Cyfoeth Naturiol Cymru
Natural Resources Wales

Advice on Sustainable Management of Coastal Shingle Resources

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Report No 273

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1. Crynodeb Gweithredol

Mae ‘graean bras’ (shingle) yn derm anffurfiol am waddodion sy'n cynnwys gronynnau gan fwyf y cyfeirir atynt yn gyffredinol fel ‘cerigos’ a ‘chobls’, ond a allai hefyd gynnwys swm arwyddocaol o dywod a chlogfeini. Yng Nghymru, mae graean bras yn bwysig am sawl rheswm, yn cynnwys rheoli risg llifogydd ac erydu arfordirol (FCERM), cadwraeth geomorffolegol a daearegol, cadwraeth natur a hamdden. Mae graean bras llystyfiant o bwysigrwydd cadwraeth Ewropeaidd, dan risg o gyfuniad o ddatblygiad i ffin arfordirol, rheolaeth dwys o draethau a chynnydd yn lefel y môr (“gwasgfa arfordirol”). Mae graean bras llystyfiant yn fregus, ac yn hawdd i'w ddifrodi gyda symudiad cerbydau, pobl a’r gwaddod ei hun. Er bod yna hanes hir o ymyraethau FCERM ar draethau graean bras yn y Deyrnas Unedig, mae’r canllaw yn ymwneud â rheolaeth arfer gorau yn gyfyngedig iawn. Mae CNC wedi nodi angen i ddatblygu canllawiau gwell parthed gwaith ymyrraeth FCERM er mwyn diogelu buddiannau ehangach nodweddion graean bras yng Nghymru. Mae’r adroddiad hwn wedi ei baratoi i hysbysu datblygiad y canllaw hwn.

Mae tair tasg wedi eu cyflawni yn rhan o’r prosiect: (1) adolygiad o lenyddiaeth, tystiolaeth, canllawiau a gwybodaeth bresennol i sefydlu gwerth a rôl nodweddion graean bras a chynefinoedd wrth gyflawni FCERM yng Nghymru, yr ymyraethau FCERM a allai fod yn berthnasol i draethau graean bras, strwythurau a chynefinoedd, a’r risg o effeithiau negyddol ar nodweddion graean bras a chynefinoedd o ganlyniad i ymyraethau FCERM; (2) dethol pedwar astudiaeth achos mewn gwahanol leoliadau amgylcheddol ble mae ymyraethau FCERM wedi eu gweithredu; mae’r lleoliadau a ddewiswyd (Dinas Dinlle, Niwgwl, Aber Dysynni a Pontllyfni) yn arddangos gwahanol broblemau, gwahanol ymatebion rheoli hanesyddol, a gwahanol ddewisiadau ar gyfer y dyfodol; (3) nodi dulliau arfer gorau a fydd yn sicrhau rheolaeth gynaliadwy o gynefinoedd graean bras yng Nghymru yn y tymor canolig i hir, a’r gofynion ar gyfer casglu data arolwg gwaelodlin a monitro dilynol.

Yn rhan o'r astudiaeth bresennol, mae 403 o safleoedd graean bras wedi eu nodi ar arfordir Cymru, yn seiliedig ar asesiad o'r ffotograffiaeth o'r awyr mwyaf diweddar sydd ar gael, data LIDAR ac arolygon ar droed o’r tir. Rhestrir y safleoedd hyn a’u priodweddau yn Atodiad 1. Mae prif gorff yr adroddiad yn ystyried agweddau allweddol o raean bras y mae angen eu deall wrth ddatblygu strategaeth mesur graean bras FCERM priodol, yn cynnwys priodweddau gwaddodol, natur prosesau graean bras, tirffurfiau a llystyfiant, arwyddocâd FCERM graean bras, a dulliau rheoli sydd ar gael. Fe ystyrir pedwar enghraifft o astudiaethau achos, gan wneud argymhellion parthed rheolaeth arfer gorau graean bras.

Yn rhan o arfer gorau, dylid datblygu cynllun rheoli traeth (BMP) graean bras sy'n ceisio lleihau'r straen ar, a chynnydd gwytnwch cynefinoedd graean bras, atal colledion, difrod neu ddarniad cynefinoedd a rhywogaethau, a cheisio sicrhau gwerth a buddion yr amrywiaeth o wasanaethau ecosystem a ddarperir. Dylid cadw amhariad ar yr arwyneb i isafswm er mwyn galluogi i lystyfiant graean bras ddatblygu; mae ailbroffilio anaml o rannau uwch

traethau a chefnennau traethau yn annog sefydlogrwydd a chroniad gwaddod mân gwagleol sy'n ofynnol ar gyfer datblygiad llystyfiant graean bras.

Yn rhan o BMP, dylid monitro lefelau traethau yn rheolaidd i ragweld problemau a gofynion ymyrraeth cyn iddynt ddod yn broblemau mawr sydd angen gwaith argyfwng. Dylid cyflawni astudiaeth arolwg gwaelodlin geomorffolegol i hysbysu datblygiad y BMP ac unrhyw gynlluniau posibl, gydag asesiadau ailadrodd ar ysbeidiau o 5 mlynedd wedi eu hysbysu gan arolygiadau safle blynyddol a dadansoddiad o ddata monitro amgylcheddol. Dylai'r astudiaeth arolwg gwaelodlin geomorffolegol gynnwys adolygiad o lenyddiaeth gefndirol, archwiliad o fapiau hanesyddol, siartiau, ffotograffiaeth o'r awyr data LIDAR, arolwg topograffeg i'r ddaear a data arolwg gwaddod, asesiad o ddata prosesau arfordirol ac arolwg ar droed o'r safle. Os nad oes data arolwg tir neu o'r awyr diweddar ar gael, dylid comisiynu arolygon newydd i hysbysu'r asesiad, a chyn cyflawni unrhyw waith ymyrraeth FCERM. Yn ogystal, dylid cyflawni arolwg gwaelodlin gan ailadrodd monitro ar ysbeidiau yn ddibynnol ar bwysigrwydd a sensitifrwydd cadwraeth y safle.

2. Executive Summary

‘Shingle’ is an informal term for sediments which consist predominantly of particles which are commonly referred to as ‘pebbles’ and ‘cobbles’, but which may also contain significant amounts of sand and boulders. Coastal shingle in Wales is important from several standpoints, including flood and coastal erosion risk management (FCERM), geomorphological and geological conservation, nature conservation, and recreation.Vegetated shingle is of European conservation importance, at risk from a combination of development of the coastal margin, intensive beach management and sea level rise (“coastal squeeze”). Shingle vegetation is fragile, and easily damaged by the movements of vehicles, people, and the sediment itself. Although there is a long history of FCERM interventions on shingle beaches in the UK, there is only limited guidance relating to best practice management. NRW have identified a need to develop better guidance relating to FCERM intervention works in order to protect the wider interests of shingle features in Wales. This report has been prepared to inform the development of this guidance.

Three tasks have been undertaken as part of the project: (1) a review of existing literature, evidence, guidance and information to establish the value and role of shingle features and habitats in delivering FCERM in Wales, the FCERM interventions potentially applicable to shingle beaches, structures and habitats, and the risk of negative impacts on shingle features and habitats as a result of FCERM interventions; (2) selection of four case studies in different environmental settings where FCERM interventions are applied; the locations chosen (Dinas Dinlle, Newgale, Aber Dysinni and Pontllyfini) illustrate different issues, different historical management responses, and differing future options; (3) identification of best practice approaches which will secure the sustainable management of shingle habitats in Wales over the medium to long term, and the requirements for baseline data collection and subsequent monitoring.

As part of the present study 403 shingle sites have been identified on the Welsh coast, based on an assessment of the most recent available aerial photography, LIDAR data and ground walkover surveys. These sites and their attributes are listed in Appendix 1. The main body of the report considers the key aspects of shingle which need to be understood in developing an appropriate FCERM shingle management strategy, including sedimentary properties, the nature of shingle processes, landforms, and vegetation, the FCERM significance of shingle, and available management methods. Four case study examples are considered, and recommendations made relating to best practice shingle management.

As part of best practice, a shingle beach management plan (BMP) should be developed which seeks to reduce the stress on, and increase the resilience of, shingle habitats, prevent loss, damage or fragmentation of habitats and species, and seek to secure the value and benefits of the range of ecosystem services provided.Surface disturbance should be kept to a minimum in order to allow shingle vegetation to develop; infrequent re-profiling of the upper parts of

beaches and beach ridges encourages stability and the build-up of interstitial fine sediment required for shingle vegetation development.

As part of the BMP regular monitoring of beach levels should be undertaken to anticipate problems and intervention requirements before they become major issues which require emergency works. An adequate geomorphological baseline study should be undertaken to inform the development of the BMP and any potential schemes, with repeat assessments at intervals of 5 years informed by annual site inspections and analysis of environmental monitoring data. The geomorphological baseline study should include a review of background literature, examination of historical maps, charts, aerial photography, LIDAR data, ground topographic survey and sediment survey data, assessment of coastal processes data, and a site walkover survey. If no recent ground or aerial survey data are available, new surveys should be commissioned to inform the assessment, and prior to any FCERM intervention works being undertaken. In addition, an ecological baseline survey should be undertaken with repeat monitoring at intervals depending on the conservation importance and sensitivity of the site.

3. Background: scope and purpose

3.1. The nature of shingle and the need for further guidance

'Shingle' is an informal term for sediments which consist predominantly of particles (or 'clasts') which are commonly referred to as 'pebbles' and 'cobbles', but which may also contain significant amounts of sand and boulders. Coastal shingle beaches and beach ridges in Wales are important from several standpoints, including flood and coastal erosion risk management (FCERM), geomorphological and geological conservation, nature conservation, and recreation. In the past, shingle was also extensively exploited as a resource for construction purposes, although this is no longer the case. Shingle can form a variety of geomorphological features, including intertidal bars, spits, storm beach ridges, beach ridge plains and forelands. These features provide habitats which often support specialist flora and fauna and which are of very restricted extent in Wales, and within Europe more generally. A large proportion of the shingle resource which originally existed on the Welsh coast has been destroyed or damaged by gravel extraction, coastal defence works and urban development, and hence there is a need to ensure that what remains is managed in a way which can maintain, and where possible enhance, the geomorphological and nature conservation interests. FCERM interventions such as beach re-profiling, re-cycling, channel clearance and construction of hard defences can potentially have damaging impacts on shingle features and habitats by destroying natural forms, interfering with natural processes and disturbing shingle surfaces to the detriment of vegetation and fauna. Over time, these changes may lead to habitat fragmentation or loss, and impact directly on species.

Vegetated shingle is recognized as being of European conservation importance, at risk from a combination of development of the coastal margin, intensive beach management and sea level rise ("coastal squeeze"). Sneddon & Randall (1993b) estimated the total area of vegetated shingle in Wales to be less than 100 ha. Vegetated shingle is also a rare habitat in Europe as a whole (Doody 2001a,b). Two shingle vegetation communities, *Annual vegetation of drift lines* and *Perennial vegetation of stony banks*, are designated under Annex 1 of the European Habitats Directive, and Coastal Vegetated Shingle is a UK Biodiversity Action Plan (BAP) priority habitat (Maddock, 2008).

Shingle vegetation is fragile, and easily damaged by the movements of vehicles, people, and the sediment itself. Projected increases in the rate of sea level rise, and potentially the frequency and magnitude of storms, suggest that the pressures on shingle beaches and beach ridges are likely to increase in the near future as a result of direct erosion and, in many areas, more intense beach management and/or hard coastal engineering interventions.

Although there is a long history of FCERM interventions on shingle beaches in England and Wales, there is only limited guidance relating to best practice management. Some guidance on shingle beach management for FCERM purposes was provided in the first edition of the Beach Management Manual (Simm et al., 1996), but this gave little attention to geomorphological and

nature conservation aspects. A scoping study to determine guidance needs for barrier beaches (including sand, shingle and mixed sand - shingle beaches) was undertaken by Stripling et al. (2008) on behalf of the Environment Agency (EA). These authors noted (p. iii) that “at present there is scant guidance available which enables a balance between intervention and natural heritage interests to be achieved, and coastal managers are sometimes left to struggle through on a trial and error basis when seeking solutions”, and that “part of the reason for the lack of management guidelines for barrier beaches is our relatively poor understanding of the processes driving their short-term morphology and long-term evolution”. The report reviewed the literature relating to barrier beach processes and morphological change, methods of predicting barrier overtopping, and management methods, and recommended further research to underpin a Best Practice Guide. A catalogue of barrier beaches in England and Wales was made available through a website, which is no longer maintained. No major national follow-up study was commissioned following this report, although a number of more locally-focused projects were undertaken by individual EA regions (e.g. Dornbusch & Cargo, 2011), and advice on a broader approach to shingle beach management was included in in the second edition of the Beach Management Manual (Rogers et al., 2010).

The damaging UK winter storms of 2013-14 and 2015-16 brought the issue of shingle and mixed sand-shingle beach management back into sharp focus, particularly in southwest England and Wales. Emergency works, including shingle beach / ridge re-profiling and importation of shingle or rock from alongshore or external sources were necessary at many locations on the Welsh coast. Following these events, NRW identified a need to develop better guidance relating to FCERM intervention works in order to protect the wider interests of shingle features in Wales. This report has been prepared to inform the development of this guidance.

3.2. Work undertaken

Three tasks have been undertaken as part of the study:

(1) a review of existing literature, evidence, guidance and information to establish:
- the value and role of shingle features and habitats in delivering FCERM in Wales
- the FCERM interventions potentially applicable to shingle beaches, structures and habitats
- the risk of negative impacts on shingle features and habitats as a result of FCERM interventions

(2) selection of four case studies in different environmental settings where FCERM interventions are applied; the locations chosen illustrate different issues, different historical management responses, and differing future options:

- Dinas Dinlle and Morfa Dinlle – the impact of hard engineering structures on shingle transport and maintained shingle bank flood defences down-drift
- Newgale – the challenges posed by shingle ridge roll-back towards significant coastal infrastructure, requiring consideration of asset relocation and habitat creation through coastal adaptation
- Aber Dysynni – the effect of alongshore drift of shingle on maintenance of land drainage and tidal exchange in a significant estuary (the Dysynni), historically controlled by construction of a terminal groyne, training walls and more recently by dredging and sediment by-passing
- Pontllyfini to Dinas Dinlle – where a combination of alongshore drift and barrier rollover presents long term challenges for the maintenance of land drainage and traditional agricultural practices in the coastal plain, but also offers opportunities for the re-creation of dynamic coastal landforms and a range of coastal habitats.

(3) identification of best practice approaches which will secure the sustainable management of shingle habitats in Wales over the medium to long term, taking account of sustainable management of natural resources principles, the steps necessary to determine the most sustainable FCERM approach in any given area, requirements for baseline data collection and subsequent monitoring and data assessment.

As part of the present study a new assessment of shingle features on the Welsh coast, including their FCERM significance, has been undertaken using 2009-2017 aerial photography, 1: 10 000 and 1: 25 000 Scale Ordnance Survey maps, British Geological Survey 1: 50 000 scale geological maps, LiDAR survey data relating to the period 2003 – 2017, discussions with selected coastal managers and site visits to selected locations. An expanded list of shingle localities in Wales has been developed which includes a total of 403 sites whose distribution is shown in Figure 1. A list of the largest twenty sites in terms of extent of bare and/or vegetated shingle is presented in Table 1. The largest areas of shingle are found at East Aberthaw, Borth and Aber Dysynni. In terms of area none of the Welsh sites approach the major shingle formations found in England such as Dungeness (1742ha), Orfordness (412ha), Chesil Beach (321ha) and Rye (234 ha), based on areal extents for the English sites reported by Murdoch et al. (2009). Nevertheless, as discussed later in this report, a number of Welsh sites are important in terms of the combination of functions which they serve.

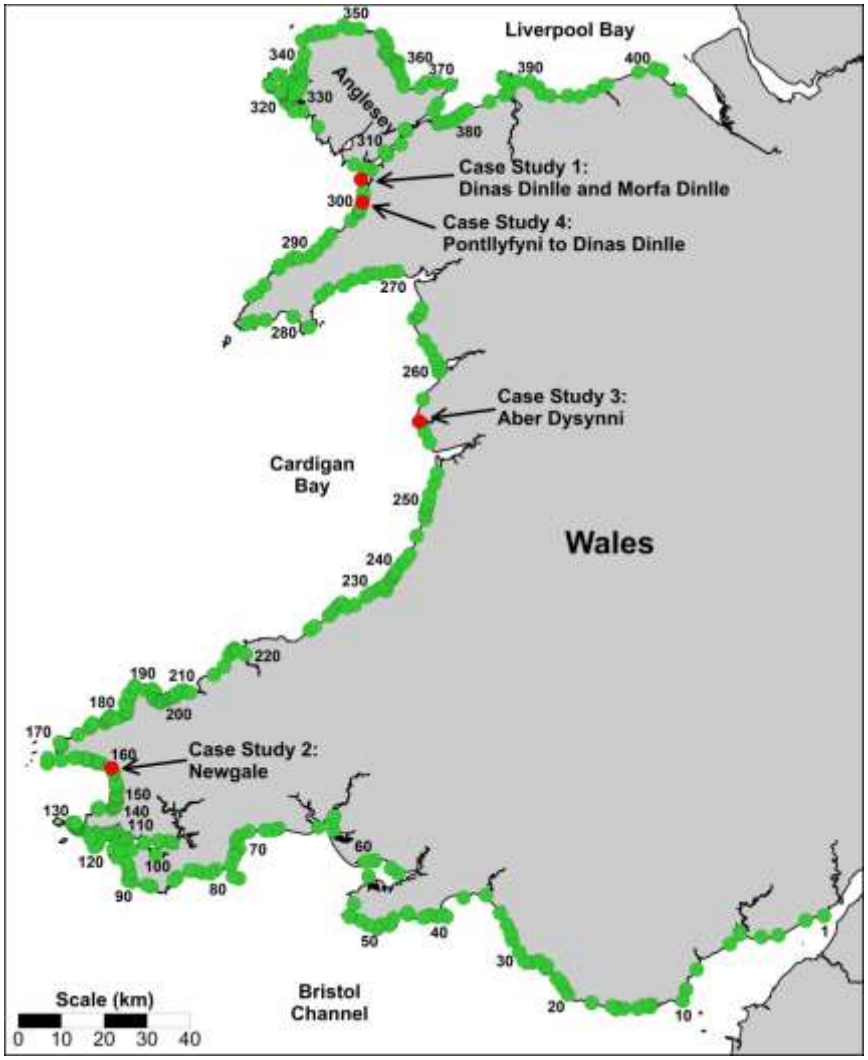


Figure 1 Distribution of the shingle sites identified in this study

Table 1 The twenty largest accumulations of Welsh coastal shingle by area

Site Number	Site	SMP2 Policy Development Zone	Morphological Type of shingle accumulation	Bare shingle area (ha)	Vegetated shingle area (ha)
13	Pebble Beach, Barry	The Knap to Watch House Beach	Barrier	8.63	0.18
14	Porthkerry	The Knap to Watch House Beach	Barrier	6.79	0.46
16	Watch House Beach, East Aberthaw	The Knap to Watch House Beach	Barrier Beach / Spit	38.25	0.73
42	Pwlldu Bay	Mumbles Head to Worms Head	Barrier Beach	3.16	0.94
44	Pennard Burrows	Mumbles Head to Worms Head	Barrier Beach	0.58	0.22
68	Amroth Beach	Dolwen Point to Giltar Point	Fringing	3.28	0.02
119	Pickleridge Beach	Little Castle Head - St Anns Head	Barrier Beach Spit	1.98	4.70
157	Newgale Sands:Sibbernock-Newgale	St Bride's Bay	Barrier Beach	4.16	0.03
184	Aber Mawr	St David's to Strumble Head	Barrier Beach	1.03	0.00
220	Pen yr Ergyd	The Teifi	Barrier Spit	0.84	0.25
233	Aberaeron to Aberarth	Aberaeron Plateau	Fringing	4.09	0.00
246	Traeth Tanybwlch, Aberystwyth	Aberystwyth	Barrier Beach/Spit	7.07	3.44
253	Borth	Dyfi	Barrier Spit	14.94	20.33
256	Tywyn to Aber Dysynni	Dyfi	Barrier Spit	8.30	24.06
262	Barmouth to Llanaber	Barmouth and the Mawddach	Fringing	2.63	0.00
269	Graig Ddu to Criccieth	Coastal Snowdonia	Barrier Beach	7.26	3.43
271	Afon Dwyfor	Coastal Snowdonia	Barrier Spit	9.05	12.37
275	Pen-ychain to Pwllheli	The South Llyn Bays	Barrier Beach	6.73	5.87
280	Porth Neigwl	Trwyn Cilan to Carreg Ddu	Fringing	10.19	0.00
297	Aberdesach	north Llyn	Barrier Beach/Spit	1.16	0.42
301	Pontllyfni to Ynys	Menai Strait	Barrier Beach/Spit	4.41	4.66
304	Morfa Dinlle	Menai Strait	Barrier Spit	14.61	11.89
346	Cemlyn Bay, Anglesey	north Anglesey	Barrier Beach	3.78	1.86
355	Dulas Bay, Anglesey	East Bays	Barrier Spit	0.35	0.02
368	Porthllongdy Spit	East Bays	Spit	0.70	0.16
396	Pensarn	Little Orme to Clwyd Estuary	Beach Ridge Plain	12.7	6.73
400	Barkby Beach to Gronant	Clwyd Estuary to Point of Ayr	Barrier Beach / Spit	6.19	0.60

The following information for each site is summarised in Appendix 1:

- location co-ordinates
- environmental setting
- morphological type
- nature of the back-beach
- management intervention methods / structures present
- main sediment type on the upper beach
- main sediment type on the lower beach
- area of bare shingle mapped from the most recent available aerial photographs
- area of vegetated shingle mapped from the most recent available aerial photographs
- conservation designations
- SMP2 management policy
- importance of the site for FCERM (both coastal erosion / coastal flooding risk and inland (river) flooding
- importance for natural habitats and nature conservation
- importance as geomorphological features
- importance for historical and archaeological conservation
- importance for recreation
- importance in terms of economic or military use

The extent of bare shingle and vegetated shingle was estimated using the most recently available aerial photographs of each area and GIS software. The aerial extent values obtained provide only a snap-shot for the time the photography was acquired, and in some areas there is uncertainty due to variability in the proportions of sand and shingle present, but they do provide a useful indicator of the relative variation in shingle extent between sites.

3.3. Report structure

The remainder of the report is divided into sections which consider the key attributes of shingle and shingle features which need to be understood and taken into account in developing an appropriate shingle management strategy for FCERM which also takes into account other shingle interests. Section four examines the sedimentary properties of shingle. A review of shingle processes and landform features is provided in Section 5, while the nature of shingle vegetation and other conservation interests is summarised in Section 6. The FCERM significance of shingle in Wales is considered in Section 7 and available methods for the management of shingle for FCERM purposes are reviewed in Section 8. Section 9 presents the four case study examples and Section 10 presents conclusions and recommendations regarding best practice for shingle management in Wales. A series of tables listing the attributes of each shingle site is presented in Appendix 1.

4. The sedimentary properties of shingle

4.1. Particle size

Many engineers have used an upper size limit for shingle of 200 mm, which corresponds with the upper size limit of medium gravel in the British Standard Classification of Soils for Civil Engineering Purposes (BS:1377 Part 2, 1990).This size scheme uses a particle size scale based on the numbers 2 and 6 which was originally proposed by the Swedish chemist and agricultural scientist A.M. Atterberg (1905), and which has since been widely adopted by geotechnical engineers across the world (Figure 2). However, most earth scientists have used an alternative size classification scheme based on size intervals of root 2, developed by the American geologists J.A. Udden (1914) and C.K. Wentworth (1922). By reference to the most recent variant of this scheme (Pye & Blott 2012), 'shingle' is defined here as ranging in size between 2 mm (the lower size limit of very fine gravel) and 256 mm (the upper size limit of small boulders; Figure 2).

Some shingle deposits consist almost entirely of gravel size material (Figure 3a), but many contain significant proportions of sand and/or larger boulders (Figure 3b)**.** Such 'mixed' sediments can be classified in terms of the proportions of gravel plus boulders, sand and mud, and described as 'shingle', 'sandy shingle', muddy shingle' etc. (Figure 4). Sediments composed predominantly of sediment particles (clasts) of any size larger than sand (>2 mm) are sometimes referred to as 'coarse clastic' (Orford & Carter, 1984, 1993).

The size distribution of shingle, like any other sediment, can be summarised using a number of quantitative measures. The median, or D50, size is often used in engineering literature as a measure of 'average' size, but this has little meaning in the context of markedly bimodal sediments such as that shown in Figure 3b. For this reason, the modal size (M1) or sizes (M1, M2, M3 etc) are more useful parameters to characterize the different grain populations present in bimodal or polymodal sediments. Measures of the range of sizes present, sometimes referred to as 'sorting', can be provided by the difference between selected percentiles of the distribution (e.g. D90- D10 or D75- D25), or by calculated statistical measures such as the second moment of the distribution or the 'phi sorting' measure of Folk & Ward (1957). A range of such summary statistics can be easily calculated using computer programmes such as GRADISTAT (Blott & Pye, 2001)

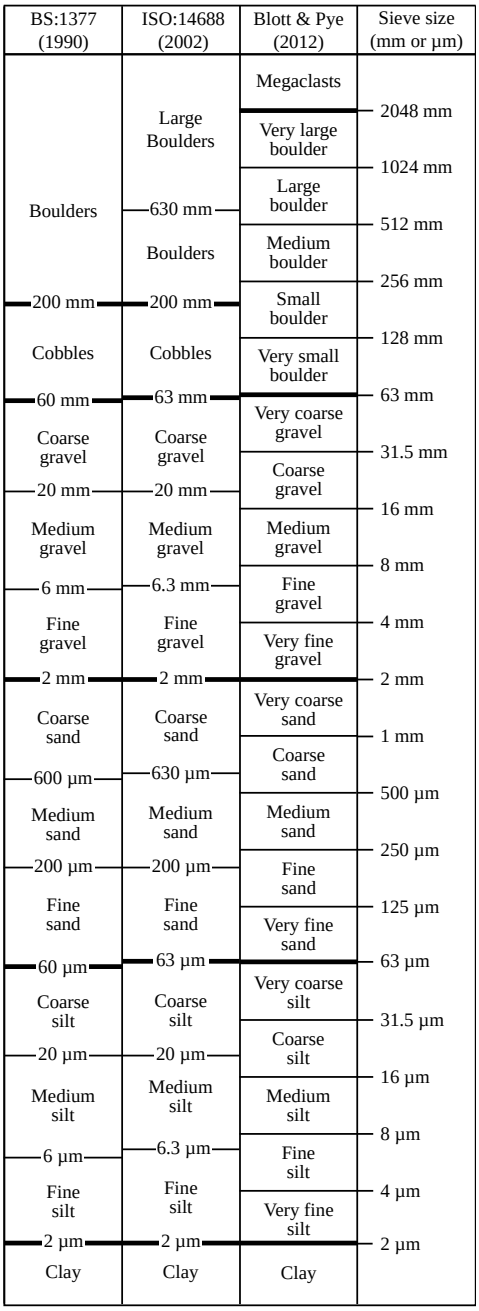
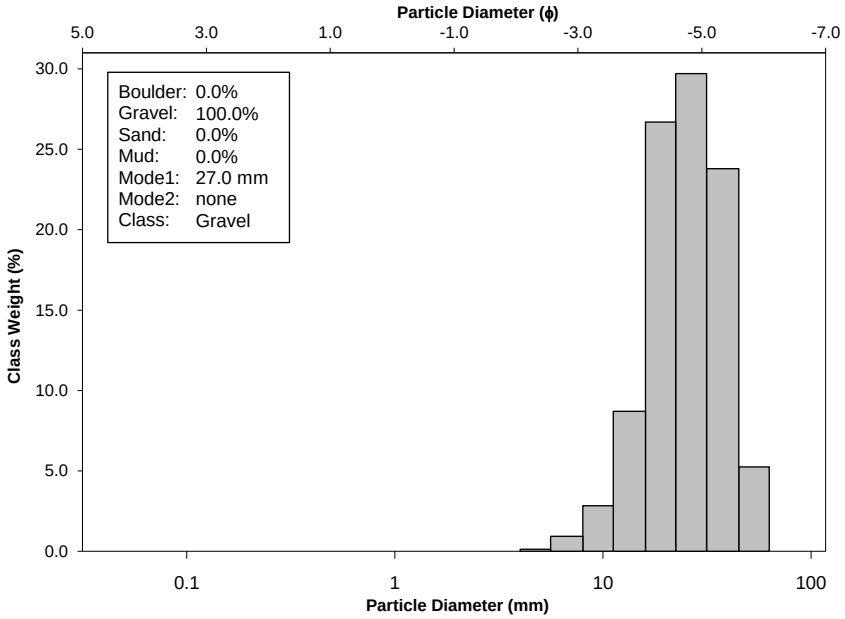


Figure 2 Particle size class terminology proposed by Blott & Pye (2012), based on a modification of Wentworth's (1922) grade scale, compared with that used BS:1377-2 1990 (BSI 1990) and ISO:14688-1 2002 (ISO 2002)

(a) Glanllynnau upper beach (Site 272)



(b) Afon Wen upper beach (Site 273)

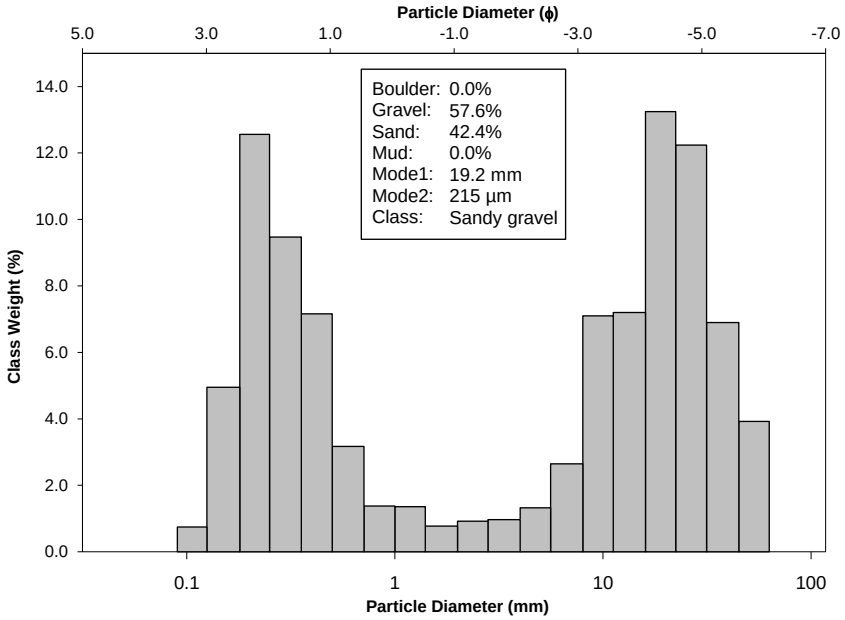


Figure 3 Example particle size frequency histograms for samples of (a) clean upper beach shingle sediment from Glanllynnau), and (b) bimodal mixed sand-shingle sediment from Afon Wen, Gwynedd

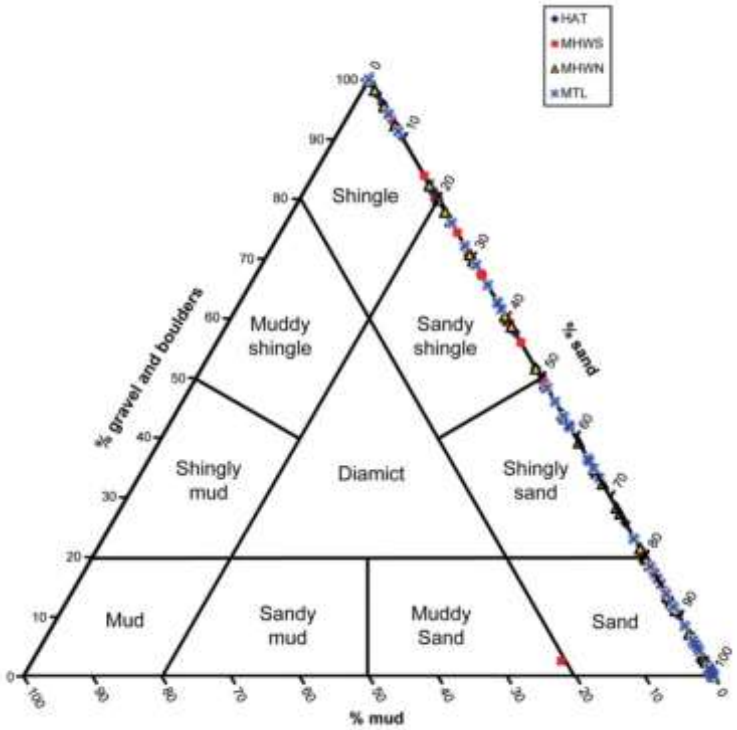


Figure 4 Example of a particle size ternary diagram, defined by the percentages of shingle (gravel and small boulders , 2 – 256 mm), sand (0.063 to 2 mm) and mud (<0.063 mm) in 256 beach samples collected by Gwynned Council Coast Protection Department from beaches between Aberdovey and Morfa Dinlle in 2010-2011

Shingle deposits commonly display a high degree of variation in particle size with depth, across-shore, and alongshore (Figure 5). Active shingle beaches often show considerable variation in particle size over time, reflecting fluctuations in wave and tide conditions. For these reasons, it is important that sediment samples taken for beach characterization purposes are sufficiently large in size and number, and taken on a number of different occasions. In strategic sediment monitoring programmes whose purpose is to identify potential change over a number of years, samples should be taken at several positions along a number of cross-shore profiles at defined intervals, ranging from 6 months to 5 years depending on the rate of expected change). The minimum size of sample required depends on sediment size, and recommended minimum values are provided in BS1377 (BSI, 1990). For sampling of shingle beaches a standard sample size of approximately 25 kg has often been specified for coastal monitoring purposes. However, where beaches contain a high proportion of large cobbles and boulders meaningful sampling for laboratory analysis is impractical and estimates of clast size distributions can usually only be obtained by direct measurement in the field or from unmanned aerial vehicle (UAV) photographs.

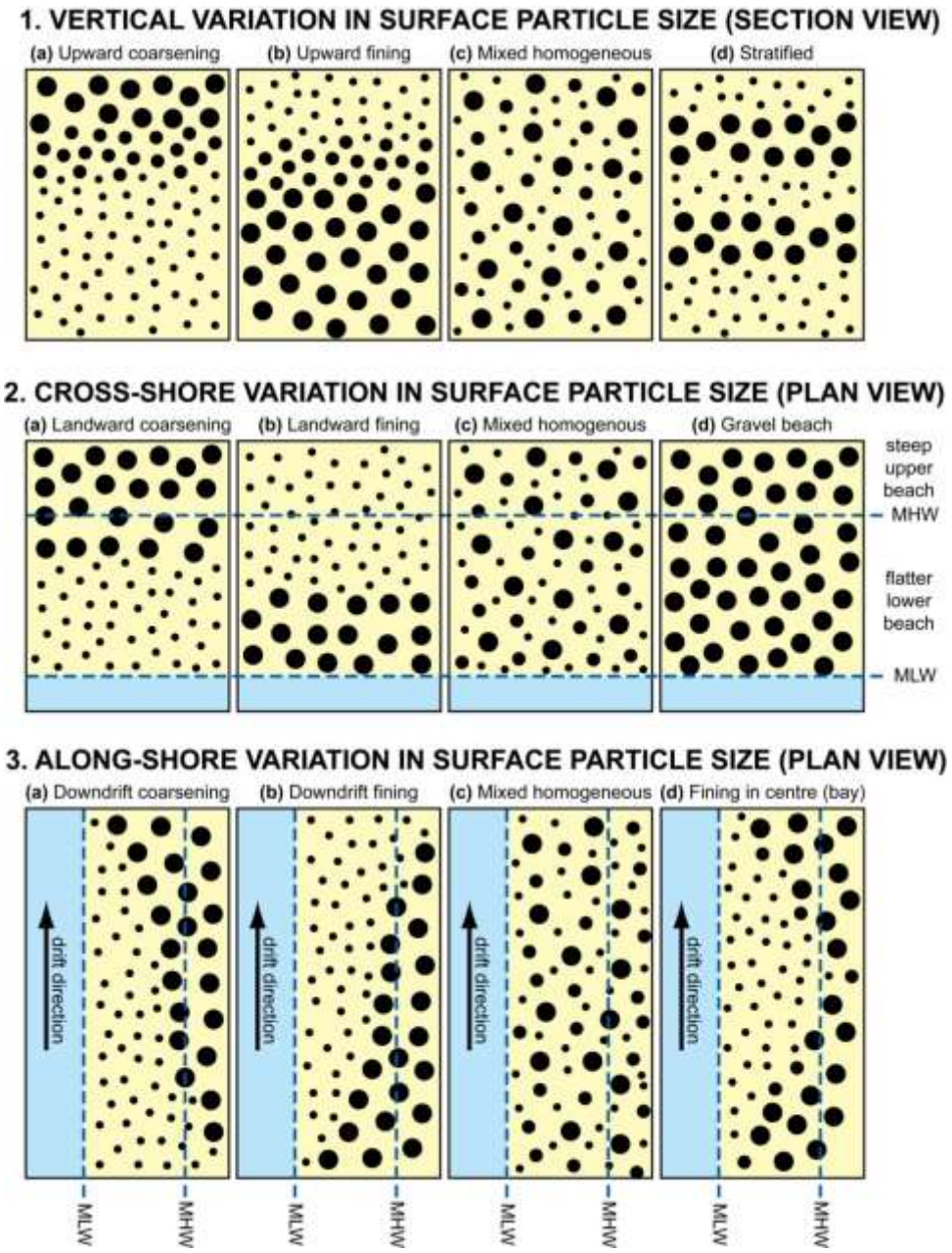


Figure 5 Schematic diagram showing patterns of variation in particle size potentially found on shingle beaches: (1) vertically; (2) cross-shore; and (3) along-shore.

4.2. Particle shape

The term ‘shape’ includes a number of different attributes of the three-dimensional geometry of a sediment clast or other object, including form, roundness and surface texture (Blott &Pye, 2008). ‘Form’ relates to the degree of equi-dimensionally of the clast, ‘roundness’ relates to the sharpness of corners and edges, and ‘surface texture’ relates to the degree of roughness or smoothness of the particle surface. Shingle clasts vary widely in shape, reflecting differences in their lithological composition, hardness and transport history. The broad-scale form (elongation and flatness) of shingle clasts is determined largely by the nature of the rocks from which the clasts were

derived, including bed thickness, fissility and degree of jointing. The degree of roundness and surface textural characteristics (roughness or smoothness is determined partly by the method of clast formation, partly the material hardness, and partly by the degree of abrasion experienced during transport. Clasts which have experienced only a short period of water-borne transport are commonly angular or sub-angular, while clasts which have previously experienced length periods of fluvial or fluvio-glacial transport, or which have been exposed to wave action for a long period in the surf zone, are often relatively well rounded. Clasts composed of limestone, sandstone and slate become rounded much more quickly than granite or gneiss. Cross-shore zonation in particle shape, as well as size, is often seen on shingle beaches, but although both cross-shore and alongshore patterns can show significant change over time due to fluctuations in wave, tide and current conditions (Bluck, 1967, 1999; Orford, 1975; Williams & Caldwell, 1988).

Hard, dense materials such as flint, chert, vein quartz, granite and greywacke usually develop smoothly polished surfaces as a result of abrasion, whereas softer materials such as limestone, Chalk and un-metamorphosed sandstone usually have rougher surface textures.

Particle shape, in addition to size, can have a significant influence on the mechanism and rate of clast movement when exposed to wave and current influence. In general, equi-dimensional, well-rounded and smooth surface clasts are moved more readily by fluid motion than non-equidimensional, angular and rough-textured clasts.

4.3. Sources and lithological composition of shingle

The main sources of coastal shingle in Wales include:

- Glacial till exposed in coastal cliffs, the intertidal zone or on the sea bed
- Rocky coastal cliffs and shore platforms
- Relict coastal and/or marine shingle accumulations
- Biogenic production (shells, fragments of Sabellaria reef etc)
- Quarry and mine waste
- Rip-rap and rubble placed as ad-hoc shore protection
- Degraded concrete sea defences
- River-transported sediment from the hinterland
- Imported shingle and cobble from inland quarry sources used for beach nourishment
- Imported shingle and sand from offshore sources used for beach nourishment

Wave reworking of glacial deposits is an important source of shingle on the coasts of North Wales, Anglesey, Cardigan Bay and Pembrokeshire. Often the gravel and boulders from such sources show a wide range of lithological types, including igneous, metamorphic and sedimentary rocks representing distant as well as local sources (e.g. Figure 6). The clasts are often angular or sub-angular unless they have experienced significant exposure to wave action and associated abrasion (Figure 7).

Figure 6 Compositionally heterogeneous mixture of cobbles and pebbles sourced primarily from glacial till cliffs, Hen Borth, Anglesey

Figure 7 Upper beach formed of sub-angular cobbles and pebbles derived mainly by wave reworking of local glacial moraine deposits exposed in the intertidal zone, north end of Whiteford Sands, Gower

Where reworking of glacial deposits has not provided an important source of material, shingle beaches usually contain a narrower range of lithological types

which reflect geological exposures in nearby cliffs, intertidal rock platforms, up-drift sedimentary formations or neighbouring river catchments. For example, many of the shingle beaches in Cardigan Bay around Aberystwyth consist largely of clasts of local Silurian greywacke (Figure 8), while the shingle beaches on the North Wales coast around Llandudno and Conwy contain a high proportion of locally derived Carboniferous limestone clasts.

Figure 8 Rounded clasts of hard Silurian greywacke and vein quartz at Borth, Ceredigion, derived mainly from the cliffs around Aberystwyth. Note also the rounded clast of concrete in the right-centre of the photograph

In some localities, including Pwlldu Bay, Morfa Conwy and around Llanelli, tipping of quarry waste, industrial slag, and degraded sea defence structures have provided significant local sources of shingle (Figure 9 & Figure 10). Elsewhere, angular quarried rock has been placed on the beach specifically for FCERM purposes (Figure 11).

Figure 9 A barrier beach / barrier spit complex formed substantially of limestone quarry waste, Pwlldu Bay, Gower

Figure 10 Fringing shingle upper beach composed of reworked slag, brick and concrete, east of Burry Port

Figure 11 Angular rock (mainly limestone with some sandstone) placed for FCERM purposes at Llanfairfechan, North Wales

Gravel-sized clasts of recent biogenic origin (bioclasts) are found on many shingle beaches in Wales but usually represent only a small percentage of the total material. Accumulations of intact and broken shells are found fairly frequently on the upper parts of shingle and mixed beaches, especially after storms, but ‘chenier’ ridges composed largely of shell, of the type found in parts of southeast and southern England (e.g. Richards & Pye, 2001), have not been reported from Wales.

Much of the shingle now found on the Welsh coast, as in other parts of the UK, was moved landwards from the nearshore sea bed by wave action during early to mid-Holocene marine transgression. The process of landward migration of shingle beaches and barriers continues today, in response to storms and rising sea level, but at a slower pace than in the past. Many of the available offshore sources of shingle have now been exhausted, and the natural rate of new sediment supply to most shingle beaches and barriers is low. A few exceptions are found close to sections of rapidly eroding cliffs.

5. Shingle processes and landforms

5.1. Movement of shingle by waves and currents

In most areas around the Welsh and English coast, tidal current speeds close to the sea bed are not sufficiently strong on their own to move clasts larger than very fine gravel (although there are local exceptions where unusually high current velocities occur), and most shingle transport is accomplished by waves and combined wave / current action. The natural forward motion of swell waves and low amplitude storm waves, which have a relatively low height to wavelength ratio (low steepness) tends to move shingle towards the shore, provided the water depth is sufficiently shallow for waves to touch bottom. In the beach surf zone, forward wave motion under non-storm conditions is often capable of moving both gravel and sand towards the shore, but off-shore directed return currents (backwash) are capable only of moving finer particles, leading to a concentration of shingle around the high water mark. However, during severe storms, when nearshore waves typically have greater height and steepness, shingle can be combed down the beach-face and moved offshore where it accumulates as nearshore bars or shingle spreads. Unless the sediment is moved far enough offshore to lie below the fair weather wave base, or is moved alongshore and out of the system, shingle eroded from a beach during storms is gradually moved back onto the beach by swell waves and minor storm waves.

Shingle beaches are typically highly dynamic, and both the beach form and distribution of different clast sizes can change quickly in response to forcing processes. In high energy coastal settings, medium boulders, large boulders and even very large boulders may be moved by wave action. During the motion of mixed sediment sizes, larger particles show a tendency to move towards the surface while finer particles show a tendency to move downwards, leading to a coarsening –upwards pattern of grain sizes. As the coarse particles on the surface are more exposed to fluid forces, under some circumstances they may travel laterally at a faster rate than the underlying finer sediments, a process known as ‘overpassing’ (Isla, 1993).

5.2. Swash and drift aligned beaches

Shingle beaches are sometimes defined as being ‘drift aligned’ or ‘swash aligned’. Drift-aligned beaches are relatively straight and are characterised by high rates of alongshore sediment transport, driven by wave crests approaching obliquely to the shore, and in favourable situations fed by a supply of shingle at the up-drift end a sediment transport cell. Alongshore variations in wave energy conditions and local coastal orientation can cause variations in the alongshore transport rate, leading to crenulations in the plan form of the beach. Areas where the alongshore sediment transport rate slows significantly are likely to see accumulation of sediment, forming local sections of wider beach, progradational beach ridge plain or even a cuspate foreland (‘ness’). By contrast, areas with locally enhanced sediment transport rate are

likely to see beach narrowing and erosion of shingle ridges, dunes or cliffs behind the beach, sometimes forming a shallow bay.

Swash-aligned beaches can be relatively straight where the dominant wave approach direction is almost perpendicular to the shore, but more commonly they have an embayed plan form, flanked by headlands, which is in quasi-equilibrium with the crests of breaking waves approaching the shore. Periodic (e.g. seasonal) changes in wave approach direction may cause temporary movement of sediment from one end of the embayment to the other, but net rates of alongshore sediment transport in any direction are low, especially where the flanking headlands effectively form a closed sediment 'compartment'. In situations where the supply of sediment to a length of coast is reduced e.g. through natural exhaustion or construction of coast protection or harbour entrance works, an initially drift-aligned shore may break down into a series of self-contained swash-aligned embayments (Pethick *et al*., 2003).

5.3. Types of coastal shingle accumulation

5.3.1. Cross-shore distribution of shingle

Coastal shingle accumulations can be divided into a number of types depending on their environmental setting:

- Subtidal accumulations
- Intertidal accumulations
- Supratidal accumulations

Subtidal accumulations may represent relict or partially reworked river, fluvio-glacial or beach deposits, formed at a time of lower sea level during the Quaternary. Reworking of material from such sources, and from glacial till exposed on the sea floor and in coastal cliffs, has in some areas led to the formation of subtidal and intertidal shingle banks and shingle lag deposit formed when waves and currents selectively remove sand and mud. Such lag deposits may form thin sheets over wide areas of the sea bed or form channel infill deposits.

Intertidal shingle deposits may take the form of mobile gravel bars, mega-ripples, gravel dunes and gravel sheets, or immobile (sometimes cemented) lag deposits (e.g. Figure 7 & Figure 12). The latter are most commonly found on the mid or lower parts of the foreshore (the zone between the mean low water mark and the mean high water mark). Many such deposits are formed as lags during the process of landward barrier recession. In some instances the exposed mid or lower foreshore gravel is continuous with the upper beach shingle berm but is buried by a relatively thin veneer of mobile sand.

Figure 12 Mid-foreshore lag deposit composed of infrequently moved small boulders and shingle, Kenfig, South Wales

Three main types of marine shingle beach can be identified on the basis of cross-shore sedimentological variation (Pye, 2001):

Type 1 - beaches dominated by shingle down to mean low water level

Type 2 - beaches with an upper beach face and storm ridge composed of shingle and a lower beach composed largely of sand, although patches of shingle may also be present (in some instances a rock platform rather than sedimentary lower beach may be present)

Type 3 - beaches where mixtures of shingle and sand occur across most or all of the intertidal profile.

Type 2 beaches are the most common in Wales, although following severe storms mixtures of sand and gravel are often seen across a large part of the foreshore (Figure 13).

Figure 13 Upper beach and storm beach ridge composed of shingle at Pensarn, North Wales (photograph taken close to time of high tide)

5.3.2. Shingle features classified on the basis of plan form

Shingle beaches and storm beach ridges can also be classified in terms of their coastal setting and the plan form of the shingle accumulation. A number of previous authors (Oliver, 1912; Chapman, 1976; Randall, 1977a; Sneddon & Randall, 1993; Doody, 2001) recognized five types, namely (a) fringing beaches, (b) spits, (c) bars (or barriers) (d) apposition beaches (or cuspate forelands) and (e) barrier islands. In this study six main types (A to F) and a number of sub-types are identified on the basis of plan morphology (Figure 14). Most of can be found in open coast, large embayment and estuarine settings, although tombolos, beach ridge plains, strand-plains, delta fans and forelands are very rarely found in estuaries.

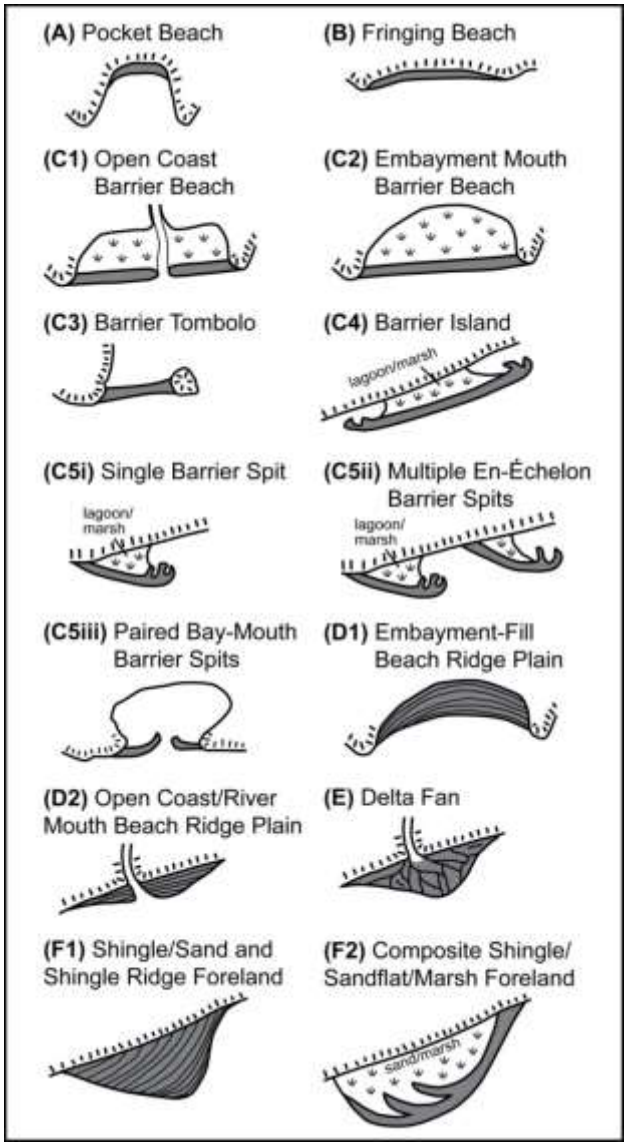


Figure 14 Schematic representation of the main morphological types of coastal shingle

5.3.2.1. Pocket beaches

Shingle pocket beaches are usually of short length (< 1 km) and occur at the head of a relatively small embayment which is deep relative to its width. In Wales they most commonly occur on indented sections of rocky open coast (Figure 15), but they can also occur within estuaries and tidal inlets. Although they sometimes block the discharge of small streams and may provide protection against wave attack on human infrastructure behind the beach, most pocket beaches are backed by non-developed rising ground and are of low FCERM significance. The shingle may be restricted to a narrow zone close to the high water mark or may extend across a wide area of the foreshore, partially and/ or periodically buried by sand.

Figure 15 Aerial photograph of Nolton Haven, Pembrokeshire. An example of a pocket beach with shingle upper beach and wide sandy lower beach

5.3.2.2. Fringing beaches

Fringing shingle beaches are the most common type found in Wales, occurring on the open coast, within embayments of many different sizes, and within estuaries such as the Dee and Severn. The size of the shingle accumulation can vary widely, ranging from a narrow, relatively thin strip to a wide, high, ramp-like accumulation. Fringing shingle beaches vary in length from a few hundreds of metres to several kilometres, often forming a ramp or berm in front of a cliff, sand dune or artificial sea defence (Figure 16, Figure 17, Figure 18 & Figure 19), and fronted by a lower, flatter beach which is predominantly sandy. In some instances the active beach face, which is regularly worked by waves, grades into a storm beach ridge with a clearly defined crest. The ridge itself may provide a barrier to flooding but fringing beaches which occur in front of coastal defences most commonly have FCERM significance because they help

to dissipate wave energy, reduce the risk of wave overtopping and reduce the required design standard of the man-made defence behind.

Figure 16 Fringing shingle upper beach in front of sand dunes at Aberdovey

Figure 17 Fringing shingle beach in front of eroding soft cliffs, north of Aberaeron, Cardigan Bay

Figure 18 Example of a narrow fringing shingle upper beach, Amroth, Carmarthenshire 2017

Figure 19 Example of a relatively wide fringing shingle and boulder beach in front of concrete sea defences and Aberthaw Power Station, both partially built on top of shingle

5.3.2.3. Barrier beaches

Barrier beaches usually consist of a laterally extensive shingle or sand beach and shingle ridge which separates the sea from low and potentially floodable land behind; it may be broken at intervals by small streams. An example is found between Criccieth and Craig Ddu in Tremadoc Bay (Figure 20).

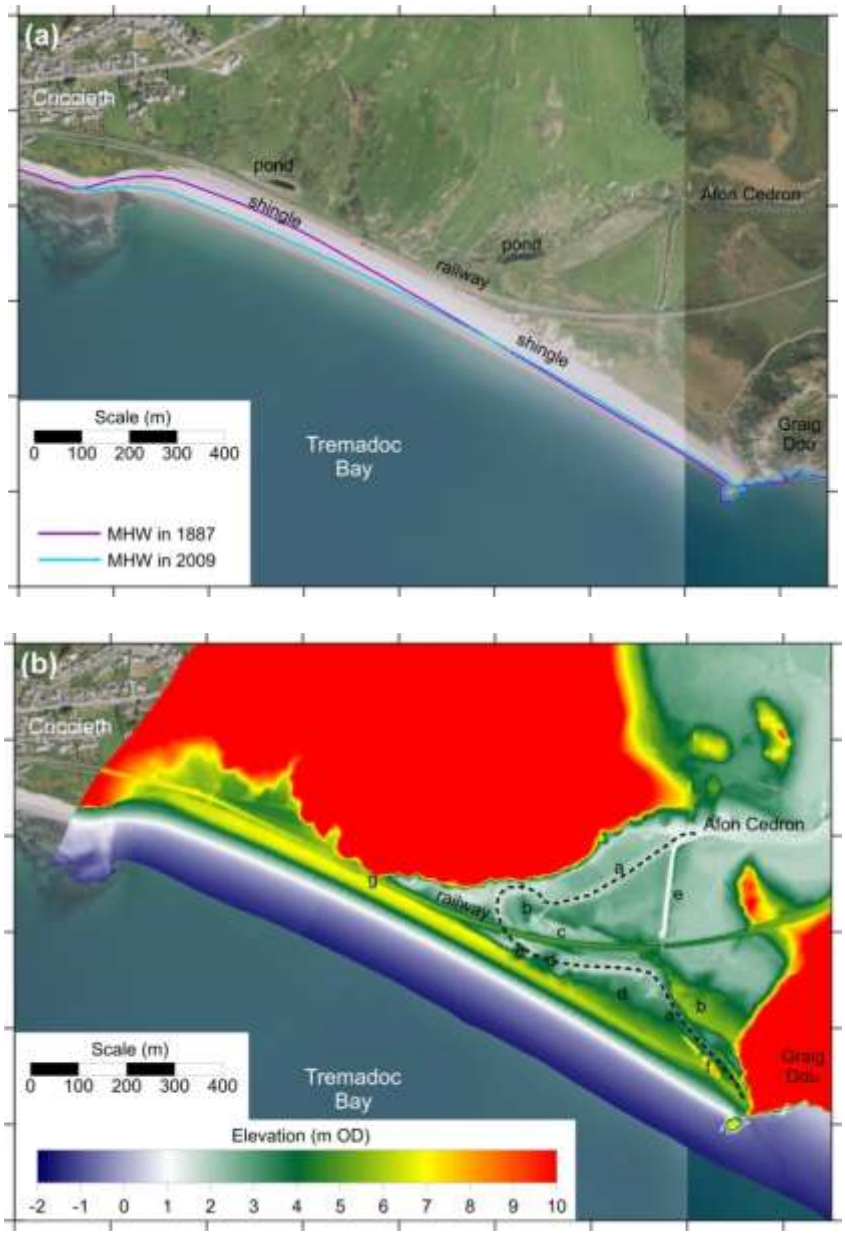


Figure 20 Aerial photograph (a) and Composite LiDAR DTM (b) of the Criccieth – Craig Ddu shingle barrier beach with Cambrian Coast railway line immediately behind. The Afon Cedron once reached the sea towards the western end of the barrier but now discharges through an artificial cut at the eastern (up-drift) end. Excavated shingle forms two vegetated NW – SE oriented mounds on the west side of the cut. The shingle ridge is subject to localised wash-over during storms and any transgressive shingle reaching the Cambrian Coast railway line is removed reactively

Where a barrier joins an island with the mainland, it may be described as a *barrier tombolo*. There are few such examples in Wales. A short tombolo, now largely covered by commercial buildings, links a glacial till outlier with the mainland at Gallow's Point on Anglesey, but does not form a barrier. The heavily modified shingle and sand ridge to the west of Carreg yr Imbill near Pwllheli could arguably be called a barrier tombolo, although the western half is more typical of a barrier beach (Figure 21).

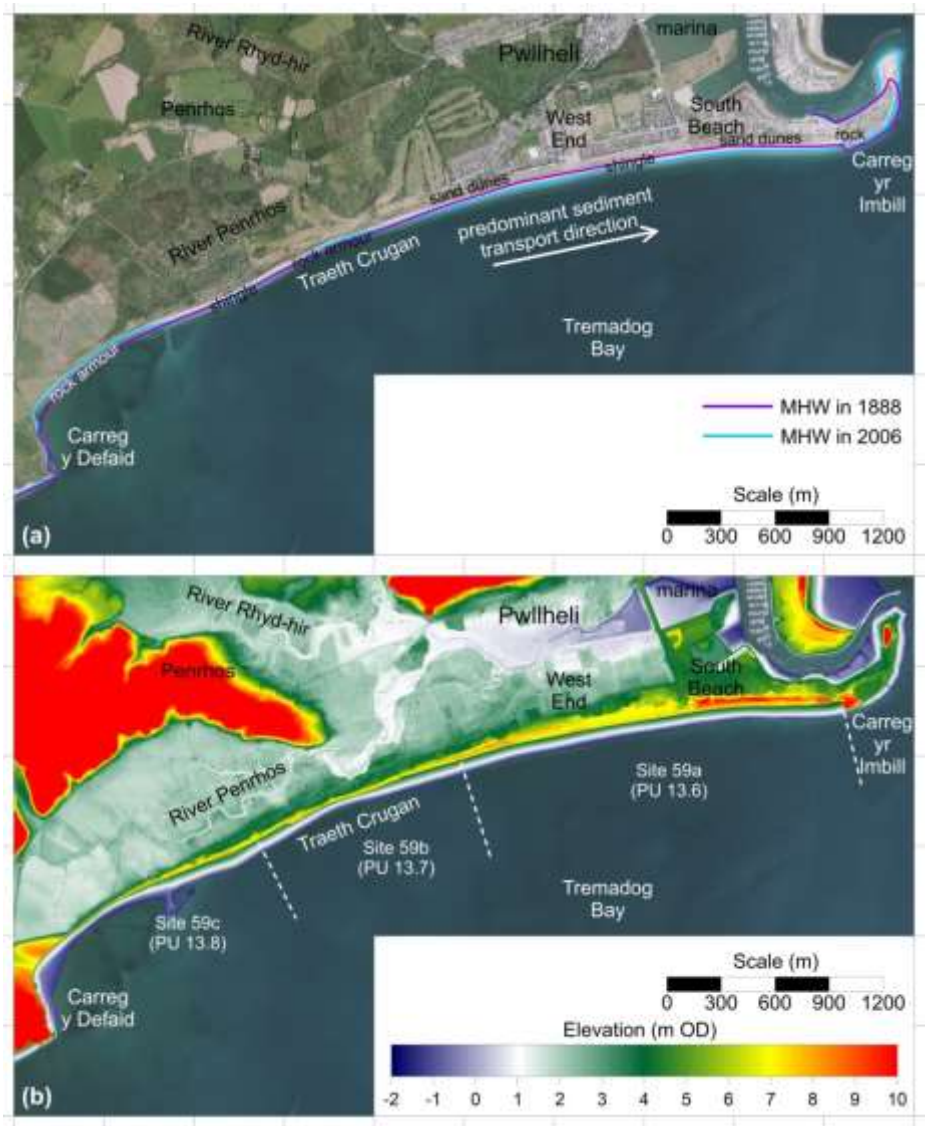


Figure 21 Aerial photograph (a) and LiDAR DTM (b) of the Carreg y Defaid – Carreg yr Imbill barrier in northern Tremadoc Bay. At its western end the barrier is low and consists of relatively coarse shingle ridge which has been reinforced with rock armour; at the eastern end near the former island of Carreg yr Imbill, the barrier is much wider and consists of dunes overlying mixed shingle and sand. The section of barrier between South Beach and Carreg yr Imbill could arguably be classified as a tombolo, while the section between Carreg yr Imbill and the entrance to Pwllheli harbour has the form of a spit. Aerial photography flown 2013-14, composite LiDAR DTM flown 2013-15

If a barrier is attached to the mainland only at one end it may be described as a *barrier spit*. Open coast barrier spits can be single features or form part of an ‘en-echelon’ series of multiple spits (not found in Wales), with shallow lagoons or areas of intertidal marsh behind. Single or paired spits can also be found at the entrance to, or within, estuaries and bays.

There are a considerable number of barrier spits in Wales; examples are found at the mouth of Afon Dwyfor in Tremadoc Bay (Figure 22), at Tanybwlch at the mouth of the River Ystwyth in Cardigan Bay (Figure 23) and at Ro Wen (Fairbourne) at the mouth of the Mawddach estuary (Figure 24). Although barrier spits do not entirely act as a barrier to tidal flooding of the areas behind, the narrow nature of the associated inlets reduces storm surge and wave ingress.

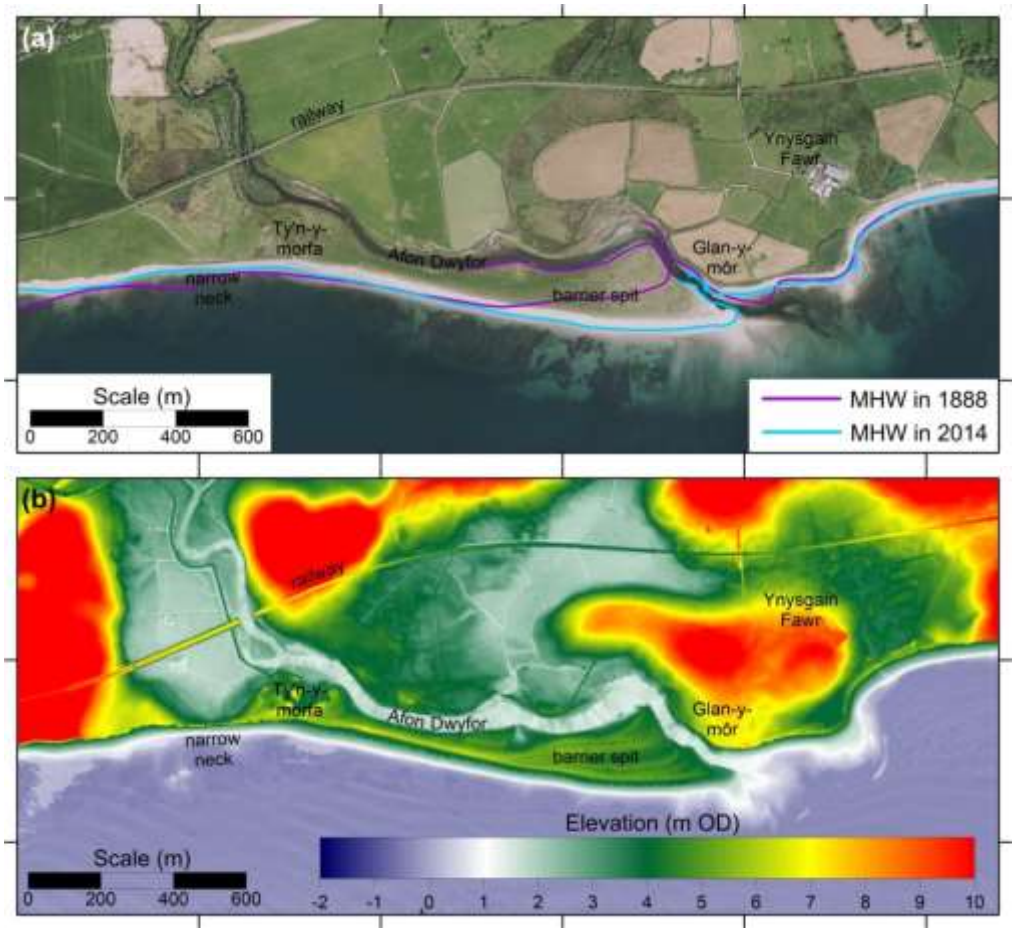


Figure 22 The Afon Dwyfor barrier spit, Tremadoc Bay. Note the very narrow nature of the spit at its neck. (a) Aerial photography flown 2013-14; (b) LiDAR DTM flown 2014

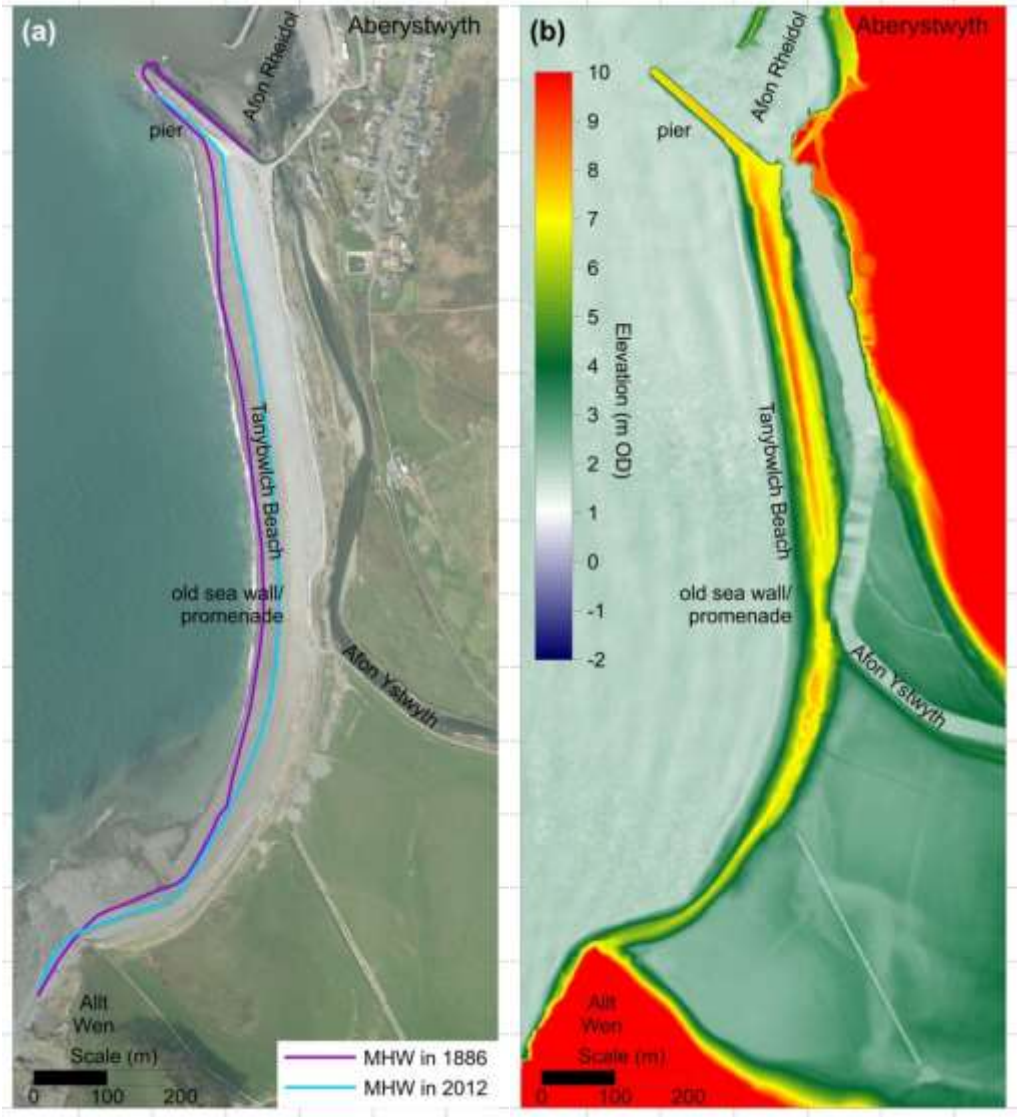


Figure 23 The Tanybwlch barrier spit at the mouth of the River Ystwyth. Note that the river has cut into the back side of the ridge as it has moved landwards, requiring placement of rock armour on the outside meander bend. The Tanybwlch barrier now receives very little new shingle from the cliffs and fringing beaches to the south and the southern end of the barrier has narrowed considerably in recent decades, despite rock armour protection. Long-term maintenance of the barrier in its present form was judged by Pethick et al. (2003) to be unsustainable. (a) Aerial photography flown 2013; (b) LiDAR digital terrain model, flown 6th to 13th January 2012

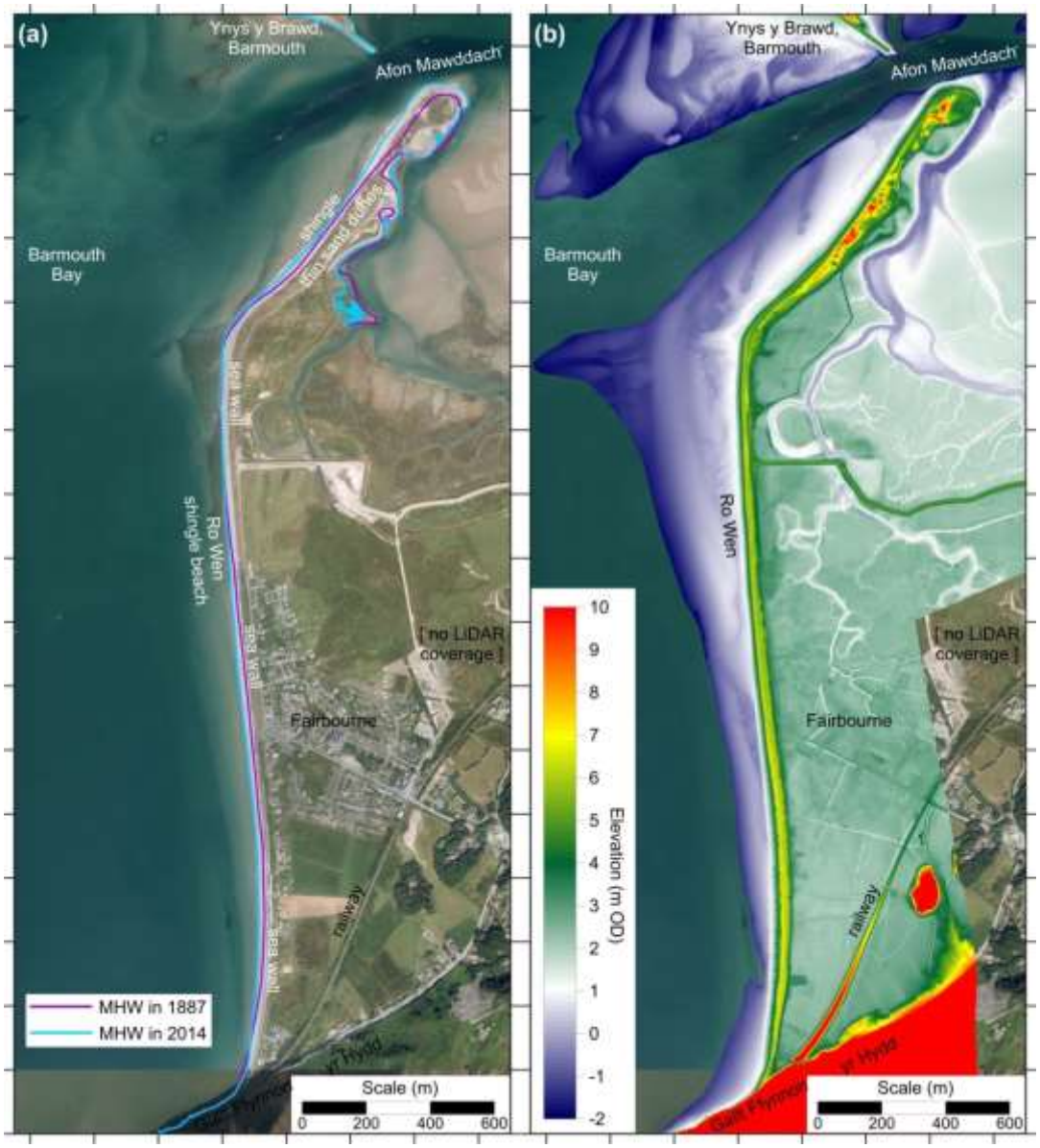


Figure 24 Ro-Wen (Fairbourne) Spit (buildings removed). At the extreme southern end near the Friog cliffs the barrier is very narrow and composed of coarse shingle and cobbles; much of the rest of the west-facing part of the barrier has a uniform width and consists of smaller shingle and cobbles, while the northwest-facing northern section is composed of finer shingle and sand capped by dunes. Much of the ridge is backed by concrete defences which provide additional coastal flood protection for the village, Fairbourne light railway and access road to the Barmouth ferry. Concerns about diminution of the shingle / cobble upper beach at Friog have led to proposals to import 4000 tonnes of cobble from an inland quarry source. (a) Aerial photography flow 2013; LiDAR DTM flown 2009

The Esgair Cemlyn shingle ridge on Anglesey was initiated as a barrier spit but is now attached at its northern end to an artificial mound and weir structure which spans the entrance to Cemlyn Lagoon (Figure 25). The ridge receives little new sediment and is migrating slowly landwards by washover during storms (Pye & Blott, 2010, 2016).

Figure 25 Esgair Cemlyn, Anglesey: an example of a relatively narrow shingle barrier which originated as a spit with a shallow tidal lagoon and intertidal flats behind, but which is now attached to an artificial mound and weir which regulates water levels in the lagoon

5.3.2.4. Beach ridge plains

Multiple beach ridge plains form where the medium to long-term beach and nearshore sediment budget is positive, allowing seaward accretion of new beach ridges over periods of decades to millennia (e.g. Billy et al., 2015). Short periods of shoreline erosion often punctuate the longer term progradation trend. The ridges may form within an embayment which acts as a ‘trap’ for sediment transported from alongshore or offshore sources, or on the open coast where large amounts of sediment are supplied by rivers and where wave processes are effective in reworking the sediment. Development of wide beach ridge plains is favoured by relatively low rates of sea level rise or falling relative sea level. Where sea level shows a net upward long-term trend, ridge crests often increase in elevation towards the active shore. If rivers supply large amounts of sediment but wave energy is insufficient to rework it completely, a delta fan may develop.

Shingle each ridge plains are rare in Wales. On the North Wales coast a series of low shingle ridges, capped by a thin layer of windblown sand, formed within a shallow embayment to the east of the Llanddulas headland, but for the past three decades the shore has been eroding (Lee, 1995; Figure 13 & Figure 26).

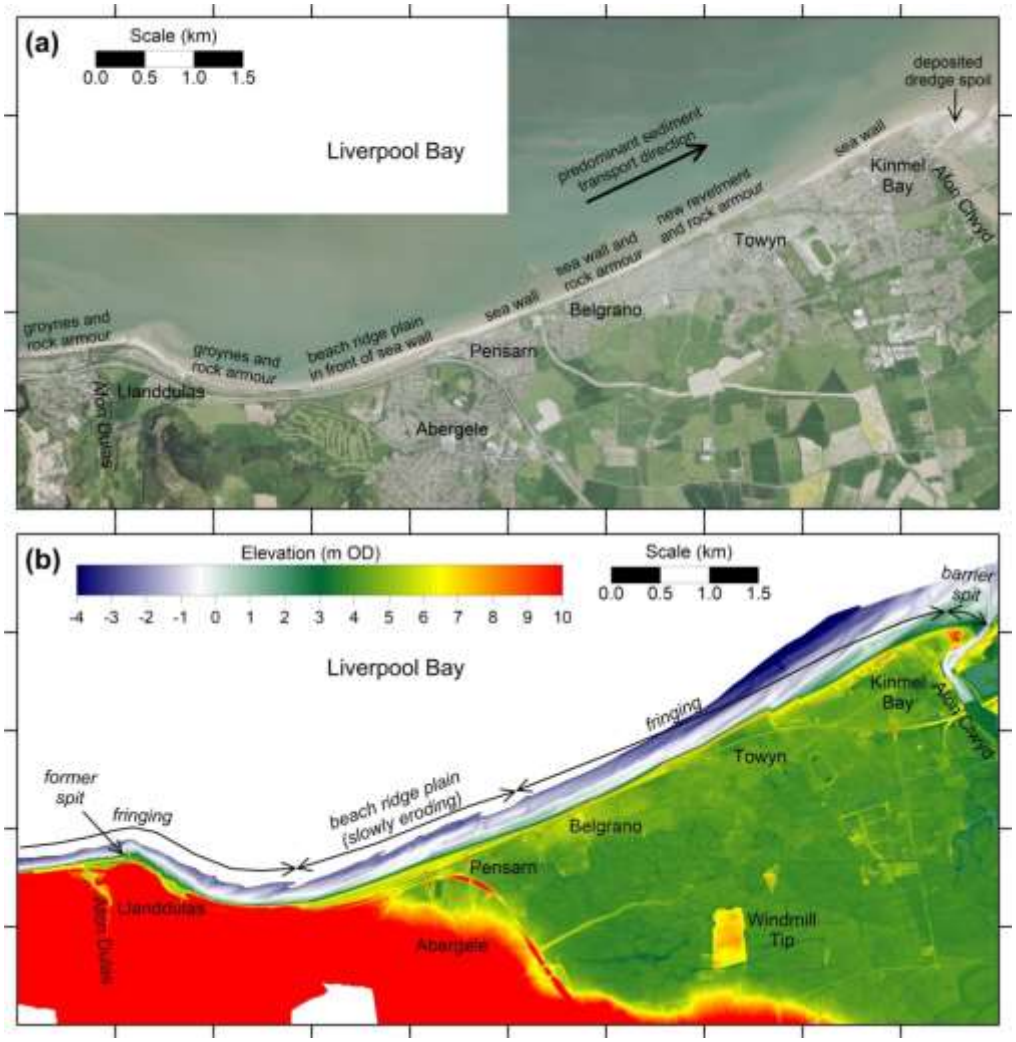


Figure 26 The heavily man-modified coast between Llanddulas and Kinmel Bay, North Wales, including the progradational embayment-fill shingle beach ridge plain between Llanddulas and Pensarn. (a) Aerial photography flown 2013-14; (b) Composite LiDAR DTM, flown 2007-2014

5.3.2.5. Fan delta

Fan delta shingle accumulations are found where high energy rivers or streams discharge relatively large amounts of mixed sediment into the coastal zone. Sand and finer sediment is dispersed away from the river mouth by wave and current action faster than the gravel-sized material, leading a coarse-grained lag accumulation. An example occurs at where the Afon Aber discharges into the sea between Bangor and Llanfairfechan (Figure 27).

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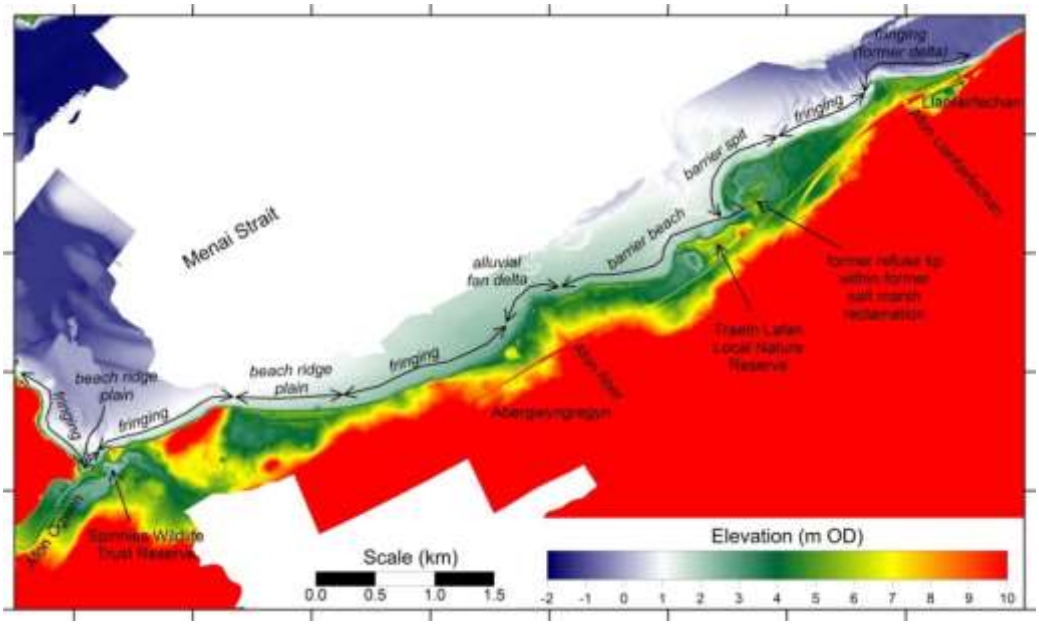


Figure 27 Fringing, barrier beach, barrier spit and alluvial fan delta types of shingle accumulation on the heavily man-modified coast between Afon Ogwen and Llanfairfechan. Composite LiDAR DEM, flown 2007-2014

5.3.2.6. Forelands

A Foreland or 'ness' is a convex or broadly triangular accumulation of sediment which project seaward from the general line of the coast. Two types may be distinguished: (a) those which are formed entirely of shingle or sand and shingle ridges, and (b) those which have an outer shingle 'skeleton', often spit-like in plan form, behind which are areas of sandy intertidal flats or saltmarshes. There are currently no examples of pure shingle or sand and shingle ridge forelands in Wales, although composite forelands which include shingle elements are found, for example at Morfa Conwy (Figure 28).

Figure 28 A composite sand and shingle foreland at Morfa Conwy

5.3.3. 46Classification based on sedimentary architecture and morphological evolution

Shingle features can also be classified on the basis of their sedimentary architecture and medium to long-term morphological development (Figure 29).

Stable shingle ridge structures (Figure 29a) display little net change in their lateral position on timescales of decades to millennia, although the beach face and ridge crest naturally displays short-term variability in response to changes in wave and tide conditions. This type of ridge is often located at the interface between marine sediments and terrestrial coastal plain sediments or underlying rock, and is associated with low rates of sediment supply and/ or small net changes in the local beach sediment budget. Under conditions of slowly rising sea level as at present), the ridge crest may increase slightly in height and width as the ridge moves landward. An example is provided by the Newgale shingle ridge in Pembrokeshire (see case study example below).

Regressive barriers (Figure 29b) usually consist of a single ridge which moves landward over periods of decades to millennia, ‘rolling back’ over back-barrier marsh, lagoon or freshwater alluvial sediments. Back-barrier sediments are often exposed on the upper part of the foreshore to seaward of the ridge. This type of barrier is usually found in areas of negative beach and nearshore sediment budget (due to low rates of supply and/ or a high rate of alongshore transport, onshore movement of deep water channels, or relatively high rates of sediment drift). There are many examples where this situation is found around the Welsh coast, although in places the recession of the barrier has been arrested over the past 100 – 150 years by coast protection measures (e.g. at Borth, Abergele, Rhyl).

Prograded barriers (Figure 29c) typically display multiple shore-parallel ridges, sometimes cross-cutting, which have developed in a net seawards direction over time. They occur in areas of long-term net sediment accumulation, either within embayments where sediment transported from alongshore or offshore becomes trapped, or where there is sudden reduction in alongshore sediment transport rate.

In drift-aligned systems it is not uncommon to find regressive barrier behaviour and morphology at the up-drift end of the sediment transport cell, stability in the centre, and progradational behaviour and morphology at the down-drift end. This situation is likely to develop if there is a reduction in the rate of sediment supply from neighbouring sections of coast up-drift, in which case the shoreline orientation may show a tendency to change from drift-alignment to swash alignment, provided sediment is trapped at the down-drift end (Orford et al., 2002).

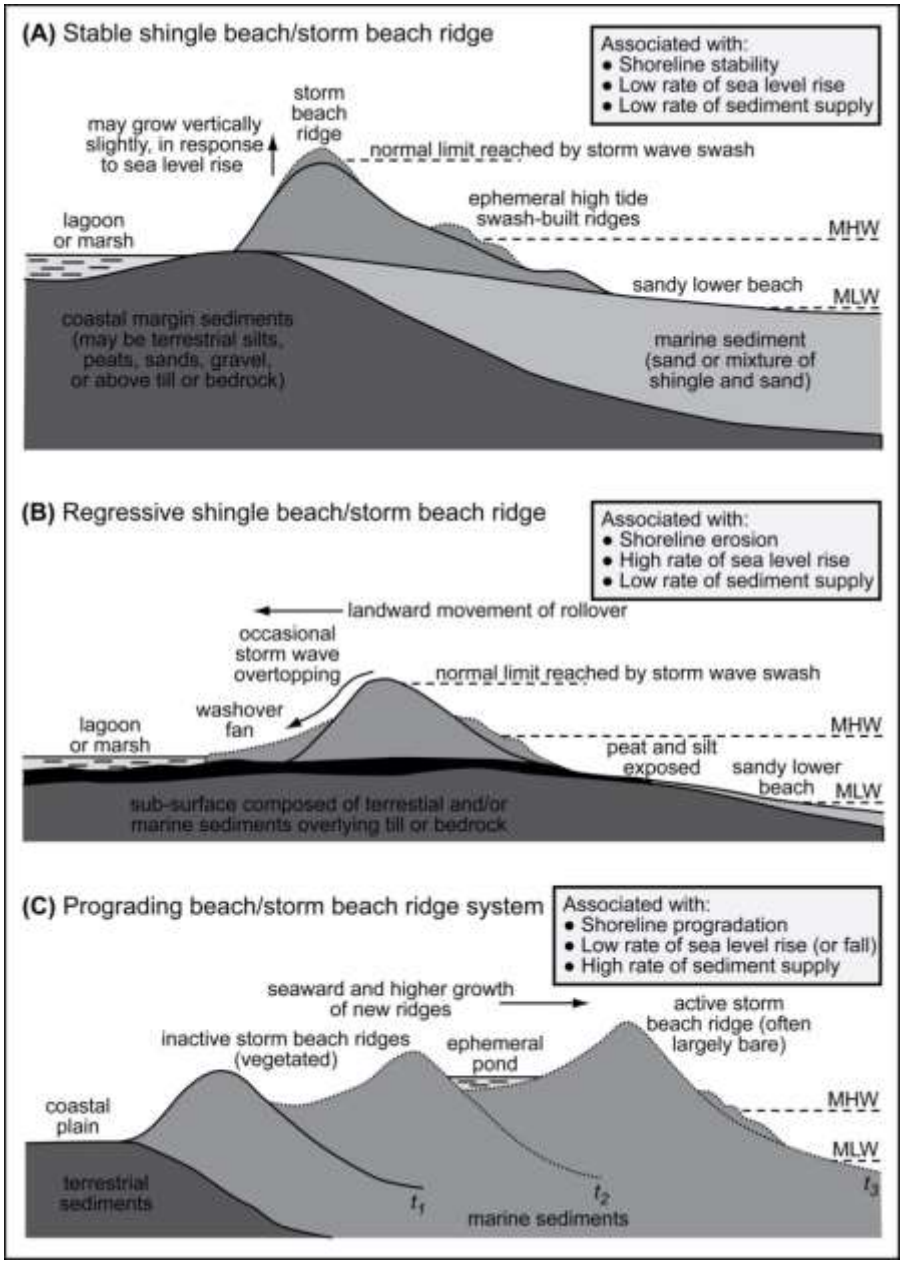


Figure 29 Three types of shingle ridge structures which display differing stratigraphic architecture in response to contrasting histories of morphological development

5.4. Response of shingle barriers to rising sea level

The response of shingle barriers to sea level rise is dependent on a number of factors:

- the local sediment budget, which determines whether a shingle beach / ridge complex can grow vertically, seawards, or move landwards keeping pace with sea level rise
- the rate of sea level rise
- the accommodation space available for a shingle beach / ridge system to adjust by moving landwards

- the nature of, and any changes in, the wave climate, particularly storm wave climate, which determines the potential for sediment to move onshore, offshore or alongshore.

  Owing to geographical variation in these factors, the response of individual shingle features to sea level rise may be complex and there is likely to be considerable variation from one shingle feature to another. Prediction of the likely response therefore requires a detailed understanding of local process and sediment supply conditions, the surrounding terrain, and likely future rates of sea level rise.

Where there is flat or gently rising land lies behind a shingle barrier it should be able to migrate landwards by a process of 'rollover', but where the features are backed by high ground or artificial defences retreat is impeded and the features will be subject to 'shingle squeeze' (Doody, 2001a,b).

On gently upward sloping coastal plains the barrier may be able to move landwards and maintain a constant sediment volume under low to medium rates of sea level rise, without any increase in sediment supply (Figure 30a). However if the barrier moves landward across flat or downward sloping ground it is likely to become drowned unless there is a significant increase in sediment supply (Figure 29b). Locally, the sediment supply may be sufficiently large to allow a beach / barrier system to prograde seawards and increase in crest height, despite sea level rise. In Wales, this is only likely to be possible at the distal ends of some barrier spit systems which are fed by alongshore movement of sediment eroded from up-drift areas (e.g. at Gronant, east of Prestatyn).

In situations where a fringing shingle beach ridge is squeezed against high ground or sea defence, it will only be possible to maintain constant morphology and sediment volume above a new higher sea level if there is significant additional sediment supply (Figure 30c). If additional sediment is not available to maintain a constant nearshore and intertidal / supratidal coastal profile, greater water depths, larger nearshore wave heights and greater wave reflection are likely to result in net offshore movement of shingle and gradual wasting of the feature. Unless large-scale beach and nearshore sediment nourishment is undertaken, this situation is likely to increasingly affect the majority of fringing and pocket shingle beaches in Wales over the coming decades.

At times during the early to mid-Holocene when sea level was rising at 5-10 mm/yr or more, barriers in some parts of the world are known to have been 'drowned' and left as relict ridges on the nearshore sea bed as the shoreline moved rapidly landwards, a process known as over-stepping (Forbes *et al*., 1991; Mellett et al., 2012). However, no definite examples of such drowned barriers have so far been identified around the Welsh coast, and forecast rates of future sea level rise in the next hundred years are unlikely to be sufficiently high for overstepping and drowning of major Welsh shingle barriers.

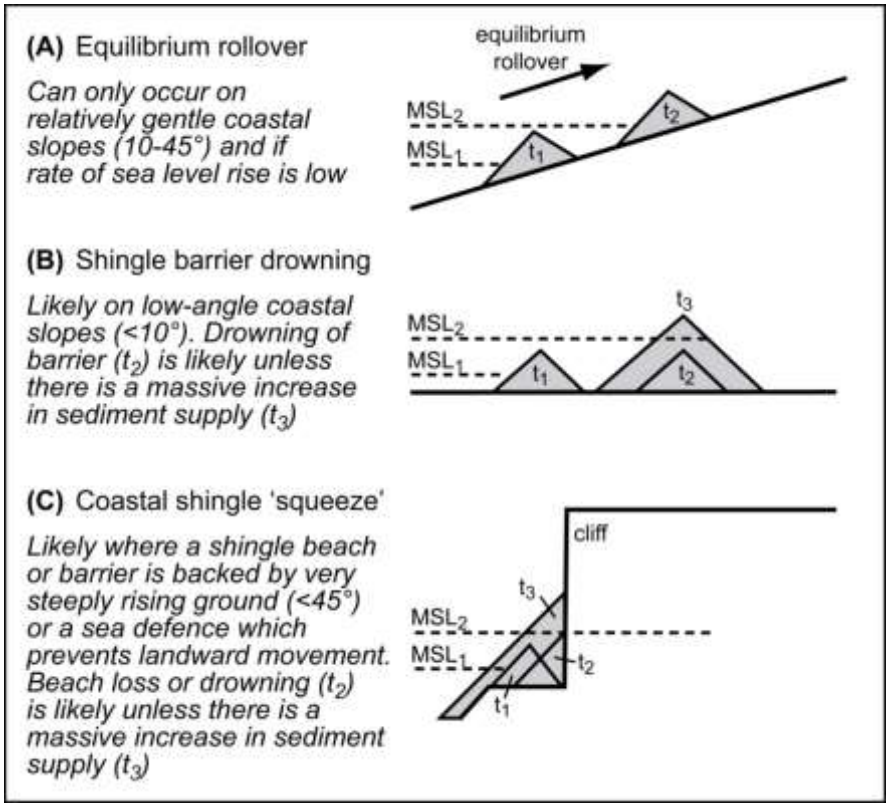


Figure 30 Schematic diagram showing the evolution of swash-aligned shingle barriers in response to sea level rise and dependence on sediment supply

The response of swash-aligned bay-barriers to sea level rise is likely to depend partly on the magnitude of sediment supply and the degree to which the sediment compartment is 'closed' or ' open' (Figure 31). In a closed sediment compartment situation, the barrier may be able to roll back and maintain its relative elevation if the embayment narrows in a landwards direction, or the level of the ground behind the barrier rises (Figure 31a). However, if the sediment compartment is partially open and there is leakage of sediment from the embayment the barrier is likely to become narrower and lower relative to the tidal frame as sea level rises, eventually leading to breach and tidal inlet formation (Figure 31b).

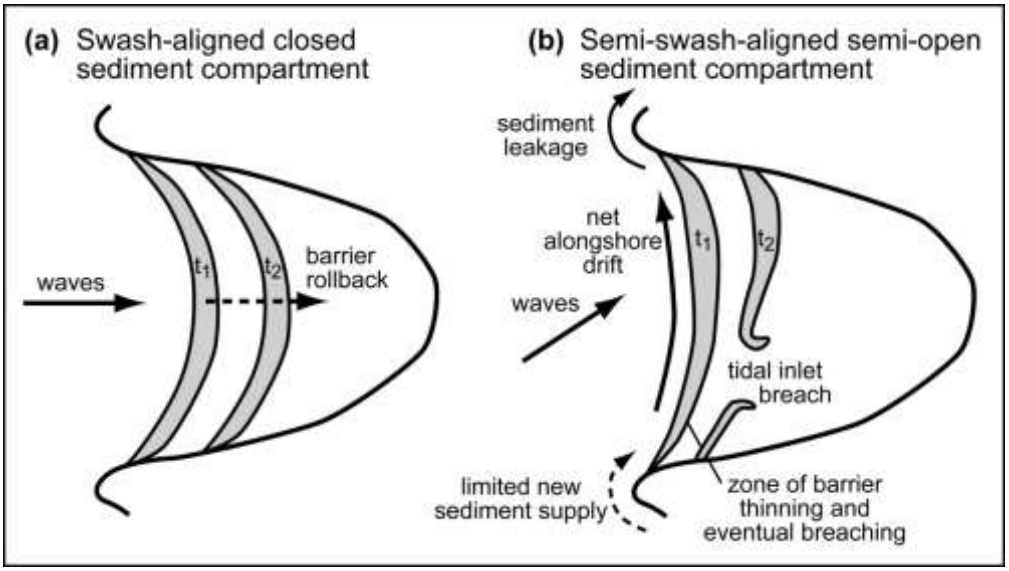


Figure 31 Schematic diagrams of barrier rollover in closed and semi-open sediment compartments

6. Shingle vegetation and other conservation interests

6.1. Requirements for establishment of shingle vegetation

For vegetation to become established on shingle the surface needs to be relatively stable (moved only every few months or years) and contain a proportion of fine material which can retain moisture. Due to its porous nature, shingle without fines above the water table does not retain water well, and most vegetation other than lichens and bryophytes cannot grow on it. The release and infiltration of organic matter from decaying seaweed and other vegetation assists the retention of moisture and allows a soil to develop in the surface layers of shingle over time. A spatial gradient of vegetation types and communities is usually seen on shingle formations, reflecting varying exposure and tolerance to salt spray, wave run-up, stability of the shingle surface and degree of surficial soil development (Oliver, 1911, 1912; Tansley, 1939; Scott, 1960; 1963; Randall, 1977b; Fuller, 1987).

Sneddon & Randall (1993a) and Randall & Sneddon (2001) recognized six main divisions of shingle vegetation classification, with a number of sub-types, which broadly follow a pattern of zonation from most landward to most seaward (Table 2). Sea kale (*Crambe maritima*) and sea campion (*Silene maritima*) are amongst the species which can tolerate salt spray and wave influence, and hence can occur on the seaward beach face down to the level of approximately mean high water spring tide level in sheltered settings such as the Menai Strait (Figure 32 & Figure 33). Higher up the beach and on the ridge crest, where there is greater shingle stability and greater accumulation of interstitial fine sediment, Sea Beet (*Beta vulgaris)*, Sea Holly, (*Eryngium maritimum*) and Sea Thrift (*Armeria maritima*) are often found. On the highest and most stable parts of the ridge Yellow-horned Poppy (*Glaucium flavum*), a range of grasses and occasional shrubs may occur. In windswept settings and on very stable shingle surfaces extensive coverage of lichens or heathland vegetation may develop. Where shingle grades into sand dunes, saltmarsh, mudflat or saline lagoons a range of transitional habitats is created which include species more typical of dune and marshy environments.

Some of the rare pioneer and early successional stage plant communities found on shingle are unique to this substratum and are highly susceptible to disturbance (Low, 2007). Slow-growing bryophyte and lichen communities develop in stable surfaces with thin soils, and tend to be restricted to large shingle structures with very low levels of surface disturbance. They are very rare in Wales. Trampling disturbance is a particular problem for these communities and also for strandline pioneer communities (Scott & Randall, 1976, Randall, 1977b). Vehicle movements, including plant used in FCERM operations, can also be a problem. To facilitate continued development and survival of these communities, access needs to be restricted.

Table 2 Major shingle vegetation divisions ordered from most landward to most seaward (Randall & Sneddon, 2001)

1. Scrub communities	1a. *Prunus spinosa* communities 1b. *Rubus fruticosus* communities 1c. *Ilex europaeus* communities	
2. Heath communities	2a. Wet heaths 2b. Dry heaths	2bi. *Pteridiummaquifolium* 2bii. *Calluna vulgaris* communities 2b.iii.. Moss-rich communities
3. Grassland communities	3a. Saltmarsh-influenced grasslands 3b. *Agrostis stolonifera* grasslands 3c. *Arrhenatherum elatius* grasslands 3d. *Festuca rubra* grasslands 3e. Mixed grasslands 3f. Sandy grasslands	
4. Mature grassland communities	4a. Mature grasslands 4b. Less mature grasslands	4a.i. Mature grasslands – *Festuca rubra* 4a.ii. Mature grasslands – *Dicranum scoparium* 4a.iii. Mature grasslands 2b.i. Less mature grasslands pure shingle 4b.ii. Less mature grassland saltmarsh influenced *Arrhenatherum elatius*
5. Secondary pioneer communities		
6. Pioneer communities	6a. *Honkenya peploides* dominated communities 6b. *Senecio viscosus* dominated communities 6c. *Beta vulgaris* dominated communities 6d. *Raphanus maritimus* dominated communities 6f. *Silene maritima* dominated pioneer communities	

Figure 32 Example of pioneer vegetation development close to the MHWS line on a fringing shingle beach with low wave exposure, Menai Strait east side

Figure 33 Example of a slowly retreating vegetated shingle ridge, Pensarn, North Wales

Other types of shingle vegetation on shingle structures require varying degrees of management to prevent invasion by scrub and coniferous trees where shingle occurs in proximity to forestry plantations. Areas of *Calluna vulgaris* on shingle generally require low levels of grazing to maintain age and species diversity, although there is risk that grazing animals will raise nutrient levels in the surface soil and lead to vegetation change (Doody, 2001a).

6.2. Important vegetated shingle sites in Wales

As part of a Nature Conservancy Council (NCC) sponsored review of vegetated shingle habitats in Great Britain, Sneddon & Randall (1993b) identified 13 shingle sites in Wales which were judged to be of importance in terms of their vegetation communities (Figure 34). This assessment was based on discussions with NCC staff, a review of available background literature, examination of maps and aerial photographs and field visits during the period 1989-1990. As part of this study maps were prepared showing the distribution of major National Vegetation Classification (NVC) communities at each of the key sites. No further surveys have been conducted at a national scale in Wales since that time, and changes at most locations remain unquantified.

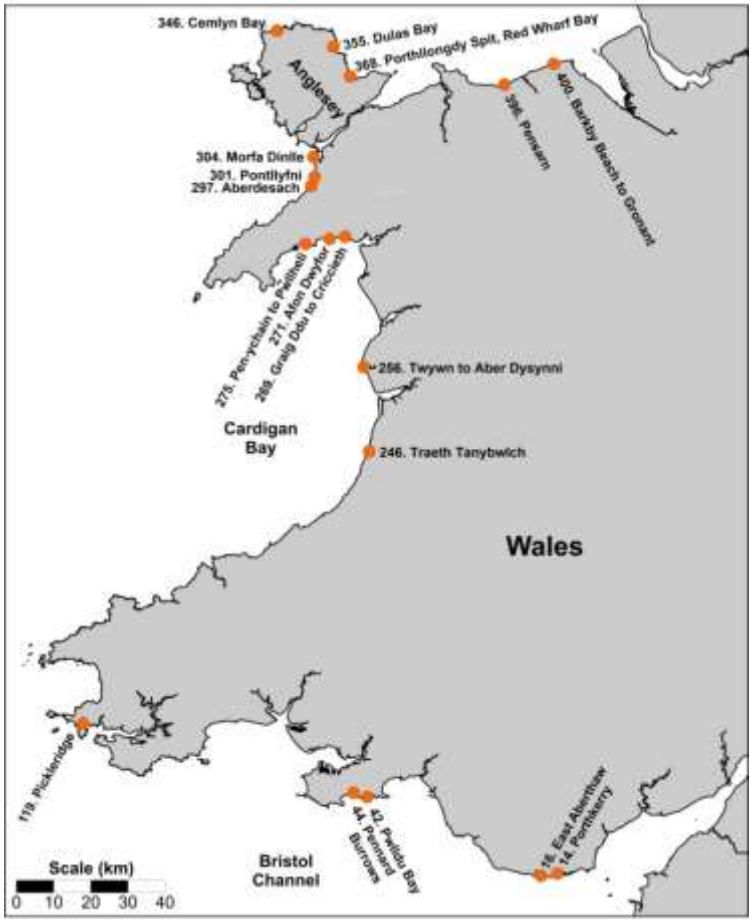


Figure 34 Sites in Wales identified by Sneddon & Randall (1993b) in terms of importance for vegetated shingle. Site numbers and names are those used in the present study

In a later assessment, Randall & Doody (1995) considered none of the shingle sites in Wales to be of National (UK) importance for vegetated shingle, although three sites (Cemlyn Bay, Traeth Tanybwlch and East Aberthaw) were included in a list of “Other sites of significance”. Tanybwlch, Cemlyn, Crabhall Saltings and Pwlldu were included in a list of the top 20 national sites for floristic diversity. Tanybwlch and Crabhall Saltings were included in the top 20 list for floristic composition and size, but only one site, Pwlldu, made the top 20 list based on a combination of floristic, size and disturbance ranking.

There are seven shingle in sites in Wales which are located within Sites of Special Scientific Importance (SSSI) and where the citations make specific reference to shingle and/or shingle vegetation features (Figure 35). All seven were included in the lists of important sites prepared by Sneddon & Randall (1993b) and Stapleton (1996).

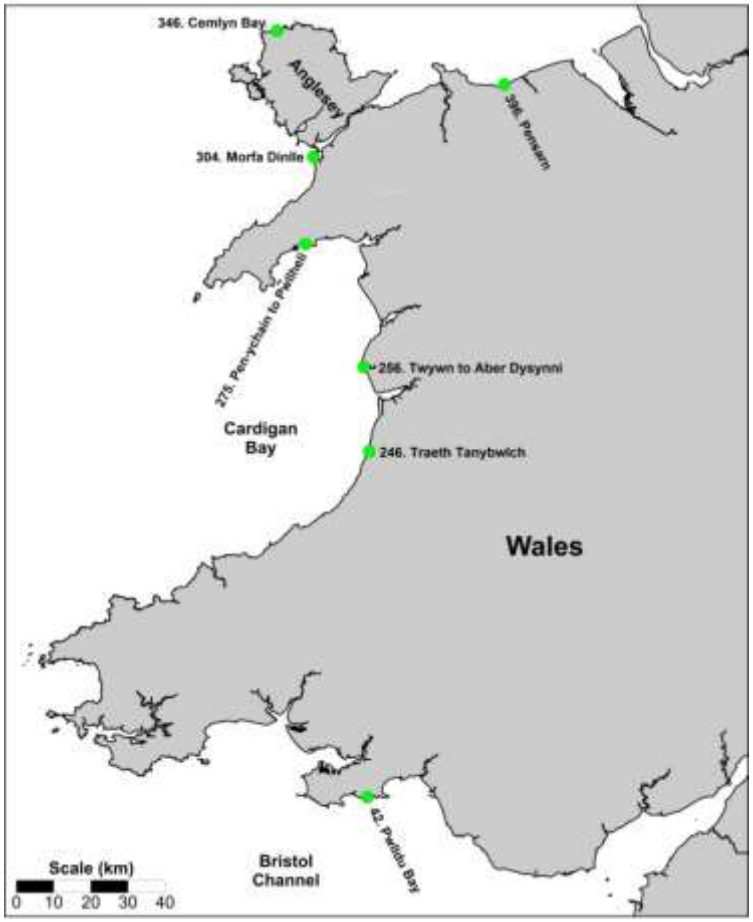


Figure 35 Shingle features within Sites of Special Scientific Interest and where the designation citation states that the shingle or vegetated shingle is a 'special' feature

Although more recent inventories of vegetated shingle have been compiled for England and Wales (Exegesis and Doody, 2009; Murdoch et al., 2014), no recent national assessment of vegetated shingle in Wales has been undertaken.

The pressures on shingle vegetation arise mainly from the following:

- heavy pedestrian visitor pressure, notably close to recreational beaches and caravan parks
- unrestricted vehicle access (off-road vehicles, quad-bikes and trail bikes)
- beach management operations, notably the movements of heavy plant

Measures which can be taken to reduce damage from pedestrians and unauthorised vehicles including fencing and provision of marked routes to the beach. Damage from beach management operations can be minimised by restricting plant movement to clearly defined access tracks and along the beach well below the drift line.

6.3. Other ecological conservation interests

A number of specialist invertebrate species are also associated with stable, vegetated or partially vegetated shingle (Morris & Parsons, 1993; Shardlow, 2001). These include the bugs *Rhopalus rufus* and *Monosynamma maritima*, the leafhopper *Aphrodes duffieldi*, the Dark Guest Ant *Anergates altratulus*, the Cuckoo Bee *Nomada ferruginata* and the Brown-banded Carder Bee (*Bombus humilis*).

Both vegetated and unvegetated shingle are also important for nesting and roosting birds, including Little Tern (*Sternula albifrons*), Arctic Tern (*Sterna paradisaea*) and Black-Headed Gull (*Chroicocephalus ribibundus*), although they are at risk from predators unless the sites used are located on islands and other inaccessible locations, or fencing protection is provided (Cadbury & Ausden, 2001). Important tern breeding sites on shingle include Cemlyn Bay on Anglesey and Gronant and Point of Ayr in North Wales.

6.4. Geomorphological conservation interests

In the mid-1990s the Institute of Estuarine and Coastal Studies (IECS) at the University of Hull was commissioned by the Countryside Council for Wales (CCW) to undertake an assessment of the geomorphological and hydrological status of the marine coastal shingle resource in Wales, in order to inform ecological and geomorphological conservation. This assessment included a literature review, consultation with maritime country and district councils, examination of 1:10 000 scale aerial photographs flown in 1992 and 1:25,000 scale Ordnance Survey maps, and field surveys at 20 selected sites (Stapleton, 1996; Figure 36).

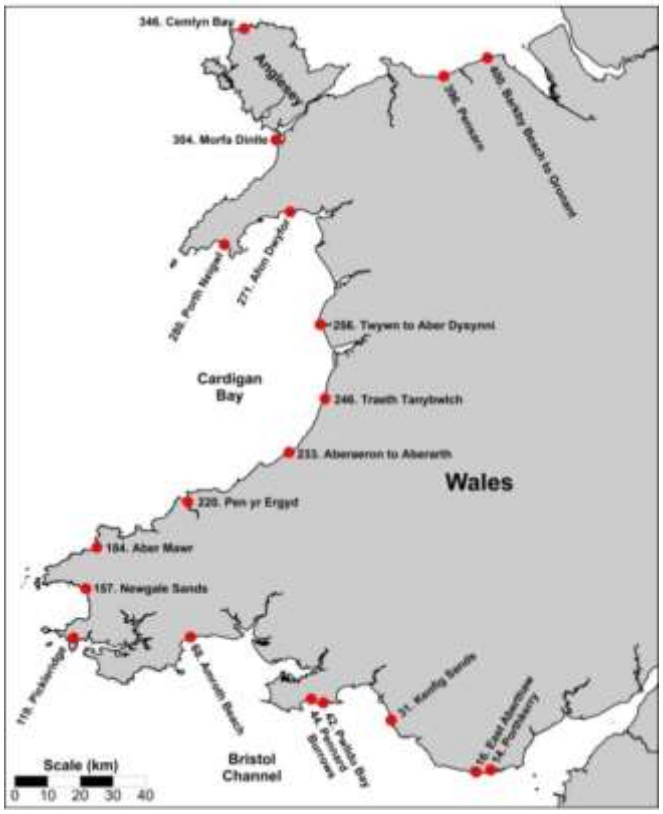


Figure 36 Important shingle structures in Wales identified by Stapleton (1996). Site numbers and names are those used in the present study

A further assessment of the geomorphological significance of a number of individual Welsh shingle sites was undertaken as part of the UK Geological Conservation Review (GCR). GCR Site Management Reports were prepared for sites in Wales which contain shingle (e.g. Mathews, 1997), but only a small number of sites were included in the national (UK) overview report (May & Hansom, 2003) as being of geomorphological and geological importance, either in their own right or as part of larger coastal landform complexes. These sites included Pwlldu, Ynyslas and Morfa Dinlle and Newborough Warren / Abermenai (May, 2003a,b,c,d).

In the present study, 49 of the 403 shingle sites identified sites have been judged to be of geomorphological significance, either in terms of area and nature of shingle features alone or shingle in combination with other features such as dunes, saltmarshes and lagoons (Table 3). Many of these sites have been modified by human activities to varying degrees but they retain important geomorphological interest features. Prior to coastal development and construction of coast protection structures in the 19th and 20th centuries, the number and frontage length of sites of geomorphological importance was much larger. However, significant areas have been lost or degraded during the past 150 years. For example, as long ago as the mid-1940s, Steers (1946) noted that “the whole length of coast between Llandudno to Point of Air is unfortunately spoiled in various ways”. Many of the original shingle (and also sand dune) features along the North Wales coast between Bangor and Prestatyn have indeed been lost or heavily modified. This is also the case at

many other shingle sites in South Wales and West Wales where hard defences have been constructed, including Amroth, Aberthaw, Fairbourne, Barmouth and Porthcawl.

Table 3 Shingle beaches and structures identified in this study as being of importance as individual geomorphological features or landform assemblages

ID	Localities	Policy Development Zone	Bare gravel area (ha)	Vegetated gravel area (ha)
13	Pebble Beach, Barry	The Knap to Watch House Beach	8.63	0.18
14	Porthkerry	The Knap to Watch House Beach	6.79	0.46
16	Watch House Beach, East Aberthaw	The Knap to Watch House Beach	38.25	0.73
18	West Aberthaw	Limpet Bay to Nash Point	9.88	2.98
42	Pwlldu Bay	Mumbles Head to Worms Head	3.16	0.94
44	Pennard Burrows	Mumbles Head to Worms Head	0.58	0.22
56	Machynys, Loughor Estuary	Loughor Estuary	1.65	8.58
119	Pickleridge Beach	Little Castle Head to St Ann's Head	1.98	4.70
156	Newgale Sands: Bathesland-Sibbernock	St Bride's Bay	1.26	0.09
157	Newgale Sands:Sibbernock-Newgale	St Bride's Bay	4.16	0.03
184	Aber Mawr	St David's to Strumble Head	1.03	0.00
185	Aber Bach, St Nicholas	St David's to Strumble Head	0.42	0.02
220	Pen yr Ergyd	The Teifi	0.84	0.25
234	Aberarth	Aberaeron Plateau	1.37	0.00
238	Llannon	Aberaeron Plateau	0.65	0.01
240	Llansantffraid	Aberaeron Plateau	0.48	0.15
242	Llanrhystud	Aberaeron Plateau	8.67	0.00
246	Traeth Tanybwlch, Aberystwyth	Aberystwyth	7.07	3.44
250	Clarach Bay	Aberystwyth	2.29	0.37
253	Borth Sands	Dyfi	14.94	20.33
254	Aberdovey to Tywyn	Dyfi	7.60	0.20
256	Tywyn to Aber Dysynni	Dyfi	8.30	24.06
258	Ro Wen, Fairbourne	Barmouth and the Mawddach	11.07	12.36
264	Afon Ysgethin, Tal-y-bont	Barmouth and the Mawddach	5.65	2.77
266	Shell Island Spit	Coastal Snowdonia	0.68	0.00
267	Llandanwg Spit	Coastal Snowdonia	1.11	0.01
269	Graig Ddu to Criccieth	Coastal Snowdonia	7.26	3.43
271	Afon Dwyfor	Coastal Snowdonia	9.05	12.37
273	Afon Wen	Coastal Snowdonia	2.71	10.07
275	Pen-ychain to Pwllheli	The South Llyn Bays	6.73	5.87
277	Traeth Crugan	The South Llyn Bays	5.09	0.00
297	Aberdesach	north Llyn	1.16	0.42
299	Trwyn Maen Dylan	Menai Strait	0.52	1.16
301	Pontllyfni to Ynys	Menai Strait	4.41	4.66
302	Ynys to Dinas Dinlle	Menai Strait	5.04	4.45
304	Morfa Dinlle	Menai Strait	14.61	11.89
311	Abermenai	Menai Strait	2.21	0.28
342	Traeth Ynys y Fydlyn, Anglesey	north Anglesey	0.29	0.09
346	Cemlyn Bay, Anglesey	north Anglesey	3.78	1.86
355	Dulas Bay, Anglesey	East Bays	0.35	0.02
368	Porthllongdy Spit	East Bays	0.70	0.16
375	Gallows Point, Beaumaris, Anglesey	Menai Strait	0.30	0.00
377	The Spinnies, Aber-Ogwen	Menai Strait	0.15	0.49
379	Coed Gyfynys to Wig Bach	Menai Strait	2.29	12.10
381	Afon Aber	Menai Strait	1.22	5.37
383	Llanfairfechan Spit	Menai Strait	3.81	1.66
396	Pensarn	Little Orme to Clwyd Estuary	12.7	6.73
400	Barkby Beach to Gronant	Clwyd Estuary to Point of Ayr	6.19	0.60
402	Point of Ayr	Clwyd Estuary to Point of Ayr	0.31	0.01

7. Flood and Coastal Erosion Risk Management Significance

7.1. Factors affecting FCERM significance

Although it has been recognized for many years that some shingle beaches, natural ridges and artificially maintained shingle embankments in Wales have considerable FCERM significance, there has been no previous systematic assessment of this aspect.

The degree of FCERM significance of a shingle feature (beach, ridge or multiple ridge structure) is related to the elevation of the hinterland, the size (crest elevation, width at MHWS elevation) of the shingle structure, the presence or otherwise of other coast protection / flood defence structures, and the value of the assets protected (Figure 37). Shingle beaches / ridges in front of high value assets (e.g. housing, industrial installations, power stations and transport infrastructure are of greater FCERM significance than those which protect farmland without additional assets (Figure 38 & Figure 39).

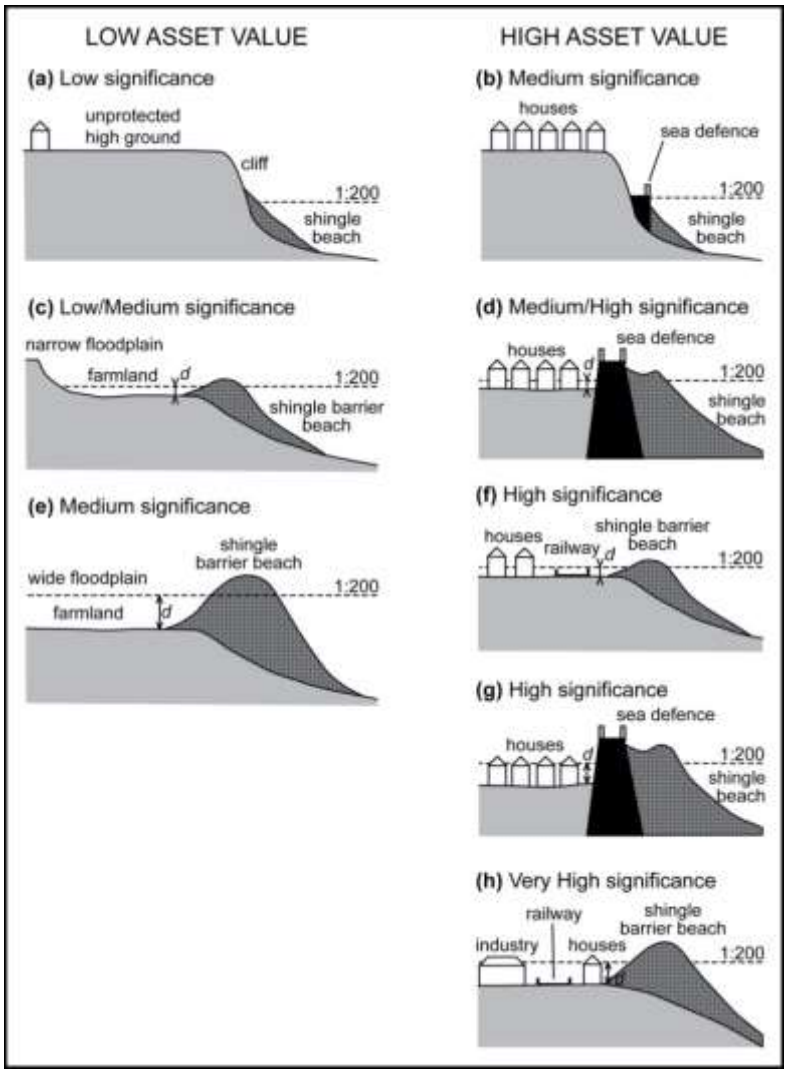


Figure 37 Schematic diagram illustrating different levels of FCERM significance of shingle features

Figure 38 Narrow shingle ridge fronting single storey housing, Aberaeron

Figure 39 High value assets inland of the shingle beach at Pensarn, North wales coast: from left to right are the A55 trunk road, the Chester to Holyhead railway line and a caravan park access road

7.2. Potential benefits and problems associated with shingle

There are a number of potential benefits and potential problems relating to the FCERM significance of shingle beaches and shingle structures which operate on different time-scales:

Potential benefits:

- a shingle beach, berm or ridge acts to dissipate the energy of waves acting on a coastal defence behind, reducing the standard of defence necessary and prolonging operational life; reduction in the volume of protective shingle can increase risk of wave overtopping, and leave defences exposed and with a reduced residual life
- a relatively high shingle barrier ridge acts to prevent, or reduce, flooding of assets behind arising from wave overtopping and surge tides; if the barrier crest is lowered for any reason, or falls relative to tidal levels and wave run-up due to sea level rise, the effectiveness of the barrier as a coastal flood defence is reduced
- a shingle barrier spit acts to reduce wave penetration into an estuary or lagoon behind; if the spit is lowered, shortened or breached this protective benefit is reduced

Potential problems:

- as with all beaches, there is a risk of landward shingle encroachment during storms onto near-coastal assets, including roads, railway lines, property, and important ecological assets; this risk is likely to increase as sea level rises and barriers move landward by rollover
- there is a risk of blockage of land drainage outlets (streams and culverts) by longshore drifted shingle; this risk is greatest on sections of relatively straight open coast dominated by waves which approach the shore obliquely from one dominant direction
- long-term net alongshore movement of shingle may lead to a permanent fall in beach levels at the up-drift ends of shingle barriers if there is no balancing supply of new material, thereby increasing the local flood risk from wave overtopping and potential undermining of defences
- measures taken to reduce or stop longshore drift of shingle and falling beach levels, such as construction of groynes and breakwaters, disrupt regional patterns of sediment transport, causing sediment starvation to beaches down-drift of the structures and creating pressure for further FCERM intervention measures in these areas
- long-term alongshore drift of shingle can result in shoaling of river mouths, harbours and navigation channels, creating a periodic dredging requirement; disposal of dredged shingle in deep water permanently removes sediment from the coastal system and deprives beaches down-drift of supply

- excessive accumulation of shingle in some down-drift locations, and/or exposure of previously buried shingle and cobbles when sand is stripped from a beach by storms, can be perceived negatively by local communities and local authorities who wish to see a sandy beach maintained for recreational purposes and sometimes remove the exposed shingle and cobbles, with negative long-term implications for long-term beach sediment budget and beach levels
- Increased abrasion of sea defences behind beaches of a certain size leading to premature failure (Dornbusch, 2010).

7.3. FCERM significance of shingle in Wales

Of the 403 sites identified in this study, 41 have been assessed as having high or medium FCERM significance (Table 4), based on a combination of morphological parameters and qualitative assessment of human and natural asset value. The morphological parameters include the height, width and lateral extent of a shingle feature, whether or not it acts as a significant barrier to marine flooding or buffer against coastal erosion, the level of the land behind, and the degree to which the barrier acts to reduce wave action and over topping risk around the margins of the back-barrier area. Examples of high value assets which are protected partly or wholly by shingle beaches and/or structures include Caernarvon Airport (Morfa Dinlle), Aberthaw Power Station, the Cambrian Coast railway line at Llanaber and to the east of Criccieth, and hotels, housing and caravan park developments on the North Wales coast between Llandudno and Rhyl. Some shingle features are important in terms of the protection they provide for historical and archaeological monuments. Examples include the Dinas Dinlle Iron Age hillfort, the 5th century St Tanwyg's Church, Llandanwg, and the 18th century Fort Belan at the northern end of Morfa Dinlle. At a number of sites shingle is also important in contributing to the protection of high value ecological features, such as the Cors Fochno raised bog, located behind the Borth – Ynyslas spit complex on the margin of the Dovey estuary, and the Esgair Cemlyn shingle ridge which protects important artificial tern nesting islands within Cemlyn Lagoon.

A further 55 sites have been assessed as having medium or medium/low FCERM significance (Table 5). The nature of this significance varies between sites, but a broad distinction can be made between sites where the importance relates principally to (a) defence against erosion and sea flooding, and (b) prevention of inland flooding associated with rivers, surface water runoff and/or rising groundwater levels.

Table 4 Shingle sites identified in this study as being of high or medium FCERM significance; respective SMP2 polices are also shown

ID	Localities	FCERM	SMP2 Policy			Hard management measures
			0-20 years (2025)	20-50 years (2050)	50-100 years (2105)	
9	Penarth to Lavernock Pt	H	HTL-NAI	HTL-NAI	HTL-NAI	Sea wall, rock armour, groynes
11	Barry Harbour	H	HTL	HTL	HTL	Rock armour, sea wall
12	Watch House Bay, Barry	H	HTL	HTL	HTL	Sea wall
13	Pebble Beach, Barry	H	HTL	MR	MR	Sea wall
17	Leys Beach, East Aberthaw	H	HTL	HTL	HTL	Sea wall, groynes
28	Seafront Beach, Porthcawl	H	HTL	HTL	HTL	Sea wall
29	West Beach, Porthcawl	H	HTL	HTL	HTL	Sea wall
37	Mumbles	H	HTL	HTL	HTL	Sea wall
39	Langland Bay, Gower	H	HTL	HTL	HTL	Sea wall
40	Caswell Bay	H	HTL	HTL	HTL	Sea wall, rock armour
61	St Ishmael's Scar	H	HTL	HTL	HTL	Sea wall
62	The Graig, Ferryside	H	HTL	HTL	HTL	Embankment, rock armour
63	Ferryside	H	HTL	HTL	HTL	Rock armour, seawall
68	Amroth Beach	H	HTL	HTL	NAI	Sea wall, groynes, rock armour
70	Saundersfoot Beach	H	NAI-HTL	NAI-HTL	NAI-MR	Sea wall
145	Broad Haven	H	HTL	HTL	MR	Sea wall
231	Aberaeron south	H	HTL	HTL	MR	Sea wall, rock armour, groynes
232	Aberaeron north	H	HTL	HTL	HTL	Sea wall, groynes, breakwater
247	South Beach, Aberystwyth	H	HTL	HTL	HTL	Sea wall
248	north Beach, Aberystwyth	H	HTL	HTL	HTL/AL	Sea wall, groynes, rock armour
253	Borth Sands	H	HTL-HTL-MR	HTL-MR-NAI	MR-MR-NAI	Sea wall, groynes, breakwaters
255	Tywyn	H	HTL	HTL	HTL	Sea wall, groynes, rock armour
256	Tywyn to Aber Dysynni	H	HTL	HTL	HTL	Embankment, rock armour
258	Ro Wen, Fairbourne	M	HTL-MR-HTL	MR	NAI	Sea wall, concrete blocks
262	Barmouth to Llanaber	H	HTL	MR-HTL	MR-HTL	Sea wall, rock armour
263	Ceunant Egryn, Llanaber	H	MR	NAI	NAI	None
269	Graig Ddu to Criccieth	H	HTL	MR	MR	Embankment
270	Criccieth	H	HTL-NAI	HTL-NAI	MR-HTL-NAI	Sea wall, groynes, rock armour
273	Afon Wen	H	HTL	MR	MR	Embankment, rock armour
277	Traeth Crugan	H	HTL	MR	MR	Rock armour
304	Morfa Dinlle	H	HTL-MR	MR	MR-NAI	Embankment, sea wall
306	Caernarfon to Plas Menai	H	HTL-NAI	HTL-NAI	HTL-NAI	Sea wall
387	Deganwy	H	HTL	HTL	MR-HTL	Sea wall, rock armour
388	Llandudno West Shore	H	HTL	HTL	MR	Sea wall, groynes
390	Llandudno Bay	H	HTL	HTL	HTL	Sea wall
391	Penrhyn Bay	H	HTL	HTL	HTL	Sea wall, groynes, rock armour
392	Rhos on Sea	H	HTL	HTL	HTL	Sea wall, breakwater
394	Penmaen Rhos	H	HTL	HTL	HTL	Sea wall, groynes, rock armour
395	Llanddulas	H	HTL	HTL	HTL	Rock armour, sea wall, groynes
396	Pensarn	H	HTL	HTL	HTL	Sea wall, rock armour
397	Belgrano to Kinmel Bay	H	HTL	HTL	HTL	Sea wall, rock armour
234	Aberarth	M/H	HTL	MR	MR	Groynes, breakwater

Table 5 Shingle sites considered in this study to have medium or low/medium FCERM significance

ID	Localities	FCERM	SMP2 Policy			Hard management measures
			0-20 years (2025)	20-50 years (2050)	50-100 years (2105)	
8	Cardiff Flats	M	HTL	HTL	HTL	Rock armour, sea wall
27	Trecco Bay, Porthcawl	M	HTL	HTL	HTL	Sea wall
34	Port Talbot Harbour	M	HTL	HTL	HTL	Rock armour, breakwaters
36	Swansea Docks	M	HTL	HTL	HTL	Breakwater, rock armour
59	Millenium Coastal Park, Burry Port	M	HTL	HTL	HTL	Rock armour, rubble
103	Neyland	M	HTL	HTL	HTL	Sea wall
105	Newton Noyes, Milford Haven	M	HTL	HTL	HTL	Sea wall
106	Gelliswick Bay, Milford Haven	M	HTL	NAI	NAI	Sea wall
120	Dale Beach	M	HTL	HTL	MR	Sea wall
143	Little Haven	M	HTL	HTL	MR	Sea wall
157	Newgale Sands:Sibbernock-Newgale	M	MR	MR	NAI	Sea wall
196	Goodwick Sands north	M	HTL	HTL	HTL/AL	Embankment, rock armour
197	Goodwick Sands South	M	HTL	MR	MR	Embankment, groynes
199	Aber Gwaun	M	HTL	HTL	HTL	Sea wall
210	Cwm-yr-Eglwys	M	HTL	HTL	HTL	Sea wall
229	Little Quay Bay	M	HTL-NAI	HTL-NAI	MR-NAI	Sea wall, groynes, rock armour
250	Clarach Bay	M	MR	MR	MR	Rock armour, sea wall
254	Aberdovey to Tywyn	M	MR	MR	MR	Geotextile bags
261	Barmouth Promenade	M	HTL	HTL	HTL	Sea wall
275	Pen-ychain to Pwllheli	M	NAI-HTL-HTL	NAI-MR-HTL	NAI-MR-HTL	Sand fencing
297	Aberdesach	M	MR	MR	MR	
305	Afon Gwyrfai to Caernarfon	M	HTL	HTL	MR	Embankment
307	Y Felinheli	M	HTL	HTL	HTL	Sea wall, groynes
393	Colwyn Bay	M	HTL	HTL	HTL	Sea wall, groynes, rock armour
399	Rhyl	M	HTL	HTL	HTL	Sea wall, groynes
403	Ffynnongroyw to Greenfield	M	HTL	HTL-MR	HTL-MR	Sea wall, rock armour
14	Porthkerry	L/M	NAI	NAI	NAI	Concrete outfall on beach
16	Watch House Beach, East Aberthaw	L/M	HTL	HTL	HTL	Sea wall, groynes, concrete blocks
18	West Aberthaw	L/M	NAI	NAI	NAI	WWII Anti Tank blocks, outfall
30	Rest Bay, Porthcawl	L/M	NAI	NAI	NAI	
56	Machynys, Loughor Estuary	L/M	HTL	HTL	HTL	Sea wall, rock armour, groynes
58	Tywyn Bach, Burry Port	L/M	HTL	HTL	HTL	Rock armour, embankment
79	Lydstep Haven	L/M	HTL	NAI	NAI	Rock armour
119	Pickleridge Beach	L/M	MR	MR	MR	Rock armour
156	Newgale Sands: Bathesland Water	L/M	MR	MR	MR	
184	Aber Mawr	L/M	NAI	NAI	NAI	
185	Aber Bach, St Nicholas	L/M	NAI	NAI	NAI	
236	Morfa Mawr	L/M	NAI	NAI	NAI	
238	Llannon	L/M	MR	MR	MR	
240	Llansantffraid	L/M	MR	MR	MR	
242	Llanrhystud	L/M	MR	MR	MR	
246	Traeth Tanybwlch, Aberystwyth	L/M	MR	MR	NAI	Rock armour, sea wall
264	Afon Ysgethin, Tal-y-bont	L/M	MR	MR	MR	
271	Afon Dwyfor	L/M	MR	NAI	NAI	
299	Trwyn Maen Dylan	L/M	NAI	NAI	NAI	
301	Pontllyfni to Ynys	L/M	NAI	NAI	NAI	
302	Ynys to Dinas Dinlle	L/M	NAI	NAI	NAI	
315	Borthwen, Holy Island	L/M	MR	MR	NAI	
342	Traeth Ynys y Fydlyn, Anglesey	L/M	NAI	NAI	NAI	
344	Hen Borth, Anglesey	L/M	NAI	NAI	NAI	
346	Cemlyn Bay, Anglesey	L/M	MR	NAI	NAI	
379	Coed Gyfynys to Wig Bach	L/M	NAI	NAI	NAI	
382	Afon Aber to Glan y mor Elias	L/M	MR	MR	HTL	
400	Barkby Beach to Gronant	L/M	MR	MR	MR	Rock armour, groynes

7.4. FCERM-related shingle management issues in Wales

The main FCERM management issues relating to coastal shingle in Wales at the present time may be summarised as follows:

- maintenance of a sufficiently high, wide shingle barrier to provide adequate protection against marine flooding or erosion(associated either with wave / tidal over-topping and/or barrier breaching, and/or attack on dunes / cliffs to landward)
- maintenance of adequate land drainage to the sea (maintenance of river/ stream outlets and outfalls)

- alongshore drift of shingle leading to blockage of outfalls, navigation channels and harbour entrances
- shingle washover and throw-over onto coastal infrastructure (roads, railway lines, property) damage to shingle structures and vegetated shingle habitats by placement of caravans, heavy pedestrian pressure and vehicular traffic movements (including plant used in FCERM works)
- management of shingle features for FCERM purposes in a manner which does disrupt regional coastal processes and does not have negative impacts on other shingle feature interests such as vegetation, fauna, geomorphology, landscape quality and visitor appeal.

These magnitudes and relative importance of these management issues are likely to change in the future due to a combination of natural process impacts and management intervention impacts, as summarised diagrammatically in Figure 40.

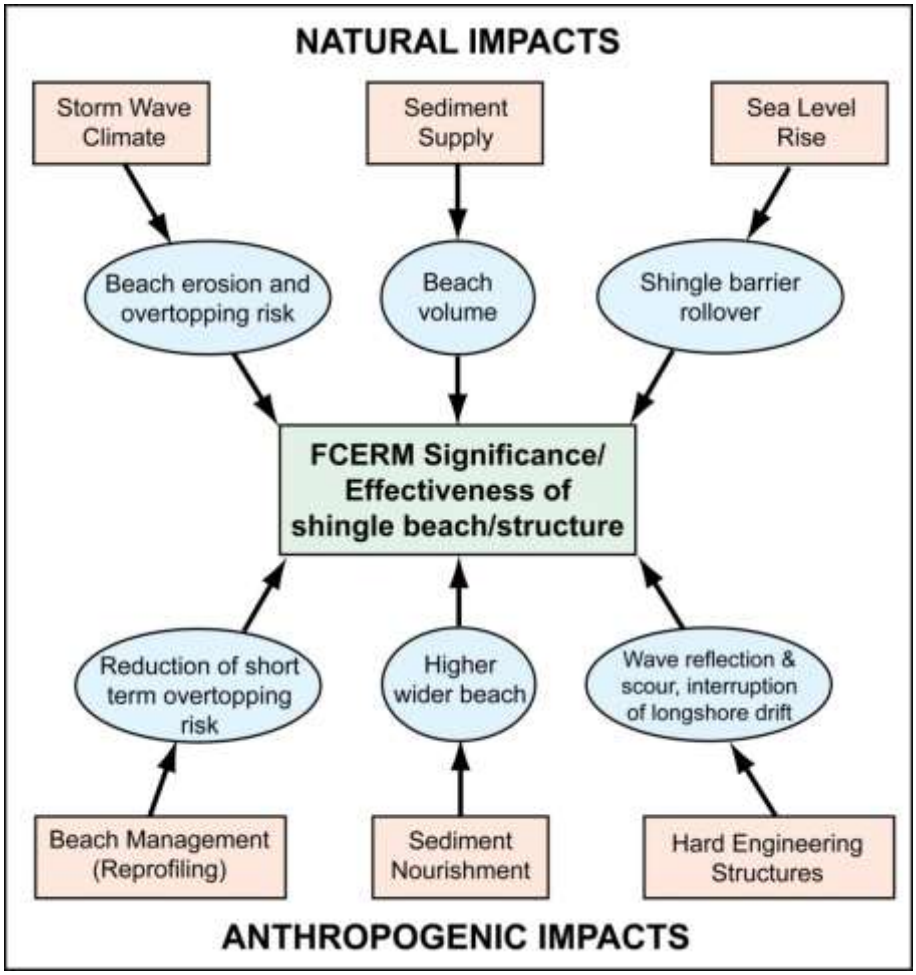


Figure 40 Natural and anthropogenic impact on FCERM significance/effectiveness of shingle beaches and structures

7.5. FCERM and SMP Policy

At the great majority of Welsh sites which have been judged in this study to have high FCERM significance the SMP2 policy in all three epochs is Hold-the-Line, and some form of hard coastal defence is present. As such the shingle features represent only one component of the overall coastal defence. Only at two locations, Ceunant Egryn (Llanaber) and Caernarfon to Plas Menai, is part of the shingle frontage not reinforced by hard structures and the current SMP Policy is either Managed Realignment (MR) or No Active Intervention (NAI). However, at several other sites, including Pebble Beach (Barry), Barmouth to Llanaber, Fairbourne, Craig Ddu to Criccieth, Afon Wen, Traeth Crugan, Morfa Dinlle and Aberarth, the recommended SMP2 policy is change to change from HTL in Epoch 1 to MR or NAI in Epoch 2 and/ or Epoch 3.

At many of the sites judged in this study to have Medium FCERM significance, including Newgale, Aberdovey to Towyn, and Aberdesach, the recommended policy in SMP 2 epoch1 and subsequent epochs is MR but the shingle beach / ridge is still currently maintained, at least in terms of shingle replacement and re-profiling following severe storms. If a policy of MR is progressively adopted in these areas, there is likely to be less maintenance and greater emphasis on managing the roll back of the shingle features, and/or relocating near-coastal assets through ‘adaptation’.

8. Shingle beach management methods

8.1. Methods used to manage coastal flooding and erosion risk

Historically, shingle beaches in Wales and other parts of the UK have been managed for FCERM purposes using the following methods, individually or in combination:

(a) beach management without structures:

- proactive and/ or reactive beach scraping (landward movement of shingle) to create and maintain a sufficiently high shingle ridge with crest level above selected joint probability exceedance levels of still water levels and waves
- reactive re-profiling of beach and transfer of over-wash deposits following storms in order to re-build beach ridge crests in the same location and to clear nuisance shingle from roads, promenades and railway lines
- seasonal, annual or aperiodic recycling of shingle from one end of a sediment compartment to another in order maintain adequate beach levels along the entire frontage
- beach and/ or shingle ridge nourishment using imported shingle / cobbles / rock / demolition waste or industrial slag
- placement of sediment on the landward side of a beach / ridge to facilitate rollback (e.g. Dornbusch & Ferguson, 2016)

(b) beach management with structures:

- groynes (timber, rock or concrete) to control alongshore sediment movement
- shore-perpendicular breakwaters (larger than groynes) to control movement of sediment into tidal channels and harbours
- shore-parallel offshore breakwaters to modify wave patterns and encourage beach building and sediment retention behind
- revetments (timber, sheet piling, rock) as structures without beach management:
- rock armour or concrete tetrapods, in front of a shingle berm or shingle ridge
- reinforcement of a shingle ridge to wave action by installing a hard rock ‘core’
- immobilization of the surface of a shingle beach or ridge by application of asphalt, cement, pebble / cobble filled gabion mattress, geotextile layers or interlocking concrete blocks
- complete encasement of shingle ridges by concrete walls / promenades

8.1.1. Beach re-profiling

During storms, depending on the coincidence of tidal levels and waves of a given height and period, shingle may be drawn down the beach or transported landwards as wash-over fans. Where shingle is transported landward and impinges on assets such as undefended stretches of railway line or roads (e.g. Figure 41), it may cause disruption to transport services. Current practice in Wales is generally to manage this issue reactively rather than proactively. In

some cases the transgressive shingle is collected and placed back on the beach, with the beach being re-profiled to a typical constant slope of 10 – 20°. However, in instances where the shingle has moved onto a ‘highway’ it is often treated as potentially ‘contaminated’ and removed for use fill, or taken to landfill, thereby resulting in a permanent loss of sediment volume in the local coastal sediment cell.

Figure 41 Section of the Cambrian Coast railway between Barmouth and Llanaber which is protected only by a shingle fringing beach. In the 2013-14 stormy winter transgression of shingle onto the line occurred, and further north parts of the line were washed away

In situations where storms cause shingle to pile up against a promenade (e.g. Figure 42), the excess shingle is often moved away to prevent wave over-topping or ‘throwing’ of shingle onto the promenade. This has the effect of reducing the potential to dissipate storm wave energy at the top of the beach and removal of the shingle from the beach altogether results in a permanent loss of beach sediment volume.

Figure 42 The eastern part of Caswell Bay, Gower. During the 2013-14 winter storms, wave-tossed shingle caused significant damage to the beach front café,; a significant proportion of the remaining shingle was removed from the toe of the promenade by the local authority and placed on the upper beach in a different part of the Bay where it was unlikely to cause further damage (photograph by J. Rewbridge, City and County of Swansea Council)

Re-profiling is often undertaken to create and maintain a pre-determined crest level and/or cross-sectional profile intended to provide a prescribed level of flood protection (e.g. against a 1 in 10, 1 in 30 or 1 in 50 year joint probability of significant over topping). However, such artificial profiles usually are not in equilibrium with storm wave run-up and the beach face and seaward side of the ridge crest often experience erosion, sometimes cutting through the ridge to create a breach (Figure 43). To counter this, design profiles sometimes incorporate a ‘sacrificial’ sediment berm on the seaward side of the main ridge with a crest level approximately at MHWS or HAT level. However, frequent maintenance is normally required to maintain the design profile which may be unsustainable in the medium to longer term if the beach sediment budget is negative.

Figure 43 Maintained shingle ridge at Llanrhystud, south of Aberystwyth, view looking north

Bull-dozing or other means of moving shingle back up the seaward beach slope, or from washover fans, to rebuild the ridge crest is usually very damaging to pioneer vegetation and may impact adversely on the sediment in-fauna. This is of particular concern where fine gravel and coarse sand deposits seaward of a shingle ridge provide a habitat for rare species such as the amphipod *Pectenogammarus planicrurus* (Webb et al., 2010).

Regular operation of heavy plant on the seaward side of a shingle barrier may also cause compaction and rutting of sub-beach silt and mud deposits, some of which (such as those at Aberdovey – Penllyn, Borth, Rhyl and Abergele) are of intrinsic Quaternary palaeo-environmental and archaeological interest.

Although there are instances where emergency post-storm flood protection works may require some bull-dozing of beach material to prevent further flooding during following high tides, this approach can have significant negative consequences (Rogers et al., 2010) and is unlikely to provide a sustainable means of coastal flood protection in the medium to longer term as sea level continues to rise, without a compensating significant increase in sediment supply.

8.1.2. Shingle recycling

Recycling of shingle from one end of a sediment compartment to the other has been practiced at some locations in Wales, although not on the same scale as at sites in England such as Dungeness and Seaford. The general objective is to maintain a design beach profile across the whole length of a frontage, or to counteract localised low beach levels and defence toe exposure at the up-drift end of local sediment cells, or in the centre of embayments where the upper

beach width is squeezed by coastal defences (Clark & Brooks, 2006). The effectiveness of this approach is partly dependent on local rates of alongshore transport and on the required distance of transport, which affects costs. In England, this approach is usually exempt from marine licencing if carried out within the same sediment cell, but this is not necessarily the case in Wales

8.1.3. Shingle by-passing

This procedure involves artificial movement of shingle in a down-drift direction. It is usually employed to assist the movement of sediment held up by groynes, breakwaters or drainage outfalls. It has been undertaken at Dinas Dinlle, Aber Dysynni and Pontllyfni, amongst many other places. In the case of small rivers and streams, excavation and placement is undertaken using a simple back-hoe digger. In the case of larger streams and tidal channels, or where harbour breakwaters are present, lorries or dumper trucks are often used to transport the sediment to the down-drift side, either along the foreshore at low tide or, if relatively deep water obstacles are present, via longer road routes. However, the latter option is rarely used due to high transport costs and the negative impact of large volumes of road traffic.

8.1.4. Beach replenishment

Shingle beach replenishment has been widely undertaken around the Welsh coast, although schemes have been much smaller than on the coasts of South East England (e.g. Coates et al., 1999; 2001; Moses et al., 2008). Ideally, nourishment is undertaken using rounded pebble or cobble-sized material which is similar in size, or slightly coarser, than the existing beach. The material should also ideally be of a similar lithological composition. However, it is often difficult to find material of a suitable grade and composition within economic transport distance. For this reason, and also because of related cost issues, quarried rock has often been used as a substitute (e.g. Figure 44). While such angular material has some advantages from a FCERM point of view, in that it is relatively cheap if a local source is available, and movement is reduced by angular clast interlocking, it has disadvantages from amenity and nature conservation viewpoints. In moderate to high energy environments rounding of relatively soft rocks such as limestone can occur with 10 – 20 years. For example, at Deganwy and Llandudno West Shore small bounders of angular limestone placed in the early 1990s now show significant rounding and a more natural appearance. As some of the rock clasts break down and become rounded they yield smaller gravel-sized clasts which may be transported considerable distances in an alongshore direction and contribute to the development of shingle and mixed-sand-shingle spits suitable for nesting terns and other birds (Figure 45).

Figure 44 Small boulders of angular limestone placed to create a wave diffusive revetment in front of eroding low dunes, Morfa Conwy

Figure 45 Tern nesting area formed on alongshore drifted shingle derived from dune toe armourstone and rip-rap protection, Gronant, Denbighshire – Flintshire

Local sources of suitable marine shingle, broadly similar in size and composition, may become available from dredging operations with nearby harbours and navigation channels. Dredged mixtures of sand, shingle and even small amounts of mud can be useful for shingle beach nourishment since wave processes rapidly sort the different size grades. Examples where dredged sand and shingle mixtures have been used to nourish shingle beaches and sand dunes include Aberdovey and Holkham's Nose, using

dredge arisings from Aberdovey Harbour and Foryd Harbour, respectively (Figure 46).

Figure 46 Shingle beach backed by dunes at Holkham's Nose formed largely by deposition of shingle and sand dredged from Foryd Harbour within the entrance to the River Clwyd

Where suitable nourishment material is not available from local marine or coastal sources, rounded 'cobble' may be obtainable from inland quarry sources. The Cefn Grianog quarry at Llanllyfni, inland from Porthmadog, has provided an important source of fluvio-glacial rounded boulders, gravel and sand for numerous beach recharge projects in North Wales and West Wales.

8.1.5. Structures to control alongshore sediment movement

8.1.5.1. Groynes

Groynes are shore-normal structures constructed of timber, rock, concrete or rock-filled gabion baskets to restrict the rate of movement of water and sediment in an alongshore direction. On the open coast and in large bays groynes are most commonly constructed as a series to influence sediment movement across a wide frontage (Figure 47), although one or two large rock groynes, including 'fishtail' groynes, may be used to hold a beach over a more limited length of frontage (Rogers et al., 2010; Figure 48 & Figure 49).

Figure 47 An example of effective timber groynes in front of Lanfairfechan promenade

An example of rock groynes at Llanddulas, North Wales, is illustrated in Figure 48 and an example of rock fishtail groyne at Penrhyn, North Wales, is illustrated in Figure 49.

Figure 48 Rock groynes and replenished beach at Llanddulas, North Wales

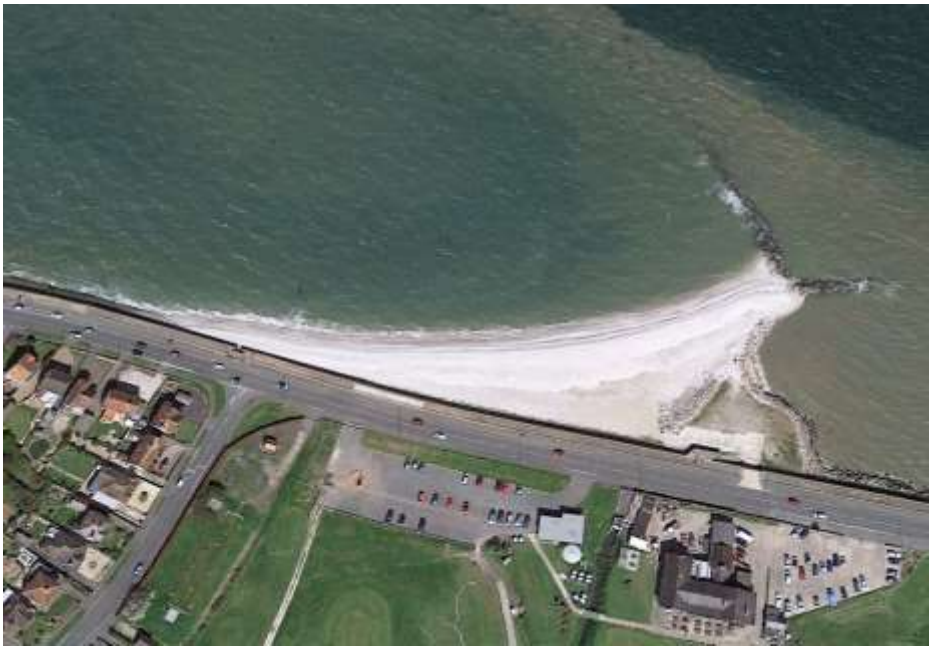


Figure 49 A fishtail rock groyne and replenished beach at Penrhyn, North Wales

When correctly designed, groynes can be effective in maintaining a high, relatively wide upper beach which protects any structures behind (e.g. Figure 47), and when groyne bays are sufficiently full with sediment they allow continued alongshore sediment movement. However, where the groynes effectively stop most of the alongshore sediment drift they have the negative effect of starving the downdrift beaches of sediment, leading to falling beach levels and increased risk of overtopping or sea wall collapse in these areas (e.g. Figure 50).

Figure 50 Sediment starved shingle beach down-drift of Aberaeron harbour entrance piers

8.1.5.2. Rock armour revetment

Placement of rock armour is one of the most widely used coast protection measures on account of relative technical simplicity and low cost (in regions such as Wales with local availability of suitable armourstone) compared with schemes which require more sophisticated design and construction methods (HR Wallingford, 2002). Structures range from simple rock revetments with as few as one layer of rocks to complex multi-tiered and size-graded structures (Figure 51). The materials used range from natural rock types such as limestone and granite, recycled waste materials such as crushed concrete, and man-made concrete blocks and tetrapods. A comprehensive guide to available materials, design and construction methods is provided in the Rock Manual (CIRIA, 2007).

Figure 51 Use of rock armour and sheet piling to protect a caravan park and Cambrian Coast Railway, on a former shingle ridge, north of Llanaber, Gwynedd

8.1.5.3. Timber revetment

Shore-parallel revetments can also be built of timber, sheet-piling, old railway track and similar materials. They are usually built in conjunction with groynes, rock armour or other structures. Low revetments (e.g. Figure 52) allow shingle to be 'thrown' over the top by breaking storm waves, but the natural processes of storm over-washing and ridge re-building are severely constrained.

Figure 52 Timber revetment and groynes, Borth and Ynyslas Golf Club frontage, Ceredigion

8.1.5.4. Asphalt aprons

Asphalt aprons are typically used to stabilise the surface of a mobile shingle beach in locations where major changes in beach level could threaten the structural integrity of a sea wall, and/or where shingle 'thrown' over the wall by storm waves poses a hazard to a highway or sea front buildings. An example at Porthcawl, South Wales, is shown in Figure 53.

Figure 53 Stabilization of the upper part of a shingle beach by an asphalt apron, Porthcawl

8.1.5.5. Offshore breakwaters and reefs

Rock can be placed in the intertidal zone to create an emergent offshore breakwater, or below the level of low water to create a submerged offshore reef. In both cases the main objective is to reduce wave energy and flood risk in the lee of the structure. A subsidiary objective and additional benefit is often to encourage sediment accretion behind and to increase the area of recreational beach. The core of the breakwater / reef may be constructed of rubble or dredged mixed sediment with rock placed to form a protective surface layer. One of the first Welsh examples of offshore breakwater was at Rhos on Sea in the early 1980s (Brampton & Smallman, 1985), while one of the most recent schemes involved the construction of a short headland breakwater at Towyn in 2010-11 (Figure 54). As part of this scheme mixed sand and shingle was imported to initiate the development of a tombolo behind the headland, and this has subsequently increased in size through natural sand and shingle accretion. Several smaller emergent breakwaters were constructed as part of the Borth coast protection scheme between 2012 and 2014 (Figure 55). The cost effectiveness of such schemes is influenced to a significant degree by tidal range, construction costs generally being higher in areas of larger tidal range. The effectiveness of breakwaters in building and

maintaining a natural high beach is also dependent on the availability of sediment supply. Where natural sediment supply is low, the combined costs of importing sediment and breakwater construction may make a scheme uneconomic.

Figure 54 Detached emergent breakwater at Towyn, Gwynedd, with a replenished shingle and sand tombolo behind

Figure 55 One of a series of detached rock breakwaters at Borth, Ceredigion

8.1.5.6. Concrete walls and promenades

In many situations where high value assets are exposed to high wave energy, concrete walls revetments and promenades have been built, partly or completely enclosing the shingle structures and/ or sand dunes which were originally present. Promenades were built as part of the development of major seafront holiday resorts in the 19th century, including at Porthcawl, Aberystwyth and Rhyl. Subsequently they have also been constructed to protect residential property, recreational and industrial infrastructure at many other smaller towns and villages, and at locations such as Tanybwlch where a concrete wall and promenade / roadway was built in the mid -1960s to prevent the sea breaking through and potentially diverting the course of the River Ystwyth (Figure 56). A wide variety of seawall and revetment design types and construction methods has been used, and reviews are provided in Thomas & Hall (1992) and McConnell (1998). They are found on the Welsh coast both as stand-alone structures and in combination with groynes, rock armour or offshore breakwaters.

Figure 56 Concrete sea wall and promenade / roadway separating the River Ystwyth from the beach at Tanybwlch, south of Aberystwyth

Concrete sea walls as a ‘permanent backstop’ in the event of beach failure and may be the only viable FCERM option where natural processes do not favour the existence of an adequate protective. However, in effectively fossilizing the shoreline they eliminate or greatly reduce the natural dynamic behaviour of a shingle beach, destroy any inherent geomorphological feature interest, and have major negative impacts on shingle vegetation and fauna.

8.2. Methods for the control of shingle impact on land drainage

There are many hundreds of natural and man-made land drainage outlets around the coast of Wales, ranging from large rivers to small streams and artificial drains. Figure 57 and Figure 58 illustrate a small natural stream outfall on the coast of Ceredigion, where a concrete groyne was been constructed on the up-drift (southern side) to restrict the movement of shingle into the channel. The groyne is now in a state of disrepair and only partially satisfies its design objective. Blockage of the channel with wave deposited shingle, especially at times of low river flow, periodically requires clearance using a mechanical digger. Examples of artificial drainage outfalls on the North wales coast east of Bangor are shown in Figure 59, Figure 60 and Figure 61. The main outfall from the North Wales Wildlife Trust Spinnies Nature Reserve is located in an area of long-term net shingle accumulation and is frequently blocked by drifting shingle which. The second outfall at the top right of Figure 59 is locate in an area of east to west shingle transport. The outfall is sufficiently long that the tidal flat discharges onto the mid-beach, seaward of the main zone of shingle transport, and the landward end of the outfall has a convex form which allows overpassing of drifting shingle.

Figure 57 Natural coastal stream outlet at Llannon on the coast of Ceredigion

Figure 58 Degraded concrete groyne built to limit shingle drift towards the stream outlet shown in Figure 57

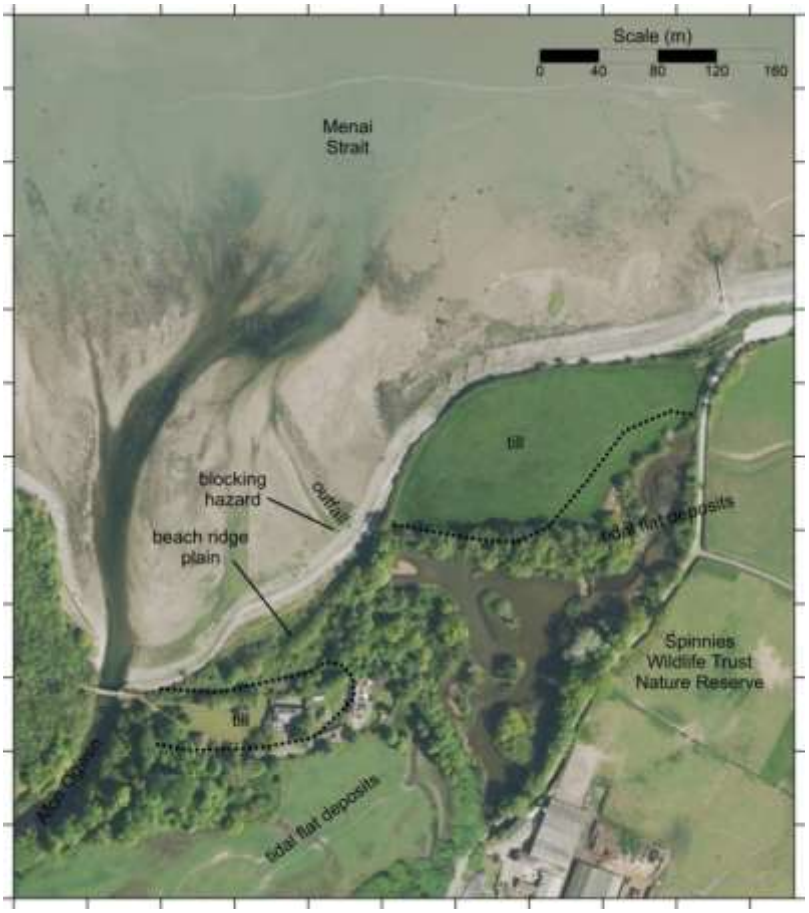


Figure 59 The shoreline near the Afon Ogwen, North Wales: the main land drainage outfall from the Spinnies Nature Reserve is sometimes blocked by drifting of shingle. A second outfall (shown in Figure 60 & Figure 61) is located at the top right of the photograph

Figure 60 The seaward end of the small outfall shown at the top right of Figure 59

Figure 61 The landward end of the outfall shown at the top right of Figure 59. The convex form of the landward end of the outfall is conducive to alongshore overpassing of shingle on the upper beach

Management of coastal shingle for inland surface water flood risk management purposes principally involves the following:

- periodic removal of shingle accumulations from river and stream outlets, tidal flaps and outfalls, most commonly excavated using a back-hoe digger and dumper trucks or lorries used to place it on the down-drift side of the drainage outlet

- removal of areas of excess shingle blocking an outlet and placement above the level of tide and wave influence
- construction of groynes, sheet piling walls or gabion walls on the up-drift side of a drainage outlet to intercept alongshore sediment drift
- construction of training walls or piers on both sides of a drainage channel; this has normally been done in areas where seasonal or inter-annual alongshore drift reversals take place, or where navigation into a larger river or harbour needs to be maintained, as for example at the entrance to the River Aeron
- use of barge-mounted excavators or cutter suction dredgers to remove drifted shingle from larger drainage and navigation channels (see Dysynni case study below).

9. Case Studies

As stated in Section 1, four case studies where FCERM interventions are applied have been selected to illustrate some of the issues and opportunities for best practice future management in more detail:

- Dinas Dinlle and Morfa Dinlle – the impact of hard engineering structures on shingle transport and maintained shingle bank flood defences down-drift
- Newgale – the challenges posed by shingle ridge roll-back towards significant coastal infrastructure, requiring consideration of asset relocation and habitat creation through coastal adaptation
- Aber Dysynni – the effect of alongshore drift of shingle on maintenance of land drainage and tidal exchange in a significant estuary (the Dysynni), historically controlled by construction of a terminal groyne, training walls and more recently by dredging and sediment by-passing
- Aberdesach to Dinas Dinlle – where a combination of alongshore drift and barrier rollover presents long term challenges for the maintenance of land drainage and traditional agricultural practices in the coastal plain, but also offers opportunities for the re-creation of dynamic coastal landforms and a range of coastal habitats.

9.1. Case Study 1: Dinas Dinlle and Morfa Dinlle

9.1.1. ‘Knock-on’ down-drift effects of hard shore defences

At Dinas Dinlle, Gwynedd (see Figure 1 for location), the sand and shingle shoreline has experienced erosion for at least the last 150 years, leading to erosion of The Mound on which an Iron Age hillfort is situated, and creating both an erosion and a coastal flood risk for the village. North of the village is an artificially maintained shingle ridge which provides flood protection for a low lying area of marshland and shingle which forms the southern part of the Morfa Dinlle peninsula, and on which Caernarfon airport is located (Figure 62).

Figure 62 View across the northern part of the Dinas Dinlle frontage, looking towards Morfa Dinlle and the Menai Strait. Note the build-up of shingle, some vegetated, on the southern side of the fishtail groyne and erosion of the shingle bank flood defence on the down-drift side of the groyne

The frontage was badly affected by storms in February 1990, following which several management options studies were undertaken. The final scheme included construction of a rock bastion across the upper part of the foreshore at the southern end of the village, a longer fishtail groyne at the northern end of the village frontage, and slight managed realignment of the artificially maintained shingle bank to the north of the fishtail groyne (Shoreline Management Partnership, 1993; Figure 63). The objectives of the scheme were to reduce, but not entirely stop, the rate of alongshore transport of shingle and sand along the upper beach, to encourage trapping of sediment and increase in upper beach levels in front of the mound and between the groynes in front of Dinas Dinlle village, and provision of flood protection to the road and land leading up to Carnarvon on airport.

Between completion of the scheme in 1994 and 2011 significant net gain of sediment occurred on the up-drift side of the rock bastion and between the rock groynes, with excess accumulation against the landward end of the fish-tail groyne (Pye & Blott, 2011; Figure 62). In order to maintain the northward drift of sediment, Gwynedd Council undertook periodic movement of predominantly shingle across both the southern rock bastion and the fishtail groyne until 2006, when the practice was abandoned. The effect of building

these structures was to starve the beach immediately to the north of the main fishtail groyne of sediment, leading to wave erosion of the sea defence bank behind the beach. The beach in this area was reinforced with imported quarry rock in 1995 and 2005, but erosion has continued (Figure 64). Two more recent assessments of the future management options for this area concluded that, if the crest levels of the fishtail groyne and rock bastion are not lowered to allow greater sediment overpassing, the shoreline to the north of the fishtail groyne will eventually form a shallow zeta-form bay, and that the existing sea defence bank should be realigned accordingly to maintain adequate protection for the coast road behind (Pye & Blott, 2011; Royal HaskoningDHV, 2013).

Between 2013 and 2015 a 200 m long section of the shingle bank north of the village experienced further erosion and localised over-washing, such that the bank no longer provides the level of design protection (Figure 65). Immediately to the north of this area, there has been some gain of sediment on the upper beach fed by erosion immediately to the south, and the ridge has increased slightly in width, forming a subdued projection of the shoreline. However, further to the north again, along the Carnarvon airport frontage, where it has so far been possible to maintain the shingle ridge with a design crest level of 6.0 m OD, monitoring suggests that the beach and seaward face of the bank are coming under increasing pressure.

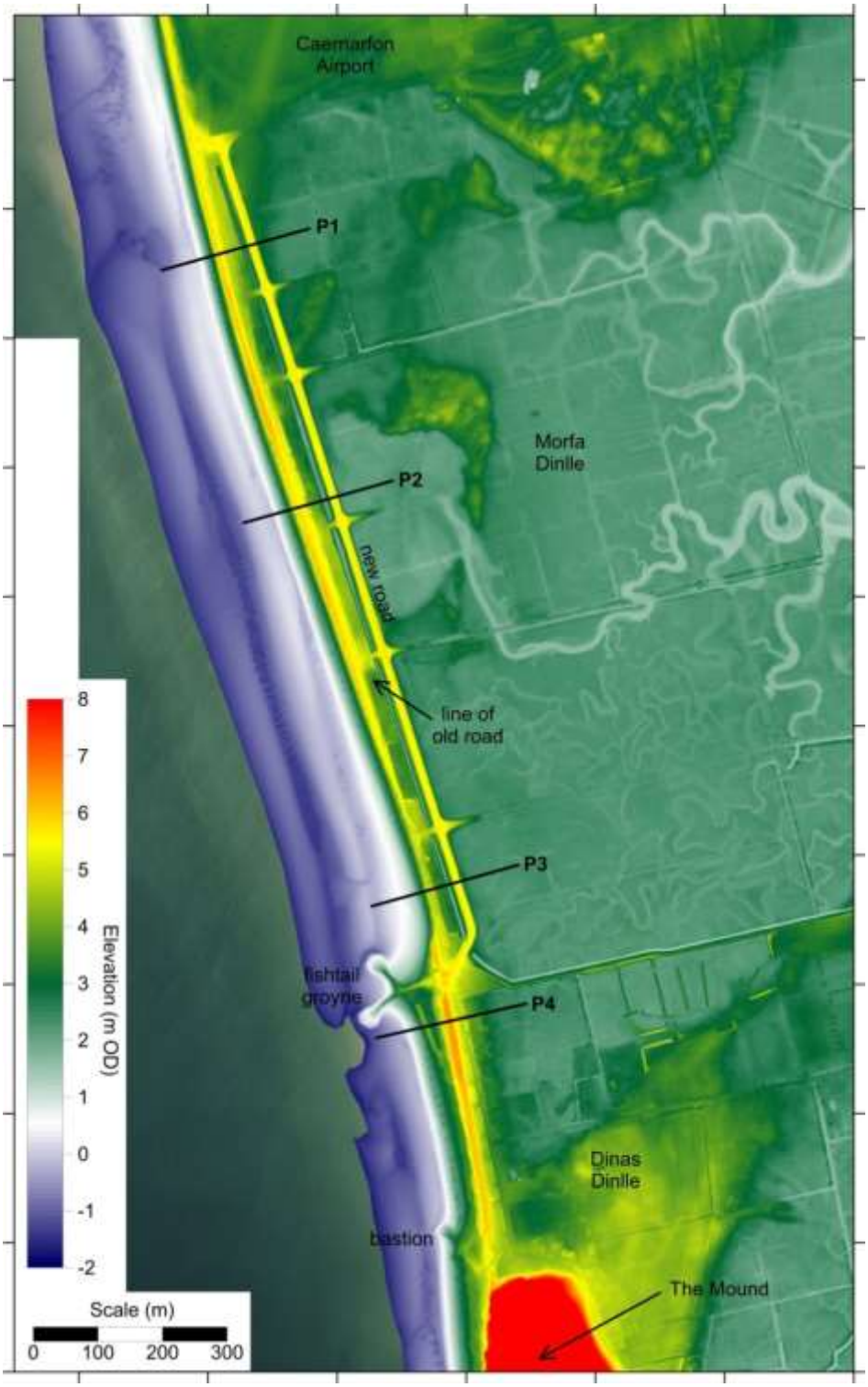


Figure 63 LiDAR digital terrain model of the Dinas Dinlle to Caernarfon airport frontage, flown 4th February 2015, showing hard defence structures built in the 1990s and the shingle bank to the north which is maintained by NRW as a flood defence but which has experienced significant erosion at its southern end, immediately to the north of the fishtail groyne

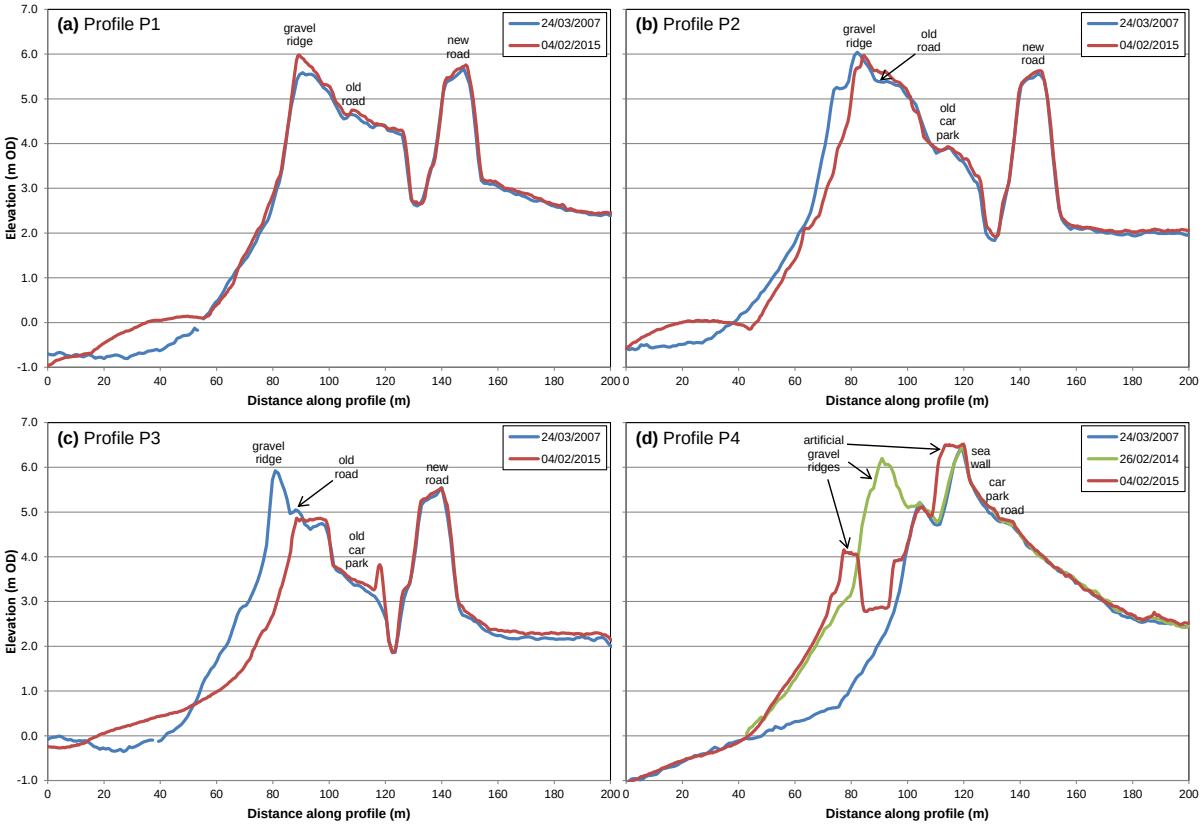


Figure 64 Comparison of cross-shore profiles P1-P4 taken from LiDAR surveys in 2007, 2014 & 2015

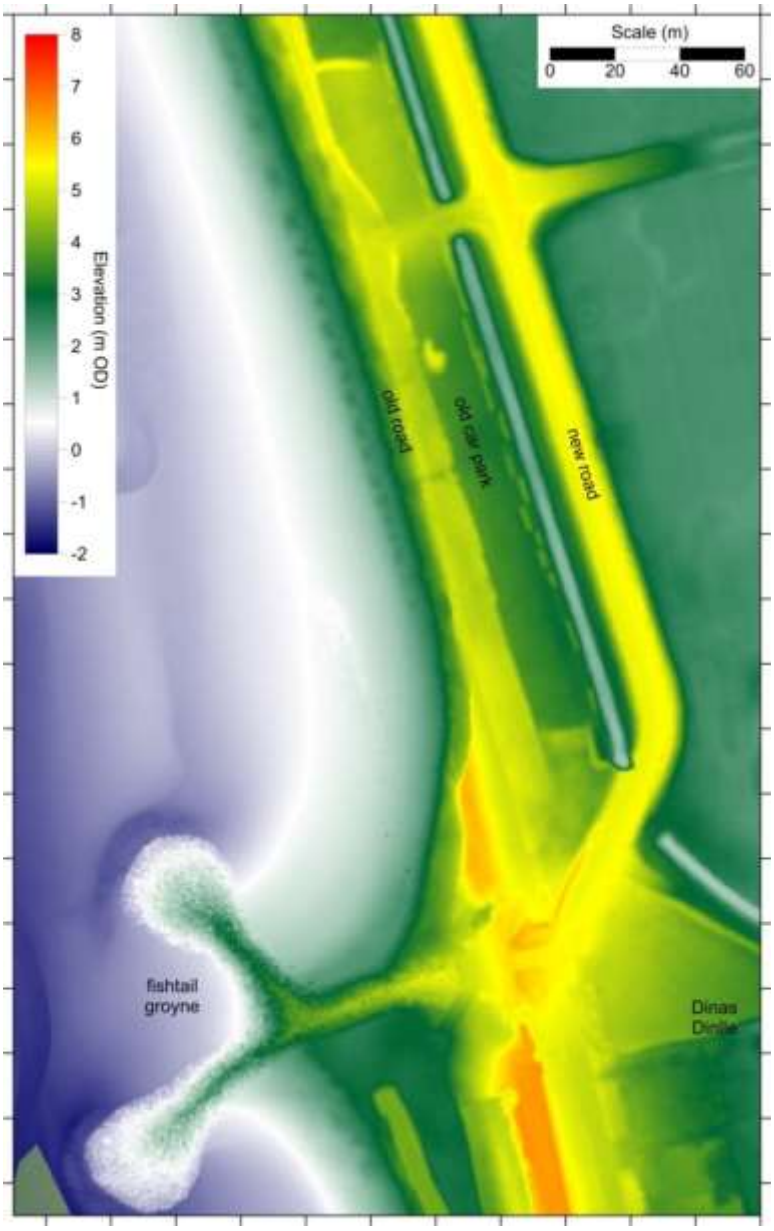


Figure 65 LiDAR digital terrain model enlargement of the area north of the fishtail groyne, flown 04/02/2015

This case provides a clear example of the 'knock-on' effects of hard defence structures on adjoining sections of shore and coastal flood defences. Although the hard engineering structures have been successful in providing a higher standard of coastal flood protection for Dinas Dinlle in the short term, they made the task of maintaining the flood bank to the north more difficult.

9.1.2. Likely effects of accelerated sea level rise

Over the next 20 to 50 years the pressure on the beach and shingle ridge to move landward is likely to increase, and maintenance of the flood defence bank on its present alignment will become unsustainable. In the short term

(next 20 years) it may suffice to allow a ‘stable’ shallow bay to develop at the southern end of the bank, allowing shingle to be periodically over-washed into the low ground area between the outer bank and the new road. However, in the medium to longer term it is likely to be impractical to maintain the design profile along much of the outer bank, with the possible exception of the northern end. Even if the present rate of sea level rise (c. 2mm/ yr), this will mean an increase in mean sea level of 10 cm over the next 50 years. The evidence from historical tide gauge records for stations such as Holyhead and Milford Haven suggests that spring tide high water levels are likely to increase more rapidly than mean sea level; this combined with projected greater frequency of severe storms in a warmer world, will act to driving the shoreline in a landwards direction. Although sea level rise and greater storminess may also enhance the rate of soft cliff erosion to the south of Dinas Dinlle, it is unlikely that this will produce sufficient supply of new shingle to offset the effect of rising sea level along the entire Morfa Dinlle shoreline.

9.1.3. A suggested ‘good practice’ way forward

Hardening of the entire seaward side of the outer bank with rock armour or other structures would be undesirable on environmental and aesthetic grounds and in any case is unlikely to be economically justifiable. The presently maintained shingle bank should therefore be allowed to adjust to a more natural profile and move landward in equilibrium with rising sea level. This increased dynamism would bring environmental benefits in the form of a variety of bare and vegetated shingle habitats, together with small saline / brackish lagoons and transitional habitats. However, if such a policy is adopted the new road embankment would act as the main flood defence and would need to be strengthened, raised or moved further landward if all-weather road access to the airport and Fort Belan at the northern end of Morfa Dinlle is to be maintained. An alternative, potentially lower cost approach would be to accept that access along the road will be occasionally disrupted as a result of storms, and to convert the road to a more adaptable design which can be easily reinstated if sections are washed out.

9.2. Case Study 2: Newgale, Pembrokeshire

9.2.1. Barrier rollover and shingle ‘squeeze’

The Newgale shingle ridge, located in the northern part of St. Bride’s Bay, Pembrokeshire (Figure 1), consists of two sections of barrier beach on either side of a short section of fringing beach around an outcrop of rock at Sibbernock Point (Figure 66). The ridge is composed of shingle derived both from local rocks around the margin of the Bay and from reworked glacial sediments (Harrison, 1965). The beach is almost swash-aligned although in most years there is a slight net sediment drift towards the north owing to the dominant effects of offshore southwesterly waves. The southern section of barrier beach acts to reduce coastal flooding of the seaward part of the Bathesland Water valley. The second, longer, section provides flood protection

for the lower parts of the Brandy Brook valley, the Newgale Sands southern car park, a camping ground, two properties and the main A487 coast road (Figure 67). The Brook drains to the sea through a narrow outlet at the northern extremity of the barrier and is periodically blocked by shingle; this is cleared by NRW to prevent fluvial flooding in the valley, with the shingle placed back on the adjoining ridge (Figure 68).

The shingle barrier ridge itself is currently maintained by Pembrokeshire County Council (PCC) as a coastal flood defence The shingle beach and barriers are located with the Pembrokeshire National Park but not within a designated SSSI or SAC. The crest level of the barrier is intended to meet a 1 in 5 year event standard, but this is increasingly difficult to achieve. During the stormy winter of 2013-14 the barrier crest was overtopped and lowered by up to 2 m, and landward spread of shingle resulted in extended closure of the A487 road link to Newgale village and disruption to neighbouring businesses When the road is closed, traffic has to follow a 6.2 km inland diversion using single track rural roads.

A comparison of LIDAR surveys in 2006 and late March 2014 demonstrates that the shingle ridge crest moved landwards slightly over this period (Figure 69), and has also lost elevation at its northern end due partly to shingle being washed into the Brandy Brook channel or spread onto the road from where it has been taken off-site. Most of the landward movement of the crest occurred during the story winters of 2006-7 and 2013-14; analysis of historical maps aerial photographs has indicated that this is part of a longer term trend by which the barrier is experiencing ‘rollover’. However, owing the presence of the fixed roadway, the active upper beach and ridge crest cannot migrate freely and is being ‘squeezed’. This trend is likely to continue, and may be enhanced, by projected increases in sea level over the next 100 years.

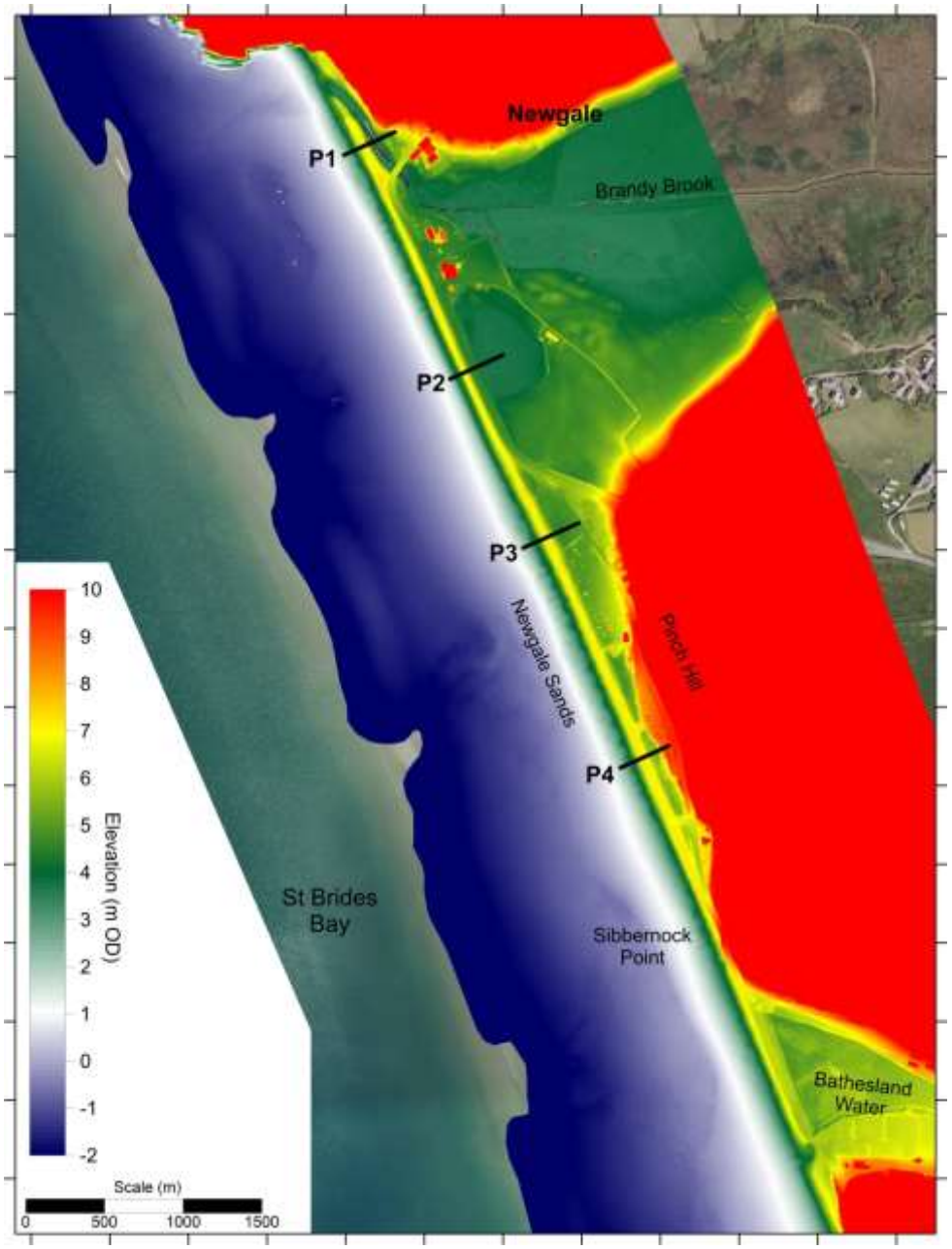
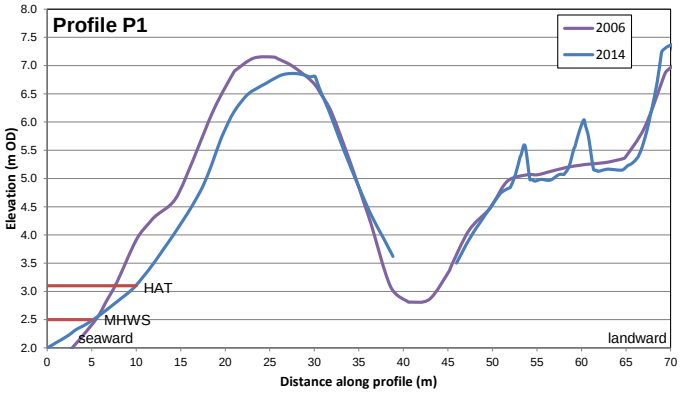
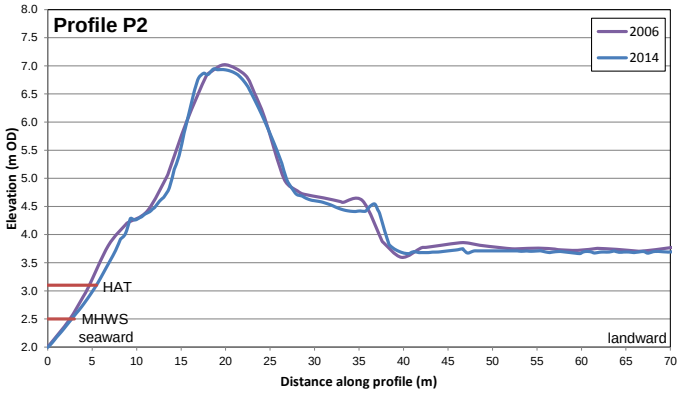


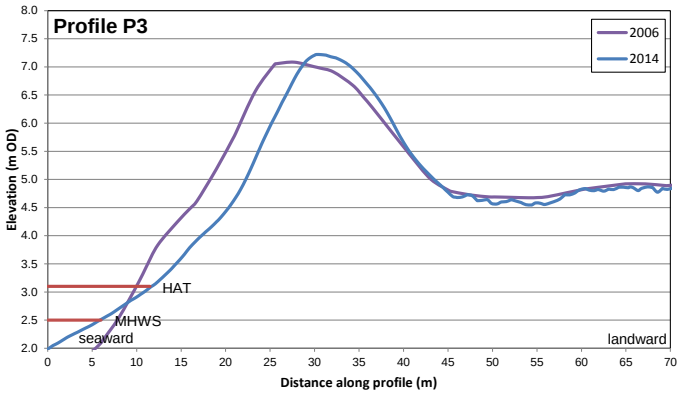
Figure 66 Composite LIDAR DEM of the Newgale shingle ridge (LiDAR flown 27th April 2006 and 30h March 2014)

Figure 67 View north along the landward side of the Newgale shingle ridge towards the Brandy Brook outlet

Figure 68 Storm overwash of the coast road at Newgale during the 2013-14 winter (photograph by Pembrokeshire County Council)







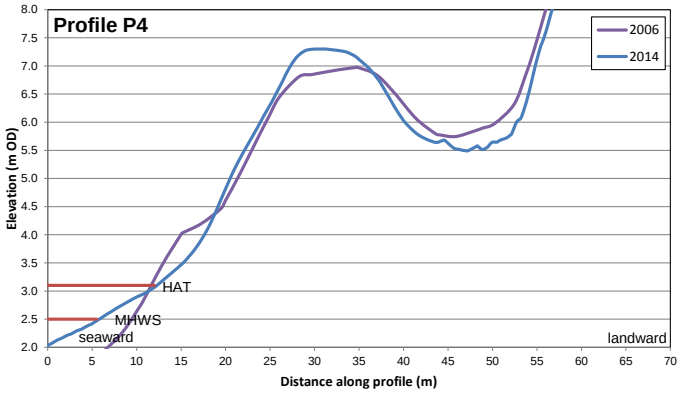


Figure 69 Profiles P3-4 across the shingle barrier, taken from LiDAR digital terrain models (filtered) flown between 27th April and 11th May 2006 and on 30th March 2014

9.2.2. Good practice assessment of management options

The West of Wales Shoreline Management Plan (RHDHV 2011) concluded that as sea level rises it will be increasingly difficult to maintain the Newgale barrier in its present form, and a separate report to PCC (RHDHV, 2014) concluded in the medium to longer term it will be necessary to allow the shoreline to roll back and to realign the A487. Following public consultation, a Final version of an Adaptation Plan was published by PCC in May 2015. A further report by RHDHV (2016) anticipated that under a 'Do Nothing' scenario the barrier would retreat by 7.5 m in 20 years, 12.5 m in 50 years and by 25 to 47 m in 120 years. A number of short term 'Do Minimum' options to maintain the road have been considered, including rebuilding the shingle bank in advance of a storm, raising the crest of the bank to prevent overtopping, and reinforcing the core of the bank, but none are considered by the consultants to provide a sustainable or effective solution. Reasons for this include the fact that sea level is rising, the supply of new shingle to the barrier is very restricted, the natural response of the barrier to both storms and sea level rise is for the seaward face to be eroded and the crest to move landward. Creation of a hard core, while it might fix the position of the lower part of the barrier, would not prevent lowering and wash-over of the crest. Three long-term options were also assessed by RHDHV, including a sea wall, an embankment with rock revetment, and a short-term gabion solution replaced in the longer term by a rock revetment and concrete wall solution with crest height of about 10.5 m OD. However, it was concluded that with all three options the shingle bank would disappear and upper beach levels would fall, changing the character of the shore and potentially leading to exposure of the toe of the defences. Estimated costs of these options ranged from £12.5M to £19.51M. It was pointed out that none of the options considered would address the problem of potential storm flooding via the Brandy Brook outlet, or as a result of heavy rainfall within the Brandy Brook catchment. The preferred solution identified therefore suggested realignment of the road and eventually to remove all associated infrastructure.

Following further public consultation of options for the road, a Final WelTAG Stage 1 Assessment report was published in July 2017 (Atkins, 2017). An Adaptation Strategy Plan (ASP), published in March 2017 (Atkins & RHDHV 2017), identified the following objectives:

- ensuring connectivity with the rest of Pembrokeshire
- maintaining physical and functional links between the northern and southern edges of Newgale
- maintaining connection to the beach
- maintaining and enhancing the natural environment
- sustaining community well-being and empowering locals to a take a lead role in adapting to change
- sustaining of business opportunities
- supporting tourism

The ASP identified potentially significant effects including loss of the existing A487 road over the next 10 - 20 years, movement of shingle towards two

existing businesses (the Duke of Edinburgh Pub and the Surf School, cafe and shop) and into the Newgale campsite which would also be subject to increased flooding from wave overtopping and ponding of water within the valley. However, opportunities associated with these changes are also identified in the ASP, including creation of wet woodland and saline lagoons, opening up of the valley area to provide additional visitor attractions (e.g. for walking, bird watching), and development of additional visitor / business facilities.

The WelTAG Stage 1 Assessment included consideration of landscape designation constraints, habitats and species likely to be affected by each of the four options identified after consultation on the initial assessment by PCC, together with preliminary engineering designs and forecast costs for each (suggested cost range £16M - £28.5M). Based on this assessment, the report recommended that the existing road line should be realigned approximately 60 m inland of the present route, with the road built on a viaduct at a level approximately 3m above the ground. A high level environmental appraisal analysis of likely new habitat development in response to such a strategy was reported by RHDHV (2017). The report considered there is likely to be an increase in both saline and freshwater flooding, due partly to more frequent blocking of the Brandy Brook outlet as the shingle barrier rolls back, but this would provide opportunities for the creation of a range of wet and transitional brackish to freshwater habitats.

This case study provides a good example of the problems created by shingle barrier rollback, which is likely to become more rapid in response to an acceleration in sea level rise, and of best practice options appraisal which has included detailed assessment of background physical process, flood risk management issues, economic impact, and potential environmental costs and benefits. Considerable effort has already been spent on the options appraisal and public consultation, although a final decision on a preferred option will be dependent on the results of further detailed site studies and availability of funding.

9.3. Case Study 3: Aber Dysynni, Gwynedd

9.3.1. Effect of alongshore shingle drift on flushing efficiency of the Dysynni estuary

The Aber Dysynni shingle feature forms a shingle spit extending northwards from Towyn towards the entrance to the Afon Dysynni (Figure 1 and Figure 70). The spit has developed across the mouth of a former large estuary under the influence of strong northerly sediment drift, driven by dominant waves from the southwest. Saltmarsh (Morfa Gwyllt) developed behind the spit but much of this was enclosed by embankments, and the land drained, in the late 19th and early 20th centuries. The Broadwater remains as a residual feature of the original estuary.

Since 1878 most of the shore south towards Tywyn has experienced erosion, supplying large amounts of sediment which has moved north towards the mouth of the Dysynni and around the Tonfannau headland Figure 70). The spit

has extended northwards, forming a series of abandoned re-curves which have been mined for gravel at various times (Figure 71). This northward movement of shingle continues today, constricting the mouth of the Dysynni, pushing it towards the Tonfanau side, and inhibiting the movement of Dysynni floodwaters towards the sea.

Figure 70 Tywyn to Aber Dysynni 2006 aerial photograph with superimposed 1878 MHW line

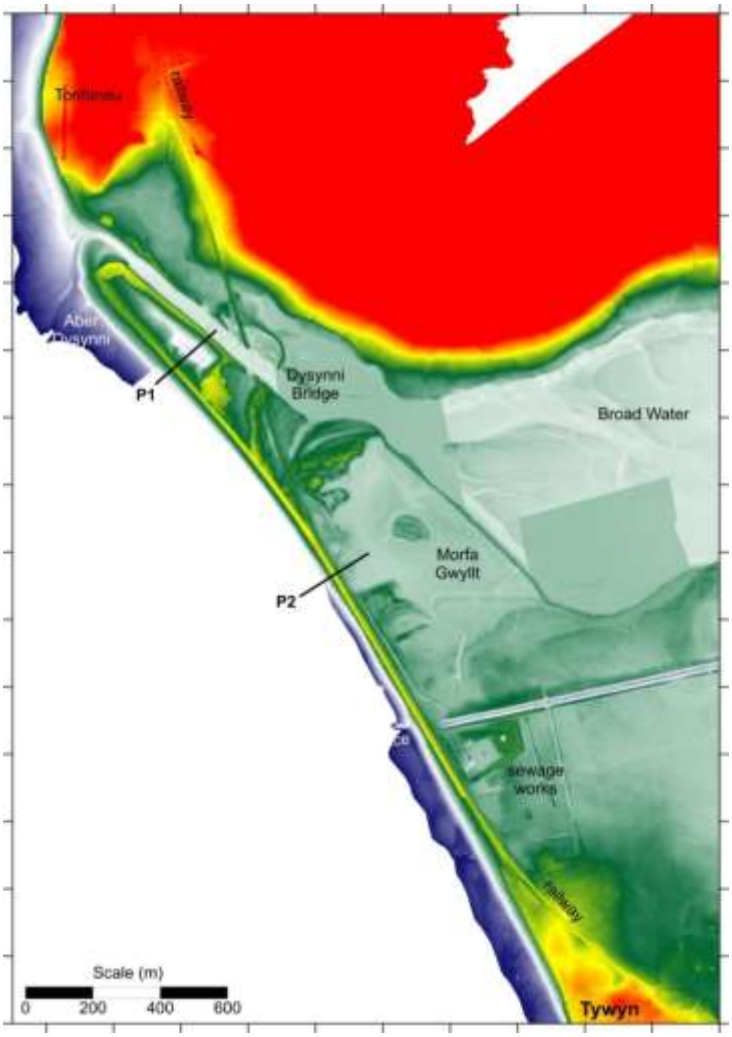


Figure 71 Aber Dysynni Lidar DTM based on surveys 2007-2015. Note area of low ground near profiles P1 due to former gravel workings

When the Cambrian Coast railway line was built in the mid-19th century, training walls were constructed to control flow and movement of the main estuarine channel beneath the railway bridge. Later, in the early 20th century, an additional breakwater was built around the northern end of the spit to regulatethe movement of shingle into the channel. However, build-up of shingle against the southern side of the structure continues, and incursion into the channel presents an ongoing problem for the maintenance of land drainage.

An embankment was constructed around the northern end of the spit in the mid-20th century to facilitate gravel extraction, and an area of low ground remains between the active shingle ridge and the landward river embankment (Figure 71 & Figure 72). Along the section of the spit centred on Profile 2 shown on Figure 71 the shingle ridge is very narrow and has a maintained crest elevation of approximately 8 m ODN (Figure 72). This ridge provides an important defence for the railway line and a large area of low-lying land behind (Figure 73). The most vulnerable section of the ridge is protected by a relatively narrow zone of rock armour on the seaward face.

The glacial till shoreline at Towyn has been protected by wooden groynes and a concrete promenade for over a century, and in more recent years rock groynes and a headland breakwater have been constructed (Figure 54). This has eliminated the sediment supply provided by cliff erosion in this area and contributed to a sediment deficit on the beaches fronting the southern part of the Aber Dysynni shingle ridge complex. A shallow bay is now forming to the north of the sewage works, placing additional stress on the ridge in this area. The natural recession of the ridge immediately to the north of this point is prevented by rock armour, but beyond the northern limit of the shore protection the ridge has a relatively natural form with storm wash-over fans in several places. The 2006 and 2013-14 aerial photographs (Figure 70 & Figure 74) show the extension of these fans into the area of former gravel workings at the northern of the spit. Diversion of shingle into this area is beneficial in restoring a more natural landscape and also in reducing the amount of material moving alongshore into the mouth of the Dysynni.

9.3.2. Channel maintenance by dredging and shingle bypassing

NRW (and previously Environment Agency Wales) have for many years removed shingle from the southern side of the Dysynni channel and placed it on the northern (Tonfanau side). Areas in which extraction and placement are permitted under the terms of the current Marine Licence are shown on Figure 74. While this practice has a beneficial effect in maintaining a supply of sediment to the beaches north of Tonfanau there is some risk that part of the sediment placed on the north side of the estuary can return to block the channel at times of strong north-westerly wave activity. Placement of the material further down-drift, or higher up the beach, could reduce the risk, but would involve additional transport distance / and cost.

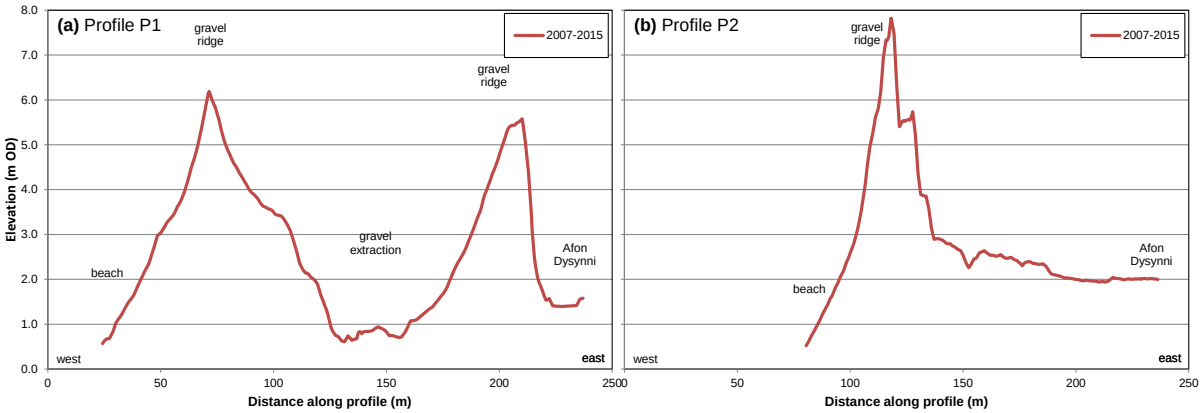


Figure 72 Aber Dysynni: cross sections P1 and P2 across the shingle ridge (extracted from the 2007-15 LiDAR DEM)

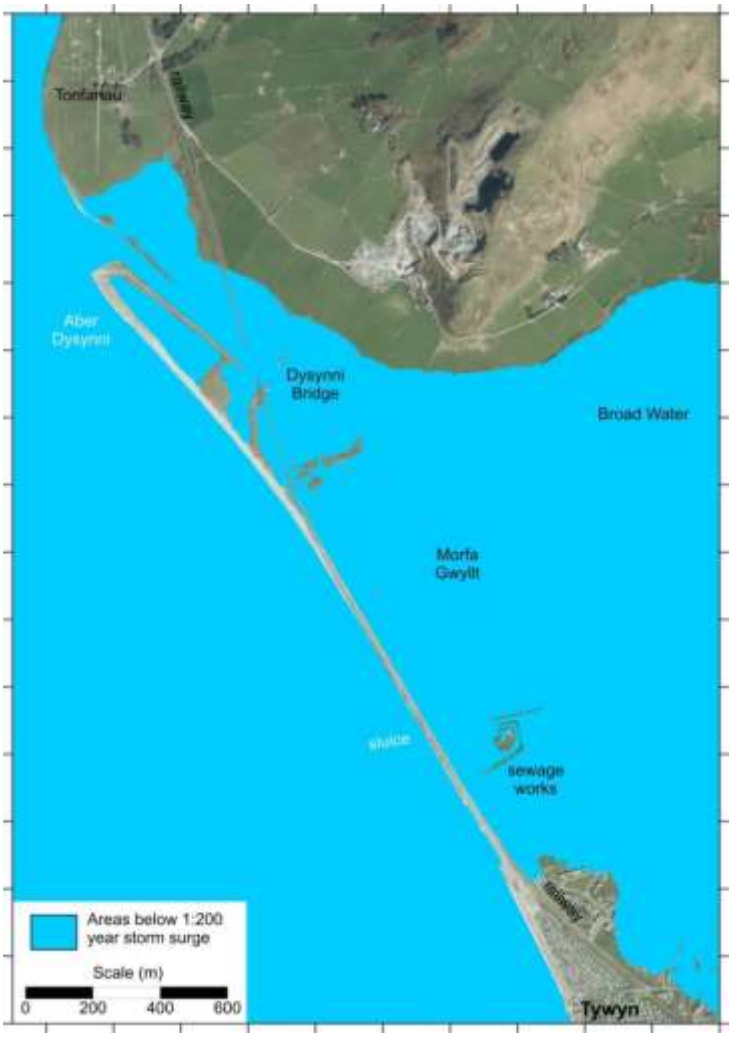


Figure 73 Tywyn to Aber Dysynni: areas below the estimated 1 in 200 year storm surge level coloured blue

Figure 74 The northern end of Aber Dysynni spit, showing the locations for which NRW currently hold a Marine Licence to remove and deposit shingle (superimposed on 2013-14 aerial photography)

9.3.3. Future management options

This case study provides a good example of the challenges posed by strong alongshore drift of shingle for the maintenance of large-scale land drainage. The present management strategy of shingle by-passing of the Dysynni entrance has reduced, but not eliminated, the problem of constriction of the entrance, and has maintained continuity of sediment transport towards the north of Tonfanau. At the present time the low water channel of the Dysynni lies very close to the Tonfanau shore and there is limited space to place additional material. An option to cut a new channel through the spit, south of the present low water channel outlet and north of the existing terminal breakwater / groyne, is under consideration. However, while this option would relieve the pressure for northward movement and infilling of the low water channel, in itself it would not provide a complete solution. The issue of beach lowering and narrowing close to the sewage works is likely to continue, and may accelerate with sea level rise, releasing more sediment which mostly would be transported towards the new cut. Other, complementary intervention

options should therefore also be considered, including shallow excavations to further encourage movement of wash-over shingle into the former gravel extraction areas, and transport of some shingle back up-drift to the area north of the sewage works (shingle recycling).

9.4. Case Study 4: Pontllyfyni to Dinas Dinlle, Gwynedd

9.4.1. Combined problems of land drainage, barrier rollover and alongshore drift

The Gwynedd coast between Aberdesach and Dinas Dinlle (Figure 1 and Figure 75) provides a good example where drifting shingle regularly causes a problem for small-scale land drainage outlets from the adjoining coastal plain. There are six main land drainage outlets in this area, the largest being the artificial cut of the Afon Llyfni. This section of coast is fringed by a series of relatively narrow shingle barrier beaches which are backed by quite extensive areas which lie below the estimated 1in 200 year marine still water level (Figure 76). Consequently there is a risk of marine flooding as well as land-based flooding arising from blockage of the drainage outlets. Artificial banks and ridges of re-profiled shingle have been created by local landowners and/or EAW/ NRW at various times, but due to continuing shoreline recession these are regularly breached or over topped and have required periodic landward realignment. The arrangement of drainage ditches on the landward side of the shingle has also required adjustment in several places as the shingle has migrated landward and filled some of the older ditches (Figure 77). Blockage of the landward side of outfall pipes which pass under the shingle ridge is often more of a problem than blockage on the seaward side.

The Pontllyfini part of the frontage is characterized by a series of connected washover lobes which were reactivated, if not entirely formed, during the February 1990 storms and again in the 2013-14 winter (Figure 78 & Figure 79). These now provide interesting dynamic geomorphological features with a range of vegetation successional stages evident.

9.4.2. Likely effects of future sea level rise

The supply of new sediment from the south is currently limited, but rates of alongshore drift can be high during periods of strong south-westerly wave action. As a result, foreshore levels in the Pontllfyni area are likely to continue to drop and there will be increased pressure for the shingle ridge to rollover landwards, probably decreasing in sediment volume and crest height as it does so. In the medium to longer term, as sea level rises, the requirement for intervention works to maintain high shingle flood banks, and to clear drainage ditches and outfalls, will increase and may become unsustainable given financial constraints and the relatively low asset value which is protected.

9.4.3. Options for future management

Allowing the coast to adapt naturally would result in some landward movement of the shoreline and would require periodic adjustments to the land drainage system, including re-design of some drainage ditches and outfalls. This could include re-design of the drainage system so that discharge to the sea is through fewer but larger outfalls which have longer pipe sections (extended both landward and seaward). This would require one or more capital schemes but could bring long-term savings in terms of maintenance. Such a change in management approach would also allow the shoreline line shingle features to adopt a more natural, dynamic form (Figure 80**Error! Reference source not found.**) and create a range of shingle habitats, including small saline lagoons, which could of vegetation and wider ecological value.

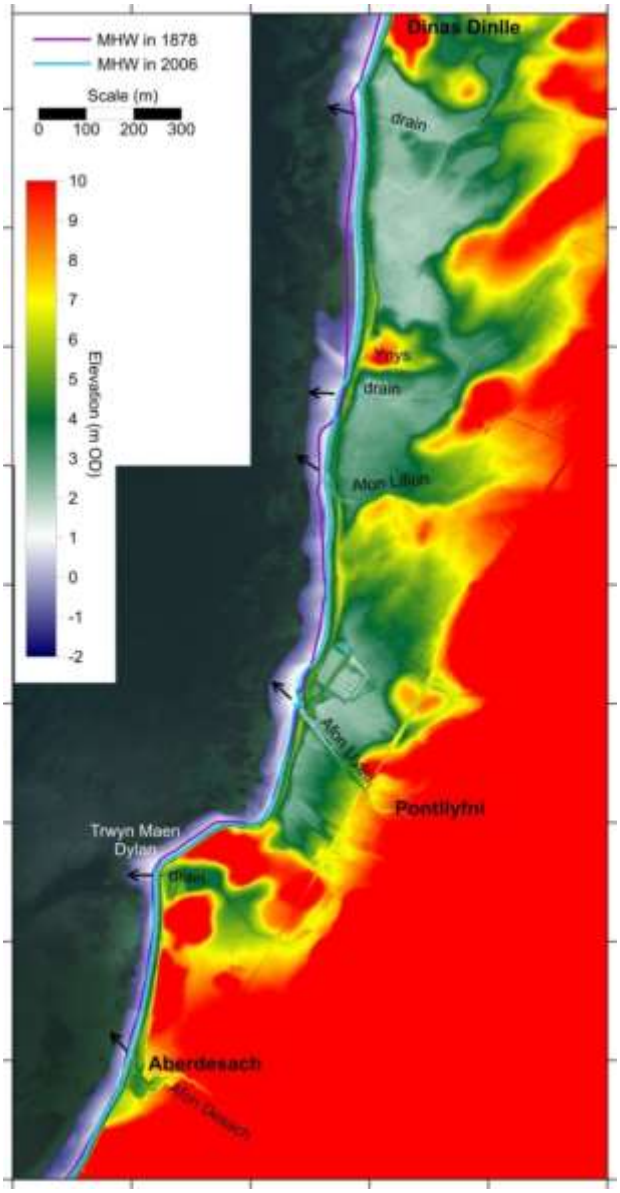


Figure 75 Location of land drainage outlets on the coast between Aberdesach and Dinas Dinlle, Gwynedd. Also shown are the positions of MHW in 1878 and 2006

Figure 76 Pontllyfni to Dinas Dinlle - areas below the estimated 1 in 200 year storm surge level

Figure 77 Enlarged aerial image showing recent shingle washovers and blocked drainage outlets, Pontllyfni frontage. Aerial photograph flown in 2006

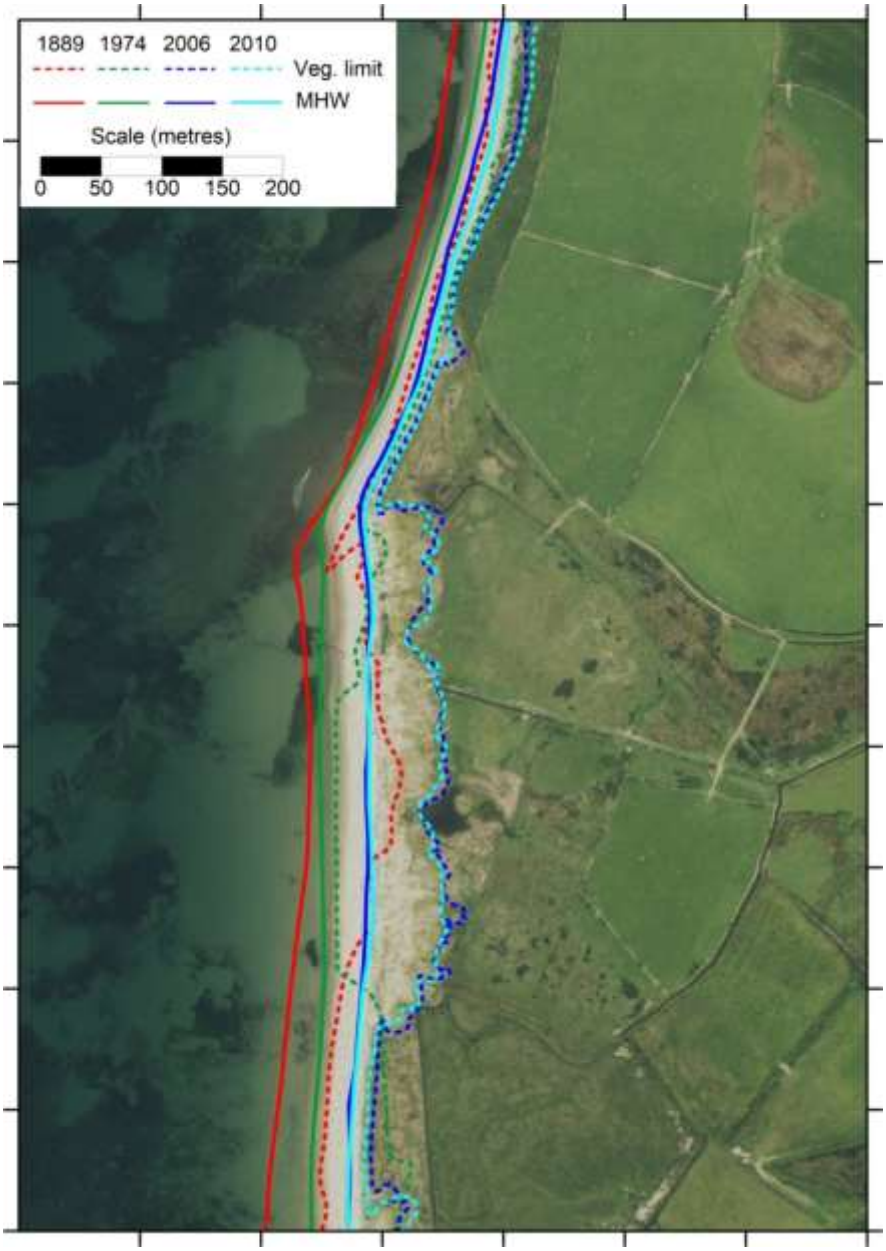


Figure 78 2014 photograph of the same area shown in Figure 77, showing changes in shoreline position and extent of vegetation on the landward side of the formerly bare shingle wash-over lobes

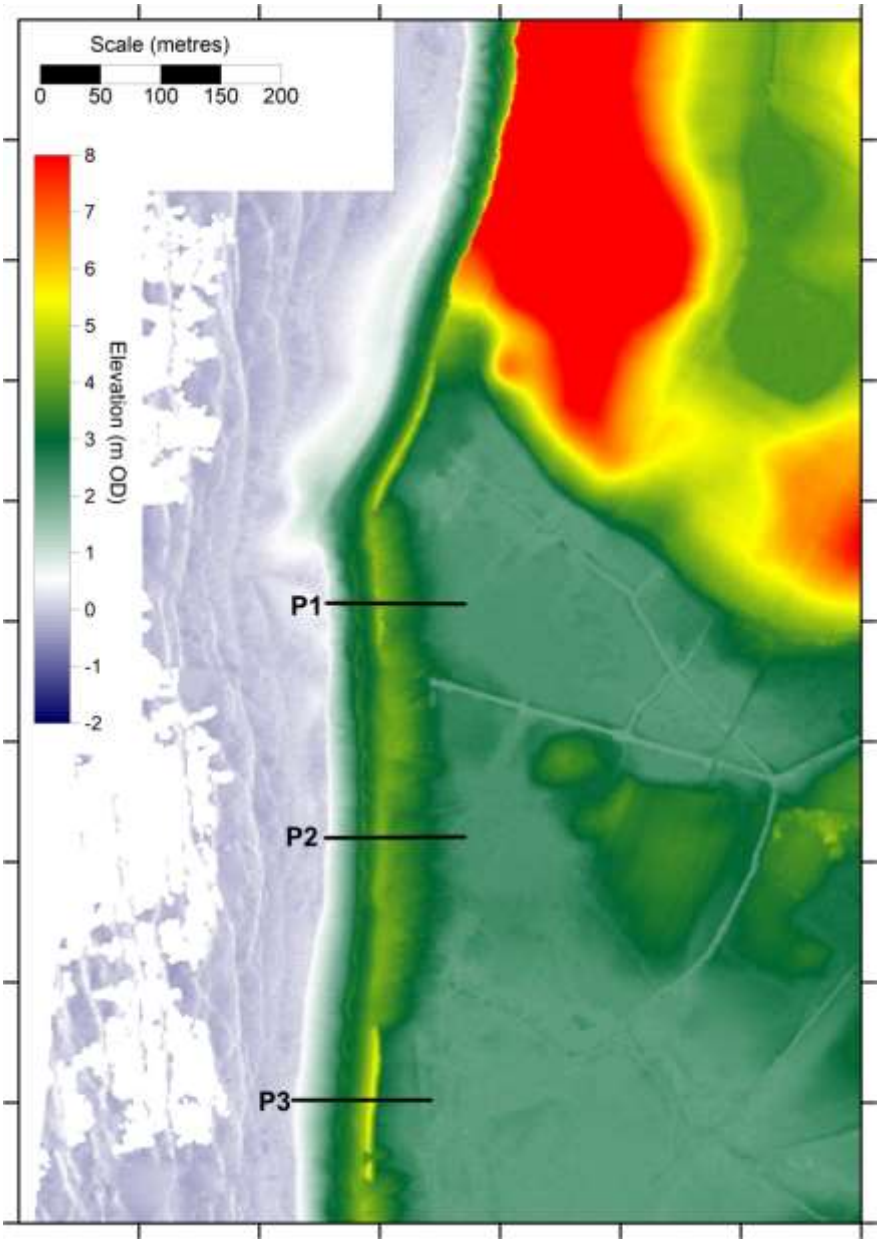


Figure 79 LiDAR DTM, based on survey 26/02/2014, of the area shown in Figure 78

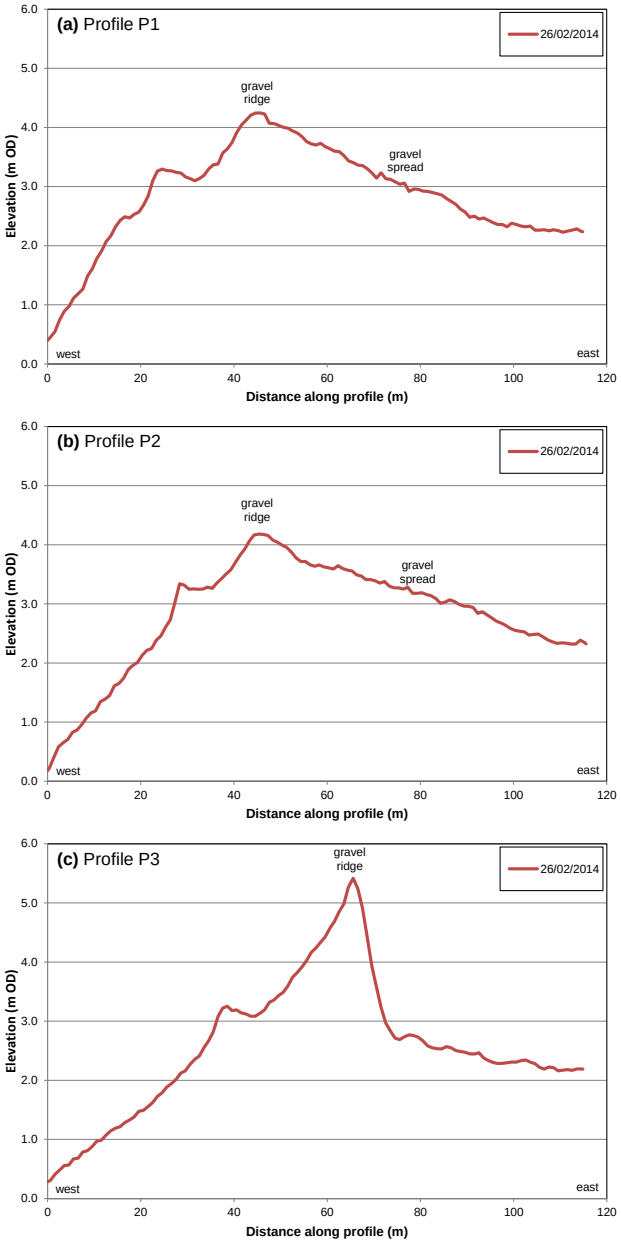


Figure 80 Cross-shore profiles at Pontllyfni northern drain, showing more natural shingle ridge and wash-over fan morphology at P1 and P2, and artificial ridge morphology at P3 (profile locations shown on Figure 79)

10. Conclusions and recommendations relating to shingle management best practice

10.1. Artificial shingle banks and replacement with more ‘natural’ profiles

Shingle beaches can be efficient in dissipating wave energy and shingle storm beach ridges act as barriers to overtopping during all but the highest tides; as such they represent effective contributors to coastal flood defence in Wales, and elsewhere. A total of 42 shingle sites on the Welsh coast have been identified as having high or medium FCERM significance. However, unlike sand dunes which can grow vertically to several tens of metres above storm tide level, no natural shingle ridge can provide complete protection against overtopping since the crest height is limited by run-up under swell-wave conditions, and crests may be lowered by overtopping, cliffing and / or breaching during severe storms. For this reason there is a long history in the UK of artificial profiling shingle ridges to create an artificial embankment which if usually flat-topped with straight, relatively steep sides, sometimes with a ‘sacrificial ‘berm’ mid-way down the seaward slope. However, such features are not in equilibrium with incident waves and can be rapidly modified by cliffing when subject to high waves and tides. Owing to the high crest level, the sediment eroded from the beach face is likely to be moved offshore or alongshore, possibly being lost from the local sediment cell altogether, and resulting in progressive loss of sediment volume from the embankment (Figure 81a).

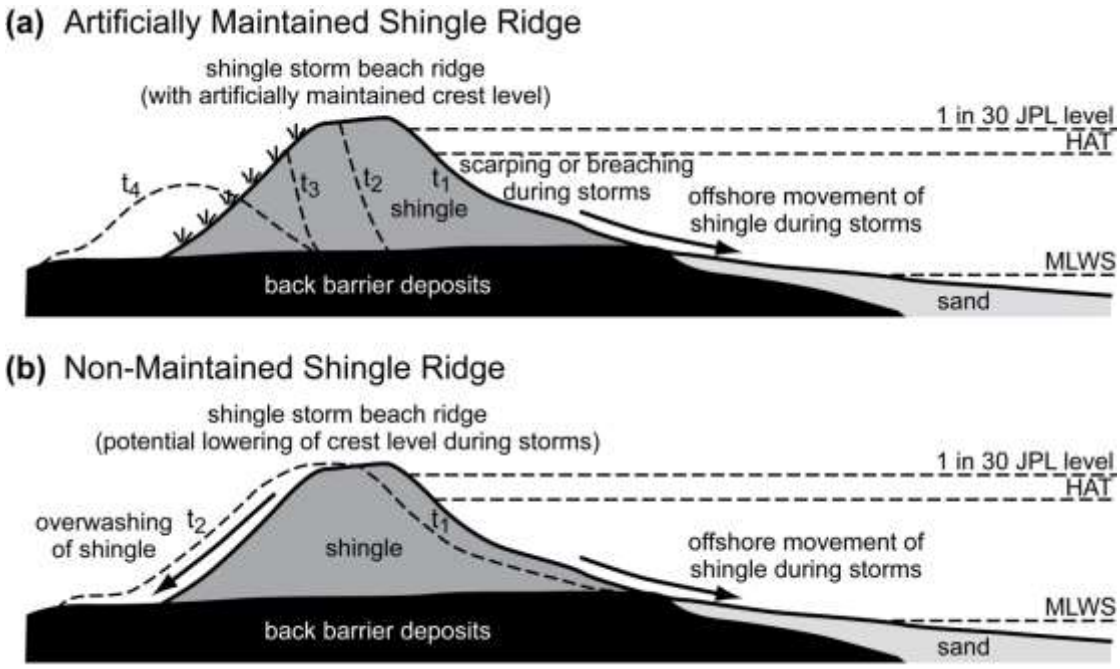


Figure 81 Schematic evolutionary scenarios for (a) an artificially maintained shingle ridge, and (b) a non-maintained shingle ridge

As part of good practice, the creation of such artificial banks should be avoided wherever possible, since regular intervention is required to maintain the design profile, and this may become unsustainable in areas where the beach sediment budget is negative. Such intervention measures also destroy the natural geomorphological features interest and have a serious negative impact on shingle vegetation and other ecological interests.

When the process of maintaining an artificial embankment profile is abandoned, a process of natural adjustment will result by which the ridge crest moves landward slightly and adopts a more natural flatter, convex-concave profile (Figure 81b). This process has been well-documented following the cessation of embankment crest maintenance at sites in Norfolk, Suffolk and elsewhere. Since over-washing is a significant process in the scenario illustrated by Figure 81b, less sediment is lost offshore and alongshore and the ridge is more likely to retain near-constant volume as it moves landwards.

The management options available for managed and unmanaged shingle banks and ridges, together with indicative FCERM effectiveness, cost, ecological impact, geomorphological / landscape impact and recreational impact, are summarised in Table 6, based on evidence from previous guidance, publically available assessment reports and the authors' own experience. Although installation of hard defenced offers the highest level of FCERM effectiveness, this option also involves the highest cost and has the greatest negative impact. Repeated re-profiling can have medium to high short-term FCERM effectiveness but low long-term effectiveness, while having high environmental impact throughout. Beach nourishment may offer the best overall compromise by allowing a wide beach and relatively high multiple ridge or platform to develop, although costs could vary widely depending on location, availability of suitable sediment, requirement for beach control structures, and requirements for repeat re-nourishment.

Table 6 Management options for shingle ridges and embankments without existing hard defences (minus signs indicate negative impact, plus signs indicate positive impact)

Option	FCERM Effectiveness and Sustainability	Cost	Ecological Impact	Geomorphological/ Landscape Impact	Recreational Impact
Repeated re-profiling after storms – may be unsustainable if net trend is for loss of sand and/or shingle	L	M	H (-)	H (-)	H (-)
Hard protection (rock armour, tetrapods)	H	H	H (-)	H (-)	H (-)
Beach nourishment (with or without beach control structures)	M	M	M (+)	M (+)	H (+)
Do nothing and allow rollback; adapt use of hinterland and/or provide hard protection around particular assets	L	L-M	M (+)	H (+)	M (N)

10.2. Provision of secondary flood defences and resilience measures

Where immovable assets of sufficiently high value are located behind a shingle ridge to warrant creation of an artificial flood bank, good practice should include creation of a concave-convex design profile which approximates a natural profile as closely as possible. If insufficient sediment is available locally to create such a profile of required crest height, a lower crest height and increased overtopping risk should be accepted, secondary flood protection measures put in place around the assets where they take the form of individual buildings or groups of buildings. Owners of the assets should also be encouraged to install suitable resilience features to allow the assets to withstand occasional flooding.

10.3. Hard defences vs coastal adaptation

Historically, significant lengths of shingle shoreline in Wales have been 'hardened' to protect inappropriately sited urban development and other assets using a range of engineering structures such as groynes, revetments, sea walls and shore-detached breakwaters. In some places this has totally destroyed the nature character of the shoreline and any associated ecological interest features. Hardening of one length of shoreline almost inevitably has a negative effect on sediment supply to adjacent areas down-drift, leading to progressive extension of the defence structures in a down-drift direction (as discussed in relation to the Dinas Dinlle case study in this report). Further lateral extension of defences and hardening of the shoreline should be avoided, wherever possible, since the process is self-perpetuating.

Given that sea level is now rising, and the rate of rise is projected to accelerate in response to global climate change, the natural response of many shingle beaches and storm beach ridge structures would be to rise in elevation and move landwards by 'rollover'. Unfortunately, there are many places where this is now difficult, if not impossible, and shingle features are being 'squeezed' because buildings, roads, railways and other assets have been built on, or very close to, the shore. Depending on the value of the assets and the relative costs of defence improvements, an adaptive strategy of asset re-location and habitat re-creation may be the most cost-effective and environmentally beneficial option (e.g. as discussed in relation to the Newgale case study). As part of strategic good practice, opportunities should be sought to remove, or modify, existing defences, especially where they serve no useful purpose in their present form, in order to restore the functioning of natural processes and natural habitats (cf. Environment Agency, 2012).
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10.4. Incorporation of beach creation and maintenance into scheme design

In locations where the restrictions of geography and value of assets make a managed realignment / adaptation approach impractical, a viable business case may can be made to upgrade or replace existing hard defences. In such

situations, management of shingle beaches still has an important part to play since, under a best case scenario with hard defences present (Figure 82a). The presence of a wide, high beach provides a first line of additional defence to any hard structure behind, and also offers opportunity to provide useful recreational space and areas where shingle vegetation can develop.

Where a wide, high beach is not present, a non-ideal scenario with hard defences present will arise. Wave reflection, toe scour, wave splash overtopping and shingle throw will all represent problems which will need to be managed (Figure 82b). The intervention options available in such a situation, together with indicative FCERM effectiveness, cost, ecological impact, geomorphological / landscape impact and recreational impact, are summarised in Table 7. The greatest FCERM effectiveness is delivered by the hard engineering options, but once again these are likely to have the highest cost and greatest environmental impact. Beach nourishment may provide a relatively lower cost option with smaller negative environmental impacts, but the FCERM benefits are likely to be lower and shorter lived. Where rates of new sediment supply are insufficient to allow maintenance of an equilibrium beach morphology in the face of sea level rise, the beach will no longer function as an effective sea defence and will need to be completely replaced by hard defences in the longer term (Dornbusch, 2017).

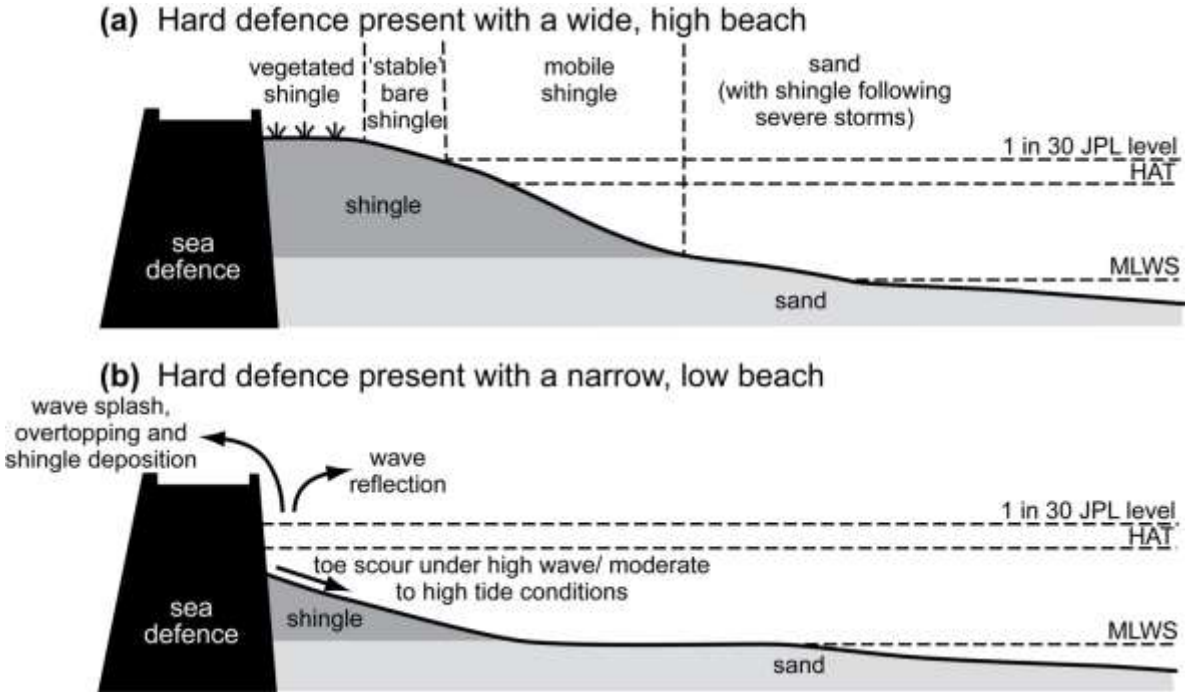

Figure 82 Schematic representation of evolutionary scenarios for situations with hard defences and (a) a wide, high beach present, and (b) only a narrow, low beach present

Table 7 Management options, FCERM effectiveness, relative cost and relative environmental impacts for a situation with hard defences and a low, narrow beach

Option	FCERM Effectiveness and Sustainability	Cost	Ecological Impact	Geomorphological/ Landscape Impact	Recreational Impact
Shingle or sand/shingle nourishment (with or without beach control station)	M-H	M-H	M (+)	M (+)	H (+)
Rock armour	H	H	H (-)	H (-)	H (-)
Offshore Breakwaters	H	H	M (N)	H (-)	M (N)
Build bigger/better wall	H	H	H (-)	H (-)	H (-)
Remove defence and allow roll back	L	M-H	M-H (+)	M-H (+)	M-H (+)

10.5. Best practice associated with shingle beach management schemes

As part of general best practice, any shingle beach management scheme should seek to reduce the stress on, and increase the resilience of, shingle habitats, prevent loss, damage or fragmentation of habitats and species, and seek to secure the value and benefits of the range of ecosystem services provided.

Surface disturbance should be kept to a minimum in order to allow shingle vegetation to develop; infrequent re-profiling of the upper parts of beaches and beach ridges encourages stability and the build-up of interstitial fine sediment required for shingle vegetation development.

Trampling disturbance is a particular problem for strandline pioneer communities and for bryophytes found on older, stable shingle surfaces (Scott & Randall, 1976, Randall, 1977b). Vehicle movements, including plant used in FCERM operations, can be a major problem. To facilitate continued development and survival of these communities, vehicular and pedestrian access needs to be restricted to guided routes during and after scheme completion.

Regular monitoring of beach levels should be undertaken to anticipate problems and intervention requirements before they become major issues which require large-scale emergency works; i.e. proactive intervention is far better than reactive intervention

Ecological surveys should be undertaken prior to any works to establish the extent and importance of habitats and species present, and intervention work at critical times of the year (e.g. plant flowering / seeding and bird nesting times) should be avoided.

An adequate geomorphological baseline study should be undertaken to inform the development of a beach management plan (e.g. Pye & Blott, 2017; AECOM 2017c), with repeat assessments at intervals of 5 years informed by annual or bi-annual site inspections and analysis of monitoring data.

Where extensive FCERM schemes are undertaken, appropriate shingle restoration or enhancement measures should be incorporated in the final stages to encourage the establishment / re-establishment of shingle vegetation and associated invertebrate fauna (e.g. Walmsley, 1995; Walmsley & Davy, 1997a,b,c, 2001).This may involve local introduction of surface fine sediment, seeding, planting, fencing to reduce trampling in the short term, based on the best available professional advice.

Wherever possible, FCERM interventions should seek to replicate natural beach profiles as closely as possible, with the possible addition of a wider backshore 'platform' if beach nourishment is being undertaken. Also wherever possible, the sediment type and grading should match the naturally existing material, although in some instances it may be desirable from a scheme performance point of view to use material which is coarser than the pre-existing sediment. Finer sediment should not be used unless an intention of the scheme is to encourage the development of dunes behind or on top of the shingle ridge at the back of the beach.

10.6. Requirements for geomorphological baseline assessment and subsequent monitoring

The geomorphological baseline assessment should include at least the following elements:

- review of background literature and unpublished reports
- examination of historical maps, charts, aerial photography and LIDAR survey data, ideally within a GIS framework
- analysis of previous ground topographic survey and sediment survey data
- assessment of coastal processes data (predicted and recorded tidal levels, predicted and recorded storm surge levels, tidal currents, winds, waves, sediment transport)
- site walkover survey with photographic record of principal geomorphological features, evidence of erosion / accretion, sediment types and distribution, presence of structures, presence of features of ecological interest

If no recent ground survey, aerial LIDAR survey, aerial photogrammetric survey or sediment data are available, new surveys should be commissioned prior to aid the assessment, and prior to any FCERM intervention works being undertaken. For ground surveys, quad-bike mounted RTK GPS surveys are preferable to line surveys since they provide better three-dimensional information, but if resources are limited, or access / use of quad bikes is restricted, shore-normal line surveys should be undertaken at 50 m intervals along the shore, extending over the crest of the shingle ridge to the landwards slope or artificial defence behind.

If no recent aerial photography is available, a new survey should be commissioned. For relatively small areas, an unmanned aerial vehicle (UAV or 'drone') survey undertaken on a low spring tide may be most cost-effective. An interpretative geomorphological map should be prepared on the basis of the aerial photography / LIDAR imagery and the ground walk-over survey.

If no recent sediment data are available, a sampling survey should be undertaken on a low spring tide. Sampling should be undertaken along at least three shore-normal transects located towards each end and the middle of the beach. For long sections of shore, more transects may be required. Samples should be taken from the shingle ridge crest, upper beach slope, mid foreshore and lower foreshore on each transect. All sampling locations should be photographed immediately prior to sampling.

Samples should be sufficiently large to give a representative size distribution: for sandy and muddy mid- and lower beach sediments a sample size of 500g (or 500 ml pot) is usually sufficient, for coarse and and fine gravel mixtures 1kg (or 1 litre pot) is sufficient, but for upper beach and shingle ridge sediments which are often dominated by medium and coarse gravel larger sample sizes of up to 25 kg may be required. Where possible, samples should be taken to a suitably equipped laboratory and analysed by dry sieving at 'half-phi' intervals. If taken from a sensitive location the sample material should be returned to the beach on completion of the analysis. If, for any reason, it is not feasible or permissible to take samples to a laboratory, size analysis can be undertaken in the field using portable equipment. If it is undesirable to disturb the sediment surface (e.g. due to the presence of lichens or other vegetation), or if the clasts are of cobble or boulder size, the surface particle size should be estimated using calipers, measuring frame or a size comparator.

For subsequent monitoring, a repeat ground topographic survey should be carried out immediately after any FCERM intervention works are completed and thereafter at intervals of at least 12 months (ideally every 6 months at the end of the winter and summer periods) for a period of at least 5 years. Subsequent monitoring can be undertaken using LIDAR surveys at intervals of 5 years or less (if resources are available). If LIDAR surveys or detailed topographic monitoring surveys cannot be undertaken, a Rapid Geomorphological Assessment (RGA) should be undertaken by a suitably experienced geomorphologist (or engineer with geomorphological training) at

annual intervals (equivalent to the annual inspections undertaken of hard defences).

In addition to the geomorphological assessments, ecological surveys should be undertaken at sensitive sites (e.g. SSSIs and SACs where vegetated shingle is a notified feature). A detailed baseline survey should be undertaken to inform the development of the BMP, and prior to any intervention works being undertaken, with follow-up surveys at specified intervals depending on the nature of the interventions and the ecological sensitivity of the site (perhaps annually for the first few years after a major scheme and then at six yearly intervals coincident with SSSI condition assessments).

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12. Appendices

Appendix A: Shingle beaches identified in this study

Table A1 Site names and coastal setting.

ID	Localities	First order coastal setting	Second order coastal setting	Third order coastal setting
1	Sudbrook Point	Estuary (Severn Estuary)	Open Shore	
2	West Pill, Rogiet	Estuary (Severn Estuary)	Open Shore	
3	Portland Grounds (Redwick to Goldcliff)	Estuary (Severn Estuary)	Open Shore	
4	Goldcliff Pill	Estuary (Severn Estuary)	Open Shore	
5	Newgout Pill, Wentlooge	Estuary (Severn Estuary)	Open Shore	
6	West Usk Lighthouse, Wentlooge	Estuary (Severn Estuary)	Open Shore	
7	Outfall Lane, Wentlooge	Estuary (Severn Estuary)	Open Shore	
8	Cardiff Flats	Estuary (Severn Estuary)	Open Shore	
9	Penarth to Lavernock Point	Estuary (Severn Estuary)	Open Shore	
10	Lavernock Point to Swanbridge	Inlet (Bristol Channel)	Open Shore	
11	Barry Harbour	Inlet (Bristol Channel)	Bay (Barry Harbour)	
12	Watch House Bay, Barry	Inlet (Bristol Channel)	Bay (Watch House Bay)	
13	Pebble Beach, Barry	Inlet (Bristol Channel)	Open Coast	
14	Porthkerry	Inlet (Bristol Channel)	Open Coast	
15	Bulwarks Fort to Rhoose Point	Inlet (Bristol Channel)	Open Coast	
16	Watch House Beach, East Aberthaw	Inlet (Bristol Channel)	Open Coast	
17	Leys Beach, East Aberthaw	Inlet (Bristol Channel)	Open Coast	
18	West Aberthaw	Inlet (Bristol Channel)	Open Coast	
19	Aberthaw to St Donats	Inlet (Bristol Channel)	Open Coast	
20	Nash Point to Cwm Nash	Inlet (Bristol Channel)	Open Coast	
21	Traeth Mawr, Broughton	Inlet (Bristol Channel)	Open Coast	
22	Traeth Bach, Broughton	Inlet (Bristol Channel)	Open Coast	
23	Dunraven Bay	Inlet (Bristol Channel)	Bay (Dunraven Bay)	
24	Ogmore-by-Sea	Inlet (Bristol Channel)	Open Coast	
25	Pwll y Defaid, Merthyr-mawr Warren	Inlet (Bristol Channel)	Estuary (Ogmore River)	
26	Black Rocks, Porthcawl	Inlet (Bristol Channel)	Open Coast	
27	Trecco Bay, Porthcawl	Inlet (Bristol Channel)	Bay (Trecco Bay)	
28	Seafront Beach, Porthcawl	Inlet (Bristol Channel)	Open Coast	
29	West Beach, Porthcawl	Inlet (Bristol Channel)	Open Coast	
30	Rest Bay, Porthcawl	Inlet (Bristol Channel)	Open Coast	
31	Kenfig Sands	Inlet (Bristol Channel)	Open Coast	
32	Afon Cynffig	Inlet (Bristol Channel)	Open Coast	
33	Margam Sands	Inlet (Bristol Channel)	Open Coast	
34	Port Talbot Harbour	Inlet (Bristol Channel)	Bay (Swansea Bay)	Bay (Port Talbot Harbour)
35	Baglan Burrows	Inlet (Bristol Channel)	Bay (Swansea Bay)	
36	Mumbles	Inlet (Bristol Channel)	Bay (Swansea Bay)	
37	Bracelet Bay, Gower	Inlet (Bristol Channel)	Open Coast	
38	Limeslade Bay, Gower	Inlet (Bristol Channel)	Open Coast	
39	Langland Bay, Gower	Inlet (Bristol Channel)	Bay (Langland Bay)	
40	Caswell Bay	Inlet (Bristol Channel)	Bay (Caswell Bay)	
41	Brandy Cove	Inlet (Bristol Channel)	Open Coast	
42	Pwlldu Bay	Inlet (Bristol Channel)	Bay (Pwlldy Bay)	
43	Pobbles Beach	Inlet (Bristol Channel)	Open Coast	
44	Pennard Burrows	Inlet (Bristol Channel)	Bay (Threecliff Bay)	
45	Oxwich Bay	Inlet (Bristol Channel)	Bay (Oxwich Bay)	
46	Holy's Wash	Inlet (Bristol Channel)	Open Coast	
47	Port-Eynon Bay	Inlet (Bristol Channel)	Bay (Port-Eynon Bay)	
48	Port-Eynon Point	Inlet (Bristol Channel)	Open Coast	
49	Overton Mere	Inlet (Bristol Channel)	Open Coast	
50	Common Cliff	Inlet (Bristol Channel)	Open Coast	
51	Ram Grove	Inlet (Bristol Channel)	Open Coast	
52	Kitchen Corner south	Inlet (Bristol Channel)	Open Coast	
53	Kitchen Corner north	Inlet (Bristol Channel)	Open Coast	
54	Rhossili Bay	Inlet (Bristol Channel)	Bay (Rhossili Bay)	
55	Whiteford Point	Inlet (Bristol Channel)	Bay (Carmarthen Bay)	
56	Machynys, Loughor Estuary	Inlet (Bristol Channel)	Bay (Carmarthen Bay)	Inlet (Burry Inlet)
57	Llanelli Harbour Mouth	Inlet (Bristol Channel)	Bay (Carmarthen Bay)	Inlet (Burry Inlet)
58	Tywyn Bach, Burry Port	Inlet (Bristol Channel)	Bay (Carmarthen Bay)	Inlet (Burry Inlet)
59	Millenium Coastal Park, Burry Port	Inlet (Bristol Channel)	Bay (Carmarthen Bay)	Inlet (Burry Inlet)
60	Burry Port Harbour Mouth	Inlet (Bristol Channel)	Bay (Carmarthen Bay)	Inlet (Burry Inlet)
61	St Ishmael's Scar	Inlet (Bristol Channel)	Bay (Carmarthen Bay)	Estuary (Gwendraeth)
62	The Graig, Ferryside	Inlet (Bristol Channel)	Bay (Carmarthen Bay)	Estuary (River Towy)
63	Ferryside	Inlet (Bristol Channel)	Bay (Carmarthen Bay)	Estuary (River Towy)
64	Ginst Point	Inlet (Bristol Channel)	Bay (Carmarthen Bay)	Estuary (River Towy)
65	Pendine	Inlet (Bristol Channel)	Bay (Carmarthen Bay)	
66	Morfa Bychan, Pendine	Inlet (Bristol Channel)	Bay (Carmarthen Bay)	
67	Marros Sands	Inlet (Bristol Channel)	Bay (Carmarthen Bay)	
68	Amroth Beach	Inlet (Bristol Channel)	Bay (Carmarthen Bay)	
69	Wiseman's Bridge Beach	Inlet (Bristol Channel)	Bay (Carmarthen Bay)	Bay (Saundersfoot Bay)
70	Saundersfoot Beach	Inlet (Bristol Channel)	Bay (Carmarthen Bay)	Bay (Saundersfoot Bay)
71	Rhode Wood, Saundersfoot	Inlet (Bristol Channel)	Bay (Carmarthen Bay)	Bay (Saundersfoot Bay)
72	Monkstone Beach	Inlet (Bristol Channel)	Bay (Carmarthen Bay)	
73	Waterwynch Bay	Inlet (Bristol Channel)	Bay (Carmarthen Bay)	Bay (Waterwynch Bay)
74	Second Bay, Tenby	Inlet (Bristol Channel)	Bay (Carmarthen Bay)	Bay (Second Bay)
75	First Bay, Tenby	Inlet (Bristol Channel)	Bay (Carmarthen Bay)	Bay (First Bay)
76	Tenby South Beach	Inlet (Bristol Channel)	Bay (Carmarthen Bay)	
77	Drinkim Beach, Caldy Island	Inlet (Bristol Channel)	Open Coast	
78	Sandtop Bay, Caldy Island	Inlet (Bristol Channel)	Open Coast	
79	Lydstep Haven	Inlet (Bristol Channel)	Bay (Lydstep Haven)	
80	Church Doors, Skrinkle Haven	Inlet (Bristol Channel)	Open Coast	
81	Manorbier Bay	Inlet (Bristol Channel)	Bay (Manorbier Bay)	

Table A1 (continued)

ID	Localities	First order coastal setting	Second order coastal setting	Third order coastal setting
82	Swanlake Bay	Inlet (Bristol Channel)	Bay (Swanlake Bay)	
83	Privar	Inlet (Bristol Channel)	Bay (Freshwater East)	
84	Greenala Point to Stackpole Quay	Inlet (Bristol Channel)	Open Coast	
85	Stackpole Quay	Inlet (Bristol Channel)	Open Coast	
86	Mowingword	Inlet (Bristol Channel)	Open Coast	
87	Bullslaughter Bay	Open Coast (Celtic Sea)	Open Coast	
88	Flimston Bay	Open Coast (Celtic Sea)	Open Coast	
89	Pen-y-holt Bay	Open Coast (Celtic Sea)	Open Coast	
90	Hobbyhorse Bay	Open Coast (Celtic Sea)	Open Coast	
91	Blucks Pool	Open Coast (Celtic Sea)	Bay (Freshwater West)	
92	Frainslake Sands	Open Coast (Celtic Sea)	Bay (Freshwater West)	
93	Little Furzenip	Open Coast (Celtic Sea)	Bay (Freshwater West)	
94	Freshwater West	Open Coast (Celtic Sea)	Bay (Freshwater West)	
95	Gravel Bay	Open Coast (Celtic Sea)	Bay (Freshwater West)	
96	West Pickard Bay	Open Coast (Celtic Sea)	Open Coast	
97	West Angle Bay	Open Coast (Celtic Sea)	Inlet (Milford Haven)	Bay (West Angle Bay)
98	The Ridge, Angle Bay	Open Coast (Celtic Sea)	Inlet (Milford Haven)	Bay (Angle Bay)
99	Angle Bay East	Open Coast (Celtic Sea)	Inlet (Milford Haven)	Bay (Angle Bay)
100	Pembroke Dock	Open Coast (Celtic Sea)	Inlet (Milford Haven)	Estuary (Pembroke River)
101	Cosheston Point to Mill Bay, Daugleddau	Open Coast (Celtic Sea)	Inlet (Milford Haven)	Estuary (Daugleddau)
102	Burton Ferry	Open Coast (Celtic Sea)	Inlet (Milford Haven)	Estuary (Daugleddau)
103	Neyland	Open Coast (Celtic Sea)	Inlet (Milford Haven)	
104	Llanstadwell	Open Coast (Celtic Sea)	Inlet (Milford Haven)	
105	Newton Noyes, Milford Haven	Open Coast (Celtic Sea)	Inlet (Milford Haven)	
106	Gelliswick Bay, Milford Haven	Open Coast (Celtic Sea)	Inlet (Milford Haven)	Bay (Gelliswick Bay)
107	Gelliswick Village, Milford Haven	Open Coast (Celtic Sea)	Inlet (Milford Haven)	
108	Little Wick, Milford Haven	Open Coast (Celtic Sea)	Inlet (Milford Haven)	
109	Kilroom	Open Coast (Celtic Sea)	Inlet (Milford Haven)	
110	Sandy Haven	Open Coast (Celtic Sea)	Inlet (Milford Haven)	Bay (Sandy Haven)
111	Sleeping Bay	Open Coast (Celtic Sea)	Inlet (Milford Haven)	
112	Butts Bay	Open Coast (Celtic Sea)	Inlet (Milford Haven)	
113	Longoar Bay	Open Coast (Celtic Sea)	Inlet (Milford Haven)	
114	Lindsway Bay	Open Coast (Celtic Sea)	Inlet (Milford Haven)	
115	Wenall Bay	Open Coast (Celtic Sea)	Inlet (Milford Haven)	
116	Watch House Bay, Milford Haven	Open Coast (Celtic Sea)	Inlet (Milford Haven)	
117	Monk Haven	Open Coast (Celtic Sea)	Inlet (Milford Haven)	
118	Musselwick	Open Coast (Celtic Sea)	Inlet (Milford Haven)	Bay (Dale Roads)
119	Pickleridge Beach	Open Coast (Celtic Sea)	Inlet (Milford Haven)	Bay (Dale Roads)
120	Dale Beach	Open Coast (Celtic Sea)	Inlet (Milford Haven)	Bay (Dale Roads)
121	Castlebeach Bay	Open Coast (Celtic Sea)	Inlet (Milford Haven)	
122	Watwick Bay	Open Coast (Celtic Sea)	Inlet (Milford Haven)	
123	Mill Bay	Open Coast (Celtic Sea)	Inlet (Milford Haven)	
124	Windmill Cove	Open Coast (Celtic Sea)	Open Coast	
125	Westdale Bay	Open Coast (Celtic Sea)	Open Coast	
126	Marloes Sands	Open Coast (Celtic Sea)	Bay (Marloes Sands)	
127	Albion Sands	Open Coast (Celtic Sea)	Restricted (Broad Sound)	
128	Watery Bay	Open Coast (Celtic Sea)	Restricted (Broad Sound)	
129	Victoria Bay	Open Coast (Celtic Sea)	Restricted (Broad Sound)	
130	Little Castle Bay	Open Coast (Celtic Sea)	Restricted (Broad Sound)	
131	Rainy Rock Bay	Open Coast (Celtic Sea)	Restricted (Broad Sound)	
132	Three Doors Bay	Open Coast (Celtic Sea)	Restricted (Broad Sound)	
133	Deadman's Bay	Open Coast (Celtic Sea)	Restricted (Broad Sound)	
134	Renney Slip	Open Coast (Celtic Sea)	Restricted (Broad Sound)	
135	Jeffry's Haven south	Open Coast (Celtic Sea)	Restricted (Jack Sound)	
136	Jeffry's Haven north	Open Coast (Celtic Sea)	Restricted (Jack Sound)	
137	Martin's Haven	Open Coast (Celtic Sea)	Bay (St Brides Bay)	
138	West hook Farm	Open Coast (Celtic Sea)	Bay (St Brides Bay)	
139	Mill Haven	Open Coast (Celtic Sea)	Bay (St Brides Bay)	
140	Brandy Bay	Open Coast (Celtic Sea)	Bay (St Brides Bay)	
141	Messelwick	Open Coast (Celtic Sea)	Bay (St Brides Bay)	
142	Rook's Bay	Open Coast (Celtic Sea)	Bay (St Brides Bay)	
143	Little Haven	Open Coast (Celtic Sea)	Bay (St Brides Bay)	
144	The Settlands	Open Coast (Celtic Sea)	Bay (St Brides Bay)	
145	Broad Haven	Open Coast (Celtic Sea)	Bay (St Brides Bay)	
146	Harold Stone south	Open Coast (Celtic Sea)	Bay (St Brides Bay)	
147	Harold Stone north	Open Coast (Celtic Sea)	Bay (St Brides Bay)	
148	Black Point south	Open Coast (Celtic Sea)	Bay (St Brides Bay)	
149	Settling Nose south	Open Coast (Celtic Sea)	Bay (St Brides Bay)	
150	Settling Nose north	Open Coast (Celtic Sea)	Bay (St Brides Bay)	
151	Druidston Haven	Open Coast (Celtic Sea)	Bay (St Brides Bay)	
152	North Haven	Open Coast (Celtic Sea)	Bay (St Brides Bay)	
153	Madoc's Haven	Open Coast (Celtic Sea)	Bay (St Brides Bay)	
154	Nolton Haven	Open Coast (Celtic Sea)	Bay (St Brides Bay)	
155	Newgale Sands: Maidenhall Pt-Bathesland	Open Coast (Celtic Sea)	Bay (St Brides Bay)	
156	Newgale Sands: Bathesland-Sibbernock	Open Coast (Celtic Sea)	Bay (St Brides Bay)	
157	Newgale Sands:Sibbernock-Newgale	Open Coast (Celtic Sea)	Bay (St Brides Bay)	
158	Porthmynawyd	Open Coast (Celtic Sea)	Bay (St Brides Bay)	
159	Aber Dwyrain	Open Coast (Celtic Sea)	Bay (St Brides Bay)	
160	Porth y Bŵch, Solva	Open Coast (Celtic Sea)	Bay (St Brides Bay)	
161	Gwadn, Solva	Open Coast (Celtic Sea)	Bay (St Brides Bay)	
162	Loch Warren	Open Coast (Celtic Sea)	Bay (St Brides Bay)	

Table A1 (continued)

ID	Localities	First order coastal setting	Second order coastal setting	Third order coastal setting
163	Aber Llong	Open Coast (Celtic Sea)	Bay (St Brides Bay)	
164	Porth y Rhaw	Open Coast (Celtic Sea)	Bay (St Brides Bay)	
165	Caer Bwdy Bay	Open Coast (Celtic Sea)	Bay (St Brides Bay)	
166	Caerfai Bay	Open Coast (Celtic Sea)	Bay (St Brides Bay)	
167	Porthlysgi Bay	Open Coast (Celtic Sea)	Bay (St Brides Bay)	
168	Porth Lleuog, Ramsey Island	Open Coast (Celtic Sea)		
169	Aber Mawr, Ramsey Island	Open Coast (Celtic Sea)		
170	Whitesands Bay	Open Coast (Celtic Sea)	Bay (Whitesands Bay)	
171	Porth Lleuog	Open Coast (Celtic Sea)	Bay (Whitesands Bay)	
172	Porthmelgan	Open Coast (Celtic Sea)	Bay (Whitesands Bay)	
173	Porth y Rhaw	Open Coast (Irish Sea/St Georges Channel)		
174	Abereiddi Bay	Open Coast (Irish Sea/St Georges Channel)		
175	Traeth Llyfn	Open Coast (Irish Sea/St Georges Channel)		
176	Porth Egr	Open Coast (Irish Sea/St Georges Channel)		
177	Aberfelin, Trefin	Open Coast (Irish Sea/St Georges Channel)		
178	Pwll Olfa	Open Coast (Irish Sea/St Georges Channel)		
179	Pwll Llong	Open Coast (Irish Sea/St Georges Channel)		
180	Pwll Whiting	Open Coast (Irish Sea/St Georges Channel)		
181	Ynys Deullyn	Open Coast (Irish Sea/St Georges Channel)		
182	Aber Castle	Open Coast (Irish Sea/St Georges Channel)		
183	Pwllstrodur	Open Coast (Irish Sea/St Georges Channel)		
184	Aber Mawr	Open Coast (Irish Sea/St Georges Channel)		
185	Aber Bach, St Nicholas	Open Coast (Irish Sea/St Georges Channel)		
186	Porth Dwgan	Open Coast (Irish Sea/St Georges Channel)		
187	Pwllcrochan	Open Coast (Irish Sea/St Georges Channel)		
188	Pwlldawnau	Open Coast (Irish Sea/St Georges Channel)		
189	Pwll Deri	Open Coast (Irish Sea/St Georges Channel)		
190	Porth Maenmelyn	Open Coast (Irish Sea/St Georges Channel)		
191	Pwlluog	Open Coast (Cardigan Bay)		
192	Porthsychan	Open Coast (Cardigan Bay)		
193	Aber Felin	Open Coast (Cardigan Bay)		
194	Porth Maen	Open Coast (Cardigan Bay)		
195	Pwll Hir	Open Coast (Cardigan Bay)	Bay (Fishguard Bay)	
196	Goodwick Sands North	Open Coast (Cardigan Bay)	Bay (Fishguard Bay)	
197	Goodwick Sands South	Open Coast (Cardigan Bay)	Bay (Fishguard Bay)	
198	Lampit Mawr	Open Coast (Cardigan Bay)	Bay (Fishguard Bay)	
199	Aber Gwaun	Open Coast (Cardigan Bay)	Bay (Fishguard Bay)	
200	Pwll Landdu	Open Coast (Cardigan Bay)	Bay (Fishguard Bay)	
201	Pwell Edyn	Open Coast (Cardigan Bay)	Bay (Fishguard Bay)	
202	Pwll Ceunant	Open Coast (Cardigan Bay)	Bay (Fishguard Bay)	
203	Aber Richard	Open Coast (Cardigan Bay)	Bay (Fishguard Bay)	
204	Pwll y Blewyn	Open Coast (Cardigan Bay)	Bay (Fishguard Bay)	
205	Aber Grugog	Open Coast (Cardigan Bay)	Bay (Fishguard Bay)	
206	Aber Hywel	Open Coast (Cardigan Bay)	Bay (Fishguard Bay)	
207	Carreg Pen-las	Open Coast (Cardigan Bay)	Bay (Fishguard Bay)	
208	Aber Bach, Fishguard	Open Coast (Cardigan Bay)	Bay (Fishguard Bay)	
209	Pwll Gwylog	Open Coast (Cardigan Bay)	Bay (Fishguard Bay)	
210	Cwm-yr-Eglwys, Afon Teifi	Open Coast (Cardigan Bay)	Bay (Newport Bay)	
211	Aber Fforest	Open Coast (Cardigan Bay)	Bay (Newport Bay)	
212	Aber Rhigian	Open Coast (Cardigan Bay)	Bay (Newport Bay)	
213	Traeth Cell-Howel	Open Coast (Cardigan Bay)		
214	Ceibwr Bay	Open Coast (Cardigan Bay)		
215	Traeth y Rhedyn	Open Coast (Cardigan Bay)		
216	Traeth Godir-coch	Open Coast (Cardigan Bay)		
217	Careg Aderyn	Open Coast (Cardigan Bay)	Bay (Afon Teifi estuary)	
218	Pwll Edrych	Open Coast (Cardigan Bay)	Bay (Afon Teifi estuary)	
219	Pwll Melyn	Open Coast (Cardigan Bay)	Bay (Afon Teifi estuary)	
220	Pen yr Ergyd	Open Coast (Cardigan Bay)	Esuary (Afon Teifi)	
221	Llangrannog	Open Coast (Cardigan Bay)		
222	Traeth y Gaerglwyd	Open Coast (Cardigan Bay)		
223	Cwmtydu	Open Coast (Cardigan Bay)		
224	Castell Bach	Open Coast (Cardigan Bay)		
225	Traeth y Coubal	Open Coast (Cardigan Bay)		
226	Llech Cimwch	Open Coast (Cardigan Bay)		
227	Traeth y Quarry	Open Coast (Cardigan Bay)		
228	New Quay Bay	Open Coast (Cardigan Bay)	Bay (New Quay Bay)	
229	Little Quay Bay	Open Coast (Cardigan Bay)	Bay (Little Quay Bay)	
230	Gilfach-yr-Halen to Clogfryn	Open Coast (Cardigan Bay)		
231	Aberaeron south	Open Coast (Cardigan Bay)		
232	Aberaeron north	Open Coast (Cardigan Bay)		
233	Aberaeron to Aberarth	Open Coast (Cardigan Bay)		
234	Aberarth	Open Coast (Cardigan Bay)		
235	Aberarth to Morfa Mawr	Open Coast (Cardigan Bay)		
236	Morfa Mawr	Open Coast (Cardigan Bay)		
237	Morfa Mawr to Llanonn	Open Coast (Cardigan Bay)		
238	Llannon	Open Coast (Cardigan Bay)		
239	Llannon to Llansantffraid	Open Coast (Cardigan Bay)		
240	Llansantffraid	Open Coast (Cardigan Bay)		
241	Llansantffraid to Llanrhystud	Open Coast (Cardigan Bay)		
242	Llanrhystud	Open Coast (Cardigan Bay)		
243	Llanrhystud to Carreg Ti-pw	Open Coast (Cardigan Bay)		

Table A1 (continued)

ID	Localities	First order coastal setting	Second order coastal setting	Third order coastal setting
244	Carreg Ti-pw to Pinderi Cliffs	Open Coast (Cardigan Bay)		
245	Twll Twrw to Traeth Tanybwlch	Open Coast (Cardigan Bay)		
246	Traeth Tanybwlch, Aberystwyth	Open Coast (Cardigan Bay)		
247	South Beach, Aberystwyth	Open Coast (Cardigan Bay)		
248	North Beach, Aberystwyth	Open Coast (Cardigan Bay)		
249	Constitution Hill	Open Coast (Cardigan Bay)		
250	Clarach Bay	Open Coast (Cardigan Bay)	Bay (Clarach Bay)	
251	Wallog Beach	Open Coast (Cardigan Bay)		
252	Pen-y-graig	Open Coast (Cardigan Bay)		
253	Borth Sands	Open Coast (Cardigan Bay)		
254	Aberdovey to Tywyn	Open Coast (Cardigan Bay)		
255	Tywyn	Open Coast (Cardigan Bay)		
256	Tywyn to Aber Dysynni	Open Coast (Cardigan Bay)	Estuary (Afon Dysynni)	
257	Tonfanau to Gallt Ffynnon yr Hydd	Open Coast (Cardigan Bay)	Bay (Barmouth Bay)	
258	Ro Wen, Fairbourne	Open Coast (Cardigan Bay)	Bay (Barmouth Bay)	Estuary (Afon Mawddach)
259	Afon Mawddach, Barmouth	Open Coast (Cardigan Bay)	Bay (Barmouth Bay)	Estuary (Afon Mawddach)
260	Ynys y Brawd, Barmouth	Open Coast (Cardigan Bay)	Bay (Barmouth Bay)	
261	Barmouth Promenade	Open Coast (Cardigan Bay)	Bay (Barmouth Bay)	
262	Barmouth to Llanaber	Open Coast (Cardigan Bay)	Bay (Barmouth Bay)	
263	Ceunant Egryn, Llanaber	Open Coast (Cardigan Bay)	Bay (Barmouth Bay)	
264	Afon Ysgethin, Tal-y-bont	Open Coast (Cardigan Bay)	Bay (Barmouth Bay)	Estuary (Afon Ysgethin)
265	Shell Island	Open Coast (Cardigan Bay)	Bay (Tremadoc Bay)	
266	Shell Island Spit	Open Coast (Cardigan Bay)	Bay (Tremadoc Bay)	Estuary (Afon Artro)
267	Llandanwg Spit	Open Coast (Cardigan Bay)	Bay (Tremadoc Bay)	Estuary (Afon Artro)
268	Llandanwg to Harlech	Open Coast (Cardigan Bay)	Bay (Tremadoc Bay)	
269	Graig Ddu to Criccieth	Open Coast (Cardigan Bay)	Bay (Tremadoc Bay)	
270	Criccieth	Open Coast (Cardigan Bay)	Bay (Tremadoc Bay)	
271	Afon Dwyfor	Open Coast (Cardigan Bay)	Bay (Tremadoc Bay)	Estuary (Afon Dwyfor)
272	Glannllynnau	Open Coast (Cardigan Bay)	Bay (Tremadoc Bay)	
273	Afon Wen	Open Coast (Cardigan Bay)	Bay (Tremadoc Bay)	Estuary (Afon Wen)
274	Hafan y Mor	Open Coast (Cardigan Bay)	Bay (Tremadoc Bay)	
275	Pen-ychain to Pwllheli	Open Coast (Cardigan Bay)		
276	Carreg yr Imbill	Open Coast (Cardigan Bay)		
277	Traeth Crugan	Open Coast (Cardigan Bay)		
278	Llanbedrog Beach	Open Coast (Cardigan Bay)		
279	Porth Ceiriad	Open Coast (Cardigan Bay)	Bay (Porth Ceiriad)	
280	Porth Neigwl	Open Coast (Cardigan Bay)	Bay (Porth Neigwl)	
281	Porth Ysgo	Open Coast (Cardigan Bay)	Bay (Porth Ysgo)	
282	Aberdaron Bay	Open Coast (Cardigan Bay)	Bay (Aberdaron Bay)	
283	Porth Meudwy	Open Coast (Cardigan Bay)	Bay (Aberdaron Bay)	
284	Porth Ferin	Open Coast (Irish Sea/St Georges Channel)	Bay (Caernarfon Bay)	
285	Porth Ty-mawr	Open Coast (Irish Sea/St Georges Channel)	Bay (Caernarfon Bay)	
286	Traeth Penllech	Open Coast (Irish Sea/St Georges Channel)	Bay (Caernarfon Bay)	
287	Bryn Gwydd south	Open Coast (Irish Sea/St Georges Channel)	Bay (Caernarfon Bay)	
288	Bryn Gwydd north	Open Coast (Irish Sea/St Georges Channel)	Bay (Caernarfon Bay)	
289	Aber Geirch	Open Coast (Irish Sea/St Georges Channel)	Bay (Caernarfon Bay)	
290	Borth Wen	Open Coast (Irish Sea/St Georges Channel)	Bay (Caernarfon Bay)	
291	Porth Dinllaen	Open Coast (Irish Sea/St Georges Channel)	Bay (Caernarfon Bay)	
292	Porth Nefyn	Open Coast (Irish Sea/St Georges Channel)	Bay (Caernarfon Bay)	
293	Porth Pistyll	Open Coast (Irish Sea/St Georges Channel)	Bay (Caernarfon Bay)	
294	Porth y Nant	Open Coast (Irish Sea/St Georges Channel)	Bay (Caernarfon Bay)	
295	Yr Eifl Beach, Trefor	Open Coast (Irish Sea/St Georges Channel)	Bay (Caernarfon Bay)	
296	Trefor to Aberdesach	Open Coast (Irish Sea/St Georges Channel)	Bay (Caernarfon Bay)	
297	Aberdesach	Open Coast (Irish Sea/St Georges Channel)	Bay (Caernarfon Bay)	
298	Aberdesach to Trwyn Maen Dylan	Open Coast (Irish Sea/St Georges Channel)	Bay (Caernarfon Bay)	
299	Trwyn Maen Dylan	Open Coast (Irish Sea/St Georges Channel)	Bay (Caernarfon Bay)	
300	Trwyn Maen Dylan to Pontllyfni	Open Coast (Irish Sea/St Georges Channel)	Bay (Caernarfon Bay)	
301	Pontllyfni to Ynys	Open Coast (Irish Sea/St Georges Channel)	Bay (Caernarfon Bay)	
302	Ynys to Dinas Dinlle	Open Coast (Irish Sea/St Georges Channel)	Bay (Caernarfon Bay)	
303	Dinas Dinlle Fort	Open Coast (Irish Sea/St Georges Channel)	Bay (Caernarfon Bay)	
304	Morfa Dinlle	Open Coast (Irish Sea/St Georges Channel)	Bay (Caernarfon Bay)	
305	Afon Gwyrfai to Caernarfon	Open Coast (Irish Sea/St Georges Channel)	Inlet (Menai Strait)	
306	Caernarfon to Plas Menai	Open Coast (Irish Sea/St Georges Channel)	Inlet (Menai Strait)	
307	Y Felinheli	Open Coast (Irish Sea/St Georges Channel)	Inlet (Menai Strait)	
308	Y Felinheli to Pont Britannia	Open Coast (Irish Sea/St Georges Channel)	Inlet (Menai Strait)	
309	Pont Britannia to Pwll-fanogl	Open Coast (Irish Sea/St Georges Channel)	Inlet (Menai Strait)	
310	Moel-y-don to Afon Braint	Open Coast (Irish Sea/St Georges Channel)	Inlet (Menai Strait)	
311	Abermenai	Open Coast (Irish Sea/St Georges Channel)	Bay (Caernarfon Bay)	
312	Traeth Llanddwyn	Open Coast (Irish Sea/St Georges Channel)	Bay (Caernarfon Bay)	Bay (Llanddwyn Bay)
313	Tywyn Fferam	Open Coast (Irish Sea/St Georges Channel)	Bay (Caernarfon Bay)	
314	Traeth Llydan, Holy Island	Open Coast (Irish Sea/St Georges Channel)	Bay (Caernarfon Bay)	
315	Borthwen, Holy Island	Open Coast (Irish Sea/St Georges Channel)	Bay (Caernarfon Bay)	
316	Porthygaran, Holy Island	Open Coast (Irish Sea/St Georges Channel)	Bay (Caernarfon Bay)	
317	Lee Caravan Park, Holy Island	Open Coast (Irish Sea/St Georges Channel)	Bay (Caernarfon Bay)	
318	Porth Diana, Holy Island	Open Coast (Irish Sea/St Georges Channel)	Bay (Caernarfon Bay)	
319	Trearddur Bay, Holy Island	Open Coast (Irish Sea/St Georges Channel)	Bay (Caernarfon Bay)	Bay (Trearddur Bay)
320	Porth Isallt-bach, Holy Island	Open Coast (Irish Sea/St Georges Channel)	Bay (Caernarfon Bay)	
321	Porth yr Afon, Holy Island	Open Coast (Irish Sea/St Georges Channel)	Bay (Caernarfon Bay)	
322	Porth yr Afon to Porth t Pwll, Holy Is.	Open Coast (Irish Sea/St Georges Channel)	Bay (Caernarfon Bay)	
323	Porth y Pwll, Holy Island	Open Coast (Irish Sea/St Georges Channel)	Bay (Caernarfon Bay)	
324	Porth-y-post, Holy Island	Open Coast (Irish Sea/St Georges Channel)	Bay (Caernarfon Bay)	

Table A1 (continued)

ID	Localities	First order coastal setting	Second order coastal setting	Third order coastal setting
325	Porth y Corwgl, Holy Island	Open Coast (Irish Sea/St Georges Ch.)	Bay (Caernarfon Bay)	
326	Abraham's Bosom, Holy Island	Open Coast (Irish Sea/St Georges Ch.)	Bay (Caernarfon Bay)	Bay (Abraham's Bosom)
327	Soldiers Point, Holy Island	Open Coast (Irish Sea)	Bay (Holyhead Bay)	
328	Peibio	Open Coast (Irish Sea)	Bay (Holyhead Bay)	
329	Traeth Penrhos, Holy Island	Open Coast (Irish Sea)	Bay (Holyhead Bay)	Bay (Traeth Penrhos)
330	Penrhos to Gorsedd-y-penrhyn	Open Coast (Irish Sea)	Bay (Holyhead Bay)	
331	Gorsedd-y-penrhyn to Stanley Embankment	Open Coast (Irish Sea)	Bay (Holyhead Bay)	Bay (Beddmanarch Bay)
332	Ynys Leurad, Anglesey	Open Coast (Irish Sea)	Inlet (Holy Is. Channel)	
333	Valley, Anglesey	Open Coast (Irish Sea)	Bay (Holyhead Bay)	
334	Traeth y Gribin, Anglesey	Open Coast (Irish Sea)	Bay (Holyhead Bay)	
335	Porth Penrhyn-mawr, Anglesey	Open Coast (Irish Sea)	Bay (Holyhead Bay)	Bay (Porth Penrhyn-mawr)
336	Porth Delysg, Anglesey	Open Coast (Irish Sea)	Bay (Holyhead Bay)	Bay (Porth Delysg)
337	Twyn Cliperau, Anglesey	Open Coast (Irish Sea)	Bay (Holyhead Bay)	
338	Porth Tywyn-mawr, Anglesey	Open Coast (Irish Sea)	Bay (Holyhead Bay)	Bay (Porth Tywyn-mawr)
339	Porth Defaid, Anglesey	Open Coast (Irish Sea)	Bay (Holyhead Bay)	
340	Porth Trefadog, Anglesey	Open Coast (Irish Sea)	Bay (Holyhead Bay)	
341	Porth Ffynnon to Porth Swtan	Open Coast (Irish Sea)	Bay (Holyhead Bay)	
342	Traeth Ynys y Fydlyn, Anglesey	Open Coast (Irish Sea)	Bay (Holyhead Bay)	
343	Porth Newydd to Porth Tywodog	Open Coast (Irish Sea)		
344	Hen Borth, Anglesey	Open Coast (Irish Sea)		
345	Hen Borth to Trwyn Cemlyn	Open Coast (Irish Sea)		
346	Cemlyn Bay, Anglesey	Open Coast (Irish Sea)	Bay (Cemlyn Bay)	
347	Porth-y-pistyll, Anglesey	Open Coast (Irish Sea)		
348	Porth y Wylfa, Anglesey	Open Coast (Irish Sea)	Bay (Cemaes Bay)	
349	Porth Llanlleiana, Anglesey	Open Coast (Irish Sea)		
350	Porth Wen, Anglesey	Open Coast (Irish Sea)	Bay (Porth Wen)	
351	Porth-Llechog, Anglesey	Open Coast (Irish Sea)	Bay (Porth Llechog)	
352	Porth Eilian, Anglesey	Open Coast (Irish Sea)		
353	Porthygwidhiaid, Anglesey	Open Coast (Irish Sea)		
354	Porth Helygen to Porth Garreg-fawr	Open Coast (Irish Sea)		
355	Dulas Bay, Anglesey	Open Coast (Irish Sea)	Bay (Dulas Bay)	
356	Traeth yr Ora	Open Coast (Irish Sea)		
357	Porth y Mor, Anglesey	Open Coast (Irish Sea)		
358	Traeth Lligwy, Anglesey	Open Coast (Irish Sea)	Bay (Lligwy Bay)	
359	Porth Forllwyd, Anglesey	Open Coast (Irish Sea)		
360	Porth Helaeth, Anglesey	Open Coast (Irish Sea)		
361	Porth yr Ynys, Anglesey	Open Coast (Irish Sea)		
362	Porth Moelfre, Anglesey	Open Coast (Irish Sea)		
363	Porth yr Aber, Anglesey	Open Coast (Irish Sea)		
364	Porth y Rhos, Anglesey	Open Coast (Irish Sea)		
365	Traeth Bychan, Anglesey	Open Coast (Irish Sea)	Bay (Traeth Bychan)	
366	Borth Wen, Anglesey	Open Coast (Irish Sea)		
367	Benllech Sand, Anglesey	Open Coast (Irish Sea)		
368	Porthllongdy Spit	Open Coast (Irish Sea)	Bay (Red Wharf Bay)	
369	Traeth-coch, Anglesey	Open Coast (Irish Sea)	Bay (Red Wharf Bay)	
370	Tan Dinas Quarry, Anglesey	Open Coast (Irish Sea)		
371	Fedw Fawr West, Anglesey	Open Coast (Irish Sea)		
372	Fedw Fawr East, Anglesey	Open Coast (Irish Sea)		
373	Trwyn Dinmor to Trwyn Du	Open Coast (Irish Sea)		
374	Trwyn Du to Beaumaris, Anglesey	Open Coast (Irish Sea)	Inlet (Menai Strait)	
375	Gallows Point, Beaumaris, Anglesey	Open Coast (Irish Sea)	Inlet (Menai Strait)	
376	Penrhyn Park	Open Coast (Irish Sea)	Inlet (Menai Strait)	
377	The Spinnies, Aber-Ogwen	Open Coast (Irish Sea)	Inlet (Menai Strait)	
378	Aber-Ogwen to Coed Gyfynys	Open Coast (Irish Sea)	Inlet (Menai Strait)	
379	Coed Gyfynys to Wig Bach	Open Coast (Irish Sea)	Inlet (Menai Strait)	
380	Wig Bach to Afon Aber	Open Coast (Irish Sea)	Inlet (Menai Strait)	
381	Afon Aber	Open Coast (Irish Sea)	Inlet (Menai Strait)	
382	Afon Aber to Glan y mor Elias	Open Coast (Irish Sea)	Inlet (Menai Strait)	
383	Llanfairfechan Spit	Open Coast (Irish Sea)	Inlet (Menai Strait)	
384	Llanfairfechan Town	Open Coast (Irish Sea)	Inlet (Menai Strait)	
385	Penmaenmawr to Penmaen-bach	Open Coast (Irish Sea)	Bay (Conway Bay)	
386	Conwy Morfa	Open Coast (Irish Sea)	Bay (Conway Bay)	
387	Deganwy	Open Coast (Irish Sea)	Bay (Conway Bay)	
388	Llandudno West Shore	Open Coast (Irish Sea)	Bay (Conway Bay)	
389	Great Orme West Shore	Open Coast (Irish Sea)	Bay (Conway Bay)	
390	Llandudno Bay	Open Coast (Liverpool Bay)	Bay (Llandudno Bay)	
391	Penrhyn Bay	Open Coast (Liverpool Bay)	Bay (Penrhyn Bay)	
392	Rhos on Sea	Open Coast (Liverpool Bay)	Bay (Colwyn Bay)	
393	Colwyn Bay	Open Coast (Liverpool Bay)	Bay (Colwyn Bay)	
394	Penmaen Rhos	Open Coast (Liverpool Bay)	Bay (Colwyn Bay)	
395	Llanddulas	Open Coast (Liverpool Bay)		
396	Pensarn	Open Coast (Liverpool Bay)		
397	Belgrano to Kinmel Bay	Open Coast (Liverpool Bay)		
398	Horton's Nose, Kinmel Bay	Open Coast (Liverpool Bay)		
399	Rhyl	Open Coast (Liverpool Bay)		
400	Barkby Beach to Gronant	Open Coast (Liverpool Bay)		
401	Gronant to Talacre	Open Coast (Liverpool Bay)		
402	Point of Ayr	Open Coast (Liverpool Bay)	Estuary (River Dee)	
403	Ffynnongroyw to Greenfield	Open Coast (Liverpool Bay)	Estuary (River Dee)	

Table A2 Site locations (OS grid reference), and areas of bare and vegetated shingle

ID	Localities	Site start		Site finish		Bare	Vegetated
		Easting	Northing	Easting	Northing	shingle (ha)	shingle (ha)
1	Sudbrook Point	351394	188032	350403	187229	3.61	0.04
2	West Pill, Rogiet	346821	186431	346555	186388	0.12	0.23
3	Portland Grounds (Redwick to Goldcliff)	342503	183873	337344	181926	2.26	0.00
4	Goldcliff Pill	336426	182513	336148	182613	0.04	0.89
5	Newgout Pill, Wentlooge	331305	183906	331317	183761	0.04	0.54
6	West Usk Lighthouse, Wentlooge	331251	183355	331145	182856	1.71	0.91
7	Outfall Lane, Wentlooge	328997	180896	328937	180878	0.13	0.00
8	Cardiff Flats	322136	177158	320507	174049	16.59	0.00
9	Penarth to Lavernock Point	319089	172319	318773	168097	21.15	0.10
10	Lavernock Point to Swanbridge	318773	168097	316664	167410	2.32	0.00
11	Barry Harbour	310965	166788	310424	166406	0.87	0.00
12	Watch House Bay, Barry	310350	166305	310342	166207	0.31	0.00
13	Pebble Beach, Barry	310202	166076	309270	166735	8.63	0.18
14	Porthkerry	308915	166767	308172	166170	6.79	0.46
15	Bulwarks Fort to Rhoose Point	308172	166170	306653	165534	5.54	0.00
16	Watch House Beach, East Aberthaw	305044	165859	303702	165873	38.25	0.73
17	Leys Beach, East Aberthaw	303702	165873	302044	166199	25.84	0.61
18	West Aberthaw	302044	166199	300166	166502	9.88	2.98
19	Aberthaw to St Donats	300166	166502	293433	167694	17.94	0.20
20	Nash Point to Cwm Nash	291541	168315	290748	169775	4.84	0.00
21	Traeth Mawr, Broughton	290429	170072	289975	171222	4.51	0.00
22	Traeth Bach, Broughton	289739	171535	288975	172674	4.03	0.00
23	Dunraven Bay	288592	172755	288453	173155	1.71	0.02
24	Ogmore-by-Sea	286382	174794	286069	175593	1.08	0.00
25	Pwll y Defaid, Merthyr-mawr Warren	286344	175976	286173	175932	0.92	0.04
26	Black Rocks, Porthcawl	285489	176695	283885	176956	1.47	0.00
27	Trecco Bay, Porthcawl	283377	176358	282847	176670	1.02	0.08
28	Seafront Beach, Porthcawl	281704	176550	281604	176609	0.08	0.00
29	West Beach, Porthcawl	281050	176970	280930	177014	0.26	0.00
30	Rest Bay, Porthcawl	280115	178485	278810	179920	6.43	3.98
31	Kenfig Sands	278938	180135	277878	183551	6.35	0.04
32	Afon Cynffig	277900	183411	277869	183577	0.21	0.00
33	Margam Sands	277484	184299	276043	187212	3.09	0.64
34	Port Talbot Harbour	275548	187827	275195	188517	0.67	0.00
35	Baglan Burrows	272178	191871	272357	192784	0.80	0.10
36	Mumbles	261987	187951	262422	187743	1.06	0.00
37	Bracelet Bay, Gower	262987	187254	262898	187205	0.35	0.00
38	Limeslade Bay, Gower	262572	187131	262514	187136	0.14	0.00
39	Langland Bay, Gower	260825	187373	260595	187349	0.36	0.00
40	Caswell Bay	259334	187607	258970	187607	0.18	0.00
41	Brandy Cove	258549	187448	258524	187439	0.03	0.00
42	Pwlldu Bay	257669	187136	257403	187015	3.16	0.94
43	Pobbles Beach	254039	187793	253995	187797	0.07	0.00
44	Pennard Burrows	253966	188142	253767	188263	0.58	0.22
45	Oxwich Bay	251040	187320	250271	186268	1.43	0.00
46	Holy's Wash	250397	184988	248468	185493	4.21	0.00
47	Port-Eynon Bay	247900	185561	247312	185401	1.39	0.00
48	Port-Eynon Point	246972	184546	246871	184484	0.22	0.00
49	Overton Mere	246467	184789	246320	184849	0.47	0.00
50	Common Cliff	244588	185382	244550	185393	0.14	0.00
51	Ram Grove	242875	186499	242858	186508	0.13	0.00
52	Kitchen Corner south	240606	187242	240269	187332	0.52	0.00
53	Kitchen Corner north	240204	187506	240321	187617	0.28	0.00
54	Rhossili Bay	241470	188313	240383	192496	2.62	0.00
55	Whiteford Point	244362	195579	244949	196639	0.44	0.00
56	Machynys, Loughor Estuary	251310	197370	251821	197478	1.65	8.58
57	Llanelli Harbour Mouth	250136	198583	249930	198661	0.42	0.02
58	Tywyn Bach, Burry Port	246343	200675	245891	200161	1.32	0.40
59	Millenium Coastal Park, Burry Port	245503	200238	244948	200103	0.63	0.00
60	Burry Port Harbour Mouth	244057	200119	243807	200059	1.69	0.00
61	St Ishmael's Scar	237082	206955	236182	208232	1.58	0.00
62	The Graig, Ferryside	236264	209364	236347	209523	0.39	0.00
63	Ferryside	236526	210297	236900	210830	0.74	0.04
64	Ginst Point	233072	208268	233001	208149	0.52	0.00
65	Pendine	224336	207787	223519	207925	0.53	0.00
66	Morfa Bychan, Pendine	222681	207478	222404	207519	1.43	0.00
67	Marros Sands	221977	207122	219177	207508	5.62	0.00
68	Amroth Beach	217495	207228	216125	206937	3.28	0.02
69	Wiseman's Bridge Beach	215019	206336	214453	205950	1.45	0.00
70	Saundersfoot Beach	214103	205412	213708	204822	0.61	0.00
71	Rhode Wood, Saundersfoot	213881	204321	214070	203970	0.31	0.00
72	Monkstone Beach	214779	202720	214218	202720	0.74	0.00
73	Waterwynch Bay	213681	202044	213673	201993	0.04	0.00
74	Second Bay, Tenby	213626	201571	213555	201514	0.09	0.00
75	First Bay, Tenby	213552	201452	213506	201359	0.12	0.00
76	Tenby South Beach	212941	199791	212228	198571	1.04	0.00
77	Drinkim Beach, Caldy Island	214618	196279	214544	196154	0.28	0.00
78	Sandtop Bay, Caldy Island	213142	196546	213128	196785	1.55	0.00
79	Lydstep Haven	209413	198573	209067	197807	3.12	0.08
80	Church Doors, Skrinkle Haven	208111	197433	208066	197388	0.07	0.00
81	Manorbier Bay	206095	197444	206041	197574	0.30	0.00

Table A2 (continued)

ID	Localities	Site start		Site finish		Bare	Vegetated
		Easting	Northing	Easting	Northing	shingle (ha)	shingle (ha)
82	Swanlake Bay	204635	197962	204413	198068	0.60	0.00
83	Privar	203101	198091	202992	198085	0.48	0.00
84	Greenala Point to Stackpole Quay	200716	196534	199463	195971	1.63	0.00
85	Stackpole Quay	199363	195865	199310	195677	0.14	0.00
86	Mowingword	199363	195865	199310	195677	0.28	0.00
87	Bullslaughter Bay	194150	194278	194027	194337	0.50	0.00
88	Flimston Bay	193190	194650	193056	194604	0.53	0.00
89	Pen-y-holt Bay	189639	195501	189587	195565	0.32	0.00
90	Hobbyhorse Bay	188760	195732	188650	195725	0.44	0.00
91	Blucks Pool	188921	197397	188897	197443	0.06	0.00
92	Frainslake Sands	189036	197595	189025	197989	0.47	0.00
93	Little Furzenip	188728	198912	188531	199350	1.20	0.00
94	Freshwater West	188500	199430	188087	200575	1.66	0.00
95	Gravel Bay	187774	200677	187715	200687	0.04	0.00
96	West Pickard Bay	186117	201140	186063	201156	0.13	0.00
97	West Angle Bay	185297	203067	185335	203273	0.17	0.00
98	The Ridge, Angle Bay	187089	202947	187024	202759	0.76	0.00
99	Angle Bay East	189114	201886	189237	203840	0.67	0.00
100	Pembroke Dock	193806	202494	194349	202902	4.39	0.00
101	Cosheston Point to Mill Bay, Daugleddau	198386	204040	199584	205056	2.28	0.00
102	Burton Ferry	199704	205399	196845	205135	2.77	0.00
103	Neyland	196661	204788	196017	204990	0.45	0.00
104	Llanstadwell	195842	205008	195672	205039	0.67	0.08
105	Newton Noyes, Milford Haven	194190	204380	190466	205728	1.12	0.00
106	Gelliswick Bay, Milford Haven	188895	205581	188531	205446	1.66	0.00
107	Gelliswick Village, Milford Haven	188382	205417	187912	205368	0.33	0.00
108	Little Wick, Milford Haven	187458	205417	187387	205419	0.19	0.00
109	Kilroom	186859	205867	186644	206215	0.31	0.00
110	Sandy Haven	186342	206987	185793	207270	0.73	0.00
111	Sleeping Bay	185573	206913	185464	206802	0.14	0.00
112	Butts Bay	185269	206563	185097	206432	0.22	0.00
113	Longoar Bay	184975	206296	184894	206158	0.38	0.00
114	Lindsway Bay	184325	206650	183995	206648	0.39	0.00
115	Wenall Bay	183904	206657	183755	206595	0.72	0.00
116	Watch House Bay, Milford Haven	183607	206502	183541	206422	0.16	0.00
117	Monk Haven	182837	206408	182807	206408	0.06	0.00
118	Musselwick	181978	206398	181402	206983	0.48	0.00
119	Pickleridge Beach	181402	206983	180878	206567	1.98	4.70
120	Dale Beach	181236	206045	181193	205667	0.33	0.00
121	Castlebeach Bay	181893	205058	181879	205016	0.03	0.00
122	Watwick Bay	181651	204066	181637	204046	0.01	0.00
123	Mill Bay	180914	203512	180895	203494	0.02	0.00
124	Windmill Cove	179948	205478	179929	205583	0.29	0.00
125	Westdale Bay	179917	205810	179857	205962	0.36	0.00
126	Marloes Sands	178952	206706	177256	207532	4.93	0.00
127	Albion Sands	177151	207562	176949	207786	0.26	0.00
128	Watery Bay	176919	207838	176845	207893	0.07	0.00
129	Victoria Bay	176809	207926	176767	207948	0.08	0.00
130	Little Castle Bay	176557	207997	176523	208001	0.11	0.00
131	Rainy Rock Bay	176461	208061	176333	208156	0.10	0.00
132	Three Doors Bay	176306	208175	176163	208334	0.14	0.00
133	Deadman's Bay	176063	208463	176046	208607	0.04	0.00
134	Renney Slip	176042	208687	175958	208792	0.15	0.00
135	Jeffry's Haven south	175584	209027	175579	209073	0.11	0.00
136	Jeffry's Haven north	175590	209119	175604	209168	0.12	0.00
137	Martin's Haven	176033	209157	176101	209160	0.19	0.00
138	West hook Farm	176510	209175	176551	209175	0.05	0.00
139	Mill Haven	181596	212356	181648	212385	0.07	0.01
140	Brandy Bay	181972	212692	181987	212727	0.05	0.00
141	Messelwick	184981	212344	185060	212433	0.19	0.00
142	Rook's Bay	185513	212931	185538	212994	0.19	0.00
143	Little Haven	185647	212939	185700	212963	0.19	0.00
144	The Settlands	185788	213172	185821	213324	0.27	0.00
145	Broad Haven	186008	213504	186124	213969	0.25	0.00
146	Harold Stone south	185973	214470	185973	214621	0.30	0.00
147	Harold Stone north	185976	214732	185965	214993	0.60	0.00
148	Black Point south	185975	215069	185979	215170	0.22	0.00
149	Settling Nose south	185952	215507	185992	215607	0.39	0.00
150	Settling Nose north	185962	215774	186010	215912	1.35	0.00
151	Druidston Haven	186166	216916	186109	217302	0.61	0.00
152	North Haven	186017	217504	185994	217568	0.10	0.00
153	Madoc's Haven	185961	217668	185947	217737	0.07	0.00
154	Nolton Haven	185947	218526	185824	218589	0.27	0.00
155	Newgale Sands: Maidenhall Pt-Bathesland	185422	220658	185321	220934	0.35	0.00
156	Newgale Sands: Bathesland-Sibbernock	185321	220934	185167	221291	1.26	0.09
157	Newgale Sands:Sibbernock-Newgale	185167	221291	184638	222437	4.16	0.03
158	Porthmynawyd	182710	222968	182612	222924	0.07	0.00
159	Aber Dwyrain	181416	223087	181354	223117	0.07	0.00
160	Porth y Bŵch, Solva	181233	223389	181032	223598	0.44	0.00
161	Gwadn, Solva	180312	223706	180269	223814	0.26	0.00
162	Loch Warren	179039	223763	178986	223920	0.21	0.00

Table A2 (continued)

ID	Localities	Site start		Site finish		Bare	Vegetated
		Easting	Northing	Easting	Northing	shingle (ha)	shingle (ha)
163	Aber Llong	178835	224122	178769	224193	0.14	0.00
164	Porth y Rhaw	178608	224308	178593	224314	0.02	0.00
165	Caer Bwdy Bay	176710	224380	176655	224393	0.17	0.00
166	Caerfai Bay	176154	224307	176037	224346	0.05	0.00
167	Porthlysgi Bay	173190	223583	173024	223727	0.31	0.00
168	Porth Lleuog, Ramsey Island	169936	223042	169909	223054	0.14	0.00
169	Aber Mawr, Ramsey Island	169945	224090	169995	224417	0.52	0.00
170	Whitesands Bay	173317	226782	173320	227267	0.32	0.00
171	Porth Lleuog	173234	227374	173217	227464	0.11	0.00
172	Porthmelgan	172833	227890	172700	227959	0.09	0.00
173	Porth y Rhaw	177025	229770	177063	229781	0.07	1.00
174	Abereiddi Bay	179698	231235	179642	231381	0.44	0.00
175	Traeth Llyfn	180241	231865	180227	232035	0.22	0.00
176	Porth Egr	180406	232355	180400	232397	0.06	0.00
177	Aberfelin, Trefin	183274	232469	183361	232506	0.14	0.00
178	Pwll Olfa	183723	232952	183785	233052	0.20	0.00
179	Pwll Llong	184109	233275	184133	233357	0.21	0.00
180	Pwll Whiting	184213	233561	184206	233668	0.17	0.00
181	Ynys Deullyn	184473	234061	184551	234103	0.02	0.00
182	Aber Castle	185232	233663	185261	233710	0.24	0.00
183	Pwllstrodur	186570	233766	186641	233829	0.13	0.00
184	Aber Mawr	188060	234448	188325	234788	1.03	0.00
185	Aber Bach, St Nicholas	188376	235018	188381	235134	0.42	0.02
186	Porth Dwgan	188310	235231	188310	235287	0.10	0.00
187	Pwllcrochan	188560	236433	188461	236559	0.18	0.00
188	Pwlldawnau	188029	237022	187960	237077	0.15	0.00
189	Pwll Deri	189210	238460	189168	238611	0.26	0.00
190	Porth Maenmelyn	188878	239153	188861	239259	0.15	0.00
191	Pwlluog	190278	241083	190277	241041	0.02	0.00
192	Porthsychan	190553	240780	190650	240758	0.13	0.00
193	Aber Felin	192762	240118	192860	240110	0.14	0.00
194	Porth Maen	194255	240390	194342	240390	0.12	0.00
195	Pwll Hir	195056	239711	195075	239591	0.09	0.00
196	Goodwick Sands North	194690	238129	194775	238042	0.14	0.00
197	Goodwick Sands South	194838	237944	194862	237864	0.06	0.00
198	Lampit Mawr	195812	237543	195845	237506	0.05	0.00
199	Aber Gwaun	196001	237221	196251	237182	0.46	0.00
200	Pwll Landdu	196651	237686	196727	237675	0.34	0.00
201	Pwell Edyn	196750	237650	196792	237683	0.22	0.00
202	Pwll Ceunant	197026	237741	197076	237770	0.09	0.00
203	Aber Richard	197852	238064	197997	238112	0.22	0.00
204	Pwll y Blewyn	198052	238204	198171	238278	0.74	0.00
205	Aber Grugog	198499	238338	198627	238414	0.53	0.00
206	Aber Hywel	199038	238541	199108	238592	0.35	0.00
207	Carreg Pen-las	199338	238770	199436	238796	0.28	0.00
208	Aber Bach, Fishguard	199641	238628	199709	238675	0.24	0.00
209	Pwll Gwylog	199899	239295	199947	239349	0.11	0.00
210	Cwm-yr-Eglwys, Afon Teifi	201509	240145	201544	240047	0.05	0.00
211	Aber Fforest	202514	239585	202611	239554	0.30	0.00
212	Aber Rhigian	203194	239564	203282	239576	0.24	0.01
213	Traeth Cell-Howel	208022	243516	209137	244035	0.57	0.00
214	Ceibwr Bay	210985	245670	211038	245720	0.76	0.10
215	Traeth y Rhedyn	212253	248170	212098	248505	0.24	0.00
216	Traeth Godir-coch	212658	249111	212881	249475	0.91	0.00
217	Careg Aderyn	213508	249856	213508	249856	0.06	0.00
218	Pwll Edrych	213772	249548	213982	249419	0.26	0.00
219	Pwll Melyn	214202	249328	214247	249323	0.11	0.00
220	Pen yr Ergyd	215973	248465	216073	248598	0.84	0.25
221	Llangrannog	231048	254187	231093	254218	0.06	0.00
222	Traeth y Gaerglwyd	232102	255014	232256	255008	0.50	0.00
223	Cwmtydu	235512	257544	235629	257588	0.48	0.01
224	Castell Bach	236227	258254	236275	258301	0.36	0.00
225	Traeth y Coubal	237150	259230	237333	259582	0.54	0.00
226	Llech Cimwch	238255	260335	238380	260400	0.15	0.00
227	Traeth y Quarry	238607	260480	238687	260452	0.07	0.00
228	New Quay Bay	239168	259598	240497	259936	2.64	0.00
229	Little Quay Bay	240663	259800	243116	261212	5.10	0.00
230	Gilfach-yr-Halen to Clogfryn	243438	261365	244835	262512	5.38	0.00
231	Aberaeron south	245039	262565	245392	263027	2.51	0.06
232	Aberaeron north	245506	263045	246466	263523	5.61	0.72
233	Aberaeron to Aberarth	246466	263523	247787	263996	4.09	0.00
234	Aberarth	247787	263996	247980	264181	1.37	0.00
235	Aberarth to Morfa Mawr	247980	264181	249885	265730	8.15	0.00
236	Morfa Mawr	249885	265730	249926	265864	0.71	0.00
237	Morfa Mawr to Llanonn	249926	265864	250641	266763	4.48	0.00
238	Llannon	250641	266763	250755	266940	0.65	0.01
239	Llannon to Llansantffraid	250755	266940	250937	267451	2.32	0.00
240	Llansantffraid	250937	267451	250972	267571	0.48	0.15
241	Llansantffraid to Llanrhystud	250972	267571	252198	268660	4.40	0.00
242	Llanrhystud	252198	268660	252853	269873	8.67	0.00
243	Llanrhystud to Carreg Ti-pw	252853	269873	253500	270734	3.73	0.00

Table A2 (continued)

ID	Localities	Site start		Site finish		Bare	Vegetated
		Easting	Northing	Easting	Northing	shingle (ha)	shingle (ha)
244	Carreg Ti-pw to Pinderi Cliffs	253500	270734	254660	272854	1.16	0.00
245	Twll Twrw to Traeth Tanybwlch	255578	274632	257742	279650	13.11	0.00
246	Traeth Tanybwlch, Aberystwyth	257742	279650	257899	280710	7.07	3.44
247	South Beach, Aberystwyth	257920	280892	257825	281596	3.79	0.00
248	North Beach, Aberystwyth	258317	282191	258292	282547	0.32	0.00
249	Constitution Hill	258287	282736	258300	282913	0.34	0.00
250	Clarach Bay	258741	283625	258605	284166	2.29	0.37
251	Wallog Beach	258779	285193	259494	287316	5.67	0.00
252	Pen-y-graig	259987	288216	260049	288455	0.57	0.00
253	Borth Sands	260699	288844	260539	294239	14.94	20.33
254	Aberdovey to Tywyn	259297	296840	258109	299792	7.60	0.20
255	Tywyn	258109	299792	257329	301453	3.66	0.00
256	Tywyn to Aber Dysynni	257329	301453	256133	303298	8.30	24.06
257	Tonfanau to Gallt Ffynnon yr Hydd	256292	303286	261038	311951	35.20	0.00
258	Ro Wen, Fairbourne	311951	257412	261701	315077	11.07	12.36
259	Afon Mawddach, Barmouth	262089	315585	261559	315529	0.24	0.00
260	Ynys y Brawd, Barmouth	261487	315199	260955	315323	0.30	0.00
261	Barmouth Promenade	260875	315820	260383	316950	1.19	0.00
262	Barmouth to Llanaber	260649	316285	259956	317772	2.63	0.00
263	Ceunant Egryn, Llanaber	259474	319006	258821	319985	3.22	0.01
264	Afon Ysgethin, Tal-y-bont	259339	320706	256865	322736	5.65	2.77
265	Shell Island	255036	326175	256161	327311	1.29	0.00
266	Shell Island Spit	256161	327311	256697	327477	0.68	0.00
267	Llandanwg Spit	256621	327615	256757	327825	1.11	0.01
268	Llandanwg to Harlech	256806	328472	257395	329803	2.22	0.00
269	Graig Ddu to Criccieth	252107	337428	250927	338064	7.26	3.43
270	Criccieth	250927	338064	248005	337239	1.22	0.00
271	Afon Dwyfor	247869	377220	246518	337323	9.05	12.37
272	Glannllynnau	246518	337323	245522	337292	2.25	0.00
273	Afon Wen	245522	337292	244136	336979	2.71	10.07
274	Hafan y Mor	244136	336979	243524	335786	0.64	0.00
275	Pen-ychain to Pwllheli	243250	335359	238665	334704	6.73	5.87
276	Carreg yr Imbill	238874	334740	238659	334253	1.13	0.08
277	Traeth Crugan	237047	334114	234131	332802	5.09	0.00
278	Llanbedrog Beach	234057	332367	233166	331410	2.05	0.00
279	Porth Ceiriad	231719	324881	230534	324675	1.35	0.00
280	Porth Neigwl	229110	325555	224271	328469	10.19	0.00
281	Porth Ysgo	221401	326142	220531	326479	0.34	0.00
282	Aberdaron Bay	218607	325675	216737	326305	4.69	0.00
283	Porth Meudwy	216354	325589	216316	325496	0.04	0.00
284	Porth Ferin	217164	331981	217215	331981	0.11	0.00
285	Porth Ty-mawr	218534	3332507	218890	333105	1.02	0.00
286	Traeth Penllech	220072	334249	220776	335219	0.43	0.00
287	Bryn Gwydd south	223766	338489	223790	338546	0.29	0.00
288	Bryn Gwydd north	224038	339065	224057	339120	0.02	0.00
289	Aber Geirch	226522	340416	226541	340648	0.26	0.00
290	Borth Wen	227302	341049	227419	341136	1.45	0.00
291	Porth Dinllaen	227606	341291	229406	341020	0.94	0.00
292	Porth Nefyn	229634	340837	231787	342061	3.25	0.00
293	Porth Pistyll	232140	342172	233179	343504	2.22	0.00
294	Porth y Nant	233942	343819	234864	345504	5.56	0.00
295	Yr Eifl Beach, Trefor	235288	345839	236563	347347	1.34	0.00
296	Trefor to Aberdesach	237568	347350	242363	351206	16.87	0.00
297	Aberdesach	242363	351206	242552	351709	1.16	0.42
298	Aberdesach to Trwyn Maen Dylan	242555	351709	242608	352118	0.91	0.00
299	Trwyn Maen Dylan	242608	352121	242690	352360	0.52	1.16
300	Trwyn Maen Dylan to Pontllyfni	242687	352360	243071	352524	0.54	0.00
301	Pontllyfni to Ynys	243068	352521	243445	354483	4.41	4.66
302	Ynys to Dinas Dinlle	243448	354483	243577	355883	5.04	4.45
303	Dinas Dinlle Fort	243572	355896	243600	356567	1.66	0.00
304	Morfa Dinlle	243600	356567	244912	360815	14.61	11.89
305	Afon Gwyrfai to Caernarfon	245361	359599	247541	362688	3.19	0.10
306	Caernarfon to Plas Menai	248011	363287	250014	365900	2.58	0.00
307	Y Felinheli	252134	367249	252341	367559	0.30	0.00
308	Y Felinheli to Pont Britannia	252541	367865	254118	370873	2.17	0.00
309	Pont Britannia to Pwll-fanogl, Anglesey	253745	371042	252758	370687	1.17	0.00
310	Moel-y-don to Afon Braint, Anglesey	251907	367763	244602	363427	7.95	0.25
311	Abermenai	244087	361696	242114	362097	2.21	0.28
312	Traeth Llanddwyn	241842	362268	240143	363399	1.01	0.00
313	Tywyn Fferam, Anglesey	233056	371158	232426	372082	0.82	0.00
314	Traeth Llydan, Holy Island	229664	375289	229147	375266	0.77	0.00
315	Borthwen, Holy Island	227488	375090	227291	375140	0.20	0.04
316	Porthygaran, Holy Island	225728	377103	225622	377205	0.25	0.01
317	Lee Caravan Park, Holy Island	225410	377367	225430	377379	0.05	0.00
318	Porth Diana, Holy Island	225439	378370	225430	378398	0.02	0.00
319	Trearddur Bay, Holy Island	225458	378634	225562	379000	0.15	0.00
320	Porth Isallt-bach, Holy Island	225073	379113	224990	379134	0.25	0.00
321	Porth yr Afon, Holy Island	224893	379114	224781	379254	0.34	0.00
322	Porth yr Afon to Porth t Pwll, Holy Island	224678	379153	224378	379256	0.38	0.00
323	Porth y Pwll, Holy Island	224408	379325	224376	379356	0.16	0.00
324	Porth-y-post, Holy Island	224283	379582	224249	379635	0.24	0.00

Table A2 (continued)

ID	Localities	Site start		Site finish		Bare	Vegetated
		Easting	Northing	Easting	Northing	shingle (ha)	shingle (ha)
325	Porth y Corwgl, Holy Island	253500	270734	254660	272854	0.17	0.00
326	Abraham's Bosom, Holy Island	255578	274632	257742	279650	0.39	0.00
327	Soldiers Point, Holy Island	257742	279650	257899	280710	0.69	0.00
328	Peibio	257920	280892	257825	281596	0.53	0.00
329	Traeth Penrhos, Holy Island	258317	282191	258292	282547	0.74	0.01
330	Penrhos to Gorsedd-y-penrhyn	258287	282736	258300	282913	1.26	0.00
331	Gorsedd-y-penrhyn to Stanley Embankment	258741	283625	258605	284166	1.44	0.00
332	Ynys Leurad, Anglesey	258779	285193	259494	287316	0.12	0.00
333	Valley, Anglesey	259987	288216	260049	288455	1.41	0.00
334	Traeth y Gribin, Anglesey	260699	288844	260539	294239	2.98	0.05
335	Porth Penrhyn-mawr, Anglesey	259297	296840	258109	299792	1.20	0.01
336	Porth Delysg, Anglesey	258109	299792	257329	301453	1.05	0.02
337	Twyn Cliperau, Anglesey	257329	301453	256133	303298	0.20	0.00
338	Porth Tywyn-mawr, Anglesey	256292	303286	261038	311951	0.10	0.00
339	Porth Defaid, Anglesey	311951	257412	261701	315077	0.29	0.00
340	Porth Trefadog, Anglesey	262089	315585	261559	315529	0.22	0.00
341	Porth Ffynnon to Porth Swtan	261487	315199	260955	315323	3.59	0.00
342	Traeth Ynys y Fydlyn, Anglesey	260875	315820	260383	316950	0.29	0.09
343	Porth Newydd to Porth Tywodog	260649	316285	259956	317772	2.09	0.00
344	Hen Borth, Anglesey	259474	319006	258821	319985	0.91	0.00
345	Hen Borth to Trwyn Cemlyn	259339	320706	256865	322736	1.68	0.00
346	Cemlyn Bay, Anglesey	255036	326175	256161	327311	3.78	1.86
347	Porth-y-pistyll, Anglesey	256161	327311	256697	327477	0.48	0.00
348	Porth y Wylfa, Anglesey	256621	327615	256757	327825	0.6	0.00
349	Porth Llanlleiana, Anglesey	256806	328472	257395	329803	0.12	0.00
350	Porth Wen, Anglesey	252107	337428	250927	338064	0.09	0.00
351	Porth-Llechog, Anglesey	250927	338064	248005	337239	0.01	0.00
352	Porth Eilian, Anglesey	247869	377220	246518	337323	0.12	0.00
353	Porthygwidhiaid, Anglesey	246518	337323	245522	337292	0.85	0.00
354	Porth Helygen to Porth Garreg-fawr	245522	337292	244136	336979	0.31	0.00
355	Dulas Bay, Anglesey	244136	336979	243524	335786	0.35	0.02
356	Traeth yr Ora	243250	335359	238665	334704	0.18	0.00
357	Porth y Mor, Anglesey	238874	334740	238659	334253	0.59	0.00
358	Traeth Lligwy, Anglesey	237047	334114	234131	332802	0.08	0.00
359	Porth Forllwyd, Anglesey	234057	332367	233166	331410	0.13	0.00
360	Porth Helaeth, Anglesey	231719	324881	230534	324675	0.39	0.00
361	Porth yr Ynys, Anglesey	229110	325555	224271	328469	0.13	0.00
362	Porth Moelfre, Anglesey	221401	326142	220531	326479	0.08	0.00
363	Porth yr Aber, Anglesey	218607	325675	216737	326305	0.12	0.00
364	Porth y Rhos, Anglesey	216354	325589	216316	325496	0.16	0.00
365	Traeth Bychan, Anglesey	217164	331981	217215	331981	0.32	0.00
366	Borth Wen, Anglesey	218534	3332507	218890	333105	0.18	0.00
367	Benllech Sand, Anglesey	220072	334249	220776	335219	0.81	0.00
368	Porthllongdy Spit	223766	338489	223790	338546	0.70	0.16
369	Traeth-coch, Anglesey	224038	339065	224057	339120	1.64	0.00
370	Tan Dinas Quarry, Anglesey	226522	340416	226541	340648	0.39	0.02
371	Fedw Fawr West, Anglesey	227302	341049	227419	341136	0.24	0.01
372	Fedw Fawr East, Anglesey	227606	341291	229406	341020	0.20	0.01
373	Trwyn Dinmor to Trwyn Du	229634	340837	231787	342061	1.14	0.00
374	Trwyn Du to Beaumaris, Anglesey	232140	342172	233179	343504	11.10	0.30
375	Gallows Point, Beaumaris, Anglesey	233942	343819	234864	345504	0.30	0.00
376	Penrhyn Park	235288	345839	236563	347347	0.16	0.00
377	The Spinnies, Aber-Ogwen	237568	347350	242363	351206	0.15	0.49
378	Aber-Ogwen to Coed Gyfynys	242363	351206	242552	351709	2.62	0.00
379	Coed Gyfynys to Wig Bach	242555	351709	242608	352118	2.29	12.10
380	Wig Bach to Afon Aber	242608	352121	242690	352360	1.06	0.00
381	Afon Aber	242687	352360	243071	352524	1.22	5.37
382	Afon Aber to Glan y mor Elias	243068	352521	243445	354483	4.21	0.17
383	Llanfairfechan Spit	243448	354483	243577	355883	3.81	1.66
384	Llanfairfechan Town	243572	355896	243600	356567	4.68	0.05
385	Penmaenmawr to Penmaen-bach	243600	356567	244912	360815	6.84	0.06
386	Conwy Morfa	245361	359599	247541	362688	4.23	0.00
387	Deganwy	248011	363287	250014	365900	4.02	0.04
388	Llandudno West Shore	252134	367249	252341	367559	1.46	0.00
389	Great Orme West Shore	252541	367865	254118	370873	4.81	0.00
390	Llandudno Bay	253745	371042	252758	370687	4.47	0.00
391	Penrhyn Bay	251907	367763	244602	363427	3.63	0.23
392	Rhos on Sea	244087	361696	242114	362097	1.40	0.00
393	Colwyn Bay	241842	362268	240143	363399	0.48	0.00
394	Penmaen Rhos	233056	371158	232426	372082	3.37	0.00
395	Llanddulas	229664	375289	229147	375266	9.50	1.49
396	Pensarn	227488	375090	227291	375140	12.7	6.73
397	Belgrano to Kinmel Bay	225728	377103	225622	377205	3.1	0.35
398	Horton's Nose, Kinmel Bay	225410	377367	225430	377379	0.94	0.00
399	Rhyl	225439	378370	225430	378398	1.28	0.00
400	Barkby Beach to Gronant	225458	378634	225562	379000	6.19	0.60
401	Gronant to Talacre	225073	379113	224990	379134	1.28	0.00
402	Point of Ayr	224893	379114	224781	379254	0.31	0.01
403	Ffynnongroyw to Greenfield	224678	379153	224378	379256	5.71	0.00
					Totals:	790.85	180.85

Table A3 Shoreline Management Plan areas, zones and policy units

ID	Localities	SMP	Area	Zone	Unit
1	Sudbrook Point	Severn Estuary	Severn Estuary	Caldicot Levels	CALD1
2	West Pill, Rogiet	Severn Estuary	Severn Estuary	Caldicot Levels	CALD1
3	Portland Grounds (Redwick to Goldcliff)	Severn Estuary	Severn Estuary	Caldicot Levels	CALD1
4	Goldcliff Pill	Severn Estuary	Severn Estuary	Caldicot Levels	CALD2
5	Newgout Pill, Wentlooge	Severn Estuary	Severn Estuary	Wentlooge	WEN2
6	West Usk Lighthouse, Wentlooge	Severn Estuary	Severn Estuary	Wentlooge	WEN2
7	Outfall Lane, Wentlooge	Severn Estuary	Severn Estuary	Wentlooge	WEN2
8	Cardiff Flats	Severn Estuary	Severn Estuary	Cardiff	CAR2
9	Penarth to Lavernock Point	Severn Estuary	Severn Estuary	Penarth	PEN1-2
10	Lavernock Point to Swanbridge	South Wales	Vale of Glamorgan	Lavernock Point to Bendrick Rock	1.1-1.2
11	Barry Harbour	South Wales	Vale of Glamorgan	Barry Island and Docks	2.5
12	Watch House Bay, Barry	South Wales	Vale of Glamorgan	Barry Island and Docks	2.5
13	Pebble Beach, Barry	South Wales	Vale of Glamorgan	The Knap to Watch House Beach	3.1
14	Porthkerry	South Wales	Vale of Glamorgan	The Knap to Watch House Beach	3.3
15	Bulwarks Fort to Rhoose Point	South Wales	Vale of Glamorgan	The Knap to Watch House Beach	3.3
16	Watch House Beach, East Aberthaw	South Wales	Vale of Glamorgan	The Knap to Watch House Beach	4.1
17	Leys Beach, East Aberthaw	South Wales	Vale of Glamorgan	Aberthaw	4.1
18	West Aberthaw	South Wales	Vale of Glamorgan	Limpet Bay to Nash Point	5.1
19	Aberthaw to St Donats	South Wales	Vale of Glamorgan	Limpet Bay to Nash Point	5.1-5.3
20	Nash Point to Cwm Nash	South Wales	Vale of Glamorgan	Nash Point to Porthcawl	6.1
21	Traeth Mawr, Broughton	South Wales	Vale of Glamorgan	Nash Point to Porthcawl	6.1
22	Traeth Bach, Broughton	South Wales	Vale of Glamorgan	Nash Point to Porthcawl	6.1
23	Dunraven Bay	South Wales	Vale of Glamorgan	Nash Point to Porthcawl	6.1
24	Ogmore-by-Sea	South Wales	Vale of Glamorgan	Nash Point to Porthcawl	6.1
25	Pwll y Defaid, Merthyr-mawr Warren	South Wales	Vale of Glamorgan	Nash Point to Porthcawl	6.2
26	Black Rocks, Porthcawl	South Wales	Vale of Glamorgan	Nash Point to Porthcawl	6.2
27	Trecco Bay, Porthcawl	South Wales	Swansea Bay	Porthcawl to Sker Point	7.2
28	Seafront Beach, Porthcawl	South Wales	Swansea Bay	Porthcawl to Sker Point	7.2
29	West Beach, Porthcawl	South Wales	Swansea Bay	Porthcawl to Sker Point	7.2
30	Rest Bay, Porthcawl	South Wales	Swansea Bay	Porthcawl to Sker Point	7.5
31	Kenfig Sands	South Wales	Swansea Bay	Sker Point to Swansea Docks	8.1
32	Afon Cynffig	South Wales	Swansea Bay	Sker Point to Swansea Docks	8.1
33	Margam Sands	South Wales	Swansea Bay	Sker Point to Swansea Docks	8.2
34	Port Talbot Harbour	South Wales	Swansea Bay	Sker Point to Swansea Docks	8.3
35	Baglan Burrows	South Wales	Swansea Bay	Sker Point to Swansea Docks	8.5
36	Mumbles	South Wales	Swansea Bay	Swansea Bay	9.4
37	Bracelet Bay, Gower	South Wales	Swansea Bay	Mumbles Head to Worms Head	10.1
38	Limeslade Bay, Gower	South Wales	Swansea Bay	Mumbles Head to Worms Head	10.1
39	Langland Bay, Gower	South Wales	Swansea Bay	Mumbles Head to Worms Head	10.2
40	Caswell Bay	South Wales	Swansea Bay	Mumbles Head to Worms Head	10.4
41	Brandy Cove	South Wales	Swansea Bay	Mumbles Head to Worms Head	10.5
42	Pwlldu Bay	South Wales	Swansea Bay	Mumbles Head to Worms Head	10.5
43	Pobbles Beach	South Wales	Swansea Bay	Mumbles Head to Worms Head	10.5
44	Pennard Burrows	South Wales	Swansea Bay	Mumbles Head to Worms Head	10.6
45	Oxwich Bay	South Wales	Swansea Bay	Mumbles Head to Worms Head	10.8
46	Holy's Wash	South Wales	Swansea Bay	Mumbles Head to Worms Head	10.9
47	Port-Eynon Bay	South Wales	Swansea Bay	Mumbles Head to Worms Head	10.10
48	Port-Eynon Point	South Wales	Swansea Bay	Mumbles Head to Worms Head	10.11
49	Overton Mere	South Wales	Swansea Bay	Mumbles Head to Worms Head	10.11
50	Common Cliff	South Wales	Swansea Bay	Mumbles Head to Worms Head	10.11
51	Ram Grove	South Wales	Swansea Bay	Mumbles Head to Worms Head	10.11
52	Kitchen Corner south	South Wales	Swansea Bay	Mumbles Head to Worms Head	10.11
53	Kitchen Corner north	South Wales	Carmarthen Bay	Worms Head to Whiteford Point	11.1
54	Rhossili Bay	South Wales	Carmarthen Bay	Worms Head to Whiteford Point	11.1-11.2
55	Whiteford Point	South Wales	Carmarthen Bay	Worms Head to Whiteford Point	11.5
56	Machynys, Loughor Estuary	South Wales	Carmarthen Bay	Loughor Estuary	12.9
57	Llanelli Harbour Mouth	South Wales	Carmarthen Bay	Loughor Estuary	12.9
58	Tywyn Bach, Burry Port	South Wales	Carmarthen Bay	Loughor Estuary	12.11
59	Millenium Coastal Park, Burry Port	South Wales	Carmarthen Bay	Loughor Estuary	12.11
60	Burry Port Harbour Mouth	South Wales	Carmarthen Bay	Loughor Estuary	12.13
61	St Ishmael's Scar	South Wales	Carmarthen Bay	Three Rivers Estuarine Complex	14.8
62	The Graig, Ferryside	South Wales	Carmarthen Bay	Three Rivers Estuarine Complex	14.9
63	Ferryside	South Wales	Carmarthen Bay	Three Rivers Estuarine Complex	14.9
64	Ginst Point	South Wales	Carmarthen Bay	Ginst Point to Dolwen Point	15.1
65	Pendine	South Wales	Carmarthen Bay	Ginst Point to Dolwen Point	15.2
66	Morfa Bychan, Pendine	South Wales	Carmarthen Bay	Dolwen Point to Giltar Point	16.1
67	Marros Sands	South Wales	Carmarthen Bay	Dolwen Point to Giltar Point	16.1
68	Amroth Beach	South Wales	Carmarthen Bay	Dolwen Point to Giltar Point	16.2
69	Wiseman's Bridge Beach	South Wales	Carmarthen Bay	Dolwen Point to Giltar Point	16.4
70	Saundersfoot Beach	South Wales	Carmarthen Bay	Dolwen Point to Giltar Point	16.6-16.7
71	Rhode Wood, Saundersfoot	South Wales	Carmarthen Bay	Dolwen Point to Giltar Point	16.8
72	Monkstone Beach	South Wales	Carmarthen Bay	Dolwen Point to Giltar Point	16.9
73	Waterwynch Bay	South Wales	Carmarthen Bay	Dolwen Point to Giltar Point	16.9
74	Second Bay, Tenby	South Wales	Carmarthen Bay	Dolwen Point to Giltar Point	16.9
75	First Bay, Tenby	South Wales	Carmarthen Bay	Dolwen Point to Giltar Point	16.9
76	Tenby South Beach	South Wales	Carmarthen Bay	Dolwen Point to Giltar Point	16.12
77	Drinkim Beach, Caldy Island	South Wales	Carmarthen Bay	Dolwen Point to Giltar Point	16.13
78	Sandtop Bay, Caldy Island	South Wales	Carmarthen Bay	Dolwen Point to Giltar Point	16.13
79	Lydstep Haven	South Wales	Pembrokeshire Coast	Giltar Point to St Govan's Head	17.2
80	Church Doors, Skrinkle Haven	South Wales	Pembrokeshire Coast	Giltar Point to St Govan's Head	17.3
81	Manorbier Bay	South Wales	Pembrokeshire Coast	Giltar Point to St Govan's Head	17.3

Table A3 (continued)

ID	Localities	SMP	Area	Zone	Unit
82	Swanlake Bay	South Wales	Pembrokeshire Coast	Giltar Point to St Govan's Head	17.3
83	Privar	South Wales	Pembrokeshire Coast	Giltar Point to St Govan's Head	17.3
84	Greenala Point to Stackpole Quay	South Wales	Pembrokeshire Coast	Giltar Point to St Govan's Head	17.5
85	Stackpole Quay	South Wales	Pembrokeshire Coast	Giltar Point to St Govan's Head	17.5
86	Mowingword	South Wales	Pembrokeshire Coast	Giltar Point to St Govan's Head	17.5
87	Bullslaughter Bay	South Wales	Pembrokeshire Coast	St Govan's Head to Thorn Island	18.1
88	Flimston Bay	South Wales	Pembrokeshire Coast	St Govan's Head to Thorn Island	18.1
89	Pen-y-holt Bay	South Wales	Pembrokeshire Coast	St Govan's Head to Thorn Island	18.1
90	Hobbyhorse Bay	South Wales	Pembrokeshire Coast	St Govan's Head to Thorn Island	18.1
91	Blucks Pool	South Wales	Pembrokeshire Coast	St Govan's Head to Thorn Island	18.2
92	Frainslake Sands	South Wales	Pembrokeshire Coast	St Govan's Head to Thorn Island	18.2
93	Little Furzenip	South Wales	Pembrokeshire Coast	St Govan's Head to Thorn Island	18.2
94	Freshwater West	South Wales	Pembrokeshire Coast	St Govan's Head to Thorn Island	18.2
95	Gravel Bay	South Wales	Pembrokeshire Coast	St Govan's Head to Thorn Island	18.3
96	West Pickard Bay	South Wales	Pembrokeshire Coast	St Govan's Head to Thorn Island	18.3
97	West Angle Bay	South Wales	Pembrokeshire Coast	St Govan's Head to Thorn Island	18.3
98	The Ridge, Angle Bay	South Wales	Pembrokeshire Coast	Thorn Island to Cleddau Bridge	19.2
99	Angle Bay East	South Wales	Pembrokeshire Coast	Thorn Island to Cleddau Bridge	19.2
100	Pembroke Dock	South Wales	Pembrokeshire Coast	Thorn Island to Cleddau Bridge	19.4
101	Cosheston Point to Mill Bay, Daugleddau	South Wales	Pembrokeshire Coast	Daugleddau - not covered by SMP	n/a
102	Burton Ferry	South Wales	Pembrokeshire Coast	Daugleddau - not covered by SMP	n/a
103	Neyland	South Wales	Pembrokeshire Coast	Cleddau Bridge to Little Castle Hd	20.2
104	Llanstadwell	South Wales	Pembrokeshire Coast	Cleddau Bridge to Little Castle Hd	20.2
105	Newton Noyes, Milford Haven	South Wales	Pembrokeshire Coast	Cleddau Bridge to Little Castle Hd	20.4
106	Gelliswick Bay, Milford Haven	South Wales	Pembrokeshire Coast	Cleddau Bridge to Little Castle Hd	20.6
107	Gelliswick Village, Milford Haven	South Wales	Pembrokeshire Coast	Cleddau Bridge to Little Castle Hd	20.7
108	Little Wick, Milford Haven	South Wales	Pembrokeshire Coast	Cleddau Bridge to Little Castle Hd	20.7
109	Kilroom	South Wales	Pembrokeshire Coast	Cleddau Bridge to Little Castle Hd	20.7
110	Sandy Haven	South Wales	Pembrokeshire Coast	Cleddau Bridge to Little Castle Hd	20.8
111	Sleeping Bay	South Wales	Pembrokeshire Coast	Cleddau Bridge to Little Castle Hd	20.8
112	Butts Bay	South Wales	Pembrokeshire Coast	Little Castle Hd to St Ann's Hd	20.8
113	Longoar Bay	South Wales	Pembrokeshire Coast	Little Castle Hd to St Ann's Hd	20.8
114	Lindsway Bay	South Wales	Pembrokeshire Coast	Little Castle Hd to St Ann's Hd	21.1
115	Wenall Bay	South Wales	Pembrokeshire Coast	Little Castle Hd to St Ann's Hd	21.1
116	Watch House Bay, Milford Haven	South Wales	Pembrokeshire Coast	Little Castle Hd to St Ann's Hd	21.1
117	Monk Haven	South Wales	Pembrokeshire Coast	Little Castle Hd to St Ann's Hd	21.1
118	Musselwick	South Wales	Pembrokeshire Coast	Little Castle Hd to St Ann's Hd	21.1
119	Pickleridge Beach	South Wales	Pembrokeshire Coast	Little Castle Hd to St Ann's Hd	21.2
120	Dale Beach	South Wales	Pembrokeshire Coast	Little Castle Hd to St Ann's Hd	21.3
121	Castlebeach Bay	South Wales	Pembrokeshire Coast	Little Castle Hd to St Ann's Hd	21.4
122	Watwick Bay	South Wales	Pembrokeshire Coast	Little Castle Hd to St Ann's Hd	21.4
123	Mill Bay	South Wales	Pembrokeshire Coast	Little Castle Hd to St Ann's Hd	21.4
124	Windmill Cove	West Wales	St Ann's Hd to Strumble Hd	Marloes and St Brides Peninsula	1.1
125	Westdale Bay	West Wales	St Ann's Hd to Strumble Hd	Marloes and St Brides Peninsula	1.1
126	Marloes Sands	West Wales	St Ann's Hd to Strumble Hd	Marloes and St Brides Peninsula	1.1
127	Albion Sands	West Wales	St Ann's Hd to Strumble Hd	Marloes and St Brides Peninsula	1.1
128	Watery Bay	West Wales	St Ann's Hd to Strumble Hd	Marloes and St Brides Peninsula	1.1
129	Victoria Bay	West Wales	St Ann's Hd to Strumble Hd	Marloes and St Brides Peninsula	1.1
130	Little Castle Bay	West Wales	St Ann's Hd to Strumble Hd	Marloes and St Brides Peninsula	1.1
131	Rainy Rock Bay	West Wales	St Ann's Hd to Strumble Hd	Marloes and St Brides Peninsula	1.1
132	Three Doors Bay	West Wales	St Ann's Hd to Strumble Hd	Marloes and St Brides Peninsula	1.1
133	Deadman's Bay	West Wales	St Ann's Hd to Strumble Hd	Marloes and St Brides Peninsula	1.1
134	Renney Slip	West Wales	St Ann's Hd to Strumble Hd	Marloes and St Brides Peninsula	1.1
135	Jeffry's Haven south	West Wales	St Ann's Hd to Strumble Hd	Marloes and St Brides Peninsula	1.1
136	Jeffry's Haven north	West Wales	St Ann's Hd to Strumble Hd	Marloes and St Brides Peninsula	1.1
137	Martin's Haven	West Wales	St Ann's Hd to Strumble Hd	Marloes and St Brides Peninsula	1.1
138	West hook Farm	West Wales	St Ann's Hd to Strumble Hd	Marloes and St Brides Peninsula	1.1
139	Mill Haven	West Wales	St Ann's Hd to Strumble Hd	Marloes and St Brides Peninsula	1.1
140	Brandy Bay	West Wales	St Ann's Hd to Strumble Hd	Marloes and St Brides Peninsula	1.1
141	Messelwick	West Wales	St Ann's Hd to Strumble Hd	St Bride's Bay	2.1
142	Rook's Bay	West Wales	St Ann's Hd to Strumble Hd	St Bride's Bay	2.1
143	Little Haven	West Wales	St Ann's Hd to Strumble Hd	St Bride's Bay	2.2
144	The Settlands	West Wales	St Ann's Hd to Strumble Hd	St Bride's Bay	2.3
145	Broad Haven	West Wales	St Ann's Hd to Strumble Hd	St Bride's Bay	2.4
146	Harold Stone south	West Wales	St Ann's Hd to Strumble Hd	St Bride's Bay	2.7
147	Harold Stone north	West Wales	St Ann's Hd to Strumble Hd	St Bride's Bay	2.7
148	Black Point south	West Wales	St Ann's Hd to Strumble Hd	St Bride's Bay	2.7
149	Settling Nose south	West Wales	St Ann's Hd to Strumble Hd	St Bride's Bay	2.7
150	Settling Nose north	West Wales	St Ann's Hd to Strumble Hd	St Bride's Bay	2.7
151	Druidston Haven	West Wales	St Ann's Hd to Strumble Hd	St Bride's Bay	2.7
152	North Haven	West Wales	St Ann's Hd to Strumble Hd	St Bride's Bay	2.7
153	Madoc's Haven	West Wales	St Ann's Hd to Strumble Hd	St Bride's Bay	2.7
154	Nolton Haven	West Wales	St Ann's Hd to Strumble Hd	St Bride's Bay	2.8
155	Newgale Sands: Maidenhall Pt-Bathesland	West Wales	St Ann's Hd to Strumble Hd	St Bride's Bay	2.10
156	Newgale Sands: Bathesland-Sibbernock	West Wales	St Ann's Hd to Strumble Hd	St Bride's Bay	2.10
157	Newgale Sands:Sibbernock-Newgale	West Wales	St Ann's Hd to Strumble Hd	St Bride's Bay	2.11
158	Porthmynawyd	West Wales	St Ann's Hd to Strumble Hd	St Bride's Bay	2.13
159	Aber Dwyrain	West Wales	St Ann's Hd to Strumble Hd	St David's to Strumble Head	3.1
160	Porth y Bŵch, Solva	West Wales	St Ann's Hd to Strumble Hd	St David's to Strumble Head	3.1
161	Gwadn, Solva	West Wales	St Ann's Hd to Strumble Hd	St David's to Strumble Head	3.1
162	Loch Warren	West Wales	St Ann's Hd to Strumble Hd	St David's to Strumble Head	3.1

Table A3 (continued)

ID	Localities	SMP	Area	Zone	Unit
163	Aber Llong	West Wales	St Ann's Hd to Strumble Hd	St David's to Strumble Head	3.1
164	Porth y Rhaw	West Wales	St Ann's Hd to Strumble Hd	St David's to Strumble Head	3.1
165	Caer Bwdy Bay	West Wales	St Ann's Hd to Strumble Hd	St David's to Strumble Head	3.1
166	Caerfai Bay	West Wales	St Ann's Hd to Strumble Hd	St David's to Strumble Head	3.1
167	Porthlysgi Bay	West Wales	St Ann's Hd to Strumble Hd	St David's to Strumble Head	3.1
168	Porth Lleuog, Ramsey Island	West Wales	St Ann's Hd to Strumble Hd	St David's to Strumble Head	3.7
169	Aber Mawr, Ramsey Island	West Wales	St Ann's Hd to Strumble Hd	St David's to Strumble Head	3.7
170	Whitesands Bay	West Wales	St Ann's Hd to Strumble Hd	St David's to Strumble Head	3.8
171	Porth Lleuog	West Wales	St Ann's Hd to Strumble Hd	St David's to Strumble Head	3.1
172	Porthmelgan	West Wales	St Ann's Hd to Strumble Hd	St David's to Strumble Head	3.1
173	Porth y Rhaw	West Wales	St Ann's Hd to Strumble Hd	St David's to Strumble Head	3.1
174	Abereiddi Bay	West Wales	St Ann's Hd to Strumble Hd	St David's to Strumble Head	3.9
175	Traeth Llyfn	West Wales	St Ann's Hd to Strumble Hd	St David's to Strumble Head	3.1
176	Porth Egr	West Wales	St Ann's Hd to Strumble Hd	St David's to Strumble Head	3.1
177	Aberfelin, Trefin	West Wales	St Ann's Hd to Strumble Hd	St David's to Strumble Head	3.1
178	Pwll Olfa	West Wales	St Ann's Hd to Strumble Hd	St David's to Strumble Head	3.1
179	Pwll Llong	West Wales	St Ann's Hd to Strumble Hd	St David's to Strumble Head	3.1
180	Pwll Whiting	West Wales	St Ann's Hd to Strumble Hd	St David's to Strumble Head	3.1
181	Ynys Deullyn	West Wales	St Ann's Hd to Strumble Hd	St David's to Strumble Head	3.1
182	Aber Castle	West Wales	St Ann's Hd to Strumble Hd	St David's to Strumble Head	3.11
183	Pwllstrodur	West Wales	St Ann's Hd to Strumble Hd	St David's to Strumble Head	3.1
184	Aber Mawr	West Wales	St Ann's Hd to Strumble Hd	St David's to Strumble Head	3.12
185	Aber Bach, St Nicholas	West Wales	St Ann's Hd to Strumble Hd	St David's to Strumble Head	3.1
186	Porth Dwgan	West Wales	St Ann's Hd to Strumble Hd	St David's to Strumble Head	3.1
187	Pwllcrochan	West Wales	St Ann's Hd to Strumble Hd	St David's to Strumble Head	3.1
188	Pwlldawnau	West Wales	St Ann's Hd to Strumble Hd	St David's to Strumble Head	3.1
189	Pwll Deri	West Wales	St Ann's Hd to Strumble Hd	St David's to Strumble Head	3.1
190	Porth Maenmelyn	West Wales	St Ann's Hd to Strumble Hd	St David's to Strumble Head	3.1
191	Pwlluog	West Wales	St Ann's Hd to Strumble Hd	St David's to Strumble Head	3.1
192	Porthsychan	West Wales	St Ann's Hd to Strumble Hd	St David's to Strumble Head	3.1
193	Aber Felin	West Wales	St Ann's Hd to Strumble Hd	St David's to Strumble Head	3.1
194	Porth Maen	West Wales	St Ann's Hd to Strumble Hd	St David's to Strumble Head	3.1
195	Pwll Hir	West Wales	Strumble Hd to New Quay Hd	Fishguard Bay and Newport Bay	4.1
196	Goodwick Sands North	West Wales	Strumble Hd to New Quay Hd	Fishguard Bay and Newport Bay	4.2
197	Goodwick Sands South	West Wales	Strumble Hd to New Quay Hd	Fishguard Bay and Newport Bay	4.3
198	Lampit Mawr	West Wales	Strumble Hd to New Quay Hd	Fishguard Bay and Newport Bay	4.4
199	Aber Gwaun	West Wales	Strumble Hd to New Quay Hd	Fishguard Bay and Newport Bay	4.7
200	Pwll Landdu	West Wales	Strumble Hd to New Quay Hd	Fishguard Bay and Newport Bay	4.9
201	Pwell Edyn	West Wales	Strumble Hd to New Quay Hd	Fishguard Bay and Newport Bay	4.9
202	Pwll Ceunant	West Wales	Strumble Hd to New Quay Hd	Fishguard Bay and Newport Bay	4.9
203	Aber Richard	West Wales	Strumble Hd to New Quay Hd	Fishguard Bay and Newport Bay	4.9
204	Pwll y Blewyn	West Wales	Strumble Hd to New Quay Hd	Fishguard Bay and Newport Bay	4.9
205	Aber Grugog	West Wales	Strumble Hd to New Quay Hd	Fishguard Bay and Newport Bay	4.9
206	Aber Hywel	West Wales	Strumble Hd to New Quay Hd	Fishguard Bay and Newport Bay	4.9
207	Carreg Pen-las	West Wales	Strumble Hd to New Quay Hd	Fishguard Bay and Newport Bay	4.9
208	Aber Bach, Fishguard	West Wales	Strumble Hd to New Quay Hd	Fishguard Bay and Newport Bay	4.9
209	Pwll Gwylog	West Wales	Strumble Hd to New Quay Hd	Fishguard Bay and Newport Bay	4.9
210	Cwm-yr-Eglwys, Afon Teifi	West Wales	Strumble Hd to New Quay Hd	Fishguard Bay and Newport Bay	4.12
211	Aber Fforest	West Wales	Strumble Hd to New Quay Hd	Fishguard Bay and Newport Bay	4.13
212	Aber Rhigian	West Wales	Strumble Hd to New Quay Hd	Fishguard Bay and Newport Bay	4.13
213	Traeth Cell-Howel	West Wales	Strumble Hd to New Quay Hd	The Teifi	5.1
214	Ceibwr Bay	West Wales	Strumble Hd to New Quay Hd	The Teifi	5.1
215	Traeth y Rhedyn	West Wales	Strumble Hd to New Quay Hd	The Teifi	5.1
216	Traeth Godir-coch	West Wales	Strumble Hd to New Quay Hd	The Teifi	5.1
217	Careg Aderyn	West Wales	Strumble Hd to New Quay Hd	The Teifi	5.2
218	Pwll Edrych	West Wales	Strumble Hd to New Quay Hd	The Teifi	5.2
219	Pwll Melyn	West Wales	Strumble Hd to New Quay Hd	The Teifi	5.2
220	Pen yr Ergyd	West Wales	Strumble Hd to New Quay Hd	The Teifi	5.3
221	Llangrannog	West Wales	Strumble Hd to New Quay Hd	South Ceredigion	6.6
222	Traeth y Gaerglwyd	West Wales	Strumble Hd to New Quay Hd	South Ceredigion	6.7
223	Cwmtydu	West Wales	Strumble Hd to New Quay Hd	South Ceredigion	6.8
224	Castell Bach	West Wales	Strumble Hd to New Quay Hd	South Ceredigion	6.7
225	Traeth y Coubal	West Wales	Strumble Hd to New Quay Hd	South Ceredigion	6.7
226	Llech Cimwch	West Wales	Strumble Hd to New Quay Hd	South Ceredigion	6.7
227	Traeth y Quarry	West Wales	Strumble Hd to New Quay Hd	South Ceredigion	6.7
228	New Quay Bay	West Wales	New Quay Hd to Sarn Gynfelyn	New Quay Bay and Little Quay Bay	7.3
229	Little Quay Bay	West Wales	New Quay Hd to Sarn Gynfelyn	New Quay Bay and Little Quay Bay	7.5-7.6
230	Gilfach-yr-Halen to Clogfryn	West Wales	New Quay Hd to Sarn Gynfelyn	Aberaeron Plateau	8.1
231	Aberaeron south	West Wales	New Quay Hd to Sarn Gynfelyn	Aberaeron Plateau	8.2
232	Aberaeron north	West Wales	New Quay Hd to Sarn Gynfelyn	Aberaeron Plateau	8.4
233	Aberaeron to Aberarth	West Wales	New Quay Hd to Sarn Gynfelyn	Aberaeron Plateau	8.5
234	Aberarth	West Wales	New Quay Hd to Sarn Gynfelyn	Aberaeron Plateau	8.6
235	Aberarth to Morfa Mawr	West Wales	New Quay Hd to Sarn Gynfelyn	Aberaeron Plateau	8.7
236	Morfa Mawr	West Wales	New Quay Hd to Sarn Gynfelyn	Aberaeron Plateau	8.7
237	Morfa Mawr to Llanonn	West Wales	New Quay Hd to Sarn Gynfelyn	Aberaeron Plateau	8.7
238	Llannon	West Wales	New Quay Hd to Sarn Gynfelyn	Aberaeron Plateau	8.8
239	Llannon to Llansantffraid	West Wales	New Quay Hd to Sarn Gynfelyn	Aberaeron Plateau	8.8
240	Llansantffraid	West Wales	New Quay Hd to Sarn Gynfelyn	Aberaeron Plateau	8.8
241	Llansantffraid to Llanrhystud	West Wales	New Quay Hd to Sarn Gynfelyn	Aberaeron Plateau	8.8
242	Llanrhystud	West Wales	New Quay Hd to Sarn Gynfelyn	Aberaeron Plateau	8.9
243	Llanrhystud to Carreg Ti-pw	West Wales	New Quay Hd to Sarn Gynfelyn	Aberaeron Plateau	8.10

Table A3 (continued)

ID	Localities	SMP	Area	Zone	Unit
244	Carreg Ti-pw to Pinderi Cliffs	West Wales	New Quay Hd to Sarn Gynfelyn	Aberystwyth	9.1
245	Twll Twrw to Traeth Tanybwlch	West Wales	New Quay Hd to Sarn Gynfelyn	Aberystwyth	9.1
246	Traeth Tanybwlch, Aberystwyth	West Wales	New Quay Hd to Sarn Gynfelyn	Aberystwyth	9.2
247	South Beach, Aberystwyth	West Wales	New Quay Hd to Sarn Gynfelyn	Aberystwyth	9.7
248	North Beach, Aberystwyth	West Wales	New Quay Hd to Sarn Gynfelyn	Aberystwyth	9.9
249	Constitution Hill	West Wales	New Quay Hd to Sarn Gynfelyn	Aberystwyth	9.10
250	Clarach Bay	West Wales	New Quay Hd to Sarn Gynfelyn	Aberystwyth	9.11
251	Wallog Beach	West Wales	New Quay Hd to Sarn Gynfelyn	Aberystwyth	9.13
252	Pen-y-graig	West Wales	Sarn Gynfelyn to Trwyn Cilan	Dyfi	10.1
253	Borth Sands	West Wales	Sarn Gynfelyn to Trwyn Cilan	Dyfi	10.2-10.4
254	Aberdovey to Tywyn	West Wales	Sarn Gynfelyn to Trwyn Cilan	Dyfi	10.15
255	Tywyn	West Wales	Sarn Gynfelyn to Trwyn Cilan	Dyfi	10.16
256	Tywyn to Aber Dysynni	West Wales	Sarn Gynfelyn to Trwyn Cilan	Dyfi	10.17
257	Tonfanau to Gallt Ffynnon yr Hydd	West Wales	Sarn Gynfelyn to Trwyn Cilan	Barmouth and the Mawddach	10.19
258	Ro Wen, Fairbourne	West Wales	Sarn Gynfelyn to Trwyn Cilan	Barmouth and the Mawddach	11.4-11.6
259	Afon Mawddach, Barmouth	West Wales	Sarn Gynfelyn to Trwyn Cilan	Barmouth and the Mawddach	11.14
260	Ynys y Brawd, Barmouth	West Wales	Sarn Gynfelyn to Trwyn Cilan	Barmouth and the Mawddach	11.14
261	Barmouth Promenade	West Wales	Sarn Gynfelyn to Trwyn Cilan	Barmouth and the Mawddach	11.14
262	Barmouth to Llanaber	West Wales	Sarn Gynfelyn to Trwyn Cilan	Barmouth and the Mawddach	11.15-11.16
263	Ceunant Egryn, Llanaber	West Wales	Sarn Gynfelyn to Trwyn Cilan	Barmouth and the Mawddach	11.17
264	Afon Ysgethin, Tal-y-bont	West Wales	Sarn Gynfelyn to Trwyn Cilan	Barmouth and the Mawddach	11.19
265	Shell Island	West Wales	Sarn Gynfelyn to Trwyn Cilan	Coastal Snowdonia	12.1
266	Shell Island Spit	West Wales	Sarn Gynfelyn to Trwyn Cilan	Coastal Snowdonia	12.2
267	Llandanwg Spit	West Wales	Sarn Gynfelyn to Trwyn Cilan	Coastal Snowdonia	12.5
268	Llandanwg to Harlech	West Wales	Sarn Gynfelyn to Trwyn Cilan	Coastal Snowdonia	12.6
269	Graig Ddu to Criccieth	West Wales	Sarn Gynfelyn to Trwyn Cilan	Coastal Snowdonia	12.17
270	Criccieth	West Wales	Sarn Gynfelyn to Trwyn Cilan	Coastal Snowdonia	12.18-12.21
271	Afon Dwyfor	West Wales	Sarn Gynfelyn to Trwyn Cilan	Coastal Snowdonia	12.22
272	Glannllynnau	West Wales	Sarn Gynfelyn to Trwyn Cilan	Coastal Snowdonia	12.23
273	Afon Wen	West Wales	Sarn Gynfelyn to Trwyn Cilan	Coastal Snowdonia	12.24
274	Hafan y Mor	West Wales	Sarn Gynfelyn to Trwyn Cilan	Coastal Snowdonia	12.25
275	Pen-ychain to Pwllheli	West Wales	Sarn Gynfelyn to Trwyn Cilan	The South Llyn Bays	13.1-13.3
276	Carreg yr Imbill	West Wales	Sarn Gynfelyn to Trwyn Cilan	The South Llyn Bays	13.4
277	Traeth Crugan	West Wales	Sarn Gynfelyn to Trwyn Cilan	The South Llyn Bays	13.7-13.8
278	Llanbedrog Beach	West Wales	Sarn Gynfelyn to Trwyn Cilan	The South Llyn Bays	13.9
279	Porth Ceiriad	West Wales	Sarn Gynfelyn to Trwyn Cilan	The South Llyn Bays	13.18
280	Porth Neigwl	West Wales	Trwyn Cilan to Carreg Ddu	Trwyn Cilan to Carreg Ddu	14.2-14.4
281	Porth Ysgo	West Wales	Trwyn Cilan to Carreg Ddu	Trwyn Cilan to Carreg Ddu	14.6
282	Aberdaron Bay	West Wales	Trwyn Cilan to Carreg Ddu	Trwyn Cilan to Carreg Ddu	14.7-14.8
283	Porth Meudwy	West Wales	Trwyn Cilan to Carreg Ddu	Trwyn Cilan to Carreg Ddu	14.11
284	Porth Ferin	West Wales	Trwyn Cilan to Carreg Ddu	Trwyn Cilan to Carreg Ddu	14.11
285	Porth Ty-mawr	West Wales	Trwyn Cilan to Carreg Ddu	Trwyn Cilan to Carreg Ddu	14.11
286	Traeth Penllech	West Wales	Trwyn Cilan to Carreg Ddu	Trwyn Cilan to Carreg Ddu	14.11
287	Bryn Gwydd south	West Wales	Trwyn Cilan to Carreg Ddu	Trwyn Cilan to Carreg Ddu	14.11
288	Bryn Gwydd north	West Wales	Trwyn Cilan to Carreg Ddu	Trwyn Cilan to Carreg Ddu	14.11
289	Aber Geirch	West Wales	Trwyn Cilan to Carreg Ddu	Trwyn Cilan to Carreg Ddu	14.11
290	Borth Wen	West Wales	Trwyn Cilan to Carreg Ddu	Trwyn Cilan to Carreg Ddu	14.11
291	Porth Dinllaen	West Wales	Menai Strait and Conwy	North Llyn	15.1-15.2
292	Porth Nefyn	West Wales	Menai Strait and Conwy	North Llyn	15.3
293	Porth Pistyll	West Wales	Menai Strait and Conwy	North Llyn	15.1
294	Porth y Nant	West Wales	Menai Strait and Conwy	North Llyn	15.1
295	Yr Eifl Beach, Trefor	West Wales	Menai Strait and Conwy	North Llyn	15.1
296	Trefor to Aberdesach	West Wales	Menai Strait and Conwy	North Llyn	15.4
297	Aberdesach	West Wales	Menai Strait and Conwy	North Llyn	15.6
298	Aberdesach to Trwyn Maen Dylan	West Wales	Menai Strait and Conwy	North Llyn	15.4
299	Trwyn Maen Dylan	West Wales	Menai Strait and Conwy	Menai Strait	16.1
300	Trwyn Maen Dylan to Pontllyfni	West Wales	Menai Strait and Conwy	Menai Strait	16.1
301	Pontllyfni to Ynys	West Wales	Menai Strait and Conwy	Menai Strait	16.1
302	Ynys to Dinas Dinlle	West Wales	Menai Strait and Conwy	Menai Strait	16.2
303	Dinas Dinlle Fort	West Wales	Menai Strait and Conwy	Menai Strait	16.2
304	Morfa Dinlle	West Wales	Menai Strait and Conwy	Menai Strait	16.3-16.4
305	Afon Gwyrfai to Caernarfon	West Wales	Menai Strait and Conwy	Menai Strait	16.11
306	Caernarfon to Plas Menai	West Wales	Menai Strait and Conwy	Menai Strait	16.12-16.13
307	Y Felinheli	West Wales	Menai Strait and Conwy	Menai Strait	16.14
308	Y Felinheli to Pont Britannia	West Wales	Menai Strait and Conwy	Menai Strait	16.15
309	Pont Britannia to Pwll-fanogl	West Wales	Menai Strait and Conwy	Menai Strait	16.16
310	Moel-y-don to Afon Braint, Anglesey	West Wales	Menai Strait and Conwy	Menai Strait	16.17
311	Abermenai	West Wales	Menai Strait and Conwy	Menai Strait	16.7
312	Traeth Llanddwyn	West Wales	Menai Strait and Conwy	Menai Strait	16.7
313	Tywyn Fferam, Anglesey	West Wales	Ynys Mon	Holy Island and West Anglesey	17.5
314	Traeth Llydan, Holy Island	West Wales	Ynys Mon	Holy Island and West Anglesey	17.9
315	Borthwen, Holy Island	West Wales	Ynys Mon	Holy Island and West Anglesey	17.10
316	Porthygaran, Holy Island	West Wales	Ynys Mon	Holy Island and West Anglesey	17.9
317	Lee Caravan Park, Holy Island	West Wales	Ynys Mon	Holy Island and West Anglesey	17.9
318	Porth Diana, Holy Island	West Wales	Ynys Mon	Holy Island and West Anglesey	17.11
319	Trearddur Bay, Holy Island	West Wales	Ynys Mon	Holy Island and West Anglesey	17.12
320	Porth Isallt-bach, Holy Island	West Wales	Ynys Mon	Holy Island and West Anglesey	17.9
321	Porth yr Afon, Holy Island	West Wales	Ynys Mon	Holy Island and West Anglesey	17.9
322	Porth yr Afon to Porth t Pwll, Holy Is.	West Wales	Ynys Mon	Holy Island and West Anglesey	17.9
323	Porth y Pwll, Holy Island	West Wales	Ynys Mon	Holy Island and West Anglesey	17.9
324	Porth-y-post, Holy Island	West Wales	Ynys Mon	Holy Island and West Anglesey	17.9

Table A3 (continued)

ID	Localities	SMP	Area	Zone	Unit
325	Porth y Corwgl, Holy Island	West Wales	Ynys Mon	Holy Island and West Anglesey	17.9
326	Abraham's Bosom, Holy Island	West Wales	Ynys Mon	Holy Island and West Anglesey	17.14
327	Soldiers Point, Holy Island	West Wales	Ynys Mon	Holy Island and West Anglesey	17.14
328	Peibio	West Wales	Ynys Mon	Holy Island and West Anglesey	17.16
329	Traeth Penrhos, Holy Island	West Wales	Ynys Mon	Holy Island and West Anglesey	17.16
330	Penrhos to Gorsedd-y-penrhyn	West Wales	Ynys Mon	Holy Island and West Anglesey	17.17
331	Gorsedd-y-penrhyn to Stanley Embkt.	West Wales	Ynys Mon	Holy Island and West Anglesey	17.17
332	Ynys Leurad, Anglesey	West Wales	Ynys Mon	Holy Island and West Anglesey	17.20
333	Valley, Anglesey	West Wales	Ynys Mon	Holy Island and West Anglesey	17.21
334	Traeth y Gribin, Anglesey	West Wales	Ynys Mon	Holy Island and West Anglesey	17.22-17.23
335	Porth Penrhyn-mawr, Anglesey	West Wales	Ynys Mon	Holy Island and West Anglesey	17.23
336	Porth Delysg, Anglesey	West Wales	Ynys Mon	North Anglesey	18.1
337	Twyn Cliperau, Anglesey	West Wales	Ynys Mon	North Anglesey	18.1
338	Porth Tywyn-mawr, Anglesey	West Wales	Ynys Mon	North Anglesey	18.2
339	Porth Defaid, Anglesey	West Wales	Ynys Mon	North Anglesey	18.1
340	Porth Trefadog, Anglesey	West Wales	Ynys Mon	North Anglesey	18.3
341	Porth Ffynnon to Porth Swtan	West Wales	Ynys Mon	North Anglesey	18.4-18.5
342	Traeth Ynys y Fydlyn, Anglesey	West Wales	Ynys Mon	North Anglesey	18.1
343	Porth Newydd to Porth Tywodog	West Wales	Ynys Mon	North Anglesey	18.1
344	Hen Borth, Anglesey	West Wales	Ynys Mon	North Anglesey	18.1
345	Hen Borth to Trwyn Cemlyn	West Wales	Ynys Mon	North Anglesey	18.1
346	Cemlyn Bay, Anglesey	West Wales	Ynys Mon	North Anglesey	18.6
347	Porth-y-pistyll, Anglesey	West Wales	Ynys Mon	North Anglesey	18.1
348	Porth y Wylfa, Anglesey	West Wales	Ynys Mon	North Anglesey	18.8
349	Porth Llanlleiana, Anglesey	West Wales	Ynys Mon	North Anglesey	18.13
350	Porth Wen, Anglesey	West Wales	Ynys Mon	North Anglesey	18.14-18.13
351	Porth-Llechog, Anglesey	West Wales	Ynys Mon	North Anglesey	18.15
352	Porth Eilian, Anglesey	West Wales	Ynys Mon	North Anglesey	18.18
353	Porthygwidhiaid, Anglesey	West Wales	Ynys Mon	North Anglesey	18.13
354	Porth Helygen to Porth Garreg-fawr	West Wales	Ynys Mon	North Anglesey	19.1
355	Dulas Bay, Anglesey	West Wales	Ynys Mon	East Bays	19.3
356	Traeth yr Ora	West Wales	Ynys Mon	East Bays	19.1
357	Porth y Mor, Anglesey	West Wales	Ynys Mon	East Bays	19.1
358	Traeth Lligwy, Anglesey	West Wales	Ynys Mon	East Bays	19.1
359	Porth Forllwyd, Anglesey	West Wales	Ynys Mon	East Bays	19.1
360	Porth Helaeth, Anglesey	West Wales	Ynys Mon	East Bays	19.1
361	Porth yr Ynys, Anglesey	West Wales	Ynys Mon	East Bays	19.1
362	Porth Moelfre, Anglesey	West Wales	Ynys Mon	East Bays	19.5
363	Porth yr Aber, Anglesey	West Wales	Ynys Mon	East Bays	19.6
364	Porth y Rhos, Anglesey	West Wales	Ynys Mon	East Bays	19.6
365	Traeth Bychan, Anglesey	West Wales	Ynys Mon	East Bays	19.7
366	Borth Wen, Anglesey	West Wales	Ynys Mon	East Bays	19.9
367	Benllech Sand, Anglesey	West Wales	Ynys Mon	East Bays	19.11
368	Porthllongdy Spit	West Wales	Ynys Mon	East Bays	19.13
369	Traeth-coch, Anglesey	West Wales	Ynys Mon	East Bays	19.15
370	Tan Dinas Quarry, Anglesey	West Wales	Ynys Mon	East Bays	19.16
371	Fedw Fawr West, Anglesey	West Wales	Ynys Mon	East Bays	19.16
372	Fedw Fawr East, Anglesey	West Wales	Ynys Mon	East Bays	19.16
373	Trwyn Dinmor to Trwyn Du	West Wales	Ynys Mon	East Bays	19.16
374	Trwyn Du to Beaumaris, Anglesey	West Wales	Menai Strait and Conwy	Menai Strait	16.25-16.21
375	Gallows Point, Beaumaris, Anglesey	West Wales	Menai Strait and Conwy	Menai Strait	16.20
376	Penrhyn Park	West Wales	Menai Strait and Conwy	Menai Strait	16.30
377	The Spinnies, Aber-Ogwen	West Wales	Menai Strait and Conwy	Menai Strait	16.31
378	Aber-Ogwen to Coed Gyfynys	West Wales	Menai Strait and Conwy	Menai Strait	16.31
379	Coed Gyfynys to Wig Bach	West Wales	Menai Strait and Conwy	Menai Strait	16.31
380	Wig Bach to Afon Aber	West Wales	Menai Strait and Conwy	Menai Strait	16.31
381	Afon Aber	West Wales	Menai Strait and Conwy	Menai Strait	16.32
382	Afon Aber to Glan y mor Elias	West Wales	Menai Strait and Conwy	Menai Strait	16.32
383	Llanfairfechan Spit	West Wales	Menai Strait and Conwy	Menai Strait	16.32
384	Llanfairfechan Town	West Wales	Menai Strait and Conwy	Menai Strait	16.33
385	Penmaenmawr to Penmaen-bach	West Wales	Menai Strait and Conwy	Conwy	20.2
386	Conwy Morfa	West Wales	Menai Strait and Conwy	Conwy	20.3
387	Deganwy	West Wales	Menai Strait and Conwy	Conwy	20.9-20.10
388	Llandudno West Shore	West Wales	Menai Strait and Conwy	Conwy	20.11
389	Great Orme West Shore	West Wales	Menai Strait and Conwy	Conwy	20.12-20.13
390	Llandudno Bay	West Wales	Great Orme's Hd to Southport	Great Orme to Little Orme	1.1
391	Penrhyn Bay	West Wales	Great Orme's Hd to Southport	Little Orme to Clwyd Estuary	2.1
392	Rhos on Sea	West Wales	Great Orme's Hd to Southport	Little Orme to Clwyd Estuary	2.2
393	Colwyn Bay	West Wales	Great Orme's Hd to Southport	Little Orme to Clwyd Estuary	2.2
394	Penmaen Rhos	West Wales	Great Orme's Hd to Southport	Little Orme to Clwyd Estuary	2.2
395	Llanddulas	West Wales	Great Orme's Hd to Southport	Little Orme to Clwyd Estuary	2.3
396	Pensarn	West Wales	Great Orme's Hd to Southport	Little Orme to Clwyd Estuary	2.3
397	Belgrano to Kinmel Bay	West Wales	Great Orme's Hd to Southport	Little Orme to Clwyd Estuary	2.3
398	Horton's Nose, Kinmel Bay	West Wales	Great Orme's Hd to Southport	Little Orme to Clwyd Estuary	3.1
399	Rhyl	West Wales	Great Orme's Hd to Southport	Clwyd Estuary to Point of Ayr	4.1
400	Barkby Beach to Gronant	West Wales	Great Orme's Hd to Southport	Clwyd Estuary to Point of Ayr	4.4
401	Gronant to Talacre	West Wales	Great Orme's Hd to Southport	Clwyd Estuary to Point of Ayr	4.4
402	Point of Ayr	West Wales	Great Orme's Hd to Southport	Clwyd Estuary to Point of Ayr	4.4
403	Ffynnongroyw to Greenfield	West Wales	Great Orme's Hd to Southport	Dee Estuary	5.1-5.2

Table A4 Shoreline Management Plan policies and coastal defences

ID	Localities	SMP Policies in three epochs			Existing defences
		0-20 years	20-50 years	50-100 years	
1	Sudbrook Point	HTL	HTL	HTL	
2	West Pill, Rogiet	HTL	HTL	HTL	Embankment
3	Portland Grounds (Redwick to Goldcliff)	HTL	HTL	HTL	Embankment
4	Goldcliff Pill	NAI	NAI	NAI	Embankment
5	Newgout Pill, Wentlooge	HTL	HTL	HTL	Embankment
6	West Usk Lighthouse, Wentlooge	HTL	HTL	HTL	Embankment
7	Outfall Lane, Wentlooge	HTL	HTL	HTL	Rock armour, embankment
8	Cardiff Flats	HTL	HTL	HTL	Rock armour, sea wall
9	Penarth to Lavernock Point	HTL-NAI	HTL-NAI	HTL-NAI	Sea wall, rock armour, groynes
10	Lavernock Point to Swanbridge	NAI	NAI	NAI	
11	Barry Harbour	HTL	HTL	HTL	Rock armour, sea wall
12	Watch House Bay, Barry	HTL	HTL	HTL	Sea wall
13	Pebble Beach, Barry	HTL	MR	MR	Sea wall
14	Porthkerry	NAI	NAI	NAI	Concrete outfall on beach
15	Bulwarks Fort to Rhoose Point	NAI	NAI	NAI	
16	Watch House Beach, East Aberthaw	HTL	HTL	HTL	Sea wall, groynes
17	Leys Beach, East Aberthaw	HTL	HTL	HTL	Sea wall, groynes
18	West Aberthaw	NAI	NAI	NAI	WWII Anti Tank blocks, outfall
19	Aberthaw to St Donats	NAI-HTL-NAI	NAI-HTL-NAI	NAI-MR-NAI	Sea wall, rock armour
20	Nash Point to Cwm Nash	NAI	NAI	NAI	
21	Traeth Mawr, Broughton	NAI	NAI	NAI	
22	Traeth Bach, Broughton	NAI	NAI	NAI	
23	Dunraven Bay	NAI	NAI	NAI	Sea wall
24	Ogmore-by-Sea	NAI	NAI	NAI	
25	Pwll y Defaid, Merthyr-mawr Warren	MR	MR	MR	
26	Black Rocks, Porthcawl	MR	MR	MR	
27	Trecco Bay, Porthcawl	HTL	HTL	HTL	Sea wall
28	Seafront Beach, Porthcawl	HTL	HTL	HTL	Sea wall
29	West Beach, Porthcawl	HTL	HTL	HTL	Sea wall
30	Rest Bay, Porthcawl	NAI	NAI	NAI	
31	Kenfig Sands	MR	MR	MR	
32	Afon Cynffig	MR	MR	MR	
33	Margam Sands	HTL	HTL	HTL	Rock armour
34	Port Talbot Harbour	HTL	HTL	HTL	Rock armour, breakwaters
35	Baglan Burrows	MR	MR	MR	Rock armour
36	Mumbles	HTL	HTL	HTL	Sea wall
37	Bracelet Bay, Gower	NAI	NAI	NAI	Sea wall
38	Limeslade Bay, Gower	NAI	NAI	NAI	Sea wall
39	Langland Bay, Gower	HTL	HTL	HTL	Sea wall
40	Caswell Bay	HTL	HTL	HTL	Sea wall, rock armour
41	Brandy Cove	NAI	NAI	NAI	
42	Pwlldu Bay	NAI	NAI	NAI	
43	Pobbles Beach	NAI	NAI	NAI	
44	Pennard Burrows	MR	MR	MR	
45	Oxwich Bay	MR	MR	MR	
46	Holy's Wash	NAI	NAI	NAI	
47	Port-Eynon Bay	MR	MR	MR	
48	Port-Eynon Point	NAI	NAI	NAI	
49	Overton Mere	NAI	NAI	NAI	
50	Common Cliff	NAI	NAI	NAI	
51	Ram Grove	NAI	NAI	NAI	
52	Kitchen Corner south	NAI	NAI	NAI	
53	Kitchen Corner north	NAI	NAI	NAI	
54	Rhossili Bay	NAI-MR	NAI-MR	NAI-MR	
55	Whiteford Point	MR	MR	MR	
56	Machynys, Loughor Estuary	HTL	HTL	HTL	Sea wall, rock armour, groynes
57	Llanelli Harbour Mouth	HTL	HTL	HTL	Sea wall, rock armour, groynes
58	Tywyn Bach, Burry Port	HTL	HTL	HTL	Rock armour, embankment
59	Millenium Coastal Park, Burry Port	HTL	HTL	HTL	Rock armour, rubble
60	Burry Port Harbour Mouth	HTL	MR	MR	
61	St Ishmael's Scar	HTL	HTL	HTL	Sea wall
62	The Graig, Ferryside	HTL	HTL	HTL	Embankment, rock armour
63	Ferryside	HTL	HTL	HTL	Rock armour, seawall
64	Ginst Point	MR	MR	MR	
65	Pendine	HTL	MR	MR	Sea wall, rock armour
66	Morfa Bychan, Pendine	NAI	NAI	NAI	
67	Marros Sands	NAI	NAI	NAI	
68	Amroth Beach	HTL	HTL	NAI	Sea wall, groynes, rock armour
69	Wiseman's Bridge Beach	HTL	NAI	NAI	Sea wall, rock armour
70	Saundersfoot Beach	NAI-HTL	NAI-HTL	NAI-MR	Sea wall
71	Rhode Wood, Saundersfoot	NAI	NAI	NAI	
72	Monkstone Beach	NAI	NAI	NAI	
73	Waterwynch Bay	NAI	NAI	NAI	
74	Second Bay, Tenby	NAI	NAI	NAI	
75	First Bay, Tenby	NAI	NAI	NAI	
76	Tenby South Beach	MR	MR	MR	
77	Drinkim Beach, Caldy Island	NAI	NAI	NAI	
78	Sandtop Bay, Caldy Island	NAI	NAI	NAI	
79	Lydstep Haven	HTL	NAI	NAI	Rock armour
80	Church Doors, Skrinkle Haven	NAI	NAI	NAI	
81	Manorbier Bay	NAI	NAI	NAI	

Table A4 (continued)

ID	Localities	SMP Policies in three epochs			Existing defences
		0-20 years	20-50 years	50-100 years	
82	Swanlake Bay	NAI	NAI	NAI	
83	Privar	NAI	NAI	NAI	
84	Greenala Point to Stackpole Quay	NAI	NAI	NAI	
85	Stackpole Quay	NAI	NAI	NAI	
86	Mowingword	NAI	NAI	NAI	
87	Bullslaughter Bay	NAI	NAI	NAI	
88	Flimston Bay	NAI	NAI	NAI	
89	Pen-y-holt Bay	NAI	NAI	NAI	
90	Hobbyhorse Bay	NAI	NAI	NAI	
91	Blucks Pool	MR	MR	MR	
92	Frainslake Sands	MR	MR	MR	
93	Little Furzenip	MR	MR	MR	
94	Freshwater West	MR	MR	MR	
95	Gravel Bay	NAI	NAI	NAI	
96	West Pickard Bay	NAI	NAI	NAI	
97	West Angle Bay	NAI	NAI	NAI	
98	The Ridge, Angle Bay	NAI	NAI	NAI	
99	Angle Bay East	NAI	NAI	NAI	
100	Pembroke Dock	NAI	NAI	NAI	
101	Cosheston Point to Mill Bay, Daugleddau	n/a	n/a	n/a	
102	Burton Ferry	n/a	n/a	n/a	
103	Neyland	HTL	HTL	HTL	Sea wall
104	Llanstadwell	HTL	HTL	HTL	Sea wall
105	Newton Noyes, Milford Haven	HTL	HTL	HTL	Sea wall
106	Gelliswick Bay, Milford Haven	HTL	NAI	NAI	Sea wall
107	Gelliswick Village, Milford Haven	NAI	NAI	NAI	
108	Little Wick, Milford Haven	NAI	NAI	NAI	
109	Kilroom	NAI	NAI	NAI	
110	Sandy Haven	NAI	NAI	NAI	
111	Sleeping Bay	NAI	NAI	NAI	
112	Butts Bay	NAI	NAI	NAI	
113	Longoar Bay	NAI	NAI	NAI	
114	Lindsway Bay	NAI	NAI	NAI	
115	Wenall Bay	NAI	NAI	NAI	
116	Watch House Bay, Milford Haven	NAI	NAI	NAI	
117	Monk Haven	NAI	NAI	NAI	
118	Musselwick	NAI	NAI	NAI	
119	Pickleridge Beach	MR	MR	MR	Rock armour
120	Dale Beach	HTL	HTL	MR	Sea wall
121	Castlebeach Bay	NAI	NAI	NAI	
122	Watwick Bay	NAI	NAI	NAI	
123	Mill Bay	NAI	NAI	NAI	
124	Windmill Cove	NAI	NAI	NAI	
125	Westdale Bay	NAI	NAI	NAI	
126	Marloes Sands	NAI	NAI	NAI	
127	Albion Sands	NAI	NAI	NAI	
128	Watery Bay	NAI	NAI	NAI	
129	Victoria Bay	NAI	NAI	NAI	
130	Little Castle Bay	NAI	NAI	NAI	
131	Rainy Rock Bay	NAI	NAI	NAI	
132	Three Doors Bay	NAI	NAI	NAI	
133	Deadman's Bay	NAI	NAI	NAI	
134	Renney Slip	NAI	NAI	NAI	
135	Jeffry's Haven south	NAI	NAI	NAI	
136	Jeffry's Haven north	NAI	NAI	NAI	
137	Martin's Haven	NAI	NAI	NAI	
138	West hook Farm	NAI	NAI	NAI	
139	Mill Haven	NAI	NAI	NAI	
140	Brandy Bay	NAI	NAI	NAI	
141	Messelwick	NAI	NAI	NAI	
142	Rook's Bay	NAI	NAI	NAI	
143	Little Haven	HTL	HTL	MR	Sea wall
144	The Settlands	NAI	NAI	NAI	
145	Broad Haven	HTL	HTL	MR	Sea wall
146	Harold Stone south	NAI	NAI	NAI	
147	Harold Stone north	NAI	NAI	NAI	
148	Black Point south	NAI	NAI	NAI	
149	Settling Nose south	NAI	NAI	NAI	
150	Settling Nose north	NAI	NAI	NAI	
151	Druidston Haven	NAI	NAI	NAI	
152	North Haven	NAI	NAI	NAI	
153	Madoc's Haven	NAI	NAI	NAI	
154	Nolton Haven	HTL	MR	MR	
155	Newgale Sands: Maidenhall Pt-Bathesland	MR	MR	MR	
156	Newgale Sands: Bathesland-Sibbernock	MR	MR	MR	
157	Newgale Sands:Sibbernock-Newgale	MR	MR	NAI	Sea wall
158	Porthmynawyd	NAI	NAI	NAI	
159	Aber Dwyrain	NAI	NAI	NAI	
160	Porth y Bŵch, Solva	NAI	NAI	NAI	
161	Gwadn, Solva	NAI	NAI	NAI	
162	Loch Warren	NAI	NAI	NAI	

Table A4 (continued)

ID	Localities	SMP Policies in three epochs			Existing defences
		0-20 years	20-50 years	50-100 years	
163	Aber Llong	NAI	NAI	NAI	
164	Porth y Rhaw	NAI	NAI	NAI	
165	Caer Bwdy Bay	NAI	NAI	NAI	
166	Caerfai Bay	NAI	NAI	NAI	
167	Porthlysgi Bay	NAI	NAI	NAI	
168	Porth Lleuog, Ramsey Island	NAI	NAI	NAI	
169	Aber Mawr, Ramsey Island	NAI	NAI	NAI	
170	Whitesands Bay	HTL	MR	MR	Rock armour, sea wall
171	Porth Lleuog	NAI	NAI	NAI	
172	Porthmelgan	NAI	NAI	NAI	
173	Porth y Rhaw	NAI	NAI	NAI	
174	Abereiddi Bay	MR	MR	MR	Sea wall
175	Traeth Llyfn	NAI	NAI	NAI	
176	Porth Egr	NAI	NAI	NAI	
177	Aberfelin, Trefin	NAI	NAI	NAI	
178	Pwll Olfa	NAI	NAI	NAI	
179	Pwll Llong	NAI	NAI	NAI	
180	Pwll Whiting	NAI	NAI	NAI	
181	Ynys Deullyn	NAI	NAI	NAI	
182	Aber Castle	HTL	MR	MR	Sea wall
183	Pwllstrodur	NAI	NAI	NAI	
184	Aber Mawr	NAI	NAI	NAI	
185	Aber Bach, St Nicholas	NAI	NAI	NAI	
186	Porth Dwgan	NAI	NAI	NAI	
187	Pwllcrochan	NAI	NAI	NAI	
188	Pwlldawnau	NAI	NAI	NAI	
189	Pwll Deri	NAI	NAI	NAI	
190	Porth Maenmelyn	NAI	NAI	NAI	
191	Pwlluog	NAI	NAI	NAI	
192	Porthsychan	NAI	NAI	NAI	
193	Aber Felin	NAI	NAI	NAI	
194	Porth Maen	NAI	NAI	NAI	
195	Pwll Hir	NAI	NAI	NAI	
196	Goodwick Sands North	HTL	HTL	HTL/AL	Embankment, rock armour
197	Goodwick Sands South	HTL	MR	MR	Embankment, groynes
198	Lampit Mawr	NAI	NAI	NAI	
199	Aber Gwaun	HTL	HTL	HTL	Sea wall
200	Pwll Landdu	NAI	NAI	NAI	
201	Pwell Edyn	NAI	NAI	NAI	
202	Pwll Ceunant	NAI	NAI	NAI	
203	Aber Richard	NAI	NAI	NAI	
204	Pwll y Blewyn	NAI	NAI	NAI	
205	Aber Grugog	NAI	NAI	NAI	
206	Aber Hywel	NAI	NAI	NAI	
207	Carreg Pen-las	NAI	NAI	NAI	
208	Aber Bach, Fishguard	NAI	NAI	NAI	
209	Pwll Gwylog	NAI	NAI	NAI	
210	Cwm-yr-Eglwys, Afon Teifi	HTL	HTL	HTL	Sea wall
211	Aber Fforest	NAI	NAI	NAI	
212	Aber Rhigian	NAI	NAI	NAI	
213	Traeth Cell-Howel	NAI	NAI	NAI	
214	Ceibwr Bay	NAI	NAI	NAI	
215	Traeth y Rhedyn	NAI	NAI	NAI	
216	Traeth Godir-coch	NAI	NAI	NAI	
217	Careg Aderyn	NAI	NAI	NAI	
218	Pwll Edrych	NAI	NAI	NAI	
219	Pwll Melyn	NAI	NAI	NAI	
220	Pen yr Ergyd	MR	MR	MR	
221	Llangrannog	HTL	MR	MR	Sea wall
222	Traeth y Gaerglwyd	NAI	NAI	NAI	
223	Cwmtydu	HTL	HTL	NAI	Sea wall
224	Castell Bach	NAI	NAI	NAI	
225	Traeth y Coubal	NAI	NAI	NAI	
226	Llech Cimwch	NAI	NAI	NAI	
227	Traeth y Quarry	NAI	NAI	NAI	
228	New Quay Bay	MR	MR	MR	
229	Little Quay Bay	HTL-NAI	HTL-NAI	MR-NAI	Sea wall, groynes, rock armour
230	Gilfach-yr-Halen to Clogfryn	NAI	NAI	NAI	
231	Aberaeron south	HTL	HTL	MR	Sea wall, rock armour, groynes
232	Aberaeron north	HTL	HTL	HTL	Sea wall, groynes, breakwater
233	Aberaeron to Aberarth	NAI	NAI	NAI	
234	Aberarth	HTL	MR	MR	Groynes, breakwater
235	Aberarth to Morfa Mawr	NAI	NAI	NAI	
236	Morfa Mawr	NAI	NAI	NAI	
237	Morfa Mawr to Llanonn	NAI	NAI	NAI	
238	Llannon	MR	MR	MR	
239	Llannon to Llansantffraid	MR	MR	MR	
240	Llansantffraid	MR	MR	MR	
241	Llansantffraid to Llanrhystud	MR	MR	MR	
242	Llanrhystud	MR	MR	MR	
243	Llanrhystud to Carreg Ti-pw	NAI	NAI	NAI	

Table A4 (continued)

ID	Localities	SMP Policies in three epochs			Existing defences
		0-20 years	20-50 years	50-100 years	
244	Carreg Ti-pw to Pinderi Cliffs	NAI	NAI	NAI	
245	Twll Twrw to Traeth Tanybwlch	NAI	NAI	NAI	
246	Traeth Tanybwlch, Aberystwyth	MR	MR	NAI	Rock armour, sea wall
247	South Beach, Aberystwyth	HTL	HTL	HTL	Sea wall
248	North Beach, Aberystwyth	HTL	HTL	HTL/AL	Sea wall, groynes, rock armour
249	Constitution Hill	NAI	NAI	NAI	
250	Clarach Bay	MR	MR	MR	Rock armour, sea wall
251	Wallog Beach	NAI	NAI	NAI	Sea wall
252	Pen-y-graig	MR	MR	MR	
253	Borth Sands	HTL-HTL-MR	HTL-MR-NAI	MR-MR-NAI	Sea wall, groynes, breakwaters
254	Aberdovey to Tywyn	MR	MR	MR	Geotextile bags
255	Tywyn	HTL	HTL	HTL	Sea wall, groynes, rock armour
256	Tywyn to Aber Dysynni	HTL	HTL	HTL	Embankment, rock armour
257	Tonfanau to Gallt Ffynnon yr Hydd	MR	MR	NAI	
258	Ro Wen, Fairbourne	HTL-MR-HTL	MR	NAI	Sea wall, concrete blocks
259	Afon Mawddach, Barmouth	HTL	HTL	HTL	Sea wall
260	Ynys y Brawd, Barmouth	HTL	HTL	HTL	Breakwater
261	Barmouth Promenade	HTL	HTL	HTL	Sea wall
262	Barmouth to Llanaber	HTL	MR-HTL	MR-HTL	Sea wall, embankment, rock armour
263	Ceunant Egryn, Llanaber	MR	NAI	NAI	
264	Afon Ysgethin, Tal-y-bont	MR	MR	MR	
265	Shell Island	NAI	NAI	NAI	
266	Shell Island Spit	HTL	MR	MR	Rock armour
267	Llandanwg Spit	HTL	MR	MR	Breakwater
268	Llandanwg to Harlech	HTL	HTL	HTL	Embankment
269	Graig Ddu to Criccieth	HTL	MR	MR	Embankment
270	Criccieth	HTL-NAI	HTL-NAI	MR-HTL-NAI	Sea wall, groynes, rock armour
271	Afon Dwyfor	MR	NAI	NAI	
272	Glannllynnau	NAI	NAI	NAI	
273	Afon Wen	HTL	MR	MR	Embankment, rock armour
274	Hafan y Mor	NAI	NAI	NAI	Rock armour
275	Pen-ychain to Pwllheli	NAI-HTL-HTL	NAI-MR-HTL	NAI-MR-HTL	Sand fencing
276	Carreg yr Imbill	HTL	HTL	HTL	Sea wall
277	Traeth Crugan	HTL	MR	MR	Rock armour
278	Llanbedrog Beach	NAI	NAI	NAI	
279	Porth Ceiriad	NAI	NAI	NAI	
280	Porth Neigwl	NAI	NAI	NAI	
281	Porth Ysgo	NAI	NAI	NAI	
282	Aberdaron Bay	NAI-HTL	NAI-MR	NAI-HTL	Sea wall
283	Porth Meudwy	NAI	NAI	NAI	
284	Porth Ferin	NAI	NAI	NAI	
285	Porth Ty-mawr	NAI	NAI	NAI	
286	Traeth Penllech	NAI	NAI	NAI	
287	Bryn Gwydd south	NAI	NAI	NAI	
288	Bryn Gwydd north	NAI	NAI	NAI	
289	Aber Geirch	NAI	NAI	NAI	
290	Borth Wen	NAI	NAI	NAI	
291	Porth Dinllaen	HTL-NAI	MR-NAI	MR-NAI	Rock armour, groynes
292	Porth Nefyn	HTL-NAI	HTL-NAI	MR-NAI	Sea wall
293	Porth Pistyll	NAI	NAI	NAI	
294	Porth y Nant	NAI	NAI	NAI	
295	Yr Eifl Beach, Trefor	NAI	NAI	NAI	
296	Trefor to Aberdesach	NAI	NAI	NAI	
297	Aberdesach	MR	MR	MR	
298	Aberdesach to Trwyn Maen Dylan	NAI	NAI	NAI	
299	Trwyn Maen Dylan	NAI	NAI	NAI	
300	Trwyn Maen Dylan to Pontllyfni	NAI	NAI	NAI	
301	Pontllyfni to Ynys	NAI	NAI	NAI	
302	Ynys to Dinas Dinlle	NAI	NAI	NAI	
303	Dinas Dinlle Fort	NAI	NAI	NAI	
304	Morfa Dinlle	HTL-MR	MR	MR-NAI	Embankment, sea wall
305	Afon Gwyrfai to Caernarfon	HTL	HTL	MR	Embankment
306	Caernarfon to Plas Menai	HTL-NAI	HTL-NAI	HTL-NAI	
307	Y Felinheli	HTL	HTL	HTL	Sea wall, groynes
308	Y Felinheli to Pont Britannia	NAI	NAI	NAI	
309	Pont Britannia to Pwll-fanogl	NAI	NAI	NAI	
310	Moel-y-don to Afon Braint, Anglesey	HTL	MR	NAI	
311	Abermenai	NAI	NAI	NAI	
312	Traeth Llanddwyn	NAI	NAI	NAI	
313	Tywyn Fferam, Anglesey	MR	MR	NAI	
314	Traeth Llydan, Holy Island	MR	MR	MR	
315	Borthwen, Holy Island	MR	MR	NAI	
316	Porthygaran, Holy Island	MR	MR	MR	
317	Lee Caravan Park, Holy Island	MR	MR	MR	
318	Porth Diana, Holy Island	HTL	HTL	HTL	Sea wall, rock armour
319	Trearddur Bay, Holy Island	HTL	HTL	HTL	Sea wall, rock armour
320	Porth Isallt-bach, Holy Island	MR	MR	MR	
321	Porth yr Afon, Holy Island	MR	MR	MR	
322	Porth yr Afon to Porth t Pwll, Holy Is.	MR	MR	MR	
323	Porth y Pwll, Holy Island	MR	MR	MR	
324	Porth-y-post, Holy Island	MR	MR	MR	

Table A4 (continued)

ID	Localities	SMP Policies in three epochs			Existing defences
		0-20 years	20-50 years	50-100 years	
325	Porth y Corwgl, Holy Island	MR	MR	MR	
326	Abraham's Bosom, Holy Island	NAI	NAI	NAI	
327	Soldiers Point, Holy Island	NAI	NAI	NAI	
328	Peibio	MR	MR	MR	
329	Traeth Penrhos, Holy Island	MR	MR	MR	
330	Penrhos to Gorsedd-y-penrhyn	NAI	NAI	NAI	
331	Gorsedd-y-penrhyn to Stanley Embkt.	NAI	NAI	NAI	
332	Ynys Leurad, Anglesey	HTL	HTL	HTL	
333	Valley, Anglesey	MR	MR	MR	
334	Traeth y Gribin, Anglesey	MR	MR	MR	
335	Porth Penrhyn-mawr, Anglesey	MR	MR	MR	
336	Porth Delysg, Anglesey	NAI	NAI	NAI	
337	Twyn Cliperau, Anglesey	NAI	NAI	NAI	
338	Porth Tywyn-mawr, Anglesey	NAI	NAI	NAI	
339	Porth Defaid, Anglesey	NAI	NAI	NAI	
340	Porth Trefadog, Anglesey	MR	NAI	NAI	
341	Porth Ffynnon to Porth Swtan	NAI	NAI	NAI	
342	Traeth Ynys y Fydlyn, Anglesey	NAI	NAI	NAI	
343	Porth Newydd to Porth Tywodog	NAI	NAI	NAI	
344	Hen Borth, Anglesey	NAI	NAI	NAI	
345	Hen Borth to Trwyn Cemlyn	NAI	NAI	NAI	
346	Cemlyn Bay, Anglesey	MR	NAI	NAI	
347	Porth-y-pistyll, Anglesey	NAI	NAI	NAI	
348	Porth y Wylfa, Anglesey	NAI	NAI	NAI	
349	Porth Llanlleiana, Anglesey	NAI	NAI	NAI	
350	Porth Wen, Anglesey	MR-NAI	MR-NAI	NAI	
351	Porth-Llechog, Anglesey	HTL	HTL	MR	Sea wall
352	Porth Eilian, Anglesey	HTL	MR	NAI	Sea wall
353	Porthygwidhiaid, Anglesey	NAI	NAI	NAI	
354	Porth Helygen to Porth Garreg-fawr	NAI	NAI	NAI	
355	Dulas Bay, Anglesey	NAI	NAI	NAI	
356	Traeth yr Ora	NAI	NAI	NAI	
357	Porth y Mor, Anglesey	NAI	NAI	NAI	
358	Traeth Lligwy, Anglesey	NAI	NAI	NAI	
359	Porth Forllwyd, Anglesey	NAI	NAI	NAI	
360	Porth Helaeth, Anglesey	NAI	NAI	NAI	
361	Porth yr Ynys, Anglesey	NAI	NAI	NAI	
362	Porth Moelfre, Anglesey	HTL	HTL	MR	Sea wall
363	Porth yr Aber, Anglesey	NAI	NAI	NAI	
364	Porth y Rhos, Anglesey	NAI	NAI	NAI	
365	Traeth Bychan, Anglesey	MR	NAI	NAI	
366	Borth Wen, Anglesey	NAI	NAI	NAI	
367	Benllech Sand, Anglesey	NAI	NAI	NAI	
368	Porthllongdy Spit	NAI	NAI	NAI	
369	Traeth-coch, Anglesey	NAI	NAI	NAI	Embankment
370	Tan Dinas Quarry, Anglesey	NAI	NAI	NAI	
371	Fedw Fawr West, Anglesey	NAI	NAI	NAI	
372	Fedw Fawr East, Anglesey	NAI	NAI	NAI	
373	Trwyn Dinmor to Trwyn Du	NAI	NAI	NAI	
374	Trwyn Du to Beaumaris, Anglesey	NAI-HTL	NAI-HTL	NAI-MR	Embankment, sea wall, rock armour
375	Gallows Point, Beaumaris, Anglesey	NAI	NAI	NAI	
376	Penrhyn Park	NAI	NAI	NAI	
377	The Spinnies, Aber-Ogwen	NAI	NAI	NAI	
378	Aber-Ogwen to Coed Gyfynys	NAI	NAI	NAI	
379	Coed Gyfynys to Wig Bach	NAI	NAI	NAI	
380	Wig Bach to Afon Aber	NAI	NAI	NAI	
381	Afon Aber	MR	MR	HTL	
382	Afon Aber to Glan y mor Elias	MR	MR	HTL	
383	Llanfairfechan Spit	MR	MR	HTL	
384	Llanfairfechan Town	HTL	HTL	MR	Sea wall
385	Penmaenmawr to Penmaen-bach	HTL	HTL	HTL	Sea wall
386	Conwy Morfa	HTL	HTL	MR	
387	Deganwy	HTL	HTL	MR-HTL	Sea wall, rock armour
388	Llandudno West Shore	HTL	HTL	MR	Sea wall, groynes
389	Great Orme West Shore	NAI	NAI	NAI	
390	Llandudno Bay	HTL	HTL	HTL	Sea wall
391	Penrhyn Bay	HTL	HTL	HTL	Sea wall, groynes, rock armour
392	Rhos on Sea	HTL	HTL	HTL	Sea wall, breakwater
393	Colwyn Bay	HTL	HTL	HTL	Sea wall, groynes, rock armour
394	Penmaen Rhos	HTL	HTL	HTL	Sea wall, groynes, rock armour
395	Llanddulas	HTL	HTL	HTL	Rock armour, sea wall, groynes
396	Pensarn	HTL	HTL	HTL	Sea wall, rock armour
397	Belgrano to Kinmel Bay	HTL	HTL	HTL	Sea wall, rock armour
398	Horton's Nose, Kinmel Bay	HTL	HTL	HTL	Breakwater
399	Rhyl	HTL	HTL	HTL	Sea wall, groynes
400	Barkby Beach to Gronant	MR	MR	MR	Rock armour, groynes
401	Gronant to Talacre	MR	MR	MR	
402	Point of Ayr	MR	MR	MR	
403	Ffynnongroyw to Greenfield	HTL	HTL-MR	HTL-MR	Sea wall, rock armour

Table A5 Beach morphological type, conservation designation and National Trust ownership

ID	Localities	Morphological type	Conservation designation	NT ownership
1	Sudbrook Point	Fringing	SAC, SPA, Ramsar, SSSI	No
2	West Pill, Rogiet	Fringing	SAC, SPA, Ramsar, SSSI	No
3	Portland Grounds (Redwick to Goldcliff)	Fringing	SAC, SPA, Ramsar, SSSI, NNR	No
4	Goldcliff Pill	Barrier Spit	SAC, SPA, Ramsar, SSSI, NNR	No
5	Newgout Pill, Wentlooge	Barrier Spit	SAC, SPA, Ramsar, SSSI	No
6	West Usk Lighthouse, Wentlooge	Barrier Spit	SAC, SPA, Ramsar, SSSI	No
7	Outfall Lane, Wentlooge	Pocket Beach	SAC, SPA, Ramsar, SSSI	No
8	Cardiff Flats	Fringing	SAC, SPA, Ramsar, SSSI	No
9	Penarth to Lavernock Point	Fringing	SAC, SPA, Ramsar, SSSI	No
10	Lavernock Point to Swanbridge	Fringing	SSSI	No
11	Barry Harbour	Fringing	None	No
12	Watch House Bay, Barry	Fringing	None	No
13	Pebble Beach, Barry	Fringing	None	No
14	Porthkerry	Barrier Beach	None	No
15	Bulwarks Fort to Rhoose Point	Fringing	None	No
16	Watch House Beach, East Aberthaw	Barrier Beach/Spit	SSSI	No
17	Leys Beach, East Aberthaw	Fringing	SSSI	No
18	West Aberthaw	Barrier Beach	HC	No
19	Aberthaw to St Donats	Fringing	HC	No
20	Nash Point to Cwm Nash	Fringing	SSSI, HC	No
21	Traeth Mawr, Broughton	Fringing	SSSI, HC	No
22	Traeth Bach, Broughton	Fringing	SSSI, HC	No
23	Dunraven Bay	Fringing	SSSI, HC	No
24	Ogmore-by-Sea	Fringing	SSSI, HC	No
25	Pwll y Defaid, Merthyr-mawr Warren	Barrier Spit	SAC, SSSI, HC	No
26	Black Rocks, Porthcawl	Fringing	SAC, SSSI, HC	No
27	Trecco Bay, Porthcawl	Fringing	None	No
28	Seafront Beach, Porthcawl	Fringing	None	No
29	West Beach, Porthcawl	Fringing	None	No
30	Rest Bay, Porthcawl	Barrier Beach	SAC, SSSI, LNR	No
31	Kenfig Sands	Fringing	SAC, SSSI, NNR, LNR	No
32	Afon Cynffig	Barrier Spit	SAC, SSSI, NNR, LNR	No
33	Margam Sands	Fringing	None	No
34	Port Talbot Harbour	Fringing	None	No
35	Baglan Burrows	Fringing	None	No
36	Mumbles	Fringing	SSSI	No
37	Bracelet Bay, Gower	Pocket Beach	SSSI, AONB	No
38	Limeslade Bay, Gower	Pocket Beach	SSSI, AONB	No
39	Langland Bay, Gower	Fringing	AONB	No
40	Caswell Bay	Fringing	SSSI, AONB, HC	No
41	Brandy Cove	Pocket Beach	SSSI, AONB, HC	No
42	Pwlldu Bay	Barrier Beach/Spit	SSSI, AONB, HC, GCR	Yes
43	Pobbles Beach	Pocket Beach	SSSI, AONB, HC	No
44	Pennard Burrows	Barrier Spit	SSSI, AONB, HC	No
45	Oxwich Bay	Fringing	SSSI, NNR, AONB, HC, GCR	No
46	Holy's Wash	Fringing	SAC, SSSI, AONB, HC	Yes
47	Port-Eynon Bay	Fringing	AONB, HC	No
48	Port-Eynon Point	Pocket Beach	SAC, SSSI, AONB, HC	Yes
49	Overton Mere	Pocket Beach	SAC, SSSI, AONB, HC	Yes
50	Common Cliff	Pocket Beach	SAC, SSSI, AONB, HC	Yes
51	Ram Grove	Pocket Beach	SAC, SSSI, AONB, HC	Yes
52	Kitchen Corner south	Fringing	SAC, SSSI, AONB, HC	Yes
53	Kitchen Corner north	Pocket Beach	SAC, SSSI, AONB, HC	Yes
54	Rhossili Bay	Fringing / Barrier Beach	SAC, SSSI, AONB, HC	Yes
55	Whiteford Point	Barrier Spit	SAC, SPA, Ramsar, SSSI, NNR, AONB, HC, GCR	Yes
56	Machynys, Loughor Estuary	Barrier Spit	SAC, SPA, Ramsar, SSSI	No
57	Llanelli Harbour Mouth	Fringing	SAC, SPA, Ramsar, SSSI	No
58	Tywyn Bach, Burry Port	Barrier Spit	SAC, SPA, Ramsar, SSSI	No
59	Millenium Coastal Park, Burry Port	Fringing	SAC, SPA, Ramsar, SSSI	No
60	Burry Port Harbour Mouth	Fringing	SAC, SPA, Ramsar, SSSI	No
61	St Ishmael's Scar	Fringing	SAC, SSSI	No
62	The Graig, Ferryside	Fringing	SAC, SSSI	No
63	Ferryside	Fringing	SAC, SSSI	No
64	Ginst Point	Barrier Spit	SAC, SSSI	No
65	Pendine	Fringing	SAC, SSSI, GCR	No
66	Morfa Bychan, Pendine	Pocket Beach	SAC, SSSI	Yes
67	Marros Sands	Fringing	SAC, SSSI	No
68	Amroth Beach	Fringing	SAC, SSSI	No
69	Wiseman's Bridge Beach	Fringing	SAC, SSSI	No
70	Saundersfoot Beach	Fringing	SAC, SSSI	No
71	Rhode Wood, Saundersfoot	Pocket Beach	SAC, SSSI	No
72	Monkstone Beach	Pocket Beach	SAC, SSSI	No
73	Waterwynch Bay	Pocket Beach	SAC, SSSI	No
74	Second Bay, Tenby	Pocket Beach	SAC, SSSI	No
75	First Bay, Tenby	Pocket Beach	SAC, SSSI	No
76	Tenby South Beach	Fringing	SSSI	No
77	Drinkim Beach, Caldy Island	Pocket Beach	HC	No
78	Sandtop Bay, Caldy Island	Pocket Beach	HC	No
79	Lydstep Haven	Fringing	SSSI, HC	No
80	Church Doors, Skrinkle Haven	Pocket Beach	SAC, SSSI, HC	No
81	Manorbier Bay	Fringing	SAC, SSSI, HC	Yes

Table A5 (continued)

ID	Localities	Morphological type	Conservation designation	NT ownership
82	Swanlake Bay	Fringing	SAC, SSSI, HC	No
83	Privar	Pocket Beach	SAC, SSSI, HC	No
84	Greenala Point to Stackpole Quay	Fringing	SAC, SSSI, HC	Yes
85	Stackpole Quay	Pocket Beach	SAC, SSSI, HC	Yes
86	Mowingword	Pocket Beach	SAC, SSSI, HC	Yes
87	Bullslaughter Bay	Pocket Beach	SAC, SPA, SSSI, HC	No
88	Flimston Bay	Pocket Beach	SAC, SPA, SSSI, HC	No
89	Pen-y-holt Bay	Pocket Beach	SAC, SPA, SSSI, HC	No
90	Hobbyhorse Bay	Pocket Beach	SAC, SPA, SSSI, HC	No
91	Blucks Pool	Pocket Beach	SAC, SPA, SSSI, HC	No
92	Frainslake Sands	Fringing	SAC, SPA, SSSI, HC	No
93	Little Furzenip	Fringing	SAC, SPA, SSSI, HC	No
94	Freshwater West	Fringing	SAC, SPA, SSSI, HC	Yes
95	Gravel Bay	Pocket Beach	SAC, SPA, SSSI, HC	No
96	West Pickard Bay	Pocket Beach	SAC, SSSI, HC	No
97	West Angle Bay	Pocket Beach	SAC, SSSI, HC	No
98	The Ridge, Angle Bay	Barrier Spit	SAC, SSSI	No
99	Angle Bay East	Fringing	SAC, SSSI	No
100	Pembroke Dock	Fringing	SAC, SSSI	No
101	Cosheston Point to Mill Bay, Daugleddau	Fringing	SAC, SSSI	No
102	Burton Ferry	Fringing	SAC, SSSI	No
103	Neyland	Fringing	SAC, SSSI	No
104	Llanstadwell	Fringing	SAC, SSSI	No
105	Newton Noyes, Milford Haven	Fringing	SAC, SSSI	No
106	Gelliswick Bay, Milford Haven	Fringing	SAC, SSSI	No
107	Gelliswick Village, Milford Haven	Pocket Beach	SAC, SSSI	No
108	Little Wick, Milford Haven	Pocket Beach	SAC, SSSI	No
109	Kilroom	Pocket Beach	SAC, SSSI	No
110	Sandy Haven	Fringing	SAC, SSSI	No
111	Sleeping Bay	Pocket Beach	SAC, SSSI	No
112	Butts Bay	Pocket Beach	SAC, SSSI	No
113	Longoar Bay	Pocket Beach	SAC, SSSI	No
114	Lindsway Bay	Pocket Beach	SAC, SSSI	No
115	Wenall Bay	Pocket Beach	SAC, SSSI	No
116	Watch House Bay, Milford Haven	Pocket Beach	SAC, SSSI	No
117	Monk Haven	Pocket Beach	SAC, SSSI	No
118	Musselwick	Fringing	SAC, SSSI	No
119	Pickleridge Beach	Barrier Beach/Spit	SAC, SSSI	No
120	Dale Beach	Fringing	SAC, SSSI	No
121	Castlebeach Bay	Pocket Beach	SAC, SSSI, HC	No
122	Watwick Bay	Pocket Beach	SAC, SSSI, HC	No
123	Mill Bay	Pocket Beach	SAC, SSSI, HC	No
124	Windmill Cove	Pocket Beach	SAC, SSSI, HC	No
125	Westdale Bay	Pocket Beach	SAC, SSSI, HC	No
126	Marloes Sands	Fringing	SAC, SPA, SSSI, HC	No
127	Albion Sands	Pocket Beach	SAC, SPA, SSSI, HC	Yes
128	Watery Bay	Pocket Beach	SAC, SPA, SSSI, HC	Yes
129	Victoria Bay	Pocket Beach	SAC, SPA, SSSI, HC	Yes
130	Little Castle Bay	Pocket Beach	SAC, SPA, SSSI, HC	Yes
131	Rainy Rock Bay	Pocket Beach	SAC, SPA, SSSI, HC	Yes
132	Three Doors Bay	Pocket Beach	SAC, SPA, SSSI, HC	Yes
133	Deadman's Bay	Pocket Beach	SAC, SPA, SSSI, HC	Yes
134	Renney Slip	Pocket Beach	SAC, SPA, SSSI, HC	Yes
135	Jeffry's Haven south	Pocket Beach	SAC, SPA, SSSI, HC	Yes
136	Jeffry's Haven north	Pocket Beach	SAC, SPA, SSSI, HC	Yes
137	Martin's Haven	Pocket Beach	SAC, SPA, SSSI, HC	Yes
138	West hook Farm	Pocket Beach	SAC, SPA, SSSI, HC	Yes
139	Mill Haven	Pocket Beach	SAC, SSSI, HC	No
140	Brandy Bay	Pocket Beach	SAC, SSSI, HC	No
141	Messelwick	Pocket Beach	SAC, SSSI, HC	Yes
142	Rook's Bay	Pocket Beach	SAC, SSSI	Yes
143	Little Haven	Pocket Beach	SAC, SSSI	Yes
144	The Settlands	Pocket Beach	SAC, SSSI	No
145	Broad Haven	Fringing	SAC, SSSI,	No
146	Harold Stone south	Pocket Beach	SAC, SSSI, HC	No
147	Harold Stone north	Pocket Beach	SAC, SSSI, HC	No
148	Black Point south	Pocket Beach	SAC, SSSI, HC	No
149	Settling Nose south	Pocket Beach	SAC, SSSI, HC	No
150	Settling Nose north	Pocket Beach	SAC, SSSI, HC	No
151	Druidston Haven	Fringing	SAC, SSSI, HC	No
152	North Haven	Pocket Beach	SAC, SSSI, HC	No
153	Madoc's Haven	Pocket Beach	SAC, SSSI, HC	No
154	Nolton Haven	Pocket Beach	SAC, SSSI, HC	No
155	Newgale Sands: Maidenhall Pt-Bathesland	Fringing	SAC, SSSI, HC	No
156	Newgale Sands: Bathesland-Sibbernock	Barrier Beach	None	No
157	Newgale Sands:Sibbernock-Newgale	Barrier Beach	None	Yes
158	Porthmynawyd	Pocket Beach	SAC, SPA, SSSI, HC	Yes
159	Aber Dwyrain	Pocket Beach	SAC, SPA, SSSI, HC	Yes
160	Porth y Bŵch, Solva	Pocket Beach	SAC, SPA, SSSI, HC	Yes
161	Gwadn, Solva	Pocket Beach	SAC, SPA, SSSI, HC	Yes
162	Loch Warren	Pocket Beach	SAC, SPA, SSSI, HC	Yes

Table A5 (continued)

ID	Localities	Morphological type	Conservation designation	NT ownership
163	Aber Llong	Pocket Beach	SAC, SPA, SSSI, HC	Yes
164	Porth y Rhaw	Pocket Beach	SAC, SPA, SSSI, HC	Yes
165	Caer Bwdy Bay	Pocket Beach	SAC, SPA, SSSI, HC	Yes
166	Caerfai Bay	Pocket Beach	SAC, SPA, SSSI, HC	Yes
167	Porthlysgi Bay	Pocket Beach	SAC, SPA, SSSI, HC	Yes
168	Porth Lleuog, Ramsey Island	Pocket Beach	SAC, SPA, SSSI, NNR, HC	No
169	Aber Mawr, Ramsey Island	Pocket Beach	SAC, SPA, SSSI, NNR, HC	No
170	Whitesands Bay	Fringing	SAC, SPA, SSSI, HC	No
171	Porth Lleuog	Pocket Beach	SAC, SPA, SSSI, HC	No
172	Porthmelgan	Pocket Beach	SAC, SPA, SSSI, HC	Yes
173	Porth y Rhaw	Pocket Beach	SAC, SPA, SSSI, HC	No
174	Abereiddi Bay	Pocket Beach	SAC, SSSI, HC	No
175	Traeth Llyfn	Pocket Beach	SAC, SSSI, HC	Yes
176	Porth Egr	Pocket Beach	SAC, SSSI, HC	Yes
177	Aberfelin, Trefin	Pocket Beach	HC	Yes
178	Pwll Olfa	Pocket Beach	HC	No
179	Pwll Llong	Pocket Beach	HC	Yes
180	Pwll Whiting	Pocket Beach	HC	Yes
181	Ynys Deullyn	Pocket Beach	HC	Yes
182	Aber Castle	Pocket Beach	HC	Yes
183	Pwllstrodur	Pocket Beach	HC	No
184	Aber Mawr	Barrier Beach	SSSI, HC	Yes
185	Aber Bach, St Nicholas	Barrier Spit	HC	Yes
186	Porth Dwgan	Pocket Beach	HC	No
187	Pwllcrochan	Pocket Beach	SAC, SSSI, HC	No
188	Pwlldawnau	Pocket Beach	SAC, SSSI, HC	No
189	Pwll Deri	Pocket Beach	SAC, SSSI, HC	Yes
190	Porth Maenmelyn	Pocket Beach	SAC, SSSI, HC	Yes
191	Pwlluog	Pocket Beach	SAC, SSSI, HC	No
192	Porthsychan	Pocket Beach	SAC, SSSI, HC	No
193	Aber Felin	Pocket Beach	HC	No
194	Porth Maen	Pocket Beach	HC	No
195	Pwll Hir	Pocket Beach	HC	No
196	Goodwick Sands North	Fringing	None	No
197	Goodwick Sands South	Fringing	None	No
198	Lampit Mawr	Pocket Beach	SSSI	No
199	Aber Gwaun	Fringing	None	No
200	Pwll Landdu	Pocket Beach	HC	No
201	Pwell Edyn	Pocket Beach	HC	No
202	Pwll Ceunant	Pocket Beach	HC	No
203	Aber Richard	Pocket Beach	HC	Yes
204	Pwll y Blewyn	Pocket Beach	HC	No
205	Aber Grugog	Pocket Beach	HC	No
206	Aber Hywel	Pocket Beach	HC	No
207	Carreg Pen-las	Pocket Beach	HC	No
208	Aber Bach, Fishguard	Pocket Beach	HC	No
209	Pwll Gwylog	Pocket Beach	HC	No
210	Cwm-yr-Eglwys, Afon Teifi	Pocket Beach	HC	No
211	Aber Fforest	Pocket Beach	HC	No
212	Aber Rhigian	Pocket Beach	HC	No
213	Traeth Cell-Howel	Fringing	HC	No
214	Ceibwr Bay	Pocket Beach	SAC, SSSI, HC	Yes
215	Traeth y Rhedyn	Fringing	SAC, SSSI, HC	Yes
216	Traeth Godir-coch	Fringing	SAC, SSSI, HC	No
217	Careg Aderyn	Fringing	SAC, SSSI, HC	No
218	Pwll Edrych	Fringing	SAC, SSSI, HC	No
219	Pwll Melyn	Fringing	SAC, SSSI, HC	No
220	Pen yr Ergyd	Barrier Spit	SAC, SSSI	No
221	Llangrannog	Pocket Beach	SAC, SSSI, HC	No
222	Traeth y Gaerglwyd	Pocket Beach	SAC, SSSI, HC	No
223	Cwmtydu	Pocket Beach	SAC, SSSI, HC	Yes
224	Castell Bach	Pocket Beach	SAC, SSSI, HC	Yes
225	Traeth y Coubal	Fringing	SAC, SSSI, HC	Yes
226	Llech Cimwch	Fringing	SAC, SSSI, HC	No
227	Traeth y Quarry	Pocket Beach	SAC, SSSI	No
228	New Quay Bay	Fringing	SAC, SSSI	No
229	Little Quay Bay	Fringing	SAC, SSSI	No
230	Gilfach-yr-Halen to Clogfryn	Fringing	SAC, SSSI	No
231	Aberaeron south	Fringing	SAC, SSSI	No
232	Aberaeron north	Fringing	SAC, SSSI	No
233	Aberaeron to Aberarth	Fringing	SAC, SSSI	No
234	Aberarth	Barrier Beach/Spit	SAC, SSSI	No
235	Aberarth to Morfa Mawr	Fringing	SSSI	No
236	Morfa Mawr	Barrier Beach/Spit	SSSI	No
237	Morfa Mawr to Llanonn	Fringing	SSSI	No
238	Llannon	Barrier Beach/Spit	SSSI	No
239	Llannon to Llansantffraid	Fringing	SSSI	No
240	Llansantffraid	Barrier Beach/Spit	SSSI	No
241	Llansantffraid to Llanrhystud	Fringing	SSSI	No
242	Llanrhystud	Barrier Beach/Spit	None	No
243	Llanrhystud to Carreg Ti-pw	Fringing	HC	No

Table A5 (continued)

ID	Localities	Morphological type	Conservation designation	NT ownership
244	Carreg Ti-pw to Pinderi Cliffs	Fringing	HC	No
245	Twll Twrw to Traeth Tanybwlch	Fringing	SSSI	No
246	Traeth Tanybwlch, Aberystwyth	Barrier Beach/Spit	SSSI, LNR	No
247	South Beach, Aberystwyth	Fringing	None	No
248	North Beach, Aberystwyth	Fringing	None	No
249	Constitution Hill	Fringing	None	No
250	Clarach Bay	Barrier Beach/Spit	SSSI	No
251	Wallog Beach	Fringing	SAC, SSSI, HC	No
252	Pen-y-graig	Pocket Beach	SAC, SSSI, HC	No
253	Borth Sands	Barrier Spit	SAC, SSSI, NNR, GCR	No
254	Aberdovey to Tywyn	Barrier Beach	SAC, SSSI	No
255	Tywyn	Fringing	None	No
256	Tywyn to Aber Dysynni	Barrier Spit	SAC, SSSI	No
257	Tonfanau to Gallt Ffynnon yr Hydd	Fringing	SSSI	No
258	Ro Wen, Fairbourne	Barrier Spit	SAC, SSSI	No
259	Afon Mawddach, Barmouth	Fringing	SAC, SSSI	No
260	Ynys y Brawd, Barmouth	Fringing	SAC, SSSI	No
261	Barmouth Promenade	Fringing	None	No
262	Barmouth to Llanaber	Fringing	None	No
263	Ceunant Egryn, Llanaber	Barrier Beach	None	Yes
264	Afon Ysgethin, Tal-y-bont	Barrier Spit	SSSI	No
265	Shell Island	Fringing	SSSI	No
266	Shell Island Spit	Barrier Spit	SSSI	No
267	Llandanwg Spit	Barrier Spit	SAC, SSSI	No
268	Llandanwg to Harlech	Fringing	SAC, SSSI	No
269	Graig Ddu to Criccieth	Barrier Beach	SAC, SSSI	No
270	Criccieth	Fringing	SAC, SSSI	No
271	Afon Dwyfor	Barrier Spit	SAC, SSSI	Yes
272	Glannllynnau	Fringing	SAC, SSSI	No
273	Afon Wen	Barrier Beach/Spit	SAC, SSSI	No
274	Hafan y Mor	Fringing	SAC, SSSI	No
275	Pen-ychain to Pwllheli	Barrier Beach	SAC, SSSI	No
276	Carreg yr Imbill	Fringing	SAC, SSSI	No
277	Traeth Crugan	Barrier Beach	SAC, SSSI	No
278	Llanbedrog Beach	Fringing	SSSI, AONB	Yes
279	Porth Ceiriad	Fringing	SAC, SPA, SSSI, AONB, HC	Yes
280	Porth Neigwl	Fringing	SAC, SSSI, AONB, HC	No
281	Porth Ysgo	Fringing	SAC, SSSI, AONB, HC	Yes
282	Aberdaron Bay	Fringing	AONB, HC	Yes
283	Porth Meudwy	Pocket Beach	SAC, SSSI, AONB, HC	Yes
284	Porth Ferin	Pocket Beach	AONB, HC	No
285	Porth Ty-mawr	Fringing	AONB, HC	No
286	Traeth Penllech	Fringing	AONB, HC	No
287	Bryn Gwydd south	Pocket Beach	SAC, SSSI, AONB, HC	No
288	Bryn Gwydd north	Pocket Beach	SAC, SSSI, AONB, HC	No
289	Aber Geirch	Pocket Beach	SAC, SSSI, AONB, HC	No
290	Borth Wen	Pocket Beach	SAC, SSSI, AONB, HC	No
291	Porth Dinllaen	Fringing	SAC, SSSI, AONB, HC	Yes
292	Porth Nefyn	Fringing	SAC, SSSI, AONB, HC	No
293	Porth Pistyll	Fringing	SAC, SSSI, AONB, HC	Yes
294	Porth y Nant	Fringing	SAC, SSSI, AONB, HC	No
295	Yr Eifl Beach, Trefor	Fringing	AONB, HC	Yes
296	Trefor to Aberdesach	Fringing	AONB, HC	No
297	Aberdesach	Barrier Beach/Spit	AONB	No
298	Aberdesach to Trwyn Maen Dylan	Fringing	None	No
299	Trwyn Maen Dylan	Barrier Beach/Spit	None	No
300	Trwyn Maen Dylan to Pontllyfni	Fringing	None	No
301	Pontllyfni to Ynys	Barrier Beach/Spit	None	No
302	Ynys to Dinas Dinlle	Barrier Beach	None	No
303	Dinas Dinlle Fort	Fringing	SSSI	Yes
304	Morfa Dinlle	Barrier Spit	SAC, SSSI, GCR	No
305	Afon Gwyrfai to Caernarfon	Fringing	SSSI, LNR	No
306	Caernarfon to Plas Menai	Fringing	None	No
307	Y Felinheli	Fringing	None	No
308	Y Felinheli to Pont Britannia	Fringing	None	Yes
309	Pont Britannia to Pwll-fanogl	Fringing	None	Yes
310	Moel-y-don to Afon Braint, Anglesey	Fringing	None	No
311	Abermenai	Barrier Spit	SAC, SSSI, NNR, AONB, GCR	No
312	Traeth Llanddwyn	Fringing	SAC, SSSI, NNR, AONB, GCR	No
313	Tywyn Fferam, Anglesey	Fringing	SPA	No
314	Traeth Llydan, Holy Island	Pocket Beach	SPA, AONB	No
315	Borthwen, Holy Island	Pocket Beach	SPA, SSSI, AONB	No
316	Porthygaran, Holy Island	Pocket Beach	SPA, AONB	No
317	Lee Caravan Park, Holy Island	Pocket Beach	SPA	No
318	Porth Diana, Holy Island	Pocket Beach	SPA	No
319	Trearddur Bay, Holy Island	Fringing	SPA	No
320	Porth Isallt-bach, Holy Island	Pocket Beach	SPA, AONB	No
321	Porth yr Afon, Holy Island	Pocket Beach	SPA, AONB	No
322	Porth yr Afon to Porth t Pwll, Holy Is.	Fringing	SPA, AONB	No
323	Porth y Pwll, Holy Island	Pocket Beach	SPA, AONB	No
324	Porth-y-post, Holy Island	Pocket Beach	SPA, AONB	No

Table A5 (continued)

ID	Localities	Morphological type	Conservation designation	NT ownership
325	Porth y Corwgl, Holy Island	Pocket Beach	SPA, AONB	No
326	Abraham's Bosom, Holy Island	Fringing	SAC, SPA, SSSI, AONB, HC	No
327	Soldiers Point, Holy Island	Pocket Beach	SPA	No
328	Peibio	Fringing	None	No
329	Traeth Penrhos, Holy Island	Fringing	None	No
330	Penrhos to Gorsedd-y-penrhyn	Fringing	SAC, SSSI, AONB	No
331	Gorsedd-y-penrhyn to Stanley Embkt.	Fringing	SAC, SSSI, AONB	No
332	Ynys Leurad, Anglesey	Fringing	SPA, SSSI, AONB	No
333	Valley, Anglesey	Fringing	SPA, SSSI, AONB	No
334	Traeth y Gribin, Anglesey	Fringing	SPA, SSSI, AONB	No
335	Porth Penrhyn-mawr, Anglesey	Fringing	SPA, SSSI, AONB	No
336	Porth Delysg, Anglesey	Fringing	SPA, AONB	No
337	Twyn Cliperau, Anglesey	Fringing	SPA, AONB	No
338	Porth Tywyn-mawr, Anglesey	Fringing	SPA, AONB	No
339	Porth Defaid, Anglesey	Fringing	SPA, AONB	No
340	Porth Trefadog, Anglesey	Fringing	SPA, AONB	No
341	Porth Ffynnon to Porth Swtan	Fringing	SPA, AONB	Yes
342	Traeth Ynys y Fydlyn, Anglesey	Barrier Beach	SPA, AONB, HC	Yes
343	Porth Newydd to Porth Tywodog	Fringing	SPA, AONB, HC	Yes
344	Hen Borth, Anglesey	Pocket Beach	SPA, SSSI, AONB, HC	Yes
345	Hen Borth to Trwyn Cemlyn	Fringing	SPA, SSSI, AONB, HC	Yes
346	Cemlyn Bay, Anglesey	Barrier Beach	SAC, SPA, SSSI, AONB, HC	Yes
347	Porth-y-pistyll, Anglesey	Pocket Beach	SPA, AONB, HC	No
348	Porth y Wylfa, Anglesey	Pocket Beach	SPA	No
349	Porth Llanlleiana, Anglesey	Pocket Beach	SPA, SSSI, AONB, HC	No
350	Porth Wen, Anglesey	Fringing	SPA, AONB, HC	No
351	Porth-Llechog, Anglesey	Fringing	SPA, AONB, HC	No
352	Porth Eilian, Anglesey	Pocket Beach	SPA, AONB, HC	No
353	Porthygwidhiaid, Anglesey	Pocket Beach	SPA, AONB, HC	No
354	Porth Helygen to Porth Garreg-fawr	Fringing	SPA, AONB	No
355	Dulas Bay, Anglesey	Barrier Spit	SPA, SSSI, AONB	No
356	Traeth yr Ora	Fringing	SPA, AONB	No
357	Porth y Mor, Anglesey	Fringing	SPA, SSSI, AONB	No
358	Traeth Lligwy, Anglesey	Fringing	SPA, AONB	No
359	Porth Forllwyd, Anglesey	Pocket Beach	SPA, AONB	No
360	Porth Helaeth, Anglesey	Fringing	SPA, AONB	No
361	Porth yr Ynys, Anglesey	Pocket Beach	SPA, AONB	No
362	Porth Moelfre, Anglesey	Fringing	SPA, AONB	No
363	Porth yr Aber, Anglesey	Fringing	SPA, AONB	No
364	Porth y Rhos, Anglesey	Fringing	SPA, AONB	No
365	Traeth Bychan, Anglesey	Fringing	SPA, AONB	No
366	Borth Wen, Anglesey	Fringing	SPA, AONB	No
367	Benllech Sand, Anglesey	Fringing	SPA, AONB	No
368	Porthllongdy Spit	Spit	SPA, AONB	No
369	Traeth-coch, Anglesey	Fringing	SPA, AONB	No
370	Tan Dinas Quarry, Anglesey	Pocket Beach	SPA, AONB	No
371	Fedw Fawr West, Anglesey	Pocket Beach	SPA, AONB	Yes
372	Fedw Fawr East, Anglesey	Pocket Beach	SPA, AONB	No
373	Trwyn Dinmor to Trwyn Du	Fringing	SPA, AONB	No
374	Trwyn Du to Beaumaris, Anglesey	Fringing	SAC, SSSI, AONB	No
375	Gallows Point, Beaumaris, Anglesey	Tombolo	AONB	No
376	Penrhyn Park	Fringing	SAC, SPA, SSSI, LNR	No
377	The Spinnies, Aber-Ogwen	Beach Ridge Plain	SAC, SPA, SSSI, LNR	No
378	Aber-Ogwen to Coed Gyfynys	Fringing	SAC, SPA, SSSI, LNR	No
379	Coed Gyfynys to Wig Bach	Beach Ridge Plain	SAC, SPA, SSSI, LNR	No
380	Wig Bach to Afon Aber	Fringing	SAC, SPA, SSSI, LNR	No
381	Afon Aber	Alluvial Fan Delta	SAC, SPA, SSSI, LNR	No
382	Afon Aber to Glan y mor Elias	Barrier Beach	SAC, SPA, SSSI, LNR	No
383	Llanfairfechan Spit	Barrier Spit	SAC, SPA, SSSI, LNR	No
384	Llanfairfechan Town	Fringing	SAC, SPA, SSSI, LNR	No
385	Penmaenmawr to Penmaen-bach	Fringing	None	No
386	Conwy Morfa	Fringing	SSSI	No
387	Deganwy	Fringing	SSSI	No
388	Llandudno West Shore	Fringing	SSSI	No
389	Great Orme West Shore	Fringing	SSSI, HC	No
390	Llandudno Bay	Fringing	None	No
391	Penrhyn Bay	Fringing	None	No
392	Rhos on Sea	Fringing	None	No
393	Colwyn Bay	Fringing	None	No
394	Penmaen Rhos	Fringing	None	No
395	Llanddulas	Fringing	None	No
396	Pensarn	Beach Ridge Plain	SSSI	No
397	Belgrano to Kinmel Bay	Fringing	None	No
398	Horton's Nose, Kinmel Bay	Barrier Spit	Nature Reserve	No
399	Rhyl	Fringing	None	No
400	Barkby Beach to Gronant	Barrier Beach/Spit	SAC, SPA, SSSI, LNR	No
401	Gronant to Talacre	Fringing	SAC, SPA, SSSI	No
402	Point of Ayr	Barrier Spit	SAC, SPA, SSSI	No
403	Ffynnongroyw to Greenfield	Fringing	SAC, SPA, SSSI	No

Table A6 Beach morphological type and sedimentological nature of the beach

ID	Localities	Morphological type	Nature of upper beach	Nature of lower beach
1	Sudbrook Point	Fringing	Gravel	Mud
2	West Pill, Rogiet	Fringing	Saltmarsh with a little gravel	Mud
3	Portland Grounds (Redwick to Goldcliff)	Fringing	Saltmarsh with a little gravel	Mud
4	Goldcliff Pill	Barrier Spit	Vegetated gravel and saltmarsh	Mud
5	Newgout Pill, Wentlooge	Barrier Spit	Vegetated gravel and saltmarsh	Mud
6	West Usk Lighthouse, Wentlooge	Barrier Spit	Vegetated gravel and saltmarsh	Mud
7	Outfall Lane, Wentlooge	Pocket Beach	Gravel	Mud
8	Cardiff Flats	Fringing	Gravel and rock debris	Mud
9	Penarth to Lavernock Point	Fringing	Gravel	Rock platform
10	Lavernock Point to Swanbridge	Fringing	Gravel	Rock platform
11	Barry Harbour	Fringing	Rock, boulders, gravel	Rock platforms, mud
12	Watch House Bay, Barry	Fringing	Gravel	Mud
13	Pebble Beach, Barry	Fringing	Cobble and gravel	Sand
14	Porthkerry	Barrier Beach	Gravel	Rock platform
15	Bulwarks Fort to Rhoose Point	Fringing	Boulder and gravel	Rock platform
16	Watch House Beach, East Aberthaw	Barrier Beach/Spit	Gravel	Gravel
17	Leys Beach, East Aberthaw	Fringing	Gravel	Rock platform
18	West Aberthaw	Barrier Beach	Gravel	Rock platform
19	Aberthaw to St Donats	Fringing	Boulder and gravel	Rock platform
20	Nash Point to Cwm Nash	Fringing	Cobble and gravel	Sand, rock platform
21	Traeth Mawr, Broughton	Fringing	Cobble and gravel	Sand, rock platform
22	Traeth Bach, Broughton	Fringing	Cobble and gravel	Sand, rock platform
23	Dunraven Bay	Fringing	Boulders and gravel	Sand, rock platform
24	Ogmore-by-Sea	Fringing	Gravel and rock	Sand, rock platform
25	Pwll y Defaid, Merthyr-mawr Warren	Barrier Spit	Sand and gravel	Sand
26	Black Rocks, Porthcawl	Fringing	Sand and gravel	Sand, rock platform
27	Trecco Bay, Porthcawl	Fringing	Sand and gravel	Sand
28	Seafront Beach, Porthcawl	Fringing	Sand, gravel and tarmac	Rock platform
29	West Beach, Porthcawl	Fringing	Sand, gravel	Rock platform
30	Rest Bay, Porthcawl	Barrier Beach	Gravel	Sand, rock platform
31	Kenfig Sands	Fringing	Gravel	Sand
32	Afon Cynffig	Barrier Spit	Gravel	Sand
33	Margam Sands	Fringing	Gravel and sand	Sand
34	Port Talbot Harbour	Fringing	Gravel and sand	Mud
35	Baglan Burrows	Fringing	Gravel and sand	Sand
36	Mumbles	Fringing	Gravel	Sand and mud
37	Bracelet Bay, Gower	Pocket Beach	Gravel and rock	Sand, rock platform
38	Limeslade Bay, Gower	Pocket Beach	Gravel and rock	Sand, rock platform
39	Langland Bay, Gower	Fringing	Gravel and rock	Sand
40	Caswell Bay	Fringing	Gravel, rock, boulders	Sand
41	Brandy Cove	Pocket Beach	Gravel	Sand
42	Pwlldu Bay	Barrier Beach/Spit	Gravel	Sand
43	Pobbles Beach	Pocket Beach	Gravel	Sand
44	Pennard Burrows	Barrier Spit	Gravel	Sand
45	Oxwich Bay	Fringing	Sand and gravel	Sand
46	Holy's Wash	Fringing	Gravel and rock	Sand
47	Port-Eynon Bay	Fringing	Gravel and sand	Sand, rock platform
48	Port-Eynon Point	Pocket Beach	Gravel and rock	Rock platform
49	Overton Mere	Pocket Beach	Gravel and rock	Rock platform
50	Common Cliff	Pocket Beach	Gravel and rock	Rock platform
51	Ram Grove	Pocket Beach	Gravel and rock	Rock platform
52	Kitchen Corner south	Fringing	Gravel and rock	Rock platform
53	Kitchen Corner north	Pocket Beach	Gravel and rock	Sand
54	Rhossili Bay	Fringing / Barrier Beach	Gravel and sand	Sand
55	Whiteford Point	Barrier Spit	Gravel and sand	Sand
56	Machynys, Loughor Estuary	Barrier Spit	Gravel and sand	Mud and sand
57	Llanelli Harbour Mouth	Fringing	Gravel and sand	Mud and sand
58	Tywyn Bach, Burry Port	Barrier Spit	Gravel and sand	Mud and sand
59	Millenium Coastal Park, Burry Port	Fringing	Rock, slag, brick, gravel	Sand
60	Burry Port Harbour Mouth	Fringing	Gravel and sand	Sand
61	St Ishmael's Scar	Fringing	Gravel	Sand and mud
62	The Graig, Ferryside	Fringing	Gravel	Sand and mud
63	Ferryside	Fringing	Gravel and sand	Sand and mud
64	Ginst Point	Barrier Spit	Gravel and sand	Sand and mud
65	Pendine	Fringing	Gravel and sand	Sand
66	Morfa Bychan, Pendine	Pocket Beach	Gravel	Sand
67	Marros Sands	Fringing	Gravel	Sand
68	Amroth Beach	Fringing	Gravel and rock	Sand
69	Wiseman's Bridge Beach	Fringing	Gravel	Sand
70	Saundersfoot Beach	Fringing	Sand and gravel	Sand
71	Rhode Wood, Saundersfoot	Pocket Beach	Gravel	Sand
72	Monkstone Beach	Pocket Beach	Gravel	Sand
73	Waterwynch Bay	Pocket Beach	Gravel	Sand
74	Second Bay, Tenby	Pocket Beach	Gravel	Sand
75	First Bay, Tenby	Pocket Beach	Gravel	Sand
76	Tenby South Beach	Fringing	Sand and gravel	Sand
77	Drinkim Beach, Caldy Island	Pocket Beach	Cobble and gravel	Sand
78	Sandtop Bay, Caldy Island	Pocket Beach	Sand	Sand
79	Lydstep Haven	Fringing	Gravel and cobble	Sand
80	Church Doors, Skrinkle Haven	Pocket Beach	Sand	Sand
81	Manorbier Bay	Fringing	Gravel	Sand

Table A6 (continued)

ID	Localities	Morphological type	Nature of upper beach	Nature of lower beach
82	Swanlake Bay	Fringing	Gravel	Sand
83	Privar	Pocket Beach	Boulders, cobble, gravel	Sand
84	Greenala Point to Stackpole Quay	Fringing	Boulders, cobble, gravel	Sand
85	Stackpole Quay	Pocket Beach	Gravel	Sand
86	Mowingword	Pocket Beach	Boulders, cobble, gravel	Sand
87	Bullslaughter Bay	Pocket Beach	Gravel	Sand
88	Flimston Bay	Pocket Beach	Cobble and gravel	Sand
89	Pen-y-holt Bay	Pocket Beach	Cobble and gravel	Rock platform
90	Hobbyhorse Bay	Pocket Beach	Cobble and gravel	Rock platform
91	Blucks Pool	Pocket Beach	Sand and gravel	Sand and rock platform
92	Frainslake Sands	Fringing	Sand and gravel	Sand and rock platform
93	Little Furzenip	Fringing	Sand and gravel	Rock platform
94	Freshwater West	Fringing	Gravel and sand	Sand
95	Gravel Bay	Pocket Beach	Gravel	Rock platform
96	West Pickard Bay	Pocket Beach	Boulders, cobble and gravel	Sand and rock platform
97	West Angle Bay	Pocket Beach	Sand and gravel	Sand
98	The Ridge, Angle Bay	Barrier Spit	Gravel, rock	Mud and sand
99	Angle Bay East	Fringing	Gravel, rock	Mud and sand
100	Pembroke Dock	Fringing	Gravel, rock	Mud and sand
101	Cosheston Point to Mill Bay, Daugleddau	Fringing	Gravel, rock	Mud and sand
102	Burton Ferry	Fringing	Gravel, rock	Mud and sand
103	Neyland	Fringing	Gravel, rock	Mud and sand
104	Llanstadwell	Fringing	Gravel	Mud and sand
105	Newton Noyes, Milford Haven	Fringing	Gravel, rock	Mud and sand
106	Gelliswick Bay, Milford Haven	Fringing	Sand and gravel	Sand
107	Gelliswick Village, Milford Haven	Pocket Beach	Sand and gravel	Sand and rock platform
108	Little Wick, Milford Haven	Pocket Beach	Sand and gravel	Sand and rock platform
109	Kilroom	Pocket Beach	Sand and gravel	Sand
110	Sandy Haven	Fringing	Gravel, rock and sand	Sand
111	Sleeping Bay	Pocket Beach	Gravel, rock and sand	Sand
112	Butts Bay	Pocket Beach	Gravel, rock and sand	Sand
113	Longoar Bay	Pocket Beach	Gravel, rock and sand	Sand
114	Lindsway Bay	Pocket Beach	Boulder and gravel	Sand
115	Wenall Bay	Pocket Beach	Gravel	Sand and rock platform
116	Watch House Bay, Milford Haven	Pocket Beach	Gravel	Sand and rock platform
117	Monk Haven	Pocket Beach	Gravel	Sand and rock platform
118	Musselwick	Fringing	Gravel	Sand and rock platform
119	Pickleridge Beach	Barrier Beach/Spit	Gravel	Gravel and sand
120	Dale Beach	Fringing	Gravel	Gravel and sand
121	Castlebeach Bay	Pocket Beach	Gravel	Sand
122	Watwick Bay	Pocket Beach	Sand and gravel	Sand
123	Mill Bay	Pocket Beach	Gravel	Sand and rock platform
124	Windmill Cove	Pocket Beach	Gravel	Sand
125	Westdale Bay	Pocket Beach	Gravel	Sand
126	Marloes Sands	Fringing	Gravel, boulders, rock	Sand
127	Albion Sands	Pocket Beach	Gravel, boulders, rock	Sand and rock platform
128	Watery Bay	Pocket Beach	Gravel, boulders, rock	Sand and rock platform
129	Victoria Bay	Pocket Beach	Gravel, boulders, rock	Sand and rock platform
130	Little Castle Bay	Pocket Beach	Gravel, boulders, rock	Sand and rock platform
131	Rainy Rock Bay	Pocket Beach	Gravel, boulders, rock	Sand and rock platform
132	Three Doors Bay	Pocket Beach	Gravel, boulders, rock	Sand and rock platform
133	Deadman's Bay	Pocket Beach	Gravel, boulders, rock	Sand and rock platform
134	Renney Slip	Pocket Beach	Gravel, boulders, rock	Sand and rock platform
135	Jeffry's Haven south	Pocket Beach	Gravel	Sand and rock platform
136	Jeffry's Haven north	Pocket Beach	Gravel	Sand and rock platform
137	Martin's Haven	Pocket Beach	Gravel	Sand and rock platform
138	West hook Farm	Pocket Beach	Gravel	Sand and rock platform
139	Mill Haven	Pocket Beach	Gravel	Sand and rock platform
140	Brandy Bay	Pocket Beach	Gravel	Sand and rock platform
141	Messelwick	Pocket Beach	Gravel	Sand and rock platform
142	Rook's Bay	Pocket Beach	Gravel	Sand
143	Little Haven	Pocket Beach	Gravel	Sand
144	The Settlands	Pocket Beach	Gravel	Sand
145	Broad Haven	Fringing	Gravel	Sand
146	Harold Stone south	Pocket Beach	Gravel	Sand and rock platform
147	Harold Stone north	Pocket Beach	Gravel	Sand and rock platform
148	Black Point south	Pocket Beach	Gravel	Sand and rock platform
149	Settling Nose south	Pocket Beach	Gravel	Sand and rock platform
150	Settling Nose north	Pocket Beach	Gravel	Sand and rock platform
151	Druidston Haven	Fringing	Gravel	Sand
152	North Haven	Pocket Beach	Gravel	Sand
153	Madoc's Haven	Pocket Beach	Gravel	Sand
154	Nolton Haven	Pocket Beach	Gravel, rock	Sand
155	Newgale Sands: Maidenhall Pt-Bathesland	Fringing	Gravel	Sand
156	Newgale Sands: Bathesland-Sibbernock	Barrier Beach	Gravel	Sand
157	Newgale Sands:Sibbernock-Newgale	Barrier Beach	Gravel, cobble	Sand
158	Porthmynawyd	Pocket Beach	Gravel	Sand
159	Aber Dwyrain	Pocket Beach	Gravel	Sand
160	Porth y Bŵch, Solva	Pocket Beach	Gravel	Sand
161	Gwadn, Solva	Pocket Beach	Gravel	Sand
162	Loch Warren	Pocket Beach	Gravel	Sand

Table A6 (continued)

ID	Localities	Morphological type	Nature of upper beach	Nature of lower beach
163	Aber Llong	Pocket Beach	Gravel	Sand
164	Porth y Rhaw	Pocket Beach	Gravel	Sand
165	Caer Bwdy Bay	Pocket Beach	Gravel	Sand
166	Caerfai Bay	Pocket Beach	Gravel	Sand
167	Porthlysgi Bay	Pocket Beach	Gravel, rock	Sand, rock
168	Porth Lleuog, Ramsey Island	Pocket Beach	Gravel	Sand
169	Aber Mawr, Ramsey Island	Pocket Beach	Gravel	Sand
170	Whitesands Bay	Fringing	Gravel	Sand
171	Porth Lleuog	Pocket Beach	Gravel	Sand
172	Porthmelgan	Pocket Beach	Gravel	Sand
173	Porth y Rhaw	Pocket Beach	Gravel	Sand
174	Abereiddi Bay	Pocket Beach	Gravel	Sand
175	Traeth Llyfn	Pocket Beach	Gravel, rock sand	Sand
176	Porth Egr	Pocket Beach	Gravel, rock sand	Sand
177	Aberfelin, Trefin	Pocket Beach	Gravel	Gravel
178	Pwll Olfa	Pocket Beach	Gravel	Gravel
179	Pwll Llong	Pocket Beach	Gravel	Gravel
180	Pwll Whiting	Pocket Beach	Gravel	Gravel
181	Ynys Deullyn	Pocket Beach	Gravel	Gravel
182	Aber Castle	Pocket Beach	Gravel	Sand
183	Pwllstrodur	Pocket Beach	Gravel	Sand
184	Aber Mawr	Barrier Beach	Gravel	Sand
185	Aber Bach, St Nicholas	Barrier Spit	Gravel	Sand
186	Porth Dwgan	Pocket Beach	Gravel	Gravel
187	Pwllcrochan	Pocket Beach	Rock, boulder, gravel	Sand
188	Pwlldawnau	Pocket Beach	Gravel	Gravel
189	Pwll Deri	Pocket Beach	Gravel	Gravel
190	Porth Maenmelyn	Pocket Beach	Gravel	Sand
191	Pwlluog	Pocket Beach	Gravel	Sand
192	Porthsychan	Pocket Beach	Gravel	Sand
193	Aber Felin	Pocket Beach	Gravel	Sand
194	Porth Maen	Pocket Beach	Gravel	Sand
195	Pwll Hir	Pocket Beach	Gravel	Sand
196	Goodwick Sands North	Fringing	Gravel	Sand
197	Goodwick Sands South	Fringing	Gravel	Sand
198	Lampit Mawr	Pocket Beach	Gravel	Gravel
199	Aber Gwaun	Fringing	Gravel	Single and mud
200	Pwll Landdu	Pocket Beach	Gravel	Gravel
201	Pwell Edyn	Pocket Beach	Gravel	Gravel
202	Pwll Ceunant	Pocket Beach	Gravel	Gravel
203	Aber Richard	Pocket Beach	Gravel	Gravel
204	Pwll y Blewyn	Pocket Beach	Gravel	Gravel
205	Aber Grugog	Pocket Beach	Gravel	Gravel
206	Aber Hywel	Pocket Beach	Gravel	Gravel
207	Carreg Pen-las	Pocket Beach	Gravel	Sand
208	Aber Bach, Fishguard	Pocket Beach	Gravel	Sand
209	Pwll Gwylog	Pocket Beach	Gravel	Sand
210	Cwm-yr-Eglwys, Afon Teifi	Pocket Beach	Gravel	Sand
211	Aber Fforest	Pocket Beach	Gravel	Sand
212	Aber Rhigian	Pocket Beach	Gravel	Sand
213	Traeth Cell-Howel	Fringing	Gravel, rock	Gravel, rock
214	Ceibwr Bay	Pocket Beach	Gravel	Gravel, rock
215	Traeth y Rhedyn	Fringing	Gravel, rock	Gravel, rock
216	Traeth Godir-coch	Fringing	Gravel, rock	Gravel, rock
217	Careg Aderyn	Fringing	Gravel, rock	Gravel, rock
218	Pwll Edrych	Fringing	Gravel, rock	Gravel, rock
219	Pwll Melyn	Fringing	Gravel, rock	Gravel, rock
220	Pen yr Ergyd	Barrier Spit	Gravel	Sand
221	Llangrannog	Pocket Beach	Sand	Sand
222	Traeth y Gaerglwyd	Pocket Beach	Gravel, rock	Gravel, rock
223	Cwmtydu	Pocket Beach	Gravel and sand	Gravel and sand
224	Castell Bach	Pocket Beach	Gravel	Sand
225	Traeth y Coubal	Fringing	Gravel, rock	Gravel, rock
226	Llech Cimwch	Fringing	Gravel, rock	Gravel, rock
227	Traeth y Quarry	Pocket Beach	Gravel, rock	Gravel, rock
228	New Quay Bay	Fringing	Cobble and gravel	Sand
229	Little Quay Bay	Fringing	Gravel	Sand
230	Gilfach-yr-Halen to Clogfryn	Fringing	Gravel, rock	Gravel, rock
231	Aberaeron south	Fringing	Gravel	Sand
232	Aberaeron north	Fringing	Gravel	Rock, gravel
233	Aberaeron to Aberarth	Fringing	Gravel	Rock, gravel
234	Aberarth	Barrier Beach/Spit	Gravel	Rock, gravel
235	Aberarth to Morfa Mawr	Fringing	Gravel	Rock, gravel
236	Morfa Mawr	Barrier Beach/Spit	Gravel	Rock, gravel
237	Morfa Mawr to Llanonn	Fringing	Gravel	Rock, gravel
238	Llannon	Barrier Beach/Spit	Gravel	Rock, gravel
239	Llannon to Llansantffraid	Fringing	Gravel	Rock, gravel
240	Llansantffraid	Barrier Beach/Spit	Gravel	Rock, gravel
241	Llansantffraid to Llanrhystud	Fringing	Gravel	Rock, gravel
242	Llanrhystud	Barrier Beach/Spit	Gravel	Sand
243	Llanrhystud to Carreg Ti-pw	Fringing	Gravel	Rock, gravel

Table A6 (continued)

ID	Localities	Morphological type	Nature of upper beach	Nature of lower beach
244	Carreg Ti-pw to Pinderi Cliffs	Fringing	Gravel	Rock, gravel
245	Twll Twrw to Traeth Tanybwlch	Fringing	Boulders and gravel	Gravel
246	Traeth Tanybwlch, Aberystwyth	Barrier Beach/Spit	Gravel	Gravel
247	South Beach, Aberystwyth	Fringing	Gravel	Gravel
248	North Beach, Aberystwyth	Fringing	Gravel	Gravel
249	Constitution Hill	Fringing	Gravel	Rock, gravel
250	Clarach Bay	Barrier Beach/Spit	Gravel	Sand
251	Wallog Beach	Fringing	Cobble and gravel	Gravel, sand and rock
252	Pen-y-graig	Pocket Beach	Gravel	Sand
253	Borth Sands	Barrier Spit	Gravel	Sand
254	Aberdovey to Tywyn	Barrier Beach	Gravel	Sand
255	Tywyn	Fringing	Gravel	Sand
256	Tywyn to Aber Dysynni	Barrier Spit	Gravel	Sand
257	Tonfanau to Gallt Ffynnon yr Hydd	Fringing	Gravel and cobble	Gravel and sand
258	Ro Wen, Fairbourne	Barrier Spit	Cobble and gravel	Sand
259	Afon Mawddach, Barmouth	Fringing	Gravel	Sand
260	Ynys y Brawd, Barmouth	Fringing	Gravel	Sand
261	Barmouth Promenade	Fringing	Gravel	Sand
262	Barmouth to Llanaber	Fringing	Gravel and sand	Sand
263	Ceunant Egryn, Llanaber	Barrier Beach	Gravel	Sand
264	Afon Ysgethin, Tal-y-bont	Barrier Spit	Gravel	Sand
265	Shell Island	Fringing	Gravel	Gravel and sand
266	Shell Island Spit	Barrier Spit	Gravel	Gravel and sand
267	Llandanwg Spit	Barrier Spit	Gravel	Gravel and sand
268	Llandanwg to Harlech	Fringing	Gravel	Gravel and sand
269	Graig Ddu to Criccieth	Barrier Beach	Gravel	Sand
270	Criccieth	Fringing	Gravel	Gravel and sand
271	Afon Dwyfor	Barrier Spit	Gravel	Sand
272	Glannllynnau	Fringing	Gravel	Sand
273	Afon Wen	Barrier Beach/Spit	Gravel	Sand
274	Hafan y Mor	Fringing	Gravel	Sand
275	Pen-ychain to Pwllheli	Barrier Beach	Gravel	Sand and gravel
276	Carreg yr Imbill	Fringing	Gravel	Sand
277	Traeth Crugan	Barrier Beach	Gravel and sand	Sand
278	Llanbedrog Beach	Fringing	Sand and gravel	Sand
279	Porth Ceiriad	Fringing	Gravel and sand	Sand
280	Porth Neigwl	Fringing	Gravel and sand	Sand
281	Porth Ysgo	Fringing	Cobble and gravel	Sand
282	Aberdaron Bay	Fringing	Gravel	Sand
283	Porth Meudwy	Pocket Beach	Gravel	Sand
284	Porth Ferin	Pocket Beach	Gravel	Sand
285	Porth Ty-mawr	Fringing	Gravel	Rock
286	Traeth Penllech	Fringing	Gravel	Sand
287	Bryn Gwydd south	Pocket Beach	Gravel	Sand
288	Bryn Gwydd north	Pocket Beach	Gravel	Sand
289	Aber Geirch	Pocket Beach	Gravel	Sand
290	Borth Wen	Pocket Beach	Gravel	Sand
291	Porth Dinllaen	Fringing	Gravel and sand	Sand
292	Porth Nefyn	Fringing	Gravel and sand	Sand
293	Porth Pistyll	Fringing	Gravel	Gravel and sand
294	Porth y Nant	Fringing	Gravel	Gravel and sand
295	Yr Eifl Beach, Trefor	Fringing	Gravel	Gravel
296	Trefor to Aberdesach	Fringing	Gravel	Gravel and sand
297	Aberdesach	Barrier Beach/Spit	Gravel	Sand, rock
298	Aberdesach to Trwyn Maen Dylan	Fringing	Gravel	Sand, rock
299	Trwyn Maen Dylan	Barrier Beach/Spit	Gravel	Sand, rock
300	Trwyn Maen Dylan to Pontllyfni	Fringing	Gravel	Sand, rock
301	Pontllyfni to Ynys	Barrier Beach/Spit	Gravel	Sand, rock
302	Ynys to Dinas Dinlle	Barrier Beach	Gravel	Sand, rock
303	Dinas Dinlle Fort	Fringing	Gravel	Sand
304	Morfa Dinlle	Barrier Spit	Gravel	Sand
305	Afon Gwyrfai to Caernarfon	Fringing	Boulder and gravel	Boulder and gravel
306	Caernarfon to Plas Menai	Fringing	Boulder and gravel	Boulder and gravel
307	Y Felinheli	Fringing	Boulder and gravel	Boulder and gravel
308	Y Felinheli to Pont Britannia	Fringing	Boulder and gravel	Boulder and gravel
309	Pont Britannia to Pwll-fanogl	Fringing	Boulder and gravel	Boulder and gravel
310	Moel-y-don to Afon Braint, Anglesey	Fringing	Boulder and gravel	Boulder and gravel
311	Abermenai	Barrier Spit	Sand and gravel	Sand
312	Traeth Llanddwyn	Fringing	Sand and gravel	Sand
313	Tywyn Fferam, Anglesey	Fringing	Gravel	Sand
314	Traeth Llydan, Holy Island	Pocket Beach	Sand and gravel	Sand
315	Borthwen, Holy Island	Pocket Beach	Gravel	Sand
316	Porthygaran, Holy Island	Pocket Beach	Gravel	Gravel
317	Lee Caravan Park, Holy Island	Pocket Beach	Gravel	Gravel
318	Porth Diana, Holy Island	Pocket Beach	Gravel	Gravel
319	Trearddur Bay, Holy Island	Fringing	Sand and gravel	Sand
320	Porth Isallt-bach, Holy Island	Pocket Beach	Gravel	Sand
321	Porth yr Afon, Holy Island	Pocket Beach	Gravel	Sand
322	Porth yr Afon to Porth t Pwll, Holy Is.	Fringing	Gravel	Sand
323	Porth y Pwll, Holy Island	Pocket Beach	Gravel	Sand
324	Porth-y-post, Holy Island	Pocket Beach	Gravel	Sand

Table A6 (continued)

ID	Localities	Morphological type	Nature of upper beach	Nature of lower beach
325	Porth y Corwgl, Holy Island	Pocket Beach	Gravel	Sand
326	Abraham's Bosom, Holy Island	Fringing	Gravel	Rock platform
327	Soldiers Point, Holy Island	Pocket Beach	Gravel	Gravel
328	Peibio	Fringing	Gravel	Rock platform
329	Traeth Penrhos, Holy Island	Fringing	Gravel	Sand
330	Penrhos to Gorsedd-y-penrhyn	Fringing	Gravel	Sand and rock
331	Gorsedd-y-penrhyn to Stanley Embkt.	Fringing	Gravel	Sand and mud
332	Ynys Leurad, Anglesey	Fringing	Gravel	Sand and mud
333	Valley, Anglesey	Fringing	Gravel	Sand and mud
334	Traeth y Gribin, Anglesey	Fringing	Gravel	Sand and mud
335	Porth Penrhyn-mawr, Anglesey	Fringing	Gravel	Sand and mud
336	Porth Delysg, Anglesey	Fringing	Gravel	Rock platform
337	Twyn Cliperau, Anglesey	Fringing	Gravel	Rock platform
338	Porth Tywyn-mawr, Anglesey	Fringing	Sand and gravel	Sand
339	Porth Defaid, Anglesey	Fringing	Gravel	Rock platform
340	Porth Trefadog, Anglesey	Fringing	Gravel	Sand
341	Porth Ffynnon to Porth Swtan	Fringing	Gravel, rock	Rock platform
342	Traeth Ynys y Fydlyn, Anglesey	Barrier Beach	Gravel	Rock platform
343	Porth Newydd to Porth Tywodog	Fringing	Gravel, rock	Rock platform
344	Hen Borth, Anglesey	Pocket Beach	Gravel	Gravel
345	Hen Borth to Trwyn Cemlyn	Fringing	Gravel	Rock platform
346	Cemlyn Bay, Anglesey	Barrier Beach	Gravel	Gravel
347	Porth-y-pistyll, Anglesey	Pocket Beach	Gravel	Gravel
348	Porth y Wylfa, Anglesey	Pocket Beach	Gravel	Gravel
349	Porth Llanlleiana, Anglesey	Pocket Beach	Gravel	Gravel and rock
350	Porth Wen, Anglesey	Fringing	Gravel	Rock
351	Porth-Llechog, Anglesey	Fringing	Gravel	Rock
352	Porth Eilian, Anglesey	Pocket Beach	Gravel	Sand
353	Porthygwidhiaid, Anglesey	Pocket Beach	Gravel	Rock platform
354	Porth Helygen to Porth Garreg-fawr	Fringing	Gravel	Rock platform
355	Dulas Bay, Anglesey	Barrier Spit	Gravel and sand	Sand
356	Traeth yr Ora	Fringing	Gravel and sand	Sand and gravel
357	Porth y Mor, Anglesey	Fringing	Gravel and sand	Sand
358	Traeth Lligwy, Anglesey	Fringing	Gravel and sand	Sand
359	Porth Forllwyd, Anglesey	Pocket Beach	Gravel and sand	Sand
360	Porth Helaeth, Anglesey	Fringing	Gravel	Sand and rock
361	Porth yr Ynys, Anglesey	Pocket Beach	Gravel	Sand and rock
362	Porth Moelfre, Anglesey	Fringing	Gravel	Sand
363	Porth yr Aber, Anglesey	Fringing	Gravel	Sand
364	Porth y Rhos, Anglesey	Fringing	Gravel	Sand
365	Traeth Bychan, Anglesey	Fringing	Gravel, rock	Sand
366	Borth Wen, Anglesey	Fringing	Gravel	Rock platform
367	Benllech Sand, Anglesey	Fringing	Gravel	Sand
368	Porthllongdy Spit	Spit	Gravel	Sand, mud
369	Traeth-coch, Anglesey	Fringing	Gravel, sand	Sand, mud
370	Tan Dinas Quarry, Anglesey	Pocket Beach	Gravel	Sand
371	Fedw Fawr West, Anglesey	Pocket Beach	Gravel	Sand
372	Fedw Fawr East, Anglesey	Pocket Beach	Gravel	Sand
373	Trwyn Dinmor to Trwyn Du	Fringing	Gravel	Sand
374	Trwyn Du to Beaumaris, Anglesey	Fringing	Boulder, gravel, sand	Gravel, sand, mud
375	Gallows Point, Beaumaris, Anglesey	Tombolo	Gravel	Gravel, sand, mud
376	Penrhyn Park	Fringing	Gravel	Sand, mud
377	The Spinnies, Aber-Ogwen	Beach Ridge Plain	Gravel	Sand, mud
378	Aber-Ogwen to Coed Gyfynys	Fringing	Gravel	Sand, mud
379	Coed Gyfynys to Wig Bach	Beach Ridge Plain	Gravel	Sand, mud
380	Wig Bach to Afon Aber	Fringing	Gravel	Sand, mud
381	Afon Aber	Alluvial Fan Delta	Gravel	Sand, mud
382	Afon Aber to Glan y mor Elias	Barrier Beach	Gravel	Sand, mud
383	Llanfairfechan Spit	Barrier Spit	Gravel	Sand, mud
384	Llanfairfechan Town	Fringing	Gravel	Sand, mud
385	Penmaenmawr to Penmaen-bach	Fringing	Cobble, Gravel	Sand
386	Conwy Morfa	Fringing	Gravel	Sand
387	Deganwy	Fringing	Gravel	Sand
388	Llandudno West Shore	Fringing	Gravel	Sand
389	Great Orme West Shore	Fringing	Gravel	Sand
390	Llandudno Bay	Fringing	Gravel	Sand
391	Penrhyn Bay	Fringing	Gravel, cobbles	Sand
392	Rhos on Sea	Fringing	Gravel	Sand
393	Colwyn Bay	Fringing	Gravel	Sand
394	Penmaen Rhos	Fringing	Gravel	Sand
395	Llanddulas	Fringing	Gravel	Sand
396	Pensarn	Beach Ridge Plain	Gravel	Sand
397	Belgrano to Kinmel Bay	Fringing	Gravel	Sand
398	Horton's Nose, Kinmel Bay	Barrier Spit	Sand and gravel	Sand
399	Rhyl	Fringing	Gravel, cobbles	Sand
400	Barkby Beach to Gronant	Barrier Beach/Spit	Gravel, cobbles	Sand
401	Gronant to Talacre	Fringing	Gravel, sand	Sand, mud
402	Point of Ayr	Barrier Spit	Gravel, sand	Sand, mud
403	Ffynnongroyw to Greenfield	Fringing	Gravel	Mud

Table A7 Nature of the hinterland and back beach

ID	Localities	Nature of hinterland	Nature of back beach
1	Sudbrook Point	Farmland, urban, solar farm	Cliff
2	West Pill, Rogiet	Farmland	Embankment
3	Portland Grounds (Redwick to Goldcliff)	Farmland	Embankment
4	Goldcliff Pill	Farmland, wildlife reserve	Embankment
5	Newgout Pill, Wentlooge	Farmland	Embankment
6	West Usk Lighthouse, Wentlooge	Farmland	Embankment
7	Outfall Lane, Wentlooge	Farmland, lake	Rock armour, embankment
8	Cardiff Flats	Industry, water treatment works	Cliff
9	Penarth to Lavernock Point	Urban, farmland	Cliff
10	Lavernock Point to Swanbridge	Urban, farmland	Cliff
11	Barry Harbour	Urban	Cliff, rock armour, sea wall
12	Watch House Bay, Barry	Urban	Promenade
13	Pebble Beach, Barry	Woodland, urban	Sea wall and cliffs
14	Porthkerry	Country park, mini golf	Gravel barrier
15	Bulwarks Fort to Rhoose Point	Woodland, caravans, quarry, farmland	Cliff
16	Watch House Beach, East Aberthaw	Marsh, railway	Gravel barrier
17	Leys Beach, East Aberthaw	Power station	Sea wall, groynes, cliff
18	West Aberthaw	Farmland	Gravel barrier, WWII Anti Tank blocks
19	Aberthaw to St Donats	Farmland	Cliff
20	Nash Point to Cwm Nash	Farmland	Cliff
21	Traeth Mawr, Broughton	Farmland	Cliff
22	Traeth Bach, Broughton	Farmland	Cliff
23	Dunraven Bay	Farmland, car park	Cliff, sea wall
24	Ogmore-by-Sea	Urban	Cliff
25	Pwll y Defaid, Merthyr-mawr Warren	Dunes	Dunes
26	Black Rocks, Porthcawl	Dunes	Dunes
27	Trecco Bay, Porthcawl	Caravans	Sea wall
28	Seafront Beach, Porthcawl	Urban	Sea wall
29	West Beach, Porthcawl	Urban	Sea wall
30	Rest Bay, Porthcawl	Golf course	Rock, dunes
31	Kenfig Sands	Dunes	Dunes
32	Afon Cynffig	Dunes	Dunes
33	Margam Sands	Dunes, industrial workings	Dunes, rock armour
34	Port Talbot Harbour	Industrial workings	Rock armour, dunes
35	Baglan Burrows	Urban, industrial workings, dunes	Dunes, sea wall, rock armour
36	Mumbles	Urban	Sea wall
37	Bracelet Bay, Gower	Heath	Cliff
38	Limeslade Bay, Gower	Heath	Cliff
39	Langland Bay, Gower	Urban, golf course	Sea wall, cliff
40	Caswell Bay	Heath, woodland, urban	Cliff, sea wall
41	Brandy Cove	River valley, woodland	Cliff
42	Pwlldu Bay	River valley, woodland	Gravel barrier
43	Pobbles Beach	Heath	Cliff
44	Pennard Burrows	Heath, river valley	Gravel barrier
45	Oxwich Bay	Dunes, heath, river valley	Dunes, cliff
46	Holy's Wash	Heath	Cliff
47	Port-Eynon Bay	Dunes, heath	Dunes, cliff
48	Port-Eynon Point	Heath, camp site	Cliff
49	Overton Mere	Heath	Cliff
50	Common Cliff	Heath	Cliff
51	Ram Grove	Heath	Cliff
52	Kitchen Corner south	Heath	Cliff
53	Kitchen Corner north	Heath	Cliff
54	Rhossili Bay	Dunes, heath	Dunes, cliff
55	Whiteford Point	Dunes	Dunes
56	Machynys, Loughor Estuary	Marsh, urban	Sea wall, rock armour, groynes
57	Llanelli Harbour Mouth	Marsh, urban, harbour	Sea wall, rock armour, groynes, dunes
58	Tywyn Bach, Burry Port	Heath	Rock armour, embankment
59	Millenium Coastal Park, Burry Port	Heath	Dunes
60	Burry Port Harbour Mouth	Caravan Park, Urban	Dunes
61	St Ishmael's Scar	Caravans, Railway	Sea wall, cliff
62	The Graig, Ferryside	Railway, caravans, urban	Embankment, rock armour
63	Ferryside	Urban, railway	Rock armour, seawall, dunes
64	Ginst Point	Dunes	Dunes
65	Pendine	Dunes	Dunes
66	Morfa Bychan, Pendine	Heath	Cliff
67	Marros Sands	Heath	Cliff
68	Amroth Beach	Heath, urban, caravans	Sea wall, groynes, cliff
69	Wiseman's Bridge Beach	Caravans, urban	Sea wall, rock armour
70	Saundersfoot Beach	Woodland, urban, harbour	Sea wall, cliff
71	Rhode Wood, Saundersfoot	Woodland	Cliff
72	Monkstone Beach	Woodland	Cliff
73	Waterwynch Bay	Garden	Cliff
74	Second Bay, Tenby	Heath	Cliff
75	First Bay, Tenby	Heath	Cliff
76	Tenby South Beach	Golf course, dune, urban, woodland	Dune
77	Drinkim Beach, Caldy Island	Farmland	Cliff
78	Sandtop Bay, Caldy Island	Farmland	Dunes, cliff
79	Lydstep Haven	Caravans	Rock armour
80	Church Doors, Skrinkle Haven	Farmland	Cliff
81	Manorbier Bay	Dunes, heath	Dunes, cliff

Table A7 (continued)

ID	Localities	Nature of hinterland	Nature of back beach
82	Swanlake Bay	Farmland	Cliff
83	Privar	Farmland	Cliff
84	Greenala Point to Stackpole Quay	Farmland	Cliff
85	Stackpole Quay	Farmland, woodland	Cliff
86	Mowingword	Farmland	Cliff
87	Bullslaughter Bay	Heath	Cliff
88	Flimston Bay	Heath	Cliff
89	Pen-y-holt Bay	Heath	Cliff
90	Hobbyhorse Bay	Heath	Cliff
91	Blucks Pool	Dunes	Dunes, cliff
92	Frainslake Sands	Dunes	Dunes
93	Little Furzenip	Dunes	Dunes, cliff
94	Freshwater West	Dunes	Dunes, cliff
95	Gravel Bay	Heath	Cliff
96	West Pickard Bay	Heath	Cliff
97	West Angle Bay	Caravans, farmland	Cliff
98	The Ridge, Angle Bay	Marsh, farmland	Cliff
99	Angle Bay East	Heath, farmland	Cliff
100	Pembroke Dock	Farmland, urban, industry	Cliff
101	Cosheston Point to Mill Bay, Daugleddau	Farmland, woodland	Cliff
102	Burton Ferry	Farmland, urban	Cliff
103	Neyland	Urban	Cliff
104	Llanstadwell	Marsh, urban	Gravel barrier
105	Newton Noyes, Milford Haven	Farmland, industry	Cliff
106	Gelliswick Bay, Milford Haven	Golf course, urban	Sea wall
107	Gelliswick Village, Milford Haven	Golf course, urban	Cliff
108	Little Wick, Milford Haven	Industry	Cliff
109	Kilroom	Industry	Cliff
110	Sandy Haven	Farmland	Cliff
111	Sleeping Bay	Farmland	Cliff
112	Butts Bay	Farmland	Cliff
113	Longoar Bay	Farmland	Cliff
114	Lindsway Bay	Farmland	Cliff
115	Wenall Bay	Farmland	Cliff
116	Watch House Bay, Milford Haven	Farmland	Cliff
117	Monk Haven	Woodland	Cliff
118	Musselwick	Farmland	Cliff
119	Pickleridge Beach	Lagoon, river valley	Gravel barrier
120	Dale Beach	River valley, car park, urban	Sea wall
121	Castlebeach Bay	Woodland	Cliff
122	Watwick Bay	Heath	Cliff
123	Mill Bay	Farmland	Cliff
124	Windmill Cove	Farmland	Cliff
125	Westdale Bay	Farmland, river valley	Cliff
126	Marloes Sands	Farmland	Cliff
127	Albion Sands	Heath	Cliff
128	Watery Bay	Heath	Cliff
129	Victoria Bay	Heath	Cliff
130	Little Castle Bay	Heath	Cliff
131	Rainy Rock Bay	Heath	Cliff
132	Three Doors Bay	Heath	Cliff
133	Deadman's Bay	Heath	Cliff
134	Renney Slip	Heath	Cliff
135	Jeffry's Haven south	Heath	Cliff
136	Jeffry's Haven north	Heath	Cliff
137	Martin's Haven	Farmland	Cliff
138	West hook Farm	Farmland	Cliff
139	Mill Haven	Farmland	Cliff
140	Brandy Bay	Farmland	Cliff
141	Messelwick	Heath	Cliff
142	Rook's Bay	Heath	Cliff
143	Little Haven	Urban	Sea wall
144	The Settlands	Heath	Cliff
145	Broad Haven	Urban, river valley	Sea wall
146	Harold Stone south	Farmland	Cliff
147	Harold Stone north	Farmland	Cliff
148	Black Point south	Farmland	Cliff
149	Settling Nose south	Farmland	Cliff
150	Settling Nose north	Farmland	Cliff
151	Druidston Haven	Farmland	Cliff
152	North Haven	Farmland	Cliff
153	Madoc's Haven	Farmland	Cliff
154	Nolton Haven	River valley, urban, caravans	Cliff
155	Newgale Sands: Maidenhall Pt-Bathesland	Heath, farmland	Cliff
156	Newgale Sands: Bathesland-Sibbernock	Marsh, river valley, caravans	Gravel barrier
157	Newgale Sands:Sibbernock-Newgale	Farmland, river valley, urban, caravans	Gravel barrier, sea wall
158	Porthmynawyd	Heath	Cliff
159	Aber Dwyrain	Heath	Cliff
160	Porth y Bŵch, Solva	Farmland	Cliff
161	Gwadn, Solva	Farmland	Cliff
162	Loch Warren	Farmland	Cliff

Table A7 (continued)

ID	Localities	Nature of hinterland	Nature of back beach
163	Aber Llong	Farmland	Cliff
164	Porth y Rhaw	Farmland	Cliff
165	Caer Bwdy Bay	River valley, farmland	Cliff
166	Caerfai Bay	Farmland	Cliff
167	Porthlysgi Bay	Farmland	Cliff
168	Porth Lleuog, Ramsey Island	Heath	Cliff
169	Aber Mawr, Ramsey Island	Farmland	Cliff
170	Whitesands Bay	Heath	Cliff
171	Porth Lleuog	Farmland	Cliff
172	Porthmelgan	Farmland	Cliff
173	Porth y Rhaw	Farmland	Cliff
174	Abereiddi Bay	Car Park, river valley	Sea wall, cliff
175	Traeth Llyfn	Farmland	Cliff
176	Porth Egr	Farmland	Cliff
177	Aberfelin, Trefin	Farmland	Cliff
178	Pwll Olfa	Farmland	Cliff
179	Pwll Llong	Farmland	Cliff
180	Pwll Whiting	Farmland	Cliff
181	Ynys Deullyn	Farmland	Cliff
182	Aber Castle	River valley, urban	Sea wall, cliff
183	Pwllstrodur	River valley, farmland	Cliff
184	Aber Mawr	River valley	Gravel barrier, cliff
185	Aber Bach, St Nicholas	River valley	Gravel barrier, cliff
186	Porth Dwgan	Heath, Farmland	Cliff
187	Pwllcrochan	Farmland	Cliff
188	Pwlldawnau	Farmland	Cliff
189	Pwll Deri	Heath	Cliff
190	Porth Maenmelyn	Farmland	Cliff
191	Pwlluog	Heath, Farmland	Cliff
192	Porthsychan	Heath	Cliff
193	Aber Felin	Farmland	Cliff
194	Porth Maen	Heath, Farmland	Cliff
195	Pwll Hir	Heath	Cliff
196	Goodwick Sands North	River valley	Embankment, rock armour
197	Goodwick Sands South	River valley	Embankment, groynes
198	Lampit Mawr	Heath	Cliff
199	Aber Gwaun	Urban, woodland	Sea wall
200	Pwll Landdu	Farmland	Cliff
201	Pwell Edyn	Farmland	Cliff
202	Pwll Ceunant	Farmland	Cliff
203	Aber Richard	Farmland	Cliff
204	Pwll y Blewyn	Farmland	Cliff
205	Aber Grugog	Farmland	Cliff
206	Aber Hywel	Farmland	Cliff
207	Carreg Pen-las	Farmland	Cliff
208	Aber Bach, Fishguard	River valley	Cliff
209	Pwll Gwylog	Farmland	Cliff
210	Cwm-yr-Eglwys, Afon Teifi	River valley, urban	Sea wall
211	Aber Fforest	River valley, farmland	Gravel barrier, cliff
212	Aber Rhigian	River valley, farmland	Gravel barrier, cliff
213	Traeth Cell-Howel	Farmland	Cliff
214	Ceibwr Bay	River valley	Gravel barrier, cliff
215	Traeth y Rhedyn	Farmland	Cliff
216	Traeth Godir-coch	Farmland	Cliff
217	Careg Aderyn	Heath, woodland	Cliff
218	Pwll Edrych	Heath, woodland	Cliff
219	Pwll Melyn	Farmland	Cliff
220	Pen yr Ergyd	Estuary, caravans	Gravel barrier
221	Llangrannog	Urban, car park	Sea wall, cliff
222	Traeth y Gaerglwyd	Heath, Farmland	Cliff
223	Cwmtydu	Car Park, river valley	Sea wall, cliff
224	Castell Bach	River valley, cliff	Gravel barrier, cliff
225	Traeth y Coubal	Heath, Farmland	Cliff
226	Llech Cimwch	Heath, Farmland	Cliff
227	Traeth y Quarry	Heath, Farmland	Cliff
228	New Quay Bay	Caravans, urban	Cliff
229	Little Quay Bay	Heath, caravans, farmland	Cliff, groynes
230	Gilfach-yr-Halen to Clogfryn	Heath, Farmland	River valley, Cliff
231	Aberaeron south	Farmland, urban	Gravel barrier, sea wall, rock armour
232	Aberaeron north	Farmland, urban, caravan	Gravel barrier, sea wall
233	Aberaeron to Aberarth	Farmland	Cliff
234	Aberarth	River valley, urban	Gravel barrier, breakwater, river valley
235	Aberarth to Morfa Mawr	Farmland	Cliff
236	Morfa Mawr	Farmland, river valley	Gravel barrier, river valley
237	Morfa Mawr to Llanonn	Farmland	Cliff
238	Llannon	Farmland, river valley	Gravel barrier, river valley
239	Llannon to Llansantffraid	Farmland	Cliff
240	Llansantffraid	Farmland, river valley	Gravel barrier, river valley
241	Llansantffraid to Llanrhystud	Farmland	Cliff
242	Llanrhystud	Farmland, caravans, river valley	Gravel barrier, river valley
243	Llanrhystud to Carreg Ti-pw	Farmland, caravans	Cliff

Table A7 (continued)

ID	Localities	Nature of hinterland	Nature of back beach
244	Carreg Ti-pw to Pinderi Cliffs	Farmland	Cliff
245	Twll Twrw to Traeth Tanybwlch	Farmland, caravans	Cliff
246	Traeth Tanybwlch, Aberystwyth	Farmland, river valley	Gravel barrier
247	South Beach, Aberystwyth	Urban	Sea wall
248	North Beach, Aberystwyth	Urban	Sea wall
249	Constitution Hill	Farmland, amenities	Cliff
250	Clarach Bay	Caravans, amusements, farmland	Natural barrier, sea wall
251	Wallog Beach	Heath, farmland	Cliff
252	Pen-y-graig	Farmland	Cliff
253	Borth Sands	Urban, golf course, dunes	Sea wall, groynes, dune
254	Aberdovey to Tywyn	Dunes, marsh, golf course	Dunes
255	Tywyn	Urban	Sea wall, groynes
256	Tywyn to Aber Dysynni	Marsh, railway	Gravel barrier, embankment
257	Tonfanau to Gallt Ffynnon yr Hydd	Heath, farmland, caravans	Cliff
258	Ro Wen, Fairbourne	Farmland, urban, marsh	Sea wall, gravel barrier
259	Afon Mawddach, Barmouth	Urban	Cliff
260	Ynys y Brawd, Barmouth	Dunes	Dunes
261	Barmouth Promenade	Urban	Sea wall
262	Barmouth to Llanaber	Railway, urban, farmland	Sea wall, embankment, rock armour
263	Ceunant Egryn, Llanaber	Marsh, railway	Gravel barrier
264	Afon Ysgethin, Tal-y-bont	River valley, heath, caravans	Gravel barrier
265	Shell Island	Camping site, marsh	Cliff
266	Shell Island Spit	Marina, marsh, camping site	Gravel barrier
267	Llandanwg Spit	Dune, marsh holiday homes	Gravel barrier
268	Llandanwg to Harlech	Holiday homes, caravans, railway	Cliff, embankment
269	Graig Ddu to Criccieth	Heath, urban	Gravel barrier, embankment
270	Criccieth	Urban, railway, farmland	Cliff, sea wall
271	Afon Dwyfor	Farmland, railway	Gravel barrier
272	Glannllynnau	Farmland	Cliff
273	Afon Wen	Farmland, railway	Gravel barrier, embankment, rock armour
274	Hafan y Mor	Caravans	Cliff
275	Pen-ychain to Pwllheli	Heath, railway, urban	Dunes, gravel barrier
276	Carreg yr Imbill	Caravans	Cliff
277	Traeth Crugan	Dunes, gold course, urban, marsh	Dunes, sea wall, rock armour
278	Llanbedrog Beach	Farmland, urban	Cliff
279	Porth Ceiriad	Heath	Cliff
280	Porth Neigwl	Farmland	Cliff
281	Porth Ysgo	Farmland	Cliff
282	Aberdaron Bay	Farmland, urban	Cliff, sea wall
283	Porth Meudwy	Farmland	River valley, cliff
284	Porth Ferin	Farmland	River valley, cliff
285	Porth Ty-mawr	Farmland	Cliff
286	Traeth Penllech	Farmland	Cliff
287	Bryn Gwydd south	Farmland	Cliff
288	Bryn Gwydd north	Farmland	Cliff
289	Aber Geirch	Golf Course	Cliff
290	Borth Wen	Golf Course	Cliff
291	Porth Dinllaen	Farmland, golf course	Cliff, rock armour, groynes
292	Porth Nefyn	Farmland, urban	Cliff, sea wall
293	Porth Pistyll	Farmland	Cliff
294	Porth y Nant	Heath	Cliff
295	Yr Eifl Beach, Trefor	Farmland, quarry	Cliff
296	Trefor to Aberdesach	Farmland	Cliff
297	Aberdesach	Farmland, houses	Gravel barrier
298	Aberdesach to Trwyn Maen Dylan	Farmland	Cliff
299	Trwyn Maen Dylan	Farmland	Gravel barrier
300	Trwyn Maen Dylan to Pontllyfni	Farmland	Cliff
301	Pontllyfni to Ynys	Farmland	Gravel barrier
302	Ynys to Dinas Dinlle	Farmland	Gravel barrier
303	Dinas Dinlle Fort	Ancient fort	Cliff
304	Morfa Dinlle	Marsh, airfield, dunes, urban	Embankment, dunes, sea wall
305	Afon Gwyrfai to Caernarfon	Farmland, golf course	Embankment
306	Caernarfon to Plas Menai	Farmland, industrial works	Cliff
307	Y Felinheli	Recreation, amenities	Cliff
308	Y Felinheli to Pont Britannia	Farmland	Cliff
309	Pont Britannia to Pwll-fanogl	Parkland	Cliff
310	Moel-y-don to Afon Braint, Anglesey	Farmland	Cliff
311	Abermenai	Dunes, marsh	Dunes
312	Traeth Llanddwyn	Dunes, forest	Dunes
313	Tywyn Fferam, Anglesey	Dune, lake	Dune
314	Traeth Llydan, Holy Island	Dunes, heath	Dune
315	Borthwen, Holy Island	Marsh	Gravel barrier
316	Porthygaran, Holy Island	Moorland, caravans	Cliff
317	Lee Caravan Park, Holy Island	Moorland, caravans	Cliff
318	Porth Diana, Holy Island	Residential	Cliff
319	Trearddur Bay, Holy Island	Dunes, urban	Cliff, sea wall, rock armour
320	Porth Isallt-bach, Holy Island	Moorland	Cliff
321	Porth yr Afon, Holy Island	Moorland	Cliff
322	Porth yr Afon to Porth t Pwll, Holy Is.	Moorland	Cliff
323	Porth y Pwll, Holy Island	Moorland	Cliff
324	Porth-y-post, Holy Island	Moorland	Cliff

Table A7 (continued)

ID	Localities	Nature of hinterland	Nature of back beach
325	Porth y Corwgl, Holy Island	Moorland	Cliff
326	Abraham's Bosom, Holy Island	Farmland	Cliff
327	Soldiers Point, Holy Island	Heath	Cliff
328	Peibio	Parkland	Cliff
329	Traeth Penrhos, Holy Island	Scrub, aluminium works	Cliff
330	Penrhos to Gorsedd-y-penrhyn	Woodland, farmland	Cliff
331	Gorsedd-y-penrhyn to Stanley Embankment	Woodland, parkland	Cliff
332	Ynys Leurad, Anglesey	Heath, marsh	Cliff
333	Valley, Anglesey	Heath, marsh	Cliff
334	Traeth y Gribin, Anglesey	Farmland, dunes	Cliff
335	Porth Penrhyn-mawr, Anglesey	Farmland, dunes	Cliff
336	Porth Delysg, Anglesey	Farmland	Cliff
337	Twyn Cliperau, Anglesey	Caravans	Cliff
338	Porth Tywyn-mawr, Anglesey	Farmland	Cliff
339	Porth Defaid, Anglesey	Farmland	Cliff
340	Porth Trefadog, Anglesey	Farmland	Cliff
341	Porth Ffynnon to Porth Swtan	Farmland	Cliff
342	Traeth Ynys y Fydlyn, Anglesey	Lake, heath	Gravel barrier
343	Porth Newydd to Porth Tywodog	Farmland	Cliff
344	Hen Borth, Anglesey	Farmland	Cliff
345	Hen Borth to Trwyn Cemlyn	Farmland	Cliff
346	Cemlyn Bay, Anglesey	Lagoon	Gravel barrier
347	Porth-y-pistyll, Anglesey	Marsh, farmland	Cliff
348	Porth y Wylfa, Anglesey	Marsh, farmland	Cliff
349	Porth Llanlleiana, Anglesey	Heath	Cliff
350	Porth Wen, Anglesey	Farmland	Cliff
351	Porth-Llechog, Anglesey	Farmland	Cliff
352	Porth Eilian, Anglesey	Woodland	Cliff
353	Porthygwidhiaid, Anglesey	Farmland, heath	Cliff
354	Porth Helygen to Porth Garreg-fawr	Farmland	Cliff
355	Dulas Bay, Anglesey	Marsh	Gravel barrier
356	Traeth yr Ora	Farmland	Dunes
357	Porth y Mor, Anglesey	Farmland	Cliff
358	Traeth Lligwy, Anglesey	Farmland	Dunes
359	Porth Forllwyd, Anglesey	Farmland	Cliff
360	Porth Helaeth, Anglesey	Heath, caravans	Cliff
361	Porth yr Ynys, Anglesey	Farmland	Cliff
362	Porth Moelfre, Anglesey	Urban	Sea wall
363	Porth yr Aber, Anglesey	Farmland	Cliff
364	Porth y Rhos, Anglesey	Farmland	Cliff
365	Traeth Bychan, Anglesey	Farmland, caravans	Cliff
366	Borth Wen, Anglesey	Farmland	Cliff
367	Benllech Sand, Anglesey	Farmland, urban	Cliff
368	Porthllongdy Spit	Urban	Bay/Estuary
369	Traeth-coch, Anglesey	Farmland, river valley	Cliff, embankment
370	Tan Dinas Quarry, Anglesey	Disused quarry workings, farmland	Cliff
371	Fedw Fawr West, Anglesey	Farmland	Cliff
372	Fedw Fawr East, Anglesey	Farmland	Cliff
373	Trwyn Dinmor to Trwyn Du	Farmland, heath	Cliff
374	Trwyn Du to Beaumaris, Anglesey	Farmland	Cliff, embankment
375	Gallows Point, Beaumaris, Anglesey	Yacht club, woodland	Gravel ridge, cliff
376	Penrhyn Park	Woodland	Cliff
377	The Spinnies, Aber-Ogwen	Lake, woodland, nature reserve	Gravel ridge
378	Aber-Ogwen to Coed Gyfynys	Farmland	Cliff
379	Coed Gyfynys to Wig Bach	Farmland	Gravel ridge
380	Wig Bach to Afon Aber	Farmland	Cliff
381	Afon Aber	Woodland, farmland	Gravel ridge
382	Afon Aber to Glan y mor Elias	Farmland, lake, nature reserve	Gravel ridge
383	Llanfairfechan Spit	Marsh	Gravel ridge
384	Llanfairfechan Town	Farmland	Sea wall
385	Penmaenmawr to Penmaen-bach	Urban, farmland	Dune, sea wall, cliff
386	Conwy Morfa	Golf course, caravans	Dune
387	Deganwy	Golf course, urban	Dune, sea wall, cliff
388	Llandudno West Shore	Urban	Dune, sea wall
389	Great Orme West Shore	Heath, gardens	Cliff
390	Llandudno Bay	Urban	Sea wall
391	Penrhyn Bay	Urban, golf course	Sea wall, cliff
392	Rhos on Sea	Urban	Sea wall
393	Colwyn Bay	Urban	Sea wall
394	Penmaen Rhos	Urban	Rock armour, sea wall
395	Llanddulas	Urban, caravans	Rock armour, sea wall
396	Pensarn	Caravans, urban, railway	Sea wall, rock armour
397	Belgrano to Kinmel Bay	Caravans, urban, dunes	Sea wall, rock armour
398	Horton's Nose, Kinmel Bay	Urban, dunes	Dunes, breakwater
399	Rhyl	Urban, golf course, dunes	Sea wall, dune
400	Barkby Beach to Gronant	Dunes, golf course	Gravel barrier, rock armour
401	Gronant to Talacre	Dunes	Dunes
402	Point of Ayr	Dunes	Gravel/sand spit
403	Ffynnongroyw to Greenfield	Scrub, railway	Cliff

Table A8 Importance of sites (very high, high, medium, low or none) in different respects

ID	Localities	FCERM	River blocking	Conservation	Geomorphology	Recreation	Economic/ Military	Historical/ Archaeology
1	Sudbrook Point	L	N	H	L	L	L	L
2	West Pill, Rogiet	L	L	H	L	L	L	L
3	Portland Grounds (Redwick to Goldcliff)	L	L	H	L	L	L	L
4	Goldcliff Pill	L	L	H	L/M	L	L	L
5	Newgout Pill, Wentlooge	L	L	H	L/M	L	L	L
6	West Usk Lighthouse, Wentlooge	L	L	H	L/M	L	L	L
7	Outfall Lane, Wentlooge	L	L	H	L	L	L	L
8	Cardiff Flats	M	L	H	L	L	L	L
9	Penarth to Lavernock Point	H	N	H	L	L	L	L
10	Lavernock Point to Swanbridge	L	N	H	L	L	L	L
11	Barry Harbour	H	N	L	L	L	L	L
12	Watch House Bay, Barry	H	N	L	L	M	L	L
13	Pebble Beach, Barry	H	N	L	L/M	M	L	L
14	Porthkerry	L/M	N	L	M	L	L	L
15	Bulwarks Fort to Rhoose Point	L	N	L	L	L	L	L
16	Watch House Beach, East Aberthaw	L/M	L	H	M	L	L	L
17	Leys Beach, East Aberthaw	H	N	H	L	L	M	L
18	West Aberthaw	L/M	N	M	M	L	L	L
19	Aberthaw to St Donats	L	N	M	L	L	L	L
20	Nash Point to Cwm Nash	L	N	H	L	L	L	L
21	Traeth Mawr, Broughton	L	N	H	L	L	L	L
22	Traeth Bach, Broughton	L	N	H	L	L	L	L
23	Dunraven Bay	L	N	H	L	L/M	L	L
24	Ogmore-by-Sea	L	N	H	L	L/M	L	L
25	Pwll y Defaid, Merthyr-mawr Warren	L	M	H	L/M	L	L	L
26	Black Rocks, Porthcawl	L	N	H	L	L/M	L	L
27	Trecco Bay, Porthcawl	M	N	L	L	H	L	L
28	Seafront Beach, Porthcawl	H	N	L	L	M	L	L
29	West Beach, Porthcawl	H	N	L	L	M	L	L
30	Rest Bay, Porthcawl	L/M	N	H	L/M	L	L	L
31	Kenfig Sands	L	L	H	L	L	L	L
32	Afon Cynffig	L	M	H	L/M	L	L	L
33	Margam Sands	L	N	L	L	L	M	L
34	Port Talbot Harbour	M	N	L	L	L	M	L
35	Baglan Burrows	L	L	L	L	L	L	L
36	Mumbles	H	N	H	L	L	L	L
37	Bracelet Bay, Gower	L	N	H	L	M	L	L
38	Limeslade Bay, Gower	L	N	H	L	M	L	L
39	Langland Bay, Gower	H	N	M	L	M	L	L
40	Caswell Bay	H	N	H	L	M	L	L
41	Brandy Cove	L	N	H	L	L	L	L
42	Pwlldu Bay	L	H	VH	VH	L	L	L
43	Pobbles Beach	L	N	H	L	L	L	L
44	Pennard Burrows	L	L	H	M	L	L	L
45	Oxwich Bay	L	N	H	L	M	L	L
46	Holy's Wash	L	N	H	L	L	L	L
47	Port-Eynon Bay	L	N	M	L	M	L	L
48	Port-Eynon Point	L	N	H	L	L	L	L
49	Overton Mere	L	N	H	L	L	L	L
50	Common Cliff	L	N	H	L	L	L	L
51	Ram Grove	L	N	H	L	L	L	L
52	Kitchen Corner south	L	N	H	L	L	L	L
53	Kitchen Corner north	L	N	H	L	L	L	L
54	Rhossili Bay	L	N	H	L	L	L	L
55	Whiteford Point	L	N	H	M	L	L	L
56	Machynys, Loughor Estuary	L/M	L	H	M	L	L	L
57	Llanelli Harbour Mouth	L	N	H	M	L	L	L
58	Tywyn Bach, Burry Port	L/M	L	H	L	L	L	L
59	Millenium Coastal Park, Burry Port	M	L	H	L	L	L	L
60	Burry Port Harbour Mouth	L	N	H	L	L/M	L	L
61	St Ishmael's Scar	H	N	H	L	L	L	L
62	The Graig, Ferryside	H	N	H	L	L	L	L
63	Ferryside	H	N	H	L	L	L	L
64	Ginst Point	L	N	H	L	L	L	L
65	Pendine	L	N	H	L	L	L	L
66	Morfa Bychan, Pendine	L	N	H	L	L	L	L
67	Marros Sands	L	N	H	L	L	L	L
68	Amroth Beach	H	N	H	L	M	L	L
69	Wiseman's Bridge Beach	L	N	H	L	M	L	L
70	Saundersfoot Beach	H	N	H	L	M	L	L
71	Rhode Wood, Saundersfoot	L	N	H	L	L	L	L
72	Monkstone Beach	L	N	H	L	L	L	L
73	Waterwynch Bay	L	N	H	L	L	L	L
74	Second Bay, Tenby	L	N	H	L	L	L	L
75	First Bay, Tenby	L	N	H	L	L	L	L
76	Tenby South Beach	L	N	H	L	H	L	L
77	Drinkim Beach, Caldy Island	L	N	M	L	L	L	L
78	Sandtop Bay, Caldy Island	L	N	M	L	L	L	L
79	Lydstep Haven	L/M	N	H	L	M	L	L
80	Church Doors, Skrinkle Haven	L	N	H	L	L	L	L
81	Manorbier Bay	L	N	H	L	L	L	L

Table A8 (continued)

ID	Localities	FCERM	River blocking	Conservation	Geomorphology	Recreation	Economic/ Military	Historical/ Archaeology
82	Swanlake Bay	L	N	H	L	L	L	L
83	Privar	L	N	H	L	L	L	L
84	Greenala Point to Stackpole Quay	L	N	H	L	L	L	L
85	Stackpole Quay	L	N	H	L	L	L	L
86	Mowingword	L	N	H	L	L	L	L
87	Bullslaughter Bay	L	N	H	L	L	L	L
88	Flimston Bay	L	N	H	L	L	L	L
89	Pen-y-holt Bay	L	N	H	L	L	L	L
90	Hobbyhorse Bay	L	N	H	L	L	L	L
91	Blucks Pool	L	N	H	L	L	L	L
92	Frainslake Sands	L	N	H	L	L	L	L
93	Little Furzenip	L	N	H	L	L	L	L
94	Freshwater West	L	N	H	L	L	L	L
95	Gravel Bay	L	N	H	L	L	L	L
96	West Pickard Bay	L	N	H	L	L	L	L
97	West Angle Bay	L	N	H	L	L	L	L
98	The Ridge, Angle Bay	L	N	H	L	L	L	L
99	Angle Bay East	L	N	H	L	L	L	L
100	Pembroke Dock	L	N	H	L	L	L	L
101	Cosheston Point to Mill Bay	L	N	H	L	L	L	L
102	Burton Ferry	L	N	H	L	L	L	L
103	Neyland	M	N	H	L	L	L	L
104	Llanstadwell	L	N	H	L	L	L	L
105	Newton Noyes, Milford Haven	M	N	H	L	L	L	L
106	Gelliswick Bay, Milford Haven	M	N	H	L	L/M	L	L
107	Gelliswick Village, Milford Haven	L	N	H	L	L	L	L
108	Little Wick, Milford Haven	L	N	H	L	L	M	L
109	Kilroom	L	N	H	L	L	L	L
110	Sandy Haven	L	N	H	L	L	L	L
111	Sleeping Bay	L	N	H	L	L	L	L
112	Butts Bay	L	N	H	L	L	L	L
113	Longoar Bay	L	N	H	L	L	L	L
114	Lindsway Bay	L	N	H	L	L	L	L
115	Wenall Bay	L	N	H	L	L	L	L
116	Watch House Bay, Milford Haven	L	N	H	L	L	L	L
117	Monk Haven	L	N	H	L	L	L	L
118	Musselwick	L	N	H	L	L	L	L
119	Pickleridge Beach	L/M	H	H	H	M	L	L
120	Dale Beach	M	N	H	L	L/M	L	L
121	Castlebeach Bay	L	N	H	L	L	L	L
122	Watwick Bay	L	N	H	L	L	L	L
123	Mill Bay	L	N	H	L	L	L	L
124	Windmill Cove	L	N	H	L	L	L	L
125	Westdale Bay	L	N	H	L	L	L	L
126	Marloes Sands	L	N	H	L	L	L	L
127	Albion Sands	L	N	H	L	L	L	L
128	Watery Bay	L	N	H	L	L	L	L
129	Victoria Bay	L	N	H	L	L	L	L
130	Little Castle Bay	L	N	H	L	L	L	L
131	Rainy Rock Bay	L	N	H	L	L	L	L
132	Three Doors Bay	L	N	H	L	L	L	L
133	Deadman's Bay	L	N	H	L	L	L	L
134	Renney Slip	L	N	H	L	L	L	L
135	Jeffry's Haven south	L	N	H	L	L	L	L
136	Jeffry's Haven north	L	N	H	L	L	L	L
137	Martin's Haven	L	N	H	L	L	L	L
138	West hook Farm	L	N	H	L	L	L	L
139	Mill Haven	L	N	H	L	L	L	L
140	Brandy Bay	L	N	H	L	L	L	L
141	Messelwick	L	N	H	L	L	L	L
142	Rook's Bay	L	N	H	L	L	L	L
143	Little Haven	M	N	H	L	M	L	L
144	The Settlands	L	N	H	L	L	L	L
145	Broad Haven	H	M	H	L	M	L	L
146	Harold Stone south	L	N	H	L	L	L	L
147	Harold Stone north	L	N	H	L	L	L	L
148	Black Point south	L	N	H	L	L	L	L
149	Settling Nose south	L	N	H	L	L	L	L
150	Settling Nose north	L	N	H	L	L	L	L
151	Druidston Haven	L	N	H	L	L	L	L
152	North Haven	L	N	H	L	L	L	L
153	Madoc's Haven	L	N	H	L	L	L	L
154	Nolton Haven	L	N	H	L	L	L	L
155	Newgale Sands: Maidenhall-Bathesland	L	N	H	L	L	L	L
156	Newgale Sands: Bathesland-Sibbernock	L/M	M	L	H	H	L	L
157	Newgale Sands:Sibbernock-Newgale	M	M	L	H	H	L	L
158	Porthmynawyd	L	N	H	L	L	L	L
159	Aber Dwyrain	L	N	H	L	L	L	L
160	Porth y Bŵch, Solva	L	N	H	L	L	L	L
161	Gwadn, Solva	L	N	H	L	L	L	L
162	Loch Warren	L	N	H	L	L	L	L

Table A8 (continued)

ID	Localities	FCERM	River blocking	Conservation	Geomorphology	Recreation	Economic/ Military	Historical/ Archaeology
163	Aber Llong	L	N	H	L	L	L	L
164	Porth y Rhaw	L	N	H	L	L	L	L
165	Caer Bwdy Bay	L	N	H	L	L	L	L
166	Caerfai Bay	L	N	H	L	L	L	L
167	Porthlysgi Bay	L	N	H	L	L	L	L
168	Porth Lleuog, Ramsey Island	L	N	H	L	L	L	L
169	Aber Mawr, Ramsey Island	L	N	H	L	L	L	L
170	Whitesands Bay	L	N	H	L	L	L	L
171	Porth Lleuog	L	N	H	L	L	L	L
172	Porthmelgan	L	N	H	L	L	L	L
173	Porth y Rhaw	L	N	H	L	L	L	L
174	Abereiddi Bay	L	N	H	L	L	L	L
175	Traeth Llyfn	L	N	H	L	L	L	L
176	Porth Egr	L	N	H	L	L	L	L
177	Aberfelin, Trefin	L	N	M	L	L	L	L
178	Pwll Olfa	L	N	M	L	L	L	L
179	Pwll Llong	L	N	M	L	L	L	L
180	Pwll Whiting	L	N	M	L	L	L	L
181	Ynys Deullyn	L	N	M	L	L	L	L
182	Aber Castle	L	N	M	L	L	L	L
183	Pwllstrodur	L	N	M	L	L	L	L
184	Aber Mawr	L/M	N	H	M	L	L	L
185	Aber Bach, St Nicholas	L/M	M	M	M	L	L	L
186	Porth Dwgan	L	N	M	L	L	L	L
187	Pwllcrochan	L	N	H	L	L	L	L
188	Pwlldawnau	L	N	H	L	L	L	L
189	Pwll Deri	L	N	H	L	L	L	L
190	Porth Maenmelyn	L	N	H	L	L	L	L
191	Pwlluog	L	N	H	L	L	L	L
192	Porthsychan	L	N	H	L	L	L	L
193	Aber Felin	L	N	M	L	L	L	L
194	Porth Maen	L	N	M	L	L	L	L
195	Pwll Hir	L	N	M	L	L	L	L
196	Goodwick Sands North	M	N	L	L	H	L	L
197	Goodwick Sands South	M	N	L	L	H	L	L
198	Lampit Mawr	L	N	H	L	L	L	L
199	Aber Gwaun	M	N	L	L	L	L	L
200	Pwll Landdu	L	N	M	L	L	L	L
201	Pwell Edyn	L	N	M	L	L	L	L
202	Pwll Ceunant	L	N	M	L	L	L	L
203	Aber Richard	L	N	M	L	L	L	L
204	Pwll y Blewyn	L	N	M	L	L	L	L
205	Aber Grugog	L	N	M	L	L	L	L
206	Aber Hywel	L	N	M	L	L	L	L
207	Carreg Pen-las	L	N	M	L	L	L	L
208	Aber Bach, Fishguard	L	N	M	L	L	L	L
209	Pwll Gwylog	L	N	M	L	L	L	L
210	Cwm-yr-Eglwys, Afon Teifi	M	N	M	L	L	L	L
211	Aber Fforest	L	L	M	L	L	L	L
212	Aber Rhigian	L	L	M	L	L	L	L
213	Traeth Cell-Howel	L	N	M	L	L	L	L
214	Ceibwr Bay	L	L	H	L	L	L	L
215	Traeth y Rhedyn	L	N	H	L	L	L	L
216	Traeth Godir-coch	L	N	H	L	L	L	L
217	Careg Aderyn	L	N	H	L	L	L	L
218	Pwll Edrych	L	N	H	L	L	L	L
219	Pwll Melyn	L	N	H	L	L	L	L
220	Pen yr Ergyd	L	L	H	M	L	L	L
221	Llangrannog	L	N	H	L	L/M	L	L
222	Traeth y Gaerglwyd	L	N	H	L	L	L	L
223	Cwmtydu	L	M	H	L	L/M	L	L
224	Castell Bach	L	L	H	L	L	L	L
225	Traeth y Coubal	L	N	H	L	L	L	L
226	Llech Cimwch	L	N	H	L	L	L	L
227	Traeth y Quarry	L	N	H	L	L	L	L
228	New Quay Bay	L	L	H	L	M	L	L
229	Little Quay Bay	M	N	H	L	L	L	L
230	Gilfach-yr-Halen to Clogfryn	L	L	H	L	L	L	L
231	Aberaeron south	H	H	H	L/M	M	L	L
232	Aberaeron north	H	L	H	L/M	M	L	L
233	Aberaeron to Aberarth	L	N	H	L	L	L	L
234	Aberarth	M/H	M	H	L/M	L	L	L
235	Aberarth to Morfa Mawr	L	N	H	L	L	L	L
236	Morfa Mawr	L/M	M	H	L/M	L	L	L
237	Morfa Mawr to Llanonn	L	N	H	L	L	L	L
238	Llannon	L/M	M	H	L/M	L	L	L
239	Llannon to Llansantffraid	L	N	H	L	L	L	L
240	Llansantffraid	L/M	M	H	L/M	L	L	L
241	Llansantffraid to Llanrhystud	L	N	H	L	L	L	L
242	Llanrhystud	L/M	M	L	M	M	L	L
243	Llanrhystud to Carreg Ti-pw	L	N	M	L	L	L	L

Table A8 (continued)

ID	Localities	FCERM	River blocking	Conservation	Geomorphology	Recreation	Economic/ Military	Historical/ Archaeology
244	Carreg Ti-pw to Pinderi Cliffs	L	N	M	L	L	L	L
245	Twll Twrw to Traeth Tanybwlch	L	N	H	L	L	L	L
246	Traeth Tanybwlch, Aberystwyth	L/M	M	VH	M	L	L	L
247	South Beach, Aberystwyth	H	M	H	M	L/M	L	L
248	North Beach, Aberystwyth	H	N	L	L	H	L	L
249	Constitution Hill	L	N	L	L	L	L	L
250	Clarach Bay	M	M	H	M	M	L	L
251	Wallog Beach	L	M	H	L	L	L	L
252	Pen-y-graig	L	N	H	L	L	L	L
253	Borth Sands	H	N	H	H	M	L	L
254	Aberdovey to Tywyn	M	N	H	L	L	L	L
255	Tywyn	H	N	L	L	M	L	L
256	Tywyn to Aber Dysynni	H	H	VH	H	L	L	L
257	Tonfanau to Gallt Ffynnon yr Hydd	L	N	H	L	L	L	L
258	Ro Wen, Fairbourne	M	L	H	H	M	L	L
259	Afon Mawddach, Barmouth	L	N	H	L	L	L	L
260	Ynys y Brawd, Barmouth	L	N	H	L	L	L	L
261	Barmouth Promenade	M	N	L	L	M	L	L
262	Barmouth to Llanaber	H	N	L	L	L	L	L
263	Ceunant Egryn, Llanaber	H	M	L	L/M	L	L	L
264	Afon Ysgethin, Tal-y-bont	L/M	M	H	M	L	L	L
265	Shell Island	L	L	H	L	H	L	L
266	Shell Island Spit	L	L	H	L/M	H	L	L
267	Llandanwg Spit	L	L	H	L/M	M	L	L
268	Llandanwg to Harlech	L	N	H	L	L	L	L
269	Graig Ddu to Criccieth	H	M	H	H	M	L	L
270	Criccieth	H	N	H	L	H	L	L
271	Afon Dwyfor	L/M	M	H	H	L	L	L
272	Glannllynnau	L	N	H	L	L	L	L
273	Afon Wen	H	M	H	H	L	L	L
274	Hafan y Mor	L	N	H	L	M	L	L
275	Pen-ychain to Pwllheli	M	M	VH	M	L/M	L	L
276	Carreg yr Imbill	L	M	H	L	M	L	L
277	Traeth Crugan	H	N	H	L/M	M	L	L
278	Llanbedrog Beach	L	N	H	L	M	L	L
279	Porth Ceiriad	L	N	H	L	M	L	L
280	Porth Neigwl	L	N	H	L	L	L	L
281	Porth Ysgo	L	N	H	L	L	L	L
282	Aberdaron Bay	L	N	M	L	L	L	L
283	Porth Meudwy	L	N	H	L	L	L	L
284	Porth Ferin	L	N	M	L	L	L	L
285	Porth Ty-mawr	L	N	M	L	L	L	L
286	Traeth Penllech	L	L	M	L	L	L	L
287	Bryn Gwydd south	L	L	M	L	L	L	L
288	Bryn Gwydd north	L	L	M	L	L	L	L
289	Aber Geirch	L	L	M	L	L	L	L
290	Borth Wen	L	L	M	L	L	L	L
291	Porth Dinllaen	L	L	M	L	L	L	L
292	Porth Nefyn	L	L	M	L	L	L	L
293	Porth Pistyll	L	L	M	L	L	L	L
294	Porth y Nant	L	L	M	L	L	L	L
295	Yr Eifl Beach, Trefor	L	L	M	L	L	L	L
296	Trefor to Aberdesach	L	L	M	L	L	L	L
297	Aberdesach	M	M	M	M	L	L	L
298	Aberdesach to Trwyn Maen Dylan	L	N	L	L	L	L	L
299	Trwyn Maen Dylan	L/M	M	L	M	L	L	L
300	Trwyn Maen Dylan to Pontllyfni	L	N	L	L	L	L	L
301	Pontllyfni to Ynys	L/M	M	L	M	L	L	L
302	Ynys to Dinas Dinlle	L/M	M	L	M	L	L	L
303	Dinas Dinlle Fort	L	N	H	L	L	L	L
304	Morfa Dinlle	H	L	VH	VH	L	H	M
305	Afon Gwyrfai to Caernarfon	M	L	H	L	L	L	L
306	Caernarfon to Plas Menai	H	N	L	L	L	L	L
307	Y Felinheli	M	N	L	L	L	L	L
308	Y Felinheli to Pont Britannia	L	N	L	L	L	L	L
309	Pont Britannia to Pwll-fanogl	L	N	L	L	L	L	L
310	Moel-y-don to Afon Braint, Anglesey	L	N	L	L	L	L	L
311	Abermenai	L	N	H	VH	L	L	L
312	Traeth Llanddwyn	L	N	H	M	M	L	L
313	Tywyn Fferam, Anglesey	L	N	H	L	L	L	L
314	Traeth Llydan, Holy Island	L	N	H	L	L	L	L
315	Borthwen, Holy Island	L/M	N	H	M	L	L	L
316	Porthygaran, Holy Island	L	N	H	L	L	L	L
317	Lee Caravan Park, Holy Island	L	N	H	L	L	L	L
318	Porth Diana, Holy Island	L	N	H	L	L	L	L
319	Trearddur Bay, Holy Island	L	N	H	L	L	L	L
320	Porth Isallt-bach, Holy Island	L	N	H	L	L	L	L
321	Porth yr Afon, Holy Island	L	N	H	L	L	L	L
322	Porth yr Afon to Porth t Pwll, Holy Is.	L	N	H	L	L	L	L
323	Porth y Pwll, Holy Island	L	N	H	L	L	L	L
324	Porth-y-post, Holy Island	L	N	H	L	L	L	L

Table A8 (continued)

ID	Localities	FCERM	River blocking	Conservation	Geomorphology	Recreation	Economic/ Military	Historical/ Archaeology
325	Porth y Corwgl, Holy Island	L	N	H	L	L	L	L
326	Abraham's Bosom, Holy Island	L	N	H	L	L	L	L
327	Soldiers Point, Holy Island	L	N	H	L	L	L	L
328	Peibio	L	N	L	L	L	L	L
329	Traeth Penrhos, Holy Island	L	N	L	L	L	L	L
330	Penrhos to Gorsedd-y-penrhyn	L	N	H	L	L	L	L
331	Gorsedd-y-penrhyn to Stanley Embkt.	L	N	H	L	L	L	L
332	Ynys Leurad, Anglesey	L	N	H	L	L	L	L
333	Valley, Anglesey	L	N	H	L	L	L	L
334	Traeth y Gribin, Anglesey	L	L	H	L	L	L	L
335	Porth Penrhyn-mawr, Anglesey	L	N	H	L	L	L	L
336	Porth Delysg, Anglesey	L	N	H	L	L	L	L
337	Twyn Cliperau, Anglesey	L	N	H	L	L	L	L
338	Porth Tywyn-mawr, Anglesey	L	N	H	L	L	L	L
339	Porth Defaid, Anglesey	L	N	H	L	L	L	L
340	Porth Trefadog, Anglesey	L	N	H	L	L	L	L
341	Porth Ffynnon to Porth Swtan	L	N	H	L	L	L	L
342	Traeth Ynys y Fydlyn, Anglesey	L/M	L	H	M	L	L	L
343	Porth Newydd to Porth Tywodog	L	N	H	L	L	L	L
344	Hen Borth, Anglesey	L/M	L	H	L	L	L	L
345	Hen Borth to Trwyn Cemlyn	L	L	H	L	L	L	L
346	Cemlyn Bay, Anglesey	L/M	M	VH	H	L	L	L
347	Porth-y-pistyll, Anglesey	L	M	H	L	L	L	L
348	Porth y Wylfa, Anglesey	L	N	H	L	L	L	L
349	Porth Llanlleiana, Anglesey	L	N	H	L	L	L	L
350	Porth Wen, Anglesey	L	N	H	L	L	L	L
351	Porth-Llechog, Anglesey	L	N	H	L	L	L	L
352	Porth Eilian, Anglesey	L	N	H	L	L	L	L
353	Porthygwidhiaid, Anglesey	L	N	H	L	L	L	L
354	Porth Helygen to Porth Garreg-fawr	L	N	H	L	L	L	L
355	Dulas Bay, Anglesey	L	L	H	M	L	L	L
356	Traeth yr Ora	L	N	H	L	L	L	L
357	Porth y Mor, Anglesey	L	N	H	L	L	L	L
358	Traeth Lligwy, Anglesey	L	N	H	L	L	L	L
359	Porth Forllwyd, Anglesey	L	N	H	L	L	L	L
360	Porth Helaeth, Anglesey	L	N	H	L	L	L	L
361	Porth yr Ynys, Anglesey	L	N	H	L	L	L	L
362	Porth Moelfre, Anglesey	L	N	H	L	L	L	L
363	Porth yr Aber, Anglesey	L	N	H	L	L	L	L
364	Porth y Rhos, Anglesey	L	N	H	L	L	L	L
365	Traeth Bychan, Anglesey	L	N	H	L	L	L	L
366	Borth Wen, Anglesey	L	N	H	L	L	L	L
367	Benllech Sand, Anglesey	L	N	H	L	L	L	L
368	Porthllongdy Spit	L	N	H	M	L	L	L
369	Traeth-coch, Anglesey	L	N	H	L	L	L	L
370	Tan Dinas Quarry, Anglesey	L	N	H	L	L	L	L
371	Fedw Fawr West, Anglesey	L	N	H	L	L	L	L
372	Fedw Fawr East, Anglesey	L	N	H	L	L	L	L
373	Trwyn Dinmor to Trwyn Du	L	N	H	L	L	L	L
374	Trwyn Du to Beaumaris, Anglesey	L	L	H	L	L	L	L
375	Gallows Point, Beaumaris, Anglesey	L	L	M	M	M	L	L
376	Penrhyn Park	L	M	H	L	L	L	L
377	The Spinnies, Aber-Ogwen	L	M	H	M	L	L	L
378	Aber-Ogwen to Coed Gyfynys	L	L	H	L	L	L	L
379	Coed Gyfynys to Wig Bach	L/M	M	H	M	L	L	L
380	Wig Bach to Afon Aber	L	L	H	L	L	L	L
381	Afon Aber	L	M	H	M	L	L	L
382	Afon Aber to Glan y mor Elias	L/M	M	H	L/M	L	L	L
383	Llanfairfechan Spit	L	M	H	H	L	L	L
384	Llanfairfechan Town	L	M	H	L	L	L	L
385	Penmaenmawr to Penmaen-bach	L	L	L	L	L	L	L
386	Conwy Morfa	L	N	H	L	L	L	L
387	Deganwy	H	N	H	L	L	L	L
388	Llandudno West Shore	H	N	H	L	L	L	L
389	Great Orme West Shore	L	N	H	L	L	L	L
390	Llandudno Bay	H	N	L	L	H	L	L
391	Penrhyn Bay	H	N	L	L	H	L	L
392	Rhos on Sea	H	N	L	L	H	L	L
393	Colwyn Bay	M	N	L	L	M	L	L
394	Penmaen Rhos	H	L	L	L	L	L	L
395	Llanddulas	H	M	L	L	L	L	L
396	Pensarn	H	M	VH	H	L	L	L
397	Belgrano to Kinmel Bay	H	L	L	L	M	L	L
398	Horton's Nose, Kinmel Bay	L	L	M	L	L	L	L
399	Rhyl	M	L	L	L	H	L	L
400	Barkby Beach to Gronant	L/M	M	H	H	L	L	L
401	Gronant to Talacre	L	L	H	L	H	L	L
402	Point of Ayr	L	L	H	M	L	L	L
403	Ffynnongroyw to Greenfield	M	L	H	L	L	L	L

Data Archive Appendix

No data outputs were produced as part of this project.

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