementation of these Planning and Archaeology guidelines and, in particular, NPPG5, there has been, at least, a threefold increase in the amount of archaeological fieldwork undertaken in Scotland as recorded through the main source of information, the Council for Scottish Archaeology's annual publication "Discovery and Excavation in Scotland" (DES)[4].

Public Access

The public have always been welcome to consult information held by the RCAHMS at the search rooms in Edinburgh, although access to newly computerised records was effectively restricted to curatorial

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[1] See www.historic-scotland.gov.uk. The principal powers and duties carried out by Historic Scotland (on behalf of Scottish Ministers) are set out in statute. These include the Planning (Listed Buildings and Conservation Areas) (Scotland) Act 1997 and the Ancient Monuments and Archaeological Areas Act 1979.

[2] The relationship between RCAHMS and the SMRs/HERs is established through a co-operation statement formally agreed in 2003 and published in 2005 – see www.rcahms.gov.uk/RCAHMS_smr.doc

[3] National Planning Policy Guideline (NPPG) 5 (1994) www.scotland.gov.uk/Publications/1998/10/nppg5 (web version 1998), NPPG 18 Planning and the Historic Environment (1998) www.scotland.gov.uk/Publications/1999/04/nppg18, Planning Advice Note 42 Archaeology – the Planning Process and Scheduled Monument Procedures (1994) and the Memorandum of Guidance on Listed Buildings and Conservation Areas (1998) www.historic-scotland.gov.uk/index/policyandguidance/memorandumofguidance.htm.

[4] Discovery and Excavation in Scotland (DES) provides a long established mechanism for gathering succinct and immediate summaries of fieldwork undertaken by professional units, academic researchers or amateur groups across the country each year. See www.scottisharchaeology.org.uk/

staff until the development of Canmore, the on-line database, in 1998. Canmore enables remote users to search across and access virtually all the information in the RCAHMS database, except for work in progress. A map-based web-GIS search facility, Canmap, was added to complement the text-based searches in 2002, and the digital image collection added to Canmore in 2004. A further web-mapping application, Pastmap, was developed in partnership with Historic Scotland in 2004 to present spatial data relating to the statutory designation of Scheduled Ancient Monuments, Listed Buildings and the register of Gardens and Designed landscapes, alongside data from RCAHMS. From the map-based search, the user may access and download information specific to the statutory designation of monuments, in addition to viewing information already available from Canmore (Gillick / McKeague / Strachan 2004). Pastmap has acted as catalyst to encourage local authority SMRs/HERs to contribute their data to the application, with links taking the user through to their own online resources. Since November 2005, several local authorities, representing 58% of the landmass of Scotland, are represented online. Pastmap is providing the impetus to encourage most of the remaining SMRs to create online resources for their areas and it is hoped that almost complete coverage will be achieved by 2010.

Pastmap provides the user with a vast, but disjointed, resource on the archaeological and built heritage of Scotland. The user cannot move seamlessly from information presented RCAHMS to the local authority view or, indeed, access the documentation relating to statutory designations managed by Historic Scotland. It is hoped that the managers of the national and local databases can work together to create a definitive national dataset for the archaeological and built heritage of Scotland using available and emerging technologies to manage the links between datasets. Collaboration between agencies will address the Scottish Executive vision for best value use of geographic information and the development of a streamlined Spatial Data Infrastructure to be achieved by 2011[5].

The Shared Web Information systems for Heritage (SWISH)

In 2003, RCAHMS entered into partnership with its sister organisation in Wales, the Royal Commission on the Ancient and Historical Monuments of Wales (RCAHMW)[6], based in Aberystwyth. The partnership, known as SWISH (Malaws / McCoy / Murray 2004)[7], arose as a result of the need for RCAHMW to upgrade their system and the recognition that the two organisations with similar visions and objectives could pool resources and work together to develop the national databases for both Scotland and Wales. SWISH uses web technology to host, maintain and develop the Welsh database in Edinburgh, whilst the data is managed and updated by staff in Aberystwyth. The data is housed in an Oracle database and ESRI GIS, with two in-house developers and one GIS technical officer employed in Edinburgh. Both organisations benefit from greater co-operation, the development of a shared vision and, crucially, shared development costs, whilst, politically, sharing resources makes best use of public money and represents "Joined-up Government" in action. The SWISH partnership enables both organisations to address the transformation from relatively simple systems reflecting their origins in recording monuments to truly relational databases reflecting all aspects of the information and material held on behalf of the public.

Developing Standards in Recording and Collections

Current initiatives through the SWISH partnership include the creation of a more structured approach to handling heritage data and the introduction of additional pick-lists to control values added to the database tables. A major development will see the addition of a hierarchical thesaurus of monument types, based on the English Heritage model[8], to replace the simple, uncontrolled values presently in use by RCAHMS. The development will include an online version to promote the adoption of controlled terminologies across the wider archaeological community in

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[5] See http://www.scotland.gov.uk/Resource/Doc/57346/0016922.pdf

[6] See www.rcahmw.gov.uk

[7] See also http://ads.ahds.ac.uk/newsletter/issue20/swish.html

[8] See http://thesaurus.english-heritage.org.uk/thesaurus.asp?thes_no=1

Scotland. Future developments will also aim to implement recognised data standards in information management for heritage as defined through the CIDOC Conceptual Reference Model and MIDAS[9] – the Monument Inventory Data Standard developed and promoted by English Heritage, as well as emerging spatial data standards requirements, such as those defined by the Infrastructure for Spatial Information in the European Community (INSPIRE) directive[10], issued by the European Union. Adoption of these and other standards ensures that the organisations involved in the maintenance of record systems relating to the cultural heritage sector are working to a common format, ensuring consistency in the data structure, easing migration between systems, and managing the evolution of the data structure as technologies and standards develop. Such standards are, moreover, essential in ensuring consistent data retrieval and exchange between users, both through searches on the Internet and, increasingly, through the provision of web services. It is equally important to adopt and follow the requisite international standards documenting the archive in the collections tables of the database. The Open Archival information system (OAIS)[11] is the model being adopted to develop our systems and organise procedures. In addition, RCAHMS is looking at the emerging accreditation scheme from the Digital Curation Centre (DCC)[12] and the checklists produced by NARA (National Archives and Records Administration, USA)[13] and NESTOR (Network of Expertise in Long-Term Storage of Digital Resources, Germany)[14]. This raft of standards aims to ensure that the information to be preserved is both independently understandable and accessible to the user in the future. They recommend the adoption of a common framework of terms and archival standards.

The Collections table at RCAHMS is being re-structured to closely follow the General International Standard for Archival Description (ISAD(G))[15] for documenting archival material. This hierarchical model takes the user from the general to the specific. Both archaeological and architectural archives contain an increasing amount of correspondence, invoices, office notices and pamphlets that are more appropriately held as a group within the collections rather than individually itemised. Adopting ISAD(G) enables a flexible approach to cataloguing the wide variety of collections held by RCAHMS, allowing batch grouping of items alongside more detailed cataloguing of individual entries of, for example, letters to other artists/architects within the batch. Other enhancements will also address the management of the collection to assess use, wear and tear of the physical archive over time.

With the growth of digital archives, the RCAHMS Collections table has been developed to manage digital information describing individual files, generated both from the RCAHMS' own field survey programme but also increasingly from external projects, stored and archived through the database. The revised structures have introduced the idea of hierarchical relationships between items and instances of the item, for example, documenting and storing both the high resolution RAW image and TIFF versions of a digital photograph. Versions for distribution such as Jpegs are not considered part of the archive but are increasingly generated to disseminate the collection to a wider audience. The revised database structure will also accommodate enhanced tables managing information about the "People" and "Organisations" associated with particular records and archives held at RCAHMS. For the first time, the database will manage the storage of hyperlinks to external resources on the Internet, such as the Dictionary of Scottish Architects[16], and potentially to other online resources, such as Wikipedia.

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[9] See http://cidoc.ics.forth.gr and www.english-heritage.org.uk/midas

[10] See http://eur-lex.europa.eu/LexUriServ/site/en/oj/2007/l_108/l_10820070425en00010014.pdf

[11] See http://ssdoo.gsfc.nasa.gov/nost/isoas/ref_model.html

[12] See www.dcc.ac.uk/

[13] See www.archives.gov/

[14] See http://www.langzeitarchivierung.de/index.php?newlang=eng

[15] See http://www.icacds.org.uk/eng/standards.htm

Implementing "Events"

"People" and "Organisations" help document the "events" that define the records held in the database, be it the context of the Events – Monuments – Archives model promoted through MIDAS and familiar to the archaeological community in Britain or the events associated with design and execution of Scotland's architectural heritage. Events will relate to the survey and recognition of a monument, but will also incorporate episodes in the life cycle of an architectural monument, from design through to construction, alteration and, on occasion, destruction. The addition of an Events table to the database will enable staff to add structure to information created both internally and externally.

Currently, when new text-based information is added to a RCAHMS record, it is simply appended below the previous text, reflecting the database's origins in a paper map and card index system. As the volume of information available grows, these blocks of text have become increasingly unwieldy, and combine the reporting of fieldwork with more descriptive accounts. Furthermore, the information presented can be contradictory and therefore confusing to the uninitiated. Major enhancement activities adding information to the database include RCAHMS' own programmes of aerial survey and transcription, rapid ground survey and re-assessment of the existing record, analysis through cataloguing architectural collections, and information generated from external sources, for research, and carried out in order to discharge planning conditions.

It is hoped that the work on the Events table will ultimately assist in the capture and dissemination of data in the future. Whilst it is designed to host index information about investigative events, it will also provide an opportunity to rationalise storage of the descriptive accounts in the database and separate content created specifically to present a record to the general public from that documenting a site in some detail. Once fully populated, it will be possible to separate and search events by type and date. The structure will be flexible enough to host and document contradictory interpretations about specific records and to manage new sources of information such as those submitted through public comments (or blogs) or a Wiki version of the record.

ASPIRE

Although most archaeological contractors in Scotland work with identical commercially available software packages, there is no agreed common approach to standardise how information is presented to the curators. In a case study analysing the nature of reporting of fieldwork along the Antonine Wall within the West of Scotland SMR area, Dr Stuart Jeffrey, then of the West of Scotland Archaeological Service, noted that in a four-year period the SMR had been consulted 155 times, leading to 88 archaeological events conducted by 23 organisations, of which 61 were developer funded. Rather than having at most 23 separate reporting standards, one for each of the separate organisations, there were in fact 88 separate formats – one for each of the events completed along the wall. A project team, comprising representatives from the local authority sector and RCAHMS, and led by Dr Jeffrey, developed a rigorously specified, yet flexible, solution that is enforceable, dynamic and deliverable, to replace the existing inconsistent practices. The Archaeological Standard Protocol for the Integrated Reporting of Events protocol (ASPIRE)[17] was adopted in 2006 by the local authority archaeologists with the support of Historic Scotland and the RCAHMS. ASPIRE defines the standards for transferring data from curatorial databases to the contracting archaeological units and vice-versa. It documents both the project events (where and when a project takes place) but also aims to ensure the summarising of site-based information in a simple structured format that can be transferred into curatorial databases. Templates and documentation are available via a website.

OASIS

The work of ASPIRE in defining standards for the reporting of archaeological fieldwork acknowledged

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[16] See www.scottisharchitects.org.uk/. This is an online resource providing biographical information and job lists for all architects known to have worked in Scotland during the period 1840 to 1940.

[17] See http://www.aspire-resource.info/.

the development of the Online AccesS to the Index of Archaeological investigationS application, more routinely referred to simply as OASIS, developed by the Archaeological Data Service (ADS) at the University of York (HARDMAN / RICHARDS 2003)[18]. OASIS streamlines the reporting of archaeological fieldwork from contractor to curator and ultimately the public. As originally conceived in England, where it has been live since 2004, OASIS sought to rationalise and streamline the reporting of developer-funded archaeological fieldwork from the contractor to curators and the public, via the Archaeology Data Service online catalogue: ArchSearch. OASIS is an online application, requiring no specialist software, designed to capture and transfer information, to consistent standards, about a piece of archaeological fieldwork. The input form comprises some 40 fields, mostly with controlled pick-lists, and is divided into five key sections detailing each project: the Project details, Location, Creators, Archive and Bibliography. Contributors are also able to upload copies of their reports digitally for transfer to local and national curators and to the ADS where the reports may be accessed online via the ADS ArchSearch catalogue. Information submitted through the OASIS form may be downloaded using MIDAS XML, validated through the FISH toolkit[19]. This XML schema has been designed to enable the movement of information between the wide variety of systems in use in the archaeological sector, as well as enforcing data standards through validation routines. It will aid the transfer of data to systems, such as the exeGesIS HBSMR software, utilised by many of the local authority services. Over the last two years, the ADS has developed a version of the form for Scottish users. Much of the infrastructure remains the same, although the form takes account of the simpler administrative structure in Scotland, and the pick-lists reflect Scottish, rather than English, legislation. A significant enhancement has been the inclusion of a module to acquire sufficient technical details describing geophysical prospection to ensure the sustainability of the Database of Geophysical Survey, presently held by the Department of Archaeology at the University of Glasgow. Following the adoption of ASPIRE by local authority archaeologists,

OASIS was implemented from April 2007, and it is now part of the standard terms and conditions for fieldwork, although it is up to individual, and often overworked, SMR officers to ensure that projects adhere to the standards.

A Case Study for Collecting Event Data: Scotland's Rural Past

While OASIS addressed the reporting of fieldwork generated by professional archaeologists, this left unresolved how data recorded outside the commercial sphere could best be incorporated into national and local records. One approach to this problem is being developed as part of the Scotland's Rural Past (SRP)[20] project. This five-year programme, with major funding from the Heritage Lottery Fund (HLF), is based in RCAHMS and is designed to work with local communities across Scotland to discover and record abandoned rural settlements. The SRP team will provide training and support to local volunteers who would like to develop their own survey and recording projects. Data collected by all SRP volunteers will be added to the RCAHMS database and an online reporting form is being developed to ensure ease of data transfer to the RCAHMS database. If successful, the form could be used to provide a simple, application neutral, online form for other users, such as archaeological units, to capture the site-based information required by the ASPIRE protocol.

To the Future…

Information in RCAHMS databases has been gathered for a wide variety of purposes, almost none of which have been for 'public presentation'. In the world of remote access, sound bites and short attention spans, the lengthy texts presented through Canmore can be off-putting to all but the specialist user. The Events Table structure could be developed and used to store information created to present short accessible summaries for public consumption, such as the text created for the Accessing Scotland's Past and Sir Basil Spence projects[21] – either through the

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[18] See http://ads.ahds.ac.uk/project/oasis/. The Archaeology Data Service supports the dissemination of digital resources – see http://ads.ahds.ac.uk/.

[19] See www.heritage-standards.org/ and http://heritage-standards.org/files/midas_caa2005.ppt.

[20] See www.scotlandsruralpast.org.uk.

[21] See www.accessingscotlandspast.org.uk and www.basilspence.org.uk

RCAHMS web site, via web services and RSS news-feeds to third party sites, or potentially through delivery to a wide range of mobile services. Redesign of both the database and the way that information is presented begs the question about the resources necessary to mediate the content. Past experience with HLF funded projects, such as Accessing Scotland's Past, highlighted the length of time required to summarise information. Furthermore, the criteria for development and delivery of some externally funded projects can result in the work being undertaken by relatively inexperienced staff rather than those with the relevant expertise. Research at the School of Informatics at the University of Edinburgh has explored the use of natural language generation to produce descriptive text, used by the international M-PIRO project (ANDROUTSOPOULOS ET AL. 2002)[22]. Sentences can be generated from data fields operating with a language model, tailored to a range of user profiles, as well as offering the possibilities of multi-lingual output.

As the centenary of RCAHMS approaches, the existing website will be substantially overhauled and the underlying technology driving Canmore rewritten. This involves separating the database structure and content from the presentation through the development and provision of web services. Furthermore, with the introduction of a Spatial Database Engine (SDE), the information in the GIS at RCAHMS will be integrated with the Oracle database, enabling a more seamless presentation of the data to the public in the future. It is intended that the New Canmore application will be launched in late 2008.

Acknowledgements

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[22] See also http://www.ltg.ed.ac.uk/mpiro

Peter McKeague

Survey and Recording
RCAHMS Royal Commission on the Ancient
and Historical Monuments of Scotland
John Sinclair House
16 Bernard Terrace
Edinburgh EH8 9NX, United Kingdom
peter.mckeague@rcahms.gov.uk

Rebecca Jones

Survey and Recording
RCAHMS Royal Commission on the Ancient
and Historical Monuments of Scotland
John Sinclair House
16 Bernard Terrace
Edinburgh EH8 9NX, United Kingdom
Rebecca.Jones@rcahms.gov.uk