

**PDZ 8. ABERAERON PLATEAU :**

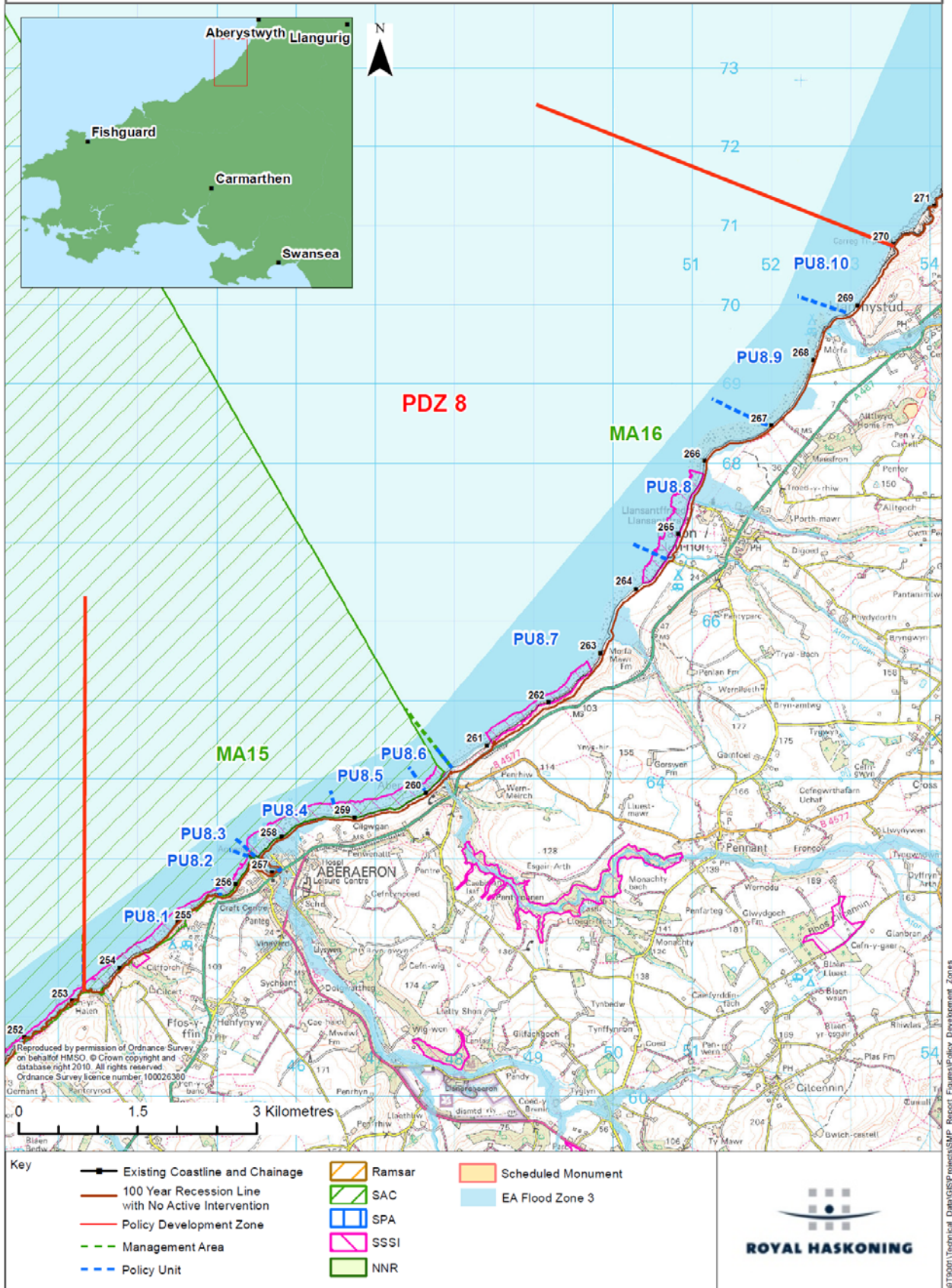


**Gilfach yr Halen to Carreg Ti-pw**

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**Shoreline Management Plan Sub Cell 9  
Baseline Location Map  
Policy Development Zone 8 - Aberaeron Plateau**



## Definitions of Scenarios Considered in Policy Development

This section defines the various scenarios that are used throughout the discussion of the Policy Development Zone.

Sea Level Rise
It is recognised that there is a continuing uncertainty with respect to Sea Level Rise (SLR). Taking different SLR scenarios may affect the scale of impact or the timing of some changes, either in terms of sustainable management or in terms of impacts. In the discussion below of the baseline and alternative management scenarios, the Defra guidance on SLR has been generally been used. Where, in any specific area, the impact of SLR is felt to be significant and may change the context of management this discussion is held within a separate box, relevant to that section of text.

### Management scenarios;

#### *Unconstrained Scenario*

Under this scenario, the behaviour of the coast is considered as if there were no man made defences, effectively if they were suddenly not there. Although recognised to be a totally theoretical scenario it does provide a better understanding of how we are influencing the coastal behaviour and therefore the stresses and broader scale impact that are introduced. This assists in assessing first how the coast might wish to change, but also in defining the limits of interaction which the SMP should be considering.

#### *Baseline Scenarios*

- **No Active Intervention (NAI) – Scenario 1**, where there would be no further work to maintain or replace defences. At the end of their residual life, structures would fail. There would be no raising of defences to improve standards of protection.
- **With Present Management (WPM) – Scenario 2**. This scenario applies the policies set in the SMP1 or, where relevant, takes updated or clarified policies, if subsequent work has been undertaken e.g. studies or strategies. In many locations, the approach to management defined by SMP1 only covers a 50 year period. Where this is so, the intent of how the coast is being managed has been assumed to apply into the future. It should be noted that WPM does not necessarily imply a Hold The Line approach throughout the zone, in many areas present management may be for a No Active Intervention approach or one of Managed Realignment.

The aim of the No Active Intervention is to identify what is at risk if defences were not maintained. In a similar way, With Present Management aims to examine how the coast may develop, identifying where there are benefits in this management approach or where there may be issues arising in the future.

At the end of this sub-section a brief summary and comparison of the economic risk for each of the baseline scenarios is provided, based on the MDSF analysis undertaken during the SMP (including other study findings where relevant). The baseline scenarios are also assessed in terms of how they address the overall objectives for the Zone. This comparison between the baseline scenarios sets the scene for discussing possible alternative management scenarios which better address all the issues. This discussion is provided in the subsequent sub-section.



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**Local Description**

This policy development zone covers the Aberaeron area from Gilfach yr Halen south of Aberaeron to Llanrhystud. This generally north west facing zone includes the large regionally important settlement of Aberaeron, together with the smaller rural settlements of Aberarth, Llanon, Llansantffraed and Llanrhystud. Much of the coastline is undefended and the general land use is agricultural.

*Gilfach yr Halen to South Aberaeron*

The coastline from the Holiday Park at Gilfach yr Halen to south Aberaeron harbour is an undeveloped stretch of coast, with high relatively soft cliffs. The small holiday park situated at the southern extent of the PDZ contains about 20 holiday homes and caters to summertime holidaymakers. The cliffs between here and the harbour provide a degree of control to the coastline but also provide important sediment supply. Further to the north of the cliffs, the land falls steeply to the valley of the Afon Aeron. The softer clay material found in this valley has been eroded and formed the shingle beach that can be seen to the south of the town. The foreshore in this area is quite wide, where the underlying well bedded and compacted glacial deposits form the lower beach. The frontage provides local boat launching access and there is a large car park and property behind the shingle bank. Further in land is the harbour itself and on the slope behind is the main Cyngor Sir Ceredigion Offices.



*Aberaeron*

Aberaeron is one of the larger towns along the Ceredigion coastline, and the largest settlement within this zone. Its historic development has provided one of the most significant urban landscapes in Wales, upon which a strong tourism and recreation industry has developed. Not only is it important for its urban significance, but it also provides an administrative base for the Local Authority. This town is mainly developed around its harbour, and the low lying area of the harbour. The harbour of Aberaeron supports an important fishing fleet fishing and recreational moorings and this, together with property around the harbour provides its essential character. Recent and ongoing works have been carried out along the frontage of Aberaeron, both to the north of the harbour and to the south, consisting of rock revetments and groynes to maintain the shingle beach and protect the coastline.

*Aberarth*



Located about 2km north of Aberaeron is the small rural village of Aberarth, situated on the same boulder clay platform as Aberaeron. It sits within the valley of the Afon Arth and the mouth of the Arth is artificially controlled by a crib groyne. A sewage pumping station for the village is situated on behind the crib groyne on the landward side of the steam behind a sea

wall. This community has been in existence since the Norman invasion and holds great historical significance. Much of the village is actually set back from the coastline. The main coastal road runs to the back of the village rising then steeply up the hillside to the north.

*Llanon to Llanrhystud*

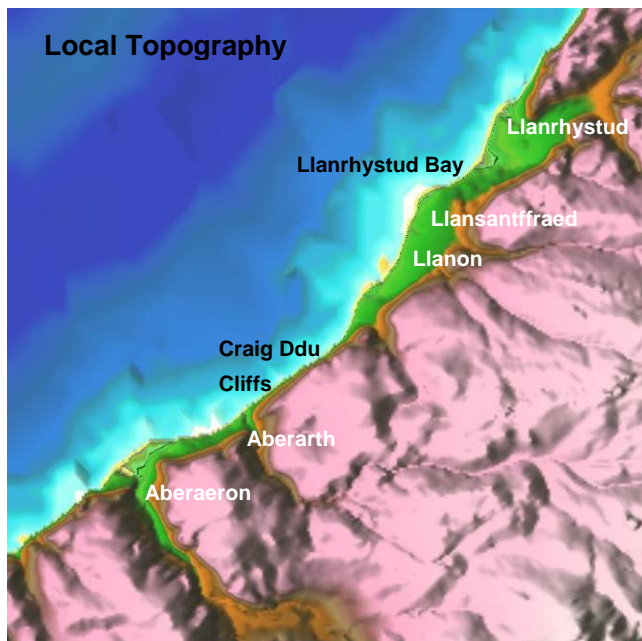
The coastline rises steeply from Aberarth to Llanon with the steep Clochtyddiau Pridd and then the harder Craig Ddu cliffs. The land then drops again to basically the same low coastal platform upon which are situated the villages of Llanon, Llansantffraed and Llanrhystud. These small villages cater to a more rural community, and the flat coastal plateau provides a good setting for the caravan parks and coastal camp sites at Llanon and Llanrhystud.



The Rivers Cledan and Peris discharge to the sea at Llanon and the Wyre Fach discharges at Llanrhystud. At the mouth of the Afon Cledan, fluvial gravels have been deposited and distributed along this stretch of coast to Llanrhystud. The communities and the main coast road are well set back from the shoreline and over most of the coast in this area the flat coastal plain is well above flood risk.

**2 Coastal Processes**

The area is exposed to a wide range of wave approach from the southwest and northwest. The stepped nature of this coastline has been formed by the presence of the intertidal control points along the coast. These points, much like the Sarns in the north, but shorter, tend to have allowed the coast to develop into a series of shallow stepped bays, rather than the more curved bay seen down at New Quay. These area of harder well bedded glacial material occur most noticeably (south to north) at Aberaeron North, Aberarth, Morfa Mawr headland, the strong point at Llansantffraed and the mouth of the Afon Wyre at Llanrhystud. However, even between the more prominent areas there is a relatively hard intertidal area.



The frontages between the settlements vary. Between Aberaeron and Aberarth, the backshore is composed of shingle whereas between Aberarth and Llanrhystud the backshore is low and steep gravel clay cliffs with gravel beaches, and between are the cliffs of Craig Ddu..

Along the PDZ, the beaches have been fed by long term erosion of the cliffs; there is limited drift into the area from the south, and this tends to be

retained at Aberaeron South Beach, or through the area to the north. The stepped nature of this coast demonstrates the processes shaping the coastline are a product of the dominant wave direction and the geology.

To the north of Aberaeron harbour, extensive coast protection works have been carried out involving a series of groynes and a large rock revetment. The town is situated forward of where the natural coastline would tend to be without the underlying hard intertidal platform. The groynes along the north beach have helped to control the



northward drift of sediment which is recognised to be relatively high. Beyond the groynes however the beach has tended to experienced accretion as the drift rates reduce along the cliff to the north. The Aberarth frontage gains sediment principally from the cliffs directly to the south and beach material is retained partly by slight forward position of the cliffs to the north, partly by the higher intertidal platform at the mouth of the Arth and along the backshore by the Crib Groyne and the series of groynes and revetment along the southern cliffs to the village. The cliffs north of Aberarth continue to provide sediment to the shoreline to the north.

Morfa Mawr, to the south of Llanon, acts as a control point for this section of the coast. The net drift to the south of Morfa Mawr is reversed towards the south and as a result this shallow 'bay' is relatively stable, with slight erosion to the south of the headland.

The coast between Morfa Mawr and the next strong point to the north of Llansantffraed has formed another shallow bay within which Llanon and Llansantffraed are situated. The erosion at Llanon in particular is significant and to prevent the imminent loss of the Caravan Park and road in front of the Plas Morfa hotel, private defences have been constructed involving timber telephone poles lining the low steep clay cliff. Beyond the 'headland' at Llansantffraed lies the slightly deeper bay of Llanrhystud Bay. This bay has





been formed in a valley where the clay cliffs of the south are replaced by a lower lying eroding shoreline. The bay has developed landward to such an extent that a shingle bank defence has naturally formed and there appears to be little net drift within the bay.

The mouth of the Wyre at Llanrhystud forms the next control point along the coast, upon which sits a large caravan park. The shape of the coastline here indicates that the Afon Wyre has created a slight headland with material held up, forming a promontory; the areas to the north and to the south of this river mouth appear to be at risk of erosion as the low clay cliffs eroding landwards and this in turn will affect the promontory.

What is seen in this is that the sediment drift is quite delicately balanced, with minor variation in coastal orientation and in foreshore level capable of influencing shoreline behaviour quite markedly. With sea level rise, this balance will be significantly affected. It might be expected that there would be increased drift as the harder intertidal area is more submerged. Erosion will increase as the coast attempts to adjust back to a position of equilibrium.

**Sea Level Rise**

With more rapid change in sea level rise, there will be an issue as to what degree the coast will be able to adjust in attempting to re-establish an equilibrium alignment and profile. This could result in greater differential drift such that some areas may erode more rapidly at first, while in other areas there could be greater accumulation of sediment. There may then be reversals in this process such that areas of greatest erosion will vary over time.

**POTENTIAL BASELINE EROSION RATES**

A distinction is made between basic erosion of the shoreline and cliff recession, affecting the crest of cliffs and coastal slopes. This is noted in the table below together with other relevant factors. In assessing erosion and recession in the future allowance has been made for Sea Level Rise and this is discussed in Appendix C. This is also discussed briefly following the table.

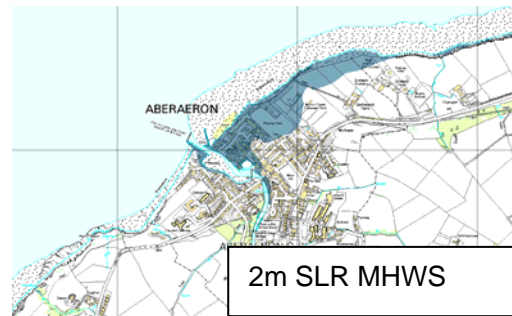
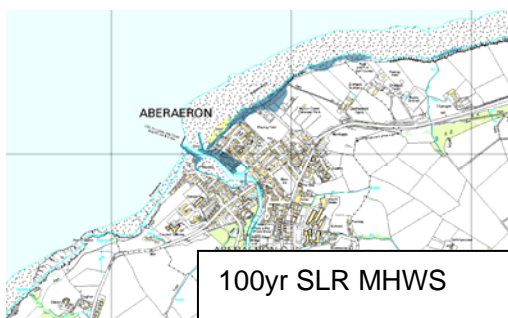
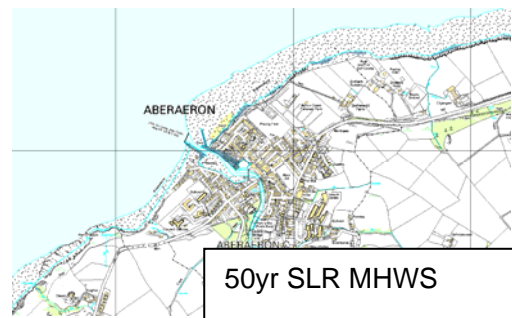
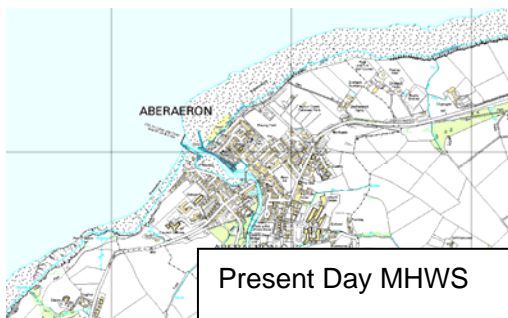
Location	NAI Base Rate (m/yr)	Notes	100yr. Erosion range (m)
Gilfach y Halen	0.04	Erosion and cliff falls in the area.	15 - 40
Aberaeron South beach	0.2	Constrained by the harbour Pier	20 - 45
Aberaeron North Beach	0.4	Defences hold this frontage	20 - 55
Aberaeron to Aberarth	0.1	Naturally eroding cliffs vulnerable to sea level rise	20 - 40
Aberarth	0.65	Line held by defences	40 - 100
Morfa Marw	0.14	High cliffs with erosion and slope failure	30 - 70
Llanon	0.3	Naturally eroding cliffs vulnerable to sea level rise	30 - 100
Llansantffraed to Llanrhystud	0.25	Naturally eroding cliffs vulnerable to sea level rise	30 - 70

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. Further detail on erosion rates together with erosion maps are provided in Appendix C.

This is an erosional coastline, and the stronger points have maintained the staggered nature of the coast. The erosion rates shown in the table below are from SMP1 and predate coast protection works that have since been carried out.

#### FLOODING

Over much of this PDZ, the impacts of sea level rise will be observed quite significantly compared to those of southern Ceredigion. At Aberaeron the current flood risk to the town is fairly well understood and recognised. As seen in the maps below, the north of the harbour is the area that is at the greatest risk.



Under present day, undefended conditions, Pen Cai and the properties along this street would be at risk of flooding on a regular basis. This flood extent expands to the north east over the different scenarios, eventually meeting a secondary coastal flood route caused by overtopping along the northern coast in the 2m SLR scenario. The area at risk in the future from normal tides over the nominal 50yr and 100yr scenarios (0.5m and 1m respectively) is relatively limited, however, clearly the flood risk in terms of more extreme events would extent over a substantially greater area. Under a 1m sea rise condition a large area of the harbour front could be affected.

#### Impact of different Sea Level Rise Scenarios

The flood risk area under normal tidal flooding is very sensitive to the rate of Sea Level Rise. Under a 2m SLR scenario over the next 100 years, the extent of flooding is significantly greater, as the coastal flooding caused by overtopping of the defences becomes a problem and as the frequency of flood risk increases. The full flood risk area could be affected within 50 to 75 years. Under this scenario the main road (A487) would be subject to regular flooding over the same time period.

The flood risk at Aberarth, is significantly lower than that at Aberaeron. Under the MHWS levels for all four scenarios, the flood extent reaches just seaward of the first coastal property (2m scenario). However, under storm conditions, this differs somewhat in the longer term. In the event of a 1:200 yr storm event, under a 1m (100yr) SLR scenario, the flood extent reaches beyond the first property and cuts off the dead end section of the road at the coast. Under a 2m scenario, a 1:200yr storm would extend



almost as far inland as the road bridge of the A487. It must be noted that these conditions are with an undefended coastline, although, the defence at the mouth of the Afon Arth is more of a control point for the estuary rather than a coastal flood defence. These levels are also still water levels and do not take into account swell and storm waves.

The coastline to the north including Llanon, Llansantffraed and Llanrhystud, although lower lying than the cliffs to the south, is not at imminent risk of coastal flooding under daily conditions for all four scenarios. There does however, appear to be some significant flooding to the caravan parks at Llanon and Llanrhystud under a 2m scenario with a 1 in 200 yr storm. The main risk associated with a rise in sea levels along this stretch of the coastline is an increase in recession rates of the low clay cliffs as discussed previously..

#### EXISTING DEFENCES

Extensive coastal defence works have been undertaken to north Aberaeron over the last few years involving rock revetments for the entire frontage, eight timber groynes, one



rock groyne and sea walls. These defences were constructed to prevent erosion of the north side of the harbour and to protect the town from coastal flooding by means of overtopping during storms. Along the shore where the groynes are in place, there lies a car park and a number of properties, together with the sewage pumping station and pumping main situated on a landfill site, which is now closed. . It is anticipated that the groynes will stabilise the beach in front of the town

and prevent the northward drift of material. The harbour itself contains a combination of reinforced concrete sea walls and sheet piled concrete quay walls to protect the properties from flood risk.



Aberaeron South beach is managed by timber groynes and by presence of the harbour Pier. There are some minor areas of rock preventing erosion behind the beach.

North of Aberaeron the coastline is undefended as far as the artificial strengthening at Aberarth. The main works, at Aberarth, consist of a bull head rail breastwork filled with rock armour and fronted by a timber groyne field with a small retaining wall to the north of the river and to the south a

groyne field with rock to the rear.

The coast from Aberarth to Llanrhystud is for the most part undefended, aside from local private defences in front of caravan parks. The coast's natural defence of the wide

cobble beach helps to dissipate the approaching wave energy; however this coastline is currently eroding.

#### UNCONSTRAINED SCENARIO

In the absence of defences the coast would erode back. The only large differences would be at Aberaeron and Aberarth, where there are significant areas of defence. In the absence of the Harbour pier much of the accumulated sediment to the south would move rapidly north with some being diverted within the harbour. The absence of defences to the north of the harbour would again result in significant set back of the shoreline, affecting a large area of the town. Over much of the frontage, however, the coast would behave very much as at present.

#### KEY INTERACTION WITH DEFENCES

Only at Aberaeron are defences substantially impacting on larger scale processes. At Aberarth, the defences are impacting on the way the mouth of the Afon Arth behaves, but not the larger scale processes of the coastline.

### 3 Management Scenarios

#### 3.1 No Active Intervention – Baseline Scenario 1.

The main area of this PDZ that would suffer under a no active intervention scenario is Aberaeron. Defence would not be maintained and potentially within the first epoch the pier to the south of the harbour might fail. This would reactivate erosion of the backshore as the large shingle bank is lost. As sea levels rise, the frontage of the town would become more frequently overtopped. The levels inside the harbour would also increase, giving rise to a substantial flood risk, mainly within the harbour given the longer term design standard of the new defence along the shoreline. Under this scenario there would be no intent to raise defences to the town. By epoch 3, potentially flooding would be to such a level that properties over the northern part of the town, and in particular along the harbour front would be abandoned. In the longer term the use of the northern area north of the road would be abandoned. The front coastal defence would deteriorate and eventually erosion would set in. In effect the very core of the town would be lost.

#### Impact of different Sea Level Rise Scenarios

The flood risk area under normal tidal flooding is very sensitive to the rate of Sea Level Rise. Under a 2m SLR scenario over the next 100 years, the extent of flooding is significantly greater and earlier. Quite probably much of the town centre would be lost by the end of the second epoch.

At Aberarth the defence at the mouth of the Afon Arth would eventually fail, possibly over the second epoch. The works to the south would similarly fail over the same period of time. The town itself lies at a fairly high level, and therefore the majority of the houses would be safe from flooding. With failure of both the defence to the south and the rib groyne erosion would result in a significant width of land at the shoreline. However it is probable that only a few properties might be lost in this area. Erosion would however, continue, such that further properties would subsequently be lost. In effect the current defence line has a buffer zone before impacting on the main part of the village. Once eroded this buffer is lost and subsequent erosion affects progressively more properties.

Erosion following the failure of the crib groyne and sea wall could act to destabilise the coastal slope and may result in loss of the main coast road.

From this point until Llanrhystud, the no active intervention scenario would not differ greatly from the current behaviour of the coastline. The land would continue to erode and the caravan parks and properties along the coast would be at greater risk in the longer term.

### 3.2 With Present Management – Baseline Scenario 2.

The following table sets out current policy and management approach for the Zone.

SMP 1 Management Units			Subsequent Management Approach
No.	Unit	Policy	
<b>Ceredigion</b>			
9.1	Aberaeron Cliffs	DN	
9.2	Aberaeron South	HTL	
10.1	Aberaeron Harbour	HTL	
11.1	Aberaeron North	HTL	
11.2	Aberarth	R, locally HTL	
11.3	Morfa Mawr	R	
11.4	Llanon	R/DN	
11.5	Llanrhystud Bay	R	
11.6	Llanrhystud North	DN	

**Key:** DN – do nothing, HTL – Hold The Line, SHTL – Selectively Hold The Line, R – Retreat, deferred – policy deferred subject to further monitoring or study.

The following information and policy is abstracted from the Pembrokeshire and Ceredigion Rivers CFMP Draft Plan

#### Preferred policies for Policy Unit 1 – Northern Coastal Rivers

<b>Policy Unit 1 Northern Coastal Rivers</b>	The Northern Coastal Rivers policy unit comprises of the watercourses draining the Pembrokeshire and Ceredigion coast from Fishguard to south of Borth.
<b>Problem risk:</b>	<p><b>Problem:</b> There are several main rivers in this policy unit, including the Afon Rheidol, Afon Clarach, Afon Ystwyth and Afon Aeron. The main sources of flooding in this policy unit are from the main rivers and from tidally influenced river flooding. Surface water and sewer flooding area also experienced in this policy unit, particularly in the main urban areas.</p> <p><b>Current flood risk:</b></p> <ul style="list-style-type: none"> <li>- The majority of the flood risk is concentrated in Aberystwyth, Aberaeron, Clarach, Bow Street, Penrhyn-coch and Llanrhystud. 71% of the people at risk in the whole policy unit are located in these main flood risk areas.</li> </ul> <p><b>Future flood risk:</b></p> <ul style="list-style-type: none"> <li>- The flood risk across the whole policy unit is not expected to increase significantly as a result of climate change, landuse change or urbanisation.</li> <li>- The majority of the increased number of people at risk in the future are located in the main flood risk areas of Aberystwyth and Aberaeron, where the current flood defences are unlikely to provide adequate protection from a 1% AEP flood event or higher in the future.</li> <li>- During a 1% AEP flood event the population at risk of flooding is expected to increase by approximately 178% and the residential and commercial properties at risk are expected to increase by approximately 108%.</li> <li>- 78% of the increased flood damages are estimated in Aberystwyth and Aberaeron.</li> <li>- The flood risk in the main flood risk areas of Aberystwyth and Aberaeron is</li> </ul>



	<p>expected to increase, as the current flood defences are unlikely to provide adequate protection in the future.</p> <ul style="list-style-type: none"> <li>- It is likely that flood depths will increase in the future, with typical depths of flooding during a 1% increasing by nearly 1m as a result of sea level rise in Aberystwyth and Aberaeron.</li> </ul>
<b>Policy selected</b>	Policy 3 – Continue with existing or alternative actions to manage flood risk at the current level
<b>Justification and alternative policies considered</b>	<p>Policy 3 - A policy option 3 would allow the flood risk management measures to be reviewed and reprioritised in order to address flood risk as it increases in the future. In the absence of new or heightened flood defences, flood warning could be prioritised and stepped up, and policy could be used to divert further development away from flood risk areas. This would benefit Aberystwyth and Aberaeron in particular. A policy 3 is appropriate for this policy unit because the level of flood risk across the policy unit as a whole is currently assessed as low and is not expected to increase significantly in the future. The majority of the increased flood risk (approximately 78%) is concentrated in Aberystwyth and Aberaeron, where the flood risk issues can be resolved through localised measures or a change in emphasis in the current levels of flood risk management activities across the remainder of the policy unit. Under a Policy 3 annual average damages are expected to increase by approximately 0.82m to £1.56m.</p> <p>We have selected this policy based on the risk posed by inland flooding sources and tidal flooding sources. If the risks posed by tidal flooding were removed from the policy appraisal process, preliminary estimates suggest that this policy would remain a P3.</p>
<b>Catchment-wide opportunities &amp; constraints</b>	<p><b>Opportunities:</b></p> <p>To reduce future flood risk by influencing and informing the planning process for new developments planned for Aberystwyth and Aberaeron and other smaller settlements in this policy unit, to prevent vulnerable land use from being located in the floodplain and through the appropriate use of SuDS.</p> <p>To reduce surface water run-off and sediment loss in the upper catchments of the Afon Rheidol, Afon Ystwyth, Afon Aeron and Afon Clarach, and improve water storage in the lower catchments through applying environmental and land management initiatives, such as Tir Cynnal, Tir Gofal and Catchment Sensitive Farming to the dairy farming activities in this policy unit.</p> <p>To reduce run-off from the upper catchments should be investigated through working with the Forestry Commission Wales and their Better Woodlands for Wales project.</p> <p>To reduce flood risk to Aberystwyth and Aberaeron through improved flood warning and emergency response.</p> <p><b>Constraints:</b></p> <p>Flood risk management objectives should compliment the Central Cardigan Bay SMP although it should also be noted that where appropriate, the CFMP may need to influence the SMP.</p> <p>Steep coastal catchments with potential for rapid response to flooding such as the Afon Rheidol, Afon Ystwyth, Afon Clarach and Afon Aeron in the Northern Coastal Rivers policy unit, can provide difficulties for certain flood risk management activities. We must recognise this, and accept that there is little we can do to change the frequency or extent of flooding. Our approach to managing flood risk therefore must focus on reducing the impact.</p>

The general approach to present management from SMP1 is, therefore, to sustain existing defences to the developed sections of the coast but to allow continued erosion to occur elsewhere. However the policy of Aberarth is one of Retreating the existing line of defence along the area of the southerly cliff while maintaining defence at the river.

The Catchment Flood Management Plan (CFMP) for this region examines the fluvial flood risks. The CFMP for the Northern Coastal Rivers region, includes the Afon Aeron, Afon Ystwyth, Afon Rheidol and Afon Clarach. This plan identifies the main areas at flood risk, in the future as well as present flood risk are Aberaeron and Aberystwyth. The preferred policy option is Policy 3; *“Continue with existing or alternative flood actions to manage flood risk at the current level”*. This CFMP discusses how flood resilience, preparedness and awareness are vital in managing the flood risk to these towns. Rather than simply raising defences to cope with higher water levels in the future, the CFMP recommends that the policy is used to divert further development away from the areas at risk.

There is, therefore, a degree of difference between the policy intent set out in the SMP1, and subsequently taken forward by the coastal strategy for Aberaeron North Beach and that set out by the CFMP. Both approaches are considered under the with present management scenario.

At Aberaeron South Beach the present policy is to Hold the Line. This relies upon maintaining the Harbour Pier, retaining the beach and providing protection to the cliffs and property behind. Over the first two epochs this approach would be very much as at present. During epoch 3, with anticipated sea level rise there would be loss of the beach as it attempts to roll back and is constrained by the defence to the rear, particularly at the southern end. The defences would be improved. There would be the need for a more substantial revetment, with possible increasing impact on the SSSI. The shingle beach would not be able to respond naturally to storm conditions and there would be a need to significantly increase defence to the crest. With the limited assets at risk this further investment in the frontage may not be justified. Areas of the south quay behind the car park would be at risk in the longer term from normal tidal flooding. This could be addressed through raising the defence in this area.

Within the harbour on the southern side there would be increased risk of wall failure in the future and the With Present Management is seen as maintaining these defences and providing protection to the properties to the rear of the wall.

The policy and approach being adopted along North Beach is for continued defence to



an acceptably high level to prevent both wave overtopping as well as tidal flooding on more extreme events. This approach has been shown to be economically justified. This approach will also stop erosion with the intent of retaining an adequate beach level. The main issue then arises within the harbour. To realise the benefits of defence on the open coast, the approach would be to reduce flooding within the harbour and to the northern section of

the town. At present and possibly over the first two epochs defence would be to prevent extreme water level flooding. This will require some rising of the defences set back from the quay face at Pen Quay and improving and raising defences around other areas of the harbour, back down to the road bridge. Moving into epoch 3, the need for defence would increase such that defences would need to be raised, under SMP1 policy, to prevent extreme water level flooding, but also to address potential flooding on normal tides. There may also be a need to raise defences along the northern bank of the river up stream of the bridge. Defences would need to be raised potentially 1m over the whole frontage over the period of the SMP.

#### Impact of different Sea Level Rise Scenarios

With higher Sea Level Rise of 2m over the next 100 years, defences to Aberaeron Harbour and frontage would need to be raised to cope with the higher sea levels and increased wave attack to the town. This may become difficult to achieve whilst maintaining the character of the town and therefore the future of Aberaeron may become more of a longer term strategic planning issue rather than a flood defence issue.

The scenario would maintain certain important aspects of the town but would increase the long term risk that defences could not sensibly be maintained indefinitely.

It is suggested in the CFMP that the emphasis for flood risk should move from one of raising defences to management of the risk. In relation to Aberaeron this cannot easily be achieved through planning control as an essential quality of the town and existing built environment is the very area that is at most risk. Furthermore developing an approach based solely on sustainable drainage principals would fail to address the regular tidal flooding under normal tidal levels. Flood warning would equally be ineffective under these conditions.

The With Present Management policy with respect to Aberarth has been reviewed. The approach would be to maintain some form of control at the mouth of the river, potentially increasing the protection to the valley and coastal slope behind, but to allow controlled retreat of the cliff line to the south. This approach is seen as sustainable and justified against the objective of maintaining the essential quality of the village. Allowing the erosion of the cliffs would improve the condition of the SSSI, without allowing uncontrolled erosion to substantially impact severely on the village. There may still be loss of some front line properties in the long term in achieving this.

Over the rest of the frontage the approach of managing the retreat is seen as being appropriate. There is not seen to be justification for substantial intervention, but this approach would not preclude minor works undertaken on the basis that over time these would be removed. This would allow a period for adaptation. Any long term defence would be seen as having a significant impact on the various sections of coast designated as SSSI.



#### **4 Summary Comparison and Assessment of Baseline scenarios.**

Table 1 compares the economic damages that might arise under the two baseline scenarios. Table 2 provides a summary comparison in terms of the overall objectives based on the key issues identified in the introduction to this Coastal Area.

Erosion damages and those associated with flooding are identified separately in Table 1. The aim of this table is to demonstrate the potential economic damage that might arise from either flooding or erosion. As such properties that might be lost in the future due to erosion are not discounted from the assessment of flooding. Similarly, properties whose value may have been written off due to regular flood damage are still included within the assessment of erosion. Such an approach is clearly not strictly in line with normal economic appraisal at strategy or scheme level. It is however, considered appropriate at the higher level of the SMP assessment where the essential aim is in identifying potential different forms of risk in assessing different scenarios. Where this is felt to disproportionately distort the economic assessment then this is identified in appendix H and the economic case adjusted accordingly.

The assessment of economic damage is made using a simplified Modelling Decision Support Framework (MDSF). In the case of erosion, this GIS based tool takes the predicted erosion distance for any section of the coast based on the assessment of erosion by the end of each epoch. It is then taken that there would be a linear erosion rate between these timelines (e.g. a property located midway between the epoch 1 timeline (20 years) and that for epoch 2 (50 years) would be taken as being lost in 35 years). Each property is defined by a single point rather than by its full footprint. No account is taken in the assessment of loss of access or loss of services, although this is discussed in the text where critical. The MDSF method then draws information from a property data base, providing general information with respect to that property. The value of the property is discounted in terms of when that property may be lost.

In the case of flooding, the open coast water levels are assessed against threshold levels for individual properties based again on the property point source data base. No detailed modelling has been undertaken to assess flow paths and or possible increase in water levels due to estuary processes. It is taken that, when a flood defence fails or is overtopped, the whole flood area behind a defence is open to flooding and that flooding would occur to the full extent of the potential flood plain, over a single high water period. Damages are assessed in relation to the depth of flooding that would occur based on the type of property identified in the data base. From this assessment of potential flood damage for any specific water level condition, annual average flood damages are determined during each epoch. An average annual average damage value is taken between the present (2010) and 50 years time (2060) and between 2060 and 2110. This average value is taken in determining an estimate of discounted Present Value (PV) Damages over the period of the SMP. This simplified approach allows consideration of flood risk under different sea level rise predictions for different scenarios.

**Table 1. Economic Assessment**

The following tables provide a brief summary of erosion and flood damages determined by the SMP2 MDSF analysis for the individual area. Further details are provided in Appendix X. 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.

**.ASSESSMENT OF EROSION DAMAGES**

Epoch	0 -20 year		20 – 50 years		50 – 100 years		50 – 100 years (2m SLR)		PV Damages (£x1000)			
	No. of properties:		No. of properties:		No. of properties:		No. of properties					
Location	Res.	Com.	Value x £k	Res.	Com.	Value x £k	Res.	Com.	Value x £k	Res.	Com.	
Aberaeron South	0	0	0	0	0	0	4	0	791	5	0	85
Aberaeron Harbour	0	0	0	1	0	149	34	7	4,588	38	7	459
Aberaeron North	0	0	0	0	0	0	24	0	2,990	28	0	277
Aberarth	0	0	0	0	0	0	5	0	655	12	0	66
Llanon to Llanrhystud	0	0	0	0	0	0	1	1	199	0	1	10
<b>Total for PDZ1</b>												
With Present Management	No. of properties		Value x £k	No. of properties		Value x £k	No. of properties		Value x £k	No. of properties		PV Damages (£x1000)
Location	Res.	Com.	Value x £k	Res.	Com.	Value x £k	Res.	Com.	Value x £k	Res.	Com.	
Aberaeron South	0	0	0	0	0	0	4	0	791	5	0	85
Aberaeron Harbour	0	0	0	0	0	0	0	0	0	0	0	0
Aberaeron North	0	0	0	0	0	0	0	0	0	0	0	0
Aberarth	0	0	0	0	0	0	2	0	229	2	0	22
Llanon to Llanrhystud	0	0	0	0	0	0	1	1	199	0	1	10
<b>Total for PDZ1</b>												
Notes: PVD determined for 1m SLR in 100 yrs.												
Other information: Local slope instability and loss of services could result in earlier loss of property, increasing damages significantly.												

The following flood damages have been determined through use of MDSF. These figures are aimed to indicate the level and impact of flood risk rather than being a detailed economic appraisal. In many areas substantial numbers of properties would be liable to flooding on the more frequent events both under NAI and WPM, a nominal write off value has been allowed in the table for properties at frequent risk; this generally excludes values at risk at present on a 1:1 year event, in 50 years time for the 1:10 year event and in 100 year time the 1:50 year event.

#### ASSESSMENT OF POTENTIAL FLOOD RISK

No Active Intervention	Flood risk tidal 2010			Flood risk tidal 2060			Flood risk tidal 2110			tidal risk 2m SLR		PVD (£x1000)
	No. of properties		AAD x £k	No. of properties		AAD x £k	No. of properties		AAD x £k	No. of properties		
	<1:10 yr.	>1:10 yr		<1:10 yr.	>1:10 yr		<1:10 yr.	>1:10 yr		<1:10 yr.	>1:10 yr	
<i>Location</i>												
Aberaeron (SW)	0	1	0.46	0	1	3	0	6	24	1	15	107
Aberaeron (NE)	0	210	105	0	250	584	0	338	5385	199	220	23839
Aberarth	0	1	0.01	0	2	0.18	2	2	20	1	7	63
Llanon	0	0	0	0	0	0	0	0	0	0	1	0
Llanrhystud	0	0	0	0	0	0	0	0	0	0	1	0
<b>Total for PDZ8</b>											24,009	
With Present Management	No. of properties		AAD x £k	No. of properties		AAD x £k	No. of properties		AAD x £k	No. of properties		PVD (£x1000)
<i>Location</i>	<1:10 yr.	>1:10 yr		<1:10 yr.	>1:10 yr		<1:10 yr.	>1:10 yr		<1:10 yr.	>1:10 yr	
Aberaeron (SW)	0	1	0.26	0	1	0.35	0	6	0.84	0	16	10
Aberaeron (NE)	0	210	55	0	250	69	0	338	104	0	419	1927
Aberarth	0	1	0.01	0	2	0.18	2	2	20	4	4	63
Llanon	0	0	0	0	0	0	0	0	0	0	1	0
Llanrhystud	0	0	0	0	0	0	0	0	0	0	1	0
<b>Total for PDZ8</b>											2001	



**Table 2. General Assessment of Objectives**

The following table provides an overall assessment of how the two baseline scenarios impact upon the overall objectives. Specific objectives are set out in more detail within Appendix E. The table aims to provide an initial high level assessment of the two baseline scenarios, highlighting potential issues of conflict. These issues are discussed in the following section, examining alternative management scenarios from which SMP2 policy is then derived.

STAKEHOLDER OBJECTIVE	NAI			WPM		
	Fails	Neutral	Acceptable	Fails	Neutral	Acceptable
Reduce risk to life						
Protect properties from flood and erosion loss						
Minimise the need for increasing effort and management of coastal defences						
Avoid reliance on defence particularly where there is a risk of catastrophic failure						
Maintain access to the communities and villages						
Maintain Aberaeron, as regional centres for the communities						
Maintain recreational use of beaches						
Maintain access to the coast including car parking and facilities						
Maintain access for boat use and associated recreation						
To maintain Aberaeron as a viable commercial centre and support opportunities for regeneration,						
To maintain the use and development of Aberaeron Harbour.						
Maintain character and integrity of coastal communities						
Maintain agricultural value of rural community						
Identify risk and reduce risk of loss of heritage features where possible						
Maintain historic landscape						
Prevent disturbance or deterioration to historic sites and their setting						
Maintain or enhance the condition or integrity of the international (SAC, SPA) designated sites and interest features within the context of a dynamic coastal system.						
Maintain or enhance the condition or integrity of the national (SSSI) designated sites and interest features within the context of a dynamic coastal system.						
Maintain and enhance educational and scientific understanding of geology and geomorphology						
Avoid damage to and enhance the natural landscape.						
Maintain the human landscape and character of communities						

STAKEHOLDER OBJECTIVE	NAI			WPM		
	Fails	Neutral	Acceptable	Fails	Neutral	Acceptable
Maintain access to larger settlements for smaller farming communities						
Maintain regional transport route						

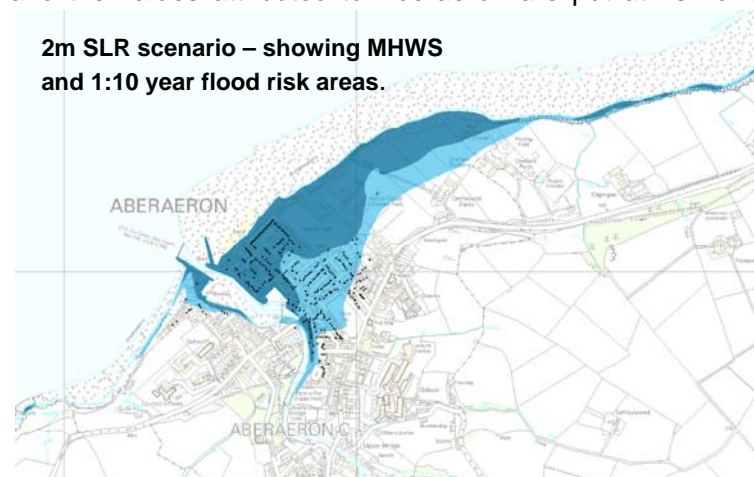
## 5 Discussion and Detailed Policy Development

Over much of the coast to the north, the approach set out in SMP1 seems appropriate. There would need to be some shift in emphasis, in that in SMP1, looking only over a period of 50 years, anticipated that local private management might be sustainable. With present understanding of sea level rise and the increasing pressure that this will bring to the coast, it is now considered that such local management will not be fully effective in the future. The shift in emphasis is, therefore, that private management should only be permitted at such a scale that it would not lead to ever increasing effort in defence and that it should only be undertaken as a means of allowing planned adaptation. This is, in fact not out of line with the local approaches that do seem to have been taken at present. It will be as erosion increases that Managed Realignment (and in this case actual managed retreat) would need to be enforced through planning and coast Protection approvals.

At Aberarth, the approach of Managed Realignment would similarly be seen as appropriate. However here, the approach would be far more one of managing a new alignment for continued defence. The approach would need to be developed further in detail. The basic concept and intent would be to replace or reinforce the existing crib groyne in such a manner that basic protection would be provided to the mouth of the Arth. This would secure the opportunity of managing the local flood issues within the valley and providing a degree of stability to the coastal slope on the northern section of the village. This would help secure the road. This control would help retain sediment to the south of the Arth, in effect reinforcing the natural high foreshore at the mouth, which controls the general alignment of the coast at present. In providing this degree of control, the defences to the southern cliff frontage would be allowed to deteriorate over the first two epochs with the long term intent of allowing the cliff to erode. This makes effective use of the buffer zone at present behind the existing defences, while still maintaining a good natural shingle defence. The details of this realignment would have to be considered with the local community. However, it is likely that there would be loss of property to create sufficient width to establish a sustainable line of natural defence.

The real issue over this section of coast is at Aberaeron. No Active Intervention is ruled out. The consequence of not defending is the effective loss of the town and the harbour. Aberaeron is identified as being vital to the well being of the region.

The difficulty, as highlighted in the assessment above, is in how Aberaeron may be sustained without creating, in the long term, such dependency on defences that people and the values attributed to Aberaeron are put at risk of sudden failure or risk under



extreme conditions. There is also the issue that, in the third epoch, essential areas of the town would be within the flood risk area even under normal tidal flooding. This issue becomes even more apparent in that, under more severe predictions of sea level rise over the next 100 years (under a 2m sea level rise



scenario), much of the northern part of the town would fall within this normal tide flood risk zone.

Management of the open coast is seen as being essential, at present. This would prevent erosion loss and provide defence against the severe wave overtopping that would otherwise destroy significant areas of the northern part of the town. In terms of flood risk occurring from the harbour area, there is a reasonable expectation that defence could be maintained within the harbour over the next 100 years under the predicted 1m sea level rise. This, however, is seen as quite a critical threshold. Flood defences would need to be raised by effectively 1m over the whole harbour front and it would be at about this threshold that the risk would change from that of extreme event management to actually providing defence against normal every day tides. Beyond the 1m threshold defence would need to include management of possible ground water flooding and the risk to life and property would significantly increase. Technically this would be possible. However, the impact on use of the harbour and on the built landscape would be such that the very nature of Aberaeron would change.

Beyond the 100 years, therefore, setting off in a manner of merely responding to sea level rise is not considered to be sustainable. (Under a 2m sea level rise scenario, this threshold could be reached in 75 years). It is therefore seen as likely that beyond the 100 (or 75 year) horizon that significant change would be required. This might then require a new approach also to be taken to management of the coastal edge and accepting that the whole sea front and harbour area would need to be redesigned. This goes beyond the remit of the SMP in defining policy, and requires far more detailed analysis in terms of an integrated spatial planning approach, incorporating management of flood risk. The policy defined for the area is therefore to Hold the Line and standard of defence over the next 100, subject to actual sea level rise, but with the caveat that there is likely to be a need for substantial change in the longer term.

This then reflects on the management of the southern part of Aberaeron. Over the short to medium term defence of South Beach would be sustainable as at present. In to the third epoch, it is unlikely that maintaining defence to the southern end of the frontage would be justified. It would be appropriate to maintain the Harbour Pier to ensure that there was no breach through to the harbour and to provide essential navigation of the harbour. This would retain a substantial beach to the south and provide the basic control in managing a policy of Managed Realignment over the rest of the frontage. This may result in loss of some properties to the back of the frontage. Even at present, there is little sediment transport along the upper shoreline and retaining sediment to the south of the pier is not seen as being critical to management of Aberaeron North Beach.

In the long term, given the caveat in relation to management of the northern part of Aberaeron, there would need to be further consideration of whether the Harbour Pier could be maintained, or should be maintained in its current position. This would need to be considered along side any redesign of the whole area.

The SMP is highlighting the probable need for massive change in the approach taken to managing the whole of Aberaeron in the future, if the present understanding of sea level rise develops as predicted. This need for change will become more apparent as sea level rise is monitored over the next 20 years. It is important that the present values of the town are managed in a way that does not pre-empt future change too early, but also that management measure taken now do not close down opportunity for change to occur in a sustainable manner, if required, in the future.

## 6

**Management Summary**

The area is divided into two general Management Areas and a summary of policy is set out in the tables below.

**M.A.15 ABERAERON AND ABERARTH:** From Gilfach yr Halen to North Cliffs of Aberarth.

Policy Unit		Policy Plan			Comment
		2025	2055	2105	
8.1	Gilfach yr Halen to Pen y Gloyn	DN	DN	DN	Currently undefended, undeveloped cliffs
8.2	Aberaeron South Beach	HTL	HTL	MR	Maintain defences, consider realignment southern end of the defence in the future. Long term management of this area would be linked to long term management of Aberaeron North.
8.3	Aberaeron Harbour	HTL	HTL	HTL	Maintain and raise existing defences over the period of the SMP. Future management would need to consider the real possibility of major change in this approach. The need for such change would critically depend on the rate of sea level rise.
8.4	Aberaeron North Beach	HTL	HTL	HTL	As above
8.5	Aberaeron to Aberarth	NAI	NAI	NAI	
8.6	Aberarth	HTL	MR	MR	Maintain and amend defence around the mouth of the Arth, allow southern coast to erode back
Key: HTL - Hold the Line, A - Advance the Line, NAI – No Active Intervention MR – Managed Realignment					

**M.A.16 LLANRHYSTUD:** From North Aberarth to Llanrhystud.

Policy Unit		Policy Plan			Comment
		2025	2055	2105	
8.7	North Aberarth to Morfa Mawr	NAI	NAI	NAI	Undefended, undeveloped cliffs allow cliff retreat with the potential need to realigning the road
8.8	Llanon and Llansantffraed	MR	MR	MR	This would not preclude time limited private defence as part of managing retreat of the shoreline, subject to normal approvals.
8.9	Llanrhystud Bay	MR	MR	MR	This would not preclude time limited private defence as part of managing retreat of the shoreline, subject to normal approvals.
8.10	Llanrhystud bay to Carreg Ti Pw	NAI	NAI	NAI	
Key: HTL - Hold the Line, A - Advance the Line, NAI – No Active Intervention MR – Managed Realignment					

**PDZ8**  
**Management Area Statements**

**MA 15 Aberaeron and Aberarth**  
*Gilfach yr Halen to North Cliffs of Aberarth*

**MA 16 Llanrhystud Bay**  
*North Aberarth to Llanrhystud*






Location reference:	<b>Aberaeron and Aberarth</b>
Management Area reference:	<b>M.A. 15</b>
Policy Development Zone:	PDZ8



\* Note: Predicted shoreline mapping is based on a combination of monitoring data, analysis of historical maps and geomorphological assessment with allowance for sea level rise. Due to inherent uncertainties in predicting future change, these predictions are necessarily indicative. For use beyond the purpose of the shoreline management plan, reference should be made to the baseline data.

The following descriptions are provided to assist interpretation of the map shown overleaf.

### 100 year shoreline position:

The following maps aim to summarise the anticipated position of the shoreline in 100 years under the two scenarios of "With Present Management" and under the "Draft Preferred Policy" being put forward through the Shoreline Management Plan.

-  In some areas the preferred policy does not change from that under the existing management approach. In some areas where there are hard defences this can be accurately identified. In other areas there is greater uncertainty. Even so, where the shoreline is likely to be quite clearly defined by a change such as the crest of a cliff the estimated position is shown as a single line.
- Where there is a difference between With Present Management and the Draft Preferred Policy this distinction is made in showing two different lines:

-  With Present Management.
-  Draft Preferred Policy.

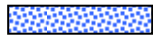
### Flood Risk Zones



General Flood Risk Zones. The explanation of these zones is provided on the Environment Agency's web site [www.environment-agency.gov.uk](http://www.environment-agency.gov.uk). The maps within this Draft SMP document show where SMP policy might influence the management of flood risk.



Indicate areas where the intent of the SMP draft policy is to continue to manage this risk.

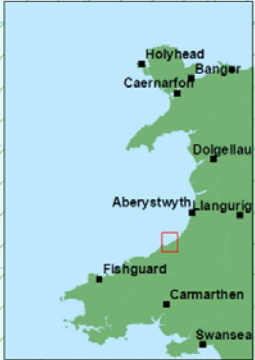
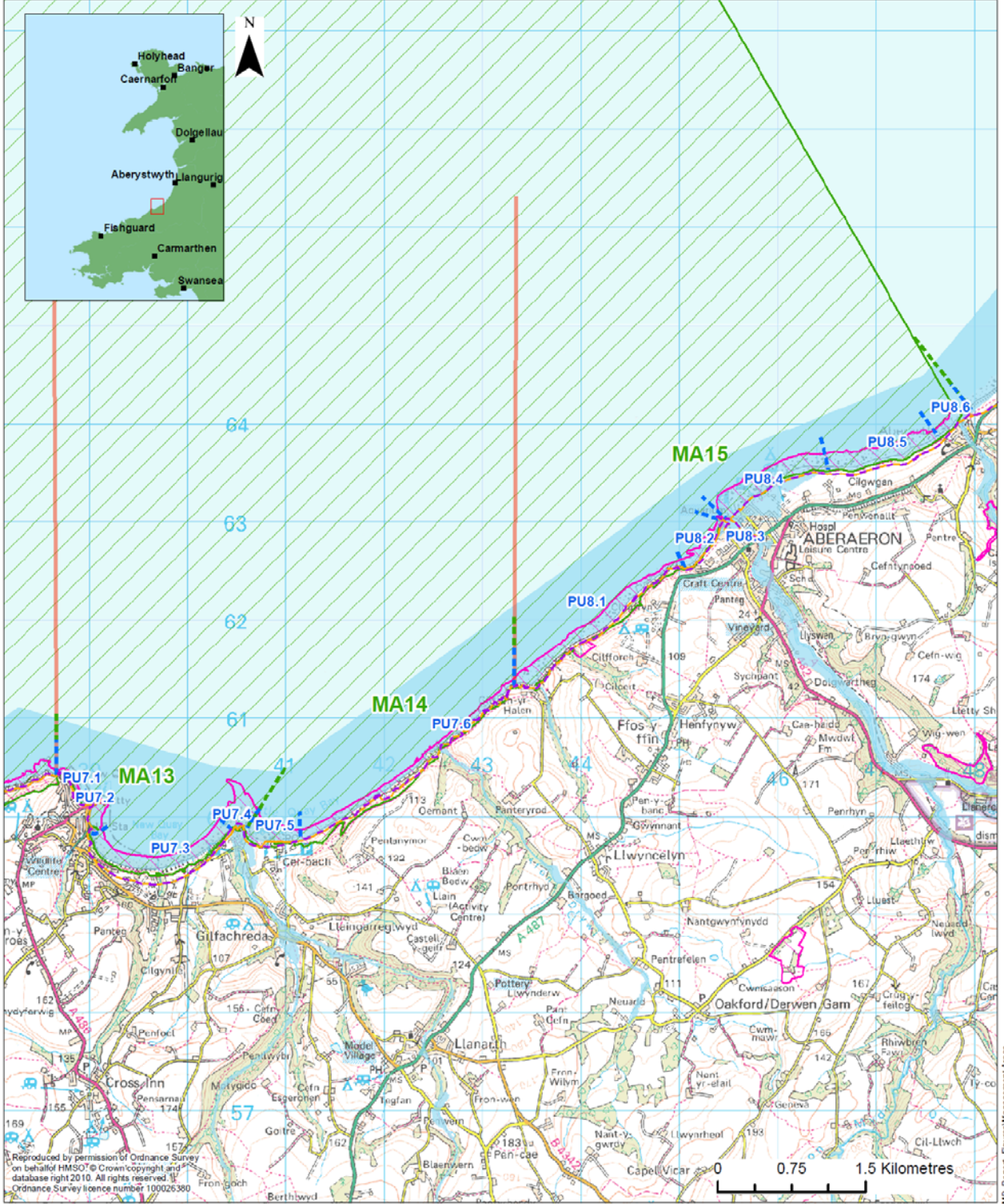


Indicate where over the 100 years the policy would allow increased risk of flooding.

The maps should be read in conjunction with the text within the Draft SMP document.

**Shoreline Management Plan Sub Cell 10  
Baseline Location Map  
Management Area 13, 14 & 15**

- Management Area
- Policy Unit
- Policy Development Zone
- Scheduled Monument



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Key	
	100 Year Shoreline Position:
	Preferred Policy would be the same as With Present Management
	With Present Management where this differs from the Preferred Policy
	Preferred Policy where this differs from the With Present Management
	Ramsar
	SAC
	SPA
	SSSI
	NNR
	Existing Indicative EA Flood Zone 3
	EA Flood Risk Zone 2 where under the SMP policy there would be increased probability of flooding



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## SUMMARY OF PREFERRED PLAN RECOMMENDATIONS AND JUSTIFICATION

### INTENT OF THE PLAN:

The aim of the plan is to sustain both the town of Aberaeron and its essential harbour area. There has been a major scheme to improve defence to North Beach, with further studies examining the need for improved defences within the harbour. The aim of these works is to provide defence over the main area of the town for 100 years.

Notwithstanding this, the SMP has highlighted the longer term risks associated with sea level rise and flood risk to much of the town centre. The intent of the plan supports the aim to sustain defence but recognises that continued raising of defence could have detrimental impacts on the character and use of the area. As such the plan highlights the need to look at ways in which defence may be provided in a more sustainable manner, looking at resilience measures to properties and looking at using the width around the harbour to landscape in defence measures. Beyond the 100 years of the SMP, there could be further increased flood risk and this needs to be considered in the approaches now being taken to flood risk management.

For South Beach, there would be increased pressure on defences. The intent within epoch 3 is for realignment of defences along with an integrated plan for the development of the harbour area and the longer term increased flooding risk.

At Aberarth, the intent would be to maintain existing defences in the short term. Over epoch 2, there would be increasing difficulty in maintaining the line of defence over the whole area. There is a view to sustain the community through adaptive management during epoch 2 such that the main area of the village is protected into epoch 3. This would focus on management around the mouth of the Arth, with a more adaptive approach being taken between here and the natural development of the shoreline to the south. This may well result in the loss of property at the southern end of the village.

### KEY ISSUES/RISK AND UNCERTAINTY:

There are uncertainties in terms of timing of the proposed changes. There is also a need for a detailed planned response to change. It will be important to relate this to national monitoring of sea level rise and more general climate change and to monitoring of beach behaviour.

There are strong economic benefits in protecting Aberaeron, but the potential impact of defence is highlighted. At Abererch there is less clear justification for defence but management would be essential to maintain the character and integrity of the village as a whole.

### ACTIONS:

ACTION	PARTNERS
Shoreline monitoring	<b>CSC</b>
Adaption planning	<b>CSC</b>
<ul style="list-style-type: none"> <li>▪ Aberaeron South Beach</li> <li>▪ Aberarth.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Approach to defence of Aberaeron</li> </ul>
Assess in detail potential impact on historic environment	<b>Communities Harbour Users</b>
Consider potential habitat creation within the harbour.	<b>Highways</b>
	<b>CSC</b>
	<b>CCW</b>

## DELIVERY OF THE PLAN

### SUMMARY OF SPECIFIC POLICIES

Policy Unit		Policy Plan			Comment
		2025	2055	2105	
8.1	Gilfach yr Halen to Pen y Gloyn	NAI	NAI	NAI	Currently undefended, undeveloped cliffs
8.2	Aberaeron South Beach	HTL	HTL	MR	Maintain defences, consider realignment southern end of the defence in the future. Long term management of this area would be linked to long term management of Aberaeron North.
8.3	Aberaeron Harbour	HTL	HTL	HTL	Maintain and raise existing defences over the period of the SMP. Future management would need to consider the real possibility of major change in this approach. The need for such change would critically depend on the rate of sea level rise.
8.4	Aberaeron North Beach	HTL	HTL	HTL	As above
8.5	Aberaeron to Aberarth	NAI	NAI	NAI	
8.6	Aberarth	HTL	MR	MR	Maintain and amend defence around the mouth of the Arth, allow southern coast to erode back
Key: HTL - Hold the Line, A - Advance the Line, NAI – No Active Intervention MR – Managed Realignment					

PREFERRED POLICY TO IMPLEMENT PLAN:	
<b>From present day</b>	Maintain existing defences and develop strategy for defence within the harbour.
<b>Medium term</b>	Maintain defences while moving towards adaptive management at Aberaeron and implementing adaption of defence at Aberarth.
<b>Long term</b>	Allow and manage realignment of defences at South Beach, in line with longer term planning for the harbour area. Maintain realigned defence at Aberarth.



## IMPLICATIONS OF THE PLAN

### CHANGES FROM PRESENT MANAGEMENT

Management at Aberaeron South Beach would change from HTL to MR in epoch 3. The policy for realignment at Aberarth is as identified in SMP1.

### ECONOMIC SUMMARY

Economics (£k PV)	by 2025	by 2055	by 2105	Total £k PV
NAI Damages	1,325.6	966.0	18,034.7	20,326.4
Preferred Plan Damages	697.6	697.4	697.0	2,092.0
Benefits	628.0	268.6	17,337.7	18,234.3
Costs	582.9	236.6	402.5	1,222.0

### FLOOD AND EROSION RISK MANAGEMENT

#### POTENTIAL LOSS

There is likely to be loss of 7 properties, 5 at Aberaeron South Beach and 2 at Aberarth, over the long term. There is a longer term increased risk of flooding to Aberaeron.

#### BENEFITS OF THE PLAN

The plan provides a longer term sustainable approach to defence of Aberaeron and Aberarth. The plan would reduce flood risk to some 338 properties, services and the use of the harbour. (There would, however, be nearly 200 properties within the undefended 1:10 year flood risk zone under a 2m sea level rise scenario.) There are some 75 properties at risk due to erosion. The plan would aim to provide protection to all but 7 of these properties.

**SUMMARY OF STRATEGIC ENVIRONMENTAL ASSESSMENT (INCLUDING HRA)**

PDZ 8				
SEA Objective	Impact of Preferred Policy for each Epoch			
	1	2	3	Mitigation
<b>Policy Units 8.1 to 8.10</b>				
To support natural processes, maintain and enhance the integrity of internationally designated nature conservation sites. Maintain / achieve favourable condition of their interest features (habitats and species).				
To avoid adverse impacts on, conserve and where practical enhance the designated interest of nationally designated nature conservation sites. Maintain/achieve favourable condition.				
To avoid adverse impacts on, conserve and where practical enhance national and local BAP habitats.				Habitat creation
To support natural processes and maintain geological exposures throughout nationally designated geological sites.				
To conserve and enhance nationally designated landscapes in relation to risks from coastal flooding and erosion and avoid conflict with AONB and National Park Management Plan Objectives.				
To minimise coastal flood and erosion risk to scheduled and other internationally and nationally important cultural heritage assets, sites and their setting.				Excavation and recording
To minimise the impact of policies on marine operations and activities.				
To minimise coastal flood and erosion risk to critical infrastructure and maintain critical services.				
To minimise coastal flood and erosion risk to agricultural land and horticultural activities.				
To minimise coastal flood and erosion risk to people and residential property.				
To minimise coastal flood and erosion risk to key community, recreational and amenity facilities.				
To minimise coastal flood and erosion risk to industrial, commercial, economic and tourism assets and activities.				

There may be opportunity for habitat creation within the harbour and through longer term realignment.

**This table provides a summary of the SEA (appendix E) and reference should be made to the Appendix for full details of the assessment.**

These next two sections provide a headline summary of the findings of the HRA (Appendix G) and the WFA (Appendix H). Reference should be made as appropriate to these Appendices for full details.

#### HRA SUMMARY

The SMP policy in this PDZ provides a range of policies along the coastline including NAI, HTL and MR. PDZ 8 includes interest features of the Cardigan Bay/ Bae Ceredigion SAC.

- 4C7.2.1 *Cardigan Bay/ Bae Ceredigion SAC:* The various policies do not result in a constraint to the development of Cardigan Bay SAC habitats as a result of sea level rise, and as such there will be **no adverse effect on the integrity of the SAC.**

## SUMMARY CONCLUSION FROM THE WATER FRAMEWORK ASSESSMENT

The assessment below is relevant to this management area and highlights potential impacts to sections of coast.

Water body (and relevant PDZ)	Environmental Objectives met?				WFD Summary Statement required?	Achievement of Any South East RBMP Mitigation Measures?	Details on how the specific South East RBMP Mitigation Measures have been attained (dark green = achieved; light green = partly achieved & red = not achieved)
	WFD 1	WFD2	WFD3	WFD4			
<b>Cardigan Bay Central (Coastal)</b>  (PDZs 6, 7 and 8) (MAN 12,13,14,15 and 16)	N/A	✓	✗ (PDZ 8)	✓	<b>Yes</b> – Environmental Objective WFD3 may not be met because of the SMPs policy in PDZ 8 (MAN 15).	<b>There were no relevant measures to the SMP2 for this water body.</b>	N/A

Further details of this assessment are provided in Appendix K and are summarised below.

Water body (including the PUs that affect it)	WFD Summary Statement checklist	A brief description of decision making and reference to further documentation within the SMP
<b>Cardigan Bay Central (Coastal – C4)</b>  <b>PU 8.3 (WFD 3)</b>	<p><b>Mitigation measures:</b> have all practicable mitigation measures been incorporated into the preferred SMP policies that affect this water body in order to mitigate the adverse impacts on the status of the water body? If not, then list mitigation measures that could be required.</p> <p><b>Other issues:</b> Can it be shown that there are no other over-riding issues that should be considered (e.g. designated sites, recommendations of the Appropriate Assessment)?</p>	<p><b>RBMP mitigation measures incorporated into SMP policies:</b></p> <ul style="list-style-type: none"> <li>There were no mitigation measures in the Western Wales RBMP for this coastal water body.</li> </ul> <p><b>Other potential mitigation measures that could be required:</b></p> <ul style="list-style-type: none"> <li>Undertake a study to investigate the integrated spatial planning options to deal with coastal and fluvial flooding for Aberaeron town and harbour. This would be to investigate how to manage the flooding and coastal erosion risks more sustainably, so that the local hydrodynamics and sediment transport pathways are not interrupted and the mouth of the Aeron River is not constrained so that it is able to adapt to sea level rise without tidal locking and to minimise loss of the benthic invertebrates, macrophytes and ensure the successful migration of fish.</li> </ul> <p>This water body only includes two environmental designations, Cardigan Bay SAC and Aberarth – Carreg Wylan SSSI. These two designations do not extend to within the harbour, only stopping at the end of the northern breakwater. The effect of the preferred policies on Cardigan Bay SAC have been assessed within the Habitats Regulations Assessment, which concluded that there will be no adverse effect on the integrity of the site.</p>




<b>Location reference:</b>	<b>Llanrhystud Bay</b>
<b>Management Area reference:</b>	<b>M.A. 16</b>
<b>Policy Development Zone:</b>	<b>PDZ8</b>



\* Note: Predicted shoreline mapping is based on a combination of monitoring data, analysis of historical maps and geomorphological assessment with allowance for sea level rise. Due to inherent uncertainties in predicting future change, these predictions are necessarily indicative. For use beyond the purpose of the shoreline management plan, reference should be made to the baseline data.

The following descriptions are provided to assist interpretation of the map shown overleaf.




**100 year shoreline position:**

The following maps aim to summarise the anticipated position of the shoreline in 100 years under the two scenarios of “With Present Management” and under the “Draft Preferred Policy” being put forward through the Shoreline Management Plan.

-  In some areas the preferred policy does not change from that under the existing management approach. In some areas where there are hard defences this can be accurately identified. In other areas there is greater uncertainty. Even so, where the shoreline is likely to be quite clearly defined by a change such as the crest of a cliff the estimated position is shown as a single line.
- Where there is a difference between With Present Management and the Draft Preferred Policy this distinction is made in showing two different lines:

-  With Present Management.
-  Draft Preferred Policy.

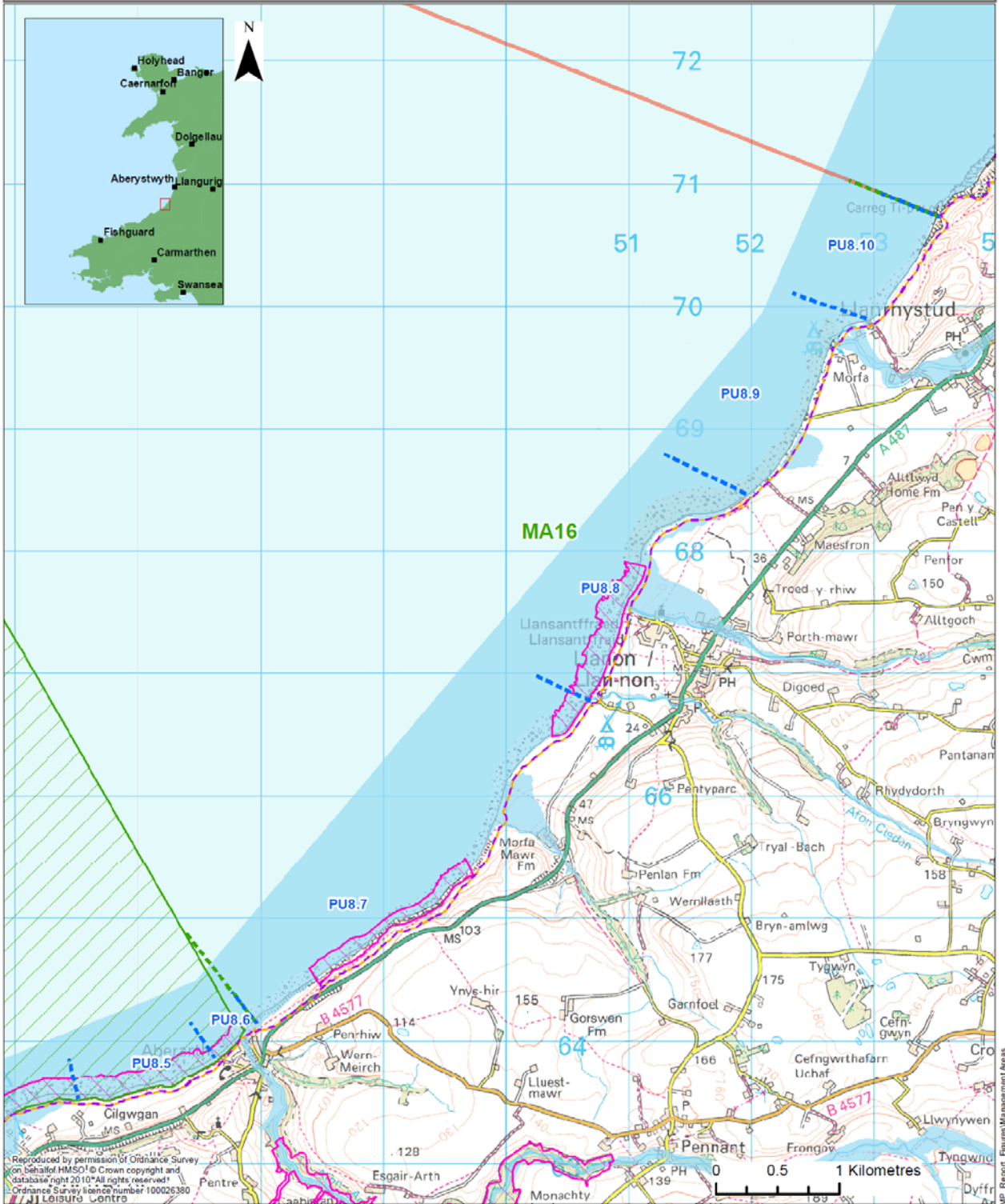
**Flood Risk Zones**


-  General Flood Risk Zones. The explanation of these zones is provided on the Environment Agency’s web site [www.environment-agency.gov.uk](http://www.environment-agency.gov.uk). The maps within this Draft SMP document show where SMP policy might influence the management of flood risk.
-  Indicate areas where the intent of the SMP draft policy is to continue to manage this risk.
-  Indicate where over the 100 years the policy would allow increased risk of flooding.

The maps should be read in conjunction with the text within the Draft SMP document.

**Shoreline Management Plan Sub Cell 10  
Baseline Location Map  
Management Area 16**

- Management Area
- Policy Unit
- Policy Development Zone
- Scheduled Monument



<p><b>Key</b></p> <p>100 Year Shoreline Position:</p> <ul style="list-style-type: none"> <li><span style="border-bottom: 1px dashed orange; width: 20px; display: inline-block;"></span> Preferred Policy would be the same as With Present Management</li> <li><span style="border-bottom: 1px solid orange; width: 20px; display: inline-block;"></span> With Present Management where this differs from the Preferred Policy</li> <li><span style="border-bottom: 1px dashed purple; width: 20px; display: inline-block;"></span> Preferred Policy where this differs from the With Present Management</li> </ul>		<ul style="list-style-type: none"> <li><span style="border: 1px solid orange; width: 15px; height: 10px; display: inline-block;"></span> Ramsar</li> <li><span style="border: 1px solid green; width: 15px; height: 10px; display: inline-block;"></span> SAC</li> <li><span style="border: 1px solid blue; width: 15px; height: 10px; display: inline-block;"></span> SPA</li> <li><span style="border: 1px solid pink; width: 15px; height: 10px; display: inline-block;"></span> SSSI</li> <li><span style="border: 1px solid green; width: 15px; height: 10px; display: inline-block;"></span> NNR</li> </ul>	<ul style="list-style-type: none"> <li><span style="background-color: lightblue; width: 15px; height: 10px; display: inline-block;"></span> Existing Indicative EA Flood Zone 3</li> <li><span style="border: 1px dotted blue; width: 15px; height: 10px; display: inline-block;"></span> EA Flood Risk Zone 2 where under the SMP policy there would be increased probability of flooding</li> </ul>	 <p><b>ROYAL HASKONING</b></p>
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I:\9T9001\Technical\_Data\GIS\Projects\SMP\_Report\Figures\Management Areas

## SUMMARY OF PREFERRED PLAN RECOMMENDATIONS AND JUSTIFICATION

### INTENT OF THE PLAN:

The intent of the plan is to allow natural development of the shoreline within this area but recognising that at present there are local private defences. The plan is therefore for managed realignment and would not preclude continued local defence measures subject to normal approvals. However, given the important ecological and geological features of the area such management must not significantly impact on the natural function of the shoreline or permanently constrain erosion such that fresh geological exposure is prevented. Areas of the shoreline and local hinterland are important for recreation and access and watersports. These are supported by that natural attraction of the shoreline and support the various tourism aspects of the area. Private defence locally supporting such activity should be undertaken in a manner sympathetic to this use and planned accordingly. There is would be a constraint on further extension of private defences or significant upgrading of existing works.

Improvement to private defences requires planning approval in addition to approval under the Coast Protection Act. This would need to take account of the potential impact on the natural coastline. It may be appropriate to look at time limited approval based on an assessment of potential impacts, with the intent to avoid future damage.

### KEY ISSUES/RISK AND UNCERTAINTY:

There are uncertainties in terms of timing of the proposed changes. There is also a need for a detailed planned response to change. It will be important to relate this to national monitoring of sea level rise and more general climate change.

### ACTIONS:

ACTION	PARTNERS
Shoreline monitoring	<b>CSC</b>
Adaption planning	<b>Landowners</b>
<ul style="list-style-type: none"> <li>▪ Llanon</li> <li>▪ Llanrhystud</li> </ul>	<b>CSC</b> <b>CCW</b>
Assess in detail potential impact on historic environment	
Plan adaptation of coastal path	<b>CSC</b>
Examine opportunities for habitat creation	<b>CSC</b> <b>CCW</b>

## DELIVERY OF THE PLAN

### SUMMARY OF SPECIFIC POLICIES

Policy Unit		Policy Plan			Comment
		2025	2055	2105	
8.7	North Aberarth to Morfa Mawr	NAI	NAI	NAI	undefended, undeveloped cliffs allow cliff retreat with the potential need to realigning the road
8.8	Llanon and Llansantffraed	MR	MR	MR	This would not preclude time limited private defence as part of managing retreat of the shoreline, subject to normal approvals.
8.9	Llanrhystud Bay	MR	MR	MR	This would not preclude time limited private defence as part of managing retreat of the shoreline, subject to normal approvals.
8.10	Llanrhystud bay to Carreg Ti Pw	NAI	NAI	NAI	
Key: HTL - Hold the Line, A - Advance the Line, NAI – No Active Intervention MR – Managed Realignment					

PREFERRED POLICY TO IMPLEMENT PLAN:	
<b>From present day</b>	Adaptation of private defences and management.
<b>Medium term</b>	Maintain defences while moving towards adaptive management
<b>Long term</b>	Implement community based adaptation.

## IMPLICATIONS OF THE PLAN

### CHANGES FROM PRESENT MANAGEMENT

No substantial change in approach.

### ECONOMIC SUMMARY

<b>Economics (£k PV)</b>	<b>by 2025</b>	<b>by 2055</b>	<b>by 2105</b>	<b>Total £k PV</b>
NAI Damages	0.0	0.0	10.0	10.0
Preferred Plan Damages	0.0	0.0	10.0	10.0
Benefits	0.0	0.0	0.0	0.0
Costs	0.0	0.0	0.0	0.0

### FLOOD AND EROSION RISK MANAGEMENT

#### POTENTIAL LOSS

There could be the loss of two properties along the frontage during epoch 3.

#### BENEFITS OF THE PLAN

The plan maintains the natural development of the shoreline.



**SUMMARY OF STRATEGIC ENVIRONMENTAL ASSESSMENT (INCLUDING HRA)**

PDZ 8				
SEA Objective	Impact of Preferred Policy for each Epoch			
	1	2	3	Mitigation
<b>Policy Units 8.1 to 8.10</b>				
To support natural processes, maintain and enhance the integrity of internationally designated nature conservation sites. Maintain / achieve favourable condition of their interest features (habitats and species).				
To avoid adverse impacts on, conserve and where practical enhance the designated interest of nationally designated nature conservation sites. Maintain/achieve favourable condition.				
To avoid adverse impacts on, conserve and where practical enhance national and local BAP habitats.				Habitat creation
To support natural processes and maintain geological exposures throughout nationally designated geological sites.				
To conserve and enhance nationally designated landscapes in relation to risks from coastal flooding and erosion and avoid conflict with AONB and National Park Management Plan Objectives.				
To minimise coastal flood and erosion risk to scheduled and other internationally and nationally important cultural heritage assets, sites and their setting.				Excavation and recording
To minimise the impact of policies on marine operations and activities.				
To minimise coastal flood and erosion risk to critical infrastructure and maintain critical services.				
To minimise coastal flood and erosion risk to agricultural land and horticultural activities.				
To minimise coastal flood and erosion risk to people and residential property.				
To minimise coastal flood and erosion risk to key community, recreational and amenity facilities.				
To minimise coastal flood and erosion risk to industrial, commercial, economic and tourism assets and activities.				

NAI policies and MR provide potential opportunity to support adaptation of habitats and habitat creation

**. This table provides a summary of the SEA (appendix E) and reference should be made to the Appendix for full details of the assessment.**

**These next two sections provide a headline summary of the findings of the HRA (Appendix G) and the WFA (Appendix H). Reference should be made as appropriate to these Appendices for full details.**

#### **HRA SUMMARY**

The SMP policy in this PDZ provides a range of policies along the coastline including NAI, HTL and MR. PDZ 8 includes interest features of the Cardigan Bay/ Bae Ceredigion SAC.

**4C7.2.2** *Cardigan Bay/ Bae Ceredigion SAC:* The various policies do not result in a constraint to the development of Cardigan Bay SAC habitats as a result of sea level rise, and as such there will be **no adverse effect on the integrity of the SAC.**

## SUMMARY CONCLUSION FROM THE WATER FRAMEWORK ASSESSMENT

The assessment below is relevant to this general area but highlights potential impacts to sections of coast outside this management area.

Water body (and relevant PDZ)	Environmental Objectives met?				WFD Summary Statement required?	Achievement of Any South East RBMP Mitigation Measures?	Details on how the specific South East RBMP Mitigation Measures have been attained (dark green = achieved; light green = partly achieved & red = not achieved)
	WFD 1	WFD2	WFD3	WFD4			
<b>Cardigan Bay Central (Coastal)</b>  (PDZs 6, 7 and 8) (MAN 12,13,14,15 and 16)	N/A	✓	✗ (PDZ 8)	✓	<b>Yes</b> – Environmental Objective WFD3 may not be met because of the SMPs policy in PDZ 8 (MAN 15).	<b>There were no relevant measures to the SMP2 for this water body.</b>	N/A