

OPTIONS FOR SUSTAINABLE ARCHAEOLOGICAL ARCHIVES

Part One - Report

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Purpose of document

This document has been produced as the final report for the Arts Council England (ACE) and Historic England (HE) funded project, *'An investigation and options appraisal on providing for the long-term storage and curation of archaeological archives in England'*. The overarching aim of the work has been to understand how the museum and wider archaeological sector can be best supported to ensure a sustainable model for providing future capacity for archaeological archives. The purpose of the document is to outline the results of the study, providing a series of scenarios and options which seek to address the archives challenge, and to outline the recommendations of the project team.

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Executive Summary

This report is the result of an Arts Council England (ACE) and Historic England (HE) funded project, 'An investigation and options appraisal on providing for the long-term storage and curation of archaeological archives in England'. The overarching aim of the work has been to understand how the museum and wider archaeological sector can be best supported to ensure a sustainable model for providing future capacity for archaeological archives. This work will contribute to the strategic response to the specific recommendations in the Mendoza Review of Museums that addressed this issue (2017).

The project was delivered from March 2020 to March 2021, with workstreams focussed on several key areas agreed with the Project Steering Group. Regular meetings were held with the Steering group to provide updates and outline progress, and to agree any changes to the delivery programme because of issues related to COVID19. Key areas of work included desk-based review of results from previous work, survey and consultation, options modelling, and recommendations.

Recommendations aim to address the capacity challenge, facilitate access to heritage and maximise public benefit from archaeology – a key need identified from the results of previous work and across the project's consultation activities. Importantly, the OSAA 2020 research suggests that, to create the desired sustainable future for archaeological archives, an ambitious and robust response must look beyond capacity and encompass both accessibility and benefit. To this end, the project proposes the creation of a National Collection of Archaeological Archives (NCAA) which would provide:

A national, sustainable archaeological archive which guarantees public benefit through being discoverable and accessible, facilitating new stories of our shared past through the continuing use and reuse of resources created by archaeological processes, equally accessible to researchers, educators, curators and the public and providing a seamless interface between data, archive materials, organisations and communities.

Key components of the NCAA would include 1) a single online catalogue – the NCAA Datastore, 2) a single set of standards for preparation, deposition, curation and access, 3) a Collections Policy which links the NCAA to national and regional research frameworks, and to the ClfA Selection Toolkit and 4) a dedicated team, including expert staff and a network of regional archives advisers to support the NCAA and build vital connections and relationships between archive creators, curators and users.

To describe the challenge, three Scenarios articulate the scale of the current problem and consider the immediate issue of inaccessible archaeological archives as well as the medium-term challenge of capacity within museums. A series of Options are then presented which respond to the scenarios, providing building blocks which address the challenge to a lesser or greater extent. Options include increased capacity within the current model, creation of a structured, distributed model which adopts a 'hub-and-spoke' approach, or the development of a single facility designed to collect and store the nations archaeological archive. In all cases, an assumption is made that some museums will continue to collect and store archives considered relevant to their collection policy and that a blended approach should be accommodated across any solution adopted. In addition, the impact of outsourced storage to accommodate and support solutions is considered across the options modelled. The NCAA would provide the sustainability needed to underpin the various options which could be adopted.

Table of Contents

Executive Summary	2
1 THE OPTIONS FOR SUSTAINABLE ARCHAEOLOGICAL ARCHIVES PROJECT	5
1.1 Project background	5
1.2 Scope and situation	5
1.3 Project methodology	6
1.4 Defining the archaeological archive	7
2 WHAT IS THE ISSUE?	8
2.1 The challenge	8
2.2 Beyond capacity – the case for sustainability	9
2.3 A vision for sustainable archaeological archives	10
3 ADDRESSING THE STORAGE CRISIS	11
3.1 Understanding data issues	11
3.2 Storage and capacity within England	12
3.3 Meeting current demand – capacity needs	14
3.4 Scenario 1: Storage for undepositable material.	15
3.5 Scenario 2: Storage for undepositable material and increased number of museums stop collecting archives.	15
3.6 Scenario 3: Storage for undepositable material, reduced museums capacity and transfer of existing collections	16
3.7 The case for off-site and/or outsourced storage	17
4 TOWARDS A NATIONAL COLLECTION OF ARCHAEOLOGICAL ARCHIVES	18
4.1 Sustainability is more than storage	18
4.2 Proposal for a National Collection	18
4.3 NCAA Datastore (Component 1)	19
4.4 NCAA Standards and Collection Policy (Components 2 and 3)	21
4.5 NCAA Team (Component 4)	22
4.6 Capital costs – building storage capacity	23
5 ARCHAEOLOGICAL ARCHIVES OPTIONS	26
5.1 Option 1 – Increase capacity within the existing network	26
5.2 Option 2 – Distributed Hub and Spoke Model	29
5.3 Option 3 – A single national solution	33

5.4	Financial summary – comparing options	40
6	DESIGNING A SUSTAINABLE SOLUTION	40
6.1	Redefining sustainable	41
6.2	NCAA - a hub and spoke design model	41
6.3	Finding a sustainable funding solution	43
	GLOSSARY AND ABBREVIATIONS	45
	BIBLIOGRAPHY	46

Tables

Table 1. Repositories in England, collection of archaeological archives and capacity	13
Table 2. Key data which supports the scenarios outlined below.....	14
Table 3. Scenario 1: Current backlog, plus undepositable archives.	15
Table 4. Scenario 2: Current backlog, undepositable archives and estimated closures.	16
Table 5. Scenario 3: Current backlog, undepositable archives, estimated museum closures and archive transfers.	16
Table 6. NCAA staffing costs.	23
Table 7. Staffing roles shown against Spinal Point, salary costs and overheads used in Archives Options cost calculations.	23
Table 8. Summary of Scenarios presented in Section 3.	26

Figures

Figure 1. Attrition rates of archive storage based on current trajectory for archaeological archive accrual and existing storage capacity of England’s repositories.	13
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1 The Options for Sustainable Archaeological Archives Project

1.1 Project background

This report is the result of an Arts Council England (ACE) and Historic England (HE) funded project, *'An investigation and options appraisal on providing for the long-term storage and curation of archaeological archives in England'*. The overarching aim of the work has been to understand how the museum and wider archaeological sector can be best supported to ensure a sustainable model for providing future capacity for archaeological archives. This work will inform the strategic response to the specific recommendations in the Mendoza Review of Museums that addressed this issue (2017). It will inform thinking about future strategies and potential interventions whether through extending current provisions or introducing new approaches.

The Recommendations of the Mendoza Review of Museums aimed to improve *'the environment for museums so that individual organisations and the sector as a whole are well supported in a streamlined and effective way'*. Among the recommendations identified was one for Historic England to *'Work with key stakeholders to produce recommendations for DCMS early in 2018, which will improve the long-term sustainability of the archaeological archives generated by developer-funded excavations'*. In response, Historic England convened a task and finish group with Arts Council England and a range of archaeology and museum organisations. The group developed an action plan to address the challenge of sustainable management of archaeological archives.

Key features of the plan include:

- Investigating the potential for national or regional repositories.
- Understanding and promoting access and use of the archives.
- Clarifying issues of ownership and title transfer.
- Exploring realistic and sustainable charging frameworks for the transfer of archaeological archives to museums.
- Ensuring that selection is a key part of the archive creation process to ensure continuing significance.
- Exploring new technologies and methods of storage.

This project related to Recommendation 2 of that plan: *DCMS should ask ACE (as the lead development body for museums) to work with HLF and Historic England, to deliver a feasibility study of the viability of establishing additional strategic capacity in terms of publicly accessible repositories for archaeological archives, acting in support of existing museum provision.* Further details of the Action Plan can be found here: <https://historicengland.org.uk/whats-new/news/new-plan-englands-archaeology-archives-challenge/>

1.2 Scope and situation

This research exercise and options appraisal has explored the capacity challenge for archaeological archives, investigating the effectiveness of different storage models currently in use and exploring how different scenarios will impact future capacity needs. The project team has modelled several options, providing broad estimates of capital costs and resourcing required to support sustainability. A key

strand within the project has been consultation, and the report incorporates results from several discussion workshops, stakeholder consultations and case study interviews.

This project considers the challenges and potential options for the long-term storage of physical archive elements from archaeological projects and does not include the digital components of the archives. The definition of the archaeological archive used in this study is as follows:

All records and materials recovered during an Archaeological Project and identified for long-term preservation, including artefacts, ecofacts and other environmental remains, waste products, scientific samples and also written and visual documentation in paper, film and digital form (Perrin et al. 2014, 20).

The report was delivered from March 2020 to March 2021, covering the period of the COVID19 pandemic where much of the UK was in varying degrees of lockdown conditions. This has influenced the methods used and, importantly, the ability of the project team to access some information. Whilst we have experienced fantastic responses and support from individuals and organisations, the working restrictions for some has limited their ability to visit workspaces, access datasets and archives. For a large part of the delivery programme, many individuals were also furloughed, the result of which was a smaller response to the archive creation and accrual survey than might be expected under more normal conditions.

It is important to note that the scope of the study was also quite specific, considering the non-digital elements of archaeological archives and providing sustainable future capacity for storage. Some areas were not considered as part of the research but may have significant bearing on the costs and implementation of the options presented, such as Title of Transfer and issues linked to Treasure Act (legislation, definition, process).

A glossary of key terms and abbreviations used within this report is included at the end of this document.

1.3 Project methodology

The project was delivered from May 2020 to March 2021 with workstreams focussed on several key areas agreed with the Project Steering Group. Regular meetings were held with the Steering group to provide updates and outline progress. It should be noted that the programme methodology used was amended throughout delivery because of ongoing issues related to COVID19.

The main work areas which have informed this project included;

- Desk based review (summarised in Section 2 and included in Appendix 1), evaluating previous work undertaken across a number of relevant projects.
- Archive creators (contracting organisations) update survey (Appendix 2), to review current understanding of the archives backlog, archive creation, accrual and deposition trends.
- Case Study review of existing solutions (Appendix 3) undertaking one-to-one interviews with archive managers and teams to explore different models of archive storage.
- User ambitions consultation workshops (Appendix 4) offering discussion-based workshops with heritage professionals across stakeholder sector groups identified in the Communications Plan.
- Stakeholder consultation (Appendix 5) delivered as a discussion workshop with key organisations identified in the Communications Plan.

- Options modelling (Sections 3 - 5), based on data collated and considering consultation responses, providing a range of options, outline costs and impacts.
- Recommendations (Section 1 and 6) from the Project Team.

It is important to note that the OSAA project is not a detailed feasibility study. The project has investigated strategic options which are presented below in comparator format, and which include many assumptions. For example, salary costs included are based on LGA Green Book data, and the local authority framework for overhead costs has also been used. This allows the reader to see a like for like comparison between each different option but should not be taken as an estimate of actual cost for the models provided. A good comparison would be with official manufacturers' fuel economy figures for vehicles: these are carried out under consistent laboratory conditions to allow comparators to be drawn, and do not reflect 'real world' returns.

This is especially true of the relationship between volume and area. The OSAA project has gathered capacity data in terms of volume and has a working assumption that 1m³ of volume requires 1.3m² of footprint. Alternatively, 1m² of footprint can accommodate 0.77m³ of storage. This is correct but makes no allowances for the height of the structure, where several m³ can be 'stacked' in the same floor area. Since building costs can be estimated on cost per m², this becomes significant, especially for larger buildings. The case study provided of a build at SMG Wroughton, for example, shows that 1m² of footprint can accommodate between 2 & 2.3m³ of material in a 'real world' example.

This makes it exceedingly difficult to provide more than ball-park scenarios at this stage and emphasises the need for detailed options appraisals to be carried out based on real world structural appraisals as the project is taken forward.

1.4 Defining the archaeological archive

The creation of a stable, ordered and accessible archive as a fundamental aspect of any archaeological project has been defined at national (Brown, 2011) and European (Perrin et al., 2014) levels. The industry accepted standard is that an archaeological archive should contain a complete record of an archaeological project; the methodology, aims and objectives, data or objects collected, analysis results, interpretations, research and publications; all parts working together as one interrogatable whole (Chartered Institute for Archaeologists 2014). These sector wide, industry accepted standards and guidance are what govern the creation, compilation and curation of archaeological archives within England. While many archaeological archives are held within museums, their requirements differ from other museum collections or types of archives. Collections management systems such as Spectrum, and schemes such as the Archive Service Accreditation and Museums Accreditation are not considered compatible with current archaeological archiving best practice because they do not refer specifically to the procedures that relate to archaeological archives, and have therefore not been discussed within this report. More detailed guidance produced by the Society for Museum Archaeology may be of interest in terms of further reading (SMA 2020, 39).

2 What is the issue?

2.1 The challenge

The *Options for Sustainable Archaeological Archives Project 2020* is the latest in a series of research and consultation projects looking at archaeological archives, commencing with the Society of Museum Archaeologists *Archaeological Archives and Museums 2012* project (Edwards 2013). A desk-based review of nine previous projects, all of which have tackled the challenge faced in the collection and management of archaeological archives, articulated several common recommendations as well as identifying existing knowledge gaps (Appendix 1).

A number of reports reviewed, including the *Archaeological Archives and Museums 2012* (Edwards 2013), *Seeing the Light of Day* (Fernie, McNulty and Dawson 2017), *21st Century Challenges* (Wills 2018) and Dr Paul's PhD thesis (Paul 2020), recommended that national or regional stores would provide an acceptable solution for the continued provision of access to archaeological collections. Therefore, in general, research undertaken consistently recommends that the strategy should be national, although none go so far as to suggest the nature and organisation of such a facility, or series of facilities. None of the reports identify any specific areas of the country where an archaeological resource centre would be best placed, the Edwards report (2013) specifically highlighting the fluid nature of the 'storage crisis'.

Edwards (2013) suggested that locality may be important in relation to archaeological archives, while Dr Paul's doctoral thesis concluded that location does not have to be a barrier to use if the systems are in place to support access. The *21st Century Challenges* report (Wills 2018) concluded that new repositories for archaeological archives should be linked to museums, and the *Empowering Collections* report (Museum Association 2019) recommends the use of shared museum storage. The *Gathering Information on Deep Storage Archive Facilities* report (Tsang 2017) suggested that off-site storage is often seen as more suitable for less frequently accessed and physically robust material, but that maintenance of a local store for material regularly accessed, or in need of regular monitoring, in-house may be required. Tsang (2017) also states that those closer to, or on the fastest access routes to the storage felt the greater benefits due to the costs of recovering material from deep storage.

While the *21st Century Challenges* report (Wills 2018) called for consideration of a transparent national costing model for archaeological archives, the *Survey of Fees for the Transfer of Archaeological Archives in England* report (Vincent 2019) concluded that setting a single fee across organisations is unrealistic due to the variation in the type, size and make up of collecting organisations. Additionally, the variable nature of income from archaeological archive deposition, should be taken into account, particularly regarding potential loss of income by museums.

A national strategy for archive completion was recommended by the *Archaeological Archives and Museums 2012* report (Edwards 2013) and the doctoral thesis 'Why do we have this? A study of museum approaches to retention and disposal of archaeological archives' (Paul 2020), while the *Seeing the Light of Day* report (Fernie, McNulty and Dawson 2017) advocates for a 'Standard Framework' for archaeological archiving procedures. Both the Edwards report (2013), *21st Century Challenges* report (Wills 2018) and Dr Paul's PhD thesis (Paul 2020) suggest the creation of a national index of archaeological archives.

Key recommendations which have been highlighted through the desk-based review, can therefore be summarised as:

- Development and adoption of a national strategy for archaeological archives.

- Development of a national index of archaeological archives.
- Creation of a standardised framework for archives management.
- Provision of a blended solution should involve museums and off-site storage.
- Consideration of archive deposition fees in terms of consistency and impact of the proposed solutions.

These recommendations provide a sound platform from which the OSAA 2020 project developed. Having also identified the significant gaps in the data, the project also undertook several consultation exercises, including survey, discussion workshops and interviews.

2.2 Beyond capacity – the case for sustainability

Feedback from the user needs discussion workshops (Appendix 4) provided an opportunity to understand the issues from all perspectives. Despite variation in the response to more focussed questions, overall there was a clear directive from everyone with regards to the need for a sustainable solution: we understand the challenge, the problem is still there, we need to address it, and its more than just boxes.

Analysis of the discussions highlighted four common themes which came out of the various discussion groups;

- The requirement for a nationally co-ordinated process or ‘brand’ for the archaeological archives, e.g. a National Collection.
- The opportunity to create a physical, national repository location.
- The need for a digitally accessible national index or register (incorporating existing archives and a process for newly created archives) including archives contents details.
- A consistent, standardised approach to preparation, storage and access to archives.

When discussing the current archaeological archiving situation, workshop attendees thought the biggest issue was online access and availability, followed closely by the variation in documentation, lack of museum resources and knowledge of where the archives are located. The three main barriers to gaining full potential from archaeological archives were lack of on-line data, staffing and resources, and the promotion and visibility of archaeological archives. However, if these barriers could be removed, it was believed that usage for multiple purposes including research and public engagement would increase, and new stories could be told.

The main changes needed to achieve a truly sustainable resource were agreed to be the need for national standards (for archive compilation, data, curation and accessibility), an on-line catalogue, better facilitation of the archiving process and to a lesser extent physical accessibility. Key to accessibility was an on-line searchable database, a dynamic central index or catalogue using standardised terminologies and data management systems. The consensus (though by no means unanimous) was that archaeological archives should be managed at the national level, although it was pointed out that change is difficult and there may be resistance from existing providers.

2.3 A vision for sustainable archaeological archives

This report includes several options and outlines different scenarios which may influence how a robust solution could be implemented. The report builds on recommendations which address the capacity challenge currently being experienced across England, but also the need facilitate access to heritage and maximise public benefit from archaeology. We feel that recommendations need to be approached as a series of objectives which fall under one important umbrella – the **National Collection of Archaeological Archives (NCAA)**. This concept, outlined in Section 4, has developed from the OSAA project and reiterates the conclusions of previous initiatives (see Section 2.1 and Appendix 1).

Options which outline possible solutions to problems recognised in the Mendoza Review of Museums (2017) are designed to address long-term sustainability of archaeological archives. The OSAA 2020 research suggests that, to create a more sustainable future for archaeological archives and meet the ambition of Arts Council England and Historic England, an ambitious and robust response is required which looks beyond capacity and encompasses the wider question of accessibility and benefit. To this end, we propose that the creation of a National Collection of Archaeological Archives provides an aspirational yet achievable solution. The proposal addresses the practical need of storage whilst enhancing existing provision and supporting a significant shift in how archaeological archives are perceived, accessed and used. The project team feel that a clear definition of sustainable archaeological archives provides a useful way to frame the aspirations of the project's recommendations.

The National Collection of Archaeological Archives (NCAA) would provide a sustainable archive, which is defined as:

A national, sustainable archaeological archive which guarantees public benefit through being discoverable and accessible, facilitating new stories of our shared past through the continuing use and reuse of resources created by archaeological processes, equally accessible to researchers, educators, curators and the public and providing a seamless interface between data, archive materials, organisations and communities.

The NCAA would provide:

- A centralised web-based catalogue and index, making archaeological archives findable and accessible, using standardised forms and including legacy data.
- Base level of standards for preparation and deposition thus simplifying operations for contractors across England, creating a more efficient and cost-effective system.
- A single point of online access for archive creators, curators and users, creating a substantial research opportunity supported by both online access to information about archives as well as physical access to collections from multiple sites.
- Ability of local museums to join and become part of the NCAA, continuing to collect archives and through agreement to meet standards and link into the data infrastructure of the NCAA.
- An underpinning collection policy for the NCAA driven by and linked to regional research frameworks, where archaeological fieldwork is evinced to add value to the NCAA.
- An approach that is collaborative and includes creators of archives (contracting organisations, Universities, community groups) in its strategic aims, as well as monitoring organisations (local authorities, national advisors) and curatorial teams (museum curators, repository managers and staff).

The NCAA would be supported by a distributed team of NCAA Archaeological Archives Advisers providing:

- Regional support to promote and engage with NCAA.
- A connection between existing repositories who choose to register with the NCAA, the central facility, archive collectors, archive hosts, users and stakeholders.

The following section provides a summary of the challenge which this project has aimed to address, outlining the methods used to approach the research aims. We identify three Scenarios which present the storage challenge faced to varying degrees over a period of 30 years and consider the changing needs and opportunities over that period which may impact the nature of the solution presented.

3 ADDRESSING THE STORAGE CRISIS

3.1 Understanding data issues

The survey data which has informed our understanding of the current capacity challenge for archaeological archives within England is not without issue, and it is important to consider the limitations of the data used within this project prior to drawing conclusions from it. In addition to the project reports reviewed as part of an initial desk-based assessment (Appendix 1), a series of annual surveys delivered by the Society for Museum Archaeology, commissioned by Historic England, underpin what we know about capacity issues in England today. These surveys have sought to gather quantitative and qualitative information about the capacity of museums to collect and considered levels of staff resource and expertise.

The main surveys used to understand capacity needs in this research include:

- 2012 Edwards Survey for FAME and SMA
- 2016 SMA Annual Survey of Collecting (Historic England)
- 2017 SMA Annual Survey of Collecting (Historic England)
- 2018 SMA Annual Survey of Collecting (Historic England)
- 2020 OSAA Project Surveys

Through the delivery of this project, it has become clear that, whilst each report provides a snapshot of a particular moment and set of questions, as a group of data they are inconsistent and incomplete. This means that making comparisons between different datasets is difficult and the results should be treated with a degree of caution. Both the Edwards (2012) and SMA Surveys (2016 – 2018) asked receiving museums to give an indication of the remaining capacity for storage of archaeological archives, but the differing approaches cast doubt on the results in several ways.

For example, it is still not known how many repositories currently exist in England. Edwards worked on the assessment that there were 160, targeting those repositories and receiving 134 responses of varying completeness. The SMA approach was more broad brush and compiled a list of 493 museums that were contacted for the survey in 2016 and increased to 512 in 2017.

During the survey design for the final year of the SMA project, it was realised that the differences between 2016 and 2017 were introducing variables into the data, so in 2018 only the 256 museums

that replied in both 2016 and 2017 were approached, with 148 complete responses received. It is not clear whether the year-on-year comparisons in the 2018 survey are based on the total responses from 2017/2018 or have been filtered down to the 256 respondents that were approached across all three years.

In terms of respondents to the SMA surveys, it appears that repositories which are non-museum based were not contacted as part of the survey. For some areas this creates confusion and gives a false impression of both capacity and resource. For example, the Cambridgeshire County Council Historic Environment Team (CCCHET), which has been the receiving repository for Cambridgeshire since 1992, was not included in the survey. Instead, eight museums were approached, none of which accession archives from developer-funded excavations. The 2018 report therefore lists three of those museums as actively collecting archives, two of which have added archaeological objects to their collections from archives held by CCCHET, and the third is a University museum and could hold material from university research excavations. However, as the UAUK 2018 Survey shows, the volumes held in universities are not a significant issue compared to archives from developer-funded fieldwork. The misrepresentation of the Cambridgeshire situation is not unique, as the data from the West Midlands also excludes those museums that are not SMA members resulting in an inaccurate picture of archaeological archive storage provision in the region.

Relating to the creation of archives, contracting archaeological organisations were surveyed in Edwards 2012 about archives in their possession. This data was updated in 2020 for the OSAA project, although it was realised that one statistic not requested in any survey has been the annual accrual of archives. This was the subject of an additional questionnaire circulated as part of the OSAA project in 2020.

Finally, it should also be noted that the OSAA 2020 surveys were undertaken during the COVID19 pandemic, so responses have been impacted by staff availability and access to files/databases.

3.2 Storage and capacity within England

As a result of the limitations of the combined survey data as outlined above, it is quite difficult to draw generalised conclusions. A key question which underpins this study is how much capacity currently exists within England's repositories, how much of that space is available to archaeological archives, and when that capacity will be exhausted should archives continue to be deposited at the current rate. The four key surveys which provide this data suggest that available capacity in England has almost halved between the period from 2012 when overall storage capacity was estimated to be 3,200m³, to 2018 when capacity was reduced to 1,870m³ (see Table 1). However, looking at the data from the SMA surveys alone suggests a degree of variability from year to year which is not easy to explain as a general trend, but it more likely to result from variation within the survey respondents that was recognised in the 2018 survey.

One aspect that does remain more consistent is the average capacity per repository (Table 1). Again, a decline in overall capacity within repositories from 2012-2017 is to be expected, but the increase seen in 2018 is unexpected. This could be the result of a more targeted approach in the SMA 2018 survey which removed museums that were not expected to hold archaeological archives of this nature. Alternatively, if one considers the decline seen in the amount of undepositable backlog held by contracting archaeological organisations from 2012 - 2020 (Appendix 2), the increased capacity in SMA 2018 data could be a result of the implementation of local archive solutions (e.g. Cambridgeshire, Northamptonshire and Suffolk).

	Data source			
	Edwards 2012	SMA 2016	SMA 2017	SMA 2018
Responses	134	200	200	148
Collecting repositories	160	119	104	88
Number stopped collecting		35	38	23
Never collected		46	58	37
Average storage capacity remaining per museum	20m ³	18.1m ³	15.3m ³	21.5m ³
Total capacity	3200m ³	2116.5m ³	1546m ³	1870m ³

Table 1. Repositories in England, collection of archaeological archives and capacity

Data gathered from archaeological organisations is very telling with regards to the volume of archive material generated on an annual basis and expectations for deposition. According to data gathered as part of the OSAA 2020 surveys, contracting organisations are creating an estimated 492m³ of archive material per annum. Of this, 379m³ of archive material per year is depositable, leaving 23% (or 113 m³) which is considered undepositable (see Appendix 2).

Comparison of the annual accrual of archive material and the estimated capacity within repositories, as estimated from Edwards 2012, SMA 2018 and OSAA 2020 data, demonstrates that existing storage capacity will be fully eroded within six to ten years should no changes be made to the current situation (Figure 1). These figures are averaged across the country and regional variation will mean that some collecting areas will have greater capacity than others, extending the timeline for some. However, even with those variables in mind, the situation is desperate. Presented as an average, the 2018 SMA figure of 1870m³ remaining archives storage capacity, would mean that repositories will be full within six years of the data collection, by 2023/4. Projection of the Edwards 2012 figure of 3200m³ against the current accrual rate, repositories will be at capacity by 2022/3.

In summary, we will exceed the capacity available within existing repositories sometime between 2022 and 2025, increasing the burden on contracting organisations to retain and store undepositable archives in perpetuity. Whichever dataset is used, a solution must be found and taken forward urgently.

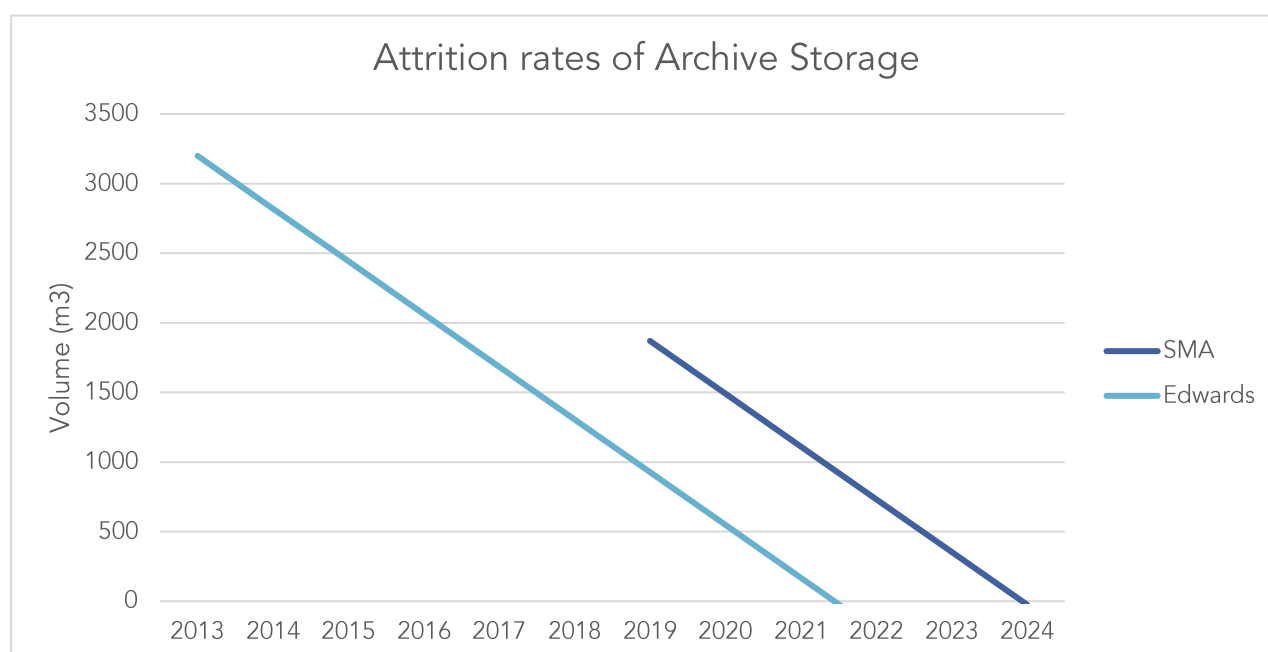


Figure 1. Attrition rates of archive storage based on current trajectory for archaeological archive accrual and existing storage capacity of England's repositories.

3.3 Meeting current demand – capacity needs

This section considers the size of facility that would be required to meet the current demand for space over a 30-year period, tackling the immediate need for England’s archaeological archives but not addressing the wider issues of sustainability, accessibility, public value or resources highlighted in Section 2.

To better understand the demand for space required to address the current archive storage crisis, as well as future needs, the project delivered an update survey in 2020 to supplement information gathered from the 2012 Edwards report. The OSAA 2020 survey (see Appendix 2 for detailed summary) has assessed the volume of archaeological archives held within contracting organisations, as well as the volume of material considered to be backlog or otherwise undepositable. In addition, the 2020 survey requested an estimate of the annual production of archives by subcontracting organisations, allowing us to gauge the space required for storage solutions into the future. This is the first time an archives survey has requested this information, so we cannot compare the data to previous reports, but it does provide a key number for us to model different options around. In total, 20 organisations responded, representing around 45% of contracting organisations in England.

The project has posited three possible scenarios which could meet the existing demand for space (Scenarios 1 to 3 below). The key information which underpins this section of the report includes the current backlog archive material held within subcontracting organisations, the amount of material accrued on an annual basis and the amount accrued annually which is undepositable (see Table 2). It is also clear that the storage challenge is more complicated than simply dealing with the existing backlog and the annual creation of new undepositable archives. Even when considering meeting only the existing demand for storage, wider questions of museum capacity and resources need to be taken into account.

The scenarios presented below incorporate two additional streams of material: the first, additional capacity to allow for the likelihood that some institutions currently collecting will reach capacity and stop receiving archaeological archives over the coming decade, and the second which considers that some museums may seek to deaccession existing collections into the new facility. Failure to manage either of these streams could seriously compromise and even defeat attempts to address the challenge of creating a truly sustainable option for archaeological archives, which responds to the full list of recommendations included in Section 2 above. The Archive Options presented in Section 5 therefore creates the capacity needed to support either or both additional streams of material.

Estimated archaeological archive holdings within contracting units in England	4,957 m ³
Estimated archaeological archive holdings within contracting units in England considered undepositable (23% of total archaeological archive)	1,140 m ³
Annual accrual of archaeological archives in England	492m ³
Annual accrual of undepositable archive material in England (23% of total archaeological archive)	113m ³

Table 2. Key data which supports the scenarios outlined below.

Please note: For the scenarios given below, figures are given in metres cubed (m³) to provide a standardised and comparable figure. Often numbers of boxes have been used in response to similar questions, but box sizes used are variable throughout the country and therefore not easily comparable. Translating m³ into m² (e.g. from storage volume to estimated floorspace) has been assessed on the

basis that 1.3m² of floor area provides 1m³ of storage. An extra 0.3m² was added to account for walkways and staff spaces but does not include specific public or research spaces.

3.4 Scenario 1: Storage for undepositable material.



Scenario 1 assumes that only the existing undepositable backlog of 1140m³ plus the annual accrual of undepositable material (e.g. 23% of the total) must be addressed. This means that the estimated volume required for a 30-year period is **4,535m³**. Table 3 shows the capacity requirements of this scenario from Years 1 – 30.

The model assumes that collecting museums and repositories will continue to develop and manage their facilities to maintain that function at the current level. However, the SMA surveys, OSAA workshops and likely impacts of the COVID pandemic indicate that this stability is unlikely, and it should be expected that more museums will cease collecting. It is important to recognise that museums have storage issues beyond that of the archaeological archive collection. In either case, limiting capacity to address current demand does not consider the likelihood that annual collecting capacity is likely to decrease and / or that some museums may seek to transfer existing collections of archaeological archives, either in part or in full.

Scenario 1	Year of Operation						
	1	5	10	15	20	25	30
Backlog (m ³)	1,140	1,140	1,140	1,140	1,140	1,140	1,140
Annual accrual undepositable (m ³)	113	566	1,132	1,697	2,263	2,829	3,395
TOTAL m³	1,253	1,706	2,272	2,837	3,403	3,969	4,535
Floor Area m ²	1,629	2,218	2,953	3,689	4,424	5,160	5,895

Table 3. Scenario 1: Current backlog, plus undepositable archives.

3.5 Scenario 2: Storage for undepositable material and increased number of museums stop collecting archives.



In this scenario, the impact of a reduction in capacity across England's collecting museums is included. Using SMA survey data, it is postulated that over the next six years around 50% of currently collecting bodies will cease collection of archaeological archives due to capacity issues. Hence the volume of undepositable archive material per annum increases as more repositories close their doors to new archaeological archives, if the current repository network does not invest to maintain current capacity.

The impact of this situation would mean that the capacity of the 30-year building detailed in Scenario 1 would be full in less than ten years. This is the result of an increase to the annual accrual of undepositable archive material from 23% of 1140m³ in Year 1 (113m³), to an estimated 90% of 1140m³ in Year 6 (443m³). Therefore, over a 30-year period, the facility required to support Scenario 2 rises in capacity to 17,499m³ in total, with an increased volume requirement of 12,964m³ resulting from

museums ceasing to collect archaeological archives. In this Scenario, 50% of existing museums and repositories do continue collecting over the 30-year period.

Scenario 2	Year of Operation						
	1	5	10	15	20	25	30
Backlog (m ³)	1,140	1,140	1,140	1,140	1,140	1,140	1,140
Annual accrual undepositable (m ³)	113	566	1,132	1,697	2,263	2,829	3,395
Closures accrual (m ³)	0	1,304	3,616	5,953	8,290	10,627	12,964
TOTAL m3	1,253	3,010	5,888	8,791	11,693	14,596	17,499
Floor Area m2	1,629	3,912	7,654	11,428	15,201	18,975	22,749

Table 4. Scenario 2: Current backlog, undepositable archives and estimated closures.

3.6 Scenario 3: Storage for undepositable material, reduced museums capacity and transfer of existing collections



Scenario 3 assumes that, with a new facility collecting archaeological archives, some museums may wish to transfer a portion of their collection from their existing stores. As such, Scenario 3 combines the needs expressed in Scenario 2, plus provision of additional capacity to support transfer of existing collections. Edwards (2012) estimated that museums held in excess of 37,800m³ of archaeological archive material in collections. If we postulate that 1% of the total museum collection (378m³) is transferred in each year, over 30 years this will account for an additional capacity need of 11,340m³ (see Table 5). In total, the volume required for Scenario 3 would be 28,839m³. As with Scenario 2, in this Scenario, 50% of existing museums and repositories do continue collecting over the 30-year period.

Scenario 3	Year of Operation						
	1	5	10	15	20	25	30
Backlog (m ³)	1,140	1,140	1,140	1,140	1,140	1,140	1,140
Annual accrual undepositable (m ³)	113	566	1,132	1,697	2,263	2,829	3,395
Closures accrual (m ³)	0	1,304	3,616	5,953	8,290	10,627	12,964
Transfers (m ³)	378	1,890	3,780	5,670	7,560	9,450	11,340
TOTAL m3	1,631	4,900	9,668	14,461	19,253	24,046	28,839
Floor Area m2	2,121	6,369	12,568	18,799	25,029	31,260	37,491

Table 5. Scenario 3: Current backlog, undepositable archives, estimated museum closures and archive transfers.

3.7 The case for off-site and/or outsourced storage

In any of the above scenarios, there is a degree of unpredictability resulting from changing circumstances, as well as the possible consequences of opening a new storage facility. One national repository included in the Case Study Review, strongly suggested that future proofing any form of storage facility or archive resource centre was dependent on having access to additional, off-site storage and ensuring that logistical provision supports this use. A blended approach to storage offers potential cost benefits, especially as any storage facility providing access to materials will require good public access, and accessible locations tend to be situated in areas with higher land costs. Off-site storage could provide additional capacity at a more remote location, which may be cheaper although would need logistical provision to ensure that access for research and education is included.

A further option is to use outsourced storage to provide additional off-site capacity. This is a ready-made solution, and is a model already practiced in the UK. Cambridgeshire County Council are known for using DeepStore in Cheshire (a series of PD5454 compliant storage vaults converted from rock salt workings) to provide additional capacity for storage of bulk materials in their collections and have reported no problems or concerns with doing so. It is known that this approach is also being considered by others. A key consideration of this model is cost, and the comparison of providing an outsourced option to one directly managed by the facility.

The Historic England Report by Tsang (2017) reviews comparative costs of outsourced vs in-house storage (on or off-site) and concluded that the in-house option was more cost effective; 'in-house' here is taken to mean storage operated by the museum, whether on site or offsite. The estimated cost of an in-house solution was £52.29 per m³ per annum. However, it is important to note that the report did not consider capital costs of stores and their subsequent depreciation and was based on the finances of a single in-house store. Desk based research identified two further cost estimates: Wessex Archaeology suggested a cost of £136m³ per annum and Wiltshire Museum £132 m³ (Appendix 1, Table 1).

For comparison, DeepStore in Cheshire were approached in 2018 by the Chair of AAF to provide an estimate for an exclusive use storage vault of sufficient size to be of national interest. The request was made to provide a comparator for the Archives Advisory Panel discussions of the Science Museum Group's Wroughton facility but is also relevant here. Like-for-like comparison is complicated as DeepStore quotes based on box sizes, but 5,600 m³ of space can be acquired for £25,000 per month, or £53 per m³ per annum.

Outsourced storage does have its challenges. Any facility would need to consider the budget required to resource costs of retrieval and deposition of archive materials. Collections which would be deposited in an off-site store would need to be prepared and catalogued to an extremely high standard, perhaps higher than expected for an in-house collection. Regarding the former, information provided by Cambridgeshire County Council Historic Environment Team suggests that travel costs associated with deposition and retrieval (e.g. from store to office) are a significant consideration, but can be managed by limiting journeys per annum. Assumptions on logistical costs such as transport costs can also be included within deposition fees. Other resourcing needs, such as cataloguing or indexing as part of the archive accessioning process, can also be estimated. For example, CCCHET indicated that a team of three can prepare 40-60 boxes per day to a level where the contents of each box were listed by context.

Off-site or outsourced storage is not necessarily any more expensive to run than in-house collections and offers additional advantages. Including some off-site storage as part of the capacity solution could be a sensible approach to a situation which, owing to the potentially changing situation for some museums, may prove complex to predict accurately. A solution which offers a degree of adaptability and will not incur the costs of changing accrual needs until space is needed, provides flexibility that a

total in-house facility solution cannot. In addition, out-sourcing would incur no capital costs and is effectively limitless in capacity. It is therefore highly recommended that this be considered as a means of ensure longevity in any identified solution.

4 Towards a National Collection of Archaeological Archives

4.1 Sustainability is more than storage

The previous section presents a series of scenarios designed to address the immediate issue of capacity and facilitate the deposition of archives which are currently stuck in process. This will have an immediate positive impact, relieving subcontracting archaeological organisations of undepositable material and making archives from hundreds of projects more accessible. We have aimed to demonstrate that a simple solution which only targets undepositable material is, however, not attractive. Within a few years, any facility designed to relieve one challenge will be overwhelmed, and we estimate that organisational change across the museum sector may mean that an initial solution intended to be available for 30 years (Scenario 1), will be at capacity within 5 years (Scenario 3). A case is made to embed the use of outsourced storage from the outset, ensuring that there is the operational provision required to access additional capacity when needed. This allows flexibility without the need to create and resource spaces which may or may not be required. A blended approach to capacity provision is therefore recommended by the OSAA project team.

As outlined in Section 1 and discussed in Section 5, the work undertaken in this project has tried to look beyond storage and capacity and to identify how the sector might address issues of perception, barriers to use and questions of value. Beyond storage, much of the discussion had during consultation workshops as well as with our case studies has underlined the need to approach the archaeological archives issue from a more ambitious and complete perspective. Space alone will not address other challenges which have been identified, workshops emphasised that use of archives is influenced by awareness of their existence, content, and accessibility. The project team has broadened the meaning of 'sustainability' with regards to this project and in response to feedback from users and stakeholders. This definition, presented in Section 1 and repeated here, provides an outline of what is considered to be a sustainable archives solution:

A national, sustainable archaeological archive which guarantees public benefit through being discoverable and accessible, facilitating new stories of our shared past through the continuing use and reuse of resources created by archaeological processes, equally accessible to researchers, educators, curators and the public and providing a seamless interface between data, archive materials, organisations and communities.

4.2 Proposal for a National Collection

Consultation provided an opportunity to explore perceptions about archaeological archives from different perspectives, including archive creators, curators and users. Our user needs workshops

reached over 70 individual practitioners and the stakeholder workshop included 20 representatives from 12 organisations including ALGAO, CBA, ClfA, EAC, EH, FAME, HS2, NHSF, NT, SMG and SMA. The results provided several common observations summarised in Section 2.3 and discussed in more depth in Appendices 4 and 5.

The message from the workshops was consistent with the results of desk-based assessment: to address sustainability, we need to look beyond the boxes. In addition to some archives being undepositable, a common complaint from contracting organisations which work across multiple collection areas is the need to adhere to a wide range of standards, which increases costs and inefficiencies. Once deposited, professionals from all sectors indicated that lack of knowledge of the location and contents of archives decreased accessibility and, within museums, that limited resources and lack of specialist knowledge proved to be a considerable barrier for re-use. Connectivity within the heritage sector was also seen as an issue, and there was general support for collaborative working approaches, dialogue between sectors and the development of a network which provided advice.

In this report we have provided a clear definition of sustainability (see Section 2.3 and above) which meets the needs of the whole sector, identifying the **National Collection of Archaeological Archives (NCAA)** as a solution which is able to provide capacity and access, underpin standards and promote use. The NCAA will address common flaws in the archiving process, namely varying standards of preparation and cataloguing, discoverability and access, funding and (of course) box sizes. Existing museums and repositories who are able and keen to continue collecting archaeological collections, would be affiliated to the NCAA network and continue to collect archaeological archives in line with the agreed standards, guidance and processes. They would need to demonstrate consistency in standards across cataloguing, storage and provision of access to archaeological archives. The implications of this are discussed in Section 5.

The four key components of the NCAA include:

1. A single online catalogue – the NCAA Datastore.
2. A single set of standards for preparation, deposition, curation and access (c.f. ClfA Standards for Archaeological Archives, Museum Accreditation).
3. A Collections Policy which links the NCAA to national and regional research frameworks, and to the ClfA Selection Toolkit.
4. NCAA Team, including facility staff and a network of regional archives advisers (c.f. Historic England Regional Science Advisers) to support the NCAA and build connections/relationships between archive creators, curators and users.

These key components are described in more detail below. The combined elements of the NCAA are included in the Archives Options outlined in Section 5, providing a model which achieves the vision of a fully sustainable archaeological archive as defined by this project. The extent to which the NCAA operations are embedded, and the degree to which each Option responds to the Scenarios presented above (Section 3), provide the building blocks for the Archive Options presented. The following section provides some additional information about the NCAA elements.

4.3 NCAA Datastore (Component 1)

Robust feedback from the user needs and stakeholder workshops suggested that a single online catalogue was a fundamental part of improving accessibility and discoverability of archaeological archives, seeking to increase connectivity within the heritage sector. The NCAA Datastore infrastructure discussed here would require some reappraisal depending on which Archive Options

presented in Section 5 were progressed. However, the general support for such an overarching, technical solution could not be underestimated.

Building on the recent redevelopment of the [OASIS](#) project at the ADS, as part of the Historic England [HIAS](#) programme, a key element of NCAA would be publication of a single, searchable, datastore online that can support 'Linked Data' from existing catalogues, multiple proprietary software platforms, OASIS and also store newly created data as a result of new accessions.

Further work to develop a proof of concept and strategy for the NCAA Datastore was beyond the scope of this project but would be required as part of the NCAA infrastructure. A full scoping exercise would need to explore what data structure would be feasible and realistically achieved whilst delivering the most economic and sustainable connectivity. Potential for linkage with other datastores, such as the Heritage Gateway, should also be explored.

A single database would be neither efficient nor sustainable to develop given the technological developments of the last decade. The NCAA Datastore would create a digital infrastructure that allows for data flow between existing regional museums and repositories, and stores newly created information side by side, that can be interrogated simultaneously.

Whilst OASIS V stands to be a powerful information-gathering tool and integral to the creation of metadata about new archive depositions, much of the data that already exists in Museum and repository systems would form the baseline of information about archives that have already been deposited.

Structure of the NCAA Datastore

The datastore would be an entirely scalable solution to the challenge of joining up existing information rather than creating an entirely new source, working together with NCAA affiliated organisations, NCAA facility staff and NCAA Advisors. Dedicated to FAIR principles and utilising existing research undertaken as part of HIAS and other programmes, the NCAA would need to establish a cross-sector agreed format for the 'structured data' the NCAA Datastore would use, building upon and employing the standardised terms and vocabularies already in use.

A subset of data from existing catalogues managed by NCAA affiliated organisations would be made available in a structured format, in non-proprietary structured formats, such as .csv (comma-separated values).

Structured data is highly organised and can be searched and manipulated relatively quickly. Providing information in this agreed format would be a pre-requisite for museums and repositories wishing to become an NCAA affiliated organisation.

New accession data created directly by the NCAA staff or NCAA affiliated organisations would be stored in the datastore, alongside the existing data, ensuring consistency of search terminology and full discoverability.

The NCAA Datastore would not require as many units of information as is required to fully catalogue and curate an archive and it would not be the intention to fully replace the existing software platforms and custom, detailed MS Access databases used by museums and repositories around the UK, but rather to act as the starting point or signpost the researcher towards the appropriate curating organisation.

Datastore staff would support data creators both using the OASIS V project to supply data but also work towards creating strong links between existing museum software platforms and staff within the NCAA affiliated organisations.

It is envisaged that the NCAAD would be able to receive information directly from OASIS V for the interventions recorded there.

Potential users of the NCAAD

The end user would be able to retrieve basic information about archive's locations, drawn from the metadata captured as part of the accessioning process, regardless of where they are stored or which NCAA store or affiliated organisation they are curated by. This would allow for inter-regional searching where putting the same request to multiple organisations would be excessively onerous.

Basic metadata about an archive would be captured primarily by the organisations preparing the archive for deposition and the rest by the receiving organisation. This could include but not be limited to the site specific data (including local HER and OASIS references where applicable), the current location, accession references and contacts of the receiving organisation, the materials and objects included within the individual archive and persistent links to any published research incorporating those archives.

It is important to note that the proposals for the NCAA Datastore do not as yet suggest that this data should be Open Data but that this could be seen as an aspirational development. Key concepts and definitions which underpin this recommendation include:

- Datastore <https://www.techopedia.com/definition/23343/datastore>
A data store is a repository for persistently storing and managing collections of data which can include databases, but also simpler store types such as spreadsheets and word documents.
- Linked Data <https://www.w3.org/standards/semanticweb/data>
Linked Data is structured data which is interlinked with other data so it becomes more useful through semantic queries.
- Structured data
Structured data is highly organised and can be searched and manipulated relatively quickly.
- Open Data <https://opendatahandbook.org/guide/en/what-is-open-data/>
Open data is data that can be freely used, re-used and redistributed by anyone - subject only, at most, to the requirement to attribute and share alike.
- FAIR data principles <https://www.go-fair.org/how-to-go-fair/>
Findability, Accessibility, Interoperability, and Reuse of digital assets.

4.4 NCAA Standards and Collection Policy (Components 2 and 3)

To support the NCAA Datastore (Component 1), standardised systems on archive preparation, deposition, curation and access will be needed. Adherence to NCAA standard (Component 2) would be required of both archive producers and archive curators affiliated with the NCAA.

It was highlighted throughout the OSAA project, that the specifics of how materials are stored, how bags and boxes are labelled, and how the archive metadata is presented, can either support or hinder archive access and re-use. Further work to develop a national standard on archaeological archiving was beyond the scope of this project but would be required as part of the NCAA infrastructure. It is suggested that national standards on compilation and recording should include; the order in which archives are sorted and organised, the terminology used for finds and sub-types, how significant finds are identified in the archive, and standardisation of archive contents recording, e.g. archive metadata and contents database.

The NCAA standards on archive preparation should link to existing industry standards and guidelines such as the ClfA Toolkit for Selecting Archaeological Archives (ClfA 2019) and the ClfA Toolkit for Specialist Reporting (ClfA 2020). NCAA standards should detail the process of deposition, curation conditions (including box sizes) and accessibility requirements for the physical archive and the archive metadata. Any project scoping the requirements for national standards on archive preparation, deposition, curation and access should consult with key stakeholders, including ALGAO, ClfA, EH, FAME, HE, and SMA.

Any museum or archaeological archive storage provider wishing to continue collecting archaeological archives as part of the NCAA would need to adhere to the standards on archive preparation, deposition, curation and access stipulated by the NCAA. In order to identify museums or institutions as members of the NCAA scheme, some form of NCAA accreditation would be required. The OSAA team are aware that Arts Council England (ACE) provides the Museum Accreditation scheme for museums across the UK (<https://www.artscouncil.org.uk/accreditation-scheme/about-accreditation#section-1>). The NCAA accreditation for archaeological archives could sit alongside this accreditation but could also provide an option for repositories that are not eligible to the ACE Museum Accreditation scheme such as archaeological sites, privately owned museums, record centres and archives which hold archaeological collections. The implementation of a NCAA accreditation scheme was beyond the remit of this project and will require further scoping.

The creation of a National Collection of Archaeological Achieves will require a Collections Policy (Component 3). The OSAA team does not propose to define what should be retained from the archaeological record for inclusion in the NCAA, but that existing archaeological frameworks such as national and regional research agendas are embedded into working practices, and industry standards and guidance such as the ClfA selection Toolkit (ClfA 2019) are applied to establish the significance of all archaeological projects in order to support future research, outreach, engagement, display and learning activities.

Alongside the creation of a digital infrastructure for the NCAA, the development of standards and a unifying collections policy will help embed processes and attitudes to archives across the archaeological project.

4.5 NCAA Team (Component 4)

Any proposal to improve provision for storage will also need to provide investment in the NCAA (e.g. staff) to raise the profile of archaeological archives and increase access and use, otherwise it will be impossible to justify the spend. The Archives Options (Section 5) are supported by two main groups of roles which underpin the NCAA; Facility Staff, the team needed to support the NCAA Datastore, and NCAA Advisors, an expert advisory network to monitor provision and support accessibility.

Indicative costs for the roles and estimated staffing needs for the NCAA are included below (Table 6). It should be borne in mind that scoping for the digital infrastructure (NCAA Datastore) will need to

take place before the full cost of implementation could be realised. In addition, these costs do not include the initial setup costs required to ingest existing stored archives into the NCAA but do give an idea of the annual running costs linked to different operating models.

To estimate the annual operating expenses required, the OSAA project has applied a standard operating overhead against staff, using the local government practice of corporate overhead deduced from an amount per hour calculated annually and added to staff costs for externally funded projects. The sum is intended to cover the costs of office space, systems (IT, payroll etc), back-office staff (e.g., Human Resources) and indirect line management. Its use is intended to check that a public sector project is fully funded and is therefore a useful tool for these calculations.

The potential NCAA staff roles are listed in Table 6 and shown with Spinal Points used for National Joint Committee pay negotiations with grades used based on known comparable job vacancies and predictions (see Table 7 for full list). From here, the building blocks of staff resourcing can be developed.

NCAA Role	No Staff	Salary, plus oncosts	Overheads	Total
Logistics	1	£44,517.00	£25,589.20	£70,106.20
Senior Datastore Manager	1	£48,106.00	£25,589.20	£73,695.20
Datastore Manager	1	£44,517.00	£25,589.20	£70,106.20
Regional Adviser	9	£44,517.00	£25,589.20	£630,955.80
Admin Support	1	£30,769.00	£25,589.20	£56,358.20
Total annual cost				£901,221.60

Table 6. NCAA staffing costs.

Role	SCP	Pay/Oncosts	Overhead
Manager	43	£ 62,170	£ 25,589
Senior Collection Manager	33	£ 48,106	£ 25,589
Collection Manager	30	£ 44,517	£ 25,589
Senior Conservator	30	£ 44,517	£ 25,589
Conservator	25	£ 38,496	£ 25,589
Senior Logistics	33	£ 48,106	£ 25,589
Logistics	30	£ 44,517	£ 25,589
Senior Datastore Manager	33	£ 48,106	£ 25,589
Datastore Manager	30	£ 44,517	£ 25,589
Regional Adviser	30	£ 44,517	£ 25,589
Outreach	25	£ 44,517	£ 25,589
Admin	15	£ 30,769	£ 25,589

Table 7. Staffing roles shown against Spinal Point, salary costs and overheads used in Archives Options cost calculations.

4.6 Capital costs – building storage capacity

The OSAA surveys and case study reviews asked for examples of capital projects, but unfortunately few were forthcoming. There are a range of figures published as part of a review of construction costs undertaken in 2019 (Xavier-Rowe 2020), which serve to demonstrate the wide variability between

different sites (see table 3, *ibid.*). However, providing suitable environmentally controlled storage will be expensive and it is important to note the demands of adequate provision. To provide some background to the guide costs used for the creation of new storage capacity, we have summarised below the examples included in the case studies. There have been a couple of examples of buildings being purchased, in each case these are 'standard' industrial estate warehouse units that require to be retrofitted to create suitable storage environments.

As the figures in the Xavier-Rowe paper and those included from our Case Studies demonstrate, there is a large variability in the costs presented from different construction and refitting projects. This is due to the vastly different circumstances of each construction project, and the methods used to model the numbers by each of the project teams. For the costs associated with the Options presented below (Section 5), we have used Chester Farm, Cambridgeshire Record Office and Wroughton as a guide for construction.

Depending on the size of the project, we have estimated that a basic construction cost would vary from £2,000 per m² to £2,500 per m². To define the cost further and provide an accurate estimate, a decision would need to be made on which Scenarios should be met and on the Option model of choice. A Quantity Surveyor would then be able to provide more specific guidance and further figures.

The costs included in this report provide an indicator using a consistent baseline construction cost, but which are likely to vary considerably because of the specific circumstances of the Capital Build project.

Case study examples

Northamptonshire County Council - Chester Farm

Chester Farm is a £12.7m project to create a heritage centre of which £1.3 – 1.5m is allocated to the storage of archives, providing 600m² of space. This gives the figure of £2,500 per m² for a smaller facility. However, this involved construction inside an existing listed barn so may not be a true reflection of construction costs and the centre makes use of other public facilities on site.

Science Museum Group - Wroughton

Wroughton is an entire new construction that will provide 33,000 m² of storage. The main building has a Gross Internal Area (GIA) of 26,394 m² with a mezzanine of 9,274m². This breaks down as follows:

Use	Space	Footprint
Stores	Object Store	23,790 sq m
	Collections Study	230 sq m
	Conservation Workshop	500 sq m
	Photography Studio	170 sq m
	Conservation Freezer	117 sq m
	Conservation Laboratory	207 sq m
	Conditioned Store	On mezzanine
	Special Collections Store	170 sq m
Services & Welfare	Staff Welfare	73 sq m
	Entrance Lobby	56 sq m
	Toilets	30 sq m
Logistics	Inward Transit	200 sq m
	Loading Bay	290 sq m
	Transit Storage	260 sq m

	Outward Transit	120 sq m
Total	Mezzanine	9,274 sq m
	Building GIA	26,394 sq m

Cambridgeshire County Council's Records Office

Another comparator (not assessed by OSAA but known to the project) is the relocation of Cambridgeshire County Council's Records Office. This project entailed taking the lease on a suitable structure - in this case a bowling alley/soft play area – and converting it into records office covering 1,750m², 1000m² of which is PD5454 storage. The remainder comprises offices, workrooms, a search room and comfort facilities. The cost of this conversion was £5.18m, or £2,960 per m². A breakdown between storage and office space conversion costs is not possible, although Cambridgeshire HET experience in their own business modelling showed that PD5454 storage was comparable in cost per m² to office space. In this case the nature and location of the building did impact on the costs. However, the committee papers for this project do indicate that the conversion was significantly cheaper than the new build option, with the latter scoped at c.£12m.

Comparing SMG Wroughton with CCC Records Office shows the benefits of scale. Of the total GIA of Wroughton, only 2253 m² (or 6.3%) is not used for storage. At the Records office, the comparator is 43%.

Ballymena (Northern Ireland).

The Historic Environment Division purchased a suitable building for conversion at a cost of £200,000. The conversion of the existing facility is estimated to be around £200,000 and will cover an area of 440 m², providing a small environmentally controlled store room within a larger facility including racking and heating. On that basis, the cost per m² will be £909, although the final budget is not yet known. The store at Ballymena is planned as a ten-year holding space to facilitate reorganisation, with ambition to have a comprehensive repository in place once that period is completed.

Amesbury Store (Wiltshire).

It has been reported that the building was purchased for £125,000 and requires £54,000 of spend. However, it is noted that this includes minimal environmental control equipment as the assumption is that the majority of archive is made up of bulk finds and therefore inert. A controlled space will be created for metalwork. The intended capacity is not large – approximately 3,500 boxes.

Secret Collection (Renfrewshire).

The refurbishment project transformed an out-of-use Littlewoods basement to a 2,100m² storage facility housing the collections of Renfrewshire Council Arts and Museums service. Delivered for £2.58 million, including racking fit out, the site is located strategically on Paisley High Street, providing easy access and contributing to the revitalisation of the town centre. Key stats:

- Main renovation works costs (Project Management and Construction) - £2,233,000.
- Storage racking costs (Rackline) - £345,000.
- Capacity 2,100m².
- Cost per m² - £1230.

5 Archaeological Archives Options

Three options are presented below which offer solutions to the Scenarios presented in Section 3 and summarised in Table 8, and address the broader issues identified through desk-based research and consultation. Each Archive Option is summarised below and includes a description of the proposed option, the pros and cons, and associated costs. The components of each option were discussed during the stakeholder consultation workshops and, perhaps unsurprisingly, those present that already practiced one of the options were the most supportive of that option as a permanent solution.

Scenario 1		Deposition of current backlog Annual accrual of undepositable archives
Scenario 2		Deposition of current backlog Annual accrual of undepositable archives Accrual increase due to closures
Scenario 3		Deposition of current backlog Annual accrual of undepositable archives Accrual increase due to closures Transfer of existing collections to NCAA

Table 8. Summary of Scenarios presented in Section 3.

5.1 Option 1 - Increase capacity within the existing network

Headlines

- Expand the existing network of repositories through building or providing additional floor space.
- Contracting organisations would be required to meet the deposition standards of the NCAA.
- Collecting museums and repositories would be affiliated with the NCAA and would meet standards for archive management, curation and access.
- Costs would involve expansion of existing network, building storage capacity and developing resources (people and infrastructure) to facilitate participation in the NCAA.
- Capacity Building Grants would need to be provided to existing archaeological holdings to bring storage provision in line with NCAA standards (cataloguing, re-boxing, new shelving etc.).
- Aside from the NCAA steam costs, staffing and overhead costs are unknown.

Scenarios addressed

- Option 1 would address Scenario 2, requiring a capacity of 17,499m³, with longer term sustainability supported using DeepStore.
- Scenario 3 would not apply as capacity issues leading to potential transfers would be addressed within the repositories.

Pros and cons

Pros	Cons
→ Builds on existing network so least culture change. → Addresses capacity within existing museums network. → Potentially, lowest costs once up and running → Additional/overflow storage could be provided by offsite (DeepStore or similar)	→ Maintains the weakness of the current system in that all collections are dispersed. → Least likely to address endemic problems in the current process as will be maintaining the status quo. → Operating the NCAA as a network would be significantly more complex and consistency of cataloguing would be more challenging. → Achieving and monitoring consistency of NCAA standards across repositories would also be challenging. → Would require substantial and unknown investment in existing collections network, potentially the most expensive capital build solution. → Could be used as a revenue stream by institutions who would otherwise be uninterested by archaeological archives

Outsourced storage

A variation on this option would be to reduce the capital build required for a sustainable capacity solution by providing back up remote storage, such as that offered by DeepStore. This would allow increased remote storage of some larger archives, or specific classes of less accessed, bulk material such as ceramic building material (CBM) or animal bone. The outsourced model also allows for exceptionally large archives including those from NSIPs such as HS2 to be created and stored as single archives rather than be created piecemeal to several differing standards and dispersed.

There would be a significant challenge of running/financing such a facility if ultimate ownership/responsibility rested with several different institutions.

Staffing

Sustainable archiving relies on more than storage capacity; it also relies on access, awareness and expertise. Whilst the NCAA, if adopted, can accommodate some of this, it is likely that the influence and value of the NCAA will be the least effective under this option, as there would be simply too many participants to support. Within the local museums and repositories, it is impossible to assess needs and therefore costs, as this option devolves the operation of archives to local levels thus to local decision making.

An additional requirement of this option might be to increase the specialist expertise available within the network by recreating archaeological curator posts, potentially by the method of 'pump priming'. There are precedents for this approach where English Heritage (now Historic England) assisted with the establishment of Development Control Officers and Countryside Advisers within local authority archaeological services.

Understanding the scale of this is difficult, although extrapolating from earlier surveys can assist. Previous attempts to understand the staffing capacity within repositories have identified the following:

	% with expertise	FTE
Edwards 2012	54	Unknown
SMA 2016	49.5	166.3
SMA 2017	45.5	142.7
SMA 2018 (smaller sample)	48	88

Even considering the difficulties of comparing data from these surveys, this does represent a reasonably consistent average of 50% of repositories having suitable expertise with approximately 150 FTE staff. However, it does demonstrate the potential scale of reinstating suitable resource across repositories. The SMA survey also identified that since 2010, 29.2% of repositories have a reduction in staff resources.

Capacity

Option 1 assumes that sufficient capacity is introduced into the existing network of locally based repositories. On the deposition scenarios outlined above (Section 3), it is considered that Scenario 2, where capacity for ALL new archives' depositions will need to be found (17,499m³).

In addition to capital costs required for storage to cover Scenario 2, a limited time grant to cover the costs of Capital Build Funding should be considered. This could be administered by an appropriate body (NLHF) and made available to existing museums wishing to operate within the NCAA network, but which may require development of infrastructure to meet NCAA requirements (digital, skills or structural). The variables in this scenario are too diverse to model, but in theory would result in the most expensive capital build solution as no economy of scale in construction would result.

It has been shown how use of supplementary outsourced storage (e.g. DeepStore) can increase sustainability by providing extra storage capacity with no capital cost, although with extra operational costs. However, to do so effectively would require robust centralisation of the resource, and such an option is unlikely to be deliverable under this model. This Option effectively ties the long-term sustainability of archiving into a network of locally run bricks and mortar solutions.

If a blended option using outsourcing is pursued, then based on the 2018 DeepStore costs of £300,000 per annum, would provide extra capacity of 5,600m³. Doubling this to 11,200m³ (e.g. two units) is also shown in the cost modelling below, increasing the cost of outsourced storage to £600,000 per annum. However not all this additional capacity, and revenue spend, would be required at the outset.

Option 1 - Summary and costs

Scenarios addressed: Scenario 2	☒	Backlog archives	
	☒	Annual undepositable accrual	
	☒	Museums closures accrual	
	☒	Transferrals	
Capital Build costs	Capacity Area m2	17,499m3 22,749m2	£56,871,750

	Cost per m2	£2,500	
Annual Expenditure	Storage facility staff costs		?
	Overhead costs		?
	NCAA Staff costs		£901,219
	TOTAL		?
Impact of outsourced storage			
Outsourced storage x 1	Reduced Capital Build cost		£29,747,500
	Annual Expenditure plus DeepStore		?
Outsourced storage x 2	Reduced Capital Build cost		£15,747,500
	Annual DeepStore cost		?

5.2 Option 2 – Distributed Hub and Spoke Model

Headlines

- Provision of a distributed hub solution by creating a network of nine new stores (Option 2A) OR extending an existing regional storage network of four (Option 2B).
- Both options comprise creation of distributed Archaeological Archive Hubs across England providing storage capacity and access to research spaces for users to come and access the collections.
- Collecting museums and repositories (the spokes) would be encouraged to continue collecting archaeological archives and sign up to be part of the NCAA, via several Hub Stores (the hubs). The affiliation with the NCAA would provide support and advice via the Archives Advisors around standards for archive management, curation and access.
- Contracting organisations would be required to meet the deposition standards of the NCAA.
- Use of outsourced storage (e.g. DeepStore) offers a blended approach to both Option 2A and 2B with savings against Capital Build requirements.
- Staffing would differ substantially between the two models in this option;
 - Both options would include NCAA team costs
 - Option 2A would require a network of new facilities requiring support from 64 staff
 - Option 2B uses an expanded existing network, so requires less staff and is expected to require 24 staff

Scenarios addressed

- Option 2A and 2B would both address Scenario 2, requiring a capacity of 17,499m³, with longer term sustainability supported using DeepStore.
- Scenario 3 is less likely to apply here as it is felt that locally based museums will be less inclined to transfer existing collections to another region – this Option lacks the balance a National Store offers.

Pros and cons – Option 2A New Distributed Hubs

Pros	Cons
→ Maintenance of the regional connection and local archive link → Creates hubs of excellence for archiving that balances the local connection against the efficiencies of scale. → The hub and spoke model supports a connected network of expertise, storage, research space. → Potential to include other organisations as hub 'Hosts', in variable roles	→ Expensive as it duplicates both capital build and staffing needs across sites if starting anew. → Overall management may be complicated

Pros and cons – Option 2B Expansion of existing hub network

Pros	Cons
→ Maintenance of the regional connection and local archive link → Creates hubs of excellence for archiving that balances the local connection against the efficiencies of scale. → The hub and spoke model supports a connected network of expertise, storage, research space. → Incorporates existing expertise and facilities → Potential to include other organisations as hub 'Hosts', in variable roles	→ Finding the right network which is happy to host the NCAA → Location - if adding into an existing regional network (e.g. English Heritage), would need to assess if existing store locations in the optimum location for users → Overall management may be complicated

Option 2A – New Hub stores, capital costs and staffing

Costs

The capital cost is based on the estimate of the total capacity required across England but distributed across nine sites. It does not take into account regional variation in those costs.

The accessioning figures for Scenario 2 will apply here, as there would be little appetite by museums to seek to transfer their existing archive holdings. This is because a 'National Collection' is a balance between a location and a branding. For local and regional solutions, the branding is more likely to be pre-eminent and the option of multiple locations is considered less appealing than a single 'National Collection' facility.

Capacity required for Scenario 2 is 17,499m³. Due to the number of facilities included, the costs of capital build remain at the higher end of the bracket, estimated at £2,400 per m².

Outsourcing assumes DeepStore costs of £300,000 per annum, for provision of 5,600m³. Doubling capacity to 11,200m³ is also shown in the cost modelling below, increasing the cost of outsourced storage to £600,000 per annum.

Staffing

As an entirely new network of archive storage facilities will be constructed, each one will need to be staffed with the following roles, equalling up to seven FTE per hub location:

Role	Roles	Pay/Oncosts	Total Salary	O/H
Manager	9	£62,170.00	£559,530.00	£230,302.80
Curator	9	£44,517.00	£400,653.00	£230,302.80
Conservator	9	£38,496.00	£346,464.00	£230,302.80
Logistics	9	£44,517.00	£400,653.00	£230,302.80
Database	9	£44,517.00	£400,653.00	£230,302.80
Admin Support	9	£30,769.00	£276,921.00	£230,302.80
Outreach Officer	9	£44,517.00	£400,653.00	£230,302.80
TOTAL	63		£2,785,527.00	£1,612,119.60

Option 2A - Summary and costs

Scenarios addressed: Scenario 2	☒ Backlog archives		
	☒ Annual undepositable accrual		
	☒ Museums closures accrual		
	☒ Transferrals		
OPTION 2A – New hubs			
Capital Build costs	Capacity Area m2 Cost per m2	17,499m3 22,749m2 £2,400	£50,397,120
Annual Expenditure	Facility Staff costs		£2,785,527
	Overhead costs		£1,612,107
	NCAA Staff costs		£901,219
	TOTAL		£5,298,853
Impact of outsourced storage			
Outsourced storage x 1	Reduced Capital Build cost		£28,557,600
	Annual Expenditure plus DeepStore		£5,598,853
Outsourced storage x 2	Reduced Capital Build cost		£12,598,000
	Annual Expenditure plus DeepStore		£5,898,853

Option 2B – Expansion of existing Hub store network, capital costs and staffing

Capital costs

One solution which has been suggested during Stakeholder Workshops is the use of an existing regional network, such as that operated by English Heritage Trust on behalf of the Historic Buildings and Monuments Commission and expand the role of the charity to include the operation of the NCAA as well as the national collection of buildings and monuments. This Option therefore allows integration with an existing national collection.

It provides an existing model for delivery, as English Heritage already manage and curate the 400+ historic sites and buildings owned by the government, and provides a receiving body for transfer of title, an important consideration. English Heritage currently operates across four hub sites which, in geographic terms, cover Eastern/Midlands, North, South West and South East respectively:

- Wrest Park, Bedfordshire
- Helmsley Castle, North Yorkshire
- Temple Cloud, Somerset
- Dover, Kent

Expanding the network offers a sensible solution with regards to both costs and staffing, as the existing infrastructure is already present, as are the skills and personnel. For example, each site already has a collections manager. In addition, English Heritage are familiar with the logistics of bringing together archives from multiple sites from their experiences creating their own archaeological stores such as the one at Wrest Park, that saw the contents of five others stores combined in one location (Amber Xavier-Rowe 2014).

As well as adding a foci to the NCAA brand, the model could support the ongoing work by English Heritage to improve their collections, although would need a change to their Collections Development Policy. However, it would bring an additional burden with the need to adopt the English Heritage backlog and any other collections issues.

There is not an equal division of annual accrual across these four EH sites, as it is understood that the regions known for the busiest levels of archaeological fieldwork are Eastern, London and South East. Whilst this division is difficult to quantify with certainty, an estimated breakdown based on ALGAO survey data showing the number of projects per annum would give:

- | | |
|--|-----|
| • Wrest Park (East of England, East Midlands) | 40% |
| • Helmsley (North East, North West, Yorkshire) | 12% |
| • Bristol (South West, West Midlands) | 23% |
| • Dover (London, South East) | 25% |

This is important as economies of scale can be applied to larger facilities, whereas smaller sites may be more expensive per m² than larger ones.

As with Option 2A, the accessioning capacity would need to cover Scenario 2 (17,499m³), although the reduced number of facilities means the costs of capital build can be lowered, estimated at £2,300 per m².

Outsourcing assumes DeepStore costs of £300,000 per annum, for provision of 5,600m³. Doubling capacity to 11,200m³ is also shown in the cost modelling below, increasing the cost of outsourced storage to £600,000 per annum.

Staffing

Should the option of enhancing an existing network (such as English Heritage stores) be used, it is likely that existing roles could be adapted, or part-time posts increased. Oversight from a managerial role would not be required and a reduction in the number of sites would mean that even where 6 FTE staff were needed per location, the overall staffing need would drop to 24 in total.

Role	Roles	Pay/Oncosts	Salary total	Sub	O/H
Curator	4	£44,517.00	£178,068.00		£102,356.80

Conservator	4	£38,496.00	£153,984.00	£102,356.80
Logistics	4	£44,517.00	£178,068.00	£102,356.80
Datastore Manager	4	£44,517.00	£178,068.00	£102,356.80
Admin Support	4	£30,769.00	£123,076.00	£102,356.80
Outreach Officer	4	£44,517.00	£178,068.00	£102,356.80
TOTAL	24		£989,332.00	£614,140.80

Option 2B - Summary and costs

Scenarios addressed: Scenario 2	☒ Backlog archives		
	☒ Annual undepositable accrual		
	☒ Museums closures accrual		
	☒ Transferrals		
OPTION 2B – Existing hub network			
Capital Build costs	Capacity	17,499m3	£48,297,240
	Area m2	22,749m2	
	Cost per m2	£2,300	
Annual Expenditure	Facility Staff costs		£989,332
	Overhead costs		£614,136
	NCAA Staff costs		£901,219
	TOTAL		£2,504,687
Impact of outsourced storage			
Outsourced storage x 1	Reduced Capital Build cost		£27,367,700
	Annual Expenditure plus DeepStore		£2,804,687
Outsourced storage x 2	Reduced Capital Build cost		£14,487,700
	Annual Expenditure plus DeepStore		£3,104,687

5.3 Option 3 – A single national solution

Headlines

- Develop a single national solution – a centre for archaeological archives.
- Creation of a single large storage facility that acts as the hub of the NCAA and accepts archaeological archives from across England.
- Given the ambition of the Science Museum Group to create a National Collections Centre at Wroughton (Swindon), co-location with this would be sensible, and the site offers a range of options from rental of a new store to upgrading existing hangar facilities (one example outlined below).
- Collecting museums and repositories (the spokes) would be encouraged to continue collecting archaeological archives and sign up to be part of the NCAA. The affiliation with the NCAA National Store (the hub) would provide support and advice via the Archives Advisors around standards for archive management, curation and access.
- Contracting organisations would be required to meet the deposition standards of the NCAA.

- Use of outsourced storage (e.g. DeepStore) offers a blended approach, offering savings against Capital Build requirements.
- Staffing would need to support the operations of a single, large facility, and is estimated to require 14 members of FTE staff.
- Option 3B illustrates how this option might work if modelled using possible solutions offered by the Science Museum Group at the National Collections Centre, Wroughton.

Scenarios addressed

- Offering a National Store facility may prove to be an attractive option for existing museums who wish to transfer some of their existing collections into the central NCAA store.
- This option would therefore need to address Scenario 3 and require an accessioning capacity of 28,839m³, with longer term sustainability supported using DeepStore.

Pros and cons

Pros	Cons
→ One location; everything on site and accessible	→ A single location may lose local emphasis and local support
→ More efficient use of staffing	→ Location may not suit that many users.
→ Easier to adopt, monitor and enforce archiving standards	→ High capital build costs
→ If co-located at the National Collections Centre it allows the facility to have higher profile and shared services	→ Potentially high-risk solution
→ It has been demonstrated that a national facility can be effective (e.g. Swords, NMI)	
→ Evidence suggests that availability is less important than location for users	
→ Centralisation allows a greater interest in research and standards supporting the wider agenda of conservation and collections management	

Capital requirements

This option represents the highest profile by creating a single national collections centre that accessions archaeological archives from across England. Such a facility would need to be located within good transport links and would benefit from co-location with the Science Museum Group at Wroughton (Swindon) as it would complement the longer-term ambition for that site, even though capital costs for a site on the M4 corridor are likely higher than for, say, the north of England.

The facility would contain general and specialist storage, plus space for researchers and conservators. It could also present the basis for a research facility into wider archaeological collections care and conservation. This encourages partnerships and innovation to be built around the facility.

It is also considered that this option would attract retrospective depositions from museums of their existing archives holdings, as transferring those to a national collections centre is more likely to appeal to senior curators and trustees (e.g. Scenario 3). This creates an extra dynamic (and resource challenge) of managing these accessions and preparing the same to NCAA standards.

This option would therefore need to address Scenario 3 and require an accessioning capacity of 28,839m³, with longer term sustainability supported using DeepStore. The single store option reduces the costs of capital build, estimated at £2,000 per m².

Outsourcing assumes DeepStore costs of £300,000 per annum, for provision of 5,600m³. Doubling capacity to 11,200m³ is also shown in the cost modelling below, increasing the cost of outsourced storage to £600,000 per annum.

Single hub plus many spokes

Collecting museums and repositories would still be encouraged to continue collecting archaeological archives (the spokes) and sign up to be part of the NCAA (the hub). The affiliation with the NCAA National Store would provide support and advice around standards for archive management, curation and access.

Success would be heavily dependent on the NCAA brand, and the use of a network of regional archaeological advisers. However, it is the easiest way to introduce and enforce centralised standards of cataloguing and archive deposition, and to create the best access for researchers and users – throughout OSAA this user group have consistently said that travelling to access is not an issue provided the archives are available.

Staffing

The single facility would need to be supported by a reasonable number of staff but has the advantage of centralising both staff and functions. This option represents the most efficient for resources with an estimated need for 14 FTE staff. By comparison, the Swords facility for the National Museum of Ireland is intended to operate with up to 6 FTE but covers a smaller geographic area.

Role	No.	Pay/Oncosts	Overhead	O/H
Manager	1	£62,170.00	£62,170.00	£25,589.20
Senior Curator	1	£48,106.00	£48,106.00	£25,589.20
Curator	2	£44,517.00	£89,034.00	£51,178.40
Senior Conservator	1	£44,517.00	£44,517.00	£25,589.20
Conservator	1	£38,496.00	£38,496.00	£25,589.20
Senior Logistics	1	£48,106.00	£48,106.00	£25,589.20
Logistics	1	£44,517.00	£44,517.00	£25,589.20
Senior Datastore Manager	1	£48,106.00	£48,106.00	£25,589.20
Datastore Manager	1	£44,517.00	£44,517.00	£25,589.20
Admin Support	2	£30,769.00	£61,538.00	£51,178.40
Outreach Officer	2	£44,517.00	£89,034.00	£51,178.40
TOTAL	14		£618,141.00	£358,248.80

Option 3A – Single store - summary and costs

Scenarios addressed: Scenario 3	☒ Backlog archives		
	☒ Annual undepositable accrual		
	☒ Museums closures accrual		
	☒ Transferrals		
OPTION 3 – Single National Store			
Capital Build costs	Capacity Area m2 Cost per m2	28,839m3 31,723m2 £2,000	£63,445,800
Annual Expenditure	Facility Staff costs		£618,141
	Overhead costs		£358,246
	NCAA Staff costs		£901,219
	Total		£1,877,606
Impact of outsourced storage			
Outsourced storage x 1	Reduced Capital Build cost		£46,478,000
	Annual Expenditure plus DeepStore		£2,177,606
Outsourced storage x 2	Reduced Capital Build cost		£35,278,000
	Annual Expenditure plus DeepStore		£2,477,606

Option 3B - Using Wroughton as the home for the NCAA

The option for co-location of a single repository with Science Museum Group (SMG) at the National Collections Centre (NCC) on the former airfield at Wroughton, Wiltshire provides a tangible example for the NCAA. The costs presented in Option 3A are presented assuming a single option constructed at a new site. The following summary is based on utilisation of the NCC site and has been collated from interviews and a site visit undertaken by Quinton Carroll in May 2021.

The NCC is a project which is relocating all SMG collections, especially those in London, from dispersed stores to a single location. Various structures at Wroughton have been modified/retrofitted for storage but most recently, SMG has commissioned 'Building One', a purpose-built facility measuring 300m x 100m x 12m and providing 26,000m² of storage plus a mezzanine of 9,000m².

In addition to storage, this facility contains photographic studios, conservation laboratories, search rooms, staff rooms, loading bays and several individually controlled separate rooms, including strong rooms. Given the size of some of SMG's exhibits, including locomotives, some of these rooms are massive. The building was constructed using a distribution warehouse as the model but with extra insulation and sealed joints to reduce active climate control suitable to maintain a suitable environment. This reduces operating costs and ensures a reasonable drift time should the plant fail before active intervention is needed. SMG's longer-term plans include the construction of more of these buildings using the same plans and designs.

Discussions throughout the project with Matt Moore of the SMG made it clear that there were options for the NCAA; the project had already reached the conclusion that co-location with an existing national facility was a sensible option so Wroughton was visited to investigate options. These are:

- Shared Space in Building One

- A new 'Building Two'
- Retrofit of a Hangar
- Internal Construction within a Hangar

These will be addressed individually.

Shared space in Building One

SMG are not currently using all the building, and have sub divided 6,000m² towards the rear that is available to rent. At present this is not fitted out nor has a mezzanine floor. There is scope here for sub-divided storage (e.g. metalwork or wood stores), back and front office space.

An estimate of capacity of this space would be between 20,000m³ and 23,000m³ depending on the use of a mezzanine or gantries. This assumes a loss of 2,000m² to provide specialist storage and other spaces.

The projections from OSAA postulate a wide range of scenarios and Building One alone would not be sufficient to meet the upper end of demand. Within Scenario 3, Building 1 would be sufficient to respond to the immediate need, annual accrual and expected closures accrual for a up to between 15 and 20 years. The space would therefore provide sufficient storage for the foreseeable future, with the options to either use DeepStore for extra capacity or to work with SMG to adopt a similar space in a future Building 2.

SMG will rent this space at an advertised cost of £70 per m² per annum, so a total of £420,000 p/a. Options including sharing front of house, facilities management, conservation, photography and search rooms can be included but at a negotiated cost. An alternative to a mezzanine is to erect racks to the full building height but use gantries in between stacks at suitable intervals.

Fit out of this space, to include subdivision, mezzanine and mechanical / electrical (M&E), but not racking, would be between £1,100 and £1,500 per m², so between £6.6m & £9m.

A new 'Building Two'

SMG has ambitions for other builds across the airfield site. There is room adjacent to Building One for several other equivalent structures. As SMG has a detailed design from Building One, their intention is to replicate this for future structures, thus reducing design costs.

The options here are to either lease a building plot and design/build a bespoke structure or to allow SMG to build according to the design of Building One, which would then be let out to the NCAA.

For the first option, the ground rent would be £35,000 per acre; Building One is a four-acre plot. Therefore the costs to lease and then replicate Building One (SMG can construct it as well) would be £48m construction (plus internal fit out), with an additional ground rent of £140,000 per annum on top of running costs. Alternatively, the entire building could be rented at £2.1m per annum.

There are additional building plots on the airfield; SMG have identified one of 1.5 acres that would hold a 6,000m² building, so equivalent to the available rental space in Building One. On the numbers as understood, this would cost between £9.6m and £12m to build (plus fit out) and have a ground rent of £52,500 per annum. Alternatively, the building could be constructed by SMG and rented at £420,000 per annum. This would be an alternative to rental of the unused space in Building One, but would not include benefits and disadvantages of a shared facility.

Retrofit of a hangar

SMG has tried to make use of existing hangers on the airfields for storage. One option is to completely refurbish a hangar by adding external cladding and upgrading the structure. SMG's experience is that hangars are not a good starting point for this as they are essentially lightweight structures constructed 80 years ago with a design life of less than 10 years, so are difficult to maintain and keep vermin proof.

Refurbishing a hangar can be done for £575 per m2. However, the resulting structure would be difficult to control environmentally without extensive M&E installations. The example that SMG currently uses experiences winter temperatures below zero degrees with associated humidity. Controlling the climate in this volume would be very costly and incur a significant carbon footprint.

Realistically, such a structure would require internal subdivision – see below.

Internal construction within a hangar

A second hangar at Wroughton has some external changes, mainly replacing the sliding hangar doors and other repairs, and has been subdivided internally. SMG reports it makes the building more complex to maintain and creates challenging internal climates.

One area is of traditional construction – mounted plasterboard with glass wool insulation. The internal climate is hard to control and running costs are significantly higher. A second structure is built of a material called hempcrete, composite material that provides thermal mass and insulation as well as being vapour permeable. Being inside another structure also protects it from the elements and it can be made rodent proof.

The rooms constructed of hempcrete blocks require no active environmental controls as the structure maintains a suitable passive environment. What is less clear is the maximum room volume that can be passively maintained by hempcrete; the rooms here are small in comparison to other spaces on the site.

Hempcrete is also expensive at £1,500 per m2 to construct, which is approaching the construction costs of new buildings. However, it does appear to reduce running costs of the storage spaces, but of course rental and maintenance of the hangar structure itself would be an issue.

Conclusion

Of the options available at Wroughton, it appears that renting the remaining 6,000m2 in Building One to be the most practical. The space potential offered would meet the requirements of the NCAA for at least 10 years and potentially up to 20 years. As the OSAA project has identified, there are unknowns over how existing repositories would respond to a national storage facility which would significantly impact capacity:

- Firstly, will existing repositories continue to invest in their storage to maintain that ability to collect archive or will increasing amounts come to the central facility?
- Secondly, would museums start to look to move existing archaeological collections to a central store to make space for other materials?

These questions make assessing business cases on a capital project extremely precarious, which is why Building One is a good option and the costs relating to the option are shown in the table below. It makes provision for the likely range of scenarios, and even on the worse assumptions of Scenario 3 would still provide up to 20 years capacity. This would allow time to develop further capacity options, either using remote storage or in line with SMG developments. The space on offer is large enough to subdivide into specialist stores where needed, with the experience of using hempcrete suggesting options here. Building One already has a low energy footprint and overall running costs could be kept low.

Wroughton generally remains a good option for the NCAA. SMG have ambitious plans for the level of anticipated use of their collections and being able to be a partner in these is beneficial. These include the refurbishment of other buildings on the airfield to provide study/conference facilities, and even researcher accommodation. SMG are also keen to have the NCAA as it gives weight to the site as the 'National Collections Centre'.

Overall, initial discussions indicate this to be a good option.

Option 3B - Summary and costs using Wroughton example

Scenarios addressed: Scenario 3	☒ Backlog archives ☒ Annual undepositable accrual ☒ Museums closures accrual ☒ Transferrals		
OPTION 3 – Single Store at Wroughton			
Fit out costs, Building One <i>Includes subdivision, mezzanine, M&E</i>	Area m2 Cost per m2 Cost per m2	6,000m2 £1,000 £1,500	£6,600,000 £9,000,000
Building One rental <i>Per annum</i>	Capacity Area m2 Rental per m2	20,000m3 6000m2 £70	£420,000
Other annual expenditure	Facility Staff costs		£618,141
	Overhead costs		£358,246
	NCAA Staff costs		£901,219
	Total annual cost		£2,297,606
Impact of outsourced storage			
Outsourced storage x 1	Reduced Capital Build cost		n/a
	Annual Expenditure plus DeepStore		£2,597,606
Outsourced storage x 2	Reduced Capital Build cost		n/a
	Annual Expenditure plus DeepStore		£2,897,606

5.4 Financial summary – comparing options

		Option 1	Option 2A	Option 2B	Option 3A	Option 3B
Key feature		Add capacity to status quo	New hubs x 9	Existing hubs x 4	Single National	Single store Wroughton
Scenario addressed		Scenario 2	Scenario 2	Scenario 2	Scenario 3	Scenario 3
Capital Build	Build	£56,871,750	£50,397,120	£48,297,240	£63,445,800	£9,000,000
Annual expenditure	Facility staff	Unknown	£2,785,527	£989,332	£618,141	£618,141
	Overhead	£ -	£1,612,107	£614,136	£358,246	£358,246
	NCAA staff	£901,219	£901,219	£901,219	£901,219	£901,219
	Rent					£420,000
	Total	Unknown	£5,298,853	£2,504,687	£1,877,606	£2,297,606
DeepStore (5,600m³)	Capital	£29,747,500	£28,557,600	£27,367,700	£46,478,000	n/a
	Annual expenditure plus DeepStore	Unknown	£5,598,853	£2,804,687	£2,177,606	£2,597,606
DeepStore (11,200m³)	Capital	£15,747,500	£12,598,000	£14,487,700	£35,278,000	n/a
	Annual expenditure plus DeepStore	Unknown	£5,898,853	£3,104,687	£2,477,606	£2,897,606

6 Designing a sustainable solution

The scope of the OSAA project was to be focused on identifying ‘sustainable’ within the context of the archiving crisis. As part of that, we had to challenge and define what comprises a sustainable archive, for it became clear in the early stages of the project that sustainability was not solely about shelf space.

As a result, the project has grown beyond the exploration of storage options and has attempted to define a solution for a ‘sustainable archive.’ As part of this, ‘ballpark’ costs have been defined that address both capital and revenue requirements. As mentioned above (Section 1.3), the costs provided are intended to facilitate comparison of the different models outlined but, due to assumptions made, they should not be understood to be ‘real world’ estimates and further modelling of costs will be required to progress the options presented once certain variables are defined. Income to support sustainability for the NCAA proposals also requires further definition although we have presented some suggestions below.

The options set out in this report come from an understanding that the current status quo is not sustainable and cannot be made to be so. This will be a serious challenge for parts of the archaeological sector and as a result ‘selling’ the concept of a sustainable archive (as presented in this report) will be a significant issue.

It also needs to be remembered that although the overall perspective of archiving across England may seem grim, there are many local exceptions to this, where local curators and contractors have worked

to develop cost effective, committed and innovative approaches for their locality. Many of these are case studies in this report. However even these local examples still fail to address many of the concepts of 'sustainability' around archaeological archives.

6.1 Redefining sustainable

At the commencement of the project, the definition of 'sustainable' was focussed around capacity and meeting the demand for space created by reduced capacity in repositories and backlogs held at contracting units. However, it was clear that other factors were involved in determining whether an archive was 'sustainable', including:

- Accessibility
- Curatorial expertise
- Consistency of content
- Access to catalogues

All these were key factors in influencing the USE of archives, at it has become clear throughout this project that sustainability is intricately linked with levels of use. The latter brings a justification for the creation of and willingness to store archives and, increasingly, an income stream through recharging externally funded research projects.

Location was rarely an issue for most archives users except for those community/outreach officers employed directly by museums. Here the willingness to use archives in public facing activities was made clear, but once again, it is unnecessary to hold an entire archive to make use of it in this way. However, it was equally clear that this type of use of archives by repositories is less common than would be beneficial.

For other, research-based users of archives, location of the archive was rarely an issue. Research projects have become comfortable with including a data gathering phase where samples and materials are collected and therefore the need to travel is understood. Whilst such users reported that having a single centre for archives would be beneficial and easier for them, having the confidence that the intended research material was as described, accessible and supported by curators was far more important.

Therefore, if sustainability of archives is closely linked with use of those archives, any solution needs to support an increase in use, thus demonstrating the value and relevance of those archives. Hence the OSAA project developed the proposal for the National Collection of Archaeological Archives (NCAA), a national team that drives a single collection standard and catalogue to raise the profile and use of archives.

6.2 NCAA - a hub and spoke design model

The OSAA project has presented three broad options based on a range of engagement from local to national level. Option 1 is effectively maintaining the status quo, with multiple small repositories and different levels of engagement across England, whereas Option 3 is a large, national facility that effectively 'takes over' archaeological archiving.

There are pros and cons to each and the models posit different challenges to the principle of 'sustainable'. The local model continues to carry the risk of fragmentation of the NCAA, whereas the

national approach, whilst the most supportive of the NCAA, may be too much of a transition from the local connection of the historic environment, thus risking becoming solely a research institute, is not cost effective and will have wider implications for access and collaborative working. The local option does avoid issues over title, which unfortunately each other option does not.

Option 2, the blended regional model, is effectively the halfway house between local and national solutions. The project sets out two possibilities: the first being the creation of a new network of regional stores loosely based on the national regions of the UK; and the second involves a partnership with an existing regional model – the English Heritage network, in this case.

To be clear, OSAA does not recommend the option of a new regional network. Although this is presented on parity with the other ideas, the project considers this to be the worst option in both capital and revenue terms and would be trying to create an operational model where none such already exist. Also, during the project the Society of Antiquaries of London released their 'Manifesto' for change in British archaeology, at the core of which was the suggestion of a network of regional archaeological hubs. This document has created a heated debate within the sector, but it is generally accepted that changes to the delivery of local authority-based services will be driven by more general changes in local authority provision, and that such a provision is unlikely in the immediate future. Unfortunately, the archives crisis cannot wait for much longer.

Conversely, the option of developing the existing English Heritage network to create four regional stores is more attainable, through increasing the capacity and resource of this network **and** enhancing its functionality through the NCAA. The model is further blended by encouraging those existing repositories that have either invested in or are willing to maintain their service provision to engage with their local facility and the NCAA – a variation of a hub and spokes model. A benefit for this arrangement is that English Heritage are already the custodians of a significant archaeological collection for properties and associated fieldwork, so bringing this to the NCAA does create a truly national collection of excavated archaeological material. However, it should be stressed here that although English Heritage did provide a case study for the project, and were keen advocates for the regional network approach, the options model and proposal included in the report has not been discussed with them.

The principle of the hub and spoke is well established in the public sector and involves a core facility supported by a network. This definition from within the health sector illustrates this:

<https://bmchealthservres.biomedcentral.com/articles/10.1186/s12913-017-2341-x>

Formally defined, the hub-and-spoke organization design is a model which arranges service delivery assets into a network consisting of an anchor establishment (hub) which offers a full array of services, complemented by secondary establishments (spokes) which offer more limited service arrays, routing patients needing more intensive services to the hub for treatment [3, 7]. The hub-and-spoke model yields a healthcare network consisting of a main campus and one or more satellite campuses. It is much more efficient than organization designs which replicate operations across multiple sites [5, 7, 8]. Hub-and-spoke networks are highly scalable, with satellites being added as needed or desired [6, 7]. When geographic distance makes satellite-to-hub access impractical, an additional hub can be created, yielding a multi-hub network [4, 5, 9].

If the existing four repositories form multiple hubs, then the spokes would be museums and other repositories that would opt into the collecting programme and manage archives on behalf of the NCAA. They will need to meet standards and demonstrate how they are providing access etc. The project recognises that some may need help, so we feel there should be a funding stream which museums could apply to for funds to support capacity building (skills, resources), as well as to create

the legacy data required to map archive locations into the NCAA data infrastructure. Such a grant scheme could be administered via existing bodies such as the NLHF.

The principle of a dedicated, Lottery supported, funding stream for a specific national objective has been undertaken before, and the English Heritage Trust already acts on behalf of Historic England on the collection of sites and buildings; this proposal would be increasing its remit.

<https://historicengland.org.uk/research/support-and-collaboration/heritage-information-access-strategy/>

The hub and spoke model would also be at the core of Option 3, the National Store. Here, a central and single hub would be provided by the NCAA which would occupy a physical store facility. As with Option 2, this would be supported by the addition of existing repositories which continue to collect and manage parts of the NCAA (the spokes). Although the success of this model would depend on a strong brand it does provide a compelling solution, especially when the opportunities presented by the Science Museum Group's National Collection Centre located at a former airfield at Wroughton Wiltshire. Exploration of this option demonstrates it could be both cost effective and flexible, with capacity to provide a staged solution as needs change.

6.3 Finding a sustainable funding solution

The OSAA project has identified significant options for developing and implementing solutions for sustainable archives and has set out outline capital and revenue costs for each. However, it has not looked in detail at the possible sources of funding.

The project has assumed that the original establishment of the NCAA, datastore development, capital provision for storage and the migration/upgrading of backlog collections would be the subject of a one-off grant application. The capital build alone has been assessed at between £48m and £65m, although the inclusion of a single storage unit at DeepStore reduces this significantly and would be highly recommended. The Wroughton facility (Option 3b) has the potential to offer a less costly set-up option with an estimated £9,000,000 capital build cost.

However, ongoing revenue across all options discussed will need to have a sustainable funding source. This has been estimated at between £1.8m and £5.2m, depending on option, which includes the NCAA at £900k p/a (assuming an equivalence in coverage to the Historic England Science Advisers network). A single DeepStore unit would add £300k p/a to this, so the favoured option of enhancing and extending the English Heritage repository network would require an estimated c.£2.8m p/a to operate.

The project has considered three possible funding options: box charges, annual subscription or project levy. All of which are dependent on the continuation of developer funding for archaeological programmes.

Box charges represent another aspect of the status quo and are applied for the simple reasons that they are simple to understand and implement. However, the report undertaken for Historic England (Vincent 2019) clearly demonstrates that the way in which charges are calculated, applied and used is wholly inconsistent. However, it concluded that the average box fee was £75 per box, without specifying the size of the box.

Vincent also clearly stated that repositories were not maximising the potential of this income stream. Using a crude calculation that the annual accrual of archives at 493m³ equates to approximately 23,600 boxes per annum (based on a 'standard long bone' box of 50cm x 25cm x 20 cm) then at £75 per box this should realise £1.95m per annum; uplifting this to £100 per box realised £2.6m per annum. This

however reflects the dangers of basing a business model on raw numbers but does give an indication of the potential of this income stream. It does not recognise the well documented realities of both the contractor and repository relying on box charges.

A further possibility is tied into planning gain funding, namely Section 106 (S106) or Community Infrastructure Levy (CIL). Both can provide support for community facilities within and connecting to any development. However, application of CIL in particular is variable, with some local planning authorities choosing not to levy it as a means to keep housing more competitively priced, although in other areas both have been used for museum or repository provision (ALGAO 2018).

But CIL is not revenue support and S106, whilst useful, can be erratic. Both are competitive processes and must provide for community facilities like schools and health centres. Regrettably, cultural provision can fall down the priority lists. Furthermore, the recent government Planning White Paper proposes overhauling both funding pots and replacing them with a single community levy which councils will have a far greater freedom over using. Unfortunately, this is likely to increase demand for this funding, making it harder for museums or repositories to access it.

The final possibility rests on the scale of the developer funded fieldwork undertaken every year. ALGAO estimated (ALGAO 2018 – Value of Developer Funded Fieldwork report) that this currently stands at £245m per annum (excluding NSIPs). The proposal is that this is utilised directly, whether by contracting archaeological organisations paying an annual subscription based on their turnover which would provide access to the NCAA and incur no project-by-project archiving costs, or by a project levy paid per project on instruction by the client. Simplistically therefore a 1% charge (either route) would potentially raise £2.45m per annum, whilst 1.5% raising £3.675m.

Clearly the solution will need to take account of the complexity of the sector and fully consider the range of projects which make up the value of the developer funded fieldwork noted above. Not all projects will produce a physical component to the project archive, and the vast majority will have digital archive elements to manage and deposit, also incurring a cost which must be accounted for.

Raising revenue by directly asking contracting organisations would be incredibly controversial but has advantages if the NCAA can provide a meaningful option for contractors to be included. By having a single standard of creation, cataloguing access, with guaranteed deposition within a national storage network, contracting units would be able to operate a more efficient post-excavation and archiving procedure, ultimately saving money in that area. It also removes the difficulties of tendering for projects, and for ensuring that a suitable archiving budget is retained until deposition. By funding the NCAA in this way, organisations are directly contributing to the creation of sustainable archives.

Glossary and abbreviations

Archaeological Archive

All records and materials recovered during an Archaeological Project and identified for long-term preservation, including artefacts, ecofacts and other environmental remains, waste products, scientific samples and also written and visual documentation in paper, film and digital form (Perrin et al. 2014, 20).

Archaeological Project

Any programme of work that involves the collection and/or production of information about an archaeological site, assemblage or object in any environment, including in the field, under water, at a desk or in a laboratory. Examples of an Archaeological Project include: intrusive projects such as excavation, field evaluation, watching brief, surface recovery and the destructive analysis of objects; non-intrusive projects such as landscape or building survey, aerial survey, remote sensing, off-site research such as desk-based assessment and the recording of objects or object assemblages. (Perrin et al. 2014, 20). One result of an Archaeological Project will be an Archaeological Archive.

Bulk Finds

Finds that occur in relatively large quantities on site and can be recorded as a group; usually materials that do not require special recording during recovery. Examples are animal bone, ceramic building material and slag.

Collecting Institution

Receives an Archaeological Archive from the Depositor for long-term curatorial care.

Curator

The individual that curates (the day to day management) Archaeological Archives on behalf of the Collecting Institution.

Digital Data

All documents and records in digital form, including: correspondence, contracts, specifications, notes, records, pro-forma, indexes, catalogues, reports, maps, plans, section drawings, elevations, site photographs, object images, CAD files, databases, digital aerial photograph interpretations, geophysical and other survey data, GIS files, audio records, images, satellite imagery, spreadsheets, text files, analytical results and 3-D data.

Selection

The process of applying a Selection Strategy to a Working Project Archive to determine which archive components, including documents, digital files and material objects, should be included in the Archaeological Archive. The aim of selection is to ensure that the Archaeological Archive contains everything required to establish the significance of the project and support future research, outreach, engagement, display and learning activities.

Selection Strategy

The methodology detailing the project-specific Selection process, agreed by all Stakeholders, which will be applied to the Working Project Archive to create the Archaeological Archive.

Abbreviations

ACE	Arts Council England
ADS	Archaeology Data Service
ALGAO	Association of Local Government Archaeological Officers
CBA	Council for British Archaeology
CHET	Cambridgeshire Historic Environment Team
CIfA	Chartered Institute for Archaeologists
CIL	Community Infrastructure Levy
DCMS	HM Government, The Department for Digital, Culture, Media & Sport
EAC	European Archaeological Council
EH	English Heritage
FAME	Federation of Archaeological Managers and Employers
HE	Historic England
HER	Historic Environment Record
HIAS	Heritage Information Access Strategy
HLF	Heritage Lottery Fund
MA	Museum Association
NCAA	National Collection of Archaeological Archives
NCAAD	National Collection of Archaeological Archives Datastore
NHSF	National Heritage Science Forum
NPPF	National Planning Policy Framework
NT	National Trust
OASIS	Online Access to the Index of archaeological investigations project
OSAA	Options for sustainable archaeological archives
SMA	Society for Museum Archaeology
SMG	Science Museum Group

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