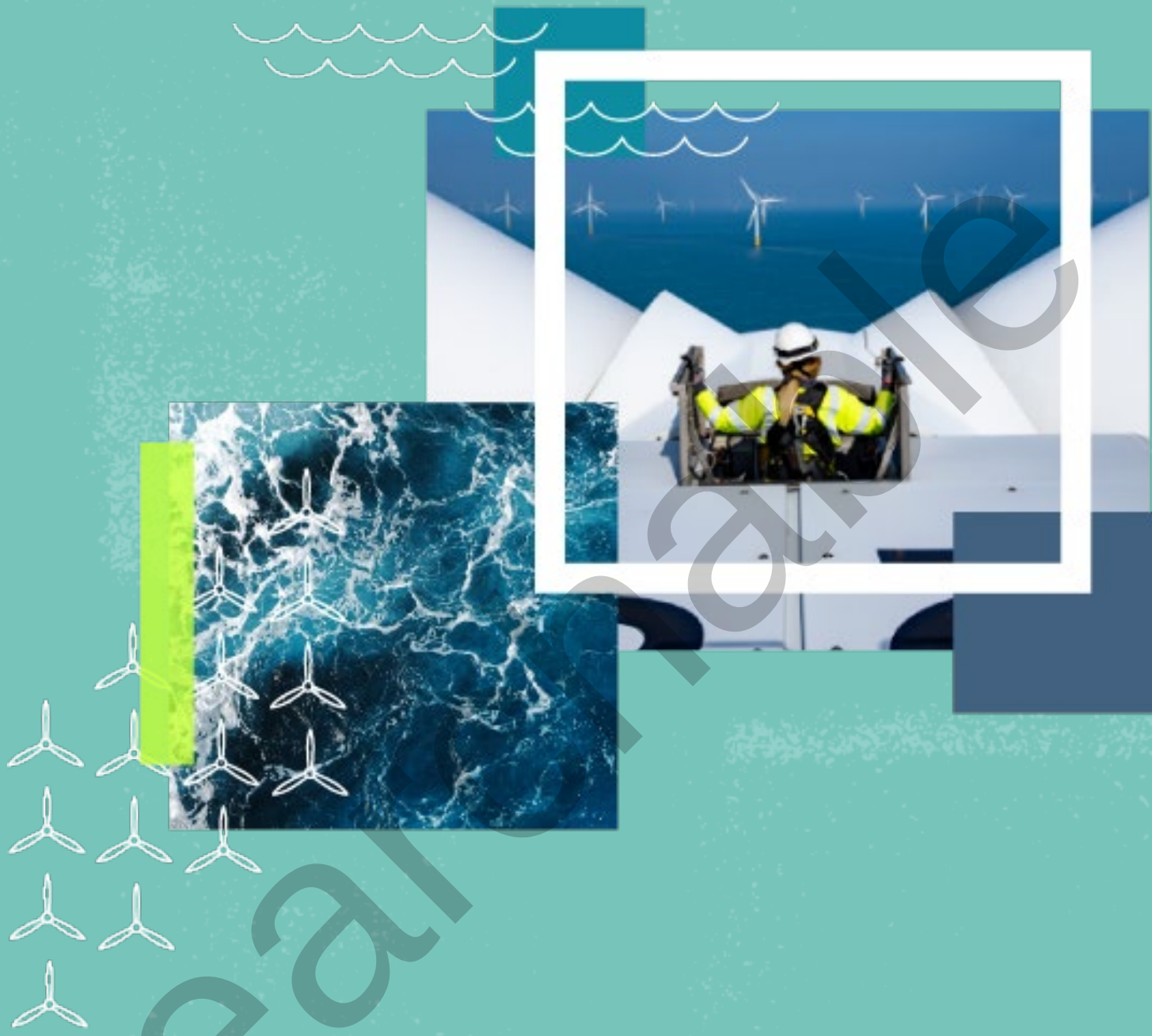

Arklow Bank Wind Park 2

Environmental Impact Assessment Report

Volume II, Chapter 18: Marine Archaeology and Cultural Heritage

sse Renewables

Version	Date	Status	Author	Reviewed by	Approved by
1.0	17/05/2024	Final (External)	ADCO	GoBe Consultants	Sure Partners Limited

Statement of authority

Name	Qualifications	Experience
Niall Brady	BA MA PhD FSA	Dr Brady is an archaeologist and a graduate of UCD (BA 1983, MA 1986) and Cornell University (MA 1993, PhD 1996). He developed his interest in underwater archaeology in the 1980s while working with the National Museum of Ireland, is founding director of the Archaeological Diving Company Ltd (ADCO) in 1999 and has been HSE Part III diver since 2000. Niall was project director for the Discovery Programme, Ireland's institute for advanced archaeological research, where he designed and implemented the Medieval Rural Settlement Project (2002-10). With more than four decades of experience in maritime-related research and resolution, Niall has extensive project management experience in the consultancy sector, and has carried out a large number of excavations, monitoring projects, and Environmental Impact Assessments on land and underwater. He has represented several high profile infrastructural projects at Oral Hearing planning enquiries, including the Corrib Onshore Pipeline project 2010; the Port of Cork Ringaskiddy Redevelopment project 2015, and Dublin Port Company's Alexandra Basin Redevelopment project 2015 and MP2 project 2022. He is editor and heritage team leader for Dublin Port Company's landmark Conservation Strategy publication (2024), and is currently engaged in a number of Offshore Renewable projects. Niall sits on several international committees, including the Society for Medieval Archaeology and Ruralia. He has been Honorary Editor for the Royal Society of Antiquaries of Ireland (2015-22) and is Associate Research Fellow at the Trinity Centre for Environmental History.

Contents

Figures

Tables

Glossary

Term	Meaning
Arklow Bank Wind Park 1 (ABWP1)	Arklow Bank Wind Park 1 consists of seven wind turbines, offshore export cable and inter-array cables. Arklow Bank Wind Park 1 has a capacity of 25.2 MW. Arklow Bank Wind Park 1 was constructed in 2003/04 and is owned and operated by Arklow Energy Limited. It remains the first and only operational offshore wind farm in Ireland.
Arklow Bank Wind Park 2 – Offshore Infrastructure	"The Proposed Development", Arklow Bank Wind Park 2 Offshore Infrastructure: This includes all elements under the existing Maritime Area Consent.
Arklow Bank Wind Park 2 (ABWP2) (the Project)	Arklow Bank Wind Park 2 (ABWP2) (The Project) is the onshore and offshore infrastructure. This EIAR is being prepared for the Offshore Infrastructure. Consents for the Onshore Grid Infrastructure (Planning Reference 310090) and Operations Maintenance Facility (Planning Reference 211316) has been granted on 26th May 2022 and 20th July 2022, respectively. • Arklow Bank Wind Park 2 Offshore Infrastructure: This includes all elements to be consented in accordance with the Maritime Area Consent. This is the subject of this EIAR and will be referred to as 'the Proposed Development' in the EIAR. • Arklow Bank Wind Park 2 Onshore Grid Infrastructure: This relates to the onshore grid infrastructure for which planning permission has been granted. • Arklow Bank Wind Park 2 Operations and Maintenance Facility (OMF): This includes the onshore and nearshore infrastructure at the OMF, for which planning permission has been granted. • Arklow Bank Wind Park 2 EirGrid Upgrade Works: any non-contestable grid upgrade works, consent to be sought and works to be completed by EirGrid.
Archaeological Exclusion Zone	Archaeological Exclusion Zones are site-specific buffer zones established around known and potential archaeological sites that are created to protect the site from direct impacts. The size of an AEZ will vary according the known or expected extent of the archaeological site, and can be modified based on updated survey data subject to the approval of the regulatory authority.
Archaeology Management Plan	Document that presents the protocols relating to archaeological mitigation in the course of the project life.
Array Area	The Array Area is the area within which the Wind Turbine Generators (WTGs), the Offshore Substation Platforms (OSPs), and associated cables (export, inter- array and interconnector cabling) and foundations will be installed.
Competent Authority (CA)	The authority designated as responsible for performing the duties arising from the EIA Directive as amended. For this application, the Competent Authority is An Bord Pleanála (ABP).

Term	Meaning
Environmental Impact Assessment (EIA)	An Environmental Impact Assessment (EIA) is a statutory process by which certain planned projects must be assessed before a formal decision to proceed can be made. It involves the collection and consideration of environmental information, which fulfils the assessment requirements of the Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment as amended by Directive 2014/52/EU of the European Parliament and of the Council (EIA Directive).
EirGrid	State-owned electric power transmission system operator (TSO) in Ireland and Transmission Asset Owner (TAO) for the Project's transmission assets.
Landfall	The area in which the offshore export cables make landfall and is the transitional area between the offshore cabling and the onshore cabling.
Maritime Area Consent (MAC)	A consent to occupy a specific part of the maritime area on a non-exclusive basis for the purpose of carrying out a Permitted Maritime Usage strictly in accordance with the conditions attached to the MAC granted on 22nd December 2022 with reference number 2022-MAC-002.
Mitigation Measure	Measure which would avoid, reduce, or remediate an impact.
Permitted Maritime Usage	The construction and operation of an offshore wind farm and associated infrastructure (including decommissioning and other works required on foot of any permission for such offshore wind farm).
The Application	The full set of documents that will be submitted to An Bord Pleanála in support of the consent application.
The Developer	Sure Partners Limited.

Acronyms

Term	Meaning
ABP	An Bord Pleanála
ABWP1	Arklow Bank Wind Park 1
ABWP2	Arklow Bank Wind Park 2
ADCO	Archaeological Diving Company Ltd
AEZ	Archaeological Exclusion Zone
AIA	Archaeological Impact Assessment
AMP	Archaeology Management Plan
BP	Before Present
CD	Chart Datum
CFE	Controlled Flow Excavation
CIA	Cumulative Impact Assessment
COWRIE	Collaborative Offshore Wind Research Into the Environment
CPT	Cone Penetration Test
DAHGI	Department of Arts, Heritage, Gaeltacht and the Islands
DCCAE	Department of the Environment, Climate and Communications
DCENR	Department of Communications, Energy and Natural Resources
DECC	Department of Environment, Climate and Communications
DELGH	Department of the Environment, Heritage and Local Government
DHLGH	Department of Housing, Local Government and Heritage
E	Easting
EEZ	Exclusive Economic Zone
EIAR	Environmental Impact Assessment Report

Term	Meaning
EPA	Environmental Protection Agency
FLA	Foreshore Licence Areas
GI	Geotechnical Investigation
GIS	Global Information Systems
GR	Green Rebel
GSI	Geological Survey of Ireland
HWM	High Water Mark
ICOMOS	International Council on Monuments and Sites
ITM	Irish Transverse Mercator
LAT	Latitude
MAC	Maritime Area Consent
MSBDL	Mean Seabed Level
N	Northing
NGR	National Grid Reference
NIAH	National Inventory of Architectural Heritage
NMI	National Museum of Ireland
NMPF	National Marine Planning Framework
NMS	National Monuments Service
OD	Ordnance Datum
OGI	Onshore Grid Infrastructure
ORE	Offshore Renewable Energy
OREDP	Offshore Renewable Energy Development Plan
OSP	Offshore Substation Platform

Term	Meaning
PLGR	Pre-Lay Grapnel Run
ROV	Remote Operated Vehicles
SEA	Strategic Environmental Assessments
SI	Site Investigations
SMR	Sites and Monuments Record
SSS	Side Scan Sonar
TSHD	Trailer Suction Hopper Dredger
UAIA	Underwater Archaeological Impact Assessment
UAU	Underwater Archaeology Unit
UKHO	United Kingdom Hydrographic Office
UNESCO	United Nations Educational Scientific and Cultural Organization
UTM	Universal Transverse Mercator
UXO	Unexploded Ordnance
WTG	Wind Turbine Generator
WW1	World War One
WWTP	Waste Water Treatment Plant
ZTV	Zone of Theoretical Visibility

Units

Unit	Description
cm	Centimetre
km	Kilometre
m	Metre

18 Marine Archaeology and Cultural Heritage

18.1 Introduction

18.1.1.1 This chapter of the Environmental Impact Assessment Report (EIAR) presents the assessment of the potential impacts of the Arklow Bank Wind Park 2 Offshore Infrastructure (hereafter referred to as 'the Proposed Development') on Marine Archaeology and Cultural Heritage. Specifically, this chapter considers the potential impact of the Proposed Development below the High Water Mark (HWM) during the construction, operational and maintenance, and decommissioning phases.

18.1.1.2 The assessment presented is informed by the following chapters of Volume II:

- Volume II, Chapter 4: Description of Development;
- Volume II, Chapter 6: Coastal Processes.
- Volume II, Chapter 17: Seascape, Landscape and Visual Amenity.

18.1.1.3 This chapter also draws upon information contained within Volume III, Appendix 18.1: Marine Archaeology and Cultural Heritage Technical Report; Volume III, Appendix 18.2: Cultural Heritage Visual Impact Assessment Report; and Volume III, Appendix 18.3: Marine Archaeology Intertidal Archaeology Report.

18.2 Regulatory background

18.2.1.1 Planning policy on renewable energy infrastructure is presented in Volume II, Chapter 2: Policy and Legislation. Planning policy, specifically in relation to marine archaeology, is contained in the National Marine Planning Framework (NMPF) (Department of Housing, Local Government and Heritage (DHLGH), 2021); the Offshore Renewable Energy Development Plan I (OREDP 1) (Department of Communications, Energy and Natural Resources (DCENR), 2014) and OREDP II (Department of Environment, Climate and Communications (DECC), 2023); the National Monuments Act 1930-2004 and the Historic and Archaeological Heritage and Miscellaneous Provisions Act 2023. A summary of the policy provisions relevant to marine archaeology is provided in Table 18.1.

18.2.1.2 In addition, a number of other guidance documents specific to the consideration of marine archaeology are available from jurisdictions/countries with established offshore renewable energy sectors where comprehensive guidance has been developed. This guidance has been used to inform the assessment of the potential impacts.

Table 18.1: Summary of regulatory background

Publisher	Name of document incl. reference	Key provisions
Statutory		
Legislation		
Government of Ireland, 1930-2004, 2023	The National Monuments Act 1930-2004; Historic and Archaeological Heritage and Miscellaneous Provisions Acthttps://www.irishstatutebook.ie/eli/2023/act/26/enacted/en/html	Protects archaeological heritage in Irish law.
Planning Policy and Development Control		
DHLGH, 2021	National Marine Planning Framework https://www.gov.ie/pdf/?file=https://assets.gov.ie/139100/f0984c45-5d63-4378-ab65-d7e8c3c34016.pdf#page=null	The NMPF proposes an integrated approach for planning the marine environment. It sits within the Harnessing our Ocean Wealth Maritime Policy, with cultural heritage as an important component of this wealth. It situates heritage assets as part of the social infrastructure. Heritage Assets Policy 1 supports proposals that demonstrate they will contribute to enhancing the significance of heritage assets where such proposals seek to avoid, minimise or mitigate harm to the significance of heritage assets. These matters are addressed in section 18.5.
DCENR, 2014	Offshore Renewable Energy Development Plan I	Sets out expected archaeological mitigations required in Offshore

Publisher	Name of document incl. reference	Key provisions
	https://www.gov.ie/pdf/?file=https://assets.gov.ie/27215/2bc3cb73b6474beebbe810e88f49d1d4.pdf#page=null	Renewable Energy (ORE) projects in Ireland, which comprise: conforming to National Monuments Act legislative requirements; conducting seabed investigations prior to device installation; avoiding sites of interest and Archaeological Exclusion Zones (AEZ); submitting artefacts to the National Monuments Service (NMS); conducting associated terrestrial walkover and related surveys; and providing reporting to NMS. These matters are addressed in section 18.5.
DECC, 2023	DRAFT Offshore Renewable Energy Development Plan II https://www.gov.ie/pdf/?file=https://assets.gov.ie/27215/2bc3cb73b6474beebbe810e88f49d1d4.pdf#page=null	Sets out where Archaeology and Cultural Heritage are to be considered within Strategic Environmental Assessments (SEA), under SEA Objectives 14 (to protect sites) and 15 (to incorporate opportunities to enhance cultural/historic knowledge and understanding). These matters are addressed in section 18.5 of the current chapter.
Non-Statutory		
Guidelines and technical standards		

Publisher	Name of document incl. reference	Key provisions
Department of Arts, Heritage, Gaeltacht and the Islands (DAHGI), 1999a	Framework and Principles for the Protection of the Archaeological Heritage https://www.archaeology.ie/sites/default/files/media/publications/framework-and-principles-for-protection-of-archaeological-heritage.pdf	Sets out the principles of national policy on the protection of the archaeological heritage in Ireland.
DAHGI, 1999b	Policy and Guidelines on Archaeological Excavation https://www.archaeology.ie/sites/default/files/media/publications/excavation-policy-and-guidelines.pdf	Sets out the policy and guidelines on archaeological excavation in Ireland.
Department of the Environment, Heritage and Local Government (DEHLG), 2006	Guidelines for Authors of Reports on Archaeological Excavations (2006) Department of Environment, Heritage and Local Government. https://www.archaeology.ie/sites/default/files/media/publications/excavation-reports-guidelines-for-authors.pdf	Sets out the recommended format and contents of archaeological reports to be submitted to the NMS in fulfilment of archaeological excavation licences.
DHLGH, 2023a	Advice to the Public on Ireland's Underwater Archaeological Heritage (2023) Department of Housing, Local Government and Heritage. https://www.archaeology.ie/sites/default/files/media/publications/advice-to-the-public-on-irelands-underwater-archaeological-heritage.pdf	Presents a general guide to good practice.
DHLGH, 2023b	Archaeology and Flood Relief Schemes: Guidelines (2023) Department of Housing, Local Government and Heritage. https://www.archaeology.ie/sites/default/files/media/publications/archaeology-and-flood-relief-schemes-guidelines-nms-2023.pdf	Presents recommended strategy for underwater archaeological projects particular to flood relief schemes, but to be regarded as applicable to marine

Publisher	Name of document incl. reference	Key provisions
		contexts too in absence of a specific marine archaeology guideline.
Environmental Protection Agency (EPA), 2022	Guidelines on the Information to be Contained in Environmental Impact Assessment Reports https://www.epa.ie/publications/monitoring--assessment/assessment/EIAR_Guidelines_2022_Web.pdf	These Guidelines apply to the preparation of all Environmental Impact Assessment Reports undertaken in the State (Ireland).
ICOMOS, 1996	Charter on the Protection and Management of the Underwater Cultural Heritage https://www.icomos.org/images/DOCUMENTS/Charters/underwater_e.pdf	Essentially voluntary in nature, the charter provides an important guiding platform for the management and development of underwater cultural heritage and establishes accepted best practice internationally and nationally.
United Nations Educational Scientific and Cultural Organization (UNESCO), 2001	UNESCO Convention on the Protection of the Underwater Cultural Heritage https://en.unesco.org/about-us/legal-affairs/convention-protection-underwater-cultural-heritage	Recognises the importance of underwater cultural heritage as an integral part of the cultural heritage of humanity; the need to codify and progressively develop rules relating to the protection and preservation of underwater cultural heritage in conformity with international law and practice; and the need to improve the effectiveness of measures at international, regional and national levels for the preservation *in situ* or, if necessary for scientific or protective purposes, the careful recovery of underwater cultural heritage.

Publisher	Name of document incl. reference	Key provisions
COWRIE, 2007	Guidance for Assessment of Cumulative Impacts on the Historic Environment from Offshore Renewable Energy	UK guidance document.
Plets *et al.,* 2013	Marine Geophysics Data Acquisition, Processing and Interpretation https://historicengland.org.uk/images-books/publications/marine-geophysics-data-acquisition-processing-interpretation/mgdapai-guidance-notes/	UK guidelines on marine geophysical survey to meet archaeological requirement, replaces in Ireland the DEHLG National Monuments Service (NMS) guidelines of 1997.
UNESCO, 2021	World Heritage and wind energy planning https://whc.unesco.org/en/wind-energy-planning/	Guidance document on international best practice for assessing visual impacts of Windfarms on World Heritage sites.
Crown Estate, 2021	Archaeological Written Schemes of Investigations for Offshore Windfarm Projects https://assets.ctfassets.net/nv65su7t80y5/7JCHxvKXAQPiXI32NvDFbH/7fab6a01c19b37149355f80646562eca/guide-to-archaeological-requirements-for-offshore-wind.pdf	UK guidance document.

18.3 Consultation

18.3.1.1 A summary of relevant issues to Marine Archaeology and Cultural Heritage that have been raised by stakeholders is presented in Table 18.2.

Table 18.2: Summary of consultation relating to Marine Archaeology and Cultural Heritage

Date	Consultation type	Consultation and key issue raised	Section where provision is addressed
July 2020	National Monuments Service (NMS), Underwater Archaeology Unit (UAU) – Meeting	Discussion of baseline data. NMS acknowledged that the historic wreck positions can be incorrect because of issues associated with projecting the positions in GIS programs. Discussion of impact assessment and recommendations for 2020 Ground Investigation (GI) programme. NMS raised potential for the Proposed Development to impact on archaeological constraints. Turbines and cables to avoid constraints as much as possible. NMS noted potential for unrecorded wrecks to be impacted, noting that two wrecks were uncovered by the Arklow Bank Wind Park 1 (ABWP1) cable installation.	Baseline data and environment is set out in section 18.5.2. Potential impacts of the Proposed Development on marine archaeology are assessed in sections 18.9 and 18.10. Factored-in measures are outlined in section 18.7.3.
December 2023	NMS, UAU – Meeting	Discussion on results of surveys and geotechnical investigations conducted in 2022 and 2023. Discussion on anticipated archaeological mitigation measures.	Results of surveys conducted since 2019 are presented in section 18.5. Factored in and mitigation measures are described in sections 18.7.3, 18.9 and 18.10.
April 2024	NMS, UAU – Meeting	Discussion on mitigation measures	Factored in and mitigation measures are described in sections 18.7.3, 18.9 and 18.10.

Date	Consultation type	Consultation and key issue raised	Section where provision is addressed
April 2024	NMS, UAU – Meeting	Mitigation measures described and discussed	Factored in and mitigation measures are described in sections 18.7.3, 18.9 and 18.10.

18.4 Study area

18.4.1.1 The Marine Archaeology Study Area, as detailed in Volume III, Appendix 18.1: Marine Archaeology and Cultural Heritage Technical Report, is focused on the footprint of the Proposed Development represented on Figure 18.1, which shows the Array Area as a rectangular extent over Arklow Bank, and the Cable Corridor and Working Area that extends around the Bank in a triangular shape, reaching some 20.5 km northeast of Arklow town and 16 km southeast of the town, with the Landfall being located to the north of Arklow at Johnstown North.

18.4.1.2 A wider marine area is also considered in Volume III, Appendix 18.1: Marine Archaeology and Cultural Heritage Technical Report that reaches one tidal cycle 20 km north and 20 km south of the Cable Corridor and Working Area, to include the area where the extents of indirect impacts could occur (Figure 18.2).

18.4.1.3 In addition, the Cultural Heritage Study Area (Volume III, Appendix 18.2: Cultural Heritage Visual Impact Assessment Report), which addresses the potential of visual impacts on upstanding archaeological sites and structures, is based on the Zone of Theoretical Visibility (ZTV) defined in Volume II, Chapter 17: Seascape, Landscape and Visual Impact Assessment, extends a 60 km buffer from Arklow Bank, which reaches north to Lambay Island, Co. Dublin, south to Carnsore Point, Co. Wexford, and inland to the Co. Wexford/Co. Carlow border. The Cultural Heritage Study Area is shown in Figure 18.3.

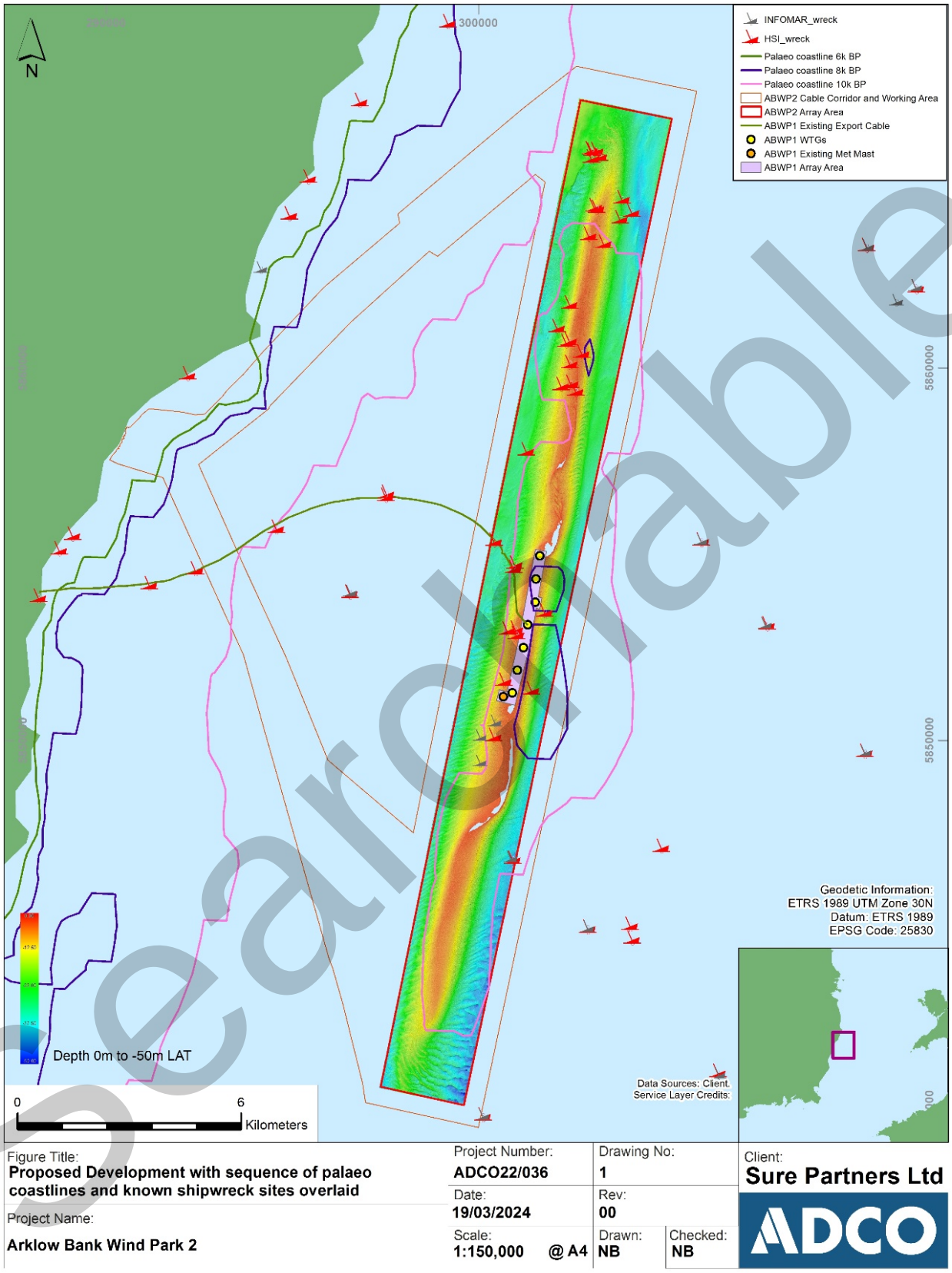

Figure 18.1: Proposed Development area, with sequence of predicted palaeo-coastlines and known shipwreck sites overlaid

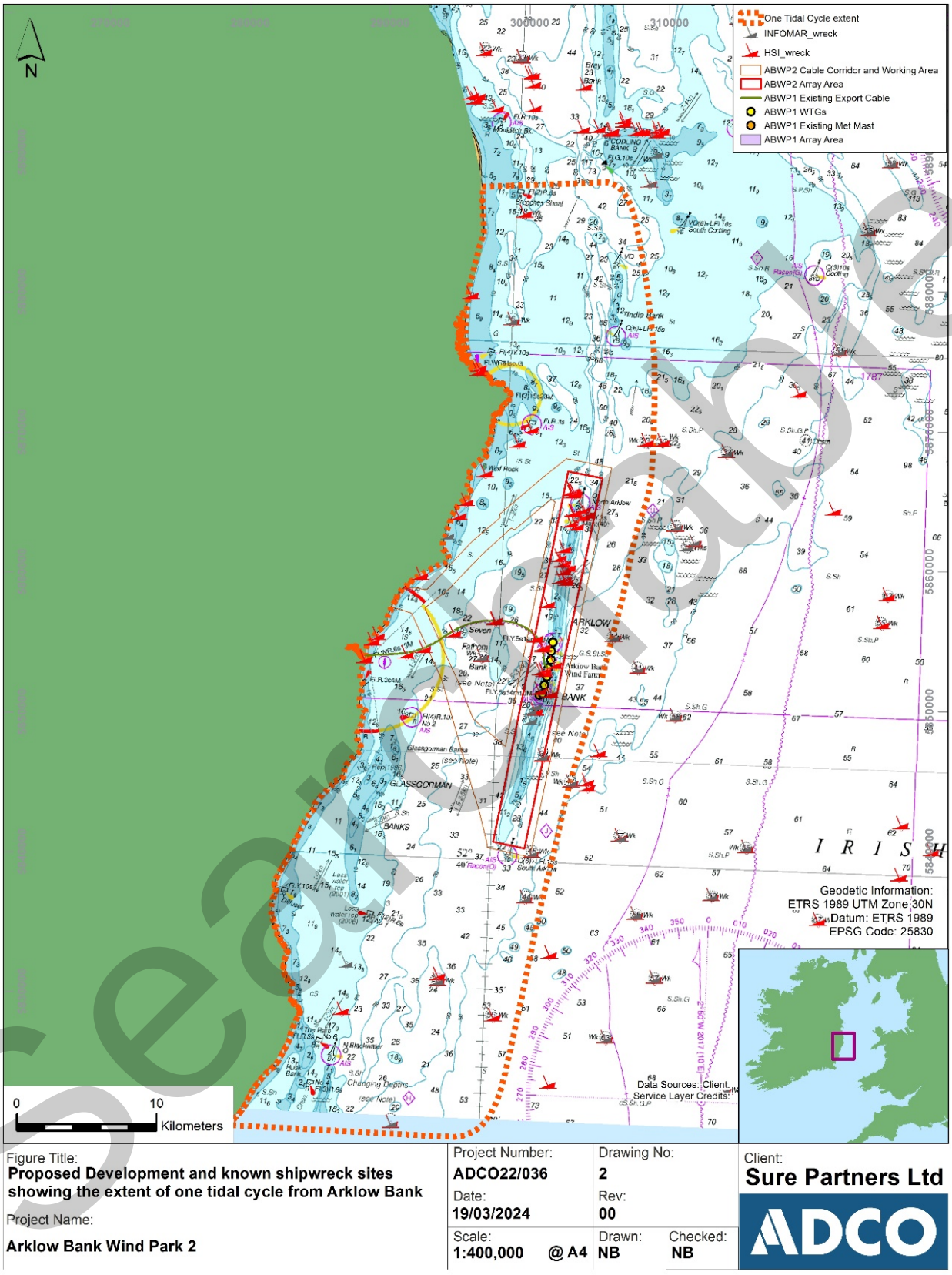

Figure 18.2: Marine Archaeology Study Area (one tidal cycle from Proposed Development) and known shipwrecks to include extent of one tidal cycle from the Cable Corridor and Working Area

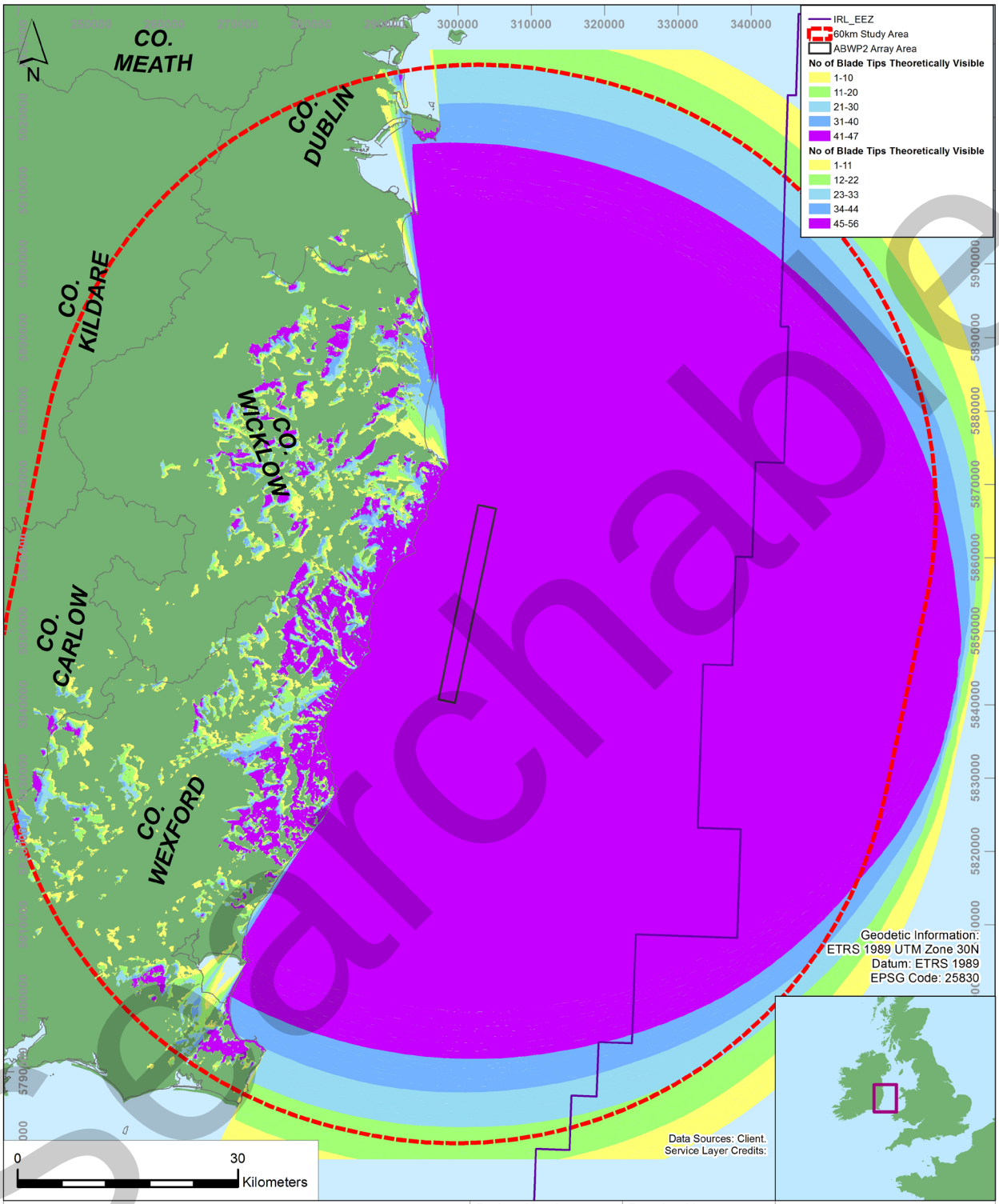

Figure Title: **Cultural Heritage study area, showing ZTV for Project Design Options 1 and 2**	Project Number: **ADCO22/036**	Drawing No: **3**	Client: **Sure Partners Ltd**
Project Name: **Arklow Bank Wind Park 2**	Date: **23/03/2024**	Rev: **00**	ADCO
	Scale: **1:800,000 @ A4**	Drawn: **NB** / Checked: **NB**	

Figure 18.3: Cultural Heritage study area, showing ZTV for Project Design Options 1 and 2

18.5 Methodology

18.5.1 Methodology to inform the baseline

Desktop studies

18.5.1.1 Information on Marine Archaeology within the Marine Archaeology study areas was collected through a detailed desktop review of existing studies and datasets. These sources are summarised in the Marine Archaeology and Cultural Heritage Technical Report, Volume III, Appendix 18.1, Table 2.

18.5.1.2 The principal archaeological archive relating to the Arklow Bank is the Historic Shipwreck Inventory maintained by the National Monuments Service (NMS) at the Department of Housing, Local Government and Heritage (DHLGH). The Inventory for four counties, including Wicklow, was published in 2008 by the NMS (Brady, 2008; pp 448 to 496). More recent records are contained in the national wreck site database, accessible as an online portal maintained by the NMS and updated to 2018. The Irish National Seabed Survey, INFOMAR, is a further resource that is accessible online. The Sites and Monuments Record archive, also maintained by the NMS and accessible online, was examined for archaeological information relating to the Landfall location. Additional sources consulted include historic Ordnance Survey maps and Admiralty Charts.

Site specific surveys

18.5.1.3 In order to inform the EIAR, site-specific surveys were undertaken. A summary of the surveys used to inform the Marine Archaeology impact assessment is outlined in Table 18.3 below. This includes two programmes of comprehensive marine geophysical survey carried out for the Proposed Development, in 2019 and 2022; intertidal archaeological surveys carried out in 2020 and 2024, and four deployments of geotechnical investigations, one in 2020, a second in 2022 and two deployments in 2023.

18.5.1.4 The desk-based sources, geophysical survey data, the site survey and geotechnical data examined are described and considered in Volume III, Appendix 18.1, and represent a comprehensive and robust sequence of datasets that allow for a detailed assessment of the archaeological constraints associated with the Array Area and Cable Corridor and Working Area.

Table 18.3: Site specific surveys

Data source	Date(s) of survey	Overview of survey	Survey contractor	Reference to further information
Marine geophysical survey	2019	Marine geophysical survey to develop ground model of seabed and seabed features, covering the Array Area, deploying multibeam bathymetry, side-scan sonar, magnetometry and sub-bottom profile surveys	Ultrabeam for Alpha Marine	Ultrabeam, 2019a

Data source	Date(s) of survey	Overview of survey	Survey contractor	Reference to further information
Marine geophysical survey	2019	Marine geophysical survey to develop ground model of seabed and seabed features, covering three cable corridors being considered in 2019, deploying multibeam bathymetry, side-scan sonar, magnetometry and sub-bottom profile surveys	Ultrabeam for Alpha Marine	Ultrabeam, 2019b
Intertidal archaeology survey	2020, 2024	Intertidal archaeology survey to provide baseline information on the Landfall location	ADCO	Volume III, 18.2
Geotechnical investigations	2020	Geotechnical investigations on Arklow Bank comprising boreholes	Geoquip	Geoquip, 2020
Marine geophysical survey	2022	Marine geophysical survey to develop ground model of seabed and seabed features, covering the Cable Corridor and Working Area, deploying multibeam bathymetry, side-scan sonar, magnetometry and sub-bottom profile surveys	Green Rebel	Green Rebel, 2022

Data source	Date(s) of survey	Overview of survey	Survey contractor	Reference to further information
Geotechnical Investigations	2022	Geotechnical investigations on Arklow Bank, comprising boreholes and CPTs	Fugro	Fugro, 2022
Geotechnical Investigations	2023	Geotechnical investigations inshore	GII	Fugro, 2023
Geotechnical Investigations	2023	Geotechnical investigations on Arklow Bank, comprising CPTs and Vibrocores	Geo	Geo, 2023

18.5.1.5 The marine archaeological sites identified within the Array Area and Cable Corridor and Working Area are presented on Figure 18.4. All sites are shipwreck sites.

18.5.2 Baseline environment

Seabed Topography

18.5.2.1 The Arklow Bank is one of a series of sandbanks that run along the east coast of Ireland from Dublin to Wexford (Figure 18.2). The bank extends continuously for approximately 25 km and is approximately 2.5 km wide at its base and 500 m wide at its top. It is oriented north northeast/south southwest. Water depth on the bank varies between 0.6 m and 25 m relative to lowest astronomical tide (LAT), with shallower areas particularly occurring in the vicinity of the ABWP1 turbines. There is a large variation in depth within the Array Area, which is located over the bank, with water depths in excess of 50 m LAT beyond the bank to the east of the Array Area.

18.5.2.2 Arklow Bank is situated geographically in an area known as the Irish Platform, which occupies a 20 km to 30 km-wide corridor off Ireland's east coast (Gavin and Doherty Geosolutions, 2019, p. 24). The seabed in the area is dominated by sand and gravel deposited by the abating ice front during the last Glaciation (pre-12,000 Before Present (BP)). The bank exists southeast of the inferred limit of the Delgany Moraine. The surface sediment is mobile, formed due to reworking following relative sea level rise post-10,000 BP. Areas around the bank are also characterised by mobile sand overlaying glacial clays. To the west of the bank, gravels are exposed on the seabed.

Submerged prehistoric archaeological potential

18.5.2.3 The south coast of Ireland is associated with the potential for prehistoric landscapes to be discovered as submerged lenses in what is a drowned landscape. The southeast coast does not fall into this category. Nevertheless, the potential for earlier remains to be discovered associated with the morainic material remains. This is supported by the recovery of two worked flint nodules during archaeological monitoring of aspects of the ABWP1 construction phase adjacent to Turbine No. 5 (Campbell, 2003; Westley and Woodman, 2020, p. 28). The precise context of the flint pieces was not identified. The pieces highlight the potential for prehistoric remains to be associated with the sandbank. Whether such remains indicate activity on the banks in early

prehistoric times when sea levels may have been lower and the sandbanks might have been exposed is another matter. The pieces could also represent loss from a coastal craft of the period.

18.5.2.4 The geotechnical investigations carried out for the Proposed Development since 2020, and described in Volume III, Appendix 18.1, provide an opportunity to observe and record buried strata in the Array Area and in the Cable Corridor and Working Area. The morainic core of the sandbank is clearly evident, with alternating layers of sand, clay and gravel extending to depth. Nearshore, bedrock rises closer to the surface. While charcoal and organic clay deposits was evident in some of the vibrocore profiles west of the bank, no peat layers were recorded indicative of submerged landscape. The results nevertheless support the consideration that direct impacts on the seabed associated with the Proposed Development, such as foundation installation or cable installation works, will encounter material at depth below the surface deposits that has the potential to be of archaeological interest.

Historic Shipwrecks

18.5.2.5 The offshore sandbanks along Ireland's east coast are hazardous to shipping and historic shipwrecking events are associated with them. Such events start to be recorded systematically after *c.* 1750, which represents the burgeoning hey-day of pre-modern navigation but does not account for wrecking events that would have occurred earlier. There are 165 historic wrecking events associated with the Arklow Bank and its immediate sea area, which represents a significant number of wreckings over what is a relatively small sea area. This number grows larger when the extent of one tidal cycle is added to complete the Marine Archaeology Study Area. That part of the Marine Archaeology Study Area that is focused on the Arklow Bank and its immediate sea area and includes the Array Area and the Cable Corridor and Working Area retains 116 recorded wrecking events whose specific locations are not known and 49 known wreck-site and potential wreck-site locations. Annex 1 of Volume III, Appendix 18.1: Marine Archaeology and Cultural Heritage Technical Report presents a list of the 116 recorded shipwrecking events associated with the bank, and Annex 2 of Volume III, Appendix 18.1: Marine Archaeology and Cultural Heritage Technical Report presents a list of the 49 known wrecks on the bank and in adjacent waters. Annex 3 of Volume III, Appendix 18.1: Marine Archaeology and Cultural Heritage Technical Report presents a list of 15 additional known wrecks that occur within the wider extent of one tidal cycle, nine of which lie to the north of the bank, and six of which lie to the south of the bank. The placing of a lightship at the south end of the bank in 1825, followed by one at the north end in 1867, reflects attempts to mitigate the danger to shipping. The southern lightship was sunk in 1917 by a German submarine (Historic Shipwreck Inventory reference W02737) (Brady, 2008; p. 474).

18.5.2.6 There are 11 wrecking events associated with the eighteenth century and three additional events located 'Off Arklow Bank'. Twelve wreckings occurred in the twentieth century up to 1939, and the remaining 90 recorded wreckings happened in the nineteenth century. Among the earliest recorded wreckings is that of the *Charming Nancy*, which, in 1766, was travelling from Dublin to Barbados, and wrecked on Arklow Bank (W02668). One life was lost, while the remaining crew were saved by fishermen. The recording of two wrecking events in 1772, within days of each other and both on the same journey, from Baltimore to Dublin, may be duplication of the same event rather than individual instances. This is further suggested by the fact that while one wrecking is named, the *Princess* or *Prince of Wales*, the other is unnamed (W02723 and W02754 respectively). There were occasions when more than one wreck is assigned the same day but these are few; for example, on 11 November 1819 two brigs were lost, one of which was the *Albion*, travelling from Swansea to Dublin and the other was thought to be an American vessel (W02651 and W02757 respectively). On 5 September 1904, the *Viola*, a 182-ton wooden barquentine, travelling from Glasgow to Cherbourg, with a cargo of coal was lost on the bank two miles off the North Arklow Lightship. An unnamed schooner or brigantine was also lost at the same location that day (W02748 and W02772 respectively). The First World War left its mark on the bank. On 19 August 1915, the German submarine U-27 was lost there, and on 21 September

1917 an unnamed submarine may have foundered on the bank (W02746 and W02773 respectively). On 28 March 1917, the South Arklow Lightship, *Guillemot*, a steel-framed vessel measuring 96 feet long, 22.66 feet wide, and 11.75 feet deep was boarded by the crew of the German submarine UC-65 and sunk (W02737). The remains of the *Guillemot* lie in 50 m of water at a known location off the bank.

18.5.2.7 The wreckings generally occurred during the winter and early spring, with the majority between November and March/April. This is in keeping with expectations for such events to occur during the seasonally foul weather. In nine cases, wind direction was recorded. It appears that storm conditions during prevailing south-westerly winds accounted for six wreckings (W02754, W02690, W2770, W02373, W0268 and W02665); north-easterlies for two wreckings (W02661 and W02770); while an east-southeasterly summertime storm resulted in the wrecking of one vessel (W02725). The Irish Sea is particularly treacherous during a northeasterly/easterly and the low numbers of wreckings recorded in such conditions suggests that most captains knew when to seek shelter and had sufficient advance warning to do so. The wreckings that occurred during southwesterlies suggests that despite efforts to hug the coastline inshore, there were many occasions when vessels trying to navigate harsh conditions were blown onto the bank.

18.5.2.8 The majority of the vessels wrecked appear to have crossed the Irish Sea regularly between Britain and Ireland. The route from Welsh ports (Pembry, Cardiff, Swansea) to Dublin would bring coal (for example, the *Sophia*, which was lost on 5 November 1855). Other vessels would have been travelling up and down the Irish Sea connecting, for instance, Glasgow and Cherbourg (the *Viola* wrecked on 5 September 1904, W02748), or participating in transatlantic journeys. The cargo being carried was also wide-ranging but, from an archaeological perspective, the loss of the 234-ton Sunderland brig *Jemine* or *Gemini* in 1799 is of interest because her manifest included three 3-pounder carriage-mounted guns, and these items could present themselves on the seabed during future marine geophysical and associated surveys. She was travelling from Opporto to Dublin (W02697). In addition, the *Thomas*, was a 318-ton ship from Sunderland carrying six 4-pounder cannon (W02744). Equally, vessels carrying more mundane cargo, such as iron sheets (the *Selina* W02734), iron (the *Louisa* or *Louise* W02707), pig-iron (the *Calcutta* WW02664, *Sarah* W02732, *Dove* W02675) and ore (the *Parton* W02719 and *Queen* W02724) are of interest in this regard.

18.5.2.9 The wooden frames and steel frames of the wrecked vessels will not survive above the seabed for any length of time as exposed elements will be eroded quickly in the seawater. Only the portions of vessels that are buried by covering sands and silts tend to survive intact over time. The deployment of side-scan sonar can identify wreckage and debris that lies proud of the seabed but it requires a magnetometer to detect material that lies buried, and magnetometers detect ferrous metal.

18.5.2.10 The large numbers of recorded wreckings provide a sense of the archaeological potential of the Arklow Bank but it is not possible to deduce from these records where the wreck sites are located. The record would be made by those watchers and reporters of the events taking place from the shore or from one of the lightships who saw and recorded a ship in distress, or have been part of rescue parties dispatched to save crews and passengers and recover cargo. Their records will typically position the ship in relation to the nearest topographic reference point. In the case of the Arklow Bank, this might be as general as being off the north or south ends of the bank. They do not record where on the bank a vessel may have finally foundered, as there are no obvious topographic markers to relate to other than either end of the 25 km-long sandbank. For further insight, it is necessary to consider other sources, including fishermen's records of 'snag points', divers' records of discoveries underwater and marine geophysical survey records. The latter will include official surveys by the United Kingdom's Hydrographic Survey Office (UKHO), which tend to record only substantial wreckage that causes navigation hazards, and more discrete surveys commissioned for marine development projects or undertaken for research purposes.

Known and Recorded wreck sites within the Marine Archaeology Study Area extending to one tidal cycle of the Cable Corridor and Working Area

18.5.2.11 There are 64 known shipwreck sites and potential wreck sites in the sea area that includes the Marine Archaeology Study Area; 15 of which are associated with the reach of one tidal cycle, and 49 of which are associated with the Arklow Bank and its immediate sea area (Figure 18.1).

18.5.2.12 The distribution of known shipwrecks and locations of potential shipwrecks as indicated on Arklow Bank highlights the northern half of Arklow Bank as an area with clusters of shipwrecks.

18.5.2.13 The 2019 survey on Arklow Bank and the three cable route corridors under consideration in 2019 has added significantly to the known wreck sites on Arklow Bank. The 2022 survey, which focused on the Cable Corridor and the Working Area, with some overlap survey on the Bank has contributed additional information. Both surveys have provided an updated account of the seabed conditions at those known shipwreck sites that lie within the Array Area and have recorded new sites (Figure 18.4). The correlations between the different surveys are noted in Annex 2 of Volume III, Appendix 18.1: Marine Archaeology and Cultural Heritage Technical Report, while the detail of the wreck sites is presented in Annex 4 of Volume III, Appendix 18.1: Marine Archaeology and Cultural Heritage Technical Report, which is a catalogue of shipwreck sites and sites of potential wreckage on Arklow Bank and the adjacent waters. The survey data examined for the Proposed Development, which focused on side-scan sonar and magnetometry data sets, did not reveal an indication of submerged prehistoric material.

18.5.2.14 Wreck sites and potential wreck sites identified in previous surveys were not all observed in the 2019 and 2022 surveys, while both surveys identified new sites in areas surveyed previously. This speaks to the dynamic environment of the Arklow Bank, where shifting sands will routinely expose and alternatively bury sites of archaeological interest.

18.5.2.15 Archaeological review of the datasets concurs with the principal observations and identifies seven additional potential wreck sites that were not highlighted in the survey reports. The archaeological interpretation concludes that the historic surveys and the surveys of 2019 and 2022 indicate the locations of 82 shipwreck sites in the Array Area and the Cable Corridor and Working Area, and adjacent to same. The 2019 survey was able to correct the locations of five shipwreck sites: W02788; W02790; W02791; W02798 and W09512

18.5.2.16 The distribution of historic wrecks on Arklow Bank and that of the sites recorded in 2019 and 2022 suggest that wreckings are focused in particular locations on the bank. There are more wreck sites recorded on the west side of the bank than on its eastern side. This accords with the pattern of historic wreckings as recorded in contemporary sources, where more vessels appear to have been lost during prevailing southwesterly storms than on other occasions.

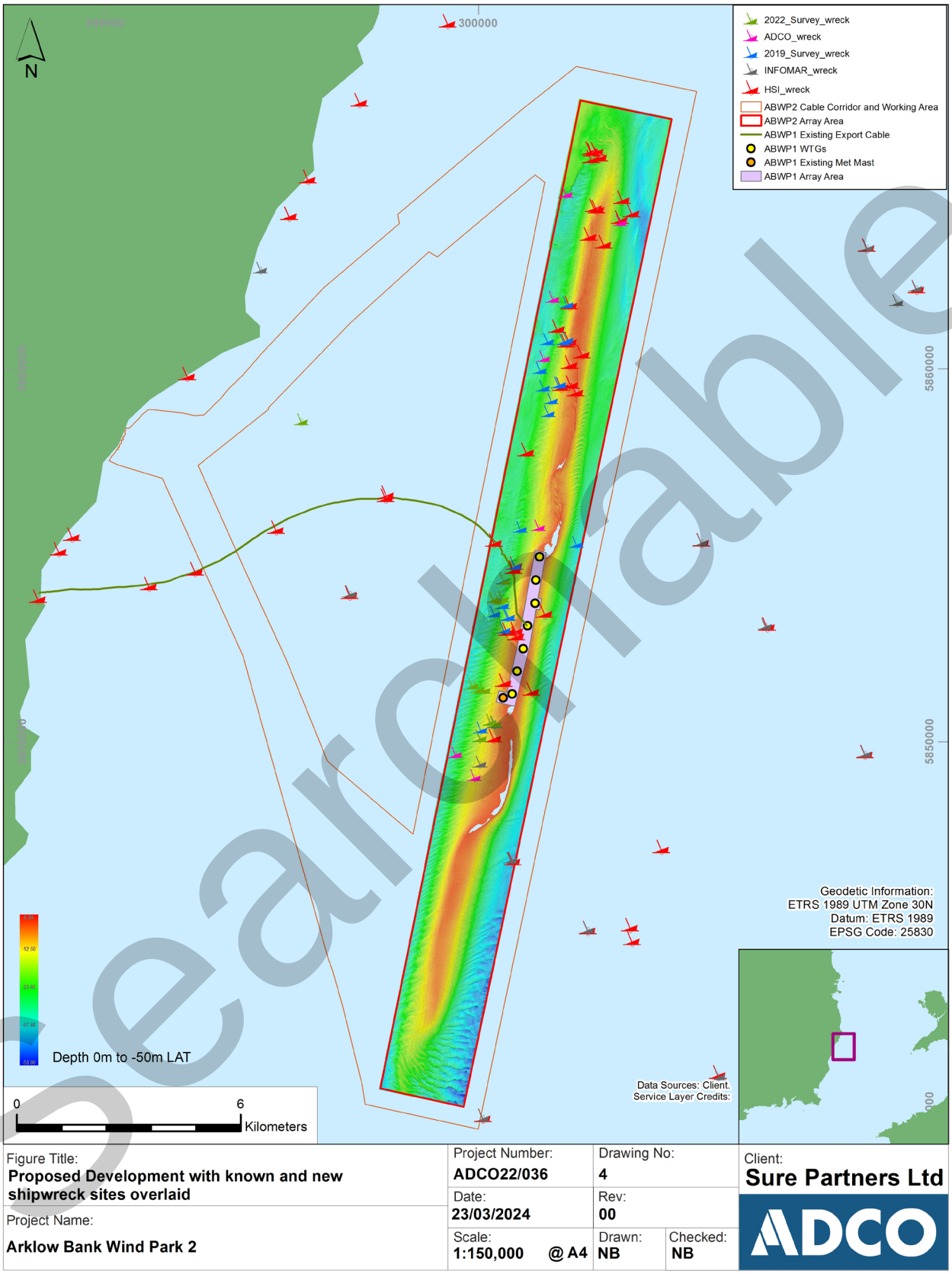

Figure 18.4: Proposed Development with known and new shipwreck sites overlaid

Archaeological potential of intertidal zone

18.5.2.17 A walkover inspection of the Landfall location at Johnstown North townland, Co. Wicklow, was carried out during low water in 2020 and 2024 to assess the archaeological potential at this location (Volume III, Appendix 18.2: Marine Archaeology Intertidal Report). The Landfall location is one of low rock cliffs interspersed with small coves that are filled with sand containing a shingle overburden, with an expanse of sandy beach (Ennereilly Beach) reaching north to Redcross River. There is no indication of archaeological features exposed at this location.

Cultural heritage assets

18.5.2.18 The Zone of Theoretical Visibility (ZTV), based on the 60 km-buffer identified in Volume II, Chapter 17: Seascape, Landscape and Visual Impact Assessment, includes archaeological and architectural heritage sites from across three counties. The selection was based on representative sites from along the coastal fringe where the greatest degree of theoretical visibility can be charted, and also from locations inland where the rising ground of the Wicklow Mountains allows for sea views from high ground on its east-facing slopes. The sites selected reflect the broad range of site types, time periods and landscape settings that exist with the greatest potential for negative visual impacts arising from cultural heritage considerations. The sites are presented in Table 18.4 and include archaeological complexes recorded in the Sites and Monuments Record (SMR) and the locations of buildings registered in the National Inventory of Architectural Heritage (NIAH) (see also Volume III, Appendix 18.2: Cultural Heritage Visual Impact Assessment Report). The sites include a wide range of site types that also represent different time-periods:

- Prehistory is represented by a cist burial (SMR WX007B0001 at Kilmichael Point) and an expanse of rock art (SMR WI030-024) inland at Ballykean, Co. Wicklow;
- The medieval period is represented at Dalkey Island (SMR DU023-029); Wicklow Head; Ardnairy, Co. Wicklow, and Glasscarrig North (SMR WX017-008); and
- The late eighteenth and nineteenth centuries are represented by coastal fortifications (SMR DU023-029) on Dalkey Island and in Killiney (SMR DU026-011), Co. Dublin; by the coastguard station (NIAH1500741) at Kilmichael Point; the lighthouse (NIAH16403101) on Wicklow Head, and by Courtown harbour, Co. Wexford. The former signal tower on Mizen Head at Ardanairy may also have dated to this period if not somewhat earlier; it is included as an example of a location for which the cultural heritage remains are no longer upstanding but whose foundations are likely to remain in situ. There are also residences from this period, including nineteenth-century seafront houses in Greystones, Co. Wicklow; Cahore House at Cahore Point, Co. Wexford; and the eighteenth-century Ballymore House, Co. Wexford, which lies somewhat inland.

18.5.2.19 While the reach of the ZTV is extensive, it is noteworthy that certain key cultural heritage sites that are known to inhabit the valleys of the Wicklow mountains lie outside the ZTV. This is the case with respect to Glendalough, the principal early medieval monastic centre in the southeast region of Ireland and candidate site for World Heritage status. The ZTV does not include the valley bottom and side slopes where the known cultural heritage sites are located, but does reach the higher ground above the cultural heritage complex. The high ground remains an area with dense woodland cover. The trees prevent visibility of the Proposed Development from such elevations.

Table 18.4: List of locations identified to consider cultural heritage setting

Location	Principal Site Type	SMR and NIAH Reference	Distance to Array Area
Dalkey Island	Archaeological complex	SMR DU023-029-	40 km

Location	Principal Site Type	SMR and NIAH Reference	Distance to Array Area
Killiney	Martello Tower	SMR DU026-011	39 km
Greystones	House	NIAH16304025	27 km
Wicklow Head	Lighthouse	NIAH16403101	6.8 km
Mizen Head	Signal Tower	SMR WI036-022	7.2 km
Kilmichael Point	Cist Burial and Coastguard Station	SMR WX007B001 and NIAH1500741	10.7 km
Courtown	Harbour	NIAH15611016	16 km
Glasscarrig North	Motte and Bailey	SMR WX017-008	17.8 km
Cahore	House	NIAH15701735	18.5 km
Ballymore	House	NIAH15701612	27 km
Ballykean	Rock Art	SMR WI030-024	13.7 km
Glendalough	Round Tower	SMR WI023-008007	28.4 km

18.5.3 'Do nothing' scenario

18.5.3.1 Annex IV of the EIA Directive sets out the information required to be included in an EIAR. This includes "a description of the relevant aspects of the current state of the environment (baseline scenario) and an outline of the likely evolution thereof without implementation of the project as far as natural changes from the baseline scenario can be assessed with reasonable effort on the basis of the availability of environmental information and scientific knowledge". In the event that the Proposed Development does not proceed, an assessment of the future baseline conditions has been carried out and is described within this section.

18.5.3.2 It is unlikely that significant change will occur to the marine archaeology and cultural heritage of Arklow Bank over the next few decades in a 'do nothing' scenario. The natural formation of the bank has remained unchanged in its millennia of existence and this will continue to be so. It is likely that sediment mobility will continue, and this natural process retains the potential to expose and re-bury shipwreck sites, leading to their deterioration over time. It also possible that new wreck sites will be exposed.

18.5.4 Data limitations

18.5.4.1 The desk-based sources, the site-specific survey data examined, and the walkover inspection of the Landfall location represent a comprehensive and robust sequence of datasets and observations that allow for a detailed assessment of the archaeological constraints associated with the Marine Archaeology Study Area, including the Array Area, the Cable Corridor and Working Area and the associated Landfall location, and the Cultural Heritage Study Area.

18.5.4.2 With respect to the 2019 and 2022 surveys, wind conditions, fishing equipment and wave action close to shore impeded the data quality, and this was mitigated where possible with additional survey lines. The only locations that are not included in the area surveyed by marine geophysics

were the heights along the centre of the sandbank that are exposed at certain low water conditions, and the immediate shoreline at the Landfall. In both instances, the shallow nature of the water cover in these locations hindered the deployment of the survey devices and the return of meaningful data. On the bank, this resulted in a zone averaging 320 m wide, expanding to 690 m wide in the central area from which multibeam survey data only was recovered. The shortfall at the Landfall at Johnstown North extends over a distance of 50 to 100 m, which covers an active surf zone.

18.5.4.3 The zone of the bank surveyed only by multibeam survey lies outside the area for wind turbine construction, but it is possible that inter-array cables may be routed across it. Where known shipwreck sites are located within this area, Archaeology Exclusion Zones (AEZs) are established around the wreck sites to ensure that the wrecks are protected from any impacts. Additional surveys are anticipated ahead of the micro-positioning of such cabling (see Table 18.10), with a view to avoiding cultural heritage features and other obstacles, and this will provide a further level of protection against impacts on cultural heritage.

18.5.4.4 The cable-lay process at Johnstown North will be by means of trenchless techniques (see Volume II, Chapter 4: Description of Development). Such work will not require the exposure of the surface sediments and consequently it is anticipated that there will be no surface-level disturbance of the surf zone or the intertidal foreshore.

18.6 Impact assessment methodology

18.6.1 Key parameters for assessment

18.6.1.1 The assessment of significance of effects has been carried out on both of the two discrete Project Design Options detailed in Volume II, Chapter 4, Description of Development. This approach has allowed for a robust and full assessment of the Proposed Development.

18.6.1.2 The two Project Design Options and parameters relevant to each potential impact are detailed in Table 18.5 and Table 18.6.

Table 18.5: Project design parameters and impacts assessed – Project Design Option 1

Potential impact	Phase			Project design option 1
	C	O	D	
Sediment disturbance and deposition leading to effects on known and unknown heritage assets	✓	✓	✓	**Construction phase** <u>Site preparation:</u> Confirmatory surveys to be undertaken during construction, as described in Table 4.10 of Volume II, Chapter 4: Description of Development, include geotechnical investigations that will result in sediment disturbance. Seabed preparation prior to installation will include boulder clearance using a grab or plough device across 100% of the cable routes. The plough will have a maximum penetration depth of 500mm. Sandwave clearance will be carried out by dredging, including Trailer Suction Hopper Dredging (TSHD), mass flow excavation, or pre-lay plough techniques on a 70 m-wide clearance width for 30% of the cable length and pre-lay grapnel runs along all the cleared corridors (PLGR). These preparation activities will result in sediment disturbance to various depths. Inter-array cable burial depth of 0-1.5m below Lowest Seabed Level. Interconnector cable burial depth of 0-2.5m below Lowest Seabed Level. Export cable burial depth of 0-2.5m below Lowest Seabed Level. Trenchless method to convey export cable across and under the intertidal foreshore anticipates a dredged exit pit on the marine side. <u>Foundation installation:</u> 56 WTGs and two OSPs installed on monopile foundations: Drilled installation of 25 WTGs employing piles of 7-11 m in diameter and two OSPs employing piles of 7-14 m in diameter at 0.2m/hr - 0.4m/hr (in rock), 0.6m/hr - 1.0m/hr (in sand) and 0.2m/hr - 0.6m/hr (in clay) to full depth of 37 m; scour protection measures; and

Potential impact	Phase			Project design option 1
	C	O	D	
				Modelled at representative locations across the Array Area. Where scour protection is required, it will be achieved by placing loose rock, rock bags, mattressing or frond mats around the foundations or seabed that has already been prepared. <u>Cable installation:</u> The inter-array and interconnector cables are buried below seabed level to ensure stability and to protect from damage by anchors, fishing gear, dropped objects, etc. Burial will be via jetting, controlled flow excavation (CFE), ploughing and simultaneous lay and burial. Inter-array cable length of between 110 – 122 km; and disturbance of seabed material of 15m wide and 1.5 m deep trench; Interconnector cabling of between 25 – 28 km; and disturbance of seabed material of 15m wide and 0-2.5m deep trench. The offshore export cable is between 35-40 km in length; and disturbance of seabed material 15 m wide and 2.5 m deep trench. Trenchless method to convey export cable across and under the intertidal foreshore anticipates a dredged exit pit on the marine side and possible deposition of drilled spoil at exit site. Modelling assumes that the cable routes extend over areas of sand and muddy sand. ***Operational and maintenance phase*** Inter-array and interconnector cable repair/reburial activities: Inter-array cables: repair and reburial one every 3 years, inter-removal of excess seabed sediment 300,000m^3 every 5 years Interconnector cables: repair and reburial one every 3 years, Offshore export cables: repair and reburial one every 5 years

Potential impact	Phase			Project design option 1
	C	O	D	
				Removal of excess sediment along the export and interconnector cables 100,000m^3 every 5 years and Disturbance of seabed material from up to 15 m wide and 0-2.5m deep trench. **Decommissioning phase** All structures above the seabed would be removed, scour protection, cables and cable protection would be left *in situ*. Monopiles will be cut 2m below the mudline; and Decommissioning would be undertaken in the reverse of construction using similar plant and techniques.
Direct impact on historic shipwreck sites	✓	✓	✓	**Construction phase** <u>Site preparation:</u> Site preparation activities including sandwave clearance, boulder clearance and PLGR as described above for 'Sediment disturbance and deposition leading to effects on known and unknown heritage assets' have the potential to further expose or bury known shipwreck sites, and have the potential to impact on unknown shipwreck sites. <u>Foundation installation:</u> Foundation installation activities including drilled foundations and scour protection measures as described above for 'Sediment disturbance and deposition leading to effects on known and unknown heritage assets'. <u>Cable installation:</u>

Potential impact	Phase			Project design option 1
	C	O	D	
				Cable installation activities via jetting as described above for 'Sediment disturbance and deposition leading to effects on known and unknown heritage assets. **Operational and maintenance phase** Operational and maintenance phase activities as described above for 'Sediment disturbance and deposition leading to effects on known and unknown heritage assets'. **Decommissioning phase** Decommissioning phase activities as described above for 'Sediment disturbance and deposition leading to effects on known and unknown heritage assets'.
Direct impact on buried palaeo-landscapes	✓	✓	✓	**Construction phase** <u>Site preparation:</u> While there are no known palaeo-landscapes within the Proposed Development, site preparation activities including sandwave clearance, boulder clearance and PLGR as described above for 'Increased suspended sediment concentrations and associated deposition leading to effects on known and unknown heritage assets' have the potential to expose previously unknown palaeo-landscapes <u>Foundation installation:</u> Foundation installation activities including drilled foundations and scour protection measures as described above for 'Sediment disturbance and deposition leading to effects on known and unknown heritage assets'. <u>Cable installation:</u> Cable installation activities via jetting as described above for 'Sediment disturbance and deposition leading to effects on known and unknown heritage assets'.

Potential impact	Phase			Project design option 1
	C	O	D	
				Operational and maintenance phase Operational and maintenance phase activities as described above for 'Sediment disturbance and deposition leading to effects on known and unknown heritage assets'. **Decommissioning phase** Decommissioning phase activities as described above for 'Sediment disturbance and deposition leading to effects on known and unknown heritage assets'.
Indirect impact on the setting of terrestrial cultural heritage assets	✓	✓	✓	**Construction phase** <u>Turbine construction:</u> Installation of 56 WTGs 273 m upper tip height above Lowest Astronomical Tide (LAT) (m). Installation of two OSPs 53 m height above LAT (m) (excluding antennae) and 46 m in length and 33.5 m in width. Lighting and marking of structures and construction site; Maximum of 4,150 vessel round trips to the Array Area over the 5-year construction phase, including 20 vessel round trips for installation of the offshore export cables (including activities at the Landfall), comprised of jack-up barge/dynamic positioning vessels, tug/anchor handlers, cable installation vessels, guard vessels, survey vessels, crew transfer vessels, and scour/cable protection installation vessels. Maximum construction schedule of 24 hours a day, 7 days a week for a maximum construction period of up to 5 years. **Operational and maintenance phase** Presence of 56 WTGs of 273 m upper tip height above LAT (m).

Potential impact	Phase			Project design option 1
	C	O	D	
				Presence of two OSPs of 53 m height above LAT (m) (excluding antennae) and 46 m in length and 33.5 m in width. Lighting and marking of structures; Maximum of 1,359 vessel round trips per year comprised of crew transfer vessels, jack-up vessels, cable repair vessels and other vessels, from local ports or transiting from a previously operational location. Operational phase up to 36.5 years. **Decommissioning phase** All structures above the seabed would be removed, scour protection, cables and cable protection would be left *in situ*; and Decommissioning would be undertaken in the reverse of construction using similar plant and techniques.

Table 18.6: Project design parameters and impacts assessed - Project Design Option 2

Potential impact	Phase			Project design option 2
	C	O	D	
Sediment disturbance and deposition leading to effects on known and unknown heritage assets	✓	✓	✓	***Construction phase*** <u>Site preparation:</u> Confirmatory surveys to be undertaken during construction include geotechnical investigations that will result in sediment disturbance. Seabed preparation prior to installation will include boulder clearance using a grab or plough device across 100% of the cable routes. The plough will have a maximum penetration depth of 500mm. Sandwave clearance will be carried out by dredging, including Trailer Suction Hopper Dredging (TSHD), mass flow excavation, or pre-lay plough techniques on a 70 m-wide clearance width for 30% of the cable length), and pre-lay grapnel runs along all the cleared corridors (PLGR). These preparation activities will result in sediment disturbance to various depths. Inter-array cable burial depth of 0-1.5m below Lowest Seabed Level. Interconnector cable burial depth of 0-2.5m below Lowest Seabed Level. Export cable burial depth of 0-2.5m below Lowest Seabed Level. Trenchless method to convey export cable across and under the intertidal foreshore anticipates a dredged exit pit on the marine side. <u>Foundation installation:</u> 47 WTGs and two OSPs installed on monopile foundations: Drilled installation of 25 WTGs employing piles of 7-11 m in diameter and two OSPs employing piles of 7-14 m in diameter at 0.2m/hr - 0.4m/hr (in rock), 0.6m/hr - 1.0m/hr (in sand) and 0.2m/hr - 0.6m/hr (in clay)to full depth of 37 m; scour protection measures; and Modelled at representative locations across the Array Area.

Potential impact	Phase C O D	Project design option 2
		<u>Cable installation:</u> The inter-array and interconnector cables are buried below seabed level to ensure stability and to protect from damage by anchors, fishing gear, dropped objects, etc. Burial will be via jetting, CFE and simultaneous lay and burial. Inter-array cable length of between 110 – 122 km; and disturbance of seabed material of 15m wide and 1.5 m deep trench; Interconnector cabling of between 25 – 28 km; and disturbance of seabed material of 15m wide and 0-2.5m deep trench. The offshore export cable is between 35-40km in length; and disturbance of seabed material 15 m wide and 2.5 m deep trench. Trenchless method to convey export cable across and under the intertidal foreshore anticipates a dredged exit pit on the marine side and possible deposition of drilled spoil at exit site. Modelling assumes that the cable routes extend over areas of sand and muddy sand. ***Operational and maintenance phase*** Inter-array and interconnector cable repair/reburial activities: Inter-array cables: repair and reburial one every 3 years, inter-removal of excess seabed sediment 300,000m^3 every 5 years Interconnector cables: repair and reburial one every 3 years, Offshore export cables: repair and reburial one every 5 years Removal of excess sediment along the export and interconnector cables 100,000m^3 every 5 years Disturbance of seabed material from up to 15 m wide and 0-2.5 m deep trench.

Potential impact	Phase			Project design option 2
	C	O	D	
				Decommissioning phase All structures above the seabed would be removed, scour protection, cables and cable protection would be left *in situ*. Monopiles will be cut 2m below the mudline; and Decommissioning would be undertaken in the reverse of construction using similar plant and techniques.
Direct impact on historic shipwreck sites	✓	✓	✓	***Construction phase*** <u>Site preparation:</u> Site preparation activities including sandwave clearance, boulder clearance and PLGR as described above for 'Sediment disturbance and deposition leading to effects on known and unknown heritage assets' have the potential to further expose or bury known shipwreck sites, and have the potential to impact on unknown shipwreck sites. <u>Foundation installation:</u> Foundation installation activities including drilled foundations and scour protection measures as described above for 'Sediment disturbance and deposition leading to effects on known and unknown heritage assets'. <u>Cable installation:</u> Cable installation activities via jetting as described above for 'Sediment disturbance and deposition leading to effects on known and unknown heritage assets'. ***Operational and maintenance phase***

Potential impact	Phase			Project design option 2
	C	O	D	
				Operational and maintenance phase activities as described above for 'Sediment disturbance and deposition leading to effects on known and unknown heritage assets'. ***Decommissioning phase*** *Decommissioning phase activities as described above for 'Sediment disturbance and deposition leading to effects on known and unknown heritage assets'.*
Direct impact on buried palaeo-landscapes	✓	✓	✓	***Construction phase*** <u>Site preparation:</u> While there are no known palaeo-landscapes within the Proposed Development, site preparation activities including sandwave clearance, boulder clearance and PLGR as described above for 'Increased suspended sediment concentrations and associated deposition leading to effects on known and unknown heritage assets' have the potential to exposed previously unknown palaeo-landscape evidence. <u>Foundation installation:</u> Foundation installation activities including drilled foundations and scour protection measures as described above for 'Sediment disturbance and deposition leading to effects on known and unknown heritage assets'. <u>Cable installation:</u> Cable installation activities via jetting as described above for 'Sediment disturbance and deposition leading to effects on known and unknown heritage assets'.

Potential impact	Phase			Project design option 2
	C	O	D	
				Operational and maintenance phase Operational and maintenance phase activities as described above for 'Sediment disturbance and deposition leading to effects on known and unknown heritage assets'. ***Decommissioning phase*** Decommissioning phase activities as described above for 'Sediment disturbance and deposition leading to effects on known and unknown heritage assets'.
Direct impact on historic shipwreck sites	✓	✓	✓	***Construction phase*** <u>Site preparation:</u> Site preparation activities including sand wave clearance, boulder clearance and PLGR as described above for 'Sediment disturbance and deposition leading to effects on known and unknown heritage assets'. <u>Foundation installation:</u> Foundation installation activities including drilled foundations and scour protection measures as described above for 'Sediment disturbance and deposition leading to effects on known and unknown heritage assets'. <u>Cable installation:</u> Cable installation activities via jetting as described above for 'Sediment disturbance and deposition leading to effects on known and unknown heritage assets'. ***Operational and maintenance phase***

Potential impact	Phase			Project design option 2
	C	O	D	
				Operations and maintenance phase activities as described above for 'Sediment disturbance and deposition leading to effects on known and unknown heritage assets'. ***Decommissioning phase*** Decommissioning phase activities as described above for 'Sediment disturbance and deposition leading to effects on known and unknown heritage assets'
Direct impact on buried palaeo-landscapes	✓	✓	✓	***Construction phase*** <u>Site preparation:</u> Site preparation activities including sand wave clearance, boulder clearance and PLGR as described above for 'Sediment disturbance and deposition leading to effects on known and unknown heritage assets'. <u>Foundation installation:</u> Foundation installation activities including drilled foundations and scour protection measures as described above for 'Sediment disturbance and deposition leading to effects on known and unknown heritage assets'. <u>Cable installation:</u> Cable installation activities via jetting as described above for 'Sediment disturbance and deposition leading to effects on known and unknown heritage assets'. ***Operational and maintenance phase*** Operations and maintenance phase activities as described above for 'Sediment disturbance and deposition leading to effects on known and unknown heritage assets'.

Potential impact	Phase			Project design option 2
	C	O	D	
				Decommissioning phase Decommissioning phase activities as described above for 'Sediment disturbance and deposition leading to effects on known and unknown heritage assets'.
Indirect impact on the setting of terrestrial cultural heritage assets	✓	✓	✓	***Construction phase*** <u>Turbine construction:</u> Installation of 47 WTGs 287 m upper tip height above Lowest Astronomical Tide (LAT) (m). Installation of two OSPs 53 m height above Lowest Astronomical Tide (LAT) (m) (excluding antennae mast) and 46 m in length and 33.5 m in width. Lighting and marking of structures and construction site; Maximum of 4,150 vessel round trips to the Array Area over the 5-year construction phase, including 20 vessel round trips for installation of the offshore export cables (including activities at the Landfall), comprised of jack-up barge/dynamic positioning vessels, tug/anchor handlers, cable installation vessels, guard vessels, survey vessels, crew transfer vessels, and scour/cable protection installation vessels. Maximum construction schedule of 24 hours a day, 7 days a week for a maximum construction period of up to 5 years ***Operational and maintenance phase*** Presence of 47 WTGs 287 m upper tip height above Lowest Astronomical Tide (LAT) (m). Presence of two OSPs 53 m height above Lowest Astronomical Tide (LAT) (m) (excluding antennae mast) and 46 m in length and 33.5 m in width. Lighting and marking of structures;

Potential impact	Phase			Project design option 2
	C	O	D	
				Maximum of 1,359 vessel round trips per year comprised of crew transfer vessels, jack-up vessels, cable repair vessels and other vessels, from local ports or transiting from a previously operational location Operational phase up to 36.5 years. ***Decommissioning phase*** All structures above the seabed would be removed, scour protection, cables and cable protection would be left *in situ*. Monopiles will be cut 2m below the mudline; and Decommissioning would be undertaken in the reverse of construction using similar plant and techniques.

18.6.2 Impacts scoped out of the assessment

18.6.2.1 On the basis of the baseline environment and the description of development outlined in Volume II, Chapter 4: Description of Development, no impacts are proposed to be scoped out of the assessment for Marine Archaeology and Cultural Heritage.

18.7 Methodology for assigning the significance of effects

18.7.1 Overview

18.7.1.1 The Marine Archaeology impact assessment has followed the methodology set out in Volume II, Chapter 5: EIA Methodology. Specific to the Marine Archaeology and Cultural Heritage impact assessment, the following guidance documents referred to in Table 18.1 have also been considered:

- DAHGI, Frameworks and Principles for the Protection of the Archaeological Heritage, 1999;
- DAHGI, Policy and Guidelines on Archaeological Excavation, 1999;
- DEHLG, Guidelines for Authors of Reports on Archaeological Excavations, 2006;
- DHLGH, Advice to the Public on Ireland's Underwater Archaeological Heritage, 2023;
- DHLGH, Archaeology and Flood Relief Schemes: Guidelines, 2023;
- EPA, Guidelines on the Information to be Contained in Environmental Impact Assessment Reports, 2022;
- ICOMOS, Charter on the Protection and Management of the Underwater Cultural Heritage, 1996;
- UNESCO, UNESCO Convention on the Protection of the Underwater Cultural Heritage, 2001;
- COWRIE, Guidance for Assessment of Cumulative Impacts on the Historic Environment from Offshore Renewable Energy, 2007;
- Plets *et al*, Historic England, Marine Geophysics Data Acquisition, Processing and Interpretation, 2013.
- UNESCO, World Heritage and Wind Energy Planning, 2021.

18.7.2 Impact assessment criteria

SENSITIVITY

18.7.2.1 In defining the sensitivity for marine archaeology and cultural heritage receptors, the vulnerability, recoverability and value/importance of the resource has been taken into consideration. Sensitivity is defined according to the scale presented in Table 18.7.

Table 18.7: Definitions of sensitivity of the receptor

Receptor sensitivity	Definition
High	High importance, protected site
Medium	Of regional or local interest
Low	Local interest

Receptor sensitivity	Definition
Negligible	Local interest

18.7.2.2 In the case of archaeological sites, all shipwreck sites considered to be over 100 years old are protected sites and considered to be of High Sensitivity.

MAGNITUDE

18.7.2.3 This section describes the criteria applied in this chapter to assign values to the magnitude of potential impacts and the sensitivity of the receptors. The terms used to define magnitude and sensitivity are based on those which are described in further detail in Volume II, Chapter 5: EIA Methodology.

Table 18.8: Definition of terms relating to the magnitude of an impact

Magnitude	Definition
High	Loss of resource and/or quality and integrity of resource; severe damage to key characteristics, features or elements (negative).
	Large scale or major improvement of resource quality; extensive restoration or enhancement; major improvement of attribute quality (positive).
Medium	Loss of resource, but not adversely affecting integrity of resource; partial loss of/damage to key characteristics, features or elements (negative).
	Benefit to, or addition of, key characteristics, features or elements; improvement of attribute quality (positive).
Low	Some measurable change in attributes, quality or vulnerability, minor loss of, or alteration to, one (maybe more) key characteristics, features or elements (negative).
	Minor benefit to, or addition of, one (maybe more) key characteristics, features or elements; some beneficial impact on attribute or a reduced risk of adverse impact occurring (positive).
Negligible	Very minor loss or detrimental alteration to one or more characteristics, features or elements (negative).
	Very minor benefit to, or positive addition of one or more characteristics, features or elements (positive).

SIGNIFICANCE OF EFFECT

18.7.2.4 The significance of the effect upon Marine Archaeology and Cultural Heritage is determined by correlating the magnitude of the impact and the sensitivity of the receptor. The particular method employed for this assessment is presented in Table 18.9. Where a range of significance of effect is presented in Table 18.9, the final assessment for each effect is based upon expert judgement.

Table 18.9: Significance of effect matrix

			Baseline Environment - Sensitivity			
			High	Medium	Low	Negligible
Description of Impact - Magnitude	Adverse Impact	High	Profound or Very Significant (significant)	Significant	Moderate*	Imperceptible
		Medium	Significant	Moderate*	Slight	Imperceptible
		Low	Moderate*	Slight	Slight	Imperceptible
	Neutral Impact	Negligible	Not Significant	Not Significant	Not Significant	Imperceptible
	Positive Impact	Low	Moderate*	Slight	Slight	Imperceptible
		Medium	Significant	Moderate*	Slight	Imperceptible
		High	Profound or Very Significant (significant)	Significant	Moderate*	Imperceptible

**Moderate levels of effect have the potential, subject to the assessor's professional judgement to be significant or not significant. Moderate will be considered as significant or not significant in EIA terms, depending on the sensitivity and magnitude of change factors evaluated. These evaluations are explained as part of the assessment, where they occur.*

18.7.3 Factored in measures

18.7.3.1 The Project Design Options set out in Volume II, Chapter 4: Description of Development includes a number of designed-in measures and management measures (or controls) which have been factored into the Proposed Development and are committed to be delivered by the Developer as part of the Proposed Development.

18.7.3.2 These factored-in measures are standard measures applied to offshore wind development, including lighting and marking of the Proposed Development, use of 'soft-starts' for piling operations etc, to reduce the potential for impacts. Factored-in measures relevant to the assessment on Marine Archaeology and Cultural Heritage are presented in Table 18.10. These measures are integrated into the description of development and have therefore been considered in the impact assessment (i.e. the determination of magnitude and therefore significance assumes implementation of these measures). These measures are considered standard industry practice for this type of development. This approach is in line with EPA guidance which states that 'in an EIAR it may be useful to describe avoidance measures that have been integrated into the proposed proposal' (EPA, 2022).

Table 18.10: Factored in measures

Factored in measures	Justification
The principal of avoidance has informed the design process, whereby impacts on known archaeological sites have been avoided wherever possible.	To ensure that known archaeological sites are protected from direct impacts associated with the Proposed Development.
Archaeological Exclusion Zones (AEZ) will be established around each known shipwreck site and potential site, within which no installation activities should take place. The AEZs are set out in Volume III, Appendix 18.1: Marine Archaeology and Cultural Heritage Technical Report, and in Volume III, Appendix 25.9: Archaeological Management Plan.	To ensure that known archaeological sites are protected from direct impacts associated with the Proposed Development.
In the event that site preparation and installation works are unable to avoid activities within an AEZ, the works can only proceed with the consent of the National Monuments Service (NMS).	To ensure that potential direct impacts associated with the Proposed Development on known archaeological sites are minimised.
Confirmatory marine geophysical surveys, Remote Operated Vehicles (ROV) surveys and geotechnical surveys conducted for the Proposed Development prior to construction will be reviewed by a maritime archaeologist as part of the project design team and the findings will be communicated to the NMS and will inform the need for micro-siting.	The undertaking of confirmatory surveys in preparation for installation activities provide the opportunity for micro-siting of infrastructure around any newly identified archaeological constraints.
An Archaeology Management Plan (AMP) has been prepared to inform the construction, operational and maintenance and decommissioning phases of works. The AMP is provided in Volume III, Appendix 25.9: Archaeological Management Plan. The AMP sets out the principal protocols that Sure Partners Ltd (SPL – the Developer) will put in place to ensure the protection of archaeological heritage through the course of the project lifetime. The AMP facilitates the recording and reporting of any archaeological material discovered during project lifetime should this occur. The AMP addresses protocols for archaeological monitoring of works where the recovery of material to the surface is possible. The AMP addresses protocols for recording and reporting observations where the recovery of material to the surface is not possible and where the seabed has already been surveyed comprehensively and no archaeological features recorded. The AMP addresses protocols for archaeological inputs when a discovery of archaeological material is made.	To ensure that archaeological sites and features that might become known in the course of the Proposed Development are recorded fully and secured from further impact where necessary, and resolved fully where impacts cannot be avoided.

Factored in measures	Justification
Project maritime archaeologists, operating under licence from the DHLGH, will be engaged on the project to monitor construction activities and observe any works where material of archaeological importance may be uncovered.	To provide opportunities to observe, record and recover material of archaeological interest that might be exposed in the course of the Proposed Development, and with the proviso to resolve fully any archaeologically significant observation.
Implementation and adherence to the Rehabilitation Schedule (Volume III, Appendix 4.1).	The Rehabilitation Schedule presented in Volume III, Appendix 4.1 outlines the measures for the decommissioning of the Proposed Development.
The Developer confirms and commits that it will not carry out any works in respect of the Proposed Development under the planning permission (if granted) at the same time as any activities the subject of the Foreshore Licence for Site Investigations (FS007339).	The Developer was granted a Foreshore Licence (FS007339) for Site Investigations (associated with the Proposed Development) from the Minister for Housing, Local Government and Heritage in May 2022. The Developer confirms and commits that it will not carry out any works in respect of the Proposed Development under the planning permission (if granted) at the same time as any activities the subject of the Foreshore Licence for Site Investigations (FS007339) being carried out. As such there is no temporal overlap between the activities consented in this Foreshore Licence and the Proposed Development and there will be no potential for cumulative effects.
The Developer confirms and commits that it will not carry out any works in respect of the Proposed Development under the planning permission (if granted) at the same time as any activities the subject of the Foreshore Licence Application for Site Surveys FS007555 (should a licence be granted) are being carried out.	The Developer submitted a Foreshore Licence Application for Site Surveys to the Minister for Housing, Local Government and Heritage in April 2023 (FS007555) and this application is pending determination. The Developer confirms and commits that it will not carry out any works in respect of the Proposed Development under the planning permission (if granted) at the same time as any activities the subject of the Foreshore Licence Application for Site Surveys FS007555 (should a licence be granted) are being carried out. As such there is no temporal overlap between the activities proposed in the

Factored in measures	Justification
	Foreshore Licence Application and the Proposed Development.

18.8 Assessment of the significance of effects

18.8.1.1 The impacts of the construction, operational and maintenance and decommissioning phases of both Project Design Options forming the Proposed Development have been assessed on Marine Archaeology and Cultural Heritage. The potential impacts arising from the construction, operational and maintenance and decommissioning phases of the Proposed Development are listed in Table 18.5 and Table 18.6, along with the project parameters against which each impact has been assessed.

18.8.1.2 A description of the potential effect on marine archaeology receptors caused by each identified impact is provided in Section 18.9 and Section 18.10.

18.9 Assessment of Project Design Option 1

18.9.1 Impact 1 – Sediment disturbance and deposition leading to effects on known and unknown heritage assets

SENSITIVITY OF THE RECEPTOR

18.9.1.1 The Arklow Bank is of national importance as a sandbank that is hazardous to shipping and the significant number of shipwrecks associated with the bank highlight the potential for more discoveries to arise on and close to the bank. The marine archaeology receptors are vulnerable sites that can be exposed further by disturbance activities. Each known shipwreck site is regarded as being of national importance and is a protected site.

18.9.1.2 The marine archaeology receptor of known and unknown heritage assets is deemed to be of high vulnerability, low recoverability and of national value. The sensitivity of the receptor is therefore, considered to be High.

Construction phase

18.9.1.3 The disturbance of sediment/seabed deposits to facilitate the construction of the Proposed Development has the potential to impact the marine archaeology on Arklow Bank and the seabed between the bank and shore. The disturbance of the sediment/seabed deposits can result in the exposure of known marine archaeology receptors (i.e. shipwreck) and the exposure of as yet unknown shipwreck, unknown buried palaeo-landscapes and associated sites. Such activities can also result in the burial of known receptors. The exposure of sites, or areas of sites, exposes the material to erosion and degradation. The burial of sites, or areas of sites, can help to preserve sites from erosion but also conceals them from further examination.

18.9.1.4 The construction phase includes confirmatory surveys that will typically be for short duration, lesser magnitude and localised, when compared to those resulting from site preparation activities.

18.9.1.5 Seabed preparation activities for foundations include:

- installation of wind turbines and OSP monopile foundations via drilling;
- cable installation via sandwave clearance;
- boulder clearance PLGR;
- landfall connection via trenchless activities to avoid direct impacts on the intertidal foreshore; and

- any associated jack-up vessel and vessel anchoring activities.

18.9.1.6 These construction activities will disturb the seabed, resulting in sediment being released into the water column and subsequently redeposited. Impacts of sediment disturbance and deposition have the potential to expose previously unrecorded marine archaeology receptors, and also to bury or partially bury known marine archaeology receptors, resulting in the potential for direct, temporary impacts on marine archaeology assets located on the sandbank and on the seabed between the bank and the shore.

18.9.1.7 During seabed preparation activities, sandwaves will be cleared within a 100 m diameter of each foundation location, with an average of 5 m depth of material being relocated. This will occur for approximately 33% of the structures.

18.9.1.8 For the inter-array and interconnector cabling, sandwaves will be cleared along a corridor up to 70 m wide with clearance activities along 30% of the cable route.

18.9.1.9 For the export cabling, sandwaves will be cleared along a corridor up to 70 m wide (for each cable). This will occur across 30% of the offshore export cable length.

18.9.1.10 The results of the modelling of suspended sediments and associated deposition arising from this activity as presented in Volume II, Chapter 6: Coastal Processes has shown that sedimentation occurs on the slack tide and resuspension and transport occurs when the tidal currents increase. Although the material is deposited at discrete locations, the high energy nature of the site causes it to be widely distributed and amalgamated with the sediment transport cycle, with sedimentation levels in the order of 1 mm in the vicinity of the Array Area one day after the completion of the operation.

18.9.1.11 During foundation installation, drilled installation of up to 14 m diameter monopiles will extend to 37 m depth. The results of the modelling of suspended sediments and associated deposition arising from this activity as presented in Chapter 6: Coastal Processes has shown that sediment will be transported mid-tide, settle on slack water and be re-suspended and further dispersed on the resumption of tidal flow. Sediment levels after the cessation of each drilling operation are not expected to be discernible from the background sediments due to the limited magnitude of deposition and the similar nature of the material.

18.9.1.12 For inter-array cable installation, the trench will be 15 m wide and up to 1.5 m deep below lowest seabed level. For interconnector cable installation, the trench will be 15 m wide and up to 0-2.5m m deep below lowest seabed level. The results of the modelling of suspended sediments and associated deposition arising from this activity as presented in Chapter 6: Coastal Processes has shown that average sedimentation during the operation is in the order of 5 mm.

18.9.1.13 For offshore export cable installation, the trench will be 15 m wide and 2.5 m deep. The results of the modelling of suspended sediments and associated deposition arising from this activity as presented in Chapter 6: Coastal Processes has shown that although the released material migrates both north and south by settling and being re-suspended on successive tides, the sedimentation level is small and following the completion of works the material is assimilated and indistinguishable from the baseline transport regime. Further detail can be found in Chapter 6: Coastal Processes.

MAGNITUDE OF THE IMPACT

18.9.1.14 The factored-in measures outlined in Table 18.10 establish a working environment based on avoiding known archaeological sites where possible, ensuring that any new observations are recorded, advancing solutions to ensure site protection, and preservation by record where required. An AMP has been prepared to inform the installation works, to facilitate the recording and reporting of any archaeological material discovered during the construction phase (Volume III, Appendix 25.9: Archaeological Management Plan).

18.9.1.15 The impact is predicted to be of local spatial extent, short to medium term duration, intermittent and low reversibility. It is predicted that the impact will affect the receptor indirectly. The magnitude is therefore, considered to be Low.

SIGNIFICANCE OF THE EFFECT

18.9.1.16 Overall, the magnitude of the impact is deemed to be **Low** and the sensitivity of the receptor is considered to be **High**. The effect will, therefore, be **Moderate**. The factored-in measures ensure that the likelihood of new significant archaeological discoveries being made in the course of the construction phase is low. As such, the effect is considered to be **not significant** in EIA terms.

PROPOSED MITIGATION

18.9.1.17 The significance of effect is not significant in EIA terms. Therefore, no additional mitigation to that already identified in Table 18.10 are considered necessary.

RESIDUAL EFFECT ASSESSMENT

18.9.1.18 The significance of effects on known and unknown heritage assets from sediment disturbance and deposition is not significant in EIA terms. Therefore, no additional mitigation to that already identified in Table 18.10 are considered necessary. Therefore, no significant adverse residual effects have been predicted in respect of sediment disturbance and deposition.

Operational and maintenance phase

MAGNITUDE OF IMPACT

18.9.1.19 The factored-in measures outlined in Table 18.10 establish a working environment based on avoiding known archaeological sites where possible, ensuring that any new observations are recorded, advancing solutions to ensure site protection, and preservation by record where required. An AMP has been prepared to inform the operational and maintenance works, to facilitate the recording and reporting of any archaeological material discovered during the operational and maintenance phase (Volume III, Appendix 25.9: Archaeological Management Plan).

18.9.1.20 The impact is predicted to be of local spatial extent, short to medium term duration, intermittent and low reversibility. It is predicted that the impact will affect the receptor indirectly. The magnitude is therefore, considered to be Low.

SIGNIFICANCE OF EFFECT

18.9.1.21 Overall, the magnitude of the impact is deemed to be **Low** and the sensitivity of the receptor is considered to be **High**. The effect will, therefore, be **Moderate**. The factored-in measures ensure that the likelihood of new significant archaeological discoveries being made in the course of the operational and maintenance phase is low. As such, the effect is considered to be **not significant** in EIA terms.

PROPOSED MITIGATION

18.9.1.22 The significance of effect is not significant in EIA terms. Therefore, no additional mitigation to that already identified in Table 18.10 are considered necessary.

RESIDUAL EFFECT ASSESSMENT

18.9.1.23 The significance of effects on known and unknown heritage assets from sediment disturbance and deposition is **not significant** in EIA terms. Therefore, no additional mitigation to that already

identified in Table 18.10 are considered necessary. Therefore, no significant adverse residual effects have been predicted in respect of sediment disturbance and deposition.

Decommissioning phase

MAGNITUDE OF IMPACT

18.9.1.24 The factored-in measures outlined in Table 18.10 establish a working environment based on avoiding known archaeological sites where possible, ensuring that any new observations are recorded, advancing solutions to ensure site protection, and preservation by record where required. An AMP has been prepared to inform the decommissioning works, to facilitate the recording and reporting of any archaeological material discovered during the decommissioning phase (Volume III, Appendix 25.9: Archaeological Management Plan).

18.9.1.25 The impact is predicted to be of local spatial extent, short to medium term duration, intermittent and low reversibility. It is predicted that the impact will affect the receptor indirectly. The magnitude is therefore, considered to be Low.

SIGNIFICANCE OF EFFECT

18.9.1.26 Overall, the magnitude of the impact is deemed to be **Low** and the sensitivity of the receptor is considered to be **High**. The effect will, therefore, be Moderate. The factored-in measures ensure that the likelihood of new significant archaeological discoveries being made in the course of the decommissioning phase is low. As such, the effect is considered to be **not significant** in EIA terms

PROPOSED MITIGATION

18.9.1.27 The significance of effect is not significant in EIA terms. Therefore, no additional mitigation to that already identified in Table 18.10 are considered necessary.

RESIDUAL EFFECT ASSESSMENT

18.9.1.28 The significance of effects on known and unknown heritage assets from sediment disturbance and deposition is not significant in EIA terms. Therefore, no additional mitigation to that already identified in Table 18.10 are considered necessary. Therefore, no significant adverse residual effects have been predicted in respect of sediment disturbance and deposition.

18.9.2 Impact 2 – Direct impact on historic shipwreck sites

SENSITIVITY OF THE RECEPTOR

18.9.2.1 The Arklow Bank is of national importance as a sandbank that is hazardous to shipping and the significant number of shipwrecks associated with the bank highlight the potential for more discoveries to arise on and close to the bank. The marine archaeology receptors are vulnerable sites that can be exposed further by disturbance activities. Each known shipwreck site is regarded as being of national importance and is a protected site.

18.9.2.2 The marine archaeology receptor of known and unknown historic shipwreck sites is deemed to be of high vulnerability, low recoverability and of national value. The sensitivity of the receptor is therefore, considered to be High.

Construction phase

18.9.2.3 The construction phase includes confirmatory surveys that will typically be for short duration, lesser magnitude and localised, when compared to those resulting from site preparation activities.

18.9.2.4 Seabed preparation measures and turbine foundation construction have the potential to impact on historic shipwreck sites on Arklow Bank and the seabed between the bank and shore.

18.9.2.5 The construction phase is comprised of seabed preparation activities for foundations installation of wind turbines, OSP monopile foundations via drilling and cable installation via sandwave clearance, boulder clearance PLGR, and landfall connection via trenchless activities to avoid direct impacts on the intertidal foreshore, and any associated jack-up vessel and vessel anchoring activities.

18.9.2.6 These construction activities will disturb the seabed, and can impact on shipwreck sites directly by being constructed on or beside shipwreck sites, and indirectly through sediment that is released into the water column and subsequently redeposited, resulting in burial of sites or parts of sites, resulting in the potential for direct, temporary impacts on historic shipwreck sites located on the sandbank and on the seabed between the bank and the shore.

18.9.2.7 During seabed preparation activities, sandwaves may be cleared within a 100 m diameter of each foundation location, with an average of 5 m depth of material being relocated. This may occur for approximately 33% of the structures.

18.9.2.8 For the inter-array and interconnector cabling, sandwaves may be cleared along a corridor up to 70 m wide with clearance activities along circa 20% of the cable route.

18.9.2.9 For the export cabling, sandwaves may be cleared along a corridor up to 70 m wide (for each cable). This may occur across 30% of the offshore export cable length.

18.9.2.10 The results of the modelling of suspended sediments and associated deposition arising from this activity as presented in Chapter 6: Coastal Processes has shown that sedimentation occurs on the slack tide and resuspension and transport occurs when the tidal currents increase. Although the material is deposited at discrete locations, the high energy nature of the site causes it to be widely distributed and amalgamated with the sediment transport cycle, with sedimentation levels in the order of 1 mm in the vicinity of the Array Area one day after the completion of the operation.

18.9.2.11 During foundation installation, drilled installation of up to 14 m diameter monopiles to up to 37 m depth. The results of the modelling of suspended sediments and associated deposition arising from this activity as presented in Chapter 6: Coastal Processes has shown that sediment will be transported mid-tide, settle on slack water and be re-suspended and further dispersed on the resumption of tidal flow. Sediment levels after the cessation of each drilling operation are not expected to be discernible from the background sediments due to the limited magnitude of deposition and the similar nature of the material.

18.9.2.12 For inter-array cable installation, the trench will be 15 m wide and up to 1.5 m deep below lowest seabed level. For interconnector cable installation, the trench will be 15 m wide and up to 2.5 m deep below lowest seabed level. The results of the modelling of suspended sediments and associated deposition arising from this activity as presented in Chapter 6: Coastal Processes has shown that average sedimentation during the operation is in the order of 5 mm.

18.9.2.13 For offshore export cable installation, the trench will be 15 m wide and up to 2.5 m deep. The results of the modelling of suspended sediments and associated deposition arising from this activity as presented in Chapter 6: Coastal Processes has shown that although the released material migrates both north and south by settling and being re-suspended on successive tides, the sedimentation level is small and following the completion of works the material is assimilated and indistinguishable from the baseline transport regime. Further detail can be found in Chapter 6: Coastal Processes.

MAGNITUDE OF THE IMPACT

18.9.2.14 The factored-in measures outlined in Table 18.10 establish a working environment based on avoiding known archaeological sites where possible, ensuring that any new observations are

recorded, advancing solutions to ensure site protection where possible, and preservation by record where required. AEZs are identified around each known historic shipwreck site to protect the integrity of the shipwreck site where possible from direct impacts, and within which works will not take place unless agreed by the NMS. An AMP has been prepared to inform the installation works, to facilitate the recording and reporting of any archaeological material discovered during the construction phase (Volume III, Appendix 25.9: Archaeological Management Plan).

18.9.2.15 The impact is predicted to be of local spatial extent, short to medium term duration, intermittent and low reversibility. It is predicted that the impact will affect the receptor indirectly. The magnitude is therefore, considered to be Low.

SIGNIFICANCE OF THE EFFECT

18.9.2.16 Overall, the magnitude of the impact is deemed to be **Low** and the sensitivity of the receptor is considered to be **High**. The effect will, therefore, be **Moderate**. The factored-in measures ensure that the likelihood of new significant archaeological discoveries being made in the course of the construction phase is low. As such, the effect is considered to be **not significant** in EIA terms.

PROPOSED MITIGATION

18.9.2.17 The significance of effect is not significant in EIA terms. Therefore, no additional mitigation to that already identified in Table 18.10 are considered necessary.

RESIDUAL EFFECT ASSESSMENT

18.9.2.18 The significance of effect from direct impact on historic shipwreck sites is not significant in EIA terms. Therefore, no additional mitigation to that already identified in Table 18.10 are considered necessary. Therefore, no significant adverse residual effects have been predicted in respect of direct impacts on historic wreck sites.

Operational and maintenance phase

MAGNITUDE OF IMPACT

18.9.2.19 The factored-in measures outlined in Table 18.10 establish a working environment based on avoiding known archaeological sites where possible, ensuring that any new observations are recorded, advancing solutions to ensure site protection, and preservation by record where required. An AMP has been prepared to inform the operational and maintenance works, to facilitate the recording and reporting of any archaeological material discovered during the operational and maintenance phase (Volume III, Appendix 25.9: Archaeological Management Plan).

18.9.2.20 The impact is predicted to be of local spatial extent, short to medium term duration, intermittent and low reversibility. It is predicted that the impact will affect the receptor indirectly. The magnitude is therefore, considered to be Low.

SIGNIFICANCE OF EFFECT

18.9.2.21 Overall, the magnitude of the impact is deemed to be **Low** and the sensitivity of the receptor is considered to be **High**. The effect will, therefore, be **Moderate**. The factored-in measures ensure that the likelihood of new significant archaeological discoveries being made in the course of the operational and maintenance phase is low. As such, the effect is considered to be **not significant** in EIA terms.

PROPOSED MITIGATION

18.9.2.22 The significance of effect is not significant in EIA terms. Therefore, no additional mitigation to that already identified in Table 18.10 are considered necessary.

RESIDUAL EFFECT ASSESSMENT

18.9.2.23 The significance of effect from direct impact on historic shipwreck sites is **not significant** in EIA terms. Therefore, no additional mitigation to that already identified in Table 18.10 are considered necessary. Therefore, no significant adverse residual effects have been predicted in respect of direct impacts on historic wreck sites.

Decommissioning phase

MAGNITUDE OF IMPACT

18.9.2.24 The factored-in measures outlined in Table 18.10 establish a working environment based on avoiding known archaeological sites where possible, ensuring that any new observations are recorded, advancing solutions to ensure site protection where possible, and preservation by record where required. An AMP has been prepared to inform the decommissioning works, to facilitate the recording and reporting of any archaeological material discovered during the decommissioning phase (Volume III, Appendix 25.9: Archaeological Management Plan).

18.9.2.25 The impact is predicted to be of local spatial extent, short to medium term duration, intermittent and low reversibility. It is predicted that the impact will affect the receptor indirectly. The magnitude is therefore, considered to be Low.

SIGNIFICANCE OF EFFECT

18.9.2.26 Overall, the magnitude of the impact is deemed to be **Low** and the sensitivity of the receptor is considered to be **High**. The effect will, therefore, be **Moderate**. The factored-in measures ensure that the likelihood of new significant archaeological discoveries being made in the course of the decommissioning phase is low. As such, the effect is considered to be **not significant** in EIA terms.

PROPOSED MITIGATION

18.9.2.27 The significance of effect is not significant in EIA terms. Therefore, no additional mitigation to that already identified in Table 18.10 are considered necessary.

RESIDUAL EFFECT ASSESSMENT

18.9.2.28 Overall, the magnitude of the impact is deemed to be **Low** and the sensitivity of the receptor is considered to be **High**. The effect will, therefore, be **Moderate**. The factored-in measures ensure that the likelihood of new significant archaeological discoveries being made in the course of the construction phase is **Low**. The effect is considered to be **not significant** in EIA terms.

18.9.3 Impact 3 – Direct impact on buried palaeo-landscapes

SENSITIVITY OF THE RECEPTOR

18.9.3.1 The Arklow Bank is of national importance as a sandbank where the seabed activities required to facilitate the construction, maintenance and decommissioning of the Proposed Development has the potential to impact on previously unrecorded palaeo-landscape locations on the bank and the seabed between the bank and shore.

18.9.3.2 The marine archaeology receptor of buried palaeo-landscape sites when identified, is deemed to be of high vulnerability, low recoverability and of national value. The sensitivity of the receptor is therefore, considered to be High.

Construction phase

18.9.3.3 The construction phase includes confirmatory surveys that will typically be for short duration, lesser magnitude and localised, when compared to those resulting from site preparation activities.

18.9.3.4 Seabed preparation measures and turbine foundation construction have the potential to expose buried palaeo-landscape sites on Arklow Bank and the seabed between the bank and shore.

18.9.3.5 The construction phase is comprised of seabed preparation activities for foundations installation of wind turbines, OSP monopile foundations via drilling and cable installation via sandwave clearance, boulder clearance PLGR, and landfall connection via trenchless activities to avoid direct impacts on the intertidal foreshore, and any associated jack-up vessel and vessel anchoring activities.

18.9.3.6 These construction activities will disturb the seabed, and have the potential to expose previously unrecorded buried palaeo-landscapes, and may also bury such locations on the sandbank and on the seabed between the bank and the shore.

18.9.3.7 During seabed preparation activities, sandwaves may be cleared within a 100 m diameter of each foundation location, with an average of 5 m depth of material being relocated. This may occur for approximately 33% of the structures.

18.9.3.8 For the inter-array and interconnector cabling, sandwaves may be cleared along a corridor up to 70 m wide with clearance activities along circa 20% of the cable route.

18.9.3.9 For the export cabling, sandwaves may be cleared along a corridor up to 70 m wide (for each cable). This may occur across 30% of the offshore export cable length.

18.9.3.10 The results of the modelling of suspended sediments and associated deposition arising from this activity as presented in Chapter 6: Coastal Processes has shown that sedimentation occurs on the slack tide and resuspension and transport occurs when the tidal currents increase. Although the material is deposited at discrete locations, the high energy nature of the site causes it to be widely distributed and amalgamated with the sediment transport cycle, with sedimentation levels in the order of 1 mm in the vicinity of the Array Area one day after the completion of the operation.

18.9.3.11 During foundation installation, the installation of up to 14 m diameter monopiles to up to 37 m depth. The results of the modelling of suspended sediments and associated deposition arising from this activity as presented in Chapter 6: Coastal Processes has shown that sediment will be transported mid-tide, settle on slack water and be re-suspended and further dispersed on the resumption of tidal flow. Sediment levels after the cessation of each drilling operation are not expected to be discernible from the background sediments due to the limited magnitude of deposition and the similar nature of the material.

18.9.3.12 For inter-array cable installation, the trench will be 15 m wide and up to 1.5 m deep below lowest seabed level. For interconnector cable installation, the trench will be 15 m wide and up to 2.5 m deep below lowest seabed level The results of the modelling of suspended sediments and associated deposition arising from this activity as presented in chapter 6: Coastal Processes has shown that average sedimentation during the operation is in the order of 5 mm.

18.9.3.13 For offshore export cable installation, the trench will be 15 m wide and up to 2.5 m deep. The results of the modelling of suspended sediments and associated deposition arising from this activity as presented in chapter 6: Coastal Processes has shown that although the released material migrates both north and south by settling and being re-suspended on successive tides, the sedimentation level is small and following the completion of works the material is assimilated

and indistinguishable from the baseline transport regime. Further detail can be found in Chapter 6: Coastal Processes.

MAGNITUDE OF THE IMPACT

18.9.3.14 The factored-in measures outlined in Table 18.10 establish a working environment based on avoiding known archaeological sites where possible, ensuring that any new observations are recorded where possible, advancing solutions to ensure site protection where possible, and preservation by record where required. An Archaeology Management Plan (AMP) has been prepared to inform the installation works, to facilitate the recording and reporting of any archaeological material discovered during the construction phase (Volume III, Appendix 25.9: Archaeological Management Plan).

18.9.3.15 The impact is predicted to be of local spatial extent, short to medium term duration, intermittent and low reversibility. It is predicted that the impact will affect the receptor indirectly. The magnitude is therefore, considered to be Low.

SIGNIFICANCE OF THE EFFECT

18.9.3.16 There are no records of buried palaeo-landscapes being present on the Arklow Bank or in the surrounding waters. Buried palaeo-landscapes are vulnerable sites that can be exposed by disturbance activities. Overall, the magnitude of the impact is deemed to be **Low** and the sensitivity of the receptor is considered to be **High**. The effect will, therefore, be **Moderate**. The factored-in measures ensure that the likelihood of new significant archaeological discoveries being made in the course of the construction phase is **Low**. As such, the effect is considered to be **not significant** in EIA terms.

PROPOSED MITIGATION

18.9.3.17 The significance of effect is not significant in EIA terms. Therefore, no additional mitigation to that already identified in Table 18.10 are considered necessary.

RESIDUAL EFFECT ASSESSMENT

18.9.3.18 The significance of effect from direct impact on buried palaeo-landscape sites is **not significant** in EIA terms. Therefore, no additional mitigation to that already identified in Table 18.10 are considered necessary. Therefore, no significant adverse residual effects have been predicted in respect of direct impacts on buried palaeo-landscapes.

Operational and maintenance phase

MAGNITUDE OF IMPACT

18.9.3.19 The factored-in measures outlined in Table 18.10 establish a working environment based on avoiding known archaeological sites where possible, ensuring that any new observations are recorded, advancing solutions to ensure site protection where possible, and preservation by record where required. An AMP has been prepared to inform the operational and maintenance works, to facilitate the recording and reporting of any archaeological material discovered during the operational and maintenance phase (Volume III, Appendix 25.9: Archaeological Management Plan).

18.9.3.20 The impact is predicted to be of local spatial extent, short to medium term duration, intermittent and low reversibility. It is predicted that the impact will affect the receptor indirectly. The magnitude is therefore, considered to be Low.

SIGNIFICANCE OF EFFECT

18.9.3.21 Overall, the magnitude of the impact is deemed to be **Low** and the sensitivity of the receptor is considered to be **High**. The effect will, therefore, be **Moderate**. The factored-in measures ensure that the likelihood of new significant archaeological discoveries being made in the course of the operational and maintenance phase is low. The effect is considered to be **not significant** in EIA terms.

PROPOSED MITIGATION

18.9.3.22 The significance of effect is not significant in EIA terms. Therefore, no additional mitigation to that already identified in Table 18.10 are considered necessary.

RESIDUAL EFFECT ASSESSMENT

18.9.3.23 The significance of effect from direct impact on buried palaeo-landscapes is **not significant** in EIA terms. Therefore, no additional mitigation to that already identified in Table 18.10 are considered necessary. Therefore, no significant adverse residual effects have been predicted in respect of direct impacts on buried palaeo-landscapes.

Decommissioning phase

MAGNITUDE OF IMPACT

18.9.3.24 The factored-in measures outlined in Table 18.10 establish a working environment based on avoiding known archaeological sites where possible, ensuring that any new observations are recorded, advancing solutions to ensure site protection where possible, and preservation by record where required. An AMP has been prepared to inform the decommissioning works, to facilitate the recording and reporting of any archaeological material discovered during the decommissioning phase (Volume III, Appendix 25.9: Archaeological Management Plan).

18.9.3.25 The impact is predicted to be of local spatial extent, short to medium term duration, intermittent and low reversibility. It is predicted that the impact will affect the receptor indirectly. The magnitude is therefore, considered to be Low.

SIGNIFICANCE OF EFFECT

18.9.3.26 Overall, the magnitude of the impact is deemed to be **Low** and the sensitivity of the receptor is considered to be **High**. The effect will, therefore, be **Moderate**. The factored-in measures ensure that the likelihood of new significant archaeological discoveries being made in the course of the decommissioning phase is low. The effect is considered to be **not significant** in EIA terms.

PROPOSED MITIGATION

18.9.3.27 The significance of effect is not significant in EIA terms. Therefore, no additional mitigation to that already identified in Table 18.10 are considered necessary.

RESIDUAL EFFECT ASSESSMENT

18.9.3.28 Overall, the magnitude of the impact is deemed to be **Low** and the sensitivity of the receptor is considered to be **High**. The effect will, therefore, be **Moderate**. The factored-in measures ensure that the likelihood of new significant archaeological discoveries being made in the course of the decommissioning phase is low. The effect is considered to be **not significant** in EIA terms.

18.9.4 Impact 4 – Indirect impact on the setting of terrestrial cultural heritage assets

SENSITIVITY OF THE RECEPTOR

18.9.4.1 The visibility of the WTGs and OSPs from cultural heritage sites inland is assessed as an indirect impact of the Proposed Development and consideration is given to understanding the nature of such impact on these sites.

18.9.4.2 The cultural heritage receptor is deemed to be of high vulnerability, low recoverability and of national value. The sensitivity of the receptor is therefore considered to be High.

Construction phase

18.9.4.3 The installation is for 56 WTGs that will each reach 273 m upper tip height above LAT (m) and two OSPs that will reach 53 m height above LAT) (m) (excluding antennae).

18.9.4.4 The construction will include lighting and marking of the installations and the construction site.

18.9.4.5 During the 5 year construction phase, there will be a maximum of 4,150 vessel round trips to the Array Area, including 20 vessel round trips for installation of the export cables (including activities at the Landfall), comprised of jack-up barge/dynamic positioning vessels, tug/anchor handlers, cable installation vessels, guard vessels, survey vessels, crew transfer vessels, and scour/cable protection installation vessels.

MAGNITUDE OF THE IMPACT

18.9.4.6 The construction phase is comprised of the above-water installation activities associated with 56 WTGs with a tip height 273 m above LAT and two OSPs reaching 53 m in height above LAT (excluding antennae), within the Array Area located approximately 6 to 15 km to the east of Arklow in County Wicklow. The ZTV suggests that visibility of the wind turbines, which will be progressively installed over the construction phase, dissipates inland, where the rising ground of the Wicklow Mountains will mean that the Proposed Development will only be visible to sites with an east-facing aspect (see Volume III, Appendix 18.2: Cultural Heritage Visual Impact Assessment Report).

18.9.4.7 The construction activities will result in indirect impacts on the visibility from cultural heritage assets. The impact is predicted to be of short to medium term duration, intermittent and low reversibility. It is predicted that the impact will affect the receptor indirectly. The magnitude is therefore, considered to be Low.

SIGNIFICANCE OF THE EFFECT

18.9.4.8 Overall, the magnitude of the impact is deemed to be **Low** and the sensitivity of the receptor is considered to be **High**. The effect will, therefore, be **Moderate**. The visibility of the wind turbines will dissipate inland and will only be visible to sites with an east-facing aspect. The indirect nature of the visual impact is considered to be **not significant** in EIA terms.

PROPOSED MITIGATION

18.9.4.9 The significance of effect is not significant in EIA terms. Therefore, no additional mitigation to that already identified in Table 18.10 are considered necessary.

RESIDUAL EFFECT ASSESSMENT

18.9.4.10 The significance of an indirect impact on the setting of terrestrial cultural heritage assets from construction of the WTGs and OSPs is not significant in EIA terms. Therefore, no additional

mitigation to that already identified in Table 18.10 are considered necessary. Therefore, no significant adverse residual effects have been predicted in respect of the setting of terrestrial cultural heritage assets.

Operational and maintenance phase

MAGNITUDE OF IMPACT

18.9.4.11 The installation is for 56 WTGs will reach 273 m upper tip height above LAT (m) and the installation of two OSPs will reach 53 m height above Lowest Astronomical Tide (LAT) (m) (excluding antennae).

18.9.4.12 The Proposed Development will include lighting and marking of the installations..

18.9.4.13 Maximum of 1,359 vessel round trips per year comprised of crew transfer vessels, jack-up vessels, cable repair vessels and other vessels, from local ports or transiting from a previously operational location.

18.9.4.14 The operational and maintenance activities will result in indirect impacts on the visibility from cultural heritage assets.

18.9.4.15 The impact is predicted to be of long term duration and low reversibility. It is predicted that the impact will affect the receptor indirectly. The magnitude is therefore, considered to be Low.

SIGNIFICANCE OF EFFECT

18.9.4.16 Overall, the magnitude of the impact is deemed to be **Low** and the sensitivity of the receptor is considered to be **High**. The effect will, therefore, be **Moderate**. The visibility of the wind turbines will dissipate inland and will only be visible to sites with an east-facing aspect. The indirect nature of the visual impact in the course of the operational and maintenance phase is low. The effect is considered to be **not significant** in EIA terms.

PROPOSED MITIGATION

18.9.4.17 The significance of effect is not significant in EIA terms. Therefore, no additional mitigation to that already identified in Table 18.10 are considered necessary.

RESIDUAL EFFECT ASSESSMENT

18.9.4.18 The significance of an indirect impact on the setting of terrestrial cultural heritage assets from operational and maintenance of the WTGs and OSPs is not significant in EIA terms. Therefore, no additional mitigation to that already identified in Table 18.10 are considered necessary. Therefore, no significant adverse residual effects have been predicted in respect of the setting of terrestrial cultural heritage assets.

Decommissioning phase

MAGNITUDE OF IMPACT

18.9.4.19 The decommissioning phase is comprised of the removal of the above-water infrastructure and associated vessel activities. The WTGs and OSPs will be progressively removed over the decommissioning phase.

18.9.4.20 The decommissioning phase activities will result in indirect positive visual impacts on the visibility from cultural heritage assets.

18.9.4.21 The impact is predicted to be of short to medium term duration. It is predicted that the impact will affect the receptor indirectly. The magnitude is therefore, considered to be Low.

SIGNIFICANCE OF EFFECT

18.9.4.22 Overall, the magnitude of the impact is deemed to be **Low** and the sensitivity of the receptor is considered to be **High**. The effect will, therefore, be **Moderate, positive**. The indirect nature of the visual impact t is considered to be **not significant** in EIA terms.

PROPOSED MITIGATION

18.9.4.23 The significance of effect is not significant in EIA terms. Therefore, no additional mitigation to that already identified in Table 18.10 are considered necessary.

RESIDUAL EFFECT ASSESSMENT

18.9.4.24 The significance of an indirect impact on the setting of terrestrial cultural heritage assets from decommissioning of the WTGs and OSPs is not significant in EIA terms. Therefore, no additional mitigation to that already identified in Table 18.10 are considered necessary. Therefore, no significant adverse residual effects have been predicted in respect of the setting of terrestrial cultural heritage assets.

18.10 Assessment of Project Design Option 2

18.10.1 Impact 1 – Sediment disturbance and deposition leading to effects on known and unknown heritage assets

SENSITIVITY OF THE RECEPTOR

18.10.1.1 The Arklow Bank is of national importance as a sandbank that is hazardous to shipping and the significant number of shipwrecks associated with the bank highlight the potential for more discoveries to arise on and close to the bank. The marine archaeology receptors are vulnerable sites that can be exposed further by disturbance activities. Each known shipwreck site is regarded as being of national importance and is a protected site.

18.10.1.2 The marine archaeology receptor of known and unknown heritage assets is deemed to be of high vulnerability, low recoverability and of national value. The sensitivity of the receptor is therefore, considered to be High.

Construction phase

18.10.1.3 The disturbance of sediment/seabed deposits to facilitate the construction of the Proposed Development has the potential to impact the marine archaeology on Arklow Bank and the seabed between the bank and shore. The disturbance of the sediment/seabed deposits can result in the exposure of known marine archaeology receptors (i.e. shipwreck) and the exposure of as yet unknown shipwreck, unknown buried palaeo-landscapes and associated sites. Such activities can also result in the burial of known receptors. The exposure of sites, or areas of sites, exposes the material to erosion and degradation. The burial of sites, or areas of sites, can help to preserve sites from erosion but also conceals them from further examination.

18.10.1.4 The construction phase is comprised of seabed preparation activities including:

- foundations installation of wind turbines and OSP monopile foundations via drilling;
- cable installation via sand wave clearance;
- boulder clearance PLGR;
- landfall connection via trenchless activities to avoid direct impacts on the intertidal foreshore; and
- any associated jack-up vessel and vessel anchoring activities.

18.10.1.5 These construction activities will disturb the seabed, resulting in sediment being released into the water column and subsequently redeposited. Impacts of sediment disturbance and deposition have the potential to expose previously unrecorded marine archaeology receptors, and also to bury or partially bury known marine archaeology receptors, resulting in the potential for direct, temporary impacts on marine archaeology assets located on the sandbank and on the seabed between the bank and the shore.

18.10.1.6 During seabed preparation activities, sandwaves will be cleared within a 100 m diameter of each foundation location, with an average of 5 m depth of material being relocated. This will occur for approximately 33% of the structures.

18.10.1.7 For the inter-array and interconnector cabling, sandwaves will be cleared along a corridor up to 70 m wide with clearance activities along 30% of the cable route.

18.10.1.8 For the export cabling, sandwaves will be cleared along a corridor up to 70 m wide (for each cable). This will occur across 30% of the offshore export cable length.

18.10.1.9 The results of the modelling of suspended sediments and associated deposition arising from this activity as presented in Volume II, Chapter 6: Coastal Processes has shown that sedimentation occurs on the slack tide and resuspension and transport occurs when the tidal currents increase. Although the material is deposited at discrete locations, the high energy nature of the site causes it to be widely distributed and amalgamated with the sediment transport cycle, with sedimentation levels in the order of 1 mm in the vicinity of the Array Area one day after the completion of the operation.

18.10.1.10 During foundation installation, drilled installation of up to 14 m diameter monopiles will extend to 37 m depth. The results of the modelling of suspended sediments and associated deposition arising from this activity as presented in Chapter 6: Coastal Processes has shown that sediment will be transported mid-tide, settle on slack water and be re-suspended and further dispersed on the resumption of tidal flow. Sediment levels after the cessation of each drilling operation are not expected to be discernible from the background sediments due to the limited magnitude of deposition and the similar nature of the material.

18.10.1.11 For inter-array cable installation, the trench will be 15 m wide and up to 1.5 m deep below lowest seabed level. For interconnector cable installation, the trench will be 15 m wide and up to 2.5 m deep below lowest seabed level. The results of the modelling of suspended sediments and associated deposition arising from this activity as presented in chapter 6: Coastal Processes has shown that average sedimentation during the operation is in the order of 5 mm.

18.10.1.12 For offshore export cable installation, the trench will be 15 m wide and 2.5 m deep. The results of the modelling of suspended sediments and associated deposition arising from this activity as presented in Chapter 6: Coastal Processes has shown that although the released material migrates both north and south by settling and being re-suspended on successive tides, the sedimentation level is small and following the completion of works the material is assimilated and indistinguishable from the baseline transport regime. Further detail can be found in Chapter 6: Coastal Processes.

MAGNITUDE OF THE IMPACT

18.10.1.13 The factored-in measures outlined in Table 18.10 establish a working environment based on avoiding known archaeological sites where possible, ensuring that any new observations are recorded, advancing solutions to ensure site protection, and preservation by record where required. An AMP has been prepared to inform the installation works, to facilitate the recording and reporting of any archaeological material discovered during the construction phase (Volume III, Appendix 25.9: Archaeological Management Plan).

18.10.1.14 The impact is predicted to be of local spatial extent, short to medium term duration, intermittent and low reversibility. It is predicted that the impact will affect the receptor indirectly. The magnitude is therefore, considered to be Low.

SIGNIFICANCE OF THE EFFECT

18.10.1.15 Overall, the magnitude of the impact is deemed to be **Low** and the sensitivity of the receptor is considered to be **High**. The effect will, therefore, be **Moderate**. The factored-in measures ensure that the likelihood of new significant archaeological discoveries being made in the course of the construction phase is **Low**. As such, the effect is considered to be **not significant** in EIA terms.

PROPOSED MITIGATION

18.10.1.16 The significance of effect is not significant in EIA terms. Therefore, no additional mitigation to that already identified in Table 18.10 are considered necessary.

RESIDUAL EFFECT ASSESSMENT

18.10.1.17 The significance of effects on known and unknown heritage assets from sediment disturbance and deposition is not significant in EIA terms. Therefore, no additional mitigation to that already identified in Table 18.10 are considered necessary. Therefore, no significant adverse residual effects have been predicted in respect of sediment disturbance and deposition.

Operational and maintenance phase

MAGNITUDE OF IMPACT

18.10.1.18 The factored-in measures outlined in Table 18.10 establish a working environment based on avoiding known archaeological sites where possible, ensuring that any new observations are recorded, advancing solutions to ensure site protection, and preservation by record where required. An AMP has been prepared to inform the operational and maintenance works, to facilitate the recording and reporting of any archaeological material discovered during the operational and maintenance phase (Volume III, Appendix 25.9: Archaeological Management Plan).

18.10.1.19 The impact is predicted to be of local spatial extent, short to medium term duration, intermittent and low reversibility. It is predicted that the impact will affect the receptor indirectly. The magnitude is therefore, considered to be Low.

SIGNIFICANCE OF EFFECT

18.10.1.20 Overall, the magnitude of the impact is deemed to be **Low** and the sensitivity of the receptor is considered to be **High**. The effect will, therefore, be **Moderate**. The factored-in measures ensure that the likelihood of new significant archaeological discoveries being made in the course of the operational and maintenance phase is **Low**. As such, the effect is considered to be **not significant** in EIA terms.

PROPOSED MITIGATION

18.10.1.21 The significance of effect is not significant in EIA terms. Therefore, no additional mitigation to that already identified in Table 18.10 are considered necessary.

RESIDUAL EFFECT ASSESSMENT

18.10.1.22 The significance of effects on known and unknown heritage assets from sediment disturbance and deposition is not significant in EIA terms. Therefore, no additional mitigation to that already identified in Table 18.10 are considered necessary. Therefore, no significant adverse residual effects have been predicted in respect of sediment disturbance and deposition.

Decommissioning phase

MAGNITUDE OF IMPACT

18.10.1.23 The factored-in measures outlined in Table 18.10 establish a working environment based on avoiding known archaeological sites where possible, ensuring that any new observations are recorded, advancing solutions to ensure site protection, and preservation by record where required. An AMP has been prepared to inform the decommissioning works, to facilitate the recording and reporting of any archaeological material discovered during the decommissioning phase (Volume III, Appendix 25.9: Archaeological Management Plan).

18.10.1.24 The impact is predicted to be of local spatial extent, short to medium term duration, intermittent and low reversibility. It is predicted that the impact will affect the receptor indirectly. The magnitude is therefore, considered to be Low.

SIGNIFICANCE OF EFFECT

18.10.1.25 Overall, the magnitude of the impact is deemed to be **Low** and the sensitivity of the receptor is considered to be **High**. The effect will, therefore, be **Moderate**. The factored-in measures ensure that the likelihood of new significant archaeological discoveries being made in the course of the decommissioning phase is low. The effect is considered to be **not significant** in EIA terms.

PROPOSED MITIGATION

18.10.1.26 The significance of effect is not significant in EIA terms. Therefore, no additional mitigation to that already identified in Table 18.10 are considered necessary.

RESIDUAL EFFECT ASSESSMENT

18.10.1.27 The significance of effects on known and unknown heritage assets from sediment disturbance and deposition is not significant in EIA terms. Therefore, no additional mitigation to that already identified in Table 18.10 are considered necessary. Therefore, no significant adverse residual effects have been predicted in respect of sediment disturbance and deposition.

18.10.2 Impact 2 – Direct impact on historic wreck sites

SENSITIVITY OF THE RECEPTOR

18.10.2.1 The Arklow Bank is of national importance as a sandbank that is hazardous to shipping and the significant number of shipwrecks associated with the bank highlight the potential for more discoveries to arise on and close to the bank. The marine archaeology receptors are vulnerable sites that can be exposed further by disturbance activities. Each known shipwreck site is regarded as being of national importance and is a protected site.

18.10.2.2 The marine archaeology receptor of known and unknown historic shipwreck sites is deemed to be of high vulnerability, low recoverability and of national value. The sensitivity of the receptor is therefore, considered to be High.

Construction phase

18.10.2.3 The construction phase includes confirmatory surveys that will typically be for short duration, lesser magnitude and localised, when compared to those resulting from site preparation activities.

18.10.2.4 Seabed preparation measures and turbine foundation construction have the potential to impact on historic shipwreck sites on Arklow Bank and the seabed between the bank and shore.

18.10.2.5 The construction phase is comprised of seabed preparation activities for foundations installation of wind turbines, OSP monopile foundations via drilling and cable installation via sand wave clearance, boulder clearance PLGR, and landfall connection via trenchless activities to avoid direct impacts on the intertidal foreshore, and any associated jack-up vessel and vessel anchoring activities.

18.10.2.6 These construction activities will disturb the seabed, and can impact on shipwreck sites directly by being constructed on or beside shipwreck sites, and indirectly through sediment that is released into the water column and subsequently redeposited, resulting in burial of sites or parts of sites, resulting in the potential for direct, temporary impacts on historic shipwreck sites located on the sandbank and on the seabed between the bank and the shore.

18.10.2.7 During seabed preparation activities, sandwaves may be cleared within a 100 m diameter of each foundation location, with an average of 5 m depth of material being relocated. This may occur for approximately 33% of the structures.

18.10.2.8 For the inter-array and interconnector cabling, sandwaves may be cleared along a corridor up to 70 m wide with clearance activities along circa 20% of the cable route.

18.10.2.9 For the export cabling, sandwaves may be cleared along a corridor up to 70 m wide (for each cable). This may occur across 30% of the offshore export cable length.

18.10.2.10 The results of the modelling of suspended sediments and associated deposition arising from this activity as presented in Chapter 6: Coastal Processes has shown that sedimentation occurs on the slack tide and resuspension and transport occurs when the tidal currents increase. Although the material is deposited at discrete locations, the high energy nature of the site causes it to be widely distributed and amalgamated with the sediment transport cycle, with sedimentation levels in the order of 1 mm in the vicinity of the Array Area one day after the completion of the operation.

18.10.2.11 During foundation installation, drilled installation of up to 14 m diameter monopiles to up to 37 m depth. The results of the modelling of suspended sediments and associated deposition arising from this activity as presented in Chapter 6: Coastal Processes has shown that sediment will be transported mid-tide, settle on slack water and be re-suspended and further dispersed on the resumption of tidal flow. Sediment levels after the cessation of each drilling operation are not expected to be discernible from the background sediments due to the limited magnitude of deposition and the similar nature of the material.

18.10.2.12 For inter-array cable installation, the trench will be 15 m wide and up to 1.5 m deep below lowest seabed level. For interconnector cable installation, the trench will be 15 m wide and up to 2.5 m deep below lowest seabed level. The results of the modelling of suspended sediments and associated deposition arising from this activity as presented in Chapter 6: Coastal Processes has shown that average sedimentation during the operation is in the order of 5 mm.

18.10.2.13 For offshore export cable installation, the trench will be 15 m wide and up to 2.5 m deep. The results of the modelling of suspended sediments and associated deposition arising from this activity as presented in Chapter 6: Coastal Processes has shown that although the released material migrates both north and south by settling and being re-suspended on successive tides, the sedimentation level is small and following the completion of works the material is assimilated and indistinguishable from the baseline transport regime. Further detail can be found in Chapter 6: Coastal Processes.

MAGNITUDE OF THE IMPACT

18.10.2.14 The factored-in measures outlined in Table 18.10 establish a working environment based on avoiding known archaeological sites where possible, ensuring that any new observations are recorded, advancing solutions to ensure site protection where possible, and preservation by record where required. AEZs are identified around each known historic shipwreck site to protect the integrity of the shipwreck site where possible from direct impacts, and within which works will not take place unless agreed by the NMS. An AMP has been prepared to inform the installation works, to facilitate the recording and reporting of any archaeological material discovered during the construction phase (Volume III, Appendix 25.9: Archaeological Management Plan).

18.10.2.15 The impact is predicted to be of local spatial extent, short to medium term duration, intermittent and low reversibility. It is predicted that the impact will affect the receptor indirectly. The magnitude is therefore, considered to be Low.

SIGNIFICANCE OF THE EFFECT

18.10.2.16 Overall, the magnitude of the impact is deemed to be **Low** and the sensitivity of the receptor is considered to be **High**. The effect will, therefore, be **Moderate**. The factored-in measures ensure that the likelihood of new significant archaeological discoveries being made in the course of the construction phase is low. As such, the effect is considered to be **not significant** in EIA terms.

PROPOSED MITIGATION

18.10.2.17 The significance of effect is not significant in EIA terms. Therefore, no additional mitigation to that already identified in Table 18.10 are considered necessary.

RESIDUAL EFFECT ASSESSMENT

18.10.2.18 The significance of effect from direct impact on historic shipwreck sites is not significant in EIA terms. Therefore, no additional mitigation to that already identified in Table 18.10 are considered necessary. Therefore, no significant adverse residual effects have been predicted in respect of direct impacts on historic wreck sites.

Operational and maintenance phase

MAGNITUDE OF IMPACT

18.10.2.19 The factored-in measures outlined in Table 18.10 establish a working environment based on avoiding known archaeological sites where possible, ensuring that any new observations are recorded, advancing solutions to ensure site protection, and preservation by record where required. An AMP has been prepared to inform the operational and maintenance works, to facilitate the recording and reporting of any archaeological material discovered during the operational and maintenance phase (Volume III, Appendix 25.9: Archaeological Management Plan).

18.10.2.20 The impact is predicted to be of local spatial extent, short to medium term duration, intermittent and low reversibility. It is predicted that the impact will affect the receptor indirectly. The magnitude is therefore, considered to be Low.

SIGNIFICANCE OF EFFECT

18.10.2.21 Overall, the magnitude of the impact is deemed to be Low and the sensitivity of the receptor is considered to be **High**. The effect will, therefore, be **Moderate**. The factored-in measures ensure that the likelihood of new significant archaeological discoveries being made in the course

of the operational and maintenance phase is **Low**. As such, the effect is considered to be **not significant** in EIA terms.

PROPOSED MITIGATION

18.10.2.22 The significance of effect is not significant in EIA terms. Therefore, no additional mitigation to that already identified in Table 18.10 are considered necessary.

RESIDUAL EFFECT ASSESSMENT

18.10.2.23 The significance of effect from direct impact on historic shipwreck sites is not significant in EIA terms. Therefore, no additional mitigation to that already identified in Table 18.10 are considered necessary. Therefore, no significant adverse residual effects have been predicted in respect of direct impacts on historic wreck sites.

Decommissioning phase

MAGNITUDE OF IMPACT

18.10.2.24 The factored-in measures outlined in Table 18.10 establish a working environment based on avoiding known archaeological sites where possible, ensuring that any new observations are recorded, advancing solutions to ensure site protection where possible, and preservation by record where required. An AMP has been prepared to inform the decommissioning works, to facilitate the recording and reporting of any archaeological material discovered during the decommissioning phase (Volume III, Appendix 25.9: Archaeological Management Plan).

18.10.2.25 The impact is predicted to be of local spatial extent, short to medium term duration, intermittent and low reversibility. It is predicted that the impact will affect the receptor indirectly. The magnitude is therefore, considered to be Low.

SIGNIFICANCE OF EFFECT

18.10.2.26 Overall, the magnitude of the impact is deemed to be **Low** and the sensitivity of the receptor is considered to be **High**. The effect will, therefore, be **Moderate**. The factored-in measures ensure that the likelihood of new significant archaeological discoveries being made in the course of the decommissioning phase is low. As such, the effect is considered to be **not significant** in EIA terms.

PROPOSED MITIGATION

18.10.2.27 The significance of effect is not significant in EIA terms. Therefore, no additional mitigation to that already identified in Table 18.10 are considered necessary.

RESIDUAL EFFECT ASSESSMENT

18.10.2.28 Overall, the magnitude of the impact is deemed to be **Low** and the sensitivity of the receptor is considered to be **High**. The effect will, therefore, be **Moderate**. The factored-in measures ensure that the likelihood of new significant archaeological discoveries being made in the course of the decommissioning phase is **Low**. As such, the effect is considered to be **not significant** in EIA terms.

18.10.3 Impact 3 – Direct impact on buried palaeo-landscapes

SENSITIVITY OF THE RECEPTOR

18.10.3.1 The Arklow Bank is of national importance as a sandbank where the seabed activities required to facilitate the construction, maintenance and decommissioning of the Proposed Development has the potential to impact on previously unrecorded palaeo-landscape locations on the bank and the seabed between the bank and shore.

18.10.3.2 The marine archaeology receptor of buried palaeo-landscape sites when identified, is deemed to be of high vulnerability, low recoverability and of national value. The sensitivity of the receptor is therefore, considered to be High.

Construction phase

18.10.3.3 The construction phase includes confirmatory surveys that will typically be for short duration, lesser magnitude and localised, when compared to those resulting from site preparation activities.

18.10.3.4 Seabed preparation measures and turbine foundation construction have the potential to expose buried palaeo-landscape sites on Arklow Bank and the seabed between the bank and shore.

18.10.3.5 The construction phase is comprised of seabed preparation activities for foundations installation of wind turbines, OSP monopile foundations via drilling and cable installation via sandwave clearance, boulder clearance PLGR, and landfall connection via trenchless activities to avoid direct impacts on the intertidal foreshore, and any associated jack-up vessel and vessel anchoring activities.

18.10.3.6 These construction activities will disturb the seabed, and have the potential to expose previously unrecorded buried palaeo-landscapes, and may also bury such locations on the sandbank and on the seabed between the bank and the shore.

18.10.3.7 During seabed preparation activities, sandwaves may be cleared within a 100 m diameter of each foundation location, with an average of 5 m depth of material being relocated. This may occur for approximately 33% of the structures.

18.10.3.8 For the inter-array and interconnector cabling, sandwaves may be cleared along a corridor up to 70 m wide with clearance activities along circa 20% of the cable route.

18.10.3.9 For the export cabling, sandwaves may be cleared along a corridor up to 70 m wide (for each cable). This may occur across 30% of the offshore export cable length.

18.10.3.10 The results of the modelling of suspended sediments and associated deposition arising from this activity as presented in Chapter 6: Coastal Processes has shown that sedimentation occurs on the slack tide and resuspension and transport occurs when the tidal currents increase. Although the material is deposited at discrete locations, the high energy nature of the site causes it to be widely distributed and amalgamated with the sediment transport cycle, with sedimentation levels in the order of 1 mm in the vicinity of the Array Area one day after the completion of the operation.

18.10.3.11 During foundation installation, the installation of up to 14 m diameter monopiles to up to 37 m depth. The results of the modelling of suspended sediments and associated deposition arising from this activity as presented in Chapter 6: Coastal Processes has shown that sediment will be transported mid-tide, settle on slack water and be re-suspended and further dispersed on the resumption of tidal flow. Sediment levels after the cessation of each drilling operation are not expected to be discernible from the background sediments due to the limited magnitude of deposition and the similar nature of the material.

18.10.3.12 For inter-array cable installation, the trench will be 15 m wide and up to 1.5 m deep below lowest seabed level. For interconnector cable installation, the trench will be 15 m wide and up to

2.5 m deep below lowest seabed level The results of the modelling of suspended sediments and associated deposition arising from this activity as presented in chapter 6: Coastal Processes has shown that average sedimentation during the operation is in the order of 5 mm.

18.10.3.13 For offshore export cable installation, the trench will be 15 m wide and up to 2.5 m deep. The results of the modelling of suspended sediments and associated deposition arising from this activity as presented in chapter 6: Coastal Processes has shown that although the released material migrates both north and south by settling and being re-suspended on successive tides, the sedimentation level is small and following the completion of works the material is assimilated and indistinguishable from the baseline transport regime. Further detail can be found in Chapter 6: Coastal Processes.

MAGNITUDE OF THE IMPACT

18.10.3.14 The factored-in measures outlined in Table 18.10 establish a working environment based on avoiding known archaeological sites where possible, ensuring that any new observations are recorded where possible, advancing solutions to ensure site protection where possible, and preservation by record where required. An Archaeology Management Plan (AMP) has been prepared to inform the installation works, to facilitate the recording and reporting of any archaeological material discovered during the construction phase.

18.10.3.15 The impact is predicted to be of local spatial extent, short to medium term duration, intermittent and low reversibility. It is predicted that the impact will affect the receptor indirectly. The magnitude is therefore, considered to be Low.

SIGNIFICANCE OF THE EFFECT

18.10.3.16 There are no records of buried palaeo-landscapes being present on the Arklow Bank or in the surrounding waters. Buried palaeo-landscapes are vulnerable sites that can be exposed by disturbance activities. Overall, the magnitude of the impact is deemed to be **Low** and the sensitivity of the receptor is considered to be **High**. The effect will, therefore, be **Moderate**. The factored-in measures ensure that the likelihood of new significant archaeological discoveries being made in the course of the construction phase is **Low**. The effect is considered to be **not significant** in EIA terms.

PROPOSED MITIGATION

18.10.3.17 The significance of effect is not significant in EIA terms. Therefore, no additional mitigation to that already identified in Table 18.10 are considered necessary.

RESIDUAL EFFECT ASSESSMENT

18.10.3.18 The significance of effect from direct impact on buried palaeo-landscape sites is not significant in EIA terms. Therefore, no additional mitigation to that already identified in Table 18.10 are considered necessary. Therefore, no significant adverse residual effects have been predicted in respect of direct impacts on buried palaeo-landscapes.

Operational and maintenance phase

MAGNITUDE OF IMPACT

18.10.3.19 The factored-in measures outlined in Table 18.10 establish a working environment based on avoiding known archaeological sites where possible, ensuring that any new observations are recorded, advancing solutions to ensure site protection where possible, and preservation by record where required. An AMP has been prepared to inform the operational and maintenance works, to facilitate the recording and reporting of any archaeological material discovered during

the operational and maintenance phase (Volume III, Appendix 25.9: Archaeological Management Plan).

18.10.3.20 The impact is predicted to be of local spatial extent, short to medium term duration, intermittent and low reversibility. It is predicted that the impact will affect the receptor indirectly. The magnitude is therefore, considered to be Low.

SIGNIFICANCE OF EFFECT

18.10.3.21 Overall, the magnitude of the impact is deemed to be **Low** and the sensitivity of the receptor is considered to be **High**. The effect will, therefore, be **Moderate**. The factored-in measures ensure that the likelihood of new significant archaeological discoveries being made in the course of the operational and maintenance phase is **Low**. As such, the effect is considered to be **not significant** in EIA terms.

PROPOSED MITIGATION

18.10.3.22 The significance of effect is not significant in EIA terms. Therefore, no additional mitigation to that already identified in Table 18.10 are considered necessary.

RESIDUAL EFFECT ASSESSMENT

18.10.3.23 The significance of effect from direct impact on buried palaeo-landscapes is not significant in EIA terms. Therefore, no additional mitigation to that already identified in Table 18.10 are considered necessary. Therefore, no significant adverse residual effects have been predicted in respect of direct impacts on buried palaeo-landscapes.

Decommissioning phase

MAGNITUDE OF IMPACT

18.10.3.24 The factored-in measures outlined in Table 18.10 establish a working environment based on avoiding known archaeological sites where possible, ensuring that any new observations are recorded, advancing solutions to ensure site protection where possible, and preservation by record where required. An AMP has been prepared to inform the decommissioning works, to facilitate the recording and reporting of any archaeological material discovered during the decommissioning phase (Volume III, Appendix 25.9: Archaeological Management Plan).

18.10.3.25 The impact is predicted to be of local spatial extent, short to medium term duration, intermittent and low reversibility. It is predicted that the impact will affect the receptor indirectly. The magnitude is therefore, considered to be Low.

SIGNIFICANCE OF EFFECT

18.10.3.26 Overall, the magnitude of the impact is deemed to be **Low** and the sensitivity of the receptor is considered to be **High**. The effect will, therefore, be **Moderate**. The factored-in measures ensure that the likelihood of new significant archaeological discoveries being made in the course of the decommissioning phase is **Low**. As such, the effect is considered to be **not significant** in EIA terms.

PROPOSED MITIGATION

18.10.3.27 The significance of effect is not significant in EIA terms. Therefore, no additional mitigation to that already identified in Table 18.10 are considered necessary.

RESIDUAL EFFECT ASSESSMENT

18.10.3.28 Overall, the magnitude of the impact is deemed to be **Low** and the sensitivity of the receptor is considered to be **High**. The effect will, therefore, be **Moderate**. The factored-in measures ensure that the likelihood of new significant archaeological discoveries being made in the course of the decommissioning phase is **Low**. As such, the effect is considered to be **not significant** in EIA terms.

18.10.4 Impact 4 – Indirect impact on the setting of terrestrial cultural heritage assets

SENSITIVITY OF THE RECEPTOR

18.10.4.1 The visibility of the WTGs and OSPs from cultural heritage sites inland is assessed as an indirect impact of the Proposed Development and consideration is given to understanding the nature of such impact on these sites.

18.10.4.2 The cultural heritage receptor is deemed to be of high vulnerability, low recoverability and of national value. The sensitivity of the receptor is therefore considered to be High.

Construction phase

18.10.4.3 The Installation is for 47 WTGs will each reach 287 m upper tip height above LAT (m) and the Installation of two OSPs that will reach 53 m height above LAT (m) (excluding antennae).

18.10.4.4 The construction will include lighting and marking of the installations and the construction site.

18.10.4.5 During the 5 year construction phase, there will be a maximum of 4,150 vessel round trips to the Array Area, including 20 vessel round trips for installation of the export cables (including activities at the Landfall), comprised of jack-up barge/dynamic positioning vessels, tug/anchor handlers, cable installation vessels, guard vessels, survey vessels, crew transfer vessels, and scour/cable protection installation vessels.

MAGNITUDE OF THE IMPACT

18.10.4.6 The construction phase is comprised of the above-water installation activities associated with 47 wind turbines with a tip height of 287 m above LAT and two OSPs reaching 53 m in height above LAT (excluding antennae), within the Array Area located approximately 6 to 15 km to the east of Arklow in County Wicklow. The ZTV suggests that visibility of the wind turbines, which will be progressively installed over the construction phase, dissipates inland, where the rising ground of the Wicklow Mountains will mean that the Proposed Development will only be visible to sites with an east-facing aspect (see Volume III, Appendix 18.2: Cultural Heritage Visual Impact Assessment Report).

18.10.4.7 The construction activities will result in indirect impacts on the visibility from cultural heritage assets.

18.10.4.8 The impact is predicted to be of short to medium term duration, intermittent and low reversibility. It is predicted that the impact will affect the receptor indirectly. The magnitude is therefore, considered to be Low.

SIGNIFICANCE OF THE EFFECT

18.10.4.9 Overall, the magnitude of the impact is deemed to be **Low** and the sensitivity of the receptor is considered to be **High**. The effect will, therefore, be **Moderate**. The visibility of the wind turbines will dissipate inland and will only be visible to sites with an east-facing aspect. The indirect nature of the visual impact is considered to be **not significant** in EIA terms.

PROPOSED MITIGATION

18.10.4.10 The significance of effect is not significant in EIA terms. Therefore, no additional mitigation to that already identified in Table 18.10 are considered necessary.

RESIDUAL EFFECT ASSESSMENT

18.10.4.11 The significance of an indirect impact on the setting of terrestrial cultural heritage assets from construction of the WTGs and OSPs is not significant in EIA terms. Therefore, no additional mitigation to that already identified in Table 18.10 are considered necessary. Therefore, no significant adverse residual effects have been predicted in respect of the setting of terrestrial cultural heritage assets.

Operational and maintenance phase

MAGNITUDE OF IMPACT

18.10.4.12 The Installation of 47 WTGs will reach 287 m upper tip height above Lowest Astronomical Tide (LAT) (m) and the Installation of two OSPs will reach 53 m height above Lowest Astronomical Tide (LAT) (m).

18.10.4.13 The Proposed Development will include lighting and marking of the installations.

18.10.4.14 The operational and maintenance operations will include a maximum of 1,359 vessel round trips per year comprised of crew transfer vessels, jack-up vessels, cable repair vessels and other vessels, from local ports or transiting from a previously operational location.

18.10.4.15 The operational and maintenance activities will result in indirect impacts on the visibility from cultural heritage assets.

18.10.4.16 The impact is predicted to be of long term duration and low reversibility. It is predicted that the impact will affect the receptor indirectly. The magnitude is therefore, considered to be Low.

SIGNIFICANCE OF EFFECT

18.10.4.17 Overall, the magnitude of the impact is deemed to be **Low** and the sensitivity of the receptor is considered to be **High**. The effect will, therefore, be **Moderate**. The visibility of the wind turbines will dissipate inland and will only be visible to sites with an east-facing aspect. The indirect nature of the visual impact in the course of the operational and maintenance phase is **Low**. As such, the effect is considered to be **not significant** in EIA terms.

PROPOSED MITIGATION

18.10.4.18 The significance of effect is not significant in EIA terms. Therefore, no additional mitigation to that already identified in Table 18.10 are considered necessary.

RESIDUAL EFFECT ASSESSMENT

18.10.4.19 The significance of an indirect impact on the setting of terrestrial cultural heritage assets from operational and maintenance of the WTGs and OSPs is not significant in EIA terms. Therefore, no additional mitigation to that already identified in Table 18.10 are considered necessary. Therefore, no significant adverse residual effects have been predicted in respect of the setting of terrestrial cultural heritage assets.

Decommissioning phase

MAGNITUDE OF IMPACT

18.10.4.20 The decommissioning phase is comprised of the removal of the above-water infrastructure and associated vessel activities. The WTGs and OSPs will be progressively removed over the decommissioning phase.

18.10.4.21 The decommissioning phase activities will result in indirect positive visual impacts on the visibility from cultural heritage assets.

18.10.4.22 The impact is predicted to be of short to medium term duration. It is predicted that the impact will affect the receptor indirectly. The magnitude is therefore, considered to be Low.

SIGNIFICANCE OF EFFECT

18.10.4.23 Overall, the magnitude of the impact is deemed to be **Low** and the sensitivity of the receptor is considered to be **High**. The effect will, therefore, be **Moderate**, positive. The indirect nature of the visual impact being made in the course of the decommissioning phase is **Low**. The effect is considered to be **not significant** in EIA terms.

PROPOSED MITIGATION

18.10.4.24 The significance of effect is not significant in EIA terms. Therefore, no additional mitigation to that already identified in Table 18.10 are considered necessary.

RESIDUAL EFFECT ASSESSMENT

18.10.4.25 The significance of an indirect impact on the setting of terrestrial cultural heritage assets from decommissioning of the WTGs and OSPs is not significant in EIA terms. Therefore, no additional mitigation to that already identified in Table 18.10 are considered necessary. Therefore, no significant adverse residual effects have been predicted in respect of the setting of terrestrial cultural heritage assets.

18.11 Cumulative impacts assessment methodology

18.11.1 Methodology

18.11.1.1 The Cumulative Impact Assessment (CIA) takes into account the impacts associated with the Proposed Development together with other proposed and reasonably foreseeable projects, plans and existing and permitted projects. The projects and plans selected as relevant to the CIA presented within this chapter are based upon the results of a screening exercise (see Volume III, Appendix 3.2: CIA Screening). Each project and plan has been considered on a case-by-case basis for screening in or out of this chapter's assessment based upon effect-receptor pathways and the spatial/temporal scales involved.

18.11.1.2 A tiered approach is adopted to provide an assessment of the Proposed Development as a whole. The tiering methodology is provided in Volume III, Appendix 3.2: CIA Screening.

18.11.1.3 Due to the commitments made by the Developer in respect of the Foreshore Licence FS007339 and Foreshore Licence Application FS007555 (Table 18.10), FS007339 and FS007555 have been screened out of the cumulative impact assessment.

Table 18.11: List of other projects and plans considered within the cumulative impact assessment

Project/Plan	Status	Distance from Array Area (km)	Distance from Cable Corridor and Working Area (km)	Description of Project/Plan	Dates of Construction	Dates of Operation	Justification for screening in
Tier 1							
ABWP2 Onshore Grid Infrastructure (OGI)	Consented	10.2	0	Onshore grid infrastructure located onshore and required for the operation of the Proposed Development	2026 - 2030	2030 - 2066	Potential temporal overlap with the Proposed Development construction, operational and maintenance phases.
ABWP1 Operational and Maintenance activities and Plough dredging on Arklow Bank	Operational	0	0.8	Operational and Maintenance activities and Plough dredging on Arklow Bank	In operation	To discontinue from 2026	Potential for temporal overlap with Proposed Development construction phase
T32-027A Irish Mussel Seed Co. Ltd	Operational	9.9	5.3	Shellfish	Operational	Current	Potential for temporal overlap with Proposed Development construction and operational and maintenance phases
Tier 3							
ABWP1 Decommissioning	Proposed	0	0	Decommissioning process is a reversal of the installation process. Monopiles to be cut		2025-2027	Potential for temporal overlap with Proposed Development construction

Project/Plan	Status	Distance from Array Area (km)	Distance from Cable Corridor and Working Area (km)	Description of Project/Plan	Dates of Construction	Dates of Operation	Justification for screening in
				at depth of 2m below the mudline. Inter-array cabling cut and buried below 2m.			and operational and maintenance phases.
Phase 1 Projects							
Codling Wind Park (formerly known as Codling I and Codling II)	Proposed	10.3	9.4	'Relevant Project'. Updated application expected to be made under the Maritime Area Planning Act 2021.	2027-2028	2029-	Potential for temporal overlap with Proposed Development construction and operational and maintenance and decommissioning phases.
Dublin Array (formerly known as Bray and Kish Offshore Wind Farms)	Proposed	25.8	24.9	'Relevant Project'. Updated application expected to be made under the Maritime Area Planning Act 2021.	2028-2032	2033-	Potential for temporal overlap with Proposed Development construction and operation and maintenance phases.

18.11.1.4 Table 18.12 presents the potential impacts, development phase, and the list of projects / plans with which the two Project Design Options have been cumulatively assessed.

Table 18.12: Cumulative assessment impacts, phases, scenarios, and projects to be considered cumulatively

Potential cumulative impact	Phase			Projects considered cumulatively	Justification for projects considered cumulatively
	C	O	D		
Sediment disturbance and deposition leading to effects on known and unknown heritage assets	✓	✓	×	Project parameters associated with Project Design Option 1 or 2 plus the following projects: **Tier 1** • ABWP2 Onshore Grid Infrastructure (OGI); • ABWP1 Plough dredging; and • T32-027A Mussel bed **Tier 3** • ABWP1 Decommissioning **Phase 1 Projects** • Codling Wind Park; and • Dublin Array	Maximum potential for cumulative effects of increased suspended sediment concentration and associated deposition leading to effects on known heritage assets. None of the projects considered are expected to have decommissioning phases which overlap with the decommissioning phase for the Proposed Development.
Direct impact on historic shipwreck sites	✓	✓	×	Project parameters associated with Project Design Option 1 or 2 plus the following projects: **Tier 1** • ABWP1 Plough dredging. **Phase 1 Projects** • Codling Wind Park; and • Dublin Array	Maximum potential for cumulative effects of direct impact on historic shipwreck sites. None of the projects considered are expected to have decommissioning phases which overlap with the decommissioning phase for the Proposed Development.
Direct impact on buried palaeo-landscapes	✓	✓	×	Project parameters associated with Project Design Option 1 or 2 plus the following projects: **Tier 1** • ABWP1 Plough dredging. **Phase 1 Projects** • Codling Wind Park; and • Dublin Array	Maximum potential for cumulative effects of direct impact unknown buried palaeo-landscapes. None of the projects considered are expected to have decommissioning phases which overlap with the decommissioning phase

Potential cumulative impact	Phase			Projects considered cumulatively	Justification for projects considered cumulatively
	C	O	D		
					for the Proposed Development..
Indirect impact on the setting of terrestrial cultural heritage assets	✓	✓	✓	Project parameters associated with Project Design Option 1 or 2 plus the following projects: **Phase 1 Projects** • Codling Wind Park; and • Dublin Array.	Maximum potential for cumulative effects on terrestrial cultural heritage assets.

18.12 Cumulative impact assessment

18.12.1.1 A description of the significance of cumulative effects upon Marine Archaeology and Cultural Heritage arising from each identified impact is given below.

18.12.2 Project Design Option 1 and 2 - Impact 1 - Sediment disturbance and deposition leading to effects on known and unknown heritage assets

SENSITIVITY OF THE RECEPTOR

18.12.2.1 The Arklow Bank is of national importance as a sandbank that is hazardous to shipping and the significant number of shipwrecks associated with the bank highlight the potential for more discoveries to arise on and close to the bank. The marine archaeology receptors are vulnerable sites that can be exposed further by disturbance activities. Each known shipwreck site is regarded as being of national importance and is a protected site.

18.12.2.2 The marine archaeology receptor of known and unknown heritage assets is deemed to be of high vulnerability, low recoverability and of national value. The sensitivity of the receptor is therefore, considered to be High.

Construction phase

MAGNITUDE OF IMPACT

TIER 1

18.12.2.3 The Proposed Development, together with the marine-based projects and plans identified in Table 18.11, may result in sediment disturbance and deposition leading to effects on known and unknown heritage assets.

18.12.2.4 ABWP1 maintenance activities, such as cable repair/reburial activities, may lead to sediment disturbance and deposition. The frequency and nature of maintenance activities at the Arklow Bank Wind Park 1 is unknown, however such activities are likely to be at a much reduced scale than that described for the Proposed Development alone (see paragraph 18.9.1.3). Maintenance activities at ABWP1 such as cable repair and reburial are unlikely to be carried out simultaneously with installation activities associated with the Proposed Development.

18.12.2.5 The consented dredging activities at ABWP1 involve seabed levelling by plough dredging of a maximum amount of 99,999 tonnes within an area to the east of the existing seven wind turbines (comprising an area approximately 700 m in length and 100 m in width). This represents direct impacts on the seabed in a location adjacent to the Proposed Development. Potential impacts from dredging and dumping/disposal activities in terms of sediment disturbance and deposition are likely to be short term and intermittent. The supporting information for the dumping at sea permit screened out marine archaeology from the assessment, as no wrecks were identified in the close vicinity of the proposed seabed levelling works (Arklow Energy Limited, 2016). Therefore there is limited potential for a cumulative impact with the Proposed Development.

18.12.2.6 It is unlikely that activities associated with the Irish Mussel Seed Company Ltd (T32-027A), located off Kilmichael Point, would impact with the Proposed Development. However, T32-027A lies within one tidal cycle of the Proposed Development, and sediment transport from the Proposed Development can be expected as part of the tidal cycle.

TIER 3

18.12.2.7 The decommissioning of ABWP1 will take place in 2025-2027, representing an overlap with the construction phase of the Proposed Development. The decommissioning works will be a reversal of the installation process. Monopiles will be cut at depth of 2m below the mudline. Inter-array cabling will be cut and buried below 2m. Such works will result in sediment disturbance on Arklow Bank and will add to that being conducted as part of construction activities for the Proposed Development.

PHASE 1 PROJECTS

18.12.2.8 The construction phases of Codling Wind Park and Dublin Array will take place in 2027-2029 and 2028-2032 respectively and will overlap with the construction phase of ABWP2. The Maritime Area Consent (MAC) areas of Codling Wind Park and Dublin Array lie outside one tidal cycle of ABWP1, which means that sediment disturbance and deposition arising from ABWP1 will not on extend to either Codling Wind Park or Dublin Array. However, the proximity of both Codling Wind Park and Dublin Array to the tidal cycle extent of the Proposed Development indicates that sediment deposition associated with Codling Wind Park and Dublin Array could extend into that of the Proposed Development.

18.12.2.9 As described in Table 18.10, an AMP will be prepared to inform the installation works, to facilitate the recording and reporting of any archaeological material discovered.

18.12.2.10 The cumulative impact is predicted to be of local spatial extent, short term duration, intermittent and low reversibility. It is predicted that the impact may affect the receptor indirectly. The magnitude is therefore, considered to be Negligible.

SIGNIFICANCE OF EFFECT

18.12.2.11 Overall, the magnitude of the cumulative impact is deemed to be **Negligible** and the sensitivity of the receptor is considered to be **High**. The cumulative effect will, therefore, be **Not significant**, which is not significant in EIA terms.

Operational and maintenance phase

MAGNITUDE OF IMPACT

TIER 1

18.12.2.12 The Proposed Development, together with the marine-based projects and plans identified in Table 18.11, may result in sediment disturbance and deposition leading to effects on known and unknown heritage assets.

18.12.2.13 ABWP1 maintenance activities, such as cable repair/reburial activities, may lead to sediment disturbance and deposition. The frequency and nature of maintenance activities at the Arklow Bank Wind Park 1 is unknown, however such activities are likely to be at a much reduced scale than that described for the Proposed Development alone (see paragraph 18.9.1.3). Maintenance activities at ABWP1 such as cable repair and reburial are unlikely to be carried out simultaneously with installation activities associated with the Proposed Development.

18.12.2.14 The consented dredging activities at ABWP1 involve seabed levelling by plough dredging of a maximum amount of 99,999 tonnes within an area to the east of the existing seven wind turbines (comprising an area approximately 700 m in length and 100 m in width). This represents direct impacts on the seabed in a location adjacent to the Proposed Development. Potential impacts from dredging and dumping/disposal activities in terms of sediment disturbance and deposition are likely to be short term and intermittent. The supporting information for the dumping at sea permit screened out marine archaeology from the assessment, as no wrecks were identified in the close vicinity of the proposed seabed levelling works (Arklow Energy Limited, 2016). Therefore there is limited potential for a cumulative impact with the Proposed Development.

18.12.2.15 It is unlikely that activities associated with the Irish Mussel Seed Company Ltd (T32-027A), located off Kilmichael Point, would impact with the Proposed Development. However, T32-027A lies within one tidal cycle of the Proposed Development, and sediment transport from the Proposed Development can be expected as part of the tidal cycle.

TIER 3

18.12.2.16 The decommissioning of ABWP1 will take place in 2025-2027, representing an overlap with the construction phase of the Proposed Development. The decommissioning works will be a reversal of the installation process. Monopiles will be cut at depth of 2m below the mudline. Inter-array cabling will be cut and buried below 2m. Such works will result in sediment disturbance on Arklow Bank and will add to that being conducted as part of construction activities for the Proposed Development.

PHASE 1 PROJECTS

18.12.2.17 The construction phases of Codling Wind Park and Dublin Array will take place in 2027-2029 and 2028-2032 respectively and will overlap with the construction phase of the Proposed Development. The MAC areas of Codling Wind Park and Dublin Array lie outside one tidal cycle of ABWP1, which means that sediment disturbance and deposition arising from ABWP1 will not on extend to either Codling Wind Park or Dublin Array. However, the proximity of both Codling Wind Park and Dublin Array to the tidal cycle extent of the Proposed Development indicates that sediment deposition associated with Codling Wind Park and Dublin Array could extend into that of the Proposed Development.

18.12.2.18 As described in Table 18.10, an AMP will be prepared to inform the installation works, to facilitate the recording and reporting of any archaeological material discovered.

18.12.2.19 The cumulative impact is predicted to be of local spatial extent, short term duration, intermittent and low reversibility. It is predicted that the impact may affect the receptor indirectly. The magnitude is therefore, considered to be Negligible.

SIGNIFICANCE OF EFFECT

18.12.2.20 Overall, the magnitude of the cumulative impact is deemed to be **Negligible** and the sensitivity of the receptor is considered to be High. The cumulative effect will, therefore, be **Not significant**, which is not significant in EIA terms.

18.12.3 Project Design Option 1 and 2 - Impact 2 – Direct impact on historic shipwreck sites

SENSITIVITY OF THE RECEPTOR

18.12.3.1 The Arklow Bank is of national importance as a sandbank that is hazardous to shipping and the significant number of shipwrecks associated with the bank highlight the potential for more discoveries to arise on and close to the bank. The marine archaeology receptors are vulnerable sites that can be exposed further by disturbance activities. Each known shipwreck site is regarded as being of national importance and is a protected site.

18.12.3.2 The marine archaeology receptor of known and unknown heritage assets is deemed to be of high vulnerability, low recoverability and of national value. The sensitivity of the receptor is therefore, considered to be High.

Construction phase

MAGNITUDE OF IMPACT

TIER 1

18.12.3.3 The Proposed Development, together with the marine-based projects and plans identified in Table 18.11, may result in direct impact on historic shipwreck sites.

18.12.3.4 ABWP1 maintenance activities, such as cable repair/reburial activities, may lead to sediment disturbance and deposition. The frequency and nature of maintenance activities at the Arklow Bank Wind Park 1 is unknown, however such activities are likely to be at a much reduced scale than that described for the Proposed Development alone (see paragraph 18.9.1.3). Maintenance activities at ABWP1 such as cable repair and reburial are unlikely to be carried out simultaneously with installation activities associated with the Proposed Development.

18.12.3.5 The consented dredging activities at ABWP1 involve seabed levelling by plough dredging of a maximum amount of 99,999 tonnes within an area to the east of the existing seven wind turbines (comprising an area approximately 700 m in length and 100 m in width). This represents direct impacts on the seabed in a location adjacent to the Proposed Development. Potential impacts from dredging and dumping/disposal activities will not result in direct impacts on known historic shipwreck sites but may result sediment deposition, which is likely to be short term and intermittent. There is limited potential for a cumulative impact with the Proposed Development.

18.12.3.6 The activities associated with the Irish Mussel Seed Company Ltd (T32-027A), located off Kilmichael Point, will not impact with known historic wreck sites on the Array Area or in the Cable Corridor and Working Area.

TIER 3

18.12.3.7 The decommissioning of ABWP1 will take place in 2025-2027, representing an overlap with the construction phase of the Proposed Development. The decommissioning works will be a reversal of the installation process. Monopiles will be cut at depth of 2m below the mudline. Inter-array cabling will be cut and buried below 2m. Such works will result in sediment disturbance on Arklow Bank and will add to that being conducted as part of construction activities for the Proposed Development.

PHASE 1 PROJECTS

18.12.3.8 The construction phases of Codling Wind Park and Dublin Array will take place in 2027-2029 and 2028-2032 respectively and will overlap with the construction phase of the Proposed Development. The MAC areas of Codling Wind Park and Dublin Array lie outside one tidal cycle of ABWP1, which means that sediment disturbance and deposition arising from ABWP1 will not on extend to either Codling Wind Park or Dublin Array. However, the proximity of both Codling Wind Park and Dublin Array to the tidal cycle extent of the Proposed Development indicates that sediment deposition associated with Codling Wind Park and Dublin Array could extend into that of the Proposed Development.

18.12.3.9 As described in Table 18.10, an AMP will be prepared to inform the installation works, to facilitate the recording and reporting of any archaeological material discovered.

18.12.3.10 The cumulative impact is predicted to be of local spatial extent, short term duration, intermittent and low reversibility. It is predicted that the impact may affect the receptor indirectly. The magnitude is therefore, considered to be Negligible.

SIGNIFICANCE OF EFFECT

18.12.3.11 Overall, the magnitude of the cumulative impact is deemed to be **Negligible** and the sensitivity of the receptor is considered to be **High**. The cumulative effect will, therefore, be **Not significant**, which is **not significant** in EIA terms.

Operational and maintenance phase

MAGNITUDE OF IMPACT

TIER 1

18.12.3.12 The Proposed Development, together with the marine-based projects and plans identified in Table 18.11, may result in sediment disturbance and deposition leading to effects on known and unknown heritage assets.

18.12.3.13 ABWP1 maintenance activities, such as cable repair/reburial activities, may lead to sediment deposition. The frequency and nature of maintenance activities at the ABWP1 is unknown, however such activities are likely to be at a much reduced scale than that described for the Proposed Development alone (see paragraph 18.9.1.3). Maintenance activities at ABWP1 such as cable repair and reburial are unlikely to be carried out simultaneously with installation activities associated with the Proposed Development.

18.12.3.14 The consented dredging activities at ABWP1 involve seabed levelling by plough dredging of a maximum amount of 99,999 tonnes within an area to the east of the existing seven wind turbines (comprising an area approximately 700 m in length and 100 m in width). This represents direct impacts on the seabed in a location adjacent to the Proposed Development. Potential impacts from dredging and dumping/disposal activities will not result in direct impacts on known

historic shipwreck sites but may result sediment deposition, which is likely to be short term and intermittent. There is limited potential for a cumulative impact with the Proposed Development.

18.12.3.15 The activities associated with the Irish Mussel Seed Company Ltd (T32-027A), located off Kilmichael Point, will not impact with known historic wreck sites on the Array Area or in the Cable Corridor and Working Area.

TIER 3

18.12.3.16 The decommissioning of ABWP1 will take place in 2025-2027, representing an overlap with the construction phase of the Proposed Development. The decommissioning works will be a reversal of the installation process. Monopiles will be cut at depth of 2m below the mudline. Inter-array cabling will be cut and buried below 2m. Such works will result in sediment disturbance on Arklow Bank and will add to that being conducted as part of construction activities for the Proposed Development.

PHASE 1 PROJECTS

18.12.3.17 The construction phases of Codling Wind Park and Dublin Array will take place in 2027-2029 and 2028-2032 respectively and will overlap with the construction phase of ABWP2. The MAC areas of Codling Wind Park and Dublin Array lie outside one tidal cycle of ABWP1, which means that deposition arising from ABWP1 will not on extend to either Codling Wind Park or Dublin Array. However, the proximity of both Codling Wind Park and Dublin Array to the tidal cycle extent of the Proposed Development indicates that sediment deposition associated with Codling Wind Park and Dublin Array could extend into that of the Proposed Development.

18.12.3.18 As described in Table 18.10, an AMP will be prepared to inform the installation works, to facilitate the recording and reporting of any archaeological material discovered.

18.12.3.19 The cumulative impact is predicted to be of local spatial extent, short term duration, intermittent and low reversibility. It is predicted that the impact may affect the receptor indirectly. The magnitude is therefore, considered to be Negligible.

SIGNIFICANCE OF EFFECT

18.12.3.20 Overall, the magnitude of the cumulative impact is deemed to be **Negligible** and the sensitivity of the receptor is considered to be **High**. The cumulative effect will, therefore, be **Not significant**, which is not significant in EIA terms.

18.12.4 Project Design Option 1 and 2 - Impact 3 – Direct impact on buried palaeo-landscapes

SENSITIVITY OF THE RECEPTOR

18.12.4.1 There are no records of buried palaeo-landscapes being present on the Arklow Bank or in the surrounding waters. Palaeo-landscapes are vulnerable sites that can be exposed by disturbance activities.

18.12.4.2 The marine archaeology receptors are deemed to be of high vulnerability, low recoverability and of national value. The sensitivity of the receptor is therefore, considered to be High.

Construction phase

MAGNITUDE OF IMPACT

TIER 1

18.12.4.3 The Proposed Development, together with the marine-based projects and plans identified in Table 18.11, may result in direct impact on unknown buried palaeo-landscapes.

18.12.4.4 ABWP1 maintenance activities, such as cable repair/reburial activities, may lead to sediment disturbance and deposition. The frequency and nature of maintenance activities at the ABWP1 is unknown, however such activities are likely to be at a much reduced scale than that described for the Proposed Development alone (see paragraph 18.9.1.3). Maintenance activities at ABWP1 such as cable repair and reburial are unlikely to be carried out simultaneously with installation activities associated with the Proposed Development.

18.12.4.5 The consented dredging activities at ABWP1 involve seabed levelling by plough dredging of a maximum amount of 99,999 tonnes within an area to the east of the existing seven wind turbines (comprising an area approximately 700 m in length and 100 m in width). This represents direct impacts on the seabed in a location adjacent to the Proposed Development. Potential impacts from dredging and dumping/disposal activities may result sediment deposition, which is likely to be short term and intermittent. There is limited potential for a cumulative impact with the Proposed Development.

18.12.4.6 The activities associated with the Irish Mussel Seed Company Ltd (T32-027A), located off Kilmichael Point, will not impact with unknown buried palaeo-landscape sites on the Array Area or in the Cable Corridor and Working Area.

TIER 3

18.12.4.7 The decommissioning of ABWP1 will take place in 2025-2027, representing an overlap with the construction phase of the Proposed Development. The decommissioning works will be a reversal of the installation process. Monopiles will be cut at depth of 2m below the mudline. Inter-array cabling will be cut and buried below 2m. Such works will result in sediment disturbance on Arklow Bank and will add to that being conducted as part of construction activities for the Proposed Development.

PHASE 1 PROJECTS

18.12.4.8 The construction phases of Codling Wind Park and Dublin Array will take place in 2027-2029 and 2028-2032 respectively and will overlap with the construction phase of the Proposed Development. The MAC area of Codling Wind Park and Dublin Array lie outside one tidal cycle of ABWP1, which means that sediment disturbance and deposition arising from ABWP1 will not on extend to either Codling Wind Park or Dublin Array. However, the proximity of both Codling Wind Park and Dublin Array to the tidal cycle extent of the Proposed Development indicates that sediment deposition associated with Codling Wind Park and Dublin Array could extend into that of the Proposed Development.

18.12.4.9 As described in Table 18.10, an AMP will be prepared to inform the installation works, to facilitate the recording and reporting of any archaeological material discovered.

18.12.4.10 The cumulative impact is predicted to be of local spatial extent, short term duration, intermittent and low reversibility. It is predicted that the impact may affect the receptor indirectly. The magnitude is therefore, considered to be Negligible.

SIGNIFICANCE OF EFFECT

18.12.4.11 Overall, the magnitude of the cumulative impact is deemed to be **Negligible** and the sensitivity of the receptor is considered to be **High**. The cumulative effect will, therefore, be **Not significant**, which is **not significant** in EIA terms.

Operational and maintenance phase

MAGNITUDE OF IMPACT

TIER 1

18.12.4.12 The Proposed Development, together with the marine-based projects and plans identified in Table 18.11, may result in sediment disturbance and deposition leading to effects on unknown buried palaeo-landscapes.

18.12.4.13 ABWP1 maintenance activities, such as cable repair/reburial activities, may lead to sediment deposition. The frequency and nature of maintenance activities at the ABWP1 is unknown, however such activities are likely to be at a much reduced scale than that described for the Proposed Development alone (see paragraph 18.9.1.3). Maintenance activities at ABWP1 such as cable repair and reburial are unlikely to be carried out simultaneously with installation activities associated with the Proposed Development.

18.12.4.14 The consented dredging activities at ABWP1 involve seabed levelling by plough dredging of a maximum amount of 99,999 tonnes within an area to the east of the existing seven wind turbines (comprising an area approximately 700 m in length and 100 m in width). This represents direct impacts on the seabed in a location adjacent to the Proposed Development. Potential impacts from dredging and dumping/disposal activities will not result in direct impacts on known historic shipwreck sites but may result sediment deposition, which is likely to be short term and intermittent. There is limited potential for a cumulative impact with the Proposed Development.

18.12.4.15 The activities associated with the Irish Mussel Seed Company Ltd (T32-027A), located off Kilmichael Point, with unknown buried palaeo-landscape sites on the Array Area or in the Cable Corridor and Working Area.

TIER 3

18.12.4.16 The decommissioning of ABWP1 will take place in 2025-2027, representing an overlap with the construction phase of the Proposed Development. The decommissioning works will be a reversal of the installation process. Monopiles will be cut at depth of 2m below the mudline. Inter-array cabling will be cut and buried below 2m. Such works will result in sediment disturbance on Arklow Bank and will add to that being conducted as part of construction activities for the Proposed Development.

PHASE 1 PROJECTS

18.12.4.17 The construction phases of Codling Wind Park and Dublin Array will take place in 2027-2029 and 2028-2032 respectively and will overlap with the construction phase of ABWP2. The MAC areas of Codling Wind Park and Dublin Array lie outside one tidal cycle of ABWP1, which means that deposition arising from ABWP1 will not on extend to either Codling Wind Park or Dublin Array. However, the proximity of both Codling Wind Park and Dublin Array to the tidal cycle extent of the Proposed Development indicates that sediment deposition associated with Codling Wind Park and Dublin Array could extend into that of the Proposed Development.

18.12.4.18 As described in Table 18.10, an AMP will be prepared to inform the installation works, to facilitate the recording and reporting of any archaeological material discovered.

18.12.4.19 The cumulative impact is predicted to be of local spatial extent, short term duration, intermittent and low reversibility. It is predicted that the impact may affect the receptor indirectly. The magnitude is therefore, considered to be Negligible.

SIGNIFICANCE OF EFFECT

18.12.4.20 Overall, the magnitude of the cumulative impact is deemed to be **Negligible** and the sensitivity of the receptor is considered to be **High**. The cumulative effect will, therefore, be **Not significant**, which is **not significant** in EIA terms.

18.12.5 Project Design Option 1 and 2 - Impact 4 – Indirect impact on the setting of terrestrial cultural heritage assets

SENSITIVITY OF THE RECEPTOR

18.12.5.1 Cultural heritage receptors are sensitive sites in relation to changes in setting. The presence of installation activities associated with the Proposed Development alongside other projects and plans in the seascape will affect the visualisation from certain sites. The sensitivity of the receptors is considered to be high.

Construction phase

MAGNITUDE OF IMPACT

TIER 1

18.12.5.2 The Proposed Development, together with the marine-based projects and plans identified in Table 18.11, may result in indirect impact on the setting of terrestrial cultural heritage assets.

18.12.5.3 ABWP1 maintenance activities, such as cable repair/reburial activities, are activities that take place underwater and, apart from surface vessel movements, will not to result in impacts on the setting of terrestrial cultural heritage assets.

18.12.5.4 The consented dredging activities at ABWP1 will also take place underwater and will not result in impacts on the setting of terrestrial cultural heritage assets. intermittent.

18.12.5.5 The activities associated with the Irish Mussel Seed Company Ltd (T32-027A), located off Kilmichael Point, will not result in impacts on the setting of terrestrial cultural heritage assets.

TIER 3

18.12.5.6 The decommissioning of ABWP1 will take place in 2025-2027, representing an overlap with the construction phase of the Proposed Development. The decommissioning works will be a reversal of the installation process. The removal of the monopiles will result in a positive indirect impact on the setting of terrestrial cultural heritage assets.

PHASE 1 PROJECTS

18.12.5.7 The construction phases of Codling Wind Park and Dublin Array will take place in 2027-2029 and 2028-2032 respectively and will overlap with the construction phase of the Proposed Development. The presence of additional offshore wind farms within the ZTV for the Proposed Development will result in additional indirect impacts on the terrestrial setting of cultural heritage assets

18.12.5.8 The cumulative impact is predicted to be of regional spatial extent, long term duration and low reversibility. It is predicted that the impact will affect the receptor indirectly. The magnitude is therefore, considered to be Medium.

SIGNIFICANCE OF EFFECT

18.12.5.9 Overall, the magnitude of the cumulative impact is deemed to be Medium and the sensitivity of the receptor is considered to be High. The cumulative effect will, therefore, be significant, which is significant in EIA terms. However, the impact is indirect.

Operational and maintenance phase

MAGNITUDE OF IMPACT

TIER 1

18.12.5.10 The Proposed Development, together with the marine-based projects and plans identified in Table 18.11, may result in indirect impact on the setting of terrestrial cultural heritage assets.

18.12.5.11 ABWP1 maintenance activities, such as cable repair/reburial activities, are activities take place underwater and, apart from surface vessel movements, will not to result in impacts on the setting of terrestrial cultural heritage assets.

18.12.5.12 The consented dredging activities at ABWP1 will also take place underwater and will not result in impacts on the setting of terrestrial cultural heritage assets. intermittent.

18.12.5.13 The activities associated with the Irish Mussel Seed Company Ltd (T32-027A), located off Kilmichael Point, will not result in impacts on the setting of terrestrial cultural heritage assets.

TIER 3

18.12.5.14 The decommissioning of ABWP1 will take place in 2025-2027, representing an overlap with the construction phase of the Proposed Development. The decommissioning works will be a reversal of the installation process. The removal of the monopiles will result in a positive indirect impact on the setting of terrestrial cultural heritage assets.

PHASE 1 PROJECTS

18.12.5.15 The construction phases of Codling Wind Park and Dublin Array will take place in 2027-2029 and 2028-2032 respectively and will overlap with the construction phase of the Proposed Development. The presence of additional offshore wind farms within the ZTV for the Proposed Development will result in additional indirect impacts on the setting of terrestrial cultural heritage assets.

18.12.5.16 The cumulative impact is predicted to be of regional spatial extent, long term duration and low reversibility. It is predicted that the impact will affect the receptor indirectly. The magnitude is therefore, considered to be Medium.

SIGNIFICANCE OF EFFECT

18.12.5.17 Overall, the magnitude of the cumulative impact is deemed to be **Medium** and the sensitivity of the receptor is considered to be **High**. The cumulative effect will, therefore, be **Significant**, which is significant in EIA terms. The effect is considered to be significant in EIA terms. However, the impact is indirect.

Decommissioning phase

MAGNITUDE OF IMPACT

PHASE 1 PROJECTS

18.12.5.18 The Proposed Development, together with the marine-based projects and plans identified in Table 18.11 will result in the removal of the WTGs and OSPs above the mudline, which will result in a positive indirect impact on the setting of terrestrial cultural heritage assets.

18.12.5.19 The impact is predicted to be of short to medium term duration. It is predicted that the impact will affect the receptor indirectly. The magnitude is therefore, considered to be Low.

SIGNIFICANCE OF EFFECT

18.12.5.20 Overall, the magnitude of the cumulative impact is deemed to be **Low** and the sensitivity of the receptor is considered to be **High**. The cumulative effect will, therefore, be **Moderate**. The significance of an indirect impact on the setting of terrestrial cultural heritage assets from decommissioning of the WTGs and OSPs is not significant in EIA terms.

18.13 Transboundary effects

18.13.1.1 A screening of transboundary impacts has been carried out and has identified that there was no potential for significant transboundary effects with regard to Marine Archaeology and Cultural Heritage from the Proposed Development upon the interests of other states.

18.14 Summary of effects

18.14.1.1 Information on marine archaeology and cultural heritage within the Marine Archaeology and Cultural Heritage Study Area was collected through desktop review, site surveys and consultation.

18.14.1.2 Table 18.13 presents a summary of the potential impacts, mitigation measures and residual effects in respect to marine archaeology and cultural heritage relating to Project Design Options 1 and 2. The impacts assessed include: sediment disturbance and deposition leading to effects on known and unknown heritage assets; direct impact on historic shipwreck sites; direct impact on buried palaeo-landscapes; and indirect impact on the setting of terrestrial cultural heritage assets. Overall, it is concluded that there will be no significant effects arising from the Proposed Development alone during the construction, operational and maintenance or decommissioning phases.

18.14.1.3 Table 18.14 presents a summary of the potential cumulative impacts, mitigation measures and residual effects in respect of Project Design Options 1 and 2. The cumulative impacts assessed include: sediment disturbance and deposition leading to effects on known and unknown heritage assets; direct impact on historic shipwreck sites; direct impact on buried palaeo-landscapes; and indirect impact on the setting of terrestrial cultural heritage assets. Overall, it is concluded that there will be significant cumulative effect arising from the Proposed Development alongside other projects/plans for indirect impact on the setting of terrestrial cultural heritage assets during the Construction and Operational and Maintenance phases. No other significant cumulative effects are predicted for the Proposed Development alongside other projects/plans.

18.14.1.4 No potential transboundary impacts have been identified in regard to effects of the Proposed Development.

Table 18.13: Summary of potential environmental impacts, mitigation and monitoring for Project Design Options 1 and 2

Description of impact	Phase C	Phase O	Phase D	Factored-in measures	Magnitude of impact	Sensitivity of Receptors	Significance of effect	Additional measures	Residual effect	Proposed monitoring
1. Sediment disturbance and deposition leading to effects on known and unknown heritage assets	✓	✓	✓	Archaeological Exclusion Zones (AEZ) will be established around each known shipwreck site and potential site, within which no installation activities should take place. The AEZs are set out in Volume III, Appendix 18.1: Marine Archaeology and Cultural Heritage Technical Report, and in Volume III, Appendix 25.9: Archaeological Management Plan. In the event that site preparation and installation works are unable to avoid activities within an AEZ, the works can only proceed with the consent of the National Monuments Service (NMS). Confirmatory marine geophysical surveys, Remote Operated Vehicles (ROV) surveys and geotechnical surveys conducted for the Proposed Development prior to construction will be reviewed by a maritime archaeologist as	C: Low O: Low D: Low	C: High O: High D: High	C: Moderate (not significant in EIA terms) O: Moderate (not significant in EIA terms) D: Moderate (not significant in EIA terms)	C: None O: None D: None	C: None O: None D: None	N/A

Description of impact	Phase C O D	Factored-in measures	Magnitude of impact	Sensitivity of Receptors	Significance of effect	Additional measures	Residual effect	Proposed monitoring
		part of the project design team and the findings will be communicated to the NMS and will inform the need for micro-siting. An Archaeology Management Plan (AMP) has been prepared to inform the construction, operational and maintenance and decommissioning phases of works. The AMP is provided in Volume III, Appendix 25.9: Archaeological Management Plan. The AMP sets out the principal protocols that the Developer will put in place to ensure the protection of archaeological heritage through the course of the project lifetime. The AMP facilitates the recording and reporting of any archaeological material discovered during project lifetime should this occur. The AMP addresses protocols for archaeological monitoring of works where the recovery of material to the surface is possible. The AMP						

Description of impact	Phase C O D	Factored-in measures	Magnitude of impact	Sensitivity of Receptors	Significance of effect	Additional measures	Residual effect	Proposed monitoring
		addresses protocols for recording and reporting observations where the recovery of material to the surface is not possible and where the seabed has already been surveyed comprehensively and no archaeological features recorded. The AMP addresses protocols for archaeological inputs when a discovery of archaeological material is made. The principle of avoidance has informed the design process, whereby impacts on known archaeological sites have been avoided wherever possible. Project maritime archaeologists, operating under licence from the Department of Housing, Local Government and Heritage (DHLGH), will be engaged on the project to monitor construction activities and observe any works where						

Description of impact	Phase C	Phase O	Phase D	Factored-in measures	Magnitude of impact	Sensitivity of Receptors	Significance of effect	Additional measures	Residual effect	Proposed monitoring
				material of archaeological importance may be uncovered. Adherence to the Rehabilitation Schedule; (Volume III, Appendix 4.1).						
2. Direct impact on historic shipwreck sites.	✓	✓	×	As per impact 1.	C: Low O: Low D: Low	C: High O: High D: High	C: Moderate (not significant in EIA terms) O: Moderate (not significant in EIA terms) D: Moderate (not significant in EIA terms)	C: None O: None D: None	C: None O: None D: None	N/A
3. Direct impact on buried palaeo-landscapes.	✓	✓	✓	As per impact 1.	C: Low O: Low D: Low	C: High O: High D: High	C: Moderate (not significant in EIA terms) O: Moderate (not significant in EIA terms)	C: None O: None D: None	C: None O: None D: None	N/A

Description of impact	Phase C O D	Factored-in measures	Magnitude of impact	Sensitivity of Receptors	Significance of effect	Additional measures	Residual effect	Proposed monitoring
					D: Moderate (not significant in EIA terms)			
4. Indirect impact on the setting of terrestrial cultural heritage sites	✓ ✓ ✓	N/A	C: Low O: Low D: Low	C: High O: High D: High	C: Moderate (not significant in EIA terms) O: Moderate (not significant in EIA terms) D: Moderate (not significant in EIA terms)	C: None O: None D: None	C: None O: None D: None	None

Table 18.14: Summary of potential cumulative environmental impacts, mitigation and monitoring for Project Design Options 1 and 2

Description of impact	Phase C O D	Factored-in measures	Magnitude of impact	Sensitivity of Receptors	Significance of effect	Additional measures	Residual effect	Proposed monitoring
1. Sediment disturbance and deposition leading to effects on known	✓ ✓ ×	Archaeological Exclusion Zones (AEZ) will be established around each known shipwreck site and	C: Negligible O:	C: High O: High	C: Not significant (not	None	C: Not significant (not	None

Description of impact	Phase C O D	Factored-in measures	Magnitude of impact	Sensitivity of Receptors	Significance of effect	Additional measures	Residual effect	Proposed monitoring
and unknown heritage assets		potential site, within which no installation activities should take place. The AEZs are set out in Volume III, Appendix 18.1: Marine Archaeology and Cultural Heritage Technical Report, and in Volume III, Appendix 25.9: Archaeological Management Plan. In the event that site preparation and installation works are unable to avoid activities within an AEZ, the works can only proceed with the consent of the National Monuments Service (NMS). Confirmatory marine geophysical surveys, Remote Operated Vehicles (ROV) surveys and geotechnical surveys conducted for the Proposed Development prior to construction will be reviewed by a maritime archaeologist as part of the project design team and the findings will be communicated to the NMS	Negligible		significant in EIA terms) O: Not significant (not significant in EIA terms)		significant in EIA terms) O: Not significant (not significant in EIA terms)	

Description of impact	Phase C O D	Factored-in measures	Magnitude of impact	Sensitivity of Receptors	Significance of effect	Additional measures	Residual effect	Proposed monitoring
		and will inform the need for micro-siting. An Archaeology Management Plan (AMP) has been prepared to inform the construction, operational and maintenance and decommissioning phases of works. The AMP is provided in Volume III, Appendix 25.9: Archaeological Management Plan. The AMP sets out the principal protocols that the Developer will put in place to ensure the protection of archaeological heritage through the course of the project lifetime. The AMP facilitates the recording and reporting of any archaeological material discovered during project lifetime should this occur. The AMP addresses protocols for archaeological monitoring of works where the recovery of material to the surface is possible. The AMP addresses protocols for						

Description of impact	Phase C O D	Factored-in measures	Magnitude of impact	Sensitivity of Receptors	Significance of effect	Additional measures	Residual effect	Proposed monitoring
		recording and reporting observations where the recovery of material to the surface is not possible and where the seabed has already been surveyed comprehensively and no archaeological features recorded. The AMP addresses protocols for archaeological inputs when a discovery of archaeological material is made. The principle of avoidance has informed the design process, whereby impacts on known archaeological sites have been avoided wherever possible. Project maritime archaeologists, operating under licence from the Department of Housing, Local Government and Heritage (DHLGH), will be engaged on the project to monitor construction activities and observe any						

Description of impact	Phase C	Phase O	Phase D	Factored-in measures	Magnitude of impact	Sensitivity of Receptors	Significance of effect	Additional measures	Residual effect	Proposed monitoring
				works where material of archaeological importance may be uncovered. Adherence to the Rehabilitation Schedule; (Volume III, Appendix 4.1).						
2. Direct impact on historic shipwreck sites.	✓	✓	×	As per impact 1.	C: Negligible O: Negligible	C: High O: High	C: Not significant (not significant in EIA terms) O: Not significant (not significant in EIA terms)	None	C: Not significant (not significant in EIA terms) O: Not significant (not significant in EIA terms)	None
3. Direct impact on buried palaeo-landscapes.	✓	✓	×	As per impact 1.	C: Negligible O: Negligible	C: High O: High	C: Not significant (not significant in EIA terms) O: Not significant (not	None	C: Not significant (not significant in EIA terms) O: Not significant (not	None

Description of impact	Phase C O D	Factored-in measures	Magnitude of impact	Sensitivity of Receptors	Significance of effect	Additional measures	Residual effect	Proposed monitoring
					significant in EIA terms)		significant in EIA terms)	
4. Indirect impact on the setting of terrestrial cultural heritage sites	✓ ✓ ✓	N/A	C: Medium O: Medium D: Low	C: High O: High D: High	C: Significant O: Significant D: Moderate (not significant in EIA terms)	None	C: Significant O: Significant D: Moderate (not significant in EIA terms)	None

18.15 References

Arklow Energy Limited (2016) Arklow Bank Dumping at Sea Permit Application Supporting Information, Available at: http://www.epa.ie/licences/lic_eDMS/090151b2805dddf2.pdf (Accessed 02/05/2024).

Boland, D (2000) Baseline Archaeology Report, Appendix 11: Archaeological assessment, proposed wind farm development, Arklow Bank.

Brady, K. (2008) Shipwreck inventory of Ireland: Louth, Meath, Dublin and Wicklow (Dublin: Stationary Office).

Brady, N. (2017) Marine geophysical survey, Arklow Waste Water Marine Outfall, 16R0219', unpublished report of the Archaeological Diving Company Ltd.

Brady, N. (2019) Underwater archaeological inspections, Arklow Waste Water Marine Outfall, 17D0078, 17R0197', unpublished report of the Archaeological Diving Company Ltd.

Campbell, K. (2003) Arklow Bank Windpark, 03E1101. In Isabel Bennett (ed.), Excavations 2003, p. 541. https://excavations.ie/report/2003/Wicklow/0011094/

COWRIE (2007) Guidance for Assessment of Cumulative Impacts on the Historic Environment from Offshore Renewable Energy.

COWRIE (2011) Offshore Geotechnical Investigations and Historic Environment Analysis: Guidance for the Renewable Energy Sector, Available at: 2011-01-offshore-geotechnical-investigations-and-historicenvironment-analysis-guidance-for-the-renewable-energy-sector.pdf

Crown Estate (2021) Archaeological Written Schemes of Investigations for Offshore Windfarm Projects. https://assets.ctfassets.net/nv65su7t80y5/7JCHxvKXAQPiXI32NvDFbH/7fab6a01c19b37149355f80646562eca/guide-to-archaeological-requirements-for-offshore-wind.pdf

CWP (2020) Codling Wind Park Offshore Scoping Report. November 2020.

DAHGI (1999a) Frameworks and Principles for the Protection of the Archaeological Heritage. https://www.archaeology.ie/sites/default/files/media/publications/framework-and-principles-for-protection-of-archaeological-heritage.pdf

DAHGI (1999b) Policy and Guidelines on Archaeological Excavation. https://www.archaeology.ie/sites/default/files/media/publications/excavation-policy-and-guidelines.pdf

DCENR (2014) Offshore Renewable Energy Development Plan I. https://www.gov.ie/pdf/?file=https://assets.gov.ie/27215/2bc3cb73b6474beebbe810e88f49d1d4.pdf#page=null

DECC (2021) DRAFT Offshore Renewable Energy Development Plan II. https://www.gov.ie/pdf/?file=https://assets.gov.ie/248270/7338cf63-e174-4932-8c61-6b840e447f3d.pdf#page=null

DEHLG (1997) Draft requirements for a geophysical survey for archaeological purposes.

DEHLG (2006) Guidelines for Authors of Reports on Archaeological Excavations. https://www.archaeology.ie/sites/default/files/media/publications/excavation-reports-guidelines-for-authors.pdf

Department of the Environment, Community and Local Government (2013) Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment.

DHLGH (2021) National Marine Planning Framework, Project Ireland 2040. https://www.gov.ie/pdf/?file=https://assets.gov.ie/139100/f0984c45-5d63-4378-ab65-d7e8c3c34016.pdf#page=null

DHLGH 2023a Advice to the Public on Ireland's Underwater Archaeological Heritage. https://www.archaeology.ie/sites/default/files/media/publications/advice-to-the-public-on-irelands-underwater-archaeological-heritage.pdf

DHLGH 2023b Archaeology and Flood Relief Schemes: Guidelines. https://www.archaeology.ie/sites/default/files/media/publications/archaeology-and-flood-relief-schemes-guidelines-nms-2023.pdf

EirGrid (2006) Cultural heritage guidelines for electricity transmission projects, Available at: http://www.eirgridgroup.com/site-files/library/EirGrid/Cultural-Heritage-Guidance-for-Electricity-TransmissionProjects.pdf.

EPA (2017) Draft Guidelines on the Information to be contained in Environmental Impact Assessment Reports (Draft August 2017).

EPA (2022) Guidelines on the Information to be Contained in Environmental Impact Assessment Reports. https://www.epa.ie/publications/monitoring--assessment/assessment/EIAR_Guidelines_2022_Web.pdf

European Commission (2017) Environmental Impact Assessment of Projects: Guidance on the preparation of the Environmental Impact Assessment Report.

Historic England (2017) The setting of historic assets, Available at: https://historicengland.org.uk/imagesbooks/publications/gpa3-setting-of-heritage-assets/.

ICOMOS (1996) Charter on the Protection and Management of the Underwater Cultural Heritage. https://www.icomos.org/images/DOCUMENTS/Charters/underwater_e.pdf

Innogy (2020) Dublin Array Offshore Wind Farm Environmental Impact Assessment Scoping Report. September 2020.

Minister for Housing, Planning and Local Government (2018) Licence under section 3(3) of the Foreshore Act, 1933, Site Investigation Licence under Section 3 of the Foreshore Act 1933, Available at: https://www.housing.gov.ie/sites/default/files/foreshore-applications/applicationdocuments/copy_executed_licence_5.pdf

Plets, Ruth, Dix, Justin and Bates, Richard (2013) Marine Geophysics Data Acquisiiton, Processing and Interpretation. English Heritage. https://historicengland.org.uk/images-books/publications/marine-geophysics-data-acquisition-processing-interpretation/

UNESCO (2001) UNESCO Convention on the Protection of the Underwater Cultural Heritage. https://en.unesco.org/about-us/legal-affairs/convention-protection-underwater-cultural-heritage

Westley, Kieran and Woodman, Peter (2020), 'Ireland : submerged prehistoric sites and landscapes', in G. Bailey, N Galanidou, H. Peeters, H. Jöns, M Mennenga (eds), The archaeology of Europe's drowned landscapes. Coastal Research Library, 35, Springer, pp 221-248. https://doi.org/10.1007/978-3-030-37367-2_11