



Dig Digital.

Work Digital. Think Archive. Create Access.

A guide to managing digital data generated from archaeological investigations

Infosheet #9 – Geophysics and digital data

Geophysical prospection is the science of investigating the ground's physical properties in a non-intrusive manner to reveal buried archaeological remains. Geophysical surveys would therefore not exist without the creation and presentation of data. Digital data occupies all steps of a geophysical survey and is presented in several different formats. Survey data is an important primary source of archaeological information and should be collected, managed and archived as carefully as physical remains.

The ClfA *Standard and guidance for archaeological geophysical survey* (2014) requires that generators of digital geophysical data have a strategy in place for the adequate storage, security and long-term accessibility of that data. Data files should be made available in formats that are open and reusable wherever possible, and digital datasets should be accompanied by documentation that allows them to be accessible. It is therefore necessary to not only deposit digital data, but to provide survey documentation and metadata to ensure longevity for the survey data.

Archiving geophysical data can be a contentious issue due to the often confidential nature of surveys for pre-planning purposes or for on-going projects of a sensitive nature. This case study outlines suggestions to help support the collection, management and curation of digital geophysical archives.

The Dig Digital resource is an Archaeological Archives Forum guidance document that supports ClfA Standards and guidance. It was created by DigVentures, in partnership with ClfA, and funded by Historic England. You can find the full resource online at: <https://www.archaeologists.net/digdigital>



Planning for geophysical data – the data management plan

Geophysical survey projects create digital data during initiation and set up and produce lots of digital data in delivery. Using a data management plan (DMP) from the outset provides a live planning tool and process that is initiated at the start of the project and can be reviewed at each stage by the project team. The DMP should be included as an appendix to key project documentation, such as the WSI or project design, the assessment report and updated project design, and as part of the final technical report. Ideally, it should also be deposited as part of the project archive. The Dig Digital example and template for a DMP can be found at:

<https://www.archaeologists.net/digdigital/planning>

By treating the DMP as a living document, it remains relevant and flexible to any changes that may occur through the project delivery stages. Used by the project team as a planning tool or checklist, the DMP helps to ensure that all parts of the geophysical archive are collated and managed appropriately throughout project delivery. Developments or changes can be recorded and are visible to all project stakeholders – including the wider project team and intended repository.

Geophysical data and stages

The procedure of digital data creation and data management in a geophysical project is relatively similar across all survey methodologies, with the same sequence of events and similar personnel being involved. All data for the project can be managed and outlined in the DMP, which will help those with less experience to make sure they collate all information necessary throughout the project.

As with all digital data, it is important to think in terms of the FAIR principles – Findable, Accessible, Interoperable, Reusable. To adhere to the FAIR principles, it is therefore necessary to not only deposit digital data, but also digital survey documentation and metadata to ensure longevity for the survey data and to allow it to be reconstructed and reprocessed if necessary.

Metadata should be recorded for each survey technique for each individual survey event. As a minimum, metadata should include

- survey type
- instrumentation and reason for choice
- area surveyed (in Ha)
- equipment configuration (electrode spacing, magnetic north, antenna configuration)
- survey methodology (survey grid layout and size, method of coverage, traverse and line separation, reading interval and sampling position, survey direction)
- site information (geology, issues)
- georeferencing information
- accuracies, issues and additional remarks
- data processing methodology



As data will be created at various stages of the geophysical survey project, the summary below defines the tasks involved in key project stages that are relevant to the creation and management of the survey data.

Project initiation

- The *project manager* produces a project design or WSI that
 - refers to technical data standards that will be followed, including best practice guidance, organisational manuals, and professional standards (namely ClfA and the EAC)
 - includes a completed DMP, meeting the standard required by ClfA Standards and providing a clear framework for how data will be managed throughout the project, from acquisition to archive
- The *project team (surveyors)* are provided with the DMP in order to review data collection, documentation and metadata requirements, and storage. The *project manager* will oversee these processes to ensure that standards are understood and achievable. Feedback and updates should be provided to the *project manager* as appropriate.

Project execution – the geophysical survey

- The *project team* ensures that standards are achieved by
 - collating metadata for the key survey information throughout the project, such as instrument configurations, survey methodologies, grid configurations (if used), directions of traverses, site information such as obstacles or features that may affect results, georeferencing information, and any additional remarks
 - establishing appropriate data standards and applying consistent and clear file naming conventions throughout the project
 - saving raw and processed data at regular intervals and creating backups throughout the survey to protect from loss or damage and to make them accessible throughout the project
 - maintaining and updating the DMP as the survey progresses.

Project analysis – the survey report

- The *project manager* and the *project team* will produce a technical survey report in line with industry guidelines and recommendations by
 - ensuring that the raw data files are saved separately to any processed data files
 - collating metadata for the key information throughout post-processing, such as the data processing steps and plotting levels, and analytical and interpretive activities
 - creating interpretive scaled illustrations that have a key
 - submitting reports and associated data/metadata in open and accessible formats, with clear signposting to a glossary for any specialist terminology
 - making recommendations for the long-term preservation of the data, discussing selection strategies with the *project team* as necessary.

Selection – what data should be included in a digital archive?

Not all digital data needs to be included in the project archive, and the project team should implement a process for selection as part of the project delivery and archive process. The ClfA *Selection Toolkit for Archaeological Archives* provides information about the application of a selection strategy within archaeological projects, and this toolkit also includes advice on how selection can be applied to digital data.

The digital archive should include the full specialist report and interpretive illustrations, as well as the raw and processed geophysical data files and composites. Interpretive illustrations created during the reporting and analysis stage of a geophysical survey should be provided in an open, accessible format that is suitable for a variety of computer programmes, such as a GeoJSON or an e-transmit of an AutoCAD file.

Importantly, the minimum metadata fields mentioned above should be recorded for each site type and for each survey technique, otherwise the raw data files would be almost impossible to arrange and understand. It is also recommended that field notes are digitised where possible and retained for long-term preservation within the digital archive. The table below summarises the recommended components of a selected project archive.

Archive category	Components
Project material	Site notes
	Technical survey report
	Interpretive illustrations
Geophysical data	Raw data files in their original format, as well as text files
	Processed data files
	Image files that represent the data
Project documentation	Data Management Plan (unless part of larger project)
	Survey metadata
	Georeferencing information
	Project metadata (data assembly and processing)
	Collection metadata and description of all the files in the archive

If project confidentiality is seen as an obstacle, the digital data included in the archive can be embargoed. To comply with FAIR principles, the conditions of access can be included with the project metadata with contact details of the person that access to the data can be discussed with. The metadata should be deposited to enable both people and machines to understand the conditions of access. In addition, the team can create signposts to the existence of the geophysical survey with the appropriate HER and OASIS, making it clear where the data is stored and how it can be requested.

All team members, including external specialists or project partners, should be aware that the digital data will be deposited and made available as part of the archaeological archive.



Making digital archives findable and accessible

As part of the Dig Digital guidance, it is recommended that an OASIS index record is initiated at the start of the project, then regularly updated. Creating an OASIS record for each archaeological project is required by most local authorities within development projects, and national heritage bodies in England, Scotland and Northern Ireland also require its use, although OASIS is not used in Wales. You can find more information about OASIS and digital archives across the UK [elsewhere in the Dig Digital toolkit](#).

Creating an OASIS record for the geophysical project, or including details of the survey within the archaeological project record, provides a findable digital record and signpost to the project data. In this way, it fulfils the FAIR guiding principles, which set out an ambition for all research project data to be [Findable, Accessible, Interoperable and Reusable](#).

It is recognised that there are concerns about and barriers to making all archaeological geophysical data fully accessible, and the issue of confidentiality plays a large role in hampering this. If project teams and stakeholders conclude that data cannot be stored with a Trusted Digital Repository, the project team should consider deposition of the project metadata and ensure that a record of the survey is provided to the appropriate body, signposting the existence of the survey. However comprehensive the deposited digital archive is, the DMP should be used as a means of documenting the decision-making process, and teams should include the final version of the DMP with the digital project archive.