UNIVERSITY OF Southampton

Rapid Coastal Zone Assessment Survey for South-West England

North Coast of Devon (excluding Exmoor) and North Coast of Cornwall

Phase One Desk-Based Assessment

Historic England Project 6047

Michael Grant, Kieran Westley and Fraser Sturt

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Abbreviations

AAR	Amino Acid Racemization
ADS	Archaeological Data Service
AMIE	Archives Monuments Information England
AMS	Accelerator Mass Spectrometry
AONB	Area of Outstanding Natural Beauty
ATL	Advance The Line
BAP	Biodiversity Action Plan
BGS	British Geological Survey
BP	Before Present. In Radiocarbon Dating to mean before AD 1950
CA	Character Area
Cal	Calibrated
CAU	Cornwall Archaeological Unit
CCA	Countryside Character Area
CCO	Channel Coast Observatory
CD	Chart datum
CGS	County Geological Sites
CHeRISH	Coastal Heritage Risk - Imagery in Support of Heritage Management
CHP	Civil Hydrography Programme
CISCAG	Cornwall and Isles of Scilly Coastal Advisory Group
CISI	Cornwall Industrial Settlements Initiative
CITiZAN	Coastal and Intertidal Zone Archaeological Network
CSUS	Cornwall and Scilly Urban Survey
DAC	Data Archive Centre
DEFRA	Department for Environment, Food & Rural Affairs
DHCMTS	Devon Historic Market & Coastal Towns Survey
DSM	Digital Surface Model

DTM	Digital Terrain Model
EA	Environment Agency
EEZ	Exclusive Economic Zone
EH	English Heritage
EHA	English Heritage Archive GIS Geographical Information System
EIA	Environmental Impact Assessment
ELC	European Landscape Convention
ESR	Electron Spin Resonance
FCERM	Flood and Coastal Erosion Risk Management
GIA	Glacial Isostatic Adjustment
GIS	Geographical Information System
HBSMR	Historic Buildings, Sites and Monuments Record
HE	Historic England
HER	Historic Environment Record
HLC	Historic Landscape Character
HSC	Historic Seascape Characterisation
HTL	Hold The Line
HUCT	Historic Urban Character Types
ICZM	Integrated Coastal Zone Management
IRSL	InfraRed Stimulated Luminescence
IHO	International Hydrographic Organisation
ISIS	Irish Sea Ice Stream
Ka	Kiloannum (Thousand years)
LAT	Lowest Astronomical Tide
LCA	Landscape Character Assessment
LGAP	Local Geodiversity Action Plan
LiDAR	Light Detection and Ranging

LLCA	Local Landscape Character Assessment
LNR	Local Nature Reserve
Ma	Megaannum (Million years)
MA	Management Area
MCA	Marine Character Area
MCA	Maritime and Coastguard Agency
MCZ	Marine Conservation Zone
MHW	Mean High Water
MHWS	Mean High Water Springs
MIS	Marine Isotope Stage
MLWST	Mean Low Water Spring Tide
MMO	Marine Management Organisation
MoLA	Museum of London Archaeology
MNR	Marine Nature Reserve
MNS	Map Note Sheet
MPS	Marine Policy Statement
MR	Managed realignment
NAI	No Active Intervention
NCA	National Character Area
NCCE	Nature Conservancy Council for England
NCERM	National Coastal Erosion Risk Mapping
NDASCAG	North Devon and Somerset Coastal Advisory Group
NE	Natural England
NGR	National Grid Reference
NHLE	National Heritage List for England
NHPCP	National Heritage Protection Commissions Programme
NIA	Nature Improvement Area

NMP	National Mapping Programme
NNR	National Nature Reserve
NRHE	National Record of the Historic Environment
NPPF	National Planning Policy Framework
NT	National Trust
OD	Ordnance Datum
OS	Ordnance Survey
OSL	Optically Stimulated Luminescence
OWF	Offshore Windfarm
PAS	Portable Antiquities Scheme
PCO	Plymouth Coastal Observatory
PDZ	Policy Development Zone
PGA	Pan Government Agreement
PPG	Planning Policy Guidance
PSA	Policy Scenario Areas
PU	Policy Unit
RAF	Royal Air Force
RCHME	Royal Commission on the Historical Monuments of England
RCZAS	Rapid Coastal Zone Assessment Survey
RDPE	Rural Development Programme for England
RIGS	Regionally Important Geological and Geomorphological Sites
ROV	Remotely Operated Vehicle
RRH	Remote Radar Head
RSL	Relative Sea Level
SAC	Special Area of Conservation
SAR	Single Aliquot Regenerative
SCA	Seascape Character Area

SCT	Seascape Character Type
SLIP	Sea Level Index Point
SPA	Special Protection Area
SPD	Supplementary Planning Document
SLIP	Sea Level Index Point
SMA	Sensitive Marine Area
SSSI	Site of Special Scientific Interest
SMP	Shoreline Management Plan
SWCP	South West Coast Path
SWRCMP	Southwest Strategic Regional Coastal Monitoring Programme
TCN	Terrestrial Cosmogenic Nuclide
TL	Thermoluminescence
MHW	Mean High Water
rMCZ	recommended Marine Conservation Zone
SWARF	South West Archaeological Research Framework
UKHO	UK Hydrographic Office
UNESCO	United Nations Educational, Scientific and Cultural Organization
USAAF	United States Army Air Force
WHS	World Heritage Site
WNBR	World Network of Biosphere Reserves

Summary

The national programme of Rapid Coastal Zone Assessment Surveys (RCZAS), funded by Historic England, is designed to enhance and update coastal Historic Environment Records (HERs) through a two-phased approach. Phase 1 (Desk-based Assessment) assesses the data available on the character of the historic environment within the project area, and potential threats to heritage assets, in order to design a strategy for Phase 2 (Field Survey) which prioritises areas where heritage assets may be most at risk.

This report describes the results of the Phase 1 component of the RCZAS for the North Coasts of Cornwall and Devon (excluding Exmoor) carried out in 2017 and 2018 by COARS, Southampton University. The aims of the project were to:

- enhance the Cornwall and Devon HERs and the National Record of the Historic Environment;
- inform future coastal and shoreline management;
- provide an overview of coastal change from the Palaeolithic onwards;
- assess the degree and nature of threat to coastal historic assets;
- provide a broad assessment of the likely archaeological potential and vulnerability of the resource;
- identify future research priorities; and
- enhance public understanding and enjoyment of the coastal heritage.

The study area extended from Combe Martin in Devon to Land's End in Cornwall. It included an assessment of surviving remains along the open coast and its tidal estuaries, extending up to 1km inland from Mean High Water (MHW), with 2km inland along the Taw-Torridge, Camel and Hayle estuaries. Offshore the boundary extended up to 25 km from MHW, utilising available bathymetry data from the Marine and Coastguard Agency Civil Hydrography Programme (MCA CHP). Overall, the project added, updated or amended 7757 records, with 1610 new sites created for Cornwall and 1249 for Devon. An extensive review of the wreck record within the intertidal and offshore demonstrated the existence of notable discrepancies between the different datasets, reinforcing the need to utilise multiple sources when analysing the offshore record. An extensive review of the Quaternary deposits along the coastline has demonstrated a number of areas where future research should take place, notably through resolving questions relating to Quaternary glaciation, the age of Pleistocene raised beaches, and the distribution and age of submerged forests and blown sand deposits.

Threats to the coastal historic environment resource can be characterised in two ways: 'natural' threats such as coastal change and rising sea-levels and 'anthropogenic' threats including coastal defence schemes, infrastructure works and visitor pressure. An assessment of the threats posed from coastal erosion demonstrated that the most common known sites at risk, under current SMP coastal management proposals, are cliff castles, barrows, cliff-top quarries, mines, footpaths, World War II features, coastal-edge graves / cremations, limekilns, submerged forests and intertidal wreck sites. In some stretches of the coastline settlements, which include a number of listed buidlings, are also potentially at risk under current SMP proposals. A total of 316 sites have been identified at risk from coastal erosion under the current SMP proposals, of which 65 are protected sites listed within the National Heritage List for England (NHLE). The north Devon coastline contains a stretch of 'complex cliffs between Clovelly and Peppercombe that have inherent uncertainties with predicting the timing and extent of erosion, with the settlement of Buck's Mills potential at greatest risk from coastal

erosion as current SMP proposals are unclear over whether coastal defences will be maintained for this historic settlement. Models of future flooding (both coastal and riverine) suggest potentially 789 sites are at risk within the study area, including 113 sites at high flood risk, under the current flood prevention strategy.

Research priorities and themes identified by the desk-based assessment are presented in the context of the regional themes and research aims set out in the South West Archaeological Research Framework (SWARF). Specific sites / themes that would benefit from further research or work include:

- Investigation of, and dating, of Pleistocene deposits
- Submerged forests and palaeolandscapes
- Analysis of prehistoric artefact scatters
- Intertidal wreck sites
- Research and surveying of the cliff castle scheduled monuments
- Assessment and recording of buildings associated with safety at sea: lifeboat stations and coastguard lookouts and cottages
- Condition assessment of World War II defences at risk
- Coastal industry, quarrying and quays
- Coastal settlement characterisations
- Shipwreck burials and coastal cemeteries

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1 Introduction

1.1 Project Background

England's coastal zone contains a legacy of historic assets including a complex array of fragile and irreplaceable archaeological remains, historic buildings, structures, and landscapes. These remains are vulnerable to a wide range of threats, including anthropogenic pressures such as those associated with commercial development and shoreline management, as well as natural processes of coastal change. The coast has always been a dynamic environment, but it is now generally accepted that coastal physical processes are being accelerated and magnified by changes in annual rainfall distribution and wave direction, relative sea-level rise and an increase in storm incidence, all associated with wider climate change.

Over recent decades it has been recognised by coastal managers and Government that the entire English coastline cannot be maintained in its present form through the 21st century and that, where possible, natural processes should be allowed to operate. Coastal management is now viewed more holistically, taking into account not just the need to protect life and property but also environmental and social factors, as part of the move towards Integrated Coastal Zone Management (ICZM).

Defra's programme of shoreline and estuary management contributes to this development. A Shoreline Management Plan (SMP), for example, provides 'a large-scale assessment of the risks associated with coastal processes and presents a policy framework to reduce these risks to people and the developed, historic and natural environment in a sustainable manner' (Defra 2001; 2005: see also Defra 2003 and McInnes 2003 for further information on coastal management).

The process of Shoreline (and Estuary) Management Plan development is consultative, drawing on information provided by, and balancing the needs of, sectoral interests. Effective participation by the heritage sector depends on identifying coastal historic assets, evaluating their significance and potential, and assessing which may be at risk from coastal change. Data collection, interpretation and synthesis for the Rapid Coastal Zone Assessment Surveys must be directed primarily towards these aims.

In 1997 English Heritage and the RCHME published a joint policy statement on the management of coastal archaeological remains (EH and RCHME 1996) and a nationally based assessment of English coastal archaeology (Fulford et al 1997). These documents were followed by more specific guidance (EH 2003; 2006). The assessment highlighted the poor quality of archaeological records relating to the coast, with the policy statement recommending that: 'The record of coastal archaeology held nationally and locally should continue to be actively developed and enhanced in order to permit effective management of the resource and to facilitate understanding of England's development as a maritime nation.'

Whilst the advantages of thematic surveys on the coast were acknowledged by the assessment, it was also noted that the quality of the available record of coastal remains was highly valuable. As such, in many areas any detailed studies would need to be preceded by rapid baseline surveys allowing a broad assessment of the range of historic assets available at the coast, their significance and their vulnerability.

1.2 Aims and objectives

The broad aims of this project were to:

1. Provide an enhanced HER and National Record of the Historic Environment (NRHE) record for coastal and near-shore marine heritage assets (including palaeoenvironmental deposits), to a nationally agreed common minimum data standard, in order to permit an improved curatorial response to strategic coastal and marine planning or management initiatives at a national and regional level;
2. Provide a factual basis for the initial curatorial response to individual applications for commercial developments or schemes, in advance of more detailed evaluation and mitigation related to Environmental Impact Assessments (EIAs) and/or planning applications;
3. Enhance public understanding and enjoyment of coastal and maritime heritage; and
4. Assist Local Authority curatorial archaeologists in development control.

The broad objectives of this project are:

1. Provide data which is compatible with the needs of other coastal managers, parallel coastal surveys, industry and researchers;
2. Provide an overview of coastal change from the Palaeolithic onwards;
3. Provide an assessment of the degree and nature of threat to coastal historic assets which has regard to the models of future coastal change presented in relevant Shoreline Management Plans;
4. Provide a broad assessment of the likely archaeological potential and vulnerability of all stretches of the coast defined in the project scope;
5. Provide a sound basis for developing management and research priorities in respect of sites and areas of potential with different levels of importance and under different levels of threat

1.3 Methods

1.3.1 Geographical Information System (GIS) database and archive searches

Concordance between the HERs and the NRHE was ensured from the beginning of the project. GIS was used to provide a single platform to carry out the initial production of enhanced data (shapefiles) and, where required xls-based gazetteers, as a structured way to update and create records that could form the reference base for later update of the HERs. This included creation of records for new sites and updates to existing records from archive searches and data collection.

Close and continuous contact was established with Historic England from the earliest stages of the project. Data was MIDAS compliant, and the standard word-lists included in INSCRIPTION were employed. Positional data was supplied in the OSGB36 datum. The existing HER data was exported from the Cornwall and Scilly and Devon County Council HBSMRs as shapefiles and selected for the entire project area. This process was discussed with each of the HERs during the preparation of this project design and there were no problems with data transfer. The NMP data for Cornwall and Devon was already integrated into the HERs, although with limited inclusion in the NRHE.

In addition to the Cornwall and Scilly and Devon County Council HER data, the other map/data sources included:

- National Heritage List for England (NHLE)
- National Record of the Historic Environment (NRHE)
- UKHO Wreck List
- The Portable Antiquities Scheme (PAS) database
- Defence of Britain Project Data
- Ordnance Survey Master Map
- Early OS map editions
- Aerial Photography and LiDAR generated by the Plymouth Coastal Observatory
- Civil Hydrography Programme Bathymetric Survey data
- *c*1840 parish Tithe Award maps and apportionments (digital copy supplied by Devon County Council)
- The draft Shoreline Management Plan (SMP) for Rame Head to Hartland Point and Hartland Point to Anchor Head
- National Coastal Erosion Risk Mapping (NCERM) data from the Environment Agency
- Grey literature reports
- Other relevant documentary sources

All GIS work followed the latest guidelines for Historic England projects involving GIS (Historic England 2015). The GIS methodology for creation of the project GIS database and subsequent enhancement of the HBSMRs is set out in Section 7 .

1.3.2 HER Enhancement

The Cornwall and Isles of Scilly and Devon County Councils HERs were enhanced with the results of the archive searches, using the GIS database created for this project. For Devon this data was integrated into the HER by members of the Devon HER teams; for Cornwall this was carried out by members of the CAU.

1.3.3 Predicted Threat analysis

In order to determine potential and current threats to the heritage assets, the National Coastal Erosion Risk Mapping (NCERM) data from the Environment Agency (EA) was used to create zones delineating the areas likely to be affected by both the preferred coastal management policy (e.g. coastal protection vs natural erosion) outlined within the SMP as well as a No Active Intervention policy (no coastal defences scenario). The EA Flood maps were also examined – these are used in the planning process as a starting point in determining how likely somewhere is to flood. These flood zones indicate the probability of flooding by rivers and the sea. The HER dataset was queried against this data and the level of risk was identified. This data was also compared to the draft SMP, forming the basis for the identification of threats within Chapter 9. The significance of each heritage asset has been considered and sites considered to be of greatest significance and exposed to the greatest level of threat are identified in Appendix 6.

1.4 Structure of this report

This report comprises twelve chapters and seven appendices. Chapter 1 is an introduction to the project. Chapter 2 describes the study area, its geology, coastline and landscape character and relevant strategic historic environment projects. Chapter 3 sets out the strategic historic environment

projects relevant to the study area. Chapter 4 provides an overview of the historic and natural environment designations within the study area. Chapter 5 concerns coastal and marine management. Chapter 6 provides an overview of coastal change from the Palaeolithic to the present day, focusing on the key sedimentary sequences within the study area, changes in the palaeogeography, and current coastal monitoring. Chapter 7 provides the methodology underpinning the RCZAS enhancement procedure, utilising data from the Cornwall and Devon HERs, NRHE, wreck databases, the Portable Antiquities Scheme, Plymouth Coastal Observatory LiDAR and Aerial Photography, MCA Bathymetry and historic maps, and provides examples of the types of enhancements made to the HERs. Chapter 8 gives an overview of the archaeological and historical resource of the study area, divided by the relevant Shoreline Managagement Programme (SMP) Policy Development Zones (PDZs) and Policy Scenario Areas (PSAs), highlighting some of the results from the enhancement stage within each area alongside the existing heritage assets in these areas. Chapter 9 appraises threats to the coastal historic environment resource from predicted coastal erosion and flooding, based upon the current SMP strategy. Chapter 10 presents research priorities and themes for future research in the area, Chapter 11 provides a list of recommendation for future projects and investigation of specific sites. Chapter 12 is a list of references, primary and secondary sources and websites. Appendix 1 is a list of Scheduled Monuments within the study area, Appendix 2 is list of Grade I and Grade II* Listed Buildings, Appendix 3 is a list of Registered Historic Parks and Gardens and Appendix 4 is a list of Protected Wreck sites. Appendix 5 provides further details of new palaeoenvironmental investigations undertaken on the submerged forests at Westward Ho! and Mawgan Porth as part of the RCZAS. Appendix 7 provides a list of sites identified at risk under current predictions of future erosion and flooding.

2 Survey area

2.1 The study area

The main study area for this component of the RCZAS stretches from Combe Martin, Devon (the western boundary of the Exmoor National Park) to Land's End in Cornwall, and also includes the island of Lundy in the Bristol Channel (Figure 2.1). Dialogue with the Cornwall Archaeological Unit (CAU) and Exmoor National Park ensured edge-matching with both adjacent RCZAS; Exmoor (Pink 2018) and South Cornwall (Johns et al. 2019).

The extent and scale of the project study area (Figure 2.2 and Figure 2.3) was discussed with Emma Trevarthen (former Senior Archaeologist, Cornwall and Scilly HER) and Bill Horner (County Archaeologist, Devon County Council) and included an assessment of surviving remains within both the open coast and its tidal estuaries, including the intertidal zone to Lowest Astronomical Tide (LAT) from the coastal strand, and the immediate coastal hinterland. For the Phase 1 Desk-Based Assessment the 'hinterland' was taken to be the equivalent to a 1km buffer of the Mean High Water (MHW) mark. For the Hayle (Management Area (MA) 27.1 to 27.8), Camel (MA 35.1 to 35.9), Torridge (Policy Unit (PU) 7c06 to 7c16) and Taw Estuaries (PU 7c17 to 7c29) a 2km buffer zone was utilised due to the shallower drainage gradients, thicker Holocene sediment infill (e.g. Kidson 1977, 259), potential for buried prehistoric archaeology within the estuaries (e.g. Yelland Stone Row), flood risk (e.g. managed realignment within some Policy Units within the Taw-Torridge Estuary) and higher development pressure (e.g. Torridge Marina proposal and manage catchment-sensitive farming in the Taw, Torridge and North Devon streams catchment).

Extension of the study area up the estuaries was determined by the extent of the SMP policy sub-units. Sediment cells for the study area are fully defined in SMP 17 (Rame's Head to Hartland Point; sediment cells 7a and 7b)) and 18 (Hartland Point to Anchor Head; sediment cells 7c to 7d). The study area for the RCZAS has utilised the MAs / PUs defined within the relevant SMP2 documents (Halcrow 2010; Royal Haskoning 2011), as shown in Figure 2.3).

The offshore limit of the study area was initially set at a minimum of 4km beyond the Mean High Water Mark, encapsulating the area of Known High Archaeological Potential defined during the Waterlands Project (Goodwyn et al. 2010); a pilot project that sought to define areas where marine palaeo-landscapes might exist. Palaeogeographical modelling of this area (section 6.4) has demonstrated that during the Late Pleistocene the coastline would have been located over 15km beyond the current coastline, indicating a greater potential offshore for submerged palaeo-landscapes than has been previously acknowledged along this coastline. As a consequence the seaward limit of the study area was adjusted to coincide with the limit of current International Hydrographic Organisation (IHO) Order 1a swathe bathymetry datasets collected in 2007-2011 (surveys HI1157 and HI1158) as part of the Marine and Coastguard Agency Civil Hydrography Programme (MCA CHP) between Land's End and Shag Point, west of Ilfracombe (shown as <2m resolution bathymetry in Figure 6.19). This extension would also capture a larger wreck record through which a more representative indication of this resource along the coastline could be generated, and spatially refined utilising the recent MCA CHP survey data. The 4km limit was retained for the offshore area between Shag Point and Combe Martin which is currently planned to be surveyed by the CHP during 2019/2020. For the no data 'white ribbon' below Mean Low Water Spring Tide (MLWST) the available bathymetric surveys along this coastline coupled with Plymouth Coastal Observatory (PCO) / Environment Agency

(EA) LiDAR and Aerial Photography were utilised, highlighting the zones where no current data coverage is available.

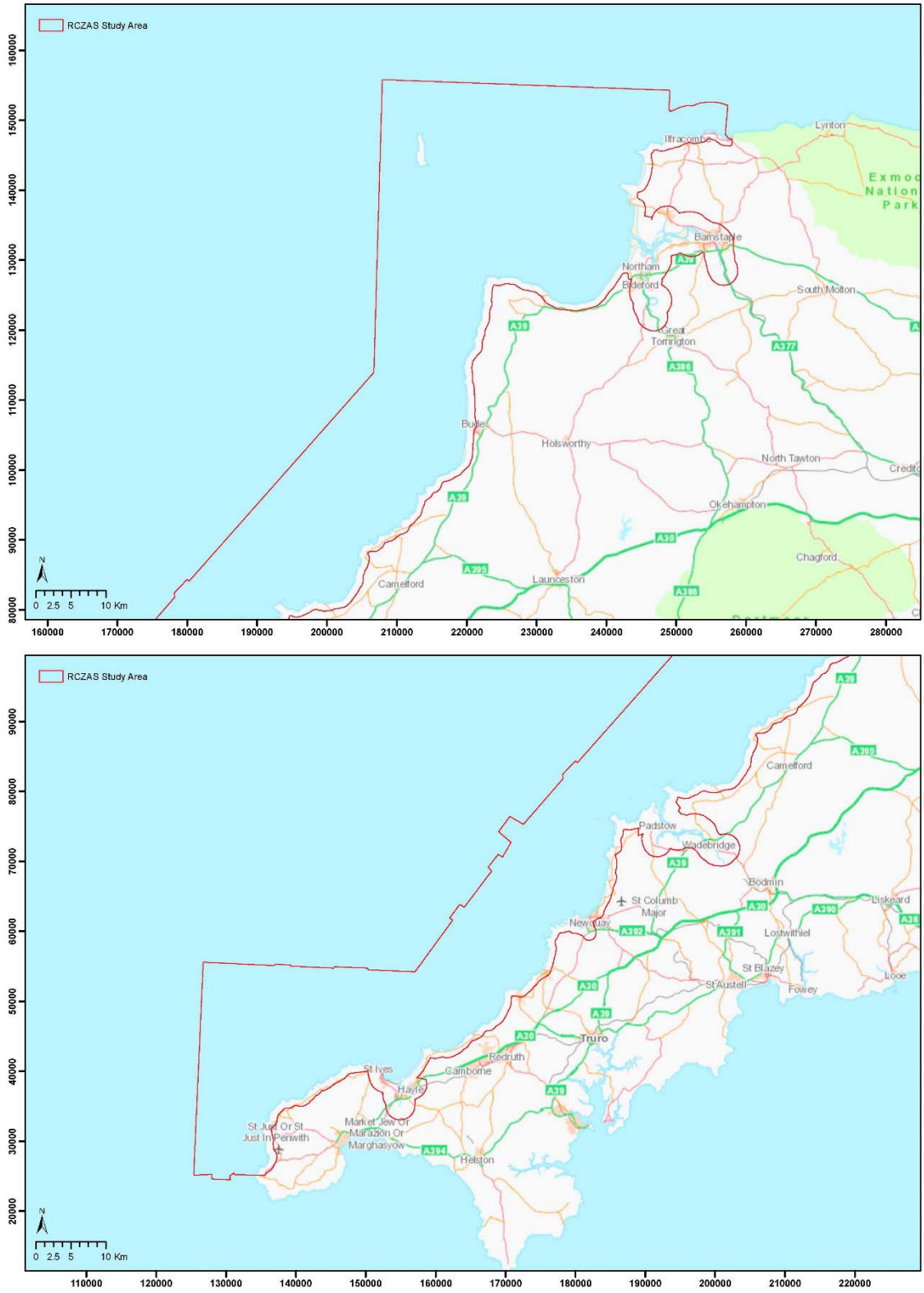


Figure 2.1: North Devon and North Cornwall RCZAS study area. Contains Ordnance Survey data © Crown copyright and database right 2019

The Phase 1 DBA study area was sub-divided according to the Policy Development Zones (PDZs) / Management Areas (MAs) set out in the Rame Head to Hartland Point SMP (Figure 2.3 and Figure 2.5) and the Policy Scenario Areas (PSAs) / Policy Units (PUs) set out in the Hartland Point to Anchor Head SMP (Figure 2.2 to Figure 2.5):

- PDZ9 Penwith Penunsula (Point Spaniard to Clodgy Point): MA24 Land's End to Clodgy Point
- PDZ10 Clodgy Point to Godrevy Point: MA25 Clodgy Point to Porthminster Point, MA26 Porthminster Point to Hayle Estuary, MA27 Hayle Estuary and MA28 Black Cliff to Godrevy Point
- PDZ11 North Cliffs (Godrevy Point to Pentire Point West): MA29 Godrevy Point to St Agnes Head and MA30 St Agnes Head to Pentire Point West
- PDZ12 Newquay (Pentire Point West to Trevelgue Head): MA31 Fistral Bay and Crantock and MA32 Newquay Bay
- PDZ13 Trevelgue Head to Stepper Point: MA33 Trevelgue Head to Trevose Head and MA34 Trevose Head to Stepper Point
- PDZ14 Camel Estuary (Stepper Point to Pentire Point): MA35 Camel Estuary (Stepper Point to Trebetherick Point) and MA36 Trebetherick Point to Pentire Point
- PDZ15 Pentire Point to Wanson Mouth: MA37 Pentire Point to Boscastle and MA38 Boscastle to Wanson Mouth
- PDZ16 Widemouth and Bude (Wanson Mouth to Lower Sharpnose Point): MA39 Wanson Mouth to Higher Longbeak and MA40 Higher Longbeak to Lower Sharpnose Point
- PDZ17 Lower Sharpnose Point to Hartland Point: MA41 Lower Sharpnose Point to Hartland Point
- PSA1 Lundy: PUs 7c01 Landing Beach and 7c02 Lundy (except Landing Beach)
- PSA2 Hartland Point to Westward Ho!: PUs 7c03 Hartland Point to Clovelly to 7c05 Clovelly to Westward Ho! (Seafield House)
- PSA3 Westward Ho! to Saunton Down including the Taw/Torridge Estuary: PUs 7c06 Westward Ho! to 7c31 Saunton Down
- PSA4 Saunton Down to Morte Point: PUs 7c32 Croyde Sands to 7c39 Woolacombe to Morte Point
- PSA5 Morte Point to Minehead (west): PUs 7d01 Morte Point to 7d11 Combe Martin to Lynmouth

2.2 Geology and coastline

Overviews of the coastline, divided based on the SMP 17 Policy Development Zones (PDZs) and SMP 18 Policy Scenario Areas (PSAs), is provided below. An overview of the regional geology is provided in Section 6.1 and shown in Figure 6.1.

2.2.1 PDZ9 Penwith Penunsula (Point Spaniard to Clodgy Point) (MA 24)

This section of coast encompasses the most western tip of the Cornish Peninsula and includes Land's End and Cape Cornwall. The dominant nature of this coastline is hard resistant granite cliffs with some small discrete coves, disconnected from the wider coastline. It also includes the larger Whitesand Bay containing Sennen Cove and Gwynver Beach. The shoreline is extremely exposed to the dominant Atlantic wave climate and weather systems. The rugged cliffs and inaccessibility of much of the shoreline reflects the often isolated and exposed feeling of the coastline. The Cornwall and West Devon Historic Mining Landscape World Heritage site occupies in excess of 15km of coastal frontage between Gribba Point and Porthmeor Cove. There are a number of cliff edge sites, with particularly

high number of features in the Botallack area, as well as at Levant and Pendeen. The present form of the Penwith Peninsula coast has been entirely shaped by the natural coastal processes. The area is very rural and feels generally isolated, with a few scattered settlements mainly set back from the immediate frontage of hard rocky sea cliffs, such as St Just positioned about 1km inland.

2.2.2 PDZ10 Clodgy Point to Godrevy Point (MA 25 to 28)

This area encompasses St Ives Bay and is made up of both developed coastline and extensive dunes. The area contains all of the beaches, harbours and cliffs of the coastal towns of St Ives, Carbis Bay and Hayle, which are densely populated areas and contain much infrastructure including the rail link between St Ives and St Erth and the raised A30 trunk road skirting the Hayle estuary. The area includes the sandy beaches of Porthmeor, Porth Gwidden, St Ives Harbour and Porthminster, with large extensive sandy beaches of Carbis Bay, Porth Kidney, Hayle, Gwithian and Godrevy, along with the associated dune systems (Towans) of Hayle, Riviere, Mexico, Phillack, Upton, Gwithian and Godrevy.

This unit comprises the deeply concave St Ives Bay. The area is underlain principally by sedimentary rock (Devonian slates) although the settlement of St Ives is perched upon the north-eastern edge of the Penwith granite extrusion. It is from this granite that the resistant headlands of St Ives Head and Porthminster Point are formed. The great majority of this frontage displays a wide, shallow-sloping sandy intertidal area. Much of the intertidal area in the central and eastern part of the Bay is backed by extensive dune fields (the Towans). Godrevy at the north-east end of the Bay has around 500m of head cliffs that are actively eroding. The western end of the Bay around St Ives is comparatively sheltered in relation to the far eastern end at Godrevy, with Atlantic swells from the west becoming increasingly refracted toward the western end of the Bay.

2.2.3 PDZ11 North Cliffs (Godrevy Point to Pentire Point West) (MA 29 to 30)

The area is a long, exposed and dramatic coastline of unstable slate cliffs, punctuated by wide exposed surf beaches, coves and some dune areas. This coastal zone is sparsely populated for the first 9km of coastline from Godrevy Head to Western Hill. Thereafter the rocky coastline is punctuated by a series of coastal communities located around the river valleys which incise through the high hard cliffs. The notable communities are Portreath, Porthtowan, St Agnes (although the main settlement is set well back), Perranporth and Holywell Bay. The initial line of cliffs (often referred to as the North Cliffs) which run from Godrevy to Portreath display a coastal fringe of heath and rough ground while the hinterland is used for mixed farming with recently enclosed land on the coast and smaller ancient enclosed land inland and to the west. Virtually the entire coastal strip through to Portreath is owned and managed by the National Trust and has many visitors each year.

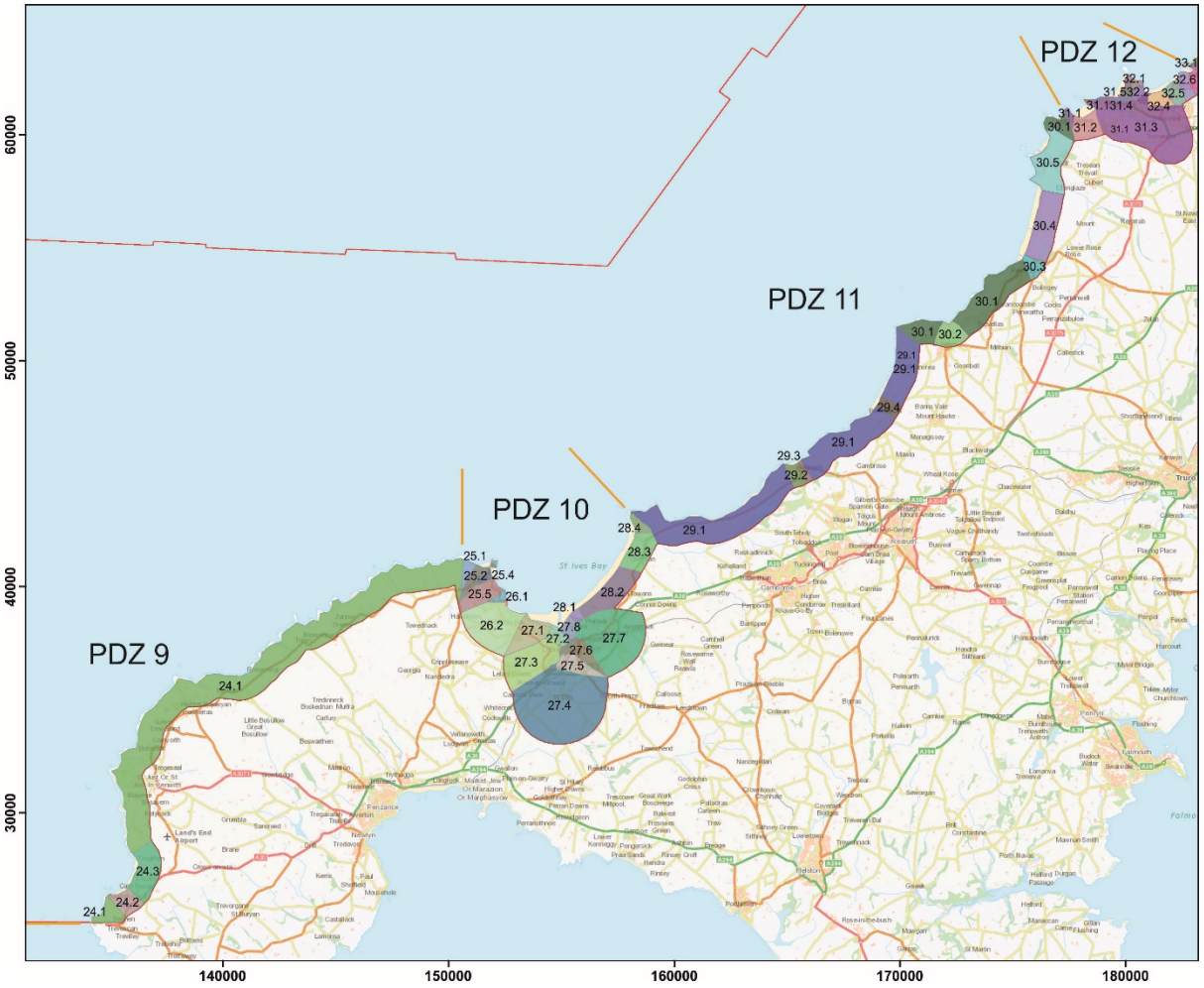


Figure 2.2: Shoreline Management Plan (SMP) Policy Development Zones (PDZ) and Management Areas: PDZ 9 to PDZ 12, North Cornwall. Contains Environment Agency and Ordnance Survey data © Crown copyright and database right 2019

The coast is formed predominantly of metamorphic Devonian slate, together with sandstones and limestones. The form of the cliffs is governed primarily by the fact that they are cut into one of several marine erosion platforms (formerly marine or land erosion platforms) uplifted during the Tertiary period. These dictate the height of the cliffs, which tend to have a flat top and sheer drop to sea level (e.g. between Navax Point and Portreath, and at St Agnes Head). Elsewhere, the cliffs generally have a hogs-back form, with a vertical bedrock lower cliff and an upper steep slope. It is usually only the lower cliff that is actively eroded. The coastline faces north-west for the length of this unit, and is therefore very exposed to the dominant Atlantic westerly wave climate and weather systems of the north coast. Frequent long-range, powerful swells approach the shoreline from the west or north-west, virtually shore-parallel, creating a swash aligned and wave dominated coast.

2.2.4 PDZ12 Newquay (Pentire Point West to Trevelgue Head) (MA 31 to 32)

This section of coastline encompasses the beach frontages and cliffs associated with the Newquay conurbation. Its contemporary character is of a frontage dominated by sandy surf beaches, heavily used in terms of year round water-based recreation, and with extensive development providing huge amounts of holiday accommodation. The vast majority of businesses in the town are linked in one way or another to the presence of the beaches. Crantock Bay (and the Gannel Estuary which discharges along the northern edge of Crantock Beach), forms the southern boundary to the Newquay

conurbation. Much of this area is owned and managed by the National Trust. Although popular with year round recreational users and tourists alike, Crantock can be described as tranquil when compared to the neighbouring Fistral Bay. Towan Head to the north then separates Fistral Bay from Newquay Bay. Newquay Bay is home to a number of beaches, disconnected at high tide but joined at low water. These more sheltered beaches are still extensively used for recreational purposes and are seen as the safer option for bathing compared to the more exposed high wave-energy environment at Fistral. Porth Beach, a long funnel shaped area of sand which follows a smaller river valley at the northern edge of Newquay, is a quieter option to the busier town beaches.

The headlands of Pentire Point West, Pentire Point East and Towan Head exert strong physical control over this stretch of the SMP coastline. They are formed primarily of Devonian slates with some intrusions of harder rock. The headlands and cliffs generally descend directly into deep water. This coastline is exposed to the dominant westerly wave climate. Fistral and Crantock beaches in particular have very energetic nearshore wave climates, with the coastline of Newquay Bay benefitting from a little more shelter due to the presence of Towan Head.

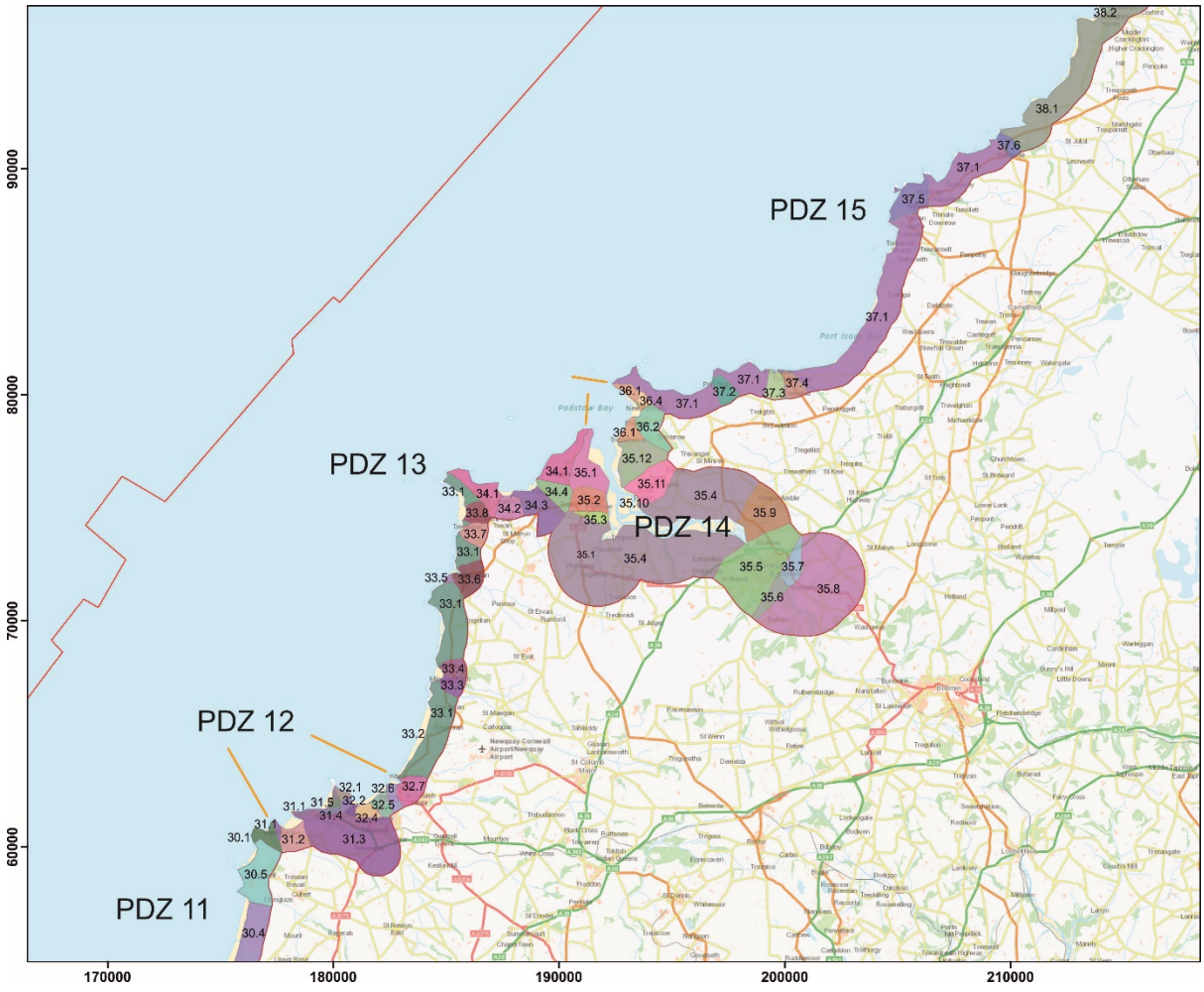


Figure 2.3: Shoreline Management Plan (SMP) Policy Development Zones (PDZ) and Management Areas: PDZ11 to PDZ15, North Cornwall. Contains Environment Agency and Ordnance Survey data © Crown copyright and database right 2019

2.2.5 PDZ13 Trevelgue Head to Stepper Point (MA 33 to 34)

This stretch of coastline starts immediately to the north of Newquay and continues around Trevose Head to finish at Steeper Point. The coastline faces mostly north-west for the length of this unit and is

therefore very exposed to the dominant Atlantic westerly wave climate and weather systems. Whilst dominated by long stretches of rocky cliffs and the prominent headlands there are sandy beaches present, with the most extensive sands at Watergate Bay. Other beaches are at Mawgan Porth, Porthcothan, Treyarnon, Constantine and Booby's Bay, Harlyn, Mother Ivey's Bay and Trevone. Bedruthan Steps, owned by the National Trust, are the specific visitor attraction of significance in this area. The area is sparsely populated, with agricultural grassland dominating the cliff tops with grazing often seen. Minor roads criss-cross the cliff tops linking hamlets and villages. The fixed assets at the coast are relatively few. Trevose Head lighthouse is prominent, while Mawgan Porth is the community of most significance on the immediate coast with residential development built into the cliff and commercial and tourist amenities located in the valley behind the beach. There is some development at Treyarnon, Constantine, Harlyn and Trevone, but this is limited at the immediate frontage.

Devonian slate cliffs dominate the coastline geology. The principal controlling headlands are Trevelgue Head, Beryl's Point, Trenance Point, Park Head and Trevose head. These headlands effectively create the bays of Newquay, Watergate, Mawgan Porth and Bedruthan. Control is provided through the resistant nature of the geology. There is no significant sheltering or attenuation of the wave climate provided by the headlands. Trevose Head is a very prominent, resistant headland marking the boundary of this zone. The headlands of Trevose Point, Cataclews Point and Stepper Point provide some control over sediment movement and also act to provide some shelter from the extremes of the westerly wave climate. The shoreline is swash aligned due to the almost shore-parallel approach of the waves. Therefore most sediment transport is cross-shore up and down the beach profile in response to storms and seasonal variation in the wave climate.

2.2.6 PDZ14 Camel Estuary (Stepper Point to Pentire Point) (MA 35 to 36)

This area is valued for its natural beauty, with the estuary environment contrasting with the small section of rugged open coast at Stepper Point and Pentire Point. Most of this area faces north and slightly less exposed to the dominant westerly Atlantic conditions that occur more to the south-west. The area is generally rural and undeveloped, including within the estuarine area. However a number of significant communities are sited towards the estuary mouth at Padstow and Rock, on the open coast at Polzeath and inland towards the estuary tidal limit at Wadebridge and Sladesbridge. Agriculture is the major land use, with fisheries still significant at Padstow and within the estuary, including a designated shell fishery. Padstow retains an active harbour and small fishing fleet. There are a significant number of fixed assets present related to the communities which include flood and coastal defences, commercial and residential properties, sewage treatment works, roads, harbour and sailing infrastructure and other amenity features such as the Camel Trail.

Upper and middle Devonian slates dominate the geology of the cliff line, along with Old Red Sandstone. The open coast is dominated by hard slate and sandstone cliffs and rocky intertidal areas, displaying wave cut platforms. Stepper Point and Pentire Point are very prominent, resistant headlands marking the boundaries of this PDZ. Stepper Point provides some control over sediment movement and acts to provide some shelter to the estuary mouth from the extremes of the westerly wave climate.

As this PPZ predominantly faces north, it is slightly less exposed to the dominant westerly Atlantic conditions than the coast immediately to the south and north. Polzeath is the most exposed open coast location. Within the estuary, the orientation of the Camel provides effective shelter against swell

propagating in from offshore with the largest wave heights at Daymer Bay. Elsewhere within the estuary, the wave height is dominated by locally generated waves. The ability for waves to propagate up the estuary, as well as generate within the estuary, is likely to be affected by the state of the tide. Large intertidal sandbanks and sandflats at low water provide the estuary with a large degree of shelter, in particular, the presence of Doom Bar at the estuary mouth.

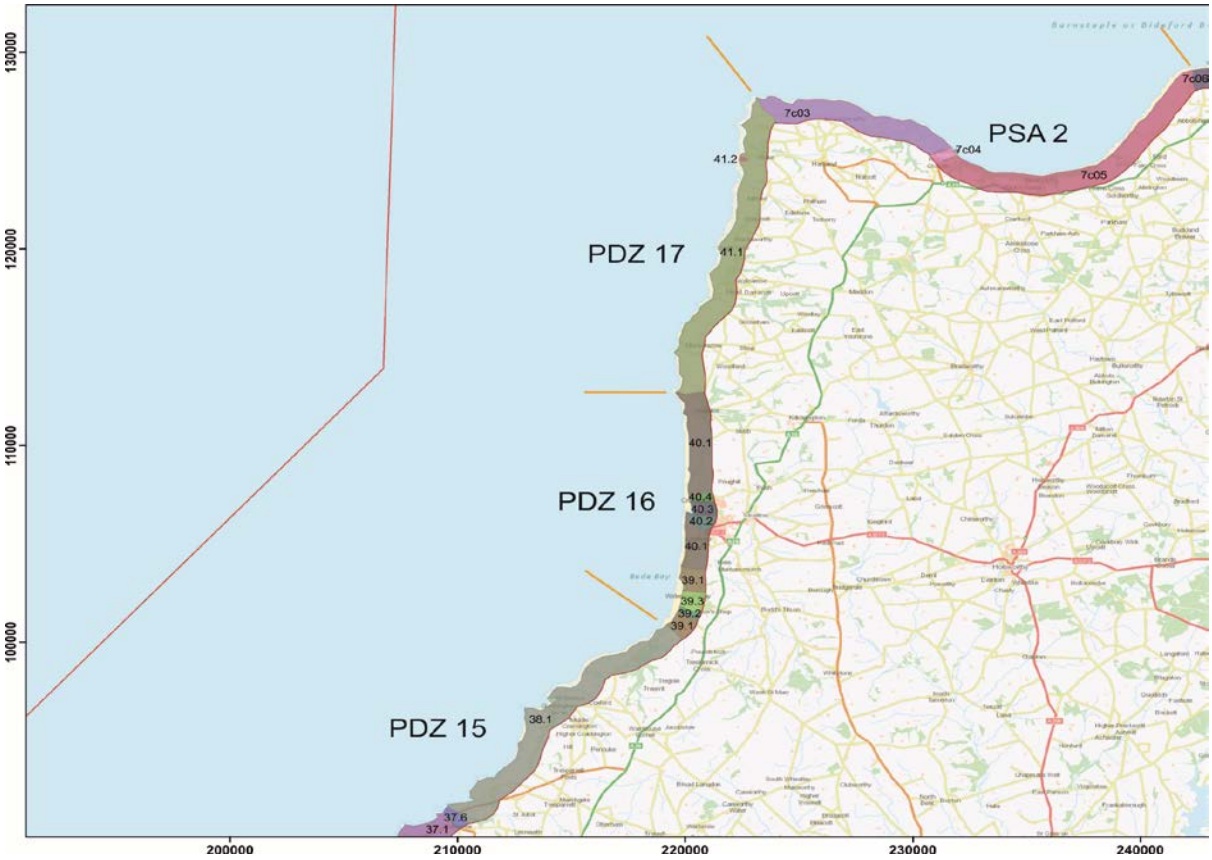


Figure 2.4: Shoreline Management Plan (SMP) Policy Development Zones (PDZ) / Policy Scenario Areas (PSA) and Management Areas / Policy Units: PDZ15 to PSA2, North Cornwall and North Devon. Contains Environment Agency and Ordnance Survey data © Crown copyright and database right 2019

2.2.7 PDZ15 Pentire Point to Wanson Mouth (MA 37 to 38)

This section of coastline faces generally north to north-west and its exposed nature is reflected in the rugged cliffs, stormy seas, stunted and wind blown trees, and isolated settlements which have grown up clustered in the shelter of river valleys. Pocket beaches are found occasionally along the cliffed coastline where steep valleys have formed allowing watercourses to reach the sea. Geographically, this PDZ covers around 50km of exposed frontage but it is one of the most sparsely populated. The character of the area is one of wild and unspoilt coastline with isolated communities existing within a framework of cliff top agriculture, small scale fishing operations and low-key tourism at discrete locations such as Port Isaac and Boscastle. Port Isaac, Tintagel and Boscastle represent the key settlements in terms of population and visitor numbers, but of these only Port Isaac has a significant part of the settlement in close proximity to MHW. Three much smaller settlements exist at Port Quin, Port Gaverne and Crackington Haven, all with a limited number of properties close to the waters edge. There are local roads running along the coastline between the settlements, in some cases directly adjacent to the shoreline and often in vulnerable locations.

2.2.8 PDZ16 Widemouth and Bude (Wanson Mouth to Lower Sharpnose Point) (MA 39 to 40)

This section of coastline covers the wide sandy beaches of Widemouth Bay and the Bude area. The southern part of this section is made up of low cliff and dune (Widemouth and Bude) with sea cliffs dominating from the north of Bude to Lower Sharp Nose Point. The community of Widemouth is small, with a row of residential properties overlooking the immediate frontage behind the coast road. Bude is a town of significant size with residential and commercial development fronting the low lying area of the beach, Canal and River Neet. To the south of Bude, fixed assets include the coast road which runs from Widemouth to Bude, along which also follows the SW coast path. A small number of isolated properties are present on the landward side of the road until the area of Uphill is reached, which quickly merges into Bude with a significant amount of residential, commercial and amenity assets, including to the rear of Summerleaze and Crooklets beaches. To the north of Bude agricultural use dominates with grassland as the predominant land cover. Here the road north of Bude is set back from the coast, with spurs running to discrete sandy beaches, with car parks and facilities at Sandy Mouth and at Duckpool; both of these sites are owned and managed by the National Trust. Cleave Camp satellite station is a significant feature at the coast in this area.

The geology is composed primarily of interbedded sandstones and slates of Carboniferous age, with varying levels of overlying head deposits. The rock strata are folded and faulted, and this is seen in the cliffs and wave-cut platforms. The principal controlling feature of the coastline is the geology and the wave cut platforms which provide some shelter to the cliff toe. Areas where the rock platform is absent can be seen to have responded by eroding back more rapidly. The small headlands provide some shelter to the adjacent coastline locally, but due to the general lack of alongshore connectivity do not exert overall control. This stretch of coast is mostly west facing and therefore exposed to extremes in North Atlantic wave height and energy. Local conditions also dictate that historically the frontage at Bude appears vulnerable to extreme water levels generated because of wind set-up.

2.2.9 PDZ17 Lower Sharpnose Point to Hartland Point (MA 41)

The PDZ extends from Lower Sharpnose Point, just north of Duckpool, to Hartland Point. A small section of the north Devon coastline is included in this final PDZ of SMP 17, as the boundary between Cornwall and Devon is situated just north of Morwenstow. This is an area of steep and rocky coastline which is very rural in nature. This stretch of coastline is almost entirely undeveloped; there are no coastal settlements and only a very limited number of fixed assets along the coastline. Cliff top agriculture is the dominant land use. At Hartland Quay there is car parking and a small number of commercial assets (hotel, museum) with associated quay structures and defences. Hartland Point is home to Hartland Point Lighthouse. Isolated properties exist adjacent to the shoreline in the near hinterland, e.g. Blackpool Cott at Blegberry Beach. Access to the shoreline by road is very limited as the scattered settlements are set back from the immediate frontage, with Welcombe Mouth and Hartland Quay the main access points.

The steep and rocky coastline of cliffs and wave cut platforms formed from Carboniferous sandstone cliffs dominates all of this section of coastline. Numerous headlands occur formed from sections of the more resistant sandstone cliffs, but it is the overall resistant nature of the geology which principally controls the evolution of this coastline, rather than the location of headlands. This stretch of coast is west facing and therefore exposed to extremes in North Atlantic wave height and energy.

2.2.10 PSA1 Lundy (PU 7c01 to 7c02)

Lundy is a small island, c. 5km long and 1km wide covering c. 450 ha, located north of Hartland Point in the middle of the Bristol Channel. The island is generally 100m high with the landing beach providing the only safe sea approach to the island, with a linking access road the only access to the village. Properties, with the exception of the lighthouses at North West Point and Surf Point, tend to be located further onland on higher land, with the majority of the island covered by farmland.

The island rises steeply from the bed of the Bristol Channel and consists of mostly erosion-resistant Tertiary granite. Much of the coast contains granite cliffs, although there are some slates present at the southern end of the island. There are embayments in which small pocket beaches have accumulated, most notably in Landing Bay where Landing Beach is situated. The presence of the island has resulted in the development of offshore sandbanks that have accumulated on the flat seabed around the island, in particular in the lee of the island. These offshore banks provide shallow areas of seabed that in turn help to protect the shoreline of Lundy from the full force of storm wave attack, particularly along the northern shore of the island.

2.2.11 PSA2 Hartland Point to Westward Ho! (PU 7c03 to 7c05)

This section of coast represents the southern extent of Barnstaple and Bideford Bay. The majority is cliffed, at some points up to 150m high, with east-west trending valleys intersecting the cliffs at a lower level. In the west the area is predominantly rural with farmland and woodland interspersed by a few small settlements at Clovelly, Buck's Mill and Peppercombe. In contrast the coastline east towards Westward Ho! is urban and low-lying. The present shoreline has evolved due to differential erosion of this hard-rock coast composed of interbedded sandstones and shales, overlain by head deposits. Cliff recession, mainly caused by a combination of erosion at the toe by marine action, and instability of the cliff face brought about by weathering, is generally slow and provides a limited supply of coarse sediment (sand, gravel, cobbles and boulders) to the shoreline, where it contributes to the formation of localised gravel storm ridges and beaches. Between Hartland and Babbacombe Mouth, cliff erosion is driven by landslips, with a number of landslip scars indicating both old and active rotational slips. The pebble ridge at Westward Ho! is thought to have been supplied with sediment from further west that was derived from erosion of both cliffs and raised beaches that contain similar rounded pebbles. However, there is currently little or no contemporary sediment source to the pebble ridge due to the low rates of erosion to the west.

Along this section Hartland Point provides protection against the dominant south-westerly swell waves from the North Atlantic to the coastline up to the west of Clovelly, from where the alignment of the coast to Westward Ho! is affected by diffracted swell waves only. The volume of sediment transport is reliant on there being sufficient sediment on the shoreline to be transported in the first place, which in turn is directly dependent upon the rate of local cliff failure events.

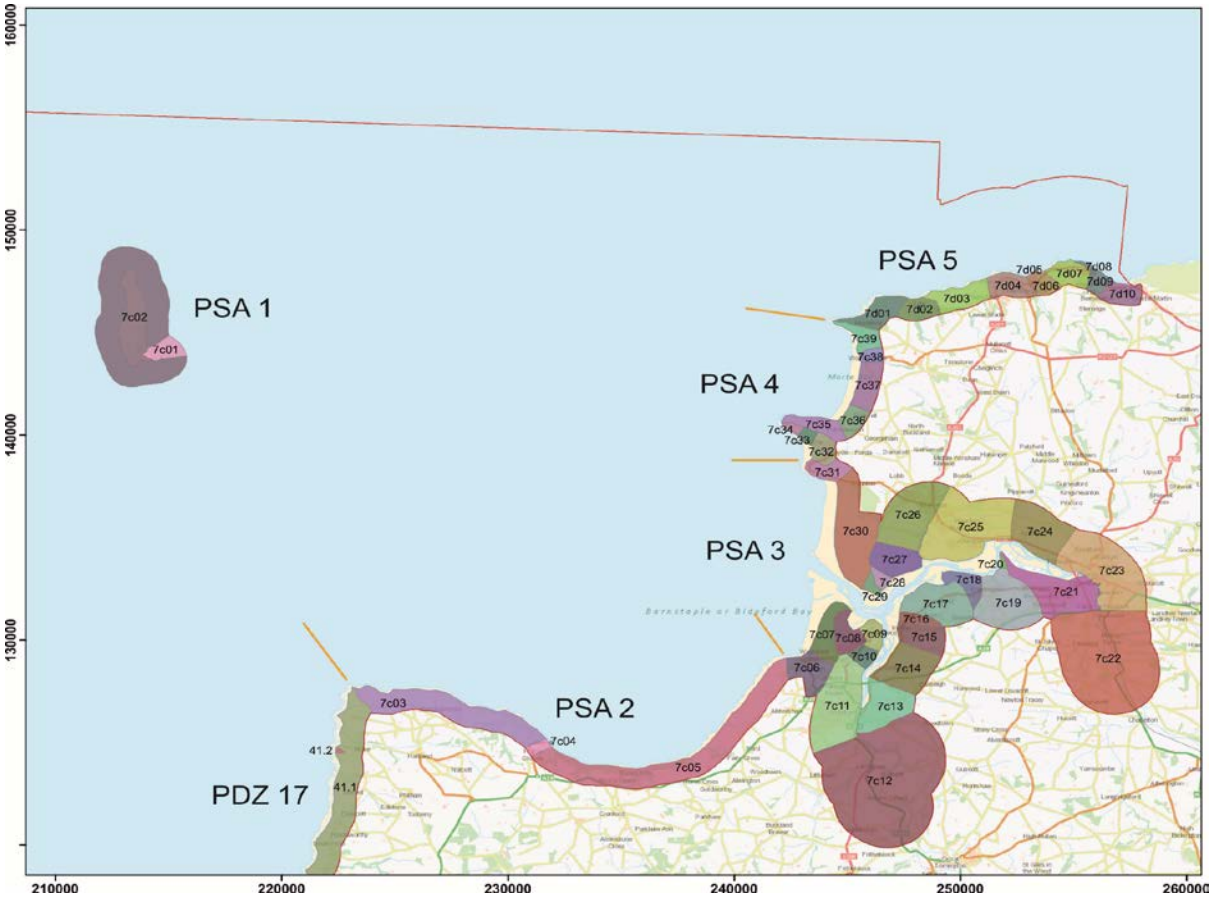


Figure 2.5: Shoreline Management Plan (SMP) Policy Development Zones (PDZ) / Policy Scenario Areas (PSA) and Management Areas / Policy Units: PDZ16 to PSA5, North Devon including Lundy. Contains Environment Agency and Ordnance Survey data © Crown copyright and database right 2019

2.2.12 PSA3 Westward Ho! to Saunton Down (PU 7c06 to 7c31)

This section comprises the mouth of Taw/Torridge Estuary and its associated extensive spit and dune systems, defined at either end by cliffs at Westward Ho! in the south and Saunton Down in the north, both of which provide strong geological controls on the extent of the embayment. This embayment, which lies within the central part of the wider Bideford Bay, is backed by low-lying land formed by the differential erosion of Permian-Triassic rock that is now occupied by the spitflanked estuary of the Rivers Taw and Torridge. There are several extensively developed areas including the towns of Bideford, Barnstaple and Braunton, as well as agricultural land and the Chivenor Military base. Coupled with these major urban centres are major road links, including the A361 along the north bank of the River Taw and A386 on the west bank of the River Torridge, along with the Barnstaple to Exeter railway line following the Taw Estuary.

Along the southern part of this section is a pebble ridge that extends northwards for approximately 3km from Westward Ho! into the mouth of the Taw/Torridge Estuary. This ridge is fronted by a wide expanse of intertidal sands and provides protection against flooding to the large low-lying expanse of Northam Burrows, the northern end of which is characterised by the Pebble Ridge backed by a sand dune system. The extensive dune system of Braunton Burrows, c. 5km in length from the headland of Saunton Down into the mouth of the Taw/Torridge Estuary, fronts the northern side of this PSA.

The estuary, in the centre of Bideford Bay, is cut into the softer Permian-Triassic rock, which backs the bay and has a significant controlling influence on the adjacent open shoreline. The channel is flanked by an incurved sand and gravel spit on either side along with extensive intertidal flats. Both the Rivers Taw and Torridge discharge via the estuary; the rivers sharing a common estuary channel for 4.5 km from Bideford Bar to Instow. Geological constraints within the inner estuaries also mean there is limited accommodation space for the development of salt marsh, even if sediments were available. The Torridge Estuary is 11.5 km long to its tidal limit and is characterised by a narrow valley floor, with steep sides that constrain the river channels resulting in a deep channel and a relatively small tidal prism. It is narrower and shorter than the Taw estuary. The inner Torridge, south of Torridge Bridge, is characterised by rock-cut meander loops. The Taw is a wide sandy estuary with the tidal influence extending 18km inland. The main channel in the Outer Taw is narrow and deeply incised (120m width and 10m depth) within the wider estuary bed. The River Caen, a small tributary, discharges into the Taw just upstream of Braunton Marsh and has muddy banks.

2.2.13 PSA4 Saunton Down to Morte Point (PU 7c32 to 7c39)

The section of coast between Saunton Down and Morte Point forms the northern part of Bideford Bay. It contains the two embayments of Croyde Bay and Morte Bay that have been formed by the differential erosion of the coast between the resistant headlands of Saunton Down, Baggy Point and Morte Point. These embayments contain wide sandy beaches backed by dune systems. There is little or no sediment exchange between the embayments or the adjacent sections of coast to the north and south, due to the presence of the cliffed headlands. The beaches at Rockham Bay, Croyde, Putsborough, Woolacombe and Barricane Bay are particularly important to the local tourist industry.

This is section of the coast dominated by cliffs with a small area of low-lying land along the coastal fringe at Woolacombe. With the exception of Putsborough sands, there are no coastal defences. This stretch of coast has numerous geological exposures of national interest. The headland cliffs of Baggy Point and Morte Point are hard and erosion resistant, although cliff failure may occur in locations over time. Settlements are largely restricted to isolated cliff top properties and farms, though small settlements (including tourist-related sites) exist around Woolacombe and Barricane beach.

2.2.14 PSA5 Morte Point to Minehead (PU 7d01 to 7d11)

This section of predominantly east-west trending coast extends from the hard rock headland of Morte Point in the west, to Minehead Harbour arm in the east. The RCZAS only covers the western end of this section between Morte Point and Combe Martin (Policy Units 7d01 to 7d11), with the area to the east covered in the Exmoor National Park RCZAS (Pink 2018). This is predominantly a cliffed coast comprised of Devonian sandstone and slate, indented with northwest-southeast trending bays that are controlled by similarly trending fault lines, such as the embayment at Combe Martin. The embayments along this section are subject to storm driven changes, primarily the wave driven eastward transport of coarse sediment along the upper foreshore. These changes vary from bay to bay, with Lee Bay at Ilfracombe experiencing progressive foreshore steepening whilst storms result in the shallowing of the harbour at Combe Martin and erosion of Watermouth Bay. This section of coast is predominantly rural with populations concentrated amoungst several small towns and villages including Lee, Ilfracome, Hele and Combe Martin. The main settlement is at Ilfracombe which has a small harbour with a fishing fleet and is a popular tourist location, including beaches at Hele, Capstone, Wildermouth and Tunnels.

2.3 Landscape and Seascape Character

2.3.1 National Character Area (NCA)

In 1996 English Nature and the Countryside Commission (now combined as Natural England), with help from English Heritage, produced a map of England that depicts the natural and cultural dimensions of the landscape. Two categories were mapped: Natural Areas and Countryside Character. Natural Areas are biogeographic zones that reflect the geological foundation, the natural systems and processes and the wildlife in different parts of England (see Natural England 2014). National Character Areas (NCAs - formerly Countryside Character Areas; CCAs) sometimes follow the Natural Areas boundaries and are described as 'unique in terms of a combination of physiographic land use, historical and cultural attributes'. NCAs provide a broad overview of landscape types and the study area contains five NCAs.

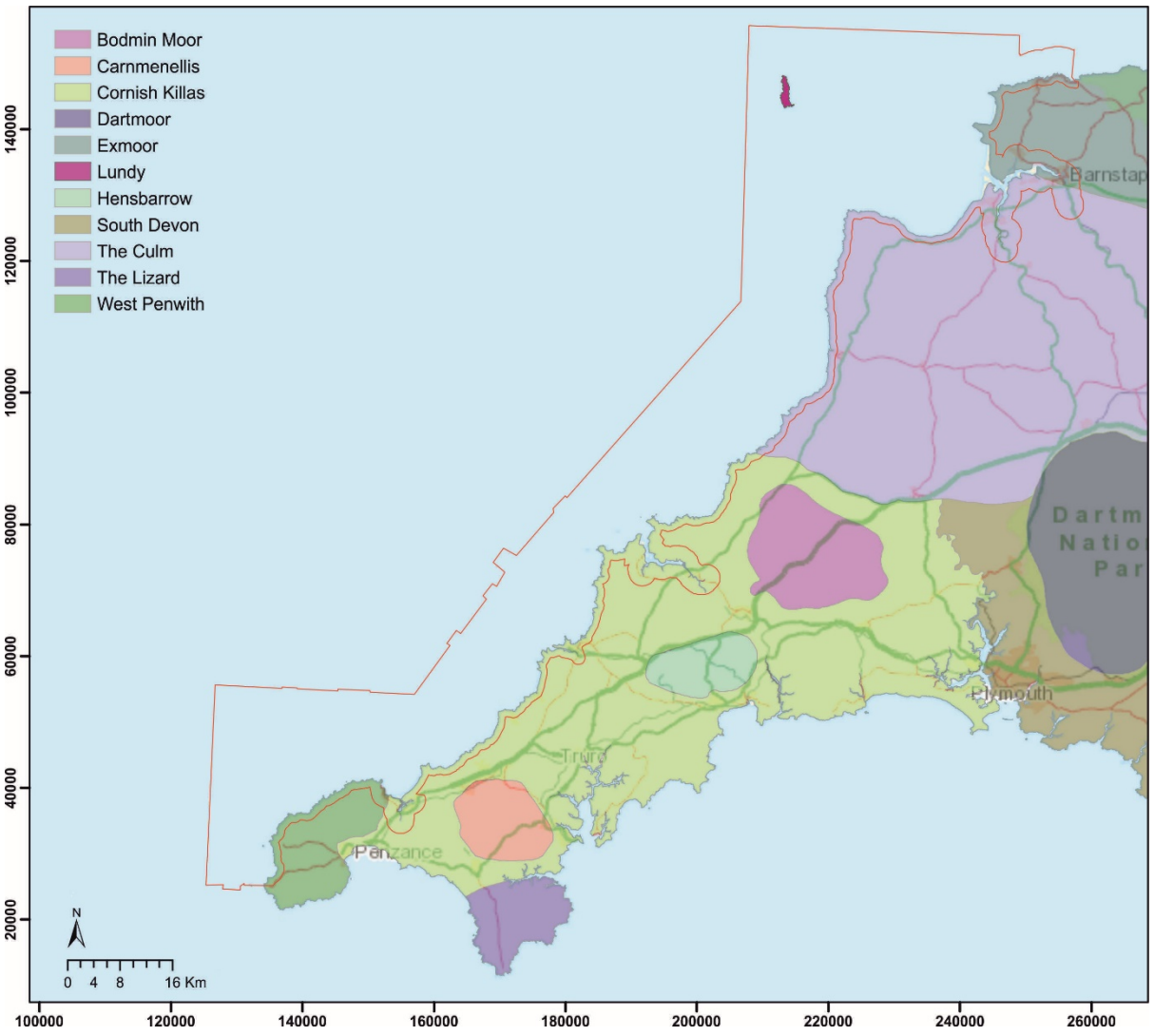


Figure 2.6: National Character Areas in SW England. Contains Natural England and Ordnance Survey data © Crown copyright and database right 2019

West Penwith (NCA 156; NE371)

This NCA is located at the south-western extremity of England, ringed by high cliffs and rising to high, rocky moorland at its centre, separated from the rest of Cornwall by a low-lying isthmus (land adjacent to the A30 between Hayle and Penzance). The entire area is underpinned and influenced by granite

geology, which defines the nature of the area: the massive columnar cliffs, tors and clitter slopes, the thin soils of high moorland ridge, and the associated mineral veins of tin and copper. The higher northern section of the plateau is dominated by a north-facing heath-covered ridge sloping down through a farmed coastal plain and a narrow strip of coastal heath to steep cliffs that plunge into the Atlantic. The high granite cliffs rise up in great columnar steps and blocks The hard nature of the cliffs results in little erosion but equally little absorption of wave energy, meaning that the full force of the Atlantic is often felt by the dune systems within the adjacent Cornish Killas NCA. Much of the area now makes up a significant portion of the Cornwall and West Devon Mining Landscape World Heritage Site; the world-famous St Just Mining District. This sparsely populated area is reflected in a dispersed settlement pattern of hamlets and farmsteads, with villages having mainly developed around the fishing or mining industries. The main settlements towards the north coast of the West Penwith NCA are St Ives and St Just.

Cornish Killas (NCA 152; NE547)

This NCA forms the main body of the Cornish landmass around the granite outcrops of Bodmin Moor, Hensbarrow, Carnmenellis, West Penwith and The Lizard. The northern half of the NCA, with its open character and general lack of tree cover, affords long views across Cornwall to neighbouring NCAs and out to sea. The rocky coastline is characterised by coves and headlands, containing a large number of important geological exposures. On the north coast, short, deeply etched valleys cut through to the sea, their streams often spilling over as waterfalls, and the land ends abruptly in sheer cliffs, commonly over 100 m high. The area is rich in minerals such as copper, tin, lead and zinc and provides access to nationally important and striking geodiversity. There is a long and internationally important history of mining, the remains of which now make up a significant portion of the Cornwall and West Devon Mining Landscape World Heritage Site. The NCA contains a diverse array of habitats, many of which are designated as nationally and internationally important nature conservation and geological sites. These include heathlands, which are characterised by heath, scrub, bristle bent and western gorse and are found in mosaics with mire, willow carr and scrub communities. There are extensive areas of unimproved grassland found on the cliff-tops and also associated with sand dune systems. The Cornish Killas NCA contains a high degree of scattered farmsteads and hamlets, including a high proportion of medieval or earlier origin. The ancient pattern of settlement is intermixed with typically small, nucleated settlements, most developing in the 12th and 13th centuries. The main coastal towns within the north of the Cornish Killas NCA are Newquay, Padstow and Wadebridge.

The Culm (NCA 149; NE389)

This NCA extends across north-west Devon and north-east Cornwall, reaching from the foot of Dartmoor in the southwest and the edge of the Cornish Killas in the west, to the spectacular Atlantic coast of cliffs and sandy beaches in the north. North-eastwards they meet the Exmoor landscape and stand high above the Devon Redlands. The open, often treeless, ridges are separated by an intricate pattern of small valleys forming the catchments of the Rivers Taw, Torridge and Mole. The geodiversity of the area is of national importance, notably the dramatically folded rocks as seen particularly around Hartland, creating a distinctive coastline rich in geodiversity. The area contains the Tintagel–Marsland–Clovelly Coast Special Areas of Conservation (SAC), with the Culm Grasslands SAC located inshore. There is limited movement of sediment along the coast, due to the characteristic pattern of inlets and headlands, and the low volume of sediment available. However, there is some littoral movement of sediment northwards from Trevose Head in the Cornish Killas NCA towards Hartland Point, and a sediment sink in Barnstaple Bay draws sediment from between Hartland Point and Morte

Point in the Exmoor NCA. Scattered farmsteads and hamlets, including a high proportion of medieval or earlier origin, with market towns and occasional small villages found across the area. There are only a few larger inland villages and small towns like Hartland and Great Torrington, the most extensive areas of settlement are on the coast at Barnstaple, Bideford, Westward Ho! and Bude.

Lundy (NCA 159; NE455)

Lundy is a flat-topped granite island surrounded by steep cliffs, up to 100m high, plunging into the Bristol Channel. The island measures c.450 ha and is located more than 20km from the nearest mainland. The shore has caves, stacks and huge granitic blocks along the rugged western coastline. The east coast is much more sheltered from prevailing winds and waves, and the vegetated slopes extend further towards sea level. The cliffs are topped by a rich habitat consisting of open and windswept grazed heathland plateau. Lundy has close coastal links to Ilfracombe and Bideford in the Culm NCA for the supply of all food and supplies, including visitors. The granite that forms the bulk of Lundy was emplaced into Devonian Morte Slates during the Tertiary Period. Lundy's small settlement, which includes a church and the Marisco Tavern, is built in locally quarried granite with slate roofs. Lundy has very high nature conservation value, and is of European significance and very well studied for its marine fauna. It holds a unique place in England's nature conservation history as the first Marine Nature Reserve and Marine Conservation Zone, and as the first statutory marine No Take Zone. The seas surrounding the island, and much of the landmass, are designated a Special Area of Conservation; the same terrestrial area is designated a Site of Special Scientific Interest. The whole of Lundy's coast is recognised as a Heritage Coast, and Lundy is within the UNESCO North Devon Biosphere Reserve.

Exmoor (NCA 145; NE342)

Exmoor National Character Area (NCA) is predominantly a landscape of upland plateaux of Devonian sandstones and slates terminating in the north at the Bristol Channel with a spectacular cliff coastline. It lies across the counties of Devon and Somerset, encompassing Exmoor National Park. To the west the area terminates at Barnstaple/Bideford Bay and the Taw and Torridge Estuary and to the east at the Vale of Taunton Deane. The area consists of a complex coastline of headlands, steep cliffs, waterfalls and coves with dramatic exposures of folded strata. This NCA also boasts the highest coastline, the highest sheer sea-cliff and the longest stretch of coastal woodland in England. The vast dune systems at Braunton Burrows and Woolacombe are distinctive coastal gemorphological features, while the Taw/Torridge estuary contains large areas of high quality saltmarsh, mudflats and sandbanks providing a rich source of food for overwintering and migratory birds. The Exmoor area contains sparse settlement, with villages mainly concentrated on lower slopes and in valleys, often sited around river crossing points. Along the coastal edge there is a greater variety and density of settlement, with the main coastal centres in the west being those of Braunton and Ilfracombe, and inland at Barnstaple. Only the western party of this NCA is included in RCZAS study area, with the coastal area of Exmoor National Park covered by the Exmoor National Park RCZAS (Pink 2018).

2.3.2 Landscape Character Area (LCA)

Landscape Character Areas (LCAs) describe the variations in character between different areas and types of landscape, and provide an evidence base for local development frameworks and plans, articulating what people perceive as distinctive and special about these landscapes. It also sets out strategies and guidelines for the protection, management and planning of the landscape. The first countywide landscape assessment was produced in 1994 for Cornwall. This was updated between

2005 and 2007 as the Cornwall and Isles of Scilly Landscape Assessment[1], with Devon's Landscape Character Assessment (LCA) consisting of the North Devon and Torridge Joint LCA in 2010, building upon the earlier North Devon Landscape Assessment (Pearson 1999), and Devon-wide Character Assessment in 2012[2]. LCAs have been assessed for the entire counties of Cornwall and Devon, resulting in 40 LCAs within Cornwall (5 for the Isles of Scilly) and 68 in Devon. Within the RCZAS study area there are 17 LCAs in Cornwall (coded as CA (Character Area); Figure 2.7 to Figure 2.13) and 6 LCAs in North Devon (no code assigned; Figure 2.15 to Figure 2.16).

CA01: West Penwith South (Land's End to Newlyn)

Only the northwestern edge of this LCA falls within the study area. This LCA contains a gently undulating plateau with a southern coastline that rises towards a line of low hills to the north and abuts the urban edge of Penzance and Newlyn and the sheltered valleys of their hinterland. Soils are shallow and impoverished, overlying metamorphic rock. Inland the shallow valleys drain generally towards the southeast becoming deep and steep-sided towards the coast with small fishing coves at the seaward end. The coast is abrupt and sheer with high cliffs and rocky headlands interspersed with coves and small sandy beaches. The area contains mixed farmland with woods, patches of open rough ground and coastal Lowland Heathland along the cliff edge with small horticultural plots in the more sheltered parts. The distinctive features of this LCA include the dramatic coastline with its coves and coastal villages and Land's End itself.

CA02: West Penwith North and West Coastal Strip

The area is a coastal shelf falling from around 120m OD, backed by the hills to the south and east in the adjacent LCA CA03 to around 100m OD on the coast. The geology is dominated by intrusive igneous rocks with granite forming the main bulk of the peninsula. Small patches of dolerite, basalt and 'Greenstone' occur on the northern coastal shelf. Middle and undifferentiated Devonian slates, greywackes and siltstones are associated with these small areas, some metamorphosed. The soils are shallow hard rock soils. Short narrow valleys punctuate the coastal shelf in a series of notches. In the extreme west and on sections of the north coast, these cliffs are almost sheer and formed of characteristic jointed granite. Along the north coast, intrusions of more resistant fine-grained dolerite, and the remains of the metamorphosed Devonian rocks have formed headlands as at Cape Cornwall to Pendeen Watch and Bosigran, and eastwards to the Island at St Ives. Elsewhere the cliffs take on a more chamfered profile, and throughout the coastline are indented with numerous small rocky coves and boulder beaches, with the broad sandy sweep of Whitesand Bay at Sennen in the west backed by a small area of dunes. The landcover is mainly farmland with very limited tree cover, while along the coast the sloping cliff contains coastal heath. The small valleys running down to the cliffs are typically vegetated with scrub, bracken and rough pasture. Boulders and rock outcrops are a feature of the landscape in and around fields. The distinctive features in this landscape are the large number of prehistoric monuments, the various distinctive prehistoric field patterns and hedges, granite farmsteads, large boulders used in structures and lying in fields, the mining structures and features, and the exposed coast and heath.

[1] https://www.cornwall.gov.uk/environment-and-planning/cornwalls-landscape/landscape-character-assessment/

[2] https://www.devon.gov.uk/planning/planning-policies/landscape/devons-landscape-character-assessment

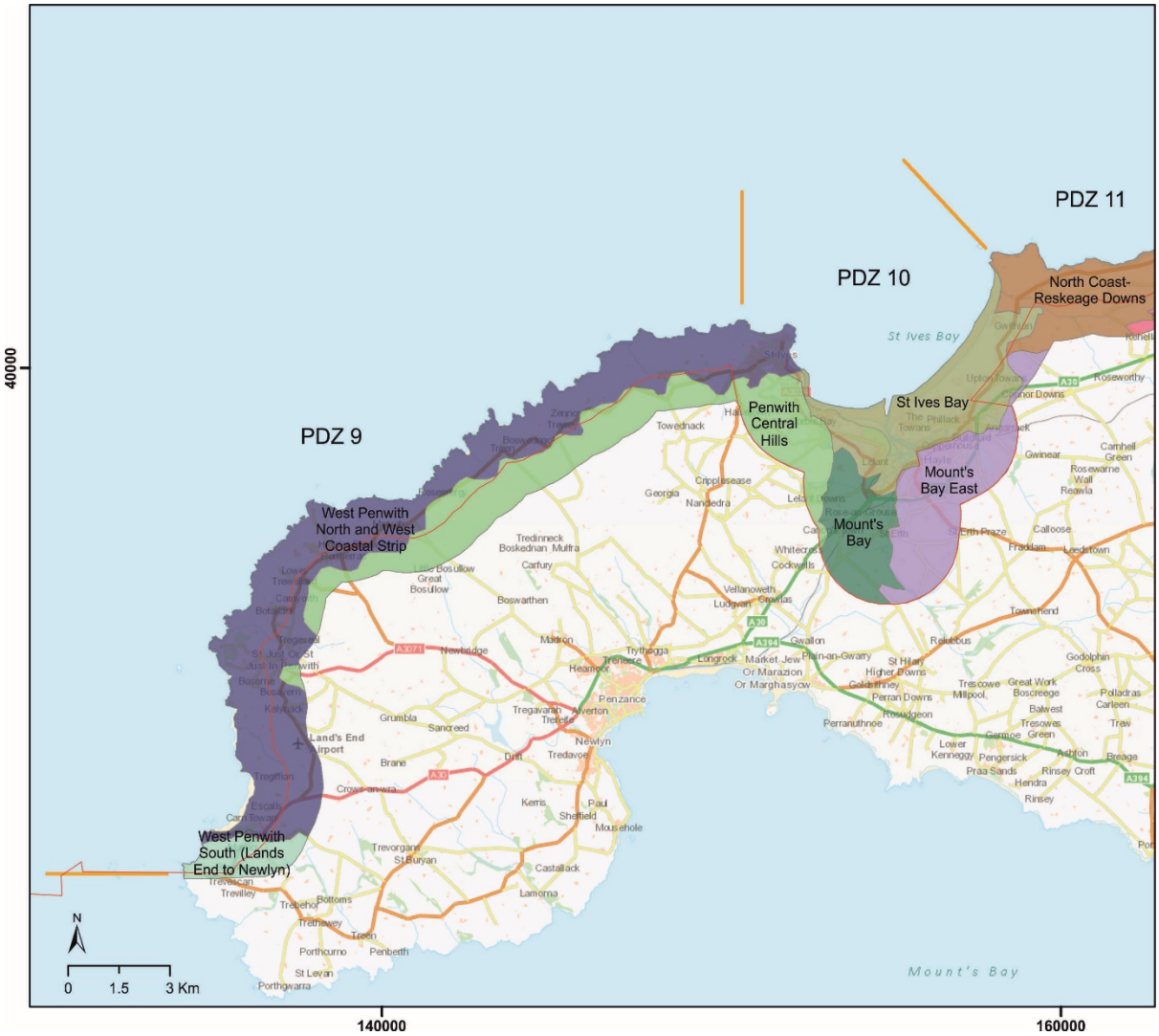


Figure 2.7: Landscape Character Areas within 2km of the coastline between Land's End and Godrevy Point, Cornwall. Contains Cornwall County Council (https://www.cornwall.gov.uk/environment-and-planning/cornwalls-landscape/landscape-character-assessment/) and Ordnance Survey data © Crown copyright and database right 2019

CA03: Penwith Central Hills

This LCA lies predominantly landward of CA02, consisting of an arc of gently rounded granitic hills with rocky outcrops, sloping more steeply to the northern coastal strip and more gently to the south. The area emerges as a narrow neck of land on the coast at Carbis Bay. Landcover is primarily improved grassland/pasture with some arable land. There are substantial areas of Lowland Heathland, bracken and neutral grassland on the hills. The distinctive features of this landscape are the spectacular rocky carns and the rounded outlines of the upland moors. There are also numerous prehistoric structures including quoits, standing stones and forts, as well as settlements like Chysauster (located outside of the RCZAS study area), while various hilltop structures form particular landmarks.

CA04 Mount's Bay

To the south of Hayle, the northern part of CA04 encounters the Hayle River and smaller streams that drain to the Hayle estuary, along with some low hills and ground cut by a number of streams running off the higher ground of CA03. The dryland is dominated by improved grassland, with an almost equal proportion of arable cultivation, especially in the farming hinterland, while the river corridor is wooded, with much wet woodland and other semi-natural habitat.

CA05: St Ives Bay

The Bay is bounded by rocky headlands within the adjacent LCA, with Clodgy Point and The Island at St Ives in the west, and Godrevy Point in the east. Within this wide curving bay are long sandy beaches backed by extensive sand dunes (The Towans) reaching 72m OD between Hayle and Godrevy as well as at Lelant covering the underlying mudstone hard ground. The tidal waters of the River Hayle and associated waterbodies divide and thus exclude the urban area of Hayle from the bay and the Towans. The river flowing out to sea through a narrow channel amongst sand banks, inland, forms extensive sheltered tidal mudflats that provide an important habitat for wading birds. On the east side of the bay a smaller river, the Red River, enters the bay close to Godrevy Point. The sand dunes around this area have been exploited for building and fertiliser. The majority of the area is made up of extensive sand dunes backing the sandy bay, fringed by development and agricultural land. Agricultural land is mostly arable with improved and unimproved grassland in places. The distinctive features of the area are the sandy beaches, extensive dunes, tidal estuary, the historic port at Hayle and the mix of enclosed field patterns. The explosive works at Upton Towans are a local feature.

CA06: Mount's Bay East

This LCA lies landward of CA05, consisting of a gently undulating low plateau dissected by shallow valleys draining into the River Hayle as well as the Roseworthy Stream that enters the Hayle Estuary (CA05 St Ives Bay) at Phillack. The farmed areas are mostly pastoral with a large proportion of arable land, making up the majority of land cover. There is generally a variable pattern of woodland and trees, with woodland mostly in the valleys, with some small fragmented areas especially in locations of former mining activity.

CA28: North Coast-Reskeage Downs

The area rises to 87m OD to the east and maintains this approximate height along the coastal strip with high, north facing cliffs. The geology consists of middle and undifferentiated Devonian slates, greywackes and siltstones, clearly exposed in the unstable, soft and gritty slate coastal cliffs. The cliff line is broken by the Carvannel valley. Behind this, the plateau slopes away from the coast and is incised by the Red River and its tributaries which run parallel to the coast and run westward, draining into St Ives Bay. Most of the area is mixed improved ley/pasture and arable, permanent pasture and horticulture to the west. Along the coast is a narrow strip of coastal rough ground, once much broader but now diminished by enclosure and coastal erosion. Woodland and tree cover is mostly at Tehidy and along the Red River valley and its tributaries.

CA11: Redruth, Camborne and Gwennap

This is rolling landscape where topography and land use closely relate to its geology. The cliffs near Portreath consist of middle and undifferentiated Devonian slates, while greywackes and siltstones underlie the bulk of the area, and dolerite, basalt and 'greenstone' lie beneath Camborne. The area is made up of two undulating catchment basins lying northeast and east of Redruth, separated by the low ridge of the North Downs. The streams from the northerly basin flow towards the north coast and enter the sea at Portreath whilst those of the other basin flow eastwards into the Carnon River which eventually joins the River Fal. These streams form incised, narrow valleys which emphasise the rolling nature of the landscape. Others radiate from the adjacent higher land of the Carnmenellis upland (LCA10) such as the Red River between Redruth and Camborne that carries water down to the coast through LCA28. Much of the landscape pattern and land use has been heavily influenced by tin and copper shaft mining, leaving a series of distinctive features including derelict engine houses, tips,

mining tracks and Methodist chapels. The main landcover is improved grassland/pasture, some arable and rough grazing. There are extensive disturbed areas left over from the mining industry where, left abandoned, scrub, bracken and heath has colonised. Small areas of woodland occur along the narrow incised valleys. The settlement pattern is a combination of the large urban areas, such as Camborne and Redruth, with a dispersed but dense mining and rural settlement pattern outside.

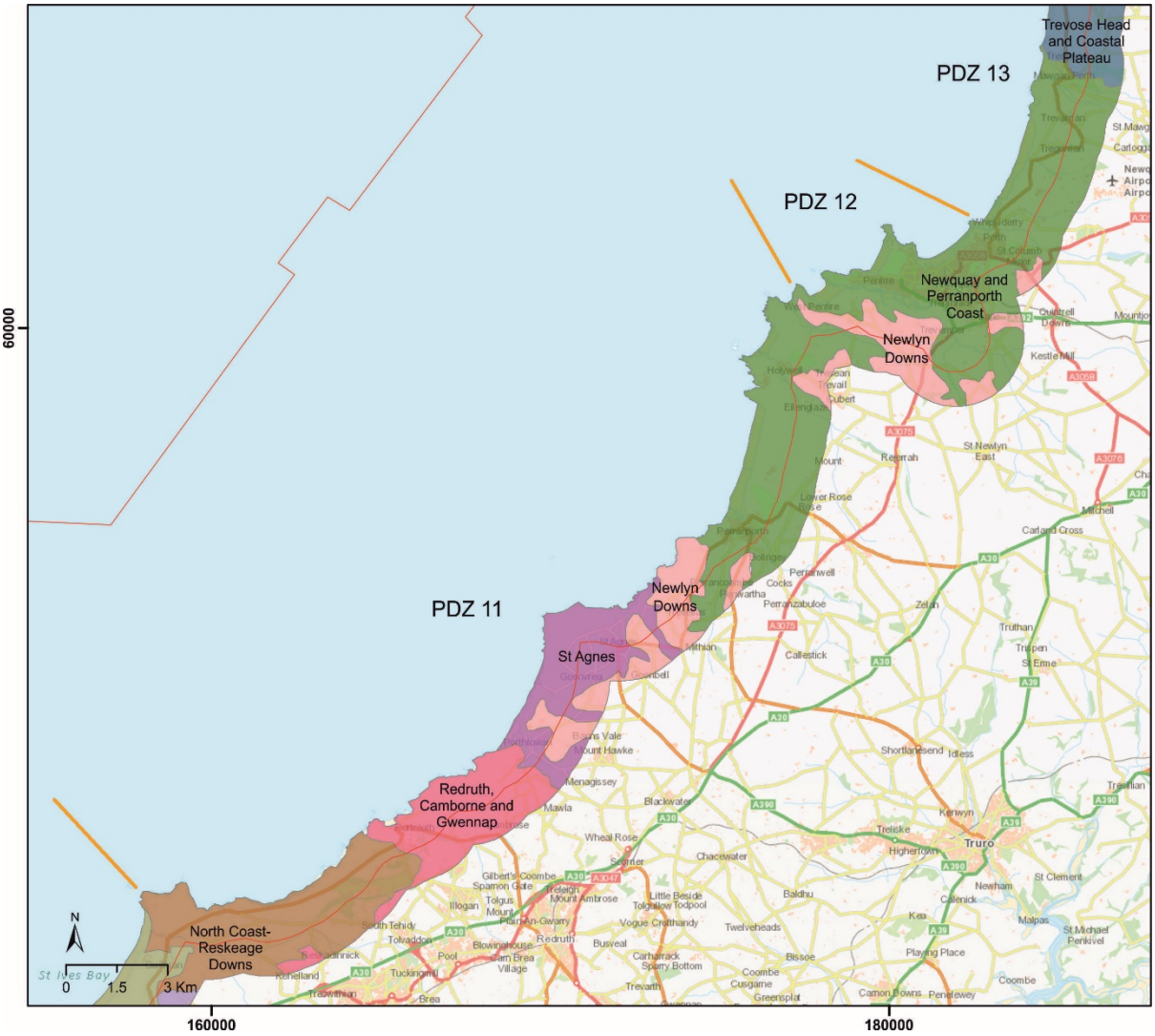


Figure 2.8: Landscape Character Areas within 2km of the coastline between Godrevy Point and Mawgan Porth, Cornwall. Contains Cornwall County Council (https://www.cornwall.gov.uk/environment-and-planning/cornwalls-landscape/landscape-character-assessment/) and Ordnance Survey data © Crown copyright and database right 2019

CA12: St Agnes

The St Agnes LCA consists of a plateau that rises from the coast reaching 192m OD at St Agnes Beacon, with incised steep valleys at Porthtowan, Trevellas Combe and Chapel Coombe, with valley sides around 100m deep. The cliffs are high and unstable with some wavecut platforms and beaches at Porthtowan/Chapel Porth. Short fast streams drain the area down the narrow valleys. The plateau consists of Devonian slates, greywackes and siltstones, and a slate killas, beneath which a granite intrusion at St Agnes Beacon has metamorphosed them to produce rich mineral veins of tin and copper. The farmed area is dominated by improved grassland in enclosures with some arable on upper inland slopes of valleys. Enclosure tends to be post medieval. A significant amount of Lowland Heathland covers some of the higher ground, the coastal strip and the valley sides closer to the coast,

and in places is associated with the derelict mine workings, which include mine-spoil dumps that exhibit patches of minimal vegetation due to metal contamination in the soil. There are large areas of scrub, bracken and some broadleaved woodland in the valleys. Tree cover is limited to valleys and settlement is clustered with small farms. A small area of sand dune lies at Porthtowan. Distinctive features of the LCA include St Agnes Beacon, the coastal Lowland Heathland, remains of chimneys, engine houses, tracks and disused roads, spoil heaps and rough ground, the small terraces in the villages and old sea harbours.

CA14: Newlyn Downs

The area has a gently undulating inland area with open and extensive views rising to a central spine that runs from Carland Cross to Chiverton. Shallow valleys and depressions on the plateau give way to steeper valleys in the north where the fingers of the plateau run towards the coast, arriving at Cligga Head with cliffs of around 85m OD. The geology of the area is Lower Devonian sandstones, siltstones and slates. The land cover consists predominantly of improved grassland and pasture with a substantial proportion of arable land. There is some Lowland Heathland and rough ground of scrub and bracken, along with some remnants of old mine spoil heaps which have developed naturally regenerating heath vegetation. Small areas of broadleaved woodland occur in sheltered hollows and valleys.



Figure 2.9: Panoramic view of the entrance to the River Gannel, looking south from Pentire Point East towards Crantock Beach

CA15: Newquay and Perranporth Coast

The landform is gently undulating with softly rounded hills dissected by small streams which have formed narrow valleys, becoming progressively incised as they meet the coast. The land slopes from around 80m OD inland to sea level at the coast, though with some cliffs also attaining 80m OD at Perranporth. The geology is Lower Devonian slates, siltstones and sandstones. Contorted and altered slates form dark cliffs and dramatic headlands between which lie broad sandy beaches and sand dunes, as at Penhale Sands, which extend inland and reach 60m OD. North of Newquay the cliffs become higher and more dramatic with a long narrow sandy beach at their foot. In these cliffs the green and purple banded slates are exposed to view. Most streams run through beaches to the sea but there is a small estuary and saltmarsh on the River Gannel at Newquay (Figure 2.9). Landcover is still predominantly rural with improved grassland/pasture with some arable. Most enclosure is post-medieval. Between Perranporth and Newquay, there are extensive areas of coastal rough ground and sand dunes. This coastal land has a history of alteration due to mining. Vegetation is low lying and windswept by prevailing sea winds, and hedgerows contain few trees. Rough ground and coastal

Lowland Heathland occurs in fragmented patches on steep slopes near the coast or exposed headlands, while trees and scrub vegetation occurs in the sheltered river valleys and particularly concentrated around Perranporth.

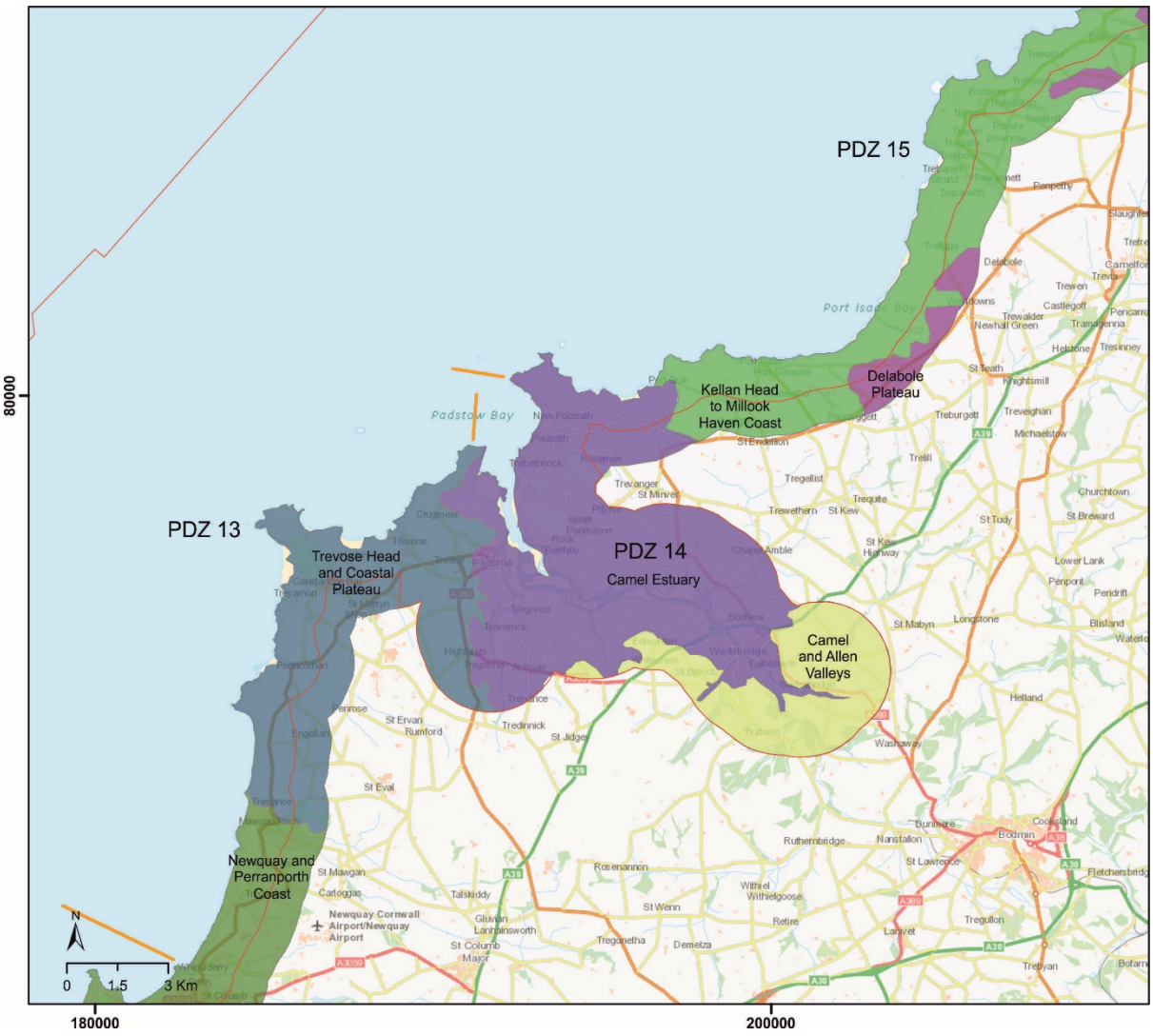


Figure 2.10: Landscape Character Areas within 2km of the coastline between Newquay Bay and Boscastle, Cornwall. Contains Cornwall County Council (https://www.cornwall.gov.uk/environment-and-planning/cornwalls-landscape/landscape-character-assessment/) and Ordnance Survey data © Crown copyright and database right 2019

CA19: Trevose Head and Coastal Plateau

The area is a low lying, gently undulating plateau, around 60m OD, with shallow and incised valleys, generally lower than the northern headlands at Trevose Head and Stepper Point which both reach 74m OD. The geology consists of east-west trending bands from south to north of Middle and undifferentiated Devonian slates, greywackes and siltstones; Upper and Middle Devonian slates with some pillow lava (dolerite, basalt and 'greenstone') and Upper Devonian slates. The greenstone and pillow lava intrusions are resistant to erosion permitting the headlands to attain higher altitudes, as opposed to the slates and shales that are eroded more rapidly resulting in the formation of sheltered bays and coves between the headlands. The soils are shallow hard rock soils with the exceptions of the raw sandy soils of the dunes and shallow calcareous soils on the peninsula at Trevose Head. The area drains north and northwest with short streams rising within the character area emptying into sandy bays at the coast. The low-lying land behind Constantine Bay has allowed an extensive dune

system to develop. A well-known and spectacular section of rocky coastal landscape occurs at Bedruthan Steps, with many stacks dotted along the cliff line. The dominant landcover is impoved grassland with substantial arable land. There are very few trees except in sheltered folds in the land and in the narrow stream valleys with the hedges mostly low and turf covered. At the coast are sand dunes and small areas of heath, rough ground and scrub.

CA34: Camel Estuary

The topography is characterised by the gently sloping and undulating valley sides of the Camel estuary and River Amble and the large expanse of water, over 500m wide, which weaves its way inland from the exposed coast at Polzeath to the town of Wadebridge. Where the landform meets the water there are low slate cliffs in places. The geology of the area is primarily Upper and Middle Devonian slates with some pillow lava. There is an east west trending band of dolerite, basalt and 'greenstone' which runs on the northern side of the estuary, partly expressed by Cant Hill, a prominent feature in the estuary. Dunes border the outer edges of the estuary at Daymer Bay and Harbour Cove. The north coast cliffs attain around 80m OD. The key features are Rumps Point and, offshore, the Mouls. Predominantly the area is farmland with very little tree cover except in the small valleys well inland. Patches of rough grassland and heath and sand dunes lie on the coast. The whole area is dominated by the wide river estuary with its mud flats and small side creeks. There are substantial settlements at Wadebridge, Padstow and Polzeath.



Figure 2.11: View seaward along the Camel Estuary and Padstow Bay from St Saviour's Point

CA35: Kellan Head to Millook Haven Coast

The land lies between the Delabole plateau (CA36) and the coast, within an area whose geology consists of predominantly Upper and Middle Devonian slates with pillow lava in places with Lower Carboniferous slates with thin limestones and shales including the Tintagel Volcanic formation. The geology of the area gave rise to many slate quarries, the last of which finished working in 1937. Many of the quarries were worked directly into the cliff face. Cuts into the rock face and platforms used for loading direct to boats moored at the cliff bottom are still clearly identifiable. The character of the

coastline falls into three main sections. To the southwest, the cliffs are a combination of vertical or chamfered rising to around 85m OD. Small incised valleys run at right angles to the coast which contains embayments at Port Quin Bay and Port Isaac Bay. The middle section centred on Tintagel has a more complex geology, much folded and faulted the hardened rocks form stacks, small islands and features such as Tintagel Island, a rounded headland connected by a narrow isthmus to the main coastline. To the north east where the plateau, in the form of Tresparrett Down, borders the coast, the cliffs rise to up to 240m OD, the highest in the county. These cliffs exhibit slumped profiles on the less stable shales and sandstones. Deeply incised valleys with large streams run down to the coast at Boscastle, Crackington Haven and Millook Haven. The land cover is predominantly improved grassland/pasture with some arable mainly to the south. Woodland, scrub, bracken and neutral grassland is mainly confined to the steep valleys in the north of the area. Rough ground and coastal heath cover the cliffs.

CA36: Delabole Plateau

The area is an elevated plateau, landward of CA35, which has been incised over time to form a broad topped undulating ridge falling from its highest point at Hendraburnick Down at over 300m OD to around 175m OD at its westernmost point and 139m OD near the coast to the north. The underlying geology is upper Devonian slates with a north west, south east trending band of lower Carboniferous slates with thin limestone and shales. Both sides of the ridge are incised by short tributary streams running into the adjacent valleys of the River Ottery, Allen, Inny and Valency. Large areas of former rough ground and heath are now enclosed and used for agriculture, mostly as improved grassland and pasture. There are few trees, though many present are mature, except for areas that have been taken in for conifer plantations.



Figure 2.12: Panoramic view of Widemouth Beach, looking west

CA37: Western Culm Plateau

The high undulating plateau rises from around 130m OD at the coast to 233m OD at Hendon Moor to the north and to around 160m OD in the south. The area is a plateau of mudstones and Carboniferous shales to the west, exposed at the coastline, and sandstone to the east as part of the Culm Measures. Small rivers cut their way through deep narrow valleys to the coast following the axes of geological folding (synclines and anticline), sometimes forming cliff waterfalls at the coastline. The area is predominantly improved grassland/pasture. There is some arable land of barley and other crops such as maize near the coast and on the higher plateau tops. Woodland occurs in the steep valleys with some conifer plantations on the plateau. The steep wooded valleys, coastal heath and tall dramatic cliffs of the coastline notably contrast with the open almost empty countryside elsewhere.

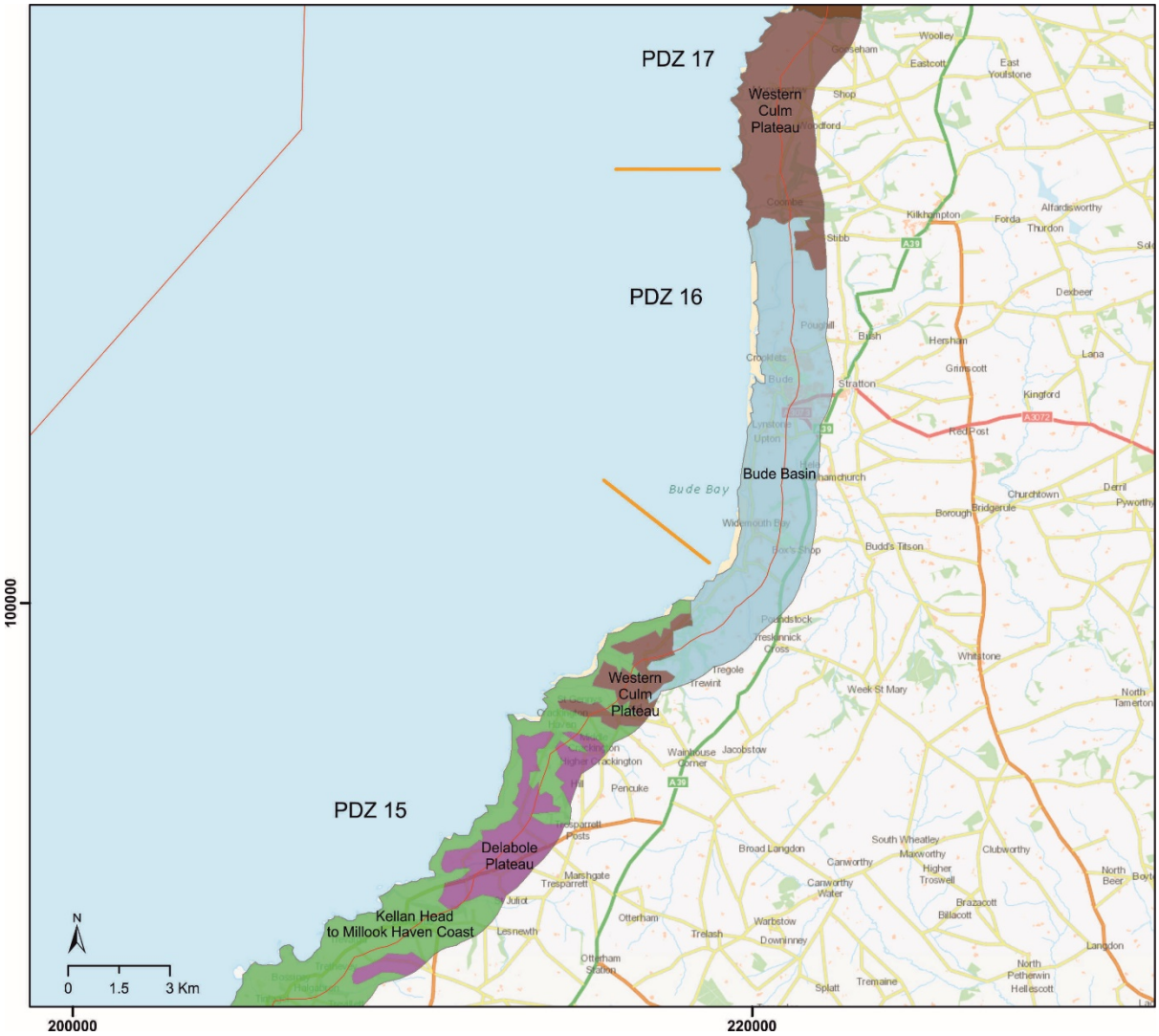


Figure 2.13: Landscape Character Areas within 2km of the coastline between Boscastle and Morwenstow, Cornwall. Contains Cornwall County Council (https://www.cornwall.gov.uk/environment-and-planning/cornwalls-landscape/landscape-character-assessment/) and Ordnance Survey data © Crown copyright and database right 2019

CA38: Bude Basin

The landform in this area is a shallow undulating basin that rises up to the Culm Plateau in the east (CA37) and is bounded by the coast in the west. The mixed hard rock is from the Carboniferous era, known as the Bude Formation, comprised of massive sandstones and thin interbedded shales. The faulting and folding of these Carboniferous shales and sandstones is a dominant Landscape Characteristic of the coastline with good examples at the major beaches of Widemouth (Figure 2.12), Bude (Figure 2.14) and Crooklets. Particularly notable are the red sandstone cliffs visible at Northcott Mouth. The coastline is straight and cliffs are low and discontinuous with stretches of sandy beaches, the largest being located at Widemouth Sands. The basin rises gently inland to approximately 140m OD. The entire basin forms a catchment area for small streams in little narrow valleys feeding the most significant, the River Neet, which flows from north to south through the basin within a flat bottomed valley before turning abruptly northwest towards the sea at Bude Haven. This is an area that is predominantly agricultural with improved grassland and pasture with some arable, with widespread medium-scale field pattern with hedgerows, and limited areas of scrub and and broadleaved woodland, mostly along the many small stream valleys. There are small areas of conifer plantation.

The low-lying coastal land in the lower part of the Neet Valley forms extensive reedbeds. Along the coast is a narrow strip of maritime cliff, scrub, neutral grassland and very small fragments of coastal heath, some of which has been enclosed for agriculture in the 20th century.



Figure 2.14: Cliff exposure at Bude Haven

Hartland Peninsula

The Hartland Peninsula forms the most southern part of the AONB and includes the settlement of Hartland. In the Hartland Peninsula, complex geology, combined with centuries of pounding by the full force of the Atlantic waves, has produced some of the most dramatic seascapes and coastal scenery in Devon. The cliffs are high and rugged, with zig-zag faults and folds. Wave-cut platforms and spectacular coastal waterfalls are also distinctive features of this jagged, exposed and windswept coastline, with the profile of Lundy visible in the open seascape. Coastal heathland is found along the cliff tops, while inland the area contains an open, flat, elevated plateau of agricultural land, which contrasts with the twisting, wooded and secretive combes that are cut into the plateau at its coastal edge.

Lundy

Lundy is an isolated and unique place, surrounded by and dominated by the ever-changing sea. Remote and undeveloped, it is regarded as a 'sanctuary' away from the mainland. Its seascapes are dramatic, with sheer cliffs rising out of the water, battered into dramatic shapes by the force of the Atlantic breakers. The desolate, windswept moorland is alive with the sounds of crashing waves and the cries of the sea birds. The island's remoteness from 21st century life, and its sense of changelessness, is enhanced by the extraordinary richness of its history. These historic sites provide a tangible link with the island's past, stretching as far back as prehistoric times.

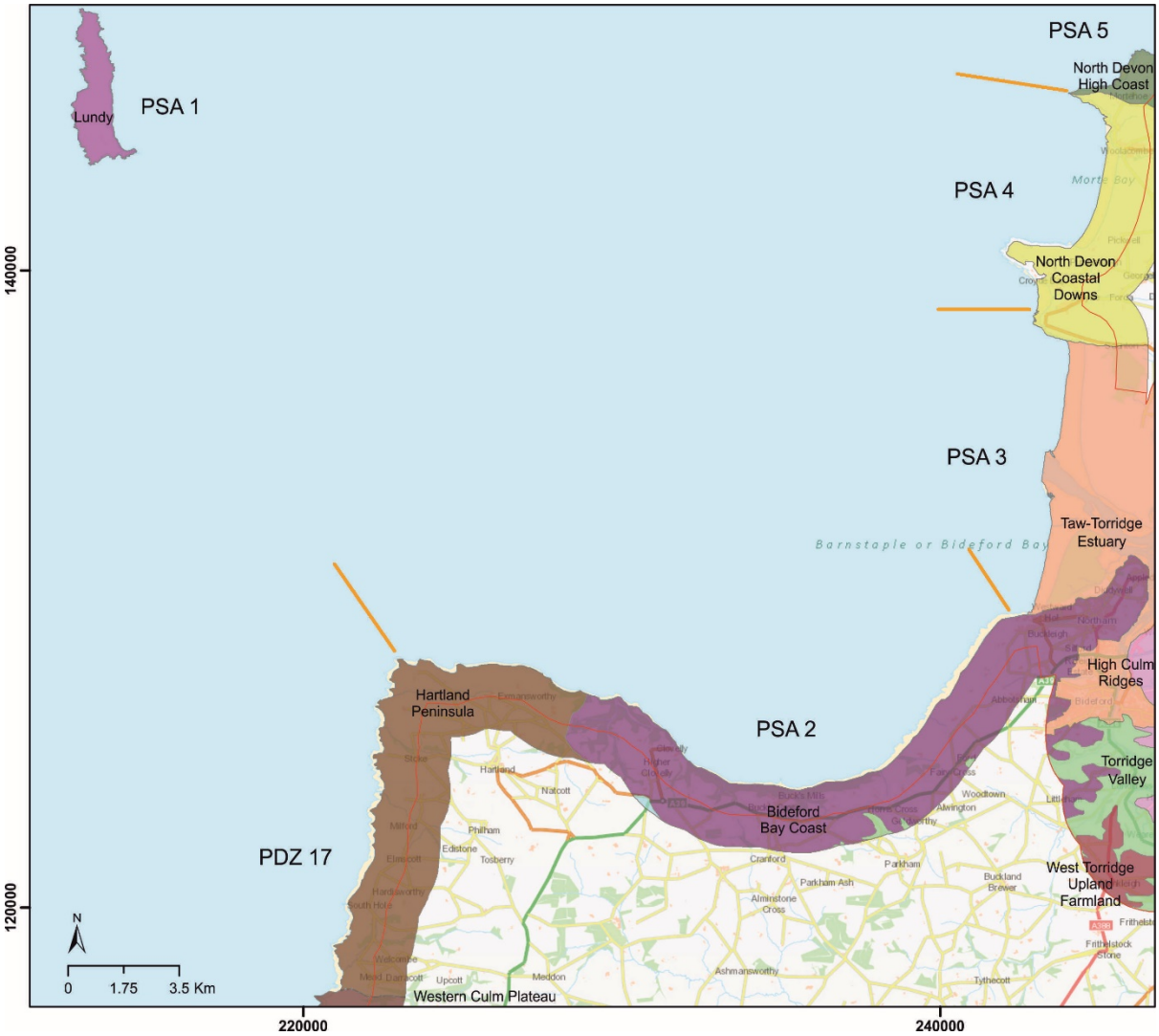


Figure 2.15: Landscape Character Areas within 2km of the coastline between Mead and Croyde, including Lundy, Devon. Contains Devon County Council (https://www.devon.gov.uk/planning/planning-policies/landscape/devons-landscape-character-assessment) and Ordnance Survey data © Crown copyright and database right 2019

Bideford Bay Coast

Running from the seaside resort at Westward Ho! to the west of Clovelly, the Bideford Bay Coast begins with farmland that runs right up to the coastline. It is largely defined by its deep combes cloaked in oak woodland winding inland from the wooded cliffs. Narrow lanes with high, fern-covered banks provide access to the sheltered combe villages of Bucks Mills and Clovelly. On higher land behind and between the combes is a landscape with a rolling patchwork of fields. There are open sea views across Bideford Bay towards the Taw Torridge estuary, with Lundy a distinctive feature on the horizon.

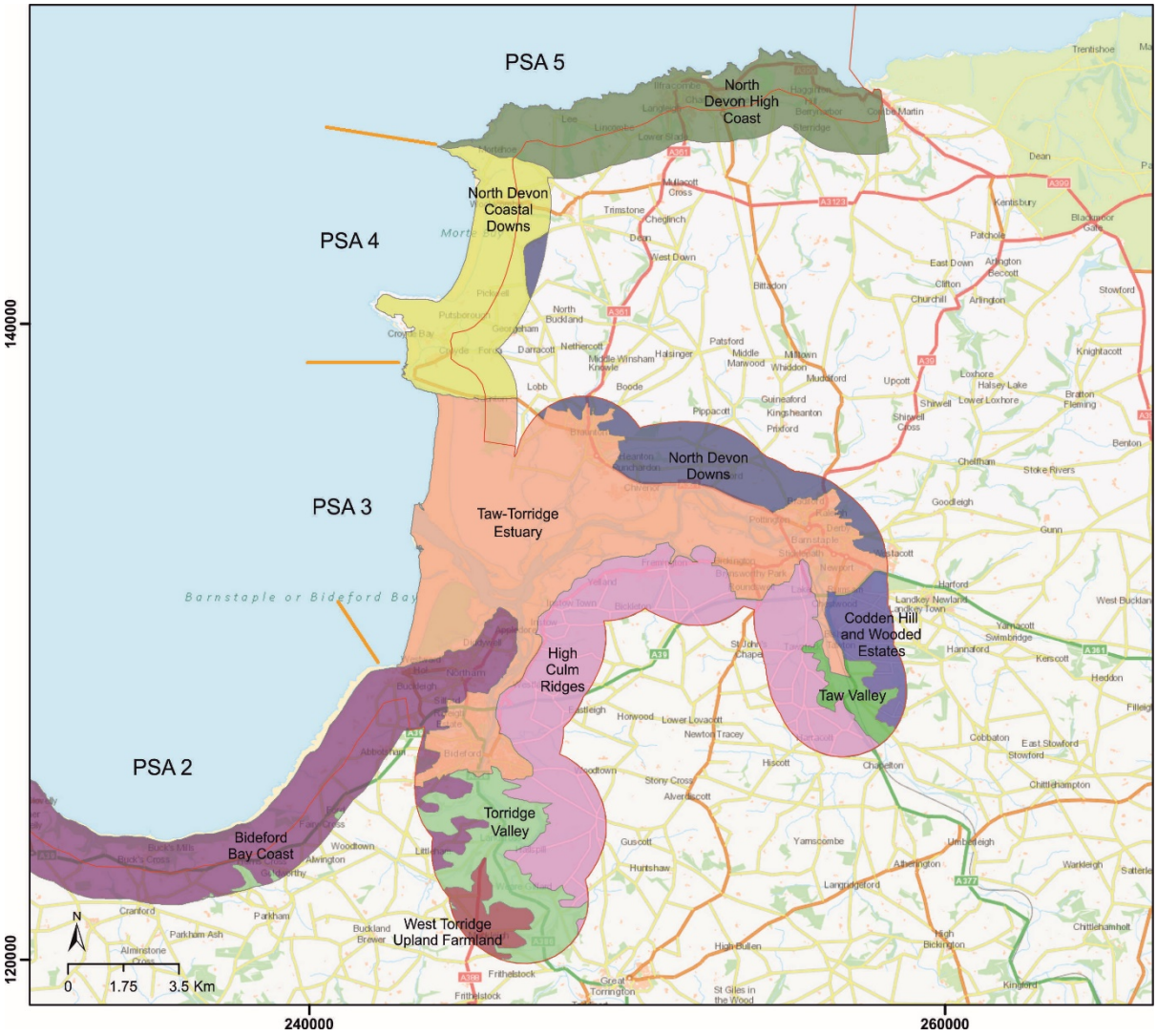


Figure 2.16: Landscape Character Areas within 2km of the coastline between Clovelly and Combe Martin, Cornwall. Contains Devon County Council (https://www.devon.gov.uk/planning/planning-policies/landscape/devons-landscape-character-assessment) and Ordnance Survey data © Crown copyright and database right 2019

Taw-Torridge Estuary

This LCA sits astride the Taw-Torridge Estuary and covers the internationally important sand dune system at Braunton Burrows. The habitats within the mosaic include dunes, beach, saltmarsh, mudflats and farmland. The estuary settlements have a strong maritime character, with historic quays.

Torridge Valley

The River Torridge flows in a series of looping meanders through dramatic gorges with dark forested sides, through open pastoral valley floors with valley sides cloaked in ancient woodland, and through tidal mudflats echoing to the call of seabirds. The river is home to otters and is overlooked by ancient defences and historic villages perched high above on the valley sides. Numerous historic features are associated with the river, including weirs, mills, bridges and a disused railway line (now the 'Tarka Trail'). This is an intricate, complex and varied landscape, with unexpected views suddenly revealed as landform and vegetation open out.

West Torridge Upland Farmland

The northern edge of this LCA is located within the study area. It is an undulating, agricultural landscape with a strong sense of history and long management. The extensive woodlands, hedgerows and parklands give the area a pastoral character and a verdant, settled quality. Its historic character is enhanced by the stone bridges, linhays, medieval castles, square church towers and prehistoric barrows which are features of the landscape. The lanes are winding and enclosed by colourful flower-rich hedgebanks, but through gaps in the hedgebanks, the views from high ground are long and open.

High Culm Ridges

The northwestern edge of this LCA lies within the study area. It is typified by an open, elevated landscape, where the long views out make an important contribution to the sense of place, with views out to sea and across the north Devon coast lending a strong maritime influence. Views across and into the neighbouring Taw and Torridge valleys emphasise the contrast between this open farmland and the wooded, enclosed and intimate valley landscapes on either side. Skylines are very important, with clumps of trees and square church towers acting as prominent features and landscape focal points. Woodland and occasional patches of unimproved grassland contribute to the seasonally-changing colour and texture of the landscape.

Taw Valley

Only the northern end of this LCA is located within the study area, which is typified by an intricate, complex and varied landscape within a dramatic valley, which contrasts with the surrounding open, elevated farmland. Woodland and slopes combine with bends and spurs in the valley to hide views onward. Tightly wooded sections unexpectedly open out to display wide vistas across the valley.

Codden Hill and Wooded Estates

This LCA is distinguished by its landform of high, whale-backed hills and the presence of large estates of woodland and parkland. There is a strong sense of peace and tranquillity in the woodlands and along the winding, hedge-banked lanes. This is a managed, working landscape with a strong sense of history and culture, with many historic parkland features still visible in today's landscape. Estate villages cluster around stone bridges or crossroads, and farms nestle into folds in the hills.

North Devon Downs

The North Devon Downs contain an agricultural-dominated landscape associated with smooth hills with rounded profiles, and are covered by a patchwork of large, regular fields. The steep valleys, which punctuate the downland, are often wooded contrasting with the open farmland on the plateaus. Small sections of this landscape character type occur within the AONB occupying the high ground behind the coast and, whilst largely undesignated, it forms an important visual backdrop to the AONB.

North Devon Coastal Downs

From the headland at Morte Point to the ridgeline at Saunton Down, and covering the resorts of Woolacombe and Croyde, this is a landscape dominated by its seascape, with the long, low outline of Lundy visible on the horizon, and views across Bideford Bay as far as Hartland Point (Figure 2.17). A series of rolling downland ridges run on to long headlands interspersed with wide sandy beaches.



Figure 2.17: Panoramic view across Bideford Bay from Saunton, showing Braunton Burrows on the left and Hartland Point in the distance on the right

North Devon High Coast

This is an area in the far north of the AONB stretching from Combe Martin to Morte Point and covers the important seaside resort of Ilfracombe. It is a landscape of spectacular seascapes, with a rugged, jagged coastline containing a series of rocky headlands and small coves with grey shingle beaches. The western part has extensive areas of colourful coastal heath and grassland. The area around Ilfracombe is more developed, with its imposing Victorian architecture reflecting its rise as a holiday destination. The enclosed, wooded coastal combes cut through rolling, agricultural downland to the sea. Trees are a prominent feature, softening the windswept landscape of the open downland below the ridge tops.



Figure 2.18: Panoramic view of Ilfracombe from Capstone Point

2.3.3 Marine Character Areas

Seascapes, like landscapes, reflect the relationship between people and place and the part it plays in forming the setting to our everyday lives. Marine Character Areas (MCAs) highlight the key natural, cultural and perceptual influences that make the character of each seascape distinct and unique. The Marine Policy Statement (MPS) states that references to seascape should be taken as meaning landscapes with views of the coast or seas, and coasts and the adjacent marine environment with cultural, historical and archaeological links with each other. Seascape can therefore be considered an umbrella term that covers both the visual resource and marine character. The Marine Management Organisation (MMO) Seascape Assessments have been broadly aligned with the guiding principles set out in Natural England's 2012 publication '*an approach to Seascape Character Assessment*' (Natural England 2012). MCA's for the southwest are defined in Ahem (2018), which also includes a Seascape Character Assessment (SCA) for each MCA. Within the RCZAS study area, there are seven MCAs (Figure 2.19). Due to its large size and small overlap with the RCZAS study area, MCA 51 (Bristol Channel Approaches) is not described below.

MCA 46: Penwith Maritime

This is an exposed west-facing seascape open to the full force of the Atlantic. The rugged coastline is characterised by the spectacular columnar sea cliffs of the Land's End peninsula, deeply incised inlets and small coves, pounded by large waves generated by the steep rise in the sea floor. The designated

granite cliffs support important seabird colonies while the granite islets and submerged reefs are highly valued for marine biodiversity (designated as SAC or MCZ). The treacherous reefs are a hazard to shipping and are marked by lighthouses and lit buoys, some far out to sea. The area has a rich industrial heritage related to coastal mining and the historical trade in metal ores and stone. Today there are low levels of fishing activity and recreational sailing, owing to exposure, but international vessels use the major north-south shipping route between Land's End and the Isles of Scilly. The potential for harnessing the MCA's high wave energy is being explored through testing sites. Tourism is an important economic activity in the area. Panoramic views out across the Atlantic from the peninsula are often marked by maritime transport.

MCA 45: Port Gaverne Bay to St Ives Bay

This is an open seascape fully exposed to the force of the Atlantic and susceptible to swells and inshore gales. The coastline is characterised by eroding slate cliffs and rocky headlands, interspersed by sheltered coves and sweeping sandy beaches backed by sand dunes and estuaries. The submerged rocky reefs, shallows and sand bars create navigational hazards which are marked by lit buoys and lighthouses. The area is rich in coastal, estuarine and marine wildlife (much designated as SAC or MCZ), as well as cultural associations with wrecking and shipwrecks, coastal mining and maritime trade. The potential for harnessing the MCA's high wave energy is being explored through renewable energy testing sites. Sandy beaches are a draw for summer visitors, with tourist development stretching from the harbour settlements along the coast. There is a strong visual connection with the adjacent MCAs along the coast and panoramic views out to the Atlantic Ocean from the high cliffs. The area has inspired writers and artists through history, including the St Ives School of Painting in the early 20th century.

MCA 44: Hartland Point to Port Isacc Bay

This is an exposed, wild and rugged seascape open to the full brunt of the Atlantic, backed by flat-topped, sheer coastal cliffs with renowned folded and faulted strata and waterfalls plunging to the sea. The cliff bases are characterised by extensive wave-cut platforms. Jagged reefs extending out from Hartland Point along with submerged pinnacles create hazards to navigation (marked by the prominent Hartland Point lighthouse). Crashing waves, swirling white water and foam characterise the sea surface, and the coastline is a surfing hotspot. The area is rich in coastal and marine wildlife (much designated as SAC or MCZ) as well as cultural associations with early human occupation, maritime trade, smuggling and shipwrecks. Views extend westwards across the Atlantic Ocean and there is strong intervisibility with adjacent seascapes, including North Cornwall and to Lundy to the north-west. Associated with Arthurian legends, Tintagel Castle, situated on a dramatic rocky headland, is a key draw for visitors to the area.

MCA 43: Lundy and Outer Bristol Channel

Lundy is a flat-topped island in the Bristol Channel, located between the North Devon coast and the Gower and Pembrokeshire coasts in Wales. It forms an important focal point in views from these coasts and within the channel. Spectacular cliffs define Lundy's coastal edge, the western waters of the MCA (and coast of Lundy) exposed to strong tidal currents and Atlantic swells. The island's clear waters and varied seabed host nationally important maritime habitats which are a haven for marine wildlife including seals and colonies of seabirds; further offshore coarse sand and gravel sediments below deep waters of up to 60m support commercially important fishing grounds. The island and its surrounding waters are rich in archaeological heritage and steeped in maritime legend; a dense

concentration of wrecks (now popular dive sites) are testament to the rough seas and position of the area within historic trading routes. Lundy is a valued destination for visitors seeking a range of experiences and recreational activities above and below the water. It is defined by its undeveloped character, rich marine biodiversity, uninterrupted views across the open Atlantic, and strong visual and cultural connections with the surrounding seascapes.

MCA 42: Bideford Bay and Taw-Torridge Estuary

The sweeping north-west orientated Bideford Bay is characterised by a predominantly sandy seabed supporting rich commercial fisheries and attracting seabirds and cetaceans. Areas of biogenetic reef, sandy shores and rock pools form valued habitats, recognised within the Bideford to Foreland Point MCZ. Draining into the bay, the large combined Taw-Torridge Estuary is surrounded by nationally important wetlands, supporting a range of bird and fish species, whilst the prominent internationally designated dunes at Braunton Burrows fringe the estuary mouth. Shipwrecks on the sea floor are testament to a long history of maritime trade and transport, including the timber trade between Newfoundland and Bideford (a working historic port on the banks of the estuary). The sheltered waters provide opportunities for a range of recreational activities, along with the popular sandy beaches at Woolacombe, Croyde, Saunton and Westward Ho!. The open bay is defined by its panoramic, uninterrupted views out to sea - featuring Lundy and distant glimpses of the Welsh coast. Seascape character is strongly influenced by visual and cultural links to the coastline surrounding the bay, with its complex and varied forms and coastal landmarks, including the prominent Hartland Point lighthouse.

MCA 41: Bristol Channel

The Bristol Channel MCA extends up to approximately 20km offshore from the North Devon and Exmoor coast, with a sense of enclosure increasing in the east as the channel narrows. Its bathymetry and seabed topography is influenced by the presence of sand and gravel banks which form havens for seasonal variations of fish species, including commercially important stocks. It is characterised by channels running perpendicular to the east-west tidal currents and the second largest tidal range in the world. The area is highly exposed to weather rolling in from the Atlantic, creating areas of high wave climate in the west. It has strong historical and current associations with maritime trade and transport (a number of shipwrecks tracing historic shipping routes), with human activity continuing to have a strong influence on character. Extensive, open views across the waters are available to the contrasting coastlines of the industrialised sections of the South Wales coast and the remote coastline of Exmoor and North Devon to the south, with its high rugged cliffs and dark night skies.

2.3.4 Seascape Character Assessment

Sitting underneath the MCA are more detailed, locally-based Seascape Character Assessments. Within the RCZAS study area the only Seascape Character Assessment undertaken at a local scale is the North Devon and Exmoor Seascape Character Assessment (Parker et al. 2015), covering the North Devon and Exmoor coast from Marshland Mouth on the border with Cornwall, to the eastern boundary of the Exmoor National Park on the edge of Minehead, extending offshore to the 12 nautical mile territorial limit (see Figure 2.19). The assessment identified 27 Seascape Character Areas (SCAs) within the North Devon and Exmoor study area, of which 19 are relevant to the RCZAS study area. In addition to aiding planning decisions and management plans both at sea and on areas of the coast, the North Devon and Exmoor Seascape Character Assessment will also support the development of the future Marine

Management Plan for the South West. The study area for the North Devon and Exmoor Seascape Character Assessment overlaps with that of the Landscape Character Assessments, thereby allowing a fully integrated resource for the landscape and seascape character of the coast. Each of the SCAs are further divided into Seascape Character Types (SCTs), reflecting the geomorphology and nature of coastal waters within each of these areas (Parker et al. 2015).

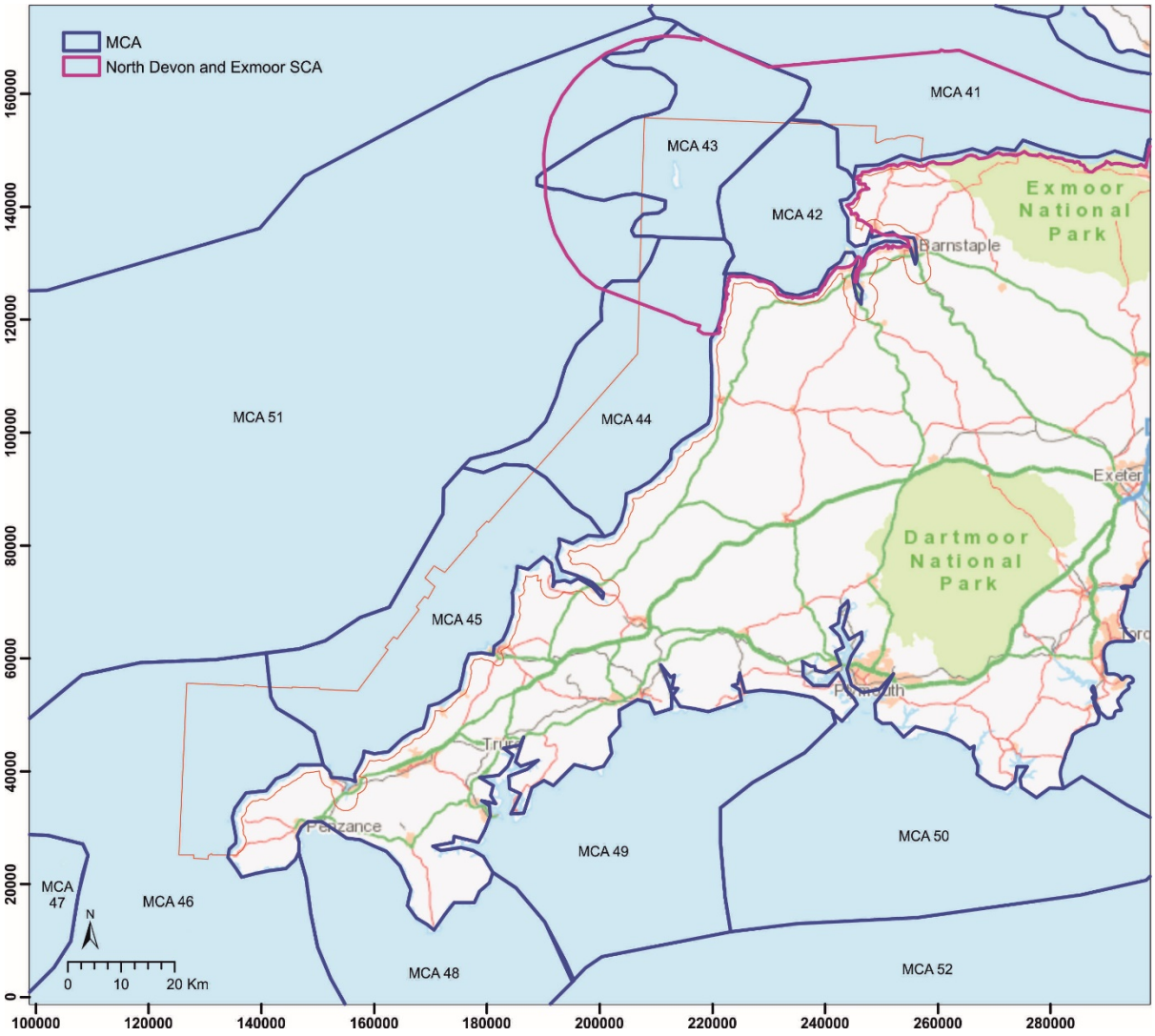


Figure 2.19: Marine Character Areas (MCA) and boundary of the North Devon and Exmoor Seascape Character Assessment. Contains Joint Nature Conservation Committee and Ordnance Survey data © Crown copyright and database right 2019

3 Strategic historic environment projects

3.1 Research Frameworks

There are a number of National and Regional thematic and chronological Research Frameworks which are relevant to the North Cornwall and North Devon RCZAS. The *South West Archaeological Research Framework* (SWARF) (Webster 2008) provides a resource assessment and research agenda covering the historic counties of Cornwall, Devon, Dorset, Somerset, Wiltshire and Gloucestershire. The project had, as its aim, the provision of a structure in which to make decisions about future archaeological research. This included a review of the current state of knowledge of the archaeological resource within the area, which provided the basis for identifying gaps in current knowledge and thus setting research priorities for the future within the form of a Research Agenda and Strategy (Grove and Croft 2012).

Research priorities relevant to the maritime, marine and coastal archaeology within England are contained within *People and the Sea: A Maritime Archaeological Research Agenda for England* (Ransley et al. 2013). The agenda provides a framework to enable long-term strategic planning, as well as informing policy and providing information for researchers.

3.2 Historic Characterisation

3.2.1 Historic Landscape Characterisation

Historic Landscape Characterisation (HLC) was pioneered in Cornwall in 1994, and has developed rapidly and broadly into a major national programme. The HLC is designed to provide a framework for broadening our understanding of the whole landscape, including time-depth, contributing to decisions affecting its use and development. HLC work is conducted in line with the European Landscape Convention (ELC), which came into force on 4 March 2004. The ELC promotes landscape as a primary aspect of the common heritage, and one that requires comprehensive understanding, democratic participation and sustainable management. HLC has been carried out for both Cornwall (Cornwall County Council 1994; Cornwall County Council 1996; Herring 1998)[3] and Devon (Turner 2005; 2015)[4]. This characterisation reflects the historic processes that have shaped the landscape and involved dividing the county into a series of HLC types, simplified in a second stage into HLC zones, each of which reflects a particular set of historic processes and tends to contain a predictable range of archaeological sites and historic features. An HLC typically adopts the following broad types:

- Unenclosed or unimproved land
- Enclosed land
- Woodland
- Industrial land
- Military
- Ornamental and recreational
- Settlements
- Orchards

[3] https://www.cornwall.gov.uk/environment-and-planning/strategic-historic-environment-service/cornwall-and-scilly-historic-environment-record/historic-landscape-character/

[4] https://www.devon.gov.uk/historicenvironment/the-devon-historic-environment-record/historic-landscape-characterisation/

- Communications
- Water and valley floor
- Water bodies

As the HLC has evolved, so have the methodologies, resulting in some differences in the data analysis and structure implementation between these two studies. For example, in Cornwall settlement and farmland were divided into separate types based upon age (modern, post-medieval, medieval or prehistoric), while in the Devon HLC additional divisions into period were assigned to each of the HLC type including confidence associated with this period association. Two of these divisions are shown in Figure 3.5 and Figure 3.6, with the former showing the characterisation of the whole modern landscape of Devon, and the latter for the late 19th century based on the 1st edition OS maps (see Turner 2005; 2015), with medieval discussed in more detail by Turner (2006).

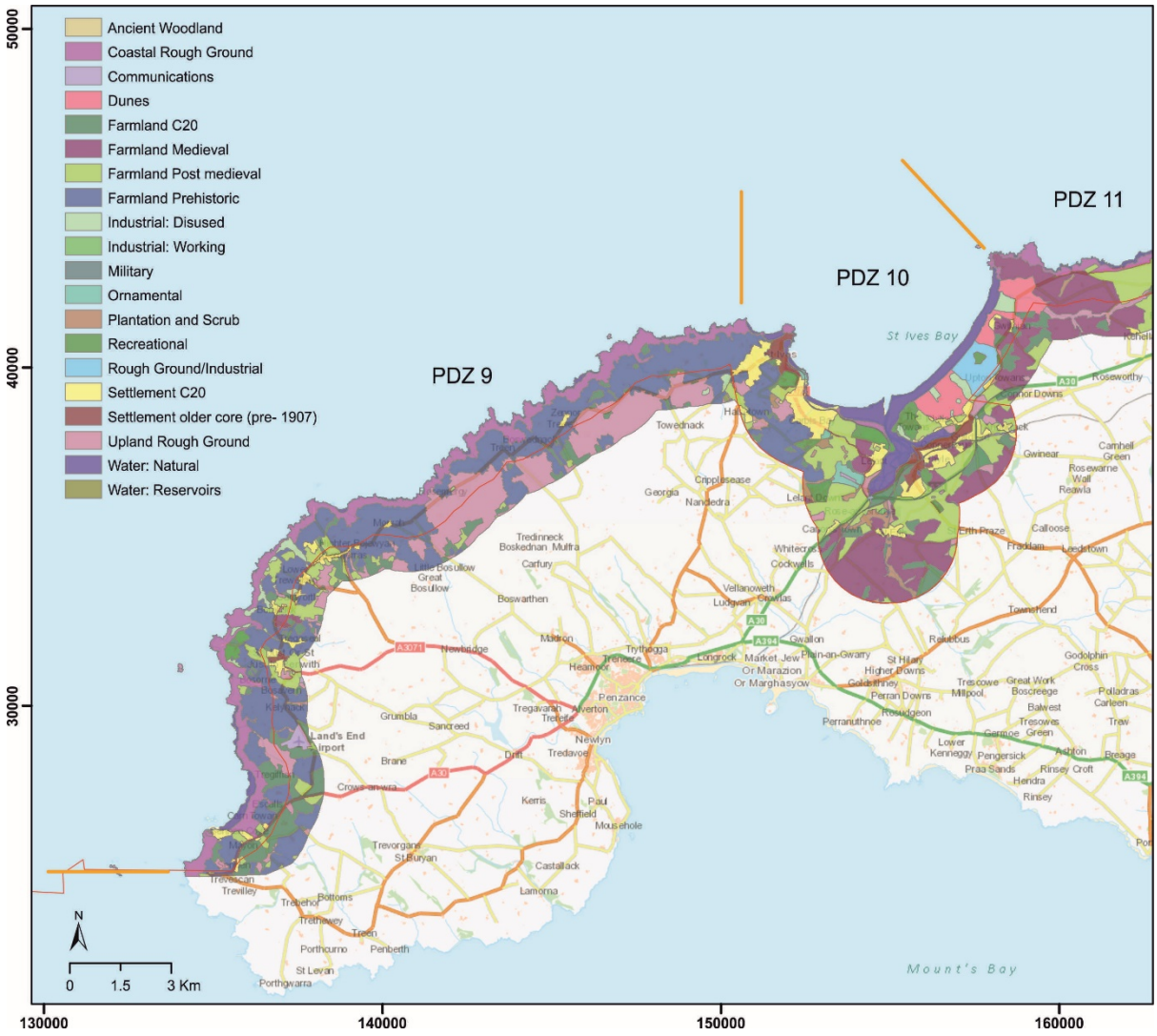


Figure 3.1: Historic Landscape Characterisation within 2km of the coastline between Land's End and Godrevy Point, Cornwall. Data from Cornwall Council 2014 (https://doi.org/10.5284/1027510). Contains Ordnance Survey data © Crown copyright and database right 2019

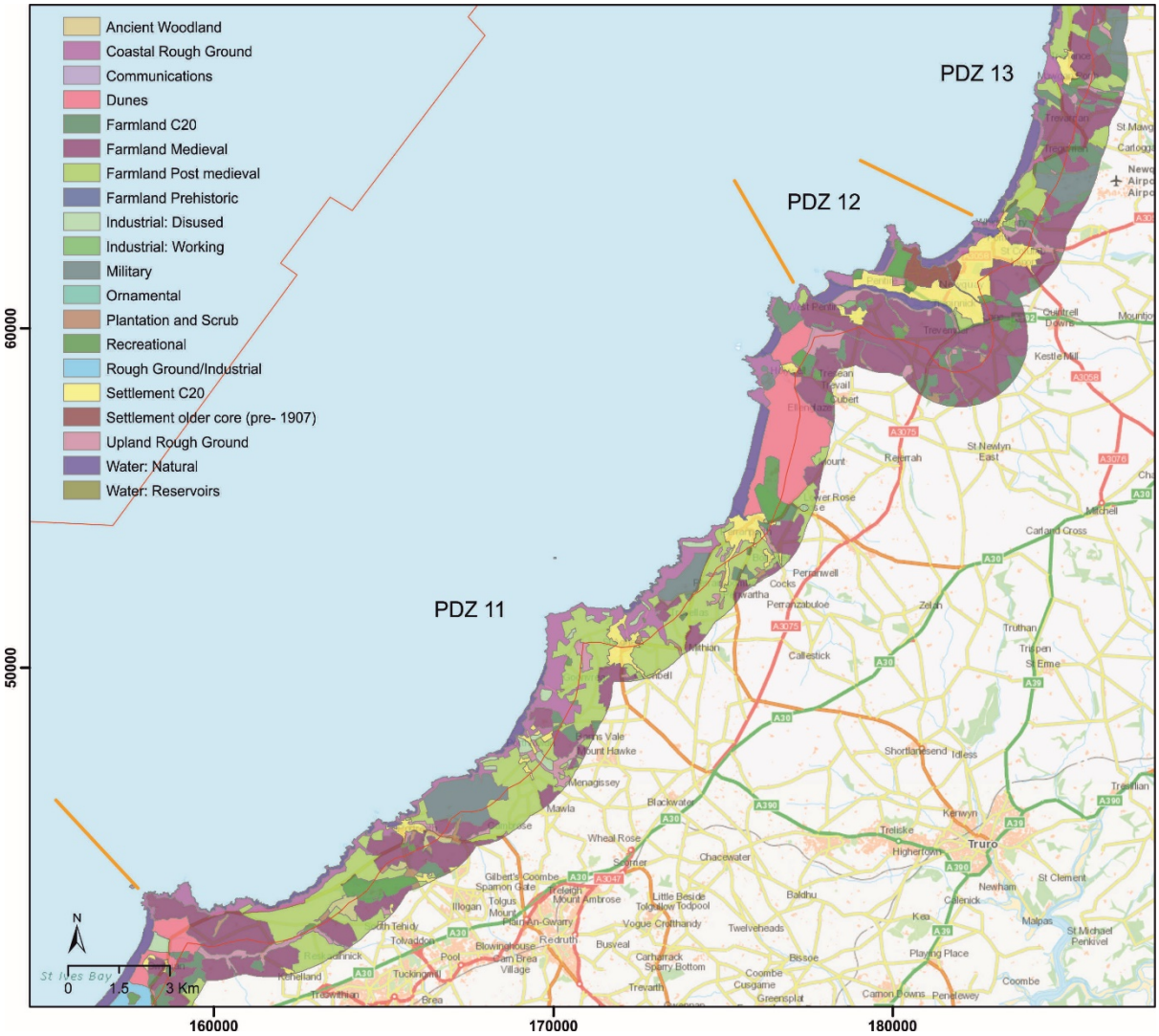


Figure 3.2: Historic Landscape Characterisation within 2km of the coastline between Godrevy Point and Mawgan Porth, Cornwall. Data from Cornwall Council 2014 (https://doi.org/10.5284/1027510). Contains Ordnance Survey data © Crown copyright and database right 2019

The results of the Cornwall HLC are summarised in Figure 3.1 to Figure 3.4. This assessment shows strong spatial patterning but with farmland being the principal land use behind the coastal fringe. The most striking spatial difference is in the period associated with this farming, with prehistoric field systems dominating the West Penwith peninsula and medieval field systems the majority of the remainder of the study area to its east, albeit with increases in post-medieval field clusters around Hayle, Portreath, St Agnes and Widemouth Bay. Much of the coastline is fronted by rough ground, with dunes also major HLC types, particularly around Gwithian and Perranporth. This HLC type was studied in more detail during the HEATH project (see Section 3.3.4). Beyond the main settlements at St Ives, Hayle, Newquay and Padstow, all of which contain discernible pre-20th century older cores, settlement within the wider area is limited to small villages typically associated with coastal settlements located at a river accessing the sea. Along the coastline there are a series of sites associated with the military dating back to World War II, including RRH Portreath (Nancekuke), Perranporth Airfield (formerly RAF Perranporth), RAF St Mawgan / Newquay Airport and RAF St Eval coastal command. Some of these are maintained for defence purposes, while others have been decommissioned although may be retained for private / commercial use.

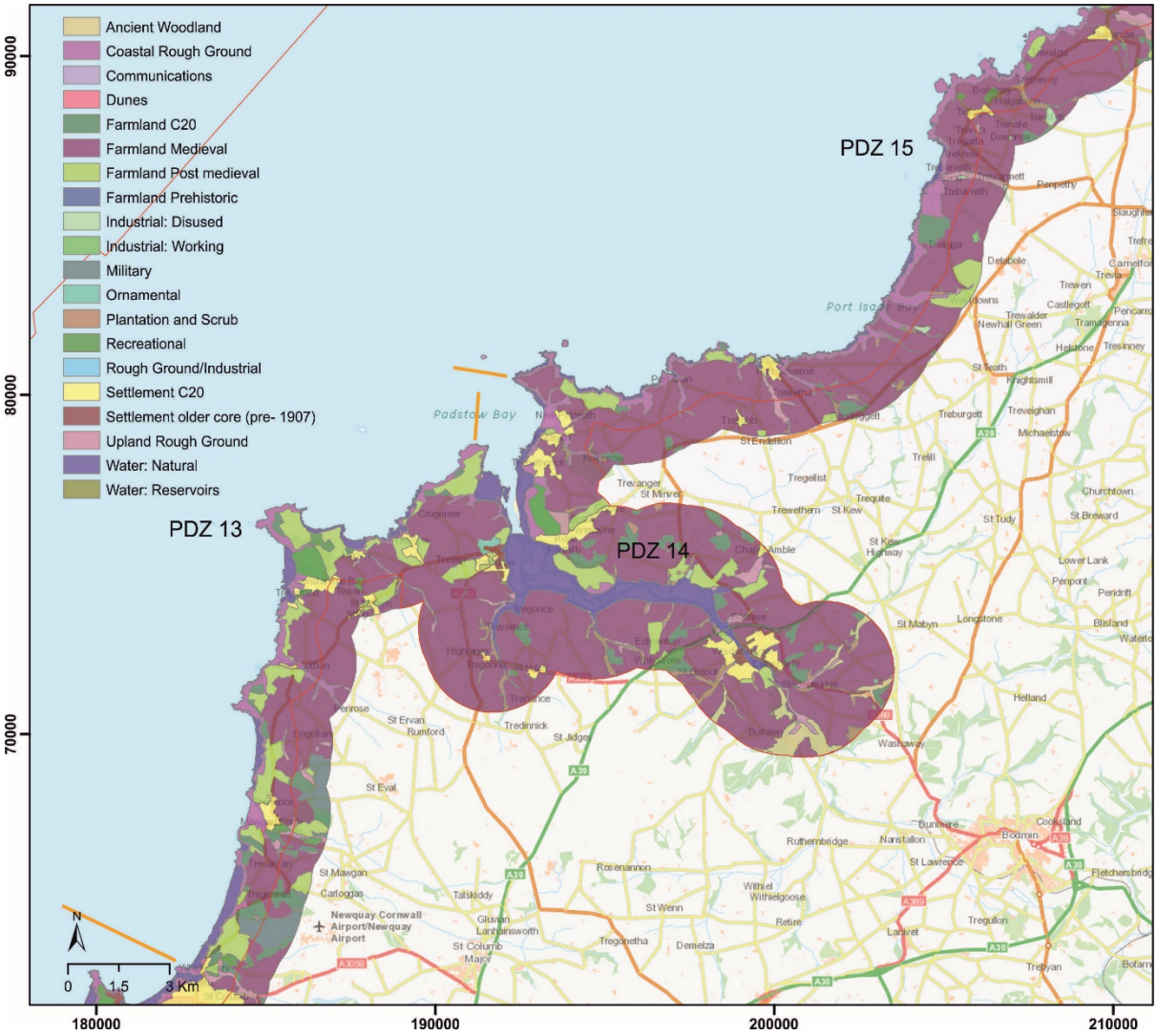


Figure 3.3: Historic Landscape Characterisation within 2km of the coastline between Newquay Bay and Boscastle, Cornwall. Data from Cornwall Council 2014 (https://doi.org/10.5284/1027510). Contains Ordnance Survey data © Crown copyright and database right 2019

The HLC of Devon (Figure 3.5 to Figure 3.6) demonstrates similar trends to those found in Cornwall with enclosures forming the principal landuse throughout the study area, with some areas of coastal rough ground notably around headlands in the Hartland Quay, Croyde, Morte Point and Lundy areas. Settlements are similarly dispersed, with the main centres found within the Taw-Torridge area at Westward Ho!, Bideford-Northam and Appledore, Fremington, Bickington, Barnstaple and Braunton. On the north coast there are also settlements at Croyde, Woolacombe and Ilfracombe. Areas of woodland are focused in areas associated with the river valleys, and are most prevalent on the north-facing slopes around Clovelly to Peppercombe and Lee Bay. Exposed cliffs are prevalent on the coastline around Lundy along with Hartland, Babbacombe, Saunton Down, Morte Point and the north coast. Within the Taw-Torridge estuary, the Northam and Braunton Burrows dunes are a dominant landform, classified as rough ground. Within the area are a series of Parks / Gardens including Hartland Abbey, Clovelly Court, Portledge Manor, Tapeley Park and Tawstock Park. Some recreation features are highlighted through the HLC, such as holiday camps near Woolacombe and the Saunton Golf

Course on the northern edge of Braunton Burrows, though the Royal North Devon Golf Club on Northam Burrows is characterised as rough ground.

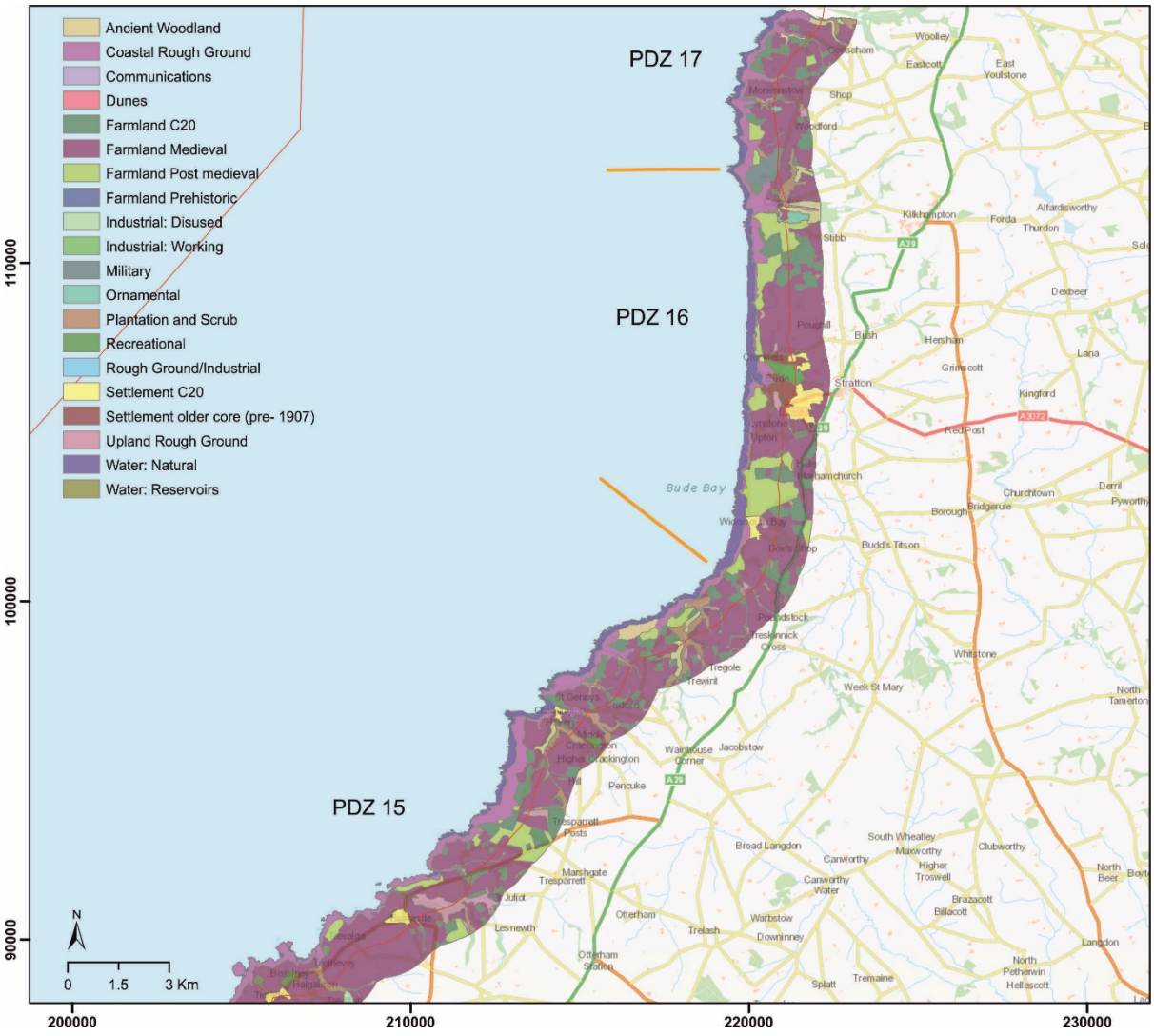


Figure 3.4: Historic Landscape Characterisation within 2km of the coastline between Boscastle and Morwenstow, Cornwall. Data from Cornwall Council 2014 (https://doi.org/10.5284/1027510). Contains Ordnance Survey data © Crown copyright and database right 2019

3.2.2 Historic Seascape Characterisation

Historic Seascape Characterisation (HSC) maintains the historic characterisation principles used in HLC but recognises the need for different expressions of those principles in the coastal and marine environment. The coastal zone to landward and seaward of mean sea level is an area of overlapping terrestrial and maritime perceptions, demanding assessment of both landward and seaward perspectives, and requiring interoperability between the overlapping HSC and HLC coverage. The RCZAS study area is covered by the South West Peninsula HSC (extending up to Hartland Point; Dudley and Johns 2014) and Bristol Channel and Severn Estuary HSC (west of Hartland Point including Lundy; Taylor et al. 2011). Historic England's national HSC implementation has now covered all of England's coasts and inshore and offshore regions, and has recently been consolidated into a single National HSC database (Manson et al. 2017).

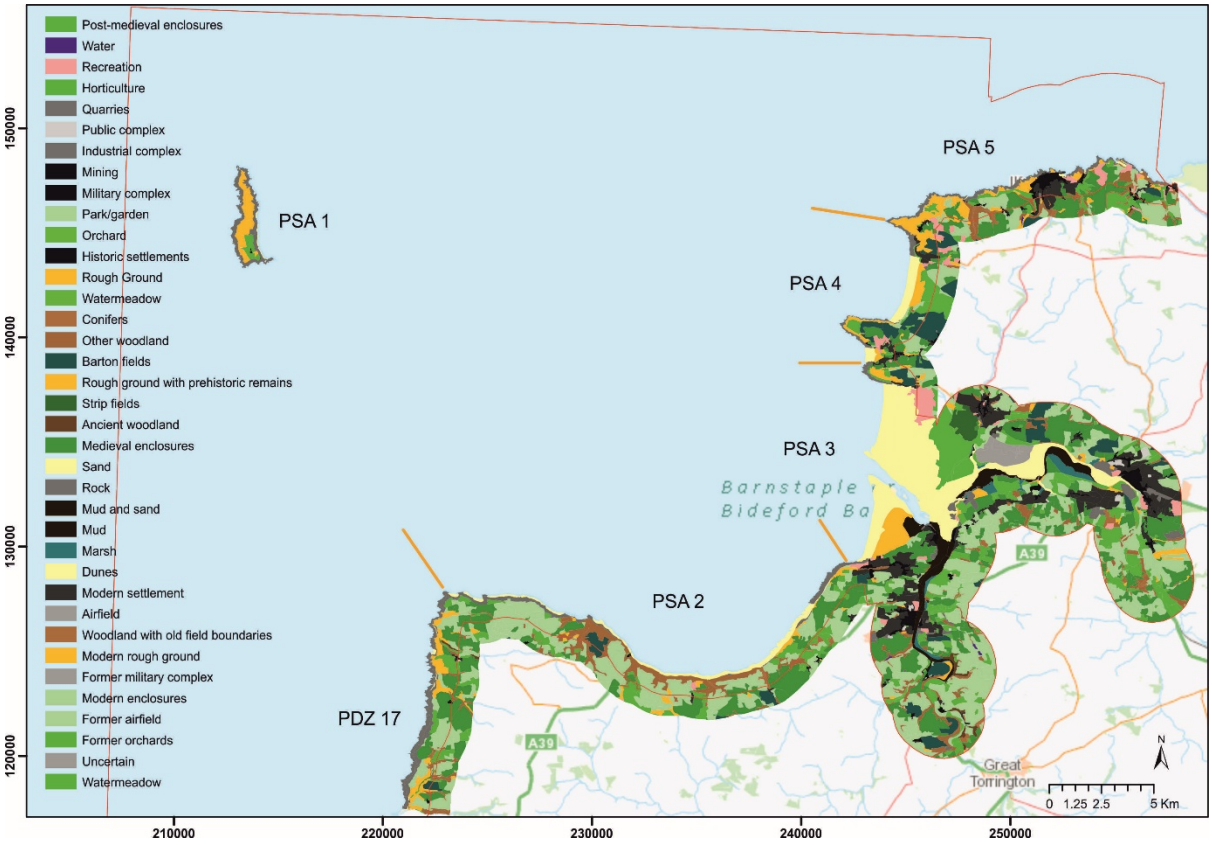


Figure 3.5: Historic Landscape Characterisation (Modern), Devon, within 2km of the coastline between Morwenstow and Combe Martin (including Lundy). Data from Turner 2015 (https://doi.org/10.5284/1032952). Contains Ordnance Survey data © Crown copyright and database right 2019

3.3 Projects and Surveys

3.3.1 Cornwall Industrial Settlements Initiative (CISI)

Cornwall's industrial settlements were the subject of a Conservation Area Partnership called the Cornwall Industrial Settlements Initiative (CISI) undertaken between 1998 until 2004. CISI assessed the character and significance of 50 of the County's industrial settlements, including villages, ports and towns associated with Cornwall's 19th century industrial revolution, based on metalliferous mining, slate and granite quarrying, and china clay extraction. CISI produced a settlement by settlement analysis in order to obtain an overview of the history, present character and importance of Cornwall's industrial settlements

For each settlement, historical research was undertaken for a date range of 1750 to 1945, together with analysis of Ordnance Survey base maps to determine the different phases of historical development. Surviving historic components, archaeological sites, key historic buildings, and statutory designations are identified in each report. The historical research was followed up by a site visit to assess settlement character and consider ways in which this could be protected and enhanced in the future.

The settlement reports relevant to the North Coast RCZAS are: Botallack and Truthwall (The Cahill Partnership and Cornwall Archaeological Unit 2002a), Trewellard (The Cahill Partnership and Cornwall Archaeological Unit 2002b), Bojewyan (The Cahill Partnership and Cornwall Archaeological Unit 2002c), Hayle (The Cahill Partnership and Cornwall Archaeological Unit 2000), Portreath (The Cahill

Partnership and Cornwall Archaeological Unit 2002d), St Agnes (The Cahill Partnership and Cornwall Archaeological Unit 2002e.) and Treknow & Tregatta (The Cahill Partnership and Cornwall Archaeological Unit 2004).

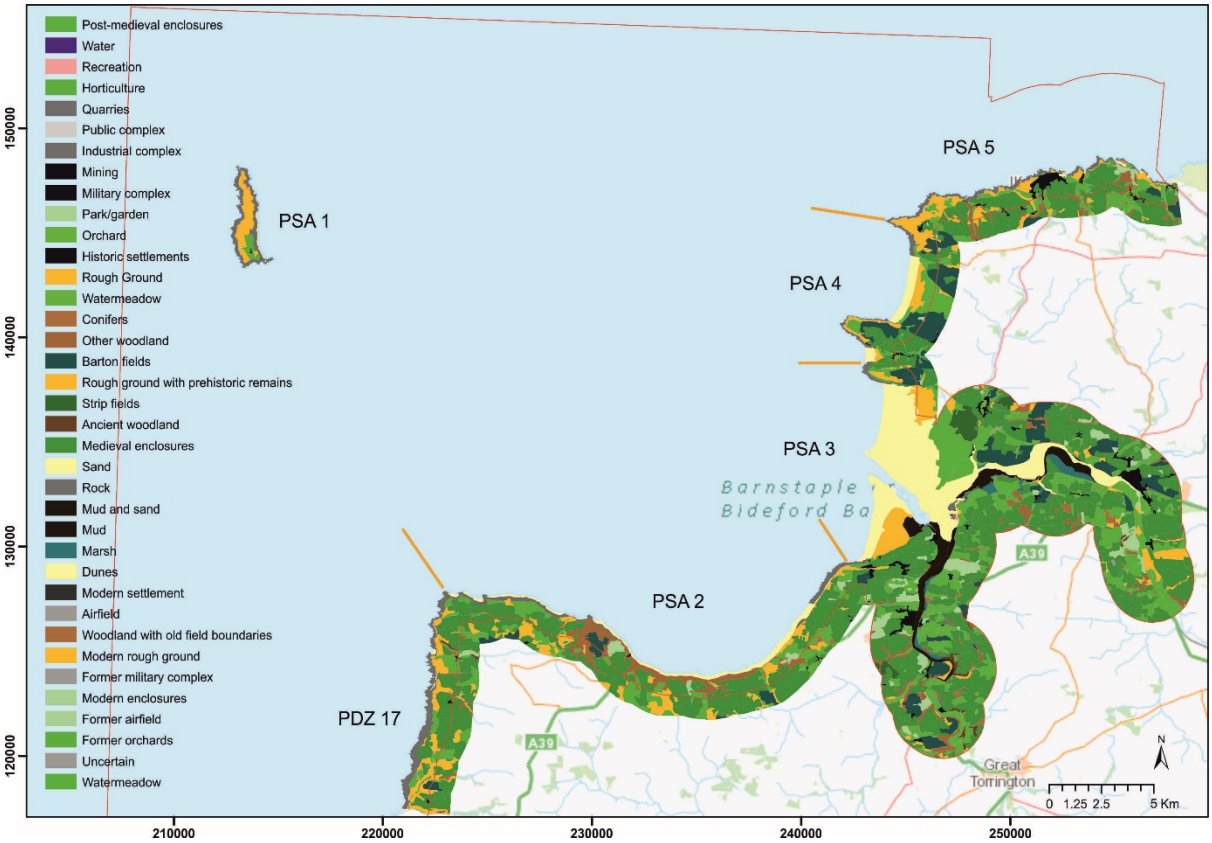


Figure 3.6: Historic Landscape Characterisation (post-medieval) for North Devon, within 2km of the coastline between Morwenstow and Combe Martin (including Lundy). Data from Turner 2015 (https://doi.org/10.5284/1032952). Contains Ordnance Survey data © Crown copyright and database right 2019

3.3.2 Cornwall and Scilly Urban Survey (CSUS)

The Cornwall and Scilly Urban Survey (2000-2005) aimed at harnessing the quality and distinctive character of the historical and archaeological legacy associated with the historic towns of Cornwall and Scilly, and understanding how the distinctive and special character of each had formed, with the aim of using this to help support successful and sustainable regeneration. The Survey investigated 19 historic towns, identified, in consultation with planning, conservation and economic regeneration officers, as those which are likely to be the focus for regeneration. The surveys created an information base and character assessment to support this process of change, seeking to ensure that in each case regeneration is based on a thorough understanding of the historic environment and builds upon the existing distinctive character of the place. The project was based within Cornwall County Council's Historic Environment Service between 2000 and 2005 and funded by English Heritage, Objective 1 and South West Rural Development Agency. The settlement reports relevant to the North Cornish Coast RCZAS are St Ives (Newell 2005), Hayle (Gillard and Newell 2005) and Newquay (Newell 2003).

3.3.3 Cornish ports and harbours project

The project, carried out between 2013 and 2017, aimed to establish effective methodologies for assessing the fabric, historic significance and character of English ports and harbours by using a study of those in Cornwall and the Isles of Scilly as a pilot. It involved a rapid assessment of the forces for

change affecting Cornwall's ports and harbours and their vulnerability or capability to benefit from change, classifying the sites according to a range of variables, undertaking historic characterisation of selected ports and harbours and carrying out limited fieldwork at the selected sites. Outputs of the project were: 15 individual port studies; a final project report (Johns and Fleming 2017); a Historic Environment Action Plan (HEAP); management recommendations and a list of sites and features within ports that are candidates for designation. The individual port studies that are relevant to the North Cornish Coast RCZAS are Hayle (Fleming et al. 2016), Portreath (Johns et al. 2016a), Bude (Fleming and Johns 2016) and Duckpool (Johns et al. 2016b).

3.3.4 The HEATH Project

The HEATH Project was an environmental partnership that ran from 2004 to 2008 and had particular focus on west Cornwall. The project aimed at improving understanding, interpretation and management of the HLC Character Type 'rough ground', and increasing public use, appreciation and enjoyment of it. The study covered not only the well-known areas of West Penwith and the Lizard but also the towans of the north coast and the formerly very extensive downlands. The project was particularly notable for its approach that integrated both the natural and the historic environment. The results were published by Dudley (2011) and Kirkham (2011).

3.3.5 Lowland Cornwall

Cornwall's lowland areas have significant archaeological potential in the county, but are poorly understood and increasingly subject to the impacts of major change in land use and development. The Lowland Cornwall project attempted to address this issue by developing a method for predictive modelling of the lowland prehistoric and Romano-British landscape. The project consisted of four stages: preparation of datasets and high level predictive models; deepening or refinement of Historic Landscape Characterisation (HLC); further analysis of the archaeological resource and the preparation of predictive models using the refined HLC; and the presentation of final results (Dudley 2013). The study focused on four areas, with those of Penwith and Poundstock falling within the RCZAS study area.

3.3.6 Unlocking our Coastal Heritage – protecting the cultural corridor

As part of a wider project funded by the Rural Development Programme for England (RDPE) and administered through DEFRA, the South West Coast Path (SWCP) team and the National Trust (NT), a number of archaeological sites were selected in order to better conserve, enhance and manage them. The sites were chosen on the basis that they were on, or adjacent to, the SWCP, and are currently at risk of being irreparably damaged or lost, or could be made more accessible for wider audiences. Work was undertaken in 2012-2013, predominantly on scheduled sites, with those selected along the north Cornwall and Devon coast being Hilsborough Promontory Fort (NHLE 1002512), Embury Beacon (NHLE 1003845), Willapark (MCO6586), Park Head bowl barrow (NHLE1003098), Crane Castle cliff castle (NHLE 1004390), Godrevy Barrow (NHLE 1004260) and the 19th century stamping mills of Porthmeor Stamps (MCO28030), Kenidjack (Boswedden; MCO29614) and Cot Mill (MCO56864).

3.3.7 Devon Historic Market & Coastal Towns Survey (DHCMTS)

The Devon Historic Market & Coastal Towns Survey (DHCMTS) is part of a national programme of Extensive Urban Surveys (EUS) initiated and supported by Historic England, and carried out between 2012 and 2016. DHCMTS aimed to increase understanding of 17 medieval towns within the county, prioritised because of their high historical significance, their archaeological potential and the

immediacy of development pressure. DHCMTS constitutes a deepening of Devon's Historic Landscape Characterisation (HLC). Standard, easily-available sources were used to identify Historic Urban Character Types (HUCTs), dividing a town up on the basis of land use. Incorporating time depth permits a town's urban extent and uses to be mapped during the different periods of its history. The HUCTs were then grouped together to define distinct geographical areas – Historic Urban Character Areas (HUCAs) – distinguishable by their specific origins, historical development, plan-form, buildings and degree of survival. HUCAs therefore became the principal tool for describing the character of the historic towns included in the survey (see Horner et al. 2017). Settlements surveyed within the RCZAS study area were Barnstaple (Green 2015) and Bideford (Ratcliffe 2015).

3.3.8 West Coast Palaeolandscape

The West Coast Palaeolandscapes Survey (Fitch and Gaffney 2011) sought to investigate the potential for submerged landscapes within the Irish Sea and Bristol Channel through an analysis of available 2D and 3D seismic datasets to explore the landscapes of these areas within the late Quaternary, and more specifically the Holocene. The project also generated a broad scale landscape characterisation mapping for the areas to help inform development and research projects (see Section 6.3.5).

3.3.9 Arch-Manche and CHeRISH

The Arch-Manche project (Archaeology, Art and Coastal Heritage) sought to develop tools to support coastal management and climate change planning across the Channel Regional Sea. The project ran between 2007-2013 and was supported through European Regional Development Funding. Arch-Manche demonstrated how under-used coastal indicators, including archaeological and palaeoenvironmental data along with historical and artistic resources, could be applied as tools to inform long-term patterns of coastal change. As part of the project two case study areas were located within the RCZAS study area: North Cornwall and Devon, located between Widemouth Bay and Hartland Point, and West Cornwall, focused on the area west of Portreath and Falmouth. The results were summarised in the report '*Coastal Management: A guide to using archaeological, palaeoenvironmental, historical and artistic resources*' along with a series of more detailed technical reports[5].

The focus on art to inform coastal management was further enhanced during the CHeRISH project, funded by Historic England (McInnes 2016). This project sought to provide information which can help protect the historic environment looking ahead over the next century by identifying those parts of the south west coast, and the heritage assets they contain, that have proved to be most sensitive to the impacts of coastal change, and indeed more likely to become increasingly susceptible in the future. Through both quantitative and qualitative assessments, the study proposed a methodology for the most effective use of such historical images in terms of supporting coastal heritage risk management.

3.3.10 CITiZAN

In response to the threats posed to the historic environment of intertidal areas and estuaries within England, a national programme named CITiZAN (Coastal and Intertidal Zone Archaeological Network)[6] has been established. This short-term project aims to target nationally important and exposed archaeological sites within the coastal zones considered to be at greatest threat. The CITiZAN project

[5] http://archmanche.maritimearchaeologytrust.org/
[6] http://www.citizan.org.uk/

itself does not offer long-term monitoring, but rather facilitates community-based training to allow volunteers to monitor and record archaeological sites within the coastal zone. CITiZAN is run by Museum of London Archaeology (MoLA), in partnership with the Council for British Archaeology and the Nautical Archaeology Society, with funding from the Heritage Lottery Fund, with additional support from the National Trust, Historic England and The Crown Estate.

3.3.11 National Mapping Programme

The RCZAS study area has been subject to two previous National Mapping Programme (NMP; now discontuned with new projects referred to as 'aerial investigation and mapping'). The North Devon Area of Outstanding Natural Beauty NMP (Knight et al. 2013) comprises an irregular shaped area covering the whole of the North Devon AONB and the Taw Estuary up river to Barnstaple. The project area comprised of 278 km^2, divided into two project blocks: Block 1 comprised an area of 117 km^2 from Hartland point to Bideford and Block 2 comprises an area of 161 km^2 from Bideford to Combe Martin. Over 1100 archaeological features were transcribed during the project, of which approximately 80% were previously unrecorded on the Devon Historic Environment Record (DCCHER) and the NRHE. Relevant information identified from aerial photographs was interpreted and mapped to a consistent standard and recorded in a digital Geographical Information System (GIS) and the DCCHER.

The Cornwall and Isles of Scilly NMP (Young 2007) covered the whole of the county of Cornwall and the Isles of Scilly, with some overlap with western Devon. Roughly 30,000 archaeological features were mapped, with more than 24,000 monument records in the Cornwall and Isles of Scilly HER either created or enhanced by data from the project. Seventy five percent of the sites identified during the project were new to the HER and 85% were new to the National Record Historic Environment (NRHE).

A third NMP was planned for the Isle of Lundy, to be undertaken at the same time as the RCZAS, by the HE Aerial Survey Team. The extent to which a full NMP survey would be required, due to the level of ground-based survey previously undertaken mainly by the National Trust, was unclear. No aerial photographs of the island from the 1940s were available in the HER or the Historic England Archive which, from experience on other coastal projects, would have been a major complementary source to ground based work. Eventually it was decided by HE that no NMP project for Lundy would take place, though this decision took place after the current RCZAS had completed its data enhancement stage.

4 Designations Relevant to the Project Area

4.1 World Heritage Site

A World Heritage Site (WHS) is a place of 'outstanding universal value', having cultural, historical, scientific or other form of significance. They are selected by the United Nations Educational, Scientific and Cultural Organisation (UNESCO). The status of The Cornwall and West Devon Mining Landscape WHS was achieved in July 2006 through the recognition of Cornwall and West Devon's historic landscape and outstanding buildings associated with the copper and tin mining, and these counties' contribution to the industrial revolution. For the WHS Bid and the Bid Management Plan[7] considerable

[7] http://www.cornish-mining.org.uk/world-heritage-site-bid-documents

landscape and contextual information was assembled for these areas, including defining the nature and extent of the archaeological remains of the mining industry.

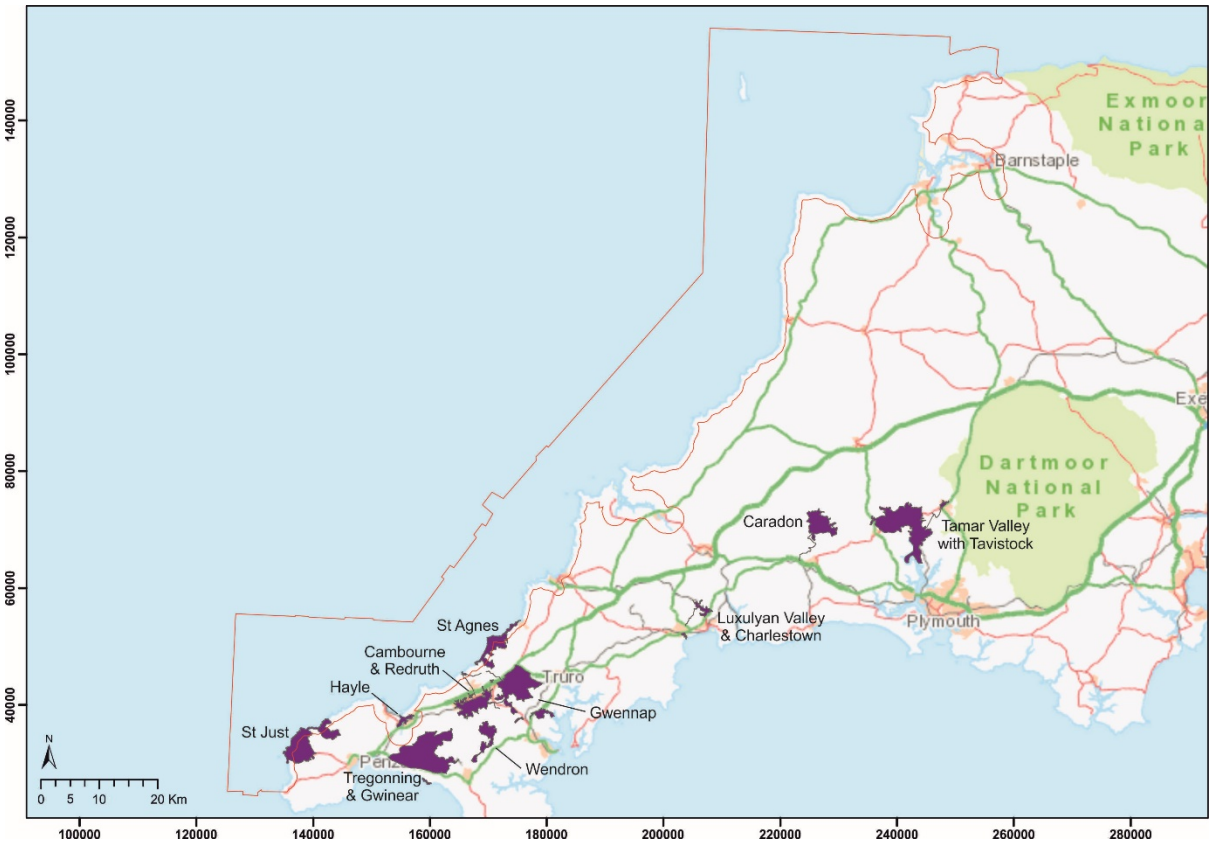


Figure 4.1: UNESCO Cornwall and West Devon Mining Landscape World Heritage Site. Contains Historic England and Ordnance Survey data © Crown copyright and database right 2019

Both UNESCO and the UK Government require WHS's to produce and periodically update a Management Plan, to identify the Site's principal management needs and strategies to address them, with the current management plan covering the period 2013-2018[8]. In 2017 a Supplementary Planning Document (SPD)[9] was published setting out how the planning system will seek to fulfil the responsibilities and opportunities of the WHS status. The SPD clearly states what makes the WHS important, why it must be protected and how the planning system can help to do this. It also provides advice for all decision makers, developers and the public on ensuring that the responsibilities conferred by this status are fully taken into consideration and opportunities taken advantage of. The RCZAS study area overlaps with three districts within the WHS: St Just Mining District, Port of Hayle and St Agnes Mining District (Figure 4.1).

4.2 Historic Environment Designations

4.2.1 Scheduled Monuments

Within the RCZAS study area there are 179 Scheduled Monuments (Figure 4.2), protected under the Ancient Monuments and Archaeological Areas Act of 1979: 60 in Devon and 119 in Cornwall (see

[8] https://www.cornwall.gov.uk/environment-and-planning/conservation/world-heritage-site/

[9] https://www.cornwall.gov.uk/environment-and-planning/planning/planning-policy/adopted-plans/planning-policy-guidance/cornwall-and-west-devon-mining-landscape-world-heritage-site-supplementary-planning-document/

Appendix 1 for a list of the Scheduled Monuments). There is a significant concentration of scheduled monuments on Lundy located on the island (41; 23% of total scheduled monuments within the RCZAS study area). The scheduled monuments within the study area also include two wrecks near Westward Ho! (NHLE 1432418 and 1432949), both scheduled in 2016.

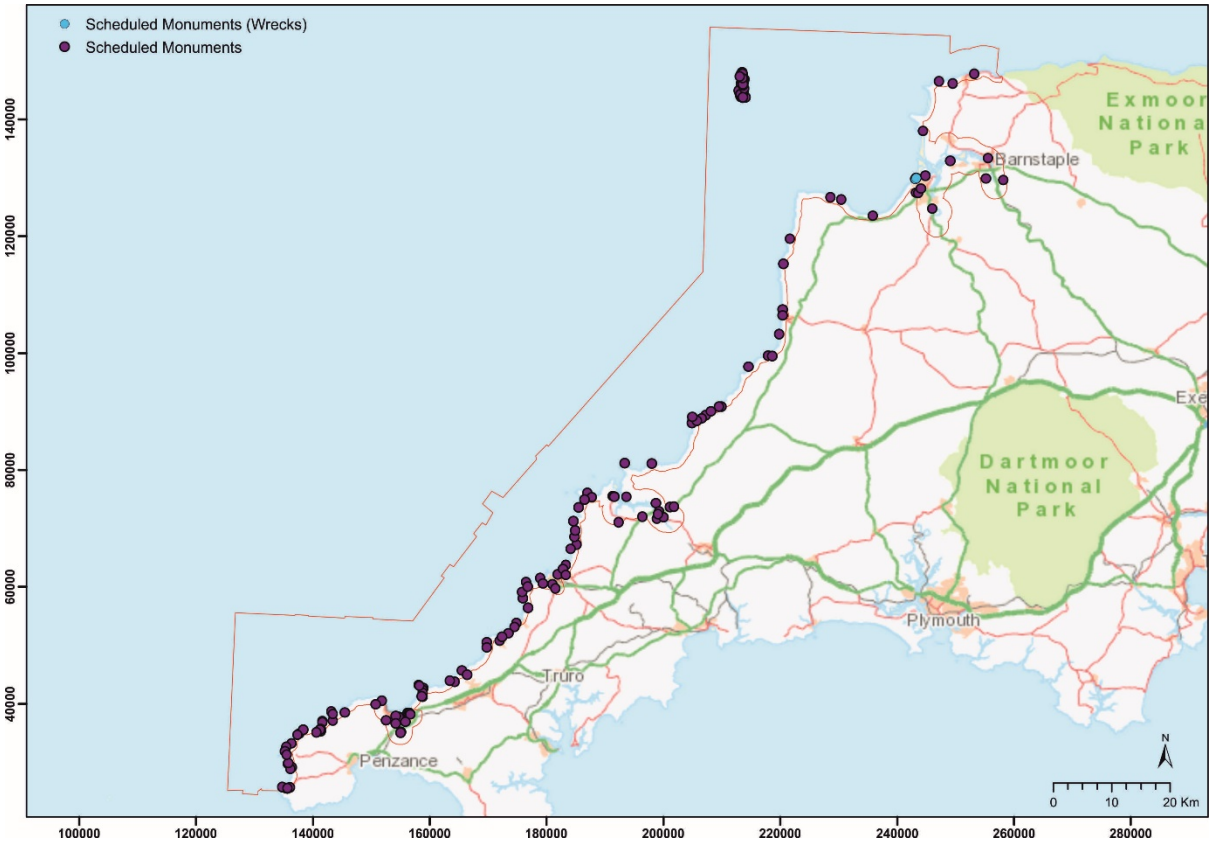


Figure 4.2: Scheduled Monuments within study area. Contains Historic England and Ordnance Survey data © Crown copyright and database right 2019

4.2.2 Listed buildings

Within the RCZAS study area there are 3017 Listed Buildings, protected under the Planning (Listed Buildings and Conservation Areas) Act 1990 (Figure 4.3 and Figure 4.4). This consists of 18 Grade I in Cornwall and 26 in Devon; 68 Grade II* in Cornwall and 56 in Devon, and 1434 Grade II in Cornwall and 1415 in Devon (see Appendix 2 for a list of Grade I and Grade II* Listed Buildings).

4.2.3 Register of Historic Parks and Gardens of special historic interest in England

Culturally and historically important 'man-made' or 'designed' landscapes, such as parks and gardens, are currently listed on a non-statutory basis on the 'Register of Historic Parks and Gardens of special historic interest in England' which was established under the National Heritage Act 1983, and is administered by Historic England. Sites included on this register are of national importance, with currently over 1600 sites on the list, many associated with stately homes of Grade I or Grade II* status. The emphasis of the Register is on gardens, grounds and other planned open spaces, such as town squares. The majority of sites registered are, or started life as, the grounds of private houses, but public parks and cemeteries form important categories too. The emphasis of the Register is on 'designed' landscapes, rather than on planting or botanical importance. Within the RCZAS study area there are four registered parks and gardens: Grade II* Tapeley Park (NHLE 10000704) in Devon, and

the Grade II Prideaux Place (NHLE 1001249), The Downes (St Michael's Convent; NHLE 1001305) and Barbara Hepworth Sculture Garden (NHLE 1001488) in Cornwall (Figure 4.50; see Appendix 3 for a list Registered Parks and Gardens).

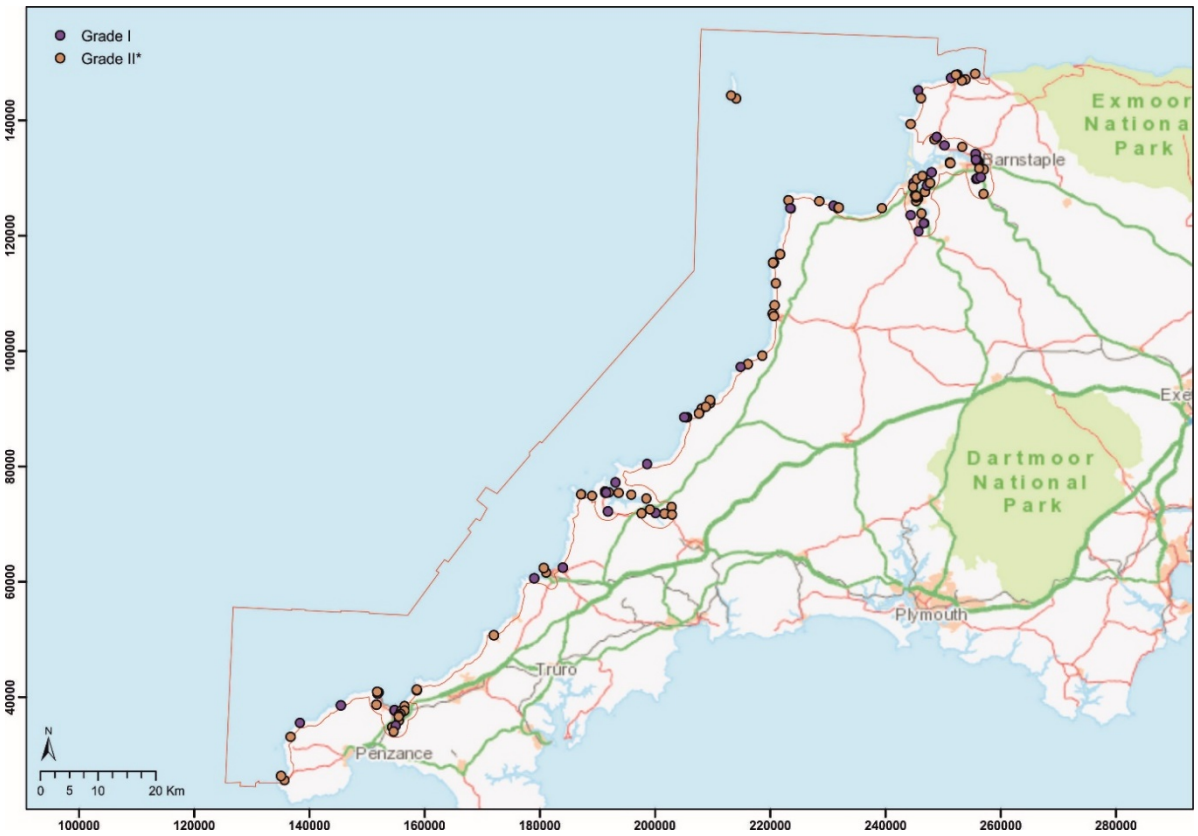


Figure 4.3: Listed Buildings (Grade I and II) within RCZAS study area Contains Historic England and Ordnance Survey data © Crown copyright and database right 2019*

4.2.4 Registered Battlefields

Battles are dramatic and often pivotal events in the history of any people or nation. Since 1995, Historic England has maintained a Register of Battlefields in order to afford the 46 sites currently on the Register a measure of protection through the planning system and to promote a better understanding of their significance and public enjoyment. The key requirements for registration are battles of national significance, a securely identified location and that these sites can still be recognised today (topographical integrity). There are no registered battlefields within the RCZAS study area.

4.2.5 Protected Wreck Sites

The Protection of Wrecks Act 1973 (section 1) is designed to protect wrecks that are of historic, archaeological or artistic importance. There are currently 53 wrecks in England designated under this act, with three of these within the RCZAS study area: the Hanover (NHLE 1000072), Gull Rock (NHLE 1000053) and Iona II (NHLE 1000051) (Figure 4.6; see Appendix 4 for a list of Protected Wreck Sites). The Hanover was recently resurveyed for the pupose of understanding the site and whether it should be proposed for de-designation (Dresch and Evans 2017). There are also the two designated intertidal wrecks, protected as Scheduled Monuments, near Westward Ho! (NHLE 1432418 and 1432949; Figure 4.6).

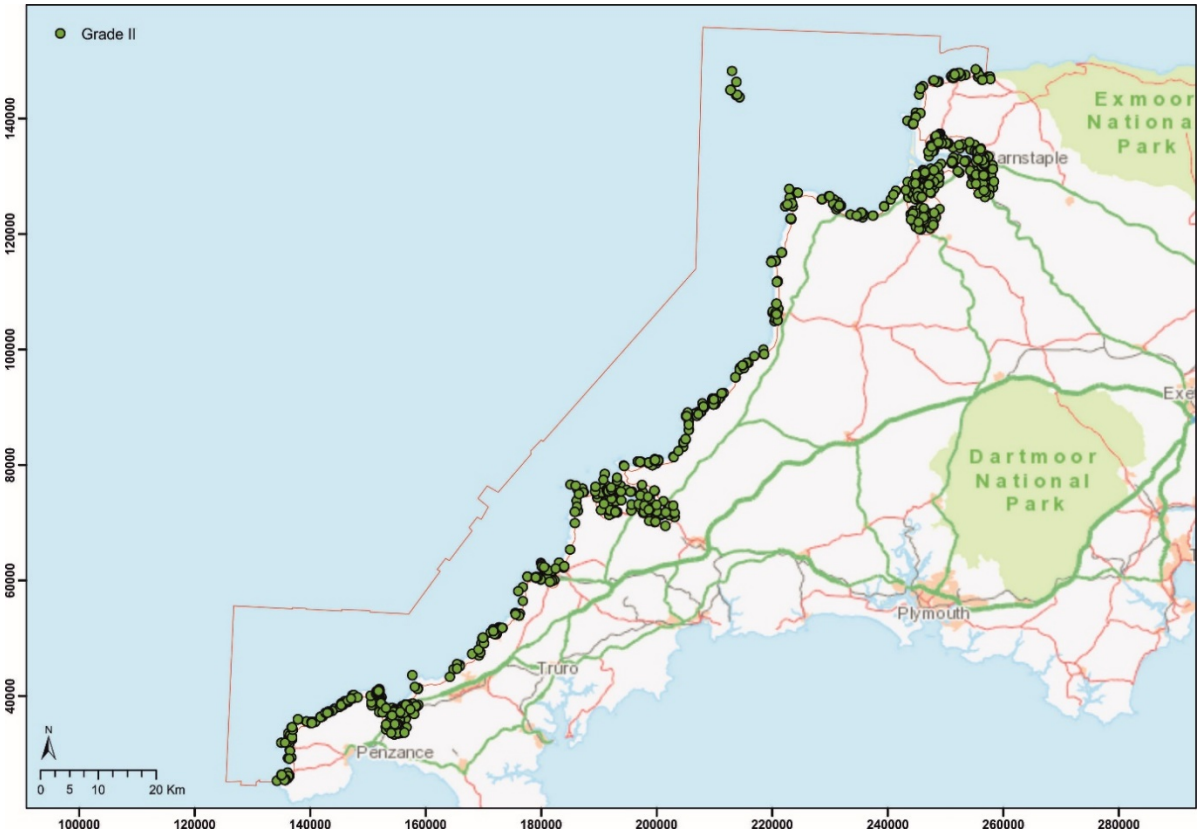


Figure 4.4: Listed Buildings (Grade II) within RCZAS study area. Contains Historic England and Ordnance Survey data © Crown copyright and database right 2019

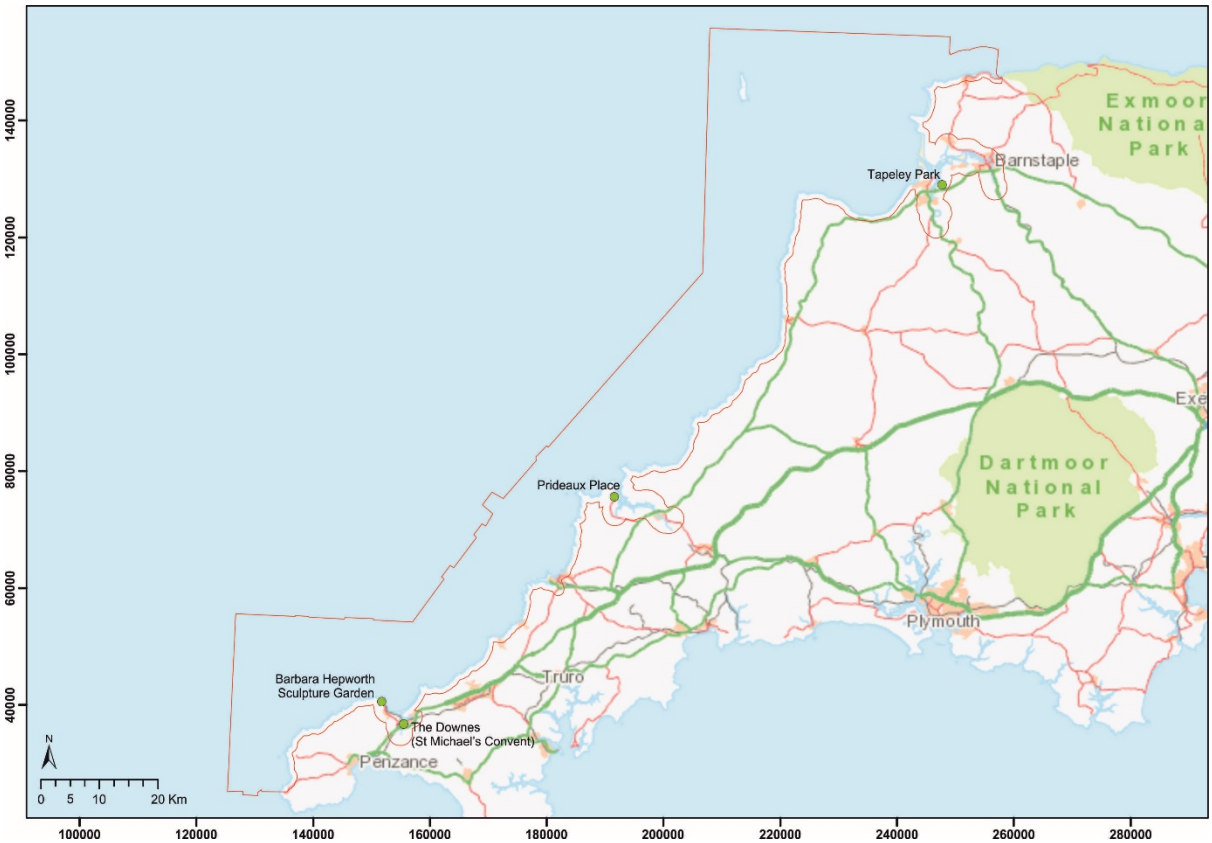


Figure 4.5: Registered Parks and Gardens within RCZAS study area. Contains Historic England and Ordnance Survey data © Crown copyright and database right 2019

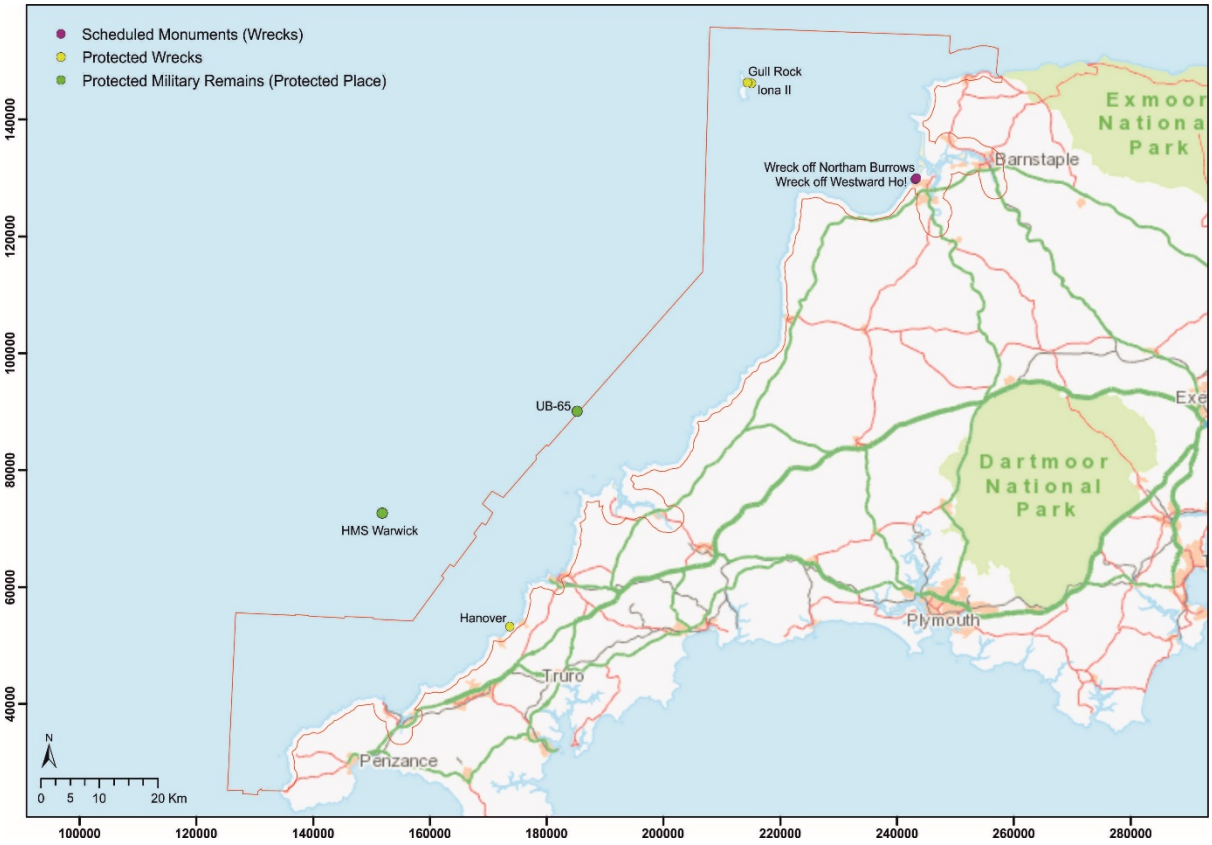


Figure 4.6: Protected Wreck Sites, Protected Military Remains (Protected Places) and Scheduled Monuments (wreck sites) within RCZAS study area. Contains Historic England and Ordnance Survey data © Crown copyright and database right 2019

4.2.6 Protected Military Remains

The Protection of Military Remains Act, 1986, deals with military remains of both aircraft and ships. All military aircraft and vessels are automatically designated under this legislation, which is administered by the Ministry of Defence. Designations can be either:

- A Controlled Site, which is a restrictive designation, requiring licensing of certain activities within the exclusion zone and knowledge of precise coordinates.
- A Protected Place, which is where activities are permitted in the vicinity of a vessel, on a look but don't touch basis. Knowledge of precise coordinates is not required, only the name of the vessel.

There are no Controlled Sites within the RCZAS study area. There is one Protected Place on the outer margin of the RCZAS study area; UB-65 (NRHE 1402209), a German submarine sunk in 10th July 1918 off Padstow, at position c. 50.67°N 5.04°W. The Protected Place HMS Warwick (NRHE 1603123 and 1603126), a British Admiralty W class destroyer sunk by a torpedo from German submarine U-413 on 20th February 1944, is located outside of the RCZAS study area c. 34km west of Trevose Head, at position c. 50.50°N 5.50°W (see Figure 4.6).

4.2.7 Heritage Coasts

Heritage Coasts are 'defined' rather than designated, so there is no statutory designation process like that associated with National Parks and Areas of Outstanding Natural Beauty (AONB). They were established to conserve the best stretches of undeveloped coast in England. A Heritage Coast is

defined by agreement between the relevant maritime local authorities and Natural England. Heritage Coasts are protected through development control within the planning system. Paragraph 114 of the National Planning Policy Framework (March 2012) states that local authorities should: 'maintain the character of the undeveloped coast, protecting and enhancing its distinctive landscapes, particularly in areas defined as Heritage Coast, and improve public access to and enjoyment of the coast.' There are 32 Heritage Coasts defined in England, with eight located within the RCZAS study area: Penwith, Godrevy-Portreath, St Agnes, Trevose Head, Pentire Point to Widemouth, Hartland (crossing the county boundary), Lundy, and North Devon. The northeastern boundary of the RCZAS directly borders the Exmoor Heritage Coast which is contained within the Exmoor National Park.

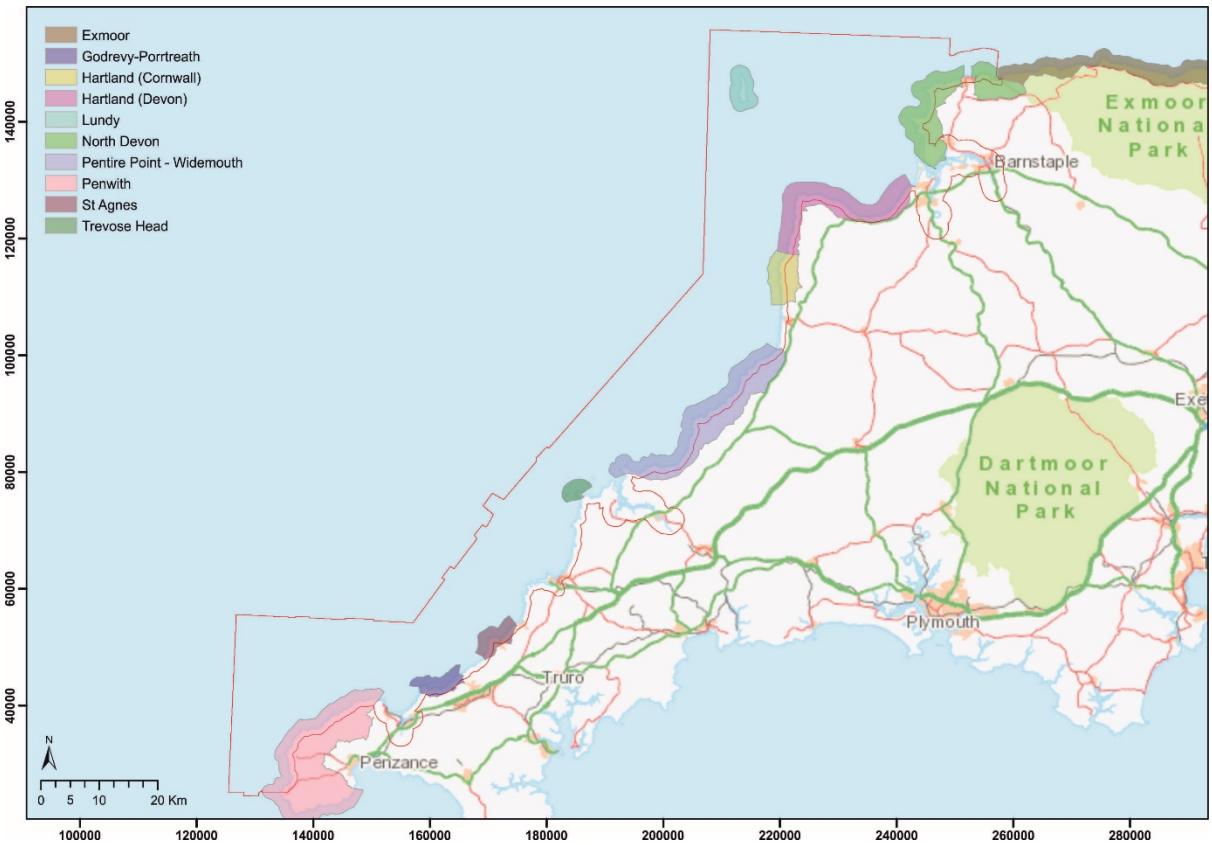


Figure 4.7: Heritage Coasts along the north coast of Devon and Cornwall. Contains Natural England and Ordnance Survey data © Crown copyright and database right 2019

4.2.8 Conservation Areas

Conservation Areas are designated by local planning authorities as areas of special architectural or historic interest, whose character or appearance it is desirable to preserve or enhance. They may vary in character, form and size but their designation means that they are all worthy of protection as areas of special merit. They usually contain buildings which are 'listed' but this is not a prerequisite of designation. There are 145 Conservation Areas in Cornwall and 41 in North Devon (excluding Exmoor National Park). Within the RCZAS study area, there are 26 Conservation Areas in Cornwall (Sennen Cove, St Just, Botallack and Truthwall, Trewellard, Pendeen, Boscaswell, Zennor, Halsetown, St Ives, Lelant, St Erth, Hayle, Phillack, Gwithian, St Agnes, Crantock, St Columb Minor, Padstow, Little Petherick, St Breock, Wadebridge, Chapel Amble, Port Isaac, Treligga, Boscastle and Bude) and 31 in North Devon (Clovelly, Bucks Mills, Appledore, Northam, Westleigh, Bideford, Bideford (Clovelly Road), Bideford (East), Instow, Fremington, Fremington Quay, Bickington, Lake, Tawstock, Bishops

Tawton, Rumsam, Barnstaple-Newport, Barnstaple-Town Centre, Barnstaple-Ebberly Lawn, Barnstaple-Pilton, Ashford, Heanton Punchardon, Braunton, Croyde, Putsborough, Woolacombe, Mortehoe, Lee, Ilfracombe, Berrynarbor and Combe Martin).

4.3 Natural Environment Designations

The coastline is protected by a series of designations and other levels of protection; a summary of some of the key levels of protection is provided below.

4.3.1 UNESCO Biosphere Reserves

Biosphere reserves are recognised under UNESCO's Man and the Biosphere (MAB) Programme. Biosphere Reserves are model regions for sustainable development and test sites for conservation approaches where communities collaborate to live in harmony with their environment. They are the world's only internationally recognised 'badge' for demonstrating excellence in sustainable development. Once designated, they lie under the United Kingdom's authority, but when grouped together in the global community they make up a network of sites within the World Network of Biosphere Reserves (WNBR). The UK's six Biosphere Reserves work to promote a balanced relationship between people and their natural environment by educating and inspiring the local community to work together for a more sustainable future. Within the RCZAS study area lies the North Devon Biosphere Reserve[10], centred on the extensive dune system at Braunton Burrows (Figure 4.8). It consists of three areas:

- Core area: highly protected ecosystem of bioregional significance – Braunton Burrows and part of the Taw-Torridge estuary
- Buffer Zone: an area where land/sea management is sympathetic to the conservation of the objectives of the core area – a large part of the AONB and remaining estuary
- Transition Area: denoted by the extent of the ecosystems where sustainability will be a key aim of the community – from Exmoor to Dartmoor and out to Lundy across much of northern Devon, including the full Taw and Torridge river catchments.

The interests of the Biosphere Reserve and the AONB have much in common, ranging from biodiversity, conservation and cultural heritage to land management, adaptation to climate change and ecosystem services. The AONB is at the heart of the Biosphere Reserve and both bodies are required to produce Management Plans that complement each other.

Reaching to the heights of Dartmoor and Exmoor and extending to the marine environment twelve miles beyond Lundy; this Biosphere has established effective partnerships which pioneer a range of projects for sustainable future in North Devon. These include significant landscape-scale land-use change and biodiversity enhancement, nature improvement areas, biodiversity offsetting, ecosystem-based local development plans, carbon reduction strategies and innovations in marine conservation and fisheries management.

The North Devon Landscape Pioneer, led by Natural England (NE) and based in the North Devon UNESCO Biosphere Reserve, was selected in 2016 as one of four 'Defra Pioneer Areas' under Defra's 25 Environmental Plan. This pioneer is focused on testing the use of natural capital in determining environmental priorities and agreeing actions to target them. At its heart is an innovative process for

[10] https://www.northdevonbiosphere.org.uk/

creating a shared plan that identifies where investment in natural capital is most needed and securing new investment for those projects in the pioneer area. The pioneer has already mapped how existing funding for natural capital is distributed across the Biosphere Reserve. The pioneer then identified the ecosystem services that are provided by the different land uses and worked with stakeholders to value them and assess how they change over time. Investment priorities – such as saltmarsh restoration or natural flood management – will be established jointly with partners, based on this assessment. The pioneer will trial a new local governance model, design and trial a payment-by-results environmental land management scheme for farming, and test natural capital as a tool for engaging communities with the benefits provided by their environment. The pioneer will also promote net environmental gain through strategic planning to expand North Devon's most valued natural capital. It will look to support more tree planting and greater enjoyment of our coastal areas.

The current strategy for the North Devon Biosphere Reserve 2014-2024[11] provides a context for partners and stakeholders to deliver programmes and projects in support of the sustainable development of the Biosphere Reserve. The four principal strategy aims are:

- Environmental Aim: To improve the environment of North Devon to reflect its world class status
- Social Aim: To support a more equitable, vibrant and thriving community within the Biosphere Reserve
- Economic Aim: To have a resilient economy in Biosphere Reserve that contributes to its environmental and social wellbeing
- Knowledge Aim: To create and share knowledge within Biosphere Reserve that improves our wellbeing and benefits others

A Driver, Pressure, Status, Impact and Response (DPSIR) analysis was carried out for the area, coupled with an ecosystem services assessment, to generate the programmes and areas for intervention required to achieve the strategy.

4.3.2 Areas of Outstanding Natural Beauty

AONBs are designated areas where protection is afforded to protect and manage the areas for visitors and local residents. Under the Countryside and Rights of Way Act 2000, Natural England has the power to designate AONBs in England that are outside National Parks and that are considered to have such natural beauty it is desirable they are conserved and enhanced. It also holds a duty to give advice on developments taking place in an AONB and take into account the conservation and enhancement of AONBs in its work.

AONB's are focused along the coastline of the southwest (Figure 4.8). The Cornwall AONB[12] was designated in 1959, with the Camel Estuary being added in 1981. The Cornwall AONB is unique in that it is made up of 12 separate geographical areas but is still one single designation, collectively covering an area of 958km^2, c. 27% of Cornwall, with a further 24% an Area of Great Landscape Value (AGLV). Within the RCZAS study area are located seven of these geographical areas: West Penwith, Godrevy

[11] https://www.northdevonbiosphere.org.uk/management--funding-review.html
[12] http://www.cornwall-aonb.gov.uk/

to Portreath, St Agnes, Carnewas to Stepper Point, The Camel Estuary, Pentire Point to Widemouth and Hartland (Cornwall). The North Devon Coast AONB[13] was designated in 1959 and was the first of the five Devon AONBs. It covers 171km^2 of mainly coastal landscape from the border with Exmoor National Park at Combe Martin, through the mouth of the Taw-Torridge Estuary, to the Cornish border at Marsland Mouth, connecting with the Cornwall AONB.

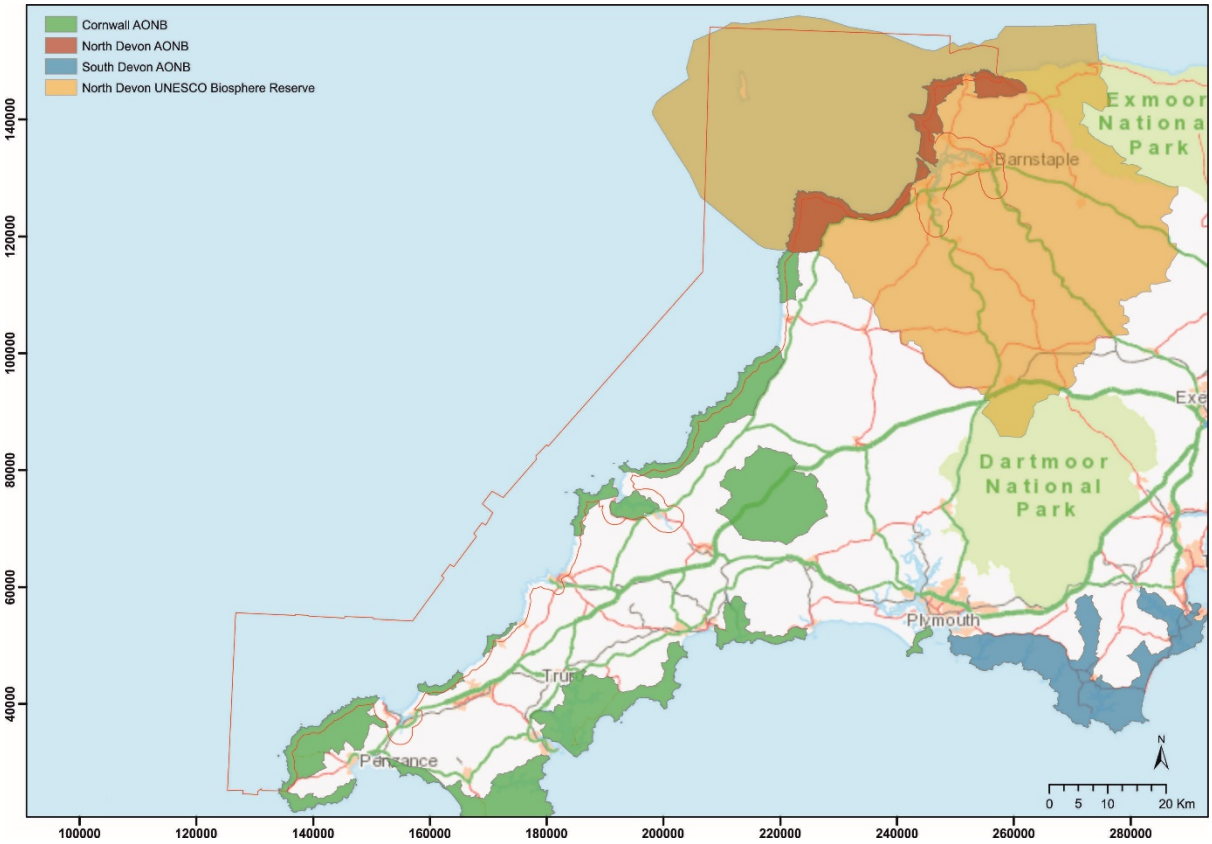


Figure 4.8: North Devon UNESCO Biosphere Reserve and AONB in Devon and Cornwall. Contains Natural England and Ordnance Survey data © Crown copyright and database right 2019

4.3.3 Marine Conservation Zones

Marine Conservation Zones (MCZs) are designated under the Marine and Coastal Access Act (2009). MCZs protect a range of nationally important marine wildlife, habitats, geology and geomorphology, and can be designated anywhere in English and Welsh territorial and UK offshore waters. These are a type of marine protected area, which exist alongside European marine sites (SACs and SPAs), SSSIs and RAMSAR sites to form an ecologically coherent network of marine protected areas. Lundy Island, a former Marine Nature Reserve, became the UK's first MCZ in January 2010. Sites are selected to protect not just the rare and threatened, but the full range of marine wildlife. Within the study area there are eight MCZs: Cape Bank (1477657), Newquay and the Gannel (UKMCZ0037), Padstow Bay and Surrounds (UKMCZ0012), Camel Estuary (1477662), Hartland Point to Tintagel (UKMCZ0034), Bideford to Foreland Point (UKMCZ0029), Morte Platform (1477667) and Lundy (UKMCZ0010) (Figure 4.9). The Taw-Torridge Estuary was put forward as a recommended MCZ (rMCZ) during the Tranche 2 MCZ consultation, but ultimately did not feature in the list of recommendations for designation by Nature England to DEFRA.

[13] https://www.northdevon-aonb.org.uk/

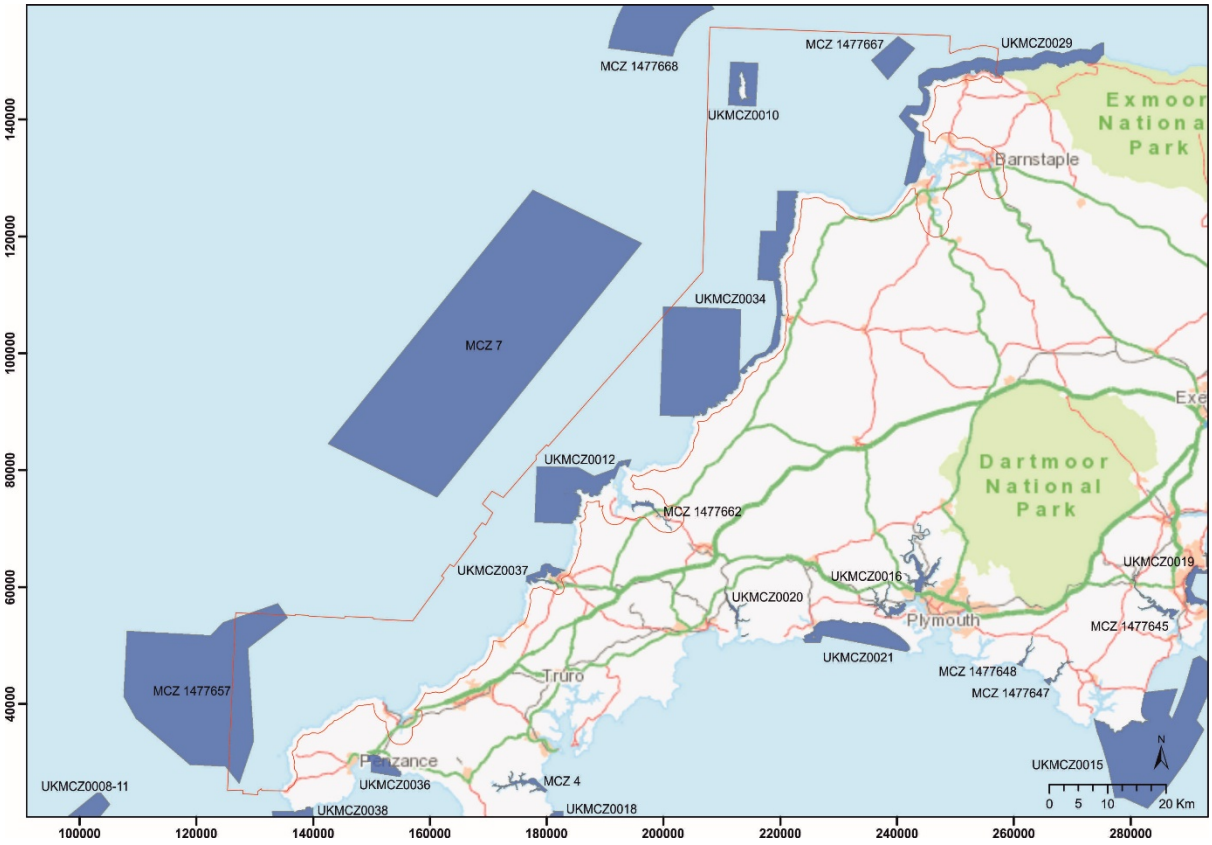


Figure 4.9: Distribution of Marine Conservation Zones around Devon and Cornwall. Contains Natural England and Ordnance Survey data © Crown copyright and database right 2019

4.3.4 RAMSAR Sites

Sites recorded on the Ramsar List of Wetlands of International Importance (Ramsar Sites) are wetland of international importance. The Ramsar Convention was signed in Ramsar, Iran, in 1971, and entered into force in the UK in 1976. There are presently 175 Ramsar Sites in the UK collectively covering an area of 1283km^2. Development of these sites will be allowed only in the rarest circumstances. If consent is given for development, lost wetlands interest will have to be replaced by restoring and recreating habitats, with developers agreeing to bear the cost of these compensatory packages. There are no RAMSAR sites within the study area.

4.3.5 Special Protection Areas

Special Protection Areas (SPAs) are strictly protected sites classified in accordance with Article 4 of the European Community Birds Directive, which came into force in April 1979, and was amended in 2009 (Directive 2009/147/EC). The Directive has great emphasis on the protection of habitats for endangered and migratory species (as listed on Annex I of the Directive), establishing a network of SPAs including all the most suitable territories for these species. There are no SPAs within the RCZAS study area.

4.3.6 Special Areas of Conservation

Special Areas of Conservation (SACs) are designated under the European Commission Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora, commonly known as the 'Habitats Directive', for habitats and species listed in Annex I and II of the Directive. The EU Habitats Directive (1992) was transposed into UK law by the Conservation of Habitats and Species Regulations

2017 within 12 nautical miles (nm) of the coast, and the Conservation of Offshore Marine Habitats and Species Regulations 2017 between 12nm out to 200nm or the UK Continental Shelf.

SACs with marine components are sites that contain qualifying marine habitats or species. 90 SACs are found in inshore waters (from landward extent of Mean High Water (MHW)/Mean High Water Springs (MHWS) to 12 nautical miles from the coast), 16 are located in offshore waters (beyond 12 nautical miles) and there are 9 sites within both inshore and offshore waters. Following submissions of several candidate SACs with marine components in 2012, and the further submission of sites for Harbour Porpoise (*Phocoena phocoena*) in 2017, the UK anticipates that the SAC network for marine habitats is now substantially complete.

Within the RCZAS study area there are eight SACs (Figure 4.10): Braunton Burrows (UK0012570), Tintagel-Marsland-Clovelly Coast (UK0013047), Godrevy Head to St Agnes (UK0012549), Penhale Dunes (UK0012559), River Camel (UK0030056), Lundy (UK0013114), Land's End and Cape Bank (UK0030375), and the Bristol Channel Approaches / Dynesfeydd Môr Hafren, the latter designated in February 2019.

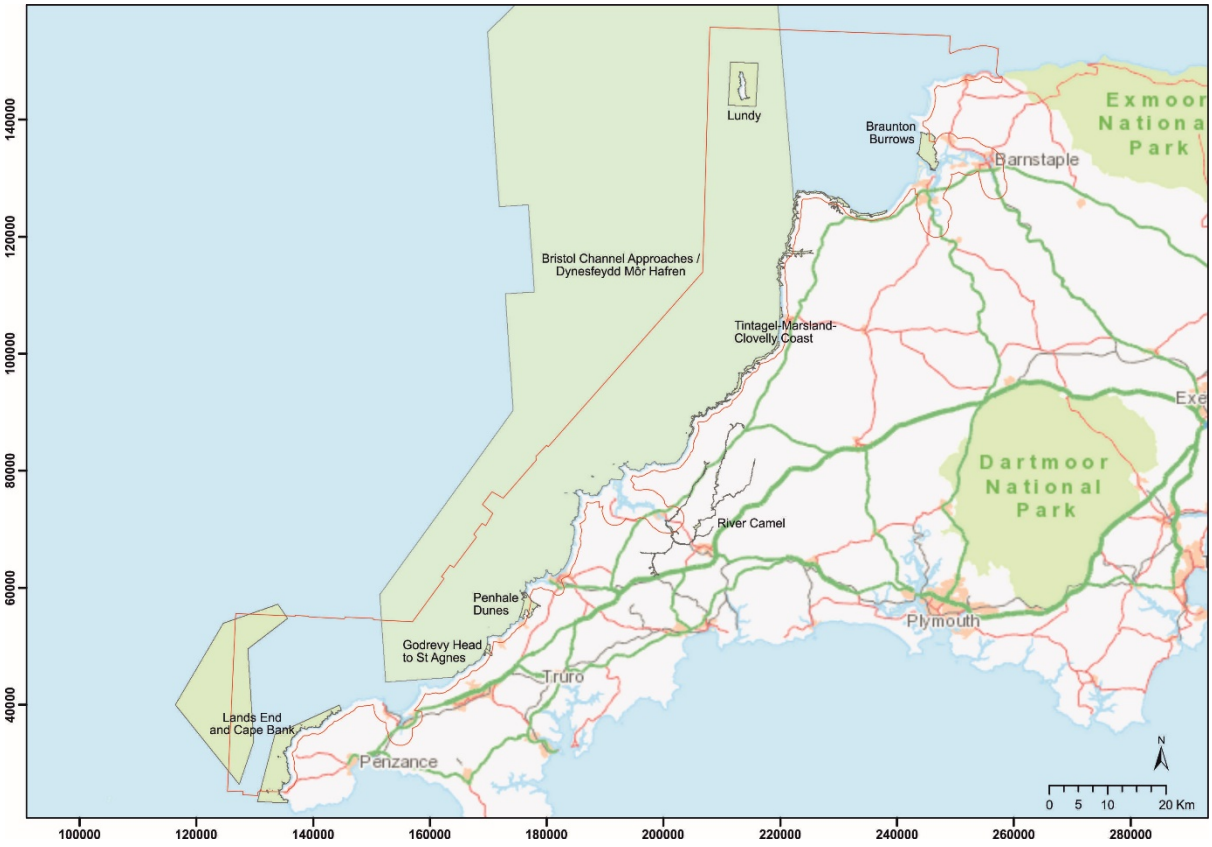


Figure 4.10: Distribution of Special Areas of Conservation (SAC) within RCZAS study area. Contains Natural England and Ordnance Survey data © Crown copyright and database right 2019

4.3.7 Site of Special Scientific Interest

Under the Wildlife and Countryside Act 1981 (amended 1985), the UK government has a duty to notify as a Site of Special Scientific Interest (SSSI) any land which, in its opinion, is of special interest by reason of any of its flora, fauna, geological or physiographical features. Within England, SSSIs are designated by Natural England. The Countryside and Rights of Way Act 2000 strengthened the law giving greater power to the designating body to enter into management agreements, to refuse consent for damaging

operations, and to take action where damage is being caused through neglect or inappropriate management. Local Authorities and other public institutions now also have a statutory duty to further the conservation and enhancement of SSSIs both in carrying out their operations, and in exercising their decision-making functions, which includes planning decisions. SSSIs form the basic unit of UK protected area legislation. Within the RCZAS study area there are 53 SSSIs (Figure 4.11).

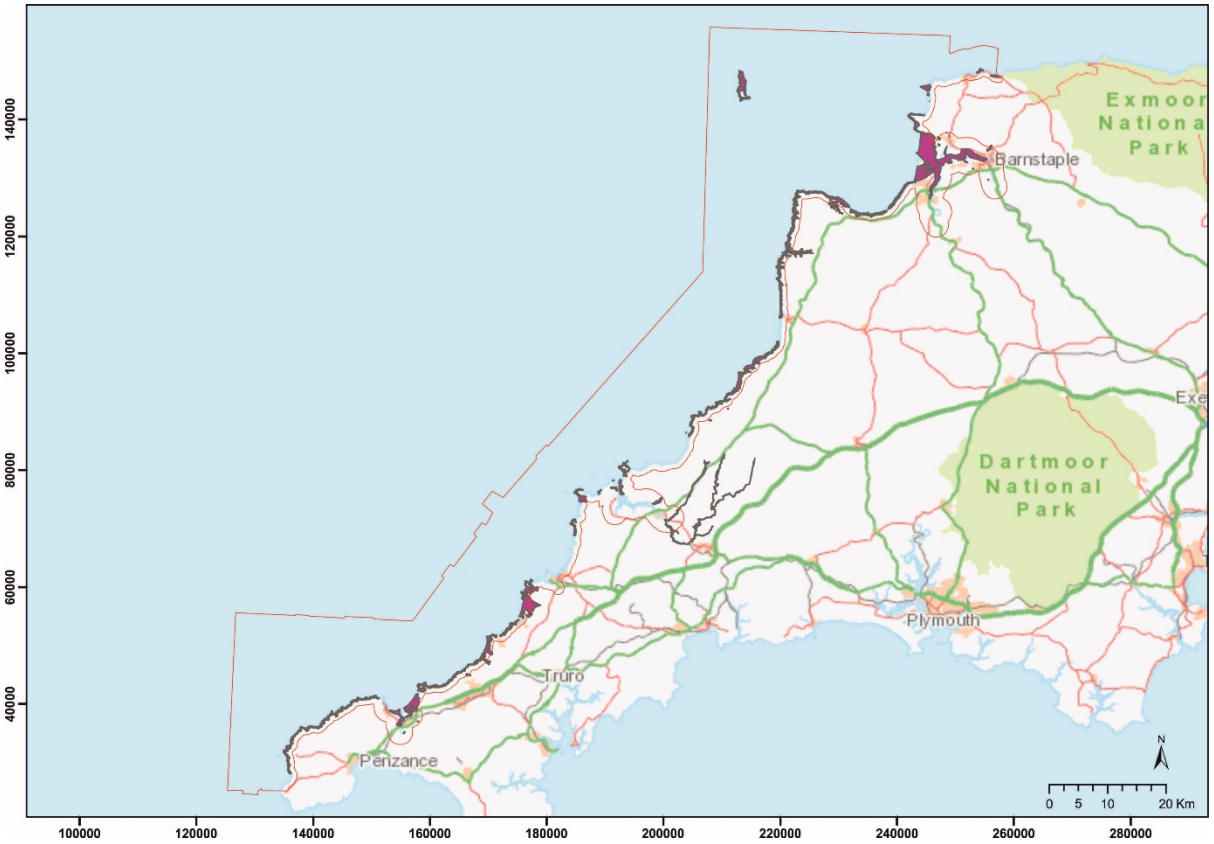


Figure 4.11: Distribution of Sites of Special Scientific Interest within RCZAS study area. Contains Natural England and Ordnance Survey data © Crown copyright and database right 2019

4.3.8 National Nature Reserves and Marine Nature Reserves

National Nature Reserves (NNRs) were established to protect some of our most important habitats, species and geology, and to provide 'outdoor laboratories' for research. Sections 16 to 29 of the National Parks and Access to the Countryside Act 1949 in England enabled the Nature Conservancy Council for England (NCCE), now Natural England, to establish nature reserves, with these provisions strengthened by the Wildlife and Countryside Act 1981. A NNR is provided strict protection against damaging operations, and any such operations must in theory be authorised by the designating body. It also has strong protection against development on and around it. A NNR has the highest level of conservation protection available under UK legislation. There are currently 224 NNRs in England with a total area of over 944km^2. Within the RCZAS study area there are no NNRs.

A Marine Nature Reserve (MNR) has similar status and protection to a NNR but is particularly concerned with a marine environment. MNRs are created by statute, under the Wildlife and Countryside Act 1981, to conserve marine flora and fauna and geological or physiographical features of special interest, while providing opportunities for study of the systems involved. MNRs may be established within 3 nautical miles of the coast under the Territorial Seas Act 1987 or, by an Order in

Council, to the limits of UK territorial waters; they include both the sea and the seabed. In 1986 Lundy became Britain's first statutory Marine Nature Reserve.

4.3.9 Local Nature Reserves

Local Nature Reserves (LNRs) are a statutory designation made under Section 21 of the National Parks and Access to the Countryside Act 1949 by principal local authorities. Parish and Town Councils can also declare LNRs but they must have the powers to do so delegated to them by a principal local authority. LNRs are for people and wildlife. They are places with wildlife or geological features that are of special interest locally. They offer people opportunities to study or learn about nature or simply to enjoy it. They range from windswept coastal headlands, ancient woodlands and flower-rich meadows to former inner city railways, long abandoned landfill sites and industrial areas now re-colonised by wildlife. Within the RCZAS study area there are 12 LNRs: Bude Marshes, Cairn Woodland, Fremington, Gwithian Green, Gwithian Towans, Hillsborough, Kenwith Valley, Kynock's Foreshore, Red River Valley, St Gothian Sands, Steeple Woodland Nature Reserve and Upton Towans.

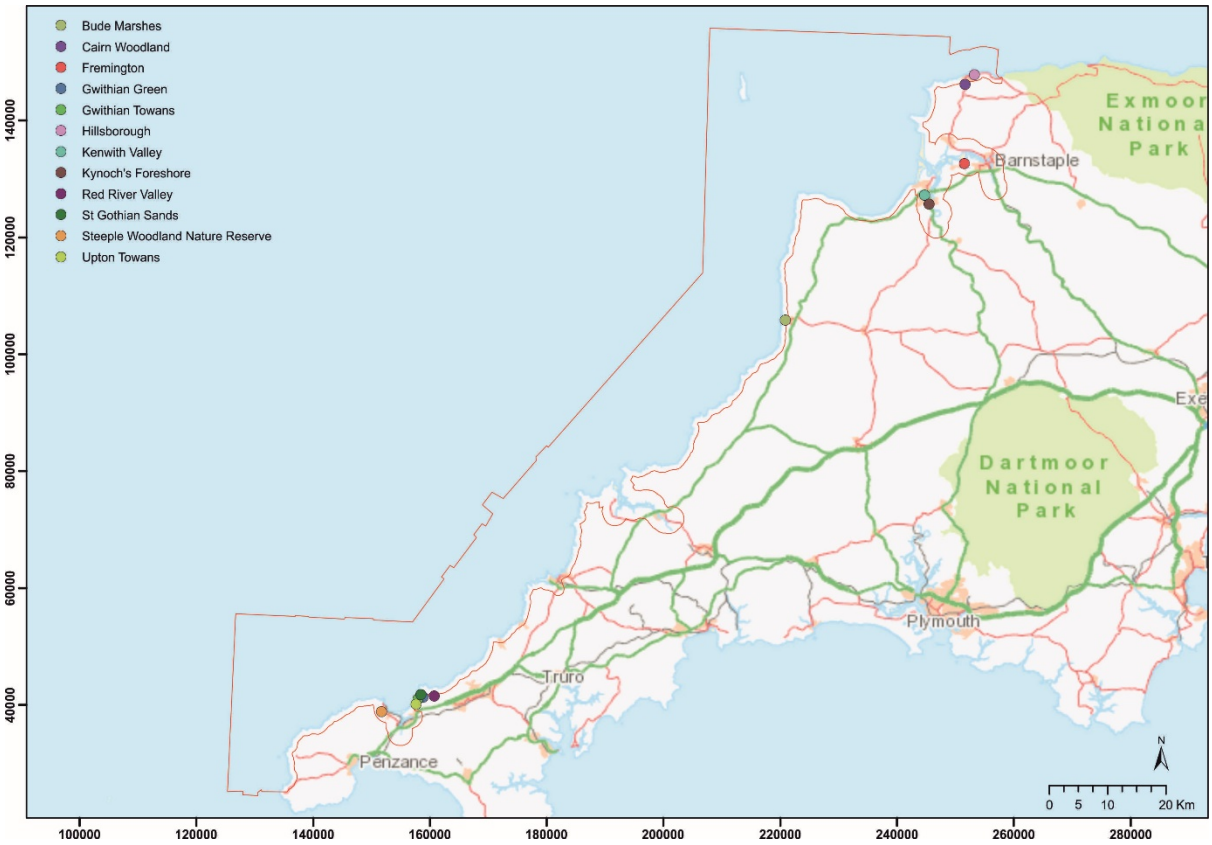


Figure 4.12: Distribution of Local Nature Reserves within RCZAS study area. Contains Natural England and Ordnance Survey data © Crown copyright and database right 2019

4.3.10 Regionally Important Geological Sites / County Geology Sites

The Devon Regionally Important Geological and Geomorphological Sites (RIGS) Group and Cornwall Geoconservation Group (formerly the Cornwall RIGS Group) were both founded in 1991 as voluntary organisations exclusively concerned with geological conservation within their respective counties. Both groups seek to promote geological conservation by working with local authorities, landowners and others utilising the protocols established through UKRIGS (now GeoConservationUK). RIGS (otherwise referred to as County Geological Sites (CGS)) are places that are considered to be especially

important for the geology they exhibit. They are mostly old quarries, pits, roadside cuttings and other excavations which expose rocks normally covered by soil and vegetation. Some sites are natural exposures of interesting rocks in river banks and cliffs, and others are fine views which demonstrate how the underlying geology and forces of erosion have shaped the landscape. On a national level, important geological sites are protected as SSSI, consisting of statutorily protected land. CGS are not a legal or statutory designation, but they are valuable enough to the region to deserve recognition and play an important role in delivering Local Geodiversity Action Plans (LGAPs). There are a total of 118 sites within Cornwall and Scilly and 246 in Devon. Of these, 34 sites in Cornwall and 15 sites in Devon are within the RCZAS study area (Figure 4.13).

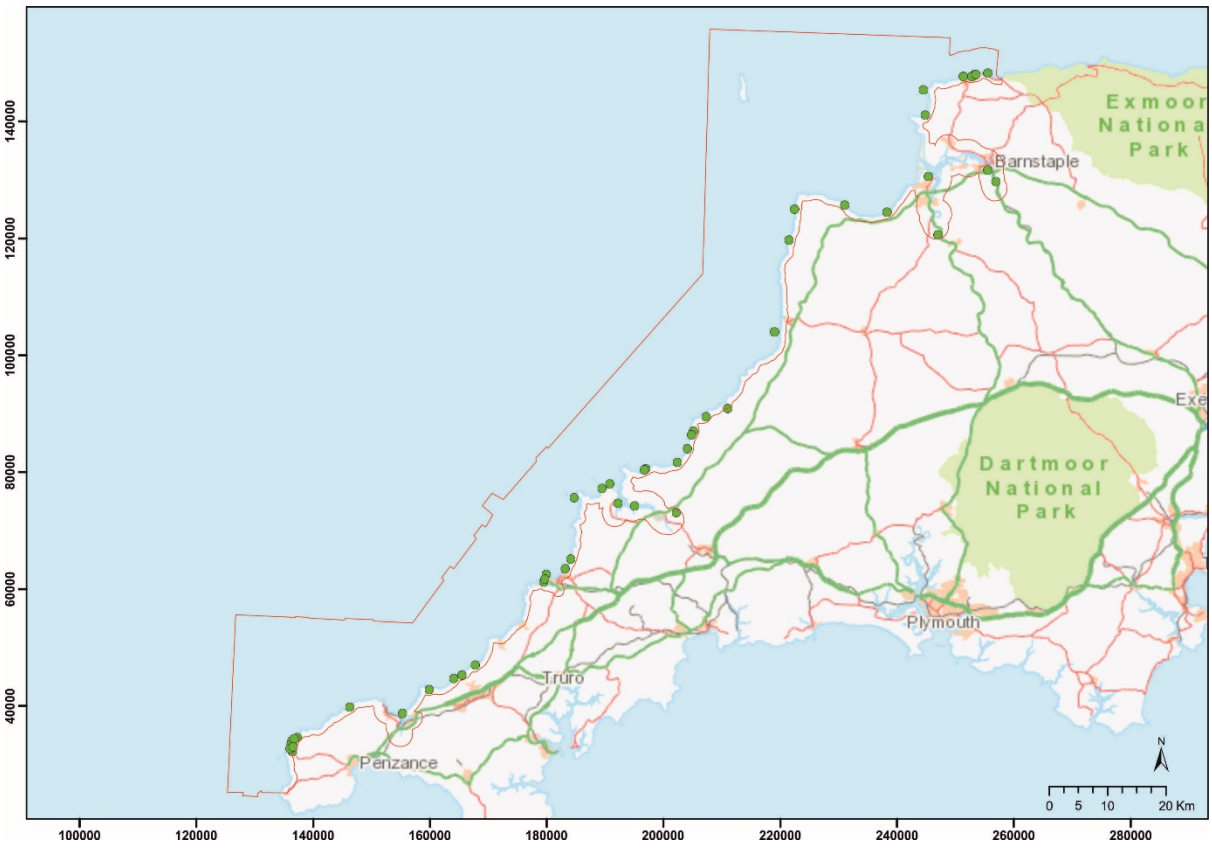


Figure 4.13: Distribution of Regionally Important Geological Sites (RIGS) / County Geological Sites (CGS) within the RCZAS study area. Contains Ordnance Survey data © Crown copyright and database right 2019

4.3.11 Sensitive Marine Areas

Sensitive Marine Areas (SMAs) are non-statutory marine areas notable for their marine animal and plant communities or which provide ecological support to adjacent statutory sites. English Nature published a Strategy for Conserving England's Marine Heritage in 1993 (English Nature 1993; 1994), which included the identification of nationally important subtidal marine areas around England, called Sensitive Marine Areas (SMAs). These had the goal of triggering interest and awareness of important wildlife areas, to stimulate discussion of management issues in estuarine and coastal management planning. These areas rely on the co-operation of users and local communities for sustainable management. Within the RCZAS study area there are three SMAs: St Ives Bay, North Cornwall (Trevose Head to Boscastle) and North Devon (Morte Point to Combe Martin).

4.3.12 Nature Improvement Areas

Nature Improvement Areas (NIA) were established to create joined up and resilient ecological networks at a landscape scale. They are run by partnerships of local authorities, local communities and landowners, the private sector and conservation organisations with funding provided by Defra and Natural England. The 12 winning NIA projects were chosen after a competitive process announced in the Natural Environment White Paper. Within the RCZAS study area is the Northern Devon NIA, residing within the North Devon Biosphere Reserve, representing land that is least well protected by existing mechanisms, but which is crucial to the Biosphere's wider ecological integrity and robustness. Benefits of the NIA included over 1,000 hectares of priority habitat re-created and restored, 60 kilometres of water courses brought into sympathetic management and 20 kilometres of river restored to suitable condition for the freshwater pearl mussel. The NIA was led by the Devon Wildlife Trust, with a delivery team including NGOs, statutory agencies and local authorities together with Exeter University, South West Water and the MetOffice.

5 Coastal and Marine Management

5.1 International Conventions

International Conventions relevant to the RCZAS study area include the European Landscape Convention (ELC)[14] - also known as the Florence Convention –an international treaty that provides a series of guidelines for the development of policies relating to the protection, management and planning of European landscapes, and organises European co-operation on landscape issues. The ELC was adopted into UK law in 2007.

The UNESCO Convention on the Protection of Underwater Cultural Heritage[15] was adopted in 2001 and sets out the principles for the protection of submerged cultural heritage, provides a detailed State cooperation system and provides widely recognised practical rules for the treatment and research of underwater cultural heritage. It has four main principles: obligation to preserve underwater cultural heritage; in situ preservation as first option; no commercial exploitation, and training and information sharing. The 2001 Convention neither regulates the ownership of wrecks nor does it change existing maritime zones. The Convention has not yet been ratified by the UK Government but is currently under consideration.

5.2 UK Legislation

Since the 1990s, EU and UK Governments have sought better understanding of coastal and marine environments and associated processes to provide the necessary information base for prospective strategic planning and long-term management of the coastal and marine environment.

From the late 1990s, European and UK legislation for the management of coastal and marine environmental resources has focused increasingly on an integrated spatial approach to marine planning. A series of reviews and reports dating from the Marine Stewardship Report 'Safeguarding our Seas' (Defra 2002) indicated that a new approach to managing activities in the marine environment was needed. In particular, better integration and more effective spatial management of conflicting pressures were identified as prerequisites for conservation and sustainable development and have subsequently become crucial aspects of delivering the UK vision for the marine environment characterised by 'clean, healthy, safe, productive and biologically diverse oceans and seas' (UK Government 2009).

5.2.1 Marine and Coastal Access Act

The Marine and Coastal Access Act of 2009 provides the legal mechanism for improved management and protection of the marine and coastal environment. It provided for a new system of marine planning to fulfil the UK Government's marine objectives and priorities for the future, and directed decision-makers and users towards more efficient, sustainable use and protection of our marine resources. The Marine Act comprises a series of key elements including the introduction of the Marine Management Organisation (MMO) to act as the main authority for marine planning for English territorial waters and UK offshore waters; provision for a strategic Marine Planning System, including a streamlined marine licensing system, the production of a Marine Policy Statement (MPS) and a series of subsequent Marine Plans (Marine Management Organisation 2014).

[14] http://www.coe.int/en/web/landscape/home
[15] http://www.unesco.org/new/en/culture/themes/underwater-cultural-heritage/2001-convention/

Section 322 divided UK Controlled Waters into two marine regions: an inshore region (0-12 nautical miles) and an offshore region (12 – c. 200 nautical miles) under each of the four Administrations (England, Northern Ireland, Scotland and Wales). In April 2011 the MMO embarked on a programme of Marine Plan preparation for the 11 English Marine Plan Areas (Figure 5.1), to be completed by 2021, with Seascape Character Assessment (SCA; see Section 2.3.4) being used to inform those Marine Plans. Marine Plans interpret and present the policies from the MPS at a sub-national level, allowing national policy to be applied on a local scale. Marine Plans have relevance to a wide range of issues relating to human activities, their associated infrastructure, and their effects on resources, features and processes in the marine and coastal environment. The MMO has now completed Marine Plans for East Inshore and Offshore and South Inshore and Offshore marine planning areas, and is currently progressing the remaining seven marine plan areas simultaneously.

The South West Inshore Marine Plan area covers a length of coastline c. 2000km, stretching from the River Severn border with Wales to the River Dart in Devon, taking in a total of over 16,000 km^2 of sea. The south west offshore marine plan area includes the marine area from 12 nautical miles extending out to the seaward limit of the Exclusive Economic Zone (EEZ), a total of approximately 68,000 km^2 of sea. The Marine Plan is undergoing its Iteration 3 consultation, comprising preferred draft policies, draft supporting text for policies including on implementation, until the 29th March 2019. It is anticipated that following Iteration 3, the draft plan consultation taking place in summer 2019, with publication of post-consultation changes to the Consultation Draft South West Marine Plan in winter 2019.

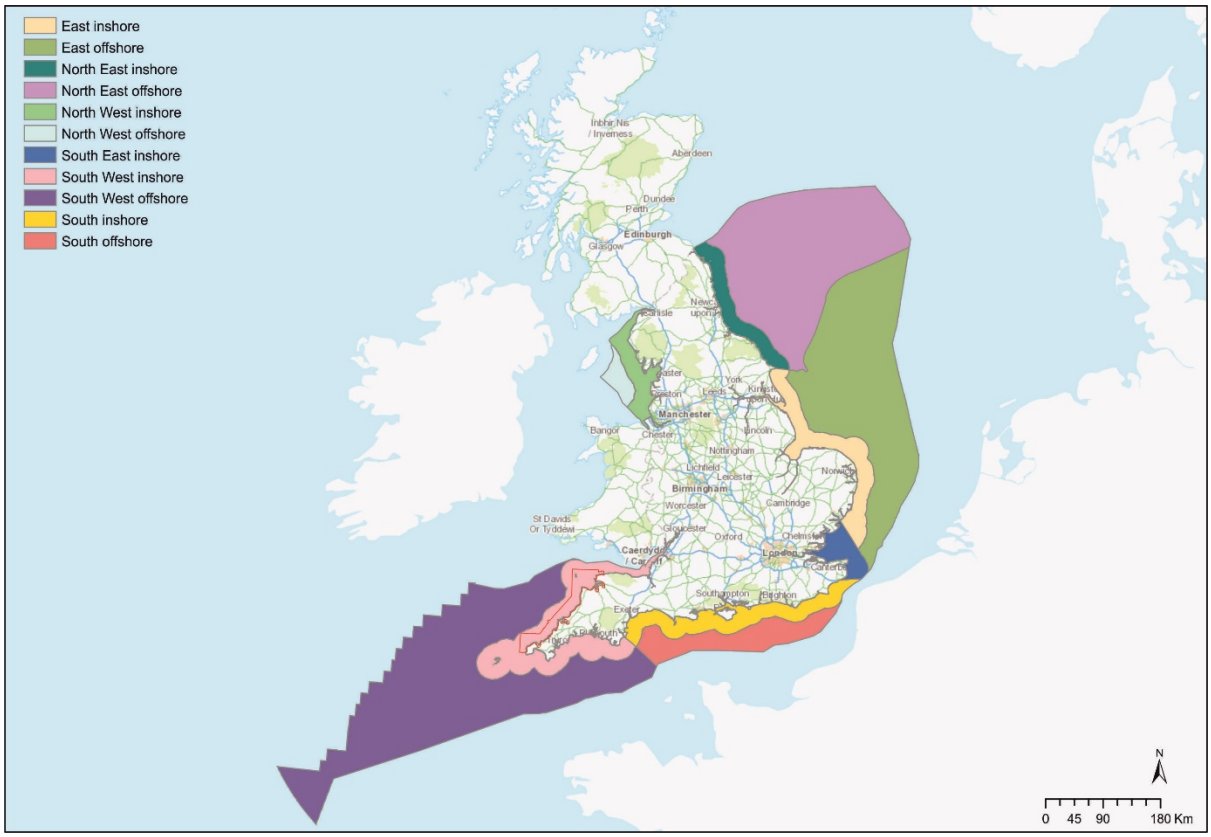


Figure 5.1: Marine Plan Areas for England. Open Government Licence. Reproduced with the permission of the Marine Management Organisation, Ordnance Survey and UK Hydrographic Office.

5.2.2 National Planning Policy Framework (NPPF)

The Department for Communities and Local Government published the National Planning Policy Framework (NPPF)[16] in 2012, setting out Government planning policies for England and replacing the former Planning Policy Guidance (PPG) 16 and 20, and Planning Policy Statement 5 (PPS5) with immediate effect. A revised version of the NPPF was published in July 2018 by the Ministry of Housing, Communities and Local Government. The NPPF sets out the Government's planning policies for England and contains details of how they should be applied, with a strong focus on the need for sustainable development. This sustainable development can be achieved within the planning system through a consideration of the economic, social and environmental aspects of a development. The environmental objective is to contribute to protecting and enhancing our natural, built and historic environment; including making effective use of land, helping to improve biodiversity, using natural resources prudently, minimising waste and pollution, and mitigating and adapting to climate change, including moving to a low carbon economy.

Archaeological sites, buildings, Historic Parks and Gardens, Conservation Areas, Registered Battlefields or other aspects of the historic environment that have significance because of their historic, archaeological, architectural or artistic interest are considered heritage assets under this policy system. These assets are an irreplaceable resource, and should be conserved in a manner appropriate to their significance, so that they can be enjoyed for their contribution to the quality of life of existing and future generations. Designated heritage assets are afforded protection as either World Heritage Sites, Scheduled Monuments, Listed Buildings or through their inclusion within Conservation Areas.

Where assets are to be affected by a planning development, local authorities should require a description of the significance of all heritage assets likely to be affected, including impacts on setting. This should be set out with a level of detail proportionate to the assets' importance and of a sufficient scale to allow the potential impact of the proposed development upon the assets' significance to be understood. Any harm or loss to an asset requires justification; substantial harm to, or loss of, designated assets is considered to be wholly exceptional unless it is demonstrated that the public benefi ts of a development outweigh the harm or loss. Local plans should set out positive strategy for the conservation and enjoyment of the historic environment, including heritage assets most at risk through neglect, decay or other threats. Local planning authorities should have access to an up-to-date evidence base, such as an HER, in order to assess the significance of heritage assets and to understand the contribution that they make to the environment.

5.2.3 The Coastal Concordat

The Coastal Concordat for England provides a framework to co-ordinate the required processes relating to the consent of coastal developments in England to ensure sustainable growth within the coastal zone. The concordat can be applied to projects that span the intertidal area in estuaries and on the coast, as well as in situations where multiple consents relating to both marine and terrestrial planning are required (Defra 2014).

[16] https://www.gov.uk/government/publications/national-planning-policy-framework--2

5.3 Coastal Management

5.3.1 Coastal access

Delivery of the England Coast Path, under the Marine and Coastal Access Act 2009 (Part 9), is governed by Natural England's Coastal Access Scheme. The scheme aims to improve public access to, and enjoyment of, the English coastline by creating clear and consistent public rights along the English coast for open-air recreation on foot. It allows existing coastal access to be secured and improved, and new access to be created in coastal places where it did not already exist. The scheme contains the key principles on which access proposals are based at the local level, and explains how these are applied in each of the main coastal scenarios.

The Act requires Natural England to review the Scheme within three years of its first approval. The first review of the Scheme was completed in March 2013 and the revised version (NE446)[17] is now followed by Natural England. Natural England expects to complete work on the England Coast Path in 2020.

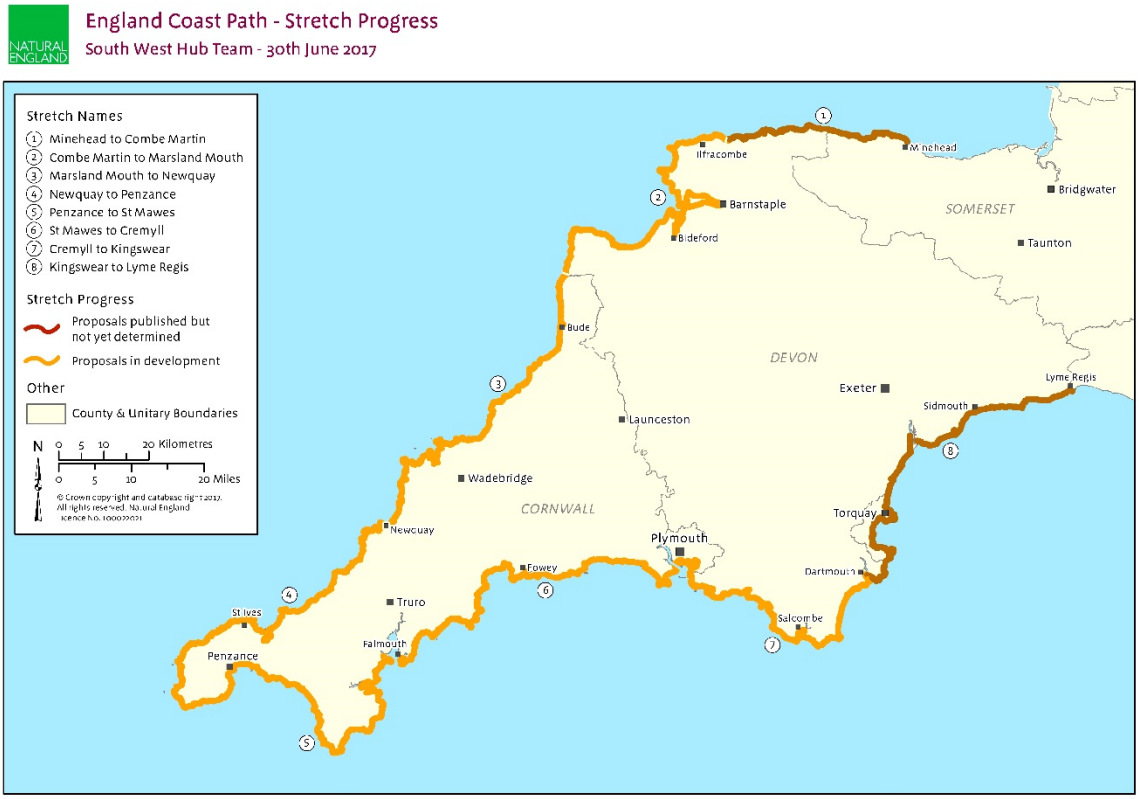


Figure 5.2: England Coast Path in south west of England [18]

5.3.2 Flood and Coastal Erosion Risk Management (FCERM)

This is a programme run by the Environment Agency, Defra, the Welsh Government and Natural Resources Wales, and aims to serve the needs of all flood and coastal operating authorities in England and Wales. The programme provides evidence, information, tools and techniques to inform the

[17] http://publications.naturalengland.org.uk/publication/5327964912746496
[18] https://www.gov.uk/government/publications/england-coast-path-in-the-south-west-of-england

development of Flood and Coastal Erosion Risk Management (FCERM) policy and strategy[19]; understand and assess coastal and flood risks and the processes by which these risks arise; manage flood and coastal erosion assets in a sustainable way; and prepare for and manage flood events effectively.

5.3.3 Shoreline Management Plan (SMP)

A Shoreline Management Plan (SMP) is a large-scale assessment of the risks associated with coastal processes and helps reduce these risks to people and the developed, historic and natural environments. Coastal processes include tidal patterns, wave height, wave direction and the movement of beach and seabed materials. The SMPs provide a 'route map' for local authorities and other decision makers to move from the present situation towards meeting our future needs, and will identify the most sustainable approaches to managing the risks to the coast in the short term (0-20 years), medium term (20-50 years) and long term (50-100 years). Within the SMP there are four principal policy options (see Figure 5.3):

- No Active Intervention (NAI): a decision not to invest in providing or maintaining built defences or the natural coastline
- Hold The Line (HTL): Actively maintain or upgrade the level of protection provided by built defences or the natural coastline
- Managed Realignment (MR): Manage the coastal processes to realign the 'natural' coastline configuration, either seaward or landward
- Advance The Line (ATL): Build new defences seaward of the existing defence line where significant landclaim is considered

These plans also provide an important part of the Defra strategy for flood and coastal defence. SMPs are non-statutory policy documents relating to coastal defence management planning, and intended to inform wider strategic planning. The policies detailed within SMPs aim to achieve long-term objectives for the management of the coastline through a sustainable approach that considers the needs of the environment and local economy.

The plans are developed by Coastal Groups with the input of a wide range of stakeholders, including local authorities and are effected by the Environment Agency through FCERM processes, as well as through neighbourhood and local planning (NPPF). Within the RCZAS study area these groups are the Cornwall and Isles of Scilly Coastal Advisory Group (CISCAG) and North Devon and Somerset Coastal Advisory Group (NDASCAG). Historic England have produced guidance to inform the consideration of coastal heritage as part of the SMP process (Murphy 2006). This large-scale assessment of the risks associated with coastal change enables the assessment of risk to the human, developed, historic and natural environments.

[19] http://evidence.environment-agency.gov.uk/FCERM/en/Default/FCRM.aspx

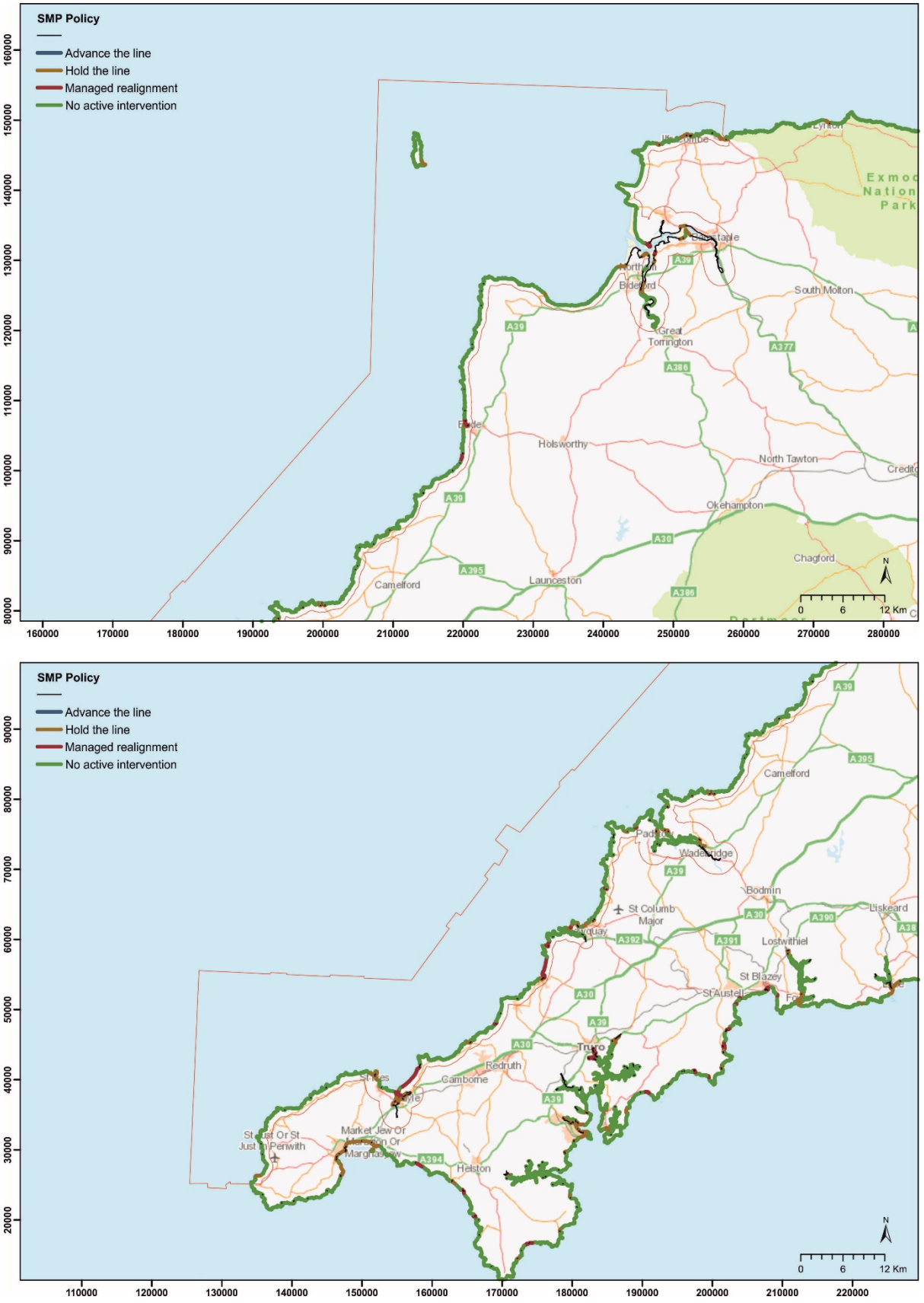


Figure 5.3: SMP Policies for Future Coastal Management. Contains Ordnance Survey data © Crown copyright and database right 2019

For the RCZAS study area there are two draft SMP covering the area: SMP 17 (Rame Head to Hartland Point)[20] and SMP 18 (Hartland Point to Anchor Head)[21]. Each SMP is divided into a series of Policy Development Zones (PDZs) in SMP 17 or Policy Scenario Areas (PSAs) in SMP 18, which themselves are subdivided into Management Areas and Policy Units respectively. Details of those relevant to the RCZAS study area are given in Section 2.2 and shown in Figure 2.2 to Figure 2.5.

5.3.4 Cornwall Maritime Strategy 2012–2030

'*A future for Maritime Cornwall: The Cornwall Maritime Strategy 2012-2030*' (the Strategy)[22] was adopted by Cornwall Council in August 2012 following a series of Consultation Drafts and a Public Consultation document. It is the first, and to date only, high-level maritime strategy to be produced by a local authority.

The Strategy's vision for Maritime Cornwall by 2030 is:

- Cornwall has a sustainably managed maritime environment, which is well understood and known internationally as an excellent location for work, wildlife and for recreation;
- Cornwall's economy is supported by a diverse range of opportunities for ports, marine-related industries, transport and businesses including environmental technologies;
- Cornwall has a rich and enviable maritime heritage, a healthy maritime natural environment and landscape;
- Cornwall has distinctive, well-connected communities, resilient in the face of change.

This strategy has been adopted to ensure coordinated activity across Cornwall Council and its partners and is underpinned by a number of objectives:

- A sustainable, low carbon future for maritime Cornwall;
- Encouragement of partnership working;
- Promotion of low carbon maritime enterprise;
- A healthy, safe and vibrant coastline;
- Protect and develop the 'working harbour' role of Cornwall's estuaries, ports and harbours;
- Stronger connectivity through sustainable, low carbon transport;
- Ensure Cornwall's natural and historic maritime environment and culture is renowned worldwide and a source of pride and inspiration locally.

The strategy includes an identification of the strong roles for landscape and seascape character in building Cornwall's future sustainable economic and community development.

[20] https://www.cornwall.gov.uk/environment-and-planning/countryside/estuaries-rivers-and-wetlands/flood-risk/coastal-erosion-and-shoreline-management/shoreline-management-plans/shoreline-management-plan-2011-smp2/

[21] http://southwest.coastalmonitoring.org/resources/smp/ndascagsmp2/

[22] https://www.cornwall.gov.uk/media/3623048/Maritime-strategy-2012.pdf

6 Coastal change from the Palaeolithic to the present

6.1 Geological background

The geology of the southwest has played a key role in influencing human activity upon this peninsula, due to not only the wide variety of landforms and available soil types, but also the economic significance of the mineral resource, including tin, copper, arsenic, silver and zinc, and other minerals such as kaolinite (china clay), along with quarrying for slate, granite and limestone for building stone. These resources have made the region one of the most important metalliferous mining districts in the UK, and have seen extraction since prehistoric times, therefore having a strongly influence on the distribution of some of the most significant human impacts within the region, notably the vast amount of earth movement, exceeding natural processes by an order of magnitude.

The economic requirement to understand the geology of the region, in order to move beyond chance discoveries of important mineral resources, has resulted in an in-depth understanding of the geological structure of the area. This is demonstrated by early accounts of the geology of the region by Carew (1602) and Borlase (1758) and the publication of the first geological map, mapped on the scale of one-inch to the mile, and associated memoir, for the Ordnance Geological Survey by Henry de la Beche (1839) on the Geology of Cornwall, Devon and West Somerset. Opportunities to map the near-surface geology are enhanced by extensive exposures in quarries, mines and coastal cliffs, while the deeper geology (>200m depth) has been revealed by the region's mining activity coupled with deep boreholes related to mineral exploration, some exceeding 1km in depth. Mapping of the region's geology was expanded in the late 19th century with mapping at the scale of six inches to the mile along the Cornish coastline, up to Boscastle, with accompanying published memoirs (Hill and MacAlister 1906; Reid and Flett, 1907; Reid and Scrivenor 1906; Reid et al. 1910). Beyond Boscastle the area was remapped at the scale of one inch to the mile, mainly by William Augustus Edmond Ussher. Mapping of the remainder of the coastline at the scale of six-inches to the mile, and accompanying memoirs for the areas north of Boscastle, did not occur until the start of the 1960s (Freshney et al. 1972; 1979; Edmonds et al. 1979; 1985).

The bedrock geology is summarised in Figure 6.1 according to geological period. The southwest peninsula forms the western part of the Cornubian Massif, overstepped in east Devon and parts of west Somerset by terrigeneous sediments (sediment derived from erosion of terrestrial rocks) of Permo-Triassic age. The massif is composed of a Late Proterozoic / Early Paleozoic basement, only visible in isolated outcrops on the south coast within the Lizard Complex (e.g. Old Lizard Head Formation and Man of War Gneiss, the latter dated c. 500 Ma).

During the Caledonian orogeny, a period during the Ordovician to Early Devonian when continental collision brought the two halves of the UK together, the land to the north of the study area was raised, leading to the development of a southwards draining pattern into a shallow sea, likely to have formed an extension of the Rheic Ocean. During the Devonian-Carboniferous succession, c. 410-315 Ma, a series of six east-west trending sedimentary basins formed. These are called the Gramscatho, Looe, South Devon, Tavy, Culm and North Devon basins, with the oldest being the Looe Basin. The Gramscatho Basin occupying South Cornwall was limited to the north by an outer shelf within which the Looe Basin developed. The sedimentary basins show evidence of sequential development and infill from south to north, during the Devonian and Carboniferous, with sediment supplied by northwest-moving stacked nappes (a large body or sheet of rock that has been moved a distance of about 2 km

or more from its original position by faulting or folding), initiated in the Early Devonian by the progressive closure of the Rheic Ocean, and by fluvial systems bringing in sediment from central Europe. Early Devonian sandstones, shales, conglomerates and some calcareous beds accumulated in this sea and at its margins, while the finer-grained deposits that form the succeeding Middle and Late Devonian slates and mudstones reflect denundation of the northern landmass to a low rolling plain. The successions in the Looe and South Devon basins show along-strike variations due to a westward deepening and a greater submergence of the intervening highs. The successions in all basins are fault-bounded, dismembered or interdigitated by episodes of deformation brought on by convergence. Closure of the Rheic Ocean is demonstrated by the Carboniferous coal-bearing mudstones and sandstones with thin developments of lignite and coal within the Westward Ho! area, demonstrating sediment accumulation within a swampy environment with riverine-sediment input. Periods of deposition within these basins were punctuated by episodes of rift-related alkali basalt magmatism and volcanism within the basins, most notably in the west of the region, and are preserved on the north coast within the cliffs at Pentire, near Newquay.

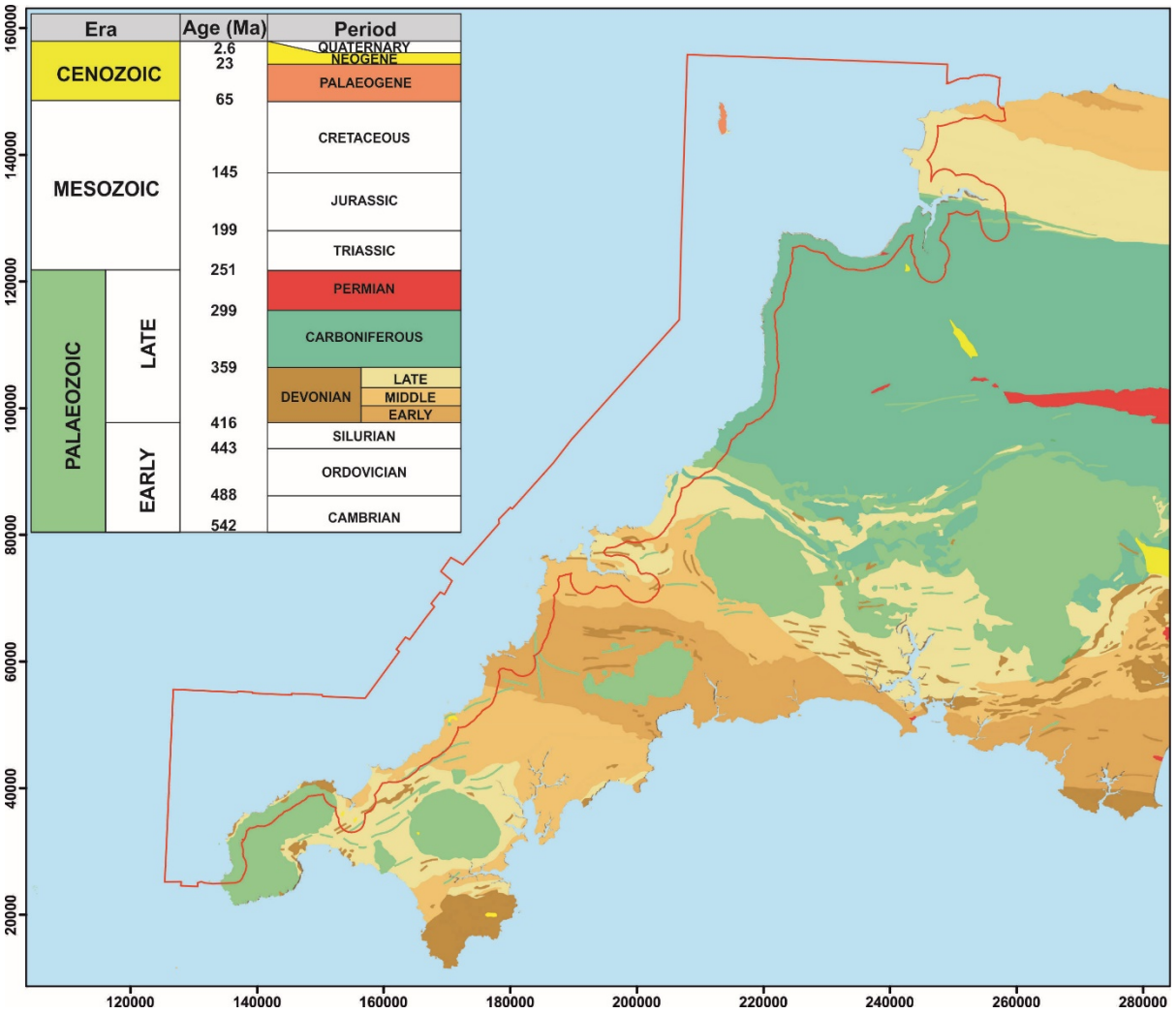


Figure 6.1: Simplified geology of the study area. Reproduced with the permission of the British Geological Survey ©UKRI. All rights Reserved

During the Variscan orogency during the Late Carboniferous to Early Permian, c. 290 Ma, the large-scale continental convergence, forming the supercontinent Pangea, led to intense east-west folding,

together with faulting and thrusting, of the Devonian-Carboniferous basin. The forces were sufficient to bend the strata over themselves resulting in some layers now lying upside down, as visible within the cliff exposures at Hartland Quay and Millook Haven. In the south, where the compression was greatest, it was strong enough to break the rocks creating faults, along with thrust faulting leading to the deposition of the geologically complex Lizard Complex, containing a variety of igneous and metamorphic rocks including ophiolites. In some places the compression and folding resulted in temperatures and pressures high enough to metamorphose the rocks so that they now have a slaty character, which has been extensively quarried for roofing slates. There are also suggestions that these movements could have led to the remobilisation and concentration of minerals within some faults at this time, as found through mining for lead and silver at Combe Martin.

These movements were followed by granite intrusions and consequent metamorphism of the rock, with a large molten mass of magma that rose from within the Earth's crust and ascended to near the surface where it spread out to form a long NE-SW aligned cylindrical body (Cornubian batholith) extending from Dartmoor to the Scillies. Extending upwards from this body, six smaller pinnacles (cupolas) rose still further and now form the granite moors and high ground visible at Dartmoor, Bodmin Moor, St Austell Moor, Carnmenellis, West Penwith and the Isle of Scilly. The rocks into which this magma intruded underwent metamorphism, resulting in harder re-crystallised rocks. The granite pinnacles that rise to the present-day surface have many associated mineral veins that formed by the cooling of mineral rich liquids associated with the magma as it was emplaced. These have been mined for tin, copper, tungsten, lead and small amounts of gold and silver, with the main areas of activity focused around St Just, Tregonning and Gwinear, Wendron, Camborne and Redruth, Gwennap, St Agnes, Caradon and the Tamar Valley. Some of the mines in these areas reach depths of over 500 m and exceptionally the Dolcoath Mine, Cambourne, reached a depth of over 1km below the surface at the beginning of the 20th century. Where the granite was altered by hot water circulating through it as it cooled, some of the minerals were altered to a very fine and white clay, known as kaolinite (china clay), which was extensively open-cast mined in areas near St Austell, Lee Moor and Camelford.

An extensive post-Variscan landmass, with arid climate and characteristic wet-season debris torrents, resulted in the formation of breccias, marls and sandstones of Permian and Triassic age, but also the erosion of the land that had been uplifted by the Variscan Orogeny. While onshore exposures associated with these periods are typically found further east, notably in south Devon, small exposures of presumably Permian age breccias with beds of sand and sandstone are located on the northern coast near Portledge and Peppercombe. Beyond these small outcrops, there are few geological exposures that can be associated with the Permian to Cretaceous period, though these are found within 10km offshore of both the South Cornwall coastline and North Devon within the Bristol Channel. However rifting during the Triassic period did lead to the expulsion of basinal fluids and the formation of NW-SE to N-S trending "crosscourse" quartz veins across Cornwall, prior to the opening up of the North Atlantic. During the Eocene, the granites of Lundy island were formed. These consist of megacrystic granite that emplaced into the Variscan-deformed Devonian Morte Shales on Lundy, which can be seen outcropping in the southeast of the island. The granite originated from both partial mantle melting, resulting in turn from extensional forces, and partly from the same lower crustal material as the Cornubian batholith. It is also the sole English granite representative of the North Atlantic Igneous Province associated with the opening of the Atlantic Ocean.

Beyond these few sites, there is relatively little known of the Mesozoic and early Cenozoic eras in the area, though erosional surfaces, ranging from below sea level to 300m OD, have been identified and suggested to relate to subaerial and marine erosion from this period up until the modern day. For the Pliocene, the most important deposit within the area is the marine deposit found at St Erth, located between 27-45m OD.

6.2 Review of coastal change and archaeological potential

The coastal sedimentary sequences of the North Devon and Cornwall coast provide a series of key contexts within which archaeological and palaeoenvironmental evidence may be preserved. They also contain a series of Pleistocene deposits that are important for understanding the palaeogeography of the area during the Palaeolithic period, such as past sea level change and palaeoclimate. The coastal deposits are divisible into two categories based upon age: Pleistocene and Holocene, with the boundary at 11,700 years ago (Walker et al. 2009). Subdivision of the Pleistocene is possible using Marine Isotope Stage's (MIS; Figure 6.3) which record the osciallations between glacial and interglacial phases of global climate.

Pleistocene deposits are associated with raised platforms and beach deposits that are found in distinct clusters along the coastline. These relate to periods of elevated sea level during past interglacials, providing an indication of the position of the previous coastline. In many locations these beach deposits are overlain by fossilied Pleistocene dune deposits created by blown sands. The age of these deposits is poorly understood, but if shown to be pre-Ipswichian (MIS 5e) they hold the potential to contain Palaeolithic archaeology. In addition to the deposits that are typically associated with warmer climates, there are also deposits associated with the Pleistocene glacial periods themselves. These may include erractic boulders carried by rafted ice, as seen in the Croyde-Saunton area, possible evidence of ice sheets reaching this coastline, as suggested for Fremington near Barnstaple, or small glaciers having developed onshore at locations such as Exmoor and Rosemergy, West Penwith. While these glacially-derived deposits are associated with periods when it is believed there were no humans living in what is now Britain due to the harsh climatic conditions that then prevailed, they are nevertheless important for understanding the position of the Devensian Irish Sea Ice Stream (ISIS) in relation to the coastline. The harsh periglacial conditions that existed and resulted in the development of extensive head deposits may have also severely impacted upon, or even removed, Palaeolithic archaeology that could have been present in the study area prior to the Devensian glaciation.

In contrast, later Holocene coastal deposits are abundant along the coastline and have been shown to provide excellent preserving environments for archaeological material, associated palaeoenvironmental evidence, and material suitable for scientific dating. Three of the most important deposits are the submerged forests, estuarine deposits and blown sands. Submerged forests may be located within the modern intertidal zone underneath the beach sands, only periodically exposed, or may be found along the river valleys within areas that were formerly marine inlets prior to sedimentation. These deposits have provided detailed information about the palaeolandscape and human activities within these wetland environments, as clearly demonstrated at Westward Ho!. Estuarine deposits have provided additional opportunities for understanding past landscapes, such as opportunities to reconstruct past sea levels. These deposits may be located in close proximity to archaeological sites that are adjacent to the wetland areas, and therefore provide important information about the nature of this human activity within the wider area. The blown sands have been shown to be outstanding preserving environments, often preserving old land surfaces and

occupation surfaces, field systems and settlement sites, industrial activity and notably activities associated with Britain at War. The spatial relationship to the archaeological record of some of these deposit types is illustrated in Figure 6.2 using the Godrevy-Gwithian landscape as an example.

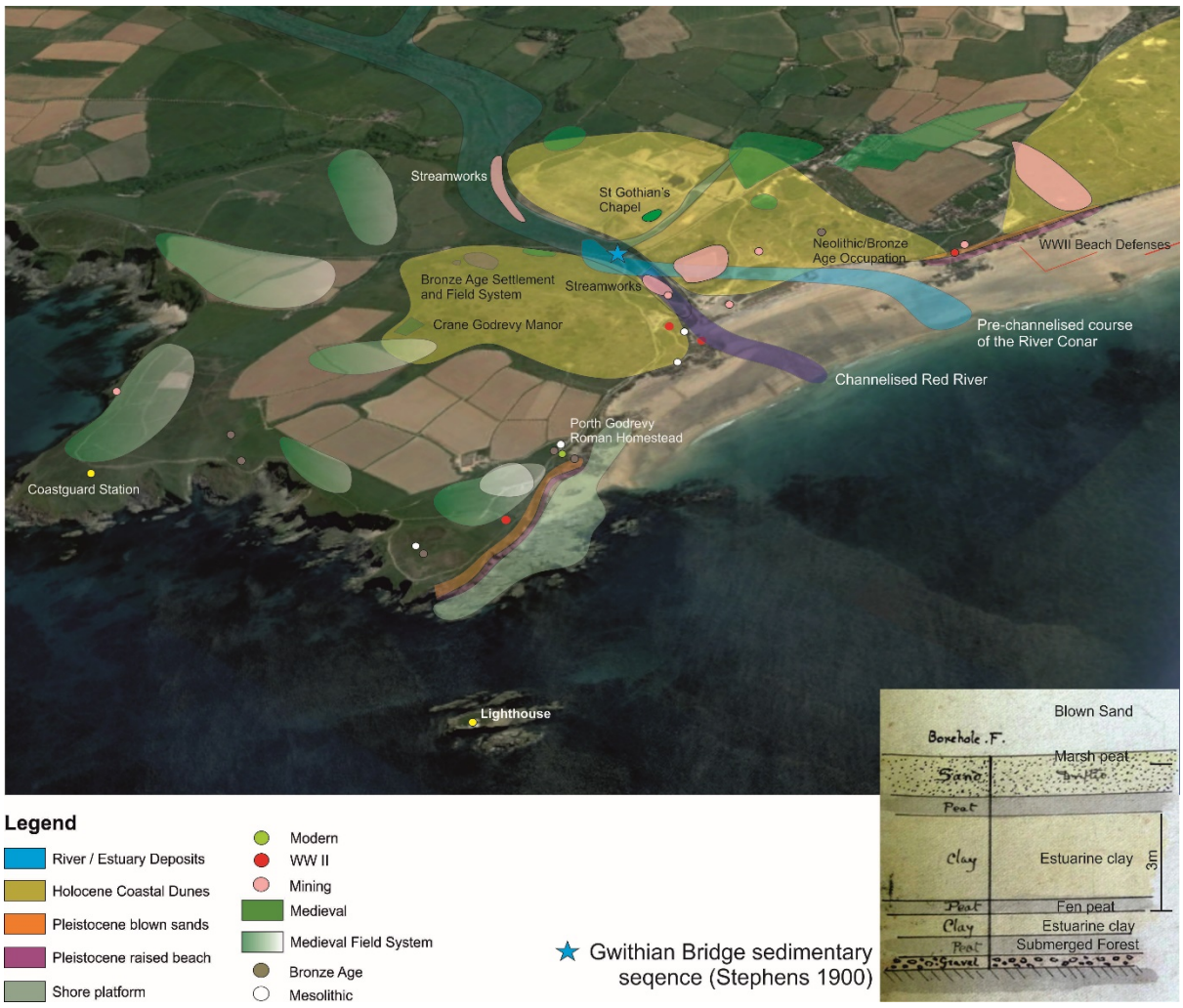
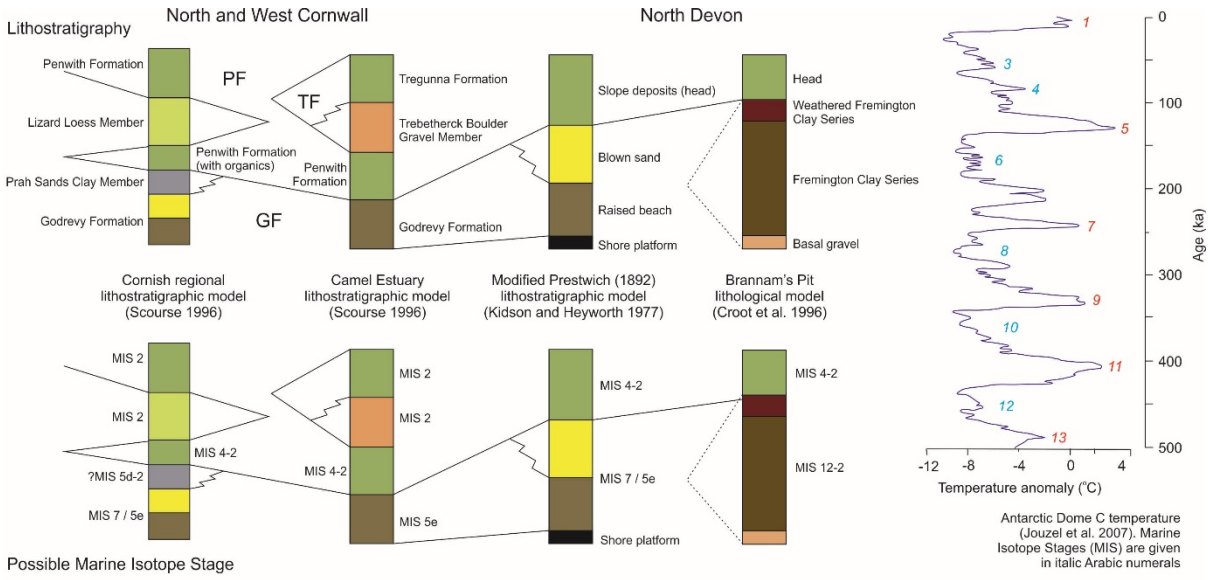


Figure 6.2: Example of the interaction between Quaternary deposits and selected archaeological sites within the Godrevy-Gwithian area. Coastal Observatory data under the Open Government Licence v3.0.

6.2.1 Pleistocene Deposits

The Quaternary geology of the southwest has been discussed in detail by multiple authors (e.g. de la Beche 1839; Ussher 1879; Kidson 1977; Campbell et al. 1998; Scourse 1996), often focusing upon the Late Pleistocene deposits exposed within coastal sequences. Prestwich (1892) adopted a simple tripartite stratigraphic relationship for these deposits, consisting of a shore platform, raised beach and overlying head deposits. Scourse (1996) provided a more complex regional lithostratigraphic model for Cornwall, along with a separate local scheme for the Camel estuary, with defined type sites and formation names. However these two schemes are broadly compatible, with the Godrevy Formation equivalent to the raised beach / dune deposits and the Penwith Formation, most commonly associated with soliflual deposits (debris resulting from solifluction), broadly comparable with the overlying head deposit (see Figure 6.3).



Lithostratigraphic models for Quaternary sequences in north and west Cornwall and north Devon, and their correlation: a) regional lithostratigraphic model for Cornwall and b) model for the Camel Estuary (Scourse 1996); c) Prestwich (1892) model for SW England, modified for Taw-Torridge Estuary; and d) Lithological sequence for Brannam's Pit (Croot et al. 1996).

Cornish model: The Lizard Loess Member (Penwith Formation) is only found outside the Camel Estuary as a discrete stratigraphic unit, and is related to the Late Devensian glaciation of the Isles of Scilly and Celtic Sea GF: Godrevy Formation; widely-distributed raised beach sediments, sometimes topped with blown sands and localised outcrops of Prah Sands Clay Member. PF: Penwith Formation; soliflual sediments dominated by locally derived materials. TF: Tregunna Formation; restricted to the Camel Estuary and containing non-local material from within the catchment of the river Camel.

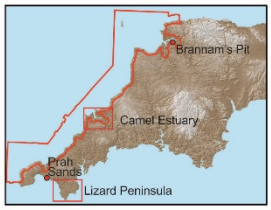


Figure 6.3: Pleistocene lithostratigraphy for North Devon and Cornwall. Contains Ordnance Survey data © Crown copyright and database right 2019.

Complexity to these schemes is introduced when postulated glacial deposits are incorporated. For Cornwall, the Scilly Till deposits are included within the Penwith Formation, with the Trebetherick Gravel Beds separated out as part of a separate Camel Estuary model. For North Devon, the Fremington Clays have been subject to many different chrono-lithostratigraphic interpretations (e.g. Edmonds 1972; Stephens 1973; Kidson 1977; Bowen *et al.* 1985; 1986; Campbell *et al.* 1999; Keene 1996). James (1974) summarises the two principal contrasting chronological models as:

- The "Irish Model", postulated by Mitchell (1960, 1972) and Stephens (1970), was based upon the premise of at least two separate head units representing different glacial periods ("Wolstonian" and Devensian) overlying a Hoxnian raised beach. The evidence for the Irish model was based upon suggested long distance facies correlation between south and south-east Ireland (Eastern General and Ballycroneen till), the Fremington Boulder Clay, the Scilly Isles weathered till and the Main or Lower Head of SW England.

- The "Anglo-Welsh Model" proposed by Bowen (1969; 1973) had incorporated a single phase of head formation (Devensian) following one raised beach episode, the Ipswichian (Last Interglacial) stage. The Irish Model has largely been abandoned in favour of the simpler Anglo-Welsh Model, mainly based upon reassessments of the relationship between the raised beaches and Fremington Clay deposits in the Barnstaple Bay area. However the absolute chronology of the numerous deposits and formations is far from resolved, and is discussed in more detail below.

6.2.2 Shore Platforms

Low-level shore platforms are recorded along large stretches of the southwest coastline and it is generally agreed that these initiated in the Pleistocene, during high sea levels during interglacial stages, though the exact timing is much debated, with Kidson (1971) suggesting that these may have been cut over several interglacial stages. In many cases, these platforms are overlain by raised beach deposits of interglacial age, with age estimates for these beaches ranging from the Ipswichian (MIS 5e) to Hoxnian (MIS 11). Using the altitude of the observed platforms along the coastline, a series of distinct levels have been proposed by some authors (e.g. Zeuner 1959; Orme 1960; Clarke 1961-2) although others, such as Stephens and Synge (1966), have argued that in some areas, such as Barnstaple Bay, the presence of multiple platforms is by no means certain, especially where different authors have used different datums (e.g. height above high water, OD, LAT, etc). James (1974) and Scourse (1996) have also observed that where these platforms can be traced laterally, they can be ≥1m higher on headlands than in adjoining coves, presumably due to the stronger wave action in the former localities. Kidson (1977, 264) and James (1995), summarising the published data, have collectively identified five broad platform elevations that have been commonly reported: -6 to 0m OD; 3.7-5.5m OD; 6-9.5m OD; 12-13m OD; and 18-20m OD.

One of the most commonly mentioned platforms along the coastline is referred to as the so-called 25-foot (7.6m) platform, though this term has been applied to a range of surfaces ranging from modern sea level to elevations well above 10.7m OD (35 feet; Kidson 1971), including the 10 foot (3m) platform of Arkell (1943). The -6 to 0m platform represents the platform found along the coastline at the base of the modern cliffs, as clearly visible in the Hartland Quay area (see below). The age of the platform formation is poorly constrained and has led to many age estimations. Zeuner (1959), for instance, attributed the +18 and +7.5m platforms to the Ipswichian, with the +3.6m to a Devensian interstadial. Mitchell (1960), however, argued that these may be much earlier, possibly pre-Anglian glaciation (pre-MIS 12). It is, however, very likely that these platforms have witnessed multiple interglacial sea level rises leading to some re-cutting / trimming with each phase. Stephens (1980) has stated that correlation of these rock platfoms present significant difficulties and strictly altimetric comparisons are at best only tentative. Furthermore, in the absence of datable material upon these platforms, dating of the overlying deposits can only provide a *terminus ante quem* date for their formation.

Along the coastline a series of high-level erosion surfaces have also been recognised and attributed to marine erosion (see Wooldridge 1954; Kidson 1971) or subaerial processes (Keane 1996) during the Pleistocene or earlier geological periods. Keane (1996: 9) has suggested that some of these may be ancient features that were buried beneath sedimentary rock and only exhumed in the comparatively recent geological past. The high level platforms, similar to the lower ones, do vary in height across the region but in general can be found to cluster in altitudinal ranges reported as 75-90m OD, 130-155m OD and 200-210m OD.

Within the Padstow area, Clarke (1961-2) has also reported additional ‘cliff notches’ at 24-38m OD and 50-55m OD. While these high-level erosion surfaces / cliff notches have been commonly associated with Early to Middle Pleistocene sea levels (e.g. Clarke 1961-2; Kidson 1968), there has been little agreement on the origin or age of these, exacerbated often by the lack of any datable material associated with them. Scourse (1987) stated that almost all of these flat surfaces are solifluction or cryoplanation terraces and not erosion surfaces, and therefore reflect a periglacial landscape rather than a relict marine-formed landscape. Kidson (1977) has suggested that periglacial

processes might have been so intense that they have led to a lack of depositional evidence of high sea levels. The only unequivocal marine deposit within the area found associated with a 'high platform' is the presence of marine sand and clay deposits at St Erth, located upon a platform at c. 30m OD, which provides one of the only pieces of direct evidence linking higher sea levels with one of these high-level platforms. Originally Millett (1885; 1886; 1895) and Reid (1890) described this as marine Pliocene deposits, with Mitchell (1965) subsequently suggesting a Cromerian (pre-MIS 12) interglacial age, although this was changed to a Late Pliocene age based upon microfossil analysis (Mitchell et al. 1973; Jenkins et al. 1986). Originally, Mitchell (1960) considered the thick sand and gravel found capping the Bickington-Hele ridge near Barnstaple, situated at 55m OD, to be equivalent to the St Erth Beds, but Kidson and Wood (1974) subsequently suggested that these are fluvio-glacial and therefore unrelated to the St Erth deposits. While St Erth can now be firmly associated with the Late Pliocene, the processes responsible for, and age of formation of, the intermediate platforms still remains unclear.

Westaway (2010) modelled the uplift history of southwest England using fluvial terraces, karstic data and the above mentioned 'marine' terraces. From this he estimated uplift since the Mid-Pliocene of c. 130m in West Cornwall and c. 135m in south Devon, with uplift since the Early Pleistocene of c. 55m and c. 60m respectively for these areas. A key aspect of this modelling focused upon the St Erth deposits, along with fluvial gravels from Crousa on the Lizard peninsula, which is taken as providing an indicative sea-level elevation for the Late Gelasian (Lower Pleistocene), whose age was assigned mainly based upon its planktonic fauna (Head 1999) as c. 2.1-2.0 Ma. The indicative sea-level correction for the St Erth marine deposit is dependent upon the sea-level elevation that can be associated with this deposit, with water depth estimates ranging from 10-100m (see Westaway 2010: supplementary material 1: 16). As such, the large uncertainty associated with the sea-level correction for the St Erth deposits has significant implications for reconstructing the rate of Pleistocene uplift within Cornwall. Roe and Hart (1999; Roe et al. 1999) have suggested the St Erth deposits represent 35-45m above sea level, while Westaway (2010), although accounting for such a wide range in water depth estimates, settled on an altitudinal range of 90m. These two estimates represent the extremes of the elevation estimates for St Erth and indicate that the rate of Pleistocene uplift could be significantly lower than suggested by Westaway (2010). Westaway (2010) used his uplift model to propose that five low elevation platforms, at 4m, 8.5m, 13m, 18m and 24m, were attributable to MIS 5e-13 respectively, with the lowermost constrained by dating of their overlying raised beach deposits (see below). However this model, as already stated, assumes the St Erth deposits are associated with a corrected altitudinal range of 90m and the 130m platform is attributed to a Pliocene wavecut platform tentatively attributed to c. 3.1 Ma. It also uses the high-elevation gravel outcrop at Crousa on the Lizard Peninsula, situated at 108m, which has been retrospectively fitted to the uplift curve depending upon whether a marine or terrestrial origin of this Pliocene deposit is accepted, though Ealey *et al.* (1999) have suggested that it is not possible to date this deposit and have even suggested a possible Lower Tertiary age based upon palynology. While the uplift model proposed by Westaway (2010) for West Cornwall has very few secure altitudinal and chronological control points, it does correlate with the uplift model for south Devon which contains a larger number of control points. The uplift model for West Cornwall is also further complicated, especially along the north coast, by the potential impact that repeated Pleistocene glaciations off the north coast could have led to increased crustal loading, river diversion and subsequent crustal rebound. As such, with all the uncertainties identified associated with the West Cornwall uplift model, it is possible that some of the lower shore platforms could have been active over several interglacial cycles, as suggested by the raised beach

dating evidence (see below), and therefore are not indicative of a sequential increase in MIS by each higher platform (of which there is considerable overlap in altitudes).

6.2.3 Raised Beaches

Along much of the southwest coastline Pleistocene raised beach deposits are present, often resting upon the shore platforms at a range of altitudes, in some locations capping / incorporating glacial erratics. The sedimentary composition of the raised beaches varies across the region, ranging from deposits almost exclusively consisting of pebbles and cobbles, such as found at Westward Ho! and Porth Nanven, to those consisting solely of current-bedded sands cemented by calcium carbonate derived from shell fragments or iron oxides, as found at Saunton. In some locations, these raised beach deposits are overlain by / grade into cemented false-bedded blown sands representative of fossil dunes, known locally as sandrock. Sandrock (aeolianite) is a semi-lithified calcareous sandstone that has been used in the region for construction and the term is meant to refer to these aeolian deposits, although it is commonly used to also refer to the cemented beach sands. The thickness of these deposits varies locally and in some locations, particularly when they have amassed against cliffs, sand thickness may exceed 30m. The upper sections of sandrock often show signs of disturbance and heaving from periglacial conditions, frequently capped by soliflucted head deposits.

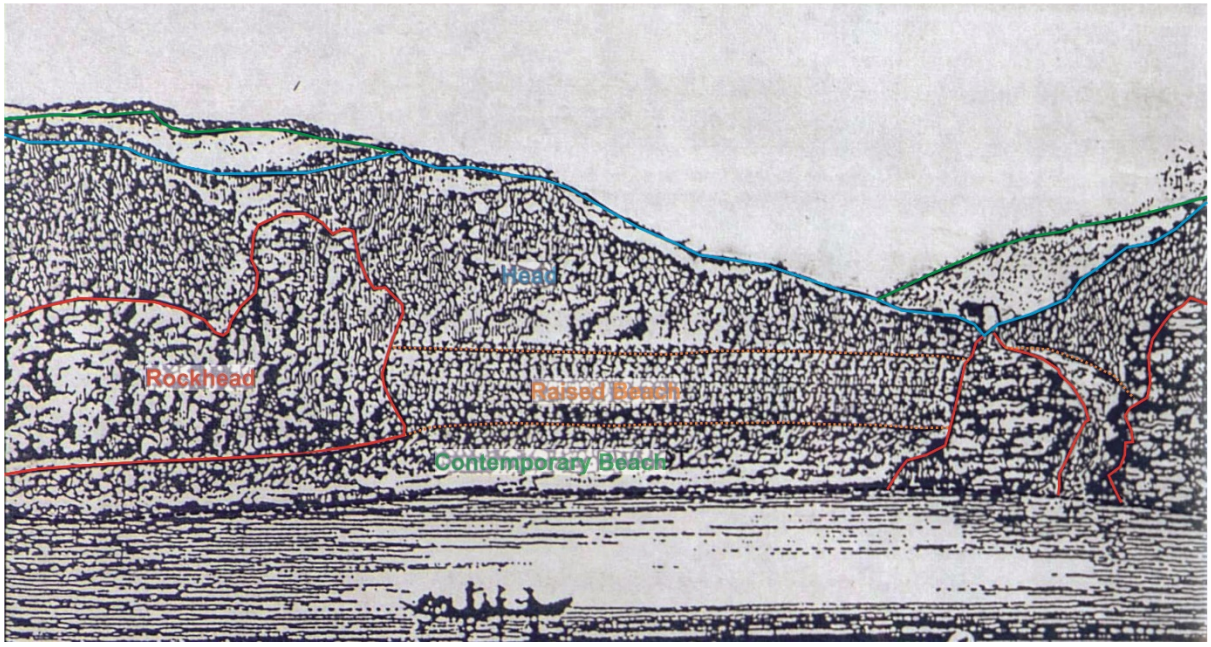


Figure 6.4: Porth Navan Raised Beach (Borlase 1758)

The earliest known recording of a raised beach deposit was by Borlase (1758) who illustrated and described the raised 'boulder' bed at Porth Nanven (Figure 6.4). Documentation of raised beaches, and (when present) their associated overlying fossil dune sequences, is extensive along the coastline. Notable past studies include de la Beche (1839), Ussher (1878; 1879a; b), Pengelly (1867), Prestwich (1892), Reid et al. (1910) Reid and Scrivenor (1906), Robson (1944; 1945), Kidson (1971; 1977), Clarke (1961-2), Edmonds et al. (1979), James (1974; 1994; 2008), Scourse (1996) and Campbell et al. (1996). Along the north coast there are over 50 locations that are known to contain raised beach deposits, with a number known to extend into the major estuaries, as found at Fremington Quay and Appledore in the Taw-Torridge Estuary, and at Casock and Cant Hill's in the Camel Estuary (Figure 6.5).

The age of these raised beaches has been a point of debate since the 19th century, with attempts to date these deposits since the mid-20th century often been based upon altitudinal correlation with respect to estimates of interglacial sea levels (e.g. Clarke 1961-2; Westaway 2010). Stephens (1980) has stated that correlations using faunal assemblages have proved as unsatisfactory as altitudinal comparisons, and therefore scientific dating techniques are required to achieve a more precise chronology. Many authors, such as Green (1943), Zeuner (1959), Guilcher (1969) and Kidson (1977), favoured an Ipswichian (MIS 5e) age for the regions' lower level raised beach deposits, while others, such as Mitchell (1960; 1972; Mitchell and Orme 1967) and Stephens (1966; Stephens and Synge 1966), have suggested two phases of raised beach formation; Hoxnian (MIS 11; though at the time this was interpreted simply as the interglacial preceding the Ipswichian) and Ipswichian, based upon the relationship of gravels with the supposed 'Wolstonian' age Fremington Clay.

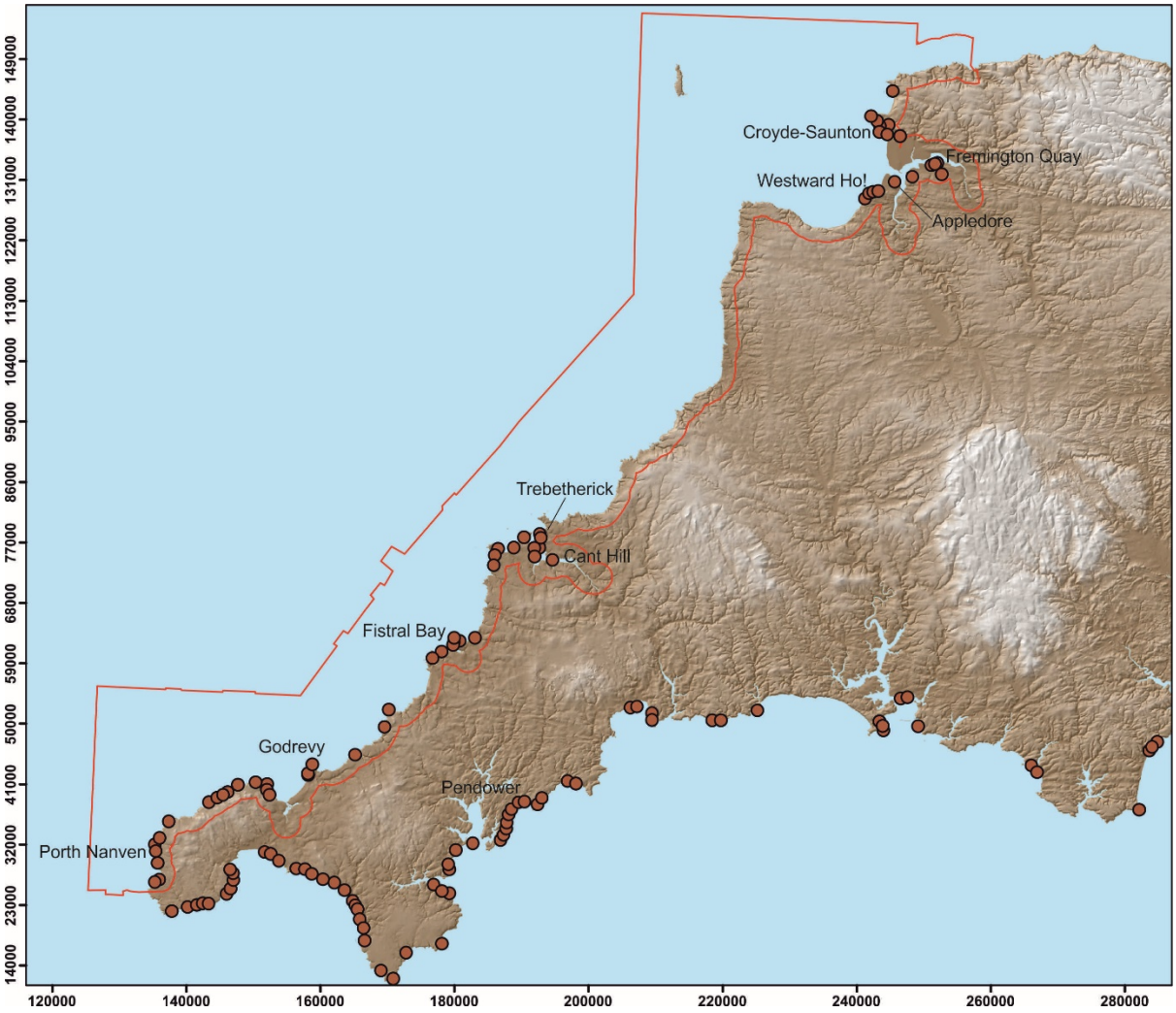


Figure 6.5: Distribution of raised beaches around the coastline. Contains Ordnance Survey data © Crown copyright and database right 2019.

Confirming the age of these deposits remains ellusive due to the limited number of studies obtaining independent dates from these raised beach deposits or their overlying fossilised dune sands. Initial attempts were made by Kidson and Wood (1974) using radiocarbon dating of molluscs associated with the raised beach and shell on the underlying shore platform, but these produced dates close to the limit of radiocarbon dates, suggesting a true age >50ka. Such dates can be obtained from deposits

older than the 50ka if very small amounts of more recent contamination is present, therefore making deposits appear to be younger than they really are (see Busschers et al. 2014; Briant and Bateman 2009).

Later, Andrews *et al.* (1979), Davies (1984) and Bowen et al (1985) used a variety of different molluscs from within the raised beach and overlying sandrock deposits to calculate Amino Acid Racemization (AAR) D/L ratios (D-form to L-form of each amino acid) to infer which MIS the deposits could be attributed to, based upon correlation with independently dated sequences from Gower, south Wales. Initial work at the Saunton 'raised beach' (presumed to be the conglomerate but could be from the marine sands) by Andrews et al. (1979) produced differing amino acid ratios from the five shells measured, which the authors suggested could indicate that this raised beach was the product of two distinct interglacial periods. Wehmiller (1982) reviewed the results of Andrews et al. (1979) and suggested that the results from Saunton could possibly be as old as MIS 7. Further measurements by Davies (1984) and Bowen *et al.* (1985) produced estimates that suggested the raised beaches and overlying sandrock at Godrevy, Fistral Bay and Saunton (raised beach only) could be attributed to MIS 7, the sandrock at Saunton to MIS 5e/7, and the raised beach at Trebetherick to MIS 5e. Changes in preparation techniques means that the determinations of Andrews et al. (1979), Davies (1984) and Bowen et al. (1985) are not directly comparable. James (1995) used this evidence to also support the concept, first proposed by Andrews et al. (1979), that two different aged raised beaches could be present at similar elevations on raised platforms. This would mean that interglacial highstands had occupied the same platforms on a number of occasions. James (1994) also suggested that parts of the cemented MIS 7 beach may have survived and been incorporated into the base of the later MIS 5e beach. However, when re-evaluating these AAR dates, James (1995) pointed out that different pre-treatment methods could suggest a lower D/L ratio for some of the MIS 7 AAR determinations that would be more consistent with MIS 5e. Meanwhile, McCarroll (2002) has questioned the ability of this 'traditional' AAR data to resolve different interglacials. Regardless of whether these AAR were correlated with MIS 7 or 5e, they did demonstrate conclusively that these raised beach sequences were Late Pleistocene and unlikely to be of Hoxnian (MIS 11) age, as suggested within the Irish model.

In the years following this pioneering AAR work, a series of new dating techniques were developed that would enable direct dating of the sediments, rather than molluscs contained within them that could have been reworked from earlier deposits. James (1995) reports that InfraRed Stimulated Luminescence (IRSL) dating was used to date the marine sand at Godrevy and the fossil dune at Fistral Beach, providing ages equivalent to MIS 5e. Southgate (1985; see Scourse 1996) used Thermoluminescence (TL) to date the fossil dune deposits at Fistral Beach, again producing an age equivalent to MIS 5e. The IRSL and TL dates at Fistral Beach therefore differ from the MIS 7 age proposed by Bowen et al. (1985) using AAR, but an MIS 5e age is most likely based upon the agreement of the two luminescence dating techniques. Gilbert (1996; Ed Rhodes pers comm.) reports attempts to optically stimulated luminescence (OSL) date, using the single aliquot regenerative (SAR) method, the sequence at Saunton, which yielded an MIS 5e age for the marine sands and MIS 4 for the overlying fossilised dune sands. More recently, Rolfe (2015) also dated the sands at Saunton with OSL confirming an MIS 5e date for this sequence. However, at Westward Ho! Rolfe (2015) reports OSL dating of aeolian sand reported to be from within the raised beach deposit yielded ages equivalent of MIS 3/4.

James (1995, 437) reports attempts to date the carbonate cemented sandrock from Godrevy using Uranium-series dating, but this carbonate deposit was found to have a coarse texture and uneven

style of cement that permitted the material to act as an open system, leading to leaching of uranium making it unsuitable to date using this technique. More recently, dating of the raised beach marine sands at Croyde Bay by van Vliet-Lanoë et al. (2000) using Electron Spin Resonance (ESR) produced an age of 261±65 ka, which the authors suggested indicated that the rock platform was MIS 9, with the overlying raised beach deposits MIS 7 and 5e.

These many contracdictory resilts mean that there remains a conflict over the age of the raised beaches along this coastline, with AAR and ESR dating tending to suggest older ages of MIS 7 or potentially MIS 9 whereas luminescence dating techniques tend to suggest MIS 5e. While this may indicate that the raised beaches from similar altitudes (dated sequences all lie on shore platforms at c. 5-8m OD), are polycyclic and associated with multiple interglacial periods, as proposed by Scourse (1996), Ussher (1879a, 25) and Young (2012), there are instances, such as at Saunton and Fistral Beach, where the available luminescence and AAR dates are consistent and associated with MIS 5e. As such, on the body of evidence, it suggests that most of the AAR dated sequences might be better aligned with MIS 5e and could, in some cases, include reworked MIS 7 shells. Most recently, Matt Telfer (pers comm.), University of Plymouth, has undertaken new luminescence dating at some of the Cornish raised beaches, including Porth Nevan and Godrevy, which has produced dates compatible with MIS 5e and comparable with the earlier luminescence dates from some of these sites. Even with the realignment of the AAR dates to MIS 5e, the single ESR date from Croyde Bay remains a distinct outlier for the north coast. However there are other similar dates found at similar altitudes on the south coast, such as the raised beach at Pendower residing on a platform at 3.5-6m OD which produced an MIS 7 TL date (208.5±43.5 ka; QTL46b; Scourse 1996). Caution is therefore required to avoid associating all low-lying raised beach deposits in the region to MIS 5e. In the absence of further new scientific dating programmes on a wider range of raised beach deposits using coupled luminescence and AAR dating, the latter using new preparation and selection techniques (e.g. Penkman 2010), the existing evidence current does cast doubts over the robustness of using the 'marine' platform elevation staircase to infer previous interglacial sea levels and the Pleistocene uplift history of the region.

While much of the focus has been on the low-lying raised beach deposits, associated with MIS 5e or, in some instances, MIS 7, there have been no investigations of the reported raised beaches associated with higher shore platform elevations along this coastline. For example, there have been reports of raised beach deposits situated at c. 30m OD around the northern part of the West Penwith Peninsula (e.g. Carne 1865; Ussher 1879a) and within the Marizion area (Round 1944), although Scourse (1996) reports that these were not visible during investigations in the 1990s. Identifying and dating of these higher-level raised beaches, if indeed they are of marine origin, could be instrumental in advancing our understanding of Pleistocene interglacial sea levels along the coastline along with constraining the current uplift model for the region, as well as access to pre-Ipswichian deposits that might contain Palaeolithic material.

The fossilised dune sands overlying the raised beach deposits have also yielded information about the palaeowind direction, established by taking palaeocurrent measurements from the cross-bedded sands (see Scourse 1996). At Fistral Bay, two sequences (A and B) were investigated, with sequence A providing a bimodal distribution with both SE and NE wind directions, while in sequence B a predominantly SE direction was measured. This difference between the basal and upper sands in Fistral A was interpreted by Scourse (1996) to possibly indicate a polycyclic raised beach, with the NE

direction in Fistral A attributable to MIS 7 and SE in Fistral A and B to MIS 5e, based upon the AAR and TL dating from these sequences. However within the Trebetherick sequence, the sands overlying the MIS 5e dated raised beach also show changing palaeocurrent directions, veering from ESE 2m above the raised beach to SSE at 7m above the raised beach. Additional measurements from Godrevy (Scourse 1996) indicate a predominantly NW wind direction. These variations in wind direction are attributable to local landforms, particularly the position of headland which may deflect the wind within bays. However, the changes in the predominant wind direction observed at sites such as Fistral Bay and Trebetherick have been suggested by Scourse (1996, 40) as a possible response to regressive phase towards the end of an interglacial cycle, with Bell and Brown (2009, 15) suggesting that these fossil dune deposits relate to retreating shorelines that may be associated with mainly cold and dry conditions.

The raised beach and sandrock deposits can also provide insights into the evolution of the coastline during the Holocene period. Ipswichian raised beaches indicate the coastal alignment during the last interglacial highstand, with older raised beaches providing a landward limit for the coastline at that time. The presence of raised beaches from a previous interglacial attest to locations where Holocene coastal erosion has been minimal and suggest that where raised beaches are associated with headlands then these were also prominent features during the previous interglacial(s). In other areas where raised beaches and shore platforms are absent, it is possible that these are locations have experienced higher levels of erosion. Prestwich (1892; Plate VIII: Figure 6.6) used this deduction to suggest coastal retreat in several areas, notably between the Camel Estuary and Westward Ho!, where raised beach deposits are absent. This information also suggested that several of the North Cornish headlands have retained their approximate position since the last interglacial(s) but the intersecting bays, where these Pleistocene deposits are absent, had been subject to erosion and bay enlargement.

The raised beaches also present an indication of the natural inland extent that these highstand beaches could attain in the absence of coastal protection schemes, most notably within the Camel and Taw-Torridge estuaries. These beaches have also been shown to have considerable horizontal depth in some locations. This has been demonstrated by Ussher (1879a, 24) near Godrevy Point (Figure 6.7) where he recorded ‘stacks’ of a raised beach, capped by a pinnacle of head deposits, are found upon the foreshore and disconnected from the modern cliff line which contains more extensive raised beach deposits. This not only demonstrates, at least in this location, that an extensive raised beach platform was originally present, but also that erosion of the raised beach back to the present cliff line has occurred during the mid- to late Holocene measuring at least 20m, with some raised beaches representing the last non-eroded components of potentially a much wider raised platform. At Godrevy the position of the cliff line does not appear to have undergone any significant retreat since the 19th century, based upon Ordnance Survey maps, but recent observations do indicate some extensive erosion of these deposits occurring during recent storm events (M. Telfer, pers comm.). Similar observations of long-term coastal retreat can also be inferred from the presence of presumably Devensian head deposits capping bedrock stacks now disconnected from the cliff line, such as Bedruthan Steps and at Tobban Horse, Porthtowan, the latter suggesting ≥200m coastal retreat during the Holocene.

Table 6.1: Dating evidence for the raised beach deposits along the North Coast of Cornwall and Devon

Site	**AAR (D/L Stage)** **[a] Andrews et al. (1979); [b] Davies (1984); [c] Bowen et al. (1985)**	**IRSL** **(James 1995)**	**TL** **Southgate (1985); Scourse (1996)**	**OSL SAR** **(Gilbert 1996; E. Rhodes pers comm.; Rolfe 2015)**	**ESR** **(van Vliet-Lanoë *et al*. 2000)**	**^{14}C** **(Kidson and Wood 1974)**
Godrevy (sandrock)	*Patella vulgata* gave D/L ratio 0.196±0.004 (ABER 146A-B; 4 shells) [b].					
Godrevy (basal sandrock)	*Patella vulgata* gave D/L ratio 0.178±0.021 (ABER 681A-C; 1 shell) [c]. Minchin Hole Stage (MIS 7).	MIS 5e				
Fistral Beach (sandrock)	*Patella vulgata* gave D/L ratio 0.198±0.013 (ABER 147A/B; ABER 160A/C; 5 shells) and *Nucella lapillus* gave D/L ratio 0.2 (ABER 161C; 1 shell) [b].	MIS 5e	QTL46a 116±8.9 ka (MIS 5e). Sand from Fistral B 6-8m OD			
Fistral Beach (basal sandrock)	*Patella vulgata* gave D/L ratio 0.186±0.009 (ABER 680A-C; 3 shells) [c]. Minchin Hole Stage (MIS 7)					
Fistral Beach (basal conglomerate)	*Patella vulgata* gave D/L ratio 0.175±0.005 (ABER 147A-b/ ABER 160A/C (5 shells) and *Littorina littorea* gave D/L ratio 0.18±0.01 (ABER 147 C/D) [b]					
Westward Ho! (Aeolian sand)			SHFD12102 69ka and SHFD14062 82 ka (MIS 3/4) 8.03m OD			
Croyde Bay (base of marine sand)					261±65 ka (MIS 7/9). 5m OD	
Saunton (base of sandrock)	*Patella vulgata* D/L ratio 0.144±0.002 (ABER709A/C; 1 shell) [c]. Unamed D/L Stage (MIS 7/5e)		SHFD12103 131 ka (MIS 5e) 5.87m OD	c. 70ka (MIS 4)		
Saunton (basal conglomerate)	*Patella vulgata* D/L ratio 0.26±0.066 (1 shell) and 0.1 (1 shell) [a] *Patella vulgata* (0.201±0.004; ABER 674A-C; 3 shells) and *Nucella lapillus* (0.107±0.003; ABER675A-C; 1 shell) [c]. Minchin Hole Stage (MIS 7)			c. 120 ka (MIS 5e) (marine sand)		I-2981 32000+2800 -1800 BP
Saunton (shore platform)						NPL-115 >40800 BP
Trebetherick Point (beach conglom-erate) (c. 7m OD)	*Littorina saxatilis* gave D/L ratio 0.113 (ABER 708 A; 1 shell) [c]. Pennard D/L Stage (5e)					

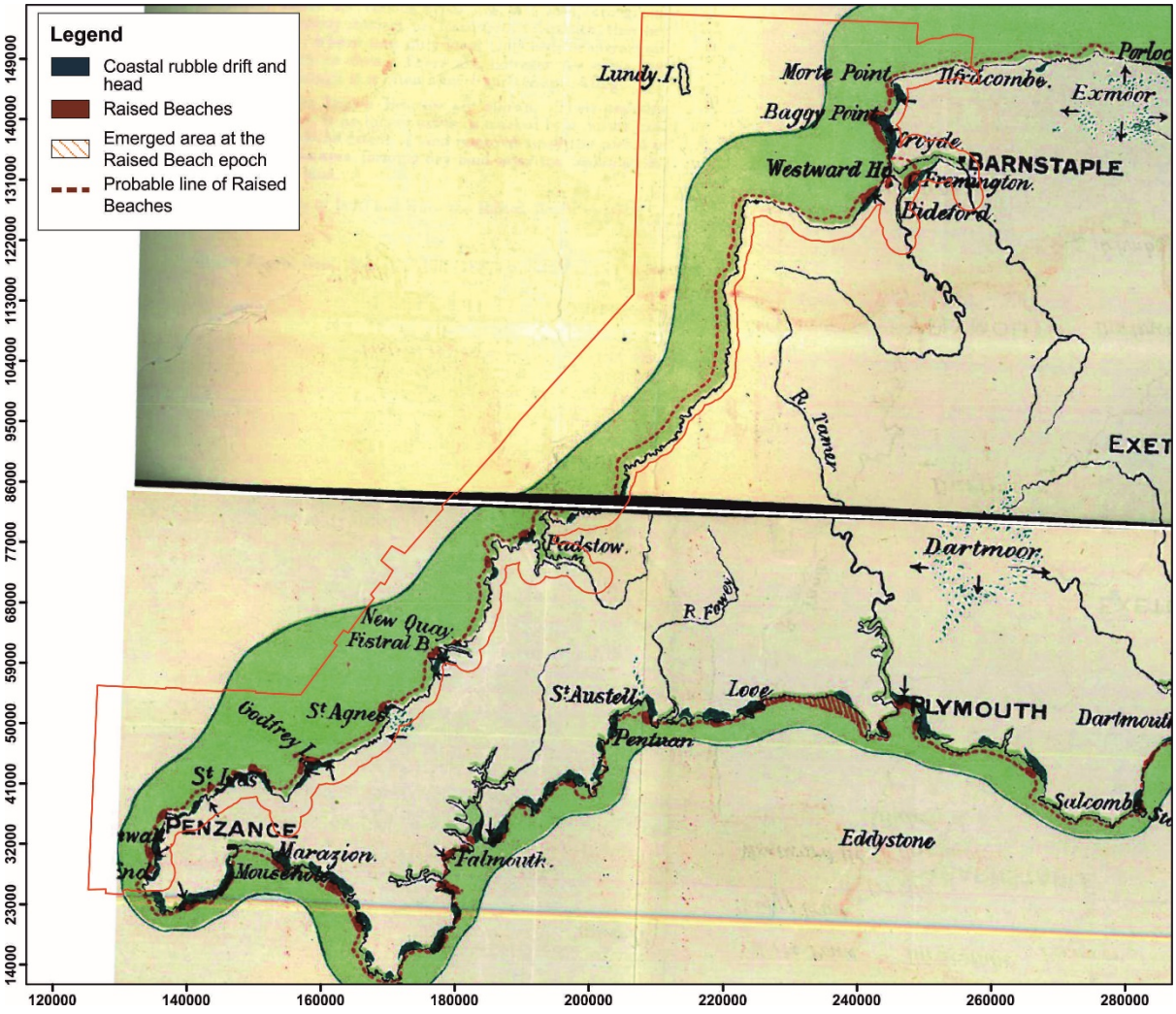
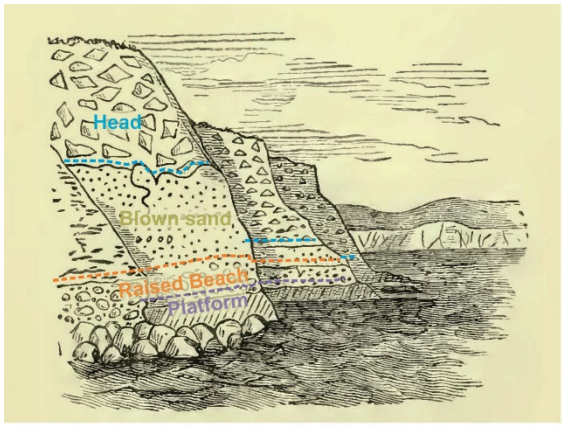


Figure 6.6: Prestwich (1892) map of raised beaches and head / rubble drift in the South of England

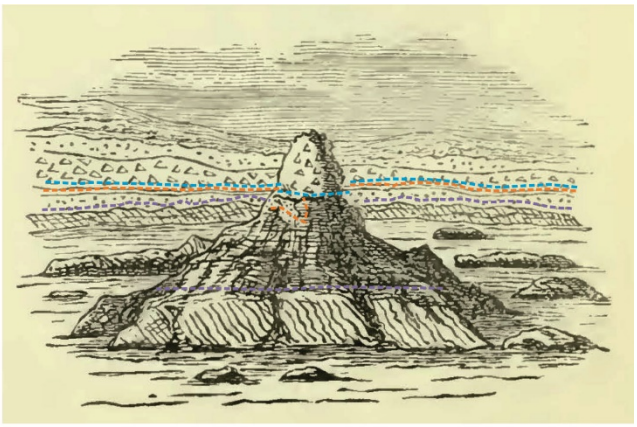
6.2.4 Pleistocene River Terraces

Geological mapping has shown that the major valleys of the southwest including the Axe, Exe, Tone, Taw, Torridge and Tamar, and smaller valleys in Cornwall, contain gravel terraces or suites (Brown 2004). While those of eastern Devon has been extensively investigated, in part due to the extensive Palaeolithic collections that were identified during quarrying, those in the west have not been subject to the same degree of investigation (see Hosfield et al. 2006; 2008). Within the study area, the Taw-Torridge Rivers host a series of well-defined river terraces, with the Taw hosting up to ten terraces and the Torridge nine. These are mapped as being especially well developed around Chapelton and Colleton Mills, just south of the study area. Within the RCZAS study area, Terrace 1 is present east of Braunton predominantly along the north bank of the Taw, with Terraces 2 and 3 appearing east and south of Barnstaple on the Taw and south of Landcross on the Torridge. Only the age of lowermost terrace one has been established, with OSL dating at Penhill Point (Rolfe 2015) providing an age of 76-87 ka (SHFD12100 and SHFD14061). This terrace is present along the floodplain margins and coring has shown it is overlain by Holocene alluvial deposition. Investigation of the other terraces, coupled with dating, could establish a series of Pleistocene deposits pre-dating MIS 5e and 7 and therefore extend our knowledge of the Pleistocene in northwest Devon beyond the current limits offered by the raised beach deposits, as well as potentially recovering Middle Palaeolithic artefacts from these deposits.

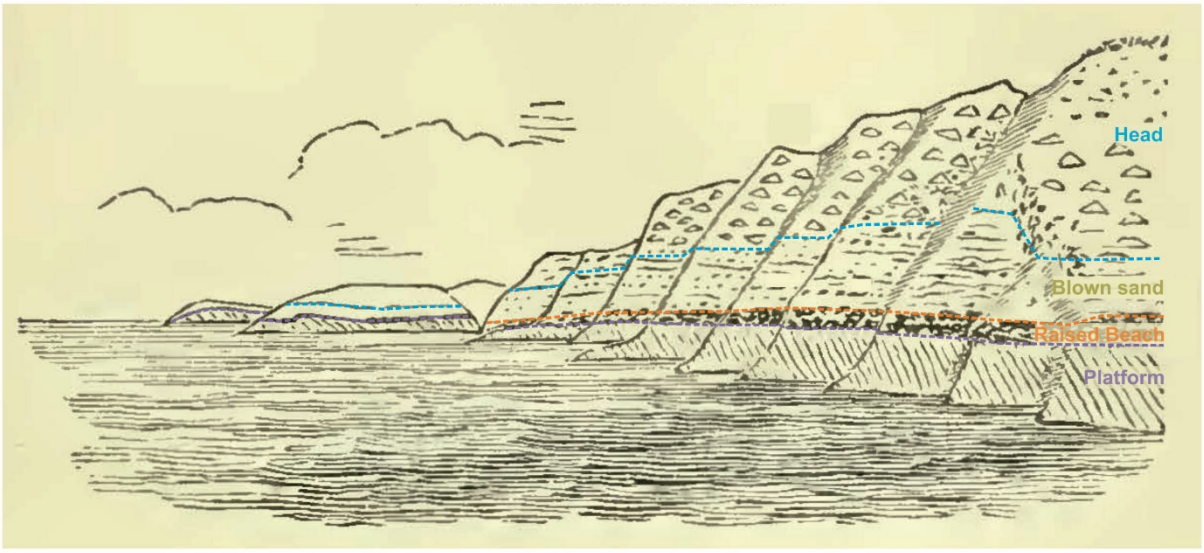
Elsewhere in the study area the river terrace deposits are poorly defined, often restricted to small outcrops with no clear stratigraphic staircase of terraces along the river valley. Between Widemouth Bay and Clovelly the deeply incised valleys have led to significant erosion of previous terrace deposits that may be restricted to small exposures on eroded valley margins but of insufficient size to permit geological mapping. This poor preservation of river terrace gravels within the study area is also probably another important contributing factor to the paucity of Palaeolithic finds from the study area, given these are the predominant source of such finds along the river valleys in east Devon.



Godrevy Cliffs looking southeast towards Gwythian



Godrevy Beach looking eastwards, showing rock reef c. 20m from cliff



Fistral Bay looking north towards Towan Head

Figure 6.7: Illustrations of North Cornwall Raised Beaches (from Ussher 1879)

6.2.5 Pleistocene Glaciation of the South West

The Pleistocene history of the north coast is complicated by the known presence of a Pleistocene ice sheet off the coastline at different periods in the past, which at times is thought to have reached the shoreline. Evidence for glaciation along the coastline is fragmentary, but has been inferred by the presence of large erractics stranded on shore platforms (often below raised beach deposits), glacigenic gravels and till deposits, especially in the Barnstaple Bay–Lundy area and the Isles of Scilly. While it is generally accepted that southwest England itself was not overrun by an ice sheet, evidence for localised glacier development ('niche' glaciers) south of the accepted glacial margins (Figure 6.8) are proposed for parts of Exmoor, Dartmoor and at Rosemergy, Penwith (Harrison *et al*. 1998; 2001; 2015; Evans *et al*. 2012), though not for Bodmin where only a well-established and potentially mature

periglacial landsystem developed (Evans *et al*. 2017). Evidence of periglacial activity is widespread throughout the study area (James 2004), for which de la Beche (1864) established the term 'head' to categorise the range of soliflucted slope deposits present that had developed under periglacial freeze-thaw conditions. These head deposits have formed extensive coastal 'terraces', as well as filling several of the coastal combe valleys, covering earlier Pleistocene features such as shore platforms, raised beaches, fossilised dune sands and large erratic boulders, though on upper slopes these deposits are generally thinner. Contrary to suggestions by authors such as Williams (1965), Hutchinson and Thomas-Betts (1990) and Croot and Griffiths (2001), James (2004) demonstrated the presence of several coastal sites containing clear evidence for the former existence of ground-ice bodies, documenting the existence of ice wedge pseudomorphs and associated vertically inclined clasts, indicating at least a sporadic / discontinuous permafrost presence during the Devensian, which may have extended as far west as St Ives Bay on the north coast and Mounts Bay in the south.

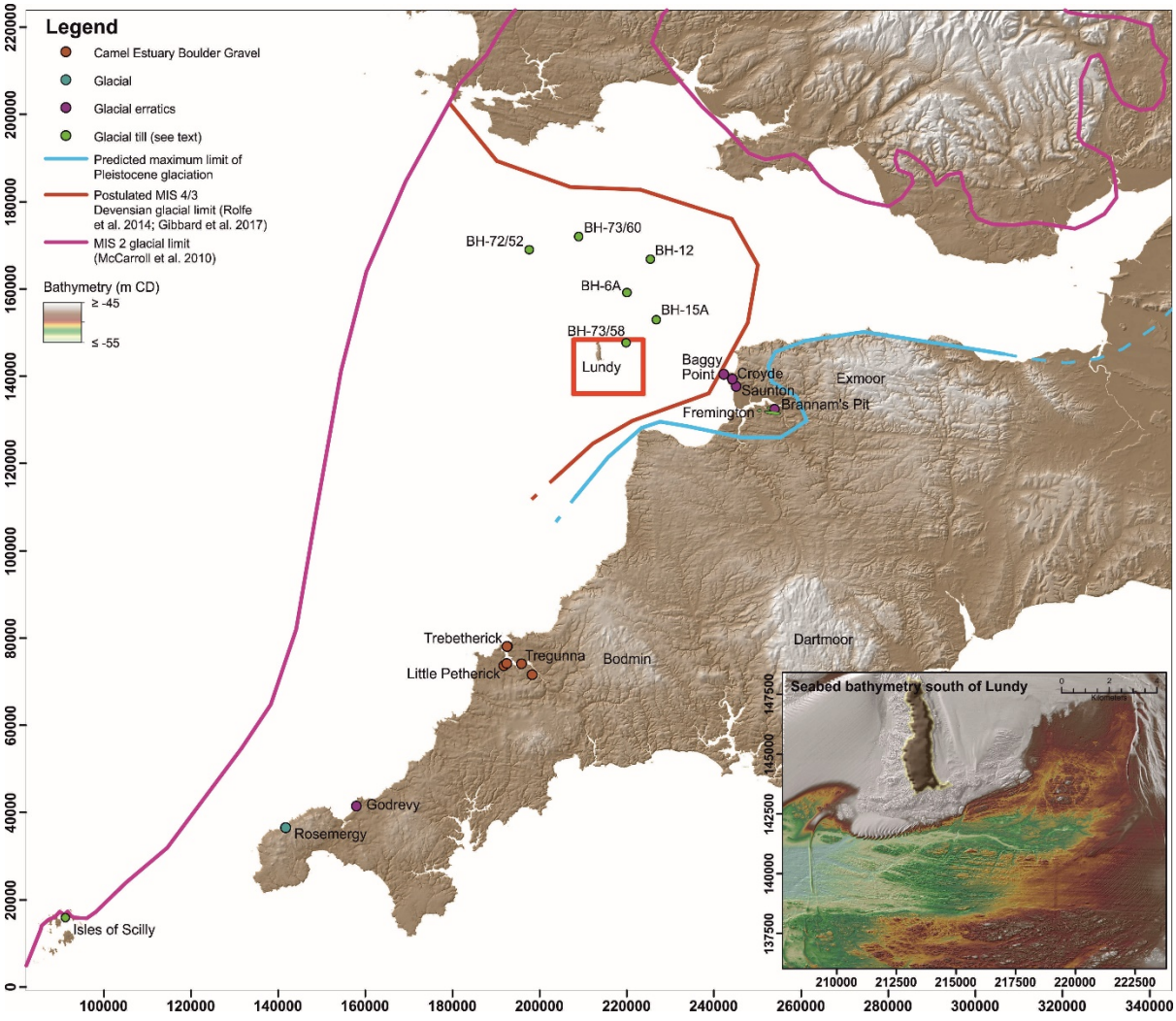


Figure 6.8: Sites reported as associated with Pleistocene glaciation in North Devon and North Cornwall. Contains Ordnance Survey data © Crown copyright and database right 2019. UKHO Bathymetry contains public sector information, licensed under the Open Government Licence v3.0.

While evidence for the presence of glacial ice along the coastline has been demonstrated, the timing of the glacial advance is poorly understood with several key sequences along the coastline lacking any firm chronological controls. Traditionally evidence of glaciation was associated with the 'Wolstonian'

stage, but this has undergone significant revision, especially where geochronological approaches have been successfully adopted. For example, within the Isles of Scilly there has been speculation that the glacially-derived material was MIS 6 (Wolstonian age; Mitchell and Orme 1967; Bowen 1973); MIS 16 (Bowen 1999) or MIS 2 (Late Devensian; Scourse 1991), but only recently have detailed geochronological studies provided firm age-estimates, using AMS radiocarbon, OSL and Terrestrial Cosmogenic Nuclide (TCN) dating, indicating that the Devensian ISIS reached the Isles of Scilly c. 26 ka (MIS 2; Smedley et al. 2017).

Glaciation of Lundy

The presence of glacier ice overlying Lundy was proposed by Mitchell (1968) and Stephens (1966), who noted that the local geomorphology could be interpreted as largely the product of glacial processes, modified by periglacial and post-glacial surface processes. Evidence put forward to support this including widespread smoothing and lineations of the granite bedrock surfaces resulting from sub-glacial ice moulding, dry channels interpreted as subglacial meltwater channels, and the presence of large areas of erratic gravels and cobbles demonstrating transport by ice and matching bedrock found in SW Wales. Mitchell (1968; 1972) used this evidence to indicate that the last glaciation over Lundy occurred during either the Anglian or Wolstonian glaciations. Recent investigation by Rolfe et al. (2012; 2014; Rolfe 2015), utilising $^{26}Al/^{10}Be$ cosmogenic exposure dating of the glaciated bedrock surfaces, suggested the last glaciation of Lundy was actually c. 40-35 ka during MIS 4-3. Carr et al. (2017) have challenged this, based upon a revised interpretation of the geomorphological and cosmogenic exposure data, and suggested that Lundy was not actually covered by ice during the Devensian glaciation but instead the cosmogenic dates relate to surface lowering during a prolonged period of subaerial granite weathering, though ongoing investigations at Lundy (Rolfe in prep.) to continue to support a MIS 4 glaciation and deglaciation in MIS 3.

Gibbard et al. (2017) evaluated the offshore glacial deposits northeast of Lundy, using boreholes collected for the proposed Atlantic Array Offshore Wind Farm (OWF), as well as coarse-resolution bathymetric data (based upon EMODnet DTM at 1/8 * 1/8 minutes resolution). Utilising the available geotechnical data it was inferred that glacial till deposits were present below marine deposits northeast of Lundy, matching earlier suggestions by Tappin et al. (1994) that these deposits might be associated with the Upper Till Member of the Cardigan Bay Formation. Carr et al. (2017) have stated that detailed analysis of the offshore borehole deposits has not occurred and would be essential before an interpretation of glacigenic sediments could be substantiated. The seabed south of Lundy does not contain any visible gorge or moraine deposits that could be indicative of grounded ice, and instead shows that incision into the bedrock is from an east-west palaeochannel network probably associated with lowstand drainage from the Taw-Torridge valleys.

Gibbard *et al*. (2017) suggested that at least three phases of glaciation are recorded in the Bristol Channel and Barnstaple Bay area: one related to the southern limits of a Late Devensian MIS 2 Welsh Ice Cap; an earlier Devensian (MIS 4–3) glaciation associated with the ISIS extending over Lundy, and another older glaciation that is associated with ice that filled the entire outer and central Bristol Channel and probably associated with the deposits found at Fremington. Carr et al. (2017) do not support this interpretation, and support the existing model of the extent, dynamics and timing of the ISIS, as shown by McCarroll et al. (2010) and Clark et al. (2012), with the ISIS significantly west of Lundy and not reaching the northern coastline of Cornwall and Devon. As a consequence, there still remains uncertainty over the age and extent of Pleistocene ice sheet advancement along this coastline, but

there remains the strong possibility that the an ice sheet might have been east of Lundy during the mid- to late-Devensian period and could have impacted upon the drainage of the Palaeo-Severn as well as the Taw-Torridge River systems.

Glacial erratics

Large erratics are found around the southwest coastline and are linked to ice transportation, but do not necessarily demonstrate the presence of an ice sheet reaching the coastline. The main concentration of erratics along the north coastline are those in Barnstaple Bay at Baggy Point, continuing along the coast at Croyde and Saunton, and last observed within Brannam's Clay Pit (SS 5290 3170) near Fremington. First reported by Williams (1837), these have been repeatedly investigated over the past 180 years (e.g. Pengelly 1867; Hughes 1887; Dewey 1913; Taylor 1956; 1958; Kidson 1971; Edmonds 1972; Kidson and Wood 1974; Madgett and Madgett 1974; Madgett and Inglis 1987; Keene 1996; Sims 1996). The erratics are most commonly found lying upon the shore platform and below the raised beach along the coastline, and have been associated with bedrock sources in northwest Wales and / or west Scotland, indicating long-distance travel. Erratics are also found at Godrevy, consisting of large fine-grained basic igneous boulders, although James (2008) suggests these should be classified as non-local rather than erratics as they are likely to be derived from Cornish basic sills and dykes located further north.

Taylor (1956), Scourse (1997) and van Vliet-Lanoë et al. (2000) suggest that the presence of erratics on the shore platform around Devon and Cornwall, as well as further afield along the Channel coast of both England and France, are unlikely to have been emplaced by grounded ice and much more convincingly explained both stratigraphically and sedimentologically as sea-ice or iceberg rafted. van Vliet-Lanoë et al. (2000), in attempting to correlate all of these erratic deposits, suggested an MIS 9 age for the ice rafted erratics, supported by an ESR date of 261±65 ka (MIS 7/9) from the sandrock fossil dune overlying the raised beach (which caps the erratics) at Croyde. This date is broadly comparable with the MIS 7 AAR date estimates of Bowen et al. (1985) and Bowen and Sykes (1988) for the raised beach at Saunton and Croyde. Attempts to radiocarbon date marine shell within the raised beach simply demonstrated ages beyond the limits of radiocarbon dating (Kidson and Wood 1974, 234).

Fremington Clay

The Fremington Clay, first identified by Maw (1964), has been extensively studied (see summaries in Campbell *et al*. 1998, 196-198; Croot *et al*. 1996). Maw observed that there were three erratic boulders of igneous rock found in nearby fields which could be matched with those from Croyde, and thus associated the Fremington Clay with a glacial origin. Further work by Zeuner (1959) and Stephens (1966; 1970) likened the clays to till deposits found in Germany and Ireland respectively. As such, the interpretation that the Fremington Clay represented a clear indication of a glacial ice margin was established within the Quaternary literature as providing evidence of one of the most southerly points of glaciation in the British Isles (Stephens 1970). Other interpretations of the deposit have included a glaciomarine (e.g. Eyles and McCabe 1989; 1991) and lacustrine (e.g. Balchin 1952) origin, but the currently most accepted interpretation has been provided by Croot et al. (1996), Scourse and Furze (2001) and Cattell (2003) who suggest a glaciolacustrine environment.

The type location for these deposits lies in Brannam's Clay Pit near Fremington, with a stratigraphic sequence (summarised by Croot et al. 1996) of:

- Unit E: Devensian Head
- Unit D: Weathered horizon of Unit B, consisting of a clayey silt with ill-defined and deformed silt-rich horizons. Clasts present consist of small gravel matching those within Unit B. Although this was previously interpreted as a basal Till, Croot et al. (1996) dismiss this as the clast fabrics are very weak and lithologies are identical to those of Unit B
- Unit C: Irregularly shaped lenses of fine sand and silt within Unit B
- Unit B: Fremington Clay series, consisting of a clay matrix with silt bands and dropstone clasts
- Unit A: Basal gravel

The controversy over the interpretation of the Fremington Clay has, in part, derived from attempts to relate the Fremington deposits with the raised beaches and erractics found within the wider Barnstaple Bay area. This partly originated from an assumption that the basal gravel (Unit A) was thought to represent a raised beach and could therefore be associated with exposures at Fremington Quay, Penhile Point. However this association was discounted by Kidson and Wood (1974) who argued that geophysical surveys showed the two units to be unrelated. As such the basal gravels are interpreted as having a local fluvial / glaciofluvial origin, with all clasts derived from sandstones, siltstones and shales characteristic of the local Crackington Formation. The second main element of association was the presence of erratics within the Fremington Clay (Units B and D). Analysis of more than 1500 clasts by Croot et al. (1996) demonstrated that, with one exception, the dropstones have strictly local petrologies, whose bedrock geology is located within 10km of the site. While other non-local clasts have been reported from the clay pits, these only represent rare occurrences (Sims 1996), though Croot et al. (1996, 34) state that the presence of a single unequivocally 'glacial' cobble infers the 'glacial' nature of the Fremington Clay. Kidson (1971) drew attention to the fact that erratics of similar provenance were found both on the coast and within the Fremington area, arguing that this demonstrated that the deposits were of the same age. However this does not take account of the fact that the rest of the clasts within the Fremington Clay were derived from a local catchment area and therefore, given the rare occurrence and small size of the glacial erratics, could be derived from secondary transport with their deposition post-dating the deposition of large coastal erratics. Croot et al. (1996) demonstrate that much of the clast material encountered within the glaciolacustrine deposits would have been transported by local river ice, therefore providing the most likely transport path for the few glacial erratic's encountered in this sequence. Micropalaeontological investigation of the Unit B clays has revealed an assemblage comparable with the Bovey Basin clays and other Tertiary basin deposits found in southwest England, noting a lack of marine fauna (although these could have decalcified) and a bedding structure of the clay (revealed through micromorphology) comparable to glaciomarine deposits. Scourse and Furze (2001, 428) have speculated that the microfossil assemblage indicates derivation by grounded ice from the Tertiary Stanley Bank Basin, located east of Lundy (present in BH-73/58 on Figure 6.8), and use this to imply grounded ice within Barnstaple Bay when the Fremington Clay was deposited, dismissing a glaciomarine origin. Croot et al. (1996) are apprehensive in providing any firm assurances that the Fremington Clay sequence was ever covered by a thick ice sheet, citing that the clays are not heavily over-consolidated and only show gentle deformation. As a result they have postulated (based upon consolidation data) that the deposit was subject to an overburden stress created by land-based glacial ice. As such, they conclude that the most likely scenario is that ice formed a seal across the Taw-Torridge estuary causing the glaciolacustrine environment to form, with a subsequent advancement of ice into the estuary area, overriding and lightly tectonising the lake-floor facies.

The timing of such an advancement is further complicated by the many differing opinions over the sedimentological interpretation of the site and attempts to correlate these deposits with other deposits within the wider area. Stephens (1970) postulated a 'Wolstonian' glacial advance, based upon the presence of overlying Devensian head and an underlying raised beach postulated to be Hoxnian (now MIS 11 but at the time widely believed to be the interglacial preceding the Ipswichian). van Vilet-Lanoë *et al.* (2000) also made this same correlation using the 'boulder beach' as the point of reference and, based upon an ESR date from the Croyde Bay sandrock, suggested an MIS 6/8 age for the clay sequence. Stephens (1973) correlated the Fremington Clay with other 'tills' in the southwest, notably the deposits at Trebetherick (though see below) and the Isles of Scilly (since demonstrated to be Devensian MIS 2; Smedley et al. 2017). While Kidson and Wood (1974) dismissed the presence of a raised beach underlying the Fremington Clay, they did suggest that the erratics at Saunton and Croyde might be contemporaneous with the Fremington Clay, postulating an Ipswichian (MIS 5e) age for the overlying raised beach. What is clear is that the stratigraphic associations between the raised beaches and the Fremington Clay sequence cannot be substantiated, and the ages assigned to some of these sequences has been significantly modified over the last 40 years as new dating evidence and stratigraphic associations have been established. Campbell et al. (1998) have cited Croot et al. (1996) as attempting to OSL date the Unit C sand lenses within the Fremington Clay, with inconclusive results indicating ages older than MIS 2 with a preferred date of MIS 12 (or an intervening period between MIS 2-12). Scourse and Furze (2001) have stated that these 'OSL dates' only securely indicate a pre-Late Devensian age, and point out that the Unit C sand lenses were probably deposited as derived frozen sand clasts, which means they not have been fully bleached prior to burial. However, David Croot has indicated that in fact no such ages were ever successfully obtained from this sequence (Rolfe 2015, 206).

A Devensian age has been postulated by Eyles and McCabe (1989) but this was dismissed by Kidson (1977) who pointed out that there is no evidence of a glacial event post-dating the raised beaches at Croyde, Saunton and Westward Ho!. Stephens (1970) and Madgett and Inglis (1987) have reported that red-brown clay containing erratics and striated stones have been observed in the Croyde area, apparently similar to the Fremington Clay, as well as other stony clays exposed in low cliffs below modern sand dunes in Croyde Bay. They claim that these observations provide supporting evidence for a former cover of 'till' within the Croyde area, some of which has subsequently been destroyed by periglacial and interglacial erosion. Kidson and Wood (1974, 232-233) examined some of these exposures and suggested a different microfauna and sedimentology to the Fremington Clay, interpreting them as solifluction or colluvial lenses, possibly including earlier glacial material, that had subsequently become incorporated into the head deposits. It is therefore unclear whether more extensive glacial deposits, of possible comparative age to the Fremington Clay, might be found within the wider Barnstaple Bay area.

It is also important to consider that the head deposits might not just relate to a single cold stage. Stephens (1966, 1970) suggested stratification within the head deposits, consisting of a thick lower relatively consolidated deposit and thin upper head containing mainly angular rock fragments, might indicate at least two separate periglacial phases. However Kidson (1971; 1977) regarded the head as a single, if very variable, sedimentary unit which is solely a product of the Devensian cold period. Head deposits are known to be remobilised during the Holocene, particularly in response to coastal erosion and slope failure, resulting in a complicated stratigraphic sequences of apparent *in situ* sediments – this is best demonstrated at Godrevy where a domesticated canine skeleton, radiocarbon dated to

1520-1800 cal. AD (OxA-9992; 251±30 BP), was found within a sequence of apparently undisturbed coarse grained head deposits (Crisp et al. 2001). Kidson (1971, 16) does acknowledge, however, that these head deposits are probably the hardest to date or correlate and elevation of these deposits carries no chrono-stratigraphical significance. In particular, there are no locations on the mainland where a stack of two raised beach deposits are observed sandwiching a cold stage deposit which could conclusively demonstrate a pre-Devensian age for its deposition.

Trebetherick boulder gravel

Although there is now indisputable evidence for the MIS 2 ISIS reaching the Isles of Scilly, and the Barnstaple Bay sequences remain the focus of ongoing discussion and research, evidence for the ISIS reaching landfall between these two locations is even less certain. Within the Camel Estuary there are a series of boulder gravels, known as the Trebetherick Boulder Beds, that have been proposed as possible glacial deposits (see Arkell 1943; Stephens 1966; Scourse 1985; 1996; Campbell et al. 1998). This sequence, first described by Ussher (1879a), consists of a shore platform, between 1-7m OD, overlain by raised beach deposits (which includes some erratic boulders at the base), wind-blown sand and finally a periglacial 'head' deposit. Within the head sequence resides a deposit known as the 'boulder gravel'. This deposit has been described as glacial sediment (Dewey 1913; Mitchell and Orme 1967; Stephens 1966; Clarke 1969), with some suggesting that this provides evidence of the southern margin of the 'Wolstonian' ISIS. Mitchell (in Mitchell and Orme 1967) regarded the pebbly clay above the boulder gravel as a weathered facies of the Fremlington Clay, and therefore the underlying gravel bed as either an outwash gravel or raised beach deposit. This was disputed by Stephens (1970) who concluded that the boulder gravel was a mixture of head, glacial outwash and Irish Sea till subjected to later frost-action and weathering. Other suggestions for this deposit include a fluvial sediment (e.g. Ussher 1879a), soliflucted (e.g. Reid et al. 1910; Bull in Arkell 1943; 165-166) or raised beach deposit (Arkell 1943; Clarke 1965a; b). Clarke (1973) further developed the glacial hypothesis by pointing out similar exposures at Tregunna House and Little Petherick, initially stating the possibility of a glacier originating on Bodmin Moor. This was subsequently modified to the ISIS hypothesis, with the material at Tregunna and Little Petherick defining the lateral moraine margins, impounding the proto-Camel and forming a 'lake flat' at Trewornan, though Scourse (1985) and Healey (1993) demonstrated the latter was a Holocene estuarine deposit.

Scourse (1996) interpreted the Trebetherick boulder gravel bed as a partially soliflucted outwash gravel or ablation till, with the general consensus now being that the material has an inland source, perhaps as far afield as Bodmin Moor (e.g. Arkill 1943; 148). Scourse (1996) also assessed the Tregunna Formation and stated that it is sedimentologically identical with phyllitic facies of the Penwith Formation derived from slate bedrocks within the Camel Estuary, but is lithologically distinctive in that it contains far-travelled (>10km from source) clasts derived by solifluction and other periglacial colluvial processes. Scourse (1996) concluded that only the boulder beds occurring at lower elevations within the Estuary (such as at Trebetherick) were soliflucted but higher level deposits remained *in situ* and were the most likely source of this material. The origin of this upper deposit remains uncertain, with Scourse citing river ice as a possibility for emplacement but also conceding that the reconstructed gradient of the various outcrops around the Camel are probably more consistent with a glacigenic (outwash) origin.

The age of these deposits has also remained subject to some debate. Arkell (1943) suggested that the raised beach and fossil dune sands were Hoxnian (MIS 11), overlain by a Wolstonian breccia, an

Ipswichian age for the boulder gravel, and later Devensian deposition of the uppermost head. Stephens (1966) was largely in agreement with the dating proposed by Arkell (1943), but grouped the boulder gravel with its underlying breccia, implying it was Wolstonian, and pointing out the different conditions of the upper and lower head deposits to imply different ages. Bowen *et al*. (1985) undertook AAR on the raised beach deposits and ascribed this to MIS 5e, akin to suggestions by Zeuner (1959), Kidson (1977) and Bowen (1969), thus implying that all of the head deposits (including the boulder gravel) were Devensian in age, therefore correlated with the Penwith Formation (Scourse 1996). Consequently it is now widely accepted that the head and boulder gravel deposits visible at Trebtherick and elsewhere in the Camel estuary were deposited during the Devensian, and were largely sourced from within the Camel catchment and therefore unrelated to the ISIS or correlated with the Fremington Clay.

6.2.6 Truncated and hanging valleys

Along the North Devon coastline cliff retreat has led to the formation of a series of truncated valleys. Erosion has led in some instances to sharp incision within the valleys close to the coast, creating 'canyons'. Where coastal retreat has led to the valleys terminating at a cliffline and head deposits have not reached the underlying rock floor, a waterfall may be present at the coast, in some instances with the waterfall spilling directly into the sea (e.g. Windbury Head; SS 292 266). The most detailed description of these valleys and their waterfalls, including their morphology, is provided by Arber (1911). At the Abbey River, the valley rock floor is found to grade to a level lower than current sea levels, probably associated with a Pleistocene lowstand. The formation process for these incised combes is well illustrated at Marsland Mouth (SS 212 174) where a three-phased process can be identified (Keane 1996):

- Phase 1: deep incision into the plateau edge, creating a cross-sectional profile of a flat rock-floor flanked by bedrock slopes
- Phase 2: partial infilling of the valley with soliflucted head deposits, several metres in thickness, during glacial (Devensian) periods
- Phase 3: post-Devensian reactivation of downcutting meandering streams incising into the head deposits resulting in a V-shaped valley coupled with a series of terraces that were created by the meandering course of the river during the incision process

Depending upon the course of the river, some abandoned valleys may be left full of head with the incised stream present in an adjacent deeply-incised valley. While most valleys run perpendicular to the coast, there are a series of abandoned 'hanging valleys' observed along the North Devon coast which run parallel to the coastline and have been breached by coastal erosion. Arber (1911: 230-239) provides the most detailed descriptions of these, with the best example being the former course of Milford Water between Speke's Mill Mouth (SS 226 235) and Hartland Quay (SS 223 247) (Figure 6.9).

The valley of Milford Water is truncated at Speke's Mill Mouth by the coastline at an elevation of 48m OD, leading to a waterfall down to the beach. However a continued valley, following the same gradient as Milford Water, can be observed meandering inland around the eastern site of St Catherine's Tor (SS 225 242), meeting the inflowing valley of Wargery Water and then skirting the coastline up to Screda Point, where the valley has again been eroded away, with a final outcrop observed to the north beneath the hotel at Hartland Quay (SS 223 247), lying at an altitude of c. 15m OD. The valley shows a gradual decline northwards and, if this gradient was extrapolated beyond Hartland Quay, could have have continued for another c. 600m before reaching OD, and is therefore likely to have joined with

the Abbey River west of Blackpool Mill (SS 226 256). Another hanging valley is found 600m north of Blackpool Mill at Smoothlands (SS 226 264) where the valley of Titchberry Water has been truncated by coastal erosion, with the hanging valley terminating at Gull Rock by Damehole Point (SS 226 265) at c. 15m OD. It is likely that Titchberry Water valley also connected with those of Milford Water and the Abbey River forming part of the same river catchment. Although the hanging valleys have flat, rock-cut floors with steep valley sides similar to the Coombes, they only contain a shallow depth of head deposits and lack incised streams.

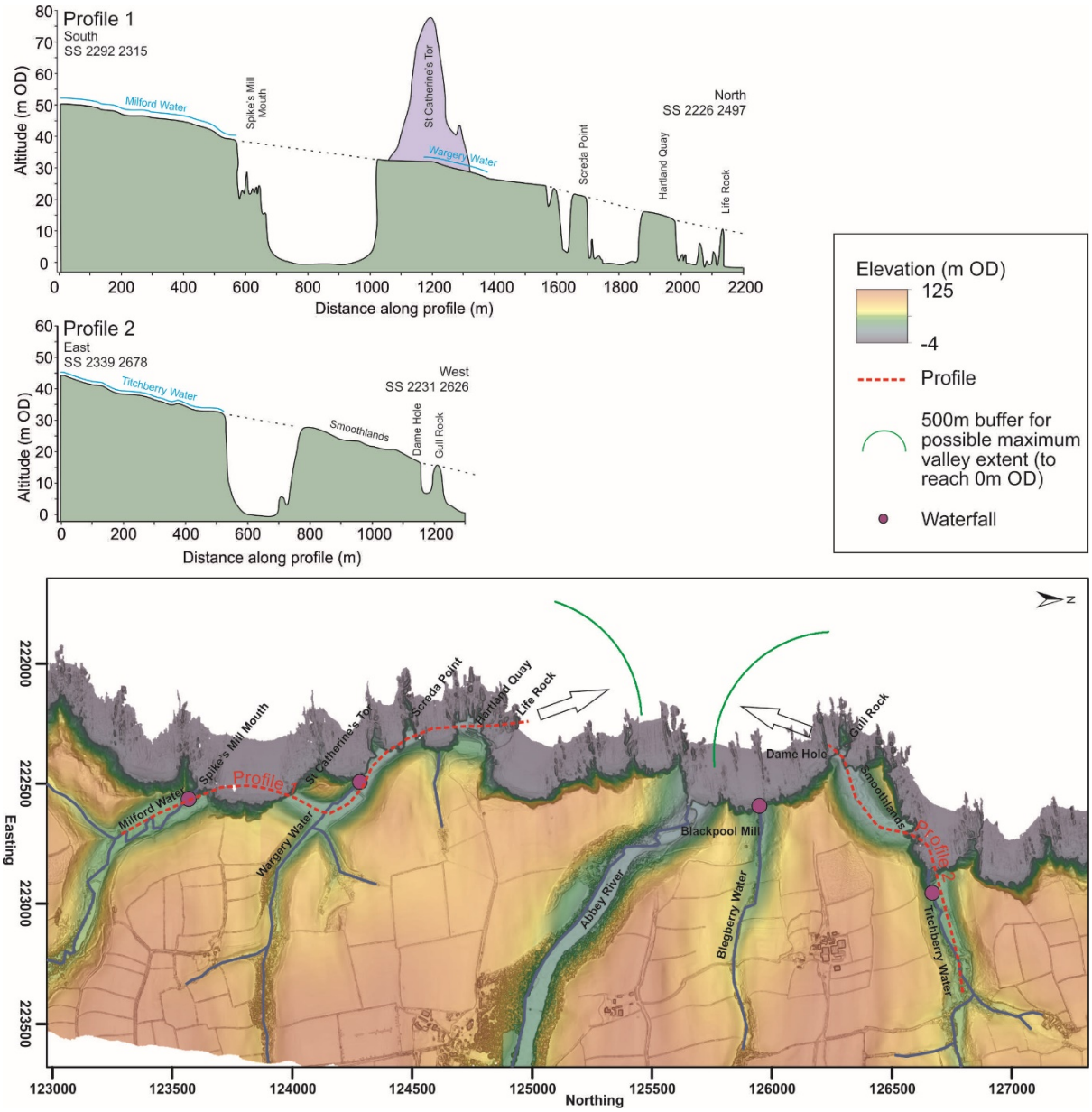


Figure 6.9: Coastal hanging valleys around Hartland Quay. Contains Ordnance Survey data © Crown copyright and database right 2019. Channel Coastal Observatory data under the Open Government Licence v3.0.

Beyond the descriptions provided by Arber (1911), little study has been undertaken on these hanging valleys. However the main interpretation is that the features along the Hartland coastline are a result of coastal erosion, with the waterfalls observed at the mouth of some of these valleys reflecting the

inability of the streams to erode sufficiently rapidly to compensate for the retreating cliff line. Along the coastline a rock platform is present and exposed on the foreshore. This platform extends seaward up to 600m off the headlands, and gradually dips down to c. -5 to -8m OD before reaching a break in slope that descends to a shelf between -20 to -25m OD. It has been suggested that the inner platform represents the extent of coastal erosion, and modelling of sea level rising using a GIA model (Sturt et al. 2013) indicates that mean sea level probably reached the outer margin of the inner platform by c. 6500 cal. BP (see Figure 6.22 and Figure 6.23). By extrapolating current cliff line retreat rates for the area, of 20 to 40 mm a^{-1}, May (2007) estimated that over a 6000 year period coastal erosion would could have led to a retreat of the current cliff line between 130-260m, significantly higher than the 30-60m of erosion that Prestwich (1892) envisioned for this coastline since raised beach formation (see Figure 6.6). This then has two implications: 1) cliff erosion rates have reduced compared to those existing during the mid-late Holocene; or 2) the platform does not only reflect Holocene erosion. The latter view is likely to be correct, with Steers (1981) suggesting that there is no reason to believe that this platform is of wholly modern origin and could be of contemporary age to the platforms found extensively along the coastline. Although extrapolation of the altitude of these platforms over large distances should be avoided (*sensu* Kidson 1977), this platform does correlate with the altitude of Pleistocene platforms in the Taw-Torridge Estuary (Kidson 1971) and Brean Down (ApSimon et al. 1961), the latter overlain by Devensian interstadial deposits. It is therefore probable that the cliffs situated upon this platform have been eroded over at least the last two interglacial stages and probably throughout much of the Pleistocene.

Goudie and Gardner (1985) have provided an alternative to the coastal retreat explanation, suggesting that the presence of the ISIS close to the North Devon coastline caused the valleys to be blocked leading to a proglacial lake to form and new flat bottomed and steep sided valleys to be carved parallel to the coastline, with the streams reverting to their former courses after ice retreat. This explanation was used to explain the head deposits within the hanging valleys and that these valleys tend to not follow the east-west strike of the underlying rocks, as witnessed in other valleys. The glacial hypothesis does not satisfactorily explain the dissection of the valleys in the Hartland area, where the former Milford Water has its left bank removed at four separate locations (Keane 1996). The implication of the hypothesis is that the stream flowed over the ice at these points if coastal retreat is not considered as a complementary process. However Keene (1996) points out that the valley of Milford Water, upstream of the truncated supposed meltwater section, is also flat and steep sided. Several of the coombes in the area have rock floors close to present sea level, suggesting that pre-Devensian streams flowed to a similar local base-level as today, but this does not necessarily confirm that the coastline was near its present position. On balance, the ice-margin hypothesis is less likely unless either Devensian ice reached the area and was banked against the coast (as suggested for the Valley of Rocks at near Lynton; see Rolfe 2015), or these valleys are the result of an earlier Pleistocene glaciation reaching the coast. This explanation seems unlikely given that cliff retreat is not simply a Holocene phenomenon and would have occurred over successive interglacials, with periods of higher sea levels clearly demonstrated by the raised beaches found extensively along this coastline to the north and south. It is therefore most likely that these hanging valleys have been abandoned as a result of coastal retreat.

Summary of evidence for Glaciation on the North Coast

The history of glaciation along the north Devon and Cornwall coastline is far from resolved, but concerted efforts in recent years have demonstrated that several of the deposits thought to be

associated with the Anglian / Wolstonian glaciation are actually younger in age and typically associated with the Devensian stage. In addition, the study of the deposits at Fremington and Trebetherick have indicated a predominantly local source for the clast material encountered and suggested that they may consist of ice transported debris from upstream within the Torridge and Camel catchments. The dating programme by van Vilet-Lanoë et al. (2000) has helped to demonstrate that many of the large glacial erratics found within the southwest are likely to have been deposited around MIS 9 and associated with ice rafted debris rather than direct proximity to an ice sheet itself.

While it might be tempting to speculate that the Fremington Clay could be related to the Devensian glacial advance, tying in with the accepted evidence from the Isles of Scilly and the proposal by Rolfe et al. (2012) and Gibbard et al. (2017) for the ISIS covering Lundy, an earlier Pleistocene glaciation (probably MIS 12) still remains the most cited interpretation. Recent OSL dating of channel deposits at Fremington Quay by Rolfe (2015) suggests, based upon stratigraphic correlation, that the Fremington Clay pre-dates MIS 4. Attempts to date the Fremington Clay deposits must remain a priority to fully understand the possible extent of Pleistocene glaciation along the northern coastline, as well as detailed investigation of the proposed glaciagenic deposits north and east of Lundy (Gibbard et al. 2017). Similarly, the evidence for onshore niche glaciers found at Exmoor, Dartmoor and Rosemergy also lack chronological control, with both Anglian and Devensian (Dimlington Stadial) ages postulated. However a Devensian age is considered most likely for the presence of glacial ice in these locations and, most importantly, suggests that these glaciers formed part of a regional-scale archipelago of small glacionival systems developed in locations where topoclimatic controls favoured a sustained positive mass balance during the Last Glacial Maximum (Harrison et al. 2015).

6.3 Holocene coastal deposits

Important Holocene deposits within the study area include submerged forests, estuarine deposits and blown sands. Other Holocene deposits of interest within the study area, but not covered in this report, include calcareous deposits such as tufas, speleothems and beachrock (Howie 2009; Howie and Ealey 2009; Howie et al. 2012)

The definition of what constitutes a submerged forest varies considerably. Bird (1998), for example, defines them as "*remains of a forest (tree stumps, trunks, branches, twigs, in a peaty soil) now in the intertidal zone or beneath the sea, usually buried by beach or estuary sediments following a rise of sea level*". French (1999), however, provided the definition that they "refer to a group of palaeosols found beneath present-day offshore sediments and typically occur in the intertidal zone of most estuaries and bays", making no specific requirement for remains of woodland and could simply contain evidence of herbaceous marsh deposits which could be redefined as 'submerged peats'. The broader definition adopted by French is probably more useful given that evidence for the location of some of the sites may be limited to just a named location within a 18th or 19th book or geological memoir, with no actual description of the exposure itself. While many regard submerged forests as those located within the intertidal zone and upon the foreshores in modern estuaries, this fails to include sites that may never be exposed on the surface and have been preserved *in situ* within river valleys which were once open estuaries. Within the region, silting up of many river valleys (and estuaries) was a consequence of high sediment discharge associated with upstream mining activities, reducing the geographical extent of the intertidal area. Johnson and David (1982), in their discussion of submerged forests in Cornwall, identify two types of situation where submerged and buried forests deposits have been found associated with marine deposits:

- Deposits exposed within and below the intertidal zone of beaches
- Deposits found in tin-streaming works in the lower reaches of river valleys

Each of these two site types provide contrasting benefits and limitations for their investigation. For instance, intertidal zone sites permit easier site access for excavation and surveying, such as mapping the distribution of trees, palaeochannels and *in situ* archaeology and/or faunal remains. However, these sites are also at high risk from coastal erosion, as has been clearly demonstrated at Westward Ho! where the Mesolithic midden site has now been completed eroded away, as well as biological damage exacerbating erosion rates such as boring molluscs. By contrast the inshore submerged sites are not exposed to such erosional damage, with the submerged forests often preserved under several metres of estuarine alluvium and, in several cases, blown sands. This means these inshore submerged sites might yield the best information for reconstructing rates of past sea level change and preserved long stratified environmental records. However while these sites might be the best preserved and at least risk from coastal erosion, they are also the hardest to sample, with geoarchaeological techniques such as boreholes required, as was demonstrated by Stephens (1900) for the River Conar (now known as the Red River) near Gwithian.

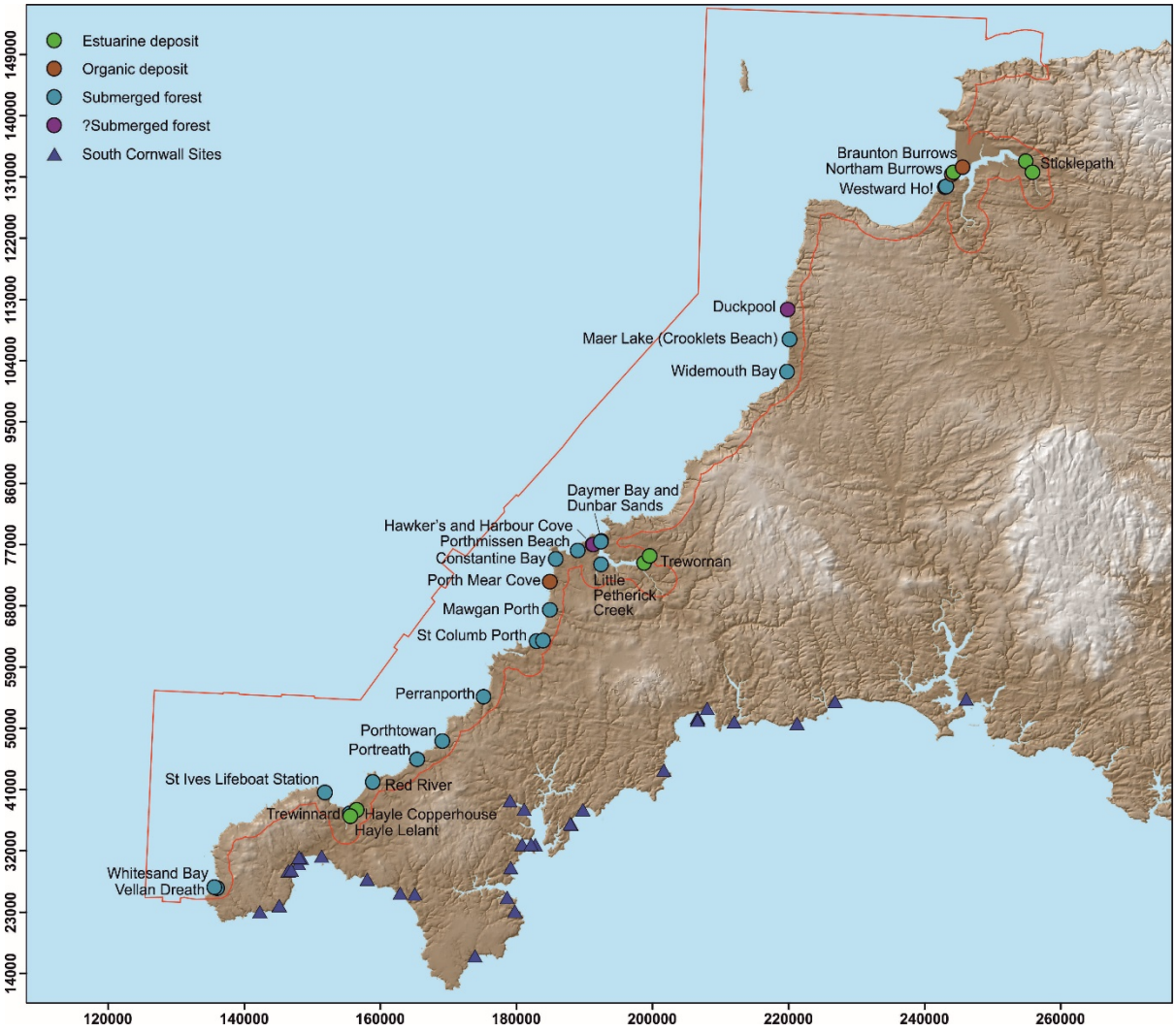


Figure 6.10: Holocene coastal deposits. Contains Ordnance Survey data © Crown copyright and database right 2019

Records of intertidal and submerged forest sites are included in both the county HERs and Historic England's Intertidal and Coastal Peat Database (Hazell 2008). However inconsistencies between these two databases exist, with the former generally providing more accurate locations. For a useful overview of the broader context of marine deposits along the coastline of Southern Britain, see the geoarchaeological review by Timpany (2009). Details of the sites recorded within the study area are provided in Table 6.2.

6.3.1 Intertidal Sites

The submerged forests along the north coast of Devon and Cornwall have all formed since the last glacial lowstand, though very few sites have scientific dating associated with them to establish the actual date when they formed. Of the 25 named intertidal locations along this stretch of coastline (shown in Figure 6.10) where remains of a submerged forest have been claimed, only five have been radiocarbon dated. Furthermore, the altitudinal elevation is rarely recorded meaning approximation of the age of the deposits, through comparison against the regional sea-level record, cannot be established. These submerged forests are often obscured by overlying minerogenic and estuarine deposits, though during periods of high storm activity this cover material can be removed revealing the submerged forest peat surfaces and prostrate trees. In other locations these submerged forests may only be visible during exceptionally low spring tides (e.g. Area 1 at Westward Ho!). Opportunities to access such exposures may therefore be limited and sporadic in frequency, but provide the best chance to survey and sample these submerged forests. This was certainly the case for the submerged forest at Mawgan Porth, exposed following storms in September 2016, which permitted members of the Newquay Old Cornwall Society to record and sample the exposed surface, permitting dating and pollen analysis of the exposures to be undertaken (Figure 6.11; see Appendix 5).

The best-known submerged forest site in this region is at Westward Ho!, which has been subject to repeated archaeological investigation since 1863 (see Appendix 5). The importance of this site is largely due to the abundant archaeology present there, most notably the Mesolithic midden site, now completely eroded away, presence of charcoal and worked flint within the peat and underlying minerogenic deposits, extensive animal bone assemblage and multi-period stake alignments (see Rogers 1946; Balaam et al. 1987). While much of the focus has been placed on the midden site, including extensive radiocarbon dating placing it within the age range 5330-4580 cal. BC (Canti et al. 2015), Westward Ho! is not the only midden deposit associated with a submerged forest site along this coastline. In 2012 site investigations at the Daymer Bay submerged forest site by Howie and Gwynn (2013) identified the presence of a spread of limpets, mussels, oysters and possible charcoal which might indicate the presence of a midden site. Although this deposit was not dated, a wood sample from the forest bed provides a *terminus post quem* of 2470-2290 cal. BC (3900±30 BP; Beta-348787) for the midden. Walker (2014; 2018) also encountered a probable midden deposit when coring within the Red River valley, containing animal bone (probably sheep and pig) and marine molluscs interbedded between marsh deposits, dating to some time between the late Bronze Age and medieval period. Therefore although Westward Ho! might be the earliest of these midden deposits, the potential for later prehistoric sites associated with the intertidal zone remains high along this stretch of coastline. Furthermore, Bell et al. (2009: 616) state that while such submerged forest sites figure little in archaeological period syntheses, probably because they have produced quite small artefact assemblages, they are important as they are sediment accumulation sites where phases of activity are stratigraphically separated and provide excellent opportunities for dating.



Figure 6.11: Members of the Newquay Old Cornwall Society inspecting and recording the exposed submerged forest at Mawgan Porth in October 2016. Photo: Sheila Harper.

There have been instances where other intertidal deposits have been encountered that provide an insight into the estuarine environment itself. North of Area 1 at Westward Ho! stake alignments and concentrations of animal bone have been found associated with estuarine clay deposits. Further north at Northam Burrows, storms in 2008 exposed four locations where cloven hoofed animal prints were present within the clays (Passmore 2009). Exposure of such sites provide a glimpse of what was probably more extensive evidence of activity within environments such as saltmarsh, as found within the Severn Estuary at Goldcliff and Redwick (Bell 2007; Barr and Bell 2017).

The limited number of dated sites on the north coast is in contrast to that from the south coast, especially at sites around Mounts Bay (see French 1999; Johns et al. 2019). Of the intertidal sites, only those from Constantine Bay (2860-2480 cal BC; 4068±31 BP; OxA-18045; Jones 2009-10), Daymer Bay (2470-2290 cal. BC), Maer Lake (c. 3760-2200 cal. BC), Westward Ho! (Area 3: c. 5500-3800 cal. BC; Area 1: 260-630 cal. AD) and Mawgan Porth (c. 330-405 cal. AD) have been dated. This small pool of dated sites indicates that the submerged forest intertidal sites are multi-period and therefore can provide unique records about the pre-submergence landscape (and vegetation composition) in each of the locations where they have been preserved.

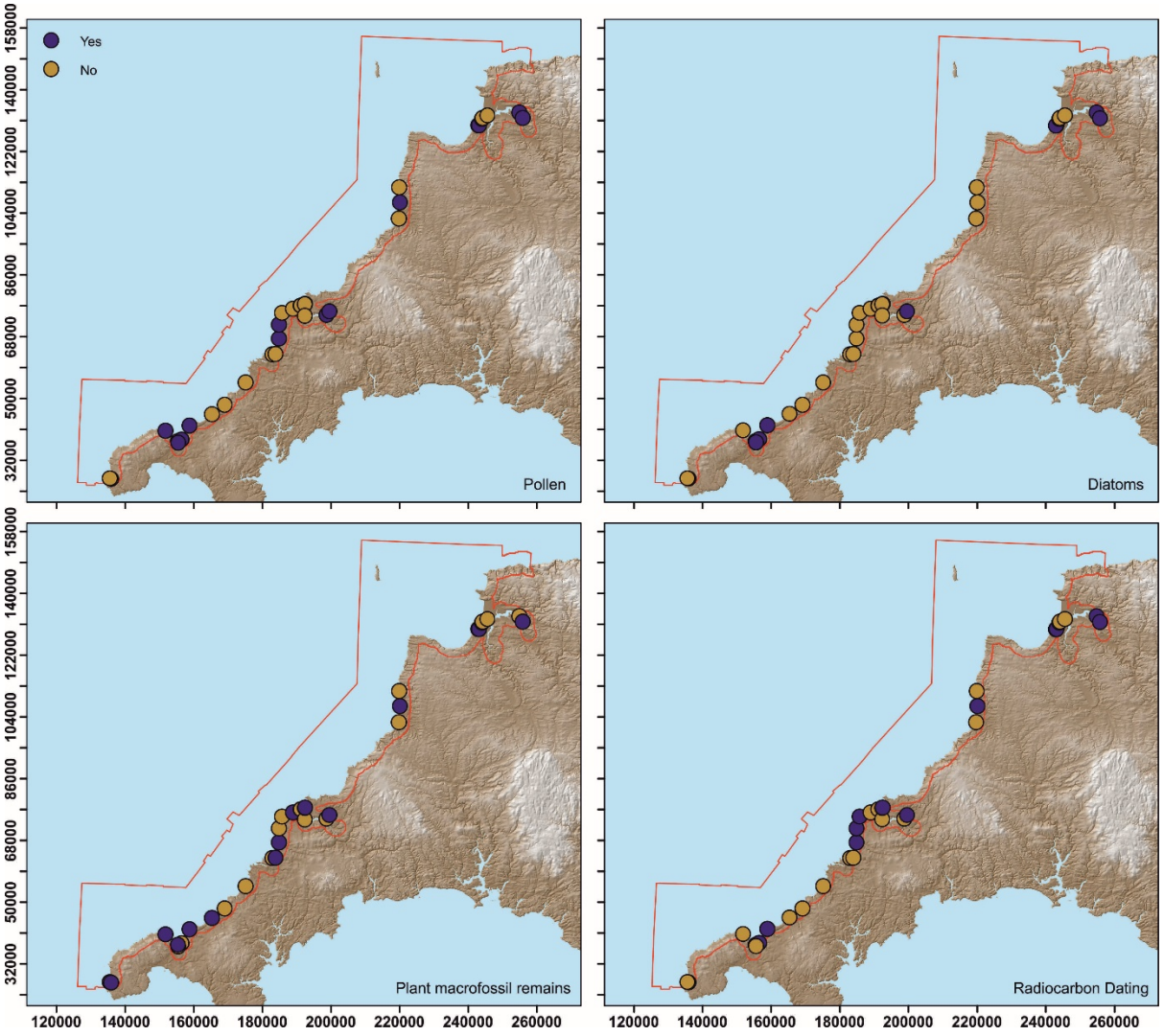


Figure 6.12: Palaeoenvironmental studies from coastal organic deposits (see Table 6.2 for full details). Contains Ordnance Survey data © Crown copyright and database right 2019

The other main question that remains to be addressed for many of the intertidal sites is what conditions led to their formation and what is the the diversity of palaeoenvironments preserved at each location? Studies at Westward Ho!, Maer Lake (Cole 2001; Ransley 2002) and Mawgan Porth point to a range of plant communities including of woodland, swamp, freshwater pools, and nearby cliff top / dune and beach communities. The work at Daymer Bay indicates that the site formed on a calcareous hydromorphic soil within an inland, predominantly well-drained scrub/woodland environment, with minor input of flora and fauna from bordering ponds and streams. As such these sites tend to indicate a freshwater environment with little / no connection to the marine environment, with several authors suggesting that these deposits formed behind seaward barrier features such as dune sands or storm beaches (e.g. Kidson and Heyworth 1973; Johnson and David 1982, 95; Healey 1993). This geomorphic setting is best illustrated by the exposures of lacustrine deposits at Porth Mear Cove. Here a barrier is suggested by Clarke (1974) to have formed across the mouth of the estuary due to the direction and strength of the prevailing direction of the winter storms, leading to the formation of a lake behind the storm beach. This resulted in the deposition of a lacustrine clay, with an interbedded impersistent peat, being preserved within the centre of the valley. Radiocarbon dating of the peat indicated its formation was 1600-910 cal. BC (3024±126 BP; Birm-197). The remains of

these barriers are rarely preserved within the marine environment as these are likely to have been eroded away under storm conditions. It is possible that at Westward Ho! the pebble alignment immediately west of the submerged forest might be associated with an earlier position of the pebble ridge that now fronts much of Northam Burrows (see Figure 6.28).

6.3.2 Inshore submerged forests

Much of the knowledge about the 'inshore' submerged forest sites is derived from observations made in association with tin-streaming, where deep excavations within the floodplain sometimes encountered 'vegetable layers' including trees and articulated mammal skeletons at the base of the floodplain sequence directly overlying the basal gravels that contained the tin-rich deposits (stanniferous placers) sought by the miners. Such findings were mentioned by Carew (1602) but the more detailed accounts begin appearing in the 18th century. While the majority of these records are associated with the south Cornish coast or upland tin-streaming sites, such as around Bodmin, there are some observations recorded from the Land's End and Hayle area on the north coast. For example, at Vellan Dreath, Sennan Cove, Borlase (1758, 220-221) reports that in 1750 tin-stream digging found a prostrate tree and deer skeleton at 30 feet, with further finds found on subsequent visits in 1753. Borlase also reports of similar sightings from within the Hayle Estuary: "*in the year 1740, Christopher Hawkins Esq, of Trewinard, draining a marshy piece of ground on the banks of the river Hayle, in Penwith, found several pieces of oak buried four feet deep or more under the surface, in a fast clay, one large stock of a tree about ten feet long had no branches, its top part pointing downhill, the colour of it very black. The timber was hard and firm*". Given that many of these observations were made in tin-streaming sites, it is unlikely that these reported submerged forests still exist at these locations. However, undisturbed submerged forest deposits are still likely to exist in unmined valleys along the north coast, such as the lower reaches of the Red River. During the investigations by Stephens (1900; shown in Figure 6.2) about 200 boreholes were collected to assess the potential of this stretch of the river for mineral rich deposits. The result was a detailed insight into the presence of a shallow tidal estuary with up to four distinct peat layers interbedded with estuarine clays, with the remains of soft reddish wood, probably alder, encountered within boreholes, along with one hard trunk, probably oak. Recent coring by Walker (2014; 2018) across part of the floodplain at Gwithian confirmed Stephens' earlier observations and that these deposits [in that location] were still preserved *in situ*, with a basal radiocarbon date showing alder growth at 3950-3700 cal. BC (5016±32 BP; OxA-28956).

6.3.3 Estuarine deposits

The estuaries within the region are also known to retain important long palaeoenvironmental sequences, though there have been comparatively few studies along this coastline compared to other areas in the southwest. Within the Hayle estuary, Healey (1993; 1996) established at Copperhouse Pool a persistent basal organic rich layer was present at -1.59m OD dated 3370-3030 cal. BC (4520±50 BP; Q-2773), while the work of Walker (2014; 2018) within the Red River showed sediment accumulation between the Late Mesolithic and post-medieval period with a stratigraphy consisting of marsh deposits subsequently overlain by blown sands. Healey (1993) also investigated the sedimentary sequence at Hayle Lelant, along the southern edge of the reservoir, and although undated did identify organic deposits at 0 to -1.8m OD in the southwest, descending to -1.9 to -2.8m ODN in the northeast.

Within the Camel Estuary, Scourse (1985) collected material from estuarine deposits at Trewornan, known to be in excess of 14.4m thick, which included an undated sedge peat from a depth of 2.5m.

Healey (1993) subsequently reinvestigated this area with a transect of five boreholes across the River Amble, finding a similar thickness of deposits with basal organics, including *Alnus* wood and *Phragmites* between -9.90 and -9.26m OD, and obtained a single radiocarbon date of 5620-5290 cal. BC (6460±80 BP; Q-2781) from -9.4m OD.

Finally, within the Taw Valley, site investigations associated with the Barnstaple Western Bypass revealed alluvial sequences with evidence for marsh development associated with palaeochannels dated from 790-510 cal. BC (2500±34 BP; KIA-25386) at Little Pill Farm, Sticklepath Hill (Barnett et al. 2007), and 180 cal. BC -20 cal. AD (2062±35 BP; NZA-19190) at Taw Bridge, Sticklepath (Allen et al. 2004). While many of the studies focused on vegetation history and identifying past human impact, they also often used diatoms to help elucidate the onset of brackish / estuarine conditions, with Havelock (2009) developing this line of investigation to use the palaeosalinity record of the inner Taw Estuary to also inform a climatic record based upon the identification of periods of increased river discharge. These deposits have also been particularly successful in obtaining a stratified and dated geochemical record of mining activity, notably through Cu, As, Sn, Pb and Zn elemental concentrations, as demonstrated within the Hayle estuary (Rollinson et al. 2007), Red River (Healy and Patel 1996; Walker 2014; 2018) and Gannel and Camel estuaries (Pirrie et al. 1999; 2000).

6.3.4 Holocene coastal sand dunes

Sand dunes provide one of the most important environments along the coastline for the preservation of archaeology and associated palaeoenvironmental information. The sands are deflated from the beach and laid down above high tide, resulting in dunefields that sometimes stretch several kilometres inland. Some of the largest dune fields are to be found at Braunton Burrows, Perranporth and Godrevy Towans, and are extremely important for biodiversity, with the former forming the core area of the UNESCO North Devon Biosphere. The archaeological importance of these sites lies in the fact that the sands have buried and preserved many archaeological sites. This is best demonstrated at Gwithian and Godrevy, where excavations within the dune sands, led by Charles Thomas between the 1940s and 1960s, identified multi-period activity from the Mesolithic period onwards (see Sturgess and Lawson Jones 2006a; 2006b; 2006c; Nowakowski 2007; Nowakowski et al. 2007; also see Figure 6.2). Some of the most notable discoveries from this area included a Bronze Age settlement with evidence of three phases of occupation between c.1800-900 cal BC, each separated by blown sand, with later occupation demonstrated by a Romano-British homestead on the nearby Godrevy Headland, and fifth to eighth centuries AD settlement with industrial activity adjacent to the earlier Bronze Age site. Each of these phases of occupation was associated with agriculture, including preserved field systems. Upon the upper Bronze Age buried soil surface there was undisputable evidence of this agricultural activity in the form of preserved plough marks and animal footprints, providing clear evidence both ploughing and cattle husbandry, possibly also including sheep and goats. This is supported in the palaeoenvironmental evidence where the mollusc assemblage indicated grazed grassland, most notably associated with the Middle to Late Bronze Age settlements. Also present were marine shells which could suggest the use of seaweed as a fertiliser on the nutrient-poor sandy soils (Walker and Bell 2013; Walker 2014; 2018). Further evidence of the use of coastal resources is demonstrated by the midden deposits sometimes found associated with the archaeological sites buried within the coastal dunes, such as at the settlement at Atlantic Road, Newquay, where dog cockle (*Glycymeris glycymeris*) was suggested to indicate that the Romano-British occupants were collecting these edible molluscs from the shoreline (Light 2017). The excellent preservation demonstrated at these sites for

vertebrate remains, molluscs and even pollen, along with the ability to date the sands using OSL, means they provide an important palaeoenvironmental resource. A synthesis of the main blown sand sequences within the study area where studies utilising mollusc analysis has been undertaken is provided in Table 6.3 and shown in Figure 6.13. An overview of the importance of these wind-blown deposits is provided by Bell and Brown (2009), with detailed study of a selection of the Cornish sites undertaken by Walker (2014; 2018), including new palaeoenvironmental studies and dating.

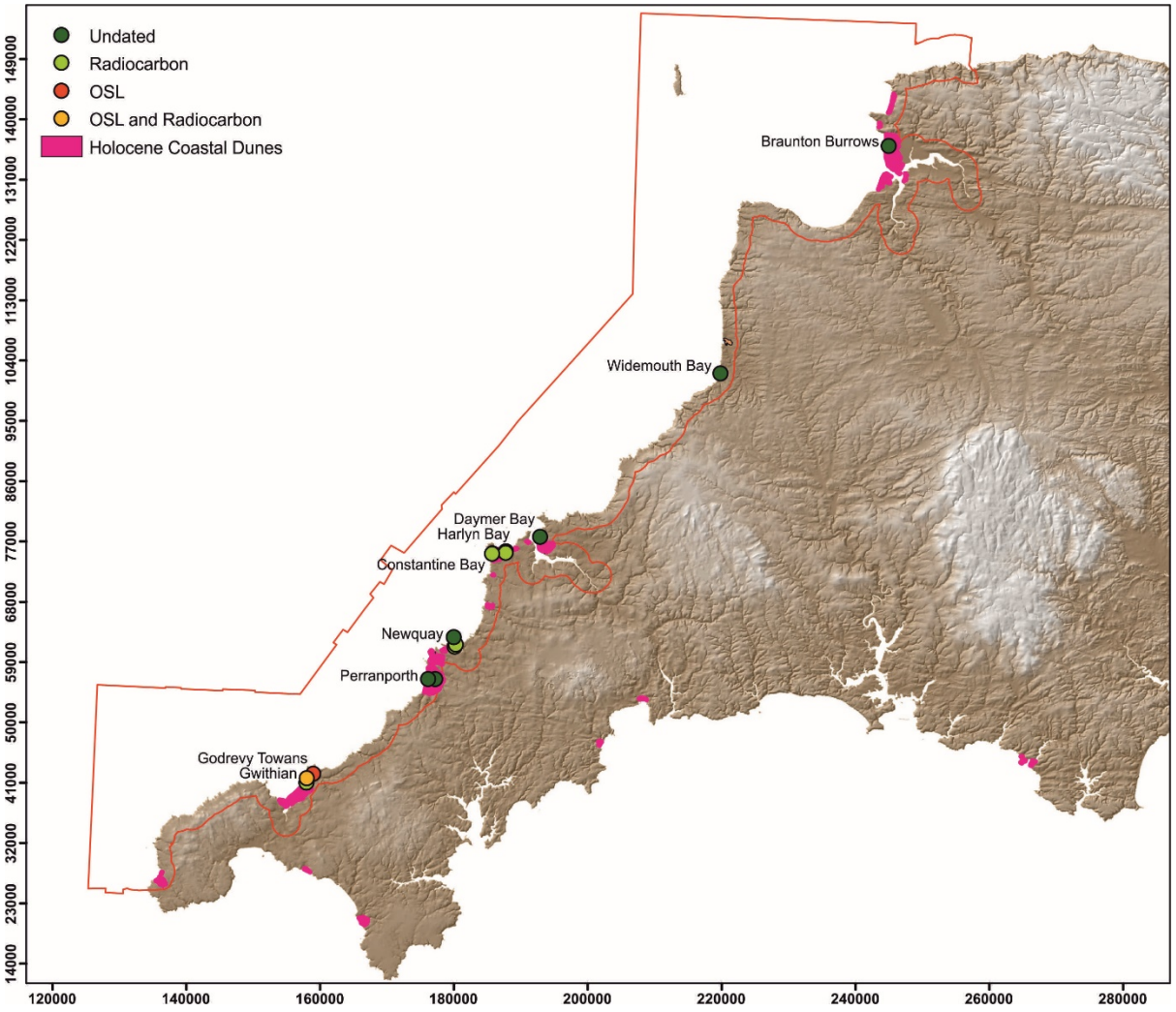


Figure 6.13: Distribution of coastal sand dunes, highlighting sites with molluscan studies. Contains Ordnance Survey data © Crown copyright and database right 2019

Table 6.2: Overview of the submerged peats (and other notable coastal organic sequences) located along the North Cornwall and Devon coastline.

Site Name **NGR** **HER No.** **HE Peat Database**	**Author**	**Site Description**	**Palaeoenvironmental Information**	**Dating**
Vellan Dreath SW 360 265	Borlase (1758)	Borlase (1758, 220-221) reports that in 1750 tin stream digging found a prostrate tree and deer skeleton at 30 feet. A subsequent visit by Borlase in 1753 found further deer antler at a depth of twenty feet, describing that these finds were within a shelly sand (attributed to a sea-stand), overlying a sandy earth intermixed with small stones, which the tinners called Cothan, which was about 1.5 feet overlying the karn.	Borlase (1758) recounts the present of a large (20 feet long and c. 2 feet diameter) oak tree, with leaves and branches attached, found adjacent to an articulated skeleton of a deer along, with antlers of deer or possible elk in overlying deposits.	No dating.
Whitesand Bay SW 3559 2664 CSHER: MCO55161	French (1999)	French indicates on his map that there is a submerged forest palaeosol at Whitesand Bay but no source is provided. It could be the same site as Vellan Dreath reported by Borlase (1758).	No information provided	No dating
St Ives Lifeboat Station SW 5184 4058 CSHER: MCO55162	Gilbert (1995) French (1999)	A peat deposit was exposed during work to deepen the lifeboat slipway within the harbour at St Ives in 1995	Pollen analysis indicated an alder fen carr, with some oak and understorey of hawthorn, hazel and holly. Towards the top of the peat, fen carr gives way to a sedge fen. Charcoal fragments, hazel nuts and dung beetles were also present.	No dating
Trewinnard SW 555 375 CSHER: 168958 HEpeat: 520	Borlase (1758) de la Beche (1839, 418) Colenso 1910	Borlase reports “in the year 1740, Christopher Hawkins Esq, of Trewinard, draining a marshy piece of ground on the banks of the river Hayle, in Penwith, found several pieces of oak buried four feet deep or more under the surface, in a fast clay, one large stock of a tree about ten feet long had no branches, its top part pointing downhill, the colour of it very black. The timber was hard and firm”. Location relates to an approximate location in proximity to Trewinnard. de la Beche states “in the Hayle estuary we again have evidence of trees and vegetable accumulations beneath the present level of the sea”. It is very probable that this relates to the Trewinnard area.	Oak trees present	No dating
Hayle Copperhouse SW 565 380	Healey (1993; 1996)	A borehole transect through the centre of Copperhouse Pool revealed basal organic-rich layer overlain by a silty clay (with some sand) and then over 4m of sand, with increasing fines towards the surface.	Pollen from the dated core shows a change from a partly wooded environment to increasingly open conditions dominated by grasses, sedges and aquatic pollen through the upper levels of the organic-rich sediment and into the overlying silty clay. Diatoms show a change from freshwater to marine / brackish conditions through the organic-rich sediment and into the overlying silty clay.	Top of the basal organic-rich layer, at -1.59m OD, dated 3370-3030 cal. BC (4520±50 BP; Q-2773)
Hayle Lelant SW 556 371	Healey (1993)	A borehole transect, between the Hayle Causeway and Railway line, revealed basal sands with some organics overlying a weathered slate bedrock. This is overlain by an organic silty-clay horizon, primarily monocot material, and, like Hayle Copperhouse, thick (up to 4m) sand deposits, with increasing fines towards the surface.	Pollen from the base of the sequence shows a initially open conditions, with some local increase of woodland, followed by increasingly open conditions dominated by grasses and sedges through the upper levels of the organic-rich sediment and into the overlying silty clay. Diatoms show marine deposits both above and below the organic deposits, with increasing freshwater conditions associated with phase of organic deposition.	No dating
Red River (formerly the River Conar) SW 589 421 CSHER: 168959	Stephens (1900) Walker (2014; 2018)	Area of the Red River, formerly the River Conar (Borlase 1758, 133, 262), was investigated at the end of the 19th century with about 200 boreholes to assess their potential for mineral rich deposits (tin-streaming), revealed a shallow tidal estuary with up to four distinct peat layers interbedded with estuarine clays. Studies by Walker (2014) have included a coring and GPR transect across the valley, just west of the Gwithian settlement site. Multiple cores show the presence of marsh deposits overlain by blown sands, which include some stabilization horizons, including some organic silt ‘marsh’ deposits. Core 30m, located on the northern edge of the valley, encountered a midden deposit which included animal bone (probably sheep and pig) and marine molluscs interbedded between marsh deposits, which is thought to relate to the adjacent post-Roman (5th to 8th century AD) settlement, although dating indicated this deposit could be within the age range of the late Bronze Age to medieval period.	Stephens (1900) reported soft reddish wood, probably alder, was encountered within boreholes, along with one hard trunk, probably oak. Walker (2014): Core 30m dated. Pollen from core 0.5m indicates the presence of an alder carr within the valley bottom, along with oak, birch, hazel and willow well represented within the pollen. By the Bronze Age, and especially the Romano-British period, oak had reduced while heathland and disturbed ground taxa have increased indicating increasingly open surrounding environment. Diatoms from Core 15m indicated freshwater environment associated with the basal marsh layers. Core 30m included alder wood and charcoal at its base, with molluscs from the stabilization horizons within the blown sands showing wet ground along with catholic and open ground fauna.	Walker (2014): Core 30m had five OSL and seven radiocarbon dates, with basal *Alnus glutinosa* wood dated 3950-3700 cal. BC (5016±32 BP; OxA-28956), and the uppermost marsh deposit within the blown sands (and overlying the midden) providing a date of 1480-1650 cal AD (313±29; OxA-29165) on *Menyanthes trifoliata* seeds.

Site Name NGR HER No. HE Peat Database	Author	Site Description	Palaeoenvironmental Information	Dating
Portreath SW 654 454 CSHER: 38502 HEpeat: 370	Hill and MacAlister (1906) Richards (1925) Pascoe (1970)	Hill and MacAlister report that peat was encountered beneath the sand in a dock excavation, with Richards also providing a note on the presence of the submerged Forest here, published in 1925. Pascoe mentions that it was exposed in January 1967 but offers no further information beyond the presence of wood of alder. The latest exposure of the submerged forest were in both 1983 and 2014 following storms. Photographs from 2014 available at: http://www.cornwalllive.com/storms-reveal-ancient-submerged-forest-portreath/story-20670578-detail/story.html#1	Pascoe reports that wood of alder was present	No dating
Porthtowan SW 691 481 CSHER: 168951 HEpeat: 375	Henwood (1858)	Henwood (1858) states that it is known that remains of ancient forests, and of the animals which inhabited them, are found extending below the present sea level at Porth Towan	No information	No dating
Perranporth SW 752 546 CSHER: 168945 HEpeat: 366	de la Beche (1839, 419) Bird (1998)	de la Beche states that there are traces of submarine forests at this named location. Bird (1998, 170) states that "traces of a submerged forest have been seen beneath the sands at the mouth of the Bolingey river".	No analysis	No dating
St Columb Porth SW 830 628 CSHER: 168965 HEpeat: 378	de la Beche (1839, 419)	de la Beche simply states that there are traces of submarine forests at this named location	No analysis	No dating
Lower St Columb Porth SW 839 629	de la Beche (1839, 405)	Tin-streaming along the valley, extending from Lower St Columb Porth by Treloy towards Tregoss Moor, revealed a "tin-ground covered by marine deposits to a certain height up the valley… a bed in which vegetable remains were abundant, chiefly oak-trees, the roots of which were described to us as standing in the position in which they appeared to have grown, rests upon the tin ground towards the seaward termination of the valley". In relation to marine incursion, de la Beche states that "in the direction of Treloy some beds of hard grauwacke traversed the bottom of the valley in such a manner that, if the whole detrital contents were now swept out, water running fown would form a cascade over them to a lower level. Upon the higher part, above this bar of rock, tin-ground became scares, but beneath it was abundant, and intermixed with shells of the common mussel of the present coast, many of which were in the position in which they were attached to the rock anterior to the accumulation of the tin-ground… supposing this information to be correct, the sea would have extended up the valley, as in a creek, to this bar of rock prior to the deposit of the tin-ground." Reid and Scrivenor (1906, 70-71) discuss the report of de la Beche but state that there is no further information available to help locate the tidal limited reported.	Oak trees are noted but no further details. Description implies this is separate but might be connected with the submerged forest at St Columb Porth.	No dating
Mawgan Porth SW 8491 6736 CSHER: 168955 HEpeat: 379	de la Beche (1839, 419) This study	de la Beche states that there are traces of submarine forests at this named location. Submerged forest was uncovered in September 2016 and was investigated by the Newquay Old Cornwall Society. The 'forest bed', consisting of peats and organic silts of variable thickness (and levels of denudation) directly overlies a loose organic sand with large rounded pebbles, probably the remains of a beach / pebble ridge. Further down the beach the peat has eroded away leaving only a thin organic sand. Five monoliths were taken to enable sediment recording and pollen analysis.	Wood and hazel nuts were abundant within the organic silts and peats. Pollen analysis showed the local presence of alder and hazel with some oak and birch along with a number of marsh species, implying the presence of an alder fen-carr environment, that transitions into a sedge fen within the uppermost peat. Micro-charcoal was abundant, especially in the upper peat, along with indicators of disturbance throughout the sequence.	Two samples from the top and base of the peat provided modelled dates of *330-405 cal. AD (95.4%;* 1719±22 BP; ETH-86007.1.1) and *260-275 cal. AD* (6.5%) or *330-390 cal. AD* (88.9%; 1673±15 BP; GrM-12921) respectively.
Porth Mear Cove SW 849 715 CSHER: 21848 HEpeat: 377	Lamb (1909) Clarke (1974)	Lamb states September 1908 the removal of the beach shingle by the sea exposed a bed of stiff clay within which was the embedded *in situ* stump of a tree along with decomposed wood in the clay. By October the shingle had returned. Lamb states the site names is Porthmeor within the parish of St Eval so it is most likely that the site is actually Porth Mear Cove. Clarke recorded a lacustrine clay lake deposit with intervening peat was sampled from the cliff face (exact location unknown). This deposit probably formed behind a barrier such as dunes of a storm beach.	Lamb tentatively identified the tree stump as possibly conifer (basis of identification partially being the dark colour of the wood). Clarke reports on insects and pollen that were extracted from peat and lake clays. Pollen from the basal clay deposit showed the main tree were alder*,* birch *and* oak, along with hazel, with sedges and fern spores abundant. Within the overlying peat deposit the same trees and shrubs were present, but there was a greater representation of grasses along with plantain species. Insect remains from the peat shown dung beetle present, indicative of grazing, with others indicative of open grassland	Clarke provides a radiocarbon date from the peat within the lacustrine deposits, dated 1600-910 cal BC (3024±126 BP; Birm-197)

Site Name NGR HER No. HE Peat Database	Author	Site Description	Palaeoenvironmental Information	Dating
Constantine Bay SW 8580 7485 CSHER: 176969	Jones (2009-10)	Submerged forest revealed a layer composed of quite large pieces of wood, including trunks and branches. In places the layer was a grey clay deposit.	No identification of trees was made	One of the trees was dated 2860-2480 cal BC (4068±31 BP; OxA-18045)
Porthmissen Beach SW 890 761 CSHER: 21751 HEpeat: 383	Henwood (1858) Clarke (1961)	Henwood records a submerged forest at this location. Clarke states that in the ?1950s the beach was swept clear of sand after a particularly high driving tide, exposing a large quantity of fossil wood with a grey clay	Fragments of hazel and birch wood with hazel nuts were found within the grey clay	No dating
Harbour Cove SW 912 770 CSHER: 168956 HEpeat: 380	Henwood (1858)	Henwood (1858) stated that "I am informed by Mr Kent that traces of [the submarine forest] were found in the harbour cove on the western side of the estuary about sixty years ago"	No analysis	No dating
Hawker's Cove SW 9132 7700 HEpeat: 555	Wessex Archaeology (1999)	HE peat database (Record 555) cites Wessex Archaeology (2009), which stated that a submerged forest was marked on the OS 1st edition 1881. The only submerged forest marked is that of Daymer Bay.	No analysis	No dating
Daymer Bay SW 925 775 CSHER: 26419 HEpeat: 381, 554	Henwood (1858) Trollope (1860) Ussher (1879c) Howie (2009) Howie & Gwynn, 2013	Early accounts of this submerged forest are provided by Henwood and Trollope based upon exposures seen in 1857. Visit by Ussher 17 years later failed to locate the submerged forest but did note masses of peaty matter in Dayme Bay containing twigs and very fragile land snails. Studies of the beachrock adjacent to the submerged forest are reported by Howie with study of the submerged forest (palaeosols) itself reported by Howie and Gwynn. The forest bed deposit lies directly on a planned surface or pavement of compacted Devensian. Exposure in 2009 and 2012 ranged from small isolated sheets a few metres square to areas c. 300m^2. The lower bed consists of 5-20cm of friable silty sand, with the upper organic-rich bed containing 15-40cm of compact soil rich in organic matter. Tree stumps, up to 50cm diameter, are rooted through both layers. Presence of a spread of limpets, mussels, oysters and possible charcoal might indicate the presence of a midden site.	Henwood and Trollope described the site as containing *in situ* stumps with roots extending up to 6m horizontally, together with trunks including oak, yew and hazel, along with layers of hazel nuts intercalated with hazel leaves and remains of various animals. This was overlain by sand and earth containing dune-dwelling snails and horns of probable red deer. Howie and Gwynn identified molluscs and plant macrofossils which indicated a predominantly dry woodland environment along with a number of marsh / watercourse associated fauna and proximity to dunes. The molluscs indicate a freshwater environment	Wood sample 2470-2290 cal. BC (3900±30 BP; Beta-348787)
Dunbar (Doom Bar) sands SW 924 774 HEpeat: 381	De la Beche (1839, 418) Henwood (1858)	De la Beche states that trees and vegetable accumulations are found "under the Dunbar sands, at the mouth of the Camel". Henwood (1858) repeats this statement, stating that "a layer of earth can be traced from above high-water, below ordinary low-water mark, beneath the Doombar, without reaching its boundary in either direction". These may just signify extensions of the Daymer Bay submerged forest.	No analysis	No dating
Trewornan SW 988 743 (Scourse) SW 996 753 (Healey)	Scourse (1985) Healey (1993)	The Trewornan 'Lake Flat' has been much debated over the years as a Pleistocene possible glacially-dammed lake (Clarke 1980). Previous excavations associated with developments had demonstrated that the deposits were in excess of 14.4m. Examination of sections and augering by Scourse demonstrated that this was not a lacustrine deposit but contains large thicknesses of Holocene alluvium. Subsequent re-investigation was undertaken by Healey who obtained a radiocarbon date from the base of the sequence categorically demonstrating a Holocene age for the sequence. He described the sequence as containing organic rich deposits at the base, overlain by thick deposits of fine sand, later grading into silts and clays at the top of the sequence.	Scourse counted a single pollen sample from a sedge peat at a depth of 2.5m, which contained an assemblage with temperate woodland taxa including alder and hazel, with grasses and sedges well represented along with aquatic taxa. This indicates the presence of a marsh forming along the margin of the valley at this time probably flanked by alder carr along the wetland-dryland edge. Healey sampled the basal organic deposits where *Phragmites*-rich peats are overlain by *Alnus* wood, also reflected in the pollen assemblage. Diatoms from the top of the peat and overlying minerogenic deposits show a transition from freshwater to brackish and marine conditions.	Single radiocarbon date from -9.40m ODN provided an age of 5620-5290 cal. BC (6460±80 BP; Q-2781).
Little Petherick Creek SW 9244 7409 CSHER: 168969 HEpeat: 382	Clarke (1961)	Clarke reports that "when the railway bridge over Little Petherick Creek was built, fossil wood was dug up from the foundations when the piers were being sunk.	No analysis	No dating
Widemouth Bay SS 198 024 CSHER: 392 HEpeat: 373	Freshney et al. (1972) Bird (1980)	Remains of a submerged forest have been recorded at Widemouth Bay, listed as being several hundred yards offshore. Bird (1980, 212) states that "there is a submerged forest offshore, usually concealed by sand deposits"	No analysis	No dating

Site Name NGR HER No. HE Peat Database	Author	Site Description	Palaeoenvironmental Information	Dating
Maer Lake (Crooklets Beach) SS 2015 0713 CSHER: 168946 HEpeat: 272	Pattison (1848) Cole (2001) Ransley (2002)	A submerged forest on Crooklets Beach had been recorded as early as 1848 and further identified on the 1880 OS map. The site was confirmed by investigations by Thorpe (2000), Cole (2001) and Ransley et al. (2002) who encountered the submerged forest within a series of trenches and boreholes laid across the beach preceding cable installations.	Environmental sampling by Cole (2001) recovered pollen and plant macrofossil remains that revealed that beach contained a complex range of plant communities comprised of woodland, swamp, freshwater pools, cliff top and beach communities. The central portion of the modern beach contained evidence of a wooded environment, with the pollen evidence suggesting that the dominant species were oak and alder, along with ash and willow. Ransley (2002) interpreted the peat layer as indicating a sequence beginning with carr woodland, fen carr and reed beds in a system of freshwater streams and ponds. This underwent stabilisation through time, possibly due to the development of a sand bar across the valley mouth, with water lilies within areas of standing freshwater. It was suggested that breaching of the barrier may have led to the end of these peat-forming communities.	Four radiocarbon dates were obtained. Two dates were from the centre of the beach, one on the northern side where oak fragments at Site H were dated 3520-3090 cal. BC (4580±60 BP; Wk-8777), and one on the south between point X-Y from the top of the peat sequence dated 3520-3090 cal. BC (4570±60; Wk-8780. At site BS, close to the slipway, dates from the top and bottom of the sequence provided dates of 2590-2200 cal. BC (3940±60 BP; Wk-8778) and 3640-3110 cal. BC (4640±70 BP; Wk-8779) respectively.
Duckpool SS 199 115 HEpeat: 821	McDouall 2006	HE peat database (Record 521) cites an English Nature report that names Duckpool as having a submerged forest. No sources or other information are provided to support this location.	No analysis	No dating
Westward Ho! SS 4298 2952 (Area 3) SS 4317 2958 (Area 1) DHER: MDV44568 (MDV107373, MDV107425, MDV107435, MDV107430, MDV107372, MDV107374, MDV107432, MDV107325) HEpeat: (169-171, 305-307, 314, 319-322, 355, 388, 422, 423)	Risdon (1811) Hall (1870) Bate (1866) Ellis (1866; 1867) Pengelly (1868) Hall (1870) Rogers (1908) Rogers (1946) Churchill (1965) Jacobi (1979) Balaam et al. (1987) Riley (2002) Tetlow (2004) Timpany (2005) Canti et al. (2015)	The submerged forest was first reported in the winter of 1863/4. An occupation horizon containing a 'kitchen' midden was later identified by Hall (1870). Peat was first dated by Churchill (1965) and the midden was first dated by Jacobi (1979). The site also has a series of wooden stake alignments and extensive animal bone. Hall records that in the mid-19th century "70-80 stems of large trees, all standing upright in the position in which they grew, though broken off at a height of two or three feet from the roots". From this date the submerged forest is known to have undergone extensive erosion, especially as the Pebble Ridge migrated eastwards leaving it more exposed. The site is divided into three areas. Area 3 (centred on SS 4295 2950) is the "outer peat" associated with the midden deposit and has been the main focus of investigation, containing Mesolithic to possibly early Neolithic deposits. Area 2 (centred on SS 4308 2955) is a small stand of peat, believed to be contemporary with area 3. Area 1 (centred on SS 4317 2959) is the "inner peat" which is the peat bed most commonly exposed. North of Area 1 are exposures of channel deposits and a series of stake alignments and bone exposures which are dated to the Middle Romano-British to Early Medieval period and assumed to be contemporary with the Area 1 peats. The site was last mapped by Riley (2002).	Extensive phases of palaeoenvironmental investigation have been undertaken since the early 20th century (see Rogers 1908). There have been four main phases of palaeoenvironmental work undertaken: • Rogers (1946) provides the best account summarising all work up to, and including, Rogers' 1946 observations of the site, including mapping and photographs of the site including the midden. This also includes summaries of the plant identifications by Clement Reid, a list of the bone assemblage, and reports that early attempts to extract pollen (by Harry Godwin) were unfruitful. • Churchill (1965) provided the first radiocarbon date for the site and focused on the sedimentary record from the midden site, including pollen and plant macrofossil analysis. • Balaam et al. (1987) undertook a rescue excavation in 1983-4, which included extensive radiocarbon dating along with palaeoenvironmental analyses including sedimentary record, molluscs, pollen, plant macrofossils, insects and vertebrate remains. Archived samples from the midden deposit were later investigated by Canti et al. (2015). • In April 2002 the site was reinvestigated by Martin Bell. Sampling for palaeoenvironmental analyses was undertaken, with the resulting studies being those of the wood (Timpany 2005), insects (Tetlow 2004) and pollen (see Appendix 5). Dating of this sequence was undertaken as part of the RCZAS (Marshall et al. 2017; Appendix 5). Balaam et al (1987) and Timpany (2005) showed that there were differences in the woodland components between areas 1 and 3, with the former containing alder, willow and oak, and the former containing hazel, oak and localised patches of just alder. This variation is also reflected in the pollen record, where within Area 3 the sequences (Scaife 1987 and Grant 2018) showed a dominance of oak, hazel and elm with little alder, but localised differences in the amount of local openness and open fen communities. The insects from the sequence accompanying the latest pollen sequence confirmed a much more open environment and suggested tall reed swamp with limited local woodland insects. By contrast the pollen sequence from Area 1 by Scaife (1987) was dominated by oak, hazel and alder.	To date the sequences from Westward Ho! have generated 43 radiocarbon dates from Area 3, the majority associated with dating the occupation layer and midden. Dating of the midden using earthworm calcite (Canti et al. 2015) suggested an age span of 5330-4580 cal. BC, which is in agreement with dates derived solely from terrestrial organic samples producing an age range of 4840-4540 cal. BC. A new series of 13 dates were obtained as part of the RCZAS from monolith <100>, originally sampled in April 2002 by Martin Bell (Marshall et al. 2017). These dates conclusively demonstrate that the sampled organic sequence, and underlying occupation layer, in Area 3 is contemporary with the midden deposit, beginning 5670-5490 cal. BC and ending 3940-3755 cal. BC. Area 1 (inner peat) peats have not been directly dated but inferred from dated material just north of Area 1: animal bones from an old channel fill, dated 250-620 cal. AD (1600±80 BP; HAR-6440), and a *Corylus avellana* wood from a stake alignment, dated 330-650 cal. AD (1560±80BP; HAR-6513).

Site Name NGR HER No. HE Peat Database	Author	Site Description	Palaeoenvironmental Information	Dating
Northam Burrows SS 440 314 DHER: MDV107446	Passmore (2014)	Below the pebble ridge the sand and gravel foreshore deposits overlie organic deposits. These were partially exposed between pebbles. It comprised localised exposures of a 20 millimetre thick root mat overlying light grey coarse sand containing shell fragments and fine roots in its upper section. No finds or charcoal were visible within either deposit. The layers are different to the deposits recorded as MDV76315 but were recorded at a similar height (approx 3.5m ODN) so may be historic in date.	No analysis	No dating
Taw Bridge, Sticklepath SS 549 333	Allen et al. (2004)	Borehole transect across the River Taw at the site of Western Bypass Taw Bridge. Auger survey encountered a series of palaeochannel and alluvial deposits overlying Pleistocene gravels.	Pollen and diatom analysis was undertaken on Auger 4, showing the presence of a wide, grass-rich floodplain with sedges, reed-mace and meadow sweet. Diatoms indicated some brackish water inundation.	Single radiocarbon date from base of Auger 4 sequence: 180 cal. BC -20 cal. AD (2062±35 BP; NZA-19190)
Little Pill Farm, Sticklepath Hill SS 5584 3166	Barnett et al. (2007)	Deep stratified waterlogged sequence of palaeochannel and floodplain deposits, including humified fen peats	Pollen, diatoms, plant remains and waterlogged wood were sampled. Shows a transition from an oak-hazel woodland and alder fen-carr transitioning to open grass-sedge fen and nearby clearance, with increased marine influence up-sequence from the Late Saxon period.	Three radiocarbon dates from palaeochannel, oldest is 790-510 cal. BC (2500±34 BP; KIA-25386)
Northam Burrows SS 44214 31679 DHER: MDV76315	Passmore (2009)	Storms in March 2008 exposing buried deposits including a layer of sand and clay, displaying hoofed animal prints at four locations. Site was sampled, but by the end of March the deposit had eroded away / been buried. Deposits are c. 4 metres higher than those recorded at Westward Ho!.	Cloven hoofed animal footprints observed	No dating
Braunton Burrows SS 456 324	De la Beche (1839, 419)	De la Beche writes that a "vegetable bed is stated to be found beneath Braunton Burrows, at the embouchure of the Taw and Torridge, near Barnstaple and Bideford"	No analysis	No dating

Table 6.3: Molluscan studies of blown sand deposits along the North Cornwall and Devon coastline

Site	Author	Site Description	Mollusc sequence	Dating
Gwithian SW 590 423	Lewis 1968 Spencer 1974, 1975 Milles 1991b Davies 2007 Walker 2014	Bronze Age and post-Roman settlements; medieval manor house. Study by Lewis c. 200m west of BA settlement. Study of Walker (2014) consists of a c. 750m north-south transect from Red River, immediately west of Post-Roman settlement which included both alluvial and blown sand deposits.	Open country fauna from the middle Neolithic, with increased vegetation cover, including scrub, from later Middle Bronze Age. Medieval samples show environment similar to today	Only two sequences are dated: Davies 2007 (Section GMXVII) and Walker 2014 (Trench 150m). Davies (2007) consists of a pair of inverted OSL dates both indicating a Bronze Age date. Walker (2014) used OSL from trench sequence indicating a Neolithic old land surface dated 3350-2870 BC (5120±240; Aber-203/GWT-12-5). Five radiocarbon dates of molluscs provided statistically coeval dates throughout the sequence, did not match the OSL dating, and were thus rejected.
Stap Rocks SW 5802 4163	Walker 2014	Old land surface with reworked head, overlain by blown sand. Site investigated due to presence of stone layers in cliff face.	Mixture of shade and open country taxa in base, with predominantly open country fauna above stones in blown sand.	Early Bronze Age, confirmed by three C14 dates on molluscs, with base of sequence dated 2140-1930 cal. BC (3650±29; OxA-28970).
Godrevy Towans SW 58 41	Walker 2010	Old land surface dated overlain by blown sand containing five stabilization horizons.	Open country fauna with little evidence of shade	Radiocarbon date on *Prunus* sp. charcoal (3950±40 BP; Beta-280906) and molluscs; (3957±29 BP; OxA-28966) provided a modelled date for OLS of 2570-2340 cal. BC. Stablization layers dated to the middle Bronze Age, late Bronze Age, Romano-British period, and two undated later horizons
Perranporth (St Piran's Oratory) SW 7722 5644	Bullen 1909	Found in area of the medieval church	Marsh and open country mollusc species	No dating
Perranporth (cliff). SW 762 564	Spencer 1974; 1975	Cliff section containing basal buried soil overlain by blown sand	Open county fauna in basal buried soil overlain by blown sand. Increased shade-loving species in sand indicating stabilization episodes	None. Spencer speculated early deforestation due to known Mesolithic activity in the area
Trethellan Farm, Newquay SW 8015 6127	Milles 1991a	Bronze Age settlement buried below colluvial sand from dunes above Fistral Bay.	Molluscs from colluvium but some from hut floors indicate almost entirely open country taxa.	15 radiocarbon dates for settlement, dated 2400-1200 cal. BC, but no dating associated with the mollusc sequences

Site	Author	Site Description	Mollusc sequence	Dating
Atlantic Road, Newquay SW 8030 6153	Reynolds 2000-1 Davies 2008 Light 2017	Romano-British settlement with mollusc column incorporating two occupation horizons separated and covered by blown sand	Progression from bare to well-vegetated to open country conditions with dune erosion	Later Iron Age and Romano-British period 11 radiocarbon dates were obtained from bone and charcoal.
Towan Head, Newquay SW 800 627	Kennard and Warren 1903 Woodward 1908 Spencer 1974, 1975 Milles 1991b Walker 2014	Extensive sampling between Fistral Bay and Towan's Head. Consisting of buried soils overlying head, overlain by blown sand	Shaded environment with light wood or scrub, giving way to open country fauna	Undated, but mollusc stratigraphy indicates higher levels are post-Roman
Constantine Island SW 85716 75133	Bullen 1902a, 1902b, 1912 Walker 2009-10 Walker 2014	Middle Bronze Age burial mound, with non-calcareous base and blown sand above. Study by Walker (2014) was close to, but separate from, the burial mound and only sampled the blown sands	Predominantly open country species	Radiocarbon date on human femur from crouched inhumation within cist 8 provided date of 1380-1080 cal. BC (2985±35; SUERC-16818).
Constantine Bay (cliff) SW 8577 7518	Spencer 1974 Boardman 2008	Blown sand with some stabilization horizons	Open country species	No dating
Harlyn Bay (Cemetery) SW 8776 7528	Bullen 1902a, 1902b, 1912 Whimster 1977 Bell and Brown 2007	Iron Age cemetery	Shade species giving way to a mixture of open country and catholic taxa.	Radiocarbon dated charcoal from stone building beneath cemetery provided date of 3140-1660 cal. BC (3550±90 BP; HAR-1192). Main sequences likely Bronze Age and Iron Age
Harlyn Bay (Cliff) SW 878 755	Evans 1979 Spencer 1974 Bell and Brown 2009 Walker 2014	Cliff section; OLS overlain by blown sand. Possible buried cultivated soil at SW 87706 75423	Open country fauna.	Mollusc stratification suggests possible post-Bronze Age / Iron Age

Site	Author	Site Description	Mollusc sequence	Dating
Polzeath, Daymer Bay SW 9266 7774	Arkell 1943 Spencer 1974 Milles 1991b Bell and Brown 2009	Buried soil sealed by blown sand with stabilization layers. Near the base of the sand Bell and Brown found two sherds of prehistoric pottery, scattered mussel and limpet shells.	Woodland, along with areas of swampy ground, giving way to open country fauna with some episodes of stabilization.	No dating but possible prehistoric old land surface
Widemouth Bay SS 1983 0205	Kennard and Woodward 1901 Bell and Brown 2009 Walker 2014	Old land surface covered by blown sand with stabilization horizons. Original study stated samples from close to a 'surface with Neolithic flakes' c. 400m north of Walker (2014) study.	Transition from swamp / marsh (in vicinity) to open country fauna. In one sequence, Bell and Brown found only marine molluscs indicating a beach sand	Undated but possible prehistoric old land surface
Braunton Burrows SS 45 36	Smith et al. 1983	Auger samples from a medieval shell midden within dunes	Open country fauna	No dating

6.3.5 Submerged landscapes of south west England

The coastal zone is always in a state of change. One major concern relates to sea level change as a result of anthropogenic-driven climate change, and the impact this will have through increased coastal flooding and erosion. Sea level change has always been an important issue in the region, most notably with the recognition of submerged landscapes and trying to understand what submerged forests are and how they originated. Reid (1913: 1-2) states that these sites have "*attracted attention from early times, all the more so owing to the existence of an uneasy feeling that, though like most other geological phenomena they were popularly explained by Noah's deluge, it was difficult thus to account for trees rooted in their original soil, and yet now found well below the level of high tide*". This is most apt for the southwest and, in particular, Cornwall where the legend of the lost land of Lyonesse has been popular in folklore and was widely debated in the 18th and 19th century regarding the competing theories over how these landscape features might have been formed.

Lyonesse was a legendary, low-lying country which once extended westwards from Land's End to the Isles of Scilly. Elizabethan antiquaries collected reports current in the 16th century claiming that, Lethowstow, the Cornish name for this area, contained fair-sized towns and 140 churches that were suddenly engulfed by the sea. The Seven Stones reef, west of Land's End, was said to be the remains of a town called the 'City of Lions' and fishermen reported that their nets brought up fragments of masonry and windows. The submerged forests around the coastline were also regularly cited as evidence to support the loss of Lyonesse, with Ussher (1879a; 45) reporting that "*Several observers have cited the occurrence of hazelnuts, in some cases with branches attached, as proof of a sudden autumnal submergence*". Mount's Bay, on the south Cornish coast, played an important role in further developing this legend. William Camden (1584) stated "*That S. Michael's Mount is call'd in Cornish Careg cowse in clowse, i.e. the hoary rock in the wood; That 'tis certain, there have been large trees, with roots and body, driven in by the sea between S. Michael's Mount and Pensance, of late years*".

William Borlase (1758) made similar observations relating the legend of Lyonesse and the evidence presented by the submerged forests, stating that "*these fossil trees sufficiently confirm the tradition of these parts, that, where the finds now stretching three miles in length, and a furlong (when the spring tide has retired to its full extent) in breadth, from the town of Penzance to St Michael's Mount, there was formerly a wood. That the body of these trees must have stood at least twelve feet higher than at present; consequently there has been a subsidence of these shores, and the ground has sunk more that twelve feet*." The mention of subsidence of the shore relates to a widely-held belief that it was not the sea that changed its elevation but instead it was the land which rose and fell in relation to the sea – a concept that remained strongly engrained in many accounts relating to submerged landscapes up until the 20th century.

During the 18th and 19th century increased mining activity within the Cornish river valleys involved expansion of deep excavations to access the tin-rich gravels found at the base of the alluvial sequence. With large areas being opened up, this not only led to the discovery of submerged forests below the alluvial sequences, but also archaeological sites associated with them. One of the best known discoveries was from the Carnon Steam Works, where it was reported in the West Briton on the 4th April 1823 that "*On Saturday [the 29th of March, 1823] as the labourers employed at Carnon stream-works were removing a quantity of mud, they discovered a heap of stones, under which were four pieces of oak enclosing a human skeleton, the teeth and larger bones of which were in nearly a perfect*

state. The tomb was covered with a deposit of mud 17 feet in depth, and was 22 feet below the present [high] water mark, on what is denominated the "tin-ground," namely, stones mixed with gravel amongst which tin is found." Such finds received considerable local interest, with Henwood (1873) reporting that the skeletal remains and site were kept open for some time for public inspection.

This unique combination of human remains, submerged forests and significant depth below the water table, coupled with legends such as Lyonesse, provided a key impetus for three notable scholars working in the region during the 19th century and was, as will be argued below, a significant driver in developing the concept and study of submerged landscapes within the British Isles.

Henry T. de la Beche (1839) considered these discoveries and the work of Borlase, leading him to write that "*assuming the beds with trees and other vegetable remains… and those with human skulls… are equivalent… and there is little doubt that many oak trees grew at the top of the tin-ground, then a considerable change took place in the relative levels of sea and land since man inhabited Cornwall, allowing estuary or marine deposits to be effected in creeks upon a surface that previously permitted the growth of terrestrial vegetation, the remains of the marine creatures entombed in the mud, silt, or sand, showing that these creatures were of the same species as those which now exist in the adjoining sea*". De la Beche (1839) continues by stating that "*unless the search for stream-tin had been so economically important, and the detrital contents of so many Cornish valleys turned over in this search, the facts above noticed never would have been known. In other parts of the district, therefore, where the detrital accumulations in the valleys have not been moved since their deposit, it can rarely happen that the existence of man could be traced to an epoch corresponding with that to which the Cornish stream tin-works, especially those near the sea, would assign it*".

Utilising these observations, de la Beche was able to envisage the significant wider implications that these submerged sites presented: "*We seem compelled to admit that a change in the relative level of the sea and land has taken place since these trees lived on the situations where we now find them. When we regard such situations, and in imagination raise the present land merely 30 feet, it will be readily perceived where the ten-fathom line is traced around the coast, that numerous small tracts of dry level country would be produced of shallow bays, and in some situations, a large tract of land would appear*". De la Beche explained the premise for his observations in more detail within his 1834 book *Researches in Theoretical Geology*. Here he developed the idea of a large exposed coastal plain, using the 100 fathom depth derived from recently published charts, to indicate the coast during the lower sea level stand (Figure 6.14), and the presence of submerged valley systems upon this shelf. He also clearly illustrated the concept that if sea level, relative to the land, rose or fell then biological life would laterally migrate to remain within its ecological niche. If sea level change was gradual and non-erosive, then the fossil remains would be preserved within these sediments and could be related to their water depth / environment at the time of deposition. This would then enable a study of successions in relation to rising sea levels, along with the lateral movement of species across the coastal plain as it flooded. This idea has strong similarities to the concept of *lateral facies succession*, known as Walther's Law, proposed by Johannes Walther (1894).

Robert A.C. [Godwin]-Austen (1850) was clearly inspired by this earlier work, stating that "*Sir H. de la Beche has represented the course of the 100-fathom line round the British islands. In closing these observations on the condition of the bed of the Channel, I gladly acknowledge my obligations to this work; to it, and Sir C. Lyell's ' Principles,' I must trace the idea I have attempted to work out."* Utilising

his extensive experience of working on the numerous gravel deposits, raised beaches and submerged forest in the area, he proposed "*that the whole area of the English Channel had at one time a higher level, is directly proved by the numerous instances along its shores where old forest ground passes beneath the present sea-bed: these are marked on the map [Figure 6.14]… it seems to be constantly assumed that the original position of these wooded tracts was close to the coastline, or at the sea-level; but for such a supposition there seem to be no grounds whatever. Proximity to the sea is generally unfavourable to the growth of timber. If we take the whole line of the coasts of the Channel on either side, we shall not find any wooded tracts coming down to it, or even single trees of any magnitude; yet in many instances the trees of these submerged lands had attained a very great size…the conclusion we may safely arrive at is, that the area of the present English Channel was in the condition of dry land previous to its occupation by the waters of the Pleistocene sea, or during the period of the Pliocene (crag) accumulations of the German basin, and that, together with a large area beyond, it served to connect the British Islands with France on the south, and Ireland on the west, into a tract which had a far greater amount of elevation than any portion of it has at present.*"



Figure 6.14: Early models of the etent of the submerged landscape arounf the British Isles

In his subsequent paper, Austen (1851) developed this concept further, compiling additional evidence from these submerged landscapes, such as mammal remains recovered by fishermen in the North Sea

and English Channel, the coastal sedimentary sequences, and the tin-streaming sites from Cornwall that de la Beche had previously noted were so important. His map, shown in Figure 6.14, therefore presents the first conceptual representation of what the submerged palaeolandscape around Britain might have looked like, noting that "*the course which this river then had… will be found to correspond in a very remarkable manner with that along which the large mammalian remains have occurred*". Austen was able in this paper to indicate that many coastal deposits, such as raised beaches and submerged forests, are post-Pliocene deposits (Pleistocene), allowing him to attempt to resolve the succession of events leading to the development of the coastal landforms he was familiar with. Key observations included a consideration of the variability in the mammal remains assemblage, episodes of glaciation were associated with low sea-level stands and erosion of the deep submerged channels might have begun in the early part of the Pleistocene. In attempting to construct a succession of events he also remarked that several distinct periods were present when fluctuations in sea level returned to that close to the present day level. With regard to the submerged forests themselves, he implies (but never explicitly states) that these are probably of Late Pleistocene age.

Several attempts to map this submerged landscape appeared over the following 60 years, such as Prestwich's (1892) map focused on Pleistocene sequences and the potential exposed landsurface during the 'cave period' (Figure 6.6). In 1913 a map appeared within the *Prehistoric Times* (Lubbock 1913; 415), focusing on mapping of the submarine river valleys on the bed of the Atlantic and North Sea, as visible upon charts. This approach, mirroring earlier observations by de la Beche (1834), utilised the notion that rivers cannot excavate valleys below sea level, and therefore such valleys visible upon charts must have been generated when sea levels were lower / land was elevated, though it did imply that their formation could date back to an earlier geological period before the Pliocene. In the same year Clement Reid published his seminal book 'Submerged Forests' where he developed some of Austen's ideas. Most notably, he advanced the idea that lower sea levels could be fairly recent in geological time, with the latest phase attributable to the post-glacial period. Reid utilised examples from across England, including material recovered from offshore, to demonstrate the existence of a now submerged landscape upon which humans, animals and plants had previously lived prior to marine inundation. The southwest played an important role in the formation of his ideas, not only through his studies of the submerged forest at Westward Ho!, but also his extensive study of the region for the Geological Survey. He specifically notes that '*On travelling westward into Cornwall we enter a region which is extremely critical in any enquiry as to the amount of change that the sea-level has undergone…On following detrital tin ore downwards towards the estuaries the "tinners" or alluvial miners found in many cases that a rich layer descended lower and lower till it passed well below the sea-level in some of the ancient silted-up valleys…Notwithstanding the early date of these excavations, some most interesting observations were recorded; and though they make us long for fuller details and regret the loss of many of the objects referred to, we must be grateful that so much was noted, and by such careful observers.*"

For submerged archaeology, Reid's book provides a seminal moment, notably by his statement that "*the geologist should be able to study ancient changes of sea-level, under such favourable conditions as to leave no doubt as to the reality and exact amount of these changes. The antiquary should find the remains of ancient races of man, sealed up with his weapons and tools. Here he will be troubled by no complications from rifled tombs, burials in older graves, false inscriptions, or accidental mixture. He ought to here find also implements of wood, basketwork, or objects in leather, such as are so rarely preserved in deposits above the water-level*." Accompanying his book was a map of the North Sea

basin (Figure 6.14) where he mapped the early postglacial North Sea shore for Europe and the distribution of the main rivers and estuaries within it. Coles (1998, 47) states that it is in recognition of this map that she coined the term 'Doggerland' which is widely used today. However like Coles, many researchers working on submerged landscapes in this region have overlooked the important work preceding Clement Reid's book (e.g. Gaffney et al. 2007; Bicket and Tizzard 2015). Reid's map shows a very close resemblance to that originally published by Austen (1851) (Figure 6.14), whose papers he cites within the bibliography. It is therefore fairly certain that although Reid is responsible for a significant advance in our understanding of submerged forests and landscapes, along with wider public dissemination of these ideas through his book, the work of his predecessors in the southwest, notably Austen and de la Beche, provided the critical basis for Reid's key breakthrough.

During the 20th and 21st century the focus of study on submerged landscapes in Britain has shifted towards the English Channel and North Sea basin, to a large extent driven by offshore developments and aggregate extraction. However this does not mean that important studies of the submerged landscape of the southwest did not continue to be undertaken utilising marine seismic geophysical survey and coring techniques, even if not recognised at a national level (e.g. Wessex Archaeology 2013; Bicket and Tizzard 2015). Notable studies include: the Lyonesse Project on the Isle of Scilly (Charman et al. 2012; 2015); Wave Hub Hayle (Camidge et al. 2006) and Mount's Bay and St Austell Bay (Camm and Dominy 1998; Camm 1999) in Cornwall; and Barnstaple Bay (McFarlane 1955; Wessex Archaeology 2012), Plymouth Sound (Eddles and Hart 1989; Reynolds 1990; Spencer 2012), Tor and Babbacombe Bay (Clarke 1970), Start Bay (Hails 1975; Kelland 1975), Exe Estuary (Durrance 1969) and the Erme Estuary (McFarlane 1955; Creak 1991) in Devon. These supplement the rich archive of data derived from studies of the stratigraphy within the deeply buried valleys of the southwest, dating back to the activities of the tin-streamers and construction of the 19th century railways, through to modern multidisciplinary studies within these areas (e.g. Healey 1993; Barnett et al. 2007; Havelock 2009), demonstrating that rich submerged palaeolandscapes exist around the southwest peninsula.

Donovan and Stride (1975) utilised existing bathymetric data to map the presence of submerged coastlines around the southwest peninsula, from Hartland Point to Torquay Bay, and inferred the presence of three drowned coastlines. Nearest inshore, a gradual slope is noted continuing from the base of the modern cliffs at MWLST to depths of -7 to -20m CD, though these are not easily observed in areas with nearshore superficial sediments such as near sandy beaches or seaward of the major rivers. Beyond this submerged cliff-line, a gentle slope then continues seaward to a depth of -27 to -37m CD, most extensive on the south coast in Bigbury Bay, off Plymouth Sound and Whitsand, St. Austell and Falmouth Bays. In deeper water, three further groups of cliffs are recognisable: upper cliff at -38 to -49m CD. middle cliff at -49 to -58m CD and the lower cliff at -58 to -69m CD. Kidson (1977; shown in Figure 6.20 to Figure 6.23) maps these offshore submerged cliff lines around the southwest coastline and suggests that these provide clear evidence of a sea-level stand of considerable duration at this depth. Wood (1974) also considered this submerged platform of marine abrasion, extending for 15km off north-west Cornwall. Wood considers the platform too wide to have been cut during a Pleistocene low sea level stage, instead suggesting that this formed prior to the deposition of the St. Erth beds but younger than the Miocene Lenham beds. Similarly, the river valleys crossing the shelf were considered to have initially formed prior to the Quaternary period. If this is the case, then these submerged cliff-lines should be considered as features that were inherited as low-stand coastal features during the Pleistocene period, possibly recut, but not indicative of formation at Pleistocene lowstands.

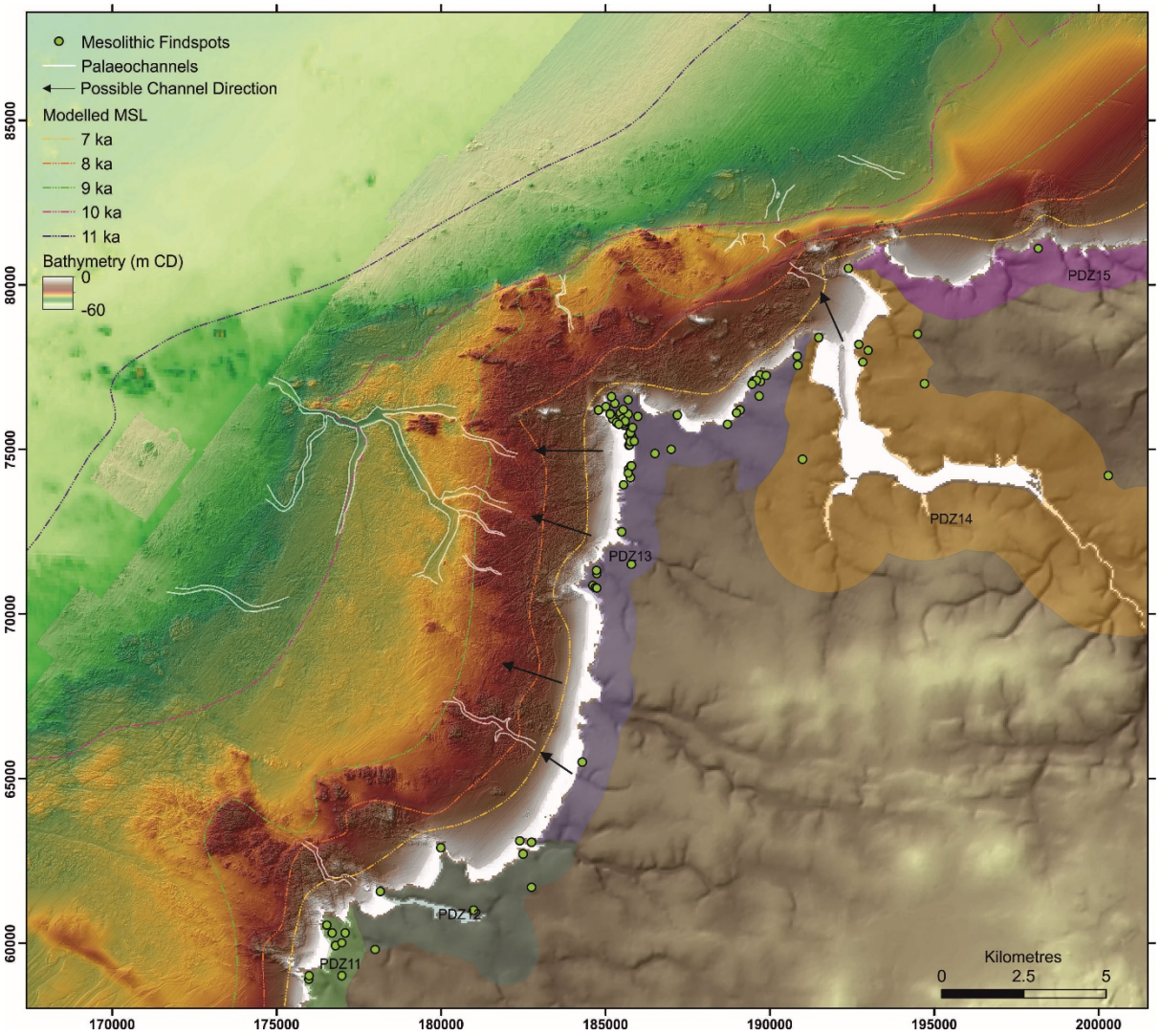


Figure 6.15: Distribution of palaeochannels offshore of Trevose Head and position of Mesolithic finds in the coastal zone. Contains Ordnance Survey data © Crown copyright and database right 2019. Channel Coastal Observatory data under the Open Government Licence v3.0. Environment Agency data under the Open Government Licence v3.0. UKHO Bathymetry contains public sector information, licensed under the Open Government Licence v3.0. EMODnet Bathymetry Consortium (2016): EMODnet Digital Bathymetry (DTM; http://doi.org/10.12770/c7b53704-999d-4721-b1a3-04ec60c87238).

Johnson and David (1982) produced a detailed study of the potential submerged landscape within the Padstow area, centred on the Mesolithic activity around Trevose Head. Within this paper they presented a series of palaeolandscape maps for the Padstow-Newquay area, utilising sea level data presented by Kidson and Heyworth (1973). This study emphasises the extensive marine lowlands now located offshore, placing the Mesolithic activity within a wider palaeogeographical context and permitting important observations to be made about the landscape setting of the Mesolithic activity, access to local resources and seasonal activity, and changes to this landscape as a result of sea level change. This study also clearly demonstrated that while these sites may today be sited on the coastline, at the time of their occupation they would have been present within a dryland terrestrial landscape with access to the marine lowlands, particularly during the later Mesolithic as the coastline migrated eastwards. The importance of Johnson and David's observations are further enhanced by the presence of an extensive submerged palaeochannel network visible in the bathymetric survey data west of Trevose Head that would have likely been active until c. 7000 BC (Figure 6.15), further emphasising the potential importance of these 'coastal' Mesolithic occupation sites and their

positioning in locations able to gain access to a wide range of resources, including river systems that can be traced laterally offshore from the relatively small terrestrial catchments onshore.

Within the Bristol Channel, Fitch and Gaffney (2011) utilised available 2D seismic data in conjunction with bathymetry data, to identify palaeolandscape features such as channels, floodplain deposits (including possible peats), sediment filled basins and possible glacial lake deposits. One of the outputs from this model was an interpolated map of these features showing potential palaeo-rivers and lakes (shown in Figure 6.16). While this map has been used to imply the submerged palaeolandscape of the outer Bristol Channel, the authors did state that "*because of the lack of absolute data, these features are considered to have a certainty of 0. They are 'guestimates' and as such, are likely to be refined when more detailed data becomes available*" (Fitch and Gaffney 2011, 54). More recent surveys, notably the higher resolution MCA CHP bathymetric surveys and studies associated with the proposed Atlantic Array OWF, have shown that several of these interpolated features are not present on the seabed or spatially imprecise. This is particularly true of the passage of the palaeo-Severn channel in the outer Bristol Channel and the apparent absence of the large glacial lake features suggested by Fitch and Gaffney (2011), with the innermost positioned over an area of exposed geology bedrock, and the outermost in an area of thin veneers of mobile sediment overlying solid geology.

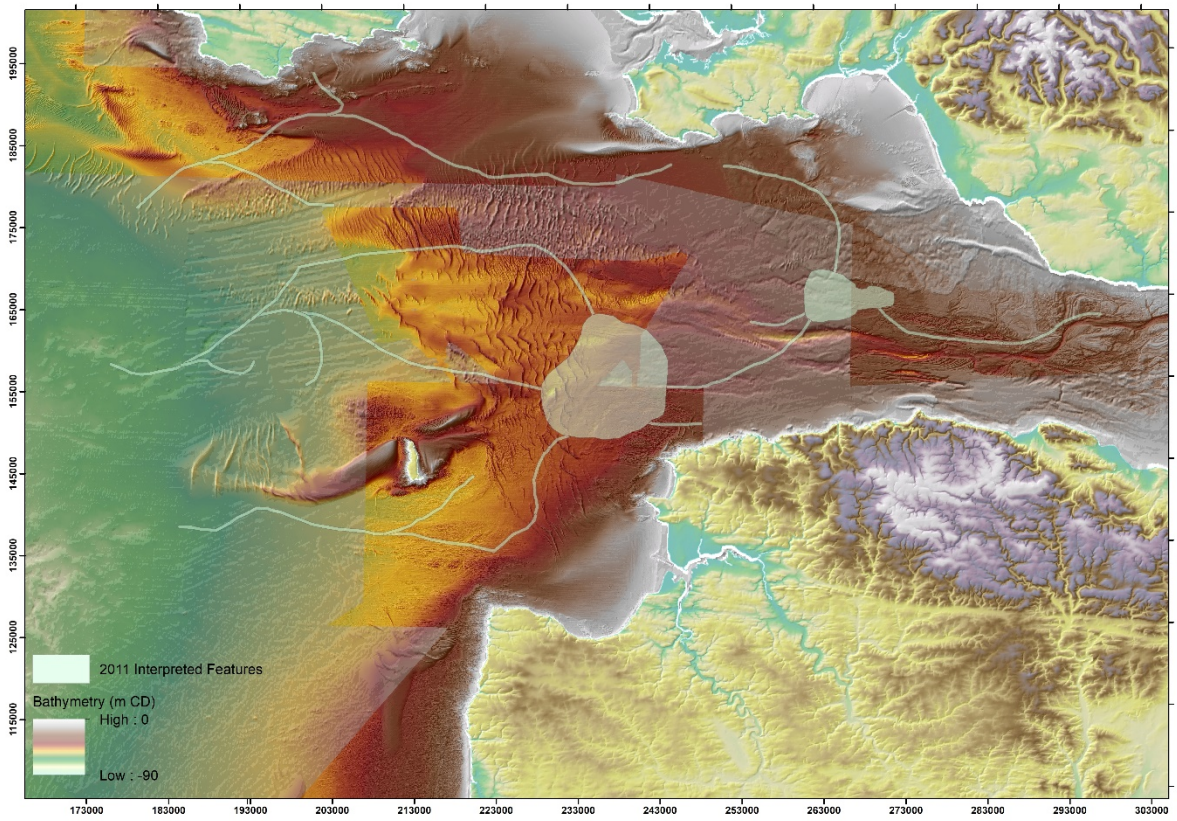


Figure 6.16: Palaeolandscape features suggested by Fitch and Gaffney (2011), compared against modern bathymetric survey data. Darker bathymetry is derived from recent swath surveys (<2m resolution). Lighter bathymetry are existent coaser-resolution bathymetry. Contains Ordnance Survey data © Crown copyright and database right 2019. UKHO Bathymetry contains public sector information, licensed under the Open Government Licence v3.0. EMODnet Bathymetry Consortium (2016): EMODnet Digital Bathymetry (DTM; http://doi.org/10.12770/c7b53704-999d-4721-b1a3-04ec60c87238). Palaeolandscape Feature data: https://doi.org/10.5284/1000398.

6.4 Late Pleistocene and Holocene Sea level

The general pattern of Holocene relative sea-level change has been established from multiple studies within the region (Heyworth and Kidson 1982; Healy 1993; 1995; Massey et al. 2008; Gehrels et al. 2011; Charman et al. 2012; 2015; Havelock 2009; Edwards 2006), though with the majority of this data was derived from beyond the RCZAS study area, notably the Isles of Scilly and Bristol Channel. Within the RCZAS study area, sea level index points have been established by Healey (1993; 1995) at Trewornan, Camel Estuary and Hayle Copper House, while Havelock (2009) has produced Sea Level Index Points (SLIPs) from within the Taw Estuary upstream of Barnstaple. The SLIPs show good agreement with Glacial Isostatic Models (GIA), such as Bradley et al. (2011), and show a period of eustatically dominated rise from -70m Relative Sea Level (RSL) at 13 ka, with a more gradual rise after reaching -7m RSL at 5.5 ka in the West Cornwall and 7ka in the North Devon and Bristol Channel areas (Figure 6.17). Within this region there are no highstands predicted within the models or suggested through the SLIP data. This means that relative sea level is now at the highest position for any period since the last interglacial highstand, when mean sea level may have exceeded current levels by several metres, as evidenced by the interglacial raised beaches found along the coastline.

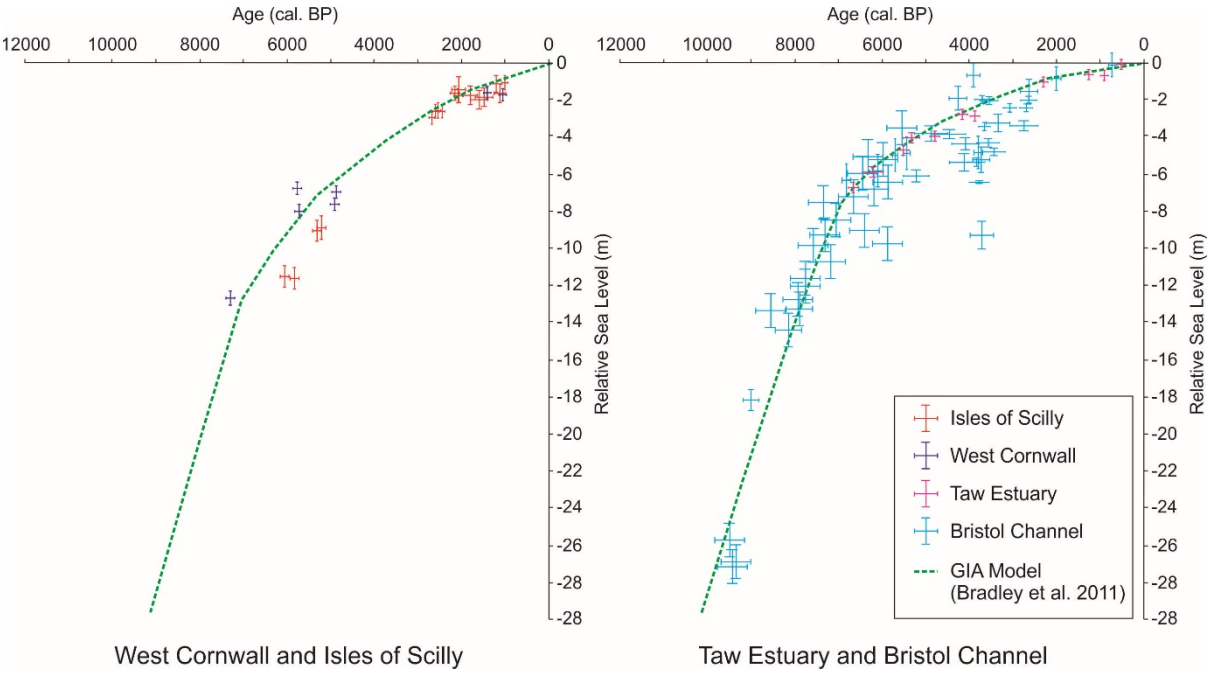


Figure 6.17: Relative sea level (RSL) reconstructions and model predictions for the study area

In addition to elevating sea-levels, there are also suggestions that the tidal range has changed throughout the Holocene period as a response to the changing palaeogeography. Mortimer et al. (2013) produced palaeotidal amplitude estimates for the Isles of Scilly showing tidal range was probably higher during the Early to Middle Holocene, before reducing to near-modern levels. This shift is demonstrated by Ward et al. (2016) through the modelling of the M_2 tidal constituent, also known as the principal lunar semi-diurnal, for the British Isles continental shelf (Figure 6.18), showing the shift during the Holocene in the highest amplitudes from the west near the Isles of Scilly during the Early Holocene, to the current highest tidal range being centred within the Bristol Channel and Severn Estuary today.

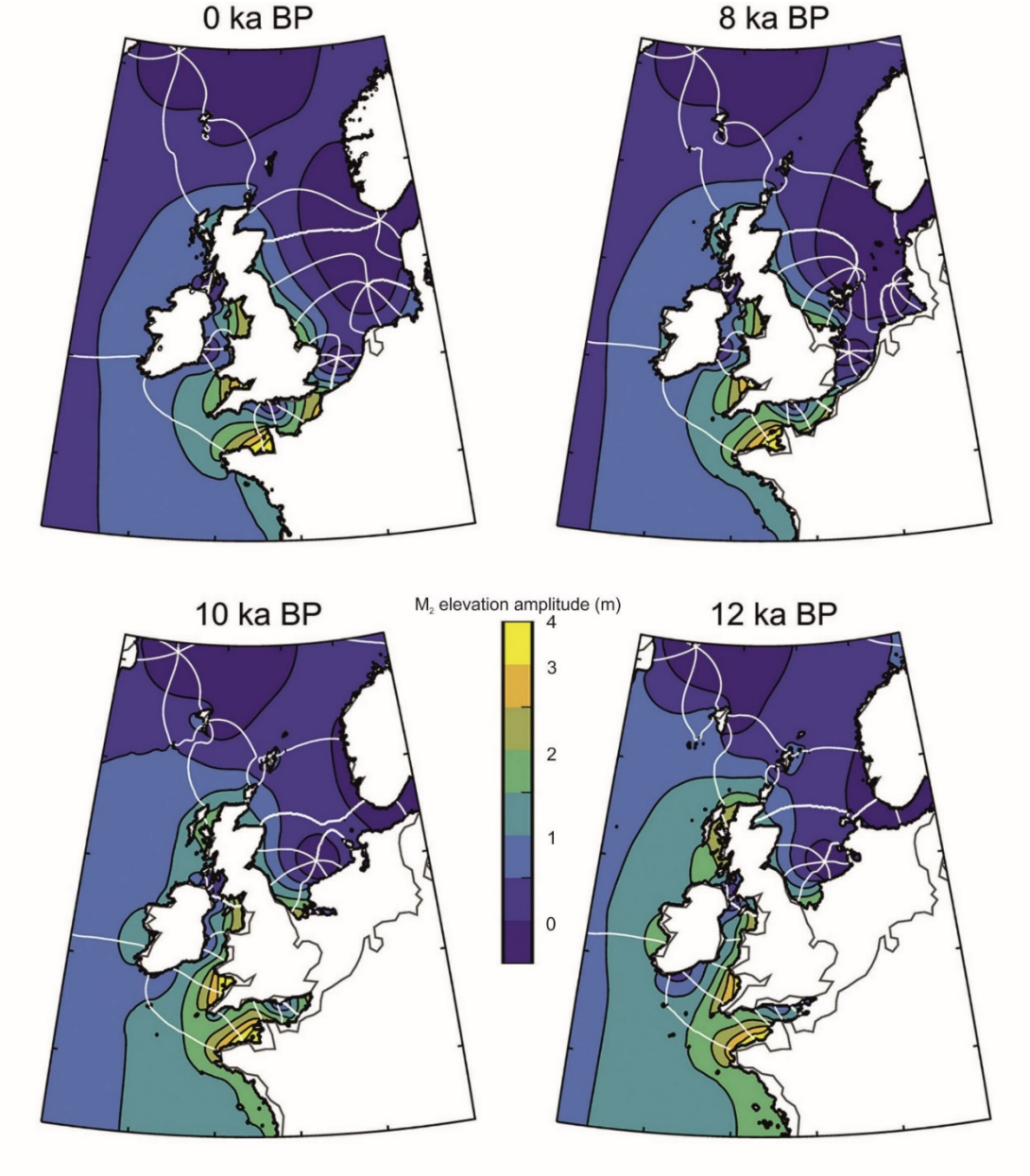


Figure 6.18: Simulated M_2 elevation amplitudes and phases for the past 12 ka, generated by Ward et al. (2016)

While these models provide the basis for understanding the regional changes in sea level against the modern conditions, it is also important to understand how this has affected the palaeogeography of the area and its potential archaeological implications, as demonstrated by Johnson and David (1982). To simulate the rate and extent of submersion of the coastal shelf area, a GIA model has been applied against a Digital Surface Model (DSM) of the southwest region. The DSM is constructed from bathymetry data derived primarily from the UKHO Bathymetry DAC and supplemented with the EMODnet Digital Terrain Model (DTM), inshore LiDAR surveys (1km strip) undertaken by the Channel Coastal Observatory survey programme, and topographic elevation data for onshore derived from the Ordnance Survey. All marine data was standardised to a common vertical datum (m OD) using the Vertical Offshore Reference Frame (VORF; Iliffe et al. 2006), allowing integration with onshore topographic mapping, and transformed using OSTN15, to create the final DSM surface.

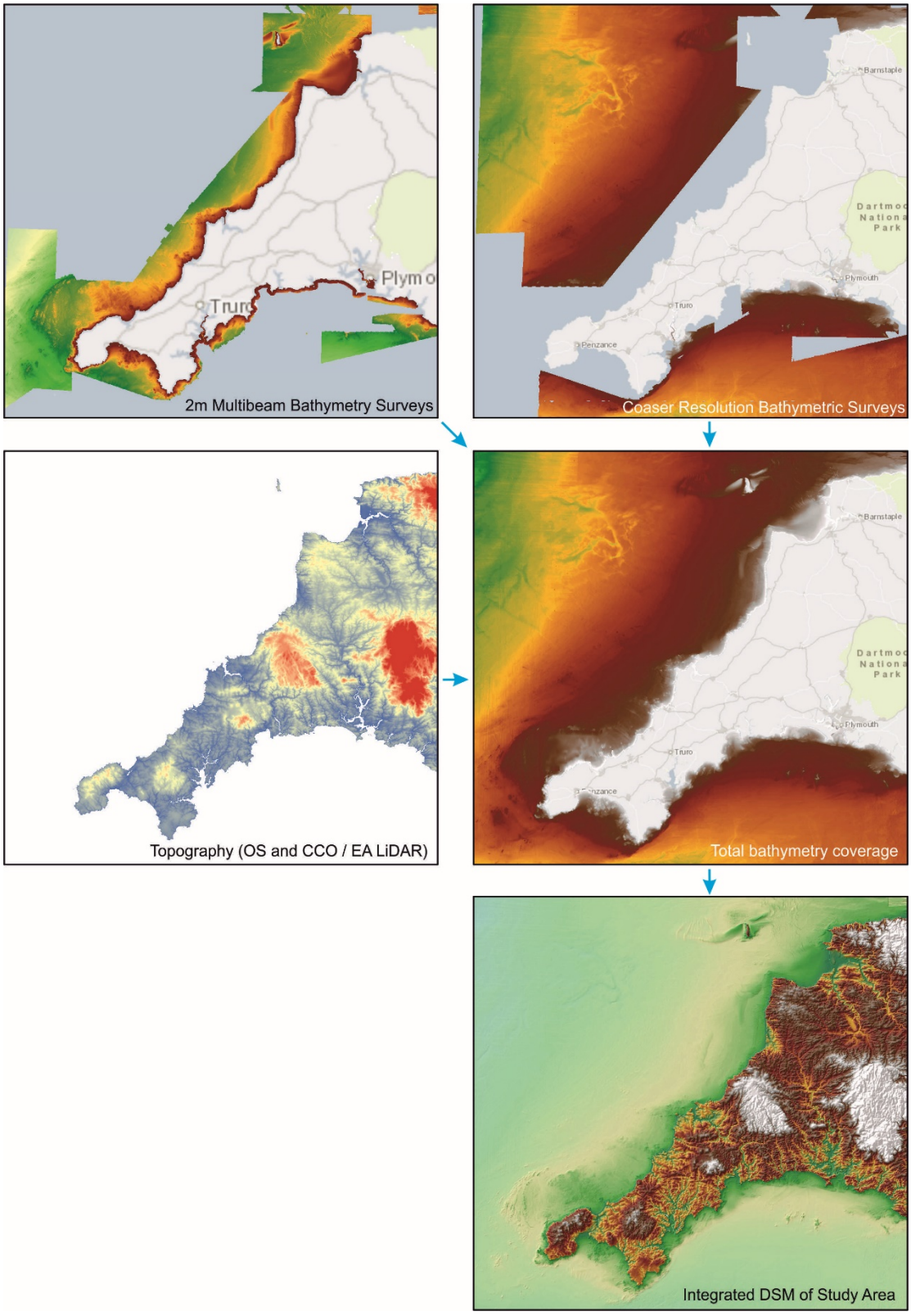


Figure 6.19: Datasets used to create the regional Digital Surface Model (DSM). Contains Ordnance Survey data © Crown copyright and database right 2019. Channel Coastal Observatory data under the Open Government Licence v3.0. Environment Agency data under the Open Government Licence v3.0. UKHO Bathymetry contains public sector information, licensed under the Open Government Licence v3.0. EMODnet Bathymetry Consortium (2016): EMODnet Digital Bathymetry (DTM; http://doi.org/10.12770/c7b53704-999d-4721-b1a3-04ec60c87238).

The Glacial Isostatic Adjustment (GIA) model of Bradley et al. (2011) was applied to the DSM for time preiods from 12ka to present, following the methodology of Sturt et al. (2013). These readjust the DSM elevation relative to the sea level at the time interval, and therefore can imply the probable location of mean sea level at the time period of interest. However these models take no account of the modelled changes in the palaeotidal range for the area nor do they account for areas where sediment accumulation has taken place, such as the large sand banks around Lundy or sedimentation associated with the mouths of estuaries. The models show that at 12 ka most of the study area would have been dryland. Lundy is likely to still retain a connection with the mainland at this time, potentially separating the palaeo-Severn catchment from that of the Taw-Torridge, located north and south of the island respectively. By 11 ka the coastline in the north of the study area would have retreated further eastwards with Lundy becoming increasingly separated from the mainland.

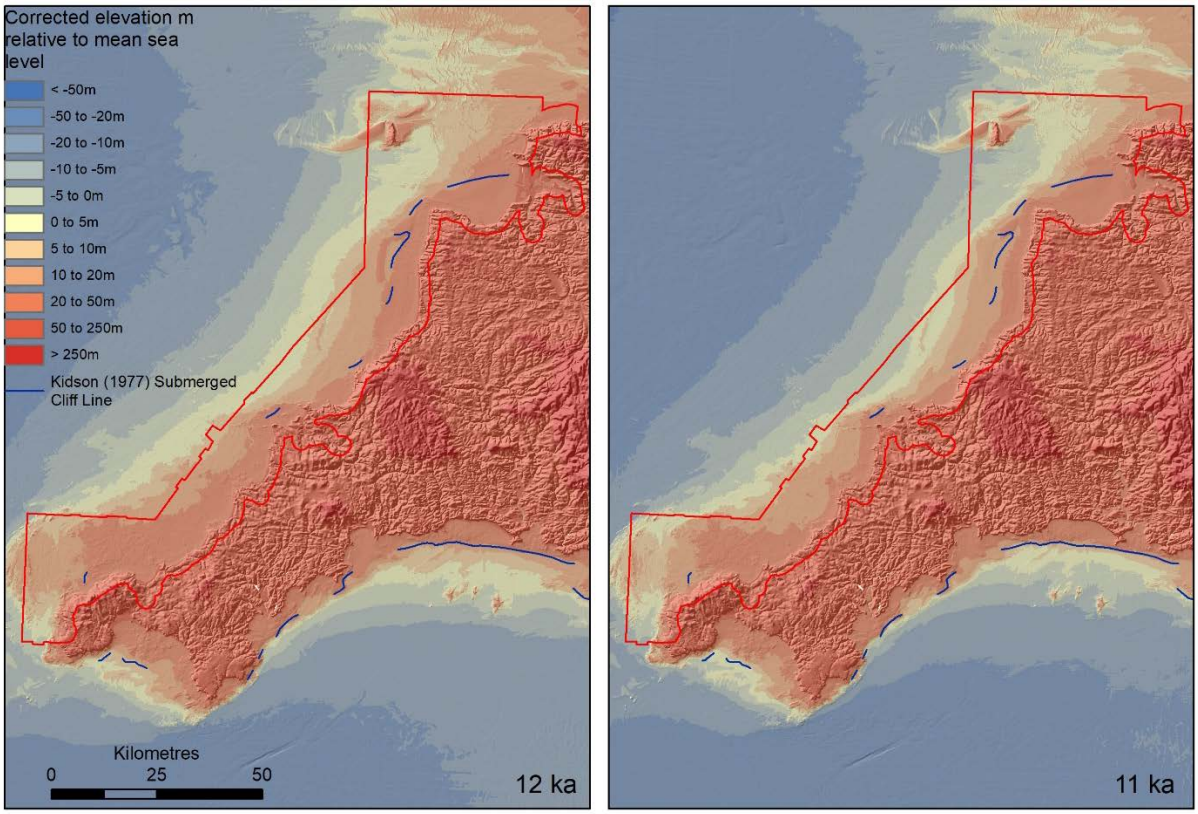


Figure 6.20: Palaeogeography reconstruction at 12 and 11 ka. Contains Ordnance Survey data © Crown copyright and database right 2019. Channel Coastal Observatory data under the Open Government Licence v3.0. Environment Agency data under the Open Government Licence v3.0. UKHO Bathymetry contains public sector information, licensed under the Open Government Licence v3.0. EMODnet Bathymetry Consortium (2016): EMODnet Digital Bathymetry (DTM; http://doi.org/10.12770/c7b53704-999d-4721-b1a3-04ec60c87238).

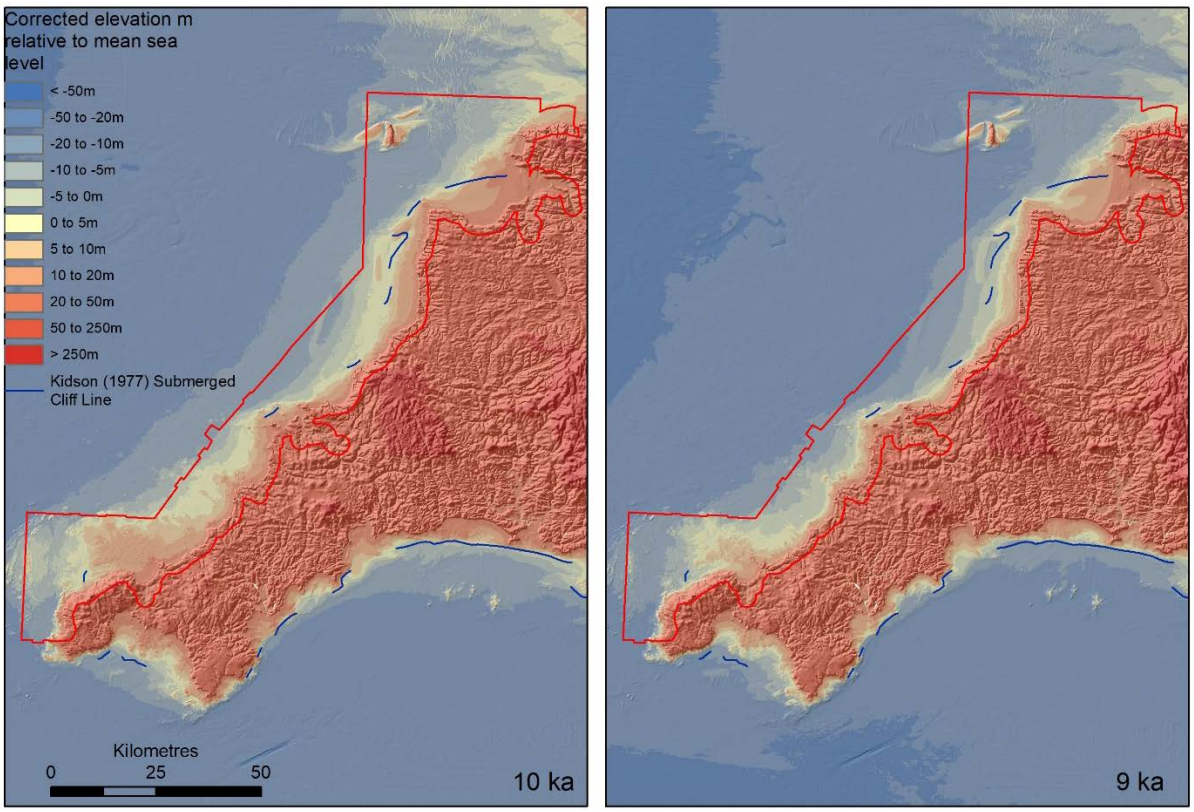


Figure 6.21: Palaeogeography reconstruction at 10 and 9 ka. Contains Ordnance Survey data © Crown copyright and database right 2019. Channel Coastal Observatory data under the Open Government Licence v3.0. Environment Agency data under the Open Government Licence v3.0. UKHO Bathymetry contains public sector information, licensed under the Open Government Licence v3.0. EMODnet Bathymetry Consortium (2016): EMODnet Digital Bathymetry (DTM; http://doi.org/10.12770/c7b53704-999d-4721-b1a3-04ec60c87238).

The submerged cliff lines mapped along the coastline by Kidson (1977) do not appear to represent persistent lowstands (at the temporal resolution reconstructed here), with inundation on the north coast occurring between 10-9 ka. By contrast, on the south coast the submerged cliff line are prevalent at the coastline on the 11-9 ka scenarios (Figure 6.20, Figure 6.21 and Figure 6.22). While coastal retreat on the north coast tends to be parallel to the modern coastline, there is a large area north of West Penwith and the Hayle estuary that remains dryland until inundation c. 8 ka. This broadly correlates with the findings of Healey (1993) where basal organic deposits within the River Amble are dated 5620-5290 cal. BC (6460±80 BP; Q-2781). By 8 ka the palaeogeography suggests that the modern shape of the coastline has been largely adopted, with the sea already close to most of the promontory headlands, although in some locations (such as the stretch around Hartland Quay) the model suggests the sea is c. 1km west of the current cliffline. By 6 ka this has reduced to c. 500m west of the current cliffline.

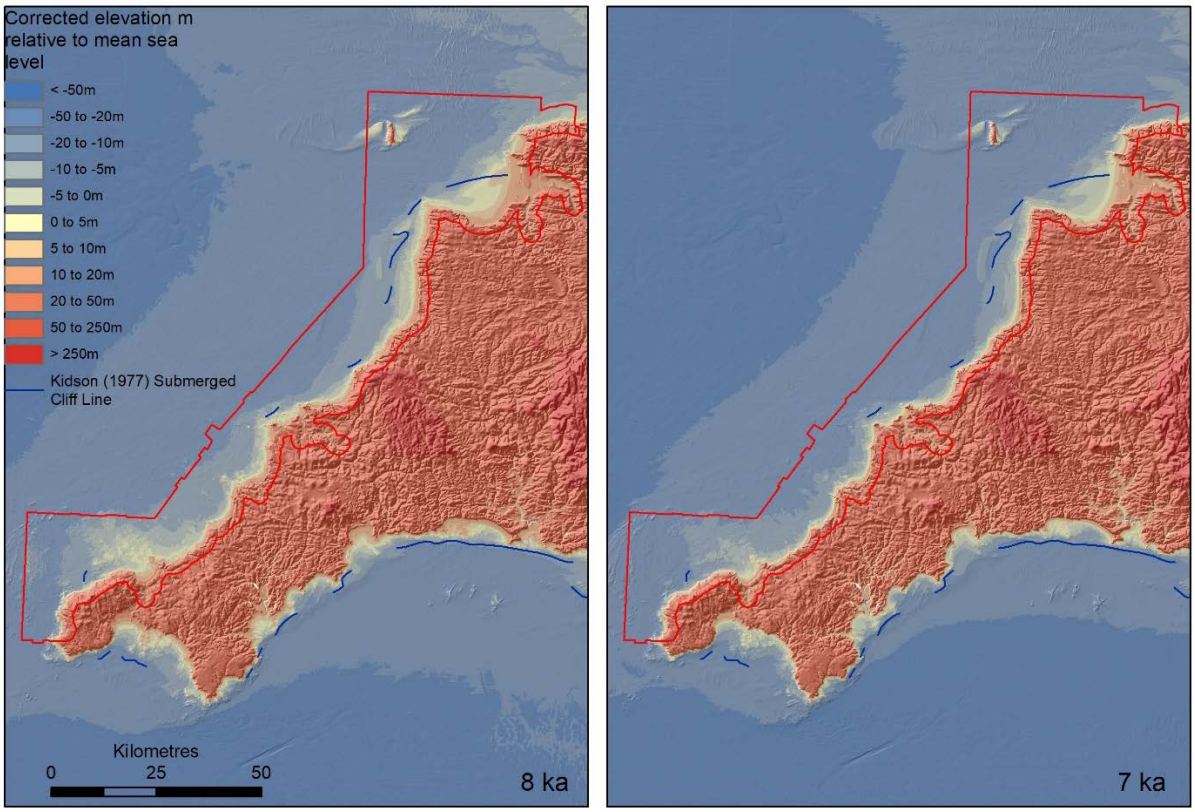


Figure 6.22: Palaeogeography reconstruction at 8 and 7 ka. Contains Ordnance Survey data © Crown copyright and database right 2019. Channel Coastal Observatory data under the Open Government Licence v3.0. Environment Agency data under the Open Government Licence v3.0. UKHO Bathymetry contains public sector information, licensed under the Open Government Licence v3.0. EMODnet Bathymetry Consortium (2016): EMODnet Digital Bathymetry (DTM; http://doi.org/10.12770/c7b53704-999d-4721-b1a3-04ec60c87238).

The palaeogeography models, as stated above, are based upon a series of simple assumptions about the interplay between the GIA model and reconstructed surface topography. However in areas of high sediment accumulation, such as at the mouths of large estuary systems or offshore sandbanks, a false impression may be generated over the extent of dryland at any given time period. Most of the seabed in the study area fortunately consists of exposed solid geology, and therefore although this is detrimental to the preservation of submerged palaeolandscape features and deposits, it does mean that the palaeogeographical models should provide a reasonably accurate reconstruction of coastline changes throughout the Late Pleistocene and Holocene periods.

To correct the issue of inaccurate modelling for the Barnstaple area, it is possible to generate a back-stripped deposit model so that Holocene superficial deposits are removed from the topographic surface. This is achievable through open access to geophysical seismic datasets from Barnstaple Bay (Atlantic Array; Wessex Archaeology (2013); and Davies (1983)) and extensive onshore studies (e.g. McFarlane 1955) coupled with borehole records retained by the British Geological Survey (BGS). The revised palaeogeography model for the area, for the period 12-1 ka, are shown in Figure 6.24 to Figure 6.26.

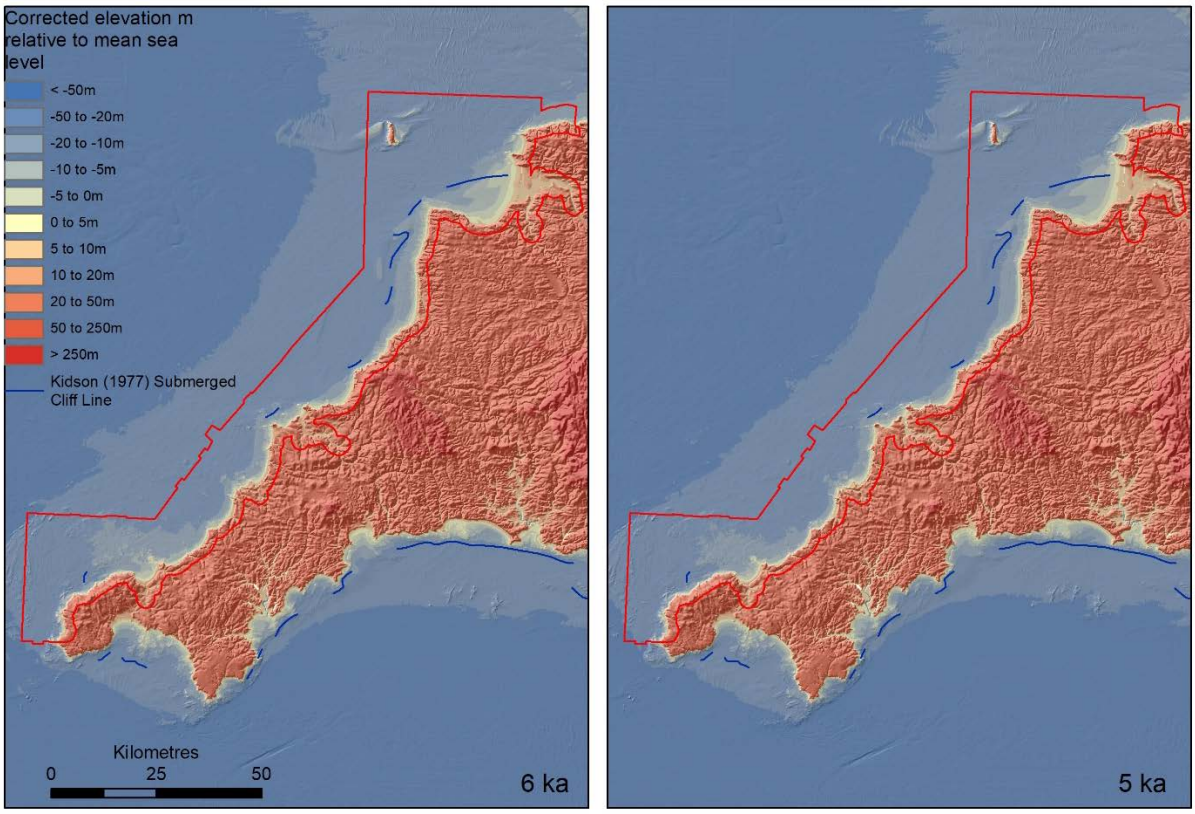


Figure 6.23: Palaeogeography reconstruction at 6 and 5 ka. Contains Ordnance Survey data © Crown copyright and database right 2019. Channel Coastal Observatory data under the Open Government Licence v3.0. Environment Agency data under the Open Government Licence v3.0. UKHO Bathymetry contains public sector information, licensed under the Open Government Licence v3.0. EMODnet Bathymetry Consortium (2016): EMODnet Digital Bathymetry (DTM; http://doi.org/10.12770/c7b53704-999d-4721-b1a3-04ec60c87238).

The model shows that during the late glacial period most of Barnstaple Bay was dryland but rapidly inundated during the Early Holocene (Figure 6.24). By 8 ka the general shape of the modern coastline is discernible, though the coast off Northam and Braunton Burrows was probably located c. 2-3km west of its current position. During this time the first marine incursion into the lower reaches of the deeply incised Taw-Torridge channel is likely to have occurred, probably extending up to Barnstaple and Appledore respectively (Figure 6.25). In the following time slices, the inland extent of estuarine influence continues to extend, agreeing with the work of Havelock (2009) within the Taw Estuary. The coastline fronting Braunton and Northam Burrows continues to migrate slowly eastwards towards its modern position, showing broad agreement with the dating of the submerged forests at Westward Ho!. After 5 ka there is little change in the gross palaeogeography of the area (Figure 6.26) beyond marginal expansion of areas of wetland along the estuary, such as the development of Yelland marsh over the probable Bronze Age stone row and nearby flint scatters.

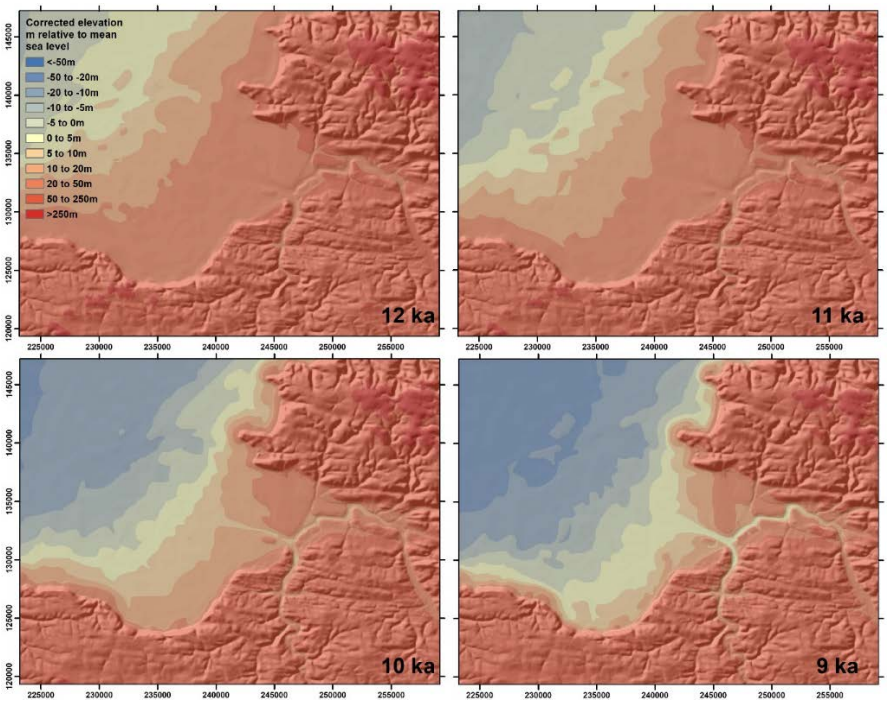


Figure 6.24: Palaeogeography reconstruction of Barnstaple Bay and the Taw-Torridge Estuary, 12-9 ka. See Figure 6.19 for data sources. Contains Ordnance Survey data © Crown copyright and database right 2019. Channel Coastal Observatory data under the Open Government Licence v3.0. Environment Agency data under the Open Government Licence v3.0. UKHO Bathymetry contains public sector information, licensed under the Open Government Licence v3.0. EMODnet Bathymetry Consortium (2016): EMODnet Digital Bathymetry (DTM; http://doi.org/10.12770/c7b53704-999d-4721-b1a3-04ec60c87238).

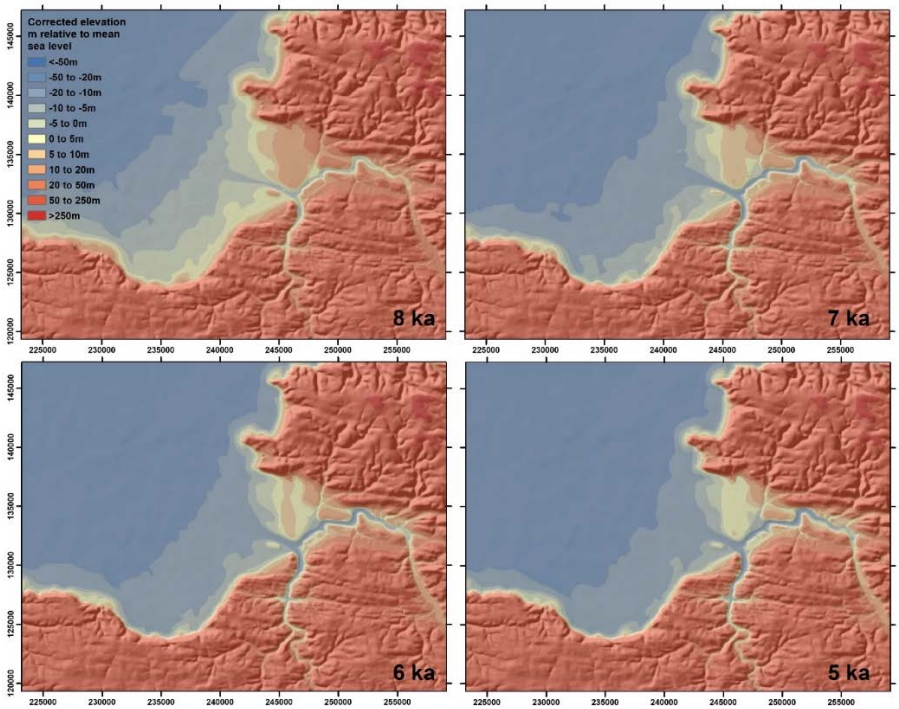


Figure 6.25: Palaeogeography reconstruction of Barnstaple Bay and the Taw-Torridge Estuary, 8-5 ka. See Figure 6.19 for data sources. Contains Ordnance Survey data © Crown copyright and database right 2019. Channel Coastal Observatory data under the Open Government Licence v3.0. Environment Agency data under the Open Government Licence v3.0. UKHO Bathymetry contains public sector information, licensed under the Open Government Licence v3.0. EMODnet Bathymetry Consortium (2016): EMODnet Digital Bathymetry (DTM; http://doi.org/10.12770/c7b53704-999d-4721-b1a3-04ec60c87238).

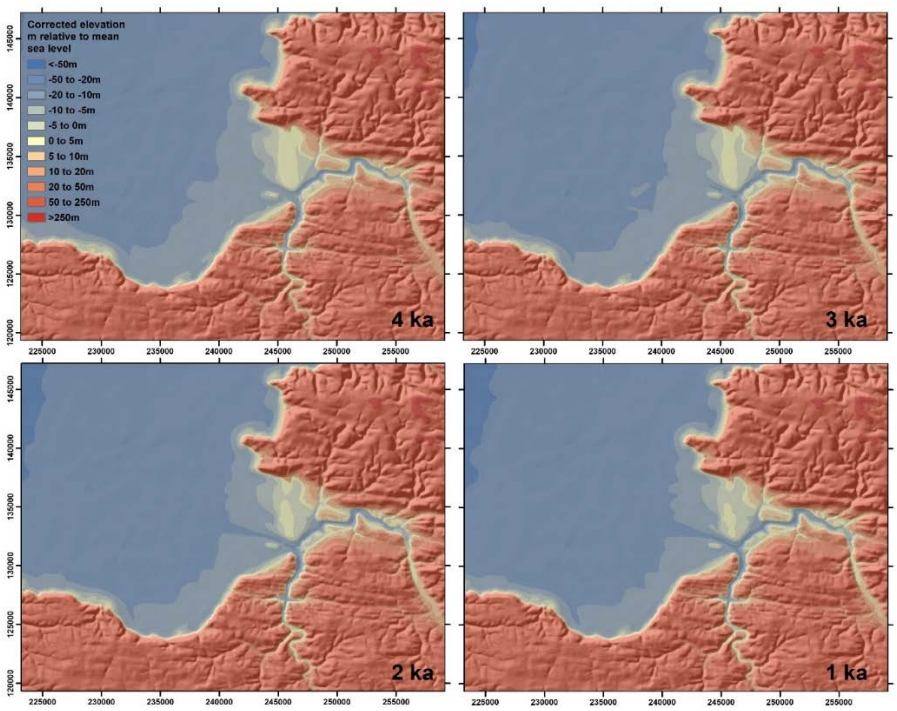


Figure 6.26: Palaeogeography reconstruction of Barnstaple Bay and the Taw-Torridge Estuary, 4-1 ka. See Figure 6.19 for data sources. Contains Ordnance Survey data © Crown copyright and database right 2019. Channel Coastal Observatory data under the Open Government Licence v3.0. Environment Agency data under the Open Government Licence v3.0. UKHO Bathymetry contains public sector information, licensed under the Open Government Licence v3.0. EMODnet Bathymetry Consortium (2016): EMODnet Digital Bathymetry (DTM; http://doi.org/10.12770/c7b53704-999d-4721-b1a3-04ec60c87238).

These models provide a coarse assessment of the changing palaeogeography within the study area and show that by the late Prehistoric period much of the modern palaeogeography had been achieved. However, as stated above, these models do not take into account estuarine sediment aggradation, most notably in areas of high sediment input, such as along the Red River and Hayle estuary. This means that in the absence of a deposit-modelling approach, the full inland extent of coastal influence, as demonstrated by inland submerged forests such as within the Red River and Hayle Estuary, may not be fully realised.

6.5 The Southwest Strategic Regional Coastal Monitoring Programme

While the Quaternary sequences provide detail on the broader changes along the coastline over millennia, this data lacks the fine-resolution information required for site management and monitoring coastal change on annual to decadal timescales. Details of these more recent changes have been captured through the Southwest Strategic Regional Coastal Monitoring Programme (SWRCMP). This programme aims to provide a consistent regional approach to coastal process monitoring, providing information on the development of strategic shoreline management plans, coastal defence strategies and operational management of coastal protection and flood defence. The Programme covers over 1000 km of open coastline between Portland Bill in Dorset and Beachley Point in Gloucestershire. Large quantities of data are made freely available from the survey and analysis programme; this has proved useful to Local Authorities within the region, the Environment Agency, consultants in coastal defence, conservation management and academic research, and for educational purposes. The Programme is managed on behalf of the Coastal Groups, in partnership with the

maritime Local Authorities and the Environment Agency Southwest Region. The Programme is funded by Defra, with Teignbridge District Council acting as the lead authority[23].

Data collected through the programme include routine coastal monitoring through LiDAR, aerial photography, topographic surveys and nearshore bathymetric surveys. This data can be used for identifying current changes in the coastal zone, such as beach elevation changes, coastal retreat and landslides. For example, at Mawgan Porth (Survey Unit 7a7A3-19; Figure 6.27), between February 2002 and 2017 an area of net erosion was identified on the eastern innermost side of the beach. This net erosion, however, only related to a significant event during late 2016 which resulted in the temporary exposure of the submerged forest within this area, which had been recovered by spring 2017 (see Appendix 5).

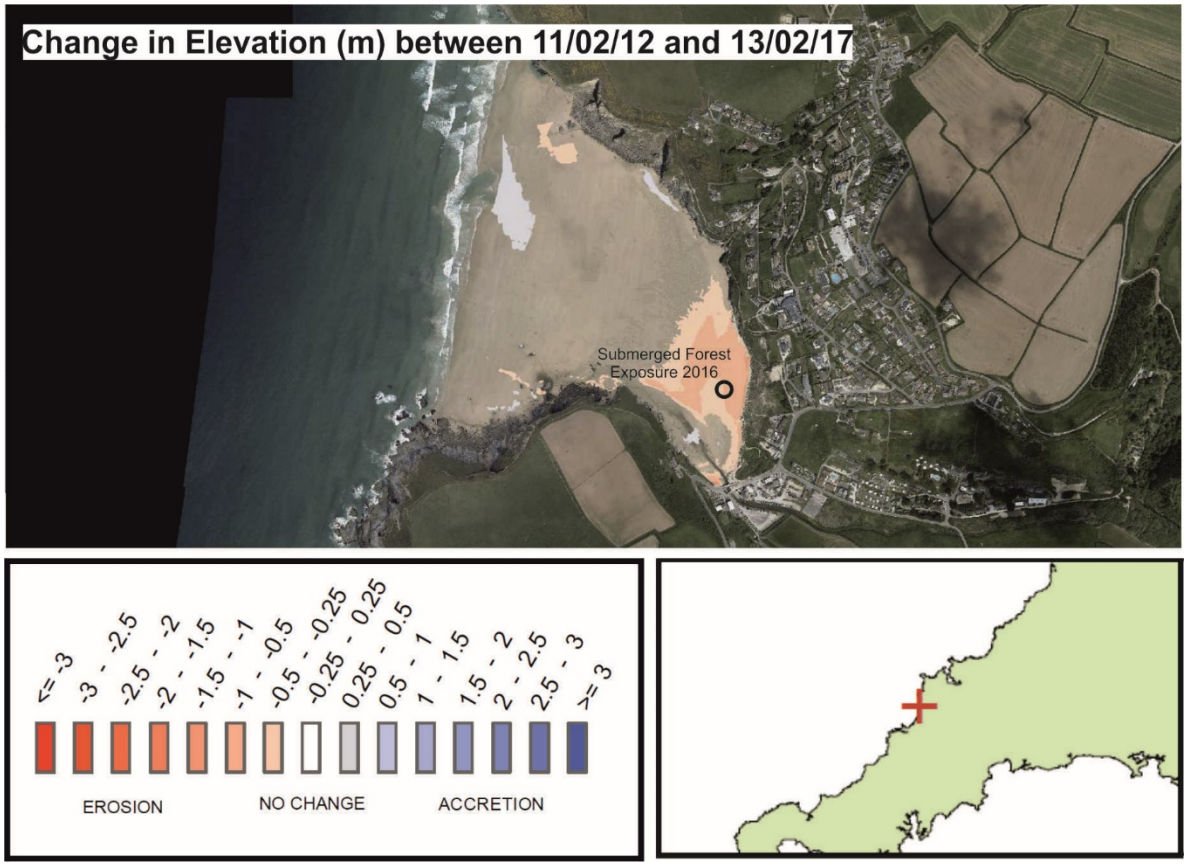


Figure 6.27: Change in beach elevation at Mawgan Porth (Survey Unit 7a7A3-19). Data from Channel Coastal Observatory (http://www.channelcoast.org/)

While these surveys highlight changes in the beach profiles, which are systematic of coastal processes and erosion, they may not be fully indicative of the conditions relating to erosion of the cliffs or dune areas located behind the beach areas, especially in stretches with comparatively soft geologies. For example, along Northam Burrows (Survey Unit 7cWest2), beach profiles show net sediment loss along stretches of the pebble ridge during the period 2007-14. This trend is also observed over a longer timescale, with historic maps and modern aerial photography revealing that the ridge has been modified over at least 150 years, with the crest of the ridge having been pushed landward at its southern end by up to 150m. In the 1870s erosion at Westward Ho! forced the hasty dismantling and re-erection of several only recently completed buildings, such as the Union Club built in 1875 and

[23] http://www.channelcoast.org/southwest/programme_aims/

dismantled in 1879. Preece (1996) has estimated that the net loss of pebbles along this stretch between 1886 and 1974 was 100,000m^3, representing a rate of net loss of about 1200m^3 a^{-1}. The ridge is recorded to have breached during major storm events in the past in 1962, 1970s and 2011 (see Moon et al. 2012; 2013). Current SMP2 predictions for no active intervention suggest further landward migration 40 to 60m by 2025 at its southern end, with up to 200 to 300m migration by 2105 under long term predictions.

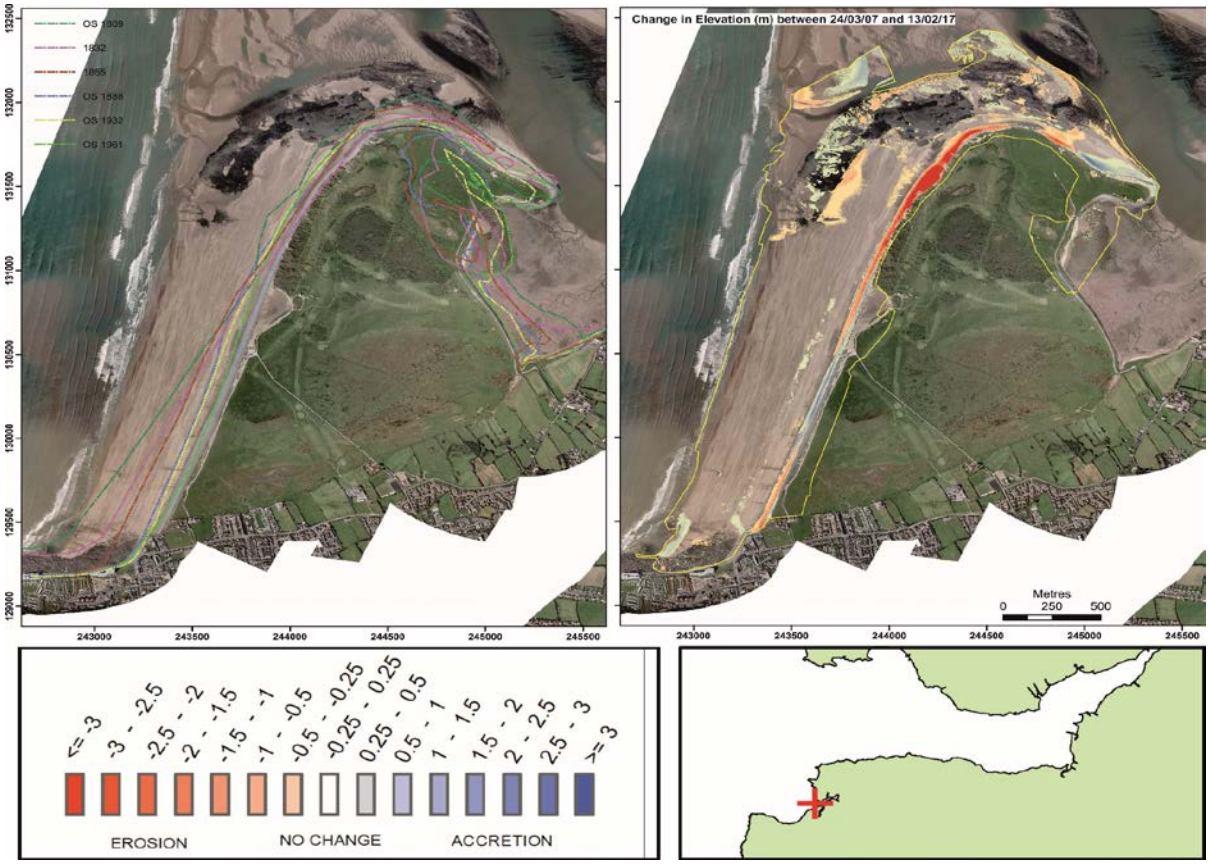


Figure 6.28: Change in beach and pebble ridge elevation at Northam Burrows 2007-2017 (Survey Unit 7cWest2). Former coastline alignments are modified from Keene (1996) and Moon et al. (2013). Data from Channel Coastal Observatory (http://www.channelcoast.org/)

7 Archaeological resource assessment and enhancement

The methodology underpinning the enhancement procedure can be divided into two broad components:

1. **County HER enhancement:** This component focused specifically on the county HERs. It consisted of an assessment aimed at verifying, enhancing, editing or adding to (where necessary) the extant county HERs.
2. **Shipwreck enhancement:** This component focused exclusively on shipwrecks. It was treated as separate from the county HER enhancement because it required construction of a new database for the study area rather than modification of existing ones. This was deemed necessary because extant shipwreck records were spread across multiple sources, each with slight differences in the level of detail, positional accuracy and data format. In addition, the structure of the extant datasets do not lend themselves to constructing queries which can be used to explore patterns in the data, further necessitating creation of a new database structure. This type of assessment is not usually undertaken in a RCZAS and more closely follows the AMAP1 and 2 (Merrit 2008; 2011) and NMR Wreck Enhancement Projects (see Dellino-Musgrave and Guiden 2013).

Before proceeding, two points must be noted. Firstly, all enhancement and editing was done on versions of the county HER's supplied at the start of the RCZAS project. Therefore, editing was not done directly into the 'live' version of the HER. Rather the the enhanced data was transferred back into the 'live' county HER on completion of the enhancement.

Secondly, despite the aforementioned separation of the county HER and shipwreck database enhancement, there was overlap between the two given that the county HERs record some, but not all, shipwrecks. Moreover, new records for unrecorded wreck material visible on aerial photographs or LiDAR (i.e. intertidal/shallow water wrecks) were created and added to the county HERs. As a result, some records appear in both the county HERs and the new wreck database. In these instances, cross-referencing has already been undertaken to ensure positional congruity while use of newly-created unique wreck ID numbers allows future cross-referencing to prevent record duplication.

7.1.1 County HER enhancement

The procedure followed for the county HER enhancement is described below.

Data acquisition

The general categories of data required for the county enhancement consist of extant HERs (both county and national-level) and spatial data. All data was acquired in digital format and from a number of sources. Historic Environment Records (HERs) included:

- Deven HER, covering North Devon only. This included the fully integrated results of the National Mapping Programme (NMP).
- Cornwall and Scilly HER, covering North Cornwall only.
- NMP data for North Cornwall.
- Mining database for North Cornwall.
- National Record of Historic England (NRHE) for North Devon and North Cornwall.

Multiple attempts were made to contact and obtain data from the National Trust HER for the study area, but this was not successful. It was not possible to integrate the National Trust HER into the RCZAS, although Heritage Gateway was used to access this data when necessary.

Additional digital databases incorporating information on particular aspects of the historic environment included:

- Portable Antiquities Scheme database (PAS) for North Devon and North Cornwall.
- Wymer and Bonsall (1977) Late Upper Palaeolithic-Mesolithic gazetteer.

Spatial data included:

- 1m-resolution (LiDAR) Digital Elevation Models (DEMs) collected by the Plymouth Coastal Observatory (PCO) between 2007-2013 and hosted on the Channel Coastal Observatory (CCO) data portal[24].
- 10cm-resolution vertical orthophotos (AP) collected by the PCO between 2006-2013 and hosted on the CCO data portal.
- Digital historic maps:
    - Ordnance Survey (OS) 1st Edition (25 inch to the mile)
    - Ordnance Survey 1st Revision, also commonly referred to as 2nd edition (25 inch to the mile)
- Devon Tithe map (mid-19th Century) supplied by Devon County Council.
- OS OpenData, including vector, raster and Terrain50 topographic data, obtained under the Open Government License

Historic aerial photos were not acquired because they had already been examined by the National Mapping Programme (NMP) for the study area (Young 2007; Knight et al. 2013).

Data integration

All data were compiled into a dedicated GIS project (.mxd) which was set up using the OSGB 1936 coordinate reference system. Spatial data were added as raster layers, either directly in the case of low-resolution datasets, or as mosaic datasets in the case of high-resolution datasets composed of multiple tiles (LiDAR, AP, OS historic maps). Additional derived visualizations were also generated in order to realise the full potential of the LiDAR data. These consisted of a standard shaded relief model (315° azimuth, 45° angle) and, to avoid azimuth-biasing, a slope map. As with the supplied LiDAR DEMs, these data were integrated as mosaic datasets.

All the HER and additional digital databases data were supplied as shapefiles (.shp, including point, polyline and polygon variants) except the PAS database, which were obtained in comma-separated variable (.csv file) format. To maintain an unmodified backup, copies of these original data were converted into individual layers within a single dedicated 'working' file geodatabase (.gdb) which would be used for the remainder of the enhancement. For this, additional fields were added to the attribute tables of the layers contained in the working HER .gdb. Any required edits or additions were then noted in these fields. This method effectively tagged each asset for edits which would be made to the county HER in the final stage of this project, and also indicated the nature of the suggested edits.

[24] http://www.channelcoast.org/

Assessment procedure

Having compiled the requisite data, the first step in the assessment was to cross-reference the county HERs against national-level records (NRHE, PAS, Wymer and Bonsall (1970) gazetteer). This was done to verify positional, descriptive and source data for each asset and determine if there were any omissions, conflicts and/or overlaps between the different records. This was done by manually checking each entry against the other sources. Cross-checking included utilisation of the linked data available online via Heritage Gateway[25], Pastscape[26] and the PAS website[27] as well as the information contained within the supplied HER records.

Following this, the next step was to cross-reference the county HERs against the high-resolution spatial datasets (LiDAR, AP, historic maps; low-resolution data were used for background mapping only). This was done to determine if additional unrecorded assets were present on these data, or if edits could be made to existing assets. For example, if an asset was marked on an earlier historic map edition than presently recorded, or its current appearance as seen on recent LiDAR or AP imagery. In most cases, the spatial data examined included multiple rounds covering the same area; for instance at least two historic map editions and up to four successive rounds of AP imagery or LiDAR.

This procedure was organized on the basis of Shoreline Management Plan (SMP) Management Area (MA) / Policy Units (PU) which run along the entire English coastline. Each MA/PU was expanded into a buffer running 1km inland from the coast which further expanded to 2km around major estuaries (Figure 2.2 to Figure 2.5). This encompassed the majority of the intertidal zone and an inland strip along the RCZAS area. Some intertidal and coastal areas fell outside (seaward) of the buffer zone owing to the rough nature of the original SMP boundary lines, so these were modified to ensure that these outlying areas were still included in the enhancement procedure.

The HER and spatial data within each MA/PU were examined separately starting at the northeastern edge of the study area (Combe Martin, Devon). The assessment proceeded south and west along the coast until the far end of the study area (Land's End, Cornwall). Therefore, in addition to the edits made directly into the working HER geodatabase, a summary document was generated for each MA/PU detailing the available data sources, and providing a descriptive overview of the changes made to the HERs and any additional comments or observations.

7.1.2 Shipwreck enhancement

The procedure followed for the shipwreck HER enhancement is described below.

Data acquisition

The general categories of data required for the county enhancement consist of extant HERs (both county and national-level) containing shipwreck records and spatial data. All data was acquired in digital format and from a number of sources which are summarized below.

Historic Environment Records (HERs) included:

- Devon HER, covering North Devon only and adjacent offshore area.
- Cornwall and Scilly HER, covering North Cornwall and adjacent offshore area.

[25] http://www.heritagegateway.org.uk/
[26] http://www.pastscape.org.uk/
[27] https://finds.org.uk/

- National Record of the Historic Environment (NRHE) for North Devon, North Cornwall and adjacent offshore area.

Additional digital archives incorporating information on particular aspects of the historic environment included:

- UK Hydrographic Office (UKHO) wreck list.
- Consultation of the records held on www.wrecksite.eu. This resource utilises UKHO records and is supplemented with observations provided by sports divers on wreck sites, such as condition of a wreck or positional errors which can be used to enhance the wreck record.
- Local history websites

Spatial data included:

- 2m resolution Maritime & Coastguard Agency (MCA) offshore bathymetry, collected 2007-2008 and 2011, hosted on the UKHO DAC and covering most of the onshore and nearshore zones (see Figure 6.19).
- 10cm-resolution vertical orthophotos (AP) collected by the PCO in 2008, hosted on the CCO data portal and covering the intertidal zone or shallow nearshore waters.

Data integration

All data were compiled into the same dedicated GIS project (OSGB 1936 coordinate system) used for the county HER enhancement.

Spatial data were added as mosaic datasets. These consisted of a standard shaded relief model (315° azimuth, 45° angle) and, to avoid azimuth-biasing, a slope map. As with the supplied bathymetry DEMs, these data were integrated as mosaic datasets.

A new MS Access database was created to contain wreck data from the various sources. The new database structure is loosely based on the UKHO data structure. This choice was made because the data are separated into additional fields compared to the extant county HERs and NRHE. This allows queries to be easily constructed in order to explore patterns in the data. For instance, additional fields include an assessment of positional accuracy, the point of origin and destination of the vessel, and an identifier indicating whether the wreck comprises known remains or is just a recorded loss. While this information is sometimes included in the county HER or NRHE, it is generally found within a longer paragraph of text and in non-standardized format. Most of the fields are self-explanatory, however, it is worth noting three key fields which depart slightly from the UKHO system. Classification refers to an identifier distinguishing between different types of entry. Specifically:

- **Wreck:** known location with wreck material (including material left after lifting).
- **Wreck?:** probable wreck site normally based on magnetometer or batymetry data.
- **Loss:** known/reported loss but no physical remains recorded by divers or survey.
- **Lift:** recorded recovery of vessel where no material is expected to have been left.
- **Aircraft:** known location with aircraft material. If not positively identified then these are categorized under Loss.
- **No record:** a dead/obsolete record (i.e wreck positively identified elsewhere).
- **Obstruction:** a feature is present but highly probable that it is natural, such as rocks.
- **Other Anthro:** a manmade feature is present but is not a wreck. Examples are piles, moorings, lost fishing gear or lost anchors.

Positional accuracy (Pos_qual) is an estimate based on the UKHO system, as utilised by wrecksite.eu:

- **Category 1: Unreliable.** Reported positions are vague (e.g. off Lundy, near Lundy), or the reported position has been surveyed and no remains found.
- **Category 2: >1000m.** Reported positions can be located to a general area. This refers either to large named geographic features (e.g. Bideford Bay) or positions with both direction and distance (e.g. 10 miles NW of Lundy).
- **Category 3: 1000m-100m**. Reported position can be located to a specific area, usually a named geographic feature (e.g. ashore at Hartland Point). It may also refer to a known wreck with a reasonably accurate reported position (e.g. from divers) but which is not visible in the bathymetry or AP data.
- **Category 4: <100m.** Reported position is based on observed physical remains observed during the RCZAS, such as in the bathymetry data or on APs.

Assessment procedure

Information on each wreck entry in the HERs was extracted and manually entered into the new database. Importantly, each individual entry was assigned a new identification number (UoS_ID), and encompasses information derived from all the aforementioned data sources. Effectively, it unifies the extant data under a single ID for each wreck and notes any conflicts between data sources, as well as any edits made to the county HERs during the RCZAS or suggested changes to the NRHE.

In addition to unifying the disparate wreck data, the assessment procedure also identified a single position regarded as the most representative place of loss for each wreck. The source of the position has been noted in the new database and is provided with an indication of its likely accuracy. Currently, many of the wrecks within the NRHE are assigned to 'named locations' which has resulted in multiple wrecks apparently located in the same place. The system of 'named locations' was a necessary step in the original creation of the NRHE wreck database, born out of the need to compile large quantities of data in a limited time and with limited numbers of personnel (S. Cant, pers comm). Therefore, the positional re-assessment was an attempt to see if improvements could be made to this system.

Some positions are known to be accurate, as they are based on visible wreckage (e.g. observed on aerial photographs or bathymetry). Others however are approximated, based on the description of loss. This can range from descriptions of localized geographic features (e.g. ashore on Hartland Point) to much vaguer statements (e.g. "off Lundy"). Therefore, positional accuracy was estimated using the variables described above. The redistribution of sites away from named locations to approximate sea positions (based upon approximate distance and direction off a named location) has resulted in the removal of hotspots from named geographical areas, notably headlands and locations such as Lundy. This is particularly important where losses might be many kilometres away from the named location. As a result headlands such as Hartland Point and Lundy no longer have multiple wreck sites attached to them, especially when losses are described as offshore collisions or losses during a storm.

As the various source records use different coordinate systems (OSGB 1936 British National Grid for the county HER/NRHE and WGS84 for the UKHO), positions were provided in both Easting/Northings and Latitude/Longitude. Transformations between the coordinate reference systems has been made in ESRI ArcMap using the inbuilt "OSGB_1936_To_WGS_1984_Petroleum" function.

Following the data compilation and position checking, the new RCZAS wreck database was cross-referenced against the bathymetry and AP data. This was done to determine if additional unrecorded

assets (anomalies) are also present, or if edits were needed to be made to existing sites. Anomalies represent features which appear different to the surrounding seabed or intertidal zone and hence could represent anthropogenic material. The presence of an exposed, tilted and well-stratified bedrock on the seabed does make identification of possible anomalies from the available remote sensing data sometimes problematic. Natural features could include isolated upstanding linear narrow outcrops which have similar dimensions to, and superficially resemble, intact upstanding shipwrecks. Full confirmation of whether any of the identified anomalies are indeed wreck material would require a program of targeted ground-truthing, such as side scan sonar, magnetometer, remotely operated vehicle (ROV), drop down camera or diver survey.

7.2 Enhancement Results: Devon

7.2.1 General Observations/Overview

The RCZAS identified a number of revisions which could be made to the Devon HER. These subdivide into five broad categories:

- **Delete?**: Record could be deleted, usually because it is a duplicate.
- **Amalgamate with:** Record can be amalgamated with another record, usually as a result of duplication.
- **Added record:** A new asset was added, either on the basis of cross-referencing from another HER or historic database (e.g. NRHE, PAS) or its appearance on one of the spatial datasets (e.g. LiDAR, AP, Historic Map). The choice of assets to add was made on the basis of previously recorded examples in the HER. For instance, wells marked on historic maps were added because examples of these were already in the county HER.
- **Additional information added:** Additional information could be added to the existing record either on the basis of cross-referencing with another HER or historic database (e.g. NRHE, PAS) or the spatial datasets (e.g. LiDAR, AP, Historic Map). This includes information on the current appearance/condition of the asset based on the spatial data, any additional source data from either the spatial datasets or other HERs or historic databases, or simply any information which is not currently recorded in the county HER.
- **Move position:** Current position of the record is incorrect either because it does not fit its described location, or does not match the position as seen on the spatial data.

Summary figures for each of these categories can be found in Table 7.1. Consistent themes have also emerged in the nature of the suggested edits for each of these categories and are detailed in the subsections below.

Table 7.1: Summary of figures for the RCZAS HER assessment for Devon only. This shows the total number of assets examined, the number tagged for additional editing or deletion and the number of unrecorded sites added to the HER.

	Total examined	**Edits suggested**	**Delete record?**	**Added record**	**Additional information added**	**Amalgamate with**	**Move position**
HER (point)	2758	935	376	185	302	274	310
HER (polygon)	4775	1388	4	1064	232	82	4
Total	7533	2324	381	1249	534	356	314

7.2.2 'Delete record' and 'Amalgamate with'

The majority of records requiring deletion stem from the migration of the county HER to HBSMR. This resulted in auto-creation of Listed Building records even where Monument records for the same asset already existed (Ann Dick, pers comm). As suggested by the Devon HER archaeologists, duplicate assets with higher MonUID numbers were tagged for deletion and their lower MonUID number equivalents (i.e. the original older record) were tagged for amalgamation with the newer records. For example:

- MDV62559 (the Lantern, a former Presbyterian meeting house in Ilfracombe) is also recorded by duplicate record MDV96534. Therefore, MDV96534 is tagged for deletion and MDV62559 is tagged for amalgamation with MDV96534.

A number of less common reasons were also identified for duplication and therefore deletion or amalgamation. In some cases, it appeared the result of the same asset was recorded in two ecclesiastical parishes (e.g. boundary stones). For example:

- MDV32612 and MDV32613 both refer to boundary stones in Fremington. The records and location are identical with the exception of the ecclesiastical parish: Fremington (MDV32612) and Instow (MDV32613). A possible cause for this duplication could be because the record derived from the old Greenbacks which detailed Listed buildings by parish. Listed assets which lie on a parish boundary (such as boundary stones, but also e.g. bridges spanning rivers) therefore always had to be listed under each parish and therefore acquired duplicate Listing IDs, and therefore duplicate HER entries, when the Greenbacks were recorded on to HERs. Many such boundary-spanning assets still have duplicate numbers within the NHLE. For the enhancement, however, MDV32612 has been tagged for amalgamation and MDV32613 for deletion.

Duplication may also result from positional uncertainty, with some records being placed at the right location, but having a similar duplicate nearby. For example:

- MDV58145 refers to 3 wooden hulks on the Torridge River foreshore. This information is derived from the UKHO wreck list which actually gives a lat/long position some 350m north of the recorded point. This spot is the location of at least 4 wooden hulks recorded as MDV53865 (polygon) and MDV66189 (point). In this case, the polygon record has the most accurate description and location, so it is suggested that the 2 point records are deleted and the information therein is amalgamated into the polygon.

In other cases, an asset was represented by both polygon and polyline feature, but with different MonID numbers. Related to this is the addition of a polygon feature (based on spatial data) which better represents the extent of an asset already recorded as a point feature. This then requires deletion of the original point feature. For example:

- MDV69873 and MDV69874 are point records for adjacent mill leats north of Barnstaple. However, MDV69873 is also recorded by a polygon feature - MDV68213 – which better represents the full extent and shape of the leat. It is therefore suggested that MDV69873 is deleted and any relevant information amalgamated into MDV68213. At the time of the assessment, MDV69874 did not have an equivalent polygon record. Therefore, a new polygon was digitised and is it suggested that the original point record - MDV69874 – is deleted and that the MonID and associated information are migrated into the new polygon record.

Finally, in a few cases, deletion was advised because the asset simply did not appear on the stated source data at the recorded position. This may have been the result of a positioning error during the original data entry. For example:

- MDV60708 refers to a limekiln at Berrynarbour recorded as being mapped on the 1904 (2nd Edition/1st Revision map). However, no such asset is present on this map, or on the earlier 1st Edition or Tithe Maps. The lack of evidence is in fact recorded in the entry on Heritage Gateway, so it is suggested that the record is deleted.

7.2.3 'Added record'

Overall, 1249 unrecorded assets were suggested for addition to the Devon HER. Site types with more than 10 counts are shown in Table 7.2.

Table 7.2: Most common types of asset suggested for addition to the Devon HER by the RCZAS (n≥10)

Monument Type	Number of Entries
WELL	233
QUARRY	137
FINDSPOT	118
BRIDGE	75
BUILDING	67
BOUNDARY	57
FIELD BOUNDARY	39
MOORING BOLLARD	39
SIGNAL POST	36
FOOTPATH	35
SLUICE	28
MILEPOST	23
FIELD SYSTEM	22

Monument Type	Number of Entries
WRECK	20
FISH TRAP	18
FORD	18
EMBANKMENT	15
LIMEKILN	12
GUIDE POST	11
LINEAR FEATURE	11
SMITHY	11
WEIR	11
STONE	10

The vast majority of records suggested for addition were based on features seen on the historic maps. This explains the preponderance of monument types such as wells, quarries, footpaths, (foot)bridges, fords, mileposts and signal posts. Quarries are also often marked on historic maps, and in some cases possible unmapped quarry pits were also visible on the LiDAR data (see below). From the historic maps, specific features relating to coastal/maritime activities include mooring bollards, sluices (when part of drainage associated with land reclamation) and artificial embankments/flood defences (Figure 7.1 and Figure 7.2). Possible features also suggestive of coastal/maritime activity include mapped footpaths leading to coves, beaches or shorelines which are otherwise relatively inaccessible (e.g. steep cliffs). Reasons for getting to these spots could range from their use as landing places, paths cut to allow salvage of stranded wrecks and cargo, or routes to activities such as coastal cliff quarrying (Figure 7.3).

The relatively high number of findspots shown in Table 7.2 is a product of inclusion of the PAS database, which alone was responsible for inclusion of 114 such records, with the remainder coming from either the NRHE or the Wymer and Bonsall (1977) gazetteer. In terms of date, the PAS finds are mainly medieval and post-medieval (Table 7.3), though the occurrence of prehistoric finds in areas such as Croyde and Mortehoe are consistent with earlier finds reported from these areas. There are notably no PAS reported discoveries in the north of the area around Ilfracombe, either suggesting low levels of investigation or reporting. A range of find types were represented, with the most common being small metal objects such as coins, tokens, buckles but also including non-metal objects such as pottery and lithics (Table 7.4). PAS finds occur across the study area, but distinct clusters are present within the Taw Torridge Estuary, particularly around Barnstaple (Figure 7.4).

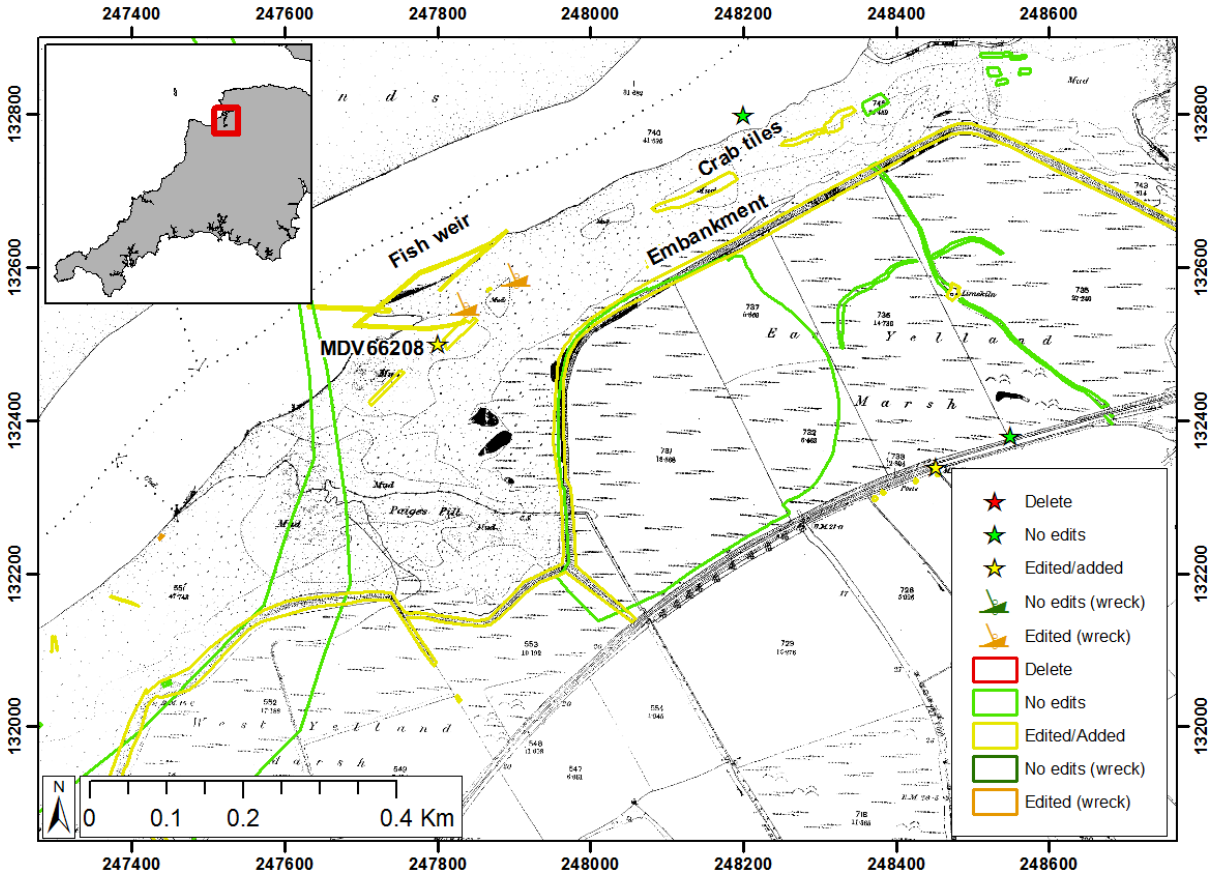


Figure 7.1: Example of unrecorded assets possibly relating to maritime activity (location: Yelland Marsh). An embankment is depicted on the OS 1st Edition map (yellow polygon running NW-SE across the image) but is not shown on the earlier Tithe Map, placing its construction in the mid-late 19th century, probably for the purpose of land claim upon the marsh. At the time of assessment, the embankment was not recorded by the Devon HER, and has therefore been tagged for inclusion along with a number of other intertidal features such as modern crab tiles. The fish weir recorded by the county HER was as a single point record (MDV66208). The former line of the weir is actually shown on the Tithe Map and therefore an equivalent polygon record has been created during the RCZAS and suggested for inclusion in the Devon HER. Contains Ordnance Survey data © Crown copyright and database right 2019 © Crown Copyright and Landmark Information Group Limited (2019). All rights reserved.

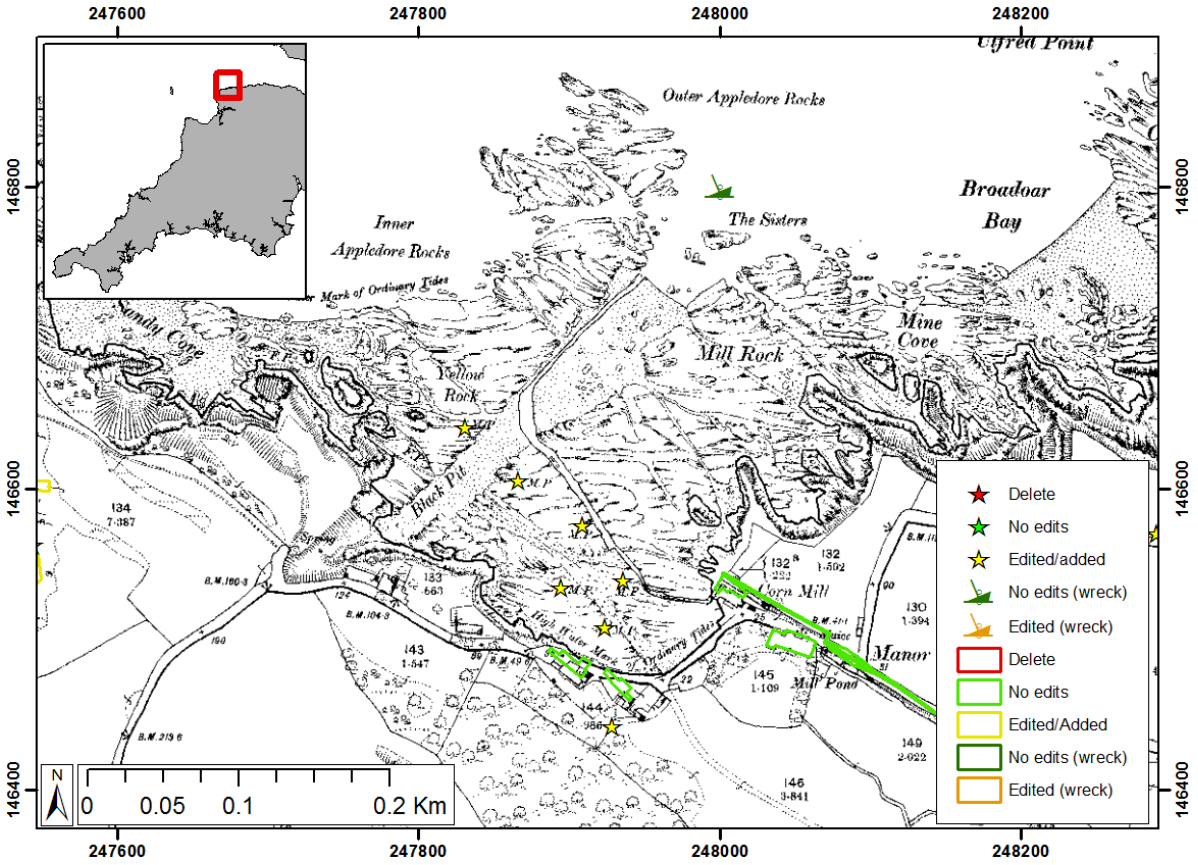


Figure 7.2: Example of unrecorded assets relating to maritime activity (location: Lee Bay). A cluster of mooring bollards (labelled 'M.P') are shown on the OS 1st Edition map in the centre of the image. At the time of assessment, these were not recorded by the Devon HER, and have therefore been tagged for inclusion. Contains Ordnance Survey data © Crown copyright and database right 2019 © Crown Copyright and Landmark Information Group Limited (2019). All rights reserved.

Table 7.3: Age distribution of PAS finds suggested for addition to the Devon HER.

Period	No. of entries
Post Medieval	43
Medieval	25
Unknown	16
Medieval to Post Medieval	11
Bronze Age	3
Neolithic to Bronze Age	3
Prehistoric	3
Roman	3
Medieval to Modern	2
Early Medieval (Saxon)	1
Late Bronze Age	1
Neolithic	1
Post Medieval to Modern	1

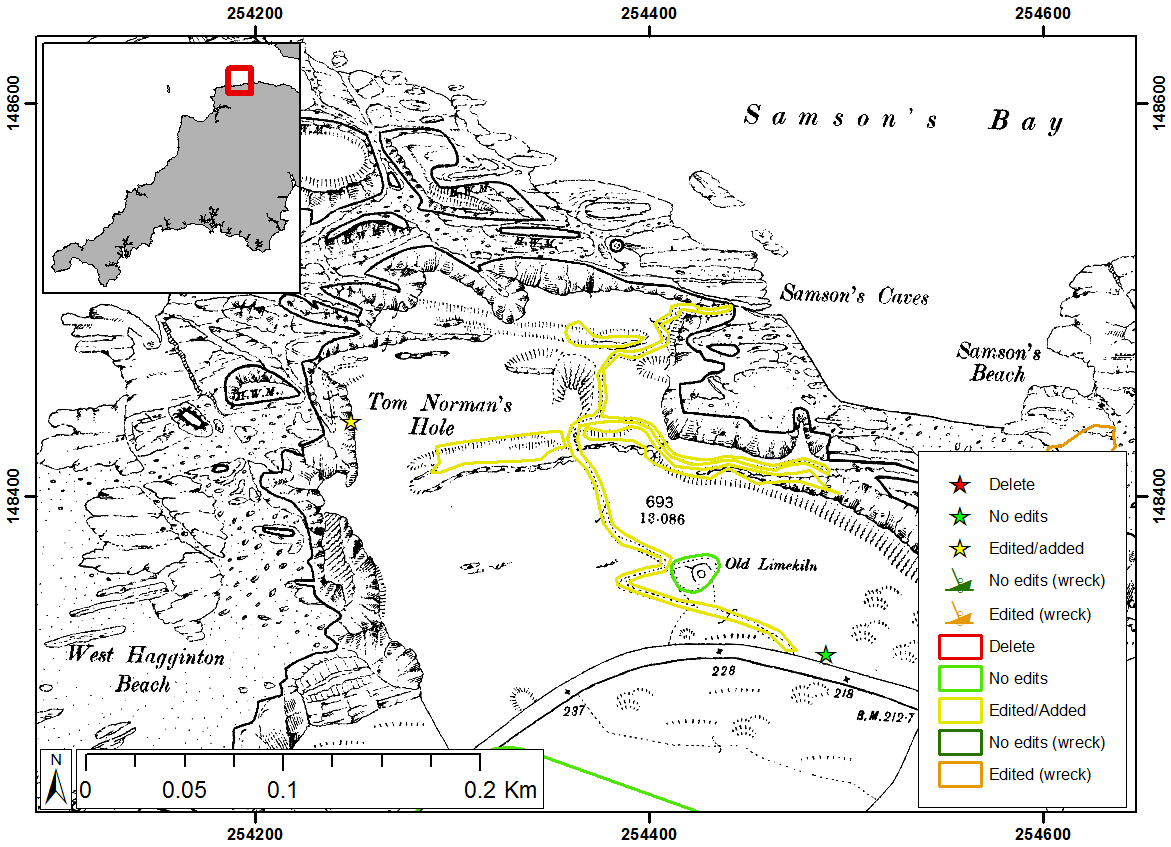


Figure 7.3: Example of unrecorded assets possibly relating to maritime activity (location: Samson's Bay). A footpath running north from the main coastal road (dashed parallel lines) is depicted on the OS 1st Edition map in the centre of the image. This links the coastal road to the shore and could have therefore been used to access Samson's Bay. Moreover, the path links a limekiln (recorded in the HER as MDV21758) to a series of mapped depressions and subvertical faces which are still visible on recent LiDAR data. It is therefore possible that these represent quarrying activity. At the time of assessment, the path and possible quarries were not recorded by the Devon HER, and have therefore been tagged for inclusion. Also tagged for inclusion is Tom Norman's Hole, a cave which local historical sources[28] suggest is a former prospection tunnel with evidence for blasting. Contains Ordnance Survey data © Crown copyright and database right 2019 © Crown Copyright and Landmark Information Group Limited (2019). All rights reserved.

Table 7.4: Most common types of PAS finds suggested for addition to the Devon HER (n≥3).

Find type	No. of entries
COIN	13
TOKEN	8
BUCKLE	7
JUG	6
CHAMBER POT	5
MOUNT	4
VESSEL	4
LITHIC IMPLEMENT	3
RING	3
TANKARD	3
UNIDENTIFIED OBJECT	3

[28] www.johnmoore.co.uk/hele/places

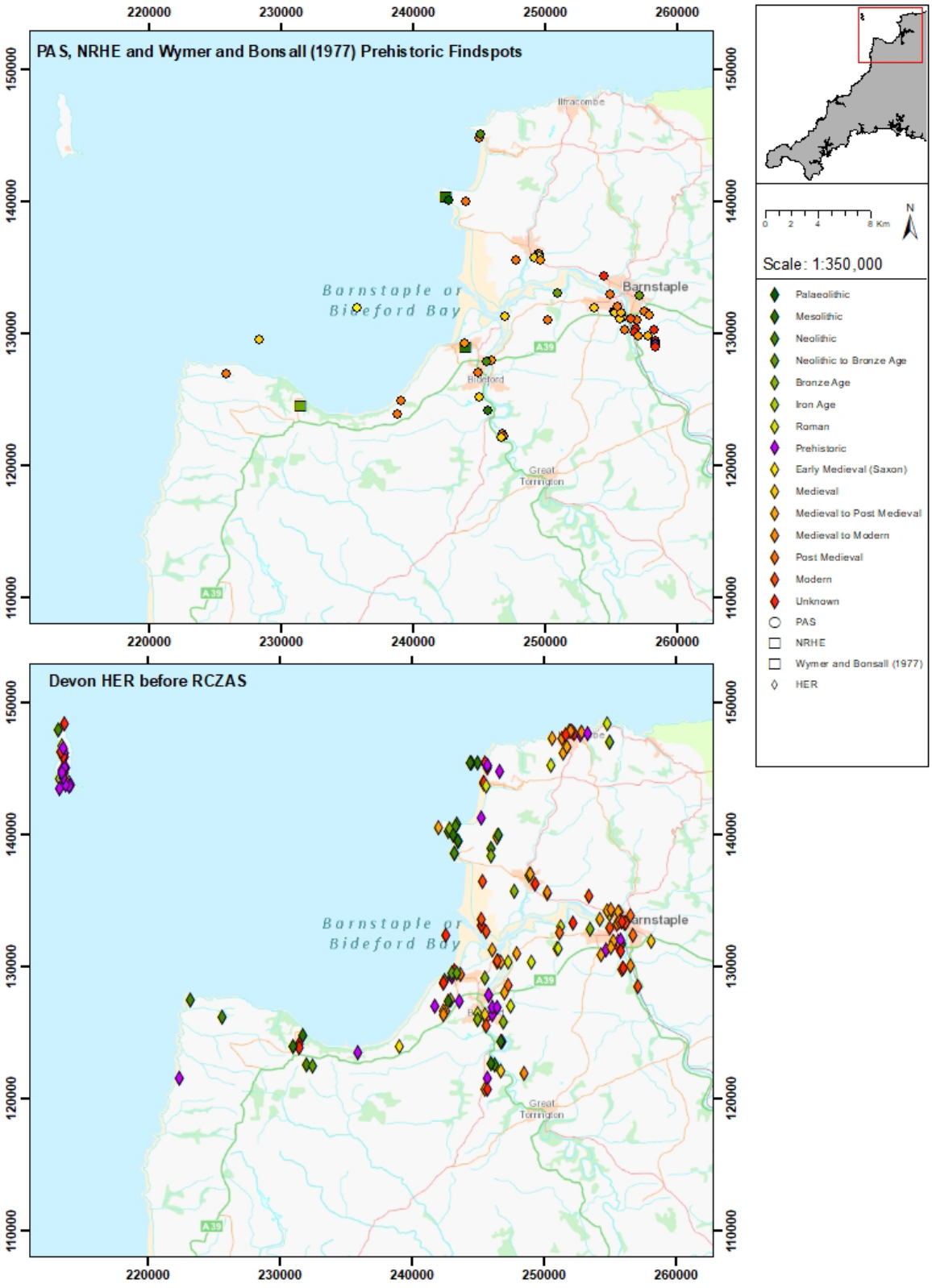


Figure 7.4: Comparison of the distribution of findspots added from the NRHE and PAS against the Devon HER data (pre-enhancement). Contains Ordnance Survey data © Crown copyright and database right 2019

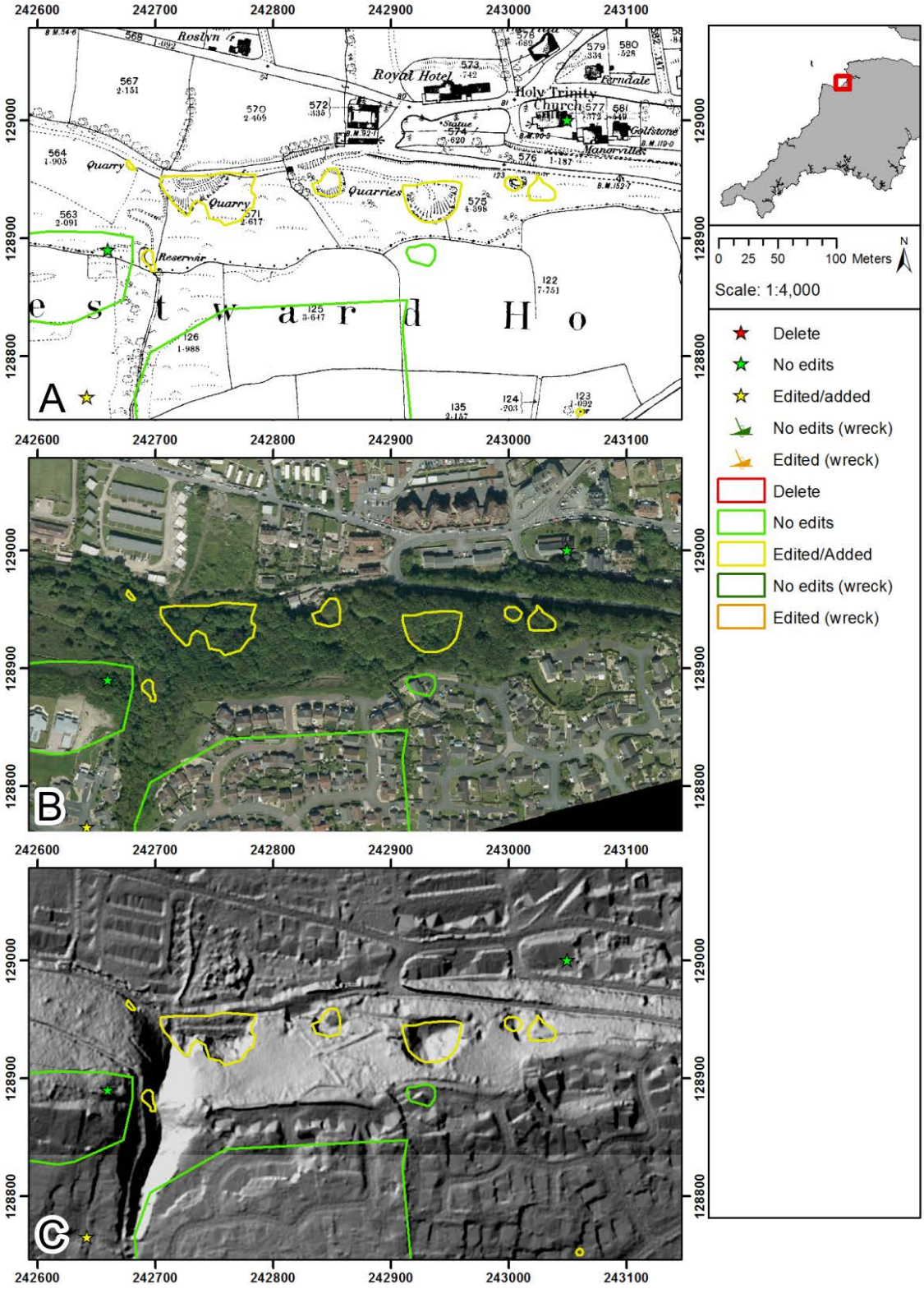


Figure 7.5: Example of unrecorded assets identified from multiple spatial datasets (location: Westward Ho!). A) A group of quarries is marked on the slope south of Westward Ho! on the OS 1st Edition map (indicated by yellow polygons). B) The same area as shown on recent APs; the slope is under tree cover and the quarries are obscured. C) As above but with a LiDAR shaded relief model and clearly showing the former quarry pits. At the time of assessment, these were not recorded by the Devon HER, and have therefore been tagged for inclusion. Contains Ordnance Survey data © Crown copyright and database right 2019 © Crown Copyright and Landmark Information Group Limited (2019). All rights reserved. Data from Channel Coastal Observatory (http://www.channelcoast.org/)

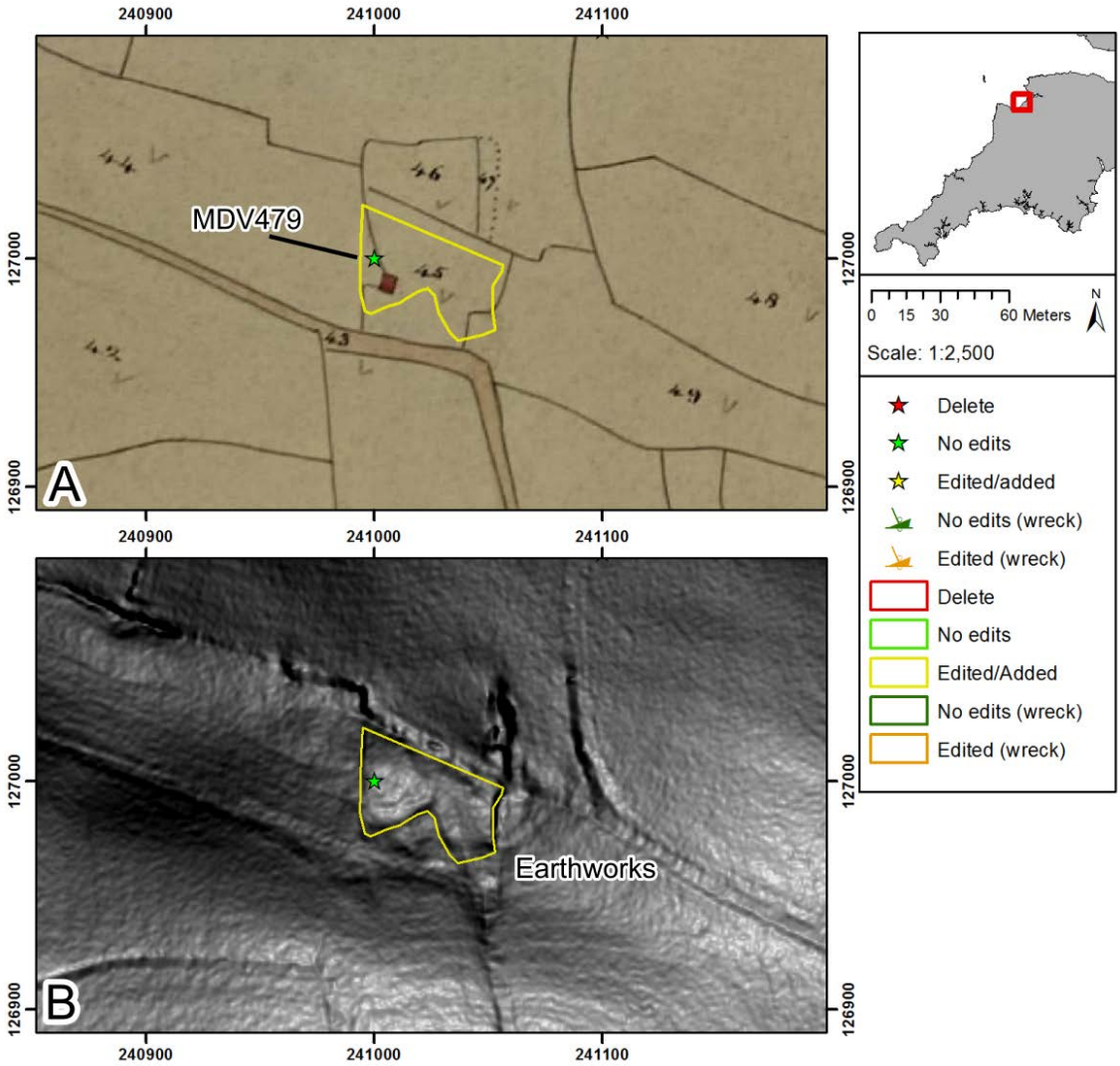


Figure 7.6: Example of unrecorded assets identified from multiple spatial datasets (location: Abbotsham). A) A small group of boundaries (indicated by yellow polygons) surrounding a small building (recorded as MDV479: possible holy well) are depicted on the Tithe. Contains Ordnance Survey data © Crown copyright and database right 2019 © Crown Copyright and Landmark Information Group Limited (2019). All rights reserved. Data from Channel Coastal Observatory (http://www.channelcoast.org/)

Some new records were added on the basis of LiDAR data. However the resolution of the LiDAR (1m) is insufficient to detect very subtle features, so the majority of features added were earthworks with a larger topographic signature. These comprised mainly removed field boundaries, quarries and embankments, with a few mounds, pits and linear features (Figure 7.5 and Figure 7.6). Many of the possible field boundaries correlate with ones depicted on the Tithe Map or OS 1st Ed map, raising the possibility that they are part of relatively recent (modern to post medieval) age field systems (Figure 6). However, examples of earlier field systems indicated by lynchets or boundaries which are not mapped on either the Tithe or OS maps occur in several places, for instance southeast of Morte Point (Figure 7.7).

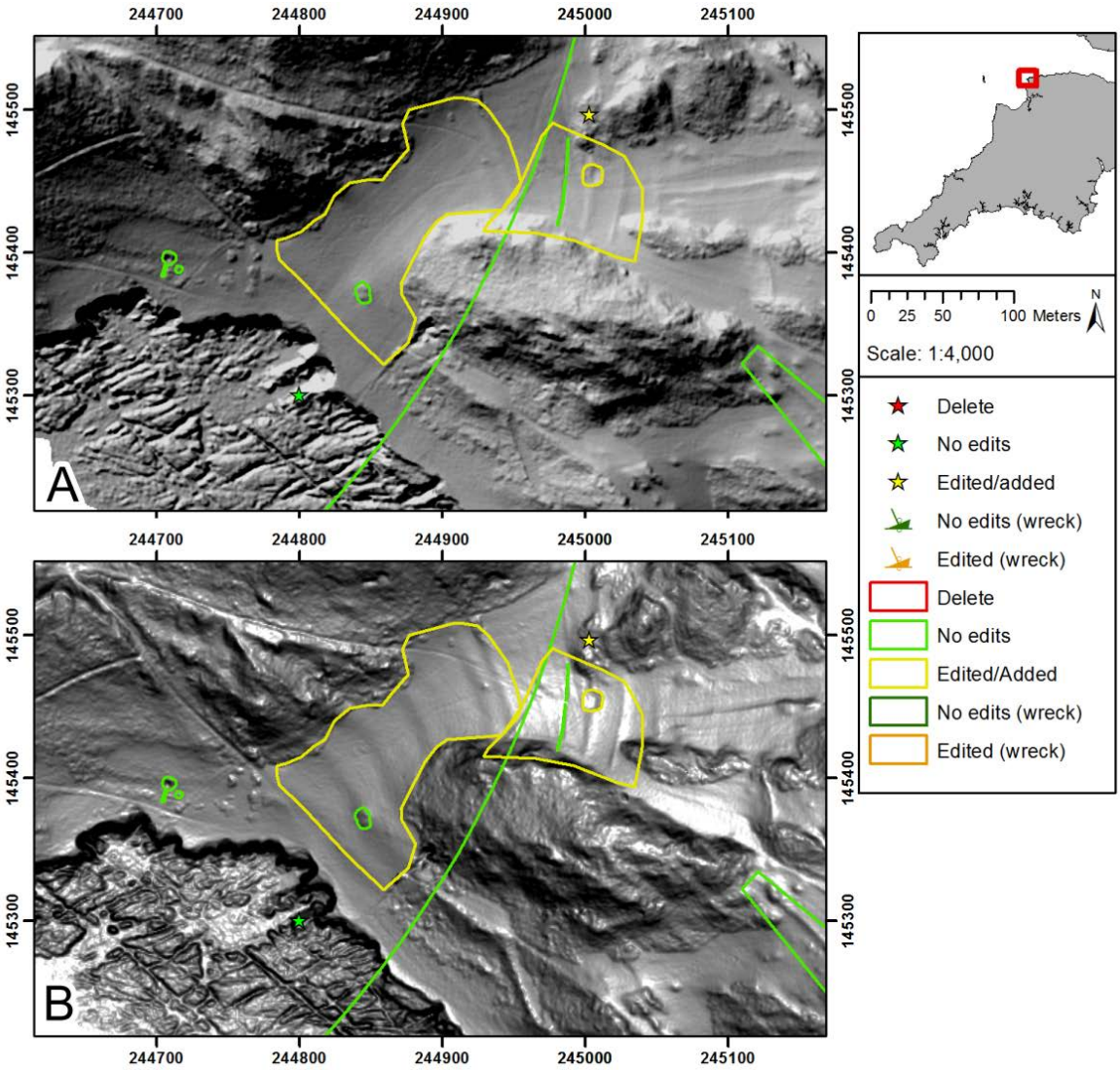


Figure 7.7: Example of unrecorded assets identified from LiDAR data alone (location: southeast of Morte Point). A) LiDAR shaded relief showing a smooth grassy slope running down to shoreline bedrock platforms. Three north-south running ridges, possible former field boundaries (encompassed by the smaller of the 2 yellow polygons) are visible. B) As above but as depicted by the LiDAR slope map. Additional faint NW-SE running breaks in slope are now visible and could represent former lynchets. None of these features are depicted on the Tithe or OS maps and therefore could represent survival of an earlier field system. At the time of assessment, these were not recorded by the Devon HER, and have therefore been tagged for inclusion. Contains Ordnance Survey data © Crown copyright and database right 2019 © Crown Copyright and Landmark Information Group Limited (2019). All rights reserved. Data from Channel Coastal Observatory (http://www.channelcoast.org/)

AP imagery proved useful in the intertidal zone, where it was able to identify a number of linear features, wrecks, fish traps and mooring features. Note however that the fish traps recorded are not the wooden fish weirs previously recorded in the Taw-Torridge Estuary, but are more recent crab tiles laid out on the foreshore. These were recorded because similar examples had previously been recorded in the Devon HER. Some linear features were also recorded which could represent partly buried wreck material or even fish trap remains. However, without ground-truthing this cannot be verified.

The wrecks include hulks and derelict vessels within the Taw-Torridge Estuary, complementing similar assets previously recorded there (Figure 7.8). Since intact and active vessels are also present on this estuary, the choice of which to record as a hulk was based on whether it appeared to be damaged or

derelict, and if had clearly not moved during the timespan encompassed by the aerial imagery (2006 to 2013 based on the CCO APs alone, but extending to 2001 if Google Earth imagery was also used) (Figure 7.9). Also included in this category are the remains of several vessels on the open coastline, such as a possible *Sharpshooter*-class torpedo boat near Ilfracombe (Figure 7.10), locally thought to be the remains of *HMS Gossamer*, and the remains of the *Johanna*, *Welbury* and *Green Ranger*, all stranded south of Hartland Point.

Other unrecorded features seen on the AP imagery include the footings for the demolished Victorian pier at Westward Ho! (Figure 7.11) and the remains of a 17th century quay at Peppercombe (Figure 7.12). Outside the intertidal areas, for the most part, the AP images provided supplementary evidence to assets mapped from the LiDAR and/or historic maps.

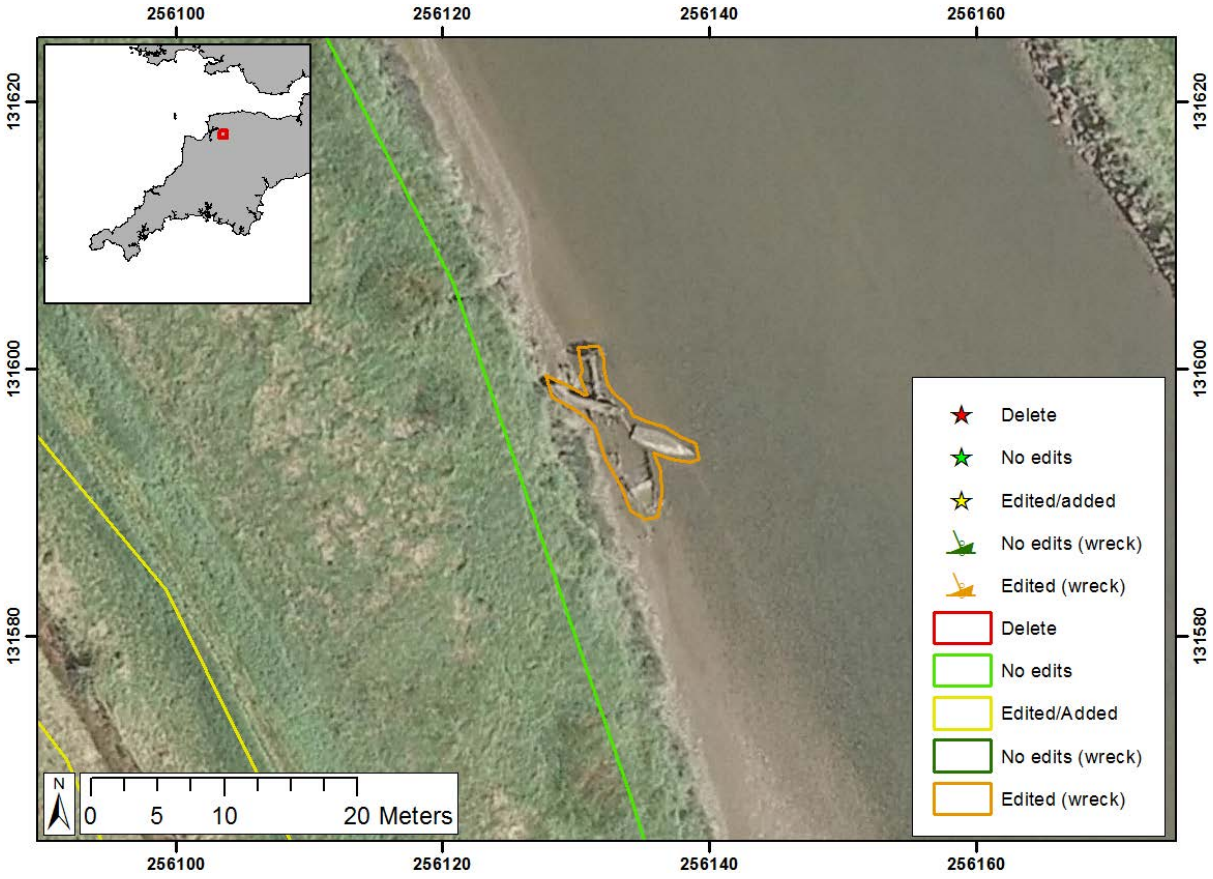


Figure 7.8: Small unrecorded wooden hulks (possibly two) identified from CCO APs on the west bank of the River Taw, south of Barnstaple. Contains Ordnance Survey data © Crown copyright and database right 2019. All rights reserved. Data from Channel Coastal Observatory (http://www.channelcoast.org/)

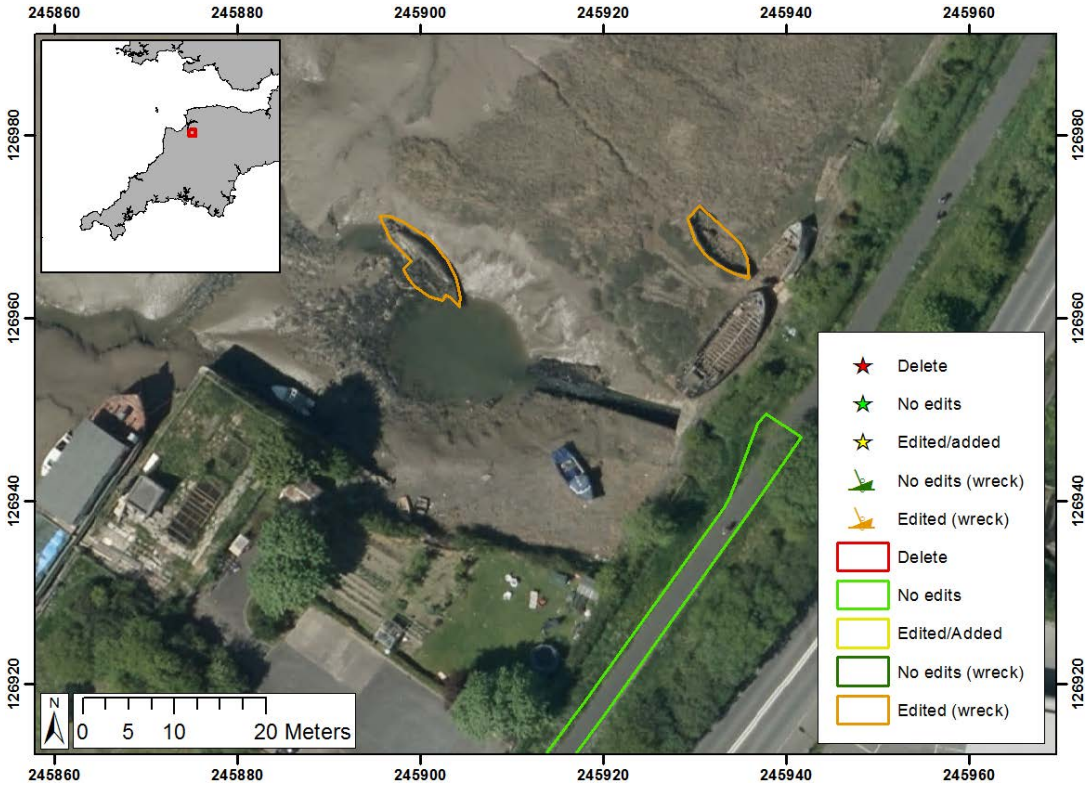


Figure 7.9: Two small unrecorded intertidal hulks identified from CCO APs on the east bank of the River Torridge, at East-the-Water. APs indicate that neither has moved since 2001, unlike the other derelict hulks visible at this location. Contains Ordnance Survey data © Crown copyright and database right 2019. Data from Channel Coastal Observatory (http://www.channelcoast.org/)

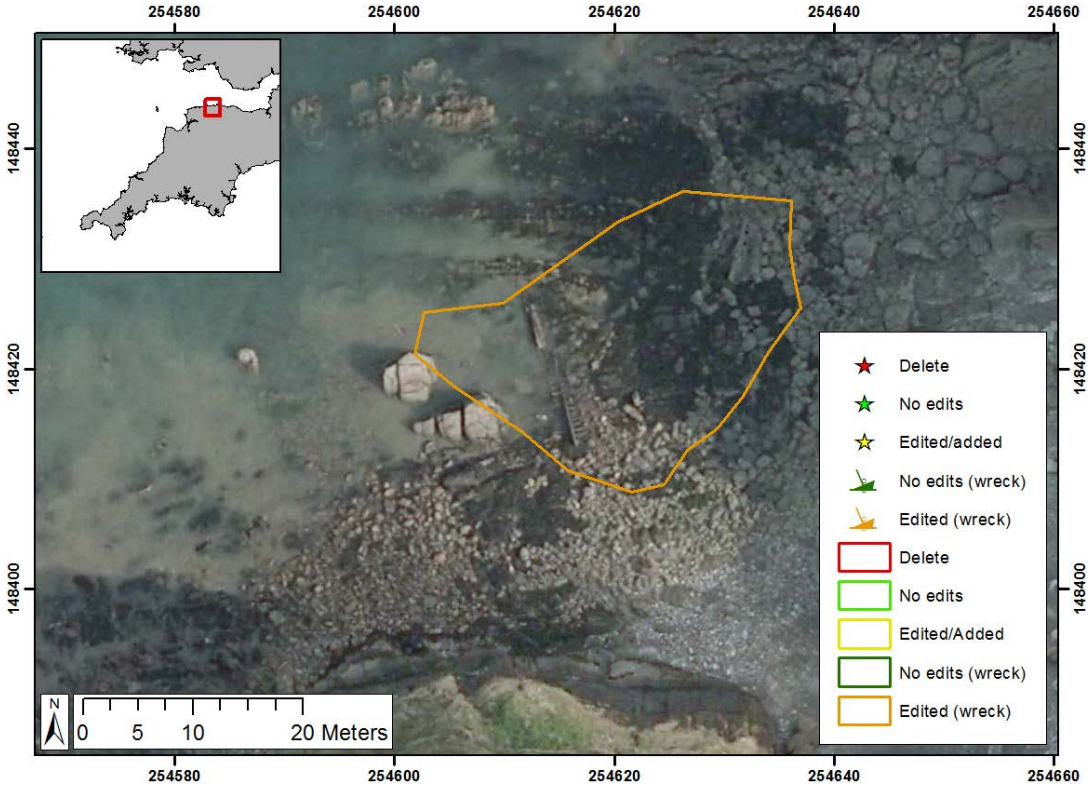


Figure 7.10: Previously unrecorded wreck thought to be a decommissioned Sharpshooter-class torpedo boat (possibly HMS Gossamer) identified from CCO APs and tagged for inclusion. Contains Ordnance Survey data © Crown copyright and database right 2019 Data from Channel Coastal Observatory (http://www.channelcoast.org/)

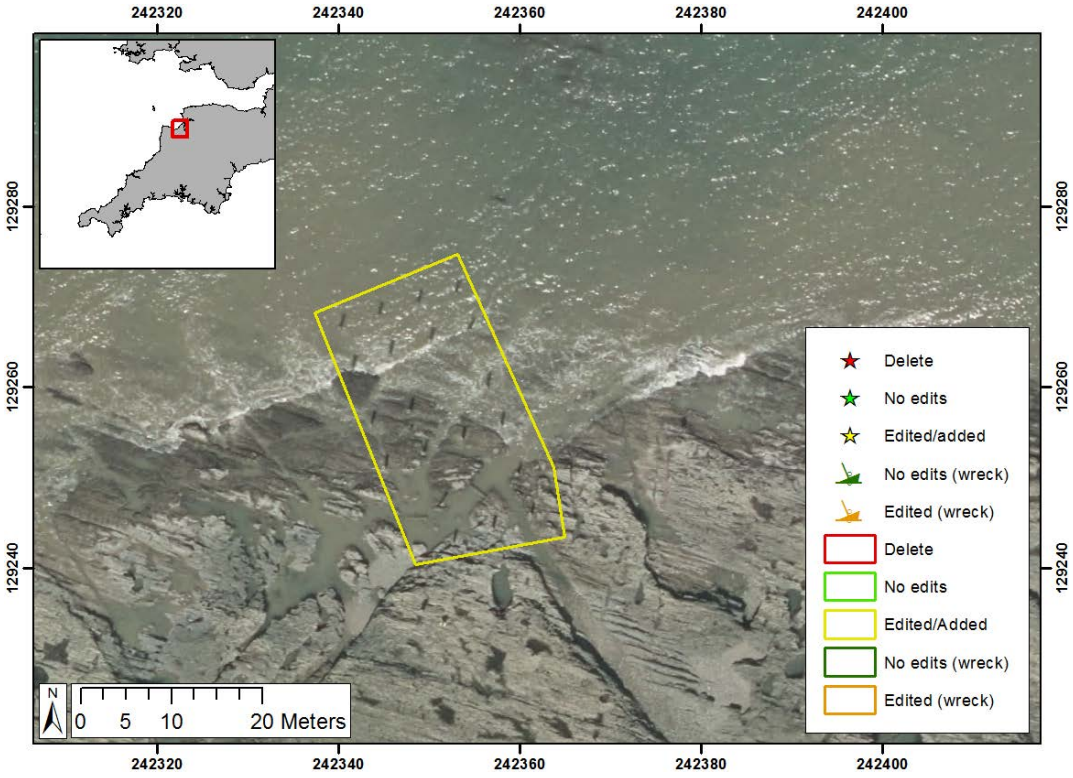


Figure 7.11: Remains of the footings for the previously unrecorded Victorian pier at Westward Ho! identified from CCO APs and therefore tagged for inclusion. Contains Ordnance Survey data © Crown copyright and database right 2019. Data from Channel Coastal Observatory (http://www.channelcoast.org/)

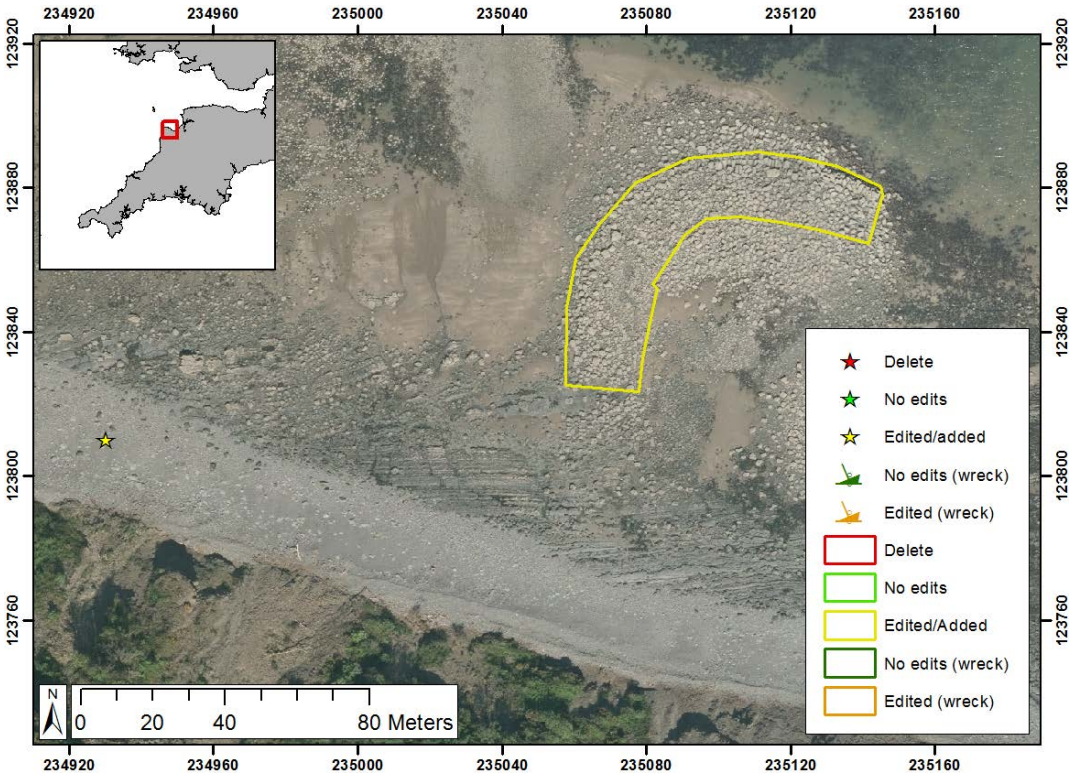


Figure 7.12: Remains of the 17th century quay at Old Quay Point near Peppercombe are still visible in the form of parallel curve lines of stone blocks amid rubble originating from the former quay (delineated by yellow polygon). Note the yellow star in the left of the image which represents the original Devon HER location for the asset. Contains Ordnance Survey data © Crown copyright and database right 2019 © Crown Copyright and Landmark Information Group Limited (2019). All rights reserved. Data from Channel Coastal Observatory (http://www.channelcoast.org/)

Overall, the vast majority of added records date from the post-medieval to Modern period, with most falling within the last 200 years (Table 7.5). This results largely from the use of the historic maps, and the fact that only larger or more recent structures are visible from the LiDAR and AP coverage. Where earlier assets are visible on these data - for instance, promontory forts or barrows – they tend to be already recorded. Thus, where older – for instance prehistoric to Roman – assets have been suggested for addition to the Devon HER, they tend to be findspots identified from the PAS database, the NRHE or the Wymer and Bonsall (1977) gazetteer.

Table 7.5: Summary of the range of periods covered by the new records suggested for inclusion into the Devon HER.

Period	**No. of entries**
XIX to XX	473
XIX	369
XX	151
Unknown	102
Post medieval	46
medieval	27
XX to XXI	17
Early medieval to XIX	13
medieval to post-medieval	12
Roman	6
World War II	6
medieval to Modern	4
Bronze Age	3
Neolithic to Bronze Age	3
Prehistoric	3
World War I	3
Mesolithic	2
Neolithic	2
Post medieval to Modern	2
Post medieval to XX	2
Early medieval (Saxon)	1
Early medieval to XXI	1
Late Bronze Age	1

7.2.4 'Additional information added'

Various types of extra information were suggested for addition to HER. These included the following broad categories:

1. Information on the current appearance of assets based on the new spatial datasets. For example:

- MDV102302 (Strip field earthworks of probable medieval Age northwest of Gilscott): LiDAR data suggests that the survival of earthworks was more extensive than described in the original record, with slope mapping in particular revealing earthworks across the entire mapped polygon not just its northeastern side as suggested in the description.

- MDV45568 (19th century linhay, Horsea Island): The last description of this asset (1983) indicated that its condition was 'quite good'. However, recent APs show it to be in a ruinous state, unroofed and with only one wall standing.
- MDV102305 (early medieval to 20th century field boundary): The original description of this asset indicates that it was visible on 1940s APs as an earthwork bank but could not be seen on 1970s APs. Recent LiDAR data shows that it survives only as a faint break in slope and therefore has been largely levelled.

2. Extra information on the asset obtained from other HERs or historic databases which is not currently recorded in the Devon HER. For example:

- MDV31776 (19th century to modern Wesleyan chapel): The original HER record only identifies this asset from its depiction on OS historic maps. However, the NRHE records additional information, such as that it was opened in 1833, has rendered walls with wall-arched windows and has now been repurposed as a gallery.
- MDV57845 (historically-documented loss of the trading vessel *John and Lily*): The NRHE and sources therein name this wreck as the *John Lilley* rather than *John and Lily*.
- MDV57180 (Raparee Cov; 17th to 19th century burials): The online HER record (Heritage Gateway) does not provide any detailed information as to the potential origin of the burials. Conversely, there is more information on the potential origin in the NRHE (1078671). Specifically, this states that though the original report suggested that the bones were of French prisoners or slaves from the Caribbean carried on the vessel *London* (lost 1796; NRHE 878080), unpublished DNA tests suggested that the remains might have come from other wrecks which also claimed significant numbers of victims, such as the wreck carrying the original 'rapparees' (Irish Jacobite soldiers), lost in 1691 (NRHE 877410), or the wreck of a Portuguese vessel, the *Bom Successo (NRHE 1318501*).

3. Additional source data not currently recorded in the Devon HER. For example:

- MDV31753 (Score Farm, late 18th-early 19th century farmstead): The original HER record notes only that the farm is marked on the OS 1st Edition and 1st Revision maps. However, buildings are also marked at this location on the earlier Tithe Map, possibly representing this farmstead.
- MDV32642 (Bow Weir limekiln, 19th century to modern): The original HER record notes only that the limekiln is marked on the OS 1st Revision map. However, it is also clearly marked on the earlier OS 1st Edition while a structure, possibly representing the limekiln, is also shown at this location on the Tithe Map.

4. Any other uncertainties or potential errors in the Devon HER. For example:

- MDV30776 (possible Medieval field system east of Brownsham): The original HER record for this asset notes that it has been identified from distinctive reverse S-shaped boundaries. However, these are not apparent at the recorded location either on historic maps or recent APs. In fact the recorded location is also west of Brownsham, not east as the description suggests. Historic maps and APs clearly show that the distinctive reverse S-shaped boundaries are present, but located c. 470m to the northeast of the originally recorded polygon.

7.2.5 Move position

Suggested edits to asset position came from a range of sources including descriptions within the county HER, the NRHE, the Listed Buildings record and as evidenced from the new spatial datasets.

For the most part, the scale of suggested position change was generally relatively small, though in a few instances moves of over several hundred metres were suggested. For example:

- MDV19123 (Early to Post Medieval Mill): Mill is marked on OS historic maps, though noted to be disused by the time of the 1st Revision. However, its mapped position is c.65m east of the location originally recorded in the county HER.
- MDV40144 (Early to Post Medieval stables and shippon with loft): The position recorded by duplicate Listed Buildings record is more accurate than the location supplied by the county HER which is c. 88m to the southeast of the actual location.
- MDV235 (Findspot of Early to Post Medieval silver penny): The original county HER location for this asset is offshore, in contrast to the description (at Baggy Point). A more likely location is onshore, though the exact spot remains uncertain.
- MDV44756 (wreck of the Green Ranger, lost 1962): The wreckage of the vessel (frames, boilers, general debris) is visible on recent APs and located c. 100m southwest of the location originally provided in the county HER.

7.3 Results: Cornwall

7.3.1 General Observations

The RCZAS identified a number of revisions which could be made to the Cornwall and Scilly HER. These subdivide into four broad categories:

- **Added record:** A new asset was added, either on the basis of cross-referencing from another HER (e.g. NRHE, PAS) or its appearance on one of the spatial datasets (e.g. LiDAR, AP, Historic Map). The choice of assets to add was made on the basis of what was already recorded in the county HER. For instance, wells marked on historic maps were added because examples of these were already in the HER.
- **Additional information added:** Additional information could be added to the existing record either on the basis of cross-referencing with another HER (e.g. NRHE, PAS) or the spatial datasets (e.g. LiDAR, AP, Historic Map). This includes the current appearance of the asset on the spatial data, its appearance on an map edition different to previously recorded, or extra detail
- **Additional polyline/polygon added:** Additional lines or polygons could be added to a previously recorded asset on the basis of the spatial data which sometimes showed additional components/elements which had not been previously recorded.
- **Move position:** Current position of the record is incorrect either because it does not fit its described location, or does not match the position as seen on the spatial data.

Summary figures for the additions, edits or revisions made or suggested can be found in Table 7.6. Consistent themes have emerged in the nature of the suggested edits for each of these categories. These are detailed in the subsections below.

Table 7.6: Summary of figures for the RCZAS HER assessment for Cornwall only. This shows the total number of assets examined, the number tagged for additional editing, tagged for deletion and the number of unrecorded sites added to the HER.

	Total examined	**Edits suggested**	**Added to HER**	**Additional info**	**Move position**	**Addition polyline**
HER (point)	7463	2080	1031	970	92	85
HER (polygon)	667	375	327	48	1	27
HER (polyline)	383	338	252	85	1	72
Total	8513	2823	1610	1103	94	184

7.3.2 Added record

Overall, 1610 unrecorded assets were suggested for addition to the Cornwall and Scilly HER. Site types with more than 10 counts are shown in Table 7.7.

Table 7.7: Most common types of asset suggested for addition to the Cornwall HER by the RCZAS (n≥10)

MonType	**Cnt_MonType**
FINDSPOT	525
QUARRY	205
FOOTPATH	67
BUILDING	47
FIELD SYSTEM	42
BRIDGE	35
WELL	29
QUARRY?	28
FIELD BOUNDARY	26
BOUNDARY	24
MOUND	22
FORD	20
MOORING BOLLARD	20
POST	19
STONE	12
WEIR	12
WRECK	12
LITHIC SCATTER	11
SMITHY	11
EXTRACTIVE PIT	10
LEAT	10
MILL POND	10
RIFLE RANGE	10
SAND PIT	10

The vast majority of newly added records have been based on features seen on the historic maps, which explains the preponderance of types such as quarries, footpaths, (foot)bridges and wells. Though usually marked on historic maps, in some cases possible unmapped quarry pits/scars were visible on the LiDAR data (see below). From the historic maps, specific features relating to coastal/maritime activities include mooring bollards, piers, quays and capstans. Of particular note are the capstans and bollards located west of Doom Bar within the Camel Estuary between Hawker's Cover and Stepper Point. These were installed in the early 19th century under the auspices of the Padstow Harbour Association for the Preservation of Life and Property from Shipwreck, who sought to install capstans and bollards on the landward side of the narrow channel entrance and place buoys on the seaward side of the channel, to enable safe passage into the Camel Estuary and avoid the infamous wrecking site of the Doom Bar sands (Figure 7.13).

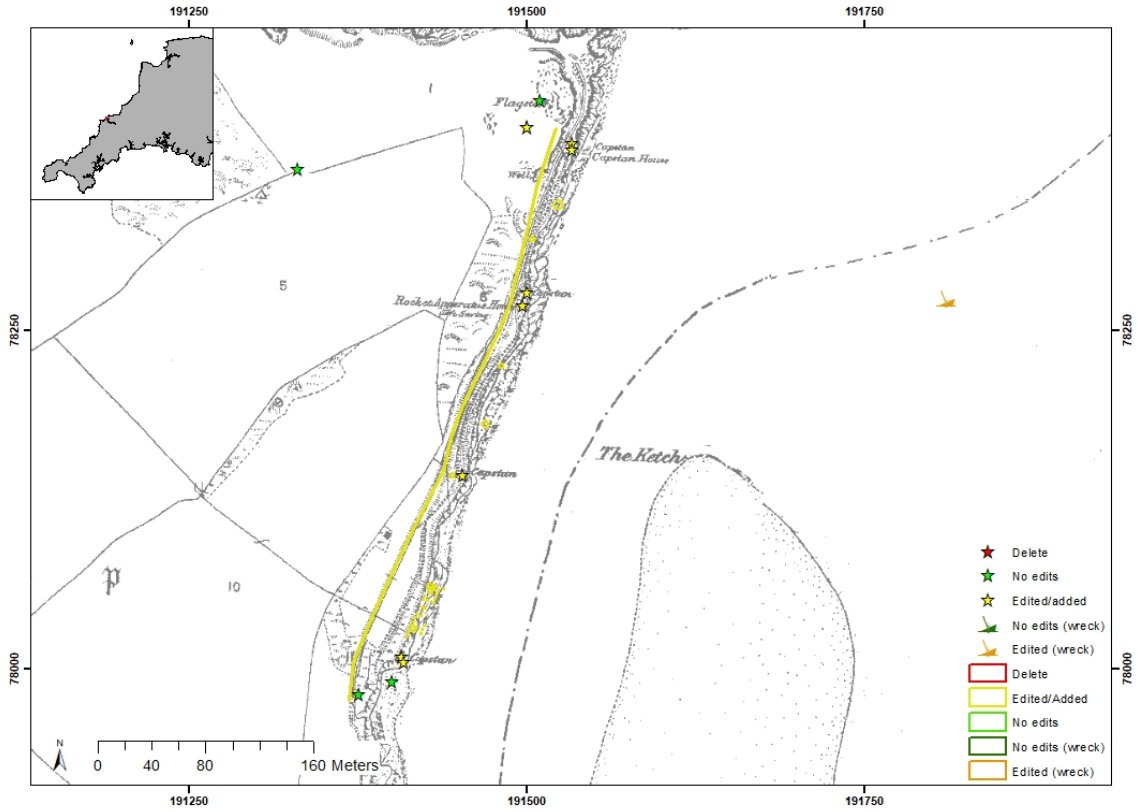


Figure 7.13: Capstans running down the west side of the Camel Mouth, used to assist ships passing the Doom Bar when entering / leaving the Camel Estuary. © Crown Copyright and Landmark Information Group Limited (2019). All rights reserved.

Another example is the visible remains of the wooden pier (New Pier, also known as 'Wood Pier') at St Ives, constructed in 1864 in an attempt to expand the harbour, but reportedly destroyed by storms in less than 20 years, subsequently leading to the extension of the adjacent Smeatons Pier in 1888-1890. The old pier is clearly depicted on the 25" OS 1st Ed (1878) and OS 1st Revision (1908). The CCO APs show some piles visible upon the foreshore following the original pier alignment (Figure 7.14).

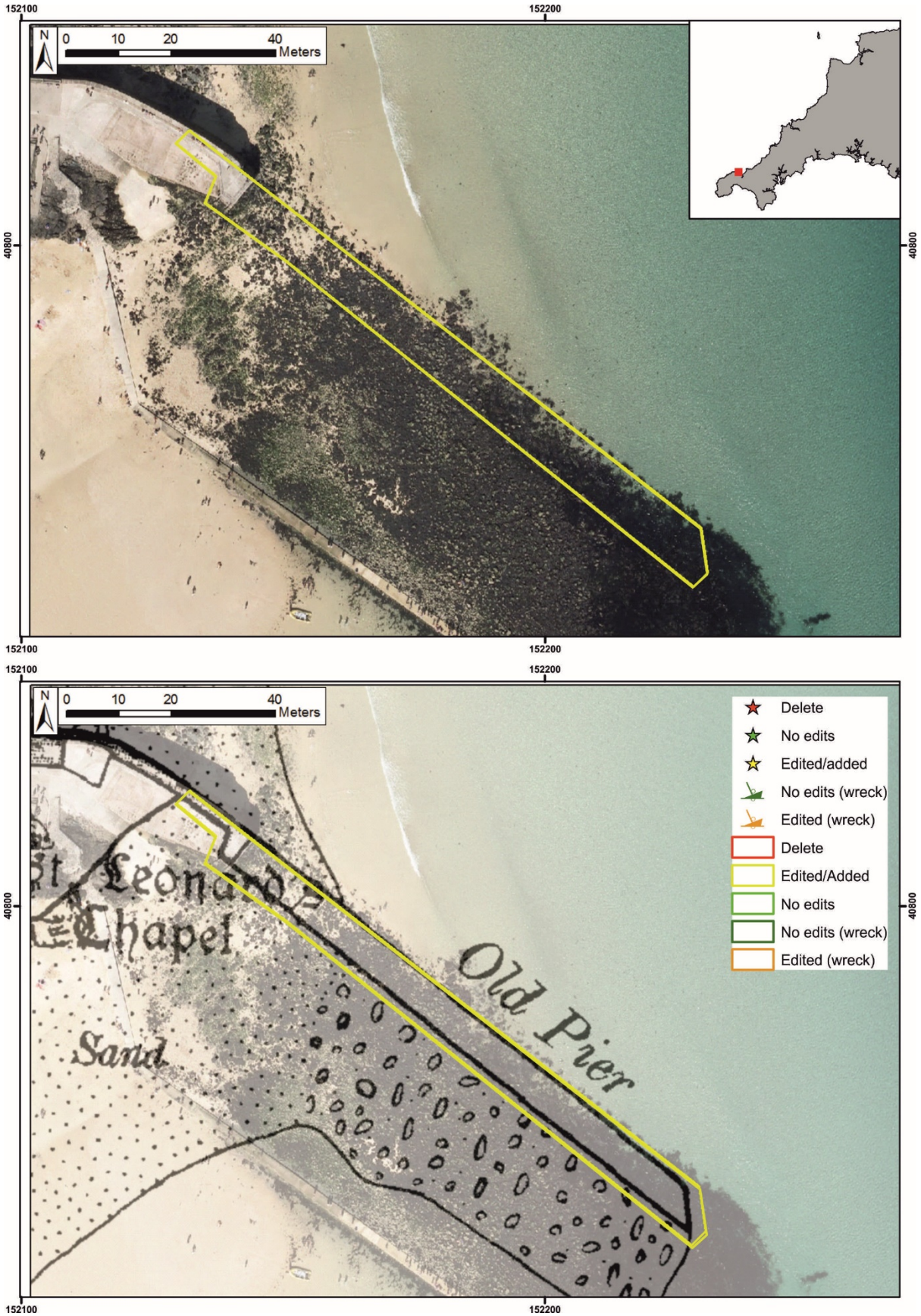


Figure 7.14: The piles for the 'Wood Pier' built 1864 at St Ives. Contains Ordnance Survey data © Crown copyright and database right 2019 © Crown Copyright and Landmark Information Group Limited (2019). All rights reserved. Data from Channel Coastal Observatory (http://www.channelcoast.org/)

The extremely high number of findspots is a product of inclusion of the PAS, which alone was responsible for inclusion of 448 findspots, with the remainder coming from the NRHE or the Wymer and Bonsall (1977) gazetteer, doubling the existent total within the Cornwall and Scilly HER for the RCZAS study area which was previously 443. In terms of date, PAS finds are mainly medieval and Post-medieval, but there is also a relatively high concentration of Roman material as well (see Table 7.8), especially in the Camel Estuary and Hayle areas. A range of find types were represented, with the most common being small metal objects such as coins, mounts, brooches but also including non-metal objects such as pottery and lithics (Table 7.9). PAS finds occur across the study area, but distinct clusters are present around Phillack (Roman to post-medieval finds) and Lellizick (Bronze Age to Modern) (Figure 7.15). This latter zone of finds has already been recorded in the HER (MCO46219) but the PAS database provides additional information on both previously recorded and unrecorded individual finds.

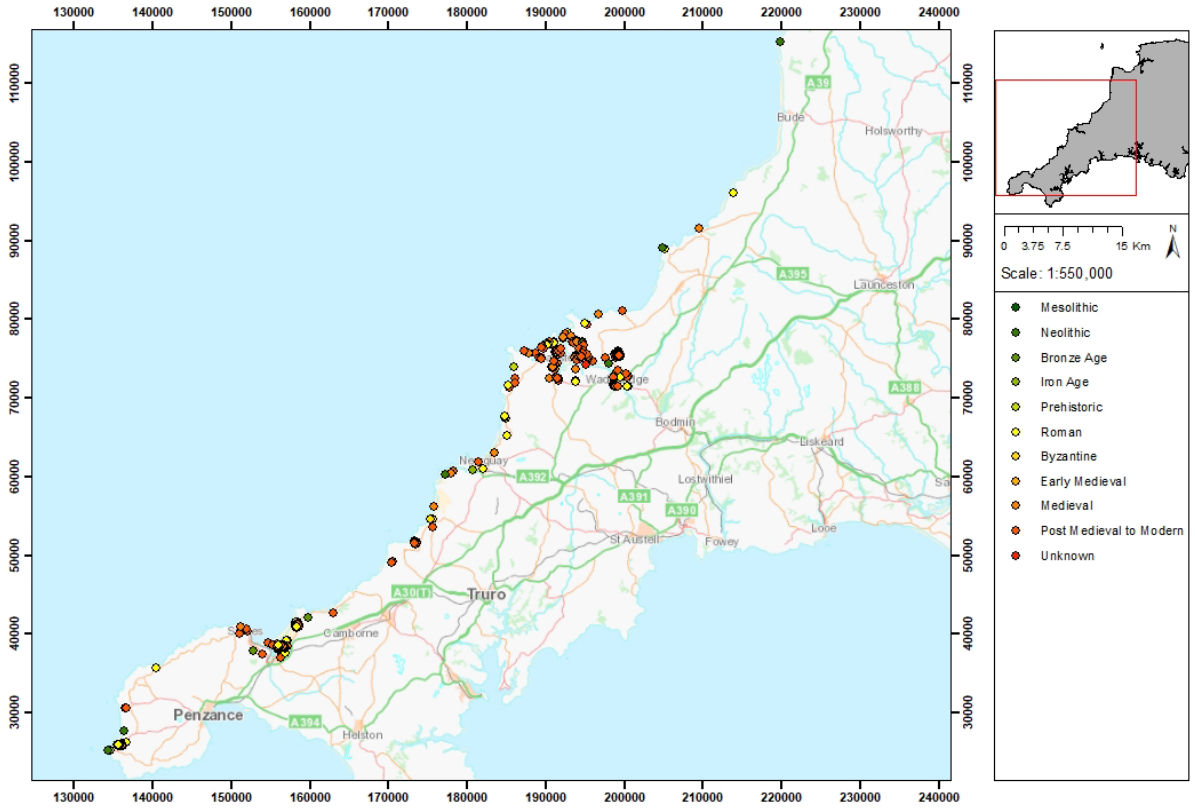


Figure 7.15: Distribution of PAS finds suggested for inclusion into the Cornwall HER and coloured according to period.

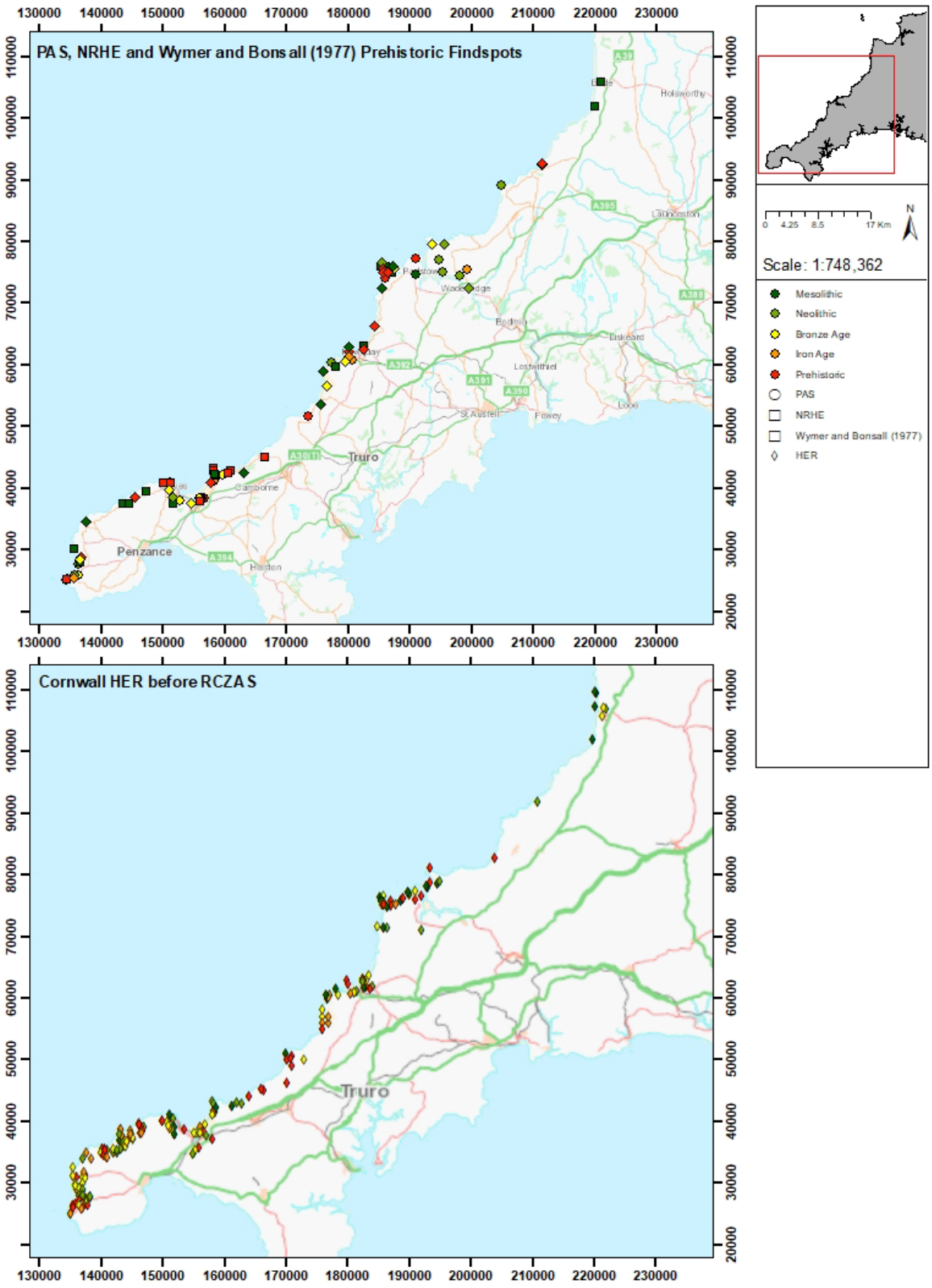


Figure 7.16: Comparison of the distribution of Prehistoric findspots added from the NRHE and PAS against the Cornwall and Scilly HER data (pre-enhancement). Contains Ordnance Survey data © Crown copyright and database right 2019

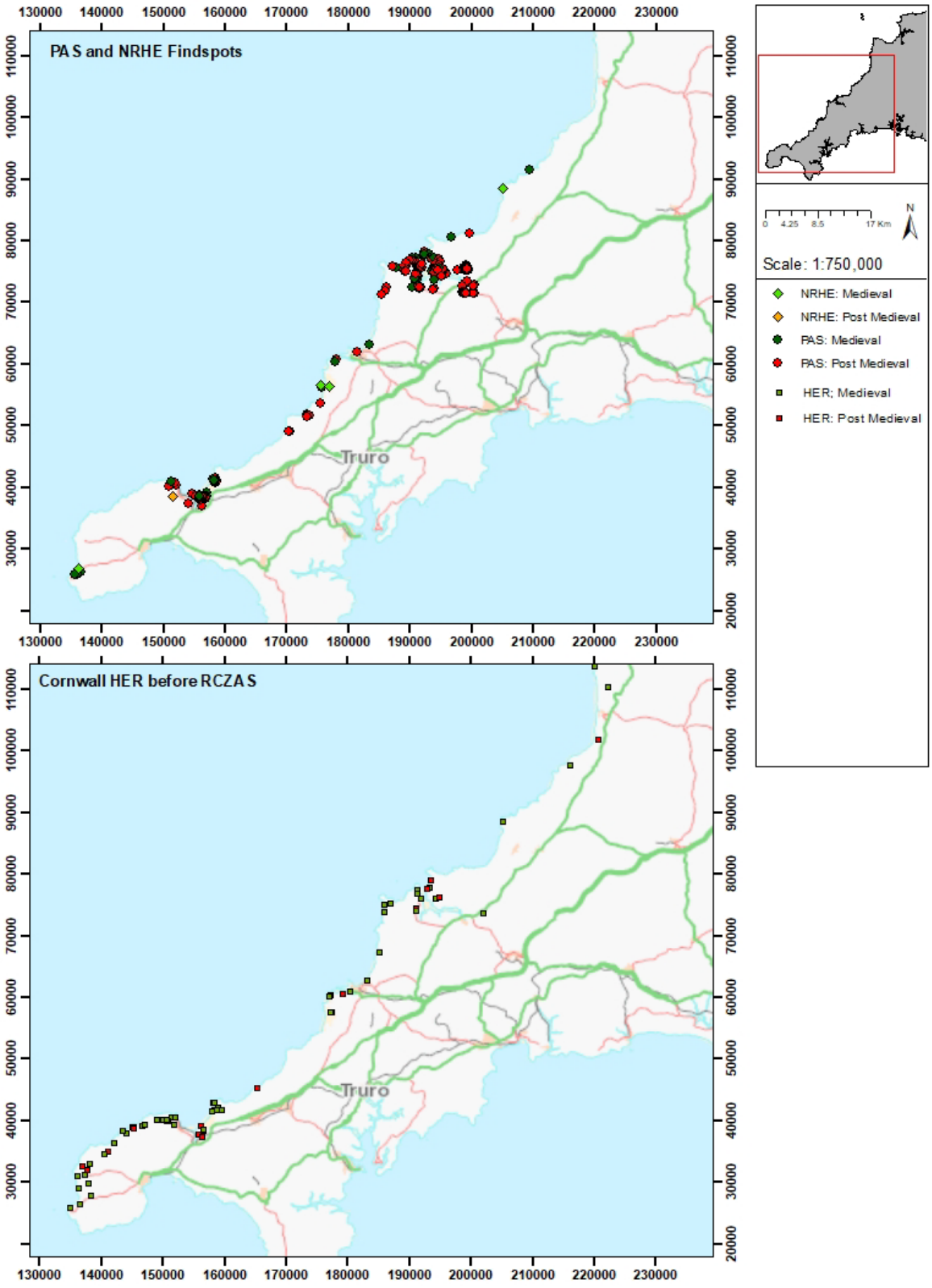


Figure 7.17: Comparison of the distribution of medieval and post-medieval findspots added from the NRHE and PAS against the Cornwall and Scilly HER data (pre-enhancement). Contains Ordnance Survey data © Crown copyright and database right 2019

Compilation of all of the findspot data permits some comparisons to be made between the different data sources, divided by period. For the prehistoric periods (Figure 7.16) the compiled datasets show a possible bias in collection focused on the coastline west of the Port Quin, with clusters around Padstow Bay, notably around Trevose within the NRHE, Wymer and Bonsall (1977) and PAS data, though the Cornwall and Scilly HER shows a wider spread of prehistoric find spots extending eastwards along this coastline towards Stepper Point. Clusters are also found in the Newquay to Penhale area, St Agnes (HER data), Portreath to St Ives, and Penwith areas. For the Padstow-Newquay area, the distribution of flint scatters is not dissimilar to that demonstrated by Johnson and David (1982). It should be noted, however, that an association of Mesolithic material with headlands is not geographically constant across the whole north coast.

In terms of age profile, medieval and post-medieval findspots occur across the area, but with some spatial differentiation observed between the NRHE and PAS data compared to the existent HER data alone. When focusing on the medieval and post-medieval periods, the PAS data add many findspots around the Camel Estuary area along with the Hayle and Sennan areas. These concentrations reflect the distribution of searching activity rather than true find concentrations, as clearly demonstrated by a comparison with the existing findspots contained within the Cornwall and Scilly HER for the same period, with a contrasting distribution of higher concentrations of medieval findspots along the northern coast of Penwith and those within the Camel Estuary focused to the western approaches (Figure 7.17).

Table 7.8: Age distribution of PAS finds added to the Cornwall and Scilly HER.

Period	**Count**
Post Medieval	207
Medieval	114
Roman	65
Modern	41
Neolithic	12
Bronze Age	9
Prehistoric	7
Iron Age	6
Mesolithic	4
Byzantine	2
Early Medieval	1
Unknown	1

Some new records were added on the basis of LiDAR data. However as the resolution of the LiDAR is insufficient to detect very subtle features, the majority of features added were earthworks with a larger topographic signature. These comprised mainly removed field boundaries, quarries (e.g. Figure 7.18) or possible extractive pits and mounds, which could be natural features, mining-related spoil heaps, or possible unrecorded barrows.

Table 7.9: Most common types (n≥5) of PAS finds suggested for addition to the Cornwall and Scilly HER during the RCZAS.

Object type	**Count**
COIN	322
BUCKLE	146
MOUNT	50
BROOCH	27
WEIGHT	27
BUTTON	23
JETTON	21
THIMBLE	21
SEAL	17
STRAP FITTING	16
RING	15
COIN WEIGHT	14
TOKEN	14
LITHIC IMPLEMENT	12
STUD	11
FINGER RING	10
DEBITAGE	9
MUSKET BALL	8
PENDANT	8
PIN	8
SPUR	8
VESSEL	8
BUCKLE FRAME	7
SPOON	7
CAULDRON	6
DRESS FASTENER (DRESS)	6
SCRAPER (TOOL)	6
HARNESS MOUNT	5
SPINDLE WHORL	5

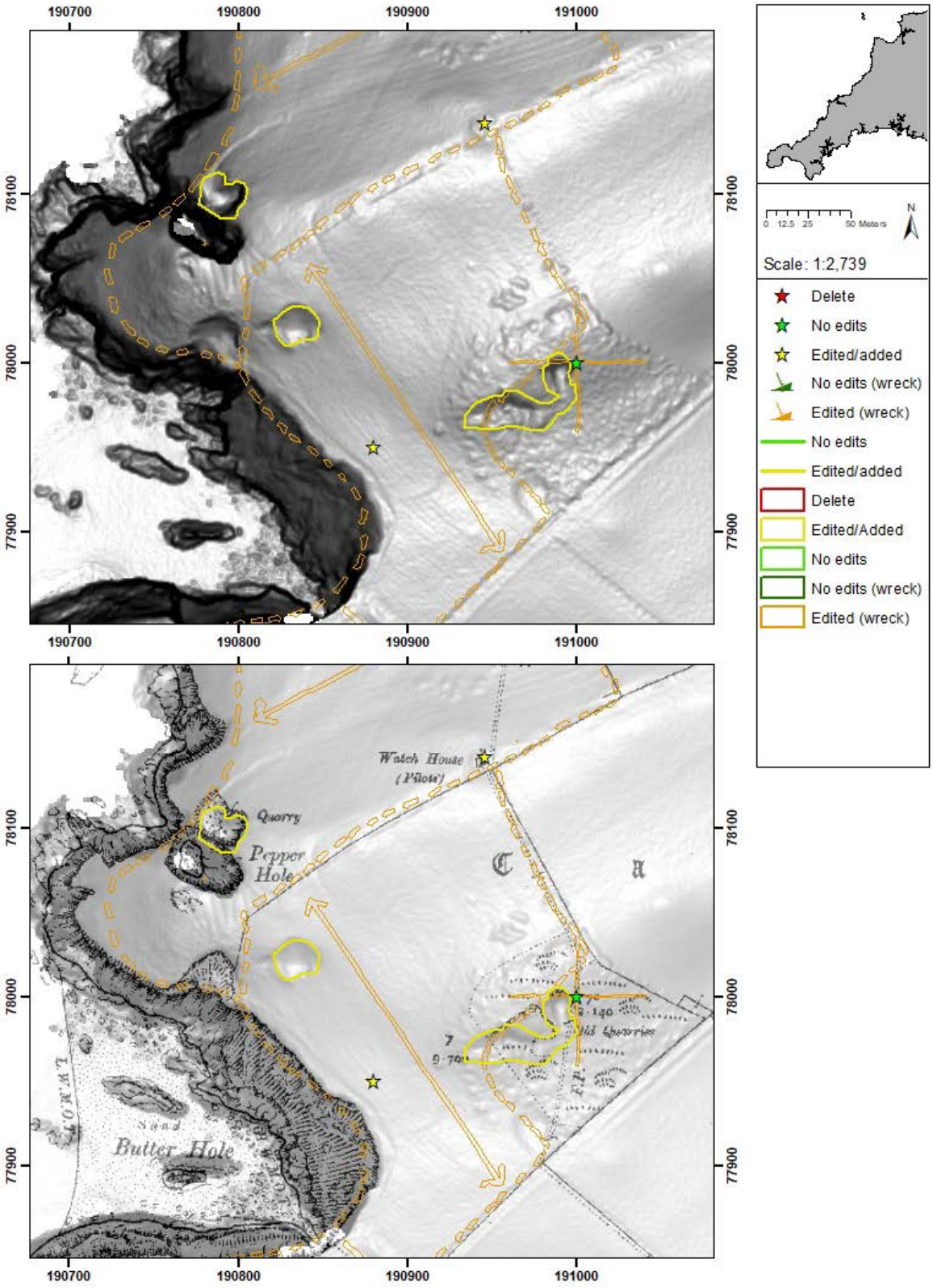


Figure 7.18: Three quarries visible in LiDAR data located west of Butterhole. Two of the quarries are recorded on the OS 1st edition, but the centre quarry is not mapped on any OS historic or current maps. Contains Ordnance Survey data © Crown copyright and database right 2019 © Crown Copyright and Landmark Information Group Limited (2019). All rights reserved. Data from Channel Coastal Observatory (http://www.channelcoast.org/)

Many of these boundaries correlated with ones depicted on the OS 1st Ed map, raising the possibility that they are part of relatively recent (modern to post medieval age) boundary. However, potential examples of remnants of earlier field systems (i.e. not depicted on OS mapping) indicated by boundaries occur at Downathan, Trebarwith, Crantock and Crane Godrevy (Figure 7.19).

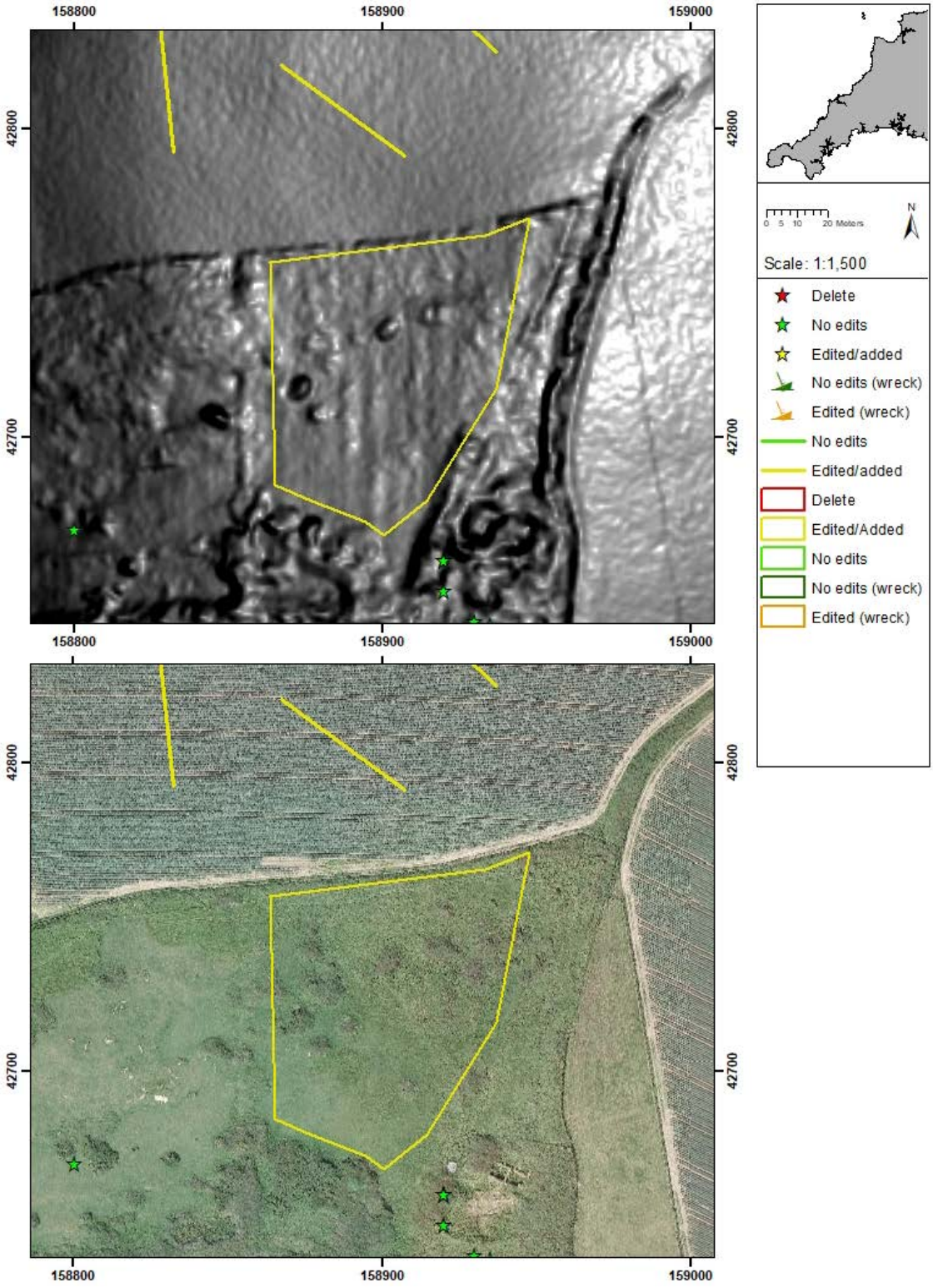


Figure 7.19: Possible strip field / lynchets immediately adjacent to the medieval settlement of Crane Godrevy (MCO14140). Contains Ordnance Survey data © Crown copyright and database right 2019. Data from Channel Coastal Observatory (http://www.channelcoast.org/)

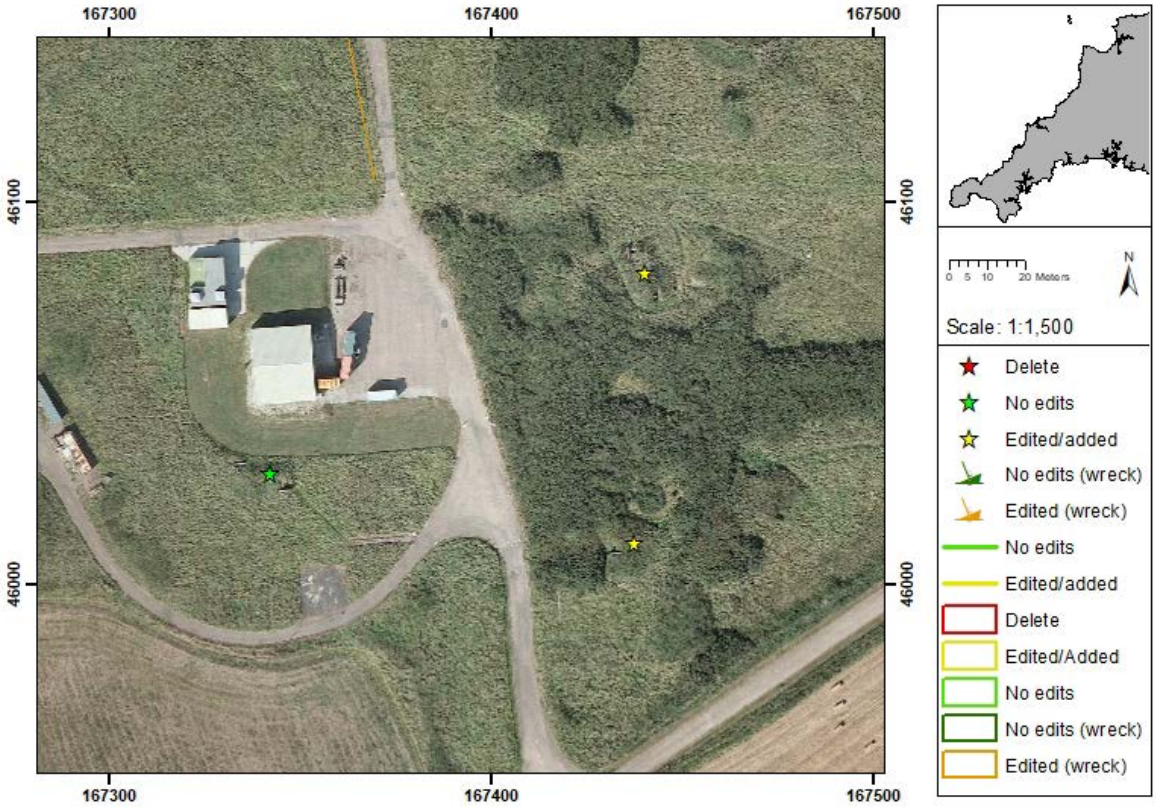


Figure 7.20: Two unrecorded air raid shelters at RAF Portreath shown on the right, with a previously recorded one (MCO56332) to the left. Contains Ordnance Survey data © Crown copyright and database right 2019. Data from Channel Coastal Observatory (http://www.channelcoast.org/)

AP imagery alone did identify a number of unrecorded features, most notably unrecorded air raid shelters at RAF Portreath (Figure 7.20), possible military structures such as building foundations (Moreenstow) and pillboxes (Mexico towans – recorded but not accurately positioned within the NRHE), quarry related buildings (Lanterdan Cove, Dennis Pt), including possible slate splitting huts (Backaways Cove), quay or jetty foundations (possible for quarrying – Stepper Point), ridge and furrow (Porthmisses), and tidal swimming pools (Portreath, St Saviours Point). An unrecorded stone circle was also observed at Trevalgan, which is known locally as the Merry Harvesters and thought to be a modern reproduction of a prehistoric monument.

The APs also proved useful in the intertidal zone and shallow water where they were able to show either unrecorded wrecks (e.g. Lelant) or give clear positions for the remains of recorded wrecks (e.g. Alactcrity, Scheldt, Umbre, Traute Sarnow; Figure 7.21). A few linear features were also marked in the intertidal zone (Trevelver and Reskajaege) and could represent walls, fords or simply natural features / accumulations (e.g. bedrock dykes, part buried flotsam).

For the most part, the AP images provided supplementary evidence to assets mapped from the LiDAR and/or historic maps. In some cases, additional features were detected which were part of previously recorded assets; this applies mainly to field systems, such as at Fire Beacon Point, Tintagel, Treligga, Boscaswell**,** but other additional features detected from APs or LiDAR included slit trenches at Penhale Camp (MCO32798), extra earthworks at Cubert Common (MCO25250), and more extensive quarry

features including quarry faces, spoil heaps and possible structures, rock cut baths at Portreath (MCO26432), the Trevorrick tidal mill wall (MCO18)), and part of the Hayle Canal (MCO27889).

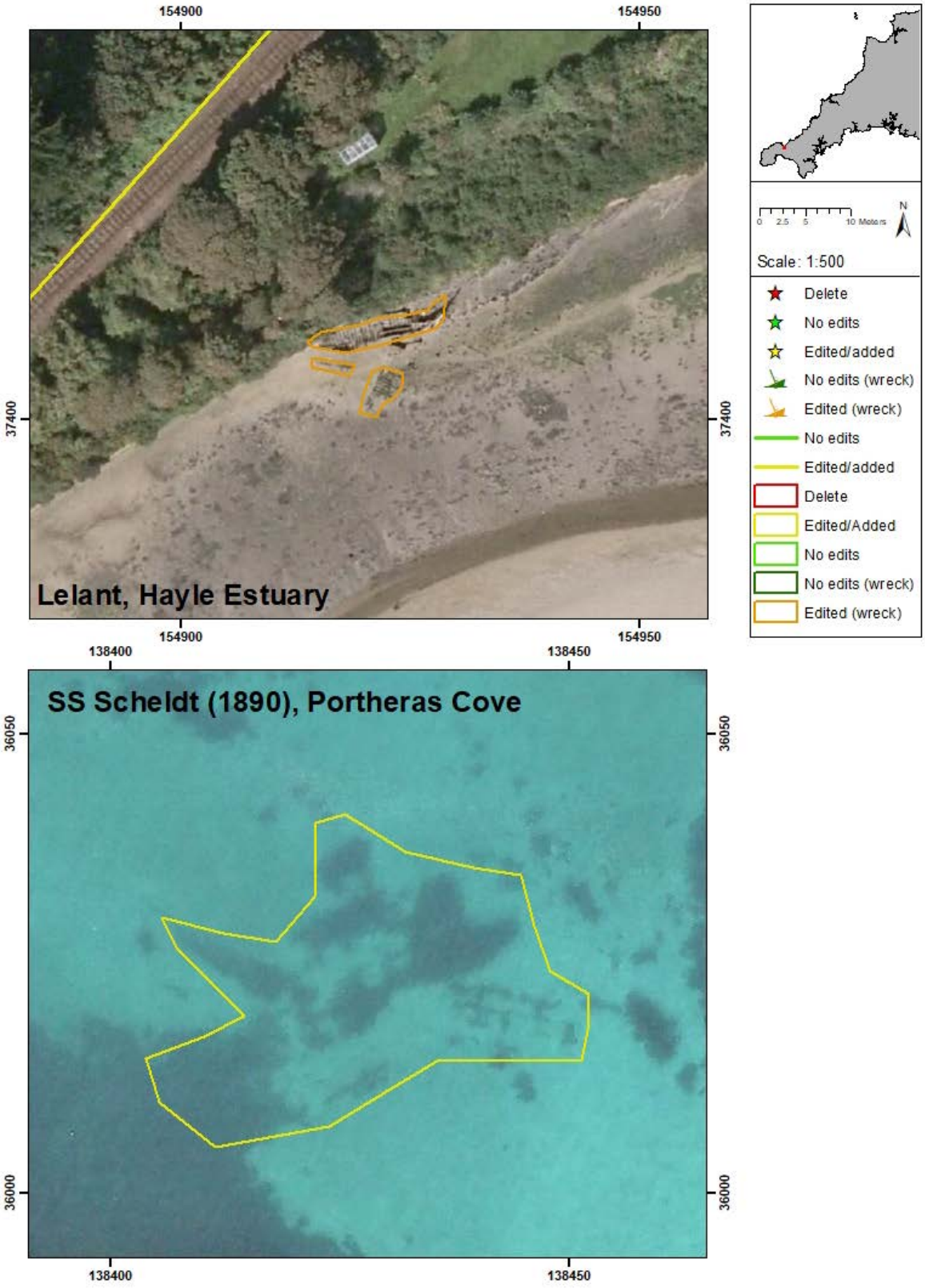


Figure 7.21: Hulks visible in the Aerial Photographs: The Lelant exposed within the Hayle Estuary and the SS Scheldt visible underwater in Portheras Cove. Contains Ordnance Survey data © Crown copyright and database right 2019 Data from Channel Coastal Observatory (http://www.channelcoast.org/)

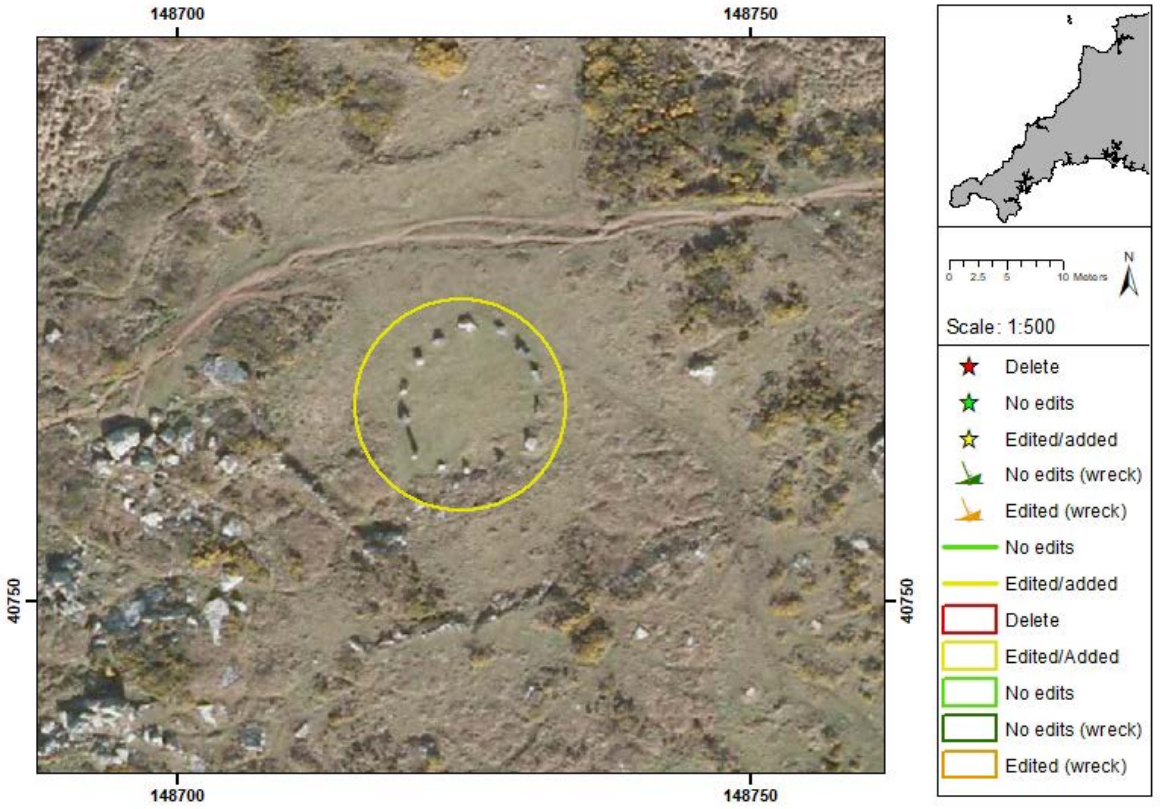


Figure 7.22: Distinct circular setting of stones c. 12m across located on coastal slope within former prehistoric/early medieval field system visible on recent APs. Locally known as The Merry Harvesters and thought to be a modern reproduction of a prehistoric stone circle. Contains Ordnance Survey data © Crown copyright and database right 2019. All rights reserved. Data from Channel Coastal Observatory (http://www.channelcoast.org/)

7.3.3 Additional information

Various types of extra information were suggested for addition to Cornwall and Scilly HER. These included:

1. Information on the current appearance of assets based on the new spatial datasets. Examples include:

- MCO51937 ST COLUMB MINOR – Post-medieval canal. Canal cut is visible on LiDAR, but appears as a break in slope rather than a channel
- MCO28837 HAYLE – Post-medieval ropewalk. Ruined buildings, probably associated with/part of the former rope manufactory are visible on recent APs, partly covered by vegetation
- MCO2061 BALLOWALL - Bronze Age barrow. No barrow visible on recent APs/LiDAR. Either completely ploughed down or removed by mining activity

2. Extra information on the asset recorded in other HERs/historic databases not currently recorded in the HER, such as:

- MCO1142 PENTIRE POINT - Mesolithic findspot. Collection includes 35 blades/flakes, 3 scrapers, 34 other finds (Wymer and Bonsall 1979; Site 481)
- MCO6623 CARRICK DU - Mesolithic lithic scatter. Wymer and Bonsall 1979 gazetteer records that Mesolithic finds inc. 400 blades/flakes, 7 cores, 2 microliths, 1 microburin

- MCO26178 TINTAGEL - Early medieval lann NRHE has updated excavation info from 1991 which confirms that this is an early Christian churchyard dating to the 6th century with burials and a building. See NRHE for full details
- MCO3849 TREVOSE HEAD - Bronze Age barrow NRHE records that the stones now lie beside the road at approx SW 85327628 where they are visible on APs (additional record digitized)

3. Additional source data not currently recorded in the county HER. Examples include:

- MCO12611 TREBETHERICK – Post-medieval mine. Mine also shown on OS 1st Ed map, albeit smaller than on 1st Rev with only a single pit and shaft marked and no associated structures
- MCO42407 PHILLACK - Modern rifle butts. Rifle range aligned NW-SE with butts at the north end and firing stations up to 600 yards range is marked on the OS 2nd Rev map, but not earlier 1st Ed and 1st Rev
- MCO39182 WIDEMOUTH – Post-medieval quarry. Quarry is not marked on OS historic maps, suggesting it is 20th C in date. Pit not visible on recent APs and LiDAR and therefore infilled.

4. Any uncertainties or potential errors in the county HER.

- MCO46322 WIDEMOUTH - Modern pillbox. Position may be erroneous as current NGR is 40m inland of coastal edge, but is described as partly eroded by sea. The equivalent NRHE record is c. 50m to the E
- MCO54351 WADEBRIDGE – Post-medieval market house. Edit summary and description which refer to town hall rather than market house
- MCO50867 HENDRA – Post-medieval quarry. Quarries are not marked on the OS 1st Ed as the description suggests, but are marked on the 1st Revision

7.3.4 Move position

Suggested edits to asset position came from a range of sources including the spatial datasets as well as the NRHE. For the most part, the scale of suggested position change was generally relatively small (low tens of metres), though in a few instances moves of over 100m were suggested**.** Moves were based on whether the assests were visible elsewhere on the spatial data, or where the description of the asset did not match its current location. Examples of changes include:

- MCO12943 GEEVOR - Modern mine. Main part of Geevor Mine is c. 300m NW of the original HER NGR. Record moved to fit
- MCO26612 BUTTER HOLE - Medieval ridge and furrow, post-medieval ridge and furrow. Ridge and furrow remains extant and visible on recent LiDAR. Main concentration is c. 100-150m N of the original HER NGR. Record moved to fit.
- MCO10072 MORWENSTOW - Medieval chapel. Description of site better fits the location recorded by NRHE, though it is also uncertain. Record moved to fit. LiDAR shows low mounds on the nearby slope but these could be natural features.
- MCO716 HAYLE RIVER - Neolithic findspot. The equivalent NRHE record suggests item may be in London. Also, its position is more representative of the find description compared to the original HER NGR which is at least 880m from the Hayle River. Record moved to fit.

7.4 Results: Wrecks

7.4.1 General Observations

The following are some general observations made from the shipwreck assessment procedure. The number of wrecks recorded to date in the new database and extant sources are summarised in Table 7.10 while the distribution of wrecks across the entire study area is shown in Figure 7.23. This numerical breakdown highlights the discrepancies between the various sources and validates the necessity of creating a unified database. This is made particularly clear by the very low number of wrecks (48) recorded by all three main sources in Devon waters.

With respect to positioning, this assessment has shown that no single source has proved the most accurate with positional information drawn from multiple sources (Table 7.10). The RCZAS has also revised a number of positions based on evidence from AP showing intertidal wrecks / hulks or based on the description of loss. In this latter category are numerous wrecks which were reportedly lost up to several miles off named geographic features, but which, prior to the RCZAS, were positioned at these named locations. This assessment has also shown the variable quality of positional data for the majority of records, with over 50% classified as having a spatial uncertainty of >1km (category 1 and 2; Table 7.11). This ties in with another feature apparent from the assessment, namely the nature of the record, with >75% entries classed as recorded losses rather than known wrecks (Table 7.12).

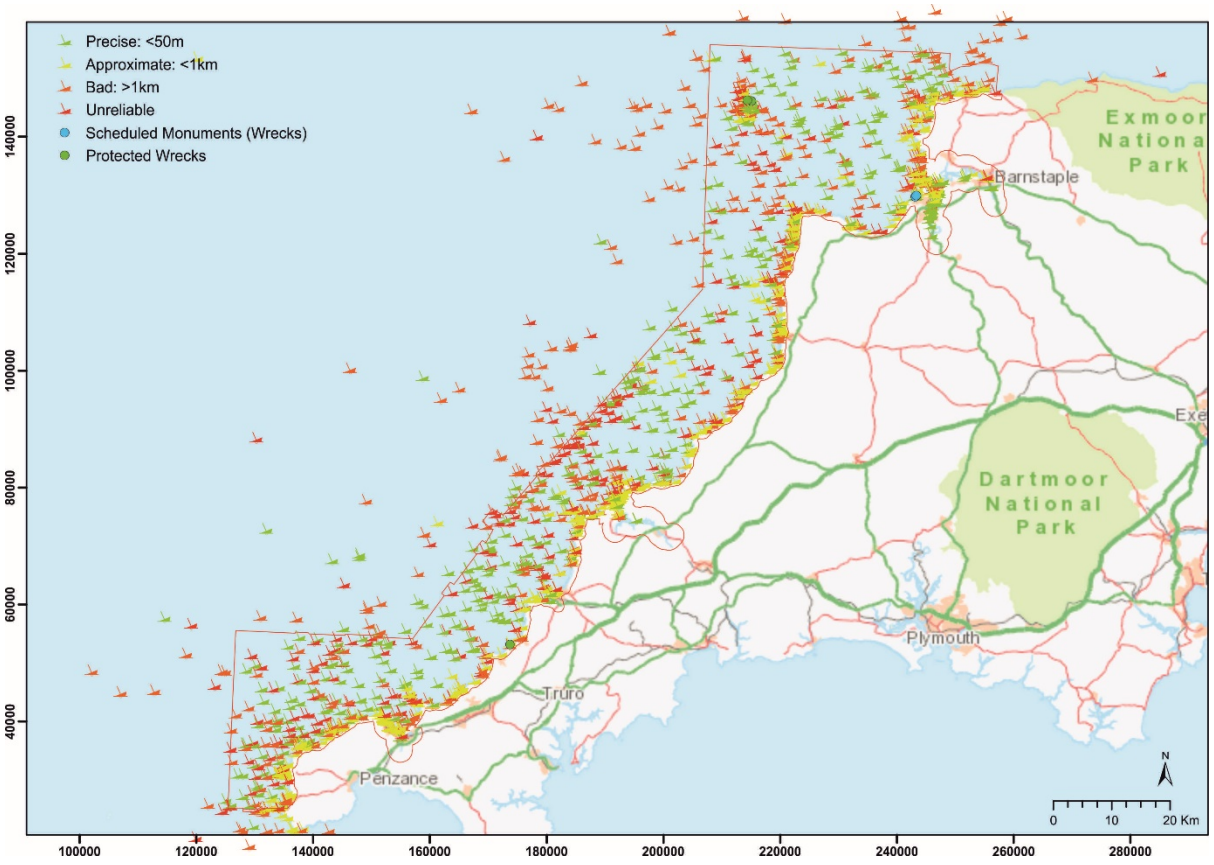


Figure 7.23: Distribution of all wreck sites within the RCZAS, including the three Protected Wrecks and two Scheduled Monument wrecks. Contains Ordnance Survey data © Crown copyright and database right 2019

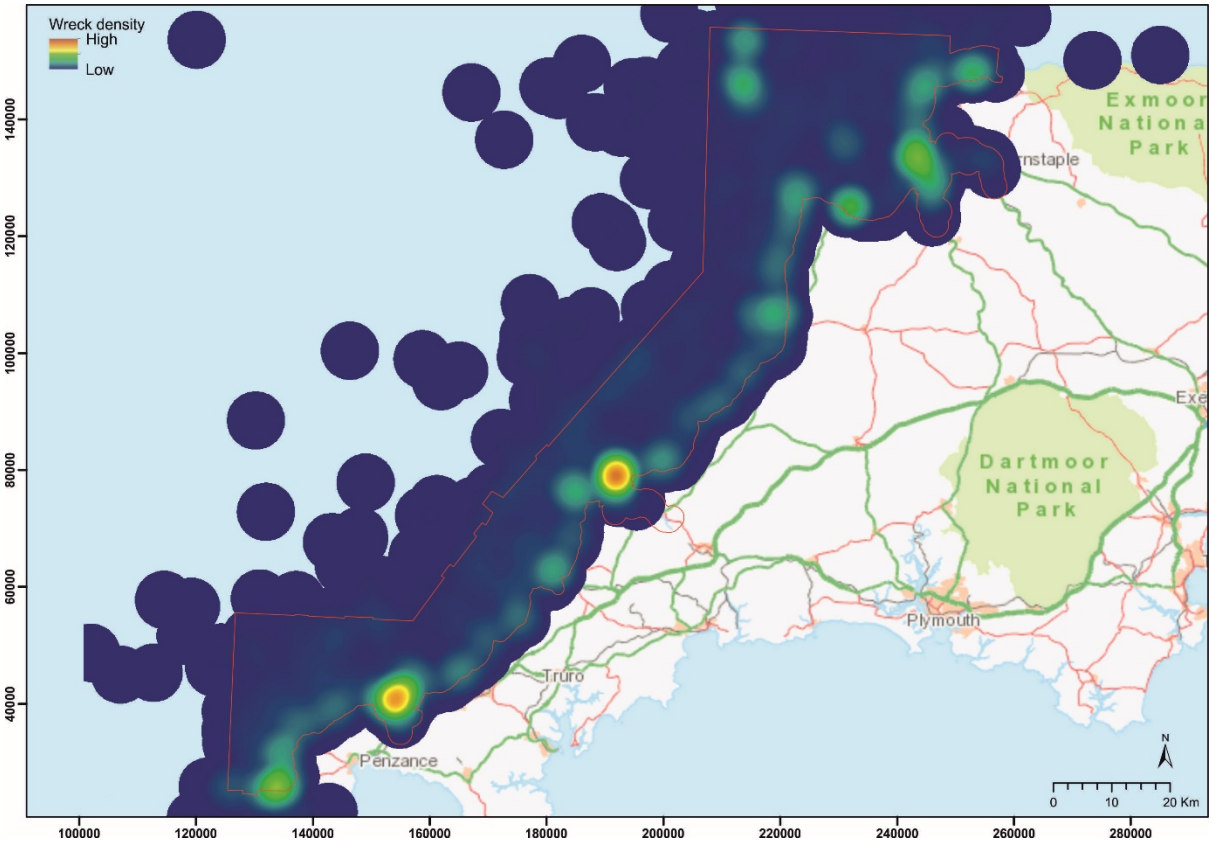


Figure 7.24: Density of all wrecks / losses for study area (categories 1 to 4). Contains Ordnance Survey data © Crown copyright and database right 2019

Table 7.10: Summary of sources used in the assignation of positions in the RCZAS wreck database and broken down by county.

Position source	No. (all)	% (all)	Devon only	Cornwall only
HER	84	3	73	11
NRHE	1418	46	456	962
RCZAS (AP)	50	16	35	15
RCZAS (Description)	825	27	316	509
RCZAS (MBES)	111	3	50	61
UKHO	619	20	149	470
Total	**3107**	**100**	**1079**	**2028**

Regarding spatial distribution, it is clear from Figure 7.23 that known wrecks and recorded losses are spread across the study area. However, the use of individual points or polygons masks frequent areas of wrecking because multiple features are superimposed. To demonstrate this, the density of these wrecks / losses is shown in Figure 7.24. This density shows hotspots associated with Land's End, St Ives Bay, Padstow Bay, Clovelly, Bideford Bay and Lundy. If the density map is redrawn solely displaying

the position of wrecks where the position is <1km (categories 3 and 4; 45% of the dataset) the same broad pattern is shown, although the densities of wrecks around Land's End, Lundy and Clovelly are reduced. This is because a lot of wrecks are simply described as being lost near or off these locations. St Ives, Bideford Bay and Padstow remain the hotspots, mainly because of historically significant wrecking sites such as Hayle Bar, Bideford Bar and Doom Bar, as well as providing major ports that would have been the focus of marine activity.

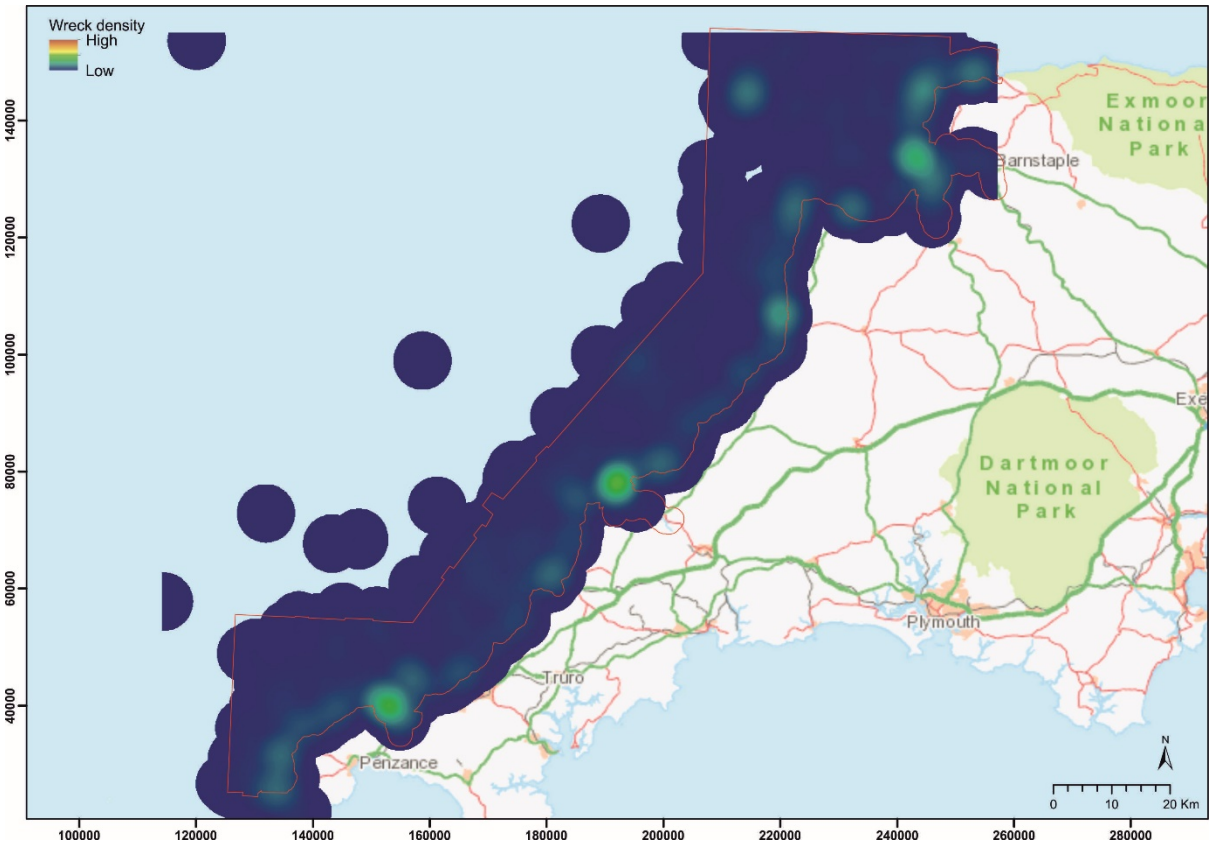


Figure 7.25: Density of wrecks / losses for study area when spatial certainty is <1km (categories 3 and 4). Contains Ordnance Survey data © Crown copyright and database right 2019

Table 7.11: Summary breakdown of positional quality of wrecks assessed to date within the RCZAS wreck database

Position quality	**No. (all)**	**% (all)**
Category 4: <100m	469	15
Category 3: 1000m-100m	930	30
Category 2: >1000m	718	23
Category 1 (unreliable)	990	32
Total	**3107**	**100**

Table 7.12: Summary breakdown of classification of wrecks assessed to date within the RCZAS wreck database

	Confirmed wreck	Documented loss	Other (lift, obstruction, no record)	Anomaly/possible wreck	Total
No. (all)	313	2340	280	174	3107
% (all)	10	75	9	6	100

Analysis of the wreck database shows a strong contrast between the historic record for losses and the number of confirmed wrecks and lifts recorded within the study area. In Figure 7.26 the 16th to 20th century period shows that the wrecks found upon the seabed and intertidal zones are dominated by vessels of 20th century (184), with only confirmed 34 wrecks from the 19th century and four from the 18th century. The recorded lifts shows higher removal of 19th century vessels (79) than the corresponding periods. By contrast, the losses record is dominated by 19th century losses (1484), with a high number of losses also recorded from the 18th century (264) and unaccounted wrecks from the 20th century (463). Of all the wrecks identified within the area, 29% (94 of 322) have not been positively identified. The oldest recorded wreck site within the area is the Gull Rock protected wreck (NHLE 1000053) on the east coast of Lundy, thought to be of 15th to 16th century as indicated by an assemblage of cannon and shot recovered from the site. It is thought that this might represent the remains of a Genoese carrack which was lost with a valuable cargo in 1418 on Lundy. The second oldest wreck positively identified is that of the Hanover (NHLE 1000072) located in Hanover Cove near Cligga Head, Cornwall, that sunk on 13th December 1763 when driven into the cove by a gale. The other protected wreck in the area is the Iona II (NHLE 1000051), a paddle steamer that sunk off Lundy in 1864 during her first transatlantic voyage via Madeira to Kingston in Jamaica and/or Nassau. Her fine hull and specially designed twin cylinder oscillating engine reputedly gave a top speed of 24 knots, and she was acquired by Charles Hopkins Boster of Richmond, Virginia, allegedly to run guns and supplies for the Confederate Forces in the American Civil War (Figure 7.27).

Within the 20th century the wreck and loss record show a significant increase in lost vessels during the period 1910-1920, represented by 94 wrecks and 189 reported losses. These primarily correspond with losses during World War I when German submarine activity was high along the south west coast.

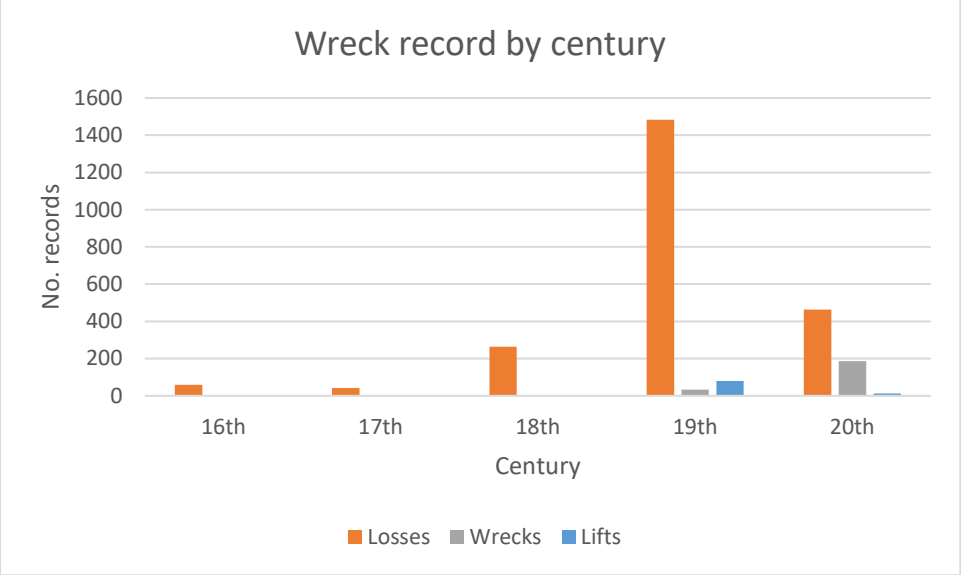


Figure 7.26: Wrecks, losses and lifts divided by century

The recorded cargos (shown in Figure 7.29) associated with the wrecks and losses (where the record exists) demonstrates that the transport of solid fuels (notably coal; n=262) is dominant within the wreck record, followed by transport of metals (tin, iron, steel etc; n=94), minerals (stone, clay, sand, etc; n=52), wood (including timber and pit props; n=46), along with 42 vessels that sank in ballast. These cargos are closely associated with the main route of trade through the area, notably the transport of coal from the South Wales coalfields and the import of Iron Ore from north Spain and France. Other cargos show a spatial distribution closer to the coastline which may represent coastal trade associated with the many ports and harbours, as shown by the distribution of the mixed cargos, food, minerals and wood. There are 20 vessels associated with military activity within the area, which includes the transport of troops, vehicles and supplies including ammunition, while five are associated with the transport of items associated with railways, including the St Chamond (MCO47411), located 3km north of St Ives, which has six locomotives onboard. This ship was torpedoed in 1918 whilst en-route from Glasgow to St Nazaire to deliver these locomotives for use during World War I.

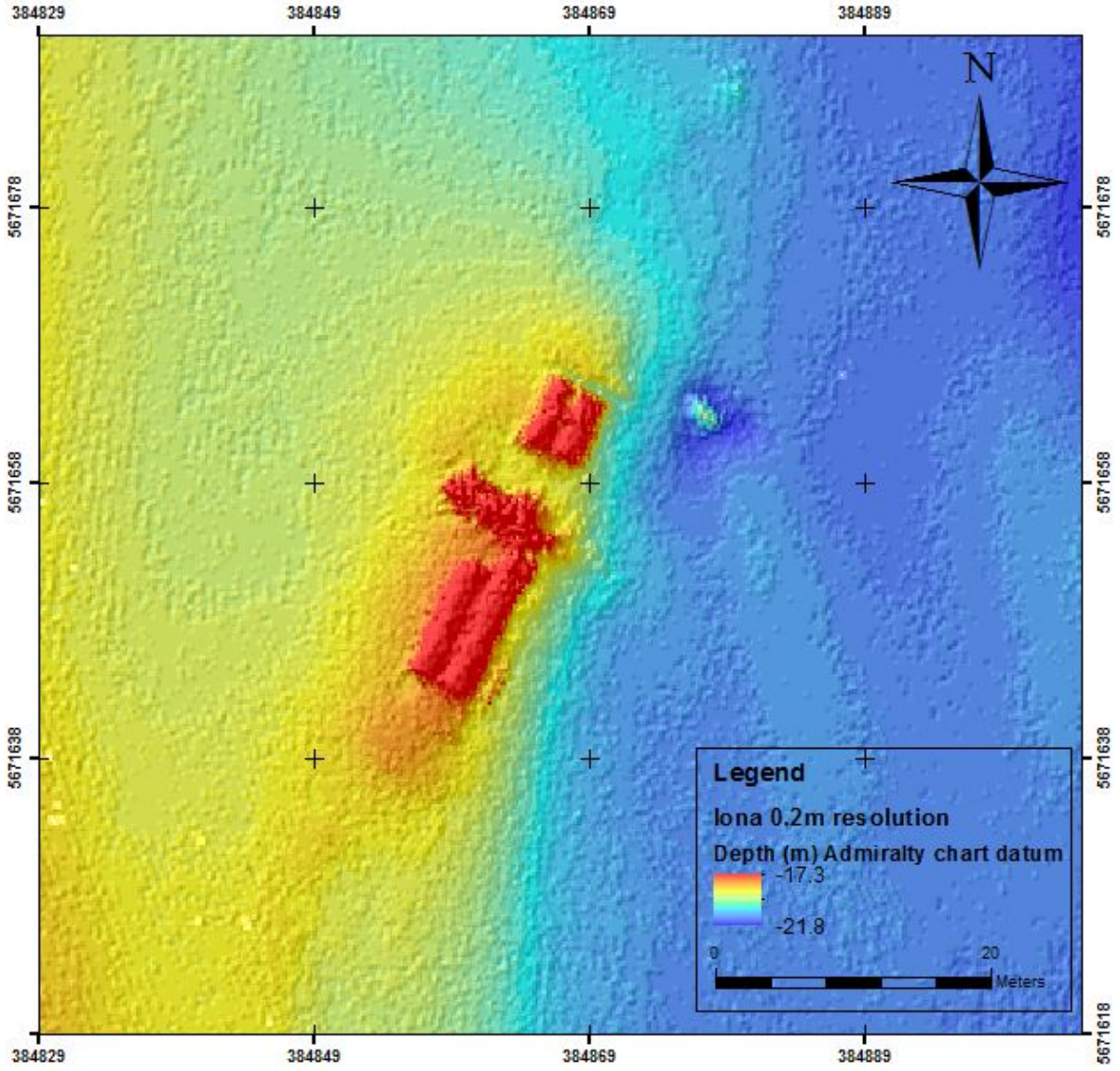


Figure 7.27: Bathymetry of the Iona II wreck site, clearly showing the remains of the fore and aft boilers upstanding on the seabed Image generated by M. Hollinrake. Contains public sector information, licensed under the Open Government Licence v3.0, from Maritime and Coastguard Agency

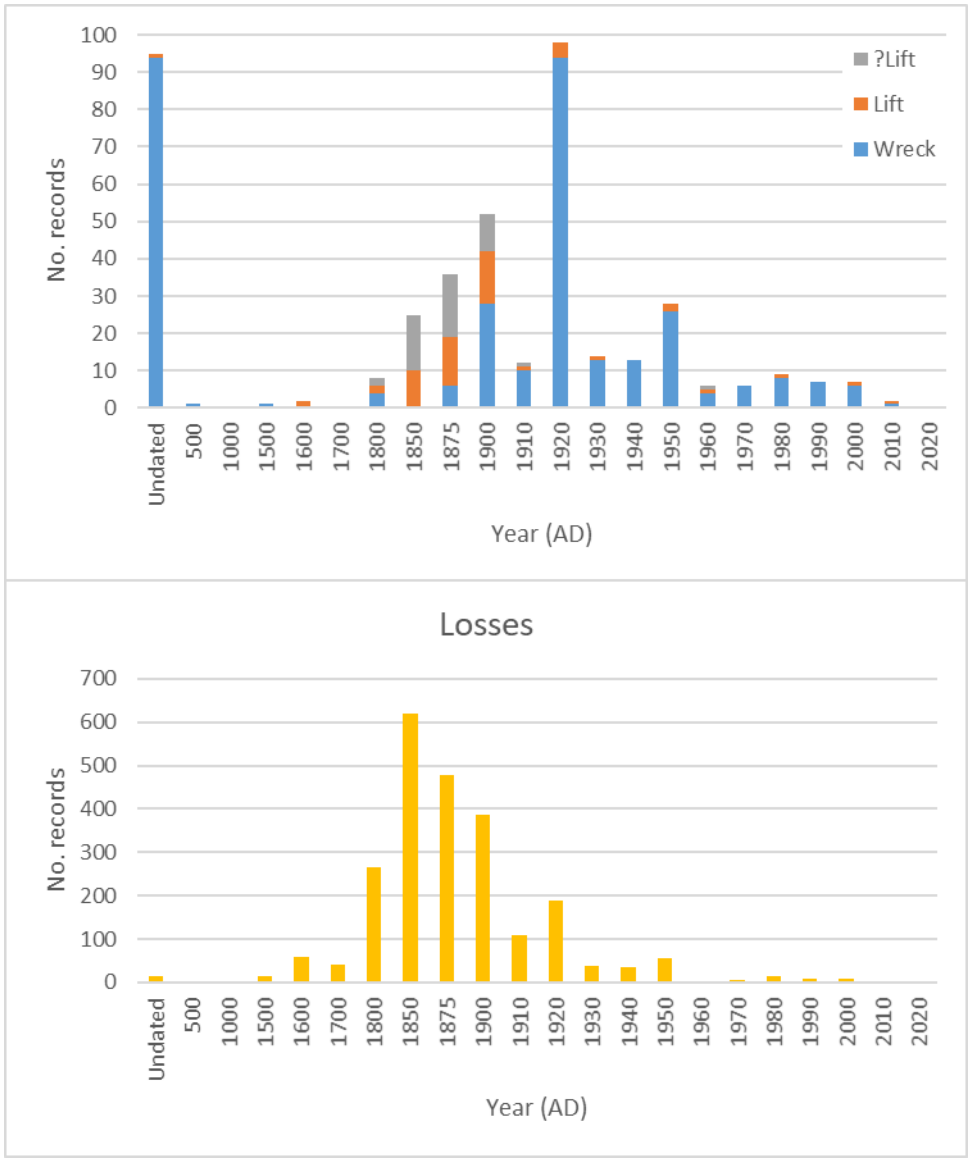


Figure 7.28: Wrecks, losses and lifts divided by age of sinking (note variable bin widths, with dates indicating the end of that bin period)

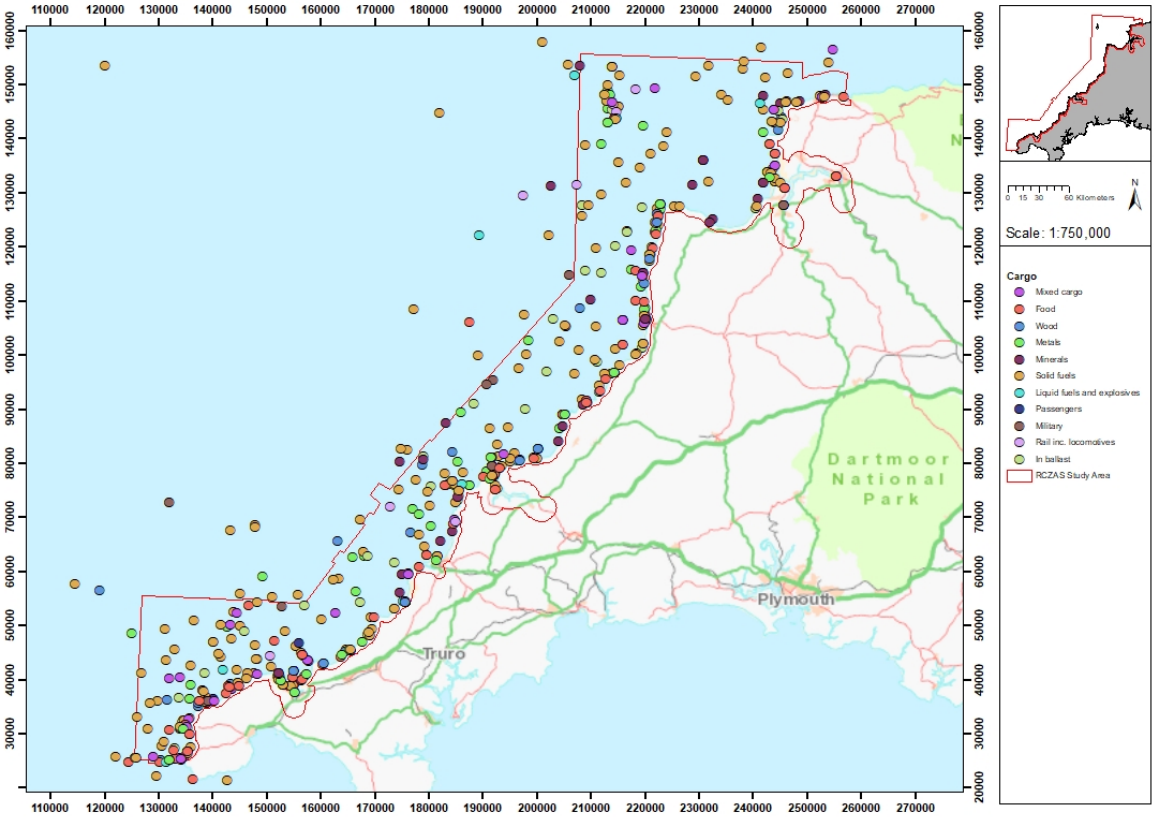


Figure 7.29: Recorded cargos associated with wrecks / losses

8 Previous archaeological and historical research

The study area included designated Heritage Assets (a World Heritage Site, Scheduled Monuments, Listed Buildings, Protected Wrecks, Conservation Areas, Registered Parks and Gardens) and non-designated Heritage Assets (archaeological sites and finds, historic buildings, wreck sites, other historic landscape features or locally-designated features, or areas of cultural historic importance).

There are a total of 3204 designated Heritage Assets within the study area. These comprise: the Cornwall and West Devon Mining Landscape World Heritage Site (Figure 4.1); 179 Scheduled Monuments (Figure 4.2); 44 Grade I Listed Buildings; 124 Grade II* Listed Buildings (Figure 4.3); 2849 Grade II Listed Buildings (Figure 4.4); three Protected Wrecks (Figure 4.6); and one Grade II* and three Grade II Registered Parks and Gardens(Figure 4.5). Designated sites discussed below will be referred to by their designation number given in the National Heritage List for England (NHLE). Non-designated heritage assets will be referred to by their reference number (MCO in Cornwall and MDV in Devon). The following discussion provides an overview of some of the key characteristics of the coastal historic environment within each of the PDZ units for Rame Head to Hartland Point SMP and each PSA unit for the Hartland Point to Anchor Head SMP. These are considered in a regional and parochial context relating to the archaeological periods in Table 8.1.

Table 8.1: Archaeological periods used in RCZAS

Period	**Date**
Prehistoric: Palaeolithic	Prior to 10000 BC
Prehistoric: Mesolithic	10000 to 4000 BC
Prehistoric: Neolithic	4000 to 2200 BC
Prehistoric: Bronze Age	2200 to 800 BC
Prehistoric: Iron Age	800 BC to AD 43
Roman	AD 43 to 410
Early medieval	410 to 1066
Medieval	AD 1066 to 1540
Post-medieval	AD 1540 to 1901
Modern (20th to 21st Centuries)	AD 1901 to present

8.1 Rame Head to Hartland Point SMP

8.1.1 PDZ9 Penwith Penunsula (Point Spaniard to Clodgy Point)

The SMP notes that this area is particularly renowned for its mining heritage with the Cornwall and West Devon Mining landscape World Heritage Site designation a reflection of this importance. Numerous prehistoric features dot the whole of the coastline, including cliff castles, settlements and field systems. The north coast is a landscape recognised for its prehistoric field pattern. Within the

RCZAS study area there are Conservation Areas at Sennen Cove, St Just, Botallack and Truthwall, Trewellard, Pendeen, Boscaswell and Zennor.

The West Penwith surveys undertaken by the CAU (in its various guises) took place between 1980 and 2010 and concentrated mostly on the north and west of the peninsula (Herring et al. 2016). A submerged forest palaeo-soil was recorded from Whitesand Bay reflecting the ephemeral, yet significant, nature of some of the prehistoric record in this region. The area contains extensive field systems of multiple ages from prehistoric to medieval, with the form of some systems preserved in the shape of modern boundaries. For others, former boundaries are visible as banks or disused walls. These were extensively mapped during the Cornwall NMP.

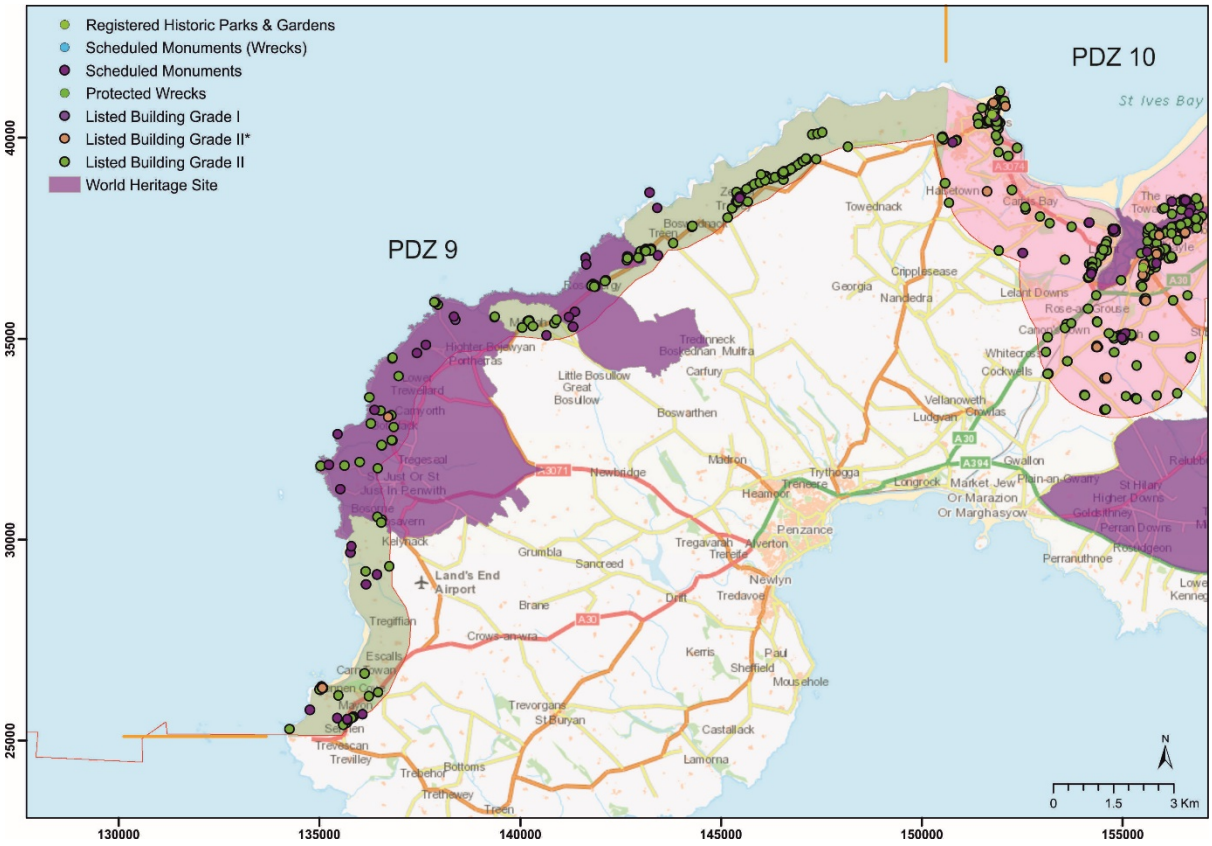


Figure 8.1: Distribution of Heritage Environment Designations (excluding Heritage Coast and Conservation Areas) in PDZ9. Contains Ordnance Survey data © Crown copyright and database right 2019

Palaeolithic

There are no recorded Palaeolithic sites or finds in this PDZ.

Mesolithic

Records relating to the Mesolithic period in the study area are characterised by artefact scatters and find spots, with probable Mesolithic flint scatter around Land's End (e.g. MCO6691) and Boscregan (e.g. MCO06607). Wymer & Bonsall (1977) gazetteer suggest a reasonable amount of material has been collected from Land's End, though precise findspot locations are often uncertain. The south coast of West Penwith has yielded some of the largest assemblages of Mesolithic flint from Cornwall, (see Hosfield *et al.* 2008), but the north coast has received little work, resulting in this period not being featured within the West Penwith Surveys volume (Jones 2016).

Neolithic and Bronze Age

Neolithic finds along this coastline are restricted to findspots of greenstone axes (e.g. MCO851) and stray finds / lithic scatters (e.g. MCO41590). While found along the coastline, the few findspots do cluster around the Trevegean Vean-Sennan area in the far west.

The Bronze Age is represented by, in addition to a series of stray finds and lithic scatters, a range of ritual and burial monuments including entrance graves (such as at Mayon Cliff (MCO24473) and Ballowall (NHLE 1013666)), which are only found elsewhere on the Isles of Scilly. Round barrows and cairns are widespread and abundant along the coastline, with a variety of size and design pointing to the significance of the coastal zone within this period. Areas of habitation are also present, such as hut circles and enclosures, as found at Boswednack (MCO27515), and a series of prehistoric field systems, such as at Bosigran (MCO20638), which are assumed to be Bronze Age based upon parallels with those found on Dartmoor and Bodmin Moor (Herring 1987), and sometimes located close to the cliff edge.

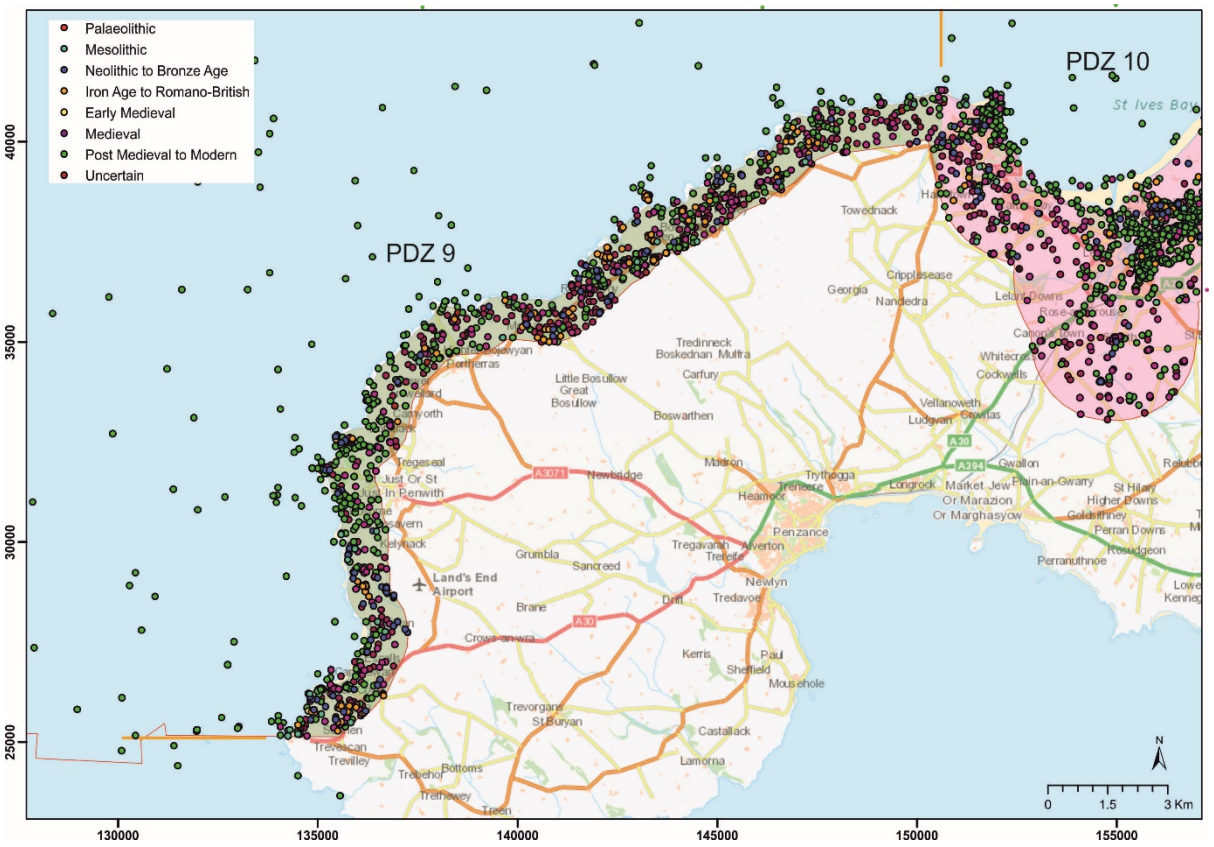


Figure 8.2: Distribution of Sites recorded in the HERs within PDZ9. Contains Ordnance Survey data © Crown copyright and database right 2019

Iron Age and Roman

A series of cliff castles are present along this stretch of coastline. Trereen Dinas (NHLE 1004300) is well represented by a series of ramparts cut across the neck of peninsula, with 18 hut circles identified within its interior. Kenidjack Castle (NHLE 1004388) also has its ramparts cut across the neck of peninsula, again with hut circles within its interior recorded. Cliff castles are also recorded from Maen Castle (NHLE 1006757), with more doubtful cliff castles found at Cape Cornwall (MCO6533) and Bosgrian Head (NHLE 1003106). Herring (1994) has suggested that such promontory fortifications are

socio-economic or ritual centres rather than simply defensive strongholds. Other settlements characteristic of the area include rounds (NHLE 1004252) and Fogous (Lower Boscaswell (NHLE 1004281)) and Pendeen Manor Farm (NHLE 1004295)), while in the Roman period there is the development of the courtyard houses (e.g. Nanjulian Farm (NHLE 1004498)). Iron Age and Roman field systems are found at Treveal (MCO27602), Treveglos (MCO28082), Bosigran (MCO20599) and Mylon Cliff (MCO21198). A Roman terracotta jar reportedly trawled up from trawling ground off Longships reef (c. 32m depth) in 1931 is worth noting, possibly representing a wreck or cargo washed overboard.

Early medieval and medieval

Early medieval sites are poorly recorded in the area and mainly relate to stray finds . At Bosigran (MCO27495), modification of a courtyard house and construction of a crow, possibly for use as a small pen, shelter, or field barn, is attributed to the early medieval period. Medieval settlements and field systems are recorded extensively across the area, along with a series of Christian sites including Chapels (e.g. St Helen's Chapel (NHLE 1004512) and Chapel Jane (NHLE 1004631)) and stone crosses (e.g. NHLE 1003109 and 1004291).

Post-medieval and modern

This area has a generally high concentration of mining activity including cliff top mines with shafts running under the seabed. One notable site on the coastline is Geevor Mine (NHLE 1004280), south of Pendeen Head (and currently on the Heritage at Risk Register), but other associated buildings, such as the tin mine calciner at Botallack Mine (NHLE 1004280), are also found across the area. The vast majority of mining-related features are already mapped by the NMP.

A series of shipwrecks are visible offshore and along the coastline, with some tied to known vessels and events. The remains of the *Alexander Yeats* (lost 1896) is reportedly visible occasionally in Treen Cove when sand is stripped. Within Penanwell Cove, near Porth Nanven, the remains of a submarine (L-1; lost 1930) has been reported as being visible occasionally at low tide and has been buoyed by the National Trust[29]. The broken up remains of the *Ravenshoe* (lost 1919) are also reported as being located in this cove, comprising anchors and plating scattered among rocks. Aerial photographs suggest that at Mayon Castle the broken up remains of *Mulheim* (lost 2003) are present, while on the east side of Gurnard Head possible wreckage from the *Traute Sarnow* (lost 1954) can be seen. Within shallow water, aerial photographs have also revealed wreckage from the *Alacrity* (lost 1963) off Pottheras Cove (seen represented 2010), and from the *Liberty* (lost 1952) off Pendeen Watch, c. 160m NNE of the eastern car park (best represented in 2013). Possible wreckage of *Scheldt* (lost 1913) may be visible on recent AP (best represented in 2007) in shallow water immediately west of Portheras Cove Immediately west of Greeb Point there is possible wreckage of the *Umbre* (lost 1899), and in White Sand Bay there is possible wreckage of *Beaumaris* (lost 1918), with bathymetry data also suggesting more wreckage/remains immediately to the west. There is the grave of an 18th/19th century shipwreck victim at Trevedra Cliff, Sennen, adjacent to the beach.

[29] https://www.submerged.co.uk/submarine-l1-and-battle-ensign-of-revenge/

8.1.2 PDZ10 Clodgy Point to Godrevy Point

The SMP notes that historic features in the area include the harbours of Hayle and St Ives and features connected to the WHS (The Port of Hayle). Important prehistoric and medieval settlements are associated with Godrevy and Gwithian, part preserved under the extensive dune system, with Upton Towans also containing the important remains of an extensive explosives works. There are conservation areas at Halsetown, St Ives, Lelant, St Erth, Hayle, Phillack and Gwithian. One of the key archaeological sites in this area is the multi-period occupation around Gwithian, showing evidence of activity from the Mesolithic through to the post-medieval period, and has been extensively investigated over the past 70 years and protected as Scheduled Monuments (NHLE 1004260, 1004259 and 1004258). This multi-period activity is well-represented across the PDZ through the PAS finds, with particular concentrations of Roman, medieval and post-medieval finds, including concentration around the village of Phillack and to the south of Gwithian.

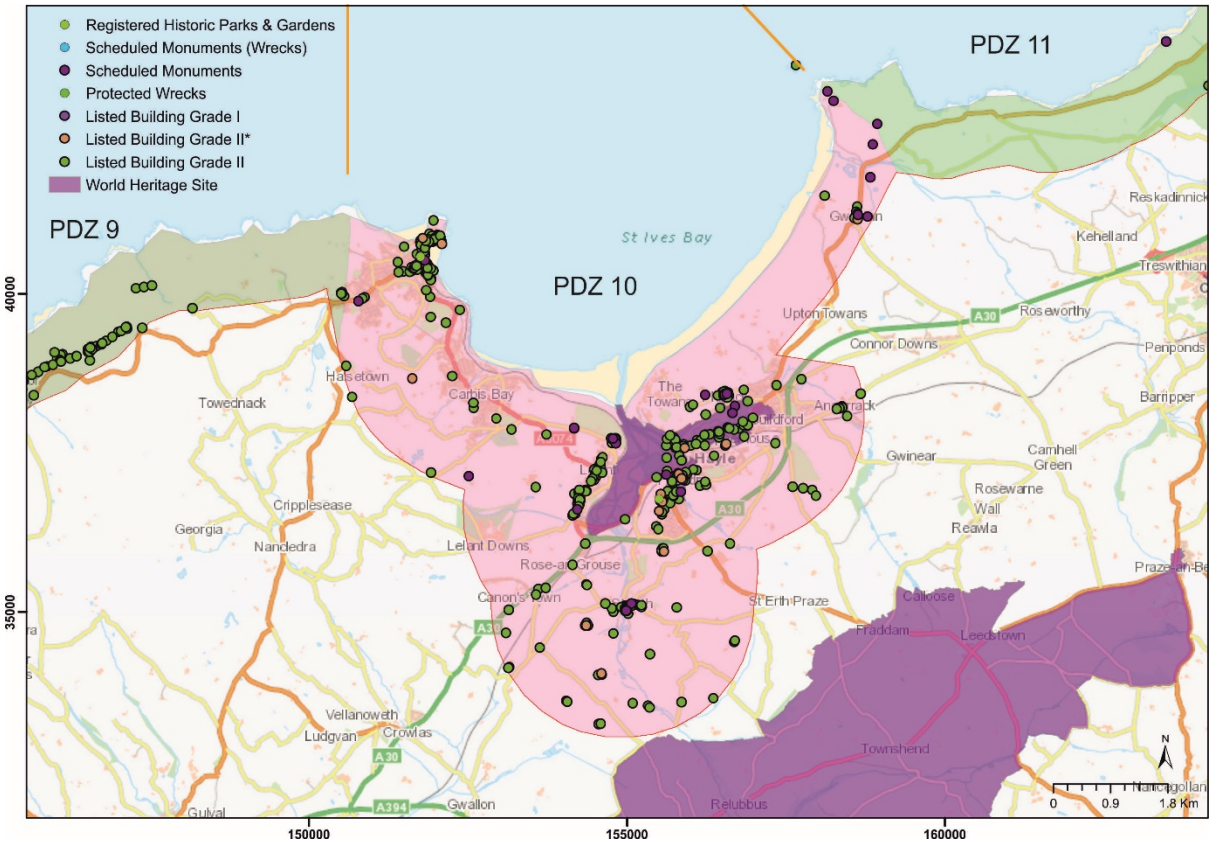


Figure 8.3: Distribution of Heritage Environment Designations (excluding Heritage Coast and Conservation Areas) in PDZ10. Contains Ordnance Survey data © Crown copyright and database right 2019

Palaeolithic

There are no recorded Palaeolithic sites or finds.

Mesolithic

Mesolithic scatters have been found across the Gwithian area. This concentration of finds may, however, be a reflection of the level of excavation in this area through the blown sand deposits; such excavation has been significantly less in the main dune area to the southwest at Upton Towans and The Towans which might equally yield buried palaeosols with prehistoric material. A series of flint scatters have also been found at Carrick Du, west of St Ives, during both building operations (MCO6623) and within outcrops (MCO55807).

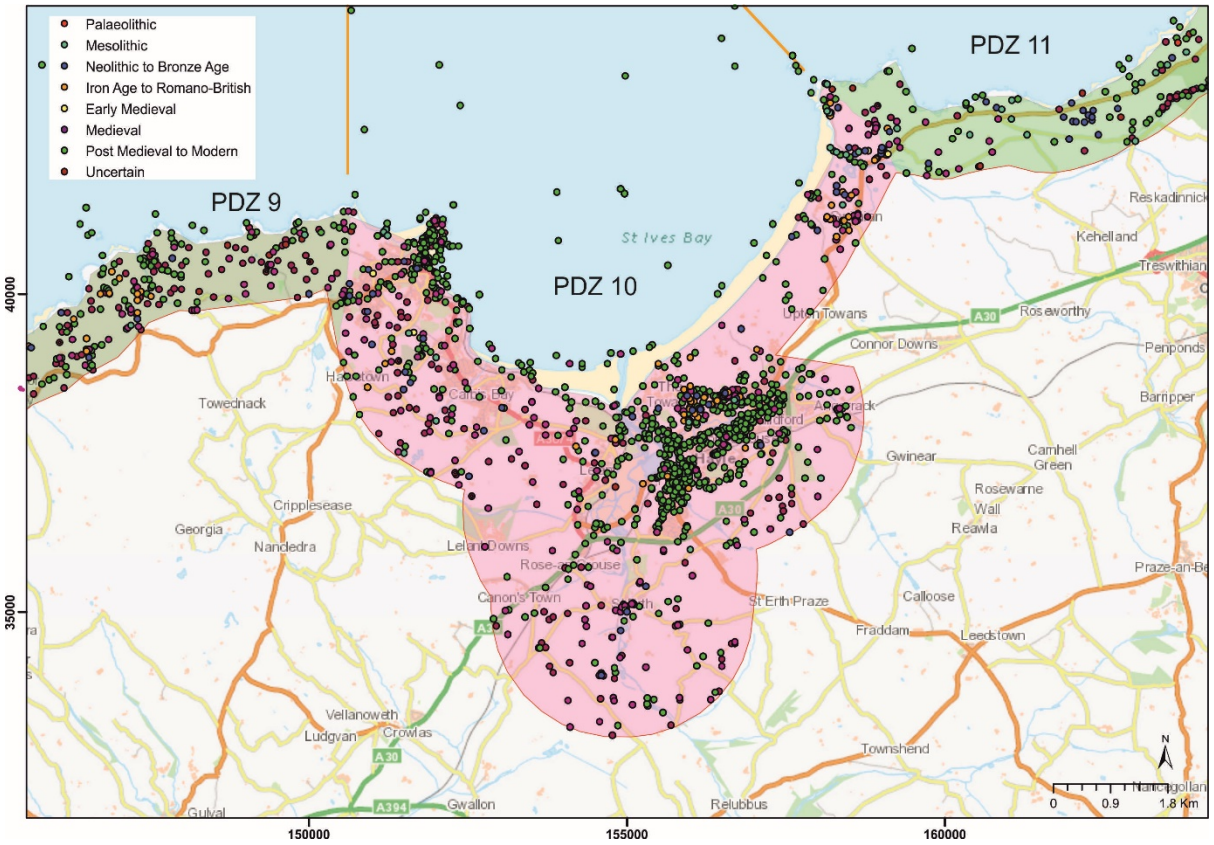


Figure 8.4: Distribution of Sites recorded in the HERs within PDZ10. Contains Ordnance Survey data © Crown copyright and database right 2019

Neolithic and Bronze Age

A greenstone outcrop near Porthminster (MCO27309) has been identified as a raw material source for Group II Neolithic axes. A probable Neolithic or Bronze Age occupation site has been identified at Wheal Emily (MCO18326), with standing stones present at Longstone (MCO7455) and Beersheba (NHLE 1006722), and a possible Neolithic midden in Phillack churchyard (MCO16297). Beyond these, most Neolithic activity is represented by find spots.

A concentration of Bronze Age material in the Phillack area is identified through the PAS, with other possible areas of Bronze Age activity around Carrick Du and Carnell. The most notable Bronze Age site in the area is at Gwithian where Bronze Age settlement, field systems and burial sites have been investigated.

Iron Age and Roman

Late Iron Age to Roman activity is again well-recorded in the Gwithian and Godrevy area, including Romano-British settlement and field systems. There is an Iron Age hillfort, now partly destroyed by farming, a railway cutting and ornamental park landscaping, at Carnsew (NHLE 1006720) on the banks of the Hayle Estuary, and a postulated Roman fort at Lelant Church (NHLE 1017628). PAS has also revealed a concentration of Roman finds within the Phillack area.

Early medieval and medieval

At Gwithian there is an important early medieval settlement and industrial site, with pottery finds suggesting occupation on Phillack Towans to the south. There are early medieval inscribed stones at

Hayle (MCO7140) and St Erth (NHLE 1010845), and possible early medieval / medieval building at Carnello (MCO27302).

Medieval settlements are well-recorded across the area, though some settlements were abandoned due to the encroachment of sand. For example, it is recorded in the 16th century that the settlement of St Ives relocated up the hill due to the encroachment of sand. It is therefore possible that parts of this abandoned medieval settlement, located between the mainland and the Island, may be preserved under blown sand.

Post-medieval and modern

The Hayle estuary became an important area for industry during the post-medieval period, with extensive docks, responsible for building numerous ships including the *SS Ramleh*, the largest to be built in Cornwall, and two large foundries; Harveys and Copperhouse, leading to the expansion of the town. Details of the historic development of Hayle can be found in the Hayle Historical Assessment (Cahill 2000). Expansion of the harbour at St Ives during this period is also evident, with remains of the ill-fated wooden pier, destroyed by storms in 1864, still evident on aerial photographs.

During World War II there were extensive defences (e.g. pillboxes and anti-aircraft batteries) built around the estuary to protect the harbour and local industries. Defences were located along the beach and coastal edge between Godrevey Point to Black Cliff, the majority of which are no longer extant.

Remains of the *Alba* (lost 1938) are visible on aerial photographs on northeast side of Portmeor Beach. Intertidal wreckage is visible on aerial photographs on the foreshore at Lelant, possibly representing up to three small wrecks, or at least the scattered remains of one larger wreck. The *St Chamond* (lost 1918) is an important World War I wreck, transporting cargo and locomotives for use on the front line in France.

8.1.3 PDZ11 North Cliffs (Godrevy Point to Pentire Point West)

The SMP notes that the dune systems at Penhale and Gear Sands preserve buried landscapes and settlements, including the iconic St Piran's Oratory. Dotted along the coast are a number of airfields originating from World War II, some still in private use. Historically much of this area was heavily associated with mining and sea trade and the derelict remains of the last harbour can still be seen on the western side of Trevaunance Cove. The WHS covers a large area, from south of Porthtowan up to Perranporth (St Agnes Mining District) and the port of Portreath (part of the Camborne/Redruth Mining District). These reflect the density of mining activity along the cliffs and represented by a number of iconic engine houses, such as the former tin mine engine houses located within a few metres of the cliff edge at Wheal Coates. There is a conservation area at St Agnes. There are recorded submerged forests at Porthown, Portreath and Perranporth.

Kelsey Head has a range of prehistoric material, reportedly including Mesolithic flints (Harding and Irwin collections), Bronze Age (barrows and artefacts), Iron Age occupation (ceramics and earthworks), Romano-British coins and medieval ceramics. Does not appear to have been subject to recent survey or controlled excavation.

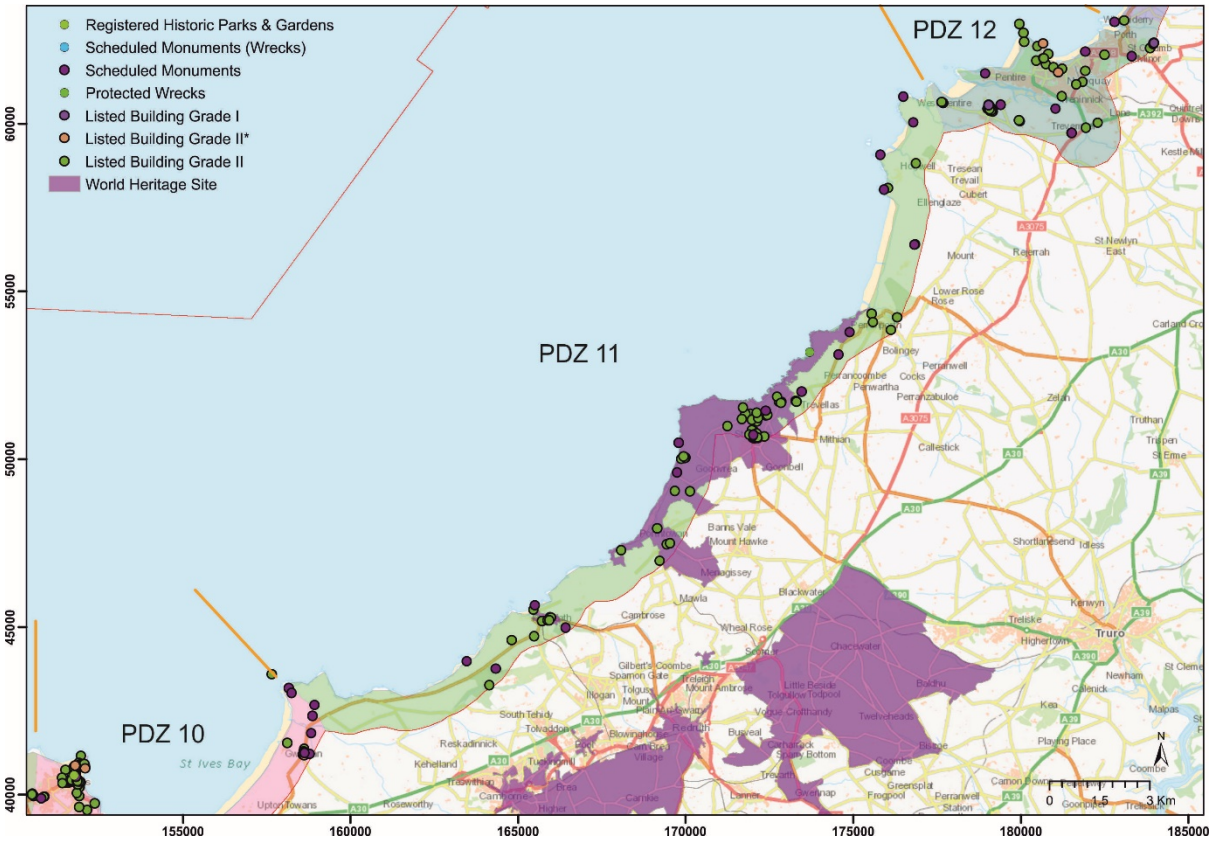


Figure 8.5: Distribution of Heritage Environment Designations (excluding Heritage Coast and Conservation Areas) in PDZ11. Contains Ordnance Survey data © Crown copyright and database right 2019

Palaeolithic

Three Upper Palaeolithic artefacts are reported from the large assemblage of prehistoric flints recovered from Raskajeage Downs (MCO40359).

Mesolithic

Large collections of Mesolithic lithic scatters have been recovered from St Agnes Head (MCO6764), Kelsey Head (MCO15092), Raskajeage Downs (MCO40359), Hudder Downs (MCO6685) and Gwithian (MCO6676). Re-analysis of the Mesolithic assemblages from the Gwithian-North Downs area has recently been undertaken, providing new insights into the form and importance of these sites (Jones et al. 2018).

Neolithic and Bronze Age

Neolithic finds show similar spatial distributions to those of the Mesolithic period, reflecting areas where the largest collections of flint have been achieved. Bronze Age barrows are found to cluster along the coastline, notably around Raskajeage Downs, Trevellas Downs and between Ligger Point (NHLE 1016990) and Kelsey Head. Some, such as that at Hudder Down (MCO2897), have been significantly impacted by cliff erosion.

Iron Age and Roman

Cliff castles are found at Caravannel (Crane Castle) (NHLE 1004390), Kelsey Head (NHLE 1020026), Tregga Head (MCO29761), Penhale Point (NHLE 1016991) and Tubby's Head (NHLE 1017017). The latter is unusual in form as the main earthwork is aligned perpendicular to the coastline and thought to possibly be protecting a landing place. The cliff castle at Penhale Point has been partially destroyed

by both mining activity and a modern radar station, but was subject to controlled excavation in the 1980s (Smith 1988). Inland there is also a purported Iron Age settlement at Holywell (MCO15026) possible Iron Age / Romano-British field system at Trevissick (MCO25178), and rounds at North Cliff (NHLE 1004257), Nance (NHLE 1007295) and Nancekuke (MCO8266).

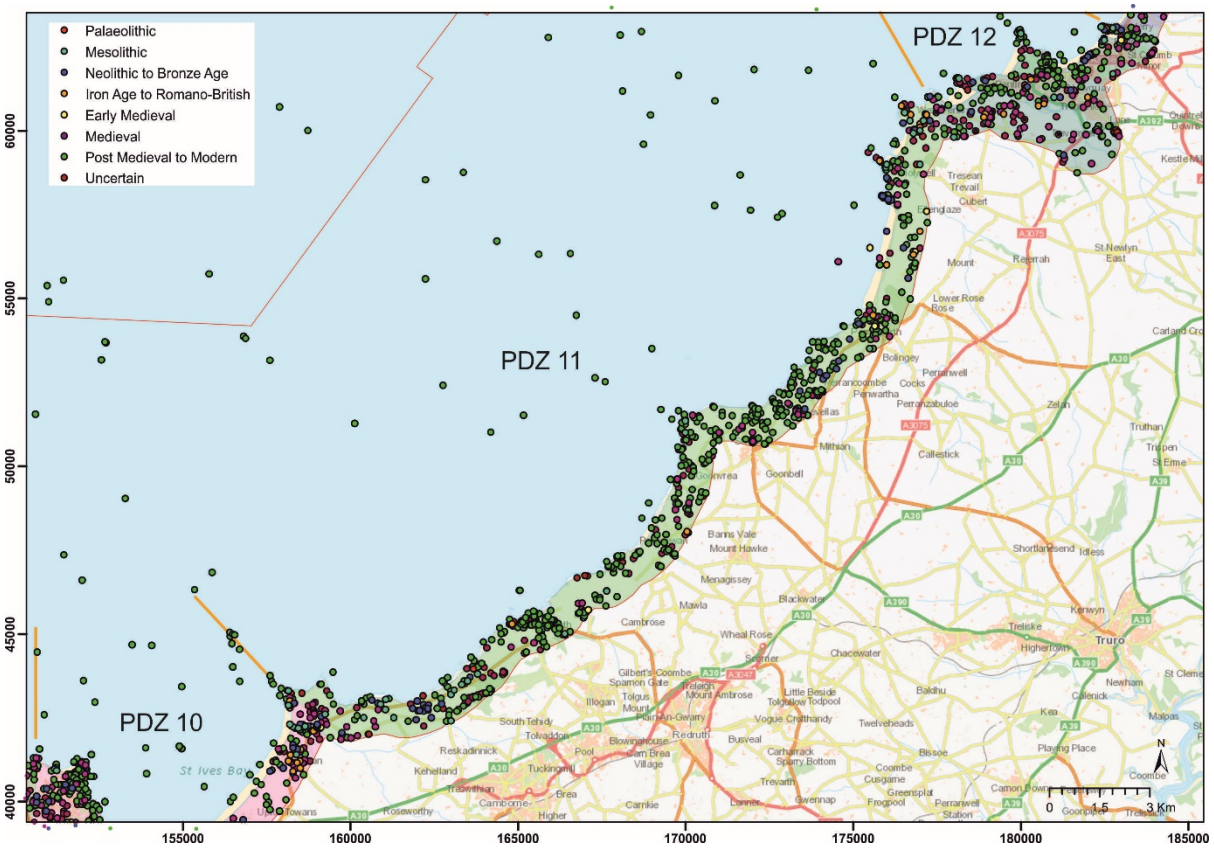


Figure 8.6: Distribution of Sites recorded in the HERs within PDZ11. Contains Ordnance Survey data © Crown copyright and database right 2019

Early medieval and medieval

St Piran's Oratory (NHLE 1018955), situated in Penhale Sands, is one of the most important early Christian sites in England. Beyond this site, early medieval settlements are also found at Nancekuke (MCO15796) and Tywarnhayle (MCO11672), along with an early medieval chapel at St Agnes (MCO10176). Findspots of early medieval pottery have also been reported from Perran Sands beach (NRHE 428163), west of St Piran's Oratory. The medieval period is typified by settlements and associated field systems, such as the ridge and furrow at Chapel Coombe (MCO33321).

Post-medieval and modern

The area has considerable amounts of mining activity along the coast, signified by the WHS St Agnes region in the centre of the PDZ, which were extensively mapped by the NMP.

World War II activity is also well represented in the area, notably at RAF Portreath and Perranporth, at which several buidlings and structures are still present. West of Portreath there are also the remains of a battery dating from 1782 (MCO26420), one of a series of defences protecting coastal settlements and estuaries in Cornwall during the Nepoleonic period. At Portreath there are also the remains of 17th century pier/harbour on west side of beach, which are sometimes visible after storms strip away beach sand.

A number of wrecks are visible along this coastline. The *Francia* (lost 1917) is visible on Holywell beach, with the *Seine* (lost 1900) reportedly visible sometimes on Perranporth Beach at low tide. The World War I submarine E-43 (lost 1921), which went adrift while under tow, came ashore under St Agnes Head and is reported to be nearly completely broken up and buried. The protected wreck the *Hanover* (lost 1763; NHLE 1000072), located in Hanover Cove, has been extensively salvaged (which was a principal driver for its designation) and was recently resurveyed to establish how much of the site remains (Dresch and Evans 2017).

8.1.4 PDZ12 Newquay (Pentire Point West to Trevelgue Head)

The SMP notes that this stretch of coastline contains some of the largest known concentrations of Bronze Age barrows, notably at Kelsey Head. It also has some substantial and highly visited Iron Age cliff castles, such as Trevelgue Head, wioth many of these sites actively eroding. There is a conservation area at Crantock and St Columb Minor. There is a submerged forest reported from Porth (St. Columb). There has been a comprehensive assessment of the Gannel undertaken by Gossip (2001), which included both a desk based assessment and field survey.

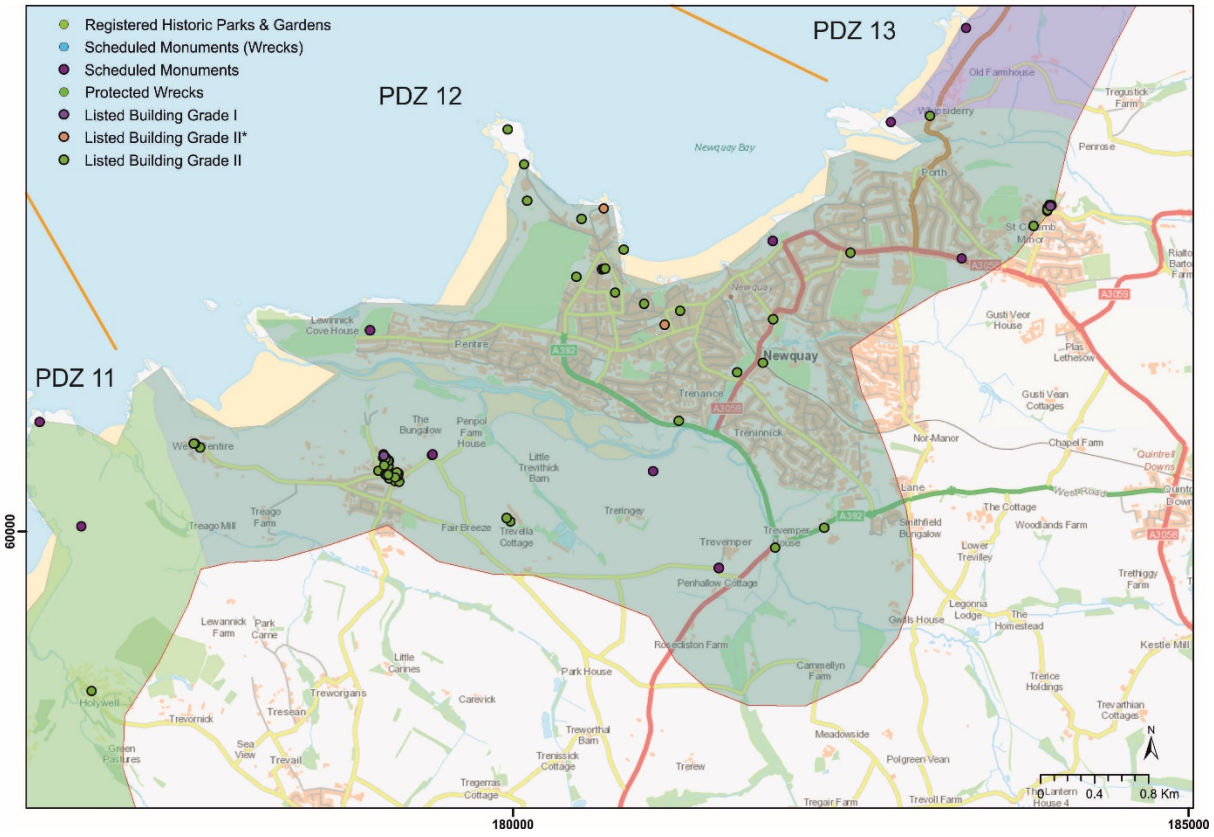


Figure 8.7: Distribution of Heritage Environment Designations (excluding Heritage Coast and Conservation Areas) in PDZ 12. Contains Ordnance Survey data © Crown copyright and database right 2019

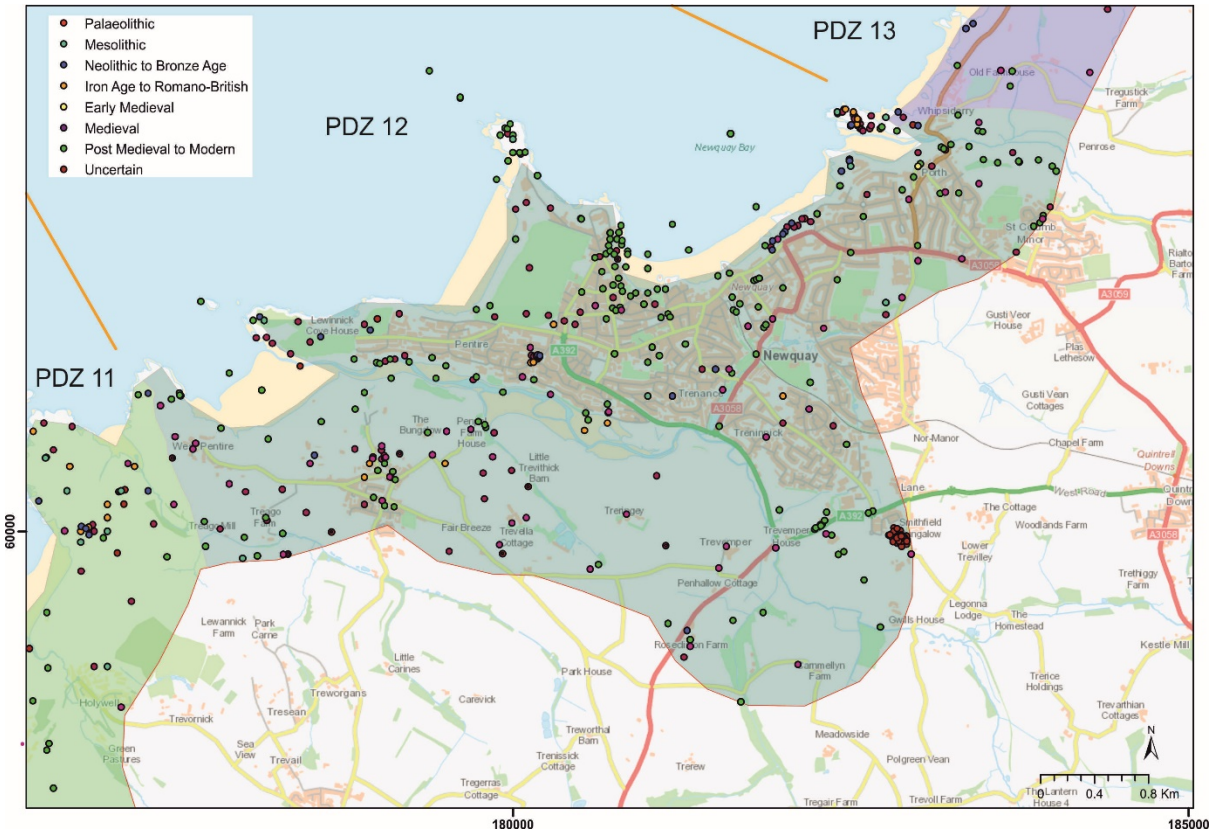


Figure 8.8: Distribution of Sites recorded in the HERs within PDZ12. Contains Ordnance Survey data © Crown copyright and database right 2019

Palaeolithic

There are no recorded Palaeolithic sites or finds, although the area does host important Pleistocene sequences at Fistral beach, where cliff erosion is reported to have exposed *Megaloceros* (Irish elk) remains in Pleistocene raised beach.

Mesolithic

A number of Mesolithic scatters and finds have been made on the main headlands of the area, notably at Pentire Point (MCO1142) and Trevelgue Head (MCO22931).

Neolithic and Bronze Age

The Neolithic is restricted to a series of findspots. However there are extensive Bronze Age remains in the area, including a large barrow group at Barrowfields (including NHLE 1004369) and a series on Pentire Point East (NHLE 1004392) and Trevelgue Head (NHLE 1006712). Several of these exhibit erosion caused by the public climbing onto them. At Trethellan Farm there is a significant Middle Bronze Age farming settlement that was discovered and excavated in advance of development (MCO47423).

Iron Age and Roman

Trevelgue Head (NHLE 1006712) is one of the most significant Iron Age sites in the region, providing a key chronological underpinning to the ceramic phasing of Iron Age sites in the region and as a nationally significant metal working site (see Nowakowski and Quinnell 2011). A series of rounds have been identified as cropmarks, with one at Tretherras excatated in 2002 (Craze et al. 2001), and at Trethellan Farm (MCO47457) and Crantock (MCO26507) Iron Age cemeteries have been identified.

Early medieval and medieval

Medieval records relate predominantly to the location of settlements, churches and field systems in the area, including an area of ridge and furrow on the cliff at Barrowfield (MCO20542).

Post-medieval and modern

There are a large number of mining sites across the Newquay area. In the town there are many fish cellars recorded, while along the Garnel there are former quays and boatyards present. A number of wrecks and hulks are worthy of mention. The *MFV Sanu,* a former Royal Navy supply tender owned by Cornish author Denys Val Baker, was stranded in the Gannel in 2002, demolished 2013, but has been recorded by the Maritime Archaeology Sea Trust / Bournemouth University.

The house Corisande, Pentire, built in 1895 and an important characteristic feature noted during the Newquay Character Study[30], has a number of interior features salvaged from ships including a staircase from *SS Corisande* (after which house is named) and keel baulking beams from Gannel Shipyard (closed 1881). The Remains of the *Bessie* (a schooner lost 1912 close to the Island), reportedly are occasionally exposed during storms, most recently in 2014. Another vessel, probably The *Ocean Queen*, was exposed in harbour by the January 2014 storms and then excavated and removed.

8.1.5 PDZ13 Trevelgue Head to Stepper Point

The SMP notes that this stretch of coastline contains some of the largest known concentrations of Bronze Age barrows, notably at Pentire and Constantine Bay. In additional numerous cist burials have been excavated, due to ongoing coastal erosion, at Harlyn Bay. The cliff castle and stone hut circles at Trevelgue Head are particularly good examples of prehistoric settlement. There are no conservation areas in this PDZ. There are submerged forests in Constantine Bay, Porthmeor, Porthmissen Beach and Mawgan Porth.

Palaeolithic

There are no recorded Palaeolithic sites or finds.

Mesolithic

There are many Mesolithic scatters on Trevose Head, Booby's Bay and Tregudder Gorge, consisting of relatively well-provenanced material (see Johnson and David 1982; Cave 1985; also see Irwin collection: MCO47814). A lot of the material has been derived from ploughed fields, though some is also eroding out of coastal/cliff top exposures, particularly in Booby's Bay.

Neolithic and Bronze Age

Significant clusters of Bronze Age barrows are found on the coastline, including the barrow cemeteries at Park Head (NHLE 1003098) and Cataclews Point (NHLE 1003088). At Park Head, of the group of recorded Bronze Age barrows, at least one is in process of being destroyed by cliff erosion, while west of Harlyn Bridge Cliff falls/coastal erosion have revealed possible barrows and burials, most recently in 2014 (see Jones 2015).

[30] http://newquayplan.org/wp-content/uploads/2019/02/Appendix-5-Newquay-Character-Study1.pdf

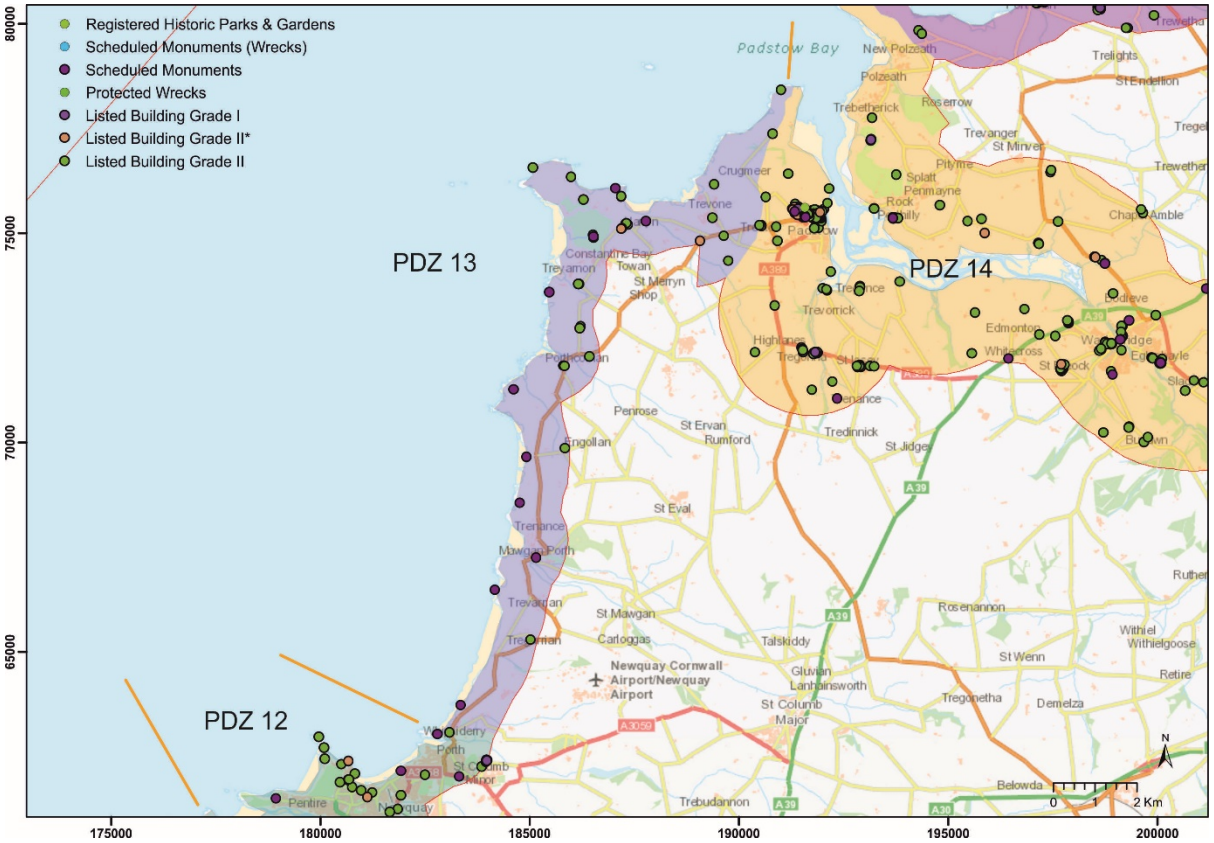


Figure 8.9: Distribution of Heritage Environment Designations (excluding Heritage Coast and Conservation Areas) in PDZ13. Contains Ordnance Survey data © Crown copyright and database right 2019

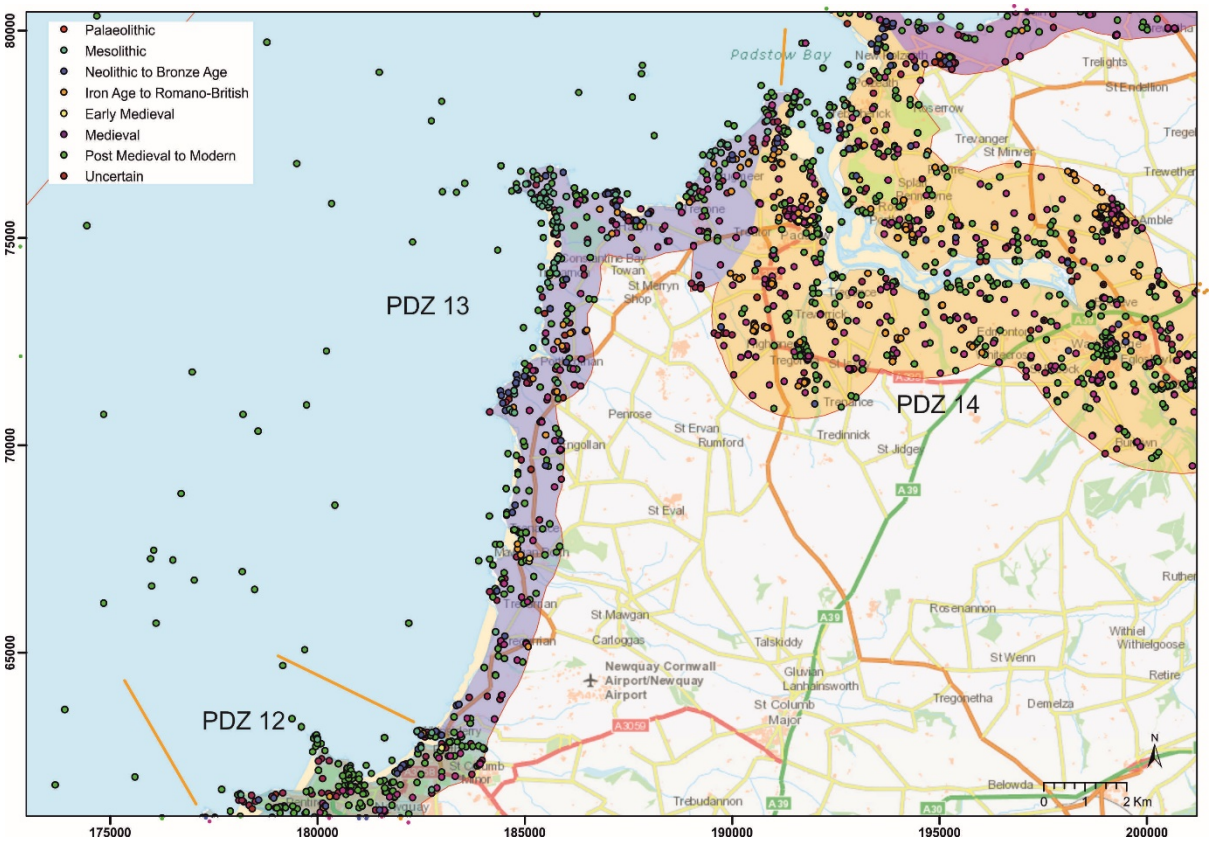


Figure 8.10: Distribution of Sites recorded in the HERs within PDZ13. Contains Ordnance Survey data © Crown copyright and database right 2019

Iron Age and Roman

A series of Iron Age cliff castles are found along this coastline, including Trethias Island (NHLE 1004234), a unique cliff castle spread over 3 separate promontories, Liveloe (Griffin's Point; NHLE 1021004), Redcliffe Castle (NHLE 1021006), Park Head (MCO6559) and Trevelgue Head (NHLE 1006712) on the boundary with PDZ12. Within Harlyn Bay there is an Iron Age cemetery (MCO25837) and prehistoric settlement under former dunes (MCO21818). Other evidence of settlement is found along this coastline, though in many instances these sites are now reduced to cropmarks which were extensively recorded during the NMP

Early medieval and medieval

At Mawgan Porth there is a significant early medieval village with associated burial ground (NHLE 1003087).

Post-medieval and modern

A number of mines are found along this coastline, but in significantly lower density to the PDZs to the south. Along the coastline area a series of cliff areas and bays were used as bombing ranges during World War II, with associated structures such as radar stations and observation posts located along the coast.

Small clusters of capstans and mooring posts on cliff tops mapped on Ordnance Survey maps (e.g. Cataclews) are indicative of former landing places. In 1994-95, a burial, probably of shipwrecked sailor, was found eroding out of shallow grave on north side of Treyarnon Bay (MCO46977). Notable shipwrecks along this coast include the *Carl of Hamburg* at Booby's Bay, which has been exposed over recent winter storms. The wreck of the *Poldown* (lost 1917) is described by the UKHO as a 'dead' record, but there is a wreck-shaped anomaly at the given location. At Trevose Head the NRHE has listed c.120 losses to this named location, but very few are strandings or wreckings were caused by striking the headland, with most of the losses resulting from offshore collisions, founderings, or World War I losses (e.g. loss of 10 vessels in 1 day to the same U-boat).

8.1.6 PDZ14 Camel Estuary (Stepper Point to Pentire Point)

The SMP notes that there are a number of Scheduled Monuments in the area including a churchyard cross in St Michael's Church. There are numerous Bronze Age barrows on the coastal strip, a submerged forest at Daymer Bay, and an important coastguard complex at Hawkers Cove, Padstow harbour. The medieval bridge at Wadebridge marks the lowest crossing point of the Camel. There are three Conservation Areas present at Padstow, Little Petherick, St Breock, Wadebridge and Chapel Amble. Submerged forests have been reported from Harbour Cove, Little Petherick Creek and Daymer Bay.

Extensive fieldwalking / metal detecting has taken place around the estuary, notably at Lellizzick / Harbour Cove, Porthilly and Chapel Amble. The former has produced a large amount of Romano-British finds as well other material from the Bronze Age to modern periods, while the latter areas have produced mainly post-medieval finds. The NMP resulted in an extensive number of cropmarks being identified in the area, though most of these features appear to have no topographic signature in the available LiDAR, suggesting that they have been completely levelled or too subtle enough to recognise within current Lidar resolution.

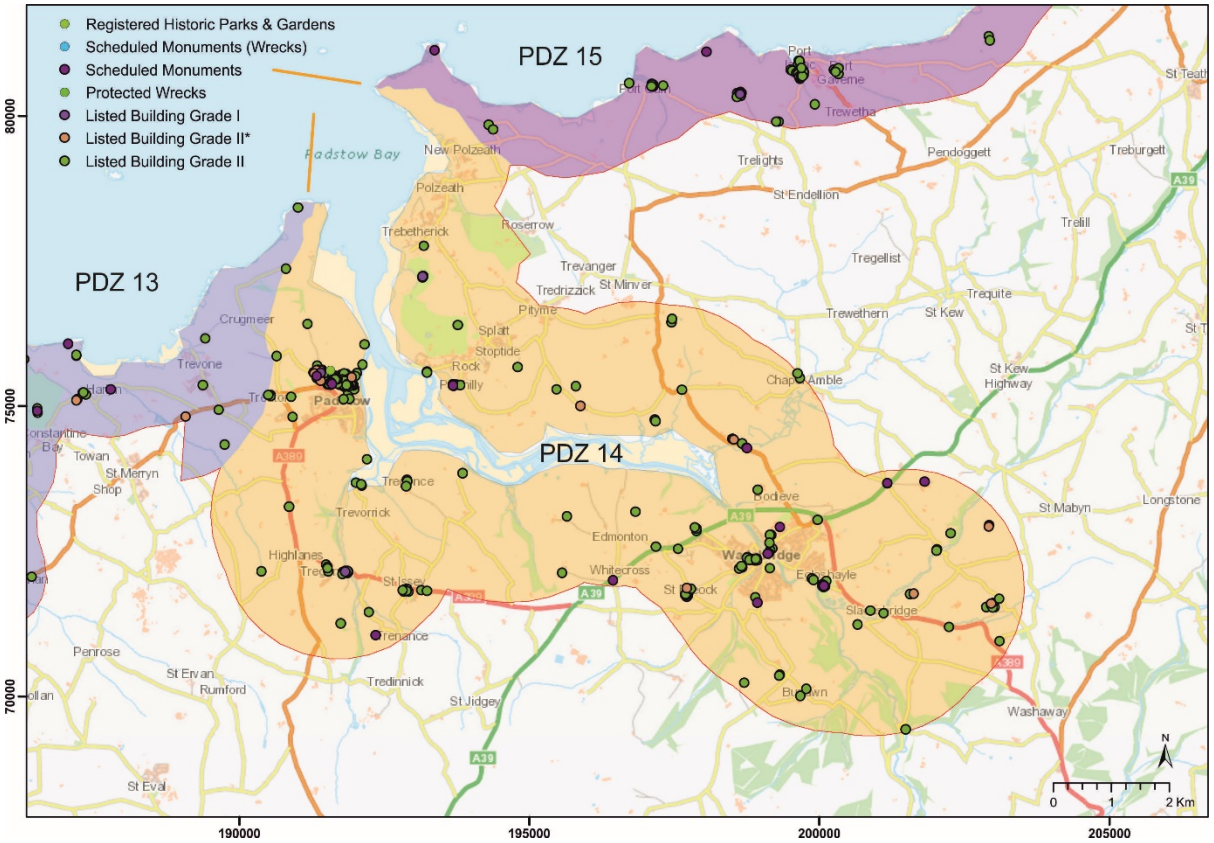


Figure 8.11: Distribution of Heritage Environment Designations (excluding Heritage Coast and Conservation Areas) in PDZ 14. Contains Ordnance Survey data © Crown copyright and database right 2019

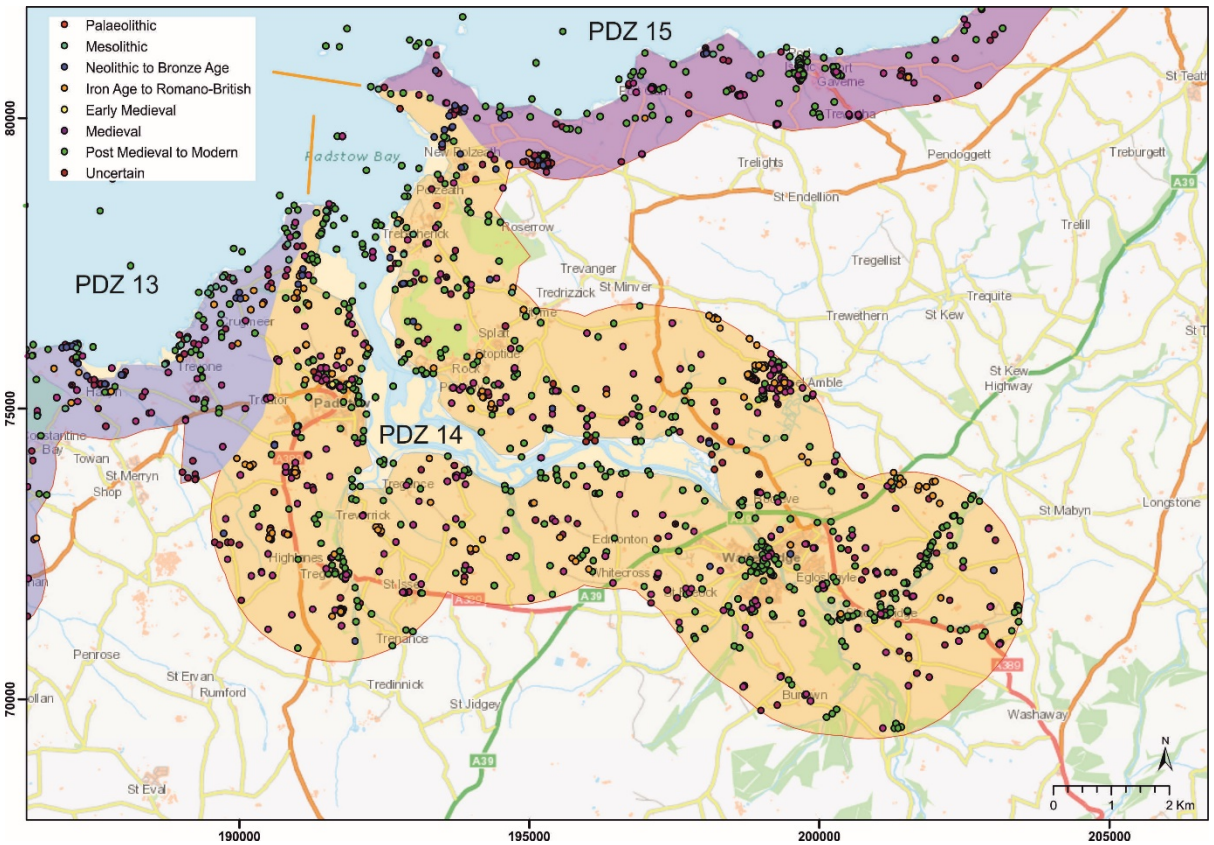


Figure 8.12: Distribution of Sites recorded in the HERs within PDZ 14. Contains Ordnance Survey data © Crown copyright and database right 2019

Palaeolithic

There are no recorded Palaeolithic sites or finds.

Mesolithic

There are few Mesolithic finds spots within the main estuary, with scatters located at promontories close to the mouth of the estuary around Polzeath, Stepper Point and Trebetherick Point.

Neolithic and Bronze Age

Neolithic sites are largely restricted to find spots although at Bozion (MCO21447) a cropmark shows univallate enclosure with both straight and curved sides, measuring 45m by 40m, with a bank appearing to be outside the ditch, which might indicate it is a small henge and therefore potentially an important earthwork.

Bronze Age barrows are clustered mainly on the north banks of the estuary in areas such as Pentireglaze and Porthilly, with low densities to the south around Burgois and Tregolds. However this fits in with a wider pattern for the area (beyond the RCZAS study area) of such sites being located on hilltops and ridges, with significant clusters in a linear band along the high ridge of St Breock Downs to the south of Wadebridge.

Iron Age and Roman

Cropmarks indicating Iron Age / Romano-British enclosures, including rounds, are found across the area, with notable concentrations at Porthilly, Killibury and Chapel Amble, while at St. Enoch a Roman settlement was excavated in the 19th century (MCO16844), with a nearby cemetery found at Stoptide (MCO26594). Similar settlement sites are also present across much of the land south of the estuary (e.g. round at Tregolds; NHLE 1004235). However many of these remain uninvestigated but have the potential to significantly improve our understanding of activity in the area during this period.

Early medieval and medieval

The HLC maps much of this area as medieval farmland, with many of the areas' settlements first recorded in this period.

Post-medieval and modern

There is evidence for a certain amount of industrial activity throughout the area, mainly of local significance, such as quarrying (and export of slates) and iron foundries at Wadebridge, with much of 19th and 20th century development dependent upon the railway connections, through the North Cornwall and Wadebridge-Bodmin line, which were closed during the late 1960s and now form the popular Camel Trail

Padstow was historically North Cornwall's main port, with quays and landing places along the Camel estuary; the maritime heritage includes significant narrative and sites of wrecks and rescue. Doom bar was infamous for the loss of life, with over 600 beachings, capsizes and wrecks since the early 19th century (French 2007), with many attempts made to ensure safe navigation into the Camel Estuary. In the early 19th century capstans were located along the shore between Hawkers Cove and Stepper Point, designed to provide a system to allow vessel to traverse narrow channel to Padstow. Coupled with this was the establishment of the coastguard and lifeboat stations at Hawkers Cove, the latter sited in different buidlings between 1825 and 1967. This station suffered two notable incidents during its operation: in 1867, five of the crew of thirteen were drowned when going to the rescue of the

schooner “Georgiana” (there is a plaque in St Petroc’s Church); and in 1900, the Padstow steam lifeboat capsized on service and eight of the crew were lost. There are possible graves of shipwreck victims at Pentireglaze Haven (MCO55904), Polzeath (MCO56202). Within the estuary there are three intertidal hulks in Cant Cove visible on aerial photographs.

8.1.7 PDZ15 Pentire Point to Wanson Mouth

The SMP notes that the historic environment is of key importance with Tintagel Castle located on the immediate frontage being one of English Heritage’s primary historical assets. There are historic and listed buildings in all of the settlements with a number lying within flood and erosion risk zones, particularly at Port Isaac but also Port Quin and Port Gaverne. Port Quin’s historic frontage is owned and maintained entirely by the National Trust. Features associated with historic quarrying activity are also numerous along this stretch of coastline, as well as Bronze Age barrows and Iron Age cliff castles including the Rumps. There are Conservation Areas at Port Isaac, Treligga and Boscastle.

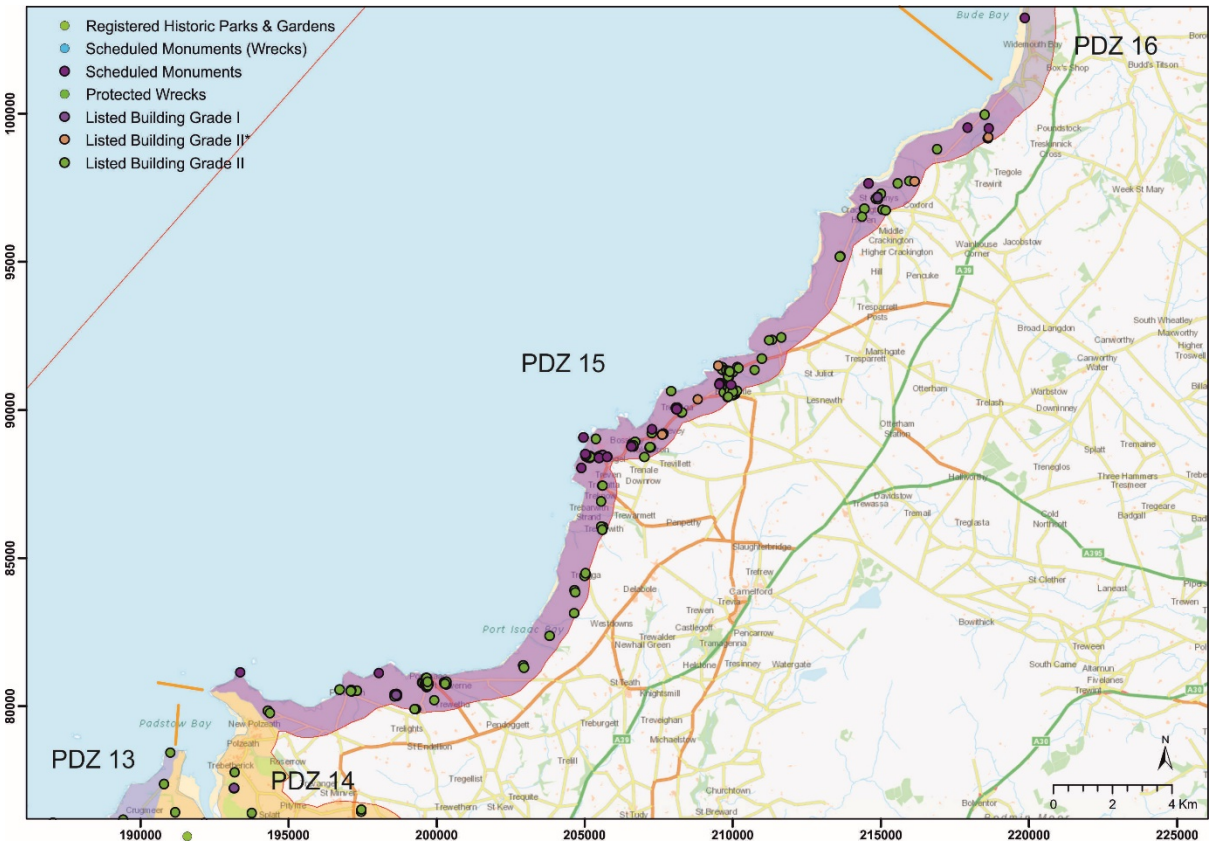


Figure 8.13: Distribution of Sites recorded in the HERs within PDZ15. Contains Ordnance Survey data © Crown copyright and database right 2019

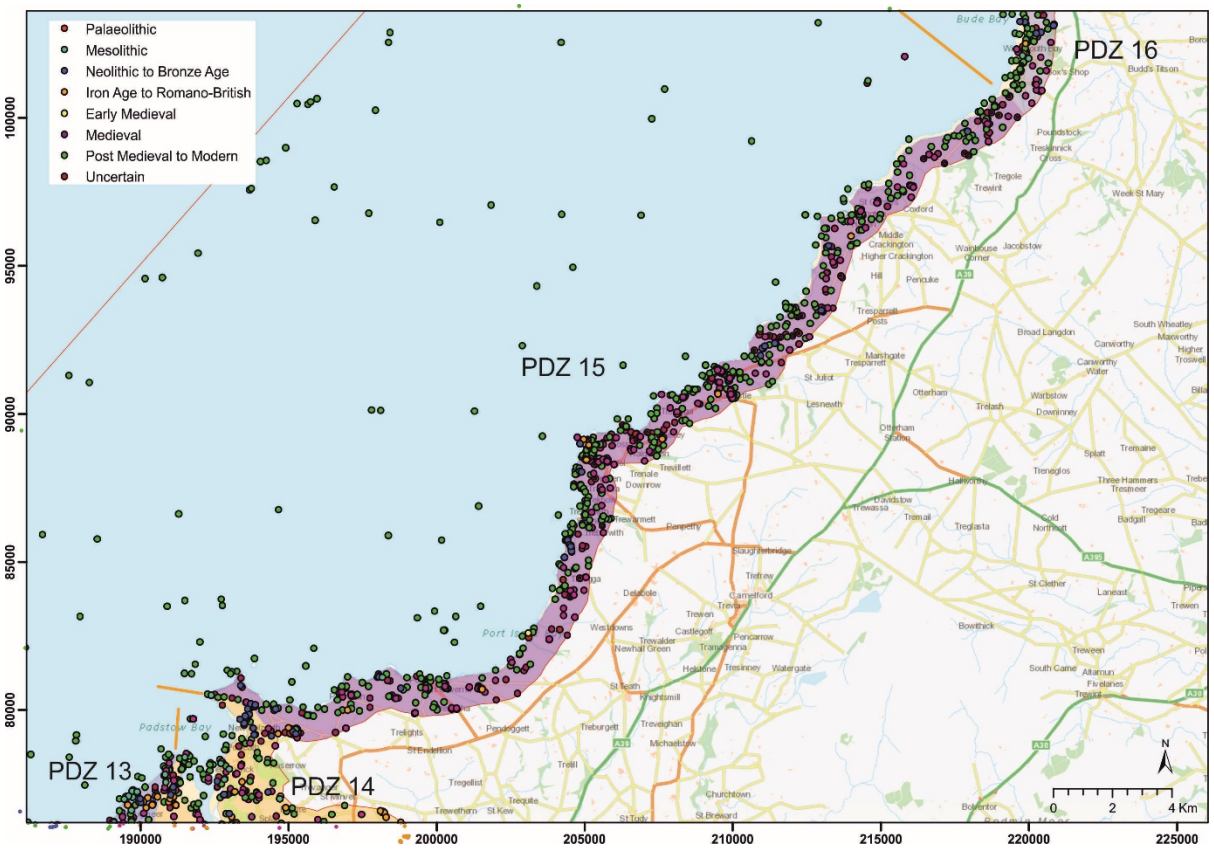


Figure 8.14: Distribution of Sites recorded in the HERs within PDZ15. Contains Ordnance Survey data © Crown copyright and database right 2019

Palaeolithic

There are no recorded Palaeolithic sites or finds.

Mesolithic

The only Mesolithic scatter in the area has been recorded at Roscarrock (MCO6747).

Neolithic and Bronze Age

Clusters of barrow sites are found at Pentire (MCO3285), Scarnor Point (NHLE 1004479) and Lower Beeny (MCO3063), although at the former many are represented by cropmarks.

Iron Age and Roman

Cliff castles are located at Willapark (MCO6586), Penhallic Point (MCO6566) and The Rumps (NHLE 1004625), while a series of enclosures, rounds and field systems have been mapped along the coast, mainly as cropmarks visible in aerial photographs, including a possible Roman signal station at High Cliffs (MCO21987). Romano-British settlement is also recorded at Tintagel (NHLE 1014793).

Early medieval and medieval

One of the most significant sites in the region is Tintagel, which emerged as a key royal stronghold in the 5th and 6th centuries AD and has been the subject of recent excavations (Nowakowski and Gossip 2017), with an early-Christian cemetery also in the local area (NHLE 1003086). Tintagel continued to be occupied into the medieval period as a fortified castle, with motte and bailey castles also being constructed nearby at Bossiney (NHLE 1006708) and Bottreaux Castles (Boscastle; NHLE 1005455). Medieval settlements are present along the coastline, with the remains of former field boundaries

and medieval field systems also extensively mapped, such as Forrabury Strips (medieval strip fields; MCO21993).

Post-medieval and modern

There are extensive coastal quarries along this stretch of coastline. At Lower Strangles, High Cliff, and Rusey Cliff, the Ordnance Survey 1st edition shows a dense network of paths on the coastal slope fronting the cliff that are no longer extant. Reason for density are unclear but suggest some sort of activity on this slope, such as quarrying, which had ended by the time of the mapping. Possible supporting evidence is that East Delabole quarry (disused by time of 1st Edition) to the south of these areas has a similar path network.

Despite the relatively high numbers of strandings, there is little evidence of wreck material on the beaches, presumably because it was broken up by a combination of natural forces and salvage. The remains of only one stranded wreck are visible on aerial photographs: that of an E-boat lost just west of Crackington Haven. Bodies of some shipwrecked sailors are reportedly buried in St. Genny's Church.

8.1.8 PDZ16 Widemouth and Bude (Wanson Mouth to Lower Sharpnose Point)

The SMP notes Scheduled Monuments, historic features and archaeological sites, such as the submerged forest at Crooklets Beach, and Bude Canal and sea gates. There is a Conservation Area at Bude, and submerged forests are recorded from Widemouth and Crooklets beaches.

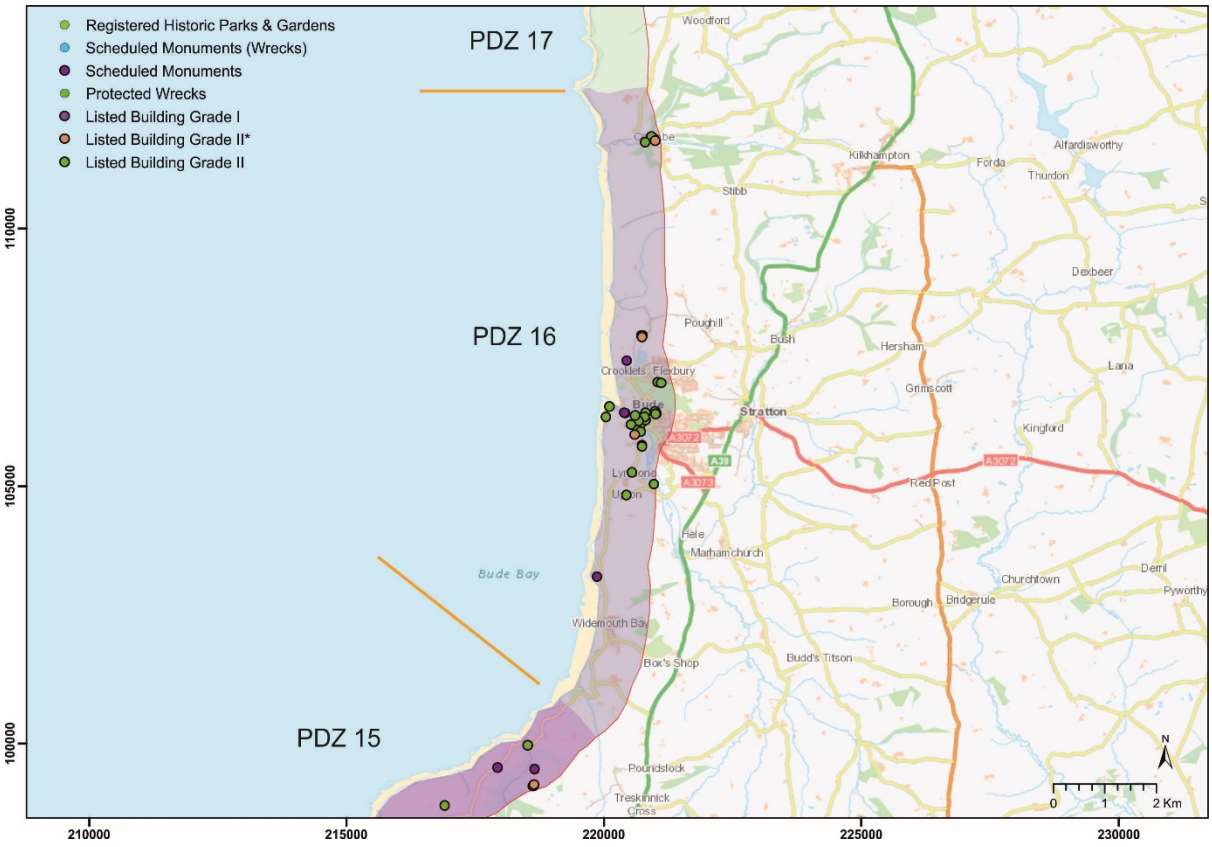


Figure 8.15: Distribution of Heritage Environment Designations (excluding Heritage Coast and Conservation Areas) in PDZ16. Contains Ordnance Survey data © Crown copyright and database right 2019

Palaeolithic

A possible Palaeolithic axe was found in a garden in Bude (MCO307).

Mesolithic

Mesolithic finds have been made along this coast, with notable collections from Widemouth Bay within the dune area (MCO1847), Crooklets (MCO525) and Summerleaze Point (MCO6806). These collections include both blades and flakes and should warrant further assessment.

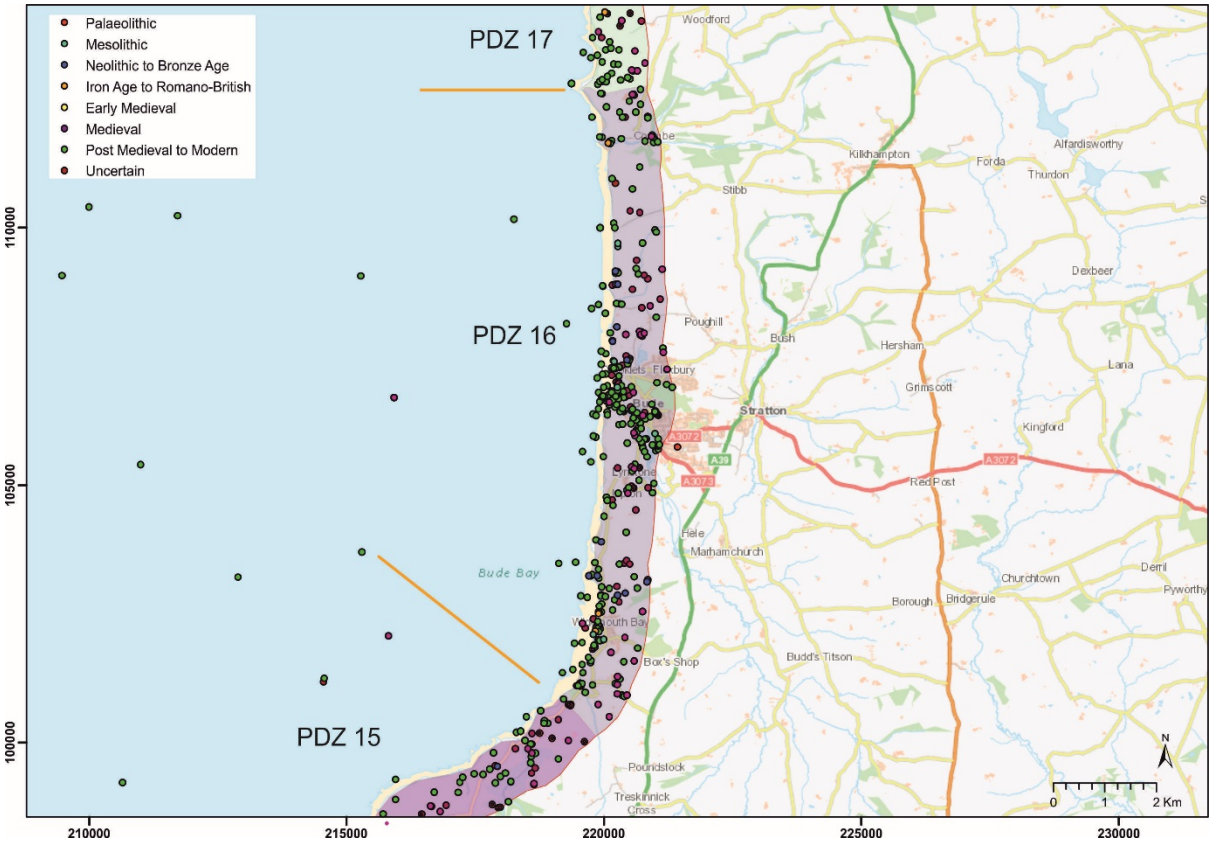


Figure 8.16: Distribution of Sites recorded in the HERs within PDZ16. Contains Ordnance Survey data © Crown copyright and database right 2019

Neolithic and Bronze Age

At Crooklets a small assemblage including leaf-shaped arrowheads of probable Neolithic date have been found (MCO47276), with possible Neolithic material also within the collection from Summerleaze Point (MCO6806). Bronze Age barrows are found in clusters along this coastline, notably at Summerleaze Point (NHLE 1004472) and Lower Longbeak (NHLE 1001723). There are a number of possible barrows in this area visible in aerial photographs but with no topographic signature, suggesting they have been ploughed out. Other barrows on the coastline, such as at Earthquake (MCO46281), are no longer visble and might have been lost through cliff erosion.

Iron Age and Roman

There are no cliff castles in this area, but evidence for Romano-British settlement is evident. At Widemouth Bay (MCO18349), erosion of a low cliff revealed an old land surface containing charred wood (mostly oak), sheep bone, tooth fragments and sherds of 2nd century AD pottery (Wood 1965). At Duckpool excavations by Ratcliffe (1995) and most recently by Taylor (2017) identified a 3rd to 4th century AD Romano-British industrial site, containing a series of hearths and possible evidence for secondary metalworking, with the beach possibly acting as a landing place.

Early medieval and medieval

Medieval field systems are evident in this area, predominantly around Bude and to its south around Upton and Widemouth.

Post-medieval and modern

The port at Bude developed through this period, though the notably development came in the early 19th century with the building of the canal and breakwater, altering the channel of the River Neet and building a sea lock, which greatly facilitated the trade in sand, coal and the export of timber, charcoal and agricultural produce, as well as two shipyards being opened. By 1825 there were 151 vessels trading in and out of Bude and this figure continued to rise reaching 315 in 1846. During this time the town was also being gradually developed as a tourist destination, which was enhanced by the arrival of the railway in 1898, though ultimately this led to a reduction in maritime trade, with the number of trading vessels falling to 145 by the start of the 20th century. The tidal swimming pool was built in 1930 with further expansion of Bude as a resort[31]

Bude Harbour and its approaches appear to have been a considerable hazard with numerous accounts of strandings. Despite the relatively high numbers of stranded wrecks, there are no visible remains with the exception of the remains of the *Belém* (NRHE 158637) at Menachurch Point, is visible on aerial photographs. Bodies of sailors from *SS Verdan* ((MCO56734), a Norwegian vessel lost 1927, were washed ashore and are buried in Marhamchurch

Widemouth beach still has some dismantled World War II anti tank obstacles, while aerial photographs and LiDAR suggest that many of the features between Lower Sharpnose Point and Higher Longbeak are no long present, though in some cases very faint earthworks are still visible.

8.1.9 PDZ17 Lower Sharpnose Point to Hartland Point

The SMP notes that there are a small number of historic features including Embury Beacon Camp and a Hawkers Hut balanced on the cliffs at Morwenstow. Hartland Point Lighthouse, built in 1874 under the direction of Sir James Douglass, is a Grade II listed building as is the Hartland Quay Hotel and its nearby historic wellhead. There are no Conservation Areas in this PDZ.

Palaeolithic

There are no recorded Palaeolithic sites or finds.

Mesolithic

By comparison to the coastline elsewhere in the RCZAS study area, this stretch is sparsely covered by Mesolithic finds, with small scatters reported from near Hartland Quay (MDV67 and MDV11617) and eroding from Mansley Cliffs (MDV86).

Neolithic and Bronze Age

Two Neolithic axes have been found along this coastline at Hartland Point (MDV57589) and Morwenstow (reported through PAS: PAS DEV-E80F86), while the Bronze Age is represented by a cairn at Marsland Manor (MCO40379) and barrow at Embury Beacon (MDV16464).

[31] https://map.cornwall.gov.uk/reports_conservation_areas/Bude.pdf

Iron Age and Roman

The main Iron Age site along this coastline is Embury Beacon (NHLE 1003845), which has been subject to repeated excavations in response to cliff erosion (see Sims et al. 2014). A hillfort at Hartland Point has also been speculated (MDV7135), suggested to have been undermined by the sea, but no evidence for such a site has been identified. At Milford (MDV102420 and MDV102421) and Blegberry (MDV81250), possible Iron Age / Roman enclosures have been suggested, while at Stanbury (MCO39475) and Oldwalls (MCO46351) cropmarks have been suggested as a possible site for a Romano-British signal station.

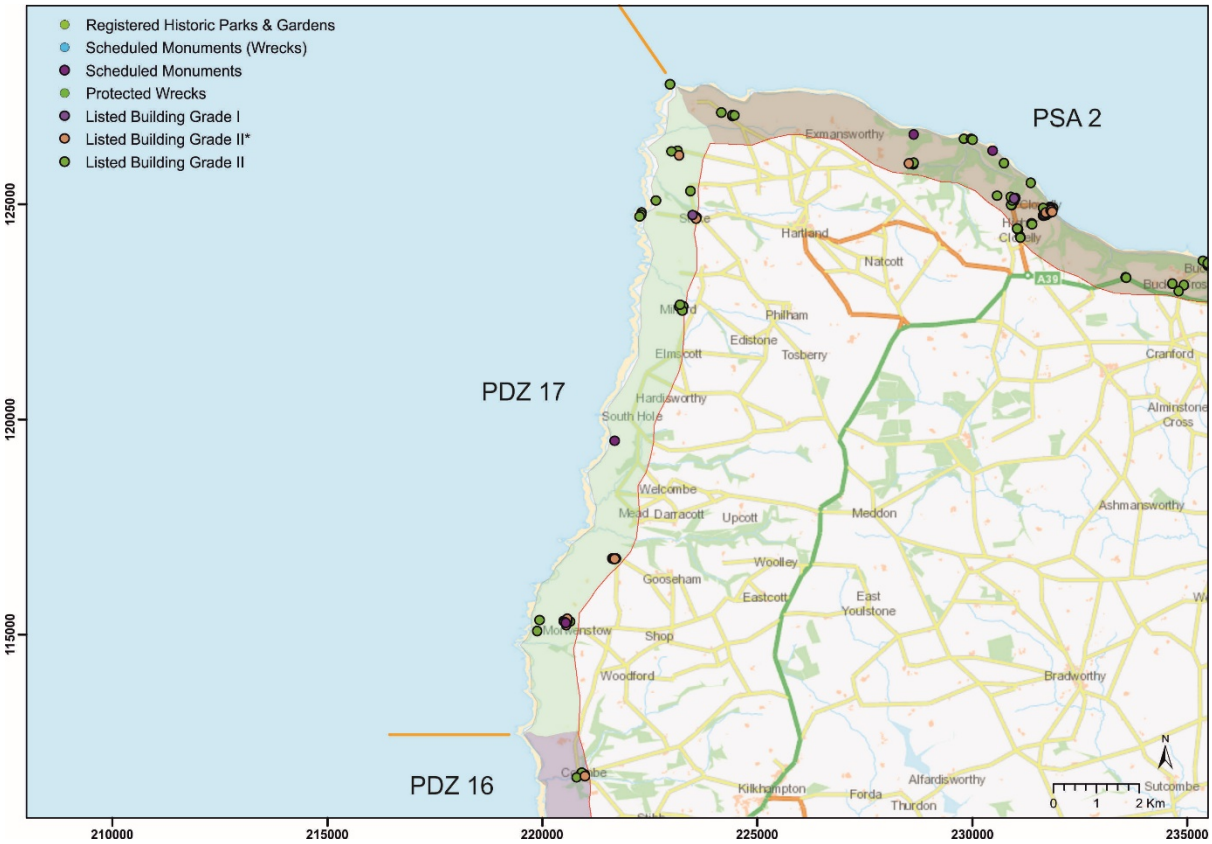


Figure 8.17: Distribution of Heritage Environment Designations (excluding Heritage Coast and Conservation Areas) in PDZ17. Contains Ordnance Survey data © Crown copyright and database right 2019

Early medieval and medieval

Evidence for early medieval activity in the area is linked to monastic activity, with St Nectan's, Stoke, possibly the site of a monastery founded in the 6th century. A possible early Christian graveyard is also found at South Hole (MDV41896). Hartland Abbey (NHLE 1104440), an Augustinian monastery established in the 12th century, while laying outside of the RCZAS study area, would have controlled much of the area around Hartland. Medieval field systems and boundaries are extensively mapped across the area. Several community studies have been undertaken on the coastline in recent years associated with the Abbey (and subsequent manor) including geophysical surveys (see Cunningham 2009) and GPS survey around the possible Swannery site below St Catherine's Tor (Hobbs 2009).

Post-medieval and modern

The principal landing place in the area is Hartland Quay (MDV18340), built in the late 16th century, possibly by William Abbot of Hartland Abbey, with the head of the pier washed away in 1887.

Despite the relatively high numbers of stranded wrecks, visible remains of wrecks along this stretch of coastline are limited. Remains of MFV *Goliath*, RFA *Green Ranger*, MV *Johanna*, SS *Sjofna,* all lost post-1944, have remains which are visible on aerial photographs on the shore/intertidal zone south of Hartland Point. At Morwenstow, the Rev. Robert Stephen Hawker witnessed and documented many of the wrecks during the mid-19th century, was involved in rescues, and buried a number of crewmen in his church.

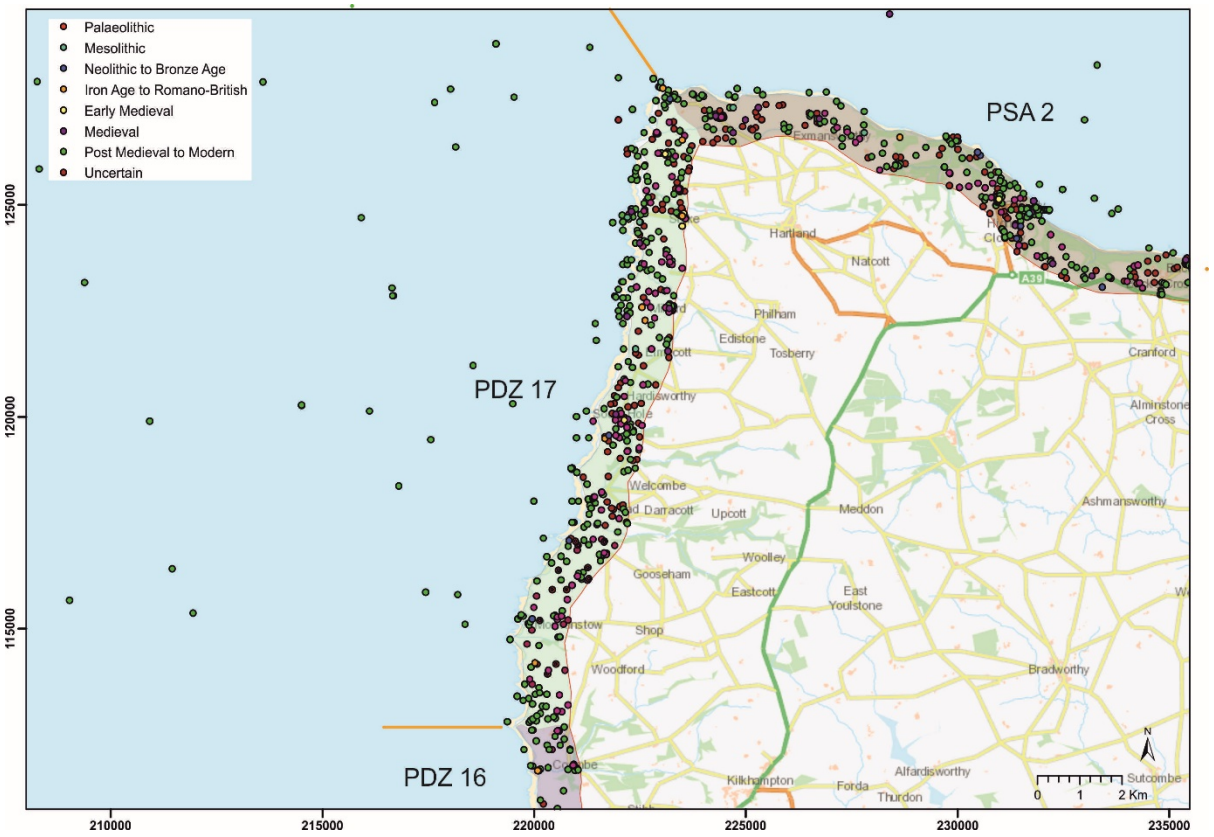


Figure 8.18: Distribution of Sites recorded in the HERs within PDZ17. Contains Ordnance Survey data © Crown copyright and database right 2019

8.2 Hartland Point to Anchor Head SMP

8.2.1 PSA1 Lundy

The SMP notes that people have lived on Lundy since prehistoric times providing an abundance of archaeological history throughout the ages. Lundy has thirteen Scheduled Monuments, many within proximity to the cliffs, and two nationally protected wrecks located on the lee (east) side of the island.

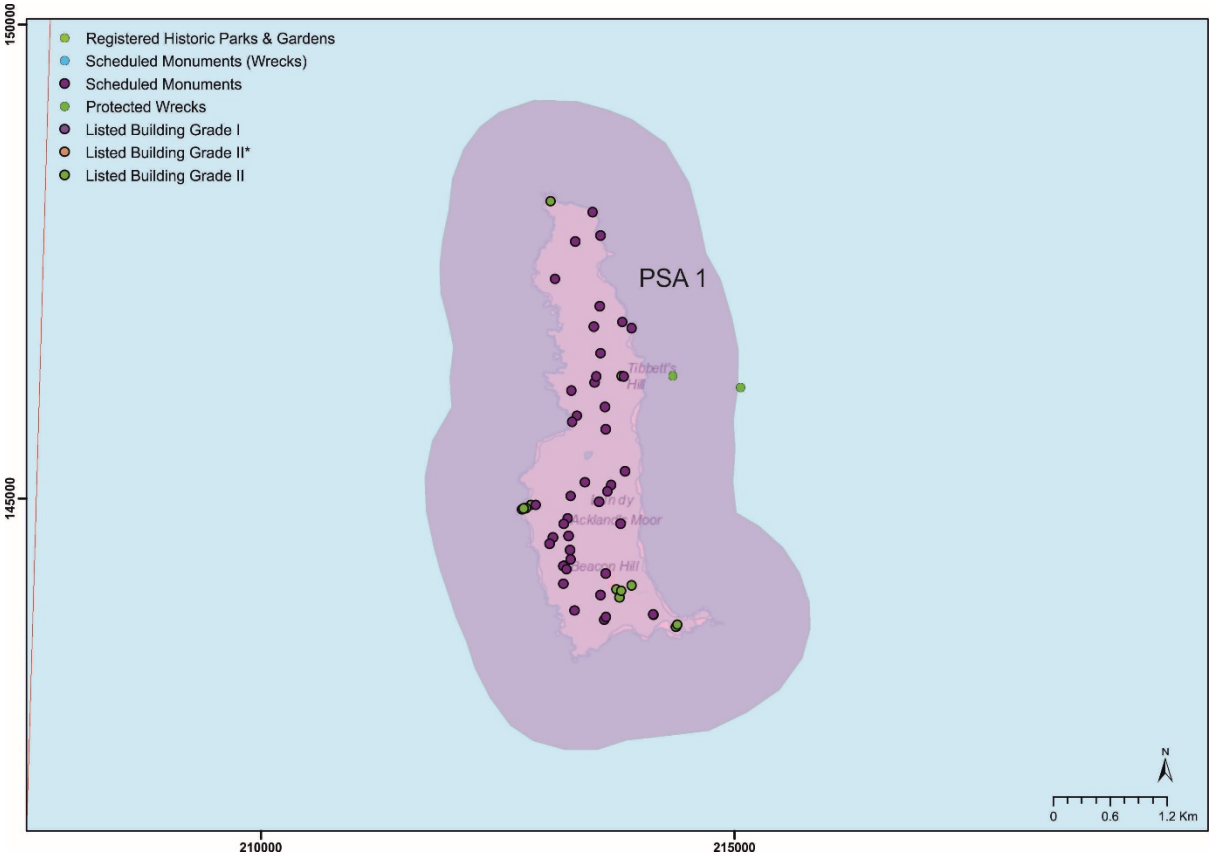


Figure 8.19: Distribution of Heritage Environment Designations (excluding Heritage Coast and Conservation Areas) in PSA1. Contains Ordnance Survey data © Crown copyright and database right 2019

Palaeolithic

There are no recorded Palaeolithic sites or finds.

Mesolithic

Evidence for this period is restricted to lithic scatter data, some identified through field walking and test pit excavation (e.g. Schofield and Webster 1989; 1990; 1991), with activity appearing to be focused in the southern and northern areas of the Island with less evidence in the central area between the Quarter Wall and Threequarter Wall. The presence of this material is significant for what it indicates about coastal activity during this period.

Neolithic and Bronze Age

Material remains from the later Neolithic and Early Bronze Age are scant on the island (Blaylock 2007). Excavation of hut circles on Beacon Hill, Middle Park and North End have produced Late Bronze Age Plain Ware dating from the 11th to the 9th centuries BC (see Quinnell 2007). Bronze Age burial sites are recorded across the island, many of which are Scheduled Monuments, with a small number of standing stones found south of Quarter Wall.

Iron Age and Roman

There is very little evidence for activity during this period, though pottery has been recovered during excavations, including some 3rd and 4th century AD pottery from excavations on Beacon Hill (NHLE 1016040). A Roman lamp is reported to have been dredged up off Lundy (MDV46009), possibly suggesting an early shipwreck or jettisoned cargo.

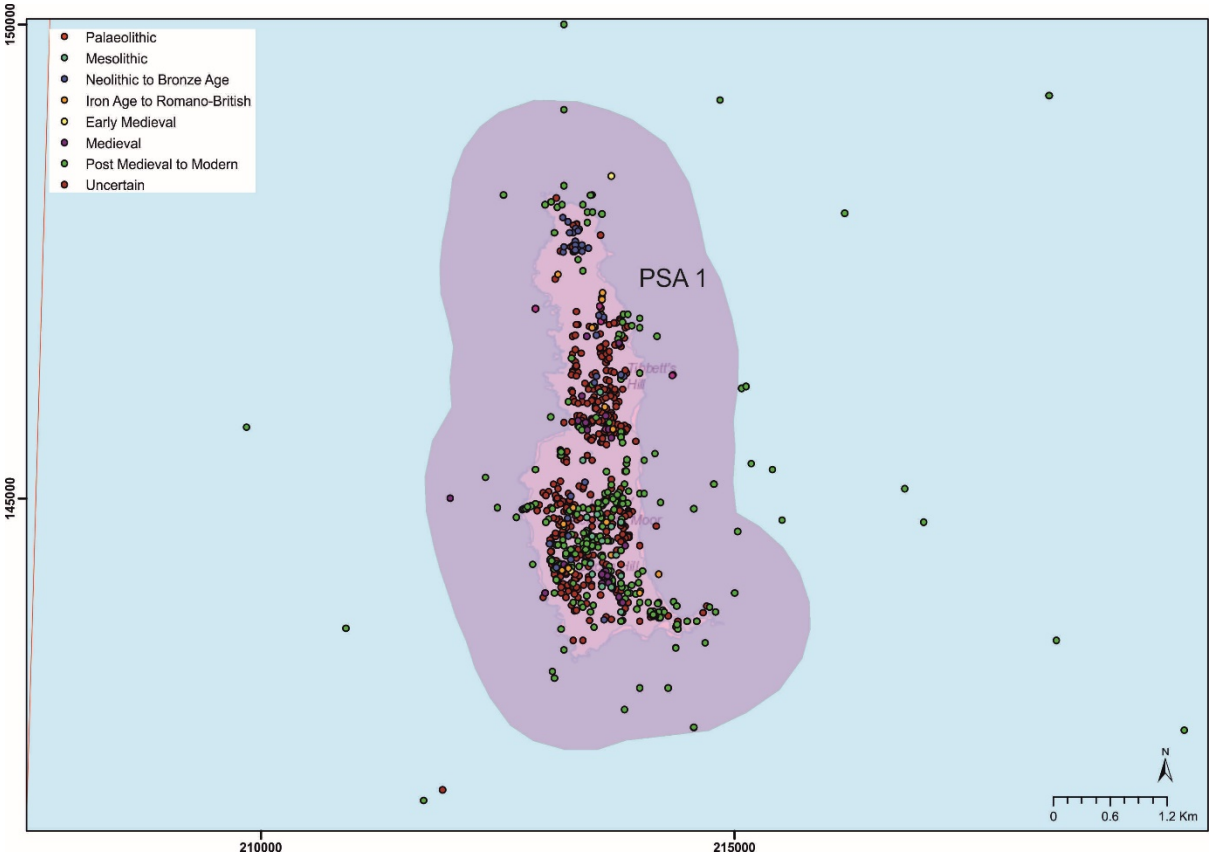


Figure 8.20: Distribution of Sites recorded in the HERs within PSA1. Contains Ordnance Survey data © Crown copyright and database right 2019

Early medieval and medieval

A group of early Christian memorial stones, coupled with the number and character of identified burials on Beacon Hill, suggests a significant community or at the very least a strong Christian influence and importance of the island in the post Roman period (Blaylock 2007). Quinnell (2007) reports that between the 12th to 15th centuries there is considerable evidence for a settled farming community on the island both in terms of archaeological remains and historic information and events. One of the best known medieval farmsteads on the island is Widow's Tenement (NHLE 1017646), north of Threequarter Wall. During this time a village or hamlet was likely in a similar position, or slightly further north, than the present village. In addition to the farming settlements across the island, a castle was constructed in 1244, positioned over the Landing Bay, though this was extensively rebuilt from the 17th century onwards (NHLE 1016034).

Post-medieval and modern

There are numerous remains from later periods, particularly the 19th century, when the Old Lighthouse (NHLE 1016039) and Fog Battery (NHLE 1016038) were constructed. There are extensive remains of the granite quarries on the east side (e.g. MDV43267) and numerous other pits that were dug to test the stone quality in other areas.

Lundy is well known as a hazard to shipping and has been associated with many losses, although many of these relate to losses in the seas around the island rather than wrecking on its shores. Where wrecking has occurred on the shore and rocks, these events are well recorded, especially when in foggy conditions (e.g. HMS Montagu in 1906; MDV46048). To the east of the island are two protected wreck sites: Gull Rock (NHLE 1000053) and the Iona II (NHLE 1082110; see Figure 7.27), the latter

recently having received a Dive Trail[32] aimed at encouraging responsible access, an enhanced visitor experience and public engagement with the care and management of this site (see Cooper and Knott 2016).

8.2.2 PSA2 Hartland Point to Westward Ho!

The SMP notes that there are numerous Grade II listed buildings and four Scheduled Monuments sparsely spread along the coast, including a round barrow cemetery, Clovelly Dykes hillfort, earthworks at Buck's Mill and Windbury Head Camp, the latter in close proximity to the cliff edge. There are two Conservation Areas at Clovelly and Buck's Mill.

Palaeolithic

There are three potential Palaeolithic finds from this area. East of Buck's Mills, handaxes are reported as having been found in the eroding cliff face (MDV23201). Possible Palaeolithic material was reported as being found on the raised beach at Westward Ho!, with further material recovered during an excavation at Abbotsham Court, c. 1km southwest of Westward Ho! (Newberry and Pearce 2005).

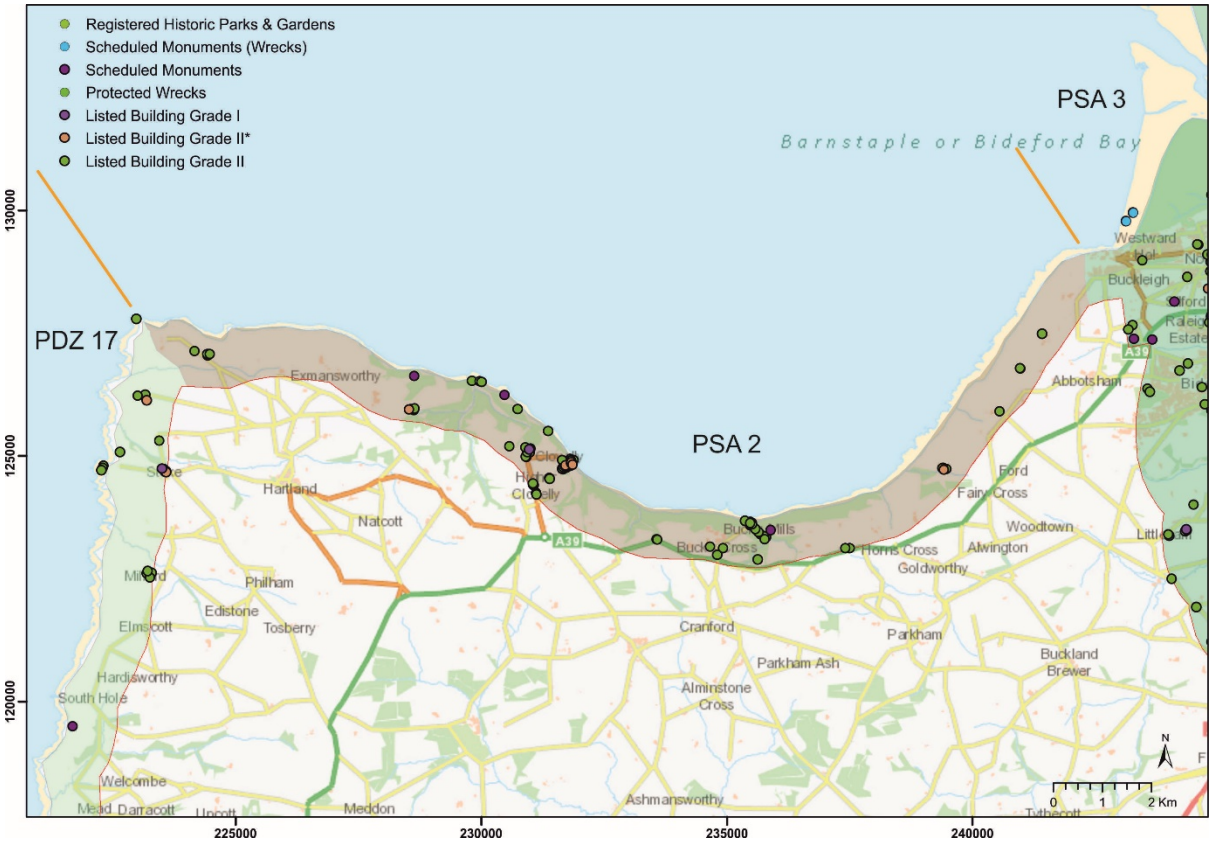


Figure 8.21: Distribution of Heritage Environment Designations (excluding Heritage Coast and Conservation Areas) in PSA2. Contains Ordnance Survey data © Crown copyright and database right 2019

Mesolithic

Concentrations of Mesolithic flint have been found along the coast between Abbotsham and Westward Ho!, largely through fieldwalking but also excavation, notably at Abbotsham Court (MDV77220) which yielded an extensive collection of >1785 items (Newberry and Pearce 2005). These

[32] http://www.landmarktrust.org.uk/lundyisland/iona-ii-dive-trail/

sites are in close proximity to the Mesolithic midden site and submerged forest at Westward Ho! (see Appendix 5).

Neolithic and Bronze Age

Neolithic and Bronze Age archaeology is sparse along this stretch of coastline, with a pair of barrows found at Gallantry Bower (NHLE 1018520 and MDV102339).

Iron Age and Roman

Iron Age promontory forts are found at Windbury Head Camp (NHLE 1003864), Peppercombe Castle (MDV11687) and a possible earthwork each of Buck's Mills (NHLE 1002527).

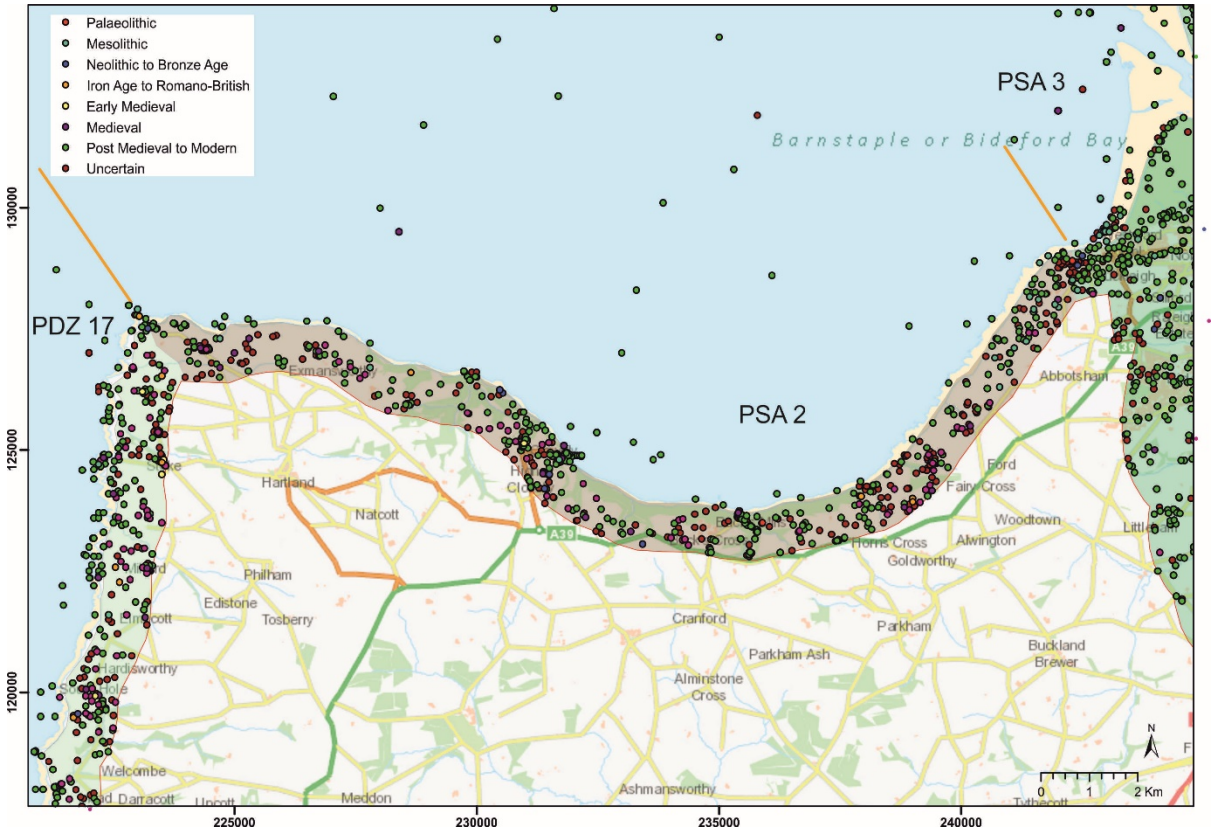


Figure 8.22: Distribution of Sites recorded in the HERs within PSA2. Contains Ordnance Survey data © Crown copyright and database right 2019

Early medieval and medieval

Like PDZ17, this coastline is strongly tied into the medieval monastic landscape, with field boundaries and settlements well represented for this period. Strip field boundaries between Gilscott and the coastal cliff show up particularly well on the available LiDAR when slope mapped, indicating greater survival of earthworks than previously recorded.

Post-medieval and modern

During the 16th century, records for the development of Clovelly indicate a pier for vessels was already established, with the village dependent on the herring industry until the early 18th century. There are numerous recorded wrecks off Clovelly, including several with quite accurate positions. One significant event to affect the village would have been the loss of 40 to 57 fishing vessels during a storm on the

4th October 1821. By the end of the Victorian period, the village had become a popular place for tourists, with steamers landing visitors at the harbour in small boats.

8.2.3 PSA3 Westward Ho! to Saunton Down

The SMP notes that there are several Scheduled Monuments, a Historic Registered Park and Garden, and numerous Grade I and II listed buildings. The Taw-Torridge estuary hosts numerous historic centres, reflected in the 22 Conservation Areas at Appledore, Northam, Westleigh, Bideford, Bideford (Clovelly Road), Bideford (East), Instow, Fremington, Fremington Quay, Bickington, Lake, Tawstock, Bishops Tawton, Rumsam, Barnstaple-Newport, Barnstaple-Town Centre, Barnstaple-Ebberly Lawn, Barnstaple-Pilton, Ashford, Heanton Punchardon and Braunton.

Palaeolithic

There are no recorded Palaeolithic sites or finds.

Mesolithic

The most notable Mesolithic site in the area is the submerged forest and Mesolithic midden (now lost to coastal erosion) at Westward Ho! (see Appendix 5). This well-dated sequence can be shown to be part of a wider concentration of Mesolithic activity within the Westward Ho! – Abbotsham area at this time (see PSA2). Within the wider area, smaller concentrations of Mesolithic material are also found from fields on the western bank of the Torridge at Landcross (MDV11770), as well as various other small collections of lithics from fields around the river, in particular from the Sparks Coll (MDV533-538) and around Yelland (MDV202). There is also evidence of Mesolithic occupation (hearths, lithics) near Little Pill Farm, Tawstock (MDV69249).

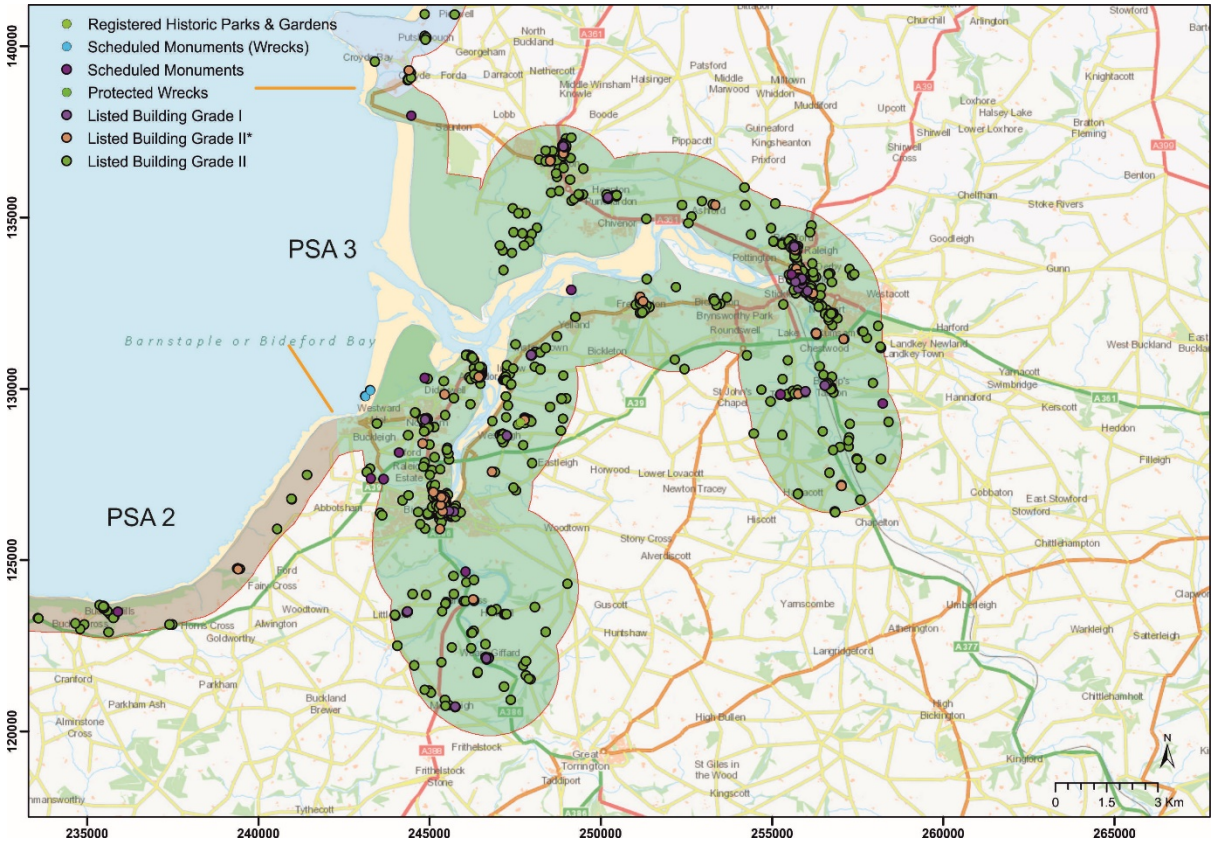


Figure 8.23: Distribution of Heritage Environment Designations (excluding Heritage Coast and Conservation Areas) in PSA3. Contains Ordnance Survey data © Crown copyright and database right 2019

Neolithic and Bronze Age

At Yelland, there is a notable double stone alignment on Isley March along with associated prehistoric material (NHLE 1003847). At Paiges Lane, Barnstaple, a possible Bronze Age hearth was exposed during excavation (MDV70638), with a number of finds also reported through PAS in the wider area, but generally there is a low level of Bronze Age activity in the area. There are four barrows recorded from the area: three are located east of the Taw near Whiddon Farm (MDV4486-7) and Codden Beacon (NHLE 1016229); and one is at Lenwood (NHLE 1016212), north of Bideford.

Iron Age and Roman

Iron Age and Roman finds are sparse within this area beyond stray finds, with only one possible Romano-British field system found south of Bideford (MDV105966-77). There is, however, very considerable evidence for Romano-British iron smelting on the western fringes of Exmoor, leading to speculation that the product might have been exported via the Taw.

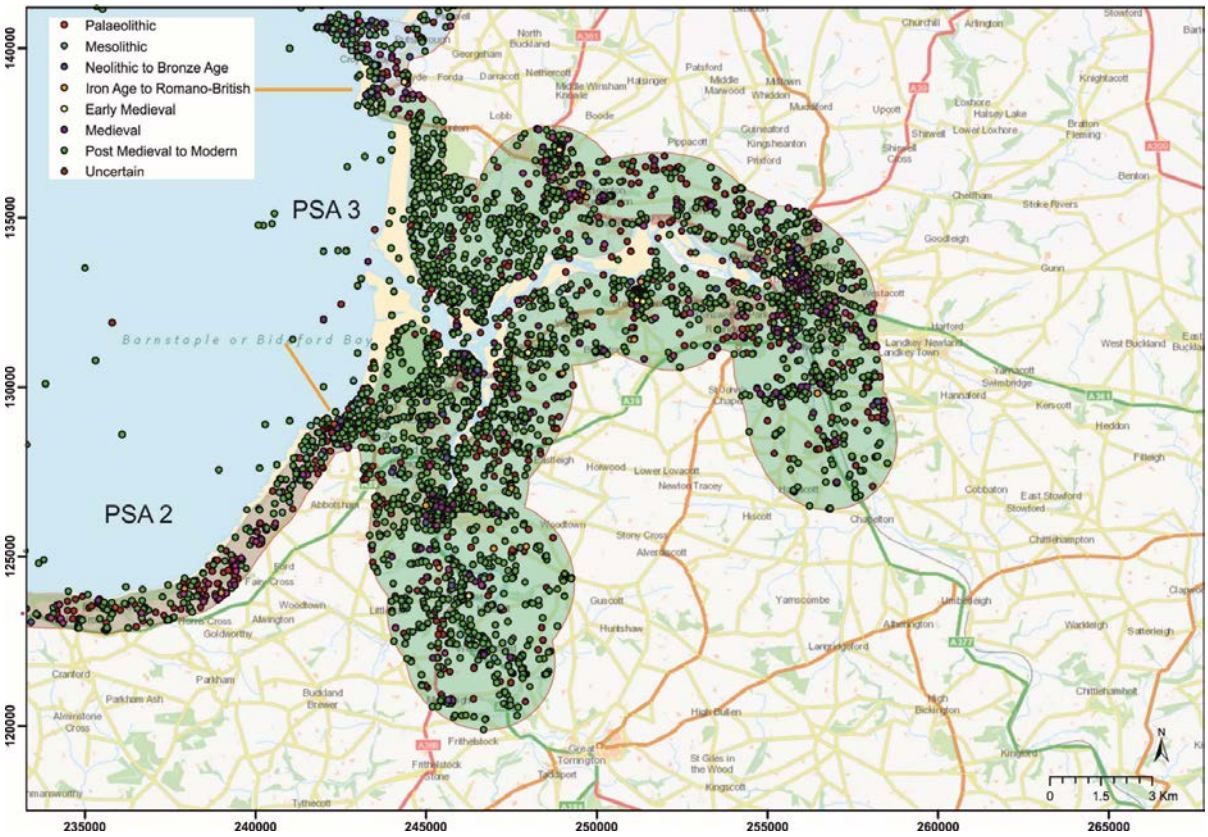


Figure 8.24: Distribution of Sites recorded in the HERs within PSA3. Contains Ordnance Survey data © Crown copyright and database right 2019

Early medieval and medieval

At Braunton a possible 6th century monastery was founded (MDV41903), with possible early Christian graveyards also found at Instow (MDV41904) and Landcross (MDV41902). During excavations in the vicinity of Barnstaple Castle, 105 graves belonging to a Saxon cemetery were encountered (MDV14597).

South of Braunton, the 'Great Field' (MDV199) survives as an example of an open field system, covering an area of c.350 acres and divided into nearly 500 arable strips of mixed ownership. This is one of only three open field systems still operating in England. On the eastern side of Braunton at

Braunton Down, traces of an extensive open field system are discernible in field boundaries (MDV11858). In the lee of Braunton Burrows, the medieval village near the Chapel of St Anne (MDV11880) is believed to have disapeared by the early 19th century, possibly buried beneath encroaching sand.

Post-medieval and modern

Along the estuary there are many features visible on the foreshore, although most are probably related to modern activity; e.g. crab tiles and mooring lines, which were extensively recorded during the NMP. Along the foreshore are an extensive set of fish weir structures, running from Crow Point at the mouth of the estuary upstream past Penhill. These were investigated by the North Devon Archaeological Society in the early 2000s (see Preece 2005). While many of these are post-medieval in date, there is the possibility that at Horsey Weir (MDV66207) the structure has had several rebuilds and could contain structural material dating back to the 9th century when it is first mentioned. Similarly, at Crow Point (MDV102755-7) one of the weirs is mentioned in a 17th century, with documentary evidence again providing evidence of rebuilding. Various saltings are marked on the banks of the river and estuary, though it is possible these names (e.g. Salterns Farm; MDV59250) relate to saltmarshes (whose patterns can be discerned in aerial photographs and LiDAR) rather than actual saltworking sites. This suggestion is also supported by the general lack of evidence for access paths and structures that would be typically associated with saltmaking.

Pottery manufacturing appears to have taken place at Bideford, as in other urban centres on the Taw-Torridge, with industrial sites (potteries) located close to the clay pits at Fremington. PAS records 26 findspots of post-medieval pottery, of which 15 are reportedly found on an island within the River Taw close to the new bridge at Barnstaple. This implies they could come from an area of the river previously recorded as having 13th to 20th century pottery (MDV72925), located 300m upstream of the new bridge or from the large sand island immediately downstream of the bridge. These finds suggest possible dumping of waste into the river by the local potteries.

Extensive World War II remains are fround across the area, notably the U.S. Army's Second World War Assault Training Centre centred on Braunton Burrows, with extensive structures also found at Northam Burrows. Much of this area was mapped by the NMP and other projects, but the shifting sands within the dune system has meant that new sites are continuously being uncovered. In addition, a World War II ship repair area (part of the Woolacombe Training Facility) was located on Instow Sand, with remains at Fremington Camp also recorded during the NMP, while at Chivenor the airfield has numerous buildings and structures, several of unknown age. Several recorded features are not identifiable from aerial photographs and LiDAR either because they have been demolished, removed, covered by shifting sand or too small to identify using this approach.

Considerable recording has already taken place in/around the historic core of Barnstaple, Appledore and Bideford. Most records relate to urban development and industrial features, but also noting that some of the latter are distinctly maritime (e.g. port/harbour at Barnstaple and reasonably sized shipyards and docks at Appledore). Industrial features also include the potteries/kiln based around the Barnstaple and Fremington clay pits. The quay at Fremington, now disused, was reportedly once important in 19th century as it affording deeper water access for larger ships compared to Barnstaple where the Taw was silting up., Near Northam boat hyde (Bothyde), the former tidal bay, embanked in 19th century, was a place where craft were beached for salvage.

Two intertidal wrecks have recently been designated as Scheduled Monuments. The wreck at Westward Ho! (NHLE 1432418; Figure 8.25) is a well-known site and frequently exposed at low tide. The assessment of the site suggested it could be the *Sally* (lost 1769), stranded on Northam Sands with a cargo of wine and shumack when travelling from Oporto to Bristol. Analysis of aerial photographs and LiDAR coverage of the site from 2006 to 2015 demonstrated that although the site was frequently covered, its outline could be easily discernible, suggesting coverage is only ever partial or temporary. Analysis of this data also demonstrated that changes in the beach profile and scour around the wreck meant that the area of designation should extend beyond a 3m buffer, with recommendations made for a larger 10m buffer to ensure that the physical processes impacting upon the wreck site were also considered in the Extent of Scheduling, permiting greater flexibility in the management and protection of the site.

The second site designated was nearby off Northam Burrows (NHLE 1432949; Figure 7.26). The wreck was assessed to be a wooden sailing vessel, likely to be a Severn trow (a locally distinctive coastal sailing vessel of south-west England), lost off Northam Burrows between the mid 18th to early 19th centuries. Based upon the mapped regression of the pebble ridge at Northam Burrows (Figure 8.27), the first wreck is located roughly the position of the ridge mapped in 1809, with the second wreck located between the 1809 and 1832 ridge positions, which would support an early 19th century stranding on the beach.



Figure 8.25: Scheduled wreck at Westward Ho! (NHLE 1432418)



Figure 8.26: Scheduled wreck off Northam Burrows (NHLE 1432949)



Figure 8.27: Position of Scheduled wrecks 1432418 and 1432949 and mapped alignment of the pebble ridge at Northam Burrows (modified from Keene (1996) and Moon et al. (2013)). Data from Channel Coastal Observatory (http://www.channelcoast.org/)

Within the Taw-Torridge estuary there are many hulks present along the shoreline. An abandoned hulk is visible on aerial photographs within the intertidal zone east of Crow Point (MDV102745) and may represent a sand barge lost in 1977. To the south, at Snuffy Corner, four 19th century vessels (*MA James*, *Emma Louise*, *Hobah* and *Bessy Clark*) and a modern fibreglass vessel are located (MDV53865). The MA James was recorded by Bournemouth University[33], who claim that this Western Ocean Yacht, built in 1900, is the best example of this type of schooner still in existence. South of Richmond Dock are three hulks, suggested to have been moved here after World War II (MDV53867). On the eastern side of the Torridge, nine wrecks are recorded from aerial photographs, including two possible pieces of wreckage. However, only those which have clearly not moved on the sets of available aerial photographs from the last 15 years were recorded.

Within the Taw, one intertidal wreck/hulk is visible on aerial photographs within the tidal part of the Taw, and a possible intertidal post alignment which may correspond to a nearby previously recorded possible revetment. Potential wreck material/debris are also visible on the western bank of Taw immediately south of the A361 bridge. Possible burials of shipwreck victims were exposed by coastal erosion in the cliff west of Downend house (MDV558) and thought to be 16th to 17th century.

8.2.4 PSA4 Saunton Down to Morte Point

The SMP notes that there are numerous archaeological sites within the study area but no Scheduled Monuments. There are Conservation Areas at Croyde, Putsborough, Woolacombe and Mortehoe.

[33] https://research.bournemouth.ac.uk/2015/04/the-ma-james/

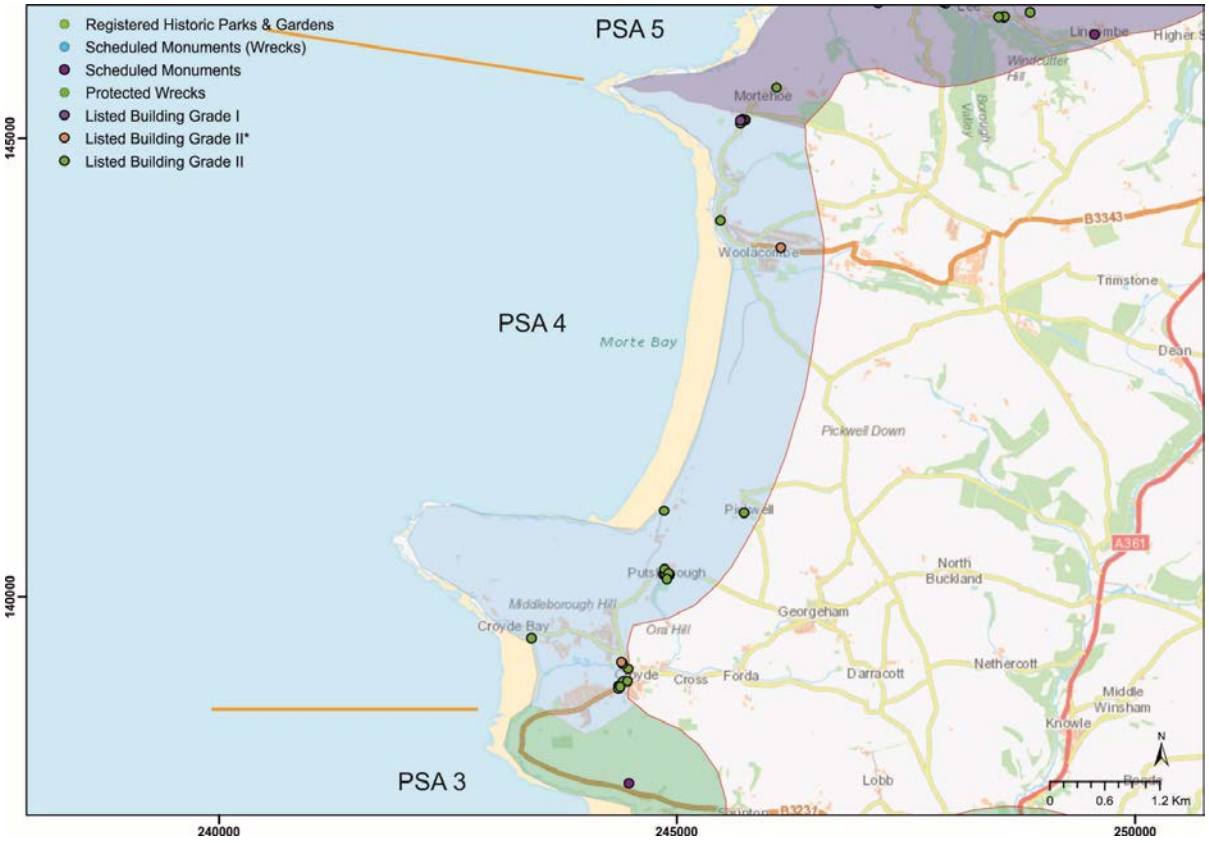


Figure 8.28: Distribution of Heritage Environment Designations (excluding Heritage Coast and Conservation Areas) in PSA4. Contains Ordnance Survey data © Crown copyright and database right 2019

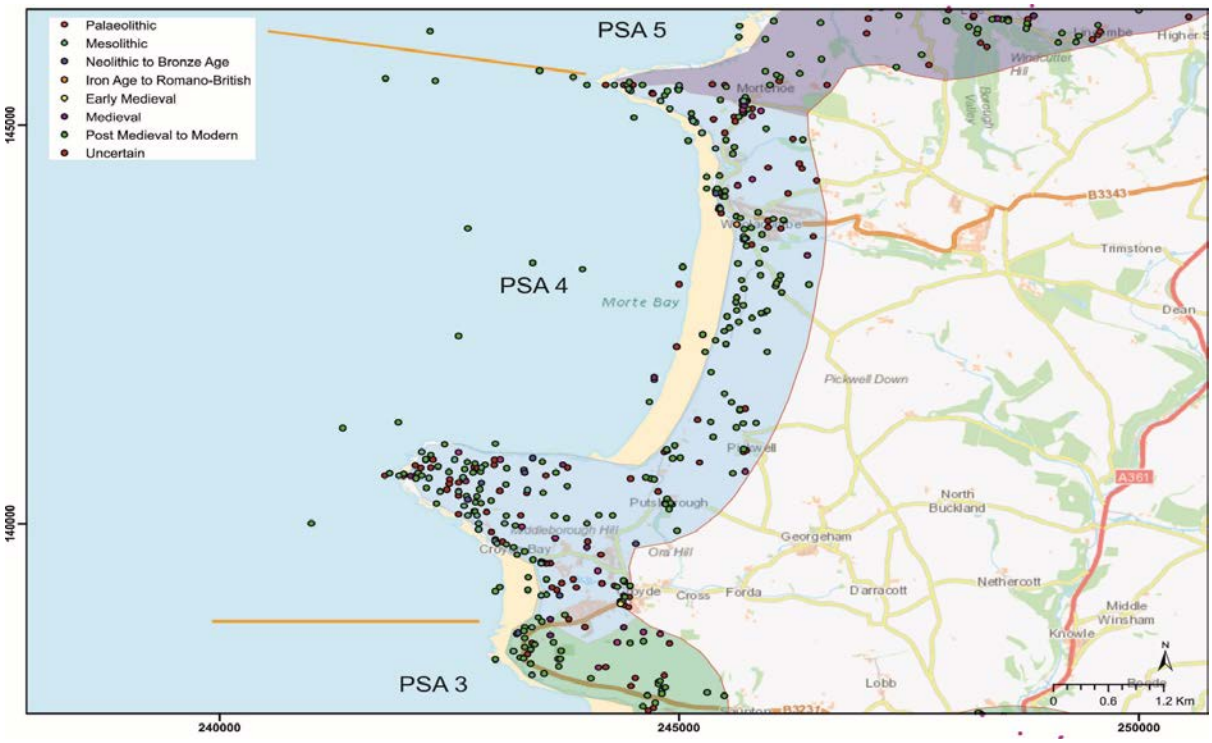


Figure 8.29: Distribution of Sites recorded in the HERs within PSA4. Contains Ordnance Survey data © Crown copyright and database right 2019

Palaeolithic

There are no recorded Palaeolithic sites or finds.

Mesolithic

This area contains significant Mesolithic scatters on the headlands at Baggy and Morte Point, often reported as eroding out of the cliffs. Mesolithic material has also been reported from beneath the dunes that back Morte (MDV20763) and Croyde Bay's, with one find reported as being recovered from a 'pre-dune landsurface' revealed by tidal erosion at Croyde (MDV57445).

Neolithic and Bronze Age

Possible Neolithic flint and axe fragments have been found around Baggy Point, with similarly sparse finds from the Bronze Age. One possible barrow is located on Ora Hill (MDV103047), while at Barracane Beach a burial pit containing a cremation burial was found in the cliff face in 1938 (MDV11915).

Iron Age and Roman

Evidence from this period is restricted to a single Roman coin found on Woolacombe Sands (MDV11911).

Early medieval and medieval

Remains of medieval/post-medieval field boundaries and field systems are found on the headlands (e.g. MDV231). Possible relict lynchets/field boundaries are also visible on LiDAR in the Woolacombe area, similar to those previously recorded to the north and south from aerial photography (e.g. MDV103059).

Post-medieval and modern

This stretch of the coastline has had a strong focus on tourism. In the 1880's a Barnstaple architect, Arnold Thorne, laid out Woolacombe for development as a coastal resort. Plots of land were set out and leased to individual developers for periods of 99 years by the Chichester Estate. The development grew at a slow pace, with the seafront along the Esplanade being mainly a row of Victorian and Edwardian villas, prior to a rapid period of building between 1890 and 1905 when maps show the Esplanade transition from being devoid of buildings to a shoreline frontage similar to today.

Extensive World War II activity is located within the dunes, hinterland and beach, with some remains of earthworks still visible on LiDAR. This activity relates to Area H of U.S. Army's Second World War Assault Training Centre, with the Woolacombe Bay Hotel (MDV58461) providing the headquarters for the training centre during this period.

Two wrecks are recorded offshore, north west of Baggy Point, of which one, the remains of HMS Weazle (lost 1799), has been salavaged for its cannons. A review of the bathymetry from this area did not reveal any potential wreck sites and instead largely exposed rock on the seabed. Towards the southern end of Morte Bay at Putsborough, a wooden wreck was been observed on the beach at very low tide in July 2014 (MDV107334), though an exact location or any recording was not undertaken.

8.2.5 PSA5 Morte Point to Minehead

There are three Scheduled Monuments along this stretch of coastline between Morte Point and Combe Martin, along with 156 listed buildings, mainly located within Ilfracombe. There are Conservation Areas at Mortehoe, Lee, Ilfracombe, Berrynarbor and Combe Martin.

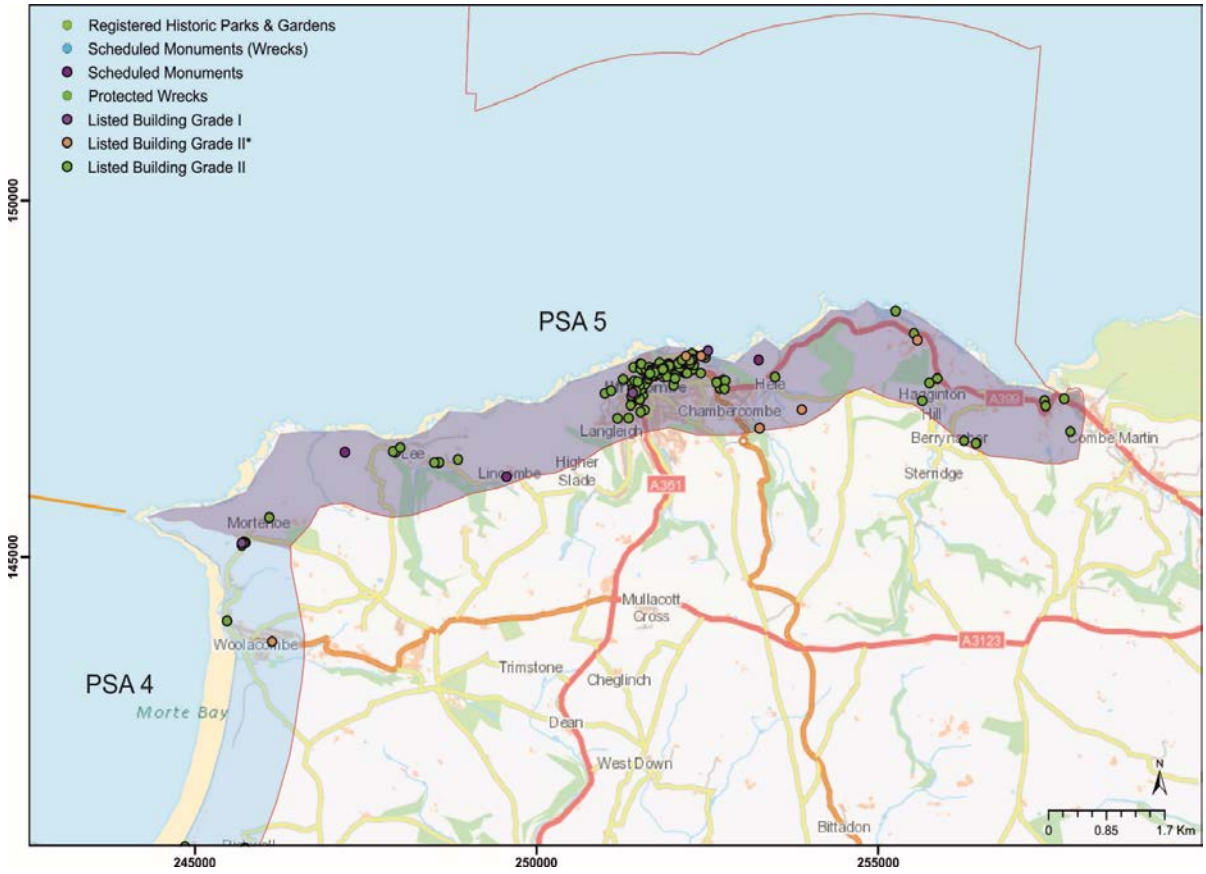


Figure 8.30: Distribution of Heritage Environment Designations (excluding Heritage Coast and Conservation Areas) in PSA5. Contains Ordnance Survey data © Crown copyright and database right 2019

Palaeolithic

There are no recorded Palaeolithic sites or finds.

Mesolithic

Unlike the west facing headlands of North Devon, there is no Mesolithic material from the northern cliffs within this PSA; this paucity of Mesolithic finds is a feature of the coastline extending eastwards through Exmoor National Park (Pink 2018).

Neolithic and Bronze Age

There are three standing stones north of Damage Barton (NHLE 1002572), with another near Whitestone Farm (NHLE 1003188). A few Bronze Age axes are present within the Ilfracombe Museum.

Iron Age and Roman

Hillsborough Iron Age promontory fort (NHLE 1002512), located north of Hele, was last surveyed in 2011 (Beamish 2011). There is also a hillfort called Newberry Castle (MDV12550) near Combe Martin. The only evidence of the Romano-British period are a few coin finds (e.g. MDV12541 and MDV21753).

Early medieval and medieval

Ilfracombe comprised two distinct communities; a farming community around the parish church called Holy Trinity, parts of which date from the 12th century, and a fishing community around the natural harbour formed between Capstone, Compass and Lantern Torrs. Because of the natural layout of the harbour, Ilfracombe became a significant safe port (registered port of refuge) on the Bristol Channel,

with trade routes between Kinsale and Tenby. To aid safe naviation, the Chapel of St Nicholas (NHLE 1208792) was adopted as a lighthouse since at least 1522, with the quay (NHLE 1203010) also thought to date, in parts, from the medieval period. Within the wider landscape strip field boundaries have been mapped by the NMP and are readily visible on LiDAR.

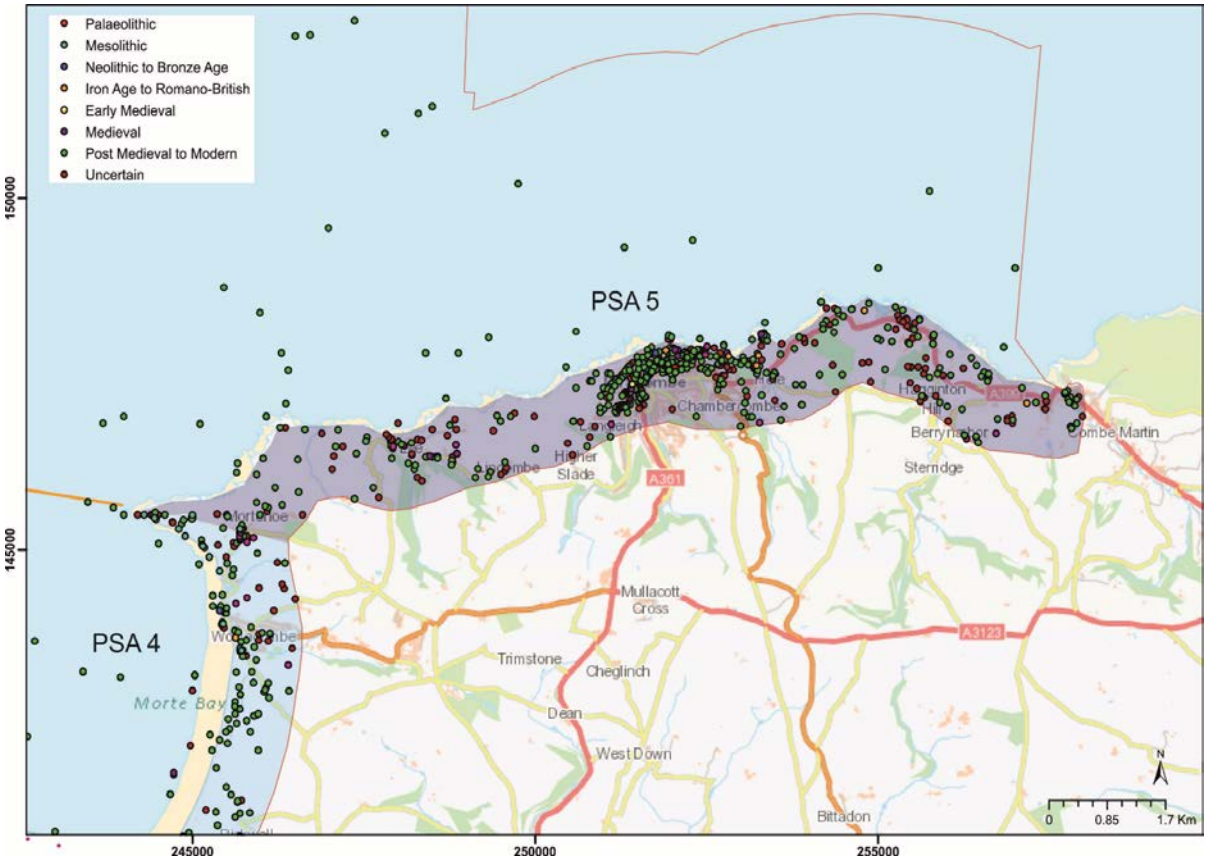


Figure 8.31: Distribution of Sites recorded in the HERs within PSA 5. Contains Ordnance Survey data © Crown copyright and database right 2019

Post-medieval and modern

19th century silver-lead mining occurred in the Watermouth-Combe Martin area, with a number of sites in the area recorded including the Napps Quarry / Golden Cove (MDV19497)[34]. At the end of the 18th century Ilfracombe was a commercial town but starting to attract visitors, though this didn't become significant until the 19th century with the arrival of the railway, facilitating the town's growing popularity and accessibility as a bathing resort, such as the Tunnel Beaches, constructed in 1820 (NHLE 1208945; MDV78906).

Some placenames here could be indicative of maritime activity, smuggling or wrecking (e.g. Brandy Cove and Freshwater Bay), while at Watermouth a labyrinth of tunnels from the harbour have proposed as a possible smugglers haven.

A number of wrecks are recorded within the coves and bays along this coastline. In Samsons Bay, the remains of a vessel are thought to be those of the World War I torpedo gunboat HMS Gossamer, launched in 1890 and lost in tow to Watermouth Cove from Ilfracombe in 1920. At Rockham Beach, remains of the *SS Collier* (lost 1914) are visible on aerial photographs. The vessel *William Wilberforce*

[34] https://johnhmoore.co.uk/hele/mining.htm

(1842), lost in Lee Bay, has some members of its crew buried in Holy Trinity Church, Ilfracombe. In 1796 the transport ship *London*, carrying prisoners or slaves from the West Indies, was wrecked off Rapparee Cove in 1796 whilst trying to reach Ilfracombe harbour. Some 40 prisoners are reported to have drowned, as well as many local people trying to save them. In January 1978 after a storm several 18th century gold coins were found by people digging in the sand, while in 1991 the wall at the back of the beach was breached by the sea and in 1997 some human bones were found there, spurring on the story that this was the site of the *London*.

9 Assessment of predicted threats from coastal erosion and flooding to coastal heritage

9.1 Coastal Erosion

Data acquired for this stage of the assessment comprised the Environment Agency's National Coastal Erosion Risk Map (NCERM). This consists of a baseline map of shoreline frontages split up into lengths with common characteristics, such as defences and rates of retreat. The national-level dataset is divided into SMP areas, with SMP 17 and 18 relevant to the RCZAS study area. In their simplest form, the policy decisions over coastal management can be divided into four categories:

- Advance The Line (ATL)
- Hold The Line (HTL)
- Managed Realignment (MR)
- No Active Intervention (NAI)

The NCERM information considers the predominant risk at the coast, although flooding and erosion processes are often linked, and data on erosion of foreshore features are, in general, not included. The data describes the upper and lower estimates of erosion risk at a particular location, within which the actual location of the coastline is expected to lie, although the data does not estimate the absolute location of the future coastline. The models are intended for guidance only and should not be used to provide details for the risk to individual properties (or archaeological sites). Details of geologically complex areas, known as "complex cliffs" are, in general, not included within the dataset due to the inherent uncertainties associated with predicting the timing and extent of erosion at these locations. Within the RCZAS study area, two areas of complex cliff areas have been defined: between Clovelly and Buck's Mills; and from Buck's Mills to Peppercombe.

This baseline is divided into 'frontages'. These are defined as lengths of coast with consistent characteristics based on the cliff behaviour and the defence characteristics. NCERM is intended to provide an up-to-date and reliable benchmark dataset showing erosion extents and rates for three periods from a base date of 2005:

- Short Term (0 – 20yr; 2005 to 2025);
- Medium Term (20 – 50yr; 2025 to 2055); and
- Long Term (50 – 100yr; 2055 to 2105).

Using these periods, the model is then run for two scenarios:

- Implementation of Shoreline Management Plan 2 Policies, uses the average (50th percentile) modelled shoreline retreat. This is stated to provide an indication of the average or most 'realisitic' scenario of future erosion.; and
- NAI Policy Scenario, using the most extreme estimate of shoreline retreat (5th percentile) based on a hypothetical scenario of NAI. This is stated to provide an indication of the 'worst-case' scenario of future erosion.

In some areas the location of the SMP2 and NCERM baselines differ as the SMP took the seaward edge of the cliff line whilst NCERM takes the landward edge. This means that there is no significant difference in areas with vertical cliffs. However, in areas along the coastline where the cliff type is slope-over-wall form, in which a vertical drop lies below a grassy slope which may be curved (convex upwards), thus forming a bevelled cliff, or may be a uniformly inclined surface yielding a hog's-back, the position of these two 'coastlines' may lie several hundred metres apart. Such slope-over-wall cliffs are common along the North Cornwall and Devon coastlines. For these reasons, NCERM erosion zones may be located a significant distance inland and it is important to consider features that may be present on the cliff slope but lying between the MHW and NCERM cliffline positions. This is highlighted in Figure 9.1 for Tintagel Castle (NHLE 1014793), where many of the early medieval structural remains are located seaward of the NCERM modelled erosion zones.

A further complexity of identifying sites at risk lies in how the data is stored within a HER. Where sites are recorded using single coordinate positions (points), it is possible that a large site has been reduced to a single central location that might not be intercepted by the modelled erosion buffers (i.e. centre of the site might lay outside the buffer but the actual site boundary does overlap it). This issue should be resolved where polygon and polyline data is available assuming that polygon boundaries are accurately plotted around a site boundary; this might not be the case for sites with complex boundaries or a buffer zone is placed around a site to enhance its protection; particularly prevalent with coastal sites such as the cliff castle Scheduled Monuments.

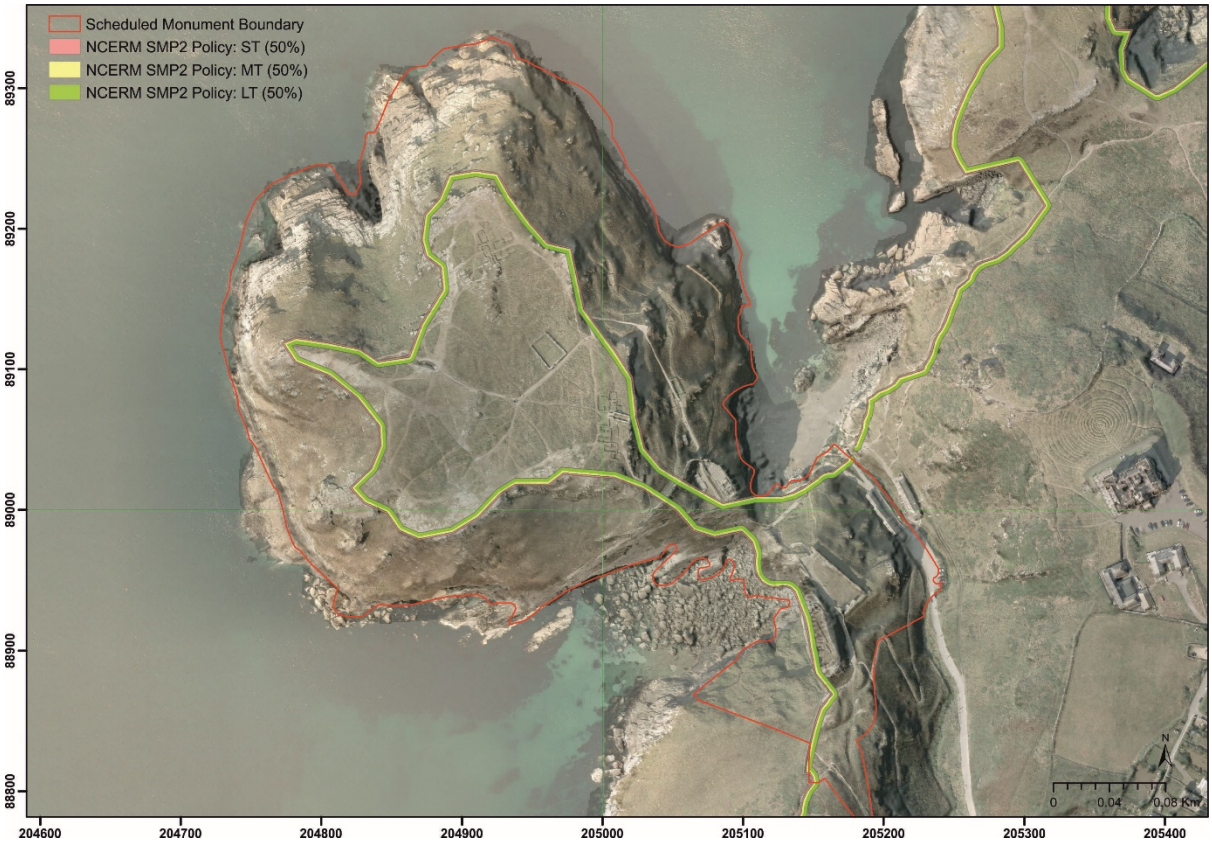


Figure 9.1: NCERM modelled erosion zones (based upon current SMP2 policy) for Tintagel Castle, showing how they adhere to the top of the slope.

Due to these complexities and limitations, a simple GIS query of recorded heritage assets against NCERM modelled erosion zones should not be implemented uncautiously, but rather as a guide during the visual inspection of the relationship between sites recorded within the HER and current models of erosion nestled within the SMP. This also adheres to the recommendations within NCERM that the modelled erosion zones are intended for guidance only and should not be used to provide details for the risk to individual sites.

A total of 316 sites have been identified that are at risk from coastal erosion under the current SMP proposals. Of these, 65 are protected sites listed within the NHLE. Eight of these are scheduled sites currently residing upon the HAR register, of which four of these are defined as at risk due to coastal erosion. The distribution of these sites is shown in Figure 9.2 and listed in Appendix 6. Each of these sites is discussed below within the context of their relevant PDZ / PSA.

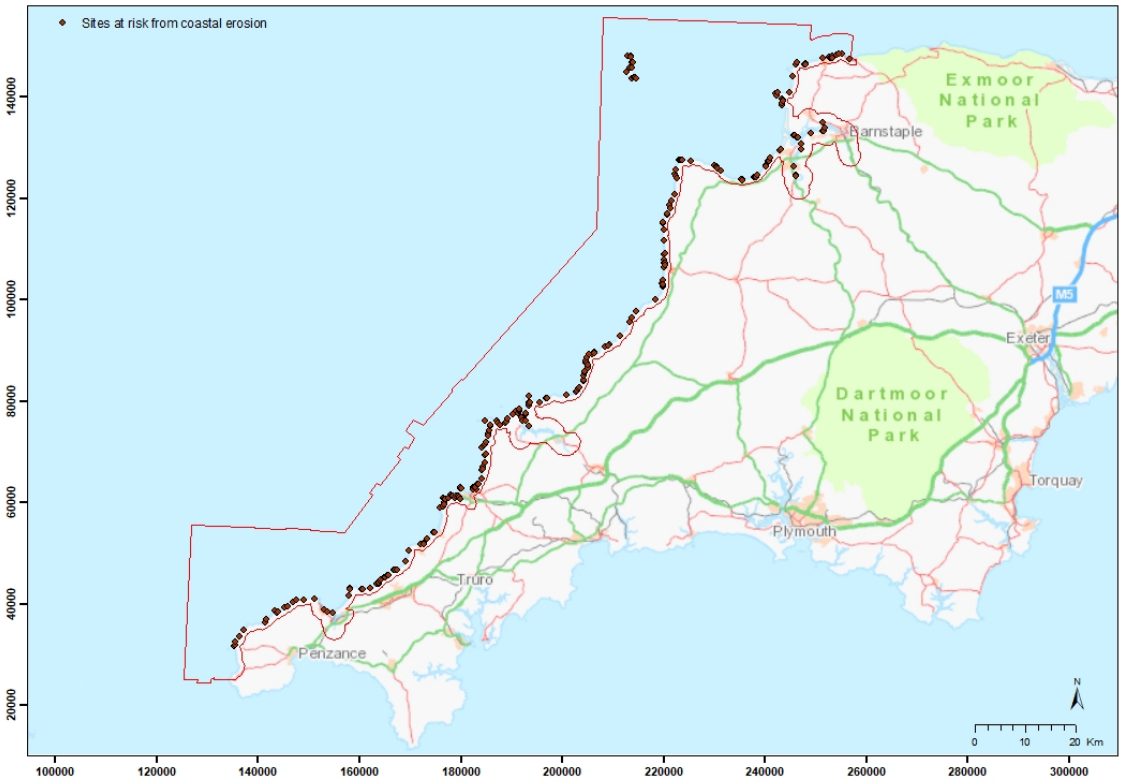


Figure 9.2: Distribution of sites identified at risk from predicted future coastal erosion under SMP2 proposals. Contains Ordnance Survey data © Crown copyright and database right 2019

9.2 Flooding

Data acquired to assess the potential risk from flooding were sourced from the national-level flood maps produced by the Environment Agency. These consist of:

- Flood Map for Planning (Rivers and Seas) Flood Zone 3 (FL3). This shows the best estimate of the extent of land at risk from flooding from rivers and seas, assuming that flood defences are ignored. It covers areas with a 1 in 100 (1%) or greater chance of flooding each year from rivers or a 1 in 200 (0.5%) chance of flooding each year from the sea.

- Flood Map for Planning (Rivers and Seas) Flood Zone 2 (FL2). This shows the best estimate of the extent of land at risk from flooding from rivers and seas, assuming that flood defences are ignored. It covers areas with up to a 1 in 1000 (0.1%) chance of flooding.
- Risk of Flooding from Seas and Rivers. This shows the chance of flooding taking into account flood defences, and their condition, and is produced using local data and expertise. Separate risk levels are used to indicate the likelihood of flooding (see below).

Classification of risk was based on whether a given historic environment asset fell within, or intersected with, areas predicted to be at risk of flooding. It also considered the type of site, with those such as documentary records, findspots, etc removed from the analysis as flood risk in preference for standing structures that could be at greater risk from the impacts of potential flooding. Sites identified as potentially at risk were then compared to the flood prediction maps using the 'select by location' tool with the enhanced county HERs as the target layers and the flood maps as the source layer. For the spatial selection method, "within the source layer" was used only for point features and "intersects the source layer" was used only for polyline and polygon features. The risk level was then based on which flood zone the given asset fell within/intersected, with risk level estimated using the Risk of Flooding Map. The decision to use this map is due to the Flood Maps for Planning (FL2 and FL3) not taking into account flood defences, and therefore could be taken as a proxy for a 'worst-case' scenario, while the Risk of Flooding Map takes these into account. The latter could therefore be considered as indicative of a more realistic scenario if the current coastal defence strategy (and infrastructure) is maintained, as proposed for many areas within SMP. Thus, for the Risk of Flooding Map:

- Sites at high risk fell within/intersected areas deemed to be at high risk of flooding (>1 in 30 chance/>3.3%)
- Sites at high risk fell within/intersected areas deemed to be at medium risk of flooding (1 in 30 to 1 in 100 chance/3.3-1%)
- Sites at low risk fell within/intersected areas deemed to be at low risk of flooding (1 in 100 to 1 in 1000 chance/1-0.1%)
- Sites at very low risk fell within/intersected areas deemed to be at low risk of flooding (<1 in 1000 chance/<0.1%)
- Sites at no risk fell outside/did not intersect areas deemed to be at any risk of flooding

A total of 789 sites have been identified that are at risk from flooding within the study area (Figure 9.2). Of these, 368 are listed buildings, divisible into 36 at very low risk, 127 at low risk, 92 at medium risk and 113 at high risk. Listed sites include bridges, quays, jetties, piers and stone structures such as milestones and walls, which under most scenarios are unlikely to be significantly impacted by surface water flooding. However extreme events, such as flash flooding as witnessed at Boscastle in August 2004, could lead to significant damage to these sites. The distribution of the sites identified as at risk are shown in Figure 9.2 and listed in Appendix 6. Each of these sites is discussed below within the context of their relevant PDZ / PSA.

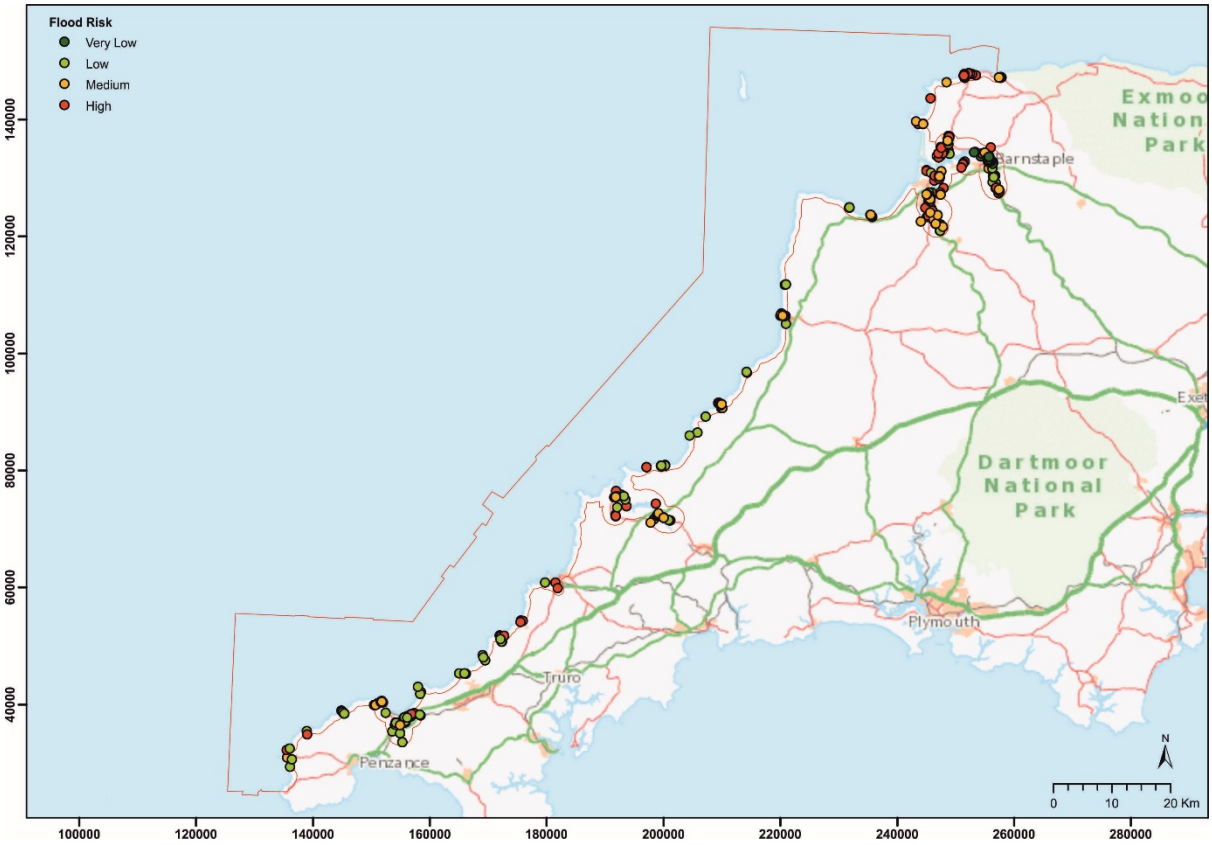


Figure 9.3: Distribution of sites identified at risk from flooding. Contains Ordnance Survey data © Crown copyright and database right 2019

9.3 Rame Head to Hartland Point SMP

9.3.1 PDZ9 Penwith Penunsula (Point Spaniard to Clodgy Point)

Current defences and SMP policy

There are infrequent defences along this section of coastline. Those present tend to be related to beach access points. However there is a small harbour at Lamorna which acts to provide some coast protection (and flood defence from wave action) to the small community at Lamorna Cove. At Sennen Cove there is a harbour at the southern end of the cove and a seawall runs behind the beach providing flood defence to properties for some 400m. Both these structures are owned and maintained by Cornwall Council.

The overarching management principle is therefore to allow the natural evolution of the coast, while supporting the coastal communities in the area and their adaptation to coastal change. The SMP policy for this stretch of coastline is as follows:

- Lands Ends to Sennen Cove: NAI
- Sennon Cove to Whitesand Bay: HTL along developed frontage, NAI elsewhere.
- Aire Point to Clodgy Point: NAI

Sites identified at risk from coastal erosion in PDZ9

Visual inspection of the coastline, coupled with the SMP policy and NCERM predictions, helped to identify the following sites likely to be at risk from coastal erosion (shown in Figure 9.4).

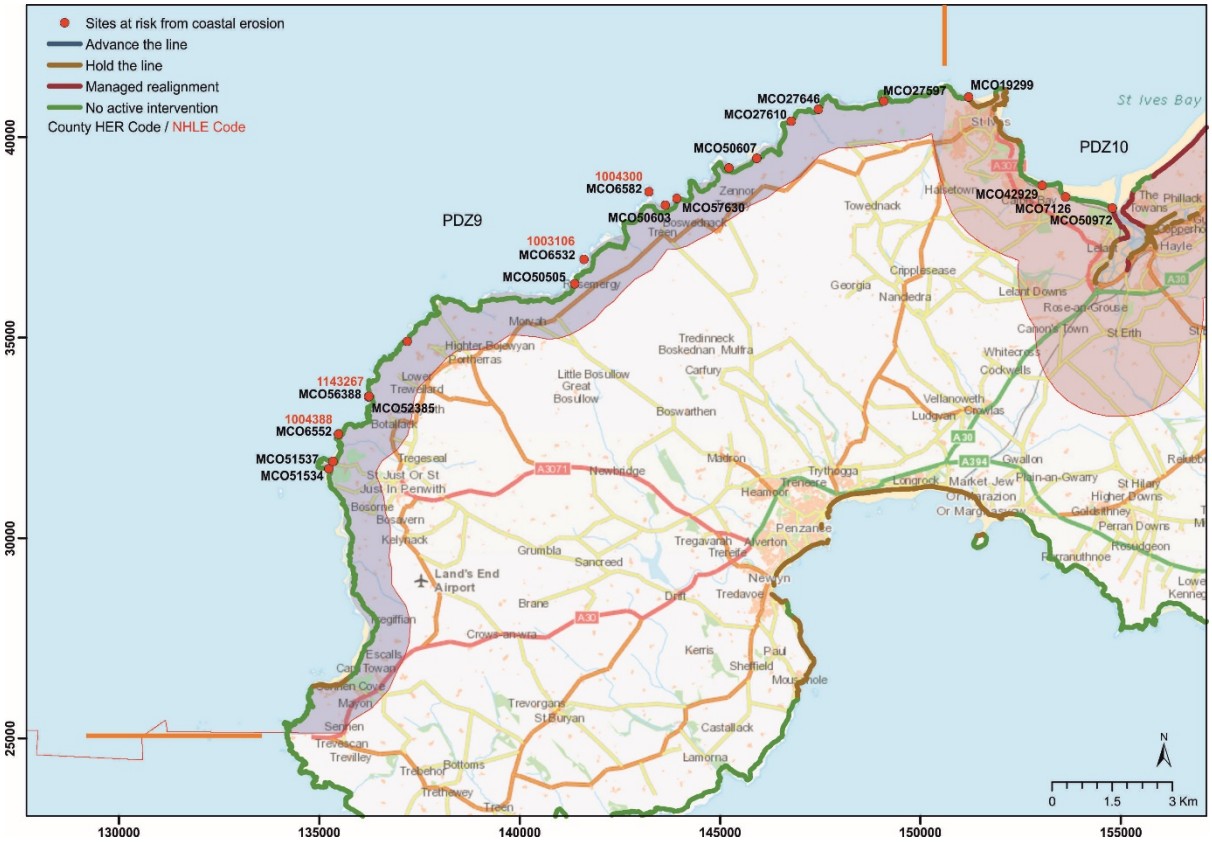


Figure 9.4: Distribution of sites within PDZ9 identified at risk from predicted future coastal erosion under SMP2 proposals. Contains Ordnance Survey data © Crown copyright and database right 2019

The three principle prehistoric sites identified as being at risk from predicted future erosion are Kenidjack Castle (MCO6552; NHLE 1004388), Bosigran Castle (MCO6532; NHLE 1003106) and Trereen Dinas (MCO6582; NHLE 1004300). For the first two, erosion is centred around the margins of the site though at Kenidjack Castle this could include areas mapped as containing hut circles. For Trereen Dinas, the site is located upon a thin peninsula that could be particularly at risk if erosion at the landward end led to a loss of safe access to the site. The medieval slipway at Porth Ledden (MCO51537 NHLE 1004388) is in an area where cliff erosion could lead to a destabilisation of the site.

Other sites identified at risk include the 19th century fishermen's stores at Cape Cornwall (MCO51534), located by the landing platform, and the fish cellar at Gurnards Head (MCO57630), located on a cliff that is predicted to erode. At Botallack, the 19th century pumping (MCO56388) and winding (MCO52385 NHLE 1143267) engine houses are located close to the cliff edge and are potentially at risk of erosion in the medium to long term. Similarly, at Geevor Mine (NRHE 1471565) the 19th / 20th century stamps are on the cliff edge and potentially at risk from erosion.

Field systems and boundaries on the cliff edges are also at risk from erosion. Notable examples where parts of the earthworks are expected to be eroded are to be found at Trevega Cliff (MCO27646), Trowan Cliff (MCO27597), Tregerthen Cliff (MCO50607) and Treval Cliffs (MCO27610), at risk of erosion in the short to medium term, as are the outer margins of the prehistoric field system at Rosemergy (MCO50505). A medieval enclosure at Boswednack Cliff (MCO50603) is also potentially at risk. Cliff access will also be reduced in some areas through erosion of pathways, notably the post medieval footpaths at Zennor Cliff (UoS 722).

Sites identified at risk from flooding in PDZ9

Sites identified at risk of flooding within PDZ9 are predominantly located along the streams draining West Penwith on its northern and western flanks (Figure 9.5). In the west, within the Nanquidno Valley a post-medieval crow (MCO56241) is at low risk, in the Cot Valley the Porthnanven mine (MCO38524) is at medium risk and The Little Orchard (NHLE 1143255) is at low risk, and in the Kenidjack Valley the remains of a post-medieval arsenic works (NRHE 1456744) and mine at Yankee Boy (MCO38531) are both at low risk while the mine at Wheal Praze (MCO38530) is at high risk. The conservation area at Bojewyan is within an area identified as at low flood risk, though where the B3306 crosses the stream there are some small areas (c. 0.1 ha) identified as medium to high flood risk.

On the north coast, along the Portherras Valley, a stamping mill at Oxmans Stamps (MCO29598) is at low risk and the streamworks at Bojewyan (MCO51587) is at high risk. Within the Zennor Valley there are nine sites identified as at low to medium risk, including those associated with mining (e.g Tewey streamworks; MCO28345), corn mills (e.g. Jawnes; MCO28126) and non-conformist chapels (e.g. at Treveglos; MCO28135). Listed sites within the area at risk from flooding include a stone cross (NHLE 1137986) and bridge (NHLE 1327288) at Zennor, which also forms part of the conservation area.

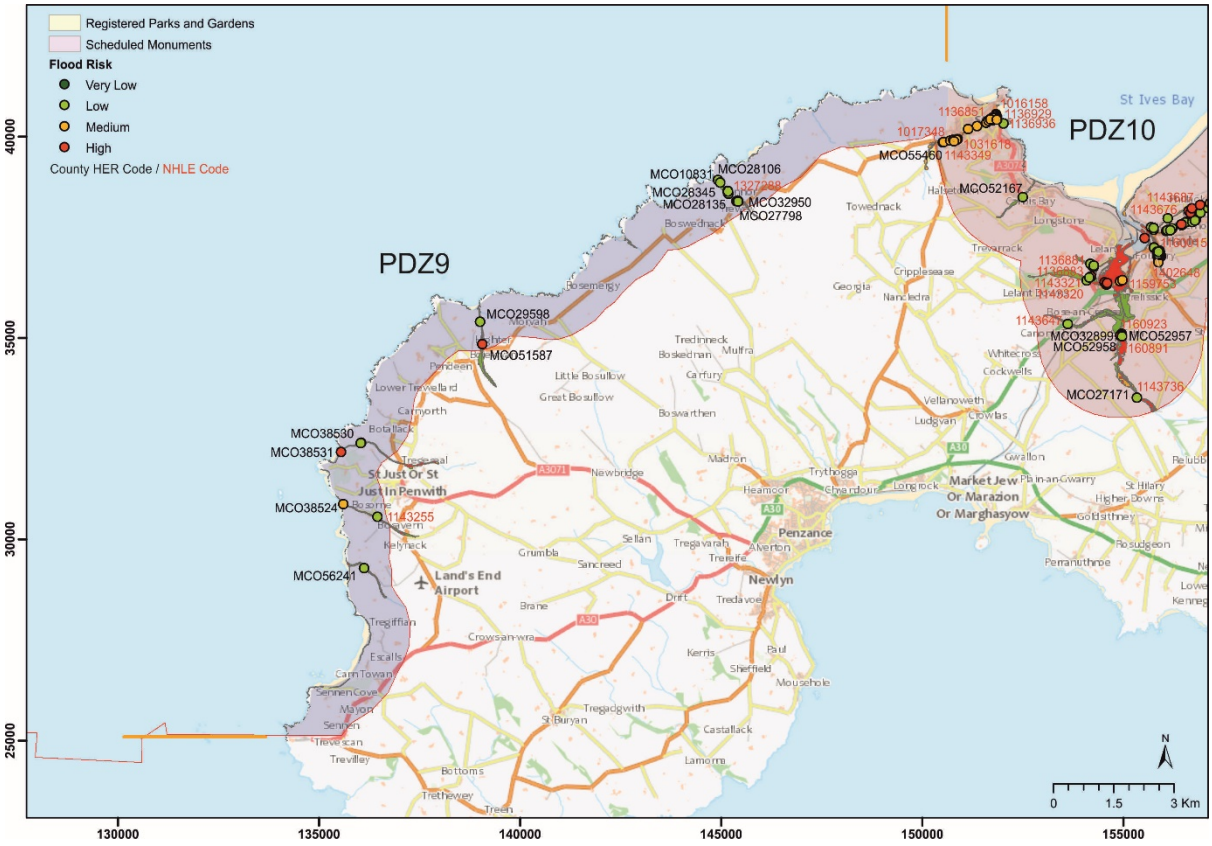


Figure 9.5: Distribution of sites within PDZ9 identified at risk from flooding. Contains Ordnance Survey data © Crown copyright and database right 2019

9.3.2 PDZ10 Clodgy Point to Godrevy Point

Current defences and SMP policy

The eastern side of this PDZ has defences and harbour structures present along much the frontage. Much of the St Ives frontage is defended, with seawalls in position along the rear of Porthmeor beach, Porthgwidden Cove and all of St Ives Harbour. The large pier structure (Smeaton's Pier), which is

orientated to the south, provides protection to the St Ives Harbour area from wave action and therefore provides both coastal flood and erosion protection. Defences are present along the rear of the beach at Carbis Bay. There are some defensive structures on the left-hand bank in the vicinity of Lelant. Quay walls are in existence around most of the Hayle frontage. They are generally in very poor condition and collapses have occurred in several locations. Sluicing gate structures exist at the entrances to the Carnewas and Copperhouse Pools and there are a range of flood defence structures operated by the Environment Agency that protect properties from both fluvial and tidal flooding. The Copperhouse Pool sluice works in combination with the pool to store river flows in times of high tides to prevent fluvial flooding, and with high ground levels either side of the sluice to defend properties from tidal flooding. The Causeway and embankments on either side of the Hayle River act to protect properties in and around St Erth from flooding. There is an artificially created bund that exists in place at the rear of the beach between Gwithian and Godrevy. This was created to provide defence to the former sand extraction works located behind the beach.

The overarching management principle is therefore to manage the coast at St Ives, Carbis Bay and Hayle to maintain the amenity value of the beaches, harbours and surrounds, and to allow the natural and unconstrained evolution of the coast along the remainder of the St Ives Bay shoreline. In addition, all management should support the adaptation and resilience of the coastal communities, particularly St Ives, which is likely to display most sensitivity to climate change and sea level rise. The SMP policy for this stretch of coastline is as follows:

- Clodgy Point to Carrick Du: NAI
- Porthmeor: HTL
- St Ives Head: NAI
- St Ives: HTL
- Carbis Bay: HTL
- Hayle Estuary: HTL
- Hayle and Gwithian Towans: NAI, but HTL at Godrevy in the short term

Sites identified at risk from erosion in PDZ10

Visual inspection of the coastline, coupled with the SMP policy and NCERM predictions, helped to identify the following sites likely to be at risk from coastal erosion, shown in Figure 9.6.

At Carrick Du a Bronze / Iron Age hut circle (MCO19299) is located on the cliff edge within the area of expected erosion. Coastal erosion is also expected to occur within an area previously yielding Mesolithic lithic scatters (such as MCO6674) and an undated hearth site (MCO28569) near Gwithian, with more lithic sites expected to be revealed as a result of furture erosion. At Venton Uny (MCO7126), a holy well is located on the cliff edge, as are pillboxes at Carbis Bay (MCO42929), Porth Kidney (MCO50972) and Godrevy Cove (MCO33839), all identified as potentially at risk over the short to medium term. At Porth Godrevy a post-medieval boathouse (MCO28559) is located within the predicted area of erosion, with another post-medieval building (MCO28568) located seaward of the cliff and identified as at risk.

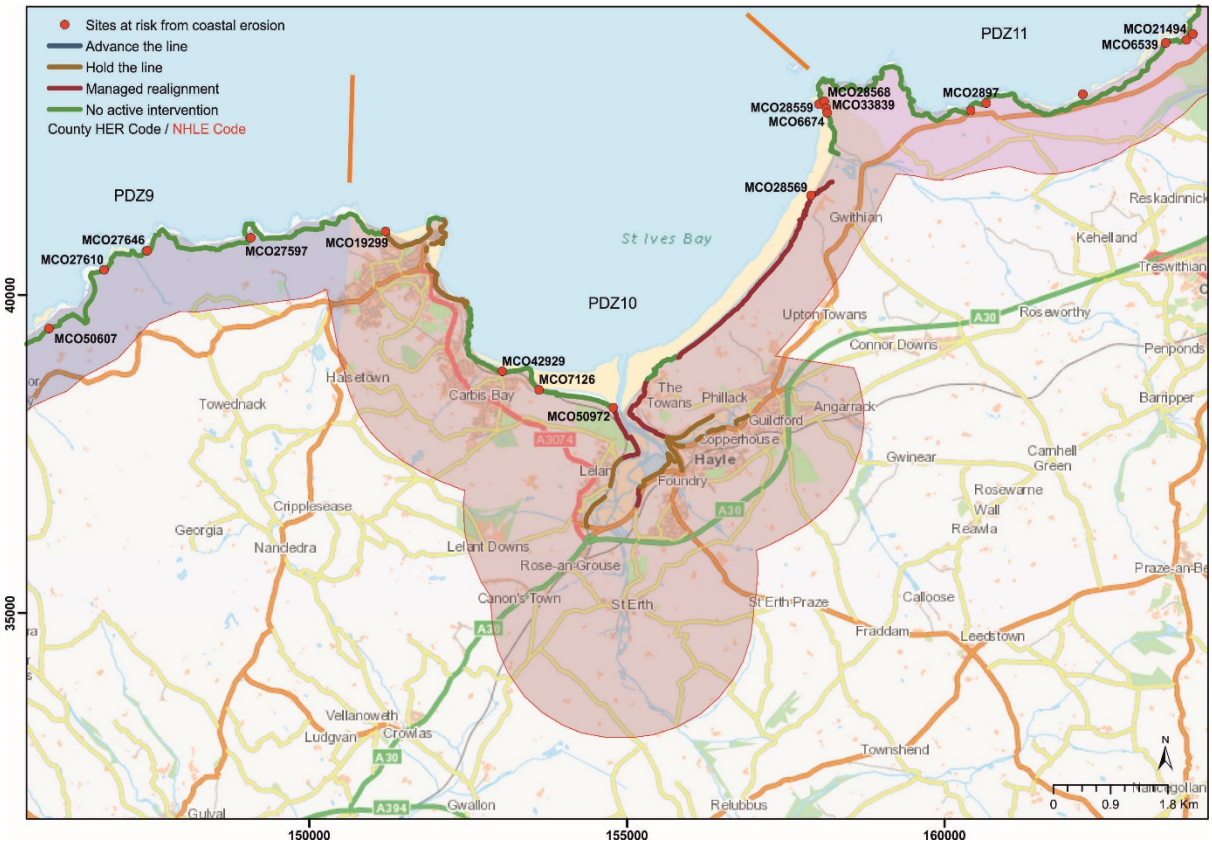


Figure 9.6: Distribution of sites within PDZ10 identified at risk from predicted future coastal erosion under SMP2 proposals. Contains Ordnance Survey data © Crown copyright and database right 2019

Sites identified at risk from flooding in PDZ10

Sites at risk from flooding within PDZ10 are clustered along the Stennack River, St Ives, and within the Hayle estuary (Figure 9.7). Within the Stennack River, flood risk is low to medium, with 14 listed buildings within this flood zone. Within the Hayle estuary, 11 listed buildings are located along the River Hayle (and its tributaries), nine along the valley south of Carnsew Pool (west Hayle) and nine along Copperhouse Pool and the Angarrack River.

Within St Ives, the listed buildings at medium flood risk along the Stennack River are clusted around the town centre of St Ives, in the southern part of the conservation area between Chapel Street and St Andrew's Street, including St Ia's churchyard (scheduled cross NHLE 1016158 and church MCO6474), and further west along Higher Stennack, centred around the Grade II listed and scheduled Penbeagle Cross (NHLE 1143349 and 1017348) (Figure 9.8).

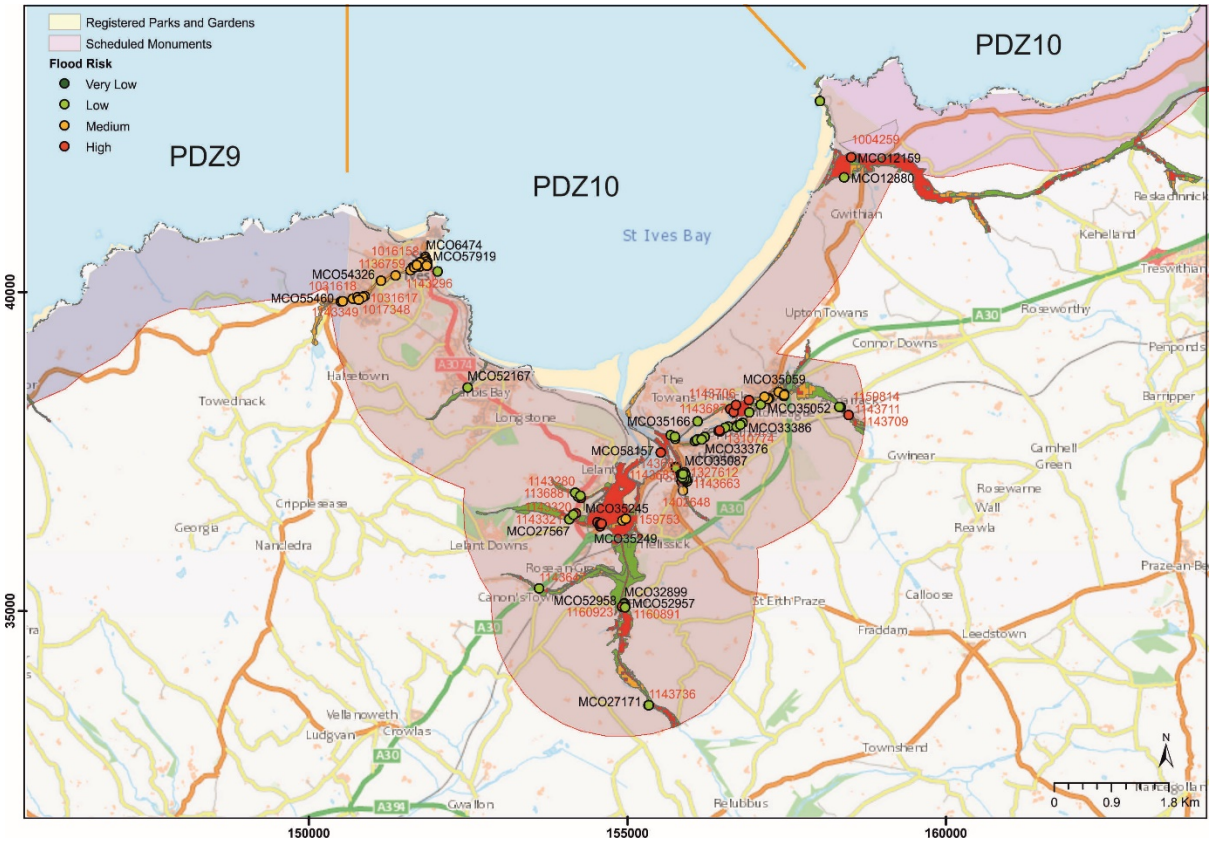


Figure 9.7: Distribution of sites within PDZ10 identified at risk from flooding. Contains Ordnance Survey data © Crown copyright and database right 2019

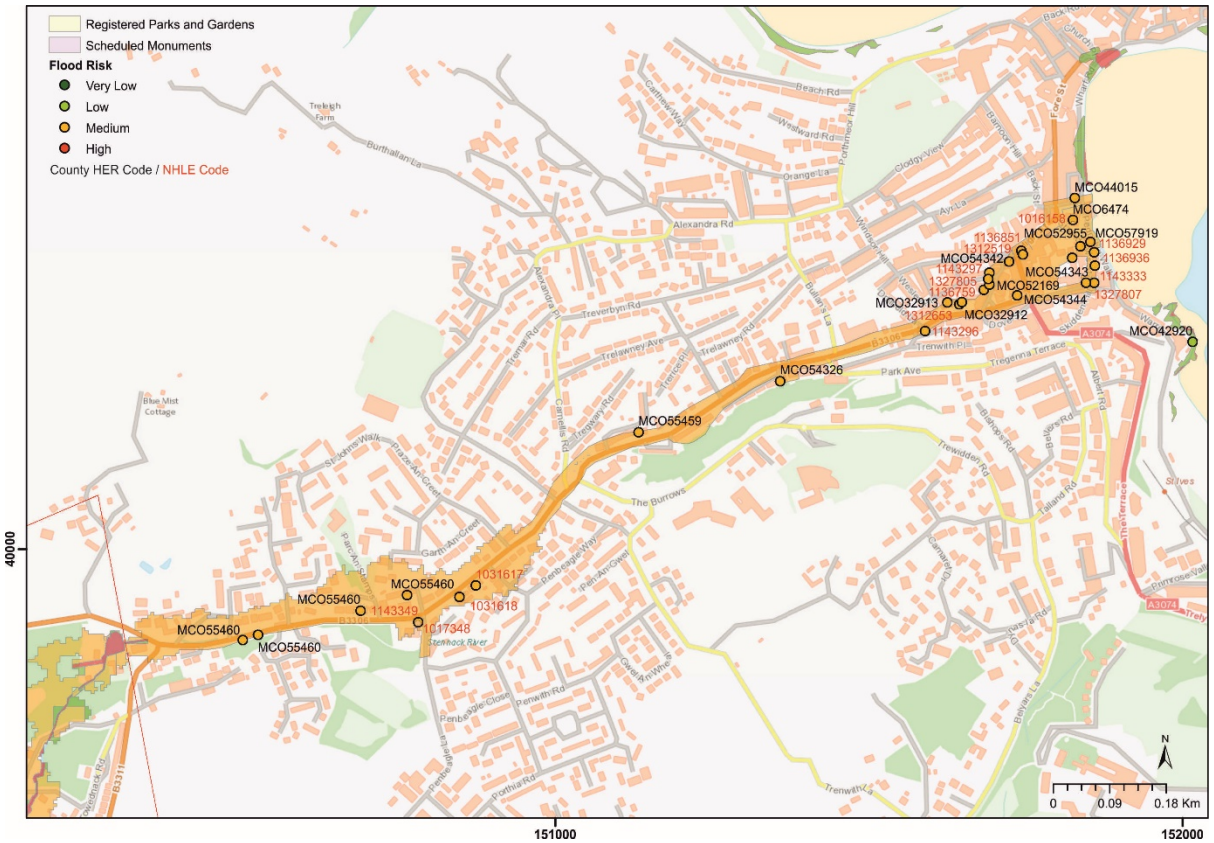


Figure 9.8: Distribution of sites along the Stennack Valley, St Ives, PDZ10, identified at risk from flooding. Contains Ordnance Survey data © Crown copyright and database right 2019

Along the Hayle River (Figure 9.9), risk of flooding to listed buildings is low with the exception of St Erth Bridge (NHLE 1160923; part of the St Erth conservation area), Wesleyan Chapel (NHLE 1136883; part of the Lelant Conservation area) and Chy An Wheel (NHLE 1143320), which are all at high risk. At Lelant a series of sites are at high flood risk including the non-conformist chapel (MCO32909), a late 19th century building (MCO35249) and the Old Quat House Inn (MCO35245). South of Carnsew Pool, the site of Barclay's Bank (NHLE 1160015), a post-medieval terrace (MCO33204), the former Trevithick's stables (MCO33345) and the scheduled site of the late 18th to 19th century mill complex, ropeworks and associated water management system immediately east of Millpond Avenue, Foundry (NHLE 1402648), are all at high risk. These are all within the Hayle conservation area. The post office in Foundary Square (MCO35087) and a building that is part of Harvey's ropewalk / hammer mills / grist mills complex (MCO35158) are at medium risk. Along Copperhouse Pool (also part of the Hayle conservation area) and the Angarrack River the listed buildings at high risk are all bridges, though Millbrook House (NHLE 1143711) is at low risk, with houses, shops and warehouses recorded in the Cornwall HER along the river margins identified as at low to medium risk. Along the Red River near Gwithian, the post-medieval chimney (MCO12159) is at high risk, while the Wheal Confidence mine (MCO12880) to the south is at low risk. The southern edge of the scheduled multi-period prehistoric settlement sites and associated field systems at Godrevy Towans (NHLE 1004259) extends south onto the edge of the Red River within the area identified as at high flood risk.

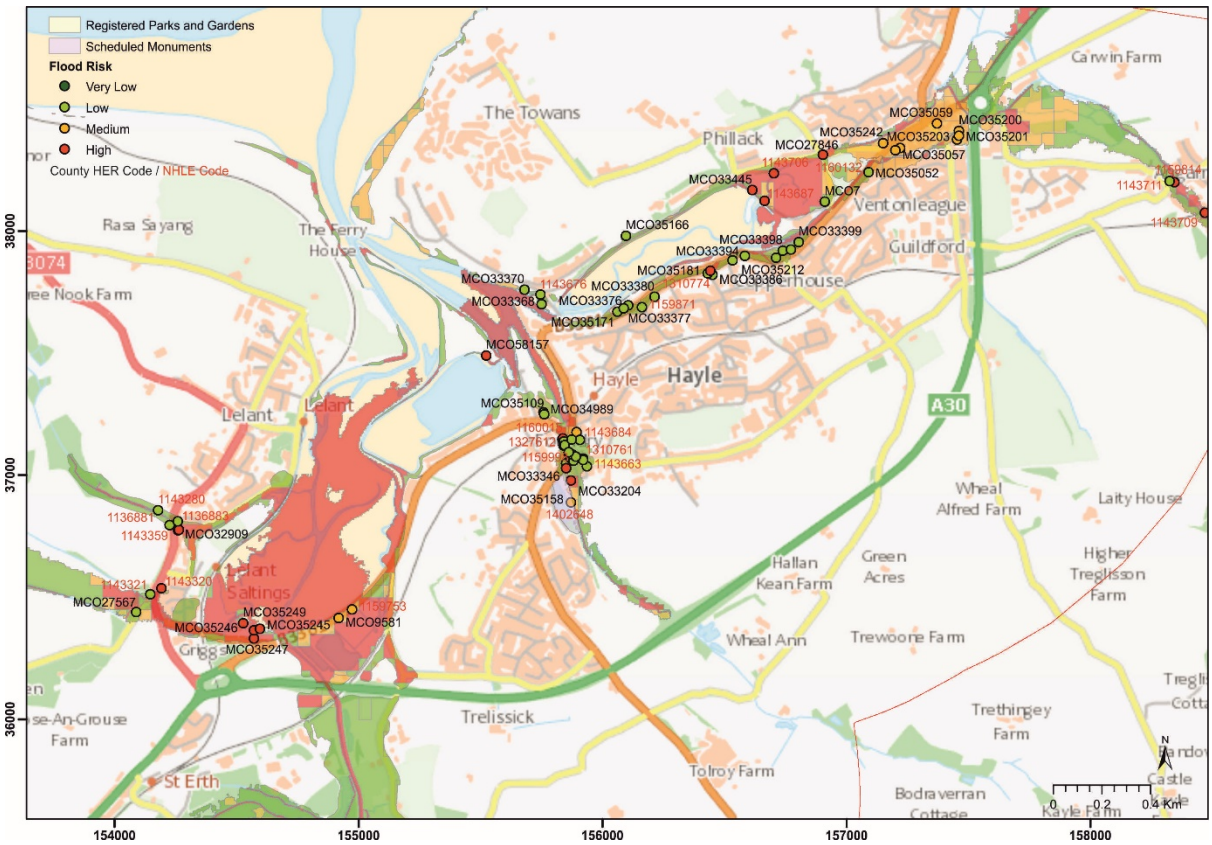


Figure 9.9: Distribution of sites around Hayle, PDZ10, identified at risk from flooding. Contains Ordnance Survey data © Crown copyright and database right 2019

9.3.3 PDZ11 North Cliffs (Godrevy Point to Pentire Point West)

Current defences and SMP policy

There are a series of defences and general coast protection structures at each of the coastal settlements. There are also small-scale private defences at Chapel Porth. Portreath has an array of structures, with a stepped masonry sea wall and fronting the car park at the rear of the beach, and a small harbour through which the Portreath Stream discharges and the 250m long pier orientated northwest which maintains the harbour channel and provides shelter to the harbour entrance and Lighthouse Hill. In addition, there are seawalls protecting the cliff line and a number of properties at Battery Hill, at the western end of the beach.

Porthtowan has some very minor defences in the form of gabions (council owned / maintained) which front the car park adjacent to the RNLI lifeguard station. There are also some low masonry (block-work) walls fronting properties on the Westcliff side of the beach. At Chapel Porth there is a masonry vertical wall at the rear of the beach, with an access point through it at the centre. It is primarily a retaining wall for the car park immediately above the beach, rather than coast protection structures, though under extreme conditions it is likely to provide that function as well.

Trevaunance Cove at St Agnes has development close to the mean high water position directly at the rear of the beach, including changing huts and cafes. These are fronted by some vertical concrete and masonry sea walls and small revetment. There are two concrete slipways onto the beach, one providing public access and the other private access from where the fishing boats pull up off the beach.

Perranporth has a number of low sea walls at the rear of the beach adjacent to the car park. It also has concrete structures associated with two engineered channels where the Perran Stream and Bolingey Stream discharge out on to the beach. These have a dual tidal / fluvial flood defence function as Perranporth is particularly at risk from combined fluvial tidal events and tide locking in the channels through the town. There are no specific flood defences or coast protection structures at Holywell Bay as the settlement is set well back behind the dune system.

The overarching management principle is therefore to allow the natural evolution of the coast while recognising the need to support the adaptation and resilience of the coastal settlements. Continuing to support the recreational and amenity value of the coast is an important part of this intent but it cannot dictate the long-term shoreline position where a more sustainable long-term realignment is desirable. The SMP policy for this stretch of coastline is as follows:

- Godrevy Cove to Portreath: NAI
- Portreath HTL
- Portreath to Porthtowan HTL
- Porthtowan HTL
- Porthtowan to Trevaunance Cove: NAI
- Trevaunance Cove: HTL
- Tevaunance Cove to Droskyn Point: NAI
- Perranporth: HTL
- Perranporth to Fistral Beach: NAI

Sites identified at risk from coastal erosion in PDZ11

Visual inspection of the coastline, coupled with the SMP policy and NCERM predictions, helped to identify the following sites likely to be at risk from coastal erosion (Figure 9.10).

At Hudder Down, a Bronze Age barrow (MCO2897) excavated in 1836 is currently half-lost to cliff erosion with the remainder expected to be fully lost within the next 50 years. Along this stretch of coastline there are several Iron Age cliff castles at risk from erosion: Kelsey Head (MCO6551; NHLE 1020026), Penhale Point (MCO6562; NHLE 1016991), Kelsey Head (MCO38379; NHLE 1020026), Tubby's Head (MCO6585; NHLE 1017017), including the prehistoric midden (MCO25225), and Crane Castle (MCO6539; NHLE 1004390). While most of these sites will experience erosion along their outer edges, at Crane Castle erosion is also expected to impact the main earthworks; this site is currently on the HAR register due to coastal erosion. An earthwork at Caracannel Downs (UoS 9466), probably too small to be a cliff castle, is also at risk from erosion.

At Treellas Porth a series of mining-related structures, including a stamping mill (MCO29187) and blowing house (MCO29188), are situated in a small valley on the coastal edge and could be at risk from erosion. This is also the case with a mineshaft at Pen a Gader (UoS 681) and Shag Rock (UoS 672), and prospecting pits at Nancekuke (UoS 756). A series of post-medieval coastal quarry sites are also at risk from erosion: Shag Rock (UoS 685), Caravannel Downs (UoS 768)), Hell's Mouth (UoS 769), Tregea Head (UoS 772), Portreath (UoS 757) and Holywel (UoS 662).

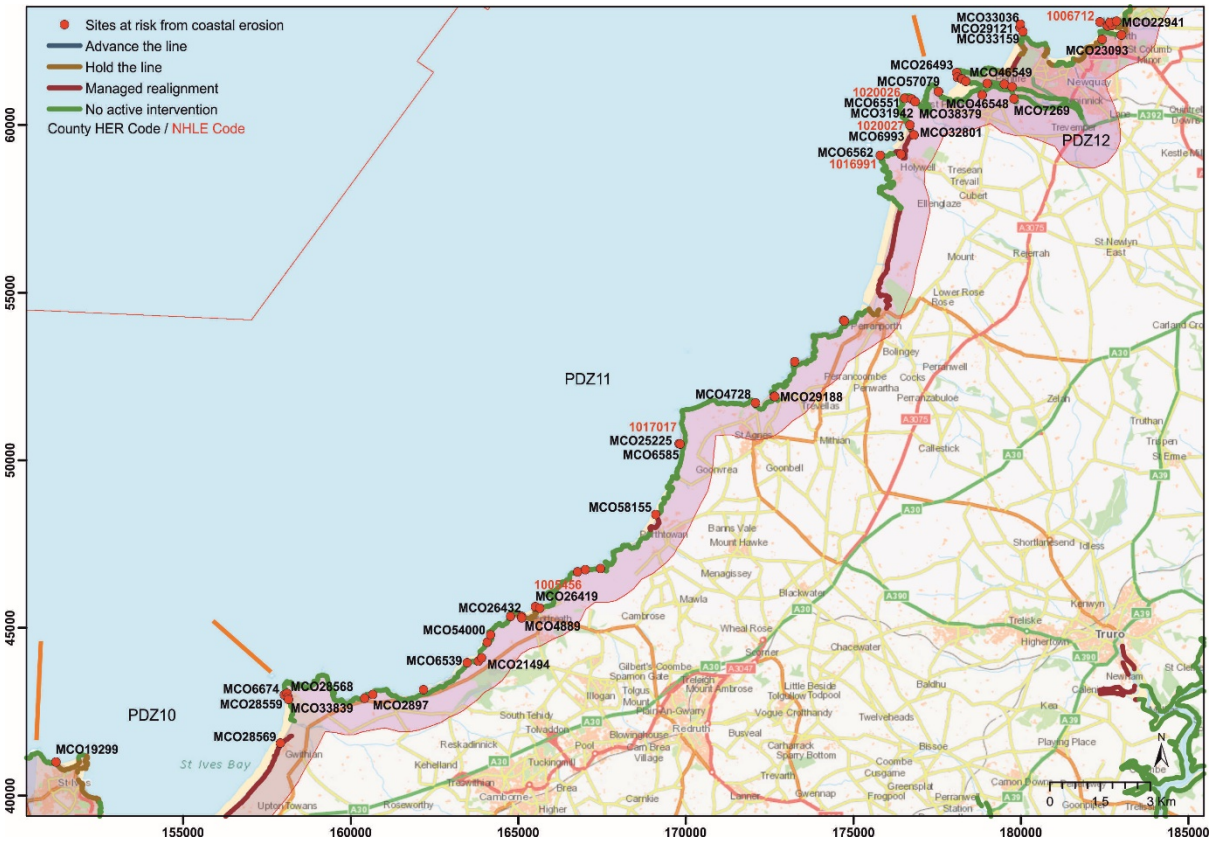


Figure 9.10: Distribution of sites within PDZ11 identified at risk from predicted future coastal erosion under SMP2 proposals. Contains Ordnance Survey data © Crown copyright and database right 2019

At St Agnes the post-medieval harbour (MCO4728) is within a zone at risk, though may be provide some shelter from the headland. At Portreath the post-medieval quay (MCO4889) and baths

(MCO26432) are also potentially at risk, as is the tidal swimming pool at Porthtowan (MCO58155), a possible intertidal wall at Reskajeage (UoS 391) and a medieval holy well at Holywell Bay (MCO6993; NHLE 1020027). At Portreath a post-medieval day mark situated on the cliff is also at risk from erosion (MCO26419; NHLE 1005456).

Enclosures and boundaries situated on the cliff tops are also at risk from short to long-term erosion, such as the undated boundaries at Kelsey Head (MCO31942), The Kelseys (MCO32801), Carvannel Downs (MCO21494) and Nancekuke (UoS 389-390). At Porthcadjack Cove, post-medieval steps (MCO54000) have the potential to be eroded and lead to a loss of access to the cove itself.

Sites identified at risk from flooding in PDZ11

Flood risk within PDZ11 is associated with the lower reaches of streams draining into the sea (Figure 9.11). At Portreath the Methodist Church (MCO33128; NHLE 1142582) and Trecarrel (NHLE 1161507) are both at high flood risk, with other sites nearby at low risk. At Porthtowan and St Agnes (including part of the conservation area) flood risk is identified as low with the exception of a World War II pillbox (NRHE 1425953) and Bridge [at SW727517] (NHLE 1137994). At Perranporth the fire station (MCO54389), a World War II gun emplacement (MCO43023) and a Bridge [at SW755540] (NHLE 1141561) are all at high flood risk.

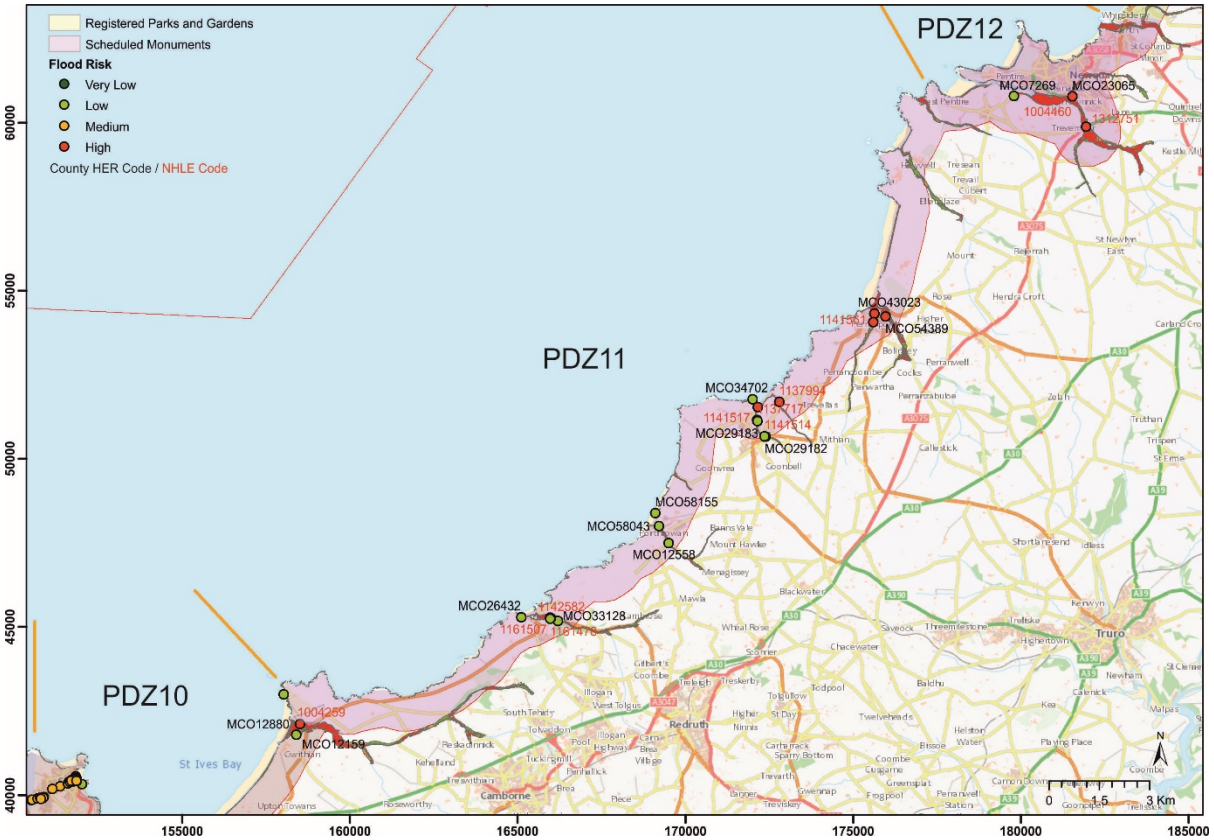


Figure 9.11: Distribution of sites within PDZ11 identified at risk from flooding. Contains Ordnance Survey data © Crown copyright and database right 2019

9.3.4 PDZ12 Newquay (Pentire Point West to Trevelgue Head)

Current defences and SMP policy

Some rock armour defences are present at the southern end of Fistral Beach. Although there are no formal sea defences at north Fistral other than dune stabilisation measures (gabions and fencing), the presence of the Fistral Surfing Centre building and a surfaced car park (both constructed in 2003) means that this end of Fistral beach has become disconnected from the dune system behind it. Defence structures are also located in discrete lengths throughout Newquay Bay, specifically at Towan Beach (including the harbour structures), Great Western Beach, Lusty Glaze, and Porth.

The high-level management intent therefore would be to facilitate the continued popularity of Newquay as a tourist destination, but this must take place against the backdrop of a management regime for the beaches and cliffs which protects and enhances their wild and rugged 'Cornishness'. Allowing natural evolution of the coast wherever possible and generally protecting and enhancing the coastal environment are identified as critical to the continued prosperity of Newquay. Supporting the long-term adaptation of beaches (and their retention) is an important part of delivering the overarching management intent. The SMP policy for this stretch of coastline is as follows:

- Perranporth to Fistral: NAI
- Fistral: HTL
- Fistral to Newquay Harbour: NAI
- Newquay and Porth: HTL
- Porth Island: NAI

Sites identified at risk from erosion in PDZ12

Visual inspection of the coastline, coupled with the SMP policy and NCERM predictions, helped to identify the following sites likely to be at risk from coastal erosion (Figure 9.12).

One of the main sites at risk from coastal erosion is Trevelgue Head (NHLE 1006712), which straddles the PDZ12/13 boundary. Many areas of this headland, including the prehistoric metal processing site, are in close proximity to the cliff edge (e.g. MCO22941, MCO22942, MCO22939). The post-medieval occupation site here (MCO22945) is also forward of the NAI zone.

At West Pentire a post-medieval slipway (MCO57079) and storehouse (MCO57080) are situated at the foot of the cliff which is at risk from erosion. Along the Gannel estuary, a post-medieval slipway and quay (MCO46548) and several undated landing stages (MCO46549, MCO46550-1) are all within areas identified as potentially at risk from erosion. Remains of a limekiln alongside Penpol Creek (MCO7269) is also within an area of predicted erosion, while the limekiln at Porth (MCO7308), although situated at the rear of the beach, within the NAI risk zone.

At Towan Head a series of features are at risk from coastal erosion, including the two gun battery (MCO42610) and medieval / post-medieval enclosure (MCO33159), both located on the causeway, as well as a post-medieval magazine (MCO29121) and post-medieval mine (MCO33036).

Three quarry sites located on the cliff edge are identified as potentially at risk from erosion: Rushy Green (UoS 9392), The Gannel (UoS 654-5)) and Pentire Point East (UoS 9398). At East Pentire an early medieval rock carving (MCO26493) located on the shoreline could also be at risk from erosion, while at Lusty Glaze (MCO23093) a post-medieval inclined plan / canal is located on an exposed cliff that has potential to be eroded.

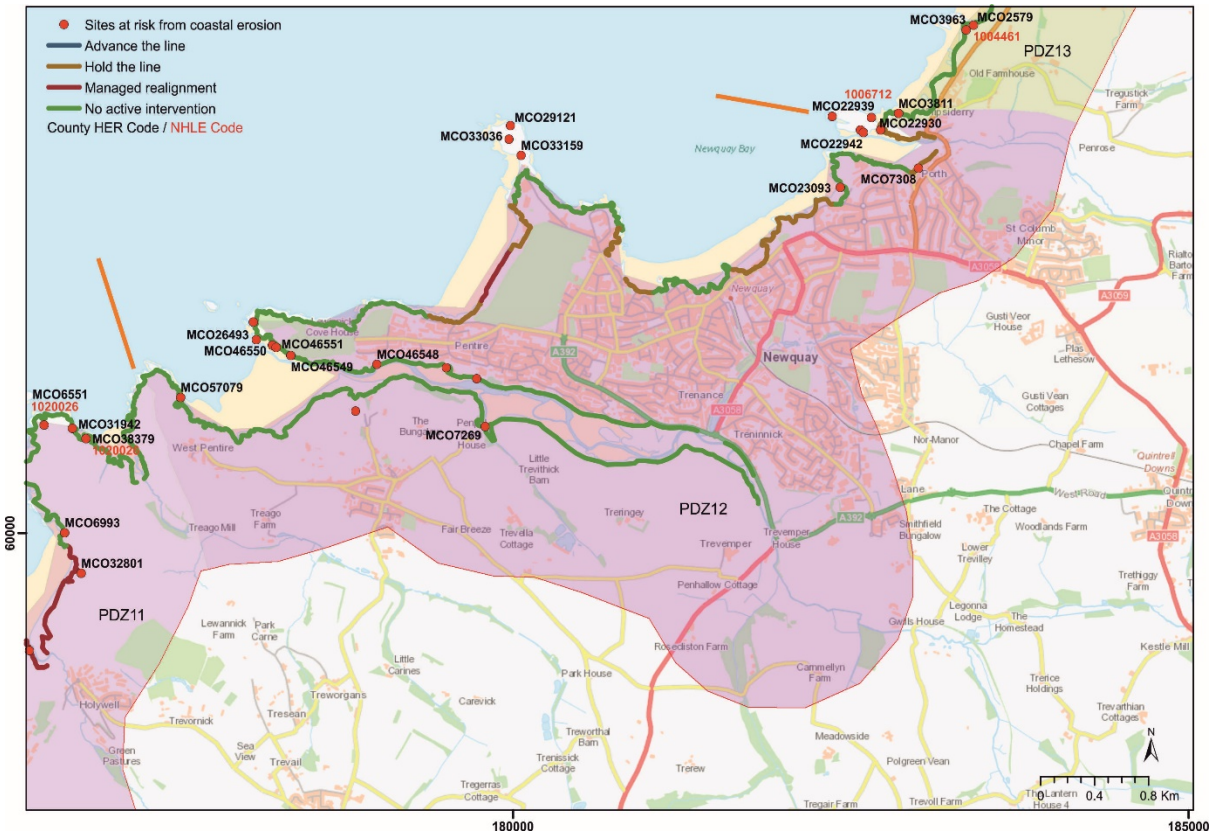


Figure 9.12: Distribution of sites within PDZ12 identified at risk from predicted future coastal erosion under SMP2 proposals. Contains Ordnance Survey data © Crown copyright and database right 2019

Sites identified at risk from coastal flooding in PDZ12

Within PDZ12 flood risk is limited to a post-medieval limekiln at Crantock (MCO7269), at low risk, and the Trevemper Bridge (NHLE 1312751) and remains of a post medieval corn mill (MCO23065), both at high risk, along the River Garnel (Figure 9.13). The northern boundary of the scheduled enclosure known as Treringey Round (NHLE 1004460) lies on the southern bank of the Garnel estuary just outside of the zone of high flood risk.

9.3.5 PDZ13 Trevelgue Head to Stepper Point

Current defences and SMP policy

Defence structures are located as discrete lengths at Watergate Bay and Mawgan Porth, with rock revetment defences existing at Trevone Bay. There are some privately owned defences located between Treyarnon and Constantine Bay. Royal Haskoning (2007) conclude that some lateral deflection of wave energy may occur at Constantine as a result of these defences.

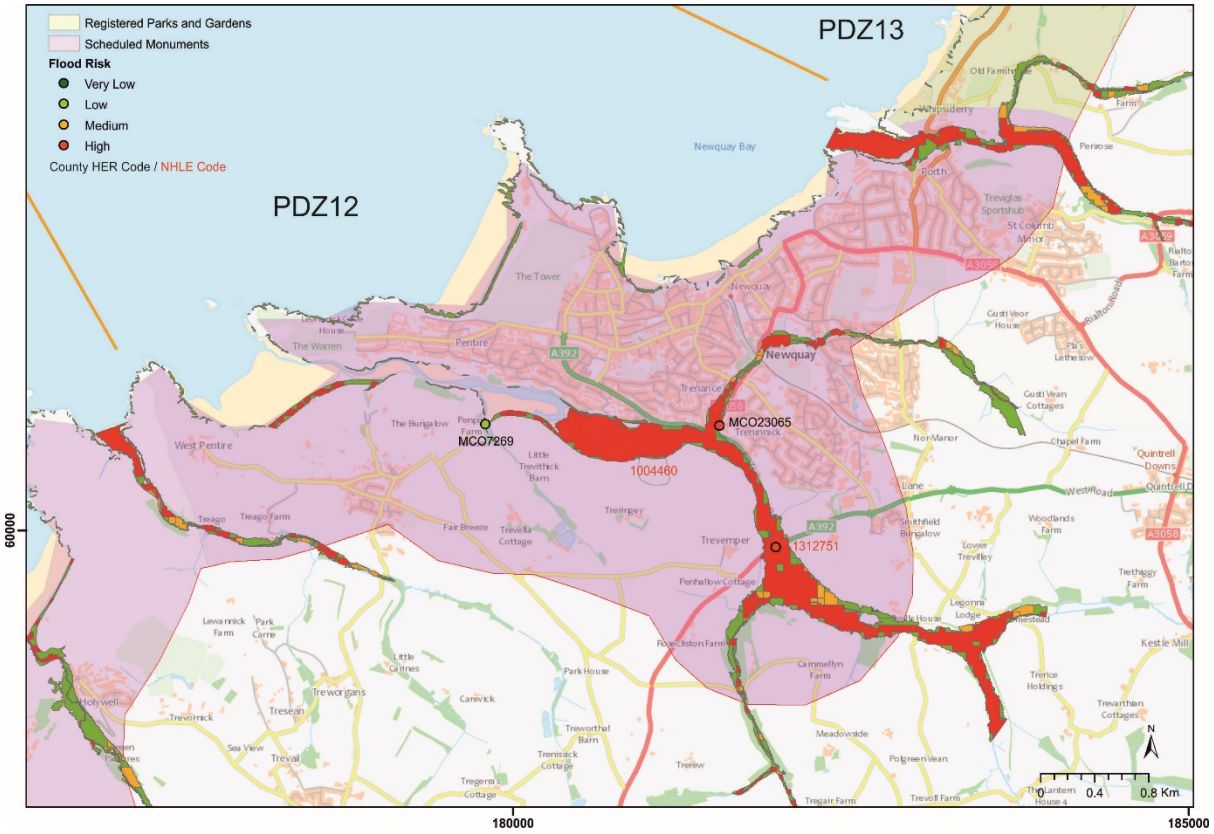


Figure 9.13: Distribution of sites within PDZ12 identified at risk from flooding. Contains Ordnance Survey data © Crown copyright and database right 2019

The overarching management principle is therefore to allow the natural evolution of the coast while recognising the need to support the adaptation and resilience of the coastal settlements. Continuing to support the recreational and amenity value of the coast is an important part of this intent, but it cannot dictate the long-term shoreline position where a more sustainable long-term realignment is desirable. The SMP policy for this stretch of coastline is as follows:

- Trevelgue Hotel to Watergate: NAI
- Watergate Bay: HTL
- Watergate Bay to Mawgan Porth: NAI
- Mawgan Porth: HTL
- Mawgan Porth to Porthcothan: NAI
- Porthcothan to Treyarnon: NAI
- Treyarnon and Constantine Bay: NAI
- Constantine to Trevose Head: NAI
- Trevose Head to Harlyn: NAI
- Harlyn: HTL
- Harlyn to Trevone Bay: NAI
- Trevone: HTL
- Trevone to Padstow: NAI

Sites identified at risk from coastal erosion in PDZ13

Visual inspection of the coastline, coupled with the SMP policy and NCERM predictions, helped to identify the following sites likely to be at risk from coastal erosion (Figure 9.14).

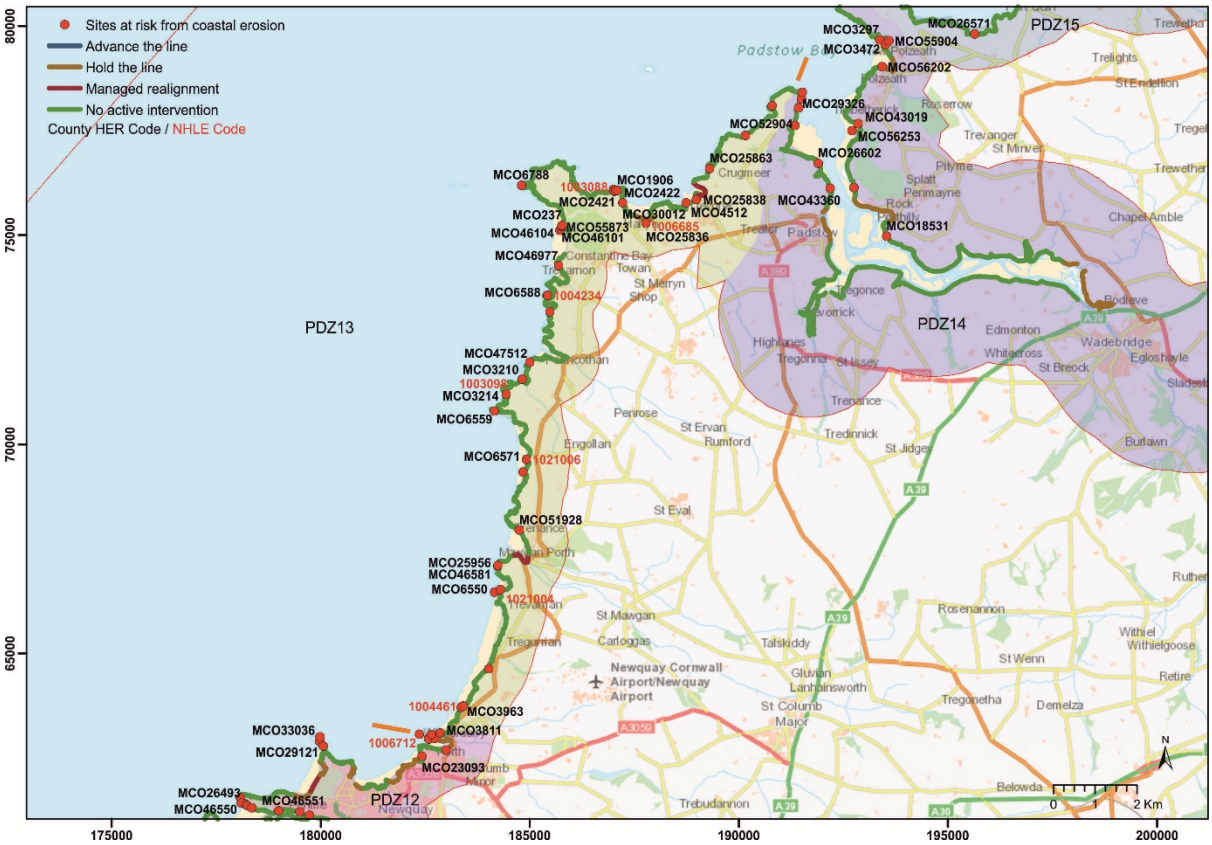


Figure 9.14: Distribution of sites within PDZ13 identified at risk from predicted future coastal erosion under SMP2 proposals. Contains Ordnance Survey data © Crown copyright and database right 2019

A number of prehistoric sites are situated along the coastline in PDZ13 that are identified as at risk from coastal erosion, including Mesolithic scatters at Trevose Head (e.g. MCO6788) and Constantine Island (e.g. MCO237), and the prehistoric lithic working site at Trevelgue Head (MCO22930; NHLE 1006712).

Bronze Age sites, some already showing evidence of erosion, are also situated along this coastline. These include a number of sites around Contantine Island and Boobys Bay where burial (MCO55873, MCO46104, MCO46101) and domestic (MCO46107) Bronze Age sites have been found eroding onto the beach. Within Newtrain and Harlyn Bay a series of Bronze Age cists, particularly on its southern edge, have been exposed suggesting that further sites are likely to be revealed, especially in associated with the inhumation cemetery at Harlyn (MCO25836; NHLE 1006685). Along the cliffs, Bronze Age barrow sites are at risk from coastal erosion at Cataclews Point (MCO2421, MCO2422 and MCO1906; NHLE 1003088), Park Head (MCO3214 and MCO3210: 1003098), Trevelgue Head (MCO3811: NHLE1006712), East Trevelgue (MCO2579; NHLE: 1004461) and West Trevelgue (MCO3963: NHLE 1004461). These are expected to reduce in size or be completely lost under predicted coastal erosion scenarios. A possible barrow at Fox Cove (UoS 628) is also located on the cliff edge, though this feature, only visible from the AP but with no topographic signature, could be a fairy ring.

Cliff castles at Trevelgue Head (NHLE 1006712), Winecove Point (MCO6588; NHLE 1004234), Park Head (MCO6559), Redcliff Castle (MCO6571; NHLE 1021006) and Griffins Point (MCO6550; NHLE 1021004) are all expected to experience erosion around the edges of the promontory they reside upon. Winecove Point, Redcliff Castle and Park Head are most at risk, with erosion expected to lead

to significant reductions to the earthworks and site interior area, with the causeway connecting Park Head expected to reduce in width to c. 15m wide under the 100 year predictive model. Of these five sites, only Redcliff Castle resides upon the HAR register, and this is due to coastal erosion. At Revone (MCO25838) a Romano-British cemetery is located on the cliff and erosion is likely to expose more burial sites.

A number of medieval and / or post-medieval quarry sites are located in areas expected to undergo coastal erosion: Porthmissen (MCO25863), Lellizzick (UoS 611), Stepper Point (UoS 609), Watergate (UoS 634), Berryls Point (MCO25956), Cataclews Point and Cataclews (MCO25858). Access to the cliffs is also expected to be impacted by erosion, with post-medieval footpaths, such as at and Griffins Point and Pendarves Point (UoS 711), affected. At Berryls Point a 19th century lookout and boundary marker (MCO46581) are both located on the cliff edge in an area predicted to erode, while at Trenance Point (MCO51928) sections of a post-medieval canal alignment have already been eroded, with the westernmost c.150m of this alignment anticipated to be lost under current predictions and NAI policy. At Porthcothan the site of a post-medieval smugglers cache is within the area of predicted erosion, with a post-medieval grave at Treyarnon (MCO46977) having already been eroded and potential for more grave sites to be exposed in this area. Finally, at Onjohn Cove a trench on the cliff top associated with World War II beach defences (MCO30012) will also likely be lost to erosion.

Sites identified at risk from flooding in PDZ13

There are no sites within PDZ13 identified as at risk from flooding. Sites within the identified flood zones include findspots and beach defences, which are unlikely to be impacted significantly by flooding unless accompanied by erosion (Figure 9.15).

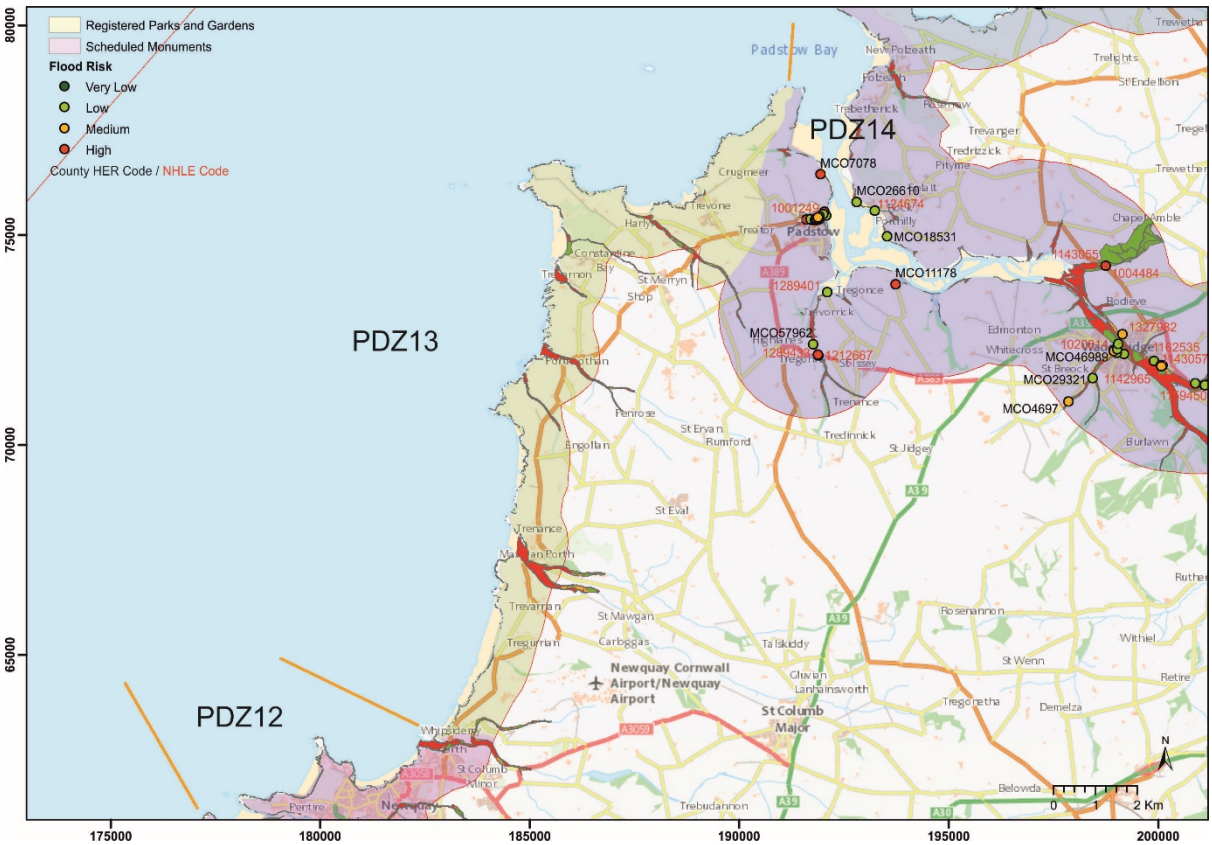


Figure 9.15: Distribution of areas at risk of flooding within PDZ13. Contains Ordnance Survey data © Crown copyright and database right 2019

9.3.6 PDZ14 Camel Estuary (Stepper Point to Pentire Point)

Current defences and SMP policy

Harbour walls and a harbour gate alleviate the risk of tidal flooding at Padstow. Embankments, flood walls and steel sheet piled walls are in place at Wadebridge to alleviate the risk of tidal flooding. Defences at Sladesbridge are to alleviate the risk of tidal and fluvial flooding. There are coastal protection structures at Rock, granite steps and timber defences exist at Polzeath and a cliff protection structure at New Polzeath.

The overarching management principle is to allow the natural evolution of the coast while recognising the need to support the adaptation and resilience of the coastal and estuarine settlements through reducing flood risks and maintaining recreational and amenity facilities (within the context of the natural amenity value of the area). Ensuring the resilience of Wadebridge as a community is particularly key, due to the magnitude of the flood risks. Importantly however, the overall management of the Estuary should be prioritised around the internationally important habitats for which it is designated. The SMP policy for this stretch of coastline is as follows:

- Trevone Bay to Padstow: NAI but maintain beach access point.
- Padstow: HTL
- Dinas to Porthilly Cove: NAI, with with strategic saltmarsh management.
- Rock and Porthilly Cove: HTL, possibly ATL in future depending on development proposals.
- Rock to Daymer Bay: NAI
- Daymer Bay: HTL
- Daymer Bay to Polzeath: NAI
- Polzeath: HTL along defended length, NAI along cliff
- Pentire Glaze to Pentire Point: NAI

Sites identified at risk from coastal erosion in PDZ14

Visual inspection of the coastline, coupled with the SMP policy and NCERM predictions, helped to identify the following sites likely to be at risk from coastal erosion (Figure 9.16).

Within the Camel Estuary, sites identified at risk from coastal erosion are predominantly located within the estuary mouth north of Padstow and Rock. On the western side, a post-medieval quarry (MCO29326), mooring posts (UoS 604) and landing stage / jetty (UoS 606) at Stepper Point are within the zone of predicted erosion, though these may be provided additional protection from the headland to the north. This protection may also be offered to a post-medieval watch house at Hawkers Cove (MCO52904). At Gun Point a post medieval battery / gun emplacement (MCO26602) and at St Saviour Point at military base (MCO43360) are in areas where erosion is predicted to occur.

On the eastern side of the estuary, erosion may be increased due to greater exposure to the Atlantic Ocean. Within Daymer Bay a prehistoric shell midden (MCO56253), and associated submerged forest, have been frequently reported as eroding and this is expected to continue. A mutilated Bronze Age barrow at Pentireglaze (MCO3297) is located on the cliff edge and expected to suffer coastal erosion, while at Slipper Point the northern part of a barrow (MCO3472) has already been partially lost through erosion.

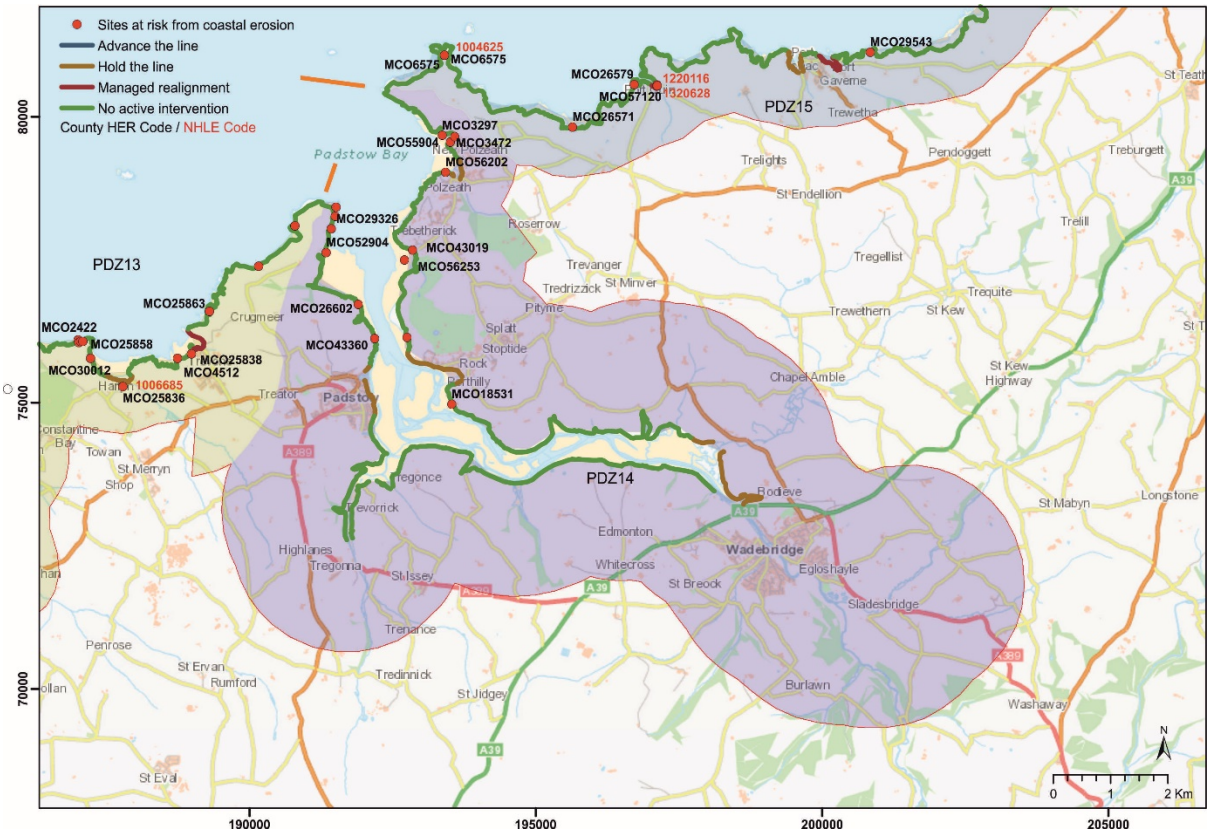


Figure 9.16: Distribution of sites within PDZ14 identified at risk from predicted future coastal erosion under SMP2 proposals. Contains Ordnance Survey data © Crown copyright and database right 2019

At Rock a post-medieval quarry (UoS 8893) may experience erosion, as could a post-medieval fish cellar at Cant (MCO18531). At Polzeath (MCO56202) and New Polzeath (MCO55904) a number of post-medieval shipwreck graves have been previous encountered in the cliff face, so further sites might be revealed from erosion. Above Daymer Bay a World War II pillbox (MCO43019) is located on the cliff edge and at risk of erosion.

Sites identified at risk from flooding in PDZ14

Within the Camel estuary, sites at risk from flooding are principally clustered around Padstow Quay, Little Petherick Creek and along the River Camel east of Wadebridge (Figure 9.17).

At Padstow, along the stream draining into Padstow Quay centred upon the conservation area, 21 listed buildings are within the flood zone, with five identified at high flood risk (8 Church Lane (NHLE 1211560), Rashleigh Cottage (NHLE 1211584), Golden Lion (NHLE 1289824), south east entrance to Churchyard (NHLE 1289858), North Quay Walls (NHLE 1212006)) and 7 identified as at medium flood risk (Butchers (NHLE 1211554), Corner House Bakery (NHLE 1211859), Dolphin Cottage (NHLE 1226669), Padstow Pottery (NHLE 1289823), Buckingham (NHLE 1211862), Cornish Stone Company (NHLE 1211863) and Cornish Candy (NHLE 1289825)) (Figure 9.18). Non-designated sites at high flood risk include the police station (MCO54339) and a post-medieval multi-use building (UoS 9221), with the institute (now Library and Museum; MCO54340) and market house (MCO54498) both at medium flood risk. The Grade II Registered Historic Park and Garden of Prideaux Place borders stream on its southern edge in an area of high to medium flood risk, and therefore could be subject to some localised flooding along this boundary, as is the churchyard of St Petroc's which contains both listed (NHLE 1289858) and scheduled (NHLE 1014216) monuments.

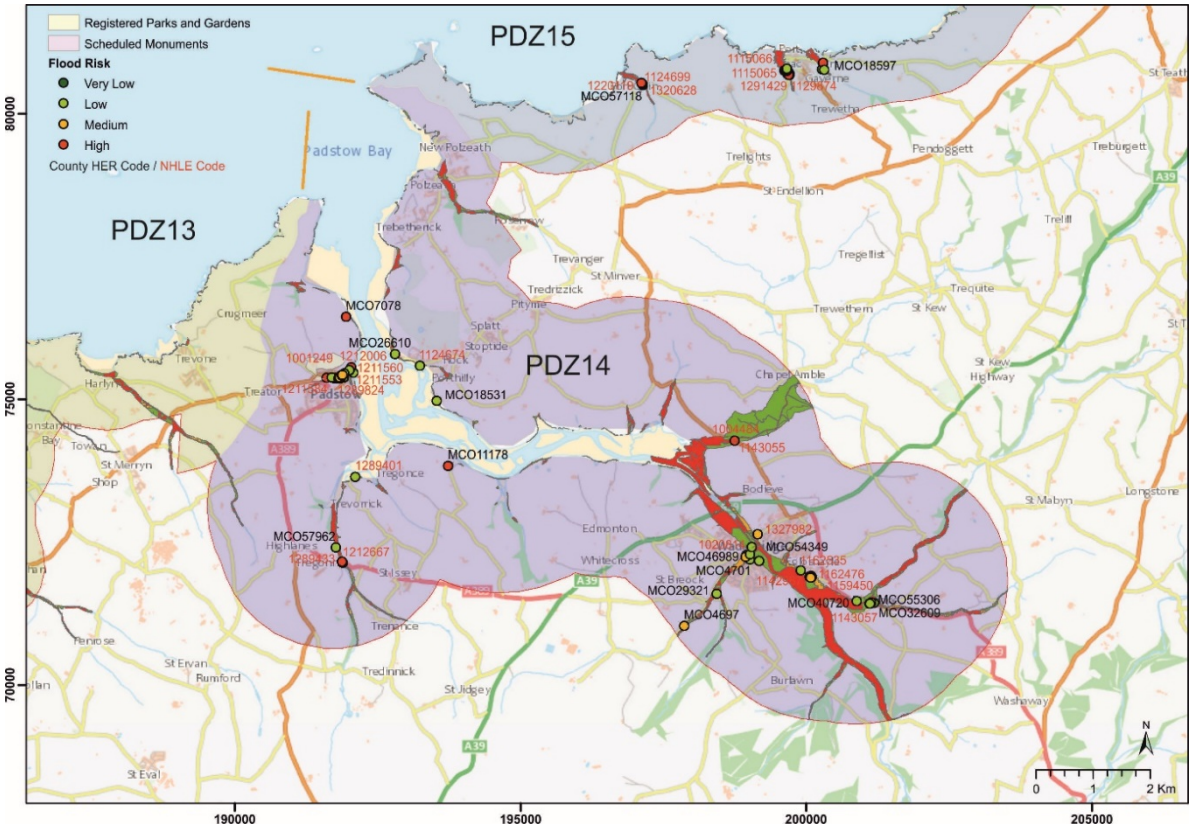


Figure 9.17: Distribution of sites within PDZ14 identified at risk from flooding. Contains Ordnance Survey data © Crown copyright and database right 2019

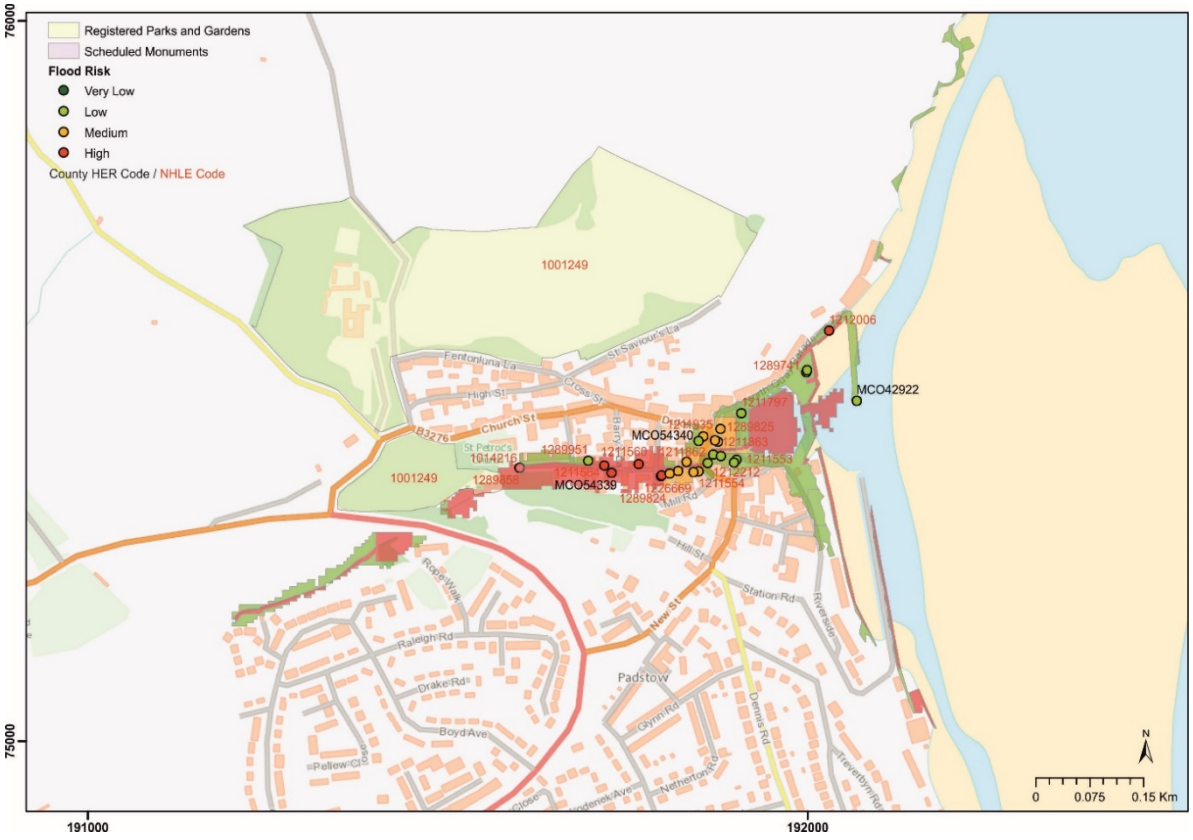


Figure 9.18: Distribution of sites within Padstow, PDZ14, identified at risk from flooding. Contains Ordnance Survey data © Crown copyright and database right 2019

Along Little Petherick Creek, listed buildings at high flood risk are the bridge (NHLE 1212667) and village hall (NHLE 1289433), both within the conservation area, and the Quay (NHLE 1289401) near Higher Sea Mills. Along the River Camel and Treguddick Stream, east and south of Wadebridge respectively and part of the conservation area, listed buildings at medium flood risk include spring gardens (NHLE 1327982), and a series of headstones, tombchests and south entrance to Egloshayle Church (NHLE 1162476, 1162496, 1142964, 1142966, 1327986-8, 1309619). At Wadebridge itself, the scheduled late medieval and 19th century bridge (NHLE 1020814) spans both low and high flood risk areas. Non-designated sites at medium flood risk are the foundries at Wadebridge (MCO4701) and Trelyll (MCO4697). Within the wider area along the banks of the Camel Estuary, Trewornan Bridge (both listed and scheduled: NHLE 1143055 and 1004484), Halwyn country house (MCO11178) and St Georges Well (MCO7078) are all within the high flood risk zone, while sites such as Rock sailing club house ((NHLE 1124674), Cant fish cellar (MCO18531) and a building at Rock Ferry (MCO26610) are within the low flood risk zone.

9.3.7 PDZ15 Pentire Point to Wanson Mouth

Current defences and SMP policy

Coastal defence structures (mainly in the form of harbour walls and quays) are present at Port Quin, Port Isaac, Port Gaverne and Boscastle. Crackington Haven and Trebarwith Strand have small-scale defences located at the rear of their respective beaches. None of these defences are influential on wider-scale coastal processes; they just perform a local coast protection or flood defence role at their respective locations.

The overarching management principle is therefore to allow the natural evolution of the coast, which should retain the tourism and amenity values of the area, recognising the need to support the adaptation and resilience of the coastal settlements, whilst aiming to maintain their overall character. The SMP policy for this stretch of coastline is as follows:

- Pentire Point to Portquin: NAI
- Portquin: HTL
- Port Quin to Port Isaac: NAI
- Port Isaac & Port Gaverne: HTL
- Port Gaverne to Tintagel: NAI, but maintain splash wall at Trebarwith
- Tintagel: NAI
- Tintagel to Boscastle: NAI
- Boscastle: HTL
- Boscastle to Crackington Haven: NAI
- Crackington Haven: HTL, but NAI for cliffs
- Crackington Haven to Widemouth Bay: NAI

Sites identified at risk from coastal erosion in PDZ15

Visual inspection of the coastline, coupled with the SMP policy and NCERM predictions, helped to identify the following sites likely to be at risk from coastal erosion (Figure 9.19).

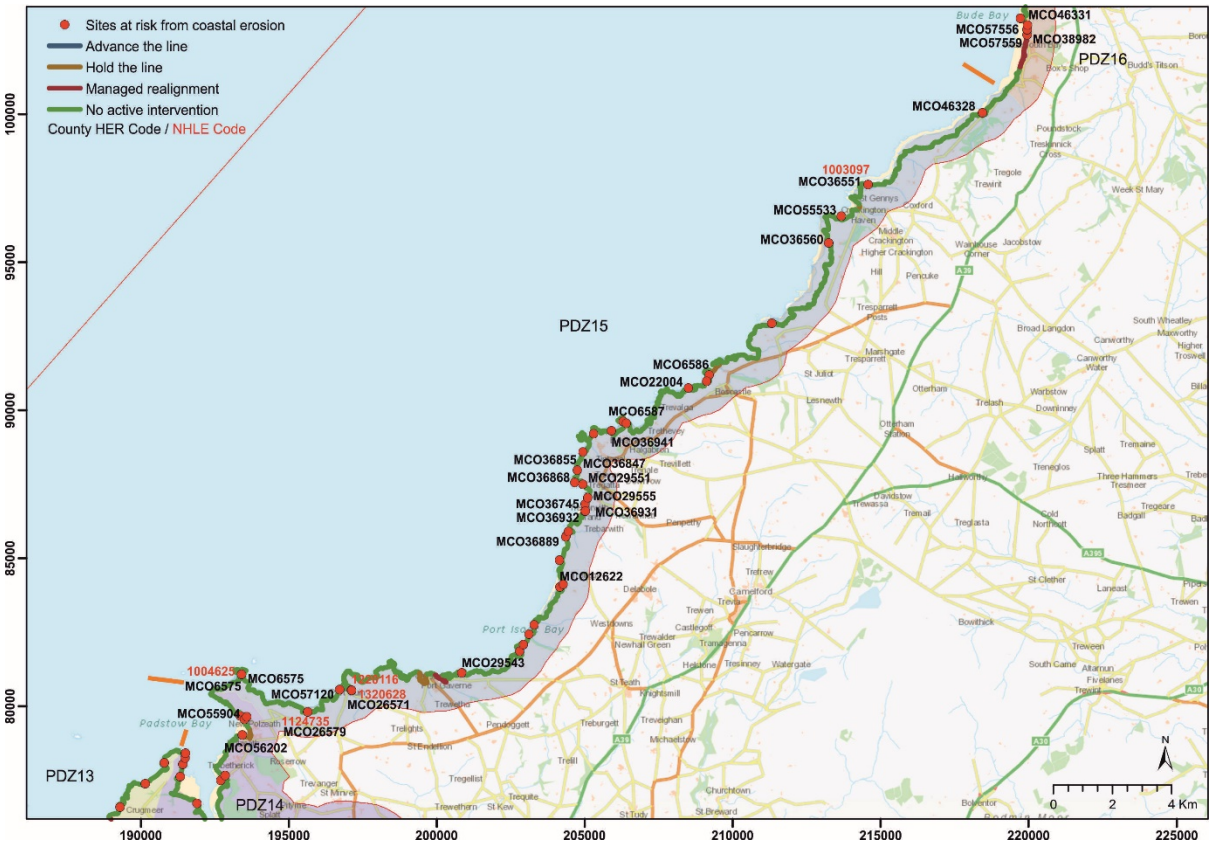


Figure 9.19: Distribution of sites within PDZ15 identified at risk from predicted future coastal erosion under SMP2 proposals. Contains Ordnance Survey data © Crown copyright and database right 2019

Two Bronze Age barrows at The Strangles are at risk of erosion; MCO36560 already shows signs of some loss on its margins, while MCO36561 is further from the cliff edge but also in the zone of predicted erosion. The cliff castle called The Rumps (MCO6575; NHLE 1004625) is currently on the HAR register for coastal erosion. Predicted erosion suggest some loss around the edges of this site and margins of the earthworks, though the main access point to the site is not expected to be impacted under the 100 NAI scenario. At Castle Point (MCO36551 NHLE 1003097), listed as a promontory fort north of the village of St Gennys, erosion is expected to significantly impact this site. The main ditch is currently only positioned 36m from the cliff edge, though it is not conclusive that this is a man-made feature, as the visible earthworks could be scarps caused by slumping off the cliffs, with LiDAR showing underlying geological structures running parallel to the 'ditch and rampart' of the site. The site is currently on the HAR, though this is for site condition (scrub) rather than coastal erosion. At Willapark, the cliff castle at MCO6587 is expected to have erosion impact the outer earthwork, with the main entrance situated only 13m from the cliff edge. At MCO6586 erosion on the eastern side of the earthwork could also lead to some loss of this structure. At Doyden Castle, the cliff castle and a post-medieval folly (MCO26579) are predicted to suffer erosion, including the western side of the site that would affect current footpath access.

At Smiths Cliff (MCO36941) an early medieval earthwork and trackway (MCO36941) is located on the cliff edge and expected to suffer some loss. The post-medieval mine at Tregardock (MCO12622), which includes a ruined building, is within the area of predicted erosion, while at Lill Cove (MCO36931 and MCO36932) the structures are located on a slope potentially liable to slip / erosion. An extractive pit at Treknow (MCO36745) is also at risk.

There are a large number of post-medieval quarries located along this coastline in areas potentially at risk from erosion, including at Start Point (UoS 700), Welshmans Quarry (MCO29543), Grower Quarry (MCO22004), Dria Quarry (MCO29551), East Delabole (UoS 676), Delabole Point (UoS 8828), Dannonchapel (UoS 185), Lundy Hole (MCO26571), Lambshouse and Gull Point Quarries (MCO36855). At some sites, such as Start Point (MCO36889), Lanterdan Quarry (MCO29555) and Gillow Quarry (MCO36847), remains of structures likely to be associated with quarry activity are also present within the zone of potential erosion. A number of post-medieval footpaths on the cliff edge are also expected to be eroded, such as at Barretts Zawn (UoS 708), Tregardock Cliff (UoS 702), Lye Cove (UoS 683), Fire Beacon Point (UoS 672) and Western Blackpit (UoS 676). A post-medieval road at Lower Penhallic Point (MCO36868), leading to Penhallic Wharf (MCO36866), is also at risk from erosion, as is a post-medieval building at Tintagel Haven (UoS 934) situated on the cliff top. At Millook (MCO46328) a post-medieval boat house is located within an area of potential erosion, as are the remains of a World War II German E-boat S89 (MCO55533) at Tremoutha Haven known to be visible on the beach but at risk from further dispersal and damage.

Sites identified at risk from flooding in PDZ15

Sites at high flood risk are located along the small streams at Port Quin, Port Isaac and Port Gaverne, and the River's Valency and Jordan which meet at Boscastle (Figure 9.20).

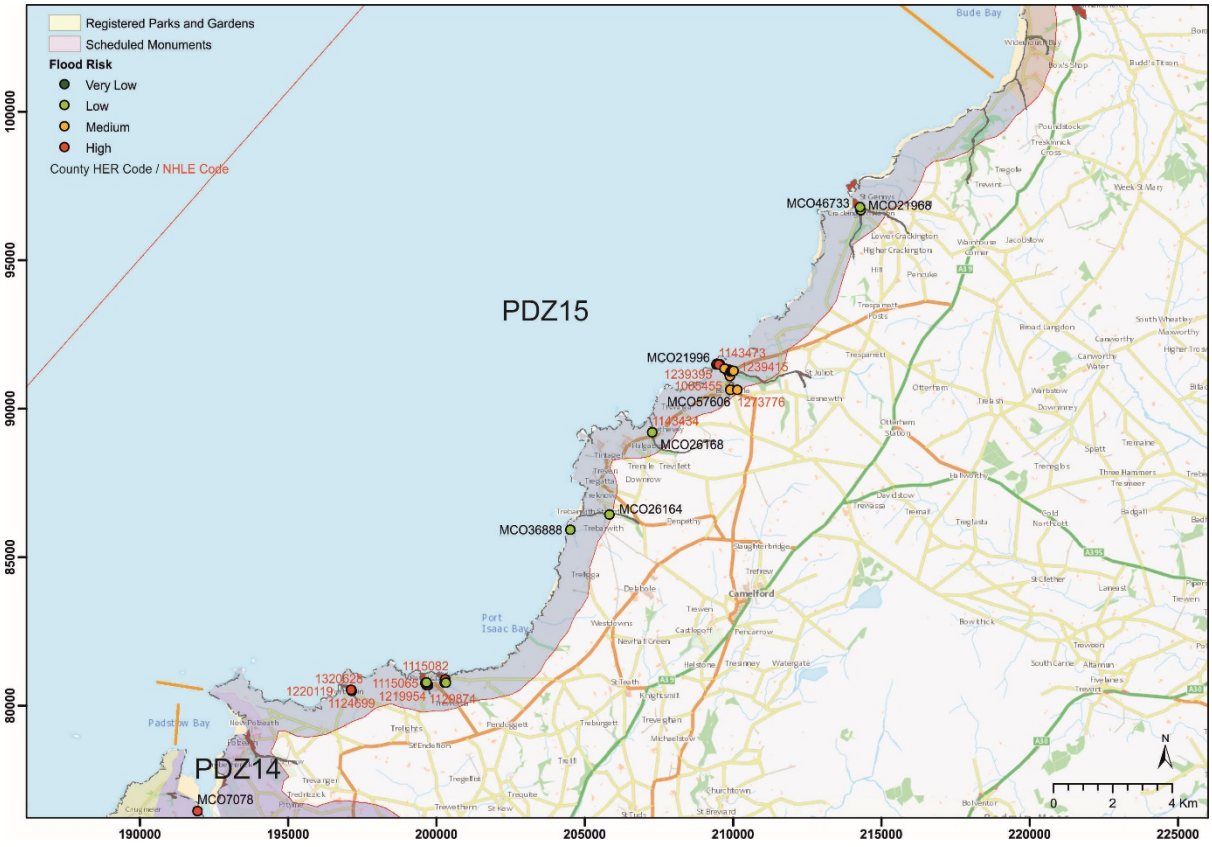


Figure 9.20: Distribution of sites within PDZ15 identified at risk from flooding. Contains Ordnance Survey data © Crown copyright and database right 2019

At Port Quin, the listed buildings of the north west wall to fish cellars (NHLE 1124699), garages / boat shed near Carolina Cellars (NHLE 1220119) and wall to beach (NHLE 1320628) are all within the high flood risk zone. At Port Isaac, within the conservation area there are 16 listed buildings within the high flood risk zone, including Greengates (NHLE 1115093), Slipway Hotel (NHLE 1219476) and several

buildings on Middle Street (NHLE 1115082, 1219968, 1291198 and 1320605), with a further five sites immediately east, centred on The Golden Lion, Fore Street, which are at low flood risk. A number of non-designated 18th and 19th century buildings are also within the high flood risk zone, along with the Lifeboat Station (MCO48404). At Port Gaverne a fish cellar (MCO18597) is within the high flood risk zone, while further south another fish cellar (MCO18596) and blacksmiths workshop (MCO9252) are within the low risk zone (Figure 9.21).

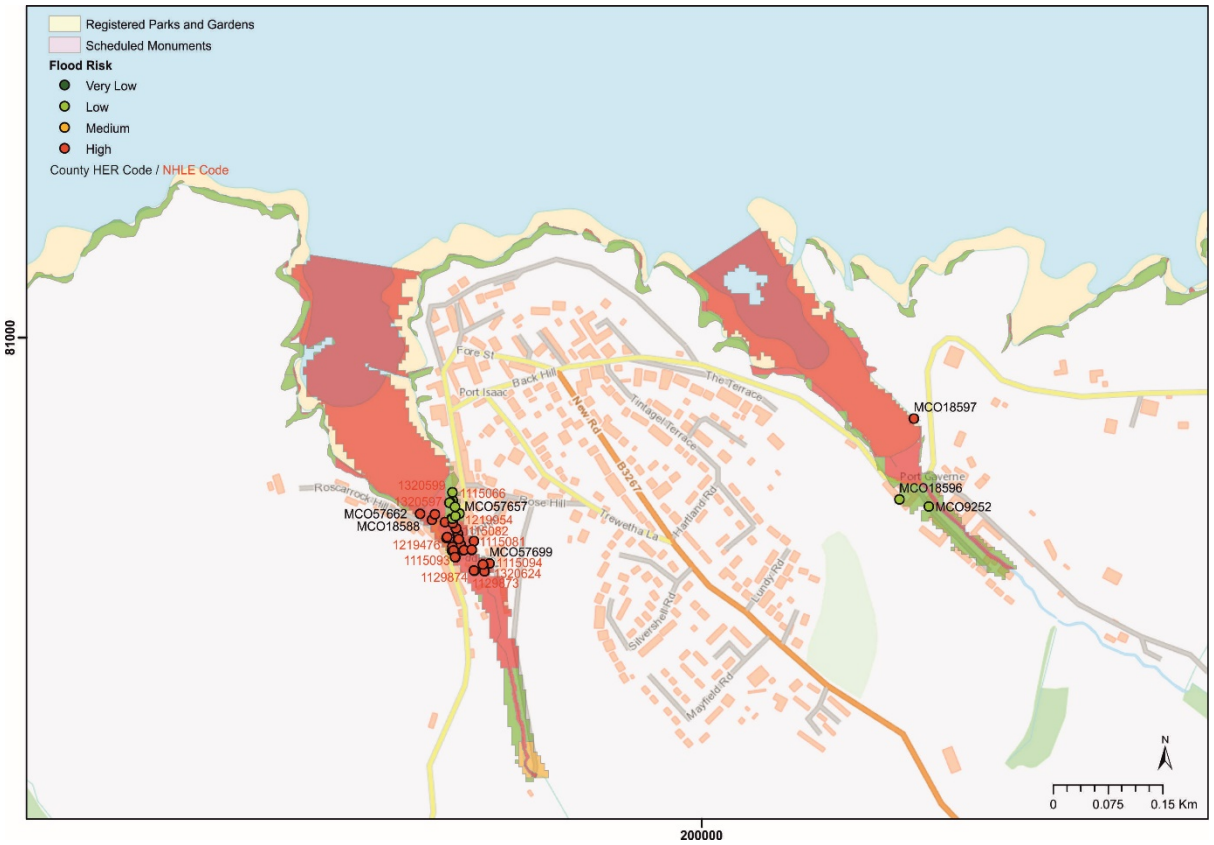


Figure 9.21: Distribution of sites within Port Isaac and Port Gaverne, PDZ15, identified at risk from flooding. Contains Ordnance Survey data © Crown copyright and database right 2019

At Boscastle, the effects of flash floods upon the conservation area are well understood following the events of the 16th August 2004, when heavily localised rainfall, amounting to 89mm within an hour, passed down the steep-sided valleys of the Jordan, Vallency and Paradise and through the village. During the event five buildings were destroyed including Harbour lights, a grade II listed building, with damage sustained 47 others, many of which were historic buildings in the area. Other historic areas which were affected included the riverbank revetment walls and the lower bridge which lost its parapets. While these floods were devastating to the settlement (but fortunately not human life), this was a community that in the past had lived alongside flooding events for very many years and had adapted to accommodate this. For example, industrial / fishing buildings, subsequently converted into dwellings and buildings associated with the tourist industry, were often originally built with the accommodation on the first flood above the flood level (North Cornwall District Council 2007). An assessment of the impact of the flood on the conservation area was undertaken by the Cornwall County Council Historic Environment Service (2005). Following this flood, a £4.5 million flood defence scheme was implemented which included widening and deepening the river channel. New drainage,

sewerage systems and land re-grading, and elevation of the car park to stop the river bursting its banks as easily (Figure 9.22).

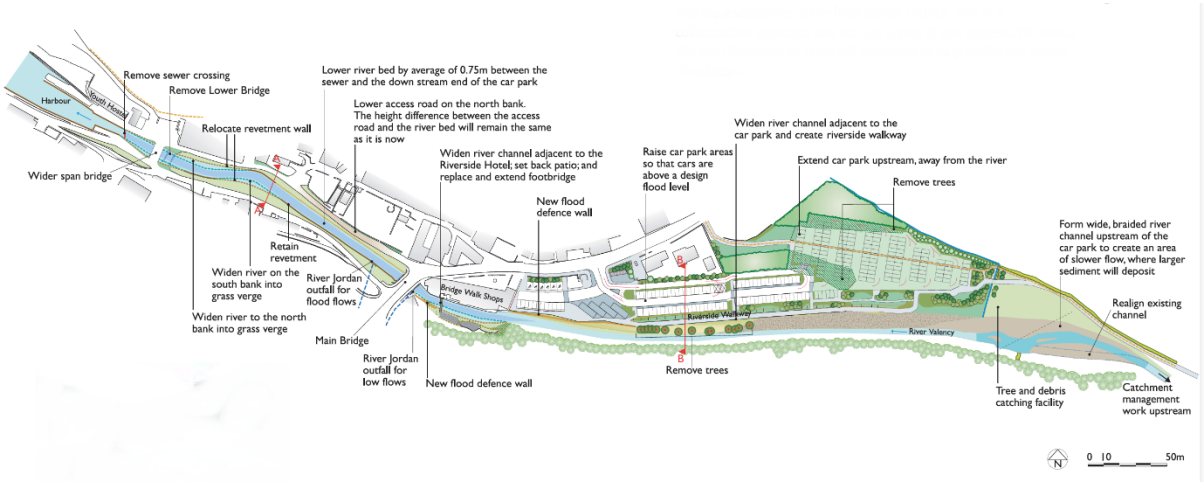


Figure 9.22: Boscastle Flood Defence Scheme (Nicholas Pearson Associates, 2012)

Under the current flood risk maps, along the River Valency the South Harbour Pier (NHLE 1143473), fish tanks (MCO21996 and MCO46494 and MCO46493), Wellington Hotel (NHLE 1239415) and 17th century coach house on Dunn Street (MCO57632) are all within the high flood risk zone, with a further 10 listed buildings and 25 non-designated buildings (notably on Valency Row and Dunn Street) at medium risk. Within the upstream part of the settlement on the banks of the Jordan Valley and Treforda Water, sites at medium flood risk are Trebutts (NHLE 1273776; MCO57593) and two 19th century houses on Gunpool Lane (MCO57606 and MCO57605), while the ditch of the scheduled motte and bailey castle (NHLE 1005455) is at low to medium risk of flooding.

Within the wider area, sites associated with low flood risk are found along the rivers and streams passing through Crackington Haven, Trebarwith Strand and St Nectan's Glen near Tintagel.

9.3.8 PDZ16 Widemouth and Bude (Wanson Mouth to Lower Sharpnose Point)

Current defences and SMP policy for PDZ16

A rock armour revetment defends the back of the beach at north Widemouth. The defence sits seaward of the small dune area which is immediately north of the car park area and has played a role in disconnecting the dunes from the beach.

At Bude, there are a variety of small-scale defences present at both Summerleaze and Crooklets Beach. At Summerleaze there are gabions forming a training wall alongside the right bank of the River Neet as it discharges onto the beach and a sloped masonry revetment on the left bank between the river channel and the Bude Canal. A large moveable sluice gate retains water within the River Neet for amenity purposes. There are sections of rock armour protecting the dunes and development at the rear of the beach to the north. There are a number of vertical masonry walls protecting property at the mouth of the Bude Canal and there are the concrete and masonry walls of the Canal itself. In addition there are inner and outer Canal sea gates which control water levels within the canal and provide a flood defence function during storm surge events. There is also a small tidal swimming pool at Summerleaze beach with walls and concrete access steps which affords some protection to the cliffs behind from wave action.

At Crooklets, small concrete walls and revetments provide some protection to beach huts and other development at the rear of the beach. A more substantial, but short, section of concrete revetment at the northern end of the beach provides protection to six properties from cliff erosion

The overarching management principle is therefore to allow the natural evolution of the coast, which should retain the tourism and amenity values of the area while recognising the need to maintain the identity of the coastal settlements. Supporting the long-term adaptation and resilience of Bude and Widemouth to coastal change will be a key part of the management intent for this area. The SMP policy for this stretch of coastline is as follows:

- Widemouth: HTL along defended frontage, NAI along remaining lengths
- Widemouth to Bude: NAI
- Bude & Crooklets: HTL, but NAI along undeveloped stretch
- Crooklets to Hartland Point: NAI, but continued maintenance of existing structures

Sites identified at risk from coastal erosion in PDZ16

Visual inspection of the coastline, coupled with the SMP policy and NCERM predictions, helped to identify the following sites likely to be at risk from coastal erosion (Figure 9.23).



Figure 9.23: Distribution of sites within PDZ16 identified at risk from predicted future coastal erosion under SMP2 proposals. Contains Ordnance Survey data © Crown copyright and database right 2019

Along the coastline a number of Bronze Age barrow sites have been identified at risk or have recently suffered coastal erosion. At Earthquake (MCO46281) and Northcott Mouth (MCO46269) the recorded barrows appear to have been completely eroded away, while at Sarshalls Pit (MCO46320) the barrow is no longer visible on LiDAR, suggesting it has been levelled by ploughing, though the position is within the zone of predicted erosion. At Bude, little remains of one barrow (MCO46298), and this is expected

to be fully lost under in the short to medium term. Barrows at Summerleaze Point (MCO46288, MCO46289 and MCO46287), Lower Longbeak (MCO46331) and Higher Longbeak (MCO2854) are also on the cliff edge and expected to be lost in the medium term, though those at Summerleaze Point may be added provided protection from the tidal pool (MCO58149) and breakwater.

At Duckpool Beach the recently excavated and regionally important Romano-British metal processing site (MCO23053) is at risk of coastal erosion. Within this PDZ only one post-medieval quarry is identified as potentially at risk from erosion at Earthquake (MCO46282). At Marhamchurch a de-listed 18th century house is predicted to be lost in the medium term. At Bude, a coastguard station (MCO46297; NHLE 1141875) is expected to be within 5m of the cliff edge under the long-term prediction, so is at risk of destabilisation and eventual loss. At Duckpool (MCO39464) and Dunsmouth (MCO38737) post-medieval riffle butts are within close proximity to the cliff edge and expected to be eroded. World War II pillboxes at Crooklets Beach (MCO43108) and Widemouth (MCO39184) are both expected to be impacted under the medium-term scenario, as are the recorded positions of gun emplacements (MCO38814 and MCO38995) near Crooklets Beach. Finally, at Widemouth an undated enclosure (MCO38982) will be largely lost through erosion over the medium to long-term.

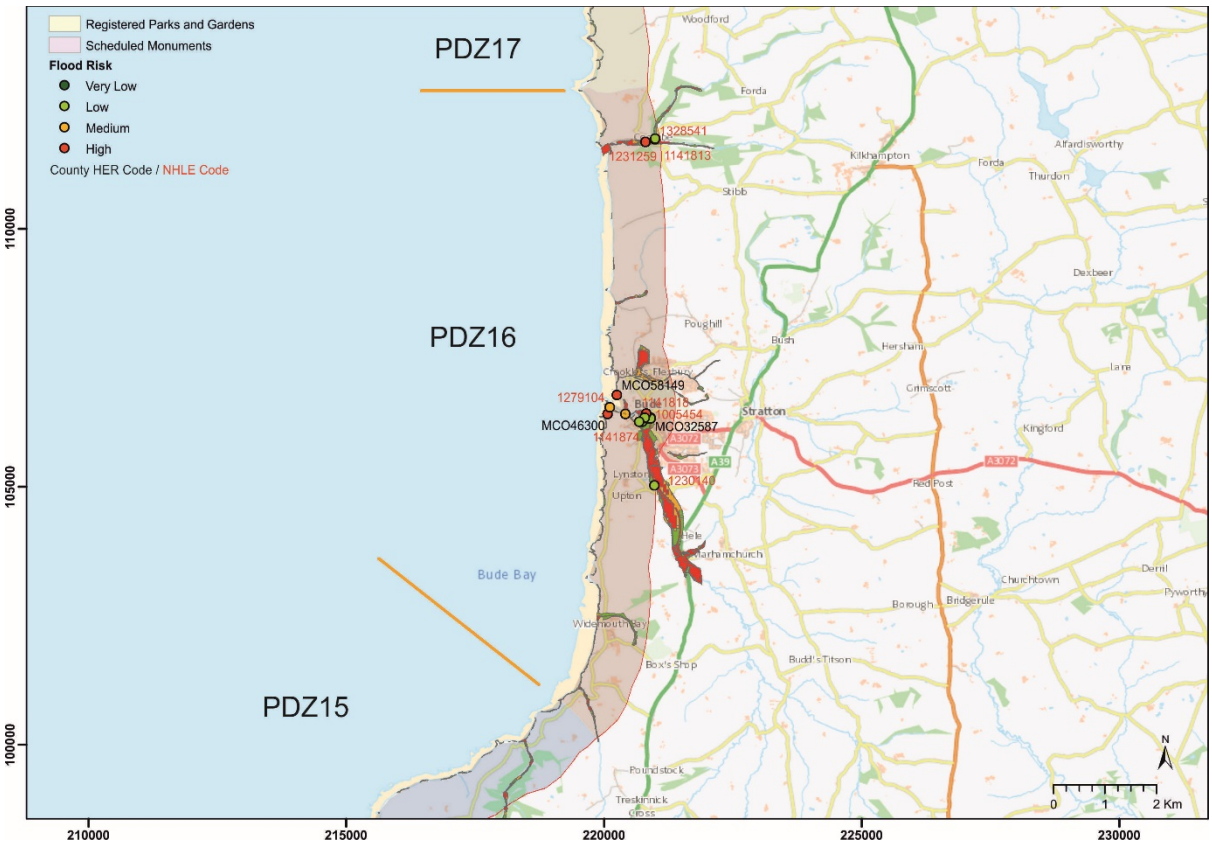


Figure 9.24: Distribution of sites within PDZ16 identified at risk from flooding. Contains Ordnance Survey data © Crown copyright and database right 2019

Sites identified at risk from flooding in PDZ16

Sites identified as at flood risk within PDZ16 are located along the River Neet or Strat at Bude and the Coombe Valley (Figure 9.24). At Bude, within the conservation area Nanny Moore's Bridge (NHLE 1141818), the tidal swimming pool (MCO58149) and a series of post-medieval boat houses (MCO46300) are at high risk, as are the Grade II listed Breakwater (NHLE 1279104) and Grade II* Sea Lock (both listed and scheduled: NHLE 1328520 and 1005454). Other sites, such as the Central

Methodist Church (NHLE 1141874) and Militaria Museum (NHLE 1278883) are considered at low flood risk. At Coombe, the King Williams Bridge (NHLE 1328541) is at high risk, while the Mill House (NHLE 1141813) and Ford Cottage (NHLE 1231259) are at low flood risk.

9.3.9 PDZ17 Lower Sharpnose Point to Hartland Point

Current defences and SMP policy for PDZ17

The only significant coastal structures present within the policy development zone are associated with Hartland Quay (quay structures and seawalls) and Hartland Point Lighthouse (retaining walls). There are relic defensive masonry walls at Welcombe Beach.

The overarching management principle is therefore to allow the natural evolution of the coast. The SMP policy for this stretch of coastline is as follows:

- Crooklets to Hartland Point: NAI, but HTL at Hartland Quay

Sites identified at risk from coastal erosion in PDZ17

Visual inspection of the coastline, coupled with the SMP policy and NCERM predictions, helped to identify the following sites likely to be at risk from coastal erosion (Figure 9.25).



Figure 9.25: Distribution of sites within PDZ17 identified at risk from predicted future coastal erosion under SMP2 proposals. Contains Ordnance Survey data © Crown copyright and database right 2019

Along this stretch of coastline, most of the sites identified at risk from erosion are post-medieval to modern. However there is the Iron Age Promontory Fort of Embury Beacon (MDV48-9; NHLE 1003845) which has been the subject of several archaeological investigations following coastal erosion (see Sims et al. 2014), with future erosion predicted to continue along it's northern edge. At Marsland Manor, a

Bronze Age cairn (MCO40379), reported to have been ploughed, is also in the zone of potential erosion.

An early medieval spring at Oldwalls (MCO39213) and Holy Well at Morwenstow (MCO39690; NHLE 1231518) are both in locations expected to be eroded in the medium to long-term. Access to the latter is already reported to be very difficult due to the cliff slope. Further south is the 19th century Hawker's Hut (MCO56297; NHLE 1328568), positioned on the cliff edge but with access provided by steps. This wooden hut, built in the early 19th century by the Reverend R S Hawker out of timbers from the wreck of the *Alonzo* site, is located within an area predicted to have slope failure / erosion in the medium to long-term. Post-medieval quarries at Morwenstow (MCO39690) and Sandhole Cliff (MDV78277) are also identified as at risk from erosion. At Sandhole Cliff, the coastal road runs in close proximity to the cliff edge and is likely to require realignment, which could then impact upon the field boundary (MDV102233) immediately east of the current road. Earthwork banks on Knap Head (MDV103446) and south of St Catherine's Tor (MDV102252) are also predicted to be subject to erosion. A Hartland/Welcombe Parish Boundary Stone (MDV34780) is also within the zone of potential erosion, as is part of the site of the Swannery (MDV51978) near St Catherine's Tor. At Childspit Beach a possible small military camp or emplacement (MDV81371) of early World War II date is visible on aerial photographs of 1942, as a possible structure and low earthworks located above the coastal cliffs, and expected to undergo erosion, as might a bomb crater (MCO39693) at Carnakey Cliff.

The current policy around Hartland Quay is to HTL, though the remains of the old pier (MDV51990) are likely to be eroded. Nearby the mound at Dyer's Lookout (MDV81209) and the Signal Station above Hartland Point are also potentially at risk from erosion in the long-term. However as this site is on the main access route to the lighthouse, some HTL policies might be developed that could benefit this site too.

Sites identified at risk from coastal flooding in PDZ17

There are no sites identified as at risk from flooding within PDZ17 (Figure 9.26).

9.3.10 PSA1 Lundy

Current defences and SMP policy for PSA1

Undefended cliffs are present around the island apart from at Landing Bay, where defences include a concrete seawall with masonry splash wall, concrete breakwater and stone gabion revetments. These structures will need maintenance to maintain the standard of defence.

The overarching management principle is therefore to allow the natural evolution of the coast, but maintain access to the island at Landing Bay. The SMP policy for this stretch of coastline is as follows:

- Landing Beach: HTL
- Lundy (except Landing Beach): NAI

Sites identified at risk from coastal erosion in PSA1

Visual inspection of the coastline, coupled with the SMP policy and NCERM predictions, helped to identify the following sites likely to be at risk from coastal erosion (Figure 9.27).

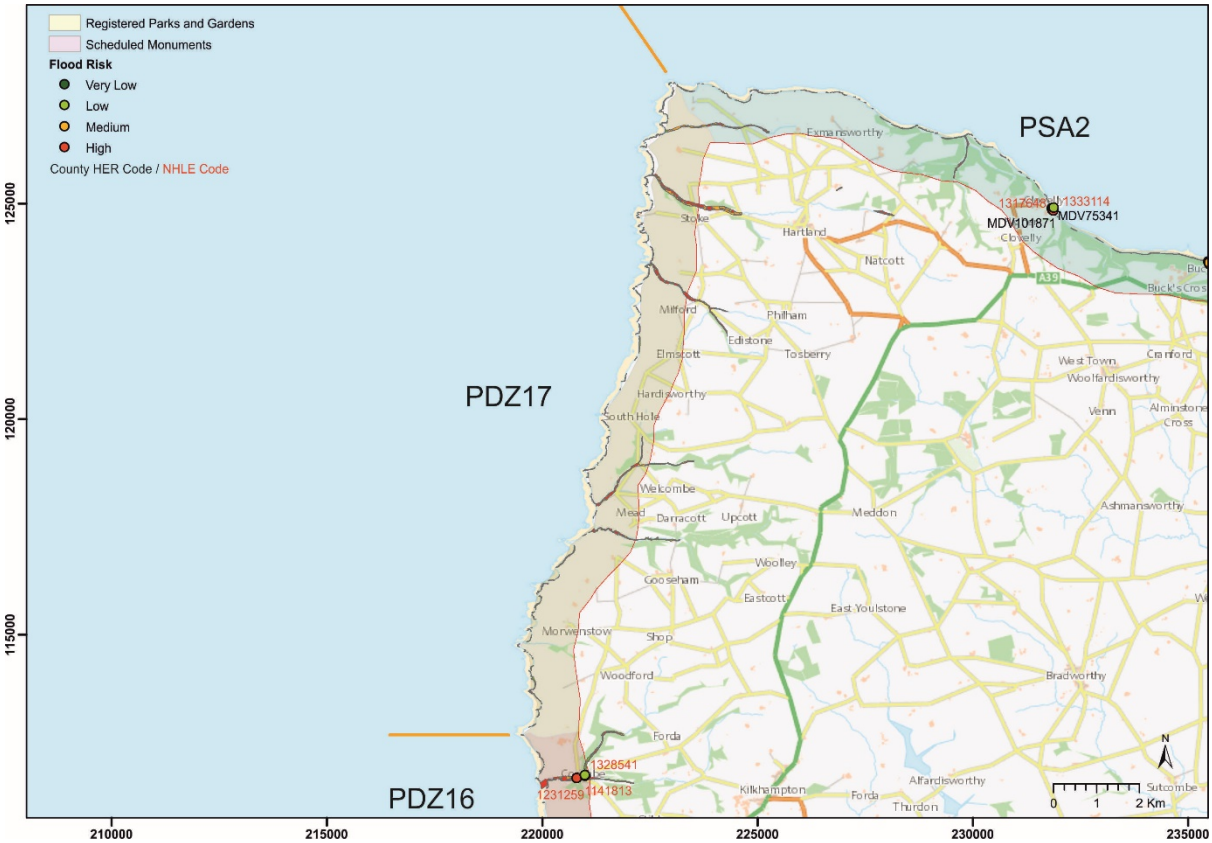


Figure 9.26: Distribution of areas at risk from flooding within PDZ17. Contains Ordnance Survey data © Crown copyright and database right 2019

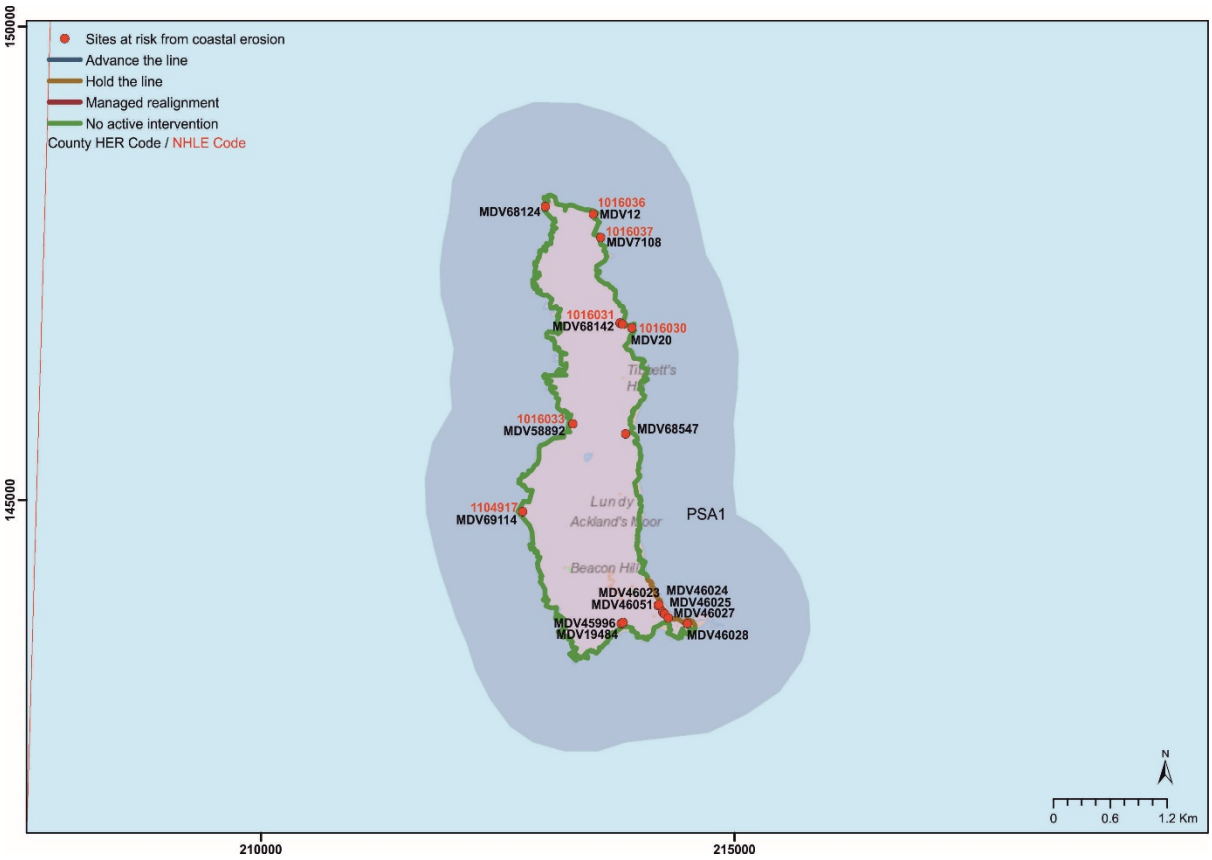


Figure 9.27: Distribution of sites within PSA1 identified at risk from predicted future coastal erosion under SMP2 proposals. Contains Ordnance Survey data © Crown copyright and database right 2019

For PSA1, the HTL policy for the Landing Beach would offer protection to a large number of heritage features that would be at risk if an NAI policy was adopted, such as the fish cellars (MDV46027), limekiln (MDV46024, Stone (MDV46025), Landing Quay Cave Boat house (MDV46051) and road itself (MDV46023). Marisco Castle (NHLE 1104957) could also be at risk if NAI was adopted, but even then is beyond the long-term predicted coastline erosion line. Elsewhere on the island, erosion risks are often applicable to cliff-edge features such as boundary walls (e.g. MDV68547 and MDV68142) or the mine and quarry at the Rattles (MDV19484 and MDV45996). However a number of more substantial structures along the coastline are also at risk including the Gun Battery at Brazen Ward (MDV20 and MDV14260; NHLE 1016030) and coastal defence platforms at the Mousehole and Trap (MDV58894; NHLE 1016031). Both are on the HAR, though only the former is due to coastal erosion. Other sites include a revetted platform to the west of Gannets Rock (MDV7108; NHLE 1016037), battery on north east point (MDV12, NHLE 1016036), lighthouse steps at north end (MDV68124), the southernmost of two coastal defence platforms above Jenny's Cove (MDV58892; NHLE 1016033) and potentially the Fog Signal Battery (MDV69114; NHLE 1104917).

Sites identified at risk from flooding in PSA1

There are no sites identified as at risk from flooding upon the island of Lundy (Figure 9.28).

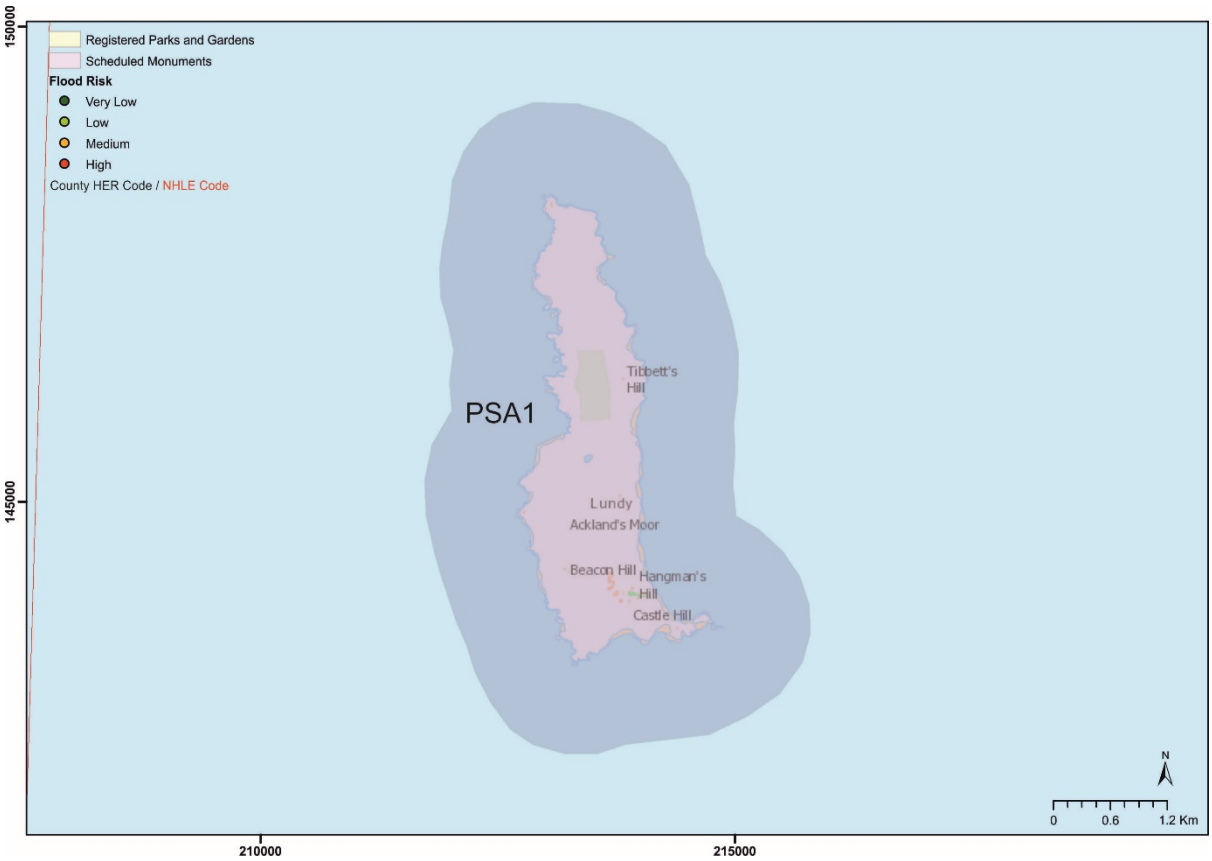


Figure 9.28: Distribution of areas at risk from flooding within PSA1. Contains Ordnance Survey data © Crown copyright and database right 2019

9.3.11 PSA2 Hartland Point to Westward Ho!

Current defences and SMP policy for PSA2

Resistant, undefended inter-bedded sandstone and shale cliffs stretch along this coastline apart from localised defences at Clovelly and Buck's Mills. At Clovelly there is currently a small harbour enclosed

by breakwaters and backed by a seawall. At Buck's Mills there is a short stretch of seawall and gabions associated with access to the beach.

The overarching management principle is therefore to allow the natural evolution of the coast while maintain defences at Clovelly, and possibly at Buck's Mills. The SMP policy for this stretch of coastline is as follows:

- Hartland Point to Clovelly: NAI
- Clovelly: HTL
- Clovelly to Rock Nose: NAI

The stretch between Clovelly and Peppercombe is regarded as containing complex cliffs. These are excluded from the NCERM predictions, as their past recession cannot be used to infer their future erosion. Instead, they erode via multi-tiered landslides at unpredictable points in time. Sites along this stretch of coastline have been identified where considered to potentially be at greatest risk from cliff erosion / slippage, but this should be reconsidered when new models of cliff stability and erosion are generated focused upon this area.

Sites identified at risk from coastal erosion in PSA2

Visual inspection of the coastline, coupled with the SMP policy and NCERM predictions, helped to identify the following sites likely to be at risk from coastal erosion (Figure 9.29).



Figure 9.29: Distribution of sites within PSA2 identified at risk from predicted future coastal erosion under SMP2 proposals. Contains Ordnance Survey data © Crown copyright and database right 2019

As mentioned in PDZ17, the signal station above Hartland Point (MDV34008) is at risk of erosion in the long-term under current predictions, as are military buildings (MDV74996), a possible military coastal structure (MDV102373) and a concrete platform west of the car park (MDV67683). The

Hartland Point Radar Station (MDV81175 and MDV52951) is also identified as at risk under the medium to long-term. On Gawlish Cliff possible medieval cultivation terraces (MDV21499) are expected to be reduced by up to 50% in area during the medium to long-term. Windbury Head Camp (MDV71; NHLE 1003864) is situated on a complex cliff could therefore potentially be susceptible to some erosion on its margins.

At Gallantry Bower a bowl barrow (MDV72; NHLE 1018520) is expected to be lost in the short to medium-term. Within the Clovelly area there is also expected to be an impact upon the Archway (MDV63552; NHLE 1333109) and The Cottage / Summerhouse (NHLE 1317288; MDV63551), which may both be lost in the short- to medium term, with a possible barrow to the southeast (MDV102339) also likely to have a similar fate. The Gazebo known as 'The Angel Wings' (NHLE 1165473; MDV102345) and the Cabin (NHLE 1104500; MDV63556) are both at risk of loss in the medium to long-term. Many sites and listed buildings could be at risk in Clovelly if there was a change from the current SMP policy of HTL to a NAI strategy.

To the east at Buck's Mills, the SMP policy is not resolved for this settlement and, in lieu of potential funding, currently a NAI policy may be adopted. Such a policy could lead to the loss of a significant number of sites, including twelve Grade II listed buildings (see Table 9.1). Other sites not listed but at risk would include the Old Quay (MDV58161) and Sea Wall (MDV58158). The status of Buck's Mills under evolving SMP plans should therefore be closely monitored from a heritage protection perspective.

Table 9.1: Listed buildings at risk from coastal erosion and flooding at Buck's Mills, PSA2

NHLE	Devon HER	Name	Erosion risk	Flood risk	Grade	NGR
1104434	MDV75412	Kings Cottage	Yes	Medium	II	SS 35507 23634
1104435	MDV75415	The Old Mill	Yes	Medium	II	SS 35498 23590
1104438	MDV101832	K6 Telephone Kiosk	Yes	High	II	SS 35522 23577
1105137	MDV101835	10 and 11	Yes	Medium	II	SS 35595 23503
1250485	MDV75416	Crippetts	Yes	None	II	SS 35480 23580
1250497	MDV11689	Lime Kiln to east of beach access with access ramp	Yes	Medium	II	SS 35477 23658
1263225	MDV75417	Lower Lookout	Yes	None	II	SS 35488 23608
1263229	MDV75411	Lime Kiln to west of beach access	Yes	None	II	SS3537123684
1305547	MDV99277	Barnacle Cottage	Yes	None	II	SS 35586 23514
1308761	MDV75418	Bucks Mills House	Yes	Medium	II	SS 35495 23608
1333151	MDV75414	White Cottage	Yes	Medium	II	SS 35508 23607

1446295		The Cabin	Yes	Medium	II	SS 35479 23635
1308725		Laburnum Cottage	No	Medium	II	SS 35774 23302
1171530		Forest Gardens	No	Medium	II	SS 35765 23361
1105136	MDV99272	Emilys / George's Cottage	No	Medium	II	SS 35690 23403

At Peppercombe, a series of sites are also potentially at risk from a NAI policy. These include a limekiln (MDV75161), coastguard lookout (MDV75158) and ruined boatshed (MDV107364). To the east, the Portledge Mouth limekiln (MDV75026) is particularly at risk from coastal erosion in the short to medium term, possibly already showing signs of damage from erosion.

At Alwington, the Cockington Cliff Quarry (MDV75002) and Portledge Mine (MDV19490) are both within the zone identified as subject to short-term erosion, as is the quarry further along the coast near Bennet Rock (MDV102146 and MDV80461) and the position of a mapped limekiln at Abbotsham Cliff (MDV102152). At far eastern end of PSA2, the stone base known as Mermaid's Pool Lookout (MDV54197) is expected to be impacted by erosion in the long-term.



Figure 9.30: Distribution of sites within PSA2 identified at risk from flooding. Contains Ordnance Survey data © Crown copyright and database right 2019

Sites identified at risk from flooding in PSA2

Along this stretch of coastline, sites identified as at risk from flooding are located at Clovelly and Buck's Mills (Figure 9.30). At Clovelly, the lifeboat house (NHLE 1333114) is considered at high risk while the site of the Old Coastguard Hut (MDV75341) is at medium flood risk. At Buck's Mills, sites at risk from flooding include 11 Grade II listed buildings (see Table 9.1).

9.3.12 PSA3 Westward Ho! to Saunton Down

Current defences and SMP policy for PSA3

Westward Ho! is protected by a seawall with additional rock armour toe protection at the northern end of the wall. The rest of the frontage is undefended. The northern seaward side of Northam Burrows is protected by rock armour where it re-curves into the estuary mouth. Along the northern side of the estuary mouth there are a series of groynes at Airy Point, although their current impact on drift is minimal, and a rock revetment along Crow Neck protects against erosion. Within the Torridge there are a range of flood walls and embankments protecting settlements and land-claimed farmland including Bideford, Hallspill and Appledore, Yelland and Instow. Within the Taw there is a range of flood walls protecting settlements including Barnstaple, Sticklepath and Bishop's Tawton. There are also defences associated with the railway and land-claimed farmland upstream of Barnstaple. Along Braunton Burrows the frontage is largely undefended apart from a series of groynes at Airy Point and a blockwork wall and gabions at Saunton.

The overarching management principles are long-term sustainable defence provision at Westward Ho!, managed realignment at Northam Burrows, exploring opportunities for managed realignment within the estuary, and investigation and management of erosion risk along the southern side of Saunton Down. The SMP policy for this stretch of coastline is as follows:

- Westward Ho!: HTL
- Pebble Ridge to West of Appledore: MR
- Appledore: HTL
- Appledore to Northam: NAI
- Northan to Yelland: HTL
- Home Farm Marsh (Yelland to Fremington (east)): MR
- Fremington to Penhill Point: NAI
- West Ashford to River Caen: HTL
- River Caen to Crow Point: MR
- Saunton Sands: NAI

For Northam Burrows, the key elements within the SMP are:

- The Pebbleridge is expected to continue rotating to become more swash aligned by moving east at its southern end but remain at its current position at the northern end for around 50 years.
- As the southern end of the Pebbleridge moves east, the preferred plan is to construct an east-west bank to protect low lying property in Westward Ho!

The plan recommends the following actions for the Pebbleridge:[35]

- Do nothing to the Pebbleridge, apart from the repair of local damage if necessary. The raised access road to the landfill on the east side of Northam Burrows should be maintained.
- The northern end around the landfill is not expected to retreat for the next 50 years due to sea level rise, but beyond then is expected to retreat by 'several hundred metres'. The SMP2 preferred strategy is to continue to take measures to maintain the landfill in situ over the next 100 years by defending it against the sea because this is likely to be less costly than trying to move it.

Sites identified at risk from coastal erosion in PSA3

Visual inspection of the coastline, coupled with the SMP policy and NCERM predictions, helped to identify the following sites likely to be at risk from coastal erosion (Figure 9.31).



Figure 9.31: Distribution of sites within PSA3 identified at risk from predicted future coastal erosion under SMP2 proposals. Contains Ordnance Survey data © Crown copyright and database right 2019

Continued erosion of the submerged forest at Westward Ho! (MDV44568 and MDV107430) is anticipated, particularly if a managed retreat policy for Northam Burrows is adopted leading to lowering of the beach profile. This could also impact upon the two scheduled wrecks on the beach (MDV50848; NHLE 1432418 and MDV58099; NHLE 1432949), leading to increased exposure as the beach gradient is reduced. Managed realignment of the pebble ridge would also impact on the dune system behind it, with predicted retreat of c. 75m retreat by 2062 and 150m by 2112 at its

35 https://www.northdevonbiosphere.org.uk/uploads/1/5/4/4/15448192/taw_torridge_pebbleridge_study_final.pdf

southernmost end at Westward Ho!, potentially exposing old land surfaces or peat deposits at the high water level as the pebbleridge realigns landwards.

Within the estuary, limekilns near Penhill Point (MDV917) and Hallsannery (MDV526; NHLE 1004578), as well as Lime Kiln Cottage at Landcross (MDV11777), are identified as at risk in the short to medium term. The Hallsannery limekiln is currently on the HAR but not on account of coastal erosion. At Yelland Stone Row (MDV5507; NHLE 1003847), localised erosion across the site has been reported, with the marsh levels known to routinely expose and cover the stone alignment. The wider marsh has a history of yielding lithic scatters and palaeosols (e.g. MDV202, MDV21944 and MDV59965) and is therefore at potential risk. This site is the subject of current geophysical investigations and potential palaeoenvironmental sampling that could provide a better understanding of the site and its vulnerability.

Within the Taw-Torridge Estuary, defences are in place for the protection of Appledore, Northam Instow, Bideford, East-the–Water Fremington, Bickington and Barnstaple, Tawstock and Braunton Conservation Areas.

At Instow Sands a former military maintenance site (MDV102580) is expected to retain some structures (e.g. Nissen-type huts) and is at risk of erosion in the medium to long term. Three landing craft visible on the beach to the south at SS 47085 30670, SS 47091 30342 and SS 47085 30369, and a group of numerous larger landing craft lined up on the sands to the south at SS 47182 29876 are likely to be associated with this complex, and could be subject to some levels of localised erosion.

A number of former military sites are identified as at risk in the medium to long term at Crow Point, notably the hut base of the beach office in the Assembly Area (MDV102738). Within the wider area other features which might be affected by realignment / breaching of Crow Point include a concrete wall (MDV102737), possible un-eroded sections of military roadway (MDV102735) and a pillbox on Crow Neck (MDV102742), the latter largely lost to erosion by 2010 but part of the base may remain. The remains of possible latrine structures (MDV102741) at Crow Point, visible in aerial photographs dating to 1945, might be buried in the sand within the area predicted to be at risk in the short to medium term by erosion and coastal realignment. At Broadsands, a probable military slipway (MDV102734), constructed to enable access to the beach for U.S. Army training during World War II was last observed on aerial photographs in the 1980s and reported as having been broken up, though some remains may survive buried in the sand. This might also be the case with anti-tank obstacles (MDV102731) at Broadsands. Some seem to have been moved between 1945 and 1946, and are not visible on later aerial photographs, though some remains may be covered by sand.

Possible machine gun emplacements south of Boardwalk Mounts, Braunton Burrows (MDV102699), are visible on aerial photographs taken in 1945 as three circular sunken structures. One has a central structure, and they have been interpreted as spigot mortar or machine gun emplacements used during the early part of World War II. They are likely to have been infilled by sand by the late 1950s and lost or damaged by coastal erosion by 1989, although there is potential for some buried remains to exist. An observation post at Braunton Burrows (MDV77510) was reported in 2009 as having the front of the structure exposed through coastal erosion. It is likely that in time, as with the adjacent lighthouse (MDV204) which is represented by a broken up foundation, this structure will be undermined and collapse. There is also a potential unrecorded slipway to the east of these structures which would be at risk from erosion.

To the south of Boardwalk Mounts, Braunton Burrows, three possible machine gun emplacements (MDV102699) are recorded by the NMP, which notes that "by 1989 coastal erosion had affected all of the sites resulting in land slippage, and any structural remains are likely to have shifted and perhaps broken up, although there is potential for buried remains to exist particularly at SS4586432528". At Chesil Cliff, the lookout station (MDV31611) is identified as being at risk in the long-term.

Sites identified at risk from flooding in PSA3

Within the Taw-Torridge estuary, continued flood protection is planned for the Appledore, Northam Instow, Bideford, East-the–Water Fremington, Bickington and Barnstaple, Tawstock and Braunton conservation areas.

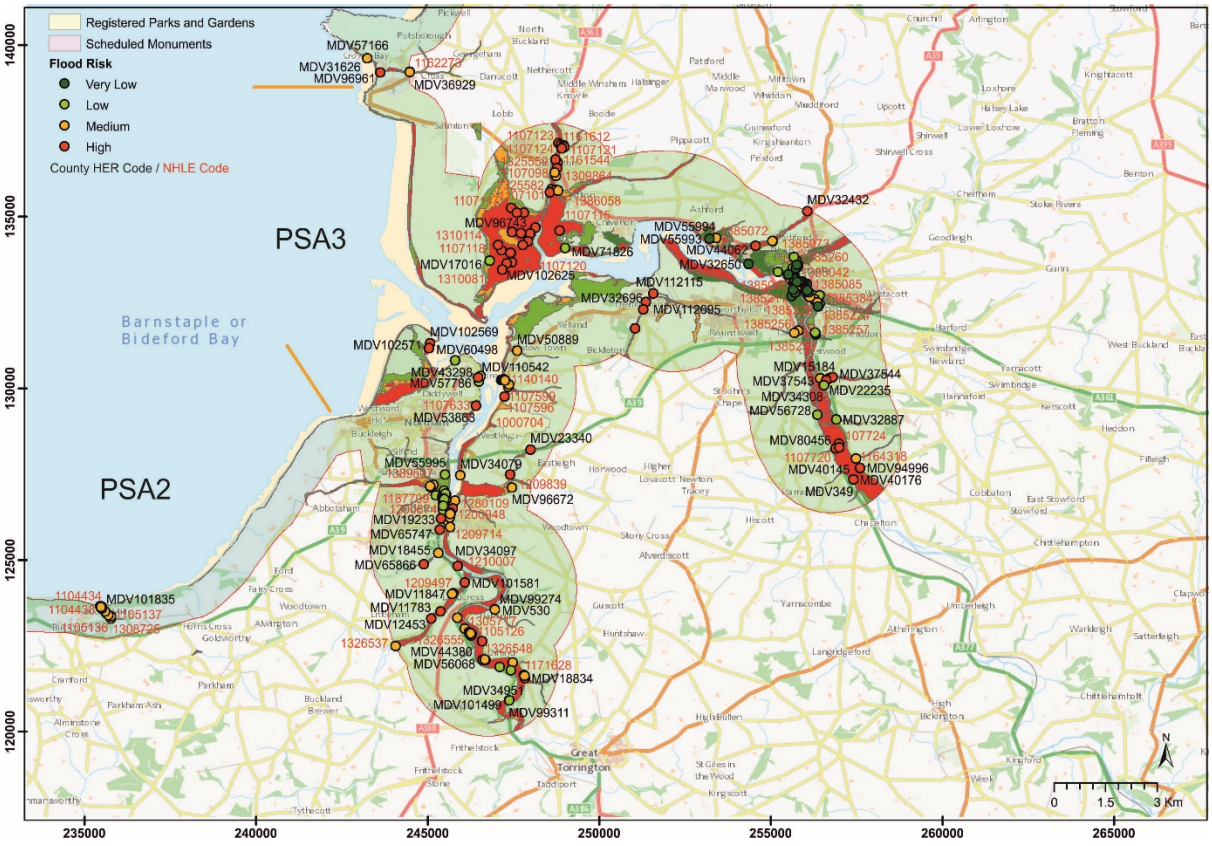


Figure 9.32: Distribution of sites within PSA3 identified at risk from flooding. Contains Ordnance Survey data © Crown copyright and database right 2019

Along the banks of the rivers, as well as upon Braunton Marsh, a large number of sites identified as at high and medium flood risk are present (Figure 9.32). Along the River Torridge, 55 listed buildings are identified at risk of flooding. Sites at high flood risk include the Grade II* Richmond Dock (NHLE 1140140) and Grade II Mill Bridge (NHLE 1305717), Landcross Methodist Church (NHLE 1210007), 7 and 8 New Road, Bideford (NHLE 1209714), Lime Kiln on Instow Beach (NHLE 1107633), Instow Quay Jetty (NHLE 1107594) and K6 Telephone Kiosk at Instow (NHLE 1249913). Grade II listed buildings at medium flood risk are Annery Kiln (NHLE 1326555) and Cottages (NHLE 1105126), Rearview (NHLE 1171628), Gatehouse at Weare Giffard Hall (NHLE 1326548), Rudha Bridge Millhouse (NHLE 1326537), Halspill Lime Kiln (NHLE 1171647), Little Whitehall (NHLE 1209497), 45-48 Torrington Street, Bideford (NHLE 1210019 and 1200948), a pine coffin bust in the public gardens at Bideford (NHLE 1200949), Swan Inn (NHLE 1210020), Swer ventilation pipe opposite Torrington Lane (NHLE 1282903), Torridge

View (NHLE 1107595), Quay House (NHLE 1107596), 1 and 2 The Balconies, Instow (NHLE 1107597), Instow Signal Box (NHLE 1107599), Quay Cottage (NHLE 1107632), Galsworth House (NHLE 1325342), No. 1 The Quay, Instow (NHLE 1325343), Carriage Shed at Bideford (NHLE 1389507), Torridge Lodge (NHLE 1200937) and 1 to 4 Causeway House, Bideford (NHLE 1209809). The Grade II* Registered Historic Park and Garden of Tapeley Park borders the River Torridge in an area of high to medium flood risk, and therefore could be subject to some localised flooding on its western and northwestern margins. Two scheduled decoy targets at Northam Radar Station (NHLE 1425448) are also located within the high risk of flooding zone.

Along Fremington Creek, Fremington Pill (MDV112095) and the Church (MDV32696) at both at high flood risk. Within Barnstaple, flood risk is generally low to very low for most listed buildings with the exception of the Grade II listed Rock Park Lodge (NHLE 1385223, plus 1385224 and 1385222), Castle Quay (NHLE 1385085), Greendale Farmhouse (NHLE 1385255), 105-108 Newport Road (NHLE 1385238, 1385239 and 1385240) and Pilton Bridge (NHLE 1385258), which are all at high risk of flooding. Barum House (NHLE 1385352), Birmingham Midshires Building Society (NHLE 1385353), The Golden Lion Tap (NHLE 1385362), 98-104 Newport Road (NHLE 1385237), War Memorial (NHLE 1385314), Museum of North Devon (NHLE 1385357) and Willshire Monument (NHLE 1385364) are at medium risk of flooding.

South of Barnstaple along the River Taw, Newbridge Bridge (NHLE 1107724) and the gatehouse at Hall Lodge (NHLE 1164318) are both at high risk, with the Great Fisherton Farmhouse (NHLE 1107720) at medium flood risk.

Within Braunton, the River Caen presents a high flood risk to the Caen Primary School (NHLE 1107121), 30 and 32 South Street (NHLE 1309864), Deans Bridge (NHLE 1107124) and several sites along Church Street (NHLE 1310016, 1325559, 1161569, 1107123, 1107125, 1161544 and 1161612). On the southern edge of Braunton, Velator Bridge (NHLE 1107101) is at high risk, while the Grade II Forsythia (NHLE 1386058), The Old (NHLE 1107098) and Honeysuckle (NHLE 1325582) Cottages are all at medium flood risk. Upon Braunton Marsh, on the west of the River Caen, sites at high flood risk include several cattle shelters, linhay and walls (NHLE 1107115-20, 1310131, 1161344, 1161356, 1325558, 1310081 and 1310084) as well as the Great Sluice (NHLE 1310114) and several other small structures (MDV102625).

Within the estuary, the conservation areas at Instow, Fremington Quay, Fremington, Tawstock, Bishops Tawton, Barnstaple-Newport, Barnstaple-Town, Barnstaple-Pilton and Braunton all contain areas identified as at high risk of flooding.

9.3.13 PSA4 Saunton Down to Morte Point

Current defences and SMP policy for PSA4

This section is largely undefended apart from a seawall protecting the northern end of Croyde Bay and local defences at Putsborough, in the form of masonry walls and a rock revetment which protect the car park to the south and dunes along the northern end of Putsborough.

The overarching management principle is no active intervention, requiring adaptation plans to be developed to plan for coastal change. The SMP policy for this stretch of coastline is as follows:

- Croyde Sands: NAI

- Middleborough Hill: HTL
- Middleborough Hill To Putsborough Sands: NAI
- Putsborough Sands and Vention: HTL
- Vention to Morte Point: NAI

Sites identified at risk from coastal erosion in PSA4

Visual inspection of the coastline, coupled with the SMP policy and NCERM predictions, helped to identify the following sites likely to be at risk from coastal erosion (Figure 9.33).



Figure 9.33: Distribution of sites within PSA4 identified at risk from predicted future coastal erosion under SMP2 proposals. Contains Ordnance Survey data © Crown copyright and database right 2019

Limekilns on the north side of Croyde Beach (MDV96971; NHLE 1107102) and Vention Cottage (MDV36863; NHLE 1107736) are both located close to the cliff edge. The former is within the modelled short-term erosion envelope and most immediately at risk, while the latter is expected to be impacted under the long-term scenario.

Near Pencil Rock, Baggy point, a slipway (MDV61372), approached by a footpath down the cliff. While the slipway itself is likely to be resistant to erosion, the footpath accessing it is likely to be impacted by erosion leading to a loss of access. A number of post-medieval quarry sites (MDV61358, MDV61370 and MDV31677) on the cliff edge around Baggy Point may also be subject to erosion.

Two World War II pillboxes (MDV21115) located beside the cliff-top footpath at Cock Rock, Croyde, and a possible observation post / pillbox (MDV103280) above Barracane Beach, Woolacombe are all expected to be eroded in the short to medium term. At Croyde Barrows a possible pillbox (MDV103041) is recorded within the zone of short-term erosion, but it is not known whether this site has already been lost.

At Croyde the NAI SMP policy means a number of recorded heritage features along the frontage are potentially at risk from erosion, including a slipway at the north end of Croyde Bay (MDV57325) that would have been part of Area 'E' of the World War II US Assault Training Centre.

Sites identified at risk from flooding in PSA4

Areas of flooding wthin PSA4 are associated with the streams entering Croyde and Morte Bay at Croyde and Woolacombe respectively (Figure 9.34). At Croyde, Bridge Farmhouse (NHLE 1162273), located within the conservation area, is at medium flood risk, while at Woolacombe parts of the conservation area are at high risk from flooding.



Figure 9.34: Distribution of sites within PSA4 identified at risk from flooding. Contains Ordnance Survey data © Crown copyright and database right 2019

9.3.14 PSA5 Morte Point to Minehead

Current defences and SMP policy for PSA5

Between Morte Point and Widmouth Head the cliffs are largely undefended apart from localised defences, including a seawall at Lee Bay, sea defences at Ilfracombe and a seawall at Hele Bay. There are also harbour structures at Ilfracombe which may provide some defence. East of Widmouth the coast is again largely undefended cliffs, with a localised section of recurved seawall at Combe Martin and harbour structures at Watermouth.

The overarching management principles are for NAI along the coastline, but maintenance of defences at Lee, Ilfracombe, Hele Beach and Combe Martin. The SMP policy for this stretch of coastline is as follows:

- Morte Point to Ilfracombe (West): NAI, HTL at Lee

- Ilfracombe: HTL
- Ilfracombe (East) to Combe Martin: NAI, HTL at Hillsborough, Hele Bay and Watermouth Slipway
- Combe Martin: HTL

Sites identified at risk from coastal erosion in PSA5

Visual inspection of the coastline, coupled with the SMP policy and NCERM predictions, helped to identify the following sites likely to be at risk from coastal erosion (Figure 9.35).

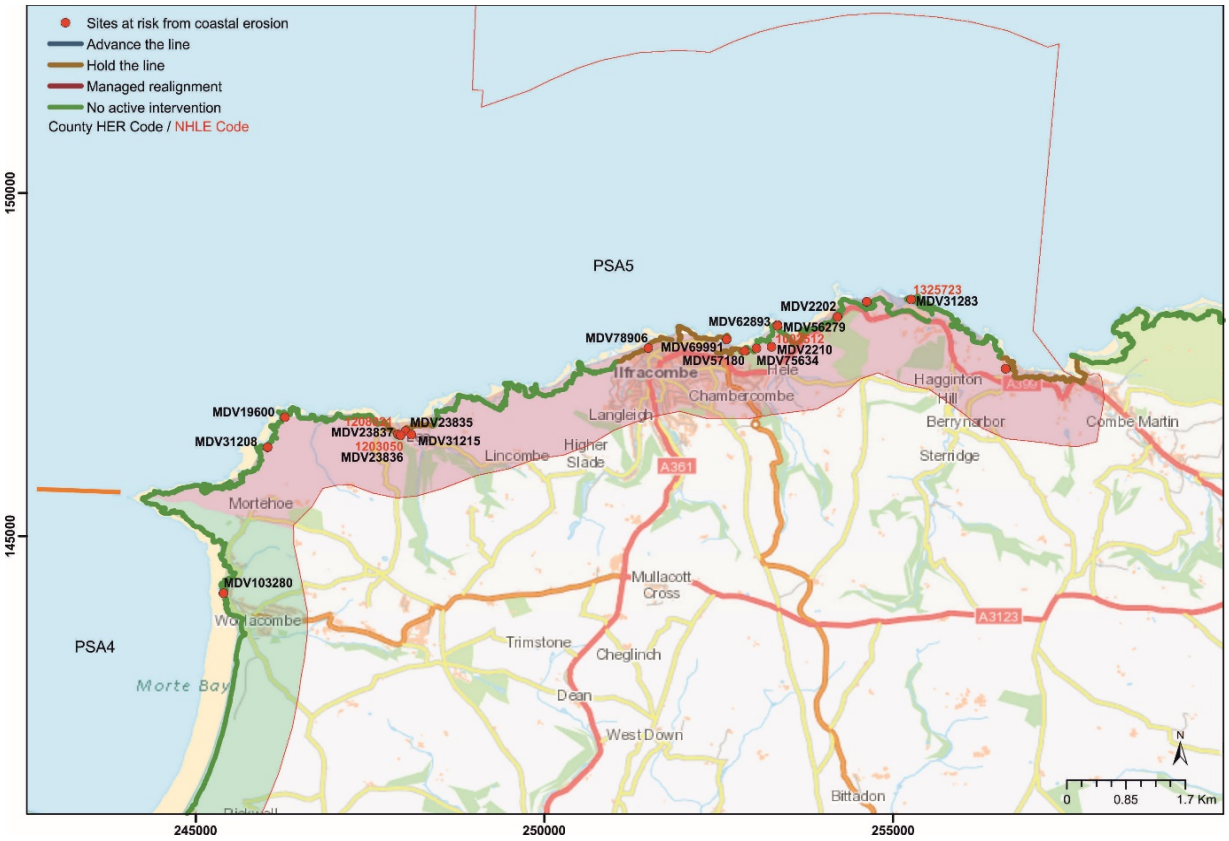


Figure 9.35: Distribution of sites within PSA5 identified at risk from predicted future coastal erosion under SMP2 proposals. Contains Ordnance Survey data © Crown copyright and database right 2019

The northern boundary of Hillsborough promontory fort (NHLE 1002512) will be eroded, with a number of later features contained within this boundary also at risk. These include a small building on the cliff edge (MDV75634) that might be a public toilet, a Gun Battery at Beacon Point (MDV56279) visible on cliff edge but very broken up, and just beyond the modelled long-term erosion envelope the site of a possible limekiln (MDV62893), within 10m of cliff edge, which may also be potentially at risk.

Post-medieval quarries on the cliff edge at risk from erosion are located at Rockham Bay (MDV31208) and Sandy Bay (UoS 4325). At Bull Point Lighthouse (MDV19600) the western boundary wall and eastern boundary, beside the cottages at northern end of site, are located within the area of modelled long-term erosion. North of Watermouth Castle, a round tower (MDV31283; NHLE 1325723) is located within the area of modelled long-term erosion, though this could be medium-term if a NAI policy was adopted.

At Ilfracombe, The Tunnels (MDV78906; NHLE 1208945) associated with the tidal bathing pools are only expected to be subject to erosion if a NAI policy was adopted instead of HTL. However, the tidal

bathing pools themselves are at risk of erosion, with the men's pool no longer retaining water due to erosion leaving only the ladies pool operational. Exposure on the beach of the wreck at Samson's Cove (UoS 4367), postulated to be the remains of HMS Gossamer, is also likely to be subject to erosion.

For the remainder of this PSA, the majority of heritage assets are located in areas where the SMP policy is HTL, notably in Ilfracombe and Combe Martin, and so no impact by erosion is anticipated unless a NAI policy was adopted instead. However, localised erosion to these sea defences could reveal archaeological sites, such as the Rapparee Cove Burials (MDV57180) that were discovered when the wall collapsed.

Sites identified at risk from flooding in PSA5

Areas of predicted highest risk from flooding are along the Borough Valley, East and West Wilder Brook at Ilfracombe, the Hele and Sterridge valleys, and the River Umber which flows through Combe Martin (Figure 9.36). PSA5 includes the Lee, Ilfracombe, Berrynarbor and Combe Martin conservation areas that all contain areas identified as having zones of high flood risk.

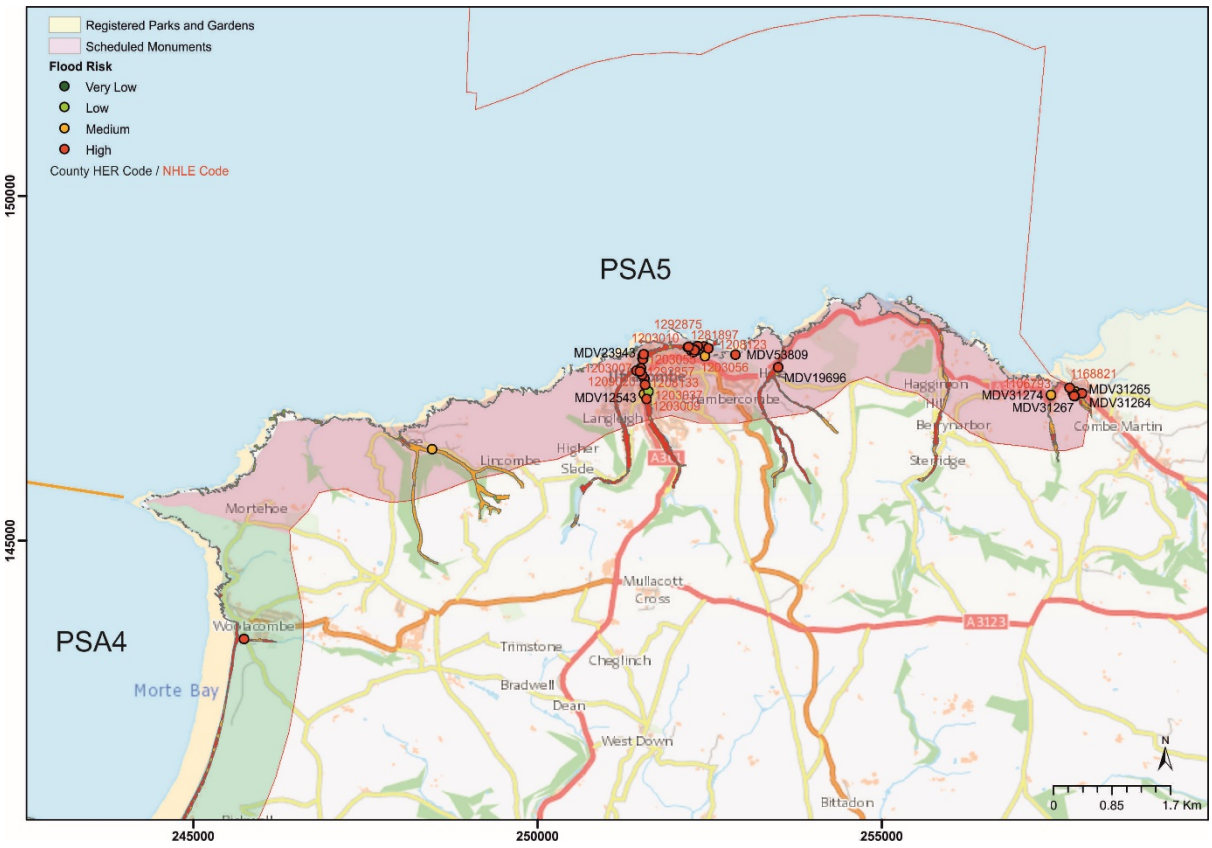


Figure 9.36: Distribution of sites within PSA5 identified at risk from flooding. Contains Ordnance Survey data © Crown copyright and database right 2019

Within the Toors Park area of Ilfracombe (see Figure 9.37), where the East and West Wilder Brook meet, a series of Grade II listed buidlings are identified at high flood risk: Holy Trinity Vicarage (NHLE 1203009), The Bath House (NHLE 1203007), Wilderscott (NHLE 1203037), 1-3 Bath Place, including garden walls (NHLE 1208043 and 1203053; MDV96549-50 and MDV23842-3), Brookdale Lodge (NHLE 1208133), Runnnymeade House (NHLE 1208960), Sandringham (NHLE 1209020) and Beaconsfield Terrace (NHLE 1292857). To the east, around the harbour and St James Place, a series of other listed buildings at high flood risk including the Grade II* Quay (NHLE 1203010) and Parish Church of St Philip

and St James (NHLE 1292875), and the Grade II Royal Britannia Hotel (NHLE 1203056) and properties along Broad Street (NHLE 1203055, 1208121, 1208123, 1208125, 1281881 and 1208993).

At Hele, the mill (NHLE 1203046; MDV19696) is at high flood risk. At Combe Martin, the Grade II listed building Seacroft (NHLE 1168821), along with remnants of Lower or Homedale Mill (MDV31265) and a smelting houses (now part of the bus garage; MDV41490) are at high flood risk, while the Grade II Newberry Cottage (NHLE 1106793) is at medium flood risk.

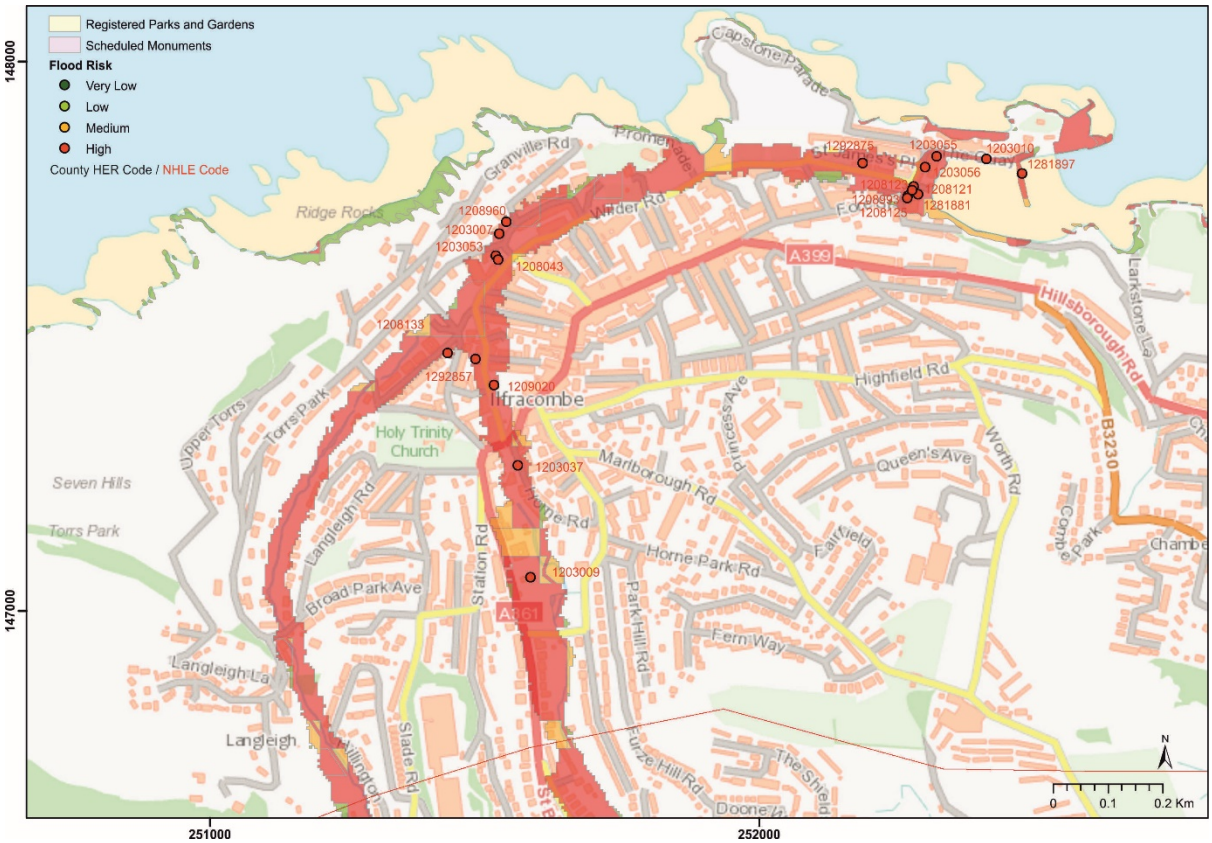


Figure 9.37: Distribution of sites within Ilfracombe, PSA5, identified at risk from flooding. Contains Ordnance Survey data © Crown copyright and database right 2019

10 Overview of RCZAS study area by archaeological period

10.1 Palaeolithic (pre-10000 BC)

10.1.1 Overview

In general, the Lower and Middle Palaeolithic archaeological evidence in North Cornwall and North Devon is characterised by a background scatter of single artefact and small findspots, often with no diagnostic features to infer their age, contrasting with richer assemblages found in eastern Devon along river valleys such as the Exe. To the west of the Exe, river gravels are relatively poorly preserved, often due to the steep river gradients and / or tendency of these rivers to cut narrow, gorge-like valleys, resulting in correspondingly sparse archaeology. Within Cornwall the extensive tin-streaming may have also led to the loss of Palaeolithic material associated with the tin-rich gravel beds, though given these are eluvial deposits any finds would have lacked a primary context. The trend of very few archaeological finds continues into the Upper Palaeolithic even when there is rich evidence for activity associated with the cave sites in outh Devon, to the north in South Wales, and east in central Somerset. Single finds are limited to those from Bude (MCO307), Little Kelynack (MCO40329) and two possible Upper Palaeolithic scrapers from near Ilfracombe (MDV64413). However there are two potential Late Upper Palaeolithic scatters on the North Cornish coast reported from Gwithian (MCO6673) and Booby's Bay (NRHE 429455) which could provide important information about the earliest arrival of humans into this area at the end of the Pleistocene period.

A number of factors may however be driving this apparent lack of evidence for Upper Palaeolithic archaeology in the study area, especially if activity was taking place further west when sea levels were much lower. Records of Pleistocene fauna being dredged from within Bideford Bay point towards a submerged Palaeolithic landscape within this area that could also yield evidence for human activity, along with datable bone assemblages and sediments that could provide a greater insight into the environmental conditions of this area prior to its submergence during the Late Pleistocene and Early Holocene period. The north coast does contain further information about the Pleistocene interglacial period in the form of the extensive raised beach and fossilised dunes along the length of its coastline. These currently suffer from poor chronological controls and should be reinvestigated for scientific dating purposes, most notably to determine if they are predominantly of Ipswichian (MIS 5e) age or potentially from earlier interglacials. Finally the presence and timing of glaciation of the north coast is still far from resolved, and with that the implications for potential hominin activity along this coastline. This is especially important given the clear evidence for glaciation just off the coastline during the late Devensian period when the ISIS reached the Isles of Scilly, coupled with evidence for small ice caps upon the uplands of the region. If the ISIS did extend into Bideford Bay, coupled with intense cryoturbation upon Lundy and extensive head-filled combes along the coastline, then any earlier superficial evidence of Palaeolithic activity could have been lost.

10.1.2 Research Priorities for the Palaeolithic

Moving to the regional level, the South West Archaeological Research Framework (SWARF) highlights the following priorities that have been, or can be, addressed within the RCZAS study area for this period:

- 1e: archaeological potential of all Quaternary deposits likely to be impacted upon by development

- 16a: Increase the use of, and improve the targeting, scientific dating, principally optically stimulated luminescence (OSL) and amino acid racemisation (AAR)
- 16d: develop higher resolution frameworks with reference to the timings and geography of the Late Upper Palaeolithic (LUP) re-colonisation of Britain
- 23c: continuation of the Palaeolithic and Mesolithic archaeology of the South West offshore
- 25a: in the South West Late Upper Palaeolithic (LUP) material is typically represented by single finds, with the issue of river valley burial and tin-streaming needing more acknowledgement

10.2 Mesolithic (10000-4000 BC)

10.2.1 Overview

As the summary of the archaeological record for each shoreline management plan area has made clear, the predominant signature for the Mesolithic comes from lithic scatter data. Key sites and findspot locations include Croyde, Mortohoe, Westward Ho!, Gwithian, Penwith and the Constantine Bay (Trevose Head) areas. Some of these scatters/collections are considerable with over 8000 pieces of worked flint being recovered from Trevose Head site TV1 covering both the Early and Late Mesolithic periods (Johnson and David 1982; Cave 1985). At Westward Ho! over 2000 pieces of Late Mesolithic worked flint have been recovered along with a shell midden deposit (now fully eroded) and a rich environmental record from the submerged forest (Balaam et al. 1987; Appendix 5). Most recently, re-evaluation of the extensive archive recovered from the North Cliffs / Gwithian area, coupled with new fieldwalking, has amassed thousands of Mesolithic flints and stone tools attributable to more than 20 distinct scatter sites within the area, representing one of the densest concentrations in Cornwall (Jones et al. 2018).

It would be all too easy to underplay the significance and potential of this resource. The dune systems that cover and preserve submerged forest and buried soil sequences represent a resource of national, if not international, significance for the insights they provide into changing Holocene environments and prehistoric activity. As the Mesolithic Research Framework (Blinkhorn and Milner 2013, 26) has made clear, ensuring this significance is better acknowledged and communicated to the public at large is a key strategic priority for research in this area. The results from this RCZAS also speak directly to Blinkhorn and Milner's (2013, 29-38) strategic themes two (enhancing approaches to fieldwork and survey) and particularly four (curation and conservation). It is clear that there is a considerable amount of Mesolithic lithic scatter material that has only recently begun to be re-engaged with. As Jones et al. (2018, 45) argue in their analysis of the North Cliffs assemblages, recent results from work on the Isles of Scilly (Anderson-Whymark et al. 2015; Garrow and Sturt 2017, 129-131) demonstrate the potential for these collections to speak to complex patterns of interaction and connectivity. Picking this out from the lithic record, however, requires detailed study that has yet to take place. In this light, the lithic resource reported here not only represents an opportunity for further fieldwork, but the necessity to revisit known assemblages to improve our understanding of them. If our priorities are to improve our understanding of the past through the material record mere presence/absence and gross level typological assessment are not sufficient.

The distribution of sites shown in Figure 10.1 indicates that this presence is not uniform. This in turn requires further work to reveal potential causes of bias (differential preservation, extent of submerged landscape in close proximity, relationship to possible landing beaches etc.) to resolve what it may indicate about Mesolithic life in this region. Again, the significance of this potential should not be played down. The material record here speaks richly of life along the coastal margin, out onto the sea

but also inland. It ties directly to national and international interests with regard to linking material culture to environmental sequences, and identification of known resources that warrant further specialist lithic analysis.

The distribution of sites and finds shows both areas of higher concentrations of finds and also stretches of the coastline apparently devoid of any such activity. In addition there has often been an assumption that Mesolithic occupation was focused upon the northern coastline, particularly in Cornwall, but studies away from the coastline, notably development-led and fieldwalking, have suggested a significant inland archaeology for this period, perhaps reflecting the exploitation of a variety of environmental and landscape contexts during the Mesolithic (see Berridge and Roberts 1986). In the Earlier Mesolithic, sites such as Trevose Head would not have been located on the coastline, and only became coastal locations by the Later Mesolithic as sea level rose and the coastline approached this location (Johnson and David 1982). Within the Taw-Torridge estuary, activity can be seen to be occurring away from the coastline at sites such as Yelland (MDV202) as well as upstream of Barnstaple and Bideford. Late Mesolithic activity is also found upon Lundy (MDV7113).

Activity along the coastline was not restricted solely to cliff top sites, but included activity across the landscape, with lower ground sites probably used as more long-term base camps (Berridge and Roberts 1986). However access to coastal resources is clearly demonstrated by both the occurrence of shell middens at sites such as Constantine Bay and Westward Ho!, with beach pebbles also probably a source of some of the flint material, and the presence of limpet scoops at several sites, notably those in Penwith. The discovery of a number of the Mesolithic sites on the north coastline has been driven by coastal erosion, either through the exposure of scatters within eroding cliff faces, or the erosion of low-lying deposits as evident at Westward Ho! Contextualising this Mesolithic activity, particularly that of the Late Mesolithic, has been rarely accomplished for the study area beyond the detailed studies at Westward Ho!. However this site reflects activity predominantly within a lowland wetland close to the coast, as opposed to upland occupation that forms an important component of the year-round activity during this period. Opportunities to explore Mesolithic activity within the wider landscape should thus be encouraged, particularly in areas where the archaeological record suggests movement along river valleys where environmental records might be preserved within the alluvial deposits. Preliminary studies in the Hayle, Camel and Barnstaple areas all suggest possible contemporary deposits that could contribute to a wider understanding of the lowland environment along the north coast during the (Late) Mesolithic.

This combination of identified areas of preservation (preserved land surfaces and submerged forests), erosion / threat, apparent patterning of material and significant lithic assemblages held in archives is notable. As noted above, it represents a resource which speaks directly to concerns and highlighted opportunities in the national research agenda for the Mesolithic (Blinkhorn and Milner 2013). In addition, it also represents a potential vulnerable resource that contributes to cross cutting themes in the Marine and Maritime Research Framework (Ransley et al. 2010). Specifically, it picks out points raised by Dix and Sturt (2010, 23) on the need to investigate coastal sequences that contribute both to discussions of human activity and sea-level change, and Bell and Warren's (2010, 73-103) identification of sea-level change, better understanding site location and variability, and indicators of seafaring..

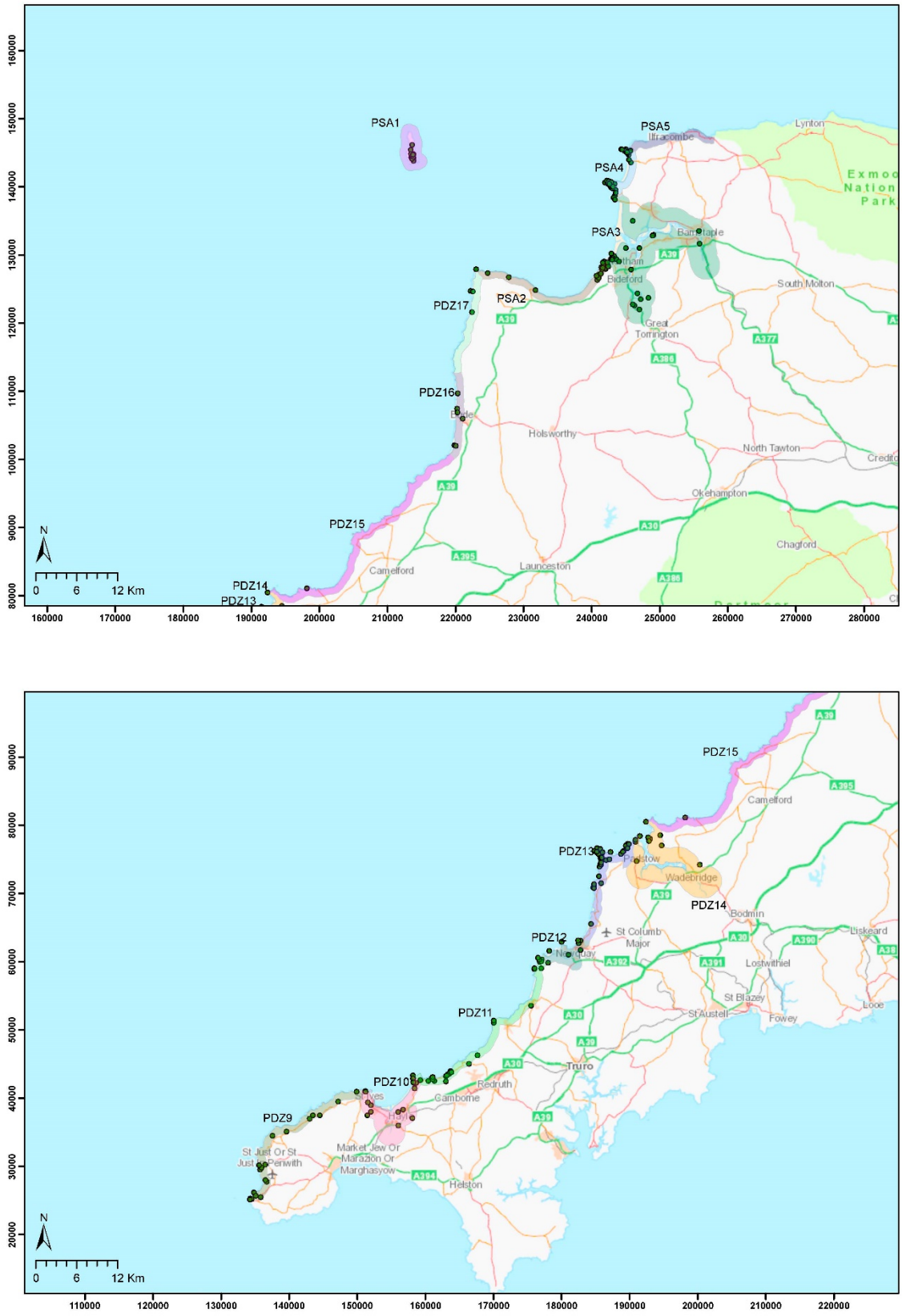


Figure 10.1: Distribution of Mesolithic archaeology within the study area. Contains OS data © Crown copyright and database right (2019)

As the preceding chapters have made clear, the geological and archaeological record of this region is well positioned to address all of the above. Furthermore, recent work such as that done on the North Cliff assemblages (Jones et al. 2018), demonstrates that important advances are being made, but also the high yields that could be gained from further targeted investigation. Within the context of an RCZAS it is clear that the dynamic nature of this environment both reveals and threatens an archive of direct interest to the archaeological community and broader public. Recent work by CITiZAN and that of Jones et al (2018) has demonstrated how this shared interest can be positively aligned to address the research priorities outlined above. Identification and monitoring of sites in the coastal zone is contingent on survey frequency, an issue that CITiZAN's work has helped to address through harnessing local communities. Re-examination of large lithic collections is both specialist in nature and time intensive, but also has opportunities for community engagement as demonstrated by Jones et al. (2018). This is important as it helps demonstrate how this coastal prehistoric record can be better brought to light and enhance local, regional and national understandings of place and historical trajectory.

10.2.2 Research Priorities for the Mesolithic

Moving to the regional level, SWARF highlights the following priorities that have been, or can be, addressed within the RCZAS study area for this period:

- Aims 1c and 1d: controlled excavation of stratified Mesolithic sites and contemporary deposits.
- Aim 2c: Development of landuse models to aid discussion of raw material transfers, human mobility), subsistence strategies
- Aim 4c: The location and importance of key collections should be highlighted, both with regards to archaeological research and public engagement.
- Aim 5a: Attention should be paid to lithic scatter resources, in particular the specific evaluation and/or re-evaluation of "grey collections"
- Aim 10a: Understanding of the processes behind rates of change, and local consequences of the Mesolithic–Neolithic transition (also priority 25b)
- Aim 23c: Improved understanding of submerged landscapes

10.3 Neolithic and Bronze Age (4000-800 BC)

The south west is host to a wealth of Neolithic and Early Bronze Age archaeology, and within the study area this is most heavily concentrated upon West Penwith (Figure 10.2), where evidence consists of a mixture of lithic scatters, funerary monuments and individual find spots. A characteristic feature of this area are the Quoit stone chambers, such as Zennor Quoit (MCO36098) and Sperris Quoit (MCO28521), although a number have been reportedly destroyed in the past (e.g. Giants Rock MCO27794 and Trewey MCO28323). Also prevalent along this coastline are sites associated with Neolithic axe production, utilising greenstone outcrops between Lay Point and St Ives, such as the Kenidjack Neolithic quarry (MCO29743), or altered sedimentary rocks around Hellesveor and Porthmeor. Such polished axes would have been utilised in extensive trade, and along with pottery derived from clays on the south coast, would have been distributed right across southern England and beyond. Beyond West Penwith, Neolithic finds are largely restricted to stray finds, such as leaf shaped arrowheads, or small scatters / flint working sites such as at Saunton Down (MDV25461), Great Torrington (Devon; MDV11844), Newquay and Trevose Head. At Gwithian some pottery of possible Neolithic date have been uncovered, along with the presence of buried soil horizons, although the

pottery is likely to be residual. Some probable Neolithic scatters are also found on Lundy. At Westward Ho! Early Neolithic stakes have been dated from the surface of the submerged forest, suggesting a possible continuation of use at this site from the Late Mesolithic. Palaeoenvironmental records from the foreshore are also provided from sites such as Constantine Bay (Jones 2009-10) and Maer Lake (Crooklets Beach; Cole (2001).

A number of Neolithic chambered tombs have been postulated along the coastline, though these have either been destroyed or doubt cast on their form when investigated. Only Rocket Pole Pond, Lundy (NHLE 1015931; MDV7112), is accepted as a Neolithic Chambered Tomb, while at Tregavone (MCO21851) a cropmark visible on an aerial photograph is interpreted as a possible Neolithic Long Barrow. The Late Neolithic and Early Bronze Age is characterised by its ceremonial and burial monuments; stone circles, stone rows, standing stones (menhirs) and barrows or cairns. Round barrows and round cairns, surviving as upstanding monuments along much of this coastline, represent the most prevalent category of prehistoric monument in the study area, though these are sparse in north west Devon, although on Lundy Bronze Age cairns are recorded across the whole island and a small number of standing stones are found south of Quarter Wall (Figure 10.3). The distribution of these features is far from even, occurring both in relative isolation, or as part of bigger cemeteries, such as around Pentire-Trebetherick Points, though the remains of those now destroyed through ploughing are being discovered through the analysis of aerial survey data. This is also potentially the case with a series of mound-like features visible within the area which could be unrecorded/degraded/ploughed down barrows, natural or later features. Examples of barrows and burials revealed through erosion include those west of Harlyn Bay, with further possible examples of barrows that may have eroded Fox Cove / Park Head. Uniquely upon West Penwith appear Scillonian chamber tombs or entrance graves, such as at Ballowall Barrow (NHLE 1013666), south of Cape Cornwall. These structures are common in Brittany, but only found in West Penwith and the Isles of Scilly within Britain, clearly showing a strong maritime connection for the people inhabiting these western areas of the peninsula. While these burial structures provide one of the iconic prehistoric structures along much of the coastline, protection as a Scheduled Monument is only provided to 31 of over 400 listed locations within the study area where such structures have been reported.

Examples of ceremonial stone structures within the study area include the Yelland Stone Row on Isley Marsh (NHLE 1003847; MDV5507), River Taw, and the group of single standing stones on the north Devon coast, such as at Whitestone (MDV216) and Damagehue Cliff (MDV213). These are best interpreted as places for the public performance of ceremonial and ritual. The stone row hints at use in processions, comprised of straight alignments of stones, usually either all large or all small, some closely, some widely spaced. At Yelland Stone Row, several flints scatters have been recovered from the adjacent marsh suggesting that this monument may form part of a more extensive area of land use and could also contain preserved buried soil surfaces below the modern marsh. This site is currently listed on the Heritage at Risk register, though in June 2018 a geophysical survey was commissioned by Historic England to better understand the structure of the site and its associated buried prehistoric landsurfaces.

While the stone structures and barrows are prevalent along parts of this coastline, one key component from the Early Bronze Age that has so far largely avoided detection is the presence of mines in the area. The earliest tin extraction in Cornwall probably occurred during the Early Bronze Age, given the evidence for smelted tin and cassiterite (see Timberlake 2017). Dating of mining artefacts, such as the

antler pick from the Carnon streamworks, dated 1620-1460 cal. BC (3269±27 BP; OxA-36336), has provided much-needed support for early mining in the region, highlighting opportunities available for further radiocarbon dating of other early mining artefacts currently in museum collections (as proposed by Penhallurick 1986). Palaeoenvironmental studies within tin-streaming areas and isotopic provenancing of the tin in Bronze Age bronzes also point to mining activity at this time, while at Trethellan Farm and Gwithian broken stone moulds reveal that small-scale bronze working was a feature of village life (Nowakowski 1991). Alluvial gold may have been extracted from the Cornish tin streams more than 4000 years ago and could have been the main source of the gold used in Ireland and Britain during the Copper-Early Bronze Ages, a theory supported by recent lead isotope work carried out on gold artefacts and sources (Timberlake 2017). However the lack of clear evidence for early mining activity within the granite areas of West Devon and Cornwall contrasts with the evidence of extensive Bronze Age landscapes within the area, representing a notable anomaly within the archaeological record (Sharpe 1997; Budd et al. 1997). While it is possible that later more intensive mining activity has removed a large proportion of the earliest evidence, this is not a trend found in other prehistoric mining areas of the British Isles. It is possible that some of this earlier evidence is obscured from view within the deeply infilled river valleys that drain the main ore-bearing geologies.

The complexity of different landuse moving into the Late-Middle Bronze Age is best demonstrated on West Penwith where the foundations of stone round houses and fields, now defined by low stone banks, are present across this peninsula, closely associated with earlier monuments. A feature of these earlier barrows and cairns of the peninsula is their longevity and complexity, with many revisited and remodelled over generations; the best known example being Ballowall Barrow (NHLE 1013666; MCO4164). Their form may develop, for example, from flat cemetery to ring-cairn to platform cairn to end in conventional round barrow form. Excavation of the burial mounds has also shown them to be complex and varied sites where burial was only one of the rites performed, and many may not have any burials at all, and are attributed broadly to the period 2000 to 1600 BC. The later settlements of Middle Bronze Age round houses (c 1500-1200 BC) have been identified and excavated at more than five sites in lowland Cornwall, including Trevisker (St Eval) and Trethellan (Newquay), and many represent equally complex histories of land use.

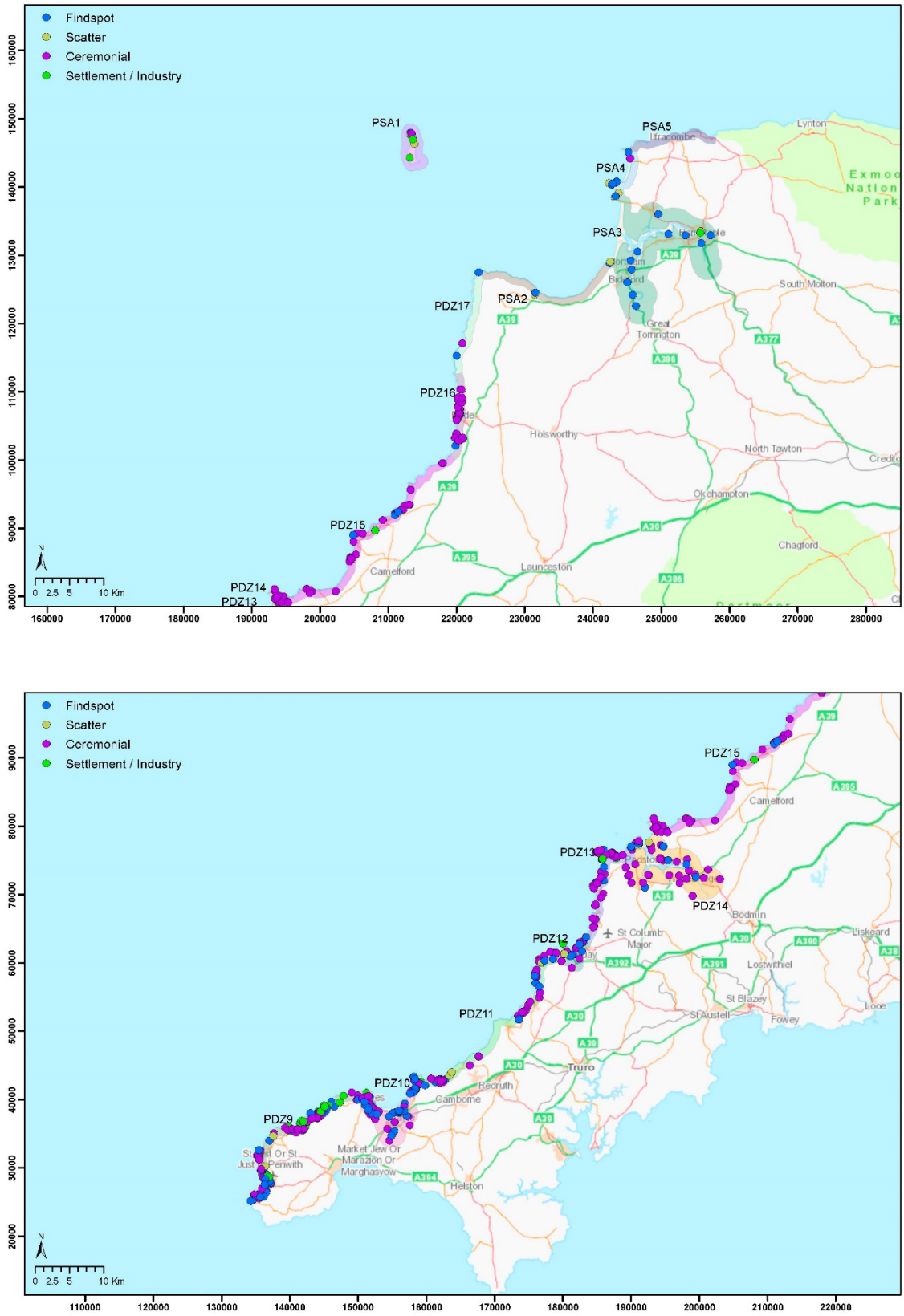


Figure 10.2: Distribution of Neolithic and Bronze Age archaeology. Contains Ordnance Survey data © Crown copyright and database right 2019

Excavations of Bronze Age fields buried by sand at Gwithian showed evidence of scratch marks in the subsoil made by the hook-shaped ploughs as well as marks around the field edges made by spade digging in those areas the plough could not reach. The importance/identity of place is clearly demonstrated by the way that locales were reworked over considerable periods of time (Nowakowski 2006). Among the structures identified are the post-built roundhouses at Gwithian site GM/XV, associated with Beaker pottery (Megaw 1976; although see Nowakowski 2004 for a reconsideration), the form of which seems to prefigure that of Middle Bronze Age roundhouses. Large quantities of marine resources (shellfish and estuarine species) have been excavated in Bronze Age contexts at Gwithian as has a large quantity of worked bone points and needles that provides indirect evidence for fishing, along with waisted, elongated, flat pebble-tools that have been interpreted as linewinders. This would imply both deep-sea as well as shoreline fishing going on at the site (Nowakowski 2004).

There is likely to have been much continuity between the Middle and Late Bronze Age, although the latter is less well-known due to the often poorer chronology of this phase. The archaeologically visible practice of deposition of large quantities of metalwork in the Late Bronze Age is worthy of note, as too is the reduced practice of cremation and rare formal inhumation. This latter change in burial practice contrives to make the period less visible to modern researchers. By the 1st millennium BC the megalithic ritual monument (standing stones, stone rows, stone circles) appear to have been abandoned. In upland areas there also seems to have been a phase of abandonment at this time, or at least a shift to use as seasonal grazing. However, at sites such as Maen Castle and Trevelgue Head, evidence points towards some continuity of activity in both upland and coastal zones during the earlier part of the 1st millennium BC. Tin-streaming and working are assumed to have been practised, although, as with the Early Bronze Age, direct evidence is slight but is apparent through metallurgical analyses.

10.3.1 Research Priorities for the Neolithic and Bronze Age

Moving to the regional level, SWARF highlights the following priorities that have been, or can be, addressed within the RCZAS study area for this period:

- Aim 1d: identification of potential stratified sites and development of methodologies and strategies underpinning the prospection for, and the assessment of the preservation potential
- Aim 10b: improve understanding of how the arrival of metalworking impacted upon later Neolithic society
- Aim 16e: use of colluvial and alluvial sequences as markers for forest clearance, agricultural intensification and for metal mining and smelting
- Aim 16g: the dating, nature, and development of prehistoric tin and copper production remain very poorly understood and should be the focus of detailed study

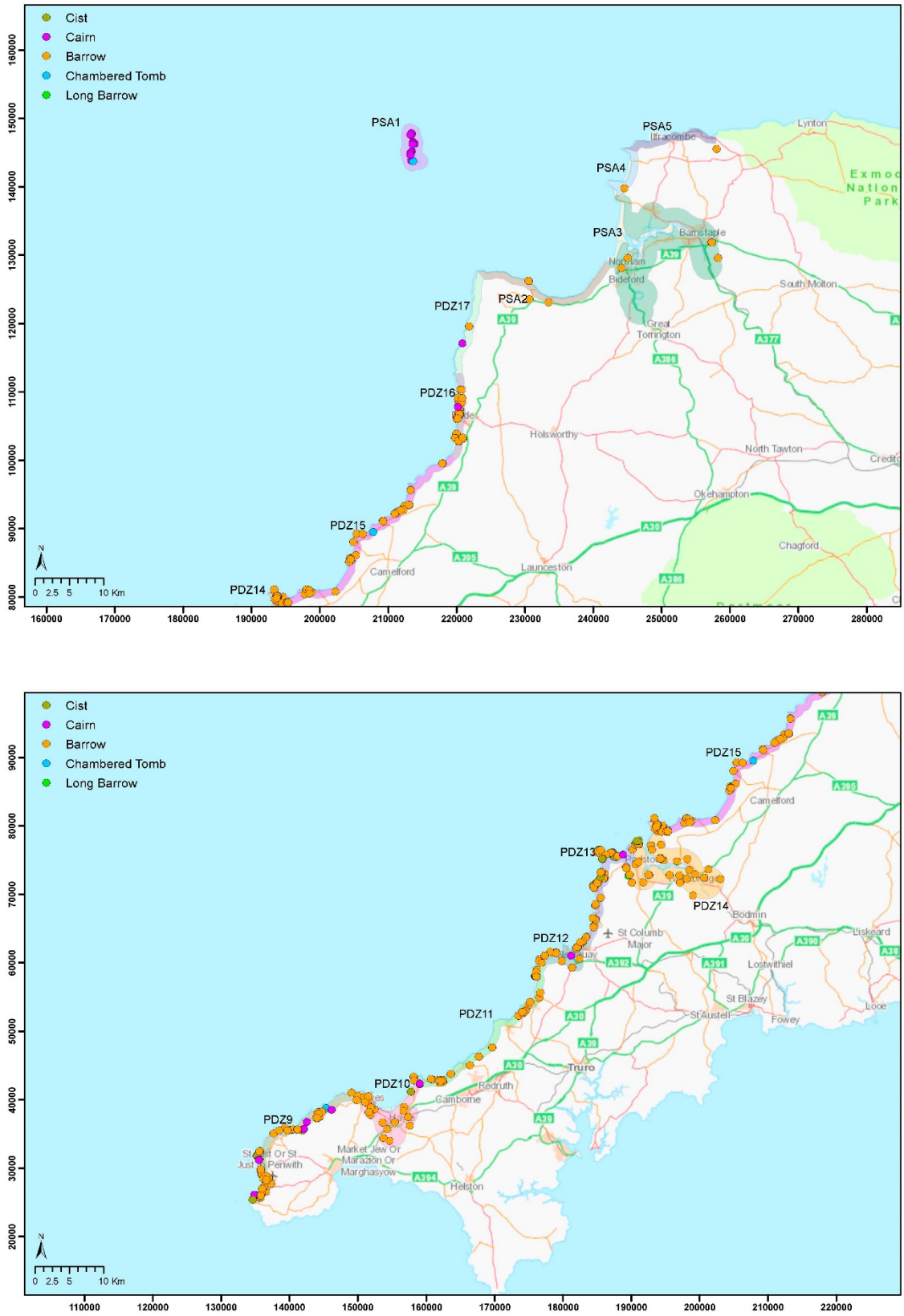


Figure 10.3: Distribution of Neolithic and Bronze Age burial structures across the study area. Contains Ordnance Survey data © Crown copyright and database right 2019

10.4 Iron Age (800 BC – AD 43)

As in the later part of the Bronze Age, the archaeological record of the Iron Age is dominated by evidence of domestic activity and farming, in the form of settlement sites and field systems. The evidence is not evenly distributed: Cornwall has a large number of recorded sites, especially around the major estuaries and in Penwith, with Lundy also well-represented, but much less is recorded in the coastal zone of North Devon. The characteristic Iron Age sites of the study area (Figure 10.4) consist of enclosed settlements (traditionally called rounds in Cornwall), open settlements, subterranean passages in Cornwall known as fogous, coastal promontory forts, which in Cornwall are generally known as cliff castles, and hillforts (Figure 10.5). There is also a small, but important, group of cemetery sites.

The settlements of the earliest Iron Age are not yet well known. The rounds, which are well documented in the study area, are characteristic of Cornwall as a whole, especially more upland areas. The term 'round' has been applied to a wide variety of enclosure forms, and it is possible that not all were occupation sites. Some were certainly being constructed and used from the beginning of the Later Iron Age, and were occupied into the Roman period, but the chronology of their origin is not certain. Excavations have shown occupation in the Roman period, and many appear to have been founded then, but the greater abundance and the more robust nature of Roman material culture, combined with the small number of radiocarbon dates, may be obscuring earlier activity. Geophysical surveys and aerial photographs have begun to reveal the landscape setting of some rounds, showing that they were often integrated into field systems, and in some cases were located near to open settlements, apparently contemporary; many were presumably the homesteads of dispersed farming communities, but the precise nature of those farming activities is not well understood.

Open settlements are present within the study area but have tended to be less studied. It is quite possible that their numbers have been underestimated, because of difficulties in recognition; unlike the rounds, they are seldom visible in the field and may give variable responses to geophysical survey or aerial photography. They are recorded in West Penwith, and likely settlements with associated field systems have also been mapped from aerial photographs during the NMP around the Camel Estuary. The relationship of the open sites to the rounds is not clear; they may represent a different farming strategy or a different form of social organisation.

Field systems are extensive in West Penwith and extend onto cliff-tops and other margins, and are also well represented on Lundy (see Blaylock 2007), in both cases associated with lynchets suggesting fairly intensive ploughing and arable cultivation.

Fogous, which are underground structures with dry-stone walls capped by flat roofing slabs, are mainly restricted to West Cornwall and the Meneage part of the Lizard peninsula; they are not known in other areas of England outside West Cornwall, but broadly similar structures are known in Scotland, Ireland and Brittany. They are not very numerous, few have survived well, and even fewer have provided well-excavated evidence. They are associated with settlement sites, including rounds, but contemporaneity with any phase of such structures is difficult to assess. Their chronology is not well established; they may date as early as the 5th century BC. Their function is unclear, but three potential uses have been widely suggested: storage, ritual or refuge.

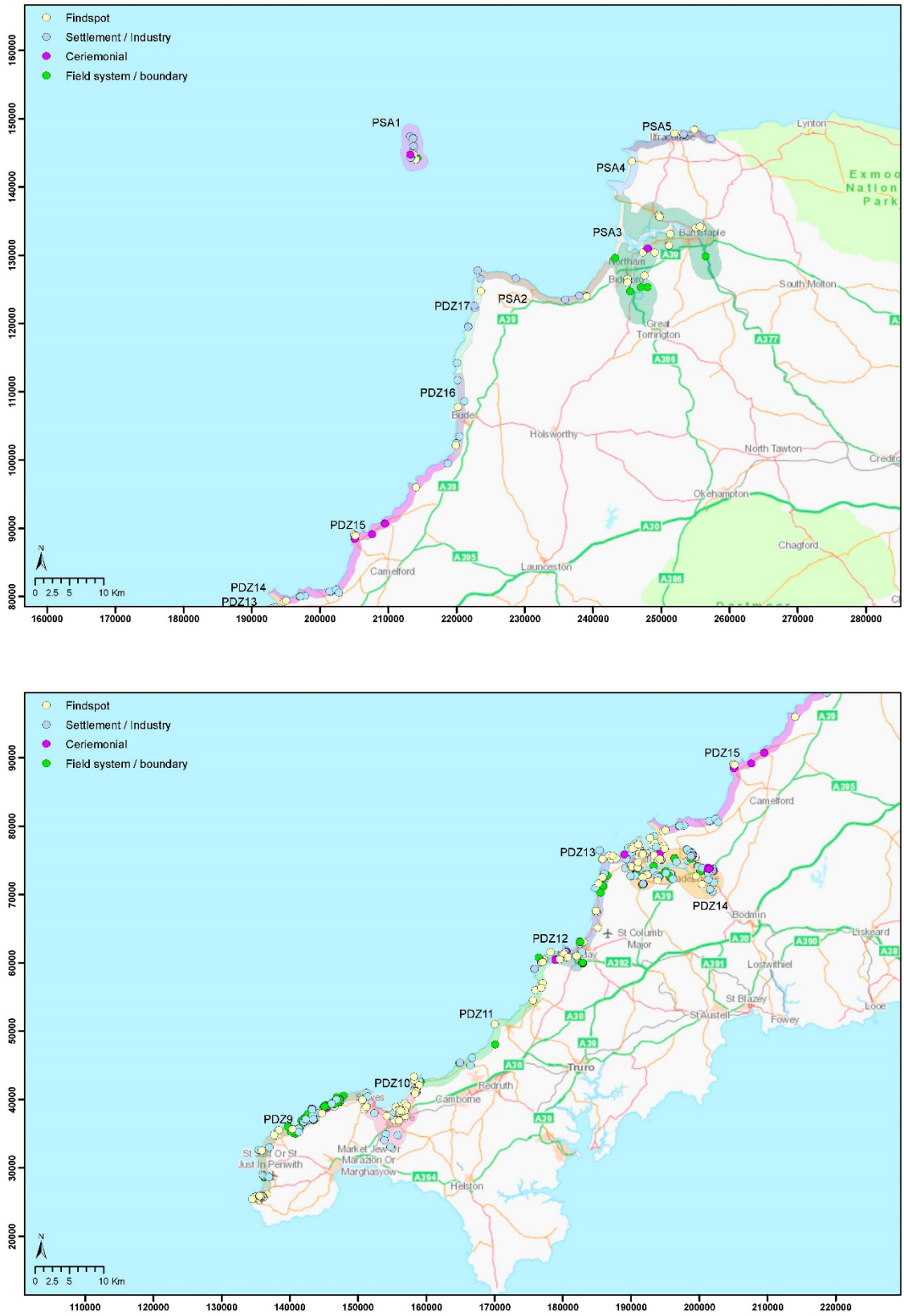


Figure 10.4: Distribution of Iron Age and Romano-British archaeology

Hillforts are found within the study area, located within the Hayle (Carnsew; MCO40) and Camel (Killibury; NHLE 1010439; MCO50) estuaries. Both of these have been partially destroyed by agricultural activity, with the former also impacted by the construction of an ornamental park in 1845 and railway cutting. Excavation at Killibury has produced evidence of dense, and probably long-lived, occupation in the second half of the Iron Age. Their strategic locations in relation to two of the major estuaries cannot be accidental, and they emphasise the importance of the estuaries for communication purposes, and possibly their role in maritime trade.

A distinctive feature of the archaeological record of Cornwall, especially the north Cornish coast and the Lizard Peninsula, are hill/clifftop enclosures. Within the study area these can be broken down into three classes: hillforts, cliff castles and promontory forts (Figure 10.5). Cliff castles and promontory forts are similar and both occupy coastal promontory positions, but are named differently depending on whether they are in Cornwall or Devon, and can also be used interchangeable with the term hillfort. These sites vary in their position on hills, their size and shape, the number and form of their banks and ditches, their entrances, intensity and form of occupation. Many forts are on hills that also have important earlier barrows and other ceremonial/ritual remains. Cliff castles/promontory forts such as Trevelgue (NHLE 1006712; MCO6584), The Rumps (NHLE 1004625; MCO6575) or Maen Castle (NHLE 1006757; MCO6558) could have served non-domestic and several functions have been suggested, including ritual/ceremonial and trading stations. They vary in form and size, with the largest being Hillsborough Promontory Fort (NHLE 1002512; MDV2210) near Ilfracombe. Eighteen Iron Age forts are Scheduled Monuments. This includes Castle Point (NHLE 1003097; MCO36551) which was Scheduled in 1966. Questions remain, however, as to whether the observed earthworks are actually natural features created by slumping of the cliff, or as in the case of Tubby's Head (NHLE 1017017; MCO6585), represent an anthropogenic defensive earthwork to protect a nearby landing place. Other potential forts within the area are included due to place name evidence, such as St Ives Island ('Pendinas' or 'Dinas Ia' suggesting the site of a cliff castle), but with no physical evidence has yet been found.

The main phase of occupation of cliff castles was in the Later Iron Age, perhaps c.400-100 BC. The position of these Iron Age enclosures on coastal promontories means that they are especially vulnerable to coastal erosion, as clearly demonstrated by continued investigations of Embury Beacon (see Sims et al. 2014), where coastal erosion has led to the almost complete loss of one of the internal banks. Another promontory fort is reported to have been completely lost from Hartland Point (MDV106219), although recent research has failed to support this claim. Analysis of artistic ouputs by the CHeRISH project (McInnes 2016; Fig. 20.1) suggests less change than previously imagined since the start of the 19th century.

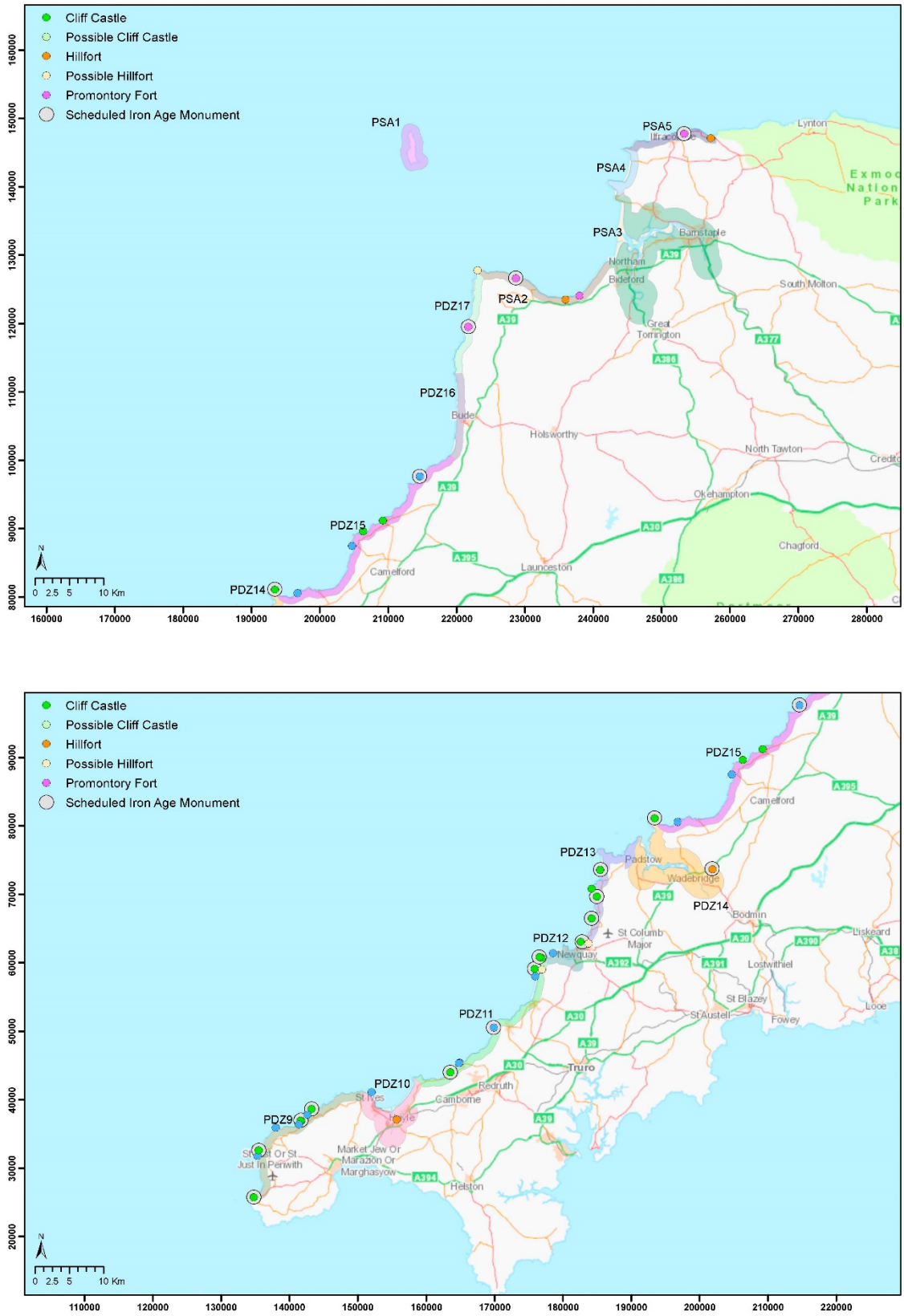


Figure 10.5: Distribution of Iron Age cliff castles, promontory forts and hillforts. Contains Ordnance Survey data © Crown copyright and database right 2019

One of the most important sites for understanding the Iron Age within this region is the cliff castle of Trevelgue, Porth. This site has not only provided a dated sequence of the entire range of south-western decorated wares, providing a key chronological underpinning to the phasing of Iron Age sites in the region, but is regarded as a nationally significant metal working site (see Nowakowski and Quinnell 2011). Trace element analysis has suggested that iron ore from Devon and Cornwall would have been a major source for iron in Wessex during the Early Iron Age, with geochemistry suggesting the source was the Great Perran lode "near Trevelgue" (Salter and Ehrenreich 1984, 16–17).

Morturary practice is also represented by a number of cemeteries. These are examples of a distinctive funerary rite found sporadically in the south-western peninsula, especially along the north Cornwall coast and in the Lizard Peninsula, comprising burials that are usually flexed or crouched inhumations in oval or rectangular graves, often lined with stone slabs. They occur as single burials or in small cemeteries, up to larger cemeteries like that behind the beach in Harlyn Bay (MCO25836) where 130 burials were excavated in 1900-1905. These are important as an indicator of a regionally specific burial rite, but are also nationally important since inhumations are comparatively rare in most of England and the human skeletal remains are valuable sources of inhumation about topics such as health, diet and place of origin.

Compared to the evidence of sites and structures, the record of material culture is less plentiful. This may be partly due to poor environmental conditions for survival of organic and even some inorganic materials; lack of large-scale excavation; and comparative lack of detailed study of what has been found. The number of records in the Portable Antiquities Scheme database is small compared to other regions of southern England, and dominated by coins. The pottery sequence for Cornwall, including the study area, has been studied, but few other categories of material.

Evidence for the nature of agricultural strategies is very sparse. Preservation conditions for animal bone are poor. Recovery of charred plant remains has been very limited. The evidence of agriculture is widespread in the form of field systems, but there is very little detail of arable or pastoral activities. Stable isotope analysis of some human skeletons from Harlyn Bay and Trethellan Farm show that for most of them diet was terrestrial, though two showed a significant element of marine resources.

Non-agricultural production is slightly better documented. The metal resources of the peninsula were certainly exploited, but details of these industries are limited. Devon and Cornwall must have continued to be the major source of tin in the Iron Age, and the export of tin is documented by classical historians; the precise location and technology of tin extraction are not understood, and the role of the study area is unclear. There is also evidence from trace element analysis that Devon and Cornwall were a major source of copper in the Iron Age, but again the role of the study area is unclear.

Iron is the best-documented metal to have been extracted within the area. The evidence from Trevelgue has been mentioned above; smelting operations there exploited iron ore sources from the surrounding region. Near Perrranzbuloe, south of Newquay, the Great Perran Lode offers a rich source of siderite and other ores, extensively exploited in the 19th century. There is no direct field evidence for Iron Age exploitation, but the smelted iron has a distinct high-cobalt and high-nickel geochemical signature, rarely found elsewhere.

Also exported from the study area were some ceramics. The south-western decorated pottery characteristic of the later Iron Age was made from at least six petrologically distinct clay sources in

Somerset, Devon and Cornwall, one of which must be derived from the gabbroic area of the Lizard (Peacock 1969). Much of the pottery produced from this source has been found locally, but some reached as afar as Somerset.

Other evidence for the region's external connections comes from the occasional finds of Iron Age coins. Cornwall was outside the area where coins were minted and widely used, but finds in the region demonstrate contacts with southern and south-eastern England. Other possible evidence for external contacts comes not from imports or exports, but from similarities in material culture and structures. Some of the brooches found with burials in the cemeteries are similar to Iberian types, either imports or close copies; it has been suggested that the origin of the pottery decoration of the Middle Iron Age may lie in decorated products from Brittany; more certainly, the cordoned wares of the Late Iron Age bear a close similarity to contemporary pottery in Brittany. The fogous have their closest structural parallel in the widespread souterrains of Brittany, dating to the Early Iron Age.

10.4.1 Research Priorities for the Iron Age

Moving to the regional level, SWARF highlights the following priorities that have been, or can be, addressed within the RCZAS study area for this period:

- Aim 1g: stable isotope analysis. The Iron Age inhumation cemeteries offer the opportunity for further analysis of stable isotopes, and possibly aDNA; such skeletal resources are rare in England, and there are few other remains of coastal populations.

- Aim 3k: regional differences. The aim is expressed in terms of defining the difference between the south-western peninsula and the wider south-west region, but there is ample scope for research into differences at a variety of scales. The regional tradition of inhumation burial and the more limited distribution of features such as fogous and cliff castles are obvious subjects of further investigation as expressions of regional culture.

- Aim 14: material culture. There has been little study of items other than pottery, and there is scope for detailed study of other materials, especially anything possibly associated with regionally important activities such as the metal industries. The Portable Antiquities Scheme database contains few records for the study region, as for the whole of Cornwall; the lack of the metalwork items common in much of the rest of southern England prompts questions about the acceptance or rejection of cultural innovations, or alternatively about regional practices of deposition.

- Aim 37: maritime sites. This is expressed in terms of a very limited focus on wrecks, but discoveries such as those of Bronze Age metalwork off the coast of Devon suggest the possibility of further seabed survey, especially off the north coast. The aim could also be extended to coastal sites including harbours and ports, in view of the apparent clustering of activity around the estuaries (Aim 46 is focused only on Roman ports) and the presence of cliff castles in the Late Iron Age.

- Aim 38: mineral extraction. This should be an aim where the study region can make a uniquely strong contribution. There are strong arguments for the importance of copper and tin extraction, and the scale of iron smelting demonstrated at Trevelgue is of national importance.

10.5 Romano-British (AD 43-410)

10.5.1 Overview

During the Romano-British period Cornwall was incorporated into the administrative area or 'civitas' centred on Exeter, although it never underwent full Romanisation with no Roman towns and very few villas. While many hillforts were abandoned this does not appear to have happened to the rounds, allowing enclosures to continue to be occupied and used resulting in the incorporation of Roman artefacts into these sites. During the 2nd century AD a form of self-contained settlement known as Courtyard Houses developed in West Penwith, with some developing from earlier open settlement round houses. At Porth Godrevy, a small clifftop site containing a single hut, excavation in 1956 and 1957 revealed a homestead, with occupation beginning in the early 1st century AD (MCO37075; Fowler 1962). Beyond the development of the Courtyard Houses, archaeological evidence for this period within the coastal zone is largely dominated by findspots, with more substantial features, such as potential ports, enclosures or even outlying fort sites often somewhat speculative (Figure 10.6). However, it is apparent that these findspots do cluster around the main estuaries of the north coast, possibly indicating the significance of these sites for trading during this period. The importance of coastal locations for industrial centres is highlighted by excavations at Duckpool by Ratcliffe (1995) and most recently by Taylor (2017), where a series of industrial hearths, with possible (but not conclusive) evidence for secondary metalworking (lead, pewter and copper-alloy) was found alongside the manufacture of dyes from marine molluscs. Dating indicated a major phase of activity during the 3rd to 4th centuries AD, with the beach possibly acting as a landing place. On the Hayle estuary, the graveyard of Lelant parish church is thought to possibly preserve the rectangular outline of a Roman fort that may have been placed to control access to the estuary (Cahill 2000). At Westward Ho! the inner submerged forest (Area 1) contains stake alignments dated to this period, though the wide calibration range also extends into the post-Roman period (Green 2015).

During this period ore extraction from the region continued to play an important role, with tin likely to have increased importantance after the 2nd century AD when the Empire's Iberian mines were in decline. Many ingots of this date are known from Cornwall and it is likely that, as with other mineral producing areas, Cornish tin was worked under Imperial control, such as near Boscarne, where there was the nearby early Roman fort of Nanstallon. Iron was also important and evidence of mining during this period has been found in southwest Exmoor near Simonbach, and it has been speculated that the product might have been exported via the River Taw, though there has been very little evidence for Roman occupation or activity within the Taw and Torridge estuary (beyond predominantly stray finds), and no fort to protect the estuary mouth.

10.5.2 Research Priorities for the Roman period

Moving to the regional level, SWARF highlights the following priorities that have been, or can be, addressed within the RCZAS study area for this period:

- Aim 10e: survival of Roman institutions and culture. The south-western peninsula was the last area of southern England to be influenced by Anglo-Saxon culture, and Cornwall is a key area for the survival of Roman practices. The area offers significant opportunities for the study of the survival of Roman settlement systems and economic activities, including farming and industry, especially the metal industries.
- Aim 29b: regional variability in the settlement record. North-west Devon was identified as a region with little evidence of settlement in the Roman period, provoking a research question about the reality of this gap, or a lack of research. This assessment has confirmed that

impression, but has also identified a similar shortfall in records for the Iron Age. The impact of the NMP needs careful consideration, as it has added greatly to our knowledge of the settlement history of the north coast of Cornwall. The contrast between our knowledge of two geographically similar regions such as the Camel estuary and the Taw/Torridge estuary is striking: it is difficult to think of archaeological reasons why their settlement histories should be so different, and much of our current understanding of the former area is due to the NMP. Targeted survey programmes in north-west Devon could help to answer the question.

- Aim 29c: non-villa settlement in the Roman period. Cornwall has one of the lowest density of villa's in southern England. The most striking feature of our current knowledge of the landscape in this period is the continuity of the pre-Roman settlement system of rounds, open settlements and fields. The area offers an opportunity, unique in southern England, to investigate such continuity within the Roman province.

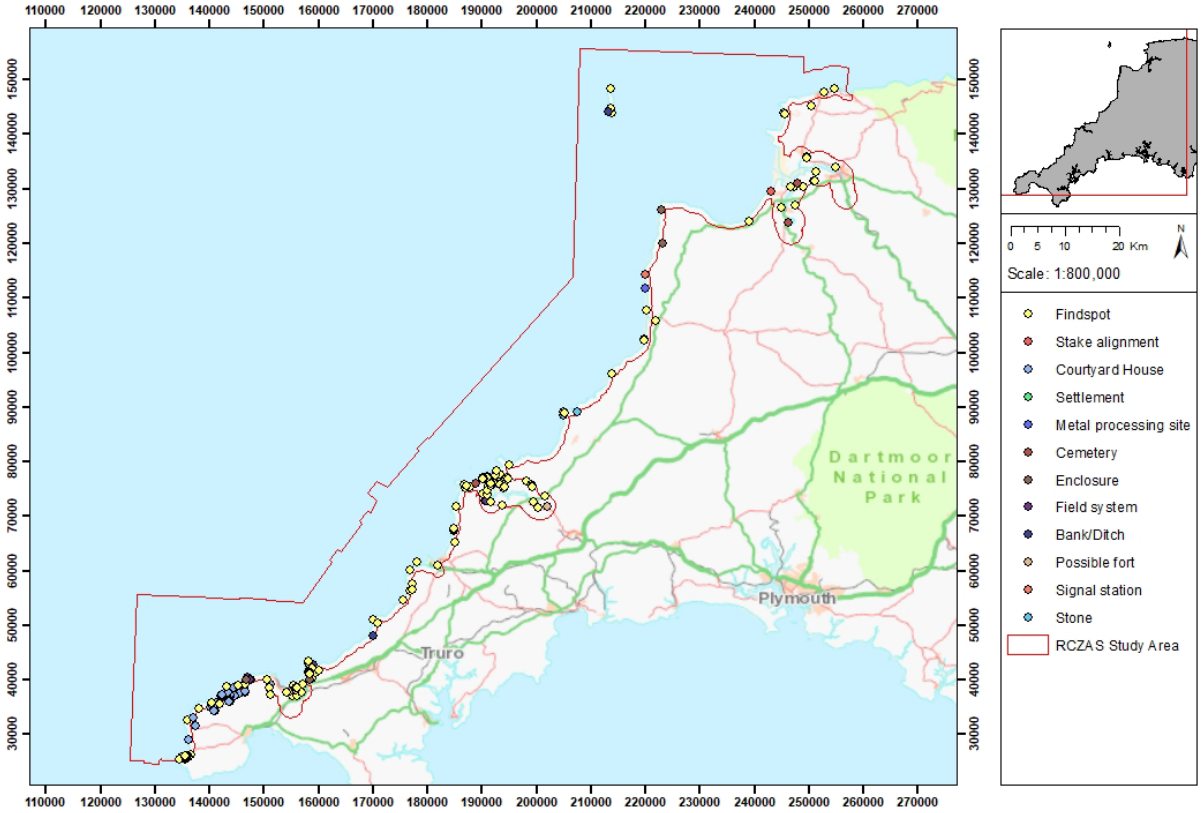


Figure 10.6: Distribution of Romano-British period archaeology. Contains Ordnance Survey data © Crown copyright and database right 2019

- Aim 38: extractive industries. The emphasis is mainly on metals and stone, and the area certainly offers opportunities for the study of the metal industries in the Roman period. Other industries could also be included: excavations at Duckpool have identified the extraction of dyes from marine molluscs. Sites for the extraction of salt from seawater have been reported from the Lizard peninsula, but similar sites have not yet been reported in the study area.

- Aim 41: impact of Rome. Despite considerable interest in transitions (Aim 10), the only mention of the Roman conquest of Britain and the transition to a Roman province is in Aim 41, restricted to the impact on farming. This overlooks an opportunity to address questions

about the wider impact of Rome in a region far removed from the nearest town, apparently with no military presence after the late 1st century AD, and with good evidence of continuity in Iron Age settlement systems and agriculture, but presumably with strong imperial interest in metal production.

- Aim 46: Roman ports. As in the Iron Age, the clustering of archaeological evidence around the major estuaries is suggestive of their importance as harbours and ports. It is possible that post-Roman alterations to the coastline, including silting due to the extent of mining operations, may have obscured such sites; if so, it is possible that well preserved features could still survive, protected by the overburden.

10.6 Early medieval (AD 410-1066)

10.6.1 Overview

A selection of early medieval features are shown in Figure 10.7. From the 5th century, after Rome had abandoned its peripheral areas, Britain fragmented into a series of kingdoms. During this time Tintagel (NHLE 1014793; MCO16987) emerged as a key royal stronghold in the 5th and 6th centuries AD. Recent geophysical survey and excavations beginning in 2016, part of the five year Tintagel Castle Archaeological Research Project (TCARP), are making significant advances in understanding this post-Roman high-status settlement. Notably there is evidence of trading links ranging from the Celtic Sea to the eastern Mediterranean, with the occupants of Tintagel appearing to have enjoyed a rich diet, as shown by bones of pig, cow, sheep / goat, oyster shells and fish (Nowakowski and Gossip 2017). These, and other ecofacts, have the potential to provide information on settlement status and economy for this period, with high potential for scientific dating to constrain the age of this settlement. At Gwithian occupation was demonstrated from the 5th to at least the 8th centuries AD, and comprised of settlements associated with a field system and evidence for small-scale (industrial) iron working. Similar to Tintagel, imported ceramics are present originating from the Mediterranean and France, with the distinctive native wares consisting of three major groups: 'Gwithian Style', 'Grass-marked' and 'Bar-lug' (see summaries in Nowakowski et al. 2007). A number of other settlements and field systems became established during this time, though in many instances continuation or minor modification to earlier features takes place.

A major force for change during the 5th and 6th centuries was the introduction of Christianity from Wales, the Mediterranean and Gaul. During the 6th century the monasteries of St Nectan's and St Brannock's are established at Hartland and Braunton respectively. On Lundy four gravestones within the graveyard on Beacon Hill, from the early medieval period, suggest the presence of Christian monks or nuns on the island, and excavations suggested a possible monastic community. In Cornwall the earliest religious communities took the form of enclosed settlements, not unlike the contemporary rounds, known as lanns. The earliest Cornish crosses, finely ornamented with interlace designs, date from the late 9th century and served both as memorials and as churchyard crosses. By the 10th and 11th centuries many more religious sites had been established. Important manors had their own chapels and every small group of hamlets would have had its own burial ground. Most pre-Norman farms have continued in use to the present day but one settlement of the 10th and 11th centuries, buried beneath the sand at Mawgan Porth, was found on excavation to be a hamlet of rectangular houses, and is a forerunner of the typical later medieval hamlets. At this time it is also thought that Barnstaple might have been instigated as one of the Anglo-Saxon burhs (MDV106447).

Isolating early medieval records within the HER's by periods is complicated by the inclusion of many medieval features into this category, leading to an over-abundance of such features within Cornwall by comparison to North Devon. Many of the observed field systems are of unspecified age and therefore simply attributed to broad 'medieval' categories.

10.6.2 Research Priorities for the early medieval period

Moving to the regional level, SWARF highlights the following priorities that have been, or can be, addressed within the RCZAS study area for this period:

- Aim 1f. Greater use should be made of ceramic petrology, lipid analysis and other techniques to track pottery production and use in all periods
- Aim 10e. nature of the late-Roman / post-Roman period, continuity of sites, and identification of post-Romano-British material culture and the influence of Christianity on these transitions
- Aim 31: Address the long-running debates about early medieval landscapes and territories
- Aim 44: Develop an understanding and identification of early medieval technologies.
- Aim 44a. hints of continuing pottery production need to be examined as a potential key to non-elite material culture, with other classes of artefact identified and considered in the same way.

10.7 Medieval (AD 1066-1540)

10.7.1 Overview

The Norman Conquest saw the complete replacement of one ruling elite by another, and as part of this new rule extensive castle-building took place, including the construction of a motte and bailey type in Barnstaple (MDV19999), Bossiney (NHLE 1006708) and Botteraux (NHLE 1005455), and the naturally defended island for Tintagel Castle (NHLE 1014793). As in other parts of Britain, the 11th to 14th centuries was a period of economic and population growth resulting in the development of open field systems, and the appearance of many small towns, with the economy across the area developed such as trade, fishing, quarrying, the cloth industry and, in the west, the tin industry. During this period the present landscape character is determined largely from medieval enclosure (e.g. medieval enclosure, medieval enclosure based on strip fields, modern enclosures adapting medieval fields).

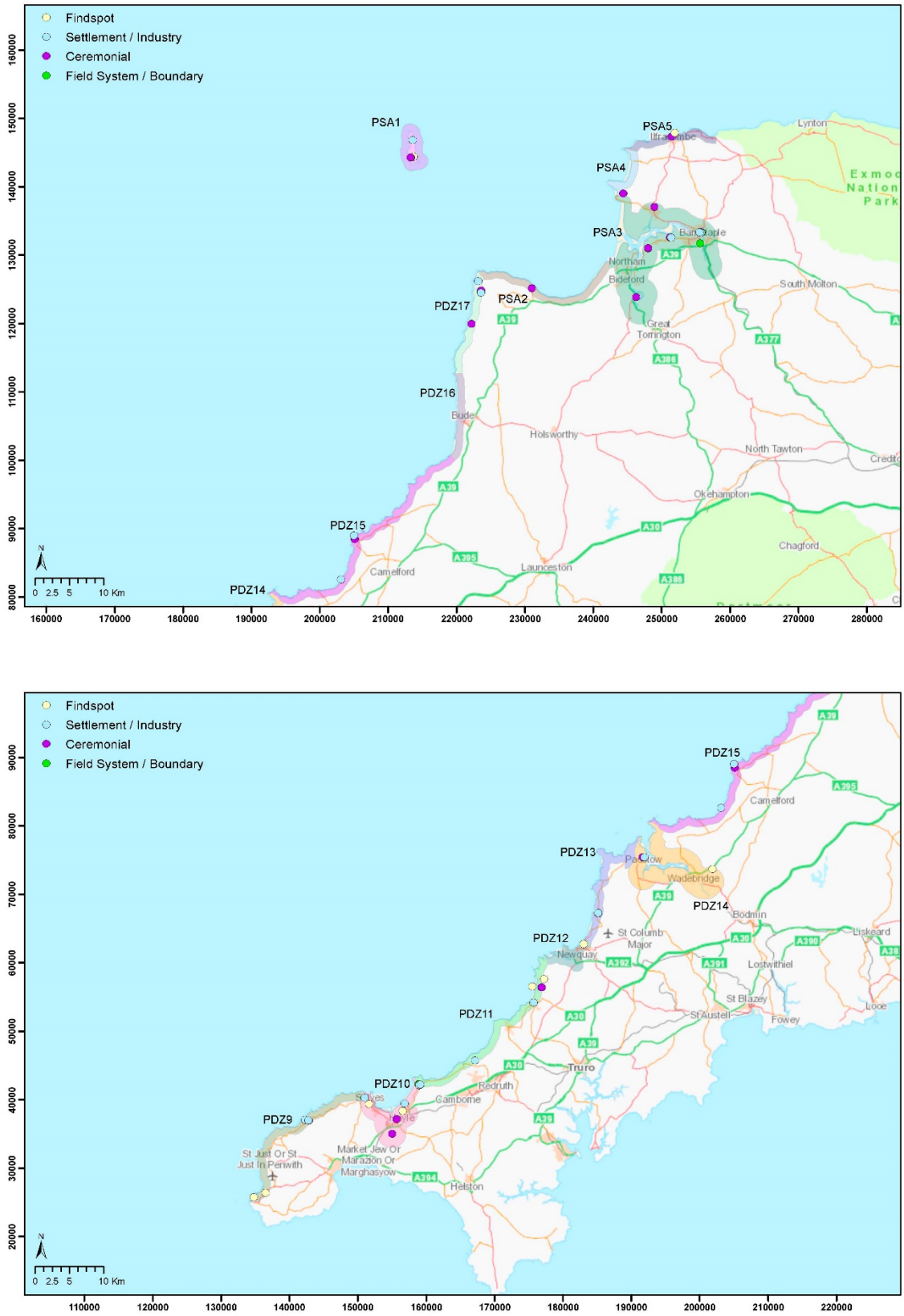


Figure 10.7: Distribution of early medieval archaeology. Contains Ordnance Survey data © Crown copyright and database right 2019

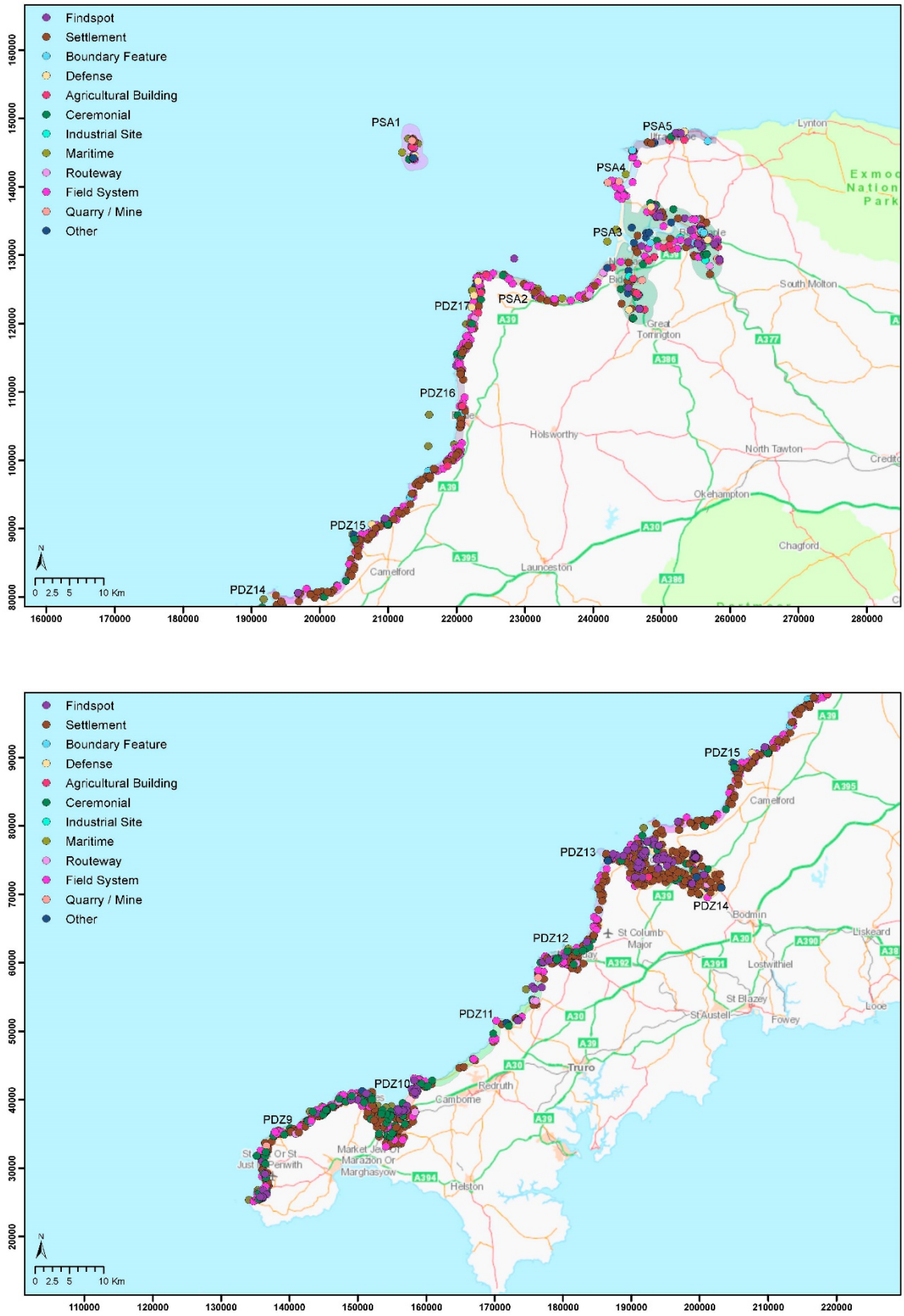


Figure 10.8: Distribution of medieval archaeology. Contains Ordnance Survey data © Crown copyright and database right 2019

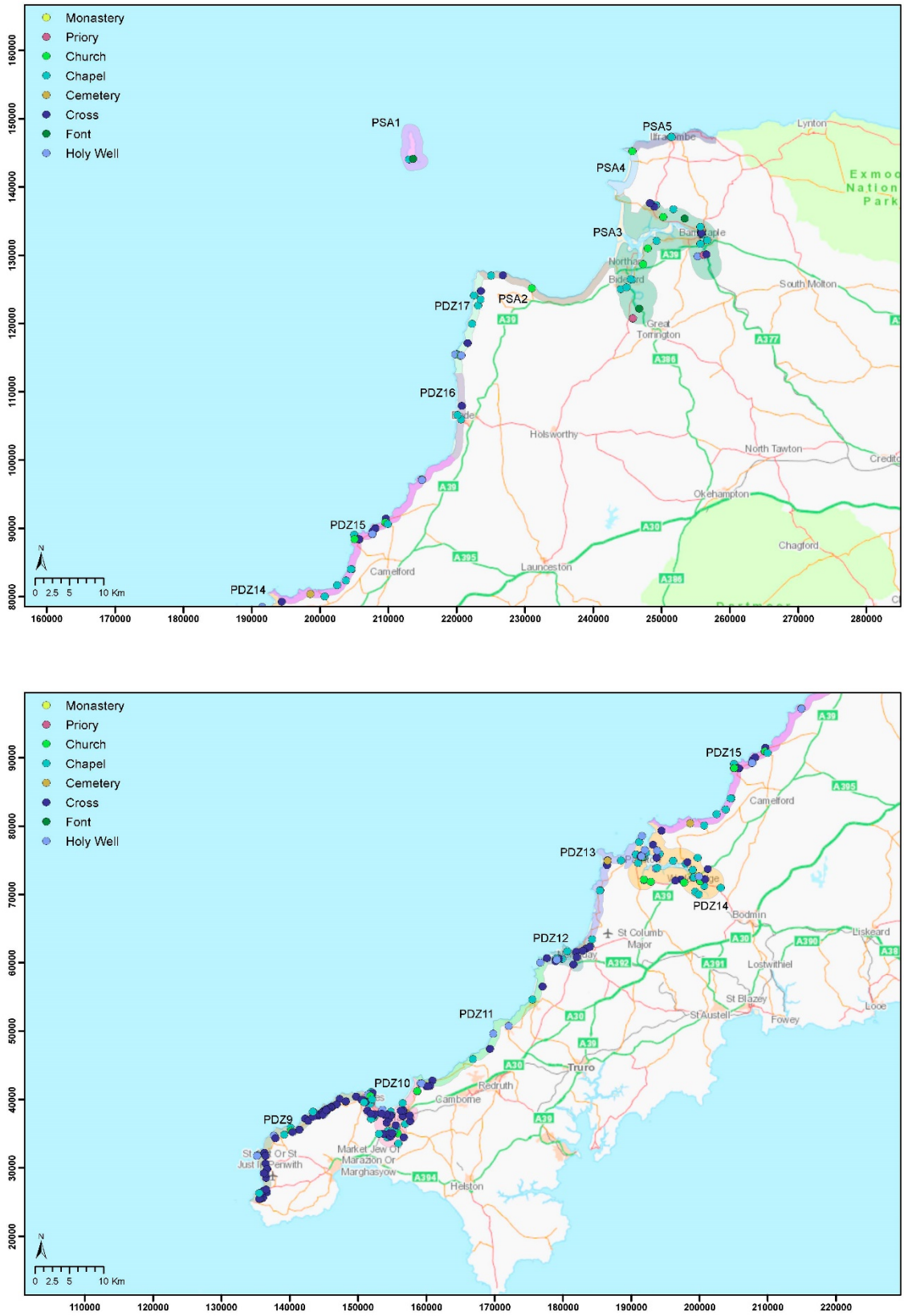


Figure 10.9: Distribution of medieval places of worship. Contains Ordnance Survey data © Crown copyright and database right 2019

In Cornwall the medieval period saw the development of a series of small to moderate sized urban market centres, many of which originated as planted settlements laid out by major local landowning families during the 12th to 14th centuries, with several on the coast such as Boscastle and St Ives. Some towns were located on spine roads and routeways but most had connections with the sea, either directly or along a tidal river, as fishing ports, trading ports or both. A number of the new urban creations have a similar "planned" layout, consisting of a main axis laid out along the spine of a ridge with burgage plots running back from the roadway down the flanks; several of those following this pattern have a castle on the same axis and also incorporate early market places, such as St Ives (MCO27310), Newport (MDV43066) and Bideford (MDV78878). Bridge building also took place to allow trade to easily cross the rivers, such as the construction of the Long Bridge in Barnstaple in the 13th century (MDV827). The manors also started to develop deer parks by the end of the medieval period, such as at Lanherne, St Mawgan (MCO25936), and it is also recorded that deer were shipped to Lundy in 1225 to stock a deer park (MDV64355).

During the medieval period the church continued to expand its influence with a profusion of chapels, churches and other religious sites, including a monastry at Padstow (MCO26597) and Priories of St Mary Magdalene in Barnstaple (MDV4488), Monkleigh (MDV21500), possibly at Tawstock (MDV72573) and Hartland Abbey. Many of the parish churches are on sites that have probably been in use for worship since the 5th or 6th centuries. Most were extensively rebuilt in the 15th century, though many retain traces of 12th and 13th century architecture. Features such as crosses are also found across the area, though notably concentrate in West Penwith.

Tin would still have been largely excavated by tin-streamers. Although underground mining had commenced during the 13th century for silver in south Devon, it was not until the early 16th century that tin mining would become necessary as surface lodes became exhausted. The earthworks resulting from the tin-streaming are visible in the upper reaches of the river systems, while further downstream sediment deposition within the lower courses and estuaries would have occurred. During the 13th - 16th centuries the centre of tin production shifted from the streamwork-dominated eastern stannaries to the west where opencast and shallow underground mining was more common. The ore was crushed in water-powered crazing and stamping mills and the tin smelted in blowing houses. Mining sites defined as being medieval in date are limited within the area, but include a shaft at Watch Croft (MCO50502) and mines at Boscubben (MCO27740), Park Bunny (PCO38424), Penhale Camp (MCO32800) and Towan Head (MCO33156).

Medieval harbours with existent structures remaining can be found at Port Isaac (MCO4718), St Ives (MCO4731), Newquay (NHLE 1137775), Portreath (NHLE 1328173), Boscastle (NHLE 1143473), Hartland Quay (NHLE1104452), Woolfardisworthy (MDV58161) and Ilfracombe (NHLE 1203010). However not all harbours would have consisted of built structures, with many coves simply consisting of landing points, especially where activities such as fishing were most prevalent. Twenty-seven wrecks are listed in the wreck database for the medieval period, with eight of these named vessels. All were carrying a mixture of general cargoes, including textiles, wood, hides and iron. With the exception of the Protected Wreck at Gull Rock, on the eastern side of Lundy (NHLE 1000053), only general positions for the wreck losses are known with no evidence of wrecks visible on the seabed in these areas. Hazards to shipping are reflected in the adoption of the Chapel of St Nicholas, Ilfracombe (NHLE1208792), as a lighthouse since at least 1522.

Fishing is well-attested as an important local industry throughout the medieval period, with documentary evidence from the Taw estuary demonstrating fishing, possibly using fish weirs, as far back as the Saxon period, and by 1086 it was recorded in Domesday that Bideford had the most valuable salmon fishery in Devon (Preece 2005; 2018). While many of the weirs may be post-medieval in age, and some show clear signs of multiple phases of rebuilding and reuse of old posts, a number of structures could be of medieval date. Such structures have been the topic of frequent disputes over their risk to safe navigation, which has been extensively recorded, with the larger structures recorded on 19th century Admiralty charts. These weirs were extensively investigated by the North Devon Archaeological Society (NDAS) in the early 2000s, but the dating of these structures still remains elusive. The two most likely candidates for pre-19th century and possibly (early) medieval aged alignments are Horsey Ridge (MDV103068), referred to in a charter probably dating to 857AD which details the gift of ten hides of land at Braunton to the Abbot of Glastonbury for the 'taking of fish for his house', and Crow Point (MDV102756), which is referred to as already being existent by 1573. If an early phase for the Horsey Weir was identified, for instance, this could make it as significant as similar finds from across southern Britain, albeit further east, such as those dated in the Blackwater (Strachan 1998; Hall and Clark 2000; O'Sullivan 2003), Severn (Chadwick and Catchpole 2012; Brunning 2007; Catchpole et al. 2013; Allen and Rippon 1997; Godbold et al. 1994), banks of the Solent (Tomalin et al. 2012; Cooper et al. 2017) and Holme Beach, Norfolk (Robertson and Ames 2010). The Horsey Ridge site was assessed for scheduling in 2015 (and subsequently rejected) but only two post-medieval structures were observed, though it was probable that other remains were buried beneath the sand.

10.7.2 Research Priorities for the medieval period

Moving to the regional level, SWARF highlights the following priorities that have been, or can be, addressed within the RCZAS study area for this period:

- Aims 19b and 47: medieval economy - Identifying changes in medieval fishing.
- Aim 21d: Site-based studies have provided environmental evidence in the medieval period but further work is needed to link sites to the wider landscape and better-dated contexts.
- Aim 38j: Although the massive medieval and post-medieval rise of the tin and copper industries in Devon and Cornwall is relatively well-known archaeologically, its sheer scale, importance, and variety means that there is still much important work to be done.
- Aim 60: Use the excavation of medieval and post-medieval burials to study wider population and social issues.

10.8 Post-medieval to modern (post-AD 1540)

10.8.1 Overview

In the post-medieval period individual farm holdings were created separate from the rest of the community. There was a significant expansion in agriculture, especially during the late 19th century, which saw many older farms enlarged and new ones created. New settlements were usually single farms rather than hamlets; their fields distinguishable from those derived from the medieval pattern. By the 17th century the previously open field systems of the medieval period in Cornwall had been enclosed with Cornish hedges. During this period there was also the loss of areas of rough ground to enclosures driven by an increasing demand for agricultural products. While some medieval manors and houses had deer parks and small gardens, it was in the 18th and 19th centuries that landscaping to form large parks and gardens surrounding large country houses occurred.

The early part of the post-medieval period was a time of significant growth for coastal ports such as Hayle, Padstow, Bideford, and Barnstaple, in terms of economy, population and physical development. By the late 16th century Bideford had become an active ship-building centre, producing ships of over 100 tons, amongst the largest in the South West. During the 17th century maritime trade had increased to the point that it became an independent port in 1672 with its own customs house, with further shipyards in the area at Appledore, Barnstaple and Rolle Canal. During this period extensive quay construction took place to cater for the maritime trade demand, though much of this has subsided since the end of World War II.

This stretch of coastline was home to parts of Britain's fishing fleet. These vessels resided both on small village slipways, such as that at Penberth Cove south of Sennen, and in larger harbours like those at Port Isaac, Padstow, and St. Ives. Many of these harbours underwent development and improvement with larger moles being constructed and increased harbour walls, such as at Port Isaac. Britain's fishing fleet and the North Atlantic fisheries are proposed as a major area where British sailors developed their skills for seafaring around the UK and beyond. Furthermore the area was home to distinct forms of working boat, such as the St. Ives Lugger, of which there are none still working. Fishing is an area that saw considerable change throughout this period with the introduction of steam driven trawlers causing major changes to the composition of the fishing fleets, with luggers and their counterparts being completely replaced by steam and paraffin motor vessels.

Along the coastline there are at least 52 separate ports, harbours and landing places, stretching from Sennen Cove in the west to Combe Martin in the North East. In addition to these sites, place names such as Brandy Cove, Brandy Cave, and Shipload Bay may point to additional landing sites associated with the unloading of smuggled goods. These coastal towns also underwent phases of urban expansion between the 16th and 19th century, resulting in changing building styles and town plan layouts. Within many of the coastal towns, however, a central early post-medieval core remains and these are typically associated with listed buildings and conservation zones.

The estuaries also hosted tide mills during this period, such as reported from Bideford, Fremington, Hallsannery and at Trevorrick within the Camel estuary. Within these estuaries evidence of fishing is also preserved, in particular the extensive fish weirs of the Taw-Torridge Estuary (see Preece 2005; 2018). Within the Taw-Torridge estuary there are several 19th century embankments that were constructed for land claim or flood defence purposes, such as at Broad Sands, East-the-Water and Northam. Two locations along the coastline are suggested as possible saltern sites based upon place name evidence or documentary records, but no firm evidence of this activity has yet been uncovered.



Figure 10.10: Bude Tidal Pool, with flagpole on Summerleaze Point visible in top right. Looking north.

This coastline has a long history of shipwrecking events. These resulted from natural events, such as storms or wrecking on the treacherous coastline, and the impact of maritime conflict. Salvage from wreck sites has resulted in parts of these vessels now being displayed on dry land, such as the flagpole on Summerleaze Point, Bude, that is the former ship mast of the ketch *Elizabeth* that was wrecked in Bude Bay in 1912 (Figure 10.10). Within the intertidal zone there are many identified wrecks and hulks. These are mainly within the Taw-Torridge estuary, but also along beaches and at the foot of cliffs. Some of these wrecks relate to former naval vessels, while a large number are also likely to be associated with local maritime trade activities. Examples of these intertidal wrecks are those at Westward Ho! (NHLE 1432418), the wreck Northam Burrows (NHLE 1432949) or the supposed remains of the *Antoinette* on the Town Bar in the Camel estuary. The wreck at Northam Burrows is thought to be a Severn Trow, a vessel type of considerable importance to the development of coastal trade in the region but rarely found in the archaeological record. Further offshore wrecks show a diversity in age and purpose, though with a notable peak in vessels lost during World War I (see below).

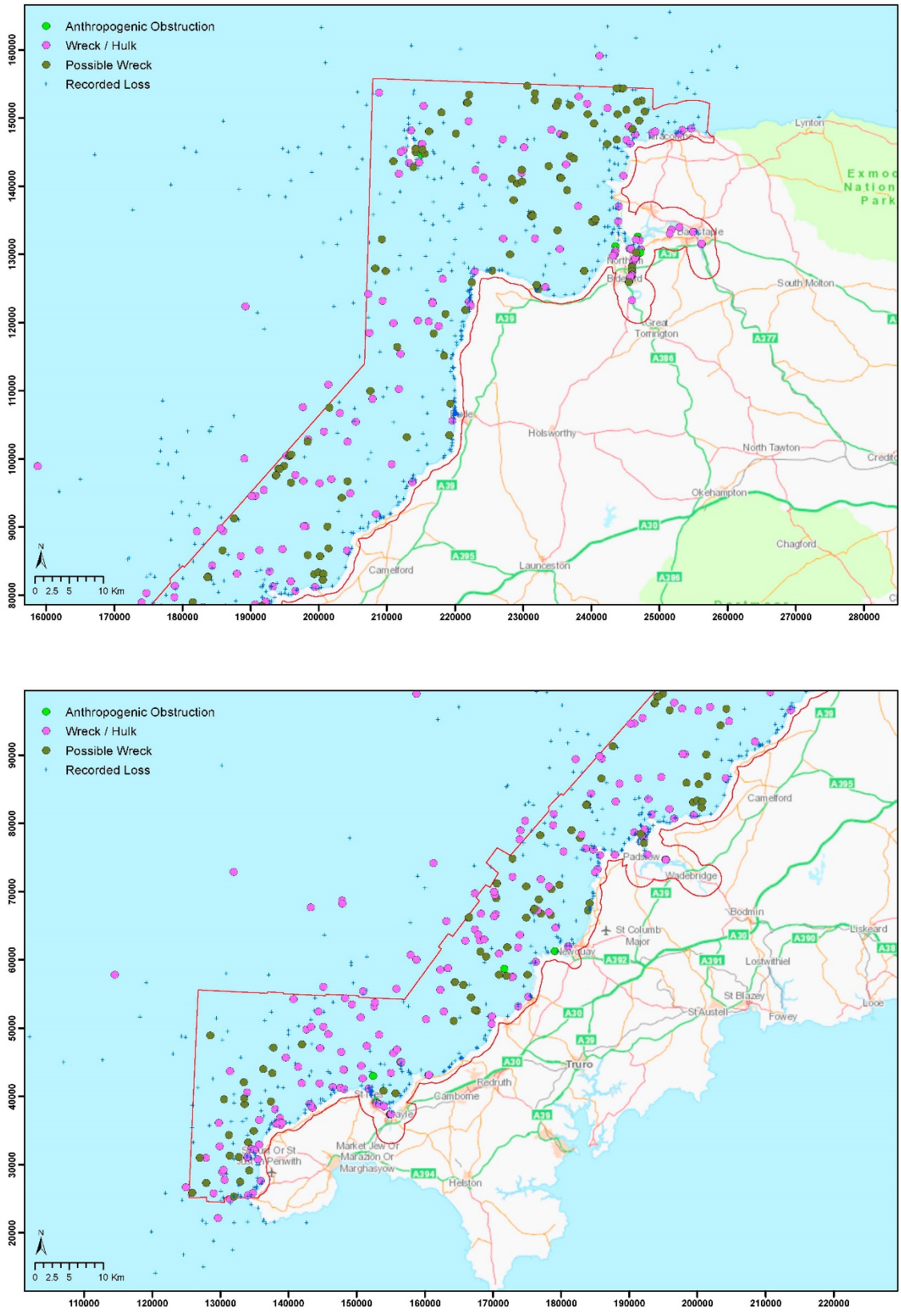


Figure 10.11: Distribution of post-medieval and modern wrecks and hulks along the coastline. Categories are divided into positive identification of remains, anomalies that could be wrecks, other human-derived obstructions, and known losses with no identified remains on the seabed. Contains Ordnance Survey data © Crown copyright and database right 2019

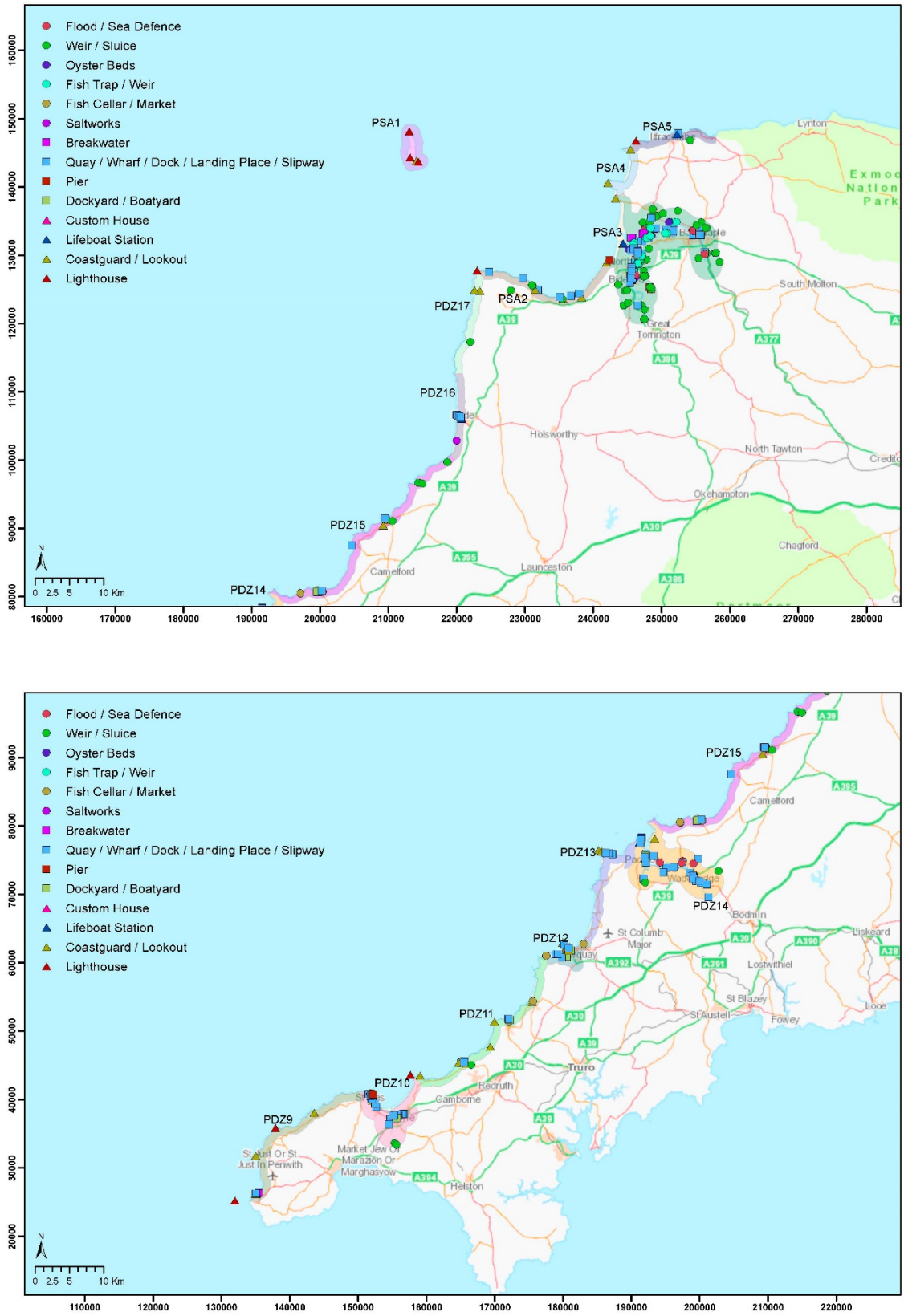


Figure 10.12: Distribution of post-medieval and modern maritime-related activity. Contains Ordnance Survey data © Crown copyright and database right 2019



Figure 10.13: Coastguard Station and lifeboat stations at Hawker's Cove, Camel Estuary. Photo by Chris J Dixon, licensed under Creative Commons Attribution-Share Alike 2.0 Generic

For some of the wrecking events, the bodies of the seamen are buried at sites along the coastline, such as Holy Trinity Churchyard (Ilfracombe), Raparee Cove (East of Ilfracombe), West of Downend House, Morewenstow, St Genny's Church between Saltstone and Penally Point, Pentireglaze Haven, Polzeath, Treyarnon Bay and Trevedra Cliff. This density of recorded losses and wrecks demonstrates clustering in areas that established a notoriety for wrecking events during this period, notably off Land's End, St Ives Bay, Padstow Bay, Clovelly, Bideford Bay and Lundy. Even when the recorded losses where no remains are visible on the seabed are removed from this list, the same clustering is apparent. The region's main estuaries, the Camel Estuary, St Ives and Bideford Bay, contain well-known navigational hazards such as Doom, Hayle and Bideford Bars, which also provide a focus for recorded losses. Tied to these wrecking events are features associated with safety at sea, such as lighthouses (eight of which are listed buildings), coastguard stations and cottages (three of which are listed buildings), waymarkers, and lifeboat rescue stations (only one at Clovelly is a listed building; NHLE 1333114) (see Figure 10.12). One of the best representations of endeavours to improve safe navigation into these estuaries is provided at Hawker's Cove, Padstow, where a complex of coastguard cottages and lifeboat stations remain, the latter going out of use when the Doom Bar shifted west across the channel and a new lifeboat station was constructed at Trevose Head.

The importance of this coastline for maritime trade is clearly demonstrated by the wreck record (Figure 10.11), both within the intertidal and offshore areas. While much of the focus may be towards

marine traffic, there are various railways and tramways constructed in the 19th century that are now either removed or disused, such as the former Bideford, Westward Ho! and Appledore Railway closed in 1917 when it was requisitioned by the War Office during World War I and never subsequently re-opened. The Ilfracombe, Torrington, Bude and Padstow branch lines were closed between 1965-1970 due to falling usage. Increasing adoption of the motor car and recommendations within the Beeching Report (1963) resulted in the national rail network only serving the north coast through terminuses at St Ives, Newquay and Barnstaple. Some of the abandoned lines have been repurposed as footpaths and cycle routes, such as the Camel and Tarka Trails, with rail infrastructure, including stations, signal boxes and bridges still visible along these routes. Other transport features within the area which have also been decommissioned include smaller narrow-gauge railways used to support mining activities or fishing communities, such as the Newquay tramway connecting the harbour to the railway station, and the St Columb Canal, also known as the Edyvean's Canal, that was authorised in 1773 but was never completed.



Figure 10.14: Towanroath Shaft Engine House, Wheal Coates. Photo by Chris Allen, licensed under Creative Commons Attribution-Share Alike 2.0 Generic

The development of industrial-scale mining of the 18th-20th centuries is one of the most extant and visible feature of Cornwall's past, notably driven by technical advances in steam pumping enabling deep mining, by the end of the 18th century. The result of this massive level of mining activity, and the area's global significance as the largest producer of copper, tin and arsenic, is recognised in the designation of the Cornwall & West Devon Mining Landscape World Heritage Site. The industrial landscape is composed of thousands of mine shafts, numerous engine houses (Figure 10.14) and the widespread remains of tin and arsenic processing. The area's importance is also derived from the role of pumping engine technology in establishing mining enterprises around the world. The deep mining developed along the Cornish coast was exported as far afield as South Africa and South America, contributing to a major expansion of industrial-scale mining. Associated industries, such as the foundries at Copperhouse (MCO4668) and Harveys (MCO1870), have been largely demolished. Particularly dense concentrations of such activity on the coastline are found between Penhale Point and Portreath, and on the West Penwith peninsula around Pendeen (Figure 10.15). Additional mining activity within the area includes anthracite and culm mines near Bideford, along with extensive quarrying (Figure 10.16), such as slate quarries around the Strangles/Delabole and coastal cliff quarries such as found between Delabole and Tregardock. Coastal paths from the cliff top to coastal slope/shore are often associated with these quarries. Many of these landscapes retain the connections and physical relationships between the pits, engine houses, administration buildings (including Count Houses), settlements, and other accommodation buildings such as those evident at Botallack, Levant, and East Pool Mine. Particularly dense path networks are present in areas of slate quarrying, such as at East Delabole, and these tend to be north of Tintagel. By comparison, the cliffs and slopes to the south of Tintagel have fewer paths, possibly a consequence of a different type of mining (e.g. tin). Some harbour structures are connected to the increase in industrial-scale mining in the area. Harbour elements were constructed to ship ore out of the county for processing, such as that at Portreath in the 18th century. These sites are particularly important when connecting the area to wider discussions of coastal trade networks and industrialisation. Furthermore many of these areas contribute to a rich narrative and historical identity locally. Stories of mine disasters like the Man-Engine at Levant, and successes such as Richard Trevithick's role in the development of mining and steam technology, play a considerable role.

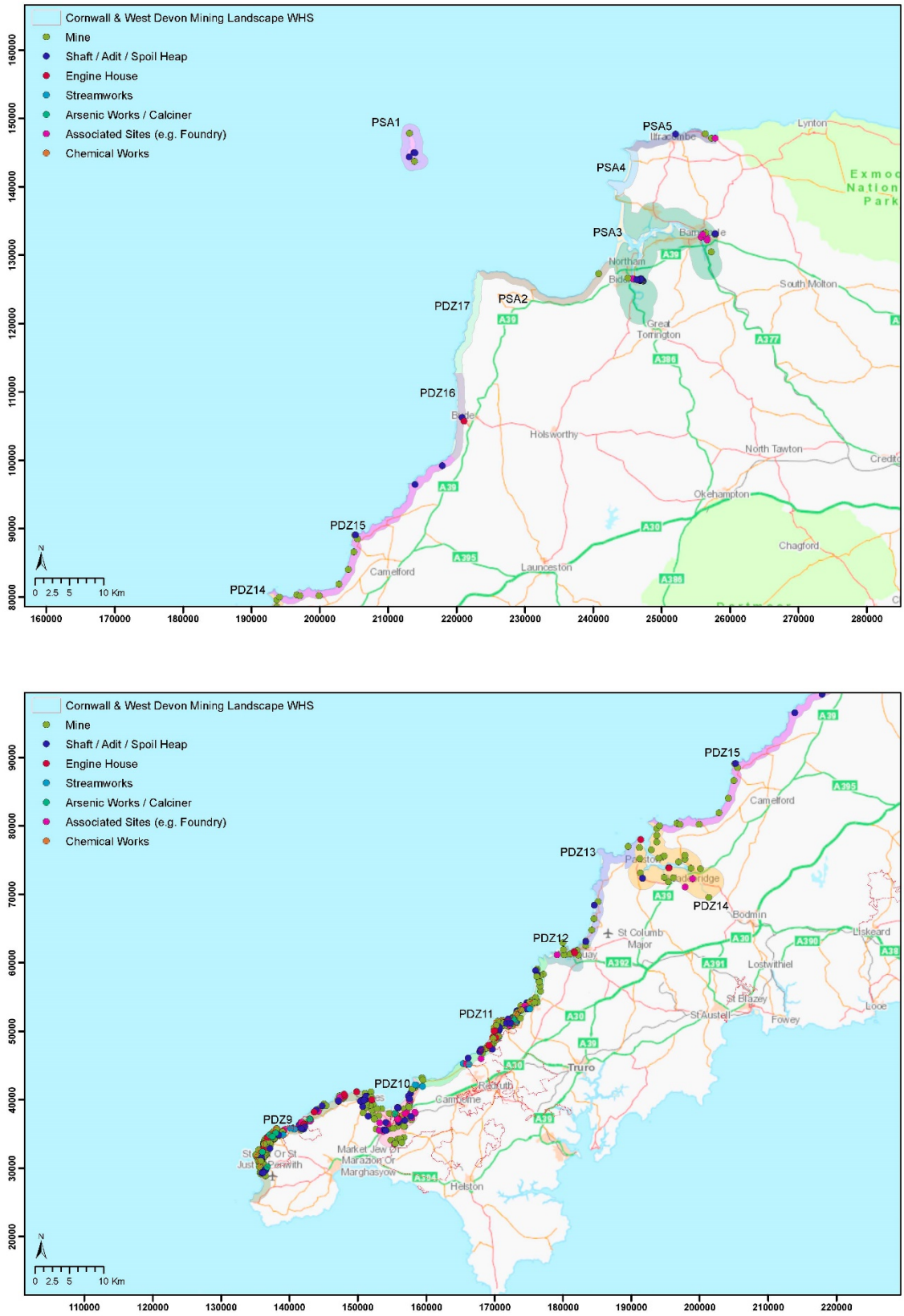


Figure 10.15: Distribution of post-medieval and modern mining activity. Contains Ordnance Survey data © Crown copyright and database right 2019

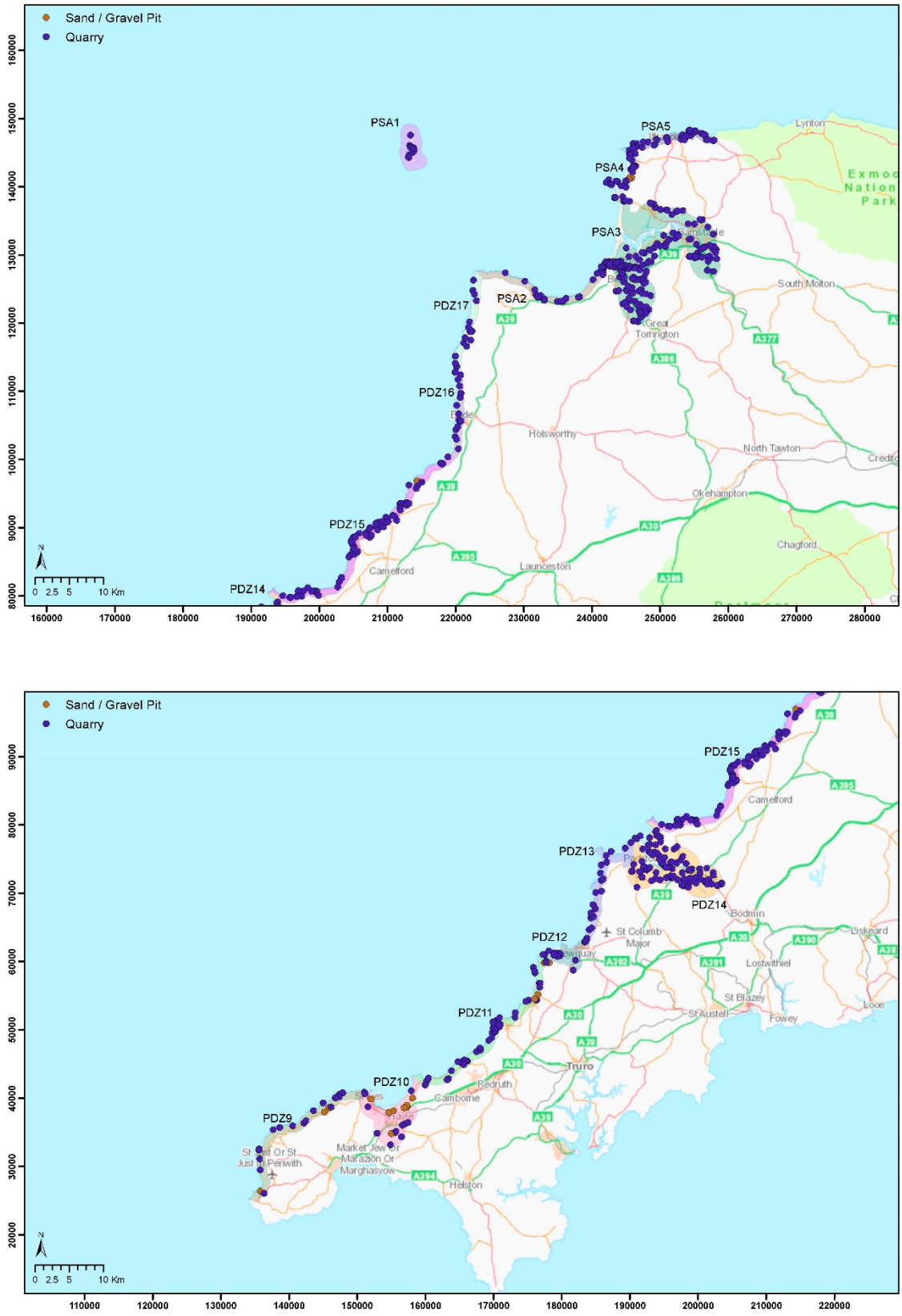


Figure 10.16: Distribution of post-medieval and modern quarry activity. Contains Ordnance Survey data © Crown copyright and database right 2019

The use of the coastline during World War I and II was extensive and has been well-documented during both NMP programmes and the Defence of Britain project (see Figure 10.17). However, post-medieval defences also include those from the late 18th century developed in case of an invasion during the Napoleonic war. These include a battery near Portreath (MCO26420), along with a series of probable pre-20th century rifle ranges, such as found at Duckpool (MCO39464), Crooklets (MCO38684) and Godrevy (MCO42391). The 20th century military structures along the coastline can be seen to form distinct clusters of military activity (Figure 10.17), with defensive structures particularly clustered around the main estuaries such as Hayle, Camel and Taw-Torridge. However, defences were also focused at smaller harbours/beaches that could have served as landing points for an invasion, such as Bude, Widemouth and Sennan Cove. Defences typically included beaches mined and protected by barbed wire, along with gun emplacements (including coastal batteries) and pillboxes. On some beaches and coastal lowlands, anti-glider/landing defences were also constructed also present (e.g. MDV55668).

During World War I two grass airfields were established on the north coast in 1918 at Crugmeer (RAF Padstow; MCO42926) and Northam Burrows (RAF Westward Ho!; NRHE 1486497), used for both coastal reconnaissance and anti-submarine patrols. Both of these were disbanded in 1919. During World War II more extensive airfields were constructed along the coastline as part of the RAF's Coastal Command to defend against raids, protect convoys of merchant shipping from German aircraft and engage German U-boats. The airfields within the study area were located at Trevellas (RAF Perranporth; MCO35735), Nancekuke (RAF Portreath; MCO33305), Morwenstow (RAF Cleave; MCO39221), RAF Chivenor (MDV51992; which eventually subsumed part of the earlier Barnstaple and North Devon Aerodrome; MDV78134) and RNAS Treligga (HMS Vulture II; MCO44613). Just inland of the study area were RAF Davidstow Moor, RAF St Eval, Trebelzue (which became RAF St Mawgan), Prefannack and RNAS St Merryn (HMS Vulture then HMS Curlew). Buildings (and indeed the runways) remain at many of these sites, with some still in military or commercial use today. To protect the airfields, and other key strategic targets, anti-aircraft guns were stationed along the coast, running from Porthcurno (MCO42258) to Yelland Cross, Taw-Torridge estuary (MDV102603). A number of British and German aircraft are reported as lost over the sea but no remains have so far been identified on the seabed.

RNAS St Merryn was designed to train fighters and torpedo bombers for the aircraft carrier fleet. This produced a distinct layout of short runways aligned in different directions so aircraft could practice take-offs into the prevailing wind direction. To facilitate the training, RNAS Treligga (HMS Vulture II; MCO44613) was adapted to be modelled on a Pacific Island to facilitate training, and was part of the wider Treligga Downs bombing range (MCO36895). Extensions of the bombing ranges were found southwestwards down to Trevose Head (MCO30007), including the offshore Gulland Rock (MCO46154), floating targets near Gurley Rock (MCO46154) and cliffs around Trevan Point (MCO29898). The other major centre for training during the World War II was focused between Morte Point and Braunton Burrows (MDV73990). In 1943, in preparation for the D-Day landings, the US Army needed an area to learn how to assault a heavily fortified and defensively prepared coastline such as those to be found on the Normandy coast. During this period over 10,000 American GI's used the training camp. While much of this activity has been mapped, based upon existent aerial photographs and numerous standing structures, the shifting sand dunes and coastal erosion has meant that new archaeological sites associated with this activity are constantly being exposed.

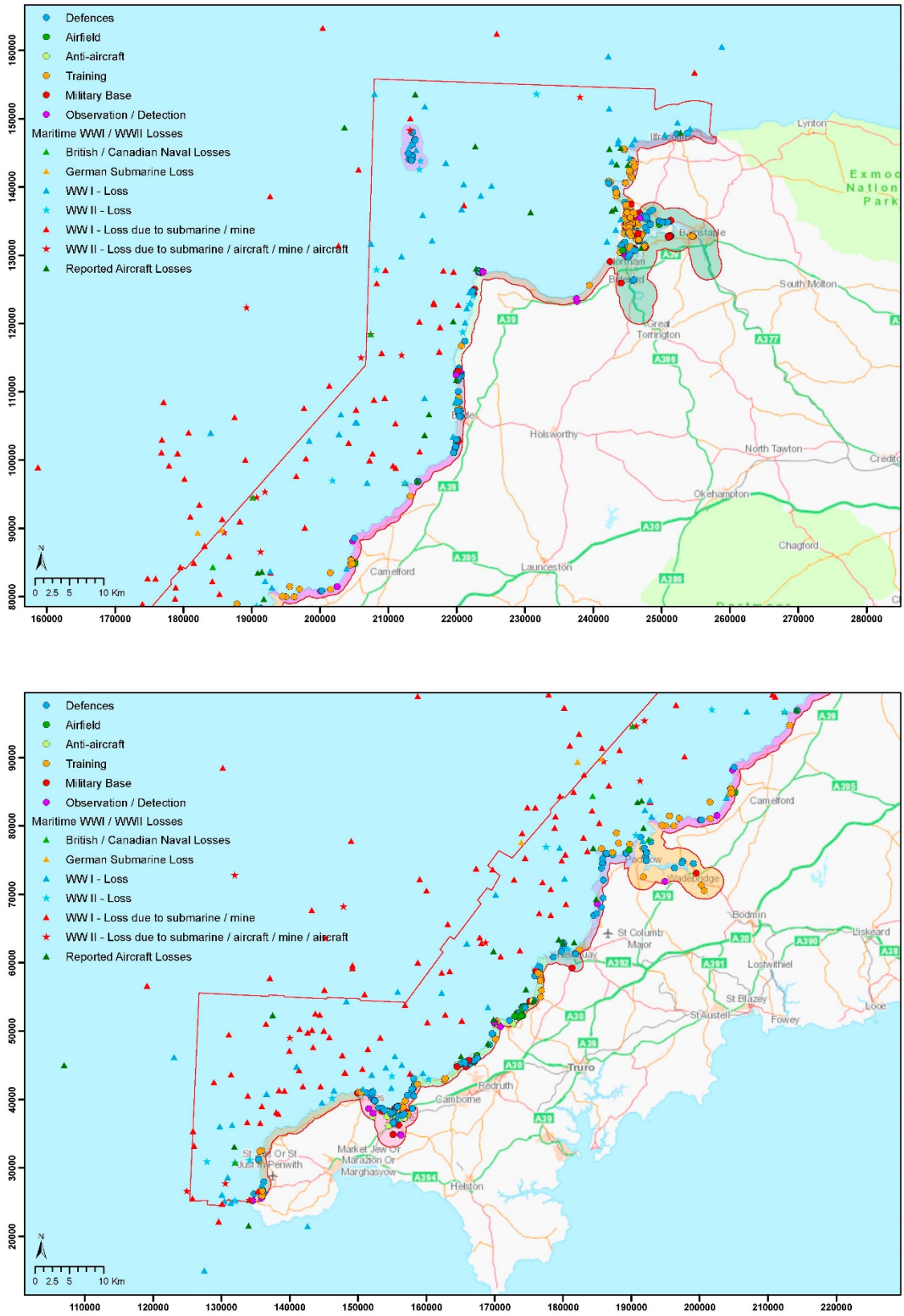


Figure 10.17: Distribution of defensive structures and World War I / II maritime losses. Contains Ordnance Survey data © Crown copyright and database right 2019

The wreck record (Figure 10.17) shows the dominance of losses during World War I, as well as a geographical division in the nature of losses encountered at the time. Nearshore losses relate to a mixture of events including storms, running aground and collisions. Further offshore the record reflects losses driven by engagement with submarines, mines, and (during World War II) aircraft. The nature of the wreck record changes through World War I. Many of the early submarine encounters led to the crew being evacuated from the vessel prior to sinking by the German U-boats. However this later changed, especially during World War II, when ships would be sunk with their crew still aboard, leading to these sites being classed as war graves. The number of losses due to submarines significantly diminishes within Bideford Bay east of a line between Lundy and Hartland Point. Three German submarines remain on the seabed on the outer edge of the study area west and northwest of Padstow: the World War I UB-65 (type UBIII; NRHE 1402209; protected under the Protection of Military Remains Act 1986) and World War II U-400 (Type VIIC; NRHE 1570063) and U-1021 (Type VIIC/41; NRHE 1570055), both sunk by mines (see overview in Walker 2014).

Tourism and recreation has played a major role in the use of this stretch of coastline. Many locations relied on visitors as a key economic contributor. Holiday camps have been constructed along the coast since the early 20th century, but before that a series of piers were constructed at locations such as Westward Ho! in the 19th century, with the aim of further developing settlements as potential resorts. Coupled with these were hotels and theatres/pavilions along with access to the sea through either the extensive golden sands or construction of tidal swimming pools, such as the Tunnel Beaches at Ilfracombe (1820) and the Bude sea pool (1930s) (Figure 10.10). Tourism remains a key economic driver along the coastline with tourist attractions and walking routes, notable the South West Coast Path, providing increased public access. There has also been a continued development of holiday camps and parks such as those at Perranporth and Constantine Bay, reflecting the continuing importance of this coastline as a tourist destination.

10.8.2 Research Priorities for the post-medieval period

Moving to the regional level, SWARF highlights the following priorities that have been, or can be, addressed within the RCZAS study area for this period:

- Aim 6a: The continuing popularity of metal detecting combined with the Portable Antiquities Scheme will continue to offer new opportunities to examine the depositional contexts and associations of new finds
- Aim 16i. In the Medieval and Post-Medieval periods diagnostic material culture becomes more commonplace, but there is a need to link scientific dating techniques to documented and well-researched sites.
- Aim 37: Increase our knowledge of maritime archaeological sites.
- Aim 38: Widen our understanding of the extraction, processing and transportation of minerals, stone and aggregates.
- Aim 38a: Use of alluvial and peat sequences to provide a chronology for, and to assess, the impact of mining activity
- Aim 38j: Although the massive medieval and post-medieval rise of the tin and copper industries in Devon and Cornwall is relatively well-known archaeologically, its sheer scale, importance, and variety means that there is still much important work to be done.
- Aim 38l. As well as the “major metals” of tin, copper, and lead, the Devon and Cornwall ore fields are notable for its range of other extracted metals and minerals; many have received little or no archaeological attention

- Aim 38n. Quarrying has been a further major extractive industry of the region. These quarries, and their associated infrastructure in their wider cultural and economic setting, remain understudied.
- Aim 45: Broaden our understanding of Post-Medieval to Modern technology and production
- Aim 48 (53): Widen understanding of Post-Medieval and Modern transport and communications.
- Aim 60: Use the excavation of medieval and post-medieval burials to study wider population and social issues.
- Aim 64: Improve our understanding of the less-researched areas of post-medieval to Modern defence and warfare:
- Aim 64a and 64b: Opportunities should be identified to better understand the nature of fixed defences, particularly the less monumental structures.

11 Recommendations for future studies

11.1 Pleistocene deposits

Extensive Pleistocene deposits are found along the coastline, but their age remains poorly understood. Focus should not just be on the raised beaches along the coastline, but also by investigating the river terraces of the Taw and Torridge which have so far eluded detailed investigation. Robust dating techniques, including OSL, AAR and ESR, should be applied to these sites to significantly improve our understanding of the Pleistocene development of the area, and potentially identify areas where Palaeolithic material might be present.

11.2 Submerged forests and palaeolandscapes

Organic deposits associated with submerged forests and palaeolandscapes have often been reported as being at risk of damage as a result of costal erosion and flooding associated with sea level rise and extreme storm events. The RCZAS has identified 31 locations where submerged forests have been reported; of these only 11 of these have been radiocarbon dated. The work at Mawgan Porth as part of this RCZAS has demonstrated that partnerships between local societies and palaeoenvironmental specialists could result in the successful identification, sampling and assessment of sites when they are revealed after storm events. Opportunities to ensure these sites are identified and accurately positioned would significantly improve our understanding of the distribution of these sites, and provides a good opportunity that can be achieved through the CITiZAN programme.

Offshore deposits, including palaeochannels and submerged palaeolandscapes, have been shown to be present along the coastline and therefore provide the opportunity to understand Late Pleistocene and early Holocene environments. Opportunities to investigate these areas, whether through research or developer-led funding, should be identified.

11.3 Analysis of prehistoric artefact scatters

Extensive flint scatters have been identified along the coastline, but little detailed assessment of the recovered assemblages has been made beyond specific projects such as at North Cliffs (Jones et al. 2018). Much of this material appears to be in private collections, and it is important that this can be located and recorded

11.4 Intertidal wreck sites

The region has a rich maritime history, and is infamous for shipwrecks. The potential exists for archaeological evidence of maritime sites of all periods from the Mesolithic to the present day to be recoverable from along the Cornwall and Devon coast and inshore waters. Maritime sites consist of either vessels (wrecks) or debris accidentally or deliberately lost overboard from a vessel (Wessex Archaeology 2007, 23). The assessment of the wreck record has helped to identify areas of highest probability for identifying wreck sites, along with positively identifying wreck sites along the coastline – many of which have never received archaeological investigation and recording. Identified wreck sites should be investigated to assess the condition of the sites and obtain positive identifications, wherever possible, on the age and type of vessels (and if possible name). Specific sites and areas that would benefit from further work include those identified in Samson's Cove and at Tremoutha Haven.

11.5 Scheduled Monuments

Various promontories along the coast have been used to site ceremonial monuments, cliff castles, for occupation and coastal defence, and as signal stations or hazard warnings. Cliff castles are particularly at threat from coastal erosion, with several listed on the HAR register, and are also vulnerable to scrub and tree growth. These sites would benefit from earthwork and geophysical surveys which would provide baseline information on their current condition against which future monitoring could be carried out. Such surveys would also help to understand these monuments in their wider context and have considerable educational potential for public interpretation and engagement.

11.6 World War II defences

Analysis of the sites that are most likely to be affected by erosion as a result of SMP policy have shown a high proportion of sites related to WWII coastal defence. Records relating to these assets have been enhanced by the NMP and the Defence of Britain Project, as well as site-specific recording and condition surveys undertaken at coastal batteries and radar stations. Field assessment should be undertaken on sites that fall within this category to determine their present condition.

11.7 Coastal industry, quarrying and quays

An assessment is required of the full range of historic quarrying and industrial activity on the north Cornwall and Devon coasts, with priority given to the identification and recording of sites, or their access points, are threatened by coastal erosion. Where access is limited, the use of UAV surveys and photogrammetric recording may be a preferred survey methodology. This work should be supported by documentary research.

11.8 Coastal settlements

Urban survey of smaller, less-studied, coastal settlements is likely to result in a higher density of recorded heritage assets, especially at long-established fishing and coastal settlements, as well as standardising the assessment methodologies applied to these settlements across the region. In North Devon, the DHCMTS methodology should be expanded to settlements such as Appledore, Clovelly, Combe Martin and Ilfracombe. In Cornwall, the methodologies employed in the Cornish ports and harbours project would benefit settlements such as Sennan, Portreath, Perranporth, Padstow, Wadebridge, Port Isaac, Boscastle and Bude.

11.9 Shipwreck burials and coastal cemeteries

Along the coastline there have been numerous reports of cremations and burials eroding from cliff exposures, with particularly high concentrations found within the Haryln Bay area. In the past excavation and recording has been reactive rather than proactive. Surveying of this coastline could help to establish if any proposective new sites might be uncovered. This work could be undertaken with community volunteers, such as through the CITiZAN programme, to educate locals in how to spot, protect and report any future burials revealed through coastal erosion.

11.10 Safety at sea

Shipwrecks are strongly associated with the Cornish and Devon coastline, and as a response lifeboat stations, coastguard lookouts and lighthouses have been constructed to help protect, or respond to, potential loss of life. These structures are often positioned in remote locations away from main settlements, and therefore fall outside conservation areas or other forms of statutory protection, with

very few designated as listed buildings. As many of these sites have now lost their primary purpose and adopted new uses (homes, holiday lets, etc) their character may be changed. A review of such sites, coupled with any recommendations for protection as listed buildings, would help to better understand and protect these iconic buildings associated with the maritime culture of the region.

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13 Appendix 1: Scheduled Monuments within the RCZAS study area

NHLE	Name	NGR
1001723	Two bowl barrows, one 220m east of Lower Longbeak and the other 320m east of Higher Longbeak	SS 19954 03896
1002512	Hillsborough Promontory Fort	SS5325347803
1002527	Earthwork E of Buck's Mills	SS 35888 23491
1002572	Three standing stones 550m, 700m and 820m north of Damage Barton	SS 47197 46472
1002639	Kenwith Castle 330yds (300m) SE of Kenwith	SS 43291 27381
1002640	Cross ridge dyke on Godborough Castle earthwork NW of Turner's Wood	SS 43667 27353
1003071	Courtyard house settlement with enclosure and fogou 235m south east of Porthmeor Farm	SW 43436 37071
1003086	Part of an early-Christian cemetery 65m north west of Tintagel church	SX 05026 88509
1003087	Mawgan Porth early medieval settlement and associated burial ground, 250m west of Lanerick	SW 85156 67257
1003088	Three bowl barrows forming part of a round barrow cemetery at Cataclews Point	SW 87050 76073
1003097	Promontory fort N of village	SX 14586 97650
1003098	Round barrow cemetery at Park Head	SW 84414 71305
1003106	Promontory fort called Bosigran Castle	SW 41622 37000
1003109	Wayside cross at Nanquidno Farm	SW 36439 29131
1003188	A standing stone 110m south of Whitestone Farm	SS 49562 46127
1003845	Embury Beacon camp	SS 21699 19503
1003847	Double stone alignment on Isley Marsh 535m north of Lower Yelland Farm	SS 49142 32884
1003864	Windbury Head camp	SS 28642 26633
1004234	Three promontory forts south of Trethias Island	SW 85469 73592
1004235	Round 600m south east of Tregolds	SW 92362 71063
1004252	Round 340m south east of Trevean	SW 41318 35294
1004257	Round in North Cliff Plantation 800yds (730m) NW of Tehidy Hospital	SW 64340 43751
1004258	Round with medieval re-use as a manor house at Crane Godrevy, 650m south east of Godrevy Farm	SW 58951 42672
1004259	Multi-period prehistoric settlement sites and associated field systems at Godrevy Towans	SW 58779 42270
1004260	Godrevy Headland - complex of prehistoric sites	SW 58176 42934
1004261	Animal pound 160m ESE of Gwithian church	SW 58789 41213
1004280	Tin mine calciner at Botallack Mine	SW 36377 33217
1004281	Fogou at Lower Boscaswell	SW 37653 34842
1004283	Two kerbed cairns 240m WSW of Boscregan	SW 35769 29680
1004291	Wayside cross 260m south east of Mayon Farm	SW 36079 25654
1004294	Standing stone 230m west of the Old Manor	SW 35453 25561
1004295	Fogou 70m north of Pendeen Manor Farm	SW 38360 35544
1004300	Promontory Fort called Trereen Dinas	SW 43209 38501
1004301	Watermill near Bosigran Castle	SW 41654 36845
1004369	Three bowl barrows, once part of a round barrow cemetery, at Barrowfields	SW 81924 62148
1004388	Promontory fort called Kenidjack Castle	SW 35462 32625

NHLE	Name	NGR
1004390	Part of a cliff castle called Crane Castle	SW 63487 43969
1004392	Three round cairns at The Warren on Pentire Point East	SW 78943 61487
1004422	Dovecote 35m south of the Vicarage, Tintagel	SX 05483 88382
1004423	Round cairn 180m north of Trevarthian	SX 04896 88039
1004454	Wayside cross called The Mexico Cross, 250m north east of Riviere Farm, Phillack	SW 56237 38408
1004460	Enclosure known as Treringey Round	SW81039 60436
1004461	Two bowl barrows 190m east of Zacry's Islands	SW 83405 63751
1004472	Three bowl barrows on the coastal ridges above Bude Bay	SS 20228 08907
1004479	Bowl barrow 200m south east of Scarnor Point	SW 98057 81108
1004484	Multi-span bridge called Trewornan Bridge	SW 98751 74278
1004487	Dovecote 90m SSE of Trevanion House	SW98934 71618
1004495	Bowl barrow 200m north east of Gonvena House	SW 99324 72918
1004498	Courtyard house settlement 335m south of Nanjulian Farm	SW36164 28874
1004512	Medieval chapel called St Helen's Chapel with a dwelling and enclosure at Cape Cornwall	SW 35234 31859
1004578	Hallsannery limekiln	SS 46059 24657
1004620	Rock art at Rocky Valley, 150m north of Trevillett Mill	SX 07279 89352
1004624	Round cairn on Carn Polpry	SW 35799 29832
1004625	Promontory fort called The Rumps	SW 93339 80998
1004631	Medieval chapel called Chapel Jane	SW 43416 38244
1005432	Stone cross in parish churchyard	SS 20550 15273
1005442	Two hut circles 380yds (350m) NE of Trevean	SW 41365 35665
1005443	Enclosure 220yds (200m) NE of Trevean	SW 41211 35534
1005445	Bowl barrow 120m south west of Horizon View	SX 17937 99534
1005446	Round 310m south of Mill Farm	SX 18660 99506
1005454	Post medieval sea lock at Bude Canal	SS 20394 06428
1005455	Motte and bailey castle at Boscastle	SX 09953 90847
1005456	Coastguard look-out tower and landmark 240m north of Portreath Harbour	SW 65508 45637
1006624	Wayside cross in the grounds of Prideaux Place 70m SSW of the house	SW 91341 75515
1006685	Prehistoric inhumation cemetery at Harlyn	SW 87779 75285
1006700	Medieval chapel called St Govian's Chapel, 200m south east of Gwithian Bridge	SW 58831 41830
1006708	Motte castle known as Bossiney Castle	SX 06572 88762
1006709	Trevena Cross	SX 05758 88410
1006712	Promontory fort and two bowl barrows at Trevelgue Head	SW 82639 63011
1006720	Small multivallate hillfort, early Christian memorial stone and C19 landscaped paths at Carnsew	SW 55663 37090
1006722	Standing stone 140m north west of Beersheba Farm	SW 52517 37129
1006740	Croftoe British village	SW 40661 35081
1006757	Cliff castle known as Maen Castle	SW 34767 25763
1007284	Linear earthworks, probably 17th century, W of Godrevy	SW 58253 43029
1007295	Iron Age defended settlement 550m east of Feadon Farm	SW 66421 44975
1007304	Railway bridge	SW 56703 38236

NHLE	Name	NGR
1007963	Medieval wayside cross at Whitecross, near Wadebridge	SW 96447 71997
1008167	The Three Holes Cross 550m west of Sandylands Farm	SX 01174 73669
1010439	Killibury Castle later Prehistoric hillfort	SX 01927 73623
1010845	St Erth Churchtown cross	SW 55071 35131
1010856	Doublestiles Cross, at the junction of Duchy Avenue and Henver Road	SW 83322 62016
1010860	Medieval wayside cross base, 140m south of Trevemper Farm	SW 81523 59728
1013462	Forrabury Cross, 40m SSW of Forrabury church	SX 09555 90853
1013666	The Ballowall Barrow incorporating entrance grave, cairn, ritual pits and cists 420m WSW of Bollowal Farm	SW 35525 31253
1014214	Trevalga Cross in Trevalga churchyard	SX 08115 90022
1014215	Churchyard cross in St Petroc's churchyard, 3m south of the church	SW 91587 75403
1014216	Churchyard cross shaft and base in St Petroc's churchyard, 30m south east of the church	SW 91601 75380
1014217	Wayside cross in Egloshayle churchyard, 0.16m west of the church porch	SX 00074 71902
1014624	Churchyard cross in St Michael's churchyard, Porthilly	SW 93687 75355
1014793	Romano-British and early medieval settlement, medieval church, castle and associated features on Tintagel Island and adjoining mainland	SX 04984 89124
1014910	Wayside cross in Egloshayle churchyard, 0.46m east of the church porch	SX 00081 71901
1015058	Wayside cross in St Agnes' churchyard	SW 72030 50724
1015061	Wayside cross-head in St Sennen's churchyard, 10m south of the church	SW 35707 25503
1015062	Wayside cross in St Sennen's churchyard, 6m north of the church	SW 35701 25526
1015926	Standing stone on Ackland's Moor 170m north east of The Old Lighthouse, Lundy	SS 13265 44452
1015927	Standing stone 220m south of Quarterwall Cottages, Lundy	SS 13798 44731
1015928	Standing stone 100m north east of The Old Lighthouse, Lundy	SS 13272 44357
1015929	Standing stone and cairn 490m south of The Old Lighthouse, Lundy	SS 13313 43816
1015930	Standing stone 190m south of The Old Lighthouse, Lundy	SS 13194 44099
1015931	Chambered tomb 165m north east of the Rocket Pole Pond, Lundy	SS 13623 43718
1015932	Standing stone 200m west of St Helen's Church, Lundy	SS 13585 43979
1015933	Standing stone and cairn 310m north of The Old Lighthouse, Lundy	SS 13247 44604
1015934	Standing stone 320m north west of The Old Lighthouse, Lundy	SS 13085 44586
1016010	Cairn 500m north of The Old Lighthouse, Lundy	SS 13239 44786
1016011	Cairn on Ackland's Moor 435m north of The Old Lighthouse, Lundy	SS 13196 44730
1016012	Cairn 530m west of Quarterwall Cottages, Lundy	SS 13270 45025
1016013	Cairn 430m north west of Quarterwall Cottages, Lundy	SS 13419 45166
1016014	Hut circle and small enclosure 270m north west of The Old Lighthouse, Lundy	SS 13047 44519
1016015	Cairn 20m east of Tibbett's Lookout, Lundy	SS 13832 46285
1016016	Chambered stone dwelling 560m south west of Tibbett's Lookout, Lundy	SS 13281 46136
1016017	Cairn 300m south west of Tibbett's Lookout, Lundy	SS 13521 46218
1016018	Cairn 270m west of Tibbett's Lookout, Lundy	SS 13541 46287
1016019	Cairn 325m north west of Tibbett's Lookout, Lundy	SS 13585 46529
1016026	Quarry infirmary and surgery, 220m north west of Quarterwall Cottages, Lundy	SS 13702 45141
1016027	Ruined cottages and well 190m north west of Quarterwall Cottages, Lundy	SS 13662 45074
1016028	Cottage foundations 240m west of Quarterwall Cottages, Lundy	SS 13568 44965

NHLE	Name	NGR
1016029	Prehistoric settlement at North End, Lundy	SS 13294 47721
1016030	Gun battery at Brazen Ward, Lundy	SS 13910 46761
1016031	Coastal defence platforms at the Mousehole and Trap, Lundy	SS 13819 46859
1016032	The northern of two coastal defence platforms above Jenny's Cove, Lundy	SS 13338 45870
1016033	The southern of two coastal defence platforms above Jenny's Cove, Lundy	SS 13289 45806
1016034	Marisco Castle, Lundy	SS 14154 43777
1016035	Bull's Paradise and Giants Graves; a settlement and burial ground on Lundy	SS 13641 44201
1016036	Battery on North East Point, Lundy	SS 13504 48018
1016037	Defensive platform 240m north west of Gannets' Rock, Lundy	SS 13584 47774
1016038	Fog battery at Battery Point, Lundy	SS 12851 44922
1016039	The Old Lighthouse, Lundy	SS 13192 44284
1016040	Chapel remains, cemetery and prehistoric settlement on Beacon Hill, Lundy	SS 13226 44251
1016041	Granite quarry on East Sidelands, Lundy	SS 13847 44957
1016154	Wayside cross-head in Phillack churchyard, south west of the church	SW 56525 38410
1016158	Churchyard cross in St Ia's churchyard	SW 51824 40520
1016162	Churchyard cross in Phillack churchyard, south of the church	SW 56537 38413
1016163	An early Christian memorial stone and a wayside cross in Phillack churchyard, south east of the church	SW 56574 38430
1016207	Tawstock holy well	SS 55255 29835
1016212	Lenwood bowl barrow, 50m south east of Lenwood Cottage	SS 44115 28137
1016229	Bowl barrow at Codden Beacon	SS 58238 29563
1016990	Linear bowl barrow group on Ligger Point, 250m west of Penhale Mine	SW 75927 58032
1016991	Cliff castle on Penhale Point	SW 75808 59078
1017017	Cliff castle at Tubby's Head	SW 69794 50492
1017348	Penbeagle Cross	SW 50781 39882
1017628	Churchyard cross 25m south of St Uny's Church, Lelant	SW 54825 37695
1017629	Wayside cross 2m south of St Uny's Church, Lelant	SW 54810 37724
1017630	Wayside cross 70m south of St Uny's Church, Lelant	SW 54826 37652
1017640	Wayside cross 330m south west of Penpol House	SW 79407 60567
1017646	The Widow's Tenement medieval settlement and prehistoric settlement sites, Lundy	SS 13784 46634
1017647	Medieval settlement immediately south of Halfway Wall, Lundy	SS 13681 45739
1017801	Churchyard cross in Gwithian churchyard	SW 58639 41240
1017918	Cairn 100m north of Halfway Wall, Lundy	SS 13632 45966
1018156	Wayside cross 65m west of St Uny's Church, Lelant	SW 54755 37726
1018157	Wayside cross 40m west of St Uny's Church, Lelant	SW 54785 37721
1018266	Standing stone 250m south west of St Helen's Church, Lundy	SS 13645 43747
1018520	Bowl barrow at Gallantry Bower	SS 30474 26240
1018547	Long house and enclosure 160m north of Widow's Tenement, Lundy	SS 13579 47026
1018548	Hut circle 625m south west of John O'Groat's House, Lundy	SS 13105 47313
1018569	St Constantine's chapel and holy well	SW 86524 74919
1018572	Wayside cross in Lelant Lane, 670m north west of St Uny's Church	SW 54172 37888
1018574	Sea Lane Cross, Lelant	SW 54225 36611
1018955	St Piran's Oratory and associated early medieval cemetery	SW 76839 56393

NHLE	Name	NGR
1019168	Three wayside crosses in the churchyard of St Sennara's Church	SW 45464 38527
1019169	Churchyard cross and wayside cross in St Erth's churchyard	SW 54975 35091
1019212	Round barrow 550m north west of Treslow Farm	SW 74903 53786
1019213	Medieval chapel and enclosures 570m north west of Wheal Freedom	SW 69757 49601
1019451	Round barrow 400m north of Anchor	SW 74564 53121
1020026	Two later prehistoric cliff castles on Kelsey Head and west of Porth Joke, and two round barrows 610m west and 760m south west of Porth Joke	SW 76486 60818
1020027	Medieval holy well north east of Holywell Beach, and two prehistoric round barrows 660m and 700m south west of Porth Joke	SW 76805 60035
1020400	Black Road causeway, Black Bridge and World War II reservoir at Copperhouse Pool	SW 56658 38128
1020556	World War II fighter pens and defences, and other associated remains, at the airfield formerly known as RAF Perranporth, Trevellas	SW 73275 51989
1020814	Late medieval and 19th century bridge at Wadebridge	SW 99115 72455
1020922	Barnstaple Castle	SS 55572 33337
1021004	Liveloe, later prehistoric cliff castle with hut circles on Griffin's Point, and prehistoric round barrow 600m south west of Bre-Pen Farm	SW 84173 66478
1021005	Two round barrows 440m and 510m north west of High Cove Farm	SW 84695 68372
1021006	Redcliff Castle, later prehistoric cliff castle 550m south west of Bedruthan	SW 84924 69647
1021164	Wheal Kitty 20th century tin processing works	SW 72432 51415
1021361	Geevor Mine	SW 37500 34322
1402648	Late C18-C19 mill complex, ropeworks and associated water management system immediately east of Millpond Avenue, Foundry	SW 55855 36881
1424711	Lynchets approximately 34m north-west of Saunton Sands Hotel	SS 44478 37965
1425448	Two decoy targets at Northam Radar Station	SS 44720 30183
1432418	Wreck at Westward Ho!	SS 43130 29780
1432949	Wreck off Northam Burrows	SS 43271 29956

14 Appendix 2: Grade I and Grade II* Listed Buildings within the RCZAS study area

NHLE	Name	Grade	NGR
1105108	GATEHOUSE APPROX 15M TO SE OF WEARE GIFFARD HALL	I	SS 46679 22101
1105152	CHURCH OF ST SWITHUN	I	SS 44354 23503
1107600	CHURCH OF ST JOHN THE BAPTIST	I	SS 47975 30987
1107743	CHURCH OF ST AUGUSTINE	I	SS 50215 35587
1107750	CHURCH OF ST MARY MAGDALENE	I	SS 45694 45190
1115088	ROSCARROCK	I	SW 98638 80375
1141774	CHURCH OF ST MORWENNA AND ST JOHN THE BAPTIST	I	SS 20505 15315
1142413	CHURCH OF ST GENESIUS	I	SX 14896 97173
1142961	EGLOSHAYLE CHURCH	I	SX 00083 71909
1143260	PENDEEN MANOR HOUSE ADJOINING WALL TO SOUTH EAST OF PENDEEN MANOR HOUSE	I	SW 38390 35473
1143403	CHURCH OF ST UNY	I	SW 54827 37728
1143424	CHURCH OF ST IA	I	SW 51822 40525
1143438	THE OLD POST OFFICE	I	SX 05627 88467
1144140	CHURCH OF ST COLUMBA	I	SW 83977 62401
1163906	CHURCH OF ST PETER	I	SS 47260 28635
1169270	CHURCH OF ST MARGARET	I	SS 44874 29099
1171583	CHURCH OF THE HOLY TRINITY	I	SS 46726 22134
1171633	WEARE GIFFARD HALL	I	SS 46668 22132
1200870	THE ROYAL HOTEL	I	SS 45713 26405
1200873	BIDEFORD BRIDGE INCLUDING PARAPET WALLS AND GATES OF EAST ABUTMENT	I	SS 45569 26427
1208207	PARISH CHURCH OF HOLY TRINITY	I	SS 51406 47305
1208792	ST NICHOLAS' CHAPEL AND LIGHTHOUSE	I	SS 52512 47891
1211902	CHURCH OF ST ENODOC	I	SW 93161 77232
1212008	PRIDEAUX PLACE	I	SW 91375 75572
1212675	CHURCH OF ST PETROC MINOR	I	SW 91828 72147
1261627	CHURCH OF ST PETER	I	SS 55977 29924
1289743	ENTRANCE GATE AND FLANKING WALLS FORMING MOCK FORTIFICATIONS TO EAST OF PRIDEAUX PLACE	I	SW 91408 75578
1289931	CHURCH OF ST PETROC	I	SW 91575 75409
1305679	CHURCH OF ST GEORGE	I	SS 45756 20718
1312091	CHURCH OF SAINT SENNAR	I	SW 45474 38513
1325560	CHURCH OF ST BRANNOCK	I	SS 48916 37072
1327391	CHURCH OF ST CARANTOC	I	SW 79046 60556
1327632	CHURCH OF SAINT ERTH	I	SW 54985 35027
1327752	CHURCH OF ST MATERIANA	I	SX 05061 88452
1333106	CHURCH OF ALL SAINTS	I	SS 30975 25135
1333125	CHURCH OF ST NECTAN	I	SS 23503 24743
1366220	CHURCH OF ST JOHN THE BAPTIST	I	SS 56546 30098
1384979	LONG BRIDGE	I	SS 55778 32921
1385041	62, BOUTPORT STREET	I	SS 55896 33057

NHLE	Name	Grade	NGR
1385078	BULL HOUSE	I	SS 55620 34118
1385215	PENROSE ALMHOUSES	I	SS 56046 32855
1385253	ST ANNES CHAPEL AND OLD GRAMMAR SCHOOL MUSEUM INCLUDING WALLS AND GATES AND PIERS	I	SS 55885 33210
1385316	PARISH CHURCH OF ST MARY THE VIRGIN	I	SS 55651 34146
1385370	QUEEN ANNES WALK	I	SS 55690 33110
1025135	MASONIC HALL, CARETAKER'S HOUSE AT REAR AND GARDEN WALLS AT LEFT AND REAR	II*	SS 45365 26825
1025001	31, BRIDGELAND STREET	II*	SS 45460 26796
1025052	27, BRIDGELAND STREET	II*	SS 45405 26794
1104517	NO 16 INCLUDING FORECOURT RETAINING WALLS, RAILINGS AND GATES	II*	SS 31718 24806
1104522	NOS 45/46 AND 47	II*	SS 31830 24852
1104957	MARISCO CASTLE, KEEP AND BAILEY WALLS	II*	SS 14146 43772
1105150	CHURCH OF HOLY TRINITY	II*	SS 46275 23847
1107084	BROADGATE	II*	SS 48916 36866
1107140	CHURCH OF ST PETER	II*	SS 53350 35357
1107574	SOUTHCOTT BARTON	II*	SS 46834 27575
1107696	ROSEHILL	II*	SS 57096 31439
1124714	CHURCH OF ST MICHAEL	II*	SW 93687 75367
1124739	TREWORNAN INCLUDING WALL TO REAR OF COURTYARD	II*	SW 98530 74424
1136866	STONE CROSS IN FURTHERMOST SOUTHERN CHURCHYARD SOUTH OF ST UNY'S CHURCH	II*	SW 54826 37652
1137246	HIGHER TRESMORN	II*	SX 16141 97704
1140140	RICHMOND DOCK	II*	SS 46471 30324
1141780	THE VICARAGE	II*	SS 20588 15362
1141812	COOMBE MILL	II*	SS 20997 11708
1142975	WADEBRIDGE BRIDGE	II*	SW 99131 72464
1143003	TREGARDEN	II*	SX 02924 72922
1143038	ST BREOCK PLACE	II*	SW 97714 71868
1143047	KESTLE	II*	SX 01633 71770
1143288	BOTALLACK MANOR HOUSE	II*	SW 36721 33041
1143354	STONE CROSS IN WESTERN CEMETERY(AT CROSSING OF PATHS) WEST OF ST UNY'S CHURCH	II*	SW 54756 37726
1143355	STONE CROSS IN CHURCHYARD, IMMEDIATELY SOUTH OF ST UNY'S CHURCH	II*	SW 54825 37695
1143383	HARBOUR WHARFS AND PIERS INCLUDING THE TWO LIGHT-HOUSES (ONE DISUSED)	II*	SW 52088 40784
1143386	KNILL'S MONUMENT, WORVAS	II*	SW 51630 38668
1143440	DOVECOTE, TINTAGEL VICARAGE	II*	SX 05483 88382
1143467	CHURCH OF ST SYMPHORIAN	II*	SX 09575 90893
1143473	SOUTH HARBOUR PIER, QUAY AND WALLS ON SOUTH WEST SIDE OF HARBOUR	II*	SX 09513 91496
1143620	TREWINNARD MANOR FARMHOUSE, INCLUDING GARDEN WALLS AND GATE PIERS ADJOINING TO NORTH	II*	SW 54612 34010
1143671	TERRACE WALLS IMMEDIATELY NORTH OF THE DOWNS	II*	SW 55529 36744

NHLE	Name	Grade	NGR
1143672	SUMMERHOUSE AT APPROXIMATELY 20 METRES NORTH EAST OF THE DOWNS	II*	SW 55577 36760
1143685	FORMER OFFICES AND REMAINS OF FOUNDRY OF HARVEY AND COMPANY	II*	SW 55822 37164
1143688	CHURCH OF ST ELWYN	II*	SW 55911 37573
1143798	CHURCH OF SAINT SENNEN	II*	SW 35709 25517
1143807	THE ROUND HOUSE	II*	SW 35077 26309
1144109	CHURCH OF ST MICHAEL	II*	SW 81123 61528
1144136	HUER'S HOUSE	II*	SW 80672 62386
1146627	CHURCH HOUSE	II*	SS 23581 24670
1160465	TERRACE WALLS AT APPROXIMATELY 40 METRES NORTH OF THE DOWNS	II*	SW 55541 36780
1159175	CROAN	II*	SX 02966 71596
1159592	METHODIST CHAPEL	II*	SW 58631 41166
1160143	CHURCH OF ST PHILLACK (ST FELICITAS)	II*	SW 56535 38421
1160426	BODRIGGY HOUSE (NO.21) SEA LANE AND NO.42 BODRIGGY STREET, INCLUDING FRONT GARDEN WALLS	II*	SW 56560 37636
1160452	DOWNS (ROMAN CATHOLIC CONVENT, PART OF ST MICHAELS HOSPITAL)	II*	SW 55560 36730
1160602	TREDREA MANOR FARMHOUSE INCLUDING GARDEN WALL AND RAILINGS AT FRONT	II*	SW 54365 34786
1161569	CHURCH HOUSE	II*	SS 48946 37052
1162257	MYRTLE FARMHOUSE	II*	SS 44395 39285
1162825	CHURCH OF ST SABINUS (WOOLACOMBE CHURCH)	II*	SS 46134 43808
1163217	CHURCH OF ST PETER	II*	SS 51189 32562
1163261	GAZEBO ON NORTH SIDE OF FREMINGTON MANOR GARDENS	II*	SS 51158 32682
1165704	COURTYARD WALL IMMEDIATELY TO WEST OF BLEGBERRY FARMHOUSE AND EXTENDING APPROXIMATELY 50 METRES TO THE SOUTH	II*	SS 23192 26135
1168686	WATERMOUTH CASTLE, INCLUDING FRONT RETAINING WALL AND REAR COURTYARD WALLS	II*	SS 55576 48041
1170778	PORTLEDGE HOTEL	II*	SS 39422 24720
1200874	4 AND 4A, BRIDGELAND STREET	II*	SS 45454 26832
1200879	NOS 28 AND 28A INCLUDING PUMP AND MILESTONE IN COURTYARD	II*	SS 45418 26785
1200893	CHURCH OF ST MARY	II*	SS 45386 26423
1200933	OLD FORD	II*	SS 45310 25908
1200936	NORTHDOWN HALL (PART OF STELLA MARIS SCHOOL)	II*	SS 45118 26980
1203010	THE QUAY FROM ROYAL BRITANNIA HOTEL ON WEST TO PIER HOTEL ON EAST INCLUDING OLD QUAY HEAD	II*	SS 52414 47822
1207958	BEARA FARMHOUSE	II*	SS 53886 47064
1208154	CHAMBERCOMBE MANOR WITH ATTACHED YARD WALLS	II*	SS 53267 46803
1208979	74 AND 74A, HIGH STREET	II*	SS 45337 26601
1211508	TRENEARNE	II*	SW 89078 74819
1211636	TREVELVER AND ARCH RESET IN WALL ON NORTH EAST	II*	SW 95884 75004
1212011	THE STABLES	II*	SW 91357 75628
1212013	LEAD BUST TO SOUTH EAST OF PRIDEAUX PLACE	II*	SW9139675540

NHLE	Name	Grade	NGR
1212128	FOOTBRIDGE OVER LANE TO ESTATE YARD AND FLANKING WALLS FORMING NORTH END OF MOCK FORTIFICATIONS TO NORTH EAST OF PRIDEAUX PLACE	II*	SW 91404 75612
1212134	DAIRY AND GROTTO	II*	SW 91333 75623
1212199	GARDEN TEMPLE TO SOUTH WEST OF PRIDEAUX PLACE	II*	SW 91310 75540
1212202	SOUTH TERRACE WITH GROTTO NICHE TO SOUTH OF PRIDEAUX PLACE	II*	SW 91395 75491
1212203	GARDEN FEATURE AT SOUTH END OF SOUTH TERRACE OF PRIDEAUX PLACE	II*	SW 91390 75453
1212204	SOUTH ENTRANCE TO PRIDEAUX PLACE	II*	SW 91403 75432
1212748	HARLYN HOUSE	II*	SW 87211 75117
1212749	DOVECOTE IMMEDIATELY TO NORTH WEST OF HARLYN HOUSE	II*	SW 87194 75102
1223492	ST PIRANS AND SURROUNDING GARDEN WALLS	II*	SX 07621 89170
1223574	CHURCH OF ST PETROC	II*	SX 08113 90030
1229361	BARN ABOUT 40 METRES SOUTH EAST OF TREMAER	II*	SS 20741 07893
1231523	RECTORY FARMHOUSE	II*	SS 20557 15219
1231610	TREBARFOOTE MANOR INCLUDING BARN ADJOINING AT NORTH EAST	II*	SX 18640 99202
1239319	WELLTOWN MANOR	II*	SX 08829 90350
1253698	WICK FARMHOUSE	II*	SS 57033 27169
1253770	GATEHOUSE TO TAWSTOCK COURT	II*	SS 55776 29843
1278377	GATEHOUSE AND BARN ABOUT 3 METRES EAST OF MARSLAND MANOR AND WALLS BETWEEN GATEHOUSE AND EAST FRONT OF MARSLAND MANOR	II*	SS 21704 16767
1289637	CANNON IN UNDERGROWTH BESIDE THE GREEN WALK OF PRIDEAUX PLACE	II*	SW 91296 75562
1289740	ABBEY HOUSE	II*	SW 91942 75499
1292875	PARISH CHURCH OF SAINT PHILIP AND ST JAMES	II*	SS 52188 47815
1306519	PORTHILL	II*	SS 44804 28400
1306534	DIDDYWELL	II*	SS 45443 29832
1309959	TOWN FARM, INCLUDING WALL ADJOINING SOUTH-EAST AND RAILINGS ADJOINING EAST	II*	SS 48525 36657
1310761	THE WHITE HART HOTEL	II*	SW 55861 37095
1325314	FREMINGTON MANOR HOUSE INCLUDING ENTRANCE GATEWAY ATTACHED TO WEST SIDE	II*	SS 51238 32554
1325332	TAPELEY PARK HOUSE	II*	SS 47778 29084
1326646	LIGHTKEEPER'S HOUSE OLD LIGHTHOUSE	II*	SS 13204 44290
1327604	SUMMERHOUSE AT APPROXIMATELY 120 METRES NORTH OF THE DOWNS	II*	SW 55533 36849
1327619	CHURCH OF SAINT GOTHIAN	II*	SW 58635 41263
1327629	TRELISSICK MANOR HOUSE, FARMHOUSE AND COTTAGE, INCLUDING FRONT AND REAR GARDEN WALL, SUMMER HOUSE, GATE PIERS AND GATE	II*	SW 55584 35946
1327655	THE COACH HOUSE, INCLUDING COURTYARD WALLS AND GATE PIERS IMMEDIATELY NORTH WEST OF TREWINNARD MANOR FARMHOUSE	II*	SW 54605 34031
1327660	GLANMOR HOUSE	II*	SW 55510 36579
1328520	SEA LOCK, LOCK GATES AND HAND WINCHES	II*	SS 20409 06415

NHLE	Name	Grade	NGR
1328542	MARSLAND MANOR	II*	SS 21687 16760
1328546	EBBINGFORD MANOR	II*	SS 20598 05999
1328565	MANNING CHEST TOMB ABOUT 17 METRES SOUTH OF THE CHANCEL OF THE CHURCH OF ST MORWENNA	II*	SS 20514 15288
1328673	CHURCH OF ST AGNES	II*	SW 72028 50734
1333011	DOCTON HOUSE	II*	SS 46437 30350
1333120	NO 53 (CRAZY KATES) AND NO 54	II*	SS 31840 24867
1333138	59, 60 AND 61	II*	SS 31864 24822
1333156	HIGHER BROWNSHAM FARMHOUSE AND BARN ADJOINING TO NORTH-WEST	II*	SS 28536 25946
1355163	LAVINGTON UNITED REFORMED CHURCH	II*	SS 45351 26826
1384982	CHURCH OF HOLY TRINITY AND ATTACHED RAILINGS AND GATE	II*	SS 56206 32778
1385068	NORTH COUNTRY INN	II*	SS 55720 33508
1385102	HORWOODS ALMSHOUSES	II*	SS 55872 33171
1385105	OLD SCHOOL COFFEE HOUSE FORMERLY HORWOODS SCHOOL	II*	SS 55862 33151
1385106	PAIGES ALMSHOUSES	II*	SS 55861 33181
1385114	8, CROSS STREET	II*	SS 55733 33177
1385154	39, HIGH STREET	II*	SS 55759 33343
1385165	THREE TUNS INN	II*	SS 55769 33243
1385188	THE GUILDHALL	II*	SS 55791 33247
1385251	CHURCH OF SAINTS PETER AND PAUL CHURCH OF ST PETER INCLUDING THE DODDRIDGE LIBRARY	II*	SS 55833 33223
1385256	PILL HOUSE	II*	SS 56293 31617
1385277	36, PILTON STREET	II*	SS 55673 34060
1390857	PORTHMEOR PILCHARD CELLARS AND STUDIOS	II*	SW 51789 40868
1420046	Roman Inscribed Stone 1m South of St Piran's	II*	SX 07618 89154

15 Appendix 3: Registered Parks and Gardens within the RCZAS study area

NHLE	Name	Grade	NGR
1000704	TAPELEY PARK	II*	SS 47681 28999
1001249	PRIDEAUX PLACE	II	SW 91573 75621
1001305	THE DOWNES (ST MICHAEL'S CONVENT)	II	SW 55496 36773
1001488	BARBARA HEPWORTH SCULPTURE GARDEN	II	SW 51750 40585

16 Appendix 4: Protected Wreck sites within the RCZAS study area

NHLE	Name	NGR
1000051	IONA II	SS 15059 46171
1000053	GULL ROCK	SS 14346 46295
1000072	HANOVER	SW 73700 53201

17 Appendix 5: Palaeoenvironmental analysis and radiocarbon dating from submerged peats undertaken during the Phase 1 RCZAS study of North Devon and North Cornwall.

During the RCZAS the opportunity arose to undertake palaeoenvironmental investigation on two submerged forest sequences in the area: Westward Ho! in Devon and Mawgan Porth in Cornwall. Westward Ho! is an important prehistoric site that is subject to continued coastal erosion, which led to the complete loss of a later Mesolithic midden deposit. A series of monoliths had been collected in 2002 but no opportunties to investigate them using pollen analysis had presented themselves, so the samples had been kept in cold storage. The significance of this site, and availability of the samples, meant that as part of the RCZAS an investigation of the pollen sequence from this site, coupled with new radiocarbon dating provided by Historic England, could be undertaken.

By contrast Mawgan Porth is a site that has not been reported as being uncovered since the 18th century, but was exposed in 2016 and drew the attention of the local Newquay Old Cornwall Society. The opportunity was therefore afforded to allow a community project to take place, with the society members sampling the submerged forest deposits and received input from the CITiZAN project, with Historic England providing support with radiocarbon dating.

The following provides brief overviews of the sites and the new results from each site.

17.1 Westward Ho!, Devon

The submerged forest at Westward Ho!, at the mouth of the Taw-Torridge Estuary, is the best known 'submerged forest' and most intensely studied intertidal deposit along the north coast of Devon and Cornwall. The peats are normally covered by beach sands, but become periodically exposed when storm events temporarily expose the underlying peat. The extent of submerged peat is known to have diminished in extent since it was first recorded: in 1863 Townsend Hall reports that the stumps of 70-80 large trees that were exposed in the winter of 1863-4; the number remaining visible today is significantly less. The site is important because it contains an intertidal land surface which had, prior to erosion, a Mesolithic 'kitchen' midden deposit, containing charcoal, lithics, bones and shells, covered by peat and associated with a submerged forest. This site is of particular importance as it is the only surviving remnant of a wetland occupation site of the 6th millennium BC in south west England (Hosfield et al. 2007, 41-42). The site has a long history of site investigations and represents one of the best-dated records of Mesolithic activity on the present coastline in northern Cornwall and Devon. The site actually consists of three areas, as defined by Balaam et al. (1987):

- Area 1 (Inner peat): extensive surface of peat commonly exposed by relatively minor episodes of tidal scouring. To the north of the peat is an area containing a variety of estuarine deposits which contain a series of stake alignments and exposures of animal bone. These have been radiocarbon dated to the Late Romano-British to Early Medieval period, 330-650 cal. AD (1560±80BP; HAR-6513) and 250-620 cal. AD (1600±80 BP; HAR-6440) respectively. It is assumed the peat is contemporary with this dated material but this has not been tested by directly dating the Area 1 peats.
- Area 2: located roughly midway between high and low water springs, containing a small area of peat overlain by grey-blue silty clay, along with some stakes. It is believed to be the same age as Area 3

- Area 3 (outer peat): area closet to low water spring tide and includes the major collections of Mesolithic material including the 'kitchen' midden site and stake alignments. The site is Mesolithic in age but has also produced an early Neolithic age from a stake.

The submerged forest was first reported in the winter of 1863/4 by Townsend Hall. Although it has often been quoted that the site was known about by local residents in 1605, it is likely that this association with Westward Ho! is incorrect. The 1605 date was quoted by Rogers (1946, 109-110) and derived from a passage by Risdon (1811; 335) which is actually attributable to Braunton Burrows:

> "*near this hamlet [Santon in the parish of Branton] the country people had so undermined a hill of sand, by digging it to carry it into their grounds, that a great quantity thereof fell down, discovering the top of a tree, which, by farther search, was found to be thirty feet in length; so that it plainly appeareth, this circuit of marsh land (now, of the sands overblowing, called the Burrows) was, in elder ages, stored with woods and tall timber trees*"

The early history of exploration of the site is well documented by Rogers (1946), recounting the earlier work of Townsend Hall who continually monitored the site between 1863 and 1872. Hall estimated that total denundation of the south end of the beach was 10 feet, with the increased wave force pushing back the pebble Ridge from 30 to 50 feet. He not only provided the first stratigraphic description of the sedimentary sequence, dividing it into seven stratigraphic units, but also in January 1865 discovered "a deposit containing flint flakes and cores in abundance, with hazel nuts, calcined flints and kitchen midden accumulation, consisting principally of oyster, limpet and mussel", along with recording numerous circular and linear stake alignments as they become uncovered over this period and also seeking to identify the animal bones associated with these deposits (see Hall 1870). In 1866 there were also records made of flint artefacts recovered from a "blue clay" layer, which was noted as lying underneath the peat or "forest bed" (Bate, 1866; Ellis, 1866; 1867).

Periodic investigations have been undertaken throughout the twentieth century, as reported by Rogers (1908), Rogers (1946) and Churchill (1965a), with most focusing on Area 3 and the midden site in particular. The first palaeoecological studies of Area 3 were by Clement Reid, published in Rogers (1908; Reid 1913), looking at the plant remains from the peat. Attempts to extract pollen from the peat by Harry Godwin, and subsequently his student Mrs Megaw who cored the site, were both unsuccessful (Rogers 1946, 121). However Churchill (1965a) was able to obtain pollen counts, along with plant macrofossils, through the midden deposit including the overlying peat. This study also produced the first radiocarbon date from the site, with a sample of the upper peat providing a calibrated date of 5740-4950 cal. BC (6585±130 BP; Q-672). After severe westerly gales in 1970 removed much of the recent beach material, revealing c. 720m^2 of the peat surface, exposed sections were recorded (cited in Edmonds *et al*. 1979, 111) and additional wood samples from the top of the exposed peat were collected that provided a radiocarbon date of 4040 – 3530 cal. BC (4995±105 BP; IGS-42; Welin et al. 1972, 331). Subsequent investigations by Jacobi (1979) included the first direct dating of the midden deposits on charcoal, dated 6100-5570 cal. BC (6955±140 BP; Q-1211) and bone, dated 5990-5490 cal. BC (6810±140 BP; Q-1212).

In 1980 the poor preservation of the peat deposits at the site, along with continued erosion and interference by visitors and holiday makers, led to the conclusion that a modern programme of survey, excavation and environmental analysis should be undertaken before this valuable archaeological and

palaeoenvironmental resource was lost forever. An investigation by the central excavation unit in 1983-4 examined the area when it was exposed by storms. The work, published by Balaam et al. (1987), confirmed the broad sedimentary sequence of silt, midden deposits, and overlying fen wood peat. They found only a small area of the midden remained due to erosion of the peats, but nonetheless were able to recover charcoal, animal bone and a number of flint artefacts were, along with more extensive radiocarbon dating across the site, including Area 1. A recent study, using archived material saved from this excavation, permitted Canti et al. (2015) to radiocarbon date calcite produced by earthworms present within the midden deposit, providing an age span for the midden of 5330-4580 cal. BC.

A detailed multi-proxy palaeoenvironmental study, including molluscs, pollen, plant macrofossils, insects and vertebrate remains, indicated that the midden was situated a little back from the shore with sand dunes to seaward and in a terrestrial woodland environment. The interpretation was that the site was located within an ecotonal situation making use of the terrestrial resources, the rocky shore resources immediately to the south from which mussels were obtained, the sandy shore to the west and north from which cockles and carpet shells were obtained and the resources of the muddy estuary to the north from which peppery furrow shells were obtained. The quantity of lithics from the 1983 excavation was not large but lithics and bones from previous discoveries were synthesised, along with both new and existent radiocarbon dates from the site. Of particular note from Area 3 was one line of wooden stakes driven into the peat which provided a radiocarbon date of 3780-3380 cal. BC (4840±70 BP; HAR-5642), which would chronologically place it within the Neolithic period.

The presence of the site being located behind a coastal barrier has been hypothesised since some of the earliest studies. During the earliest studies at the site the source of a barrier was postulated as being attributed to an earlier alignment of the pebbleridge which today fronts Northam Burrows. While the presence of the submerged pebbleridge immediately west and seaward of Area 3 is discussed by Rogers (1946), it is not considered in the more recent site investigations. Rogers (1908) recognised this alignment of pebbles on the foreshore as being related to a pebbleridge, but before this Pengelly (1868) had already envisioned that this ridge could have produced a lagoon of the Slapton Ley type, which could have encouraged the growth of peat, while Ellis (1866, 81) stated that as “there is evidence that the pebble ridge is constantly driven inland by the sea, it is not improbably that the submerged forest bed may have been within the ridge, and been a part of the Northam Marsh”. Churchill (1965) suggested that the submerged pebble ridge might be contemporary with the midden. The landward migration of the modern pebble ridge can be mapped as having moved c. 150m eastwards at its southern end between 1861 and c. 1947, and Rogers (1908) reports that in 1863 the ridge extended to the Area 1 inner peat (Area 1). It is therefore plausible that this submerged pebble ridge could represent an earlier position of the current pebble ridge and form part of the coastal barrier that is discussed by Balaam et al. (1987, 192). The formation of the Westward Ho! peat deposits behind a barrier system could also explain some of the discrepancies that have arisen between the many investigations of the Westward Ho! peats for the purposes of reconstructing sea-level history. For example, Churchill (1965b) and Rogers (1946) have suggested that the midden formed at or near the strand line, but the investigations of the midden by Balaam et al (1987) did not find any evidence for marine silt deposition within the midden, biota characteristic of a strandline assemblage, or indeed any evidence of being in close proximity to the shore. Churchill assumed that the blue clay beneath the midden was estuarine clay, but investigations by both Churchill (1965a, 76-77) and Balaam et al. (1987, 178) both failed to find any foraminifera, ostracods or diatoms to support an estuarine origin

interpretation. Reid (1913) suggested, based upon the plant species present within the peat, that the plant assemblage indicated a brackish-water marsh such as may occur behind a shingle beach.

Investigations of the Area 1 indicated a Romano-British age for peat formation along with a different palaeoecological signal to that from Area 3. Archaeological finds are associated with estuarine silts overlying this peat, including animal bones from a channel cut into the silts, one of which has been radiocarbon dated to cal. AD 250-620 (1600±80 BP; HAR-6440). To the North of Area 3, additional channels also produced bones and wood structures dated to the Romano-British period (Balaam et al 1987).



Figure 17.1: Area 1 peat, looking north towards Northam Burrows

The most recent phase of site investigations were conducted by Martin Bell between 1987 and 2008, consisting of a number of monitoring visits to the site which have continued to reveal new exposed faces and provide archaeological finds which have been recorded. In April 2002 further recording was undertaken following a very good exposure of the intertidal peat and Mesolithic deposits by a storm by a team from Reading University, in collaboration with Exeter University. Surveying of the exposures (Riley 2002) enabled an assessment of the level of erosion that had taken place between 1983-2001, and demonstrated that the midden deposit from Area 3 had been eroded away during this period. These new investigations included new radiocarbon dates, along with palaeoenvironmental investigations of the wood (Timpany 2005) and insects remains (Tetlow 2004). Careful archiving of sediment samples from the site have also permitted new pollen (Figure 17.3) and radiocarbon investigations (Figure 17.4 and Table 17.1) of the peat deposits from Area 3 as part of the current RCZAS project.



Figure 17.2: Area 3 peats looking east towards Westward Ho!

Timpany (2005) undertook wood identifications of a series of samples collected from this site investigation demonstrating that the peats of Area 3 and 1 contain different woodland phases. Wood samples from the surface of Area 3 show the *Salix-Quercus* woodland was succeeded by *Quercus-Corylus* woodland, while area 1 contains the development of *Alnus-Salix-Quercus* carr woodland, correlating well with the pollen (Scaife 1987; this study: see Figure 17.3) and plant macrofossil (Vaughn 1987) evidence.

Stake samples from Area 3, which probably correlate with those identified (including radiocarbon dating) by Balaam et al. (1987) in both Area 2 and 3 and structures documented by Hall (1870), were also sampled. In the 2002 study these were identified as *Corylus avellana* (hazel) with ring-counts of between 6 and 12 years for most samples. All stakes were round-wood with an average diameter of 3.5cm. The consistency in age and size of the stakes suggests that they were coppiced and therefore derived from managed woodland in the early Neolithic period. Tetlow (2004) looked at the insect assemblages from Area 3 and found her results corroborated the earlier findings of Girling et al. (1987) and the pollen (this study) on the same sequence. The 'wood peat' contained an insect fauna indicative of sedge tussock or damp grassland with reedswamp nearby. The overlying *'Phragmites peat'* fauna suggested lush reedswamp with abundant rotting organic material, possibly dung and carrion. The humified reed peat fauna suggested sedge tussocks forming under significantly drier conditions, while the uppermost reed peat is dominated by a fauna indicative of species associated with muddy, damp, boggy ground and coastal locations.

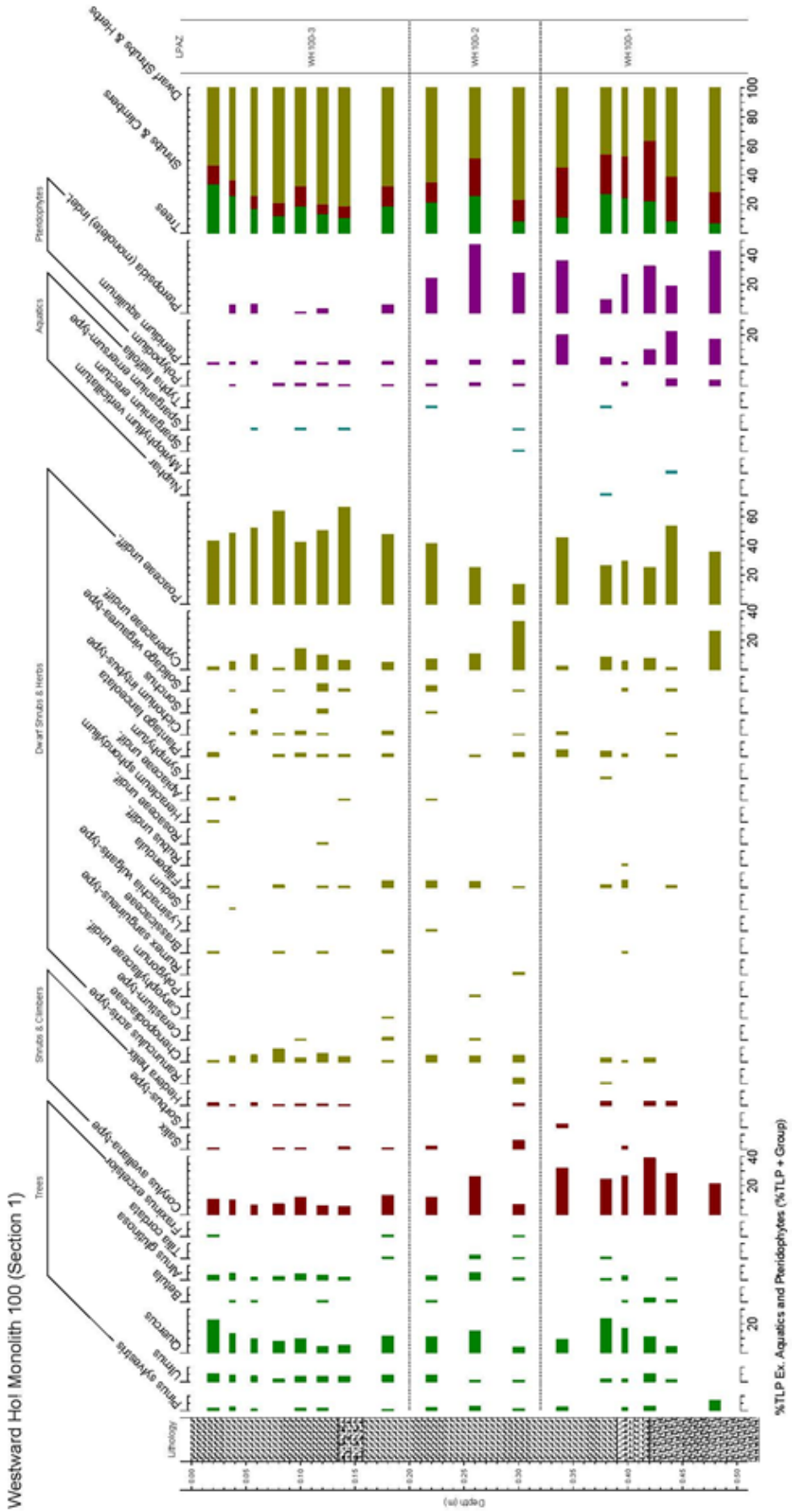


Figure 17.3: Summary pollen diagram from monolith <100>, Westward Ho!, Area 3

Table 17.1: Radiocarbon Dates from Monolith 100 at Westward Ho! (Marshall et al. 2017)

Laboratory Number	Sample reference	Material	Radiocarbon Age (BP)	$\delta^{13}C$ (‰)
UB33908	0.01–0.03m sample A	Plant macrofossil, *Phargmites australis* culm, from 0.01–0.03m	Failed insufficient carbon	
GU43280	0.01–0.03m sample B	Plant macrofossil, *Phargmites australis* culm, from 0.01–0.03m	Failed insufficient carbon	
SUERC-73277	0.01–0.02m sample C	Plant macrofossil, *Phargmites australis* culm, from 0.01–0.02m	5090±25	−26.4±0.2
UBA-34716	0.01–0.02m sample D	Plant macrofossil, *Phargmites australis* culm, from 0.01–0.02m	5016±36	−26.9±0.22
UBA-33909	0.08–0.09m sample A	Plant macrofossil, *Phargmites australis* culm, from 0.08–0.09m	5413±35	−27.8±0.22
SUERC-72434	0.08–0.09m sample B	Plant macrofossil, *Phargmites australis* culm, from 0.08–0.09m	5298±25	−26.9±0.2
UBA-33910	0.24–0.25m sample A	Plant macrofossil, *Phargmites australis* culm, from 0.24–0.25m	5018±47	n/m
SUERC-72435	0.24–0.25m sample M	Wood, unidentified twig including node	5792±29	−27.6±0.2
UBA-33912	0.24–0.25m	Bulk peat (alkali-soluble fraction) from 0.24–0.25m	5845±31	−28.2±0.22
UBA-33913	0.24–0.25m	Bulk peat (alkali- and acid-insoluble fraction) from 0.24–0.25m	5766±38	−28.2±0.22
	0.24–0.25m	T'=2.6; T'(5%)=3.8; ν=1	5814±25	-
SUERC-72427	0.34–0.35m	Bulk peat (alkali-soluble fraction) from 0.34–0.35m	5940±29	−28.3±0.2
SUERC-72428	0.34–0.35m	Bulk peat (alkali- and acid-insoluble fraction) from 0.34–0.35m	6024±29	−28.7±0.2
	0.34–0.35m	T'=4.2; T'(5%)=3.8; ν=1	5982±21	-
UBA-33918	0.44–0.45m	Bulk peat (alkali-soluble fraction) from 0.44–0.45m	6184±35	−27.3±0.22
UBA-33919	0.44–0.45m	Bulk peat (alkali- and acid-insoluble fraction) from 0.44–0.45m	6070±34	−28.1±0.22
	0.44–0.45m	T'=5.5; T'(5%)=3.8; ν=1	6126±25	-
SUERC-72432	0.57–0.58m	Bulk peat (alkali-soluble fraction) from 0.57–0.58m	6553±30	−26.7±0.2
SUERC-72433	0.57–0.58m	Bulk peat (alkali- and acid-insoluble fraction) from 0.57–0.58m	6548±29	−26.8±0.2
	0.57–0.58m	T'=0.0; T'(5%)=3.8; ν=1	6550±21	-

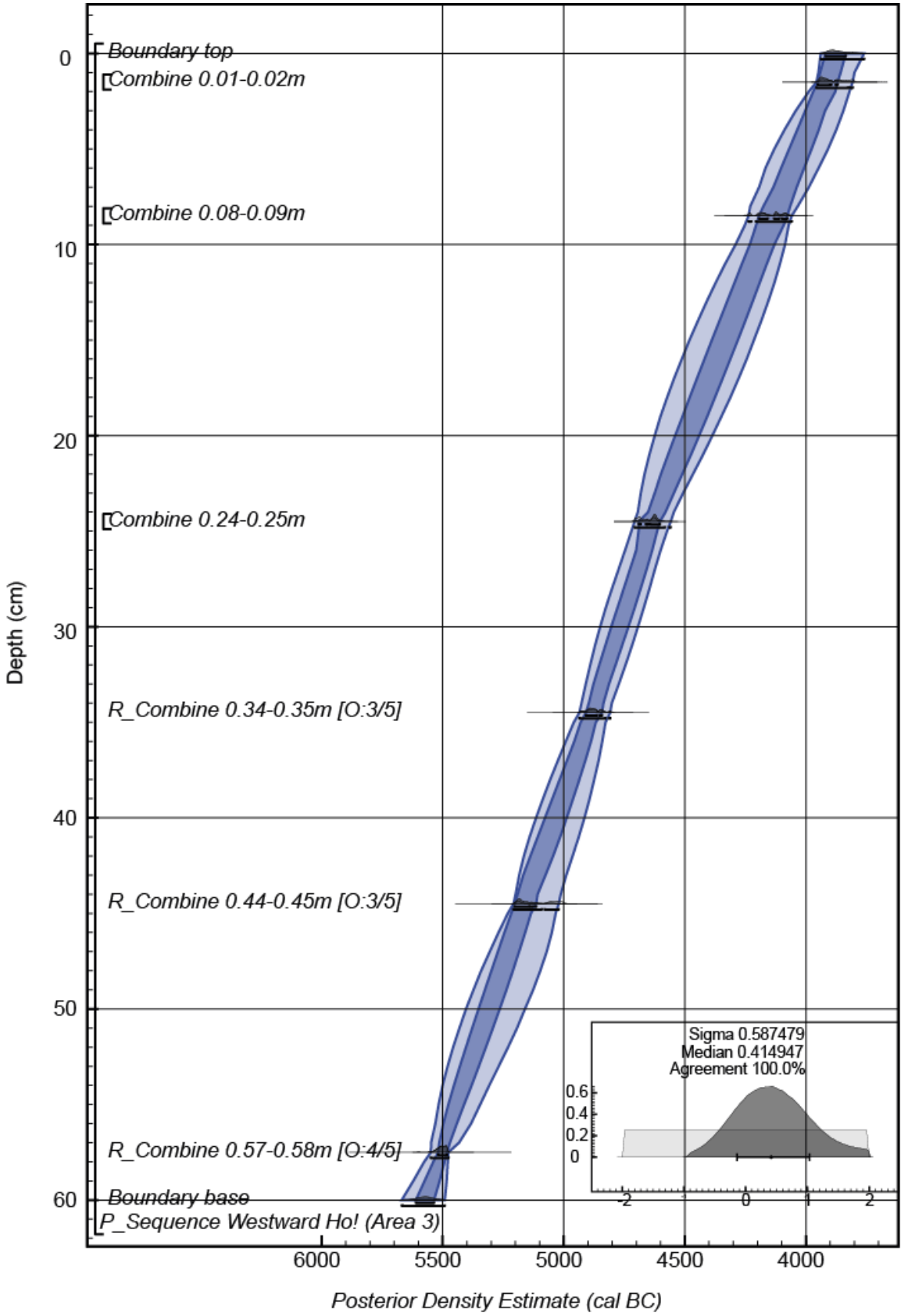


Figure 17.4: Bayesian age-depth model of the chronology of section 1 monolith <100> (P_Sequence model (k=0.01–100); Bronk Ramsey 2008; Bronk Ramsey and Lee 2013). The coloured bands show the estimated date of the sediment at the corresponding depth at 95% (Marshall et al. 2017)

17.2 Mawgan Porth, Cornwall

Mawgan Porth is one of the submerged forest sites listed by de la Beche (1839), though exposure of the site has not been reported since the 19th century. In September 2016 following the removal of a large amount of sand from the rear of the beach following storms (see Figure 6.27), the submerged forest was exposed, allowing members of the Newquay Old Cornwall Society to investigate the site. Wood and hazel nuts were found to be abundant within the organic silts and peats, with the mollusc *Radix balthica* (common pond snail) found within the organic silt deposits.

The available exposures at the site revealed a variable site stratigraphy and consequently four locations were sampled with monoliths by the Society members, led by Sheila Harper, with advice from both the University of Southampton and CITiZAN project. Within the centre of the site, where the wood remains were most abundant, a wood peat directly overlays a bed of large sub-rounded beach pebbles, some up to 15cm diameter. This 14cm thick wood peat was overlain by a 14cm organic silty loam attributable to a marsh / fen deposit (monolith <1>). Monolith <4>, taken close to this location, revealed a basal channel deposit, overlain by the beach pebbles, and then a 10cm peat bed. Approximately 15m north of this location there was no peat present but instead a channel deposit consisting of horizontally banded loamy sand overlying the beach pebbles, itself overlain by an organic loamy sand (monolith <2/3>). The final sampling location (monolith <5>), c. 10m south of the main peat bed, consisted of a grey clay with horizontally banded fibrous organic remains, possibly a lacustrine deposit. Monoliths were sampled for pollen analysis and also sampled for identifiable short-lived plant macrofossil remains suitable for radiocarbon dating. Historic England provided funding for two radiocarbon dates from the peat as establishing the age of the sequence, coupled with the palaeoenvironmental analysis, was directly relevant to the current RCZAS study and understanding the age of the submerged forest sequences along the coastline.

The radiocarbon dating results from Monolith 1 indicate that the submerged forest bed dates from the 4th century AD (Figure 17.5 and Table 17.2).

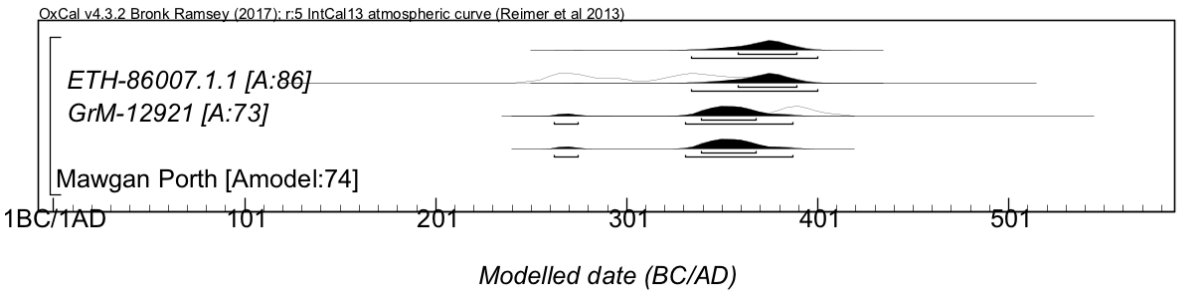


Figure 17.5: Radiocarbon dates from Monolith 1 at Mawgan Porth.

Table 17.2: Radiocarbon Dates from Monolith 1 at Mawgan Porth

Lab ID	**Material Dated**	**Sample depth in monolith**	**Radiocarbon Age BP**	**$\delta^{13}C$ (‰)**	***Posterior Density Estimate (cal. AD)***
ETH-86007.1.1	Waterlogged plant macrofossils: assorted seeds & fruits including *Carex*, *Ranunculus* sp., *Betula* and *Alnus glutinosa*	0-0.02m	1719±22	−29.9	330-405 (95.4%)
GrM-12921	Waterlogged plant macrofossil: *Corylus avellana* nut fragment	0.265-0.28m	1673±15	−29.7±0.14	260-275 (6.5%) 330-390 (88.9%)

Pollen analysis undertaken on these monoliths has shown the presence of onsite alder carr with hazel (Figure 17.6). However by contrast to sites such as Westward Ho! there is very little oak woodland within the area, suggesting it did not form part of the submerged forest, especially as no large tree stumps were observed when the peat was exposed. The sequences from Mawgan Porth demonstrate the presence of a mosaic of habitats preserved within the submerged forest site, consisting of areas of hazel and alder woodland, coupled with channels and areas of standing open water. There is little evidence of a marine influence at the site beyond the pebble base upon which the peat sits and / or has incorporated. This could represent a shingle barrier that had formed across the mouth of Mawgan Porth allowing the marsh deposits to accumulate behind it. The occasional pebbles within the peat itself might therefore relate to those thrown up by storms.

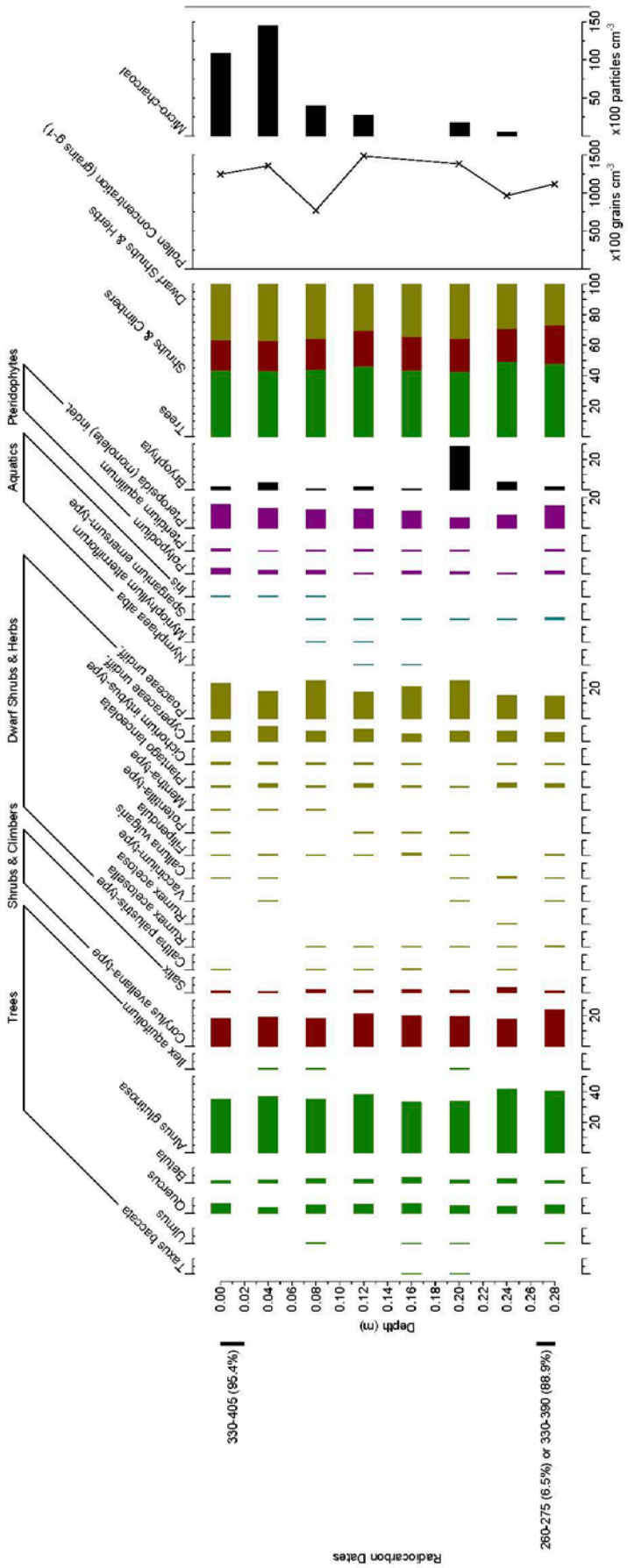


Figure 17.6: Pollen diagram (selected taxa) from Monolith 1, Mawgan Porth submerged forest

18 Appendix 6: Sites identified at risk from coastal erosion and flooding

Table 18.1: Sites identified at risk from coastal erosion

PDZ / PSA	MCO/MDV / NRHE No.	NHLE No.	UoS No.	Easting	Northing	Description
Cornwall						
PDZ09	MCO51534			135237	31733	CAPE CORNWALL - C19 fishermen's stores
PDZ09	MCO51537	1004388		135342	31914	PORTH LEDDEN - Medieval slipway
PDZ09	MCO6552	1004388		135480	32590	KENIDJACK CASTLE - Iron Age cliff castle
PDZ09	MCO56388			136220	33524	BOTALLACK - C19 pumping engine house
PDZ09	MCO52385	1143267		136242	33534	BOTALLACK - C19 winding engine house
PDZ09	(1471565)		9650	137195	34909	GEEVOR MINE - C19/C20 stamps
PDZ09	MCO50505			141368	36345	ROSEMERGY - Prehistoric field system
PDZ09	MCO6532			141600	36950	BOSIGRAN CASTLE - Bronze Age cliff castle, Iron Age cliff castle
PDZ09	MCO6582	1004300		143220	38638	Promontory Fort called Trereen Dinas
PDZ09	MCO57630			143632	38310	GURNARDS HEAD - C19 fish cellar
PDZ09	MCO50603			143919	38473	BOSWEDNACK CLIFF - Medieval enclosure
PDZ09			722	145218	39236	ZENNOR CLIFF - Post Medieval footpath
PDZ09	MCO50607			145906	39477	TREGERTHEN CLIFF - Post Medieval field boundary
PDZ09	MCO27610			146770	40400	TREVEAL CLIFFS - Post Medieval field system
PDZ09	MCO27646			147450	40700	TREVEGA CLIFF - Post Medieval boundary bank
PDZ09	MCO27597			149080	40900	TROWAN CLIFF - Post Medieval field system
PDZ10	MCO19299			151200	41000	CARRICK DU - Bronze Age hut circle, Iron Age hut circle
PDZ10	MCO42929			153035	38800	CARBIS BAY - Modern pillbox
PDZ10	MCO7126			153613	38512	VENTON UNY - Medieval holy well
PDZ10	MCO50972			154783	38229	PORTH KIDNEY - Modern pillbox
PDZ10	MCO28569			157900	41570	GWITHIAN - Undated hearth
PDZ10	MCO28568			158020	43000	PORTH GODREVY - Post Medieval building
PDZ10	MCO33839			158100	43050	GODREVY COVE - Modern battery

PDZ / PSA	MCO/MDV / NRHE No.	NHLE No.	UoS No.	Easting	Northing	Description
PDZ10	MCO28559			158136	42935	PORTH GODREVY - Post Medieval boat house
PDZ10	MCO6674			158150	42870	GWITHIAN, SITE GT - Mesolithic lithic scatter
PDZ11			769	160407	42902	HELL'S MOUTH - Post Medieval quarry
PDZ11	MCO2897			160653	43017	HUDDER DOWN - Bronze Age barrow
PDZ11			391	162172	43158	RESKAJEAGE - undated intertidal wall?
PDZ11	MCO6539			163478	43965	NHLE 1004390 - CRANE CASTLE - Iron Age cliff castle
PDZ11			768	163803	44012	CARAVANNEL DOWNS - Post Medieval quarry
PDZ11	MCO21494			163905	44105	CARVANNEL DOWNS - Undated enclosure
PDZ11			9466	164076	44576	CARAVANNEL DOWNS - Uncertain earthwork, alledged cliff castle
PDZ11	MCO54000			164165	44796	PORTHCADJACK COVE - Post Medieval steps
PDZ11			772	164765	45343	TREGEA HEAD - Post Medieval quarry?
PDZ11	MCO4889			165100	45350	PORTREATH - Post Medieval quay
PDZ11	MCO26432			165100	45300	PORTREATH - Post Medieval baths
PDZ11	MCO26419			165508	45636	PORTREATH - Post Medieval day mark
PDZ11			757	165645	45595	PORTREATH - Post Medieval quarry?
PDZ11			390	166766	46671	NANCEKUKE - undated boundaries?
PDZ11			389	167004	46736	NANCEKUKE - undated boundaries?
PDZ11			756	167454	46773	NANCEKUKE - Post Medieval pospecting pits?
PDZ11	MCO58155			169096	48389	PORTHTOWAN - C20 tidal swimming pool
PDZ11	MCO25225			169795	50501	TUBBYS HEAD - Prehistoric midden
PDZ11	MCO6585	1017017		169833	50485	TUBBYS HEAD - Iron Age harbour, Iron Age cliff castle
PDZ11	MCO25225			169833	50485	TUBBYS HEAD - Prehistoric midden
PDZ11	MCO4728			172070	51720	ST AGNES - Post Medieval harbour
PDZ11	MCO29188			172629	51915	TREVELLAS PORTH - Post Medieval blowing house
PDZ11	MCO29187			172650	51900	TREVELLAS PORTH - Post Medieval stamping mill

PDZ / PSA	MCO/MDV / NRHE No.	NHLE No.	UoS No.	Easting	Northing	Description
PDZ11			681	173243	52944	PEN A GADER - Post Medieval mineshaft
PDZ11			672	174701	54180	SHAG ROCK - Post Medieval mineshaft
PDZ11			685	174729	54159	SHAG ROCK - Post Medieval quarry?
PDZ11	MCO6562	1016991		175800	59100	PENHALE POINT - Iron Age/Romano British cliff castle
PDZ11			662	176421	59135	HOLYWELL - Undated quarry/platform?
PDZ11	MCO6551	1020026		176528	60800	KELSEY HEAD - Iron Age cliff castle, Romano British cliff castle
PDZ11	MCO6993			176682	60002	HOLYWELL BAY - Medieval holy well
PDZ11	MCO31942			176738	60776	KELSEY HEAD - Undated enclosure
PDZ11	MCO32801			176802	59703	THE KELSEYS - Undated enclosure
PDZ11	MCO38379			176840	60700	KELSEY HEAD - Iron Age cliff castle, Romano British cliff castle
PDZ12	MCO57079			177539	61004	WEST PENTIRE – Post Medieval slipway
PDZ12	MCO57080			177539	61004	WEST PENTIRE – Post Medieval storehouse
PDZ12			9398	178079	61560	PENTIRE POINT EAST - Modern quarry
PDZ12	MCO26493			178100	61429	EAST PENTIRE - Early Medieval rock carving
PDZ12	MCO46551		5617	178218	61390	THE GANNEL - Undated landing stage
PDZ12	MCO46550		6121	178246	61373	THE GANNEL - Undated landing stage
PDZ12	MCO46549		6159	178354	61312	THE GANNEL - Undated landing stage
PDZ12			9392	178834	60903	RUSHY GREEN - Post Medieval quarry
PDZ12	MCO46548			178992	61248	THE GANNEL - Post Medieval slipway, Post Medieval quay
PDZ12			654	179503	61222	THE GANNEL - Modern quarry
PDZ12			655	179729	61142	THE GANNEL - Modern quarry
PDZ12	MCO7269			179793	60789	PENPOL CREEK - Post Medieval lime kiln
PDZ12	MCO33036			179970	62910	TOWAN HEAD - Post Medieval mine, Undated mine
PDZ12	MCO29121			179980	63010	TOWAN HEAD - Post Medieval magazine

PDZ / PSA	MCO/MDV / NRHE No.	NHLE No.	UoS No.	Easting	Northing	Description
PDZ12	MCO33159			180060	62790	TOWAN HEAD - Medieval enclosure, Post Medieval enclosure
PDZ12	MCO42610			180060	62790	TOWAN HEAD - gun battery
PDZ12	MCO22939	1006712		182360	63080	TREVELGUE HEAD - Prehistoric metal processing site
PDZ12	MCO23093			182420	62555	LUSTY GLAZE - Post Medieval inclined plane, Post Medieval canal
PDZ12	MCO22941	1006712		182570	62980	TREVELGUE HEAD - Prehistoric metal processing site
PDZ12	MCO22942	1006712		182590	62960	TREVELGUE HEAD - Prehistoric metal processing site
PDZ12	MCO22945			182720	62980	TREVELGUE HEAD - Post Medieval occupation site
PDZ12	MCO7308			182998	62696	PORTH - Post Medieval lime kiln
PDZ13	MCO22930	1006712		182652	63071	TREVELGUE HEAD - Prehistoric lithic working site
PDZ13	MCO3811	1006712		182853	63100	TREVELGUE HEAD - Bronze Age barrow
PDZ13	MCO3963	1004461		183352	63719	WEST TREVELGUE - Bronze Age barrow
PDZ13	MCO2579	1004461		183406	63752	EAST TREVELGUE - Bronze Age barrow
PDZ13			634	184017	64640	WATERGATE - Post Medieval quarry
PDZ13	MCO6550	1021004		184150	66470	GRIFFINS POINT - Iron Age cliff castle
PDZ13	MCO6559			184150	70800	PARK HEAD - Iron Age cliff castle
PDZ13	MCO46581			184230	67100	BERRYLS POINT - C19 lookout, boundary marker
PDZ13	MCO25956			184234	67109	BERRYLS POINT - Post Medieval quarry
PDZ13				184291	66537	GRIFFINS POINT - Post Medieval footpath
PDZ13	MCO3214			184440	71200	PARK HEAD - Bronze Age barrow
PDZ13	MCO51928			184746	67954	TRENANCE POINT - Post Medieval canal
PDZ13	MCO6788			184800	76200	TREVOSE HEAD - Mesolithic Scatter
PDZ13	MCO3210			184816	71570	PARK HEAD - Bronze Age barrow
PDZ13			711	184841	69346	PENDARVES POINT - Post Medieval footpath
PDZ13	MCO6571	1021006		184920	69650	REDCLIFF CASTLE - Iron Age cliff castle

PDZ / PSA	MCO/MDV / NRHE No.	NHLE No.	UoS No.	Easting	Northing	Description
PDZ13	MCO47512			184998	71969	PORTHCOTHAN - Post Medieval smugglers cache
PDZ13	MCO6588	1004234		185420	73570	WINECOVE POINT - Iron Age cliff castle
PDZ13			628	185480	73172	FOX COVE - Bronze Age barrow
PDZ13	MCO46977			185687	74274	TREYARNON - Post Medieval grave
PDZ13	MCO55873			185719	75122	CONSTANTINE ISLAND - Bronze Age midden
PDZ13	MCO46104			185740	75150	CONSTANTINE ISLAND - Bronze Age cist
PDZ13	MCO46101			185760	75220	BOOBYS BAY - Bronze Age cist
PDZ13	MCO46107			185760	75230	BOOBYS BAY - Bronze Age round house (domestic)
PDZ13	MCO237			185770	75240	BOOBYS BAY - Mesolithic findspot
PDZ13	MCO25858			187000	76100	CATACLEWS - Bronze Age quarry, Modern quarry
PDZ13	MCO2422			187017	76058	CATACLEWS POINT - Bronze Age barrow
PDZ13	MCO2421			187049	76073	CATACLEWS POINT - Bronze Age barrow
PDZ13	MCO1906	1003088		187085	76075	CATACLEWS POINT - Bronze Age barrow cemetery
PDZ13	MCO30012			187220	75780	ONJOHN COVE - Modern beach defence
PDZ13	MCO25836	1006685		187781	75287	HARLYN BAY - prehistoric cemetery
PDZ13	MCO4512			188740	75780	NEWTRAIN BAY - Bronze Age cairn
PDZ13	MCO25838			188980	75860	TREVONE - Romano British cemetery
PDZ13	MCO25863			189300	76600	PORTHMISSEN - Post Medieval quarry
PDZ13			611	190155	77393	LELLIZZICK - Post Medieval quarry
PDZ13			609	190790	78099	STEPPER POINT - Post Medieval quarry
PDZ14	MCO52904			191336	77630	HAWKERS COVE - Post Medieval watch house
PDZ14			606	191424	78046	STEPPER POINT - Remains of Post-Medieval landing stage/jetty?
PDZ14			604	191493	78261	STEPPER POINT - Modern mooring posts
PDZ14	MCO29326			191510	78420	STEPPER POINT - Post Medieval quarry
PDZ14	MCO26602			191895	76726	GUN POINT - Post Medieval battery, Modern gun emplacement

PDZ / PSA	MCO/MDV / NRHE No.	NHLE No.	UoS No.	Easting	Northing	Description
PDZ14	MCO43360			192180	76127	ST SAVIOURS POINT - Modern military base
PDZ14	MCO56253			192700	77500	DAYMER BAY - Prehistoric shell midden
PDZ14	MCO43019			192844	77670	DAYMER BAY - Modern pillbox
PDZ14	MCO3297			193363	79677	PENTIREGLAZE - Bronze Age barrow
PDZ14	MCO6575	1004625		193400	81080	THE RUMPS - Iron Age cliff castle
PDZ14	MCO56202			193422	79031	POLZEATH - Post medieval shipwreck grave
PDZ14	MCO3472			193501	79557	SLIPPER POINT - Bronze Age barrow
PDZ14	MCO18531			193530	74980	CANT - Post Medieval fish cellar
PDZ14	MCO55904			193583	79655	NEW POLZEATH - C18 shipwreck grave
PDZ14			8893	192746	76145	ROCK - Post Medieval quarry
PDZ15	MCO6575	1004625		193400	81080	THE RUMPS - Iron Age cliff castle
PDZ15	MCO26571			195640	79820	LUNDY HOLE - Post Medieval quarry
PDZ15	MCO26579			196718	80565	DOYDEN CASTLE - Iron Age cliff castle, Post Medieval folly
PDZ15	MCO57120	1220116		197111	80555	PORT QUIN - 19C Quay Cottage
PDZ15	MCO57121	1320628		197115	80537	PORT QUIN - walls on northern side
PDZ15	MCO57123	1320628		197121	80542	PORT QUIN - walls on northern side
PDZ15	MCO29543			200840	81130	WELSHMANS QUARRY - Post Medieval quarry
PDZ15	MCO12622			204160	84040	TREGARDOCK - Post Medieval mine
PDZ15	MCO36889			204370	85750	START POINT - Post Medieval building
PDZ15	MCO36868			204660	87570	LOWER PENHALLIC POINT - Post Medieval road
PDZ15	MCO36855			204740	87980	LAMBSHOUSE AND GULL POINT QUARRIES – plus footpaths
PDZ15	MCO29551			204930	87500	DRIA QUARRY - Post Medieval quarry
PDZ15	MCO36847			204930	88600	GILLOW QUARRY - Post Medieval horse whim
PDZ15	MCO36931			205000	86600	LILL COVE - Post Medieval mine
PDZ15	MCO36745			205010	86840	TREKNOW - Post Medieval extractive pit
PDZ15	MCO36932			205024	86598	LILL COVE - Post Medieval mine

PDZ / PSA	MCO/MDV / NRHE No.	NHLE No.	UoS No.	Easting	Northing	Description
PDZ15	MCO29555			205100	87050	LANTERDAN QUARRY - Post Medieval quarry AND WEST QUARRY - Post medieval building
PDZ15	MCO36941			205900	89310	SMITHS CLIFF - Early Medieval bank (earthwork), Early Medieval trackway
PDZ15	MCO6587			206290	89620	WILLAPARK - Iron Age cliff castle
PDZ15	MCO22004			208500	90750	GROWER QUARRY - Post Medieval quarry
PDZ15	MCO6586			209200	91200	WILLAPARK - Iron Age cliff castle
PDZ15	MCO36560			213240	95650	THE STRANGLES - Bronze Age barrow
PDZ15	MCO55533			213668	96562	TREMOUTHA HAVEN - WWII wreck
PDZ15	MCO36551	1003097		214570	97630	CASTLE POINT - Iron Age cliff castle
PDZ15	MCO46328			218434	100051	MILLOOK - Post Medieval boat house
PDZ15			708	202803	81865	BARRETTS ZAWN - Post Medieval footpath
PDZ15			8828	202922	82085	DELABOLE POINT - Post Medieval quarry
PDZ15			446	203117	82443	DANNONCHAPEL - undated tunnel
PDZ15			185	203287	82754	DANNONCHAPEL - Post Medieval quarries
PDZ15			702	204274	84126	TREGARDOCK CLIFF - Post Medieval footpaths
PDZ15			176	204147	84936	TRELIGGA - Post medieval building
PDZ15			700	204359	85725	START POINT - Post Medieval quarry?
PDZ15			162	204444	85909	BACKWAYS COVE - Post Medieval building
PDZ15			934	205300	89212	TINTAGEL HAVEN - Post Medieval building
PDZ15			683	206401	89556	LYE COVE- Post Medieval footpath
PDZ15			676	209122	90983	WESTERN BLACKPIT - Post Medieval footpath
PDZ15			672	211313	92934	FIRE BEACON POINT - Post Medieval footpath
PDZ15			676	209121	90982	EAST DELABOLE - Post Medieval footpaths
PDZ16	MCO46331			219713	103241	LOWER LONGBEAK - Bronze Age barrow
PDZ16	MCO38982			219938	102686	WIDEMOUTH - Modern enclosure
PDZ16	MCO57556			219943	102848	MARHAMCHURCH - C18 house

PDZ / PSA	MCO/MDV / NRHE No.	NHLE No.	UoS No.	Easting	Northing	Description
PDZ16	MCO57559			219944	102861	MARHAMCHURCH - C18 house
PDZ16	MCO2854			219950	103896	HIGHER LONGBEAK - Bronze Age barrow
PDZ16	MCO39184			219959	103019	WIDEMOUTH - Modern pillbox
PDZ16	MCO46298			220044	106352	BUDE - Bronze Age barrow
PDZ16	MCO46297	1141875		220046	106344	BUDE - Post Medieval coastguard station
PDZ16	MCO23053			220089	111645	DUCKPOOL BEACH - Romano British metal processing site, Romano British hearth
PDZ16	MCO39464			220117	111670	DUCKPOOL - Post Medieval rifle butts, Post Medieval mound
PDZ16	MCO46282			220126	107951	EARTHQUAKE - Post Medieval quarry
PDZ16	MCO46269			220166	108887	NORTHCOTT MOUTH - Bronze Age barrow
PDZ16	MCO46281			220172	107791	EARTHQUAKE - Bronze Age barrow
PDZ16	MCO43108			220195	107267	CROOKLETS BEACH - Modern pillbox
PDZ16	MCO38814			220204	107298	CROOKLETS BEACH - Modern pillbox
PDZ16	MCO46320			220228	109150	SARSHALLS PIT - Bronze Age barrow
PDZ16	MCO46288			220260	106960	SUMMERLEAZE POINT - Bronze Age barrow
PDZ16	MCO38737			220263	109146	DUNSMOUTH - Post Medieval firing range, Post Medieval rifle butts, Post Medieval rifle butts
PDZ16	MCO46289			220286	106971	SUMMERLEAZE POINT - Bronze Age barrow
PDZ16	MCO46287			220290	107010	SUMMERLEAZE POINT - Bronze Age barrow
PDZ16	MCO38995			220298	107287	CROOKLETS BEACH - Modern pillbox
PDZ16	MCO46290			220300	106820	SUMMERLEAZE POINT - Bronze Age barrow
PDZ16	MCO46292			220382	106762	SUMMERLEAZE POINT - Bronze Age barrow
PDZ16	MCO46293			220410	106740	SUMMERLEAZE POINT - Bronze Age barrow
PDZ17	MCO39690			219915	115150	MORWENSTOW - Post Medieval quarry
PDZ17	MCO39213			219989	113823	OLDWALLS - Prehistoric spring, Early Medieval spring
PDZ17	MCO39693			220637	116703	CARNAKEY CLIFF - Modern bomb crater

PDZ / PSA	MCO/MDV / NRHE No.	NHLE No.	UoS No.	Easting	Northing	Description
PDZ17	MCO40379			220830	117076	MARSLAND MANOR - Bronze Age cairn
PDZ17		1231518		219940	115332	HOLY WELL OF ST MORWENNA
PDZ17	MDV51978			222501	124298	SWANNERY
Devon						
PDZ17	MDV103446			221168	118572	Complex of Banks on Knap Head.
PDZ17	MDV34780			221298	118026	Hartland/Welcombe Parish Boundary Stone
PDZ17	MDV48	1003845		221677	119482	Embury Beacon Fort
PDZ17	MDV49	1003845		221677	119522	Embury Beacon Fort
PDZ17	MDV78277			222133	120887	Quarry at Sandhole Cliff
PDZ17	MDV51990			222300	124900	Outline of old pier visible
PDZ17	MDV81209			222441	125607	Mound at Dyer's Lookout, Hartland
PDZ17	MDV81371			222453	124329	Second World War emplacement, Childspit Beach
PDZ17	MDV102252			222563	124017	Earthwork bank south of St Catherine's Tor
PDZ17	MDV34008			223149	127581	Signal Station above Hartland Point
PSA1	MDV69114	1104917		212760	144880	Possibly the Fog Signal Battery
PSA1	MDV68124			213000	148100	Lighthouse steps, north end
PSA1	MDV58892	1016033		213289	145806	The southern of two coastal defence platforms above Jenny's Cove
PSA1	MDV12	1016036		213505	148020	Battery on North East Point, Lundy
PSA1	MDV7108	1016037		213587	147776	Revetted Platform to West of Gannets Rock, Lundy
PSA1	MDV68142			213790	146870	A short length of orthostatic wall at lower end of combe between brazen ward and mousehole and trap, Lundy
PSA1	MDV19484			213800	143700	Mine and quarry at the rattles
PSA1	MDV58894	1016031		213818	146860	Coastal defence platforms at the Mousehole and Trap
PSA1	MDV45996			213820	143710	Mine and quarry at the rattles
PSA1	MDV68547			213850	145700	A small section of retaining wall in the gully, north of a stream and apparently cut by it, Lundy
PSA1	MDV20	1016030		213916	146820	Gun Battery at Brazen Ward

PDZ / PSA	MCO/MDV / NRHE No.	NHLE No.	UoS No.	Easting	Northing	Description
PSA1	MDV14260	1016030		213916	146820	Gun Battery at Brazen Ward
PSA1	MDV46023			214190	143890	Landing Quay Cave Boat house on road
PSA1	MDV46051			214200	143900	Landing Quay Cave Boat house on road
PSA1	MDV46024			214240	143820	Lime kiln, Lundy
PSA1	MDV46025			214260	143800	Stone, Lundy
PSA1	MDV46027			214300	143760	Lundy, Fish Cellars
PSA1	MDV46028			214500	143700	Jetty, Lundy
PSA2	MDV34008			223149	127581	Signal Station above Hartland Point
PSA2	MDV67683			223309	127516	Concrete Platform to West of Carpark at Hartland Point
PSA2	MDV102373			223325	127608	Possible military coastal structure, Hartland Point
PSA2	MDV74996			223388	127490	Military Buildings near Hartland Point
PSA2	MDV52951			223743	127615	Hartland Point Radar Station
PSA2	MDV81175			223774	127597	Hartland Point Radar Station
PSA2	MDV21499			225482	127370	Terraces on Gawlish Cliff, Hartland
PSA2	MDV63551	1317288		229973	126514	The Cottage / Summerhouse, The Wilderness, Clovelly Court
PSA2	MDV63552	1333109		230009	126503	Archway, The Wilderness, Clovelly Court
PSA2	MDV72	1018520		230474	126240	Bowl Barrow at Gallantry Bower, Clovelly
PSA2	MDV102339			230547	126169	possible barrow, Clovelly
PSA2	MDV102345	1165473		230750	125944	Gazebo known as 'The Angel Wings', Clovelly
PSA2	MDV63556	1104500		231363	125501	The Cabin, Clovelly
PSA2	MDV107364			237899	124250	ruined boatshed, Peppercombe
PSA2	MDV75161			238050	124250	Limekiln, Peppercombe
PSA2	MDV75158			238264	124280	Coastguard Lookout, Peppercombe
PSA2	MDV75026			238460	124507	Portledge Mouth Limekiln
PSA2	MDV19490			240099	126404	Portledge Mine, Alwington
PSA2	MDV75002			240118	126359	Cockington Cliff Quarry, Alwington
PSA2	MDV80461			240720	127297	quarry near Bennet Rock
PSA2	MDV102146			240751	127291	quarry near Bennet Rock
PSA2	MDV102152			241118	127889	Mound in the position of a mapped linekiln at Abbotsham Cliff
PSA2		1104434		235507	123634	KINGS COTTAGE

PDZ / PSA	MCO/MDV / NRHE No.	NHLE No.	UoS No.	Easting	Northing	Description
PSA2		1104435		235498	123590	THE OLD MILL
PSA2		1104438		235522	123577	K6 TELEPHONE KIOSK
PSA2		1105137		235595	123503	10 AND 11
PSA2		1250485		235480	123580	CRIPPETTS
PSA2		1250497		235477	123658	LIME KILN TO EAST OF BEACH ACCESS WITH ACCESS RAMP
PSA2		1263225		235488	123608	LOWER LOOKOUT
PSA2		1263229		235371	123684	LIME KILN TO WEST OF BEACH ACCESS
PSA2		1305547		235586	123514	BARNACLE COTTAGE
PSA2		1308761		235495	123608	BUCKS MILLS HOUSE
PSA2		1333151		235508	123607	WHITE COTTAGE
PSA2		1446295		235479	123635	The Cabin
PSA3	MDV44568			242980	129510	Submerged Forest, Westward Ho!
PSA3	MDV107430			243164	129634	Submerged Forest, Westward Ho!
PSA3	MDV31611			243272	138320	Chesil Cliff Lookout Station
PSA3	MDV16847			245646	126392	Tollhouse, Bideford Bridge
PSA3	MDV204			245780	132492	Bideford or Braunton Lighthouse, Braunton Burrows
PSA3	MDV77510			245793	132489	Observation Post, Braunton Burrows
PSA3	MDV102699			245836	132511	Three possible machine gun emplacements south of Boardwalk Mounts, Braunton Burrows
PSA3	MDV102699			245836	132511	Three possible machine gun emplacements south of Boardwalk Mounts, Braunton Burrows
PSA3	MDV526	1004578		246060	124660	Hallsannery Limekiln
PSA3	MDV11777			246190	124346	Lime Kiln Cottage, Landcross
PSA3	MDV102742			246422	132100	Possible pillbox on Crow Neck, Braunton Burrows
PSA3	MDV102735			246429	132079	Possible sections of military roadways at Crow Point
PSA3	MDV102737			246489	132039	Concrete wall at Crow Point
PSA3	MDV102734			246561	132059	Probable military slipway at Broadsands
PSA3	MDV102731			246610	132088	Anti-tank obstacles at Broadsands
PSA3	MDV102741			246610	131978	Possible latrine structures in the Assembly Area at Crow Point

PDZ / PSA	MCO/MDV / NRHE No.	NHLE No.	UoS No.	Easting	Northing	Description
PSA3	MDV102738			246635	131936	Hut base of the beach office in the Assembly Area at Crow Point
PSA3	MDV102580			247076	130665	Military maintenance site on Instow Sands
PSA3	MDV32736	1107633		247232	129774	Lime Kiln at Instow
PSA3	MDV32680	1325290		251346	133198	Limekiln by Fremington Pill
PSA3	MDV56006			251446	134924	Limekiln at Heanton Court Barton
PSA3	MDV32679			251593	133344	Fremington Quay
PSA3	MDV917			251746	133986	Lime Kiln near Penhill Point
PSA3	MDV50848	1432418		243130	129780	wreck near Westward Ho!
PSA3	MDV58099	1432949		243200	129700	wreck near Northam Burrows
PSA3	MDV5507	1003847		249142	132884	Yelland Stone Row
PSA4	MDV61370			242080	140597	Quarry
PSA4	MDV61358			242130	140600	Quarry
PSA4	MDV61372			242360	140250	Slipway
PSA4	MDV31677			242450	140990	Quarry
PSA4	MDV96971	1107102		243414	139546	LIMEKILN TO NORTH SIDE OF CROYDE BEACH AT O.S
PSA4	MDV21115			243470	138820	one of two pill boxesbeside the footpath at the property known as cock rock
PSA4	MDV57325			243554	139496	Slipway, Croyde
PSA4	MDV103041			243557	139108	Probable military feature, possibly a pillbox, on Croyde Burrows
PSA4	MDV36863	1107736		244864	140926	Limekiln, north side of Vention Cottage
PSA4	MDV103280			245398	144172	Possible Observation Post or Pillbox above Barracane Beach, Woolacombe
PSA5	MDV31208			246030	146300	quarry on cliff edge
PSA5	MDV19600			246282	146734	Bull Point Lighthouse
PSA5	MDV23835			248006	146535	Site of the Old Mill, Lee
PSA5	MDV31215			248095	146483	Site of the Old Mill, Lee
PSA5	MDV78906			251487	147744	The Tunnels, Ilfracombe.
PSA5	MDV69991			252610	147870	Ilfracombe promenade pier
PSA5	MDV57180			252870	147700	Rapparee Cove Burials
PSA5	MDV75634			253035	147738	small building on cliff edge, Hillsborough Promontory Fort
PSA5	MDV56279			253340	148080	Gun Battery at Beacon Point
PSA5	MDV62893			253341	148070	Limekiln at Hillsborough
PSA5	MDV2202			254200	148200	Quarry on cliff edge

PDZ / PSA	MCO/MDV / NRHE No.	NHLE No.	UoS No.	Easting	Northing	Description
PSA5	MDV31283	1325723		255255	148452	ROUND TOWER CIRCA 600 METRES NORTH WEST OF WATERMOUTH CASTLE
PSA5			4325	256611	147440	Quarry
PSA5	MDV23837	1208021		247902	146485	The White House, Combe Martin
PSA5	MDV23836	1203050		247935	146469	Smugglers Cottage, Combe Martin
PSA5	MDV2210	1002512		253256	147761	Hillsborough Promontory Fort
PSA5			4367	254621	148421	Wreck, possible the HMS Gossamer, on beach within Samson's Cove

Table 18.2: Listed buildings identified at risk from flooding

PDZ / PSA	NHLE No.	Name	Grade	NGR	Risk from Flooding
PDZ09	1327288	ZENNOR BRIDGE	II	SW 45425 38403	High
PDZ09	1143255	THE LITTLE ORCHARD	II	SW 36451 30565	Low
PDZ09	1137986	PIGGERY, PLAGUE STONE AND CROSS IMMEDIATELY NORTH OF BRIDGE COTTAGE	II	SW 45415 38397	Low
PDZ10	1136883	WESLEYAN CHAPEL	II	SW 54263 36776	High
PDZ10	1160015	BARCLAYS BANK	II	SW 55836 37151	High
PDZ10	1143320	CHY-AN-WHEEL	II	SW 54192 36537	High
PDZ10	1160923	ST ERTH BRIDGE	II	SW 54915 35070	High
PDZ10	1310774	MILESTONE AT SW564378	II	SW 56441 37836	High
PDZ10	1143709	THE VIADUCT AT SW58353801	II	SW 58468 38075	High
PDZ10	1159814	BRIDGE OF MELLANVRANE	II	SW 58344 38199	High
PDZ10	1143687	BLACK BRIDGE	II	SW 56663 38123	High
PDZ10	1143706	RAILWAY BRIDGE AT SW566382	II	SW 56701 38235	High
PDZ10	1160132	BRIDGE AND BOUNDARY STONE AT SW5687 3830	II	SW 56902 38311	High
PDZ10	1143736	CARBIS MILL	II	SW 55333 33522	Low
PDZ10	1143647	GATE PIERS AND FLANKING WALLS AT APPROXIMATELY 120 METRES NORTH EAST OF MOORGROVE	II	SW 53610 35357	Low
PDZ10	1160891	LYCH GATE AND CHURCHYARD WALLS WEST AND SOUTH OF CHURCH OF ST ERTH	II	SW 54963 35056	Low
PDZ10	1143321	LODGE AT TREVETHOE HOUSE SOUTH EAST OF THE HOUSE	II	SW 54146 36513	Low
PDZ10	1136881	HAMPTON COURT	II	SW 54225 36796	Low
PDZ10	1143280	WELL-HEAD APPROXIMATELY 50 METRES SOUTH WEST OF THE ABBEY	II	SW 54178 36857	Low
PDZ10	1143359	TRENDREATH HOUSE	II	SW 54258 36812	Low

PDZ / PSA	NHLE No.	Name	Grade	NGR	Risk from Flooding
PDZ10	1143684	PREMISES OCCUPIED BY R.M. MUNDAY	II	SW 55841 37139	Low
PDZ10	1327612	PREMISES OCCUPIED BY HOMESTEAD AND CORNISH LINEN SERVICE	II	SW 55844 37125	Low
PDZ10	1143663	MILESTONE OF SW559370 IN GARDEN WALL OF NO.3	II	SW 55920 37063	Low
PDZ10	1143683	FREEMASONS' HALL	II	SW 55875 37085	Low
PDZ10	1159998	7, FOUNDRY SQUARE	II	SW 55889 37076	Low
PDZ10	1310761	THE WHITE HART HOTEL	II*	SW 55861 37095	Low
PDZ10	1327611	LLOYDS BANK	II	SW 55872 37147	Low
PDZ10	1143676	BRIDGE AT APPROXIMATELY 50 METRES NORTH WEST OF THE CUSTOM HOUSE	II	SW 55745 37740	Low
PDZ10	1159871	THE WAR MEMORIAL	II	SW 56161 37688	Low
PDZ10	1143711	MILLBROOK HOUSE INCLUDING FRONT GARDEN AREA WALLS AND GATE-PIERS	II	SW 58324 38204	Low
PDZ10	1159753	HAYLE CAUSEWAY	II	SW 54973 36450	Medium
PDZ10	1031617	LEACH POTTERY	II	SW 50873 39942	Medium
PDZ10	1031618	POTTERY COTTAGE	II	SW 50847 39924	Medium
PDZ10	1136759	7, CHAPEL STREET	II	SW 51692 40421	Medium
PDZ10	1136851	PREMISES OF EDWARD MARSH (MEN'S OUTFITTERS) AND CLOTWORTHYS (MEN'S OUTFITTERS)	II	SW 51743 40475	Medium
PDZ10	1136929	1,2 AND 3, ST ANDREWS STREET	II	SW5185940472	Medium
PDZ10	1136936	ST ANDREWS HOUSE	II	SW 51837 40482	Medium
PDZ10	1143296	5 AND 6, THE STENNACK	II	SW 51589 40347	Medium
PDZ10	1143297	3, STREET-AN-GARROW	II	SW 51692 40440	Medium
PDZ10	1143333	DRIFTWOOD FLATS	II	SW5186040451	Medium
PDZ10	1143349	STONE CROSS	II	SW5078139884	Medium
PDZ10	1312519	PREMISES OF R G AND L A QUICK	II	SW 51745 40469	Medium
PDZ10	1312653	WESLEYAN SCHOOL	II	SW 51648 40393	Medium
PDZ10	1327805	24, STREET-AN-GARROW	II	SW 51690 40430	Medium
PDZ10	1327807	OUTRIGGER RESTAURANT	II	SW 51846 40424	Medium
PDZ11	1137994	BRIDGE AT SW727517	II	SW7279551700	High
PDZ11	1141561	BRIDGE AT SW755540	II	SW 75596 54079	High
PDZ11	1142582	METHODIST CHURCH	II	SW 65967 45284	High
PDZ11	1161507	TRECARREL	II	SW 65983 45272	High
PDZ11	1141514	12 AND 13, PETERVILLE SQUARE	II	SW 72347 50678	Low
PDZ11	1137717	LANTERN COTTAGE	II	SW 72133 51159	Low
PDZ11	1141517	TREVAUNANCE HOUSE, INCLUDING GATE-PIERS AND FLANKING WALLS	II	SW 72139 51131	Low
PDZ11	1161478	MILEPOST OPPOSITE METHODIST CHURCH	II	SW 65966 45248	Low
PDZ12	1312751	TREVEMPER BRIDGE	II	SW 81943 59878	High

PDZ / PSA	NHLE No.	Name	Grade	NGR	Risk from Flooding
PDZ14	1212667	LITTLE PETHERICK BRIDGE	II	SW 91882 72144	High
PDZ14	1289433	LITTLE PETHERICK VILLAGE HALL AND ATTACHED CARETAKERS COTTAGE	II	SW 91873 72162	High
PDZ14	1211560	8, CHURCH LANE	II	SW 91765 75385	High
PDZ14	1211584	RASHLEIGH COTTAGE	II	SW 91728 75373	High
PDZ14	1289824	GOLDEN LION	II	SW 91797 75369	High
PDZ14	1289858	GATES AND GATEPIERS AT SOUTH EAST ENTRANCE TO CHURCHYARD	II	SW 91599 75379	High
PDZ14	1212006	NORTH QUAY WALLS	II	SW 92029 75570	High
PDZ14	1143055	TREWORNAN BRIDGE	II	SW 98746 74281	High
PDZ14	1143057	SLADES HOUSE COUNTRY INN	II	SX 01112 71429	Low
PDZ14	1159450	MILESTONE TO SOUTH OF NURSERY	II	SX 00880 71474	Low
PDZ14	1162535	HURSTHOLM	II	SW 99899 72007	Low
PDZ14	1289401	SLIP, QUAY AND RETAINING WALLS	II	SW 92099 73650	Low
PDZ14	1211553	THE TASTEBUD	II	SW 91861 75387	Low
PDZ14	1211933	KELVIN PLATT GALLERY AND SHOP ADJOINING ON SOUTH WEST	II	SW 91869 75399	Low
PDZ14	1212212	T HENWOOD AND SONS THE STRAND BOOKSHOP	II	SW 91879 75396	Low
PDZ14	1212302	THE LOBSTER POT	II	SW 91901 75391	Low
PDZ14	1289573	CORNISH KITCHEN MR T SHIRT	II	SW 91897 75387	Low
PDZ14	1211935	NEWSAGENTS W E AND B E KESSELL	II	SW9184875417	Low
PDZ14	1289741	RED BRICK WAREHOUSE DIRECTLY TO EAST OF THE SHIPWRIGHTS	II	SW 91999 75515	Low
PDZ14	1124674	ROCK SAILING CLUB HOUSE	II	SW 93236 75592	Low
PDZ14	1142965	HEADSTONE OF ALEXANDER ANDERSON 8 METRES TO SOUTH OF WEST TOWER OF EGLOSHAYLE CHURCH	II	SX 00065 71905	Low
PDZ14	1142967	HEADSTONE OF WILMOT LAWRY AGAINST WEST WALL OF CHURCHYARD TO SOUTH WEST OF WEST TOWER OF EGLOSHAYLE CHURCH	II	SX 00056 71901	Low
PDZ14	1289951	NOS 16, 18, 20, 22 AND WAREHOUSE ADJOINING TO EAST	II	SW 91695 75390	Low
PDZ14	1211797	HARBOUR WALLS COMPRISING WALLS TO SOUTH OF NORTH QUAY, TO EAST OF THE STRAND AND TO NORTH OF SOUTH	II	SW 91907 75456	Low

PDZ / PSA	NHLE No.	Name	Grade	NGR	Risk from Flooding
		QUAY, SLIPS AND PIER ON NORTH EAST OF SOUTH QUAY			
PDZ14	1327982	SPRING GARDENS	II	SW 99145 72644	Medium
PDZ14	1211554	BUTCHERS	II	SW 91848 75375	Medium
PDZ14	1211859	CORNER HOUSE BAKERY	II	SW 91841 75374	Medium
PDZ14	1226669	DOLPHIN COTTAGE	II	SW 91808 75372	Medium
PDZ14	1289823	PADSTOW POTTERY	II	SW 91820 75375	Medium
PDZ14	1211862	BUCKINGHAM	II	SW 91831 75388	Medium
PDZ14	1211863	CORNISH STONE COMPANY LIMITED, GIFT HORSE, THE COUCH, W J PRIOR AND SON	II	SW 91871 75418	Medium
PDZ14	1289825	CORNISH CANDY AND SHOP ADJOINING ON NORTH	II	SW 91879 75434	Medium
PDZ14	1142964	HEADSTONE OF JOHN NANCOLLINS 5 METRES TO SOUTH OF SOUTH AISLE OF EGLOSHAYLE CHURCH	II	SX 00097 71897	Medium
PDZ14	1142966	HEADSTONE OF MARY OSBURN 10 METRES TO SOUTH OF SOUTH AISLE OF EGLOSHAYLE CHURCH	II	SX 00083 71893	Medium
PDZ14	1162476	HEADSTONE OF CHARLES AND MARK PASCO 8 METRES TO SOUTH OF SOUTH AISLE OF EGLOSHAYLE CHURCH	II	SX 00091 71895	Medium
PDZ14	1162496	TOMBCHEST OF RALPH BROWN 19 METRES TO SOUTH OF WEST TOWER OF EGLOSHAYLE CHURCH	II	SX 00061 71894	Medium
PDZ14	1309619	HEADSTONE OF RICHARD GEACH 8.5 METRES TO SOUTH OF SOUTH AISLE OF EGLOSHAYLE CHURCH	II	SX 00088 71894	Medium
PDZ14	1327986	HEADSTONE OF GEORGE SCANTLEBURY 7.5 METRES TO SOUTH OF SOUTH AISLE OF EGLOSHAYLE CHURCH	II	SX 00074 71896	Medium
PDZ14	1327987	HEADSTONE OF HONOR BROWN 18 METRES TO SOUTH OF WEST TOWER OF EGLOSHAYLE CHURCH	II	SX 00062 71896	Medium
PDZ14	1327988	SOUTH ENTRANCE TO CHURCHYARD OF EGLOSHAYLE CHURCH	II	SX0007471882	Medium
PDZ15	1124699	NORTH WEST WALL TO FISH CELLARS	II	SW 97137 80501	High
PDZ15	1220119	GARAGES/BOAT SHED AND ADJOINING WALLS 3 METRES SOUTH WEST OF CAROLINA CELLARS	II	SW 97130 80523	High
PDZ15	1320628	WALL TO BEACH ON NORTH EAST SIDE OF PORTQUIN	II	SW 97111 80541	High

PDZ / PSA	NHLE No.	Name	Grade	NGR	Risk from Flooding
PDZ15	1115065	FISH CELLARS	II	SW 99631 80752	High
PDZ15	1115081	LITTLE DOLPHINS	II	SW 99667 80733	High
PDZ15	1115082	17, MIDDLE STREET	II	SW 99670 80718	High
PDZ15	1115093	GREENGATES	II	SW 99659 80715	High
PDZ15	1115094	5 AND 7, CHURCH HILL	II	SW 99661 80710	High
PDZ15	1129873	WINDLASS	II	SW 99703 80682	High
PDZ15	1129874	THE PUMP INCLUDING ADJOINING PUMP	II	SW 99701 80691	High
PDZ15	1219476	SLIPWAY HOTEL	II	SW 99652 80728	High
PDZ15	1219954	KITTIWAKE COTTAGE	II	SW 99664 80740	High
PDZ15	1219968	13 AND 15, MIDDLE STREET	II	SW 99668 80726	High
PDZ15	1291198	21, MIDDLE STREET	II	SW 99675 80711	High
PDZ15	1291429	M AND C PROVIS BUTCHER	II	SW 99663 80701	High
PDZ15	1320597	SLIPWAY AND BRIDGE OVER STREAM ADJOINING FISH CELLARS, THE PLATT	II	SW 99636 80759	High
PDZ15	1320604	BEACH COTTAGE	II	SW 99660 80747	High
PDZ15	1320605	27, MIDDLE STREET	II	SW 99686 80711	High
PDZ15	1320624	BROOK COTTAGE	II	SW 99689 80683	High
PDZ15	1143473	SOUTH HARBOUR PIER, QUAY AND WALLS ON SOUTH WEST SIDE OF HARBOUR	II*	SX 09513 91496	High
PDZ15	1239415	WELLINGTON HOTEL	II	SX 09883 91186	High
PDZ15	1115066	THE MARKET HOUSE	II	SW 99655 80775	Low
PDZ15	1115070	HARBOUR CAFE	II	SW 99659 80753	Low
PDZ15	1219824	QUAY COTTAGE	II	SW 99663 80757	Low
PDZ15	1320598	THE WHEELHOUSE RESTAURANT	II	SW 99663 80770	Low
PDZ15	1320599	SLIPWAY AND RETAINING WALL TO HARBOUR TO SOUTH WEST OF THE GOLDEN LION	II	SW 99659 80789	Low
PDZ15	1143434	TREVILLET MILL	II	SX 07272 89206	Low
PDZ15	1273776	TREBUTTS	II	SX 10142 90638	Medium
PDZ15	1239395	THE OLD MILL	II	SX 09888 91220	Medium
PDZ15	1327707	ISLAND STUDIO THE CANDLE SHOP	II	SX 09890 91236	Medium
PDZ15	1143423	K6 TELEPHONE KIOSK (TELEPHONE NO 272)	II	SX 09875 91227	Medium
PDZ15	1143497	MARINE TERRACE	II	SX 09883 91141	Medium
PDZ15	1239434	FROGAPITS	II	SX 09882 91108	Medium
PDZ15	1143474	PIXIE SHOP	II	SX 09718 91358	Medium
PDZ15	1143476	OLD MANOR HOUSE RESTAURANT	II	SX 09974 91270	Medium
PDZ15	1143496	RIVERSIDE HOTEL	II	SX 09910 91251	Medium
PDZ15	1239696	SHOP DIRECTLY TO WEST OF OLD MANOR HOUSE RESTAURANT	II	SX 09964 91271	Medium
PDZ15	1239728	THE COBWEB	II	SX 10011 91279	Medium

PDZ / PSA	NHLE No.	Name	Grade	NGR	Risk from Flooding
PDZ16	1141818	NANNY MOORE'S BRIDGE	II	SS 20813 06420	High
PDZ16	1328541	KING WILLIAMS BRIDGE	II	SS 20800 11678	High
PDZ16	1230140	MILEPOST ABOUT 100 METRES NORTH OF RODDS BRIDGE	II	SS 20972 05032	Low
PDZ16	1141874	CENTRAL METHODIST CHAPEL	II	SS 20789 06344	Low
PDZ16	1141813	MILL HOUSE	II	SS 20982 11730	Low
PDZ16	1231259	FORD COTTAGE	II	SS 20986 11746	Low
PDZ16	1278883	MILITARIA MUSEUM	II	SS 20679 06266	Low
PDZ16	1279104	THE BREAKWATER	II	SS 20111 06549	Medium
PDZ16	1328520	SEA LOCK, LOCK GATES AND HAND WINCHES	II*	SS 20409 06415	Medium
PSA2	1104438	K6 TELEPHONE KIOSK	II	SS 35522 23577	High
PSA2	1333114	LIFEBOAT HOUSE WITH SLIPWAY ON FORESHORE	II	SS 31864 24844	High
PSA2	1317648	THE PIER	II	SS 31874 24912	Low
PSA2	1308725	LABURNUM COTTAGE	II	SS 35774 23302	Medium
PSA2	1171530	FOREST GARDENS	II	SS 35765 23361	Medium
PSA2	1105136	EMILYS	II	SS 35690 23403	Medium
PSA2	1105137	10 AND 11	II	SS 35595 23503	Medium
PSA2	1104434	KINGS COTTAGE	II	SS 35507 23634	Medium
PSA2	1104435	THE OLD MILL	II	SS 35498 23590	Medium
PSA2	1250497	LIME KILN TO EAST OF BEACH ACCESS WITH ACCESS RAMP	II	SS 35477 23658	Medium
PSA2	1308761	BUCKS MILLS HOUSE	II	SS 35495 23608	Medium
PSA2	1333151	WHITE COTTAGE	II	SS 35508 23607	Medium
PSA2	1446295	The Cabin	II	SS 35479 23635	Medium
PSA3	1305717	MILL BRIDGE	II	SS 45371 23503	High
PSA3	1210007	LANDCROSS METHODIST CHURCH INCLUDING FRONT AREA RAILING AND GATE	II	SS 46081 24349	High
PSA3	1209714	7 AND 8, NEW ROAD	II	SS 45381 26215	High
PSA3	1280109	MILESTONE OPPOSITE SHIP ON LAUNCH PUBLIC HOUSE (NOT INCLUDED)	II	SS 45730 26504	High
PSA3	1107724	NEWBRIDGE BRIDGE	II	SS 56986 28290	High
PSA3	1164318	GATEPIERS, FLANKING WALLS AND TERMINAL PIERS APPROXIMATELY 2 METRES SOUTH OF HALL LODGE	II	SS 57596 27688	High
PSA3	1107633	LIMEKILN ON INSTOW BEACH CIRCA 75 METRES SOUTH WEST OF INSTOW SAILING CLUB HOUSE	II	SS 47232 29774	High
PSA3	1140140	RICHMOND DOCK	II*	SS 46471 30324	High
PSA3	1107594	INSTOW QUAY JETTY	II	SS 47153 30256	High
PSA3	1249913	K6 TELEPHONE KIOSK	II	SS 47195 30272	High
PSA3	1385224	BALUSTRADE AND LAMP POST TO ROCK PARK LODGE	II	SS 56271 32604	High
PSA3	1107101	VELATOR BRIDGE	II	SS 48557 35718	High

PDZ / PSA	NHLE No.	Name	Grade	NGR	Risk from Flooding
PSA3	1107115	CATTLE SHELTER AND FOLD YARD WALLS 630 METRES NORTH EAST OF THE GREAT SLUICE	II	SS 48138 34694	High
PSA3	1107116	CATTLE SHELTER 350 METRES NORTH OF THE GREAT SLUICE	II	SS 47718 34534	High
PSA3	1107117	CATTLE SHELTER AND ADJOINING WALL 480 METRES NORTH-WEST OF THE GREAT SLUICE	II	SS 47458 34567	High
PSA3	1107118	CATTLE SHELTER AND ADJOINING WALL 630 METRES WEST SOUTH-WEST OF THE GREAT SLUICE	II	SS 47146 34031	High
PSA3	1107119	LINHAY AND ADJOINING FOLD YARD WALLS 1.14 KILOMETRES NORTH NORTH-WEST OF THE GREAT SLUICE	II	SS 47435 35264	High
PSA3	1107120	STILE AND FLANKING WALLS 400 METRES SOUTH-WEST OF THE GREAT SLUICE	II	SS 47414 33959	High
PSA3	1107121	CAEN PRIMARY SCHOOL	II	SS 48725 36668	High
PSA3	1107123	HOUSE ADJOINING CHURCH HOUSE	II	SS 48952 37034	High
PSA3	1107124	DEANS BRIDGE OVER RIVER CAEN	II	SS 48879 37103	High
PSA3	1107125	BLACK HORSE INN	II	SS 48955 37062	High
PSA3	1161344	CATTLE SHELTER 950 METRES NORTH OF THE GREAT SLUICE	II	SS 47799 35121	High
PSA3	1161356	TWO ADJOINING CATTLE SHELTERS 400 METRES NORTH-EAST OF THE GREAT SLUICE	II	SS4798834517	High
PSA3	1161544	33,35 AND 37, CHURCH STREET	II	SS 48951 37012	High
PSA3	1161569	CHURCH HOUSE	II*	SS 48946 37052	High
PSA3	1161612	36 AND 36A, CHURCH STREET	II	SS 48961 37074	High
PSA3	1309864	30 AND 32, SOUTH STREET	II	SS 48768 36416	High
PSA3	1310016	BOWENS AND RAILINGS. GATEPIERS AND OUTBUILDING	II	SS 48981 37030	High
PSA3	1310081	STILE AND FLANKING WALLS 900 METRES SOUTH-WEST OF THE GREAT SLUICE	II	SS 47168 33467	High
PSA3	1310084	STILE AND FLANKING WALLS 200 METRES NORTH-EAST OF THE GREAT SLUICE	II	SS 47917 34295	High
PSA3	1310114	GREAT SLUICE	II	SS 47764 34178	High
PSA3	1310131	CATTLE SHELTER AND ADJOINING WALL 700 METRES WEST OF THE GREAT SLUICE	II	SS 47054 34182	High
PSA3	1325558	CATTLE SHELTER 950 METRES NORTH NORTH-WEST OF THE GREAT SLUICE	II	SS 47598 35125	High

PDZ / PSA	NHLE No.	Name	Grade	NGR	Risk from Flooding
PSA3	1325559	LENGTH OF COB WALL AND BEE-BOLES 5 METRES WEST OF NO. 29	II	SS 48903 36986	High
PSA3	1385085	CASTLE QUAY WITH 12 BOLLARDS FROM AND INCLUDING STEPS TO SLIPWAY AT CIVIC CENTRE END	II	SS 55567 33167	High
PSA3	1385073	MILESTONE IMMEDIATELY NORTH WEST OF BRADIFORD BRIDGE AT SS 5505 3430	II	SS 55052 34302	High
PSA3	1385255	GREENDALE FARMHOUSE	II	SS 56309 31581	High
PSA3	1385238	105, NEWPORT ROAD	II	SS 56323 32550	High
PSA3	1385239	106 AND 107, NEWPORT ROAD	II	SS 56318 32558	High
PSA3	1385240	108, NEWPORT ROAD	II	SS 56309 32569	High
PSA3	1385222	RAILINGS ON NORTH SIDE OF ROCK PARK	II	SS 56222 32634	High
PSA3	1385223	ROCK PARK LODGE	II	SS 56259 32606	High
PSA3	1385258	PILTON BRIDGE AND CAUSEWAY SOUTH OF PILTON QUAY INCLUDING GATES AND PIERS TO PILTON PARK	II	SS 55746 33736	High
PSA3	1105126	ANNERY KILN COTTAGES	II	SS 46227 22874	Medium
PSA3	1326555	ANNERY KILN	II	SS 46250 22868	Medium
PSA3	1171628	RIVERVIEW	II	SS 47818 21627	Medium
PSA3	1326548	WALL ATTACHED TO W OF GATEHOUSE, AND TO S OF WEARE GIFFARD HALL.	II	SS 46664 22107	Medium
PSA3	1326537	RUDHA BRIDGE MILLHOUSE	II	SS 44063 22500	Medium
PSA3	1171647	HALSPILL LIME KILN	II	SS 46955 23565	Medium
PSA3	1209497	LITTLE WHITEHALL	II	SS 45713 24013	Medium
PSA3	1200948	48, TORRINGTON STREET	II	SS 45663 26359	Medium
PSA3	1200949	PINE COFFIN BUST IN PUBLIC GARDEN ADJOINING SOUTH EAST ABUTMENT OF BIDEFORD BRIDGE	II	SS 45652 26384	Medium
PSA3	1210020	SWAN INN	II	SS 45667 26366	Medium
PSA3	1282903	SEWER VENTILATION PIPE OPPOSITE ENTRANCE TO TORRINGTON LANE	II	SS 45638 26252	Medium
PSA3	1107720	GREAT FISHERTON FARMHOUSE INCLUDING OUTBUILDING ADJOINING TO SOUTH WEST	II	SS 57475 27957	Medium
PSA3	1107595	TORRIDGE VIEW, INCLUDING FRONT GARDEN RAILINGS	II	SS 47215 30272	Medium
PSA3	1107596	QUAY HOUSE, INCLUDING FRONT GARDEN RAILINGS	II	SS 47226 30258	Medium
PSA3	1107597	1 AND 2, THE BALCONIES	II	SS 47230 30250	Medium
PSA3	1107599	INSTOW SIGNAL BOX	II	SS 47361 30117	Medium
PSA3	1107632	QUAY COTTAGE	II	SS 47238 30243	Medium

PDZ / PSA	NHLE No.	Name	Grade	NGR	Risk from Flooding
PSA3	1325342	GALSWORTHY HOUSE, INCLUDING FRONT GARDEN RAILINGS	II	SS 47220 30264	Medium
PSA3	1325343	1, THE QUAY	II	SS 47252 30232	Medium
PSA3	1386058	FORSYTHIA COTTAGE	II	SS 48796 35770	Medium
PSA3	1107098	THE OLD COTTAGE	II	SS 48732 36191	Medium
PSA3	1325582	HONEYSUCKLE COTTAGE	II	SS 48697 36289	Medium
PSA3	1210019	45, 46 AND 47, TORRINGTON STREET	II	SS 45657 26349	Medium
PSA3	1389507	CARRIAGE SHED	II	SS 45164 27192	Medium
PSA3	1385221	LAMP POST AT JUNCTION OF NEW ROAD AND PARK TERRACE	II	SS 56278 32600	Medium
PSA3	1385352	BARUM HOUSE	II	SS 55926 33021	Medium
PSA3	1385353	BIRMINGHAM MIDSHIRES BUILDING SOCIETY	II	SS 55911 33018	Medium
PSA3	1385362	THE GOLDEN LION TAP PUBLIC HOUSE	II	SS 55901 33038	Medium
PSA3	1209839	MILESTONE APPROXIMATELY 220 METRES NORTH EAST OF ENTRANCE TO PILLHEAD HOUSE	II	SS 47456 27115	Medium
PSA3	1200937	TORRIDGE LODGE INCLUDING GATE PIERS AND FRONT BOUNDARY WALL	II	SS 45078 27121	Medium
PSA3	1209809	1-4 CAUSEWAY HOUSE	II	SS 45064 27164	Medium
PSA3	1385237	98-104, NEWPORT ROAD	II	SS 56350 32510	Medium
PSA3	1385314	WAR MEMORIAL INCLUDING POSTS AND CHAINS	II	SS 56138 32665	Medium
PSA3	1385357	MUSEUM OF NORTH DEVON INCLUDING GARDEN RAILINGS ADJACENT TO RIVER FRONT	II	SS 55864 32968	Medium
PSA3	1385364	WILLSHIRE MONUMENT ON TRAFFIC ISLAND	II	SS 55887 32996	Medium
PSA3	1385074	FRONT GARDEN WALL AND RAILINGS TO CEDAR COTTAGE	II	SS 55043 34305	Medium
PSA3	1209976	15 AND 16, THE STRAND	II	SS 45242 26889	Low
PSA3	1282940	17 AND 18, THE STRAND	II	SS 45232 26891	Low
PSA3	1187709	3, BRIDGELAND STREET	II	SS 45464 26825	Low
PSA3	1200874	4 AND 4A, BRIDGELAND STREET	II*	SS 45454 26832	Low
PSA3	1206709	THE OLD CUSTOM HOUSE	II	SS 45489 26825	Low
PSA3	1245947	BIDEFORD ARTS CENTRE	II	SS 45499 26867	Low
PSA3	1282945	2, BRIDGELAND STREET	II	SS 45478 26822	Low
PSA3	1282946	6 AND 6A, BRIDGELAND STREET	II	SS 45429 26832	Low
PSA3	1292390	STATUE OF CHARLES KINGSLEY	II	SS 45535 26908	Low
PSA3	1292425	BLACKMORE'S DEPOSITORY	II	SS 45428 26859	Low
PSA3	1298581	5, BRIDGELAND STREET	II	SS 45434 26825	Low
PSA3	1200918	GATES AND GATEPIERS AT MAIN ENTRANCE TO VICTORIA PARK	II	SS 45510 26946	Low
PSA3	1385218	UNION TERRACE	II	SS 56164 32711	Low
PSA3	1385383	1, UNION PLACE	II	SS 56197 32720	Low

PDZ / PSA	NHLE No.	Name	Grade	NGR	Risk from Flooding
PSA3	1385384	2, UNION PLACE	II	SS 56210 32729	Low
PSA3	1385211	RIVERSVALE	II	SS 56084 32770	Low
PSA3	1385212	BEACHCROFT	II	SS 56072 32781	Low
PSA3	1385213	RIVERSIDE	II	SS 56062 32792	Low
PSA3	1385040	ROYAL AND FORTESCUE HOTEL	II	SS 55910 33069	Low
PSA3	1385041	62, BOUTPORT STREET	I	SS 55896 33057	Low
PSA3	1385042	63 AND 64, BOUTPORT STREET	II	SS 55887 33056	Low
PSA3	1385046	69, BOUTPORT STREET	II	SS 55870 33055	Low
PSA3	1385047	HEARTS OF OAK PUBLIC HOUSE	II	SS 55865 33058	Low
PSA3	1385127	TAVERN IN THE TOWN PUBLIC HOUSE	II	SS 55965 33063	Low
PSA3	1385135	3, HIGH STREET	II	SS 55873 33096	Low
PSA3	1385182	104, HIGH STREET	II	SS 55845 33099	Low
PSA3	1385183	105, HIGH STREET	II	SS 55852 33093	Low
PSA3	1385184	107, HIGH STREET	II	SS 55859 33080	Low
PSA3	1385185	108 AND 109, HIGH STREET	II	SS 55868 33078	Low
PSA3	1385220	JALEPENO RESTAURANT	II	SS 55850 33059	Low
PSA3	1385327	28, SILVER STREET	II	SS 55971 33063	Low
PSA3	1385097	27, CASTLE STREET	II	SS 55704 33143	Low
PSA3	1385117	13, CROSS STREET	II	SS 55725 33135	Low
PSA3	1385118	14, CROSS STREET	II	SS 55732 33135	Low
PSA3	1385087	17, CASTLE STREET	II	SS 55590 33234	Low
PSA3	1385099	BARNSTAPLE TOWN STATION INCLUDING RAILINGS AND GATES AT NORTH END	II	SS 55554 33211	Low
PSA3	1385260	9 AND 10, PILTON STREET	II	SS 55666 33841	Low
PSA3	1385072	BRADIFORD BRIDGE	II	SS 55054 34293	Low
PSA3	1200940	WHITE HART PUBLIC HOUSE	II	SS 45446 26696	Low
PSA3	1209848	JUBILEE HOUSE	II	SS 45445 26706	Low
PSA3	1385214	K6 TELEPHONE KIOSK IMMEDIATELY NORTH OF THE IMPERIAL HOTEL	II	SS 55941 32928	Low
PSA3	1385356	CLOCKTOWER	II	SS 55906 32951	Low
PSA3	1385363	WILLSHIRE FOUNTAIN ON TRAFFIC ISLAND	II	SS 55906 32989	Low
PSA3	1247229	FOUR LAMP POSTS [OUTSIDE NUMBERS 7 AND 8 THE INN ON THE STRAND AND JENNY WRENS TEA ROOMS AND QUEEN ANNES WALK]	II	SS 55786 33066	Low
PSA3	1385366	BRIDGE CHAMBERS INCLUDING GARDEN RAILINGS ADJOINING THE RIVER FRONT	II	SS 55816 33020	Low
PSA3	1385369	PAIR OF K6 TELEPHONE KIOSKS APPROXIMATELY 6 METRES SOUTH OF BUS STATION OFFICES	II	SS 55758 33055	Low
PSA3	1025001	31, BRIDGELAND STREET	II*	SS 45460 26796	Low

PDZ / PSA	NHLE No.	Name	Grade	NGR	Risk from Flooding
PSA3	1200942	MIDLAND BANK	II	SS 45453 26673	Low
PSA3	1200943	18 AND 19, THE QUAY	II	SS 45480 26742	Low
PSA3	1209853	5, QUEEN STREET	II	SS 45454 26727	Low
PSA3	1209947	QUAY HOUSE	II	SS 45474 26715	Low
PSA3	1282939	37 CAST IRON FENCE POSTS BETWEEN BRIDGELAND STREET AND BIDEFORD BRIDGE	II	SS 45491 26661	Low
PSA3	1292384	PROSPECT PLACE	II	SS 45479 26782	Low
PSA3	1292979	BOLLARD SET INTO CORNER OF 1 HIGH STREET ADJOINING THE QUAY	II	SS 45451 26584	Low
PSA3	1385256	PILL HOUSE	II*	SS 56293 31617	Low
PSA3	1385257	BOUNDARY WALL TO PILL HOUSE FRONTING PILL LANE	II	SS 56282 31632	Low
PSA3	1385242	NEWPORT TERRACE	II	SS 56417 32468	Low
PSA3	1385312	OBELISK AT NORTH ENTRANCE	II	SS 56089 32705	Low
PSA3	1385313	PAIR OF LAMP STANDARDS WITH PEDESTALS AT NORTH ENTRANCE OF ROCK PARK	II	SS 56088 32703	Low
PSA3	1385389	ARUNDEL AND BOUNDARY WALL AND GATE PIERS	II	SS 56418 32721	Low
PSA3	1385359	GATES AND GATE PIERS AND LAMP STANDARDS APPROXIMATELY 18 METRES SOUTH OF SOUTH EAST CORNER OF MUSEUM	II	SS 55864 32945	Low
PSA3	1385200	9, LITCHDON STREET	II	SS 55999 32891	Low
PSA3	1385348	IMPERIAL HOTEL	II	SS 55973 32884	Low
PSA3	1385349	1 AND 2, TAW VALE PARADE	II	SS 55963 32857	Low
PSA3	1385350	3-11, TAW VALE PARADE	II	SS 55988 32825	Low
PSA3	1385351	NUMBER 1 AND HOUSE ADJOINING ON RIGHT WITH ATTACHED WALLS AND RAILINGS	II	SS 55959 32940	Low
PSA3	1385043	65, BOUTPORT STREET	II	SS 55888 33049	Low
PSA3	1385044	66 AND 67, BOUTPORT STREET	II	SS 55884 33041	Low
PSA3	1385045	68, BOUTPORT STREET	II	SS 55867 33048	Low
PSA3	1385355	BRIDGE BUILDINGS	II	SS 55856 33030	Low
PSA3	1385360	OLD EMPLOYMENT EXCHANGE	II	SS 55889 33032	Low
PSA3	1385367	BUS STATION OFFICES	II	SS 55743 33067	Low
PSA3	1385370	QUEEN ANNES WALK	I	SS 55690 33110	Low
PSA3	1385371	TOME STONE UNDER CENTRE OF QUEEN ANNES WALK	II	SS 55697 33115	Low
PSA3	1385373	BUILDING BEHIND QUEEN ANNES WALK (OVER 60'S CLUB)	II	SS 55684 33118	Low
PSA3	1385075	THE BOATHOUSE	II	SS 55636 33506	Low
PSA3	1385246	TRAFALGAR LAWN (TERRACE) AND ATTACHED REAR COURTYARD WALLS	II	SS 56371 32396	Very Low

PDZ / PSA	NHLE No.	Name	Grade	NGR	Risk from Flooding
PSA3	1385345	WAREHOUSE KNOWN AS OLD SLAUGHTERHOUSE SOUTH SOUTH WEST OF LONG BRIDGE	II	SS 55697 32794	Very Low
PSA3	1427989	Oliver Buildings at the Former Shapland and Petter Factory	II	SS 55643 32853	Very Low
PSA3	1385202	LITCHDON POTTERY INCLUDING BOTTLE KILNS AND ALL BUILDINGS ON THE SITE	II	SS 56008 32886	Very Low
PSA3	1385204	EXETER INN	II	SS 56026 32870	Very Low
PSA3	1385205	14 AND 15, LITCHDON STREET	II	SS 56062 32835	Very Low
PSA3	1385206	16, LITCHDON STREET	II	SS 56069 32829	Very Low
PSA3	1385207	17, LITCHDON STREET	II	SS 56082 32829	Very Low
PSA3	1385208	18, LITCHDON STREET	II	SS 56091 32822	Very Low
PSA3	1385209	19, LITCHDON STREET	II	SS 56097 32814	Very Low
PSA3	1385210	20, LITCHDON STREET	II	SS 56106 32805	Very Low
PSA3	1385215	PENROSE ALMHOUSES	I	SS 56046 32855	Very Low
PSA3	1385217	PUMP IN COURTYARD AT PENROSE ALMSHOUSES	II	SS 56056 32862	Very Low
PSA3	1385038	55, 55A AND 56, BOUTPORT STREET	II	SS 55918 33118	Very Low
PSA3	1385039	57, 58 AND 59, BOUTPORT STREET	II	SS 55913 33107	Very Low
PSA3	1385048	75, BOUTPORT STREET	II	SS 55897 33114	Very Low
PSA3	1385086	QUEEN ANNES COURT INCLUDING FORMER AMBULANCE STATION FRONTING COMMERCIAL ROAD	II	SS 55666 33155	Very Low
PSA3	1385088	23, CASTLE STREET	II	SS 55663 33183	Very Low
PSA3	1385089	24, CASTLE STREET	II	SS 55673 33176	Very Low
PSA3	1385090	25, CASTLE STREET	II	SS 55678 33172	Very Low
PSA3	1385091	CASTLE CHAMBERS	II	SS 55690 33166	Very Low
PSA3	1385115	LIBERAL CLUB	II	SS 55726 33170	Very Low
PSA3	1385116	10, CROSS STREET	II	SS 55717 33158	Very Low
PSA3	1385119	LLOYDS BANK	II	SS 55745 33157	Very Low
PSA3	1385136	4, HIGH STREET	II	SS 55870 33101	Very Low
PSA3	1385137	5, HIGH STREET	II	SS 55867 33110	Very Low
PSA3	1385180	98, HIGH STREET	II	SS 55822 33130	Very Low
PSA3	1385181	99, HIGH STREET	II	SS 55825 33125	Very Low
PSA3	1385189	GARAGE AT EAST END OF THE ANCHOR PUBLIC HOUSE (THE ANCHOR PUBLIC HOUSE NOT INCLUDED)	II	SS 55663 33212	Very Low
PSA3	1385247	CASTLE LODGE INCLUDING SUNDIAL	II	SS 55506 33317	Very Low
PSA3	1385248	ENTRANCE GATES AND GATE PIERS AND ADJACENT WALLS TO PARK AT CASTLE MOUND	II	SS 55503 33329	Very Low
PSA3	1385374	WEST VIEW	II	SS 55750 33109	Very Low
PSA3	1385066	125, BOUTPORT STREET	II	SS 55750 33525	Very Low

PDZ / PSA	NHLE No.	Name	Grade	NGR	Risk from Flooding
PSA3	1385067	127, BOUTPORT STREET	II	SS 55727 33512	Very Low
PSA3	1385068	NORTH COUNTRY INN	II*	SS 55720 33508	Very Low
PSA3	1385259	WAREHOUSE INCLUDING PREMISES OF THE SHEEPSKIN SHOP	II	SS 55752 33610	Very Low
PSA4	1162273	BRIDGE FARMHOUSE WITH ATTACHED BARN TO SOUTH	II	SS 44467 39210	Medium
PSA5	1203009	HOLY TRINITY VICARAGE	II	SS 51583 47061	High
PSA5	1203010	THE QUAY FROM ROYAL BRITANNIA HOTEL ON WEST TO PIER HOTEL ON EAST INCLUDING OLD QUAY HEAD	II*	SS 52414 47822	High
PSA5	1203055	3 AND 4, BROAD STREET	II	SS 52302 47808	High
PSA5	1203056	THE ROYAL BRITANNIA HOTEL	II	SS 52323 47827	High
PSA5	1208121	8, BROAD STREET	II	SS 52281 47772	High
PSA5	1208123	11, BROAD STREET	II	SS 52271 47755	High
PSA5	1208125	12, BROAD STREET	II	SS 52269 47751	High
PSA5	1208993	BEACH HOUSE	II	SS 52290 47758	High
PSA5	1281881	SHIP AND PILOT INN	II	SS 52278 47765	High
PSA5	1281897	K6 TELEPHONE KIOSK	II	SS 52479 47796	High
PSA5	1292875	PARISH CHURCH OF SAINT PHILIP AND ST JAMES	II*	SS 52188 47815	High
PSA5	1203007	THE BATH HOUSE	II	SS 51526 47686	High
PSA5	1203037	WILDERSCOT	II	SS 51560 47265	High
PSA5	1203053	ATTACHED GARDEN WALL AND GATE PIERS	II	SS 51520 47646	High
PSA5	1208043	ATTACHED GARDEN WALLS	II	SS 51524 47639	High
PSA5	1208133	BROOKDALE LODGE	II	SS 51432 47469	High
PSA5	1208960	RUNNYMEADE HOUSE	II	SS 51539 47708	High
PSA5	1209020	SANDRINGHAM	II	SS 51517 47411	High
PSA5	1292857	BEACONSFIELD TERRACE	II	SS 51483 47458	High
PSA5	1168821	SEACROFT	II	SS 57725 47219	High
PSA5	1106793	NEWBERRY COTTAGE	II	SS 57450 47116	Medium

Table 18.3: Scheduled Monuments identified at risk from flooding

PDZ	ListEntry	Name	NGR	Risk from Flooding
PDZ10	1004259	Multi-period prehistoric settlement sites and associated field systems at Godrevy Towans	SW 58779 42270	High
PDZ10	1016158	Churchyard cross in St Ia's churchyard	SW 51824 40520	Medium
PDZ10	1017348	Penbeagle Cross	SW 50781 39882	Medium
PDZ10	1402648	Late C18-C19 mill complex, ropeworks and associated water management system immediately east of Millpond Avenue, Foundry	SW 55855 36881	High
PDZ12	1004460	Enclosure known as Treringey Round	SW 81039 60436	High
PDZ14	1014216	Churchyard cross shaft and base in St Petroc's churchyard, 30m south east of the church	SW 91601 75380	Medium / High
PDZ14	1020814	Late medieval and 19th century bridge at Wadebridge	SW 99115 72455	Low / High
PDZ14	1004484	Multi-span bridge called Trewornan Bridge	SW 98751 74278	Low
PDZ15	1005455	Motte and bailey castle at Boscastle	SX 09953 90847	Medium
PDZ16	1005454	Post medieval sea lock at Bude Canal	SS 20394 06428	High

Table 18.4: Registered parks and gardens identified at risk from flooding

PDZ / PSA	ListEntry	Name	Grade	NGR	Risk from Flooding
PDZ14	1001249	PRIDEAUX PLACE	II	SW 91573 75621	Medium
PSA3	1000704	TAPELEY PARK	II*	SS 47681 28999	Medium / High

Table 18.5: Sites within Cornwall and Scilly HER identified at risk from flooding

Cornwall HER	Name	Easting	Northing	Flood Risk	PDZ
MCO10831	JAWNES - Post Medieval house	145150	38660	Medium	PDZ09
MCO27798	ZENNOR - Post Medieval corn mill	145379	38405	Medium	PDZ09
MCO28106	PENDOWER STAMPS - Medieval stamping mill	144910	38925	Low	PDZ09
MCO28345	TREWEY - Early Medieval streamworks	145170	38590	Low	PDZ09
MCO28135	TREVEGLOS - Post Medieval nonconformist chapel	145400	38430	Low	PDZ09
MCO27523	EGLOSMEOR MILL - Post Medieval corn mill	144967	38864	Low	PDZ09
MCO28126	JAWNES - Post Medieval corn mill	145150	38650	Low	PDZ09
MCO32950	ZENNOR - Post Medieval nonconformist chapel	145400	38430	Low	PDZ09
MCO28127	JAWNES - Post Medieval platform	145160	38650	Low	PDZ09
MCO29598	OXMANS STAMPS - Post Medieval stamping mill	139000	35410	Low	PDZ09

Cornwall HER	Name	Easting	Northing	Flood Risk	PDZ
MCO38524	PORTHNANVEN - Post Medieval mine	135600	30880	Medium	PDZ09
MCO38530	WHEAL PRAZE - Post Medieval mine	135538	32174	High	PDZ09
MCO38531	YANKEE BOY - Post Medieval mine	136045	32411	Low	PDZ09
MCO51587	BOJEWYAN - Post Medieval streamworks	139056	34862	High	PDZ09
MCO55460	ST IVES CONSOLS - Modern shafts	150502	39856	Medium	PDZ09
MCO55460	ST IVES CONSOLS - Modern shafts	150526	39864	Medium	PDZ09
MCO56241	NANJULIAN - Post medieval crow	136112	29297	Low	PDZ09
	KENIDJACK VALLEY - Post Medieval arsenic works	136034	32402	Low	PDZ09
MCO12159	GWITHIAN - Post Medieval chimney	158508	42115	High	PDZ10
MCO12880	WHEAL CONFIDENCE - Post Medieval mine	158400	41800	Low	PDZ10
MCO27846	HAYLE - Post Medieval public house	157220	38340	Medium	PDZ10
MCO28568	PORTH GODREVY - Post Medieval building	158020	43000	Low	PDZ10
MCO27567	TREVETHOE MILL - Post Medieval corn mill	154087	36440	Low	PDZ10
MCO27171	CARBIS MILL - Post Medieval corn mill	155331	33522	Low	PDZ10
MCO33347	HAYLE - Post Medieval public house	155860	37090	Low	PDZ10
MCO33346	HAYLE - Post Medieval stable	155850	37050	Low	PDZ10
MCO35203	HAYLE - Post Medieval house	157452	38375	Medium	PDZ10
MCO33204	HAYLE - Post Medieval terrace	155870	36980	High	PDZ10
MCO35249	LELANT - Post Medieval building	154526	36394	High	PDZ10
MCO33349	HAYLE - Post Medieval house	155880	37070	Low	PDZ10
MCO33352	HAYLE - Post Medieval terrace	155920	37070	Low	PDZ10
MCO33348	HAYLE - Post Medieval freemasons hall	155870	37070	Low	PDZ10
MCO32913	ST IVES - Post Medieval nonconformist chapel	151625	40393	Medium	PDZ10
MCO32909	LELANT - Post Medieval nonconformist chapel	154260	36776	High	PDZ10
MCO35200	HAYLE - Post Medieval house	157460	38410	Medium	PDZ10
MCO32899	ST ERTH - Post Medieval nonconformist chapel	154950	35120	Low	PDZ10
MCO32912	ST IVES - Post Medieval school, Post Medieval sunday school	151644	40390	Medium	PDZ10
MCO33386	HAYLE - Post Medieval public house	156450	37820	Low	PDZ10
MCO33376	HAYLE - Modern drill hall	156060	37670	Low	PDZ10
MCO33345	HAYLE - Post Medieval stable	155850	37030	High	PDZ10
MCO33377	HAYLE - Post Medieval institute, Post Medieval library	156105	37695	Low	PDZ10
MCO35052	HAYLE - Modern terrace	157090	38240	Low	PDZ10
MCO35057	HAYLE - Modern house	157200	38330	Medium	PDZ10
MCO33350	HAYLE - Post Medieval house	155880	37060	Low	PDZ10
MCO34290	HAYLE - Post Medieval shop	155935	37038	Low	PDZ10

Cornwall HER	Name	Easting	Northing	Flood Risk	PDZ
MCO35059	HAYLE - Post Medieval house	157370	38440	Medium	PDZ10
MCO35245	LELANT - Post Medieval public house	154571	36332	High	PDZ10
MCO35158	HAYLE - Post Medieval building	155870	36890	Medium	PDZ10
MCO35171	HAYLE - Post Medieval house	156086	37683	Low	PDZ10
MCO35242	HAYLE - Post Medieval house	157150	38360	Medium	PDZ10
MCO33368	HAYLE - Post Medieval custom house	155750	37700	Low	PDZ10
MCO33399	HAYLE - Post Medieval sunday school, Post Medieval church hall, Modern drill hall	156804	37954	Low	PDZ10
MCO33445	HAYLE - Post Medieval causeway	156613	38167	High	PDZ10
MCO33394	HAYLE - Post Medieval house	156583	37898	Low	PDZ10
MCO33199	HAYLE - Post Medieval office	155840	37123	Low	PDZ10
MCO35246	LELANT - Post Medieval outbuilding	154570	36366	High	PDZ10
MCO35247	LELANT - Modern building	154595	36372	High	PDZ10
MCO35166	HAYLE - Post Medieval house	156096	37980	Low	PDZ10
MCO33370	HAYLE - Post Medieval office, Post Medieval stable	155680	37760	Low	PDZ10
MCO33398	HAYLE - Post Medieval warehouse	156738	37919	Low	PDZ10
MCO35065	HAYLE - Post Medieval row	156532	37879	Low	PDZ10
MCO34989	HAYLE - Modern house	155757	37258	Low	PDZ10
MCO33380	HAYLE - Post Medieval house	156212	37730	Low	PDZ10
MCO35201	HAYLE - Post Medieval house	157460	38390	Medium	PDZ10
MCO35087	HAYLE - Modern post office	155893	37177	Medium	PDZ10
MCO35109	HAYLE - Post Medieval drawing office	155760	37250	Low	PDZ10
MCO33198	HAYLE - Post Medieval house	155840	37136	Low	PDZ10
MCO35181	HAYLE - Post Medieval letter box	156430	37826	Low	PDZ10
MCO35234	HAYLE - Modern shop	156710	37890	Low	PDZ10
MCO35212	HAYLE - Post Medieval shop	156772	37924	Low	PDZ10
MCO35088	HAYLE - Modern office	155906	37145	Low	PDZ10
MCO33196	HAYLE - Post Medieval shop	155835	37148	Low	PDZ10
MCO42920	ST IVES - Modern pillbox	152016	40330	Low	PDZ10
MCO44015	ST IVES - Post Medieval lifeboat station	151828	40559	Medium	PDZ10
MCO52167	CARBIS WATER - Post Medieval nonconformist chapel	152492	38508	Low	PDZ10
MCO58157	HAYLE - C20 lido	155523	37490	High	PDZ10
MCO52169	ST IVES, CHAPEL STREET - Post Medieval nonconformist chapel	151683	40413	Medium	PDZ10
MCO54326	ST IVES - Modern fire station	151358	40268	Medium	PDZ10
MCO7	COPPERHOUSE MILL - Post Medieval tide mill	156910	38120	Low	PDZ10
MCO52958	ST ERTH - Post Medieval school	154941	35109	Low	PDZ10
MCO54342	ST IVES - Modern post office	151723	40458	Medium	PDZ10
MCO54343	ST IVES - Post Medieval fire station	151859	40424	Medium	PDZ10
MCO54344	ST IVES - Post Medieval library	151736	40404	Medium	PDZ10

Cornwall HER	Name	Easting	Northing	Flood Risk	PDZ
MCO52955	ST IVES - Post Medieval school, Modern sunday school	151824	40464	Medium	PDZ10
MCO52957	ST ERTH - Post Medieval school	154964	35070	Low	PDZ10
MCO6474	ST IVES - Medieval church	151825	40524	Medium	PDZ10
MCO9581	HAYLE - Post Medieval causeway	154918	36416	Medium	PDZ10
MCO55460	ST IVES CONSOLS - Modern shafts	150690	39902	Medium	PDZ10
MCO55460	ST IVES CONSOLS - Modern shafts	150764	39927	Medium	PDZ10
MCO55459	WHEAL TRENWITH - Post Medieval shaft	151133	40187	Medium	PDZ10
MCO27576	LELANT - Post Medieval well	154178	36857	Low	PDZ10
MCO57919	ST IVES, ST ANDREWS STREET - C19 fish cellar	151853	40489	Medium	PDZ10
MCO12558	SOUTH WHEAL TOWAN - Post Medieval mine	169500	47500	Low	PDZ11
MCO26432	PORTREATH - Post Medieval baths	165100	45300	Low	PDZ11
MCO29183	ST AGNES - Post Medieval malt house	172380	50670	Low	PDZ11
MCO29182	ST AGNES - Post Medieval malt house	172360	50670	Low	PDZ11
MCO33128	PORTREATH - Post Medieval nonconformist chapel	165970	45280	High	PDZ11
MCO34702	TREVAUNANCE COVE - Post Medieval ore store	172000	51780	Low	PDZ11
MCO58155	PORTHTOWAN - C20 tidal swimming pool	169096	48389	Low	PDZ11
MCO43023	DROSKYN - Modern gun emplacement	175624	54333	High	PDZ11
MCO51359	PORTREATH - Post Medieval school	166202	45186	Low	PDZ11
MCO54389	PERRANPORTH - Modern fire station	175955	54242	High	PDZ11
MCO58043	PORTHTOWAN - C20 pillbox	169208	48010	Low	PDZ11
	ST AGNES - WW2 Pillbox	172157	51552	High	PDZ11
MCO23065	NEWQUAY - Post Medieval corn mill	181527	60778	High	PDZ12
MCO7269	CRANTOCK - Post Medieval lime kiln	179793	60789	Low	PDZ12
MCO11178	HALWYN - Medieval country house	193727	73840	High	PDZ14
MCO18531	CANT - Post Medieval fish cellar	193530	74980	Low	PDZ14
MCO46989	WADEBRIDGE - Post Medieval goods shed	199175	72173	Low	PDZ14
MCO29321	POLMORLA - Post Medieval corn mill	198430	71600	Low	PDZ14
MCO26610	ROCK FERRY - Modern building	192800	75800	Low	PDZ14
MCO32609	SLADESBRIDGE - Post Medieval nonconformist chapel	201180	71440	Low	PDZ14
MCO32740	WADEBRIDGE - C19 nonconformist chapel	199011	72203	Low	PDZ14
MCO42922	PADSTOW - Modern pillbox	192068	75473	Low	PDZ14
MCO46995	WADEBRIDGE - Post Medieval house	198948	72277	Low	PDZ14
MCO4701	WADEBRIDGE - Post Medieval foundry	198936	72248	Medium	PDZ14

Cornwall HER	Name	Easting	Northing	Flood Risk	PDZ
MCO40720	SLADESBRIDGE - Post Medieval public house	201105	71430	Low	PDZ14
MCO4697	TRELYLL - Post Medieval foundry	197860	71040	Medium	PDZ14
MCO54339	PADSTOW - Post Medieval police station	191717	75383	High	PDZ14
MCO6309	EGLOSHAYLE - Medieval church	200084	71912	Low	PDZ14
MCO7078	ST GEORGES WELL - Medieval holy well	191940	76452	High	PDZ14
MCO54348	WADEBRIDGE - Post Medieval town hall	199014	72292	Low	PDZ14
MCO54349	WADEBRIDGE - Post Medieval mechanics institute	199047	72418	Low	PDZ14
MCO55306	SLADESBRIDGE - Post Medieval post office	201138	71444	Low	PDZ14
MCO54340	PADSTOW - Post Medieval institute	191855	75424	Medium	PDZ14
MCO54498	PADSTOW - Post Medieval market house	191875	75416	Medium	PDZ14
MCO57962	LITTLE PETHERICK - Post medieval well and chute	191765	72411	Low	PDZ14
	PADSTOW - Post Medieval warehouse	191998	75513	Low	PDZ14
	PADSTOW - Post Medieval building, multiple uses	191796	75368	High	PDZ14
MCO21968	CRACKING MANOR - Post Medieval mill house	214300	96700	Low	PDZ15
MCO18588	PORT ISAAC - Post Medieval fish cellar	199615	80760	High	PDZ15
MCO18596	PORTGAVERNE - Post Medieval fish cellar	200270	80780	Low	PDZ15
MCO18597	PORTGAVERNE - Post Medieval fish cellar	200290	80890	High	PDZ15
MCO21996	BOSCASTLE - Post Medieval fish tank	209442	91496	Low	PDZ15
MCO22007	BOSCASTLE - Post Medieval boat yard	209696	91366	Medium	PDZ15
MCO57661	PORT ISAAC, FORE STREET - C19 house	199664	80757	Low	PDZ15
MCO21988	BOSCASTLE MILL - Post Medieval corn mill, Post Medieval leat	209890	91220	Medium	PDZ15
MCO57206	PORT ISAAC - C18 house	199686	80711	High	PDZ15
MCO57647	BOSCASTLE, THE BRIDGE - C19 warehouse	209910	91250	Medium	PDZ15
MCO57648	BOSCASTLE, HARBOUR - C18 house	209964	91271	Medium	PDZ15
MCO26168	TREVILLETT MILL - Post Medieval corn mill, Post Medieval water wheel	207272	89205	Low	PDZ15
MCO57662	PORT ISAAC, MIDDLE STREET - C18 cottage pair, C20 café	199658	80754	Low	PDZ15
MCO26164	TREKNOW - Post Medieval corn mill, Post Medieval water wheel	205830	86440	Low	PDZ15
MCO36888	BACKWAYS COVE - Modern building, Modern platform	204510	85930	Low	PDZ15
MCO57207	PORT ISAAC - C18 house	199663	80701	High	PDZ15

Cornwall HER	Name	Easting	Northing	Flood Risk	PDZ
MCO46494	BOSCASTLE - Post Medieval fish tank	209546	91502	High	PDZ15
MCO46492	BOSCASTLE - C19 tidal baths	209443	91498	Low	PDZ15
MCO46733	CRACKINGTON HAVEN - Post Medieval yard	214274	96797	Low	PDZ15
MCO48404	PORT ISAAC - Modern lifeboat station	199649	80749	High	PDZ15
MCO47574	BOSCASTLE - Post Medieval public house, Post Medieval brewery	209885	91307	Medium	PDZ15
MCO47573	BOSCASTLE - Post Medieval coastguard station	209846	91307	Medium	PDZ15
MCO46493	BOSCASTLE - Post Medieval fish tank	209445	91516	High	PDZ15
MCO47576	BOSCASTLE - Post Medieval garage	209908	91286	Medium	PDZ15
MCO9252	PORTGAVERNE - Post Medieval blacksmiths workshop	200310	80770	Low	PDZ15
MCO7206	BOSCASTLE - Post Medieval lime kiln	209794	91332	Medium	PDZ15
MCO57264	BOSCASTLE, VALENCY ROW - Early C19 House	209911	91297	Medium	PDZ15
MCO57118	PORT QUIN - Post medieval boatsheds	197131	80524	High	PDZ15
MCO57658	PORT ISAAC, FORE STREET - C18/C19 building, fish cellar, storehouse, C20 flats	199660	80778	Low	PDZ15
MCO57289	BOSCASTLE, DUNN STREET - Late C18 house	209882	91108	Medium	PDZ15
MCO32670	PORT ISAAC - Post Medieval manse	199674	80710	High	PDZ15
MCO57593	MINSTER - C18 house	210143	90637	Medium	PDZ15
MCO57673	PORT ISAAC, CHURCH HILL - C19 house	199658	80710	High	PDZ15
MCO57674	PORT ISAAC, CHURCH HILL - C19 house	199663	80711	High	PDZ15
MCO57675	BOSCASTLE, VALENCY ROW - C17 house	209871	91317	Medium	PDZ15
MCO57676	BOSCASTLE, THE HARBOUR - C19 stables	209717	91358	Medium	PDZ15
MCO57616	PORT ISAAC - C19 hotel	199651	80727	High	PDZ15
MCO57649	BOSCASTLE, THE HARBOUR - C18 house	209973	91270	Medium	PDZ15
MCO57652	BOSCASTLE, HARBOUR - C20 public house	210010	91278	Medium	PDZ15
MCO57294	BOSCASTLE, THE HARBOUR - C19 House	209785	91300	Low	PDZ15
MCO57657	PORT ISAAC, FORE STREET - C18/C19 building, fish cellar, storehouse, C20 flats	199657	80776	Low	PDZ15
MCO57663	PORT ISAAC, MIDDLE STREET - C18 house	199660	80748	High	PDZ15
MCO57664	PORT ISAAC, MIDDLE STREET - C18 house	199664	80740	High	PDZ15
MCO57643	BOSCASTLE, MINSTER - C20 telephone kiosk	209874	91225	Medium	PDZ15

Cornwall HER	Name	Easting	Northing	Flood Risk	PDZ
MCO57606	GUNPOOL LANE, BOSCASTLE - C19 house	209907	90649	Medium	PDZ15
MCO57672	BOSCASTLE, VALENCY ROW - C18 house	209929	91288	Medium	PDZ15
MCO57644	BOSCASTLE, THE BRIDGE - C18 house	209889	91239	Medium	PDZ15
MCO57646	BOSCASTLE, THE BRIDGE - C18 house	209891	91232	Medium	PDZ15
MCO57665	PORT ISAAC, MIDDLE STREET - C18 house	199666	80733	High	PDZ15
MCO57667	PORT ISAAC, MIDDLE STREET - C19 pair cottages	199667	80728	High	PDZ15
MCO57668	PORT ISAAC, MIDDLE STREET - C19 pair cottages	199667	80724	High	PDZ15
MCO57670	PORT ISAAC, MIDDLE STREET - C19 house	199670	80719	High	PDZ15
MCO57669	BOSCASTLE, VALENCY ROW - C17 house	209901	91300	Medium	PDZ15
MCO57671	PORT ISAAC, CHURCH HILL - C19 ship chandler, C20 house	199659	80715	High	PDZ15
MCO57605	GUNPOOL LANE, BOSCASTLE - C19 house	209900	90644	Medium	PDZ15
MCO57204	PORT ISAAC - C19 house	199689	80682	High	PDZ15
MCO57699	PORT ISAAC, MIDDLE STREET - C18 house	199710	80692	High	PDZ15
MCO57701	PORT ISAAC, MIDDLE STREET - C19 house	199701	80691	High	PDZ15
MCO57702	PORT ISAAC, MIDDLE STREET - C19 house	199703	80682	High	PDZ15
MCO57632	BOSCASTLE, DUNN STREET - C17 coaching house	209885	91182	High	PDZ15
MCO57633	BOSCASTLE, DUNN STREET - C19 terraced house	209883	91157	Medium	PDZ15
MCO57634	BOSCASTLE, DUNN STREET - C19 terraced house	209883	91152	Medium	PDZ15
MCO57635	BOSCASTLE, DUNN STREET - C19 terraced house	209883	91147	Medium	PDZ15
MCO57636	BOSCASTLE, DUNN STREET - C19 terraced house	209883	91143	Medium	PDZ15
MCO57637	BOSCASTLE, DUNN STREET - C19 terraced house	209883	91139	Medium	PDZ15
MCO57638	BOSCASTLE, DUNN STREET - C19 terraced house	209883	91134	Medium	PDZ15
MCO57639	BOSCASTLE, DUNN STREET - C19 terraced house	209883	91130	Medium	PDZ15
MCO57641	BOSCASTLE, DUNN STREET - C19 terraced house	209883	91125	Medium	PDZ15
MCO57621	PORT ISAAC - C19 house	199669	80760	Low	PDZ15
MCO57209	PORT ISAAC - C18 house	199689	80723	High	PDZ15
MCO32587	BUDE - Post Medieval manse	220830	106320	Low	PDZ16
MCO32585	BUDE - C19 nonconformist chapel	220790	106340	Low	PDZ16
MCO32586	BUDE - Post Medieval sunday school	220810	106330	Low	PDZ16

Cornwall HER	Name	Easting	Northing	Flood Risk	PDZ
MCO46300	BUDE - Post Medieval boat house	220065	106418	High	PDZ16
MCO48514	BUDE - Modern shop	220902	106346	Low	PDZ16
MCO48509	BUDE - Modern hotel	220902	106331	Low	PDZ16
MCO53223	BUDE - Post Medieval school	220734	106265	Low	PDZ16
MCO58149	BUDE - C20 tidal swimming pool	220247	106783	High	PDZ16

Table 18.6: Sites within Devon HER identified at risk from flooding

Devon HER / UoS No.	Name	Easting	Northing	Flood Risk	PDZ
MDV75341	Old Coastguard Hut, Clovelly	231830	124900	Medium	PSA2
MDV101871	NO 53 (CRAZY KATES) AND NO 54	231840	124867	Medium	PSA2
MDV58158	Sea Wall at Buck's Mills, Woolfardisworthy	235400	123600	Medium	PSA2
MDV75413	K6 Telephone Kiosk, Buck's Mills, Woolfardisworthy	235480	123620	Medium	PSA2
MDV101832	K6 TELEPHONE KIOSK	235481	123628	Medium	PSA2
MDV99275	LOWER LOOKOUT	235493	123619	Medium	PSA2
MDV75418	Bucks Mills House, Buck's Mills, Woolfardisworthy	235490	123620	Medium	PSA2
MDV99279	BUCKS MILLS HOUSE	235493	123622	Medium	PSA2
MDV75408	Buck's Mills, Woolfardisworthy	235500	123610	Medium	PSA2
MDV101835	10 AND 11	235595	123503	Medium	PSA2
MDV99272	GEORGE'S COTTAGE	235648	123446	Low	PSA2
UoS_3733	STONE	256879	128254	High	PSA3
UoS_3813	SLUICE	251046	131755	High	PSA3
MDV65866	MILL	244850	124860	High	PSA3
MDV102571	Targets associated with military training on the Skern	245040	131176	High	PSA3
MDV102569	Possible targets associated with military training on the Skern	245069	131321	High	PSA3
MDV11783	Former hop gardens, now meadow.	245100	123300	High	PSA3
MDV65747	Crane, Bideford	245349	125889	High	PSA3
MDV99091	MILL BRIDGE (THAT PART ON LANDCROSS CP)	245370	123502	High	PSA3
MDV54233	Tramway laid in the Bideford-East-the-Water quay adit	245670	126430	High	PSA3
MDV19234	Ship-on-Launch Pottery, East the Water	245700	126500	High	PSA3
MDV34097	Bideford, Riverside Pottery	245870	124830	High	PSA3
MDV101581	LANDCROSS METHODIST CHURCH INCLUDING FRONT AREA RAILING AND GATE	246081	124349	High	PSA3
MDV53863	Appldore Shipyard	246400	129500	High	PSA3
MDV60890	LIME KILN	246590	122640	High	PSA3
MDV56068	WELL	246600	122100	High	PSA3
MDV96648	INSTOW QUAY JETTY	247153	130256	High	PSA3

Devon HER / UoS No.	Name	Easting	Northing	Flood Risk	PDZ
MDV96742	STILE AND FLANKING WALLS 90 METRES SOUTH-WEST OF THE GREAT SLUICE	247172	133468	High	PSA3
MDV96657	K6 TELEPHONE KIOSK	247195	130272	High	PSA3
MDV32736	LIME KILN	247220	129790	High	PSA3
MDV96656	LIMEKILN ON INSTOW BEACH CIRCA 75 METRES SOUTH WEST OF INSTOW SAILING CLUB HOUSE	247232	129774	High	PSA3
MDV102625	Two small structures on Braunton Marshes	247378	133667	High	PSA3
MDV102625	Two small structures on Braunton Marshes	247378	133667	High	PSA3
MDV34072	MILL	247400	127500	High	PSA3
MDV96739	STILE AND FLANKING WALLS 40 METRES SOUTH-WEST OF THE GREAT SLUICE	247419	133957	High	PSA3
MDV96736	CATTLE SHELTER AND ADJOINING WALL 48 METRES NORTH-WEST OF THE GREAT SLUICE	247456	134571	High	PSA3
MDV18833	Turton's Blanket Mill	247800	121650	High	PSA3
MDV34951	FORGE	247830	121570	High	PSA3
MDV96743	STILE AND FLANKING WALLS 20 METRES NORTH-EAST OF THE GREAT SLUICE	247917	134301	High	PSA3
MDV23340	HOUSE	248000	128220	High	PSA3
MDV96893	VELATOR BRIDGE	248557	135718	High	PSA3
MDV1555	The Cross Tree	248792	136573	High	PSA3
MDV11864	St. Brannock's Chapel	248810	137140	High	PSA3
MDV109933	Stanton Shelter at RAF Chivenor	248840	134610	High	PSA3
MDV41903	St Brannock's Monastery, Braunton	248900	137000	High	PSA3
MDV101478	LENGTH OF COB WALL AND BEE-BOLES 5 METRES WEST OF NO. 29	248903	136986	High	PSA3
MDV32696	CHURCH	251280	132310	High	PSA3
MDV112095	Possible Harbour Serving Fremington Manor	251359	132529	High	PSA3
MDV112115	Salt Mill, Fremington Creek	251574	132778	High	PSA3
MDV44062	BRIDGE	254550	134160	High	PSA3
MDV23045	Dyehouse at Rackfield, Barnstaple	255800	133600	High	PSA3
MDV32432	BRIDGE	256080	135150	High	PSA3
MDV37543	SAW MILL	256600	130300	High	PSA3
MDV58062	BLACKSMITHS WORKSHOP	256610	130250	High	PSA3
MDV37544	MILL	256800	130330	High	PSA3
MDV94994	NEWBRIDGE BRIDGE	256986	128290	High	PSA3
MDV80456	Bridge over River Taw at Newbridge.	256980	128400	High	PSA3
MDV11986	New Bridge over River Taw at Newbridge	257000	128280	High	PSA3
MDV349	RAILWAY	257400	127350	High	PSA3

Devon HER / UoS No.	Name	Easting	Northing	Flood Risk	PDZ
MDV94996	GATEPIERS, FLANKING WALLS AND TERMINAL PIERS APPROXIMATELY 2 METRES SOUTH OF HALL LODGE	257596	127688	High	PSA3
UoS_3820	PILLBOX	247136	130249	Medium	PSA3
UoS_3827	FACTORY	245650	125970	Medium	PSA3
MDV18455	Salt Mill, Bideford	245309	125213	Medium	PSA3
MDV19233	Pottery Field near Torrington Lane	245668	126132	Medium	PSA3
MDV43295	Former Warehouse on Torrington Street	245600	126100	Medium	PSA3
MDV16847	Tollhouse, Bideford Bridge	245646	126392	Medium	PSA3
MDV14255	St Mary's Chapel, Bideford Bridge	245650	126380	Medium	PSA3
MDV101580	LITTLE WHITEHALL	245713	124013	Medium	PSA3
MDV11847	LIME KILN	245760	124050	Medium	PSA3
MDV43287	Limekilns at Bideford East the Water	245800	126740	Medium	PSA3
MDV14124	Rolle Canal Shipyard	245860	123320	Medium	PSA3
MDV34079	LIME KILN	245930	127430	Medium	PSA3
MDV12453	Monkleigh, Annery Pottery	246080	123010	Medium	PSA3
MDV44381	COTTAGE NON SPECIFIC	246200	122900	Medium	PSA3
MDV101574	ANNERY KILN COTTAGES	246222	122855	Medium	PSA3
MDV44379	Canal Dock	246230	122890	Medium	PSA3
MDV532	LIME KILN	246250	122800	Medium	PSA3
MDV99096	ANNERY KILN	246258	122858	Medium	PSA3
MDV44380	COTTAGE NON SPECIFIC	246260	122800	Medium	PSA3
MDV44382	BUILDING	246280	122850	Medium	PSA3
MDV99085	WALL ATTACHED TO W OF GATEHOUSE, AND TO S OF WEARE GIFFARD HALL.	246664	122107	Medium	PSA3
MDV18805	Gatehouse, Weare Giffard Hall	246679	122101	Medium	PSA3
MDV530	Weare Giffard, Halspill Lime Kiln	246952	123569	Medium	PSA3
MDV99274	HALSPILL LIME KILN	246955	123565	Medium	PSA3
MDV96649	TORRIDGE VIEW, INCLUDING FRONT GARDEN RAILINGS	247215	130272	Medium	PSA3
MDV32601	Torridge View	247210	130300	Medium	PSA3
MDV96650	QUAY HOUSE, INCLUDING FRONT GARDEN RAILINGS	247226	130258	Medium	PSA3
MDV101504	GALSWORTHY HOUSE, INCLUDING FRONT GARDEN RAILINGS	247220	130264	Medium	PSA3
MDV32598	HOUSE	247220	130280	Medium	PSA3
MDV96655	QUAY COTTAGE	247238	130243	Medium	PSA3
MDV32599	Quay House	247230	130250	Medium	PSA3
MDV66193	COTTAGE NON SPECIFIC	247230	130250	Medium	PSA3
MDV96651	1 AND 2, THE BALCONIES	247230	130250	Medium	PSA3
MDV101502	1, THE QUAY	247252	130232	Medium	PSA3
MDV32619	No 1 the quay.	247280	130220	Medium	PSA3
MDV32600	Galsworthy House	247280	130310	Medium	PSA3
MDV32635	RAILWAY STATION	247350	130050	Medium	PSA3

Devon HER / UoS No.	Name	Easting	Northing	Flood Risk	PDZ
MDV32631	SIGNAL BOX	247350	130140	Medium	PSA3
MDV96652	INSTOW SIGNAL BOX	247361	130117	Medium	PSA3
MDV96672	MILESTONE APPROXIMATELY 220 METRES NORTH EAST OF ENTRANCE TO PILLHEAD HOUSE	247456	127115	Medium	PSA3
MDV34953	MILL	247470	122020	Medium	PSA3
MDV50889	BUILDING	247600	131100	Medium	PSA3
MDV99313	RIVERVIEW	247818	121627	Medium	PSA3
MDV198	Limekilns at Velator	248600	135800	Medium	PSA3
MDV63794	Limekiln near Velator Marsh	248730	135790	Medium	PSA3
MDV55994	BUILDING	253400	134390	Medium	PSA3
MDV12528	Medieval Chapel at Pill, Lake, Tawstock	255680	131620	Medium	PSA3
MDV23371	Pill	255800	131690	Medium	PSA3
MDV15184	LIME KILN	256440	130300	Medium	PSA3
MDV34308	FONT	256540	130110	Medium	PSA3
MDV94991	GREAT FISHERTON FARMHOUSE INCLUDING OUTBUILDING ADJOINING TO SOUTH WEST	257475	127957	Medium	PSA3
MDV40145	FARMHOUSE	257490	127940	Medium	PSA3
MDV40176	Bishops Tawton, Hall, Gatepiers & Walls at Hall Lodge	257600	127680	Medium	PSA3
UoS_3719	GUILDHALL	255710	133120	Low	PSA3
MDV14254	All Saints Chapel, Bideford Bridge	245450	126450	Low	PSA3
MDV75577	Bollard on Corner of High Street and The Quay, Bideford	245450	126585	Low	PSA3
MDV38936	Bideford, Victoria Park Pottery Deposits	245469	127026	Low	PSA3
MDV55995	Tidemill	245500	127500	Low	PSA3
MDV60498	Lime kiln south-west of Instow	245800	130820	Low	PSA3
MDV43298	SLIPWAY	246490	130210	Low	PSA3
MDV110542	Wall, Marine Parade, Appledore	246503	130344	Low	PSA3
MDV57786	Northam, Custom House	246540	130370	Low	PSA3
MDV17016	Barn near South Burrow Cottage	246800	133730	Low	PSA3
MDV18834	HOUSE	247090	121890	Low	PSA3
MDV99311	BEAM BRIDGE (THAT PART IN MONKLEIGH CP)	247367	120917	Low	PSA3
MDV101499	AQUEDUCT BRIDGE (THAT PART WITHIN GREAT TORRINGTON BOROUGH)	247372	120911	Low	PSA3
MDV69333	QUARRY	247420	121790	Low	PSA3
MDV71826	Light Anti Aircraft Battery 3, Chivenor	249000	134100	Low	PSA3
MDV80173	Summerwill's Yard, Pottington Quay	255200	133400	Low	PSA3
MDV50123	Pottery Kiln No. 1, Tuly Street, Barnstaple	255590	133381	Low	PSA3
MDV4502	Pig Market, Castle Street, Barnstaple	255600	133200	Low	PSA3

Devon HER / UoS No.	Name	Easting	Northing	Flood Risk	PDZ
MDV49639	Castle Green Gibbet, Barnstaple	255600	133200	Low	PSA3
MDV58911	Pottery Kiln No. 2, Tuly Street, Barnstaple	255600	133410	Low	PSA3
MDV58910	Pottery Kiln No. 3, Tuly Street, Barnstaple	255610	133420	Low	PSA3
MDV63402	Prison adjacent to St. Nicholas Chapel, Barnstaple	255774	133048	Low	PSA3
MDV108364	Wells to east of The Square, Barnstaple	255930	132990	Low	PSA3
MDV20900	Prison on The Square, Barnstaple	255940	132990	Low	PSA3
MDV108278	Ship Yard	256076	132759	Low	PSA3
MDV56728	LIME KILN	256300	129100	Low	PSA3
MDV96300	CHURCH OF ST JOHN THE BAPTIST	256546	130098	Low	PSA3
MDV22235	HOUSE	256700	130300	Low	PSA3
MDV32887	MILESTONE	256900	129100	Low	PSA3
UoS_3718	TILE KILN	255740	133170	Very Low	PSA3
MDV55993	BUILDING	253210	134370	Very Low	PSA3
MDV32650	Signal Post to West of Pottington, Barnstaple	254350	133630	Very Low	PSA3
MDV16710	Barnstaple Mint	255500	133300	Very Low	PSA3
MDV70643	Limekiln on Castle Green, Barnstaple	255510	133330	Very Low	PSA3
MDV38917	Coal Store at Raleigh Works, Barnstaple	255600	132700	Very Low	PSA3
MDV104133	Medieval Pottery Kiln, Barnstaple	255614	133358	Very Low	PSA3
MDV70644	Castle Lane, Barnstaple	255610	133350	Very Low	PSA3
MDV50027	Workshop or Warehouse close to Barnstaple Castle	255610	133360	Very Low	PSA3
MDV38774	Post Medieval Pottery Works in Barnstaple	255610	133390	Very Low	PSA3
MDV110240	Presumed Line of Town Wall, Castle Street, Barnstaple	255634	133207	Very Low	PSA3
MDV50028	Bell Casting Site adjacent to Barnstaple Castle	255630	133350	Very Low	PSA3
MDV108340	Bell's School, Barnstaple	255640	133364	Very Low	PSA3
MDV18033	Barnstaple Prison	255650	133360	Very Low	PSA3
MDV63405	18th-19th Century Buildings in Holland Street, Barnstaple	255680	133220	Very Low	PSA3
MDV106447	Barnstaple	255690	133270	Very Low	PSA3
MDV58919	Ropewalk, Rackfield Lane	255793	133589	Very Low	PSA3
MDV38759	Medieval Buildings in Rackford Lane, Barnstaple	255770	133560	Very Low	PSA3
MDV63404	Workers Cottages at Rackfield, Barnstaple	255802	133588	Very Low	PSA3
MDV21589	Holy Trinity Hospital, Barnstaple	256000	133000	Very Low	PSA3
MDV22236	Hospital of St. Mary Magdalene, Barnstaple	256000	133000	Very Low	PSA3
MDV59654	Building Remains, Barnstaple Bus Station	256044	133054	Very Low	PSA3
UoS_3689	LIFEBOAT HOUSE	245734	143576	High	PSA4

Devon HER / UoS No.	Name	Easting	Northing	Flood Risk	PDZ
MDV31626	BRIDGE	243650	139220	High	PSA4
MDV57166	LIME KILN	243240	139610	Medium	PSA4
MDV96961	BRIDGE FARMHOUSE WITH ATTACHED BARN TO SOUTH	244467	139210	Medium	PSA4
MDV36929	FARMHOUSE	244470	139220	Medium	PSA4
MDV96583	BROOKDALE LODGE	251432	147469	High	PSA5
MDV96587	BEACONSFIELD TERRACE	251483	147458	High	PSA5
MDV18665	Ilfracombe	251500	147500	High	PSA5
MDV96546	SANDRINGHAM	251517	147411	High	PSA5
MDV96549	ATTACHED GARDEN WALLS	251524	147639	High	PSA5
MDV23843	HOUSE	251520	147640	High	PSA5
MDV96550	ATTACHED GARDEN WALL AND GATE PIERS	251520	147646	High	PSA5
MDV96551	THE BATH HOUSE	251526	147686	High	PSA5
MDV23842	Nos 1 and 2, bath place.	251530	147640	High	PSA5
MDV23943	THE BATH HOUSE	251530	147680	High	PSA5
MDV96555	RUNNYMEADE HOUSE	251539	147708	High	PSA5
MDV23942	RUNNYMEADE HOUSE	251540	147710	High	PSA5
MDV96543	NORTHCOTE BUILDINGS	251550	147358	High	PSA5
MDV96559	WILDERSCOT	251560	147265	High	PSA5
MDV96558	HOLY TRINITY VICARAGE	251583	147061	High	PSA5
MDV2197	PARISH CHURCH OF SAINT PHILIP AND ST JAMES	252000	147800	High	PSA5
MDV96479	PARISH CHURCH OF SAINT PHILIP AND ST JAMES	252188	147815	High	PSA5
MDV55504	AIR RAID SHELTER	252230	147760	High	PSA5
MDV23851	No 13, broad street.	252260	147740	High	PSA5
MDV96477	12, BROAD STREET	252269	147751	High	PSA5
MDV23850	12, BROAD STREET	252270	147750	High	PSA5
MDV96471	11, BROAD STREET	252271	147755	High	PSA5
MDV23848	8, 9 BROAD STREET	252280	147770	High	PSA5
MDV96476	8, BROAD STREET	252281	147772	High	PSA5
MDV96470	BEACH HOUSE	252290	147758	High	PSA5
MDV23948	1, 2, THE STRAND	252290	147760	High	PSA5
MDV23913	Nos 2 and 3, hierns lane.	252290	147770	High	PSA5
MDV96472	3 AND 4, BROAD STREET	252302	147808	High	PSA5
MDV23847	3 AND 4, BROAD STREET	252300	147810	High	PSA5
MDV96473	THE ROYAL BRITANNIA HOTEL	252323	147827	High	PSA5
MDV57180	Rapparee Cove Burials	252870	147700	High	PSA5
MDV19696	HELE MILL	253490	147520	High	PSA5
MDV96411	SEACROFT	257724	147224	High	PSA5
MDV31334	SEACROFT	257740	147230	High	PSA5
MDV31267	Combe Martin, Higher Mill	257770	147140	High	PSA5
MDV60709	LIME KILN	257789	147105	High	PSA5
MDV41490	SMELTING HOUSE	257800	147100	High	PSA5
MDV31264	BUILDING	257900	147140	High	PSA5

Devon HER / UoS No.	Name	Easting	Northing	Flood Risk	PDZ
MDV30618	Lee, Ilfracombe	248466	146329	Medium	PSA5
MDV12543	brick tollhouse on st. Brannock's road	251540	147130	Medium	PSA5
MDV53809	BUILDING	252430	147680	Medium	PSA5
MDV31274	NEWBERRY COTTAGE	257450	147116	Medium	PSA5
MDV96413	NEWBERRY COTTAGE	257450	147116	Medium	PSA5
MDV31265	Combe Martin, Lower or Homedale Mill	257806	147167	Medium	PSA5
MDV23928	No 34 (herne house)	251610	147170	Low	PSA5