MARINE ENERGY WALES

MARINE ENERGY TEST AREA (META)

Environmental Impact Assessment

Chapter 13:
Marine Archaeology

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Glossary

Term	Definition
Cadw	The historic environment service of the Welsh Government
Designation	The recognition of particular heritage value(s) of an historic asset by giving it formal status under law or policy intended to sustain those values.
Heritage	All inherited resources which people value for reasons beyond mere utility.
Heritage, cultural	Inherited assets which people identify and value as a reflection and expression of their evolving knowledge, beliefs and traditions, and of their understanding of the beliefs and traditions of others.
Heritage, natural	Inherited habitats, species, ecosystems, geology and landforms, including those in and under water, to which people attach value.
Heritage asset	An identifiable component of the historic environment. It may consist or be a combination of an archaeological site, an historic building, or a parcel of historic landscape. Nationally important historic assets will normally be designated.
Historic environment	All aspects of the environment resulting from the interaction between people and places through time, including all surviving physical remains of past human activity, whether visible, buried or submerged, and deliberately planted or managed.
Historic Environment Record	A public, map-based data set, primarily intended to inform the management of the historic environment. In Wales these are maintained by the four Welsh Archaeological Trusts.
Intertidal	Area that is above water during low tide and underwater during high tide.
Natural change	Change which takes place in the historic environment without human intervention, which may require specific management responses (particularly maintenance or periodic renewal) in order to sustain the significance of a place.
Reversible	Capable of being reversed so that the previous state is restored.
Scouring	Erosive action of suspended sediment.
Sediment transport	Movement of solid particles (sediment) due to gravitational forces and/or the movement of the fluid in which the sediment is entrained.
Setting	The surroundings in which an historic asset is experienced, its local context, embracing present and past relationships to the adjacent landscape.
Importance	The sum of the cultural heritage values
Spring tides	Tide following a new or full moon during which the tidal range is maximum.
Tidal excursion	The horizontal distance along the estuary that a particle moves during one tidal cycle of ebb and flood.
Tidal flow (or current)	Currents resulting from the impact on sea level caused by the interaction of the Earth, sun and moon.
Tidal range	Height difference between high tide ad low tide.
Value	An aspect of worth or importance, here given by people to historic assets.
Value, aesthetic	Value deriving from the ways in which people draw sensory and intellectual stimulation from a place.
Value, communal	Value deriving from the meanings of a place for the people who relate to it, or for whom it figures in their collective experience or memory.
Value, evidential	Value deriving from the potential of a place to yield evidence about past human activity.
Value, historical	Value deriving from the ways in which past people, events and aspects of life can be connected through a place to the present.
Value, heritage	The sum of the four component values (evidential, historical, aesthetic and communal).

Acronyms

Acronym	Description
AD	Anno Domini
BC	Before Christ
EIA	Environmental Impact Assessment
ES	Environmental Statement
DAT	Dyfed Archaeological Trust
dWNMP	Draft Welsh National Marine Plan
HER	Historic Environment Records
ICOMOS	International Council on Monuments and Sites
NPS	National Policy Statement
PDE	Project Design Envelope
LCG	Landing Craft Gun
LDP	Local Development Plan
MCA	Marine Character Area
META	Marine Energy Test Area
MHWS	Mean High Water Spring
MLWS	Mean Low Water Spring
NPS	National Policy Statement
NMRW	National Monuments Record in Wales
NRW	Natural Resources Wales
PCC	Pembrokeshire County Council
PCNPA	Pembrokeshire Coast National Park Authority
PPW	Planning Policy Wales
RCAHMW	Royal Commission for Ancient and Historic Monuments in Wales
SCA	Seascape Character Area
SSC	Suspended sediment concentration
UK	United Kingdom
ZoI	Zone of Impact

Units

Unit	Description
m	metres
m^2	metres squared
km	kilometre
NM	nautical miles
in	inches
ft	feet
hp	horse power
gt	Gross tonnage

Unit	Description
nt	Net tonnage
%	percentage
tons	Internal capacity

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13. MARINE ARCHAEOLOGY

13.1 Introduction

13.1.1.1 This chapter of the Environmental Statement presents the results of the Environmental Impact Assessment (EIA) for the potential impacts of the META project on marine archaeology.

13.1.1.2 The assessment presented is also informed by the following technical chapters:

- Chapter 5: Coastal Processes;
- Chapter 14: Seascape; and
- Chapter 16: Other Users.

13.1.1.3 The EIA will consider the potential effects the installation, operation and maintenance and decommissioning phases of the META project on historic assets within the marine archaeology study area. The impact assessment will consider both direct and indirect potential impact and will be assessed based on the nature of the proposed activities.

13.1.1.4 This Environmental Statement chapter will review the legislative, policy and guidance framework relevant to marine archaeology and will also set out an appropriate methodology for the assessment of impacts and effects on the historic environment.

13.1.1.5 The significance of potential impacts will be assessed by taking into account the potential magnitude of impacts (e.g. a high magnitude impact could involve the total loss of a heritage asset) and the sensitivity of heritage assets.

13.1.1.6 The assessment of the likely effects on the historic environment will include the following activities:

- Identification of all heritage assets that could be affected by the proposed development, along with provision of a description of the value / sensitivity of those assets;
- Identification of the likely effects of the proposed development on heritage assets within the site and an appropriate study area centred on it; and
- Assessment of significance of effects, taking into account measures proposed to avoid, reduce or offset adverse effects.

13.1.1.7 This chapter is supported by information contained within a technical report included in Appendix 13.1: Marine Archaeology.

13.2 Purpose of this chapter

13.2.1.1 The primary purpose of the Environmental Statement is to support the marine consent applications for the META project, which are outlined in chapter 1: Introduction.

13.2.1.2 It is intended that the Environmental Statement will provide statutory and non-statutory consultees with sufficient information to determine the potential significant impacts of the META project on the receiving environment and will inform the issue of appropriate consent and/or licences by the regulatory authorities. It will also inform any consent conditions.

13.2.1.3 In particular, this Environmental Statement chapter:

- Presents the existing marine archaeology baseline established from desk studies, and consultation;
- Presents the potential environmental effects on marine archaeology arising from the META project, based on the information gathered and the analysis and assessments undertaken;
- Identifies any assumptions and limitations encountered in compiling the baseline information; and
- Highlights any necessary monitoring and/or mitigation measures which could prevent, minimise, reduce or offset the possible environmental effects identified in the EIA process.

13.3 Study area

13.3.1.1 The marine archaeology study area (see Figure 13.1) for the proposals is defined as the Milford Haven Waterway (henceforth referred to as “the Waterway”) – the area inclusive of the Waterway and extends 12 NM from St Govan’s Head to Skomer Island.

13.3.1.2 The marine archaeology study area was set out in the EIA Scoping Report and agreed with the Royal Commission for Ancient and Historic Monuments in Wales (RCHAMS) as well as the Dyfed Archaeological Trust (DAT), from whom baseline data records were obtained.

13.3.1.3 The marine archaeology study area includes the marine zone of the Waterway offshore (below Mean Low Water Spring (MLWS)), and a buffer to also include the intertidal zone (between MLWS and Mean High Water Spring (MHWS). This is because in accordance with planning guidance for land-use planning purposes, the seaward limit of the coastal zone is generally MLWS, but between MHWS and MLWS the planning system usually needs to operate in tandem with a range of sectoral controls over coastal and marine development.

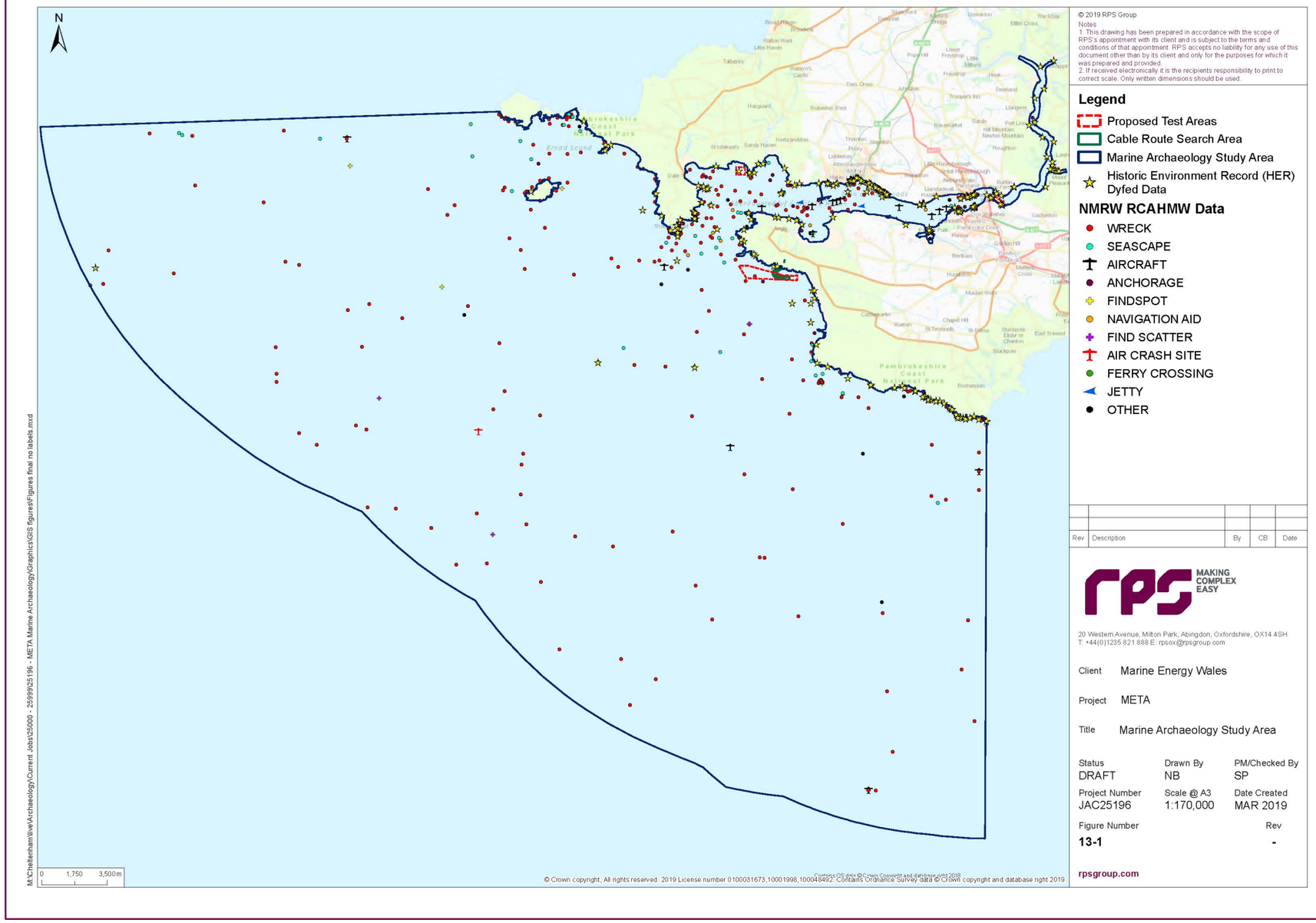


Figure 13.1: Marine Archaeology Study Area.

13.4 Policy context

13.4.1.1 Planning policy guidance provides advice concerning how the historic environment should be addressed within the planning process. This is set out in detail within technical appendix 13.1 and summarised in Table 13.1 below.

13.4.2 National Planning Policy

13.4.2.1 While it is recognised that the META project does not constitute a Nationally Significant Infrastructure project (NSIP), the National Policy Statements (NPS) available to support NSIPs are considered to provide useful context to the production of an Environmental Statement. Chapter 3: Needs and Alternatives outlines the policy context for the META project, and how the META project has adhered to the UK marine Policy Statement and the draft Welsh National Marine Plan (dWNMP).

13.4.2.2 The principal national planning policy relevant to this assessment is Planning Policy Wales (Edition 10, Welsh Government, December 2018), (PPW10). Chapter 6 of PPW10 (Distinctive and Natural Places) includes a section (6.1) on The Historic Environment. This establishes Welsh Government objectives with regard to the protection of the historic environment, including in marine and intertidal zones, as well as onshore, and explains that responsibility for caring for the historic environment lies with all those that have an interest in the planning system.

13.4.3 Local Planning Policy

13.4.3.1 Planning Pembrokeshire's Future is Pembrokeshire County Council's (PCC) Local Development Plan (up to 2021) (the LDP) and was adopted in February 2013 and contains policies relevant to this assessment.

13.4.3.2 The Pembrokeshire Coast National Park Authority (PCNPA) LDP was adopted by the National Park Authority on the 29 September 2010, and also includes policies relevant for this assessment.

13.4.3.3 The Pembrokeshire Coast National Park Authority (PCNPA) issues Supplementary Planning Guidance to the LDP for the Pembrokeshire Coast National Park, including the 'Historic Environment (Archaeology)', adopted 22 June 2011. PCNPA also issued Supplementary Planning Guidance to the Local Development Plan, Adopted 11 December 2013 titled 'Seascape Character Assessment'.

Table 13.1: Summary of policy framework provisions relevant to marine archaeology.

Summary of relevant policy framework	How and where considered in the Environmental Statement
Planning Policy Wales (Edition 10, Welsh Government, December 2018), Chapter 6 - Distinctive and Natural Places - section 6.1 "The Historic Environment". • Objectives regarding the historic environment are defined in paragraph 6.1.6, as follows: – protect the Outstanding Universal Value of the World Heritage Sites; – conserve archaeological remains, both for their own sake and for their role in education, leisure and the economy; – safeguard the character of historic buildings and manage change so that their special architectural and historic interest is preserved; – preserve or enhance the character or appearance of conservation areas, while at the same time helping them remain vibrant and prosperous; – preserve the special interest of sites on the register of historic parks and gardens; and – protect areas on the register of historic landscapes in Wales. • Regarding archaeological remains, Section 6.1 of PPW10 states: 'The conservation of archaeological remains and their settings is a material consideration in determining planning applications, whether those remains are a scheduled monument or not' (Paragraph 6.1.23). • 'Where nationally important archaeological remains are likely to be affected by proposed development, there should be a presumption in favour of their physical protection in situ. It will only be in exceptional circumstances that planning permission will be granted if development would result in a direct adverse impact on a scheduled monument (or an archaeological site shown to be of national importance)' (Paragraph 6.1.24). • In cases involving less significant archaeological remains, local planning authorities will need to weigh the relative importance of the archaeological remains and their settings against other factors, including the need for the proposed development' (paragraph 6.1.25). • Section 6.1 goes on to say: 'Where archaeological remains are known to exist or there is a potential for them to survive, an application should be accompanied by sufficient information, through desk-based assessment and/or field evaluation, to understand a full understanding of the impact of the proposal on the significance of the remains' (paragraph 6.1.26). • 'If the planning authority is minded to approve an application and where archaeological remains are affected by proposals that alter or destroy them, the planning authority must be satisfied that the developer has secured appropriate and satisfactory provision for their recording and investigation, followed by the analysis and publication of the results and the deposition of the resulting archive in an approved repository' (paragraph 6.1.27).	The assessment of the likely potential impacts of the proposals has been undertaken in accordance with the PPW 10. Relevant designated assets surrounding the META project, and non-designated heritage assets on and surrounding the META project have been identified and the likely potential impacts of the proposals assessed proportionately within the Environmental Statement and baseline Appendices. Where appropriate, mitigation is put forward to enable preservation. The only site which will require planning permission is Warrior Way, as it is within the jurisdiction of PCC, however, the principles of assessment set out in PPW 10 have also been applied to the other sites as they are relevant to inform marine consent.
Pembrokeshire County Council Local Development Plan (up to 2021), adopted in February 2013 • Policy GN.38: Protection and Enhancement of the Historic Environment	The significance of known and potential assets has been considered in the baseline assessments and these

Summary of relevant policy framework	How and where considered in the Environmental Statement
– "Development that affects sites and landscapes of architectural and/or historical merit or archaeological importance, or their setting, will only be permitted where it can be demonstrated that it would protect or enhance their character and integrity."	judgements and the appropriate mitigation measures will be agreed through consultation with relevant statutory bodies.
Pembrokeshire Coast National Park Local Development Plan, adopted 29 September 2010 • Policy 17 Shore Based Facilities – "Development of shore-based facilities including those linked to proposals below mean low water, will be permitted within the developed areas of the coast where compatible with adjacent uses"	The significance of known and potential assets up to MHWS associated with the META project have been considered in the baseline assessments and these judgements and the appropriate mitigation measures will be agreed through consultation with relevant statutory bodies.
Pembrokeshire Coast National Park Authority - Supplementary Planning Guidance 'Historic Environment (Archaeology)', adopted 22 June 2011 The Register of Landscapes of Outstanding Historic Interest (Register of Landscapes of Outstanding Historic Interest in Wales. Cadw/ICOMOS UK. 1998) recognises that historic landscapes are one of Wales' most valuable cultural assets being a special, often fragile and irreplaceable part of our heritage. Four of these Registered Landscapes lie within Pembrokeshire Coast National Park, including Milford Haven Waterway, described as a 'highly articulate and distinctive land and seascape'.	The Milford Haven Waterway Registered Landscape has been scoped out from the maritime archaeology chapter, given the proposed development would have no more than a local impact on this landscape, however, the landscape assessment and descriptions are used to inform this assessment, and therefore considered in the baseline study.
Pembrokeshire Coast National Park Authority - Supplementary Planning Guidance 'Seascape Character Assessment', adopted 11 December 2013 • The seascape character assessment of Pembrokeshire Coast National Park includes territorial waters up to 12 nautical miles offshore and extends from Cardigan Island in the north to the Taf estuary in Carmarthen Bay in the south. The study area reaches inland to include the areas of Milford Haven outside the Park, and up to the tidal limits of the Daugleddau. The following Seascape Character Areas (SCAs) are relevant for this assessment: – SCA 31 – Outer Milford Haven (Dale Road – Site 7) – SCA 32 – Inner Milford Haven (Warrior Way – Site 6) – SCA 34 – Freshwater West (East Pickard Bay – Site 8)	The marine aspects of the relevant Seascape Character Assessments are considered in the baseline study.

13.5 Consultation

13.5.1.1 A summary of the key issues raised during consultation specific to marine archaeology is outlined below in Table 13.2, together with how these issues have been considered in the production of this Environmental Statement chapter.

Table 13.2: Summary of key consultation issues raised during consultation activities undertaken for the META project relevant to marine archaeology.

Date	Consultee and type of response	Issues raised	Response to issue raised and/or where considered in this chapter
December 2018	Dyfed Archaeological Trust – baseline data	Marine archaeology study area does not include heritage assets in intertidal zone, which need to be considered.	Marine archaeology study area revised to include buffer zone covering intertidal areas.
16 Jan 2019	Welsh Government	The scoping report has identified the relevant data sources for the marine archaeology in the vicinity of Sites 6, 7 and 8 and in our opinion the approach to consider both the direct and indirect impact on the identified historic assets is appropriate.	No action required
16 Jan 2019	Welsh Government	The elements of the proposed developments that will be visible in the registered Milford Haven landscape of outstanding historic interest will have no more than a local impact on the registered historic landscape. Consequently, we consider that the impact of the propose development on the registered historic landscape can be scoped out of the EIA.	This receptor has not been included as receptor, but included as part of baseline research
01 Apr 2019	NRW/MMO Scoping Opinion	This work must be carried out to the standard outlined by the Chartered Institute for Archaeologists (CIfA)	Section 13.6.1 outlines how the work has been carried out in accordance with CIfA

13.6 Methodology to inform the baseline

13.6.1 Desktop study

13.6.1.1 The overall aim of the baseline assessment is the identification of all heritage assets that would be affected by the proposed development, along with provision of a description of the value / sensitivity of those assets, in compliance with the '*Standard and guidance for historic environment desk-based assessments*' (Chartered Institute for Archaeologists, December 2014, revised in 2017).

13.6.1.2 Information on marine archaeology within the marine archaeology study area was collected through a detailed desktop review of existing studies and datasets. These are summarised at Table 13.3 below.

Table 13.3: Summary of key desktop reports.

Title	Source	Year	Author
Historic Environment Records (**NPRN numbers referenced in text and figures below**)	Royal Commission for Ancient and Historic Monuments in Wales / National Monuments Record for Wales	2018	Royal Commission for Ancient and Historic Monuments in Wales / National Monuments Record for Wales
Historic Environment Records (**PRN numbers referenced in text and figures below**)	Dyfed Archaeological Trust / Cadw	2018	Dyfed Archaeological Trust / Cadw
Records wrecks and obstructions	United Kingdom Hydrological Office	2018	United Kingdom Hydrological Office

Title	Source	Year	Author
Milford haven Waterway Ports & Harbours Project	Dyfed Archaeological Trust	2008	Dyfed Archaeological Trust
National Seascape Assessment for Wales	Natural Resources Wales	2015	Natural Resources Wales
Supplementary Planning Guidance to the Local Development Plan - 'Seascape Character Assessment'	Pembrokeshire Coast National Park Authority	2013	Pembrokeshire Coast National Park Authority
Landscapes of Outstanding Historic Interest	Cadw	1998	Cadw, CCW, and ICOMOS UK

13.6.2 Identification of designated and non-designated heritage assets

13.6.2.1 All designated and non-designated heritage assets within the marine archaeology study area of archaeological value / sensitivity that could be affected by the installation, operation and maintenance, and decommissioning of the META project were identified using the three-step process described below:

- Step 1: All designated sites of international, national and local importance within the marine archaeology study area were identified using a number of sources. These included the Royal Commission for Ancient and Historic Monuments in Wales (RCAHMW), National Monuments Record for Wales (NMRW), Dyfed Archaeological Trust (DAT), Cadw, Natural Resources Wales (NRW) and PCNPA;
- Step 2: Information was compiled on the relevant heritage assets for each of these sites from the baseline records provided and additional documentary research; and
- Step 3: Using the above information and expert judgement, sites were included for further consideration if:
  - A designated site directly overlaps with the META project; and
  - Sites and associated features (including setting) were located within the potential Zone of Impact (ZoI) for impacts associated with the META project.

13.7 Marine archaeology baseline environment

13.7.1 Designated and non-designated heritage assets

13.7.1.1 Maritime archaeological sites and materials can be defined as the physical remains of boats and ships that have been wrecked, sunk or have foundered; aircraft losses; historical human structures (such as settlements) and artefacts which rest upon the seabed as the result of being jettisoned or lost overboard (for example, anchors, cannon or fishing gear).

13.7.1.2 Records of known wreck sites and losses in UK waters are biased towards the recent, predominantly post-Medieval and modern periods, through the survival of associated historic sources. Although the existence and survival of Palaeolithic watercraft are highly speculative in the UK, Bronze and Iron Age sea-going vessels are considered likely to have been lost in the marine archaeology search area. The precise location of most wrecks is not known. The majority of known and recorded wreck sites lie relatively close to the coast, by virtue of their accessibility and visibility.

13.7.1.3 Data for known shipwrecks and recorded shipping losses within the marine archaeology search area are depicted in Figure 13.2, Figure 13.3 and Figure 13.4. These datasets provide a general picture of maritime casualties in the marine archaeology search area but should not be viewed as representing the totality of the potential maritime archaeological remains in the marine archaeology search area. Wrecks and obstructions are generally charted, although a small number lack accurate positional information. It is also worth noting that locations can change or disperse overtime due to the effect of currents and storms.

13.7.1.4 Further information on relevant assets is provided in the gazetteer presented in technical appendix 13.1, and Table 13.4 to Table 13.9 below. These are not all of the heritage assets identified on the searches, rather they are the ones identified within a 500 m radius of the sites in Royal Commission for Ancient and Historic Monuments / National Monument Record (RCAHMW/NMR) and Dyfed Archaeological Trust (DAT) searches and considered to be relevant to this assessment.

13.7.1.5 Two sites, Warrior Way (site 6) and Dale Roads (site 7) lie within the registered landscape of outstanding historical importance in Wales known as the Milford Haven Waterway (see chapter 14: Seascape). Unlike many such flooded valleys in Britain, the Waterway has not silted up due to its limited freshwater inflow and its orientation facing into the Gulf Stream current, which generates a high energy environment in the mouth of the Waterway. The depth of water and character of the marine archaeology search area varies considerably throughout the Waterway, from shallow intertidal bays and coves to subtidal water in the central Waterway channel. The Waterway's main tidal channel is deep, with a typical depth of 20 m between the mouth and the Cleddau Bridge and a typical depth of 10 m upstream of the Cleddau Bridge at the confluence at Lawrenny Quay. The varying topography of the seabed and its relationship with the adjacent coast has a direct relationship with the nature, density and character of the archaeological remains found on and under it.

13.7.1.6 Sea level fluctuations caused by three major glaciations (the Anglian, Wolstonian and the Devensian) have shaped the submerged Prehistoric landscape within the marine archaeology search area. The Waterway was subjected to considerable changes through the result of ice ages, with meltwater further deepening existing river valleys and leaving behind the deep macro-tidal ria, and water levels were significantly lower (up to 30 m below current levels) until the Mesolithic period.

13.7.1.7 The deep and sheltered waters of a drowned valley extend 30 km inland. This deep water sheltered anchorage has long been recognised and was used as a muster point for the Anglo-Norman invasion of Ireland, as a landing place by Owain Glyndwr and Henry Tudor, and as sheltered anchorage for the British Fleet in the eighteenth century.

13.7.1.8 Two of the major Welsh towns/ports of the Medieval and later periods, Haverfordwest and Pembroke, are located on the upper reaches of Waterway. Industrialisation during the late seventeenth century and eighteenth century brought fishing, coastal trading and small-scale boat-building that would have been undertaken from the numerous small creeks. Amongst the villages, only Dale and Angle, both situated at the mouth of the Waterway, had a strong maritime economy. By 1700, coal from pits at Land Shipping, Cresswell, Hook and Llangwm were the major export from the Waterway. Many small quays developed to serve this industry. Numerous limekilns along the shore of the Waterway are evidence of the increasing importance of coastal trade. By the late eighteenth century, the need for a town close to deep-water anchorages to service large ships and provide a port for Irish trade led to the foundation of Milford Haven town. A few years later naval dockyards and the town of Pembroke Dock were established. The advent of the railways in the mid-nineteenth century diminished coastal trade, but small ships continued to call at Haverfordwest, Pembroke and other quays into the twentieth century, and both Milford Haven town and Neyland became important fishing ports.

13.7.1.9 The following sections set out the baseline marine archaeology at each META site in the order Warrior Way (site 6), Dale Roads (site 7) and East Pickard Bay (site 8). A summary is provided in Section 13.7.5.

13.7.2 Warrior Way (site 6)

Designated heritage assets (within the site)

13.7.2.1 A review of marine archaeological data has returned no designated heritage assets within Warrior Way (site 6).

Non-designated heritage assets (within the site)

13.7.2.2 A review of marine archaeological data has returned no known non-designated sites within Warrior Way (site 6).

13.7.2.3 Warrior Way (site 6) lies within Marine Character Area (MCA) 21 – Milford Haven, as defined by the National Seascape Assessment for Wales (Natural Resources Wales, November 2015). This MCA (MCA 21) comprises the sheltered ria (drowned river valley) of Milford Haven including the upper stretches of the Daugleddau estuaries (see technical appendix 13.1).

13.7.2.4 Warrior Way (site 6), also lies within Seascape Character Area 32 – Inner Milford Haven, as defined by the PCNPA Supplementary Planning Guidance to the Local Development Plan, adopted 11 December 2013, and titled ‘Seascape Character Assessment’ (see technical appendix 13.1).

13.7.2.5 Warrior Way (site 6) is located to the north-east of Pembroke Dock, as depicted in Figure 13.2, which also includes the non-designated assets (outside the site boundary) referenced below.

Prehistoric and Roman (within 500 m radius of site boundary)

13.7.2.6 There are no known heritage assets dating to the Prehistoric or Roman periods within the 500 m radius search area from Warrior Way (site 6).

13.7.2.7 The site is assessed as having negligible potential for heritage assets from the Neolithic to the Roman periods.

13.7.2.8 Water levels were significantly lower (up to 30 m below current levels) until the Mesolithic period, and the site includes area 46 of Dyfed Archaeological Trust’s “Milford Haven Waterway Ports & Harbours Project” survey (see technical appendix 13.1), categorised as an area of possible sediment with “Medium Archaeological Potential”, on account of sloping river banks indicating this area may have filled up rapidly. An acoustic survey was undertaken in this area which suggests some sediment may survive of Palaeolithic/Mesolithic interest.

Medieval and Post Medieval (within 500 m radius of site boundary)

13.7.2.9 The deep natural harbour at Milford Haven has long been used for the advantage of its sheltered waters and strategic position on the Welsh coast. The Waterway reaches inland as far as Haverfordwest and Canaston Bridge, connecting Medieval settlements along their shorelines to the sea. The Waterway enabled these communities to trade commodities including limestone and coal from a network of small quays (MCA 21 / SCA 32).

13.7.2.10 The route of the "Burton-Pembroke" ferry is of Medieval origins and was probably in use well into the twentieth century. The ferry was an essential link in the route between Pembroke and Haverfordwest. The only surviving physical trace of the ferry embarkation point on the southern bank of the Daugleddau is a slip down to the water’s edge close to the Ferry Inn pub on the Burton side of the river, approximately 160 m to the south-west of the site (PRN 37445 / NPRN 524,833, mapped in the 1st edition Ordnance Survey).

13.7.2.11 On the northern shore of the Daugleddau, the village gets its name from the ferry which used to embark from Burton beach to cross the Cleddau to Pembroke Ferry. On the 1st and 2nd edition 6” Ordnance Survey maps this place was still named Pembroke Ferry. The ferry service ceased in the 1950s and all that remains today is a slipway close to the pub (PRN 46430), approximately 370 m to the north of the site.

13.7.2.12 A historic Admiralty chart is annotated with 'Pembroke Ferry Point' in this vicinity (Landing Place at Burton Cliff – NPRN 518,693). This annotation may relate to the track which leaves the main road and continues southeast to the water's edge. Modern mapping depicts the track curving south to a concrete quayside (NPRN 407,850, see below). It is possible that this older landing, which would entail the ferry route crossing the site was used instead of the usual Pembroke Ferry (PRN 46430, see above) at time of certain tides and wind direction (e.g. westerly winds might make Pembroke ferry too exposed for beach landings).

13.7.2.13 The site includes area 46 of Dyfed Archaeological Trust's "Milford Haven Waterway Ports & Harbours Project" survey. The overall area was subject to documentary research and an acoustic survey in which no known or suspected wreck sites were identified, therefore the site is assessed as having low potential for heritage assets dating to the Medieval period.

Modern (within 500 m radius of the site boundary)

13.7.2.14 The timber jetty, wall and gatepiers to Trinity House, built 1860-61, on the northern shore of the Daugleddau, are Grade II listed (PRN 60488 / PRN 23500). The monument consists of a wooden jetty or pier connected to a walled large enclosure around Trinity House, approximately 360 m to the north-west of Warrior Way (Site 6), at its nearest point (not mapped). This wooden jetty was built circa 1880 to provide a landing stage for vessels deployed by the Trinity House depot for serving and servicing lightships, lighthouses and fleet tankers. The pier extending out from walls, is in the intertidal zone approximately 360 m to the north of the Warrior Way (site 6).

13.7.2.15 Brunel's Great Western Railway initially sponsored (1845) and eventually assumed control of (1852), the South Wales Railway, which originally intended to reach Fishguard to tap the Atlantic and Irish traffic, but made Milford Haven its terminus; trains connected with the Atlantic steamships. A very large floating pontoon (Neyland Pontoon, NPRN 34,610), designed by Brunel, was launched in the spring of 1857 to facilitate the transport of passengers and livestock to and from Ireland. The location is mapped 200 m to the north-west of the Warrior Way (site 6) (see technical appendix 13.1: Figure 13.9), however this is incorrect as the pontoon is located approximately 1 km to the west of the site off what is today's Brunel Quay (PRN 34543). Two substantial timber driven uprights within the channel are all that remain of the pontoon. The structure was 46.9 m in length and used 300 tons of iron and 600 tons of timber in its construction. The pontoon was intended to serve the biggest ship in the world at that time, the SS Great Eastern, which was launched in January 1858. Later, the SS Great Eastern was laid up at the town of Milford Haven for nearly twelve years (1874-86), whilst laying 4,200 kilometres (2,600 mi) of the 1865 transatlantic telegraph cable.

13.7.2.16 The site is assessed as having low potential for heritage assets dating to the post-Medieval period.

13.7.2.17 Evidence of the Haven's long-standing historic military associations and strategic value is present along the coastline and within the Haven. During World War II the Haven was used as a base for allied American troops and was involved with the D-Day embarkments; wrecks including fallen aircraft, mined patrol vessels and bombed cargo ships now lie within the estuary – further reinforcing the area's strong military and defensive past (MCA 21 / SCA 32).

13.7.2.18 The Burton Beach Overlord Hard is a scheduled monument located approximately 310 m to the north-east of Warrior Way (site 6), on the northern shore of the Daugleddau (not mapped). The monument consists of a World War II Overlord Hard (landing place) at Burton Beach. The hard-formed part of a chain of embarkation points. The surviving structures include the hard, the foundations of the hard jetty, and part of the original dedicated access road, together with the remains of three Royal Naval detachment offices and storage buildings, partly in the intertidal zone, and therefore adjacent to the marine archaeology search area (PRN 46413 / NPRN 408,288). All that remains now are two wooden piles and two concrete bases some 4 m apart visible on the pebble shore. Some 10 m behind these however, is a rectangular concrete apron of slightly sloping concrete, measuring circa 65 m by 30 m which was obviously an integral component of the landing stage arrangement in use during the war.

13.7.2.19 On the north bank of the Daugleddau, 200 m to the north of the site, a rectangular quay of steel trough piling construction, built c. 1951 for the Royal Navy and NATO forces, is now disused but in good condition (PRN 46412 / NPRN 407,850, not mapped). The quay measures some 200 m wide and extends 100 m out into the Waterway; it has an asphalt road surface and is some 4 m high. It encloses mud flats to the rear and appears as a hollow rectangle in plan.

13.7.2.20 A quarry, probably for Old Red Sandstone (PRN 37450), marked on the 2nd edition 6" OS map of 1909 and situated on the western promontory, within Ferry Wood, at the mouth of Cosheston Pill, 40 m to the south-east of the site. The exact location is uncertain from the cartographic evidence, however there is a distinct possibility that the quarry was located on the coast in the cliffs where three deep water jetties (PRN 37051) serving former naval oil fuel depot at Llanion were constructed. The mooring dolphins are linked to the former oil fuel depot by a tunnel, located approximately 10 m to the south of the site.

13.7.2.21 There is a modern navigation marker made of metal, indicating the mouth of Cosheston Pill (PRN 37052) 40 m to the east of the site.

13.7.2.22 The site is assessed as having low potential for heritage assets dating to the Modern period.

Archaeological Potential

13.7.2.23 The site straddles areas 45 and 46 of Dyfed Archaeological Trust's "Milford Haven Waterway Ports & Harbours Project" survey (see technical appendix 13.1).

13.7.2.24 Water levels were significantly lower (up to 30 m below current levels) until the Mesolithic period, and the site includes area 46 of Dyfed Archaeological Trust's "Milford Haven Waterway Ports & Harbours Project" survey, categorised as an area of possible sediment with "Medium Archaeological Potential", on account of sloping river banks indicating this area may have filled up rapidly. An acoustic survey was undertaken in this area which suggests some sediment may survive of Palaeolithic/Mesolithic interest.

13.7.2.25 Area 45, at the north of the site, has the general description of 'Major Bar / Landing Point' and is deemed to be of 'High Archaeological Potential'. Area 45 primarily fronts known beaching points and quays of Burton Ferry, in use since the medieval period, however no known or suspected wreck sites were identified during documentary research and acoustic surveys, therefore, the potential for all other periods is assessed as low for the site, which lies at the southern edge of Area 45, in the centre of the waterway, and therefore furthest from the landing points.

13.7.3 Dale Roads (site 7)

Designated heritage assets (within the site)

13.7.3.1 A review of marine archaeological data has returned no designated heritage assets within Dale Roads (site 7).

Non-designated heritage assets (within the site)

13.7.3.2 A review of marine archaeological data has returned no known non-designated heritage assets within Dale Roads (site 7).

13.7.3.3 Dale Roads (site 7) also lies within MCA 21 – Milford Haven (see above for description). The contributing elements of the general character of this character area (MCA 21) are referenced in the appropriate period sections below.

13.7.3.4 Dale Roads (site 7) also lies within SCA 31 – Outer Milford Haven, as defined by the PCNPA Supplementary Planning Guidance to the Local Development Plan, adopted 11 December 2013, and titled 'Seascape Character Assessment' (see technical appendix 13-1). Part of this area also lies within the Milford Haven Waterway Landscape of Outstanding Historic Interest. The contributing elements of the general character of this character area (SCA 31) are referenced in the appropriate period sections below.

13.7.3.5 Dale Roads (site 7) is located in Lindsway Bay, to the south-east of St Ishmael's, as depicted in Figure 13.3, which also includes the non-designated assets (outside the site boundary) referenced below.

Prehistoric (within 500 m radius of site boundary)

13.7.3.6 Two Prehistoric artefacts are recorded at Cull Point (on the shore, approximately 340 m to the north of the site, although poorly mapped). The artefacts are a flint flake fragment (Great Castle Farm, PRN 12809), and a small and 'poor example' of a tanged and barbed arrowhead recovered from a flint scatter (PRN 2994), which was recorded as a 'flint chipping floor' of Mesolithic and Neolithic date exposed in a footpath running across Cull Point (Cull Point, PRN 2953), both collected by T C Cantrill in 1915.

13.7.3.7 Coastal processes will have resulted in previous land areas now being submerged, and therefore the proximity of these finds may be indicative of potential for Mesolithic remains within the site. This is further attested in Dyfed Archaeological Trust's "Milford Haven Waterway Ports & Harbours Project" survey, where the site is located within Area 23, described as "Possible Sediment" with "Medium Archaeological Potential". This area follows the MLWS contour line. Sediment Acoustic survey Indicates a fairly even spread of sediment with some rock exposures, but borehole data suggests this sediment may be mainly sands and gravels, the potential of which isn't clear.

13.7.3.8 The site also sits within area 25 of Dyfed Archaeological Trust's "Milford Haven Waterway Ports & Harbours Project" survey. The potential for this area is summarised in that document and indicates that the Lindsway Bay (Area 25) is likely to be of not more than 'Medium Archaeological Potential', attributed on account of the bathymetric levels suggesting possible sediment survival, although they were not boreholed during this survey.

13.7.3.9 The site lies 220 m to the west of the promontory fort on Great Castle Head (PRN 3006 / NPRN 305, 356, not mapped), a scheduled monument. The monument comprises a well-preserved coastal promontory fort, probably dating from the Iron Age period (800 BC – 74 AD). It is located at the southern end of a headland, which projects south into the Waterway. The fort is defended by steep natural cliffs on the east, south and west sides. The north side of the fort is defended by a single east-west aligned bank and ditch that runs across the neck of the headland. A lighthouse compound is situated towards the west edge of the interior and is excluded from the scheduled area (see below). The monument forms an important element within the wider later Prehistoric landscape.

13.7.3.10 The site is assessed as having medium potential for Mesolithic and earlier deposits, and negligible potential for heritage assets from the Neolithic to the Iron Age periods.

Roman and Medieval (within 500 m radius of site boundary)

13.7.3.11 There are no known heritage assets dating to the Roman or Medieval periods within the 500 m radius search area from Dale Roads (site 7).

13.7.3.12 The site is assessed as having negligible potential for heritage assets from the Roman to the Medieval periods.

Post-Medieval (within 500 m radius of site boundary)

13.7.3.13 There are two wrecks dating from this period in the vicinity of the site, namely:

- The brig Flora (NPRN 272,684), which was on passage from Bury to Dublin with a cargo of coal under the command of master Richards, when it went onshore on Great Castle Head on 17 December 1819. Of the crew of nine, only one was saved. The wreck is mapped approximately 200 m to the east of the Dale Roads (site 7); and
- The Glyndwr (NPRN 272,615) was a wooden schooner built by William Thomas at Amlwch in 1879. Technical and configuration specifications are given as 26.25 gt; 55.8 ft length x 14.2 ft breadth x 6 ft depth with one deck, two masts, rigging fore and aft, stern square, built carvel, framework wood. The schooner was travelling from Fishguard to Dale when it was lost on Great Castle Head on 16 December 1910. The wreck is mapped approximately 300 m to the east of the site.

13.7.3.14 The site sits within area 25 of Dyfed Archaeological Trust's "Milford Haven Waterway Ports & Harbours Project" survey. The potential for this area is summarised in that document and indicates that the Lindsway Bay (Area 25) is likely to be of not more than 'Medium Archaeological Potential', due to its small size and being without easy access, therefore likely to have seen little use and therefore less archaeological potential. The bays are exposed to full force of the waves and the beaches are vulnerable to periodic loss of beach material.

13.7.3.15 The site is assessed as having low potential for heritage assets from the post-Medieval period.

Modern (within 500 m radius of site boundary)

13.7.3.16 During World War II the Haven was used as a base for allied American troops and was involved with the D-Day embarkments; wrecks including fallen aircraft, mine patrol vessels and bombed cargo ships now lie within the estuary (MCA 21 / SCA 31). Two small sites for Quadrant Shelters are shown on historic plans to be located on Great Castle Head and Watch House Point.

13.7.3.17 At Monk Haven / Watch House Point, buildings and enclosures consisting of three regular rectangular dashed boundaries and two irregulars, are mapped in rough pasture on coastal slopes identified from 1st edition OS. There is no visible evidence of these features, although there is an extensive coastal artillery battery system within this locality. Therefore, these are possibly an earlier military installation later replaced by the camp and battery dating to WWII (NPRNs 270,509, 270,710, 270,708, 270,707, and 270,709).

13.7.3.18 Great Castle Head was identified as a heavy anti-aircraft battery in historic plans. The same site is now recorded as a gun emplacement (NPRN 270,734). It has a square plan, and earthen emplacement set into a hedge.

13.7.3.19 Great Castle Head (PRN 34765) was identified as a searchlight battery from historic plans. This site has been destroyed, however an earthwork platform and some rubble mark its position. This is also recorded as the Coast Artillery Searchlight at St Ishmael's (NPRN 270,717).

13.7.3.20 There is one wreck from this period in the vicinity of the site, the Behar 1 (NPRN 273,239), a steel-hulled steamship built by Harland & Wolf Ltd, Greenock, in 1928. Technical and configuration specifications are given as 6100 gt, 2910 nt; 436 ft long x 57 ft 6 in breadth x 29 ft 6 in depth; with two decks, seven bulkheads, cruiser stern, forecastle 34 ft; screw propulsion powered by five boilers linked to quadruple steam engine and LP turbine producing 1245 horse power (hp). The vessel was owned at time of loss by the Hain Steamship Company Ltd, St Ives, Cornwall. The ship was on passage from the Clyde to Milford Haven with 4,770 tons of Government stores when it detonated German laid mine in Milford Haven. The ship was beached 4.5 cables, 230 degrees from the Great Castle Head lower light and became a total loss after salvage efforts were hindered by bad weather and enemy mine laying. Salvage work was abandoned on 27 October 1941 and the wreck was sold to the British Iron and Steel Corporation (Salvage) Ltd to be demolished where it lay. Trinity House took the decision to permanently buoy the wreck in 1952. At least three phases of salvage had been undertaken by 1970. The wreck is mapped approximately 400 m to the south-east of the site and is used for recreational diving purposes.

13.7.3.21 Lindsway Bay (PRN 110332), within which the site is located, was a practice bombing range approved for the use of Flying Boat Squadrons based at R.A.F. stationed at Pembroke Dock in 1951. The target was to be situated in the centre of a danger area circle of 800 yards radius.

13.7.3.22 The site is assessed as being of no more than 'Medium Archaeological Potential' for the Modern period.

Archaeological Potential

13.7.3.23 The site and 500 m search radius straddles areas 23, 24 and 25 of Dyfed Archaeological Trust's "Milford Haven Waterway Ports & Harbours Project" survey. The potential for these three areas is characterised as follows:

- Area 23 – Possible Sediment – Medium Archaeological Potential – Area follows the underwater contour line sediment acoustic survey indicates a fairly even spread of sediment with some rock exposures, but borehole data suggests this sediment may be mainly sands and gravels, the potential of which isn't clear. This area does contain some large and well-known wreck sites.
- Area 34 – Major Bay / Landing Point – High Archaeological Potential – Dale Roads, one of the main traditional anchorage points in the Haven, and the approach to both Dale Harbour and the adjacent beach, both important landing points since at least the medieval period and presumably earlier. Some known and suspected wreck sites lie within this area. Not covered by surveys or boreholes but sediment survival would appear likely. The bay is still a popular launching point for boats.
- Area 25 – Bay – Medium Archaeological Potential – Small sandy bays but without easy access, likely to have seen little use and therefore less archaeological potential. They aren't mentioned by Owen, and map evidence suggests they weren't used for anything more recently. Levels suggest possible sediment survival, but not surveyed or boreholed. The bays are exposed to full force of the waves and the beaches are vulnerable to periodic loss of beach material. Watch House Bay of the western side is a water-skiing zone.

13.7.3.24 Coastal erosion processes may have resulted in previous land areas now being submerged, and therefore the proximity of Mesolithic finds may be indicative of potential for early Prehistoric remains in the wider area, including the site.

13.7.3.25 Lindsway Bay is relatively small, and without easy access, therefore likely to have seen little use. The bay was used as a practice bombing range approved for the use of Flying Boat Squadrons based at R.A.F. stationed at Pembroke Dock in 1951.

13.7.3.26 The site is therefore likely to be of no more than medium archaeological potential for the Prehistoric and Modern periods, low archaeological potential for the post-Medieval period, and the potential for all other periods is assessed as negligible for the site.

13.7.4 East Pickard Bay (site 8)

Designated heritage assets within East Pickard Bay (site 8)

13.7.4.1 A review of marine archaeological data has returned no designated sites within the East Pickard Bay (site 8).

Non-designated heritage within East Pickard Bay (site 8)

13.7.4.2 An unnamed wreck (NPRN 240,879) can be found within the East Pickard Bay site boundary (Figure 13.4). The wreck lies orientated north-south with the bows to the north and has a length of 70 m and width of 10 m. It stands 3 m above the general level of the seabed and was first located in July 2006. A Notice to Mariners was subsequently issued (NM 447/07). The precise location of the wreck is unconfirmed (see NPRN 273,100 Highland Home below). The full character and extent of archaeological remains is presently unknown.

13.7.4.3 East Pickard Bay (site 8) lies within Marine Character Area 22 – South Pembrokeshire Coastal and Inshore Waters, as defined by the National Seascape Assessment for Wales (Natural Resources Wales, November 2015). This Marine Character Area (MCA) comprises the coastal and inshore waters hugging the south Pembrokeshire coast. It stretches from Old Castle Head in the east to the southern entrance to Milford Haven in the west (see technical appendix 13.1).

13.7.4.4 East Pickard Bay (site 8) also lies within Seascape Character Area 34 – Freshwater West, as defined by the PCNPA Supplementary Planning Guidance to the Local Development Plan, adopted 11 December 2013, and titled 'Seascape Character Assessment' (see technical appendix 13.1).

13.7.4.5 East Pickard Bay (site 8) falls within the South Pembrokeshire Heritage Coast. This area has recently been used in the making of the film Robin Hood (2010) and in Harry Potter and the Deathly Hallows – Part 2 (2011).

13.7.4.6 East Pickard Bay (site 8) is located to the south of the Angle peninsula, and to the west of Castlemartin, as depicted in Figure 13.4, which also includes the non-designated assets (outside the site boundary) referenced below.

13.7.4.7 West Pickard Camp (NPRN 92,623 / PRN 3099) is a scheduled monument located on the coast onshore at East Pickard bay, approximately 60 m to the north of East Pickard Bay. This Iron Age promontory fort is univallate and occupies a blunt promontory at c. 40 m above sea level. It is protected by sea cliffs to the west and south and by a curving bank and ditch to the north and east. A simple northeast-facing entrance lies midway along the defences. The internal area measures c. 55 m east-west and 60 m north-south. The western side is thought to have been lost to erosion. Flint flakes and cores have been found in this area, but there are few details regarding the circumstances of recovery, or the amount of flint recovered (PRN 3100, to the north of the site).

Prehistoric (within 500 m radius of site boundary)

13.7.4.8 A flint tranchet axe, flint flakes and a flint implement have been recovered from a site eroding from below a peat exposure, identified as a Prehistoric submerged forest (NPRN 524,740). The peat has been sampled and dated to a calibrated C14 date of 5250-4550 BC. Charcoal was also recovered. This site is mapped approximately 1.2 km to the south-west of the site at Freshwater West beach, however, these deposits may extend beyond the recorded area and into the area of the site.

13.7.4.9 As mentioned above, the western side of West Pickard Camp is thought to have been lost to erosion. Flint flakes and cores have also been found in this area. Along with coastal processes which will have resulted in previous land areas now being submerged, the proximity of these finds may be indicative of medium potential for Prehistoric remains within the site.

Roman and Medieval (within 500 m radius of site boundary)

13.7.4.10 There are no known heritage assets dating to the Roman or Medieval periods within the 500 m radius search area from East Pickard Bay (site 8).

13.7.4.11 The site is assessed as having negligible potential for heritage assets from the Roman to the Medieval periods.

Post-Medieval (within 500 m radius of site boundary)

13.7.4.12 The Speedwell (NPRN 272,900) was a 99 ton wooden schooner belonging to Conwy. At time of loss on 2 November 1854, the schooner was on passage from Neath to Liverpool. The vessel ran onto Sheep Island, floated off and then sank in deep water, mapped approximately 350 m to the north-west of the site. The crew managed to escape the vessel and landed at Milford.

13.7.4.13 The Highland Home (NPRN 273,100) was an iron-hulled barque built by Ramage and Ferguson, Leith, in 1886. Technical and configuration specifications are given as 1371 gt, 1298 nt; 234 ft length x 37 ft breadth x 21 ft 2 in depth; one deck, one bulkhead, passenger deck 31 ft, forecastle 28 ft. At time of loss, the vessel was owned by J R Cutherbertson, Glasgow, and was on passage from Fleetwood to London. The barque was under tow to the steam tug Warrior between St Anne's Head and West Freshwater Bay. The tow parted, and the two vessels became separated. Wreckage from the Highland Home was later found in Freshwater Bay and around Linney Head. Finds from the Highland Home recovered and reported to the Receiver of Wreck, include a brass letter 'O'; the ship's bell; portholes; a silver coffee pot and a pair of binoculars. The precise location of the wreck is unconfirmed, although it is possible that this is the Unnamed Wreck (NPRN 240,879) (see above).

13.7.4.14 Assuming thee Unnamed Wreck (NPRN 240,879) is the provenance of the finds reported to the Receiver of Wreck and recorded as the Highland Home (NPRN 273,100), it is possible that other elements of the Unnamed Wreck have dispersed throughout the site, therefore, the site is assessed as having a high archaeological potential for finds associated with this wreck.

Modern (within 500 m radius of site boundary)

13.7.4.15 West Pickard Camp (see section 13.7.4.7) was used by the military during WW2, in association with the nearby Angle Airfield. A gun emplacement (PRN 32765) was constructed in its south-eastern corner, necessitating the removal of part of the defensive bank. To the east of West Pickard Camp scheduled monument boundary, is a weapons pit (PRN 33438 / NPRN 270745), and to the north-east of the bay at East Pickard is a gun emplacement (PRN 33438 / NPRN 270754).

13.7.4.16 Castlemartin's military training areas and ranges strongly influence the character and sounds associated with the MCA's coast and waters. Castlemartin is the only UK Army range where armoured units practice direct-fire live gunnery exercises, with both on-land impact areas and a large offshore safety area adjacent to the east and south-east of the site – coastal and marine access is restricted during live firing (MCA 22 / SCA 34).

13.7.4.17 Castlemartin played a vital role in the preparation and run up to D-Day, with several shore to sea and sea to shore practice operations taking place. The area also saw the use of several remotely controlled Tiger Moths or Queen Bees as gunnery target practice during WWII. Causalities of aircraft bombing lie on the sea floor, where several boats were downed by aircraft with others torpedoed by German submarines. These waters contain the convergence of the shipping lanes heading for Milford Haven and those continuing westward. On the reef habitats there are several large upstanding and unidentified steel wrecks, likely to be war-time losses (MCA 22 / SCA 34).

13.7.4.18 A modern wreck, Landing Craft Gun (LCG No. 15 (NPRN 273,231)) can be found to the south-west, 180 m to the south of the site. This wreck is reported to lie upside down and is a Protected Place under the Protection of Military Remains Act (1986). This Act makes it an offence to interfere with the wreckage of any designated vessel without a licence. The wreck site is used for recreational diving purposes. The LCG No. 15 was a large flat-bottomed landing craft of 627 tons, modified to act as a gun platform for 4.7-inch guns, and intended to be used in the invasion of Sicily. The craft sank whilst in transit due to heavy sea conditions with the loss of all on board on 25 April 1943. This led to modifications for subsequent craft used in the latter stages of the Second World War.

13.7.4.19 General patterns in reported shipping losses define a traditional sailing route inside the St Govan's Shoal, hugging the coast to pass inside the Crow's rock, or passing to the south of St Govan's Shoal and the former location of a lightship. Freshwater Bay (NPRN 518,475) traditionally provided sheltered anchorage for vessels passing through these waters and an anchorage is suggested by an anchor symbol on an historic chart. Sailing Directions dating to 1884 note '… offers fair shelter with offshore winds, in depths not less than 9 fathoms. If caught with an onshore wind, it is better to work on the southern or Linney head side of the bay…'

13.7.4.20 Sheep Rock is also identified as a seascape asset (NPRN 518,599) used as a navigational aid. This isolated pinnacle is shown (with water depths over of 6.4 m) some 750 m to the west of Sheep Island on an historic chart. Described as '… several patches off the southwest side of Sheep island, the shoals, named Sheep rock of 3 1/3 fathoms.' In Sailing Directions dating to 1884.

13.7.4.21 There are a number of wrecks, arbitrarily mapped at SM8814700050, whose exact location and condition is not known, and may be in, or in the vicinity of East Pickard Bay (site 8).

13.7.4.22 The site is assessed as being of low archaeological potential for the Modern period.

Archaeological Potential

13.7.4.23 The site is not covered by the Dyfed Archaeological Trust's "Milford Haven Waterway Ports & Harbours Project" survey.

13.7.4.24 A Prehistoric submerged forest is mapped approximately 1.2 km to the south-east of the site at Freshwater West beach (NPRN 524,740), but possibly present elsewhere, and remains associated with the West Pickard Camp (western side) may survive in the inter-tidal area of East Pickard Bay (site 8), potential attested by the recorded flint flakes and cores which have been found in this area (PRN 3100).

13.7.4.25 There are a number of wrecks, arbitrarily mapped at SM8814700050, and one within the site, whose exact location and condition are not known, and may be within, or in the vicinity of East Pickard Bay (site 8).

13.7.4.26 The site itself has high potential for deposits dated to the post-Medieval period, specifically associated with the wreck mapped on site (Figure 13.4), believed to be the Highland Home.

13.7.4.27 Overall, the site has medium potential for archaeological deposits dating to the Prehistoric periods, and low potential for the Modern period.

13.7.4.28 The site has negligible potential for archaeological deposits dating to the Roman and Medieval periods.

13.7.5 Summary of marine archaeology baseline

13.7.5.1 Designated assets are considered here to be statutory designated assets such as scheduled monuments and designated wrecks. All non-statutory designations, such as local designations, are considered in this chapter as non-designated assets.

13.7.5.2 Designated and non-designated heritage assets identified are described in in this baseline, and are summarised in Table 13.4, Table 13.5 and Table 13.6. These heritage assets, including those identified as relevant for the assessment of marine archaeology in relation to the META project, including a minimum 500 m radius from each META project site (Warrior Way (site 6), Dale roads (site 7) and East Pickard Bay (site 8), are depicted in Figure 13.2, Figure 13.3 and Figure 13.4.

13.7.5.3 There are no designated heritage assets within the boundaries of any of the META project sites.

Table 13.4: Designated and non-designated heritage assets and relevant qualifying interest features in proximity to Warrior Way (site 6).

Designated and non-designated heritage assets	Closest distance to Warrior Way (site 6) (km)	Relevant qualifying feature
Burton Beach Overlord Hard (Scheduled Monument) PRN 46413 / NPRN 408288	0.31	Designated heritage asset – landing place
Timber jetty, wall and gate piers to Trinity House (Grade II listed) PRN 60488	0.36	Designated heritage asset - jetty
Llanion Jetty PRN 37051	0.10	Non-designated - three deep water jetties
Old Red Sandstone quarry PRN 37050	0.40	Non-designated - quarry
Cleddau Reach PRN 37052	0.40	Non-designated –navigation marker
(Burton - Pembroke) Pembroke ferry slipway PRN 37445 / NPRN 524833	0.16	Non-designated - slipway
NATO quay PRN 46412 / NPRN 407850	0.23	Non-designated - quay
The North Britton NPRN 272883	0.37	Non-designated - wreck
(Burton - Pembroke) Burton ferry slipway PRN 46430	0.38	Non-designated - slipway
Landing Place at Burton Cliff - Burton-Pembroke ferry NPRN 518693	0.48	Non-designated– landing place
Neyland Pontoon PRN 34543 / NPRN 34610	1.10	Non-designated - pontoon
Milford Haven Waterway Ports & Harbours Project - Area 45 – Major Bar / Landing Point	0.00	High Archaeological Potential for archaeological deposits associated with the ferry route and landing points
Milford Haven Waterway Ports & Harbours Project - Area 46 – Possible Sediment	0.00	Medium Archaeological Potential for Prehistoric deposits and sediments

Table 13.5: Designated and non-designated heritage assets and relevant qualifying interest features in proximity to Dale Roads (site 7).

Designated and non-designated heritage assets	Closest distance to Dale Roads (site 7) (km)	Relevant qualifying feature
Great Castle Head (Scheduled Monument) PRN 3006 / NPRN 305,356	0.22	Designated heritage asset – prehistoric fortification
Great Castle Farm PRN 12809	0.34	Non-designated – prehistoric artefact
Cull Point PRN 2994	0.34	Non-designated – prehistoric artefact
Cull Point PRN 2953	0.34	Non-designated – prehistoric artefact
Lindsway Bay PRN 110332	0.00	Non-designated – practice bombing range
Flora NPRN 272,684	0.20	Non-designated - wreck
Great Castle Head PRN 34763	0.21	Non-designated – military
Gun Emplacement, St Ishmael's NPRN 270,734	0.21	Non-designated – military
Great Castle Head PRN 34765	0.23	Non-designated – military
Great Castle Head Beacon (front) NPRN 308,193	0.24	Non-designated – beacon
Great Castle Head Beacon (rear) NPRN 308,194	0.29	Non-designated – beacon

Designated and non-designated heritage assets	Closest distance to Dale Roads (site 7) (km)	Relevant qualifying feature
Glyndwr NPRN 272,615	0.29	Non-designated - wreck
Behar 1 NPRN 273,239	0.37	Non-designated - wreck
Monk Haven PRN 34465	0.46	Non-designated - military
Watch House Point PRN 34762	0.46	Non-designated - military
Watch House Point PRN 35080	0.46	Non-designated – military
Coast Artillery Searchlight, St Ishmael's NPRN 270,717	0.46	Non-designated – military
Unnamed Wreck NPRN 272,795	Not known	Non-designated - wreck
Milford Haven Waterway Ports & Harbours Project - Area 23 – Possible Sediment	0.00	Medium Archaeological Potential for Prehistoric deposits and sediments
Milford Haven Waterway Ports & Harbours Project - Area 34 – Major Bay / Landing Point	0.00	High Archaeological Potential for archaeological deposits associated with Dale Roads bay
Milford Haven Waterway Ports & Harbours Project - Area 25 – Bay	0.00	Medium Archaeological Potential associated with Lindsway Bay

Table 13.6: Designated and non-designated heritage assets and relevant qualifying interest features in proximity to East Pickard Bay (site 8).

Designated and non-designated heritage assets	Closest distance to East Pickard Bay (site 8) (km)	Relevant qualifying feature
West Pickard Camp (Scheduled Monument) PRN 3099 / NPRN 92623	0.00	Designated heritage asset – prehistoric fortification
Pickard (prehistoric artefacts) PRN 3100	0.00	Non-designated – prehistoric artefacts
LCG No 15 (wreck) NPRN 273,231	0.16	Protected Place under the Protection of Military Remains Act (1986)
Gun Emplacement, Angle PRN 32765	0.06	Non-designated – military
Weapons Pit, Angle PRN 33438 / NPRN 270745	0.08	Non-designated – military
Gun Emplacement, Angle PRN 33438 / NPRN 270754	0.30	Non-designated – military
Speedwell NPRN 272,900	0.35	Non-designated – wreck
Anchorage, Freshwater Bay NPRN 518,475	0.16	Non-designated – anchorage
Submerged Forest, Freshwater West PRN 11976 / NPRN 524,740	0.47	Non-designated – prehistoric deposits
Sheep Rock NPRN 518,599	0.79	Non-designated – obstruction
Highland Home NPRN 273,100	1.12	Non-designated – wreck
Unnamed Wreck NPRN 240,879	0.00	Non-designated - wreck

13.7.5.4 As set out above (paragraph 13.6.2.1), 'Step 3' sets out that sites were included for further consideration if a designated site directly overlaps with the META project' and/or designated heritage sites and associated features (including setting) were located within the potential Zone of Impact (ZoI) for impacts associated with the META project.

13.7.5.5 Potential ZoI would be areas where known and potential heritage assets could be affected in terms of partial or total loss of significance as a result of direct changes to the asset, change within the setting of the asset, or indirect changes from the proposals (such as sediment disturbance).

13.7.5.6 The assessment of impact of proposed devices on suspended sediment concentrations (chapter 5: Coastal Processes) considered that the very finest material disturbed from installation, operation and maintenance and decommissioning activities would travel in the order of 100 m from the Warrior Way site (site 6), 600 m from the Dale Roads site (site 7) and 50 m from the East Pickard Bay site (site 8), during an average tide (see chapter 5: Coastal Processes and chapter 16: Other Users).

13.7.5.7 Only heritage assets within sites and/or within the potential ZoI, as depicted in Figure 13.2, Figure 13.3 and Figure 13.4, will be considered in terms of the impact assessment presented below (Section 13.11). For ease of reference these are listed below in Table 13.7, Table 13.8 and Table 13.9.

Table 13.7: Designated and non-designated heritage assets subject to impact assessment for the META project in relation to marine archaeology at Warrior Way (site 6).

Designated and non-designated heritage assets	Closest distance to Warrior Way (site 6) (km)	Relevant Qualifying Interest Feature
Llanion Jetty	0.10	Non-designated - three deep water jetties

Designated and non-designated heritage assets	Closest distance to Warrior Way (site 6) (km)	Relevant Qualifying Interest Feature
PRN 37051		
Old Red Sandstone quarry PRN 37450	0.40	Non-designated - quarry
Cleddau Reach PRN 37052	0.40	Non-designated – navigation marker
Milford Haven Waterway Ports & Harbours Project - Area 45 – Major Bar / Landing Point	0.00	High Archaeological Potential for archaeological deposits associated with the ferry route and landing points, reduced to Low Archaeological Potential due to distance of landing points from site
Milford Haven Waterway Ports & Harbours Project - Area 46 – Possible Sediment	0.00	Medium Archaeological Potential for Prehistoric deposits and sediments

Table 13.8: Designated and non-designated heritage assets subject to impact assessment for the META project in relation to marine archaeology at Dale Roads (site 7).

Designated and non-designated heritage assets	Closest distance to Dale Roads (site 7) (km)	Relevant Qualifying Interest Feature
Great Castle Farm PRN 12809	0.34	Non-designated – prehistoric artefact
Cull Point PRN 2994	0.34	Non-designated – prehistoric artefact
Cull Point PRN 2953	0.34	Non-designated – prehistoric artefact
Lindsway Bay PRN 110332	0.00	Non-designated – practice bombing range
Flora NPRN 272,684	0.2	Non-designated - wreck
Glyndwr NPRN 272,615	0.29	Non-designated - wreck
Behar 1 NPRN 273,239	0.37	Non-designated - wreck
Unnamed Wreck NPRN 272,795	Not known	Non-designated - wreck
Milford Haven Waterway Ports & Harbours Project - Area 23 – Possible Sediment	0.00	Medium Archaeological Potential for Prehistoric deposits and sediments
Milford Haven Waterway Ports & Harbours Project - Area 34 – Major Bay / Landing Point	0.00	High Archaeological Potential for archaeological deposits associated with Dale Roads bay, reduced to Low Archaeological Potential due to distance of that bay from site.
Milford Haven Waterway Ports & Harbours Project - Area 25 – Bay	0.00	Medium Archaeological Potential associated with Lindsway Bay

Table 13.9: Designated and non-designated heritage assets subject to impact assessment for the META project in relation to marine archaeology at East Pickard Bay (site 8).

Designated and non-designated heritage assets	Closest distance to East Pickard Bay (site 8) (km)	Relevant Qualifying Interest Feature
LCG No 15 (wreck) NPRN 273,231	0.16	Protected Place under the Protection of Military Remains Act (1986)
West Pickard Camp (Scheduled Monument) PRN 3099 / NPRN 92623	0.00	Designated heritage asset – prehistoric fortification
Pickard (prehistoric artefacts) PRN 3100	0.00	Non-designated – prehistoric artefacts
Highland Home NPRN 273,100	1.12	Non-designated – wreck

13.7.5.8 The designated and non-designated heritage assets presented in Table 13.7 to Table 13.9 contribute to the selection of marine archaeological receptors to be taken forward to the marine archaeology impact assessment for the META project as set-out in the following sections (13.7.6, 13.7.7, and 13.7.8).

13.7.6 Warrior Way (site 6)

13.7.6.1 Warrior *Way* (site 6) falls within the registered landscape of Milford Haven Waterway, and also lies within MCA 21 – Milford Haven, and within SSCA 32 – Inner Milford Haven.

13.7.6.2 A review of marine archaeological data has returned no designated or non-designated sites within Warrior Way (site 6).

13.7.6.3 Water levels were significantly lower (up to 30 m below current levels) until the Mesolithic period, and the site includes area 46 of Dyfed Archaeological Trust's "Milford Haven Waterway Ports & Harbours Project" survey, categorised as an area of possible sediment with "Medium Archaeological Potential". An acoustic survey was undertaken in this area which suggests some sediment may survive of Palaeolithic/Mesolithic interest, which if it does, would be of regional importance on account of its evidential value.

13.7.6.4 Should they survive, archaeological assets associated with the route of the "Burton-Pembroke" ferry, of Medieval origins and probably in use well into the twentieth century would be of local importance. This is postulated to lie to the west of the site, although it may have used different nearby landing places, such as the landing place at Burton Cliff, which would have meant the ferry route may have at least on occasions of poor weather conditions crossed the site. The local importance of these assets would stem from their evidential and historic value.

13.7.6.5 Should they survive, Modern archaeological assets associated with the quarry situated on the western promontory within Ferry Wood, infrastructure associated with the three deep water jetties serving former naval oil fuel depot at Llanion, would be of no more than local importance, on the basis of their evidential and historic value.

13.7.7 Dale Roads (site 7)

13.7.7.1 Dale Roads (site 7) falls within the registered landscape of Milford Haven Waterway, and also lies within Marine Character Area 21 – Milford Haven and within Seascape Character Area 31 – Outer Milford Haven.

13.7.7.2 A review of marine archaeological data has returned no designated sites within the Dale Roads (Site 7).

13.7.7.3 Two Prehistoric artefacts (PRN 12809 and PRN 2953) recovered from a flint scatter (PRN 2994), recorded as a 'flint chipping floor' of Prehistoric date, exposed in a footpath running across Cull Point, on the coast to the north of the site. These are assets of local to regional importance, which is derived from their evidential value. This is further attested in Dyfed Archaeological Trust's "Milford Haven Waterway Ports & Harbours Project" survey, where the site is located within Area 23 (follows the MLWS contour line), described as "Possible Sediment" with "Medium Archaeological Potential", and Area 25, "Bay – Medium Archaeological Potential". Sediment Acoustic survey indicates a fairly even spread of sediment in Area 23, with some rock exposures but borehole data suggests this sediment may be mainly sands and gravels, the potential of which isn't clear. Area 25 was not boreholed.

13.7.7.4 Coastal processes will have resulted in previous land areas now being submerged, and therefore the proximity of these finds may be indicative of potential for Mesolithic remains within the site. Where these survive, they would be of regional importance on account of their evidential value.

13.7.7.5 There are a number of known and potential wrecks in the vicinity of the site, of which the nearest known wrecks are:

- The brig Flora (NPRN 272684) wrecked on Great Castle Head in 1819, and mapped approximately 200 m to the east of the site;
- The Glyndwr (NPRN 272,615) a wooden schooner wrecked in 1910, and mapped approximately 300 m to the east of the site; and
- The Behar 1 (NPRN 273,239) was a steel-hulled steamship wrecked in 1928, when it detonated German laid mine in Milford Haven, and mapped approximately 400 m to the south-east of the site.

13.7.7.6 These known wrecks are of local importance, which stems from these wrecks' evidential and historic value, as would comparable wrecks for which there is currently no location or condition data, but which have a low potential to be located with the site or immediate vicinity.

13.7.7.7 Lindsway Bay (PRN 110332), within which the site is located, was a practice bombing range approved for the use of Flying Boat Squadrons based at R.A.F. stationed in Pembroke Dock in 1951, as is therefore an asset of local importance itself. The importance of Lindsway Bay as practice bombing range stems from its evidential, historic and communal value.

13.7.8 East Pickard Bay (site 8)

13.7.8.1 East Pickard Bay (site 8) falls within the South Pembrokeshire Heritage Coast, and also lies within Marine Character Area 22 – South Pembrokeshire Coastal and Inshore Waters and Seascape Character Area 34 – Freshwater West.

13.7.8.2 A review of marine archaeological data has returned no designated sites within East Pickard Bay (site 8).

13.7.8.3 A Prehistoric submerged forest is mapped approximately 500 m to the south of the south eastern corner of East Pickard Bay (site 8), at Freshwater West beach (NPRN 524,740), but possibly present elsewhere, and remains associated with the West Pickard Camp (western side) may survive in the inter-tidal area of West Pickard bay, possibly also attested by the recorded flint flakes and cores which have been found in this area (PRN 3100). The site is assessed as having medium potential for archaeological deposits from the Prehistoric period. Should similar archaeological deposits survive within the site, they would be of local to regional importance, on account of their evidential value.

13.7.8.4 The Anchorage at Freshwater Bay (NPRN 518475), mapped adjacent to the south of the site, is suggested by an anchor symbol on an historic chart in Sailing Directions dating to 1884, which also identifies Sheep Rock (NPRN 518599), an isolated pinnacle some 750 m to the west of Sheep Island in Sailing Directions dating to 1884. Non-designated wrecks of local importance from this period include:

- an unnamed wreck (NPRN 240,879) mapped within the site boundary, where some of the wreckage was found, and likely to be the Highland Home (NPRN 273100), built in 1886, whose precise location is unconfirmed; and
- the Speedwell (NPRN 272900), a 99 ton wooden schooner was lost in 1854 when it ran onto Sheep Island, floated off and then sank in deep water, and is mapped approximately 350 m to the north-west of the site.

13.7.8.5 These known wrecks are of local importance, which stems from these wrecks' evidential and historic value, as would comparable wrecks for which there is currently no location or condition data, but which have a low potential to be located with the site or immediate vicinity.

13.7.8.6 There are a number of wrecks, arbitrarily mapped at SM8814700050, and one within the East Pickard Bay site (site 8), but whose exact location and condition are not known, and may be in, or in the vicinity of East Pickard Bay (site 8).

13.7.8.7 LCG No. 15 (NPRN 273,231) can be found immediately adjacent to the south of the site. This large flat-bottomed landing craft sunk in 1943 and is reported to lie upside down. This is a Protected Place under the Protection of Military Remains Act 1986.

13.7.8.8 The heritage value of each archaeological asset to be assessed at each META project site (Warrior Way (site 6), Dale Roads (site 7) and East Pickard Bay (site 8) is summarised in Table 13.10 below.

Table 13.10: The assessed value of non-designated heritage assets subject to impact assessment in the marine archaeology chapter, for each META project site.

Non-designated Heritage assets	Archaeological Potential	Heritage Value
Warrior Way (site 6)		
Area 46 of Dyfed Archaeological Trust's "Milford Haven Waterway Ports & Harbours Project" survey (Possible Sediment)	Categorised as an area of possible sediment with m**edium** archaeological potential. An acoustic survey was undertaken in this area which suggests some sediment of Palaeolithic/Mesolithic interest may survive.	**Regionally** important (medium evidential value)
Area 45 of Dyfed Archaeological Trust's "Milford Haven Waterway Ports & Harbours Project" survey (Major Bar / Landing Point – Pembroke Ferry and Burton landing points)	Deemed to be of high archaeological potential, however the potential for archaeological deposits is assessed as **low** for the site (site 6), which lies at the southern edge of Area 45, in the centre of the Waterway, and therefore furthest from the landing points.	**Locally** important (low evidential and historic value)
Dale Roads (site 7)		
Area 23 of Dyfed Archaeological Trust's "Milford Haven Waterway Ports & Harbours Project" survey (Possible Sediment)	Deemed to be of **medium** archaeological potential, this area follows the MLWS contour line. Acoustic surveys of sediment indicates a fairly even spread of sediment with some rock exposures, but borehole data suggests this sediment may be mainly sands and gravels, the archaeological potential of which isn't clear. This area does contain some large and well-known wreck sites, and the proximity of Mesolithic finds in the intertidal zone may be indicative of potential for early Prehistoric remains in the wider area, including within Dale Roads (site 7).	**Locally** to **Regionally** important (low to medium evidential value)
Area 34 of Dyfed Archaeological Trust's "Milford Haven Waterway Ports & Harbours Project" survey (Major Bay / Landing Point – Dales Road)	Deemed to be of high archaeological potential for material culture associated with the use of Dales Road as a major bay / landing point in the post-Medieval and Modern periods, however, l**ow** archaeological potential for the early pre-historic and post-Medieval period is assessed for the site due to distance to Dale Roads bay itself. This area was not covered by surveys or boreholes, but sediment survival would appear likely.	**Locally** to **regionally** important (low to medium evidential and historic value)
Area 25 of Dyfed Archaeological Trust's "Milford Haven Waterway Ports & Harbours Project" survey (Bay – Lindsway Bay)	Lindsway Bay is deemed to be of **medium** archaeological potential for the early Prehistoric, post-Medieval and Modern periods as a small sandy bay, without easy access and therefore likely to have seen little use. Levels suggest possible sediment survival, but area is not surveyed or bore-holed.	**Locally** to **regionally** important (low to medium evidential, historic and communal value)
East Pickard Bay (site 8)		
Unnamed Wreck / 'Highland Home'	The site itself has **high** potential for deposits dated to the post-Medieval period, specifically associated with the wreck mapped on site, believed to be the Highland Home.	**Locally** important (low evidential and historic value)
Prehistoric deposits	The East Pickard Bay site (site 8) has **medium** potential for archaeological deposits dating to the Prehistoric period, associated with the proximal record of a Prehistoric submerged forest, and finds on the intertidal zone in the proximity of West Pickard Camp.	**Locally** to **Regionally** important (low to medium evidential value)
Marine archaeological resource - wrecks	The East Pickard Bay site (site 8) has **low** potential for unknown wrecks dating to the post-Medieval Modern period to be located within the site.	**Locally** important (low evidential and historic value)

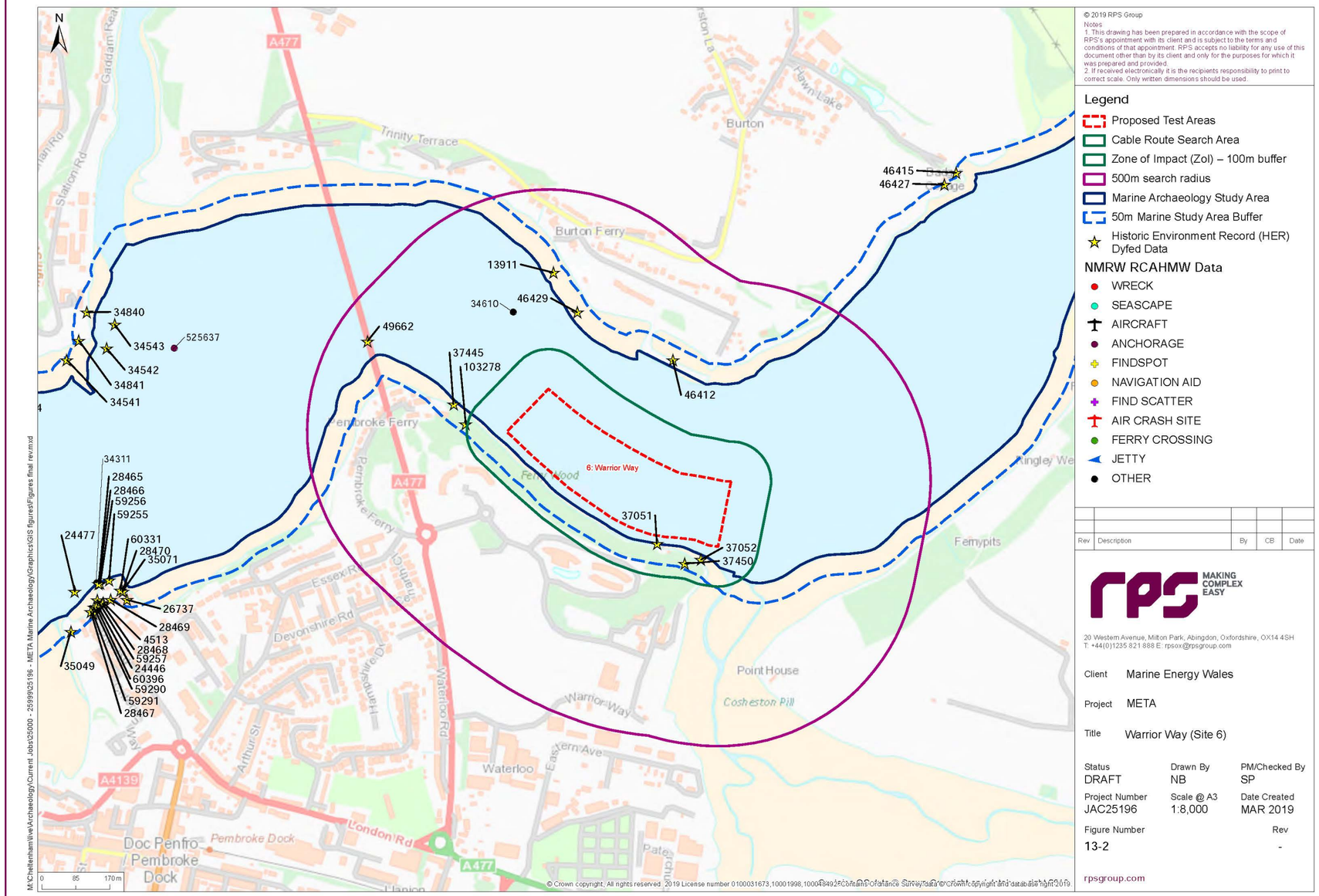


Figure 13.2: Heritage assets identified in proximity to Warrior Way (site 6).

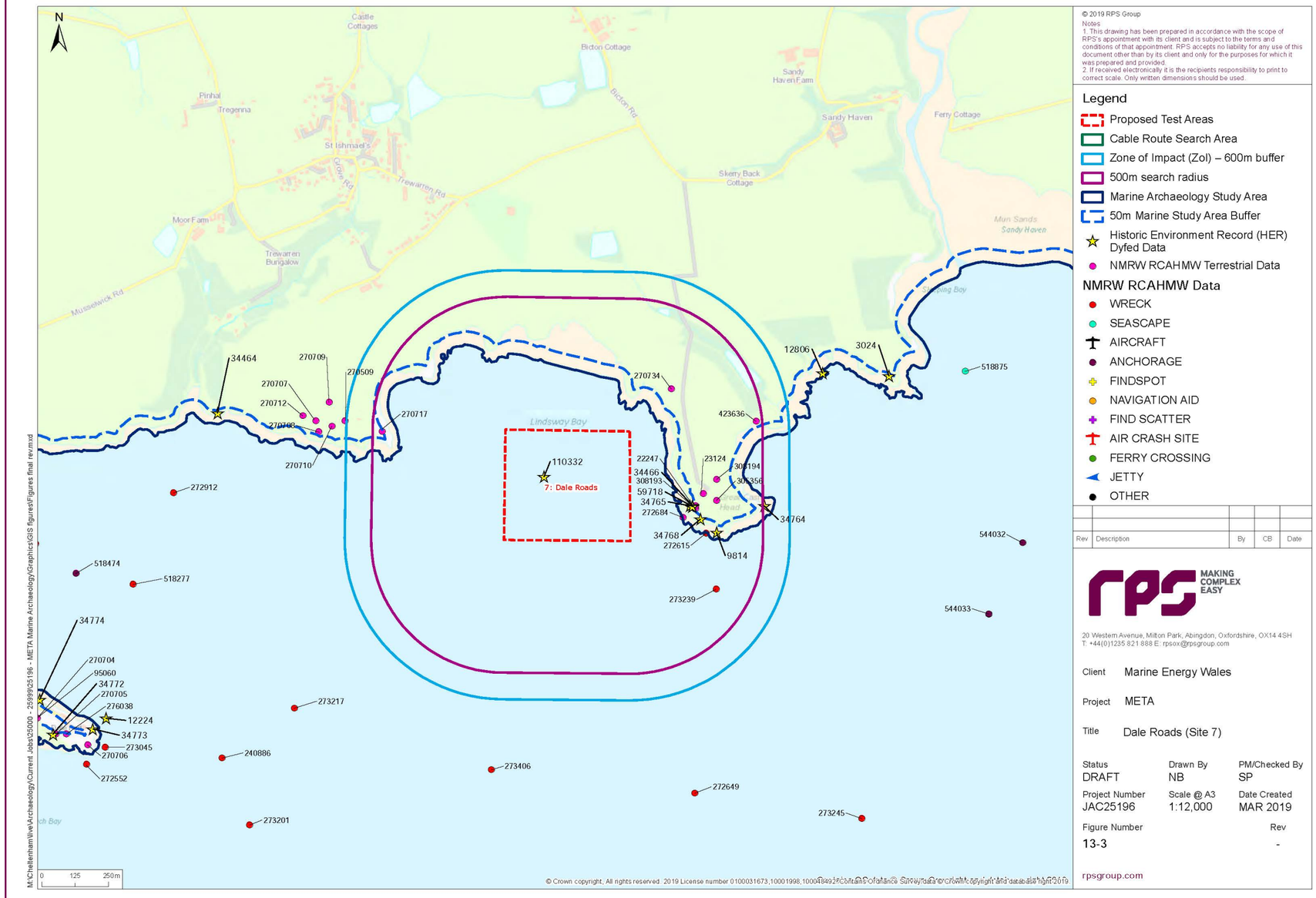
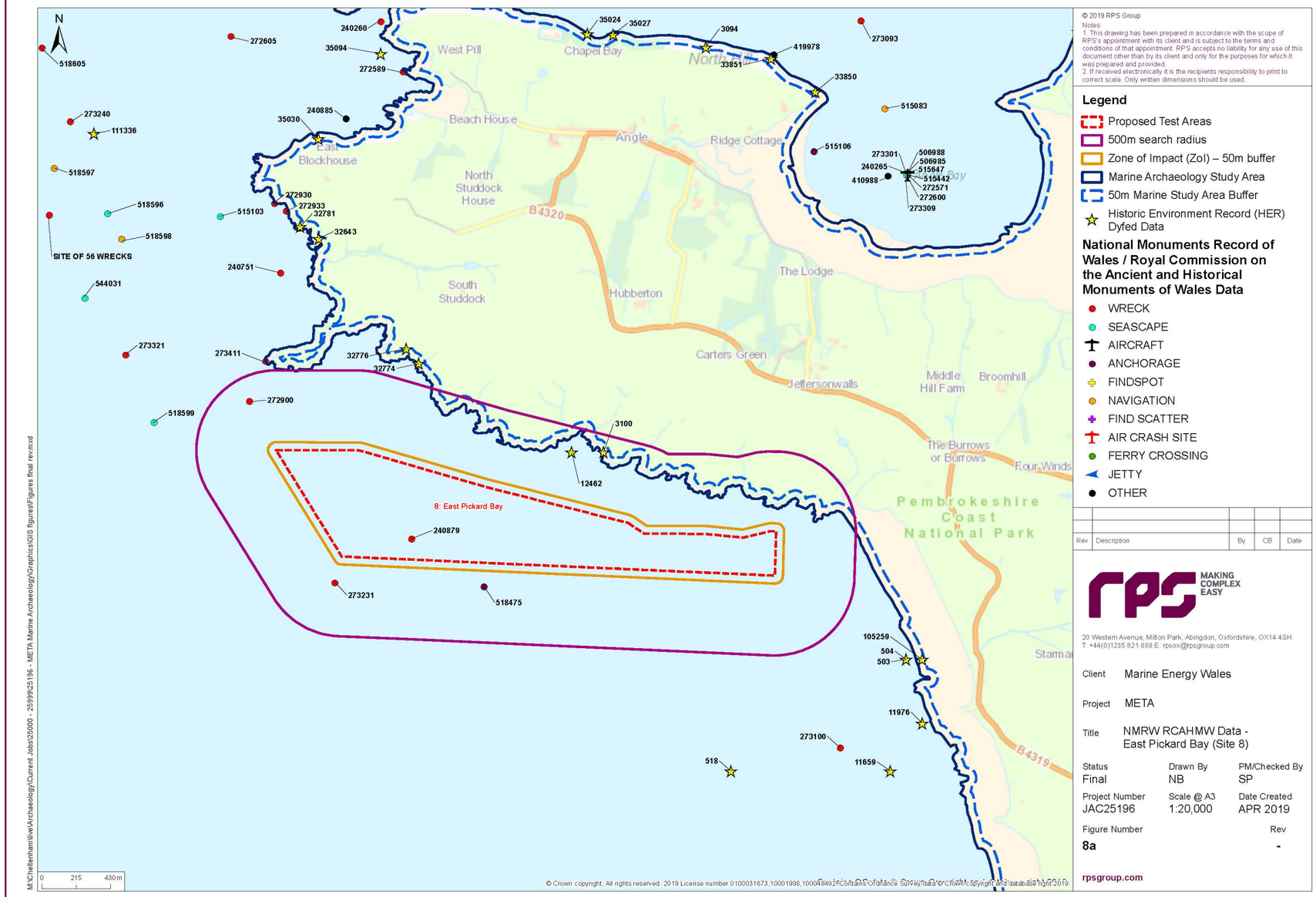


Figure 13.3: Heritage assets identified in proximity to Dales Road (site 7).



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Legend

- Proposed Test Areas
- 500m search radius
- Zone of Impact (ZoI) – 50m buffer
- Marine Archaeology Study Area
- 50m Marine Study Area Buffer
- Historic Environment Record (HER) Dyfed Data

National Monuments Record of Wales / Royal Commission on the Ancient and Historical Monuments of Wales Data

- WRECK
- SEASCAPE
- AIRCRAFT
- ANCHORAGE
- FINDSPOT
- NAVIGATION
- FIND SCATTER
- AIR CRASH SITE
- FERRY CROSSING
- JETTY
- OTHER

Rev	Description	By	CB	Date

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Project	META
Title	NMRW RCAHMW Data - East Pickard Bay (Site 8)

Status	Drawn By	PM/Checked By
Final	NB	SP
Project Number	**Scale @ A3**	**Date Created**
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Figure Number		**Rev**
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Figure 13.4: Heritage assets identified in proximity to East Pickard Bay (site 8).

13.7.9 Future baseline scenario

13.7.9.1 The (Marine Works (EIA) Regulations 2007 (as amended)) requires that *"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*" is included within the Environmental Statement.

13.7.9.2 In the event that the META project does not come forward, an assessment of the future baseline conditions has been carried out and is described within this section.

13.7.9.3 All heritage assets mentioned above will continue to deteriorate slowly through natural erosion and coastal processes, without the implementation of the META project, or measures to protect them. The rate of deterioration cannot be ascertained from available data, but this is widely considered to be a long-term process.

13.7.10 Data limitations

13.7.10.1 There were no known significant limitations for the baseline assessment presented in this chapter, which is deemed to comply with the relevant policy and guidance set out above.

13.7.10.2 No surveys were undertaken to verify the baseline, and therefore the exact location of a number of heritage assets and wrecks in particular, cannot be confidently established. However, it is considered that the location of likely and known heritage assets has been established within acceptable levels. These data limitations may affect the certainty of the EIA.

13.8 Key parameters for assessment

13.8.1 Maximum and most likely design scenario

13.8.1.1 The maximum design scenarios identified in Table 13.11 below have been selected as those having the potential to result in the greatest effect on an identified receptor or receptor group. These scenarios have been selected from the details provided in the project description (chapter 2: Project Description).

13.8.1.2 The most likely design scenarios identified in Table 13.11 below have been selected as those having the potential to result in the most likely effect on an identified receptor or receptor group. These scenarios have been selected from the details provided in the project description (chapter 2: Project Description). Effects of greater adverse significance are outlined under the maximum design scenario.

13.8.1.3 This chapter is informed by assessments presented in the following chapters:

- Chapter 5 "Coastal Processes";
- Chapter 14 "Seascape"; and
- Chapter 16 "Other Users".

13.8.2 Impacts scoped out of the assessment

13.8.2.1 No marine archaeological impacts have been scoped out of assessment.

Table 13.11: Maximum and most likely design scenarios considered for the assessment of potential impacts on marine archaeology.

Potential impact	Maximum design scenario	Most likely design scenario	Justification
Installation and Decommissioning phases			
Removal or disturbance of sediments – buried prehistoric deposits Removal or disturbance of archaeological resource – shipwrecks	**Warrior Way (site 6)** • Up to one testing activity/device deployment at any one time; • Up to four device deployments in a 12-month period (i.e. up to 60 deployments over the project lifetime), 50 % of which may touch the seabed; • Up to 330 m^2 of temporary disturbance at Warrior Way per testing scenario (5 m buffer around device footprint (200 m^2) for seabed clearance activities); • No pin piling will be carried out at Warrior Way. **Dale Roads (site 7)** • Up to one testing activity/device deployment at any one time • Up to two device deployments in a 12-month period (i.e. up to 30 deployments over the project lifetime), 50 % of which may touch the seabed. • Up to 510 m^2 of temporary disturbance at Dale Roads per testing scenario (from a 5 m buffer around device footprint (600 m^2) for seabed clearance activities • Pin piles - ≤ 4 drilled pin piles per device. Each pin pile up to 100 mm diameter installed to a depth of 10 – 20 m. **East Pickard Bay (site 8)** • Up to two testing activity/device deployments at any one time; • Up to four device deployments in a 12-month period (i.e. up to 60 deployments over the project lifetime), 50 % of which may touch the seabed; • Up to 123,486 m^2 of temporary disturbance at East Pickard Bay per testing scenario broken down as follows: - Up to 3,486m^2 from a 10 m buffer around device footprint (8,000 m^2) for seabed clearance activities; and - Up to 120,000 m^2 from mooring spread for deployment vessels for up to two test activities at any one time - Pin piles - Up to 4 drilled pin piles per device. Each pin pile up to 100 mm diameter installed to a depth of 10 - 20 m.	**Warrior Way (site 6)** • Up to one testing activity/device deployment at any one time • Up to two device deployments in a 12-month period (i.e. up to 30 deployments over the project lifetime), 50 % of which may touch the seabed; • No sea-bed preparation required and no pin piling. **Dale Roads (site 7)** • Up to one testing activity/device deployment at any one time • Up to one device deployments in a 12-month period (i.e. up to 15 deployments over the project lifetime), 50 % of which may touch the seabed. • No sea-bed clearance required and no pin-piling **East Pickard Bay (site 8)** • Up to one testing activity/device deployment at any one time • Up to one device deployments in a 12-month period (i.e. up to 15 deployments over the project lifetime), 50 % of which may touch the seabed; • Up to 70,000 m^2 of temporary disturbance at East Pickard Bay from mooring spread for deployment vessels per test activity; • Pin piles - No pin pilling required	There is potential for removal or disturbance of sediments due to installation or decommissioning of marine renewable devices resulting in a potential effect on near-surface and deeply buried prehistoric deposits and shipwrecks.
Sediment deposition on the seabed	The impact of devices on suspended sediment concentrations (SSC) is assessed in chapter 5: Coastal Processes. That assessment considers that the very finest material disturbed from installation and decommissioning activities would travel in the order of 100 m from the Warrior Way site (site 6), 600 m from the Dale Roads site (site 7); and 50 m from the East Pickard Bay site (site 8); during an average tide.	As per maximum design scenario.	There is potential for sediment deposition due to installation or decommissioning of marine renewable devices resulting in a potential effect on a variety of heritage assets.
Operation and maintenance phase			
Removal or disturbance of sediments - buried prehistoric deposits Removal or disturbance of archaeological resource – shipwrecks	**Warrior Way (site 6)** • Up to one testing activity at any one time; • Up to four device deployments in a 12-month period (i.e. up to 60 deployments over the project lifetime), 50 % of which may touch the seabed • Up to 200 m^2 from device or component footprint on the seabed (including mooring/pin pile footprint) • Mooring/attachment method - Up to 4 drag anchors with associated slack lines, catenary mooring system. Gravity base may be required at Warrior Way - maximum area up to 25 m^2. • Mooring spread per test – 150 m^2	**Warrior Way (site 6)** • Up to one testing activity at any one time; • Up to two device deployments in a 12-month period (i.e. up to 30 deployments over the project lifetime), 50 % of which may touch the seabed • Up to 100 m^2 of habitat loss at Warrior Way per testing scenario from device or component footprint on the seabed • Mooring/attachment method - Deployed from vessel or attached to test support buoys.	Presence of devices on the seabed and operation and maintenance activities including the deployment of vessel moorings, may affect a variety of heritage assets through the removal or disturbance of archaeological resource.

Potential impact	Maximum design scenario	Most likely design scenario	Justification
	Dale Roads (site 7) • Up to one testing activity at any one time; • Up to two test deployments in a 12-month period (i.e. up to 30 deployments over the project lifetime), 50 % of which may touch the seabed; • Up to 600 m^2 from device or component footprint on the seabed (including mooring/pin pile footprint) • Mooring/attachment method - Up to 10 drag anchors with associated slack lines, catenary mooring system. Gravity base may be required at Dale Roads - maximum area up to 500 m^2. Pin piling (drilled) may be required at Dale Roads. • Mooring spread per test - 200 m^2 **East Pickard Bay (site 8)** • Up to two testing activities at any one time; • Up to four test deployments in a 12-month period (i.e. up to 60 deployments over the project lifetime), 50 % of which may touch the seabed • Up to 10,250 m^2 for up to two device or component footprints on the seabed (including mooring/pin pile footprint). • Up to 10 standard drag embedment anchors. • Gravity base up to 1125 m^2 • Mooring spread per test up to 500 m x 500 m (250,000 m^2) • Total mooring spread for multiple activities - 500,000 m^2.	• Mooring spread per test ≥75 m^2 **Dale Roads (site 7)** • Up to one testing activity at any one time; • Up to one test deployments in a 12-month period (i.e. up to 15 deployments over the project lifetime), 50 % of which may touch the seabed • Up to 200 m^2 of habitat loss at Dale Roads per testing scenario from device or component footprint on the seabed; • Mooring/attachment method - Dynamic tether mooring system or up to 4 standard drag embedment anchors. Gravity base up to 75 m^2. No pin piling. • Mooring spread per test up to 100 m^2 **East Pickard Bay (site 8)** • Up to one testing activity at any one time; • Up to one test deployment in a 12-month period (i.e. up to 15 deployments over the project lifetime), 50 % of which may touch the seabed • Up to 1,700 m^2 of habitat loss at East Pickard Bay per testing scenario from device or component footprint on the seabed. • Up to four standard drag embedment anchors. • Gravity base up to 1125 m^2. • Mooring spread per test - 25 x 25 m (625 m^2)	

13.9 Impact assessment methodology

13.9.1 Overview

13.9.1.1 The marine archaeology EIA has followed the methodology set out in chapter 4: Environmental Impact Assessment Methodology. Specific to the marine archaeology EIA, the following guidance documents have also been considered:

- Technical Advice Note 24: The Historic Environment (TAN24: Welsh Government 2017);
- Conservation Principles for the Sustainable Management of the Historic Environment in Wales (Welsh Assembly Government, published by Cadw in 2011);
- The National Seascape Assessment for Wales (Natural Resources Wales, November 2015), comprises two complementary and linked elements: a marine character assessment; and a visual resource mapping element – only the marine character aspects are considered in this assessment; and
- 'Standard and guidance for historic environment desk-based assessments' (Chartered Institute for Archaeologists, December 2014, revised in December 2017).

13.9.1.2 In addition, the marine archaeology EIA has considered the legislative frameworks which provide protection to the historic environment. Statutory protection for archaeology is principally enshrined in the Ancient Monuments and Archaeological Areas Act (1979) amended by the National Heritage Act (1983) and the National Heritage Act (2002). Nationally important archaeological sites are listed in a Schedule of Monuments and are afforded statutory protection.

13.9.1.3 For other components of the historic environment, the Planning (Listed Buildings and Conservation Areas) Act (1990) and the Town and County Planning Act (1990) provide statutory protection to listed buildings and their settings, and present measures to designate and preserve the character and appearance of Conservation Areas.

13.9.1.4 The Historic Environment (Wales) Act (2016) gives more effective protection to listed buildings and scheduled monuments, improves the sustainable management of the historic environment, and introduces greater transparency and accountability regarding decisions affecting the historic environment.

13.9.1.5 The Marine and Coastal Access Act (2009) provides the legal mechanism to help ensure clean, healthy, safe, productive and biologically diverse oceans and seas by putting in place a new system for improved management and protection of the marine and coastal environment.

13.9.1.6 There are numerous maritime wrecks in the seas around Wales. Although all of them have historic value, six currently have legal protection. These six are known as 'designated wrecks' or 'protected wrecks' and are statutorily protected by the Protection of Wrecks Act (1973). None of these wrecks occur within proximity of the META project.

13.9.2 Impact assessment criteria

13.9.2.1 The criteria for determining the significance of effects is a two-stage process that involves defining the sensitivity of the receptors and the magnitude of the impacts. This section describes the criteria applied in this chapter to assign values to the sensitivity of receptors and the magnitude of potential impacts. The terms used to define sensitivity and magnitude are based on those which are described in further detail in chapter 4: Environmental Assessment Methodology.

Magnitude

13.9.2.2 The criteria for defining magnitude in this chapter are outlined in Table 13.12 below.

Table 13.12: Definition of terms relating to the magnitude of an impact.

Magnitude of impact	Definition
Major	Change to most or all key archaeological materials, such that the resource is totally altered. Comprehensive changes to setting (adverse)
	Large scale or major improvement or resource quality; extensive restoration or enhancement; major improvement of attribute quality (beneficial)
Moderate	Changes to many key archaeological materials, such that the resource is clearly modified. Considerable changes to setting that affect the character of the asset. (adverse)
	Benefit to, or addition of, key characteristics, features or elements; improvement of attribute quality (beneficial)
Minor	Changes to key archaeological materials, such that the asset is slightly altered. Slight changes to setting. (adverse)
	Minor benefit to, or addition of, one (maybe more) key characteristics, features or elements; some beneficial impact on attribute or a reduced risk of negative impact occurring (beneficial)
Negligible	Very minor changes to archaeological materials or setting (adverse)
	Very minor benefit to, or positive addition of one or more characteristics, features or elements (beneficial)
No change	No loss or alteration or characteristics, features or elements; no observable impact in either direction

Sensitivity

13.9.2.3 The criteria for defining sensitivity in this chapter are outlined in Table 13.13 below.

Table 13.13: Definition of terms relating to the sensitivity of the receptor.

Sensitivity	Definition
Very High	• World Heritage Sites (including nominated sites). • Assets of acknowledged international importance. • Assets that can contribute significantly to acknowledged international research objectives.
High	• Scheduled Monuments (including proposed sites). • Undesignated assets of schedulable quality and importance.

Sensitivity	Definition
	• Assets that can contribute significantly to acknowledged national research objectives.
Medium	• Designated or undesignated assets that contribute to regional research objectives.
Low (or lower)	• Designated and undesignated assets of local importance. • Assets compromised by poor preservation and/or poor survival of contextual associations. • Assets of limited value, but with potential to contribute to local research objectives.
Negligible	• Assets with very little or no surviving archaeological interest.
Unknown	• The importance of the resource has not been ascertained.

Significance

13.9.2.4 The significance of the effect upon marine archaeology 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 13.14. Where a range of significance of effect is presented in Table 13.14, the final assessment for each effect is based upon expert judgement.

13.9.2.5 For the purposes of this assessment, any effects with a significance level of minor or less have been concluded to be not significant in terms of the EIA Regulations.

Table 13.14: Matrix used for the assessment of the significance of the effect.

Sensitivity of receptor	Magnitude of impact: No change	Negligible	Minor	Moderate	Major
Negligible	Negligible	Negligible	Negligible or minor	Negligible or minor	Minor
Low	Negligible	Negligible or minor	Negligible or minor	Minor	Minor or moderate
Medium	Negligible	Negligible or minor	Minor	Moderate	Moderate or major
High	Negligible	Minor	Minor or moderate	Moderate or major	Major or substantial
Very high	Negligible	Minor	Moderate or major	Major or substantial	Substantial

13.10 Measures adopted as part of the META Project

13.10.1.1 As part of the project design process, designed-in measures have been proposed to reduce the potential for impacts on marine archaeology (see Table 13.15). As there is a commitment to implementing these measures, they are considered inherently part of the design of the META project and have therefore been considered in the assessment presented in section 13.11 below (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.

Table 13.15: Designed-in measures adopted as part of the META project.

Measures adopted as part of the META project	Justification
Installation works will be undertaken in accordance with the Environmental Mitigation and Monitoring Plan (EMMP).	The EMMP sets out the key management measures that contractors and clients will be required to adopt and implement. These measures include strategies and control measures for managing the potential environmental effects of installation and limiting disturbance from installation activities as far as reasonably practicable.

13.10.1.2 In some cases, particularly where potentially significant effects are identified, there may be additional mitigation measures required that are not "built in" to the project design ahead of the assessment. These are discussed in "Further mitigation and residual effect" below.

13.11 Assessment of significance

13.11.1.1 The baseline summarised above indicates human activity within a 500 m search radius from each site during the Prehistoric, Medieval, post-Medieval and Modern periods.

13.11.1.2 The overall significance of heritage assets derives from a combination of the key heritage values identified in the Cadw guidance document *Conservation Principles for the Sustainable Management of the Historic Environment in Wales (Welsh Assembly Government, published by Cadw in 2011),* evidential, historical, aesthetic and communal values.

13.11.2 Installation phase

13.11.2.1 The impacts of the installation of the META project have been assessed on marine archaeology. The potential impacts arising from the installation of the META project are listed in Table 13.11 along with the maximum and most likely design scenarios against which each impact has been assessed. A conclusion of significance of effect will be made for the META project and for each META phase 2 site individually where appropriate (Warrior Way (site 6), Dale Roads (site 7); East Pickard Bay (site 8)).

13.11.2.2 A description of the potential effect on marine archaeology receptors resulting from each identified impact is given below.

Removal or disturbance of sediments – buried prehistoric deposits

Magnitude of impact

13.11.2.3 There is potential for removal or disturbance of sediments caused by the installation (and decommissioning) of marine renewable devices at all sites, resulting in a potential effect on near-surface and deeply buried prehistoric deposits.

13.11.2.4 The maximum and most likely design scenarios for each site are set out in Table 13.11 above. The impact is predicted to be of local spatial extent (see ZoI above), long-term duration over the consented period of the project, but intermittent (short-term installation activities) and not reversible. It is predicted that the impact would affect the receptor directly. The magnitude is therefore, considered to be minor.

Sensitivity of the receptor

13.11.2.5 Each META site's marine archaeological potential and heritage value is assessed in section 13.7, and is summarised in relation to Prehistoric deposits in Table 13.16 below:

Table 13.16: Buried prehistoric deposits – potential and heritage value

Non-designated heritage assets	Archaeological Potential	Heritage Value
Warrior Way (site 6)		
Area 46 of Dyfed Archaeological Trust's "Milford Haven Waterway Ports & Harbours Project" survey (Possible Sediment)	Categorised as an area of possible sediment with m**edium** archaeological potential, an acoustic survey was undertaken in this area which suggests some sediment may survive of Palaeolithic/Mesolithic interest.	**Regionally** important (medium evidential value)
Dale Roads (site 7)		
Area 23 of Dyfed Archaeological Trust's "Milford Haven Waterway Ports & Harbours Project" survey (Possible Sediment)	Deemed to be of **medium** archaeological potential, this area follows the LMWS contour line. Sediment Acoustic survey Indicates a fairly even spread of sediment with some rock exposures but borehole data suggests this sediment may be mainly sands and gravels, the potential of which isn't clear. This area does contain some large and well known wreck sites, and the proximity of Mesolithic finds on the intertidal zone may be indicative of potential for early Prehistoric remains in the wider area, including the site.	**Locally** to **Regionally** important (low to medium evidential value)
Area 34 of Dyfed Archaeological Trust's "Milford Haven Waterway Ports & Harbours Project" survey (Major Bay / Landing Point – Dales Road)	Deemed to be of high archaeological potential, however, l**ow** archaeological potential for the early pre-historic period is assessed for the site. This area was not covered by surveys or boreholes, but sediment survival would appear likely.	**Locally** to **regionally** important (low to medium evidential and historic value)
Area 25 of Dyfed Archaeological Trust's "Milford Haven Waterway Ports & Harbours Project" survey (Bay – Lindsway Bay)	Lindsway Bay is deemed to be of **medium** archaeological potential for the early Prehistoric period as a small sandy bay, without easy access, likely to have seen little use. Levels suggest possible sediment survival, but not surveyed or boreholed.	**Locally** to **regionally** important (low to medium evidential, historic and communal value)
East Pickard Bay (site 8)		
Prehistoric deposits	The site has **medium** potential for archaeological deposits dating to the Prehistoric period, associated with the proximal record of a Prehistoric submerged forest, and finds on the intertidal zone in the proximity of West Pickard Camp.	**Locally** to **Regionally** important (low to medium evidential value)

13.11.2.6 The potential Prehistoric deposits on all three sites are deemed to be of medium vulnerability, and medium value. The sensitivity of the receptor is therefore, considered to be medium.

Significance of the effect

13.11.2.7 Overall, the sensitivity of the receptor is considered to be medium and the magnitude of the impact is deemed to be minor. The effect will, therefore, be of **minor adverse significance** which is not significant in EIA terms.

13.11.2.8 No surveys were undertaken to verify the baseline, and therefore the exact location, condition and extent of buried prehistoric deposits cannot be confidently established. Although this potential has been established within acceptable levels, these data limitations may affect the certainty of the assessment.

Further mitigation and residual effect

13.11.2.9 Each META project site will be the subject of preliminary surveys to confirm or otherwise the archaeological potential for Prehistoric deposits. Where these are present, the archaeological deposits will be appropriately sampled and recorded, in accordance with current best-practice guidance.

13.11.2.10 Archaeological fieldwork is an inherently destructive process; however, the resulting reports would potentially contribute to acknowledged regional research aims. Therefore, although the further mitigation would result in further erosion of the asset, this would be offset by enhancing the body of knowledge for this particular heritage asset type.

13.11.2.11 Should the archaeological mitigation proposed confirm the presence of Prehistoric archaeological deposits in each site, the effect from the proposed development would be reduced to **negligible** significance. It is possible however, that these deposits are not present, or if present, not significant, in one or more of the sites, and should this be confirmed through further survey and investigation, the stated residual effect would be re-assessed.

Removal or disturbance of archaeological resource – shipwrecks

Magnitude of impact

13.11.2.12 There is potential for removal or disturbance of archaeological deposits during the installation (and decommissioning) of marine renewable devices at all sites, resulting in a potential effect on shipwrecks, should they be present within each site.

13.11.2.13 The maximum and most likely design scenarios for each site are set out in Table 13.11 above. The impact is predicted to be of local spatial extent, short duration, intermittent and not reversible. It is predicted that the impact would affect the receptor directly. The magnitude is therefore, considered to be **Minor**.

Sensitivity of the receptor

13.11.2.14 Each META site's marine archaeological potential and heritage value is assessed in 13.7, and is summarised in relation to the archaeological resource, including wrecks, in Table 13.17 below:

Table 13.17: Archaeological resource including wrecks – potential and heritage value

Non-designated heritage assets	Archaeological Potential	Heritage Value
Warrior Way		
Area 45 of Dyfed Archaeological Trust's "Milford Haven Waterway Ports & Harbours Project" survey (Major Bar / Landing Point – Pembroke Ferry and Burton landing points)	Deemed to be of high archaeological potential, however, the potential is assessed as **low** for the site, which lies at the southern edge of Area 45, in the centre of the waterway, and therefore furthest from the landing points.	**Locally** important (low evidential and historic value)
Dale Roads		
Area 34 of Dyfed Archaeological Trust's "Milford Haven Waterway Ports & Harbours Project" survey (Major Bay / Landing Point – Dales Road)	Deemed to be of high archaeological potential, however, l**ow** archaeological potential for the early Prehistoric period is assessed for the site site due to distance to Dales Road Bay itself.	**Locally** important (low evidential and historic value)
Area 25 of Dyfed Archaeological Trust's "Milford Haven Waterway Ports & Harbours Project" survey (Bay – Lindsway Bay)	Lindsway Bay is deemed to be of **medium** archaeological potential for the post-Medieval and Modern periods as a small sandy bay, without easy access, likely to have seen little use, although historically in use as a firing range.	**Locally** important (low evidential, historic and communal value)
East Pickard Bay		
Unnamed Wreck / 'Highland Home'	The site itself has **high** potential for deposits dated to the post-Medieval period, specifically associated with the wreck mapped on site, believed to be the Highland Home.	**Locally** important (low evidential and historic value)
Marine archaeological resource - wrecks	The site has **low** potential for unknown wrecks dating to the post-Medieval Modern period to be located within the site.	**Locally** important (low evidential and historic value)

13.11.2.15 The potential marine archaeological resource, including wrecks on all three sites is deemed to be of low vulnerability, low recoverability and low value. The sensitivity of the receptor is therefore, considered to be low.

Significance of the effect

13.11.2.16 Overall, the sensitivity of the receptor is considered to be low and the magnitude of the impact is deemed to be minor. The effect will, therefore, be of **minor adverse significance**.

13.11.2.17 No surveys were undertaken to verify the baseline, and therefore the exact location, condition and extent of wrecks cannot be confidently established. Although this potential has been established within acceptable levels, these data limitations may affect the certainty/predictability of the EIA.

Further mitigation and residual effect

13.11.2.18 Paragraphs 13.11.2.9 and 13.11.2.10 outline preliminary surveys proposed at each site.

13.11.2.19 Archaeological recording of wrecks is a mostly non-destructive process and in principle, allows preservation in situ of remains, should this be possible within the proposed development. Should preliminary surveys confirm the presence of wrecks in either site, the effect from the proposed development could be reduced to **negligible** if these assets are avoided through design.

13.11.2.20 It is also possible, that these deposits are not present, or if present, not significant, in one or more of the sites, and should this be confirmed through further survey and investigation, the stated residual effect would also be reduced to **negligible**.

13.11.2.21 If wrecks are present in any of the sites, but they cannot be avoided through design, the residual effect will remain **minor adverse significance**, which is not significant in EIA terms.

Sediment deposition on the seabed

Magnitude of impact

13.11.2.22 There is potential for sediment deposition during the installation (and decommissioning) of marine renewable devices at all sites to result in a potential effect on a variety of heritage assets.

13.11.2.23 The maximum and most likely design scenarios for each site are set out in Table 13.11 above. The impact of device installation on suspended sediment concentrations (SSC) is assessed in chapter 5: Coastal Processes. That assessment considers that the very finest material disturbed from installation and decommissioning activities would travel in the order of 600 m from the Dale Roads site (site 7); 50 m from the East Pickard Bay site (site 8); and 100 m from the Warrior Way site (site 6) during an average tide.

13.11.2.24 The impact is therefore predicted to be of local spatial extent, long-term duration, but intermittent (short-term installation and decommissioning activities) and reversible. It is predicted that the impact will affect the receptor indirectly. The magnitude is therefore, considered to be **negligible**.

Sensitivity of the receptor

13.11.2.25 The potential for Prehistoric deposits on all three sites is deemed to be of medium vulnerability, medium recoverability and medium value. The sensitivity of this receptor is therefore, considered to be medium (see above).

13.11.2.26 The potential marine archaeological resource, including wrecks, on all three sites is deemed to be of low vulnerability, low recoverability and low value. The sensitivity of the receptor is therefore, considered to be low (see above).

13.11.2.27 Other heritage assets within the ZoI of each site are listed in Table 13.18 and considered here.

Table 13.18: Marine archaeological deposits – potential and heritage value

Non-designated heritage assets	Archaeological Potential	Heritage Value
Warrior Way (site 6)		
Area 46 of Dyfed Archaeological Trust's "Milford Haven Waterway Ports & Harbours Project" survey (Possible Sediment)	Categorised as an area of possible sediment with m**edium** archaeological potential, an acoustic survey was undertaken in this area which suggests some sediment may survive of Palaeolithic/Mesolithic interest.	**Regionally** important (medium evidential value)
Area 45 of Dyfed Archaeological Trust's "Milford Haven Waterway Ports & Harbours Project" survey (Major Bar / Landing Point – Pembroke Ferry and Burton landing points)	Deemed to be of high archaeological potential, however, the potential is assessed as **low** for the site, which lies at the southern edge of Area 45, in the centre of the waterway, and therefore furthest from the landing points.	**Locally** important (low evidential and historic value)
Dale Roads (site 7)		
Area 23 of Dyfed Archaeological Trust's "Milford Haven Waterway Ports & Harbours Project" survey (Possible Sediment)	Deemed to be of **medium** archaeological potential, this area follows the LMWS contour line. Sediment Acoustic survey Indicates a fairly even spread of sediment with some rock exposures, but borehole data suggests this sediment may be mainly sands and gravels, the potential of which isn't clear. This area does contain some large and well-known wreck sites, and the proximity of Mesolithic finds on the intertidal zone may be indicative of potential for early Prehistoric remains in the wider area, including the site.	**Locally** to **Regionally** important (low to medium evidential value)
Area 34 of Dyfed Archaeological Trust's "Milford Haven Waterway Ports & Harbours Project" survey (Major Bay / Landing Point – Dales Road)	Deemed to be of high archaeological potential, however, l**ow** archaeological potential for the early pre-historic and post-Medieval period is assessed for the site due to distance to Dales Road Bay itself. This area was not covered by surveys or boreholes, but sediment survival would appear likely.	**Locally** to **regionally** important (low to medium evidential and historic value)
Area 25 of Dyfed Archaeological Trust's "Milford Haven Waterway Ports & Harbours Project" survey (Bay – Lindsway Bay)	Lindsway Bay is deemed to be of **medium** archaeological potential for the early Prehistoric, post-Medieval and Modern periods as a small sandy bay, without easy access, likely to have seen little use. Levels suggest possible sediment survival, but not surveyed or boreholed.	**Locally** to **regionally** important (low to medium evidential, historic and communal value)
East Pickard Bay (site 8)		
Unnamed Wreck / 'Highland Home'	The site itself has **high** potential for deposits dated to the post-Medieval period, specifically associated with the wreck mapped on site, believed to be the Highland Home.	**Locally** important (low evidential and historic value)
Prehistoric deposits	The site has **medium** potential for archaeological deposits dating to the Prehistoric period, associated with the proximal record of a Prehistoric submerged forest, and finds on the intertidal zone in the proximity of West Pickard Camp.	**Locally** to **Regionally** important (low to medium evidential value)
Marine archaeological resource - wrecks	The site has **low** potential for unknown wrecks dating to the post-Medieval Modern period to be located within the site.	**Locally** important (low evidential and historic value)

13.11.2.28 The potential marine archaeological resource on all three sites is deemed to be of low vulnerability, low recoverability and low to medium value. The sensitivity of the receptor is therefore, considered to be low to medium.

Significance of the effect

13.11.2.29 Overall, the sensitivity of the above receptors is considered to be low to medium and the magnitude of the impact is deemed to be negligible. The effect will, therefore, be of **negligible** to **minor adverse significance**.

Further mitigation and residual effect

13.11.2.30 No further mitigation is proposed for this impact.

Future monitoring

13.11.2.31 No marine archaeology monitoring to test the predictions made within the installation phase impact assessment is considered necessary, however, the LCG No. 15 (NPRN 273,231), 180 m to the south of East Pickard Bay (site 8), is a Protected Place under the Protection of Military Remains Act (1986). This Act makes it an offence to interfere with the wreckage of any designated vessel without a licence, and appropriate consultation should be made with regards to work in the vicinity to establish the radius of the protected area. It is also worthy of note that this Protected Place is located within Castlemartin's MoD firing range, which also restricts types of activity within this area.

13.11.3 Operation and maintenance phase

Removal or disturbance of sediments - buried prehistoric deposits

Magnitude of impact

13.11.3.1 Operation and maintenance activities, including the deployment of vessel or device moorings and placement of devices on the seabed, may affect a variety of heritage assets through the removal or disturbance of sediments.

13.11.3.2 The maximum and most likely design scenarios for each site are set out in Table 13.11 above. The impact is predicted to be of local spatial extent, short duration, intermittent and not reversible. It is predicted that the impact would affect the receptor directly. The magnitude is therefore, considered to be **minor**.

Sensitivity of the receptor

13.11.3.3 Each META site's marine archaeological potential and heritage value is assessed in section 13.7, and is summarised in relation to Prehistoric deposits in Table 13.19 below

Table 13.19: Buried prehistoric deposits – potential and heritage value

Non-designated heritage assets	Archaeological Potential	Heritage Value
Warrior Way		
Area 46 of Dyfed Archaeological Trust's "Milford Haven Waterway Ports & Harbours Project" survey (Possible Sediment)	Categorised as an area of possible sediment with m**edium** archaeological potential, an acoustic survey was undertaken in this area which suggests some sediment may survive of Palaeolithic/Mesolithic interest.	**Regionally** important (medium evidential value)
Dale Roads		
Area 23 of Dyfed Archaeological Trust's "Milford Haven Waterway Ports & Harbours Project" survey (Possible Sediment)	Deemed to be of **medium** archaeological potential, this area follows the LMWS contour line. Sediment Acoustic survey Indicates a fairly even spread of sediment with some rock exposures, but borehole data suggests this sediment may be mainly sands and gravels, the potential of which isn't clear. This area does contain some large and well-known wreck sites, and the proximity of Mesolithic finds on the intertidal zone may be indicative of potential for early Prehistoric remains in the wider area, including the site.	**Locally** to **Regionally** important (low to medium evidential value)
Area 34 of Dyfed Archaeological Trust's "Milford Haven Waterway Ports & Harbours Project" survey (Major Bay / Landing Point – Dales Road)	Deemed to be of high archaeological potential, however, l**ow** archaeological potential for the early pre-historic period is assessed for the site. This area was not covered by surveys or boreholes, but sediment survival would appear likely.	**Locally** to **regionally** important (low to medium evidential and historic value)
Area 25 of Dyfed Archaeological Trust's "Milford Haven Waterway Ports & Harbours Project" survey (Bay – Lindsway Bay)	Lindsway Bay is deemed to be of **medium** archaeological potential for the early Prehistoric period as a small sandy bay, without easy access, likely to have seen little use. Levels suggest possible sediment survival, but not surveyed or boreholed.	**Locally** to **regionally** important (low to medium evidential, historic and communal value)
East Pickard Bay		
Prehistoric deposits	The site has **medium** potential for archaeological deposits dating to the Prehistoric period, associated with the proximal record of a Prehistoric submerged forest, and finds on the intertidal zone in the proximity of West Pickard Camp.	**Locally** to **Regionally** important (low to medium evidential value)

13.11.3.4 The potential Prehistoric deposits on all three sites are deemed to be of medium vulnerability, and medium value. The sensitivity of the receptor is therefore, considered to be medium.

Significance of the effect

13.11.3.5 Overall, the sensitivity of the receptor is considered to be medium and the magnitude of the impact is deemed to be minor. The effect will, therefore, be of **minor adverse significance**, which is not significant in EIA terms.

13.11.3.6 No surveys were undertaken to verify the baseline, and therefore the exact location, condition and extent of buried prehistoric deposits cannot be confidently established. Although this potential has been established within acceptable levels, these data limitations may affect the certainty/predictability of the EIA.

Further mitigation and residual effect

13.11.3.7 Paragraphs 13.11.2.9 and 13.11.2.10 outline preliminary surveys proposed at each site.

13.11.3.8 Should the archaeological mitigation proposed confirm the presence of Prehistoric archaeological deposits in each site, the effect from the proposed development would be reduced to **negligible** significance. It is possible, however, that these deposits are not present, or if present, not significant, in one or more of the sites, and should this be confirmed through further survey and investigation, the stated residual effect would be re-assed.

Removal or disturbance of archaeological resource – shipwrecks

Magnitude of impact

13.11.3.9 Maintenance activities including the deployment of vessel moorings, may affect a variety of heritage assets resulting in a potential effect on shipwrecks, should they be present within each site.

13.11.3.10 The maximum and most likely design scenarios for each site are set out in Table 13.11 above. The impact is predicted to be of local spatial extent, short duration, intermittent and no reversibility. It is predicted that the impact would affect the receptor directly. The magnitude is therefore, considered to be minor.

Sensitivity of the receptor

13.11.3.11 Each META site's marine archaeological potential and heritage value is assessed in 13.7, and is summarised in relation to the archaeological resource, including wrecks, in Table 13.17 below.

Table 13.20: Archaeological resource including wrecks – potential and heritage value

Non-designated heritage assets	Archaeological Potential	Heritage Value
Warrior Way (site 6)		
Area 45 of Dyfed Archaeological Trust's "Milford Haven Waterway Ports & Harbours Project" survey (Major Bar / Landing Point – Pembroke Ferry and Burton landing points)	Deemed to be of high archaeological potential, however, the potential is assessed as **low** for the site, which lies at the southern edge of Area 45, in the centre of the waterway, and therefore furthest from the landing points.	**Locally** important (low evidential and historic value)
Dale Roads (site 7)		
Area 34 of Dyfed Archaeological Trust's "Milford Haven Waterway Ports & Harbours Project" survey (Major Bay / Landing Point – Dales Road)	Deemed to be of high archaeological potential, however, l**ow** archaeological potential for the early Prehistoric period is assessed for the site due to distance to Dales Road Bay itself.	**Locally** important (low evidential and historic value)
Area 25 of Dyfed Archaeological Trust's "Milford Haven Waterway Ports & Harbours Project" survey (Bay – Lindsway Bay)	Lindsway Bay is deemed to be of **medium** archaeological potential for the post-Medieval and Modern periods as a small sandy bay, without easy access, likely to have seen little use, although historically in use as a firing range.	**Locally** important (low evidential, historic and communal value)
East Pickard Bay (site 8)		
Unnamed Wreck / 'Highland Home'	The site itself has **high** potential for deposits dated to the post-Medieval period, specifically associated with the wreck mapped on site, believed to be the Highland Home.	**Locally** important (low evidential and historic value)
Marine archaeological resource - wrecks	The site has **low** potential for unknown wrecks dating to the post-Medieval Modern period to be located within the site.	**Locally** important (low evidential and historic value)

13.11.3.12 The potential wrecks on all three sites are deemed to be of low vulnerability, low recoverability and low value. The sensitivity of the receptor is therefore, considered to be low.

Significance of the effect

13.11.3.13 Overall, the sensitivity of the receptor is considered to be low and the magnitude of the impact is deemed to be minor. The effect will, therefore, be of **minor adverse significance**.

13.11.3.14 No surveys were undertaken to verify the baseline, and therefore the exact location, condition and extent of wrecks cannot be confidently established. Although this potential has been established within acceptable levels, these data limitations may affect the certainty/predictability of the EIA.

Further mitigation and residual effect

13.11.3.15 Paragraph 13.11.2.9 outlines preliminary surveys proposed at each site.

13.11.3.16 Archaeological recording of wrecks is a mostly non-destructive process and in principle, allows preservation *in situ* of remains, should this be possible within the proposed development. Should preliminary surveys confirm the presence of wrecks in either site, the effect from the proposed development could be reduced to **negligible** if these assets are avoided through design.

13.11.3.17 It is also possible, that these deposits are not present, or if present, not significant, in one or more of the sites, and should this be confirmed through further survey and investigation, the stated residual effect would also be reduced to **negligible**.

13.11.3.18 If wrecks are present in any of the sites, but they cannot be avoided through design, the residual effect will remain **minor adverse significance**, which is not significant in EIA terms.

Future monitoring

13.11.3.19 No marine archaeology monitoring to test the predictions made within the operation and maintenance phase impact assessment is considered necessary, however, the LCG No. 15 (NPRN 273,231), 180 m to the south of the East Pickard Bay (site 8) site, is a Protected Place under the Protection of Military Remains Act (1986). This Act makes it an offence to interfere with the wreckage of any designated vessel without a licence, and appropriate consultation should be made with regards to work in the vicinity to establish the radius of the protected area.

13.11.4 Decommissioning phase

13.11.4.1 The impacts of the decommissioning of the META project have been assessed on marine archaeology. The environmental effects arising from the decommissioning of the META project are listed in Table 13.11, along with the maximum and most likely design scenario against which each decommissioning phase impact has been assessed. A conclusion of significance of effect will be made for the META project as a whole, and for each META phase 2 site individually where appropriate (Warrior Way (site 6), Dale Roads (site 7); East Pickard Bay (site 8)).

13.11.4.2 A description of the potential effect on marine archaeology receptors resulting from each identified impact is given below.

Removal or disturbance of sediments – buried prehistoric deposits

13.11.4.3 The effects of decommissioning activities are expected to be the same or similar to the effects from the installation. The significance of effect is therefore **minor adverse significance** (see paragraph 13.11.2.7).

Removal or disturbance of archaeological resource – shipwrecks

13.11.4.4 The effects of decommissioning activities are expected to be the same or similar to the effects from the installation. The effect will, therefore, be of **minor adverse significance** (see paragraph 13.11.2.16).

Sediment deposition on the seabed

13.11.4.5 The effects of decommissioning activities are expected to be the same or similar to the effects from the installation. The effect will, therefore, be of **negligible** to **minor adverse significance** (see paragraph 13.11.2.29).

13.12 Cumulative Impact Assessment

13.12.1 Methodology

13.12.2 Screening of other projects and plans into the Cumulative Impact Assessment

13.12.2.1 The Cumulative Impact Assessment (CIA) takes into account the impact associated with the META project together with other projects and plans. The projects and plans selected as relevant to the CIA presented within this chapter are based upon the results of a screening exercise. Each project has been considered on a case by case basis for scoping in or out of this chapter's assessment based upon data confidence, effect-receptor pathways and the spatial/temporal scales involved.

13.12.2.2 In undertaking the CIA for the META project, it is important to bear in mind that other projects and plans under consideration will have differing potential for proceeding to an operational stage and hence a differing potential to ultimately contribute to a cumulative impact alongside the META project. For example, relevant projects and plans that are already under construction are likely to contribute to cumulative impact with the META project (providing effect or spatial pathways exist), whereas projects and plans not yet approved or not yet submitted are less certain to contribute to such an impact, as some may not achieve approval or may not ultimately be built due to other factors.

13.12.2.3 Table 13.21 lists the projects considered within the marine archaeology CIA.

13.12.2.4 The following projects have not been considered within the marine archaeology CIA due to lack of receptor-impact pathway (see table 4.6, chapter 4: Environmental Assessment Methodology for further details on these projects):

- Neyland: Dredge disposal site (LU190);
- University of Swansea: bubble curtain research;
- University of Swansea: deployment of marker buoys; and
- Ministry of Defence - ongoing operations.

Table 13.21: Projects considered within the marine archaeology CIA

Phase	Developer - Reference	Distance from Warrior Way (km)	Distance from Dale Roads (km)	Distance from East Pickard Bay (km)	Spatial/ temporal overlap with the META project	Details	Date of Installation/ operation	Further Consideration in technical chapters required?	Justification
Dredging sites									
Installation/ operation and maintenance	Neyland Yacht Haven ltd. - DML1743	1.1	12.3	10.5	No spatial overlap with consented areas. Potential for temporal overlap.	Dredge and disposal from Neyland Marina - annual volume 5500 m^3.	13/12/2017-12/12/2020	No	There is no spatial overlap with consented areas, and therefore no dredging activities listed here are considered to materially affect the baseline.
Installation/ operation and maintenance	Milford Haven Port Authority - DML1646	1.3	1.5	2.5	No spatial overlap with consented areas Temporal overlap with all sites.	Maintenance dredging throughout the Milford Haven. Annual volume 362500 m^3.	09/03/2017-08/03/2022	No	
Research									
Installation	Greenlink Interconnector Ltd. - RML1827	10.4	6.0	0.0	Spatial overlap with East Pickard Bay (site 8). Temporal overlap with East Pickard Bay.	Ground investigations	07-2018 - no end date given	Yes	Research operations are likely to have vessels present, with equipment for undertaking ground truthing surveys therefore this project cannot be excluded from further consideration in the CIA.
Infrastructure									
Installation/ operation and maintenance	Neyland Yacht Haven Ltd - CML1658	1.1	12.3	10.5	No spatial overlap with consented areas Temporal overlap with Warrior Way (site 6)	Pile replacement in Neyland Marina.	21/11/2016-20/11/2019	No	There is no spatial overlap wth consented areas, and therefore no installation/operation ad maintenance activities listed here are considered to materially affect the baseline.
Installation/ operation and maintenance	Mixed use developments - Local Planning Authority Reference: 14/0158/PA	7.3	5.3	5.6	No spatial overlap with any consented areas. Temporal overlap remains unknown due to insufficient information on start and end dates.	Undetermined planning application. Demolition of several existing buildings and the mixed-use redevelopment of Milford Waterfront comprising up to 26,266 m^2 of commercial, hotel, leisure, retail and fishery related floorspace. Up to 190 residential properties, up to 70 additional marina berths, replacement boat yards, landscaping, public realm enhancements, access and ancillary works. A decision on this application is yet to be made by the local planning authority.	EIA screening decision was returned on the 30/04/2018 - no further information has been provided	No	

Phase	Developer - Reference	Distance from Warrior Way (km)	Distance from Dale Roads (km)	Distance from East Pickard Bay (km)	Spatial/ temporal overlap with the META project	Details	Date of Installation/ operation	Further Consideration in technical chapters required?	Justification
Installation/ operation and maintenance / decommissioning	Greenlink Interconnector Ltd. - Government reference: qA1296053	10.4	6.0	0.0	Spatial overlap with East Pickard Bay (site 8). Temporal overlap will occur throughout the duration of the META project	The Project is a 500MW subsea electricity interconnector linking the power markets in Ireland and Great Britain and is planned for commissioning in 2023. As an EU Project of Common Interest, it is one of Europe's most important energy infrastructure projects. The interconnector is planned to make Landfall at Fresh Water West beach to the south of the mouth of the Waterway.	07/2018 - ongoing	Yes	Given potential for temporal and spatial overlap with META phase 2 sites this project cannot be excluded from further consideration in the CIA.
Installation/ operation and maintenance / decommissioning	Bombora Wave Energy	11.6	5.0	0.0	Spatial overlap with East Pickard Bay (site 8) within META test area. Potential for temporal overlap	Bombora on- and off-shore infrastructure and deployment of Bombora mWave device at East Pickard Bay. This is to include device deployment (mWave device), installation of temporary communications cable between mWave device and temporary onshore control station to be located above East Pickard Bay, and installation and operation of temporary control station onshore. Laying of marine cable to shore and through intertidal area at East Pickard Bay to involve up to 3 days cable laying below MHWS using cable lay vessel and up to four vessels, including guard boat. Cable to be laid on seabed and kept in place in sandy sediment by using six, three tonne rock bags covering an area of 4.5 m^2 per rock bag. Where the marine cable traverse's potential reefy habitat, it will follow natural rock channel. In the intertidal area, the cable will be laid through a natural gully, or up the vertical gully side and attached to the semi-vertical rock face with rock bolts using hand held tools. JCB will pull the cable through the intertidal area from a location above MHWS.	Q1 2020	Yes	There is the potential for spatial overlap in the META East Pickard Bay test area (site 8) and temporal overlap with all META project sites installation and operation and maintenance phases, therefore this project cannot be excluded from further consideration in the CIA.
Pembroke Dock Marine Projects									
Installation/ operation and maintenance	Milford Haven Port Authority - SC1810: Pembroke Dock Infrastructure	2.0	11.3	8.8	No spatial overlap with consented sites. Potential for temporal overlap.	Pembroke Dock redevelopment Scoping Report submitted. The intention of the Project is to create a flexible and efficient port-related office, industrial, warehousing and distribution, and ancillary operations infrastructure. This will involve the redevelopment of its existing space to incorporate increased deep-water access, internal and external heavy fabrication areas, construction of MEECE and Education/Skills Facility and the construction of a heavy lift facility.	Q3 2019 – Q3 2023	No	There is no spatial overlap with consented areas, and therefore no installation/operation ad maintenance activities listed here are considered to materially affect the baseline.
Installation/ operation and maintenance / decommissioning	Marine Energy Wales - DEML1875	1.7	11.7	9.4	No spatial overlap with any of the consented areas. Potential for temporal overlap	Marine Energy Test Area - Phase 1 Band 2 application submitted. The Project aims to create pre-consented test areas within the Pembroke Dock area. The test areas will have licensable activities to suit testing of initial stage marine renewable devices. These	21/04/2019-21/04/2029	No	

Phase	Developer - Reference	Distance from Warrior Way (km)	Distance from Dale Roads (km)	Distance from East Pickard Bay (km)	Spatial/ temporal overlap with the META project	Details	Date of Installation/ operation	Further Consideration in technical chapters required?	Justification
						include testing of non-operating components and subassemblies. No full-scale testing is to be support within the test areas			
Installation/ operation and maintenance / decommissioning	Wave Hub Ltd. - SC1082	31.4	31.1	25.8	No spatial overlap with any consented areas. Potential for temporal overlap as the projects are linked.	Demonstration zone Scoping Report submitted The Project entails the development of 90 km2 of seabed with water depths of approximately 50 metres and a wave resource of approximately 19 kW/m; to support the demonstration of wave arrays with a generating capacity of up to 30MW for each project. Consent for this Project could be achieved in 2022, infrastructure could be built by 2024 and the first technology could be installed in 2025.	Jul-18	No	

13.12.3 Cumulative Impact Assessment

13.12.3.1 A description of the significance of cumulative effects upon marine archaeology receptors arising from each identified impact is given below.

13.12.3.2 The only consented scheme with the potential to have a cumulative impact on the heritage assets identified in the above assessment is the Greenlink Interconnector Ltd as demonstrated in Table 13.21. This consented scheme has a specific overlap with East Pickard Bay (site 8), as set out below. Bombora Wave Energy (Bombora) proposed works also have the potential to overlap spatially and temporally with the META project and have therefore been considered further in the CIA.

Removal or disturbance of sediments – buried prehistoric deposits

13.12.3.3 There is potential for cumulative removal or disturbance of sediments as a result of the META project, the proposed Bombora works below MHWS including the installation of the mWave device and installation of a temporary marine communications cable to MHWS, and the Greenlink Interconnector site surveys and marine cable installation, resulting in a potential effect on near-surface and deeply buried prehistoric deposits.

Magnitude of impact

13.12.3.4 Sediment disturbance associated with the ground investigation works and marine cable installation associated with the Greenlink Interconnector and installation of the Bombora marine cable and mWave device are, like the META Project, likely to be of local spatial extent, long-term duration over the consented period of the project, but intermittent (short-term installation activities) and not reversible. It is predicted that the impact would affect the potential receptors directly. The cumulative magnitude is therefore, considered to be **minor**.

Sensitivity of receptor

13.12.3.5 The potential Prehistoric deposits East Pickard Bay (site 8) are deemed to be of medium vulnerability, and medium value. The sensitivity of the receptor is therefore, considered to be **medium**.

Significance of effect

13.12.3.6 Overall, the sensitivity of the receptor is considered to be medium and the magnitude of the impact is deemed to be minor. The effect will, therefore, be of **minor adverse significance** which is not significant in EIA terms.

13.12.3.7 No surveys were undertaken to verify the baseline, and therefore the exact location, condition and extent of buried prehistoric deposits cannot be confidently established. Although this potential has been established within acceptable levels, these data limitations may affect the certainty of the assessment.

Further mitigation and residual effect

13.12.3.8 Paragraphs 13.11.2.9 and 13.11.2.10 outline preliminary surveys proposed at East Pickard Bay (site 8). Should the archaeological mitigation proposed confirm the presence of Prehistoric archaeological deposits at East Pickard Bay (site 8), the effect from the proposed development would be reduced to **negligible** significance. It is possible however, that these deposits are not present, or if present, not significant, in one or more of the sites, and should this be confirmed through further survey and investigation, the stated residual effect would be re-assessed.

Removal or disturbance of archaeological resource – shipwrecks

13.12.3.9 There is potential for sediment deposition during the installation (and decommissioning) of marine renewable devices and the Bombora marine cable at this site to result in a potential effect on known and potential shipwrecks.

13.12.3.10 The maximum and most likely design scenarios for each site are set out in Table 13.11 above. The impact of device installation on suspended sediment concentrations (SSC) is assessed in chapter 5: Coastal Processes. That assessment considers that the very finest material disturbed from installation and decommissioning activities would travel in the order of 50 m from the East Pickard Bay site (site 8) during an average tide.

Magnitude of impact

13.12.3.11 Removal or disturbance of archaeological resource - shipwrecks is predicted to be of local spatial extent, long-term duration, but intermittent (short-term installation and decommissioning activities) and reversible for both the META project (East Pickard Bay (site 8)), the Greenlink Interconnector, and Bombora marine cable and mWave device. It is predicted that the impact will affect the receptor indirectly. The magnitude is therefore, considered to be **negligible**.

Sensitivity of receptor

13.12.3.12 The potential marine archaeological resource, including wrecks is deemed to be of low vulnerability, low recoverability and low value. The sensitivity of the receptor is therefore, considered to be **low**.

Significance of effect

13.12.3.13 Overall, the sensitivity of the receptor is considered to be low and the magnitude of the impact is deemed to be minor. The effect will, therefore, be of **minor adverse significance**.

13.12.3.14 No surveys were undertaken to verify the baseline, and therefore the exact location, condition and extent of wrecks cannot be confidently established. Although this potential has been established within acceptable levels, these data limitations may affect the certainty/predictability of the EIA.

Further mitigation and residual effect

13.12.3.15 Paragraph 13.11.2.9 outlines preliminary surveys proposed at East Pickard Bay (site 8).

13.12.3.16 Archaeological recording of wrecks is a mostly non-destructive process and in principle, allows preservation *in situ* of remains, should this be possible within the proposed development. Should preliminary surveys confirm the presence of wrecks in either site, the effect from the proposed development could be reduced to **negligible** if these assets are avoided through design.

13.12.3.17 It is also possible, that these deposits are not present, or if present, not significant, in one or more of the sites, and should this be confirmed through further survey and investigation, the stated residual effect would also be reduced to **negligible**.

13.12.3.18 If wrecks are present in any of the sites, but they cannot be avoided through design, the residual effect will remain **minor adverse significance**, which is not significant in EIA terms.

Sediment deposition on the seabed

13.12.3.19 There is potential for sediment deposition during the installation (and decommissioning) of the marine communications cable (to MHWS) at East Pickard Bay (site 8) associated with the proposed Bombora project, ground investigation and marine cable installation works associated with GreenLink Interconnector, and marine renewable devices at this site (site 8) resulting in a potential cumulative impact on potential heritage assets.

13.12.3.20 The impact of device installation on suspended sediment concentrations (SSC) is assessed in chapter 5: Coastal Processes. That assessment considers that the very finest material disturbed from installation and decommissioning activities would travel in the order of 50 m from the East Pickard Bay site (site 8) during an average tide.

Magnitude of impact

13.12.3.21 Cumulative sediment deposition on the seabed associated with the META project, the Bombora mWave installation and temporary marine cable, and the Greenlink Interconnector, are predicted to be of local spatial extent, long-term duration, but intermittent (short-term installation and decommissioning activities) and reversible. It is predicted that the impact will affect the receptor indirectly. The magnitude is therefore, considered to be **negligible**.

Sensitivity of receptor

13.12.3.22 The potential for Prehistoric deposits on East Pickard Bay (site 8) is deemed to be of medium vulnerability, medium recoverability and medium value. The sensitivity of this receptor is therefore, considered to be **medium**.

13.12.3.23 The potential marine archaeological resource, including wrecks, on East Pickard Bay (site 8) is deemed to be of low vulnerability, low recoverability and low value. The sensitivity of the receptor is therefore, considered to be **low**.

Significance of effect

13.12.3.24 Overall, the sensitivity of the above receptors is considered to be low to medium and the magnitude of the impact is deemed to be negligible. The effect will, therefore, be of **negligible** to **minor adverse significance**.

Further mitigation and residual effect

13.12.3.25 *No further mitigation is proposed for this non-significant effect.*

Future monitoring

13.12.3.26 No marine archaeology monitoring to test the predictions made within the CIA is considered necessary, however the LCG No. 15 (NPRN 273,231), 180 m to the south of East Pickard Bay (site 8), is a Protected Place under the Protection of Military Remains Act (1986). This Act makes it an offence to interfere with the wreckage of any designated vessel without a licence, and appropriate consultation should be made with regards to work in the vicinity to establish the radius of the protected area.

13.13 Transboundary effects

13.13.1.1 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 from the META project upon the interests of other EEA States.

13.14 Inter-related effects

13.14.1.1 Inter-relationships are considered to be the impacts and associated effects of different aspects of the proposal on the same receptor. These are considered to be:

- Project lifetime effects: Assessment of the scope for effects that occur throughout more than one phase of the project (construction/installation, operation and maintenance, and decommissioning), to interact to potentially create a more significant effect on a receptor than if just assessed in isolation in these three key project stages (e.g. subsea noise effects, operational turbines, vessels and decommissioning); and
- Receptor led effects: Assessment of the scope for all effects to interact, spatially and temporally, to create inter-related effects on a receptor. As an example, all effects on [chapter topic], such as [direct habitat loss or disturbance, sediment plumes, scour, jack-up vessel use etc.], may interact to produce a different, or greater effect on this receptor than when the effects are considered in

isolation. Receptor-led effects might be short term, temporary or transient effects, or incorporate longer term effects.

13.14.1.2 No inter-related effects arising from the META project on marine archaeology have been identified.

13.15 Conclusion and summary

13.15.1.1 The potential impact of the installation, operation and maintenance and decommissioning of the META project has been assessed for each site: Warrior Way (site 6), Dale Roads (site 7) and East Pickard Bay (site 8).

13.15.1.2 There is potential for removal or disturbance of sediments caused by the installation (and decommissioning) of marine renewable devices at all sites resulting in a potential direct and non-reversible effect on near-surface and deeply buried Prehistoric deposits, as well as a potential effect on shipwrecks, should they be present within each site.

13.15.1.3 There is also some potential for sediment deposition during the installation (and decommissioning) of marine renewable devices at all sites, resulting in a potential temporary effect on a variety of heritage assets.

13.15.1.4 The maximum and most likely design scenarios for each site are set out in Table 13.11 above. The impact of devices on suspended sediment concentrations (SSC) is assessed in chapter 5: Coastal Processes. That assessment considers that the very finest material disturbed from installation and decommissioning activities would travel in the order of 600 m from the Dale Roads site (site 7); 50 m from the East Pickard Bay site (site 8); and 100 m from the Warrior Way site (site 6) during an average tide.

13.15.1.5 The Warrior Way tidal site (site 6) may experience temporary increases in suspended sediment concentration during the installation phase. Deployment at this site is temporary for a maximum of 3 months and any effects would be transitory.

13.15.1.6 The Dale Roads (site 7) may experience temporary increases in suspended sediment concentration during the installation phase should the maximum design scenario be implemented. All impacts would be transitory and following decommissioning after a maximum period of 3 months, coastal processes would return to those experienced prior to device testing.

13.15.1.7 The East Pickard Bay (site 8) would be used for the largest full-scale wave devices and floating offshore wind. However only minor changes may be seen in seabed transport due to the open bay location and device alignment (chapter 5: Coastal Processes). As with the other sites, deployment is temporary for a maximum of 18 months and any effects would be transitory and wave climate and sediment transport would return to previous levels.

13.15.1.8 In conclusion due to the limited number and size of devices, and the temporary nature of deployments, the impacts of the META project is assessed as negligible to minor adverse significance, which is not significant in EIA terms.

13.15.1.9 Table 13.22 provides a summary of the potential impacts, mitigation measures and residual effects during the installation, operation and maintenance, and decommissioning phases of the META project.

Table 13.22: Summary of potential environment effects, mitigation and monitoring at the META project.

Description of impact	Measures adopted as part of the project	Magnitude of impact	Sensitivity of receptor	Significance of effect	Additional measures	Residual effect	Proposed monitoring
Installation phase							
Removal or disturbance of sediments – buried prehistoric deposits	Installation works will be undertaken in accordance with the EMP	Minor	Medium	Minor adverse (not significant in EIA terms)	Preliminary survey – check by archaeologist recommended	Negligible	None
Removal or disturbance of archaeological resource – shipwrecks	Installation works will be undertaken in accordance with the EMP	Minor	Low	Minor adverse (not significant in EIA terms)	Preliminary survey – check by archaeologist recommended	Negligible to Minor adverse (not significant in EIA terms)	None
Sediment deposition on the seabed	Installation works will be undertaken in accordance with the EMP	Negligible	Low - Medium	Negligible to Minor adverse (not significant in EIA terms)	None	Negligible to Minor adverse (not significant in EIA terms)	None
Operation and maintenance phase							
Removal or disturbance of sediments - buried prehistoric deposits	None	Minor	Medium	Minor adverse (not significant in EIA terms)	Preliminary survey – check by archaeologist recommended	Negligible	None
Removal or disturbance of archaeological resource – shipwrecks	None	Minor	Low	Minor adverse (not significant in EIA terms)	Preliminary survey – check by archaeologist recommended	Negligible to Minor adverse (not significant in EIA terms)	None
Decommissioning phase							
Removal or disturbance of sediments –buried prehistoric deposits	Decommissioning works will be undertaken in accordance with the EMP)	Minor	Medium	Minor adverse (not significant in EIA terms)	Preliminary survey – check by archaeologist recommended	Negligible	None
Removal or disturbance of archaeological resource – shipwrecks	Decommissioning works will be undertaken in accordance with the EMP)	Minor	Low	Minor adverse (not significant in EIA terms)	Preliminary survey – check by archaeologist recommended	Negligible to Minor adverse (not significant in EIA terms)	None
Sediment deposition on the seabed	Decommissioning works will be undertaken in accordance with the EMP)	Negligible	Low - Medium	Negligible to Minor adverse (not significant in EIA terms)	None	Negligible to Minor adverse (not significant in EIA terms)	None

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