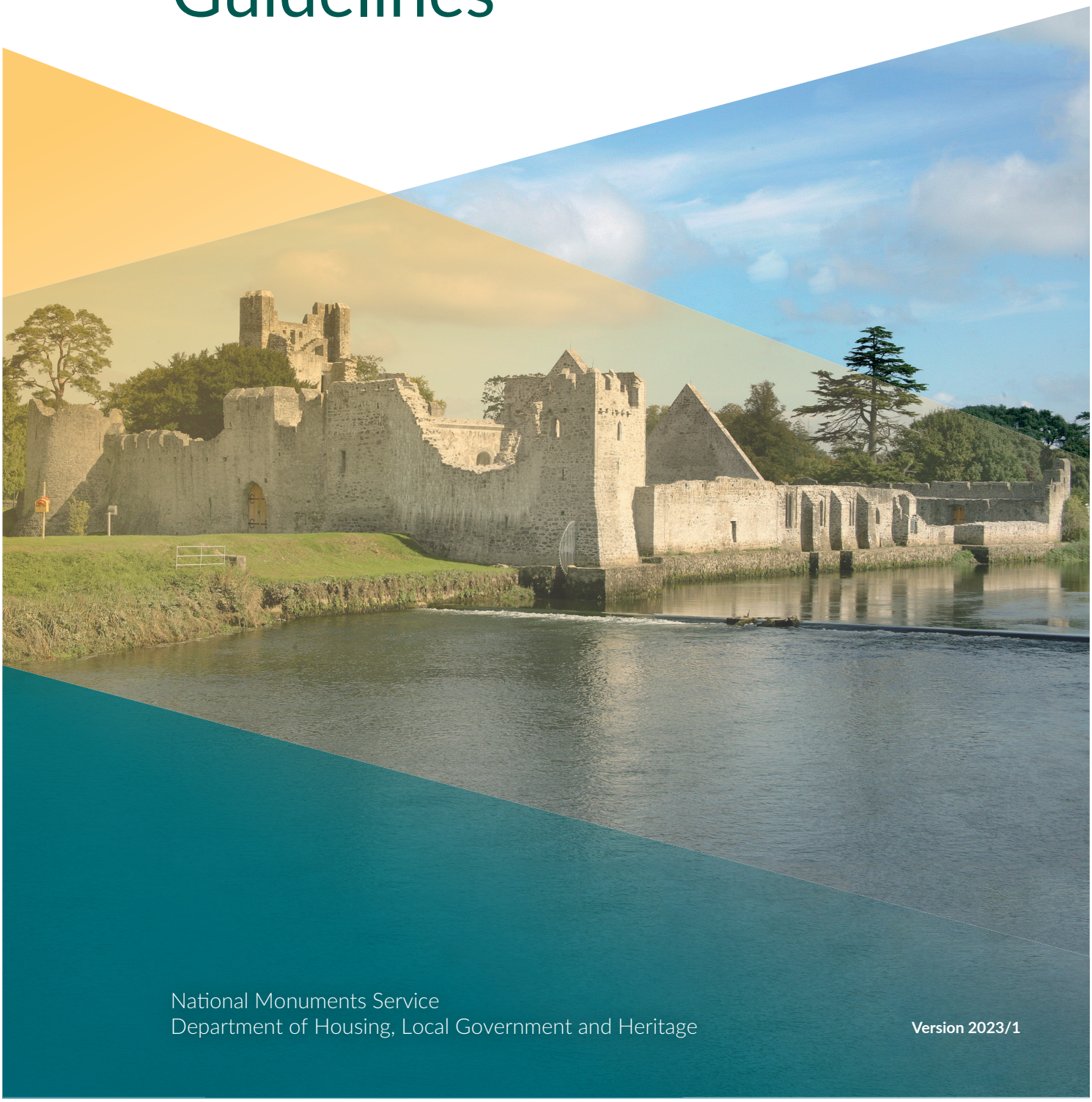
Rialtas na hÉireann
Government of Ireland

Archaeology and Flood Relief Schemes: Guidelines



National Monuments Service
Department of Housing, Local Government and Heritage

Version 2023/1

These Guidelines have been prepared by the National Monuments Service of the Department of Housing, Local Government and Heritage with key input from Archaeological Management Solutions. During the drafting of the Guidelines, valuable feedback was sought and received from the Office of Publics Works, Flood Risk Management division.

Cover image:
Desmond castle, Adare, County Limerick, situated on the north bank of the River Maigue just above Adare bridge (©Photographic Archive, National Monuments Service, Government of Ireland).

Contents

Contents 3

Abbreviations 6

Executive Summary 7

1. INTRODUCTION 9

1.1 Purpose of Guidelines 9

1.2 Flood Relief Schemes 11

1.3 Relevant Legislation 12

1.4 Archaeological Licences 13

2. ROLES AND RESPONSIBILITIES 15

2.1 The National Monuments Service 16

2.2 National Museum of Ireland 17

2.3 Competent Authority 17

2.4 Contracting Authority 18

2.5 The Office of Public Works 18

2.6 Local Authorities 18

2.7 Engineering and Environmental Consultants 19

2.8 Project Archaeologists 19

2.9 Archaeological Consultants 20

2.10 Works Contractor 22

2.11 Archaeological Contractor 22

2.12 Tender Documentation/Specifications 23

2.13 Stages of a Flood Relief Scheme and Stakeholder Inputs 24

3. ARCHAEOLOGICAL ASSESSMENT AND FLOOD RELIEF SCHEMES 31

3.1 Introduction 32

3.2 Considerations in Archaeological Assessment of Flood Relief Schemes 33

3.3 Archaeological Heritage and Flood Relief Schemes 34

3.4 Desk-based Assessment 37

3.5 Field Survey 37

3.6 Underwater Archaeological Impact Assessment 38

3.7 Underwater Archaeological Impact Assessment Reporting Requirements 42

3.8 Other Types of Investigation 43

3.9 Reporting 44

4. ARCHAEOLOGICAL MITIGATION FOR FLOOD RELIEF SCHEMES 47

4.1 Overview of Established Mitigation Strategies 48

4.2 Advance Archaeological Test Excavations 50

4.3 Archaeological Excavation (“Preservation by Record”) 52

4.4 Archaeological Monitoring 53

Further Reading 57

Archaeology and Flood Relief Schemes: Guidelines

Abbreviations

ACA	Architectural Conservation Area
AIA	Archaeological Impact Assessment
DAU	Development Applications Unit (Department of Housing, Local Government and Heritage)
DBA	Desk-Based Assessment
DHLGH	Department of Housing, Local Government and Heritage
EDM	Electronic Distance Measurement
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report
EPA	Environmental Protection Agency
FRS	Flood Relief Scheme(s)
GPS	Global Positioning System
ITM	Irish Transverse Mercator
MS	Method Statement
MCA	Multi-Criteria Analysis
NIAH	National Inventory of Architectural Heritage
NMI	National Museum of Ireland
NMS	National Monuments Service (Department of Housing, Local Government and Heritage)
NPWS	National Parks and Wildlife Service (Department of Housing, Local Government and Heritage)
OPW	Office of Public Works
PA	Project Archaeologist
RMP	Record of Monuments and Places
RPS	Record of Protected Structures
SSBL	Super-Short Baseline
SI	Site Investigation
SMR	Sites and Monuments Record
UAIA	Underwater Archaeological Impact Assessment
USBL	Ultra-Short Baseline
UAU	Underwater Archaeology Unit (National Monuments Service, Department of Housing, Local Government and Heritage)
WIID	Wreck Inventory of Ireland Database

Executive Summary

These guidelines provide a framework for the effective integration of archaeological heritage into the design and development of Flood Relief Schemes (FRS) developed by the Office of Public Works (OPW) directly or in association with relevant local authorities. With the aim of facilitating a consistent approach to archaeological heritage impact assessment and mitigation, they present a framework for the integration of archaeological interventions into the scoping, design, and construction of flood relief projects. The guidelines highlight opportunities for flood relief projects to enhance the protection, setting and amenity of heritage by opening sites and historic areas that were previously inaccessible, facilitating the conservation and interpretation of monuments, providing artefacts for designated museum displays, and presenting research opportunities and outputs such as publications, websites and exhibitions.

Chapter 1 outlines the legal framework for FRS and the protections afforded to archaeological heritage therein, the obligations and procedures under the National Monuments Acts 1930 to 2014, and the roles and responsibilities of all key stakeholders, including the National Monuments Service (NMS), the OPW, the National Museum of Ireland (NMI), local authorities, project archaeologists (PAs), engineering and environmental consultants, archaeological consultants, and archaeological contractors.

Chapter 2 provides an overview of the character of archaeological heritage that can typically be present on FRS projects.

Chapter 3 gives an account of the range and scope of archaeological assessment methods and techniques that may be deployed in desk-based assessments (DBAs), field surveys, Underwater Archaeological Impact Assessments (UAIAs), test-excavations and built heritage assessments, all of which aim to provide for the maximum extent of pre-construction assessment and mitigation by design.

Chapter 4 recommends measures to mitigate the effects of an FRS on archaeology, including avoidance, preservation in situ and preservation by record.

Figure 1: Trim Castle, Trim, County Meath, located on the River Boyne (©Photographic Archive, National Monuments Service, Government of Ireland).

1

Introduction

1. Introduction

1.1 Purpose of Guidelines

These guidelines have been prepared by the National Monuments Service (NMS) of the Department of Housing, Local Government and Heritage (DHLGH) to provide a framework for the integration of archaeology in Flood Relief Schemes (FRS).[1] They apply to FRS projects being delivered in Ireland in accordance with the requirements of the EU Floods Directive and under the Office of Public Works (OPW) flood relief capital works programme. They may also be applied as best practice to other smaller-scale FRS projects such as those being undertaken directly by local authorities, including those that are below the threshold to require an Environmental Impact Assessment (EIA).

The guidelines provide direction on the archaeological requirements for various stages of FRS, from pre-design, through inception and onto completion, thereby ensuring continued adherence to the state's ongoing commitment to the preservation of our archaeological heritage.[2] This document provides an overview of the roles and responsibilities of the various entities that are typically engaged in the delivery of archaeological strategies on FRS, including the NMS, the OPW, local authorities, engineering and environmental consultants, PAs, archaeological consultants and archaeological contractors.

The guidelines are also aimed at informing other stakeholders of the range and significance of archaeological interventions in FRS projects, including local authority personnel, designers, developers, works contractors, and subcontractors.[3]

In summary, these guidelines aim to provide an understanding of the:

- Protections afforded to archaeological heritage under the National Monuments Acts 1930 to 2014.
- Legal obligations and procedures with respect to excavation licences (Section 26 1930 National Monuments Act), Ministerial Consent requirements (Section 14 1930 National Monuments Act), underwater licences (Section 3 1987 National Monuments (Amendment) Act), and detection device consents (Section 2 1987 National Monuments (Amendment) Act).
- Potential impacts and effects on the archaeological heritage resource that can typically arise from FRS projects.
- Procedures to be followed and standards expected by the NMS in relation to FRS EIA and EIA Reports (EIARs), Archaeological Impact Assessments (AIAs) and Underwater Archaeological Impact Assessments (UAIAs).
- Respective roles of Project Archaeologists (PAs), archaeological consultants, archaeological contractors, and other key personnel in relation to the successive phases of each FRS.

[1] These guidelines and their implementation will be subject to ongoing review and may be revised from time to time. However, until such time as a full revision is published, they will remain applicable. In September 2023 the Historic and Archaeological Heritage and Miscellaneous Provisions Act 2023 was enacted. It is envisaged that it will be commenced in the coming period but in the interim the National Monuments Acts apply.

[2] National policy on the protection of the archaeological heritage in the context of development is set out in the document *Framework and Principles for the Protection of the Archaeological Heritage* (Government of Ireland, 1999).

[3] For the purposes of these guidelines archaeological heritage can be understood in its broadest sense to include terrestrial, underwater, built, industrial and vernacular heritage (see Section 3.3). Due to the diverse range of environments that can be affected by FRS projects, for the purpose of these guidelines the same principles of best practice that apply to the assessment and mitigation of archaeological heritage on land apply to those within and/or under water.

- Advisability of undertaking as much advance assessment and mitigation of the main construction works as possible, to minimise the impacts on archaeological heritage and enable fully informed mitigation scopes to be developed.

These guidelines should be considered in tandem with national policies on the protection of the archaeological heritage, that is, *Framework and Principles for the Protection of the Archaeological Heritage*,[4] *Policy and Guidelines on Archaeological Excavation*,[5] *Architectural Heritage Guidelines for Local Authorities*[6] and any other relevant guidelines issued by the NMS and other bodies.

1.2 Flood Relief Schemes

FRS projects being delivered under the OPW flood relief capital works programme are generally progressed under one of two models. **Model A** schemes are led by the local authority as the contracting authority and progress the project under the Planning and Development Act, 2000 (as amended) and the Local Authorities (Works) Act 1949. For schemes progressed through this model, the local authority leads on the procurement and delivery of the project, while the OPW provides full funding and may also provide some technical/management support to the local authority. Since 2018, with the significant increase in the number of schemes being progressed, this has become the default delivery model. In **Model B** schemes the OPW (or in some cases the local authority) is the contracting authority.

Depending on the planning route chosen, the steps involved can differ, but FRS projects are generally developed in five stages:

- Stage I – Scheme Development and Preliminary Design.
- Stage II – Planning Process or Public Exhibition/Confirmation.
- Stage III – Detailed Design.
- Stage IV – Implementation/Construction.
- Stage V – Handover of Works.

These schemes can pose adverse effects on archaeological heritage, both terrestrial and underwater. Conversely, FRS projects may also lead to a positive impact by reducing flood risks and providing opportunities to further knowledge of our past and to conserve and provide access to sites and monuments and architectural heritage structures. The ability to avoid adverse effects on known and previously unrecorded archaeological heritage and other cultural heritage assets can be somewhat limited, but, in line with state heritage policy, their preservation in situ should be sought.

To achieve this, extensive archaeological heritage assessment should take place at Stage I of an FRS development and *before* approval for a given scheme is sought, thus allowing for its modification, to prevent archaeological impacts, wherever possible, as part of the Stage I design phase (this includes underwater assessment where large-scale in-water works are proposed). This approach diminishes the risk of adverse effects on the archaeological heritage, which in turn reduces the risk of progress being impeded by the emergence of extensive and unforeseen archaeological issues, particularly during construction (Stage IV).

[4] https://www.archaeology.ie/sites/default/files/media/publications/framework-and-principles-for-protection-of-archaeological-heritage.pdf

[5] https://www.archaeology.ie/sites/default/files/media/publications/excavation-policy-and-guidelines.pdf

[6] https://www.buildingsofireland.ie/app/uploads/2019/10/Architectural-Heritage-Protection-Guidelines-for-Planning-Authorities-2011.pdf

1.3 Relevant Legislation

Arterial Drainage Acts and Planning and Development Act

Most FRS projects for the OPW flood relief capital works programme are delivered through the Planning and Development Act, 2000 (as amended), with the Arterial Drainage Acts, 1945 and 1995 (as amended) being utilised to a lesser degree. The OPW or the relevant local authority is the lead authority. EIA (including the preparation of EIARs) will likely form part of the planning applications and approval processes for schemes carried out under these legislative provisions.[7]

National Monuments Acts

The Minister for Housing, Local Government and Heritage is charged under the National Monuments Acts with a range of functions regarding the protection of monuments, wrecks and archaeological objects, including the regulation of activities that impact upon the archaeological heritage. The 1987 Amendment Act directly addresses the protection of underwater archaeology, which can be particularly relevant to FRS projects.

The provisions of the National Monuments Acts that are applicable to the assessment, mitigation and construction stages of FRS projects include the following:

- Works at or in relation to a site or monument recorded under Section 12 of the 1994 National Monuments (amendment) Act or registered under Section 5 of the 1987 National Monuments (amendment) Act must not take place unless two months notice has been given to the Minister for Housing, Local Government and Heritage, except in cases of urgent necessity and with the consent of the Minister.
- With very limited exceptions, all archaeological excavation (wherever occurring and regardless of whether directed at a known archaeological site or monument) requires an archaeological excavation licence under Section 26 of the National Monuments Act 1930, unless conducted under a Ministerial Consent under Section 14 of the 1930 National Monuments Act (where a proposed archaeological excavation requires a consent under Section 14 of the 1930 National Monuments Act, it will be dealt with under that section, and not under Section 26 of the 1930 National Monuments Act).
- The diving on, survey of, or interference with, wrecks of 100+ years old or underwater archaeological objects requires a licence under Section 3 of the 1987 National Monuments Act.
- Wrecks that are less than 100 years old and the potential locations of wrecks or underwater archaeological objects may also be protected under Section 3 of the 1987 National Monuments (amendment) Act by the placement of an underwater heritage order if the wreck, area, or object is considered to be of sufficient historical, archaeological or artistic importance to merit such protection.
- The use of a detection device to search for archaeological objects (or the possession of such a device on a monument protected under the National Monuments Acts 1930 to 2014) is prohibited without a consent under Section 2 of the 1987 National Monuments (amendment) Act.
- Section 2 of the 1987 National Monuments (amendment) Act prohibits the possession of a detection device (including geophysical survey equipment) in or at the site of a Recorded Monument or National Monument of which the Minister for Housing, Local Government and Heritage or a local authority is the owner or guardian, or which is subject to a Preservation Order under the National Monuments Acts.

[7] EIAs should be undertaken and EIARs prepared in accordance with Directive 2014/52/EU ('the EIA Directive'), the relevant transposing legislation, regulations and guidance.

- The interference with, or alteration of ground, within, around, or in proximity to a National Monument of which the Minister for Housing, Local Government and Heritage or a local authority is the owner or guardian, or which is subject to a Preservation Order under the National Monuments Acts (and also ground disturbance around or in proximity to any such monument in state care), requires a consent under Section 14 of the 1930 National Monuments Act. The NMS advises that town walls are to be considered as National Monuments within the meaning of the National Monuments Acts which includes the consideration of all town defences, unless otherwise notified, subject to Section 14 of the 1930 Act.[8]
- Finds of archaeological objects made other than during licensed archaeological excavations or underwater dive/surveys, or during activity carried out under a Section 14 1930 National Monuments Act consent, must be reported to the National Museum of Ireland (NMI) within 96 hours and must not be interfered with (Section 23 of the 1930 National Monuments Act).
- Alteration of an archaeological object requires a licence (Section 24 of the 1930 National Monuments Act).
- The export of archaeological objects requires a licence under Section 49 (7) of the National Cultural Institutions Act 1997.

1.4 Archaeological Licences

Approval under the Arterial Drainage Acts, 1945 and 1995 (as amended), and Planning and Development Act, 2000 (as amended), does not remove legal requirements under the National Monuments Acts. It is essential that applications for necessary licences and consents under the National Monuments Acts are made in a timely manner.[9]

The onus is on applicants for licences and consents under the National Monuments Acts to demonstrate that the application, including the proposed work or activity and the proposed methodology, is appropriate. Applicants must also demonstrate that they have the necessary experience and expertise to undertake the proposed archaeological works, or that they have it available to them as part of their team, where relevant.

Finds of archaeological objects made other than under an archaeological excavation licence or a Section 14 consent of the 1930 National Monuments Act must be individually reported to the NMI and not disturbed (with limited exception) pending inspection by the NMI. Accordingly, and to avoid delay, archaeological monitoring should be conducted under an archaeological excavation licence (Sections 14 or 26 of the National Monuments Act 1930).

It is recommended that archaeological underwater dive surveys, even when not directed at a known wreck site or underwater archaeological object, be carried out following receipt of a licence under Section 3 of the 1987 National Monuments Act.[10]

[8] https://www.archaeology.ie/sites/default/files/media/publications/national-policy-on-town-defences.pdf

[9] Up to six weeks should be allowed for the NMS and NMI to process applications; note that incomplete applications or methodologies may result in delays to approval.

[10] The issuing of a licence to dive by NMS does not negate the legal requirements for the applicant to ensure full compliance with the Health and Safety Authority's Code of Practice for Inland and Inshore Diving (2018) and the Safety, Health and Welfare at Work (Diving) Regulations (2018). https://www.irishstatutebook.ie/eli/2018/si/254/made/en/pdf

Figure 2: Thirteenth century effigy of an ecclesiastic, recovered during archaeological investigations by the Archaeological Diving Company Ltd. for the River Nore Flood Relief Scheme in Kilkenny City, where it had been reused to reinforce an eighteenth-century bridge abutment (Photograph: Cóilín Ó Drisceoil).

2

Roles and Responsibilities

2. Roles and Responsibilities

2.1 The National Monuments Service

The NMS, on behalf of the Minister for Housing, Local Government and Heritage, is the state body with responsibility for the protection and preservation of archaeological heritage in Ireland and its territorial waters. The NMS has responsibility for, *inter alia*:

- Implementing legislation in relation to the protection of monuments and sites, including historic wrecks and underwater archaeological sites.
- Regulating archaeological excavations, use of detection devices for archaeological purposes, diving on historic wrecks and on underwater archaeological sites or for archaeological purposes.
- Providing advice to planning authorities on development proposals (development plans, heritage plans and individual planning applications) that may have implications for the archaeological heritage.

The role of the NMS Underwater Archaeology Unit (UAU) is to manage and ensure the protection of underwater archaeological heritage. Where FRS projects are concerned, the brief spans underwater and terrestrial archaeological heritage as well as built heritage. Applications and consultations, which can include FRS pre-design scoping, various archaeological assessment reports, EIAs and EIARs are received by the UAU through the Development Applications Unit (DAU).

A dedicated NMS officer is in place to liaise with FRS PAs, ensuring collaborative engagement and a consistent approach to the progress on the management and protection of the archaeological heritage.

- The NMS assesses FRS applications/consultations received and makes observations, submissions and recommendations for assessment and mitigation that will, in turn, be issued to the relevant applicants/authorities. To ensure consistency, all planning consultations on FRS projects should be channelled through the DAU, which will forward consultations to the NMS and, where relevant, to an officer in the Built Heritage Policy division of the department.
- Assessment of consultations received may include a review for approval of AIA/UAIA reports, EIARs, test-excavations reports, built heritage assessments and other reports undertaken as part of the EIA process or for ongoing FRS projects.
- The NMS vets all licence applications received, that is, detection device, underwater, excavation or Ministerial Consent applications, including submitted Method Statements (MSs) and requests for extensions. All licence applications should be reviewed by the PA and sent to the archaeological licencing section of the NMS. The NMS will vet, discuss, and approve licence/consent applications and attendant MSs submitted.
- Such licences or consent applications, in the first instance, may be submitted by the PA until an archaeological consultant or archaeological contractor has been appointed, who will thereafter hold, with the approval of the NMS, such (transferred) licences.
- The NMS will review and may, if necessary, issue observations/comments/further requirements on archaeological reports received pertaining to licenced works. All such reports should be reviewed by the PA before being issued to the NMS.

- Further requirements will be issued by the NMS, ideally through the DAU or directly to the relevant authority (OPW, local authority and/or engineering and environmental consultant, archaeological consultant, PA), if applicable.
- The NMS may, in conjunction with the PA, carry out inspections of licenced archaeological works to ensure that they are being undertaken in compliance with the conditions of licences, consents and the methodologies described in their attendant method statements. Regular scheduled meetings will take place between the NMS and relevant parties, such as the contracting authority, the PA and the archaeological consultant.
- The NMS will review and provide feedback on all information submitted pertaining to FRS projects, including early or pre-design scoping documentation.
- The NMS may be invited to attend pre-design scoping meetings and workshops to become better informed on a scheme, to discuss same and to engage with the main stakeholders.
- The NMS may meet on site with the PA, engineering and environmental consultants, the construction works contractor, and the archaeological consultant/contractor.

2.2 National Museum of Ireland

The NMI is the state repository for all archaeological objects discovered in the state with no known owner. The NMI is a statutory consultee under the National Monuments Acts regarding Section 26 Excavation Licences (1930 National Monuments Act) and Section 14 Consent Applications (1930 National Monuments Act and 2004 National Monuments (amendment) Act) and advises on portable archaeological heritage. The NMI will advise on relevant regulatory elements and requirements, including finds reporting, issuing licences for the altering or exporting of artefacts, best practice for the handling of finds, and post-excavation requirements. NMI officers may also undertake site inspections and attend site meetings, when required.

2.3 Competent Authority

The competent authority is either the Minister or the Public Authority to which an EIAR is required to be submitted, that is, the authority charged with examining an EIAR with a view to issuing a consent to develop or operate. The Minister for Public Expenditure and Reform is the competent authority responsible for assessing and approving FRS projects under Sections 4 and 7 of the Arterial Drainage Acts, 1945 and 1995 (as amended). An Bord Pleanála is the competent authority responsible for the determination of applications for FRS projects under the Planning and Development Act, 2000 (as amended) and associated legislation. For smaller schemes the local authority is generally considered the competent authority.

2.4 Contracting Authority

For FRS projects the contracting authority is either the OPW, or the local authority in association with or funded by the OPW. The contracting authority is a member of the project steering group, which is made up of staff from the OPW and local authorities who have significant experience in delivery of FRS.

2.5 The Office of Public Works

The OPW is the lead agency for flood risk management and for minimising the impacts of flooding through sustainable planning. It is responsible for developing, implementing and coordinating comprehensive policies and strategies for flood risk management. Its primary functions in terms of flood risk management are to:

- Advise the Government on flood risk management and flood risk management policy.
- Develop and deliver on flood risk management work programmes and measures.
- Implement an effective programme of maintenance of river courses under the provisions of the Arterial Drainage Acts.

Archaeological considerations should form part of project planning from the earliest stages of a particular scheme. In this regard, all works will comply with the provisions of the National Monuments Acts 1930 to 2014 and adhere to best practice as set out in the national policy statements *Framework and Principles for the Protection of the Archaeological Heritage and Policy and Guidelines on Archaeological Excavation* (1999). Project steering groups, comprising representatives of the OPW and local authorities, monitor the progress and implementation of each project and meet regularly to discuss issues arising, including archaeology.

2.6 Local Authorities

Local authorities are often the contracting authority for FRS. Local authorities have an important role to play in heritage protection by setting out strategies, objectives and policies for the protection and promotion of archaeological heritage and built heritage, including maintaining a Record of Protected Structures, and managing Architectural Conservation Areas (ACAs) as part of their County Development Plan. The local authority ensures that council polices relating to archaeological and built heritage in Development Plans are applied in relation to heritage protection, while providing practical expert advice through their Conservation Officers and/or Heritage Officers on matters pertaining to conservation and preservation of archaeological and built heritage.

2.7 Engineering and Environmental consultants

Engineering and environmental consultancies are appointed by the contracting authority at Stage I to design the FRS and manage it through the planning process (Stages I and II), undertake detailed design and procurement for construction (Stage III), and oversee construction works by the works contractor (Stage IV and V). In some instances, the OPW or local authorities may have their own in-house engineering and environmental consultants to fill these roles. The engineering and environmental consultant may appoint an archaeological consultant and/or archaeological specialists to provide archaeological services to their team.

2.8 Project Archaeologists

Project archaeologists (PAs) advise contracting authorities on the archaeological aspects of FRS from the earliest stages. This is a separate role to that of the Archaeological Consultants who undertake the archaeological assessment and mitigation for individual FRS projects. Their advice is considered in the project design, for mitigating archaeological impacts, for developing mitigation strategies to resolve known archaeological requirements, and for minimising risk to the archaeological heritage.

Specific tasks to be undertaken by the PA, as agreed by the contracting authority, typically include the following:

- Providing advice to the contracting authority regarding archaeological aspects of FRS project design.
- Reviewing and providing advice on archaeological mitigation strategies for each FRS project, based on discussions with engineering and environmental consultants, including the Site Investigation (SI) strategy at pre-design stage.
- Advising the contracting authority on the best options for assessing and managing risk to the archaeological heritage at pre-design stage.
- Assisting the contracting authority by reviewing the archaeological consultant's methodology, scope and content for the EIAR chapter and appendices on cultural heritage.
- Reviewing and advising on specifications for archaeological services, including impact assessments and services to comply with the approved FRS project's Schedule of Environmental Commitments.
- Reviewing the archaeological contractor's MSs, work methodologies and licence applications, and providing comments.
- Reviewing tender documents, specifications, and pricing documents for the procurement of archaeological services.
- Advising on statutory responsibilities and obligations, particularly regarding licensing and consent requirements.
- With the agreement of the contracting authority, liaising with statutory bodies including the NMS, the NMI, the National Parks, and Wildlife Service (NPWS) and local authorities at appropriate points, and providing advice in this regard.
- Providing recommendations to ensure that engineering and environmental consultants' liaison with the NMS occurs at the earliest opportunity regarding any potentially significant archaeological heritage issues within a given FRS.

- Providing support and guidance to the contracting authority regarding works contractors and any subcontractors, where required by the engineering and environmental consultants.
- With the agreement of the contracting authority, liaising with consultants and the archaeological contractors engaged for individual schemes, and the works contractor or subcontractors, both during and after the scheme, to ensure that all licensing requirements are fulfilled.

The PA will also advise the contracting authority on the following:

- Archaeological heritage and other architectural and cultural heritage aspects of EIA, Multi-Criteria Analysis (MCA), options selection, EIA screening, and EIA scoping and drafting of EIARs (Stage I).
- Appropriate archaeological methodologies for particular FRS projects, including (but not limited to) desktop research, historical research, cartographic regression analysis, laser scan surveys, LiDAR analysis, geophysical and metal detecting surveys, geoarchaeological analysis and archaeological deposit modelling, dive or wade surveys, bathymetric and side-scan sonar surveys, built heritage surveys including laser scan and photogrammetric surveys and interpretation, geomatics surveys, visual impact/settings assessment, and archaeological test excavations.
- AIAs and UAIAs for smaller/sub-threshold schemes or as follow-up requirements during schemes if archaeology is identified.
- Archaeological mitigations, including surveys, archaeological monitoring, the assessment of potential archaeological discoveries, archaeological excavations, and reporting requirements (Stage IV). This may include inspections of archaeological heritage (both terrestrial and underwater).
- The competence and qualifications of archaeological service providers.
- Post-excavation progress, requirements, and archiving (Stages IV and V).
- The publication and dissemination of results of archaeological works (Stage V).

The PA will advise on compliance with relevant legislation (including the Planning and Development Act, 2000, as amended), the implications of local authority listing of Protected Structures and ACAs, and compliance with the National Monuments Acts. This is critical where a site is also a National Monument in the care of the state or the local authority, such as town defences. Compliance with consent conditions is a statutory requirement for these and consideration of measures to mitigate impacts to such sites, including visual impacts, should inform the national FRS programme of works as well as individual projects at design stage.

2.9 Archaeological Consultants

Archaeological consultants are competent experts in archaeological heritage, and are responsible for undertaking such tasks as conducting the archaeological assessments at Stage I and preparing the EIAR cultural heritage chapter, the supporting appendices, and the Schedule of Environmental Commitments for cultural heritage at Stage I.

Archaeological consultants can also, as required, provide input into the detailed design of a project at Stage III. The role of the archaeological consultant can include, but is not limited to, the following:

- Working closely with the engineering and environmental consultancy and specialisms therein, such as landscape and visual specialists, and conservation engineers.
- With the agreement of the contracting authority, liaising with the PA.
- Managing their archaeological team.
- Conducting archaeological dives/surveys in compliance with National Monuments legislation, licensing, MSs and NMS consent conditions, and in compliance with other relevant legislative and regulatory measures.
- Conducting archaeological recording (survey recording, descriptive, drawn/illustrative, photographic, video, 3D photogrammetry, underwater, geomatics).
- Carrying out targeted archaeological test excavations, including underwater investigations, as necessary, undertaken in compliance with excavation licence MSs, licensing and consent conditions.
- Buildings archaeology assessments, interpretation, and recording.
- Making visual impact assessments and assessments of impacts on the setting of monuments, architectural/built heritage.
- Conducting geophysical surveys (terrestrial and underwater).
- Assessing and interpreting LiDAR data.
- Conducting geophysical surveys, including obtaining the necessary consents, carrying out the survey, managing the data, interpreting the results of the survey, and preparing reports.
- Metal detecting for archaeological purposes (including that of spoil from SIs and archaeological test excavations).
- Providing post-excavation services, including conservation, engaging specialists, obtaining the necessary consents and licences for altering or exporting archaeological material, research, report writing, public dissemination and publication, graphics production, and incorporating the results into an archaeological assessment.
- Preparing an EIA cultural heritage chapter and supporting appendices (Stage I).
- Presenting the cultural heritage findings at oral hearings, if required.
- Preparing cultural heritage geospatial datasets generated during Stage I.
- Preparing inputs to detailed design (Stage III), as required,

All archaeological works, whether terrestrial or on or within water, must be carried out by suitably qualified and experienced archaeologists (referred to in the EIA Directive as “competent experts”) working under an appropriate and approved licence, where required. The archaeological consultant should have sufficient qualified archaeological personnel to cover all works. Archaeological work in any riverine/lacustrine or marine environment requires personnel with certain additional specialisms, qualifications, and experience, in order to undertake the work safely and provide the necessary advice on all elements of archaeological mitigation within that environment. All work needs to be undertaken according to best practice and in compliance with all licensing and consent conditions. If underwater archaeological works are required, then the archaeological consultant should have a suitably qualified and experienced commercially trained underwater archaeological dive team available to carry out these aspects of the work.

2.10 Works Contractor

The works contractor is engaged by the contracting authority to undertake construction or maintenance tasks on a FRS (Stages IV and V). The works contractor may be required to engage the services of a suitably qualified and experienced archaeological contractor and/or archaeological specialists to oversee the specified archaeological requirements, including those pertaining to underwater archaeology. There may also be a requirement to undertake initial enabling works at Stage IV, including undertaking pre-construction mitigation, which may require the services of an archaeological contractor and/or specialists.

The works contractor is required to ensure that their archaeological contractor provides adequate numbers of suitably qualified and experienced archaeologists (that is, experienced with FRS projects, schemes in similar environments and of similar scale, and aspects of archaeological works for such schemes, such as archaeological monitoring of riverine/estuarine/marine environments), including an underwater dive team, where required, to undertake all archaeological work, in compliance with EIAR environmental commitments, planning, licensing and consent conditions.

With the agreement of the contracting authority, these requirements should be adequately specified by the engineering and environmental consultants and the PA and addressed in the works contractor's programme of work. The contracting authority should be consulted in the case of any changes in the works programme and they should seek the PA's advice. The works contractor and their archaeological contractor may be advised by both the NMS and the PA regarding specified archaeological services (prepared at Stage III), methodologies and licensing, and compliance requirements under the National Monuments Acts 1930 to 2014.

2.11 Archaeological Contractor

Archaeological contractors are professional service providers who carry out the archaeological works specified by the PA for Stages IV and V of the FRS. The archaeological contractor is usually subcontracted by the works contractor, or occasionally directly by the contracing authority (OPW or local authority). They must be suitably qualified and experienced to carry out the archaeological works, including being eligible to hold an appropriate licence (Section 26 1930 National Monuments Act Excavation Licence; Section 2 1987 National Monuments (Amendment) Act Detection Device Consent and Section 3 underwater licence 1987 National Monuments (Amendment) Act). The archaeological contractor must ensure compliance with all licensing requirements and conditions.

The role of the archaeological contractor in Stages IV and V is varied and can include, but is not limited to, the following:

- Managing their archaeological team and any subcontractors and specialists during a project.
- With the agreement of the contracting authority, liaising with the PA.

- Preparing the appropriate licence and consent applications and methodologies.
- Carrying out the specified archaeological works.
- Conducting archaeological recording (survey recording, descriptive, drawn/illustrative, photographic, video, 3D photogrammetry, underwater).
- Archaeological monitoring, including monitoring of dredging works, SIs, and periodic inspections to ensure compliance with all legislative requirements, such as EIAR Schedule of Commitments, MSs, licensing and consent conditions.
- Carrying out archaeological test excavations and investigation/excavation, including underwater investigations and buildings archaeology assessments and recording, as necessary, undertaken in compliance with excavation licence MSs, licensing and consent conditions.
- Conducting archaeological excavation to preserve archaeology by record.
- Conducting geophysical surveys (terrestrial and underwater).
- Making visual impact assessments.
- Metal detecting for archaeological purposes (including metal detection and assessment of dredged spoil).
- Conducting post-consent surveys, including archaeological dive/surveys, in compliance with National Monuments legislation, licensing, MSs and NMS consent conditions, and in compliance with other relevant legislative and regulatory measures.
- Providing post-excavation services, including reporting, engaging specialists, final report writing, researching, publishing, and disseminating material publicly.
- Community engagement, outreach and publication.

2.12 Tender Documentation/Specifications

The required archaeological services for the design phase (Stages I and III), and for compliance with the relevant Schedule of Environmental Commitments and approval conditions arising from the EIAR for that scheme or for other stages of the FRS process, will be tendered. In partnership with the engineering and environmental consultants, the PA will prepare the relevant archaeological specifications on behalf of the contracting authority (OPW or local authority), to be included in the works contract tender specification prepared during Stage III.

This specification should address all relevant requirements outlined in the EIAR's Schedule of Environmental Commitments and planning permissions for the scheme. Before completing and issuing all archaeological specifications, the PA should ensure that any concerns of the NMS (and the relevant local authority archaeologist, if applicable) are addressed.

All tender documentation/specifications relating to required archaeological services should include minimum qualifications and experience requirements for each grade of staff required to work on the relevant project, to be set out in a Suitability Assessment Questionnaire.

2.13 Stages of a Flood Relief Scheme and Stakeholder Inputs

While each FRS is unique, the key inputs for the PA, archaeological contractors and NMS into the stages of FRS projects may typically be summarised as follows:

Table 1: Stages of a Flood Relief Scheme and Stakeholder Inputs

Stage I - Scheme Development and Preliminary Design Part 1

Project Archaeologist (PA):

Providing expert advice to the contracting authority and the steering group the PAs will:

- Attend steering group meetings, where appropriate.
- Review scope, methodology, specialist assessments, and schedule for Stage I Cultural Heritage Assessments and Desk-Based Assessments (DBAs) prepared by archaeological consultants.
- Review and advise contracting authority on AIA, archaeological investigations, for Geotechnical SIs.
- Review and advise contracting authority on methodology for licence/consent to monitor SI and undertake associated investigations.
- Review and advise contracting authority on Section 12 Notifications to be submitted to NMS.
- Make occasional site attendance during SI works, to provide relevant advice to contracting authority.
- Review and advise contracting authority on draft reports from archaeological monitoring of SI and related investigations.
- Review and advise contracting authority on cultural heritage contribution to MCA and options selections.
- On request of contracting authority, liaise with engineering and environmental consultants to highlight red-flag cultural heritage issues.

Archaeological Consultant:

As a key member of the engineering and environmental consultants' team the archaeological consultant will:

- Set out scope, methodology, specialist assessments, and schedule for Stage I Cultural Heritage Assessment and DBA, to be reviewed by PA.
- As part of DBA prepare desk-based cultural heritage GIS: study area, recorded archaeology, recorded built heritage, historical maps.
- Screen proposed SI against recorded cultural heritage DBA.
- Prepare AIA for proposed SI, with assessment of impacts and mitigations, which may include archaeological investigations, for each SI location.
- Prepare Section 12 Notifications to be submitted to NMS.
- Prepare archaeological licence applications for SI: archaeological monitoring, archaeological investigations.
- Contribute to constraints and screening assessments.
- Monitor SI and undertake related archaeological investigations.
- Prepare reports describing results of archaeological monitoring of SI and investigations.
- Prepare cultural heritage contribution to MCA and Options Selection.

Stage I - Scheme Development and Preliminary Design Part 1 cont'd

National Monuments Service (NMS):

The NMS will:

- Review Cultural Heritage DBA.
- Review AIA for SI.
- Review Section 12 Notifications.
- Vet and approve methodologies and licence applications for archaeological monitoring SI works and any other archaeological investigations.
- Carry out site visits or inspections during SI works.
- Approve and archive archaeological monitoring reports from SI and any other archaeological investigations.

Stage I Options Assessment, Scheme Development and Design Part 2

Project Archaeologist (PA):

For the benefit of the contracting authority and the steering group the PA will ordinarily be invited to perform a series of reviews:

- Review selected option FRS design.
- Review cultural heritage EIA chapter outline, scope and methodology.
- Review study area proposed by archaeological consultant.
- Review preliminary list of cultural heritage receptors.
- Review methodologies for licence/consents for archaeological investigations.
- Review cultural heritage assessment reports.
- Review cultural heritage component of an EIA Screening report.
- On request of contracting authority, contribute to pre-planning consultations and workshops (led by engineering and environmental consultants).

Archaeological Consultant:

The archaeological consultant will:

- Analyse selected option FRS design.
- Set out cultural heritage EIA chapter outline, scope, and methodology, to be reviewed by PA.
- Propose study area.
- Prepare preliminary list of cultural heritage receptors.
- Apply for necessary consents, licences, and Section 12 Notifications for archaeological investigations.
- Carry out and prepare reports for agreed cultural heritage assessments, field surveys, underwater assessments, and other investigations, where appropriate:
  - Underwater archaeological survey and assessment.
  - Built heritage survey and assessment.
  - Archaeological geophysical surveys.
  - Metal detection surveys.
  - Targeted archaeological test excavations.
  - Geoarchaeological assessment.

Stage I Options Assessment, Scheme Development and Design Part 2 cont'd

  - LiDAR assessment.
  - Historical research.
  - Historic map regression analysis.
- Identify cultural heritage receptors.
- Prepare reports on assessment of archaeological discoveries, including extent, depth, characteristics and significance of archaeology and proposed mitigation measures.
- Agree post-excavation strategy with PA.
- Lead pre-planning consultations and workshops with engineering and environmental consultants.
- Prepare cultural heritage component of EIA Screening Report.

National Monuments Service (NMS):

The NMS will:

- Undertake archaeological site inspections, as required.
- Contribute to pre-planning consultations and workshops with engineering and environmental consultants, as required.
- Review EIA Screening and SI screening report findings.
- Advise, where required, on cultural heritage EIA chapter outline, scope, and methodology.

Stage I Options Assessment, Scheme Development and Design Part 3

Project Archaeologist (PA):

To provide the contracting authority with useful advice, and noting the contractual obligations of the archaeological consultant, the PA will:

- On request of contracting authority, liaise with engineering and environmental consultants to ensure maximum extent of mitigation by design of identified archaeological heritage.
- Assist contracting authority in identifying where inspections (terrestrial and underwater) of archaeological heritage assessment works are necessary.
- On request of contracting authority, liaise with NMS on any significant archaeological heritage issues identified.
- Review draft cultural heritage chapter and supporting appendices for EIAR.

Archaeological Consultant:

- Prepare cultural heritage chapter for EIAR, including supporting appendices, datasets, assessments of effects and impacts, and Schedule of Environmental Commitments for cultural heritage.

National Monuments Service (NMS):

- Review draft cultural heritage EIAR chapter and supporting appendices.

Stage II Planning/Development Consent Processes

Project Archaeologists (PA):

Project Archaeologists (PA) will:

- Review responses to further information requests regarding cultural heritage and advise contracting authority accordingly.
- Review cultural heritage brief of evidence for oral hearings and advise contracting authority accordingly.
- Review draft answers/EIAR addenda to requests for further information/clarification of further information and advise contracting authority accordingly.
- Review planning permission and planning conditions relating to cultural heritage and advise contracting authority accordingly.

Archaeological Consultant:

Archaeological consultant will, if necessary:

- Respond to requests for further information relating to cultural heritage.
- Prepare Brief of Evidence for oral hearing relating to cultural heritage.
- Prepare addenda to cultural heritage chapter of EIAR and supporting appendices.

National Monuments Service (NMS):

The NMS will:

- Review EIAR, including cultural heritage chapter and supporting appendices, and Schedule of Environmental Commitments.
- Issue responses to EIAR as required.
- Attend Oral Hearings, if required.

Stage III Detailed Construction Design and Tender

Project Archaeologist (PA):

Project Archaeologist (PA) will:

- Review Schedule of Environmental Commitments.
- Review detailed design for Stage IV works.
- Liaise with NMS on any significant archaeological heritage issues identified in EIAR.
- Liaise with design team to ensure maximum extent of mitigation by design of identified archaeological heritage.
- Prepare specifications for cultural heritage services for Stage IV works.
- Prepare draft methodologies for cultural heritage services for Stage IV works.
- Prepare pricing documents for cultural heritage services for Stage IV works.
- Advise on any tender queries relating to cultural heritage services.
- Review suitability of nominated archaeological contractors.

National Monuments Service (NMS):

- Review draft specifications and methodologies for cultural heritage services for Stage IV works.

Stage III Detailed Construction Design and Tender cont'd

Archaeological Consultant

The archaeological consultant will:

- Respond to requests for further information relating to cultural heritage.
- Carry out and prepare reports for agreed cultural heritage assessments, field surveys, underwater assessments and other SIs, where appropriate, to input into detailed design.

Stage IV Construction

Project Archaeologist (PA):

To provide the contracting authority with useful advice, and noting the contractual obligations of archaeological consultant, PA will:

- Agree scope of works, schedules, and methodologies for Stage IV cultural heritage services with archaeological contractors.
- Review and agree with archaeological contractor necessary consents and licences for archaeological works.
- Ensure that archaeological works are undertaken in advance of construction works, where possible, to reduce risk of delays to construction programme.
- Regularly attend site to inspect archaeological works (both terrestrial and underwater).
- Review archaeological contractor's progress reports.
- Prepare regular progress reports for NMS.
- Advise on significance of, and appropriate mitigation strategies for, archaeological discoveries.
- Review draft methodologies for mitigating impacts on archaeological discoveries.

Archaeological Contractor:

As a professional service provider who carries out the archaeological works, archaeological contractor will:

- Review specifications and agree scope of works, schedules, and methodologies with PA.
- Apply for necessary consents and licences, following review of same by PA, for archaeological works.
- Carry out archaeological works with suitably qualified archaeologists, as specified, including (but not limited to) archaeological monitoring, built heritage services, archaeological excavations, geomatic surveys, underwater archaeological surveys and excavations, metal detection and geophysical surveys, and specialist services, such as finds conservation, osteoarchaeological services, artefact analysis, and historical research.
- Prepare regular progress reports for PA.
- Report discovery of archaeological sites or materials to NMS, NMI, PA.
- Prepare reports on assessment of archaeological discoveries, including extent, depth, characteristics and significance of archaeology and proposed mitigation measures.
- Agree post-excavation strategy with PA. Post-ex to commence and be ongoing throughout Stage IV works.
- Apply for necessary consents and licences for altering or export of archaeological material, where required.
- Process finds and samples, including all necessary conservation, scientific dating and specialist analysis.
- Commence preparation of drawings and images, as specified.
- Prepare Preliminary Reports.
- Prepare regular progress reports for PA.

Stage IV Construction cont'd

National Monuments Service (NMS):

The NMS will:

- Vet and approve methodologies and licence applications for archaeological works.
- Review regular progress reports from PA.
- Inspect licenced archaeological works in progress to ensure compliance with licence conditions and MSs.
- Provide, if required, recommendations to PA and archaeological contractor.
- Liaise with PA as required.
- Liaise with PA and archaeological contractor regarding significant discoveries made during Stage IV works.

Stage V Handover of Works

Project Archaeologist (PA):

To provide the contracting authority with useful advice, and noting the contractual obligations of the archaeological consultant, the PA will:

- Agree with archaeological contractor scope and schedule of post-excavation works, including reports and publications, dissemination and outreach.
- Review draft Preliminary Reports.
- Review draft Final Reports.
- Review agreed publications.
- Review archives.

Archaeological Contractor:

The archaeological contractor will:

- Agree with PA scope, content and schedule of post-excavation works, including preliminary and final reports and publications and other forms of dissemination.
- Prepare regular progress reports for PA for post-excavation works.
- Prepare all drawings and images, as specified.
- Prepare Preliminary Archaeological Reports.
- Prepare Final Archaeological Reports.
- Prepare agreed publications, including Excavations Bulletin
- Deposit finds with NMI, as specified by NMI.
- Deposit archive with NMS, as specified by NMS.
- Submit digital archive, as specified.

National Monuments Service (NMS):

- Review and approve Preliminary Reports.
- Review and approve Final Reports.

Figure 3: The River Boyne at Newgrange, Co. Meath with a barrow mound/passage tomb (foreground) and the great passage tomb (©Photographic Archive, National Monuments Service, Government of Ireland).

3

Archaeological Assessment and Flood Relief Schemes

3. Archaeological Assessment and Flood Relief Schemes

3.1 Introduction

FRS projects can have a significant effect on a broad range of archaeological heritage, which should be comprehensively addressed through the archaeological assessment process. An AIA and mitigation strategy for a proposed FRS project, including for design and SIs (Stage I), and for enabling works and construction (Stage IV), should aim to avoid or reduce effects on the archaeological heritage and inform the design of a given scheme with reasonable alternatives that achieve the maximum amount of preservation in situ of archaeological heritage. The risk of adverse effects on archaeological heritage can be reduced through carrying out mitigation as early as possible (ideally in Stage I).

Each phase of an FRS requires its own approach and strategy for archaeological assessment and mitigation. As each stage reaches completion, the archaeological strategy and mitigation in place may need to continue onto the next stage or be expanded in the event, for example, that new discoveries are made that warrant additional archaeological inputs. Assessment recommendations, with appropriate avoidance or mitigation measures, require implementation regardless of whether the assessment took place before or after a grant of approval for a FRS. As SI works are generally undertaken before a project receives approval, they will require separate screening, assessment, and Section 12 of the National Monuments Act 1930 notification and monitoring, as set out in an assessment report to be submitted and agreed with the NMS.

EIARs will include a Schedule of Environmental Commitments detailing specific measures to be undertaken to mitigate impacts and adverse effects on the archaeological heritage. The PA will assess the Schedule of Environmental Commitments for each scheme as they relate to archaeological heritage and manage their implementation on behalf of the contracting authority. The archaeological elements of the Schedule of Environmental Commitments will also be reviewed by the NMS as part of the consultative process. It is the responsibility of the works contractor to implement all mitigations contained in the Schedule of Environmental Commitments.

The PA will also provide ongoing advice to the contracting authority, in liaison with the NMS, on archaeological strategies to mitigate effects on the archaeological heritage, including when previously unknown archaeology is identified during works. The PA will play a key role in ensuring that the mitigation is undertaken in compliance with the Schedule of Environmental Commitments and conditions of all archaeological licences issued. Similarly, they will have a key role in ensuring that mitigation, which has already been undertaken but which requires further archaeological input to avoid or reduce an impact, is also carried out. This would be most critical where multi-phased works are taking place, and which may result in multiple archaeological contractors being engaged across different stages of a project.

3.2 Considerations in Archaeological Assessment of Flood Relief Schemes

For each FRS a detailed assessment of the existing environment, including archaeological heritage, undertaken by suitably qualified specialists, is required during the pre-design and/or design phase, as part of the EIA (Stage I). The purpose of such assessments is to identify, describe and assess the likely significant effects on archaeological heritage resulting from, *inter alia*, the construction and operation of a project. This is to ensure that significant adverse effects can be avoided, reduced or offset, and that mitigation measures can be embedded into the design, wherever possible.

Assessment should address direct and indirect effects, both positive and negative, and should include issues such as SIs, enabling works, vibration, hydrological change, and any cumulative effects. In many case, cumulative or indirect (secondary) impacts and enabling works may be more significant than direct impacts from a scheme (for example, the installation of cofferdams to enable the underpinning of a bridge; the locating of compounds close to monuments, within or close to historic towns or riverbanks; or the temporary placement of haul roads and bunds within watercourses).

Each phase of an FRS project will have its own elements for consideration. The risk of unforeseen or unplanned effects also needs to be addressed, including the potential for a project to cause risks to archaeology due to its vulnerability to external accidents or disasters (for example, the flooding of a site due to a burst dam). Consideration should be given, as far as reasonably practical, to down- and up-river effects, including on archaeological heritage outside a given study area. For instance, will the construction of flood defences at one location cause increased flooding or flow rates downstream; and, if so, will this impact archaeology in that location? Riverbed scouring because of new bridge piers or flood walls should also be assessed, and in this regard any hydrological studies carried out for a scheme should be consulted by the archaeologist and the results incorporated into the assessments and EIAR.

Hydrological assessment should form part of the consideration for all schemes regarding potential impacts on both terrestrial and underwater cultural heritage. Consideration should also be given to whether the dredging of riverbeds or tidal zones and the subsequent lowering of water levels could result in known or potential submerged archaeology becoming exposed, particularly during dry spells or summer months. Furthermore, such works might lead to de-watering altogether, which could potentially result in degradation of in situ archaeological remains. It is particularly important to assess this potential effect in urban areas, where rich organic archaeological remains may be preserved in situ. The impact of vibrations on upstanding archaeological monuments or built heritage during FRS works would also need to be considered and mitigated in advance, particularly regarding upstanding structures such as town walls.

Similarly, impact on the setting/visual environment of archaeological monuments and on views of and from monuments arising from new or upgraded FRS infrastructure (such as flood defence walls or embankments) should be assessed and mitigated, where necessary. This is particularly

important where there is the potential for the setting of a National Monument or significant views within and of a historic town to be affected by a FRS project. Any interactions between impacts on archaeological heritage and other environmental factors should also be documented for each asset and captured in a matrix of interactions (for example, an archaeological monument may have amenity value, which would need to be assessed under Population and Human Health in the EIAR).

The description of effects should be precise and concise and focus on effects that are probable or likely to occur, including the reasonably foreseeable worst-case scenario. Discussion of negligible effects should be avoided.[11] Assessment should also include a description of proposed mitigation measures for a given programme of works, consideration of a do-nothing scenario, and alternatives to avoid or reduce significant adverse effects.

3.3 Archaeological Heritage and Flood Relief Schemes

There is a potential for all FRS works to impact upon terrestrial and underwater archaeological heritage.[12] Historic towns can contain cultural layers that have built up over time and this can be particularly the case in waterways and in areas that have been subject to flooding in the past. Rural areas may also contain well-preserved layers of cultural material. Even within reclaimed areas that are now land but were formally wet zones there is a potential that previously undiscovered waterway-related archaeology may be found. For example, infill (such as dredged spoil) used to reclaim an area of former river floodplain may retain cultural material, including the remains of abandoned vessels (called hulks) and wrecks used as part of the reclamation process or buried in the underlying original sediments.

An historic town or the frequency of certain types of monuments within a given landscape (such as Bronze Age sites) forming the study area for an FRS can be strong indicators of previously unknown sites and artefacts remaining within proposed project areas. Assessment of archaeological potential, therefore, is not just site specific but must also include the historic and archaeological landscape context within which monuments are located, including watercourses. Similarly, because the bulk of FRS projects include urban riverine environments, a range of archaeological, built, and cultural heritage can typically occur in these contexts and should be considered, where appropriate, both in the assessment process and in the compilation of EIARs and other assessments.

Urban riverscapes are characteristically repositories of dense concentrations of a diverse range of archaeological heritage in a variety of settings, including terrestrial, underwater, reclaimed ground, floodplains, industrial, vernacular, estuarine and maritime. Typically, the vast bulk of this heritage does not enjoy formal protection/designation in the Record of Monuments and Places (RMP) and Record of Protected Structures (RPS).[13] It is essential to look beyond standard sources such as the SMR/RMP/

[11] Further information on describing effects is given in the Environmental Protection Agency (EPA's) *Guidelines on the Information to be Contained in Environmental Impact Assessment Reports* (EPA, 2022). Available for download at: https://www.epa.ie/publications/monitoring--assessment/assessment/guidelines-on-the-information-to-be-contained-in-environmental-impact-assessment.php.

[12] Further information on Ireland's underwater archaeology is contained in the booklet produced by the NMS entitled *Advice to the Public on Ireland's Underwater Archaeological Heritage*: https://assets.gov.ie/239954/5bd23936-3d87-46bb-8acd-90dd796bbb9a.pdf

NIAH when constructing baseline inventories (and their attendant mapping) of the archaeological, built and cultural heritage within a given study area. Field surveys and historical (including research on primary sources) and historic cartographic sources can be of particular importance for mapping topographical, built heritage, industrial and vernacular cultural heritage receptors, both extant and in their former locations, within urban riverine environments. Local knowledge is another key source that should be included in all assessments.

In line with national policy, in relation to protection of archaeological heritage and EPA guidelines on environmental impact assessment reports, it is essential that assessments include all elements of archaeological built and cultural heritage, including post-c. 1700 receptors, to be sufficiently accurate in providing a reliable reference against which the effects of a project can be assessed.[14]

Below are examples of the various types of archaeological, architectural and cultural heritage receptors, arranged under broad categories, that are typically represented within urban riverine environments and which, if present, would require consideration:

WATER POWER

- Mills (cereals, rape, wool, cloth, wood, paper and stone)
- Distilleries
- Breweries
- Mill buildings
- Mill wheels
- Millers'/brewers'/distillers' houses
- Revetments
- Millraces
- Weirs
- Artificial/modified mill islands
- Millponds
- Warehouses

CANALS/NAVIGATIONS

- Canal cuts
- Locks
- Revetments
- Aqueducts for stream diversions (often beneath canals)
- Canal bridges
- Steps into canals
- Floodgates
- Sluices
- Canal quays
- Canal weirs
- In-river canalisation/dredging channels
- Contiguous tow paths
- Canal construction camps

CROSSINGS

- Road and footbridges (stone, timber, metal, "stick bridges", clapper bridges)
- Abutments, fragments of earlier bridges (underwater, in banks, and incorporated into existing bridges)
- Fording points and infrastructure
- Fording pavements (in-stream)
- Construction remnants (bunds, construction waste, revetments)

[13] As an example, recent Heritage Audits of the Rivers Nore and Suir have documented that of the 3,171 archaeological and built heritage sites identified in the studies, just 15.5% (494) were included on the Sites and Monuments Record (SMR)/RMP and 9.7% (310) were on the National Inventory of Architectural Heritage (NIAH). http://kilkennyheritage.ie/wp-content/uploads/2018/08/Vol-1-RNHA-light-1.pdf [accessed 22/2/2022].

[14] Frameworks and Principles for the Protection of the Archaeological Heritage Sections 1.1, 3.3.6, 3.6.4; EPA Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (2022, 32).

BOATS AND BOATING INFRASTRUCTURE

- Wrecks (including logboats)
- Traditional boats (wrecks and in use)
- Snap net/cot fishing – flat-bottomed cot boats
- Barges (wrecks and in use)
- Reused elements of boats/ships, including hulks
- Fragments of wreckage
- Ballast mounds
- Cargo
- Boat jetties
- Moorings (stone/timber)
- River piers
- Formal quays (with integral slips, steps to river, mooring posts/rings)
- Artificial river harbours/inlets

FISHING BUILT HERITAGE

- Fish weirs
- Fish traps
- Tidal head weirs (V-shaped, L-shaped, or C-shaped)
- Non-tidal riverine weirs (generally V-shaped)
- Fishing mill dams
- Draft net fishing infrastructure: watchtowers, cranes
- Rod-fishing stands

DESIGNED LANDSCAPES

- Waterways as integral part of designed landscapes for country houses
- Designed landscape relics (such as shelter belts or avenues) aligned on rivers
- Cultural landscapes and walks/ promenades along rivers
- Shared amenity, pleasure grounds
- "Eye catchers"
- Views and vistas

HISTORIC FLOODPLAIN MANAGEMENT

- Managed water-meadows for winter grazing
- Drainage and reclamation of floodplains for agricultural land in "age of improvement"
- Historic flood embankments (usually earthen)
- Rivers rerouted leaving behind relic channels
- Palaeo river channels

EXTRACTION IN AND ALONG RIVER CHANNELS

- Gravel quarries (in stream and adjacent)
- Stone quarries from riverbanks
- Lime kilns and lime kiln quarries (adjacent rivers)
- Brick manufactories (adjacent rivers)

WOODLAND/VEGETATION MANAGEMENT

- Osieries, such as willow or hazel (some still in use)
- Managed reed beds (some still in use)

WASTE DISPOSAL

- Urban disposal (such as downstream artefact "traps")
- Casual losses, such as weapons, at bridge/fording point crossings

AGRICULTURAL BUILT HERITAGE

- In-stream cattle enclosures
- Sheep-dips
- Sheep pounds

INTANGIBLE HERITAGE: COLLECTIVE MEMORY

- River names (local names given to various parts of the river)
- Fishing heritage in traditional river names
- Drownings, battles, folklore and other elements in traditional river names/ folk memory

3.4 Desk-based Assessment

As a first step in the EIA process (Stage I), a baseline study DBA should be carried out to ascertain the existence, location, character, condition and extent of any recorded and previously unrecorded archaeological features/deposits, sites/monuments or objects, built heritage or underwater cultural heritage within a defined study area. This will involve a DBA of the land and waters effected by the FRS and wider landscape and will inform requirements for further archaeological investigation, assessment, and mitigation, either in advance of or during the FRS.

Given the broad variety of environments that a FRS project typically encompasses the DBA may require inputs from a range of suitably qualified and experienced archaeologists, historians, underwater archaeologists, and other specialists. It is essential that the DBA capture as comprehensively as possible the archaeological, built and cultural heritage landscape of the proposed FRS project area and it should include the outcome – utilising primary and secondary sources – of historical and archaeological research in order to identify sites and locations of potential. These should be accurately mapped (using a sequential numbering system) and inventoried. Where substantive archaeological heritage issues are identified, they should be flagged with the PA at the earliest opportunity. When the DBA has been completed and its recommendations considered and agreed, further archaeological assessment by way of field survey and impact assessment will be required. The nature and extent of these investigations will be defined by the DBA and reviewed by the PA.

3.5 Field Survey

Field surveys (including topographical and geophysical surveys and test excavations) and site inspections (both terrestrial and underwater) should be carried out at the earliest opportunity and undertaken by suitably qualified and experienced archaeologists. Where large-scale, in-water impacts are proposed, these surveys should include the recording, inspection, and mapping of the extent of all sites recorded in the DBA and the identification of any new, previously unrecorded and potential archaeological heritage sites, including those underwater. The field survey should include a visual inspection of any riverbanks and riverbeds and other waterbodies (by boat, if required), where they are visible. This is best carried out following vegetation clearance (where permitted) or during winter, when vegetation cover is less dense.

The field survey should ascertain the existence, location, character, condition and extent of any recorded and previously unrecorded archaeological features/deposits, sites/monuments or objects, built heritage or cultural heritage within a study area and likely to be affected by the proposed works (including any associated temporary works, SI works). The field survey should also facilitate accurate mapping and inventorying (including photography) of any recorded and previously unrecorded archaeological features/deposits, sites/monuments, or objects, built heritage or cultural heritage. Findings should be presented in map and inventory form with associated geospatial data, and it is essential that, where possible, the full (known) extent of the archaeology identified be mapped and described.

A report that combines the results of the DBA and field surveys should be collated and, with the contracting authority's approval, be submitted first to the PA for review and then to the NMS for comment. This report should identify the likely effects on archaeological, built, and cultural heritage sites, and it should recommend appropriate measures (such as archaeological exclusion zones) for the avoidance of these remains or, where this cannot be achieved, measures to mitigate the impact of the works. The report should also include proposals for further investigations, as required, as part of the assessment process.

3.6 Underwater Archaeological Impact Assessment

It is essential that an UAIA be carried out for all FRS projects where watercourses are being impacted or where the potential exists for underwater archaeological remains to be affected. This will be particularly important where major elements of a scheme take place in-water, as fisheries or weather restrictions may limit in-water archaeological works at construction stage. In urban areas where extensive reclamation of rivers and their floodplains has been undertaken the scope of underwater assessment may extend into what are now terrestrial areas. This will ensure that a full assessment of the archaeological potential of the project area be produced at the earliest stage possible. It will also enable the appropriate mitigation strategies to be put in place (avoidance, preservation in situ or excavation). Such assessments need to be carried out by suitably qualified and experienced archaeologists, under the appropriate licences, to ensure compliance with the National Monuments Acts.

There are three main types of underwater surveys, outlined in detail below (A-C), along with methodologies for geophysical surveying (side-scan sonar, bathymetry, magnetometry, multibeam echosounder, sub-bottom profiling).

Type A – this type of underwater survey should be carried out where water is shallow and where water clarity and velocity allow visual inspection of the riverbed/seabed. The survey should include the following:

- A desktop/baseline study.
- A field/walkover survey of any foreshore/riverbank.
- A wade/snorkel and metal detector survey.

The desktop/baseline study should be carried out, often as part of the overall DBA (Stage I), before the field surveys takes place so that the underwater archaeologist is fully informed on the nature, extent and potential of the area or site that being surveyed. Waterways can be dangerous environments in which to work and the archaeologist carrying out the survey should be suitably qualified and experienced, ensuring that the appropriate measures are in place to carry out the survey in safety.

Overview of Survey Type A Requirements

- Each survey area should be subject to a systematic inspection (wading using visual and accompanying bathyscope or by snorkelling) and a metal detection survey to identify any evidence of archaeological remains (structures/features/deposits) and archaeological objects located in, or adjacent to, the waterbody.
- The survey should include a visual assessment of the coastal zone/intertidal/foreshore/river and lake banks, as well as river and lakebed, where visible; it is best carried out following vegetation clearance. Any clearly identified or potential archaeological remains/objects should be described, recorded and photographed, and their location and extent should be surveyed.
- The topography and condition of the area and riverbed should also be recorded.
- The survey must be based – as a minimum measure – on a survey grid with a baseline established in the field for survey control, to ensure full coverage of the riverbed.
- The survey should be performed systematically over the entire length of the water body, within the area subject to the scheme, where this can be achieved. Any constraints that impede completion of the survey (such as the presence of immovable obstacles, deep water, strong water currents, weirs, or dangerous conditions) should be recorded, described and illustrated in the maps accompanying the UAIA report.
- The metal detection survey should be undertaken by an experienced licenced metal detectorist using a suitable underwater metal detector.
- The location of all ferrous and non-ferrous material contained within the survey area (that is, in the waterbody) should be recorded using a Global Positioning System (GPS). The metal detection survey should provide a quantitative estimation of the amounts of metals in the area to be impacted by the scheme.
- The location of all archaeological remains or objects identified should be recorded using Electronic Distance Measurement and/or Digital GPS, as appropriate.
- All archaeological remains or objects identified should be photographed if possible and left in situ until an agreement has been reached, in consultation with the NMS, the NMI, the contracting authority and the PA, to remove them. Finds of archaeological significance that are in threat of being damaged or irretrievably lost may be retrieved. The NMS, NMI, the contracting authority, and the PA should be immediately informed of the find.
- Submerged remains/objects are to be photographed using an underwater digital camera.

Type B – this type of underwater survey should be carried out where water is of such depth and/or where there is insufficient clarity in the water column to enable visual inspection by way of Type A Survey. The survey should include the following:

- A desktop/baseline study.

- A field/walkover survey of any foreshore/riverbank or other element.
- A dive and metal detector survey.

Type B Surveys incorporate the requirements for Type A Surveys outlined above, and include archaeological dive and metal detector surveys.

Overview of Survey B Requirements

- Breathing apparatus/dive equipment (either commercial SCUBA or full surface supplied dive gear) and other dedicated equipment (such as compressors, dive panels or lifelines) will be needed to safely carry out all diving, as required for this type of survey.
- The survey must be carried out by a team of underwater archaeologists whose members are suitably qualified and experienced in both diving and underwater archaeology.
- Each underwater survey area should be subject to a systematic visual and metal detector survey conducted by the archaeological divers, to identify any evidence for archaeological remains (structures/features/ deposits) and archaeological objects located in, or on the bed of, the water body.
- The proposed survey methodology will be submitted to the contracting authority for review and agreement with the PA, and for ultimate approval by the NMS through the licensing process. The survey will be carried out using one of the following methods:
  - A circular search pattern working out from a fixed point (such as a weighted buoy from surface).
  - A survey grid with a baseline established in the field that can facilitate a jackstay survey search for survey control.
  - An alternative agreed method that allows for full visual and metal detection survey of the required area.
- A suitable and accredited underwater metal detector should be used with the location and extents of any structures/features/deposits/artefacts mapped and georeferenced, as detailed above.
- The types of equipment and instruments to be used should be detailed in the MS that accompanies the licence application, to be approved by the contracting authority before being submitted to the NMS.
- The underwater survey will be conducted over the entire length of the waterbody within the area potentially affected by the proposed scheme. The locations of all identified archaeological remains and objects will be recorded by one of the following methods:
  - Communications relayed to the surface tied into a baseline.
  - USBL (ultra-short baseline) or SSBL (super-short baseline) as an underwater acoustic positioning and tracking system to an on-board computer.
  - Fixed positioning via a surface marker buoy and georeferenced using a handheld GPS or DGPS from a support vessel on the surface.
- All remains/finds are to be photographed in situ using an underwater digital stills camera and/or underwater digital video camera and other equipment, as appropriate to the task. Underwater photogrammetry should be carried out where appropriate.
- The topography of the river, lake or seabed in the survey area should be recorded in plan and section at appropriate scales (1:50 or 1:20 where scale allows). Survey data is to be in Irish Transverse Mercator (ITM) (EPSG 2157) and with reference to recorded levels (OPW data or equivalent) (Ordnance Datum Malin Head).

- As with Type A surveys, any constraints that impede completion of the survey (such as the presence of immovable obstacles or areas unsuitable for survey) are to be recorded, described, and mapped.

Type C – this type of underwater survey should be carried out where the area is large in scale and therefore logistically impracticable for a full archaeological dive/survey. The survey should include the following:

- A desktop/baseline study.
- A field/walkover survey of accessible areas.
- A geophysical survey.
- A targeted dive and metal detector survey of known sites, identified geophysical anomalies and areas of high archaeological potential identified from DBA and other investigations.

Overview of Survey Type C Requirements

- As with the other two survey types a detailed desktop study should inform Type C Survey.
- Only appropriately qualified and competent professionals working under licence from the NMS should carry out the survey.
- The geophysical survey should be carried out to specifications issued by the PA, in consultation with the contracting authority, and agreed with the NMS.
- The results of the survey should be interpreted by a suitably qualified and experienced underwater archaeo-geophysicist.
- The location and type of site will inform what equipment can be used/deployed. Ideally, the full swathe of geophysical survey equipment should be used, including side scan sonar, magnetometer, multibeam and sub-bottom profiler (see below).
- Following interpretation of the data an archaeological dive/survey should be carried out at a minimum on all identified geophysical anomalies that have the potential to be archaeological in nature, unless they can be avoided by the works for the FRS, with no archaeological impact (either direct or indirect), and thereby allowing for preservation in situ. A dive/survey may also be required for the entire project area.
- The methodologies for Type C surveys should be submitted to the contracting authority for review by the PA and then submitted for approval to the NMS in the licensing process.

River depths, riverbed types and water velocity and clarity can greatly vary even in a short stretch of a river. A combination of wading, snorkelling, diving, and geophysical surveys may therefore be required to properly assess the archaeological potential of a riverbed and its banks. At times, it may not be possible to determine the type of survey required until in-water survey work begins; and if this is the case, then the underwater archaeologist should have the capability and resources on site to carry out all the necessary surveys, whether wade, snorkel and/or dive/surveys (Survey Types A, B or C as above). The survey type deployed will depend on the type of site, time of year, depth of water at site, scale of area to be surveyed, and conditions at the site. The PA will advise the contracting authority on the timing of such UAIA, and they should seek to have such undertaken at the earliest possible time (but ideally at EIA compilation stage). In certain instances, aspects of these surveys (such as metal detecting or dive inspections) may also form part of the post-consent or approval mitigations under the Schedule of Environmental Commitments, rather than forming a part of the EIA process.

Geophysical Survey: Side-scan Sonar, Magnetometry, Single Beam Echosounder, Multibeam Echosounder, Sub-Bottom Profiling

Where works are due to take place within fresh watercourses, lower foreshore areas or subtidal zones, and are large in scale, a geophysical survey may be appropriate. The scale in many cases determines whether this type of survey is the most viable first-option phase of an assessment, as a large area may make individual archaeological diver surveys logistically impractical and cost prohibitive. In such a case, a geophysical survey may be undertaken that will allow for the identification of archaeological sites, features, or objects.[15] The use of a detection device (metal detector or magnetometer) to search for archaeology requires a detection device consent. The use of other geophysical equipment with the intention or surveying a known or potential historic wreck or archaeological object requires a dive/survey licence.

Geophysical surveys can comprise several detection techniques, including:

- **Side-scan sonar**, which can map large swathes of a river, lake or seabed using sonar beams (single or dual) to acquire imagery of what lies on the bed.
- **Magnetometry**, which can detect ferrous and non-ferrous material on or within the river, lake or seabed.
- **Singlebeam and multibeam echosounder surveys**. Singlebeam echosounder surveys determine depths and create basic bathymetric maps, while multibeam echosounder surveys use a fan of acoustic beams providing much greater resolution and detail, and are most employed to provide full coverage of seafloors, riverbeds and lakebeds.
- **Sub-bottom profiling survey**, using seismology, which can detect various marine sediment layers beneath the riverbed/seabed and therefore identify changes in stratigraphy that may indicate submerged palaeo-landscape materials, wreck remains and artefactual material.

Used in combination, the results from these geophysical techniques can provide important information of large-scale areas that in turn allows for the targeting of areas that are of archaeological potential. As noted above, the results from a geophysical survey should be interpreted by a suitably qualified and experienced archaeo-geophysicist. The interpreted results may identify “anomalies” that have archaeological potential and these in turn may need to be inspected by an archaeological diver to assess their nature and extent if they cannot be sufficiently avoided. The results of the dive/survey will inform the UAIA and further archaeological mitigation, if required (for example archaeological test excavation/full excavation).

3.7 Underwater Archaeological Impact Assessment Reporting Requirements

A full descriptive report for all types of surveys should be prepared and should include as a minimum:

- A description of the location of any material cultural remains that may be present on or above the riverbed/waterway. In addition, the survey should record a number of aspects relating to the general setting of these remains, including width of river, lake, depth, flow direction and current flow rate, visibility, hazards, bottom type, and height of banks. Any material of archaeological or possible archaeological significance should be fully described.

[15] The NMS advises on these specifications.

- An assessment of potential alluvial archaeology and palaeo river channels in the surrounding flood plains.
- A detailed digital photographic record of the general setting of the watercourses and riverbed, as well as the condition of any features or finds of an archaeological nature. Photogrammetry of features or sites should be used, where appropriate.
- Illustrations of the topography in the survey areas, including contours and surface details, which will be depicted in plan and section at appropriate scales (1:50 or 1:20 where scale allows).
- Survey data located in ITM (EPSG 2157) and with reference to recorded levels (Ordnance Datum Malin Head).
- Placement of the areas surveyed within their wider landscape context to include the nature, extent and use of the waterbody over time.
- Sufficient historical mapping and historical and archaeological research to illustrate the changing nature of the watercourse through time and to assist with placing in context any feature or structure known or identified during the surveys.

Such reports should be integrated into, and form an appendix to, the EIAR if carried out as part of the EIA, or a standalone report, if undertaken as part of pre- or post-consent mitigation works. Appendix 1 below provides more detailed templates for such reports.

3.8 Other Types of Investigation

Other investigations that could inform the EIA and other assessments during various phases of the FRS include (and are not limited to):

- Geophysical surveys (both land-based and water-based).
- Test excavations.
- Metal detection surveys.
- Archaeological building/structural surveys.
- Photogrammetric surveys.
- Specialist historical research.
- LiDAR assessments.
- Assessment and monitoring of SI works (such as geotechnical investigations).
- Monitoring of groundworks (may follow on from some of the recommendations made in an EIAR/UAIA).
- Digital Elevation Models/Digital Surface Models/Digital Terrain Models data collection and assessment.
- Visual impact assessment and assessment of impact on setting.

All such investigations, when employed, should be carried out by appropriately qualified and competent professionals under licence from the NMS, where required. The need for, and scope of, such investigations are considered by the contracting authority on a case-by-case basis, in close liaison with the PA. With the contracting authority's approval, the PA will seek approval from the NMS through the licensing process and approval of submitted methodologies. All archaeological methodologies accompanying the required licence or consent applications should be submitted to the contracting authority and reviewed by the PA before being submitted to the NMS for approval.

3.9 Reporting

A full, descriptive report of the outcome of the assessments, including UAIA and all terrestrial/underwater survey types, should be prepared for submission to the contracting authority, which may engage the PA for review. Following the PA's review, the report will be submitted to the NMS for comment as early in the design process as practicable. The NMS may make further recommendations as part of the planning process. Where appropriate, reports should form an appendix to the EIAR (if carried out as part of the EIA), or as standalone reports, reports for post-consent mitigation works, or reports for sub-threshold works.

The assessment report should include, as a minimum, the following (see Appendix 1 for a full list of required contents and suggested report templates):

- Results of the desktop/baseline study.
- Results of the field and underwater surveys, including descriptions of the locations of any archaeological remains present within the watercourse or in adjacent areas (that is, foreshore/riverbank/lakeshore).
- Accurate mapping and inventory (including photography) of any identified recorded and previously unrecorded archaeological features/deposits, sites/monuments, or objects, built heritage or cultural heritage. Findings should be presented in map and inventory form with associated geospatial data; where possible, the full (known) extent of archaeology identified should be mapped using polygons. For ease of use each item, regardless of designation, should be numbered using a sequential system of identifiers.
- A detailed Archaeological Impact Statement, which includes drawings/mapping that clearly show impacts and effects, and recommendations for appropriate mitigation of any adverse impacts and effects to known or potential archaeological heritage.

The terms "impact" and "effect" should be clearly defined and used consistently in EIARs and UAIAs. "Impact" is defined as the change caused by the development. "Effect" is the result of that change. In real terms, an example of an impact would be construction of a flood wall on top of nineteenth-century quay walls (*impact* on the cultural heritage asset) which has the *effect* of diminishing the historic setting of the quay wall. In this case the effect may be described as adverse (negative). The assessment reports should also assess the magnitude of impacts:

Table 2: Magnitude of Impact and Criteria/Typical Descriptions

Magnitude of Impact	Criteria/Typical Descriptions
Very High	Major alteration to, or complete loss of, key archaeological heritage environment. Effects likely to be experienced at a very large-scale, considered permanent and irreversible.
High	Notable or longer-term change to key archaeological heritage environment.
Medium	Moderate or longer-term change over a restricted area or a moderate change in key archaeological heritage environment.
Low	Minor short- or medium-term change over a restricted area or a minor change in key archaeological heritage environment.
Very Low/ Negligible	Imperceptible change in archaeological heritage environment.

The magnitude of impact depends on the nature, scale, duration, and reversibility of the particular change that is envisaged, the location in which it is proposed, and the overall effect on a particular archaeological, built heritage and/or cultural heritage site and receiving environment.

The effects should be assessed in terms of predicted significance:

Table 3: Predicted significance.

Imperceptible	An effect capable of measurement but without significant consequences.
Not Significant	An effect that causes noticeable changes in the character of the archaeological heritage environment but without significant consequences.
Slight	An effect that causes noticeable changes in the character of the archaeological heritage environment without effecting its importance.
Moderate	An effect that is not extreme or excessive; that does not alter the character of the archaeological heritage environment in a manner; that is consistent with existing and emerging baseline trends.
Significant	An effect which, by its character, magnitude, duration or intensity alters an important aspect of the archaeological heritage environment.
Very Significant	An effect which, by its character, magnitude, duration or intensity significantly alters most of an important aspect of the archaeological heritage environment.
Profound	An effect which obliterates important characteristics

The significance of effect is determined by comparing the magnitude of the impact with the importance and sensitivity of the archaeological heritage environment/receptor. The professional judgement of the archaeological consultant plays a key role in determining the significance of the effect.

The report should make recommendations for further archaeological mitigation, which may include some or all the following:

- Preservation in situ/avoidance (the preferred option).
- Archaeological test excavation to establish the nature, extent and date, significance/importance of identified or potential archaeology.
- Full excavation (preservation by record) where archaeological heritage cannot be avoided.
- Archaeological monitoring (terrestrial and underwater, such as SI works or dredging operations).
- Metal detection assessment of all or a percentage of dredged/excavated spoil as part of a finds-retrieval strategy (that is, the material is spread and systematically metal detected).
- Follow-up archaeological inspections (terrestrial and/or underwater), for example to assess that there are no residual impacts (such as hydrological impacts or scouring,) due to the FRS works (see Section 3.2).

Figure 4: A National Monuments Service underwater archaeologist recording a logboat discovered in Lough Corrib, Co. Galway (©Photographic Archive, National Monuments Service, Government of Ireland).

4

Archaeological Mitigation for Flood Relief Schemes

4. Archaeological Mitigation for Flood Relief Schemes

Once the likely direct, indirect and cumulative impacts and effects on archaeological heritage have been identified and assessed, measures to mitigate any adverse effects should be devised and implemented, with the review and approval of the contracting authority and the NMS (and with guidance from the PA). Mitigation measures contained in the EIAR (and/or planning conditions) can be included in a compendium of mitigation and monitoring commitments, often referred to as a Schedule of Commitments/Schedule of Mitigations under the EIA process. This should comprise of a list of relevant measures that the FRS contracting authority is obligated to undertake to mitigate adverse effects. It is in the contracting authority's interest, as the applicant, to ensure that all undertakings to mitigate are fully understood and accepted and that the resources are available to ensure compliance with such commitments (such as preservation in situ, test-excavations, monitoring, archaeological excavation, post-excavation requirements and, where relevant, publication of results and other forms of dissemination).

4.1 Overview of Established Mitigation Strategies

There are four established strategies for the mitigation of adverse effects — avoidance, prevention, reduction and offsetting. Further details of these strategies are available in the *Guidelines on the Information to be Contained in Environmental Impact Assessment Reports* (EPA 2022) and the following is a summary, tailored to archaeological heritage mitigation strategies.

Mitigation by Avoidance/Preservation in situ — when no impact is caused, often through consideration of alternatives (that is, a design solution). Mitigation by Avoidance is generally the most time- and cost-effective form of impact mitigation. Avoidance will, in general, be designed into the FRS at Stage I, and may require defined exclusion zones, buffers, vibration monitoring and periodic inspection.

Mitigation by Prevention — when a potential impact is prevented by a measure to avoid the possibility of the impact occurring. This includes measures to prevent accidental events giving rise to adverse effects (for example, fencing off a vulnerable site on land or temporarily bunding a site in water to prevent accidental damage during construction).

Mitigation by Reduction — when an impact is reduced or lessened. This is a very common strategy for dealing with effects that cannot be avoided. It can involve, for example, a reduction of visual impact on nearby built heritage (such as town walls), while retaining the integrity of the feature/monument by using barriers or planting to screen off the FRS infrastructure.

Mitigation by Remedy/Offsetting — when an adverse effect is compensated for by a remedial action and balanced by a positive effect (for example, archaeological excavation, research, recording and publishing/dissemination of the information acquired, or the provision of a new amenity area to compensate for the unavoidable loss of access to a heritage asset). Offsetting might also include compensatory works that seek to restore the environment to an approximation of its previous condition (such as reinstating/conserving historic buildings, stone walls or other features). Mitigation by remedy or offsetting may be the only option available for projects that cannot avoid significant adverse effects due to their need to be located on a particular site or within a particular area.

Some mitigation measures may respond to exceedances detected by monitoring and are expressed as "if"/"then" measures (for instance, "If unidentified archaeology is encountered during construction, then it will either be avoided or preserved by record"). Commitments to undertake such measures should be clearly stated in the Schedule of Commitments within the EIAR, or in the case of sub-threshold schemes, they should form part of planning conditions issued by the local authority based on the recommendations made in the AIA/ UAIA and vetted and approved by the NMS.

Avoidance (Preservation in Situ)

Preservation *in situ* of archaeological heritage, and all cultural heritage assets, including those underwater, should be a primary objective of the archaeological heritage assessment component of FRS projects. This approach is embedded in the EIA process and across other established guidance, including the UNESCO *Convention on the Protection of the Underwater Cultural Heritage* and its Annex Rules[16] and the UNESCO 1992 *Convention for the Protection of the Archaeological Heritage of Europe* (revised).[17] It is also consistent with government policy as outlined in the *Framework and Principles for the Protection of the Archaeological Heritage* (DAHGI 1999, 33), which requires a presumption in favour of avoidance of impacts.[18] This includes:

- Avoiding locations or designs containing or effecting archaeological heritage features.
- Minimising impacts on such features.
- Remedying any changes in context or fabric that may occur.

Mitigation by avoidance should occur, to the greatest extent possible, during the pre-design or design phases (Stage I), when the presence, location, and extent of archaeological or other cultural heritage assets are known (such as recorded sites or those identified during SI works). Preservation in situ may also be used where archaeology discovered during construction (Stage IV) can be preserved with suitable measures, such as changing the construction design, avoiding impacts using buffer zones, physical protection (for example covering with geotextile and soils), once this is agreed with the NMS (and the NMI, where relevant). However, preservation in situ after the discovery of archaeological heritage within Stage IV will normally require a variation to the design and construction, which can be costly and impact on the programme of works, and should therefore be avoided, where possible, through adequate prior archaeological assessments. This is particularly critical when dealing with sites underwater.

[16] https://unesdoc.unesco.org/ark:/48223/pf0000126065

[17] https://www.coe.int/en/web/culture-and-heritage/valletta-convention

[18] https://www.archaeology.ie/sites/default/files/media/publications/framework-and-principles-for-protection-of-archaeological-heritage.pdf

4.2 Advance Archaeological Test Excavations

Where recommended by the NMS, archaeological test excavations should be undertaken at Stage I, in order to inform the FRS design and manage the risk to archaeology. Similarly, where warranted and recommended by the NMS, SI works undertaken at Stage I should be dovetailed with archaeological test excavation. The EIAR may also require that archaeological test excavations be carried out at Stage III before the start of the main contract construction works (Stage IV), to inform the detailed design (Stage III) of the FRS. The purpose of test excavation is to collect data on the presence, location, extent, type, character, quality, date, scale, and significance of the archaeology so that a reasoned mitigation strategy can be devised and presented to the NMS for approval. The archaeological test investigations may be informed by the results of the DBA, historical research, field surveys and any previous geophysical surveys, LiDAR assessments, geoarchaeological deposit modelling where available and fieldwork. The location and overall area of test trenching undertaken should be commensurate with the potential archaeological impact of the proposed FRS project. A detailed MS needs to accompany each licence application, and this should include specific details on the number, extent and location of proposed test trenches and a finds retrieval strategy (all test excavations will require accompanying metal detection). The MS should be reviewed by the contracting authority, which will invite the input of the PA in advance of submission to the NMS for review and approval.

Preferred Strategy for Test Excavations

The following should be noted when devising test excavation strategies for EIA/UAIA purposes (both terrestrial and underwater):

- Non-stratified overburden and/or modern material (such as concrete surfaces) may be removed by machine.
- No machine excavation will be permitted on upstanding archaeological remains or on the site of known buried monuments, structures or features, areas where human remains are likely, unless impracticable, for example, on modern surfaces such as car parks, and with agreement of the NMS, and all machine excavations should be subject to close archaeological monitoring during the removal of the modern material.
- Excavation using hand tools and recording (and metal detection) to commence once potential archaeological/stratified deposits are reached to characterise and establish the nature, extent, date and depth of the archaeological materials. Excavation to be limited to discreet areas required to characterise archaeology, recover samples for dating, and remainder preserved *in situ* using appropriate methods for protection.
- Trenches should be of sufficient size to allow the archaeologist to carry out full test excavations safely and adequately, metal detection, recording and interpretation of exposed sections (including when trench is shored).
- Removed spoil/fill to be spread, inspected and metal detected as part of the Finds Retrieval Strategy. Metal detection should also be carried out on in situ archaeological horizons before their excavation.
- Underwater test excavation should be undertaken by the archaeologist by means of hand or controlled suction dredge; if the latter is being used, then provision for the sieving of the material being dredged should form part of the finds-retrieval strategy.
- Test excavation extent should reach work impact depths, plus an appropriate buffer, or when natural, sterile deposits or geological horizon are reached.

- Archaeological structures, features, and deposits should be protected and retained in situ pending further advice from the NMS. This will be critical for underwater discoveries, to ensure that they remain stable and secure until a considered decision can be made by the NMS on further mitigation measures required.
- All trench positions and any archaeological materials therein should be surveyed and recorded with GPS relevant to national grid coordinates (ITM), with vertical levels relevant to Ordnance Datum (OD) (Malin Head).

Reporting Requirements

The initial test excavation report and any subsequent reports relating to the site should include the following:

- Techniques and methods utilised to compile the report, including the methods of excavation, sampling strategy relative to overall impacts, and recording.
- Location of test trenches (including the grid coordinates (ITM) of all the trench corners and level OD of base of cuttings and archaeological deposits, features, and structures) and a brief summary of their contents.
- All archaeological features/contexts in each test trench to be given a unique identifier number identifiable to that test trench. It is not appropriate to use one number for features/contexts in multiple test trenches.
- Total area of the excavation in square metres and total volume of excavated material in metres cubed to be provided as accurately as possible. Area of test excavations to be expressed as a percentage of total development area.
- A clear drawing, with context numbers, levels, and explanatory text, showing the layout of archaeological features in relation to the proposed FRS development, historic maps where appropriate, and with all impacts concisely indicated.
- Stratigraphic sequence (from base upwards) with numbered contexts and a brief description of each layer/feature with dimensions and sufficient explanatory photographs and drawings.
- Upper and lower levels OD of each trench and their archaeological deposits.
- A record of the number and type of finds recovered.
- A finds catalogue to record any artefacts recovered, in accordance with NMI standards, including the holding address for artefacts and excavation records. Specialist reports on classes of archaeological objects should be included, where appropriate, and the results integrated into the stratigraphic report.
- An analysis of any samples taken, together with any scientific dating evidence procured and the results of same.
- A record of archaeological structures/features identified, shown on scaled plans, with ITM corner co-ordinates and levels OD. The trench section should be drawn manually at scale of 1:10 or 1:20 (where practicable) and should include levels OD and context numbers, photogrammetry, where practicable, as well as explanatory text to make reading of sections straightforward. Trenches should be large enough to allow the archaeologist to do this.
- A complete photographic record of the test excavation procedure. If detailed section drawing was not possible, the reason(s) why should be stated.

Refer to Appendix 1 for a suggested report template.

4.3 Archaeological Excavation ("Preservation by Record")

Where impacts on archaeology cannot be avoided, a full excavation should be carried out to mitigate the impact of the works by preserving the archaeological remains by record. Preservation by record is a mitigation of last resort and this principle is an important part of state policy in relation to archaeological heritage. All reasonable options to avoid impacting archaeological remains must be considered, and only when these alternatives have been proven unviable in the judgement of the NMS should preservation by record be undertaken. Before an approval is provided for full archaeological excavation the NMS will require sufficient evidence from the contracting authority that all options for preservation in situ have been exhausted.

As also stated in the Department's *Policy and Guidelines on Archaeological Excavation* (1999),[19] in all cases the proposed methods of excavation must be appropriate to the types of archaeology within the site and designed to maximise the amount of new knowledge of the past that can be obtained from the archaeological investigation. The methodology should also be informed by any prior DBA, field survey, and other investigations such as geophysical surveys, historical research, and archaeological test investigations. This applies across all archaeological mitigation strategies, including archaeological monitoring, where certain monitoring requirements (such as for dredging works) must be appropriate to the needs of the archaeological strategy. The methodology should be reviewed by the PA and approved by the contracting authority before being submitted to the NMS for approval. Mitigation relating to residual impact of the excavation on remaining archaeological deposits/features/structures may also need to be addressed.

The methodology for the excavation will require approval as part of the archaeological licensing process or Ministerial Consent process (National Monuments Acts 1930 to 2014). A licence must be applied for with a site-specific methodology that outlines the strategy to be employed during the proposed excavation. Such a strategy, as outlined in the Department's *Policy and Guidelines on Archaeological Excavation* (1999), should include (at a minimum) information under the following headings:

- Archaeological and historical background to the proposed excavation.
- Archaeological research priorities of the proposed excavation, based on prior research, historical and archaeological background.
- The size, location, and scope of the proposed excavation.
- The methods of excavation envisaged. If underwater, then the methodology should include details on the underwater archaeological dive team, excavation process, how the site will be protected during downtime until excavation has been completed.
- The size and experience of the team involved.
- Proposed sampling strategies and proposals for dealing with organic materials and human remains in the event of them being encountered.
- The proposed artefact-recovery strategy (metal detection is a standard requirement on all FRS related excavations).
- The proposed publication/public dissemination programme.

[19] https://www.archaeology.ie/sites/default/files/media/publications/excavation-policy-and-guidelines.pdf

Additional information presented in the methodology may include:

- Access and egress from site.
- How the site/features/structures/objects will be secured and protected during the excavation when the team leaves the site each day.
- How the site will be excavated to maximise recovery methods (for example by hand-tools or by suction dredge with sieving of spoil on the surface).
- How structures/features/deposits/objects will be surveyed/georeferenced on site.
- How material will be safely recovered (in accordance with NMI standards).
- How material (including organic remains) will be stored during excavation (in accordance with NMI standards).

A full list of required contents for final excavation reports, and a suggested template, are given in Appendix 1.

4.4 Archaeological Monitoring

Archaeological monitoring is generally undertaken following prior archaeological assessments being carried out for the EIAR/UAIA, with the objective of identifying and protecting previously unidentified archaeological deposits, features, structures, objects, wrecks, and other materials which may be encountered or otherwise affected by the FRS works.

As archaeological monitoring is generally undertaken during the works contractor's construction programme (Stage IV), it is essential that it is not carried out as a primary means of mitigation but rather as a method of dealing with any residual risks to archaeological heritage that remain following the completion of prior assessments and mitigations. When archaeology is discovered during construction works it can often lead to delays whilst the impacts are mitigated. It is critical that, where possible, detailed cultural heritage assessments and mitigations are carried out to identify and manage these risks. Archaeological monitoring can include (but is not limited to):

- Monitoring of groundworks (brown- or green-field sites/works in urban areas/street or road take/ riverbanks/lakeshore).
- Monitoring of SI works (geotechnical test pits, grab samples) (Stage I).
- Monitoring works on the coastal/foreshore/intertidal zone.
- Monitoring of dredging works.
- Monitoring of dredged spoil through metal detection assessment.
- Periodic/intermittent monitoring.

In the first instance, the archaeological contractor should draft a MS for the contracting authority, which will be reviewed by the PA. The MS and licence or consent applications will be submitted to the NMS for review and approval.

Dredge Spoil Monitoring and Assessment

In certain cases, the archaeological monitoring methodology for an FRS project should include the archaeological assessment of dredged/excavated spoil that is removed from riverbeds, streambeds, alluvial environments, and other waterways. This material, particularly in urban areas, can be very rich in archaeological materials and objects, including organic materials. It is generally the approach of the NMS, in consultation with the NMI, that dredged spoil is assessed by means of spreading, searching for objects, and metal detection (for metal objects). In order for artefacts to be accurately provenanced, where practicable, searching and metal detection should take place before bulk excavations occur, for instance where riverbeds have been temporarily dewatered and exposed. The following general approach is applied on a case-by-case basis, where dredged spoil is being removed off-site:

- 100% volume assessment of spoil – all spoil from areas being dredged within the Zone of Archaeological Potential for an historic town, identified area of high archaeological potential, within or in proximity of a wreck or of a Zone of Notification of a Recorded Monument, at or near a monument that is subject to Section 14 of the National Monuments 1930-2014 Acts, or in areas that are traditionally known to have high potential to contain archaeological material (such as fording and bridging points or rivers in historic towns).
- 25% volume assessment of spoil from all other areas.
- Scaling of assessment of dredged spoil. In general, the NMS will consider the scaling up or down of 25% volume assessment of the dredged spoil based on the artefactual retrieval results over an agreed time.

Sufficient archaeological personnel need to be on site to monitor all aspects of works for an FRS, including work in water. Suitably qualified underwater archaeological personnel should be available to carry out rapid inspections following underwater discoveries to ensure assessment and stabilisation. To illustrate the need for adequate provision of competent and experienced personnel, and to highlight areas that need consideration when undertaking such work, archaeological monitoring of dredging/excavation operations may include some or all the following and may have some or all the associated requirements:

Table 4: Underwater activities and requirements

Activity	Requirements
24-hour Monitoring	Sufficient archaeological personnel to cover monitoring works.
Archaeological Excavation	A full archaeological excavation/underwater team if the site/feature/object cannot be avoided following inspection.
Communications	A communications strategy to ensure that the plant operator will suspend dredging/excavations if potential archaeology is identified.
Dredged Spoil	Management of the archaeological team to assess dredged spoil.
Finds Recovery	A methodology to identify, locate, recover and record find locations; and to assess if the artefacts are associated with an archaeological site or are isolated finds.

Table 4: Underwater activities and requirements cont'd

Activity	Requirements
High-level Management	Liaison with the contracting authority, relevant consultants and service providers (PA, OPW, local authority, works contractor, archaeological contractor, plant operators and own archaeological team; regular reports to contracting authority, for review by the PA).
In River/Lake Shore/ Nearshore	Monitoring from bank/shore if this allows full view of material being dredged.
Licences/Consents	MS and licence/consent application compilation and submission.
Multiple Dredging Works	Multiple monitoring archaeologists.
Post-excavation Works	As per standards for all archaeological excavation, with added interpretation of underwater finds and discoveries. Specialist analysis and conservation for waterlogged finds.
Reporting	Dedicated Dredge Monitoring Report to form part of Final Report.
Team Management	Coordinating archaeological monitoring team to cover multiple plant and machinery; daily logs; regular reports.
Underwater Discovery and Mitigation	Rapid archaeological dive inspection by suitably qualified and experienced underwater archaeologists to assess archaeology and to secure site feature/artefacts pending agreed further mitigation.
Waterlogged Material	Recovery of material that requires rapid first-aid and temporary storage in suitable holding tanks of water.
Within Watercourse/ Offshore	Monitoring archaeologists should be on/near the dredge plant to monitor the works.

Licensing of Archaeological Monitoring

All archaeological monitoring should be carried out under licence. This will ensure that there are no avoidable delays arising from the subsequent application for a licence to mitigate the impacts of the development on any archaeology that may be discovered. If the impacted archaeology is under water, both a Section 26 (National Monuments Act 1930) licence and Section 3 (National Monuments Act (amendment) 1987) licence may be required (see Section 3.2).

Follow-up Inspections

There may be a need for periodic follow-up inspections after the main works have been completed, as part of the agreed mitigation. These may be required to assess the effectiveness of certain mitigation measures that were put in place (for example, barriers or screening to prevent or reduce impacts to sensitive archaeological, or built heritage sites, stabilisation mechanisms for underwater sites or features) or to inspect newly discovered sites/features/objects that were preserved in situ to ensure that no unforeseen residual impacts are occurring.

Figure 5: Detail of pommel of a Viking sword discovered during dredging of the River Moy, Co. Mayo in 1963 (© National Museum of Ireland).

Further Reading

Further Reading

Architectural Heritage Protection Guidelines for Planning Authorities. Department of Arts, Heritage and the Gaeltacht, 2011. Available to download at: https://www.buildingsofireland.ie/app/uploads/2019/10/Architectural-Heritage-Protection-Guidelines-for-Planning-Authorities-2011.pdf

Places for People, Government Policy on Architecture 2009-2015. Available to download at: https://assets.gov.ie/224573/aac6d6ce-8a48-49a8-85f0-76da56be8ba4.pdf

Interpretation of Definitions of Project Categories of Annex I and II of the EIA Directive. European Union, 2015. Available for download at: http://ec.europa.eu/environment/eia/pdf/cover_2015_en.pdf

Guidelines on the Information to be Contained in Environmental Impact Statements. Environmental Protection Authority, 2002. Available for download at: http://www.epa.ie/pubs/advice/ea/guidelines/Eproject archaeologist_Guidelines_EIS_2002.pdf

Advice Notes on Current Practice (in the Preparation of Environmental Impact Statements), 2003. Environmental Protection Authority. Available for download at: https://www.epa.ie/pubs/advice/ea/guidelines/Eproject archaeologist_advice_on_EIS_2003.pdf

Relevant forms (NMS Form 1 & 2) for Archaeological Purposes and Criteria Used by NMS for Assessment of Requests. Available to download at: http://www.epa.ie/pubs/forms/lic/das/DaS_GuidanceDocumentV7.pdf

Electronic Data on Built Heritage Sites, Structures and Features: www.buildingsofireland.ie

Framework and Principles for the Protection of the Archaeological Heritage, Department of Culture, Heritage and the Gaeltacht, 1999. Available to download at: https://www.archaeology.ie/sites/default/files/media/publications/framework-and-principles-for-protection-of-archaeological-heritage.pdf

Policy and Guidelines on Archaeological Excavation, Department of Culture, Heritage and the Gaeltacht, 1999. Available to download at: https://www.archaeology.ie/sites/default/files/media/publications/excavation-policy-and-guidelines.pdf

Guidelines for Authors of Reports on Archaeological Excavation, NMS, Department of Housing, Local Government and Heritage

Guidelines for Planning Authorities and An Bord Pleanála on Carrying out Environmental Impact Assessment, 2013, Department of Housing, Local Government and Heritage

National Policy on Town Defences. Department of Environment, Heritage and Local Government. Available for download at: https://www.archaeology.ie/sites/default/files/media/publications/national-policy-on-town-defences.pdf

Guidelines for Licences and Consents. Available for download at: https://www.archaeology.ie/publications-forms-legislation

Guidelines for the Assessment of Archaeological Heritage Impacts on National Road Schemes. National Roads Authority, 2005a. Available for download at: https://www.tiipublications.ie/downloads/SRM/12-Archaeology-Planning-Guidelines-2005.pdf

Guidelines for the Assessment of Built Heritage Impacts on National Road Schemes. National Roads Authority, 2005b. Available for download at: https://www.tiipublications.ie/downloads/SRM/14-Architectural-Planning-Guidelines-2005.pdf

Environmental Impact Assessment of National Road Schemes – A Practical Guide. National Roads Authority, 2008. Available for download at: https://www.tii.ie/technical-services/environment/planning/Environmental-Impact-Assessment-of-National-Road-Schemes-Practical-Guide.pdf

UNESCO Convention on the Protection of the Underwater Cultural Heritage and its Annex Rules, 2001. Available at: https://unesdoc.unesco.org/ark:/48223/pf0000126065

Convention for the Protection of the Archaeological Heritage of Europe (revised) (Valletta, 1992). Available at: https://www.coe.int/en/web/culture-and-heritage/valletta-convention

Wreck Inventory of Ireland Database (WIID). Hard copy accessible through appointment with UAU.

Wreck Viewer online (with additional access to WIID): https://dahg.maps.arcgis.com/apps/webappviewer/index.html?id=89e50518e5f4437abfa6284ff39fd640

Prepared by Department of Housing,
Local Government and Heritage
gov.ie/housing

Rialtas na hÉireann
Government of Ireland