PDZ: 14	Camel Estuary (Stepper Point to Pentire Point)	Management Area 35 Management Area 36

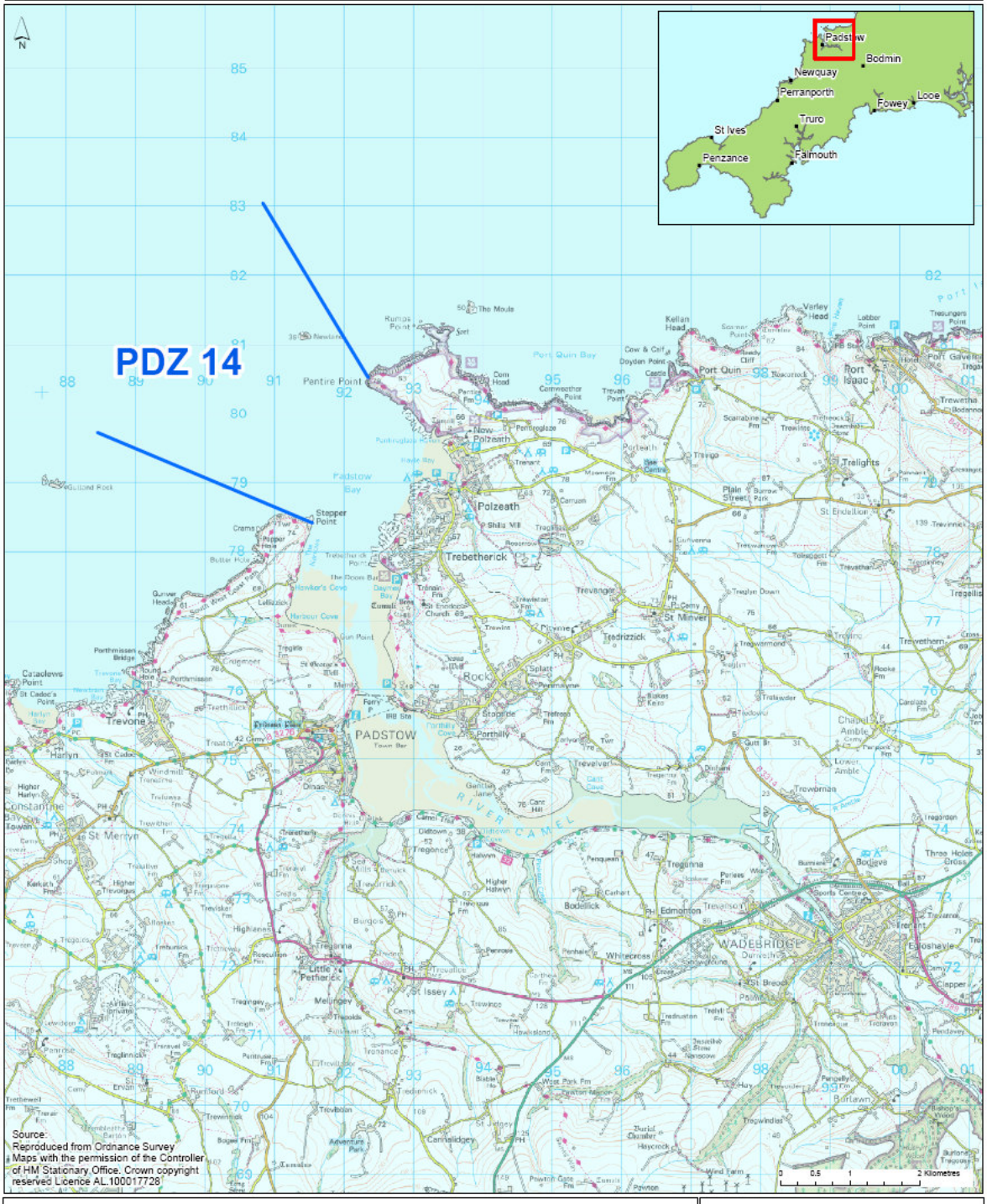
Camel Estuary (Stepper Point to Pentire Point)

This area is valued for its natural beauty, with the calm estuary environment contrasting with the small section of rugged open coast at Stepper Point and Pentire Point. Most of this area faces north and is 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.

Policy Development Zone 14 - Camel Estuary (Stepper Point to Pentire Point)

Key
Policy Development Zone



Cornwall & Isles of Scilly
Shoreline Management Plan Review

General Description

Built Environment

Agriculture the major land use, with fisheries still significant at Padstow and within the estuary with 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.

A39 viaduct over the Camel at Wadebridge

Heritage

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. There is 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 Wadebridge and Egloshayle, Padstow and Little Petherick.

St Enodoc Church

Environment and Nature Conservation

Nature conservation interests are significant and include the River Camel SAC, with Rock Dunes, Trebetherick Point, Pentire Peninsula and Amble Marshes all designated as SSSIs, with Saline lagoons, Fen and Coastal and Floodplain Grazing Marsh BAP Priority habitats present. Much of the area is designated as Cornwall ANOB.

View from Pentire Point to Camel Estuary

Recreation and Amenity

Tourism and recreation are the key activities of the area, with Padstow, Rock, Wadebridge and Polzeath attracting large numbers of tourists and locals alike to participate in cycling (Camel Trail), surfing, beach days, sailing and pleasure boats. Padstow is well known for its sea food restaurants and harbour amenities. Wadebridge has historical links to the estuary for trade, which is now its best natural asset used recreationally.

Camel estuary and Rock dunes

Key Values and Drivers

The key value of this area is the interaction of the communities with the scenic estuarine and coastal environment predominantly through tourism and recreation, but also for the traditional commercial activities of sea and shell fisheries.

- Tourism and recreational interests
- Natural environmental value of Camel Estuary
- Natural amenity value of the coast, particularly the estuary environment
- Landscape designations of Cornwall AONB and heritage coast
- Communities of Padstow, Rock, Polzeath and Wadebridge

PDZ Management Intent
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.

A primary geomorphological feature is the wide mouth of the Camel which discharges into Padstow Bay and enters the open sea between Stepper Point and Pentire Point. It is one of the few locations in Cornwall where there is a significant sediment link between a tidal estuarine area and the open coast.

The Camel Estuary acts as a sediment sink for marine sediments, but it is not thought to directly draw sediment from any of the beaches. There are however possibly some links between the Camel Estuary mouth and Polzeath beach, particularly under high-energy conditions.

The mouth of the Camel Estuary is orientated in a northerly direction meaning that swell can propagate into the estuary from offshore although it is sheltered from the predominant south westerly winds. The estuary is large and relatively shallow and has a large surface area, with large expanses of sandflat exposed at low tide. Beaches and dune systems are also present near the mouth on both the east and west banks of the estuary.

TIDE AND WATER LEVELS (mODN)

Extremes(mODN)

Location:	1:1	1:4.571 04.75	1:25	1:50	1:100	1:200	1:500	1:1000
Padstow Bay	4.36	4.75	4.69	4.75	4.87	4.95	5.05	5.14
Padstow	4.54	4.75	4.87	4.93	5.05	5.13	5.23	5.33
Wadebridge R Camel	4.54	4.75	4.87	4.93	5.05	5.13	5.23	5.33

Wave Climate

Most of this unit faces north and is slightly less exposed to the dominant westerly Atlantic conditions than the coast immediately to the south and north. Polzeath is the most exposed location 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 and to also generate within the estuary is likely to be affected by the state of the tide. The 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.

Tidal Flow

In summary in terms of peak current speeds the estuary appears to be slightly flood dominant at the mouth, becoming slightly ebb dominant up estuary in the main channel towards Rock with some evidence of flood dominance over Halwyn and Town Bank. It should be noted that this assessment is based on a limited dataset which only considers one tidal cycle and does not take into account parameters such as the duration of peak velocity or the duration of the tidal cycle above a threshold able to transport sand sized sediment. Because of this the dataset cannot be used to fully detail tidal asymmetry patterns and subsequent movements of sediment, to do this more data would need to be collected over a longer timescale.

The Camel Estuary is fed by the Rivers Camel, Amble and Allen, however the input from these rivers is minor.

PROCESSES

Control Features:

Upper and middle Devonian slates dominate the geology of the cliff line, along with Old Red Sandstone. The open coast in this unit is to be 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 unit. 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.

Existing Defences:

Harbour walls and a harbour gate alleviate the risk of tidal flooding at Padstow.
Embankments, flood walls and steel sheet piled walls in place at Wadebridge to alleviate the risk of tidal flooding.
Defences at Sladesbridge 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.

Processes:

Bedforms visible on the intertidal areas of Town Bar, Halwyn Bank and Doom Bar have been viewed in oblique aerial photographs by Royal Haskoning (2005). These bedforms show a flood tide asymmetry which is not reversed on the ebb tide, indicating a net transport into the estuary of coarse bedload material across the intertidal.

The outer estuary in the vicinity of the Doom Bar is likely to be wave dominated (McMullen and Associates and Herrington Geoscience, 1989) and therefore wave processes as well as tidal processes will contribute to the up estuary transport of bedload sediments in this location.

Patterns of peak flow within the Camel Estuary indicate flood dominance at the mouth of the estuary becoming ebb dominant at Rock. Although the subtidal channels and intertidal flats are dynamic within the estuary, it is thought that the area of these features

has remained constant due to a sufficient supply of marine sourced sand. The presence of asymmetric bedforms on intertidal sandflats indicates a net transport of sediment into the estuary and a stable intertidal zone. The flow of the rivers entering the Camel is low and it is thought that they contribute little sediment to the estuary. Much of the fine sediment entering the estuary is deposited on the mudflats and saltmarshes upstream of Tregenna.

Available evidence suggests that sand dunes within the Camel Estuary are a net sink for sediment.

Unconstrained Scenario:
Although unrealistic, because of the residual impact of defences, this scenario considers how the coast would evolve in the absence of defences.

With no defences present it could reasonably be expected that there would be limited erosion along the more open coast banks as is presently experienced. Within the lower estuary, some very low level erosion would occur along both banks although accretion may be expected along the dune fronts of Daymer Bay and Brea Hill. There would therefore be some limited change to the plan form and geomorphology of the open coast and lower estuary areas. Potential changes around the lower and middle estuary would depend to an extent on the central channel position and future movement of it in response to a variety of geomorphic and climatic variables.

In the middle estuary, the bank topography would limit the amount of additional area inundated due to sea level rise. There would be some low level erosion along the banks in response to increased tidal flows due to sea level rise (and potentially increased fluvial flows due to climate change). In the upper estuary, particularly around Amble Marshes, Wadebridge, Egloshayle and Sladesbridge it would be expected that the lower-lying topography would allow increasing occurrence of inundation of the flood plain. Through time the area subject to inundation (particularly that dictated by MHWS and the 1:1 year flood level) would become a more saline intertidal type of habitat.

POTENTIAL BASELINE EROSION RATES

Base rates have been assessed from monitoring and historical data. The range of potential erosion is assessed in terms of variation from the base rate and sensitivity in potential sea level rise. The base rates provided below are taken as an average based on historical records. The rates are a composite value based on erosion of the toe and recession of the crest of the cliff and reflect the erosion rates following failure of defences.
(Sea Level Rise assumed rates: 0.06m to year 2025; 0.34m to year 2055; 0.96m to year 2105.)

Location	Historic recession rate (lower) (m/100 yr)	Historic recession rate (upper) (m/100 yr)	Projected 100 year erosion rate (lower) (m)	Projected 100 year erosion rate (upper) (m)	Notes
Polzeath	-	-	30	50	
Stepper Point	0	1.5	0	0.9	
Pentire Point	0	1.5	0	1.9	
Padstow Point	0	1.5	0	2.7	

BASELINE MANAGEMENT SCENARIOS

PRESENT MANAGEMENT

Present Management is taken as that policy defined by SMP1, modified by subsequent strategies or studies. It should be noted that both in the case of SMP1 and that of many of the strategies undertaken before 2005, the period over which the assessment was carried out tended to be 50 years.

	SMP1	
MU	**LOCATION**	**POLICY**
7B-1	Trevone Bay to Padstow	Do nothing with continued maintenance of beach access point.
7B-1	Padstow	Hold the existing defence line along entire length to maintain character and operation of harbour whilst also protecting the Camel Trail and backing properties.
7B-1	Dinas to Porthilly Cove	Do nothing strategy in conjunction with strategic saltmarsh management implementation guidance.
7B-1	Rock and Porthilly Cove	Hold the existing defence line along defended frontage with future hold the line elsewhere to protect assets currently undefended. Possible future advancement of the line depending on development proposals.
7B-1	Rock to Daymer Bay	Do nothing to conserve important dune habitats and species.
7B-1	Daymer Bay	Hold the existing defence throughout the back of the bay. Dune management will be required in order to attempt to stabilise the dunes as attempts to date have failed.
7B-1	Daymer Bay to Polzeath	Do nothing as no assets in need of defence.
7B-1	Polzeath	Hold the existing defence line along defended length to ensure continued beach access for car parking and maintenance of other economic assets. Do nothing for cliff lengths either side of main-frontage with cliff stability monitoring in the short term to assess environmental acceptability of intervention around Crockett Haven an at Pentire Glaze.
7B-1	Pentire Glaze to Pentire Point	Do nothing as no built assets and area is of national conservation importance.

Economic Assessment

The following table provides a brief summary of damages determined by the SMP2 analysis for the whole PDZ. Further details are provided in Appendix H. Where further, more detailed information is provided by studies, this is highlighted. The table aims to provide an initial high level assessment of potential damages occurring under the two baseline scenarios. The damages for each epoch are current values. These are discounted to give present values in the final column.

ASSESSMENT OF EROSION DAMAGES

Epoch	0 -20 year		20 – 50 years		50 – 100 years		Total	
No Active Intervention *Location*	**Number of properties**	**Present Value x £1000**	**Number of properties**	**Present Value x £1000**	**Number of properties**	**Present Value x £1000**	**Number of properties**	**Present Value Damages (£x1000)**
	0	0	2	75	11	230	13	305
						Total for PDZ		

ASSESSMENT OF POTENTIAL FLOOD RISK

Epoch	Flood risk tidal 2025		Flood risk tidal 2055		Flood risk tidal 2105		Total	
No Active Intervention *Location*	**Number of properties**	**Present Value x £1000**	**Number of properties**	**Present Value x £1000**	**Number of properties**	**Present Value x £1000**	**Number of properties**	**Present Value Damages (£x1000)**
	645	4,627	706	2,641	800	952	800	8220

PDZ 14: Camel Estuary (Stepper Point to Pentire Point)
Management Area Statements

MA35 – Camel Estuary (Stepper Point to Trebetherick Point)
Covering previous SMP1 management units:

7B-1	Trevone Bay to Padstow
7B-1	Padstow
7B-1	Dinas to Porthilly Cove
7B-1	Rock and Porthilly Cove
7B-1	Rock to Daymer Bay
7B-1	Daymer Bay

MA36 – Trebetherick Point to Pentire Point
Covering previous SMP1 management units:

7B-1	Daymer Bay to Polzeath
7B-1	Polzeath
7B-1	Pentire Glaze to Pentire Point