European Community Directive on the Conservation of Natural Habitats and of Wild Fauna and Flora (92/43/EEC)

Fourth Report by the United Kingdom under Article 17

on the implementation of the Directive
from January 2013 to December 2018

Supporting documentation for the
conservation status assessment for the habitat:

H1140 - Mudflats and sandflats not covered by seawater at low tide

WALES

IMPORTANT NOTE - PLEASE READ

- The information in this document is a country-level contribution to the UK Report on the conservation status of this habitat, submitted to the European Commission as part of the 2019 UK Reporting under Article 17 of the EU Habitats Directive.
- The 2019 Article 17 UK Approach document provides details on how this supporting information was used to produce the UK Report.
- The UK Report on the conservation status of this habitat is provided in a separate document.
- The reporting fields and options used are aligned to those set out in the European Commission guidance.
- Explanatory notes (where provided) by the country are included at the end. These provide an audit trail of relevant supporting information.
- Some of the reporting fields have been left blank because either: (i) there was insufficient information to complete the field; (ii) completion of the field was not obligatory; and/or (iii) the field was only relevant at UK-level (sections 10 Future prospects and 11 Conclusions).
- For technical reasons, the country-level future trends for Range, Area covered by habitat and Structure and functions are only available in a separate spreadsheet that contains all the country-level supporting information.
- The country-level reporting information for all habitats and species is also available in spreadsheet format.

Visit the JNCC website, https://jncc.gov.uk/article17, for further information on UK Article 17 reporting.

Report on the main results of the surveillance under Article 17 for Annex I habitat types (Annex D)

NATIONAL LEVEL

1. General information

1.1 Member State	**UK (Wales information only)**
1.2 Habitat code	**1140 - Mudflats and sandflats not covered by seawater at low tide**

2. Maps

2.1 Year or period	1996-2010
2.3 Distribution map	Yes
2.3 Distribution map Method used	Complete survey or a statistically robust estimate
2.4 Additional maps	No

BIOGEOGRAPHICAL LEVEL

3. Biogeographical and marine regions

3.1 Biogeographical or marine region where the habitat occurs

Marine Atlantic (MATL)

3.2 Sources of information

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4. Range

4.1 Surface area (in km²)	415.99	
4.2 Short-term trend Period		
4.3 Short-term trend Direction	Stable (0)	
4.4 Short-term trend Magnitude	a) Minimum	b) Maximum
4.5 Short-term trend Method used		

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4.6 Long-term trend Period			
4.7 Long-term trend Direction			
4.8 Long-term trend Magnitude	a) Minimum	b) Maximum	
4.9 Long-term trend Method used			
4.10 Favourable reference range	a) Area (km²) b) Operator c) Unknown No d) Method		
4.11 Change and reason for change in surface area of range	No change The change is mainly due to:		
4.12 Additional information			

5. Area covered by habitat

5.1 Year or period	2010-2018		
5.2 Surface area (in km²)	a) Minimum 415.99	b) Maximum 415.99	c) Best single value 415.99
5.3 Type of estimate	Best estimate		
5.4 Surface area Method used	Complete survey or a statistically robust estimate		
5.5 Short-term trend Period	2007-2018		
5.6 Short-term trend Direction	Decreasing (-)		
5.7 Short-term trend Magnitude	a) Minimum	b) Maximum	c) Confidence interval
5.8 Short-term trend Method used	Based mainly on extrapolation from a limited amount of data		
5.9 Long-term trend Period	1994-2018		
5.10 Long-term trend Direction	Decreasing (-)		
5.11 Long-term trend Magnitude	a) Minimum	b) Maximum	c) Confidence interval
5.12 Long-term trend Method used	Based mainly on extrapolation from a limited amount of data		
5.13 Favourable reference area	a) Area (km²) b) Operator c) Unknown No d) Method		
5.14 Change and reason for change in surface area of range	No change The change is mainly due to:		
5.15 Additional information			

6. Structure and functions

6.1 Condition of habitat	a) Area in good condition (km²)	Minimum 62.97	Maximum 62.97
	b) Area in not-good condition (km²)	Minimum 337.9	Maximum 337.9
	c) Area where condition is not known (km²)	Minimum 15.12	Maximum 15.12
6.2 Condition of habitat Method used	Based mainly on extrapolation from a limited amount of data		

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6.3 Short-term trend of habitat area in good condition Period	2010-2018
6.4 Short-term trend of habitat area in good condition Direction	Uncertain (u)
6.5 Short-term trend of habitat area in good condition Method used	Based mainly on extrapolation from a limited amount of data
6.6 Typical species	Has the list of typical species changed in comparison to the previous reporting period? No
6.7 Typical species Method used	
6.8 Additional information	

7. Main pressures and threats

7.1 Characterisation of pressures/threats

Pressure	Ranking
Mixed source marine water pollution (marine and coastal) (J02)	H
Modification of coastline, estuary and coastal conditions for development, use and protection of residential, commercial, industrial and recreational infrastructure and areas (including sea defences or coastal protection works and infrastructures) (F08)	H
Sports, tourism and leisure activities (F07)	M
Marine fish and shellfish harvesting (professional, recreational) activities causing physical loss and disturbance of seafloor habitats (G03)	M
Marine fish and shellfish harvesting (professional, recreational) causing reduction of species/prey populations and disturbance of species (G01)	M
Development and operation of energy production plants (including bioenergy plants, fossil and nuclear energy plants) (D05)	M
Residential or recreational activities and structures generating marine macro- and micro- particulate pollution (e.g. plastic bags, Styrofoam) (F22)	M
Industrial or commercial activities and structures generating marine macro- and micro- particulate pollution (e.g. plastic bags, Styrofoam) (F23)	M

Threat	Ranking
Mixed source marine water pollution (marine and coastal) (J02)	H
Modification of coastline, estuary and coastal conditions for development, use and protection of residential, commercial, industrial and recreational infrastructure and areas (including sea defences or coastal protection works and infrastructures) (F08)	H
Marine fish and shellfish harvesting (professional, recreational) activities causing physical loss and disturbance of seafloor habitats (G03)	M

Sports, tourism and leisure activities (F07)	M
Marine fish and shellfish harvesting (professional, recreational) causing reduction of species/prey populations and disturbance of species (G01)	M
Other invasive alien species (other then species of Union concern) (I02)	M
Development and maintenance of beach areas for tourism and recreation incl. beach nourishment and beach cleaning (F06)	M
Development and operation of energy production plants (including bioenergy plants, fossil and nuclear energy plants) (D05)	M
Sea-level and wave exposure changes due to climate change (N04)	M
Residential or recreational activities and structures generating marine macro- and micro- particulate pollution (e.g. plastic bags, Styrofoam) (F22)	M

7.2 Sources of information

7.3 Additional information

8. Conservation measures

8.1 Status of measures	a) Are measures needed?	Yes
	b) Indicate the status of measures	Measures identified and taken
8.2 Main purpose of the measures taken		Maintain the current range, population and/or habitat for the species
8.3 Location of the measures taken		Both inside and outside Natura 2000
8.4 Response to the measures		Medium-term results (within the next two reporting periods, 2019-2030)
8.5 List of main conservation measures		

Manage changes in hydrological and coastal systems and regimes for construction and development (CF10)
Reduce impact of outdoor sports, leisure and recreational activities (CF03)
Management of professional/commercial fishing (including shellfish and seaweed harvesting) (CG01)
Reduce/eliminate marine contamination with litter (CF08)
Reduce impact of mixed source pollution (CJ01)
Habitat restoration of areas impacted by residential, commercial, industrial and recreational infrastructure, operations and activities (CF02)
Reduce/eliminate marine pollution from industrial, commercial, residential and recreational areas and activities (CF07)

8.6 Additional information

9. Future prospects

9.1 Future prospects of parameters	a) Range
	b) Area
	c) Structure and functions

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9.2 Additional information	

10. Conclusions

10.1. Range	
10.2. Area	
10.3. Specific structure and functions (incl. typical species)	
10.4. Future prospects	
10.5 Overall assessment of Conservation Status	
10.6 Overall trend in Conservation Status	
10.7 Change and reasons for change in conservation status and conservation status trend	a) Overall assessment of conservation status No change The change is mainly due to: b) Overall trend in conservation status No change The change is mainly due to:
10.8 Additional information	

11. Natura 2000 (pSCIs, SCIs, SACs) coverage for Annex I habitat types

11.1 Surface area of the habitat type inside the pSCIs, SCIs and SACs network (in km² in biogeographical/ marine region)	a) Minimum	330.03
	b) Maximum	330.03
	c) Best single value	330.03
11.2 Type of estimate	Best estimate	
11.3 Surface area of the habitat type inside the network Method used	Complete survey or a statistically robust estimate	
11.4 Short-term trend of habitat area in good condition within the network Direction	Uncertain (u)	
11.5 Short-term trend of habitat area in good condition within network Method used	Based mainly on expert opinion with very limited data	
11.6 Additional information		

12. Complementary information

12.1 Justification of % thresholds for trends	
12.2 Other relevant information	

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Distribution Map

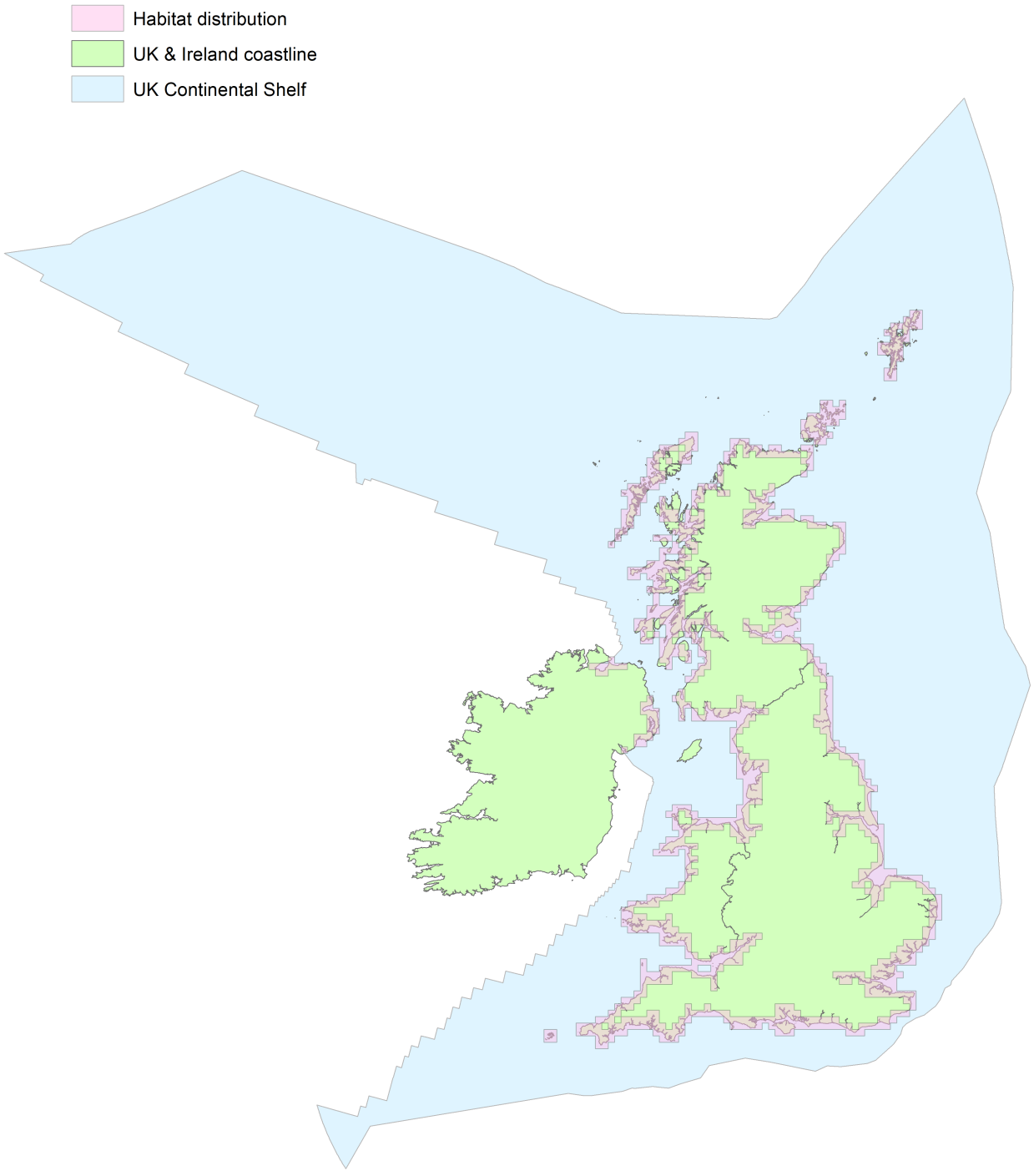

Figure 1: UK distribution map for H1140 - Mudflats and sandflats not covered by seawater at low tide.

The 10km grid square distribution map is based on available habitat records which are considered to be representative of the distribution within the current reporting period. For further details see the 2019 Article17 UK Approach document.

Range Map

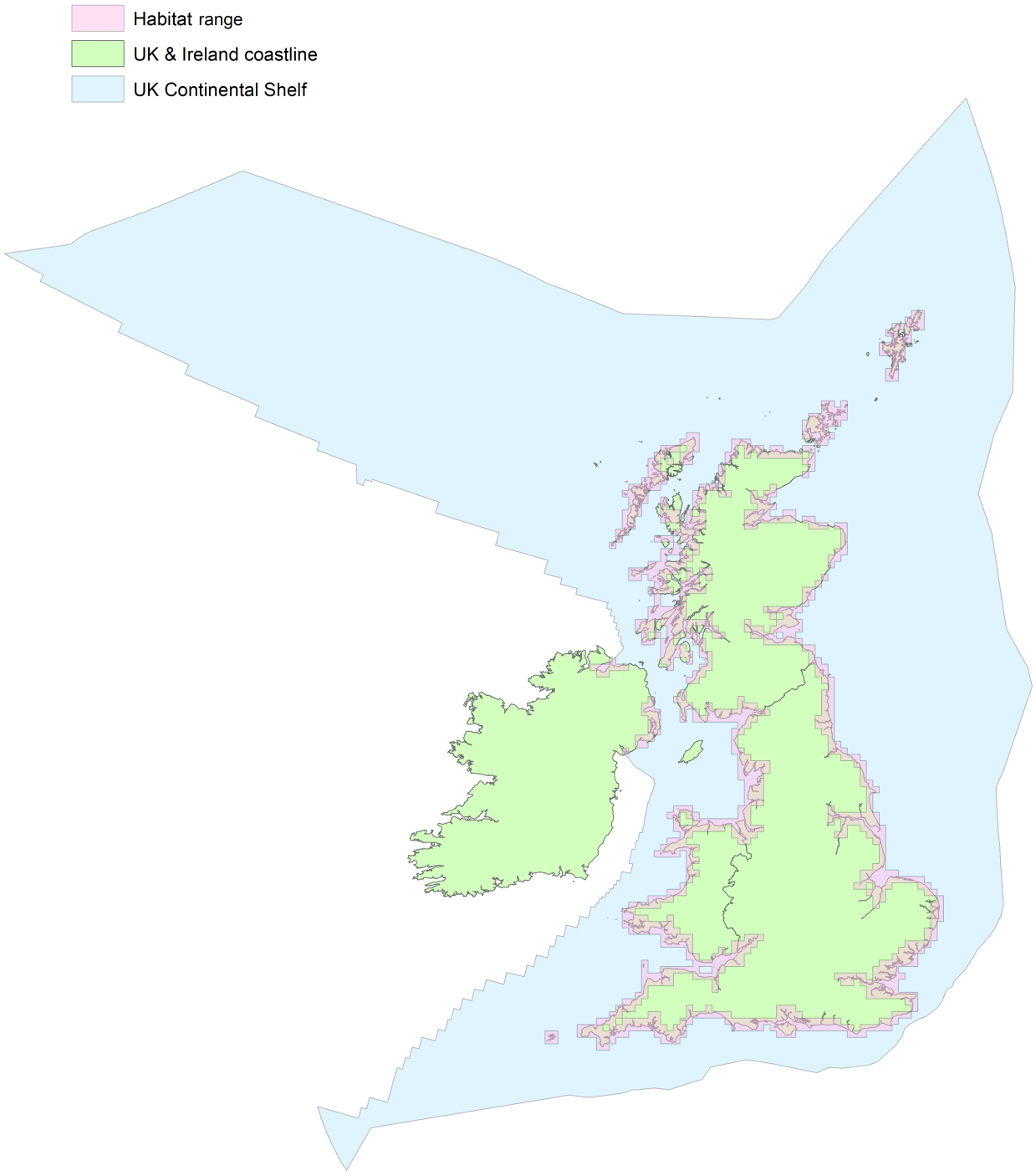

Figure 2: UK range map for H1140 - Mudflats and sandflats not covered by seawater at low tide.

The range of mudflats and sandflats is determined by physical and geological processes and was not related to the biological communities or processes supported by them. Therefore, the range was considered equivalent to the surface area of the habitat.

Explanatory Notes

Habitat code: 1140

Field label	Note
2.2 Distribution map	The range map for mudflats and sandflats is based on NRW's Intertidal Phase I survey (1996 - 2005) (Wyn et al., 2006) and an update in 2010 for a section of coast in Tremadoc Bay (Egerton et al., 2010). The survey covered all of Welsh shores, and whilst the data was gathered over several years and small localised changes are bound to have occurred, the data set provides a comprehensive broadscale map of sand and mudflat distribution and extent across Wales. Confidence in the mapped values is good, though it should be recognised that localised natural habitat changes and the height of the tide on the day a shore was visited will affect the accuracy of the value. The feature maps are over 10 years old and have not been reviewed or updated within this reporting round.

Habitat code: 1140 Region code: MATL

Field label	Note
5.2 Surface area	The area map for mudflats and sandflats is based on NRW's Intertidal Phase I survey (1996 - 2005) (Wyn et al., 2006) and an update in 2010 for a section of coast in Tremadoc Bay (Egerton et al., 2010). The survey covered all of Welsh shores, and whilst the data was gathered over several years and small localised changes are bound to have occurred, the data set provides a comprehensive broadscale map of sand and mudflat distribution and extent across Wales. Confidence in the mapped values is good, though it should be recognised that localised natural habitat changes and the height of the tide on the day a shore was visited will affect the accuracy of the value. The feature maps are over 10 years old and have not been reviewed or updated within this reporting round. Full extent of the feature as derived from JNCC version of feature maps. NRW feature maps state an additional 3.54 km2 which may be accounted for through GIS processing. This covers any gains and losses that are referred to elsewhere in this document. The value includes definite and probable intertidal sandflats and mudflats, but does not account for changes in dynamic systems, where sediment levels have fluctuated. These are assumed to be in dynamic equilibrium, such that, whilst the location of the feature may change, there remains the same extent of the resource. Casework records have been considered, in order to understand changes in area covered by mudflat and sandflats. Casework records are within the last 6 years, or ongoing that influence the cover in the last 6 years. Losses resulted from: - developments, including coastal defences, outside of N2K sites, and not requiring a HRA. - Construction of sea defences - Illegal placement of structures in the intertidal - Changes to saltmarsh or sand dune, where it is likely to revert back in the near future.
5.6 Short term trend; Direction	Actual values (above) do not reflect decreasing area, but known losses along the coast (amounting to 0.01%) are known and recorded.
5.9 Long term trend; Period	The range map for mudflats and sandflats is based on NRW's Intertidal Phase I survey (1996 - 2005) (Wyn et al., 2006) and an update in 2010 for a section of coast in Tremadoc Bay (Egerton et al., 2010). The survey covered all of Welsh shores, and whilst the data was gathered over several years and small localised changes are bound to have occurred, the data set provides a comprehensive broadscale map of sand and mudflat distribution and extent across Wales. Confidence in the mapped values is good, though it should be recognised that localised natural habitat changes and the height of the tide on the day a shore was visited will affect the accuracy of the value. The feature maps are over 10 years old and have not been reviewed or updated within this reporting round.

6.1 Condition of habitat	The area in good/not good/unknown condition of structure and function was assessed using collated available evidence. Evidence used included data from intersecting WFD waterbody classification. Where an intersecting waterbody status, for either ecology or chemistry, was less than 'good' the structure and function of this feature were assessed as 'Unfavourable' e.g. WFD waterbodies that fail for TBT, BDPE and other pollutants (water sampling) are unfavourable, since a fail for a determinand under WFD is deemed to be of ecological significance. Manuel Nicolaus & Barry (2015) completed a survey in 2014, including Tenby, which showed imposex to be below the OSPAR Ecotoxicological Assessment Criterion (EAC) (The level of imposex in the more sensitive gastropod species (223c30-223c100 % of the females have imposex) indicates exposure to TBT) concentrations below the EAC derived by OSPAR for TBT, e.g. adverse effects in the more sensitive taxa of the ecosystem caused by long-term exposure to TBT are predicted to be unlikely to occur.) Waterbody boundaries do not reflect coastal processes, sediment cells or hydrography. For this reason, the WFD results from a particular sampling location may not be appropriate for the feature in the rest of the waterbody. There has not been the opportunity to verify that a WFD sampling location is appropriate to use for the feature across the spatial extent of the waterbody. For example, extensive tracts of north cardigan Bay are 'not good' due to mercury levels, but no evaluation has been done to the appropriateness of this outcome, since the sampling location is likely to be a long way from some parts of the feature. Low confidence should be associated with applying WFD results to feature condition. Some locations such as the Dee estuary have a moderate DIN under WFD, deemed detrimental to this feature. IS&F is deemed to be below ‚Good' where: - There are coastal developments/structures that have the potential to cause habitat loss through coastal squeeze, and/or cause an increase in wave energy and erosion through relfection of waves off structures; - excess macroalgae; - disturbance from bait digging or boat moorings; - dredging or dumping sites; - loss other than natural fluctuations. Additional evidence has been drawn from the NRW indicative condition reports (NRWa - j, 2018). An activity may pass a Habitats Regulations Assessment (HRA), based on there being no adverse effect on site integrity arising from the proposal or plan. However, there are circumstances where the plan is adjusted or the HRA has failed to identify impacts. It is possible that there are negative effects due to incomplete (anticipated) recovery from disturbances identified in the HRA. Where the HRA has not fully protected the features of a SAC, then further action is being undertaken to rectify this, which will result in future reporting being more favourable. Levels of litter have not been used in the assessment condition, since there is currently no evidence to suggest that it is affecting the condition of the feature. Habitats Directive monitoring (grab samples) in Milford Haven Inlets over intertidal areas show significant community change where samples have been in areas with excessive macroalgae (SAC monitoring 2015 - NRW, 2018f).
6.4 Short term trend of habitat area in good condition; Direction	(2013 values: Good = 42.128 Km2, Not Good = 374.53 km2) Increase in recorded 'Good' is largely accounted for by different methods of mapping condition (including uncertainty on the effects of fishery activities) and changes in WFD waterbodies failures for chemical determinands.

7.1 Characterisation of pressures/ threats

The levels of Pressure and Threat listed are based on those recorded in the NRW Actions Database for each of the SACs. The frequency of occurrence of each Pressure or Threat across the SACs, the extent of the Pressure or Threat and the severity have been considered to produce a final level for each Pressure or Threat. The full extent of the effect of an activity has been considered, which typically extends beyond the immediate footprint of the activity. Pressures and threats taken from the Actions Database and translated to the latest EU pressure/threat codes. Some adjustment required to differentiate between codes and to prioritise the pressures and threats. A back check has been completed, against the 2013 reports, to ensure consistency of approach. J02 Mixed source marine water pollution (marine and coastal). Pressure: High; Threat: High There is an assortment of sources to pollution to the marine environment that are difficult to quantify and apportion. Diffuse pollution is derived primarily from agricultural activities, with abandoned mines being the second likely cause of failure of a WFD waterbody. The former is due to raised levels of nutrient (nitrogen and phosphorus) and sediment run off, whilst the latter is due to metal contamination. Waterbody failures due to diffuse nutrients from agriculture affect some estuaries and bays, particularly Milford Haven Waterway (NRW, 2014), Carmarthen Bay and Y Foryd) (NRW, 2013; Edwards, 2014; Haines & Edwards, 2016). In Milford Haven Waterway this is resulting in raised levels of suspended silt, silt deposition and increased plant growth. Raised turbidity and silt deposition is likely to be affecting algae, whilst dense and widespread macroalgae overlying mud and sandflats is having negative consequences for sediment biota and generating eutrophication and smothering impacts when it is washed up on the strandlines, reefs and saltmarsh. F08 Modification of coastline, estuary and coastal conditions for development, use and protection of residential, commercial, industrial and recreational infrastructure and areas (including sea defence or coast protection works and infrastructures Pressure: High; Threat: High Numerous recorded small losses or modification of habitat are associated with the creation and maintenance of infrastructure along the coast (e.g. Tremadog Bay, Milford Haven Waterway). Creation of private slipways and hard standing on shoreline reef, and maintenance or establishment of shore defences is increasing in areas where housing has water frontage. Threat of a number of renewable energy tidal lagoons in the future. F07 Sports, tourism and leisure activities (unregulated access with vehicles). Pressure: medium; threat: medium There are numerous beaches where disturbance, compaction and waste result from unregulated vehicle access for recreational purposes. G01 Marine fish and shellfish harvesting (professional, recreational) causing reduction of species/prey populations and disturbance of species. Pressure: medium; Threat: medium G03 (Marine fish and shellfish harvesting (professional, recreational) activities causing physical loss and disturbance of seafloor habitats. Pressure: medium; Threat: medium Bait collection (boulder turning) and crab shelters are present, often in sensitive sheltered and tide-swept habitats. Bait digging is locally intensive and has generated clear habitat damage and modification in some areas. Sensitive habitats such as seagrass and muddy gravels are being impacted (e.g. Milford Haven). Commercial shellfisheries are active in some areas and include winkle picking (with associated boulder turning and ecosystem effects) and mussel laying and harvesting (HRA completed, but some of the feature has been removed for 15+ years). Cockle gathering in SACs are regulated through the HRA process and cockle stock assessments. However, there have been sporadic and intensive commercial cockling activity which has previously impacted sheltered sediment habitats, such as the Three Rivers Estuaries and seagrass beds e.g. in Angle Bay. Whilst sites are Regulated, the difficulties of enforcement in the marine environment means that unconsented commercial (no appropriate assessment and no SSSI consent) activity continues at some intertidal sites. There is limited but increasing collection of other molluscs (e.g. razor fish) by hand (intertidally, widespread). Whilst no single fishery is especially extensive or totally destructive, the aggregation of the wide variety of fishery activities occurring on the

feature total up to significant pressure and future threat. The Welsh Government's future vision, through the Wales Marine Plan for expansion of shellfisheries across Wales will have appropriate safeguards within Protected Sites, to protect the features. Where Regulating and Several Orders are applied for, this provides some safeguards to protect Annex I habitats outside of SACs, although these orders are not compulsory, leaving features under these circumstances under potential threat. F22: Residential or recreational activities and structures generating marine macro- and micro- particulate pollution (e.g. plastic bags, Styrofoam). Pressure: medium; Threat: medium F23 Industrial or commercial activities and structures generating marine macro- and micro-particulate pollution (e.g. plastic bags, Styrofoam). Pressure: medium; Threat: medium but not going to JNCC Marine macro-pollution (e.g. plastic bags, lost and discarded fishing gear and other anthropogenically derived debris) is often found in depositional areas and on strandlines. There is an increasing trend in marine litter on Welsh beaches (Nelms et al., 2017). (MCS BeachWatch Wales Data 1996-2012.xls), which is directly relevant to intertidal mudflats and sandflats. In general, the key physical impact of litter is likely to be linked to ingestion of plastic. Several invertebrate and fish species have been shown to ingest plastic in field and laboratory experiments. Negative (and some negligible) impacts of ingestion of plastic have been observed on marine species but the research on the impacts of litter in the marine environment is in its infancy and impacts are poorly understood (Bergmann et al., 2015; Gall & Thompson, 2015; Galloway & Lewis, 2016). Further assessment of the impacts is required to aid understanding of the extent and the likely impact of litter on the function of infaunal communities and recommendations of any appropriate management action. Monitoring, reporting and method development under MSFD and OSPAR will help increase knowledge and confidence in the future. D05 Development and operation of energy production plants (including bioenergy plants, fossil and nuclear energy plants). Pressure: medium; Threat: medium Extent of effects in intertidal sediments is considered relatively localised. Thermal impacts from the discharged cooling water at Pembroke Power station are being monitored. Other than direct localised impacts around the point of discharge, there is at present no evidence of significant thermal impacts from this source. There is no evidence for effects on mortality and reduced survival of typical species, such as larval and juvenile vertebrates and invertebrates through their impingement and entrainment; biocide or heated water. F20 Residential or recreational activities and structures generating marine pollution (excl. marine macro- and micro-particular pollution. Pressure: low; Threat: low Discharges associated with population centres (sewage) as well as industrial areas. Available nutrient levels, contaminants in sediments and/or poor water quality is present in several locations (e.g. Milford Haven Waterway, Carmarthen Bay, Swansea Bay). Below 'Good' WFD water body assessments tend to reflect this. I02 Other invasive alien species (other than species of Union concern). Pressure: Low; Threat: medium Species of significance include Crepidula fornicata, Magallana (Crassostrea) gigas and Sargassum muticum (Bohn, 2014). Modification of habitat and associated community is observable in areas of high density (particularly Milford Haven Waterway). Presence of C. fornicata is currently limited to the south and south west coast of Wales. S. muticum forms a complete zone in the lower intertidal in some locations (Menai Strait). Milford Haven is a hot spot, with a high UK diversity of non-natives being present (Mieszkowska, 2011). F06 Development and maintenance of beach areas for tourism and recreation incl. beach nourishment and beach cleaning. Pressure: Low; Threat: medium Localised development and maintenance of beach areas at resorts in north and south Wales, with much more widespread littering from recreational activities. Some beaches remain open to access by tourist motor vehicles, resulting in compaction and possible changes sediment drainage. N04 Sea-level and wave exposure changes due to climate change. Pressure, low; Threat, medium As a consequence of climate change: Changes in abiotic conditions, including sea level rise and wave climate are likely to cause the greatest changes in IM&S morphology and dynamism. Natural patterns of erosion and accretion

mean that net losses and gains in the extent of this feature can be difficult to quantify. Many of the Welsh estuaries are infilling with sediment allowing for expansion of the saltmarsh at the expense of intertidal sand and mud. However, losses due to coastal squeeze where habitats are caught between rising sea-levels and fixed defences, are predicted by the Shoreline Management Plans (SMPs) (Atkins 2010, Halcrow 2012(a), Halcrow 2012(b), Royal Haskoning 2012) and Jones et al (2011). Within the first epoch (2005 to 2025) the SMPs estimate that 331 ha* of intertidal habitat (including saltmarsh) is predicted to be lost from the SACs within or partially within Wales. The figure for predicted losses for intertidal habitats has not been adjusted for estuary infilling or morphological response to sea level rise and in that context, is seen as a worst-case scenario. Actual losses for this feature within the period of the short-term trend are likely to be relatively low. The National Habitat Creation Programme (NHCP) has been set up to create compensation habitat to offset intertidal habitat loss due to coastal squeeze caused by coastal defences owned and maintained by Risk Management Authorities in Wales (which includes NRW and Local Authorities). So far, one realignment site has been established as part of this programme with the aim of creating approximately 39 ha of intertidal habitat, (although the majority of this is expected to develop into saltmarsh). However, this site is still developing and the new features are not yet attributable to Natura 2000 features. Other potential realignment sites around Wales are being progressed. Therefore, the short-term trend in area is likely to be declining due to sea level rise offset and infilling of estuaries, forming into saltmarsh. There is, however, a lack of evidence to confirm this, therefore the direction is listed as uncertain. *This figure has been arrived at from the predicted losses set out in the Annexes for the four SMPs which partially or wholly cover Wales. The highest losses predicted are from within the Severn Estuary where 679 ha are predicted to be lost within the first epoch, however only approximately a third of this is from within Wales and the overall figure above has been adjusted to reflect this. No loss is predicted for the Dee which is a cross boarder site for the first epoch. Temperature changes, flooding and increased precipitation (increasing runoff from land) and changes in acidity due to climate change do not currently have a known effect on the feature. Thermal effects of climate change (N01) are likely to act in combination, with and exacerbate, localised temperature changes associated with current and future power stations (Wylfa Newydd) due to power station cooling water. H08 Other human intrusions and disturbance not mentioned above. Pressure: Low; Threat: medium but not going to JNCC In some areas the level of dumped construction materials on some shores is significantly changing the nature of the shore. This includes material lost from failed coastal defences (e.g. gabion baskets) as well as multiple small illegal placement of boulders and waste material. As an unregulated and largely unrecorded activity this is a significant threat to the feature, especially when associated with coastal squeeze from sea level rise. G16 Marine aquaculture generating marine pollution. Pressure: low; Threat: medium but not going to JNCC Increased siltation and turbidity arising from marine aquaculture - mussel growing in the Menai Strait, as well as some loss of IM&SF feature beneath laid mussels. Whilst the mussel lay is not a permanent change in habitats, the lays have now existed for over 15 years and as such, the intertidal mudflat and sandflat feature has not existed in that location during that time. The Welsh Government's future vision, through the Wales Marine Plan for expansion of shellfisheries across Wales will have appropriate safeguards within Protected Sites, to protect the features. Where Regulating and Several Orders are applied for, this provides some safeguards to protect Annex I habitats outside of SACs, although these orders are not compulsory, leaving features under these circumstances under potential threat. F21 Industrial or commercial activities and structures generating marine pollution (excluding marine macro- and micro-particulate pollution. Pressure: low; Threat: low Open coast areas are relatively unpolluted, but several estuaries and bays adjacent to large catchments have raised levels of nutrients and contaminants. Nutrients are largely diffuse input from agriculture etc. but also storm water overflow

and STW discharges. Contaminant inputs are from diffuse (urban and industrial run off) as well as point source industrial discharges. Sediments adjacent to capped landfill discharge in Milford Haven Waterway have significantly raised contaminant levels (PAH & metals). Contaminant levels are greatest where industry is associated in an adjacent catchment e.g. Milford Haven Waterway, Holyhead Harbour. Groundwater contamination from the oil industry (and historical hydrocarbon infrastructure) is present in some limited areas (e.g. Milford Haven Waterway), typically related to infrastructure failures, accidents and historical war-time events. Pollution to groundwater also contributes to diffuse nutrient input (NRW 2014). There is pressure from chronic input of hydrocarbons in port and recreational harbour areas, especially Milford Haven Waterway, though indications are that hydrocarbon contaminant loads there are decreasing (Little, 2009). Bioaccumulation of contaminants indicates some levels high enough to cause adverse effects to biota (Langston et al., 2011). E03 Shipping lanes, ferry lanes and anchorage infrastructure (e.g. canalisation, dredging) Pressure: low; Threat: low As a consequence of low levels of effects of: -navigational and development related dredging (Milford Haven Waterway); -land claim associated with marinas (consented), harbour projects, slipways, coastal defences and -sea walls and significant jetty and harbour wall constructions. F34 Abstractions of ground and surface waters (including marine) for commercial/industrial use (excluding energy) Pressure: low; Threat: low Reduced flows in rivers result in low flow rates in estuaries and potentially higher concentrations of pollutants from water treatment sites. E02 Shipping lanes and ferry lanes transport operations (associated litter, fly tipping). Pressure: Low; Threat: Low Milford Haven Waterway supports one of the UK's biggest ports. Investment in port infrastructure generates frequent plans that have had consequences for the ria. Significant amounts of large vessel anchoring and dredging potentially impact intertidal sediments through siltation and turbidity effects. Further work is required to identify links between silt levels and the various shipping activities. Pressure from occasional spills (e.g. Sea Empress) and continued presence and reworking of historic oil. TBT levels are reducing but pressure from use of antifoulants on recreational boats and commercial shipping is still present. J03 Mixed source air pollution, air-borne pollutants. Threat, Low Nitrogen input is particularly cumulative in areas with existing high nitrogen loads such as the Milford Haven, where there are inputs from LNG plants and the power station as well as water borne oxides of nitrogen. Small amounts of other air born pollutants are likely to be derived from other industries across Wales. I03 Plant and animal pathogens and pests. Pressure, low; Threat, low Grid based monitoring of shellfish populations of estuary sediment flats important for SPA bird features (Burry Inlet, Three Rivers) previously showed a significant decline in cockle populations and cockle population dynamics parameters (population size structure, wet and dry weight). This has been attributed to mass mortality events, precise cause undetermined, but likely related to parasite load. Recent improvements in abundance have not reinstated previous levels, (Moore, 2009a,b, Moore, 2012). Monitoring of mussel populations (bed area, density, wet & dry weight) shows an increasing trend in most parameters (Moore, 2012). C15 Mining and extraction activities not referred to above Pressure: low; Threat: low Waste water from mines in mid Wales has resulted in sediments in and adjacent to these catchments having raised heavy metals. Estuary sediments particularly hold a legacy of heavy metals which are a threat to water and surface sediment quality, should it be disturbed in the future (including from river spate and changing river channels).

8.5 List of main conservation measures	CJ01 Reduce impact of mixed source pollution Implementation and enforcement of water quality regulation (both marine and freshwater) is ongoing work and is making gains in improving water quality. Management of the wider countryside including the implementation of the River Basin Management Plans by NRW and EA (cross boarder catchments) is also contributing to improvements (NRW 2015). Shared multi-agency pollution response plans to deal with major incidences are in place and are regularly updated. Remediation work continues for capturing mine water and removing heavy metal contaminants (Jarvis et al., 2014). Diffuse Water Pollution Thematic Action Plan (TAP) (see below) Marine Litter TAP (see below) CF02 Habitat restoration of areas impacted by residential, commercial, industrial and recreational infrastructures, operations and activities The National Habitat Creation Program has been put in place by the Welsh Government to identify and progress opportunities for managed retreat of the coastal line, in order to mitigate losses of intertidal habitats as a result of man-made constraints where Hold-The-Line policies of the Shoreline Management Plan have been maintained. General regulatory framework for assessment of environmental impacts prior to development, plans and projects. 79% of Wales' 'mudflats and sandflats not covered by seawater at low tide' is an Annex I feature that is protected by Welsh SACs and is an Annex I feature. Local authority byelaws restricting use of vehicles on the shore. Voluntary management measures were implemented on the Gann flats but were not successful. As a result, a byelaw is being developed in an attempt to reduce the impact of bait digging at this location. Invasive Species and Pathogens TAP (see below) Flood and Coastal Erosion Risk Management TAP (see below) CF07 Reduce/eliminate marine pollution from industrial, commercial, residential and recreational areas and activities Implementation and enforcement of water quality regulation (both marine and freshwater) is ongoing work and is making gains in improving water quality. Management of the wider countryside including the implementation of the River Basin Management Plans by NRW and EA (cross boarder catchments) is also contributing to improvements (NRW 2015). Shared multi-agency pollution response plans to deal with major incidences are in place and are regularly updated. Diffuse Water Pollution TAP (see below) Marine Litter TAP (see below) CF10 Manage changes in hydrological and coastal systems and regimes for construction and development Compensation for the loss of intertidal habitats as a result of coastal squeeze caused by flood and coastal erosion schemes is delivered through the National Habitat Creation Project (NHCP). This is in response to the Welsh Government's statutory obligation for compensatory measures under Article 6(4) of the Habitats Directive, relating to offsetting the impacts of coastal squeeze on Natura 2000 sites. Within the NRW Actions database 185 actions were listed relating to coastal squeeze, 49 of these were under control and 61 complete. The Pen Llyn a'r Sarnau SAC has an objective to restore the 'Estuaries' feature (of which Intertidal Mudflats and Sandflats are a component habitat) where the structure and functions of the estuaries that have been damaged/degraded by the constraints of artificial structures such as flood banks. A reduction in the artificial constraints (such as flood banks) on the tidal limits within the estuaries would provide the potential to increase and re-establish estuary communities that have been reduced or lost to past interventions in the estuaries and the full range of zones which this feature encompasses. However, there are many barriers to achieving restoration on such as scale. The Shoreline Management Plans (SMP) (Atkins 2010, Halcrow 2012(a), Halcrow 2012(b), Royal Haskoning 2012), which identify the most sustainable approach to managing the flood and coastal erosion risks to the coastline in the short medium and long term have been produced for the whole of the Welsh coast, however, these plans have yet to be fully implemented. (see section 9.1b). CF03 Reduce impact of outdoor sports, leisure and recreational activities General regulatory framework for assessment of environmental impacts prior to development, plans and projects. Local authority byelaws restricting use of vehicles on the shore. Voluntary exclusion zone for bait digging on Gann Flats. CG01 Management of professional/commercial fishing (including shellfish and seaweed harvesting) General

	regulatory framework for assessment of environmental impacts prior to development, plans and projects. Key measures which are in place to mitigate fisheries related pressure and threats identified in this assessment (G01 & G03) are driven by national and European legislation and cover the wider sea area. Management of shellfisheries is, to an increasing degree, taking account of the protected nature of mudflats in SACs. The Welsh National Marine Plan includes sustainable blue Growth - aquaculture, in Strategic Resource Areas, this will ensure that aquaculture will be managed sustainably to avoid impacts from infrastructure, intertidal assets and access to sites. The Marine Strategy Framework Directive (MSFD) 2009 aims to achieve Good Environmental Status (GES) of the EU's marine waters by 2020. The MSFD has 11 descriptors, one of which is Commercial fisheries (D3) (target = Populations of all commercially exploited fish and shellfish are within safe biological limits, exhibiting a population age and size distribution that is indicative of a healthy stock), other descriptors also have relevance for marine fisheries including Biodiversity (D1), Food webs (D4) and Seafloor integrity (D6). The aim of the Marine and Coastal Access Act (MCAA) 2009 is to improve management and protection of the UK marine and coastal environment. It has eight key elements, including fisheries management and marine enforcement. The legislation allowed Welsh Government (WG) to rationalise the management of marine fisheries in Wales by transferring functions of the two Sea Fisheries Committees and the Marine Fisheries Agency (MFA) to the Welsh Government. It also expanded the remit of marine fisheries management organisations to conserve marine ecosystems. Voluntary management measures were implemented at the Gann Flats to manage the intensity of bait digging, but these were not successful. As a result, a byelaw is being developed in an attempt to reduce the impact of bait digging at this location. Minimum size for shellfish collecting: - Byelaws of the former north Western and north Wales sea fisheries committee and south Wales SFC; Welsh Government Statutory Instrument. Introduction of The Scallop Fishing (Wales) (No.2) Order 2010 that prohibits scallop dredging in Welsh SACs (except parts of Cardigan Bay) and near shore waters (1 nm or 3 nm). Marine Fisheries TAP (see below) CF08 Reduce/eliminate marine contamination with litter Some steps have been made towards controlling the use of single use plastics. The Single Use Carrier Bags Charge (Wales) Regulations 2010 (http://www.legislation.gov.uk/wsi/2010/2880/contents/made) came into force on the 1 October 2011 and brought into effect a charge of 5p for all single use plastic bags. Environmental Protection (Microbeads) (Wales) Regulations 2018 was voted on and passed by the Welsh Assembly in June 2018 (http://www.assembly.wales/laid documents/sub-ld11558-em/sub-ld11558-em-e.pdf) - the actual legislation is not yet published, but the Explanatory Memorandum was prepared by the Department for Economy, Skills and Natural Resources and laid before the National Assembly for Wales on the 18th May 2018. Future legislation: the EU is looking to create a Directive on single use plastics: http://ec.europa.eu/environment/circular-economy/pdf/single-use_plastics_proposal.pdf. The European Commission (EC) has proposed a full ban on some of the most commonly used and littered disposable plastic products in Europe. The draft \Single-Use Plastics Directive\, announced on Monday (28 May), proposes measures covering a range of items which constitute the most common sources of marine litter in Europe, including 10 single-use plastic products.
11.1 Surface area of the habitat type inside the pSCIs, SCIs and SACs network	Figure derived from NRW ArcMap mapping of the feature (NRW_Art_17 _mudflat_sandflat_condition_2018)
11.4 Short term trend of habitat area in good condition within the network; Direction	Changes in extent varies according to the N2K site, such that overall, it is unclear what the trajectory is.