

**PDZ 18. NORTH ANGLESEY :**



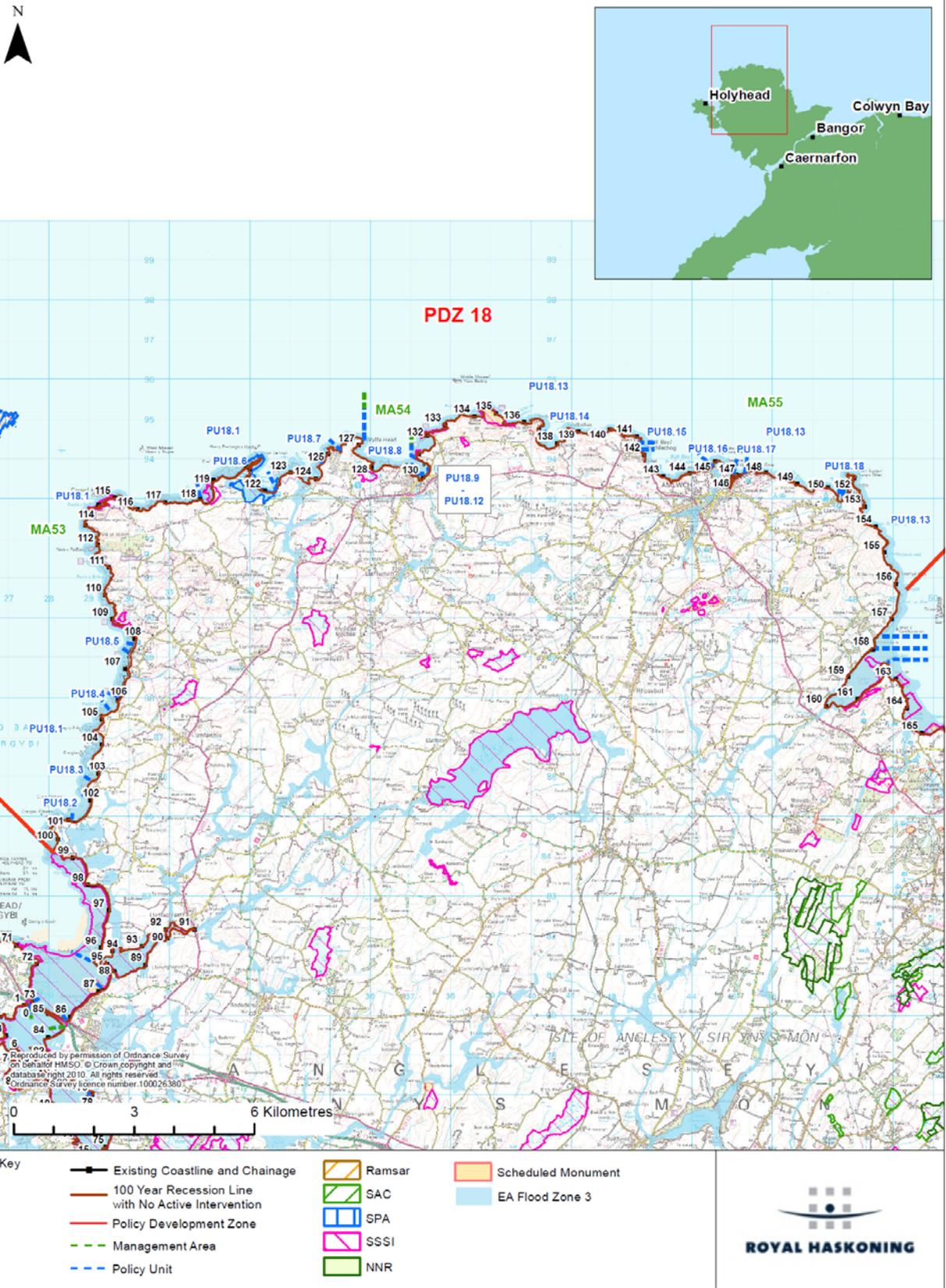
*Porth - Llechog/ Bull Bay*

**Twyn Cliperau to Trwyn Cwmrwd**

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Shoreline Management Plan Sub Cell 10  
 Baseline Location Map  
 Policy Development Zone 18 - North Anglesey



## 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 (Modelling Decision Support Framework) 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.

## Local Description

The Zone covers the northwest, northern and northeastern coast of Ynys Mon, extending from the headland of Twyn Cliperau in the west to Trwyn Cwmrwd on the northern side of Dulas Bay in the east; a length of nearly 60km. The frontage generally comprises rocky cliffs interrupted by local bays with curving sand or shingly bays. The general level of the land rises from the relatively low lying western shoreline through to the higher cliffs in the north and east.

To the western extent of the zone, the coast is west facing and still sheltered to some extent by Holy Island from the predominant south westerly waves. Between the headland at Twyn Cliperau and Porth Swtan the coast is characterised by a series of bays with sandy beaches and numerous rock outcrops. The land adjacent to the coast is mainly agricultural with sporadic distribution of individual properties and some small hamlets. Much of this section of the coast, running round to the north facing section, is under the stewardship of the National Trust and the area is also designated as one of Ynys Mons Areas of Outstanding Natural Beauty, and as Heritage Coast. There is also within this northern section the SPA designated feature of the Cemlyn Bay lagoon, with the designated area extending to include the Trwyn Cemlyn Headland. To the east of Cemlyn Bay is the Wylfa Power station, with Cestyll, designated as a Historic Park and Garden, between the power station and Cemlyn Bay. Access to the coast is via a network of small roads, tending to run through to the coast rather than along the coastline.

Further east, along the northern section, there are the larger villages of Cemaes and Porthllechog/ Bull Bay, both within local bays, and the larger town of Amlwch, with the old chemical works on the headland and the port developed within a narrow rocky cove. Beyond this is the small village of Llanelian. Other features of this section are the Prehistoric Dinas Gynfor Hill Fort and much more modern Porth Wen Brickworks, extending down to the shoreline, both designated SAMs. There are three short sections of the coast owned by the National Trust and, with the exception of the area from the Wylfa Power Station through to Cemaes, the coast is again designated as an Area of Outstanding Natural Beauty and as Heritage Coast. Both these designations extend around Trwyn Eilian south to Trwyn Cwmrwd and the eastern end of this policy development zone. The main A5025 runs around this north eastern section of Ynys Mon and runs close to the coast at both Porthllechog and at Cemaes.

The whole area is important for tourism, combining the industrial heritage of the Amlwch area and the natural attraction and relative remoteness of much of the rest of the area. The settlements are very much individual entities supporting tourism in the area but also being important traditional communities in their own right.

In terms of the general coastal processes and flood risk, this again is seen as being quite local, specific to individual areas. In this way and reflecting the broader character of the area, the zone can be seen very much at two levels. At the higher level is that important natural unspoilt nature of the coast but, residing within this, being local important features requiring more detailed examination.

For this reason, the format of the SMP document changes slightly; first discussing the general coast, before focussing down to appropriate level of detail for each local area. The normal overall format is adopted, however, so that for each local area a description is given, the baseline scenarios are considered and assessed. This is summarised location by location, with summary tables providing an initial comparison of these two

baseline approaches to management. The plan and SMP policy is then discussed and developed.

In undertaking the comparison of the two baseline scenarios, the initial table compares the economic damages that might arise under the alternative scenarios and the second table 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; the aim being 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.

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. 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.

Having discussed individual areas in this manner and having developed the SMP policy, the conclusions for the whole area are pulled together at the end of the process.

## 2

### Coastal Processes

The principal processes significant to the SMP process work at the local scale. The western section of the coast is exposed to the dominant southwesterly wave direction, with the northern section affected far more by waves approaching from the northwest. The eastern section is more sheltered from the main wave directions but is vulnerable to waves diffracting around the north east headland of Ynys Mon and to direct attack from waves approaching from the north east.

Where there has been erosion of the hard rock cliffs, this has created local bays, within which sediment tends to be trapped. On the western side of the area the bays tend to face out to the dominant wave direction. The softer clay cliffs within these bays are eroding back. Over the northern coast the various bays tend to be more deeply indented from the general line cliff line, with relatively small pocket beaches set at the shore line within larger bays, between major headlands extending out to deeper water. Along the eastern section there are no significant bays and there is a very narrow rocky intertidal area below steep cliffs.

#### 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. Further detail on erosion rates together with erosion maps are provided in Appendix C. 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)             |
|---------------------------------|----------------------|---|--------------------------------------|
| Porth Tywyn-mawr to Porth Swtan | 0.05 – 0.2           | Low erosion of the hard rock outcrops with general erosion and roll back of shingle beaches within the bays. Sensitive to sea level rise. | 5 – 20<br>Increasing locally 20 - 70 |
| Trwyn y Gader                   | 0.05                 | Hard rock cliff line  | 10                                   |
| Cemlyn                          | 0.05 – 0.1           | Roll back of shingle ridge, sensitive to SLR  | 20 - 45                              |
| Cemaes                          | 0.2                  | Defended frontage   | 20 - 70                              |
| Porthllechog                    | 0.05                 | General roll back of storm beach, sensitive to SLR  | 20 - 35                              |
| Amlwch                          | 0.05                 | Generally hard rock   | 10 - 15                              |
| Llaneilian                      | 0.05                 | Local erosion with bays   | 2 - 20                               |

While within local bays, sea level rise (SLR) will be a significant factor in future development of the shoreline, over much of the zone the very slow erosion of the main hard cliffs would be affected little. Where there are softer cliffs or shorelines, suffering erosion, the rate of erosion is likely to increase with SLR. This might be by a factor of 1.7 to 2.5 times the existing base erosion rate, over the 100 years. Where there are more stable features, such as fully developed storm beaches there would be a natural roll back of the beach, potentially in the order of 10m to 40m, depending of the nature of beach and the coast behind. As beaches, protecting at present relatively stable coastal slopes, erode or roll back this could result in re-activating landslides and slope instability.

#### FLOODING

Flooding over the area is very local in nature. The most extensive area of flood risk is to Cemlyn Bay. There are areas of Cemaes and Porthllechog, where overtopping due to

wave action is an important issue. These specific issues are discussed area by area in the local assessment.

**EXISTING DEFENCES**

Defences are at a local level with only in total, some 2 km of defence over the whole 60 km of coast. These are identified at the local level.

**UNCONSTRAINED SCENARIO**

The general unconstrained behaviour of the coast is for very slow erosion of the hard rock geology.

**KEY INTERACTION WITH DEFENCES**

This is considered within each local area.

**3 Management scenarios**

Over the general coast there are few defences and as such the two baseline scenarios are the same. The main impact at the broader level would be on the historic environment and on agricultural use of the land. Given the slow rate of erosion generally, and the significant cost, and the severe impact attempting to defend the coast would have a on the important naturalness of the coast, anything other than a policy of No Active Intervention would neither be justified nor acceptable. At the more local scale, the NAI intervention policy could have a significant impact of the local communities and specific features and this is considered further in the local assessments. This general policy decision is reflected in the policy developed during SMP1.

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

| SMP 1           |                                 |        | Subsequent Management Approach |
|-----------------|---------------------------------|--------|--------------------------------|
| No.             | Management Unit                 | Policy |                                |
| <b>Anglesey</b> |                                 |        |                                |
| 2.17            | Cregiau Cliperau to Carmel head | DN     |                                |
| 2.17a           | Porth Twywn-mawr                | DN/HTL |                                |
| 2.17b           | Porth Trefadog                  | HTL    |                                |
| 2.17c           | Porth Trywn                     | DN     |                                |
| 2.17d           | Porth Swtan                     | DN/MR  |                                |
| 2.18            | The Skerries                    | DN     |                                |
| 3.1             | Carmel Head to Point Lynas      | DN     |                                |
| 3.1a            | Cemlyn Bay                      | DN/MR  |                                |
| 3.1b            | Wylfa Power Station             | DN     |                                |
| 3.1c            | Cemaes Bay                      | DN/HTL |                                |
| 3.1d            | Bull Bay village                | DN/HTL |                                |
| 3.1e            | Amlwch Port                     | DN/HTL |                                |
| 3.1f            | Porth Eilian                    | HTL    |                                |
| 4.1             | Point Lynas to Portobello       | DN     |                                |

The North West Wales Catchment Flood Management Draft Plan does not go into great detail for this area. The area is covered by one policy unit covering the whole of Anglesey and the policy assessment is summarised below.

|                                   |  |
|-----------------------------------|--|
| <b>Policy unit 1<br/>Anglesey</b> | This unit covers Anglesey including all the river catchments draining the island. Mostly rural catchment consisting of the Anglesey AONB and the towns of Llangefni Holyhead and Amlwch. |
|-----------------------------------|--|

|                        |  |
|------------------------|--|
| <b>Problem/risk:</b>   | <p><b>Physical characteristics:</b></p> <p>People, property and infrastructure in a number of small towns and villages.</p> <p>There are several scattered small villages and settlements situated upon gently undulating and low-lying land. Apart from the far south east corner where, slightly steeper land can be found.</p> <p>Predominantly moderate quality grade 3-4 agricultural land.</p> <p>The northern part of the island consists mainly of poorly draining seasonally waterlogged soils.</p> <p>The entire policy unit is an Environmentally Sensitive Area with much of the coastline designated an Area of Outstanding Natural Beauty.</p>   |
|                        | <p><b>Flood mechanism:</b></p> <p>Sewer flooding.<br/>Surface water flooding.</p> <p>Small localised river flooding as the river channel quickly fill and spill out over the banks. This usually occurs after long periods of rainfall and occurs in Llangefni and several small villages (e.g. Amlwch, Menai Bridge, Beaumaris etc.). The flood depths in this policy unit are shallow and the flood extents in the rural areas can be relatively wide owing to the wide floodplains.</p>   |
|                        | <p><b>Future flood risk summary (in 100 years time)</b></p>  |
|                        | <p>Climate change is unlikely to have a significant affect on the number of people and properties at risk of flooding in Anglesey. This is likely to be the case across most of the villages and settlements in Anglesey with only small increases in flood risk due to climate change.</p> <p>More people may be affected by increased surface water and sewer flooding. Wetter winters with more frequent and more severe storm events are expected to increase flow volumes.</p> <p>The broad scale modelling showed sea-level rise has very little effect on the flood risk in the policy unit.</p>  |
|                        | <p><b>Policy 3</b> - Continue with existing or alternative actions to manage flood risk at the current level.</p>  |
| <b>Policy selected</b> | <p>The current flood risk in this policy unit is from a combination of surface water flooding and localised river flooding. Sewer flooding also presents a flood risk. 1% of the population in the policy unit is at risk from a 1% AEP flood event. The number of people at risk only increases by 0.2% in the future as a result of climate change. The flood risk is considered tolerable and therefore a policy 5 is not justified.</p> <p>There are a number of villages and small settlements where current flood risk management actions are carried out (e.g. Llangefni, Amlwch, Beaumaris, Llanfairpwll etc.). Policy 3 is the obvious policy choice for this policy unit. This will support the existing flood risk management activities, maintaining a relatively low flood risk across the whole island. Policy 3 will allow alternative flood risk management activities to be explored to maintain the current level of flood risk. There is likely to be an increase in the number of flood events as a result of climate change. However this flooding is unlikely to significantly increase the risk to people or disrupt community life considerably. We will continue to maintain the river channels and local flood defences to sustain the same level of flood risk across the all the locations at risk. There may be opportunities in some places to work with land owners and the local authorities to provide alternative and more sustainable options, such as increasing the area of woodland to reduce run-off and therefore maintain the same level of flood risk. However, increasing the frequency of flooding to reduce flood risk over the whole policy unit, i.e.</p> |

|   |  |
|---|--|
|   | <p>selecting policy 6, is unlikely to meet the objectives of ensuring the harm to life caused by flooding does not increase across the whole of Anglesey. Therefore policy 6 is not the most appreciate policy choice.</p> <p>Although climate change does increase flood damages slightly in the future the number of people at risk only increases by 1.2%. Therefore, a policy 4 is not required.</p> <p>Stopping or reducing the existing flood risk management actions would allow existing flood defences to fall into a state of disrepair and would increase the number of people and property in the policy unit at a greater risk of flooding. There are likely to be more than 1,200 people at risk if the current flood risk management actions were discontinued or reduced. This does not meet the policy unit objectives and therefore policies 1 and 2 are unsuitable</p>  |
| <p><b>Justification and alternative policies considered</b></p> | <p>Opportunities:</p> <ul style="list-style-type: none"> <li>- Ensure no increase in run-off from the new developments proposed in the Wales Spatial Plan through development control.</li> <li>- Reduce future flood risk by influencing and informing the planning process.</li> <li>- Help meet national biodiversity action plan (BAP) targets through flood risk management activities.</li> <li>- To improve water level management, meeting the needs of flood risk management as well as enhancing wetland habitats through development of Water Level Management Plans (WLMPs).</li> <li>- To reduce flood risk and improve water quality by promoting and encouraging the appropriate use of SuDS in the proposed urban developments in the Wales Spatial Plan.</li> <li>- To improve the sustainability of flood risk management along the coastline and estuaries through influencing the second generation of Shoreline Management Plans.</li> <li>- Reduce flood risk throughout the CFMP area through initiatives and actions that will enhance the character of the landscape and increase amenity opportunities for recreation, tourism and leisure activities within the National Park and Areas of Outstanding Natural Beauty.</li> <li>- Reduce run-off from upper catchments through working with the Forestry Commission Wales and their Better Woodlands for Wales project.</li> <li>- Reduce peak discharge rates in rivers through restoration of watercourses to a good geomorphological river status (i.e. naturally functioning watercourse) in accordance with the Water Framework Directive.</li> <li>- Reduce flood risk through improved flood warning and emergency response.</li> </ul> <p>Constraints:</p> <ul style="list-style-type: none"> <li>- Government and international legislation, environmental management policies, plans and strategies for the catchment should be complied with, such as accommodating new housing within the catchment as detailed in the Wales Spatial Plan and compliance with the Habitats Regulations.</li> <li>- Some environmentally designated habitats are susceptible to changes in flood frequency, flood water chemistry, groundwater levels and drainage system maintenance.</li> <li>- Visual impact of flood risk management activities within the, AONBs and ESAs.</li> <li>- Presence of protected species with specific water level, water quality and habitat requirements, such as great-crested newt and reed bunting</li> </ul> |

- Large number of river catchments operating individually.
- Historic development and some heritage designation present permanent physical obstructions in floodplains.
- No degradation of existing fish passage and habitats.
- Some exposed and subsurface archaeological sites in the floodplain are susceptible to changes in water level, flood frequency and water chemistry.
- Tourism, leisure and recreation amenities are vital to the economy of the area.

In general terms the policy derived by the CFMP is similar in nature to the more local assessment provided by SMP 1, in that it is for continued local management of specific areas at risk. From the CFMP perspective, there is no significant increase in risk as a result of climate change. However, the CFMP specifically does not consider the direct increase in risk due to sea level rise, this being deferred to the SMP2.

The overarching conclusion of the SMP2 review of policy is for No Active Intervention. Even where, in the following local assessment, this overarching policy is modified, the overall intent for the area is to minimise intervention. The overarching plan is to steer management in such a manner that the important landscape and natural qualities of the whole area are maintained.

## The Western Bays

### LOCAL DESCRIPTION

This frontage comprises a series of relatively small bays formed between substantial rock outcrops and headlands. The southern section of the frontage tends to be lower lying with bays backed by sand and shingle ridges. To the northern end, the general land level rises, with bays backed by more resilient cliffs.

The first of the bays is Porth Tywyn-mawr and is the largest, with a long sweeping shingle beach and flatter sandy foreshore. The beach is a significant asset for the caravan park and campsite on the headland.

Porth Trefadog is substantially enclosed by the rock outcrops to north and south, narrowing the main entrance to the bay. There is a small caravan park and cottage to the south and farm buildings more to the north. The main farm house is a listed building. The site of the promontory fort to the south is a SAM. A small stream cuts through to the shore between the caravan park and the farm. The main access road runs to the north of the farm and provides access to property to the northern end of the bay.

The next significant bay is Porth Trwyn, although there is a less well defined bay just to the south of here.

This slightly embayed section of the coast is owned by the National Trust, with a minor track and local parking places set at the back of a rocky beach area.

At Porth Trwyn there are several properties above the beach. The land behind the beach rises slightly and, although there is a substantial shingle upper beach, the main backshore is an eroding cliff, which rises in height to the north. The final bay of note is Porth Swtan where there is a track down to the beach from the properties on the cliffs above, at the southern end. The whole bay is backed by these high rock cliffs and locally where the cliffs have eroded sufficient to create width, there is an upper shingle beach. The lower foreshore is a wide expanse of sand.

Beyond Porth Swtan the topography rises into the high cliffs that dominate this Zone.

### EXISTING DEFENCES

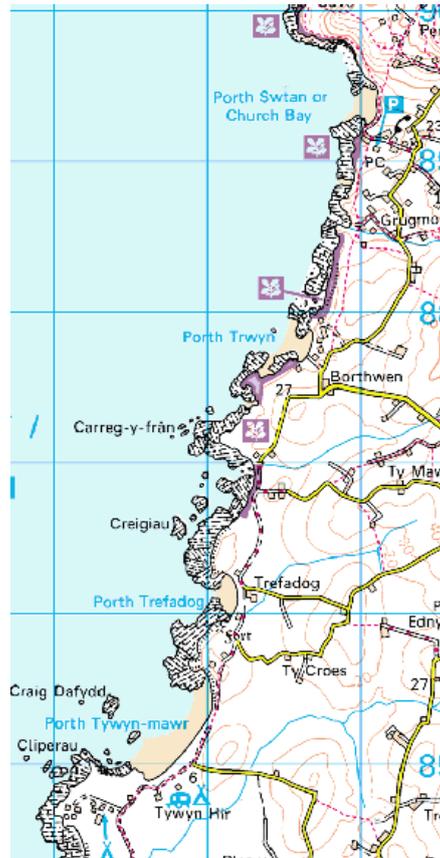
There are only local defences at Porth Trefadog to the caravan park at the southern end and local to the access path at Porth Swtan. The natural beach acts as a flood defence to sections of both Porth Tywyn mawr and at Porth Trefadog.

### UNCONSTRAINED SCENARIO

The coast would slowly erode and the bays would attempt to roll back with increasing sea levels.

### COASTAL PROCESSES

The frontage is exposed to the main south westerly offshore wave climate although gaining some protection from Holy Island. This protection means that the net wave energy at the shoreline is from the northwest backing slightly more to the west at the northern end. Locally,



each bay gains protection from its headlands. As such, each bay has developed in well defined curves, with local influence of rock outcrops. The depth, or degree to which the bays are indented from the general coastal alignment, is limited by the energy able to enter the bay and by the relative hardness of the back shore. The southern bays have little resistance to erosion of the backshore and as such have developed fully. The northern bays are more constrained by the harder backshore and the development of an upper beach is more limited. This geomorphological nature of the bays is important with respect to sea level rise. With increasing water levels, the rock outcrops would be more submerged and this will allow more energy to enter the bays. In the case of the southern bays, this will mean that the bays will attempt to roll back. In the case, particularly, of Porth Swtan, there is less ability of the bay to deepen and there is likely to be loss of the upper beach area.

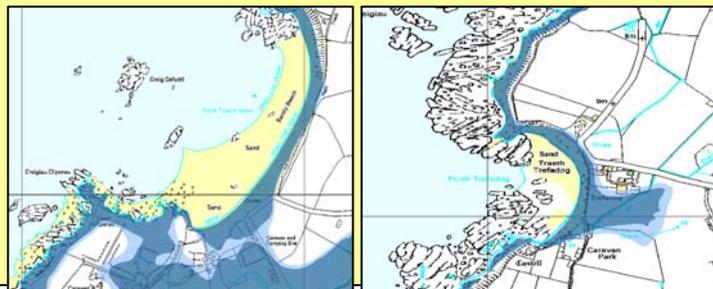
Overall, there would appear to be very limited movement of sediment between bays and the shape of the bays would suggest that there is little significant longshore movement of material.

#### FLOODING

At present there is limit direct flood risk in any of the bays. The southern bays are clearly most vulnerable, with the potential for some overtopping of shingle back beach. With 1m sea level rise the caravan park and property at the southern end of the Porth Tywyn-mawr is at risk on events greater than a 1:10 year return period.

#### Sea Level Rise

Under a 2m sea level rise scenario there is a step change in areas potentially affected by direct flooding at Porth Tywyn-mawr and at Porth Trefadog. This is shown in the following plots, indicating the potential extent of MHWs and 200 year surge levels with 2m sea level rise.



#### MANAGEMENT SCENARIOS

##### No ACTIVE INTERVENTION – BASELINE SCENARIO 1.

With the limited local defences within the area, the coast will tend to erode and roll back with sea level rise. It is only in epoch 3 that there is likely to be loss of properties, but this would critically depend on the affect of sea level rise. There is likely to be some loss of caravan pitches to the southern end of Porth Tywyn-mawr, potentially in epoch 2 and the local access roads may be affected over the same times scale.

##### WITH PRESENT MANAGEMENT – BASELINE SCENARIO 2.

SMP1 recognised the local nature of issues along the frontage, taking a similar approach to that being discussed in this document. The local policies looked to holding the line along lengths of Porth Tywyn-mawr and Trefadog, with the potential for managed realignment at Porth Swtan. Critical to this was the 50 year horizon, considered under SMP1.

Taking a longer term perspective, the broader issues for management really occur towards the end of that period and in the subsequent years. Attempting to Hold the Line as the coast moves back will result in significant interference in the overall integrity of the naturally

functioning beach. This would have two potentially significant consequences. First, where defences are put in place they are likely to result in a loss of beach in front of the defence. Second, as adjacent sections of the coast continue to retreat, to maintain defence to assets behind the initial defence, there would be a need to continue defence over a broader area. The longer term consequence of following such a sequence of management would be that the shoreline would become increasingly hardened and, quite apart from the increasing cost and effort required, there would be significant impact on the natural landscape. This would affect the amenity value, with consequence on tourism, and the integral natural landscape.

There is very low economic value in providing defence and it would run counter to the overarching objective in minimising the impact of defence on the area.

#### **DISCUSSION AND DETAILED POLICY DEVELOPMENT**

The issues and difference between the two based scenarios are at a very local level. However, under the With Present Management approach the impact and commitment to defence increases substantially over time. This is not considered sustainable and fails to deliver against the important objectives in terms of maintaining the natural character of the area. Even where defence is undertaken over the short to medium term, there would come a point at which the cost and pressure on the defence would increase such that no further investment would be sensible.

As such, the long term plan intent for the area has to be for No Active Intervention. In implementing this, it is recognised that there are different factors at play for each of the specific bays.

At Porth Tywyn-mawr, the risk comes initially from erosion or roll back of the natural shoreline, but with sea level rise this risk increases and there is a risk of flooding over the southern section of the bay. This longer term flood risk might be managed locally but it is unlikely to attract grant aid. Management of risk of erosion is better achieved through planned relocation and lay out of the caravan park over time. The policy for this frontage is therefore NAI.

At Porth Trefadog there are present protection works to the southern end, there is also risk issues in relation to the minor road to the north. Continuing and reinforcing defences would have a serious impact on the behaviour of the backshore and could increase the rate of retreat in the centre of the bay. There is also the risk of flooding in the centre of the bay. The long term intent is for NAI. However, given that there will be the need for this to be managed in terms of use of the area and initial policy is for managed realignment.

At Port Trwyn, there appears to be little risk in the short to medium term, the policy for this frontage would be for NAI over all epochs.

At Porth Swtan, the risk is from the slow erosion of the backshore cliffs. There has been little monitoring of this and there is significant uncertainty as to future erosion rates. However, any defence would not be seen as being sustainable, risking damage to the natural beach area. The policy here is for NAI over all epochs. There would be a need to further examine options for managing access to the beach.

In all these areas the policy aims to maintain the natural function of the shoreline, local action providing improved flood defence would not be precluded by this policy where defence did not impact on this natural function. This would be subject to normal permissions.

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

##### ASSESSMENT OF EROSION DAMAGES

| Epoch   | 0 -20 year         |      | 20 – 50 years |                    |      | 50 – 100 years |                    | 50 – 100 years<br>(2m SLR) |               |                   |      |            |
|---|--------------------|------|---------------|--------------------|------|----------------|--------------------|----------------------------|---------------|-------------------|------|------------|
| Location  | No. of properties: |      | Value<br>x £k | No. of properties: |      | Value<br>x £k  | No. of properties: |                            | Value<br>x £k | No. of properties |      | PV Damages |
| Western Bays  | Res.               | Com. |               | Res.               | Com. |                | Res.               | Com.                       |               | Res.              | Com. |            |
| <b>NAI</b>  | 0                  | 0    | 0             | 0                  | 0    | 0              | 3                  | 0                          | 740           | 8                 | 1    | 129        |
| <b>WPM</b>  | 0                  | 0    | 0             | 0                  | 0    | 0              | 3                  | 0                          | 740           | 7                 | 1    | 129        |
| Notes: PVD determined for 1m SLR in 100 yrs.  |                    |      |               |                    |      |                |                    |                            |               |                   |      |            |
| Other information: This assessment does not identify potential erosion lost to caravan sites. |                    |      |               |                    |      |                |                    |                            |               |                   |      |            |

**ASSESSMENT OF POTENTIAL FLOOD RISK**

| <i>Location</i>     | Flood risk tidal 2010 |       |             | Flood risk tidal 2060 |       |             | Flood risk tidal 2110 |       |             | tidal risk 2m SLR |       | PVD<br>(£x1000) |
|---------------------|-----------------------|-------|-------------|-----------------------|-------|-------------|-----------------------|-------|-------------|-------------------|-------|-----------------|
| <i>Western Bays</i> | No. of properties     |       | AAD<br>x £k | No. of properties     |       | AAD<br>x £k | No. of properties     |       | AAD<br>x £k | No. of properties |       |                 |
|                     | <1:10                 | >1:10 |             | <1:10                 | >1:10 |             | <1:10                 | >1:10 |             | <1:10             | >1:10 |                 |
| <b>NAI</b>          | 0                     | 0     | 0           | 0                     | 0     | 0           | 0                     | 1     | 3           | 0                 | 1     | 10              |
| <b>WPM</b>          | 0                     | 0     | 0           | 0                     | 0     | 0           | 0                     | 1     | 3           | 0                 | 1     | 10              |

**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.

| Objectives  | NAI |        |       | WPM |        |       |
|---|-----|--------|-------|-----|--------|-------|
|   | Red | Orange | Green | Red | Orange | Green |
| Reduce risk to life.  |     | Orange |       |     |        | Green |
| Protect properties from flood and erosion loss.                             | Red |        |       | Red |        |       |
| Minimise the need for increasing effort and management of coastal defences. |     |        | Green | Red |        |       |
| Maintain access to local centres, villages and isolated properties          |     | Orange |       |     | Orange |       |
| Maintain recreational use of beaches and bays                               |     |        | Green |     |        | Green |
| Maintain access to the coast including car parking and facilities.          | Red |        |       | Red |        |       |
| Maintain character and integrity of coastal communities.                    |     | Orange |       |     | Orange |       |
| Maintain agricultural value of rural community                              | Red |        |       | Red |        |       |
| Identify risk and reduce risk of loss of heritage features where possible.  |     |        | Green |     |        | Green |
| Maintain historic landscape.  |     |        | Green |     |        | Green |
| Prevent disturbance or deterioration to historic sites and their setting.   | Red |        |       | Red |        |       |
| Avoid damage to and enhance the natural landscape                           |     |        | Green | Red |        |       |
| Maintain the human landscape and character of communities.                  | Red |        |       | Red |        |       |

## Cemlyn Bay and Headland

### LOCAL DESCRIPTION



Cemlyn Bay is backed by a large shingle bank in the lee of the hard rock headland of Trwyn Cemlyn. The headland is a continuation of the hard rock cliff line to the west. Behind the shingle ridge is a broad brackish lagoon extending within a narrower valley to the west. The lagoon and headland are designated an SSSI, SPA and SAC. The main lagoon is partially divided by a ridge of high ground running down to the back of the lagoon from the farm at Plas Cemlyn. This farmstead is a collection of grade II listed buildings.

There is access to a small car park at the eastern end and to the western end of the bay is the main inlet to the lagoon, with weir, maintaining the level of water within the lagoon. There are properties at the western end, together with a further car park, and access to the car park and properties runs to the back of the lagoon, across a causeway over the narrow valley to the higher ground of the headland. There is a sluice at the causeway, which controls water levels within the upper valley.

This valley extends to the west almost to the western shoreline where there is a narrow shingle sand beach closing off the head of the valley. There is a spur valley running southwest from the main western part of the lagoon. This valley extends through to Hen Borth, where there is a narrow shingle sand ridge at the shoreline. These valleys extending west from the lagoon effectively create the headland as two islands. On the southern side of these two areas of raised ground is the farm of Tyn Llan and to the south of here is Church of St Rhwydrys, this is a grade I listed building. The whole western coastal strip, running through to and including the headland is in the ownership of the National Trust.

The overall land use is for agriculture and this together with the international designations, the heritage and the landscape and the unique area for visitors provides the main values and character of this section of the coast.

### EXISTING DEFENCES

The main defence management is in terms of the control of water levels at the weir and at the sluice. This is made possible by the natural defence at the shoreline through the main shingle barrier and the natural backshore defence on the open western coast and at Hen Borth. There is in addition a short length of defence at the eastern end at the car park and a more extensive defence around the slight ridge of land behind the weir at the northern end. This provides flood defence to the properties and car park in this area.

### UNCONSTRAINED SCENARIO

The open western shoreline will erode slowly and as the shoreline moves back, it is probable that the natural backshore shingle ridges will be maintained naturally. With sea level rise, there is the possibility of increased over topping of these ridges with the potential to open new tidal inlets through to the back of the main lagoon. If defences within the main area of the bay were suddenly removed the lagoon would develop in an entirely natural manner. It would attempt to roll back and there is the distinct possibility that the ridge would breach just north of the central section creating a new inlet that would replace the present inlet to the north. There is the potential for the lagoon to become more tidally influenced. The ridge at



## Sea Level Rise

Under a 2m sea level rise scenario there is a significant increase in area potentially affected by normal tidal flooding, including risk to various farms around the back of the lagoon and to the access roads.

### MANAGEMENT SCENARIOS

#### No ACTIVE INTERVENTION – BASELINE SCENARIO 1.

In terms of the shoreline there is little present management. Only at the eastern end of the main bay is there any defence. This would fall into disrepair and there would be roll back of the shingle ridge in this area. Apart from here, the behaviour of the coast would be as described earlier under the unconstrained scenario. Inland, the flood defence and management of flood defence would fall into disrepair and the natural flood area would be fully developed.

The impacts, under this scenario, would be to put the properties at the northern end under increased flood risk, with the probability that properties in the area of the car park would be unusable within epoch 2. There is a slight possibility that the main valley to the west would be open to full tidal inundation although it seems more likely that the natural shoreline ridge would be maintained. The tidal inundation from the main bay would probably mean that by the end of epoch 2 the causeway way would be tidal. The most significant implications under this scenario would be the changes to the designated features of the area. The main lagoon is likely to become more saline with a natural unconstrained inlet, probably in the area of the small island. The residual section of the shingle bank would then move back and infill the existing channel area with a shingle beach being formed in this area.

The change in habitat is likely to be quite significant but, from available information, it is not possible to predict the impact on the features within the designated areas, either in terms of extent of habitat change or impact on the designated species. It would change the quality of the water body, but would allow the water body to function in a more natural manner.

#### WITH PRESENT MANAGEMENT – BASELINE SCENARIO 2.

SMP1 indicates a policy for this area of Do Nothing with a longer term policy for Managed Realignment, this being assessed over a 50 year period.

With the SMP1 document, the Do Nothing Policy is based on the assumption that there would be no need to take any action immediately, rather than an intent for taking no action in the future.

The intent of the future managed realignment was that the shingle ridge be allowed to change naturally but that local works would be under taken to defend local areas in the future. Taking this through as the With Present Management scenario over 100 years and beyond, the intent would be to continue to defend the eastern car park and to continue to manage flood risk behind the lagoon.



At the eastern end there may already be seen some increasing pressure on the defence. The shingle beach is lowering and this process is likely to continue with sea level rise. As the shingle bank, in general, moves back, so the end of the defence would be

outflanked. The whole section of the bank would become increasingly vulnerable to breach. Continued management of this area is not seen as being sustainable.

At the northern end of the lagoon, the continuing roll back of the shingle ridge is likely to result in the weir becoming redundant as a new entrance forms to the south. The timing of this is uncertain. The long length of defence around the properties and car park would be retained under this scenario. The cost to maintain this defence against sea level rise is likely to be uneconomic.

Under this scenario the causeway and sluice would continue to be maintained, this being compatible with the CFMP policy as well as SMP1 and this would create the need in the future to raise the defence, in protecting land and habitat behind. This would create an increasingly vulnerable situation, made less effective due to the risk of flooding from the open coast to the west, and is not considered sustainable.

## **5 Discussion and Detailed Policy Development**

No Active Intervention raises serious issues in relation to the designated habitat which cannot be resolved on current information. It also puts in place a scenario where land use and protection of property becomes increasingly fragile and subject to sudden unplanned change. In comparison, the Managed Retreat policy of SMP 1, in detail is for setting back defence or for local defence action as required. As such, With Present Management could result in increased fragility of the whole system, with an expectation of continued defence locally in the future but with no guarantee of continued management due to funding and sustainability issues. It would also result in damage to the natural function of the shingle ridge and consequential damage to the designated features.

There is significant uncertainty as to the nature of change in terms of features and impact on designated species. The Cemlyn Lagoon is recognised as being quite unique and potentially very sensitive to change, not merely in terms of the main lagoon but to the mosaic of different areas of the water body and surrounding habitat. The SMP2 cannot, therefore, be prescriptive about detailed management but strongly recommends as an action the need for the development of an appropriate integrated management plan to address these issues.

The longer term intent from the SMP2 perspective would be to establish a system that was allowed to function naturally while retaining the values of the area as far as possible and the ecological function of the overall lagoon feature. This is best reflected in a policy for No Active intervention by epoch 3. Several issues being raised do need immediate attention, to prevent deterioration of the system and as such the short term policy is for Managed Realignment. The medium term policy depends critically on information that would be developed during epoch 1, the epoch 2 policy is for No Active Intervention but with the recognition that some form of management may be required over this period of time.

The main focus of a detailed action plan would centre on adaption of the designated areas. However, within this there would need to be involvement with local landowners and departments within the local authority considering aspects of flood risk and landuse, access and management of visitors to the area.

**SUMMARY COMPARISON AND ASSESSMENT OF BASELINE 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 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.

**ASSESSMENT OF EROSION DAMAGES**

| Epoch  | 0 -20 year         |      | 20 – 50 years      |      | 50 – 100 years     |      | 50 – 100 years<br>(2m SLR) |      | PV Damages |
|--|--------------------|------|--------------------|------|--------------------|------|----------------------------|------|------------|
|  | No. of properties: |      | No. of properties: |      | No. of properties: |      | No. of properties          |      |            |
| Location                                     | Value<br>x £k      |      | Value<br>x £k      |      | Value<br>x £k      |      | Value<br>x £k              |      | (£x1000)   |
| Cemlyn                                       | Res.               | Com. | Res.               | Com. | Res.               | Com. | Res.                       | Com. |            |
| <b>NAI</b>                                   | 0                  | 0    | 0                  | 0    | 0                  | 0    | 0                          | 0    | 0          |
| <b>WPM</b>                                   | 0                  | 0    | 0                  | 0    | 0                  | 0    | 0                          | 0    | 0          |
| Notes: PVD determined for 1m SLR in 100 yrs. |                    |      |                    |      |                    |      |                            |      |            |
| Other information:.                          |                    |      |                    |      |                    |      |                            |      |            |

**ASSESSMENT OF POTENTIAL FLOOD RISK**

| <i>Location</i> | Flood risk tidal 2010 |       |             | Flood risk tidal 2060 |       |             | Flood risk tidal 2110 |       |             | tidal risk 2m SLR |       |                 |
|-----------------|-----------------------|-------|-------------|-----------------------|-------|-------------|-----------------------|-------|-------------|-------------------|-------|-----------------|
| <i>Cemlyn</i>   | No. of properties     |       | AAD<br>x £k | No. of properties     |       | AAD<br>x £k | No. of properties     |       | AAD<br>x £k | No. of properties |       | PVD<br>(£x1000) |
|                 | <1:10                 | >1:10 |             | <1:10                 | >1:10 |             | <1:10                 | >1:10 |             | <1:10             | >1:10 |                 |
| <b>NAI</b>      | 0                     | 1     | 7           | 0                     | 2     | 12          | 2                     | 0     | 77          | 2                 | 1     | 480             |
| <b>WPM</b>      | 0                     | 1     | 2           | 0                     | 2     | 12          | 0                     | 2     | 16          | 0                 | 3     | 199             |

**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.

| Objectives  | NAI |        |       | WPM |        |       |
|---|-----|--------|-------|-----|--------|-------|
|   | Red | Orange | Green | Red | Orange | Green |
| Reduce risk to life.  | Red |        |       | Red |        |       |
| Protect properties from flood and erosion loss.   | Red |        |       |     | Orange |       |
| Minimise the need for increasing effort and management of coastal defences.   |     |        | Green | Red |        |       |
| Avoid reliance on defence particularly where there is a risk of catastrophic failure  | Red |        |       | Red |        |       |
| Maintain access to local centres, villages and isolated properties  | Red |        |       |     | Orange |       |
| Maintain recreational use of beaches and bays   |     |        | Green |     | Orange |       |
| Maintain access to the coast including car parking and facilities.  | Red |        |       |     | Orange |       |
| Maintain agricultural value of rural community  | Red |        |       |     | Orange |       |
| Maintain historic landscape   |     |        | Green |     |        | Green |
| . Prevent disturbance or deterioration to historic sites and their setting  |     |        | Green |     |        | Green |
| .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 | Red |        |       | Red |        |       |
| Maintain or enhance the condition or integrity of the national (SSSI) designated sites and interest features within the context of a dynamic coastal system           | Red |        |       | Red |        |       |
| Avoid damage to and enhance the natural landscape   |     |        | Green |     | Orange |       |
| Maintain the human landscape and character of communities.  | Red |        |       |     | Orange |       |

## Wylfa

### LOCAL DESCRIPTION

The Wylfa Power Station is constructed on the Mynydd y Wylfa Headland at the western headland to Cemaes Bay. There is a pier and water inlet to the western side of the headland and the cooling water outlet within a small cove to the main head of the headland.

The power station is a major national asset and is an important local employer.

### EXISTING DEFENCES

Defences have been constructed to the western frontage. These are founded to the rock.

### UNCONSTRAINED SCENARIO

The coast would slowly erode.

### COASTAL PROCESSES

The defence has little impact on coastal processes. The headland is exposed to deep water waves from all main directions and the defended area is exposed to the dominant southwest to northwest wave climate.

### FLOODING

At present, the main risk of flooding would be from wave overtopping along the main western defended section. This risk will increase with sea level rise. The general assessment of flooding would indicate that under a 2m sea level rise scenario the defended section of the coast could be subject to limited direct flooding on extreme conditions. This would only impact locally on the roadway and office building.

## MANAGEMENT SCENARIOS

### NO ACTIVE INTERVENTION – BASELINE SCENARIO 1.

Under this scenario the defences would deteriorate over time. The defences are substantial and are understood to be in good condition. It is unlikely that they would fail during the period of the SMP. There would, under this scenario, be no intent to raise defences and this would present issues with respect both to direct flooding and wave overtopping with sea level rise. This would expose the power station to unacceptable risk.

### WITH PRESENT MANAGEMENT – BASELINE SCENARIO 2.

The SMP1 policy is for Do Nothing. The reasoning within the SMP1 was that over the 50 year period there was seen as being no need for additional works. This policy would be unacceptable for the reasons given above.

### DISCUSSION AND DETAILED POLICY DEVELOPMENT

There will be a need in the future to monitor both the condition and performance of the existing defences. It is likely that there would be a need to raise the defences in line with sea level rise in order to provide adequate protection to this important asset. As such the policy for this frontage is changed to Hold the Line.

### SUMMARY COMPARISON AND ASSESSMENT OF BASELINE SCENARIOS

The two baseline scenarios are the same. No economic assessment has been undertaken. Both policies would fail to meet the key objective in maintaining the power station.

## Cemaes Bay

### LOCAL DESCRIPTION

Cemaes is one of the three major developments within this section of the coast. The village is located to the south western corner of Cemaes Bay, which is formed between the two headlands of Wylfa Head to the west and Trwyn Buarth to the east. The main area of development is centred on the harbour within a small sub-bay in the south western corner of the main bay. This sub-bay, facing out in a northwest direction, is formed between the headlands of Trwyn y Penrhyn on the southern side and Trwyn y Parc to the north. The sub-bay is cut very squarely through the hard rock geology. The northern flank of the bay is steep hard rock cliffs. The southern flank is a more gently rising coastal slope upon which is built the main part of the village. The Harbour is formed out upon a further rock ridge. At the head of the bay the shoreline is relatively wide beach area (Traeth Mawr) backed by a softer coastal slope, with some development and rising to the main A5025, the main road for the whole of northern Ynys Mon.



The village extends slightly to the west of Trwyn y Penrhyn, along the crest of the rocky cliffs.

Along the main sea front, south of Trwyn y Penrhyn, a seawall protects the road (Ffordd y Traeth) that runs along the shoreline to the properties on the headland at Penrhyn. To the western end of this promenade a small stream runs down to the shoreline. There is a small pocket beach in this area and areas of sand and shingle to several local sections

of the sea wall. However, much of the foreshore through to the harbour is rock outcrop. The harbour is protected by a large masonry breakwater and this provides shelter to a variety of small boats. A relatively new promenade protects the coastal slope to the east of the harbour and this also incorporates a small car park. The main beach sits in front of this promenade, with the coastal slope behind.

The Afon Wygyr runs in a steeply sided valley in the lee of the harbour breakwater.

### EXISTING DEFENCES

The principal defences in the area are the sea wall along Ffordd y Traeth, the main breakwater and defences within the harbour area and the promenade wall to the east of the harbour. This last structure is relatively new and follows around the crest of much of the sandy/ shingly beach to the eastern part of the village. The sea wall along Ffordd y Traeth has a relatively high crest wall above the height of the road.

### UNCONSTRAINED SCENARIO

In the absence of defences the coastal slope to the western side of the village would suffer significant toe erosion and encouraging slope instability in the area. The harbour breakwater helps for the shape of the shoreline at the head of the bay and this would realign with significant erosion at its southern end. The new wall along the main beach follows the crest

of the beach, however, without the defence the beach would roll back exposing the toe of the coastal slope behind.

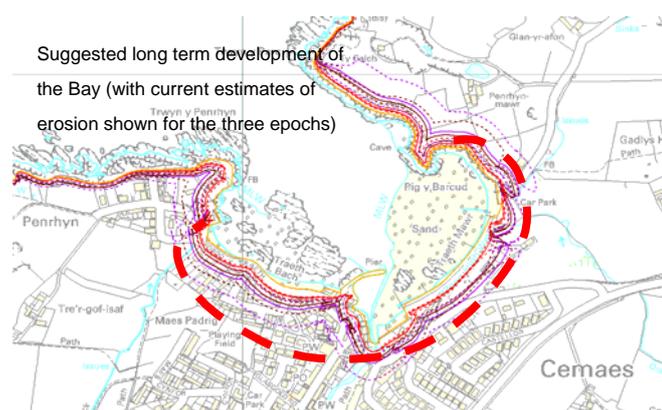
#### COASTAL PROCESSES

The main offshore wave energy is from the south west through to north and this spread of direction is highlighted by the shape of the several small sub-bays within the larger Cemaes Bay, so that without the constraint of the significant hard rock sections within Cemaes Bay



one might expect the bay to form quite a uniform curving backshore facing out to the north. The hard rock coast within the main bay holds this shoreline forward, with the several sub-bays being set back around this uniform curve. This would suggest that the waves entering the sub-bay of within which the village sits is limited by direction, tending to be channelled down the narrow entrance before spreading out within the softer wider head of the bay. The area would also be subject to relatively long period waves generated over the significant offshore fetch. Quite probably, there is significant reflection off the steep hard cliffs on the northern side, giving rise to an interaction of incident and reflected waves hitting the southern shoreline, particularly in the area just seaward of the harbour. This seems to be evidenced in the adjacent photographs of wave overtopping along Ffordd y Traeth. There is also some suggestion from the lower photograph of some mach stem effect running along the

sea wall in this area, contributing to this high energy location. Clearly with any sea level rise this situation will become worse.



With this type of behaviour, there is significant and long term pressure for the coast to realign and a suggested bay shape, shown adjacent might develop. This would be modified depending on exposure of rock beneath the general coastal slope but is still indicative of the typical extent to which the bay might develop in the long term, probably beyond the period of SMP2. Despite the

increased wave energy, the coast is held well forward of this suggested line by the structures at the harbour and the ridge running down through the village in the area of the harbour.

The development of a sandy beach both in this area and within the various bays with Cemaes Bay would suggest that there is some nearshore supply of sediment and that where there is sufficient width in the shoreline system there is the capacity form some natural development and retention of a beach.

## FLOODING

As highlighted in the photographs above, one of the principal flood risks is from wave overtopping. There is the risk of direct sea level flooding at the harbour and to the northern end of Ffordd y Traeth and at the car park at the northern end of Traeth Mawr on more extreme events. Even with 1m or 2m sea level rise it is these same areas that remain at principal risk. More extensive flooding could extend along the promenade to Traeth Mawr under the 2m sea level rise scenario.

### Management scenarios

#### **No ACTIVE INTERVENTION – BASELINE SCENARIO 1.**

Under this scenario the existing defences would fail over time. Probably initial failure would occur along Ffordd y Traeth cutting access to the properties at Penrhyn. This might be addressed by creating a new access point from the west along the existing track. As this defence unravels, there would be loss of properties at the harbour and outflanking of the main harbour structures.

With sea level rise, the beach at Traeth Mawr would tend to erode back and this would undermine the new sea wall and promenade.

The loss of the wall along Ffordd y Traeth would allow erosion of the toe of the coastal slope and this is likely to result in the loss of a significant number of properties further back in the village. Loss and erosion of the promenade along Traeth Mawr is likely to result in destabilising the cliff to the eastern side of Cemaes and this again could result in loss of properties and potentially risk to the main road above.

From the assessment of coastal processes, the erosion and consequential loss of properties would continue into the future. No time scale can sensibly, be put on this, however, loss is likely to increase in the future. From the table setting out the potential losses, it may be seen that some 5 properties might be lost in epoch 2, a further 6 in epoch 3 and some 31 under a 2m sea level rise scenario. In the future, there might be loss of much of the property on the slope around the harbour, the harbour itself and a substantial number of properties to the east of the harbour. Cemaes would lose not only its sea and traditional character as a small port but would lose much of its historic character.

#### **WITH PRESENT MANAGEMENT – BASELINE SCENARIO 2.**

SMP1 policy is for Do Nothing and then Hold the Line. The detail of this is as in other areas that there was seen as being little need for immediate action but an overall intent to hold the line to the area of the village. The approach taken in considering this scenario over the next 100 years would be for continued maintenance and management of existing defences along the current line of defence.

This would address the issues raised above as to the long term loss of properties. However, in taking this forward there would be need to further raise defences particularly in the Ffordd y Traeth area and the need to address the future risk of undermining of the promenade wall along Traeth Mawr. In the case of the former, defences might typically need to be raised a further 1m or more over the next 100 years as water levels increase and, as a result, wave height increases along the frontage. Alternative approaches might be through the construction of a revetment along the sea wall. Certainly, raising the wall is likely to have a significant impact on the character of the sea front. In the case of the latter, further reinforcing the sea wall, typically with a rock toe would help retain a beach but with sea level rise there is still likely to be significant impact on the amenity use of the area.

Although in both areas works might be considered sustainable over the 100 years, the approach builds in very little ability for further adaptation, tending set an approach to defence that could be difficult to sustain beyond 100 years without in effect separating the village from its association with the coast.

There is concern with any of these options that funding may not be fully justified in terms attracting grant in aid. There may well be a need to consider alternative funding arrangements.

#### **DISCUSSION AND DETAILED POLICY DEVELOPMENT**

The No Active Intervention scenario would be unacceptable in terms of the significant socio-economic loss to the village of Cemaes and the impact on surrounding areas and in relation to the value of Cemaes in meeting strategic aims set out in the Wales Spatial Plan. This is in addition to direct economic loss within the local community. There is little scope for adapting from this NAI option in that particularly with respect to the harbour and the defence along Ffordd y Traeth fully setting back the defence would result in loss of access along and to the shoreline. Once defence is moved primarily from its present position it is unlikely, given the gradual losses that would accrue over time, that there would be further justification for establishing a new defence line. In effect, once taking a NAI approach this would set the direction of risk management in the future.

Under the With Present Management approach there are concerns that a rigid Hold the Line approach to the village would, although potentially sustainable over the period of the SMP, lead management down a route that would require eventual change in policy in the future. A more general approach with the intent of maintaining the core character and function of the community is seen as introducing the ability for future adaptation.

In developing this distinction between strictly holding the line and some form of adaptation it is important to consider those aspects of the frontage that contribute to the essential sustainability of Cemaes as an important local centre, also the nature of risk to that sustainability.

At present one of the key issues is the wave overtopping and focus of wave energy on the sea front area. Consideration would need to be given to reducing this wave energy possibly by use of rock revetments or more probably by use of cross shore structures. This alternative approach in increasing the width of effective protection management would aim to reduce wave interaction and potentially allow the opportunity to adapt access in the future. The opportunity is also introduced to develop a retained beach in front of the defences. There may still be a need to restrict access under storm conditions along Ffordd y Traeth and to consider either realignment or raising the road at the northern end. Associated with this might be the need to consider developing an alternative emergency access to Penrhyn from the west. The current practice of Hold the Line to this frontage is seen as sustainable over the short to medium term but even during that time developing on the more general need to introduce the ability to plan adaptation in the future. As such, the policy for this area would be Hold the Line during Epoch 1 and 2 with Managed realignment in epoch 3.

Such an approach does not necessarily mean moving defences. As works become necessary to the frontage, either in terms of improvements or new works to address current problems of flooding and overtopping, alternative approaches should be considered rather than merely raising or reinforcing existing defences. The aim would still be to defend the general area but looking to create better use of width and changes to the wave behaviour. In terms of planning, the above should be taken into account such that consideration might be given to change to the road system (if this is possible) and that any proposals for new development are examined critically in terms of how this might constrain future adaptation.

In the case of the harbour, there is little scope for significant adaptation. Monitoring should be undertaken to establish whether the harbour breakwater contributes to the focus of wave energy further to the west. This would then need to be considered in any future management requirements of the harbour. However, the harbour and the harbour breakwater are seen as essential features in terms of the character of the village and in the control of the overall behaviour of protection to the village. As such the policy in this area would be for Hold the Line across all three epochs.

In holding this central core of the village, this provides important protection to the promenade to the south and east. Here it would be anticipated that the present form of defence could be sustained without significant impact on the beach, potentially over epochs 1 and 2. As sea level rises, particularly over the central and eastern ends of the sea wall there may be loss of beach and risk to the integrity of the wall. As in the case of the Ffordd y Traeth frontage there may be scope for examining some form of cross shore or nearshore control to support the beach. To take full advantage of such an approach, the eastern end of the promenade, together with the car park area may need to be moved. Although, this is seen as being an opportunity or possible need in the future it requires an awareness at the present so that any future development of these areas does not constrain such future adaptation. The policy for this area would be Hold the Line for epochs 1 and 2, with Managed Realignment in epoch 3.

There are potential funding issues in relation to the future management of each and all of these sections. The SMP policy reflects an intent for continued sustainable management at Cemaes. It seems probable that there would still need to be alternative funding sources. The obvious default policy if funding were not viable would be for No Active Intervention.

The broader intent of this whole zone of the coast is to maintain as far as possible the natural landscape and function of the shoreline and to resist further encroachment of defence along the shore. As such, the policy beyond these three areas around the main village, covering the rest of Cemaes Bay would be for No Active Intervention. This policy would include the open coast section to the west of Trwyn y Penrhyn.

**SUMMARY COMPARISON AND ASSESSMENT OF BASELINE 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 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.

**ASSESSMENT OF EROSION DAMAGES**

| Epoch  | 0 -20 year         |             | 20 – 50 years |                    |             | 50 – 100 years |                    | 50 – 100 years<br>(2m SLR) |               |                   |             |            |
|--|--------------------|-------------|---------------|--------------------|-------------|----------------|--------------------|----------------------------|---------------|-------------------|-------------|------------|
| Location   | No. of properties: |             | Value<br>x £k | No. of properties: |             | Value<br>x £k  | No. of properties: |                            | Value<br>x £k | No. of properties |             | PV Damages |
| <i>Cemaes</i>  | <i>Res.</i>        | <i>Com.</i> |               | <i>Res.</i>        | <i>Com.</i> |                | <i>Res.</i>        | <i>Com.</i>                |               | <i>Res.</i>       | <i>Com.</i> | (£x1000)   |
| <b>NAI</b>   | 0                  | 0           | 0             | 3                  | 2           | 320            | 3                  | 3                          | 884           | 23                | 8           | 254        |
| <b>WPM</b>   | 0                  | 0           | 0             | 0                  | 0           | 0              | 0                  | 0                          | 0             | 0                 | 0           | 0          |
| Notes: PVD determined for 1m SLR in 100 yrs.   |                    |             |               |                    |             |                |                    |                            |               |                   |             |            |
| Other information: this assessment does not take account of loss of access to Penrhyn or of potential loss due to cliff instability. |                    |             |               |                    |             |                |                    |                            |               |                   |             |            |

**ASSESSMENT OF POTENTIAL FLOOD RISK**

| <i>Location</i> | Flood risk tidal 2010 |       |             | Flood risk tidal 2060 |       |             | Flood risk tidal 2110 |       |             | tidal risk 2m SLR |       |                 |
|-----------------|-----------------------|-------|-------------|-----------------------|-------|-------------|-----------------------|-------|-------------|-------------------|-------|-----------------|
| <i>Cemaes</i>   | No. of properties     |       | AAD<br>x £k | No. of properties     |       | AAD<br>x £k | No. of properties     |       | AAD<br>x £k | No. of properties |       | PVD<br>(£x1000) |
|                 | <1:10                 | >1:10 |             | <1:10                 | >1:10 |             | <1:10                 | >1:10 |             | <1:10             | >1:10 |                 |
| <b>NAI</b>      | 0                     | 5     | 1           | 0                     | 5     | 3           | 0                     | 7     | 23          | 0                 | 12    | 125             |
| <b>WPM</b>      | 0                     | 5     | 0.69        | 0                     | 5     | 2           | 0                     | 7     | 5           | 0                 | 12    | 44              |

**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.

|  | NAI |        |       | WPM |        |       |
|--|-----|--------|-------|-----|--------|-------|
| <b>Objectives</b>  | Red | Orange | Green | Red | Orange | Green |
| Reduce risk to life.   | Red |        |       |     |        | Green |
| Protect properties from flood and erosion loss.                                      | Red |        |       |     |        | Green |
| Minimise the need for increasing effort and management of coastal defences.          |     |        | Green | Red |        |       |
| Avoid reliance on defence particularly where there is a risk of catastrophic failure | Red |        |       | Red |        |       |
| Maintain access to local centres, villages and isolated properties                   | Red |        |       |     |        | Green |
| Maintain important local centres supporting the smaller communities                  | Red |        |       |     |        | Green |
| Maintain recreational use of beaches and bays  | Red |        |       | Red |        |       |
| Maintain access to the coast including car parking and facilities.                   | Red |        |       |     | Orange |       |
| Maintain access for boat use and associated water sport activity                     | Red |        |       |     |        | Green |
| Maintain character and integrity of coastal communities.                             | Red |        |       | Red |        |       |
| Maintain historic landscape.   | Red |        |       | Red |        |       |
| Avoid damage to and enhance the natural landscape                                    |     |        | Green | Red |        |       |
| Maintain the human landscape and character of communities.                           | Red |        |       | Red |        |       |

## Porth Wen

### LOCAL DESCRIPTION

The Borth Wen Brickworks are to the western shore of the otherwise natural bay of Porth Wen. The works comprise a small harbour built out from and upon a natural rock outcrop, kilns and constructed incline. To either side are natural sandy beaches developed on this western, more sheltered side of the bay.

The disused Brickworks, much of which are in a state of disrepair, are designated as a Scheduled Ancient Monument, reflecting the important industrial use of this whole north eastern landscape.

### EXISTING DEFENCES

There are masonry wall defences to the main rock outcrop to the harbour and to buildings within the harbour. Some of the walls are in reasonable condition but more generally would need repair and pointing if they are to continue to provide a suitable defence.

### UNCONSTRAINED SCENARIO

The natural behaviour of the shore would be for slow erosion of the frontage. The existing defences only act locally to resist erosion.

### COASTAL PROCESSES

The works are within a sheltered area of the bay exposed principally to diffracted wave action and the more occasional north easterly storm.

The brickworks act to influence the development of the sandy beaches to either side.

### FLOODING

The works upon the rock outcrop would be at flood risk on more extreme present conditions. With sea level rise the harbour structures and the rock outcrop would be subject to significantly greater wave action and overtopping.

## MANAGEMENT SCENARIOS

### No ACTIVE INTERVENTION – BASELINE SCENARIO 1.

Under this scenario no work would be undertaken to maintain the existing defence. The harbour walls may fail over epoch 1 or to and with this failure there would be increased erosion within the harbour. Failure of the walls around the rock outcrop may fail over epoch two and local erosion would occur. It is uncertain to what degree the rock outcrop has been levelled with infill material. In areas where failure of the wall has already occurred there has been significant erosion of the land behind. If this is more generally the case, then it is possible that some of Kilns would be at risk.

The flood risk will increase with sea level rise and with this the affect of overtopping will increase. Under this scenario there would be significant deterioration in the defences and it is probable that parts of the SAM will be at risk.

The key objectives for this area relate to the historic environment. This scenario would not protect a significant designated feature, with potential impact on the historic landscape. Since the brickworks are currently defended, through maintenance, immediate deterioration could be avoided, this scenario does not meet the objectives.

### WITH PRESENT MANAGEMENT – BASELINE SCENARIO 2.

The present policy for this section of the coast is for Do Nothing. As such this scenario is the same as scenario 1.

#### **DISCUSSION AND DETAILED POLICY DEVELOPMENT**

It has not been possible to evaluate the potential damages. However, if a value were determined based on the cost of relocation of the historic assets then this would be far greater than the cost of maintaining the existing defences. In this case, relocation is unlikely to be of significant benefit and would actually cause damage to the setting and landscape associated with the feature.

It is both technically feasible and sustainable in the short to medium term to maintain defences in such a condition that they would provide a good degree of continued protection to the structures. As sea level rises this becomes both more onerous and through the need to raise and strengthen defences, there may well be an adverse impact on the feature and its surrounding landscape.

On this basis, the policies defined for the area would be for Managed Realignment over epochs 1 and 2, where action is taken to maintain at least critical sections of the defence in such a manner as not to impact on the context of the site. In epoch 3 the policy realistically reverts to that of No Active Intervention. This suite of policies is considered to provide sufficient time in which to mitigate the losses that might occur through recording of essential archaeological information and to plan for adaptation to subsequent loss.

## Porth Llechog

### LOCAL DESCRIPTION

The small village at Porth-Llechog is located with a local bay in the shelter of the Tywyn Melyn headland. Although quite separated from the main housing development making up the village, its sea front provides an important core element of the traditional coastal village. Much of this part of the village is situated on moderately high ground with natural rock cliffs at the coast line. It is only at the head of the bay where there is substantial risk from erosion and flooding. The main coastal road for northern Ynys Mon (A5025) runs to the crest of the cliffs to the south of the village and it is not seen as being at risk.

Within the bay there is a slipway for launching small boats but only a small beach area. Within the village there are several hotels and a post office but no other services. It is likely that there is reliance on nearby Amlwch for other services by the residents of Porth-Llechog.

### EXISTING DEFENCES

The short section of the sea front is protected by a masonry sea wall.

### UNCONSTRAINED SCENARIO

The coast would slowly erode. There is little immediate pressure of erosion, however in the absence of the sea wall this would result in loss of the road and some 3 to 4 properties to the rear.

### COASTAL PROCESSES

The bay is well protected from the dominant offshore wave directions but is vulnerable to storms from the north east. The small beach has developed as a storm beach but is constrained from developing further by the presence of the sea wall.

### FLOODING



The sea front is lowest at its northern end and here there is risk of direct flooding on to the road at the critical junction providing access to properties to the north. Even under the 1m sea level rise scenario, however, direct flooding of the road would only occur on more extreme events, with flooding to a limited number of properties. Under a 2m sea level rise scenario there would be regular tidal flooding to this area of the sea front.

The main issues, in terms of flooding, would be with wave action. At present wave overtopping can affect properties along the sea front. With increased water levels and with little opportunity for increasing beach volume, wave overtopping would become an ever increasingly regular occurrence, threatening the use of the properties in the local area.

### MANAGEMENT SCENARIOS

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

Over epoch 1, the existing defences would start to fail leading to erosion during epoch 2. This could result in loss of property over the medium term, with increased erosion resulting in the loss of the road and properties behind over epoch 3. This is likely to cut the access road to the properties to the north.

Under this scenario over the period of the SMP much of the lower village would be lost.

#### **WITH PRESENT MANAGEMENT – BASELINE SCENARIO 2.**

SMP 1 has a policy of Do Nothing followed by a policy for Hold the Line. This really reflects the fact that there was seen as being little need to take action in the short term but with the intent to defend the area as it came under threat. In terms of policy, therefore, the decision was really to continue to defend.

The basic concept within SMP 1 is however agreed with, in that there appears to be little need for improving defence over the first epoch. Managing the existing defences would seem feasible. Even into the second epoch, there is not seen as being significant pressure on defences and the situation remains manageable. The main pressure develops in epoch 3 with increased sea level rise. The defences would need to be raised and strengthened and in doing this there is likely to be increased loss of beach. Even over this time, however, there is significant benefit in defending the community and technically this could be viable.

It is really beyond this that such an approach starts to present problems, with the policy driving an approach which relies more and more heavily on defence and the effective separation of the community from its beach area. Purely looking to increase defence along the established line is not seen as sustainable into the future.

#### **DISCUSSION AND DETAILED POLICY DEVELOPMENT**

The No Active Intervention scenario pre-empts the need for change, ignoring the ability to sustain defence over the short to medium term in sustaining the community. The With Present Management scenario on the other hand assumes that the existing defence could be managed well into the future, which is not felt to be the case.

Some change is required and this is likely to be triggered by sea level rise. Over the second epoch, there needs to be consideration of how this is to be managed. This will need to examine in more detail how the frontage is used and where there may be scope for setting assets back to gain further benefit from the sheltered position of the frontage. This may result in the loss of some property, most probably at the northern end with the intent also to set back the road in this area to maintain access through the village. Such an approach would sensibly be developed with the community, looking to planning a more sustainable community in the future.

On this basis, the policy for the area would change to Hold the Line over epochs 1 and 2, with Managed Realignment in epoch 3.

**SUMMARY COMPARISON AND ASSESSMENT OF BASELINE 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 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.

**ASSESSMENT OF EROSION DAMAGES**

| Epoch           | 0 -20 year         |             | 20 – 50 years |                    |             | 50 – 100 years |                    | 50 – 100 years<br>(2m SLR) |               | PV Damages<br><br>(£x1000) |                   |             |
|-----------------|--------------------|-------------|---------------|--------------------|-------------|----------------|--------------------|----------------------------|---------------|----------------------------|-------------------|-------------|
|                 | No. of properties: |             | Value<br>x £k | No. of properties: |             | Value<br>x £k  | No. of properties: |                            | Value<br>x £k |                            | No. of properties |             |
| <i>Location</i> | <i>Res.</i>        | <i>Com.</i> |               | <i>Res.</i>        | <i>Com.</i> |                | <i>Res.</i>        | <i>Com.</i>                |               | <i>Res.</i>                | <i>Com.</i>       | <i>Res.</i> |
| <b>NAI</b>      | 0                  | 0           | 0             | 3                  | 0           | 313            | 3                  | 1                          | 817           | 7                          | 2                 | 208         |
| <b>WPM</b>      | 0                  | 0           | 0             | 0                  | 0           | 0              | 0                  | 0                          | 0             | 0                          | 0                 | 0           |

Notes: PVD determined for 1m SLR in 100 yrs.

Other information: This assessment does not identify potential erosion lost to caravan sites.

**ASSESSMENT OF POTENTIAL FLOOD RISK**

| <i>Location</i>      | Flood risk tidal 2010 |       |             | Flood risk tidal 2060 |       |             | Flood risk tidal 2110 |       |             | tidal risk 2m SLR |       | PVD<br>(£x1000) |
|----------------------|-----------------------|-------|-------------|-----------------------|-------|-------------|-----------------------|-------|-------------|-------------------|-------|-----------------|
| <i>Porth-Llechog</i> | No. of properties     |       | AAD<br>x £k | No. of properties     |       | AAD<br>x £k | No. of properties     |       | AAD<br>x £k | No. of properties |       |                 |
|                      | <1:10                 | >1:10 |             | <1:10                 | >1:10 |             | <1:10                 | >1:10 |             | <1:10             | >1:10 |                 |
| <b>NAI</b>           | 0                     | 2     | 1           | 0                     | 2     | 3           | 0                     | 5     | 19          | 0                 | 6     | 114             |
| <b>WPM</b>           | 0                     | 2     | 0.65        | 0                     | 2     | 2           | 0                     | 5     | 4           | 0                 | 6     | 39              |

**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.

| Objectives   | NAI |        |       | WPM |        |       |
|--|-----|--------|-------|-----|--------|-------|
|  | Red | Orange | Green | Red | Orange | Green |
| Reduce risk to life.   | Red |        |       |     | Orange |       |
| Protect properties from flood and erosion loss.                                      | Red |        |       |     |        | Green |
| Minimise the need for increasing effort and management of coastal defences.          |     |        | Green | Red |        |       |
| Avoid reliance on defence particularly where there is a risk of catastrophic failure |     |        | Green | Red |        |       |
| Maintain access to local centres, villages and isolated properties                   | Red |        |       |     |        | Green |
| Maintain important local centres supporting the smaller communities                  | Red |        |       |     |        | Green |
| Maintain recreational use of beaches and bays  |     | Orange |       |     | Orange |       |
| Maintain access to the coast including car parking and facilities.                   | Red |        |       | Red |        |       |
| Maintain access for boat use and associated water sport activity                     | Red |        |       | Red |        |       |
| Maintain character and integrity of coastal communities.                             | Red |        |       | Red |        |       |
| Maintain historic landscape.   |     | Orange |       |     | Orange |       |
| Avoid damage to and enhance the natural landscape                                    |     |        | Green | Red |        |       |
| Maintain the human landscape and character of communities.                           | Red |        |       | Red |        |       |

## Amlwch Area

### LOCAL DESCRIPTION

Amlwch is the largest settlement within this northern part of Ynys Mon. The area is designated as an Historic Landscape Area but falls outside of the Area of Outstanding Natural Beauty, which extends along the adjacent sections of the coastline. The main part of



the town, which provides many of the key services over the area, is set well back from the coast and is not considered to be at risk. There are two areas at the coast and these are an integral aspect of both the historic landscape.

The old Chemical Works site is located on the Trwyn Costog headland. The old works have been substantially cleared and the area provides potentially important development land. The old works include various structures at sea level where presumably there were outfalls and water intakes.

To the south of the headland is Amlwch harbour. The harbour is protected by breakwaters on both sides, and inside these there are several quaysides and moorings. The harbour is no longer a major commercial port; however there is a small fishing fleet and moorings for recreational visitors.



In the past the harbour was involved in the export of copper



ore from nearby Parys Mountain and ship building which are the main reason for its size today. As a result, there are several listed buildings surrounding the harbour and the harbour is an essential part of Amlwch's history and part of the important industrial heritage, as well as providing important local employment and acting as a significant tourism feature to the area.

### EXISTING DEFENCES

Both areas are built on or out from the hard rock headland. There are sections of concrete sea wall around much of the old Chemical Works and much of the harbour area is protected by masonry structures or masonry infill to the steep sides of the narrow harbour reach. To the eastern end of the harbour is a large rock revetment protecting a short section of softer coastal slope.

### UNCONSTRAINED SCENARIO

Without defences the hard rock cliffs would erode very slowly, although there might be more significant erosion just to the east of the Harbour. Without the various breakwaters the narrow harbour reach would be subject to significant wave action, concentrated between the steep cliffs to either side.

### COASTAL PROCESSES

With most of the area being hard rock, despite the very exposed position, there is little in terms of sediment dynamics at work in the area. The main consideration in terms of coastal

processes is the severe wave climate with deep water at the cliff line allowing the full force of the waves against the existing defences.

#### **FLOODING**

Potential flood risk is an issue, with the northern end of the headland and local areas to the east of the harbour both at risk from extreme water level conditions at present and potentially at risk from direct normal tidal level flooding in the future with sea level rise.

#### **MANAGEMENT SCENARIOS**

##### **No ACTIVE INTERVENTION – BASELINE SCENARIO 1.**

At present, although not maintained the substantial concrete defences, founded to the underlying rock, around much of the headland are likely to have a long residual life. The more significant issue, rather than that of erosion will be that of flooding. With no further works to raise defences, even at present there is significant over topping risk and risk of flooding to the old site. This risk will increase significantly with sea level rise. This could potentially reduce the opportunities for use of the area.

In terms of the harbour, the key structures are the breakwaters, which would fall into disrepair during the period of the SMP. Without these structures the harbour would be unusable. There is some erosion and overtopping flood risk to the east of the harbour. Again, without maintenance, the revetment would fall into disrepair. This would impact on the use of the harbour and potentially initiate slippage of the cliff that would result in loss of harbour buildings, potentially including the harbour museum. While principally an issue relating to use of the harbour, loss of the harbour would have a significant impact on the community, amenity, heritage and tourism.

##### **WITH PRESENT MANAGEMENT – BASELINE SCENARIO 2.**

The SMP1 policy for the area is for Do Nothing but with an intent to Hold the Line in the medium term. In relation to the old Chemical Works site, such as policy taken through to the long term, would imply that the whole area was suitable for re-development. This would then require future raising of defences in line with sea level rise. This would, in practice then establish an unsustainable cycle of investment and fuelling the need to arise defences, potentially leading to further investment upon which the economic wellbeing of Amlwch depended. This by its nature is unsustainable.

At the harbour, the policy would allow future maintenance and reinforcing of the harbour structures. While it is recognised that operational practice within the harbour may need to adapt in line with sea level rise, there is little option but to support and raise harbour structures to maintain that basic function. Over the very long term there may need to be consideration for redeveloping the harbour but in principle Holding the Line is not seen as being unsustainable over the period of the SMP2.

#### **DISCUSSION AND DETAILED POLICY DEVELOPMENT**

For the Chemical Works site, the key issues would depend on future development intent for the site. While the opportunity for development should be maintained there is also the need for some framework to be put in place establishing how this could be achieved without moving into a cycle that depends on ever increasing need for defences. It would be envisaged that within such a framework the existing structure might be used to affect and as such the policy for the area would be for Managed Realignment over the three epochs. Detailed examination would be required to look at flood and overtopping risk in developing such a planning framework.

The policy for the harbour area would continue to be Hold the Line. However, there would be a caveat to this in that new development within the harbour, together with existing use should be considered with a view to the potential for sea level rise in excess of 1m.

**SUMMARY COMPARISON AND ASSESSMENT OF BASELINE SCENARIOS**

**Table 1. Economic Assessment**

No economic damages have been determined. The principle risks are to the potential opportunities for future development at the old Chemical Works site and the potential risk to harbour operation and to the risk of cliff instability to the east of the harbour.

**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.

|  | NAI |        |       | WPM |        |       |
|--|-----|--------|-------|-----|--------|-------|
| <b>Objectives</b>  | Red | Orange | Green | Red | Orange | Green |
| Reduce risk to life.   | Red |        |       |     |        | Green |
| Protect properties from flood and erosion loss.                                      | Red |        |       |     | Orange |       |
| Minimise the need for increasing effort and management of coastal defences.          |     |        | Green | Red |        |       |
| Avoid reliance on defence particularly where there is a risk of catastrophic failure |     |        | Green | Red |        |       |
| Maintain access to the coast including car parking and facilities.                   | Red |        |       |     |        | Green |
| Maintain character and integrity of coastal communities.                             | Red |        |       |     |        | Green |
| Identify risk and reduce risk of loss of heritage features where possible.           | Red |        |       |     |        | Green |
| Maintain historic landscape.   | Red |        |       |     |        | Green |
| Prevent disturbance or deterioration to historic sites and their setting.            | Red |        |       |     |        | Green |
| Avoid damage to and enhance the natural landscape.                                   |     |        | Green |     | Orange |       |
| Maintain the human landscape and character of communities.                           | Red |        |       |     |        | Green |

## Porth Eilian

### LOCAL DESCRIPTION

Porth Eilian is a small bay to the northeastern corner of Ynys Mon, situated within the larger bay formed between the hard rock headland of Ogo's Sant and the major rock promontory of Trwyn Eilian. The small bay of Porth Eilian lies to the southwestern corner of this larger inlet and gains significant additional protection from the local rock headland of Graig Ddu. The bay is backed by a low but steep coastal slope, at the crest of which runs the only road through to the Lighthouse on Trwyn Eilian.



The local beach comprises an upper area of shingle running out to a stoney foreshore. There is a small slipway in the northwestern corner of the bay and a short section of defence acting to retain the coastal slope to the road in the southeastern corner. The main development of the village of Porth Eilian is set back from the coast with a limited number of properties quite well set back behind the rock cliffs to the north of the bay.

The bay is an important local attraction with superb views of the adjacent coast line.

### EXISTING DEFENCES

Much of the toe of the slope is protected, retaining the stability of the slope.

### UNCONSTRAINED SCENARIO

The coast would slowly erode and the bay would roll back with increasing sea levels. This would affect the stability of the coastal slope impacting on the road

### COASTAL PROCESSES

The main exposure to the main bay is from the west through to north and this is further constrained by the local rock headland at the smaller bay. This headland provides protection principally over the northern half of the small bay and the southern end is more exposed.

### FLOODING

There is no significant tidal flood risk to the area, even under more extreme sea level rise.

## MANAGEMENT SCENARIOS

### NO ACTIVE INTERVENTION – BASELINE SCENARIO 1.

Under this scenario the local defence within the bay would fail and the principal impact would be to the access to the bay and the access road out to the main headland to the east. There could be potential to realign this road in the future. Removing the risk to the road and allowing the bay to erode back naturally would help sustain the important amenity function of the bay.

### WITH PRESENT MANAGEMENT – BASELINE SCENARIO 2.

The SMP1 identifies a policy for Hold the Line. Maintaining the existing defences will become more onerous over time as sea level rises and will tend to reduce the opportunity to maintain a suitable natural amenity beach in the area. The existing access to the bay is at risk and this would continue to be defended under this scenario. However, to continue defence on the

existing line would mean that, with further lowering of the beach, there would be undermining of the slipway and the defences.

#### **DISCUSSION AND DETAILED POLICY DEVELOPMENT**

The key issues are the need to maintain the road through to the east and maintaining use of the beach. The more sustainable approach to achieve this would be to relocate the road and to relocate the access. The existing defences are in reasonable or good condition. However in the future holding their position will become increasingly difficult. The policy for this section is, therefore, to allow adaptation in to the future with policies reflecting this of Hold the Line, Managed realignment and the longer term intent of No Active Intervention. This is consistent with the more general policy for the adjacent shoreline and would provide better opportunity to sustain a good amenity beach.

**SUMMARY COMPARISON AND ASSESSMENT OF BASELINE SCENARIOS**

**Table 1. Economic Assessment**

No economic damages are identified for this area although, obviously, there would be significant impact in terms of the loss of the road.

**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.

|   | NAI |        |       | WPM    |        |       |
|---|-----|--------|-------|--------|--------|-------|
| <b>Objectives</b>   | Red | Orange | Green | Red    | Orange | Green |
| Reduce risk to life.  |     | Orange |       |        | Orange |       |
| Protect properties from flood and erosion loss.                             |     | Orange |       |        | Orange |       |
| Minimise the need for increasing effort and management of coastal defences. |     |        | Green | Red    |        |       |
| Maintain access to local centres, villages and isolated properties          |     | Orange |       |        |        | Green |
| Maintain recreational use of beaches and bays                               |     |        | Green | Red    |        |       |
| Maintain access to the coast including car parking and facilities.          |     |        | Green |        |        | Green |
| Avoid damage to and enhance the natural landscape                           |     |        | Green | Red    |        |       |
| Maintain the human landscape and character of communities.                  |     |        | Green | Orange |        |       |

## 6

**Management Summary.**

The intent of the plan over the open coast is to allow as far as possible natural behaviour of the coast. Within this overall policy there would be the need for local management. The zone is divided into Management Areas reflecting this. The policy for each Management Area is summarised in the tables below.

**NORTHWEST YNYS MON: From Twyn Cliperau to Wylfa Head.**

| Policy Unit   |                             | Policy Plan |      |      |   |
|---|-----------------------------|-------------|------|------|---|
|   |                             | 2025        | 2055 | 2105 | Comment   |
| 18.1  | Twyn Cliperau to Wylfa Head | NAI         | NAI  | NAI  | Overarching policy for whole area, with local policy as set out below |
| 18.2  | Porth Tywyn-mawr            | NAI         | NAI  | NAI  | Local adaption  |
| 18.3  | Porth Trefadog              | MR          | NAI  | NAI  | Local adaptation  |
| 18.4  | Porth Trwyn                 | NAI         | NAI  | NAI  |   |
| 18.5  | Porth Swtan                 | NAI         | NAI  | NAI  |   |
| 18.6  | Cemlyn Bay and Headland     | MR          | NAI  | NAI  | Requires a development of a detailed management plan.                 |
| 18.7  | Wylfa Power Station         | HTL         | HTL  | HTL  |   |
| Key: HTL - Hold the Line, NAI – No Active Intervention MR – Managed Realignment |                             |             |      |      |   |

**CEMAES BAY: From Wylfa Head to Trwyn y Parc.**

| Policy Unit   |                       | Policy Plan |      |      |   |
|---|-----------------------|-------------|------|------|---|
|   |                       | 2025        | 2055 | 2105 | Comment   |
| 18.8  | Cemaes Bay west       | NAI         | NAI  | NAI  | .   |
| 18.9  | Ffordd y Traeth       | HTL         | HTL  | MR   | .Works undertaken during the short to medium term should maintain opportunity for realignment |
| 18.10   | Cemaes Harbour        | HTL         | HTL  | HTL  | Important control, to the whole frontage  |
| 18.11   | Traeth Mawr Promenade | HTL         | HTL  | MR   | Maintain opportunity for future adjustment of defence alignment                               |
| 18.12   | Pig y Barcud Cliffs   | NAI         | NAI  | NAI  |   |
| Key: HTL - Hold the Line, NAI – No Active Intervention MR – Managed Realignment |                       |             |      |      |   |

**NORTHEAST YNYS MON: From Trwyn y Parc to Trwyn Cwmrwd**

| Policy Unit   |                              | Policy Plan |      |      |  |
|---|------------------------------|-------------|------|------|--|
|   |                              | 2025        | 2055 | 2105 | Comment  |
| 18.13   | Trwyn y Parc to Trwyn Cwmryd | NAI         | NAI  | NAI  | Overarching policy for whole area, with local policy as set out below                        |
| 18.14   | Porth Wen Brickworks         | MR          | MR   | NAI  | Critically examine need for maintain defence to support key historic feature.                |
| 18.15   | Porth -Llechog               | HTL         | HTL  | MR   | Works undertaken during the short to medium term should maintain opportunity for realignment |
| 18.16   | Trwyn Costog                 | MR          | MR   | MR   | Develop a planning frame to minimise future need for defence                                 |
| 18.17   | Amlwch                       | HTL         | HTL  | HTL  |  |
| 18.18   | Porth Elian                  | HTL         | MR   | NAI  | Relocate road and necessary  |
| Key: HTL - Hold the Line, , NAI – No Active Intervention MR – Managed Realignment |                              |             |      |      |  |

# PDZ18

## Management Area Statements

### **MA 53 Northwest Ynys Mon**

*Twyn Cliperau to Wylfa Head*

### **MA 54 Cemaes Bay**

*Wylfa Head to Trwyn y Parc*

### **MA 55 Northeast Ynys Mon**

*Trwyn y Parc to Trwyn Cwmrwd*

|                                   |                           |
|-----------------------------------|---------------------------|
| <b>Location reference:</b>        | <b>Northwest Ynys Mon</b> |
| <b>Management Area reference:</b> | <b>M.A. 53</b>            |
| <b>Policy Development Zone:</b>   | PDZ18                     |

\* 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 53 & 54**

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



VEHICLE FERRIES FROM HOLYHEAD TO  
Dublin 3 1/2 hrs  
Dun Laoghaire 3 1/2 hrs  
Reproduced by permission of Ordnance Survey on behalf of HMSO. © Crown copyright and database right 2010. All rights reserved.  
Ordnance Survey licence number 100026380

|  |  |  |                               |
|--|--|--|-------------------------------|
| <p><b>Key</b></p> <ul style="list-style-type: none"> <li><span style="color: red;">—</span> 100 Year Shoreline Position:</li> <li><span style="color: blue;">—</span> Preferred Policy would be the same as With Present Management</li> <li><span style="color: orange;">—</span> With Present Management where this differs from the Preferred Policy</li> <li><span style="color: purple;">—</span> Preferred Policy where this differs from the With Present Management</li> </ul> | <ul style="list-style-type: none"> <li><span style="color: orange;">■</span> Ramsar</li> <li><span style="color: green;">■</span> SAC</li> <li><span style="color: blue;">■</span> SPA</li> <li><span style="color: pink;">■</span> SSSI</li> <li><span style="color: lightgreen;">■</span> NNR</li> </ul> | <ul style="list-style-type: none"> <li><span style="color: lightblue;">■</span> Existing Indicative EA Flood Zone 3</li> <li><span style="color: blue;">■</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> |
|--|--|--|-------------------------------|

## SUMMARY OF PREFERRED PLAN RECOMMENDATIONS AND JUSTIFICATION

### INTENT OF THE PLAN:

This area covers the northwest coastline of Ynys Mon. Much of the coast is natural and, as such, specific management issues are very local focussing on the individual properties and small communities to the back of the bays on the west facing coastline and the community and important feature of the Cemlyn Lagoon on the northern section of the shoreline. In addition the area contains the Wylfa Power Station.

Along the western bays, the intent of the plan would not preclude local management of existing defences, subject to normal approvals, but with the clear intent that over the longer term the shoreline is allowed to adapt in an increasingly natural manner. Long term management of defence is not seen as being sustainable and would require greater investment, intervention and extension of defence over the natural coastline. The aim of the plan is to provide the time and opportunity for properties and use of the area to adapt, but not to increase the need for, intervention.

At Cemlyn Bay, there is significant uncertainty and sensitivity associated with how the lagoon will develop with sea level rise. There is, within this area, a complex interrelationship between landuse, access and the development of the natural environment, as well as significant historic features. The intent of the plan is to move away from management of the area, moving to natural adaptation. This aim is driven by the need to avoid greater reliance on defence which would become increasingly vulnerable to sudden change. It is recognised that a move to a more naturally functioning system will require more detailed planning involving the community, landowners and nature conservation bodies.

The intent with respect to the power station would be to support on-going defence to maintain access and operation of the power station.

### KEY ISSUES/RISK AND UNCERTAINTY:

There are uncertainties in terms of timing of the identified impacts and proposed changes. There is 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 local monitoring of shoreline behaviour at critical locations.

The development of a local management plan at Cemlyn is essential.

### ACTIONS:

| ACTION               | PARTNERS                |
|----------------------|-------------------------|
| Shoreline monitoring | <b>Ynys Mon Council</b> |
| Adaption planning    | <b>Ynys Mon Council</b> |
| ▪ Western Bays       | <b>Communities</b>      |
| ▪ Cemlyn Bay         | <b>Landowners</b>       |
|                      | <b>EA</b>               |
|                      | <b>Highways</b>         |
|                      | <b>NT</b>               |
|                      | <b>CCW</b>              |

## DELIVERY OF THE PLAN

### SUMMARY OF SPECIFIC POLICIES

| Policy Unit   |                             | Policy Plan |      |      | Comment  |
|---|-----------------------------|-------------|------|------|--|
|   |                             | 2025        | 2055 | 2105 |  |
| 18.1  | Twyn Cliperau to Wylfa Head | NAI         | NAI  | NAI  | Overarching policy for whole area, with local policy as set out below. |
| 18.2  | Porth Tywyn-mawr            | NAI         | NAI  | NAI  | Local adaptation.  |
| 18.3  | Porth Trefadog              | MR          | NAI  | NAI  | Local adaptation.  |
| 18.4  | Porth Trwyn                 | NAI         | NAI  | NAI  |  |
| 18.5  | Porth Swtan                 | NAI         | NAI  | NAI  |  |
| 18.6  | Cemlyn Bay and Headland     | MR          | NAI  | NAI  | Requires development of a detailed management plan.                    |
| 18.7  | Wylfa Power Station         | HTL         | HTL  | HTL  |  |
| Key: HTL - Hold the Line, NAI – No Active Intervention MR – Managed Realignment |                             |             |      |      |  |

| PREFERRED POLICY TO IMPLEMENT PLAN: |   |
|-------------------------------------|---|
| <b>From present day</b>             | Support adaptation planning.                      |
| <b>Medium term</b>                  | Support and implement community based adaptation. |
| <b>Long term</b>                    | Support and implement community based adaptation. |

## IMPLICATIONS OF THE PLAN

### CHANGES FROM PRESENT MANAGEMENT

No substantial change but with greater emphasis on planned adaptation.

### ECONOMIC SUMMARY

| Economics (£k PV)      | by 2025 | by 2055 | by 2105 | Total £k PV |
|------------------------|---------|---------|---------|-------------|
| NAI Damages            | 98.9    | 116.1   | 519.5   | 734.5       |
| Preferred Plan Damages | 37.4    | 88.8    | 326.8   | 452.9       |
| Benefits               | 61.5    | 27.4    | 192.7   | 281.6       |
| Costs                  | 0.0     | 201.0   | 34.2    | 235.2       |

### FLOOD AND EROSION RISK MANAGEMENT

#### POTENTIAL LOSS

There is likely to be loss of some 5 properties across the area and continued flood risk.

#### BENEFITS OF THE PLAN

The plan provides a longer term sustainable approach to management. The plan would support management to sustain use and protect properties over a longer period of time. In doing so the plan would also act to reduce flood risk in the short term and encourage adaption to avoid increased flood risk to some 5 properties in the longer term.

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

| PDZ 18   |   |   |   |                                   |
|--|---|---|---|-----------------------------------|
| SEA Objective  | Impact of Preferred Policy for each Epoch |   |   |                                   |
|  | 1   | 2 | 3 | Mitigation                        |
| <b>Policy Units 18.1 to 18.18</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.  |   |   |   | Relocation of path (PU 18.1/18.5) |
| To minimise coastal flood and erosion risk to industrial, commercial, economic and tourism assets and activities.  |   |   |   |                                   |

Mitigation associated with the impacted features of the historic environment may include excavation and recording and monitoring of erosion rates.

**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 18 includes interest features of the Bae Cemlyn / Cemlyn Bay SAC, and the Ynys Feurig, Cemlyn Bay and The Skerries SPA.

***Implications for the integrity of the Site:***

*Bae Cemlyn/ Cemlyn Bay SAC: no adverse effect on the integrity of the SAC.*

*Ynys Feurig, Cemlyn Bay and The Skerries SPA: no adverse effect on the integrity of the SPA.*

**SUMMARY CONCLUSION FROM THE WATER FRAMEWORK ASSESSMENT**

| 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>Caernarfon Bay North (Coastal – C7)</b><br><br>(PDZ part 16, part 17 and part 18)<br>(MAN part 41, part 48, 49, part 50 and part 53) | N/A                           | ✓    | ✓    | ✓    | <b>No</b> - not necessary as delivery of the WFD Environmental Objectives will not be prevented by the SMP policies and in some cases will ensure they are of benefit. | <b>There were no relevant measures to the SMP2 for this water body.</b> | N/A  |
| <b>The Skerries (Coastal)</b><br><br>(PDZ part 18)<br>(MAN part 53)   | N/A                           | ✓    | ✓    | ✓    | <b>No</b> - not necessary as delivery of the WFD Environmental Objectives will not be prevented by the SMP policies and in some cases will ensure they are of benefit. | <b>There were no relevant measures to the SMP2 for this water body.</b> | N/A  |
| <b>Cemlyn Lagoon (Coastal)</b><br><br>(PDZ part 18)<br>(MAN part 53)  | N/A                           | ✓    | ✓    | ✓    | <b>No</b> - not necessary as delivery of the WFD Environmental Objectives will not be prevented by the SMP policies and in some cases will ensure they                 | <b>There were no relevant measures to the SMP2 for this water body.</b> | N/A  |

| 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 |                                 |   |  |
|                               |                               |      |      |      | are of benefit.                 |   |  |

|                                   |                   |
|-----------------------------------|-------------------|
| <b>Location reference:</b>        | <b>Cemaes Bay</b> |
| <b>Management Area reference:</b> | <b>M.A. 54</b>    |
| <b>Policy Development Zone:</b>   | <b>PDZ18</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 53 & 54**



|  |  |  |  |
|--|--|--|--|
| <p><b>Key</b></p> <ul style="list-style-type: none"> <li>100 Year Shoreline Position: <ul style="list-style-type: none"> <li>Preferred Policy would be the same as With Present Management (dashed line)</li> <li>With Present Management where this differs from the Preferred Policy (solid line)</li> <li>Preferred Policy where this differs from the With Present Management (dotted line)</li> </ul> </li> </ul> | <ul style="list-style-type: none"> <li>Ramsar (orange hatched)</li> <li>SAC (green hatched)</li> <li>SPA (blue hatched)</li> <li>SSSI (pink hatched)</li> <li>NNR (green solid)</li> </ul> | <ul style="list-style-type: none"> <li>Existing Indicative EA Flood Zone 3 (light blue)</li> <li>EA Flood Risk Zone 2 where under the SMP policy there would be increased probability of flooding (dotted blue)</li> </ul> |  |
|--|--|--|--|

I:\9T9001\Technical\_L\_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 sustain the village of Cemaes as an important community and amenity resource to the wider area. The aim of the plan would be to maintain existing defences over the short to medium term but to allow opportunity for some realignment to support future management as sea level rises. In particular this may require some realignment of the defence along Ffordd y Traeth, with the intent of reducing wave action along the frontage and to retain the ability to realign along the Traeth Mawr frontage to avoid loss of the beach.

Along other sections of the coastline there would be no active intervention.

### 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.

Continued defence and future adaption would require a collaborative funding approach, working with the operation of the harbour and developing from the amenity value of the area.

### ACTIONS:

| ACTION  | PARTNERS   |
|---|--|
| Shoreline monitoring                                      | <b>Ynys Mon Council</b>  |
| Adaption planning of the sea front                        | <b>Ynys Mon Council<br/>Community<br/>EA</b> <b>Highways<br/>Harbour Authority</b> |
| Assess in detail potential impact on historic environment |  |

## DELIVERY OF THE PLAN

### SUMMARY OF SPECIFIC POLICIES

| Policy Unit   |                       | Policy Plan |      |      | Comment  |
|---|-----------------------|-------------|------|------|--|
|   |                       | 2025        | 2055 | 2105 |  |
| 18.8  | Cemaes Bay west       | NAI         | NAI  | NAI  | .  |
| 18.9  | Ffordd y Traeth       | HTL         | HTL  | MR   | .Works undertaken during the short to medium term should maintain opportunity for realignment. |
| 18.10   | Cemaes Harbour        | HTL         | HTL  | HTL  | Important control, to the whole frontage.  |
| 18.11   | Traeth Mawr Promenade | HTL         | HTL  | MR   | Maintain opportunity for future adjustment of defence alignment.                               |
| 18.12   | Pig y Barcud Cliffs   | NAI         | NAI  | NAI  |  |
| Key: HTL - Hold the Line, NAI – No Active Intervention MR – Managed Realignment |                       |             |      |      |  |

| PREFERRED POLICY TO IMPLEMENT PLAN: |  |
|-------------------------------------|--|
| <b>From present day</b>             | Maintain existing defences.  |
| <b>Medium term</b>                  | Maintain existing defences. Develop realignment approach.<br>Develop funding plan. |
| <b>Long term</b>                    | Implement realignment approach.  |

## IMPLICATIONS OF THE PLAN

### CHANGES FROM PRESENT MANAGEMENT

No substantial change in policy.

### ECONOMIC SUMMARY

| Economics (£k PV)      | by 2025 | by 2055 | by 2105 | Total £k PV |
|------------------------|---------|---------|---------|-------------|
| NAI Damages            | 15.4    | 163.0   | 190.7   | 369.1       |
| Preferred Plan Damages | 8.6     | 14.7    | 31.1    | 54.5        |
| Benefits               | 6.8     | 148.3   | 159.6   | 314.6       |
| Costs                  | 3.4     | 222.9   | 255.7   | 482.0       |

### FLOOD AND EROSION RISK MANAGEMENT

#### POTENTIAL LOSS

There is likely to be loss of 1 property to the west of Cemaes and continued flood risk to properties along Ffordd y Traeth

#### BENEFITS OF THE PLAN

The plan provides a longer term sustainable approach to defence, maintaining defence to the core community areas. The plan would provide protection to some 10 properties within the village and would reduce flood risk to the highway and to some 7 properties over the long term.

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

| PDZ 18   |   |   |   |                                   |
|--|---|---|---|-----------------------------------|
| SEA Objective  | Impact of Preferred Policy for each Epoch |   |   |                                   |
|  | 1   | 2 | 3 | Mitigation                        |
| <b>Policy Units 18.1 to 18.18</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.  |   |   |   | Relocation of path (PU 18.1/18.5) |
| To minimise coastal flood and erosion risk to industrial, commercial, economic and tourism assets and activities.  |   |   |   |                                   |

Mitigation associated with the impacted features of the historic environment may include excavation and recording and monitoring of erosion rates.

**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 18 includes interest features of the Bae Cemlyn / Cemlyn Bay SAC, and the Ynys Feurig, Cemlyn Bay and The Skerries SPA.

***Implications for the integrity of the Site:***

*Bae Cemlyn/ Cemlyn Bay SAC: no adverse effect on the integrity of the SAC.*

*Ynys Feurig, Cemlyn Bay and The Skerries SPA: no adverse effect on the integrity of the SPA.*

**SUMMARY CONCLUSION FROM THE WATER FRAMEWORK ASSESSMENT**

| 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>Anglesey North (Coastal)</b><br><br>(PDZs part 18 and 19)<br>(MAN 54, 55, 56, 57 and 58) | N/A                           | <b>x</b><br>(PDZ 18) | <b>x</b><br>(PDZ 18) | <b>x</b><br>(PDZ 18) | <b>Yes</b> – Environmental Objectives WFD2, 3 and 4 may not be met because of the SMP policy in PDZ18 (MAN 55). | There were no relevant measures to the SMP2 for this water body. | N/A  |

|                                   |                           |
|-----------------------------------|---------------------------|
| <b>Location reference:</b>        | <b>Northeast Ynys Mon</b> |
| <b>Management Area reference:</b> | <b>M.A. 55</b>            |
| <b>Policy Development Zone:</b>   | PDZ18                     |

\* 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 55**

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



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| Key   |  |
|---|--|
| <span style="color: red;">—</span>  | 100 Year Shoreline Position:   |
| <span style="color: blue;">—</span>   | Preferred Policy would be the same as With Present Management                                    |
| <span style="color: orange;">—</span>   | With Present Management where this differs from the Preferred Policy                             |
| <span style="color: purple;">—</span>   | Preferred Policy where this differs from the With Present Management                             |
| <span style="border: 1px solid orange; display: inline-block; width: 15px; height: 10px;"></span>                             | Ramsar   |
| <span style="border: 1px solid green; display: inline-block; width: 15px; height: 10px;"></span>                              | SAC  |
| <span style="border: 1px solid blue; display: inline-block; width: 15px; height: 10px;"></span>                               | SPA  |
| <span style="border: 1px solid pink; display: inline-block; width: 15px; height: 10px;"></span>                               | SSSI   |
| <span style="border: 1px solid lightgreen; display: inline-block; width: 15px; height: 10px;"></span>                         | NNR  |
| <span style="background-color: lightblue; border: 1px solid blue; display: inline-block; width: 15px; height: 10px;"></span>  | Existing Indicative EA Flood Zone 3  |
| <span style="background-color: lightblue; border: 1px dashed blue; display: inline-block; width: 15px; height: 10px;"></span> | EA Flood Risk Zone 2 where under the SMP policy there would be increased probability of flooding |



## SUMMARY OF PREFERRED PLAN RECOMMENDATIONS AND JUSTIFICATION

### INTENT OF THE PLAN:

Much of the shoreline is natural with slowly eroding cliffs. The plan would maintain this general process. Management is focused on local areas.

The two main settlements are at Porth Llechog and Amlwch. At Porth Llechog, the aim of the plan would aim to support the village and maintain its important seafront area. With sea level rise this would mean maintaining the opportunity to realign the existing defence in epoch 3 to sustain the beach and the overall defence of the frontage.

At Amlwch, the aim would be to maintain defence to the port and associated development within this local area. The plan highlights the need to consider future increased wave overtopping and potential flooding in any plans to redevelop the old chemical works at Trwyn Costog. In addition, consideration would need to be given to potential risk of contamination due to flooding.

In other areas, the significance of the Porth Wen Brickworks are recognised as an important aspect of the historic landscape. The plan identifies the need for a management plan in terms of managing existing dilapidated defences.

At Porth Elian the intent of the plan would be to sustain the existing defences in the short term but for future management to look to realignment of the road.

### 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.

Justification for defence at Porth Wen would critically depend on the intent to maintain aspects of the historic feature.

At Port Llechog future defence may require collaborative funding through support to the highway and in terms of maintaining access to properties within the village.

### ACTIONS:

| ACTION   | PARTNERS  |
|--|---|
| Shoreline monitoring   | <b>Ynys Mon Council</b>                                       |
| Adaption planning at Porth Llechog   | <b>Ynys Mon Council</b><br><b>Communities</b> <b>Highways</b> |
| Assess in detail potential impact on historic environment with respect to Porth Wen Brickworks | <b>Ynys Mon Council</b>                                       |

## DELIVERY OF THE PLAN

### SUMMARY OF SPECIFIC POLICIES

| Policy Unit   |                              | Policy Plan |      |      | Comment  |
|---|------------------------------|-------------|------|------|--|
|   |                              | 2025        | 2055 | 2105 |  |
| 18.13   | Trwyn y Parc to Trwyn Cwmryd | NAI         | NAI  | NAI  | Overarching policy for whole area.   |
| 18.14   | Porth Wen Brickworks         | MR          | MR   | NAI  | Critically examine need for maintain defence to support key historic feature.                |
| 18.15   | Porth -Llechog               | HTL         | HTL  | MR   | Works undertaken during the short to medium term should maintain opportunity for realignment |
| 18.16   | Trwyn Costog                 | MR          | MR   | MR   | Develop a planning frame to minimise future need for defence.                                |
| 18.17   | Amlwch                       | HTL         | HTL  | HTL  |  |
| 18.18   | Porth Elian                  | HTL         | MR   | NAI  | Relocate road and necessary.   |
| Key: HTL - Hold the Line, , NAI – No Active Intervention MR – Managed Realignment |                              |             |      |      |  |

| PREFERRED POLICY TO IMPLEMENT PLAN: |   |
|-------------------------------------|---|
| <b>From present day</b>             | Maintain existing defences.   |
| <b>Medium term</b>                  | Maintain defences while moving towards adaptive management at Porth Llechog. Plan realignment at Porth Elian. |
| <b>Long term</b>                    | Maintain defences at Amlwch. Realignment at Porth Llechog and Port Elian.                                     |

## IMPLICATIONS OF THE PLAN

### CHANGES FROM PRESENT MANAGEMENT

There is a change in policy at Porth Elian to managed realignment and then No Active Intervention.

### ECONOMIC SUMMARY

| Economics (£k PV)      | by 2025 | by 2055 | by 2105 | Total £k PV |
|------------------------|---------|---------|---------|-------------|
| NAI Damages            | 18.0    | 264.7   | 219.4   | 502.1       |
| Preferred Plan Damages | 8.1     | 12.3    | 66.4    | 86.9        |
| Benefits               | 9.9     | 252.4   | 153.0   | 415.2       |
| Costs                  | 0.0     | 286.4   | 93.9    | 380.3       |

### FLOOD AND EROSION RISK MANAGEMENT

#### POTENTIAL LOSS

There would be the potential loss of 3 properties at Porth Llechog, subject to planned realignment.

#### BENEFITS OF THE PLAN

The plan provides a longer term sustainable approach to defence, maintaining defence to the core community areas. The plan would maintain defence or delay loss of some 17 properties due to erosion and would reduce flood risk to 5 properties.

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

**PDZ 18**

| SEA Objective  | Impact of Preferred Policy for each Epoch |   |   |                                   |
|--|---|---|---|-----------------------------------|
|  | 1   | 2 | 3 | Mitigation                        |
| <b>Policy Units 18.1 to 18.18</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.  |   |   |   | Relocation of path (PU 18.1/18.5) |
| To minimise coastal flood and erosion risk to industrial, commercial, economic and tourism assets and activities.  |   |   |   |                                   |

Mitigation associated with the impacted features of the historic environment may include excavation and recording and monitoring of erosion rates.

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**SUMMARY CONCLUSION FROM THE WATER FRAMEWORK ASSESSMENT**

| 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) |
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|   | WFD 1                         | WFD2                 | WFD3                 | WFD4                 |   |  |  |
| <b>Anglesey North (Coastal)</b><br><br>(PDZs part 18 and 19)<br>(MAN 54, 55, 56, 57 and 58) | N/A                           | <b>x</b><br>(PDZ 18) | <b>x</b><br>(PDZ 18) | <b>x</b><br>(PDZ 18) | <b>Yes</b> – Environmental Objectives WFD2, 3 and 4 may not be met because of the SMP policy in PDZ18 (MAN 55). | There were no relevant measures to the SMP2 for this water body. | N/A  |

| 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>Anglesey North (Coastal – C14)</b><br><br><b>PU18.16</b> (WFD 2, 3 & 4) | <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>The local council could undertake a study/strategy to investigate the re-development possibilities for the old chemical works and if not, Environment Agency Wales how to remedy the contamination issue by the use of innovative passive treatment technologies.</li> <li>Undertake environmental and chemical monitoring of the designated sites.</li> <li>Ensure the SMP2 policies and flood and erosion risks are accounted for in the next revisions of land use plans.</li> </ul> <p>There are no Natura 2000 sites or SSSIs adjacent to or within the vicinity of PU 17.15.</p> |