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:

H1150 - Coastal lagoons

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	**1150 - Coastal lagoons**

2. Maps

2.1 Year or period	
2.3 Distribution map	Yes
2.3 Distribution map Method used	
2.4 Additional maps	No

BIOGEOGRAPHICAL LEVEL

3. Biogeographical and marine regions

3.1 Biogeographical or marine region where the habitat occurs	**Atlantic (ATL)**
3.2 Sources of information	Anderson, M. & Thompson, A. 2004. Multivariate control charts for ecological and environmental monitoring. Ecological Applications, 14(6), 1921-1935. Article 17 supporting documentation Wales. 2013. Supporting documentation for the Third Report by the United Kingdom under Article 17. http://jncc.defra.gov.uk/pdf/Article17Consult_20131010/H1150_WALES.pdf Bamber, R.N. 2004. Temporal variation and monitoring of important lagoonal communities and species in Wales. Bangor, CCW Marine Monitoring Report No: 12. 42pp Bamber, R.N., Evans, N. J. & Whittall, A. 2000. Survey of potential coastal saline lagoons and pools in Wales, December 1998. CCW Contract Science Report No: 377 Bamber, R.N., Evans, N. J., Sanderson, W.G. & Whittall, A. 2001. Coastal saline lagoons and pools in Wales: review and proposals. CCW Contract Science Report No: 464 Bergmann, M., Gutow L., & Klages M. 2015. Marine Anthropogenic Litter. https://link.springer.com/content/pdf/10.1007%2F978-3-319-16510-3.pdf CCW. 2008. Core Management Plan Including Conservation Objectives. FOR Ynys Feurig, Cemlyn Bay and The Skerries SPA, Cemlyn Bay SAC, Ynys Feurig SSSI, The Skerries SSSI and Cemlyn Bay SSSI. Edwards, P. 2005. An assessment of the eutrophication risks and impacts in the Milford Haven Waterway. Environment Agency Wales. (used to inform Indicative condition assessment) Edwards, P. 2014. Nutrient concentrations in the Milford Haven catchment area. Tech. memo: TMW14-09 Natural Resources Wales. NRW. European Commission descriptor 10 webpage, accessed 2017 http://ec.europa.eu/environment/marine/good-environmental-status/descriptor-10/index_en.htm European Commission. 1992. The Habitats Directive (1992) http://ec.europa.eu/environment/nature/legislation/habitatsdirective/index_en.htm European Commission. 2000. The EU Water Framework Directive http://ec.europa.eu/environment/water/water-framework/index_en.html European Commission. 2008. The Marine Strategy Framework Directive https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32008L0056

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Horizon Nuclear Power. 2018. Wylfa Newydd Project, 6.4.80 ES Volume D - WNDA Development App D12-1 - Coastal Geomorphology Baseline for the Wylfa Newydd Project - 2014
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4. Range

4.1 Surface area (in km²)	0.84	
4.2 Short-term trend Period		
4.3 Short-term trend Direction		
4.4 Short-term trend Magnitude	a) Minimum	b) Maximum
4.5 Short-term trend Method used		
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	Use of different method	
	The change is mainly due to:	Use of different method
4.12 Additional information		

5. Area covered by habitat

5.1 Year or period			
5.2 Surface area (in km²)	a) Minimum 0.84	b) Maximum 0.84	c) Best single value 0.84

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5.3 Type of estimate			
5.4 Surface area Method used			
5.5 Short-term trend Period			
5.6 Short-term trend Direction			
5.7 Short-term trend Magnitude	a) Minimum	b) Maximum	c) Confidence interval
5.8 Short-term trend Method used			
5.9 Long-term trend Period			
5.10 Long-term trend Direction			
5.11 Long-term trend Magnitude	a) Minimum	b) Maximum	c) Confidence interval
5.12 Long-term trend Method used			
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	Use of different method The change is mainly due to: Use of different method		
5.15 Additional information			

6. Structure and functions

6.1 Condition of habitat	a) Area in good condition (km²)	Minimum	0.17	Maximum	0.17
	b) Area in not-good condition (km²)	Minimum	0.3	Maximum	0.3
	c) Area where condition is not known (km²)	Minimum	0.36	Maximum	0.36
6.2 Condition of habitat Method used	Based mainly on extrapolation from a limited amount of data				
6.3 Short-term trend of habitat area in good condition Period	2006-2013				
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	Insufficient or no data available				
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
Agricultural activities generating marine pollution (A28)	H
Residential or recreational activities and structures generating marine macro- and micro- particulate pollution (e.g. plastic bags, Styrofoam) (F22)	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)	M
Other invasive alien species (other then species of Union concern) (I02)	M
Mining and extraction activities not referred to above (C15)	M
Other soil management practices in agriculture (A16)	M

Threat	Ranking
Agricultural activities generating marine pollution (A28)	H
Residential or recreational activities and structures generating marine macro- and micro- particulate pollution (e.g. plastic bags, Styrofoam) (F22)	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)	M
Other invasive alien species (other then species of Union concern) (I02)	M
Sea-level and wave exposure changes due to climate change (N04)	M
Change of habitat location, size, and / or quality due to climate change (N05)	M
Temperature changes (e.g. rise of temperature & extremes) due to climate change (N01)	M
Development and operation of energy production plants (including bioenergy plants, fossil and nuclear energy plants) (D05)	M
Mining and extraction activities not referred to above (C15)	M
Other soil management practices in agriculture (A16)	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, but none yet taken

8.2 Main purpose of the measures taken

8.3 Location of the measures taken

8.4 Response to the measures

8.5 List of main conservation measures

Adapt/manage fossil energy installation, facilities and operation (CC05)

Reduce impact of mixed source pollution (CJ01)	
Reduce/eliminate marine contamination with litter (CF08)	
Management, control or eradication of other invasive alien species (CI03)	
Reduce impact of outdoor sports, leisure and recreational activities (CF03)	
Reduce impact of other specific human actions (CH03)	

8.6 Additional information

9. Future prospects

9.1 Future prospects of parameters	a) Range b) Area c) Structure and functions
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	0.51
	b) Maximum	0.51
	c) Best single value	0.51
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	Insufficient or no data available
11.6 Additional information	

12. Complementary information

12.1 Justification of % thresholds for trends	
12.2 Other relevant information	

Distribution Map

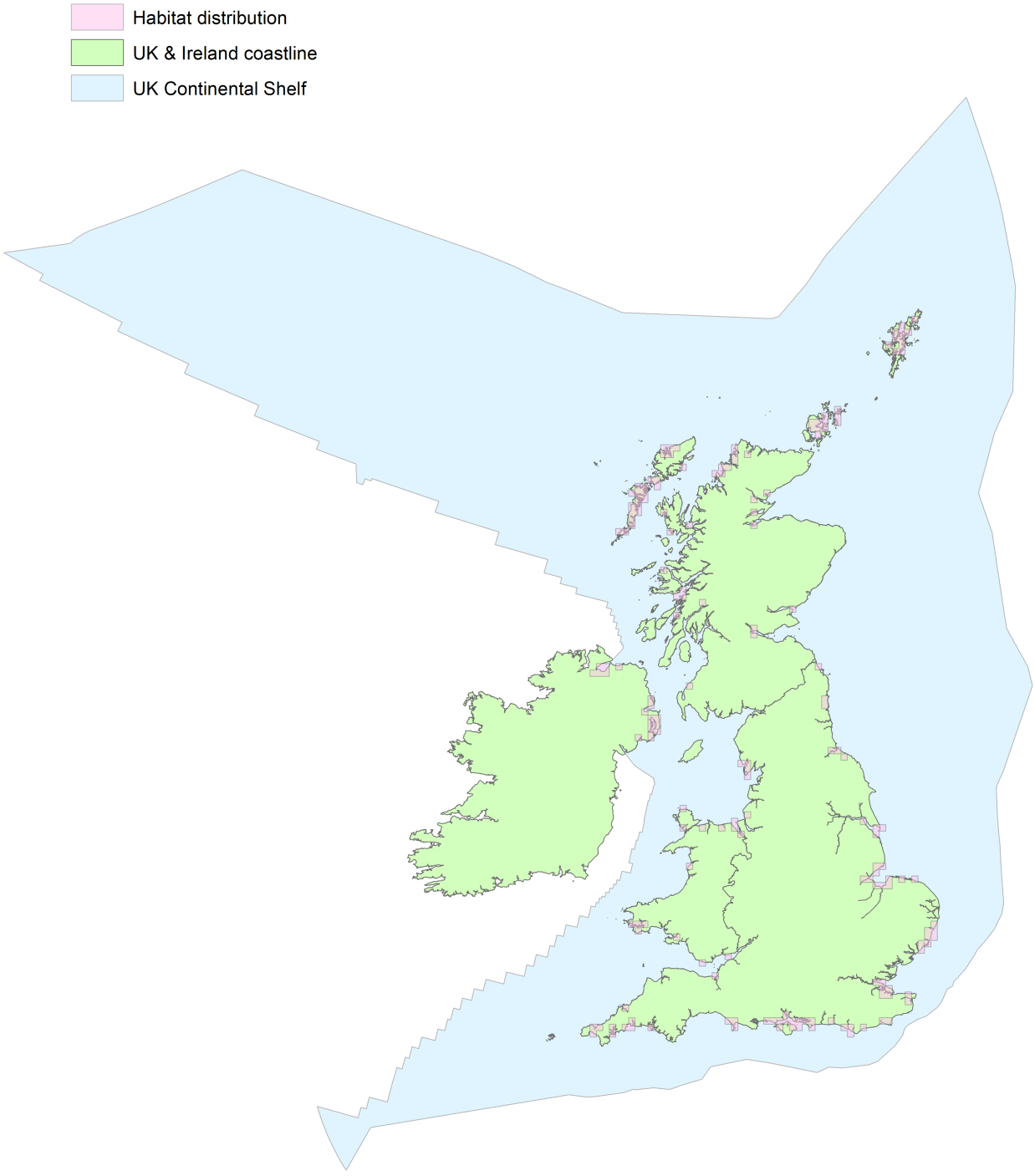

Figure 1: UK distribution map for H1150 - Coastal lagoons.

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

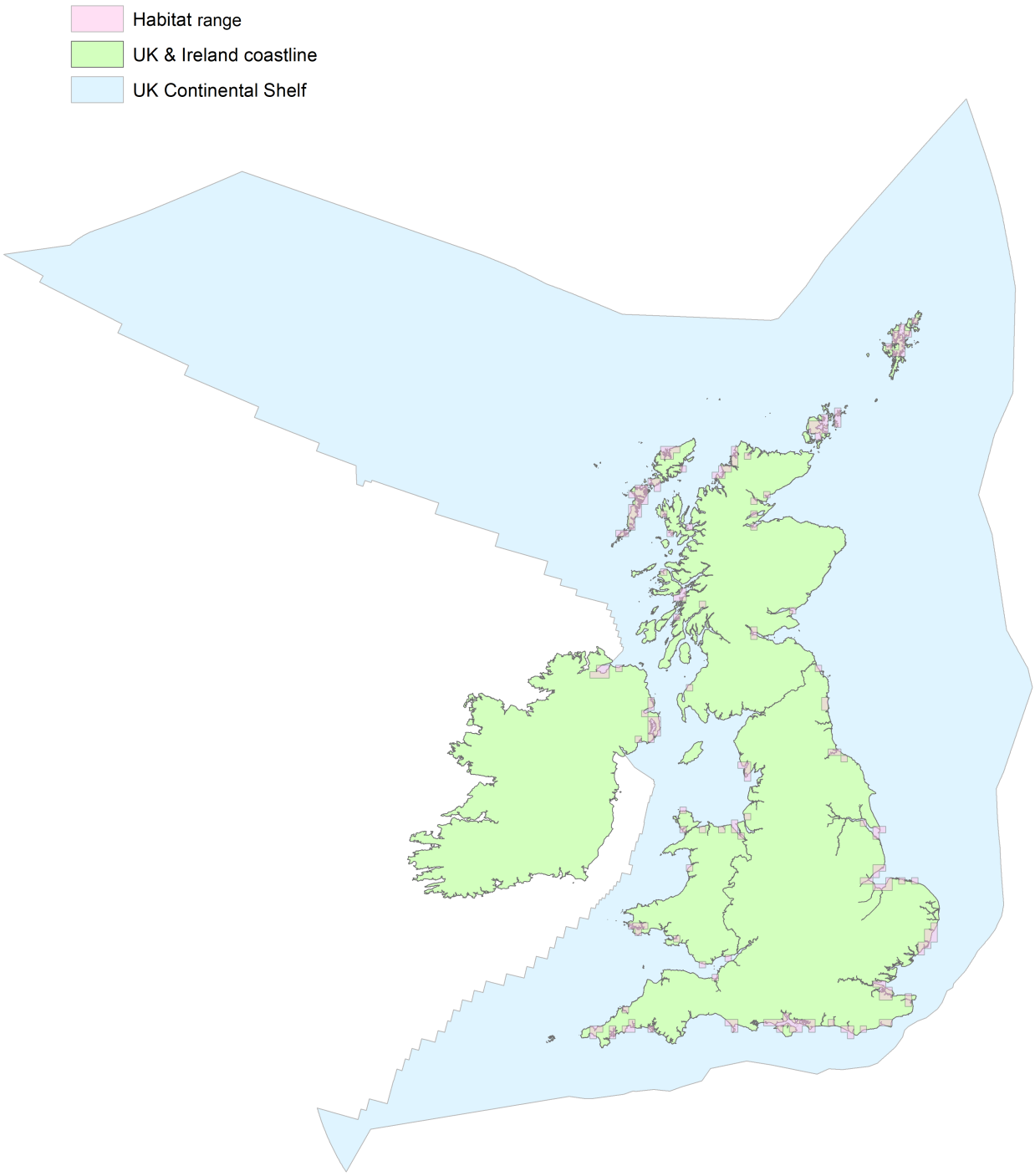

Figure 2: UK range map for H1150 - Coastal lagoons.

The range was considered equivalent to the surface area. Coastal lagoons are physiographic features and so their range is determined primarily by geomorphological and hydrographic processes occurring over long time-scales and is not related to biological communities or processes supported by communities.

Explanatory Notes

Habitat code: 1150 Region code: ATL

Field label	Note
4.3 Short term trend; Direction	The occurrence of this habitat is largely defined by physiographic processes over long timescales. While the physical area of some lagoons may have declined as discussed in section 5, the geographic spread and distribution of features is not thought to have been reduced. Therefore, assumed stable over the past 12 years.
4.11 Change and reason for change in surface area of range	there was a difference in the area calculated by JNCC of 0.01km2. It is assumed this is due to different methods (possibly projection etc). Maps provided are the same as in 2013.
5.6 Short term trend; Direction	Cemlyn Lagoon (20.2% of Welsh lagoon resource): There is some evidence of landward retreat of a shingle bank which provides a barrier between Cemlyn lagoon and the adjacent sea. Pye and Blott, 2016; \The suggestion that the upper part of the beach and shingle ridge has retreated slowly is supported by the fact that the remains of concrete fence posts, erected on the ridge crest during the early Hewitt era in the 1930's, are now visible on the upper beach face slope and outer part of the ridge crest today, suggesting an average retreat of 5 - 10 m over the last 70 years (< 0.1 to 0.2 m / year).\ Based on the 2006 aerial photography and a May 2017 LiDAR survey the change in shingle area caused by the over wash was calculated. The area is approximately 435m2 which equates to a loss of 0.28% of Cemlyn's overall area (K. Pye Pers Comm, 2018). Furthermore, in February 2018 a significant storm event (Storm Emma) occurred which overtopped the Cemlyn lagoon barrier pushing lobes of ridge material back into the lagoon by approximately up to 3m at the western end of the ridge (Wynne, 2018). The latest assessment (NRW, 2018 - Indicative condition assessment) of distribution & extent identified as favourable at this site but highlights risks as mentioned above. However, due to demonstrated loss over time this has been assessed as decreasing. It should be noted that the amount loss is very small relative to the entire lagoon resource.
5.14 Change and reason for change in surface area	there was a difference in the area calculated by JNCC of 0.01km2. It is assumed this is due to different methods (possibly projection etc). Maps provided are the same as in 2013.

6.1 Condition of habitat

The area in good/not good/unknown condition for structure and function of Welsh lagoons was assessed using collated available evidence and conclusions from specific data analysis which were spatially and ecologically relevant to Welsh lagoons. Evidence used included; Water Framework Directive assessments, conclusions of the indicative site level assessments for specific lagoons within Welsh SACs, observations from local conservation officers, casework and presence of litter. Due to the isolated nature of lagoons, the condition of lagoons not specifically indicated in Indicative condition assessments was not extrapolated from monitored sites. Where data or recent evidence were not available, the condition was assessed as 'unknown' (The remaining, unknown, lagoons were mostly originally assessed by Bamber et al [Bamber et al., 2000 & Bamber et al., 2001]). It is assumed that the sites assessed as unknown do not receive lagoon relevant management and are therefore likely to be in worse condition to those managed (i.e. not good). This will be indicated in the 'UK additional question'. High quality annual macrofaunal invertebrate lagoon survey data collected up to 2017 from 5 Welsh lagoons was collected at fixed stations and lagoons were randomly sampled using a sweep net, however due to resource restrictions recent data (from 2014) has not been analysed in detail. This data analysis would have increased confidence in this assessment. Future site level assessments should include assessment of this data. Indicative Condition Assessment: Indicative condition assessments used existing readily available data to assess indicative condition of lagoon habitats within SACs around Wales. Information was collated and assessed at an organisation-wide workshop held with NRW's specialists. By using the evidence available at the workshop and applying expert judgement, staff examined each feature for each Special Area of Conservation (SAC) and drew indicative conclusions on condition. Where indicative condition assessments indicated that either structure and function and/or typical species of lagoons were in unfavourable condition, the structure and function of assessed lagoons, which are features of SACs, were assessed to be overall Unfavourable (equating to 'Not Good'). NRW monitors 5 lagoons annually (Carew Castle Moat, Neyland Weir Pool, Pickleridge lagoon, Morfa Gwyllt Spit lagoon and Cemlyn lagoon). The data for these lagoons were assessed in indicative condition assessments along with other available evidence. Group inferences were made from patterns in observed in data which indicated likely condition. Each component of the indicative condition assessment had an associated confidence level with an agreed overall confidence level for the assessment based on agreed rules. The assessments went through an external quality assurance and were then collated into site level reports. Data assessed in indicative condition assessments included records up to 2013 (NRW, 2018a). Water Framework Directive Monitoring: Where a lagoon was wholly or partially encompassed within a WFD water body, the WFD assessments for that water body were incorporated into the lagoon's assessment using a relevant ecological element. Generally, this information was used as supplementary information to more site-specific observations. However, there is one site where only WFD assessment was used for assessment (Point of Ayr Colliery), this assessment was associated with low confidence (more detail below). The only lagoon in a WFD waterbody in Good Ecological Status was Cemlyn lagoon, this was based on habitats directive monitoring data and expert judgement and therefore added no more additional information. There are only 2 WFD designated 'Lagoon' waterbodies in Wales (Pickleridge and Cemlyn Lagoon) (WFD waterbody classification, 2015). Casework and observations: Structured interviews with conservation officers were undertaken in 2018 to assess current status of lagoons from observations and casework. Information was noted, and conclusions were drawn in combination with other assessment information. Litter: Artificial material (usually reported as 'plastic', 'metal' or 'glass') from anthropogenic origin were recorded at all lagoons surveyed in 2017 by NRW. All items were identified post sieving (over 0.5mm sieve). Plastic was by far the most commonly recorded litter item (in terms of abundance). The number of particles of plastic ranged from 0 - 64 per sample (sample area varied from 0.025 - 0.0044m2) or an average of 0 - 14.2 items per sample. The

mass of the litter is unclear at all lagoons. In general, the key physical impact of litter on species associated with lagoons is likely to be linked to ingestion of plastic. Several invertebrate species in relevant taxonomic groups to the species associated lagoons 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 currently poorly understood (Bergmann et al., 2015). Further assessment of the impacts is required to aid understanding of the extent and the likely impact of litter on the function of communities associated with lagoons (and other protected marine habitats) to recommend any appropriate management action. Further assessment of thresholds in relation to condition of marine habitats will be considered in the future. Monitoring, reporting and method development under MSFD and OSPAR will help increase knowledge and confidence over the coming years. Due to the high proportion of samples where litter has been recorded as present, evidence of ingestion of many related taxa and demonstrated impact on some studied marine taxa, there is cause for concern. Therefore, where a high proportion of samples contained litter (recorded present) this was considered at the associated lagoon. Due to the lack of understanding of the extent of litter, the potential for sample contamination and the uncertainty of ecological impact of the litter at lagoons low confidence was associated with this assessment and this was not used alone for the calculation of condition area. Lagoon Environmental Variation: The temperature, salinity and depth in the lagoons have been systematically recorded with data recorders since 2006. This has provided an enormous wealth of data, upon which, contextual information can be drawn should there be changes in the recorded biological data. Some of the lagoons water inputs are managed, such as Cemlyn via its weir. The data loggers enable the physical effects of the management to be observed and adjusted if necessary. The data loggers have also provided a greater understanding of the lagoons and the conditions they experience, which influences the fauna and flora which inhabit them. No lagoon is the same but may be broadly similar depending on the lagoon type (i.e. percolation). Cemlyn and Morfa Gwyllt lagoons have similar average monthly temperatures. Cemlyn's temperature ranges between 3.3 degree C in the winter and 20.4 degree C in the summer. Morfa Gwyllt is similar and ranges between 4.2 degree C in the winter and 21.2 degree C in the summer. Pickleridge lagoon is slightly warmer ranging from between an average of 6.0 degree C in the winter and 21.8 degree C in the summer. Extreme temperatures events are also recorded and defined as those less than 2 degree C or greater than 25 degree C. This has been based on observations of the natural variability in the data. Morfa Gwyllt has the most consistently variable temperatures, experiencing the most frequent (370) extreme temperature events, probably due to low flushing rates and relatively small size. Conversely, Cemlyn tends to experience colder extremes at a less frequent rate (221 extreme events). Pickleridge experienced only 22 extreme temperature events and is by far the most stable lagoon with respect to temperature. Extreme low salinity events are recorded as days when salinity falls below 8ppt. Again, Pickleridge has the fewest low salinity events with just 24 events recorded since 2007. Cemlyn has 218 events and Morfa Gwyllt has 441 events. Extreme high salinity events are days when the salinity average exceeds 28ppt. Cemlyn and Pickleridge have a similar number of events, occurring 1461 and 1388 times respectively over the survey period. In contrast to this Morfa Gwyllt has not had any events and only occasionally exceeds 25ppt. The conditions found in each lagoon are unique. There are no apparent trends, in the conditions recorded although there are yearly fluctuations which are dependent upon the weather experienced. Summary of lagoon condition (where recently assessed): Cemlyn SAC Cemlyn Lagoon (20.2% of national resource; 0.1689km2 Good): Cemlyn lagoon currently meets minimum requirements for favourable condition (3 of 4 specialist species present [Core Management Plan; CCW, 2008]). The most recent indicative condition assessment (NRW, 2018f) concluded that typical species were unfavourable (overall unfavourable

with high confidence), since this assessment, along with other recently recorded lagoon specialist species (Ecrobia ventrosa & Idotea chelipes), Conopeum seurati has been recently recorded (NRW net sweeps monitoring data, 2014), therefore 3 of 4 named lagoon specialists have recently been confirmed present at the lagoon which changes the condition to favourable based on this conservation objective (NRW net sweeps monitoring data, 2014 & CCW, 2008). Overall the salinity regime at Cemlyn is assessed to be satisfactory. However, during the spring/summer management of water levels, changes in the salinity of the lagoon can be seen in the recorded logger data. The limitation of seawater flowing into the lagoon reduces the frequency of high saline events. The overall effect of this is unknown. Litter (mainly plastic) was present at all three infauna and sediment monitoring stations at Cemlyn Lagoon. Litter was more common at station 1 (average of 10 items of plastic per 0.025m2) than the other 2 stations (2 & 3) (average between 0.25 - 1 per 0.025m2) in recent survey (2017) which is of concern. Dee SAC Point of Ayr Colliery (1.5% of national resource; 0.0122km2 Not Good): The WFD assessment of the surrounding waterbody was less than good due to high levels of DIN with phytoplankton blooms and elevated levels of Mercury and Its Compounds and Brominated diphenylether (BDPE) (WFD waterbody classification, 2015). This lagoon is not specifically monitored by NRW. Low confidence is associated with this assessment as the specific location of the sampling points contributing to the assessment have not been reviewed due to lack of time. Pembrokeshire SAC (indicative condition assessment: Structure and Function Unfavourable and Typical Species Unfavourable; High confidence) (NRW, 2018d) Carew Castle Moat (9.5% of national resource; 0.0795km2 Not Good): Pressures observed at the lagoon are thought to be having an impact because they cumulatively reduce water level, effect salinity and water quality which is assumed to have impact on communities present. Pressures include; quarry discharge causing hydrological discontinuity, the lagoon appears to be silting up and although some repairs have been undertaken by the Pembrokeshire National Park Authority, some repairs required on retaining wall and local water pollution issues have been observed (NRW meeting minutes 22.03.2018). WFD assessment less than good due to high levels of DIN with phytoplankton blooms and elevated levels of Tributyltin Compounds and Mercury and Its Compounds, Brominated diphenylether (BDPE) in surrounding waterbody (Milford Haven Inner Waterbody) (WFD waterbody classification, 2015). Litter (mainly plastic in terms of abundance) relatively homogeneous across 3 annual infauna monitoring stations; the average number of plastic particles (unknown size) were between 6.4 - 8.8 (per 0.025m2) in recent survey (2017) which is of concern. Pembroke Castle Pond (4.3% of national resource; 0.0359km2 Not Good): WFD assessment less than good due to high levels of DIN with phytoplankton blooms in surrounding waterbody (WFD waterbody classification, 2015). There have been observations of green algae growth indicating high levels of nutrients and the lagoon has been observed to be emptied for days at a time, suggesting that management is not appropriate to keep conditions required for lagoon specialist species (NRW meeting minutes 22.03.2018). Neyland Weir Pool (13.1% of national resource; 0.1097km2 Not Good): There are high levels of nutrients in the feeder streams (Edwards, 2014). WFD assessment less than good due to high levels of DIN with phytoplankton blooms and elevated levels of Tributyltin Compounds and Mercury and Its Compounds, Brominated diphenylether (BDPE) in surrounding waterbody (Milford Haven Inner Waterbody) (WFD waterbody classification, 2015). Plastic litter was sampled at all 3 monitoring stations; the average number of recorded litter items was variable (1.4-14.2 per 0.0044m2). Pickleridge lagoon, (7.5% of the national resource; 0.063km2 Not Good) The stream running alongside the lagoon has very high levels of DIN and DIP. The tiny streams running directly into the lagoon are not monitored but observed algal bloom in 2013 and large amounts of green macroalgae suggest there is a nutrient problem (NRW, 2018d). A decline in taxonomic distinctness was observed at one station (NRW, 2018d - typical species unfavourable). Plastic litter was sampled at all 3 monitoring stations; the average number of recorded

	plastic particles was variable (0.6-16.6 particles per 0.0044m2). Pen Llyn a'r Sarnau SAC Morfa Gwyllt Spit lagoon (0.4% of national resource; 0.0037km2 Not Good) Although structure and function was assessed as favourable (Medium confidence) typical species of this lagoon were assessed as unfavourable (high confidence) due to the loss of Conopeum seurati (lagoon specialist species), this is one of very few taxa present (NRW, 2018c). Litter was recorded at 7 of 10 samples; between 1 and 15 plastic particles (per 0.0044m2) were recorded (NRW monitoring data). Larger litter items are frequently noted at the lagoon during site visits (NRW monitoring staff observations). Summary of condition of lagoons not recently monitored (assessed in 2000): Lagoons not mentioned above: Includes; Malltraeth Cob Pool, Connah's Quay, Morfa Madryn pools, Penclawydd North Pool, Rhyl Marine Lake, Aberthaw lagoon, Gwent Levels and Morfa Aber pools. No formal common standards or WFD monitoring has been undertaken at these pools or recent observations made. These lagoons were originally assessed by Bamber et al., (2000 & 2001). The condition of these lagoons is unknown as no recent assessment has been made.
6.2 Condition of habitat; Method used	See 6.1 for additional information.
6.4 Short term trend of habitat area in good condition; Direction	We are currently uncertain of the short-term trend in the area of good condition for this feature. Whilst evidence is available we are unable to assess this field in a meaningful way given current time resources.
6.5 Short term trend of habitat area in good condition; Method used	Whilst evidence is available we are unable to assess this field in a meaningful way given current time resources.

7.1 Characterisation of pressures/ threats	Pressures and threats were identified from indicative condition assessments, scientific literature, the 2013 article 17 report, interviews with casework officers and monitoring data. Pressures and threats ranked based on expert opinion with reference to EU definitions and consideration of internal guidance. Outputs from the Actions Database were not considered relevant for this assessment. The top ten threats were selected based on expert judgement with reference to the likely impacts as detailed below. Pressures: A28 Agricultural activities generating marine pollution (High): Raised levels of nutrients; either measured directly or inferred from high algae growth were key reasons for 5 of 7 monitored/observed lagoons to be in unfavourable condition. The dominant sources of DIN were assessed to be from agricultural losses in the Milford Haven Waterway where many Welsh lagoons are situated. Agricultural land is considered to be the primary source of diffuse pollutants impacting on water quality within waterbodies the related Milford Haven Waterway catchment area (NRW, 2014). The impact on other lagoons is not known, variable confidence is associated with this assessment as the quality of evidence varies with lagoon. F22 Residential or recreational activities and structures generating marine macro- and micro- particulate pollution (e.g. plastic bags, Styrofoam) (High) F23 Industrial or commercial activities and structures generating marine macro- and micro- particulate pollution (e.g. plastic bags, Styrofoam) (High) Note: The source of litter at welsh lagoons is generally unknown this pressure was coded under F22 however F23 may also be relevant, F22 only was used due to high number of pressure and threats. Artificial material (mainly plastic) from anthropogenic origin were recorded at all lagoons surveyed in 2017 by NRW at most monitoring stations, if this is extrapolated out to the whole lagoon the numbers of particles are very large. Furthermore, at Morfa Gwyllt observations of large amounts of marine litter (plastic bags, bottles and containers) were made by NRW staff. This is windblown marine litter (residential and commercial) that collects in the slack (in which the lagoon is situated) behind the cobble sea barrier. It was uncertain whether artificial litter originated from residential (F22) or industrial (F23) sources. Lagoons were assessed to be sinks for litter and therefore may be more vulnerable to litter than other features. Poor knowledge of the material present and little knowledge of its impact on species gives little scope to infer persistence of materials and impact (Bergmann et al., 2015). However, due to the high proportion of samples where litter has been recorded as present at Welsh lagoons, the long-term prevalence of some anthropogenic materials, evidence of ingestion of many related taxa and demonstrated impact on some studied marine taxa, there is cause for concern. Due to the lack of understanding of the extent of litter, the potential for sample contamination and the uncertainty of ecological impact of the litter at lagoons low confidence was associated with this assessment. 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) (Medium): Cemlyn Lagoon's seawater input is managed via a weir. During the spring and summer, the input to the lagoon is limited so that the protected Sandwich Tern nest colony on the islands do not get flooded. Also, at Cemlyn a foot bridge has been built across the creek which is also thought to reduce the flow of seawater to the lagoon. This is also thought to contribute to a reduction in salinity in the lagoon and could be linked to the loss of the lagoon cockle Cerastaderma glaucum which has a preference for higher salinity. Bamber (2004), states that C. glaucum occurs commonly at salinities between 10 and 402030, preferring levels around 352030, but will briefly tolerate a range from 2 to 602030; however, individuals observed in the field at 42030 for over a week were found to be gaping and torpid. This loss could impact the future conservation status of this lagoon. Ranked medium as it is important pressure but impacting a moderate sized area and monitoring data has shown consistent records of lagoon specialists which is an important component of this feature. There is also a complex interplay between the conservation of lagoon specialists and sandwich terns which are both managed at this site. It is appreciated

that there may be no perfect solution. The sluice gate at Carew Lagoon was broken, presumably impacting abiotic conditions for lagoon specialists. This has since been repaired. Repairs are required on the wall which have not been undertaken. The impact of this is unknown. Collapsed retaining wall at Penclawydd North Pool, the impact of this is uncertain. No current management plan to improve this (NRW meeting minutes 22.03.2018). C15 Mining and extraction activities not referred to above (Medium): A quarry upstream of Carew discharges into the lagoon causing hydrological discontinuity. When the quarry gets down to a level there may be an effect on the water level in the lagoon (NRW meeting minutes 22.03.2018). Carew Mill Pond receives a direct dewatering discharge from a quarry that represents > 12% of the average freshwater input but could represent > 81% during low natural flow (Article 17 supporting documentation Wales, 2013). There is concern that this level of input would reduce the salinity of the water in the lagoon. The impact is potentially over a moderate sized area (in relation to Welsh lagoon resource) and the area is of high conservation value due to the presence of lagoon tentacle worm, Alkmaria romijni which is nationally scarce. The last broad scale detailed assessment of the populations of this species at Carew was undertaken in 2006. The current status of this species is not well understood. The recorded abundance of the species at Carew monitoring stations are very variable (2011-2016), preliminary assessment does not indicate a concerning trend or that the latest numbers are below that expected. However, variability in abundance over time was high and there has also been a change in methods at 2 of 3 stations over the time series so confidence in this assessment is low. A16 Other soil management practices in agriculture (Medium): Carew lagoon appears to be silting up, it was assessed that this is likely to be as a result from agricultural practice (NRW meeting minutes 22.03.2018). Ranked medium as impacts are potentially over a moderate area (in relation to Welsh resource) and changes to mud assessed as a threat to Tentacled lagoon-worm, Alkmaria romijni (nationally scarce marine animal) (JNCC website, accessed 2018). The presence of this species is a key reason this lagoon is of conservation interest (Bamber, 2000). The last broad scale detailed assessment of the populations of this species at Carew was undertaken in 2006. The current status of this species is not well understood. The recorded abundance of A. romijni at Carew monitoring stations are very variable (2011-2016), preliminary assessment does not indicate a concerning trend or that the latest numbers are below that expected. However, variability in abundance over time was high and there has also been a change in methods at 2 of 3 stations over the time series so confidence in this assessment is low. I02 Other invasive alien species (other then species of Union concern) (Medium): 1 of 2 species considered non-native were recorded at 2 of 5 monitored Welsh lagoons between 2006-2016. These are the polychaete tube worm, Ficopomatus enigmaticus (recorded only Pickleridge lagoon in relatively high numbers) and mud snail, Potamopyrgus antipodarum (one individual recorded at Carew in 1 of 6 annual surveys). P. antipodarum was assessed to be low or unknown risk whereas F. enigmaticus was assessed medium risk (Welsh Government, 2017). It is noted that the impact of F. enigmaticus on native species is more likely to be beneficial than problematic, however, this may not be considering lagoon habitats (Welsh Government, 2017) and it has also been noted that since it faces little competition in relatively confined waters with variable salinity, it is able to flourish in characteristically highly productive habitats. In the presence of native competitors, abundant populations F. enigmaticus are known to deplete resources from and even replace them (IUCN Global Invasive Species Database, accessed 2018). This species, has been recorded at Pickleridge lagoon and Pembroke castle pond. Assessment of quantitative data collected at Pickleridge show that numbers of this species are very variable, and in some cases relatively high. The impact of non-native taxa on lagoons is currently unknown, preliminary assessment of this species abundance data don't indicate an increasing trend over ten years of monitoring at Pickleridge. Furthermore, this taxon was defined in CSM guidance as a lagoon specialist (\UK population would be

unsustainable without the presence of saline lagoons\). This was based on a criteria of UK population would be unsustainable without the presence of saline lagoons, i.e. >30% of current sites are lagoons at the time of CSM Guidance compilation in 2004. It is uncertain whether this is still the case. In the CSM guidance, the presence of lagoon specialists was generally seen as desirable and presence of non-native species as undesirable (JNCC, 2004). It is uncertain whether the presence of this taxa is desirable or not (presumably not). Ranked medium as ecological/physical impacts not understood but potentially impacting a lagoon of high conservation value covering a moderate area. Threats: A28 Agricultural activities generating marine pollution (High): Raised levels of nutrients; either measured directly or inferred from high levels of algae growth were key reasons for 5 of 7 monitored/observed lagoons to be in unfavourable condition. The dominant sources of DIN were assessed to be from agricultural losses in the Milford Haven Waterway where many Welsh lagoons are situated. Agricultural land is considered to be the primary source of diffuse pollutants impacting on water quality within waterbodies the related to the Milford Haven Waterway catchment area (NRW, 2014). Nutrient rich run-off from agricultural land adjacent to Cemlyn Lagoon has been identified as potential threat (National Trust, 2017). The impact on other lagoons is not known. It is likely that some improvements will be seen over the next two reporting cycles due to planned measures however it is difficult to predict the time scales and success of measures at this point, measures are currently not planned to tackle specific local issues relating to many lagoons (NRW meeting minutes 22.03.2018; Indicative condition assessments & WFD waterbody classification, 2015). F22 Residential or recreational activities and structures generating marine macro- and micro- particulate pollution (e.g. plastic bags, Styrofoam) (High) F23 Industrial or commercial activities and structures generating marine macro- and micro- particulate pollution (e.g. plastic bags, Styrofoam) (High) Note: The source of litter at welsh lagoons is generally unknown this pressure was coded under F22 however F23 may also be relevant, F22 only was used due to high number of pressure and threats. Artificial material (mainly plastic) from anthropogenic origin were recorded at all lagoons surveyed in 2017 by NRW at most monitoring stations. Furthermore, at Morfa Gwyllt observations of large amounts of marine litter (plastic bags, bottles and containers) were made by NRW staff. This is windblown marine litter (residential and commercial) that collects in the slack (in which the lagoon is situated) behind the cobble sea barrier. It was uncertain whether artificial litter originated from residential (F22) or industrial (F23) sources. Poor knowledge of the material present and little knowledge of its impact on species gives limited scope to infer persistence of materials and future impact (Bergmann, 2015). However, due to the high proportion of stations where litter has been recorded as present at Welsh lagoons, the long-term prevalence of some anthropogenic materials, evidence of ingestion of many related taxa and demonstrated impact on some studied marine taxa, there is cause for concern and it is likely that pressure will continue into the near future (Bergmann, 2015). Due to the lack of understanding of the extent of litter, the potential for sample contamination and the uncertainty of ecological impact of the litter at lagoons, low confidence was associated with this assessment. There is uncertainty about the origin of marine litter, therefore both codes have been provided for pressure. However, for threats; there were more medium and high codes identified than that could be sent to JNCC (max 10). Therefore, F22 was removed and F23 included so that I02 could then be included as a medium threat. This was discussed and agreed with L. Molloy at JNCC (received email Thu 26/07/2018 16:35). F22 was included as it was assumed that regulation may reduce litter from industry more effectively than from recreation, however we have no evidence for this, so both codes are probably still relevant. 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) (Medium): Cemlyn lagoon's seawater input is managed via a weir. During the spring and summer, the input to the lagoon is limited so that the protected

Sandwich Tern nest colony on the islands do not get flooded. Also, at Cemlyn a foot bridge has been built across the marine creek which is also thought to reduce the flow of seawater to the lagoon. This is also thought to contribute to a reduction in salinity in the lagoon and could be linked to the loss of the Lagoon Cockle Cerastaderma glaucum which has a preference for higher salinity. Bamber (2004) states that C. glaucum occurs commonly at salinities between 10 and 402030, preferring levels around 352030, but will briefly tolerate a range from 2 to 602030; however, individuals observed in the field at 42030 for over a week were found to be gaping and torpid. The loss of the lagoon cockle could impact the future conservation status of this lagoon. Assessed as a medium rank as it is an important threat but monitoring data has shown consistent records of other lagoon specialists which is an important component of this feature. There is also a complex interplay between the conservation of lagoon specialists and sandwich terns which are both managed at this site. It is appreciated that there may be no perfect solution. Collapsed retaining wall at Penclawydd North Pool, the impact of this is uncertain. No current management plan to improve this (NRW meeting minutes 22.03.2018). D05 Development and operation of energy production plants (including bioenergy plants, fossil and nuclear energy plants) (Medium): Cemlyn lagoon is situated in close proximity to a proposed nuclear power station extension. Associated construction, operation and decommissioning works on land and sea adjacent to the lagoon pose a potential threat. Perceived threats are from; - Increased sedimentation (and associated heavy metals) associated with groundworks, in the lagoon from run-off entering a feeder stream. However, planned work to eliminate this occurring has been proposed that would temporarily re-route the flow away during construction period. Increased sedimentation associated with marine works - turbid seawater may be drawn into the lagoon from Cemlyn Bay, increasing sedimentation affecting the fauna and flora present. - Wave reflection - There will also be some marine structures constructed as part of the Wylfa Newydd development. Modelling predicts that under certain conditions, primarily under north-westerly storm conditions, waves can be reflected off the breakwater back towards the Western part of Cemlyn Bay. The Environmental Statement assesses the impacts on Esgair Gemlyn as negligible during construction, and minor during operation. Therefore, there is some potential for the breakwater to influence the morphology of the shingle ridge fronting the lagoon, particularly at the Western end, but this should be considered in the context of the ridge as a naturally dynamic feature which will be modified under storm conditions even without the breakwater associated with the Wylfa Newydd project. - Temperature increases caused by the thermal plume from cooling water discharge - Warmed water may be drawn into Cemlyn Lagoon from the Bay through the weir which may affect the fauna and flora present. - Water quality related to temporary sewage pipe - In combination effects related to this development The impacts of the Wylfa Newydd Project will be assessed through HRA, and as part of this process, measures to avoid adverse effects on Esgair Gemlyn will be considered (Horizon Nuclear Power 2018; various). Esgair Gemlyn and Cemlyn lagoon will still be subject to the influence of climate change threats described in N01, N02, N03, N04 and N05, and these threats will need to be taken into consideration when determining appropriate mitigation measures in association with the Wylfa Newydd project. The impact severity and likelihood of these threats is currently unclear as the development application is only part way through the consenting process. I02 Other invasive alien species (other then species of Union concern) (Medium): 1 of 2 species considered non-native were recorded at 2 of 5 monitored Welsh lagoons between 2006-2016. These are the polychaete tube worm, Ficopomatus enigmaticus (recorded only Pickleridge lagoon in relatively high numbers) and mud snail, Potamopyrgus antipodarum (one individual recorded at Carew in 1 of 6 annual surveys). P. antipodarum was assessed to be low or unknown risk whereas F. enigmaticus was assessed medium risk (Welsh Government, 2017). It is noted that the impact of F. enigmaticus on native species is more likely to be beneficial than problematic, however, this may not be considering lagoon habitats (Welsh

Government, 2017) and it has also been noted that since it faces little competition in relatively confined waters with variable salinity, it is able to flourish in these characteristically highly productive habitats. In the presence of native competitors, abundant populations F. enigmaticus is known to deplete resources from and even replace them (IUCN Global Invasive Species Database, accessed 2018). This species, has been recorded at Pickleridge lagoon and Pembroke Castle Pond. Assessment of quantitative data collected at Pickleridge indicate that numbers of this species are very variable, and in some cases relatively high. The impact of non-native taxa on lagoons is currently unknown, preliminary assessment of this species abundance data don't indicate an increasing trend over ten years of monitoring at Pickleridge. Furthermore, this taxon was defined in CSM guidance as a lagoon specialist (\UK population would be unsustainable without the presence of saline lagoons\). In the guidance, the presence of lagoon specialists was generally seen as desirable and presence of non-native species as undesirable (JNCC, 2004). It is uncertain whether the presence of this taxa is desirable or not (presumably not). Now F. enigmaticus have colonised lagoons it is likely that they will persist and presumably in some way impact lagoon communities. Further analysis is required to understand the impact of this species at Pickleridge lagoon. Recently Gracilaria vermiculophylla (a highly invasive non-native species) has been recorded in inlets in Dwyryd and Malltraeth waterways. This species has a high tolerance to variable salinity, if this species colonises lagoons there is a potential for high impact on communities present (through displacement, habitat alteration, food availability and abiotic factors such as reducing light, sediment accretion and oxygen availability) (NNSS, 2017). At Cemlyn lagoon proposed development activities (increased shipping, artificial structures and water temperature increases) associated with the Wylfa Newydd may increase the likelihood of introduction and colonisation of non-native species. Continuation of this pressure and introduction of species likely to colonise lagoons is a good indication that invasive non-native species are likely to affect the lagoon feature to some degree in the next two reporting rounds. N04 Sea-level and wave exposure changes due to climate change (Medium): International and local studies have identified Lagoons as being vulnerable to climate change (e.g. Anthony et al., 2009; NRW, 2015 and Jones et al., 2011). Their setting within the coastal landscape leaves them especially vulnerable to profound physical and ecological disturbance from global climate change. Expected shifts in physical and ecological characteristics range from changes in flushing regime, freshwater inputs, and water chemistry to complete inundation and loss and the loss of natural communities (Anthony et al., 2009). Threats were ranked as medium as impacts are most likely to occur in the long term (beyond the next 12 years) but are likely to impact all lagoons in Wales to some degree. The likely impact of various factors modelled to be caused by climate change will vary with lagoon physical and ecological community characteristics. Lagoons are rare in Wales. A vulnerability assessment of Welsh lagoons assessed that lagoons would be very sensitive with high urgency to climate change for the following reasons (Jones et al., 2011): All lagoons are likely to be adversely affected by sea level rise and may cease to be lagoons depending on the rise of water and height of the retaining barrier (N04) (Jones et al., 2011). Mean sea-level rise measured at tide gauges around the UK (1901-present) is estimated at 1.4 +- 0.5 mm per year, which is consistent with the globally averaged figure from tide gauge records (of 1.8 +- 0.5 mm per year). The rate of sea-level increase was greater in the 20th century than the 19th century (MCCIP: Horsburgh & Lowe, 2013). Tillin et al., 2010 assessed lagoons to be highly sensitive to sea-level rise (Pressure benchmark: Increased ASL of 21 cm by 2050 in London). Sea-level increase over the next 12 years is likely to be lower than benchmark levels assessed but probably still of notable concern over the long term, the extent of sea level rise relative to land will depend latitude with more effect seen in south Wales (Teferle et al., 2009). Much of the lagoon resource is in the south of Wales. Specific studies at Cemlyn lagoon (situated on Anglesey, North Wales), which is of high conservation merit (Pye and Blott, 2010; 2016), present sea level change as a threat and predict future issues. At Cemlyn

lagoon, the shingle barrier currently appears to be in no immediate danger of a major breach and over-washing is relatively infrequent. However, the frequency of over-washing appears to have increased since 2000, and a severe event could occur at any time. The rate of retreat indicated by historical maps is low (< 0.2 m / year since the late 19th century). The 2006 aerial photography and May 2017 LiDAR survey was used to calculate the change in shingle area caused by the over wash. The area is approximately 435m2 which equates to a loss of 0.28% of Cemlyn's overall area (K. Pye pers comm, 2018). In February 2018 a significant storm event (Storm Emma) occurred which overtopped the Cemlyn lagoon barrier pushing lobes of ridge material back into the lagoon by approximately up to 3m at the western edge of the ridge (Wynne, 2018) There are no obvious sources of new sediment supply to the barrier and any future acceleration in sea level rise will make it increasingly difficult for the barrier to maintain its relative crest level and an equilibrium cross-sectional profile. The frequency and severity of over-washing are therefore likely to increase, leading to more rapid landward movement of the barrier and adoption of a flatter profile, reducing the extent of the lagoon. Landward extension of shingle is most likely to occur where the barrier crest is currently lowest, close to the artificial islands. An increase in the frequency of barrier over-washing, and higher rates of percolation through the barrier, are likely to raise salinity in the lagoon. Periodic saltwater intrusion into the site from the north, notably Hen Borth, have occurred during past storm events and are likely to increase in future unless remedial measures are taken (Pye and Blott, 2010; 2016). Increases in storminess may further impact the barrier creating the lagoons (N04) (Jones et al., 2011) however natural variability in wave climate is strong and the role of anthropogenic forcing is uncertain. There is, as yet, no consensus on the future storm and wave climate, stemming from diverse projections of future storm track behaviour (MCCIP: Woolf and Wolf, 2013). This makes predictions about future threats in relation to climate change driven storminess difficult. C15 Mining and extraction activities not referred to above (Medium): A quarry upstream of Carew discharges into the lagoon causing hydrological discontinuity. When the quarry gets down to a level there may be an effect on the water level in the lagoon (NRW meeting minutes 22.03.2018). No current management plan to improve this is currently planned (NRW meeting minutes 22.03.2018). Carew Mill Pond receives a direct dewatering discharge from a quarry that represents > 12% of the average freshwater input but could represent > 81% during low natural flow (Article 17 supporting documentation Wales, 2013). There is concern that this level of input would reduce the salinity of the water in the lagoon. The impact is potentially over a moderate sized area (in relation to Welsh lagoon resource) and the area is of high conservation value due to the presence of lagoon tentacle worm, Alkmaria romijni which is nationally scarce. The last broad scale detailed assessment of the populations of this species at Carew was undertaken in 2006. The current status of this species is not well understood. The recorded abundance of the species at Carew monitoring stations are very variable (2011-2016), preliminary assessment does not indicate a concerning trend or that the latest numbers are below that expected. However, variability in abundance over time was high and there has also been a change in methods at 2 of 3 stations over the time series so confidence in this assessment is low. A16 Other soil management practices in agriculture (Medium): Carew lagoon appears to be silting up as a presumed result of increased run off from agricultural practice. There is no known current specific management plan to improve this (NRW meeting minutes 22.03.2018). Ranked medium as impacts are potentially over a moderate area (in relation to Welsh resource) and changes to mud assessed as a threat to Tentacled lagoon-worm, Alkmaria romijni (nationally scarce marine animal) (JNCC website, accessed 2018). The presence of this species is a key reason this lagoon is of conservation interest. The last broad scale detailed assessment of the populations of this species at Carew was undertaken in 2006. The current status of this species is not well understood. The recorded abundance of the species at Carew monitoring stations are very variable (2011-2016), preliminary assessment does not indicate a concerning

	trend or that the latest numbers are below that expected. However, variability in abundance over time was high and there has also been a change in methods at 2 of 3 stations over the time series so confidence in this assessment is low. N05 Change of habitat location, size, and / or quality due to climate change (Medium): International and local studies have identified Lagoons as being vulnerable to climate change (e.g. Anthony et al., 2009; NRW, 2015 and Jones et al., 2011). Their setting within the coastal landscape leaves them especially vulnerable to profound physical and ecological disturbance from global climate change. Expected shifts in physical and ecological characteristics range from changes in flushing regime, freshwater inputs, and water chemistry to complete inundation and loss and the loss of natural communities (Anthony et al., 2009). Threats were ranked as medium as impacts are most likely to occur in the long term (beyond the next 12 years) but are likely to impact all lagoons in Wales to some degree. The likely impact of various factors modelled to be caused by climate change will vary with lagoon physical and ecological community characteristics. Lagoons are rare in Wales. A vulnerability assessment of Welsh lagoons assessed that lagoons would be very sensitive with high urgency to climate change for the following reasons (Jones et al., 2011): It is thought that all threats identified are likely to lead to N05. N01 Temperature changes (e.g. rise of temperature & extremes) due to climate change (Medium): Lagoons were assessed as having medium sensitivity to seawater temperature changes by Tillin et al., (2010) however Jones et al., (2011) state that angiosperms and invertebrate specialists inhabiting lagoons have a high tolerance for increased temperature. A recent study projected increases in sea surface temperature over the long term (2069-89 relative to 1960-89) of over 3 degree C for the Irish and Celtic Seas (Hughes et al., 2017). It is difficult to make predictions on temperature trends over the next two Article 17 reporting cycles (12 years). The shallowest percolation lagoons such as Morfa Gwyllt are the most likely to experience problems because they don't tend to have as much daily tidal exchange of water.
8.1 Status of measures	Some measures have been taken (e.g. restricted access at Morfa Gwyllt, fixing weir at Carew) but the majority of the most important have neither been planned or implemented (I.e. specific mitigation of nutrient pressures, climate change mitigation and resolve specific litter issues). NRW are currently planning to reduce general nutrient levels. However, there is no current plan to resolve lagoon site specific issues. Site specific measures as well as general measures are required.

8.5 List of main conservation measures	CJ01 Reduce impact of mixed source pollution (High): Key measures which are in place to mitigate water quality related pressure and threats identified in this assessment (A28) are driven by European legislation and cover the wider sea area: The Water Framework Directive (WFD) aims to maintain the \high and good status\ of waters where it exists, prevent any deterioration in the existing status of waters and to restore at least \good status\ in relation to all waters. The mechanism by which this is to be achieved under the WFD is through the adoption and implementation of River Basin Management Plans and Programmes of Measures for each of the identified River Basin Districts. The programme of measures will be incorporated in to the delivery plan for updated river basin management plans. The aim is to have the programme of measures operational by December 2018. NRW are reviewing progress currently. Many measures planned aim to deal with issues causing WFD coastal and estuarine waterbody failures for ecological and chemical elements. The Programme of measures delivers many of the statutory requirements for other directives and associated legislations e.g. Marine Strategy Framework Directive, Urban Waste Water Directive, Bathing Waters Directive and Eel Regulations. For example, Welsh Government are currently considering putting in place a Nitrate Vulnerable Zone which will facilitate the reduction of diffuse nutrients entering the lagoons originating from the wider area. Other examples of related measures are the Building Resilience in Catchments Project, Blue Green Algae Group, incident response follow-ups targeting specific diffuse runoff issues and the recruitment of an Agricultural Officer at NRW. This measure is relevant to a large area, it may, potentially, have a big impact. Most of pressures/threats relate to nutrient issues but it was considered that there isn't enough detail in place to use CA13 currently. The likely impact of this measure and timescale is currently unclear, there is low confidence on impact for lagoons feature. CC05 Adapt/manage fossil energy installation, facilities and operation (High): This conservation measure relates to D05. Consents are required to develop power stations and associated cable lines. Developers of nuclear power stations are required to gain approval from the UK government (Nationally Significant Infrastructure Projects - Planning Act 2008). For projects such as these a marine licence is also required (Marine and Coastal Access Act, 2009). The licence application is determined by NRW. Each application requires an Environmental Impact Assessment and Habitats Regulation Assessment (where within or adjacent to a Natura 2000 site). Based on evidence produced any mitigation required is agreed and implemented as appropriate. The inclusion of mitigation in a project proposal or consent reduces the environmental impact, or potential environmental impact, to a level acceptable under the relevant regulatory framework. If there are outstanding unresolved issues then they will be subject to monitoring, mitigation or compensatory measures as appropriate. This measure relates to D05 and was ranked as high because it relates to a moderate area of lagoon with high conservation merit and mitigates potentially severe impacts. From April 2019, the consenting requirements for marine energy generation in Wales will change, as requirements of the Wales Act are implemented. CF08 Reduce/eliminate marine contamination with litter (High): This conservation measure relates to pressure and threat F22 & F23. European policies aim to reduce the effect of marine litter, which has recently been well publicised as an issue. The Marine Strategy Framework Directive (MSFD) (descriptor 10) requires EU Member States to ensure that, by 2020, properties and quantities of marine litter do not cause harm to the coastal and marine environment. Pollution of the seas from plastics and microplastics is one of the three major areas of the Strategy for Plastics, adopted by the European Commission on 16th January 2018; most of the proposed Actions are directly or indirectly related to marine litter, including its international dimension. Initiatives against plastic pollution of the oceans, flowing from the Strategy are (EU descriptor 10 website, accessed 2017): - consideration of measures against Single Use Plastics and fishing gear - assessment of the need to restrict microplastics intentionally used in products - consideration of measures against microplastics generated during the life cycle of products - The 7th Environment Action Programme calls for the development of an EU-wide quantitative

reduction headline target for marine litter, supported by source-based measures and taking into account marine strategies established by Member States. The Circular Economy Package sets a target for reducing by 30% beach litter and list fishing gear until 2020. Actions Identified by the actions database (site level) include: - Direct management is the most frequently identified mechanism for addressing marine litter impacts. This mechanism predominantly refers to action required by Local Authorities (LA) to support and help implement measures to remove litter from beaches (e.g. third-party collections and LA beach cleaning), ensuring that approaches are sensitive to features. - Investigation actions principally relate to improving the evidence base to underpin better management and reduce both sources of marine litter and impacts on features. This includes investigations to develop better understanding of local sources of marine litter and its disposal, and identification or high-risk areas for marine litter. - Targeted education, awareness raising, and liaison actions include, for example, developing opportunities to reduce litter at source (locally), including site level awareness. Example legislation include: - Plastic bags: 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 plastic bags formerly given out for free by retailers. - 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) - Explanatory Memorandum 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. This measure was assessed as high as it has the potential to impact all lagoons (although no specific measures planned yet). CF03 Reduce impact of outdoor sports, leisure and recreational activities (Medium): Since issues (relating to access to Morfa Gwyllt lagoon) were identified in the NRW actions database and the Pen Llyn a'r Sarnau management scheme, Gwynedd Council have installed a robust metal fence and gate preventing easy access to Morfa Gwyllt Lagoon. The gate is locked. This essentially prevents easy access to the site. The only way to access the site is by wading through the river under the bridge or by walking a fair distance along a stony beach (approx. half an hour walk). There have been issues in the past with unidentified members of the public breaking the lock on the gate and breaking the gate itself to gain access to the site. However, this has not occurred in the last 18 months. The lock remains secure. Therefore, there was no need to install any fences or gates at the site (Hargrave, 2018). Identified as medium as it is effective but effects a very small area. CI03 Management, control or eradication of other invasive alien species (Medium): Legislative agreements seek to protect biodiversity, species and habitats, and include provisions requiring measures to prevent the introduction, spread and control of, invasive non-native species, especially those that threaten native or protected species and habitats. The UK is a signatory to the Ballast Water Convention which aims to prevent the spread of harmful aquatic organisms by establishing standards and procedures for the management and control of ships' ballast water and sediments. These include specific ballast water management standards (e.g. concerning the efficacy of water exchange), the requirement for international vessel traffic to manage ballast water and sediments in accordance with vessel-specific ballast water management plans, and for all such vessel to carry a ballast water record book and an international ballast water management certificate. Through its implementation of the Marine Strategy Framework Directive (MSFD), the UK aims to

ensure that INNS introduced by human activities are at levels that do not adversely alter the ecosystems'. The UK's Marine Strategy includes targets to reduce the risk of introduction and spread of non-native species through improved management of high risk pathways and vectors, and for action plans to be developed for key high-risk marine non-indigenous species by 2020. The strategy also sets out indicators for Good Ecological Status (GES) in respect of these INNS targets, and monitoring programmes for measuring progress towards achieving or maintaining GES. In Wales, various statutory and ad-hoc monitoring programmes contribute towards the MSFD INNS evidence baseline. Examples include marine rapid assessment surveys of Welsh marinas carried out in 2011 and 2014. Contingency plans are currently being developed for priority marine INNS species not yet established in Wales. The impacts associated with INNS are also recognised as potentially significant anthropogenic pressures through the UK's approach to implementing the Water Framework Directive. Impacts from invasive non-native species are considered as part of the assessment of the ecological status of water bodies and, in general terms, measures are adopted to improve status and address impacts, on a water body by water body basis, where INNS are implicated in a water body failing to achieve its objectives. At a national level, specific legislation restricts the spread or release of INNS in the wild. Section 14 of the Wildlife and Countryside Act 1981, for example, contains specific provisions relating to the introduction of new species and provides that it is an offence to release or allow to escape into the wild, any animal which is not ordinarily resident in Great Britain, or those listed in Schedule 9. In Wales, anthropogenic activities with the potential to introduce or spread INNS are managed through the implementation of biosecurity risk assessment and management planning under existing regulatory and consenting frameworks. Examples include the marine licensing provisions of the Marine and Coastal Access Act, Habitats Regulations Assessments under the Conservation of Habitats and Species Regulations 2017 and Sites of the Special Scientific Interest (SSSI) consenting procedures under the Wildlife and Countryside Act 1981. Natural Resources Wales and the Welsh Government are standing members of the UK Marine Pathways Group, a coordinated approach to preventing new INNS introductions, early detection and rapid action to prevent the establishment of INNS, and containment and long-term control measures across the UK and Ireland. The Marine Pathways Group, in its earlier project form, produced specific INNS guidance and voluntary best practice for marina operators, boat owners and the aquaculture sector, and led on the identification of locations at high risk of introduction where biosecurity efforts should be focused. Specific Welsh control and eradication projects taken forward under the Marine Pathways banner include The Dee Chinese Mitten Crab Project and determining the extent of Grateloupia turuturu in Wales and feasibility of eradication. CH03 Reduce impact of other specific human actions (Medium): There has been works to infill part of one of Cemlyn lagoon's island to increase the area available for tern breeding habitats, this was mitigated through measures such as creating a temporary gangway to access the island and transfer additional material across. This involved collaboration between NRW staff, the North Wales Wildlife Trust and the land owners (The National Trust). The SSSI consent issued to North Wales Wildlife Trust went through Habitats Regulations Assessment HRA. There are proposals to create further nesting area for tern's in Cemlyn lagoon either by extending the existing island or by creating a new artificial island, mitigation will be implemented to reduce impacts to an acceptable level.

9.1 Future prospects of parameters	9.1a Future prospects of -range. Assumed stable The occurrence of this habitat is largely defined by physiographic processes over long timescales. While the physical area of some lagoons may change (see 9.1b), the geographic spread and distribution of features is not expected to change within the next 12 years. 9.1b Future prospects of -area Lagoons are considerably vulnerable to climate change; if unmanaged this is likely to result in a significant loss over the long-term. It is difficult to assess the timescale of likely loss. Some loss has already been observed at Cemlyn lagoon this is currently modelled to be less than 1% per year. Over the next 12 years loss is expected to continue. It is difficult to predict the rate of loss; however landward movement of the lagoon barrier at Cemlyn has been observed to be increasing. Climate change related impacts are predicted to be likely to affect the area of other lagoons. It is likely that Pickleridge lagoon will experience similar pressures. 9.1c Future prospects of -structure and function Application of expert judgement indicates that the future trend of structure and function is assessed as negative as various pressures have been identified which are likely to remain in the near future. Lagoons have been highlighted as very vulnerable to climate change; it is likely that various physical alterations predicted to be caused by climate change will impact lagoons cumulatively. There is little in the way of current planned local mitigation. However, the effects are likely to be seen over long-time periods which mean that it is possible to adapt and act in the coming years as has been recommended in cited publications (Jones et al., 2011 [section 4.4.5]; National Trust, 2017; Pye & Blott, 2016). High nutrient levels; although there are plans to improve general water quality around Wales through a program of measures, the issues highlighted at lagoons are likely to be mainly related to adjacent locations in addition to background levels. There are currently limited known plans to resolve these issues and therefore they are likely to continue into the near future. Litter; plastic is present at almost all stations recently monitored by NRW within 5 lagoons across Wales. The extent of litter (mainly plastic) and effects of this on functioning of the lagoon communities are not understood but impacts are presumably undesirable and often plastics will remain present for long periods. It is also likely that planned regulation will take some years to become effective. It is possible that maintaining infrastructure at some lagoons may improve functioning which will help achieve FCS. This has been undertaken at some locations but not all. Resolving this may be positive step to improve resilience and functioning of lagoons into the future. Overall, due to the vulnerability of lagoons to climate change, ongoing nutrient issues and presence of litter in lagoons without current measures to mitigate impacts the future prospects of structure and function were assessed as negative.
11.3 Surface area of the habitat type inside the network; Method used	Data sources include combination of Field surveys, OS mastermap and aerial photos
11.4 Short term trend of habitat area in good condition within the network; Direction	We are currently uncertain of the short-term trend in the area of good condition for this feature within SACs. Whilst evidence may be available we are unable to assess this field given current resources.